Table of Contents

List of Figures

List of Figures (Continued)

6.6 Appendix

This appendix contains computer input/output for the analyses presented in Section 6.4.

6.6.1 PWR Fuel Assemblies

This section contains abbreviated output files from the most reactive normal condition and accident condition moderator density variation cases.

Figure 6.6.1-1 CSAS Input/Output for NAC-LWT with PWR Fuel – 3.7% Enrichment – Most Reactive Normal Condition Configuration

```
PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
   MODULE CSAS25   WILL BE CALLED
     LWT ANALYSIS; Exxon 15x15(W) ASSEMBLY;  NO WATER IN GAP
     27GROUPNDF4 LATTICECELL
     UO2  1  0.95 293.0 92235 3.7 92238 96.3 END
     ZR   2  1.0  293.0  END
     H2O   3 1.000 293.0 END
     AL   4  1.0  293.0  END
     SS304 5 1.0  293.0  END
     PB    6 1.0 293.0 END
     H2O   7 1.0 293.0 END
     H2O   8 1.0E-20 293.0 END
     H2O   9 1.0E-20 293.0 END
     END COMP
     SQUAREPITCH  1.4300 0.9056 1 3 1.0770 2 0.9246 9 END
     LWT ANALYSIS; Exxon 15x15(W) ASSEMBLY;  NO WATER IN GAP
     READ PARAM RUN=YES PLT=NO TME=5000 GEN=303 NPG=1000 END PARAM
     READ GEOM
     UNIT  1
     COM='FUEL PIN CELL - WITH H2O'
     CYLINDER  1 1  0.4528   2P182.88
     CYLINDER  9 1  0.4623   2P182.88
     CYLINDER  2 1  0.5385   2P182.88
     CUBOID    3 1  4P0.7150 2P182.88
     UNIT  2
     COM='WATER ROD CELL - WITH H2O'
     CYLINDER  3 1  0.6477   2P182.88
     CYLINDER  2 1  0.6909   2P182.88
     CUBOID    3 1  4P0.7150 2P182.88
     GLOBAL UNIT 9
     ARRAY  1  -10.7250 -10.7250 -182.88
     CUBOID 3 1 4P11.3157 2P182.88
     CYLINDER 4 1 16.891 2P182.88
     CYLINDER 3 1 16.9863 2P182.88
     CYLINDER 5 1 18.8913 2P182.88
     CYLINDER 6 1 33.4963 2P182.88
     CYLINDER 5 1 36.5443 2P182.88
     CYLINDER 7 1 49.2443 2P182.88
     CYLINDER 5 1 49.8539 212.48 -192.16
     CYLINDER 6 1 49.8539 212.48 -199.78
     CYLINDER 5 1 49.8539 212.48 -208.67
     CUBOID 8 1 4P81.0000 243.00 -240.00
     END GEOM
     READ ARRAY
     ARA=1   NUX=15 NUY=15 NUZ=1  FILL
                       30R1
     2R1   2   2R1   2   3R1   2   2R1   2   2R1
                  7R1   2   7R1
             4R1   2   5R1   2   4R1
             2R1   2   9R1   2   2R1
                       15R1
         3R1   2   3R1   2   3R1   2   3R1
                       15R1
             2R1   2   9R1   2   2R1
             4R1   2   5R1   2   4R1
                  7R1   2   7R1
     2R1   2   2R1   2   3P1   2   2R1   2   2R1
                       30R1
     END FILL
     END ARRAY
     READ BOUNDS ZFC=VAC YXF=VAC END BOUNDS
     END DATA

   SECONDARY MODULE 000008   HAS BEEN CALLED.

   MODULE 000008   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     1.32 (SECONDS).

   SECONDARY MODULE 000002   HAS BEEN CALLED.

   MODULE 000002   IS FINISHED. COMPLETION CODE     0. CPU TIME USED    13.68 (SECONDS).

   SECONDARY MODULE 000009   HAS BEEN CALLED.

   MODULE 000009   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   593.36 (SECONDS).

   MODULE CSAS25   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   612.37 (SECONDS).
```

```
CCCCCCCCCCC    SSSSSSSSSSS     AAAAAAAAA     SSSSSSSSSSS     22222222222     5555555555555
CCCCCCCCCCCCC  SSSSSSSSSSSSS   AAAAAAAAAAA   SSSSSSSSSSSSS   2222222222222   5555555555555
CC        CC   SS        SS   AA        AA   SS        SS   22         22   55
CC             SS             AA        AA   SS                        22   55
CC             SS             AA        AA   SS                        22   55
CC             SSSSSSSSSSSS   AAAAAAAAAAAAA  SSSSSSSSSSSS              22    555555555555
CC              SSSSSSSSSSSS  AAAAAAAAAAAAA   SSSSSSSSSSSS           22      5555555555555
CC                       SS   AA        AA             SS         22                  55
CC                       SS   AA        AA             SS       22                    55
CC        CC   SS        SS   AA        AA   SS        SS     22            55        55
CCCCCCCCCCCCC  SSSSSSSSSSSSS  AA        AA   SSSSSSSSSSSSS  2222222222222   5555555555555
CCCCCCCCCCC    SSSSSSSSSSS   AA         AA   SSSSSSSSSSS    2222222222222   55555555555


SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA     LL             EEEEEEEEEEEEE                 PPPPPPPPPPPP     CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA    LL            EEEEEEEEEEEEE                 PPPPPPPPPPPPP    CCCCCCCCCCCCC
SS        SS   CC        CC   AA        AA    LL            EE                             PP        PP   CC        CC
SS             CC             AA        AA    LL            EE                             PP        PP   CC
SS             CC             AA        AA    LL            EE                             PP        PP   CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA   LL            EEEEEEEEE       -------------  PPPPPPPPPPPPP  CC
SSSSSSSSSSSS  CC             AAAAAAAAAAAAA   LL             EEEEEEEEE      -------------  PPPPPPPPPPPP   CC
SS    CC            AA        AA    LL            EE                     PP           CC
SS    CC            AA        AA    LL            EE                     PP           CC
SS        SS   CC        CC   AA        AA    LL            EE                             PP             CC        CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA        AA    LLLLLLLLLLLL  EEEEEEEEEEEEE                  PP             CCCCCCCCCCCCC
SSSSSSSSSSS    CCCCCCCCCCC   AA         AA   LLLLLLLLLLLL   EEEEEEEEEEEEE                 PP              CCCCCCCCCCC


0000000      7777777777777          //  22222222222    22222222222          //  99999999999   88888888888
000000000     777777777777          //  2222222222222  2222222222222        //  9999999999999  8888888888888
00     00    77       77            //  22         22  22         22        //   99        99   88        88
00       00             77          //             22             22       //    99        99   88        88
00       00            77          //              22             22      //     99        99   88        88
00       00           77          //             22             22       //      9999999999999   8888888888888
00       00           77         //            22             22        //        999999999999   88888888888
00       00          77         //           22             22         //                  99   88        88
00       00          77        //          22             22          //                   99   88        88
00     00          77         //         22             22            //                  99   88        88
000000000           77       //          2222222222222  2222222222222   //       9999999999999   8888888888888
0000000            77       //          2222222222222  2222222222222   //       99999999999     88888888888


11           7777777777777                0000000           44                33333333333     0000000
111           777777777777               000000000          444               3333333333333    000000000
1111       77         77      :::        00       00       4444       :::        33         33   00       00
11               77          :::    00        00         44 44       :::                 33    00        00
11              77           :::    00        00        44  44       :::                 33    00        00
11             77                   00        00       44   44                          333    00        00
11             77                   00        00      44    44                          333    00        00
11            77             :::    00        00     444444444444    :::                 33    00        00
11            77             :::    00        00    4444444444444    :::                 33    00        00
11           77              :::     00      00             44       :::        33       33    00       00
11111111      77                      000000000             44                 3333333333333    000000000
11111111      77                       0000000              44                 33333333333      0000000
```

```
 SSSSSSSSSSS   CCCCCCCCCCC    AAAAAAAAA   LL            EEEEEEEEEEEEE                PPPPPPPPPPPP   CCCCCCCCCCC
SSSSSSSSSSSSS CCCCCCCCCCCCC  AAAAAAAAAAA  LL            EEEEEEEEEEEEE                PPPPPPPPPPPPP CCCCCCCCCCCCC
SS        SS  CC         CC AA         AA LL            EE                           PP         PP CC         CC
SS            CC            AA         AA LL            EE                           PP         PP CC
SS            CC            AA         AA LL            EE                           PP         PP CC
SSSSSSSSSSSS  CC            AAAAAAAAAAAAA LL            EEEEEEEEE    -------------   PPPPPPPPPPPPP CC
 SSSSSSSSSSSS CC            AAAAAAAAAAAAA LL            EEEEEEEEE    -------------   PPPPPPPPPPPP  CC
           SS CC            AA         AA LL            EE                           PP            CC
           SS CC            AA         AA LL            EE                           PP            CC
SS        SS  CC         CC AA         AA LL            EE                           PP            CC         CC
SSSSSSSSSSSSS CCCCCCCCCCCCC AA         AA LLLLLLLLLLLLL EEEEEEEEEEEEE                PP            CCCCCCCCCCCCC
 SSSSSSSSSSS   CCCCCCCCCCC  AA         AA LLLLLLLLLLLLL EEEEEEEEEEEEE                PP             CCCCCCCCCCC
```

```
********************************************************************************
********************************************************************************
********************************************************************************
*****                                                                      *****
*****                  PROGRAM VERIFICATION INFORMATION                    *****
*****                                                                      *****
*****                 CODE SYSTEM:  SCALE-PC VERSION:  4.3                 *****
*****                                                                      *****
********************************************************************************
********************************************************************************
*****                                                                      *****
*****                                                                      *****
*****              PROGRAM:  CSAS                                          *****
*****                                                                      *****
*****        CREATION DATE:  03/08/96                                      *****
*****                                                                      *****
*****               VOLUME:  ENG                                           *****
*****                                                                      *****
*****              LIBRARY:  G:\SCALE43\WIN_NT\EXE                         *****
*****                                                                      *****
*****                                                                      *****
*****      PRODUCTION CODE:  CSAS                                          *****
*****                                                                      *****
*****              VERSION:  3.1                                           *****
*****                                                                      *****
*****              JOBNAME:  SCALE-PC                                      *****
*****                                                                      *****
*****    DATE OF EXECUTION:  07/22/98                                      *****
*****                                                                      *****
*****    TIME OF EXECUTION:  17:04:30                                      *****
*****                                                                      *****
*****                                                                      *****
********************************************************************************
********************************************************************************
********************************************************************************
```

```
LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY;  NO WATER IN GAP


**** PROBLEM PARAMETERS ****

LIB 27GROUPNDF4  LIBRARY
MXX            9 MIXTURES
MSC            9 COMPOSITION SPECIFICATIONS
IZM            4 MATERIAL ZONES
GE  LATTICECELL  GEOMETRY
MORE           0 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
MSLN           0 FUEL SOLUTIONS


**** PROBLEM COMPOSITION DESCRIPTION ****

SC  UO2          STANDARD COMPOSITION
MX             1 MIXTURE NO.
VF        0.9500 VOLUME FRACTION
ROTH     10.9600 THEORETICAL DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           92000      1.00 ATOM/MOLECULE
                            92235     3.700 WT%
                            92238    96.300 WT%
            8016      2.00 ATOMS/MOLECULE
END

SC  ZR           STANDARD COMPOSITION
MX             2 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      6.4900 THEORETICAL DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           40000      1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX             3 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      0.9982 THEORETICAL DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
            1001      2.00 ATOMS/MOLECULE
            8016      1.00 ATOM/MOLECULE
END

SC  AL           STANDARD COMPOSITION
MX             4 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      2.7020 THEORETICAL DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           13027      1.00 ATOM/MOLECULE
END

SC  SS304        STANDARD COMPOSITION
MX             5 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      7.9200 THEORETICAL DENSITY
NEL            4 NO. ELEMENTS
ICP            0 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           24304    19.000 WT%
           25055     2.000 WT%
           26304    69.500 WT%
           28304     9.500 WT%
END

SC  PB           STANDARD COMPOSITION
MX             6 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH     11.3440 THEORETICAL DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           82000      1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX             7 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      0.9982 THEORETICAL DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
            1001      2.00 ATOMS/MOLECULE
            8016      1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
```

```
MX          8 MIXTURE NO.
VF     0.0000 VOLUME FRACTION
ROTH   0.9982 THEORETICAL DENSITY
NEL         2 NO. ELEMENTS
ICP         1 0/1 MIXTURE/COMPOUND
TEMP    293.0 DEG KELVIN
         1001       2.00 ATOMS/MOLECULE
         8016       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX          9 MIXTURE NO.
VF     0.0000 VOLUME FRACTION
ROTH   0.9982 THEORETICAL DENSITY
NEL         2 NO. ELEMENTS
ICP         1 0/1 MIXTURE/COMPOUND
TEMP    293.0 DEG KELVIN
         1001       2.00 ATOMS/MOLECULE
         8016       1.00 ATOM/MOLECULE
END


**** PROBLEM GEOMETRY ****

CTP SQUAREPITCH  CELL TYPE
PITCH    1.4300 CM CENTER TO CENTER SPACING
FUELOD   0.9056 CM FUEL DIAMETER OR SLAB THICKNESS
MFUEL         1 MIXTURE NO. OF FUEL
MMOD          3 MIXTURE NO. OF MODERATOR
CLADOD   1.0770 CM CLAD OUTER DIAMETER
MCLAD         2 MIXTURE NO. OF CLAD
GAPOD    0.9246 CM GAP OUTER DIAMETER
MGAP          9 MIXTURE NO. OF GAP


ZONE SPECIFICATIONS FOR LATTICECELL GEOMETRY

               ZONE  1 IS FUEL
               ZONE  2 IS GAP
               ZONE  3 IS CLAD
               ZONE  4 IS MOD
```

```
***********************************************************************************************************
***                                                                                                     ***
***                       LWT ANALYSIS: EXXON 15X15(W) ASSEMBLY; NO WATER IN GAP                        ***
***                                                                                                     ***
***********************************************************************************************************
***********************************************************************************************************
***                                                                                                     ***
***                        ********** DATA LIBRARY INFORMATION **********                               ***
***                                                                                                     ***
***          UNIT                                              VOLUME                                   ***
***         NUMBER              DATA SET NAME                   NAME        UNIT FUNCTION               ***
***         ------              -------------                   ----        -------------               ***
***                                                                                                     ***
***           89      G:\scale43\DATALIB\FT89F001                           STANDARD COMPOSITION LIBRARY ***
***                                                                                                     ***
***           82      G:\scale43\DATALIB\FT82F001                           CROSS SECTION LIBRARY       ***
***                                                                                                     ***
***           11      D:\PROJECTS\BU85-C~1\pwrfin02\15NX1M\FT11F00          SHORT CROSS SECTION LIBRARY ***
***                                                                                                     ***
***           90      D:\PROJECTS\BU85-C~1\pwrfin02\15NX1M\FT90F00          INPUT DATA DIRECT ACCESS    ***
***                                                                                                     ***
***********************************************************************************************************
***********************************************************************************************************
***                                                                                                     ***
***                                                                                                     ***
***                             STANDARD COMPOSITION LIBRARY DATA                                       ***
***                             ---------------------------------                                       ***
***                                                                                                     ***
***           UNIT NUMBER  :  89                                                                        ***
***                                                                                                     ***
***           DATASET NAME :  G:\scale43\DATALIB\FT89F001                                               ***
***                                                                                                     ***
***           LIBRARY TITLE:  SCALE-4 STANDARD COMPOSITION LIBRARY                                      ***
***                           637 STANDARD COMPOSITIONS, 490 NUCLIDES                                   ***
***                           90 ELEMENTS WITH VARIABLE ISOTOPIC DISTRBUTIONS.                          ***
***                                                                                                     ***
***           CREATION DATE:   6/30/95                                                                  ***
***                                                                                                     ***
***                                                                                                     ***
***                                                                                                     ***
***                                CROSS SECTION LIBRARY DATA                                           ***
***                                --------------------------                                           ***
***                                                                                                     ***
***           UNIT NUMBER  :  82                                                                        ***
***                                                                                                     ***
***           DATASET NAME :  G:\scale43\DATALIB\FT82F001                                               ***
***                                                                                                     ***
***           LIBRARY TITLE:  SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY                                ***
***                              BASED ON ENDF-B VERSION 4 DATA                                         ***
***                                 COMPILED FOR NRC      1/27/89                                       ***
       ***                                    LAST UPDATED                                     08/12/94  ***
       ***                                       L.M.PETRIE    -    ORNL                                 ***
       ***                                                                                               ***
       ***                                                                                               ***
       ***                                                                                               ***
       ***                                                                                               ***
       *************************************************************************************************************
       *************************************************************************************************************

                        ........    0 IO'S WERE USED BEFORE READING KENO V DATA     ........

                        ........    0 IO'S WERE USED READING THE KENO V PARAMETER DATA    ........

                       ************** DATA READING COMPLETED **************

                        ........    0 IO'S WERE USED PREPARING THE KENO V INPUT DATA    ........

                        ........    0 IO'S WERE USED LOADING THE KENO V DATA    ........

                        ........    0 IO'S WERE USED LOADING THE DATA    ........

                        ........    0 IO'S WERE USED CHECKING THE KENO V GEOMETRY DATA    ........
                        *****  RESTART DATA HAS BEEN WRITTEN ON UNIT 95  *****

                        ........    0 IO'S WERE USED WRITING THE KENO V - CSAS DATA    ........

                        ........    0 IO'S WERE USED PROCESSING CSAS INPUT DATA    ........

 CONTROL MODULE CSAS25    IS COMPLETE.
```

```
KK          KK  EEEEEEEEEEEEE  NN          NN   OOOOOOOOOOO                    VV          VV
KK         KK   EEEEEEEEEEEEE  NNN         NN  OOOOOOOOOOOOO                   VV          VV
KK        KK    EE             NNNN        NN  OO         OO                   VV          VV
KK       KK     EE             NN NN       NN  OO         OO                   VV          VV
KK      KK      EE             NN  NN      NN  OO         OO                   VV          VV
KKKKKKKK        EEEEEEEEE      NN   NN     NN  OO         OO  -------------    VV          VV
KKKKKKKK        EEEEEEEEE      NN    NN    NN  OO         OO  -------------     VV        VV
KK      KK      EE             NN     NN   NN  OO         OO                     VV      VV
KK       KK     EE             NN      NN  NN  OO         OO                      VV    VV
KK        KK    EE             NN       NNNN   OO         OO                       VV  VV
KK         KK   EEEEEEEEEEEEE  NN        NNN   OOOOOOOOOOOOO                        VVV
KK          KK  EEEEEEEEEEEEE  NN         NN    OOOOOOOOOOO                          V

 SSSSSSSSSSS    CCCCCCCCCCC      AAAAAAAAA     LL             EEEEEEEEEEEEE                    PPPPPPPPPPPP     CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC    AAAAAAAAAAA    LL             EEEEEEEEEEEEE                    PPPPPPPPPPPPP   CCCCCCCCCCCCC
SS         SS  CC         CC   AA         AA   LL             EE                               PP         PP   CC         CC
SS             CC              AA         AA   LL             EE                               PP         PP   CC
SS             CC              AA         AA   LL             EE                               PP         PP   CC
SSSSSSSSSSSS   CC              AAAAAAAAAAAAA   LL             EEEEEEEEE       -------------    PPPPPPPPPPPPP   CC
 SSSSSSSSSSSS  CC              AAAAAAAAAAAAA   LL             EEEEEEEEE       -------------    PPPPPPPPPPPP    CC
           SS  CC              AA         AA   LL             EE                               PP              CC
           SS  CC              AA         AA   LL             EE                               PP              CC
SS         SS  CC         CC   AA         AA   LL             EE                               PP              CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL  EEEEEEEEEEEEE                    PP              CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC    AA         AA   LLLLLLLLLLLLL  EEEEEEEEEEEEE                    PP               CCCCCCCCCCC

   0000000     7777777777777            //   22222222222    22222222222             //   99999999999     88888888888
  000000000    777777777777            //   2222222222222  2222222222222           //   9999999999999   8888888888888
 00       00   77        77           //    22         22  22         22          //    99         99   88         88
00         00           77           //               22             22          //     99         99   88         88
00         00          77           //               22             22          //      99         99   88         88
00         00         77           //              22             22           //       9999999999999    88888888888
00         00        77           //             22             22            //         99999999999     88888888888
00         00       77           //            22             22             //                   99   88         88
00         00       77          //           22             22              //                    99   88         88
 00       00        77         //          22             22               //                     99   88         88
  000000000         77        //          2222222222222  2222222222222    //          9999999999999   8888888888888
   0000000          77       //           2222222222222  2222222222222   //           999999999999     88888888888

     11        7777777777777                0000000           44                        44       88888888888
    111        777777777777                000000000         444                       444      8888888888888
   1111        77        77       :::     00       00       4444          :::         4444      88         88
     11                 77        :::     00       00      44 44          :::        44 44      88         88
     11                77         :::     00       00     44  44          :::       44  44      88         88
     11               77                  00       00    44   44                   44   44       88888888888
     11              77                   00       00   44    44                  44    44       88888888888
     11             77            :::     00       00  4444444444444      :::    4444444444444  88         88
     11             77            :::     00       00  4444444444444      :::    4444444444444  88         88
     11            77             :::     00       00           44        :::             44    88         88
  11111111         77                      000000000            44                        44    8888888888888
  11111111         77                       0000000             44                        44     88888888888
```

```
 SSSSSSSSSSS     CCCCCCCCCCC      AAAAAAAAA     LL             EEEEEEEEEEEEE                     PPPPPPPPPPPP     CCCCCCCCCCC
SSSSSSSSSSSSS   CCCCCCCCCCCCC    AAAAAAAAAAA    LL             EEEEEEEEEEEEE                     PPPPPPPPPPPPP   CCCCCCCCCCCCC
SS         SS   CC         CC   AA         AA   LL             EE                                PP         PP   CC         CC
SS              CC              AA         AA   LL             EE                                PP         PP   CC
SS              CC              AA         AA   LL             EE                                PP         PP   CC
SSSSSSSSSSSS    CC              AAAAAAAAAAAAA   LL             EEEEEEEEE      -------------      PPPPPPPPPPPPP   CC
 SSSSSSSSSSSS   CC              AAAAAAAAAAAAA   LL             EEEEEEEEE      -------------      PPPPPPPPPPPP    CC
           SS   CC              AA         AA   LL             EE                                PP              CC
           SS   CC              AA         AA   LL             EE                                PP              CC
SS         SS   CC         CC   AA         AA   LL             EE                                PP              CC         CC
SSSSSSSSSSSSS   CCCCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL  EEEEEEEEEEEEE                     PP              CCCCCCCCCCCCC
 SSSSSSSSSSS     CCCCCCCCCCC    AA         AA   LLLLLLLLLLLLL  EEEEEEEEEEEEE                     PP               CCCCCCCCCCC
```

```
***************************************************************************
***************************************************************************
***************************************************************************
*****                                                                 *****
*****                 PROGRAM VERIFICATION INFORMATION                *****
*****                                                                 *****
*****               CODE SYSTEM:  SCALE-PC VERSION:  4.3              *****
*****                                                                 *****
***************************************************************************
***************************************************************************
*****                                                                 *****
*****                                                                 *****
*****              PROGRAM:  000009                                   *****
*****                                                                 *****
*****        CREATION DATE:  03/08/96                                 *****
*****                                                                 *****
*****               VOLUME:  ENG                                      *****
*****                                                                 *****
*****              LIBRARY:  G:\SCALE43\WIN_NT\EXE                    *****
*****                                                                 *****
*****                                                                 *****
*****      PRODUCTION CODE:  KENOVA                                   *****
*****                                                                 *****
*****              VERSION:  3.1                                      *****
*****                                                                 *****
*****              JOBNAME:  SCALE-PC                                 *****
*****                                                                 *****
*****    DATE OF EXECUTION:  07/22/98                                 *****
*****                                                                 *****
*****    TIME OF EXECUTION:  17:04:48                                 *****
*****                                                                 *****
*****                                                                 *****
***************************************************************************
***************************************************************************
***************************************************************************
```

```
LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY; NO WATER IN GAP

****** NUMERIC PARAMETERS ******

TME   MAXIMUM PROBLEM TIME (MIN)                    ******
TBA   TIME PER GENERATION (MIN)                       0.50
GEN   NUMBER OF GENERATIONS                            303
NPG   NUMBER PER GENERATION                           1000
NSK   NUMBER OF GENERATIONS TO BE SKIPPED                3
BEG   BEGINNING GENERATION NUMBER                        1
RES   GENERATIONS BETWEEN CHECKPOINTS                    0
X1D   NUMBER OF EXTRA 1-D CROSS SECTIONS                 1
NBK   NEUTRON BANK SIZE                               1025
XNB   EXTRA POSITIONS IN NEUTRON BANK                    0
NFB   FISSION BANK SIZE                               1000
XFB   EXTRA POSITIONS IN FISSION BANK                    0
WTA   DEFAULT VALUE OF WEIGHT AVERAGE               0.5000
WTH   WEIGHT HIGH FOR SPLITTING                     3.0000
WTL   WEIGHT LOW FOR RUSSIAN ROULETTE               0.3333
RND   STARTING RANDOM NUMBER                  BB827100001
NB8   NUMBER OF D.A. BLOCKS ON UNIT 8                  200
NL8   LENGTH OF D.A. BLOCKS ON UNIT 8                  512
ADJ   MODE OF CALCULATION                          FORWARD
      INPUT DATA WRITTEN ON RESTART UNIT                NO
      BINARY DATA INTERFACE                            YES
```

```
LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY; NO WATER IN GAP

****** LOGICAL PARAMETERS ******

RUN  EXECUTE PROBLEM AFTER CHECKING DATA     YES    PLT  PLOT PICTURE MAP(S)                         NO
FLX  COMPUTE FLUX                            NO     FDN  COMPUTE FISSION DENSITIES                   NO
SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION    NO     NUB  COMPUTE NU-BAR & AVG FISSION GROUP          YES
MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER     NO     MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION       NO
CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER   NO     CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION     NO
FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER   NO     FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION     NO
MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER     NO     MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER        NO
CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER   NO     CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER      NO
FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER   NO     FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER      NO
HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL    NO     HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL       NO
AMX  PRINT ALL MIXED CROSS SECTIONS          NO     FAR  PRINT FIS. AND ABS. BY REGION               NO
XS1  PRINT 1-D MIXTURE X-SECTIONS            NO     GAS  PRINT FAR BY GROUP                          NO
XS2  PRINT 2-D MIXTURE X-SECTIONS            NO     PAX  PRINT XSEC-ALBEDO CORRELATION TABLES        NO
XAP  PRINT MIXTURE ANGLES & PROBABILITIES    NO     PWT  PRINT WEIGHT AVERAGE ARRAY                  NO
PKI  PRINT FISSION SPECTRUM                  NO     PGM  PRINT INPUT GEOMETRY                        NO
P1D  PRINT EXTRA 1-D CROSS SECTIONS          NO     BUG  PRINT DEBUG INFORMATION                     NO
                                                    TRK  PRINT TRACKING INFORMATION                  NO

PARAMETER INPUT COMPLETED

........ 0 IO'S WERE USED READING THE PARAMETER DATA ........

*************** DATA READING COMPLETED ***************
```

```
LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY; NO WATER IN GAP

   UNIT                                                 VOLUME
  NUMBER           DATA SET NAME                         NAME     UNIT FUNCTION
  ------           -------------                         ----     -------------

XSC  14   D:\PROJECTS\BU85-C~1\pwrfin02\15NX1M\FT14F00            MIXED CROSS SECTIONS
ALB  79   G:\scale43\DATALIB\FT79F001                             INPUT ALBEDOS
WTS  80   G:\scale43\DATALIB\FT80F001                             INPUT WEIGHTS
SKT  16    UNKNOWN                                                WRITE SCRATCH DATA
BIN  95   D:\PROJECTS\BU85-C~1\pwrfin02\15NX1M\FT95F00            BINARY INPUT DATA
RST  95   D:\PROJECTS\BU85-C~1\pwrfin02\15NX1M\FT95F00            READ RESTART DATA
LIB   4   D:\PROJECTS\BU85-C~1\pwrfin02\15NX1M\FT04F00            INPUT AMPX WORKING LIBRARY
      8   D:\PROJECTS\BU85-C~1\pwrfin02\15NX1M\FT08F00            INPUT DATA DIRECT ACCESS
      9    UNKNOWN                                                SUPER GROUPED DIRECT ACCESS
     10    UNKNOWN                                                XSEC MIXING DIRECT ACCESS

   .......    0 IO'S WERE USED PREPARING INPUT DATA    .......

   CROSS SECTIONS READ FROM THE AMPX WORKING LIBRARY ON UNIT    4
```

```
                                  LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY;  NO WATER IN GAP

                                                  MIXING TABLE

                                        NUMBER OF SCATTERING ANGLES =  2
                                     CROSS SECTION MESSAGE THRESHOLD =3.0E-05

MIXTURE =      1          DENSITY(G/CC) =  10.412
   NUCLIDE   ATOM-DENS.   WGT. FRAC.      ZA       AWT                 NUCLIDE TITLE
   1008016  4.64601E-02  1.18483E-01    8016     15.9904      OXYGEN-16       ENDF/B-IV MAT 1276                             UPDATED
08/12/94
   1092235  8.70095E-04  3.26161E-02   92235    235.0441      URANIUM-235     ENDF/B-IV MAT 1261                             UPDATED
08/12/94
   1092238  2.23600E-02  8.48901E-01   92238    238.0510      URANIUM-238     ENDF/B-IV MAT 1262                             UPDATED
08/12/94

MIXTURE =      2          DENSITY(G/CC) =   6.4900
   NUCLIDE   ATOM-DENS.   WGT. FRAC.      ZA       AWT                 NUCLIDE TITLE
   2040000  4.28457E-02  1.00000E+00   40000     91.2196      ZIRCONIUM       ENDF/B-IV MAT 7141                             UPDATED
08/12/94

MIXTURE =      3          DENSITY(G/CC) = 0.99817
   NUCLIDE   ATOM-DENS.   WGT. FRAC.      ZA       AWT                 NUCLIDE TITLE
   3001001  6.67692E-02  1.11927E-01    1001      1.0077      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                    UPDATED
08/12/94
   3008016  3.33846E-02  8.88074E-01    8016     15.9904      OXYGEN-16       ENDF/B-IV MAT 1276                             UPDATED
08/12/94

MIXTURE =      4          DENSITY(G/CC) =   2.7020
   NUCLIDE   ATOM-DENS.   WGT. FRAC.      ZA       AWT                 NUCLIDE TITLE
   4013027  6.03066E-02  1.00000E+00   13027     26.9818     AL-27 1193 218 GP 040375(5)                                     UPDATED
08/12/94

MIXTURE =      5          DENSITY(G/CC) =   7.9200
   NUCLIDE   ATOM-DENS.   WGT. FRAC.      ZA       AWT                 NUCLIDE TITLE
   5024304  1.74286E-02  1.90000E-01   24000     51.9957     CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'                UPDATED
08/12/94
   5025055  1.73633E-03  1.99999E-02   25055     54.9379      MANGANESE-55    ENDF/B-IV MAT 1197                             UPDATED
08/12/94
   5026304  5.93579E-02  6.95000E-01   26000     55.8447     FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'                UPDATED
08/12/94
   5028304  7.72070E-03  9.50001E-02   28000     58.6872     NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'                UPDATED
08/12/94

MIXTURE =      6          DENSITY(G/CC) =  11.344
   NUCLIDE   ATOM-DENS.   WGT. FRAC.      ZA       AWT                 NUCLIDE TITLE
   6082000  3.29690E-02  1.00000E+00   82000    207.2100     PB   1288 218NGP 042375 P-3 293K                                UPDATED
08/12/94

MIXTURE =      7          DENSITY(G/CC) = 0.99817
   NUCLIDE   ATOM-DENS.   WGT. FRAC.      ZA       AWT                 NUCLIDE TITLE
   7001001  6.67692E-02  1.11927E-01    1001      1.0077      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                    UPDATED
08/12/94
   7008016  3.33846E-02  8.88074E-01    8016     15.9904      OXYGEN-16       ENDF/B-IV MAT 1276                             UPDATED
08/12/94

MIXTURE =      8          DENSITY(G/CC) = 0.99817E-20
   NUCLIDE   ATOM-DENS.   WGT. FRAC.      ZA       AWT                 NUCLIDE TITLE
   8001001  6.67692E-22  1.11927E-01    1001      1.0077      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                    UPDATED
08/12/94
   8008016  3.33846E-22  8.88073E-01    8016     15.9904      OXYGEN-16       ENDF/B-IV MAT 1276                             UPDATED
08/12/94

MIXTURE =      9          DENSITY(G/CC) = 0.99817E-20
   NUCLIDE   ATOM-DENS.   WGT. FRAC.      ZA       AWT                 NUCLIDE TITLE
   9001001  6.67692E-22  1.11927E-01    1001      1.0077      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                    UPDATED
08/12/94
   9008016  3.33846E-22  8.88073E-01    8016     15.9904      OXYGEN-16       ENDF/B-IV MAT 1276                             UPDATED
08/12/94

                             3001001       HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                   UPDATED 08/12/94
                             7001001       HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                   UPDATED 08/12/94
                             8001001       HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                   UPDATED 08/12/94
                             9001001       HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                   UPDATED 08/12/94
                             1008016       OXYGEN-16       ENDF/B-IV MAT 1276                            UPDATED 08/12/94
                             3008016       OXYGEN-16       ENDF/B-IV MAT 1276                            UPDATED 08/12/94
                             7008016       OXYGEN-16       ENDF/B-IV MAT 1276                            UPDATED 08/12/94
                             8008016       OXYGEN-16       ENDF/B-IV MAT 1276                            UPDATED 08/12/94
                             9008016       OXYGEN-16       ENDF/B-IV MAT 1276                            UPDATED 08/12/94
                             4013027      AL-27 1193 218 GP 040375(5)                                    UPDATED 08/12/94
                             5024304      CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'               UPDATED 08/12/94
                             5025055       MANGANESE-55    ENDF/B-IV MAT 1197                            UPDATED 08/12/94
                             5026304      FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'               UPDATED 08/12/94
                             5028304      NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'               UPDATED 08/12/94
                             2040000       ZIRCONIUM       ENDF/B-IV MAT 7141                            UPDATED 08/12/94
                             6082000      PB   1288 218NGP 042375 P-3 293K                               UPDATED 08/12/94
                             1092235       URANIUM-235     ENDF/B-IV MAT 1261                            UPDATED 08/12/94
                             1092238       URANIUM-238     ENDF/B-IV MAT 1262                            UPDATED 08/12/94

KENO MESSAGE NUMBER K5-222        1 TRANSFERS FOR MIXTURE      3 WERE CORRECTED FOR BAD MOMENTS.
KENO MESSAGE NUMBER K5-222        1 TRANSFERS FOR MIXTURE      7 WERE CORRECTED FOR BAD MOMENTS.
KENO MESSAGE NUMBER K5-222        1 TRANSFERS FOR MIXTURE      8 WERE CORRECTED FOR BAD MOMENTS.
KENO MESSAGE NUMBER K5-222        1 TRANSFERS FOR MIXTURE      9 WERE CORRECTED FOR BAD MOMENTS.

                                   1-D CROSS SECTION ARRAY ID NUMBERS
                                      1  2002  1452     27     18  1018

                                .......     0 IO'S WERE USED PREPARING THE CROSS SECTIONS     .......
```

```
*******************************************************************************************************
***                                                                                                 ***
***         LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY;  NO WATER IN GAP                                 ***
***                                                                                                 ***
*******************************************************************************************************
*******************************************************************************************************
***                                                                                                 ***
***                              ****** ADDITIONAL INFORMATION ******                               ***
***                                                                                                 ***
***  NUMBER OF ENERGY GROUPS                27       USE LATTICE GEOMETRY                     YES   ***
***                                                                                                 ***
***  NO. OF FISSION SPECTRUM SOURCE GROUP    1       GLOBAL ARRAY NUMBER                        1   ***
***                                                                                                 ***
***  NO. OF SCATTERING ANGLES IN XSECS       2       NUMBER OF UNITS IN THE GLOBAL X DIR.      15   ***
***                                                                                                 ***
***  ENTRIES/NEUTRON IN THE NEUTRON BANK    16       NUMBER OF UNITS IN THE GLOBAL Y DIR.      15   ***
***                                                                                                 ***
***  ENTRIES/NEUTRON IN THE FISSION BANK     9       NUMBER OF UNITS IN THE GLOBAL Z DIR.       1   ***
***                                                                                                 ***
***  NUMBER OF MIXTURES USED                 9       USE A GLOBAL REFLECTOR                   YES   ***
***                                                                                                 ***
***  NUMBER OF BIAS ID'S USED                1       USE NESTED HOLES                          NO   ***
***                                                                                                 ***
***  NUMBER OF DIFFERENTIAL ALBEDOS USED     0       NUMBER OF HOLES                            0   ***
***                                                                                                 ***
***  TOTAL INPUT GEOMETRY REGIONS           19       MAXIMUM HOLE NESTING LEVEL                 0   ***
***                                                                                                 ***
***  NUMBER OF GEOMETRY REGIONS USED        19       USE NESTED ARRAYS                         NO   ***
***                                                                                                 ***
***  LARGEST GEOMETRY UNIT NUMBER            9       NUMBER OF ARRAYS USED                      1   ***
***                                                                                                 ***
***  LARGEST ARRAY NUMBER                    1       MAXIMUM ARRAY NESTING LEVEL                1   ***
***                                                                                                 ***
***                                                                                                 ***
***  +X BOUNDARY CONDITION                 VAC       -X BOUNDARY CONDITION                    VAC   ***
***                                                                                                 ***
***  +Y BOUNDARY CONDITION                 VAC       -Y BOUNDARY CONDITION                    VAC   ***
***                                                                                                 ***
***  +Z BOUNDARY CONDITION                 VAC       -Z BOUNDARY CONDITION                    VAC   ***
***                                                                                                 ***
*******************************************************************************************************
```

```
***********************************************************************************************
***                                                                                         ***
***         LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY;  NO WATER IN GAP                         ***
***                                                                                         ***
***********************************************************************************************
***********************************************************************************************
***                                                                                         ***
***                     ****** SPACE AND SUPERGROUP INFORMATION ******                      ***
***                                                                                         ***
***       100000 WORDS IS THE TOTAL SPACE AVAILABLE.                                        ***
***                                                                                         ***
***        28389 WORDS WERE USED FOR NON-SUPERGROUP STORAGE.                                ***
***                                                                                         ***
***        71611 WORDS OF STORAGE ARE AVAILABLE FOR SUPERGROUPED DATA.                      ***
***                                                                                         ***
***        99759 WORDS OF STORAGE ARE AVAILABLE FOR CONSTRUCTING THE SUPERGROUPS.           ***
***                                                                                         ***
***        71551 WORDS OF STORAGE ARE AVAILABLE TO EACH SUPERGROUP.                         ***
***                                                                                         ***
***         1172 WORDS ARE NEEDED FOR THE LARGEST GROUP.                                    ***
***                                                                                         ***
***        29777 WORDS OF STORAGE IS SUFFICIENT TO RUN THIS PROBLEM.                        ***
***                                                                                         ***
***        41991 WORDS OF STORAGE WILL ALLOW THE PROBLEM TO RUN WITH ONE SUPERGROUP.        ***
***                                                                                         ***
***        42144 WORDS OF STORAGE WILL BE USED TO RUN THIS PROBLEM.                         ***
***                                                                                         ***
***********************************************************************************************
***********************************************************************************************
***                                                                                         ***
***                      STARTING      ENDING       XSEC       ALBEDO      TOTAL            ***
***    SUPERGROUP          GROUP        GROUP       LENGTH     LENGTH      LENGTH           ***
***                                                                                         ***
***                                                                                         ***
***        1                 1           27          2697         0         13542           ***
***                                                                                         ***
***********************************************************************************************

            ........    0 IO'S WERE USED IN SUPERGROUPING    ........

            ........    0 IO'S WERE USED LOADING THE DATA    ........
```

```
                                        LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY;  NO WATER IN GAP

                    MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION               NUM   ID


                                                ----- UNIT     1   -----

FUEL PIN CELL - WITH H2O

  1 CYLINDER          1  1  RADIUS = 0.45280    +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  2 CYLINDER          9  1  RADIUS = 0.46230    +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CYLINDER          2  1  RADIUS = 0.53850    +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  4 CUBOID            3  1      +X = 0.71500    -X =-0.71500    +Y = 0.71500    -Y =-0.71500     +Z =  182.88     -Z = -182.88

                                                ----- UNIT     2   -----

WATER ROD CELL - WITH H2O

  1 CYLINDER          3  1  RADIUS = 0.64770    +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  2 CYLINDER          2  1  RADIUS = 0.69090    +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CUBOID            3  1      +X = 0.71500    -X =-0.71500    +Y = 0.71500    -Y =-0.71500     +Z =  182.88     -Z = -182.88

                                        ******************  GLOBAL   ******************
                                        -----   UNIT     9  EXTERNAL TO LATTICE  1   -----

  1 ARRAY NUMBER      1         +X =  10.725    -X = -10.725    +Y =  10.725    -Y = -10.725     +Z =  182.88     -Z = -182.88

  2 CUBOID            3  1      +X =  11.316    -X = -11.316    +Y =  11.316    -Y = -11.316     +Z =  182.88     -Z = -182.88

  3 CYLINDER          4  1  RADIUS =  16.891    +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  4 CYLINDER          3  1  RADIUS =  16.986    +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  5 CYLINDER          5  1  RADIUS =  18.891    +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  6 CYLINDER          6  1  RADIUS =  33.496    +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  7 CYLINDER          5  1  RADIUS =  36.544    +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  8 CYLINDER          7  1  RADIUS =  49.244    +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  9 CYLINDER          5  1  RADIUS =  49.854    +Z =  212.48    -Z = -192.16    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

 10 CYLINDER          6  1  RADIUS =  49.854    +Z =  212.48    -Z = -199.78    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

 11 CYLINDER          5  1  RADIUS =  49.854    +Z =  212.48    -Z = -208.67    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

 12 CUBOID            8  1      +X =  81.000    -X = -81.000    +Y =  81.000    -Y = -81.000     +Z =  243.00     -Z = -240.00
```

```
                    LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY;  NO WATER IN GAP

               -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   1        -------

Z LAYER   1, X COLUMN   1 TO  15 LEFT TO RIGHT   Y ROW   1 TO  15  BOTTOM TO TOP

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 2 1 1 2 1 1 1 2 1 1 2 1 1

 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1

 1 1 1 1 2 1 1 1 1 1 2 1 1 1 1

 1 1 2 1 1 1 1 1 1 1 1 1 2 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 1 2 1 1 1 2 1 1 1 2 1 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 2 1 1 1 1 1 1 1 1 1 2 1 1

 1 1 1 1 2 1 1 1 1 1 2 1 1 1 1

 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1

 1 1 2 1 1 2 1 1 1 2 1 1 2 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY; NO WATER IN GAP
VOLUMES FOR THOSE UNITS UTILIZED IN THIS PROBLEM

UNIT	REGION	GEOMETRY REGION	VOLUME	CUMULATIVE VOLUME
1	1	1	2.35591E+02 CM**3	2.35591E+02 CM**3
	2	2	9.98936E+00 CM**3	2.45581E+02 CM**3
	3	3	8.76291E+01 CM**3	3.33210E+02 CM**3
	4	4	4.14733E+02 CM**3	7.47943E+02 CM**3
2	1	5	4.82052E+02 CM**3	4.82052E+02 CM**3
	2	6	6.64478E+01 CM**3	5.48500E+02 CM**3
	3	7	1.99443E+02 CM**3	7.47943E+02 CM**3

SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 8 IS AN ARRAY PLACEMENT BOUNDARY REGION

UNIT	REGION	GEOMETRY REGION	VOLUME	CUMULATIVE VOLUME
9	1	8	1.68287E+05 CM**3	1.68287E+05 CM**3
	2	9	1.90480E+04 CM**3	1.87335E+05 CM**3
	3	10	1.40501E+05 CM**3	3.27836E+05 CM**3
	4	11	3.70972E+03 CM**3	3.31546E+05 CM**3
	5	12	7.85353E+04 CM**3	4.10081E+05 CM**3
	6	13	8.79177E+05 CM**3	1.28926E+06 CM**3
	7	14	2.45308E+05 CM**3	1.53457E+06 CM**3
	8	15	1.25193E+06 CM**3	2.78649E+06 CM**3
	9	16	3.72996E+05 CM**3	3.15949E+06 CM**3
	10	17	5.94983E+04 CM**3	3.21899E+06 CM**3
	11	18	6.94145E+04 CM**3	3.28840E+06 CM**3
	12	19	9.38745E+06 CM**3	1.26759E+07 CM**3

UNIT	USES	REGION	MIXTURE	TOTAL VOLUME
1	204	1	1	4.80606E+04 CM**3
		2	9	2.03783E+03 CM**3
		3	2	1.78763E+04 CM**3
		4	3	8.46055E+04 CM**3
2	21	1	3	1.01231E+04 CM**3
		2	2	1.39540E+03 CM**3
		3	3	4.18830E+03 CM**3
9	1	1		1.68287E+05 CM**3
		2	3	1.90480E+04 CM**3
		3	4	1.40501E+05 CM**3
		4	3	3.70972E+03 CM**3
		5	5	7.85353E+04 CM**3
		6	6	8.79177E+05 CM**3
		7	5	2.45308E+05 CM**3
		8	7	1.25193E+06 CM**3
		9	5	3.72996E+05 CM**3
		10	6	5.94983E+04 CM**3
		11	5	6.94145E+04 CM**3
		12	8	9.38745E+06 CM**3

TOTAL MIXTURE VOLUMES

MIXTURE	TOTAL VOLUME	MASS(G)
1	4.80606E+04 CM**3	5.00406E+05
2	1.92717E+04 CM**3	1.25074E+05
3	1.21675E+05 CM**3	1.21452E+05
4	1.40501E+05 CM**3	3.79634E+05
5	7.66253E+05 CM**3	6.06873E+06
6	9.38675E+05 CM**3	1.06483E+07
7	1.25193E+06 CM**3	1.24964E+06
8	9.38745E+06 CM**3	9.37028E-14
9	2.03783E+03 CM**3	2.03410E-17

```
************************************************************************************************
***                                                                                          ***
***                                   BIASING INFORMATION                                    ***
***                                                                                          ***
***    A DEFAULT WEIGHT OF    0.500 WILL BE USED FOR ALL BIAS ID'S.                          ***
***                                                                                          ***
************************************************************************************************
```

.... 0 IO'S WERE USED IN KENO-V BEFORE TRACKING ....

.... 0.01650 MINUTES WERE USED PROCESSING DATA. ....

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 2.85587E-01

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED WITH A FLAT DISTRIBUTION IN A CUBOID DEFINED BY:
+X= 1.07250E+01 -X=-1.07250E+01 +Y= 1.07250E+01 -Y=-1.07250E+01 +Z= 1.82880E+02 -Z=-1.82880E+02
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

0.09867 MINUTES WERE REQUIRED FOR STARTING. TOTAL ELAPSED TIME IS 0.11733 MINUTES.

LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY; NO WATER IN GAP

KENO MESSAGE NUMBER K5-132 WARNING....ONLY 987 INDEPENDENT FISSION POINTS WERE GENERATED

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
1	8.94813E-01	1.53833E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	8.81756E-01	1.87667E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
3	9.26407E-01	2.19667E-01	9.26407E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	9.47962E-01	2.52667E-01	9.37184E-01	1.07775E-02	0.00000E+00	0.00000E+00
5	9.44398E-01	2.84667E-01	9.39589E-01	6.67085E-03	0.00000E+00	0.00000E+00
6	9.57348E-01	3.16667E-01	9.44028E-01	6.47781E-03	0.00000E+00	0.00000E+00
7	9.08890E-01	3.50667E-01	9.37001E-01	8.63509E-03	0.00000E+00	0.00000E+00
8	9.21987E-01	3.80833E-01	9.34499E-01	7.48138E-03	0.00000E+00	0.00000E+00
9	9.25118E-01	4.12000E-01	9.33158E-01	6.46338E-03	0.00000E+00	0.00000E+00
10	9.55106E-01	4.44000E-01	9.35902E-01	6.23361E-03	0.00000E+00	0.00000E+00
11	9.07018E-01	4.77833E-01	9.32693E-01	6.36572E-03	0.00000E+00	0.00000E+00
12	9.39932E-01	5.10833E-01	9.33416E-01	5.73951E-03	0.00000E+00	0.00000E+00
13	9.50831E-01	5.42833E-01	9.35000E-01	5.42759E-03	0.00000E+00	0.00000E+00
14	9.66727E-01	5.75833E-01	9.37644E-01	5.61601E-03	0.00000E+00	0.00000E+00
15	9.31262E-01	6.07833E-01	9.37153E-01	5.18925E-03	0.00000E+00	0.00000E+00
16	9.19301E-01	6.39000E-01	9.35878E-01	4.97064E-03	0.00000E+00	0.00000E+00
17	9.05264E-01	6.72833E-01	9.33837E-01	5.05748E-03	0.00000E+00	0.00000E+00
18	9.66305E-01	7.04000E-01	9.35866E-01	5.14771E-03	0.00000E+00	0.00000E+00
19	9.19402E-01	7.35167E-01	9.34897E-01	4.93146E-03	0.00000E+00	0.00000E+00
20	9.26002E-01	7.67167E-01	9.34403E-01	4.67562E-03	0.00000E+00	0.00000E+00
21	9.12766E-01	7.98333E-01	9.33264E-01	4.56695E-03	0.00000E+00	0.00000E+00
22	9.45442E-01	8.28500E-01	9.33873E-01	4.37516E-03	0.00000E+00	0.00000E+00
23	9.38969E-01	8.57833E-01	9.34116E-01	4.16868E-03	0.00000E+00	0.00000E+00
24	9.52939E-01	8.88833E-01	9.34972E-01	4.06573E-03	0.00000E+00	0.00000E+00
25	9.21769E-01	9.19167E-01	9.34398E-01	3.92711E-03	0.00000E+00	0.00000E+00
26	8.98143E-01	9.52000E-01	9.32887E-01	4.05203E-03	0.00000E+00	0.00000E+00
27	9.47410E-01	9.81333E-01	9.33468E-01	3.92974E-03	0.00000E+00	0.00000E+00
28	8.74141E-01	1.01517E+00	9.31186E-01	4.41152E-03	0.00000E+00	0.00000E+00
29	9.01779E-01	1.04900E+00	9.30097E-01	4.38248E-03	0.00000E+00	0.00000E+00
30	9.57997E-01	1.08200E+00	9.31093E-01	4.33903E-03	0.00000E+00	0.00000E+00
31	9.34656E-01	1.11400E+00	9.31216E-01	4.18854E-03	0.00000E+00	0.00000E+00
32	8.76054E-01	1.14700E+00	9.29377E-01	4.44469E-03	0.00000E+00	0.00000E+00
33	9.15205E-01	1.17900E+00	9.28920E-01	4.32317E-03	0.00000E+00	0.00000E+00
34	9.46478E-01	1.21117E+00	9.29469E-01	4.22169E-03	0.00000E+00	0.00000E+00
35	9.16337E-01	1.24317E+00	9.29071E-01	4.11107E-03	0.00000E+00	0.00000E+00
36	9.25952E-01	1.27517E+00	9.28979E-01	3.98938E-03	0.00000E+00	0.00000E+00
37	9.18173E-01	1.30633E+00	9.28671E-01	3.88601E-03	0.00000E+00	0.00000E+00
38	8.87881E-01	1.33750E+00	9.27537E-01	3.94282E-03	0.00000E+00	0.00000E+00
39	9.43313E-01	1.36950E+00	9.27964E-01	3.85841E-03	0.00000E+00	0.00000E+00
40	9.03753E-01	1.40250E+00	9.27327E-01	3.80916E-03	0.00000E+00	0.00000E+00
41	9.28225E-01	1.43533E+00	9.27350E-01	3.71028E-03	0.00000E+00	0.00000E+00
42	9.87952E-01	1.46750E+00	9.28865E-01	3.92087E-03	0.00000E+00	0.00000E+00
43	9.16508E-01	1.50133E+00	9.28563E-01	3.83590E-03	0.00000E+00	0.00000E+00
44	9.29004E-01	1.53433E+00	9.28574E-01	3.74347E-03	0.00000E+00	0.00000E+00
45	9.22795E-01	1.56533E+00	9.28440E-01	3.65785E-03	0.00000E+00	0.00000E+00
46	8.95947E-01	1.60017E+00	9.27701E-01	3.64925E-03	0.00000E+00	0.00000E+00
47	9.60195E-01	1.63033E+00	9.28423E-01	3.63958E-03	0.00000E+00	0.00000E+00
48	9.23892E-01	1.66333E+00	9.28325E-01	3.56094E-03	0.00000E+00	0.00000E+00
49	9.09483E-01	1.69633E+00	9.27924E-01	3.50734E-03	0.00000E+00	0.00000E+00
50	8.85010E-01	1.72833E+00	9.27030E-01	3.54798E-03	0.00000E+00	0.00000E+00
51	9.38381E-01	1.76133E+00	9.27261E-01	3.48253E-03	0.00000E+00	0.00000E+00
52	9.41845E-01	1.79517E+00	9.27553E-01	3.42462E-03	0.00000E+00	0.00000E+00
53	9.46666E-01	1.82633E+00	9.27928E-01	3.37765E-03	0.00000E+00	0.00000E+00
54	9.24769E-01	1.85917E+00	9.27867E-01	3.31262E-03	0.00000E+00	0.00000E+00
55	9.41126E-01	1.89317E+00	9.28117E-01	3.25913E-03	0.00000E+00	0.00000E+00
56	9.71286E-01	1.92517E+00	9.28917E-01	3.29660E-03	0.00000E+00	0.00000E+00
57	9.32230E-01	1.95717E+00	9.28977E-01	3.23667E-03	0.00000E+00	0.00000E+00
58	9.08528E-01	1.99100E+00	9.28612E-01	3.19925E-03	0.00000E+00	0.00000E+00
59	9.67068E-01	2.02133E+00	9.29287E-01	3.21430E-03	0.00000E+00	0.00000E+00
60	9.16362E-01	2.05233E+00	9.29064E-01	3.16625E-03	0.00000E+00	0.00000E+00
61	9.21463E-01	2.08633E+00	9.28935E-01	3.11479E-03	0.00000E+00	0.00000E+00
62	9.52391E-01	2.11917E+00	9.29326E-01	3.08728E-03	0.00000E+00	0.00000E+00
63	9.43213E-01	2.15033E+00	9.29554E-01	3.04477E-03	0.00000E+00	0.00000E+00
64	9.49338E-01	2.18233E+00	9.29873E-01	3.01221E-03	0.00000E+00	0.00000E+00
65	9.37709E-01	2.21533E+00	9.29997E-01	2.96662E-03	0.00000E+00	0.00000E+00
66	9.33550E-01	2.24833E+00	9.30053E-01	2.92043E-03	0.00000E+00	0.00000E+00
67	9.78257E-01	2.28033E+00	9.30794E-01	2.96925E-03	0.00000E+00	0.00000E+00
68	8.92296E-01	2.31417E+00	9.30211E-01	2.98153E-03	0.00000E+00	0.00000E+00
69	9.03144E-01	2.34533E+00	9.29807E-01	2.96435E-03	0.00000E+00	0.00000E+00
70	9.37593E-01	2.37550E+00	9.29922E-01	2.92267E-03	0.00000E+00	0.00000E+00
71	9.27195E-01	2.40750E+00	9.29882E-01	2.88027E-03	0.00000E+00	0.00000E+00
72	9.34762E-01	2.44150E+00	9.29952E-01	2.83969E-03	0.00000E+00	0.00000E+00
73	9.19989E-01	2.47250E+00	9.29811E-01	2.80292E-03	0.00000E+00	0.00000E+00
74	9.33397E-01	2.50650E+00	9.29861E-01	2.76416E-03	0.00000E+00	0.00000E+00
75	9.10163E-01	2.53850E+00	9.29591E-01	2.73936E-03	0.00000E+00	0.00000E+00
76	9.32267E-01	2.57050E+00	9.29628E-01	2.70233E-03	0.00000E+00	0.00000E+00
77	9.26710E-01	2.60250E+00	9.29589E-01	2.66634E-03	0.00000E+00	0.00000E+00
78	8.98330E-01	2.63550E+00	9.29177E-01	2.66297E-03	0.00000E+00	0.00000E+00
79	9.35670E-01	2.66750E+00	9.29262E-01	2.62951E-03	0.00000E+00	0.00000E+00
80	9.33596E-01	2.69967E+00	9.29317E-01	2.59618E-03	0.00000E+00	0.00000E+00
81	9.48769E-01	2.72983E+00	9.29563E-01	2.57490E-03	0.00000E+00	0.00000E+00
82	9.39203E-01	2.76183E+00	9.29684E-01	2.54537E-03	0.00000E+00	0.00000E+00
83	9.28844E-01	2.79200E+00	9.29674E-01	2.51377E-03	0.00000E+00	0.00000E+00
84	8.94824E-01	2.82317E+00	9.29249E-01	2.51903E-03	0.00000E+00	0.00000E+00
85	9.08282E-01	2.85517E+00	9.28996E-01	2.50129E-03	0.00000E+00	0.00000E+00
86	9.15407E-01	2.88917E+00	9.28834E-01	2.47662E-03	0.00000E+00	0.00000E+00
87	9.93412E-01	2.92017E+00	9.29594E-01	2.56252E-03	0.00000E+00	0.00000E+00
88	9.42819E-01	2.95400E+00	9.29748E-01	2.53721E-03	0.00000E+00	0.00000E+00
89	9.39362E-01	2.98517E+00	9.29858E-01	2.51031E-03	0.00000E+00	0.00000E+00
90	9.64034E-01	3.01633E+00	9.30247E-01	2.51183E-03	0.00000E+00	0.00000E+00

91	9.41603E-01	3.04933E+00	9.30374E-01	2.48672E-03	0.00000E+00	0.00000E+00
92	9.26417E-01	3.08217E+00	9.30330E-01	2.45933E-03	0.00000E+00	0.00000E+00
93	9.39822E-01	3.11433E+00	9.30434E-01	2.43439E-03	0.00000E+00	0.00000E+00
94	9.41933E-01	3.14633E+00	9.30559E-01	2.41102E-03	0.00000E+00	0.00000E+00
95	9.08772E-01	3.17833E+00	9.30325E-01	2.39644E-03	0.00000E+00	0.00000E+00
96	9.68022E-01	3.20667E+00	9.30726E-01	2.40448E-03	0.00000E+00	0.00000E+00
97	9.63263E-01	3.23700E+00	9.31069E-01	2.40357E-03	0.00000E+00	0.00000E+00
98	9.49781E-01	3.26983E+00	9.31264E-01	2.38637E-03	0.00000E+00	0.00000E+00
99	8.60497E-01	3.30383E+00	9.30740E-01	2.41894E-03	0.00000E+00	0.00000E+00
100	9.29169E-01	3.33583E+00	9.30724E-01	2.39418E-03	0.00000E+00	0.00000E+00
101	9.14967E-01	3.36883E+00	9.30565E-01	2.37521E-03	0.00000E+00	0.00000E+00
102	9.58820E-01	3.40083E+00	9.30848E-01	2.36826E-03	0.00000E+00	0.00000E+00
103	9.43701E-01	3.43383E+00	9.30975E-01	2.34814E-03	0.00000E+00	0.00000E+00
104	9.40429E-01	3.46583E+00	9.31068E-01	2.32685E-03	0.00000E+00	0.00000E+00
105	9.08479E-01	3.49883E+00	9.30848E-01	2.31457E-03	0.00000E+00	0.00000E+00
106	8.98088E-01	3.53167E+00	9.30533E-01	2.31375E-03	0.00000E+00	0.00000E+00
107	9.19000E-01	3.56100E+00	9.30423E-01	2.29424E-03	0.00000E+00	0.00000E+00
108	9.46591E-01	3.59400E+00	9.30576E-01	2.27760E-03	0.00000E+00	0.00000E+00
109	9.09390E-01	3.62517E+00	9.30378E-01	2.26489E-03	0.00000E+00	0.00000E+00
110	9.05182E-01	3.65533E+00	9.30145E-01	2.25591E-03	0.00000E+00	0.00000E+00
111	9.27537E-01	3.68550E+00	9.30121E-01	2.23525E-03	0.00000E+00	0.00000E+00
112	9.22314E-01	3.71850E+00	9.30050E-01	2.21597E-03	0.00000E+00	0.00000E+00
113	9.10178E-01	3.75133E+00	9.29871E-01	2.20320E-03	0.00000E+00	0.00000E+00
114	9.28726E-01	3.78433E+00	9.29861E-01	2.18347E-03	0.00000E+00	0.00000E+00
115	9.26631E-01	3.81733E+00	9.29832E-01	2.16425E-03	0.00000E+00	0.00000E+00
116	9.21527E-01	3.85033E+00	9.29759E-01	2.14641E-03	0.00000E+00	0.00000E+00
117	9.45762E-01	3.88317E+00	9.29898E-01	2.13221E-03	0.00000E+00	0.00000E+00
118	9.52413E-01	3.91433E+00	9.30092E-01	2.12265E-03	0.00000E+00	0.00000E+00
119	9.15698E-01	3.94817E+00	9.29969E-01	2.10802E-03	0.00000E+00	0.00000E+00
120	9.03018E-01	3.97933E+00	9.29741E-01	2.10252E-03	0.00000E+00	0.00000E+00
121	9.42731E-01	4.01050E+00	9.29850E-01	2.08763E-03	0.00000E+00	0.00000E+00
122	9.28797E-01	4.04067E+00	9.29841E-01	2.07018E-03	0.00000E+00	0.00000E+00
123	8.99805E-01	4.07267E+00	9.29593E-01	2.06795E-03	0.00000E+00	0.00000E+00
124	9.50440E-01	4.10383E+00	9.29764E-01	2.05804E-03	0.00000E+00	0.00000E+00
125	9.34668E-01	4.13583E+00	9.29804E-01	2.04163E-03	0.00000E+00	0.00000E+00
126	9.35066E-01	4.16700E+00	9.29846E-01	2.02554E-03	0.00000E+00	0.00000E+00
127	9.12199E-01	4.20083E+00	9.29705E-01	2.01422E-03	0.00000E+00	0.00000E+00
128	9.04448E-01	4.23300E+00	9.29505E-01	2.00820E-03	0.00000E+00	0.00000E+00
129	9.19795E-01	4.26583E+00	9.29428E-01	1.99380E-03	0.00000E+00	0.00000E+00
130	9.34935E-01	4.29700E+00	9.29471E-01	1.97863E-03	0.00000E+00	0.00000E+00
131	9.75830E-01	4.33000E+00	9.29831E-01	1.99585E-03	0.00000E+00	0.00000E+00
132	9.55577E-01	4.36300E+00	9.30029E-01	1.99031E-03	0.00000E+00	0.00000E+00
133	9.51182E-01	4.39317E+00	9.30190E-01	1.98165E-03	0.00000E+00	0.00000E+00
134	9.32807E-01	4.42433E+00	9.30210E-01	1.96668E-03	0.00000E+00	0.00000E+00
135	9.24365E-01	4.45533E+00	9.30166E-01	1.95233E-03	0.00000E+00	0.00000E+00
136	8.97090E-01	4.48833E+00	9.29919E-01	1.95337E-03	0.00000E+00	0.00000E+00
137	9.25851E-01	4.52317E+00	9.29889E-01	1.93908E-03	0.00000E+00	0.00000E+00
138	9.04873E-01	4.55783E+00	9.29705E-01	1.93354E-03	0.00000E+00	0.00000E+00
139	9.46926E-01	4.59083E+00	9.29831E-01	1.92348E-03	0.00000E+00	0.00000E+00
140	9.14020E-01	4.62283E+00	9.29716E-01	1.91293E-03	0.00000E+00	0.00000E+00
141	9.23100E-01	4.65583E+00	9.29669E-01	1.89971E-03	0.00000E+00	0.00000E+00
142	9.62653E-01	4.68700E+00	9.29904E-01	1.90075E-03	0.00000E+00	0.00000E+00
143	9.30360E-01	4.72083E+00	9.29907E-01	1.88723E-03	0.00000E+00	0.00000E+00
144	9.26224E-01	4.75200E+00	9.29881E-01	1.87407E-03	0.00000E+00	0.00000E+00
145	9.54848E-01	4.78317E+00	9.30056E-01	1.86909E-03	0.00000E+00	0.00000E+00
146	8.96790E-01	4.81517E+00	9.29825E-01	1.87039E-03	0.00000E+00	0.00000E+00
147	9.04833E-01	4.84817E+00	9.29653E-01	1.86542E-03	0.00000E+00	0.00000E+00
148	8.98946E-01	4.88200E+00	9.29442E-01	1.86450E-03	0.00000E+00	0.00000E+00
149	9.33294E-01	4.91400E+00	9.29469E-01	1.85196E-03	0.00000E+00	0.00000E+00
150	9.34657E-01	4.94700E+00	9.29504E-01	1.83974E-03	0.00000E+00	0.00000E+00
151	9.18472E-01	4.97983E+00	9.29430E-01	1.82885E-03	0.00000E+00	0.00000E+00
152	8.67052E-01	5.01467E+00	9.29014E-01	1.86360E-03	0.00000E+00	0.00000E+00
153	9.27600E-01	5.04483E+00	9.29004E-01	1.85124E-03	0.00000E+00	0.00000E+00
154	9.47229E-01	5.07783E+00	9.29124E-01	1.84293E-03	0.00000E+00	0.00000E+00
155	9.32962E-01	5.10900E+00	9.29149E-01	1.83102E-03	0.00000E+00	0.00000E+00
156	9.72611E-01	5.14017E+00	9.29432E-01	1.84085E-03	0.00000E+00	0.00000E+00
157	9.65798E-01	5.17033E+00	9.29666E-01	1.84392E-03	0.00000E+00	0.00000E+00
158	9.17370E-01	5.20233E+00	9.29587E-01	1.83376E-03	0.00000E+00	0.00000E+00
159	9.10247E-01	5.23617E+00	9.29464E-01	1.82620E-03	0.00000E+00	0.00000E+00
160	9.13379E-01	5.26917E+00	9.29362E-01	1.81746E-03	0.00000E+00	0.00000E+00
161	9.28367E-01	5.30117E+00	9.29356E-01	1.80600E-03	0.00000E+00	0.00000E+00
162	9.19275E-01	5.33700E+00	9.29293E-01	1.79579E-03	0.00000E+00	0.00000E+00
163	9.35844E-01	5.36900E+00	9.29334E-01	1.78506E-03	0.00000E+00	0.00000E+00
164	9.11599E-01	5.40200E+00	9.29224E-01	1.77738E-03	0.00000E+00	0.00000E+00
165	9.78200E-01	5.43217E+00	9.29525E-01	1.79182E-03	0.00000E+00	0.00000E+00
166	9.48222E-01	5.46333E+00	9.29639E-01	1.78450E-03	0.00000E+00	0.00000E+00
167	9.32245E-01	5.49433E+00	9.29655E-01	1.77372E-03	0.00000E+00	0.00000E+00
168	9.59548E-01	5.52650E+00	9.29835E-01	1.77218E-03	0.00000E+00	0.00000E+00
169	9.26540E-01	5.55483E+00	9.29815E-01	1.76165E-03	0.00000E+00	0.00000E+00
170	9.56491E-01	5.58317E+00	9.29974E-01	1.75831E-03	0.00000E+00	0.00000E+00
171	9.66214E-01	5.61517E+00	9.30188E-01	1.76098E-03	0.00000E+00	0.00000E+00
172	8.99076E-01	5.64817E+00	9.30005E-01	1.76014E-03	0.00000E+00	0.00000E+00
173	9.28426E-01	5.68017E+00	9.29996E-01	1.74984E-03	0.00000E+00	0.00000E+00
174	8.75995E-01	5.71417E+00	9.29682E-01	1.76774E-03	0.00000E+00	0.00000E+00
175	9.07432E-01	5.74983E+00	9.29553E-01	1.76219E-03	0.00000E+00	0.00000E+00
176	9.06518E-01	5.78267E+00	9.29421E-01	1.75703E-03	0.00000E+00	0.00000E+00
177	9.02496E-01	5.81750E+00	9.29267E-01	1.75372E-03	0.00000E+00	0.00000E+00
178	9.32729E-01	5.84950E+00	9.29287E-01	1.74384E-03	0.00000E+00	0.00000E+00
179	9.45110E-01	5.87983E+00	9.29376E-01	1.73626E-03	0.00000E+00	0.00000E+00
180	9.40149E-01	5.91083E+00	9.29437E-01	1.72754E-03	0.00000E+00	0.00000E+00
181	8.96099E-01	5.94200E+00	9.29250E-01	1.72793E-03	0.00000E+00	0.00000E+00
182	9.11153E-01	5.97317E+00	9.29150E-01	1.72124E-03	0.00000E+00	0.00000E+00
183	8.67411E-01	6.00617E+00	9.28919E-01	1.72717E-03	0.00000E+00	0.00000E+00
184	9.49590E-01	6.03817E+00	9.29033E-01	1.72140E-03	0.00000E+00	0.00000E+00
185	8.61613E-01	6.07117E+00	9.28774E-01	1.73147E-03	0.00000E+00	0.00000E+00

186	9.11404E-01	6.10500E+00	9.28679E-01	1.72462E-03	0.00000E+00	0.00000E+00
187	9.02526E-01	6.13983E+00	9.28538E-01	1.72109E-03	0.00000E+00	0.00000E+00
188	9.31905E-01	6.17183E+00	9.28556E-01	1.71191E-03	0.00000E+00	0.00000E+00
189	9.08840E-01	6.20483E+00	9.28451E-01	1.70599E-03	0.00000E+00	0.00000E+00
190	9.42424E-01	6.23583E+00	9.28525E-01	1.69852E-03	0.00000E+00	0.00000E+00
191	9.30885E-01	6.26700E+00	9.28537E-01	1.68955E-03	0.00000E+00	0.00000E+00
192	9.48939E-01	6.29900E+00	9.28645E-01	1.68406E-03	0.00000E+00	0.00000E+00
193	9.06979E-01	6.33100E+00	9.28542E-01	1.67838E-03	0.00000E+00	0.00000E+00
194	9.15399E-01	6.36217E+00	9.28473E-01	1.67102E-03	0.00000E+00	0.00000E+00
195	9.47854E-01	6.39233E+00	9.28574E-01	1.66537E-03	0.00000E+00	0.00000E+00
196	9.42632E-01	6.42350E+00	9.28646E-01	1.65835E-03	0.00000E+00	0.00000E+00
197	8.91985E-01	6.45733E+00	9.28458E-01	1.66050E-03	0.00000E+00	0.00000E+00
198	9.18838E-01	6.49033E+00	9.28409E-01	1.65273E-03	0.00000E+00	0.00000E+00
199	9.75930E-01	6.52050E+00	9.28650E-01	1.66192E-03	0.00000E+00	0.00000E+00
200	9.16611E-01	6.55267E+00	9.28590E-01	1.65463E-03	0.00000E+00	0.00000E+00
201	8.98135E-01	6.58550E+00	9.28437E-01	1.65339E-03	0.00000E+00	0.00000E+00
202	9.50982E-01	6.61850E+00	9.28549E-01	1.64896E-03	0.00000E+00	0.00000E+00
203	9.12632E-01	6.65150E+00	9.28470E-01	1.64264E-03	0.00000E+00	0.00000E+00
204	9.43946E-01	6.68350E+00	9.28547E-01	1.63629E-03	0.00000E+00	0.00000E+00
205	9.34774E-01	6.71550E+00	9.28577E-01	1.62849E-03	0.00000E+00	0.00000E+00
206	8.96601E-01	6.74667E+00	9.28421E-01	1.62806E-03	0.00000E+00	0.00000E+00
207	9.29265E-01	6.77783E+00	9.28425E-01	1.62010E-03	0.00000E+00	0.00000E+00
208	9.12953E-01	6.80983E+00	9.28350E-01	1.61396E-03	0.00000E+00	0.00000E+00
209	9.25468E-01	6.84283E+00	9.28336E-01	1.60621E-03	0.00000E+00	0.00000E+00
210	9.23886E-01	6.87667E+00	9.28314E-01	1.59861E-03	0.00000E+00	0.00000E+00
211	9.47202E-01	6.90783E+00	9.28405E-01	1.59351E-03	0.00000E+00	0.00000E+00
212	9.95862E-01	6.93900E+00	9.28726E-01	1.61811E-03	0.00000E+00	0.00000E+00
213	9.76294E-01	6.97183E+00	9.28951E-01	1.62612E-03	0.00000E+00	0.00000E+00
214	9.04657E-01	7.00567E+00	9.28837E-01	1.62249E-03	0.00000E+00	0.00000E+00
215	8.92376E-01	7.03783E+00	9.28666E-01	1.62390E-03	0.00000E+00	0.00000E+00
216	9.49883E-01	7.06983E+00	9.28765E-01	1.61933E-03	0.00000E+00	0.00000E+00
217	9.32266E-01	7.10000E+00	9.28781E-01	1.61186E-03	0.00000E+00	0.00000E+00
218	9.11619E-01	7.13300E+00	9.28702E-01	1.60635E-03	0.00000E+00	0.00000E+00
219	9.71129E-01	7.16417E+00	9.28897E-01	1.61084E-03	0.00000E+00	0.00000E+00
220	9.10902E-01	7.19617E+00	9.28815E-01	1.60556E-03	0.00000E+00	0.00000E+00
221	9.48981E-01	7.22817E+00	9.28907E-01	1.60086E-03	0.00000E+00	0.00000E+00
222	9.19034E-01	7.26117E+00	9.28862E-01	1.59420E-03	0.00000E+00	0.00000E+00
223	9.28355E-01	7.29317E+00	9.28860E-01	1.58697E-03	0.00000E+00	0.00000E+00
224	9.28464E-01	7.32700E+00	9.28858E-01	1.57981E-03	0.00000E+00	0.00000E+00
225	9.44280E-01	7.35917E+00	9.28927E-01	1.57423E-03	0.00000E+00	0.00000E+00
226	9.11169E-01	7.39300E+00	9.28848E-01	1.56919E-03	0.00000E+00	0.00000E+00
227	8.98061E-01	7.42600E+00	9.28711E-01	1.56818E-03	0.00000E+00	0.00000E+00
228	9.34595E-01	7.45700E+00	9.28737E-01	1.56144E-03	0.00000E+00	0.00000E+00
229	9.01249E-01	7.48817E+00	9.28616E-01	1.55926E-03	0.00000E+00	0.00000E+00
230	9.00532E-01	7.51933E+00	9.28493E-01	1.55728E-03	0.00000E+00	0.00000E+00
231	9.65530E-01	7.54950E+00	9.28654E-01	1.55888E-03	0.00000E+00	0.00000E+00
232	9.05497E-01	7.58250E+00	9.28554E-01	1.55535E-03	0.00000E+00	0.00000E+00
233	9.32295E-01	7.61550E+00	9.28570E-01	1.54868E-03	0.00000E+00	0.00000E+00
234	9.39394E-01	7.64750E+00	9.28616E-01	1.54270E-03	0.00000E+00	0.00000E+00
235	9.24179E-01	7.68133E+00	9.28597E-01	1.53618E-03	0.00000E+00	0.00000E+00
236	9.00026E-01	7.71433E+00	9.28475E-01	1.53447E-03	0.00000E+00	0.00000E+00
237	9.26802E-01	7.74717E+00	9.28468E-01	1.52794E-03	0.00000E+00	0.00000E+00
238	9.10312E-01	7.78117E+00	9.28391E-01	1.52340E-03	0.00000E+00	0.00000E+00
239	9.25053E-01	7.81500E+00	9.28377E-01	1.51702E-03	0.00000E+00	0.00000E+00
240	9.51164E-01	7.84700E+00	9.28473E-01	1.51367E-03	0.00000E+00	0.00000E+00
241	9.42666E-01	7.87717E+00	9.28532E-01	1.50849E-03	0.00000E+00	0.00000E+00
242	9.56394E-01	7.91017E+00	9.28648E-01	1.50667E-03	0.00000E+00	0.00000E+00
243	9.17748E-01	7.94317E+00	9.28603E-01	1.50109E-03	0.00000E+00	0.00000E+00
244	9.51436E-01	7.97517E+00	9.28698E-01	1.49785E-03	0.00000E+00	0.00000E+00
245	9.64962E-01	8.00633E+00	9.28847E-01	1.49912E-03	0.00000E+00	0.00000E+00
246	6.98459E-01	8.04017E+00	9.28722E-01	1.49814E-03	0.00000E+00	0.00000E+00
247	9.54002E-01	8.07217E+00	9.28825E-01	1.49558E-03	0.00000E+00	0.00000E+00
248	9.21945E-01	8.10433E+00	9.28797E-01	1.48975E-03	0.00000E+00	0.00000E+00
249	9.16143E-01	8.13717E+00	9.28746E-01	1.48459E-03	0.00000E+00	0.00000E+00
250	9.25566E-01	8.16933E+00	9.28733E-01	1.47865E-03	0.00000E+00	0.00000E+00
251	9.46658E-01	8.20133E+00	9.28813E-01	1.47487E-03	0.00000E+00	0.00000E+00
252	9.34766E-01	8.23333E+00	9.28837E-01	1.46915E-03	0.00000E+00	0.00000E+00
253	9.68129E-01	8.26450E+00	9.28994E-01	1.47164E-03	0.00000E+00	0.00000E+00
254	8.64140E-01	8.29467E+00	9.28736E-01	1.48821E-03	0.00000E+00	0.00000E+00
255	8.96829E-01	8.32667E+00	9.28610E-01	1.48767E-03	0.00000E+00	0.00000E+00
256	9.27779E-01	8.35967E+00	9.28607E-01	1.48180E-03	0.00000E+00	0.00000E+00
257	9.35282E-01	8.39167E+00	9.28633E-01	1.47621E-03	0.00000E+00	0.00000E+00
258	9.36664E-01	8.42550E+00	9.28665E-01	1.47077E-03	0.00000E+00	0.00000E+00
259	9.21719E-01	8.45667E+00	9.28638E-01	1.46528E-03	0.00000E+00	0.00000E+00
260	9.18450E-01	8.48967E+00	9.28598E-01	1.46013E-03	0.00000E+00	0.00000E+00
261	9.36405E-01	8.52267E+00	9.28628E-01	1.45479E-03	0.00000E+00	0.00000E+00
262	9.22285E-01	8.55550E+00	9.28604E-01	1.44939E-03	0.00000E+00	0.00000E+00
263	6.93737E-01	8.58667E+00	9.28470E-01	1.44999E-03	0.00000E+00	0.00000E+00
264	9.65537E-01	8.61867E+00	9.28612E-01	1.45136E-03	0.00000E+00	0.00000E+00
265	9.45569E-01	8.64900E+00	9.28676E-01	1.44727E-03	0.00000E+00	0.00000E+00
266	9.37357E-01	8.68183E+00	9.28709E-01	1.44215E-03	0.00000E+00	0.00000E+00
267	9.23928E-01	8.71583E+00	9.28691E-01	1.43681E-03	0.00000E+00	0.00000E+00
268	8.63376E-01	8.74967E+00	9.28445E-01	1.45231E-03	0.00000E+00	0.00000E+00
269	9.47296E-01	8.78167E+00	9.28516E-01	1.44858E-03	0.00000E+00	0.00000E+00
270	9.61230E-01	8.81367E+00	9.28638E-01	1.44832E-03	0.00000E+00	0.00000E+00
271	9.03436E-01	8.84667E+00	9.28544E-01	1.44596E-03	0.00000E+00	0.00000E+00
272	9.29466E-01	8.87867E+00	9.28548E-01	1.44060E-03	0.00000E+00	0.00000E+00
273	9.12897E-01	8.91167E+00	9.28490E-01	1.43644E-03	0.00000E+00	0.00000E+00
274	9.22394E-01	8.94550E+00	9.28468E-01	1.43132E-03	0.00000E+00	0.00000E+00
275	9.33945E-01	8.97667E+00	9.28488E-01	1.42621E-03	0.00000E+00	0.00000E+00
276	9.18429E-01	9.00600E+00	9.28451E-01	1.42147E-03	0.00000E+00	0.00000E+00
277	9.11184E-01	9.03617E+00	9.28388E-01	1.41768E-03	0.00000E+00	0.00000E+00
278	9.44100E-01	9.07000E+00	9.28445E-01	1.41368E-03	0.00000E+00	0.00000E+00
279	9.31465E-01	9.10383E+00	9.28456E-01	1.40861E-03	0.00000E+00	0.00000E+00
280	9.47174E-01	9.13783E+00	9.28523E-01	1.40515E-03	0.00000E+00	0.00000E+00

281	9.35082E-01	9.16983E+00	9.28547E-01	1.40030E-03	0.00000E+00	0.00000E+00
282	9.27815E-01	9.20183E+00	9.28544E-01	1.39530E-03	0.00000E+00	0.00000E+00
283	9.31773E-01	9.23567E+00	9.28556E-01	1.39037E-03	0.00000E+00	0.00000E+00
284	9.16095E-01	9.26867E+00	9.28512E-01	1.38613E-03	0.00000E+00	0.00000E+00
285	9.84640E-01	9.30067E+00	9.28710E-01	1.39539E-03	0.00000E+00	0.00000E+00
286	9.25277E-01	9.33100E+00	9.28698E-01	1.39052E-03	0.00000E+00	0.00000E+00
287	9.09745E-01	9.36300E+00	9.28631E-01	1.38723E-03	0.00000E+00	0.00000E+00
288	9.57832E-01	9.39600E+00	9.28733E-01	1.38614E-03	0.00000E+00	0.00000E+00
289	9.24622E-01	9.42700E+00	9.28719E-01	1.38137E-03	0.00000E+00	0.00000E+00
290	8.97633E-01	9.46100E+00	9.28611E-01	1.38079E-03	0.00000E+00	0.00000E+00
291	9.12205E-01	9.49383E+00	9.28554E-01	1.37718E-03	0.00000E+00	0.00000E+00
292	9.76897E-01	9.52500E+00	9.28721E-01	1.38251E-03	0.00000E+00	0.00000E+00
293	9.34423E-01	9.55800E+00	9.28741E-01	1.37789E-03	0.00000E+00	0.00000E+00
294	9.58806E-01	9.58900E+00	9.28844E-01	1.37702E-03	0.00000E+00	0.00000E+00
295	8.90681E-01	9.62200E+00	9.28713E-01	1.37848E-03	0.00000E+00	0.00000E+00
296	8.85455E-01	9.65500E+00	9.28566E-01	1.38164E-03	0.00000E+00	0.00000E+00
297	9.45813E-01	9.68800E+00	9.28625E-01	1.37819E-03	0.00000E+00	0.00000E+00
298	9.52040E-01	9.71817E+00	9.28704E-01	1.37580E-03	0.00000E+00	0.00000E+00
299	9.51573E-01	9.74833E+00	9.28781E-01	1.37332E-03	0.00000E+00	0.00000E+00
300	9.49305E-01	9.78033E+00	9.28850E-01	1.37043E-03	0.00000E+00	0.00000E+00
301	9.08119E-01	9.81150E+00	9.28780E-01	1.36760E-03	0.00000E+00	0.00000E+00
302	9.20235E-01	9.84450E+00	9.28752E-01	1.36333E-03	0.00000E+00	0.00000E+00
303	9.30871E-01	9.87467E+00	9.28759E-01	1.35881E-03	0.00000E+00	0.00000E+00

KENO MESSAGE NUMBER K5-123 EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY; NO WATER IN GAP

LIFETIME = 9.73114E-05 + OR - 2.94167E-07 GENERATION TIME = 3.71858E-05 + OR - 9.05456E-08
NU BAR = 2.43684E+00 + OR - 1.00493E-04 AVERAGE FISSION GROUP = 2.24236E+01 + OR - 5.68246E-03
ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION = 1.68092E-01 + OR - 8.11248E-04

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.92877	+ OR - 0.00136	0.92740 TO 0.93013	0.92604 TO 0.93149	0.92468 TO 0.93286	300000
4	0.92870	+ OR - 0.00137	0.92734 TO 0.93007	0.92597 TO 0.93144	0.92460 TO 0.93280	299000
5	0.92865	+ OR - 0.00137	0.92728 TO 0.93002	0.92591 TO 0.93139	0.92454 TO 0.93276	298000
6	0.92855	+ OR - 0.00137	0.92718 TO 0.92992	0.92581 TO 0.93130	0.92444 TO 0.93267	297000
7	0.92862	+ OR - 0.00137	0.92725 TO 0.92999	0.92587 TO 0.93137	0.92450 TO 0.93274	296000
8	0.92864	+ OR - 0.00138	0.92726 TO 0.93002	0.92588 TO 0.93140	0.92451 TO 0.93278	295000
9	0.92865	+ OR - 0.00138	0.92727 TO 0.93004	0.92589 TO 0.93142	0.92450 TO 0.93280	294000
10	0.92856	+ OR - 0.00139	0.92718 TO 0.92995	0.92579 TO 0.93133	0.92441 TO 0.93272	293000
11	0.92864	+ OR - 0.00139	0.92725 TO 0.93003	0.92586 TO 0.93141	0.92447 TO 0.93280	292000
12	0.92860	+ OR - 0.00139	0.92721 TO 0.92999	0.92581 TO 0.93138	0.92442 TO 0.93278	291000
17	0.92849	+ OR - 0.00141	0.92709 TO 0.92990	0.92568 TO 0.93130	0.92428 TO 0.93271	286000
22	0.92839	+ OR - 0.00142	0.92697 TO 0.92982	0.92555 TO 0.93124	0.92413 TO 0.93266	281000
27	0.92833	+ OR - 0.00144	0.92689 TO 0.92977	0.92546 TO 0.93121	0.92402 TO 0.93265	276000
32	0.92869	+ OR - 0.00143	0.92726 TO 0.93012	0.92583 TO 0.93155	0.92440 TO 0.93298	271000
37	0.92877	+ OR - 0.00145	0.92732 TO 0.93022	0.92587 TO 0.93168	0.92441 TO 0.93313	266000
42	0.92874	+ OR - 0.00145	0.92729 TO 0.93019	0.92584 TO 0.93164	0.92439 TO 0.93309	261000
47	0.92882	+ OR - 0.00147	0.92735 TO 0.93028	0.92588 TO 0.93175	0.92442 TO 0.93322	256000
52	0.92900	+ OR - 0.00148	0.92752 TO 0.93048	0.92603 TO 0.93196	0.92455 TO 0.93345	251000
57	0.92871	+ OR - 0.00150	0.92721 TO 0.93021	0.92571 TO 0.93171	0.92421 TO 0.93321	246000
62	0.92862	+ OR - 0.00152	0.92710 TO 0.93013	0.92559 TO 0.93165	0.92407 TO 0.93317	241000
67	0.92820	+ OR - 0.00153	0.92667 TO 0.92973	0.92514 TO 0.93126	0.92361 TO 0.93279	236000
72	0.92840	+ OR - 0.00155	0.92685 TO 0.92995	0.92530 TO 0.93150	0.92375 TO 0.93305	231000
77	0.92848	+ OR - 0.00158	0.92690 TO 0.93007	0.92532 TO 0.93165	0.92374 TO 0.93323	226000
82	0.92842	+ OR - 0.00161	0.92682 TO 0.93003	0.92521 TO 0.93164	0.92360 TO 0.93325	221000
87	0.92843	+ OR - 0.00161	0.92682 TO 0.93004	0.92522 TO 0.93164	0.92361 TO 0.93325	216000
92	0.92809	+ OR - 0.00163	0.92646 TO 0.92972	0.92483 TO 0.93135	0.92319 TO 0.93298	211000

LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY; NO WATER IN GAP

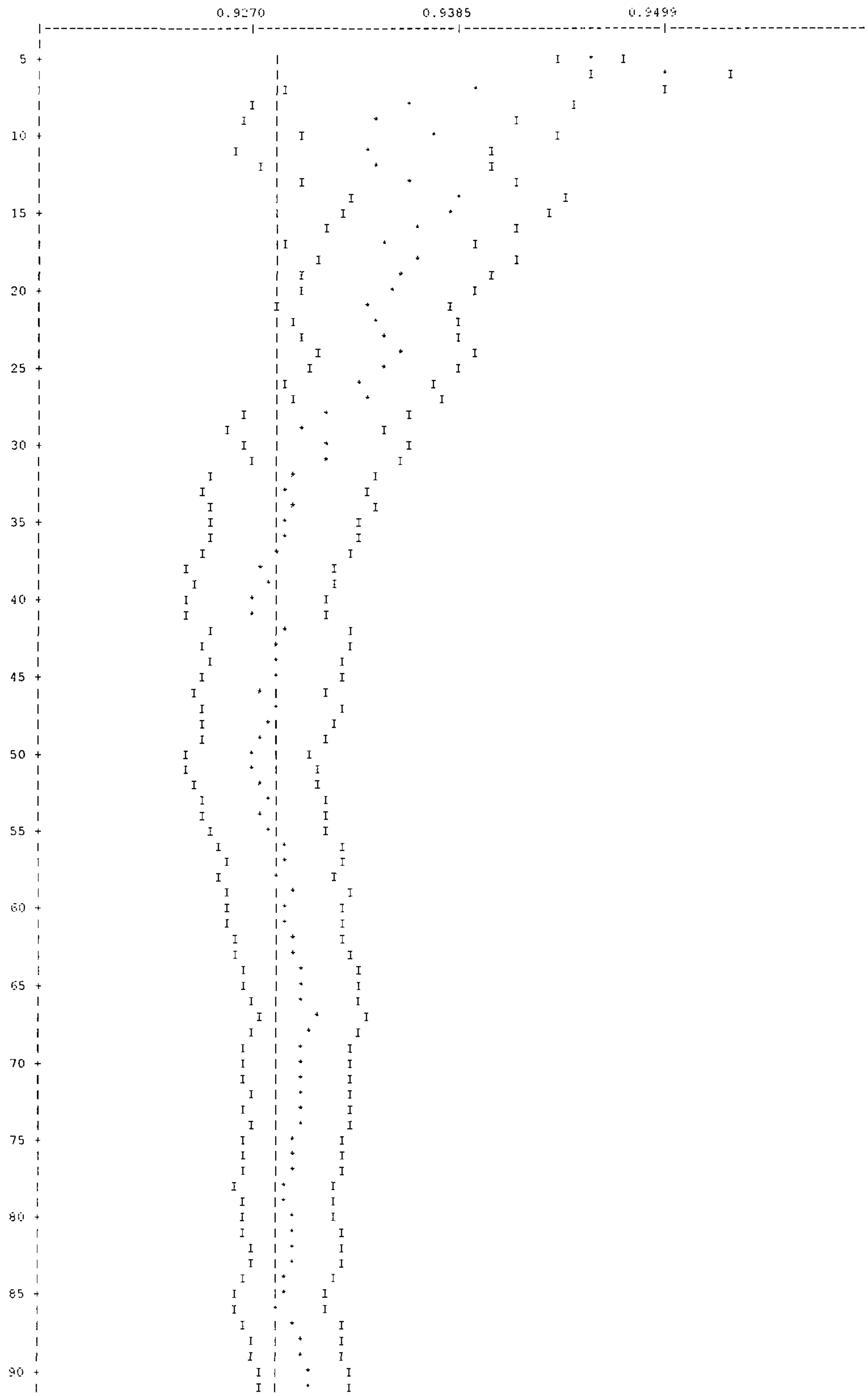
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
97	0.92769	+ OR - 0.00165	0.92605 TO 0.92934	0.92440 TO 0.93099	0.92276 TO 0.93263	206000
102	0.92772	+ OR - 0.00166	0.92606 TO 0.92938	0.92440 TO 0.93104	0.92274 TO 0.93269	201000
107	0.92787	+ OR - 0.00169	0.92618 TO 0.92955	0.92449 TO 0.93124	0.92281 TO 0.93293	196000
112	0.92802	+ OR - 0.00172	0.92629 TO 0.92974	0.92457 TO 0.93146	0.92285 TO 0.93318	191000
117	0.92805	+ OR - 0.00176	0.92629 TO 0.92982	0.92453 TO 0.93158	0.92277 TO 0.93334	186000
122	0.92804	+ OR - 0.00180	0.92624 TO 0.92984	0.92445 TO 0.93164	0.92265 TO 0.93343	181000
127	0.92809	+ OR - 0.00183	0.92625 TO 0.92992	0.92442 TO 0.93176	0.92258 TO 0.93359	176000
132	0.92779	+ OR - 0.00185	0.92594 TO 0.92965	0.92409 TO 0.93150	0.92223 TO 0.93336	171000
137	0.92784	+ OR - 0.00190	0.92594 TO 0.92974	0.92405 TO 0.93163	0.92215 TO 0.93353	166000
142	0.92776	+ OR - 0.00193	0.92583 TO 0.92969	0.92390 TO 0.93163	0.92197 TO 0.93356	161000
147	0.92793	+ OR - 0.00197	0.92596 TO 0.92990	0.92399 TO 0.93187	0.92202 TO 0.93384	156000
152	0.92851	+ OR - 0.00198	0.92652 TO 0.93049	0.92454 TO 0.93247	0.92256 TO 0.93446	151000
157	0.92780	+ OR - 0.00201	0.92579 TO 0.92980	0.92378 TO 0.93181	0.92177 TO 0.93382	146000
162	0.92815	+ OR - 0.00207	0.92608 TO 0.93022	0.92401 TO 0.93229	0.92194 TO 0.93436	141000
167	0.92767	+ OR - 0.00210	0.92557 TO 0.92978	0.92346 TO 0.93188	0.92136 TO 0.93399	136000
172	0.92714	+ OR - 0.00213	0.92501 TO 0.92927	0.92289 TO 0.93140	0.92076 TO 0.93353	131000
177	0.92805	+ OR - 0.00215	0.92590 TO 0.93021	0.92375 TO 0.93236	0.92160 TO 0.93451	126000
182	0.92818	+ OR - 0.00221	0.92596 TO 0.93039	0.92375 TO 0.93261	0.92153 TO 0.93482	121000
187	0.92911	+ OR - 0.00222	0.92689 TO 0.93133	0.92467 TO 0.93356	0.92244 TO 0.93578	116000
192	0.92895	+ OR - 0.00231	0.92665 TO 0.93126	0.92434 TO 0.93356	0.92204 TO 0.93587	111000
197	0.92931	+ OR - 0.00237	0.92694 TO 0.93168	0.92458 TO 0.93405	0.92221 TO 0.93641	106000
202	0.92917	+ OR - 0.00241	0.92677 TO 0.93158	0.92436 TO 0.93399	0.92196 TO 0.93639	101000
207	0.92947	+ OR - 0.00250	0.92697 TO 0.93197	0.92448 TO 0.93447	0.92198 TO 0.93697	96000
212	0.92883	+ OR - 0.00252	0.92632 TO 0.93135	0.92380 TO 0.93387	0.92129 TO 0.93638	91000
217	0.92870	+ OR - 0.00254	0.92616 TO 0.93124	0.92362 TO 0.93379	0.92108 TO 0.93633	86000
222	0.92848	+ OR - 0.00261	0.92587 TO 0.93109	0.92325 TO 0.93371	0.92064 TO 0.93632	81000
227	0.92890	+ OR - 0.00274	0.92616 TO 0.93164	0.92342 TO 0.93438	0.92068 TO 0.93712	76000

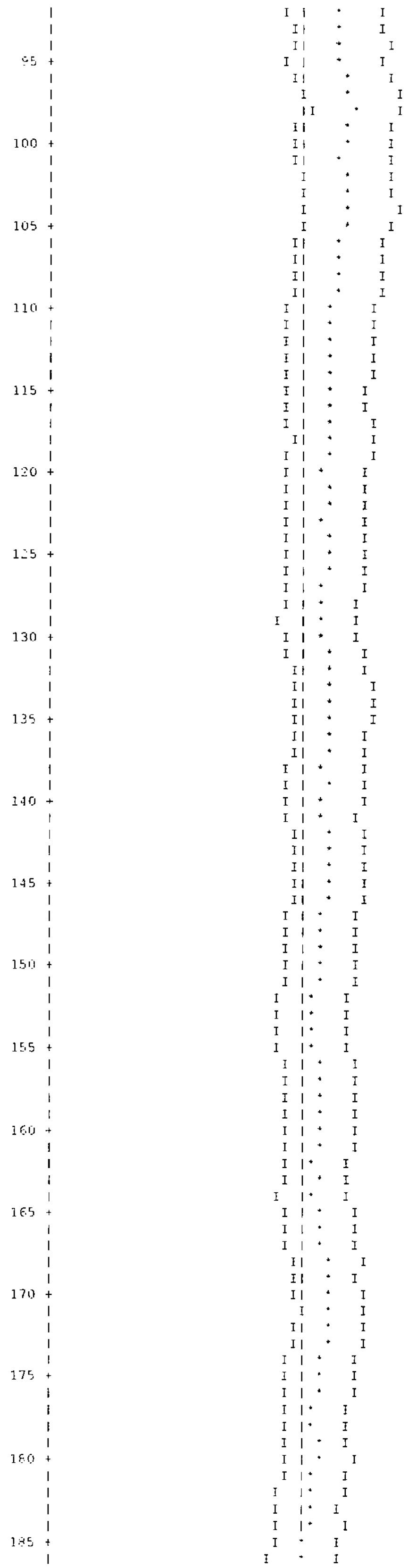
LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY; NO WATER IN GAP

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
232	0.92942	+ OR - 0.00281	0.92661 TO 0.93224	0.92380 TO 0.93505	0.92099 TO 0.93786	71000
237	0.92979	+ OR - 0.00299	0.92681 TO 0.93278	0.92382 TO 0.93577	0.92084 TO 0.93875	66000
242	0.92919	+ OR - 0.00316	0.92604 TO 0.93235	0.92288 TO 0.93551	0.91972 TO 0.93867	61000
247	0.92847	+ OP - 0.00327	0.92519 TO 0.93174	0.92192 TO 0.93502	0.91865 TO 0.93829	56000
252	0.92838	+ OR - 0.00356	0.92481 TO 0.93194	0.92125 TO 0.93550	0.91769 TO 0.93906	51000
257	0.92946	+ OR - 0.00351	0.92594 TO 0.93297	0.92243 TO 0.93648	0.91892 TO 0.94000	46000
262	0.92974	+ OR - 0.00392	0.92582 TO 0.93366	0.92190 TO 0.93759	0.91798 TO 0.94151	41000
267	0.92926	+ OR - 0.00421	0.92505 TO 0.93347	0.92085 TO 0.93767	0.91664 TO 0.94188	36000
272	0.93060	+ OR - 0.00413	0.92647 TO 0.93473	0.92233 TO 0.93886	0.91820 TO 0.94299	31000
277	0.93268	+ OR - 0.00478	0.92790 TO 0.93746	0.92312 TO 0.94224	0.91834 TO 0.94702	26000
282	0.93162	+ OR - 0.00587	0.92575 TO 0.93749	0.91989 TO 0.94335	0.91402 TO 0.94922	21000
287	0.93103	+ OR - 0.00673	0.92430 TO 0.93776	0.91757 TO 0.94450	0.91083 TO 0.95123	16000
292	0.92976	+ OR - 0.00770	0.92205 TO 0.93746	0.91435 TO 0.94516	0.90665 TO 0.95287	11000
297	0.93536	+ OR - 0.00759	0.92777 TO 0.94294	0.92018 TO 0.95053	0.91260 TO 0.95812	6000

LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY; NO WATER IN GAP

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.9288 + OR - 0.0014 WHICH OCCURS FOR 303 GENERATIONS RUN.




95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185

```
     |                        I   *   I
     |                        I   *   I
     |                        I   *  I
 190 +                        I   *   I
     |                        I   *   I
     |                        I   *   I
     |                        I   *  I
     |                        I   *  I
 195 +                        I   *   I
     |                        I   *   I
     |                        I   *  I
     |                        I   *  I
     |                        I   *   I
 200 +                        I   *   I
     |                        I   *  I
     |                        I   *  I
     |                        I   *  I
     |                        I   *  I
 205 +                        I   *  I
     |                        I   *  I
     |                        I   *  I
     |                        I  *|  I
     |                        I  *|  I
 210 +                        I  *|  I
     |                        I  *|  I
     |                         I  *   I
     |                         I  |*  I
     |                         I  *   I
 215 +                         I  *   I
     |                         I  *   I
     |                         I  *   I
     |                         I  *   I
     |                         I  |*  I
 220 +                         I  *   I
     |                         I  |*  I
     |                         I  |*  I
     |                         I  *   I
     |                         I  *   I
 225 +                         I  |*  I
     |                         I  *   I
     |                         I  *   I
     |                         I  *   I
     |                         I  *  I
 230 +                        I   *  I
     |                         I  *  I
     |                        I   *  I
     |                        I   *  I
     |                         I  *  I
 235 +                         I  *  I
     |                        I   *  I
     |                        I   *  I
     |                        I  *|  I
     |                        I  *|  I
 240 +                        I   *  I
     |                        I   *  I
     |                         I  *  I
     |                         I  *  I
     |                         I  *  I
 245 +                         I  *   I
     |                         I  *  I
     |                         I  *   I
     |                         I  *   I
     |                         I  *   I
 250 +                         I  *  I
     |                         I  *   I
     |                         I  *   I
     |                          I |*  I
     |                         I  *  I
 255 +                         I  *  I
     |                         I  *  I
     |                         I  *  I
     |                         I  *  I
     |                         I  *  I
 260 +                         I  *  I
     |                         I  *  I
     |                         I  *  I
     |                        I   *  I
     |                         I  *  I
 265 +                         I  *  I
     |                         I  *  I
     |                         I  *  I
     |                        I   *  I
     |                         I  *  I
 270 +                         I  *  I
     |                         I  *  I
     |                         I  *  I
     |                         I  *  I
     |                        I   *  I
 275 +                         I  *  I
     |                        I   *  I
     |                        I  *|  I
     |                        I   *  I
     |                         I  *  I
 280 +                         I  *  I
     |                         I  *  I
```

```
      |                          I  *  I
      |                          I  *  I
      |                          I  *  I
  285 +                          I  *  I
      |                          I  *  I
      |                          I  *  I
      |                          I  *  I
      |                          I  *  I
  290 +                          I  *  I
      |                          I  *  I
      |                          I  *  I
      |                          I  *  I
      |                          I  *  I
  295 +                          I  *  I
      |                          I  *  I
      |                          I  *  I
      |                          I  *  I
      |                          I  *  I
  300 +                          I  *  I
      |                          I  *  I
      |                          I  *  I
      |                          I  *  I
```

LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY; NO WATER IN GAP

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0045			4.13525E-03	2.1624	2.31474E-03	1.6942	1.16131E-04	17.4208
2	0.0184			1.70563E-02	0.6777	8.53945E-03	0.5701	3.24894E-04	9.2849
3	0.0203			1.88901E-02	0.5923	7.85394E-03	0.5710	6.72946E-04	6.9707
4	0.0085			7.89259E-03	0.7446	3.77855E-03	0.7149	3.66621E-04	9.1531
5	0.0027			2.50503E-03	0.5824	2.63470E-03	0.5120	7.00533E-04	7.3109
6	0.0024			2.18471E-03	0.4558	4.37485E-03	0.3727	1.49246E-03	4.9447
7	0.0023			2.16286E-03	0.4659	4.93271E-03	0.3755	1.74377E-03	4.3704
8	0.0023			2.17357E-03	0.5027	7.35496E-03	0.4059	7.33592E-04	6.1702
9	0.0032			2.94449E-03	0.5013	1.14341E-02	0.4011	3.78803E-04	8.7840
10	0.0068			6.27675E-03	0.5048	1.73735E-02	0.4335	3.43542E-04	9.0743
11	0.0142			1.32020E-02	0.4807	2.83683E-02	0.3962	3.93503E-04	8.8978
12	0.0186			1.73191E-02	0.5908	3.00757E-02	0.5258	2.80550E-04	10.6990
13	0.0173			1.60818E-02	0.6608	3.00656E-02	0.5610	2.75200E-04	9.6225
14	0.0136			1.26222E-02	0.6139	4.26237E-02	0.5164	2.48169E-04	11.1716
15	0.0030			2.82311E-03	1.0771	8.92172E-03	0.7964	1.17966E-04	16.4384
16	0.0021			1.90622E-03	1.3681	5.33009E-03	0.8758	6.21348E-05	21.6067
17	0.0031			2.90625E-03	1.8577	3.68193E-03	1.1582	5.40723E-05	23.9178
18	0.0042			3.89564E-03	1.9751	3.87745E-03	1.1947	3.15613E-05	36.6593
19	0.0052			4.80254E-03	1.4571	6.07032E-03	0.8868	3.98236E-05	26.8273
20	0.0218			2.02349E-02	0.7613	2.39932E-02	0.6156	1.81114E-04	12.7240
21	0.0120			1.11287E-02	1.2990	1.05616E-02	0.8876	7.94104E-05	18.5923
22	0.0287			2.66463E-02	0.8876	2.42407E-02	0.6724	1.87182E-04	10.7523
23	0.1052			9.77197E-02	0.4944	9.31371E-02	0.3247	1.46447E-03	3.6272
24	0.2112			1.96132E-01	0.3421	1.86364E-01	0.2154	2.87278E-03	2.4320
25	0.1808			1.67964E-01	0.3689	1.59086E-01	0.2113	1.91103E-03	2.9220
26	0.2176			2.02106E-01	0.3731	1.94026E-01	0.2287	1.55253E-03	2.9482
27	0.0700			6.50546E-02	0.6649	6.47251E-02	0.4115	2.30984E-04	7.4502
SYSTEM TOTAL =				9.28767E-01	0.1468	9.85739E-01	0.0516	1.68558E-02	1.1296

ELAPSED TIME 9.87833 MINUTES

RANDOM NUMBER= 79596BFA0823

```
LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY;  NO WATER IN GAP

                                    FREQUENCY FOR GENERATIONS    4 TO  303
0.8560 TO 0.8686      ***
0.8686 TO 0.8813      ****
0.8813 TO 0.8939      **********
0.8939 TO 0.9066      ***********************************
0.9066 TO 0.9192      *****************************************************
0.9192 TO 0.9319      *************************************************************
0.9319 TO 0.9445      **********************************************************
0.9445 TO 0.9572      *******************************************
0.9572 TO 0.9698      *********************
0.9698 TO 0.9825      *********
0.9825 TO 0.9951      ***
0.9951 TO 1.0078      *

                                    FREQUENCY FOR GENERATIONS   79 TO  303
0.8560 TO 0.8686      ***
0.8686 TO 0.8813      **
0.8813 TO 0.8939      *******
0.8939 TO 0.9066      ****************************
0.9066 TO 0.9192      ****************************************
0.9192 TO 0.9319      *******************************************
0.9319 TO 0.9445      *****************************************
0.9445 TO 0.9572      ********************************
0.9572 TO 0.9698      ***************
0.9698 TO 0.9825      *******
0.9825 TO 0.9951      **
0.9951 TO 1.0078      *

                                    FREQUENCY FOR GENERATIONS  154 TO  303
0.8560 TO 0.8686      **
0.8686 TO 0.8813      *
0.8813 TO 0.8939      *******
0.8939 TO 0.9066      *****************
0.9066 TO 0.9192      ****************************
0.9192 TO 0.9319      ***************************
0.9319 TO 0.9445      ************************
0.9445 TO 0.9572      **********************
0.9572 TO 0.9698      **********
0.9698 TO 0.9825      ******
0.9825 TO 0.9951      *
0.9951 TO 1.0078      *

                                    FREQUENCY FOR GENERATIONS  229 TO  303
0.8560 TO 0.8686      **
0.8686 TO 0.8813
0.8813 TO 0.8939      ***
0.8939 TO 0.9066      ********
0.9066 TO 0.9192      ***********
0.9192 TO 0.9319      ******************
0.9319 TO 0.9445      ************
0.9445 TO 0.9572      ************
0.9572 TO 0.9698      *******
0.9698 TO 0.9825      *
0.9825 TO 0.9951      *
0.9951 TO 1.0078


**********************************************************************************************************************************
*

          CONGRATULATIONS!  YOU HAVE  SUCCESSFULLY TRAVERSED THE PERILOUS PATH THROUGH KENO V IN   9.87833 MINUTES

**********************************************************************************************************************************
*
```

Figure 6.6.1-2 CSAS Input/Output for NAC-LWT with PWR Fuel – 3.7% Enrichment – Most Reactive Accident Condition Configuration

```
PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
   MODULE CSAS25    WILL BE CALLED
     LWT ANALYSIS; Exxon 15x15(W) ASSEMBLY;  WATER IN GAP
     27GROUPNDF4 LATTICECELL
     UO2  1  0.95 293.0 92235 3.7 92238 96.3 END
     ZR   2  1.0  293.0  END
     H2O  3  1.0  293.0  END
     AL   4  1.0  293.0  END
     SS304 5 1.0  293.0  END
     PB    6 1.0 293.0 END
     H2O   7 1.000 293.0 END
     H2O   8 1.000 293.0 END
     H2O   9 1.0 293.0 END
     END COMP
     SQUAREPITCH  1.4300 0.9056 1 3 1.0770 2 0.9246 9 END
     LWT ANALYSIS; Exxon 15x15(W) ASSEMBLY;  WATER IN GAP
     READ PARAM RUN=YES PLT=NO TME=5000 GEN=303 RND=1D NPG=1000 END PARAM
     READ GEOM
     UNIT  1
     COM='FUEL PIN CELL - WITH H2O'
     CYLINDER  1 1  0.4528   2P182.88
     CYLINDER  9 1  0.4623   2P182.88
     CYLINDER  2 1  0.5385   2P182.88
     CUBOID    3 1  4P0.7150 2P182.88
     UNIT  2
     COM='WATER ROD CELL - WITH H2O'
     CYLINDER  3 1  0.6477   2P182.88
     CYLINDER  2 1  0.6909   2P182.88
     CUBOID    3 1  4P0.7150 2P182.88
     GLOBAL UNIT 9
     ARRAY  1  -10.7250 -10.7250 -182.88
     CUBOID 3 1 4P11.3157 2P182.88
     CYLINDER 4 1 16.891 2P182.88
     CYLINDER 3 1 16.9863 2P182.88
     CYLINDER 5 1 18.8913 2P182.88
     CYLINDER 6 1 33.4963 2P182.88
     CYLINDER 5 1 36.5443 2P182.88
     CYLINDER 7 1 49.2443 2P182.88
     CYLINDER 5 1 49.8539 212.48 -192.16
     CYLINDER 6 1 49.8539 212.48 -199.76
     CYLINDER 5 1 49.8539 212.48 -208.67
     CUBOID 8 1 4P81.0000 243.00 -240.00
     END GEOM
     READ ARRAY
     ARA=1   NUX=15 NUY=15 NUZ=1  FILL
                       30R1
     2R1   2   2R1   2   3R1   2   2R1   2   2R1
                   7R1   2   7R1
               4R1   2   5R1   2   4R1
               2R1   2   9R1   2   2R1
                       15R1
         3R1   2   3R1   2   3R1   2   3R1
                       15R1
               2R1   2   9R1   2   2R1
               4R1   2   5R1   2   4R1
                   7R1   2   7R1
     2R1   2   2R1   2   3R1   2   2R1   2   2R1
                       30R1
     END FILL
     END ARRAY
     READ BOUNDS ZFC=VAC YXF=VAC END BOUNDS
     END DATA

   SECONDARY MODULE 000008    HAS BEEN CALLED.

   MODULE 000008    IS FINISHED. COMPLETION CODE     0. CPU TIME USED     0.44 (SECONDS).

   SECONDARY MODULE 000002    HAS BEEN CALLED.

   MODULE 000002    IS FINISHED. COMPLETION CODE     0. CPU TIME USED     5.27 (SECONDS).

   SECONDARY MODULE 000009    HAS BEEN CALLED.

   MODULE 000009    IS FINISHED. COMPLETION CODE     0. CPU TIME USED   317.91 (SECONDS).

   MODULE CSAS25    IS FINISHED. COMPLETION CODE     0. CPU TIME USED   325.16 (SECONDS).
```

```
 CCCCCCCCCCC    SSSSSSSSSSS     AAAAAAAAA     SSSSSSSSSSS     22222222222    5555555555555
CCCCCCCCCCCCC  SSSSSSSSSSSSS   AAAAAAAAAAA   SSSSSSSSSSSSS   2222222222222   5555555555555
CC         CC  SS         SS   AA       AA   SS         SS   22         22   55
CC             SS              AA       AA   SS                         22   55
CC             SS              AA       AA   SS                         22   55
CC             SSSSSSSSSSSS    AAAAAAAAAAAAA SSSSSSSSSSSS             22     555555555555
CC              SSSSSSSSSSSS   AAAAAAAAAAAAA  SSSSSSSSSSSS          22       5555555555555
CC                        SS   AA       AA              SS       22                    55
CC                        SS   AA       AA              SS     22                      55
CC         CC  SS         SS   AA       AA   SS         SS   22              55        55
CCCCCCCCCCCCC  SSSSSSSSSSSSS   AA       AA   SSSSSSSSSSSSS   2222222222222   5555555555555
 CCCCCCCCCCC    SSSSSSSSSSS    AA       AA    SSSSSSSSSSS    2222222222222    55555555555

 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL              EEEEEEEEEEEEE                   PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL              EEEEEEEEEEEEE                   PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC   AA       AA   LL              EE                              PP         PP  CC         CC
SS             CC              AA       AA   LL              EE                              PP         PP  CC
SS             CC              AA       AA   LL              EE                              PP         PP  CC
SSSSSSSSSSSS   CC              AAAAAAAAAAAAA LL              EEEEEEEEE       -------------   PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC              AAAAAAAAAAAAA LL              EEEEEEEEE       -------------   PPPPPPPPPPPP   CC
           SS  CC              AA       AA   LL              EE                              PP             CC
           SS  CC              AA       AA   LL              EE                              PP             CC
SS         SS  CC         CC   AA       AA   LL              EE                              PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AA       AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                   PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC    AA       AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                   PP              CCCCCCCCCCC

   0000000     7777777777777           //    33333333333        11                 //    99999999999     88888888888
  000000000    777777777777           //    3333333333333      111                //    9999999999999   8888888888888
 00     00     77        77          //     33         33     1111               //     99         99   88         88
00       00            77           //                 33       11              //      99         99   88         88
00       00           77           //                  33       11             //       99         99   88         88
00       00          77           //                333         11            //        9999999999999    88888888888
00       00          77          //                 333         11           //          999999999999    88888888888
00       00         77          //                     33       11          //                     99   88         88
00       00         77         //                      33       11         //                      99   88         88
 00     00          77        //            33         33       11        //                       99   88         88
  000000000         77       //             3333333333333    11111111    //             9999999999999   8888888888888
   0000000          77      //               33333333333     11111111   //               99999999999     88888888888

 22222222222         11                      11          11                   5555555555555   5555555555555
2222222222222       111                     111         111                   5555555555555   5555555555555
22         22      1111         :::        1111        1111        :::        55              55
           22        11         :::          11          11        :::        55              55
           22        11         :::          11          11        :::        55              55
         22          11                      11          11                   555555555555    555555555555
       22            11                      11          11                   5555555555555   5555555555555
     22              11         :::          11          11        :::                   55              55
   22                11         :::          11          11        :::                   55              55
 22                  11         :::          11          11        :::        55         55   55         55
2222222222222     11111111                11111111    11111111                5555555555555   5555555555555
2222222222222     11111111                11111111    11111111                 55555555555     55555555555
```

```
  SSSSSSSSSSS     CCCCCCCCCCC      AAAAAAAAA      LL             EEEEEEEEEEEEE                      PPPPPPPPPPPP     CCCCCCCCCCC
 SSSSSSSSSSSSS   CCCCCCCCCCCCC    AAAAAAAAAAA     LL             EEEEEEEEEEEEE                      PPPPPPPPPPPPP   CCCCCCCCCCCCC
 SS         SS   CC         CC   AA         AA    LL             EE                                 PP         PP   CC         CC
 SS              CC              AA         AA    LL             EE                                 PP         PP   CC
 SS              CC              AA         AA    LL             EE                                 PP         PP   CC
 SSSSSSSSSSSS    CC              AAAAAAAAAAAAA    LL             EEEEEEEEE       -------------      PPPPPPPPPPPPP   CC
  SSSSSSSSSSSS   CC              AAAAAAAAAAAAA    LL             EEEEEEEEE       -------------      PPPPPPPPPPPP    CC
            SS   CC              AA         AA    LL             EE                                 PP              CC
            SS   CC              AA         AA    LL             EE                                 PP              CC
 SS         SS   CC         CC   AA         AA    LL             EE                                 PP              CC         CC
 SSSSSSSSSSSSS   CCCCCCCCCCCCC   AA         AA    LLLLLLLLLLLLL  EEEEEEEEEEEEE                      PP              CCCCCCCCCCCCC
  SSSSSSSSSSS     CCCCCCCCCCC    AA         AA    LLLLLLLLLLLLL  EEEEEEEEEEEEE                      PP               CCCCCCCCCCC
```

```
********************************************************************************
********************************************************************************
********************************************************************************
*****                                                                      *****
*****                   PROGRAM VERIFICATION INFORMATION                   *****
*****                                                                      *****
*****                 CODE SYSTEM:  SCALE-PC VERSION:  4.3                 *****
*****                                                                      *****
********************************************************************************
********************************************************************************
*****                                                                      *****
*****                                                                      *****
*****                  PROGRAM:  CSAS                                      *****
*****                                                                      *****
*****            CREATION DATE:  03/08/96                                  *****
*****                                                                      *****
*****                   VOLUME:  ENG                                       *****
*****                                                                      *****
*****                  LIBRARY:  G:\SCALE43\WIN_NT\EXE                     *****
*****                                                                      *****
*****                                                                      *****
*****          PRODUCTION CODE:  CSAS                                      *****
*****                                                                      *****
*****                  VERSION:  3.1                                       *****
*****                                                                      *****
*****                  JOBNAME:  SCALE-PC                                  *****
*****                                                                      *****
*****        DATE OF EXECUTION:  07/31/98                                  *****
*****                                                                      *****
*****        TIME OF EXECUTION:  21:11:55                                  *****
*****                                                                      *****
*****                                                                      *****
********************************************************************************
********************************************************************************
********************************************************************************
```

```
LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY:  WATER IN GAP


**** PROBLEM PARAMETERS ****

LIB 27GROUPNDF4  LIBRARY
MXX              9 MIXTURES
MSC              9 COMPOSITION SPECIFICATIONS
IZM              4 MATERIAL ZONES
GE  LATTICECELL  GEOMETRY
MORE             0 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
MSLN             0 FUEL SOLUTIONS


**** PROBLEM COMPOSITION DESCRIPTION ****

SC  UO2            STANDARD COMPOSITION
MX               1 MIXTURE NO.
VF          0.9500 VOLUME FRACTION
ROTH       10.9600 THEORETICAL DENSITY
NEL              2 NO. ELEMENTS
ICP              1 0/1 MIXTURE/COMPOUND
TEMP         293.0 DEG KELVIN
             92000       1.00 ATOM/MOLECULE
                            92235     3.700 WT%
                            92238    96.300 WT%
              8016       2.00 ATOMS/MOLECULE
END

SC  ZR             STANDARD COMPOSITION
MX               2 MIXTURE NO.
VF          1.0000 VOLUME FRACTION
ROTH        6.4900 THEORETICAL DENSITY
NEL              1 NO. ELEMENTS
ICP              1 0/1 MIXTURE/COMPOUND
TEMP         293.0 DEG KELVIN
             40000       1.00 ATOM/MOLECULE
END

SC  H2O            STANDARD COMPOSITION
MX               3 MIXTURE NO.
VF          1.0000 VOLUME FRACTION
ROTH        0.9982 THEORETICAL DENSITY
NEL              2 NO. ELEMENTS
ICP              1 0/1 MIXTURE/COMPOUND
TEMP         293.0 DEG KELVIN
              1001       2.00 ATOMS/MOLECULE
              8016       1.00 ATOM/MOLECULE
END

SC  AL             STANDARD COMPOSITION
MX               4 MIXTURE NO.
VF          1.0000 VOLUME FRACTION
ROTH        2.7020 THEORETICAL DENSITY
NEL              1 NO. ELEMENTS
ICP              1 0/1 MIXTURE/COMPOUND
TEMP         293.0 DEG KELVIN
             13027       1.00 ATOM/MOLECULE
END

SC  SS304          STANDARD COMPOSITION
MX               5 MIXTURE NO.
VF          1.0000 VOLUME FRACTION
ROTH        7.9200 THEORETICAL DENSITY
NEL              4 NO. ELEMENTS
ICP              0 0/1 MIXTURE/COMPOUND
TEMP         293.0 DEG KELVIN
             24304     19.000 WT%
             25055      2.000 WT
             26304     69.500 WT%
             28304      9.500 WT%
END

SC  PB             STANDARD COMPOSITION
MX               6 MIXTURE NO.
VF          1.0000 VOLUME FRACTION
ROTH       11.3440 THEORETICAL DENSITY
NEL              1 NO. ELEMENTS
ICP              1 0/1 MIXTURE/COMPOUND
TEMP         293.0 DEG KELVIN
             82000       1.00 ATOM/MOLECULE
END

SC  H2O            STANDARD COMPOSITION
MX               7 MIXTURE NO.
VF          1.0000 VOLUME FRACTION
ROTH        0.9982 THEORETICAL DENSITY
NEL              2 NO. ELEMENTS
ICP              1 0/1 MIXTURE/COMPOUND
TEMP         293.0 DEG KELVIN
              1001       2.00 ATOMS/MOLECULE
              8016       1.00 ATOM/MOLECULE
END

SC  H2O            STANDARD COMPOSITION
```

```
MX            8 MIXTURE NO.
VF       1.0000 VOLUME FRACTION
ROTH     0.9982 THEORETICAL DENSITY
NEL           2 NO. ELEMENTS
ICP           1 0/1 MIXTURE/COMPOUND
TEMP      293.0 DEG KELVIN
           1001       2.00 ATOMS/MOLECULE
           8016       1.00 ATOM/MOLECULE
END

SC  H2O         STANDARD COMPOSITION
MX            9 MIXTURE NO.
VF       1.0000 VOLUME FRACTION
ROTH     0.9982 THEORETICAL DENSITY
NEL           2 NO. ELEMENTS
ICP           1 0/1 MIXTURE/COMPOUND
TEMP      293.0 DEG KELVIN
           1001       2.00 ATOMS/MOLECULE
           8016       1.00 ATOM/MOLECULE
END

**** PROBLEM GEOMETRY ****

CTP SQUAREPITCH  CELL TYPE
PITCH    1.4300 CM CENTER TO CENTER SPACING
FUELOD   0.9056 CM FUEL DIAMETER OR SLAB THICKNESS
MFUEL         1 MIXTURE NO. OF FUEL
MMOD          3 MIXTURE NO. OF MODERATOR
CLADOD   1.0770 CM CLAD OUTER DIAMETER
MCLAD         2 MIXTURE NO. OF CLAD
GAPOD    0.9246 CM GAP OUTER DIAMETER
MGAP          9 MIXTURE NO. OF GAP

ZONE SPECIFICATIONS FOR LATTICECELL GEOMETRY

               ZONE  1 IS FUEL
               ZONE  2 IS GAP
               ZONE  3 IS CLAD
               ZONE  4 IS MOD
```

```
*****************************************************************************************************
***                                                                                               ***
***                      LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY;  WATER IN GAP                     ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************
***                                                                                               ***
***                      ********** DATA LIBRARY INFORMATION **********                           ***
***                                                                                               ***
***        UNIT                                              VOLUME                               ***
***       NUMBER              DATA SET NAME                   NAME        UNIT FUNCTION           ***
***       ------              -------------                   ----        -------------           ***
***                                                                                               ***
***         89     G:\scale43\DATALIB\FT89F001                            STANDARD COMPOSITION LIBRARY ***
***                                                                                               ***
***         82     G:\scale43\DATALIB\FT82F001                            CROSS SECTION LIBRARY   ***
***                                                                                               ***
***         11     C:\mev-pwr\RERUNS\15HX2MD\FT11F001                     SHORT CROSS SECTION LIBRARY ***
***                                                                                               ***
***         90     C:\mev-pwr\RERUNS\15HX2MD\FT90F001                     INPUT DATA DIRECT ACCESS ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************
***                                                                                               ***
***                                                                                               ***
***                          STANDARD COMPOSITION LIBRARY DATA                                    ***
***                          ---------------------------------                                    ***
***                                                                                               ***
***        UNIT NUMBER  :  89                                                                     ***
***                                                                                               ***
***        DATASET NAME :  G:\scale43\DATALIB\FT89F001                                            ***
***                                                                                               ***
***        LIBRARY TITLE:  SCALE-4 STANDARD COMPOSITION LIBRARY                                   ***
***                        637 STANDARD COMPOSITIONS, 490 NUCLIDES                                ***
***                        90 ELEMENTS WITH VARIABLE ISOTOPIC DISTRBUTIONS.                       ***
***                                                                                               ***
***        CREATION DATE:   6/30/95                                                               ***
***                                                                                               ***
***                                                                                               ***
***                                                                                               ***
***                              CROSS SECTION LIBRARY DATA                                       ***
***                              --------------------------                                       ***
***                                                                                               ***
***        UNIT NUMBER  :  82                                                                     ***
***                                                                                               ***
***        DATASET NAME :  G:\scale43\DATALIB\FT82F001                                            ***
***                                                                                               ***
***        LIBRARY TITLE:  SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY                             ***
***                           BASED ON ENDF-B VERSION 4 DATA                                      ***
***                              COMPILED FOR NRC      1/27/89                                    ***
***                                 LAST UPDATED                                        08/12/94  ***
***                                    L.M.PETRIE    -    ORNL                                    ***
***                                                                                               ***
***                                                                                               ***
***                                                                                               ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************

                 ........    0 IO'S WERE USED BEFORE READING KENO V DATA     ........

                 ........    0 IO'S WERE USED READING THE KENO V PARAMETER DATA     ........


                *************** DATA READING COMPLETED ***************

                 ........    0 IO'S WERE USED PREPARING THE KENO V INPUT DATA     ........

                 ........    0 IO'S WERE USED LOADING THE KENO V DATA     ........

                 ........    0 IO'S WERE USED LOADING THE DATA     ........

                 ........    0 IO'S WERE USED CHECKING THE KENO V GEOMETRY DATA     ........
                 *****  RESTART DATA HAS BEEN WRITTEN ON UNIT 95   *****

                 ........    0 IO'S WERE USED WRITING THE KENO V - CSAS DATA     ........

                 ........    0 IO'S WERE USED PROCESSING CSAS INPUT DATA     ........

 CONTROL MODULE CSAS25    IS COMPLETE.
```

```
KK          KK  EEEEEEEEEEEEE  NN          NN  00000000000                     VV          VV
KK         KK   EEEEEEEEEEEEE  NNN         NN  0000000000000                   VV          VV
KK        KK    EE             NNNN        NN  00         00                   VV          VV
KK       KK     EE             NN NN       NN  00         00                   VV          VV
KK      KK      EE             NN  NN      NN  00         00                   VV          VV
KKKKKKKK        EEEEEEEEE      NN   NN     NN  00         00  -------------    VV          VV
KKKKKKKK        EEEEEEEEE      NN    NN    NN  00         00  -------------     VV        VV
KK      KK      EE             NN     NN   NN  00         00                     VV      VV
KK       KK     EE             NN      NN  NN  00         00                      VV    VV
KK        KK    EE             NN       NNNN   00         00                       VV  VV
KK         KK   EEEEEEEEEEEEE  NN        NNN   0000000000000                        VVVV
KK          KK  EEEEEEEEEEEEE  NN         NN    00000000000                          VV


 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL              EEEEEEEEEEEEE                   PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL              EEEEEEEEEEEEE                   PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL              EE                              PP         PP  CC         CC
SS             CC             AA         AA  LL              EE                              PP         PP  CC
SS             CC             AA         AA  LL              EE                              PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL              EEEEEEEEE      -------------    PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL              EEEEEEEEE      -------------    PPPPPPPPPPPP   CC
           SS  CC             AA         AA  LL              EE                              PP             CC
           SS  CC             AA         AA  LL              EE                              PP             CC
SS         SS  CC         CC  AA         AA  LL              EE                              PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLLL   EEEEEEEEEEEEE                   PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLLL   EEEEEEEEEEEEE                   PP              CCCCCCCCCCC


  0000000     7777777777777          //    33333333333       11          //    99999999999    88888888888
 000000000    777777777777          //    3333333333333     111         //    9999999999999  8888888888888
00       00   77         77        //     33         33    1111        //     99         99  88         88
00       00             77        //                 33      11       //      99         99  88         88
00       00            77        //                  33      11      //       99         99  88         88
00       00           77        //                  333      11     //        9999999999999   88888888888
00       00          77        //                  333       11    //          999999999999   88888888888
00       00         77        //                     33      11   //                     99  88         88
00       00        77        //                      33      11  //                      99  88         88
00       00       77        //        33         33      11 //                       99  88         88
 000000000       77        //         3333333333333   11111111 //                9999999999999  8888888888888
  0000000        77       //           33333333333    11111111 //                 999999999999   88888888888


 22222222222       11                    11      22222222222               0000000      22222222222
2222222222222     111                   111     2222222222222             000000000    2222222222222
22         22    1111       :::        1111     22         22    :::     00       00   22         22
           22      11       :::          11                22    :::     00       00              22
          22       11       :::          11               22     :::     00       00             22
        22         11                    11             22               00       00           22
      22           11                    11           22                 00       00         22
    22             11       :::          11         22           :::     00       00       22
  22               11       :::          11       22             :::     00       00     22
22                 11       :::          11     22               :::     00       00   22
2222222222222   11111111              11111111  2222222222222             000000000    2222222222222
2222222222222   11111111              11111111  2222222222222              0000000     2222222222222
```

LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY; WATER IN GAP

****** NUMERIC PARAMETERS ******

TME	MAXIMUM PROBLEM TIME (MIN)	******
TBA	TIME PER GENERATION (MIN)	0.50
GEN	NUMBER OF GENERATIONS	303
NPG	NUMBER PER GENERATION	1000
NSK	NUMBER OF GENERATIONS TO BE SKIPPED	3
BEG	BEGINNING GENERATION NUMBER	1
RES	GENERATIONS BETWEEN CHECKPOINTS	0
X1D	NUMBER OF EXTRA 1-D CROSS SECTIONS	1
NBK	NEUTRON BANK SIZE	1025
XNB	EXTRA POSITIONS IN NEUTRON BANK	0
NFB	FISSION BANK SIZE	1000
XFB	EXTRA POSITIONS IN FISSION BANK	0
WTA	DEFAULT VALUE OF WEIGHT AVERAGE	0.5000
WTH	WEIGHT HIGH FOR SPLITTING	3.0000
WTL	WEIGHT LOW FOR RUSSIAN ROULETTE	0.3333
RND	STARTING RANDOM NUMBER	1D
NB8	NUMBER OF D.A. BLOCKS ON UNIT 8	200
NL8	LENGTH OF D.A. BLOCKS ON UNIT 8	512
ADJ	MODE OF CALCULATION	FORWARD
	INPUT DATA WRITTEN ON RESTART UNIT	NO
	BINARY DATA INTERFACE	YES

```
LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY;  WATER IN GAP

****** LOGICAL PARAMETERS ******

RUN  EXECUTE PROBLEM AFTER CHECKING DATA    YES        PLT  PLOT PICTURE MAP(S)                        NO
FLX  COMPUTE FLUX                           NO         FDN  COMPUTE FISSION DENSITIES                  NO
SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION   NO         NUB  COMPUTE NU-BAR & AVG FISSION GROUP         YES
MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER    NO         MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION      NO
CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER  NO         CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION    NO
FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER  NO         FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION    NO
MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER    NO         MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER       NO
CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER  NO         CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER     NO
FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER  NO         FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER     NO
HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL   NO         HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL      NO
AMX  PRINT ALL MIXED CROSS SECTIONS         NO         FAR  PRINT FIS. AND ABS. BY REGION              NO
XS1  PRINT 1-D MIXTURE X-SECTIONS           NO         GAS  PRINT FAR BY GROUP                         NO
XS2  PRINT 2-D MIXTURE X-SECTIONS           NO         PAX  PRINT XSEC-ALBEDO CORRELATION TABLES       NO
XAP  PRINT MIXTURE ANGLES & PROBABILITIES   NO         PWT  PRINT WEIGHT AVERAGE ARRAY                 NO
PKI  PRINT FISSION SPECTRUM                 NO         PGM  PRINT INPUT GEOMETRY                       NO
P1D  PRINT EXTRA 1-D CROSS SECTIONS         NO         BUG  PRINT DEBUG INFORMATION                    NO
                                                       TRK  PRINT TRACKING INFORMATION                 NO

                         PARAMETER INPUT COMPLETED

        ........    0 IO'S WERE USED READING THE PARAMETER DATA      ........

              ************** DATA READING COMPLETED **************
```

```
LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY;  WATER IN GAP

****** ADDITIONAL INFORMATION ******

NUMBER OF ENERGY GROUPS                  27     USE LATTICE GEOMETRY                       YES
NO. OF FISSION SPECTRUM SOURCE GROUP      1     GLOBAL ARRAY NUMBER                          1
NO. OF SCATTERING ANGLES IN XSECS         2     NUMBER OF UNITS IN THE GLOBAL X DIR.        15
ENTRIES/NEUTRON IN THE NEUTRON BANK      16     NUMBER OF UNITS IN THE GLOBAL Y DIR.        15
ENTRIES/NEUTRON IN THE FISSION BANK       9     NUMBER OF UNITS IN THE GLOBAL Z DIR.         1
NUMBER OF MIXTURES USED                   9     USE A GLOBAL REFLECTOR                     YES
NUMBER OF BIAS ID'S USED                  1     USE NESTED HOLES                            NO
NUMBER OF DIFFERENTIAL ALBEDOS USED       0     NUMBER OF HOLES                              0
TOTAL INPUT GEOMETRY REGIONS             19     MAXIMUM HOLE NESTING LEVEL                   0
NUMBER OF GEOMETRY REGIONS USED          19     USE NESTED ARRAYS                           NO
LARGEST GEOMETRY UNIT NUMBER              9     NUMBER OF ARRAYS USED                        1
LARGEST ARRAY NUMBER                      1     MAXIMUM ARRAY NESTING LEVEL                  1

+X BOUNDARY CONDITION                   VAC     -X BOUNDARY CONDITION                      VAC
+Y BOUNDARY CONDITION                   VAC     -Y BOUNDARY CONDITION                      VAC
+Z BOUNDARY CONDITION                   VAC     -Z BOUNDARY CONDITION                      VAC
```

```
*******************************************************************************************
***                                                                                     ***
***         LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY;  WATER IN GAP                        ***
***                                                                                     ***
*******************************************************************************************
*******************************************************************************************
***                                                                                     ***
***                   ****** SPACE AND SUPERGROUP INFORMATION ******                    ***
***                                                                                     ***
***       100000 WORDS IS THE TOTAL SPACE AVAILABLE.                                    ***
***                                                                                     ***
***        28389 WORDS WERE USED FOR NON-SUPERGROUP STORAGE.                            ***
***                                                                                     ***
***        71611 WORDS OF STORAGE ARE AVAILABLE FOR SUPERGROUPED DATA.                  ***
***                                                                                     ***
***        99759 WORDS OF STORAGE ARE AVAILABLE FOR CONSTRUCTING THE SUPERGROUPS.       ***
***                                                                                     ***
***        71551 WORDS OF STORAGE ARE AVAILABLE TO EACH SUPERGROUP.                     ***
***                                                                                     ***
***         1172 WORDS ARE NEEDED FOR THE LARGEST GROUP.                                ***
***                                                                                     ***
***        29777 WORDS OF STORAGE IS SUFFICIENT TO RUN THIS PROBLEM.                    ***
***                                                                                     ***
***        41991 WORDS OF STORAGE WILL ALLOW THE PROBLEM TO RUN WITH ONE SUPERGROUP.    ***
***                                                                                     ***
***        42144 WORDS OF STORAGE WILL BE USED TO RUN THIS PROBLEM.                     ***
***                                                                                     ***
*******************************************************************************************
*******************************************************************************************
***                                                                                     ***
***                      STARTING     ENDING      XSEC       ALBEDO      TOTAL          ***
***   SUPERGROUP          GROUP       GROUP      LENGTH      LENGTH      LENGTH         ***
***                                                                                     ***
***                                                                                     ***
***        1                1           27        2697          0        13542          ***
***                                                                                     ***
*******************************************************************************************

            ........    0 IO'S WERE USED IN SUPERGROUPING     ........

            ........    0 IO'S WERE USED LOADING THE DATA     ........
```

```
                                   LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY;  WATER IN GAP

             MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION        NUM   ID

                                                    -----   UNIT     1   -----

FUEL PIN CELL - WITH H2O

  1 CYLINDER        1  1  RADIUS = 0.45280    +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  2 CYLINDER        9  1  RADIUS = 0.46230    +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CYLINDER        2  1  RADIUS = 0.53850    +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  4 CUBOID          3  1      +X = 0.71500    -X =-0.71500    +Y = 0.71500    -Y =-0.71500     +Z =  182.88    -Z = -182.88

                                                    -----   UNIT     2   -----

WATER ROD CELL - WITH H2O

  1 CYLINDER        3  1  RADIUS = 0.64770    +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  2 CYLINDER        2  1  RADIUS = 0.69090    +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CUBOID          3  1      +X = 0.71500    -X =-0.71500    +Y = 0.71500    -Y =-0.71500     +Z =  182.88    -Z = -182.88

                                       ******************   GLOBAL   ******************
                                       -----   UNIT     9  EXTERNAL TO LATTICE  1   -----

  1 ARRAY NUMBER    1         +X =  10.725    -X = -10.725    +Y =  10.725    -Y = -10.725     +Z =  182.88    -Z = -182.88

  2 CUBOID          3  1      +X =  11.316    -X = -11.316    +Y =  11.316    -Y = -11.316     +Z =  182.88    -Z = -182.88

  3 CYLINDER        4  1  RADIUS =  16.891    +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  4 CYLINDER        3  1  RADIUS =  16.986    +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  5 CYLINDER        5  1  RADIUS =  18.891    +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  6 CYLINDER        6  1  RADIUS =  33.496    +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  7 CYLINDER        5  1  RADIUS =  36.544    +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  8 CYLINDER        7  1  RADIUS =  49.244    +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  9 CYLINDER        5  1  RADIUS =  49.854    +Z =  212.48    -Z = -192.16    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

 10 CYLINDER        6  1  RADIUS =  49.854    +Z =  212.48    -Z = -199.78    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

 11 CYLINDER        5  1  RADIUS =  49.854    +Z =  212.48    -Z = -208.67    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

 12 CUBOID          8  1      +X =  81.000    -X = -81.000    +Y =  81.000    -Y = -81.000     +Z =  243.00    -Z = -240.00
                        LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY;  WATER IN GAP

                 -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   1          -------

Z LAYER   1, X COLUMN   1 TO  15 LEFT TO RIGHT   Y ROW   1 TO  15  BOTTOM TO TOP

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 2 1 1 2 1 1 1 2 1 1 2 1 1

 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1

 1 1 1 1 2 1 1 1 1 1 2 1 1 1 1

 1 1 2 1 1 1 1 1 1 1 1 1 2 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 1 2 1 1 1 2 1 1 1 2 1 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 2 1 1 1 1 1 1 1 1 1 2 1 1

 1 1 1 1 2 1 1 1 1 1 2 1 1 1 1

 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1

 1 1 2 1 1 2 1 1 1 2 1 1 2 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY; WATER IN GAP
VOLUMES FOR THOSE UNITS UTILIZED IN THIS PROBLEM

UNIT	REGION	GEOMETRY REGION	VOLUME	CUMULATIVE VOLUME
1	1	1	2.35591E+02 CM**3	2.35591E+02 CM**3
	2	2	9.98936E+00 CM**3	2.45581E+02 CM**3
	3	3	8.76291E+01 CM**3	3.33210E+02 CM**3
	4	4	4.14733E+02 CM**3	7.47943E+02 CM**3
2	1	5	4.82052E+02 CM**3	4.82052E+02 CM**3
	2	6	6.64478E+01 CM**3	5.48500E+02 CM**3
	3	7	1.99443E+02 CM**3	7.47943E+02 CM**3

SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 8 IS AN ARRAY PLACEMENT BOUNDARY REGION

UNIT	REGION	GEOMETRY REGION	VOLUME	CUMULATIVE VOLUME
9	1	8	1.68287E+05 CM**3	1.68287E+05 CM**3
	2	9	1.90480E+04 CM**3	1.87335E+05 CM**3
	3	10	1.40501E+05 CM**3	3.27836E+05 CM**3
	4	11	3.70972E+03 CM**3	3.31546E+05 CM**3
	5	12	7.85353E+04 CM**3	4.10081E+05 CM**3
	6	13	8.79177E+05 CM**3	1.28926E+06 CM**3
	7	14	2.45308E+05 CM**3	1.53457E+06 CM**3
	8	15	1.25193E+06 CM**3	2.78649E+06 CM**3
	9	16	3.72996E+05 CM**3	3.15949E+06 CM**3
	10	17	5.94983E+04 CM**3	3.21899E+06 CM**3
	11	18	6.94145E+04 CM**3	3.28840E+06 CM**3
	12	19	9.38745E+06 CM**3	1.26759E+07 CM**3

UNIT	USES	REGION	MIXTURE	TOTAL VOLUME
1	204	1	1	4.80606E+04 CM**3
		2	9	2.03783E+03 CM**3
		3	2	1.78763E+04 CM**3
		4	3	8.46055E+04 CM**3
2	21	1	3	1.01231E+04 CM**3
		2	2	1.39540E+03 CM**3
		3	3	4.18830E+03 CM**3
9	1	1		1.68287E+05 CM**3
		2	3	1.90480E+04 CM**3
		3	4	1.40501E+05 CM**3
		4	3	3.70972E+03 CM**3
		5	5	7.85353E+04 CM**3
		6	6	8.79177E+05 CM**3
		7	5	2.45308E+05 CM**3
		8	7	1.25193E+06 CM**3
		9	5	3.72996E+05 CM**3
		10	6	5.94983E+04 CM**3
		11	5	6.94145E+04 CM**3
		12	8	9.38745E+06 CM**3

TOTAL MIXTURE VOLUMES

MIXTURE	TOTAL VOLUME	MASS(G)
1	4.80606E+04 CM**3	5.00406E+05
2	1.92717E+04 CM**3	1.25074E+05
3	1.21675E+05 CM**3	1.21452E+05
4	1.40501E+05 CM**3	3.79634E+05
5	7.66253E+05 CM**3	6.06873E+06
6	9.38675E+05 CM**3	1.06483E+07
7	1.25193E+06 CM**3	1.24964E+06
8	9.38745E+06 CM**3	9.37028E+06
9	2.03783E+03 CM**3	2.03410E+03

BIASING INFORMATION

A DEFAULT WEIGHT OF 0.500 WILL BE USED FOR ALL BIAS ID'S.

.... 0 IO'S WERE USED IN KENO-V BEFORE TRACKING ....

.... 0.00833 MINUTES WERE USED PROCESSING DATA. ....

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 2.85587E-01

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED WITH A FLAT DISTRIBUTION IN A CUBOID DEFINED BY:
+X= 1.07250E+01 -X=-1.07250E+01 +Y= 1.07250E+01 -Y=-1.07250E+01 +Z= 1.82880E+02 -Z=-1.82880E+02
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

0.04883 MINUTES WERE REQUIRED FOR STARTING. TOTAL ELAPSED TIME IS 0.06400 MINUTES.

LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY; WATER IN GAP

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
1	9.01758E-01	7.60000E-02	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY 997 INDEPENDENT FISSION POINTS WERE GENERATED				
2	9.43422E-01	9.35000E-02	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
3	9.50011E-01	1.11667E-01	9.50011E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	9.23268E-01	1.29167E-01	9.36639E-01	1.33713E-02	0.00000E+00	0.00000E+00
5	9.41541E-01	1.47500E-01	9.38273E-01	7.89095E-03	0.00000E+00	0.00000E+00
6	9.48674E-01	1.64000E-01	9.40874E-01	6.15584E-03	0.00000E+00	0.00000E+00
7	9.40843E-01	1.80333E-01	9.40867E-01	4.76829E-03	0.00000E+00	0.00000E+00
8	9.73009E-01	1.96833E-01	9.46224E-01	6.62232E-03	0.00000E+00	0.00000E+00
9	9.23107E-01	2.13333E-01	9.42922E-01	6.49858E-03	0.00000E+00	0.00000E+00
10	9.40767E-01	2.30667E-01	9.42653E-01	5.63438E-03	0.00000E+00	0.00000E+00
11	9.89496E-01	2.47167E-01	9.47857E-01	7.19592E-03	0.00000E+00	0.00000E+00
12	9.23595E-01	2.65500E-01	9.45431E-01	6.87834E-03	0.00000E+00	0.00000E+00
13	9.06062E-01	2.83000E-01	9.41852E-01	7.17767E-03	0.00000E+00	0.00000E+00
14	9.44836E-01	2.99333E-01	9.42101E-01	6.55700E-03	0.00000E+00	0.00000E+00
15	9.41754E-01	3.15833E-01	9.42074E-01	6.03162E-03	0.00000E+00	0.00000E+00
16	9.56168E-01	3.33333E-01	9.43081E-01	5.67421E-03	0.00000E+00	0.00000E+00
17	9.41557E-01	3.49833E-01	9.42979E-01	5.28338E-03	0.00000E+00	0.00000E+00
18	9.48574E-01	3.65333E-01	9.43329E-01	4.95450E-03	0.00000E+00	0.00000E+00
19	8.99072E-01	3.82667E-01	9.40726E-01	5.33259E-03	0.00000E+00	0.00000E+00
20	9.79909E-01	4.00167E-01	9.42902E-01	5.47865E-03	0.00000E+00	0.00000E+00
21	9.20847E-01	4.17500E-01	9.41742E-01	5.31070E-03	0.00000E+00	0.00000E+00
22	9.31596E-01	4.34000E-01	9.41234E-01	5.06365E-03	0.00000E+00	0.00000E+00
23	9.03910E-01	4.52333E-01	9.39457E-01	5.13397E-03	0.00000E+00	0.00000E+00
24	9.37084E-01	4.69667E-01	9.39349E-01	4.89624E-03	0.00000E+00	0.00000E+00
25	9.44135E-01	4.86167E-01	9.39557E-01	4.68314E-03	0.00000E+00	0.00000E+00
26	9.19049E-01	5.03500E-01	9.38703E-01	4.56447E-03	0.00000E+00	0.00000E+00
27	9.19408E-01	5.20000E-01	9.37931E-01	4.44559E-03	0.00000E+00	0.00000E+00
28	9.51081E-01	5.36500E-01	9.38437E-01	4.30102E-03	0.00000E+00	0.00000E+00
29	9.50371E-01	5.53833E-01	9.38879E-01	4.16220E-03	0.00000E+00	0.00000E+00
30	9.27492E-01	5.71333E-01	9.38472E-01	4.03136E-03	0.00000E+00	0.00000E+00
31	9.31326E-01	5.87833E-01	9.38226E-01	3.89766E-03	0.00000E+00	0.00000E+00
32	9.40426E-01	6.04167E-01	9.38299E-01	3.76621E-03	0.00000E+00	0.00000E+00
33	9.51578E-01	6.21667E-01	9.38727E-01	3.66780E-03	0.00000E+00	0.00000E+00
34	9.23158E-01	6.38167E-01	9.38241E-01	3.58450E-03	0.00000E+00	0.00000E+00
35	9.28308E-01	6.55500E-01	9.37940E-01	3.48720E-03	0.00000E+00	0.00000E+00
36	9.40023E-01	6.72000E-01	9.38001E-01	3.38364E-03	0.00000E+00	0.00000E+00
37	9.32004E-01	6.89333E-01	9.37830E-01	3.29000E-03	0.00000E+00	0.00000E+00
38	9.15507E-01	7.05833E-01	9.37210E-01	3.25688E-03	0.00000E+00	0.00000E+00
39	8.96861E-01	7.22333E-01	9.36119E-01	3.35009E-03	0.00000E+00	0.00000E+00
40	9.34545E-01	7.39667E-01	9.36078E-01	3.26100E-03	0.00000E+00	0.00000E+00
41	9.73308E-01	7.56167E-01	9.37032E-01	3.31663E-03	0.00000E+00	0.00000E+00
42	9.19912E-01	7.73667E-01	9.36604E-01	3.26087E-03	0.00000E+00	0.00000E+00
43	9.11551E-01	7.90000E-01	9.35993E-01	3.23851E-03	0.00000E+00	0.00000E+00
44	9.79666E-01	8.06500E-01	9.37033E-01	3.32713E-03	0.00000E+00	0.00000E+00
45	9.39856E-01	8.24833E-01	9.37099E-01	3.24949E-03	0.00000E+00	0.00000E+00
46	9.26522E-01	8.42333E-01	9.36858E-01	3.18387E-03	0.00000E+00	0.00000E+00
47	9.81390E-01	8.58667E-01	9.37848E-01	3.26585E-03	0.00000E+00	0.00000E+00
48	9.43632E-01	8.76167E-01	9.37974E-01	3.19654E-03	0.00000E+00	0.00000E+00
49	9.47915E-01	8.91667E-01	9.38185E-01	3.13493E-03	0.00000E+00	0.00000E+00
50	9.04586E-01	9.09000E-01	9.37485E-01	3.14774E-03	0.00000E+00	0.00000E+00
51	9.24459E-01	9.26500E-01	9.37219E-01	3.09427E-03	0.00000E+00	0.00000E+00
52	9.18151E-01	9.43833E-01	9.36838E-01	3.05565E-03	0.00000E+00	0.00000E+00
53	9.48855E-01	9.61333E-01	9.37074E-01	3.00439E-03	0.00000E+00	0.00000E+00
54	9.03575E-01	9.78667E-01	9.36429E-01	3.01565E-03	0.00000E+00	0.00000E+00
55	9.55673E-01	9.96000E-01	9.36792E-01	2.98041E-03	0.00000E+00	0.00000E+00
56	9.17601E-01	1.01250E+00	9.36437E-01	2.94621E-03	0.00000E+00	0.00000E+00
57	9.68348E-01	1.02900E+00	9.37017E-01	2.94977E-03	0.00000E+00	0.00000E+00
58	9.04699E-01	1.04733E+00	9.36440E-01	2.95355E-03	0.00000E+00	0.00000E+00
59	9.35986E-01	1.06383E+00	9.36432E-01	2.90128E-03	0.00000E+00	0.00000E+00
60	9.48324E-01	1.08033E+00	9.36637E-01	2.85818E-03	0.00000E+00	0.00000E+00
61	9.40586E-01	1.09767E+00	9.36704E-01	2.81012E-03	0.00000E+00	0.00000E+00
62	9.24890E-01	1.11417E+00	9.36507E-01	2.76989E-03	0.00000E+00	0.00000E+00
63	9.09367E-01	1.13150E+00	9.36062E-01	2.76020E-03	0.00000E+00	0.00000E+00
64	8.96454E-01	1.14900E+00	9.35423E-01	2.78946E-03	0.00000E+00	0.00000E+00
65	9.22110E-01	1.16633E+00	9.35212E-01	2.75295E-03	0.00000E+00	0.00000E+00
66	9.99260E-01	1.18183E+00	9.36213E-01	2.88849E-03	0.00000E+00	0.00000E+00
67	9.50733E-01	1.19933E+00	9.36436E-01	2.85247E-03	0.00000E+00	0.00000E+00
68	9.22057E-01	1.21567E+00	9.36218E-01	2.81735E-03	0.00000E+00	0.00000E+00
69	9.53002E-01	1.23217E+00	9.36469E-01	2.78627E-03	0.00000E+00	0.00000E+00
70	9.28308E-01	1.24967E+00	9.36349E-01	2.74761E-03	0.00000E+00	0.00000E+00
71	9.15497E-01	1.26700E+00	9.36047E-01	2.72431E-03	0.00000E+00	0.00000E+00
72	9.30934E-01	1.28350E+00	9.35974E-01	2.68610E-03	0.00000E+00	0.00000E+00
73	9.11776E-01	1.30083E+00	9.35633E-01	2.66984E-03	0.00000E+00	0.00000E+00
74	9.38164E-01	1.31733E+00	9.35668E-01	2.63273E-03	0.00000E+00	0.00000E+00
75	9.43395E-01	1.33483E+00	9.35774E-01	2.59857E-03	0.00000E+00	0.00000E+00
76	9.15137E-01	1.35217E+00	9.35495E-01	2.57834E-03	0.00000E+00	0.00000E+00
77	9.59855E-01	1.36950E+00	9.35820E-01	2.56439E-03	0.00000E+00	0.00000E+00
78	9.05825E-01	1.38700E+00	9.35425E-01	2.56101E-03	0.00000E+00	0.00000E+00
79	9.08305E-01	1.40333E+00	9.35073E-01	2.55195E-03	0.00000E+00	0.00000E+00
80	9.29653E-01	1.42083E+00	9.35003E-01	2.51998E-03	0.00000E+00	0.00000E+00
81	9.37316E-01	1.43817E+00	9.35033E-01	2.48805E-03	0.00000E+00	0.00000E+00
82	9.36897E-01	1.45467E+00	9.35056E-01	2.45687E-03	0.00000E+00	0.00000E+00
83	9.28681E-01	1.47200E+00	9.34977E-01	2.42762E-03	0.00000E+00	0.00000E+00
84	9.54221E-01	1.48850E+00	9.35212E-01	2.40929E-03	0.00000E+00	0.00000E+00
85	9.31478E-01	1.50600E+00	9.35167E-01	2.38051E-03	0.00000E+00	0.00000E+00
86	9.29477E-01	1.52333E+00	9.35099E-01	2.35297E-03	0.00000E+00	0.00000E+00
87	9.74410E-01	1.53983E+00	9.35562E-01	2.37068E-03	0.00000E+00	0.00000E+00
88	9.35244E-01	1.55817E+00	9.35558E-01	2.34295E-03	0.00000E+00	0.00000E+00
89	9.23112E-01	1.57467E+00	9.35415E-01	2.32028E-03	0.00000E+00	0.00000E+00
90	9.44556E-01	1.59200E+00	9.35519E-01	2.29611E-03	0.00000E+00	0.00000E+00

91	9.26975E-01	1.60933E+00	9.35423E-01	2.27219E-03	0.00000E+00	0.00000E+00
92	8.84113E-01	1.62683E+00	9.34853E-01	2.31801E-03	0.00000E+00	0.00000E+00
93	9.48189E-01	1.64233E+00	9.34999E-01	2.29707E-03	0.00000E+00	0.00000E+00
94	9.47857E-01	1.65967E+00	9.35139E-01	2.27626E-03	0.00000E+00	0.00000E+00
95	9.29915E-01	1.67717E+00	9.35083E-01	2.25236E-03	0.00000E+00	0.00000E+00
96	9.34510E-01	1.69550E+00	9.35077E-01	2.22627E-03	0.00000E+00	0.00000E+00
97	9.39685E-01	1.71183E+00	9.35125E-01	2.20523E-03	0.00000E+00	0.00000E+00
98	9.19399E-01	1.72933E+00	9.34962E-01	2.18828E-03	0.00000E+00	0.00000E+00
99	9.33830E-01	1.74667E+00	9.34950E-01	2.16563E-03	0.00000E+00	0.00000E+00
100	9.84360E-01	1.76233E+00	9.35454E-01	2.20192E-03	0.00000E+00	0.00000E+00
101	9.20610E-01	1.77967E+00	9.35304E-01	2.18471E-03	0.00000E+00	0.00000E+00
102	9.33212E-01	1.79700E+00	9.35283E-01	2.16286E-03	0.00000E+00	0.00000E+00
103	9.34488E-01	1.81450E+00	9.35275E-01	2.14135E-03	0.00000E+00	0.00000E+00
104	9.40228E-01	1.83083E+00	9.35324E-01	2.12081E-03	0.00000E+00	0.00000E+00
105	9.43811E-01	1.84733E+00	9.35406E-01	2.10173E-03	0.00000E+00	0.00000E+00
106	9.16527E-01	1.86383E+00	9.35225E-01	2.08933E-03	0.00000E+00	0.00000E+00
107	9.06519E-01	1.88133E+00	9.34951E-01	2.08731E-03	0.00000E+00	0.00000E+00
108	9.13204E-01	1.89767E+00	9.34746E-01	2.07768E-03	0.00000E+00	0.00000E+00
109	9.63474E-01	1.91417E+00	9.35015E-01	2.07561E-03	0.00000E+00	0.00000E+00
110	9.54392E-01	1.93167E+00	9.35194E-01	2.06412E-03	0.00000E+00	0.00000E+00
111	9.53435E-01	1.94817E+00	9.35361E-01	2.05193E-03	0.00000E+00	0.00000E+00
112	9.23131E-01	1.96450E+00	9.35250E-01	2.03623E-03	0.00000E+00	0.00000E+00
113	9.75856E-01	1.98100E+00	9.35616E-01	2.05069E-03	0.00000E+00	0.00000E+00
114	9.73856E-01	1.99750E+00	9.35957E-01	2.06078E-03	0.00000E+00	0.00000E+00
115	8.72786E-01	2.01583E+00	9.35398E-01	2.11759E-03	0.00000E+00	0.00000E+00
116	8.97897E-01	2.03317E+00	9.35069E-01	2.12455E-03	0.00000E+00	0.00000E+00
117	9.40812E-01	2.04967E+00	9.35119E-01	2.10659E-03	0.00000E+00	0.00000E+00
118	9.06429E-01	2.06717E+00	9.34872E-01	2.10294E-03	0.00000E+00	0.00000E+00
119	9.14217E-01	2.08450E+00	9.34696E-01	2.09235E-03	0.00000E+00	0.00000E+00
120	9.17762E-01	2.10183E+00	9.34552E-01	2.07950E-03	0.00000E+00	0.00000E+00
121	9.95103E-01	2.11833E+00	9.35061E-01	2.12381E-03	0.00000E+00	0.00000E+00
122	8.92628E-01	2.13483E+00	9.34707E-01	2.13552E-03	0.00000E+00	0.00000E+00
123	9.38176E-01	2.15133E+00	9.34736E-01	2.11799E-03	0.00000E+00	0.00000E+00
124	8.97548E-01	2.16867E+00	9.34431E-01	2.12256E-03	0.00000E+00	0.00000E+00
125	9.13047E-01	2.18617E+00	9.34257E-01	2.11240E-03	0.00000E+00	0.00000E+00
126	9.36527E-01	2.20250E+00	9.34276E-01	2.09537E-03	0.00000E+00	0.00000E+00
127	9.32372E-01	2.21900E+00	9.34260E-01	2.07860E-03	0.00000E+00	0.00000E+00
128	9.08977E-01	2.23650E+00	9.34060E-01	2.07177E-03	0.00000E+00	0.00000E+00
129	9.05814E-01	2.25383E+00	9.33837E-01	2.06739E-03	0.00000E+00	0.00000E+00
130	9.36365E-01	2.27117E+00	9.33857E-01	2.05127E-03	0.00000E+00	0.00000E+00
131	9.69187E-01	2.28867E+00	9.34131E-01	2.05365E-03	0.00000E+00	0.00000E+00
132	9.18397E-01	2.30600E+00	9.34010E-01	2.04139E-03	0.00000E+00	0.00000E+00
133	9.35649E-01	2.32333E+00	9.34022E-01	2.02578E-03	0.00000E+00	0.00000E+00
134	9.05045E-01	2.34083E+00	9.33803E-01	2.02233E-03	0.00000E+00	0.00000E+00
135	9.19642E-01	2.35917E+00	9.33696E-01	2.00989E-03	0.00000E+00	0.00000E+00
136	9.26498E-01	2.37650E+00	9.33643E-01	1.99555E-03	0.00000E+00	0.00000E+00
137	9.15749E-01	2.39383E+00	9.33510E-01	1.98515E-03	0.00000E+00	0.00000E+00
138	9.01954E-01	2.41033E+00	9.33278E-01	1.98411E-03	0.00000E+00	0.00000E+00
139	9.46567E-01	2.42683E+00	9.33375E-01	1.97196E-03	0.00000E+00	0.00000E+00
140	9.19810E-01	2.44417E+00	9.33277E-01	1.96009E-03	0.00000E+00	0.00000E+00
141	9.14692E-01	2.46167E+00	9.33143E-01	1.95052E-03	0.00000E+00	0.00000E+00
142	9.31690E-01	2.47900E+00	9.33133E-01	1.93657E-03	0.00000E+00	0.00000E+00
143	8.87356E-01	2.49733E+00	9.32808E-01	1.95000E-03	0.00000E+00	0.00000E+00
144	9.08196E-01	2.51467E+00	9.32635E-01	1.94396E-03	0.00000E+00	0.00000E+00
145	9.18122E-01	2.53117E+00	9.32533E-01	1.93298E-03	0.00000E+00	0.00000E+00
146	9.17517E-01	2.54767E+00	9.32429E-01	1.92234E-03	0.00000E+00	0.00000E+00
147	9.39000E-01	2.56417E+00	9.32474E-01	1.90958E-03	0.00000E+00	0.00000E+00
148	9.15950E-01	2.58150E+00	9.32361E-01	1.89983E-03	0.00000E+00	0.00000E+00
149	9.45130E-01	2.59800E+00	9.32448E-01	1.88886E-03	0.00000E+00	0.00000E+00
150	9.41765E-01	2.61450E+00	9.32511E-01	1.87711E-03	0.00000E+00	0.00000E+00
151	8.95929E-01	2.63183E+00	9.32266E-01	1.88057E-03	0.00000E+00	0.00000E+00
152	9.44531E-01	2.64933E+00	9.32347E-01	1.86978E-03	0.00000E+00	0.00000E+00
153	9.26586E-01	2.66583E+00	9.32309E-01	1.85775E-03	0.00000E+00	0.00000E+00
154	9.69541E-01	2.68317E+00	9.32554E-01	1.86167E-03	0.00000E+00	0.00000E+00
155	9.20252E-01	2.70050E+00	9.32474E-01	1.85121E-03	0.00000E+00	0.00000E+00
156	9.26564E-01	2.71800E+00	9.32435E-01	1.83955E-03	0.00000E+00	0.00000E+00
157	9.91752E-01	2.73533E+00	9.32818E-01	1.86728E-03	0.00000E+00	0.00000E+00
158	8.83350E-01	2.75267E+00	9.32501E-01	1.88217E-03	0.00000E+00	0.00000E+00
159	9.14138E-01	2.77017E+00	9.32384E-01	1.87380E-03	0.00000E+00	0.00000E+00
160	9.39314E-01	2.78667E+00	9.32428E-01	1.86242E-03	0.00000E+00	0.00000E+00
161	9.38305E-01	2.80400E+00	9.32465E-01	1.85104E-03	0.00000E+00	0.00000E+00
162	9.10987E-01	2.82050E+00	9.32331E-01	1.84432E-03	0.00000E+00	0.00000E+00
163	9.44044E-01	2.83783E+00	9.32403E-01	1.83428E-03	0.00000E+00	0.00000E+00
164	9.28029E-01	2.85433E+00	9.32376E-01	1.82312E-03	0.00000E+00	0.00000E+00
165	9.21940E-01	2.87167E+00	9.32312E-01	1.81303E-03	0.00000E+00	0.00000E+00
166	9.29656E-01	2.88817E+00	9.32296E-01	1.80201E-03	0.00000E+00	0.00000E+00
167	9.23887E-01	2.90467E+00	9.32245E-01	1.79178E-03	0.00000E+00	0.00000E+00
168	9.32727E-01	2.92117E+00	9.32248E-01	1.78096E-03	0.00000E+00	0.00000E+00
169	9.35740E-01	2.93850E+00	9.32269E-01	1.77039E-03	0.00000E+00	0.00000E+00
170	9.18509E-01	2.95600E+00	9.32187E-01	1.76172E-03	0.00000E+00	0.00000E+00
171	9.48287E-01	2.97250E+00	9.32282E-01	1.75386E-03	0.00000E+00	0.00000E+00
172	9.36651E-01	2.98900E+00	9.32308E-01	1.74370E-03	0.00000E+00	0.00000E+00
173	9.41403E-01	3.00533E+00	9.32361E-01	1.73429E-03	0.00000E+00	0.00000E+00
174	9.14841E-01	3.02283E+00	9.32259E-01	1.72718E-03	0.00000E+00	0.00000E+00
175	8.86355E-01	3.04117E+00	9.31994E-01	1.73755E-03	0.00000E+00	0.00000E+00
176	9.04627E-01	3.05850E+00	9.31837E-01	1.73468E-03	0.00000E+00	0.00000E+00
177	9.43446E-01	3.07500E+00	9.31903E-01	1.72601E-03	0.00000E+00	0.00000E+00
178	9.25594E-01	3.09233E+00	9.31867E-01	1.71655E-03	0.00000E+00	0.00000E+00
179	9.77007E-01	3.10800E+00	9.32122E-01	1.72577E-03	0.00000E+00	0.00000E+00
180	9.50983E-01	3.12533E+00	9.32228E-01	1.71932E-03	0.00000E+00	0.00000E+00
181	9.23091E-01	3.14267E+00	9.32177E-01	1.71045E-03	0.00000E+00	0.00000E+00
182	9.16612E-01	3.15917E+00	9.32091E-01	1.70312E-03	0.00000E+00	0.00000E+00
183	9.52241E-01	3.17750E+00	9.32202E-01	1.69734E-03	0.00000E+00	0.00000E+00
184	9.27574E-01	3.19400E+00	9.32177E-01	1.68816E-03	0.00000E+00	0.00000E+00
185	9.09302E-01	3.21233E+00	9.32052E-01	1.68357E-03	0.00000E+00	0.00000E+00

186	9.13016E-01	3.22883E+00	9.31948E-01	1.67759E-03	0.00000E+00	0.00000E+00
187	9.29239E-01	3.24617E+00	9.31933E-01	1.66856E-03	0.00000E+00	0.00000E+00
188	9.30232E-01	3.26267E+00	9.31924E-01	1.65959E-03	0.00000E+00	0.00000E+00
189	9.23889E-01	3.28000E+00	9.31881E-01	1.65125E-03	0.00000E+00	0.00000E+00
190	9.26294E-01	3.29650E+00	9.31852E-01	1.64271E-03	0.00000E+00	0.00000E+00
191	9.25582E-01	3.31483E+00	9.31818E-01	1.63434E-03	0.00000E+00	0.00000E+00
192	9.16807E-01	3.33317E+00	9.31750E-01	1.62715E-03	0.00000E+00	0.00000E+00
193	9.09692E-01	3.34967E+00	9.31634E-01	1.62273E-03	0.00000E+00	0.00000E+00
194	9.16176E-01	3.36600E+00	9.31554E-01	1.61626E-03	0.00000E+00	0.00000E+00
195	9.17106E-01	3.38350E+00	9.31479E-01	1.60960E-03	0.00000E+00	0.00000E+00
196	9.06240E-01	3.40083E+00	9.31349E-01	1.60656E-03	0.00000E+00	0.00000E+00
197	9.31866E-01	3.41833E+00	9.31352E-01	1.59830E-03	0.00000E+00	0.00000E+00
198	8.98806E-01	3.43567E+00	9.31186E-01	1.59877E-03	0.00000E+00	0.00000E+00
199	9.67376E-01	3.45217E+00	9.31369E-01	1.60121E-03	0.00000E+00	0.00000E+00
200	9.21816E-01	3.46950E+00	9.31321E-01	1.59383E-03	0.00000E+00	0.00000E+00
201	9.65537E-01	3.48600E+00	9.31493E-01	1.59510E-03	0.00000E+00	0.00000E+00
202	9.04126E-01	3.50333E+00	9.31356E-01	1.59299E-03	0.00000E+00	0.00000E+00
203	9.42746E-01	3.52083E+00	9.31413E-01	1.58606E-03	0.00000E+00	0.00000E+00
204	9.06986E-01	3.53817E+00	9.31292E-01	1.58281E-03	0.00000E+00	0.00000E+00
205	9.05345E-01	3.55467E+00	9.31164E-01	1.58018E-03	0.00000E+00	0.00000E+00
206	9.33457E-01	3.57117E+00	9.31175E-01	1.57245E-03	0.00000E+00	0.00000E+00
207	9.60506E-01	3.58850E+00	9.31318E-01	1.57129E-03	0.00000E+00	0.00000E+00
208	9.13098E-01	3.60600E+00	9.31230E-01	1.56614E-03	0.00000E+00	0.00000E+00
209	9.03316E-01	3.62417E+00	9.31095E-01	1.56438E-03	0.00000E+00	0.00000E+00
210	8.96795E-01	3.64167E+00	9.30930E-01	1.56555E-03	0.00000E+00	0.00000E+00
211	9.35330E-01	3.65817E+00	9.30951E-01	1.55818E-03	0.00000E+00	0.00000E+00
212	9.01380E-01	3.67633E+00	9.30810E-01	1.55713E-03	0.00000E+00	0.00000E+00
213	9.01621E-01	3.69383E+00	9.30672E-01	1.55589E-03	0.00000E+00	0.00000E+00
214	9.76733E-01	3.72317E+00	9.30889E-01	1.56370E-03	0.00000E+00	0.00000E+00
215	9.31450E-01	3.73950E+00	9.30892E-01	1.55635E-03	0.00000E+00	0.00000E+00
216	9.24359E-01	3.75700E+00	9.30861E-01	1.54936E-03	0.00000E+00	0.00000E+00
217	9.59991E-01	3.77433E+00	9.30997E-01	1.54807E-03	0.00000E+00	0.00000E+00
218	9.34758E-01	3.79350E+00	9.31014E-01	1.54099E-03	0.00000E+00	0.00000E+00
219	9.03956E-01	3.81183E+00	9.30890E-01	1.53893E-03	0.00000E+00	0.00000E+00
220	9.28686E-01	3.82833E+00	9.30880E-01	1.53188E-03	0.00000E+00	0.00000E+00
221	9.28484E-01	3.84667E+00	9.30870E-01	1.52491E-03	0.00000E+00	0.00000E+00
222	9.26410E-01	3.86400E+00	9.30849E-01	1.51810E-03	0.00000E+00	0.00000E+00
223	9.59803E-01	3.88150E+00	9.30980E-01	1.51688E-03	0.00000E+00	0.00000E+00
224	9.54579E-01	3.89983E+00	9.31087E-01	1.51377E-03	0.00000E+00	0.00000E+00
225	9.05585E-01	3.91900E+00	9.30972E-01	1.51130E-03	0.00000E+00	0.00000E+00
226	9.45070E-01	3.93733E+00	9.31035E-01	1.50585E-03	0.00000E+00	0.00000E+00
227	9.37493E-01	3.95383E+00	9.31064E-01	1.49942E-03	0.00000E+00	0.00000E+00
228	9.48382E-01	3.97217E+00	9.31140E-01	1.49474E-03	0.00000E+00	0.00000E+00
229	9.40329E-01	3.98850E+00	9.31181E-01	1.48869E-03	0.00000E+00	0.00000E+00
230	9.48385E-01	4.00683E+00	9.31256E-01	1.48406E-03	0.00000E+00	0.00000E+00
231	8.89040E-01	4.02433E+00	9.31072E-01	1.48903E-03	0.00000E+00	0.00000E+00
232	9.65909E-01	4.04167E+00	9.31224E-01	1.49025E-03	0.00000E+00	0.00000E+00
233	9.74599E-01	4.05900E+00	9.31411E-01	1.49562E-03	0.00000E+00	0.00000E+00
234	9.16760E-01	4.07733E+00	9.31348E-01	1.49050E-03	0.00000E+00	0.00000E+00
235	9.30789E-01	4.09363E+00	9.31346E-01	1.48409E-03	0.00000E+00	0.00000E+00
236	9.20432E-01	4.11117E+00	9.31299E-01	1.47847E-03	0.00000E+00	0.00000E+00
237	9.26650E-01	4.12867E+00	9.31279E-01	1.47230E-03	0.00000E+00	0.00000E+00
238	9.93530E-01	4.14517E+00	9.31543E-01	1.48959E-03	0.00000E+00	0.00000E+00
239	9.42901E-01	4.16333E+00	9.31591E-01	1.48406E-03	0.00000E+00	0.00000E+00
240	9.49539E-01	4.18083E+00	9.31666E-01	1.47974E-03	0.00000E+00	0.00000E+00
241	9.51291E-01	4.19917E+00	9.31749E-01	1.47582E-03	0.00000E+00	0.00000E+00
242	9.35034E-01	4.21650E+00	9.31762E-01	1.46972E-03	0.00000E+00	0.00000E+00
243	9.55411E-01	4.23300E+00	9.31860E-01	1.46690E-03	0.00000E+00	0.00000E+00
244	9.26882E-01	4.25033E+00	9.31840E-01	1.46097E-03	0.00000E+00	0.00000E+00
245	9.25955E-01	4.26783E+00	9.31816E-01	1.45514E-03	0.00000E+00	0.00000E+00
246	9.41014E-01	4.28417E+00	9.31853E-01	1.44966E-03	0.00000E+00	0.00000E+00
247	9.19919E-01	4.30067E+00	9.31805E-01	1.44455E-03	0.00000E+00	0.00000E+00
248	8.96194E-01	4.31900E+00	9.31660E-01	1.44593E-03	0.00000E+00	0.00000E+00
249	9.52413E-01	4.33650E+00	9.31744E-01	1.44251E-03	0.00000E+00	0.00000E+00
250	9.43548E-01	4.35383E+00	9.31791E-01	1.43747E-03	0.00000E+00	0.00000E+00
251	9.10655E-01	4.37300E+00	9.31707E-01	1.43420E-03	0.00000E+00	0.00000E+00
252	9.59810E-01	4.39050E+00	9.31819E-01	1.43287E-03	0.00000E+00	0.00000E+00
253	9.16570E-01	4.40783E+00	9.31758E-01	1.42844E-03	0.00000E+00	0.00000E+00
254	9.18358E-01	4.42517E+00	9.31705E-01	1.42376E-03	0.00000E+00	0.00000E+00
255	9.50095E-01	4.44167E+00	9.31778E-01	1.41998E-03	0.00000E+00	0.00000E+00
256	9.46913E-01	4.45917E+00	9.31837E-01	1.41563E-03	0.00000E+00	0.00000E+00
257	9.48633E-01	4.47833E+00	9.31903E-01	1.41161E-03	0.00000E+00	0.00000E+00
258	9.16091E-01	4.49667E+00	9.31841E-01	1.40744E-03	0.00000E+00	0.00000E+00
259	9.46780E-01	4.51767E+00	9.31900E-01	1.40316E-03	0.00000E+00	0.00000E+00
260	9.01064E-01	4.54233E+00	9.31780E-01	1.40281E-03	0.00000E+00	0.00000E+00
261	9.46954E-01	4.56250E+00	9.31839E-01	1.39861E-03	0.00000E+00	0.00000E+00
262	9.66209E-01	4.58000E+00	9.31971E-01	1.39948E-03	0.00000E+00	0.00000E+00
263	9.09969E-01	4.59817E+00	9.31887E-01	1.39665E-03	0.00000E+00	0.00000E+00
264	9.35793E-01	4.61467E+00	9.31901E-01	1.39139E-03	0.00000E+00	0.00000E+00
265	9.45468E-01	4.63217E+00	9.31953E-01	1.38705E-03	0.00000E+00	0.00000E+00
266	9.62098E-01	4.64950E+00	9.32067E-01	1.38650E-03	0.00000E+00	0.00000E+00
267	9.17831E-01	4.66683E+00	9.32013E-01	1.38230E-03	0.00000E+00	0.00000E+00
268	9.31604E-01	4.68433E+00	9.32012E-01	1.37709E-03	0.00000E+00	0.00000E+00
269	9.39430E-01	4.70350E+00	9.32040E-01	1.37221E-03	0.00000E+00	0.00000E+00
270	9.49882E-01	4.72000E+00	9.32106E-01	1.36870E-03	0.00000E+00	0.00000E+00
271	9.26082E-01	4.73917E+00	9.32084E-01	1.36378E-03	0.00000E+00	0.00000E+00
272	9.22410E-01	4.75667E+00	9.32048E-01	1.35920E-03	0.00000E+00	0.00000E+00
273	9.24674E-01	4.77317E+00	9.32021E-01	1.35444E-03	0.00000E+00	0.00000E+00
274	9.41151E-01	4.79050E+00	9.32054E-01	1.34987E-03	0.00000E+00	0.00000E+00
275	9.58979E-01	4.80700E+00	9.32153E-01	1.34853E-03	0.00000E+00	0.00000E+00
276	9.37074E-01	4.82433E+00	9.32171E-01	1.34372E-03	0.00000E+00	0.00000E+00
277	9.14275E-01	4.84167E+00	9.32106E-01	1.34040E-03	0.00000E+00	0.00000E+00
278	9.58754E-01	4.85733E+00	9.32202E-01	1.33902E-03	0.00000E+00	0.00000E+00
279	9.03889E-01	4.87567E+00	9.32100E-01	1.33809E-03	0.00000E+00	0.00000E+00
280	9.38855E-01	4.89300E+00	9.32125E-01	1.33349E-03	0.00000E+00	0.00000E+00

281	9.43286E-01	4.91217E+00	9.32165E-01	1.32931E-03	0.00000E+00	0.00000E+00
282	9.20021E-01	4.93233E+00	9.32121E-01	1.32526E-03	0.00000E+00	0.00000E+00
283	9.26751E-01	4.95067E+00	9.32103E-01	1.32067E-03	0.00000E+00	0.00000E+00
284	9.00211E-01	4.96900E+00	9.31989E-01	1.32083E-03	0.00000E+00	0.00000E+00
285	9.01443E-01	4.98633E+00	9.31881E-01	1.32057E-03	0.00000E+00	0.00000E+00
286	9.01616E-01	5.00283E+00	9.31774E-01	1.32022E-03	0.00000E+00	0.00000E+00
287	9.41979E-01	5.02033E+00	9.31810E-01	1.31607E-03	0.00000E+00	0.00000E+00
288	9.35863E-01	5.03767E+00	9.31824E-01	1.31154E-03	0.00000E+00	0.00000E+00
289	9.11547E-01	5.05600E+00	9.31754E-01	1.30887E-03	0.00000E+00	0.00000E+00
290	9.29271E-01	5.07250E+00	9.31745E-01	1.30434E-03	0.00000E+00	0.00000E+00
291	9.58920E-01	5.08883E+00	9.31839E-01	1.30322E-03	0.00000E+00	0.00000E+00
292	9.66201E-01	5.10533E+00	9.31958E-01	1.30411E-03	0.00000E+00	0.00000E+00
293	9.26759E-01	5.12367E+00	9.31940E-01	1.29975E-03	0.00000E+00	0.00000E+00
294	9.08628E-01	5.14017E+00	9.31860E-01	1.29774E-03	0.00000E+00	0.00000E+00
295	9.30354E-01	5.15667E+00	9.31855E-01	1.29332E-03	0.00000E+00	0.00000E+00
296	9.45246E-01	5.17400E+00	9.31900E-01	1.28972E-03	0.00000E+00	0.00000E+00
297	8.99599E-01	5.19150E+00	9.31791E-01	1.28999E-03	0.00000E+00	0.00000E+00
298	9.42083E-01	5.20883E+00	9.31826E-01	1.28610E-03	0.00000E+00	0.00000E+00
299	9.31882E-01	5.22533E+00	9.31826E-01	1.28176E-03	0.00000E+00	0.00000E+00
300	9.31684E-01	5.24367E+00	9.31825E-01	1.27745E-03	0.00000E+00	0.00000E+00
301	9.54073E-01	5.26017E+00	9.31900E-01	1.27534E-03	0.00000E+00	0.00000E+00
302	9.46381E-01	5.27833E+00	9.31948E-01	1.27200E-03	0.00000E+00	0.00000E+00
303	9.56835E-01	5.29400E+00	9.32031E-01	1.27046E-03	0.00000E+00	0.00000E+00

KENO MESSAGE NUMBER K5-123 EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY; WATER IN GAP

```
LIFETIME =  1.01160E-04 + OR -  3.16687E-07          GENERATION TIME =  3.72912E-05 + OR -  9.47620E-08
NU BAR   =  2.43654E+00 + OR -  9.54075E-05     AVERAGE FISSION GROUP =  2.24639E+01 + OR -  5.71557E-03
               ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION =  1.62849E-01 + OR -  7.87513E-04
```

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.93197	+ OR - 0.00127	0.93070 TO 0.93324	0.92942 TO 0.93452	0.92815 TO 0.93579	300000
4	0.93200	+ OR - 0.00128	0.93072 TO 0.93328	0.92945 TO 0.93455	0.92817 TO 0.93583	299000
5	0.93197	+ OR - 0.00128	0.93069 TO 0.93325	0.92941 TO 0.93453	0.92812 TO 0.93581	298000
6	0.93191	+ OR - 0.00128	0.93063 TO 0.93320	0.92934 TO 0.93448	0.92806 TO 0.93576	297000
7	0.93188	+ OR - 0.00129	0.93059 TO 0.93317	0.92931 TO 0.93446	0.92802 TO 0.93575	296000
8	0.93174	+ OR - 0.00128	0.93046 TO 0.93303	0.92917 TO 0.93431	0.92789 TO 0.93560	295000
9	0.93177	+ OR - 0.00129	0.93048 TO 0.93306	0.92919 TO 0.93435	0.92790 TO 0.93564	294000
10	0.93174	+ OR - 0.00129	0.93045 TO 0.93303	0.92915 TO 0.93433	0.92786 TO 0.93562	293000
11	0.93154	+ OR - 0.00128	0.93026 TO 0.93283	0.92898 TO 0.93411	0.92770 TO 0.93539	292000
12	0.93157	+ OR - 0.00129	0.93028 TO 0.93286	0.92900 TO 0.93414	0.92771 TO 0.93543	291000
17	0.93146	+ OR - 0.00130	0.93016 TO 0.93276	0.92885 TO 0.93406	0.92755 TO 0.93536	286000
22	0.93138	+ OR - 0.00131	0.93007 TO 0.93268	0.92876 TO 0.93399	0.92746 TO 0.93529	281000
27	0.93150	+ OR - 0.00132	0.93017 TO 0.93282	0.92885 TO 0.93414	0.92753 TO 0.93547	276000
32	0.93134	+ OR - 0.00134	0.92999 TO 0.93268	0.92865 TO 0.93402	0.92731 TO 0.93537	271000
37	0.93127	+ OR - 0.00137	0.92990 TO 0.93263	0.92854 TO 0.93400	0.92717 TO 0.93537	266000
42	0.93133	+ OR - 0.00137	0.92996 TO 0.93270	0.92858 TO 0.93408	0.92721 TO 0.93545	261000
47	0.93101	+ OR - 0.00137	0.92964 TO 0.93238	0.92826 TO 0.93375	0.92689 TO 0.93512	256000
52	0.93107	+ OR - 0.00139	0.92968 TO 0.93246	0.92829 TO 0.93386	0.92690 TO 0.93525	251000
57	0.93092	+ OR - 0.00140	0.92952 TO 0.93232	0.92811 TO 0.93372	0.92671 TO 0.93512	246000
62	0.93092	+ OR - 0.00142	0.92949 TO 0.93234	0.92807 TO 0.93376	0.92665 TO 0.93518	241000
67	0.93082	+ OR - 0.00141	0.92941 TO 0.93223	0.92800 TO 0.93364	0.92659 TO 0.93505	236000
72	0.93084	+ OR - 0.00144	0.92940 TO 0.93227	0.92796 TO 0.93371	0.92653 TO 0.93514	231000
77	0.93077	+ OR - 0.00146	0.92932 TO 0.93223	0.92786 TO 0.93369	0.92640 TO 0.93514	226000
82	0.93094	+ OR - 0.00148	0.92945 TO 0.93242	0.92797 TO 0.93390	0.92649 TO 0.93538	221000
87	0.93064	+ OR - 0.00150	0.92914 TO 0.93214	0.92765 TO 0.93364	0.92615 TO 0.93513	216000
92	0.93083	+ OR - 0.00151	0.92931 TO 0.93234	0.92780 TO 0.93386	0.92628 TO 0.93537	211000

LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY; WATER IN GAP

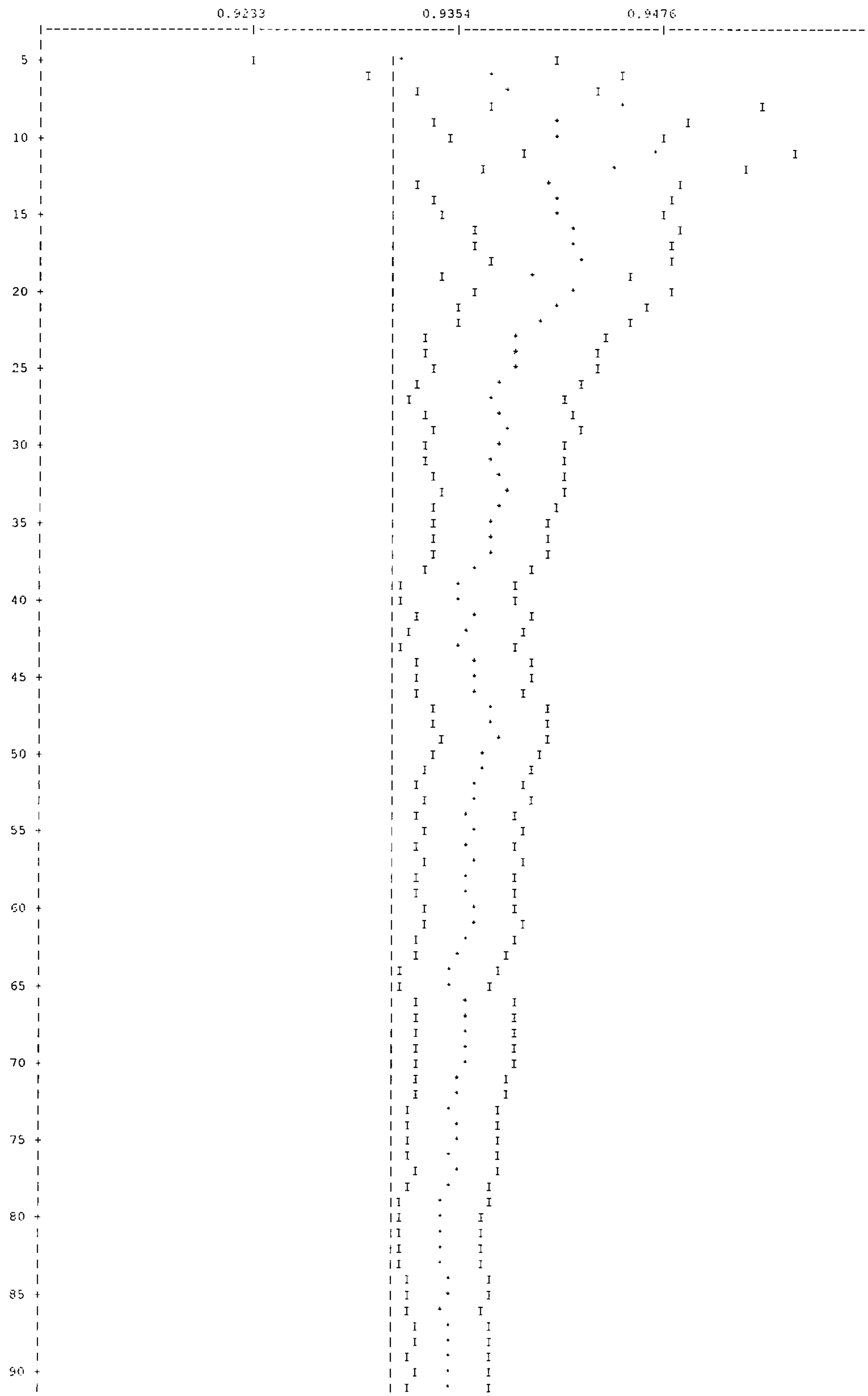
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
97	0.93060	+ OR - 0.00155	0.92906 TO 0.93215	0.92751 TO 0.93370	0.92596 TO 0.93524	206000
102	0.93041	+ OR - 0.00156	0.92885 TO 0.93197	0.92729 TO 0.93353	0.92573 TO 0.93509	201000
107	0.93047	+ OR - 0.00159	0.92887 TO 0.93206	0.92728 TO 0.93365	0.92569 TO 0.93524	196000
112	0.93018	+ OR - 0.00161	0.92857 TO 0.93179	0.92695 TO 0.93340	0.92534 TO 0.93501	191000
117	0.93012	+ OR - 0.00158	0.92854 TO 0.93170	0.92696 TO 0.93328	0.92538 TO 0.93486	186000
122	0.93026	+ OR - 0.00156	0.92870 TO 0.93182	0.92714 TO 0.93337	0.92558 TO 0.93493	181000
127	0.93045	+ OR - 0.00159	0.92886 TO 0.93204	0.92727 TO 0.93362	0.92568 TO 0.93521	176000
132	0.93053	+ OR - 0.00161	0.92892 TO 0.93213	0.92731 TO 0.93374	0.92571 TO 0.93534	171000
137	0.93083	+ OR - 0.00164	0.92918 TO 0.93247	0.92754 TO 0.93411	0.92590 TO 0.93576	166000
142	0.93107	+ OR - 0.00168	0.92940 TO 0.93275	0.92772 TO 0.93443	0.92604 TO 0.93610	161000
147	0.93162	+ OR - 0.00170	0.92992 TO 0.93331	0.92823 TO 0.93501	0.92653 TO 0.93671	156000
152	0.93172	+ OR - 0.00173	0.92999 TO 0.93344	0.92826 TO 0.93517	0.92653 TO 0.93690	151000
157	0.93120	+ OR - 0.00172	0.92948 TO 0.93291	0.92776 TO 0.93463	0.92605 TO 0.93634	146000
162	0.93169	+ OR - 0.00173	0.92996 TO 0.93342	0.92823 TO 0.93515	0.92650 TO 0.93689	141000
167	0.93177	+ OR - 0.00179	0.92998 TO 0.93356	0.92819 TO 0.93535	0.92640 TO 0.93714	136000
172	0.93167	+ OR - 0.00185	0.92982 TO 0.93352	0.92797 TO 0.93537	0.92612 TO 0.93722	131000
177	0.93221	+ OR - 0.00187	0.93034 TO 0.93408	0.92847 TO 0.93595	0.92660 TO 0.93782	126000
182	0.93194	+ OR - 0.00190	0.93004 TO 0.93384	0.92815 TO 0.93574	0.92625 TO 0.93763	121000
187	0.93219	+ OR - 0.00195	0.93023 TO 0.93414	0.92828 TO 0.93610	0.92632 TO 0.93805	116000
192	0.93251	+ OR - 0.00204	0.93048 TO 0.93455	0.92844 TO 0.93658	0.92640 TO 0.93862	111000
197	0.93328	+ OR - 0.00210	0.93118 TO 0.93538	0.92909 TO 0.93747	0.92699 TO 0.93957	106000
202	0.93337	+ OR - 0.00210	0.93127 TO 0.93547	0.92917 TO 0.93756	0.92707 TO 0.93966	101000
207	0.93355	+ OR - 0.00215	0.93140 TO 0.93570	0.92925 TO 0.93785	0.92710 TO 0.94000	96000
212	0.93485	+ OR - 0.00216	0.93268 TO 0.93701	0.93052 TO 0.93917	0.92836 TO 0.94133	91000
217	0.93462	+ OR - 0.00218	0.93244 TO 0.93679	0.93026 TO 0.93897	0.92808 TO 0.94115	86000
222	0.93524	+ OR - 0.00228	0.93296 TO 0.93752	0.93069 TO 0.93979	0.92841 TO 0.94207	81000
227	0.93489	+ OR - 0.00235	0.93254 TO 0.93725	0.93018 TO 0.93960	0.92783 TO 0.94196	76000

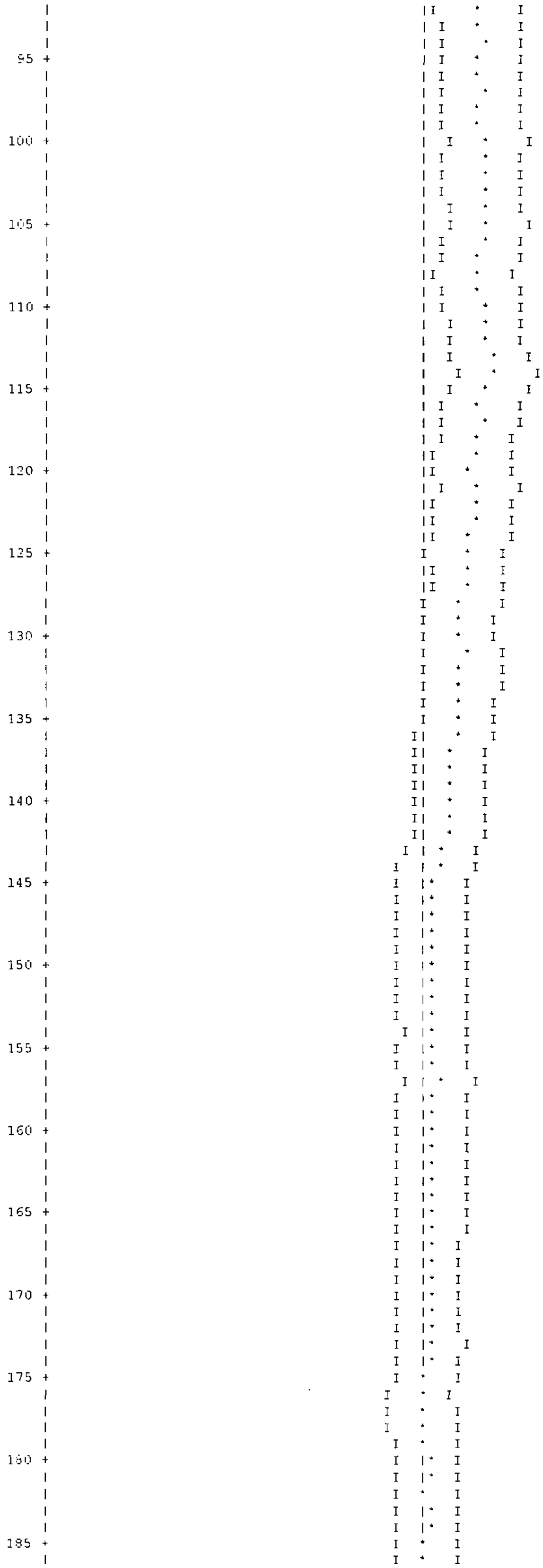
LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY; WATER IN GAP

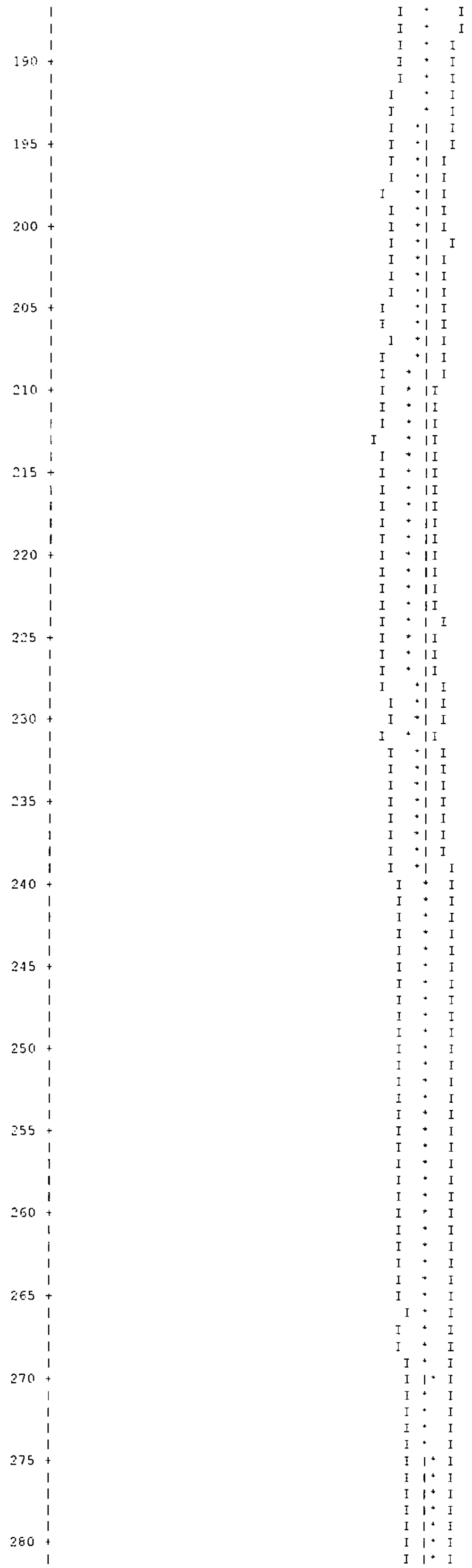
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
232	0.93465	+ OR - 0.00238	0.93227 TO 0.93703	0.92989 TO 0.93940	0.92751 TO 0.94178	71000
237	0.93471	+ OR - 0.00246	0.93225 TO 0.93717	0.92979 TO 0.93962	0.92733 TO 0.94208	66000
242	0.93309	+ OR - 0.00244	0.93065 TO 0.93553	0.92821 TO 0.93796	0.92577 TO 0.94040	61000
247	0.93302	+ OR - 0.00261	0.93041 TO 0.93563	0.92781 TO 0.93824	0.92520 TO 0.94084	56000
252	0.93307	+ OR - 0.00265	0.93042 TO 0.93572	0.92777 TO 0.93836	0.92513 TO 0.94101	51000
257	0.93274	+ OR - 0.00284	0.92990 TO 0.93558	0.92706 TO 0.93841	0.92423 TO 0.94125	46000
262	0.93241	+ OR - 0.00291	0.92950 TO 0.93532	0.92660 TO 0.93822	0.92369 TO 0.94113	41000
267	0.93216	+ OR - 0.00310	0.92906 TO 0.93525	0.92597 TO 0.93835	0.92287 TO 0.94144	36000
272	0.93188	+ OR - 0.00353	0.92835 TO 0.93541	0.92483 TO 0.93894	0.92130 TO 0.94246	31000
277	0.93124	+ OR - 0.00399	0.92724 TO 0.93523	0.92325 TO 0.93922	0.91926 TO 0.94321	26000
282	0.93083	+ OR - 0.00450	0.92632 TO 0.93533	0.92182 TO 0.93983	0.91732 TO 0.94433	21000
287	0.93596	+ OR - 0.00470	0.93126 TO 0.94066	0.92656 TO 0.94536	0.92186 TO 0.95005	16000
292	0.93396	+ OR - 0.00537	0.92859 TO 0.93933	0.92322 TO 0.94470	0.91785 TO 0.95007	11000
297	0.94382	+ OR - 0.00437	0.93945 TO 0.94820	0.93508 TO 0.95257	0.93070 TO 0.95694	6000

LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY; WATER IN GAP

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.9320 + OR - 0.0013 WHICH OCCURS FOR 303 GENERATIONS RUN.




95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185


190
195
200
205
210
215
220
225
230
235
240
245
250
255
260
265
270
275
280

```
       |                                       I |* I
       |                                       I |* I
       |                                       I *  I
   285 +                                      I  *  I
       |                                      I  *  I
       |                                      I  *  I
       |                                      I  *  I
       |                                      I  *  I
   290 +                                      I  * I
       |                                      I  *  I
       |                                       I *  I
       |                                       I *  I
       |                                      I  *  I
   295 +                                      I  *  I
       |                                      I  *  I
       |                                      I  *  I
       |                                      I  *  I
       |                                      I  *  I
   300 +                                      I  *  I
       |                                      I  *  I
       |                                       I *  I
       |                                       I *  I
```

LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY: WATER IN GAP

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0044			4.12382E-03	2.2144	2.31596E-03	1.7429	9.65822E-06	57.6063
2	0.0180			1.67539E-02	0.6733	8.40488E-03	0.5753	0.00000E+00	0.0000
3	0.0200			1.86620E-02	0.5834	7.76219E-03	0.5667	0.00000E+00	0.0000
4	0.0084			7.85246E-03	0.7543	3.75926E-03	0.7213	0.00000E+00	0.0000
5	0.0026			2.42704E-03	0.5530	2.56147E-03	0.4791	0.00000E+00	0.0000
6	0.0023			2.15423E-03	0.4075	4.32427E-03	0.3424	0.00000E+00	0.0000
7	0.0023			2.11604E-03	0.4532	4.86679E-03	0.3862	0.00000E+00	0.0000
8	0.0023			2.14614E-03	0.5016	7.24848E-03	0.4245	0.00000E+00	0.0000
9	0.0031			2.89714E-03	0.5196	1.12585E-02	0.4242	0.00000E+00	0.0000
10	0.0067			6.25759E-03	0.5651	1.73420E-02	0.4456	0.00000E+00	0.0000
11	0.0140			1.30250E-02	0.5315	2.80004E-02	0.4400	0.00000E+00	0.0000
12	0.0184			1.71878E-02	0.6059	2.98291E-02	0.5484	0.00000E+00	0.0000
13	0.0170			1.58165E-02	0.6547	2.97315E-02	0.5618	0.00000E+00	0.0000
14	0.0134			1.25289E-02	0.6097	4.23690E-02	0.5109	0.00000E+00	0.0000
15	0.0030			2.76823E-03	1.0342	8.78912E-03	0.8033	0.00000E+00	0.0000
16	0.0021			1.92938E-03	1.3874	5.29241E-03	0.8411	0.00000E+00	0.0000
17	0.0032			2.97248E-03	1.6548	3.72679E-03	1.1017	0.00000E+00	0.0000
18	0.0042			3.95071E-03	1.9001	3.84560E-03	1.2468	0.00000E+00	0.0000
19	0.0051			4.79233E-03	1.2874	6.01308E-03	0.8243	0.00000E+00	0.0000
20	0.0216			2.01376E-02	0.8603	2.36640E-02	0.5959	0.00000E+00	0.0000
21	0.0119			1.10782E-02	1.2904	1.04705E-02	0.9036	0.00000E+00	0.0000
22	0.0289			2.69181E-02	0.9346	2.43475E-02	0.6607	0.00000E+00	0.0000
23	0.1036			9.65919E-02	0.4601	9.35088E-02	0.3275	0.00000E+00	0.0000
24	0.2115			1.97140E-01	0.3347	1.90608E-01	0.1993	0.00000E+00	0.0000
25	0.1819			1.69493E-01	0.3884	1.63260E-01	0.2228	8.62806E-07	100.0000
26	0.2191			2.04213E-01	0.3709	2.00778E-01	0.2291	1.58655E-06	100.0000
27	0.0709			6.60369E-02	0.6982	6.74562E-02	0.4170	0.00000E+00	0.0000
SYSTEM TOTAL =				9.31971E-01	0.1366	1.00153E+00	0.0446	1.21076E-05	48.1945

ELAPSED TIME 5.29483 MINUTES

RANDOM NUMBER= 9A242D7225

```
LWT ANALYSIS; EXXON 15X15(W) ASSEMBLY;  WATER IN GAP

                              FREQUENCY FOR GENERATIONS    4 TO  303
0.8694 TO 0.8820     *
0.8820 TO 0.8947     ******
0.8947 TO 0.9073     **********************************
0.9073 TO 0.9200     ************************************************
0.9200 TO 0.9326     ***************************************************************
0.9326 TO 0.9453     **************************************************************
0.9453 TO 0.9579     ************************************
0.9579 TO 0.9706     *****************
0.9706 TO 0.9832     ***********
0.9832 TO 0.9959     *****
0.9959 TO 1.0085     *

                              FREQUENCY FOR GENERATIONS   79 TO  303
0.8694 TO 0.8820     *
0.8820 TO 0.8947     ******
0.8947 TO 0.9073     **************************
0.9073 TO 0.9200     **************************************
0.9200 TO 0.9326     ************************************************
0.9326 TO 0.9453     ***********************************************
0.9453 TO 0.9579     *************************
0.9579 TO 0.9706     ***************
0.9706 TO 0.9832     ******
0.9832 TO 0.9959     ****
0.9959 TO 1.0085

                              FREQUENCY FOR GENERATIONS  154 TO  303
0.8694 TO 0.8820
0.8820 TO 0.8947     ***
0.8947 TO 0.9073     *****************
0.9073 TO 0.9200     ********************
0.9200 TO 0.9326     ********************************
0.9326 TO 0.9453     *************************
0.9453 TO 0.9579     *****************
0.9579 TO 0.9706     ************
0.9706 TO 0.9832     ***
0.9832 TO 0.9959     **
0.9959 TO 1.0085

                              FREQUENCY FOR GENERATIONS  229 TO  303
0.8694 TO 0.8820
0.8820 TO 0.8947     *
0.8947 TO 0.9073     *******
0.9073 TO 0.9200     ***********
0.9200 TO 0.9326     ****************
0.9326 TO 0.9453     ***************
0.9453 TO 0.9579     ***************
0.9579 TO 0.9706     ********
0.9706 TO 0.9832     *
0.9832 TO 0.9959     *
0.9959 TO 1.0085


***********************************************************************************************************************************
*

         CONGRATULATIONS!  YOU HAVE  SUCCESSFULLY TRAVERSED THE PERILOUS PATH THROUGH KENO V IN    5.29483 MINUTES

***********************************************************************************************************************************
*
-
```

Figure 6.6.1-3 CSAS Input/Output for NAC-LWT with PWR Fuel – 3.5% Enrichment – Most Reactive Normal Condition Configuration

```
PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
   MODULE CSAS25   WILL BE CALLED
     LWT ANALYSIS; W17x17 OFA ASSEMBLY;  NO WATER IN GAP
     27GROUPNDF4 LATTICECELL
     UO2  1  0.95 293.0 92235 3.5 92238 96.5 END
     ZR   2  1.0  293.0  END
     H2O   3 1.000 293.0 END
     AL   4  1.0  293.0  END
     SS304 5 1.0  293.0  END
     PB    6 1.0 293.0 END
     H2O 7 1.0 293.0 END
     H2O   8 1.0E-20 293.0 END
     H2O 9 1.0E-20 293.0 END
     END COMP
     SQUAREPITCH  1.2598 0.7844 1 3 0.9144 2 0.8002 9 END
     LWT ANALYSIS; W17x17 OFA ASSEMBLY; NO WATER IN GAP
     READ PARAM RUN=YES PLT=NO TME=5000 GEN=303 RND= NPG=1000 END PARAM
     READ GEOM
     UNIT  1
     COM='FUEL PIN CELL - WITH H2O'
     CYLINDER  1 1  0.3922   2P182.88
     CYLINDER  9 1  0.4001   2P182.88
     CYLINDER  2 1  0.4572   2P182.88
     CUBOID    3 1  4P0.6299 2P182.88
     UNIT  2
     COM='WATER ROD CELL - WITH H2O'
     CYLINDER  3 1  0.5715   2P182.88
     CYLINDER  2 1  0.6121   2P182.88
     CUBOID    3 1  4P0.6299 2P182.88
     GLOBAL UNIT 9
     ARRAY  1  -10.7083 -10.7083 -182.88
     CUBOID 3 1 4P11.2776 2P182.88
     CYLINDER 4 1 16.891 2P182.88
     CYLINDER 3 1 16.9863 2P182.88
     CYLINDER 5 1 18.8913 2P182.88
     CYLINDER 6 1 33.4963 2P182.88
     CYLINDER 5 1 36.5443 2P182.88
     CYLINDER 7 1 49.2443 2P182.88
     CYLINDER 5 1 49.8539 212.48 -192.16
     CYLINDER 6 1 49.8539 212.48 -199.78
     CYLINDER 5 1 49.8539 212.48 -208.67
     CUBOID 8 1 4P81.0000 243.00 -240.00
     END GEOM
     READ ARRAY
     ARA=1   NUX=17 NUY=17 NUZ=1  FILL
                              34R1
               5R1   2   2R1   2   2R1   2   5R1
                    3R1   2   9R1   2   3R1
                              17R1
     2R1   2   2R1   2   2R1   2   2R1   2   2R1   2   2R1
                              34R1
     2R1   2   2R1   2   2R1   2   2R1   2   2R1   2   2R1
                              34R1
     2R1   2   2R1   2   2R1   2   2R1   2   2R1   2   2R1
                              17R1
                    3R1   2   9R1   2   3R1
               5R1   2   2R1   2   2R1   2   5R1
                              34R1
     END FILL
     END ARRAY
     READ BOUNDS ZFC=VAC YXF=VAC END BOUNDS
     END DATA

  SECONDARY MODULE 000008   HAS BEEN CALLED.

  MODULE 000008   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     1.26 (SECONDS).

  SECONDARY MODULE 000002   HAS BEEN CALLED.

  MODULE 000002   IS FINISHED. COMPLETION CODE     0. CPU TIME USED    13.24 (SECONDS).

  SECONDARY MODULE 000009   HAS BEEN CALLED.

  MODULE 000009   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   607.64 (SECONDS).

  MODULE CSAS25   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   626.15 (SECONDS).
```

```
 CCCCCCCCCCC    SSSSSSSSSSS     AAAAAAAAA     SSSSSSSSSSS    22222222222   5555555555555
CCCCCCCCCCCCC  SSSSSSSSSSSSS   AAAAAAAAAAA   SSSSSSSSSSSSS  2222222222222  5555555555555
CC         CC  SS         SS  AA         AA  SS         SS  22         22  55
CC             SS             AA         AA  SS                        22  55
CC             SS             AA         AA  SS                        22  55
CC             SSSSSSSSSSSS   AAAAAAAAAAAAA  SSSSSSSSSSSS             22   555555555555
CC              SSSSSSSSSSSS  AAAAAAAAAAAAA   SSSSSSSSSSSS          22     5555555555555
CC                        SS  AA         AA             SS       22                   55
CC                        SS  AA         AA             SS     22                     55
CC         CC  SS         SS  AA         AA  SS         SS  22             55         55
CCCCCCCCCCCCC  SSSSSSSSSSSSS  AA         AA  SSSSSSSSSSSSS  2222222222222  5555555555555
 CCCCCCCCCCC    SSSSSSSSSSS   AA         AA   SSSSSSSSSSS   2222222222222   55555555555

 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA     LL             EEEEEEEEEEEEE                   PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA    LL             EEEEEEEEEEEEE                   PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA   LL             EE                              PP         PP  CC         CC
SS             CC             AA         AA   LL             EE                              PP         PP  CC
SS             CC             AA         AA   LL             EE                              PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA   LL             EEEEEEEEE       -------------   PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA   LL             EEEEEEEEE       -------------   PPPPPPPPPPPP   CC
           SS  CC             AA         AA   LL             EE                              PP             CC
           SS  CC             AA         AA   LL             EE                              PP             CC
SS         SS  CC         CC  AA         AA   LL             EE                              PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA   LLLLLLLLLLLLL  EEEEEEEEEEEEE                   PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL  EEEEEEEEEEEEE                   PP              CCCCCCCCCCC

   0000000     7777777777777          //   22222222222    33333333333          //   99999999999    88888888888
  000000000    777777777777          //   2222222222222  3333333333333        //   9999999999999  8888888888888
 00       00   77         77        //    22         22  33         33       //    99         99  88         88
00         00            77        //                22             33      //     99         99  88         88
00         00           77        //                 22             33     //      99         99  88         88
00         00          77        //                22              333    //       9999999999999   8888888888
00         00          77       //               22                333   //         999999999999   8888888888
00         00         77       //              22                   33  //                    99  88         88
00         00         77      //             22                     33  //                    99  88         88
 00       00          77     //            22           33         33 //                      99  88         88
  000000000           77    //            2222222222222 3333333333333 //       9999999999999  8888888888888
   0000000            77   //             2222222222222  33333333333 //        999999999999    88888888888

   0000000      99999999999              22222222222   7777777777777                  11       66666666666
  000000000    9999999999999            2222222222222  777777777777                  111      6666666666666
 00       00   99         99    :::     22         22  77         77      :::       1111      66
00         00  99         99    :::                22            77       :::         11      66
00         00  99         99    :::                22           77        :::         11      66
00         00  9999999999999                     22            77                     11      666666666666
00         00   999999999999                   22             77                      11      6666666666666
00         00             99    :::          22              77           :::         11      66         66
00         00             99    :::        22               77            :::         11      66         66
 00       00              99    :::      22                77             :::         11      66         66
  000000000    9999999999999            2222222222222      77                    11111111     6666666666666
   0000000     999999999999             2222222222222      77                    11111111      66666666666
```

```
 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL            EEEEEEEEEEEEE                  PPPPPPPPPPPP     CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL            EEEEEEEEEEEEE                  PPPPPPPPPPPPP   CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL            EE                             PP         PP   CC         CC
SS             CC             AA         AA  LL            EE                             PP         PP   CC
SS             CC             AA         AA  LL            EE                             PP         PP   CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL            EEEEEEEEE     -------------    PPPPPPPPPPPPP   CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL            EEEEEEEEE     -------------    PPPPPPPPPPPP    CC
           SS  CC             AA         AA  LL            EE                             PP              CC
           SS  CC             AA         AA  LL            EE                             PP              CC
SS         SS  CC         CC  AA         AA  LL            EE                             PP              CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLLL EEEEEEEEEEEEE                  PP              CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLLL EEEEEEEEEEEEE                  PP               CCCCCCCCCCC
```

```
*****************************************************************************
*****************************************************************************
*****************************************************************************
*****                                                                   *****
*****                   PROGRAM VERIFICATION INFORMATION                *****
*****                                                                   *****
*****                  CODE SYSTEM:   SCALE-PC VERSION:   4.3           *****
*****                                                                   *****
*****************************************************************************
*****************************************************************************
*****                                                                   *****
*****                                                                   *****
*****               PROGRAM:  CSAS                                      *****
*****                                                                   *****
*****         CREATION DATE:  03/08/96                                  *****
*****                                                                   *****
*****                VOLUME:  ENG                                       *****
*****                                                                   *****
*****               LIBRARY:  G:\SCALE43\WIN_NT\EXE                     *****
*****                                                                   *****
*****                                                                   *****
*****       PRODUCTION CODE:  CSAS                                      *****
*****                                                                   *****
*****               VERSION:  3.1                                       *****
*****                                                                   *****
*****               JOBNAME:  SCALE-PC                                  *****
*****                                                                   *****
*****     DATE OF EXECUTION:  07/23/98                                  *****
*****                                                                   *****
*****     TIME OF EXECUTION:  09:27:16                                  *****
*****                                                                   *****
*****                                                                   *****
*****************************************************************************
*****************************************************************************
*****************************************************************************
```

```
LWT ANALYSIS; W17X17 OFA ASSEMBLY;  NO WATER IN GAP


**** PROBLEM PARAMETERS ****

LIB 27GROUPNDF4  LIBRARY
MXX            9 MIXTURES
MSC            9 COMPOSITION SPECIFICATIONS
IZM            4 MATERIAL ZONES
GE  LATTICECELL  GEOMETRY
MORE           0 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
MSLN           0 FUEL SOLUTIONS


**** PROBLEM COMPOSITION DESCRIPTION ****

SC  UO2          STANDARD COMPOSITION
MX             1 MIXTURE NO.
VF        0.9500 VOLUME FRACTION
ROTH     10.9600 THEORETICAL DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           92000       1.00 ATOM/MOLECULE
                           92235      3.500 WT%
                           92238     96.500 WT%
            8016       2.00 ATOMS/MOLECULE
END

SC  ZR           STANDARD COMPOSITION
MX             2 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      6.4900 THEORETICAL DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           40000       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX             3 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      0.9982 THEORETICAL DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
            1001       2.00 ATOMS/MOLECULE
            8016       1.00 ATOM/MOLECULE
END

SC  AL           STANDARD COMPOSITION
MX             4 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      2.7020 THEORETICAL DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           13027       1.00 ATOM/MOLECULE
END

SC  SS304        STANDARD COMPOSITION
MX             5 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      7.9200 THEORETICAL DENSITY
NEL            4 NO. ELEMENTS
ICP            0 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           24304     19.000 WT%
           25055      2.000 WT%
           26304     69.500 WT%
           28304      9.500 WT%
END

SC  PB           STANDARD COMPOSITION
MX             6 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH     11.3440 THEORETICAL DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           82000       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX             7 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      0.9982 THEORETICAL DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
            1001       2.00 ATOMS/MOLECULE
            8016       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
```

```
MX          8 MIXTURE NO.
VF          0.0000 VOLUME FRACTION
ROTH        0.9982 THEORETICAL DENSITY
NEL              2 NO. ELEMENTS
ICP              1 0/1 MIXTURE/COMPOUND
TEMP         293.0 DEG KELVIN
            1001       2.00 ATOMS/MOLECULE
            8016       1.00 ATOM/MOLECULE
END

SC  H2O           STANDARD COMPOSITION
MX               9 MIXTURE NO.
VF          0.0000 VOLUME FRACTION
ROTH        0.9982 THEOPETICAL DENSITY
NEL              2 NO. ELEMENTS
ICP              1 0/1 MIXTURE/COMPOUND
TEMP         293.0 DEG KELVIN
            1001       2.00 ATOMS/MOLECULE
            8016       1.00 ATOM/MOLECULE
END


**** PROBLEM GEOMETRY ****

CTP SQUAREPITCH  CELL TYPE
PITCH       1.2598 CM CENTER TO CENTER SPACING
FUELOD      0.7844 CM FUEL DIAMETER OR SLAB THICKNESS
MFUEL            1 MIXTURE NO. OF FUEL
MMOD             3 MIXTURE NO. OF MODERATOR
CLADOD      0.9144 CM CLAD OUTER DIAMETER
MCLAD            2 MIXTURE NO. OF CLAD
GAPOD       0.8002 CM GAP OUTER DIAMETER
MGAP             9 MIXTURE NO. OF GAP


ZONE SPECIFICATIONS FOR LATTICECELL GEOMETRY

              ZONE  1 IS FUEL
              ZONE  2 IS GAP
              ZONE  3 IS CLAD
              ZONE  4 IS MOD
```

```
LWT ANALYSIS; W17X17 OFA ASSEMBLY; NO WATER IN GAP

********** DATA LIBRARY INFORMATION **********

UNIT                                              VOLUME
NUMBER         DATA SET NAME                      NAME      UNIT FUNCTION
------         -------------                      ----      -------------

  89    G:\scale43\DATALIB\FT89F001                         STANDARD COMPOSITION LIBRARY

  82    G:\scale43\DATALIB\FT82F001                         CROSS SECTION LIBRARY

  11    D:\PROJECTS\BU85-C~1\pwrfin02\17NX1M\FT11F00        SHORT CROSS SECTION LIBRARY

  90    D:\PROJECTS\BU85-C~1\pwrfin02\17NX1M\FT90F00        INPUT DATA DIRECT ACCESS


                    STANDARD COMPOSITION LIBRARY DATA
                    ---------------------------------

      UNIT NUMBER  :  89

      DATASET NAME :  G:\scale43\DATALIB\FT89F001

      LIBRARY TITLE:  SCALE-4 STANDARD COMPOSITION LIBRARY
                      637 STANDARD COMPOSITIONS, 490 NUCLIDES
                      90 ELEMENTS WITH VARIABLE ISOTOPIC DISTRBUTIONS.

      CREATION DATE:   6/30/95


                       CROSS SECTION LIBRARY DATA
                       ---------------------------

      UNIT NUMBER  :  82

      DATASET NAME :  G:\scale43\DATALIB\FT82F001

      LIBRARY TITLE:  SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
                         BASED ON ENDF-B VERSION 4 DATA
                            COMPILED FOR NRC      1/27/89
                               LAST UPDATED                                     08/12/94
                                  L.M.PETRIE   -   ORNL


              ........    0 IO'S WERE USED BEFORE READING KENO V DATA     ........

              ........    0 IO'S WERE USED READING THE KENO V PARAMETER DATA     ........

             ************** DATA READING COMPLETED **************

              ........    0 IO'S WERE USED PREPARING THE KENO V INPUT DATA     ........

              ........    0 IO'S WERE USED LOADING THE KENO V DATA     ........

              ........    0 IO'S WERE USED LOADING THE DATA     ........

              ........    0 IO'S WERE USED CHECKING THE KENO V GEOMETRY DATA     ........
              *****  RESTART DATA HAS BEEN WRITTEN ON UNIT 95  *****

              ........    0 IO'S WERE USED WRITING THE KENO V - CSAS DATA     ........

              ........    0 IO'S WERE USED PROCESSING CSAS INPUT DATA     ........

CONTROL MODULE CSAS25    IS COMPLETE.
```

```
              KK          KK  EEEEEEEEEEEEE  NN          NN   00000000000                   VV          VV
              KK         KK   EEEEEEEEEEEEE  NNN         NN  0000000000000                  VV          VV
              KK        KK    EE             NNNN        NN  00         00                  VV          VV
              KK       KK     EE             NN NN       NN  00         00                  VV          VV
              KK      KK      EE             NN  NN      NN  00         00                  VV          VV
              KKKKKKKK        EEEEEEEEE      NN   NN     NN  00         00  -------------   VV          VV
              KKKKKKKK        EEEEEEEEE      NN    NN    NN  00         00  -------------    VV        VV
              KK      KK      EE             NN     NN   NN  00         00                    VV      VV
              KK       KK     EE             NN      NN  NN  00         00                     VV    VV
              KK        KK    EE             NN       NNNN   00         00                      VV VV
              KK         KK   EEEEEEEEEEEEE  NN        NNN  0000000000000                        VVV
              KK          KK  EEEEEEEEEEEEE  NN         NN   00000000000                          V

 SSSSSSSSSSS   CCCCCCCCCCC     AAAAAAAAA     LL             EEEEEEEEEEEEE                  PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS CCCCCCCCCCCCC   AAAAAAAAAAA    LL             EEEEEEEEEEEEE                  PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS CC         CC  AA         AA   LL             EE                             PP         PP  CC         CC
SS            CC             AA         AA   LL             EE                             PP         PP  CC
SS            CC             AA         AA   LL             EE                             PP         PP  CC
SSSSSSSSSSSS  CC             AAAAAAAAAAAAA   LL             EEEEEEEEE      -------------   PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS CC             AAAAAAAAAAAAA   LL             EEEEEEEEE      -------------   PPPPPPPPPPPP   CC
           SS CC             AA         AA   LL             EE                             PP             CC
           SS CC             AA         AA   LL             EE                             PP             CC
SS         SS CC         CC  AA         AA   LL             EE                             PP             CC         CC
SSSSSSSSSSSSS CCCCCCCCCCCCC  AA         AA   LLLLLLLLLLLLL  EEEEEEEEEEEEE                  PP             CCCCCCCCCCCCC
 SSSSSSSSSSS   CCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL  EEEEEEEEEEEEE                  PP              CCCCCCCCCCC

   0000000    7777777777777          //   22222222222    33333333333          //   99999999999    88888888888
  000000000   777777777777          //   2222222222222  3333333333333        //   9999999999999  8888888888888
 00       00  77         77        //    22         22  33         33       //    99         99  88         88
00         00           77        //                22             33      //     99         99  88         88
00         00          77        //                 22             33     //      99         99  88         88
00         00         77        //                22              333    //       9999999999999   88888888888
00         00        77        //               22                333   //         999999999999   88888888888
00         00       77        //              22                   33  //                    99  88         88
00         00       77       //             22                     33 //                     99  88         88
 00       00        77      //             22               33      33//                      99  88         88
  000000000         77     //              2222222222222  3333333333333                 9999999999999  8888888888888
   0000000          77    //               2222222222222   33333333333                  999999999999    88888888888

   0000000    99999999999               22222222222    7777777777777              33333333333    33333333333
  000000000  9999999999999             2222222222222   777777777777              3333333333333  3333333333333
 00       00 99         99     :::     22         22  77         77     :::     33         33  33         33
00         00 99        99     :::                22             77     :::                33             33
00         00 99        99     :::                22            77      :::                33             33
00         00 9999999999999                     22             77                         333            333
00         00  999999999999                   22              77                          333            333
00         00           99     :::          22               77        :::                 33             33
00         00           99     :::        22                77         :::                 33             33
 00       00            99     :::     22                  77          :::      33         33  33         33
  000000000  9999999999999             2222222222222       77                   3333333333333  3333333333333
   0000000   999999999999              2222222222222       77                    33333333333    33333333333
```

```
 SSSSSSSSSSS    CCCCCCCCCCC      AAAAAAAAA     LL              EEEEEEEEEEEEE                  PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC    AAAAAAAAAAA    LL              EEEEEEEEEEEEE                  PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC   AA         AA   LL              EE                             PP         PP  CC         CC
SS             CC              AA         AA   LL              EE                             PP         PP  CC
SS             CC              AA         AA   LL              EE                             PP         PP  CC
SSSSSSSSSSSS   CC              AAAAAAAAAAAAA   LL              EEEEEEEEE     -------------    PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC              AAAAAAAAAAAAA   LL              EEEEEEEEE     -------------    PPPPPPPPPPPP   CC
           SS  CC              AA         AA   LL              EE                             PP             CC
           SS  CC              AA         AA   LL              EE                             PP             CC
SS         SS  CC         CC   AA         AA   LL              EE                             PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                  PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC    AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                  PP              CCCCCCCCCCC


*****************************************************************************
*****************************************************************************
*****************************************************************************
*****                                                                   *****
*****                PROGRAM VERIFICATION INFORMATION                   *****
*****                                                                   *****
*****              CODE SYSTEM:  SCALE-PC VERSION:  4.3                 *****
*****                                                                   *****
*****************************************************************************
*****************************************************************************
*****                                                                   *****
*****                                                                   *****
*****              PROGRAM:  000009                                     *****
*****                                                                   *****
*****        CREATION DATE:  03/08/96                                   *****
*****                                                                   *****
*****               VOLUME:  ENG                                        *****
*****                                                                   *****
*****              LIBRARY:  G:\SCALE43\WIN_NT\EXE                      *****
*****                                                                   *****
*****                                                                   *****
*****      PRODUCTION CODE:  KENOVA                                     *****
*****                                                                   *****
*****              VERSION:  3.1                                        *****
*****                                                                   *****
*****              JOBNAME:  SCALE-PC                                   *****
*****                                                                   *****
*****    DATE OF EXECUTION:  07/23/98                                   *****
*****                                                                   *****
*****    TIME OF EXECUTION:  09:27:33                                   *****
*****                                                                   *****
*****                                                                   *****
*****************************************************************************
*****************************************************************************
*****************************************************************************
```

LWT ANALYSIS; W17X17 OFA ASSEMBLY; NO WATER IN GAP

****** NUMERIC PARAMETERS ******

TME	MAXIMUM PROBLEM TIME (MIN)	******
TBA	TIME PER GENERATION (MIN)	0.50
GEN	NUMBER OF GENERATIONS	303
NPG	NUMBER PER GENERATION	1000
NSK	NUMBER OF GENERATIONS TO BE SKIPPED	3
BEG	BEGINNING GENERATION NUMBER	1
RES	GENERATIONS BETWEEN CHECKPOINTS	0
X1D	NUMBER OF EXTRA 1-D CROSS SECTIONS	1
NBK	NEUTRON BANK SIZE	1025
XNB	EXTRA POSITIONS IN NEUTRON BANK	0
NFB	FISSION BANK SIZE	1000
XFB	EXTRA POSITIONS IN FISSION BANK	0
WTA	DEFAULT VALUE OF WEIGHT AVERAGE	0.5000
WTH	WEIGHT HIGH FOR SPLITTING	3.0000
WTL	WEIGHT LOW FOR RUSSIAN ROULETTE	0.3333
RND	STARTING RANDOM NUMBER	BB827100001
NB8	NUMBER OF D.A. BLOCKS ON UNIT 8	200
NL8	LENGTH OF D.A. BLOCKS ON UNIT 8	512
ADJ	MODE OF CALCULATION	FORWARD
	INPUT DATA WRITTEN ON RESTART UNIT	NO
	BINARY DATA INTERFACE	YES

```
***************************************************************************************************
***************************************************************************************************
***                                                                                             ***
***                      LWT ANALYSIS; W17X17 OFA ASSEMBLY; NO WATER IN GAP                     ***
***                                                                                             ***
***************************************************************************************************
***                              ******    LOGICAL PARAMETERS    ******                         ***
***                                                                                             ***
***  RUN  EXECUTE PROBLEM AFTER CHECKING DATA    YES     PLT  PLOT PICTURE MAP(S)           NO ***
***                                                                                             ***
***  FLX  COMPUTE FLUX                            NO     FDN  COMPUTE FISSION DENSITIES     NO ***
***                                                                                             ***
***  SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION    NO     NUB  COMPUTE NU-BAR & AVG FISSION GROUP  YES ***
***                                                                                             ***
***  MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER     NO     MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION  NO ***
***                                                                                             ***
***  CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER   NO     CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION  NO ***
***                                                                                             ***
***  FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER   NO     FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION  NO ***
***                                                                                             ***
***  MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER     NO     MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER    NO ***
***                                                                                             ***
***  CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER   NO     CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER  NO ***
***                                                                                             ***
***  FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER   NO     FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER  NO ***
***                                                                                             ***
***  HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL    NO     HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL   NO ***
***                                                                                             ***
***  AMX  PRINT ALL MIXED CROSS SECTIONS          NO     FAR  PRINT FIS. AND ABS. BY REGION           NO ***
***                                                                                             ***
***  XS1  PRINT 1-D MIXTURE X-SECTIONS            NO     GAS  PRINT FAR BY GROUP                      NO ***
***                                                                                             ***
***  XS2  PRINT 2-D MIXTURE X-SECTIONS            NO     PAX  PRINT XSEC-ALBEDO CORRELATION TABLES    NO ***
***                                                                                             ***
***  XAP  PRINT MIXTURE ANGLES & PROBABILITIES    NO     PWT  PRINT WEIGHT AVERAGE ARRAY              NO ***
***                                                                                             ***
***  PKI  PRINT FISSION SPECTRUM                  NO     PGM  PRINT INPUT GEOMETRY                    NO ***
***                                                                                             ***
***  P1D  PRINT EXTRA 1-D CROSS SECTIONS          NO     BUG  PRINT DEBUG INFORMATION                 NO ***
***                                                                                             ***
***                                                      TRK  PRINT TRACKING INFORMATION              NO ***
***                                                                                             ***
***                                                                                             ***
***************************************************************************************************
***************************************************************************************************
***************************************************************************************************
                                     PARAMETER INPUT COMPLETED

                 ........    0 IO'S WERE USED READING THE PARAMETER DATA     ........

                 *************** DATA READING COMPLETED ***************
```

```
*****************************************************************************************
***                                                                                   ***
***          LWT ANALYSIS; W17X17 OFA ASSEMBLY; NO WATER IN GAP                       ***
***                                                                                   ***
*****************************************************************************************
*****************************************************************************************
***                                                                                   ***
***                          ****** ADDITIONAL INFORMATION ******                     ***
***                                                                                   ***
***  NUMBER OF ENERGY GROUPS                27      USE LATTICE GEOMETRY          YES ***
***                                                                                   ***
***  NO. OF FISSION SPECTRUM SOURCE GROUP   1       GLOBAL ARRAY NUMBER             1 ***
***                                                                                   ***
***  NO. OF SCATTERING ANGLES IN XSECS      2       NUMBER OF UNITS IN THE GLOBAL X DIR.   17 ***
***                                                                                   ***
***  ENTRIES/NEUTRON IN THE NEUTRON BANK    16      NUMBER OF UNITS IN THE GLOBAL Y DIR.   17 ***
***                                                                                   ***
***  ENTRIES/NEUTRON IN THE FISSION BANK    9       NUMBER OF UNITS IN THE GLOBAL Z DIR.    1 ***
***                                                                                   ***
***  NUMBER OF MIXTURES USED                9       USE A GLOBAL REFLECTOR        YES ***
***                                                                                   ***
***  NUMBER OF BIAS ID'S USED               1       USE NESTED HOLES               NO ***
***                                                                                   ***
***  NUMBER OF DIFFERENTIAL ALBEDOS USED    0       NUMBER OF HOLES                 0 ***
***                                                                                   ***
***  TOTAL INPUT GEOMETRY REGIONS           19      MAXIMUM HOLE NESTING LEVEL      0 ***
***                                                                                   ***
***  NUMBER OF GEOMETRY REGIONS USED        19      USE NESTED ARRAYS              NO ***
***                                                                                   ***
***  LARGEST GEOMETRY UNIT NUMBER           9       NUMBER OF ARRAYS USED           1 ***
***                                                                                   ***
***  LARGEST ARRAY NUMBER                   1       MAXIMUM ARRAY NESTING LEVEL     1 ***
***                                                                                   ***
***                                                                                   ***
***  +X BOUNDARY CONDITION                VAC       -X BOUNDARY CONDITION         VAC ***
***                                                                                   ***
***  +Y BOUNDARY CONDITION                VAC       -Y BOUNDARY CONDITION         VAC ***
***                                                                                   ***
***  +Z BOUNDARY CONDITION                VAC       -Z BOUNDARY CONDITION         VAC ***
***                                                                                   ***
*****************************************************************************************
```

```
*****************************************************************************************
***                                                                                   ***
***         LWT ANALYSIS; W17X17 OFA ASSEMBLY; NO WATER IN GAP                        ***
***                                                                                   ***
*****************************************************************************************
*****************************************************************************************
***                                                                                   ***
***                    ****** SPACE AND SUPERGROUP INFORMATION ******                 ***
***                                                                                   ***
***       100000 WORDS IS THE TOTAL SPACE AVAILABLE.                                  ***
***                                                                                   ***
***        28457 WORDS WERE USED FOR NON-SUPERGROUP STORAGE.                          ***
***                                                                                   ***
***        71543 WORDS OF STORAGE ARE AVAILABLE FOR SUPERGROUPED DATA.                ***
***                                                                                   ***
***        99759 WORDS OF STORAGE ARE AVAILABLE FOR CONSTRUCTING THE SUPERGROUPS.     ***
***                                                                                   ***
***        71483 WORDS OF STORAGE ARE AVAILABLE TO EACH SUPERGROUP.                   ***
***                                                                                   ***
***         1172 WORDS ARE NEEDED FOR THE LARGEST GROUP.                              ***
***                                                                                   ***
***        29845 WORDS OF STORAGE IS SUFFICIENT TO RUN THIS PROBLEM.                  ***
***                                                                                   ***
***        42059 WORDS OF STORAGE WILL ALLOW THE PROBLEM TO RUN WITH ONE SUPERGROUP.  ***
***                                                                                   ***
***        42144 WORDS OF STORAGE WILL BE USED TO RUN THIS PROBLEM.                   ***
***                                                                                   ***
*****************************************************************************************
*****************************************************************************************
***                                                                                   ***
***                    STARTING     ENDING      XSEC      ALBEDO     TOTAL            ***
***   SUPERGROUP        GROUP       GROUP      LENGTH     LENGTH     LENGTH           ***
***                                                                                   ***
***                                                                                   ***
***        1              1           27        2697         0        13542           ***
***                                                                                   ***
*****************************************************************************************

            ........    0 IO'S WERE USED IN SUPERGROUPING    ........

            ........    0 IO'S WERE USED LOADING THE DATA    ........
```

```
                                    LWT ANALYSIS: W17X17 OFA ASSEMBLY; NO WATER IN GAP

                   MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION              NUM   ID

                                                  -----   UNIT     1   -----

FUEL PIN CELL - WITH H2O

  1 CYLINDER          1   1  RADIUS = 0.39220     +Z =   182.88      -Z = -182.88      CENTERLINE IS AT  X = 0.00000       Y = 0.00000

  2 CYLINDER          9   1  RADIUS = 0.40010     +Z =   182.88      -Z = -182.88      CENTERLINE IS AT  X = 0.00000       Y = 0.00000

  3 CYLINDER          2   1  RADIUS = 0.45720     +Z =   182.88      -Z = -182.88      CENTERLINE IS AT  X = 0.00000       Y = 0.00000

  4 CUBOID            3   1       +X = 0.62990     -X =-0.62990      +Y = 0.62990      -Y =-0.62990      +Z =  182.88      -Z = -182.88

                                                  -----   UNIT     2   -----

WATER ROD CELL - WITH H2O

  1 CYLINDER          3   1  RADIUS = 0.57150     +Z =   182.88      -Z = -182.88      CENTERLINE IS AT  X = 0.00000       Y = 0.00000

  2 CYLINDER          2   1  RADIUS = 0.61210     +Z =   182.88      -Z = -182.88      CENTERLINE IS AT  X = 0.00000       Y = 0.00000

  3 CUBOID            3   1       +X = 0.62990     -X =-0.62990      +Y = 0.62990      -Y =-0.62990      +Z =  182.88      -Z = -182.88

                                          ******************   GLOBAL   ******************
                                          -----   UNIT     9  EXTERNAL TO LATTICE  1   -----

  1 ARRAY NUMBER      1          +X =  10.708     -X = -10.708      +Y =  10.708      -Y = -10.708      +Z =  182.88      -Z = -182.88

  2 CUBOID            3   1      +X =  11.278     -X = -11.278      +Y =  11.278      -Y = -11.278      +Z =  182.88      -Z = -182.88

  3 CYLINDER          4   1  RADIUS =  16.891     +Z =   182.88      -Z = -182.88      CENTERLINE IS AT  X = 0.00000       Y = 0.00000

  4 CYLINDER          3   1  RADIUS =  16.986     +Z =   182.88      -Z = -182.88      CENTERLINE IS AT  X = 0.00000       Y = 0.00000

  5 CYLINDER          5   1  RADIUS =  18.891     +Z =   182.88      -Z = -182.88      CENTERLINE IS AT  X = 0.00000       Y = 0.00000

  6 CYLINDER          6   1  RADIUS =  33.496     +Z =   182.88      -Z = -182.88      CENTERLINE IS AT  X = 0.00000       Y = 0.00000

  7 CYLINDER          5   1  RADIUS =  36.544     +Z =   182.88      -Z = -182.88      CENTERLINE IS AT  X = 0.00000       Y = 0.00000

  8 CYLINDER          7   1  RADIUS =  49.244     +Z =   182.88      -Z = -182.88      CENTERLINE IS AT  X = 0.00000       Y = 0.00000

  9 CYLINDER          5   1  RADIUS =  49.854     +Z =   212.48      -Z = -192.16      CENTERLINE IS AT  X = 0.00000       Y = 0.00000

 10 CYLINDER          6   1  RADIUS =  49.854     +Z =   212.48      -Z = -199.78      CENTERLINE IS AT  X = 0.00000       Y = 0.00000

 11 CYLINDER          5   1  RADIUS =  49.854     +Z =   212.48      -Z = -208.67      CENTERLINE IS AT  X = 0.00000       Y = 0.00000

 12 CUBOID            8   1      +X =  81.000     -X = -81.000      +Y =  81.000      -Y = -81.000      +Z =  243.00      -Z = -240.00
```

```
                    LWT ANALYSIS; W17X17 OFA ASSEMBLY; NO WATER IN GAP

                ------- UNIT ORIENTATION DESCRIPTION FOR ARRAY    1          -------

Z LAYER   1, X COLUMN   1 TO  17 LEFT TO RIGHT   Y ROW   1 TO  17  BOTTOM TO TOP

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 1 1 1 2 1 1 2 1 1 2 1 1 1 1 1

 1 1 1 2 1 1 1 1 1 1 1 1 1 2 1 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 1 2 1 1 1 1 1 1 1 1 1 2 1 1 1

 1 1 1 1 1 2 1 1 2 1 1 2 1 1 1 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

```
                    LWT ANALYSIS; W17X17 OFA ASSEMBLY; NO WATER IN GAP
                   VOLUMES FOR THOSE UNITS UTILIZED IN  THIS PROBLEM

                         GEOMETRY                                   CUMULATIVE
  UNIT      REGION        REGION             VOLUME                   VOLUME

   1          1             1            1.76751E+02 CM**3          1.76751E+02 CM**3
              2             2            7.19223E+00 CM**3          1.83943E+02 CM**3
              3             3            5.62490E+01 CM**3          2.40192E+02 CM**3
              4             4            3.40304E+02 CM**3          5.80496E+02 CM**3

   2          1             5            3.75300E+02 CM**3          3.75300E+02 CM**3
              2             6            5.52175E+01 CM**3          4.30518E+02 CM**3
              3             7            1.49979E+02 CM**3          5.80496E+02 CM**3

  SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION      8 IS AN ARRAY PLACEMENT BOUNDARY REGION

   9          1             8            1.67763E+05 CM**3          1.67763E+05 CM**3
              2             9            1.83123E+04 CM**3          1.86076E+05 CM**3
              3            10            1.41760E+05 CM**3          3.27836E+05 CM**3
              4            11            3.70972E+03 CM**3          3.31546E+05 CM**3
              5            12            7.85353E+04 CM**3          4.10081E+05 CM**3
              6            13            8.79177E+05 CM**3          1.28926E+06 CM**3
              7            14            2.45308E+05 CM**3          1.53457E+06 CM**3
              8            15            1.25193E+06 CM**3          2.78649E+06 CM**3
              9            16            3.72996E+05 CM**3          3.15949E+06 CM**3
             10            17            5.94983E+04 CM**3          3.21899E+06 CM**3
             11            18            6.94145E+04 CM**3          3.28840E+06 CM**3
             12            19            9.38745E+06 CM**3          1.26759E+07 CM**3


                       UNIT      USES     REGION      MIXTURE         TOTAL VOLUME

                         1        264        1            1         4.66622E+04 CM**3
                                             2            9         1.89875E+03 CM**3
                                             3            2         1.48497E+04 CM**3
                                             4            3         8.98403E+04 CM**3

                         2         25        1            3         9.38250E+03 CM**3
                                             2            2         1.38044E+03 CM**3
                                             3            3         3.74947E+03 CM**3

                         9          1        1                      1.67763E+05 CM**3
                                             2            3         1.83123E+04 CM**3
                                             3            4         1.41760E+05 CM**3
                                             4            3         3.70972E+03 CM**3
                                             5            5         7.85353E+04 CM**3
                                             6            6         8.79177E+05 CM**3
                                             7            5         2.45308E+05 CM**3
                                             8            7         1.25193E+06 CM**3
                                             9            5         3.72996E+05 CM**3
                                            10            6         5.94983E+04 CM**3
                                            11            5         6.94145E+04 CM**3
                                            12            8         9.38745E+06 CM**3


                                     TOTAL MIXTURE VOLUMES
                              MIXTURE       TOTAL VOLUME              MASS(G)
                                 1        4.66622E+04 CM**3         4.85846E+05
                                 2        1.62302E+04 CM**3         1.05334E+05
                                 3        1.24994E+05 CM**3         1.24766E+05
                                 4        1.41760E+05 CM**3         3.63037E+05
                                 5        7.66253E+05 CM**3         6.06673E+06
                                 6        9.38675E+05 CM**3         1.06483E+07
                                 7        1.25193E+06 CM**3         1.24964E+06
                                 8        9.38745E+06 CM**3         9.37028E-14
                                 9        1.89875E+03 CM**3         1.89528E-17

      ****************************************************************************************************
      ***                                                                                              ***
      ***                                     BIASING INFORMATION                                      ***
      ***                                                                                              ***
      ***     A DEFAULT WEIGHT OF    0.500 WILL BE USED FOR ALL BIAS ID'S.                             ***
      ***                                                                                              ***
      ****************************************************************************************************

                  ........     0 IO'S WERE USED IN KENO-V BEFORE TRACKING       ........

                  ........   0.01650 MINUTES WERE USED PROCESSING DATA.         ........

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 2.78143E-01

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED WITH A FLAT DISTRIBUTION IN A CUBOID DEFINED BY:
                    +X= 1.07083E+01  -X=-1.07083E+01  +Y= 1.07083E+01  -Y=-1.07083E+01  +Z= 1.82880E+02  -Z=-1.82880E+02
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

0.09217 MINUTES WERE REQUIRED FOR STARTING.   TOTAL ELAPSED TIME IS 0.11733 MINUTES.
```

LWT ANALYSIS; W17X17 OFA ASSEMBLY; NO WATER IN GAP

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
KENO MESSAGE NUMBER K5-132 WARNING....ONLY 965 INDEPENDENT FISSION POINTS WERE GENERATED						
1	8.85686E-01	1.53833E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	9.39214E-01	1.88667E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132 WARNING....ONLY 994 INDEPENDENT FISSION POINTS WERE GENERATED						
3	9.13529E-01	2.21500E-01	9.13529E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	9.01018E-01	2.54500E-01	9.07274E-01	6.25521E-03	0.00000E+00	0.00000E+00
5	9.02144E-01	2.86500E-01	9.05564E-01	3.99573E-03	0.00000E+00	0.00000E+00
6	8.82090E-01	3.20333E-01	8.99695E-01	6.51315E-03	0.00000E+00	0.00000E+00
7	9.06539E-01	3.57000E-01	9.01064E-01	5.22744E-03	0.00000E+00	0.00000E+00
8	9.56216E-01	3.90833E-01	9.10256E-01	1.01345E-02	0.00000E+00	0.00000E+00
9	9.36446E-01	4.30333E-01	9.13997E-01	9.34672E-03	0.00000E+00	0.00000E+00
10	8.87858E-01	4.62333E-01	9.10730E-01	8.72908E-03	0.00000E+00	0.00000E+00
11	8.91353E-01	4.97167E-01	9.08577E-01	7.99371E-03	0.00000E+00	0.00000E+00
12	9.34083E-01	5.35500E-01	9.11128E-01	7.59111E-03	0.00000E+00	0.00000E+00
13	9.54576E-01	5.67500E-01	9.15078E-01	7.92145E-03	0.00000E+00	0.00000E+00
14	8.96471E-01	6.01500E-01	9.13527E-01	7.39563E-03	0.00000E+00	0.00000E+00
15	9.28672E-01	6.34333E-01	9.14692E-01	6.90202E-03	0.00000E+00	0.00000E+00
16	9.41564E-01	6.68333E-01	9.16611E-01	6.67208E-03	0.00000E+00	0.00000E+00
17	9.01900E-01	6.99333E-01	9.15631E-01	6.28831E-03	0.00000E+00	0.00000E+00
18	9.69297E-01	7.32333E-01	9.18985E-01	6.77129E-03	0.00000E+00	0.00000E+00
19	9.56127E-01	7.67167E-01	9.21170E-01	6.72530E-03	0.00000E+00	0.00000E+00
20	9.01176E-01	7.99167E-01	9.20059E-01	6.43723E-03	0.00000E+00	0.00000E+00
21	8.94538E-01	8.32167E-01	9.18716E-01	6.23540E-03	0.00000E+00	0.00000E+00
22	9.29596E-01	8.63333E-01	9.19260E-01	5.94038E-03	0.00000E+00	0.00000E+00
23	9.16368E-01	8.98000E-01	9.19122E-01	5.65211E-03	0.00000E+00	0.00000E+00
24	9.97989E-01	9.29167E-01	9.22707E-01	6.47252E-03	0.00000E+00	0.00000E+00
25	9.36630E-01	9.63000E-01	9.23312E-01	6.21426E-03	0.00000E+00	0.00000E+00
26	9.17401E-01	9.96833E-01	9.23066E-01	5.95480E-03	0.00000E+00	0.00000E+00
27	9.49137E-01	1.02800E+00	9.24109E-01	5.80606E-03	0.00000E+00	0.00000E+00
28	8.87709E-01	1.06183E+00	9.22709E-01	5.75128E-03	0.00000E+00	0.00000E+00
29	9.19245E-01	1.09400E+00	9.22581E-01	5.53565E-03	0.00000E+00	0.00000E+00
30	9.30737E-01	1.12783E+00	9.22872E-01	5.34224E-03	0.00000E+00	0.00000E+00
31	9.54481E-01	1.15983E+00	9.23962E-01	5.26871E-03	0.00000E+00	0.00000E+00
32	9.12407E-01	1.19100E+00	9.23577E-01	5.10461E-03	0.00000E+00	0.00000E+00
33	9.19944E-01	1.22217E+00	9.23459E-01	4.93859E-03	0.00000E+00	0.00000E+00
34	9.27206E-01	1.25500E+00	9.23577E-01	4.78320E-03	0.00000E+00	0.00000E+00
35	9.05590E-01	1.28983E+00	9.23031E-01	4.66792E-03	0.00000E+00	0.00000E+00
36	9.50760E-01	1.32283E+00	9.23847E-01	4.60140E-03	0.00000E+00	0.00000E+00
37	9.34740E-01	1.35583E+00	9.24158E-01	4.47882E-03	0.00000E+00	0.00000E+00
38	9.25213E-01	1.38783E+00	9.24188E-01	4.35273E-03	0.00000E+00	0.00000E+00
39	9.61123E-01	1.41983E+00	9.25186E-01	4.34956E-03	0.00000E+00	0.00000E+00
40	9.42560E-01	1.45367E+00	9.25643E-01	4.25817E-03	0.00000E+00	0.00000E+00
41	8.96787E-01	1.48750E+00	9.24903E-01	4.21302E-03	0.00000E+00	0.00000E+00
42	9.39391E-01	1.51783E+00	9.25265E-01	4.12229E-03	0.00000E+00	0.00000E+00
43	9.50404E-01	1.54883E+00	9.25878E-01	4.06697E-03	0.00000E+00	0.00000E+00
44	9.24725E-01	1.58183E+00	9.25851E-01	3.96906E-03	0.00000E+00	0.00000E+00
45	9.17061E-01	1.61463E+00	9.25647E-01	3.88104E-03	0.00000E+00	0.00000E+00
46	9.32233E-01	1.64683E+00	9.25799E-01	3.79485E-03	0.00000E+00	0.00000E+00
47	9.06479E-01	1.68067E+00	9.25369E-01	3.73433E-03	0.00000E+00	0.00000E+00
48	9.19627E-01	1.71467E+00	9.25244E-01	3.65437E-03	0.00000E+00	0.00000E+00
49	9.41650E-01	1.74750E+00	9.25593E-01	3.59277E-03	0.00000E+00	0.00000E+00
50	9.05315E-01	1.78050E+00	9.25171E-01	3.54241E-03	0.00000E+00	0.00000E+00
51	9.27366E-01	1.81433E+00	9.25216E-01	3.46965E-03	0.00000E+00	0.00000E+00
52	9.08010E-01	1.84550E+00	9.24872E-01	3.41692E-03	0.00000E+00	0.00000E+00
53	9.37532E-01	1.87750E+00	9.25120E-01	3.35844E-03	0.00000E+00	0.00000E+00
54	9.45465E-01	1.90967E+00	9.25511E-01	3.31638E-03	0.00000E+00	0.00000E+00
55	9.10189E-01	1.94350E+00	9.25222E-01	3.26603E-03	0.00000E+00	0.00000E+00
56	9.17433E-01	1.97733E+00	9.25078E-01	3.20822E-03	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132 WARNING....ONLY 977 INDEPENDENT FISSION POINTS WERE GENERATED						
57	8.41913E-01	2.01033E+00	9.23566E-01	3.49354E-03	0.00000E+00	0.00000E+00
58	8.95416E-01	2.04417E+00	9.23063E-01	3.46722E-03	0.00000E+00	0.00000E+00
59	9.47738E-01	2.07617E+00	9.23496E-01	3.43325E-03	0.00000E+00	0.00000E+00
60	9.14869E-01	2.10817E+00	9.23348E-01	3.37679E-03	0.00000E+00	0.00000E+00
61	8.97825E-01	2.14117E+00	9.22915E-01	3.34714E-03	0.00000E+00	0.00000E+00
62	9.65730E-01	2.17133E+00	9.23629E-01	3.36736E-03	0.00000E+00	0.00000E+00
63	8.85004E-01	2.20433E+00	9.22995E-01	3.37169E-03	0.00000E+00	0.00000E+00
64	9.52399E-01	2.23617E+00	9.23470E-01	3.35059E-03	0.00000E+00	0.00000E+00
65	9.39262E-01	2.27117E+00	9.23720E-01	3.30649E-03	0.00000E+00	0.00000E+00
66	9.14343E-01	2.30417E+00	9.23574E-01	3.25772E-03	0.00000E+00	0.00000E+00
67	9.17100E-01	2.33717E+00	9.23474E-01	3.20875E-03	0.00000E+00	0.00000E+00
68	9.73007E-01	2.37000E+00	9.24225E-01	3.24766E-03	0.00000E+00	0.00000E+00
69	9.19364E-01	2.40483E+00	9.24152E-01	3.19965E-03	0.00000E+00	0.00000E+00
70	8.97601E-01	2.43600E+00	9.23762E-01	3.17633E-03	0.00000E+00	0.00000E+00
71	8.99201E-01	2.46983E+00	9.23406E-01	3.15014E-03	0.00000E+00	0.00000E+00
72	9.23122E-01	2.50000E+00	9.23402E-01	3.10481E-03	0.00000E+00	0.00000E+00
73	9.11981E-01	2.53200E+00	9.23241E-01	3.06499E-03	0.00000E+00	0.00000E+00
74	8.98014E-01	2.56500E+00	9.22890E-01	3.04237E-03	0.00000E+00	0.00000E+00
75	9.35208E-01	2.59700E+00	9.23059E-01	3.00514E-03	0.00000E+00	0.00000E+00
76	9.23685E-01	2.63100E+00	9.23068E-01	2.96426E-03	0.00000E+00	0.00000E+00
77	9.59360E-01	2.66300E+00	9.23551E-01	2.96424E-03	0.00000E+00	0.00000E+00
78	9.59641E-01	2.69500E+00	9.24026E-01	2.96327E-03	0.00000E+00	0.00000E+00
79	9.56868E-01	2.72617E+00	9.24453E-01	2.95547E-03	0.00000E+00	0.00000E+00
80	9.55649E-01	2.76000E+00	9.24855E-01	2.94497E-03	0.00000E+00	0.00000E+00
81	9.42287E-01	2.79383E+00	9.25076E-01	2.91581E-03	0.00000E+00	0.00000E+00
82	9.36740E-01	2.82417E+00	9.25222E-01	2.88282E-03	0.00000E+00	0.00000E+00
83	8.96816E-01	2.85700E+00	9.24871E-01	2.86653E-03	0.00000E+00	0.00000E+00
84	9.14175E-01	2.89000E+00	9.24741E-01	2.83633E-03	0.00000E+00	0.00000E+00
85	9.53858E-01	2.92200E+00	9.25091E-01	2.82382E-03	0.00000E+00	0.00000E+00
86	9.32691E-01	2.95500E+00	9.25182E-01	2.79147E-03	0.00000E+00	0.00000E+00
87	9.41861E-01	2.98800E+00	9.25378E-01	2.76541E-03	0.00000E+00	0.00000E+00
88	9.17970E-01	3.02083E+00	9.25292E-01	2.73442E-03	0.00000E+00	0.00000E+00

89	9.41289E-01	3.05383E+00	9.25476E-01	2.70905E-03	0.00000E+00	0.00000E+00
90	9.23612E-01	3.08767E+00	9.25455E-01	2.67817E-03	0.00000E+00	0.00000E+00
91	9.08846E-01	3.12067E+00	9.25268E-01	2.65448E-03	0.00000E+00	0.00000E+00
92	9.13348E-01	3.15267E+00	9.25136E-01	2.62816E-03	0.00000E+00	0.00000E+00
93	9.28301E-01	3.18567E+00	9.25170E-01	2.59935E-03	0.00000E+00	0.00000E+00
94	9.60296E-01	3.21867E+00	9.25552E-01	2.59914E-03	0.00000E+00	0.00000E+00
95	9.14216E-01	3.25167E+00	9.25430E-01	2.57392E-03	0.00000E+00	0.00000E+00
96	8.75089E-01	3.28550E+00	9.24895E-01	2.60210E-03	0.00000E+00	0.00000E+00
97	9.35398E-01	3.31850E+00	9.25005E-01	2.57694E-03	0.00000E+00	0.00000E+00
98	9.06488E-01	3.35050E+00	9.24812E-01	2.55724E-03	0.00000E+00	0.00000E+00
99	8.97848E-01	3.38433E+00	9.24534E-01	2.54596E-03	0.00000E+00	0.00000E+00
100	8.98266E-01	3.41733E+00	9.24266E-01	2.53406E-03	0.00000E+00	0.00000E+00
101	8.94082E-01	3.44933E+00	9.23962E-01	2.52680E-03	0.00000E+00	0.00000E+00
102	9.34591E-01	3.48233E+00	9.24068E-01	2.50366E-03	0.00000E+00	0.00000E+00
103	9.31607E-01	3.51433E+00	9.24142E-01	2.47987E-03	0.00000E+00	0.00000E+00
104	9.31387E-01	3.54633E+00	9.24214E-01	2.45647E-03	0.00000E+00	0.00000E+00
105	9.45878E-01	3.57833E+00	9.24424E-01	2.44158E-03	0.00000E+00	0.00000E+00
106	9.24709E-01	3.61133E+00	9.24427E-01	2.41799E-03	0.00000E+00	0.00000E+00
107	9.39009E-01	3.64433E+00	9.24565E-01	2.39887E-03	0.00000E+00	0.00000E+00
108	9.45330E-01	3.67733E+00	9.24761E-01	2.38419E-03	0.00000E+00	0.00000E+00
109	9.65529E-01	3.70933E+00	9.25142E-01	2.39234E-03	0.00000E+00	0.00000E+00
110	9.34481E-01	3.74233E+00	9.25229E-01	2.37166E-03	0.00000E+00	0.00000E+00
111	9.40742E-01	3.77517E+00	9.25371E-01	2.35411E-03	0.00000E+00	0.00000E+00
112	9.68989E-01	3.80817E+00	9.25768E-01	2.36608E-03	0.00000E+00	0.00000E+00
113	9.21929E-01	3.84200E+00	9.25733E-01	2.34492E-03	0.00000E+00	0.00000E+00
114	9.46170E-01	3.87500E+00	9.25916E-01	2.33104E-03	0.00000E+00	0.00000E+00
115	9.22961E-01	3.90883E+00	9.25889E-01	2.31047E-03	0.00000E+00	0.00000E+00
116	9.65666E-01	3.94367E+00	9.26238E-01	2.31654E-03	0.00000E+00	0.00000E+00
117	9.21870E-01	3.97567E+00	9.26200E-01	2.29662E-03	0.00000E+00	0.00000E+00
118	9.01764E-01	4.00767E+00	9.25990E-01	2.28646E-03	0.00000E+00	0.00000E+00
119	9.07249E-01	4.04167E+00	9.25830E-01	2.27249E-03	0.00000E+00	0.00000E+00
120	9.81145E-01	4.07267E+00	9.26298E-01	2.30139E-03	0.00000E+00	0.00000E+00
121	9.44074E-01	4.10383E+00	9.26448E-01	2.28685E-03	0.00000E+00	0.00000E+00
122	9.21559E-01	4.13317E+00	9.26407E-01	2.26808E-03	0.00000E+00	0.00000E+00
123	9.20260E-01	4.16517E+00	9.26356E-01	2.24983E-03	0.00000E+00	0.00000E+00
124	9.19285E-01	4.20000E+00	9.26298E-01	2.23207E-03	0.00000E+00	0.00000E+00
125	9.16275E-01	4.23300E+00	9.26217E-01	2.21535E-03	0.00000E+00	0.00000E+00
126	8.91448E-01	4.26500E+00	9.25936E-01	2.21523E-03	0.00000E+00	0.00000E+00
127	9.26114E-01	4.29983E+00	9.25938E-01	2.19743E-03	0.00000E+00	0.00000E+00
128	9.12693E-01	4.33367E+00	9.25833E-01	2.18246E-03	0.00000E+00	0.00000E+00
129	9.60210E-01	4.36483E+00	9.26103E-01	2.18206E-03	0.00000E+00	0.00000E+00
130	9.29697E-01	4.39767E+00	9.26131E-01	2.16513E-03	0.00000E+00	0.00000E+00
131	9.42543E-01	4.43167E+00	9.26259E-01	2.15204E-03	0.00000E+00	0.00000E+00
132	9.16525E-01	4.46550E+00	9.26184E-01	2.13673E-03	0.00000E+00	0.00000E+00
133	8.96387E-01	4.49833E+00	9.25956E-01	2.13253E-03	0.00000E+00	0.00000E+00
134	9.54271E-01	4.53233E+00	9.26171E-01	2.12715E-03	0.00000E+00	0.00000E+00
135	9.38826E-01	4.56333E+00	9.26266E-01	2.11324E-03	0.00000E+00	0.00000E+00
136	9.33384E-01	4.59633E+00	9.26319E-01	2.09808E-03	0.00000E+00	0.00000E+00
137	9.04157E-01	4.63117E+00	9.26155E-01	2.08894E-03	0.00000E+00	0.00000E+00
138	9.50015E-01	4.66233E+00	9.26330E-01	2.08094E-03	0.00000E+00	0.00000E+00
139	9.66112E-01	4.69433E+00	9.26621E-01	2.08600E-03	0.00000E+00	0.00000E+00
140	9.26934E-01	4.72817E+00	9.26623E-01	2.07083E-03	0.00000E+00	0.00000E+00
141	9.02740E-01	4.76483E+00	9.26451E-01	2.06305E-03	0.00000E+00	0.00000E+00
142	9.24085E-01	4.79867E+00	9.26434E-01	2.04833E-03	0.00000E+00	0.00000E+00
143	9.55953E-01	4.83067E+00	9.26644E-01	2.04450E-03	0.00000E+00	0.00000E+00
144	9.38778E-01	4.86450E+00	9.26729E-01	2.03184E-03	0.00000E+00	0.00000E+00
145	9.28669E-01	4.89850E+00	9.26743E-01	2.01763E-03	0.00000E+00	0.00000E+00
146	9.21329E-01	4.93050E+00	9.26705E-01	2.00392E-03	0.00000E+00	0.00000E+00
147	9.10886E-01	4.96350E+00	9.26596E-01	1.99304E-03	0.00000E+00	0.00000E+00
148	9.24269E-01	4.99633E+00	9.26580E-01	1.97941E-03	0.00000E+00	0.00000E+00
149	9.03222E-01	5.03117E+00	9.26421E-01	1.97231E-03	0.00000E+00	0.00000E+00
150	8.95189E-01	5.06417E+00	9.26210E-01	1.97027E-03	0.00000E+00	0.00000E+00
151	9.48126E-01	5.09717E+00	9.26357E-01	1.96252E-03	0.00000E+00	0.00000E+00
152	9.08228E-01	5.13100E+00	9.26236E-01	1.95314E-03	0.00000E+00	0.00000E+00
153	9.18349E-01	5.16667E+00	9.26184E-01	1.94087E-03	0.00000E+00	0.00000E+00
154	9.52513E-01	5.19783E+00	9.26357E-01	1.93582E-03	0.00000E+00	0.00000E+00
155	9.26765E-01	5.22983E+00	9.26360E-01	1.92313E-03	0.00000E+00	0.00000E+00
156	9.22425E-01	5.26183E+00	9.26334E-01	1.91077E-03	0.00000E+00	0.00000E+00
157	9.50244E-01	5.29383E+00	9.26489E-01	1.90466E-03	0.00000E+00	0.00000E+00
158	9.34982E-01	5.32783E+00	9.26543E-01	1.89319E-03	0.00000E+00	0.00000E+00
159	9.46343E-01	5.36067E+00	9.26669E-01	1.88532E-03	0.00000E+00	0.00000E+00
160	9.24231E-01	5.39467E+00	9.26654E-01	1.87341E-03	0.00000E+00	0.00000E+00
161	9.26075E-01	5.42750E+00	9.26650E-01	1.86160E-03	0.00000E+00	0.00000E+00
162	9.16128E-01	5.46233E+00	9.26584E-01	1.85109E-03	0.00000E+00	0.00000E+00
163	9.29809E-01	5.49433E+00	9.26604E-01	1.83967E-03	0.00000E+00	0.00000E+00
164	9.31262E-01	5.52733E+00	9.26633E-01	1.82850E-03	0.00000E+00	0.00000E+00
165	9.29190E-01	5.56117E+00	9.26649E-01	1.81732E-03	0.00000E+00	0.00000E+00
166	9.36944E-01	5.59417E+00	9.26712E-01	1.80729E-03	0.00000E+00	0.00000E+00
167	9.17540E-01	5.62800E+00	9.26656E-01	1.79717E-03	0.00000E+00	0.00000E+00
168	9.04166E-01	5.66183E+00	9.26521E-01	1.79144E-03	0.00000E+00	0.00000E+00
169	9.59455E-01	5.69483E+00	9.26718E-01	1.79157E-03	0.00000E+00	0.00000E+00
170	9.67619E-01	5.72867E+00	9.26961E-01	1.79743E-03	0.00000E+00	0.00000E+00
171	9.32381E-01	5.75983E+00	9.26993E-01	1.78705E-03	0.00000E+00	0.00000E+00
172	9.39258E-01	5.79100E+00	9.27065E-01	1.77798E-03	0.00000E+00	0.00000E+00
173	8.62756E-01	5.82400E+00	9.26689E-01	1.80711E-03	0.00000E+00	0.00000E+00
174	9.38090E-01	5.85867E+00	9.26756E-01	1.79780E-03	0.00000E+00	0.00000E+00
175	9.00613E-01	5.89267E+00	9.26605E-01	1.79375E-03	0.00000E+00	0.00000E+00
176	9.19542E-01	5.92650E+00	9.26564E-01	1.78388E-03	0.00000E+00	0.00000E+00
177	9.04231E-01	5.96033E+00	9.26436E-01	1.77824E-03	0.00000E+00	0.00000E+00
178	9.17689E-01	5.99333E+00	9.26387E-01	1.76880E-03	0.00000E+00	0.00000E+00
179	9.26085E-01	6.02817E+00	9.26385E-01	1.75878E-03	0.00000E+00	0.00000E+00
180	9.10857E-01	6.06100E+00	9.26298E-01	1.75105E-03	0.00000E+00	0.00000E+00
181	9.43644E-01	6.09483E+00	9.26395E-01	1.74393E-03	0.00000E+00	0.00000E+00

KENO MESSAGE NUMBER K5-132 WARNING....ONLY 997 INDEPENDENT FISSION POINTS WERE GENERATED

182	8.47673E-01	6.13067E+00	9.25957E-01	1.78851E-03	0.00000E+00	0.00000E+00

183	9.38183E-01	6.16350E+00	9.26025E-01	1.77989E-03	0.00000E+00	0.00000E+00
184	8.90668E-01	6.19650E+00	9.25831E-01	1.78071E-03	0.00000E+00	0.00000E+00
185	9.35330E-01	6.22950E+00	9.25882E-01	1.77171E-03	0.00000E+00	0.00000E+00
186	9.26899E-01	6.26333E+00	9.25888E-01	1.76207E-03	0.00000E+00	0.00000E+00
187	9.23684E-01	6.29533E+00	9.25876E-01	1.75256E-03	0.00000E+00	0.00000E+00
188	9.10842E-01	6.32833E+00	9.25795E-01	1.74498E-03	0.00000E+00	0.00000E+00
189	9.37209E-01	6.35950E+00	9.25856E-01	1.73670E-03	0.00000E+00	0.00000E+00
190	9.50270E-01	6.39150E+00	9.25986E-01	1.73231E-03	0.00000E+00	0.00000E+00
191	9.52251E-01	6.42533E+00	9.26125E-01	1.72871E-03	0.00000E+00	0.00000E+00
192	9.25949E-01	6.45833E+00	9.26124E-01	1.71959E-03	0.00000E+00	0.00000E+00
193	9.42037E-01	6.49033E+00	9.26207E-01	1.71259E-03	0.00000E+00	0.00000E+00
194	9.51804E-01	6.52233E+00	9.26341E-01	1.70886E-03	0.00000E+00	0.00000E+00
195	9.25686E-01	6.55633E+00	9.26337E-01	1.69998E-03	0.00000E+00	0.00000E+00
196	9.32754E-01	6.58833E+00	9.26370E-01	1.69152E-03	0.00000E+00	0.00000E+00
197	9.07192E-01	6.62217E+00	9.26272E-01	1.68570E-03	0.00000E+00	0.00000E+00
198	9.25103E-01	6.65600E+00	9.26266E-01	1.67708E-03	0.00000E+00	0.00000E+00
199	9.27047E-01	6.68817E+00	9.26270E-01	1.66855E-03	0.00000E+00	0.00000E+00
200	9.45517E-01	6.71917E+00	9.26367E-01	1.66295E-03	0.00000E+00	0.00000E+00
201	9.42746E-01	6.75400E+00	9.26450E-01	1.65662E-03	0.00000E+00	0.00000E+00
202	9.31617E-01	6.78517E+00	9.26475E-01	1.64852E-03	0.00000E+00	0.00000E+00
203	9.67107E-01	6.82000E+00	9.26678E-01	1.65270E-03	0.00000E+00	0.00000E+00
204	9.59893E-01	6.85200E+00	9.26842E-01	1.65270E-03	0.00000E+00	0.00000E+00
205	9.58868E-01	6.88500E+00	9.27000E-01	1.65209E-03	0.00000E+00	0.00000E+00
206	9.21028E-01	6.91967E+00	9.26971E-01	1.64423E-03	0.00000E+00	0.00000E+00
207	9.17286E-01	6.95267E+00	9.26923E-01	1.63687E-03	0.00000E+00	0.00000E+00
208	8.93367E-01	6.98650E+00	9.26760E-01	1.63703E-03	0.00000E+00	0.00000E+00
209	9.42777E-01	7.02033E+00	9.26838E-01	1.63094E-03	0.00000E+00	0.00000E+00
210	9.26255E-01	7.05433E+00	9.26835E-01	1.62308E-03	0.00000E+00	0.00000E+00
211	9.45864E-01	7.08717E+00	9.26926E-01	1.61786E-03	0.00000E+00	0.00000E+00
212	9.35674E-01	7.11933E+00	9.26968E-01	1.61068E-03	0.00000E+00	0.00000E+00
213	9.47448E-01	7.15217E+00	9.27065E-01	1.60596E-03	0.00000E+00	0.00000E+00
214	9.81191E-01	7.18517E+00	9.27320E-01	1.61863E-03	0.00000E+00	0.00000E+00
215	9.12594E-01	7.22000E+00	9.27251E-01	1.61250E-03	0.00000E+00	0.00000E+00
216	9.36204E-01	7.25017E+00	9.27293E-01	1.60549E-03	0.00000E+00	0.00000E+00
217	9.40146E-01	7.28133E+00	9.27353E-01	1.59912E-03	0.00000E+00	0.00000E+00
218	8.81631E-01	7.31983E+00	9.27141E-01	1.60572E-03	0.00000E+00	0.00000E+00
219	9.11088E-01	7.35267E+00	9.27067E-01	1.60001E-03	0.00000E+00	0.00000E+00
220	9.41373E-01	7.38567E+00	9.27132E-01	1.59401E-03	0.00000E+00	0.00000E+00
221	9.70273E-01	7.41867E+00	9.27329E-01	1.59889E-03	0.00000E+00	0.00000E+00
222	8.98617E-01	7.45250E+00	9.27199E-01	1.59695E-03	0.00000E+00	0.00000E+00
223	9.34582E-01	7.48450E+00	9.27232E-01	1.59006E-03	0.00000E+00	0.00000E+00
224	8.82409E-01	7.51833E+00	9.27030E-01	1.59570E-03	0.00000E+00	0.00000E+00
225	9.25143E-01	7.55233E+00	9.27022E-01	1.58855E-03	0.00000E+00	0.00000E+00
226	9.50005E-01	7.58333E+00	9.27125E-01	1.58477E-03	0.00000E+00	0.00000E+00
227	9.19263E-01	7.61633E+00	9.27090E-01	1.57810E-03	0.00000E+00	0.00000E+00
228	9.81226E-01	7.64833E+00	9.27329E-01	1.58926E-03	0.00000E+00	0.00000E+00
229	9.42088E-01	7.68233E+00	9.27394E-01	1.58358E-03	0.00000E+00	0.00000E+00
230	9.20421E-01	7.71433E+00	9.27364E-01	1.57691E-03	0.00000E+00	0.00000E+00
231	9.10318E-01	7.74733E+00	9.27289E-01	1.57177E-03	0.00000E+00	0.00000E+00
232	9.16055E-01	7.77933E+00	9.27240E-01	1.56569E-03	0.00000E+00	0.00000E+00
233	9.80212E-01	7.81133E+00	9.27470E-01	1.57567E-03	0.00000E+00	0.00000E+00
234	9.62820E-01	7.84333E+00	9.27622E-01	1.57625E-03	0.00000E+00	0.00000E+00
235	9.27678E-01	7.87900E+00	9.27622E-01	1.56947E-03	0.00000E+00	0.00000E+00
236	9.67358E-01	7.91300E+00	9.27792E-01	1.57194E-03	0.00000E+00	0.00000E+00
237	9.01526E-01	7.94583E+00	9.27680E-01	1.56923E-03	0.00000E+00	0.00000E+00
238	9.58282E-01	7.97800E+00	9.27810E-01	1.56793E-03	0.00000E+00	0.00000E+00
239	9.18623E-01	8.01183E+00	9.27771E-01	1.56179E-03	0.00000E+00	0.00000E+00
240	9.52132E-01	8.04200E+00	9.27874E-01	1.55857E-03	0.00000E+00	0.00000E+00
241	9.09282E-01	8.07583E+00	9.27796E-01	1.55399E-03	0.00000E+00	0.00000E+00
242	9.65912E-01	8.10700E+00	9.27955E-01	1.55563E-03	0.00000E+00	0.00000E+00
243	8.83765E-01	8.13900E+00	9.27771E-01	1.55997E-03	0.00000E+00	0.00000E+00
244	9.07330E-01	8.17300E+00	9.27687E-01	1.55581E-03	0.00000E+00	0.00000E+00
245	9.47471E-01	8.20500E+00	9.27768E-01	1.55153E-03	0.00000E+00	0.00000E+00
246	9.34985E-01	8.23700E+00	9.27798E-01	1.54544E-03	0.00000E+00	0.00000E+00
247	9.30121E-01	8.27083E+00	9.27807E-01	1.53915E-03	0.00000E+00	0.00000E+00
248	9.37416E-01	8.30300E+00	9.27846E-01	1.53338E-03	0.00000E+00	0.00000E+00
249	9.22009E-01	8.33583E+00	9.27823E-01	1.52734E-03	0.00000E+00	0.00000E+00
250	9.18967E-01	8.36967E+00	9.27787E-01	1.52159E-03	0.00000E+00	0.00000E+00
251	9.02685E-01	8.40267E+00	9.27686E-01	1.51881E-03	0.00000E+00	0.00000E+00
252	9.26316E-01	8.43467E+00	9.27681E-01	1.51274E-03	0.00000E+00	0.00000E+00
253	9.74284E-01	8.46767E+00	9.27866E-01	1.51809E-03	0.00000E+00	0.00000E+00
254	9.37892E-01	8.49967E+00	9.27906E-01	1.51258E-03	0.00000E+00	0.00000E+00
255	9.47611E-01	8.53183E+00	9.27984E-01	1.50860E-03	0.00000E+00	0.00000E+00
256	9.15238E-01	8.56383E+00	9.27934E-01	1.50349E-03	0.00000E+00	0.00000E+00
257	9.14173E-01	8.59767E+00	9.27880E-01	1.49855E-03	0.00000E+00	0.00000E+00
258	9.56068E-01	8.63067E+00	9.27990E-01	1.49674E-03	0.00000E+00	0.00000E+00
259	9.15185E-01	8.66367E+00	9.27940E-01	1.49174E-03	0.00000E+00	0.00000E+00
260	9.26990E-01	8.69650E+00	9.27936E-01	1.48595E-03	0.00000E+00	0.00000E+00
261	9.43962E-01	8.72950E+00	9.27998E-01	1.48150E-03	0.00000E+00	0.00000E+00
262	9.26172E-01	8.76250E+00	9.27991E-01	1.47580E-03	0.00000E+00	0.00000E+00
263	9.46401E-01	8.79533E+00	9.28062E-01	1.47183E-03	0.00000E+00	0.00000E+00
264	9.55709E-01	8.82933E+00	9.28167E-01	1.46999E-03	0.00000E+00	0.00000E+00
265	9.28681E-01	8.86217E+00	9.28169E-01	1.46439E-03	0.00000E+00	0.00000E+00
266	9.33084E-01	8.89517E+00	9.28188E-01	1.45896E-03	0.00000E+00	0.00000E+00
267	9.04980E-01	8.92900E+00	9.28100E-01	1.45608E-03	0.00000E+00	0.00000E+00
268	9.32353E-01	8.96200E+00	9.28116E-01	1.45068E-03	0.00000E+00	0.00000E+00
269	9.39166E-01	8.99500E+00	9.28158E-01	1.44583E-03	0.00000E+00	0.00000E+00
270	9.32928E-01	9.02617E+00	9.28176E-01	1.44053E-03	0.00000E+00	0.00000E+00
271	8.93832E-01	9.06000E+00	9.28048E-01	1.44084E-03	0.00000E+00	0.00000E+00
272	9.38845E-01	9.09300E+00	9.28088E-01	1.43605E-03	0.00000E+00	0.00000E+00
273	9.41662E-01	9.12500E+00	9.28138E-01	1.43161E-03	0.00000E+00	0.00000E+00
274	8.94413E-01	9.15883E+00	9.28014E-01	1.43172E-03	0.00000E+00	0.00000E+00
275	9.33043E-01	9.19083E+00	9.28032E-01	1.42659E-03	0.00000E+00	0.00000E+00
276	9.65242E-01	9.22200E+00	9.28168E-01	1.42784E-03	0.00000E+00	0.00000E+00
277	9.15540E-01	9.25683E+00	9.28122E-01	1.42338E-03	0.00000E+00	0.00000E+00

278	9.55975E-01	9.28967E+00	9.28223E-01	1.42160E-03	0.00000E+00	0.00000E+00
279	9.17744E-01	9.32267E+00	9.28185E-01	1.41716E-03	0.00000E+00	0.00000E+00
280	8.97664E-01	9.35467E+00	9.28076E-01	1.41632E-03	0.00000E+00	0.00000E+00
281	9.03312E-01	9.38767E+00	9.27987E-01	1.41402E-03	0.00000E+00	0.00000E+00
282	9.23108E-01	9.42067E+00	9.27969E-01	1.40907E-03	0.00000E+00	0.00000E+00
283	9.40724E-01	9.45367E+00	9.28015E-01	1.40478E-03	0.00000E+00	0.00000E+00
284	9.30739E-01	9.48650E+00	9.28024E-01	1.39982E-03	0.00000E+00	0.00000E+00
285	8.82695E-01	9.51950E+00	9.27864E-01	1.40403E-03	0.00000E+00	0.00000E+00
286	9.34289E-01	9.55333E+00	9.27887E-01	1.39926E-03	0.00000E+00	0.00000E+00
287	9.39833E-01	9.58633E+00	9.27929E-01	1.39498E-03	0.00000E+00	0.00000E+00
288	9.81553E-01	9.61833E+00	9.28116E-01	1.40268E-03	0.00000E+00	0.00000E+00
289	8.93769E-01	9.65233E+00	9.27997E-01	1.40290E-03	0.00000E+00	0.00000E+00
290	9.20555E-01	9.68617E+00	9.27971E-01	1.39826E-03	0.00000E+00	0.00000E+00
291	9.42749E-01	9.72000E+00	9.28022E-01	1.39435E-03	0.00000E+00	0.00000E+00
292	8.99384E-01	9.75383E+00	9.27923E-01	1.39303E-03	0.00000E+00	0.00000E+00
293	9.30678E-01	9.78683E+00	9.27933E-01	1.38827E-03	0.00000E+00	0.00000E+00
294	9.11641E-01	9.82067E+00	9.27877E-01	1.38463E-03	0.00000E+00	0.00000E+00
295	9.18919E-01	9.85267E+00	9.27846E-01	1.38024E-03	0.00000E+00	0.00000E+00
296	8.89102E-01	9.88667E+00	9.27714E-01	1.38183E-03	0.00000E+00	0.00000E+00
297	9.07287E-01	9.91767E+00	9.27645E-01	1.37888E-03	0.00000E+00	0.00000E+00
298	9.27070E-01	9.94983E+00	9.27643E-01	1.37422E-03	0.00000E+00	0.00000E+00
299	9.10371E-01	9.98267E+00	9.27585E-01	1.37082E-03	0.00000E+00	0.00000E+00
300	9.32232E-01	1.00167E+01	9.27601E-01	1.36630E-03	0.00000E+00	0.00000E+00
301	9.37152E-01	1.00495E+01	9.27633E-01	1.36209E-03	0.00000E+00	0.00000E+00
302	8.94576E-01	1.00825E+01	9.27522E-01	1.36201E-03	0.00000E+00	0.00000E+00
303	9.23771E-01	1.01163E+01	9.27510E-01	1.35754E-03	0.00000E+00	0.00000E+00

KENO MESSAGE NUMBER K5-123 EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

LWT ANALYSIS: W17X17 OFA ASSEMBLY; NO WATER IN GAP

LIFETIME = 9.74486E-05 + OR - 2.73865E-07 GENERATION TIME = 3.83859E-05 + OR - 5.46030E-08
NU BAR = 2.43569E+00 + OR - 9.63558E-05 AVERAGE FISSION GROUP = 2.26257E+01 + OR - 5.66318E-03
ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION = 1.43638E-01 + OR - 6.80425E-04

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.92756	+ OR - 0.00136	0.92620 TO 0.92892	0.92483 TO 0.93028	0.92347 TO 0.93164	300000
4	0.92765	+ OR - 0.00136	0.92628 TO 0.92901	0.92492 TO 0.93037	0.92356 TO 0.93173	299000
5	0.92773	+ OR - 0.00136	0.92637 TO 0.92910	0.92500 TO 0.93046	0.92364 TO 0.93183	298000
6	0.92788	+ OR - 0.00136	0.92652 TO 0.92925	0.92516 TO 0.93061	0.92380 TO 0.93197	297000
7	0.92796	+ OR - 0.00136	0.92659 TO 0.92932	0.92523 TO 0.93068	0.92387 TO 0.93205	296000
8	0.92786	+ OR - 0.00136	0.92650 TO 0.92923	0.92513 TO 0.93059	0.92377 TO 0.93195	295000
9	0.92783	+ OR - 0.00137	0.92646 TO 0.92920	0.92509 TO 0.93057	0.92372 TO 0.93194	294000
10	0.92797	+ OR - 0.00137	0.92660 TO 0.92933	0.92523 TO 0.93070	0.92387 TO 0.93207	293000
11	0.92809	+ OR - 0.00137	0.92673 TO 0.92946	0.92536 TO 0.93082	0.92400 TO 0.93219	292000
12	0.92807	+ OR - 0.00137	0.92670 TO 0.92944	0.92533 TO 0.93081	0.92396 TO 0.93218	291000
17	0.92813	+ OR - 0.00138	0.92675 TO 0.92952	0.92537 TO 0.93090	0.92398 TO 0.93228	286000
22	0.92810	+ OR - 0.00139	0.92671 TO 0.92949	0.92532 TO 0.93087	0.92393 TO 0.93226	281000
27	0.92782	+ OR - 0.00139	0.92643 TO 0.92920	0.92505 TO 0.93059	0.92366 TO 0.93198	276000
32	0.92795	+ OR - 0.00140	0.92655 TO 0.92934	0.92515 TO 0.93074	0.92375 TO 0.93214	271000
37	0.92795	+ OR - 0.00142	0.92653 TO 0.92937	0.92511 TO 0.93079	0.92369 TO 0.93221	266000
42	0.92785	+ OR - 0.00143	0.92642 TO 0.92929	0.92498 TO 0.93072	0.92355 TO 0.93216	261000
47	0.92789	+ OR - 0.00146	0.92643 TO 0.92934	0.92497 TO 0.93080	0.92352 TO 0.93226	256000
52	0.92804	+ OR - 0.00148	0.92656 TO 0.92952	0.92508 TO 0.93099	0.92360 TO 0.93247	251000
57	0.92839	+ OR - 0.00146	0.92693 TO 0.92986	0.92546 TO 0.93132	0.92400 TO 0.93278	246000
62	0.92848	+ OR - 0.00147	0.92701 TO 0.92995	0.92553 TO 0.93142	0.92406 TO 0.93289	241000
67	0.92862	+ OR - 0.00148	0.92714 TO 0.93011	0.92565 TO 0.93159	0.92417 TO 0.93308	236000
72	0.92875	+ OR - 0.00149	0.92726 TO 0.93025	0.92577 TO 0.93174	0.92428 TO 0.93323	231000
77	0.92882	+ OR - 0.00151	0.92731 TO 0.93033	0.92580 TO 0.93185	0.92429 TO 0.93336	226000
82	0.92834	+ OR - 0.00153	0.92681 TO 0.92987	0.92528 TO 0.93139	0.92376 TO 0.93292	221000
87	0.92835	+ OR - 0.00155	0.92680 TO 0.92990	0.92525 TO 0.93144	0.92371 TO 0.93299	216000
92	0.92852	+ OR - 0.00158	0.92694 TO 0.93010	0.92537 TO 0.93168	0.92379 TO 0.93326	211000

LWT ANALYSIS; W17X17 OFA ASSEMBLY; NO WATER IN GAP

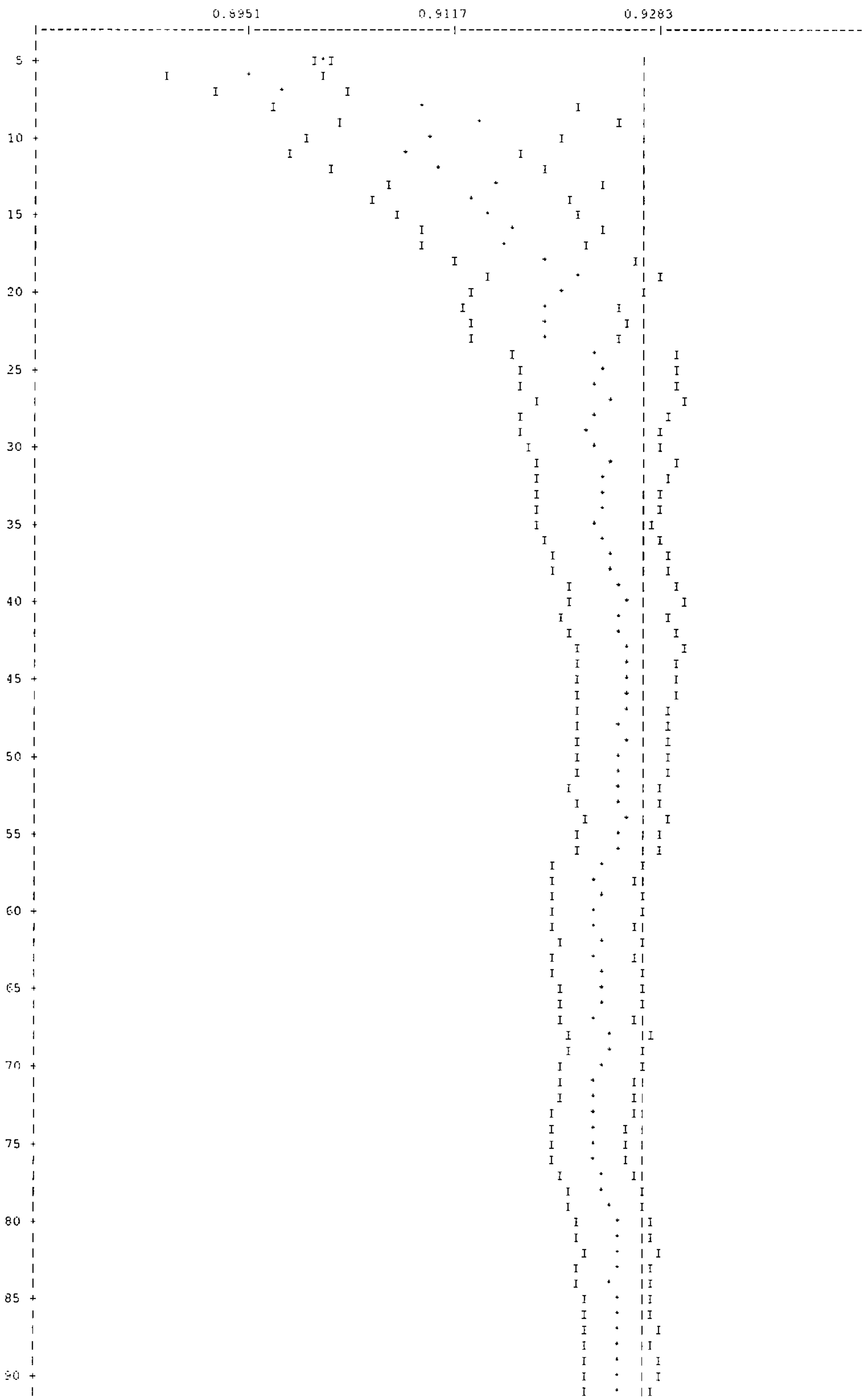
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
97	0.92867	+ OR - 0.00159	0.92708 TO 0.93025	0.92549 TO 0.93184	0.92391 TO 0.93342	206000
102	0.92922	+ OR - 0.00160	0.92763 TO 0.93082	0.92603 TO 0.93242	0.92443 TO 0.93401	201000
107	0.92909	+ OR - 0.00164	0.92745 TO 0.93072	0.92582 TO 0.93236	0.92418 TO 0.93399	196000
112	0.92851	+ OR - 0.00165	0.92686 TO 0.93016	0.92521 TO 0.93181	0.92356 TO 0.93346	191000
117	0.92832	+ OR - 0.00168	0.92664 TO 0.93000	0.92496 TO 0.93168	0.92328 TO 0.93336	186000
122	0.92824	+ OR - 0.00169	0.92655 TO 0.92993	0.92487 TO 0.93162	0.92318 TO 0.93330	181000
127	0.92863	+ OR - 0.00172	0.92691 TO 0.93035	0.92519 TO 0.93207	0.92347 TO 0.93378	176000
132	0.92852	+ OR - 0.00175	0.92676 TO 0.93027	0.92501 TO 0.93203	0.92326 TO 0.93378	171000
137	0.92861	+ OR - 0.00178	0.92683 TO 0.93039	0.92505 TO 0.93218	0.92326 TO 0.93396	166000
142	0.92845	+ OR - 0.00181	0.92663 TO 0.93026	0.92482 TO 0.93207	0.92301 TO 0.93388	161000
147	0.92836	+ OR - 0.00186	0.92650 TO 0.93022	0.92465 TO 0.93207	0.92279 TO 0.93393	156000
152	0.92878	+ OR - 0.00189	0.92689 TO 0.93066	0.92500 TO 0.93255	0.92311 TO 0.93444	151000
157	0.92859	+ OR - 0.00194	0.92666 TO 0.93053	0.92472 TO 0.93247	0.92278 TO 0.93441	146000
162	0.92856	+ OR - 0.00200	0.92656 TO 0.93056	0.92456 TO 0.93256	0.92256 TO 0.93456	141000
167	0.92855	+ OR - 0.00207	0.92648 TO 0.93062	0.92440 TO 0.93269	0.92233 TO 0.93476	136000
172	0.92809	+ OR - 0.00211	0.92598 TO 0.93019	0.92388 TO 0.93230	0.92177 TO 0.93440	131000
177	0.92900	+ OR - 0.00210	0.92690 TO 0.93110	0.92480 TO 0.93321	0.92269 TO 0.93531	126000
182	0.92982	+ OR - 0.00207	0.92775 TO 0.93189	0.92568 TO 0.93396	0.92361 TO 0.93603	121000
187	0.93012	+ OR - 0.00213	0.92798 TO 0.93225	0.92585 TO 0.93438	0.92372 TO 0.93651	116000
192	0.92988	+ OR - 0.00220	0.92768 TO 0.93208	0.92548 TO 0.93429	0.92327 TO 0.93649	111000
197	0.92979	+ OR - 0.00228	0.92750 TO 0.93207	0.92522 TO 0.93436	0.92293 TO 0.93664	106000
202	0.92956	+ OR - 0.00239	0.92717 TO 0.93195	0.92478 TO 0.93434	0.92239 TO 0.93672	101000
207	0.92876	+ OR - 0.00244	0.92633 TO 0.93120	0.92389 TO 0.93364	0.92145 TO 0.93607	96000
212	0.92876	+ OR - 0.00253	0.92623 TO 0.93129	0.92371 TO 0.93382	0.92118 TO 0.93635	91000
217	0.92790	+ OR - 0.00258	0.92532 TO 0.93049	0.92274 TO 0.93307	0.92016 TO 0.93565	86000
222	0.92835	+ OR - 0.00259	0.92576 TO 0.93094	0.92318 TO 0.93353	0.92059 TO 0.93612	81000
227	0.92875	+ OR - 0.00267	0.92608 TO 0.93143	0.92341 TO 0.93410	0.92073 TO 0.93677	76000

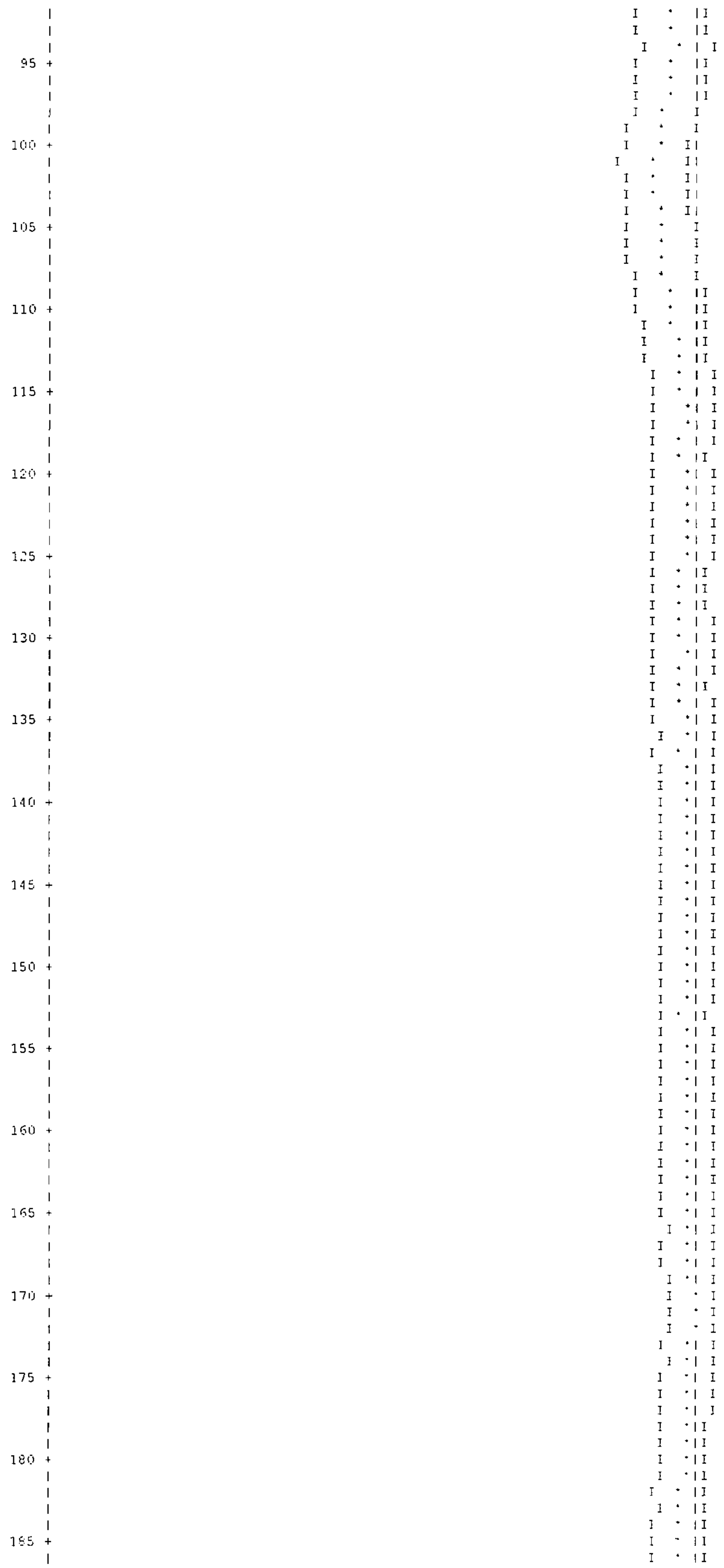
LWT ANALYSIS; W17X17 OFA ASSEMBLY; NO WATER IN GAP

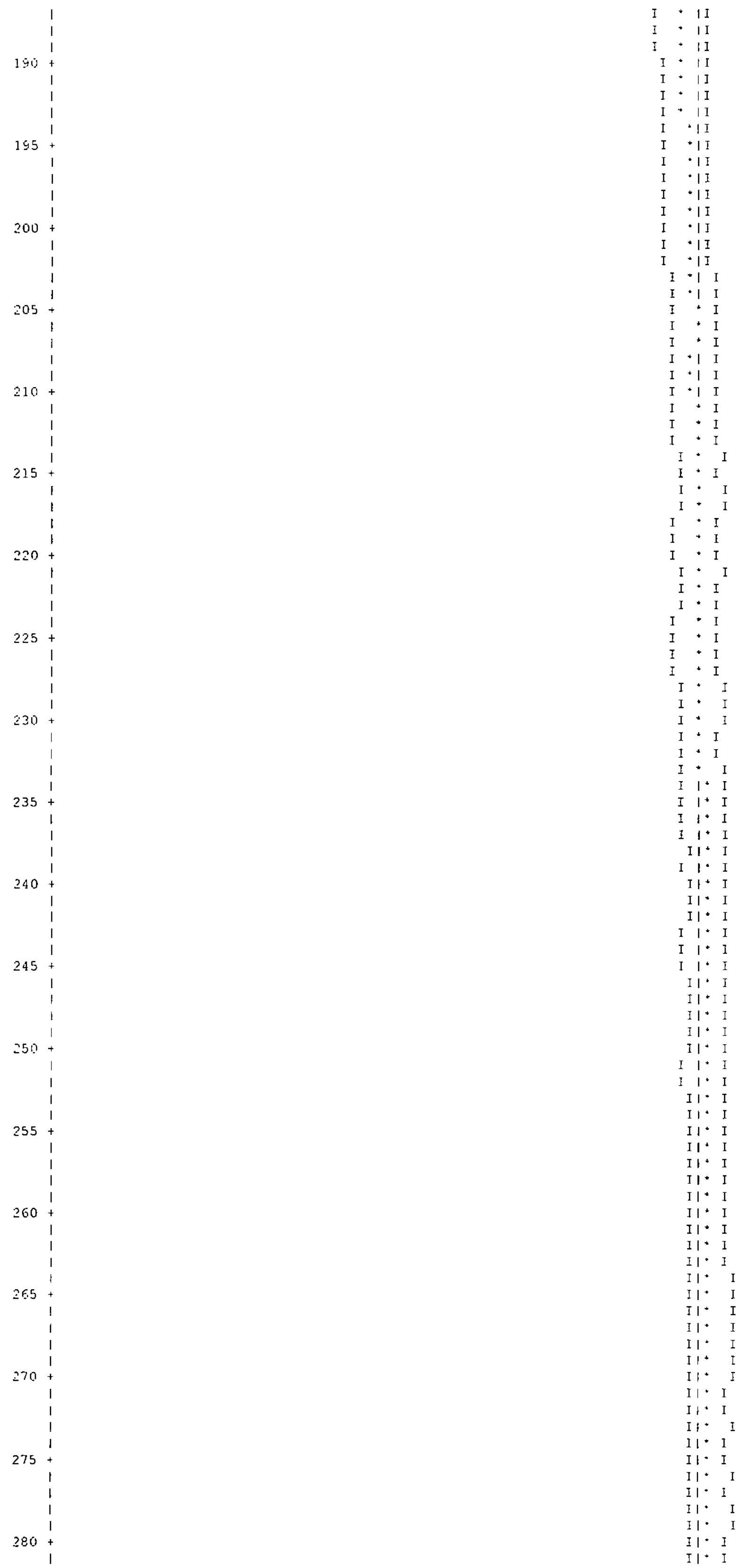
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
232	0.92838	+ OR - 0.00274	0.92565 TO 0.93112	0.92291 TO 0.93386	0.92017 TO 0.93659	71000
237	0.92690	+ OR - 0.00269	0.92422 TO 0.92959	0.92153 TO 0.93228	0.91884 TO 0.93496	66000
242	0.92576	+ OR - 0.00273	0.92303 TO 0.92850	0.92029 TO 0.93123	0.91756 TO 0.93396	61000
247	0.92621	+ OR - 0.00283	0.92338 TO 0.92904	0.92055 TO 0.93187	0.91772 TO 0.93470	56000
252	0.92667	+ OR - 0.00306	0.92361 TO 0.92974	0.92055 TO 0.93280	0.91749 TO 0.93586	51000
257	0.92546	+ OR - 0.00316	0.92229 TO 0.92862	0.91913 TO 0.93179	0.91597 TO 0.93495	46000
262	0.92446	+ OR - 0.00343	0.92103 TO 0.92789	0.91760 TO 0.93132	0.91416 TO 0.93475	41000
267	0.92316	+ OR - 0.00371	0.91946 TO 0.92687	0.91575 TO 0.93058	0.91204 TO 0.93429	36000
272	0.92248	+ OR - 0.00412	0.91836 TO 0.92659	0.91424 TO 0.93071	0.91013 TO 0.93483	31000
277	0.92103	+ OR - 0.00440	0.91664 TO 0.92543	0.91224 TO 0.92983	0.90785 TO 0.93422	26000
282	0.92139	+ OR - 0.00499	0.91639 TO 0.92638	0.91140 TO 0.93137	0.90641 TO 0.93636	21000
287	0.92005	+ OR - 0.00576	0.91429 TO 0.92581	0.90853 TO 0.93157	0.90276 TO 0.93734	16000
292	0.91662	+ OR - 0.00469	0.91193 TO 0.92131	0.90723 TO 0.92600	0.90254 TO 0.93070	11000
297	0.92086	+ OR - 0.00644	0.91443 TO 0.92730	0.90799 TO 0.93373	0.90155 TO 0.94017	6000

LWT ANALYSIS; W17X17 OFA ASSEMBLY; NO WATER IN GAP

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.9276 + OR - 0.0014 WHICH OCCURS FOR 303 GENERATIONS RUN.




95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185


190
195
200
205
210
215
220
225
230
235
240
245
250
255
260
265
270
275
280

```
      |                                                    I|* I
      |                                                    I|* I
      |                                                    I|* I
  285 +                                                    I|* I
      |                                                    I|* I
      |                                                    I|* I
      |                                                    I|* I
      |                                                    I|* I
  290 +                                                    I|* I
      |                                                    I|* I
      |                                                    I|* I
      |                                                    I|* I
      |                                                    I|* I
  295 +                                                    I|* I
      |                                                    I|* I
      |                                                    I|* I
      |                                                    I|* I
      |                                                   I |* I
  300 +                                                   I |* I
      |                                                    I|* I
      |                                                   I * I
      |                                                   I * I
```

LWT ANALYSIS; W17X17 OFA ASSEMBLY; NO WATER IN GAP

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0041			3.82159E-03	2.2285	2.23872E-03	1.6019	1.15365E-04	17.5402
2	0.0176			1.62875E-02	0.6788	8.22928E-03	0.5887	2.90700E-04	10.4431
3	0.0195			1.81087E-02	0.5982	7.53114E-03	0.5755	6.30226E-04	6.7848
4	0.0080			7.43364E-03	0.7828	3.56477E-03	0.7521	3.81020E-04	9.1521
5	0.0025			2.29030E-03	0.5584	2.46799E-03	0.4834	5.72032E-04	7.7086
6	0.0021			1.92991E-03	0.4310	4.08883E-03	0.3925	1.56084E-03	4.7185
7	0.0020			1.89655E-03	0.4214	4.61079E-03	0.3581	1.76478E-03	4.2262
8	0.0021			1.94380E-03	0.5120	6.93673E-03	0.4313	8.11684E-04	6.1129
9	0.0028			2.63948E-03	0.5738	1.08006E-02	0.4894	4.31467E-04	8.9926
10	0.0062			5.70684E-03	0.5540	1.67942E-02	0.4655	4.62936E-04	7.9790
11	0.0129			1.19819E-02	0.5434	2.73418E-02	0.4594	4.15735E-04	8.2827
12	0.0169			1.57150E-02	0.5901	2.90498E-02	0.5221	2.65027E-04	10.9580
13	0.0161			1.49765E-02	0.7211	2.96920E-02	0.6243	2.26158E-04	11.3033
14	0.0127			1.17814E-02	0.6073	4.24296E-02	0.5074	2.55644E-04	11.0784
15	0.0027			2.53721E-03	1.0023	8.66856E-03	0.7845	1.32182E-04	15.6621
16	0.0019			1.75894E-03	1.3997	5.16861E-03	0.9238	6.54276E-05	20.1921
17	0.0029			2.66520E-03	1.8406	3.52185E-03	1.0888	4.77522E-05	24.4371
18	0.0039			3.58287E-03	1.8401	3.66608E-03	1.1653	3.29000E-05	29.7861
19	0.0048			4.46800E-03	1.3701	5.84850E-03	0.8953	5.72786E-05	22.5666
20	0.0202			1.87404E-02	0.8243	2.29555E-02	0.5788	1.84537E-04	12.2584
21	0.0111			1.02892E-02	1.2914	1.00103E-02	0.8827	5.76837E-05	23.1358
22	0.0270			2.50763E-02	0.8781	2.31897E-02	0.6229	1.56659E-04	11.8902
23	0.1015			9.41627E-02	0.4969	9.15781E-02	0.3251	1.41312E-03	3.5432
24	0.2107			1.95465E-01	0.3094	1.86579E-01	0.2124	2.86114E-03	2.3289
25	0.1843			1.70920E-01	0.3838	1.61167E-01	0.2326	1.77367E-03	3.1578
26	0.2272			2.10732E-01	0.3707	1.99426E-01	0.2299	1.38539E-03	3.3467
27	0.0762			7.06463E-02	0.6653	6.77221E-02	0.3877	1.95343E-04	8.6185
SYSTEM TOTAL =				9.27557E-01	0.1468	9.85278E-01	0.0469	1.65467E-02	1.1479

ELAPSED TIME 10.11817 MINUTES

RANDOM NUMBER= 3F140C717467

```
LWT ANALYSIS; W17X17 OFA ASSEMBLY; NO WATER IN GAP

                                    FREQUENCY FOR GENERATIONS    4 TO  303
0.8396 TO 0.8523     **
0.8523 TO 0.8649     *
0.8649 TO 0.8776     *
0.8776 TO 0.8902     *********
0.8902 TO 0.9028     **********************************
0.9028 TO 0.9155     ***************************************
0.9155 TO 0.9281     ********************************************************************
0.9281 TO 0.9408     **************************************************************
0.9408 TO 0.9534     ******************************************
0.9534 TO 0.9661     ***************************
0.9661 TO 0.9787     *********
0.9787 TO 0.9914     *****
0.9914 TO 1.0040     *

                                    FREQUENCY FOR GENERATIONS   79 TO  303
0.8396 TO 0.8523     *
0.8523 TO 0.8649     *
0.8649 TO 0.8776     *
0.8776 TO 0.8902     *****
0.8902 TO 0.9028     **********************
0.9028 TO 0.9155     *******************************
0.9155 TO 0.9281     ********************************************************
0.9281 TO 0.9408     *****************************************************
0.9408 TO 0.9534     ***********************************
0.9534 TO 0.9661     ********************
0.9661 TO 0.9787     *******
0.9787 TO 0.9914     *****
0.9914 TO 1.0040

                                    FREQUENCY FOR GENERATIONS  154 TO  303
0.8396 TO 0.8523     *
0.8523 TO 0.8649     *
0.8649 TO 0.8776
0.8776 TO 0.8902     *****
0.8902 TO 0.9028     *************
0.9028 TO 0.9155     *******************
0.9155 TO 0.9281     **************************************
0.9281 TO 0.9408     *************************************
0.9408 TO 0.9534     ************************
0.9534 TO 0.9661     ***********
0.9661 TO 0.9787     *****
0.9787 TO 0.9914     ****
0.9914 TO 1.0040

                                    FREQUENCY FOR GENERATIONS  229 TO  303
0.8396 TO 0.8523
0.8523 TO 0.8649
0.8649 TO 0.8776
0.8776 TO 0.8902     ***
0.8902 TO 0.9028     *********
0.9028 TO 0.9155     ************
0.9155 TO 0.9281     *****************
0.9281 TO 0.9408     *******************
0.9408 TO 0.9534     *********
0.9534 TO 0.9661     ********
0.9661 TO 0.9787     **
0.9787 TO 0.9914     **
0.9914 TO 1.0040


*********************************************************************************************************************************************
*

         CONGRATULATIONS!  YOU HAVE  SUCCESSFULLY TRAVERSED THE PERILOUS PATH THROUGH KENO V IN  10.11817 MINUTES

*********************************************************************************************************************************************
*
```

Figure 6.6.1-4 CSAS Input/Output for NAC-LWT with PWR Fuel – 3.5% Enrichment – Most Reactive Accident Condition Configuration

```
         PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
MODULE CSAS25   WILL BE CALLED
  LWT ANALYSIS; W17x17 OFA ASSEMBLY;  WATER IN GAP
  27GROUPNDF4 LATTICECELL
  UO2  1  0.95 293.0 92235 3.5 92238 96.5 END
  ZR   2  1.0  293.0  END
  H2O  3  1.0  293.0  END
  AL   4  1.0  293.0  END
  SS304 5 1.0  293.0  END
  PB    6 1.0 293.0 END
  H2O   7 1.000 293.0 END
  H2O   8 1.000 293.0 END
  H2O 9 1.0 293.0 END
  END COMP
  SQUAREPITCH  1.2598 0.7844 1 3 0.9144 2 0.8002 9 END
  LWT ANALYSIS; W17x17 OFA ASSEMBLY; WATER IN GAP
  READ PARAM RUN=YES PLT=NO TME=5000 GEN=303 NPG=1000 END PARAM
  READ GEOM
  UNIT  1
  COM='FUEL PIN CELL - WITH H2O'
  CYLINDER  1 1  0.3922   2P182.88
  CYLINDER  9 1  0.4001   2P182.88
  CYLINDER  2 1  0.4572   2P182.88
  CUBOID    3 1  4P0.6299 2P182.88
  UNIT  2
  COM='WATER ROD CELL - WITH H2O'
  CYLINDER  3 1  0.5715   2P182.88
  CYLINDER  2 1  0.6121   2P182.88
  CUBOID    3 1  4P0.6299 2P182.88
  GLOBAL UNIT 9
  ARRAY  1  -10.7083 -10.7083 -182.88
  CUBOID 3 1 4P11.2776 2P182.88
  CYLINDER 4 1 16.891 2P182.88
  CYLINDER 3 1 16.9863 2P182.88
  CYLINDER 5 1 18.8913 2P182.88
  CYLINDER 6 1 33.4963 2P182.88
  CYLINDER 5 1 36.5443 2P182.88
  CYLINDER 7 1 49.2443 2P182.88
  CYLINDER 5 1 49.8539 212.48 -192.16
  CYLINDER 6 1 49.8539 212.48 -199.78
  CYLINDER 5 1 49.8539 212.48 -208.67
  CUBOID 8 1 4P81.0000 243.00 -240.00
  END GEOM
  READ ARRAY
  ARA=1   NUX=17 NUY=17 NUZ=1  FILL
                          34R1
           5R1  2   2R1   2   2R1   2   5R1
                3R1  2   9R1   2   3R1
                          17R1
  2R1   2   2R1   2   2R1   2   2R1   2   2R1   2   2R1
                          34R1
  2R1   2   2R1   2   2R1   2   2R1   2   2R1   2   2R1
                          34R1
  2R1   2   2R1   2   2R1   2   2R1   2   2R1   2   2R1
                          17R1
                3R1  2   9R1   2   3R1
           5R1  2   2R1   2   2R1   2   5R1
                          34R1
  END FILL
  END ARRAY
  READ BOUNDS ZFC=VAC YXF=VAC END BOUNDS
  END DATA

SECONDARY MODULE 000008   HAS BEEN CALLED.

MODULE 000008   IS FINISHED. COMPLETION CODE     0. CPU TIME USED      1.32 (SECONDS).

SECONDARY MODULE 000002   HAS BEEN CALLED.

MODULE 000002   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     13.07 (SECONDS).

SECONDARY MODULE 000009   HAS BEEN CALLED.

MODULE 000009   IS FINISHED. COMPLETION CODE     0. CPU TIME USED    622.14 (SECONDS).

MODULE CSAS25   IS FINISHED. COMPLETION CODE     0. CPU TIME USED    641.09 (SECONDS).
```

```
 CCCCCCCCCCC    SSSSSSSSSSS      AAAAAAAAA      SSSSSSSSSSS    22222222222    5555555555555
CCCCCCCCCCCCC  SSSSSSSSSSSSS    AAAAAAAAAAA    SSSSSSSSSSSSS  2222222222222   5555555555555
CC         CC  SS         SS   AA         AA  SS         SS  22         22   55
CC             SS              AA         AA  SS                        22   55
CC             SS              AA         AA  SS                        22   55
CC             SSSSSSSSSSSS    AAAAAAAAAAAAA  SSSSSSSSSSSS             22    555555555555
CC              SSSSSSSSSSSS   AAAAAAAAAAAAA   SSSSSSSSSSSS          22      5555555555555
CC                        SS   AA         AA            SS        22                  55
CC                        SS   AA         AA            SS      22                    55
CC         CC  SS         SS   AA         AA  SS         SS  22           55          55
CCCCCCCCCCCCC  SSSSSSSSSSSSS   AA         AA  SSSSSSSSSSSSS  2222222222222   5555555555555
 CCCCCCCCCCC    SSSSSSSSSSS    AA         AA   SSSSSSSSSSS   2222222222222    55555555555


 SSSSSSSSSSS    CCCCCCCCCCC      AAAAAAAAA     LL            EEEEEEEEEEEEE                  PPPPPPPPPPPP     CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC    AAAAAAAAAAA    LL            EEEEEEEEEEEEE                  PPPPPPPPPPPPP   CCCCCCCCCCCCC
SS         SS  CC         CC   AA         AA   LL            EE                             PP         PP   CC         CC
SS             CC              AA         AA   LL            EE                             PP         PP   CC
SS             CC              AA         AA   LL            EE                             PP         PP   CC
SSSSSSSSSSSS   CC              AAAAAAAAAAAAA   LL            EEEEEEEEE      -------------   PPPPPPPPPPPPP   CC
 SSSSSSSSSSSS  CC              AAAAAAAAAAAAA   LL            EEEEEEEEE      -------------   PPPPPPPPPPPP    CC
           SS  CC              AA         AA   LL            EE                             PP              CC
           SS  CC              AA         AA   LL            EE                             PP              CC
SS         SS  CC         CC   AA         AA   LL            EE                             PP              CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL EEEEEEEEEEEEE                  PP              CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC    AA         AA   LLLLLLLLLLLLL EEEEEEEEEEEEE                  PP               CCCCCCCCCCC


   0000000     7777777777777          //   22222222222    33333333333          //   99999999999    88888888888
  000000000    7777777777777         //   2222222222222  3333333333333        //   9999999999999  8888888888888
 00     00     77         77        //    22         22  33         33       //    99         99  88         88
00       00              77        //                22             33      //     99         99  88         88
00       00             77        //                 22             33     //      99         99  88         88
00       00            77        //                 22             333    //       9999999999999   88888888888
00       00           77        //                22               333   //         999999999999   88888888888
00       00          77        //               22                  33  //                    99  88         88
00       00          77       //              22                    33 //                     99  88         88
 00     00          77       //             22               33     33//                      99  88         88
  000000000         77      //             2222222222222  3333333333333//              9999999999999  8888888888888
   0000000          77     //              2222222222222   33333333333//               999999999999    88888888888


   0000000     33333333333                     11           11                   0000000     33333333333
  000000000   3333333333333                   111          111                  000000000   3333333333333
 00     00    33         33     :::          1111         1111        :::      00     00    33         33
00       00              33     :::            11           11        :::     00       00              33
00       00              33     :::            11           11        :::     00       00              33
00       00             333                    11           11                00       00             333
00       00             333                    11           11                00       00             333
00       00              33     :::            11           11        :::     00       00              33
00       00              33     :::            11           11        :::     00       00              33
 00     00    33         33     :::            11           11        :::      00     00    33         33
  000000000   3333333333333                 11111111     11111111               000000000   3333333333333
   0000000     33333333333                  11111111     11111111                0000000     33333333333
```

```
  SSSSSSSSSSS     CCCCCCCCCCC      AAAAAAAAA     LL              EEEEEEEEEEEEE                          PPPPPPPPPPPP    CCCCCCCCCCC
 SSSSSSSSSSSSS   CCCCCCCCCCCCC    AAAAAAAAAAA    LL              EEEEEEEEEEEEE                          PPPPPPPPPPPPP  CCCCCCCCCCCCC
 SS         SS   CC         CC   AA         AA   LL              EE                                     PP         PP  CC         CC
 SS              CC              AA         AA   LL              EE                                     PP         PP  CC
 SS              CC              AA         AA   LL              EE                                     PP         PP  CC
 SSSSSSSSSSSS    CC              AAAAAAAAAAAAA   LL              EEEEEEEEE        -------------         PPPPPPPPPPPPP  CC
  SSSSSSSSSSSS   CC              AAAAAAAAAAAAA   LL              EEEEEEEEE        -------------         PPPPPPPPPPPP   CC
            SS   CC              AA         AA   LL              EE                                     PP             CC
            SS   CC              AA         AA   LL              EE                                     PP             CC
 SS         SS   CC         CC   AA         AA   LL              EE                                     PP             CC         CC
 SSSSSSSSSSSSS   CCCCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                          PP             CCCCCCCCCCCCC
  SSSSSSSSSSS     CCCCCCCCCCC    AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                          PP              CCCCCCCCCCC
```

```
*******************************************************************************
*******************************************************************************
*******************************************************************************
*****                                                                     *****
*****                  PROGRAM VERIFICATION INFORMATION                   *****
*****                                                                     *****
*****                CODE SYSTEM:  SCALE-PC VERSION:  4.3                 *****
*****                                                                     *****
*******************************************************************************
*******************************************************************************
*****                                                                     *****
*****                                                                     *****
*****              PROGRAM:  CSAS                                         *****
*****                                                                     *****
*****        CREATION DATE:  03/08/96                                     *****
*****                                                                     *****
*****               VOLUME:  ENG                                          *****
*****                                                                     *****
*****              LIBRARY:  G:\SCALE43\WIN_NT\EXE                        *****
*****                                                                     *****
*****                                                                     *****
*****      PRODUCTION CODE:  CSAS                                         *****
*****                                                                     *****
*****              VERSION:  3.1                                          *****
*****                                                                     *****
*****              JOBNAME:  SCALE-PC                                     *****
*****                                                                     *****
*****    DATE OF EXECUTION:  07/23/98                                     *****
*****                                                                     *****
*****    TIME OF EXECUTION:  03:11:03                                     *****
*****                                                                     *****
*****                                                                     *****
*******************************************************************************
*******************************************************************************
*******************************************************************************
```

```
LWT ANALYSIS; W17X17 OFA ASSEMBLY;  WATER IN GAP


**** PROBLEM PARAMETERS ****

LIB 27GROUPNDF4  LIBRARY
MIX            9 MIXTURES
MSC            9 COMPOSITION SPECIFICATIONS
IZM            4 MATERIAL ZONES
GE  LATTICECELL  GEOMETRY
MORE           0 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
MSLN           0 FUEL SOLUTIONS


**** PROBLEM COMPOSITION DESCRIPTION ****

SC  UO2          STANDARD COMPOSITION
MX             1 MIXTURE NO.
VF        0.9500 VOLUME FRACTION
ROTH     10.9600 THEORETICAL DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           92000      1.00 ATOM/MOLECULE
                            92235     3.500 WT%
                            92238    96.500 WT%
            8016      2.00 ATOMS/MOLECULE
END

SC  ZR           STANDARD COMPOSITION
MX             2 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      6.4900 THEORETICAL DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           40000      1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX             3 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      0.9982 THEORETICAL DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
            1001      2.00 ATOMS/MOLECULE
            8016      1.00 ATOM/MOLECULE
END

SC  AL           STANDARD COMPOSITION
MX             4 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      2.7020 THEORETICAL DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           13027      1.00 ATOM/MOLECULE
END

SC  SS304        STANDARD COMPOSITION
MX             5 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      7.9200 THEORETICAL DENSITY
NEL            4 NO. ELEMENTS
ICP            0 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           24304    19.000 WT%
           25055     2.000 WT%
           26304    69.500 WT%
           28304     9.500 WT%
END

SC  PB           STANDARD COMPOSITION
MX             6 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH     11.3440 THEORETICAL DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           82000      1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX             7 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      0.9982 THEORETICAL DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
            1001      2.00 ATOMS/MOLECULE
            8016      1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
```

```
MX           8 MIXTURE NO.
VF      1.0000 VOLUME FRACTION
ROTH    0.9982 THEORETICAL DENSITY
NEL          2 NO. ELEMENTS
ICP          1 0/1 MIXTURE/COMPOUND
TEMP     293.0 DEG KELVIN
            1001      2.00 ATOMS/MOLECULE
            8016      1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX           9 MIXTURE NO.
VF      1.0000 VOLUME FRACTION
ROTH    0.9982 THEORETICAL DENSITY
NEL          2 NO. ELEMENTS
ICP          1 0/1 MIXTURE/COMPOUND
TEMP     293.0 DEG KELVIN
            1001      2.00 ATOMS/MOLECULE
            8016      1.00 ATOM/MOLECULE
END


**** PROBLEM GEOMETRY ****

CTP SQUAREPITCH  CELL TYPE
PITCH     1.2598 CM CENTER TO CENTER SPACING
FUELOD    0.7844 CM FUEL DIAMETER OR SLAB THICKNESS
MFUEL          1 MIXTURE NO. OF FUEL
MMOD           3 MIXTURE NO. OF MODERATOR
CLADOD    0.9144 CM CLAD OUTER DIAMETER
MCLAD          2 MIXTURE NO. OF CLAD
GAPOD     0.8002 CM GAP OUTER DIAMETER
MGAP           9 MIXTURE NO. OF GAP


ZONE SPECIFICATIONS FOR LATTICECELL GEOMETRY

              ZONE  1 IS FUEL
              ZONE  2 IS GAP
              ZONE  3 IS CLAD
              ZONE  4 IS MOD
```

```
LWT ANALYSIS; W17X17 OFA ASSEMBLY; WATER IN GAP

********** DATA LIBRARY INFORMATION **********

UNIT                                                VOLUME
NUMBER         DATA SET NAME                        NAME       UNIT FUNCTION
------         -------------                        ----       -------------

  89    G:\scale43\DATALIB\FT89F001                            STANDARD COMPOSITION LIBRARY

  82    G:\scale43\DATALIB\FT82F001                            CROSS SECTION LIBRARY

  11    D:\PROJECTS\BU85-C~1\pwrfin02\17HX2M\FT11F00           SHORT CROSS SECTION LIBRARY

  90    D:\PROJECTS\BU85-C~1\pwrfin02\17HX2M\FT90F00           INPUT DATA DIRECT ACCESS


                    STANDARD COMPOSITION LIBRARY DATA
                    ---------------------------------

UNIT NUMBER  :  89

DATASET NAME :  G:\scale43\DATALIB\FT89F001

LIBRARY TITLE:  SCALE-4 STANDARD COMPOSITION LIBRARY
                637 STANDARD COMPOSITIONS, 490 NUCLIDES
                90 ELEMENTS WITH VARIABLE ISOTOPIC DISTRBUTIONS.

CREATION DATE:   6/30/95


                       CROSS SECTION LIBRARY DATA
                       --------------------------

UNIT NUMBER  :  82

DATASET NAME :  G:\scale43\DATALIB\FT82F001

LIBRARY TITLE:  SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
                   BASED ON ENDF-B VERSION 4 DATA
                      COMPILED FOR NRC      1/27/89
                         LAST UPDATED                                     08/12/94
                            L.M.PETRIE   -    ORNL


........   0 IO'S WERE USED BEFORE READING KENO V DATA    ........

........   0 IO'S WERE USED READING THE KENO V PARAMETER DATA    ........

*************** DATA READING COMPLETED ***************

........   0 IO'S WERE USED PREPARING THE KENO V INPUT DATA    ........

........   0 IO'S WERE USED LOADING THE KENO V DATA    ........

........   0 IO'S WERE USED LOADING THE DATA    ........

........   0 IO'S WERE USED CHECKING THE KENO V GEOMETRY DATA    ........
*****  RESTART DATA HAS BEEN WRITTEN ON UNIT 95  *****

........   0 IO'S WERE USED WRITING THE KENO V - CSAS DATA    ........

........   0 IO'S WERE USED PROCESSING CSAS INPUT DATA    ........

CONTROL MODULE CSAS25   IS COMPLETE.
```

```
                KK          KK  EEEEEEEEEEEEE  NN          NN  00000000000                  VV          VV
                KK         KK   EEEEEEEEEEEEE  NNN         NN  0000000000000                VV          VV
                KK        KK    EE             NNNN        NN  OO         OO                VV          VV
                KK       KK     EE             NN NN       NN  OO         OO                VV          VV
                KK      KK      EE             NN  NN      NN  OO         OO                VV          VV
                KKKKKKKK        EEEEEEEEE      NN   NN     NN  OO         OO  ------------- VV          VV
                KKKKKKKK        EEEEEEEEE      NN    NN    NN  OO         OO  -------------  VV        VV
                KK      KK      EE             NN     NN   NN  OO         OO                  VV      VV
                KK       KK     EE             NN      NN  NN  OO         OO                   VV    VV
                KK        KK    EE             NN       NNNN   OO         OO                    VV  VV
                KK         KK   EEEEEEEEEEEEE  NN        NNN   0000000000000                     VVVV
                KK          KK  EEEEEEEEEEEEE  NN         NN    00000000000                       V

  SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA     LL              EEEEEEEEEEEEE                PPPPPPPPPPPP    CCCCCCCCCCC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA    LL              EEEEEEEEEEEEE                PPPPPPPPPPPPP  CCCCCCCCCCCCC
 SS         SS  CC         CC  AA         AA   LL              EE                           PP         PP  CC         CC
 SS             CC             AA         AA   LL              EE                           PP         PP  CC
 SS             CC             AA         AA   LL              EE                           PP         PP  CC
 SSSSSSSSSSSS   CC             AAAAAAAAAAAAA   LL              EEEEEEEEE      ------------- PPPPPPPPPPPPP  CC
  SSSSSSSSSSSS  CC             AAAAAAAAAAAAA   LL              EEEEEEEEE      ------------- PPPPPPPPPPPP   CC
            SS  CC             AA         AA   LL              EE                           PP             CC
            SS  CC             AA         AA   LL              EE                           PP             CC
 SS         SS  CC         CC  AA         AA   LL              EE                           PP             CC         CC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                PP             CCCCCCCCCCCCC
  SSSSSSSSSSS    CCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                PP              CCCCCCCCCCC

   0000000      7777777777777            //   22222222222    33333333333          //   99999999999    88888888888
  000000000     777777777777            //   2222222222222  3333333333333        //   9999999999999  8888888888888
 00       00    77        77           //    22         22  33         33       //    99         99  88         88
 00       00             77           //               22             33       //     99         99  88         88
 00       00            77           //               22              33     //      99         99  88         88
 00       00           77           //              22             333      //       9999999999999   88888888888
 00       00          77           //             22               333     //         999999999999   88888888888
 00       00         77           //            22                  33    //                    99  88         88
 00       00        77           //           22                    33   //                     99  88         88
  00     00        77           //          22              33         33  //                     99  88         88
  000000000        77          //          2222222222222   3333333333333  //          9999999999999  8888888888888
   0000000         77         //           2222222222222    33333333333  //           999999999999    88888888888

   0000000      33333333333                       11              11                  22222222222        11
  000000000    3333333333333                     111             111                 2222222222222      111
 00       00  33           33        :::        1111            1111          :::   22         22     1111
 00       00               33        :::          11              11          :::              22       11
 00       00               33        :::          11              11          :::             22        11
 00       00             333                      11              11                         22         11
 00       00             333                      11              11                       22           11
 00       00               33        :::          11              11          :::        22             11
 00       00               33        :::          11              11          :::      22               11
  00     00   33           33        :::          11              11          :::    22                 11
  000000000    3333333333333                   11111111        11111111             2222222222222   11111111
   0000000      33333333333                    11111111        11111111             2222222222222   11111111
```

```
LWT ANALYSIS; W17X17 OFA ASSEMBLY; WATER IN GAP

****** NUMERIC PARAMETERS ******

TME   MAXIMUM PROBLEM TIME (MIN)                 ******
TBA   TIME PER GENERATION (MIN)                    0.50
GEN   NUMBER OF GENERATIONS                         303
NPG   NUMBER PER GENERATION                        1000
NSK   NUMBER OF GENERATIONS TO BE SKIPPED             3
BEG   BEGINNING GENERATION NUMBER                     1
RES   GENERATIONS BETWEEN CHECKPOINTS                 0
X1D   NUMBER OF EXTRA 1-D CROSS SECTIONS              1
NBK   NEUTRON BANK SIZE                            1025
XNB   EXTRA POSITIONS IN NEUTRON BANK                 0
NFB   FISSION BANK SIZE                            1000
XFB   EXTRA POSITIONS IN FISSION BANK                 0
WTA   DEFAULT VALUE OF WEIGHT AVERAGE            0.5000
WTH   WEIGHT HIGH FOR SPLITTING                  3.0000
WTL   WEIGHT LOW FOR RUSSIAN ROULETTE            0.3333
RND   STARTING RANDOM NUMBER                BB827100001
NB8   NUMBER OF D.A. BLOCKS ON UNIT  8              200
NL8   LENGTH OF D.A. BLOCKS ON UNIT  8              512
ADJ   MODE OF CALCULATION                       FORWARD
      INPUT DATA WRITTEN ON RESTART UNIT             NO
      BINARY DATA INTERFACE                         YES
```

```
*****************************************************************************************************
*****************************************************************************************************
***                                                                                               ***
***                         LWT ANALYSIS; W17X17 OFA ASSEMBLY; WATER IN GAP                       ***
***                                                                                               ***
*****************************************************************************************************
***                        ******     LOGICAL PARAMETERS      ******                              ***
***                                                                                               ***
*** RUN  EXECUTE PROBLEM AFTER CHECKING DATA     YES      PLT  PLOT PICTURE MAP(S)             NO ***
***                                                                                               ***
*** FLX  COMPUTE FLUX                            NO       FDN  COMPUTE FISSION DENSITIES       NO ***
***                                                                                               ***
*** SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION    NO       NUB  COMPUTE NU-BAR & AVG FISSION GROUP  YES ***
***                                                                                               ***
*** MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER     NO       MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION   NO ***
***                                                                                               ***
*** CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER   NO       CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION NO ***
***                                                                                               ***
*** FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER   NO       FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION NO ***
***                                                                                               ***
*** MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER     NO       MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER    NO ***
***                                                                                               ***
*** CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER   NO       CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER  NO ***
***                                                                                               ***
*** FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER   NO       FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER  NO ***
***                                                                                               ***
*** HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL    NO       HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL   NO ***
***                                                                                               ***
*** AMX  PRINT ALL MIXED CROSS SECTIONS          NO       FAR  PRINT FIS. AND ABS. BY REGION       NO ***
***                                                                                               ***
*** XS1  PRINT 1-D MIXTURE X-SECTIONS            NO       GAS  PRINT FAR BY GROUP                  NO ***
***                                                                                               ***
*** XS2  PRINT 2-D MIXTURE X-SECTIONS            NO       PAX  PRINT XSEC-ALBEDO CORRELATION TABLES    NO ***
***                                                                                               ***
*** XAP  PRINT MIXTURE ANGLES & PROBABILITIES    NO       PWT  PRINT WEIGHT AVERAGE ARRAY          NO ***
***                                                                                               ***
*** PKI  PRINT FISSION SPECTRUM                  NO       PGM  PRINT INPUT GEOMETRY                NO ***
***                                                                                               ***
*** P1D  PRINT EXTRA 1-D CROSS SECTIONS          NO       BUG  PRINT DEBUG INFORMATION             NO ***
***                                                                                               ***
***                                                       TRK  PRINT TRACKING INFORMATION          NO ***
***                                                                                               ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************
*****************************************************************************************************
                              PARAMETER INPUT COMPLETED

              ........     0 IO'S WERE USED READING THE PARAMETER DATA      ........

              *************** DATA READING COMPLETED ***************
```

```
*****************************************************************************************************
***                                                                                               ***
***        LWT ANALYSIS; W17X17 OFA ASSEMBLY; WATER IN GAP                                        ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************
***                                                                                               ***
***                            ****** ADDITIONAL INFORMATION ******                               ***
***                                                                                               ***
*** NUMBER OF ENERGY GROUPS                27       USE LATTICE GEOMETRY                      YES ***
***                                                                                               ***
*** NO. OF FISSION SPECTRUM SOURCE GROUP    1       GLOBAL ARRAY NUMBER                         1 ***
***                                                                                               ***
*** NO. OF SCATTERING ANGLES IN XSECS       2       NUMBER OF UNITS IN THE GLOBAL X DIR.       17 ***
***                                                                                               ***
*** ENTRIES/NEUTRON IN THE NEUTRON BANK    16       NUMBER OF UNITS IN THE GLOBAL Y DIR.       17 ***
***                                                                                               ***
*** ENTRIES/NEUTRON IN THE FISSION BANK     9       NUMBER OF UNITS IN THE GLOBAL Z DIR.        1 ***
***                                                                                               ***
*** NUMBER OF MIXTURES USED                 9       USE A GLOBAL REFLECTOR                    YES ***
***                                                                                               ***
*** NUMBER OF BIAS ID'S USED                1       USE NESTED HOLES                           NO ***
***                                                                                               ***
*** NUMBER OF DIFFERENTIAL ALBEDOS USED     0       NUMBER OF HOLES                             0 ***
***                                                                                               ***
*** TOTAL INPUT GEOMETRY REGIONS           19       MAXIMUM HOLE NESTING LEVEL                  0 ***
***                                                                                               ***
*** NUMBER OF GEOMETRY REGIONS USED        19       USE NESTED ARRAYS                          NO ***
***                                                                                               ***
*** LARGEST GEOMETRY UNIT NUMBER            9       NUMBER OF ARRAYS USED                       1 ***
***                                                                                               ***
*** LARGEST ARRAY NUMBER                    1       MAXIMUM ARRAY NESTING LEVEL                 1 ***
***                                                                                               ***
***                                                                                               ***
*** +X BOUNDARY CONDITION                 VAC       -X BOUNDARY CONDITION                     VAC ***
***                                                                                               ***
*** +Y BOUNDARY CONDITION                 VAC       -Y BOUNDARY CONDITION                     VAC ***
***                                                                                               ***
*** +Z BOUNDARY CONDITION                 VAC       -Z BOUNDARY CONDITION                     VAC ***
***                                                                                               ***
*****************************************************************************************************
```

```
*****************************************************************************************
***                                                                                   ***
***          LWT ANALYSIS: W17X17 OFA ASSEMBLY; WATER IN GAP                          ***
***                                                                                   ***
*****************************************************************************************
*****************************************************************************************
***                                                                                   ***
***                      ****** SPACE AND SUPERGROUP INFORMATION ******               ***
***                                                                                   ***
***        100000 WORDS IS THE TOTAL SPACE AVAILABLE.                                 ***
***                                                                                   ***
***         28457 WORDS WERE USED FOR NON-SUPERGROUP STORAGE.                         ***
***                                                                                   ***
***         71543 WORDS OF STORAGE ARE AVAILABLE FOR SUPERGROUPED DATA.               ***
***                                                                                   ***
***         99759 WORDS OF STORAGE ARE AVAILABLE FOR CONSTRUCTING THE SUPERGROUPS.    ***
***                                                                                   ***
***         71483 WORDS OF STORAGE ARE AVAILABLE TO EACH SUPERGROUP.                  ***
***                                                                                   ***
***          1172 WORDS ARE NEEDED FOR THE LARGEST GROUP.                             ***
***                                                                                   ***
***         29845 WORDS OF STORAGE IS SUFFICIENT TO RUN THIS PROBLEM.                 ***
***                                                                                   ***
***         42059 WORDS OF STORAGE WILL ALLOW THE PROBLEM TO RUN WITH ONE SUPERGROUP. ***
***                                                                                   ***
***         42144 WORDS OF STORAGE WILL BE USED TO RUN THIS PROBLEM.                  ***
***                                                                                   ***
*****************************************************************************************
*****************************************************************************************
***                                                                                   ***
***                      STARTING      ENDING      XSEC       ALBEDO     TOTAL        ***
***    SUPERGROUP          GROUP        GROUP      LENGTH     LENGTH     LENGTH       ***
***                                                                                   ***
***                                                                                   ***
***          1               1            27        2697          0       13542       ***
***                                                                                   ***
*****************************************************************************************

             ........     0 IO'S WERE USED IN SUPERGROUPING     ........

             ........     0 IO'S WERE USED LOADING THE DATA     ........
```

```
                                        LWT ANALYSIS: W17X17 OFA ASSEMBLY; WATER IN GAP

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                                  -----   UNIT     1   -----

FUEL PIN CELL - WITH H2O

  1 CYLINDER        1   1  RADIUS = 0.39220   +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  2 CYLINDER        9   1  RADIUS = 0.40010   +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CYLINDER        2   1  RADIUS = 0.45720   +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  4 CUBOID          3   1      +X = 0.62990   -X =-0.62990    +Y = 0.62990    -Y =-0.62990     +Z =  182.88     -Z = -182.88

                                                  -----   UNIT     2   -----

WATER ROD CELL - WITH H2O

  1 CYLINDER        3   1  RADIUS = 0.57150   +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  2 CYLINDER        2   1  RADIUS = 0.61210   +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CUBOID          3   1      +X = 0.62990   -X =-0.62990    +Y = 0.62990    -Y =-0.62990     +Z =  182.88     -Z = -182.88

                                        ******************   GLOBAL   ******************
                                        -----   UNIT     9  EXTERNAL TO LATTICE  1   -----

  1 ARRAY NUMBER    1          +X =  10.708   -X = -10.708    +Y =  10.708    -Y = -10.708     +Z =  182.88     -Z = -182.88

  2 CUBOID          3   1      +X =  11.278   -X = -11.278    +Y =  11.278    -Y = -11.278     +Z =  182.88     -Z = -182.88

  3 CYLINDER        4   1  RADIUS =  16.891   +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  4 CYLINDER        3   1  RADIUS =  16.986   +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  5 CYLINDER        5   1  RADIUS =  18.891   +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  6 CYLINDER        6   1  RADIUS =  33.496   +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  7 CYLINDER        5   1  RADIUS =  36.544   +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  8 CYLINDER        7   1  RADIUS =  49.244   +Z =  182.88    -Z = -182.88    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  9 CYLINDER        5   1  RADIUS =  49.854   +Z =  212.48    -Z = -192.16    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

 10 CYLINDER        6   1  RADIUS =  49.854   +Z =  212.48    -Z = -199.78    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

 11 CYLINDER        5   1  RADIUS =  49.854   +Z =  212.48    -Z = -208.67    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

 12 CUBOID          8   1      +X =  81.000   -X = -81.000    +Y =  81.000    -Y = -81.000     +Z =  243.00     -Z = -240.00
```

```
                         LWT ANALYSIS; W17X17 OFA ASSEMBLY; WATER IN GAP

                 -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   1          -------

Z LAYER   1, X COLUMN   1 TO  17 LEFT TO RIGHT   Y ROW   1 TO  17  BOTTOM TO TOP

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 1 1 1 2 1 1 2 1 1 2 1 1 1 1 1

 1 1 1 2 1 1 1 1 1 1 1 1 1 2 1 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 1 2 1 1 1 1 1 1 1 1 1 2 1 1 1

 1 1 1 1 1 2 1 1 2 1 1 2 1 1 1 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
```

```
                                   LWT ANALYSIS; W17X17 OFA ASSEMBLY; WATER IN GAP
                                  VOLUMES FOR THOSE UNITS UTILIZED IN  THIS PROBLEM

                           GEOMETRY                                  CUMULATIVE
UNIT     REGION             REGION           VOLUME                    VOLUME

  1         1                  1        1.76751E+02 CM**3        1.76751E+02 CM**3
            2                  2        7.19223E+00 CM**3        1.83943E+02 CM**3
            3                  3        5.62490E+01 CM**3        2.40192E+02 CM**3
            4                  4        3.40304E+02 CM**3        5.80496E+02 CM**3

  2         1                  5        3.75300E+02 CM**3        3.75300E+02 CM**3
            2                  6        5.52175E+01 CM**3        4.30518E+02 CM**3
            3                  7        1.49979E+02 CM**3        5.80496E+02 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION      8 IS AN ARRAY PLACEMENT BOUNDARY REGION

  9         1                  8        1.67763E+05 CM**3        1.67763E+05 CM**3
            2                  9        1.83123E+04 CM**3        1.86076E+05 CM**3
            3                 10        1.41760E+05 CM**3        3.27836E+05 CM**3
            4                 11        3.70972E+03 CM**3        3.31546E+05 CM**3
            5                 12        7.85353E+04 CM**3        4.10081E+05 CM**3
            6                 13        8.79177E+05 CM**3        1.28926E+06 CM**3
            7                 14        2.45308E+05 CM**3        1.53457E+06 CM**3
            8                 15        1.25193E+06 CM**3        2.78649E+06 CM**3
            9                 16        3.72996E+05 CM**3        3.15949E+06 CM**3
           10                 17        5.94983E+04 CM**3        3.21899E+06 CM**3
           11                 18        6.94145E+04 CM**3        3.28840E+06 CM**3
           12                 19        9.38745E+06 CM**3        1.26759E+07 CM**3


                        UNIT      USES     REGION      MIXTURE          TOTAL VOLUME

                          1        264        1           1          4.66622E+04 CM**3
                                              2           9          1.89875E+03 CM**3
                                              3           2          1.48497E+04 CM**3
                                              4           3          8.98403E+04 CM**3

                          2         25        1           3          9.38250E+03 CM**3
                                              2           2          1.38044E+03 CM**3
                                              3           3          3.74947E+03 CM**3

                          9          1        1                      1.67763E+05 CM**3
                                              2           3          1.83123E+04 CM**3
                                              3           4          1.41760E+05 CM**3
                                              4           3          3.70972E+03 CM**3
                                              5           5          7.85353E+04 CM**3
                                              6           6          8.79177E+05 CM**3
                                              7           5          2.45308E+05 CM**3
                                              8           7          1.25193E+06 CM**3
                                              9           5          3.72996E+05 CM**3
                                             10           6          5.94983E+04 CM**3
                                             11           5          6.94145E+04 CM**3
                                             12           8          9.38745E+06 CM**3


                                     TOTAL MIXTURE VOLUMES
                                MIXTURE        TOTAL VOLUME                MASS(G)
                                   1        4.66622E+04 CM**3          4.85846E+05
                                   2        1.62302E+04 CM**3          1.05334E+05
                                   3        1.24994E+05 CM**3          1.24766E+05
                                   4        1.41760E+05 CM**3          3.83037E+05
                                   5        7.66253E+05 CM**3          6.06873E+06
                                   6        9.38675E+05 CM**3          1.06463E+07
                                   7        1.25193E+06 CM**3          1.24964E+06
                                   8        9.38745E+06 CM**3          9.37028E+06
                                   9        1.89875E+03 CM**3          1.89528E+03

      *****************************************************************************************
      ***                                                                                   ***
      ***                                  BIASING INFORMATION                              ***
      ***                                                                                   ***
      ***   A DEFAULT WEIGHT OF    0.500 WILL BE USED FOR ALL BIAS ID'S.                   ***
      ***                                                                                   ***
      *****************************************************************************************

                    ........    0 IO'S WERE USED IN KENO-V BEFORE TRACKING        ........

                    ........  0.01650 MINUTES WERE USED PROCESSING DATA.          ........

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 2.78143E-01

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED WITH A FLAT DISTRIBUTION IN A CUBOID DEFINED BY:
              +X= 1.07083E+01  -X=-1.07083E+01  +Y= 1.07083E+01  -Y=-1.07083E+01  +Z= 1.82880E+02  -Z=-1.82880E+02
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

0.10317 MINUTES WERE REQUIRED FOR STARTING.   TOTAL ELAPSED TIME IS 0.12800 MINUTES.
```

LWT ANALYSIS; W17X17 OFA ASSEMBLY; WATER IN GAP

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
1	9.51010E-01	1.56500E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	9.40984E-01	1.90500E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
3	9.54190E-01	2.22500E-01	9.54190E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	9.40285E-01	2.57167E-01	9.47237E-01	6.95261E-03	0.00000E+00	0.00000E+00
5	9.16672E-01	2.91167E-01	9.37049E-01	1.09506E-02	0.00000E+00	0.00000E+00
6	9.40452E-01	3.25000E-01	9.37900E-01	7.78983E-03	0.00000E+00	0.00000E+00
7	9.34813E-01	3.58833E-01	9.37282E-01	6.06547E-03	0.00000E+00	0.00000E+00
8	9.30026E-01	3.92667E-01	9.36073E-01	5.09798E-03	0.00000E+00	0.00000E+00
9	9.38348E-01	4.26667E-01	9.36398E-01	4.32082E-03	0.00000E+00	0.00000E+00
10	8.92032E-01	4.62333E-01	9.30852E-01	6.69006E-03	0.00000E+00	0.00000E+00
11	9.11582E-01	4.95333E-01	9.28711E-01	6.27656E-03	0.00000E+00	0.00000E+00
12	9.15588E-01	5.30000E-01	9.27399E-01	5.76527E-03	0.00000E+00	0.00000E+00
13	9.52711E-01	5.63000E-01	9.29700E-01	5.69999E-03	0.00000E+00	0.00000E+00
14	9.35356E-01	5.96833E-01	9.30171E-01	5.22466E-03	0.00000E+00	0.00000E+00
15	9.37142E-01	6.29833E-01	9.30707E-01	4.83580E-03	0.00000E+00	0.00000E+00
16	9.37905E-01	6.64667E-01	9.31222E-01	4.50651E-03	0.00000E+00	0.00000E+00
17	9.29604E-01	6.97500E-01	9.31114E-01	4.19672E-03	0.00000E+00	0.00000E+00
18	9.20469E-01	7.30500E-01	9.30448E-01	3.98165E-03	0.00000E+00	0.00000E+00
19	9.29994E-01	7.63500E-01	9.30422E-01	3.74020E-03	0.00000E+00	0.00000E+00
20	9.46117E-01	7.97333E-01	9.31294E-01	3.63250E-03	0.00000E+00	0.00000E+00
21	9.12522E-01	8.32167E-01	9.30306E-01	3.57523E-03	0.00000E+00	0.00000E+00
22	9.43921E-01	8.66000E-01	9.30986E-01	3.45941E-03	0.00000E+00	0.00000E+00
23	9.57911E-01	8.99833E-01	9.32269E-01	3.53151E-03	0.00000E+00	0.00000E+00
24	8.94522E-01	9.33667E-01	9.30553E-01	3.77910E-03	0.00000E+00	0.00000E+00
25	9.25850E-01	9.69500E-01	9.30348E-01	3.61684E-03	0.00000E+00	0.00000E+00
26	9.11303E-01	1.00333E+00	9.29555E-01	3.55262E-03	0.00000E+00	0.00000E+00
27	9.20195E-01	1.03717E+00	9.29180E-01	3.42806E-03	0.00000E+00	0.00000E+00
28	9.35677E-01	1.07100E+00	9.29430E-01	3.30303E-03	0.00000E+00	0.00000E+00
29	9.32110E-01	1.10583E+00	9.29530E-01	3.17990E-03	0.00000E+00	0.00000E+00
30	9.16956E-01	1.13967E+00	9.29080E-01	3.09695E-03	0.00000E+00	0.00000E+00
31	9.18142E-01	1.17550E+00	9.28703E-01	3.01196E-03	0.00000E+00	0.00000E+00
32	9.52791E-01	1.20933E+00	9.29506E-01	3.01858E-03	0.00000E+00	0.00000E+00
33	9.20900E-01	1.24400E+00	9.29229E-01	2.93275E-03	0.00000E+00	0.00000E+00
34	9.29466E-01	1.27800E+00	9.29236E-01	2.83963E-03	0.00000E+00	0.00000E+00
35	9.66663E-01	1.31267E+00	9.30370E-01	2.97677E-03	0.00000E+00	0.00000E+00
36	9.38891E-01	1.34567E+00	9.30621E-01	2.89874E-03	0.00000E+00	0.00000E+00
37	9.03279E-01	1.37867E+00	9.29840E-01	2.92110E-03	0.00000E+00	0.00000E+00
38	9.28671E-01	1.41250E+00	9.29807E-01	2.83898E-03	0.00000E+00	0.00000E+00
39	9.62627E-01	1.44450E+00	9.30694E-01	2.90017E-03	0.00000E+00	0.00000E+00
40	8.95883E-01	1.48033E+00	9.29776E-01	2.96774E-03	0.00000E+00	0.00000E+00
41	9.06233E-01	1.51500E+00	9.29174E-01	2.95301E-03	0.00000E+00	0.00000E+00
42	9.15541E-01	1.54800E+00	9.28834E-01	2.89835E-03	0.00000E+00	0.00000E+00
43	9.72554E-01	1.58100E+00	9.29900E-01	3.02122E-03	0.00000E+00	0.00000E+00
44	9.38366E-01	1.61667E+00	9.30101E-01	2.95529E-03	0.00000E+00	0.00000E+00
45	9.32599E-01	1.65150E+00	9.30160E-01	2.88633E-03	0.00000E+00	0.00000E+00
46	9.88065E-01	1.68617E+00	9.31476E-01	3.11194E-03	0.00000E+00	0.00000E+00
47	9.33628E-01	1.72100E+00	9.31523E-01	3.04237E-03	0.00000E+00	0.00000E+00
48	9.52331E-01	1.75300E+00	9.31976E-01	3.00969E-03	0.00000E+00	0.00000E+00
49	9.32474E-01	1.78517E+00	9.31986E-01	2.94497E-03	0.00000E+00	0.00000E+00
50	9.19013E-01	1.81900E+00	9.31716E-01	2.89561E-03	0.00000E+00	0.00000E+00
51	9.64448E-01	1.85183E+00	9.32384E-01	2.91351E-03	0.00000E+00	0.00000E+00
52	9.41027E-01	1.88583E+00	9.32557E-01	2.85987E-03	0.00000E+00	0.00000E+00
53	9.11931E-01	1.92050E+00	9.32152E-01	2.83226E-03	0.00000E+00	0.00000E+00
54	9.08637E-01	1.95533E+00	9.31700E-01	2.81384E-03	0.00000E+00	0.00000E+00
55	9.47154E-01	1.98833E+00	9.31992E-01	2.77559E-03	0.00000E+00	0.00000E+00
56	9.20431E-01	2.02033E+00	9.31778E-01	2.73211E-03	0.00000E+00	0.00000E+00
57	9.27528E-01	2.05150E+00	9.31700E-01	2.68309E-03	0.00000E+00	0.00000E+00
58	9.16484E-01	2.08533E+00	9.31429E-01	2.64871E-03	0.00000E+00	0.00000E+00
59	8.88613E-01	2.12017E+00	9.30678E-01	2.70809E-03	0.00000E+00	0.00000E+00
60	9.62017E-01	2.15217E+00	9.31218E-01	2.71529E-03	0.00000E+00	0.00000E+00
61	9.47144E-01	2.18700E+00	9.31488E-01	2.68249E-03	0.00000E+00	0.00000E+00
62	9.04490E-01	2.22167E+00	9.31038E-01	2.67551E-03	0.00000E+00	0.00000E+00
63	9.40984E-01	2.25567E+00	9.31201E-01	2.63633E-03	0.00000E+00	0.00000E+00
64	9.52704E-01	2.28850E+00	9.31548E-01	2.61655E-03	0.00000E+00	0.00000E+00
65	9.07223E-01	2.32250E+00	9.31162E-01	2.60347E-03	0.00000E+00	0.00000E+00
66	9.30334E-01	2.35633E+00	9.31149E-01	2.56250E-03	0.00000E+00	0.00000E+00
67	9.25560E-01	2.39117E+00	9.31063E-01	2.52424E-03	0.00000E+00	0.00000E+00
68	9.66495E-01	2.42583E+00	9.31600E-01	2.54301E-03	0.00000E+00	0.00000E+00
69	9.41208E-01	2.45883E+00	9.31743E-01	2.50887E-03	0.00000E+00	0.00000E+00
70	9.33999E-01	2.49267E+00	9.31776E-01	2.47192E-03	0.00000E+00	0.00000E+00
71	9.71056E-01	2.52383E+00	9.32345E-01	2.50147E-03	0.00000E+00	0.00000E+00
72	8.88156E-01	2.55867E+00	9.31714E-01	2.54501E-03	0.00000E+00	0.00000E+00
73	9.80005E-01	2.59150E+00	9.32394E-01	2.59947E-03	0.00000E+00	0.00000E+00
74	9.13067E-01	2.62550E+00	9.32126E-01	2.57713E-03	0.00000E+00	0.00000E+00
75	9.70327E-01	2.65833E+00	9.32649E-01	2.59489E-03	0.00000E+00	0.00000E+00
76	9.31805E-01	2.69233E+00	9.32638E-01	2.55961E-03	0.00000E+00	0.00000E+00
77	9.52213E-01	2.72517E+00	9.32899E-01	2.53871E-03	0.00000E+00	0.00000E+00
78	9.47160E-01	2.75917E+00	9.33086E-01	2.51210E-03	0.00000E+00	0.00000E+00
79	8.93701E-01	2.79117E+00	9.32575E-01	2.53147E-03	0.00000E+00	0.00000E+00
80	9.47226E-01	2.82233E+00	9.32763E-01	2.50586E-03	0.00000E+00	0.00000E+00
81	9.48589E-01	2.85333E+00	9.32963E-01	2.48203E-03	0.00000E+00	0.00000E+00
82	9.25849E-01	2.88733E+00	9.32874E-01	2.45242E-03	0.00000E+00	0.00000E+00
83	9.01492E-01	2.92117E+00	9.32467E-01	2.45275E-03	0.00000E+00	0.00000E+00
84	9.20041E-01	2.95500E+00	9.32335E-01	2.42740E-03	0.00000E+00	0.00000E+00
85	8.82999E-01	2.98933E+00	9.31741E-01	2.47055E-03	0.00000E+00	0.00000E+00
86	9.23140E-01	3.02450E+00	9.31638E-01	2.44311E-03	0.00000E+00	0.00000E+00
87	9.43337E-01	3.05750E+00	9.31776E-01	2.41812E-03	0.00000E+00	0.00000E+00
88	9.28753E-01	3.09233E+00	9.31741E-01	2.39009E-03	0.00000E+00	0.00000E+00
89	9.25355E-01	3.12533E+00	9.31667E-01	2.36360E-03	0.00000E+00	0.00000E+00
90	9.33163E-01	3.15917E+00	9.31684E-01	2.33665E-03	0.00000E+00	0.00000E+00
91	9.25500E-01	3.19400E+00	9.31615E-01	2.31129E-03	0.00000E+00	0.00000E+00

92	9.17867E-01	3.22867E+00	9.31462E-01	2.29056E-03	0.00000E+00	0.00000E+00
93	9.65543E-01	3.26267E+00	9.31837E-01	2.29600E-03	0.00000E+00	0.00000E+00
94	9.29435E-01	3.29733E+00	9.31810E-01	2.27106E-03	0.00000E+00	0.00000E+00
95	9.05071E-01	3.32933E+00	9.31523E-01	2.26483E-03	0.00000E+00	0.00000E+00
96	9.28498E-01	3.36233E+00	9.31491E-01	2.24084E-03	0.00000E+00	0.00000E+00
97	9.20727E-01	3.39617E+00	9.31377E-01	2.22002E-03	0.00000E+00	0.00000E+00
98	9.03651E-01	3.43017E+00	9.31089E-01	2.21568E-03	0.00000E+00	0.00000E+00
99	9.74784E-01	3.46300E+00	9.31539E-01	2.23851E-03	0.00000E+00	0.00000E+00
100	9.78591E-01	3.49517E+00	9.32019E-01	2.26698E-03	0.00000E+00	0.00000E+00
101	9.62223E-01	3.52900E+00	9.32324E-01	2.26460E-03	0.00000E+00	0.00000E+00
102	9.36007E-01	3.56383E+00	9.32361E-01	2.24215E-03	0.00000E+00	0.00000E+00
103	9.34207E-01	3.59583E+00	9.32379E-01	2.21991E-03	0.00000E+00	0.00000E+00
104	9.19747E-01	3.62883E+00	9.32256E-01	2.20153E-03	0.00000E+00	0.00000E+00
105	9.53358E-01	3.66267E+00	9.32460E-01	2.18965E-03	0.00000E+00	0.00000E+00
106	9.26897E-01	3.69650E+00	9.32407E-01	2.16916E-03	0.00000E+00	0.00000E+00
107	9.08431E-01	3.72950E+00	9.32179E-01	2.16050E-03	0.00000E+00	0.00000E+00
108	8.99971E-01	3.76333E+00	9.31875E-01	2.16148E-03	0.00000E+00	0.00000E+00
109	9.16471E-01	3.79717E+00	9.31731E-01	2.14602E-03	0.00000E+00	0.00000E+00
110	9.29757E-01	3.83200E+00	9.31712E-01	2.12614E-03	0.00000E+00	0.00000E+00
111	9.33557E-01	3.86583E+00	9.31729E-01	2.10661E-03	0.00000E+00	0.00000E+00
112	9.11116E-01	3.90067E+00	9.31542E-01	2.09576E-03	0.00000E+00	0.00000E+00
113	9.66848E-01	3.93550E+00	9.31860E-01	2.10101E-03	0.00000E+00	0.00000E+00
114	9.52387E-01	3.96833E+00	9.32043E-01	2.09022E-03	0.00000E+00	0.00000E+00
115	9.36334E-01	4.00217E+00	9.32081E-01	2.07199E-03	0.00000E+00	0.00000E+00
116	9.24067E-01	4.03617E+00	9.32011E-01	2.05494E-03	0.00000E+00	0.00000E+00
117	9.10967E-01	4.07083E+00	9.31828E-01	2.04519E-03	0.00000E+00	0.00000E+00
118	9.57862E-01	4.10200E+00	9.32052E-01	2.03987E-03	0.00000E+00	0.00000E+00
119	9.24976E-01	4.13317E+00	9.31992E-01	2.02326E-03	0.00000E+00	0.00000E+00
120	9.72013E-01	4.16517E+00	9.32331E-01	2.03451E-03	0.00000E+00	0.00000E+00
121	9.31745E-01	4.19817E+00	9.32326E-01	2.01735E-03	0.00000E+00	0.00000E+00
122	9.64947E-01	4.23300E+00	9.32598E-01	2.01885E-03	0.00000E+00	0.00000E+00
123	9.49515E-01	4.26583E+00	9.32738E-01	2.00697E-03	0.00000E+00	0.00000E+00
124	9.21618E-01	4.30167E+00	9.32647E-01	1.99254E-03	0.00000E+00	0.00000E+00
125	9.35152E-01	4.33550E+00	9.32667E-01	1.97638E-03	0.00000E+00	0.00000E+00
126	9.32698E-01	4.37033E+00	9.32667E-01	1.96038E-03	0.00000E+00	0.00000E+00
127	9.38079E-01	4.40317E+00	9.32711E-01	1.94511E-03	0.00000E+00	0.00000E+00
128	9.67843E-01	4.43617E+00	9.32989E-01	1.94965E-03	0.00000E+00	0.00000E+00
129	9.30624E-01	4.46917E+00	9.32971E-01	1.93433E-03	0.00000E+00	0.00000E+00
130	9.48983E-01	4.50300E+00	9.33096E-01	1.92323E-03	0.00000E+00	0.00000E+00
131	9.73819E-01	4.53500E+00	9.33412E-01	1.93420E-03	0.00000E+00	0.00000E+00
132	9.23245E-01	4.56983E+00	9.33333E-01	1.92086E-03	0.00000E+00	0.00000E+00
133	8.78670E-01	4.60367E+00	9.32916E-01	1.95128E-03	0.00000E+00	0.00000E+00
134	9.46469E-01	4.63667E+00	9.33019E-01	1.93916E-03	0.00000E+00	0.00000E+00
135	9.56328E-01	4.66867E+00	9.33194E-01	1.93249E-03	0.00000E+00	0.00000E+00
136	9.65680E-01	4.69983E+00	9.33437E-01	1.93327E-03	0.00000E+00	0.00000E+00
137	9.39728E-01	4.73367E+00	9.33483E-01	1.91946E-03	0.00000E+00	0.00000E+00
138	9.42256E-01	4.76750E+00	9.33548E-01	1.90639E-03	0.00000E+00	0.00000E+00
139	9.55999E-01	4.80133E+00	9.33711E-01	1.89950E-03	0.00000E+00	0.00000E+00
140	9.20811E-01	4.83533E+00	9.33618E-01	1.88800E-03	0.00000E+00	0.00000E+00
141	9.49597E-01	4.87000E+00	9.33733E-01	1.87789E-03	0.00000E+00	0.00000E+00
142	9.24254E-01	4.90483E+00	9.33665E-01	1.86566E-03	0.00000E+00	0.00000E+00
143	9.63811E-01	4.93500E+00	9.33879E-01	1.86468E-03	0.00000E+00	0.00000E+00
144	9.43771E-01	4.97167E+00	9.33949E-01	1.85281E-03	0.00000E+00	0.00000E+00
145	8.98301E-01	5.00550E+00	9.33699E-01	1.85662E-03	0.00000E+00	0.00000E+00
146	9.22833E-01	5.03950E+00	9.33624E-01	1.84523E-03	0.00000E+00	0.00000E+00
147	9.24198E-01	5.07417E+00	9.33559E-01	1.83361E-03	0.00000E+00	0.00000E+00
148	9.26591E-01	5.10800E+00	9.33511E-01	1.82163E-03	0.00000E+00	0.00000E+00
149	9.14254E-01	5.14283E+00	9.33380E-01	1.81393E-03	0.00000E+00	0.00000E+00
150	8.93634E-01	5.17667E+00	9.33112E-01	1.82154E-03	0.00000E+00	0.00000E+00
151	9.31493E-01	5.21067E+00	9.33101E-01	1.80931E-03	0.00000E+00	0.00000E+00
152	9.41517E-01	5.24450E+00	9.33157E-01	1.79808E-03	0.00000E+00	0.00000E+00
153	9.18224E-01	5.27833E+00	9.33058E-01	1.78887E-03	0.00000E+00	0.00000E+00
154	9.42222E-01	5.31217E+00	9.33118E-01	1.77808E-03	0.00000E+00	0.00000E+00
155	9.02412E-01	5.34617E+00	9.32918E-01	1.77779E-03	0.00000E+00	0.00000E+00
156	9.16376E-01	5.38183E+00	9.32810E-01	1.76947E-03	0.00000E+00	0.00000E+00
157	9.57243E-01	5.41467E+00	9.32968E-01	1.76507E-03	0.00000E+00	0.00000E+00
158	8.95329E-01	5.45050E+00	9.32727E-01	1.77024E-03	0.00000E+00	0.00000E+00
159	9.40781E-01	5.48433E+00	9.32778E-01	1.75967E-03	0.00000E+00	0.00000E+00
160	9.48603E-01	5.51817E+00	9.32878E-01	1.75137E-03	0.00000E+00	0.00000E+00
161	9.90183E-01	5.55200E+00	9.33238E-01	1.77725E-03	0.00000E+00	0.00000E+00
162	9.11692E-01	5.58500E+00	9.33104E-01	1.77123E-03	0.00000E+00	0.00000E+00
163	9.36520E-01	5.61883E+00	9.33125E-01	1.76032E-03	0.00000E+00	0.00000E+00
164	9.47902E-01	5.65100E+00	9.33216E-01	1.75180E-03	0.00000E+00	0.00000E+00
165	9.23662E-01	5.68483E+00	9.33158E-01	1.74200E-03	0.00000E+00	0.00000E+00
166	9.40662E-01	5.71867E+00	9.33203E-01	1.73195E-03	0.00000E+00	0.00000E+00
167	9.12898E-01	5.75250E+00	9.33080E-01	1.72582E-03	0.00000E+00	0.00000E+00
168	9.41259E-01	5.78550E+00	9.33130E-01	1.71610E-03	0.00000E+00	0.00000E+00
169	9.74665E-01	5.81933E+00	9.33378E-01	1.72383E-03	0.00000E+00	0.00000E+00
170	9.36418E-01	5.85417E+00	9.33396E-01	1.71363E-03	0.00000E+00	0.00000E+00
171	9.54401E-01	5.88800E+00	9.33521E-01	1.70799E-03	0.00000E+00	0.00000E+00
172	9.46339E-01	5.91917E+00	9.33596E-01	1.69959E-03	0.00000E+00	0.00000E+00
173	9.44046E-01	5.95300E+00	9.33657E-01	1.69072E-03	0.00000E+00	0.00000E+00
174	9.51695E-01	5.98600E+00	9.33762E-01	1.68413E-03	0.00000E+00	0.00000E+00
175	9.21412E-01	6.01900E+00	9.33691E-01	1.67589E-03	0.00000E+00	0.00000E+00
176	9.24146E-01	6.05283E+00	9.33636E-01	1.66713E-03	0.00000E+00	0.00000E+00
177	9.08439E-01	6.08767E+00	9.33492E-01	1.66382E-03	0.00000E+00	0.00000E+00
178	9.67472E-01	6.11967E+00	9.33685E-01	1.66557E-03	0.00000E+00	0.00000E+00
179	9.40432E-01	6.15433E+00	9.33723E-01	1.65657E-03	0.00000E+00	0.00000E+00
180	9.47099E-01	6.18650E+00	9.33798E-01	1.64895E-03	0.00000E+00	0.00000E+00
181	9.12795E-01	6.22033E+00	9.33681E-01	1.64391E-03	0.00000E+00	0.00000E+00
182	9.35628E-01	6.25517E+00	9.33692E-01	1.63478E-03	0.00000E+00	0.00000E+00
183	9.31479E-01	6.28800E+00	9.33679E-01	1.62577E-03	0.00000E+00	0.00000E+00
184	9.04767E-01	6.32200E+00	9.33521E-01	1.62460E-03	0.00000E+00	0.00000E+00
185	9.63407E-01	6.35583E+00	9.33684E-01	1.62393E-03	0.00000E+00	0.00000E+00
186	9.82646E-01	6.38883E+00	9.33950E-01	1.63686E-03	0.00000E+00	0.00000E+00

187	9.07694E-01	6.42350E+00	9.33808E-01	1.63416E-03	0.00000E+00	0.00000E+00
188	9.34557E-01	6.45650E+00	9.33814E-01	1.62536E-03	0.00000E+00	0.00000E+00
189	9.51836E-01	6.49217E+00	9.33910E-01	1.61952E-03	0.00000E+00	0.00000E+00
190	9.14491E-01	6.52700E+00	9.33807E-01	1.61419E-03	0.00000E+00	0.00000E+00
191	9.31743E-01	6.56083E+00	9.33796E-01	1.60566E-03	0.00000E+00	0.00000E+00
192	9.40107E-01	6.59383E+00	9.33829E-01	1.59753E-03	0.00000E+00	0.00000E+00
193	9.12241E-01	6.62767E+00	9.33716E-01	1.59316E-03	0.00000E+00	0.00000E+00
194	9.48538E-01	6.65883E+00	9.33793E-01	1.58672E-03	0.00000E+00	0.00000E+00
195	9.31343E-01	6.69183E+00	9.33781E-01	1.57653E-03	0.00000E+00	0.00000E+00
196	9.43479E-01	6.72467E+00	9.33831E-01	1.57117E-03	0.00000E+00	0.00000E+00
197	9.58436E-01	6.75950E+00	9.33957E-01	1.56817E-03	0.00000E+00	0.00000E+00
198	9.06278E-01	6.79150E+00	9.33815E-01	1.56653E-03	0.00000E+00	0.00000E+00
199	8.92724E-01	6.82633E+00	9.33607E-01	1.57245E-03	0.00000E+00	0.00000E+00
200	9.34782E-01	6.86117E+00	9.33613E-01	1.56450E-03	0.00000E+00	0.00000E+00
201	9.59515E-01	6.89500E+00	9.33743E-01	1.56205E-03	0.00000E+00	0.00000E+00
202	9.35452E-01	6.92800E+00	9.33752E-01	1.55425E-03	0.00000E+00	0.00000E+00
203	9.13608E-01	6.96000E+00	9.33651E-01	1.54974E-03	0.00000E+00	0.00000E+00
204	9.24135E-01	6.99383E+00	9.33604E-01	1.54277E-03	0.00000E+00	0.00000E+00
205	9.55551E-01	7.02683E+00	9.33712E-01	1.53895E-03	0.00000E+00	0.00000E+00
206	9.06918E-01	7.06067E+00	9.33581E-01	1.53701E-03	0.00000E+00	0.00000E+00
207	9.42248E-01	7.09550E+00	9.33623E-01	1.53008E-03	0.00000E+00	0.00000E+00
208	9.20183E-01	7.12933E+00	9.33558E-01	1.52403E-03	0.00000E+00	0.00000E+00
209	9.43419E-01	7.16233E+00	9.33606E-01	1.51740E-03	0.00000E+00	0.00000E+00
210	9.41051E-01	7.19433E+00	9.33641E-01	1.51051E-03	0.00000E+00	0.00000E+00
211	9.42003E-01	7.22733E+00	9.33681E-01	1.50380E-03	0.00000E+00	0.00000E+00
212	8.90982E-01	7.26200E+00	9.33478E-01	1.51037E-03	0.00000E+00	0.00000E+00
213	9.57178E-01	7.29600E+00	9.33590E-01	1.50738E-03	0.00000E+00	0.00000E+00
214	9.10290E-01	7.33067E+00	9.33481E-01	1.50428E-03	0.00000E+00	0.00000E+00
215	8.84104E-01	7.36650E+00	9.33249E-01	1.51504E-03	0.00000E+00	0.00000E+00
216	9.50654E-01	7.40033E+00	9.33330E-01	1.51013E-03	0.00000E+00	0.00000E+00
217	9.26341E-01	7.43233E+00	9.33298E-01	1.50344E-03	0.00000E+00	0.00000E+00
218	9.29420E-01	7.46617E+00	9.33280E-01	1.49658E-03	0.00000E+00	0.00000E+00
219	9.03187E-01	7.50100E+00	9.33141E-01	1.49610E-03	0.00000E+00	0.00000E+00
220	9.51222E-01	7.53483E+00	9.33224E-01	1.49153E-03	0.00000E+00	0.00000E+00
221	9.23679E-01	7.56967E+00	9.33180E-01	1.48535E-03	0.00000E+00	0.00000E+00
222	9.27250E-01	7.60450E+00	9.33153E-01	1.47882E-03	0.00000E+00	0.00000E+00
223	9.37266E-01	7.63833E+00	9.33172E-01	1.47224E-03	0.00000E+00	0.00000E+00
224	9.58940E-01	7.67133E+00	9.33288E-01	1.47018E-03	0.00000E+00	0.00000E+00
225	9.28442E-01	7.70333E+00	9.33266E-01	1.46373E-03	0.00000E+00	0.00000E+00
226	9.13553E-01	7.73817E+00	9.33178E-01	1.45984E-03	0.00000E+00	0.00000E+00
227	8.91995E-01	7.77200E+00	9.32995E-01	1.46482E-03	0.00000E+00	0.00000E+00
228	9.01803E-01	7.80767E+00	9.32857E-01	1.46484E-03	0.00000E+00	0.00000E+00
229	9.60438E-01	7.84067E+00	9.32979E-01	1.46342E-03	0.00000E+00	0.00000E+00
230	8.93772E-01	7.87533E+00	9.32807E-01	1.46710E-03	0.00000E+00	0.00000E+00
231	9.66852E-01	7.90933E+00	9.32955E-01	1.46823E-03	0.00000E+00	0.00000E+00
232	9.74108E-01	7.94317E+00	9.33134E-01	1.47274E-03	0.00000E+00	0.00000E+00
233	8.89062E-01	7.97800E+00	9.32944E-01	1.47871E-03	0.00000E+00	0.00000E+00
234	9.62702E-01	8.01183E+00	9.33072E-01	1.47790E-03	0.00000E+00	0.00000E+00
235	9.06169E-01	8.04850E+00	9.32956E-01	1.47607E-03	0.00000E+00	0.00000E+00
236	9.11933E-01	8.08317E+00	9.32867E-01	1.47249E-03	0.00000E+00	0.00000E+00
237	9.44068E-01	8.11717E+00	9.32914E-01	1.46698E-03	0.00000E+00	0.00000E+00
238	9.47216E-01	8.15000E+00	9.32975E-01	1.46201E-03	0.00000E+00	0.00000E+00
239	9.23614E-01	8.18383E+00	9.32935E-01	1.45636E-03	0.00000E+00	0.00000E+00
240	9.52147E-01	8.21783E+00	9.33016E-01	1.45248E-03	0.00000E+00	0.00000E+00
241	8.93068E-01	8.25250E+00	9.32849E-01	1.45601E-03	0.00000E+00	0.00000E+00
242	9.16811E-01	8.28650E+00	9.32782E-01	1.45147E-03	0.00000E+00	0.00000E+00
243	9.29697E-01	8.32117E+00	9.32769E-01	1.44549E-03	0.00000E+00	0.00000E+00
244	9.16165E-01	8.35700E+00	9.32701E-01	1.44114E-03	0.00000E+00	0.00000E+00
245	9.04298E-01	8.39267E+00	9.32584E-01	1.43995E-03	0.00000E+00	0.00000E+00
246	9.53972E-01	8.42550E+00	9.32671E-01	1.43671E-03	0.00000E+00	0.00000E+00
247	9.35449E-01	8.45850E+00	9.32683E-01	1.43088E-03	0.00000E+00	0.00000E+00
248	9.66397E-01	8.49233E+00	9.32820E-01	1.43163E-03	0.00000E+00	0.00000E+00
249	9.77602E-01	8.52633E+00	9.33001E-01	1.43730E-03	0.00000E+00	0.00000E+00
250	9.53491E-01	8.56100E+00	9.33084E-01	1.43388E-03	0.00000E+00	0.00000E+00
251	9.53652E-01	8.59317E+00	9.33166E-01	1.43049E-03	0.00000E+00	0.00000E+00
252	9.10631E-01	8.62783E+00	9.33076E-01	1.42761E-03	0.00000E+00	0.00000E+00
253	9.66311E-01	8.66000E+00	9.33209E-01	1.42806E-03	0.00000E+00	0.00000E+00
254	9.30825E-01	8.69467E+00	9.33199E-01	1.42242E-03	0.00000E+00	0.00000E+00
255	9.67691E-01	8.72867E+00	9.33336E-01	1.42340E-03	0.00000E+00	0.00000E+00
256	9.07966E-01	8.76333E+00	9.33236E-01	1.42130E-03	0.00000E+00	0.00000E+00
257	9.23536E-01	8.79717E+00	9.33198E-01	1.41623E-03	0.00000E+00	0.00000E+00
258	9.50763E-01	8.82933E+00	9.33267E-01	1.41235E-03	0.00000E+00	0.00000E+00
259	9.18617E-01	8.86033E+00	9.33210E-01	1.40800E-03	0.00000E+00	0.00000E+00
260	9.42168E-01	8.89333E+00	9.33245E-01	1.40296E-03	0.00000E+00	0.00000E+00
261	9.04953E-01	8.92817E+00	9.33135E-01	1.40180E-03	0.00000E+00	0.00000E+00
262	9.38220E-01	8.96200E+00	9.33155E-01	1.39653E-03	0.00000E+00	0.00000E+00
263	9.04271E-01	8.99683E+00	9.33044E-01	1.39557E-03	0.00000E+00	0.00000E+00
264	8.98266E-01	9.03167E+00	9.32912E-01	1.39655E-03	0.00000E+00	0.00000E+00
265	9.55485E-01	9.06550E+00	9.32997E-01	1.39388E-03	0.00000E+00	0.00000E+00
266	9.33548E-01	9.09850E+00	9.32999E-01	1.38659E-03	0.00000E+00	0.00000E+00
267	9.56060E-01	9.13317E+00	9.33087E-01	1.38608E-03	0.00000E+00	0.00000E+00
268	9.39827E-01	9.16517E+00	9.33112E-01	1.38109E-03	0.00000E+00	0.00000E+00
269	9.21043E-01	9.19817E+00	9.33067E-01	1.37665E-03	0.00000E+00	0.00000E+00
270	9.05240E-01	9.23200E+00	9.32963E-01	1.37543E-03	0.00000E+00	0.00000E+00
271	9.35161E-01	9.26600E+00	9.32971E-01	1.37033E-03	0.00000E+00	0.00000E+00
272	9.58771E-01	9.29883E+00	9.33067E-01	1.36858E-03	0.00000E+00	0.00000E+00
273	9.37723E-01	9.33183E+00	9.33084E-01	1.36363E-03	0.00000E+00	0.00000E+00
274	9.11992E-01	9.36667E+00	9.33006E-01	1.36082E-03	0.00000E+00	0.00000E+00
275	9.03998E-01	9.40333E+00	9.32900E-01	1.35999E-03	0.00000E+00	0.00000E+00
276	9.23672E-01	9.43717E+00	9.32866E-01	1.35543E-03	0.00000E+00	0.00000E+00
277	9.59550E-01	9.47100E+00	9.32963E-01	1.35397E-03	0.00000E+00	0.00000E+00
278	9.42804E-01	9.50400E+00	9.32999E-01	1.34953E-03	0.00000E+00	0.00000E+00
279	9.58298E-01	9.53600E+00	9.33090E-01	1.34775E-03	0.00000E+00	0.00000E+00
280	9.68398E-01	9.56983E+00	9.33217E-01	1.34888E-03	0.00000E+00	0.00000E+00
281	9.54490E-01	9.60183E+00	9.33294E-01	1.34620E-03	0.00000E+00	0.00000E+00

282	9.05657E-01	9.63667E+00	9.33195E-01	1.34501E-03	0.00000E+00	0.00000E+00
283	9.47219E-01	9.67050E+00	9.33245E-01	1.34115E-03	0.00000E+00	0.00000E+00
284	9.51373E-01	9.70450E+00	9.33309E-01	1.33793E-03	0.00000E+00	0.00000E+00
285	9.59679E-01	9.73733E+00	9.33402E-01	1.33644E-03	0.00000E+00	0.00000E+00
286	9.45263E-01	9.77133E+00	9.33444E-01	1.33238E-03	0.00000E+00	0.00000E+00
287	9.77649E-01	9.80417E+00	9.33599E-01	1.33673E-03	0.00000E+00	0.00000E+00
288	8.93935E-01	9.84083E+00	9.33460E-01	1.33925E-03	0.00000E+00	0.00000E+00
289	9.55230E-01	9.87383E+00	9.33536E-01	1.33673E-03	0.00000E+00	0.00000E+00
290	9.40062E-01	9.90767E+00	9.33559E-01	1.33227E-03	0.00000E+00	0.00000E+00
291	9.60614E-01	9.94150E+00	9.33653E-01	1.33095E-03	0.00000E+00	0.00000E+00
292	9.39502E-01	9.97633E+00	9.33673E-01	1.32650E-03	0.00000E+00	0.00000E+00
293	9.03937E-01	1.00112E+01	9.33571E-01	1.32588E-03	0.00000E+00	0.00000E+00
294	9.05696E-01	1.00458E+01	9.33475E-01	1.32478E-03	0.00000E+00	0.00000E+00
295	9.57129E-01	1.00770E+01	9.33556E-01	1.32271E-03	0.00000E+00	0.00000E+00
296	8.99288E-01	1.01118E+01	9.33439E-01	1.32335E-03	0.00000E+00	0.00000E+00
297	8.80477E-01	1.01465E+01	9.33260E-01	1.33102E-03	0.00000E+00	0.00000E+00
298	8.99152E-01	1.01805E+01	9.33145E-01	1.33151E-03	0.00000E+00	0.00000E+00
299	8.93755E-01	1.02162E+01	9.33012E-01	1.33363E-03	0.00000E+00	0.00000E+00
300	9.30119E-01	1.02518E+01	9.33002E-01	1.32918E-03	0.00000E+00	0.00000E+00
301	8.74132E-01	1.02875E+01	9.32805E-01	1.33928E-03	0.00000E+00	0.00000E+00
302	8.94503E-01	1.03215E+01	9.32678E-01	1.34090E-03	0.00000E+00	0.00000E+00
303	9.07105E-01	1.03553E+01	9.32593E-01	1.33914E-03	0.00000E+00	0.00000E+00

KENO MESSAGE NUMBER K5-123 EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

LWT ANALYSIS: W17X17 OFA ASSEMBLY; WATER IN GAP

LIFETIME = 1.00988E-04 + OR - 2.94947E-07   GENERATION TIME = 3.85312E-05 + OR - 8.81779E-08
NU BAR = 2.43572E+00 + OR - 9.65096E-05   AVERAGE FISSION GROUP = 2.26571E+01 + OR - 5.04111E-03
ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION = 1.40077E-01 + OR - 6.25718E-04

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.93252	+ OR - 0.00134	0.93118 TO 0.93386	0.92984 TO 0.93520	0.92850 TO 0.93655	300000
4	0.93249	+ OR - 0.00135	0.93115 TO 0.93384	0.92980 TO 0.93519	0.92846 TO 0.93653	299000
5	0.93255	+ OR - 0.00135	0.93120 TO 0.93390	0.92985 TO 0.93525	0.92850 TO 0.93660	298000
6	0.93252	+ OR - 0.00135	0.93117 TO 0.93387	0.92981 TO 0.93523	0.92846 TO 0.93658	297000
7	0.93251	+ OR - 0.00136	0.93116 TO 0.93387	0.92980 TO 0.93523	0.92844 TO 0.93659	296000
8	0.93252	+ OR - 0.00136	0.93116 TO 0.93388	0.92980 TO 0.93525	0.92843 TO 0.93661	295000
9	0.93250	+ OR - 0.00137	0.93113 TO 0.93387	0.92977 TO 0.93524	0.92840 TO 0.93660	294000
10	0.93264	+ OR - 0.00136	0.93128 TO 0.93401	0.92991 TO 0.93537	0.92855 TO 0.93674	293000
11	0.93271	+ OR - 0.00137	0.93134 TO 0.93408	0.92998 TO 0.93545	0.92861 TO 0.93682	292000
12	0.93277	+ OR - 0.00137	0.93140 TO 0.93414	0.93003 TO 0.93551	0.92866 TO 0.93688	291000
17	0.93267	+ OR - 0.00139	0.93126 TO 0.93406	0.92988 TO 0.93546	0.92849 TO 0.93685	286000
22	0.93271	+ OR - 0.00141	0.93129 TO 0.93412	0.92988 TO 0.93554	0.92846 TO 0.93695	281000
27	0.93290	+ OR - 0.00143	0.93147 TO 0.93433	0.93005 TO 0.93576	0.92862 TO 0.93718	276000
32	0.93293	+ OR - 0.00145	0.93148 TO 0.93438	0.93004 TO 0.93583	0.92859 TO 0.93728	271000
37	0.93295	+ OR - 0.00147	0.93149 TO 0.93442	0.93002 TO 0.93589	0.92856 TO 0.93735	266000
42	0.93317	+ OR - 0.00148	0.93169 TO 0.93465	0.93021 TO 0.93612	0.92874 TO 0.93760	261000
47	0.93278	+ OR - 0.00148	0.93130 TO 0.93426	0.92981 TO 0.93575	0.92833 TO 0.93723	256000
52	0.93260	+ OR - 0.00150	0.93110 TO 0.93410	0.92959 TO 0.93561	0.92809 TO 0.93711	251000
57	0.93279	+ OR - 0.00153	0.93127 TO 0.93432	0.92974 TO 0.93585	0.92821 TO 0.93737	246000
62	0.93298	+ OR - 0.00154	0.93144 TO 0.93452	0.92991 TO 0.93605	0.92837 TO 0.93759	241000
67	0.93301	+ OR - 0.00156	0.93145 TO 0.93458	0.92989 TO 0.93614	0.92833 TO 0.93770	236000
72	0.93286	+ OR - 0.00157	0.93129 TO 0.93443	0.92972 TO 0.93599	0.92816 TO 0.93756	231000
77	0.93249	+ OR - 0.00158	0.93092 TO 0.93407	0.92934 TO 0.93564	0.92777 TO 0.93722	226000
82	0.93249	+ OR - 0.00160	0.93089 TO 0.93409	0.92930 TO 0.93568	0.92770 TO 0.93728	221000
87	0.93291	+ OR - 0.00161	0.93131 TO 0.93452	0.92970 TO 0.93613	0.92809 TO 0.93774	216000
92	0.93307	+ OR - 0.00164	0.93143 TO 0.93472	0.92979 TO 0.93636	0.92814 TO 0.93801	211000

LWT ANALYSIS; W17X17 OFA ASSEMBLY; WATER IN GAP

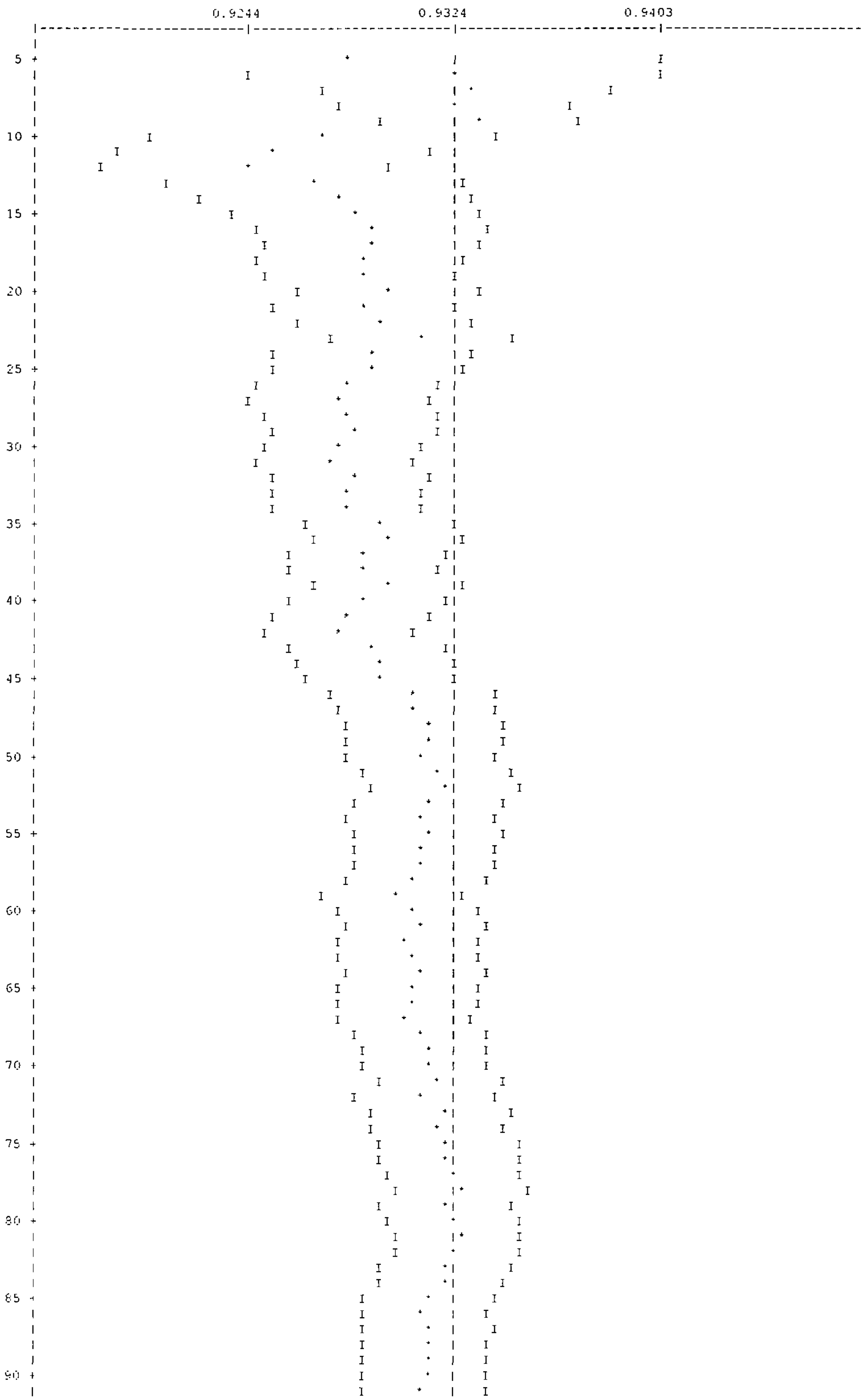
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
97	0.93315	+ OR - 0.00167	0.93148 TO 0.93482	0.92981 TO 0.93649	0.92814 TO 0.93816	206000
102	0.93271	+ OR - 0.00167	0.93104 TO 0.93438	0.92937 TO 0.93605	0.92770 TO 0.93772	201000
107	0.93281	+ OR - 0.00170	0.93111 TO 0.93452	0.92941 TO 0.93622	0.92770 TO 0.93793	196000
112	0.93320	+ OR - 0.00173	0.93146 TO 0.93493	0.92973 TO 0.93667	0.92800 TO 0.93840	191000
117	0.93307	+ OR - 0.00176	0.93130 TO 0.93483	0.92954 TO 0.93659	0.92778 TO 0.93836	186000
122	0.93259	+ OR - 0.00178	0.93080 TO 0.93437	0.92902 TO 0.93616	0.92724 TO 0.93794	181000
127	0.93251	+ OR - 0.00183	0.93068 TO 0.93434	0.92885 TO 0.93617	0.92702 TO 0.93800	176000
132	0.93203	+ OR - 0.00185	0.93018 TO 0.93388	0.92832 TO 0.93574	0.92647 TO 0.93759	171000
137	0.93187	+ OR - 0.00186	0.93001 TO 0.93373	0.92814 TO 0.93559	0.92628 TO 0.93746	166000
142	0.93166	+ OR - 0.00191	0.92975 TO 0.93357	0.92784 TO 0.93548	0.92593 TO 0.93739	161000
147	0.93169	+ OR - 0.00194	0.92975 TO 0.93364	0.92780 TO 0.93558	0.92586 TO 0.93753	156000
152	0.93203	+ OR - 0.00199	0.93004 TO 0.93402	0.92805 TO 0.93601	0.92607 TO 0.93800	151000
157	0.93219	+ OR - 0.00203	0.93016 TO 0.93423	0.92813 TO 0.93626	0.92609 TO 0.93829	146000
162	0.93201	+ OR - 0.00204	0.92997 TO 0.93405	0.92794 TO 0.93609	0.92590 TO 0.93813	141000
167	0.93200	+ OR - 0.00210	0.92990 TO 0.93410	0.92779 TO 0.93621	0.92569 TO 0.93831	136000
172	0.93129	+ OR - 0.00215	0.92914 TO 0.93344	0.92700 TO 0.93559	0.92485 TO 0.93773	131000
177	0.93134	+ OR - 0.00222	0.92913 TO 0.93356	0.92691 TO 0.93577	0.92470 TO 0.93799	126000
182	0.93096	+ OR - 0.00228	0.92868 TO 0.93323	0.92640 TO 0.93551	0.92413 TO 0.93779	121000
187	0.93065	+ OR - 0.00230	0.92836 TO 0.93295	0.92606 TO 0.93525	0.92377 TO 0.93754	116000
192	0.93048	+ OR - 0.00239	0.92809 TO 0.93286	0.92570 TO 0.93525	0.92332 TO 0.93763	111000
197	0.93008	+ OR - 0.00247	0.92761 TO 0.93255	0.92514 TO 0.93502	0.92267 TO 0.93749	106000
202	0.93030	+ OR - 0.00254	0.92776 TO 0.93283	0.92522 TO 0.93537	0.92269 TO 0.93791	101000
207	0.93039	+ OR - 0.00264	0.92776 TO 0.93303	0.92512 TO 0.93566	0.92249 TO 0.93830	96000
212	0.93055	+ OR - 0.00274	0.92781 TO 0.93328	0.92508 TO 0.93602	0.92234 TO 0.93875	91000
217	0.93083	+ OR - 0.00281	0.92802 TO 0.93364	0.92522 TO 0.93644	0.92241 TO 0.93925	86000
222	0.93107	+ OR - 0.00295	0.92812 TO 0.93402	0.92517 TO 0.93697	0.92223 TO 0.93991	81000
227	0.93140	+ OR - 0.00307	0.92833 TO 0.93447	0.92527 TO 0.93754	0.92220 TO 0.94060	76000

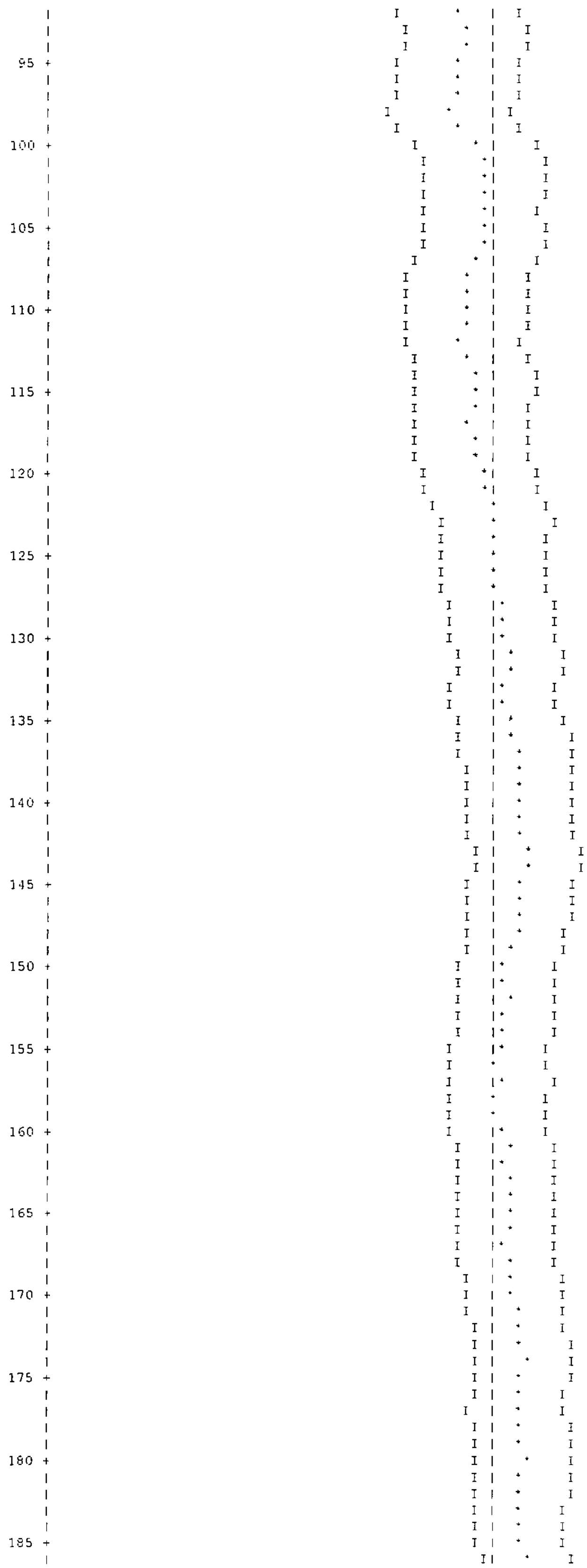
LWT ANALYSIS; W17X17 OFA ASSEMBLY; WATER IN GAP

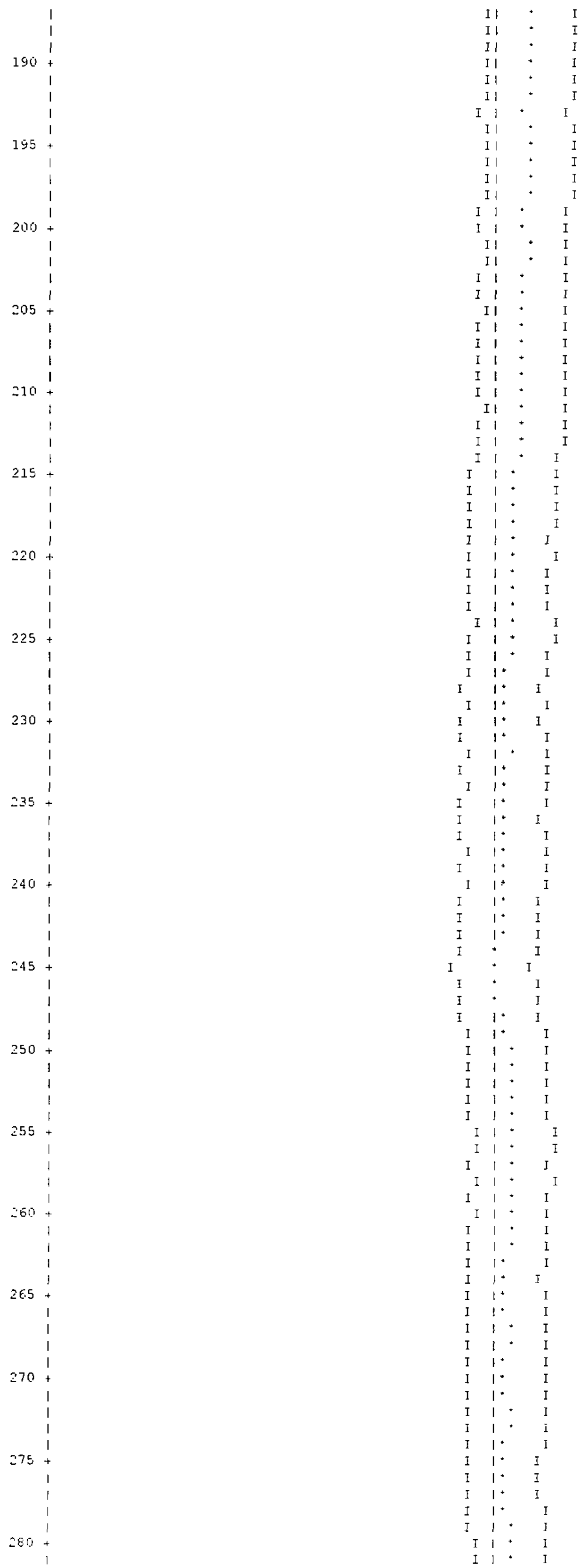
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
232	0.93084	+ OR - 0.00309	0.92775 TO 0.93393	0.92466 TO 0.93701	0.92157 TO 0.94010	71000
237	0.93145	+ OR - 0.00318	0.92826 TO 0.93463	0.92508 TO 0.93782	0.92190 TO 0.94100	66000
242	0.93185	+ OR - 0.00335	0.92850 TO 0.93520	0.92515 TO 0.93855	0.92180 TO 0.94189	61000
247	0.93220	+ OR - 0.00358	0.92862 TO 0.93578	0.92503 TO 0.93936	0.92145 TO 0.94295	56000
252	0.93022	+ OR - 0.00369	0.92653 TO 0.93391	0.92284 TO 0.93760	0.91915 TO 0.94129	51000
257	0.92924	+ OR - 0.00390	0.92534 TO 0.93313	0.92144 TO 0.93703	0.91755 TO 0.94092	46000
262	0.92903	+ OR - 0.00428	0.92475 TO 0.93330	0.92047 TO 0.93758	0.91620 TO 0.94186	41000
267	0.92896	+ OR - 0.00463	0.92433 TO 0.93358	0.91970 TO 0.93821	0.91507 TO 0.94284	36000
272	0.92846	+ OR - 0.00522	0.92325 TO 0.93368	0.91803 TO 0.93890	0.91281 TO 0.94411	31000
277	0.92867	+ OR - 0.00600	0.92268 TO 0.93467	0.91668 TO 0.94066	0.91069 TO 0.94666	26000
282	0.92456	+ OR - 0.00675	0.91781 TO 0.93132	0.91106 TO 0.93807	0.90430 TO 0.94482	21000
287	0.91466	+ OR - 0.00703	0.90763 TO 0.92170	0.90060 TO 0.92873	0.89356 TO 0.93577	16000
292	0.90412	+ OR - 0.00688	0.89724 TO 0.91100	0.89036 TO 0.91787	0.88348 TO 0.92475	11000
297	0.89979	+ OR - 0.00752	0.89227 TO 0.90731	0.88475 TO 0.91483	0.87723 TO 0.92235	6000

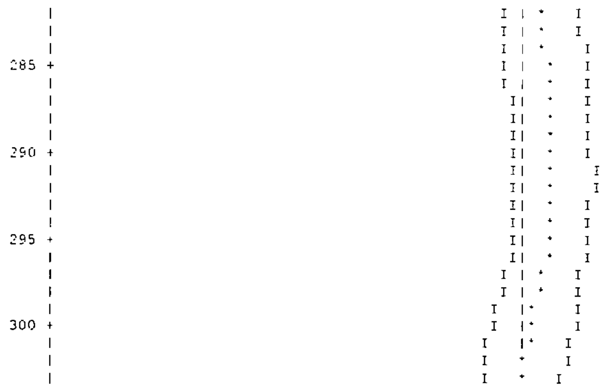
LWT ANALYSIS; W17X17 OFA ASSEMBLY; WATER IN GAP

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.9325 + OR - 0.0013 WHICH OCCURS FOR 303 GENERATIONS RUN.




95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185




285
290
295
300

LWT ANALYSIS; W17X17 OFA ASSEMBLY; WATER IN GAP

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0043			3.96333E-03	2.2101	2.32667E-03	1.5738	7.13220E-06	70.5924
2	0.0172			1.60748E-02	0.6729	8.15133E-03	0.5683	6.56993E-06	71.1810
3	0.0191			1.78139E-02	0.5962	7.42025E-03	0.5726	0.00000E+00	0.0000
4	0.0080			7.43939E-03	0.7686	3.56443E-03	0.7418	0.00000E+00	0.0000
5	0.0024			2.25833E-03	0.5724	2.43004E-03	0.5047	3.33836E-06	100.0000
6	0.0020			1.90579E-03	0.4378	4.02480E-03	0.3774	7.64047E-06	71.5891
7	0.0020			1.88267E-03	0.4394	4.57068E-03	0.3857	2.92771E-06	100.0000
8	0.0021			1.93315E-03	0.4678	6.88167E-03	0.3994	0.00000E+00	0.0000
9	0.0028			2.63764E-03	0.5077	1.07470E-02	0.4242	0.00000E+00	0.0000
10	0.0060			5.62159E-03	0.5638	1.65638E-02	0.4683	0.00000E+00	0.0000
11	0.0129			1.20234E-02	0.5301	2.72875E-02	0.4436	0.00000E+00	0.0000
12	0.0170			1.58775E-02	0.5790	2.92963E-02	0.5009	3.27701E-06	100.0000
13	0.0158			1.47503E-02	0.6289	2.92144E-02	0.5315	0.00000E+00	0.0000
14	0.0126			1.17142E-02	0.5393	4.22411E-02	0.4594	0.00000E+00	0.0000
15	0.0027			2.52808E-03	1.0582	8.58507E-03	0.8058	0.00000E+00	0.0000
16	0.0019			1.73386E-03	1.3526	5.11345E-03	0.9908	0.00000E+00	0.0000
17	0.0029			2.67751E-03	1.7290	3.51488E-03	1.0442	0.00000E+00	0.0000
18	0.0040			3.71272E-03	1.8852	3.72257E-03	1.2083	0.00000E+00	0.0000
19	0.0047			4.39970E-03	1.5321	5.76579E-03	0.9257	0.00000E+00	0.0000
20	0.0202			1.88134E-02	0.8208	2.28784E-02	0.6376	3.09353E-06	100.0000
21	0.0110			1.02323E-02	1.2799	1.00350E-02	0.8804	0.00000E+00	0.0000
22	0.0269			2.50706E-02	0.9306	2.32588E-02	0.6493	0.00000E+00	0.0000
23	0.1002			9.34293E-02	0.5043	9.17259E-02	0.3357	8.32955E-07	100.0000
24	0.2103			1.96081E-01	0.3276	1.90202E-01	0.2028	1.56009E-06	71.2983
25	0.1855			1.72976E-01	0.3897	1.65903E-01	0.2460	1.66667E-06	100.0000
26	0.2288			2.13321E-01	0.3454	2.05684E-01	0.2108	2.11603E-06	74.7173
27	0.0768			7.16497E-02	0.6616	7.04055E-02	0.3989	9.96604E-07	100.0000
SYSTEM TOTAL =				9.32521E-01	0.1439	1.00151E+00	0.0436	4.11515E-05	26.6621

ELAPSED TIME 10.35717 MINUTES

RANDOM NUMBER= 1EE413D01710

```
LWT ANALYSIS; W17X17 OFA ASSEMBLY; WATER IN GAP

                         FREQUENCY FOR GENERATIONS    4 TO  303
0.8692 TO 0.8818     ***
0.8818 TO 0.8945     ***************
0.8945 TO 0.9071     *******************************
0.9071 TO 0.9198     ****************************************
0.9198 TO 0.9324     **********************************************************
0.9324 TO 0.9451     *************************************************************
0.9451 TO 0.9577     **********************************************
0.9577 TO 0.9704     ********************************
0.9704 TO 0.9830     ************
0.9830 TO 0.9957     **

                         FREQUENCY FOR GENERATIONS   79 TO  303
0.8692 TO 0.8818     ***
0.8818 TO 0.8945     ************
0.8945 TO 0.9071     **************************
0.9071 TO 0.9198     **************************
0.9198 TO 0.9324     ******************************************
0.9324 TO 0.9451     ******************************************
0.9451 TO 0.9577     ************************************
0.9577 TO 0.9704     *************************
0.9704 TO 0.9830     *********
0.9830 TO 0.9957     *

                         FREQUENCY FOR GENERATIONS  154 TO  303
0.8692 TO 0.8818     **
0.8818 TO 0.8945     *********
0.8945 TO 0.9071     *********************
0.9071 TO 0.9198     ******************
0.9198 TO 0.9324     ********************
0.9324 TO 0.9451     ******************************
0.9451 TO 0.9577     ***************************
0.9577 TO 0.9704     *****************
0.9704 TO 0.9830     *****
0.9830 TO 0.9957     *

                         FREQUENCY FOR GENERATIONS  229 TO  303
0.8692 TO 0.8818     **
0.8818 TO 0.8945     *****
0.8945 TO 0.9071     **************
0.9071 TO 0.9198     *******
0.9198 TO 0.9324     *******
0.9324 TO 0.9451     ***********
0.9451 TO 0.9577     **************
0.9577 TO 0.9704     ************
0.9704 TO 0.9830     ***
0.9830 TO 0.9957


**********************************************************************************************************************************
*

          CONGRATULATIONS!  YOU HAVE  SUCCESSFULLY TRAVERSED THE PERILOUS PATH THROUGH KENO V IN  10.35717 MINUTES

**********************************************************************************************************************************
*
```

6.6.2 BWR Fuel Assemblies

This section contains abbreviated output files from the most reactive normal condition and accident condition moderator density variation cases.

Figure 6.6.2-1 CSAS Input/Output for NAC-LWT with BWR Fuel Assemblies – Most Reactive Normal Condition Configuration

```
      PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
 MODULE CSAS25   WILL BE CALLED
   NAC-LWT CASK MODEL; Exxon 9x9 - 2 Water Rods  80 MIL CHANNEL
   27GROUPNDF4 LATTICECELL
   UO2    1 0.95 293.0 92235 4.0 92238 96.0 END
   ZIRCALLOY  2 1.0  293.0  END
   H2O    3 1.0  293.0  END
   AL     4 1.0 293.0 END
   SS304 5 1.0 293.0 END
   PB     6 1.0 293.0 END
   H2O    7 1.0 293.0 END
   H2O    8 1.000 293.0 END
   H2O    9 1.0E-20 293.0 END
   END COMP
   SQUAREPITCH  1.4529 0.9055 1 3 1.0770 2 0.9246 9 END
   NAC-LWT CASK MODEL; Exxon 9x9 - 2 Water Rods  80 MIL CHANNEL
   READ PARAM RUN=YES PLT=NO TME=5000 GEN=303 NPG=1000 END PARAM
   READ GEOM
   UNIT  1
   COM='FUEL PIN CELL - WITH H2O'
   CYLINDER  1 1  0.4528   2P10.0
   CYLINDER  9 1  0.4623   2P10.0
   CYLINDER  2 1  0.5385   2P10.0
   CUBOID    3 1  4P0.7264 2P10.0
   UNIT  2
   COM='WATER ROD CELL - WITH H2O'
   CYLINDER  3 1  0.4623   2P10.0
   CYLINDER  2 1  0.5385   2P10.0
   CUBOID    3 1  4P0.7264 2P10.0
   UNIT 3
   ARRAY    1   -6.5376 -6.5376 -10.0
   CUBOID   3 1 4P6.7031   2P10.0
   CUBOID   2 1 4P6.9063   2P10.0
   CUBOID   3 1 4P7.3025   2P10.0
   UNIT 4
   ARRAY    1   -6.5376 -6.5376 -10.0
   CUBOID   3 1 4P6.7031   2P10.0
   CUBOID   2 1 4P6.9063   2P10.0
   CUBOID   3 1 4P7.3025   2P10.0
   UNIT 5
   CYLINDER 4 1 16.8275    2P10.0
   HOLE  3   -7.4613  0.0  0.0
   HOLE  4    7.4613  0.0  0.0
   CYLINDER 3 1 16.9863    2P10.0
   CYLINDER 5 1 18.8913    2P10.0
   CYLINDER 6 1 33.4963    2P10.0
   CYLINDER 5 1 36.5443    2P10.0
   CYLINDER 7 1 49.2443    2P10.0
   CYLINDER 5 1 49.8539    2P10.0
   GLOBAL UNIT 6
   CYLINDER 8 1 696.00   2P10.0
   HOLE 5  00.00     00.00  0.0
   HOLE 5  00.00     243.80  0.0
   HOLE 5  211.17    121.90  0.0
   HOLE 5  211.17   -121.90  0.0
   HOLE 5  00.00    -243.80  0.0
   HOLE 5 -211.17   -121.90  0.0
   HOLE 5 -211.17    121.90  0.0
   HOLE 5    0.0      487.7  0.0
   HOLE 5  211.2     365.8  0.0
   HOLE 5  422.3      243.8  0.0
   HOLE 5  422.3        0.0  0.0
   HOLE 5  422.3     -243.8  0.0
   HOLE 5  211.2    -365.8  0.0
   HOLE 5    0.0     -487.7  0.0
   HOLE 5 -211.2    -365.8  0.0
   HOLE 5 -422.3     -243.88 0.0
   HOLE 5 -422.3       0.0  0.0
   HOLE 5 -422.3      243.8  0.0
   HOLE 5 -211.2     365.8  0.0
   HOLE 5  633.51     121.9 0.0
   CUBOID   8 1 4P696.00   2P10.0
   END GEOM
   READ ARRAY
   ARA=1   NUX=9 NUY=9 NUZ=1  FILL
       36R1
    4R1  2   4R1
    5R1  2   3R1
       27R1
   END FILL
   END ARRAY
   READ BOUNDS ZFC=REF YXF=H2O END BOUNDS
   END DATA

 SECONDARY MODULE 000008   HAS BEEN CALLED.

 MODULE 000008   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     0.61 (SECONDS).
```

```
SECONDARY MODULE 000002   HAS BEEN CALLED.

MODULE 000002   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     5.88 (SECONDS).

SECONDARY MODULE 000009   HAS BEEN CALLED.

MODULE 000009   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   440.77 (SECONDS).

MODULE CSAS25   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   448.85 (SECONDS).
```

```
 CCCCCCCCCC    SSSSSSSSSS     AAAAAAAA     SSSSSSSSSS     2222222222   555555555555
CCCCCCCCCCCC  SSSSSSSSSSSS   AAAAAAAAAA   SSSSSSSSSSSS   222222222222  555555555555
CC        CC  SS        SS  AA        AA  SS        SS  22        22  55
CC            SS            AA        AA  SS                      22  55
CC            SS            AA        AA  SS                      22  55
CC            SSSSSSSSSSS   AAAAAAAAAAAA  SSSSSSSSSSS            22   55555555555
CC             SSSSSSSSSSS  AAAAAAAAAAAA   SSSSSSSSSSS          22    555555555555
CC                      SS  AA        AA            SS        22                55
CC                      SS  AA        AA            SS      22                  55
CC        CC  SS        SS  AA        AA  SS        SS    22        55        55
CCCCCCCCCCCC  SSSSSSSSSSSS  AA        AA  SSSSSSSSSSSS  222222222222  555555555555
 CCCCCCCCCC    SSSSSSSSSS   AA        AA   SSSSSSSSSS   222222222222   5555555555


 SSSSSSSSSS    CCCCCCCCCC     AAAAAAAA    LL            EEEEEEEEEEEE                PPPPPPPPPPP    CCCCCCCCCC
SSSSSSSSSSSS  CCCCCCCCCCCC   AAAAAAAAAA   LL            EEEEEEEEEEEE                PPPPPPPPPPPP  CCCCCCCCCCCC
SS        SS  CC        CC  AA        AA  LL            EE                          PP        PP  CC        CC
SS            CC            AA        AA  LL            EE                          PP        PP  CC
SS            CC            AA        AA  LL            EE                          PP        PP  CC
SSSSSSSSSSS   CC            AAAAAAAAAAAA  LL            EEEEEEEE      ------------  PPPPPPPPPPPP  CC
 SSSSSSSSSSS  CC            AAAAAAAAAAAA  LL            EEEEEEEE      ------------  PPPPPPPPPPP   CC
          SS  CC            AA        AA  LL            EE                          PP            CC
          SS  CC            AA        AA  LL            EE                          PP            CC
SS        SS  CC        CC  AA        AA  LL            EE                          PP            CC        CC
SSSSSSSSSSSS  CCCCCCCCCCCC  AA        AA  LLLLLLLLLLLL  EEEEEEEEEEEE                PP            CCCCCCCCCCCC
 SSSSSSSSSS    CCCCCCCCCC   AA        AA  LLLLLLLLLLLL  EEEEEEEEEEEE                PP             CCCCCCCCCC


   0000000    777777777777            //   2222222222    3333333333            //   9999999999    8888888888
 000000000    777777777777           //   222222222222  333333333333          //   999999999999  888888888888
 00      00   77        77          //    22        22  33        33         //    99        99  88        88
00        00           77          //               22            33        //     99        99  88        88
00        00          77          //                22            33       //      99        99  88        88
00        00         77          //               22           333        //       999999999999   8888888888
00        00         77         //              22             333       //         99999999999   8888888888
00        00        77         //             22                33      //                   99  88        88
00        00        77        //            22                  33     //                    99  88        88
 00      00         77       //           22          33        33    //                     99  88        88
 000000000          77      //            222222222222  333333333333 //            999999999999  888888888888
   0000000          77     //             222222222222   3333333333 //             999999999999   8888888888


 2222222222        11                        11        2222222222                 3333333333    3333333333
222222222222      111                       111       222222222222               333333333333  333333333333
22        22     1111         :::          1111       22        22      :::      33        33  33        33
          22       11         :::            11                 22      :::                33            33
          22       11         :::            11                 22      :::                33            33
        22         11                        11               22                          333           333
      22           11                        11             22                            333           333
    22             11         :::            11           22            :::                33            33
  22               11         :::            11         22              :::                33            33
22                 11         :::            11       22                :::      33        33  33        33
222222222222    11111111                  11111111    222222222222               333333333333  333333333333
222222222222    11111111                  11111111    222222222222                3333333333    3333333333
```

```
 SSSSSSSSSSS    CCCCCCCCCCC      AAAAAAAAA     LL            EEEEEEEEEEEEE                   PPPPPPPPPPPP     CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC    AAAAAAAAAAA    LL            EEEEEEEEEEEEE                   PPPPPPPPPPPPP   CCCCCCCCCCCCC
SS         SS  CC         CC   AA         AA   LL            EE                              PP         PP   CC         CC
SS             CC              AA         AA   LL            EE                              PP         PP   CC
SS             CC              AA         AA   LL            EE                              PP         PP   CC
SSSSSSSSSSSS   CC              AAAAAAAAAAAAA   LL            EEEEEEEEE       -------------   PPPPPPPPPPPPP   CC
 SSSSSSSSSSSS  CC              AAAAAAAAAAAAA   LL            EEEEEEEEE       -------------   PPPPPPPPPPPP    CC
           SS  CC              AA         AA   LL            EE                              PP              CC
           SS  CC              AA         AA   LL            EE                              PP              CC
SS         SS  CC         CC   AA         AA   LL            EE                              PP              CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL EEEEEEEEEEEEE                   PP              CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC    AA         AA   LLLLLLLLLLLLL EEEEEEEEEEEEE                   PP               CCCCCCCCCCC
```

```
*****                                                              *****
*****              PROGRAM VERIFICATION INFORMATION                *****
*****                                                              *****
*****            CODE SYSTEM:   SCALE-PC VERSION:   4.3            *****
*****                                                              *****

*****                                                              *****
*****                                                              *****
*****              PROGRAM:  CSAS                                  *****
*****                                                              *****
*****        CREATION DATE:  03/08/96                              *****
*****                                                              *****
*****               VOLUME:  ENG                                   *****
*****                                                              *****
*****              LIBRARY:  G:\SCALE43\WIN_NT\EXE                 *****
*****                                                              *****
*****                                                              *****
*****      PRODUCTION CODE:  CSAS                                  *****
*****                                                              *****
*****              VERSION:  3.1                                   *****
*****                                                              *****
*****              JOBNAME:  SCALE-PC                              *****
*****                                                              *****
*****    DATE OF EXECUTION:  07/23/98                              *****
*****                                                              *****
*****    TIME OF EXECUTION:  21:12:33                              *****
*****                                                              *****
*****                                                              *****
```

```
NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS  80 MIL CHANNEL

**** PROBLEM PARAMETERS ****

LIB 27GROUPNDF4  LIBRARY
MXX            9 MIXTURES
MSC            9 COMPOSITION SPECIFICATIONS
IZM            4 MATERIAL ZONES
GE  LATTICECELL  GEOMETRY
MORE           0 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
MSLN           0 FUEL SOLUTIONS

**** PROBLEM COMPOSITION DESCRIPTION ****

SC  UO2          STANDARD COMPOSITION
MX             1 MIXTURE NO.
VF        0.9500 VOLUME FRACTION
ROTH     10.9600 THEORETICAL DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           92000      1.00 ATOM/MOLECULE
                           92235     4.000 WT%
                           92238    96.000 WT%
            8016      2.00 ATOMS/MOLECULE
END

SC  ZIRCALLOY    STANDARD COMPOSITION
MX             2 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      6.5600 THEORETICAL DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           40302      1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX             3 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      0.9982 THEORETICAL DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
            1001      2.00 ATOMS/MOLECULE
            8016      1.00 ATOM/MOLECULE
END

SC  AL           STANDARD COMPOSITION
MX             4 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      2.7020 THEORETICAL DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           13027      1.00 ATOM/MOLECULE
END

SC  SS304        STANDARD COMPOSITION
MX             5 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      7.9200 THEORETICAL DENSITY
NEL            4 NO. ELEMENTS
ICP            0 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           24304    19.000 WT%
           25055     2.000 WT%
           26304    69.500 WT%
           28304     9.500 WT%
END

SC  PB           STANDARD COMPOSITION
MX             6 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH     11.3440 THEORETICAL DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           82000      1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX             7 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      0.9982 THEORETICAL DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
            1001      2.00 ATOMS/MOLECULE
            8016      1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
```

```
MX          8 MIXTURE NO.
VF     1.0000 VOLUME FRACTION
POTH   0.9982 THEORETICAL DENSITY
NEL         2 NO. ELEMENTS
ICP         1 0/1 MIXTURE/COMPOUND
TEMP    293.0 DEG KELVIN
          1001       2.00 ATOMS/MOLECULE
          8016       1.00 ATOM/MOLECULE
END

SC  H2O         STANDARD COMPOSITION
MX          9 MIXTURE NO.
VF     0.0000 VOLUME FRACTION
ROTH   0.9982 THEORETICAL DENSITY
NEL         2 NO. ELEMENTS
ICP         1 0/1 MIXTURE/COMPOUND
TEMP    293.0 DEG KELVIN
          1001       2.00 ATOMS/MOLECULE
          8016       1.00 ATOM/MOLECULE
END


**** PROBLEM GEOMETRY ****

CTP SQUAREPITCH  CELL TYPE
PITCH    1.4529 CM CENTER TO CENTER SPACING
FUELOD   0.9055 CM FUEL DIAMETER OR SLAB THICKNESS
MFUEL         1 MIXTURE NO. OF FUEL
MMOD          3 MIXTURE NO. OF MODERATOR
CLADOD   1.0770 CM CLAD OUTER DIAMETER
MCLAD         2 MIXTURE NO. OF CLAD
GAPOD    0.9246 CM GAP OUTER DIAMETER
MGAP          9 MIXTURE NO. OF GAP


ZONE SPECIFICATIONS FOR LATTICECELL GEOMETRY

              ZONE  1 IS FUEL
              ZONE  2 IS GAP
              ZONE  3 IS CLAD
              ZONE  4 IS MOD
```

```
*********************************************************************************************************
***                                                                                                   ***
***                     NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS  80 MIL CHANNEL                  ***
***                                                                                                   ***
*********************************************************************************************************
*********************************************************************************************************
***                                                                                                   ***
***                          ********** DATA LIBRARY INFORMATION **********                           ***
***                                                                                                   ***
***        UNIT                                               VOLUME                                  ***
***       NUMBER             DATA SET NAME                     NAME         UNIT FUNCTION             ***
***       ------             -------------                     ----         -------------             ***
***                                                                                                   ***
***         89     G:\scale43\DATALIB\FT89F001                              STANDARD COMPOSITION LIBRARY ***
***                                                                                                   ***
***         82     G:\scale43\DATALIB\FT82F001                              CROSS SECTION LIBRARY     ***
***                                                                                                   ***
***         11     D:\PROJECTS\BU85-C~1\BWRFIN\19NZ2M\FT11F001              SHORT CROSS SECTION LIBRARY ***
***                                                                                                   ***
***         90     D:\PROJECTS\BU85-C~1\BWRFIN\19NZ2M\FT90F001              INPUT DATA DIRECT ACCESS  ***
***                                                                                                   ***
*********************************************************************************************************
*********************************************************************************************************
***                                                                                                   ***
***                                                                                                   ***
***                                STANDARD COMPOSITION LIBRARY DATA                                  ***
***                                ---------------------------------                                  ***
***                                                                                                   ***
***          UNIT NUMBER  :  89                                                                       ***
***                                                                                                   ***
***          DATASET NAME :  G:\scale43\DATALIB\FT89F001                                              ***
***                                                                                                   ***
***          LIBRARY TITLE:  SCALE-4 STANDARD COMPOSITION LIBRARY                                     ***
***                          637 STANDARD COMPOSITIONS, 490 NUCLIDES                                  ***
***                          90 ELEMENTS WITH VARIABLE ISOTOPIC DISTRBUTIONS.                         ***
***                                                                                                   ***
***          CREATION DATE:   6/30/95                                                                 ***
***                                                                                                   ***
***                                                                                                   ***
***                                                                                                   ***
***                                    CROSS SECTION LIBRARY DATA                                     ***
***                                   ---------------------------                                     ***
***                                                                                                   ***
***          UNIT NUMBER  :  82                                                                       ***
***                                                                                                   ***
***          DATASET NAME :  G:\scale43\DATALIB\FT82F001                                              ***
***                                                                                                   ***
***          LIBRARY TITLE:  SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY                               ***
***                             BASED ON ENDF-B VERSION 4 DATA                                        ***
***                                COMPILED FOR NRC      1/27/89                                      ***
***                                   LAST UPDATED                                       08/12/94     ***
***                                      L.M.PETRIE    -    ORNL                                      ***
***                                                                                                   ***
***                                                                                                   ***
***                                                                                                   ***
***                                                                                                   ***
*********************************************************************************************************
*********************************************************************************************************

                 ........    0 IO'S WERE USED BEFORE READING KENO V DATA    ........

                 ........    0 IO'S WERE USED READING THE KENO V PARAMETER DATA    ........

                ************** DATA READING COMPLETED **************

                 ........    0 IO'S WERE USED PREPARING THE KENO V INPUT DATA    ........

                 ........    0 IO'S WERE USED LOADING THE KENO V DATA    ........

                 ........    0 IO'S WERE USED LOADING THE DATA    ........

                 ........    0 IO'S WERE USED CHECKING THE KENO V GEOMETRY DATA    ........
                 *****  RESTART DATA HAS BEEN WRITTEN ON UNIT 95  *****

                 ........    0 IO'S WERE USED WRITING THE KENO V - CSAS DATA    ........

                 ........    0 IO'S WERE USED PROCESSING CSAS INPUT DATA    ........

CONTROL MODULE CSAS25    IS COMPLETE.
```

```
KK          KK  EEEEEEEEEEEEE  NN          NN   00000000000                    VV          VV
KK         KK   EEEEEEEEEEEEE  NNN         NN  0000000000000                   VV          VV
KK        KK    EE             NNNN        NN  OO         OO                   VV          VV
KK       KK     EE             NN NN       NN  OO         OO                   VV          VV
KK      KK      EE             NN  NN      NN  OO         OO                   VV          VV
KKKKKKKK        EEEEEEEEE      NN   NN     NN  OO         OO  -------------    VV          VV
KKKKKKKK        EEEEEEEEE      NN    NN    NN  OO         OO  -------------     VV        VV
KK      KK      EE             NN     NN   NN  OO         OO                     VV      VV
KK       KK     EE             NN      NN  NN  OO         OO                      VV    VV
KK        KK    EE             NN       NNNN   OO         OO                       VV VV
KK         KK   EEEEEEEEEEEEE  NN        NNN   0000000000000                        VVV
KK          KK  EEEEEEEEEEEEE  NN         NN    00000000000                          V

 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL             EEEEEEEEEEEEE                  PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL             EEEEEEEEEEEEE                  PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL             EE                             PP         PP  CC         CC
SS             CC             AA         AA  LL             EE                             PP         PP  CC
SS             CC             AA         AA  LL             EE                             PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------   PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------   PPPPPPPPPPPP   CC
           SS  CC             AA         AA  LL             EE                             PP             CC
           SS  CC             AA         AA  LL             EE                             PP             CC
SS         SS  CC         CC  AA         AA  LL             EE                             PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLLL  EEEEEEEEEEEEE                  PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLLL  EEEEEEEEEEEEE                  PP              CCCCCCCCCCC

  0000000     7777777777777          //   22222222222    33333333333          //  99999999999    88888888888
 000000000    777777777777          //   2222222222222  3333333333333        //  9999999999999  8888888888888
00       00   77        77         //    22         22  33         33       //   99         99  88         88
00       00            77         //                22             33      //    99         99  88         88
00       00           77         //                 22             33     //     99         99  88         88
00       00          77         //                22              333    //      9999999999999   88888888888
00       00         77         //               22              333     //        999999999999   88888888888
00       00        77         //              22                 33    //                   99  88         88
00       00        77        //             22                   33   //                    99  88         88
 00     00         77       //            22          33         33  //                     99  88         88
 000000000         77      //            2222222222222  3333333333333 //           9999999999999  8888888888888
  0000000          77     //             2222222222222   33333333333 //             999999999999   88888888888

 22222222222        11                     11       22222222222                 44          11
2222222222222      111                    111      2222222222222               444         111
22         22     1111         :::       1111      22         22     :::      4444        1111
           22       11         :::         11                 22     :::     44 44          11
           22       11         :::         11                 22     :::    44  44          11
         22         11                     11               22             44   44          11
       22           11                     11             22              44    44          11
     22             11         :::         11           22           :::  444444444444      11
   22               11         :::         11         22             :::  444444444444      11
 22                 11         :::         11       22               :::        44          11
2222222222222    11111111               11111111   2222222222222                44       11111111
2222222222222    11111111               11111111   2222222222222                44       11111111
```

```
*****************************************************************************************************
***                                                                                               ***
***                   NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS  80 MIL CHANNEL                ***
***                                                                                               ***
*****************************************************************************************************
***                   ******      NUMERIC PARAMETERS      ******                                  ***
***                                                                                               ***
***                                                                                               ***
***        TME        MAXIMUM PROBLEM TIME (MIN)                        ******                    ***
***                                                                                               ***
***        TBA        TIME PER GENERATION (MIN)                           0.50                    ***
***                                                                                               ***
***        GEN        NUMBER OF GENERATIONS                                303                    ***
***                                                                                               ***
***        NPG        NUMBER PER GENERATION                               1000                    ***
***                                                                                               ***
***        NSK        NUMBER OF GENERATIONS TO BE SKIPPED                    3                    ***
***                                                                                               ***
***        BEG        BEGINNING GENERATION NUMBER                            1                    ***
***                                                                                               ***
***        RES        GENERATIONS BETWEEN CHECKPOINTS                        0                    ***
***                                                                                               ***
***        X1D        NUMBER OF EXTRA 1-D CROSS SECTIONS                     1                    ***
***                                                                                               ***
***        NBK        NEUTRON BANK SIZE                                   1025                    ***
***                                                                                               ***
***        XNB        EXTRA POSITIONS IN NEUTRON BANK                        0                    ***
***                                                                                               ***
***        NFB        FISSION BANK SIZE                                   1000                    ***
***                                                                                               ***
***        XFB        EXTRA POSITIONS IN FISSION BANK                        0                    ***
***                                                                                               ***
***        WTA        DEFAULT VALUE OF WEIGHT AVERAGE                   0.5000                    ***
***                                                                                               ***
***        WTH        WEIGHT HIGH FOR SPLITTING                         3.0000                    ***
***                                                                                               ***
***        WTL        WEIGHT LOW FOR RUSSIAN ROULETTE                   0.3333                    ***
***                                                                                               ***
***        RND        STARTING RANDOM NUMBER                      BB827100001                    ***
***                                                                                               ***
***        NB8        NUMBER OF D.A. BLOCKS ON UNIT  8                     200                    ***
***                                                                                               ***
***        NL8        LENGTH OF D.A. BLOCKS ON UNIT  8                     512                    ***
***                                                                                               ***
***        ADJ        MODE OF CALCULATION                              FORWARD                    ***
***                                                                                               ***
***                   INPUT DATA WRITTEN ON RESTART UNIT                    NO                    ***
***                                                                                               ***
***                   BINARY DATA INTERFACE                                YES                    ***
***                                                                                               ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************
```

```
******************************************************************************************************************
******************************************************************************************************************
***                                                                                                            ***
***                          NAC-LWT CASK MODEL: EXXON 9X9 - 2 WATER RODS  80 MIL CHANNEL                      ***
***                                                                                                            ***
******************************************************************************************************************
***                               ******     LOGICAL PARAMETERS     ******                                     ***
***                                                                                                            ***
***  RUN  EXECUTE PROBLEM AFTER CHECKING DATA     YES        PLT  PLOT PICTURE MAP(S)                       NO ***
***                                                                                                            ***
***  FLX  COMPUTE FLUX                             NO        FDN  COMPUTE FISSION DENSITIES                 NO ***
***                                                                                                            ***
***  SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION     NO        NUB  COMPUTE NU-BAR & AVG FISSION GROUP       YES ***
***                                                                                                            ***
***  MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER      NO        MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION     NO ***
***                                                                                                            ***
***  CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER    NO        CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION   NO ***
***                                                                                                            ***
***  FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER    NO        FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION   NO ***
***                                                                                                            ***
***  MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER      NO        MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER      NO ***
***                                                                                                            ***
***  CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER    NO        CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER    NO ***
***                                                                                                            ***
***  FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER    NO        FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER    NO ***
***                                                                                                            ***
***  HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL     NO        HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL     NO ***
***                                                                                                            ***
***  AMX  PRINT ALL MIXED CROSS SECTIONS           NO        FAR  PRINT FIS. AND ABS. BY REGION             NO ***
***                                                                                                            ***
***  XS1  PRINT 1-D MIXTURE X-SECTIONS             NO        GAS  PRINT FAR BY GROUP                        NO ***
***                                                                                                            ***
***  XS2  PRINT 2-D MIXTURE X-SECTIONS             NO        FAX  PRINT XSEC-ALBEDO CORRELATION TABLES      NO ***
***                                                                                                            ***
***  XAP  PRINT MIXTURE ANGLES & PROBABILITIES     NO        PWT  PRINT WEIGHT AVERAGE ARRAY                NO ***
***                                                                                                            ***
***  PKI  PRINT FISSION SPECTRUM                   NO        PGM  PRINT INPUT GEOMETRY                      NO ***
***                                                                                                            ***
***  P1D  PRINT EXTRA 1-D CROSS SECTIONS           NO        BUG  PRINT DEBUG INFORMATION                   NO ***
***                                                                                                            ***
***                                                          TRK  PRINT TRACKING INFORMATION                NO ***
***                                                                                                            ***
***                                                                                                            ***
******************************************************************************************************************
******************************************************************************************************************
******************************************************************************************************************
                                     PARAMETER INPUT COMPLETED

                        ........    0 IO'S WERE USED READING THE PARAMETER DATA      ........

                        *************** DATA READING COMPLETED ***************
```

```
*****************************************************************************************************
***                                                                                               ***
***         NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS  80 MIL CHANNEL                          ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************
***                                                                                               ***
***                            ****** ADDITIONAL INFORMATION ******                               ***
***                                                                                               ***
*** NUMBER OF ENERGY GROUPS                27      USE LATTICE GEOMETRY                       YES ***
***                                                                                               ***
*** NO. OF FISSION SPECTRUM SOURCE GROUP   1       GLOBAL ARRAY NUMBER                          0 ***
***                                                                                               ***
*** NO. OF SCATTERING ANGLES IN XSECS      2       NUMBER OF UNITS IN THE GLOBAL X DIR.         0 ***
***                                                                                               ***
*** ENTRIES/NEUTRON IN THE NEUTRON BANK    19      NUMBER OF UNITS IN THE GLOBAL Y DIR.         0 ***
***                                                                                               ***
*** ENTRIES/NEUTRON IN THE FISSION BANK    12      NUMBER OF UNITS IN THE GLOBAL Z DIR.         0 ***
***                                                                                               ***
*** NUMBER OF MIXTURES USED                9       USE A GLOBAL REFLECTOR                     YES ***
***                                                                                               ***
*** NUMBER OF BIAS ID'S USED               1       USE NESTED HOLES                           YES ***
***                                                                                               ***
*** NUMBER OF DIFFERENTIAL ALBEDOS USED    1       NUMBER OF HOLES                             22 ***
***                                                                                               ***
*** TOTAL INPUT GEOMETRY REGIONS           24      MAXIMUM HOLE NESTING LEVEL                   2 ***
***                                                                                               ***
*** NUMBER OF GEOMETRY REGIONS USED        24      USE NESTED ARRAYS                           NO ***
***                                                                                               ***
*** LARGEST GEOMETRY UNIT NUMBER           6       NUMBER OF ARRAYS USED                        1 ***
***                                                                                               ***
*** LARGEST ARRAY NUMBER                   1       MAXIMUM ARRAY NESTING LEVEL                  1 ***
***                                                                                               ***
***                                                                                               ***
*** +X BOUNDARY CONDITION                 H2O      -X BOUNDARY CONDITION                      H2O ***
***                                                                                               ***
*** +Y BOUNDARY CONDITION                 H2O      -Y BOUNDARY CONDITION                      H2O ***
***                                                                                               ***
*** +Z BOUNDARY CONDITION                 PER      -Z BOUNDARY CONDITION                      PER ***
***                                                                                               ***
*****************************************************************************************************


*********************************************************************************************
***                                                                                       ***
***         NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS  80 MIL CHANNEL                  ***
***                                                                                       ***
*********************************************************************************************
*********************************************************************************************
***                                                                                       ***
***                  ****** SPACE AND SUPERGROUP INFORMATION ******                       ***
***                                                                                       ***
***        100000 WORDS IS THE TOTAL SPACE AVAILABLE.                                     ***
***                                                                                       ***
***         34647 WORDS WERE USED FOR NON-SUPERGROUP STORAGE.                             ***
***                                                                                       ***
***         65353 WORDS OF STORAGE ARE AVAILABLE FOR SUPERGROUPED DATA.                   ***
***                                                                                       ***
***         99458 WORDS OF STORAGE ARE AVAILABLE FOR CONSTRUCTING THE SUPERGROUPS.        ***
***                                                                                       ***
***         65292 WORDS OF STORAGE ARE AVAILABLE TO EACH SUPERGROUP.                      ***
***                                                                                       ***
***          1576 WORDS ARE NEEDED FOR THE LARGEST GROUP.                                 ***
***                                                                                       ***
***         36466 WORDS OF STORAGE IS SUFFICIENT TO RUN THIS PROBLEM.                     ***
***                                                                                       ***
***         51430 WORDS OF STORAGE WILL ALLOW THE PROBLEM TO RUN WITH ONE SUPERGROUP.     ***
***                                                                                       ***
***         51872 WORDS OF STORAGE WILL BE USED TO RUN THIS PROBLEM.                      ***
***                                                                                       ***
*********************************************************************************************
*********************************************************************************************
***                                                                                       ***
***                      STARTING      ENDING      XSEC       ALBEDO      TOTAL           ***
***     SUPERGROUP         GROUP        GROUP      LENGTH     LENGTH      LENGTH          ***
***                                                                                       ***
***                                                                                       ***
***         1                1           27         2764        544       16854           ***
***                                                                                       ***
*********************************************************************************************

            ........    0 IO'S WERE USED IN SUPERGROUPING     ........
            ........    0 IO'S WERE USED LOADING THE DATA     ........
```

```
                                   NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS  80 MIL CHANNEL

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                           -----  UNIT     1   -----

FUEL PIN CELL - WITH H2O

  1 CYLINDER         1  1  RADIUS = 0.45260    +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000

  2 CYLINDER         9  1  RADIUS = 0.46230    +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000

  3 CYLINDER         2  1  RADIUS = 0.53850    +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000

  4 CUBOID           3  1      +X = 0.72640    -X =-0.72640     +Y = 0.72640     -Y =-0.72640     +Z =  10.000     -Z = -10.000


                                           -----  UNIT     2   -----

WATER ROD CELL - WITH H2O

  1 CYLINDER         3  1  RADIUS = 0.46230    +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000

  2 CYLINDER         2  1  RADIUS = 0.53850    +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000

  3 CUBOID           3  1      +X = 0.72640    -X =-0.72640     +Y = 0.72640     -Y =-0.72640     +Z =  10.000     -Z = -10.000

                                    -----  UNIT     3  EXTERNAL TO LATTICE  1   -----

  1 ARRAY NUMBER     1         +X =  6.5376    -X = -6.5376     +Y =  6.5376     -Y = -6.5376     +Z =  10.000     -Z = -10.000

  2 CUBOID           3  1      +X =  6.7031    -X = -6.7031     +Y =  6.7031     -Y = -6.7031     +Z =  10.000     -Z = -10.000

  3 CUBOID           2  1      +X =  6.9063    -X = -6.9063     +Y =  6.9063     -Y = -6.9063     +Z =  10.000     -Z = -10.000

  4 CUBOID           3  1      +X =  7.3025    -X = -7.3025     +Y =  7.3025     -Y = -7.3025     +Z =  10.000     -Z = -10.000

                                    -----  UNIT     4  EXTERNAL TO LATTICE  1   -----

  1 ARRAY NUMBER     1         +X =  6.5376    -X = -6.5376     +Y =  6.5376     -Y = -6.5376     +Z =  10.000     -Z = -10.000

  2 CUBOID           3  1      +X =  6.7031    -X = -6.7031     +Y =  6.7031     -Y = -6.7031     +Z =  10.000     -Z = -10.000

  3 CUBOID           2  1      +X =  6.9063    -X = -6.9063     +Y =  6.9063     -Y = -6.9063     +Z =  10.000     -Z = -10.000

  4 CUBOID           3  1      +X =  7.3025    -X = -7.3025     +Y =  7.3025     -Y = -7.3025     +Z =  10.000     -Z = -10.000
                                   NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS  80 MIL CHANNEL

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID


                                           -----  UNIT     5   -----

  1 CYLINDER         4  1  RADIUS =  16.827    +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000

    HOLE NUMBER      1       AT X = -7.4613     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER      3

    HOLE NUMBER      2       AT X =  7.4613     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER      4

  2 CYLINDER         3  1  RADIUS =  16.986    +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000

  3 CYLINDER         5  1  RADIUS =  18.891    +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000

  4 CYLINDER         6  1  RADIUS =  33.496    +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000

  5 CYLINDER         5  1  RADIUS =  36.544    +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000

  6 CYLINDER         7  1  RADIUS =  49.244    +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000

  7 CYLINDER         5  1  RADIUS =  49.854    +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000

                                   NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS  80 MIL CHANNEL

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID


                                    ...................   GLOBAL   ...................
                                           -----  UNIT     6   -----

  1 CYLINDER         8  1  RADIUS =  696.00    +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000

    HOLE NUMBER      3       AT X = 0.00000     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER      5

    HOLE NUMBER      4       AT X = 0.00000     Y =  243.80      Z = 0.00000     IS UNIT NUMBER      5

    HOLE NUMBER      5       AT X =  211.17     Y =  121.90      Z = 0.00000     IS UNIT NUMBER      5
```

```
   HOLE NUMBER     6      AT X =  211.17     Y = -121.90     Z = 0.00000     IS UNIT NUMBER     5
   HOLE NUMBER     7      AT X = 0.00000     Y = -243.80     Z = 0.00000     IS UNIT NUMBER     5
   HOLE NUMBER     8      AT X = -211.17     Y = -121.90     Z = 0.00000     IS UNIT NUMBER     5
   HOLE NUMBER     9      AT X = -211.17     Y =  121.90     Z = 0.00000     IS UNIT NUMBER     5
   HOLE NUMBER    10      AT X = 0.00000     Y =  487.70     Z = 0.00000     IS UNIT NUMBER     5
   HOLE NUMBER    11      AT X =  211.20     Y =  365.80     Z = 0.00000     IS UNIT NUMBER     5
   HOLE NUMBER    12      AT X =  422.30     Y =  243.80     Z = 0.00000     IS UNIT NUMBER     5
   HOLE NUMBER    13      AT X =  422.30     Y = 0.00000     Z = 0.00000     IS UNIT NUMBER     5
   HOLE NUMBER    14      AT X =  422.30     Y = -243.80     Z = 0.00000     IS UNIT NUMBER     5
   HOLE NUMBER    15      AT X =  211.20     Y = -365.80     Z = 0.00000     IS UNIT NUMBER     5
   HOLE NUMBER    16      AT X = 0.00000     Y = -487.70     Z = 0.00000     IS UNIT NUMBER     5
   HOLE NUMBER    17      AT X = -211.20     Y = -365.80     Z = 0.00000     IS UNIT NUMBER     5
   HOLE NUMBER    18      AT X = -422.30     Y = -243.88     Z = 0.00000     IS UNIT NUMBER     5
   HOLE NUMBER    19      AT X = -422.30     Y = 0.00000     Z = 0.00000     IS UNIT NUMBER     5
   HOLE NUMBER    20      AT X = -422.30     Y =  243.80     Z = 0.00000     IS UNIT NUMBER     5
   HOLE NUMBER    21      AT X = -211.20     Y =  365.80     Z = 0.00000     IS UNIT NUMBER     5
   HOLE NUMBER    22      AT X =  633.51     Y =  121.90     Z = 0.00000     IS UNIT NUMBER     5
 2 CUBOID          8   1     +X =  696.00    -X = -696.00    +Y =  696.00    -Y = -696.00    +Z =  10.000    -Z = -10.000

                        NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS  80 MIL CHANNEL

                   ------- UNIT ORIENTATION DESCRIPTION FOR ARRAY   1          -------

Z LAYER   1, X COLUMN   1 TO   9 LEFT TO RIGHT   Y ROW   1 TO   9  BOTTOM TO TOP

 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 2 1 1 1
 1 1 1 1 2 1 1 1 1
 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1
```

NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS 80 MIL CHANNEL
VOLUMES FOR THOSE UNITS UTILIZED IN THIS PROBLEM

UNIT	REGION	GEOMETRY REGION	VOLUME	CUMULATIVE VOLUME
1	1	1	1.28823E+01 CM**3	1.28823E+01 CM**3
	2	2	5.46226E-01 CM**3	1.34285E+01 CM**3
	3	3	4.79162E+00 CM**3	1.82201E+01 CM**3
	4	4	2.39924E+01 CM**3	4.22126E+01 CM**3
2	1	5	1.34285E+01 CM**3	1.34285E+01 CM**3
	2	6	4.79162E+00 CM**3	1.82201E+01 CM**3
	3	7	2.39924E+01 CM**3	4.22126E+01 CM**3
SURROUNDING GEOMETRY VOLUMES -			GEOMETRY REGION	8 IS AN ARRAY PLACEMENT BOUNDARY REGION
3	1	8	3.41922E+03 CM**3	3.41922E+03 CM**3
	2	9	1.75307E+02 CM**3	3.59452E+03 CM**3
	3	10	2.21234E+02 CM**3	3.81576E+03 CM**3
	4	11	4.50362E+02 CM**3	4.26612E+03 CM**3
SURROUNDING GEOMETRY VOLUMES -			GEOMETRY REGION	12 IS AN ARRAY PLACEMENT BOUNDARY REGION
4	1	12	3.41922E+03 CM**3	3.41922E+03 CM**3
	2	13	1.75307E+02 CM**3	3.59452E+03 CM**3
	3	14	2.21234E+02 CM**3	3.81576E+03 CM**3
	4	15	4.50362E+02 CM**3	4.26612E+03 CM**3
5	1	16	9.25953E+03 CM**3	1.77918E+04 CM**3
	2	17	3.37383E+02 CM**3	1.81291E+04 CM**3
	3	18	4.29436E+03 CM**3	2.24235E+04 CM**3
	4	19	4.80740E+04 CM**3	7.04975E+04 CM**3
	5	20	1.34136E+04 CM**3	8.39110E+04 CM**3
	6	21	6.84563E+04 CM**3	1.52367E+05 CM**3
	7	22	3.79567E+03 CM**3	1.56163E+05 CM**3
6	1	23	2.73135E+07 CM**3	3.04368E+07 CM**3
	2	24	8.31653E+06 CM**3	3.87533E+07 CM**3

UNIT	USES	REGION	MIXTURE	TOTAL VOLUME
1	3160	1	1	4.07080E+04 CM**3
		2	9	1.72607E+03 CM**3
		3	2	1.51415E+04 CM**3
		4	3	7.58161E+04 CM**3
2	80	1	3	1.07428E+03 CM**3
		2	2	3.83329E+02 CM**3
		3	3	1.91939E+03 CM**3
3	20	1		6.83843E+04 CM**3
		2	3	3.50614E+03 CM**3
		3	2	4.42469E+03 CM**3
		4	3	9.00723E+03 CM**3
4	20	1		6.83843E+04 CM**3
		2	3	3.50614E+03 CM**3
		3	2	4.42469E+03 CM**3
		4	3	9.00723E+03 CM**3
5	20	1	4	1.85191E+05 CM**3
		2	3	6.74766E+03 CM**3
		3	5	8.58872E+04 CM**3
		4	6	9.61479E+05 CM**3
		5	5	2.68272E+05 CM**3
		6	7	1.36913E+06 CM**3
		7	5	7.59134E+04 CM**3
6	1	1	8	2.73135E+07 CM**3
		2	8	8.31653E+06 CM**3

TOTAL MIXTURE VOLUMES

MIXTURE	TOTAL VOLUME	MASS(G)
1	4.07080E+04 CM**3	4.23851E+05
2	2.43742E+04 CM**3	1.59895E+05
3	1.10584E+05 CM**3	1.10382E+05
4	1.85191E+05 CM**3	5.00385E+05
5	4.30072E+05 CM**3	3.40617E+06
6	9.61479E+05 CM**3	1.09070E+07
7	1.36913E+06 CM**3	1.36662E+06
8	3.56300E+07 CM**3	3.55648E+07
9	1.72607E+03 CM**3	1.72292E-17

```
*******************************************************************************
***                                                                         ***
***                          BIASING INFORMATION                            ***
***                                                                         ***
***    A DEFAULT WEIGHT OF    0.500 WILL BE USED FOR ALL BIAS ID'S.         ***
***                                                                         ***
*******************************************************************************
```

.... 0 IO'S WERE USED IN KENO-V BEFORE TRACKING ....

.... 0.00717 MINUTES WERE USED PROCESSING DATA. ....

```
VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 1.30338E-02

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED WITH A FLAT DISTRIBUTION IN A CUBOID DEFINED BY:
                    +X= 6.96000E+02  -X=-6.96000E+02  +Y= 6.96000E+02  -Y=-6.96000E+02  +Z= 1.00000E+01  -Z=-1.00000E+01
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

KENO MESSAGE NUMBER K5-105       ***** WARNING, ONLY   24 INDEPENDENT STARTING POSITIONS WERE GENERATED.  *****

  976 ADDITIONAL STARTING POINTS WERE PICKED FROM THE INITAL DISTRIBUTION.

0.45333 MINUTES WERE REQUIRED FOR STARTING.   TOTAL ELAPSED TIME IS 0.46933 MINUTES.
_NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS  80 MIL CHANNEL

                 GENERATION     ELAPSED TIME       AVERAGE        AVG K-EFF        MATRIX       MATRIX K-EFF
   GENERATION   K-EFFECTIVE       MINUTES        K-EFFECTIVE      DEVIATION      K-EFFECTIVE      DEVIATION
KENO MESSAGE NUMBER K5-132    WARNING....ONLY  874 INDEPENDENT FISSION POINTS WERE GENERATED
       1        8.03015E-01     4.86000E-01     1.00000E+00     0.00000E+00     0.00000E+00     0.00000E+00
KENO MESSAGE NUMBER K5-132    WARNING....ONLY  967 INDEPENDENT FISSION POINTS WERE GENERATED
       2        8.55134E-01     5.08000E-01     1.00000E+00     0.00000E+00     0.00000E+00     0.00000E+00
KENO MESSAGE NUMBER K5-132    WARNING....ONLY  904 INDEPENDENT FISSION POINTS WERE GENERATED
       3        8.61212E-01     5.29000E-01     8.61212E-01     0.00000E+00     0.00000E+00     0.00000E+00
       4        8.44058E-01     5.51000E-01     8.52635E-01     8.57702E-03     0.00000E+00     0.00000E+00
       5        8.82350E-01     5.73833E-01     8.62540E-01     1.10737E-02     0.00000E+00     0.00000E+00
       6        8.47498E-01     5.97667E-01     8.58780E-01     8.68646E-03     0.00000E+00     0.00000E+00
       7        8.51571E-01     6.20667E-01     8.57338E-01     6.88123E-03     0.00000E+00     0.00000E+00
       8        8.93368E-01     6.41667E-01     8.63343E-01     8.22366E-03     0.00000E+00     0.00000E+00
       9        8.33529E-01     6.64500E-01     8.59084E-01     8.15146E-03     0.00000E+00     0.00000E+00
      10        8.36796E-01     6.87333E-01     8.56298E-01     7.58924E-03     0.00000E+00     0.00000E+00
      11        8.82450E-01     7.09333E-01     8.59204E-01     7.29663E-03     0.00000E+00     0.00000E+00
      12        8.44942E-01     7.32333E-01     8.57778E-01     6.68031E-03     0.00000E+00     0.00000E+00
      13        8.42681E-01     7.55167E-01     8.56405E-01     6.19646E-03     0.00000E+00     0.00000E+00
      14        8.42487E-01     7.78000E-01     8.55245E-01     5.77424E-03     0.00000E+00     0.00000E+00
      15        8.27233E-01     8.01000E-01     8.53091E-01     5.73198E-03     0.00000E+00     0.00000E+00
      16        8.58392E-01     8.23833E-01     8.53469E-01     5.32028E-03     0.00000E+00     0.00000E+00
      17        8.42240E-01     8.45833E-01     8.52721E-01     5.00917E-03     0.00000E+00     0.00000E+00
      18        8.33538E-01     8.68667E-01     8.51522E-01     4.83660E-03     0.00000E+00     0.00000E+00
      19        8.75942E-01     8.91500E-01     8.52958E-01     4.76489E-03     0.00000E+00     0.00000E+00
      20        8.17923E-01     9.15333E-01     8.51012E-01     4.89591E-03     0.00000E+00     0.00000E+00
      21        8.49207E-01     9.40000E-01     8.50917E-01     4.63204E-03     0.00000E+00     0.00000E+00
      22        8.28669E-01     9.63000E-01     8.49804E-01     4.53294E-03     0.00000E+00     0.00000E+00
      23        8.19649E-01     9.85833E-01     8.48368E-01     4.54452E-03     0.00000E+00     0.00000E+00
      24        8.72484E-01     1.00867E+00     8.49465E-01     4.46954E-03     0.00000E+00     0.00000E+00
      25        8.08727E-01     1.03250E+00     8.47693E-01     4.62351E-03     0.00000E+00     0.00000E+00
      26        8.63732E-01     1.05450E+00     8.48362E-01     4.47683E-03     0.00000E+00     0.00000E+00
      27        8.27315E-01     1.07650E+00     8.47520E-01     4.37577E-03     0.00000E+00     0.00000E+00
      28        8.69706E-01     1.09933E+00     8.48373E-01     4.28983E-03     0.00000E+00     0.00000E+00
      29        8.44903E-01     1.12217E+00     8.48245E-01     4.12989E-03     0.00000E+00     0.00000E+00
      30        8.33130E-01     1.14417E+00     8.47705E-01     4.01610E-03     0.00000E+00     0.00000E+00
      31        8.77643E-01     1.16617E+00     8.48737E-01     4.01030E-03     0.00000E+00     0.00000E+00
      32        8.42523E-01     1.18900E+00     8.48530E-01     3.87985E-03     0.00000E+00     0.00000E+00
      33        8.60517E-01     1.21100E+00     8.48917E-01     3.77248E-03     0.00000E+00     0.00000E+00
      34        8.50583E-01     1.23400E+00     8.48969E-01     3.65306E-03     0.00000E+00     0.00000E+00
      35        8.88333E-01     1.25683E+00     8.50162E-01     3.73617E-03     0.00000E+00     0.00000E+00
      36        8.28639E-01     1.27967E+00     8.49529E-01     3.67948E-03     0.00000E+00     0.00000E+00
      37        8.98219E-01     1.30167E+00     8.50920E-01     3.83409E-03     0.00000E+00     0.00000E+00
      38        8.55574E-01     1.32450E+00     8.51049E-01     3.72831E-03     0.00000E+00     0.00000E+00
      39        8.64577E-01     1.34833E+00     8.51415E-01     3.64453E-03     0.00000E+00     0.00000E+00
      40        8.18400E-01     1.37217E+00     8.50546E-01     3.65217E-03     0.00000E+00     0.00000E+00
      41        8.44594E-01     1.39500E+00     8.50393E-01     3.56056E-03     0.00000E+00     0.00000E+00
      42        8.25882E-01     1.41800E+00     8.49780E-01     3.52409E-03     0.00000E+00     0.00000E+00
      43        8.94276E-01     1.43900E+00     8.50866E-01     3.60433E-03     0.00000E+00     0.00000E+00
      44        8.48984E-01     1.46100E+00     8.50821E-01     3.51775E-03     0.00000E+00     0.00000E+00
      45        8.38897E-01     1.48283E+00     8.50544E-01     3.44615E-03     0.00000E+00     0.00000E+00
      46        8.27345E-01     1.50483E+00     8.50016E-01     3.40795E-03     0.00000E+00     0.00000E+00
      47        8.43568E-01     1.52867E+00     8.49873E-01     3.33443E-03     0.00000E+00     0.00000E+00
      48        8.34958E-01     1.55067E+00     8.49549E-01     3.27722E-03     0.00000E+00     0.00000E+00
      49        8.28192E-01     1.57350E+00     8.49094E-01     3.23677E-03     0.00000E+00     0.00000E+00
      50        8.79751E-01     1.59550E+00     8.49733E-01     3.23426E-03     0.00000E+00     0.00000E+00
      51        8.30097E-01     1.61833E+00     8.49332E-01     3.19282E-03     0.00000E+00     0.00000E+00
      52        8.31352E-01     1.64217E+00     8.48973E-01     3.14891E-03     0.00000E+00     0.00000E+00
      53        8.02345E-01     1.66517E+00     8.48058E-01     3.21911E-03     0.00000E+00     0.00000E+00
      54        8.39723E-01     1.68700E+00     8.47898E-01     3.16067E-03     0.00000E+00     0.00000E+00
      55        8.40903E-01     1.71000E+00     8.47766E-01     3.10326E-03     0.00000E+00     0.00000E+00
      56        8.68127E-01     1.73183E+00     8.48143E-01     3.06851E-03     0.00000E+00     0.00000E+00
      57        8.55930E-01     1.75483E+00     8.48285E-01     3.01553E-03     0.00000E+00     0.00000E+00
      58        8.32171E-01     1.77683E+00     8.47997E-01     2.97514E-03     0.00000E+00     0.00000E+00
      59        8.32146E-01     1.79967E+00     8.47719E-01     2.93568E-03     0.00000E+00     0.00000E+00
      60        8.61564E-01     1.82250E+00     8.47958E-01     2.89448E-03     0.00000E+00     0.00000E+00
      61        8.36321E-01     1.84550E+00     8.47760E-01     2.85182E-03     0.00000E+00     0.00000E+00
      62        8.22286E-01     1.87017E+00     8.47336E-01     2.83585E-03     0.00000E+00     0.00000E+00
      63        8.05083E-01     1.89300E+00     8.46643E-01     2.87370E-03     0.00000E+00     0.00000E+00
      64        8.58331E-01     1.91500E+00     8.46832E-01     2.83325E-03     0.00000E+00     0.00000E+00
      65        8.31174E-01     1.93783E+00     8.46583E-01     2.79897E-03     0.00000E+00     0.00000E+00
      66        8.26488E-01     1.96083E+00     8.46269E-01     2.77273E-03     0.00000E+00     0.00000E+00
      67        8.41472E-01     1.98183E+00     8.46195E-01     2.73073E-03     0.00000E+00     0.00000E+00
      68        8.70657E-01     2.00567E+00     8.46566E-01     2.71446E-03     0.00000E+00     0.00000E+00
      69        8.59016E-01     2.02850E+00     8.46752E-01     2.68009E-03     0.00000E+00     0.00000E+00
      70        8.64105E-01     2.05133E+00     8.47007E-01     2.65269E-03     0.00000E+00     0.00000E+00
      71        8.65970E-01     2.07433E+00     8.47282E-01     2.62837E-03     0.00000E+00     0.00000E+00
      72        8.45386E-01     2.09717E+00     8.47255E-01     2.59069E-03     0.00000E+00     0.00000E+00
      73        8.20063E-01     2.12183E+00     8.46872E-01     2.58249E-03     0.00000E+00     0.00000E+00
      74        8.18769E-01     2.14383E+00     8.46482E-01     2.57611E-03     0.00000E+00     0.00000E+00
      75        8.28930E-01     2.16667E+00     8.46241E-01     2.55193E-03     0.00000E+00     0.00000E+00
```

76	8.41596E-01	2.19050E+00	8.46178E-01	2.51799E-03	0.00000E+00	0.00000E+00
77	8.55685E-01	2.21350E+00	8.46305E-01	2.48742E-03	0.00000E+00	0.00000E+00
78	8.53658E-01	2.23633E+00	8.46402E-01	2.45638E-03	0.00000E+00	0.00000E+00
79	8.74212E-01	2.25917E+00	8.46763E-01	2.45103E-03	0.00000E+00	0.00000E+00
80	8.66232E-01	2.28200E+00	8.47013E-01	2.43224E-03	0.00000E+00	0.00000E+00
81	8.25765E-01	2.30500E+00	8.46744E-01	2.41627E-03	0.00000E+00	0.00000E+00
82	8.22817E-01	2.32700E+00	8.46445E-01	2.40455E-03	0.00000E+00	0.00000E+00
83	8.19809E-01	2.35067E+00	8.46116E-01	2.39734E-03	0.00000E+00	0.00000E+00
84	8.41692E-01	2.37367E+00	8.46062E-01	2.36854E-03	0.00000E+00	0.00000E+00
85	8.83550E-01	2.39650E+00	8.46513E-01	2.38302E-03	0.00000E+00	0.00000E+00
86	8.57558E-01	2.41933E+00	8.46645E-01	2.35815E-03	0.00000E+00	0.00000E+00
87	8.91905E-01	2.44133E+00	8.47177E-01	2.39030E-03	0.00000E+00	0.00000E+00
88	8.35818E-01	2.46333E+00	8.47045E-01	2.36603E-03	0.00000E+00	0.00000E+00
89	8.49144E-01	2.48533E+00	8.47069E-01	2.33880E-03	0.00000E+00	0.00000E+00
90	8.47923E-01	2.50917E+00	8.47079E-01	2.31210E-03	0.00000E+00	0.00000E+00
91	8.38329E-01	2.53200E+00	8.46981E-01	2.28808E-03	0.00000E+00	0.00000E+00
92	8.46967E-01	2.55583E+00	8.46981E-01	2.26252E-03	0.00000E+00	0.00000E+00
93	8.22641E-01	2.57867E+00	8.46713E-01	2.25345E-03	0.00000E+00	0.00000E+00
94	8.38773E-01	2.60150E+00	8.46627E-01	2.23049E-03	0.00000E+00	0.00000E+00
95	8.72416E-01	2.62533E+00	8.46904E-01	2.22373E-03	0.00000E+00	0.00000E+00
96	8.42833E-01	2.64733E+00	8.46861E-01	2.20037E-03	0.00000E+00	0.00000E+00
97	8.39828E-01	2.67117E+00	8.46787E-01	2.17835E-03	0.00000E+00	0.00000E+00
98	8.20131E-01	2.69500E+00	8.46509E-01	2.17335E-03	0.00000E+00	0.00000E+00
99	8.27881E-01	2.71783E+00	8.46317E-01	2.15938E-03	0.00000E+00	0.00000E+00
100	8.89356E-01	2.73883E+00	8.46756E-01	2.18189E-03	0.00000E+00	0.00000E+00
101	8.75624E-01	2.76083E+00	8.47048E-01	2.17933E-03	0.00000E+00	0.00000E+00
102	8.58070E-01	2.78283E+00	8.47158E-01	2.16024E-03	0.00000E+00	0.00000E+00
103	8.50854E-01	2.80567E+00	8.47195E-01	2.13906E-03	0.00000E+00	0.00000E+00
104	8.25914E-01	2.82867E+00	8.46986E-01	2.12824E-03	0.00000E+00	0.00000E+00
105	8.30769E-01	2.85150E+00	8.46829E-01	2.11335E-03	0.00000E+00	0.00000E+00
106	8.44415E-01	2.87433E+00	8.46805E-01	2.09305E-03	0.00000E+00	0.00000E+00
107	8.25184E-01	2.89633E+00	8.46599E-01	2.08323E-03	0.00000E+00	0.00000E+00
108	8.37758E-01	2.91917E+00	8.46516E-01	2.06517E-03	0.00000E+00	0.00000E+00
109	8.49844E-01	2.94217E+00	8.46547E-01	2.04601E-03	0.00000E+00	0.00000E+00
110	8.55113E-01	2.96500E+00	8.46626E-01	2.02853E-03	0.00000E+00	0.00000E+00
111	8.46195E-01	2.98700E+00	8.46623E-01	2.00984E-03	0.00000E+00	0.00000E+00
112	8.45141E-01	3.00983E+00	8.46609E-01	1.99153E-03	0.00000E+00	0.00000E+00
113	8.31607E-01	3.03183E+00	8.46474E-01	1.97813E-03	0.00000E+00	0.00000E+00
114	8.24469E-01	3.05467E+00	8.46277E-01	1.97021E-03	0.00000E+00	0.00000E+00
115	8.55939E-01	3.07667E+00	8.46363E-01	1.95456E-03	0.00000E+00	0.00000E+00
116	8.35861E-01	3.09950E+00	8.46271E-01	1.93953E-03	0.00000E+00	0.00000E+00
117	8.89436E-01	3.12150E+00	8.46646E-01	1.95889E-03	0.00000E+00	0.00000E+00
118	8.36781E-01	3.14433E+00	8.46561E-01	1.94379E-03	0.00000E+00	0.00000E+00
119	8.56479E-01	3.16733E+00	8.46646E-01	1.92897E-03	0.00000E+00	0.00000E+00
120	8.31943E-01	3.19117E+00	8.46521E-01	1.91661E-03	0.00000E+00	0.00000E+00
121	8.47051E-01	3.21400E+00	8.46526E-01	1.90044E-03	0.00000E+00	0.00000E+00
122	8.56000E-01	3.23600E+00	8.46605E-01	1.88619E-03	0.00000E+00	0.00000E+00
123	8.66896E-01	3.25983E+00	8.46772E-01	1.87804E-03	0.00000E+00	0.00000E+00
124	8.87945E-01	3.28267E+00	8.47110E-01	1.89290E-03	0.00000E+00	0.00000E+00
125	8.03069E-01	3.30550E+00	8.46752E-01	1.91129E-03	0.00000E+00	0.00000E+00
126	8.28590E-01	3.32833E+00	8.46605E-01	1.90146E-03	0.00000E+00	0.00000E+00
127	8.37357E-01	3.35217E+00	8.46531E-01	1.88764E-03	0.00000E+00	0.00000E+00
128	8.54670E-01	3.37417E+00	8.46596E-01	1.87371E-03	0.00000E+00	0.00000E+00
129	8.34564E-01	3.39700E+00	8.46501E-01	1.86131E-03	0.00000E+00	0.00000E+00
130	8.31266E-01	3.41900E+00	8.46382E-01	1.85055E-03	0.00000E+00	0.00000E+00
131	8.26428E-01	3.44200E+00	8.46227E-01	1.84265E-03	0.00000E+00	0.00000E+00
132	7.89605E-01	3.46483E+00	8.45792E-01	1.87958E-03	0.00000E+00	0.00000E+00
133	8.36767E-01	3.48683E+00	8.45723E-01	1.86645E-03	0.00000E+00	0.00000E+00
134	8.63284E-01	3.51050E+00	8.45856E-01	1.85703E-03	0.00000E+00	0.00000E+00
135	8.58040E-01	3.53167E+00	8.45948E-01	1.84529E-03	0.00000E+00	0.00000E+00
136	8.47175E-01	3.55450E+00	8.45957E-01	1.83149E-03	0.00000E+00	0.00000E+00
137	8.11359E-01	3.57733E+00	8.45701E-01	1.83585E-03	0.00000E+00	0.00000E+00
138	8.36414E-01	3.60033E+00	8.45632E-01	1.82358E-03	0.00000E+00	0.00000E+00
139	8.34532E-01	3.62317E+00	8.45551E-01	1.81203E-03	0.00000E+00	0.00000E+00
140	8.29938E-01	3.64700E+00	8.45438E-01	1.80241E-03	0.00000E+00	0.00000E+00
141	8.32637E-01	3.67083E+00	8.45346E-01	1.79176E-03	0.00000E+00	0.00000E+00
142	8.61959E-01	3.69367E+00	8.45465E-01	1.78287E-03	0.00000E+00	0.00000E+00
143	8.93369E-01	3.71567E+00	8.45805E-01	1.80252E-03	0.00000E+00	0.00000E+00
144	8.40488E-01	3.73950E+00	8.45767E-01	1.79017E-03	0.00000E+00	0.00000E+00
145	8.37730E-01	3.76233E+00	8.45711E-01	1.77849E-03	0.00000E+00	0.00000E+00
146	8.08936E-01	3.78433E+00	8.45456E-01	1.78447E-03	0.00000E+00	0.00000E+00
147	8.51072E-01	3.80633E+00	8.45494E-01	1.77254E-03	0.00000E+00	0.00000E+00
148	8.25831E-01	3.82917E+00	8.45360E-01	1.76550E-03	0.00000E+00	0.00000E+00
149	8.72426E-01	3.85200E+00	8.45544E-01	1.76309E-03	0.00000E+00	0.00000E+00
150	8.48161E-01	3.87400E+00	8.45561E-01	1.75123E-03	0.00000E+00	0.00000E+00
151	8.12393E-01	3.89783E+00	8.45339E-01	1.75362E-03	0.00000E+00	0.00000E+00
152	8.27142E-01	3.91983E+00	8.45218E-01	1.74611E-03	0.00000E+00	0.00000E+00
153	8.56056E-01	3.94267E+00	8.45269E-01	1.73599E-03	0.00000E+00	0.00000E+00
154	8.43779E-01	3.96550E+00	8.45279E-01	1.72456E-03	0.00000E+00	0.00000E+00
155	8.23765E-01	3.98933E+00	8.45139E-01	1.71902E-03	0.00000E+00	0.00000E+00
156	8.62734E-01	4.01133E+00	8.45253E-01	1.71164E-03	0.00000E+00	0.00000E+00
157	8.36394E-01	4.03417E+00	8.45196E-01	1.70152E-03	0.00000E+00	0.00000E+00
158	8.44308E-01	4.05617E+00	8.45190E-01	1.69058E-03	0.00000E+00	0.00000E+00
159	8.62940E-01	4.07900E+00	8.45303E-01	1.68358E-03	0.00000E+00	0.00000E+00
160	8.61780E-01	4.10100E+00	8.45407E-01	1.67614E-03	0.00000E+00	0.00000E+00
161	8.35460E-01	4.12383E+00	8.45345E-01	1.66674E-03	0.00000E+00	0.00000E+00
162	8.25338E-01	4.14683E+00	8.45220E-01	1.66100E-03	0.00000E+00	0.00000E+00
163	8.40146E-01	4.16883E+00	8.45188E-01	1.65095E-03	0.00000E+00	0.00000E+00
164	8.42656E-01	4.19167E+00	8.45173E-01	1.64081E-03	0.00000E+00	0.00000E+00
165	8.39231E-01	4.21450E+00	8.45136E-01	1.63112E-03	0.00000E+00	0.00000E+00
166	8.54434E-01	4.23750E+00	8.45193E-01	1.62213E-03	0.00000E+00	0.00000E+00
167	8.59968E-01	4.26033E+00	8.45293E-01	1.61475E-03	0.00000E+00	0.00000E+00
168	8.44632E-01	4.28317E+00	8.45279E-01	1.60500E-03	0.00000E+00	0.00000E+00
169	8.66339E-01	4.30517E+00	8.45405E-01	1.60034E-03	0.00000E+00	0.00000E+00
170	8.30213E-01	4.32717E+00	8.45314E-01	1.59335E-03	0.00000E+00	0.00000E+00

171	8.53259E-01	4.34917E+00	8.45361E-01	1.58459E-03	0.00000E+00	0.00000E+00
172	8.52991E-01	4.37200E+00	8.45406E-01	1.57588E-03	0.00000E+00	0.00000E+00
173	8.35313E-01	4.39483E+00	8.45347E-01	1.56775E-03	0.00000E+00	0.00000E+00
174	8.39402E-01	4.41867E+00	8.45313E-01	1.55900E-03	0.00000E+00	0.00000E+00
175	8.85390E-01	4.44150E+00	8.45544E-01	1.56717E-03	0.00000E+00	0.00000E+00
176	8.67804E-01	4.46350E+00	8.45672E-01	1.56338E-03	0.00000E+00	0.00000E+00
177	8.90259E-01	4.48650E+00	8.45927E-01	1.57517E-03	0.00000E+00	0.00000E+00
178	8.63545E-01	4.50750E+00	8.46027E-01	1.56939E-03	0.00000E+00	0.00000E+00
179	8.24477E-01	4.53133E+00	8.45905E-01	1.56524E-03	0.00000E+00	0.00000E+00
180	8.48311E-01	4.55317E+00	8.45919E-01	1.55648E-03	0.00000E+00	0.00000E+00
181	8.24968E-01	4.57617E+00	8.45802E-01	1.55218E-03	0.00000E+00	0.00000E+00
182	8.74340E-01	4.59817E+00	8.45960E-01	1.55165E-03	0.00000E+00	0.00000E+00
183	8.43356E-01	4.62100E+00	8.45946E-01	1.54312E-03	0.00000E+00	0.00000E+00
184	7.96098E-01	4.64567E+00	8.45672E-01	1.55887E-03	0.00000E+00	0.00000E+00
185	8.19912E-01	4.66767E+00	8.45531E-01	1.55671E-03	0.00000E+00	0.00000E+00
186	8.50512E-01	4.68867E+00	8.45558E-01	1.54846E-03	0.00000E+00	0.00000E+00
187	8.38616E-01	4.71167E+00	8.45521E-01	1.54052E-03	0.00000E+00	0.00000E+00
188	8.32801E-01	4.73450E+00	8.45452E-01	1.53374E-03	0.00000E+00	0.00000E+00
189	8.18017E-01	4.75733E+00	8.45306E-01	1.53256E-03	0.00000E+00	0.00000E+00
190	8.06131E-01	4.78033E+00	8.45097E-01	1.53856E-03	0.00000E+00	0.00000E+00
191	8.34888E-01	4.80400E+00	8.45043E-01	1.53135E-03	0.00000E+00	0.00000E+00
192	8.40406E-01	4.82700E+00	8.45019E-01	1.52347E-03	0.00000E+00	0.00000E+00
193	8.51144E-01	4.84900E+00	8.45051E-01	1.51581E-03	0.00000E+00	0.00000E+00
194	8.51368E-01	4.87183E+00	8.45084E-01	1.50825E-03	0.00000E+00	0.00000E+00
195	8.53999E-01	4.89567E+00	8.45130E-01	1.50113E-03	0.00000E+00	0.00000E+00
196	8.57997E-01	4.91667E+00	8.45196E-01	1.49484E-03	0.00000E+00	0.00000E+00
197	8.31102E-01	4.93950E+00	8.45124E-01	1.48891E-03	0.00000E+00	0.00000E+00
198	8.60282E-01	4.96250E+00	8.45201E-01	1.48331E-03	0.00000E+00	0.00000E+00
199	8.09193E-01	4.98433E+00	8.45019E-01	1.48704E-03	0.00000E+00	0.00000E+00
200	8.45723E-01	5.00817E+00	8.45022E-01	1.47952E-03	0.00000E+00	0.00000E+00
201	8.47729E-01	5.03017E+00	8.45036E-01	1.47212E-03	0.00000E+00	0.00000E+00
202	8.67544E-01	5.05300E+00	8.45148E-01	1.46906E-03	0.00000E+00	0.00000E+00
203	8.42843E-01	5.07600E+00	8.45137E-01	1.46178E-03	0.00000E+00	0.00000E+00
204	8.50551E-01	5.09883E+00	8.45164E-01	1.45477E-03	0.00000E+00	0.00000E+00
205	8.15964E-01	5.12083E+00	8.45020E-01	1.45472E-03	0.00000E+00	0.00000E+00
206	8.43229E-01	5.14283E+00	8.45011E-01	1.44760E-03	0.00000E+00	0.00000E+00
207	8.66512E-01	5.16483E+00	8.45116E-01	1.44433E-03	0.00000E+00	0.00000E+00
208	8.56123E-01	5.18850E+00	8.45169E-01	1.43829E-03	0.00000E+00	0.00000E+00
209	8.34250E-01	5.21150E+00	8.45117E-01	1.43230E-03	0.00000E+00	0.00000E+00
210	8.24644E-01	5.23517E+00	8.45018E-01	1.42879E-03	0.00000E+00	0.00000E+00
211	8.23410E-01	5.25717E+00	8.44915E-01	1.42569E-03	0.00000E+00	0.00000E+00
212	8.32794E-01	5.28200E+00	8.44857E-01	1.42006E-03	0.00000E+00	0.00000E+00
213	8.65427E-01	5.30483E+00	8.44955E-01	1.41667E-03	0.00000E+00	0.00000E+00
214	8.32568E-01	5.32683E+00	8.44896E-01	1.41119E-03	0.00000E+00	0.00000E+00
215	8.54053E-01	5.34967E+00	8.44939E-01	1.40520E-03	0.00000E+00	0.00000E+00
216	8.71032E-01	5.37067E+00	8.45061E-01	1.40393E-03	0.00000E+00	0.00000E+00
217	8.52064E-01	5.39267E+00	8.45094E-01	1.39776E-03	0.00000E+00	0.00000E+00
218	8.32361E-01	5.41650E+00	8.45035E-01	1.39252E-03	0.00000E+00	0.00000E+00
219	8.69524E-01	5.43750E+00	8.45148E-01	1.39068E-03	0.00000E+00	0.00000E+00
220	8.56193E-01	5.46050E+00	8.45198E-01	1.38521E-03	0.00000E+00	0.00000E+00
221	8.61809E-01	5.48333E+00	8.45274E-01	1.38095E-03	0.00000E+00	0.00000E+00
222	8.63130E-01	5.50433E+00	8.45355E-01	1.37706E-03	0.00000E+00	0.00000E+00
223	8.14770E-01	5.52633E+00	8.45217E-01	1.37778E-03	0.00000E+00	0.00000E+00
224	8.06651E-01	5.55017E+00	8.45043E-01	1.38252E-03	0.00000E+00	0.00000E+00
225	8.61994E-01	5.57300E+00	8.45119E-01	1.37840E-03	0.00000E+00	0.00000E+00
226	8.35567E-01	5.59600E+00	8.45077E-01	1.37290E-03	0.00000E+00	0.00000E+00
227	8.18250E-01	5.61883E+00	8.44957E-01	1.37197E-03	0.00000E+00	0.00000E+00
228	8.50376E-01	5.64267E+00	8.44981E-01	1.36610E-03	0.00000E+00	0.00000E+00
229	8.37106E-01	5.66550E+00	8.44947E-01	1.36051E-03	0.00000E+00	0.00000E+00
230	8.59032E-01	5.68750E+00	8.45008E-01	1.35594E-03	0.00000E+00	0.00000E+00
231	8.38066E-01	5.71033E+00	8.44978E-01	1.35034E-03	0.00000E+00	0.00000E+00
232	8.78583E-01	5.73233E+00	8.45124E-01	1.35238E-03	0.00000E+00	0.00000E+00
233	8.00052E-01	5.75517E+00	8.44929E-01	1.36057E-03	0.00000E+00	0.00000E+00
234	8.38247E-01	5.77900E+00	8.44900E-01	1.35500E-03	0.00000E+00	0.00000E+00
235	8.13711E-01	5.80283E+00	8.44766E-01	1.35580E-03	0.00000E+00	0.00000E+00
236	8.19853E-01	5.82483E+00	8.44660E-01	1.35418E-03	0.00000E+00	0.00000E+00
237	8.59566E-01	5.84850E+00	8.44723E-01	1.34990E-03	0.00000E+00	0.00000E+00
238	8.73399E-01	5.87050E+00	8.44845E-01	1.34965E-03	0.00000E+00	0.00000E+00
239	8.28429E-01	5.89250E+00	8.44776E-01	1.34572E-03	0.00000E+00	0.00000E+00
240	9.03342E-01	5.91450E+00	8.45022E-01	1.36246E-03	0.00000E+00	0.00000E+00
241	8.45582E-01	5.93733E+00	8.45024E-01	1.35675E-03	0.00000E+00	0.00000E+00
242	8.44312E-01	5.96033E+00	8.45021E-01	1.35109E-03	0.00000E+00	0.00000E+00
243	8.31148E-01	5.98400E+00	8.44963E-01	1.34671E-03	0.00000E+00	0.00000E+00
244	8.42377E-01	6.00517E+00	8.44953E-01	1.34117E-03	0.00000E+00	0.00000E+00
245	8.26543E-01	6.02800E+00	8.44877E-01	1.33779E-03	0.00000E+00	0.00000E+00
246	8.69212E-01	6.05000E+00	8.44977E-01	1.33602E-03	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	962 INDEPENDENT	FISSION POINTS WERE	GENERATED	
247	7.82290E-01	6.07383E+00	8.44721E-01	1.35493E-03	0.00000E+00	0.00000E+00
248	8.70272E-01	6.09483E+00	8.44825E-01	1.35341E-03	0.00000E+00	0.00000E+00
249	8.66825E-01	6.11767E+00	8.44914E-01	1.35086E-03	0.00000E+00	0.00000E+00
250	8.37830E-01	6.13967E+00	8.44685E-01	1.34570E-03	0.00000E+00	0.00000E+00
251	8.32824E-01	6.16350E+00	8.44837E-01	1.34116E-03	0.00000E+00	0.00000E+00
252	8.86829E-01	6.18550E+00	8.45005E-01	1.34630E-03	0.00000E+00	0.00000E+00
253	8.62470E-01	6.20750E+00	8.45074E-01	1.34273E-03	0.00000E+00	0.00000E+00
254	8.60390E-01	6.22933E+00	8.45135E-01	1.33878E-03	0.00000E+00	0.00000E+00
255	8.26730E-01	6.25233E+00	8.45062E-01	1.33546E-03	0.00000E+00	0.00000E+00
256	8.47655E-01	6.27517E+00	8.45073E-01	1.33023E-03	0.00000E+00	0.00000E+00
257	8.32829E-01	6.29717E+00	8.45025E-01	1.32587E-03	0.00000E+00	0.00000E+00
258	8.41696E-01	6.32000E+00	8.45012E-01	1.32075E-03	0.00000E+00	0.00000E+00
259	8.35759E-01	6.34283E+00	8.44976E-01	1.31609E-03	0.00000E+00	0.00000E+00
260	8.28722E-01	6.36667E+00	8.44913E-01	1.31249E-03	0.00000E+00	0.00000E+00
261	8.24629E-01	6.38867E+00	8.44834E-01	1.30976E-03	0.00000E+00	0.00000E+00
262	8.30084E-01	6.41150E+00	8.44801E-01	1.30514E-03	0.00000E+00	0.00000E+00
263	8.46821E-01	6.43450E+00	8.44608E-01	1.30016E-03	0.00000E+00	0.00000E+00
264	8.46912E-01	6.45650E+00	8.44816E-01	1.29521E-03	0.00000E+00	0.00000E+00

265	8.46996E-01	6.47833E+00	8.44825E-01	1.29030E-03	0.00000E+00	0.00000E+00
266	8.67247E-01	6.50217E+00	8.44910E-01	1.28821E-03	0.00000E+00	0.00000E+00
267	8.66171E-01	6.52500E+00	8.44990E-01	1.28584E-03	0.00000E+00	0.00000E+00
268	8.78363E-01	6.54617E+00	8.45115E-01	1.28713E-03	0.00000E+00	0.00000E+00
269	8.34032E-01	6.57000E+00	8.45074E-01	1.28297E-03	0.00000E+00	0.00000E+00
270	8.74759E-01	6.59283E+00	8.45185E-01	1.28297E-03	0.00000E+00	0.00000E+00
271	8.67916E-01	6.61567E+00	8.45269E-01	1.28098E-03	0.00000E+00	0.00000E+00
272	8.51054E-01	6.63950E+00	8.45290E-01	1.27640E-03	0.00000E+00	0.00000E+00
273	8.31307E-01	6.66150E+00	8.45239E-01	1.27273E-03	0.00000E+00	0.00000E+00
274	8.44673E-01	6.68533E+00	8.45237E-01	1.26805E-03	0.00000E+00	0.00000E+00
275	8.33542E-01	6.70817E+00	8.45194E-01	1.26412E-03	0.00000E+00	0.00000E+00
276	8.59575E-01	6.72917E+00	8.45246E-01	1.26059E-03	0.00000E+00	0.00000E+00
277	8.33866E-01	6.75300E+00	8.45205E-01	1.25668E-03	0.00000E+00	0.00000E+00
278	8.12346E-01	6.77583E+00	8.45086E-01	1.25776E-03	0.00000E+00	0.00000E+00
279	8.89446E-01	6.79783E+00	8.45246E-01	1.26341E-03	0.00000E+00	0.00000E+00
280	7.95746E-01	6.82083E+00	8.45068E-01	1.27138E-03	0.00000E+00	0.00000E+00
281	8.27775E-01	6.84367E+00	8.45006E-01	1.26833E-03	0.00000E+00	0.00000E+00
282	8.66185E-01	6.86467E+00	8.45082E-01	1.26606E-03	0.00000E+00	0.00000E+00
283	8.75302E-01	6.88750E+00	8.45189E-01	1.26612E-03	0.00000E+00	0.00000E+00
284	8.16010E-01	6.91050E+00	8.45086E-01	1.26586E-03	0.00000E+00	0.00000E+00
285	8.63003E-01	6.93333E+00	8.45149E-01	1.26297E-03	0.00000E+00	0.00000E+00
286	8.73404E-01	6.95533E+00	8.45249E-01	1.26244E-03	0.00000E+00	0.00000E+00
287	8.61558E-01	6.97817E+00	8.45306E-01	1.25930E-03	0.00000E+00	0.00000E+00
288	8.57909E-01	7.00200E+00	8.45350E-01	1.25566E-03	0.00000E+00	0.00000E+00
289	8.08852E-01	7.02300E+00	8.45223E-01	1.25773E-03	0.00000E+00	0.00000E+00
290	8.31189E-01	7.04683E+00	8.45174E-01	1.25430E-03	0.00000E+00	0.00000E+00
291	8.34772E-01	7.06883E+00	8.45138E-01	1.25047E-03	0.00000E+00	0.00000E+00
292	8.18060E-01	7.09167E+00	8.45045E-01	1.24964E-03	0.00000E+00	0.00000E+00
293	8.01426E-01	7.11550E+00	8.44895E-01	1.25433E-03	0.00000E+00	0.00000E+00
294	8.35443E-01	7.13750E+00	8.44862E-01	1.25045E-03	0.00000E+00	0.00000E+00
295	8.35251E-01	7.16033E+00	8.44830E-01	1.24660E-03	0.00000E+00	0.00000E+00
296	8.18200E-01	7.18333E+00	8.44739E-01	1.24565E-03	0.00000E+00	0.00000E+00
297	8.00944E-01	7.20700E+00	8.44591E-01	1.25027E-03	0.00000E+00	0.00000E+00
298	8.21223E-01	7.23000E+00	8.44512E-01	1.24853E-03	0.00000E+00	0.00000E+00
299	8.47216E-01	7.25100E+00	8.44521E-01	1.24436E-03	0.00000E+00	0.00000E+00
300	8.60221E-01	7.27300E+00	8.44573E-01	1.24129E-03	0.00000E+00	0.00000E+00
301	8.49427E-01	7.29583E+00	8.44590E-01	1.23724E-03	0.00000E+00	0.00000E+00
302	8.72947E-01	7.31783E+00	8.44684E-01	1.23673E-03	0.00000E+00	0.00000E+00
303	8.51278E-01	7.33983E+00	8.44706E-01	1.23281E-03	0.00000E+00	0.00000E+00

KENO MESSAGE NUMBER K5-123 EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS 80 MIL CHANNEL

LIFETIME = 1.15449E-04 + OR - 3.48275E-07 GENERATION TIME = 3.88784E-05 + OR - 1.17453E-07
NU BAR = 2.43690E+00 + OR - 1.11422E-04 AVERAGE FISSION GROUP = 2.23149E+01 + OR - 6.58134E-03
ENERGY(EV) OF THE AVERAGE LETHAPGY CAUSING FISSION = 1.81957E-01 + OR - 1.00812E-03

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.84465	+ OR - 0.00124	0.84342 TO 0.84589	0.84218 TO 0.84712	0.84094 TO 0.84836	300000
4	0.84465	+ OR - 0.00124	0.84341 TO 0.84589	0.84217 TO 0.84713	0.84093 TO 0.84837	299000
5	0.84453	+ OR - 0.00124	0.84329 TO 0.84576	0.84205 TO 0.84700	0.84081 TO 0.84824	298000
6	0.84452	+ OR - 0.00124	0.84327 TO 0.84576	0.84203 TO 0.84700	0.84079 TO 0.84824	297000
7	0.84449	+ OR - 0.00125	0.84325 TO 0.84574	0.84200 TO 0.84698	0.84076 TO 0.84823	296000
8	0.84433	+ OR - 0.00124	0.84309 TO 0.84557	0.84185 TO 0.84680	0.84061 TO 0.84804	295000
9	0.84436	+ OR - 0.00124	0.84312 TO 0.84561	0.84188 TO 0.84685	0.84064 TO 0.84809	294000
10	0.84439	+ OR - 0.00125	0.84314 TO 0.84564	0.84190 TO 0.84688	0.84065 TO 0.84813	293000
11	0.84426	+ OR - 0.00124	0.84302 TO 0.84550	0.84177 TO 0.84675	0.84053 TO 0.84799	292000
12	0.84426	+ OR - 0.00125	0.84301 TO 0.84550	0.84176 TO 0.84675	0.84051 TO 0.84800	291000
17	0.84429	+ OR - 0.00127	0.84302 TO 0.84555	0.84175 TO 0.84682	0.84048 TO 0.84809	286000
22	0.84434	+ OR - 0.00128	0.84306 TO 0.84562	0.84178 TO 0.84690	0.84050 TO 0.84818	281000
27	0.84445	+ OR - 0.00129	0.84317 TO 0.84574	0.84188 TO 0.84702	0.84059 TO 0.84831	276000
32	0.84428	+ OR - 0.00130	0.84298 TO 0.84558	0.84168 TO 0.84688	0.84038 TO 0.84818	271000
37	0.84389	+ OR - 0.00130	0.84259 TO 0.84518	0.84130 TO 0.84648	0.84000 TO 0.84777	266000
42	0.84393	+ OR - 0.00131	0.84262 TO 0.84524	0.84131 TO 0.84655	0.83999 TO 0.84786	261000
47	0.84380	+ OR - 0.00132	0.84248 TO 0.84512	0.84116 TO 0.84644	0.83984 TO 0.84776	256000
52	0.84386	+ OR - 0.00134	0.84252 TO 0.84519	0.84119 TO 0.84653	0.83985 TO 0.84786	251000
57	0.84391	+ OR - 0.00135	0.84256 TO 0.84525	0.84121 TO 0.84660	0.83986 TO 0.84795	246000
62	0.84405	+ OR - 0.00137	0.84268 TO 0.84542	0.84132 TO 0.84679	0.83995 TO 0.84816	241000
67	0.84430	+ OR - 0.00138	0.84291 TO 0.84568	0.84153 TO 0.84706	0.84015 TO 0.84844	236000
72	0.84393	+ OR - 0.00140	0.84253 TO 0.84533	0.84113 TO 0.84674	0.83973 TO 0.84814	231000
77	0.84418	+ OR - 0.00142	0.84275 TO 0.84560	0.84133 TO 0.84702	0.83991 TO 0.84844	226000
82	0.84408	+ OR - 0.00144	0.84264 TO 0.84551	0.84120 TO 0.84695	0.83977 TO 0.84839	221000
87	0.84373	+ OR - 0.00144	0.84230 TO 0.84517	0.84086 TO 0.84660	0.83943 TO 0.84804	216000
92	0.84374	+ OR - 0.00147	0.84227 TO 0.84520	0.84080 TO 0.84667	0.83933 TO 0.84814	211000

NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS 80 MIL CHANNEL

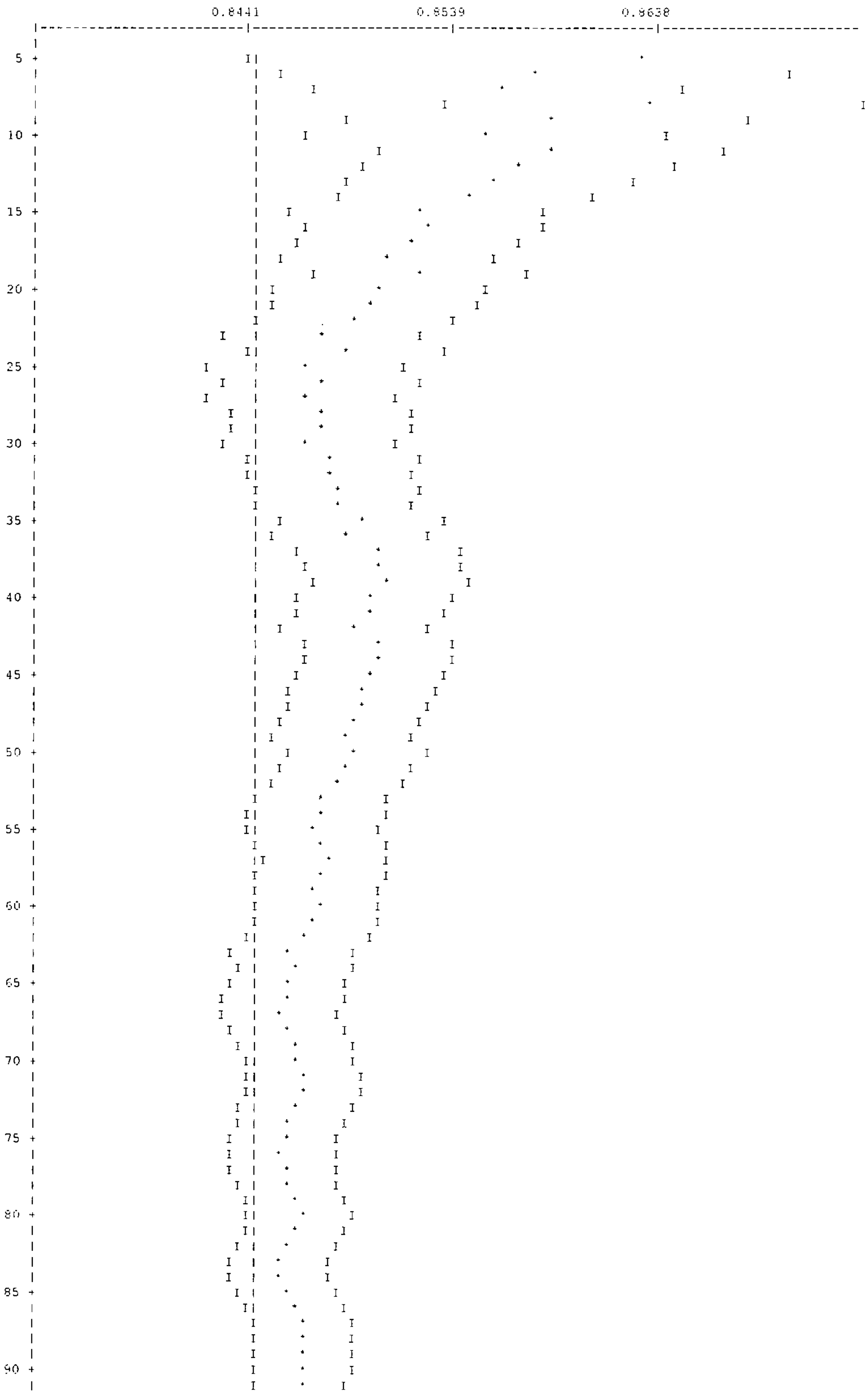
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
97	0.84375	+ OR - 0.00149	0.84225 TO 0.84524	0.84076 TO 0.84673	0.83926 TO 0.84823	206000
102	0.84349	+ OR - 0.00150	0.84199 TO 0.84498	0.84049 TO 0.84648	0.83899 TO 0.84798	201000
107	0.84369	+ OR - 0.00153	0.84216 TO 0.84522	0.84064 TO 0.84675	0.83911 TO 0.84828	196000
112	0.84361	+ OR - 0.00157	0.84204 TO 0.84518	0.84048 TO 0.84674	0.83891 TO 0.84831	191000
117	0.84351	+ OR - 0.00158	0.84192 TO 0.84509	0.84034 TO 0.84667	0.83876 TO 0.84826	186000
122	0.84345	+ OR - 0.00162	0.84183 TO 0.84507	0.84020 TO 0.84669	0.83858 TO 0.84831	181000
127	0.84341	+ OR - 0.00162	0.84179 TO 0.84503	0.84016 TO 0.84666	0.83854 TO 0.84828	176000
132	0.84388	+ OR - 0.00164	0.84225 TO 0.84552	0.84061 TO 0.84715	0.83898 TO 0.84879	171000
137	0.84390	+ OR - 0.00167	0.84223 TO 0.84556	0.84057 TO 0.84723	0.83890 TO 0.84890	166000
142	0.84405	+ OR - 0.00171	0.84234 TO 0.84576	0.84063 TO 0.84746	0.83892 TO 0.84917	161000
147	0.84397	+ OR - 0.00172	0.84225 TO 0.84569	0.84054 TO 0.84741	0.83882 TO 0.84913	156000
152	0.84420	+ OR - 0.00175	0.84245 TO 0.84594	0.84071 TO 0.84769	0.83896 TO 0.84943	151000
157	0.84419	+ OR - 0.00179	0.84239 TO 0.84598	0.84060 TO 0.84777	0.83861 TO 0.84956	146000
162	0.84412	+ OR - 0.00184	0.84228 TO 0.84596	0.84044 TO 0.84781	0.83860 TO 0.84965	141000
167	0.84401	+ OR - 0.00190	0.84210 TO 0.84591	0.84020 TO 0.84781	0.83829 TO 0.84972	136000
172	0.84380	+ OR - 0.00196	0.84183 TO 0.84576	0.83987 TO 0.84773	0.83791 TO 0.84969	131000
177	0.84301	+ OR - 0.00197	0.84104 TO 0.84498	0.83907 TO 0.84695	0.83710 TO 0.84892	126000
182	0.84284	+ OR - 0.00202	0.84083 TO 0.84486	0.83881 TO 0.84687	0.83679 TO 0.84889	121000
187	0.84341	+ OR - 0.00205	0.84136 TO 0.84546	0.83930 TO 0.84751	0.83725 TO 0.84956	116000
192	0.84417	+ OR - 0.00210	0.84207 TO 0.84627	0.83997 TO 0.84837	0.83787 TO 0.85047	111000
197	0.84394	+ OR - 0.00219	0.84175 TO 0.84612	0.83956 TO 0.84831	0.83737 TO 0.85050	106000
202	0.84383	+ OR - 0.00225	0.84158 TO 0.84608	0.83933 TO 0.84833	0.83707 TO 0.85059	101000
207	0.84383	+ OR - 0.00234	0.84149 TO 0.84617	0.83915 TO 0.84851	0.83681 TO 0.85085	96000
212	0.84436	+ OR - 0.00244	0.84192 TO 0.84680	0.83948 TO 0.84924	0.83704 TO 0.85167	91000
217	0.84374	+ OR - 0.00254	0.84120 TO 0.84628	0.83865 TO 0.84882	0.83611 TO 0.85136	86000
222	0.84294	+ OP - 0.00265	0.84029 TO 0.84559	0.83764 TO 0.84824	0.83499 TO 0.85090	81000
227	0.84396	+ OR - 0.00272	0.84124 TO 0.84669	0.83851 TO 0.84941	0.83579 TO 0.85214	76000

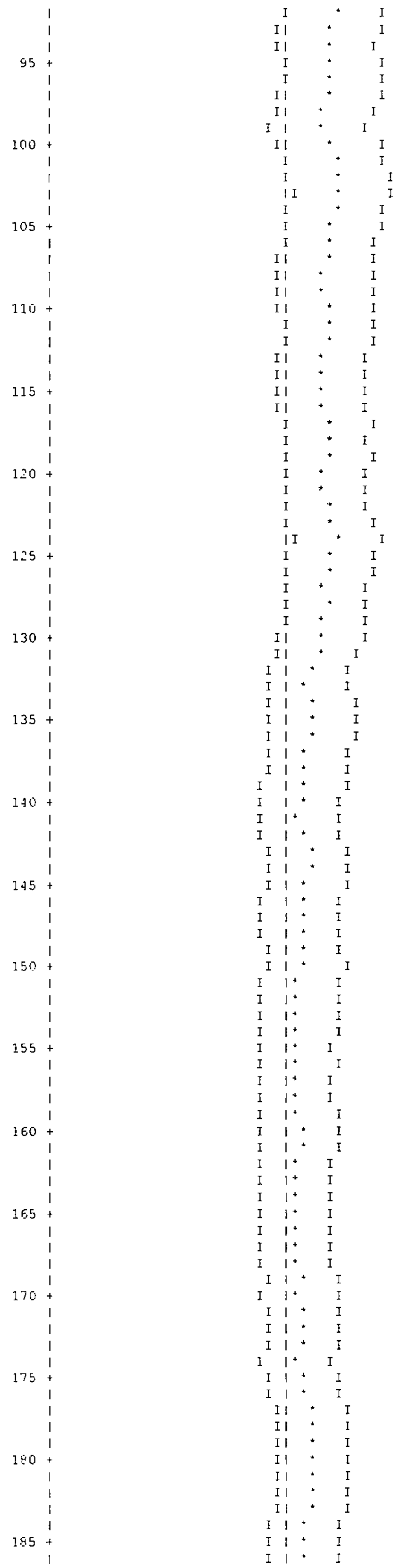
NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS 80 MIL CHANNEL

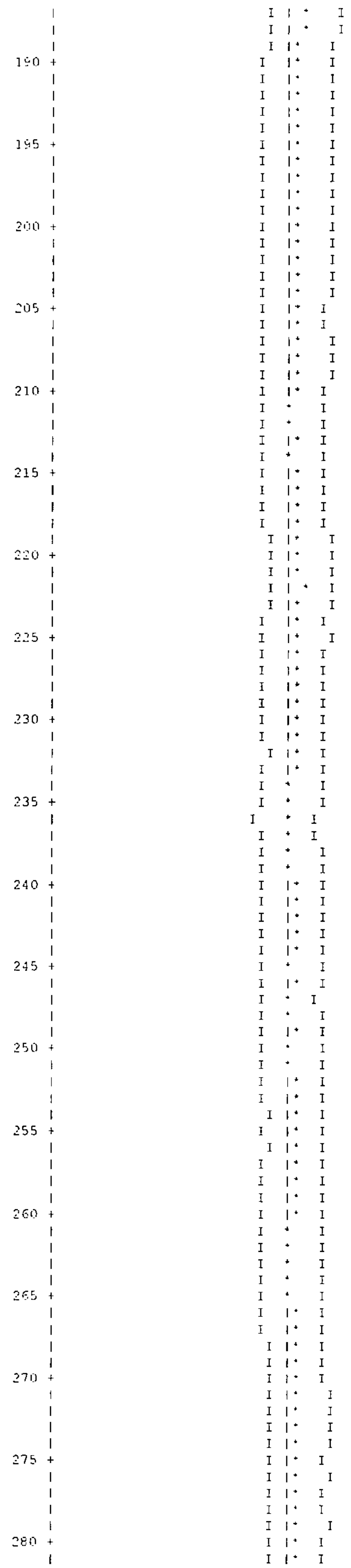
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
232	0.84335	+ OR - 0.00286	0.84049 TO 0.84621	0.83763 TO 0.84908	0.83476 TO 0.85194	71000
237	0.84464	+ OR - 0.00294	0.84171 TO 0.84758	0.83877 TO 0.85052	0.83583 TO 0.85346	66000
242	0.84347	+ OR - 0.00298	0.84049 TO 0.84644	0.83752 TO 0.84942	0.83454 TO 0.85239	61000
247	0.84464	+ OR - 0.00299	0.84165 TO 0.84763	0.83867 TO 0.85062	0.83568 TO 0.85360	56000
252	0.84324	+ OR - 0.00309	0.84016 TO 0.84633	0.83707 TO 0.84941	0.83399 TO 0.85250	51000
257	0.84294	+ OR - 0.00335	0.83959 TO 0.84629	0.83624 TO 0.84964	0.83290 TO 0.85299	46000
262	0.84411	+ OR - 0.00371	0.84040 TO 0.84781	0.83670 TO 0.85152	0.83299 TO 0.85522	41000
267	0.84262	+ OR - 0.00412	0.83850 TO 0.84674	0.83438 TO 0.85086	0.83026 TO 0.85498	36000
272	0.83962	+ OR - 0.00440	0.83521 TO 0.84402	0.83081 TO 0.84842	0.82641 TO 0.85282	31000
277	0.83943	+ OR - 0.00518	0.83425 TO 0.84461	0.82907 TO 0.84979	0.82388 TO 0.85497	26000
282	0.83970	+ OR - 0.00522	0.83447 TO 0.84492	0.82925 TO 0.85014	0.82403 TO 0.85536	21000
287	0.83402	+ OR - 0.00538	0.82864 TO 0.83940	0.82326 TO 0.84479	0.81788 TO 0.85017	16000
292	0.83578	+ OR - 0.00704	0.82874 TO 0.84282	0.82170 TO 0.84986	0.81466 TO 0.85690	11000
297	0.85039	+ OR - 0.00700	0.84339 TO 0.85738	0.83639 TO 0.86438	0.82940 TO 0.87137	6000

NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS 80 MIL CHANNEL

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.8447 + OR - 0.0012 WHICH OCCURS FOR 303 GENERATIONS RUN.




95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185


190
195
200
205
210
215
220
225
230
235
240
245
250
255
260
265
270
275
280

```
     |                        I |*  I
     |                        I |*  I
     |                        I |*  I
 285 +                        I |*  I
     |                        I |*   I
     |                        I | *  I
     |                        I | *  I
     |                        I |*   I
 290 +                        I |*  I
     |                        I |*  I
     |                        I |*  I
     |                       I  *   I
     |                       I  *   I
 295 +                       I  *  I
     |                       I  *  I
     |                       I  *  I
     |                      I   *  I
     |                      I   *  I
 300 +                       I  *  I
     |                       I  *  I
     |                       I  *  I
     |                       I  *  I
```

NAC-LWT CASK MODEL: EXXON 9X9 - 2 WATER RODS 80 MIL CHANNEL

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0043			3.61777E-03	2.2735	2.18472E-03	1.6447	0.00000E+00	0.0000
2	0.0185			1.56076E-02	0.6937	7.98975E-03	0.5770	0.00000E+00	0.0000
3	0.0206			1.74335E-02	0.6802	7.32774E-03	0.6498	0.00000E+00	0.0000
4	0.0087			7.32810E-03	0.7389	3.57368E-03	0.7003	0.00000E+00	0.0000
5	0.0029			2.41700E-03	0.5573	2.60715E-03	0.4706	0.00000E+00	0.0000
6	0.0026			2.17260E-03	0.4693	4.41687E-03	0.3848	0.00000E+00	0.0000
7	0.0025			2.14659E-03	0.4714	5.01186E-03	0.3688	0.00000E+00	0.0000
8	0.0025			2.11131E-03	0.5189	7.13242E-03	0.4091	0.00000E+00	0.0000
9	0.0034			2.90308E-03	0.5647	1.14886E-02	0.4381	0.00000E+00	0.0000
10	0.0073			6.15712E-03	0.5802	1.69292E-02	0.4601	0.00000E+00	0.0000
11	0.0153			1.29563E-02	0.6108	2.73480E-02	0.4723	0.00000E+00	0.0000
12	0.0197			1.66202E-02	0.6463	2.84516E-02	0.5647	0.00000E+00	0.0000
13	0.0182			1.53687E-02	0.7378	2.89485E-02	0.6118	0.00000E+00	0.0000
14	0.0142			1.19993E-02	0.6820	4.07978E-02	0.5531	0.00000E+00	0.0000
15	0.0032			2.70080E-03	1.0990	9.69814E-03	0.7338	0.00000E+00	0.0000
16	0.0022			1.83704E-03	1.4949	5.76935E-03	0.8555	0.00000E+00	0.0000
17	0.0034			2.89596E-03	1.7804	3.96015E-03	1.0609	0.00000E+00	0.0000
18	0.0044			3.75823E-03	1.9471	4.04526E-03	1.1440	0.00000E+00	0.0000
19	0.0055			4.68498E-03	1.4897	6.51489E-03	0.8758	0.00000E+00	0.0000
20	0.0230			1.94468E-02	0.8207	2.53005E-02	0.5405	0.00000E+00	0.0000
21	0.0121			1.02611E-02	1.2461	1.07616E-02	0.7964	0.00000E+00	0.0000
22	0.0290			2.44663E-02	0.9071	2.45684E-02	0.6055	0.00000E+00	0.0000
23	0.1059			8.94160E-02	0.4903	9.55808E-02	0.3058	0.00000E+00	0.0000
24	0.2106			1.77859E-01	0.3520	1.91926E-01	0.1980	0.00000E+00	0.0000
25	0.1788			1.51066E-01	0.4321	1.63657E-01	0.2162	0.00000E+00	0.0000
26	0.2140			1.80725E-01	0.3744	1.99844E-01	0.2280	0.00000E+00	0.0000
27	0.0671			5.66943E-02	0.7907	6.62470E-02	0.4303	0.00000E+00	0.0000
SYSTEM TOTAL =				8.44651E-01	0.1463	1.00208E+00	0.0498	0.00000E+00	0.0000

THE WEIGHT LOST IN THE ALBEDO PORTION OF THE PROBLEM = 1.2281E-07 + OR - 0.0000

ELAPSED TIME 7.34067 MINUTES

RANDOM NUMBER= 26E447865737

```
NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS  80 MIL CHANNEL

                              FREQUENCY FOR GENERATIONS    4 TO  303
0.7799 TO 0.7925     **
0.7925 TO 0.8052     ********
0.8052 TO 0.8178     *************
0.8178 TO 0.8305     ************************************************
0.8305 TO 0.8431     **************************************************************************
0.8431 TO 0.8558     ********************************************************
0.8558 TO 0.8684     ***************************************************
0.8684 TO 0.8811     *********************
0.8811 TO 0.8937     **************
0.8937 TO 0.9064     ***

                              FREQUENCY FOR GENERATIONS   79 TO  303
0.7799 TO 0.7925     **
0.7925 TO 0.8052     ******
0.8052 TO 0.8178     ************
0.8178 TO 0.8305     *********************************
0.8305 TO 0.8431     ********************************************************
0.8431 TO 0.8558     ******************************************
0.8558 TO 0.8684     ****************************************
0.8684 TO 0.8811     ****************
0.8811 TO 0.8937     **********
0.8937 TO 0.9064     *

                              FREQUENCY FOR GENERATIONS  154 TO  303
0.7799 TO 0.7925     *
0.7925 TO 0.8052     *****
0.8052 TO 0.8178     *********
0.8178 TO 0.8305     ********************
0.8305 TO 0.8431     ************************************
0.8431 TO 0.8558     *****************************
0.8558 TO 0.8684     ******************************
0.8684 TO 0.8811     ************
0.8811 TO 0.8937     ****
0.8937 TO 0.9064     *

                              FREQUENCY FOR GENERATIONS  229 TO  303
0.7799 TO 0.7925     *
0.7925 TO 0.8052     ****
0.8052 TO 0.8178     ****
0.8178 TO 0.8305     **********
0.8305 TO 0.8431     *******************
0.8431 TO 0.8558     ***********
0.8558 TO 0.8684     **************
0.8684 TO 0.8811     *********
0.8811 TO 0.8937     **
0.8937 TO 0.9064     *


**************************************************************************************************************************************
*

          CONGRATULATIONS!  YOU HAVE  SUCCESSFULLY TRAVERSED THE PERILOUS PATH THROUGH KENO V IN   7.34067 MINUTES

**************************************************************************************************************************************
*
```

Figure 6.6.2-2 CSAS Input/Output for NAC-LWT with BWR Fuel Assemblies – Most Reactive Accident Condition Configuration

```
     PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
MODULE CSAS25   WILL BE CALLED
  NAC-LWT CASK MODEL; Exxon 9x9 - 2 Water Rods  80 MIL CHANNEL
  27GPOUPNDF4 LATTICECELL
  UO2   1 0.95 293.0 92235 4.0 92238 96.0 END
  ZIRCALLOY  2 1.0  293.0  END
  H2O   3 1.000 293.0 END
  AL    4 1.0 293.0 END
  SS304 5 1.0 293.0 END
  PB    6 1.0 293.0 END
  H2O   7 1.0E-20 293.0 END
  H2O   8 1.0E-20 293.0 END
  H2O   9 1.0 293.0 END
  END COMP
  SQUAREPITCH  1.4529 0.9055 1 3 1.0770 2 0.9246 9 END
  NAC-LWT CASK MODEL; Exxon 9x9 - 2 Water Rods  80 MIL CHANNEL
  READ PARAM RUN=YES PLT=NO TME=5000 GEN=303 NPG=1000 END PARAM
  READ GEOM
  UNIT  1
  COM='FUEL PIN CELL - WITH H2O'
  CYLINDER  1 1  0.4528   2P10.0
  CYLINDER  9 1  0.4623   2P10.0
  CYLINDER  2 1  0.5385   2P10.0
  CUBOID    3 1  4P0.7264 2P10.0
  UNIT  2
  COM='WATER ROD CELL - WITH H2O'
  CYLINDER  3 1  0.4623   2P10.0
  CYLINDER  2 1  0.5385   2P10.0
  CUBOID    3 1  4P0.7264 2P10.0
  UNIT 3
  ARRAY    1   -6.5376 -6.5376 -10.0
  CUBOID   3 1 4P6.7031   2P10.0
  CUBOID   2 1 4P6.9063   2P10.0
  CUBOID   3 1 4P7.3025   2P10.0
  UNIT 4
  ARRAY    1   -6.5376 -6.5376 -10.0
  CUBOID   3 1 4P6.7031   2P10.0
  CUBOID   2 1 4P6.9063   2P10.0
  CUBOID   3 1 4P7.3025   2P10.0
  UNIT 5
  CYLINDER 4 1 16.8275    2P10.0
  HOLE  3    -7.4613  0.0  0.0
  HOLE  4     7.4613  0.0  0.0
  CYLINDER 3 1 16.9863    2P10.0
  CYLINDER 5 1 18.8913    2P10.0
  CYLINDER 6 1 33.4963    2P10.0
  CYLINDER 5 1 36.5443    2P10.0
  CYLINDER 7 1 49.2443    2P10.0
  CYLINDER 5 1 49.8539    2P10.0
  GLOBAL UNIT 6
  CYLINDER 8 1 314.00   2P10.0
  HOLE 5  00.00   00.00  0.0
  HOLE 5  00.00   99.80  0.0
  HOLE 5  86.43   49.90  0.0
  HOLE 5  86.43  -49.90  0.0
  HOLE 5  00.00  -99.80  0.0
  HOLE 5 -86.43  -49.90  0.0
  HOLE 5 -86.43   49.90  0.0
  HOLE 5    0.0     199.6  0.0
  HOLE 5   86.43    149.7  0.0
  HOLE 5  172.85     99.8  0.0
  HOLE 5  172.86      0.0  0.0
  HOLE 5  172.86    -99.8  0.0
  HOLE 5   86.43   -149.7  0.0
  HOLE 5    0.0    -199.6  0.0
  HOLE 5  -86.43   -149.7  0.0
  HOLE 5 -172.86    -99.86 0.0
  HOLE 5 -172.86      0.0  0.0
  HOLE 5 -172.86     99.8  0.0
  HOLE 5  -86.43    149.7  0.0
  HOLE 5   259.29     49.9  0.0
  CUBOID   8 1 4P314.00   2P10.0
  END GEOM
  READ ARRAY
  ARA=1   NUX=9 NUY=9 NUZ=1  FILL
      36R1
   4R1  2   4R1
   5R1  2   3R1
      27R1
  END FILL
  END ARRAY
  READ BOUNDS ZFC=PER YXF=H2O END BOUNDS
  END DATA

SECONDARY MODULE 000008   HAS BEEN CALLED.

MODULE 000008   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     0.55 (SECONDS).
```

```
SECONDARY MODULE 000002   HAS BEEN CALLED.
MODULE 000002   IS FINISHED. COMPLETION CODE     0. CPU TIME USED      5.93 (SECONDS).
SECONDARY MODULE 000009   HAS BEEN CALLED.
MODULE 000009   IS FINISHED. COMPLETION CODE     0. CPU TIME USED    438.36 (SECONDS).
MODULE CSAS25   IS FINISHED. COMPLETION CODE     0. CPU TIME USED    446.44 (SECONDS).
```


CSAS25
SCALE-PC
07/21/98
12:27:03

```
 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA     LL              EEEEEEEEEEEEE               PPPPPPPPPPPP     CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA    LL              EEEEEEEEEEEEE               PPPPPPPPPPPPP   CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA   LL              EE                          PP         PP   CC         CC
SS             CC             AA         AA   LL              EE                          PP         PP   CC
SS             CC             AA         AA   LL              EE                          PP         PP   CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA   LL              EEEEEEEEE     -------------  PPPPPPPPPPPPP   CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA   LL              EEEEEEEEE     -------------  PPPPPPPPPPPP    CC
           SS  CC             AA         AA   LL              EE                          PP              CC
           SS  CC             AA         AA   LL              EE                          PP              CC
SS         SS  CC         CC  AA         AA   LL              EE                          PP              CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE               PP              CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE               PP               CCCCCCCCCCC
```

```
*****************************************************************************************
*****************************************************************************************
*****************************************************************************************
*****                                                                               *****
*****                     PROGRAM VERIFICATION INFORMATION                          *****
*****                                                                               *****
*****                  CODE SYSTEM:  SCALE-PC VERSION:  4.3                         *****
*****                                                                               *****
*****************************************************************************************
*****************************************************************************************
*****                                                                               *****
*****                                                                               *****
*****               PROGRAM:  CSAS                                                  *****
*****                                                                               *****
*****         CREATION DATE:  03/08/96                                              *****
*****                                                                               *****
*****                VOLUME:  ENG                                                   *****
*****                                                                               *****
*****               LIBRARY:  G:\SCALE43\WIN_NT\EXE                                 *****
*****                                                                               *****
*****                                                                               *****
*****       PRODUCTION CODE:  CSAS                                                  *****
*****                                                                               *****
*****               VERSION:  3.1                                                   *****
*****                                                                               *****
*****               JOBNAME:  SCALE-PC                                              *****
*****                                                                               *****
*****     DATE OF EXECUTION:  07/21/98                                              *****
*****                                                                               *****
*****     TIME OF EXECUTION:  12:27:03                                              *****
*****                                                                               *****
*****                                                                               *****
*****************************************************************************************
*****************************************************************************************
*****************************************************************************************
```

```
NAC-LWT CASK MODEL: EXXON 9X9 - 2 WATER RODS  80 MIL CHANNEL


**** PROBLEM PARAMETERS ****

LIB 27GROUPNDF4  LIBRARY
MXX             9 MIXTURES
MSC             9 COMPOSITION SPECIFICATIONS
IZM             4 MATERIAL ZONES
GE  LATTICECELL  GEOMETRY
MORE            0 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
MSLN            0 FUEL SOLUTIONS


**** PROBLEM COMPOSITION DESCRIPTION ****

SC  UO2          STANDARD COMPOSITION
MX              1 MIXTURE NO.
VF         0.9500 VOLUME FRACTION
ROTH      10.9600 THEORETICAL DENSITY
NEL             2 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
            92000       1.00 ATOM/MOLECULE
                                 92235      4.000 WT%
                                 92238     96.000 WT%
             8016       2.00 ATOMS/MOLECULE
END

SC  ZIRCALLOY    STANDARD COMPOSITION
MX              2 MIXTURE NO.
VF         1.0000 VOLUME FRACTION
ROTH       6.5600 THEORETICAL DENSITY
NEL             1 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
            40302       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX              3 MIXTURE NO.
VF         1.0000 VOLUME FRACTION
ROTH       0.9982 THEORETICAL DENSITY
NEL             2 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
             1001       2.00 ATOMS/MOLECULE
             8016       1.00 ATOM/MOLECULE
END

SC  AL           STANDARD COMPOSITION
MX              4 MIXTURE NO.
VF         1.0000 VOLUME FRACTION
ROTH       2.7020 THEORETICAL DENSITY
NEL             1 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
            13027       1.00 ATOM/MOLECULE
END

SC  SS304        STANDARD COMPOSITION
MX              5 MIXTURE NO.
VF         1.0000 VOLUME FRACTION
ROTH       7.9200 THEORETICAL DENSITY
NEL             4 NO. ELEMENTS
ICP             0 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
            24304     19.000 WT%
            25055      2.000 WT%
            26304     69.500 WT%
            28304      9.500 WT%
END

SC  PB           STANDARD COMPOSITION
MX              6 MIXTURE NO.
VF         1.0000 VOLUME FRACTION
ROTH      11.3440 THEORETICAL DENSITY
NEL             1 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
            82000       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX              7 MIXTURE NO.
VF         0.0000 VOLUME FRACTION
ROTH       0.9982 THEORETICAL DENSITY
NEL             2 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
             1001       2.00 ATOMS/MOLECULE
             8016       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
```

```
MX          8 MIXTURE NO.
VF     0.0000 VOLUME FRACTION
ROTH   0.9982 THEOPETICAL DENSITY
NEL         2 NO. ELEMENTS
ICP         1 0/1 MIXTURE/COMPOUND
TEMP    293.0 DEG KELVIN
         1001       2.00 ATOMS/MOLECULE
         8016       1.00 ATOM/MOLECULE
END

SC  H2O       STANDARD COMPOSITION
MX          9 MIXTURE NO.
VF     1.0000 VOLUME FRACTION
ROTH   0.9982 THEORETICAL DENSITY
NEL         2 NO. ELEMENTS
ICP         1 0/1 MIXTURE/COMPOUND
TEMP    293.0 DEG KELVIN
         1001       2.00 ATOMS/MOLECULE
         8016       1.00 ATOM/MOLECULE
END

**** PROBLEM GEOMETRY ****

CTP SQUAREPITCH  CELL TYPE
PITCH    1.4529 CM CENTER TO CENTER SPACING
FUELOD   0.9055 CM FUEL DIAMETER OR SLAB THICKNESS
MFUEL         1 MIXTURE NO. OF FUEL
MMOD          3 MIXTURE NO. OF MODERATOR
CLADOD   1.0770 CM CLAD OUTER DIAMETER
MCLAD         2 MIXTURE NO. OF CLAD
GAPOD    0.9246 CM GAP OUTER DIAMETER
MGAP          9 MIXTURE NO. OF GAP

ZONE SPECIFICATIONS FOR LATTICECELL GEOMETRY

               ZONE  1 IS FUEL
               ZONE  2 IS GAP
               ZONE  3 IS CLAD
               ZONE  4 IS MOD
```

```
NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS  80 MIL CHANNEL

********** DATA LIBRARY INFORMATION **********

UNIT                                                  VOLUME
NUMBER        DATA SET NAME                           NAME      UNIT FUNCTION
------        -------------                           ----      -------------

  89    G:\scale43\DATALIB\FT89F001                             STANDARD COMPOSITION LIBRARY

  82    G:\scale43\DATALIB\FT82F001                             CROSS SECTION LIBRARY

  11    D:\PROJECTS\BU85-C~1\BWRFIN\19HX1M\FT11F001             SHORT CROSS SECTION LIBRARY

  90    D:\PROJECTS\BU85-C~1\BWRFIN\19HX1M\FT90F001             INPUT DATA DIRECT ACCESS


                  STANDARD COMPOSITION LIBRARY DATA
                  ---------------------------------

     UNIT NUMBER  :  89

     DATASET NAME :  G:\scale43\DATALIB\FT89F001

     LIBRARY TITLE:  SCALE-4 STANDARD COMPOSITION LIBRARY
                     637 STANDARD COMPOSITIONS, 490 NUCLIDES
                     90 ELEMENTS WITH VARIABLE ISOTOPIC DISTRBUTIONS.

     CREATION DATE:   6/30/95


                  CROSS SECTION LIBRARY DATA
                  --------------------------

     UNIT NUMBER  :  82

     DATASET NAME :  G:\scale43\DATALIB\FT82F001

     LIBRARY TITLE:  SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
                        BASED ON ENDF-B VERSION 4 DATA
                           COMPILED FOR NRC      1/27/89
                              LAST UPDATED                                   08/12/94
                                 L.M.PETRIE    -    ORNL


        ........   0 IO'S WERE USED BEFORE READING KENO V DATA     ........

        ........   0 IO'S WERE USED READING THE KENO V PARAMETER DATA     ........

       ************** DATA READING COMPLETED **************

        ........   0 IO'S WERE USED PREPARING THE KENO V INPUT DATA     ........

        ........   0 IO'S WERE USED LOADING THE KENO V DATA     ........

        ........   0 IO'S WERE USED LOADING THE DATA     ........

        ........   0 IO'S WERE USED CHECKING THE KENO V GEOMETRY DATA     ........
        *****  RESTART DATA HAS BEEN WRITTEN ON UNIT 95  *****

        ........   0 IO'S WERE USED WRITING THE KENO V - CSAS DATA     ........

        ........   0 IO'S WERE USED PROCESSING CSAS INPUT DATA     ........

CONTROL MODULE CSAS25    IS COMPLETE.
```

```
KK         KK  EEEEEEEEEEEEE  NN         NN   00000000000            VV           VV
KK        KK   EEEEEEEEEEEEE  NNN        NN  0000000000000           VV           VV
KK       KK    EE             NNNN       NN  00         00           VV           VV
KK      KK     EE             NN NN      NN  00         00           VV           VV
KK     KK      EE             NN  NN     NN  00         00           VV           VV
KKKKKKKK       EEEEEEEEE      NN   NN    NN  00         00  -------------  VV     VV
KKKKKKKK       EEEEEEEEE      NN    NN   NN  00         00  -------------   VV   VV
KK     KK      EE             NN     NN  NN  00         00                   VV VV
KK      KK     EE             NN      NN NN  00         00                    VV VV
KK       KK    EE             NN       NNNN  00         00                     VV VV
KK        KK   EEEEEEEEEEEEE  NN        NNN  0000000000000                      VVV
KK         KK  EEEEEEEEEEEEE  NN         NN   00000000000                        V

 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL              EEEEEEEEEEEEE                  PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL              EEEEEEEEEEEEE                  PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL              EE                             PP         PP  CC         CC
SS             CC             AA         AA  LL              EE                             PP         PP  CC
SS             CC             AA         AA  LL              EE                             PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL              EEEEEEEEE     -------------    PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL              EEEEEEEEE     -------------    PPPPPPPPPPPP   CC
           SS  CC             AA         AA  LL              EE                             PP             CC
           SS  CC             AA         AA  LL              EE                             PP             CC
SS         SS  CC         CC  AA         AA  LL              EE                             PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLLL   EEEEEEEEEEEEE                  PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLLL   EEEEEEEEEEEEE                  PP              CCCCCCCCCCC

  0000000     7777777777777           //   22222222222       11            //   99999999999    88888888888
 000000000    777777777777           //   2222222222222     111           //   9999999999999  8888888888888
00       00   77        77          //    22         22    1111          //    99         99  88         88
00       00            77          //                22      11         //     99         99  88         88
00       00           77          //                 22      11        //      99         99  88         88
00       00          77          //                22        11       //       9999999999999   88888888888
00       00          77         //               22          11      //         999999999999   88888888888
00       00         77         //              22            11     //                    99  88         88
00       00         77        //             22              11    //                     99  88         88
 00     00          77       //            22                11   //                      99  88         88
 000000000          77      //            2222222222222   11111111 //           9999999999999  8888888888888
  0000000           77     //             2222222222222   11111111 //           999999999999    88888888888

      11      22222222222              22222222222   7777777777777               11          11
     111     2222222222222            2222222222222  777777777777               111         111
    1111     22         22    :::     22         22  77        77      :::     1111        1111
      11                22    :::                22           77       :::       11          11
      11                22    :::                22          77        :::       11          11
      11              22                       22           77                   11          11
      11            22                       22            77                    11          11
      11          22          :::          22             77           :::       11          11
      11        22            :::        22              77            :::       11          11
      11      22              :::      22               77             :::       11          11
 11111111    2222222222222            2222222222222     77                 11111111    11111111
 11111111    2222222222222            2222222222222     77                 11111111    11111111
```

NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS 80 MIL CHANNEL

****** NUMERIC PARAMETERS ******

TME	MAXIMUM PROBLEM TIME (MIN)	******
TBA	TIME PER GENERATION (MIN)	0.50
GEN	NUMBER OF GENERATIONS	303
NPG	NUMBER PER GENERATION	1000
NSK	NUMBER OF GENERATIONS TO BE SKIPPED	3
BEG	BEGINNING GENERATION NUMBER	1
RES	GENERATIONS BETWEEN CHECKPOINTS	0
X1D	NUMBER OF EXTRA 1-D CROSS SECTIONS	1
NBK	NEUTRON BANK SIZE	1025
XNB	EXTRA POSITIONS IN NEUTRON BANK	0
NFB	FISSION BANK SIZE	1000
XFB	EXTRA POSITIONS IN FISSION BANK	0
WTA	DEFAULT VALUE OF WEIGHT AVERAGE	0.5000
WTH	WEIGHT HIGH FOR SPLITTING	3.0000
WTL	WEIGHT LOW FOR RUSSIAN ROULETTE	0.3333
RND	STARTING RANDOM NUMBER	BB827100001
NB8	NUMBER OF D.A. BLOCKS ON UNIT 8	200
NL8	LENGTH OF D.A. BLOCKS ON UNIT 8	512
ADJ	MODE OF CALCULATION	FORWARD
	INPUT DATA WRITTEN ON RESTART UNIT	NO
	BINARY DATA INTERFACE	YES

```
**********************************************************************************************************************
**********************************************************************************************************************
***                                                                                                                ***
***                            NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS  80 MIL CHANNEL                         ***
***                                                                                                                ***
**********************************************************************************************************************
***                    ******     LOGICAL PARAMETERS      ******                                                   ***
***                                                                                                                ***
*** RUN  EXECUTE PROBLEM AFTER CHECKING DATA     YES           PLT  PLOT PICTURE MAP(S)                         NO ***
***                                                                                                                ***
*** FLX  COMPUTE FLUX                             NO           FDN  COMPUTE FISSION DENSITIES                   NO ***
***                                                                                                                ***
*** SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION     NO           NUB  COMPUTE NU-BAR & AVG FISSION GROUP         YES ***
***                                                                                                                ***
*** MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER      NO           MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION       NO ***
***                                                                                                                ***
*** CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER    NO           CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION     NO ***
***                                                                                                                ***
*** FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER    NO           FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION     NO ***
***                                                                                                                ***
*** MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER      NO           MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER        NO ***
***                                                                                                                ***
*** CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER    NO           CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER      NO ***
***                                                                                                                ***
*** FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER    NO           FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER      NO ***
***                                                                                                                ***
*** HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL     NO           HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL       NO ***
***                                                                                                                ***
*** AMX  PRINT ALL MIXED CROSS SECTIONS           NO           FAR  PRINT FIS. AND ABS. BY REGION               NO ***
***                                                                                                                ***
*** XS1  PRINT 1-D MIXTURE X-SECTIONS             NO           GAS  PRINT FAR BY GROUP                          NO ***
***                                                                                                                ***
*** XS2  PRINT 2-D MIXTURE X-SECTIONS             NO           PAX  PRINT XSEC-ALBEDO CORRELATION TABLES        NO ***
***                                                                                                                ***
*** XAP  PRINT MIXTURE ANGLES & PROBABILITIES     NO           PWT  PRINT WEIGHT AVERAGE ARRAY                  NO ***
***                                                                                                                ***
*** PKI  PRINT FISSION SPECTRUM                   NO           PGM  PRINT INPUT GEOMETRY                        NO ***
***                                                                                                                ***
*** P1D  PRINT EXTRA 1-D CROSS SECTIONS           NO           BUG  PRINT DEBUG INFORMATION                     NO ***
***                                                                                                                ***
***                                                            TRK  PRINT TRACKING INFORMATION                  NO ***
***                                                                                                                ***
***                                                                                                                ***
**********************************************************************************************************************
**********************************************************************************************************************
                                              PARAMETER INPUT COMPLETED

                               ........     0 IO'S WERE USED READING THE PARAMETER DATA       ........

                               *************** DATA READING COMPLETED ***************

     ***************************************************************************************************
     ***                                                                                             ***
     ***          NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS  80 MIL CHANNEL                       ***
     ***                                                                                             ***
     ***************************************************************************************************
     ***************************************************************************************************
     ***                                                                                             ***
     ***                           ****** ADDITIONAL INFORMATION ******                              ***
     ***                                                                                             ***
     ***  NUMBER OF ENERGY GROUPS               27       USE LATTICE GEOMETRY                  YES   ***
     ***                                                                                             ***
     ***  NO. OF FISSION SPECTRUM SOURCE GROUP   1       GLOBAL ARRAY NUMBER                     0   ***
     ***                                                                                             ***
     ***  NO. OF SCATTERING ANGLES IN XSECS      2       NUMBER OF UNITS IN THE GLOBAL X DIR.    0   ***
     ***                                                                                             ***
     ***  ENTRIES/NEUTRON IN THE NEUTRON BANK   19       NUMBER OF UNITS IN THE GLOBAL Y DIR.    0   ***
     ***                                                                                             ***
     ***  ENTRIES/NEUTRON IN THE FISSION BANK   12       NUMBER OF UNITS IN THE GLOBAL Z DIR.    0   ***
     ***                                                                                             ***
     ***  NUMBER OF MIXTURES USED                9       USE A GLOBAL REFLECTOR                YES   ***
     ***                                                                                             ***
     ***  NUMBER OF BIAS ID'S USED               1       USE NESTED HOLES                      YES   ***
     ***                                                                                             ***
     ***  NUMBER OF DIFFERENTIAL ALBEDOS USED    1       NUMBER OF HOLES                        22   ***
     ***                                                                                             ***
     ***  TOTAL INPUT GEOMETRY REGIONS          24       MAXIMUM HOLE NESTING LEVEL              2   ***
     ***                                                                                             ***
     ***  NUMBER OF GEOMETRY REGIONS USED       24       USE NESTED ARRAYS                      NO   ***
     ***                                                                                             ***
     ***  LARGEST GEOMETRY UNIT NUMBER           6       NUMBER OF ARRAYS USED                   1   ***
     ***                                                                                             ***
     ***  LARGEST ARRAY NUMBER                   1       MAXIMUM ARRAY NESTING LEVEL             1   ***
     ***                                                                                             ***
     ***                                                                                             ***
     ***  +X BOUNDARY CONDITION                H2O       -X BOUNDARY CONDITION                 H2O   ***
     ***                                                                                             ***
     ***  +Y BOUNDARY CONDITION                H2O       -Y BOUNDARY CONDITION                 H2O   ***
     ***                                                                                             ***
     ***  +Z BOUNDARY CONDITION                PER       -Z BOUNDARY CONDITION                 PER   ***
     ***                                                                                             ***
     ***************************************************************************************************
```

```
NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS  80 MIL CHANNEL

****** SPACE AND SUPERGROUP INFORMATION ******

100000 WORDS IS THE TOTAL SPACE AVAILABLE.

 34647 WORDS WERE USED FOR NON-SUPERGROUP STORAGE.

 65353 WORDS OF STORAGE ARE AVAILABLE FOR SUPERGROUPED DATA.

 99458 WORDS OF STORAGE ARE AVAILABLE FOR CONSTRUCTING THE SUPERGROUPS.

 65292 WORDS OF STORAGE ARE AVAILABLE TO EACH SUPERGROUP.

  1576 WORDS ARE NEEDED FOR THE LARGEST GROUP.

 36466 WORDS OF STORAGE IS SUFFICIENT TO RUN THIS PROBLEM.

 51430 WORDS OF STORAGE WILL ALLOW THE PROBLEM TO RUN WITH ONE SUPERGROUP.

 51872 WORDS OF STORAGE WILL BE USED TO RUN THIS PROBLEM.
```

SUPERGROUP	STARTING GROUP	ENDING GROUP	XSEC LENGTH	ALBEDO LENGTH	TOTAL LENGTH
1	1	27	2764	544	16854

```
........   0 IO'S WERE USED IN SUPERGROUPING   ........

........   0 IO'S WERE USED LOADING THE DATA   ........
```

```
                                   NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS  80 MIL CHANNEL

               MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION          NUM   ID

                                             -----   UNIT     1   -----

FUEL PIN CELL - WITH H2O

  1 CYLINDER       1  1  RADIUS = 0.45280    +Z =  10.000     -Z = -10.000    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  2 CYLINDER       9  1  RADIUS = 0.46230    +Z =  10.000     -Z = -10.000    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  3 CYLINDER       2  1  RADIUS = 0.53850    +Z =  10.000     -Z = -10.000    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  4 CUBOID         3  1      +X = 0.72640    -X =-0.72640     +Y = 0.72640    -Y =-0.72640     +Z =  10.000     -Z = -10.000

                                             -----   UNIT     2   -----

WATER ROD CELL - WITH H2O

  1 CYLINDER       3  1  RADIUS = 0.46230    +Z =  10.000     -Z = -10.000    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  2 CYLINDER       2  1  RADIUS = 0.53850    +Z =  10.000     -Z = -10.000    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  3 CUBOID         3  1      +X = 0.72640    -X =-0.72640     +Y = 0.72640    -Y =-0.72640     +Z =  10.000     -Z = -10.000

                                      -----   UNIT     3  EXTERNAL TO LATTICE  1   -----

  1 ARRAY NUMBER   1         +X =  6.5376    -X = -6.5376     +Y =  6.5376    -Y = -6.5376     +Z =  10.000     -Z = -10.000
  2 CUBOID         3  1      +X =  6.7031    -X = -6.7031     +Y =  6.7031    -Y = -6.7031     +Z =  10.000     -Z = -10.000
  3 CUBOID         2  1      +X =  6.9063    -X = -6.9063     +Y =  6.9063    -Y = -6.9063     +Z =  10.000     -Z = -10.000
  4 CUBOID         3  1      +X =  7.3025    -X = -7.3025     +Y =  7.3025    -Y = -7.3025     +Z =  10.000     -Z = -10.000

                                      -----   UNIT     4  EXTERNAL TO LATTICE  1   -----

  1 ARRAY NUMBER   1         +X =  6.5376    -X = -6.5376     +Y =  6.5376    -Y = -6.5376     +Z =  10.000     -Z = -10.000
  2 CUBOID         3  1      +X =  6.7031    -X = -6.7031     +Y =  6.7031    -Y = -6.7031     +Z =  10.000     -Z = -10.000
  3 CUBOID         2  1      +X =  6.9063    -X = -6.9063     +Y =  6.9063    -Y = -6.9063     +Z =  10.000     -Z = -10.000
  4 CUBOID         3  1      +X =  7.3025    -X = -7.3025     +Y =  7.3025    -Y = -7.3025     +Z =  10.000     -Z = -10.000

                                   NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS  80 MIL CHANNEL

               MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION          NUM   ID

                                             -----   UNIT     5   -----

  1 CYLINDER       4  1  RADIUS =  16.827    +Z =  10.000     -Z = -10.000    CENTEPLINE IS AT  X = 0.00000      Y = 0.00000
    HOLE NUMBER    1        AT X = -7.4613    Y = 0.00000      Z = 0.00000    IS UNIT NUMBER      3
    HOLE NUMBER    2        AT X =  7.4613    Y = 0.00000      Z = 0.00000    IS UNIT NUMBER      4
  2 CYLINDER       3  1  RADIUS =  16.986    +Z =  10.000     -Z = -10.000    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  3 CYLINDER       5  1  RADIUS =  18.891    +Z =  10.000     -Z = -10.000    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  4 CYLINDER       6  1  RADIUS =  33.496    +Z =  10.000     -Z = -10.000    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  5 CYLINDER       5  1  RADIUS =  36.544    +Z =  10.000     -Z = -10.000    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  6 CYLINDER       7  1  RADIUS =  49.244    +Z =  10.000     -Z = -10.000    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  7 CYLINDER       5  1  PADIUS =  49.854    +Z =  10.000     -Z = -10.000    CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                   NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS  80 MIL CHANNEL

               MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION          NUM   ID

                                   ...................  GLOBAL   ...................
                                             -----   UNIT     6   -----

  1 CYLINDER       8  1  RADIUS =  314.00    +Z =  10.000     -Z = -10.000    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
    HOLE NUMBER    3        AT X = 0.00000    Y = 0.00000      Z = 0.00000    IS UNIT NUMBER      5
    HOLE NUMBER    4        AT X = 0.00000    Y =  99.800      Z = 0.00000    IS UNIT NUMBER      5
    HOLE NUMBER    5        AT X =  86.430    Y =  49.900      Z = 0.00000    IS UNIT NUMBER      5
```

```
   HOLE NUMBER     6       AT X =  86.430      Y = -49.900       Z = 0.00000      IS UNIT NUMBER      5
   HOLE NUMBER     7       AT X = 0.00000      Y = -99.800       Z = 0.00000      IS UNIT NUMBER      5
   HOLE NUMBER     8       AT X = -86.430      Y = -49.900       Z = 0.00000      IS UNIT NUMBER      5
   HOLE NUMBER     9       AT X = -86.430      Y =  49.900       Z = 0.00000      IS UNIT NUMBER      5
   HOLE NUMBER    10       AT X = 0.00000      Y =  199.60       Z = 0.00000      IS UNIT NUMBER      5
   HOLE NUMBER    11       AT X =  86.430      Y =  149.70       Z = 0.00000      IS UNIT NUMBER      5
   HOLE NUMBER    12       AT X =  172.85      Y =  99.800       Z = 0.00000      IS UNIT NUMBER      5
   HOLE NUMBER    13       AT X =  172.86      Y = 0.00000       Z = 0.00000      IS UNIT NUMBER      5
   HOLE NUMBER    14       AT X =  172.86      Y = -99.800       Z = 0.00000      IS UNIT NUMBER      5
   HOLE NUMBER    15       AT X =  66.430      Y = -149.70       Z = 0.00000      IS UNIT NUMBER      5
   HOLE NUMBER    16       AT X = 0.00000      Y = -199.60       Z = 0.00000      IS UNIT NUMBER      5
   HOLE NUMBER    17       AT X = -86.430      Y = -149.70       Z = 0.00000      IS UNIT NUMBER      5
   HOLE NUMBER    18       AT X = -172.86      Y = -99.880       Z = 0.00000      IS UNIT NUMBER      5
   HOLE NUMBER    19       AT X = -172.86      Y = 0.00000       Z = 0.00000      IS UNIT NUMBER      5
   HOLE NUMBER    20       AT X = -172.86      Y =  99.800       Z = 0.00000      IS UNIT NUMBER      5
   HOLE NUMBER    21       AT X = -86.430      Y =  149.70       Z = 0.00000      IS UNIT NUMBER      5
   HOLE NUMBER    22       AT X =  259.29      Y =  49.900       Z = 0.00000      IS UNIT NUMBER      5
 2 CUBOID          8  1      +X =  314.00     -X = -314.00     +Y =  314.00     -Y = -314.00     +Z =  10.000      -Z = -10.000

                              NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS  80 MIL CHANNEL

                       -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   1          -------

Z LAYER   1, X COLUMN   1 TO   9 LEFT TO RIGHT   Y ROW   1 TO   9  BOTTOM TO TOP

 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 2 1 1 1
 1 1 1 1 2 1 1 1 1
 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1
 1 1 1 1 1 1 1 1 1
```

```
                    NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS  80 MIL CHANNEL
                   VOLUMES FOR THOSE UNITS UTILIZED IN  THIS PROBLEM

                          GEOMETRY                                    CUMULATIVE
 UNIT      REGION          REGION          VOLUME                       VOLUME

   1          1              1         1.28823E+01 CM**3            1.28823E+01 CM**3
              2              2         5.46226E-01 CM**3            1.34285E+01 CM**3
              3              3         4.79162E+00 CM**3            1.82201E+01 CM**3
              4              4         2.39924E+01 CM**3            4.22126E+01 CM**3

   2          1              5         1.34285E+01 CM**3            1.34285E+01 CM**3
              2              6         4.79162E+00 CM**3            1.82201E+01 CM**3
              3              7         2.39924E+01 CM**3            4.22126E+01 CM**3

 SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION      8 IS AN ARRAY PLACEMENT BOUNDARY REGION

   3          1              8         3.41922E+03 CM**3            3.41922E+03 CM**3
              2              9         1.75307E+02 CM**3            3.59452E+03 CM**3
              3             10         2.21234E+02 CM**3            3.81576E+03 CM**3
              4             11         4.50362E+02 CM**3            4.26612E+03 CM**3

 SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     12 IS AN ARRAY PLACEMENT BOUNDARY REGION

   4          1             12         3.41922E+03 CM**3            3.41922E+03 CM**3
              2             13         1.75307E+02 CM**3            3.59452E+03 CM**3
              3             14         2.21234E+02 CM**3            3.81576E+03 CM**3
              4             15         4.50362E+02 CM**3            4.26612E+03 CM**3

   5          1             16         9.25953E+03 CM**3            1.77918E+04 CM**3
              2             17         3.37383E+02 CM**3            1.81291E+04 CM**3
              3             18         4.29436E+03 CM**3            2.24235E+04 CM**3
              4             19         4.80740E+04 CM**3            7.04975E+04 CM**3
              5             20         1.34136E+04 CM**3            8.39110E+04 CM**3
              6             21         6.84563E+04 CM**3            1.52367E+05 CM**3
              7             22         3.79567E+03 CM**3            1.56163E+05 CM**3

   6          1             23         3.07171E+06 CM**3            6.19497E+06 CM**3
              2             24         1.69271E+06 CM**3            7.88768E+06 CM**3


                    UNIT      USES     REGION     MIXTURE         TOTAL VOLUME

                      1       3160        1          1          4.07080E+04 CM**3
                                          2          9          1.72607E+03 CM**3
                                          3          2          1.51415E+04 CM**3
                                          4          3          7.58161E+04 CM**3

                      2         80        1          3          1.07428E+03 CM**3
                                          2          2          3.83329E+02 CM**3
                                          3          3          1.91939E+03 CM**3

                      3         20        1                     6.83843E+04 CM**3
                                          2          3          3.50614E+03 CM**3
                                          3          2          4.42469E+03 CM**3
                                          4          3          9.00723E+03 CM**3

                      4         20        1                     6.83843E+04 CM**3
                                          2          3          3.50614E+03 CM**3
                                          3          2          4.42469E+03 CM**3
                                          4          3          9.00723E+03 CM**3

                      5         20        1          4          1.85191E+05 CM**3
                                          2          3          6.74766E+03 CM**3
                                          3          5          8.58872E+04 CM**3
                                          4          6          9.61479E+05 CM**3
                                          5          5          2.68272E+05 CM**3
                                          6          7          1.36913E+06 CM**3
                                          7          5          7.59134E+04 CM**3

                      6          1        1          8          3.07171E+06 CM**3
                                          2          8          1.69271E+06 CM**3

                                 TOTAL MIXTURE VOLUMES
                             MIXTURE        TOTAL VOLUME                MASS(G)
                                1        4.07080E+04 CM**3           4.23651E+05
                                2        2.43742E+04 CM**3           1.59895E+05
                                3        1.10584E+05 CM**3           1.10382E+05
                                4        1.85191E+05 CM**3           5.00385E+05
                                5        4.30072E+05 CM**3           3.40617E+06
                                6        9.61479E+05 CM**3           1.09070E+07
                                7        1.36913E+06 CM**3           1.36662E-14
                                8        4.76442E+06 CM**3           4.75571E-14
                                9        1.72607E+03 CM**3           1.72292E+03

*****************************************************************************************************
***                                                                                               ***
***                                      BIASING INFORMATION                                      ***
***                                                                                               ***
***    A DEFAULT WEIGHT OF    0.500 WILL BE USED FOR ALL BIAS ID'S.                               ***
***                                                                                               ***
*****************************************************************************************************
```

```
                                ........    0 IO'S WERE USED IN KENO-V BEFORE TRACKING        ........

                                ........  0.00833 MINUTES WERE USED PROCESSING DATA.         ........

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 1.30336E-02

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED WITH A FLAT DISTRIBUTION IN A CUBOID DEFINED BY:
                       +X= 3.14000E+02  -X=-3.14000E+02  +Y= 3.14000E+02  -Y=-3.14000E+02  +Z= 1.00000E+01  -Z=-1.00000E+01
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

KENO MESSAGE NUMBER K5-105     ***** WARNING, ONLY  148 INDEPENDENT STARTING POSITIONS WERE GENERATED.  *****

  852 ADDITIONAL STARTING POINTS WERE PICKED FROM THE INITAL DISTRIBUTION.

0.45350 MINUTES WERE REQUIRED FOR STARTING.   TOTAL ELAPSED TIME IS 0.46933 MINUTES.
```

NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS 80 MIL CHANNEL

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
KENO MESSAGE NUMBER K5-132 WARNING....ONLY 976 INDEPENDENT FISSION POINTS WERE GENERATED						
1	9.01189E-01	4.86167E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	9.28035E-01	5.07167E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132 WARNING....ONLY 994 INDEPENDENT FISSION POINTS WERE GENERATED						
3	8.92323E-01	5.29167E-01	8.92323E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	9.34444E-01	5.50167E-01	9.13383E-01	2.10603E-02	0.00000E+00	0.00000E+00
5	9.07684E-01	5.73000E-01	9.11483E-01	1.23067E-02	0.00000E+00	0.00000E+00
6	9.48055E-01	5.96000E-01	9.20626E-01	1.26222E-02	0.00000E+00	0.00000E+00
7	8.92456E-01	6.18833E-01	9.14992E-01	1.12843E-02	0.00000E+00	0.00000E+00
8	9.27400E-01	6.39833E-01	9.17060E-01	9.44284E-03	0.00000E+00	0.00000E+00
9	9.27652E-01	6.62833E-01	9.18573E-01	8.12283E-03	0.00000E+00	0.00000E+00
10	9.14856E-01	6.83833E-01	9.18109E-01	7.04991E-03	0.00000E+00	0.00000E+00
11	8.96192E-01	7.06667E-01	9.15673E-01	6.67731E-03	0.00000E+00	0.00000E+00
12	8.97511E-01	7.27833E-01	9.13857E-01	6.24242E-03	0.00000E+00	0.00000E+00
13	9.10384E-01	7.49667E-01	9.13541E-01	5.65531E-03	0.00000E+00	0.00000E+00
14	9.30904E-01	7.72667E-01	9.14988E-01	5.36149E-03	0.00000E+00	0.00000E+00
15	9.47282E-01	7.93667E-01	9.17473E-01	5.52215E-03	0.00000E+00	0.00000E+00
16	9.07252E-01	8.15667E-01	9.16742E-01	5.16438E-03	0.00000E+00	0.00000E+00
17	9.01455E-01	8.37667E-01	9.15723E-01	4.91462E-03	0.00000E+00	0.00000E+00
18	8.88184E-01	8.59667E-01	9.14002E-01	4.90885E-03	0.00000E+00	0.00000E+00
19	8.96816E-01	8.83333E-01	9.12991E-01	4.72059E-03	0.00000E+00	0.00000E+00
20	9.40758E-01	9.07167E-01	9.14534E-01	4.71037E-03	0.00000E+00	0.00000E+00
21	9.02359E-01	9.30167E-01	9.13893E-01	4.50140E-03	0.00000E+00	0.00000E+00
22	9.53151E-01	9.52000E-01	9.15856E-01	4.69994E-03	0.00000E+00	0.00000E+00
23	9.22802E-01	9.75000E-01	9.16187E-01	4.48275E-03	0.00000E+00	0.00000E+00
24	9.32954E-01	9.96833E-01	9.16949E-01	4.34156E-03	0.00000E+00	0.00000E+00
25	9.47618E-01	1.01883E+00	9.18282E-01	4.35754E-03	0.00000E+00	0.00000E+00
26	9.36387E-01	1.04183E+00	9.19037E-01	4.23968E-03	0.00000E+00	0.00000E+00
27	9.64685E-01	1.06367E+00	9.20862E-01	4.45769E-03	0.00000E+00	0.00000E+00
28	9.41832E-01	1.08483E+00	9.21669E-01	4.35809E-03	0.00000E+00	0.00000E+00
29	9.41274E-01	1.10767E+00	9.22395E-01	4.25597E-03	0.00000E+00	0.00000E+00
30	9.43159E-01	1.12967E+00	9.23137E-01	4.16766E-03	0.00000E+00	0.00000E+00
31	9.11565E-01	1.15350E+00	9.22738E-01	4.04113E-03	0.00000E+00	0.00000E+00
32	9.11421E-01	1.17633E+00	9.22360E-01	3.92228E-03	0.00000E+00	0.00000E+00
33	9.11966E-01	1.19917E+00	9.22025E-01	3.80844E-03	0.00000E+00	0.00000E+00
34	9.17329E-01	1.22300E+00	9.21878E-01	3.69042E-03	0.00000E+00	0.00000E+00
35	8.90667E-01	1.24500E+00	9.20933E-01	3.69978E-03	0.00000E+00	0.00000E+00
36	9.29267E-01	1.26783E+00	9.21178E-01	3.59767E-03	0.00000E+00	0.00000E+00
37	9.38488E-01	1.29167E+00	9.21672E-01	3.52820E-03	0.00000E+00	0.00000E+00
38	9.15709E-01	1.31450E+00	9.21507E-01	3.43279E-03	0.00000E+00	0.00000E+00
39	9.11158E-01	1.33933E+00	9.21227E-01	3.35042E-03	0.00000E+00	0.00000E+00
40	8.92236E-01	1.36133E+00	9.20464E-01	3.34912E-03	0.00000E+00	0.00000E+00
41	8.91023E-01	1.38500E+00	9.19709E-01	3.34832E-03	0.00000E+00	0.00000E+00
42	9.11460E-01	1.40700E+00	9.19503E-01	3.27005E-03	0.00000E+00	0.00000E+00
43	8.81758E-01	1.42983E+00	9.18582E-01	3.31950E-03	0.00000E+00	0.00000E+00
44	8.89869E-01	1.45183E+00	9.17899E-01	3.31085E-03	0.00000E+00	0.00000E+00
45	8.88130E-01	1.47567E+00	9.17206E-01	3.30623E-03	0.00000E+00	0.00000E+00
46	9.54337E-01	1.49850E+00	9.18050E-01	3.33863E-03	0.00000E+00	0.00000E+00
47	9.32707E-01	1.52050E+00	9.18376E-01	3.27981E-03	0.00000E+00	0.00000E+00
48	9.25099E-01	1.54350E+00	9.18522E-01	3.21104E-03	0.00000E+00	0.00000E+00
49	9.04156E-01	1.56533E+00	9.18216E-01	3.15681E-03	0.00000E+00	0.00000E+00
50	9.52327E-01	1.58733E+00	9.18927E-01	3.17100E-03	0.00000E+00	0.00000E+00
51	9.26219E-01	1.60933E+00	9.19076E-01	3.10918E-03	0.00000E+00	0.00000E+00
52	9.38677E-01	1.63217E+00	9.19468E-01	3.07148E-03	0.00000E+00	0.00000E+00
53	9.59202E-01	1.65517E+00	9.20247E-01	3.10983E-03	0.00000E+00	0.00000E+00
54	9.34213E-01	1.67700E+00	9.20516E-01	3.06124E-03	0.00000E+00	0.00000E+00
55	9.23051E-01	1.70000E+00	9.20563E-01	3.00331E-03	0.00000E+00	0.00000E+00
56	9.43534E-01	1.72283E+00	9.20989E-01	2.97771E-03	0.00000E+00	0.00000E+00
57	8.99568E-01	1.74667E+00	9.20599E-01	2.94890E-03	0.00000E+00	0.00000E+00
58	9.47481E-01	1.76867E+00	9.21079E-01	2.93528E-03	0.00000E+00	0.00000E+00
59	9.19284E-01	1.79067E+00	9.21048E-01	2.88349E-03	0.00000E+00	0.00000E+00
60	9.33921E-01	1.81350E+00	9.21270E-01	2.84202E-03	0.00000E+00	0.00000E+00
61	9.04019E-01	1.83633E+00	9.20977E-01	2.80870E-03	0.00000E+00	0.00000E+00
62	9.03335E-01	1.85833E+00	9.20683E-01	2.77710E-03	0.00000E+00	0.00000E+00
63	9.43630E-01	1.88117E+00	9.21060E-01	2.75698E-03	0.00000E+00	0.00000E+00
64	9.15463E-01	1.90317E+00	9.20969E-01	2.71365E-03	0.00000E+00	0.00000E+00
65	9.27783E-01	1.92700E+00	9.21077E-01	2.67242E-03	0.00000E+00	0.00000E+00
66	9.64049E-01	1.94900E+00	9.21749E-01	2.71467E-03	0.00000E+00	0.00000E+00
67	9.52222E-01	1.97100E+00	9.22218E-01	2.71339E-03	0.00000E+00	0.00000E+00
68	9.38790E-01	1.99383E+00	9.22469E-01	2.68373E-03	0.00000E+00	0.00000E+00
69	9.39284E-01	2.01583E+00	9.22720E-01	2.65526E-03	0.00000E+00	0.00000E+00
70	9.18021E-01	2.03867E+00	9.22651E-01	2.61683E-03	0.00000E+00	0.00000E+00
71	9.09255E-01	2.06250E+00	9.22457E-01	2.58593E-03	0.00000E+00	0.00000E+00
72	9.85449E-01	2.08350E+00	9.23356E-01	2.70292E-03	0.00000E+00	0.00000E+00
73	8.82877E-01	2.10733E+00	9.22786E-01	2.72489E-03	0.00000E+00	0.00000E+00
74	9.20326E-01	2.13017E+00	9.22752E-01	2.68700E-03	0.00000E+00	0.00000E+00
75	8.82683E-01	2.15217E+00	9.22203E-01	2.70618E-03	0.00000E+00	0.00000E+00
76	9.51438E-01	2.17417E+00	9.22598E-01	2.69844E-03	0.00000E+00	0.00000E+00
77	9.20571E-01	2.19617E+00	9.22571E-01	2.66235E-03	0.00000E+00	0.00000E+00
78	9.38215E-01	2.21900E+00	9.22777E-01	2.63514E-03	0.00000E+00	0.00000E+00
79	9.19033E-01	2.24183E+00	9.22728E-01	2.60115E-03	0.00000E+00	0.00000E+00
80	9.20555E-01	2.26483E+00	9.22701E-01	2.56774E-03	0.00000E+00	0.00000E+00
81	9.21486E-01	2.28667E+00	9.22685E-01	2.53507E-03	0.00000E+00	0.00000E+00
82	9.18215E-01	2.30967E+00	9.22629E-01	2.50381E-03	0.00000E+00	0.00000E+00
83	9.27842E-01	2.33250E+00	9.22694E-01	2.47354E-03	0.00000E+00	0.00000E+00
84	9.11448E-01	2.35450E+00	9.22557E-01	2.44703E-03	0.00000E+00	0.00000E+00
85	9.03452E-01	2.37650E+00	9.22326E-01	2.42830E-03	0.00000E+00	0.00000E+00
86	9.28189E-01	2.39933E+00	9.22396E-01	2.40024E-03	0.00000E+00	0.00000E+00
87	9.32908E-01	2.42217E+00	9.22520E-01	2.37505E-03	0.00000E+00	0.00000E+00
88	9.32844E-01	2.44417E+00	9.22640E-01	2.35034E-03	0.00000E+00	0.00000E+00
89	9.37330E-01	2.46717E+00	9.22809E-01	2.32930E-03	0.00000E+00	0.00000E+00

90	9.35225E-01	2.48900E+00	9.22950E-01	2.30699E-03	0.00000E+00	0.00000E+00
91	9.34490E-01	2.51100E+00	9.23079E-01	2.28461E-03	0.00000E+00	0.00000E+00
92	9.08846E-01	2.53383E+00	9.22921E-01	2.26461E-03	0.00000E+00	0.00000E+00
93	9.17967E-01	2.55500E+00	9.22867E-01	2.24025E-03	0.00000E+00	0.00000E+00
94	8.85436E-01	2.57853E+00	9.22460E-01	2.25281E-03	0.00000E+00	0.00000E+00
95	9.31770E-01	2.60067E+00	9.22560E-01	2.23070E-03	0.00000E+00	0.00000E+00
96	8.86037E-01	2.62367E+00	9.22172E-01	2.24078E-03	0.00000E+00	0.00000E+00
97	9.34995E-01	2.64567E+00	9.22307E-01	2.22118E-03	0.00000E+00	0.00000E+00
98	9.41668E-01	2.66850E+00	9.22508E-01	2.20715E-03	0.00000E+00	0.00000E+00
99	9.32066E-01	2.68950E+00	9.22607E-01	2.18650E-03	0.00000E+00	0.00000E+00
100	9.22857E-01	2.71150E+00	9.22609E-01	2.16407E-03	0.00000E+00	0.00000E+00
101	9.31972E-01	2.73350E+00	9.22704E-01	2.14419E-03	0.00000E+00	0.00000E+00
102	9.09239E-01	2.75733E+00	9.22569E-01	2.12691E-03	0.00000E+00	0.00000E+00
103	8.75690E-01	2.78017E+00	9.22105E-01	2.15629E-03	0.00000E+00	0.00000E+00
104	9.00232E-01	2.80300E+00	9.21891E-01	2.14579E-03	0.00000E+00	0.00000E+00
105	9.03079E-01	2.82600E+00	9.21708E-01	2.13269E-03	0.00000E+00	0.00000E+00
106	9.40959E-01	2.84883E+00	9.21893E-01	2.12018E-03	0.00000E+00	0.00000E+00
107	9.49846E-01	2.87167E+00	9.22159E-01	2.11670E-03	0.00000E+00	0.00000E+00
108	9.39698E-01	2.89467E+00	9.22325E-01	2.10315E-03	0.00000E+00	0.00000E+00
109	9.32212E-01	2.91750E+00	9.22417E-01	2.08545E-03	0.00000E+00	0.00000E+00
110	8.92871E-01	2.94033E+00	9.22144E-01	2.08408E-03	0.00000E+00	0.00000E+00
111	9.28407E-01	2.96233E+00	9.22201E-01	2.06568E-03	0.00000E+00	0.00000E+00
112	9.21416E-01	2.98517E+00	9.22194E-01	2.04682E-03	0.00000E+00	0.00000E+00
113	9.33755E-01	3.00817E+00	9.22298E-01	2.03097E-03	0.00000E+00	0.00000E+00
114	9.35223E-01	3.03100E+00	9.22414E-01	2.01606E-03	0.00000E+00	0.00000E+00
115	9.39859E-01	3.05383E+00	9.22568E-01	2.00410E-03	0.00000E+00	0.00000E+00
116	9.12919E-01	3.07767E+00	9.22483E-01	1.98824E-03	0.00000E+00	0.00000E+00
117	9.31885E-01	3.10050E+00	9.22565E-01	1.97257E-03	0.00000E+00	0.00000E+00
118	9.34053E-01	3.12250E+00	9.22664E-01	1.95800E-03	0.00000E+00	0.00000E+00
119	9.57707E-01	3.14450E+00	9.22964E-01	1.96416E-03	0.00000E+00	0.00000E+00
120	9.38524E-01	3.16650E+00	9.23095E-01	1.95190E-03	0.00000E+00	0.00000E+00
121	9.16934E-01	3.18933E+00	9.23044E-01	1.93612E-03	0.00000E+00	0.00000E+00
122	9.19902E-01	3.21217E+00	9.23018E-01	1.92010E-03	0.00000E+00	0.00000E+00
123	9.04315E-01	3.23333E+00	9.22863E-01	1.91043E-03	0.00000E+00	0.00000E+00
124	8.89191E-01	3.25617E+00	9.22587E-01	1.91470E-03	0.00000E+00	0.00000E+00
125	8.78869E-01	3.27900E+00	9.22232E-01	1.93205E-03	0.00000E+00	0.00000E+00
126	9.21744E-01	3.30100E+00	9.22228E-01	1.91641E-03	0.00000E+00	0.00000E+00
127	9.29411E-01	3.32400E+00	9.22285E-01	1.90188E-03	0.00000E+00	0.00000E+00
128	9.28569E-01	3.34500E+00	9.22335E-01	1.88739E-03	0.00000E+00	0.00000E+00
129	9.54092E-01	3.36700E+00	9.22585E-01	1.88909E-03	0.00000E+00	0.00000E+00
130	9.14894E-01	3.38900E+00	9.22525E-01	1.87523E-03	0.00000E+00	0.00000E+00
131	8.92940E-01	3.41063E+00	9.22296E-01	1.87472E-03	0.00000E+00	0.00000E+00
132	9.15062E-01	3.43283E+00	9.22240E-01	1.86108E-03	0.00000E+00	0.00000E+00
133	9.34626E-01	3.45567E+00	9.22334E-01	1.84924E-03	0.00000E+00	0.00000E+00
134	9.30755E-01	3.47867E+00	9.22398E-01	1.83628E-03	0.00000E+00	0.00000E+00
135	8.84656E-01	3.50067E+00	9.22114E-01	1.84438E-03	0.00000E+00	0.00000E+00
136	8.97894E-01	3.52350E+00	9.21934E-01	1.83947E-03	0.00000E+00	0.00000E+00
137	8.83584E-01	3.54633E+00	9.21650E-01	1.84776E-03	0.00000E+00	0.00000E+00
138	8.90514E-01	3.56933E+00	9.21421E-01	1.84836E-03	0.00000E+00	0.00000E+00
139	9.40755E-01	3.59217E+00	9.21562E-01	1.84023E-03	0.00000E+00	0.00000E+00
140	9.26957E-01	3.61417E+00	9.21601E-01	1.82727E-03	0.00000E+00	0.00000E+00
141	9.41954E-01	3.63517E+00	9.21747E-01	1.81997E-03	0.00000E+00	0.00000E+00
142	8.86837E-01	3.65900E+00	9.21498E-01	1.82405E-03	0.00000E+00	0.00000E+00
143	9.11581E-01	3.68100E+00	9.21428E-01	1.81244E-03	0.00000E+00	0.00000E+00
144	9.59398E-01	3.70283E+00	9.21695E-01	1.81938E-03	0.00000E+00	0.00000E+00
145	9.14863E-01	3.72483E+00	9.21647E-01	1.80725E-03	0.00000E+00	0.00000E+00
146	9.31201E-01	3.74683E+00	9.21714E-01	1.79588E-03	0.00000E+00	0.00000E+00
147	8.92769E-01	3.76883E+00	9.21514E-01	1.79459E-03	0.00000E+00	0.00000E+00
148	9.65823E-01	3.79167E+00	9.21817E-01	1.80791E-03	0.00000E+00	0.00000E+00
149	9.38353E-01	3.81467E+00	9.21930E-01	1.79909E-03	0.00000E+00	0.00000E+00
150	8.90125E-01	3.83750E+00	9.21715E-01	1.79976E-03	0.00000E+00	0.00000E+00
151	9.40850E-01	3.85950E+00	9.21844E-01	1.79225E-03	0.00000E+00	0.00000E+00
152	9.50210E-01	3.88150E+00	9.22033E-01	1.79028E-03	0.00000E+00	0.00000E+00
153	9.10546E-01	3.90333E+00	9.21957E-01	1.78001E-03	0.00000E+00	0.00000E+00
154	9.31720E-01	3.92633E+00	9.22021E-01	1.76943E-03	0.00000E+00	0.00000E+00
155	9.01260E-01	3.94917E+00	9.21885E-01	1.76305E-03	0.00000E+00	0.00000E+00
156	9.42117E-01	3.97117E+00	9.22016E-01	1.75649E-03	0.00000E+00	0.00000E+00
157	9.24665E-01	3.99317E+00	9.22034E-01	1.74520E-03	0.00000E+00	0.00000E+00
158	9.22738E-01	4.01683E+00	9.22038E-01	1.73399E-03	0.00000E+00	0.00000E+00
159	9.32738E-01	4.03800E+00	9.22106E-01	1.72425E-03	0.00000E+00	0.00000E+00
160	8.92679E-01	4.06083E+00	9.21920E-01	1.72340E-03	0.00000E+00	0.00000E+00
161	9.08268E-01	4.08183E+00	9.21834E-01	1.71468E-03	0.00000E+00	0.00000E+00
162	8.95632E-01	4.10483E+00	9.21670E-01	1.71178E-03	0.00000E+00	0.00000E+00
163	9.32096E-01	4.12767E+00	9.21735E-01	1.70234E-03	0.00000E+00	0.00000E+00
164	9.51827E-01	4.14867E+00	9.21921E-01	1.70197E-03	0.00000E+00	0.00000E+00
165	8.85013E-01	4.17067E+00	9.21694E-01	1.70659E-03	0.00000E+00	0.00000E+00
166	9.05424E-01	4.19167E+00	9.21595E-01	1.69905E-03	0.00000E+00	0.00000E+00
167	9.38226E-01	4.21467E+00	9.21696E-01	1.69172E-03	0.00000E+00	0.00000E+00
168	9.18271E-01	4.23750E+00	9.21675E-01	1.68163E-03	0.00000E+00	0.00000E+00
169	9.24393E-01	4.25950E+00	9.21692E-01	1.67161E-03	0.00000E+00	0.00000E+00
170	8.82554E-01	4.28233E+00	9.21459E-01	1.67788E-03	0.00000E+00	0.00000E+00
171	9.18620E-01	4.30350E+00	9.21442E-01	1.66801E-03	0.00000E+00	0.00000E+00
172	9.37974E-01	4.32633E+00	9.21539E-01	1.66101E-03	0.00000E+00	0.00000E+00
173	9.49211E-01	4.34733E+00	9.21701E-01	1.65916E-03	0.00000E+00	0.00000E+00
174	9.12638E-01	4.37117E+00	9.21648E-01	1.65035E-03	0.00000E+00	0.00000E+00
175	9.28413E-01	4.39317E+00	9.21687E-01	1.64125E-03	0.00000E+00	0.00000E+00
176	9.40138E-01	4.41517E+00	9.21793E-01	1.63523E-03	0.00000E+00	0.00000E+00
177	9.25922E-01	4.43700E+00	9.21817E-01	1.62603E-03	0.00000E+00	0.00000E+00
178	9.42747E-01	4.46000E+00	9.21936E-01	1.62113E-03	0.00000E+00	0.00000E+00
179	9.43369E-01	4.48283E+00	9.22057E-01	1.61649E-03	0.00000E+00	0.00000E+00
180	9.64434E-01	4.50483E+00	9.22295E-01	1.62492E-03	0.00000E+00	0.00000E+00
181	9.61077E-01	4.52767E+00	9.22512E-01	1.63027E-03	0.00000E+00	0.00000E+00
182	9.21660E-01	4.55150E+00	9.22507E-01	1.62120E-03	0.00000E+00	0.00000E+00
183	9.06974E-01	4.57533E+00	9.22421E-01	1.61450E-03	0.00000E+00	0.00000E+00
184	8.98888E-01	4.59917E+00	9.22292E-01	1.61080E-03	0.00000E+00	0.00000E+00

185	9.33264E-01	4.62200E+00	9.22352E-01	1.60310E-03	0.00000E+00	0.00000E+00
186	9.04862E-01	4.64483E+00	9.22257E-01	1.59719E-03	0.00000E+00	0.00000E+00
187	9.27530E-01	4.66783E+00	9.22285E-01	1.58879E-03	0.00000E+00	0.00000E+00
188	9.02055E-01	4.69067E+00	9.22177E-01	1.58397E-03	0.00000E+00	0.00000E+00
189	9.67078E-01	4.71167E+00	9.22417E-01	1.59366E-03	0.00000E+00	0.00000E+00
190	9.60754E-01	4.73367E+00	9.22621E-01	1.59823E-03	0.00000E+00	0.00000E+00
191	9.25358E-01	4.75650E+00	9.22635E-01	1.58982E-03	0.00000E+00	0.00000E+00
192	9.82945E-01	4.77950E+00	9.22952E-01	1.61297E-03	0.00000E+00	0.00000E+00
193	9.36432E-01	4.80233E+00	9.23023E-01	1.60605E-03	0.00000E+00	0.00000E+00
194	9.52149E-01	4.82617E+00	9.23175E-01	1.60485E-03	0.00000E+00	0.00000E+00
195	9.50764E-01	4.84900E+00	9.23318E-01	1.60290E-03	0.00000E+00	0.00000E+00
196	9.07413E-01	4.87183E+00	9.23236E-01	1.59672E-03	0.00000E+00	0.00000E+00
197	9.26760E-01	4.89567E+00	9.23264E-01	1.58877E-03	0.00000E+00	0.00000E+00
198	9.07747E-01	4.91767E+00	9.23185E-01	1.58262E-03	0.00000E+00	0.00000E+00
199	9.21906E-01	4.94150E+00	9.23178E-01	1.57458E-03	0.00000E+00	0.00000E+00
200	9.25988E-01	4.96533E+00	9.23193E-01	1.56667E-03	0.00000E+00	0.00000E+00
201	9.29846E-01	4.98733E+00	9.23226E-01	1.55914E-03	0.00000E+00	0.00000E+00
202	9.15257E-01	5.01017E+00	9.23186E-01	1.55183E-03	0.00000E+00	0.00000E+00
203	9.08503E-01	5.03400E+00	9.23113E-01	1.54582E-03	0.00000E+00	0.00000E+00
204	9.08062E-01	5.05683E+00	9.23039E-01	1.53995E-03	0.00000E+00	0.00000E+00
205	9.08777E-01	5.07883E+00	9.22968E-01	1.53396E-03	0.00000E+00	0.00000E+00
206	9.02570E-01	5.10167E+00	9.22868E-01	1.52969E-03	0.00000E+00	0.00000E+00
207	9.23500E-01	5.12367E+00	9.22871E-01	1.52221E-03	0.00000E+00	0.00000E+00
208	8.96954E-01	5.14650E+00	9.22746E-01	1.52002E-03	0.00000E+00	0.00000E+00
209	9.09160E-01	5.16850E+00	9.22680E-01	1.51409E-03	0.00000E+00	0.00000E+00
210	9.25769E-01	5.19050E+00	9.22695E-01	1.50686E-03	0.00000E+00	0.00000E+00
211	9.02445E-01	5.21433E+00	9.22598E-01	1.50276E-03	0.00000E+00	0.00000E+00
212	9.04908E-01	5.23717E+00	9.22514E-01	1.49796E-03	0.00000E+00	0.00000E+00
213	9.10647E-01	5.26000E+00	9.22457E-01	1.49190E-03	0.00000E+00	0.00000E+00
214	8.68898E-01	5.28300E+00	9.22205E-01	1.50619E-03	0.00000E+00	0.00000E+00
215	9.45750E-01	5.30483E+00	9.22315E-01	1.50317E-03	0.00000E+00	0.00000E+00
216	9.32390E-01	5.32600E+00	9.22362E-01	1.49687E-03	0.00000E+00	0.00000E+00
217	9.43201E-01	5.34800E+00	9.22459E-01	1.49304E-03	0.00000E+00	0.00000E+00
218	9.35512E-01	5.37083E+00	9.22520E-01	1.48734E-03	0.00000E+00	0.00000E+00
219	8.85614E-01	5.39367E+00	9.22350E-01	1.49021E-03	0.00000E+00	0.00000E+00
220	9.81417E-01	5.41567E+00	9.22621E-01	1.50790E-03	0.00000E+00	0.00000E+00
221	9.44546E-01	5.43767E+00	9.22721E-01	1.50433E-03	0.00000E+00	0.00000E+00
222	9.39459E-01	5.46150E+00	9.22797E-01	1.49941E-03	0.00000E+00	0.00000E+00
223	9.10404E-01	5.48433E+00	9.22741E-01	1.49366E-03	0.00000E+00	0.00000E+00
224	9.18697E-01	5.50717E+00	9.22723E-01	1.48703E-03	0.00000E+00	0.00000E+00
225	8.84000E-01	5.53100E+00	9.22549E-01	1.49050E-03	0.00000E+00	0.00000E+00
226	9.02204E-01	5.55383E+00	9.22458E-01	1.48661E-03	0.00000E+00	0.00000E+00
227	9.24094E-01	5.57767E+00	9.22465E-01	1.48000E-03	0.00000E+00	0.00000E+00
228	9.02574E-01	5.60067E+00	9.22377E-01	1.47606E-03	0.00000E+00	0.00000E+00
229	9.26655E-01	5.62350E+00	9.22396E-01	1.46967E-03	0.00000E+00	0.00000E+00
230	9.24029E-01	5.64633E+00	9.22403E-01	1.46323E-03	0.00000E+00	0.00000E+00
231	9.20599E-01	5.66917E+00	9.22395E-01	1.45684E-03	0.00000E+00	0.00000E+00
232	9.34938E-01	5.69117E+00	9.22450E-01	1.45152E-03	0.00000E+00	0.00000E+00
233	9.27772E-01	5.71500E+00	9.22473E-01	1.44541E-03	0.00000E+00	0.00000E+00
234	9.26126E-01	5.73783E+00	9.22489E-01	1.43925E-03	0.00000E+00	0.00000E+00
235	8.98642E-01	5.75983E+00	9.22386E-01	1.43671E-03	0.00000E+00	0.00000E+00
236	8.87684E-01	5.78283E+00	9.22238E-01	1.43822E-03	0.00000E+00	0.00000E+00
237	9.32308E-01	5.80567E+00	9.22281E-01	1.43273E-03	0.00000E+00	0.00000E+00
238	8.85845E-01	5.82950E+00	9.22127E-01	1.43498E-03	0.00000E+00	0.00000E+00
239	9.39433E-01	5.85133E+00	9.22200E-01	1.43077E-03	0.00000E+00	0.00000E+00
240	9.06601E-01	5.87433E+00	9.22134E-01	1.42626E-03	0.00000E+00	0.00000E+00
241	9.27072E-01	5.89817E+00	9.22155E-01	1.42043E-03	0.00000E+00	0.00000E+00
242	9.23204E-01	5.92183E+00	9.22159E-01	1.41450E-03	0.00000E+00	0.00000E+00
243	9.58466E-01	5.94383E+00	9.22310E-01	1.41665E-03	0.00000E+00	0.00000E+00
244	9.54488E-01	5.96767E+00	9.22443E-01	1.41704E-03	0.00000E+00	0.00000E+00
245	9.53238E-01	5.98967E+00	9.22569E-01	1.41687E-03	0.00000E+00	0.00000E+00
246	9.40665E-01	6.01167E+00	9.22644E-01	1.41300E-03	0.00000E+00	0.00000E+00
247	8.89099E-01	6.03633E+00	9.22507E-01	1.41387E-03	0.00000E+00	0.00000E+00
248	9.59811E-01	6.05917E+00	9.22658E-01	1.41625E-03	0.00000E+00	0.00000E+00
249	9.36168E-01	6.08033E+00	9.22713E-01	1.41157E-03	0.00000E+00	0.00000E+00
250	9.12594E-01	6.10400E+00	9.22672E-01	1.40646E-03	0.00000E+00	0.00000E+00
251	9.11767E-01	6.12700E+00	9.22628E-01	1.40148E-03	0.00000E+00	0.00000E+00
252	9.12741E-01	6.15063E+00	9.22589E-01	1.39642E-03	0.00000E+00	0.00000E+00
253	8.81522E-01	6.17367E+00	9.22425E-01	1.40044E-03	0.00000E+00	0.00000E+00
254	9.43794E-01	6.19650E+00	9.22510E-01	1.39745E-03	0.00000E+00	0.00000E+00
255	9.35168E-01	6.21933E+00	9.22560E-01	1.39281E-03	0.00000E+00	0.00000E+00
256	9.50770E-01	6.24133E+00	9.22671E-01	1.39175E-03	0.00000E+00	0.00000E+00
257	9.01853E-01	6.26433E+00	9.22590E-01	1.38869E-03	0.00000E+00	0.00000E+00
258	9.25094E-01	6.28617E+00	9.22599E-01	1.38329E-03	0.00000E+00	0.00000E+00
259	8.87971E-01	6.31000E+00	9.22465E-01	1.38447E-03	0.00000E+00	0.00000E+00
260	9.16477E-01	6.33200E+00	9.22441E-01	1.37929E-03	0.00000E+00	0.00000E+00
261	9.24263E-01	6.35583E+00	9.22448E-01	1.37397E-03	0.00000E+00	0.00000E+00
262	8.86397E-01	6.37867E+00	9.22310E-01	1.37568E-03	0.00000E+00	0.00000E+00
263	9.15748E-01	6.40150E+00	9.22285E-01	1.37063E-03	0.00000E+00	0.00000E+00
264	9.21627E-01	6.42350E+00	9.22282E-01	1.36539E-03	0.00000E+00	0.00000E+00
265	9.27530E-01	6.44650E+00	9.22302E-01	1.36033E-03	0.00000E+00	0.00000E+00
266	9.43546E-01	6.46933E+00	9.22383E-01	1.35756E-03	0.00000E+00	0.00000E+00
267	9.60302E-01	6.49133E+00	9.22526E-01	1.35997E-03	0.00000E+00	0.00000E+00
268	9.05761E-01	6.51417E+00	9.22463E-01	1.35632E-03	0.00000E+00	0.00000E+00
269	9.55820E-01	6.53700E+00	9.22588E-01	1.35699E-03	0.00000E+00	0.00000E+00
270	9.09560E-01	6.55900E+00	9.22539E-01	1.35279E-03	0.00000E+00	0.00000E+00
271	9.21786E-01	6.58200E+00	9.22536E-01	1.34776E-03	0.00000E+00	0.00000E+00
272	9.16804E-01	6.60463E+00	9.22515E-01	1.34292E-03	0.00000E+00	0.00000E+00
273	9.07458E-01	6.62867E+00	9.22459E-01	1.33911E-03	0.00000E+00	0.00000E+00
274	9.00971E-01	6.65050E+00	9.22380E-01	1.33652E-03	0.00000E+00	0.00000E+00
275	9.36201E-01	6.67067E+00	9.22431E-01	1.33257E-03	0.00000E+00	0.00000E+00
276	9.20443E-01	6.69367E+00	9.22424E-01	1.32772E-03	0.00000E+00	0.00000E+00
277	9.20281E-01	6.71733E+00	9.22416E-01	1.32291E-03	0.00000E+00	0.00000E+00
278	9.34639E-01	6.74033E+00	9.22460E-01	1.31885E-03	0.00000E+00	0.00000E+00
279	9.61809E-01	6.76233E+00	9.22602E-01	1.32174E-03	0.00000E+00	0.00000E+00

280	9.22592E-01	6.78417E+00	9.22602E-01	1.31697E-03	0.00000E+00	0.00000E+00
281	9.54083E-01	6.80717E+00	9.22715E-01	1.31709E-03	0.00000E+00	0.00000E+00
282	9.53818E-01	6.82917E+00	9.22826E-01	1.31707E-03	0.00000E+00	0.00000E+00
283	8.97614E-01	6.85283E+00	9.22736E-01	1.31543E-03	0.00000E+00	0.00000E+00
284	9.11954E-01	6.87667E+00	9.22698E-01	1.31132E-03	0.00000E+00	0.00000E+00
285	9.21965E-01	6.89867E+00	9.22696E-01	1.30668E-03	0.00000E+00	0.00000E+00
286	9.34111E-01	6.92150E+00	9.22736E-01	1.30269E-03	0.00000E+00	0.00000E+00
287	9.36488E-01	6.94450E+00	9.22764E-01	1.29901E-03	0.00000E+00	0.00000E+00
288	9.22643E-01	6.96633E+00	9.22784E-01	1.29446E-03	0.00000E+00	0.00000E+00
289	9.21979E-01	6.98932E+00	9.22816E-01	1.29034E-03	0.00000E+00	0.00000E+00
290	9.26679E-01	7.01133E+00	9.22836E-01	1.28601E-03	0.00000E+00	0.00000E+00
291	9.46820E-01	7.03317E+00	9.22919E-01	1.28424E-03	0.00000E+00	0.00000E+00
292	9.09605E-01	7.05617E+00	9.22873E-01	1.28062E-03	0.00000E+00	0.00000E+00
293	8.99557E-01	7.07800E+00	9.22793E-01	1.27873E-03	0.00000E+00	0.00000E+00
294	9.32222E-01	7.10100E+00	9.22825E-01	1.27475E-03	0.00000E+00	0.00000E+00
295	9.65427E-01	7.12383E+00	9.22971E-01	1.27869E-03	0.00000E+00	0.00000E+00
296	8.93684E-01	7.14583E+00	9.22871E-01	1.27822E-03	0.00000E+00	0.00000E+00
297	9.39107E-01	7.16867E+00	9.22926E-01	1.27507E-03	0.00000E+00	0.00000E+00
298	9.29070E-01	7.19067E+00	9.22947E-01	1.27092E-03	0.00000E+00	0.00000E+00
299	8.85026E-01	7.21350E+00	9.22819E-01	1.27305E-03	0.00000E+00	0.00000E+00
300	9.44079E-01	7.23550E+00	9.22890E-01	1.27078E-03	0.00000E+00	0.00000E+00
301	9.33244E-01	7.25750E+00	9.22925E-01	1.26699E-03	0.00000E+00	0.00000E+00
302	9.49263E-01	7.28033E+00	9.23013E-01	1.26581E-03	0.00000E+00	0.00000E+00
303	9.34646E-01	7.30150E+00	9.23051E-01	1.26219E-03	0.00000E+00	0.00000E+00

KENO MESSAGE NUMBER K5-123 EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS 80 MIL CHANNEL

LIFETIME = 4.56164E-04 + OR - 4.31099E-06 GENERATION TIME = 4.02381E-05 + OR - 1.18607E-07
NU BAR = 2.43523E+00 + OR - 9.27544E-05 AVERAGE FISSION GROUP = 2.24439E+01 + OR - 5.65727E-03
ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION = 1.63071E-01 + OR - 7.57220E-04

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.92315	+ OR - 0.00126	0.92189 TO 0.92442	0.92063 TO 0.92568	0.91937 TO 0.92694	300000
4	0.92312	+ OR - 0.00127	0.92185 TO 0.92438	0.92058 TO 0.92565	0.91932 TO 0.92691	299000
5	0.92317	+ OR - 0.00127	0.92190 TO 0.92444	0.92063 TO 0.92571	0.91936 TO 0.92698	298000
6	0.92308	+ OR - 0.00127	0.92181 TO 0.92435	0.92054 TO 0.92563	0.91927 TO 0.92690	297000
7	0.92319	+ OR - 0.00127	0.92192 TO 0.92446	0.92065 TO 0.92573	0.91938 TO 0.92700	296000
8	0.92317	+ OR - 0.00127	0.92190 TO 0.92445	0.92062 TO 0.92572	0.91935 TO 0.92700	295000
9	0.92316	+ OR - 0.00128	0.92188 TO 0.92444	0.92060 TO 0.92572	0.91932 TO 0.92700	294000
10	0.92319	+ OR - 0.00128	0.92190 TO 0.92447	0.92062 TO 0.92575	0.91934 TO 0.92704	293000
11	0.92328	+ OR - 0.00128	0.92199 TO 0.92456	0.92071 TO 0.92585	0.91943 TO 0.92713	292000
12	0.92337	+ OR - 0.00129	0.92208 TO 0.92465	0.92080 TO 0.92594	0.91951 TO 0.92722	291000
17	0.92344	+ OR - 0.00130	0.92213 TO 0.92474	0.92083 TO 0.92604	0.91953 TO 0.92734	286000
22	0.92356	+ OR - 0.00131	0.92226 TO 0.92487	0.92095 TO 0.92618	0.91964 TO 0.92748	281000
27	0.92325	+ OR - 0.00132	0.92193 TO 0.92457	0.92061 TO 0.92589	0.91930 TO 0.92720	276000
32	0.92313	+ OR - 0.00134	0.92179 TO 0.92446	0.92046 TO 0.92580	0.91912 TO 0.92713	271000
37	0.92323	+ OR - 0.00135	0.92188 TO 0.92459	0.92053 TO 0.92594	0.91918 TO 0.92729	266000
42	0.92360	+ OR - 0.00137	0.92223 TO 0.92496	0.92086 TO 0.92633	0.91950 TO 0.92769	261000
47	0.92387	+ OR - 0.00136	0.92251 TO 0.92524	0.92115 TO 0.92660	0.91978 TO 0.92796	256000
52	0.92377	+ OR - 0.00138	0.92238 TO 0.92515	0.92100 TO 0.92653	0.91962 TO 0.92791	251000
57	0.92360	+ OR - 0.00140	0.92220 TO 0.92500	0.92081 TO 0.92639	0.91941 TO 0.92779	246000
62	0.92364	+ OR - 0.00142	0.92222 TO 0.92506	0.92081 TO 0.92648	0.91939 TO 0.92789	241000
67	0.92328	+ OR - 0.00143	0.92185 TO 0.92471	0.92042 TO 0.92614	0.91900 TO 0.92757	236000
72	0.92296	+ OR - 0.00143	0.92153 TO 0.92439	0.92010 TO 0.92582	0.91867 TO 0.92725	231000
77	0.92321	+ OR - 0.00143	0.92178 TO 0.92464	0.92034 TO 0.92608	0.91891 TO 0.92751	226000
82	0.92320	+ OR - 0.00146	0.92174 TO 0.92467	0.92028 TO 0.92613	0.91881 TO 0.92760	221000
87	0.92326	+ OR - 0.00149	0.92177 TO 0.92475	0.92027 TO 0.92625	0.91878 TO 0.92774	216000
92	0.92311	+ OR - 0.00152	0.92158 TO 0.92463	0.92006 TO 0.92615	0.91854 TO 0.92768	211000

NAC-LWT CASK MODEL: EXXON 9X9 - 2 WATER RODS 80 MIL CHANNEL

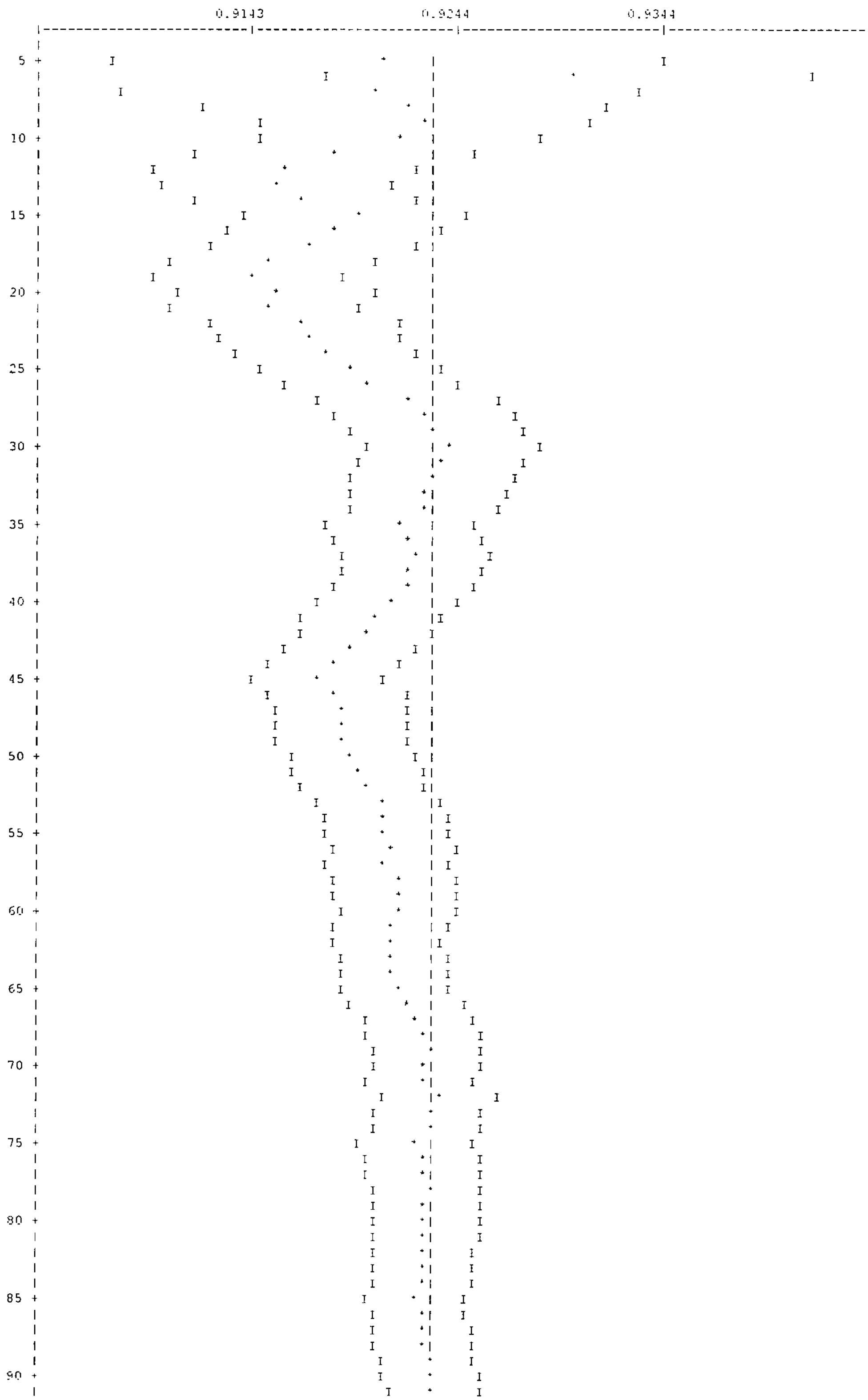
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
97	0.92340	+ OR - 0.00154	0.92186 TO 0.92493	0.92032 TO 0.92647	0.91878 TO 0.92801	206000
102	0.92329	+ OR - 0.00157	0.92172 TO 0.92486	0.92015 TO 0.92643	0.91858 TO 0.92800	201000
107	0.92353	+ OR - 0.00157	0.92195 TO 0.92510	0.92038 TO 0.92668	0.91880 TO 0.92825	196000
112	0.92355	+ OR - 0.00161	0.92194 TO 0.92515	0.92034 TO 0.92676	0.91873 TO 0.92836	191000
117	0.92335	+ OR - 0.00164	0.92171 TO 0.92499	0.92007 TO 0.92664	0.91843 TO 0.92828	186000
122	0.92307	+ OR - 0.00167	0.92140 TO 0.92475	0.91973 TO 0.92642	0.91805 TO 0.92809	181000
127	0.92360	+ OR - 0.00169	0.92191 TO 0.92528	0.92022 TO 0.92697	0.91853 TO 0.92866	176000
132	0.92367	+ OR - 0.00172	0.92195 TO 0.92538	0.92024 TO 0.92710	0.91852 TO 0.92882	171000
137	0.92419	+ OR - 0.00173	0.92247 TO 0.92592	0.92074 TO 0.92764	0.91901 TO 0.92937	166000
142	0.92440	+ OR - 0.00175	0.92266 TO 0.92615	0.92091 TO 0.92789	0.91917 TO 0.92964	161000
147	0.92448	+ OR - 0.00177	0.92271 TO 0.92625	0.92094 TO 0.92803	0.91916 TO 0.92980	156000
152	0.92406	+ OR - 0.00178	0.92228 TO 0.92585	0.92050 TO 0.92763	0.91872 TO 0.92941	151000
157	0.92413	+ OR - 0.00183	0.92230 TO 0.92596	0.92047 TO 0.92779	0.91864 TO 0.92962	146000
162	0.92462	+ OR - 0.00187	0.92275 TO 0.92648	0.92089 TO 0.92835	0.91902 TO 0.93021	141000
167	0.92470	+ OR - 0.00189	0.92280 TO 0.92659	0.92091 TO 0.92848	0.91902 TO 0.93037	136000
172	0.92501	+ OR - 0.00193	0.92308 TO 0.92695	0.92115 TO 0.92888	0.91921 TO 0.93082	131000
177	0.92477	+ OR - 0.00200	0.92277 TO 0.92676	0.92078 TO 0.92876	0.91878 TO 0.93075	126000
182	0.92386	+ OR - 0.00202	0.92184 TO 0.92588	0.91983 TO 0.92789	0.91781 TO 0.92991	121000
187	0.92427	+ OR - 0.00208	0.92219 TO 0.92635	0.92012 TO 0.92843	0.91804 TO 0.93051	116000
192	0.92322	+ OR - 0.00203	0.92119 TO 0.92525	0.91916 TO 0.92729	0.91712 TO 0.92932	111000
197	0.92266	+ OR - 0.00208	0.92058 TO 0.92474	0.91849 TO 0.92683	0.91641 TO 0.92891	106000
202	0.92278	+ OR - 0.00218	0.92060 TO 0.92496	0.91842 TO 0.92714	0.91624 TO 0.92933	101000
207	0.92344	+ OR - 0.00227	0.92117 TO 0.92570	0.91890 TO 0.92797	0.91663 TO 0.93024	96000
212	0.92429	+ OR - 0.00235	0.92194 TO 0.92664	0.91960 TO 0.92899	0.91725 TO 0.93134	91000
217	0.92453	+ OR - 0.00237	0.92216 TO 0.92690	0.91979 TO 0.92927	0.91742 TO 0.93164	86000
222	0.92374	+ OR - 0.00234	0.92140 TO 0.92608	0.91906 TO 0.92842	0.91672 TO 0.93076	81000
227	0.92479	+ OR - 0.00241	0.92237 TO 0.92720	0.91996 TO 0.92961	0.91755 TO 0.93202	76000

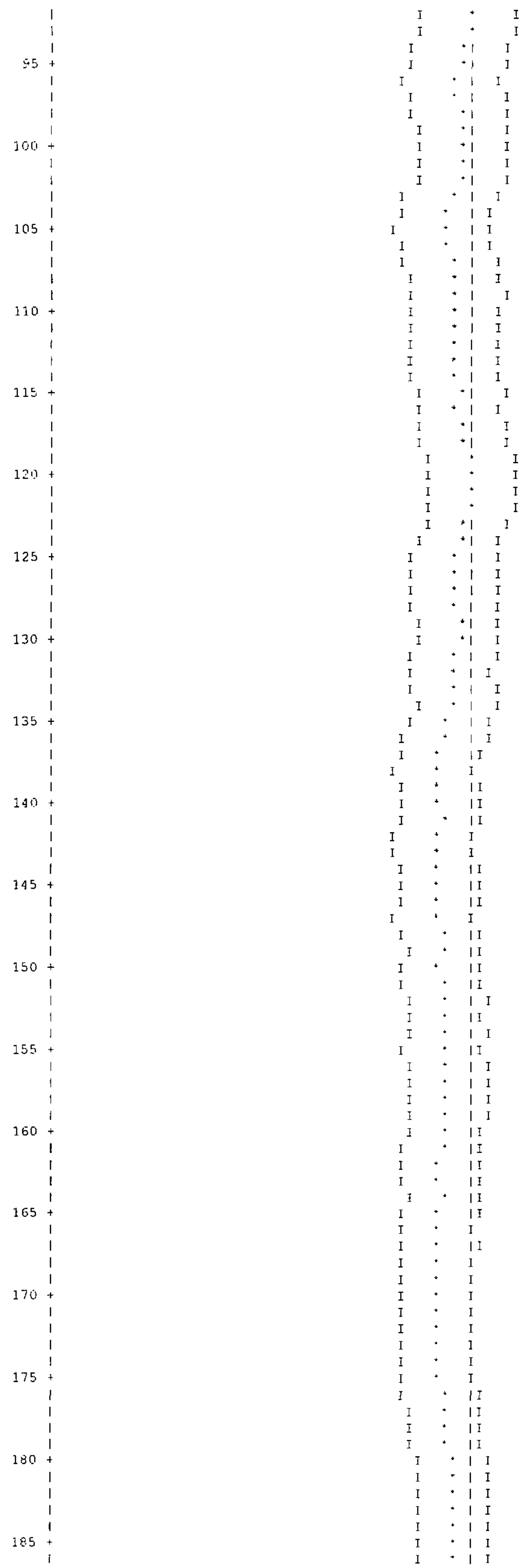
NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS 80 MIL CHANNEL

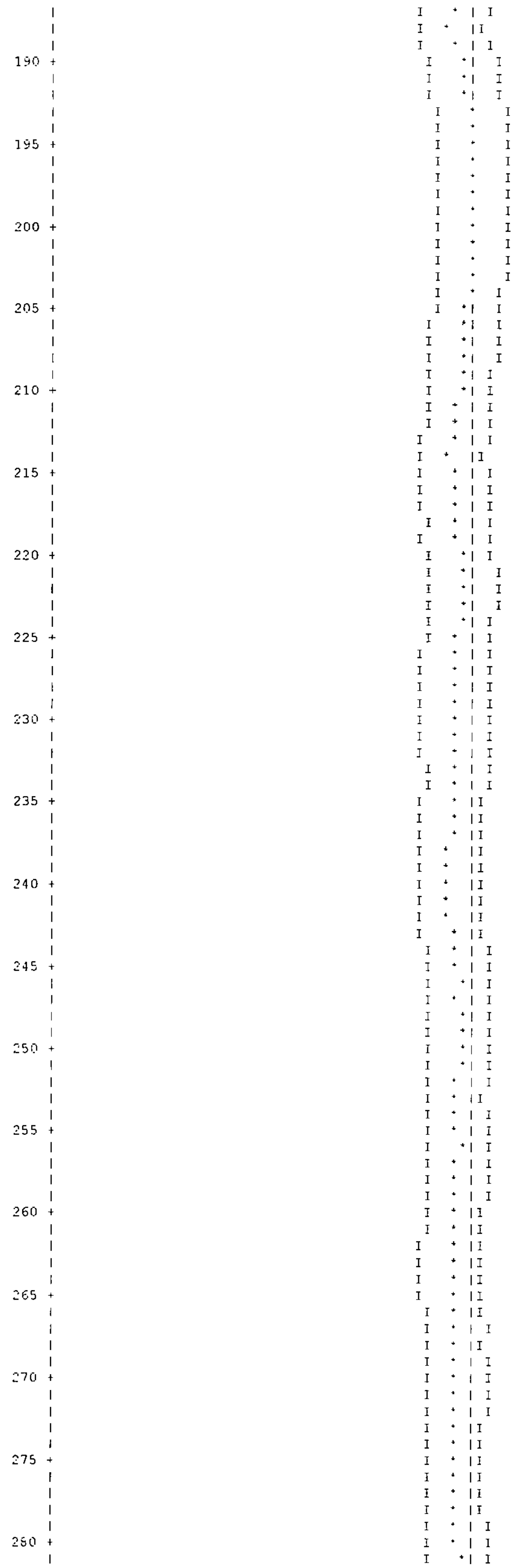
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
232	0.92500	+ OR - 0.00256	0.92244 TO 0.92756	0.91988 TO 0.93012	0.91732 TO 0.93268	71000
237	0.92579	+ OR - 0.00266	0.92314 TO 0.92845	0.92048 TO 0.93111	0.91782 TO 0.93377	66000
242	0.92656	+ OR - 0.00277	0.92379 TO 0.92934	0.92102 TO 0.93211	0.91824 TO 0.93488	61000
247	0.92543	+ OR - 0.00279	0.92265 TO 0.92822	0.91986 TO 0.93101	0.91707 TO 0.93380	56000
252	0.92532	+ OR - 0.00295	0.92237 TO 0.92827	0.91942 TO 0.93121	0.91648 TO 0.93416	51000
257	0.92561	+ OR - 0.00300	0.92261 TO 0.92861	0.91962 TO 0.93161	0.91662 TO 0.93460	46000
262	0.92776	+ OR - 0.00306	0.92469 TO 0.93082	0.92163 TO 0.93388	0.91857 TO 0.93694	41000
267	0.92692	+ OR - 0.00332	0.92361 TO 0.93024	0.92029 TO 0.93355	0.91697 TO 0.93687	36000
272	0.92773	+ OR - 0.00361	0.92412 TO 0.93134	0.92050 TO 0.93495	0.91689 TO 0.93856	31000
277	0.92977	+ OR - 0.00406	0.92572 TO 0.93383	0.92166 TO 0.93789	0.91760 TO 0.94195	26000
282	0.92606	+ OR - 0.00440	0.92165 TO 0.93046	0.91725 TO 0.93486	0.91285 TO 0.93927	21000
287	0.92782	+ OR - 0.00536	0.92246 TO 0.93318	0.91710 TO 0.93854	0.91173 TO 0.94390	16000
292	0.92776	+ OR - 0.00748	0.92027 TO 0.93524	0.91279 TO 0.94272	0.90531 TO 0.95020	11000
297	0.92922	+ OR - 0.00935	0.91987 TO 0.93857	0.91053 TO 0.94792	0.90118 TO 0.95726	6000

NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS 80 MIL CHANNEL

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.9232 + OR - 0.0013 WHICH OCCURS FOR 303 GENERATIONS RUN.




95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185


190
195
200
205
210
215
220
225
230
235
240
245
250
255
260
265
270
275
280

```
      |                    I   *| I
      |                   I    *| I
      |                   I    *| I
285   +                   I    *| I
      |                   I    *| I
      |                    I   *| I
      |                    I   *| I
      |                    I   *| I
290   +                    I   *| I
      |                    I   *| I
      |                    I   *| I
      |                    I   *| I
      |                    I   *| I
295   +                    I   *| I
      |                    I   *| I
      |                    I   *| I
      |                    I   *| I
      |                    I   *| I
300   +                    I   *| I
      |                    I   *| I
      |                    I   *|  I
      |                    I    *  I
```

NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS 80 MIL CHANNEL

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0041			3.77954E-03	2.4762	2.27971E-03	1.7625	0.00000E+00	0.0000
2	0.0166			1.53484E-02	0.6823	7.91156E-03	0.5604	0.00000E+00	0.0000
3	0.0185			1.70463E-02	0.6535	7.23633E-03	0.6156	0.00000E+00	0.0000
4	0.0078			7.19320E-03	0.8032	3.55433E-03	0.7494	0.00000E+00	0.0000
5	0.0026			2.36365E-03	0.5822	2.76274E-03	0.4823	0.00000E+00	0.0000
6	0.0024			2.18845E-03	0.4869	5.90695E-03	0.4100	0.00000E+00	0.0000
7	0.0024			2.19241E-03	0.4650	8.30656E-03	0.4008	0.00000E+00	0.0000
8	0.0024			2.23029E-03	0.4971	1.00129E-02	0.3818	0.00000E+00	0.0000
9	0.0033			3.05338E-03	0.5503	1.42582E-02	0.3863	0.00000E+00	0.0000
10	0.0071			6.54045E-03	0.5588	2.39631E-02	0.4360	0.00000E+00	0.0000
11	0.0150			1.38589E-02	0.6088	3.57136E-02	0.4483	0.00000E+00	0.0000
12	0.0191			1.76731E-02	0.6127	3.44911E-02	0.4689	0.00000E+00	0.0000
13	0.0180			1.66595E-02	0.6443	3.67475E-02	0.4907	0.00000E+00	0.0000
14	0.0142			1.31041E-02	0.5990	5.11136E-02	0.4462	0.00000E+00	0.0000
15	0.0031			2.87393E-03	1.0394	1.43410E-02	0.6200	0.00000E+00	0.0000
16	0.0022			2.02285E-03	1.3462	8.24815E-03	0.7862	0.00000E+00	0.0000
17	0.0033			3.08454E-03	1.9387	5.08476E-03	0.9479	0.00000E+00	0.0000
18	0.0045			4.14548E-03	1.7991	5.04738E-03	1.0115	0.00000E+00	0.0000
19	0.0055			5.09696E-03	1.4471	7.99143E-03	0.7852	0.00000E+00	0.0000
20	0.0234			2.15608E-02	0.7556	2.94462E-02	0.5373	0.00000E+00	0.0000
21	0.0122			1.12665E-02	1.3926	1.19914E-02	0.8317	0.00000E+00	0.0000
22	0.0301			2.77517E-02	0.9038	2.66452E-02	0.6349	0.00000E+00	0.0000
23	0.1071			9.88951E-02	0.4773	8.80475E-02	0.3489	0.00000E+00	0.0000
24	0.2116			1.95307E-01	0.3360	1.56040E-01	0.2555	0.00000E+00	0.0000
25	0.1806			1.66702E-01	0.3986	1.28382E-01	0.3147	0.00000E+00	0.0000
26	0.2136			1.97207E-01	0.3631	1.51858E-01	0.2826	0.00000E+00	0.0000
27	0.0693			6.40088E-02	0.7565	5.95539E-02	0.5464	0.00000E+00	0.0000
SYSTEM TOTAL =				9.23154E-01	0.1367	9.36935E-01	0.0630	0.00000E+00	0.0000

THE WEIGHT LOST IN THE ALBEDO PORTION OF THE PROBLEM = 6.5153E-02 + OR - 0.0004

ELAPSED TIME 7.30150 MINUTES

RANDOM NUMBER= 677D583D1706

```
NAC-LWT CASK MODEL; EXXON 9X9 - 2 WATER RODS  80 MIL CHANNEL

                                FREQUENCY FOR GENERATIONS    4 TO  303
0.8597 TO 0.8724     .
0.8724 TO 0.8850     .............
0.8850 TO 0.8977     ...............................
0.8977 TO 0.9103     ............................................
0.9103 TO 0.9230     ..........................................................
0.9230 TO 0.9356     ..........................................................................
0.9356 TO 0.9483     ................................................
0.9483 TO 0.9609     ...........................
0.9609 TO 0.9736     ........
0.9736 TO 0.9862     ...

                                FREQUENCY FOR GENERATIONS   79 TO  303
0.8597 TO 0.8724     .
0.8724 TO 0.8850     .........
0.8850 TO 0.8977     .....................
0.8977 TO 0.9103     ...................................
0.9103 TO 0.9230     ...........................................
0.9230 TO 0.9356     .............................................................
0.9356 TO 0.9483     ................................
0.9483 TO 0.9609     .....................
0.9609 TO 0.9736     ......
0.9736 TO 0.9862     ..

                                FREQUENCY FOR GENERATIONS  154 TO  303
0.8597 TO 0.8724     .
0.8724 TO 0.8850     .....
0.8850 TO 0.8977     ...........
0.8977 TO 0.9103     ............................
0.9103 TO 0.9230     ..........................
0.9230 TO 0.9356     .......................................
0.9356 TO 0.9483     ......................
0.9483 TO 0.9609     ...............
0.9609 TO 0.9736     .....
0.9736 TO 0.9862     ..

                                FREQUENCY FOR GENERATIONS  229 TO  303
0.8597 TO 0.8724
0.8724 TO 0.8850     ..
0.8850 TO 0.8977     .......
0.8977 TO 0.9103     .........
0.9103 TO 0.9230     ...............
0.9230 TO 0.9356     .....................
0.9356 TO 0.9483     ..........
0.9483 TO 0.9609     ..........
0.9609 TO 0.9736     ..
0.9736 TO 0.9862


...................................................................................................................................
.

          CONGRATULATIONS!  YOU HAVE  SUCCESSFULLY TRAVERSED THE PERILOUS PATH THROUGH KENO V IN   7.30233 MINUTES

...................................................................................................................................
.
_
```

6.6.3 MTR Fuel Elements

This section contains abbreviated output files from the most reactive normal condition and accident condition moderator density variation cases.

Figure 6.6.3-1 CSAS Input/Output for NAC-LWT with Design Basis MTR Fuel - Most Reactive Normal Condition Configuration

```
PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
  MODULE CSAS25   WILL BE CALLED
    LWT HFBR DESIGN U3O8-AL FUEL 93 W/O U235 ELEMENTS IN CLOSE, MIN BASKET PLATES
    27GROUPNDF4  LATTICECELL
    'LINE MATCH
    URANIUM  1 DEN=3.990 0.3000 293 92235 93. 92238 7. END
    O        1 DEN=3.990 0.0542 293 END
    AL       1 DEN=3.990 0.6468 293 END
    AL    2 1.0 293.0 END
    H2O   3 1.000 293.0 END
    AL    4 1.0 293.0 END
    SS304 5 1.0 293.0 END
    PB    6 1.0 293.0 END
    H2O   7 1.000 293.0 END
    H2O   8 1.0 293.0 END
    END COMP
    SYMMSLABCELL 0.3708 0.053 1 3 0.127 2 END

    READ PARAM RUN=YES PLT=YES RND=2 GEN=206 NPG=800 END PARAM
    READ GEOM
    UNIT 1
    COM='AL PLATE CELL'
    CUBOID 2 1 2P3.1250 2P0.127 2P10.0
    CUBOID 3 1 2P3.1250 2P0.254 2P10.0
    UNIT 2
    COM='HFBR FUEL PLATE CELL 1'
    CUBOID 1 1 2P2.8600 2P0.0265 2P10.0
    CUBOID 2 1 2P3.1250 2P0.0635 2P10.0
    CUBOID 3 1 2P3.1250 0.1905 -0.2134 2P10.0
    UNIT 3
    COM='HFBR FUEL PLATE CELL 2'
    CUBOID 1 1 2P2.8600 2P0.0265 2P10.0
    CUBOID 2 1 2P3.1250 2P0.0635 2P10.0
    CUBOID 3 1 2P3.1250 0.2134 -0.2007 2P10.0
    UNIT 4
    COM='HFBR FUEL PLATE CELL 3'
    CUBOID 1 1 2P2.8600 2P0.0265 2P10.0
    CUBOID 2 1 2P3.1250 2P0.0635 2P10.0
    CUBOID 3 1 2P3.1250 0.2007 -0.1854 2P10.0
    UNIT 5
    COM='HFBR FUEL PLATE CELL 4'
    CUBOID 1 1 2P2.8600 2P0.0265 2P10.0
    CUBOID 2 1 2P3.1250 2P0.0635 2P10.0
    CUBOID 3 1 2P3.1250 0.1854 -0.1854 2P10.0
    UNIT 6
    COM='HFBR FUEL PLATE CELL 5'
    CUBOID 1 1 2P2.8600 2P0.0265 2P10.0
    CUBOID 2 1 2P3.1250 2P0.0635 2P10.0
    CUBOID 3 1 2P3.1250 0.1854 -0.2007 2P10.0
    UNIT 7
    COM='HFBR FUEL PLATE CELL 6'
    CUBOID 1 1 2P2.8600 2P0.0265 2P10.0
    CUBOID 2 1 2P3.1250 2P0.0635 2P10.0
    CUBOID 3 1 2P3.1250 0.2007 -0.2134 2P10.0
    UNIT 8
    COM='HFBR FUEL PLATE CELL 7'
    CUBOID 1 1 2P2.8600 2P0.0265 2P10.0
    CUBOID 2 1 2P3.1250 2P0.0635 2P10.0
    CUBOID 3 1 2P3.1250 0.2134 -0.1905 2P10.0
    UNIT 90
    COM='HFBR FUEL ARRAY 20 PLATES IN 5/16 IN. WEB CENTER'
    ARRAY 1 -3.1250 -3.9369 -10.0
    REPLICATE 3 1 2R0.0 2R0.1631 2R0.0 1
    REPLICATE 4 1 2R0.4750 4R0.0 1
    REPLICATE 3 1 2R0.7690 2R0.2688 2R0.0 1
    REPLICATE 5 1 2R0.3556 4R0.0 1
    UNIT 91
    COM='HFBR FUEL ARRAY 20 PLATES IN 5/16 IN. WEB RIGHT'
    ARRAY 1 -3.1250 -3.9369 -10.0
    REPLICATE 3 1 2R0.0 2R0.1631 2R0.0 1
    REPLICATE 4 1 2R0.4750 4R0.0 1
    REPLICATE 3 1 1.5380 0.0 2R0.2688 2R0.0 1
    REPLICATE 5 1 2R0.3556 4R0.0 1
    UNIT 92
    COM='HFBR FUEL ARRAY 20 PLATES IN 5/16 IN. WEB LEFT'
    ARRAY 1 -3.1250 -3.9369 -10.0
    REPLICATE 3 1 2R0.0 2R0.1631 2R0.0 1
    REPLICATE 4 1 2R0.4750 4R0.0 1
    REPLICATE 3 1 0.0 1.5380 2R0.2688 2R0.0 1
    REPLICATE 5 1 2R0.3556 4R0.0 1
    UNIT 10
    COM='HFBR FUEL ARRAY WITH HALF OF 1/4 PLATE ON RIGHT -  TOP STACK'
    ARRAY 1 -3.1250 -3.9369 -10.0
    REPLICATE 3 1 2R0.0 2R0.1631 2R0.0 1
    REPLICATE 4 1 2R0.4750 4R0.0 1
    REPLICATE 3 1 2R0.7690 0.5376 0.0 2R0.0 1
    REPLICATE 5 1 0.3048 5R0.0 1
    UNIT 101
    COM='HFBR FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON RIGHT -  BOTTOM STACK'
```

```
ARRAY 1 -3.1250 -3.9369 -10.0
REPLICATE 3 1 2R0.0 2R0.1631 2R0.0 1
REPLICATE 4 1 2R0.4750 4R0.0 1
REPLICATE 3 1 2R0.7690 0.0 0.5376 2R0.0 1
REPLICATE 5 1 0.3048 5R0.0 1
UNIT 11
COM='HFBR FUEL WITH HALF OF 1/4 IN. PLATE ON LEFT  TOP STACK'
ARRAY 1 -3.1250 -3.9369 -10.0
REPLICATE 3 1 2R0.0 2R0.1631 2R0.0 1
REPLICATE 4 1 2R0.4750 4R0.0 1
REPLICATE 3 1 2R0.7690 0.5376 0.0 2R0.0 1
REPLICATE 5 1 0.0 0.3048 4R0.0 1
UNIT 111
COM='HFBR FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON LEFT - BOTTOM STACK'
ARRAY 1 -3.1250 -3.9369 -10.0
REPLICATE 3 1 2R0.0 2R0.1631 2R0.0 1
REPLICATE 4 1 2R0.4750 4R0.0 1
REPLICATE 3 1 2R0.7690 0.0 0.5376 2R0.0 1
REPLICATE 5 1 0.0 0.3048 4R0.0 1
UNIT 12
COM='2 UNIT ARRAY WITH 0.120 IN. PLATE ON TOP AND SIDES'
ARRAY 2 -9.0428 -4.3688 -10.0
REPLICATE 5 1 3R0.3048 0.0 2R0.0 1
UNIT 13
COM='3 UNIT ARRAY WITH REST OF 5/16 WEB'
ARRAY 3 -14.1738 -4.3688 -10.0
REPLICATE 5 1 2R0.3556 2R0.7112 2R0.0 1
UNIT 14
COM='2 UNIT ARRAY WITH 0.120 IN. PLATE ON BOTTOM and SIDES'
ARRAY 4 -9.0428 -4.3688 -10.0
REPLICATE 5 1 2R0.3048 0.0 0.3048 2R0.0 1
'LINE MATCH
'LINE MATCH
'LINE MATCH
GLOBAL UNIT 15
COM='7 HFBR ASSEMBLIES IN THE LWT'
CYLINDER 3 1 17.0500 2P10.0
HOLE 12 0.0 +9.4489 0.0
HOLE 13 0.0 0.0 0.0
HOLE 14 0.0 -9.4489 0.0
CYLINDER 5 1 18.8913 2P10.0
CYLINDER 6 1 33.4963 2P10.0
CYLINDER 5 1 36.5443 2P10.0
CYLINDER 8 1 49.2443 2P10.0
CYLINDER 5 1 80.33900 2P10.0
CUBOID   7 1 4P80.33900 2P10.0
END GEOM
READ ARRAY
ARA=1 NUX=1 NUY=20 NUZ=1 FILL 1 8 7 6 12R5 4 3 2 1 END FILL
ARA=2 NUX=2 NUY=1 NUZ=1 FILL 10 11 END FILL
ARA=3 NUX=3 NUY=1 NUZ=1 FILL 92 90 91 END FILL
ARA=4 NUX=2 NUY=1 NUZ=1 FILL 101 111 END FILL
END ARRAY
READ BOUNDS ALL=MIR END BOUNDS
READ PLOT
TTL='X-Y PLOT OF ASSEMBLY'
NCH=' FCWASPW'
UAX=1.0 VDN=-1.0 NAX=130
XUL=-5.0 YUL=5.0 ZUL=0.0
XLR=5.0 YLR=-5.0 ZLR=0.0 END
TTL='X-Y PLOT OF CASK'
UAX=1.0 VDN=-1.0 NAX=130
XUL=-65.0 YUL=65.0 ZUL=0.0
XLR=65.0 YLR=-65.0 ZLR=0.0 END
TTL='X-Y PLOT OF BASKET'
UAX=1.0 VDN=-1.0 NAX=130
XUL=-17.0 YUL=17.0 ZUL=0.0
XLR=17.0 YLR=-17.0 ZLR=0.0 END
TTL='X-Z PLOT OF BASKET'
VAX=1.0 WDN=-1.0
XUL=0.0 YUL=-5.0 ZUL=10.0
XLR=0.0 YLR=5.0 ZLR=-10.0
END PLOT
END DATA

SECONDARY MODULE 000008   HAS BEEN CALLED.
```

CSAS25

SCALE - PC

06/15/98

14:29:09

```
PROGRAM VERIFICATION INFORMATION

CODE SYSTEM:  SCALE-PC VERSION:  4.3

             PROGRAM:  CSAS

       CREATION DATE:  03-08-96

              VOLUME:  ENG

             LIBRARY:  G:\SCALE43\EXE

     PRODUCTION CODE:  CSAS

             VERSION:  3.1

             JOBNAME:  SCALE-PC

   DATE OF EXECUTION:  06/15/98

   TIME OF EXECUTION:  14:29:09
```

```
LWT HFBR DESIGN U308-AL FUEL 93 W/O U235 ELEMENTS IN CLOSE, MIN BASKET PLATES

********** DATA LIBRARY INFORMATION **********

UNIT                                                    VOLUME
NUMBER        DATA SET NAME                             NAME      UNIT FUNCTION
------        -------------                             ----      -------------

  89     G:\scale43\DATALIB\FT89F001                              STANDARD COMPOSITION LIBRARY

  82     G:\scale43\DATALIB\FT82F001                              CROSS SECTION LIBRARY

  11     C:\PROJECTS\bu85-crit\nct\NCTY3M\FT11F001                SHORT CROSS SECTION LIBRARY

  90     C:\PROJECTS\bu85-crit\nct\NCTY3M\FT90F001                INPUT DATA DIRECT ACCESS


                    STANDARD COMPOSITION LIBRARY DATA
                    ---------------------------------

UNIT NUMBER  :  89

DATASET NAME :  G:\scale43\DATALIB\FT89F001

LIBRARY TITLE:  SCALE-4 STANDARD COMPOSITION LIBRARY
                637 STANDARD COMPOSITIONS, 490 NUCLIDES
                90 ELEMENTS WITH VARIABLE ISOTOPIC DISTRBUTIONS.

CREATION DATE:   6/30/95


                    CROSS SECTION LIBRARY DATA
                    --------------------------

UNIT NUMBER  :  82

DATASET NAME :  G:\scale43\DATALIB\FT82F001

LIBRARY TITLE:  SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
                   BASED ON ENDF-B VERSION 4 DATA
                      COMPILED FOR NRC      1/27/89
                         LAST UPDATED                                  08/12/94
                            L.M.PETRIE   -   ORNL
```

```
            KK        KK  EEEEEEEEEEEE  NN        NN   OOOOOOOOOO                       VV        VV
            KK       KK   EEEEEEEEEEEE  NNN       NN  OOOOOOOOOOOO                      VV        VV
            KK      KK    EE            NNNN      NN  OO        OO                      VV        VV
            KK     KK     EE            NN NN     NN  OO        OO                      VV        VV
            KK    KK      EE            NN  NN    NN  OO        OO                      VV        VV
            KKKKKKKK      EEEEEEEE      NN   NN   NN  OO        OO  -------------       VV        VV
            KKKKKKKK      EEEEEEEE      NN    NN  NN  OO        OO  -------------        VV      VV
            KK    KK      EE            NN     NN NN  OO        OO                        VV    VV
            KK     KK     EE            NN      NNNN  OO        OO                         VV  VV
            KK      KK    EE            NN       NNN  OO        OO                          VVVV
            KK       KK   EEEEEEEEEEEE  NN        NN  OOOOOOOOOOOO                           VV
            KK        KK  EEEEEEEEEEEE  NN        NN   OOOOOOOOOO                             V

 SSSSSSSSSS    CCCCCCCCCC     AAAAAAAA    LL            EEEEEEEEEEEE                       PPPPPPPPPPP    CCCCCCCCCC
SSSSSSSSSSSS  CCCCCCCCCCCC   AAAAAAAAAA   LL            EEEEEEEEEEEE                       PPPPPPPPPPPP  CCCCCCCCCCCC
SS        SS  CC        CC  AA        AA  LL            EE                                 PP        PP  CC        CC
SS            CC            AA        AA  LL            EE                                 PP        PP  CC
SS            CC            AA        AA  LL            EE                                 PP        PP  CC
SSSSSSSSSSS   CC            AAAAAAAAAAAA  LL            EEEEEEEE      -------------        PPPPPPPPPPPP  CC
 SSSSSSSSSSS  CC            AAAAAAAAAAAA  LL            EEEEEEEE      -------------        PPPPPPPPPPP   CC
          SS  CC            AA        AA  LL            EE                                 PP            CC
          SS  CC            AA        AA  LL            EE                                 PP            CC
SS        SS  CC        CC  AA        AA  LL            EE                                 PP            CC        CC
SSSSSSSSSSSS  CCCCCCCCCCCC  AA        AA  LLLLLLLLLLLL  EEEEEEEEEEEE                       PP            CCCCCCCCCCCC
 SSSSSSSSSS    CCCCCCCCCC   AA        AA  LLLLLLLLLLLL  EEEEEEEEEEEE                       PP             CCCCCCCCCC

   00000000    666666666666           //       11       555555555555          //    9999999999     8888888888
  0000000000   666666666666          //       111       555555555555         //    999999999999   888888888888
 00      00   66                    //       1111       55                  //     99        99   88        88
00        00  66                   //          11       55                 //      99        99   88        88
00        00  66                  //           11       55                //       99        99   88        88
00        00  666666666666       //            11       555555555555     //        999999999999    8888888888
00        00  666666666666      //             11       555555555555    //          99999999999    8888888888
00        00  66        66     //              11                 55   //                   99    88        88
00        00  66        66    //               11                 55  //                    99    88        88
 00      00   66        66   //                11       55        55 //                     99    88        88
  0000000000  666666666666  //              11111111    555555555555//         999999999999     888888888888
   00000000    6666666666  //               11111111     5555555555 //          9999999999       8888888888

      11             44                   2222222222   9999999999                 2222222222        11
     111            444                  222222222222 999999999999               222222222222      111
    1111           4444          :::     22        22 99        99      :::      22        22     1111
      11          44 44          :::               22 99        99      :::                22       11
      11         44  44          :::              22  99        99      :::               22        11
      11        44   44                          22   999999999999                       22         11
      11       44    44                         22     99999999999                      22          11
      11      444444444444       :::           22              99       :::            22           11
      11      444444444444       :::          22               99       :::           22            11
      11             44          :::         22                99       :::          22             11
   11111111          44                  222222222222 999999999999               222222222222    11111111
   11111111          44                  222222222222 999999999999               222222222222    11111111
```

```
PROGRAM VERIFICATION INFORMATION

CODE SYSTEM:  SCALE-PC VERSION:  4.3

         PROGRAM:  000009

   CREATION DATE:  03-08-96

          VOLUME:  ENG

         LIBRARY:  G:\SCALE43\EXE

 PRODUCTION CODE:  KENOVA

         VERSION:  3.1

         JOBNAME:  SCALE-PC

DATE OF EXECUTION: 06/15/98

TIME OF EXECUTION: 14:29:21
```

```
****** NUMERIC PARAMETERS ******

TME   MAXIMUM PROBLEM TIME (MIN)                  30.00
TBA   TIME PER GENERATION (MIN)                    0.50
GEN   NUMBER OF GENERATIONS                         206
NPG   NUMBER PER GENERATION                         800
NSK   NUMBER OF GENERATIONS TO BE SKIPPED             3
BEG   BEGINNING GENERATION NUMBER                     1
RES   GENERATIONS BETWEEN CHECKPOINTS                 0
X1D   NUMBER OF EXTRA 1-D CROSS SECTIONS              1
NBK   NEUTRON BANK SIZE                             825
XNB   EXTRA POSITIONS IN NEUTRON BANK                 0
NFB   FISSION BANK SIZE                             800
XFB   EXTRA POSITIONS IN FISSION BANK                 0
WTA   DEFAULT VALUE OF WEIGHT AVERAGE            0.5000
WTH   WEIGHT HIGH FOR SPLITTING                  3.0000
WTL   WEIGHT LOW FOR RUSSIAN ROULETTE            0.3333
RND   STARTING RANDOM NUMBER                          2
NB8   NUMBER OF D.A. BLOCKS ON UNIT  8              200
NL8   LENGTH OF D.A. BLOCKS ON UNIT  8              512
ADJ   MODE OF CALCULATION                       FORWARD
      INPUT DATA WRITTEN ON RESTART UNIT             NO
      BINARY DATA INTERFACE                         YES
```

```
***************************************************************************************************
***************************************************************************************************
***                                                                                             ***
***                                                                                             ***
***                                                                                             ***
***************************************************************************************************
***                             ******    LOGICAL PARAMETERS     ******                         ***
***                                                                                             ***
*** RUN  EXECUTE PROBLEM AFTER CHECKING DATA    YES        PLT  PLOT PICTURE MAP(S)          YES ***
***                                                                                             ***
*** FLX  COMPUTE FLUX                           NO         FDN  COMPUTE FISSION DENSITIES     NO ***
***                                                                                             ***
*** SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION   NO         NUB  COMPUTE NU-BAR & AVG FISSION GROUP   YES ***
***                                                                                             ***
*** MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER    NO         MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION   NO ***
***                                                                                             ***
*** CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER  NO         CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION NO ***
***                                                                                             ***
*** FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER  NO         FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION NO ***
***                                                                                             ***
*** MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER    NO         MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER    NO ***
***                                                                                             ***
*** CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER  NO         CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER  NO ***
***                                                                                             ***
*** FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER  NO         FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER  NO ***
***                                                                                             ***
*** HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL   NO         HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL   NO ***
***                                                                                             ***
*** AMX  PRINT ALL MIXED CROSS SECTIONS         NO         FAR  PRINT FIS. AND ABS. BY REGION           NO ***
***                                                                                             ***
*** XS1  PRINT 1-D MIXTURE X-SECTIONS           NO         GAS  PRINT FAR BY GROUP                      NO ***
***                                                                                             ***
*** XS2  PRINT 2-D MIXTURE X-SECTIONS           NO         PAX  PRINT XSEC-ALBEDO CORRELATION TABLES    NO ***
***                                                                                             ***
*** XAP  PRINT MIXTURE ANGLES & PROBABILITIES   NO         PWT  PRINT WEIGHT AVERAGE ARRAY              NO ***
***                                                                                             ***
*** PKI  PRINT FISSION SPECTRUM                 NO         PGM  PRINT INPUT GEOMETRY                    NO ***
***                                                                                             ***
*** P1D  PRINT EXTRA 1-D CROSS SECTIONS         NO         BUG  PRINT DEBUG INFORMATION                 NO ***
***                                                                                             ***
***                                                        TRK  PRINT TRACKING INFORMATION              NO ***
***                                                                                             ***
***                                                                                             ***
***************************************************************************************************
***************************************************************************************************
***************************************************************************************************
                                  PARAMETER INPUT COMPLETED

                 ........    0 IO'S WERE USED READING THE PARAMETER DATA      ........

                 ************** DATA READING COMPLETED **************
```

```
*****************************************************************************************************
***                                                                                               ***
***                                                                                               ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************
***                                                                                               ***
***          UNIT                                                   VOLUME                        ***
***         NUMBER               DATA SET NAME                       NAME       UNIT FUNCTION     ***
***         ------               -------------                       ----       -------------     ***
***                                                                                               ***
***       XSC  14    C:\PROJECTS\bu85-crit\nct\NCTY3M\FT14F001                  MIXED CROSS SECTIONS  ***
***                                                                                               ***
***       ALB  79    G:\scale43\DATALIB\FT79F001                                INPUT ALBEDOS     ***
***                                                                                               ***
***       WTS  80    G:\scale43\DATALIB\FT80F001                                INPUT WEIGHTS     ***
***                                                                                               ***
***       SKT  16     UNKNOWN                                                   WRITE SCRATCH DATA  ***
***                                                                                               ***
***       BIN  95    C:\PROJECTS\bu85-crit\nct\NCTY3M\FT95F001                  BINARY INPUT DATA  ***
***                                                                                               ***
***       RST  95    C:\PROJECTS\bu85-crit\nct\NCTY3M\FT95F001                  READ RESTART DATA  ***
***                                                                                               ***
***       LIB   4    C:\PROJECTS\bu85-crit\nct\NCTY3M\FT04F001                  INPUT AMPX WORKING LIBRARY  ***
***                                                                                               ***
***             8    C:\PROJECTS\bu85-crit\nct\NCTY3M\FT08F001                  INPUT DATA DIRECT ACCESS  ***
***                                                                                               ***
***             9     UNKNOWN                                                   SUPER GROUPED DIRECT ACCESS  ***
***                                                                                               ***
***            10     UNKNOWN                                                   XSEC MIXING DIRECT ACCESS  ***
***                                                                                               ***
*****************************************************************************************************
```

```
                                        MIXING TABLE

                               NUMBER OF SCATTERING ANGLES =  2
                            CROSS SECTION MESSAGE THRESHOLD =3.0E-05

MIXTURE =      1          DENSITY(G/CC) =  3.9940
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT              NUCLIDE TITLE
   1008016  8.14438E-03  5.41451E-02    8016    15.9904      OXYGEN-16      ENDF/B-IV MAT 1276                         UPDATED
08/12/94
   1013027  5.76000E-02  6.46154E-01   13027    26.9818     AL-27 1193 218 GP 040375(5)                               UPDATED
08/12/94
   1092235  2.85219E-03  2.78722E-01   92235   235.0441      URANIUM-235    ENDF/B-IV MAT 1261                         UPDATED
08/12/94
   1092238  2.11969E-04  2.09790E-02   92238   238.0510      URANIUM-238    ENDF/B-IV MAT 1262                         UPDATED
08/12/94

MIXTURE =      2          DENSITY(G/CC) =  2.7020
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT              NUCLIDE TITLE
   2013027  6.03066E-02  1.00000E+00   13027    26.9818     AL-27 1193 218 GP 040375(5)                               UPDATED
08/12/94

MIXTURE =      3          DENSITY(G/CC) = 0.99817
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT              NUCLIDE TITLE
   3001001  6.67692E-02  1.11927E-01    1001     1.0077      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002                UPDATED
08/12/94
   3008016  3.33846E-02  8.88074E-01    8016    15.9904      OXYGEN-16      ENDF/B-IV MAT 1276                         UPDATED
08/12/94

MIXTURE =      4          DENSITY(G/CC) =  2.7020
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT              NUCLIDE TITLE
   4013027  6.03066E-02  1.00000E+00   13027    26.9818     AL-27 1193 218 GP 040375(5)                               UPDATED
08/12/94

MIXTURE =      5          DENSITY(G/CC) =  7.9200
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT              NUCLIDE TITLE
   5024304  1.74286E-02  1.90000E-01   24000    51.9957     CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED
08/12/94
   5025055  1.73633E-03  1.99999E-02   25055    54.9379      MANGANESE-55   ENDF/B-IV MAT 1197                         UPDATED
08/12/94
   5026304  5.93579E-02  6.95000E-01   26000    55.8447     FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED
08/12/94
   5028304  7.72070E-03  9.50001E-02   28000    58.6872     NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED
08/12/94

MIXTURE =      6          DENSITY(G/CC) =  11.344
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT              NUCLIDE TITLE
   6082000  3.29690E-02  1.00000E+00   82000   207.2100     PB   1288 218NGP 042375 P-3 293K                          UPDATED
08/12/94

MIXTURE =      7          DENSITY(G/CC) = 0.99817
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT              NUCLIDE TITLE
   7001001  6.67692E-02  1.11927E-01    1001     1.0077      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002                UPDATED
08/12/94
   7008016  3.33846E-02  8.88074E-01    8016    15.9904      OXYGEN-16      ENDF/B-IV MAT 1276                         UPDATED
08/12/94

MIXTURE =      8          DENSITY(G/CC) = 0.99817
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT              NUCLIDE TITLE
   8001001  6.67692E-02  1.11927E-01    1001     1.0077      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002                UPDATED
08/12/94
   8008016  3.33846E-02  8.88074E-01    8016    15.9904      OXYGEN-16      ENDF/B-IV MAT 1276                         UPDATED
08/12/94


                             3001001      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94
                             7001001      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94
                             8001001      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94
                             1008016      OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED 08/12/94
                             3008016      OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED 08/12/94
                             7008016      OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED 08/12/94
                             8008016      OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED 08/12/94
                             1013027     AL-27 1193 218 GP 040375(5)                              UPDATED 08/12/94
                             2013027     AL-27 1193 218 GP 040375(5)                              UPDATED 08/12/94
                             4013027     AL-27 1193 218 GP 040375(5)                              UPDATED 08/12/94
                             5024304     CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94
                             5025055      MANGANESE-55   ENDF/B-IV MAT 1197                       UPDATED 08/12/94
                             5026304     FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94
                             5028304     NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94
                             6082000     PB   1288 218NGP 042375 P-3 293K                         UPDATED 08/12/94
                             1092235      URANIUM-235    ENDF/B-IV MAT 1261                       UPDATED 08/12/94
                             1092238      URANIUM-238    ENDF/B-IV MAT 1262                       UPDATED 08/12/94
```

```
*********************************************************************************************
***                                                                                       ***
***                                                                                       ***
***                                                                                       ***
*********************************************************************************************
*********************************************************************************************
***                                                                                       ***
***                         ****** ADDITIONAL INFORMATION ******                          ***
***                                                                                       ***
***  NUMBER OF ENERGY GROUPS                 27     USE LATTICE GEOMETRY             YES  ***
***                                                                                       ***
***  NO. OF FISSION SPECTRUM SOURCE GROUP     1     GLOBAL ARRAY NUMBER                0  ***
***                                                                                       ***
***  NO. OF SCATTERING ANGLES IN XSECS        2     NUMBER OF UNITS IN THE GLOBAL X DIR. 0 ***
***                                                                                       ***
***  ENTRIES/NEUTRON IN THE NEUTRON BANK     22     NUMBER OF UNITS IN THE GLOBAL Y DIR. 0 ***
***                                                                                       ***
***  ENTRIES/NEUTRON IN THE FISSION BANK     15     NUMBER OF UNITS IN THE GLOBAL Z DIR. 0 ***
***                                                                                       ***
***  NUMBER OF MIXTURES USED                  8     USE A GLOBAL REFLECTOR           YES  ***
***                                                                                       ***
***  NUMBER OF BIAS ID'S USED                 1     USE NESTED HOLES                  NO  ***
***                                                                                       ***
***  NUMBER OF DIFFERENTIAL ALBEDOS USED      0     NUMBER OF HOLES                    3  ***
***                                                                                       ***
***  TOTAL INPUT GEOMETRY REGIONS            71     MAXIMUM HOLE NESTING LEVEL         1  ***
***                                                                                       ***
***  NUMBER OF GEOMETRY REGIONS USED         71     USE NESTED ARRAYS                YES  ***
***                                                                                       ***
***  LARGEST GEOMETRY UNIT NUMBER           111     NUMBER OF ARRAYS USED              4  ***
***                                                                                       ***
***  LARGEST ARRAY NUMBER                     4     MAXIMUM ARRAY NESTING LEVEL        2  ***
***                                                                                       ***
***                                                                                       ***
***  +X BOUNDARY CONDITION                  MIR     -X BOUNDARY CONDITION            MIR  ***
***                                                                                       ***
***  +Y BOUNDARY CONDITION                  MIR     -Y BOUNDARY CONDITION            MIR  ***
***                                                                                       ***
***  +Z BOUNDARY CONDITION                  MIR     -Z BOUNDARY CONDITION            MIR  ***
***                                                                                       ***
*********************************************************************************************
```

```
*** ****** SPACE AND SUPERGROUP INFORMATION ****** ***

100000 WORDS IS THE TOTAL SPACE AVAILABLE.

34213 WORDS WERE USED FOR NON-SUPERGROUP STORAGE.

65787 WORDS OF STORAGE ARE AVAILABLE FOR SUPERGROUPED DATA.

99721 WORDS OF STORAGE ARE AVAILABLE FOR CONSTRUCTING THE SUPERGROUPS.

65727 WORDS OF STORAGE ARE AVAILABLE TO EACH SUPERGROUP.

1037 WORDS ARE NEEDED FOR THE LARGEST GROUP.

35466 WORDS OF STORAGE IS SUFFICIENT TO RUN THIS PROBLEM.

45792 WORDS OF STORAGE WILL ALLOW THE PROBLEM TO RUN WITH ONE SUPERGROUP.

46240 WORDS OF STORAGE WILL BE USED TO RUN THIS PROBLEM.
```

SUPERGROUP	STARTING GROUP	ENDING GROUP	XSEC LENGTH	ALBEDO LENGTH	TOTAL LENGTH
1	1	27	2252	0	11519

.... 0 IO'S WERE USED IN SUPERGROUPING ....

ARRAY NUMBER	UNITS IN X DIR.	UNITS IN Y DIR.	UNITS IN Z DIR.	NESTING LEVEL
1	1	20	1	2
2	2	1	1	1
3	3	1	1	1
4	2	1	1	1

```
MEDIA BIAS       GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION             NUM   ID

                                                  -----   UNIT     1   -----

AL PLATE CELL

  1 CUBOID          2  1    +X =  3.1250    -X = -3.1250    +Y = 0.12700     -Y =-0.12700     +Z =  10.000     -Z = -10.000

  2 CUBOID          3  1    +X =  3.1250    -X = -3.1250    +Y = 0.25400     -Y =-0.25400     +Z =  10.000     -Z = -10.000

                                                  -----   UNIT     2   -----

HFBR FUEL PLATE CELL 1

  1 CUBOID          1  1    +X =  2.8600    -X = -2.8600    +Y = 2.65000E-02 -Y =-2.65000E-02 +Z =  10.000     -Z = -10.000

  2 CUBOID          2  1    +X =  3.1250    -X = -3.1250    +Y = 6.35000E-02 -Y =-6.35000E-02 +Z =  10.000     -Z = -10.000

  3 CUBOID          3  1    +X =  3.1250    -X = -3.1250    +Y = 0.19050     -Y =-0.21340     +Z =  10.000     -Z = -10.000

                                                  -----   UNIT     3   -----

HFBR FUEL PLATE CELL 2

  1 CUBOID          1  1    +X =  2.8600    -X = -2.8600    +Y = 2.65000E-02 -Y =-2.65000E-02 +Z =  10.000     -Z = -10.000

  2 CUBOID          2  1    +X =  3.1250    -X = -3.1250    +Y = 6.35000E-02 -Y =-6.35000E-02 +Z =  10.000     -Z = -10.000

  3 CUBOID          3  1    +X =  3.1250    -X = -3.1250    +Y = 0.21340     -Y =-0.20070     +Z =  10.000     -Z = -10.000

                                                  -----   UNIT     4   -----

HFBR FUEL PLATE CELL 3

  1 CUBOID          1  1    +X =  2.8600    -X = -2.8600    +Y = 2.65000E-02 -Y =-2.65000E-02 +Z =  10.000     -Z = -10.000

  2 CUBOID          2  1    +X =  3.1250    -X = -3.1250    +Y = 6.35000E-02 -Y =-6.35000E-02 +Z =  10.000     -Z = -10.000

  3 CUBOID          3  1    +X =  3.1250    -X = -3.1250    +Y = 0.20070     -Y =-0.18540     +Z =  10.000     -Z = -10.000

                                                  -----   UNIT     5   -----

HFBR FUEL PLATE CELL 4

  1 CUBOID          1  1    +X =  2.8600    -X = -2.8600    +Y = 2.65000E-02 -Y =-2.65000E-02 +Z =  10.000     -Z = -10.000

  2 CUBOID          2  1    +X =  3.1250    -X = -3.1250    +Y = 6.35000E-02 -Y =-6.35000E-02 +Z =  10.000     -Z = -10.000

  3 CUBOID          3  1    +X =  3.1250    -X = -3.1250    +Y = 0.18540     -Y =-0.18540     +Z =  10.000     -Z = -10.000
```

```
                   MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION              NUM   ID

                                              -----   UNIT     6   -----

HFBR FUEL PLATE CELL 5

  1 CUBOID           1   1      +X =   2.8600     -X = -2.8600      +Y = 2.65000E-02 -Y =-2.65000E-02 +Z =  10.000      -Z = -10.000

  2 CUBOID           2   1      +X =   3.1250     -X = -3.1250      +Y = 6.35000E-02 -Y =-6.35000E-02 +Z =  10.000      -Z = -10.000

  3 CUBOID           3   1      +X =   3.1250     -X = -3.1250      +Y = 0.18540     -Y =-0.20070     +Z =  10.000      -Z = -10.000

                                              -----   UNIT     7   -----

HFBR FUEL PLATE CELL 6

  1 CUBOID           1   1      +X =   2.8600     -X = -2.8600      +Y = 2.65000E-02 -Y =-2.65000E-02 +Z =  10.000      -Z = -10.000

  2 CUBOID           2   1      +X =   3.1250     -X = -3.1250      +Y = 6.35000E-02 -Y =-6.35000E-02 +Z =  10.000      -Z = -10.000

  3 CUBOID           3   1      +X =   3.1250     -X = -3.1250      +Y = 0.20070     -Y =-0.21340     +Z =  10.000      -Z = -10.000

                                              -----   UNIT     8   -----

HFBR FUEL PLATE CELL 7

  1 CUBOID           1   1      +X =   2.8600     -X = -2.8600      +Y = 2.65000E-02 -Y =-2.65000E-02 +Z =  10.000      -Z = -10.000

  2 CUBOID           2   1      +X =   3.1250     -X = -3.1250      +Y = 6.35000E-02 -Y =-6.35000E-02 +Z =  10.000      -Z = -10.000

  3 CUBOID           3   1      +X =   3.1250     -X = -3.1250      +Y = 0.21340     -Y =-0.19050     +Z =  10.000      -Z = -10.000

                                 -----   UNIT    10  EXTERNAL TO LATTICE  1   -----

HFBR FUEL ARRAY WITH HALF OF 1/4 PLATE ON RIGHT -  TOP STACK

  1 ARRAY NUMBER     1              +X =   3.1250     -X = -3.1250      +Y =   3.9369     -Y = -3.9369     +Z =  10.000      -Z = -10.000

  2 CUBOID           3   1      +X =   3.1250     -X = -3.1250      +Y =   4.1000     -Y = -4.1000     +Z =  10.000      -Z = -10.000

  3 CUBOID           4   1      +X =   3.6000     -X = -3.6000      +Y =   4.1000     -Y = -4.1000     +Z =  10.000      -Z = -10.000

  4 CUBOID           3   1      +X =   4.3690     -X = -4.3690      +Y =   4.6376     -Y = -4.1000     +Z =  10.000      -Z = -10.000

  5 CUBOID           5   1      +X =   4.6738     -X = -4.3690      +Y =   4.6376     -Y = -4.1000     +Z =  10.000      -Z = -10.000
```

```
                    MEDIA BIAS       GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION               NUM   ID

                                        -----   UNIT    11  EXTERNAL TO LATTICE  1    -----

HFBR FUEL WITH HALF OF 1/4 IN. PLATE ON LEFT  TOP STACK

  1 ARRAY NUMBER      1          +X =  3.1250     -X = -3.1250     +Y =  3.9369     -Y = -3.9369     +Z =  10.000     -Z = -10.000

  2 CUBOID            3   1      +X =  3.1250     -X = -3.1250     +Y =  4.1000     -Y = -4.1000     +Z =  10.000     -Z = -10.000

  3 CUBOID            4   1      +X =  3.6000     -X = -3.6000     +Y =  4.1000     -Y = -4.1000     +Z =  10.000     -Z = -10.000

  4 CUBOID            3   1      +X =  4.3690     -X = -4.3690     +Y =  4.6376     -Y = -4.1000     +Z =  10.000     -Z = -10.000

  5 CUBOID            5   1      +X =  4.3690     -X = -4.6738     +Y =  4.6376     -Y = -4.1000     +Z =  10.000     -Z = -10.000

                                        -----   UNIT    12  EXTERNAL TO LATTICE  2    -----

2 UNIT ARRAY WITH 0.120 IN. PLATE ON TOP AND SIDES

  1 ARRAY NUMBER      2          +X =  9.0428     -X = -9.0428     +Y =  4.3688     -Y = -4.3688     +Z =  10.000     -Z = -10.000

  2 CUBOID            5   1      +X =  9.3476     -X = -9.3476     +Y =  4.6736     -Y = -4.3688     +Z =  10.000     -Z = -10.000

                                        -----   UNIT    13  EXTERNAL TO LATTICE  3    -----

3 UNIT ARRAY WITH REST OF 5/16 WEB

  1 ARRAY NUMBER      3          +X =  14.174     -X = -14.174     +Y =  4.3688     -Y = -4.3688     +Z =  10.000     -Z = -10.000

  2 CUBOID            5   1      +X =  14.529     -X = -14.529     +Y =  5.0800     -Y = -5.0800     +Z =  10.000     -Z = -10.000

                                        -----   UNIT    14  EXTERNAL TO LATTICE  4    -----

2 UNIT ARRAY WITH 0.120 IN. PLATE ON BOTTOM AND SIDES

  1 ARRAY NUMBER      4          +X =  9.0428     -X = -9.0428     +Y =  4.3688     -Y = -4.3688     +Z =  10.000     -Z = -10.000

  2 CUBOID            5   1      +X =  9.3476     -X = -9.3476     +Y =  4.3688     -Y = -4.6736     +Z =  10.000     -Z = -10.000
```

```
                 MEDIA BIAS       GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                    ******************   GLOBAL   ******************
                                                ----- UNIT   15  -----

7 HFBR ASSEMBLIES IN THE LWT

  1 CYLINDER       3  1  RADIUS =  17.050    +Z =  10.000    -Z = -10.000    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
    HOLE NUMBER    1       AT X = 0.00000    Y =  9.4489     Z = 0.00000     IS UNIT NUMBER    12
    HOLE NUMBER    2       AT X = 0.00000    Y = 0.00000     Z = 0.00000     IS UNIT NUMBER    13
    HOLE NUMBER    3       AT X = 0.00000    Y = -9.4489     Z = 0.00000     IS UNIT NUMBER    14
  2 CYLINDER       5  1  RADIUS =  18.891    +Z =  10.000    -Z = -10.000    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  3 CYLINDER       6  1  RADIUS =  33.496    +Z =  10.000    -Z = -10.000    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  4 CYLINDER       5  1  RADIUS =  36.544    +Z =  10.000    -Z = -10.000    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  5 CYLINDER       8  1  RADIUS =  49.244    +Z =  10.000    -Z = -10.000    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  6 CYLINDER       5  1  RADIUS =  80.339    +Z =  10.000    -Z = -10.000    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  7 CUBOID         7  1      +X =  80.339    -X = -80.339    +Y =  80.339    -Y = -80.339    +Z =  10.000    -Z = -10.000

                                    ----- UNIT   90  EXTERNAL TO LATTICE  1  -----

HFBR FUEL ARRAY 20 PLATES IN 5/16 IN. WEB CENTER

  1 ARRAY NUMBER   1           +X =  3.1250    -X = -3.1250    +Y =  3.9369    -Y = -3.9369    +Z =  10.000    -Z = -10.000
  2 CUBOID         3  1        +X =  3.1250    -X = -3.1250    +Y =  4.1000    -Y = -4.1000    +Z =  10.000    -Z = -10.000
  3 CUBOID         4  1        +X =  3.6000    -X = -3.6000    +Y =  4.1000    -Y = -4.1000    +Z =  10.000    -Z = -10.000
  4 CUBOID         3  1        +X =  4.3690    -X = -4.3690    +Y =  4.3688    -Y = -4.3688    +Z =  10.000    -Z = -10.000
  5 CUBOID         5  1        +X =  4.7246    -X = -4.7246    +Y =  4.3688    -Y = -4.3688    +Z =  10.000    -Z = -10.000

                                    ----- UNIT   91  EXTERNAL TO LATTICE  1  -----

HFBR FUEL ARRAY 20 PLATES IN 5/16 IN. WEB RIGHT

  1 ARRAY NUMBER   1           +X =  3.1250    -X = -3.1250    +Y =  3.9369    -Y = -3.9369    +Z =  10.000    -Z = -10.000
  2 CUBOID         3  1        +X =  3.1250    -X = -3.1250    +Y =  4.1000    -Y = -4.1000    +Z =  10.000    -Z = -10.000
  3 CUBOID         4  1        +X =  3.6000    -X = -3.6000    +Y =  4.1000    -Y = -4.1000    +Z =  10.000    -Z = -10.000
  4 CUBOID         3  1        +X =  5.1380    -X = -3.6000    +Y =  4.3688    -Y = -4.3688    +Z =  10.000    -Z = -10.000
  5 CUBOID         5  1        +X =  5.4936    -X = -3.9556    +Y =  4.3688    -Y = -4.3688    +Z =  10.000    -Z = -10.000
```

REGION	MEDIA NUM	BIAS ID	GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM					

----- UNIT 92 EXTERNAL TO LATTICE 1 -----

HFBR FUEL ARRAY 20 PLATES IN 5/16 IN. WEB LEFT

1 ARRAY NUMBER	1		+X = 3.1250	-X = -3.1250	+Y = 3.9369	-Y = -3.9369	+Z = 10.000	-Z = -10.000
2 CUBOID	3	1	+X = 3.1250	-X = -3.1250	+Y = 4.1000	-Y = -4.1000	+Z = 10.000	-Z = -10.000
3 CUBOID	4	1	+X = 3.6000	-X = -3.6000	+Y = 4.1000	-Y = -4.1000	+Z = 10.000	-Z = -10.000
4 CUBOID	3	1	+X = 3.6000	-X = -5.1380	+Y = 4.3688	-Y = -4.3688	+Z = 10.000	-Z = -10.000
5 CUBOID	5	1	+X = 3.9556	-X = -5.4936	+Y = 4.3688	-Y = -4.3688	+Z = 10.000	-Z = -10.000

----- UNIT 101 EXTERNAL TO LATTICE 1 -----

HFBR FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON RIGHT - BOTTOM STACK

1 ARRAY NUMBER	1		+X = 3.1250	-X = -3.1250	+Y = 3.9369	-Y = -3.9369	+Z = 10.000	-Z = -10.000
2 CUBOID	3	1	+X = 3.1250	-X = -3.1250	+Y = 4.1000	-Y = -4.1000	+Z = 10.000	-Z = -10.000
3 CUBOID	4	1	+X = 3.6000	-X = -3.6000	+Y = 4.1000	-Y = -4.1000	+Z = 10.000	-Z = -10.000
4 CUBOID	3	1	+X = 4.3690	-X = -4.3690	+Y = 4.1000	-Y = -4.6376	+Z = 10.000	-Z = -10.000
5 CUBOID	5	1	+X = 4.6738	-X = -4.3690	+Y = 4.1000	-Y = -4.6376	+Z = 10.000	-Z = -10.000

----- UNIT 111 EXTERNAL TO LATTICE 1 -----

HFBR FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON LEFT - BOTTOM STACK

1 ARRAY NUMBER	1		+X = 3.1250	-X = -3.1250	+Y = 3.9369	-Y = -3.9369	+Z = 10.000	-Z = -10.000
2 CUBOID	3	1	+X = 3.1250	-X = -3.1250	+Y = 4.1000	-Y = -4.1000	+Z = 10.000	-Z = -10.000
3 CUBOID	4	1	+X = 3.6000	-X = -3.6000	+Y = 4.1000	-Y = -4.1000	+Z = 10.000	-Z = -10.000
4 CUBOID	3	1	+X = 4.3690	-X = -4.3690	+Y = 4.1000	-Y = -4.6376	+Z = 10.000	-Z = -10.000
5 CUBOID	5	1	+X = 4.3690	-X = -4.6738	+Y = 4.1000	-Y = -4.6376	+Z = 10.000	-Z = -10.000

```
               -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY    1          -------

Z LAYER    1, X COLUMN    1 TO    1 LEFT TO RIGHT    Y ROW    1 TO   20  BOTTOM TO TOP

 1

 2

 3

 4

 5

 5

 5

 5

 5

 5

 5

 5

 5

 5

 5

 5

 6

 7

 8

 1
               -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY    2          -------

Z LAYER    1, X COLUMN    1 TO    2 LEFT TO RIGHT    Y ROW    1 TO    1  BOTTOM TO TOP

 10 11
               -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY    3          -------

Z LAYER    1, X COLUMN    1 TO    3 LEFT TO RIGHT    Y ROW    1 TO    1  BOTTOM TO TOP

 92 90 91
               -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY    4          -------

Z LAYER    1, X COLUMN    1 TO    2 LEFT TO RIGHT    Y ROW    1 TO    1  BOTTOM TO TOP

 101 111
```

VOLUMES FOR THOSE UNITS UTILIZED IN THIS PROBLEM

UNIT	REGION	GEOMETRY REGION	VOLUME	CUMULATIVE VOLUME
1	1	1	3.17500E+01 CM**3	3.17500E+01 CM**3
	2	2	3.17500E+01 CM**3	6.35000E+01 CM**3
2	1	3	6.06320E+00 CM**3	6.06320E+00 CM**3
	2	4	9.81180E+00 CM**3	1.58750E+01 CM**3
	3	5	3.46125E+01 CM**3	5.04875E+01 CM**3
3	1	6	6.06320E+00 CM**3	6.06320E+00 CM**3
	2	7	9.81180E+00 CM**3	1.58750E+01 CM**3
	3	8	3.58875E+01 CM**3	5.17625E+01 CM**3
4	1	9	6.06320E+00 CM**3	6.06320E+00 CM**3
	2	10	9.81180E+00 CM**3	1.58750E+01 CM**3
	3	11	3.23875E+01 CM**3	4.82625E+01 CM**3
5	1	12	6.06320E+00 CM**3	6.06320E+00 CM**3
	2	13	9.81180E+00 CM**3	1.58750E+01 CM**3
	3	14	3.04750E+01 CM**3	4.63500E+01 CM**3
6	1	15	6.06320E+00 CM**3	6.06320E+00 CM**3
	2	16	9.81180E+00 CM**3	1.58750E+01 CM**3
	3	17	3.23875E+01 CM**3	4.82625E+01 CM**3
7	1	18	6.06320E+00 CM**3	6.06320E+00 CM**3
	2	19	9.81180E+00 CM**3	1.58750E+01 CM**3
	3	20	3.58875E+01 CM**3	5.17625E+01 CM**3
8	1	21	6.06320E+00 CM**3	6.06320E+00 CM**3
	2	22	9.81180E+00 CM**3	1.58750E+01 CM**3
	3	23	3.46125E+01 CM**3	5.04875E+01 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 39 IS AN ARRAY PLACEMENT BOUNDARY REGION				
10	1	39	9.84225E+02 CM**3	9.84225E+02 CM**3
	2	40	4.07750E+01 CM**3	1.02500E+03 CM**3
	3	41	1.55800E+02 CM**3	1.18080E+03 CM**3
	4	42	3.46183E+02 CM**3	1.52698E+03 CM**3
	5	43	5.32644E+01 CM**3	1.58025E+03 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 49 IS AN ARRAY PLACEMENT BOUNDARY REGION				
11	1	49	9.84225E+02 CM**3	9.84225E+02 CM**3
	2	50	4.07750E+01 CM**3	1.02500E+03 CM**3
	3	51	1.55800E+02 CM**3	1.18080E+03 CM**3
	4	52	3.46183E+02 CM**3	1.52698E+03 CM**3
	5	53	5.32644E+01 CM**3	1.58025E+03 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 59 IS AN ARRAY PLACEMENT BOUNDARY REGION				
12	1	59	3.16049E+03 CM**3	3.16049E+03 CM**3
	2	60	2.20495E+02 CM**3	3.38099E+03 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 61 IS AN ARRAY PLACEMENT BOUNDARY REGION				
13	1	61	4.95380E+03 CM**3	4.95380E+03 CM**3
	2	62	9.50948E+02 CM**3	5.90475E+03 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 63 IS AN ARRAY PLACEMENT BOUNDARY REGION				
14	1	63	3.16049E+03 CM**3	3.16049E+03 CM**3
	2	64	2.20495E+02 CM**3	3.38099E+03 CM**3
15	1	65	5.59865E+03 CM**3	1.82654E+04 CM**3
	2	66	4.15813E+03 CM**3	2.24235E+04 CM**3
	3	67	4.80740E+04 CM**3	7.04975E+04 CM**3
	4	68	1.34136E+04 CM**3	8.39110E+04 CM**3
	5	69	6.84563E+04 CM**3	1.52367E+05 CM**3
	6	70	2.53172E+05 CM**3	4.05539E+05 CM**3
	7	71	1.10809E+05 CM**3	5.16348E+05 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 24 IS AN ARRAY PLACEMENT BOUNDARY REGION				
90	1	24	9.84225E+02 CM**3	9.84225E+02 CM**3
	2	25	4.07750E+01 CM**3	1.02500E+03 CM**3
	3	26	1.55800E+02 CM**3	1.18080E+03 CM**3
	4	27	3.46183E+02 CM**3	1.52698E+03 CM**3
	5	28	1.24284E+02 CM**3	1.65127E+03 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 29 IS AN ARRAY PLACEMENT BOUNDARY REGION				
91	1	29	9.84225E+02 CM**3	9.84225E+02 CM**3
	2	30	4.07750E+01 CM**3	1.02500E+03 CM**3
	3	31	1.55800E+02 CM**3	1.18080E+03 CM**3
	4	32	3.46183E+02 CM**3	1.52698E+03 CM**3
	5	33	1.24284E+02 CM**3	1.65127E+03 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 34 IS AN ARRAY PLACEMENT BOUNDARY REGION				
92	1	34	9.84225E+02 CM**3	9.84225E+02 CM**3

	2	35	4.07750E+01 CM**3	1.02500E+03 CM**3
	3	36	1.55800E+02 CM**3	1.18080E+03 CM**3
	4	37	3.46183E+02 CM**3	1.52698E+03 CM**3
	5	38	1.24284E+02 CM**3	1.65127E+03 CM**3

SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 44 IS AN ARRAY PLACEMENT BOUNDARY REGION

101	1	44	9.84225E+02 CM**3	9.84225E+02 CM**3
	2	45	4.07750E+01 CM**3	1.02500E+03 CM**3
	3	46	1.55800E+02 CM**3	1.18080E+03 CM**3
	4	47	3.46183E+02 CM**3	1.52698E+03 CM**3
	5	48	5.32644E+01 CM**3	1.58025E+03 CM**3

SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 54 IS AN ARRAY PLACEMENT BOUNDARY REGION

111	1	54	9.84225E+02 CM**3	9.84225E+02 CM**3
	2	55	4.07750E+01 CM**3	1.02500E+03 CM**3
	3	56	1.55800E+02 CM**3	1.18080E+03 CM**3
	4	57	3.46183E+02 CM**3	1.52698E+03 CM**3
	5	58	5.32644E+01 CM**3	1.58025E+03 CM**3

UNIT	USES	REGION	MIXTURE	TOTAL VOLUME
1	14	1	2	4.44500E+02 CM**3
		2	3	4.44500E+02 CM**3
2	7	1	1	4.24424E+01 CM**3
		2	2	6.86826E+01 CM**3
		3	3	2.42288E+02 CM**3
3	7	1	1	4.24424E+01 CM**3
		2	2	6.86826E+01 CM**3
		3	3	2.51213E+02 CM**3
4	7	1	1	4.24424E+01 CM**3
		2	2	6.86826E+01 CM**3
		3	3	2.26713E+02 CM**3
5	84	1	1	5.09309E+02 CM**3
		2	2	8.24191E+02 CM**3
		3	3	2.55990E+03 CM**3
6	7	1	1	4.24424E+01 CM**3
		2	2	6.86826E+01 CM**3
		3	3	2.26713E+02 CM**3
7	7	1	1	4.24424E+01 CM**3
		2	2	6.86826E+01 CM**3
		3	3	2.51213E+02 CM**3
8	7	1	1	4.24424E+01 CM**3
		2	2	6.86826E+01 CM**3
		3	3	2.42288E+02 CM**3
10	1	1		9.84225E+02 CM**3
		2	3	4.07750E+01 CM**3
		3	4	1.55800E+02 CM**3
		4	3	3.46183E+02 CM**3
		5	5	5.32644E+01 CM**3
11	1	1		9.84225E+02 CM**3
		2	3	4.07750E+01 CM**3
		3	4	1.55800E+02 CM**3
		4	3	3.46183E+02 CM**3
		5	5	5.32644E+01 CM**3
12	1	1		3.16049E+03 CM**3
		2	5	2.20495E+02 CM**3
13	1	1		4.95380E+03 CM**3
		2	5	9.50948E+02 CM**3
14	1	1		3.16049E+03 CM**3
		2	5	2.20495E+02 CM**3
15	1	1	3	5.59865E+03 CM**3
		2	5	4.15813E+03 CM**3
		3	6	4.80740E+04 CM**3
		4	5	1.34136E+04 CM**3
		5	8	6.84563E+04 CM**3
		6	5	2.53172E+05 CM**3
		7	7	1.10809E+05 CM**3
90	1	1		9.84225E+02 CM**3
		2	3	4.07750E+01 CM**3
		3	4	1.55800E+02 CM**3
		4	3	3.46183E+02 CM**3
		5	5	1.24284E+02 CM**3
91	1	1		9.84225E+02 CM**3
		2	3	4.07750E+01 CM**3
		3	4	1.55800E+02 CM**3
		4	3	3.46183E+02 CM**3

```
                        5          5         1.24284E+02 CM**3

         92       1     1                    9.84225E+02 CM**3
                        2          3         4.07750E+01 CM**3
                        3          4         1.55800E+02 CM**3
                        4          3         3.46183E+02 CM**3
                        5          5         1.24284E+02 CM**3

        101       1     1                    9.84225E+02 CM**3
                        2          3         4.07750E+01 CM**3
                        3          4         1.55800E+02 CM**3
                        4          3         3.46183E+02 CM**3
                        5          5         5.32644E+01 CM**3

        111       1     1                    9.84225E+02 CM**3
                        2          3         4.07750E+01 CM**3
                        3          4         1.55800E+02 CM**3
                        4          3         3.46183E+02 CM**3
                        5          5         5.32644E+01 CM**3


                  TOTAL MIXTURE VOLUMES
            MIXTURE        TOTAL VOLUME              MASS(G)
               1       7.63963E+02 CM**3         3.05126E+03
               2       1.68079E+03 CM**3         4.54148E+03
               3       1.27522E+04 CM**3         1.27289E+04
               4       1.09060E+03 CM**3         2.94680E+03
               5       2.72721E+05 CM**3         2.15995E+06
               6       4.80740E+04 CM**3         5.45351E+05
               7       1.10809E+05 CM**3         1.10607E+05
               8       6.84563E+04 CM**3         6.83311E+04

*****************************************************************************************************************
***                                                                                                           ***
***                                         BIASING INFORMATION                                               ***
***                                                                                                           ***
***     A DEFAULT WEIGHT OF     0.500 WILL BE USED FOR ALL BIAS ID'S.                                         ***
***                                                                                                           ***
*****************************************************************************************************************
```

.... 0 IO'S WERE USED IN KENO-V BEFORE TRACKING ....

.... 0.01750 MINUTES WERE USED PROCESSING DATA. ....

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 6.03126E-02

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED WITH A FLAT DISTRIBUTION IN A CUBOID DEFINED BY:
+X= 8.03390E+01 -X=-8.03390E+01 +Y= 8.03390E+01 -Y=-8.03390E+01 +Z= 1.00000E+01 -Z=-1.00000E+01
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

KENO MESSAGE NUMBER K5-105 ***** WARNING, ONLY 336 INDEPENDENT STARTING POSITIONS WERE GENERATED. *****

464 ADDITIONAL STARTING POINTS WERE PICKED FROM THE INITAL DISTRIBUTION.

0.45383 MINUTES WERE REQUIRED FOR STARTING. TOTAL ELAPSED TIME IS 0.48000 MINUTES.

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	700 INDEPENDENT	FISSION POINTS WERE	GENERATED	
1	7.82588E-01	5.06333E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	744 INDEPENDENT	FISSION POINTS WERE	GENERATED	
2	8.20012E-01	5.35500E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	741 INDEPENDENT	FISSION POINTS WERE	GENERATED	
3	8.31350E-01	5.64833E-01	8.31350E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	7.85323E-01	5.95000E-01	8.08337E-01	2.30137E-02	0.00000E+00	0.00000E+00
5	8.23855E-01	6.24333E-01	8.13509E-01	1.42583E-02	0.00000E+00	0.00000E+00
6	7.56112E-01	6.54500E-01	7.99160E-01	1.75371E-02	0.00000E+00	0.00000E+00
7	8.45663E-01	6.84833E-01	8.08461E-01	1.64631E-02	0.00000E+00	0.00000E+00
8	7.80519E-01	7.15000E-01	8.03804E-01	1.42259E-02	0.00000E+00	0.00000E+00
9	7.77308E-01	7.45167E-01	8.00019E-01	1.26048E-02	0.00000E+00	0.00000E+00
10	8.03211E-01	7.75333E-01	8.00418E-01	1.09234E-02	0.00000E+00	0.00000E+00
11	7.61307E-01	8.04667E-01	7.96072E-01	1.05683E-02	0.00000E+00	0.00000E+00
12	8.34185E-01	8.35833E-01	7.99883E-01	1.01920E-02	0.00000E+00	0.00000E+00
13	7.68171E-01	8.66000E-01	7.97000E-01	9.65929E-03	0.00000E+00	0.00000E+00
14	8.61627E-01	8.93500E-01	8.02386E-01	1.03322E-02	0.00000E+00	0.00000E+00
15	8.43867E-01	9.23667E-01	8.05577E-01	1.00256E-02	0.00000E+00	0.00000E+00
16	8.23382E-01	9.53000E-01	8.06849E-01	9.36864E-03	0.00000E+00	0.00000E+00
17	7.80078E-01	9.83167E-01	8.05064E-01	8.90246E-03	0.00000E+00	0.00000E+00
18	8.45103E-01	1.01250E+00	8.07566E-01	8.69537E-03	0.00000E+00	0.00000E+00
19	7.79327E-01	1.04267E+00	8.05905E-01	8.33508E-03	0.00000E+00	0.00000E+00
20	7.67797E-01	1.07300E+00	8.03788E-01	8.13857E-03	0.00000E+00	0.00000E+00
21	8.11431E-01	1.10400E+00	8.04190E-01	7.70882E-03	0.00000E+00	0.00000E+00
22	8.23154E-01	1.13433E+00	8.05138E-01	7.37444E-03	0.00000E+00	0.00000E+00
23	7.58654E-01	1.16450E+00	8.02925E-01	7.35546E-03	0.00000E+00	0.00000E+00
24	8.22415E-01	1.19467E+00	8.03811E-01	7.06889E-03	0.00000E+00	0.00000E+00
25	8.05434E-01	1.22583E+00	8.03881E-01	6.75493E-03	0.00000E+00	0.00000E+00
26	8.03967E-01	1.25600E+00	8.03885E-01	6.46735E-03	0.00000E+00	0.00000E+00
27	7.94770E-01	1.28617E+00	8.03520E-01	6.21397E-03	0.00000E+00	0.00000E+00
28	7.85637E-01	1.31833E+00	8.02833E-01	6.00968E-03	0.00000E+00	0.00000E+00
29	8.06424E-01	1.34850E+00	8.02966E-01	5.78435E-03	0.00000E+00	0.00000E+00
30	8.66667E-01	1.37783E+00	8.05241E-01	6.02035E-03	0.00000E+00	0.00000E+00
31	7.60055E-01	1.40883E+00	8.03683E-01	6.01438E-03	0.00000E+00	0.00000E+00
32	7.38283E-01	1.44100E+00	8.01503E-01	6.20593E-03	0.00000E+00	0.00000E+00
33	7.67211E-01	1.47117E+00	8.00396E-01	6.10348E-03	0.00000E+00	0.00000E+00
34	7.73616E-01	1.50233E+00	7.99559E-01	5.96863E-03	0.00000E+00	0.00000E+00
35	8.51868E-01	1.53150E+00	8.01145E-01	5.99817E-03	0.00000E+00	0.00000E+00
36	8.07863E-01	1.56163E+00	8.01342E-01	5.82243E-03	0.00000E+00	0.00000E+00
37	8.05200E-01	1.59283E+00	8.01452E-01	5.65471E-03	0.00000E+00	0.00000E+00
38	7.85393E-01	1.62317E+00	8.01006E-01	5.51346E-03	0.00000E+00	0.00000E+00
39	7.67882E-01	1.65333E+00	8.00111E-01	5.43660E-03	0.00000E+00	0.00000E+00
40	8.40520E-01	1.68350E+00	8.01174E-01	5.39739E-03	0.00000E+00	0.00000E+00
41	8.53727E-01	1.71283E+00	8.02522E-01	5.42712E-03	0.00000E+00	0.00000E+00
42	8.04652E-01	1.74400E+00	8.02575E-01	5.28997E-03	0.00000E+00	0.00000E+00
43	8.28772E-01	1.77500E+00	8.03214E-01	5.19875E-03	0.00000E+00	0.00000E+00
44	7.84712E-01	1.80717E+00	8.02774E-01	5.09255E-03	0.00000E+00	0.00000E+00
45	7.97866E-01	1.83733E+00	8.02660E-01	4.97401E-03	0.00000E+00	0.00000E+00
46	7.82687E-01	1.86750E+00	8.02206E-01	4.88081E-03	0.00000E+00	0.00000E+00
47	8.10596E-01	1.89683E+00	8.02392E-01	4.77475E-03	0.00000E+00	0.00000E+00
48	8.36581E-01	1.92700E+00	8.03135E-01	4.72858E-03	0.00000E+00	0.00000E+00
49	8.35149E-01	1.95717E+00	8.03816E-01	4.67674E-03	0.00000E+00	0.00000E+00
50	8.07847E-01	1.98650E+00	8.03900E-01	4.57905E-03	0.00000E+00	0.00000E+00
51	7.90965E-01	2.01583E+00	8.03636E-01	4.49239E-03	0.00000E+00	0.00000E+00
52	7.91820E-01	2.04700E+00	8.03400E-01	4.40796E-03	0.00000E+00	0.00000E+00
53	8.58332E-01	2.07617E+00	8.04477E-01	4.45290E-03	0.00000E+00	0.00000E+00
54	7.93312E-01	2.10733E+00	8.04262E-01	4.37170E-03	0.00000E+00	0.00000E+00
55	8.46627E-01	2.13667E+00	8.05062E-01	4.36228E-03	0.00000E+00	0.00000E+00
56	8.50713E-01	2.16783E+00	8.05907E-01	4.36342E-03	0.00000E+00	0.00000E+00
57	7.93341E-01	2.19800E+00	8.05679E-01	4.28944E-03	0.00000E+00	0.00000E+00
58	7.63313E-01	2.22817E+00	8.04922E-01	4.27954E-03	0.00000E+00	0.00000E+00
59	7.77036E-01	2.25833E+00	8.04433E-01	4.23216E-03	0.00000E+00	0.00000E+00
60	7.99289E-01	2.28767E+00	8.04344E-01	4.15950E-03	0.00000E+00	0.00000E+00
61	8.41467E-01	2.31883E+00	8.04973E-01	4.13653E-03	0.00000E+00	0.00000E+00
62	8.13266E-01	2.34900E+00	8.05112E-01	4.06935E-03	0.00000E+00	0.00000E+00
63	8.19781E-01	2.38017E+00	8.05352E-01	4.00930E-03	0.00000E+00	0.00000E+00
64	8.32399E-01	2.41133E+00	8.05768E-01	3.96816E-03	0.00000E+00	0.00000E+00
65	8.11585E-01	2.44150E+00	8.05860E-01	3.90575E-03	0.00000E+00	0.00000E+00
66	8.01330E-01	2.47167E+00	8.05809E-01	3.84489E-03	0.00000E+00	0.00000E+00
67	8.35365E-01	2.50183E+00	8.06264E-01	3.81249E-03	0.00000E+00	0.00000E+00
68	8.14892E-01	2.53117E+00	8.06395E-01	3.75656E-03	0.00000E+00	0.00000E+00
69	7.95567E-01	2.56050E+00	8.06233E-01	3.70358E-03	0.00000E+00	0.00000E+00
70	8.18935E-01	2.59167E+00	8.06420E-01	3.65349E-03	0.00000E+00	0.00000E+00
71	7.74137E-01	2.62367E+00	8.05952E-01	3.63042E-03	0.00000E+00	0.00000E+00
72	8.45016E-01	2.65383E+00	8.06510E-01	3.62144E-03	0.00000E+00	0.00000E+00

73	7.67445E-01	2.68500E+00	8.05960E-01	3.61222E-03	0.00000E+00	0.00000E+00
74	8.70584E-01	2.71433E+00	8.06858E-01	3.67304E-03	0.00000E+00	0.00000E+00
75	8.94342E-01	2.74533E+00	8.08056E-01	3.81547E-03	0.00000E+00	0.00000E+00
76	7.88294E-01	2.77467E+00	8.07789E-01	3.77302E-03	0.00000E+00	0.00000E+00
77	8.07239E-01	2.80483E+00	8.07782E-01	3.72238E-03	0.00000E+00	0.00000E+00
78	8.27989E-01	2.83417E+00	8.08048E-01	3.68269E-03	0.00000E+00	0.00000E+00
79	8.03489E-01	2.86433E+00	8.07988E-01	3.63503E-03	0.00000E+00	0.00000E+00
80	7.63271E-01	2.89467E+00	8.07415E-01	3.63364E-03	0.00000E+00	0.00000E+00
81	7.63581E-01	2.92567E+00	8.06860E-01	3.63000E-03	0.00000E+00	0.00000E+00
82	7.71390E-01	2.95600E+00	8.06417E-01	3.61166E-03	0.00000E+00	0.00000E+00
83	7.87178E-01	2.98617E+00	8.06179E-01	3.57469E-03	0.00000E+00	0.00000E+00
84	7.96479E-01	3.01733E+00	8.06061E-01	3.53281E-03	0.00000E+00	0.00000E+00
85	8.33068E-01	3.04650E+00	8.06386E-01	3.50512E-03	0.00000E+00	0.00000E+00
86	7.88310E-01	3.07683E+00	8.06171E-01	3.46982E-03	0.00000E+00	0.00000E+00
87	7.73423E-01	3.10700E+00	8.05786E-01	3.45034E-03	0.00000E+00	0.00000E+00
88	8.19029E-01	3.13817E+00	8.05940E-01	3.41345E-03	0.00000E+00	0.00000E+00
89	8.08473E-01	3.16917E+00	8.05969E-01	3.37412E-03	0.00000E+00	0.00000E+00
90	8.24039E-01	3.19767E+00	8.06174E-01	3.34187E-03	0.00000E+00	0.00000E+00
91	8.03419E-01	3.22867E+00	8.06143E-01	3.30425E-03	0.00000E+00	0.00000E+00
92	8.31295E-01	3.25900E+00	8.06423E-01	3.27926E-03	0.00000E+00	0.00000E+00
93	8.05054E-01	3.29183E+00	8.06408E-01	3.24306E-03	0.00000E+00	0.00000E+00
94	7.80756E-01	3.32117E+00	8.06129E-01	3.21971E-03	0.00000E+00	0.00000E+00
95	8.21524E-01	3.35233E+00	8.06295E-01	3.18920E-03	0.00000E+00	0.00000E+00
96	7.86701E-01	3.38250E+00	8.06086E-01	3.16197E-03	0.00000E+00	0.00000E+00
97	8.30205E-01	3.41283E+00	8.06340E-01	3.13879E-03	0.00000E+00	0.00000E+00
98	7.78165E-01	3.44300E+00	8.06047E-01	3.11976E-03	0.00000E+00	0.00000E+00
99	8.65698E-01	3.47133E+00	8.06662E-01	3.14808E-03	0.00000E+00	0.00000E+00
100	7.89119E-01	3.50150E+00	8.06483E-01	3.12093E-03	0.00000E+00	0.00000E+00
101	7.71266E-01	3.53267E+00	8.06127E-01	3.10966E-03	0.00000E+00	0.00000E+00
102	7.42795E-01	3.56383E+00	8.05493E-01	3.14287E-03	0.00000E+00	0.00000E+00
103	7.84546E-01	3.59400E+00	8.05286E-01	3.11850E-03	0.00000E+00	0.00000E+00
104	7.83195E-01	3.62517E+00	8.05069E-01	3.09537E-03	0.00000E+00	0.00000E+00
105	8.38004E-01	3.65350E+00	8.05389E-01	3.08180E-03	0.00000E+00	0.00000E+00
106	8.06543E-01	3.68367E+00	8.05400E-01	3.05204E-03	0.00000E+00	0.00000E+00
107	8.19463E-01	3.71400E+00	8.05534E-01	3.02580E-03	0.00000E+00	0.00000E+00
108	8.01206E-01	3.74500E+00	8.05493E-01	2.99740E-03	0.00000E+00	0.00000E+00
109	7.77892E-01	3.77617E+00	8.05235E-01	2.98044E-03	0.00000E+00	0.00000E+00
110	7.64249E-01	3.80633E+00	8.04856E-01	2.97700E-03	0.00000E+00	0.00000E+00
111	7.83489E-01	3.83667E+00	8.04660E-01	2.95607E-03	0.00000E+00	0.00000E+00
112	7.95690E-01	3.86767E+00	8.04578E-01	2.93021E-03	0.00000E+00	0.00000E+00
113	8.34454E-01	3.89800E+00	8.04848E-01	2.91614E-03	0.00000E+00	0.00000E+00
114	8.14258E-01	3.92717E+00	8.04932E-01	2.89120E-03	0.00000E+00	0.00000E+00
115	8.12118E-01	3.95750E+00	8.04995E-01	2.86621E-03	0.00000E+00	0.00000E+00
116	8.12652E-01	3.98767E+00	8.05062E-01	2.84175E-03	0.00000E+00	0.00000E+00
117	8.16646E-01	4.01517E+00	8.05163E-01	2.81873E-03	0.00000E+00	0.00000E+00
118	7.75865E-01	4.04717E+00	8.04910E-01	2.80572E-03	0.00000E+00	0.00000E+00
119	8.03062E-01	4.07733E+00	8.04895E-01	2.78168E-03	0.00000E+00	0.00000E+00
120	8.05484E-01	4.10667E+00	8.04900E-01	2.75801E-03	0.00000E+00	0.00000E+00
121	8.51749E-01	4.13683E+00	8.05293E-01	2.76293E-03	0.00000E+00	0.00000E+00
122	8.49198E-01	4.16617E+00	8.05659E-01	2.76413E-03	0.00000E+00	0.00000E+00
123	8.51824E-01	4.19633E+00	8.06041E-01	2.76761E-03	0.00000E+00	0.00000E+00
124	8.19276E-01	4.22650E+00	8.06149E-01	2.74697E-03	0.00000E+00	0.00000E+00
125	7.72826E-01	4.25683E+00	8.05878E-01	2.73799E-03	0.00000E+00	0.00000E+00
126	7.77407E-01	4.28783E+00	8.05649E-01	2.72550E-03	0.00000E+00	0.00000E+00
127	8.48435E-01	4.31817E+00	8.05991E-01	2.72519E-03	0.00000E+00	0.00000E+00
128	8.14418E-01	4.34833E+00	8.06058E-01	2.70431E-03	0.00000E+00	0.00000E+00
129	7.58884E-01	4.37850E+00	8.05686E-01	2.70852E-03	0.00000E+00	0.00000E+00
130	7.83040E-01	4.40867E+00	8.05510E-01	2.69309E-03	0.00000E+00	0.00000E+00
131	7.73447E-01	4.43983E+00	8.05261E-01	2.68367E-03	0.00000E+00	0.00000E+00
132	8.01253E-01	4.46917E+00	8.05230E-01	2.66312E-03	0.00000E+00	0.00000E+00
133	8.13066E-01	4.49933E+00	8.05290E-01	2.64339E-03	0.00000E+00	0.00000E+00
134	8.24373E-01	4.52950E+00	8.05435E-01	2.62727E-03	0.00000E+00	0.00000E+00
135	8.10658E-01	4.56067E+00	8.05474E-01	2.60774E-03	0.00000E+00	0.00000E+00
136	7.70361E-01	4.59183E+00	8.05212E-01	2.60144E-03	0.00000E+00	0.00000E+00
137	7.79411E-01	4.62300E+00	8.05021E-01	2.59916E-03	0.00000E+00	0.00000E+00
138	8.08704E-01	4.65317E+00	8.05048E-01	2.57019E-03	0.00000E+00	0.00000E+00
139	7.67183E-01	4.68333E+00	8.04771E-01	2.56629E-03	0.00000E+00	0.00000E+00
140	7.80991E-01	4.71450E+00	8.04599E-01	2.55345E-03	0.00000E+00	0.00000E+00
141	8.36822E-01	4.74467E+00	8.04831E-01	2.54559E-03	0.00000E+00	0.00000E+00
142	7.86705E-01	4.77483E+00	8.04701E-01	2.53065E-03	0.00000E+00	0.00000E+00
143	7.81529E-01	4.80517E+00	8.04537E-01	2.51801E-03	0.00000E+00	0.00000E+00
144	7.91742E-01	4.83533E+00	8.04447E-01	2.50184E-03	0.00000E+00	0.00000E+00
145	8.04700E-01	4.86550E+00	8.04449E-01	2.48428E-03	0.00000E+00	0.00000E+00
146	7.93523E-01	4.89567E+00	8.04373E-01	2.46813E-03	0.00000E+00	0.00000E+00
147	7.83499E-01	4.92600E+00	8.04229E-01	2.45528E-03	0.00000E+00	0.00000E+00
148	8.12237E-01	4.95617E+00	8.04284E-01	2.43902E-03	0.00000E+00	0.00000E+00
149	8.40777E-01	4.98733E+00	8.04532E-01	2.43506E-03	0.00000E+00	0.00000E+00
150	8.57578E-01	5.01650E+00	8.04890E-01	2.44496E-03	0.00000E+00	0.00000E+00
151	8.01474E-01	5.04683E+00	8.04867E-01	2.42861E-03	0.00000E+00	0.00000E+00
152	7.89781E-01	5.07700E+00	8.04767E-01	2.41446E-03	0.00000E+00	0.00000E+00
153	8.32128E-01	5.10633E+00	8.04948E-01	2.40525E-03	0.00000E+00	0.00000E+00
154	8.02724E-01	5.13650E+00	8.04933E-01	2.38942E-03	0.00000E+00	0.00000E+00
155	8.62724E-01	5.16583E+00	8.05311E-01	2.40361E-03	0.00000E+00	0.00000E+00
156	8.43748E-01	5.19600E+00	8.05561E-01	2.40096E-03	0.00000E+00	0.00000E+00
157	8.42898E-01	5.22533E+00	8.05802E-01	2.39755E-03	0.00000E+00	0.00000E+00
158	8.27336E-01	5.25467E+00	8.05940E-01	2.38613E-03	0.00000E+00	0.00000E+00
159	8.31212E-01	5.28483E+00	8.06101E-01	2.37634E-03	0.00000E+00	0.00000E+00
160	8.22070E-01	5.31417E+00	8.06202E-01	2.36342E-03	0.00000E+00	0.00000E+00
161	8.47374E-01	5.34333E+00	8.06461E-01	2.36274E-03	0.00000E+00	0.00000E+00
162	7.73563E-01	5.37450E+00	8.06255E-01	2.35691E-03	0.00000E+00	0.00000E+00
163	8.28438E-01	5.40467E+00	8.06393E-01	2.34627E-03	0.00000E+00	0.00000E+00
164	7.84095E-01	5.43500E+00	8.06255E-01	2.33580E-03	0.00000E+00	0.00000E+00
165	7.79844E-01	5.46700E+00	8.06093E-01	2.32708E-03	0.00000E+00	0.00000E+00
166	8.10761E-01	5.49717E+00	8.06122E-01	2.31302E-03	0.00000E+00	0.00000E+00
167	8.59358E-01	5.52650E+00	8.06444E-01	2.32149E-03	0.00000E+00	0.00000E+00

168	8.69515E-01	5.55583E+00	8.06824E-01	2.33853E-03	0.00000E+00	0.00000E+00
169	8.35061E-01	5.58600E+00	8.06993E-01	2.33063E-03	0.00000E+00	0.00000E+00
170	8.07052E-01	5.61617E+00	8.06994E-01	2.31672E-03	0.00000E+00	0.00000E+00
171	7.74453E-01	5.64633E+00	8.06801E-01	2.31100E-03	0.00000E+00	0.00000E+00
172	8.82550E-01	5.67483E+00	8.07247E-01	2.34018E-03	0.00000E+00	0.00000E+00
173	8.16679E-01	5.70500E+00	8.07302E-01	2.32711E-03	0.00000E+00	0.00000E+00
174	8.42197E-01	5.73333E+00	8.07505E-01	2.32242E-03	0.00000E+00	0.00000E+00
175	7.44863E-01	5.76450E+00	8.07143E-01	2.33717E-03	0.00000E+00	0.00000E+00
176	7.76623E-01	5.79567E+00	8.06967E-01	2.33031E-03	0.00000E+00	0.00000E+00
177	8.15792E-01	5.82667E+00	8.07018E-01	2.31751E-03	0.00000E+00	0.00000E+00
178	8.05464E-01	5.85600E+00	8.07009E-01	2.30432E-03	0.00000E+00	0.00000E+00
179	8.04421E-01	5.88617E+00	8.06994E-01	2.29131E-03	0.00000E+00	0.00000E+00
180	8.40447E-01	5.91650E+00	8.07182E-01	2.28614E-03	0.00000E+00	0.00000E+00
181	8.46729E-01	5.94667E+00	8.07403E-01	2.28404E-03	0.00000E+00	0.00000E+00
182	8.06325E-01	5.97683E+00	8.07397E-01	2.27132E-03	0.00000E+00	0.00000E+00
183	8.24680E-01	6.00617E+00	8.07493E-01	2.26076E-03	0.00000E+00	0.00000E+00
184	7.83884E-01	6.03817E+00	8.07363E-01	2.25204E-03	0.00000E+00	0.00000E+00
185	8.08498E-01	6.06833E+00	8.07369E-01	2.23971E-03	0.00000E+00	0.00000E+00
186	8.16651E-01	6.09767E+00	8.07420E-01	2.22808E-03	0.00000E+00	0.00000E+00
187	8.35256E-01	6.12700E+00	8.07570E-01	2.22110E-03	0.00000E+00	0.00000E+00
188	7.99256E-01	6.15717E+00	8.07525E-01	2.20958E-03	0.00000E+00	0.00000E+00
189	7.74893E-01	6.18733E+00	8.07351E-01	2.20465E-03	0.00000E+00	0.00000E+00
190	8.10815E-01	6.21767E+00	8.07369E-01	2.19297E-03	0.00000E+00	0.00000E+00
191	8.38668E-01	6.24683E+00	8.07535E-01	2.18761E-03	0.00000E+00	0.00000E+00
192	7.76145E-01	6.27717E+00	8.07370E-01	2.18233E-03	0.00000E+00	0.00000E+00
193	7.91436E-01	6.30633E+00	8.07286E-01	2.17248E-03	0.00000E+00	0.00000E+00
194	7.71756E-01	6.33567E+00	8.07101E-01	2.16904E-03	0.00000E+00	0.00000E+00
195	7.86135E-01	6.36583E+00	8.06993E-01	2.16050E-03	0.00000E+00	0.00000E+00
196	8.36534E-01	6.39517E+00	8.07145E-01	2.15473E-03	0.00000E+00	0.00000E+00
197	7.78126E-01	6.42633E+00	8.06996E-01	2.14881E-03	0.00000E+00	0.00000E+00
198	8.21092E-01	6.45650E+00	8.07068E-01	2.13903E-03	0.00000E+00	0.00000E+00
199	8.06780E-01	6.48667E+00	8.07066E-01	2.12814E-03	0.00000E+00	0.00000E+00
200	7.93471E-01	6.51783E+00	8.06998E-01	2.11848E-03	0.00000E+00	0.00000E+00
201	8.25068E-01	6.54717E+00	8.07089E-01	2.10976E-03	0.00000E+00	0.00000E+00
202	7.79774E-01	6.57733E+00	8.06952E-01	2.10362E-03	0.00000E+00	0.00000E+00
203	7.99331E-01	6.60750E+00	8.06914E-01	2.09347E-03	0.00000E+00	0.00000E+00
204	8.00386E-01	6.63967E+00	8.06882E-01	2.08334E-03	0.00000E+00	0.00000E+00
205	8.00388E-01	6.66983E+00	8.06850E-01	2.07329E-03	0.00000E+00	0.00000E+00
206	7.93801E-01	6.70100E+00	8.06786E-01	2.06410E-03	0.00000E+00	0.00000E+00

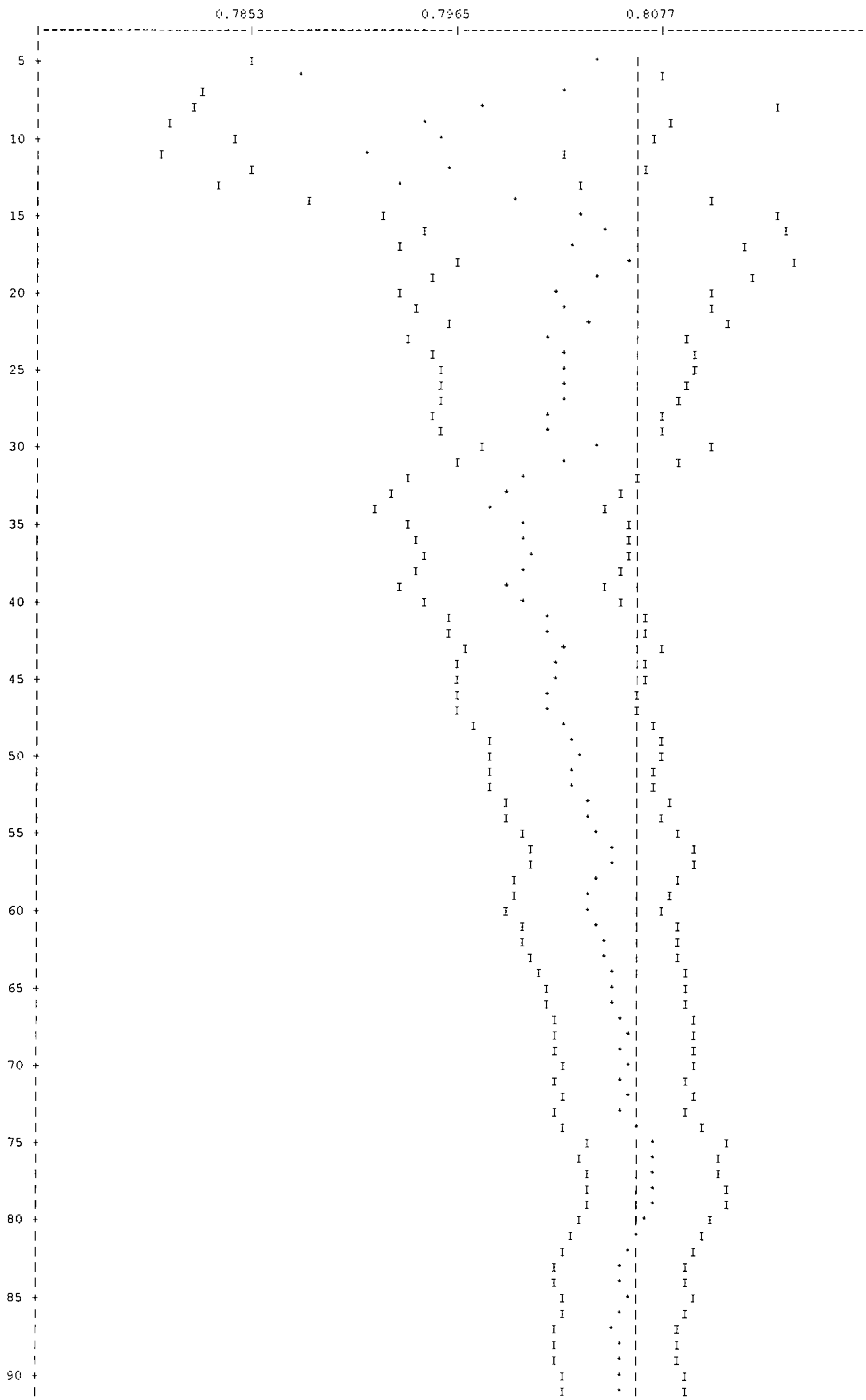
KENO MESSAGE NUMBER K5-123 EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

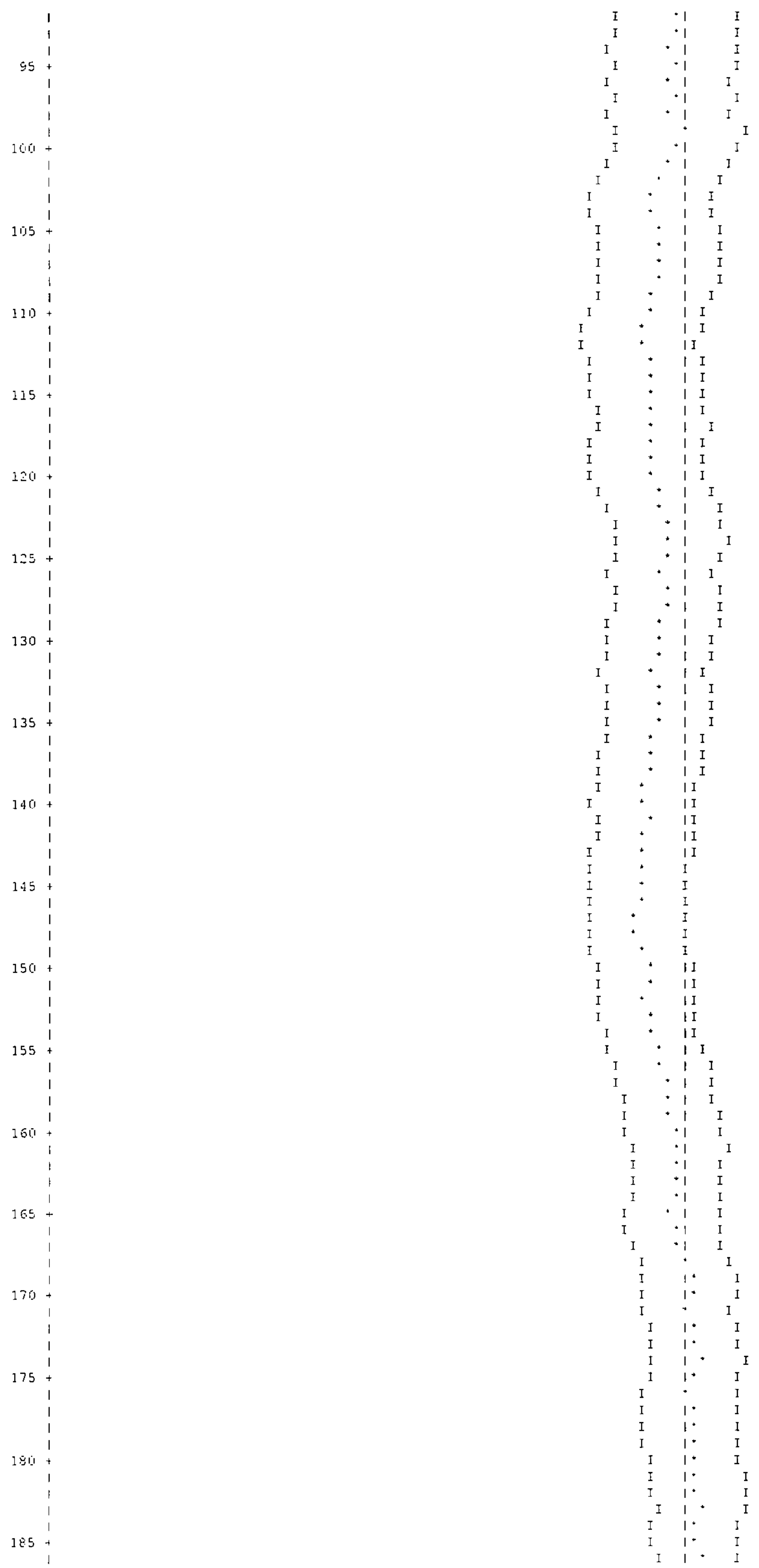
```
LIFETIME =  9.98934E-05 + OR -  3.46130E-07          GENERATION TIME =  4.27633E-05 + OR -  1.65576E-07
NU BAR   =  2.42064E+00 + OR -  2.24711E-05      AVERAGE FISSION GROUP =  2.34293E+01 + OR -  9.34937E-03
                 ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION =  7.08986E-02 + OR -  4.92764E-04
```

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.80666	+ OR - 0.00207	0.80459 TO 0.80874	0.80252 TO 0.81081	0.80045 TO 0.81288	162400
4	0.80677	+ OR - 0.00208	0.80469 TO 0.80885	0.80261 TO 0.81093	0.80054 TO 0.81301	161600
5	0.80669	+ OR - 0.00209	0.80460 TO 0.80877	0.80251 TO 0.81086	0.80042 TO 0.81295	160800
6	0.80694	+ OR - 0.00208	0.80486 TO 0.80902	0.80277 TO 0.81110	0.80069 TO 0.81318	160000
7	0.80674	+ OR - 0.00208	0.80466 TO 0.80883	0.80258 TO 0.81091	0.80049 TO 0.81299	159200
8	0.80688	+ OR - 0.00209	0.80479 TO 0.80897	0.80270 TO 0.81106	0.80061 TO 0.81314	158400
9	0.80703	+ OR - 0.00209	0.80493 TO 0.80912	0.80284 TO 0.81122	0.80074 TO 0.81331	157600
10	0.80705	+ OR - 0.00211	0.80494 TO 0.80915	0.80283 TO 0.81126	0.80073 TO 0.81336	156800
11	0.80728	+ OR - 0.00210	0.80518 TO 0.80938	0.80307 TO 0.81149	0.80097 TO 0.81359	156000
12	0.80714	+ OR - 0.00211	0.80503 TO 0.80925	0.80292 TO 0.81136	0.80081 TO 0.81347	155200
17	0.80692	+ OR - 0.00212	0.80480 TO 0.80904	0.80268 TO 0.81116	0.80056 TO 0.81328	151200
22	0.80696	+ OR - 0.00215	0.80481 TO 0.80912	0.80266 TO 0.81127	0.80051 TO 0.81342	147200
27	0.80724	+ OR - 0.00219	0.80505 TO 0.80943	0.80286 TO 0.81162	0.80067 TO 0.81382	143200
32	0.80770	+ OR - 0.00217	0.80553 TO 0.80987	0.80335 TO 0.81204	0.80118 TO 0.81421	139200
37	0.80789	+ OR - 0.00220	0.80569 TO 0.81009	0.80349 TO 0.81229	0.80130 TO 0.81448	135200
42	0.80781	+ OR - 0.00222	0.80559 TO 0.81003	0.80337 TO 0.81226	0.80115 TO 0.81448	131200
47	0.80803	+ OR - 0.00228	0.80575 TO 0.81031	0.80348 TO 0.81258	0.80120 TO 0.81486	127200
52	0.80789	+ OR - 0.00233	0.80555 TO 0.81022	0.80322 TO 0.81255	0.80089 TO 0.81488	123200
57	0.80719	+ OR - 0.00235	0.80485 TO 0.80954	0.80250 TO 0.81189	0.80015 TO 0.81424	119200
62	0.80748	+ OR - 0.00239	0.80509 TO 0.80987	0.80270 TO 0.81226	0.80031 TO 0.81465	115200
67	0.80703	+ OR - 0.00246	0.80457 TO 0.80949	0.80211 TO 0.81195	0.79965 TO 0.81441	111200
72	0.80693	+ OR - 0.00252	0.80441 TO 0.80945	0.80189 TO 0.81197	0.79937 TO 0.81449	107200
77	0.80621	+ OR - 0.00245	0.80375 TO 0.80866	0.80130 TO 0.81111	0.79885 TO 0.81357	103200
82	0.80702	+ OR - 0.00248	0.80454 TO 0.80951	0.80206 TO 0.81199	0.79958 TO 0.81447	99200
87	0.80750	+ OR - 0.00255	0.80495 TO 0.81005	0.80240 TO 0.81260	0.79985 TO 0.81515	95200
92	0.80707	+ OR - 0.00265	0.80443 TO 0.80972	0.80178 TO 0.81237	0.79913 TO 0.81501	91200

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
97	0.80717	+ OR - 0.00274	0.80443 TO 0.80991	0.80169 TO 0.81266	0.79895 TO 0.81540	87200
102	0.80803	+ OR - 0.00270	0.80532 TO 0.81073	0.80262 TO 0.81344	0.79992 TO 0.81614	83200
107	0.80811	+ OR - 0.00280	0.80531 TO 0.81091	0.80251 TO 0.81372	0.79971 TO 0.81652	79200
112	0.80937	+ OR - 0.00288	0.80649 TO 0.81225	0.80362 TO 0.81512	0.80074 TO 0.81800	75200
117	0.80888	+ OR - 0.00302	0.80586 TO 0.81191	0.80284 TO 0.81493	0.79981 TO 0.81795	71200
122	0.80840	+ OR - 0.00310	0.80530 TO 0.81149	0.80220 TO 0.81459	0.79910 TO 0.81769	67200
127	0.80804	+ OR - 0.00315	0.80489 TO 0.81119	0.80174 TO 0.81434	0.79860 TO 0.81749	63200
132	0.80952	+ OR - 0.00324	0.80628 TO 0.81276	0.80304 TO 0.81599	0.79981 TO 0.81923	59200
137	0.81024	+ OR - 0.00339	0.80685 TO 0.81363	0.80346 TO 0.81702	0.80007 TO 0.82041	55200
142	0.81135	+ OR - 0.00352	0.80783 TO 0.81486	0.80431 TO 0.81838	0.80079 TO 0.82190	51200
147	0.81307	+ OR - 0.00372	0.80935 TO 0.81679	0.80564 TO 0.82050	0.80192 TO 0.82422	47200
152	0.81239	+ OR - 0.00391	0.80848 TO 0.81631	0.80457 TO 0.82022	0.80065 TO 0.82413	43200
157	0.80990	+ OR - 0.00405	0.80585 TO 0.81395	0.80180 TO 0.81800	0.79775 TO 0.82205	39200
162	0.80872	+ OR - 0.00430	0.80442 TO 0.81301	0.80013 TO 0.81731	0.79583 TO 0.82160	35200
167	0.80823	+ OR - 0.00454	0.80369 TO 0.81277	0.79916 TO 0.81730	0.79462 TO 0.82184	31200
172	0.80448	+ OR - 0.00410	0.80038 TO 0.80858	0.79628 TO 0.81269	0.79217 TO 0.81679	27200
177	0.80539	+ OR - 0.00397	0.80141 TO 0.80936	0.79744 TO 0.81334	0.79346 TO 0.81731	23200
182	0.80220	+ OR - 0.00418	0.79802 TO 0.80638	0.79384 TO 0.81056	0.78966 TO 0.81474	19200
187	0.79915	+ OR - 0.00462	0.79453 TO 0.80377	0.78992 TO 0.80838	0.78530 TO 0.81300	15200
192	0.79886	+ OR - 0.00496	0.79391 TO 0.80382	0.78895 TO 0.80877	0.78400 TO 0.81373	11200
197	0.80223	+ OR - 0.00466	0.79757 TO 0.80690	0.79291 TO 0.81156	0.78824 TO 0.81622	7200
202	0.79848	+ OR - 0.00158	0.79690 TO 0.80005	0.79532 TO 0.80163	0.79374 TO 0.80321	3200

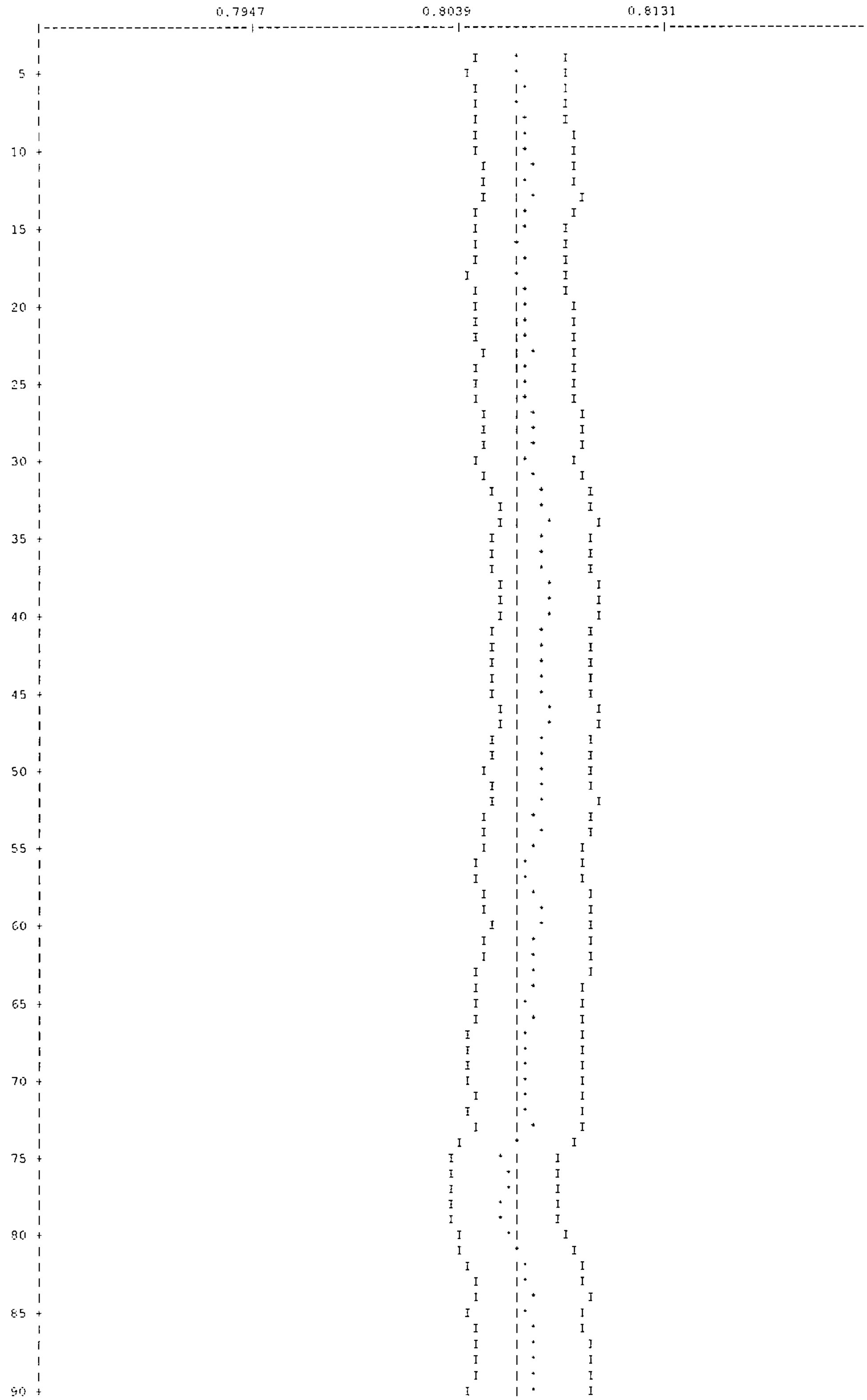
PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.8067 + OR - 0.0021 WHICH OCCURS FOR 206 GENERATIONS RUN.

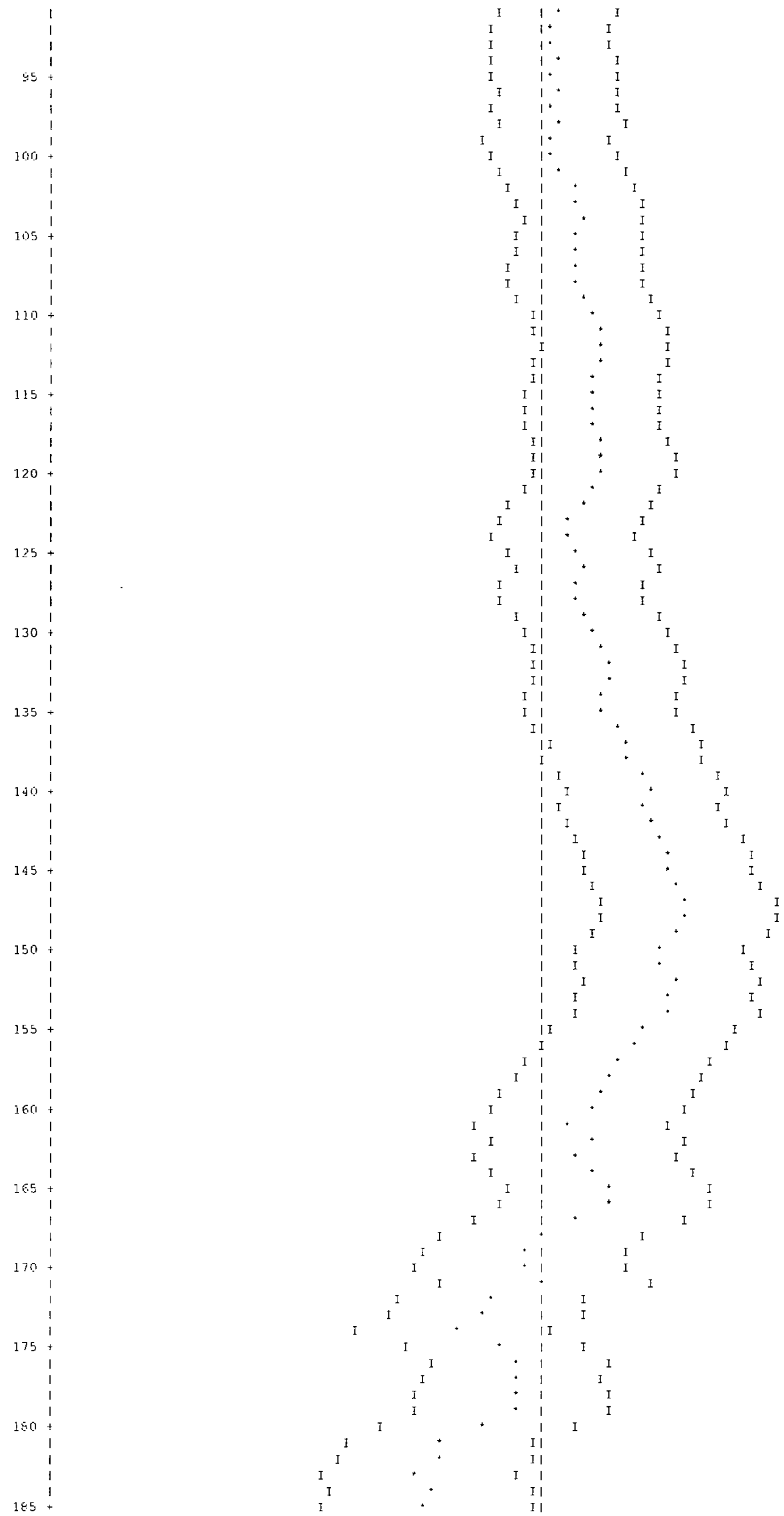


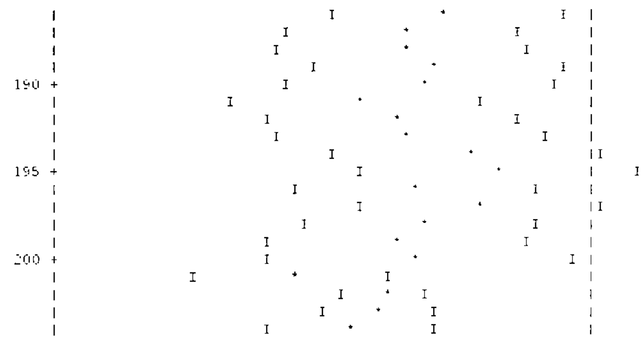

95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185

```
     |                                                            I  | *    I
     |                                                            I  | *    I
     |                                                           I   |*    I
 190 +                                                           I   |*    I
     |                                                            I  | *    I
     |                                                            I  |*    I
     |                                                           I   |*    I
     |                                                           I   |*    I
 195 +                                                           I   |*   I
     |                                                           I   |*    I
     |                                                           I   |*   I
     |                                                           I   |*    I
     |                                                           I   |*   I
 200 +                                                           I   |*   I
     |                                                           I   |*    I
     |                                                           I   *    I
     |                                                           I   *    I
     |                                                           I   *    I
 205 +                                                           I   *    I
     |                                                          I    *    I
```

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION SKIPPED.
THE LINE REPRESENTS K-EFF = 0.8067 + OR - 0.0021 WHICH OCCURS FOR 3 GENERATIONS SKIPPED.




95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185


190
195
200

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0004			2.86476E-04	5.6283	1.52136E-03	2.1427	0.00000E+00	0.0000
2	0.0016			1.31520E-03	1.6881	3.28436E-03	0.6898	0.00000E+00	0.0000
3	0.0020			1.65180E-03	1.3890	1.02449E-03	0.9693	0.00000E+00	0.0000
4	0.0012			9.43977E-04	1.6759	5.32299E-04	1.2734	0.00000E+00	0.0000
5	0.0016			1.30055E-03	1.4876	8.62508E-04	1.0596	0.00000E+00	0.0000
6	0.0022			1.73728E-03	1.1993	1.59844E-03	0.8216	0.00000E+00	0.0000
7	0.0022			1.73932E-03	1.2733	1.82219E-03	0.7980	0.00000E+00	0.0000
8	0.0021			1.70173E-03	1.6759	1.95710E-03	1.0360	0.00000E+00	0.0000
9	0.0028			2.29548E-03	2.1618	2.68646E-03	1.1910	0.00000E+00	0.0000
10	0.0062			4.98683E-03	2.0026	5.54078E-03	1.1600	0.00000E+00	0.0000
11	0.0130			1.04472E-02	1.7934	1.01338E-02	1.2292	0.00000E+00	0.0000
12	0.0178			1.43956E-02	1.7857	1.22652E-02	1.3669	0.00000E+00	0.0000
13	0.0173			1.39667E-02	1.8845	1.47971E-02	1.3920	0.00000E+00	0.0000
14	0.0147			1.18675E-02	1.8872	1.70869E-02	1.1396	0.00000E+00	0.0000
15	0.0028			2.27686E-03	3.6085	7.05768E-03	1.3004	0.00000E+00	0.0000
16	0.0019			1.57102E-03	4.9306	4.44604E-03	1.5434	0.00000E+00	0.0000
17	0.0031			2.48854E-03	4.6242	3.13351E-03	2.2078	0.00000E+00	0.0000
18	0.0041			3.32845E-03	5.0847	3.32257E-03	2.6860	0.00000E+00	0.0000
19	0.0048			3.86190E-03	4.1248	5.22856E-03	1.7409	0.00000E+00	0.0000
20	0.0218			1.76250E-02	1.9493	2.19269E-02	1.0219	0.00000E+00	0.0000
21	0.0122			9.81387E-03	2.8332	9.93820E-03	1.4733	0.00000E+00	0.0000
22	0.0293			2.36442E-02	1.8314	2.35717E-02	0.9757	0.00000E+00	0.0000
23	0.1071			8.63764E-02	0.9656	1.02873E-01	0.4780	0.00000E+00	0.0000
24	0.2203			1.77698E-01	0.6344	2.22769E-01	0.3016	0.00000E+00	0.0000
25	0.1876			1.51351E-01	0.6628	1.94392E-01	0.2872	0.00000E+00	0.0000
26	0.2344			1.89104E-01	0.6734	2.42944E-01	0.2717	0.00000E+00	0.0000
27	0.0854			6.88912E-02	1.0923	8.53098E-02	0.5363	0.00000E+00	0.0000
SYSTEM TOTAL =				8.06665E-01	0.2567	1.00203E+00	0.0566	0.00000E+00	0.0000

ELAPSED TIME 6.70283 MINUTES

RANDOM NUMBER= 62803D4620D2

```
                          FREQUENCY FOR GENERATIONS    4 TO  206
0.7335 TO 0.7476     ***
0.7476 TO 0.7617     *****
0.7617 TO 0.7759     ***********************
0.7759 TO 0.7900     *************************************
0.7900 TO 0.8042     *****************************
0.8042 TO 0.8183     *************************************
0.8183 TO 0.8324     *************************
0.8324 TO 0.8466     ***********************
0.8466 TO 0.8607     *************
0.8607 TO 0.8749     ******
0.8749 TO 0.8890     *
0.8890 TO 0.9032     *

                          FREQUENCY FOR GENERATIONS   55 TO  206
0.7335 TO 0.7476     **
0.7476 TO 0.7617     *
0.7617 TO 0.7759     ******************
0.7759 TO 0.7900     ****************************
0.7900 TO 0.8042     **********************
0.8042 TO 0.8183     *****************************
0.8183 TO 0.8324     ********************
0.8324 TO 0.8466     ****************
0.8466 TO 0.8607     **********
0.8607 TO 0.8749     ****
0.8749 TO 0.8890     *
0.8890 TO 0.9032     *

                          FREQUENCY FOR GENERATIONS  105 TO  206
0.7335 TO 0.7476     *
0.7476 TO 0.7617     *
0.7617 TO 0.7759     **********
0.7759 TO 0.7900     ******************
0.7900 TO 0.8042     ***************
0.8042 TO 0.8183     ***********************
0.8183 TO 0.8324     ***********
0.8324 TO 0.8466     ************
0.8466 TO 0.8607     ********
0.8607 TO 0.8749     **
0.8749 TO 0.8890     *
0.8890 TO 0.9032

                          FREQUENCY FOR GENERATIONS  156 TO  206
0.7335 TO 0.7476     *
0.7476 TO 0.7617
0.7617 TO 0.7759     ****
0.7759 TO 0.7900     ********
0.7900 TO 0.8042     *******
0.8042 TO 0.8183     ***********
0.8183 TO 0.8324     *******
0.8324 TO 0.8466     ********
0.8466 TO 0.8607     ***
0.8607 TO 0.8749     *
0.8749 TO 0.8890     *
0.8890 TO 0.9032


************************************************************************************************************************************************
*

          CONGRATULATIONS!  YOU HAVE  SUCCESSFULLY TRAVERSED THE PERILOUS PATH THROUGH KENO V IN    6.70283 MINUTES

************************************************************************************************************************************************
*
```

Figure 6.6.3-2 CSAS Input/Output for NAC-LWT with Design Basis MTR Fuel - Most Reactive Accident Condition Configuration – 94 wt %, 355 g ^{235}U

```
PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
   MODULE CSAS25   WILL BE CALLED
     LWT HFBR DESIGN U3O8-AL FUEL 93 W/O U235 PLATES IN CLOSE & PLATES @ FULL PITCH
     'MIN BASKET PLATE
     27GROUPNDF4  LATTICECELL
     URANIUM  1 DEN=3.9912 0.3000 293 92235 94. 92238 6. END
     O         1 DEN=3.990  0.0542 293 END
     AL        1 DEN=3.990  0.6468 293 END
     AL    2 1.0 293.0 END
     H2O   3 1.000 293.0 END
     AL    4 1.0 293.0 END
     SS304 5 1.0 293.0 END
     PB    6 1.0 293.0 END
     H2O   7 1.0E-20 293.0 END
     H2O   8 1.0E-20 293.0 END
     END COMP
     SYMMSLABCELL 0.4572 0.053 1 3 0.127 2 END

     READ PARAM RUN=YES PLT=YES RND=2 GEN=206 NPG=800 END PARAM
     READ GEOM
     UNIT 1
     COM='AL PLATE CELL'
     CUBOID 2 1 2P3.1250 2P0.127 2P10.0
     UNIT 2
     COM='HFBR FUEL PLATE CELL 1'
     CUBOID 1 1 2P2.8600 2P0.0265 2P10.0
     CUBOID 2 1 2P3.1250 2P0.0635 2P10.0
     CUBOID 3 1 2P3.1250 2P0.2286 2P10.0
     UNIT 3
     COM='HFBR FUEL PLATE CELL 2'
     CUBOID 1 1 2P2.8600 2P0.0265 2P10.0
     CUBOID 2 1 2P3.1250 2P0.0635 2P10.0
     CUBOID 3 1 2P3.1250 2P0.2286 2P10.0
     UNIT 4
     COM='HFBR FUEL PLATE CELL 3'
     CUBOID 1 1 2P2.8600 2P0.0265 2P10.0
     CUBOID 2 1 2P3.1250 2P0.0635 2P10.0
     CUBOID 3 1 2P3.1250 2P0.2286 2P10.0
     UNIT 5
     COM='HFBR FUEL PLATE CELL 4'
     CUBOID 1 1 2P2.8600 2P0.0265 2P10.0
     CUBOID 2 1 2P3.1250 2P0.0635 2P10.0
     CUBOID 3 1 2P3.1250 2P0.2286 2P10.0
     UNIT 6
     COM='HFBR FUEL PLATE CELL 5'
     CUBOID 1 1 2P2.8600 2P0.0265 2P10.0
     CUBOID 2 1 2P3.1250 2P0.0635 2P10.0
     CUBOID 3 1 2P3.1250 2P0.2286 2P10.0
     UNIT 7
     COM='HFBR FUEL PLATE CELL 6'
     CUBOID 1 1 2P2.8600 2P0.0265 2P10.0
     CUBOID 2 1 2P3.1250 2P0.0635 2P10.0
     CUBOID 3 1 2P3.1250 2P0.2286 2P10.0
     UNIT 8
     COM='HFBR FUEL PLATE CELL 7'
     CUBOID 1 1 2P2.8600 2P0.0265 2P10.0
     CUBOID 2 1 2P3.1250 2P0.0635 2P10.0
     CUBOID 3 1 2P3.1250 2P0.2286 2P10.0
     UNIT 81
     CUBOID 2 1 2P0.2375 2P4.1 2P10.0
     UNIT 83
     CUBOID 2 1 2P0.2375 2P4.1 2P10.0
     UNIT 90
     COM='HFBR FUEL ARRAY 20 PLATES IN 5/16 IN. WEB CENTER'
     ARRAY 1 -3.1250 -4.3688 -10.0
     CUBOID 3 1 2P4.3688 2P4.3688 2P10.0
     HOLE 81 -4.1312 0.0 0.0
     HOLE 83 4.1312 0.0 0.0
     REPLICATE 5 1 2R0.3556 4R0.0 1
     UNIT 91
     COM='HFBR FUEL ARRAY 20 PLATES IN 5/16 IN. WEB RIGHT'
     ARRAY 1 -3.8935 -4.3688 -10.0
     CUBOID 3 1 2P4.3688 2P4.3688 2P10.0
     HOLE 81 -4.1312 0.0 0.0
     HOLE 83 4.1312 0.0 0.0
     REPLICATE 5 1 2R0.3556 4R0.0 1
     UNIT 92
     COM='HFBR FUEL ARRAY 20 PLATES IN 5/16 IN. WEB LEFT'
     ARRAY 1 -2.3565 -4.3688 -10.0
     CUBOID 3 1 2P4.3688 2P4.3688 2P10.0
     HOLE 81 -4.1312 0.0 0.0
     HOLE 83 4.1312 0.0 0.0
     REPLICATE 5 1 2R0.3556 4R0.0 1
     UNIT 10
     COM='HFBR FUEL ARRAY WITH HALF OF 1/4 PLATE ON RIGHT -  TOP STACK'
     ARRAY 1 -2.3565 -4.3688 -10.0
     CUBOID 3 1 2P4.3688 2P4.3688 2P10.0
     HOLE 81 -4.1312 0.0 0.0
     HOLE 83 4.1312 0.0 0.0
```

```
REPLICATE 5 1 0.3048 5R0.0 1
UNIT 101
COM='HFBR FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON RIGHT -  BOTTOM STACK'
ARRAY 1 -2.3565 -4.3688 -10.0
CUBOID 3 1 2P4.3688 2P4.3688 2P10.0
HOLE 81 -4.1312 0.0 0.0
HOLE 83 4.1312 0.0 0.0
REPLICATE 5 1 0.3048 5R0.0 1
UNIT 11
COM='HFBR FUEL WITH HALF OF 1/4 IN. PLATE ON LEFT  TOP STACK'
ARRAY 1 -3.8935 -4.3688 -10.0
CUBOID 3 1 2P4.3688 2P4.3688 2P10.0
HOLE 81 -4.1312 0.0 0.0
HOLE 83 4.1312 0.0 0.0
REPLICATE 5 1 0.0 0.3048 4R0.0 1
UNIT 111
COM='HFBR FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON LEFT - BOTTOM STACK'
ARRAY 1 -3.8935 -4.3688 -10.0
CUBOID 3 1 2P4.3688 2P4.3688 2P10.0
HOLE 81 -4.1312 0.0 0.0
HOLE 83 4.1312 0.0 0.0
REPLICATE 5 1 0.0 0.3048 4R0.0 1
UNIT 12
COM='2 UNIT ARRAY WITH 0.120 IN. PLATE ON TOP AND SIDES'
ARRAY 2 -9.0428 -4.3688 -10.0
REPLICATE 5 1 3R0.3048 0.0 2R0.0 1
UNIT 13
COM='3 UNIT ARRAY WITH REST OF 5/16 WEB'
ARRAY 3 -14.1738 -4.3688 -10.0
REPLICATE 5 1 2R0.3556 2R0.7112 2R0.0 1
UNIT 14
COM='2 UNIT ARRAY WITH 0.120 IN. PLATE ON BOTTOM and SIDES'
ARRAY 4 -9.0428 -4.3688 -10.0
REPLICATE 5 1 2R0.3048 0.0 0.3048 2R0.0 1
GLOBAL UNIT 15
COM='7 HFBR ASSEMBLIES IN THE LWT'
CYLINDER 3 1 17.0500 2P10.0
HOLE 12 0.0 +9.4489 0.0
HOLE 13 0.0 0.0 0.0
HOLE 14 0.0 -9.4489 0.0
CYLINDER 5 1 18.8913 2P10.0
CYLINDER 6 1 33.4963 2P10.0
CYLINDER 5 1 36.5443 2P10.0
CYLINDER 8 1 49.2443 2P10.0
CYLINDER 5 1 49.85390 2P10.0
CUBOID   7 1 4P49.85390 2P10.0
END GEOM
READ ARRAY
ARA=1 NUX=1 NUY=20 NUZ=1 FILL 1 8 7 6 12R5 4 3 2 1 END FILL
ARA=2 NUX=2 NUY=1 NUZ=1 FILL 10 11 END FILL
ARA=3 NUX=3 NUY=1 NUZ=1 FILL 92 90 91 END FILL
ARA=4 NUX=2 NUY=1 NUZ=1 FILL 101 111 END FILL
END ARRAY
READ BOUNDS ALL=MIR END BOUNDS
READ PLOT
TTL='X-Y PLOT OF ASSEMBLY'
NCH=' FCWASRW'
UAX=1.0 VDN=-1.0 NAX=130
XUL=-5.0 YUL=5.0 ZUL=0.0
XLR=5.0 YLR=-5.0 ZLR=0.0 END
TTL='X-Y PLOT OF CASK'
UAX=1.0 VDN=-1.0 NAX=130
XUL=-65.0 YUL=65.0 ZUL=0.0
XLR=65.0 YLR=-65.0 ZLR=0.0 END
TTL='X-Y PLOT OF BASKET'
UAX=1.0 VDN=-1.0 NAX=130
XUL=-17.0 YUL=17.0 ZUL=0.0
XLR=17.0 YLR=-17.0 ZLR=0.0 END
TTL='X-Z PLOT OF BASKET'
VAX=1.0 WDN=-1.0
XUL=0.0 YUL=-5.0 ZUL=10.0
XLR=0.0 YLR=5.0 ZLR=-10.0
END PLOT
END DATA

SECONDARY MODULE 000008   HAS BEEN CALLED.
```

```
 CCCCCCCCCCC    SSSSSSSSSSS     AAAAAAAAA     SSSSSSSSSSS    22222222222   5555555555555
CCCCCCCCCCCCC  SSSSSSSSSSSSS   AAAAAAAAAAA   SSSSSSSSSSSSS  2222222222222  5555555555555
CC         CC  SS         SS  AA         AA  SS         SS  22         22  55
CC             SS             AA         AA  SS                        22  55
CC             SS             AA         AA  SS                        22  55
CC             SSSSSSSSSSSS   AAAAAAAAAAAAA  SSSSSSSSSSSS             22   555555555555
CC              SSSSSSSSSSSS  AAAAAAAAAAAAA   SSSSSSSSSSSS          22     5555555555555
CC                        SS  AA         AA             SS        22                  55
CC                        SS  AA         AA             SS      22                    55
CC         CC  SS         SS  AA         AA  SS         SS    22           55         55
CCCCCCCCCCCCC  SSSSSSSSSSSSS  AA         AA  SSSSSSSSSSSSS  2222222222222  5555555555555
 CCCCCCCCCCC    SSSSSSSSSSS   AA         AA   SSSSSSSSSSS   2222222222222   55555555555


 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL             EEEEEEEEEEEEE                 PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL             EEEEEEEEEEEEE                 PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL             EE                            PP         PP  CC         CC
SS             CC             AA         AA  LL             EE                            PP         PP  CC
SS             CC             AA         AA  LL             EE                            PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------  PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------  PPPPPPPPPPPP   CC
           SS  CC             AA         AA  LL             EE                            PP             CC
           SS  CC             AA         AA  LL             EE                            PP             CC
SS         SS  CC         CC  AA         AA  LL             EE                            PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLL   EEEEEEEEEEEEE                 PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLL   EEEEEEEEEEEEE                 PP              CCCCCCCCCCC


   0000000     7777777777777             //     0000000     22222222222             //   99999999999     88888888888
  000000000    777777777777             //     000000000   2222222222222           //   9999999999999   8888888888888
 00       00   77         77           //     00       00  22         22          //    99         99   88         88
00         00            77           //     00         00             22         //    99         99   88         88
00         00           77           //      00         00             22        //     99         99   88         88
00         00          77           //       00         00            22        //      9999999999999    88888888888
00         00          77          //        00         00          22         //        999999999999    88888888888
00         00         77          //         00         00        22          //                   99   88         88
00         00         77         //          00         00      22           //                    99   88         88
 00       00          77        //            00       00     22            //                     99   88         88
  000000000           77       //              000000000   2222222222222   //       9999999999999   8888888888888
   0000000            77      //                0000000    2222222222222  //        999999999999     88888888888


    11                44                        44     7777777777777                     44     22222222222
   111               444                       444     777777777777                     444    2222222222222
  1111              4444        :::           4444     77         77     :::           4444    22         22
    11             44 44        :::          44 44               77      :::          44 44               22
    11            44  44        :::         44  44              77       :::         44  44               22
    11           44   44                   44   44             77                   44   44             22
    11          44    44                  44    44             77                  44    44           22
    11         4444444444444    :::      4444444444444        77         :::      4444444444444     22
    11         4444444444444    :::      4444444444444        77         :::      4444444444444   22
    11                44        :::             44           77          :::             44      22
  11111111            44                        44           77                          44      2222222222222
  11111111            44                        44           77                          44      2222222222222
```

```
PROGRAM VERIFICATION INFORMATION

CODE SYSTEM:  SCALE-PC VERSION:  4.3

          PROGRAM:  CSAS
    CREATION DATE:  03-08-96
           VOLUME:  ENG
          LIBRARY:  G:\SCALE43\EXE

  PRODUCTION CODE:  CSAS
          VERSION:  3.1
          JOBNAME:  SCALE-PC
DATE OF EXECUTION:  07/02/98
TIME OF EXECUTION:  14:47:42
```

```
LWT HFBR DESIGN U3O8-AL FUEL 93 W/O U235 PLATES IN CLOSE 6 PLATES @ FULL PITCH

    **** PROBLEM PARAMETERS ****

    LIB 27GROUPNDF4  LIBRARY
    MMX            8 MIXTURES
    MSC           10 COMPOSITION SPECIFICATIONS
    ISM            3 MATERIAL ZONES
    GE  LATTICECELL  GEOMETRY
    MORE           0 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
    MSLN           0 FUEL SOLUTIONS

    **** PROBLEM COMPOSITION DESCRIPTION ****

    SC  URANIUM      STANDARD COMPOSITION
    MX             1 MIXTURE NO.
    VF        0.3000 VOLUME FRACTION
    ROTH      3.9912 SPECIFIED DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               92000       1.00 ATOM/MOLECULE
                                92235     94.000 WT%
                                92238      6.000 WT%
    END

    SC  O            STANDARD COMPOSITION
    MX             1 MIXTURE NO.
    VF        0.0542 VOLUME FRACTION
    ROTH      3.9900 SPECIFIED DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
                8016       1.00 ATOM/MOLECULE
    END

    SC  AL           STANDARD COMPOSITION
    MX             1 MIXTURE NO.
    VF        0.6468 VOLUME FRACTION
    ROTH      3.9900 SPECIFIED DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               13027       1.00 ATOM/MOLECULE
    END

    SC  AL           STANDARD COMPOSITION
    MX             2 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      2.7020 THEORETICAL DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               13027       1.00 ATOM/MOLECULE
    END

    SC  H2O          STANDARD COMPOSITION
    MX             3 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      0.9982 THEORETICAL DENSITY
    NEL            2 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
                1001       2.00 ATOMS/MOLECULE
                8016       1.00 ATOM/MOLECULE
    END

    SC  AL           STANDARD COMPOSITION
    MX             4 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      2.7020 THEORETICAL DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               13027       1.00 ATOM/MOLECULE
    END

    SC  SS304        STANDARD COMPOSITION
    MX             5 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      7.9200 THEORETICAL DENSITY
    NEL            4 NO. ELEMENTS
    ICP            0 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               24304     19.000 WT%
               25055      2.000 WT%
               26304     69.500 WT%
               28304      9.500 WT%
    END

    SC  PB           STANDARD COMPOSITION
    MX             6 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
```

```
ROTH     11.3440 THEORETICAL DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           82000       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX             7 MIXTURE NO.
VF        0.0000 VOLUME FRACTION
ROTH      0.9982 THEORETICAL DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
            1001       2.00 ATOMS/MOLECULE
            8016       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX             8 MIXTURE NO.
VF        0.0000 VOLUME FRACTION
ROTH      0.9982 THEORETICAL DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
            1001       2.00 ATOMS/MOLECULE
            8016       1.00 ATOM/MOLECULE
END

**** PROBLEM GEOMETRY ****

CTP SYMMSLABCELL CELL TYPE
PITCH     0.4572 CM CENTER TO CENTER SPACING
FUELOD    0.0530 CM FUEL DIAMETER OR SLAB THICKNESS
MFUEL          1 MIXTURE NO. OF FUEL
MMOD           3 MIXTURE NO. OF MODERATOR
CLADOD    0.1270 CM CLAD OUTER DIAMETER
MCLAD          2 MIXTURE NO. OF CLAD

ZONE SPECIFICATIONS FOR LATTICECELL GEOMETRY

               ZONE  1 IS FUEL
               ZONE  2 IS CLAD
               ZONE  3 IS MOD
```

```
LWT HFBR DESIGN U3O8-AL FUEL 93 W/O U235 PLATES IN CLOSE & PLATES @ FULL PITCH

********** DATA LIBRARY INFORMATION **********

UNIT                                                VOLUME
NUMBER          DATA SET NAME                        NAME       UNIT FUNCTION
------          -------------                        ----       -------------

  89     G:\scale43\DATALIB\FT89F001                            STANDARD COMPOSITION LIBRARY

  82     G:\scale43\DATALIB\FT82F001                            CROSS SECTION LIBRARY

  11     G:\SHARED\cxl\mtr35\hacxlm_94_355\FT11F001             SHORT CROSS SECTION LIBRARY

  90     G:\SHARED\cxl\mtr35\hacxlm_94_355\FT90F001             INPUT DATA DIRECT ACCESS


                    STANDARD COMPOSITION LIBRARY DATA
                    ---------------------------------

   UNIT NUMBER  :  89

   DATASET NAME :  G:\scale43\DATALIB\FT89F001

   LIBRARY TITLE:  SCALE-4 STANDARD COMPOSITION LIBRARY
                   637 STANDARD COMPOSITIONS, 490 NUCLIDES
                   90 ELEMENTS WITH VARIABLE ISOTOPIC DISTRBUTIONS.

   CREATION DATE:   6/30/95


                       CROSS SECTION LIBRARY DATA
                       --------------------------

   UNIT NUMBER  :  82

   DATASET NAME :  G:\scale43\DATALIB\FT82F001

   LIBRARY TITLE:  SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
                      BASED ON ENDF-B VERSION 4 DATA
                         COMPILED FOR NRC      1/27/89
                            LAST UPDATED                                  08/12/94
                               L.M.PETRIE    -    ORNL
```

```
               KK         KK  EEEEEEEEEEEEE  NN         NN   00000000000                  VV          VV
               KK        KK   EEEEEEEEEEEEE  NNN        NN  0000000000000                 VV          VV
               KK       KK    EE             NNNN       NN  OO         OO                 VV          VV
               KK      KK     EE             NN NN      NN  OO         OO                 VV          VV
               KK     KK      EE             NN  NN     NN  OO         OO                 VV          VV
               KKKKKKKK       EEEEEEEEE      NN   NN    NN  OO         OO  -------------  VV          VV
               KKKKKKKK       EEEEEEEEE      NN    NN   NN  OO         OO  -------------   VV        VV
               KK     KK      EE             NN     NN  NN  OO         OO                    VV    VV
               KK      KK     EE             NN      NN NN  OO         OO                     VV  VV
               KK       KK    EE             NN       NNNN  OO         OO                      VV VV
               KK        KK   EEEEEEEEEEEEE  NN        NNN  0000000000000                       VVV
               KK         KK  EEEEEEEEEEEEE  NN         NN   00000000000                         V

 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL             EEEEEEEEEEEEE                 PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL             EEEEEEEEEEEEE                 PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL             EE                            PP         PP  CC         CC
SS             CC             AA         AA  LL             EE                            PP         PP  CC
SS             CC             AA         AA  LL             EE                            PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------  PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------  PPPPPPPPPPPP   CC
           SS  CC             AA         AA  LL             EE                            PP             CC
           SS  CC             AA         AA  LL             EE                            PP             CC
SS         SS  CC         CC  AA         AA  LL             EE                            PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLLL  EEEEEEEEEEEEE                 PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLLL  EEEEEEEEEEEEE                 PP              CCCCCCCCCCC

   0000000     7777777777777             //     0000000      22222222222             //   99999999999    88888888888
  000000000    777777777777             //     000000000    2222222222222           //   9999999999999  8888888888888
 00       00   77        77            //     00       00   22         22          //    99         99  88         88
00         00           77            //     00         00             22         //     99         99  88         88
00         00          77            //      00         00             22        //      99         99  88         88
00         00         77            //       00         00           22         //       9999999999999   88888888888
00         00        77            //        00         00         22          //         99999999999    88888888888
00         00       77            //         00         00       22           //                   99  88         88
00         00       77           //          00         00     22            //                    99  88         88
 00       00        77          //            00       00    22             //                     99  88         88
  000000000         77         //              000000000    2222222222222  //        9999999999999  8888888888888
   0000000          77        //                0000000     2222222222222  //        999999999999    88888888888

     11             44                             44    7777777777777                 5555555555555   33333333333
    111            444                            444    777777777777                  5555555555555  3333333333333
   1111           4444          :::              4444    77        77      :::         55             33         33
     11          44 44          :::             44 44             77       :::         55                        33
     11         44  44          :::            44  44            77        :::         55                        33
     11        44   44                        44   44           77                     555555555555            333
     11       44    44                       44    44           77                     5555555555555           333
     11      444444444444       :::         444444444444       77          :::                    55             33
     11     4444444444444       :::        4444444444444       77          :::                    55             33
     11             44          :::                44          77          :::         55         55  33         33
  11111111          44                             44          77                      5555555555555  3333333333333
  11111111          44                             44          77                       55555555555    33333333333
```

```
PROGRAM VERIFICATION INFORMATION

CODE SYSTEM:  SCALE-PC VERSION:  4.3

           PROGRAM:  000009

     CREATION DATE:  03-08-96

            VOLUME:  ENG

           LIBRARY:  G:\SCALE43\EXE

   PRODUCTION CODE:  KENOVA

           VERSION:  3.1

           JOBNAME:  SCALE-PC

 DATE OF EXECUTION:  07/02/98

 TIME OF EXECUTION:  14:47:53
```

NUMERIC PARAMETERS

TME	MAXIMUM PROBLEM TIME (MIN)	30.00
TBA	TIME PER GENERATION (MIN)	0.50
GEN	NUMBER OF GENERATIONS	206
NPG	NUMBER PER GENERATION	800
NSK	NUMBER OF GENERATIONS TO BE SKIPPED	3
BEG	BEGINNING GENERATION NUMBER	1
RES	GENERATIONS BETWEEN CHECKPOINTS	0
X1D	NUMBER OF EXTRA 1-D CROSS SECTIONS	1
NBK	NEUTRON BANK SIZE	825
XNB	EXTRA POSITIONS IN NEUTRON BANK	0
NFB	FISSION BANK SIZE	800
XFB	EXTRA POSITIONS IN FISSION BANK	0
WTA	DEFAULT VALUE OF WEIGHT AVERAGE	0.5000
WTH	WEIGHT HIGH FOR SPLITTING	3.0000
WTL	WEIGHT LOW FOR RUSSIAN ROULETTE	0.3333
RND	STARTING RANDOM NUMBER	2
NB8	NUMBER OF D.A. BLOCKS ON UNIT 8	200
NL8	LENGTH OF D.A. BLOCKS ON UNIT 8	512
ADJ	MODE OF CALCULATION	FORWARD
	INPUT DATA WRITTEN ON RESTART UNIT	NO
	BINARY DATA INTERFACE	YES

```
*****************************************************************************************************
*****************************************************************************************************
***                                                                                               ***
***                                                                                               ***
***                                                                                               ***
*****************************************************************************************************
***                              ******     LOGICAL PARAMETERS       ******                        ***
***                                                                                               ***
*** RUN  EXECUTE PROBLEM AFTER CHECKING DATA    YES          PLT  PLOT PICTURE MAP(S)           YES ***
***                                                                                               ***
*** FLX  COMPUTE FLUX                           NO           FDN  COMPUTE FISSION DENSITIES       NO ***
***                                                                                               ***
*** SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION   NO           NUB  COMPUTE NU-BAR & AVG FISSION GROUP  YES ***
***                                                                                               ***
*** MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER    NO           MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION    NO ***
***                                                                                               ***
*** CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER  NO           CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION  NO ***
***                                                                                               ***
*** FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER  NO           FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION  NO ***
***                                                                                               ***
*** MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER    NO           MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER     NO ***
***                                                                                               ***
*** CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER  NO           CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER   NO ***
***                                                                                               ***
*** FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER  NO           FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER   NO ***
***                                                                                               ***
*** HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL   NO           HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL    NO ***
***                                                                                               ***
*** AMX  PRINT ALL MIXED CROSS SECTIONS         NO           FAR  PRINT FIS. AND ABS. BY REGION            NO ***
***                                                                                               ***
*** XS1  PRINT 1-D MIXTURE X-SECTIONS           NO           GAS  PRINT FAR BY GROUP                       NO ***
***                                                                                               ***
*** XS2  PRINT 2-D MIXTURE X-SECTIONS           NO           PAX  PRINT XSEC-ALBEDO CORRELATION TABLES     NO ***
***                                                                                               ***
*** XAP  PRINT MIXTURE ANGLES & PROBABILITIES   NO           PWT  PRINT WEIGHT AVERAGE ARRAY               NO ***
***                                                                                               ***
*** PKI  PRINT FISSION SPECTRUM                 NO           PGM  PRINT INPUT GEOMETRY                     NO ***
***                                                                                               ***
*** P1D  PRINT EXTRA 1-D CROSS SECTIONS         NO           BUG  PRINT DEBUG INFORMATION                  NO ***
***                                                                                               ***
***                                                          TRK  PRINT TRACKING INFORMATION               NO ***
***                                                                                               ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************
*****************************************************************************************************
                                      PARAMETER INPUT COMPLETED

                          ........    0 IO'S WERE USED READING THE PARAMETER DATA      ........

                          *************** DATA READING COMPLETED ***************
```

```
*****************************************************************************************************
***                                                                                               ***
***                                                                                               ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************
***                                                                                               ***
***        UNIT                                                   VOLUME                          ***
***       NUMBER                DATA SET NAME                      NAME        UNIT FUNCTION      ***
***       ------                -------------                      ----        -------------      ***
***                                                                                               ***
***   XSC  14     G:\SHARED\cxl\mtr35\hacxlm_94_355\FT14F001                  MIXED CROSS SECTIONS                ***
***                                                                                               ***
***   ALB  79     G:\scale43\DATALIB\FT79F001                                 INPUT ALBEDOS                       ***
***                                                                                               ***
***   WTS  80     G:\scale43\DATALIB\FT80F001                                 INPUT WEIGHTS                       ***
***                                                                                               ***
***   SKT  16      UNKNOWN                                                    WRITE SCRATCH DATA                  ***
***                                                                                               ***
***   BIN  95     G:\SHARED\cxl\mtr35\hacxlm_94_355\FT95F001                  BINARY INPUT DATA                   ***
***                                                                                               ***
***   RST  95     G:\SHARED\cxl\mtr35\hacxlm_94_355\FT95F001                  READ RESTART DATA                   ***
***                                                                                               ***
***   LIB   4     G:\SHARED\cxl\mtr35\hacxlm_94_355\FT04F001                  INPUT AMPX WORKING LIBRARY          ***
***                                                                                               ***
***         8     G:\SHARED\cxl\mtr35\hacxlm_94_355\FT08F001                  INPUT DATA DIRECT ACCESS            ***
***                                                                                               ***
***         9      UNKNOWN                                                    SUPER GROUPED DIRECT ACCESS         ***
***                                                                                               ***
***        10      UNKNOWN                                                    XSEC MIXING DIRECT ACCESS           ***
***                                                                                               ***
*****************************************************************************************************

                 .......    0 IO'S WERE USED PREPARING INPUT DATA    .......

                  CROSS SECTIONS READ FROM THE AMPX WORKING LIBRARY ON UNIT    4
```

```
                                        MIXING TABLE

                               NUMBER OF SCATTERING ANGLES =  2
                             CROSS SECTION MESSAGE THRESHOLD =3.0E-05

MIXTURE =     1         DENSITY(G/CC) =  3.9943
   NUCLIDE   ATOM-DENS.  WGT. FRAC.     ZA      AWT             NUCLIDE TITLE
   1008016  8.14438E-03 5.41402E-02   8016    15.9904      OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED
08/12/94
   1013027  5.76000E-02 6.46096E-01  13027    26.9818     AL-27 1193 218 GP 040375(5)                               UPDATED
08/12/94
   1092235  2.88273E-03 2.81778E-01  92235   235.0441      URANIUM-235    ENDF/B-IV MAT 1261                       UPDATED
08/12/94
   1092238  1.81743E-04 1.79858E-02  92238   238.0510      URANIUM-238    ENDF/B-IV MAT 1262                       UPDATED
08/12/94

MIXTURE =     2         DENSITY(G/CC) =  2.7020
   NUCLIDE   ATOM-DENS.  WGT. FRAC.     ZA      AWT             NUCLIDE TITLE
   2013027  6.03066E-02 1.00000E+00  13027    26.9818     AL-27 1193 218 GP 040375(5)                               UPDATED
08/12/94

MIXTURE =     3         DENSITY(G/CC) = 0.99817
   NUCLIDE   ATOM-DENS.  WGT. FRAC.     ZA      AWT             NUCLIDE TITLE
   3001001  6.67692E-02 1.11927E-01   1001     1.0077      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED
08/12/94
   3008016  3.33846E-02 8.88074E-01   8016    15.9904      OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED
08/12/94

MIXTURE =     4         DENSITY(G/CC) =  2.7020
   NUCLIDE   ATOM-DENS.  WGT. FRAC.     ZA      AWT             NUCLIDE TITLE
   4013027  6.03066E-02 1.00000E+00  13027    26.9818     AL-27 1193 218 GP 040375(5)                               UPDATED
08/12/94

MIXTURE =     5         DENSITY(G/CC) =  7.9200
   NUCLIDE   ATOM-DENS.  WGT. FRAC.     ZA      AWT             NUCLIDE TITLE
   5024304  1.74286E-02 1.90000E-01  24000    51.9957     CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED
08/12/94
   5025055  1.73633E-03 1.99999E-02  25055    54.9379      MANGANESE-55   ENDF/B-IV MAT 1197                       UPDATED
08/12/94
   5026304  5.93579E-02 6.95000E-01  26000    55.8447     FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED
08/12/94
   5028304  7.72070E-03 9.50001E-02  28000    58.6872     NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED
08/12/94

MIXTURE =     6         DENSITY(G/CC) =  11.344
   NUCLIDE   ATOM-DENS.  WGT. FRAC.     ZA      AWT             NUCLIDE TITLE
   6082000  3.29690E-02 1.00000E+00  82000   207.2100     PB   1288 218NGP 042375 P-3 293K                          UPDATED
08/12/94

MIXTURE =     7         DENSITY(G/CC) = 0.99817E-20
   NUCLIDE   ATOM-DENS.  WGT. FRAC.     ZA      AWT             NUCLIDE TITLE
   7001001  6.67692E-22 1.11927E-01   1001     1.0077      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED
08/12/94
   7008016  3.33846E-22 8.88073E-01   8016    15.9904      OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED
08/12/94

MIXTURE =     8         DENSITY(G/CC) = 0.99817E-20
   NUCLIDE   ATOM-DENS.  WGT. FRAC.     ZA      AWT             NUCLIDE TITLE
   8001001  6.67692E-22 1.11927E-01   1001     1.0077      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED
08/12/94
   8008016  3.33846E-22 8.88073E-01   8016    15.9904      OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED
08/12/94

                                 3001001     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94
                                 7001001     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94
                                 8001001     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94
                                 1008016     OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94
                                 3008016     OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94
                                 7008016     OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94
                                 8008016     OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94
                                 1013027    AL-27 1193 218 GP 040375(5)                             UPDATED 08/12/94
                                 2013027    AL-27 1193 218 GP 040375(5)                             UPDATED 08/12/94
                                 4013027    AL-27 1193 218 GP 040375(5)                             UPDATED 08/12/94
                                 5024304    CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94
                                 5025055     MANGANESE-55   ENDF/B-IV MAT 1197                      UPDATED 08/12/94
                                 5026304    FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94
                                 5028304    NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94
                                 6082000    PB   1288 218NGP 042375 P-3 293K                        UPDATED 08/12/94
                                 1092235     URANIUM-235    ENDF/B-IV MAT 1261                      UPDATED 08/12/94
                                 1092238     URANIUM-238    ENDF/B-IV MAT 1262                      UPDATED 08/12/94

KENO MESSAGE NUMBER K5-222        1 TRANSFERS FOR MIXTURE      3 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222        1 TRANSFERS FOR MIXTURE      7 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222        1 TRANSFERS FOR MIXTURE      8 WERE CORRECTED FOR BAD MOMENTS.

                                  ........    0 IO'S WERE USED MIXING CROSS-SECTIONS       ........

                                    1-D CROSS SECTION ARRAY ID NUMBERS
                                       1  2002  1452     27     18   1018
```

```
*******************************************************************************************
***                                                                                     ***
***                                                                                     ***
***                                                                                     ***
*******************************************************************************************
*******************************************************************************************
***                                                                                     ***
***                          ****** ADDITIONAL INFORMATION ******                       ***
***                                                                                     ***
***  NUMBER OF ENERGY GROUPS              27      USE LATTICE GEOMETRY            YES   ***
***                                                                                     ***
***  NO. OF FISSION SPECTRUM SOURCE GROUP  1      GLOBAL ARRAY NUMBER               0   ***
***                                                                                     ***
***  NO. OF SCATTERING ANGLES IN XSECS     2      NUMBER OF UNITS IN THE GLOBAL X DIR.  0   ***
***                                                                                     ***
***  ENTRIES/NEUTRON IN THE NEUTRON BANK  24      NUMBER OF UNITS IN THE GLOBAL Y DIR.  0   ***
***                                                                                     ***
***  ENTRIES/NEUTRON IN THE FISSION BANK  17      NUMBER OF UNITS IN THE GLOBAL Z DIR.  0   ***
***                                                                                     ***
***  NUMBER OF MIXTURES USED               7      USE A GLOBAL REFLECTOR          YES   ***
***                                                                                     ***
***  NUMBER OF BIAS ID'S USED              1      USE NESTED HOLES                YES   ***
***                                                                                     ***
***  NUMBER OF DIFFERENTIAL ALBEDOS USED   0      NUMBER OF HOLES                  17   ***
***                                                                                     ***
***  TOTAL INPUT GEOMETRY REGIONS         58      MAXIMUM HOLE NESTING LEVEL        2   ***
***                                                                                     ***
***  NUMBER OF GEOMETRY REGIONS USED      58      USE NESTED ARRAYS               YES   ***
***                                                                                     ***
***  LARGEST GEOMETRY UNIT NUMBER        111      NUMBER OF ARRAYS USED             4   ***
***                                                                                     ***
***  LARGEST ARRAY NUMBER                  4      MAXIMUM ARRAY NESTING LEVEL       2   ***
***                                                                                     ***
***                                                                                     ***
***  +X BOUNDARY CONDITION               MIR      -X BOUNDARY CONDITION           MIR   ***
***                                                                                     ***
***  +Y BOUNDARY CONDITION               MIR      -Y BOUNDARY CONDITION           MIR   ***
***                                                                                     ***
***  +Z BOUNDARY CONDITION               MIR      -Z BOUNDARY CONDITION           MIR   ***
***                                                                                     ***
*******************************************************************************************
```

```
****** SPACE AND SUPERGROUP INFORMATION ******

100000 WORDS IS THE TOTAL SPACE AVAILABLE.

 37327 WORDS WERE USED FOR NON-SUPERGROUP STORAGE.

 62673 WORDS OF STORAGE ARE AVAILABLE FOR SUPERGROUPED DATA.

 99750 WORDS OF STORAGE ARE AVAILABLE FOR CONSTRUCTING THE SUPERGROUPS.

 62613 WORDS OF STORAGE ARE AVAILABLE TO EACH SUPERGROUP.

   958 WORDS ARE NEEDED FOR THE LARGEST GROUP.

 38501 WORDS OF STORAGE IS SUFFICIENT TO RUN THIS PROBLEM.

 48151 WORDS OF STORAGE WILL ALLOW THE PROBLEM TO RUN WITH ONE SUPERGROUP.

 48288 WORDS OF STORAGE WILL BE USED TO RUN THIS PROBLEM.
```

SUPERGROUP	STARTING GROUP	ENDING GROUP	XSEC LENGTH	ALBEDO LENGTH	TOTAL LENGTH
1	1	27	2124	0	10764

.... 0 IO'S WERE USED IN SUPERGROUPING ....

ARRAY NUMBER	UNITS IN X DIR.	UNITS IN Y DIR.	UNITS IN Z DIR.	NESTING LEVEL
1	1	20	1	2
2	2	1	1	1
3	3	1	1	1
4	2	1	1	1

.... 0 IO'S WERE USED LOADING THE DATA ....

```
                   MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION              NUM   ID

                                                    -----   UNIT     1   -----

AL PLATE CELL

  1 CUBOID            2   1      +X =  3.1250    -X = -3.1250     +Y = 0.12700      -Y =-0.12700      +Z =  10.000      -Z = -10.000

                                                    -----   UNIT     2   -----

HFBR FUEL PLATE CELL 1

  1 CUBOID            1   1      +X =  2.8600    -X = -2.8600     +Y = 2.65000E-02 -Y =-2.65000E-02 +Z =  10.000      -Z = -10.000
  2 CUBOID            2   1      +X =  3.1250    -X = -3.1250     +Y = 6.35000E-02 -Y =-6.35000E-02 +Z =  10.000      -Z = -10.000
  3 CUBOID            3   1      +X =  3.1250    -X = -3.1250     +Y = 0.22860      -Y =-0.22860      +Z =  10.000      -Z = -10.000

                                                    -----   UNIT     3   -----

HFBR FUEL PLATE CELL 2

  1 CUBOID            1   1      +X =  2.8600    -X = -2.8600     +Y = 2.65000E-02 -Y =-2.65000E-02 +Z =  10.000      -Z = -10.000
  2 CUBOID            2   1      +X =  3.1250    -X = -3.1250     +Y = 6.35000E-02 -Y =-6.35000E-02 +Z =  10.000      -Z = -10.000
  3 CUBOID            3   1      +X =  3.1250    -X = -3.1250     +Y = 0.22860      -Y =-0.22860      +Z =  10.000      -Z = -10.000

                                                    -----   UNIT     4   -----

HFBR FUEL PLATE CELL 3

  1 CUBOID            1   1      +X =  2.8600    -X = -2.8600     +Y = 2.65000E-02 -Y =-2.65000E-02 +Z =  10.000      -Z = -10.000
  2 CUBOID            2   1      +X =  3.1250    -X = -3.1250     +Y = 6.35000E-02 -Y =-6.35000E-02 +Z =  10.000      -Z = -10.000
  3 CUBOID            3   1      +X =  3.1250    -X = -3.1250     +Y = 0.22860      -Y =-0.22860      +Z =  10.000      -Z = -10.000

                                                    -----   UNIT     5   -----

HFBR FUEL PLATE CELL 4

  1 CUBOID            1   1      +X =  2.8600    -X = -2.8600     +Y = 2.65000E-02 -Y =-2.65000E-02 +Z =  10.000      -Z = -10.000
  2 CUBOID            2   1      +X =  3.1250    -X = -3.1250     +Y = 6.35000E-02 -Y =-6.35000E-02 +Z =  10.000      -Z = -10.000
  3 CUBOID            3   1      +X =  3.1250    -X = -3.1250     +Y = 0.22860      -Y =-0.22860      +Z =  10.000      -Z = -10.000
```

```
                  MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION             NUM   ID

                                                  -----  UNIT     6   -----

HFBR FUEL PLATE CELL 5

  1 CUBOID            1  1      +X =  2.8600     -X = -2.8600     +Y = 2.65000E-02 -Y =-2.65000E-02 +Z =  10.000     -Z = -10.000

  2 CUBOID            2  1      +X =  3.1250     -X = -3.1250     +Y = 6.35000E-02 -Y =-6.35000E-02 +Z =  10.000     -Z = -10.000

  3 CUBOID            3  1      +X =  3.1250     -X = -3.1250     +Y = 0.22860     -Y =-0.22860     +Z =  10.000     -Z = -10.000

                                                  -----  UNIT     7   -----

HFBR FUEL PLATE CELL 6

  1 CUBOID            1  1      +X =  2.8600     -X = -2.8600     +Y = 2.65000E-02 -Y =-2.65000E-02 +Z =  10.000     -Z = -10.000

  2 CUBOID            2  1      +X =  3.1250     -X = -3.1250     +Y = 6.35000E-02 -Y =-6.35000E-02 +Z =  10.000     -Z = -10.000

  3 CUBOID            3  1      +X =  3.1250     -X = -3.1250     +Y = 0.22860     -Y =-0.22860     +Z =  10.000     -Z = -10.000

                                                  -----  UNIT     8   -----

HFBR FUEL PLATE CELL 7

  1 CUBOID            1  1      +X =  2.8600     -X = -2.8600     +Y = 2.65000E-02 -Y =-2.65000E-02 +Z =  10.000     -Z = -10.000

  2 CUBOID            2  1      +X =  3.1250     -X = -3.1250     +Y = 6.35000E-02 -Y =-6.35000E-02 +Z =  10.000     -Z = -10.000

  3 CUBOID            3  1      +X =  3.1250     -X = -3.1250     +Y = 0.22860     -Y =-0.22860     +Z =  10.000     -Z = -10.000

                                          -----  UNIT    10  EXTERNAL TO LATTICE  1   -----

HFBR FUEL ARRAY WITH HALF OF 1/4 PLATE ON RIGHT -  TOP STACK

  1 ARRAY NUMBER      1         +X =  3.8935     -X = -2.3565     +Y =  4.3688     -Y = -4.3688     +Z =  10.000     -Z = -10.000

  2 CUBOID            3  1      +X =  4.3688     -X = -4.3688     +Y =  4.3688     -Y = -4.3688     +Z =  10.000     -Z = -10.000

    HOLE NUMBER       7       AT X = -4.1312      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER     81

    HOLE NUMBER       8       AT X =  4.1312      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER     83

  3 CUBOID            5  1      +X =  4.6736     -X = -4.3688     +Y =  4.3688     -Y = -4.3688     +Z =  10.000     -Z = -10.000
```

```
                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                ----- UNIT    11  EXTERNAL TO LATTICE  1   -----

HFBR FUEL WITH HALF OF 1/4 IN. PLATE ON LEFT  TOP STACK

  1 ARRAY NUMBER     1          +X =  2.3565    -X = -3.8935    +Y =  4.3688    -Y = -4.3688    +Z =  10.000    -Z = -10.000

  2 CUBOID           3  1       +X =  4.3688    -X = -4.3688    +Y =  4.3688    -Y = -4.3688    +Z =  10.000    -Z = -10.000

    HOLE NUMBER     11       AT X = -4.1312     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER    81

    HOLE NUMBER     12       AT X =  4.1312     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER    83

  3 CUBOID           5  1       +X =  4.3688    -X = -4.6736    +Y =  4.3688    -Y = -4.3688    +Z =  10.000    -Z = -10.000

                                ----- UNIT    12  EXTERNAL TO LATTICE  2   -----

2 UNIT ARRAY WITH 0.120 IN. PLATE ON TOP AND SIDES

  1 ARRAY NUMBER     2          +X =  9.0420    -X = -9.0428    +Y =  4.3688    -Y = -4.3688    +Z =  10.000    -Z = -10.000

  2 CUBOID           5  1       +X =  9.3468    -X = -9.3476    +Y =  4.6736    -Y = -4.3688    +Z =  10.000    -Z = -10.000

                                ----- UNIT    13  EXTERNAL TO LATTICE  3   -----

3 UNIT ARRAY WITH REST OF 5/16 WEB

  1 ARRAY NUMBER     3          +X =  14.173    -X = -14.174    +Y =  4.3688    -Y = -4.3688    +Z =  10.000    -Z = -10.000

  2 CUBOID           5  1       +X =  14.528    -X = -14.529    +Y =  5.0800    -Y = -5.0800    +Z =  10.000    -Z = -10.000

                                ----- UNIT    14  EXTERNAL TO LATTICE  4   -----

2 UNIT ARRAY WITH 0.120 IN. PLATE ON BOTTOM AND SIDES

  1 ARRAY NUMBER     4          +X =  9.0420    -X = -9.0428    +Y =  4.3688    -Y = -4.3688    +Z =  10.000    -Z = -10.000

  2 CUBOID           5  1       +X =  9.3468    -X = -9.3476    +Y =  4.3688    -Y = -4.6736    +Z =  10.000    -Z = -10.000
```

```
                   MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION              NUM   ID

                                              ******************   GLOBAL   *****************
                                                           -----   UNIT    15    -----

7 HFBR ASSEMBLIES IN THE LWT

  1 CYLINDER        3   1  RADIUS =  17.050     +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

    HOLE NUMBER    15        AT X = 0.00000      Y =  9.4489      Z = 0.00000     IS UNIT NUMBER     12

    HOLE NUMBER    16        AT X = 0.00000      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER     13

    HOLE NUMBER    17        AT X = 0.00000      Y = -9.4489      Z = 0.00000     IS UNIT NUMBER     14

  2 CYLINDER        5   1  RADIUS =  18.891     +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  3 CYLINDER        6   1  RADIUS =  33.496     +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  4 CYLINDER        5   1  RADIUS =  36.544     +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  5 CYLINDER        8   1  RADIUS =  49.244     +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  6 CYLINDER        5   1  RADIUS =  49.854     +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  7 CUBOID          7   1       +X =  49.854     -X = -49.854     +Y =  49.854     -Y = -49.854      +Z =  10.000     -Z = -10.000

                                                           -----   UNIT    81    -----

  1 CUBOID          2   1       +X = 0.23750     -X =-0.23750     +Y =  4.1000     -Y = -4.1000      +Z =  10.000     -Z = -10.000

                                                           -----   UNIT    83    -----

  1 CUBOID          2   1       +X = 0.23750     -X =-0.23750     +Y =  4.1000     -Y = -4.1000      +Z =  10.000     -Z = -10.000

                                              -----   UNIT    90   EXTERNAL TO LATTICE  1   -----

HFBR FUEL ARRAY 20 PLATES IN 5/16 IN. WEB CENTER

  1 ARRAY NUMBER    1           +X =  3.1250     -X = -3.1250     +Y =  4.3688     -Y = -4.3688      +Z =  10.000     -Z = -10.000

  2 CUBOID          3   1       +X =  4.3688     -X = -4.3688     +Y =  4.3688     -Y = -4.3688      +Z =  10.000     -Z = -10.000

    HOLE NUMBER     1        AT X = -4.1312      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER     81

    HOLE NUMBER     2        AT X =  4.1312      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER     83

  3 CUBOID          5   1       +X =  4.7244     -X = -4.7244     +Y =  4.3688     -Y = -4.3688      +Z =  10.000     -Z = -10.000
```

```
                  MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                 -----   UNIT    91  EXTERNAL TO LATTICE  1   -----

HFBR FUEL ARRAY 20 PLATES IN 5/16 IN. WEB RIGHT

  1 ARRAY NUMBER      1          +X =  2.3565     -X = -3.8935     +Y =  4.3688     -Y = -4.3688     +Z =  10.000     -Z = -10.000
  2 CUBOID            3   1      +X =  4.3688     -X = -4.3688     +Y =  4.3688     -Y = -4.3688     +Z =  10.000     -Z = -10.000
    HOLE NUMBER       3       AT X = -4.1312       Y = 0.00000       Z = 0.00000     IS UNIT NUMBER    81
    HOLE NUMBER       4       AT X =  4.1312       Y = 0.00000       Z = 0.00000     IS UNIT NUMBER    83
  3 CUBOID            5   1      +X =  4.7244     -X = -4.7244     +Y =  4.3688     -Y = -4.3688     +Z =  10.000     -Z = -10.000

                                 -----   UNIT    92  EXTERNAL TO LATTICE  1   -----

HFBR FUEL ARRAY 20 PLATES IN 5/16 IN. WEB LEFT

  1 ARRAY NUMBER      1          +X =  3.8935     -X = -2.3565     +Y =  4.3688     -Y = -4.3688     +Z =  10.000     -Z = -10.000
  2 CUBOID            3   1      +X =  4.3688     -X = -4.3688     +Y =  4.3688     -Y = -4.3688     +Z =  10.000     -Z = -10.000
    HOLE NUMBER       5       AT X = -4.1312       Y = 0.00000       Z = 0.00000     IS UNIT NUMBER    81
    HOLE NUMBER       6       AT X =  4.1312       Y = 0.00000       Z = 0.00000     IS UNIT NUMBER    83
  3 CUBOID            5   1      +X =  4.7244     -X = -4.7244     +Y =  4.3688     -Y = -4.3688     +Z =  10.000     -Z = -10.000

                                 -----   UNIT   101  EXTERNAL TO LATTICE  1   -----

HFBR FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON RIGHT -  BOTTOM STACK

  1 ARRAY NUMBER      1          +X =  3.8935     -X = -2.3565     +Y =  4.3688     -Y = -4.3688     +Z =  10.000     -Z = -10.000
  2 CUBOID            3   1      +X =  4.3688     -X = -4.3688     +Y =  4.3688     -Y = -4.3688     +Z =  10.000     -Z = -10.000
    HOLE NUMBER       9       AT X = -4.1312       Y = 0.00000       Z = 0.00000     IS UNIT NUMBER    81
    HOLE NUMBER      10       AT X =  4.1312       Y = 0.00000       Z = 0.00000     IS UNIT NUMBER    83
  3 CUBOID            5   1      +X =  4.6736     -X = -4.3688     +Y =  4.3688     -Y = -4.3688     +Z =  10.000     -Z = -10.000
                                 -----   UNIT   111  EXTERNAL TO LATTICE  1   -----

HFBR FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON LEFT - BOTTOM STACK

  1 ARRAY NUMBER      1          +X =  2.3565     -X = -3.8935     +Y =  4.3688     -Y = -4.3688     +Z =  10.000     -Z = -10.000
  2 CUBOID            3   1      +X =  4.3688     -X = -4.3688     +Y =  4.3688     -Y = -4.3688     +Z =  10.000     -Z = -10.000
    HOLE NUMBER      13       AT X = -4.1312       Y = 0.00000       Z = 0.00000     IS UNIT NUMBER    81
    HOLE NUMBER      14       AT X =  4.1312       Y = 0.00000       Z = 0.00000     IS UNIT NUMBER    83
  3 CUBOID            5   1      +X =  4.3688     -X = -4.6736     +Y =  4.3688     -Y = -4.3688     +Z =  10.000     -Z = -10.000
```

```
                  -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY    1          -------
Z LAYER    1, X COLUMN    1 TO    1 LEFT TO RIGHT    Y ROW    1 TO   20  BOTTOM TO TOP
 1
 2
 3
 4
 5
 5
 5
 5
 5
 5
 5
 5
 5
 5
 5
 5
 6
 7
 8
 1
                  -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY    2          -------
Z LAYER    1, X COLUMN    1 TO    2 LEFT TO RIGHT    Y ROW    1 TO    1  BOTTOM TO TOP
 10 11
                  -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY    3          -------
Z LAYER    1, X COLUMN    1 TO    3 LEFT TO RIGHT    Y ROW    1 TO    1  BOTTOM TO TOP
 92 90 91
                  -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY    4          -------
Z LAYER    1, X COLUMN    1 TO    2 LEFT TO RIGHT    Y ROW    1 TO    1  BOTTOM TO TOP
 101 111
```

VOLUMES FOR THOSE UNITS UTILIZED IN THIS PROBLEM

UNIT	REGION	GEOMETRY REGION	VOLUME	CUMULATIVE VOLUME
1	1	1	3.17500E+01 CM**3	3.17500E+01 CM**3
2	1	2	6.06320E+00 CM**3	6.06320E+00 CM**3
	2	3	9.81180E+00 CM**3	1.58750E+01 CM**3
	3	4	4.12750E+01 CM**3	5.71500E+01 CM**3
3	1	5	6.06320E+00 CM**3	6.06320E+00 CM**3
	2	6	9.81180E+00 CM**3	1.58750E+01 CM**3
	3	7	4.12750E+01 CM**3	5.71500E+01 CM**3
4	1	8	6.06320E+00 CM**3	6.06320E+00 CM**3
	2	9	9.81180E+00 CM**3	1.58750E+01 CM**3
	3	10	4.12750E+01 CM**3	5.71500E+01 CM**3
5	1	11	6.06320E+00 CM**3	6.06320E+00 CM**3
	2	12	9.81180E+00 CM**3	1.58750E+01 CM**3
	3	13	4.12750E+01 CM**3	5.71500E+01 CM**3
6	1	14	6.06320E+00 CM**3	6.06320E+00 CM**3
	2	15	9.81180E+00 CM**3	1.58750E+01 CM**3
	3	16	4.12750E+01 CM**3	5.71500E+01 CM**3
7	1	17	6.06320E+00 CM**3	6.06320E+00 CM**3
	2	18	9.81180E+00 CM**3	1.58750E+01 CM**3
	3	19	4.12750E+01 CM**3	5.71500E+01 CM**3
8	1	20	6.06320E+00 CM**3	6.06320E+00 CM**3
	2	21	9.81180E+00 CM**3	1.58750E+01 CM**3
	3	22	4.12750E+01 CM**3	5.71500E+01 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 34 IS AN ARRAY PLACEMENT BOUNDARY REGION				
10	1	34	1.09220E+03 CM**3	1.09220E+03 CM**3
	2	35	2.78913E+02 CM**3	1.52691E+03 CM**3
	3	36	5.32644E+01 CM**3	1.58018E+03 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 40 IS AN ARRAY PLACEMENT BOUNDARY REGION				
11	1	40	1.09220E+03 CM**3	1.09220E+03 CM**3
	2	41	2.78913E+02 CM**3	1.52691E+03 CM**3
	3	42	5.32644E+01 CM**3	1.58018E+03 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 46 IS AN ARRAY PLACEMENT BOUNDARY REGION				
12	1	46	3.16036E+03 CM**3	3.16036E+03 CM**3
	2	47	2.20490E+02 CM**3	3.38085E+03 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 48 IS AN ARRAY PLACEMENT BOUNDARY REGION				
13	1	48	4.95359E+03 CM**3	4.95359E+03 CM**3
	2	49	9.50914E+02 CM**3	5.90450E+03 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 50 IS AN ARRAY PLACEMENT BOUNDARY REGION				
14	1	50	3.16036E+03 CM**3	3.16036E+03 CM**3
	2	51	2.20490E+02 CM**3	3.38085E+03 CM**3
15	1	52	5.59918E+03 CM**3	1.82654E+04 CM**3
	2	53	4.15813E+03 CM**3	2.24235E+04 CM**3
	3	54	4.80740E+04 CM**3	7.04975E+04 CM**3
	4	55	1.34136E+04 CM**3	8.39110E+04 CM**3
	5	56	6.84563E+04 CM**3	1.52367E+05 CM**3
	6	57	3.79567E+03 CM**3	1.56163E+05 CM**3
	7	58	4.26699E+04 CM**3	1.98833E+05 CM**3
81	1	23	7.79000E+01 CM**3	7.79000E+01 CM**3
83	1	24	7.79000E+01 CM**3	7.79000E+01 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 25 IS AN ARRAY PLACEMENT BOUNDARY REGION				
90	1	25	1.09220E+03 CM**3	1.09220E+03 CM**3
	2	26	2.78913E+02 CM**3	1.52691E+03 CM**3
	3	27	1.24284E+02 CM**3	1.65120E+03 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 28 IS AN ARRAY PLACEMENT BOUNDARY REGION				
91	1	28	1.09220E+03 CM**3	1.09220E+03 CM**3
	2	29	2.78913E+02 CM**3	1.52691E+03 CM**3
	3	30	1.24284E+02 CM**3	1.65120E+03 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 31 IS AN ARRAY PLACEMENT BOUNDARY REGION				
92	1	31	1.09220E+03 CM**3	1.09220E+03 CM**3
	2	32	2.78913E+02 CM**3	1.52691E+03 CM**3
	3	33	1.24284E+02 CM**3	1.65120E+03 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 37 IS AN ARRAY PLACEMENT BOUNDARY REGION				
101	1	37	1.09220E+03 CM**3	1.09220E+03 CM**3
	2	38	2.78913E+02 CM**3	1.52691E+03 CM**3
	3	39	5.32644E+01 CM**3	1.58018E+03 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 43 IS AN ARRAY PLACEMENT BOUNDARY REGION				

111	1	43	1.09220E+03 CM**3	1.09220E+03 CM**3
	2	44	2.78913E+02 CM**3	1.52691E+03 CM**3
	3	45	5.32644E+01 CM**3	1.58018E+03 CM**3

UNIT	USES	REGION	MIXTURE	TOTAL VOLUME
1	14	1	2	4.44500E+02 CM**3
2	7	1	1	4.24424E+01 CM**3
		2	2	6.86826E+01 CM**3
		3	3	2.88925E+02 CM**3
3	7	1	1	4.24424E+01 CM**3
		2	2	6.86826E+01 CM**3
		3	3	2.88925E+02 CM**3
4	7	1	1	4.24424E+01 CM**3
		2	2	6.86826E+01 CM**3
		3	3	2.88925E+02 CM**3
5	84	1	1	5.09309E+02 CM**3
		2	2	8.24191E+02 CM**3
		3	3	3.46710E+03 CM**3
6	7	1	1	4.24424E+01 CM**3
		2	2	6.86826E+01 CM**3
		3	3	2.68925E+02 CM**3
7	7	1	1	4.24424E+01 CM**3
		2	2	6.86826E+01 CM**3
		3	3	2.88925E+02 CM**3
8	7	1	1	4.24424E+01 CM**3
		2	2	6.86826E+01 CM**3
		3	3	2.88925E+02 CM**3
10	1	1		1.09220E+03 CM**3
		2	3	2.78913E+02 CM**3
		3	5	5.32644E+01 CM**3
11	1	1		1.09220E+03 CM**3
		2	3	2.78913E+02 CM**3
		3	5	5.32644E+01 CM**3
12	1	1		3.16036E+03 CM**3
		2	5	2.20490E+02 CM**3
13	1	1		4.95359E+03 CM**3
		2	5	9.50914E+02 CM**3
14	1	1		3.16036E+03 CM**3
		2	5	2.20490E+02 CM**3
15	1	1	3	5.59918E+03 CM**3
		2	5	4.15813E+03 CM**3
		3	6	4.80740E+04 CM**3
		4	5	1.34136E+04 CM**3
		5	8	6.84563E+04 CM**3
		6	5	3.79567E+03 CM**3
		7	7	4.26699E+04 CM**3
81	7	1	2	5.45300E+02 CM**3
83	7	1	2	5.45300E+02 CM**3
90	1	1		1.09220E+03 CM**3
		2	3	2.78913E+02 CM**3
		3	5	1.24284E+02 CM**3
91	1	1		1.09220E+03 CM**3
		2	3	2.76913E+02 CM**3
		3	5	1.24284E+02 CM**3
92	1	1		1.09220E+03 CM**3
		2	3	2.78913E+02 CM**3
		3	5	1.24284E+02 CM**3
101	1	1		1.09220E+03 CM**3
		2	3	2.78913E+02 CM**3
		3	5	5.32644E+01 CM**3
111	1	1		1.09220E+03 CM**3
		2	3	2.78913E+02 CM**3
		3	5	5.32644E+01 CM**3

TOTAL MIXTURE VOLUMES

MIXTURE	TOTAL VOLUME	MASS (G)
1	7.63963E+02 CM**3	3.05153E+03
2	2.77139E+03 CM**3	7.48828E+03
3	1.27522E+04 CM**3	1.27289E+04
5	2.33452E+04 CM**3	1.84894E+05
6	4.80740E+04 CM**3	5.45351E+05
7	4.26699E+04 CM**3	4.25919E-16
8	6.84563E+04 CM**3	6.83311E-16

```
****************************************************************************************************
***                                                                                              ***
***                                     BIASING INFORMATION                                      ***
***                                                                                              ***
***    A DEFAULT WEIGHT OF    0.500 WILL BE USED FOR ALL BIAS ID'S.                              ***
***                                                                                              ***
****************************************************************************************************
```

```
........     0 IO'S WERE USED IN KENO-V BEFORE TRACKING        ........

                                ........  0.02017 MINUTES WERE USED PROCESSING DATA.        ........

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 6.03151E-02

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED WITH A FLAT DISTRIBUTION IN A CUBOID DEFINED BY:
             +X= 4.98539E+01  -X=-4.98539E+01  +Y= 4.98539E+01  -Y=-4.98539E+01  +Z= 1.00000E+01  -Z=-1.00000E+01
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

0.38617 MINUTES WERE REQUIRED FOR STARTING.   TOTAL ELAPSED TIME IS 0.40533 MINUTES.
```

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	770 INDEPENDENT	FISSION POINTS WERE	GENERATED	
1	8.64733E-01	4.39500E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	9.07119E-01	4.72500E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	773 INDEPENDENT	FISSION POINTS WERE	GENERATED	
3	8.54140E-01	5.05333E-01	8.54140E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	9.38616E-01	5.37333E-01	8.96378E-01	4.22379E-02	0.00000E+00	0.00000E+00
5	9.22249E-01	5.69500E-01	9.05002E-01	2.58659E-02	0.00000E+00	0.00000E+00
6	8.79528E-01	6.01500E-01	8.98633E-01	1.93669E-02	0.00000E+00	0.00000E+00
7	8.98732E-01	6.34500E-01	8.98653E-01	1.50016E-02	0.00000E+00	0.00000E+00
8	9.11786E-01	6.67333E-01	9.00842E-01	1.24428E-02	0.00000E+00	0.00000E+00
9	8.87381E-01	6.99500E-01	8.98919E-01	1.06904E-02	0.00000E+00	0.00000E+00
10	9.20980E-01	7.30500E-01	9.01676E-01	9.66016E-03	0.00000E+00	0.00000E+00
11	8.91180E-01	7.62667E-01	9.00510E-01	8.59892E-03	0.00000E+00	0.00000E+00
12	9.06228E-01	7.93667E-01	9.01082E-01	7.71233E-03	0.00000E+00	0.00000E+00
13	9.05461E-01	8.25833E-01	9.01480E-01	6.98741E-03	0.00000E+00	0.00000E+00
14	8.42803E-01	8.58667E-01	8.96590E-01	8.03718E-03	0.00000E+00	0.00000E+00
15	9.41479E-01	8.89833E-01	9.00043E-01	8.15975E-03	0.00000E+00	0.00000E+00
16	8.65977E-01	9.21833E-01	8.97610E-01	7.93666E-03	0.00000E+00	0.00000E+00
17	8.83131E-01	9.55833E-01	8.96645E-01	7.45142E-03	0.00000E+00	0.00000E+00
18	8.92163E-01	9.87833E-01	8.96365E-01	6.97579E-03	0.00000E+00	0.00000E+00
19	9.28505E-01	1.01983E+00	8.98255E-01	6.81991E-03	0.00000E+00	0.00000E+00
20	9.26201E-01	1.05283E+00	8.99808E-01	6.61465E-03	0.00000E+00	0.00000E+00
21	8.97280E-01	1.08583E+00	8.99675E-01	6.25825E-03	0.00000E+00	0.00000E+00
22	9.39284E-01	1.11683E+00	9.01655E-01	6.25871E-03	0.00000E+00	0.00000E+00
23	9.00410E-01	1.14900E+00	9.01596E-01	5.95351E-03	0.00000E+00	0.00000E+00
24	9.47855E-01	1.18100E+00	9.03699E-01	6.05338E-03	0.00000E+00	0.00000E+00
25	8.96969E-01	1.21300E+00	9.03406E-01	5.79160E-03	0.00000E+00	0.00000E+00
26	9.50013E-01	1.24500E+00	9.05348E-01	5.87526E-03	0.00000E+00	0.00000E+00
27	8.87597E-01	1.27700E+00	9.04638E-01	5.67990E-03	0.00000E+00	0.00000E+00
28	8.42086E-01	1.31000E+00	9.02232E-01	5.96387E-03	0.00000E+00	0.00000E+00
29	9.09686E-01	1.34017E+00	9.02508E-01	5.74538E-03	0.00000E+00	0.00000E+00
30	9.01398E-01	1.37133E+00	9.02468E-01	5.53653E-03	0.00000E+00	0.00000E+00
31	9.13198E-01	1.40433E+00	9.02838E-01	5.35500E-03	0.00000E+00	0.00000E+00
32	9.38927E-01	1.43633E+00	9.04041E-01	5.31143E-03	0.00000E+00	0.00000E+00
33	8.62382E-01	1.47017E+00	9.02698E-01	5.31010E-03	0.00000E+00	0.00000E+00
34	8.79410E-01	1.50233E+00	9.01970E-01	5.19273E-03	0.00000E+00	0.00000E+00
35	8.92716E-01	1.53433E+00	9.01689E-01	5.04072E-03	0.00000E+00	0.00000E+00
36	8.98063E-01	1.56733E+00	9.01583E-01	4.89138E-03	0.00000E+00	0.00000E+00
37	8.71316E-01	1.60117E+00	9.00718E-01	4.82766E-03	0.00000E+00	0.00000E+00
38	9.11996E-01	1.63317E+00	9.01031E-01	4.70209E-03	0.00000E+00	0.00000E+00
39	9.15148E-01	1.66617E+00	9.01413E-01	4.58913E-03	0.00000E+00	0.00000E+00
40	8.98372E-01	1.69817E+00	9.01333E-01	4.46744E-03	0.00000E+00	0.00000E+00
41	8.70585E-01	1.73017E+00	9.00544E-01	4.42223E-03	0.00000E+00	0.00000E+00
42	9.05086E-01	1.76233E+00	9.00658E-01	4.31175E-03	0.00000E+00	0.00000E+00
43	8.90824E-01	1.79333E+00	9.00418E-01	4.21211E-03	0.00000E+00	0.00000E+00
44	9.25132E-01	1.82633E+00	9.01006E-01	4.15250E-03	0.00000E+00	0.00000E+00
45	8.42242E-01	1.85933E+00	8.99640E-01	4.27889E-03	0.00000E+00	0.00000E+00
46	9.37250E-01	1.88950E+00	9.00495E-01	4.26700E-03	0.00000E+00	0.00000E+00
47	8.61176E-01	1.92250E+00	8.99621E-01	4.26164E-03	0.00000E+00	0.00000E+00
48	9.01697E-01	1.95450E+00	8.99666E-01	4.16821E-03	0.00000E+00	0.00000E+00
49	8.79237E-01	1.98650E+00	8.99231E-01	4.10165E-03	0.00000E+00	0.00000E+00
50	8.96693E-01	2.01850E+00	8.99178E-01	4.01564E-03	0.00000E+00	0.00000E+00
51	8.91902E-01	2.05067E+00	8.99030E-01	3.93564E-03	0.00000E+00	0.00000E+00
52	9.47823E-01	2.08350E+00	9.00006E-01	3.97768E-03	0.00000E+00	0.00000E+00
53	9.14853E-01	2.11567E+00	9.00297E-01	3.90976E-03	0.00000E+00	0.00000E+00
54	9.02976E-01	2.14767E+00	9.00348E-01	3.83419E-03	0.00000E+00	0.00000E+00
55	9.32633E-01	2.18067E+00	9.00958E-01	3.81015E-03	0.00000E+00	0.00000E+00
56	8.62429E-01	2.21350E+00	9.00244E-01	3.80640E-03	0.00000E+00	0.00000E+00
57	8.78213E-01	2.24567E+00	8.99844E-01	3.75796E-03	0.00000E+00	0.00000E+00
58	9.29361E-01	2.27667E+00	9.00371E-01	3.72770E-03	0.00000E+00	0.00000E+00
59	9.52866E-01	2.30700E+00	9.01292E-01	3.77575E-03	0.00000E+00	0.00000E+00
60	9.43472E-01	2.33800E+00	9.02019E-01	3.78069E-03	0.00000E+00	0.00000E+00
61	8.91892E-01	2.37100E+00	9.01847E-01	3.72002E-03	0.00000E+00	0.00000E+00
62	9.24170E-01	2.40300E+00	9.02219E-01	3.67637E-03	0.00000E+00	0.00000E+00
63	8.90868E-01	2.43517E+00	9.02033E-01	3.62038E-03	0.00000E+00	0.00000E+00
64	8.44533E-01	2.46800E+00	9.01106E-01	3.68028E-03	0.00000E+00	0.00000E+00
65	9.19200E-01	2.50017E+00	9.01393E-01	3.63276E-03	0.00000E+00	0.00000E+00
66	8.68369E-01	2.53217E+00	9.00877E-01	3.61259E-03	0.00000E+00	0.00000E+00
67	8.64434E-01	2.56500E+00	9.00316E-01	3.60050E-03	0.00000E+00	0.00000E+00
68	8.77680E-01	2.59800E+00	8.99973E-01	3.56208E-03	0.00000E+00	0.00000E+00
69	9.24317E-01	2.63000E+00	9.00337E-01	3.52727E-03	0.00000E+00	0.00000E+00
70	9.11875E-01	2.66300E+00	9.00506E-01	3.47915E-03	0.00000E+00	0.00000E+00
71	9.00279E-01	2.69417E+00	9.00503E-01	3.42836E-03	0.00000E+00	0.00000E+00
72	9.37083E-01	2.72533E+00	9.01026E-01	3.41920E-03	0.00000E+00	0.00000E+00
73	8.71049E-01	2.75817E+00	9.00603E-01	3.39704E-03	0.00000E+00	0.00000E+00
74	8.95938E-01	2.79033E+00	9.00539E-01	3.35015E-03	0.00000E+00	0.00000E+00
75	8.91734E-01	2.82317E+00	9.00418E-01	3.30614E-03	0.00000E+00	0.00000E+00
76	9.07962E-01	2.85533E+00	9.00520E-01	3.26275E-03	0.00000E+00	0.00000E+00

77	9.00078E-01	2.88817E+00	9.00514E-01	3.21896E-03	0.00000E+00	0.00000E+00
78	9.26636E-01	2.91933E+00	9.00858E-01	3.19486E-03	0.00000E+00	0.00000E+00
79	9.14409E-01	2.95133E+00	9.01034E-01	3.15801E-03	0.00000E+00	0.00000E+00
80	8.93065E-01	2.98250E+00	9.00932E-01	3.11893E-03	0.00000E+00	0.00000E+00
81	9.39654E-01	3.01550E+00	9.01422E-01	3.11796E-03	0.00000E+00	0.00000E+00
82	8.68000E-01	3.04933E+00	9.01004E-01	3.10696E-03	0.00000E+00	0.00000E+00
83	8.77484E-01	3.08233E+00	9.00714E-01	3.08207E-03	0.00000E+00	0.00000E+00
84	9.09180E-01	3.11433E+00	9.00817E-01	3.04600E-03	0.00000E+00	0.00000E+00
85	8.63521E-01	3.14733E+00	9.00368E-01	3.04244E-03	0.00000E+00	0.00000E+00
86	9.10772E-01	3.18017E+00	9.00491E-01	3.00856E-03	0.00000E+00	0.00000E+00
87	8.64429E-01	3.21233E+00	9.00067E-01	3.00307E-03	0.00000E+00	0.00000E+00
88	9.44313E-01	3.24333E+00	9.00582E-01	3.01221E-03	0.00000E+00	0.00000E+00
89	9.37499E-01	3.27450E+00	9.01006E-01	3.00747E-03	0.00000E+00	0.00000E+00
90	8.76265E-01	3.30650E+00	9.00725E-01	2.98636E-03	0.00000E+00	0.00000E+00
91	8.53479E-01	3.33767E+00	9.00194E-01	2.99996E-03	0.00000E+00	0.00000E+00
92	8.75077E-01	3.36883E+00	8.99915E-01	2.97954E-03	0.00000E+00	0.00000E+00
93	9.21511E-01	3.40083E+00	9.00152E-01	2.95616E-03	0.00000E+00	0.00000E+00
94	8.75884E-01	3.43383E+00	8.99888E-01	2.93572E-03	0.00000E+00	0.00000E+00
95	9.73236E-01	3.46500E+00	9.00677E-01	3.00918E-03	0.00000E+00	0.00000E+00
96	8.90701E-01	3.49783E+00	9.00571E-01	2.97888E-03	0.00000E+00	0.00000E+00
97	8.76098E-01	3.53000E+00	9.00313E-01	2.95860E-03	0.00000E+00	0.00000E+00
98	9.14973E-01	3.56283E+00	9.00466E-01	2.93160E-03	0.00000E+00	0.00000E+00
99	8.94076E-01	3.59500E+00	9.00400E-01	2.90196E-03	0.00000E+00	0.00000E+00
100	8.91300E-01	3.62700E+00	9.00307E-01	2.87370E-03	0.00000E+00	0.00000E+00
101	9.34534E-01	3.65900E+00	9.00653E-01	2.86546E-03	0.00000E+00	0.00000E+00
102	9.36717E-01	3.69017E+00	9.01014E-01	2.85949E-03	0.00000E+00	0.00000E+00
103	8.92327E-01	3.72317E+00	9.00928E-01	2.83234E-03	0.00000E+00	0.00000E+00
104	8.66639E-01	3.75600E+00	9.00592E-01	2.82451E-03	0.00000E+00	0.00000E+00
105	9.69759E-01	3.78817E+00	9.01263E-01	2.87644E-03	0.00000E+00	0.00000E+00
106	9.43452E-01	3.81833E+00	9.01669E-01	2.87739E-03	0.00000E+00	0.00000E+00
107	8.76250E-01	3.85133E+00	9.01427E-01	2.86012E-03	0.00000E+00	0.00000E+00
108	9.13006E-01	3.88417E+00	9.01536E-01	2.83511E-03	0.00000E+00	0.00000E+00
109	8.85045E-01	3.91617E+00	9.01382E-01	2.81272E-03	0.00000E+00	0.00000E+00
110	8.93914E-01	3.94917E+00	9.01313E-01	2.78741E-03	0.00000E+00	0.00000E+00
111	9.25573E-01	3.98117E+00	9.01535E-01	2.77067E-03	0.00000E+00	0.00000E+00
112	8.95593E-01	4.01333E+00	9.01481E-01	2.74590E-03	0.00000E+00	0.00000E+00
113	8.69591E-01	4.04617E+00	9.01194E-01	2.73617E-03	0.00000E+00	0.00000E+00
114	8.97932E-01	4.07833E+00	9.01165E-01	2.71179E-03	0.00000E+00	0.00000E+00
115	8.74422E-01	4.11217E+00	9.00928E-01	2.69808E-03	0.00000E+00	0.00000E+00
116	8.98152E-01	4.14417E+00	9.00904E-01	2.67442E-03	0.00000E+00	0.00000E+00
117	8.69339E-01	4.17717E+00	9.00629E-01	2.66524E-03	0.00000E+00	0.00000E+00
118	9.22756E-01	4.20733E+00	9.00820E-01	2.64904E-03	0.00000E+00	0.00000E+00
119	9.30999E-01	4.23850E+00	9.01078E-01	2.63893E-03	0.00000E+00	0.00000E+00
120	9.49007E-01	4.26967E+00	9.01484E-01	2.64781E-03	0.00000E+00	0.00000E+00
121	9.04560E-01	4.30167E+00	9.01510E-01	2.62560E-03	0.00000E+00	0.00000E+00
122	9.66280E-01	4.33183E+00	9.02050E-01	2.65898E-03	0.00000E+00	0.00000E+00
123	8.53077E-01	4.36383E+00	9.01645E-01	2.66780E-03	0.00000E+00	0.00000E+00
124	9.58663E-01	4.39500E+00	9.02112E-01	2.68680E-03	0.00000E+00	0.00000E+00
125	8.70734E-01	4.42700E+00	9.01857E-01	2.67705E-03	0.00000E+00	0.00000E+00
126	9.45178E-01	4.45817E+00	9.02207E-01	2.67826E-03	0.00000E+00	0.00000E+00
127	9.16217E-01	4.49017E+00	9.02319E-01	2.65911E-03	0.00000E+00	0.00000E+00
128	9.42022E-01	4.52133E+00	9.02634E-01	2.65667E-03	0.00000E+00	0.00000E+00
129	9.05724E-01	4.55433E+00	9.02658E-01	2.63578E-03	0.00000E+00	0.00000E+00
130	8.73590E-01	4.58550E+00	9.02431E-01	2.62495E-03	0.00000E+00	0.00000E+00
131	9.25854E-01	4.61650E+00	9.02613E-01	2.61084E-03	0.00000E+00	0.00000E+00
132	8.99176E-01	4.64950E+00	9.02586E-01	2.59082E-03	0.00000E+00	0.00000E+00
133	9.47677E-01	4.68150E+00	9.02930E-01	2.59390E-03	0.00000E+00	0.00000E+00
134	8.65875E-01	4.71367E+00	9.02650E-01	2.58944E-03	0.00000E+00	0.00000E+00
135	8.83745E-01	4.74650E+00	9.02507E-01	2.57382E-03	0.00000E+00	0.00000E+00
136	8.93197E-01	4.77950E+00	9.02438E-01	2.55549E-03	0.00000E+00	0.00000E+00
137	8.86474E-01	4.81150E+00	9.02320E-01	2.53924E-03	0.00000E+00	0.00000E+00
138	9.50594E-01	4.84167E+00	9.02675E-01	2.54538E-03	0.00000E+00	0.00000E+00
139	9.30560E-01	4.87200E+00	9.02878E-01	2.53491E-03	0.00000E+00	0.00000E+00
140	9.10665E-01	4.90483E+00	9.02935E-01	2.51711E-03	0.00000E+00	0.00000E+00
141	8.51616E-01	4.93783E+00	9.02565E-01	2.52606E-03	0.00000E+00	0.00000E+00
142	8.82287E-01	4.97083E+00	9.02421E-01	2.51213E-03	0.00000E+00	0.00000E+00
143	9.37502E-01	5.00283E+00	9.02669E-01	2.50663E-03	0.00000E+00	0.00000E+00
144	9.22123E-01	5.03400E+00	9.02806E-01	2.49268E-03	0.00000E+00	0.00000E+00
145	9.65204E-01	5.06700E+00	9.03243E-01	2.51336E-03	0.00000E+00	0.00000E+00
146	8.92216E-01	5.09983E+00	9.03166E-01	2.49702E-03	0.00000E+00	0.00000E+00
147	8.90569E-01	5.13200E+00	9.03079E-01	2.48126E-03	0.00000E+00	0.00000E+00
148	8.94205E-01	5.16400E+00	9.03019E-01	2.46495E-03	0.00000E+00	0.00000E+00
149	9.01752E-01	5.19600E+00	9.03010E-01	2.44814E-03	0.00000E+00	0.00000E+00
150	8.96245E-01	5.22900E+00	9.02964E-01	2.43198E-03	0.00000E+00	0.00000E+00
151	9.03029E-01	5.26017E+00	9.02965E-01	2.41560E-03	0.00000E+00	0.00000E+00
152	9.25901E-01	5.29300E+00	9.03118E-01	2.40431E-03	0.00000E+00	0.00000E+00
153	9.19935E-01	5.32517E+00	9.03229E-01	2.39093E-03	0.00000E+00	0.00000E+00
154	9.25819E-01	5.35617E+00	9.03378E-01	2.37979E-03	0.00000E+00	0.00000E+00
155	9.06503E-01	5.38833E+00	9.03398E-01	2.36427E-03	0.00000E+00	0.00000E+00
156	8.54453E-01	5.42117E+00	9.03080E-01	2.37028E-03	0.00000E+00	0.00000E+00
157	9.18177E-01	5.45317E+00	9.03178E-01	2.35695E-03	0.00000E+00	0.00000E+00
158	8.97244E-01	5.48433E+00	9.03140E-01	2.34210E-03	0.00000E+00	0.00000E+00
159	8.88518E-01	5.51633E+00	9.03046E-01	2.32900E-03	0.00000E+00	0.00000E+00
160	9.01194E-01	5.54933E+00	9.03035E-01	2.31424E-03	0.00000E+00	0.00000E+00
161	8.86233E-01	5.58133E+00	9.02929E-01	2.30206E-03	0.00000E+00	0.00000E+00
162	8.50360E-01	5.61350E+00	9.02600E-01	2.31110E-03	0.00000E+00	0.00000E+00
163	8.91927E-01	5.64633E+00	9.02534E-01	2.29766E-03	0.00000E+00	0.00000E+00
164	8.84833E-01	5.67850E+00	9.02425E-01	2.28605E-03	0.00000E+00	0.00000E+00
165	9.40537E-01	5.70867E+00	9.02659E-01	2.28398E-03	0.00000E+00	0.00000E+00
166	9.42814E-01	5.73983E+00	9.02904E-01	2.28318E-03	0.00000E+00	0.00000E+00
167	8.92170E-01	5.77267E+00	9.02838E-01	2.27023E-03	0.00000E+00	0.00000E+00
168	8.82412E-01	5.80567E+00	9.02715E-01	2.25986E-03	0.00000E+00	0.00000E+00
169	8.92368E-01	5.83767E+00	9.02653E-01	2.24715E-03	0.00000E+00	0.00000E+00
170	9.25805E-01	5.86983E+00	9.02791E-01	2.23798E-03	0.00000E+00	0.00000E+00
171	9.07353E-01	5.90267E+00	9.02618E-01	2.22486E-03	0.00000E+00	0.00000E+00

172	8.51698E-01	5.93483E+00	9.02518E-01	2.23208E-03	0.00000E+00	0.00000E+00
173	8.89087E-01	5.96583E+00	9.02439E-01	2.22038E-03	0.00000E+00	0.00000E+00
174	9.33412E-01	5.99883E+00	9.02619E-01	2.21476E-03	0.00000E+00	0.00000E+00
175	8.92776E-01	6.03183E+00	9.02562E-01	2.20266E-03	0.00000E+00	0.00000E+00
176	9.06610E-01	6.06200E+00	9.02585E-01	2.19009E-03	0.00000E+00	0.00000E+00
177	9.14163E-01	6.09583E+00	9.02652E-01	2.17854E-03	0.00000E+00	0.00000E+00
178	8.62825E-01	6.12783E+00	9.02425E-01	2.17792E-03	0.00000E+00	0.00000E+00
179	9.10867E-01	6.15900E+00	9.02473E-01	2.16610E-03	0.00000E+00	0.00000E+00
180	9.67527E-01	6.19017E+00	9.02839E-01	2.18469E-03	0.00000E+00	0.00000E+00
181	9.26699E-01	6.22133E+00	9.02973E-01	2.17660E-03	0.00000E+00	0.00000E+00
182	9.44357E-01	6.25417E+00	9.03203E-01	2.17665E-03	0.00000E+00	0.00000E+00
183	9.04451E-01	6.28533E+00	9.03210E-01	2.16460E-03	0.00000E+00	0.00000E+00
184	8.61304E-01	6.31917E+00	9.02979E-01	2.16496E-03	0.00000E+00	0.00000E+00
185	8.58905E-01	6.35133E+00	9.02739E-01	2.16652E-03	0.00000E+00	0.00000E+00
186	8.43845E-01	6.38333E+00	9.02419E-01	2.17836E-03	0.00000E+00	0.00000E+00
187	9.00057E-01	6.41533E+00	9.02406E-01	2.16659E-03	0.00000E+00	0.00000E+00
188	8.91287E-01	6.44650E+00	9.02346E-01	2.15574E-03	0.00000E+00	0.00000E+00
189	8.87537E-01	6.48033E+00	9.02267E-01	2.14564E-03	0.00000E+00	0.00000E+00
190	8.77943E-01	6.51150E+00	9.02137E-01	2.13811E-03	0.00000E+00	0.00000E+00
191	8.85705E-01	6.54167E+00	9.02051E-01	2.12855E-03	0.00000E+00	0.00000E+00
192	9.03397E-01	6.57367E+00	9.02058E-01	2.11733E-03	0.00000E+00	0.00000E+00
193	8.93692E-01	6.60583E+00	9.02014E-01	2.10667E-03	0.00000E+00	0.00000E+00
194	9.00854E-01	6.63967E+00	9.02008E-01	2.09568E-03	0.00000E+00	0.00000E+00
195	8.96094E-01	6.67167E+00	9.01977E-01	2.08501E-03	0.00000E+00	0.00000E+00
196	8.86010E-01	6.70367E+00	9.01895E-01	2.07587E-03	0.00000E+00	0.00000E+00
197	8.92024E-01	6.73483E+00	9.01844E-01	2.06582E-03	0.00000E+00	0.00000E+00
198	8.68306E-01	6.76600E+00	9.01673E-01	2.06236E-03	0.00000E+00	0.00000E+00
199	9.07466E-01	6.79800E+00	9.01702E-01	2.05208E-03	0.00000E+00	0.00000E+00
200	9.32423E-01	6.82917E+00	9.01858E-01	2.04757E-03	0.00000E+00	0.00000E+00
201	9.20243E-01	6.86217E+00	9.01950E-01	2.03935E-03	0.00000E+00	0.00000E+00
202	8.43967E-01	6.89500E+00	9.01660E-01	2.04974E-03	0.00000E+00	0.00000E+00
203	9.18508E-01	6.92617E+00	9.01744E-01	2.04124E-03	0.00000E+00	0.00000E+00
204	9.21690E-01	6.95917E+00	9.01843E-01	2.03350E-03	0.00000E+00	0.00000E+00
205	8.85344E-01	6.99200E+00	9.01761E-01	2.02509E-03	0.00000E+00	0.00000E+00
206	9.25774E-01	7.02317E+00	9.01879E-01	2.01858E-03	0.00000E+00	0.00000E+00

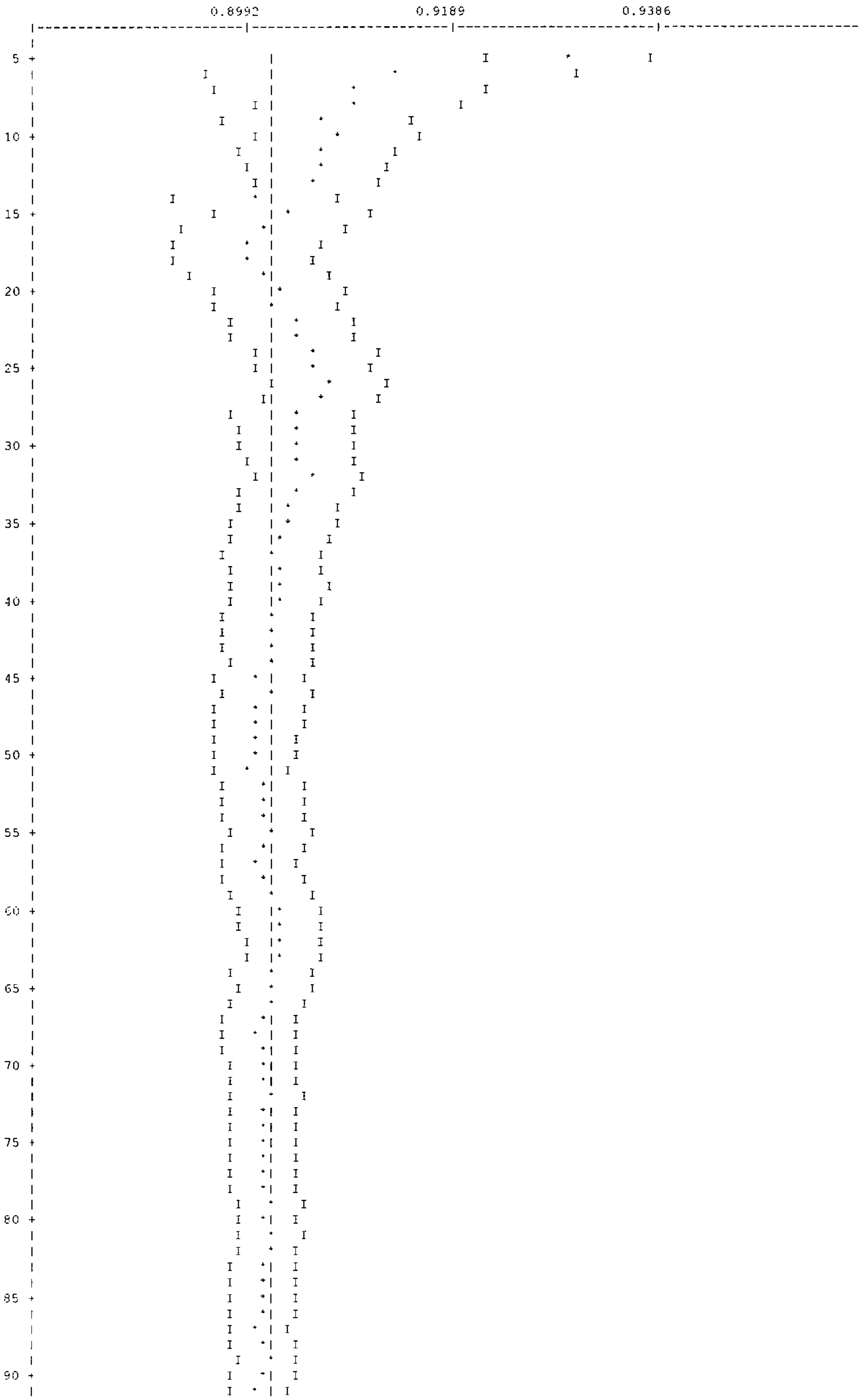
KENO MESSAGE NUMBER K5-123 EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

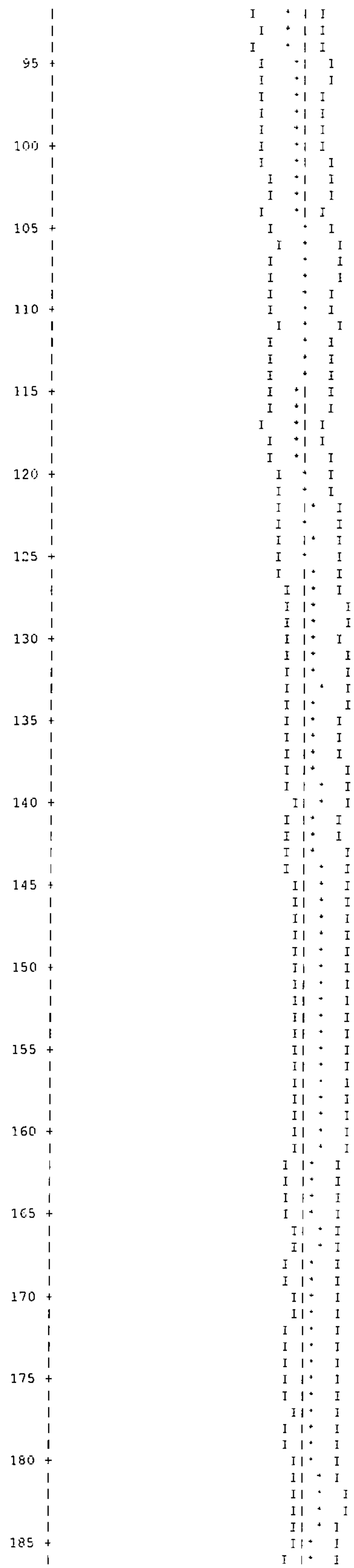
```
LIFETIME =  8.34755E-05 + OR -  2.90697E-07              GENERATION TIME =  4.14031E-05 + OR -  1.44102E-07
NU BAR   =  2.42026E+00 + OR -  1.85916E-05         AVERAGE FISSION GROUP =  2.35537E+01 + OR -  8.36356E-03
                    ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION =  6.47922E-02 + OR -  4.37889E-04
```

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.90211	+ OR - 0.00201	0.90010 TO 0.90413	0.89808 TO 0.90614	0.89607 TO 0.90816	162400
4	0.90193	+ OR - 0.00202	0.89992 TO 0.90395	0.89790 TO 0.90597	0.89588 TO 0.90798	161600
5	0.90183	+ OR - 0.00202	0.89981 TO 0.90386	0.89778 TO 0.90588	0.89576 TO 0.90790	160800
6	0.90194	+ OR - 0.00203	0.89991 TO 0.90398	0.89788 TO 0.90601	0.89585 TO 0.90804	160000
7	0.90196	+ OR - 0.00204	0.89992 TO 0.90400	0.89788 TO 0.90604	0.89584 TO 0.90808	159200
8	0.90191	+ OR - 0.00205	0.89986 TO 0.90396	0.89781 TO 0.90601	0.89576 TO 0.90806	158400
9	0.90198	+ OR - 0.00206	0.89992 TO 0.90404	0.89786 TO 0.90610	0.89580 TO 0.90816	157600
10	0.90189	+ OR - 0.00207	0.89982 TO 0.90396	0.89775 TO 0.90602	0.89568 TO 0.90809	156800
11	0.90194	+ OR - 0.00208	0.89986 TO 0.90402	0.89779 TO 0.90610	0.89571 TO 0.90818	156000
12	0.90192	+ OR - 0.00209	0.89983 TO 0.90401	0.89774 TO 0.90610	0.89565 TO 0.90819	155200
17	0.90229	+ OR - 0.00210	0.90019 TO 0.90439	0.89810 TO 0.90649	0.89600 TO 0.90859	151200
22	0.90190	+ OR - 0.00214	0.89977 TO 0.90404	0.89763 TO 0.90618	0.89549 TO 0.90832	147200
27	0.90149	+ OR - 0.00216	0.89933 TO 0.90366	0.89717 TO 0.90582	0.89500 TO 0.90798	143200
32	0.90151	+ OR - 0.00219	0.89932 TO 0.90369	0.89713 TO 0.90588	0.89494 TO 0.90807	139200
37	0.90212	+ OR - 0.00223	0.89989 TO 0.90435	0.89766 TO 0.90658	0.89544 TO 0.90880	135200
42	0.90218	+ OR - 0.00229	0.89989 TO 0.90446	0.89761 TO 0.90675	0.89532 TO 0.90903	131200
47	0.90252	+ OR - 0.00230	0.90022 TO 0.90481	0.89793 TO 0.90711	0.89563 TO 0.90941	127200
52	0.90249	+ OR - 0.00235	0.90014 TO 0.90483	0.89779 TO 0.90718	0.89545 TO 0.90953	123200
57	0.90263	+ OR - 0.00239	0.90024 TO 0.90503	0.89784 TO 0.90742	0.89545 TO 0.90982	119200
62	0.90174	+ OR - 0.00242	0.89931 TO 0.90416	0.89689 TO 0.90658	0.89447 TO 0.90901	115200
67	0.90261	+ OR - 0.00244	0.90017 TO 0.90505	0.89772 TO 0.90750	0.89528 TO 0.90994	111200
72	0.90232	+ OR - 0.00251	0.89982 TO 0.90483	0.89731 TO 0.90734	0.89480 TO 0.90985	107200
77	0.90267	+ OR - 0.00259	0.90008 TO 0.90527	0.89749 TO 0.90786	0.89489 TO 0.91045	103200
82	0.90244	+ OR - 0.00266	0.89979 TO 0.90510	0.89713 TO 0.90776	0.89447 TO 0.91041	99200
87	0.90317	+ OR - 0.00272	0.90045 TO 0.90589	0.89773 TO 0.90861	0.89501 TO 0.91133	95200
92	0.90343	+ OR - 0.00274	0.90069 TO 0.90617	0.89794 TO 0.90892	0.89520 TO 0.91166	91200

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
97	0.90324	+ OR - 0.00277	0.90048 TO 0.90601	0.89771 TO 0.90878	0.89494 TO 0.91155	87200
102	0.90271	+ OR - 0.00286	0.89985 TO 0.90557	0.89699 TO 0.90843	0.89413 TO 0.91129	83200
107	0.90236	+ OR - 0.00286	0.89950 TO 0.90522	0.89664 TO 0.90808	0.89378 TO 0.91094	79200
112	0.90234	+ OR - 0.00299	0.89935 TO 0.90534	0.89636 TO 0.90833	0.89337 TO 0.91132	75200
117	0.90349	+ OR - 0.00310	0.90040 TO 0.90659	0.89730 TO 0.90969	0.89420 TO 0.91279	71200
122	0.90164	+ OR - 0.00312	0.89852 TO 0.90475	0.89540 TO 0.90787	0.89228 TO 0.91099	67200
127	0.90118	+ OR - 0.00310	0.89809 TO 0.90428	0.89499 TO 0.90738	0.89189 TO 0.91047	63200
132	0.90064	+ OR - 0.00322	0.89742 TO 0.90386	0.89420 TO 0.90708	0.89098 TO 0.91030	59200
137	0.90102	+ OR - 0.00333	0.89769 TO 0.90435	0.89436 TO 0.90768	0.89103 TO 0.91101	55200
142	0.90069	+ OR - 0.00337	0.89732 TO 0.90406	0.89395 TO 0.90744	0.89058 TO 0.91081	51200
147	0.89893	+ OR - 0.00340	0.89553 TO 0.90233	0.89214 TO 0.90572	0.88874 TO 0.90912	47200
152	0.89844	+ OR - 0.00368	0.89476 TO 0.90211	0.89109 TO 0.90579	0.88741 TO 0.90947	43200
157	0.89777	+ OR - 0.00386	0.89391 TO 0.90163	0.89005 TO 0.90549	0.88619 TO 0.90935	39200
162	0.89926	+ OR - 0.00414	0.89511 TO 0.90340	0.89097 TO 0.90754	0.88683 TO 0.91168	35200
167	0.89782	+ OR - 0.00438	0.89344 TO 0.90220	0.88905 TO 0.90659	0.88467 TO 0.91097	31200
172	0.89869	+ OR - 0.00474	0.89395 TO 0.90342	0.88921 TO 0.90816	0.88447 TO 0.91290	27200
177	0.89722	+ OR - 0.00538	0.89184 TO 0.90260	0.88646 TO 0.90797	0.88108 TO 0.91335	23200
182	0.89195	+ OR - 0.00493	0.88702 TO 0.89688	0.88209 TO 0.90181	0.87717 TO 0.90674	19200
187	0.89675	+ OR - 0.00496	0.89179 TO 0.90171	0.88684 TO 0.90666	0.88188 TO 0.91162	15200
192	0.89946	+ OR - 0.00649	0.89297 TO 0.90595	0.88648 TO 0.91244	0.87999 TO 0.91892	11200
197	0.90264	+ OR - 0.01006	0.89257 TO 0.91270	0.88251 TO 0.92276	0.87245 TO 0.93282	7200
202	0.91283	+ OR - 0.00928	0.90355 TO 0.92211	0.89427 TO 0.93139	0.88498 TO 0.94067	3200

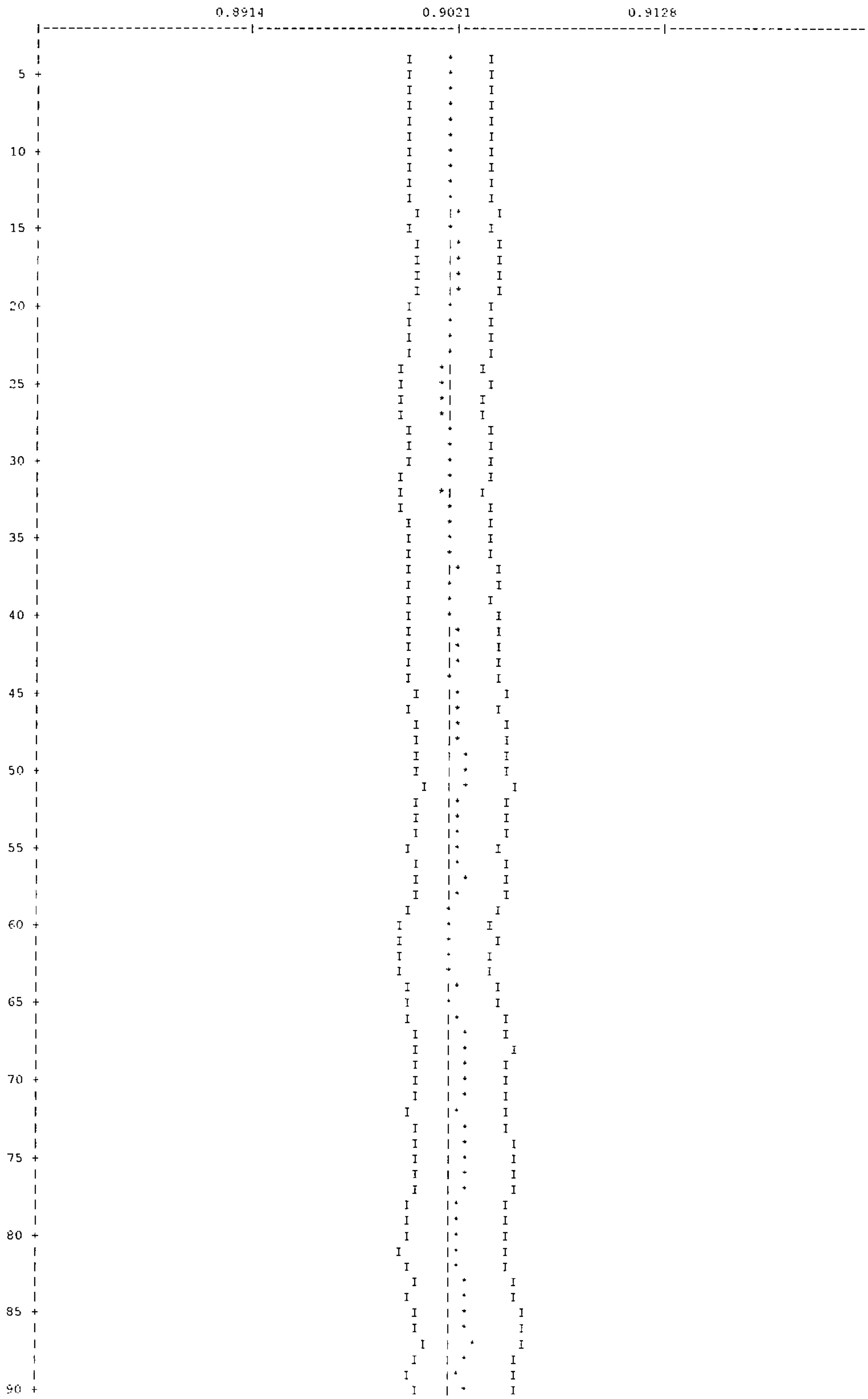
PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.9021 + OR - 0.0020 WHICH OCCURS FOR 206 GENERATIONS RUN.

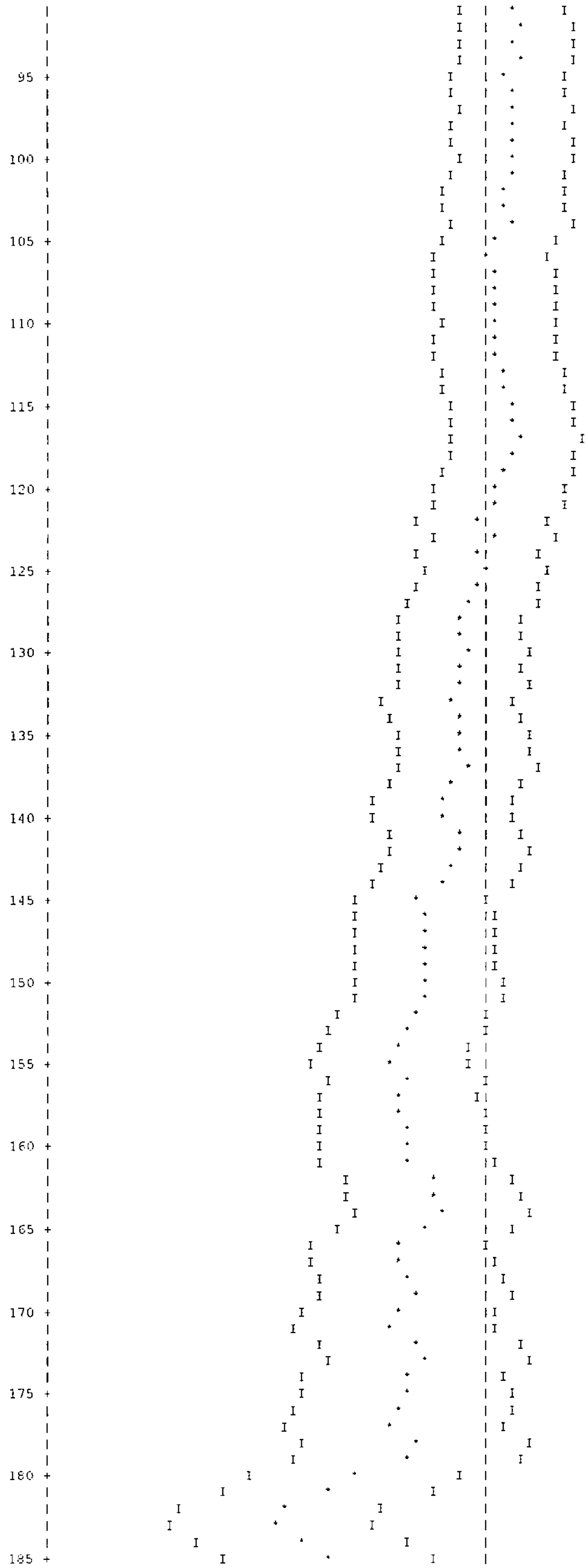


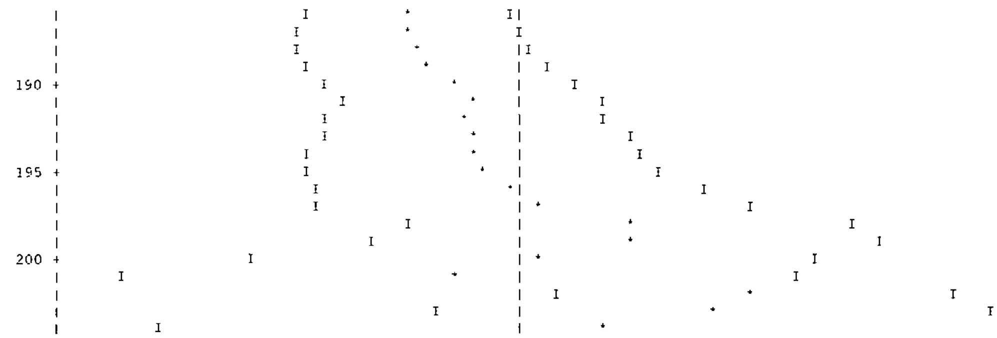


```
      |                         I |*  I
      |                         I |*  I
      |                         I |* I
  190 +                         I |* I
      |                         I *  I
      |                         I *  I
      |                         I *  I
      |                         I *  I
  195 +                         I *  I
      |                         I *  I
      |                         I *  I
      |                        I  *  I
      |                        I  *  I
  200 +                         I *  I
      |                         I *  I
      |                        I  *  I
      |                        I  *  I
      |                         I *  I
  205 +                         I *  I
      |                         I *  I
```

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION SKIPPED.
THE LINE REPRESENTS K-EFF = 0.9021 + OR - 0.0020 WHICH OCCURS FOR 3 GENERATIONS SKIPPED.




95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185


190
195
200

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0003			2.56035E-04	5.4573	1.50773E-03	2.1757	0.00000E+00	0.0000
2	0.0013			1.19711E-03	1.7824	3.23043E-03	0.6837	0.00000E+00	0.0000
3	0.0017			1.52498E-03	1.4960	1.03787E-03	1.0080	0.00000E+00	0.0000
4	0.0010			9.21900E-04	1.7058	5.67407E-04	1.2742	0.00000E+00	0.0000
5	0.0014			1.25991E-03	1.4508	1.02450E-03	0.9580	0.00000E+00	0.0000
6	0.0018			1.65059E-03	1.1540	2.63366E-03	0.8416	0.00000E+00	0.0000
7	0.0019			1.70295E-03	1.1907	4.22649E-03	0.8983	0.00000E+00	0.0000
8	0.0020			1.79592E-03	1.8803	3.80393E-03	1.0126	0.00000E+00	0.0000
9	0.0027			2.41033E-03	1.9931	4.26692E-03	1.0242	0.00000E+00	0.0000
10	0.0058			5.23952E-03	1.9873	9.84187E-03	1.0582	0.00000E+00	0.0000
11	0.0122			1.10506E-02	1.7951	1.50933E-02	1.0254	0.00000E+00	0.0000
12	0.0166			1.49499E-02	1.8439	1.56324E-02	1.2484	0.00000E+00	0.0000
13	0.0162			1.46159E-02	1.7701	1.92808E-02	1.0976	0.00000E+00	0.0000
14	0.0137			1.23654E-02	1.9835	2.24392E-02	1.0243	0.00000E+00	0.0000
15	0.0027			2.41279E-03	3.3935	1.01851E-02	1.1256	0.00000E+00	0.0000
16	0.0019			1.67969E-03	4.3603	6.19063E-03	1.3070	0.00000E+00	0.0000
17	0.0029			2.65759E-03	4.7425	3.98055E-03	2.0496	0.00000E+00	0.0000
18	0.0041			3.68149E-03	4.6778	4.09399E-03	2.2997	0.00000E+00	0.0000
19	0.0049			4.46071E-03	3.9852	6.55610E-03	1.5972	0.00000E+00	0.0000
20	0.0208			1.87417E-02	1.8909	2.46814E-02	0.9581	0.00000E+00	0.0000
21	0.0115			1.03529E-02	2.7066	1.06895E-02	1.4122	0.00000E+00	0.0000
22	0.0277			2.49519E-02	1.9069	2.45621E-02	1.1086	0.00000E+00	0.0000
23	0.1056			9.52794E-02	0.9464	1.01529E-01	0.5113	0.00000E+00	0.0000
24	0.2186			1.97206E-01	0.6778	2.12961E-01	0.3258	0.00000E+00	0.0000
25	0.1915			1.72761E-01	0.6087	1.83980E-01	0.3180	0.00000E+00	0.0000
26	0.2416			2.17928E-01	0.5720	2.28888E-01	0.3164	0.00000E+00	0.0000
27	0.0876			7.90606E-02	1.0865	7.84555E-02	0.6611	0.00000E+00	0.0000
SYSTEM TOTAL =				9.02114E-01	0.2233	1.00134E+00	0.0542	0.00000E+00	0.0000

ELAPSED TIME 7.02500 MINUTES

RANDOM NUMBER= 791A56DD44CA

```
                         FREQUENCY FOR GENERATIONS    4 TO  206
0.8419 TO 0.8561     ************
0.8561 TO 0.8702     *****************
0.8702 TO 0.8843     **********************
0.8843 TO 0.8985     *************************************************
0.8985 TO 0.9126     *********************************
0.9126 TO 0.9268     ******************************
0.9268 TO 0.9409     *******************
0.9409 TO 0.9551     ***************
0.9551 TO 0.9692     ****
0.9692 TO 0.9833     **

                         FREQUENCY FOR GENERATIONS   55 TO  206
0.8419 TO 0.8561     *********
0.8561 TO 0.8702     **************
0.8702 TO 0.8843     ****************
0.8843 TO 0.8985     *************************************
0.8985 TO 0.9126     **********************
0.9126 TO 0.9268     ***********************
0.9268 TO 0.9409     **************
0.9409 TO 0.9551     ***********
0.9551 TO 0.9692     ****
0.9692 TO 0.9833     **

                         FREQUENCY FOR GENERATIONS  105 TO  206
0.8419 TO 0.8561     *******
0.8561 TO 0.8702     *******
0.8702 TO 0.8843     ********
0.8843 TO 0.8985     ****************************
0.8985 TO 0.9126     ****************
0.9126 TO 0.9268     ****************
0.9268 TO 0.9409     *******
0.9409 TO 0.9551     ********
0.9551 TO 0.9692     ****
0.9692 TO 0.9833     *

                         FREQUENCY FOR GENERATIONS  156 TO  206
0.8419 TO 0.8561     *****
0.8561 TO 0.8702     ****
0.8702 TO 0.8843     **
0.8843 TO 0.8985     *****************
0.8985 TO 0.9126     *********
0.9126 TO 0.9268     *******
0.9268 TO 0.9409     ****
0.9409 TO 0.9551     **
0.9551 TO 0.9692     *
0.9692 TO 0.9833


********************************************************************************************************************************************
*

          CONGRATULATIONS!  YOU HAVE  SUCCESSFULLY TRAVERSED THE PERILOUS PATH THROUGH KENO V IN    7.02500 MINUTES

********************************************************************************************************************************************
*
```

6.6.4 Intact PWR and BWR Fuel Rods in a Rod Holder or Fuel Assembly Lattice

This section contains abbreviated output files from the most reactive normal condition and accident condition moderator density variation cases.

Figure 6.6.4-1 CSAS Input/Output for NAC-LWT with 25 PWR Rods – Most Reactive Normal Condition Configuration

```
        PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
 MODULE CSAS25   WILL BE CALLED
   PWR RODS, NO BASKET, VOID EXTERIOR, GAP VOID
   27GROUPNDF4    LATTICECELL
   UO2        1    0.95  293.0  92235  5.0  92238   95.0  END
   ZIRCALLOY 2    1.0            293.0     END
   H2O   3 1.000 293.0 END
   AL         4    1.0            293.0     END
   SS304      5    1.0            293.0     END
   PB         6    1.0            293.0     END
   H2O        7    1.0            293.0     END
   H2O   8 1.000 293.0 END
   H2O        9    1.0E-20        293.0     END
   END COMP
   TRIANGPITCH   2.92169   0.9564  1  3  1.1175 2 0.9753 9 END
   "LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"
   READ PARAM PUN=YES PLT=NO  GEN=103 NPG=400 END PARAM
   READ GEOM
   UNIT 1
   COM="PWR FUEL ROD"
   CYLINDER      1  1  0.4781    2P10.0
   CYLINDER      9  1  0.4876    2P10.0
   CYLINDER      2  1  0.5588    2P10.0
   GLOBAL UNIT 2
   CYLINDER     3   1   16.9863  2P10.0
   HOLE    1     .0000     .0000    .0000
   HOLE    1     .0000    2.9216    .0000
   HOLE    1    2.5301    1.4608    .0000
   HOLE    1    2.5301   -1.4608    .0000
   HOLE    1     .0000   -2.9216    .0000
   HOLE    1   -2.5301   -1.4608    .0000
   HOLE    1   -2.5301    1.4608    .0000
   HOLE    1   -2.5301    4.3825    .0000
   HOLE    1     .0000    5.8433    .0000
   HOLE    1    2.5301    4.3825    .0000
   HOLE    1    5.0603    2.9216    .0000
   HOLE    1    5.0603     .0000    .0000
   HOLE    1    5.0603   -2.9216    .0000
   HOLE    1    2.5301   -4.3825    .0000
   HOLE    1     .0000   -5.8433    .0000
   HOLE    1   -2.5301   -4.3825    .0000
   HOLE    1   -5.0603   -2.9216    .0000
   HOLE    1   -5.0603     .0000    .0000
   HOLE    1   -5.0603    2.9216    .0000
   HOLE    1   -5.0603    5.8433    .0000
   HOLE    1    2.5301    7.3041    .0000
   HOLE    1    7.5904    1.4608    .0000
   HOLE    1    5.0603   -5.8433    .0000
   HOLE    1   -2.5301   -7.3041    .0000
   HOLE    1   -7.5904   -1.4608    .0000
   CYLINDER     5   1    18.8913  2P10.0
   CYLINDER     6   1    33.4963  2P10.0
   CYLINDER     5   1    36.5443  2P10.0
   CYLINDER     7   1    49.2443  2P10.0
   CYLINDER     5   1    49.8539  2P10.0
   CUBOID   8 1 4P49.8539  2P10.0
   END GEOM
   READ BOUNDS  ALL=MIR     END BOUNDS
   END DATA

 SECONDARY MODULE 000008   HAS BEEN CALLED.

 MODULE 000008   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     0.60 (SECONDS).

 SECONDARY MODULE 000002   HAS BEEN CALLED.

 MODULE 000002   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     5.93 (SECONDS).

 SECONDARY MODULE 000009   HAS BEEN CALLED.

 MODULE 000009   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   262.93 (SECONDS).

 MODULE CSAS25   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   271.12 (SECONDS).
```

```
 CCCCCCCCCCC    SSSSSSSSSSS      AAAAAAAAA    SSSSSSSSSSS    22222222222   5555555555555
CCCCCCCCCCCCC  SSSSSSSSSSSSS   AAAAAAAAAAA   SSSSSSSSSSSSS  2222222222222  5555555555555
CC         CC  SS         SS  AA         AA  SS         SS  22         22  55
CC             SS             AA         AA  SS                        22  55
CC             SS             AA         AA  SS                        22  55
CC             SSSSSSSSSSSS   AAAAAAAAAAAAA  SSSSSSSSSSSS             22   555555555555
CC              SSSSSSSSSSSS  AAAAAAAAAAAAA   SSSSSSSSSSSS          22     5555555555555
CC                        SS  AA         AA             SS       22                   55
CC                        SS  AA         AA             SS     22                     55
CC         CC  SS         SS  AA         AA  SS         SS  22             55         55
CCCCCCCCCCCCC  SSSSSSSSSSSSS  AA         AA  SSSSSSSSSSSSS  2222222222222  5555555555555
 CCCCCCCCCCC    SSSSSSSSSSS   AA         AA   SSSSSSSSSSS   2222222222222   55555555555


 SSSSSSSSSSS    CCCCCCCCCCC      AAAAAAAAA    LL             EEEEEEEEEEEEE                 PPPPPPPPPPPP     CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL             EEEEEEEEEEEEE                 PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL             EE                            PP         PP  CC         CC
SS             CC             AA         AA  LL             EE                            PP         PP  CC
SS             CC             AA         AA  LL             EE                            PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------  PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------  PPPPPPPPPPPP   CC
           SS  CC             AA         AA  LL             EE                            PP             CC
           SS  CC             AA         AA  LL             EE                            PP             CC
SS         SS  CC         CC  AA         AA  LL             EE                            PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLLL  EEEEEEEEEEEEE                 PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLLL  EEEEEEEEEEEEE                 PP              CCCCCCCCCCC


   0000000      88888888888              //     0000000     5555555555555             //   99999999999    88888888888
  000000000    8888888888888            //     000000000    5555555555555            //   9999999999999  8888888888888
 00       00   88         88           //     00       00   55                      //    99         99  88         88
00         00  88         88          //     00         00  55                     //     99         99  88         88
00         00  88         88         //      00         00  55                    //      99         99  88         88
00         00   88888888888         //       00         00  555555555555         //       9999999999999   88888888888
00         00   88888888888        //        00         00  5555555555555       //         999999999999   88888888888
00         00  88         88       //         00         00             55      //                     99  88         88
00         00  88         88      //          00         00             55     //                      99  88         88
 00       00   88         88     //            00       00   55         55    //                       99  88         88
  000000000    8888888888888    //             000000000    5555555555555   //            9999999999999  8888888888888
   0000000      88888888888   //                0000000      55555555555   //             999999999999    88888888888


   0000000      88888888888                       11            0000000                             44             44
  000000000    8888888888888                     111           000000000                           444            444
 00       00   88         88       :::         1111          00       00       :::              4444          4444
00         00  88         88       :::           11         00         00      :::             44 44         44 44
00         00  88         88       :::           11         00         00      :::            44  44        44  44
00         00   88888888888                      11         00         00                    44   44       44   44
00         00   88888888888                      11         00         00                   44    44      44    44
00         00  88         88       :::           11         00         00      :::       444444444444   444444444444
00         00  88         88       :::           11         00         00      :::       444444444444   444444444444
 00       00   88         88       :::           11          00       00       :::                44             44
  000000000    8888888888888                  11111111       000000000                            44             44
   0000000      88888888888                   11111111        0000000                             44             44
```

```
 SSSSSSSSSSS     CCCCCCCCCCC      AAAAAAAAA      LL             EEEEEEEEEEEEE                   PPPPPPPPPPPP      CCCCCCCCCCC
SSSSSSSSSSSSS   CCCCCCCCCCCCC    AAAAAAAAAAA     LL             EEEEEEEEEEEEE                   PPPPPPPPPPPPP    CCCCCCCCCCCCC
SS         SS   CC         CC   AA         AA    LL             EE                              PP         PP    CC         CC
SS              CC              AA         AA    LL             EE                              PP         PP    CC
SS              CC              AA         AA    LL             EE                              PP         PP    CC
SSSSSSSSSSSS    CC              AAAAAAAAAAAAA    LL             EEEEEEEEE       -------------   PPPPPPPPPPPPP    CC
 SSSSSSSSSSSS   CC              AAAAAAAAAAAAA    LL             EEEEEEEEE       -------------   PPPPPPPPPPPP     CC
           SS   CC              AA         AA    LL             EE                              PP               CC
           SS   CC              AA         AA    LL             EE                              PP               CC
SS         SS   CC         CC   AA         AA    LL             EE                              PP               CC         CC
SSSSSSSSSSSSS   CCCCCCCCCCCCC   AA         AA    LLLLLLLLLLLLL  EEEEEEEEEEEEE                   PP               CCCCCCCCCCCCC
 SSSSSSSSSSS     CCCCCCCCCCC    AA         AA    LLLLLLLLLLLLL  EEEEEEEEEEEEE                   PP                CCCCCCCCCCC
```

```
*****************************************************************************
*****************************************************************************
*****************************************************************************
*****                                                                   *****
*****                   PROGRAM VERIFICATION INFORMATION                *****
*****                                                                   *****
*****                 CODE SYSTEM:   SCALE-PC VERSION:   4.3            *****
*****                                                                   *****
*****************************************************************************
*****************************************************************************
*****                                                                   *****
*****                                                                   *****
*****               PROGRAM:  CSAS                                      *****
*****                                                                   *****
*****         CREATION DATE:  03/08/96                                  *****
*****                                                                   *****
*****                VOLUME:  ENG                                       *****
*****                                                                   *****
*****               LIBRARY:  G:\SCALE43\WIN_NT\EXE                     *****
*****                                                                   *****
*****                                                                   *****
*****       PRODUCTION CODE:  CSAS                                      *****
*****                                                                   *****
*****               VERSION:  3.1                                       *****
*****                                                                   *****
*****               JOBNAME:  SCALE-PC                                  *****
*****                                                                   *****
*****     DATE OF EXECUTION:  08/05/98                                  *****
*****                                                                   *****
*****     TIME OF EXECUTION:  08:10:44                                  *****
*****                                                                   *****
*****                                                                   *****
*****************************************************************************
*****************************************************************************
*****************************************************************************
```

```
PWR RODS, NO BASKET, VOID EXTERIOR, GAP VOID

**** PROBLEM PARAMETERS ****

LIB 27GROUPNDF4  LIBRARY
MXX           9 MIXTURES
MSC           9 COMPOSITION SPECIFICATIONS
IZM           4 MATERIAL ZONES
GE  LATTICECELL  GEOMETRY
MORE          0 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
MSLN          0 FUEL SOLUTIONS

**** PROBLEM COMPOSITION DESCRIPTION ****

SC  UO2          STANDARD COMPOSITION
MX            1 MIXTURE NO.
VF       0.9500 VOLUME FRACTION
ROTH    10.9600 THEORETICAL DENSITY
NEL           2 NO. ELEMENTS
ICP           1 0/1 MIXTURE/COMPOUND
TEMP      293.0 DEG KELVIN
          92000      1.00 ATOM/MOLECULE
                         92235      5.000 WT%
                         92238     95.000 WT%
           8016      2.00 ATOMS/MOLECULE
END

SC  ZIRCALLOY    STANDARD COMPOSITION
MX            2 MIXTURE NO.
VF       1.0000 VOLUME FRACTION
ROTH     6.5600 THEORETICAL DENSITY
NEL           1 NO. ELEMENTS
ICP           1 0/1 MIXTURE/COMPOUND
TEMP      293.0 DEG KELVIN
          40302      1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX            3 MIXTURE NO.
VF       1.0000 VOLUME FRACTION
ROTH     0.9982 THEORETICAL DENSITY
NEL           2 NO. ELEMENTS
ICP           1 0/1 MIXTURE/COMPOUND
TEMP      293.0 DEG KELVIN
           1001      2.00 ATOMS/MOLECULE
           8016      1.00 ATOM/MOLECULE
END

SC  AL           STANDARD COMPOSITION
MX            4 MIXTURE NO.
VF       1.0000 VOLUME FRACTION
ROTH     2.7020 THEORETICAL DENSITY
NEL           1 NO. ELEMENTS
ICP           1 0/1 MIXTURE/COMPOUND
TEMP      293.0 DEG KELVIN
          13027      1.00 ATOM/MOLECULE
END

SC  SS304        STANDARD COMPOSITION
MX            5 MIXTURE NO.
VF       1.0000 VOLUME FRACTION
ROTH     7.9200 THEORETICAL DENSITY
NEL           4 NO. ELEMENTS
ICP           0 0/1 MIXTURE/COMPOUND
TEMP      293.0 DEG KELVIN
          24304    19.000 WT%
          25055     2.000 WT%
          26304    69.500 WT%
          28304     9.500 WT%
END

SC  PB           STANDARD COMPOSITION
MX            6 MIXTURE NO.
VF       1.0000 VOLUME FRACTION
ROTH    11.3440 THEORETICAL DENSITY
NEL           1 NO. ELEMENTS
ICP           1 0/1 MIXTURE/COMPOUND
TEMP      293.0 DEG KELVIN
          82000      1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX            7 MIXTURE NO.
VF       1.0000 VOLUME FRACTION
ROTH     0.9982 THEORETICAL DENSITY
NEL           2 NO. ELEMENTS
ICP           1 0/1 MIXTURE/COMPOUND
TEMP      293.0 DEG KELVIN
           1001      2.00 ATOMS/MOLECULE
           8016      1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
```

```
MX           8 MIXTURE NO.
VF      1.0000 VOLUME FRACTION
ROTH    0.9982 THEORETICAL DENSITY
NEL          2 NO. ELEMENTS
ICP          1 0/1 MIXTURE/COMPOUND
TEMP     293.0 DEG KELVIN
          1001       2.00 ATOMS/MOLECULE
          8016       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX           9 MIXTURE NO.
VF      0.0000 VOLUME FRACTION
ROTH    0.9982 THEORETICAL DENSITY
NEL          2 NO. ELEMENTS
ICP          1 0/1 MIXTURE/COMPOUND
TEMP     293.0 DEG KELVIN
          1001       2.00 ATOMS/MOLECULE
          8016       1.00 ATOM/MOLECULE
END

**** PROBLEM GEOMETRY ****

CTP TRIANGPITCH  CELL TYPE
PITCH    2.9217 CM CENTER TO CENTER SPACING
FUELOD   0.9564 CM FUEL DIAMETER OR SLAB THICKNESS
MFUEL         1 MIXTURE NO. OF FUEL
MMOD          3 MIXTURE NO. OF MODERATOR
CLADOD   1.1175 CM CLAD OUTER DIAMETER
MCLAD         2 MIXTURE NO. OF CLAD
GAPOD    0.9753 CM GAP OUTER DIAMETER
MGAP          9 MIXTURE NO. OF GAP

ZONE SPECIFICATIONS FOR LATTICECELL GEOMETRY

               ZONE  1 IS FUEL
               ZONE  2 IS GAP
               ZONE  3 IS CLAD
               ZONE  4 IS MOD
```

```
****************************************************************************************************
***                                                                                              ***
***                          PWR RODS, NO BASKET, VOID EXTERIOR, GAP VOID                        ***
***                                                                                              ***
****************************************************************************************************
****************************************************************************************************
***                                                                                              ***
***                         ********** DATA LIBRARY INFORMATION **********                       ***
***                                                                                              ***
***      UNIT                                                VOLUME                              ***
***     NUMBER              DATA SET NAME                     NAME       UNIT FUNCTION           ***
***     ------              -------------                     ----       -------------           ***
***                                                                                              ***
***       89     G:\scale43\DATALIB\FT89F001                             STANDARD COMPOSITION LIBRARY ***
***                                                                                              ***
***       82     G:\scale43\DATALIB\FT82F001                             CROSS SECTION LIBRARY   ***
***                                                                                              ***
***       11     D:\PROJECTS\BU85-C~1\rods9\RONX3M\FT11F001              SHORT CROSS SECTION LIBRARY ***
***                                                                                              ***
***       90     D:\PROJECTS\BU85-C~1\rods9\RONX3M\FT90F001              INPUT DATA DIRECT ACCESS ***
***                                                                                              ***
****************************************************************************************************
****************************************************************************************************
***                                                                                              ***
***                                                                                              ***
***                             STANDARD COMPOSITION LIBRARY DATA                                ***
***                             ---------------------------------                                ***
***                                                                                              ***
***        UNIT NUMBER  :  89                                                                    ***
***                                                                                              ***
***        DATASET NAME :  G:\scale43\DATALIB\FT89F001                                           ***
***                                                                                              ***
***        LIBRARY TITLE:  SCALE-4 STANDARD COMPOSITION LIBRARY                                  ***
***                        637 STANDARD COMPOSITIONS, 490 NUCLIDES                               ***
***                        90 ELEMENTS WITH VARIABLE ISOTOPIC DISTRBUTIONS.                      ***
***                                                                                              ***
***        CREATION DATE:   6/30/95                                                              ***
***                                                                                              ***
***                                                                                              ***
***                                                                                              ***
***                               CROSS SECTION LIBRARY DATA                                     ***
***                               --------------------------                                     ***
***                                                                                              ***
***        UNIT NUMBER  :  82                                                                    ***
***                                                                                              ***
***        DATASET NAME :  G:\scale43\DATALIB\FT82F001                                           ***
***                                                                                              ***
***        LIBRARY TITLE:  SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY                            ***
***                           BASED ON ENDF-B VERSION 4 DATA                                     ***
***                              COMPILED FOR NRC      1/27/89                                   ***
***                                 LAST UPDATED                                       08/12/94  ***
***                                    L.M.PETRIE    -    ORNL                                   ***
***                                                                                              ***
***                                                                                              ***
***                                                                                              ***
***                                                                                              ***
****************************************************************************************************
****************************************************************************************************

             ........    0 IO'S WERE USED BEFORE READING KENO V DATA    ........

             ........    0 IO'S WERE USED READING THE KENO V PARAMETER DATA    ........

            ************** DATA READING COMPLETED **************

             ........    0 IO'S WERE USED PREPARING THE KENO V INPUT DATA    ........

             ........    0 IO'S WERE USED LOADING THE KENO V DATA    ........

             ........    0 IO'S WERE USED LOADING THE DATA    ........

             ........    0 IO'S WERE USED CHECKING THE KENO V GEOMETRY DATA    ........
             *****  RESTART DATA HAS BEEN WRITTEN ON UNIT 95  *****

             ........    0 IO'S WERE USED WRITING THE KENO V - CSAS DATA    ........

             ........    0 IO'S WERE USED PROCESSING CSAS INPUT DATA    ........

CONTROL MODULE CSAS25    IS COMPLETE.
```

```
      KK          KK  EEEEEEEEEEEEE  NN          NN  00000000000                   VV          VV
      KK         KK   EEEEEEEEEEEEE  NNN         NN  0000000000000                 VV          VV
      KK        KK    EE             NNNN        NN  00         00                 VV          VV
      KK       KK     EE             NN NN       NN  00         00                 VV          VV
      KK      KK      EE             NN  NN      NN  00         00                 VV          VV
      KKKKKKKKK       EEEEEEEEE      NN   NN     NN  00         00  -------------  VV          VV
      KKKKKKKKK       EEEEEEEEE      NN    NN    NN  00         00  -------------   VV        VV
      KK      KK      EE             NN     NN   NN  00         00                   VV      VV
      KK       KK     EE             NN      NN  NN  00         00                    VV    VV
      KK        KK    EE             NN       NNNN   00         00                     VV  VV
      KK         KK   EEEEEEEEEEEEE  NN        NNN   0000000000000                      VVVV
      KK          KK  EEEEEEEEEEEEE  NN         NN   00000000000                         V

  SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA   LL               EEEEEEEEEEEEE                   PPPPPPPPPPPP   CCCCCCCCCCC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA  LL               EEEEEEEEEEEEE                   PPPPPPPPPPPPP CCCCCCCCCCCCC
 SS         SS  CC         CC  AA         AA LL               EE                              PP         PP CC         CC
 SS             CC             AA         AA LL               EE                              PP         PP CC
 SS             CC             AA         AA LL               EE                              PP         PP CC
 SSSSSSSSSSSS   CC             AAAAAAAAAAAAA LL               EEEEEEEEE       -------------   PPPPPPPPPPPPP CC
  SSSSSSSSSSSS  CC             AAAAAAAAAAAAA LL               EEEEEEEEE       -------------   PPPPPPPPPPPP  CC
            SS  CC             AA         AA LL               EE                              PP            CC
            SS  CC             AA         AA LL               EE                              PP            CC
 SS         SS  CC         CC  AA         AA LL               EE                              PP            CC         CC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA LLLLLLLLLLLLL    EEEEEEEEEEEEE                   PP            CCCCCCCCCCCCC
  SSSSSSSSSSS    CCCCCCCCCCC   AA         AA LLLLLLLLLLLLL    EEEEEEEEEEEEE                   PP             CCCCCCCCCCC

   0000000      88888888888            //     0000000    5555555555555          //   99999999999    88888888888
  000000000    8888888888888          //     000000000   5555555555555         //   9999999999999  8888888888888
 00       00   88         88         //     00       00  55                   //    99         99  88         88
00         00  88         88        //     00         00 55                  //     99         99  88         88
00         00  88         88       //      00         00 55                 //      99         99  88         88
00         00   88888888888       //       00         00 555555555555      //       9999999999999   88888888888
00         00   88888888888      //        00         00 5555555555555    //         999999999999   88888888888
00         00  88         88    //         00         00             55  //                    99  88         88
00         00  88         88   //          00         00             55 //                     99  88         88
 00       00   88         88  //            00       00  55         55 //                      99  88         88
  000000000    8888888888888 //              000000000   5555555555555 //           9999999999999  8888888888888
   0000000      88888888888 //                0000000     55555555555 //            999999999999    88888888888

   0000000      88888888888                 11          0000000                    5555555555555   22222222222
  000000000    8888888888888               111         000000000                   5555555555555  2222222222222
 00       00   88         88     :::      1111        00       00        :::       55             22         22
00         00  88         88     :::        11       00         00       :::       55                        22
00         00  88         88     :::        11       00         00       :::       55                        22
00         00   88888888888                 11       00         00                 555555555555            22
00         00   88888888888                 11       00         00                 5555555555555         22
00         00  88         88     :::        11       00         00       :::                  55      22
00         00  88         88     :::        11       00         00       :::                  55    22
 00       00   88         88     :::        11        00       00        :::       55         55  22
  000000000    8888888888888              11111111     000000000                   5555555555555  2222222222222
   0000000      88888888888               11111111      0000000                     55555555555   2222222222222
```

"LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"

****** NUMERIC PARAMETERS ******

TME	MAXIMUM PROBLEM TIME (MIN)	30.00
TBA	TIME PER GENERATION (MIN)	0.50
GEN	NUMBER OF GENERATIONS	103
NPG	NUMBER PER GENERATION	400
NSK	NUMBER OF GENERATIONS TO BE SKIPPED	3
BEG	BEGINNING GENERATION NUMBER	1
RES	GENERATIONS BETWEEN CHECKPOINTS	0
X1D	NUMBER OF EXTRA 1-D CROSS SECTIONS	1
NBK	NEUTRON BANK SIZE	425
XNB	EXTRA POSITIONS IN NEUTRON BANK	0
NFB	FISSION BANK SIZE	400
XFB	EXTRA POSITIONS IN FISSION BANK	0
WTA	DEFAULT VALUE OF WEIGHT AVERAGE	0.5000
WTH	WEIGHT HIGH FOR SPLITTING	3.0000
WTL	WEIGHT LOW FOR RUSSIAN ROULETTE	0.3333
RND	STARTING RANDOM NUMBER	8B827100001
NB8	NUMBER OF D.A. BLOCKS ON UNIT 8	200
NL8	LENGTH OF D.A. BLOCKS ON UNIT 8	512
ADJ	MODE OF CALCULATION	FORWARD
	INPUT DATA WRITTEN ON RESTART UNIT	NO
	BINARY DATA INTERFACE	YES

```
*****************************************************************************************************************
*****************************************************************************************************************
***                                                                                                           ***
***                      "LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"                     ***
***                                                                                                           ***
*****************************************************************************************************************
***                                ******     LOGICAL PARAMETERS     ******                                   ***
***                                                                                                           ***
*** RUN  EXECUTE PROBLEM AFTER CHECKING DATA     YES        PLT  PLOT PICTURE MAP(S)                        NO ***
***                                                                                                           ***
*** FLX  COMPUTE FLUX                            NO         FDN  COMPUTE FISSION DENSITIES                  NO ***
***                                                                                                           ***
*** SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION    NO         NUB  COMPUTE NU-BAR & AVG FISSION GROUP        YES ***
***                                                                                                           ***
*** MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER     NO         MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION      NO ***
***                                                                                                           ***
*** CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER   NO         CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION    NO ***
***                                                                                                           ***
*** FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER   NO         FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION    NO ***
***                                                                                                           ***
*** MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER     NO         MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER       NO ***
***                                                                                                           ***
*** CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER   NO         CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER     NO ***
***                                                                                                           ***
*** FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER   NO         FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER     NO ***
***                                                                                                           ***
*** HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL    NO         HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL      NO ***
***                                                                                                           ***
*** AMX  PRINT ALL MIXED CROSS SECTIONS          NO         FAR  PRINT FIS. AND ABS. BY REGION              NO ***
***                                                                                                           ***
*** XS1  PRINT 1-D MIXTURE X-SECTIONS            NO         GAS  PRINT FAR BY GROUP                         NO ***
***                                                                                                           ***
*** XS2  PRINT 2-D MIXTURE X-SECTIONS            NO         PAX  PRINT XSEC-ALBEDO CORRELATION TABLES       NO ***
***                                                                                                           ***
*** XAP  PRINT MIXTURE ANGLES & PROBABILITIES    NO         PWT  PRINT WEIGHT AVERAGE ARRAY                 NO ***
***                                                                                                           ***
*** PKI  PRINT FISSION SPECTRUM                  NO         PGM  PRINT INPUT GEOMETRY                       NO ***
***                                                                                                           ***
*** P1D  PRINT EXTRA 1-D CROSS SECTIONS          NO         BUG  PRINT DEBUG INFORMATION                    NO ***
***                                                                                                           ***
***                                                         TRK  PRINT TRACKING INFORMATION                 NO ***
***                                                                                                           ***
***                                                                                                           ***
*****************************************************************************************************************
*****************************************************************************************************************
*****************************************************************************************************************
                                   PARAMETER INPUT COMPLETED

                      ........     0 IO'S WERE USED READING THE PARAMETER DATA     ........

                      ************** DATA READING COMPLETED **************
```

```
"LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"

****** ADDITIONAL INFORMATION ******

NUMBER OF ENERGY GROUPS                 27      USE LATTICE GEOMETRY                     NO
NO. OF FISSION SPECTRUM SOURCE GROUP    1       GLOBAL ARRAY NUMBER                      0
NO. OF SCATTERING ANGLES IN XSECS       2       NUMBER OF UNITS IN THE GLOBAL X DIR.     0
ENTRIES/NEUTRON IN THE NEUTRON BANK     17      NUMBER OF UNITS IN THE GLOBAL Y DIR.     0
ENTRIES/NEUTRON IN THE FISSION BANK     10      NUMBER OF UNITS IN THE GLOBAL Z DIR.     0
NUMBER OF MIXTURES USED                 8       USE A GLOBAL REFLECTOR                   YES
NUMBER OF BIAS ID'S USED                1       USE NESTED HOLES                         NO
NUMBER OF DIFFERENTIAL ALBEDOS USED     0       NUMBER OF HOLES                          25
TOTAL INPUT GEOMETRY REGIONS            10      MAXIMUM HOLE NESTING LEVEL               1
NUMBER OF GEOMETRY REGIONS USED         10      USE NESTED ARRAYS                        NO
LARGEST GEOMETRY UNIT NUMBER            2       NUMBER OF ARRAYS USED                    0
LARGEST ARRAY NUMBER                    1       MAXIMUM ARRAY NESTING LEVEL              0

+X BOUNDARY CONDITION                  MIR      -X BOUNDARY CONDITION                    MIR
+Y BOUNDARY CONDITION                  MIR      -Y BOUNDARY CONDITION                    MIR
+Z BOUNDARY CONDITION                  MIR      -Z BOUNDARY CONDITION                    MIR
```

```
                              "LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"

              MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION         NUM   ID

                                          -----  UNIT    1  -----

PWR FUEL ROD

  1 CYLINDER      1   1  RADIUS = 0.47810    +Z =  10.000    -Z = -10.000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  2 CYLINDER      9   1  RADIUS = 0.48760    +Z =  10.000    -Z = -10.000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CYLINDER      2   1  RADIUS = 0.55880    +Z =  10.000    -Z = -10.000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
                              "LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"

              MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION         NUM   ID

                              ******************  GLOBAL  ******************
                                          -----  UNIT    2  -----

  1 CYLINDER      3   1  RADIUS =  16.986    +Z =  10.000    -Z = -10.000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

    HOLE NUMBER   1        AT X = 0.00000     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER      1

    HOLE NUMBER   2        AT X = 0.00000     Y =  2.9216     Z = 0.00000    IS UNIT NUMBER      1

    HOLE NUMBER   3        AT X =  2.5301     Y =  1.4608     Z = 0.00000    IS UNIT NUMBER      1

    HOLE NUMBER   4        AT X =  2.5301     Y = -1.4608     Z = 0.00000    IS UNIT NUMBER      1

    HOLE NUMBER   5        AT X = 0.00000     Y = -2.9216     Z = 0.00000    IS UNIT NUMBER      1

    HOLE NUMBER   6        AT X = -2.5301     Y = -1.4608     Z = 0.00000    IS UNIT NUMBER      1

    HOLE NUMBER   7        AT X = -2.5301     Y =  1.4608     Z = 0.00000    IS UNIT NUMBER      1

    HOLE NUMBER   8        AT X = -2.5301     Y =  4.3825     Z = 0.00000    IS UNIT NUMBER      1

    HOLE NUMBER   9        AT X = 0.00000     Y =  5.8433     Z = 0.00000    IS UNIT NUMBER      1

    HOLE NUMBER  10        AT X =  2.5301     Y =  4.3825     Z = 0.00000    IS UNIT NUMBER      1

    HOLE NUMBER  11        AT X =  5.0603     Y =  2.9216     Z = 0.00000    IS UNIT NUMBER      1

    HOLE NUMBER  12        AT X =  5.0603     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER      1

    HOLE NUMBER  13        AT X =  5.0603     Y = -2.9216     Z = 0.00000    IS UNIT NUMBER      1

    HOLE NUMBER  14        AT X =  2.5301     Y = -4.3825     Z = 0.00000    IS UNIT NUMBER      1

    HOLE NUMBER  15        AT X = 0.00000     Y = -5.8433     Z = 0.00000    IS UNIT NUMBER      1

    HOLE NUMBER  16        AT X = -2.5301     Y = -4.3825     Z = 0.00000    IS UNIT NUMBER      1

    HOLE NUMBER  17        AT X = -5.0603     Y = -2.9216     Z = 0.00000    IS UNIT NUMBER      1

    HOLE NUMBER  18        AT X = -5.0603     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER      1

    HOLE NUMBER  19        AT X = -5.0603     Y =  2.9216     Z = 0.00000    IS UNIT NUMBER      1

    HOLE NUMBER  20        AT X = -5.0603     Y =  5.8433     Z = 0.00000    IS UNIT NUMBER      1

    HOLE NUMBER  21        AT X =  2.5301     Y =  7.3041     Z = 0.00000    IS UNIT NUMBER      1

    HOLE NUMBER  22        AT X =  7.5904     Y =  1.4608     Z = 0.00000    IS UNIT NUMBER      1

    HOLE NUMBER  23        AT X =  5.0603     Y = -5.8433     Z = 0.00000    IS UNIT NUMBER      1

    HOLE NUMBER  24        AT X = -2.5301     Y = -7.3041     Z = 0.00000    IS UNIT NUMBER      1

    HOLE NUMBER  25        AT X = -7.5904     Y = -1.4608     Z = 0.00000    IS UNIT NUMBER      1

  2 CYLINDER      5   1  RADIUS =  18.891    +Z =  10.000    -Z = -10.000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CYLINDER      6   1  RADIUS =  33.496    +Z =  10.000    -Z = -10.000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  4 CYLINDER      5   1  RADIUS =  36.544    +Z =  10.000    -Z = -10.000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  5 CYLINDER      7   1  RADIUS =  49.244    +Z =  10.000    -Z = -10.000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  6 CYLINDER      5   1  RADIUS =  49.854    +Z =  10.000    -Z = -10.000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  7 CUBOID        8   1      +X =  49.854    -X = -49.854    +Y =  49.854    -Y = -49.854     +Z =  10.000    -Z = -10.000
```

```
"LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"
VOLUMES FOR THOSE UNITS UTILIZED IN  THIS PROBLEM

                       GEOMETRY                              CUMULATIVE
UNIT     REGION         REGION          VOLUME                  VOLUME

  1         1             1        1.43621E+01 CM**3       1.43621E+01 CM**3
            2             2        5.76429E-01 CM**3       1.49385E+01 CM**3
            3             3        4.68120E+00 CM**3       1.96197E+01 CM**3

  2         1             4        1.76387E+04 CM**3       1.81291E+04 CM**3
            2             5        4.29436E+03 CM**3       2.24235E+04 CM**3
            3             6        4.80740E+04 CM**3       7.04975E+04 CM**3
            4             7        1.34136E+04 CM**3       8.39110E+04 CM**3
            5             8        6.84563E+04 CM**3       1.52367E+05 CM**3
            6             9        3.79567E+03 CM**3       1.56163E+05 CM**3
            7            10        4.26699E+04 CM**3       1.98833E+05 CM**3


          UNIT     USES     REGION     MIXTURE       TOTAL VOLUME

            1       25        1           1        3.59052E+02 CM**3
                              2           9        1.44107E+01 CM**3
                              3           2        1.17030E+02 CM**3

            2        1        1           3        1.76387E+04 CM**3
                              2           5        4.29436E+03 CM**3
                              3           6        4.80740E+04 CM**3
                              4           5        1.34136E+04 CM**3
                              5           7        6.84563E+04 CM**3
                              6           5        3.79567E+03 CM**3
                              7           8        4.26699E+04 CM**3


                    TOTAL MIXTURE VOLUMES
               MIXTURE          TOTAL VOLUME             MASS(G)
                  1          3.59052E+02 CM**3        3.73844E+03
                  2          1.17030E+02 CM**3        7.67717E+02
                  3          1.76387E+04 CM**3        1.76064E+04
                  5          2.15036E+04 CM**3        1.70309E+05
                  6          4.80740E+04 CM**3        5.45351E+05
                  7          6.84563E+04 CM**3        6.83311E+04
                  8          4.26699E+04 CM**3        4.25919E+04
                  9          1.44107E+01 CM**3        1.43844E-19

***************************************************************************************************************
***                                                                                                         ***
***                                       BIASING INFORMATION                                               ***
***                                                                                                         ***
***    A DEFAULT WEIGHT OF    0.500 WILL BE USED FOR ALL BIAS ID'S.                                         ***
***                                                                                                         ***
***************************************************************************************************************

          ........    0 IO'S WERE USED IN KENO-V BEFORE TRACKING        ........

          ........  0.00733 MINUTES WERE USED PROCESSING DATA.          ........

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 1.80580E-03

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED UNIFORMLY THROUGHOUT THE ENTIRE VOLUME DEFINED BY THE OUTERMOST GEOMETRY CARD.
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

KENO MESSAGE NUMBER K5-105      ***** WARNING, ONLY   49 INDEPENDENT STARTING POSITIONS WERE GENERATED.  *****

  351 ADDITIONAL STARTING POINTS WERE PICKED FROM THE INITAL DISTRIBUTION.

0.45350 MINUTES WERE REQUIRED FOR STARTING.   TOTAL ELAPSED TIME IS 0.46933 MINUTES.
```

"LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
KENO MESSAGE NUMBER K5-132 WARNING....ONLY 292 INDEPENDENT FISSION POINTS WERE GENERATED						
1	6.50062E-01	5.01667E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132 WARNING....ONLY 279 INDEPENDENT FISSION POINTS WERE GENERATED						
2	5.88790E-01	5.39167E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132 WARNING....ONLY 274 INDEPENDENT FISSION POINTS WERE GENERATED						
3	5.83844E-01	5.75833E-01	5.83844E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	6.88844E-01	6.13333E-01	6.36344E-01	5.25002E-02	0.00000E+00	0.00000E+00
5	6.44585E-01	6.51667E-01	6.39091E-01	3.04352E-02	0.00000E+00	0.00000E+00
6	5.62068E-01	6.91167E-01	6.19835E-01	2.68780E-02	0.00000E+00	0.00000E+00
7	5.91573E-01	7.29500E-01	6.14183E-01	2.30719E-02	0.00000E+00	0.00000E+00
8	6.00952E-01	7.66167E-01	6.11978E-01	1.89668E-02	0.00000E+00	0.00000E+00
9	5.94883E-01	8.05500E-01	6.09535E-01	1.62148E-02	0.00000E+00	0.00000E+00
10	5.68206E-01	8.43000E-01	6.04369E-01	1.49626E-02	0.00000E+00	0.00000E+00
11	5.68268E-01	8.81500E-01	6.00358E-01	1.37919E-02	0.00000E+00	0.00000E+00
12	6.39110E-01	9.18167E-01	6.04233E-01	1.29303E-02	0.00000E+00	0.00000E+00
13	6.16368E-01	9.56667E-01	6.05336E-01	1.17478E-02	0.00000E+00	0.00000E+00
14	6.31496E-01	9.95000E-01	6.07516E-01	1.09435E-02	0.00000E+00	0.00000E+00
15	6.40650E-01	1.03167E+00	6.10065E-01	1.03842E-02	0.00000E+00	0.00000E+00
16	6.11881E-01	1.07100E+00	6.10195E-01	9.61479E-03	0.00000E+00	0.00000E+00
17	5.87702E-01	1.11033E+00	6.08695E-01	9.07561E-03	0.00000E+00	0.00000E+00
18	6.06461E-01	1.14783E+00	6.08556E-01	8.49061E-03	0.00000E+00	0.00000E+00
19	6.06772E-01	1.18550E+00	6.08451E-01	7.97623E-03	0.00000E+00	0.00000E+00
20	6.11538E-01	1.22383E+00	6.08622E-01	7.52201E-03	0.00000E+00	0.00000E+00
21	6.15649E-01	1.26333E+00	6.08992E-01	7.12472E-03	0.00000E+00	0.00000E+00
22	5.94314E-01	1.29983E+00	6.08258E-01	6.79883E-03	0.00000E+00	0.00000E+00
23	6.27934E-01	1.33733E+00	6.09195E-01	6.53450E-03	0.00000E+00	0.00000E+00
24	6.25886E-01	1.37683E+00	6.09954E-01	6.27642E-03	0.00000E+00	0.00000E+00
25	6.02958E-01	1.41433E+00	6.09650E-01	6.00503E-03	0.00000E+00	0.00000E+00
26	6.47925E-01	1.45450E+00	6.11245E-01	5.96648E-03	0.00000E+00	0.00000E+00
27	5.22236E-01	1.49400E+00	6.07684E-01	6.73995E-03	0.00000E+00	0.00000E+00
28	5.79080E-01	1.53333E+00	6.06584E-01	6.56832E-03	0.00000E+00	0.00000E+00
29	6.35278E-01	1.56900E+00	6.07647E-01	6.40910E-03	0.00000E+00	0.00000E+00
30	6.28571E-01	1.60750E+00	6.08394E-01	6.22101E-03	0.00000E+00	0.00000E+00
31	6.10947E-01	1.64500E+00	6.08482E-01	6.00330E-03	0.00000E+00	0.00000E+00
32	6.08800E-01	1.68067E+00	6.08493E-01	5.79975E-03	0.00000E+00	0.00000E+00
33	6.17914E-01	1.71917E+00	6.08797E-01	5.61777E-03	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132 WARNING....ONLY 396 INDEPENDENT FISSION POINTS WERE GENERATED						
34	5.28187E-01	1.75750E+00	6.06278E-01	5.99438E-03	0.00000E+00	0.00000E+00
35	5.88405E-01	1.79700E+00	6.05736E-01	5.83508E-03	0.00000E+00	0.00000E+00
36	5.79583E-01	1.83633E+00	6.04967E-01	5.71288E-03	0.00000E+00	0.00000E+00
37	6.11891E-01	1.87483E+00	6.05165E-01	5.55078E-03	0.00000E+00	0.00000E+00
38	5.52803E-01	1.91317E+00	6.03710E-01	5.58703E-03	0.00000E+00	0.00000E+00
39	6.43414E-01	1.95067E+00	6.04783E-01	5.53887E-03	0.00000E+00	0.00000E+00
40	6.75353E-01	1.98650E+00	6.06640E-01	5.70204E-03	0.00000E+00	0.00000E+00
41	6.05556E-01	2.02483E+00	6.06612E-01	5.55398E-03	0.00000E+00	0.00000E+00
42	6.21874E-01	2.06333E+00	6.06994E-01	5.42678E-03	0.00000E+00	0.00000E+00
43	6.17653E-01	2.10083E+00	6.07254E-01	5.29914E-03	0.00000E+00	0.00000E+00
44	5.88315E-01	2.14117E+00	6.06803E-01	5.19106E-03	0.00000E+00	0.00000E+00
45	6.10426E-01	2.17867E+00	6.06887E-01	5.06960E-03	0.00000E+00	0.00000E+00
46	6.11801E-01	2.21717E+00	6.06999E-01	4.95430E-03	0.00000E+00	0.00000E+00
47	6.77640E-01	2.25183E+00	6.08569E-01	5.09102E-03	0.00000E+00	0.00000E+00
48	5.29465E-01	2.29133E+00	6.06849E-01	5.26771E-03	0.00000E+00	0.00000E+00
49	5.89260E-01	2.32883E+00	6.06475E-01	5.16798E-03	0.00000E+00	0.00000E+00
50	6.09912E-01	2.36817E+00	6.06547E-01	5.05967E-03	0.00000E+00	0.00000E+00
51	6.27383E-01	2.40483E+00	6.06972E-01	4.97355E-03	0.00000E+00	0.00000E+00
52	6.12326E-01	2.44233E+00	6.07079E-01	4.87424E-03	0.00000E+00	0.00000E+00
53	5.84348E-01	2.47983E+00	6.06633E-01	4.79846E-03	0.00000E+00	0.00000E+00
54	5.59227E-01	2.51917E+00	6.05721E-01	4.79278E-03	0.00000E+00	0.00000E+00
55	5.75477E-01	2.55850E+00	6.05151E-01	4.73598E-03	0.00000E+00	0.00000E+00
56	5.74859E-01	2.59883E+00	6.04590E-01	4.68119E-03	0.00000E+00	0.00000E+00
57	5.67444E-01	2.63817E+00	6.03914E-01	4.64465E-03	0.00000E+00	0.00000E+00
58	6.45415E-01	2.67583E+00	6.04656E-01	4.62077E-03	0.00000E+00	0.00000E+00
59	5.95972E-01	2.71517E+00	6.04503E-01	4.54154E-03	0.00000E+00	0.00000E+00
60	6.03708E-01	2.75533E+00	6.04490E-01	4.46257E-03	0.00000E+00	0.00000E+00
61	5.57989E-01	2.79483E+00	6.03701E-01	4.45653E-03	0.00000E+00	0.00000E+00
62	6.24697E-01	2.83317E+00	6.04051E-01	4.39557E-03	0.00000E+00	0.00000E+00
63	6.29967E-01	2.87167E+00	6.04476E-01	4.34374E-03	0.00000E+00	0.00000E+00
64	6.46987E-01	2.90733E+00	6.05162E-01	4.32777E-03	0.00000E+00	0.00000E+00
65	6.05749E-01	2.94400E+00	6.05171E-01	4.25853E-03	0.00000E+00	0.00000E+00
66	6.35054E-01	2.98250E+00	6.05638E-01	4.21739E-03	0.00000E+00	0.00000E+00
67	7.15795E-01	3.01817E+00	6.07333E-01	4.48455E-03	0.00000E+00	0.00000E+00
68	5.59694E-01	3.05750E+00	6.06611E-01	4.47468E-03	0.00000E+00	0.00000E+00
69	5.57212E-01	3.09683E+00	6.05874E-01	4.46863E-03	0.00000E+00	0.00000E+00
70	6.06197E-01	3.13350E+00	6.05878E-01	4.40243E-03	0.00000E+00	0.00000E+00
71	6.20951E-01	3.17100E+00	6.06097E-01	4.34365E-03	0.00000E+00	0.00000E+00
72	5.86138E-01	3.20850E+00	6.05812E-01	4.29064E-03	0.00000E+00	0.00000E+00
73	6.15314E-01	3.24600E+00	6.05946E-01	4.23189E-03	0.00000E+00	0.00000E+00
74	6.49943E-01	3.28450E+00	6.06557E-01	4.21721E-03	0.00000E+00	0.00000E+00
75	6.17206E-01	3.32383E+00	6.06703E-01	4.16159E-03	0.00000E+00	0.00000E+00
76	6.31617E-01	3.35950E+00	6.07039E-01	4.11875E-03	0.00000E+00	0.00000E+00
77	5.38890E-01	3.39800E+00	6.06131E-01	4.16382E-03	0.00000E+00	0.00000E+00
78	6.39127E-01	3.43467E+00	6.06565E-01	4.13154E-03	0.00000E+00	0.00000E+00
79	6.26966E-01	3.47217E+00	6.06830E-01	4.08613E-03	0.00000E+00	0.00000E+00
80	5.73296E-01	3.50967E+00	6.06400E-01	4.05625E-03	0.00000E+00	0.00000E+00
81	6.21337E-01	3.54633E+00	6.06589E-01	4.00904E-03	0.00000E+00	0.00000E+00
82	5.88458E-01	3.58300E+00	6.06362E-01	3.96509E-03	0.00000E+00	0.00000E+00
83	6.20492E-01	3.62050E+00	6.06537E-01	3.91972E-03	0.00000E+00	0.00000E+00
84	5.68290E-01	3.65800E+00	6.06070E-01	3.89962E-03	0.00000E+00	0.00000E+00
85	6.35831E-01	3.69467E+00	6.06429E-01	3.86900E-03	0.00000E+00	0.00000E+00
86	5.45458E-01	3.73483E+00	6.05703E-01	3.89096E-03	0.00000E+00	0.00000E+00
87	6.36212E-01	3.77250E+00	6.06062E-01	3.86163E-03	0.00000E+00	0.00000E+00

88	5.97694E-01	3.80900E+00	6.05965E-01	3.81770E-03	0.00000E+00	0.00000E+00
89	6.40220E-01	3.84650E+00	6.06358E-01	3.79405E-03	0.00000E+00	0.00000E+00
90	5.96305E-01	3.88600E+00	6.06244E-01	3.75243E-03	0.00000E+00	0.00000E+00
91	6.06641E-01	3.92350E+00	6.06249E-01	3.71003E-03	0.00000E+00	0.00000E+00
92	5.96472E-01	3.96100E+00	6.06140E-01	3.67019E-03	0.00000E+00	0.00000E+00
93	6.39682E-01	4.00033E+00	6.06508E-01	3.64830E-03	0.00000E+00	0.00000E+00
94	6.01010E-01	4.03883E+00	6.06449E-01	3.60892E-03	0.00000E+00	0.00000E+00
95	6.31734E-01	4.07733E+00	6.06721E-01	3.58024E-03	0.00000E+00	0.00000E+00
96	6.48617E-01	4.11363E+00	6.07166E-01	3.56988E-03	0.00000E+00	0.00000E+00
97	6.37762E-01	4.15150E+00	6.07488E-01	3.54676E-03	0.00000E+00	0.00000E+00
98	6.23961E-01	4.18983E+00	6.07660E-01	3.51381E-03	0.00000E+00	0.00000E+00
99	5.81891E-01	4.22733E+00	6.07394E-01	3.48753E-03	0.00000E+00	0.00000E+00
100	6.24901E-01	4.26583E+00	6.07573E-01	3.45638E-03	0.00000E+00	0.00000E+00
101	6.07566E-01	4.30333E+00	6.07573E-01	3.42129E-03	0.00000E+00	0.00000E+00
102	6.08627E-01	4.34000E+00	6.07583E-01	3.38692E-03	0.00000E+00	0.00000E+00
103	6.08048E-01	4.37667E+00	6.07588E-01	3.35322E-03	0.00000E+00	0.00000E+00

KENO MESSAGE NUMBER K5-123 EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

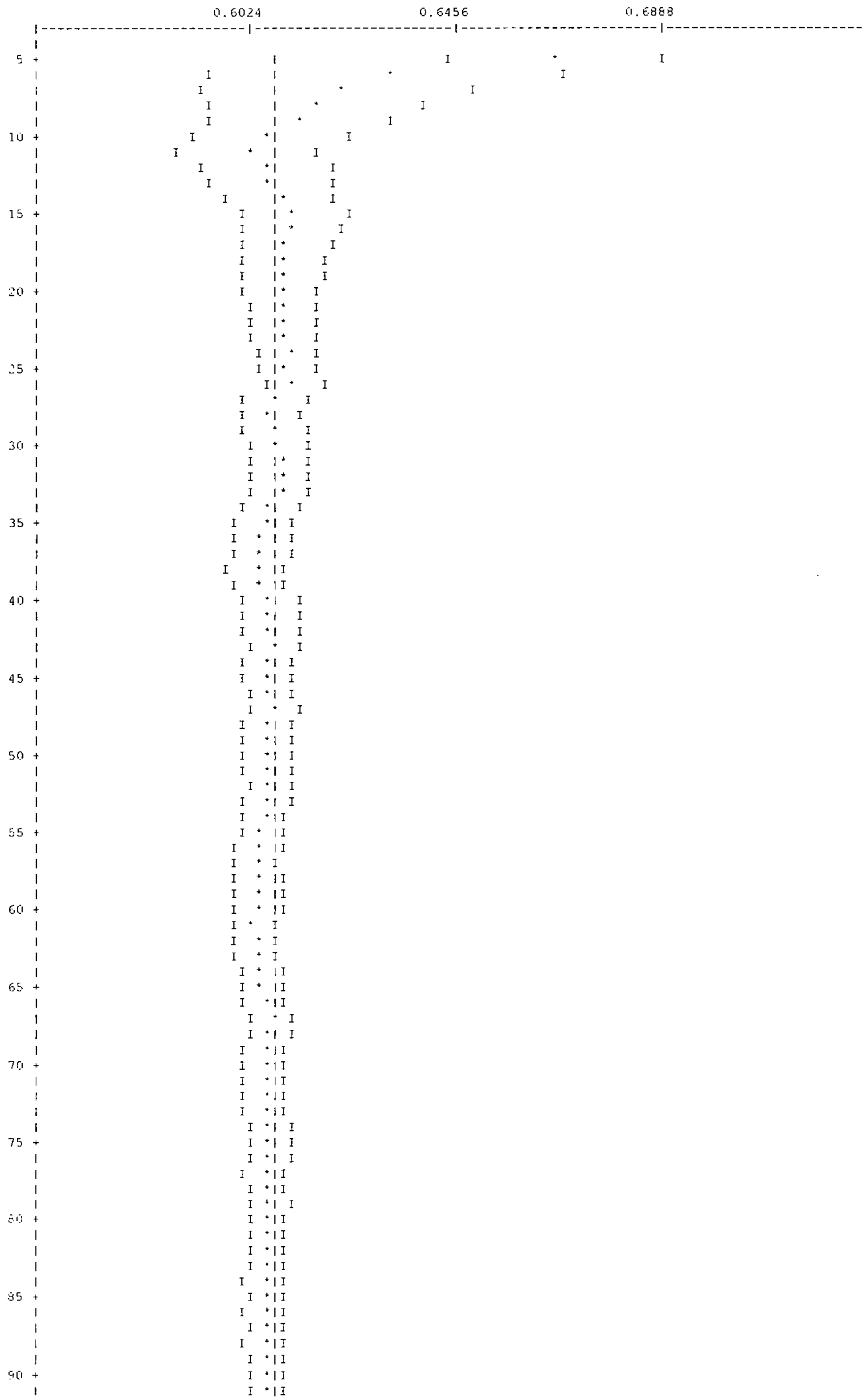
"LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"

LIFETIME = 2.21135E-04 + OR - 1.12274E-06 GENERATION TIME = 1.16931E-04 + OR - 8.33192E-07
NU BAR = 2.42948E+00 + OR - 2.62739E-04 AVERAGE FISSION GROUP = 2.38394E+01 + OR - 1.55874E-02
ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION = 6.34530E-02 + OR - 9.03504E-04

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.60783	+ OR - 0.00339	0.60445 TO 0.61120	0.60107 TO 0.61458	0.59769 TO 0.61796	40000
4	0.60701	+ OR - 0.00331	0.60370 TO 0.61032	0.60038 TO 0.61363	0.59707 TO 0.61694	39600
5	0.60662	+ OR - 0.00332	0.60330 TO 0.60995	0.59998 TO 0.61327	0.59666 TO 0.61659	39200
6	0.60708	+ OR - 0.00332	0.60376 TO 0.61041	0.60043 TO 0.61373	0.59711 TO 0.61706	38800
7	0.60724	+ OR - 0.00336	0.60389 TO 0.61060	0.60053 TO 0.61396	0.59718 TO 0.61731	38400
8	0.60731	+ OR - 0.00339	0.60392 TO 0.61070	0.60053 TO 0.61409	0.59714 TO 0.61748	38000
9	0.60744	+ OR - 0.00342	0.60402 TO 0.61087	0.60059 TO 0.61429	0.59717 TO 0.61772	37600
10	0.60786	+ OR - 0.00343	0.60443 TO 0.61130	0.60100 TO 0.61473	0.59756 TO 0.61817	37200
11	0.60830	+ OR - 0.00344	0.60485 TO 0.61174	0.60141 TO 0.61519	0.59796 TO 0.61863	36800
12	0.60796	+ OR - 0.00347	0.60449 TO 0.61142	0.60102 TO 0.61489	0.59756 TO 0.61835	36400
17	0.60739	+ OR - 0.00363	0.60377 TO 0.61102	0.60014 TO 0.61465	0.59651 TO 0.61828	34400
22	0.60742	+ OR - 0.00385	0.60357 TO 0.61127	0.59972 TO 0.61512	0.59588 TO 0.61897	32400
27	0.60756	+ OR - 0.00389	0.60367 TO 0.61145	0.59977 TO 0.61534	0.59588 TO 0.61923	30400
32	0.60721	+ OR - 0.00412	0.60309 TO 0.61132	0.59897 TO 0.61544	0.59485 TO 0.61956	28400
37	0.60887	+ OR - 0.00423	0.60465 TO 0.61310	0.60042 TO 0.61732	0.59620 TO 0.62155	26400
42	0.60798	+ OR - 0.00430	0.60368 TO 0.61228	0.59938 TO 0.61657	0.59508 TO 0.62087	24400
47	0.60680	+ OR - 0.00449	0.60231 TO 0.61129	0.59781 TO 0.61579	0.59332 TO 0.62028	22400
52	0.60809	+ OR - 0.00466	0.60343 TO 0.61275	0.59877 TO 0.61740	0.59411 TO 0.62206	20400
57	0.61198	+ OR - 0.00481	0.60717 TO 0.61679	0.60236 TO 0.62160	0.59755 TO 0.62641	18400
62	0.61276	+ OR - 0.00514	0.60762 TO 0.61790	0.60248 TO 0.62304	0.59735 TO 0.62818	16400
67	0.60805	+ OR - 0.00487	0.60318 TO 0.61292	0.59831 TO 0.61779	0.59344 TO 0.62266	14400
72	0.61160	+ OR - 0.00507	0.60653 TO 0.61667	0.60145 TO 0.62174	0.59638 TO 0.62682	12400
77	0.61179	+ OP - 0.00507	0.60672 TO 0.61686	0.60165 TO 0.62194	0.59658 TO 0.62701	10400
82	0.61226	+ OR - 0.00570	0.60656 TO 0.61795	0.60087 TO 0.62365	0.59517 TO 0.62934	8400
87	0.61570	+ OR - 0.00493	0.61076 TO 0.62063	0.60583 TO 0.62556	0.60089 TO 0.63050	6400
92	0.61944	+ OR - 0.00598	0.61345 TO 0.62542	0.60747 TO 0.63140	0.60149 TO 0.63738	4400
97	0.60917	+ OR - 0.00636	0.60280 TO 0.61553	0.59644 TO 0.62189	0.59008 TO 0.62825	2400

"LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.6078 + OR - 0.0034 WHICH OCCURS FOR 103 GENERATIONS RUN.



```
     |                            I  *|I
     |                            I  *|I
     |                            I  *|I
  95 +                            I  *|I
     |                            I  *|I
     |                             I  *  I
     |                             I  *  I
     |                            I   *  I
 100 +                             I  *  I
     |                             I  *  I
     |                             I  *  I
     |                             I  *  I
```

"LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0026			1.57985E-03	8.7976	1.46109E-03	4.6127	0.00000E+00	0.0000
2	0.0115			7.00679E-03	2.7598	4.70633E-03	1.7867	0.00000E+00	0.0000
3	0.0117			7.09670E-03	2.4508	2.94741E-03	2.3817	0.00000E+00	0.0000
4	0.0050			3.04076E-03	2.7124	1.44708E-03	2.5780	0.00000E+00	0.0000
5	0.0017			1.05042E-03	2.2811	9.71530E-04	2.0226	0.00000E+00	0.0000
6	0.0013			8.01924E-04	1.8786	1.27437E-03	1.5946	0.00000E+00	0.0000
7	0.0011			6.58599E-04	2.2485	1.13115E-03	1.8620	0.00000E+00	0.0000
8	0.0009			5.46337E-04	2.7318	1.38799E-03	2.3369	0.00000E+00	0.0000
9	0.0011			6.88145E-04	3.2905	2.04965E-03	2.8429	0.00000E+00	0.0000
10	0.0023			1.37228E-03	4.0690	3.08278E-03	3.1438	0.00000E+00	0.0000
11	0.0050			3.01285E-03	3.2726	5.58792E-03	2.7255	0.00000E+00	0.0000
12	0.0068			4.14269E-03	4.1673	6.55793E-03	3.5414	0.00000E+00	0.0000
13	0.0061			3.70803E-03	4.2331	6.66073E-03	3.2560	0.00000E+00	0.0000
14	0.0052			3.14150E-03	3.9860	1.00693E-02	2.9291	0.00000E+00	0.0000
15	0.0010			5.92258E-04	6.9217	2.66806E-03	3.6113	0.00000E+00	0.0000
16	0.0008			4.92749E-04	8.2799	1.72052E-03	4.2351	0.00000E+00	0.0000
17	0.0011			6.58539E-04	11.8002	1.10648E-03	5.0772	0.00000E+00	0.0000
18	0.0015			9.35353E-04	13.1549	1.20556E-03	5.5875	0.00000E+00	0.0000
19	0.0020			1.22599E-03	9.2968	2.04936E-03	3.7905	0.00000E+00	0.0000
20	0.0084			5.09529E-03	5.8262	8.23197E-03	2.6286	0.00000E+00	0.0000
21	0.0050			3.03201E-03	7.8495	3.81663E-03	4.1344	0.00000E+00	0.0000
22	0.0132			8.02532E-03	4.6382	9.93741E-03	2.4315	0.00000E+00	0.0000
23	0.0855			5.19793E-02	2.0678	7.77471E-02	0.8462	0.00000E+00	0.0000
24	0.2422			1.47194E-01	1.2481	2.28032E-01	0.4439	0.00000E+00	0.0000
25	0.2248			1.36621E-01	1.1692	2.18870E-01	0.4151	0.00000E+00	0.0000
26	0.2717			1.65140E-01	1.0707	2.89862E-01	0.3604	0.00000E+00	0.0000
27	0.0806			4.89865E-02	2.5235	1.07785E-01	0.6253	0.00000E+00	0.0000
SYSTEM TOTAL =				6.07825E-01	0.5556	1.00237E+00	0.1147	0.00000E+00	0.0000

ELAPSED TIME 4.37750 MINUTES

RANDOM NUMBER= 141C1CDC4912

```
"LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"

                           FREQUENCY FOR GENERATIONS    4 TO  103
0.5183 TO 0.5383     ***
0.5383 TO 0.5583     *****
0.5583 TO 0.5783     **********
0.5783 TO 0.5983     ****************
0.5983 TO 0.6183     **************************
0.6183 TO 0.6383     *******************
0.6383 TO 0.6583     ***********
0.6583 TO 0.6783     **
0.6783 TO 0.6983     *
0.6983 TO 0.7183     *

                           FREQUENCY FOR GENERATIONS   29 TO  103
0.5183 TO 0.5383     **
0.5383 TO 0.5583     *****
0.5583 TO 0.5783     *******
0.5783 TO 0.5983     ************
0.5983 TO 0.6183     *******************
0.6183 TO 0.6383     *****************
0.6383 TO 0.6583     ********
0.6583 TO 0.6783     **
0.6783 TO 0.6983
0.6983 TO 0.7183     *

                           FREQUENCY FOR GENERATIONS   54 TO  103
0.5183 TO 0.5383
0.5383 TO 0.5583     ****
0.5583 TO 0.5783     *******
0.5783 TO 0.5983     *******
0.5983 TO 0.6183     **********
0.6183 TO 0.6383     *************
0.6383 TO 0.6583     *******
0.6583 TO 0.6783
0.6783 TO 0.6983
0.6983 TO 0.7183     *

                           FREQUENCY FOR GENERATIONS   79 TO  103
0.5183 TO 0.5383
0.5383 TO 0.5583     *
0.5583 TO 0.5783     **
0.5783 TO 0.5983     *****
0.5983 TO 0.6183     *****
0.6183 TO 0.6383     *********
0.6383 TO 0.6583     ***
0.6583 TO 0.6783
0.6783 TO 0.6983
0.6983 TO 0.7183


*******************************************************************************************************************************
*

         CONGRATULATIONS!  YOU HAVE  SUCCESSFULLY TRAVERSED THE PERILOUS PATH THROUGH KENO V IN   4.37750 MINUTES

*******************************************************************************************************************************
*
_
```

Figure 6.6.4-2 CSAS Input/Output for NAC-LWT with 25 PWR Rods – Most Reactive Accident Condition Configuration

```
PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
   MODULE CSAS25   WILL BE CALLED
     PWR RODS, NO BASKET, VOID EXTERIOR, GAP FULL
     27GROUPNDF4    LATTICECELL
     UO2        1    0.95  293.0  92235  5.0  92238   95.0  END
     ZIRCALLOY 2    1.0          293.0     END
     H2O   3 1.000 293.0 END
     AL         4    1.0          293.0     END
     SS304      5    1.0          293.0     END
     PB         6    1.0          293.0     END
     H2O   7 1.000 293.0 END
     H2O   8 1.000 293.0 END
     H2O        9    1.0          293.0     END
     END COMP
     TRIANGPITCH   2.92169   0.9564  1  3  1.1175 2 0.9753 9 END
     "LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"
     READ PARAM RUN=YES PLT=NO  GEN=103 NPG=400 END PARAM
     READ GEOM
     UNIT 1
     COM="PWR FUEL ROD"
     CYLINDER     1  1  0.4781    2P10.0
     CYLINDER     9  1  0.4876    2P10.0
     CYLINDER     2  1  0.5588    2P10.0
     GLOBAL UNIT 2
     CYLINDER    3   1   16.9863  2P10.0
     HOLE     1     .0000    .0000    .0000
     HOLE     1     .0000   2.9216    .0000
     HOLE     1   2.5301    1.4608    .0000
     HOLE     1   2.5301   -1.4608    .0000
     HOLE     1     .0000  -2.9216    .0000
     HOLE     1  -2.5301   -1.4608    .0000
     HOLE     1  -2.5301    1.4608    .0000
     HOLE     1  -2.5301    4.3825    .0000
     HOLE     1     .0000   5.8433    .0000
     HOLE     1   2.5301    4.3825    .0000
     HOLE     1   5.0603    2.9216    .0000
     HOLE     1   5.0603     .0000    .0000
     HOLE     1   5.0603   -2.9216    .0000
     HOLE     1   2.5301   -4.3825    .0000
     HOLE     1     .0000  -5.8433    .0000
     HOLE     1  -2.5301   -4.3825    .0000
     HOLE     1  -5.0603   -2.9216    .0000
     HOLE     1  -5.0603     .0000    .0000
     HOLE     1  -5.0603    2.9216    .0000
     HOLE     1  -5.0603    5.8433    .0000
     HOLE     1   2.5301    7.3041    .0000
     HOLE     1   7.5904    1.4608    .0000
     HOLE     1   5.0603   -5.8433    .0000
     HOLE     1  -2.5301   -7.3041    .0000
     HOLE     1  -7.5904   -1.4608    .0000
     CYLINDER    5   1    18.8913  2P10.0
     CYLINDER    6   1    33.4963  2P10.0
     CYLINDER    5   1    36.5443  2P10.0
     CYLINDER    7   1    49.2443  2P10.0
     CYLINDER    5   1    49.8539  2P10.0
     CUBOID   8 1 4P49.8539  2P10.0
     END GEOM
     READ BOUNDS  ALL=MIR      END BOUNDS
     END DATA

   SECONDARY MODULE 000008   HAS BEEN CALLED.

   MODULE 000008   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     1.04 (SECONDS).

   SECONDARY MODULE 000002   HAS BEEN CALLED.

   MODULE 000002   IS FINISHED. COMPLETION CODE     0. CPU TIME USED    11.48 (SECONDS).

   SECONDARY MODULE 000009   HAS BEEN CALLED.

   MODULE 000009   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   472.53 (SECONDS).

   MODULE CSAS25   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   488.18 (SECONDS).
```

```
  CCCCCCCCCCC    SSSSSSSSSSS      AAAAAAAAA      SSSSSSSSSSS    22222222222    5555555555555
 CCCCCCCCCCCCC  SSSSSSSSSSSSS    AAAAAAAAAAA    SSSSSSSSSSSSS  2222222222222   5555555555555
 CC         CC  SS         SS   AA         AA   SS         SS  22         22   55
 CC             SS              AA         AA   SS                        22   55
 CC             SS              AA         AA   SS                        22   55
 CC             SSSSSSSSSSSS    AAAAAAAAAAAAA   SSSSSSSSSSSS             22    555555555555
 CC              SSSSSSSSSSSS   AAAAAAAAAAAAA    SSSSSSSSSSSS          22      5555555555555
 CC                        SS   AA         AA              SS        22                   55
 CC                        SS   AA         AA              SS      22                     55
 CC         CC  SS         SS   AA         AA   SS         SS    22            55         55
 CCCCCCCCCCCCC  SSSSSSSSSSSSS   AA         AA   SSSSSSSSSSSSS  2222222222222   5555555555555
  CCCCCCCCCCC    SSSSSSSSSSS    AA         AA    SSSSSSSSSSS   2222222222222    55555555555

  SSSSSSSSSSS    CCCCCCCCCCC      AAAAAAAAA     LL             EEEEEEEEEEEEE                   PPPPPPPPPPPP    CCCCCCCCCCC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC    AAAAAAAAAAA    LL             EEEEEEEEEEEEE                   PPPPPPPPPPPPP  CCCCCCCCCCCCC
 SS         SS  CC         CC   AA         AA   LL             EE                              PP         PP  CC         CC
 SS             CC              AA         AA   LL             EE                              PP         PP  CC
 SS             CC              AA         AA   LL             EE                              PP         PP  CC
 SSSSSSSSSSSS   CC              AAAAAAAAAAAAA   LL             EEEEEEEEE       -------------   PPPPPPPPPPPPP  CC
  SSSSSSSSSSSS  CC              AAAAAAAAAAAAA   LL             EEEEEEEEE       -------------   PPPPPPPPPPPP   CC
            SS  CC              AA         AA   LL             EE                              PP             CC
            SS  CC              AA         AA   LL             EE                              PP             CC
 SS         SS  CC         CC   AA         AA   LL             EE                              PP             CC         CC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL  EEEEEEEEEEEEE                   PP             CCCCCCCCCCCCC
  SSSSSSSSSSS    CCCCCCCCCCC    AA         AA   LLLLLLLLLLLLL  EEEEEEEEEEEEE                   PP              CCCCCCCCCCC

   0000000      7777777777777            //    33333333333      0000000               //    99999999999     88888888888
  000000000     777777777777            //    3333333333333    000000000             //    9999999999999   8888888888888
 00       00    77         77          //     33         33   00       00           //     99         99   88         88
00         00             77          //                 33  00         00         //      99         99   88         88
00         00            77          //                  33  00         00        //       99         99   88         88
00         00           77          //                  333  00         00       //        9999999999999    88888888888
00         00           77         //                   333  00         00      //          999999999999    88888888888
00         00          77         //                     33  00         00     //                     99   88         88
00         00          77        //                      33  00         00    //                      99   88         88
 00       00           77       //        33             33   00       00    //                       99   88         88
  000000000            77      //         3333333333333        000000000    //             9999999999999   8888888888888
   0000000             77     //           33333333333          0000000    //              999999999999     88888888888

        11        99999999999                   11            44                 5555555555555  7777777777777
       111       9999999999999                 111           444                 5555555555555  777777777777
      1111       99         99     :::        1111          4444         :::     55             77         77
        11       99         99     :::          11         44 44         :::     55                       77
        11       99         99     :::          11        44  44         :::     55                      77
        11       9999999999999                  11       44   44                 555555555555           77
        11        999999999999                  11      44    44                 5555555555555          77
        11                  99     :::          11     4444444444444     :::                55         77
        11                  99     :::          11     4444444444444     :::                55         77
        11                  99     :::          11                44     :::     55         55        77
     11111111    9999999999999               11111111             44             5555555555555        77
     11111111    999999999999                11111111             44              55555555555         77
```

```
 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL             EEEEEEEEEEEEE                PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL             EEEEEEEEEEEEE                PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL             EE                           PP         PP  CC         CC
SS             CC             AA         AA  LL             EE                           PP         PP  CC
SS             CC             AA         AA  LL             EE                           PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------  PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------  PPPPPPPPPPPP   CC
           SS  CC             AA         AA  LL             EE                           PP             CC
           SS  CC             AA         AA  LL             EE                           PP             CC
SS         SS  CC         CC  AA         AA  LL             EE                           PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLLL  EEEEEEEEEEEEE                PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLLL  EEEEEEEEEEEEE                PP              CCCCCCCCCCC
```

```
*************************************************************************************
*************************************************************************************
*************************************************************************************
*****                                                                           *****
*****                     PROGRAM VERIFICATION INFORMATION                      *****
*****                                                                           *****
*****                   CODE SYSTEM:   SCALE-PC VERSION:  4.3                   *****
*****                                                                           *****
*************************************************************************************
*************************************************************************************
*****                                                                           *****
*****                                                                           *****
*****              PROGRAM:  CSAS                                               *****
*****                                                                           *****
*****        CREATION DATE:  03/08/96                                           *****
*****                                                                           *****
*****               VOLUME:  ENG                                                *****
*****                                                                           *****
*****              LIBRARY:  G:\SCALE43\WIN_NT\EXE                              *****
*****                                                                           *****
*****                                                                           *****
*****      PRODUCTION CODE:  CSAS                                               *****
*****                                                                           *****
*****              VERSION:  3.1                                                *****
*****                                                                           *****
*****              JOBNAME:  SCALE-PC                                           *****
*****                                                                           *****
*****    DATE OF EXECUTION:  07/30/98                                           *****
*****                                                                           *****
*****    TIME OF EXECUTION:  19:14:57                                           *****
*****                                                                           *****
*****                                                                           *****
*************************************************************************************
*************************************************************************************
*************************************************************************************
```

```
PWR RODS, NO BASKET, VOID EXTERIOR, GAP FULL

**** PROBLEM PARAMETERS ****

LIB 27GROUPNDF4  LIBRARY
MXX            9 MIXTURES
MSC            9 COMPOSITION SPECIFICATIONS
IZM            4 MATERIAL ZONES
GE  LATTICECELL  GEOMETRY
MORE           0 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
MSLN           0 FUEL SOLUTIONS

**** PROBLEM COMPOSITION DESCRIPTION ****

SC  UO2          STANDARD COMPOSITION
MX             1 MIXTURE NO.
VF        0.9500 VOLUME FRACTION
ROTH     10.9600 THEORETICAL DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           92000       1.00 ATOM/MOLECULE
                           92235      5.000 WT%
                           92238     95.000 WT%
            8016       2.00 ATOMS/MOLECULE
END

SC  ZIRCALLOY    STANDARD COMPOSITION
MX             2 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      6.5600 THEORETICAL DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           40302       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX             3 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      0.9982 THEORETICAL DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
            1001       2.00 ATOMS/MOLECULE
            8016       1.00 ATOM/MOLECULE
END

SC  AL           STANDARD COMPOSITION
MX             4 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      2.7020 THEORETICAL DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           13027       1.00 ATOM/MOLECULE
END

SC  SS304        STANDARD COMPOSITION
MX             5 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      7.9200 THEORETICAL DENSITY
NEL            4 NO. ELEMENTS
ICP            0 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           24304     19.000 WT%
           25055      2.000 WT%
           26304     69.500 WT%
           28304      9.500 WT%
END

SC  PB           STANDARD COMPOSITION
MX             6 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH     11.3440 THEORETICAL DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           82000       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX             7 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      0.9982 THEORETICAL DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
            1001       2.00 ATOMS/MOLECULE
            8016       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
```

```
MX          8 MIXTURE NO.
VF     1.0000 VOLUME FRACTION
ROTH   0.9982 THEORETICAL DENSITY
NEL         2 NO. ELEMENTS
ICP         1 0/1 MIXTURE/COMPOUND
TEMP    293.0 DEG KELVIN
         1001      2.00 ATOMS/MOLECULE
         8016      1.00 ATOM/MOLECULE
END

SC  H2O       STANDARD COMPOSITION
MX          9 MIXTURE NO.
VF     1.0000 VOLUME FRACTION
ROTH   0.9982 THEORETICAL DENSITY
NEL         2 NO. ELEMENTS
ICP         1 0/1 MIXTURE/COMPOUND
TEMP    293.0 DEG KELVIN
         1001      2.00 ATOMS/MOLECULE
         8016      1.00 ATOM/MOLECULE
END


**** PROBLEM GEOMETRY ****

CTP TRIANGPITCH  CELL TYPE
PITCH    2.9217 CM CENTER TO CENTER SPACING
FUELOD   0.9564 CM FUEL DIAMETER OR SLAB THICKNESS
MFUEL         1 MIXTURE NO. OF FUEL
MMOD          3 MIXTURE NO. OF MODERATOR
CLADOD   1.1175 CM CLAD OUTER DIAMETER
MCLAD         2 MIXTURE NO. OF CLAD
GAPOD    0.9753 CM GAP OUTER DIAMETER
MGAP          9 MIXTURE NO. OF GAP


ZONE SPECIFICATIONS FOR LATTICECELL GEOMETRY

               ZONE  1 IS FUEL
               ZONE  2 IS GAP
               ZONE  3 IS CLAD
               ZONE  4 IS MOD
```

```
**********************************************************************************************************
***                                                                                                    ***
***                            PWR RODS, NO BASKET, VOID EXTERIOR, GAP FULL                            ***
***                                                                                                    ***
**********************************************************************************************************
**********************************************************************************************************
***                                                                                                    ***
***                              ********** DATA LIBRARY INFORMATION **********                        ***
***                                                                                                    ***
***          UNIT                                          VOLUME                                      ***
***         NUMBER             DATA SET NAME                NAME        UNIT FUNCTION                  ***
***         ------             -------------                ----        -------------                  ***
***                                                                                                    ***
***           89      G:\scale43\DATALIB\FT89F001                       STANDARD COMPOSITION LIBRARY   ***
***                                                                                                    ***
***           82      G:\scale43\DATALIB\FT82F001                       CROSS SECTION LIBRARY          ***
***                                                                                                    ***
***           11      D:\PROJECTS\BU85-C~1\rods8\ROHX3M\FT11F001        SHORT CROSS SECTION LIBRARY    ***
***                                                                                                    ***
***           90      D:\PROJECTS\BU85-C~1\rods8\ROHX3M\FT90F001        INPUT DATA DIRECT ACCESS       ***
***                                                                                                    ***
**********************************************************************************************************
**********************************************************************************************************
***                                                                                                    ***
***                                                                                                    ***
***                                  STANDARD COMPOSITION LIBRARY DATA                                 ***
***                                  ---------------------------------                                 ***
***                                                                                                    ***
***             UNIT NUMBER  :  89                                                                     ***
***                                                                                                    ***
***             DATASET NAME :  G:\scale43\DATALIB\FT89F001                                            ***
***                                                                                                    ***
***             LIBRARY TITLE:  SCALE-4 STANDARD COMPOSITION LIBRARY                                   ***
***                             637 STANDARD COMPOSITIONS, 490 NUCLIDES                                ***
***                             90 ELEMENTS WITH VARIABLE ISOTOPIC DISTRBUTIONS.                       ***
***                                                                                                    ***
***             CREATION DATE:   6/30/95                                                               ***
***                                                                                                    ***
***                                                                                                    ***
***                                                                                                    ***
***                                     CROSS SECTION LIBRARY DATA                                     ***
***                                     --------------------------                                     ***
***                                                                                                    ***
***             UNIT NUMBER  :  82                                                                     ***
***                                                                                                    ***
***             DATASET NAME :  G:\scale43\DATALIB\FT82F001                                            ***
***                                                                                                    ***
***             LIBRARY TITLE:  SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY                             ***
***                                BASED ON ENDF-B VERSION 4 DATA                                      ***
***                                   COMPILED FOR NRC      1/27/89                                    ***
***                                      LAST UPDATED                                       08/12/94   ***
***                                         L.M.PETRIE   -    ORNL                                     ***
***                                                                                                    ***
***                                                                                                    ***
***                                                                                                    ***
***                                                                                                    ***
**********************************************************************************************************
**********************************************************************************************************

                      ........   0 IO'S WERE USED BEFORE READING KENO V DATA    ........

                      ........   0 IO'S WERE USED READING THE KENO V PARAMETER DATA    ........

                     ************** DATA READING COMPLETED **************

                      ........   0 IO'S WERE USED PREPARING THE KENO V INPUT DATA    ........

                      ........   0 IO'S WERE USED LOADING THE KENO V DATA    ........

                      ........   0 IO'S WERE USED LOADING THE DATA    ........

                      ........   0 IO'S WERE USED CHECKING THE KENO V GEOMETRY DATA    ........
                      *****  RESTART DATA HAS BEEN WRITTEN ON UNIT 95  *****

                      ........   0 IO'S WERE USED WRITING THE KENO V - CSAS DATA    ........

                      ........   0 IO'S WERE USED PROCESSING CSAS INPUT DATA    ........

CONTROL MODULE CSAS25   IS COMPLETE.
```

```
KK         KK  EEEEEEEEEEEE  NN         NN   00000000000                VV         VV
KK        KK   EEEEEEEEEEEE  NNN        NN  0000000000000               VV         VV
KK       KK    EE            NNNN       NN  OO         OO               VV         VV
KK      KK     EE            NN NN      NN  OO         OO               VV         VV
KK     KK      EE            NN  NN     NN  OO         OO               VV         VV
KKKKKKKK       EEEEEEEEE     NN   NN    NN  OO         OO  -----------  VV         VV
KKKKKKKK       EEEEEEEEE     NN    NN   NN  OO         OO  -----------   VV       VV
KK     KK      EE            NN     NN  NN  OO         OO                 VV     VV
KK      KK     EE            NN      NN NN  OO         OO                  VV   VV
KK       KK    EE            NN       NNNN  OO         OO                   VV VV
KK        KK   EEEEEEEEEEEE  NN        NNN  0000000000000                    VVV
KK         KK  EEEEEEEEEEEE  NN         NN   00000000000                      V

 SSSSSSSSSS    CCCCCCCCCC     AAAAAAAAA    LL            EEEEEEEEEEEE                 PPPPPPPPPPP    CCCCCCCCCC
SSSSSSSSSSSS  CCCCCCCCCCCC   AAAAAAAAAAA   LL            EEEEEEEEEEEE                 PPPPPPPPPPPP  CCCCCCCCCCCC
SS        SS  CC        CC  AA         AA  LL            EE                           PP        PP  CC        CC
SS            CC            AA         AA  LL            EE                           PP        PP  CC
SS            CC            AA         AA  LL            EE                           PP        PP  CC
SSSSSSSSSSS   CC            AAAAAAAAAAAAA  LL            EEEEEEEEE    -----------     PPPPPPPPPPPP  CC
 SSSSSSSSSSS  CC            AAAAAAAAAAAAA  LL            EEEEEEEEE    -----------     PPPPPPPPPPP   CC
          SS  CC            AA         AA  LL            EE                           PP            CC
          SS  CC            AA         AA  LL            EE                           PP            CC
SS        SS  CC        CC  AA         AA  LL            EE                           PP            CC        CC
SSSSSSSSSSSS  CCCCCCCCCCCC  AA         AA  LLLLLLLLLLLL  EEEEEEEEEEEE                 PP            CCCCCCCCCCCC
 SSSSSSSSSS    CCCCCCCCCC   AA         AA  LLLLLLLLLLLL  EEEEEEEEEEEE                 PP             CCCCCCCCCC

  0000000    777777777777          //   3333333333    0000000          //   999999999    888888888
 000000000   777777777777         //   333333333333  000000000        //   99999999999  88888888888
00       00  77        77        //    33        33 00       00      //    99       99  88       88
00       00           77        //               33 00       00     //     99       99  88       88
00       00          77        //                33 00       00    //      99       99  88       88
00       00         77        //               333  00       00   //       99999999999   888888888
00       00        77        //                333  00       00  //         9999999999   888888888
00       00       77        //                   33 00       00 //                  99  88       88
00       00      77        //                    33 00       00//                   99  88       88
 00     00      77        //           33        33  00     00//                    99  88       88
 000000000     77        //            333333333333  000000000//           99999999999  88888888888
  0000000      77       //              3333333333    0000000//            999999999     888888888

    11     9999999999          11     555555555555          11    2222222222
   111    999999999999        111     555555555555         111   222222222222
  1111    99        99  :::  1111     55              :::  1111  22        22
    11    99        99  :::    11     55              :::    11            22
    11    99        99  :::    11     55              :::    11            22
    11    999999999999         11     55555555555            11           22
    11     99999999999         11     555555555555           11          22
    11              99  :::    11               55    :::    11         22
    11              99  :::    11               55    :::    11       22
    11              99  :::    11     55        55    :::    11     22
 11111111 999999999999      11111111  555555555555        11111111 222222222222
 11111111  9999999999       11111111   5555555555         11111111 222222222222
```

"LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"

****** NUMERIC PARAMETERS ******

TME	MAXIMUM PROBLEM TIME (MIN)	30.00
TBA	TIME PER GENERATION (MIN)	0.50
GEN	NUMBER OF GENERATIONS	103
NPG	NUMBER PER GENERATION	400
NSK	NUMBER OF GENERATIONS TO BE SKIPPED	3
BEG	BEGINNING GENERATION NUMBER	1
RES	GENERATIONS BETWEEN CHECKPOINTS	0
X1D	NUMBER OF EXTRA 1-D CROSS SECTIONS	1
NBK	NEUTRON BANK SIZE	425
XNB	EXTRA POSITIONS IN NEUTRON BANK	0
NFB	FISSION BANK SIZE	400
XFB	EXTRA POSITIONS IN FISSION BANK	0
WTA	DEFAULT VALUE OF WEIGHT AVERAGE	0.5000
WTH	WEIGHT HIGH FOR SPLITTING	3.0000
WTL	WEIGHT LOW FOR RUSSIAN ROULETTE	0.3333
RND	STARTING RANDOM NUMBER	BB827100001
NB8	NUMBER OF D.A. BLOCKS ON UNIT 8	200
NL8	LENGTH OF D.A. BLOCKS ON UNIT 8	512
ADJ	MODE OF CALCULATION	FORWARD
	INPUT DATA WRITTEN ON RESTART UNIT	NO
	BINARY DATA INTERFACE	YES

```
*****************************************************************************************************************
*****************************************************************************************************************
***                                                                                                           ***
***                    "LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"                     ***
***                                                                                                           ***
*****************************************************************************************************************
***                             ******      LOGICAL PARAMETERS      ******                                    ***
***                                                                                                           ***
***  RUN  EXECUTE PROBLEM AFTER CHECKING DATA    YES          PLT  PLOT PICTURE MAP(S)                    NO ***
***                                                                                                           ***
***  FLX  COMPUTE FLUX                            NO          FDN  COMPUTE FISSION DENSITIES              NO ***
***                                                                                                           ***
***  SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION    NO          NUB  COMPUTE NU-BAR & AVG FISSION GROUP    YES ***
***                                                                                                           ***
***  MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER     NO          MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION  NO ***
***                                                                                                           ***
***  CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER   NO          CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION NO ***
***                                                                                                           ***
***  FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER   NO          FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION NO ***
***                                                                                                           ***
***  MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER     NO          MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER   NO ***
***                                                                                                           ***
***  CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER   NO          CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER NO ***
***                                                                                                           ***
***  FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER   NO          FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER NO ***
***                                                                                                           ***
***  HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL    NO          HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL  NO ***
***                                                                                                           ***
***  AMX  PRINT ALL MIXED CROSS SECTIONS          NO          FAR  PRINT FIS. AND ABS. BY REGION          NO ***
***                                                                                                           ***
***  XS1  PRINT 1-D MIXTURE X-SECTIONS            NO          GAS  PRINT FAR BY GROUP                     NO ***
***                                                                                                           ***
***  XS2  PRINT 2-D MIXTURE X-SECTIONS            NO          FAX  PRINT XSEC-ALBEDO CORRELATION TABLES   NO ***
***                                                                                                           ***
***  XAP  PRINT MIXTURE ANGLES & PROBABILITIES    NO          PWT  PRINT WEIGHT AVERAGE ARRAY             NO ***
***                                                                                                           ***
***  PKI  PRINT FISSION SPECTRUM                  NO          PGM  PRINT INPUT GEOMETRY                   NO ***
***                                                                                                           ***
***  P1D  PRINT EXTRA 1-D CROSS SECTIONS          NO          BUG  PRINT DEBUG INFORMATION                NO ***
***                                                                                                           ***
***                                                           TRK  PRINT TRACKING INFORMATION             NO ***
***                                                                                                           ***
***                                                                                                           ***
*****************************************************************************************************************
*****************************************************************************************************************
*****************************************************************************************************************
                               PARAMETER INPUT COMPLETED

              ........    0 IO'S WERE USED READING THE PARAMETER DATA     ........

              *************** DATA READING COMPLETED ***************
```

```
*****************************************************************************************
***                                                                                   ***
***        "LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"         ***
***                                                                                   ***
*****************************************************************************************
*****************************************************************************************
***                                                                                   ***
***                     ****** ADDITIONAL INFORMATION ******                         ***
***                                                                                   ***
*** NUMBER OF ENERGY GROUPS              27      USE LATTICE GEOMETRY              NO ***
***                                                                                   ***
*** NO. OF FISSION SPECTRUM SOURCE GROUP  1      GLOBAL ARRAY NUMBER                0 ***
***                                                                                   ***
*** NO. OF SCATTERING ANGLES IN XSECS     2      NUMBER OF UNITS IN THE GLOBAL X DIR.  0 ***
***                                                                                   ***
*** ENTRIES/NEUTRON IN THE NEUTRON BANK  17      NUMBER OF UNITS IN THE GLOBAL Y DIR.  0 ***
***                                                                                   ***
*** ENTRIES/NEUTRON IN THE FISSION BANK  10      NUMBER OF UNITS IN THE GLOBAL Z DIR.  0 ***
***                                                                                   ***
*** NUMBER OF MIXTURES USED               8      USE A GLOBAL REFLECTOR           YES ***
***                                                                                   ***
*** NUMBER OF BIAS ID'S USED              1      USE NESTED HOLES                  NO ***
***                                                                                   ***
*** NUMBER OF DIFFERENTIAL ALBEDOS USED   0      NUMBER OF HOLES                   25 ***
***                                                                                   ***
*** TOTAL INPUT GEOMETRY REGIONS         10      MAXIMUM HOLE NESTING LEVEL         1 ***
***                                                                                   ***
*** NUMBER OF GEOMETRY REGIONS USED      10      USE NESTED ARRAYS                 NO ***
***                                                                                   ***
*** LARGEST GEOMETRY UNIT NUMBER          2      NUMBER OF ARRAYS USED              0 ***
***                                                                                   ***
*** LARGEST ARRAY NUMBER                  1      MAXIMUM ARRAY NESTING LEVEL        0 ***
***                                                                                   ***
***                                                                                   ***
*** +X BOUNDARY CONDITION               MIR      -X BOUNDARY CONDITION            MIR ***
***                                                                                   ***
*** +Y BOUNDARY CONDITION               MIR      -Y BOUNDARY CONDITION            MIR ***
***                                                                                   ***
*** +Z BOUNDARY CONDITION               MIR      -Z BOUNDARY CONDITION            MIR ***
***                                                                                   ***
*****************************************************************************************
```

```
*****************************************************************************************
***                                                                                   ***
***        "LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"         ***
***                                                                                   ***
*****************************************************************************************
*****************************************************************************************
***                                                                                   ***
***              ****** SPACE AND SUPERGROUP INFORMATION ******                      ***
***                                                                                   ***
***       100000 WORDS IS THE TOTAL SPACE AVAILABLE.                                  ***
***                                                                                   ***
***        12479 WORDS WERE USED FOR NON-SUPERGROUP STORAGE.                          ***
***                                                                                   ***
***        87521 WORDS OF STORAGE ARE AVAILABLE FOR SUPERGROUPED DATA.                ***
***                                                                                   ***
***        99784 WORDS OF STORAGE ARE AVAILABLE FOR CONSTRUCTING THE SUPERGROUPS.     ***
***                                                                                   ***
***        87461 WORDS OF STORAGE ARE AVAILABLE TO EACH SUPERGROUP.                   ***
***                                                                                   ***
***         1165 WORDS ARE NEEDED FOR THE LARGEST GROUP.                              ***
***                                                                                   ***
***        13860 WORDS OF STORAGE IS SUFFICIENT TO RUN THIS PROBLEM.                  ***
***                                                                                   ***
***        25594 WORDS OF STORAGE WILL ALLOW THE PROBLEM TO RUN WITH ONE SUPERGROUP.  ***
***                                                                                   ***
***        25760 WORDS OF STORAGE WILL BE USED TO RUN THIS PROBLEM.                   ***
***                                                                                   ***
*****************************************************************************************
*****************************************************************************************
***                                                                                   ***
***                  STARTING    ENDING     XSEC      ALBEDO     TOTAL                ***
***   SUPERGROUP      GROUP      GROUP     LENGTH     LENGTH     LENGTH               ***
***                                                                                   ***
***                                                                                   ***
***       1             1          27       2636         0       13055                ***
***                                                                                   ***
*****************************************************************************************

            ........    0 IO'S WERE USED IN SUPERGROUPING    ........

            ........    0 IO'S WERE USED LOADING THE DATA    ........
```

```
                              "LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"

                MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID


                                      -----   UNIT     1   -----

PWR FUEL ROD

  1 CYLINDER       1   1  RADIUS = 0.47810     +Z =   10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000

  2 CYLINDER       9   1  RADIUS = 0.48760     +Z =   10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000

  3 CYLINDER       2   1  RADIUS = 0.55880     +Z =   10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000
                              "LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"

                MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID


                              ..................  GLOBAL   ..................
                                      -----   UNIT     2   -----

  1 CYLINDER       3   1  RADIUS =  16.986     +Z =   10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000

    HOLE NUMBER    1        AT X = 0.00000     Y = 0.00000       Z = 0.00000      IS UNIT NUMBER      1

    HOLE NUMBER    2        AT X = 0.00000     Y =  2.9216       Z = 0.00000      IS UNIT NUMBER      1

    HOLE NUMBER    3        AT X =  2.5301     Y =  1.4608       Z = 0.00000      IS UNIT NUMBER      1

    HOLE NUMBER    4        AT X =  2.5301     Y = -1.4608       Z = 0.00000      IS UNIT NUMBER      1

    HOLE NUMBER    5        AT X = 0.00000     Y = -2.9216       Z = 0.00000      IS UNIT NUMBER      1

    HOLE NUMBER    6        AT X = -2.5301     Y = -1.4608       Z = 0.00000      IS UNIT NUMBER      1

    HOLE NUMBER    7        AT X = -2.5301     Y =  1.4608       Z = 0.00000      IS UNIT NUMBER      1

    HOLE NUMBER    8        AT X = -2.5301     Y =  4.3825       Z = 0.00000      IS UNIT NUMBER      1

    HOLE NUMBER    9        AT X = 0.00000     Y =  5.8433       Z = 0.00000      IS UNIT NUMBER      1

    HOLE NUMBER   10        AT X =  2.5301     Y =  4.3825       Z = 0.00000      IS UNIT NUMBER      1

    HOLE NUMBER   11        AT X =  5.0603     Y =  2.9216       Z = 0.00000      IS UNIT NUMBER      1

    HOLE NUMBER   12        AT X =  5.0603     Y = 0.00000       Z = 0.00000      IS UNIT NUMBER      1

    HOLE NUMBER   13        AT X =  5.0603     Y = -2.9216       Z = 0.00000      IS UNIT NUMBER      1

    HOLE NUMBER   14        AT X =  2.5301     Y = -4.3825       Z = 0.00000      IS UNIT NUMBER      1

    HOLE NUMBER   15        AT X = 0.00000     Y = -5.8433       Z = 0.00000      IS UNIT NUMBER      1

    HOLE NUMBER   16        AT X = -2.5301     Y = -4.3825       Z = 0.00000      IS UNIT NUMBER      1

    HOLE NUMBER   17        AT X = -5.0603     Y = -2.9216       Z = 0.00000      IS UNIT NUMBER      1

    HOLE NUMBER   18        AT X = -5.0603     Y = 0.00000       Z = 0.00000      IS UNIT NUMBER      1

    HOLE NUMBER   19        AT X = -5.0603     Y =  2.9216       Z = 0.00000      IS UNIT NUMBER      1

    HOLE NUMBER   20        AT X = -5.0603     Y =  5.8433       Z = 0.00000      IS UNIT NUMBER      1

    HOLE NUMBER   21        AT X =  2.5301     Y =  7.3041       Z = 0.00000      IS UNIT NUMBER      1

    HOLE NUMBER   22        AT X =  7.5904     Y =  1.4608       Z = 0.00000      IS UNIT NUMBER      1

    HOLE NUMBER   23        AT X =  5.0603     Y = -5.8433       Z = 0.00000      IS UNIT NUMBER      1

    HOLE NUMBER   24        AT X = -2.5301     Y = -7.3041       Z = 0.00000      IS UNIT NUMBER      1

    HOLE NUMBER   25        AT X = -7.5904     Y = -1.4608       Z = 0.00000      IS UNIT NUMBER      1
  2 CYLINDER       5   1  RADIUS =  18.891     +Z =   10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000
  3 CYLINDER       6   1  RADIUS =  33.496     +Z =   10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000
  4 CYLINDER       5   1  RADIUS =  36.544     +Z =   10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000
  5 CYLINDER       7   1  RADIUS =  49.244     +Z =   10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000
  6 CYLINDER       5   1  RADIUS =  49.854     +Z =   10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000
  7 CUBOID         8   1      +X =  49.854     -X = -49.854     +Y =  49.854     -Y = -49.854     +Z =  10.000      -Z = -10.000
```

"LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"
VOLUMES FOR THOSE UNITS UTILIZED IN THIS PROBLEM

UNIT	REGION	GEOMETRY REGION	VOLUME	CUMULATIVE VOLUME
1	1	1	1.43621E+01 CM**3	1.43621E+01 CM**3
	2	2	5.76429E-01 CM**3	1.49385E+01 CM**3
	3	3	4.68120E+00 CM**3	1.96197E+01 CM**3
2	1	4	1.76387E+04 CM**3	1.81291E+04 CM**3
	2	5	4.29436E+03 CM**3	2.24235E+04 CM**3
	3	6	4.80740E+04 CM**3	7.04975E+04 CM**3
	4	7	1.34136E+04 CM**3	8.39110E+04 CM**3
	5	8	6.84563E+04 CM**3	1.52367E+05 CM**3
	6	9	3.79567E+03 CM**3	1.56163E+05 CM**3
	7	10	4.26699E+04 CM**3	1.98833E+05 CM**3

UNIT	USES	REGION	MIXTURE	TOTAL VOLUME
1	25	1	1	3.59052E+02 CM**3
		2	9	1.44107E+01 CM**3
		3	2	1.17030E+02 CM**3
2	1	1	3	1.76387E+04 CM**3
		2	5	4.29436E+03 CM**3
		3	6	4.80740E+04 CM**3
		4	5	1.34136E+04 CM**3
		5	7	6.84563E+04 CM**3
		6	5	3.79567E+03 CM**3
		7	8	4.26699E+04 CM**3

TOTAL MIXTURE VOLUMES

MIXTURE	TOTAL VOLUME	MASS(G)
1	3.59052E+02 CM**3	3.73844E+03
2	1.17030E+02 CM**3	7.67717E+02
3	1.76387E+04 CM**3	1.76064E+04
5	2.15036E+04 CM**3	1.70309E+05
6	4.80740E+04 CM**3	5.45351E+05
7	6.84563E+04 CM**3	6.83311E+04
8	4.26699E+04 CM**3	4.25919E+04
9	1.44107E+01 CM**3	1.43844E+01

```
*****************************************************************************************************
***                                                                                               ***
***                                   BIASING INFORMATION                                         ***
***                                                                                               ***
***     A DEFAULT WEIGHT OF    0.500 WILL BE USED FOR ALL BIAS ID'S.                              ***
***                                                                                               ***
*****************************************************************************************************
```

.... 0 IO'S WERE USED IN KENO-V BEFORE TRACKING ....

.... 0.01550 MINUTES WERE USED PROCESSING DATA. ....

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 1.80580E-03

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED UNIFORMLY THROUGHOUT THE ENTIRE VOLUME DEFINED BY THE OUTERMOST GEOMETRY CARD.
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

KENO MESSAGE NUMBER K5-105 ***** WARNING, ONLY 26 INDEPENDENT STARTING POSITIONS WERE GENERATED. *****

374 ADDITIONAL STARTING POINTS WERE PICKED FROM THE INITAL DISTRIBUTION.

0.45333 MINUTES WERE REQUIRED FOR STARTING. TOTAL ELAPSED TIME IS 0.46933 MINUTES.

"LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	307 INDEPENDENT	FISSION POINTS WERE	GENERATED	
1	6.17738E-01	5.35500E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	281 INDEPENDENT	FISSION POINTS WERE	GENERATED	
2	5.93025E-01	6.09667E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	282 INDEPENDENT	FISSION POINTS WERE	GENERATED	
3	5.90939E-01	6.82000E-01	5.90939E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	5.62855E-01	7.58833E-01	5.76897E-01	1.40421E-02	0.00000E+00	0.00000E+00
5	6.03062E-01	8.32000E-01	5.85619E-01	1.19079E-02	0.00000E+00	0.00000E+00
6	6.08147E-01	9.02500E-01	5.91251E-01	1.01301E-02	0.00000E+00	0.00000E+00
7	5.88029E-01	9.74833E-01	5.90606E-01	7.87316E-03	0.00000E+00	0.00000E+00
8	5.65290E-01	1.05083E+00	5.86387E-01	7.68943E-03	0.00000E+00	0.00000E+00
9	6.54057E-01	1.11767E+00	5.96054E-01	1.16484E-02	0.00000E+00	0.00000E+00
10	6.16964E-01	1.19467E+00	5.98668E-01	1.04209E-02	0.00000E+00	0.00000E+00
11	6.46536E-01	1.26600E+00	6.03987E-01	1.06185E-02	0.00000E+00	0.00000E+00
12	6.84139E-01	1.33917E+00	6.12002E-01	1.24276E-02	0.00000E+00	0.00000E+00
13	6.15014E-01	1.41333E+00	6.12276E-01	1.12445E-02	0.00000E+00	0.00000E+00
14	6.19643E-01	1.48383E+00	6.12890E-01	1.02831E-02	0.00000E+00	0.00000E+00
15	6.40168E-01	1.55250E+00	6.14986E-01	9.68907E-03	0.00000E+00	0.00000E+00
16	6.32312E-01	1.62033E+00	6.16225E-01	9.05528E-03	0.00000E+00	0.00000E+00
17	5.78563E-01	1.69800E+00	6.13715E-01	8.79599E-03	0.00000E+00	0.00000E+00
18	5.70044E-01	1.77317E+00	6.10985E-01	8.66878E-03	0.00000E+00	0.00000E+00
19	6.15171E-01	1.84183E+00	6.11231E-01	8.14663E-03	0.00000E+00	0.00000E+00
20	6.43942E-01	1.91050E+00	6.13049E-01	7.89277E-03	0.00000E+00	0.00000E+00
21	6.52849E-01	1.98100E+00	6.15143E-01	7.75412E-03	0.00000E+00	0.00000E+00
22	6.00828E-01	2.04967E+00	6.14428E-01	7.39094E-03	0.00000E+00	0.00000E+00
23	6.41552E-01	2.12183E+00	6.15719E-01	7.14786E-03	0.00000E+00	0.00000E+00
24	6.32890E-01	2.19050E+00	6.16500E-01	6.85976E-03	0.00000E+00	0.00000E+00
25	6.27317E-01	2.26467E+00	6.16970E-01	6.57158E-03	0.00000E+00	0.00000E+00
26	6.23046E-01	2.33617E+00	6.17223E-01	6.29690E-03	0.00000E+00	0.00000E+00
27	5.82499E-01	2.40850E+00	6.15834E-01	6.19743E-03	0.00000E+00	0.00000E+00
28	6.21451E-01	2.48167E+00	6.16050E-01	5.95821E-03	0.00000E+00	0.00000E+00
29	6.11586E-01	2.55667E+00	6.15885E-01	5.73568E-03	0.00000E+00	0.00000E+00
30	5.99803E-01	2.62717E+00	6.15311E-01	5.55680E-03	0.00000E+00	0.00000E+00
31	5.79691E-01	2.70050E+00	6.14082E-01	5.50065E-03	0.00000E+00	0.00000E+00
32	5.81116E-01	2.77183E+00	6.12984E-01	5.42656E-03	0.00000E+00	0.00000E+00
33	5.97332E-01	2.84233E+00	6.12479E-01	5.27282E-03	0.00000E+00	0.00000E+00
34	5.84740E-01	2.91467E+00	6.11612E-01	5.17845E-03	0.00000E+00	0.00000E+00
35	6.17649E-01	2.98333E+00	6.11795E-01	5.02241E-03	0.00000E+00	0.00000E+00
36	5.60931E-01	3.05933E+00	6.10299E-01	5.09693E-03	0.00000E+00	0.00000E+00
37	5.93069E-01	3.12983E+00	6.09806E-01	4.97359E-03	0.00000E+00	0.00000E+00
38	5.93479E-01	3.20400E+00	6.09353E-01	4.85469E-03	0.00000E+00	0.00000E+00
39	6.36434E-01	3.27633E+00	6.10085E-01	4.77805E-03	0.00000E+00	0.00000E+00
40	6.22092E-01	3.34583E+00	6.10401E-01	4.66134E-03	0.00000E+00	0.00000E+00
41	6.21971E-01	3.41717E+00	6.10698E-01	4.54993E-03	0.00000E+00	0.00000E+00
42	6.35092E-01	3.48400E+00	6.11307E-01	4.47646E-03	0.00000E+00	0.00000E+00
43	6.37146E-01	3.55450E+00	6.11938E-01	4.41116E-03	0.00000E+00	0.00000E+00
44	5.55148E-01	3.63233E+00	6.10585E-01	4.51220E-03	0.00000E+00	0.00000E+00
45	6.02323E-01	3.70650E+00	6.10393E-01	4.41021E-03	0.00000E+00	0.00000E+00
46	5.85122E-01	3.77967E+00	6.09819E-01	4.34692E-03	0.00000E+00	0.00000E+00
47	6.17823E-01	3.85567E+00	6.09997E-01	4.25294E-03	0.00000E+00	0.00000E+00
48	6.50272E-01	3.92717E+00	6.10872E-01	4.25061E-03	0.00000E+00	0.00000E+00
49	6.48568E-01	3.99583E+00	6.11674E-01	4.23581E-03	0.00000E+00	0.00000E+00
50	6.21761E-01	4.06633E+00	6.11885E-01	4.15195E-03	0.00000E+00	0.00000E+00
51	6.32914E-01	4.13867E+00	6.12314E-01	4.08892E-03	0.00000E+00	0.00000E+00
52	5.92216E-01	4.21000E+00	6.11912E-01	4.02642E-03	0.00000E+00	0.00000E+00
53	5.74569E-01	4.28133E+00	6.11180E-01	4.01403E-03	0.00000E+00	0.00000E+00
54	6.21663E-01	4.35000E+00	6.11381E-01	3.94124E-03	0.00000E+00	0.00000E+00
55	6.18352E-01	4.41967E+00	6.11513E-01	3.86840E-03	0.00000E+00	0.00000E+00
56	6.14087E-01	4.49567E+00	6.11560E-01	3.79638E-03	0.00000E+00	0.00000E+00
57	6.45562E-01	4.56883E+00	6.12179E-01	3.77765E-03	0.00000E+00	0.00000E+00
58	6.83629E-01	4.63483E+00	6.13454E-01	3.92286E-03	0.00000E+00	0.00000E+00
59	5.84007E-01	4.70983E+00	6.12938E-01	3.88790E-03	0.00000E+00	0.00000E+00
60	6.02552E-01	4.78033E+00	6.12759E-01	3.82448E-03	0.00000E+00	0.00000E+00
61	6.55602E-01	4.85167E+00	6.13485E-01	3.82859E-03	0.00000E+00	0.00000E+00
62	5.56112E-01	4.92317E+00	6.12529E-01	3.88379E-03	0.00000E+00	0.00000E+00
63	6.06527E-01	4.99550E+00	6.12430E-01	3.82086E-03	0.00000E+00	0.00000E+00
64	6.12000E-01	5.06683E+00	6.12423E-01	3.75873E-03	0.00000E+00	0.00000E+00
65	6.24962E-01	5.14000E+00	6.12622E-01	3.70394E-03	0.00000E+00	0.00000E+00
66	5.48012E-01	5.21700E+00	6.11613E-01	3.78281E-03	0.00000E+00	0.00000E+00
67	5.62255E-01	5.28933E+00	6.10854E-01	3.80078E-03	0.00000E+00	0.00000E+00
68	5.93111E-01	5.36167E+00	6.10585E-01	3.75239E-03	0.00000E+00	0.00000E+00
69	5.80987E-01	5.43117E+00	6.10143E-01	3.72227E-03	0.00000E+00	0.00000E+00
70	6.00007E-01	5.50533E+00	6.09994E-01	3.67015E-03	0.00000E+00	0.00000E+00
71	6.45326E-01	5.57300E+00	6.10506E-01	3.65264E-03	0.00000E+00	0.00000E+00
72	6.32962E-01	5.64267E+00	6.10827E-01	3.61435E-03	0.00000E+00	0.00000E+00
73	5.79951E-01	5.71217E+00	6.10392E-01	3.58952E-03	0.00000E+00	0.00000E+00
74	5.69347E-01	5.78267E+00	6.09822E-01	3.58493E-03	0.00000E+00	0.00000E+00
75	6.21438E-01	5.85233E+00	6.09981E-01	3.53905E-03	0.00000E+00	0.00000E+00
76	5.52810E-01	5.93000E+00	6.09208E-01	3.57537E-03	0.00000E+00	0.00000E+00
77	5.94347E-01	5.99967E+00	6.09010E-01	3.53294E-03	0.00000E+00	0.00000E+00
78	6.16649E-01	6.07283E+00	6.09111E-01	3.48759E-03	0.00000E+00	0.00000E+00
79	6.16676E-01	6.14517E+00	6.09209E-01	3.44340E-03	0.00000E+00	0.00000E+00
80	5.91369E-01	6.21750E+00	6.08980E-01	3.40665E-03	0.00000E+00	0.00000E+00
81	5.93922E-01	6.29167E+00	6.08790E-01	3.36865E-03	0.00000E+00	0.00000E+00
82	6.17036E-01	6.36400E+00	6.08893E-01	3.32787E-03	0.00000E+00	0.00000E+00
83	5.64033E-01	6.44083E+00	6.08339E-01	3.33287E-03	0.00000E+00	0.00000E+00
84	6.18586E-01	6.51317E+00	6.08464E-01	3.29434E-03	0.00000E+00	0.00000E+00
85	5.97377E-01	6.58833E+00	6.08330E-01	3.25715E-03	0.00000E+00	0.00000E+00
86	6.07878E-01	6.66417E+00	6.08325E-01	3.21815E-03	0.00000E+00	0.00000E+00
87	6.82650E-01	6.73100E+00	6.09199E-01	3.29809E-03	0.00000E+00	0.00000E+00
88	6.42164E-01	6.79783E+00	6.09583E-01	3.28200E-03	0.00000E+00	0.00000E+00

89	5.55622E-01	6.87567E+00	6.08963E-01	3.30282E-03	0.00000E+00	0.00000E+00
90	6.06546E-01	6.94617E+00	6.08935E-01	3.26518E-03	0.00000E+00	0.00000E+00
91	5.78821E-01	7.02133E+00	6.08597E-01	3.24597E-03	0.00000E+00	0.00000E+00
92	5.66679E-01	7.09083E+00	6.08131E-01	3.24332E-03	0.00000E+00	0.00000E+00
93	6.20164E-01	7.16500E+00	6.08263E-01	3.21020E-03	0.00000E+00	0.00000E+00
94	6.06480E-01	7.23550E+00	6.08244E-01	3.17518E-03	0.00000E+00	0.00000E+00
95	5.78361E-01	7.30233E+00	6.07923E-01	3.15724E-03	0.00000E+00	0.00000E+00
96	5.96211E-01	7.37650E+00	6.07819E-01	3.12518E-03	0.00000E+00	0.00000E+00
97	5.80272E-01	7.44783E+00	6.07529E-01	3.10568E-03	0.00000E+00	0.00000E+00
98	6.13701E-01	7.51750E+00	6.07594E-01	3.07383E-03	0.00000E+00	0.00000E+00
99	6.02968E-01	7.58700E+00	6.07546E-01	3.04235E-03	0.00000E+00	0.00000E+00
100	6.10898E-01	7.65383E+00	6.07580E-01	3.01134E-03	0.00000E+00	0.00000E+00
101	5.52344E-01	7.72700E+00	6.07022E-01	3.03253E-03	0.00000E+00	0.00000E+00
102	6.13199E-01	7.79567E+00	6.07084E-01	3.00269E-03	0.00000E+00	0.00000E+00
103	6.08742E-01	7.86433E+00	6.07101E-01	2.97286E-03	0.00000E+00	0.00000E+00

KENO MESSAGE NUMBER K5-123   EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

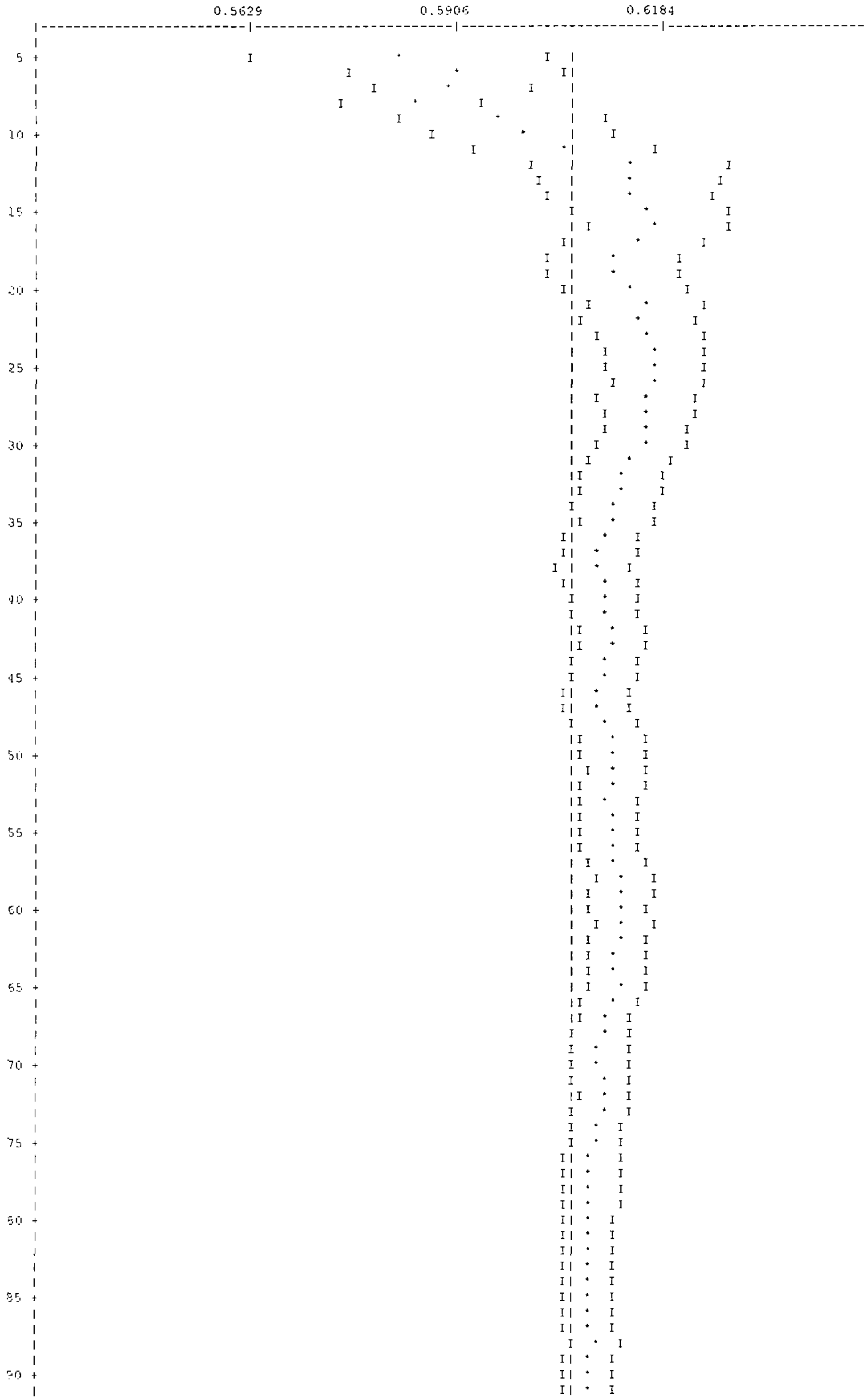
"LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"

LIFETIME = 2.18556E-04 + OR - 1.10041E-06 GENERATION TIME = 1.16144E-04 + OR - 8.15332E-07
NU BAR = 2.42957E+00 + OR - 2.50942E-04 AVERAGE FISSION GROUP = 2.38494E+01 + OR - 1.41599E-02
ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION = 6.26896E-02 + OR - 8.45492E-04

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.60726	+ OR - 0.00300	0.60426 TO 0.61026	0.60127 TO 0.61326	0.59827 TO 0.61626	40000
4	0.60771	+ OR - 0.00299	0.60472 TO 0.61071	0.60172 TO 0.61370	0.59873 TO 0.61669	39600
5	0.60776	+ OR - 0.00302	0.60473 TO 0.61078	0.60171 TO 0.61381	0.59868 TO 0.61683	39200
6	0.60775	+ OR - 0.00306	0.60470 TO 0.61081	0.60164 TO 0.61387	0.59859 TO 0.61692	38800
7	0.60796	+ OR - 0.00308	0.60488 TO 0.61104	0.60180 TO 0.61412	0.59872 TO 0.61720	38400
8	0.60841	+ OR - 0.00308	0.60533 TO 0.61149	0.60225 TO 0.61457	0.59917 TO 0.61765	38000
9	0.60792	+ OR - 0.00307	0.60485 TO 0.61100	0.60177 TO 0.61407	0.59870 TO 0.61715	37600
10	0.60783	+ OR - 0.00311	0.60472 TO 0.61093	0.60161 TO 0.61404	0.59851 TO 0.61715	37200
11	0.60741	+ OR - 0.00311	0.60429 TO 0.61052	0.60118 TO 0.61363	0.59807 TO 0.61674	36800
12	0.60656	+ OR - 0.00303	0.60353 TO 0.60959	0.60051 TO 0.61262	0.59748 TO 0.61565	36400
17	0.60595	+ OR - 0.00314	0.60280 TO 0.60909	0.59966 TO 0.61223	0.59652 TO 0.61538	34400
22	0.60529	+ OR - 0.00322	0.60207 TO 0.60851	0.59885 TO 0.61173	0.59563 TO 0.61495	32400
27	0.60423	+ OR - 0.00334	0.60089 TO 0.60757	0.59754 TO 0.61091	0.59420 TO 0.61426	30400
32	0.60461	+ OR - 0.00354	0.60108 TO 0.60815	0.59754 TO 0.61169	0.59400 TO 0.61522	28400
37	0.60567	+ OR - 0.00372	0.60194 TO 0.60939	0.59822 TO 0.61311	0.59450 TO 0.61683	26400
42	0.60434	+ OR - 0.00394	0.60040 TO 0.60828	0.59646 TO 0.61222	0.59252 TO 0.61616	24400
47	0.60477	+ OR - 0.00414	0.60063 TO 0.60891	0.59649 TO 0.61305	0.59236 TO 0.61719	22400
52	0.60238	+ OR - 0.00430	0.59808 TO 0.60669	0.59377 TO 0.61099	0.58947 TO 0.61530	20400
57	0.60103	+ OR - 0.00460	0.59643 TO 0.60563	0.59183 TO 0.61023	0.58723 TO 0.61482	18400
62	0.59916	+ OR - 0.00438	0.59477 TO 0.60354	0.59039 TO 0.60792	0.58601 TO 0.61231	16400
67	0.60032	+ OR - 0.00459	0.59573 TO 0.60492	0.59114 TO 0.60951	0.58654 TO 0.61411	14400
72	0.59869	+ OR - 0.00497	0.59371 TO 0.60366	0.58874 TO 0.60863	0.58377 TO 0.61361	12400
77	0.60159	+ OR - 0.00540	0.59620 TO 0.60699	0.59080 TO 0.61238	0.58540 TO 0.61778	10400
82	0.60027	+ OR - 0.00655	0.59372 TO 0.60683	0.58717 TO 0.61338	0.58061 TO 0.61993	8400
87	0.59595	+ OR - 0.00620	0.58975 TO 0.60215	0.58354 TO 0.60836	0.57734 TO 0.61456	6400
92	0.59867	+ OR - 0.00613	0.59254 TO 0.60479	0.58642 TO 0.61092	0.58029 TO 0.61704	4400
97	0.60031	+ OR - 0.00972	0.59059 TO 0.61004	0.58086 TO 0.61976	0.57114 TO 0.62948	2400

"LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.6073 + OR - 0.0030 WHICH OCCURS FOR 103 GENERATIONS RUN.



```
     |                                                  I|*  I
     |                                                   I| * I
     |                                                   I| * I
  95 +                                                  I |*  I
     |                                                  I |*  I
     |                                                  I |*  I
     |                                                  I |*  I
     |                                                  I |*  I
 100 +                                                  I |*  I
     |                                                  I *  I
     |                                                  I *  I
     |                                                  I *  I
```

"LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0026			1.58113E-03	8.8616	1.46856E-03	4.5943	0.00000E+00	0.0000
2	0.0115			7.01126E-03	2.7409	4.68199E-03	1.7423	0.00000E+00	0.0000
3	0.0117			7.11948E-03	2.6033	2.96074E-03	2.5228	0.00000E+00	0.0000
4	0.0047			2.82935E-03	3.1388	1.34864E-03	3.0296	0.00000E+00	0.0000
5	0.0017			1.01685E-03	2.3549	9.47995E-04	2.0780	0.00000E+00	0.0000
6	0.0013			7.72662E-04	1.9853	1.22786E-03	1.6528	0.00000E+00	0.0000
7	0.0010			6.27492E-04	2.3255	1.08055E-03	1.9573	0.00000E+00	0.0000
8	0.0009			5.24207E-04	3.1331	1.32918E-03	2.5888	0.00000E+00	0.0000
9	0.0011			6.47597E-04	3.4079	1.99941E-03	2.8600	0.00000E+00	0.0000
10	0.0024			1.44552E-03	3.5593	3.33204E-03	2.9680	0.00000E+00	0.0000
11	0.0051			3.11237E-03	3.6134	5.75020E-03	3.0300	0.00000E+00	0.0000
12	0.0062			3.75062E-03	4.0647	6.04935E-03	3.3493	0.00000E+00	0.0000
13	0.0063			3.84031E-03	4.3839	6.85260E-03	3.4473	0.00000E+00	0.0000
14	0.0052			3.15665E-03	4.1710	1.01914E-02	3.0251	0.00000E+00	0.0000
15	0.0010			5.91114E-04	7.7815	2.56756E-03	3.7314	0.00000E+00	0.0000
16	0.0009			5.41851E-04	8.1764	1.74955E-03	3.8844	0.00000E+00	0.0000
17	0.0013			8.03768E-04	11.7890	1.25184E-03	6.1496	0.00000E+00	0.0000
18	0.0015			9.01252E-04	13.2285	1.15433E-03	6.4656	0.00000E+00	0.0000
19	0.0020			1.22418E-03	10.4069	1.99020E-03	4.6794	0.00000E+00	0.0000
20	0.0081			4.88855E-03	5.3486	8.15507E-03	2.6046	0.00000E+00	0.0000
21	0.0049			2.95337E-03	7.9215	3.74379E-03	3.8325	0.00000E+00	0.0000
22	0.0133			8.08212E-03	5.1373	9.89744E-03	2.5451	0.00000E+00	0.0000
23	0.0851			5.16556E-02	1.6624	7.75125E-02	0.7161	0.00000E+00	0.0000
24	0.2434			1.47805E-01	1.0804	2.28168E-01	0.4195	0.00000E+00	0.0000
25	0.2251			1.36676E-01	1.0379	2.18079E-01	0.3868	0.00000E+00	0.0000
26	0.2699			1.63912E-01	1.2141	2.88964E-01	0.4041	0.00000E+00	0.0000
27	0.0820			4.97920E-02	2.2488	1.07512E-01	0.6855	0.00000E+00	0.0000
SYSTEM TOTAL =				6.07262E-01	0.4937	9.99966E-01	0.1233	0.00000E+00	0.0000

ELAPSED TIME 7.86533 MINUTES

RANDOM NUMBER= 16DE4F176D87

```
"LWT CASK, 25 PWR RODS, NO PWR BASKET, 5 W/O U235 VARIABLE PITCH"

                                        FREQUENCY FOR GENERATIONS    4 TO  103
0.5410 TO 0.5610     *******
0.5610 TO 0.5810     **************
0.5810 TO 0.6010     ********************
0.6010 TO 0.6210     ****************************
0.6210 TO 0.6410     *****************
0.6410 TO 0.6610     ***********
0.6610 TO 0.6810
0.6810 TO 0.7010     ***

                                        FREQUENCY FOR GENERATIONS   29 TO  103
0.5410 TO 0.5610     *******
0.5610 TO 0.5810     **********
0.5810 TO 0.6010     *****************
0.6010 TO 0.6210     **********************
0.6210 TO 0.6410     ***********
0.6410 TO 0.6610     ******
0.6610 TO 0.6810
0.6810 TO 0.7010     **

                                        FREQUENCY FOR GENERATIONS   54 TO  103
0.5410 TO 0.5610     *****
0.5610 TO 0.5810     ********
0.5810 TO 0.6010     *********
0.6010 TO 0.6210     ******************
0.6210 TO 0.6410     ****
0.6410 TO 0.6610     ****
0.6610 TO 0.6810
0.6810 TO 0.7010     **

                                        FREQUENCY FOR GENERATIONS   79 TO  103
0.5410 TO 0.5610     **
0.5610 TO 0.5810     *****
0.5810 TO 0.6010     ****
0.6010 TO 0.6210     ************
0.6210 TO 0.6410
0.6410 TO 0.6610     *
0.6610 TO 0.6810
0.6810 TO 0.7010     *


************************************************************************************************************************************
*

          CONGRATULATIONS!  YOU HAVE  SUCCESSFULLY TRAVERSED THE PERILOUS PATH THROUGH KENO V II    7.86533 MINUTES

************************************************************************************************************************************
*
```

Figure 6.6.4-3 CSAS Input/Output for NAC-LWT with 25 BWR Rods – Most Reactive Normal Condition Configuration

```
        PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
MODULE CSAS25   WILL BE CALLED
  BWR RODS, NO BASKET, VOID EXTERIOR, GAP VOID
  27GROUPNDF4     LATTICECELL
  UO2        1     0.95  293.0  92235  5.0  92238    95.0  END
  ZIRCALLOY 2      1.0          293.0     END
  H2O        3     1.0          293.0     END
  AL         4     1.0          293.0     END
  SS304      5     1.0          293.0     END
  PB         6     1.0          293.0     END
  H2O        7     1.0          293.0     END
  H2O    8 0.025 293.0 END
  H2O        9     1.0E-20      293.0     END
  END COMP
  TRIANGPITCH    3.69059   1.2446  1  3  1.4478 2 1.2650 9 END
  "LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"
  READ PARAM RUN=YES PLT=NO  GEN=103 NPG=400 END PARAM
  READ GEOM
  UNIT 1
  COM="BWR FUEL ROD"
  CYLINDER     1  1  0.62230    2P10.0
  CYLINDER     9  1  0.63250    2P10.0
  CYLINDER     2  1  0.72390    2P10.0
  GLOBAL UNIT 2
  CYLINDER    3   1   16.9863  2P10.0
  HOLE    1     .0000     .0000    .0000
  HOLE    1     .0000    3.6905    .0000
  HOLE    1    3.1960    1.8453    .0000
  HOLE    1    3.1960   -1.8453    .0000
  HOLE    1     .0000   -3.6905    .0000
  HOLE    1   -3.1960   -1.8453    .0000
  HOLE    1   -3.1960    1.8453    .0000
  HOLE    1   -3.1960    5.5358    .0000
  HOLE    1     .0000    7.3810    .0000
  HOLE    1    3.1960    5.5358    .0000
  HOLE    1    6.3920    3.6905    .0000
  HOLE    1    6.3920     .0000    .0000
  HOLE    1    6.3920   -3.6905    .0000
  HOLE    1    3.1960   -5.5358    .0000
  HOLE    1     .0000   -7.3810    .0000
  HOLE    1   -3.1960   -5.5358    .0000
  HOLE    1   -6.3920   -3.6905    .0000
  HOLE    1   -6.3920     .0000    .0000
  HOLE    1   -6.3920    3.6905    .0000
  HOLE    1   -6.3920    7.3810    .0000
  HOLE    1    3.1960    9.2263    .0000
  HOLE    1    9.5879    1.8453    .0000
  HOLE    1    6.3920   -7.3810    .0000
  HOLE    1   -3.1960   -9.2263    .0000
  HOLE    1   -9.5879   -1.8453    .0000
  CYLINDER    5   1    18.8913  2P10.0
  CYLINDER    6   1    33.4963  2P10.0
  CYLINDER    5   1    36.5443  2P10.0
  CYLINDER    7   1    49.2443  2P10.0
  CYLINDER    5   1    49.8539  2P10.0
  CUBOID   8 1 4P121.92   2P10.0
  END GEOM
  READ BOUNDS  ALL=MIR     END BOUNDS
  END DATA

SECONDARY MODULE 000008   HAS BEEN CALLED.

MODULE 000008   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     0.71 (SECONDS).

SECONDARY MODULE 000002   HAS BEEN CALLED.

MODULE 000002   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     7.03 (SECONDS).

SECONDARY MODULE 000009   HAS BEEN CALLED.

MODULE 000009   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   231.51 (SECONDS).

MODULE CSAS25   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   242.27 (SECONDS).
```

```
 CCCCCCCCCCC    SSSSSSSSSSS     AAAAAAAAA     SSSSSSSSSSS    22222222222   5555555555555
CCCCCCCCCCCCC  SSSSSSSSSSSSS   AAAAAAAAAAA   SSSSSSSSSSSSS  2222222222222  5555555555555
CC         CC  SS         SS  AA         AA  SS         SS  22         22  55
CC             SS             AA         AA  SS                        22  55
CC             SS             AA         AA  SS                        22  55
CC             SSSSSSSSSSSS   AAAAAAAAAAAAA  SSSSSSSSSSSS            22    555555555555
CC              SSSSSSSSSSSS  AAAAAAAAAAAAA   SSSSSSSSSSSS         22      5555555555555
CC                        SS  AA         AA             SS       22                   55
CC                        SS  AA         AA             SS     22                     55
CC         CC  SS         SS  AA         AA  SS         SS   22            55         55
CCCCCCCCCCCCC  SSSSSSSSSSSSS  AA         AA  SSSSSSSSSSSSS  2222222222222  5555555555555
 CCCCCCCCCCC    SSSSSSSSSSS   AA         AA   SSSSSSSSSSS   2222222222222   55555555555


 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL             EEEEEEEEEEEEE                 PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL             EEEEEEEEEEEEE                 PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL             EE                            PP         PP  CC         CC
SS             CC             AA         AA  LL             EE                            PP         PP  CC
SS             CC             AA         AA  LL             EE                            PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------  PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------  PPPPPPPPPPPP   CC
           SS  CC             AA         AA  LL             EE                            PP             CC
           SS  CC             AA         AA  LL             EE                            PP             CC
SS         SS  CC         CC  AA         AA  LL             EE                            PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLLL  EEEEEEEEEEEEE                 PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLLL  EEEEEEEEEEEEE                 PP              CCCCCCCCCCC


   0000000          11                   //     0000000     666666666666              //     0000000        0000000
  000000000        111                  //     000000000    6666666666666            //     000000000      000000000
 00       00      1111                 //     00       00   66                      //     00       00    00       00
00         00       11                //     00         00  66                     //     00         00  00         00
00         00       11               //      00         00  66                    //      00         00  00         00
00         00       11              //       00         00  666666666666         //       00         00  00         00
00         00       11             //        00         00  6666666666666       //        00         00  00         00
00         00       11            //         00         00  66         66      //         00         00  00         00
00         00       11           //          00         00  66         66     //          00         00  00         00
 00       00        11          //            00       00   66         66    //            00       00    00       00
  000000000       11111111     //              000000000    6666666666666   //              000000000      000000000
   0000000        11111111    //                0000000      66666666666   //                0000000        0000000


     11                 44                 5555555555555   33333333333                           44       11
    111                444                 5555555555555  3333333333333                         444      111
   1111               4444         :::     55             33         33       :::              4444     1111
     11              44 44         :::     55                        33       :::             44 44       11
     11             44  44         :::     55                        33       :::            44  44       11
     11            44   44                   555555555555            333                      44   44       11
     11           44    44                   5555555555555           333                     44    44       11
     11         444444444444       :::                  55             33       :::        444444444444       11
     11        4444444444444       :::                  55             33       :::       4444444444444       11
     11                 44         :::     55         55  33         33       :::                44         11
   11111111             44                   5555555555555  3333333333333                          44       11111111
   11111111             44                    55555555555    33333333333                           44       11111111
```

```
 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA     LL             EEEEEEEEEEEEE                 PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA    LL             EEEEEEEEEEEEE                 PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA   LL             EE                            PP         PP  CC         CC
SS             CC             AA         AA   LL             EE                            PP         PP  CC
SS             CC             AA         AA   LL             EE                            PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA   LL             EEEEEEEEE     -------------   PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA   LL             EEEEEEEEE     -------------   PPPPPPPPPPPP   CC
           SS  CC             AA         AA   LL             EE                            PP             CC
           SS  CC             AA         AA   LL             EE                            PP             CC
SS         SS  CC         CC  AA         AA   LL             EE                            PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA   LLLLLLLLLLLLL  EEEEEEEEEEEEE                 PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL  EEEEEEEEEEEEE                 PP              CCCCCCCCCCC
```

```
*****************************************************************************
*****************************************************************************
*****************************************************************************
*****                                                                   *****
*****                 PROGRAM VERIFICATION INFORMATION                  *****
*****                                                                   *****
*****                CODE SYSTEM:   SCALE-PC VERSION:  4.3              *****
*****                                                                   *****
*****************************************************************************
*****************************************************************************
*****                                                                   *****
*****                                                                   *****
*****              PROGRAM:  CSAS                                       *****
*****                                                                   *****
*****        CREATION DATE:  03/08/96                                   *****
*****                                                                   *****
*****               VOLUME:  ENG                                        *****
*****                                                                   *****
*****              LIBRARY:  G:\SCALE43\WIN_NT\EXE                      *****
*****                                                                   *****
*****                                                                   *****
*****      PRODUCTION CODE:  CSAS                                       *****
*****                                                                   *****
*****              VERSION:  3.1                                        *****
*****                                                                   *****
*****              JOBNAME:  SCALE-PC                                   *****
*****                                                                   *****
*****    DATE OF EXECUTION:  01/06/00                                   *****
*****                                                                   *****
*****    TIME OF EXECUTION:  14:53:41                                   *****
*****                                                                   *****
*****                                                                   *****
*****************************************************************************
*****************************************************************************
*****************************************************************************
```

```
BWR RODS, NO BASKET, VOID EXTERIOR, GAP VOID


**** PROBLEM PARAMETERS ****

LIB 27GROUPNDF4  LIBRARY
MXX             9 MIXTURES
MSC             9 COMPOSITION SPECIFICATIONS
IZM             4 MATERIAL ZONES
GE  LATTICECELL  GEOMETRY
MORE            0 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
MSLN            0 FUEL SOLUTIONS


**** PROBLEM COMPOSITION DESCRIPTION ****

SC  UO2          STANDARD COMPOSITION
MX              1 MIXTURE NO.
VF         0.9500 VOLUME FRACTION
ROTH      10.9600 THEORETICAL DENSITY
NEL             2 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
            92000       1.00 ATOM/MOLECULE
                             92235     5.000 WT%
                             92238    95.000 WT%
             8016       2.00 ATOMS/MOLECULE
END

SC  ZIRCALLOY    STANDARD COMPOSITION
MX              2 MIXTURE NO.
VF         1.0000 VOLUME FRACTION
ROTH       6.5600 THEORETICAL DENSITY
NEL             1 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
            40302       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX              3 MIXTURE NO.
VF         1.0000 VOLUME FRACTION
ROTH       0.9982 THEORETICAL DENSITY
NEL             2 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
             1001       2.00 ATOMS/MOLECULE
             8016       1.00 ATOM/MOLECULE
END

SC  AL           STANDARD COMPOSITION
MX              4 MIXTURE NO.
VF         1.0000 VOLUME FRACTION
ROTH       2.7020 THEORETICAL DENSITY
NEL             1 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
            13027       1.00 ATOM/MOLECULE
END

SC  SS304        STANDARD COMPOSITION
MX              5 MIXTURE NO.
VF         1.0000 VOLUME FRACTION
ROTH       7.9200 THEORETICAL DENSITY
NEL             4 NO. ELEMENTS
ICP             0 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
            24304     19.000 WT%
            25055      2.000 WT%
            26304     69.500 WT%
            28304      9.500 WT%
END

SC  PB           STANDARD COMPOSITION
MX              6 MIXTURE NO.
VF         1.0000 VOLUME FRACTION
ROTH      11.3440 THEORETICAL DENSITY
NEL             1 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
            82000       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX              7 MIXTURE NO.
VF         1.0000 VOLUME FRACTION
ROTH       0.9982 THEORETICAL DENSITY
NEL             2 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
             1001       2.00 ATOMS/MOLECULE
             8016       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
```

```
MX             8 MIXTURE NO.
VF        0.0250 VOLUME FRACTION
ROTH      0.9982 THEORETICAL DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
            1001        2.00 ATOMS/MOLECULE
            8016        1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX             9 MIXTURE NO.
VF        0.0000 VOLUME FRACTION
ROTH      0.9982 THEORETICAL DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
            1001        2.00 ATOMS/MOLECULE
            8016        1.00 ATOM/MOLECULE
END

**** PROBLEM GEOMETRY ****

CTP TRIANGPITCH  CELL TYPE
PITCH     3.6906 CM CENTER TO CENTER SPACING
FUELOD    1.2446 CM FUEL DIAMETER OR SLAB THICKNESS
MFUEL          1 MIXTURE NO. OF FUEL
MMOD           3 MIXTURE NO. OF MODERATOR
CLADOD    1.4478 CM CLAD OUTER DIAMETER
MCLAD          2 MIXTURE NO. OF CLAD
GAPOD     1.2650 CM GAP OUTER DIAMETER
MGAP           9 MIXTURE NO. OF GAP

ZONE SPECIFICATIONS FOR LATTICECELL GEOMETRY

               ZONE  1 IS FUEL
               ZONE  2 IS GAP
               ZONE  3 IS CLAD
               ZONE  4 IS MOD
```

```
*****************************************************************************************************
***                                                                                               ***
***                          BWR RODS, NO BASKET, VOID EXTERIOR, GAP VOID                         ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************
***                                                                                               ***
***                           ********** DATA LIBRARY INFORMATION **********                      ***
***                                                                                               ***
***        UNIT                                          VOLUME                                   ***
***       NUMBER              DATA SET NAME               NAME       UNIT FUNCTION                ***
***       ------              -------------               ----       -------------                ***
***                                                                                               ***
***          89    G:\scale43\DATALIB\FT89F001                       STANDARD COMPOSITION LIBRARY ***
***                                                                                               ***
***          82    G:\scale43\DATALIB\FT82F001                       CROSS SECTION LIBRARY        ***
***                                                                                               ***
***          11    D:\dcn\326023-1.3_R\BRONZ2D\FT11F001              SHORT CROSS SECTION LIBRARY  ***
***                                                                                               ***
***          90    D:\dcn\326023-1.3_R\BRONZ2D\FT90F001              INPUT DATA DIRECT ACCESS     ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************
***                                                                                               ***
***                                                                                               ***
***                               STANDARD COMPOSITION LIBRARY DATA                               ***
***                               --------------------------------                                ***
***                                                                                               ***
***          UNIT NUMBER  :  89                                                                   ***
***                                                                                               ***
***          DATASET NAME :  G:\scale43\DATALIB\FT89F001                                          ***
***                                                                                               ***
***          LIBRARY TITLE:  SCALE-4 STANDARD COMPOSITION LIBRARY                                 ***
***                          637 STANDARD COMPOSITIONS, 490 NUCLIDES                              ***
***                          90 ELEMENTS WITH VARIABLE ISOTOPIC DISTRBUTIONS.                     ***
***                                                                                               ***
***          CREATION DATE:   6/30/95                                                             ***
***                                                                                               ***
***                                                                                               ***
***                                                                                               ***
***                                   CROSS SECTION LIBRARY DATA                                  ***
***                                   --------------------------                                  ***
***                                                                                               ***
***          UNIT NUMBER  :  82                                                                   ***
***                                                                                               ***
***          DATASET NAME :  G:\scale43\DATALIB\FT82F001                                          ***
***                                                                                               ***
***          LIBRARY TITLE:  SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY                           ***
***                             BASED ON ENDF-B VERSION 4 DATA                                    ***
***                                COMPILED FOR NRC      1/27/89                                  ***
***                                   LAST UPDATED                                      08/12/94  ***
***                                      L.M.PETRIE   -    ORNL                                   ***
***                                                                                               ***
***                                                                                               ***
***                                                                                               ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************

                      ........    0 IO'S WERE USED BEFORE READING KENO V DATA     ........

                      ........    0 IO'S WERE USED READING THE KENO V PARAMETER DATA     ........

                     ************** DATA READING COMPLETED **************

                      ........    0 IO'S WERE USED PREPARING THE KENO V INPUT DATA     ........

                      ........    0 IO'S WERE USED LOADING THE KENO V DATA     ........

                      ........    0 IO'S WERE USED LOADING THE DATA     ........

                      ........    0 IO'S WERE USED CHECKING THE KENO V GEOMETRY DATA     ........
                      *****  RESTART DATA HAS BEEN WRITTEN ON UNIT 95  *****

                      ........    0 IO'S WERE USED WRITING THE KENO V - CSAS DATA     ........

                      ........    0 IO'S WERE USED PROCESSING CSAS INPUT DATA     ........

CONTROL MODULE CSAS25    IS COMPLETE.
```

KENO - V

SCALE - PC

01/06/00

14:53:51

```
"LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"

****** NUMERIC PARAMETERS ******

TME   MAXIMUM PROBLEM TIME (MIN)                 30.00
TBA   TIME PER GENERATION (MIN)                   0.50
GEN   NUMBER OF GENERATIONS                        103
NPG   NUMBER PER GENERATION                        400
NSK   NUMBER OF GENERATIONS TO BE SKIPPED            3
BEG   BEGINNING GENERATION NUMBER                    1
RES   GENERATIONS BETWEEN CHECKPOINTS                0
X1D   NUMBER OF EXTRA 1-D CROSS SECTIONS             1
NBK   NEUTRON BANK SIZE                            425
XNB   EXTRA POSITIONS IN NEUTRON BANK                0
NFB   FISSION BANK SIZE                            400
XFB   EXTRA POSITIONS IN FISSION BANK                0
WTA   DEFAULT VALUE OF WEIGHT AVERAGE           0.5000
WTH   WEIGHT HIGH FOR SPLITTING                 3.0000
WTL   WEIGHT LOW FOR RUSSIAN ROULETTE           0.3333
RND   STARTING RANDOM NUMBER              BB827100001
NB8   NUMBER OF D.A. BLOCKS ON UNIT  8             200
NL8   LENGTH OF D.A. BLOCKS ON UNIT  8             512
ADJ   MODE OF CALCULATION                      FORWARD
      INPUT DATA WRITTEN ON RESTART UNIT            NO
      BINARY DATA INTERFACE                        YES
```

```
...                "LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"                ...

...                ******      LOGICAL PARAMETERS      ******                                      ...

*** RUN  EXECUTE PROBLEM AFTER CHECKING DATA      YES      PLT  PLOT PICTURE MAP(S)                    NO ***
*** FLX  COMPUTE FLUX                             NO       FDN  COMPUTE FISSION DENSITIES              NO ***
*** SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION     NO       NUB  COMPUTE NU-BAR & AVG FISSION GROUP    YES ***
*** MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER      NO       MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION  NO ***
*** CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER    NO       CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION NO ***
*** FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER    NO       FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION NO ***
*** MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER      NO       MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER   NO ***
*** CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER    NO       CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER NO ***
*** FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER    NO       FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER NO ***
*** HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL     NO       HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL  NO ***
*** AMX  PRINT ALL MIXED CROSS SECTIONS           NO       FAR  PRINT FIS. AND ABS. BY REGION          NO ***
*** XS1  PRINT 1-D MIXTURE X-SECTIONS             NO       GAS  PRINT FAR BY GROUP                     NO ***
*** XS2  PRINT 2-D MIXTURE X-SECTIONS             NO       PAX  PRINT XSEC-ALBEDO CORRELATION TABLES   NO ***
*** XAP  PRINT MIXTURE ANGLES & PROBABILITIES     NO       PWT  PRINT WEIGHT AVERAGE ARRAY             NO ***
*** PKI  PRINT FISSION SPECTRUM                   NO       PGM  PRINT INPUT GEOMETRY                   NO ***
*** P1D  PRINT EXTRA 1-D CROSS SECTIONS           NO       BUG  PRINT DEBUG INFORMATION                NO ***
***                                                        TRK  PRINT TRACKING INFORMATION             NO ***

                         PARAMETER INPUT COMPLETED

     .......     0 IO'S WERE USED READING THE PARAMETER DATA     .......

     ************** DATA READING COMPLETED **************
```

```
"LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"

****** ADDITIONAL INFORMATION ******

NUMBER OF ENERGY GROUPS                 27     USE LATTICE GEOMETRY                      NO
NO. OF FISSION SPECTRUM SOURCE GROUP     1     GLOBAL ARRAY NUMBER                        0
NO. OF SCATTERING ANGLES IN XSECS        2     NUMBER OF UNITS IN THE GLOBAL X DIR.       0
ENTRIES/NEUTRON IN THE NEUTRON BANK     17     NUMBER OF UNITS IN THE GLOBAL Y DIR.       0
ENTRIES/NEUTRON IN THE FISSION BANK     10     NUMBER OF UNITS IN THE GLOBAL Z DIR.       0
NUMBER OF MIXTURES USED                  8     USE A GLOBAL REFLECTOR                   YES
NUMBER OF BIAS ID'S USED                 1     USE NESTED HOLES                          NO
NUMBER OF DIFFERENTIAL ALBEDOS USED      0     NUMBER OF HOLES                           25
TOTAL INPUT GEOMETRY REGIONS            10     MAXIMUM HOLE NESTING LEVEL                 1
NUMBER OF GEOMETRY REGIONS USED         10     USE NESTED ARRAYS                         NO
LARGEST GEOMETRY UNIT NUMBER             2     NUMBER OF ARRAYS USED                      0
LARGEST ARRAY NUMBER                     1     MAXIMUM ARRAY NESTING LEVEL                0

+X BOUNDARY CONDITION                  MIR     -X BOUNDARY CONDITION                    MIR
+Y BOUNDARY CONDITION                  MIR     -Y BOUNDARY CONDITION                    MIR
+Z BOUNDARY CONDITION                  MIR     -Z BOUNDARY CONDITION                    MIR
```

```
"LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"

****** SPACE AND SUPERGROUP INFORMATION ******

 100000 WORDS IS THE TOTAL SPACE AVAILABLE.
  12479 WORDS WERE USED FOR NON-SUPERGROUP STORAGE.
  87521 WORDS OF STORAGE ARE AVAILABLE FOR SUPERGROUPED DATA.
  99784 WORDS OF STORAGE ARE AVAILABLE FOR CONSTRUCTING THE SUPERGROUPS.
  87461 WORDS OF STORAGE ARE AVAILABLE TO EACH SUPERGROUP.
   1165 WORDS ARE NEEDED FOR THE LARGEST GROUP.
  13860 WORDS OF STORAGE IS SUFFICIENT TO RUN THIS PROBLEM.
  25594 WORDS OF STORAGE WILL ALLOW THE PROBLEM TO RUN WITH ONE SUPERGROUP.
  25760 WORDS OF STORAGE WILL BE USED TO RUN THIS PROBLEM.
```

SUPERGROUP	STARTING GROUP	ENDING GROUP	XSEC LENGTH	ALBEDO LENGTH	TOTAL LENGTH
1	1	27	2636	0	13055

```
........   0 IO'S WERE USED IN SUPERGROUPING    ........
........   0 IO'S WERE USED LOADING THE DATA    ........
```

```
                              "LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"
-
               MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION          NUM   ID

                                    -----  UNIT    1  -----

BWR FUEL ROD

  1 CYLINDER     1  1  RADIUS = 0.62230    +Z =  10.000    -Z = -10.000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  2 CYLINDER     9  1  RADIUS = 0.63250    +Z =  10.000    -Z = -10.000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CYLINDER     2  1  RADIUS = 0.72390    +Z =  10.000    -Z = -10.000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
                              "LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"
-
               MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION          NUM   ID

                              ******************  GLOBAL  ******************
                                    -----  UNIT    2  -----

  1 CYLINDER     3  1  RADIUS =  16.986    +Z =  10.000    -Z = -10.000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
    HOLE NUMBER   1      AT X = 0.00000    Y = 0.00000     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER   2      AT X = 0.00000    Y =  3.6905     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER   3      AT X =  3.1960    Y =  1.8453     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER   4      AT X =  3.1960    Y = -1.8453     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER   5      AT X = 0.00000    Y = -3.6905     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER   6      AT X = -3.1960    Y = -1.8453     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER   7      AT X = -3.1960    Y =  1.8453     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER   8      AT X = -3.1960    Y =  5.5358     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER   9      AT X = 0.00000    Y =  7.3810     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER  10      AT X =  3.1960    Y =  5.5358     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER  11      AT X =  6.3920    Y =  3.6905     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER  12      AT X =  6.3920    Y = 0.00000     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER  13      AT X =  6.3920    Y = -3.6905     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER  14      AT X =  3.1960    Y = -5.5358     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER  15      AT X = 0.00000    Y = -7.3810     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER  16      AT X = -3.1960    Y = -5.5358     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER  17      AT X = -6.3920    Y = -3.6905     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER  18      AT X = -6.3920    Y = 0.00000     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER  19      AT X = -6.3920    Y =  3.6905     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER  20      AT X = -6.3920    Y =  7.3810     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER  21      AT X =  3.1960    Y =  9.2263     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER  22      AT X =  9.5879    Y =  1.8453     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER  23      AT X =  6.3920    Y = -7.3810     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER  24      AT X = -3.1960    Y = -9.2263     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER  25      AT X = -9.5879    Y = -1.8453     Z = 0.00000     IS UNIT NUMBER     1
  2 CYLINDER     5  1  RADIUS =  18.891    +Z =  10.000    -Z = -10.000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  3 CYLINDER     6  1  RADIUS =  33.496    +Z =  10.000    -Z = -10.000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  4 CYLINDER     5  1  RADIUS =  36.544    +Z =  10.000    -Z = -10.000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  5 CYLINDER     7  1  RADIUS =  49.244    +Z =  10.000    -Z = -10.000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  6 CYLINDER     5  1  RADIUS =  49.854    +Z =  10.000    -Z = -10.000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  7 CUBOID       8  1      +X =  121.92    -X = -121.92    +Y =  121.92    -Y = -121.92     +Z =  10.000    -Z = -10.000
```

```
                     "LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"
                     VOLUMES FOR THOSE UNITS UTILIZED IN  THIS PROBLEM

                       GEOMETRY                                  CUMULATIVE
   UNIT     REGION      REGION          VOLUME                    VOLUME

    1         1           1        2.43321E+01 CM**3         2.43321E+01 CM**3
              2           2        8.04178E-01 CM**3         2.51363E+01 CM**3
              3           3        7.78958E+00 CM**3         3.29259E+01 CM**3

    2         1           4        1.73060E+04 CM**3         1.81291E+04 CM**3
              2           5        4.29436E+03 CM**3         2.24235E+04 CM**3
              3           6        4.80740E+04 CM**3         7.04975E+04 CM**3
              4           7        1.34136E+04 CM**3         8.39110E+04 CM**3
              5           8        6.84563E+04 CM**3         1.52367E+05 CM**3
              6           9        3.79567E+03 CM**3         1.56163E+05 CM**3
              7          10        1.03300E+06 CM**3         1.18916E+06 CM**3


                     UNIT     USES     REGION     MIXTURE       TOTAL VOLUME

                      1        25        1           1        6.08302E+02 CM**3
                                         2           9        2.01045E+01 CM**3
                                         3           2        1.94739E+02 CM**3

                      2         1        1           3        1.73060E+04 CM**3
                                         2           5        4.29436E+03 CM**3
                                         3           6        4.80740E+04 CM**3
                                         4           5        1.34136E+04 CM**3
                                         5           7        6.84563E+04 CM**3
                                         6           5        3.79567E+03 CM**3
                                         7           8        1.03300E+06 CM**3


                              TOTAL MIXTURE VOLUMES
                         MIXTURE     TOTAL VOLUME             MASS(G)
                            1      6.08302E+02 CM**3        6.33363E+03
                            2      1.94739E+02 CM**3        1.27749E+03
                            3      1.73060E+04 CM**3        1.72744E+04
                            5      2.15036E+04 CM**3        1.70309E+05
                            6      4.80740E+04 CM**3        5.45351E+05
                            7      6.84563E+04 CM**3        6.83311E+04
                            8      1.03300E+06 CM**3        2.57777E+04
                            9      2.01045E+01 CM**3        2.00677E-19

*******************************************************************************************
***                                                                                     ***
***                                 BIASING INFORMATION                                 ***
***                                                                                     ***
***     A DEFAULT WEIGHT OF    0.500 WILL BE USED FOR ALL BIAS ID'S.                    ***
***                                                                                     ***
*******************************************************************************************

                ........   0 IO'S WERE USED IN KENO-V BEFORE TRACKING       ........

                ........  0.00917 MINUTES WERE USED PROCESSING DATA.        ........

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 5.11540E-04

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED UNIFORMLY THROUGHOUT THE ENTIRE VOLUME DEFINED BY THE OUTERMOST GEOMETRY CARD.
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

KENO MESSAGE NUMBER K5-105      ***** WARNING, ONLY   15 INDEPENDENT STARTING POSITIONS WERE GENERATED.  *****

  385 ADDITIONAL STARTING POINTS WERE PICKED FROM THE INITAL DISTRIBUTION.

0.45350 MINUTES WERE REQUIRED FOR STARTING.   TOTAL ELAPSED TIME IS 0.46933 MINUTES.
```

_"LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	361 INDEPENDENT	FISSION POINTS WERE	GENERATED	
1	7.65516E-01	4.96167E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	361 INDEPENDENT	FISSION POINTS WERE	GENERATED	
2	7.64413E-01	5.28167E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	290 INDEPENDENT	FISSION POINTS WERE	GENERATED	
3	6.19918E-01	5.62000E-01	6.19918E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	6.88459E-01	5.94000E-01	6.54189E-01	3.42704E-02	0.00000E+00	0.00000E+00
5	6.93179E-01	6.26167E-01	6.67185E-01	2.36729E-02	0.00000E+00	0.00000E+00
6	7.10288E-01	6.59000E-01	6.77961E-01	1.99077E-02	0.00000E+00	0.00000E+00
7	7.07097E-01	6.93000E-01	6.83788E-01	1.64848E-02	0.00000E+00	0.00000E+00
8	7.15380E-01	7.25000E-01	6.89054E-01	1.44529E-02	0.00000E+00	0.00000E+00
9	6.58122E-01	7.58000E-01	6.84635E-01	1.29896E-02	0.00000E+00	0.00000E+00
10	6.93095E-01	7.90833E-01	6.85692E-01	1.12990E-02	0.00000E+00	0.00000E+00
11	7.03366E-01	8.23000E-01	6.87656E-01	1.01564E-02	0.00000E+00	0.00000E+00
12	6.93030E-01	8.55833E-01	6.88194E-01	9.10004E-03	0.00000E+00	0.00000E+00
13	7.18064E-01	8.88000E-01	6.90909E-01	8.66765E-03	0.00000E+00	0.00000E+00
14	7.91370E-01	9.20000E-01	6.99281E-01	1.15193E-02	0.00000E+00	0.00000E+00
15	7.11343E-01	9.52000E-01	7.00209E-01	1.06367E-02	0.00000E+00	0.00000E+00
16	7.52201E-01	9.83167E-01	7.03922E-01	1.05247E-02	0.00000E+00	0.00000E+00
17	6.89461E-01	1.01700E+00	7.02958E-01	9.84525E-03	0.00000E+00	0.00000E+00
18	6.37132E-01	1.05083E+00	6.98844E-01	1.00866E-02	0.00000E+00	0.00000E+00
19	6.94222E-01	1.08383E+00	6.98572E-01	9.47858E-03	0.00000E+00	0.00000E+00
20	7.51433E-01	1.11500E+00	7.01509E-01	9.40665E-03	0.00000E+00	0.00000E+00
21	7.68996E-01	1.14517E+00	7.05061E-01	9.58056E-03	0.00000E+00	0.00000E+00
22	7.12882E-01	1.17717E+00	7.05452E-01	9.09732E-03	0.00000E+00	0.00000E+00
23	6.30991E-01	1.20917E+00	7.01906E-01	9.35157E-03	0.00000E+00	0.00000E+00
24	7.22451E-01	1.24217E+00	7.02840E-01	8.96514E-03	0.00000E+00	0.00000E+00
25	7.50445E-01	1.27517E+00	7.04910E-01	8.81299E-03	0.00000E+00	0.00000E+00
26	6.81428E-01	1.30900E+00	7.03931E-01	8.49433E-03	0.00000E+00	0.00000E+00
27	7.14582E-01	1.34383E+00	7.04357E-01	8.15861E-03	0.00000E+00	0.00000E+00
28	6.40212E-01	1.37950E+00	7.01890E-01	8.21762E-03	0.00000E+00	0.00000E+00
29	6.65960E-01	1.41250E+00	7.00560E-01	8.01861E-03	0.00000E+00	0.00000E+00
30	6.91062E-01	1.44450E+00	7.00220E-01	7.73437E-03	0.00000E+00	0.00000E+00
31	7.57552E-01	1.47833E+00	7.02197E-01	7.72032E-03	0.00000E+00	0.00000E+00
32	6.91203E-01	1.51400E+00	7.01831E-01	7.46753E-03	0.00000E+00	0.00000E+00
33	7.04664E-01	1.54617E+00	7.01922E-01	7.22321E-03	0.00000E+00	0.00000E+00
34	6.86342E-01	1.58000E+00	7.01498E-01	7.00670E-03	0.00000E+00	0.00000E+00
35	6.85905E-01	1.61300E+00	7.01025E-01	6.80748E-03	0.00000E+00	0.00000E+00
36	6.66605E-01	1.64583E+00	7.00013E-01	6.68137E-03	0.00000E+00	0.00000E+00
37	6.80386E-01	1.67700E+00	6.99452E-01	6.51185E-03	0.00000E+00	0.00000E+00
38	7.23576E-01	1.70900E+00	7.00122E-01	6.36376E-03	0.00000E+00	0.00000E+00
39	7.15526E-01	1.74300E+00	7.00539E-01	6.20336E-03	0.00000E+00	0.00000E+00
40	6.23193E-01	1.77583E+00	6.98503E-01	6.37175E-03	0.00000E+00	0.00000E+00
41	6.95180E-01	1.80883E+00	6.98418E-01	6.20681E-03	0.00000E+00	0.00000E+00
42	6.69420E-01	1.84450E+00	6.97693E-01	6.09293E-03	0.00000E+00	0.00000E+00
43	6.81143E-01	1.87850E+00	6.97289E-01	5.95616E-03	0.00000E+00	0.00000E+00
44	6.79605E-01	1.91233E+00	6.96868E-01	5.82785E-03	0.00000E+00	0.00000E+00
45	7.20777E-01	1.94250E+00	6.97424E-01	5.71780E-03	0.00000E+00	0.00000E+00
46	6.89621E-01	1.97633E+00	6.97247E-01	5.58915E-03	0.00000E+00	0.00000E+00
47	6.36373E-01	2.01117E+00	6.95894E-01	5.62851E-03	0.00000E+00	0.00000E+00
48	6.90145E-01	2.04417E+00	6.95769E-01	5.50621E-03	0.00000E+00	0.00000E+00
49	6.55189E-01	2.07800E+00	6.94906E-01	5.45653E-03	0.00000E+00	0.00000E+00
50	6.78749E-01	2.11283E+00	6.94569E-01	5.35224E-03	0.00000E+00	0.00000E+00
51	7.12716E-01	2.14483E+00	6.94940E-01	5.25494E-03	0.00000E+00	0.00000E+00
52	7.09477E-01	2.17783E+00	6.95230E-01	5.15697E-03	0.00000E+00	0.00000E+00
53	7.09112E-01	2.21167E+00	6.95503E-01	5.06216E-03	0.00000E+00	0.00000E+00
54	6.80390E-01	2.24467E+00	6.95212E-01	4.97236E-03	0.00000E+00	0.00000E+00
55	6.96364E-01	2.27667E+00	6.95234E-01	4.87769E-03	0.00000E+00	0.00000E+00
56	7.48925E-01	2.31050E+00	6.96228E-01	4.88869E-03	0.00000E+00	0.00000E+00
57	7.63567E-01	2.34167E+00	6.97452E-01	4.95270E-03	0.00000E+00	0.00000E+00
58	6.97674E-01	2.37550E+00	6.97456E-01	4.86345E-03	0.00000E+00	0.00000E+00
59	6.98240E-01	2.40850E+00	6.97470E-01	4.77739E-03	0.00000E+00	0.00000E+00
60	7.03477E-01	2.44233E+00	6.97574E-01	4.69544E-03	0.00000E+00	0.00000E+00
61	7.40246E-01	2.47533E+00	6.98297E-01	4.67150E-03	0.00000E+00	0.00000E+00
62	6.67840E-01	2.50733E+00	6.97789E-01	4.62095E-03	0.00000E+00	0.00000E+00
63	6.53727E-01	2.54117E+00	6.97067E-01	4.60161E-03	0.00000E+00	0.00000E+00
64	7.02464E-01	2.57417E+00	6.97154E-01	4.52762E-03	0.00000E+00	0.00000E+00
65	7.40766E-01	2.60533E+00	6.97846E-01	4.50863E-03	0.00000E+00	0.00000E+00
66	6.94688E-01	2.63917E+00	6.97797E-01	4.43790E-03	0.00000E+00	0.00000E+00
67	7.11041E-01	2.67217E+00	6.98001E-01	4.37384E-03	0.00000E+00	0.00000E+00
68	7.03696E-01	2.70417E+00	6.98087E-01	4.30793E-03	0.00000E+00	0.00000E+00
69	7.20287E-01	2.73617E+00	6.98418E-01	4.25606E-03	0.00000E+00	0.00000E+00
70	7.02888E-01	2.76917E+00	6.98484E-01	4.19352E-03	0.00000E+00	0.00000E+00
71	6.33670E-01	2.80300E+00	6.97545E-01	4.23771E-03	0.00000E+00	0.00000E+00
72	7.50994E-01	2.83417E+00	6.98308E-01	4.24596E-03	0.00000E+00	0.00000E+00
73	6.74181E-01	2.86700E+00	6.97968E-01	4.19950E-03	0.00000E+00	0.00000E+00
74	6.83273E-01	2.90000E+00	6.97764E-01	4.14579E-03	0.00000E+00	0.00000E+00
75	7.35040E-01	2.93383E+00	6.98275E-01	4.12037E-03	0.00000E+00	0.00000E+00
76	6.78234E-01	2.96683E+00	6.98004E-01	4.07332E-03	0.00000E+00	0.00000E+00
77	7.31130E-01	2.99800E+00	6.98446E-01	4.04284E-03	0.00000E+00	0.00000E+00
78	7.11384E-01	3.03000E+00	6.98616E-01	3.99292E-03	0.00000E+00	0.00000E+00
79	7.94480E-01	3.06200E+00	6.99861E-01	4.13271E-03	0.00000E+00	0.00000E+00
80	7.94996E-01	3.09233E+00	7.01081E-01	4.25782E-03	0.00000E+00	0.00000E+00
81	7.51317E-01	3.12250E+00	7.01717E-01	4.25140E-03	0.00000E+00	0.00000E+00
82	7.39398E-01	3.15550E+00	7.02188E-01	4.22426E-03	0.00000E+00	0.00000E+00
83	6.90066E-01	3.18833E+00	7.02038E-01	4.17447E-03	0.00000E+00	0.00000E+00
84	7.08567E-01	3.22317E+00	7.02118E-01	4.12402E-03	0.00000E+00	0.00000E+00
85	6.84831E-01	3.25700E+00	7.01909E-01	4.07935E-03	0.00000E+00	0.00000E+00
86	6.71388E-01	3.29000E+00	7.01546E-01	4.04684E-03	0.00000E+00	0.00000E+00
87	7.77551E-01	3.32200E+00	7.02440E-01	4.09769E-03	0.00000E+00	0.00000E+00
88	6.72849E-01	3.35417E+00	7.02096E-01	4.06436E-03	0.00000E+00	0.00000E+00

89	7.24210E-01	3.38617E+00	7.02350E-01	4.02540E-03	0.00000E+00	0.00000E+00
90	7.44614E-01	3.42000E+00	7.02830E-01	4.00827E-03	0.00000E+00	0.00000E+00
91	7.96997E-01	3.45383E+00	7.03689E-01	4.10179E-03	0.00000E+00	0.00000E+00
92	6.49206E-01	3.48767E+00	7.03281E-01	4.10121E-03	0.00000E+00	0.00000E+00
93	6.91987E-01	3.51983E+00	7.03157E-01	4.05779E-03	0.00000E+00	0.00000E+00
94	6.71316E-01	3.55267E+00	7.02811E-01	4.02834E-03	0.00000E+00	0.00000E+00
95	6.77878E-01	3.58667E+00	7.02543E-01	3.99380E-03	0.00000E+00	0.00000E+00
96	7.22040E-01	3.61867E+00	7.02750E-01	3.95652E-03	0.00000E+00	0.00000E+00
97	6.94216E-01	3.65067E+00	7.02660E-01	3.91568E-03	0.00000E+00	0.00000E+00
98	6.89477E-01	3.68450E+00	7.02523E-01	3.87711E-03	0.00000E+00	0.00000E+00
99	6.54985E-01	3.71667E+00	7.02033E-01	3.86811E-03	0.00000E+00	0.00000E+00
100	7.30407E-01	3.74683E+00	7.02322E-01	3.83936E-03	0.00000E+00	0.00000E+00
101	7.01445E-01	3.77800E+00	7.02314E-01	3.80040E-03	0.00000E+00	0.00000E+00
102	7.58112E-01	3.80900E+00	7.02872E-01	3.80335E-03	0.00000E+00	0.00000E+00
103	7.90971E-01	3.84117E+00	7.03744E-01	3.86522E-03	0.00000E+00	0.00000E+00

KENO MESSAGE NUMBER K5-123 EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

"LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"

```
LIFETIME =  2.20278E-04 + OR -  4.37502E-06          GENERATION TIME =  1.11547E-04 + OR -  7.28438E-07
NU BAR   =  2.43036E+00 + OR -  2.66918E-04      AVERAGE FISSION GROUP =  2.37161E+01 + OR -  1.32587E-02
                 ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION =  7.18706E-02 + OR -  8.84026E-04
```

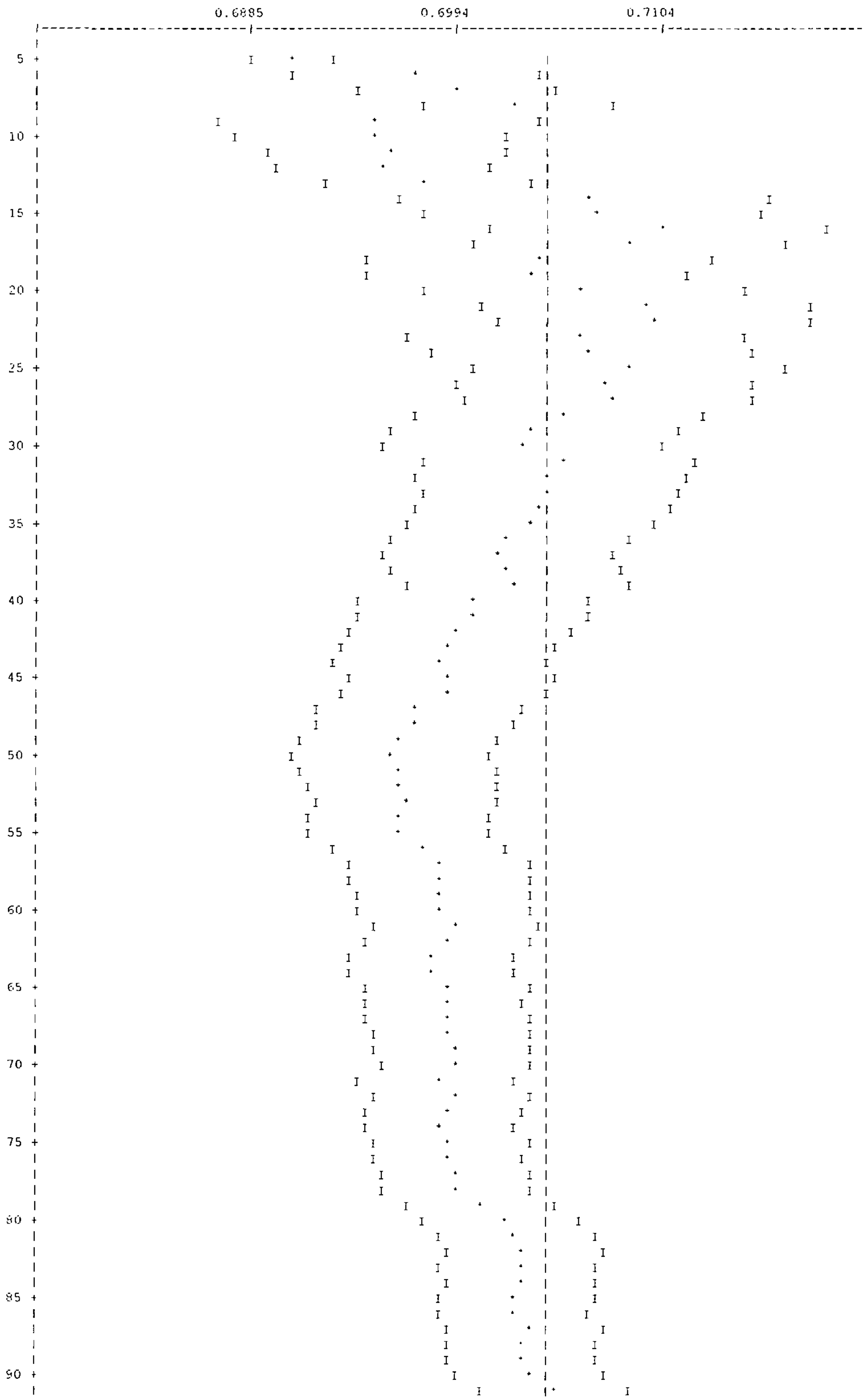
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.70458	+ OR - 0.00381	0.70077 TO 0.70839	0.69696 TO 0.71220	0.69315 TO 0.71602	40000
4	0.70474	+ OR - 0.00385	0.70090 TO 0.70859	0.69705 TO 0.71244	0.69321 TO 0.71628	39600
5	0.70486	+ OR - 0.00388	0.70098 TO 0.70875	0.69710 TO 0.71263	0.69321 TO 0.71651	39200
6	0.70481	+ OR - 0.00392	0.70088 TO 0.70873	0.69696 TO 0.71265	0.69304 TO 0.71658	38800
7	0.70478	+ OR - 0.00396	0.70082 TO 0.70875	0.69685 TO 0.71271	0.69289 TO 0.71668	38400
8	0.70467	+ OR - 0.00401	0.70067 TO 0.70868	0.69666 TO 0.71268	0.69266 TO 0.71669	38000
9	0.70517	+ OR - 0.00402	0.70115 TO 0.70918	0.69713 TO 0.71320	0.69312 TO 0.71722	37600
10	0.70530	+ OR - 0.00406	0.70124 TO 0.70935	0.69718 TO 0.71341	0.69312 TO 0.71747	37200
11	0.70532	+ OR - 0.00410	0.70122 TO 0.70942	0.69711 TO 0.71352	0.69301 TO 0.71763	36800
12	0.70545	+ OR - 0.00415	0.70131 TO 0.70960	0.69716 TO 0.71374	0.69302 TO 0.71789	36400
17	0.70388	+ OR - 0.00423	0.69966 TO 0.70811	0.69543 TO 0.71233	0.69120 TO 0.71656	34400
22	0.70332	+ OR - 0.00429	0.69903 TO 0.70761	0.69474 TO 0.71191	0.69045 TO 0.71620	32400
27	0.70354	+ OR - 0.00441	0.69913 TO 0.70795	0.69472 TO 0.71237	0.69031 TO 0.71678	30400
32	0.70455	+ OR - 0.00454	0.70002 TO 0.70909	0.69548 TO 0.71362	0.69095 TO 0.71816	28400
37	0.70602	+ OR - 0.00481	0.70120 TO 0.71083	0.69639 TO 0.71565	0.69158 TO 0.72046	26400
42	0.70771	+ OR - 0.00497	0.70274 TO 0.71269	0.69776 TO 0.71766	0.69279 TO 0.72263	24400
47	0.71005	+ OR - 0.00520	0.70486 TO 0.71525	0.69966 TO 0.72044	0.69446 TO 0.72564	22400
52	0.71209	+ OR - 0.00555	0.70654 TO 0.71764	0.70099 TO 0.72319	0.69544 TO 0.72874	20400
57	0.71127	+ OR - 0.00595	0.70532 TO 0.71722	0.69937 TO 0.72316	0.69342 TO 0.72911	18400
62	0.71246	+ OR - 0.00654	0.70592 TO 0.71899	0.69939 TO 0.72553	0.69285 TO 0.73207	16400
67	0.71411	+ OR - 0.00720	0.70691 TO 0.72131	0.69972 TO 0.72851	0.69252 TO 0.73571	14400
72	0.71602	+ OR - 0.00783	0.70818 TO 0.72385	0.70035 TO 0.73169	0.69251 TO 0.73952	12400
77	0.71903	+ OR - 0.00894	0.71008 TO 0.72797	0.70114 TO 0.73692	0.69219 TO 0.74586	10400
82	0.70967	+ OR - 0.00941	0.70026 TO 0.71908	0.69085 TO 0.72849	0.68144 TO 0.73790	8400
87	0.71067	+ OR - 0.01120	0.69947 TO 0.72187	0.68827 TO 0.73306	0.67708 TO 0.74426	6400
92	0.70753	+ OR - 0.01206	0.69547 TO 0.71959	0.68342 TO 0.73164	0.67136 TO 0.74370	4400

"LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
97	0.72090	+ OR - 0.02008	0.70082 TO 0.74098	0.68074 TO 0.76106	0.66066 TO 0.78114	2400

"LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.7046 + OR - 0.0038 WHICH OCCURS FOR 103 GENERATIONS RUN.



```
        |                                                  I        *|        I
        |                                                  I        *|       I
        |                                                 I        * |      I
     95 +                                                 I        * |      I
        |                                                 I        * |      I
        |                                                 I        * |      I
        |                                                 I        * |     I
        |                                                I       *   |    I
    100 +                                                I        *  |     I
        |                                                I        *  |     I
        |                                                  I       * |      I
        |                                                    I       *        I
```

"LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0032			2.25095E-03	7.8999	1.69980E-03	4.5846	0.00000E+00	0.0000
2	0.0117			8.26592E-03	2.6166	5.12285E-03	1.8582	0.00000E+00	0.0000
3	0.0133			9.37768E-03	2.2716	3.87435E-03	2.1804	0.00000E+00	0.0000
4	0.0053			3.70092E-03	2.7681	1.76169E-03	2.6427	0.00000E+00	0.0000
5	0.0017			1.21374E-03	2.1824	1.13160E-03	1.9162	0.00000E+00	0.0000
6	0.0014			1.01081E-03	1.6627	1.54773E-03	1.3194	0.00000E+00	0.0000
7	0.0012			8.22068E-04	2.2097	1.39633E-03	1.8199	0.00000E+00	0.0000
8	0.0010			6.71540E-04	2.8381	1.69331E-03	2.3480	0.00000E+00	0.0000
9	0.0012			8.56593E-04	2.9293	2.54030E-03	2.5375	0.00000E+00	0.0000
10	0.0024			1.66103E-03	3.2172	3.64944E-03	2.5647	0.00000E+00	0.0000
11	0.0050			3.52613E-03	3.1318	6.32132E-03	2.5665	0.00000E+00	0.0000
12	0.0071			5.00778E-03	3.8527	7.57670E-03	3.3871	0.00000E+00	0.0000
13	0.0066			4.62519E-03	3.9332	7.92726E-03	3.0584	0.00000E+00	0.0000
14	0.0050			3.54103E-03	3.7969	1.09799E-02	2.8209	0.00000E+00	0.0000
15	0.0012			8.75754E-04	6.3603	3.16548E-03	3.1721	0.00000E+00	0.0000
16	0.0009			5.99919E-04	7.4684	1.91457E-03	4.0471	0.00000E+00	0.0000
17	0.0013			8.93173E-04	10.4906	1.30725E-03	5.0843	0.00000E+00	0.0000
18	0.0019			1.32780E-03	10.3387	1.42220E-03	5.9406	0.00000E+00	0.0000
19	0.0020			1.41318E-03	8.8499	2.19704E-03	4.2113	0.00000E+00	0.0000
20	0.0096			6.75531E-03	4.9862	9.53559E-03	2.6179	0.00000E+00	0.0000
21	0.0052			3.65163E-03	7.6738	4.17396E-03	3.9216	0.00000E+00	0.0000
22	0.0131			9.23177E-03	5.0220	1.09786E-02	2.5974	0.00000E+00	0.0000
23	0.0905			6.37689E-02	1.8699	8.17951E-02	0.8746	0.00000E+00	0.0000
24	0.2506			1.76576E-01	1.0931	2.33370E-01	0.5061	0.00000E+00	0.0000
25	0.2238			1.57684E-01	1.1584	2.16982E-01	0.4441	0.00000E+00	0.0000
26	0.2640			1.86030E-01	1.1510	2.80289E-01	0.4053	0.00000E+00	0.0000
27	0.0699			4.92422E-02	2.4599	9.82105E-02	0.7319	0.00000E+00	0.0000
SYSTEM TOTAL =				7.04582E-01	0.5409	1.00256E+00	0.1192	0.00000E+00	0.0000

ELAPSED TIME 3.84117 MINUTES

RANDOM NUMBER= 12FB24B34616

```
_"LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"

                                 FREQUENCY FOR GENERATIONS    4 TO  103
0.6045 TO 0.6245     *
0.6245 TO 0.6445     *****
0.6445 TO 0.6645     *****
0.6645 TO 0.6845     *****************
0.6845 TO 0.7045     ****************************
0.7045 TO 0.7245     *********************
0.7245 TO 0.7445     ******
0.7445 TO 0.7645     **********
0.7645 TO 0.7845     **
0.7845 TO 0.8045     *****

                                 FREQUENCY FOR GENERATIONS   29 TO  103
0.6045 TO 0.6245     *
0.6245 TO 0.6445     **
0.6445 TO 0.6645     ****
0.6645 TO 0.6845     ****************
0.6845 TO 0.7045     *********************
0.7045 TO 0.7245     *************
0.7245 TO 0.7445     ******
0.7445 TO 0.7645     *******
0.7645 TO 0.7845     *
0.7845 TO 0.8045     ****

                                 FREQUENCY FOR GENERATIONS   54 TO  103
0.6045 TO 0.6245
0.6245 TO 0.6445     *
0.6445 TO 0.6645     ***
0.6645 TO 0.6845     *********
0.6845 TO 0.7045     **************
0.7045 TO 0.7245     ******
0.7245 TO 0.7445     ******
0.7445 TO 0.7645     ******
0.7645 TO 0.7845     *
0.7845 TO 0.8045     ****

                                 FREQUENCY FOR GENERATIONS   79 TO  103
0.6045 TO 0.6245
0.6245 TO 0.6445
0.6445 TO 0.6645     **
0.6645 TO 0.6845     ****
0.6845 TO 0.7045     ******
0.7045 TO 0.7245     ***
0.7245 TO 0.7445     **
0.7445 TO 0.7645     ***
0.7645 TO 0.7845     *
0.7845 TO 0.8045     ****


********************************************************************************************************************************
*

          CONGRATULATIONS!  YOU HAVE  SUCCESSFULLY TRAVERSED THE PERILOUS PATH THROUGH KENO V IN    3.84117 MINUTES

********************************************************************************************************************************
*
_
```

Figure 6.6.4-4 CSAS Input/Output for NAC-LWT with 25 BWR Rods – Most Reactive Accident Condition Configuration

```
        PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
MODULE CSAS25   WILL BE CALLED
  BWR RODS, NO BASKET, VOID EXTERIOR, GAP FULL
  27GROUPNDF4     LATTICECELL
  UO2        1    0.95  293.0  92235  5.0  92238   95.0  END
  ZIRCALLOY 2     1.0          293.0     END
  H2O        3    1.0          293.0     END
  AL         4    1.0          293.0     END
  SS304      5    1.0          293.0     END
  PB         6    1.0          293.0     END
  H2O    7 1E-20 293.0 END
  H2O    8 1E-20 293.0 END
  H2O        9    1.0          293.0     END
  END COMP
  TRIANGPITCH   3.69059   1.2446  1  3  1.4478 2 1.2650 9 END
  "LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"
  READ PARAM RUN=YES PLT=NO  GEN=103 NPG=400 END PARAM
  READ GEOM
  UNIT 1
  COM="BWR FUEL ROD"
  CYLINDER     1  1  0.62230    2P10.0
  CYLINDER     9  1  0.63250    2P10.0
  CYLINDER     2  1  0.72390    2P10.0
  GLOBAL UNIT 2
  CYLINDER    3   1    16.9863  2P10.0
  HOLE    1     .0000     .0000    .0000
  HOLE    1     .0000    3.6905    .0000
  HOLE    1    3.1960    1.8453    .0000
  HOLE    1    3.1960   -1.8453    .0000
  HOLE    1     .0000   -3.6905    .0000
  HOLE    1   -3.1960   -1.8453    .0000
  HOLE    1   -3.1960    1.8453    .0000
  HOLE    1   -3.1960    5.5358    .0000
  HOLE    1     .0000    7.3810    .0000
  HOLE    1    3.1960    5.5358    .0000
  HOLE    1    6.3920    3.6905    .0000
  HOLE    1    6.3920     .0000    .0000
  HOLE    1    6.3920   -3.6905    .0000
  HOLE    1    3.1960   -5.5358    .0000
  HOLE    1     .0000   -7.3810    .0000
  HOLE    1   -3.1960   -5.5358    .0000
  HOLE    1   -6.3920   -3.6905    .0000
  HOLE    1   -6.3920     .0000    .0000
  HOLE    1   -6.3920    3.6905    .0000
  HOLE    1   -6.3920    7.3810    .0000
  HOLE    1    3.1960    9.2263    .0000
  HOLE    1    9.5879    1.8453    .0000
  HOLE    1    6.3920   -7.3810    .0000
  HOLE    1   -3.1960   -9.2263    .0000
  HOLE    1   -9.5879   -1.8453    .0000
  CYLINDER    5   1    18.8913  2P10.0
  CYLINDER    6   1    33.4963  2P10.0
  CYLINDER    5   1    36.5443  2P10.0
  CYLINDER    7   1    49.2443  2P10.0
  CYLINDER    5   1    49.8539  2P10.0
  CUBOID   8 1 4P121.92   2P10.0
  END GEOM
  READ BOUNDS  ALL=MIR      END BOUNDS
  END DATA

SECONDARY MODULE 000008   HAS BEEN CALLED.

MODULE 000008   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     0.44 (SECONDS).

SECONDARY MODULE 000002   HAS BEEN CALLED.

MODULE 000002   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     6.37 (SECONDS).

SECONDARY MODULE 000009   HAS BEEN CALLED.

MODULE 000009   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   238.65 (SECONDS).

MODULE CSAS25   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   247.05 (SECONDS).
```

CSAS25

SCALE-PC

01/06/00

08:47:17

```
  SSSSSSSSSSS    CCCCCCCCCCC      AAAAAAAAA      LL              EEEEEEEEEEEEE                     PPPPPPPPPPPP     CCCCCCCCCCC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC    AAAAAAAAAAA     LL              EEEEEEEEEEEEE                     PPPPPPPPPPPPP   CCCCCCCCCCCCC
 SS         SS  CC         CC   AA         AA    LL              EE                                PP         PP   CC         CC
 SS             CC              AA         AA    LL              EE                                PP         PP   CC
 SS             CC              AA         AA    LL              EE                                PP         PP   CC
 SSSSSSSSSSSS   CC              AAAAAAAAAAAAA    LL              EEEEEEEEE       -------------     PPPPPPPPPPPPP   CC
  SSSSSSSSSSSS  CC              AAAAAAAAAAAAA    LL              EEEEEEEEE       -------------     PPPPPPPPPPPP    CC
           SS   CC              AA         AA    LL              EE                                PP              CC
           SS   CC              AA         AA    LL              EE                                PP              CC
 SS        SS   CC         CC   AA         AA    LL              EE                                PP              CC         CC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC   AA         AA    LLLLLLLLLLLLL   EEEEEEEEEEEEE                     PP              CCCCCCCCCCCCC
  SSSSSSSSSSS    CCCCCCCCCCC    AA         AA    LLLLLLLLLLLLL   EEEEEEEEEEEEE                     PP               CCCCCCCCCCC


                        ******************************************************************************
                        ******************************************************************************
                        ******************************************************************************
                        *****                                                                    *****
                        *****                  PROGRAM VERIFICATION INFORMATION                  *****
                        *****                                                                    *****
                        *****                 CODE SYSTEM:  SCALE-PC VERSION:  4.3               *****
                        *****                                                                    *****
                        ******************************************************************************
                        ******************************************************************************
                        *****                                                                    *****
                        *****                                                                    *****
                        *****              PROGRAM:  CSAS                                        *****
                        *****                                                                    *****
                        *****        CREATION DATE:  03/08/96                                    *****
                        *****                                                                    *****
                        *****               VOLUME:  ENG                                         *****
                        *****                                                                    *****
                        *****              LIBRARY:  G:\SCALE43\WIN_NT\EXE                       *****
                        *****                                                                    *****
                        *****                                                                    *****
                        *****      PRODUCTION CODE:  CSAS                                        *****
                        *****                                                                    *****
                        *****              VERSION:  3.1                                         *****
                        *****                                                                    *****
                        *****              JOBNAME:  SCALE-PC                                    *****
                        *****                                                                    *****
                        *****    DATE OF EXECUTION:  01/06/00                                    *****
                        *****                                                                    *****
                        *****    TIME OF EXECUTION:  08:47:17                                    *****
                        *****                                                                    *****
                        *****                                                                    *****
                        ******************************************************************************
                        ******************************************************************************
                        ******************************************************************************
```

```
BWR RODS, NO BASKET, VOID EXTERIOR, GAP FULL


**** PROBLEM PARAMETERS ****

LIB 27GPOUPNDF4  LIBRARY
MXX            9 MIXTURES
MSC            9 COMPOSITION SPECIFICATIONS
IZM            4 MATERIAL ZONES
GE  LATTICECELL  GEOMETRY
MORE           0 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
MSLN           0 FUEL SOLUTIONS


**** PROBLEM COMPOSITION DESCRIPTION ****

SC  UO2          STANDARD COMPOSITION
MX             1 MIXTURE NO.
VF        0.9500 VOLUME FRACTION
ROTH     10.9600 THEORETICAL DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           92000       1.00 ATOM/MOLECULE
                           92235      5.000 WT%
                           92238     95.000 WT%
            8016       2.00 ATOMS/MOLECULE
END

SC  ZIRCALLOY    STANDARD COMPOSITION
MX             2 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      6.5600 THEORETICAL DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           40302       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX             3 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      0.9982 THEORETICAL DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
            1001       2.00 ATOMS/MOLECULE
            8016       1.00 ATOM/MOLECULE
END

SC  AL           STANDARD COMPOSITION
MX             4 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      2.7020 THEORETICAL DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           13027       1.00 ATOM/MOLECULE
END

SC  SS304        STANDARD COMPOSITION
MX             5 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      7.9200 THEORETICAL DENSITY
NEL            4 NO. ELEMENTS
ICP            0 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           24304     19.000 WT%
           25055      2.000 WT%
           26304     69.500 WT%
           28304      9.500 WT%
END

SC  PB           STANDARD COMPOSITION
MX             6 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH     11.3440 THEORETICAL DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           82000       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX             7 MIXTURE NO.
VF        0.0000 VOLUME FRACTION
ROTH      0.9982 THEORETICAL DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
            1001       2.00 ATOMS/MOLECULE
            8016       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
```

```
MX          8 MIXTURE NO.
VF     0.0000 VOLUME FRACTION
ROTH   0.9982 THEORETICAL DENSITY
NEL         2 NO. ELEMENTS
ICP         1 0/1 MIXTURE/COMPOUND
TEMP    293.0 DEG KELVIN
          1001      2.00 ATOMS/MOLECULE
          8016      1.00 ATOM/MOLECULE
END

SC  H2O        STANDARD COMPOSITION
MX          9 MIXTURE NO.
VF     1.0000 VOLUME FRACTION
ROTH   0.9982 THEORETICAL DENSITY
NEL         2 NO. ELEMENTS
ICP         1 0/1 MIXTURE/COMPOUND
TEMP    293.0 DEG KELVIN
          1001      2.00 ATOMS/MOLECULE
          8016      1.00 ATOM/MOLECULE
END

**** PROBLEM GEOMETRY ****

CTP TRIANGPITCH  CELL TYPE
PITCH    3.6906 CM CENTER TO CENTER SPACING
FUELOD   1.2446 CM FUEL DIAMETER OR SLAB THICKNESS
MFUEL         1 MIXTURE NO. OF FUEL
MMOD          3 MIXTURE NO. OF MODERATOR
CLADOD   1.4478 CM CLAD OUTER DIAMETER
MCLAD         2 MIXTURE NO. OF CLAD
GAPOD    1.2650 CM GAP OUTER DIAMETER
MGAP          9 MIXTURE NO. OF GAP

ZONE SPECIFICATIONS FOR LATTICECELL GEOMETRY

               ZONE  1 IS FUEL
               ZONE  2 IS GAP
               ZONE  3 IS CLAD
               ZONE  4 IS MOD
```

```
*************************************************************************************************
***                                                                                           ***
***                        BWR RODS, NO BASKET, VOID EXTERIOR, GAP FULL                       ***
***                                                                                           ***
*************************************************************************************************
*************************************************************************************************
***                                                                                           ***
***                        ********** DATA LIBRARY INFORMATION **********                     ***
***                                                                                           ***
***        UNIT                                              VOLUME                           ***
***       NUMBER             DATA SET NAME                    NAME        UNIT FUNCTION       ***
***       ------             -------------                    ----        -------------       ***
***                                                                                           ***
***         89    G:\scale43\DATALIB\FT89F001                             STANDARD COMPOSITION LIBRARY ***
***                                                                                           ***
***         82    G:\scale43\DATALIB\FT82F001                             CROSS SECTION LIBRARY ***
***                                                                                           ***
***         11    D:\dcn\326023~1.3_R\BROHZ2A\FT11F001                    SHORT CROSS SECTION LIBRARY ***
***                                                                                           ***
***         90    D:\dcn\326023~1.3_R\BROHZ2A\FT90F001                    INPUT DATA DIRECT ACCESS ***
***                                                                                           ***
*************************************************************************************************
*************************************************************************************************
***                                                                                           ***
***                                                                                           ***
***                           STANDARD COMPOSITION LIBRARY DATA                               ***
***                           ---------------------------------                               ***
***                                                                                           ***
***        UNIT NUMBER  :  89                                                                 ***
***                                                                                           ***
***        DATASET NAME :  G:\scale43\DATALIB\FT89F001                                        ***
***                                                                                           ***
***        LIBRARY TITLE:  SCALE-4 STANDARD COMPOSITION LIBRARY                               ***
***                        637 STANDARD COMPOSITIONS, 490 NUCLIDES                            ***
***                        90 ELEMENTS WITH VARIABLE ISOTOPIC DISTRBUTIONS.                   ***
***                                                                                           ***
***        CREATION DATE:   6/30/95                                                           ***
***                                                                                           ***
***                                                                                           ***
***                                                                                           ***
***                              CROSS SECTION LIBRARY DATA                                   ***
***                              --------------------------                                   ***
***                                                                                           ***
***        UNIT NUMBER  :  82                                                                 ***
***                                                                                           ***
***        DATASET NAME :  G:\scale43\DATALIB\FT82F001                                        ***
***                                                                                           ***
***        LIBRARY TITLE:  SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY                         ***
***                           BASED ON ENDF-B VERSION 4 DATA                                  ***
***                              COMPILED FOR NRC     1/27/89                                 ***
***                                 LAST UPDATED                                  08/12/94    ***
***                                    L.M.PETRIE   -   ORNL                                  ***
***                                                                                           ***
***                                                                                           ***
***                                                                                           ***
***                                                                                           ***
*************************************************************************************************
*************************************************************************************************

                   ........    0 IO'S WERE USED BEFORE READING KENO V DATA     ........

                   ........    0 IO'S WERE USED READING THE KENO V PARAMETER DATA     ........

                  ************** DATA READING COMPLETED **************

                   ........    0 IO'S WERE USED PREPARING THE KENO V INPUT DATA     ........

                   ........    0 IO'S WERE USED LOADING THE KENO V DATA     ........

                   ........    0 IO'S WERE USED LOADING THE DATA     ........

                   ........    0 IO'S WERE USED CHECKING THE KENO V GEOMETRY DATA     ........
                   *****  RESTART DATA HAS BEEN WRITTEN ON UNIT 95  *****

                   ........    0 IO'S WERE USED WRITING THE KENO V - CSAS DATA     ........

                   ........    0 IO'S WERE USED PROCESSING CSAS INPUT DATA     ........

CONTROL MODULE CSAS25    IS COMPLETE.
```

KENO-V

SCALE-PC

01/06/00

08:47:25

"LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"

****** NUMERIC PARAMETERS ******

TME	MAXIMUM PROBLEM TIME (MIN)	30.00
TBA	TIME PER GENERATION (MIN)	0.50
GEN	NUMBER OF GENERATIONS	103
NPG	NUMBER PER GENERATION	400
NSK	NUMBER OF GENERATIONS TO BE SKIPPED	3
BEG	BEGINNING GENERATION NUMBER	1
RES	GENERATIONS BETWEEN CHECKPOINTS	0
X1D	NUMBER OF EXTRA 1-D CROSS SECTIONS	1
NBK	NEUTRON BANK SIZE	425
XNB	EXTRA POSITIONS IN NEUTRON BANK	0
NFB	FISSION BANK SIZE	400
XFB	EXTRA POSITIONS IN FISSION BANK	0
WTA	DEFAULT VALUE OF WEIGHT AVERAGE	0.5000
WTH	WEIGHT HIGH FOR SPLITTING	3.0000
WTL	WEIGHT LOW FOR RUSSIAN ROULETTE	0.3333
RND	STARTING RANDOM NUMBER	BB8271000001
NB8	NUMBER OF D.A. BLOCKS ON UNIT 8	200
NL8	LENGTH OF D.A. BLOCKS ON UNIT 8	512
ADJ	MODE OF CALCULATION	FORWARD
	INPUT DATA WRITTEN ON RESTART UNIT	NO
	BINARY DATA INTERFACE	YES

```
***                "LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"                ***

***                         ******  LOGICAL PARAMETERS  ******                         ***

*** RUN  EXECUTE PROBLEM AFTER CHECKING DATA     YES    PLT  PLOT PICTURE MAP(S)                       NO  ***
*** FLX  COMPUTE FLUX                            NO     FDN  COMPUTE FISSION DENSITIES                 NO  ***
*** SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION    NO     NUB  COMPUTE NU-BAR & AVG FISSION GROUP        YES ***
*** MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER     NO     MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION     NO  ***
*** CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER   NO     CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION   NO  ***
*** FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER   NO     FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION   NO  ***
*** MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER     NO     MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER      NO  ***
*** CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER   NO     CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER    NO  ***
*** FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER   NO     FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER    NO  ***
*** HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL    NO     HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL     NO  ***
*** AMX  PRINT ALL MIXED CROSS SECTIONS          NO     FAR  PRINT FIS. AND ABS. BY REGION             NO  ***
*** XS1  PRINT 1-D MIXTURE X-SECTIONS            NO     GAS  PRINT FAR BY GROUP                        NO  ***
*** XS2  PRINT 2-D MIXTURE X-SECTIONS            NO     FAX  PRINT XSEC-ALBEDO CORRELATION TABLES      NO  ***
*** XAP  PRINT MIXTURE ANGLES & PROBABILITIES    NO     PWT  PRINT WEIGHT AVERAGE ARRAY                NO  ***
*** FKI  PRINT FISSION SPECTRUM                  NO     PGM  PRINT INPUT GEOMETRY                      NO  ***
*** P1D  PRINT EXTRA 1-D CROSS SECTIONS          NO     BUG  PRINT DEBUG INFORMATION                   NO  ***
***                                                     TRK  PRINT TRACKING INFORMATION                NO  ***

                              PARAMETER INPUT COMPLETED

              ........   0 IO'S WERE USED READING THE PARAMETER DATA   ........

              *************** DATA READING COMPLETED ***************
```

```
"LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"

****** ADDITIONAL INFORMATION ******

NUMBER OF ENERGY GROUPS                  27      USE LATTICE GEOMETRY                      NO
NO. OF FISSION SPECTRUM SOURCE GROUP     1       GLOBAL ARRAY NUMBER                       0
NO. OF SCATTERING ANGLES IN XSECS        2       NUMBER OF UNITS IN THE GLOBAL X DIR.      0
ENTRIES/NEUTRON IN THE NEUTRON BANK      17      NUMBER OF UNITS IN THE GLOBAL Y DIR.      0
ENTRIES/NEUTRON IN THE FISSION BANK      10      NUMBER OF UNITS IN THE GLOBAL Z DIR.      0
NUMBER OF MIXTURES USED                  8       USE A GLOBAL REFLECTOR                    YES
NUMBER OF BIAS ID'S USED                 1       USE NESTED HOLES                          NO
NUMBER OF DIFFERENTIAL ALBEDOS USED      0       NUMBER OF HOLES                           25
TOTAL INPUT GEOMETRY REGIONS             10      MAXIMUM HOLE NESTING LEVEL                1
NUMBER OF GEOMETRY REGIONS USED          10      USE NESTED ARRAYS                         NO
LARGEST GEOMETRY UNIT NUMBER             2       NUMBER OF ARRAYS USED                     0
LARGEST ARRAY NUMBER                     1       MAXIMUM ARRAY NESTING LEVEL               0

+X BOUNDARY CONDITION                    MIR     -X BOUNDARY CONDITION                     MIR
+Y BOUNDARY CONDITION                    MIR     -Y BOUNDARY CONDITION                     MIR
+Z BOUNDARY CONDITION                    MIR     -Z BOUNDARY CONDITION                     MIR
```

```
"LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"

****** SPACE AND SUPERGROUP INFORMATION ******

100000 WORDS IS THE TOTAL SPACE AVAILABLE.
 12479 WORDS WERE USED FOR NON-SUPERGROUP STORAGE.
 87521 WORDS OF STORAGE ARE AVAILABLE FOR SUPERGROUPED DATA.
 99784 WORDS OF STORAGE ARE AVAILABLE FOR CONSTRUCTING THE SUPERGROUPS.
 87461 WORDS OF STORAGE ARE AVAILABLE TO EACH SUPERGROUP.
  1165 WORDS ARE NEEDED FOR THE LARGEST GROUP.
 13860 WORDS OF STORAGE IS SUFFICIENT TO RUN THIS PROBLEM.
 25594 WORDS OF STORAGE WILL ALLOW THE PROBLEM TO RUN WITH ONE SUPERGROUP.
 25760 WORDS OF STORAGE WILL BE USED TO RUN THIS PROBLEM.
```

SUPERGROUP	STARTING GROUP	ENDING GROUP	XSEC LENGTH	ALBEDO LENGTH	TOTAL LENGTH
1	1	27	2636	0	13055

```
........   0 IO'S WERE USED IN SUPERGROUPING   ........
........   0 IO'S WERE USED LOADING THE DATA   ........
```

```
                              "LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"

                MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID

                                        -----   UNIT    1   -----

BWR FUEL ROD

  1 CYLINDER       1   1  RADIUS = 0.62230     +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  2 CYLINDER       9   1  RADIUS = 0.63250     +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CYLINDER       2   1  RADIUS = 0.72390     +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
                               "LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"

                MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID

                              ******************  GLOBAL  ******************
                                        -----   UNIT    2   -----

  1 CYLINDER       3   1  RADIUS =  16.986     +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
    HOLE NUMBER    1        AT X = 0.00000     Y = 0.00000      Z = 0.00000      IS UNIT NUMBER     1
    HOLE NUMBER    2        AT X = 0.00000     Y =  3.6905      Z = 0.00000      IS UNIT NUMBER     1
    HOLE NUMBER    3        AT X =  3.1960     Y =  1.8453      Z = 0.00000      IS UNIT NUMBER     1
    HOLE NUMBER    4        AT X =  3.1960     Y = -1.8453      Z = 0.00000      IS UNIT NUMBER     1
    HOLE NUMBER    5        AT X = 0.00000     Y = -3.6905      Z = 0.00000      IS UNIT NUMBER     1
    HOLE NUMBER    6        AT X = -3.1960     Y = -1.8453      Z = 0.00000      IS UNIT NUMBER     1
    HOLE NUMBER    7        AT X = -3.1960     Y =  1.8453      Z = 0.00000      IS UNIT NUMBER     1
    HOLE NUMBER    8        AT X = -3.1960     Y =  5.5358      Z = 0.00000      IS UNIT NUMBER     1
    HOLE NUMBER    9        AT X = 0.00000     Y =  7.3810      Z = 0.00000      IS UNIT NUMBER     1
    HOLE NUMBER   10        AT X =  3.1960     Y =  5.5358      Z = 0.00000      IS UNIT NUMBER     1
    HOLE NUMBER   11        AT X =  6.3920     Y =  3.6905      Z = 0.00000      IS UNIT NUMBER     1
    HOLE NUMBER   12        AT X =  6.3920     Y = 0.00000      Z = 0.00000      IS UNIT NUMBER     1
    HOLE NUMBER   13        AT X =  6.3920     Y = -3.6905      Z = 0.00000      IS UNIT NUMBER     1
    HOLE NUMBER   14        AT X =  3.1960     Y = -5.5358      Z = 0.00000      IS UNIT NUMBER     1
    HOLE NUMBER   15        AT X = 0.00000     Y = -7.3810      Z = 0.00000      IS UNIT NUMBER     1
    HOLE NUMBER   16        AT X = -3.1960     Y = -5.5358      Z = 0.00000      IS UNIT NUMBER     1
    HOLE NUMBER   17        AT X = -6.3920     Y = -3.6905      Z = 0.00000      IS UNIT NUMBER     1
    HOLE NUMBER   18        AT X = -6.3920     Y = 0.00000      Z = 0.00000      IS UNIT NUMBER     1
    HOLE NUMBER   19        AT X = -6.3920     Y =  3.6905      Z = 0.00000      IS UNIT NUMBER     1
    HOLE NUMBER   20        AT X = -6.3920     Y =  7.3810      Z = 0.00000      IS UNIT NUMBER     1
    HOLE NUMBER   21        AT X =  3.1960     Y =  9.2263      Z = 0.00000      IS UNIT NUMBER     1
    HOLE NUMBER   22        AT X =  9.5879     Y =  1.8453      Z = 0.00000      IS UNIT NUMBER     1
    HOLE NUMBER   23        AT X =  6.3920     Y = -7.3810      Z = 0.00000      IS UNIT NUMBER     1
    HOLE NUMBER   24        AT X = -3.1960     Y = -9.2263      Z = 0.00000      IS UNIT NUMBER     1
    HOLE NUMBER   25        AT X = -9.5879     Y = -1.8453      Z = 0.00000      IS UNIT NUMBER     1
  2 CYLINDER       5   1  RADIUS =  18.891     +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  3 CYLINDER       6   1  RADIUS =  33.496     +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  4 CYLINDER       5   1  RADIUS =  36.544     +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  5 CYLINDER       7   1  RADIUS =  49.244     +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  6 CYLINDER       5   1  RADIUS =  49.654     +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  7 CUBOID         8   1      +X =  121.92     -X = -121.92     +Y =  121.92     -Y = -121.92     +Z =  10.000     -Z = -10.000
```

```
                    "LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"
                   VOLUMES FOR THOSE UNITS UTILIZED IN  THIS PROBLEM

                           GEOMETRY                                   CUMULATIVE
   UNIT      REGION         REGION            VOLUME                    VOLUME

     1          1              1          2.43321E+01 CM**3        2.43321E+01 CM**3
                2              2          8.04178E-01 CM**3        2.51363E+01 CM**3
                3              3          7.78958E+00 CM**3        3.29259E+01 CM**3

     2          1              4          1.73060E+04 CM**3        1.81291E+04 CM**3
                2              5          4.29436E+03 CM**3        2.24235E+04 CM**3
                3              6          4.80740E+04 CM**3        7.04975E+04 CM**3
                4              7          1.34136E+04 CM**3        8.39110E+04 CM**3
                5              8          6.84563E+04 CM**3        1.52367E+05 CM**3
                6              9          3.79567E+03 CM**3        1.56163E+05 CM**3
                7             10          1.03300E+06 CM**3        1.18916E+06 CM**3


                   UNIT      USES      REGION      MIXTURE        TOTAL VOLUME

                     1        25          1            1         6.08302E+02 CM**3
                                          2            9         2.01045E+01 CM**3
                                          3            2         1.94739E+02 CM**3

                     2         1          1            3         1.73060E+04 CM**3
                                          2            5         4.29436E+03 CM**3
                                          3            6         4.80740E+04 CM**3
                                          4            5         1.34136E+04 CM**3
                                          5            7         6.84563E+04 CM**3
                                          6            5         3.79567E+03 CM**3
                                          7            8         1.03300E+06 CM**3


                                   TOTAL MIXTURE VOLUMES
                              MIXTURE     TOTAL VOLUME              MASS(G)
                                 1      6.08302E+02 CM**3        6.33363E+03
                                 2      1.94739E+02 CM**3        1.27749E+03
                                 3      1.73060E+04 CM**3        1.72744E+04
                                 5      2.15036E+04 CM**3        1.70309E+05
                                 6      4.80740E+04 CM**3        5.45351E+05
                                 7      6.84563E+04 CM**3        6.83311E-16
                                 8      1.03300E+06 CM**3        1.03111E-14
                                 9      2.01045E+01 CM**3        2.00677E+01

 ***********************************************************************************************************
 ***                                                                                                     ***
 ***                                       BIASING INFORMATION                                           ***
 ***                                                                                                     ***
 ***    A DEFAULT WEIGHT OF     0.500 WILL BE USED FOR ALL BIAS ID'S.                                    ***
 ***                                                                                                     ***
 ***********************************************************************************************************

                 ........   0 ID'S WERE USED IN KENO-V BEFORE TRACKING        ........

                 ........  0.00917 MINUTES WERE USED PROCESSING DATA.          ........

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 5.11540E-04

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED UNIFORMLY THROUGHOUT THE ENTIRE VOLUME DEFINED BY THE OUTERMOST GEOMETRY CARD.
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

KENO MESSAGE NUMBER K5-105      ***** WARNING, ONLY   14 INDEPENDENT STARTING POSITIONS WERE GENERATED.  *****

  386 ADDITIONAL STARTING POINTS WERE PICKED FROM THE INITAL DISTRIBUTION.

0.45333 MINUTES WERE REQUIRED FOR STARTING.   TOTAL ELAPSED TIME IS 0.46933 MINUTES.
```

"LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	355 INDEPENDENT	FISSION POINTS WERE	GENERATED	
1	7.36934E-01	4.97000E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	322 INDEPENDENT	FISSION POINTS WERE	GENERATED	
2	7.00540E-01	5.31833E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	326 INDEPENDENT	FISSION POINTS WERE	GENERATED	
3	6.71687E-01	5.67500E-01	6.71687E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	6.83887E-01	5.99500E-01	6.77787E-01	6.10024E-03	0.00000E+00	0.00000E+00
5	7.44438E-01	6.33500E-01	7.00004E-01	2.24944E-02	0.00000E+00	0.00000E+00
6	7.18158E-01	6.66333E-01	7.04543E-01	1.65408E-02	0.00000E+00	0.00000E+00
7	6.78785E-01	7.01167E-01	6.99391E-01	1.38093E-02	0.00000E+00	0.00000E+00
8	6.94194E-01	7.35000E-01	6.98525E-01	1.13085E-02	0.00000E+00	0.00000E+00
9	7.72562E-01	7.67167E-01	7.09102E-01	1.42552E-02	0.00000E+00	0.00000E+00
10	7.21756E-01	8.02833E-01	7.10683E-01	1.24463E-02	0.00000E+00	0.00000E+00
11	6.98534E-01	8.38500E-01	7.09333E-01	1.10593E-02	0.00000E+00	0.00000E+00
12	7.61200E-01	8.70500E-01	7.14520E-01	1.11691E-02	0.00000E+00	0.00000E+00
13	7.20594E-01	9.06167E-01	7.15072E-01	1.01179E-02	0.00000E+00	0.00000E+00
14	6.57647E-01	9.39167E-01	7.10287E-01	1.04024E-02	0.00000E+00	0.00000E+00
15	7.81967E-01	9.73000E-01	7.15801E-01	1.10437E-02	0.00000E+00	0.00000E+00
16	7.31759E-01	1.00600E+00	7.16941E-01	1.02879E-02	0.00000E+00	0.00000E+00
17	6.52070E-01	1.03983E+00	7.12616E-01	1.05086E-02	0.00000E+00	0.00000E+00
18	7.26461E-01	1.07467E+00	7.13481E-01	9.86793E-03	0.00000E+00	0.00000E+00
19	7.31605E-01	1.10767E+00	7.14547E-01	9.33041E-03	0.00000E+00	0.00000E+00
20	6.64178E-01	1.14150E+00	7.11749E-01	9.23114E-03	0.00000E+00	0.00000E+00
21	6.96133E-01	1.17633E+00	7.10927E-01	8.77036E-03	0.00000E+00	0.00000E+00
22	7.46534E-01	1.21017E+00	7.12708E-01	8.50866E-03	0.00000E+00	0.00000E+00
23	6.33256E-01	1.24500E+00	7.08924E-01	8.93400E-03	0.00000E+00	0.00000E+00
24	6.99280E-01	1.27883E+00	7.08486E-01	8.52951E-03	0.00000E+00	0.00000E+00
25	7.17385E-01	1.31183E+00	7.08873E-01	8.15941E-03	0.00000E+00	0.00000E+00
26	6.87181E-01	1.34650E+00	7.07969E-01	7.86415E-03	0.00000E+00	0.00000E+00
27	6.91288E-01	1.38233E+00	7.07302E-01	7.57248E-03	0.00000E+00	0.00000E+00
28	7.17809E-01	1.41700E+00	7.07706E-01	7.28662E-03	0.00000E+00	0.00000E+00
29	7.78800E-01	1.45000E+00	7.10339E-01	7.48967E-03	0.00000E+00	0.00000E+00
30	7.21974E-01	1.48567E+00	7.10754E-01	7.22918E-03	0.00000E+00	0.00000E+00
31	7.46391E-01	1.51867E+00	7.11983E-01	7.08286E-03	0.00000E+00	0.00000E+00
32	7.20315E-01	1.55250E+00	7.12261E-01	6.84832E-03	0.00000E+00	0.00000E+00
33	6.85997E-01	1.58633E+00	7.11414E-01	6.67769E-03	0.00000E+00	0.00000E+00
34	7.05263E-01	1.62033E+00	7.11222E-01	6.46850E-03	0.00000E+00	0.00000E+00
35	7.53469E-01	1.65600E+00	7.12502E-01	6.39880E-03	0.00000E+00	0.00000E+00
36	7.05465E-01	1.68983E+00	7.12295E-01	6.21119E-03	0.00000E+00	0.00000E+00
37	7.46440E-01	1.72367E+00	7.13270E-01	6.10951E-03	0.00000E+00	0.00000E+00
38	7.07186E-01	1.75750E+00	7.13101E-01	5.93978E-03	0.00000E+00	0.00000E+00
39	7.02359E-01	1.79050E+00	7.12811E-01	5.78431E-03	0.00000E+00	0.00000E+00
40	7.12597E-01	1.82433E+00	7.12805E-01	5.63004E-03	0.00000E+00	0.00000E+00
41	6.97974E-01	1.85917E+00	7.12425E-01	5.49695E-03	0.00000E+00	0.00000E+00
42	6.89038E-01	1.89300E+00	7.11840E-01	5.38957E-03	0.00000E+00	0.00000E+00
43	6.76648E-01	1.92700E+00	7.10982E-01	5.32610E-03	0.00000E+00	0.00000E+00
44	7.06919E-01	1.95983E+00	7.10885E-01	5.19864E-03	0.00000E+00	0.00000E+00
45	6.80629E-01	1.99467E+00	7.10182E-01	5.12483E-03	0.00000E+00	0.00000E+00
46	7.02685E-01	2.02767E+00	7.10011E-01	5.00990E-03	0.00000E+00	0.00000E+00
47	6.90168E-01	2.06233E+00	7.09570E-01	4.91712E-03	0.00000E+00	0.00000E+00
48	7.12393E-01	2.09533E+00	7.09632E-01	4.80943E-03	0.00000E+00	0.00000E+00
49	7.41267E-01	2.13017E+00	7.10305E-01	4.75388E-03	0.00000E+00	0.00000E+00
50	7.25287E-01	2.16400E+00	7.10617E-01	4.66424E-03	0.00000E+00	0.00000E+00
51	6.44596E-01	2.19783E+00	7.09270E-01	4.76262E-03	0.00000E+00	0.00000E+00
52	6.86745E-01	2.23367E+00	7.08819E-01	4.68809E-03	0.00000E+00	0.00000E+00
53	6.87129E-01	2.26750E+00	7.08394E-01	4.61489E-03	0.00000E+00	0.00000E+00
54	7.71959E-01	2.30133E+00	7.09616E-01	4.68747E-03	0.00000E+00	0.00000E+00
55	7.77561E-01	2.33433E+00	7.10898E-01	4.77354E-03	0.00000E+00	0.00000E+00
56	7.34540E-01	2.36817E+00	7.11336E-01	4.70472E-03	0.00000E+00	0.00000E+00
57	7.52295E-01	2.40200E+00	7.12081E-01	4.67805E-03	0.00000E+00	0.00000E+00
58	7.29056E-01	2.43583E+00	7.12384E-01	4.60374E-03	0.00000E+00	0.00000E+00
59	7.02691E-01	2.46983E+00	7.12214E-01	4.52545E-03	0.00000E+00	0.00000E+00
60	7.22378E-01	2.50183E+00	7.12389E-01	4.45019E-03	0.00000E+00	0.00000E+00
61	7.43714E-01	2.53567E+00	7.12920E-01	4.40622E-03	0.00000E+00	0.00000E+00
62	7.04102E-01	2.56950E+00	7.12773E-01	4.33465E-03	0.00000E+00	0.00000E+00
63	7.19153E-01	2.60433E+00	7.12878E-01	4.26428E-03	0.00000E+00	0.00000E+00
64	7.64399E-01	2.63817E+00	7.13709E-01	4.27645E-03	0.00000E+00	0.00000E+00
65	7.45281E-01	2.67217E+00	7.14210E-01	4.23776E-03	0.00000E+00	0.00000E+00
66	6.90775E-01	2.70683E+00	7.13844E-01	4.18707E-03	0.00000E+00	0.00000E+00
67	6.98713E-01	2.74067E+00	7.13611E-01	4.12871E-03	0.00000E+00	0.00000E+00
68	7.40004E-01	2.77367E+00	7.14011E-01	4.08529E-03	0.00000E+00	0.00000E+00
69	7.17451E-01	2.80850E+00	7.14062E-01	4.02419E-03	0.00000E+00	0.00000E+00
70	7.25053E-01	2.84233E+00	7.14224E-01	3.96786E-03	0.00000E+00	0.00000E+00
71	6.98406E-01	2.87533E+00	7.13994E-01	3.91665E-03	0.00000E+00	0.00000E+00
72	7.36907E-01	2.90833E+00	7.14322E-01	3.87414E-03	0.00000E+00	0.00000E+00
73	6.98716E-01	2.94217E+00	7.14102E-01	3.82550E-03	0.00000E+00	0.00000E+00
74	7.11126E-01	2.97600E+00	7.14061E-01	3.77222E-03	0.00000E+00	0.00000E+00
75	7.61261E-01	3.01167E+00	7.14707E-01	3.77596E-03	0.00000E+00	0.00000E+00
76	7.15602E-01	3.04833E+00	7.14719E-01	3.72461E-03	0.00000E+00	0.00000E+00
77	7.38835E-01	3.08133E+00	7.15041E-01	3.68865E-03	0.00000E+00	0.00000E+00
78	7.37002E-01	3.11417E+00	7.15330E-01	3.65125E-03	0.00000E+00	0.00000E+00
79	6.91165E-01	3.14900E+00	7.15016E-01	3.61715E-03	0.00000E+00	0.00000E+00
80	7.01831E-01	3.18567E+00	7.14847E-01	3.57448E-03	0.00000E+00	0.00000E+00
81	6.91587E-01	3.22050E+00	7.14552E-01	3.54120E-03	0.00000E+00	0.00000E+00
82	6.72616E-01	3.25333E+00	7.14028E-01	3.53573E-03	0.00000E+00	0.00000E+00
83	7.49505E-01	3.28817E+00	7.14466E-01	3.51917E-03	0.00000E+00	0.00000E+00
84	7.09137E-01	3.32383E+00	7.14401E-01	3.47660E-03	0.00000E+00	0.00000E+00
85	7.07948E-01	3.35767E+00	7.14324E-01	3.43532E-03	0.00000E+00	0.00000E+00
86	6.94416E-01	3.39250E+00	7.14087E-01	3.40245E-03	0.00000E+00	0.00000E+00
87	7.80753E-01	3.42817E+00	7.14871E-01	3.45246E-03	0.00000E+00	0.00000E+00
88	7.16176E-01	3.46217E+00	7.14886E-01	3.41211E-03	0.00000E+00	0.00000E+00

```
      89      6.91396E-01     3.49600E+00     7.14616E-01     3.38345E-03     0.00000E+00     0.00000E+00
      90      7.56111E-01     3.52800E+00     7.15088E-01     3.37786E-03     0.00000E+00     0.00000E+00
      91      6.92488E-01     3.56283E+00     7.14834E-01     3.34933E-03     0.00000E+00     0.00000E+00
      92      6.77406E-01     3.59850E+00     7.14418E-01     3.33791E-03     0.00000E+00     0.00000E+00
      93      6.75274E-01     3.63150E+00     7.13988E-01     3.32893E-03     0.00000E+00     0.00000E+00
      94      7.41337E-01     3.66433E+00     7.14285E-01     3.30594E-03     0.00000E+00     0.00000E+00
      95      6.86783E-01     3.69733E+00     7.13989E-01     3.28355E-03     0.00000E+00     0.00000E+00
      96      7.19390E-01     3.73217E+00     7.14047E-01     3.24894E-03     0.00000E+00     0.00000E+00
      97      6.80724E-01     3.76783E+00     7.13696E-01     3.23363E-03     0.00000E+00     0.00000E+00
KENO MESSAGE NUMBER K5-132    WARNING....ONLY  386 INDEPENDENT FISSION POINTS WERE GENERATED
      98      6.20195E-01     3.80167E+00     7.12722E-01     3.34472E-03     0.00000E+00     0.00000E+00
      99      6.48745E-01     3.83833E+00     7.12062E-01     3.37513E-03     0.00000E+00     0.00000E+00
     100      7.70577E-01     3.86950E+00     7.12659E-01     3.39346E-03     0.00000E+00     0.00000E+00
     101      7.09621E-01     3.90417E+00     7.12619E-01     3.35925E-03     0.00000E+00     0.00000E+00
     102      7.17891E-01     3.93717E+00     7.12671E-01     3.32591E-03     0.00000E+00     0.00000E+00
     103      7.57292E-01     3.97200E+00     7.13113E-01     3.32232E-03     0.00000E+00     0.00000E+00

KENO MESSAGE NUMBER K5-123          EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.
_
```

"LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"

LIFETIME = 2.16183E-04 + OR - 2.12662E-06 GENERATION TIME = 1.13659E-04 + OR - 8.29443E-07
NU BAR = 2.42979E+00 + OR - 2.35841E-04 AVERAGE FISSION GROUP = 2.37499E+01 + OR - 1.33856E-02
ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION = 6.89807E-02 + OR - 8.35504E-04

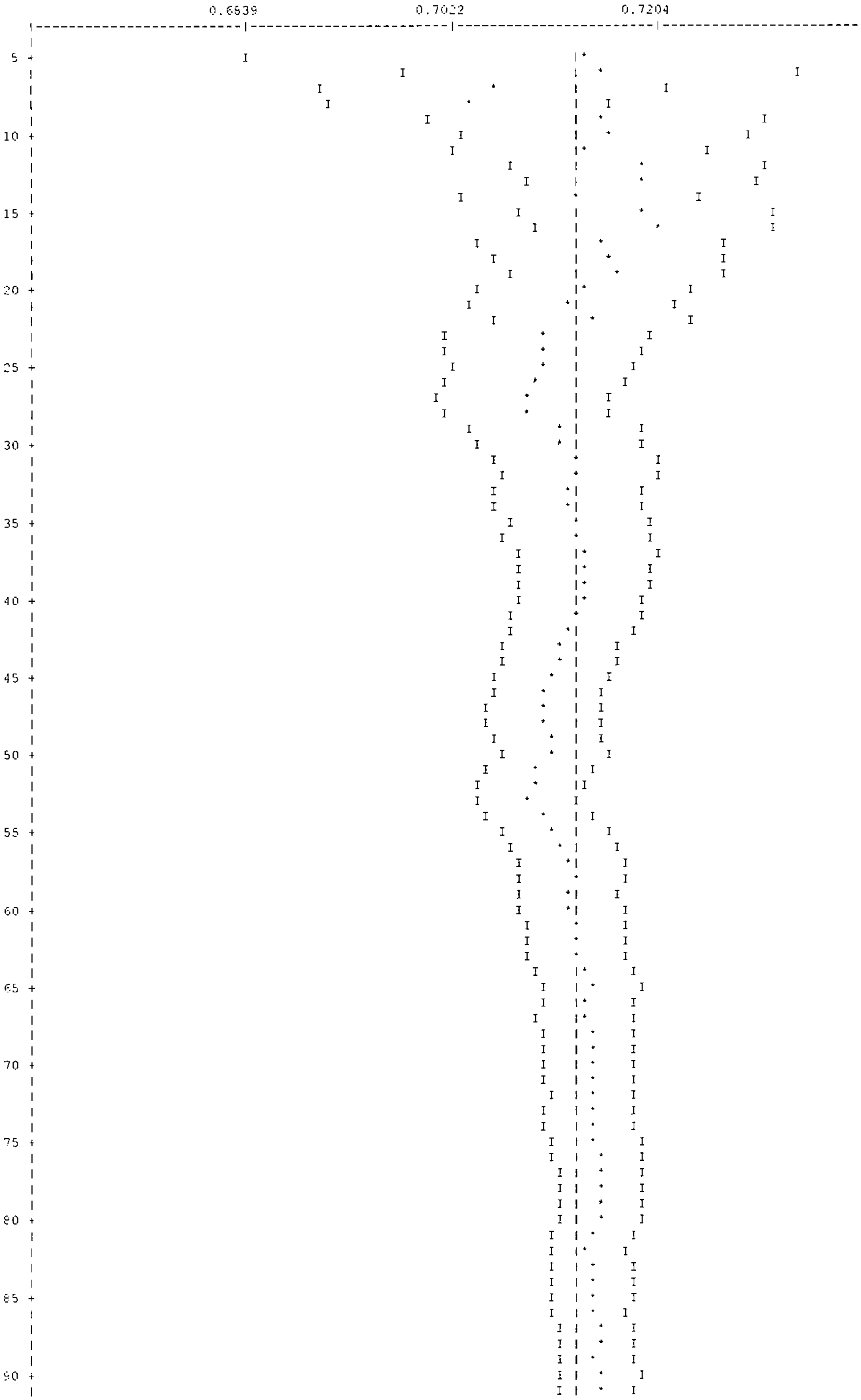
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.71353	+ OR - 0.00333	0.71020 TO 0.71686	0.70687 TO 0.72019	0.70354 TO 0.72352	40000
4	0.71383	+ OR - 0.00335	0.71048 TO 0.71718	0.70713 TO 0.72053	0.70378 TO 0.72388	39600
5	0.71351	+ OR - 0.00337	0.71015 TO 0.71688	0.70678 TO 0.72025	0.70341 TO 0.72362	39200
6	0.71347	+ OR - 0.00340	0.71006 TO 0.71687	0.70666 TO 0.72027	0.70325 TO 0.72368	38800
7	0.71383	+ OR - 0.00342	0.71041 TO 0.71725	0.70699 TO 0.72067	0.70357 TO 0.72409	38400
8	0.71403	+ OR - 0.00345	0.71058 TO 0.71748	0.70713 TO 0.72093	0.70368 TO 0.72438	38000
9	0.71341	+ OR - 0.00343	0.70998 TO 0.71684	0.70655 TO 0.72027	0.70312 TO 0.72370	37600
10	0.71332	+ OR - 0.00347	0.70986 TO 0.71679	0.70639 TO 0.72025	0.70293 TO 0.72372	37200
11	0.71348	+ OR - 0.00350	0.70998 TO 0.71698	0.70648 TO 0.72048	0.70298 TO 0.72398	36800
12	0.71296	+ OR - 0.00350	0.70946 TO 0.71646	0.70596 TO 0.71996	0.70246 TO 0.72345	36400
17	0.71320	+ OR - 0.00348	0.70972 TO 0.71668	0.70625 TO 0.72015	0.70277 TO 0.72363	34400
22	0.71321	+ OR - 0.00360	0.70961 TO 0.71681	0.70601 TO 0.72041	0.70241 TO 0.72401	32400
27	0.71502	+ OR - 0.00365	0.71137 TO 0.71868	0.70772 TO 0.72233	0.70407 TO 0.72598	30400
32	0.71347	+ OR - 0.00377	0.70970 TO 0.71724	0.70593 TO 0.72101	0.70216 TO 0.72478	28400
37	0.71303	+ OR - 0.00395	0.70908 TO 0.71698	0.70512 TO 0.72094	0.70117 TO 0.72489	26400
42	0.71395	+ OR - 0.00425	0.70970 TO 0.71820	0.70545 TO 0.72244	0.70120 TO 0.72669	24400
47	0.71596	+ OR - 0.00451	0.71145 TO 0.72047	0.70694 TO 0.72498	0.70244 TO 0.72948	22400
52	0.71732	+ OR - 0.00468	0.71264 TO 0.72200	0.70797 TO 0.72668	0.70329 TO 0.73136	20400
57	0.71435	+ OR - 0.00473	0.70962 TO 0.71908	0.70488 TO 0.72381	0.70015 TO 0.72854	18400
62	0.71361	+ OR - 0.00524	0.70838 TO 0.71885	0.70314 TO 0.72408	0.69790 TO 0.72932	16400
67	0.71221	+ OR - 0.00567	0.70654 TO 0.71789	0.70087 TO 0.72356	0.69520 TO 0.72923	14400
72	0.71038	+ OR - 0.00645	0.70394 TO 0.71683	0.69749 TO 0.72328	0.69104 TO 0.72973	12400
77	0.70755	+ OR - 0.00733	0.70023 TO 0.71488	0.69290 TO 0.72220	0.68557 TO 0.72953	10400
82	0.70963	+ OR - 0.00875	0.70088 TO 0.71838	0.69213 TO 0.72713	0.68338 TO 0.73587	8400
87	0.70378	+ OR - 0.01015	0.69363 TO 0.71392	0.68348 TO 0.72407	0.67333 TO 0.73422	6400
92	0.70244	+ OR - 0.01376	0.68868 TO 0.71620	0.67492 TO 0.72996	0.66116 TO 0.74372	4400

"LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
97	0.70389	+ OR - 0.02420	0.67969 TO 0.72808	0.65549 TO 0.75228	0.63130 TO 0.77647	2400

"LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.7135 + OR - 0.0033 WHICH OCCURS FOR 103 GENERATIONS RUN.



```
    |                                                           I  | *    I
    |                                                           I  |*    I
    |                                                           I  | *   I
 95 +                                                           I  |*    I
    |                                                           I  |*    I
    |                                                          I   |*   I
    |                                                         I    *   I
    |                                                        I    *| I
100 +                                                         I   *|   I
    |                                                         I   *|   I
    |                                                         I   *|   I
    |                                                          I   *    I
```

"LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0027			1.92049E-03	7.9551	1.55933E-03	4.6801	0.00000E+00	0.0000
2	0.0119			8.47839E-03	2.3095	5.24441E-03	1.6315	0.00000E+00	0.0000
3	0.0124			8.87829E-03	2.4641	3.70982E-03	2.3483	0.00000E+00	0.0000
4	0.0051			3.61159E-03	3.2896	1.73888E-03	3.1541	0.00000E+00	0.0000
5	0.0017			1.24621E-03	1.8610	1.25950E-03	1.6420	0.00000E+00	0.0000
6	0.0014			1.00221E-03	1.6885	2.17782E-03	1.6503	0.00000E+00	0.0000
7	0.0012			8.32696E-04	2.1601	2.77279E-03	1.9339	0.00000E+00	0.0000
8	0.0009			6.32962E-04	2.3808	2.54617E-03	2.1997	0.00000E+00	0.0000
9	0.0011			8.12195E-04	3.1579	3.22371E-03	2.3339	0.00000E+00	0.0000
10	0.0024			1.71284E-03	3.3921	5.74338E-03	2.3470	0.00000E+00	0.0000
11	0.0052			3.71633E-03	2.9123	8.87449E-03	2.1449	0.00000E+00	0.0000
12	0.0066			4.74161E-03	3.6874	8.82059E-03	2.7710	0.00000E+00	0.0000
13	0.0063			4.51110E-03	4.4318	9.69352E-03	2.7547	0.00000E+00	0.0000
14	0.0052			3.72684E-03	3.9334	1.36092E-02	2.5871	0.00000E+00	0.0000
15	0.0013			9.07042E-04	6.3377	4.51955E-03	3.1016	0.00000E+00	0.0000
16	0.0008			5.46759E-04	7.0791	2.57548E-03	3.9213	0.00000E+00	0.0000
17	0.0012			8.73620E-04	11.1197	1.64378E-03	5.2113	0.00000E+00	0.0000
18	0.0018			1.28315E-03	10.7961	1.66254E-03	5.4296	0.00000E+00	0.0000
19	0.0023			1.65015E-03	8.1758	2.73285E-03	3.5998	0.00000E+00	0.0000
20	0.0096			6.86870E-03	4.2910	1.04665E-02	2.3819	0.00000E+00	0.0000
21	0.0053			3.76837E-03	7.3940	4.49843E-03	3.9745	0.00000E+00	0.0000
22	0.0137			9.74644E-03	4.5119	1.12421E-02	2.5474	0.00000E+00	0.0000
23	0.0891			6.35829E-02	1.7811	8.04947E-02	0.8691	0.00000E+00	0.0000
24	0.2522			1.79948E-01	1.0626	2.28908E-01	0.5136	0.00000E+00	0.0000
25	0.2261			1.61345E-01	1.0192	2.13349E-01	0.4255	0.00000E+00	0.0000
26	0.2579			1.84035E-01	0.8679	2.71962E-01	0.4119	0.00000E+00	0.0000
27	0.0745			5.31486E-02	2.3429	9.70387E-02	0.6775	0.00000E+00	0.0000
SYSTEM TOTAL =				7.13527E-01	0.4666	1.00207E+00	0.1233	0.00000E+00	0.0000

ELAPSED TIME 3.97283 MINUTES

RANDOM NUMBER= 6ECC71283DC6

```
"LWT CASK, 25 BWR RODS, NO BWR BASKET, 5 W/O U235 VARIABLE PITCH"

                           FREQUENCY FOR GENERATIONS    4 TO  103
0.6076 TO 0.6276     *
0.6276 TO 0.6476     **
0.6476 TO 0.6676     ****
0.6676 TO 0.6876     *************
0.6876 TO 0.7076     **************************
0.7076 TO 0.7276     ***********************
0.7276 TO 0.7476     ****************
0.7476 TO 0.7676     ********
0.7676 TO 0.7876     *******

                           FREQUENCY FOR GENERATIONS   29 TO  103
0.6076 TO 0.6276     *
0.6276 TO 0.6476     *
0.6476 TO 0.6676     *
0.6676 TO 0.6876     **********
0.6876 TO 0.7076     *********************
0.7076 TO 0.7276     *****************
0.7276 TO 0.7476     ************
0.7476 TO 0.7676     *******
0.7676 TO 0.7876     *****

                           FREQUENCY FOR GENERATIONS   54 TO  103
0.6076 TO 0.6276     *
0.6276 TO 0.6476
0.6476 TO 0.6676     *
0.6676 TO 0.6876     *****
0.6876 TO 0.7076     ************
0.7076 TO 0.7276     ************
0.7276 TO 0.7476     *********
0.7476 TO 0.7676     ******
0.7676 TO 0.7876     ****

                           FREQUENCY FOR GENERATIONS   79 TO  103
0.6076 TO 0.6276     *
0.6276 TO 0.6476
0.6476 TO 0.6676     *
0.6676 TO 0.6876     *****
0.6876 TO 0.7076     ******
0.7076 TO 0.7276     ******
0.7276 TO 0.7476     *
0.7476 TO 0.7676     ***
0.7676 TO 0.7876     **


*********************************************************************************************************************************
*

          CONGRATULATIONS!  YOU HAVE  SUCCESSFULLY TRAVERSED THE PERILOUS PATH THROUGH KENO V IN    3.97283 MINUTES

*********************************************************************************************************************************
*

-
-
```

6.6.5 TRIGA Fuel Elements

This section contains abbreviated output files from the most reactive non-poisoned and poisoned basket configurations for TRIGA fuel elements, and a sample benchmark case for TRIGA fuel.

Figure 6.6.5-1 Summary of CSAS Input/Output for NAC-LWT with TRIGA Fuel Elements - Most Reactive Nonpoisoned Basket Configuration

```
PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
   MODULE CSAS25   WILL BE CALLED
     TRIGA - PREF. FLOOD CANISTER  - 2 ROD FILLING CANISTER + TOLERANCE
     27GROUPNDF4  INFHOMMEDIUM
     'FUEL
     U-235    1 0.0 2.3049E-04 END
     U-238    1 0.0 9.8008E-05 END
     ZR       1 0.0 8.7748E-03 END
     H        1 0.0 1.4040E-02 END
     H2O      1 0.7454 293.0 END
     'CLAD, BASKET, AND CASK
     SS304    2 1.0 293.0 END
     'CANISTER INTERNAL MODERATOR
     H2O      3 1.0 293.0 END
     'ZIRCONIUM ROD
     ZR       4 1.0 293.0 END
     'GRAPHITE REFLETOR
     C        5 1.0 293.0 END
     'LEAD SHIELD
     PB       6 1.0 293.0 END
     'NEUTRON SHIELD
     H2O      7 1.0E-20 293.0 END
     'CASK EXTERNAL MATERIAL
     H2O      8 1.0E-20 293.0 END
     'END FITTING FOR FUEL ELEMENT
     SS304    9 0.337137 293.0 END
     H2O      9 0.662863 293.0 END
     'SECOND FUEL MATERIAL FOR UN-CANISTERED
     U-235    10 0.0 9.052980E-4 END
     U-238    10 0.0 3.849480E-4 END
     ZR       10 0.0 3.446510E-2 END
     H        10 0.0 5.514420E-2 END
     'SECOND END-FITTING MATERIAL FOR UN-CANISTERED FUEL
     SS304    11 0.337137 293.0 END
     H2O      11 DEN=0.662863 1.0E-20 293.0 END
     'CASK INTERIOR MODERATOR MATERIAL
     H2O  12 1.0E-20 293.0 END
     END COMP
     MORE DATA
     RES=10  CYLINDER 1.8224 DAN(10)=8.52196E-01
     END MORE
     TRIGA - PREF. FLOOD CANISTER  - 2 ROD FILLING CANISTER + TOLERANCE
     READ PARAM TME=170.0 GEN=403 NPG=1000 RUN=YES PLT=NO
     TBA=2.0 END PARAM
     READ GEOM
     UNIT 1
     COM='TRIGA FUEL (SMEARED)'
     CYLINDER 1 1 3.9877 60.959 0.001
     UNIT 5
     COM='3.38 in Width / 0.28 in Thickness DIVIDER CENTER STACK (SEALED)'
     CUBOID   2 1 2P4.2926 0.7112 0.0 +74.29 -8.255
     UNIT 6
     COM='3.38 in Width / 0.24 in Thickness DIVIDER OUTSIDE STACK (SEALED)'
     CUBOID   2 1 2P4.2926 0.6096 0.0 +74.29 -8.255
     UNIT 7
     COM='SEALED CANISTER'
     CYLINDER 12 1 3.9878 +60.96 0.0
     HOLE      1  0.0 0.0 0.0
     CYLINDER  2 1 4.1529 +63.50 -1.27
     CYLINDER 12 1 4.1529 +74.29 -8.255
     UNIT 10
     COM='TRIGA ELEMENTS IN Top of 3.38 in x 3.38 in OPENING (SEALED)'
     CUBOID    12 1 2P4.2926 2P4.2926 +74.29 -8.255
     HOLE 7    0.0 0.1396 0.0
     UNIT 11
     COM='TRIGA ELEMENTS IN Bottom of 3.38 in x 3.38 in OPENING (SEALED)'
     CUBOID    12 1 2P4.2926 2P4.2926 +74.29 -8.255
     HOLE 7    0.0 -0.1396 0.0
     UNIT 12
     COM='TRIGA ELEMENTS IN Bottom Right of 3.38 in x 3.38 in OPENING (SEALED)'
     CUBOID    12 1 2P4.2926 2P4.2926 +74.29 -8.255
     HOLE 7    +0.1396 -0.1396 0.0
     UNIT 13
     COM='TRIGA ELEMENTS IN Top Right of 3.38 in x 3.38 in OPENING (SEALED)'
     CUBOID    12 1 2P4.2926 2P4.2926 +74.29 -8.255
     HOLE 7    +0.1396 +0.1396 0.0
     UNIT 14
     COM='TRIGA ELEMENTS IN Bottom Left of 3.38 in x 3.38 in OPENING (SEALED)'
     CUBOID    12 1 2P4.2926 2P4.2926 +74.29 -8.255
     HOLE 7    -0.1396 -0.1396 0.0
     UNIT 15
     COM='TRIGA ELEMENTS IN Top Left of 3.38 in x 3.38 in OPENING (SEALED)'
     CUBOID    12 1 2P4.2926 2P4.2926 +74.29 -8.255
     HOLE 7    -0.1396 +0.1396 0.0
     UNIT 16
     COM='TRIGA BASKET 3.38 in x 3.38 in CENTER OPENING (SEALED)'
     CUBOID    12 1 2P4.2926 2P4.2926 +74.29 -8.255
     UNIT 20
```

```
COM='CENTER COLUMN OF THREE OPENINGS w/ 0.28 in plate (SEALED)'
ARRAY 1  -4.2926 -13.589 -8.255
REPLICATE 2 1 4R0.7112 2R0.0 1
UNIT 21
COM='LEFT OUTSIDE COLUMN OF TWO OPENINGS w/ 0.12 in plate (SEALED)'
ARRAY 2  -4.2926 -8.89 -8.255
REPLICATE 2 1 0.0 0.3048 2R0.3048 2R0.0 1
UNIT 22
COM='RIGHT OUTSIDE COLUMN OF TWO OPENINGS w/ 0.12 in plate (SEALED)'
ARRAY 3  -4.2926 -8.89 -8.255
REPLICATE 2 1 0.3048 0.0 2R0.3048 2R0.0 1
UNIT 30
COM='NAC-LWT TRIGA BASKET (SEALED)'
CYLINDER 12  1 17.1 +74.29 -8.255
HOLE 20   0.0     0.0 0.0
HOLE 21  -9.2974 0.0 0.0
HOLE 22  +9.2974 0.0 0.0
CYLINDER 2  1 18.9103 +74.93 -8.890
CYLINDER 6  1 33.4645 +74.93 -8.890
CYLINDER 2  1 36.5188 +74.93 -8.890
CYLINDER 7  1 49.2227 +74.93 -8.890
CYLINDER 2  1 49.8221 +74.93 -8.890
CUBOID   8  1 4P49.8221 +74.93 -8.890
UNIT 41
COM='TRIGA FUEL ELEMENT'
CYLINDER 4  1 0.2858 2P19.05
CYLINDER 10 1 1.8224 2P19.05
CYLINDER 5  1 1.8224 2P27.7368
CYLINDER 2  1 1.8771 2P27.7368
CYLINDER 11 1 1.8771 2P36.703
UNIT 45
COM='3.38 in Width / 0.28 in Thickness DIVIDER CENTER STACK'
CUBOID   2 1 2P4.2926 0.7112 0.0 2P36.703
UNIT 46
COM='3.38 in Width / 0.24 in Thickness DIVIDER OUTSIDE STACK'
CUBOID   2 1 2P4.2926 0.6096 0.0 2P36.703
UNIT 50
COM='TRIGA FUEL ELEMENTS IN Top of 3.38 in x 3.38 in OPENING'
CUBOID     12 1 2P4.2926 2P4.2926 2P36.703
HOLE       41  +1.8772 +2.4154 0.0
HOLE       41  -1.8772 +2.4154 0.0
HOLE       41  -1.8772 -1.3389 0.0
HOLE       41  +1.8772 -1.3389 0.0
UNIT 51
COM='TRIGA FUEL ELEMENTS IN Bottom of 3.38 in x 3.38 in OPENING'
CUBOID     12 1 2P4.2926 2P4.2926 2P36.703
HOLE       41  +1.8772 -2.4154 0.0
HOLE       41  -1.8772 -2.4154 0.0
HOLE       41  -1.8772 +1.3389 0.0
HOLE       41  +1.8772 +1.3389 0.0
UNIT 52
COM='TRIGA FUEL ELEMENTS IN Bottom Right of 3.38 in x 3.38 in OPENING'
CUBOID     12 1 2P4.2926 2P4.2926 2P36.703
HOLE       41  +2.4154 -2.4154  0.0
HOLE       41  +2.4154 +1.3389  0.0
HOLE       41  -1.3389 -2.4154  0.0
HOLE       41  -1.3389 +1.3389  0.0
UNIT 53
COM='TRIGA FUEL ELEMENTS IN Top Right of 3.38 in x 3.38 in OPENING'
CUBOID     12 1 2P4.2926 2P4.2926 2P36.703
HOLE       41 +2.4154 +2.4154  0.0
HOLE       41 +2.4154 -1.3389  0.0
HOLE       41 -1.3389 +2.4154  0.0
HOLE       41 -1.3389 -1.3389  0.0
UNIT 54
COM='TRIGA FUEL ELEMENTS IN Bottom Left of 3.38 in x 3.38 in OPENING'
CUBOID     12 1 2P4.2926 2P4.2926 2P36.703
HOLE       41  -2.4154 -2.4154  0.0
HOLE       41  -2.4154 +1.3389  0.0
HOLE       41  +1.3389 -2.4154  0.0
HOLE       41  +1.3389 +1.3389  0.0
UNIT 55
COM='TRIGA FUEL ELEMENTS IN Top Left of 3.38 in x 3.38 in OPENING'
CUBOID     12 1 2P4.2926 2P4.2926 2P36.703
HOLE       41  -2.4154 +2.4154  0.0
HOLE       41  -2.4154 -1.3389  0.0
HOLE       41  +1.3389 +2.4154  0.0
HOLE       41  +1.3389 -1.3389  0.0
UNIT 56
COM='TRIGA BASKET 3.38 in x 3.38 in CENTER OPENING'
CUBOID     12 1 2P4.2926 2P4.2926 2P36.703
UNIT 60
COM='CENTER COLUMN OF THREE OPENINGS w/ 0.28 in plate'
ARRAY 11  -4.2926 -13.589 -36.703
REPLICATE 2 1 4R0.7112 2R0.0 1
UNIT 61
COM='LEFT OUTSIDE COLUMN OF TWO OPENINGS w/ 0.12 in plate'
ARRAY 12  -4.2926 -8.89 -36.703
REPLICATE 2 1 0.0 0.3048 2R0.3048 2R0.0 1
UNIT 62
COM='RIGHT OUTSIDE COLUMN OF TWO OPENINGS w/ 0.12 in plate'
ARRAY 13  -4.2926 -8.89 -36.703
REPLICATE 2 1 0.3048 0.0 2R0.3048 2R0.0 1
UNIT 70
COM='NAC-LWT TRIGA BASKET'
```

```
CYLINDER 12  1 17.1 2P36.703
HOLE 60   0.0    0.0 0.0
HOLE 61  -9.2974 0.0 0.0
HOLE 62  +9.2974 0.0 0.0
CYLINDER 2  1 18.9103 2P37.338
CYLINDER 6  1 33.4645 2P37.338
CYLINDER 2  1 36.5188 2P37.338
CYLINDER 7  1 49.2227 2P37.338
CYLINDER 2  1 49.8221 2P37.338
CUBOID   8  1 4P49.8221 2P37.338
UNIT 80
COM='SIMPLIFIED LID STRUCTURE NAC-LWT'
CYLINDER 2 1 36.5188 2P14.1351
CYLINDER 8 1 49.8221 2P14.1351
CUBOID   8 1 4P49.8221 2P14.1351
UNIT 81
COM='SIMPLIFIED CASK BOTTOM STRUCTURE NAC-LWT'
CYLINDER 6 1 26.3525 2P3.81
CYLINDER 2 1 36.6188 +13.97 -12.7
CYLINDER 8 1 49.8221 +13.97 -12.7
CUBOID   8 1 4P49.8221 +13.97 -12.7
GLOBAL UNIT 82
COM='STACK OF 5 BASKETS IN CASK'
ARRAY  20  -49.8221 -49.8221 -221.3
END GEOM
READ ARRAY
ARA=1 NUX=1 NUY=5 NUZ=1 FILL 10 5 16 5 11 END FILL
ARA=2 NUX=1 NUY=3 NUZ=1 FILL 13 6 12 END FILL
ARA=3 NUX=1 NUY=3 NUZ=1 FILL 15 6 14 END FILL
ARA=11 NUX=1 NUY=5 NUZ=1 FILL 50 45 56 45 51 END FILL
ARA=12 NUX=1 NUY=3 NUZ=1 FILL 53 46 52 END FILL
ARA=13 NUX=1 NUY=3 NUZ=1 FILL 55 46 54 END FILL
ARA=20 NUX=1 NUY=1 NUZ=7 FILL 81 30 3R70 30 80 END FILL
END ARRAY
READ BOUNDS ALL=MIR END BOUNDS
READ PLOT
TTL='X-Y PLOT OF CASK (CANISTER ELEVATION)'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=800
XUL=-50.0 YUL=50.0 ZUL=149.352
XLR=50.0 YLR=-50.0 ZLR=149.352 END
TTL='X-Y PLOT OF BASKET (CANISTER ELEVATION)'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=800
XUL=-17.2 YUL=17.2 ZUL=149.352
XLR=17.2 YLR=-17.2 ZLR=149.352 END
TTL='X-Y PLOT OF BASKET (CAVITY MID PLANE)'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=800
XUL=-17.2 YUL=17.2 ZUL=0.0
XLR=17.2 YLR=-17.2 ZLR=0.0 END
TTL='X-Y PLOT OF CENTER OPENING (CANISTER ELEVATION)'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=800
XUL=-7.0 YUL=7.0 ZUL=149.352
XLR=7.0 YLR=-7.0 ZLR=149.352 END
TTL='X-Y PLOT OF PERIPHERAL OPENING (CANISTER ELEVATION)'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=800
XUL=-7.0 YUL=16.0 ZUL=149.352
XLR=7.0  YLR=4.0 ZLR=149.352 END
TTL='Y-Z PLOT OF BASKET (CENTER OF FUEL ELEMENTS,CANISTER ELEVATION)'
SCR=YES PIC=MAT LPI=10
VAX=1.0 WDN=-1.0 NAX=800
XUL=2.12 YUL=-14.0 ZUL=186.69
XLR=2.12 YLR=-4.5 ZLR=112.014 END
TTL='Y-Z PLOT OF BASKET (CASK)'
SCR=YES PIC=MAT LPI=10
VAX=1.0 WDN=-1.0 NAX=800
XUL=2.12 YUL=-51 ZUL=250
XLR=2.12 YLR=+51 ZLR=-250
END PLOT
END DATA

SECONDARY MODULE 000008   HAS BEEN CALLED.

MODULE 000008   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     0.88 (SECONDS).

SECONDARY MODULE 000002   HAS BEEN CALLED.

MODULE 000002   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     9.72 (SECONDS).

SECONDARY MODULE 000009   HAS BEEN CALLED.

MODULE 000009   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   718.10 (SECONDS).

MODULE CSAS25   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   729.96 (SECONDS).
```

```
 CCCCCCCCCCC     SSSSSSSSSSS      AAAAAAAAA      SSSSSSSSSSS     22222222222    5555555555555
CCCCCCCCCCCCC   SSSSSSSSSSSSS    AAAAAAAAAAA    SSSSSSSSSSSSS   2222222222222   5555555555555
CC         CC   SS         SS   AA         AA   SS         SS   22         22   55
CC              SS              AA         AA   SS                         22   55
CC              SS              AA         AA   SS                         22   55
CC              SSSSSSSSSSSS    AAAAAAAAAAAAA   SSSSSSSSSSSS             22     555555555555
CC               SSSSSSSSSSSS   AAAAAAAAAAAAA    SSSSSSSSSSSS          22       5555555555555
CC                         SS   AA         AA              SS        22                    55
CC                         SS   AA         AA              SS      22                      55
CC         CC   SS         SS   AA         AA   SS         SS    22             55         55
CCCCCCCCCCCCC   SSSSSSSSSSSSS   AA         AA   SSSSSSSSSSSSS   2222222222222   5555555555555
 CCCCCCCCCCC     SSSSSSSSSSS    AA         AA    SSSSSSSSSSS    2222222222222    55555555555


 SSSSSSSSSSS     CCCCCCCCCCC      AAAAAAAAA      LL              EEEEEEEEEEEEE                   PPPPPPPPPPPP     CCCCCCCCCCC
SSSSSSSSSSSSS   CCCCCCCCCCCCC    AAAAAAAAAAA    LL              EEEEEEEEEEEEE                   PPPPPPPPPPPPP   CCCCCCCCCCCCC
SS         SS   CC         CC   AA         AA   LL              EE                              PP         PP   CC         CC
SS              CC              AA         AA   LL              EE                              PP         PP   CC
SS              CC              AA         AA   LL              EE                              PP         PP   CC
SSSSSSSSSSSS    CC              AAAAAAAAAAAAA   LL              EEEEEEEEE       -------------   PPPPPPPPPPPPP   CC
 SSSSSSSSSSSS   CC              AAAAAAAAAAAAA   LL              EEEEEEEEE       -------------   PPPPPPPPPPPP    CC
           SS   CC              AA         AA   LL              EE                              PP              CC
           SS   CC              AA         AA   LL              EE                              PP              CC
SS         SS   CC         CC   AA         AA   LL              EE                              PP              CC         CC
SSSSSSSSSSSSS   CCCCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                   PP              CCCCCCCCCCCCC
 SSSSSSSSSSS     CCCCCCCCCCC    AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                   PP               CCCCCCCCCCC


      11         22222222222           //    33333333333      0000000             //    99999999999     88888888888
     111        2222222222222          //   3333333333333    000000000            //   9999999999999   8888888888888
    1111        22         22         //    33         33   00       00          //    99         99   88         88
      11                   22        //               33   00         00        //     99         99   88         88
      11                   22       //                33   00         00       //      99         99   88         88
      11                 22        //                333   00         00      //       9999999999999    88888888888
      11               22         //                 333   00         00     //         99999999999     88888888888
      11             22          //                   33   00         00    //                   99   88         88
      11           22          //                     33   00         00   //                    99   88         88
      11         22           //            33         33   00       00   //                     99   88         88
   11111111     2222222222222 //            3333333333333    000000000   //            9999999999999   8888888888888
   11111111     2222222222222//              33333333333      0000000   //             999999999999     88888888888


   0000000      5555555555555                33333333333     33333333333                5555555555555    88888888888
  000000000     5555555555555               3333333333333   3333333333333               5555555555555   8888888888888
 00       00    55                  :::     33         33   33         33       :::     55              88         88
00         00   55                  :::                33              33       :::     55              88         88
00         00   55                  :::                33              33       :::     55              88         88
00         00   555555555555                          333             333               555555555555     88888888888
00         00   5555555555555                         333             333               5555555555555    88888888888
00         00              55       :::                33              33       :::                55   88         88
00         00              55       :::                33              33       :::                55   88         88
 00       00    55         55       :::     33         33   33         33       :::     55         55   88         88
  000000000     5555555555555               3333333333333   3333333333333               5555555555555   8888888888888
   0000000       55555555555                 33333333333     33333333333                 55555555555     88888888888
```

```
 SSSSSSSSSSS    CCCCCCCCCCC      AAAAAAAAA     LL              EEEEEEEEEEEEE                     PPPPPPPPPPPP     CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC    AAAAAAAAAAA    LL              EEEEEEEEEEEEE                     PPPPPPPPPPPPP   CCCCCCCCCCCCC
SS         SS  CC         CC   AA         AA   LL              EE                                PP         PP   CC         CC
SS             CC              AA         AA   LL              EE                                PP         PP   CC
SS             CC              AA         AA   LL              EE                                PP         PP   CC
SSSSSSSSSSSS   CC              AAAAAAAAAAAAA   LL              EEEEEEEEE       -------------     PPPPPPPPPPPPP   CC
 SSSSSSSSSSSS  CC              AAAAAAAAAAAAA   LL              EEEEEEEEE       -------------     PPPPPPPPPPPP    CC
           SS  CC              AA         AA   LL              EE                                PP              CC
           SS  CC              AA         AA   LL              EE                                PP              CC
SS         SS  CC         CC   AA         AA   LL              EE                                PP              CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                     PP              CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC    AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                     PP               CCCCCCCCCCC

                    *****************************************************************************
                    *****************************************************************************
                    *****************************************************************************
                    *****                                                                   *****
                    *****                  PROGRAM VERIFICATION INFORMATION                 *****
                    *****                                                                   *****
                    *****                 CODE SYSTEM:  SCALE-PC VERSION:  4.3              *****
                    *****                                                                   *****
                    *****************************************************************************
                    *****************************************************************************
                    *****                                                                   *****
                    *****                                                                   *****
                    *****                PROGRAM:  CSAS                                     *****
                    *****                                                                   *****
                    *****          CREATION DATE:  03/08/96                                 *****
                    *****                                                                   *****
                    *****                VOLUME:   ENG                                      *****
                    *****                                                                   *****
                    *****               LIBRARY:  G:\SCALE43\WIN_NT\EXE                     *****
                    *****                                                                   *****
                    *****                                                                   *****
                    *****        PRODUCTION CODE:  CSAS                                     *****
                    *****                                                                   *****
                    *****               VERSION:  3.1                                       *****
                    *****                                                                   *****
                    *****               JOBNAME:  SCALE-PC                                  *****
                    *****                                                                   *****
                    *****      DATE OF EXECUTION:  12/30/98                                 *****
                    *****                                                                   *****
                    *****      TIME OF EXECUTION:  05:33:58                                 *****
                    *****                                                                   *****
                    *****                                                                   *****
                    *****************************************************************************
                    *****************************************************************************
                    *****************************************************************************

   TRIGA - PREF. FLOOD CANISTER  - 2 ROD FILLING CANISTER + TOLERANCE


   **** PROBLEM PARAMETERS ****

   LIB 27GPOURNDF4  LIBRARY
   MXX            12 MIXTURES
   MSC            21 COMPOSITION SPECIFICATIONS
   IZM             1 MATERIAL ZONES
   GE  INFHOMMEDIUM GEOMETRY
   MORE            1 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
   MSLN            0 FUEL SOLUTIONS


   **** PROBLEM GEOMETRY ****


   **** INFINITE HOMOGENEOUS MEDIUM ****
   MFUEL           1 MIXTURE NO. OF THE INFINITE HOMOGENEOUS MEDIUM

   **** SPECIAL PARAMETERS ****

   ISN             8 ORDER OF ANGULAR QUADRATURE
   IIM            20 INNER ITERATION MAXIMUM
   ICM            25 OUTER ITERATION MAXIMUM
   SZF   1.00000E+00 SIZE FACTOR FOR SPATIAL MESH
   EPS   1.00000E-04 OVERALL PROBLEM CONVERGENCE
   PTC   1.00000E-04 SCALAR FLUX CONVERGENCE
   BKL   1.42089E+00 BUCKLING FACTOR
   IUS             0 THERMAL UPSCATTER SCALING
   BAL          FINE BALANCE TABLE PRINT FLAG
   DY    0.00000E+00 BUCKLING HEIGHT
   DZ    0.00000E+00 BUCKLING DEPTH
   IPN             0 DIFFUSION COEFFICIENT OPTION
   FRD             0 LOGICAL UNIT NUMBER TO READ FLUX GUESS
   FWR            -1 LOGICAL UNIT NUMBER TO WRITE FLUX GUESS
   MSH          2001 NUMBER OF INTERVALS FOR RES. INTGRTNS
   MLV             2 MAX LVALUE FOR RES. INTGRTNS
   AXS             0 LOGICAL UNIT NUMBER TO WRITE ANISN LIB
   RES            10 MIXTURE WITH SPECIAL RESONANCE CORRECTION
     *      CYLINDER GEOMETRY FOR SPECIAL RESONANCE CORRECTION
     *   1.82240E+00 DIMENSION (LBAR) FOR SPECIAL RESONANCE CORRECTION


   DANCOFF FACTOR SPECIFICATION
   MIXTURE      FACTOR
        10     0.85220
```

```
          KK          KK  EEEEEEEEEEEEE  NN          NN   00000000000                 VV          VV
          KK         KK   EEEEEEEEEEEEE  NNN         NN  0000000000000                VV          VV
          KK        KK    EE             NNNN        NN  00         00                VV          VV
          KK       KK     EE             NN NN       NN  00         00                VV          VV
          KK      KK      EE             NN  NN      NN  00         00                VV          VV
          KKKKKKKK        EEEEEEEEE      NN   NN     NN  00         00  ------------- VV          VV
          KKKKKKKK        EEEEEEEEE      NN    NN    NN  00         00  -------------  VV        VV
          KK      KK      EE             NN     NN   NN  00         00                  VV      VV
          KK       KK     EE             NN      NN  NN  00         00                   VV    VV
          KK        KK    EE             NN       NNNN   00         00                    VV VV
          KK         KK   EEEEEEEEEEEEE  NN        NNN   0000000000000                     VVV
          KK          KK  EEEEEEEEEEEEE  NN         NN    00000000000                       V

 SSSSSSSSSSS     CCCCCCCCCCC     AAAAAAAAA     LL               EEEEEEEEEEEEE                 PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS   CCCCCCCCCCCCC   AAAAAAAAAAA    LL               EEEEEEEEEEEEE                 PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS   CC         CC   AA       AA    LL               EE                            PP         PP  CC         CC
SS              CC              AA       AA    LL               EE                            PP         PP  CC
SS              CC              AA       AA    LL               EE                            PP         PP  CC
SSSSSSSSSSSS    CC              AAAAAAAAAAAAA  LL               EEEEEEEEE      -------------  PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS   CC              AAAAAAAAAAAAA  LL               EEEEEEEEE      -------------  PPPPPPPPPPPP   CC
           SS   CC              AA       AA    LL               EE                            PP             CC
           SS   CC              AA       AA    LL               EE                            PP             CC
SS         SS   CC         CC   AA       AA    LL               EE                            PP             CC         CC
SSSSSSSSSSSSS   CCCCCCCCCCCCC   AA       AA    LLLLLLLLLLLLL    EEEEEEEEEEEEE                 PP             CCCCCCCCCCCCC
 SSSSSSSSSSS     CCCCCCCCCCC    AA       AA    LLLLLLLLLLLLL    EEEEEEEEEEEEE                 PP              CCCCCCCCCCC

      11          22222222222            //   33333333333      0000000          //   99999999999     88888888888
     111         2222222222222          //   3333333333333    000000000        //   9999999999999   8888888888888
    1111         22         22         //    33         33   00       00      //    99         99   88         88
      11                    22        //                33   00       00     //     99         99   88         88
      11                    22       //                 33   00       00    //      99         99   88         88
      11                  22        //                333    00       00   //       9999999999999   88888888888
      11                22         //                 333    00       00  //         999999999999   88888888888
      11              22          //                  33     00       00 //                    99   88         88
      11            22           //                   33     00       00//                     99   88         88
      11           22           //       33         33   00       00 //                   99   88         88
   11111111      2222222222222 //        3333333333333    000000000 //       9999999999999   8888888888888
   11111111      2222222222222//          33333333333      0000000  //       999999999999     88888888888

   0000000      5555555555555              33333333333          44                   11        0000000
  000000000     5555555555555             3333333333333        444                  111       000000000
 00       00    55                 :::    33         33       4444         :::     1111      00       00
00         00   55                 :::               33      44 44         :::       11      00       00
00         00   55                 :::               33     44  44         :::       11      00       00
00         00   555555555555                        333    44   44                   11      00       00
00         00   5555555555555                       333   44    44                   11      00       00
00         00              55      :::               33  4444444444444     :::       11      00       00
00         00              55      :::               33  4444444444444     :::       11      00       00
 00       00    55         55      :::    33         33         44         :::       11       00     00
  000000000     5555555555555             3333333333333         44               11111111    000000000
   0000000       55555555555               33333333333          44               11111111     0000000
```

```
 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA     LL          EEEEEEEEEEEEE              PPPPPPPPPPPP   CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA    LL          EEEEEEEEEEEEE              PPPPPPPPPPPPP CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA   LL          EE                         PP         PP CC         CC
SS             CC             AA         AA   LL          EE                         PP         PP CC
SS             CC             AA         AA   LL          EE                         PP         PP CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA   LL          EEEEEEEEE    -------------  PPPPPPPPPPPPP CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA   LL          EEEEEEEEE    -------------  PPPPPPPPPPPP  CC
           SS  CC             AA         AA   LL          EE                         PP            CC
           SS  CC             AA         AA   LL          EE                         PP            CC
SS         SS  CC         CC  AA         AA   LL          EE                         PP            CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA   LLLLLLLLLLLLL EEEEEEEEEEEEE            PP            CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL EEEEEEEEEEEEE            PP             CCCCCCCCCCC
```

```
***************************************************************************
***************************************************************************
***************************************************************************
*****                                                                 *****
*****                  PROGRAM VERIFICATION INFORMATION               *****
*****                                                                 *****
*****               CODE SYSTEM:  SCALE-PC VERSION:  4.3              *****
*****                                                                 *****
***************************************************************************
***************************************************************************
*****                                                                 *****
*****                                                                 *****
*****             PROGRAM:  000009                                    *****
*****                                                                 *****
*****       CREATION DATE:  03/08/96                                  *****
*****                                                                 *****
*****              VOLUME:  ENG                                       *****
*****                                                                 *****
*****             LIBRARY:  G:\SCALE43\WIN_NT\EXE                     *****
*****                                                                 *****
*****                                                                 *****
*****     PRODUCTION CODE:  KENOVA                                    *****
*****                                                                 *****
*****             VERSION:  3.1                                       *****
*****                                                                 *****
*****             JOBNAME:  SCALE-PC                                  *****
*****                                                                 *****
*****   DATE OF EXECUTION:  12/30/98                                  *****
*****                                                                 *****
*****   TIME OF EXECUTION:  05:34:10                                  *****
*****                                                                 *****
*****                                                                 *****
***************************************************************************
***************************************************************************
***************************************************************************
```

```
TRIGA - PREF. FLOOD CANISTER  - 2 ROD FILLING CANISTER + TOLERANCE

******       NUMERIC PARAMETERS       ******

TME    MAXIMUM PROBLEM TIME (MIN)                 170.00
TBA    TIME PER GENERATION (MIN)                    2.00
GEN    NUMBER OF GENERATIONS                         403
NPG    NUMBER PER GENERATION                        1000
NSK    NUMBER OF GENERATIONS TO BE SKIPPED             3
BEG    BEGINNING GENERATION NUMBER                     1
RES    GENERATIONS BETWEEN CHECKPOINTS                 0
X1D    NUMBER OF EXTRA 1-D CROSS SECTIONS              1
NBK    NEUTRON BANK SIZE                            1025
XNB    EXTRA POSITIONS IN NEUTRON BANK                 0
NFB    FISSION BANK SIZE                            1000
XFB    EXTRA POSITIONS IN FISSION BANK                 0
WTA    DEFAULT VALUE OF WEIGHT AVERAGE            0.5000
WTH    WEIGHT HIGH FOR SPLITTING                  3.0000
WTL    WEIGHT LOW FOR RUSSIAN ROULETTE            0.3333
RND    STARTING RANDOM NUMBER               BB8271000001
NB8    NUMBER OF D.A. BLOCKS ON UNIT  8              200
NL8    LENGTH OF D.A. BLOCKS ON UNIT  8              512
ADJ    MODE OF CALCULATION                       FORWARD
       INPUT DATA WRITTEN ON RESTART UNIT             NO
       BINARY DATA INTERFACE                         YES
```

```
***********************************************************************************************************************
***********************************************************************************************************************
***                                                                                                                 ***
***                     TRIGA - PREF. FLOOD CANISTER  - 2 ROD FILLING CANISTER + TOLERANCE                          ***
***                                                                                                                 ***
***********************************************************************************************************************
***                                ******  LOGICAL PARAMETERS     ******                                            ***
***                                                                                                                 ***
***  RUN  EXECUTE PROBLEM AFTER CHECKING DATA     YES            PLT  PLOT PICTURE MAP(S)                       NO  ***
***                                                                                                                 ***
***  FLX  COMPUTE FLUX                             NO            FDN  COMPUTE FISSION DENSITIES                 NO  ***
***                                                                                                                 ***
***  SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION     NO            NUB  COMPUTE NU-BAR & AVG FISSION GROUP       YES  ***
***                                                                                                                 ***
***  MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER      NO            MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION     NO  ***
***                                                                                                                 ***
***  CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER    NO            CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION   NO  ***
***                                                                                                                 ***
***  FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER    NO            FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION   NO  ***
***                                                                                                                 ***
***  MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER      NO            MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER      NO  ***
***                                                                                                                 ***
***  CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER    NO            CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER    NO  ***
***                                                                                                                 ***
***  FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER    NO            FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER    NO  ***
***                                                                                                                 ***
***  HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL     NO            HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL     NO  ***
***                                                                                                                 ***
***  AMX  PRINT ALL MIXED CROSS SECTIONS           NO            FAR  PRINT FIS. AND ABS. BY REGION             NO  ***
***                                                                                                                 ***
***  XS1  PRINT 1-D MIXTURE X-SECTIONS             NO            GAS  PRINT FAR BY GROUP                        NO  ***
***                                                                                                                 ***
***  XS2  PRINT 2-D MIXTURE X-SECTIONS             NO            PAX  PRINT XSEC-ALBEDO CORRELATION TABLES      NO  ***
***                                                                                                                 ***
***  XAP  PRINT MIXTURE ANGLES & PROBABILITIES     NO            PWT  PRINT WEIGHT AVERAGE ARRAY                NO  ***
***                                                                                                                 ***
***  PKI  PRINT FISSION SPECTRUM                   NO            PGM  PRINT INPUT GEOMETRY                      NO  ***
***                                                                                                                 ***
***  P1D  PRINT EXTRA 1-D CROSS SECTIONS           NO            BUG  PRINT DEBUG INFORMATION                   NO  ***
***                                                                                                                 ***
***                                                              TRK  PRINT TRACKING INFORMATION                NO  ***
***                                                                                                                 ***
***                                                                                                                 ***
***********************************************************************************************************************
***********************************************************************************************************************
***********************************************************************************************************************
                                        PARAMETER INPUT COMPLETED

                          ........    0 IO'S WERE USED READING THE PARAMETER DATA       ........

                        ************** DATA READING COMPLETED **************

     ******************************************************************************************
     ***                                                                                    ***
     ***         TRIGA - PREF. FLOOD CANISTER  - 2 ROD FILLING CANISTER + TOLERANCE         ***
     ***                                                                                    ***
     ******************************************************************************************
     ******************************************************************************************
     ***                                                                                    ***
     ***                        ****** ADDITIONAL INFORMATION ******                        ***
     ***                                                                                    ***
     ***  NUMBER OF ENERGY GROUPS                27       USE LATTICE GEOMETRY          YES  ***
     ***                                                                                    ***
     ***  NO. OF FISSION SPECTRUM SOURCE GROUP  1       GLOBAL ARRAY NUMBER            20  ***
     ***                                                                                    ***
     ***  NO. OF SCATTERING ANGLES IN XSECS      2       NUMBER OF UNITS IN THE GLOBAL X DIR.  1  ***
     ***                                                                                    ***
     ***  ENTRIES/NEUTRON IN THE NEUTRON BANK  25       NUMBER OF UNITS IN THE GLOBAL Y DIR.  1  ***
     ***                                                                                    ***
     ***  ENTRIES/NEUTRON IN THE FISSION BANK  18       NUMBER OF UNITS IN THE GLOBAL Z DIR.  7  ***
     ***                                                                                    ***
     ***  NUMBER OF MIXTURES USED               10       USE A GLOBAL REFLECTOR        YES  ***
     ***                                                                                    ***
     ***  NUMBER OF BIAS ID'S USED               1       USE NESTED HOLES              YES  ***
     ***                                                                                    ***
     ***  NUMBER OF DIFFERENTIAL ALBEDOS USED    0       NUMBER OF HOLES                37  ***
     ***                                                                                    ***
     ***  TOTAL INPUT GEOMETRY REGIONS          61       MAXIMUM HOLE NESTING LEVEL      3  ***
     ***                                                                                    ***
     ***  NUMBER OF GEOMETRY REGIONS USED       61       USE NESTED ARRAYS             YES  ***
     ***                                                                                    ***
     ***  LARGEST GEOMETRY UNIT NUMBER          82       NUMBER OF ARRAYS USED           7  ***
     ***                                                                                    ***
     ***  LARGEST ARRAY NUMBER                  20       MAXIMUM ARRAY NESTING LEVEL     2  ***
     ***                                                                                    ***
     ***                                                                                    ***
     ***  +X BOUNDARY CONDITION                MIR       -X BOUNDARY CONDITION         MIR  ***
     ***                                                                                    ***
     ***  +Y BOUNDARY CONDITION                MIR       -Y BOUNDARY CONDITION         MIR  ***
     ***                                                                                    ***
     ***  +Z BOUNDARY CONDITION                MIR       -Z BOUNDARY CONDITION         MIR  ***
     ***                                                                                    ***
     ******************************************************************************************
```

```
***************************************************************************************
***                                                                                 ***
***        TRIGA - PREF. FLOOD CANISTER  - 2 ROD FILLING CANISTER + TOLERANCE       ***
***                                                                                 ***
***************************************************************************************
***************************************************************************************
***                                                                                 ***
***                   ****** SPACE AND SUPERGROUP INFORMATION ******                ***
***                                                                                 ***
***      100000 WORDS IS THE TOTAL SPACE AVAILABLE.                                 ***
***                                                                                 ***
***       48807 WORDS WERE USED FOR NON-SUPERGROUP STORAGE.                         ***
***                                                                                 ***
***       51193 WORDS OF STORAGE ARE AVAILABLE FOR SUPERGROUPED DATA.               ***
***                                                                                 ***
***       99679 WORDS OF STORAGE ARE AVAILABLE FOR CONSTRUCTING THE SUPERGROUPS.    ***
***                                                                                 ***
***       51133 WORDS OF STORAGE ARE AVAILABLE TO EACH SUPERGROUP.                  ***
***                                                                                 ***
***        1315 WORDS ARE NEEDED FOR THE LARGEST GROUP.                             ***
***                                                                                 ***
***       50338 WORDS OF STORAGE IS SUFFICIENT TO RUN THIS PROBLEM.                 ***
***                                                                                 ***
***       65200 WORDS OF STORAGE WILL ALLOW THE PROBLEM TO RUN WITH ONE SUPERGROUP. ***
***                                                                                 ***
***       65696 WORDS OF STORAGE WILL BE USED TO RUN THIS PROBLEM.                  ***
***                                                                                 ***
***************************************************************************************
***************************************************************************************
***                                                                                 ***
***                   STARTING    ENDING      XSEC      ALBEDO      TOTAL           ***
***   SUPERGROUP       GROUP       GROUP     LENGTH     LENGTH      LENGTH          ***
***                                                                                 ***
***                                                                                 ***
***        1             1          27        3334         0        16333           ***
***                                                                                 ***
***************************************************************************************

          ........    0 IO'S WERE USED IN SUPERGROUPING    ........

          ****************************************************
          **                                                **
          **  ARRAY     UNITS IN   UNITS IN   UNITS IN   NESTING  **
          **  NUMBER     X DIR.     Y DIR.     Z DIR.     LEVEL   **
          **                                                **
          **    1          1          5          1          2    **
          **                                                **
          **    2          1          3          1          2    **
          **                                                **
          **    3          1          3          1          2    **
          **                                                **
          **   11          1          5          1          2    **
          **                                                **
          **   12          1          3          1          2    **
          **                                                **
          **   13          1          3          1          2    **
          **                                                **
          **   20 GLOBAL   1          1          7          1    **
          **                                                **
          ****************************************************

          ........    0 IO'S WERE USED LOADING THE DATA    ........

                  TRIGA - PREF. FLOOD CANISTER  - 2 ROD FILLING CANISTER + TOLERANCE

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                         -----  UNIT    1  -----

TRIGA FUEL (SMEARED)

  1 CYLINDER        1   1  RADIUS =  3.9877    +Z =  60.959    -Z = 1.00000E-03 CENTERLINE IS AT  X = 0.00000     Y = 0.00000

                                         -----  UNIT    5  -----

3.38 IN WIDTH / 0.28 IN THICKNESS DIVIDER CENTER STACK (SEALED)

  1 CUBOID          2   1    +X =  4.2926    -X = -4.2926    +Y = 0.71120    -Y = 0.00000    +Z =  74.290    -Z = -8.2550

                                         -----  UNIT    6  -----

3.38 IN WIDTH / 0.24 IN THICKNESS DIVIDER OUTSIDE STACK (SEALED)

  1 CUBOID          2   1    +X =  4.2926    -X = -4.2926    +Y = 0.60960    -Y = 0.00000    +Z =  74.290    -Z = -8.2550

                                         -----  UNIT    7  -----

SEALED CANISTER

  1 CYLINDER       12   1  RADIUS =  3.9878    +Z =  60.960    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
```

```
   HOLE NUMBER      1       AT X = 0.00000     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER      1

 2 CYLINDER         2   1  RADIUS =  4.1529    +Z =  63.500     -Z = -1.2700    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

 3 CYLINDER        12   1  RADIUS =  4.1529    +Z =  74.290     -Z = -8.2550    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

                                              -----   UNIT    10    -----

TRIGA ELEMENTS IN TOP OF 3.38 IN X 3.38 IN OPENING (SEALED)

 1 CUBOID          12   1      +X =  4.2926     -X = -4.2926     +Y =  4.2926     -Y = -4.2926     +Z =  74.290     -Z = -8.2550

   HOLE NUMBER      2       AT X = 0.00000     Y = 0.13960      Z = 0.00000     IS UNIT NUMBER      7

                                              -----   UNIT    11    -----

TRIGA ELEMENTS IN BOTTOM OF 3.38 IN X 3.38 IN OPENING (SEALED)

 1 CUBOID          12   1      +X =  4.2926     -X = -4.2926     +Y =  4.2926     -Y = -4.2926     +Z =  74.290     -Z = -8.2550

   HOLE NUMBER      3       AT X = 0.00000     Y =-0.13960      Z = 0.00000     IS UNIT NUMBER      7
                                    TRIGA - PREF. FLOOD CANISTER  - 2 ROD FILLING CANISTER + TOLERANCE
-
                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                              -----   UNIT    12    -----

TRIGA ELEMENTS IN BOTTOM RIGHT OF 3.38 IN X 3.38 IN OPENING (SEALED)

 1 CUBOID          12   1      +X =  4.2926     -X = -4.2926     +Y =  4.2926     -Y = -4.2926     +Z =  74.290     -Z = -8.2550

   HOLE NUMBER      4       AT X = 0.13960     Y =-0.13960      Z = 0.00000     IS UNIT NUMBER      7

                                              -----   UNIT    13    -----

TRIGA ELEMENTS IN TOP RIGHT OF 3.38 IN X 3.38 IN OPENING (SEALED)

 1 CUBOID          12   1      +X =  4.2926     -X = -4.2926     +Y =  4.2926     -Y = -4.2926     +Z =  74.290     -Z = -8.2550

   HOLE NUMBER      5       AT X = 0.13960     Y = 0.13960      Z = 0.00000     IS UNIT NUMBER      7

                                              -----   UNIT    14    -----

TRIGA ELEMENTS IN BOTTOM LEFT OF 3.38 IN X 3.38 IN OPENING (SEALED)

 1 CUBOID          12   1      +X =  4.2926     -X = -4.2926     +Y =  4.2926     -Y = -4.2926     +Z =  74.290     -Z = -8.2550

   HOLE NUMBER      6       AT X =-0.13960     Y =-0.13960      Z = 0.00000     IS UNIT NUMBER      7

                                              -----   UNIT    15    -----

TRIGA ELEMENTS IN TOP LEFT OF 3.38 IN X 3.38 IN OPENING (SEALED)

 1 CUBOID          12   1      +X =  4.2926     -X = -4.2926     +Y =  4.2926     -Y = -4.2926     +Z =  74.290     -Z = -8.2550

   HOLE NUMBER      7       AT X =-0.13960     Y = 0.13960      Z = 0.00000     IS UNIT NUMBER      7

                                              -----   UNIT    16    -----

TRIGA BASKET 3.38 IN X 3.38 IN CENTER OPENING (SEALED)

 1 CUBOID          12   1      +X =  4.2926     -X = -4.2926     +Y =  4.2926     -Y = -4.2926     +Z =  74.290     -Z = -8.2550

                                 -----   UNIT    20  EXTERNAL TO LATTICE  1   -----

CENTER COLUMN OF THREE OPENINGS W/ 0.28 IN PLATE (SEALED)

 1 ARRAY NUMBER     1          +X =  4.2926     -X = -4.2926     +Y =  13.589     -Y = -13.589     +Z =  74.290     -Z = -8.2550

 2 CUBOID           2   1      +X =  5.0038     -X = -5.0038     +Y =  14.300     -Y = -14.300     +Z =  74.290     -Z = -8.2550
                                    TRIGA - PREF. FLOOD CANISTER  - 2 ROD FILLING CANISTER + TOLERANCE
-
                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                 -----   UNIT    21  EXTERNAL TO LATTICE  2   -----

LEFT OUTSIDE COLUMN OF TWO OPENINGS W/ 0.12 IN PLATE (SEALED)

 1 ARRAY NUMBER     2          +X =  4.2926     -X = -4.2926     +Y =  8.8900     -Y = -8.8900     +Z =  74.290     -Z = -8.2550

 2 CUBOID           2   1      +X =  4.2926     -X = -4.5974     +Y =  9.1948     -Y = -9.1948     +Z =  74.290     -Z = -8.2550
```

```
                                    -----   UNIT    22  EXTERNAL TO LATTICE  3   -----

RIGHT OUTSIDE COLUMN OF TWO OPENINGS W/ 0.12 IN PLATE (SEALED)

  1 ARRAY NUMBER     3           +X =   4.2926     -X = -4.2926     +Y =   8.8900     -Y = -8.8900     +Z =   74.290     -Z = -8.2550

  2 CUBOID           2   1       +X =   4.5974     -X = -4.2926     +Y =   9.1948     -Y = -9.1948     +Z =   74.290     -Z = -8.2550

                                                -----   UNIT    30   -----

NAC-LWT TRIGA BASKET (SEALED)

  1 CYLINDER        12   1  RADIUS =   17.100     +Z =   74.290     -Z = -8.2550     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

    HOLE NUMBER      8        AT X = 0.00000      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER     20

    HOLE NUMBER      9        AT X = -9.2974      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER     21

    HOLE NUMBER     10        AT X =  9.2974      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER     22

  2 CYLINDER         2   1  RADIUS =   18.910     +Z =   74.930     -Z = -8.8900     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CYLINDER         6   1  RADIUS =   33.465     +Z =   74.930     -Z = -8.8900     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  4 CYLINDER         2   1  RADIUS =   36.519     +Z =   74.930     -Z = -8.8900     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  5 CYLINDER         7   1  RADIUS =   49.223     +Z =   74.930     -Z = -8.8900     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  6 CYLINDER         2   1  RADIUS =   49.822     +Z =   74.930     -Z = -8.8900     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  7 CUBOID           8   1       +X =   49.822     -X = -49.822     +Y =   49.822     -Y = -49.822     +Z =   74.930     -Z = -8.8900
                                      TRIGA - PREF. FLOOD CANISTER  - 2 ROD FILLING CANISTER + TOLERANCE
-
                  MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION             NUM   ID

                                                -----   UNIT    41   -----

TRIGA FUEL ELEMENT

  1 CYLINDER         4   1  RADIUS = 0.28580     +Z =   19.050     -Z = -19.050     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  2 CYLINDER        10   1  RADIUS =  1.8224     +Z =   19.050     -Z = -19.050     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CYLINDER         5   1  RADIUS =  1.8224     +Z =   27.737     -Z = -27.737     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  4 CYLINDER         2   1  RADIUS =  1.8771     +Z =   27.737     -Z = -27.737     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  5 CYLINDER        11   1  RADIUS =  1.8771     +Z =   36.703     -Z = -36.703     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

                                                -----   UNIT    45   -----

3.38 IN WIDTH / 0.28 IN THICKNESS DIVIDER CENTER STACK

  1 CUBOID           2   1       +X =   4.2926     -X = -4.2926     +Y = 0.71120     -Y = 0.00000     +Z =   36.703     -Z = -36.703

                                                -----   UNIT    46   -----

3.38 IN WIDTH / 0.24 IN THICKNESS DIVIDER OUTSIDE STACK

  1 CUBOID           2   1       +X =   4.2926     -X = -4.2926     +Y = 0.60960     -Y = 0.00000     +Z =   36.703     -Z = -36.703

                                                -----   UNIT    50   -----

TRIGA FUEL ELEMENTS IN TOP OF 3.38 IN X 3.38 IN OPENING

  1 CUBOID          12   1       +X =   4.2926     -X = -4.2926     +Y =   4.2926     -Y = -4.2926     +Z =   36.703     -Z = -36.703

    HOLE NUMBER     11        AT X =  1.8772      Y =  2.4154      Z = 0.00000     IS UNIT NUMBER     41

    HOLE NUMBER     12        AT X = -1.8772      Y =  2.4154      Z = 0.00000     IS UNIT NUMBER     41

    HOLE NUMBER     13        AT X = -1.8772      Y = -1.3389      Z = 0.00000     IS UNIT NUMBER     41

    HOLE NUMBER     14        AT X =  1.8772      Y = -1.3389      Z = 0.00000     IS UNIT NUMBER     41
                                      TRIGA - PREF. FLOOD CANISTER  - 2 ROD FILLING CANISTER + TOLERANCE
-
                  MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION             NUM   ID

                                                -----   UNIT    51   -----

TRIGA FUEL ELEMENTS IN BOTTOM OF 3.38 IN X 3.38 IN OPENING

  1 CUBOID          12   1       +X =   4.2926     -X = -4.2926     +Y =   4.2926     -Y = -4.2926     +Z =   36.703     -Z = -36.703

    HOLE NUMBER     15        AT X =  1.8772      Y = -2.4154      Z = 0.00000     IS UNIT NUMBER     41

    HOLE NUMBER     16        AT X = -1.8772      Y = -2.4154      Z = 0.00000     IS UNIT NUMBER     41
```

```
    HOLE NUMBER     17      AT X = -1.8772      Y =  1.3389      Z = 0.00000     IS UNIT NUMBER     41
    HOLE NUMBER     18      AT X =  1.8772      Y =  1.3389      Z = 0.00000     IS UNIT NUMBER     41

                                         -----  UNIT    52   -----
TRIGA FUEL ELEMENTS IN BOTTOM RIGHT OF 3.38 IN X 3.38 IN OPENING
  1 CUBOID          12  1       +X =  4.2926      -X = -4.2926      +Y =  4.2926      -Y = -4.2926      +Z =  36.703     -Z = -36.703
    HOLE NUMBER     19      AT X =  2.4154      Y = -2.4154      Z = 0.00000     IS UNIT NUMBER     41
    HOLE NUMBER     20      AT X =  2.4154      Y =  1.3389      Z = 0.00000     IS UNIT NUMBER     41
    HOLE NUMBER     21      AT X = -1.3389      Y = -2.4154      Z = 0.00000     IS UNIT NUMBER     41
    HOLE NUMBER     22      AT X = -1.3389      Y =  1.3389      Z = 0.00000     IS UNIT NUMBER     41

                                         -----  UNIT    53   -----
TRIGA FUEL ELEMENTS IN TOP RIGHT OF 3.38 IN X 3.38 IN OPENING
  1 CUBOID          12  1       +X =  4.2926      -X = -4.2926      +Y =  4.2926      -Y = -4.2926      +Z =  36.703     -Z = -36.703
    HOLE NUMBER     23      AT X =  2.4154      Y =  2.4154      Z = 0.00000     IS UNIT NUMBER     41
    HOLE NUMBER     24      AT X =  2.4154      Y = -1.3389      Z = 0.00000     IS UNIT NUMBER     41
    HOLE NUMBER     25      AT X = -1.3389      Y =  2.4154      Z = 0.00000     IS UNIT NUMBER     41
    HOLE NUMBER     26      AT X = -1.3389      Y = -1.3389      Z = 0.00000     IS UNIT NUMBER     41
                                    TRIGA - PREF. FLOOD CANISTER  - 2 ROD FILLING CANISTER + TOLERANCE
-
                  MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION             NUM   ID

                                         -----  UNIT    54   -----
TRIGA FUEL ELEMENTS IN BOTTOM LEFT OF 3.38 IN X 3.38 IN OPENING
  1 CUBOID          12  1       +X =  4.2926      -X = -4.2926      +Y =  4.2926      -Y = -4.2926      +Z =  36.703     -Z = -36.703
    HOLE NUMBER     27      AT X = -2.4154      Y = -2.4154      Z = 0.00000     IS UNIT NUMBER     41
    HOLE NUMBER     28      AT X = -2.4154      Y =  1.3389      Z = 0.00000     IS UNIT NUMBER     41
    HOLE NUMBER     29      AT X =  1.3389      Y = -2.4154      Z = 0.00000     IS UNIT NUMBER     41
    HOLE NUMBER     30      AT X =  1.3389      Y =  1.3389      Z = 0.00000     IS UNIT NUMBER     41

                                         -----  UNIT    55   -----
TRIGA FUEL ELEMENTS IN TOP LEFT OF 3.38 IN X 3.38 IN OPENING
  1 CUBOID          12  1       +X =  4.2926      -X = -4.2926      +Y =  4.2926      -Y = -4.2926      +Z =  36.703     -Z = -36.703
    HOLE NUMBER     31      AT X = -2.4154      Y =  2.4154      Z = 0.00000     IS UNIT NUMBER     41
    HOLE NUMBER     32      AT X = -2.4154      Y = -1.3389      Z = 0.00000     IS UNIT NUMBER     41
    HOLE NUMBER     33      AT X =  1.3389      Y =  2.4154      Z = 0.00000     IS UNIT NUMBER     41
    HOLE NUMBER     34      AT X =  1.3389      Y = -1.3389      Z = 0.00000     IS UNIT NUMBER     41

                                         -----  UNIT    56   -----
TRIGA BASKET 3.38 IN X 3.38 IN CENTER OPENING
  1 CUBOID          12  1       +X =  4.2926      -X = -4.2926      +Y =  4.2926      -Y = -4.2926      +Z =  36.703     -Z = -36.703

                                  -----  UNIT    60  EXTERNAL TO LATTICE 11   -----
CENTER COLUMN OF THREE OPENINGS W/ 0.28 IN PLATE
  1 ARRAY NUMBER    11          +X =  4.2926      -X = -4.2926      +Y =  13.589      -Y = -13.589      +Z =  36.703     -Z = -36.703
  2 CUBOID           2  1       +X =  5.0038      -X = -5.0038      +Y =  14.300      -Y = -14.300      +Z =  36.703     -Z = -36.703

                                  -----  UNIT    61  EXTERNAL TO LATTICE 12   -----
LEFT OUTSIDE COLUMN OF TWO OPENINGS W/ 0.12 IN PLATE
  1 ARRAY NUMBER    12          +X =  4.2926      -X = -4.2926      +Y =  8.8900      -Y = -8.8900      +Z =  36.703     -Z = -36.703
  2 CUBOID           2  1       +X =  4.2926      -X = -4.5974      +Y =  9.1948      -Y = -9.1948      +Z =  36.703     -Z = -36.703
                                    TRIGA - PREF. FLOOD CANISTER  - 2 ROD FILLING CANISTER + TOLERANCE
-
                  MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION             NUM   ID

                                  -----  UNIT    62  EXTERNAL TO LATTICE 13   -----
RIGHT OUTSIDE COLUMN OF TWO OPENINGS W/ 0.12 IN PLATE
```

```
  1 ARRAY NUMBER    13        +X =  4.2926     -X = -4.2926     +Y =  8.8900     -Y = -8.8900     +Z =  36.703     -Z = -36.703
  2 CUBOID           2  1     +X =  4.5974     -X = -4.2926     +Y =  9.1948     -Y = -9.1948     +Z =  36.703     -Z = -36.703

                                                 -----   UNIT    70   -----

NAC-LWT TRIGA BASKET
  1 CYLINDER        12  1  RADIUS =  17.100    +Z =  36.703     -Z = -36.703     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
    HOLE NUMBER     35        AT X = 0.00000     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER     60
    HOLE NUMBER     36        AT X = -9.2974     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER     61
    HOLE NUMBER     37        AT X =  9.2974     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER     62
  2 CYLINDER         2  1  RADIUS =  18.910    +Z =  37.338     -Z = -37.338     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  3 CYLINDER         6  1  RADIUS =  33.465    +Z =  37.338     -Z = -37.338     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  4 CYLINDER         2  1  RADIUS =  36.519    +Z =  37.338     -Z = -37.338     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  5 CYLINDER         7  1  RADIUS =  49.223    +Z =  37.338     -Z = -37.338     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  6 CYLINDER         2  1  RADIUS =  49.822    +Z =  37.338     -Z = -37.338     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  7 CUBOID           8  1     +X =  49.822     -X = -49.822     +Y =  49.822     -Y = -49.822     +Z =  37.338     -Z = -37.338

                                                 -----   UNIT    80   -----

SIMPLIFIED LID STRUCTURE NAC-LWT
  1 CYLINDER         2  1  RADIUS =  36.519    +Z =  14.135     -Z = -14.135     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  2 CYLINDER         8  1  RADIUS =  49.822    +Z =  14.135     -Z = -14.135     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  3 CUBOID           8  1     +X =  49.822     -X = -49.822     +Y =  49.822     -Y = -49.822     +Z =  14.135     -Z = -14.135
_                                        TRIGA - PREF. FLOOD CANISTER  - 2 ROD FILLING CANISTER + TOLERANCE

                MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID

                                                 -----   UNIT    81   -----

SIMPLIFIED CASK BOTTOM STRUCTURE NAC-LWT
  1 CYLINDER         6  1  RADIUS =  26.353    +Z =  3.8100     -Z = -3.8100     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  2 CYLINDER         2  1  RADIUS =  36.619    +Z =  13.970     -Z = -12.700     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  3 CYLINDER         8  1  RADIUS =  49.822    +Z =  13.970     -Z = -12.700     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  4 CUBOID           8  1     +X =  49.822     -X = -49.822     +Y =  49.822     -Y = -49.822     +Z =  13.970     -Z = -12.700

                                        ******************    GLOBAL   ******************
                                        -----    UNIT    82  EXTERNAL TO LATTICE 20    -----

STACK OF 5 BASKETS IN CASK
  1 ARRAY NUMBER    20        +X =  49.822     -X = -49.822     +Y =  49.822     -Y = -49.822     +Z =  225.31     -Z = -221.30
_                             TRIGA - PREF. FLOOD CANISTER  - 2 ROD FILLING CANISTER + TOLERANCE

                  -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   1          -------

Z LAYER    1, X COLUMN    1 TO    1 LEFT TO RIGHT    Y ROW    1 TO    5  BOTTOM TO TOP
 11
  5
 16
  5
 10

                  -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   2          -------

Z LAYER    1, X COLUMN    1 TO    1 LEFT TO RIGHT    Y ROW    1 TO    3  BOTTOM TO TOP
 12
  6
 13

                  -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   3          -------

Z LAYER    1, X COLUMN    1 TO    1 LEFT TO RIGHT    Y ROW    1 TO    3  BOTTOM TO TOP
 14
  6
 15

                  -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  11          -------
```

```
Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   5  BOTTOM TO TOP
 51
 45
 56
 45
 50
                ------- UNIT ORIENTATION DESCRIPTION FOR ARRAY  12        -------
Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   3  BOTTOM TO TOP
 52
 46
 53
                       TRIGA - PREF. FLOOD CANISTER  - 2 ROD FILLING CANISTER + TOLERANCE
                ------- UNIT ORIENTATION DESCRIPTION FOR ARRAY  13        -------
Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   3  BOTTOM TO TOP
 54
 46
 55
                ------- UNIT ORIENTATION DESCRIPTION FOR ARRAY  20        -------
Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
 81
Z LAYER   2, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
 30
Z LAYER   3, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
 70
Z LAYER   4, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
 70
Z LAYER   5, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
 70
Z LAYER   6, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
 30
Z LAYER   7, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
 80
                             TRIGA - PREF. FLOOD CANISTER  - 2 ROD FILLING CANISTER + TOLERANCE
                            VOLUMES FOR THOSE UNITS UTILIZED IN  THIS PROBLEM
```

UNIT	REGION	GEOMETRY REGION	VOLUME	CUMULATIVE VOLUME
1	1	1	3.04527E+03 CM**3	3.04527E+03 CM**3
5	1	2	5.04003E+02 CM**3	5.04003E+02 CM**3
6	1	3	4.32002E+02 CM**3	4.32002E+02 CM**3
7	1	4	2.52441E-01 CM**3	3.04552E+03 CM**3
	2	5	4.63830E+02 CM**3	3.50935E+03 CM**3
	3	6	9.63081E+02 CM**3	4.47243E+03 CM**3
10	1	7	1.61160E+03 CM**3	6.08403E+03 CM**3
11	1	8	1.61160E+03 CM**3	6.08403E+03 CM**3
12	1	9	1.61160E+03 CM**3	6.08403E+03 CM**3
13	1	10	1.61160E+03 CM**3	6.08403E+03 CM**3
14	1	11	1.61160E+03 CM**3	6.08403E+03 CM**3
15	1	12	1.61160E+03 CM**3	6.08403E+03 CM**3
16	1	13	6.08403E+03 CM**3	6.08403E+03 CM**3
SURROUNDING GEOMETRY VOLUMES -			GEOMETRY REGION	14 IS AN ARRAY PLACEMENT BOUNDARY REGION
20	1	14	1.92601E+04 CM**3	1.92601E+04 CM**3
	2	15	4.36604E+03 CM**3	2.36261E+04 CM**3
SURROUNDING GEOMETRY VOLUMES -			GEOMETRY REGION	16 IS AN ARRAY PLACEMENT BOUNDARY REGION
21	1	16	1.26001E+04 CM**3	1.26001E+04 CM**3
	2	17	8.94680E+02 CM**3	1.34948E+04 CM**3
SURROUNDING GEOMETRY VOLUMES -			GEOMETRY REGION	18 IS AN ARRAY PLACEMENT BOUNDARY REGION
22	1	18	1.26001E+04 CM**3	1.26001E+04 CM**3
	2	19	8.94680E+02 CM**3	1.34948E+04 CM**3

```
 30          1        20          2.52129E+04 CM**3         7.58286E+04 CM**3
             2        21          1.83375E+04 CM**3         9.41660E+04 CM**3
             3        22          2.00728E+05 CM**3         2.94894E+05 CM**3
             4        23          5.62864E+04 CM**3         3.51181E+05 CM**3
             5        24          2.86831E+05 CM**3         6.38011E+05 CM**3
             6        25          1.56332E+04 CM**3         6.53645E+05 CM**3
             7        26          1.78602E+05 CM**3         8.32246E+05 CM**3

 41          1        27          9.77686E+00 CM**3         9.77686E+00 CM**3
             2        28          3.87746E+02 CM**3         3.97523E+02 CM**3
             3        29          1.81270E+02 CM**3         5.78793E+02 CM**3
             4        30          3.52668E+01 CM**3         6.14060E+02 CM**3
             5        31          1.98501E+02 CM**3         8.12561E+02 CM**3

 45          1        32          4.48202E+02 CM**3         4.48202E+02 CM**3

 46          1        33          3.84173E+02 CM**3         3.84173E+02 CM**3

 50          1        34          2.16019E+03 CM**3         5.41044E+03 CM**3

 51          1        35          2.16019E+03 CM**3         5.41044E+03 CM**3

 52          1        36          2.16019E+03 CM**3         5.41044E+03 CM**3

 53          1        37          2.16019E+03 CM**3         5.41044E+03 CM**3

 54          1        38          2.16019E+03 CM**3         5.41044E+03 CM**3

 55          1        39          2.16019E+03 CM**3         5.41044E+03 CM**3

 56          1        40          5.41044E+03 CM**3         5.41044E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     41 IS AN ARRAY PLACEMENT BOUNDARY REGION

 60          1        41          1.71277E+04 CM**3         1.71277E+04 CM**3
             2        42          3.88265E+03 CM**3         2.10104E+04 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     43 IS AN ARRAY PLACEMENT BOUNDARY REGION

 61          1        43          1.12050E+04 CM**3         1.12050E+04 CM**3
             2        44          7.95625E+02 CM**3         1.20007E+04 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     45 IS AN ARRAY PLACEMENT BOUNDARY REGION

 62          1        45          1.12050E+04 CM**3         1.12050E+04 CM**3
             2        46          7.95625E+02 CM**3         1.20007E+04 CM**3

 70          1        47          2.24215E+04 CM**3         6.74332E+04 CM**3
             2        48          1.64602E+04 CM**3         8.38934E+04 CM**3
             3        49          1.78831E+05 CM**3         2.62724E+05 CM**3
             4        50          5.01461E+04 CM**3         3.12870E+05 CM**3
             5        51          2.55540E+05 CM**3         5.68410E+05 CM**3
             6        52          1.39278E+04 CM**3         5.82338E+05 CM**3
             7        53          1.59118E+05 CM**3         7.41456E+05 CM**3

 80          1        54          1.18444E+05 CM**3         1.18444E+05 CM**3
             2        55          1.02013E+05 CM**3         2.20456E+05 CM**3
             3        56          6.02374E+04 CM**3         2.80694E+05 CM**3

 81          1        57          1.66245E+04 CM**3         1.66245E+04 CM**3
             2        58          9.57276E+04 CM**3         1.12352E+05 CM**3
             3        59          9.56257E+04 CM**3         2.07978E+05 CM**3
             4        60          5.68278E+04 CM**3         2.64806E+05 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     61 IS AN ARRAY PLACEMENT BOUNDARY REGION

 82          1        61          4.43436E+06 CM**3         4.43436E+06 CM**3
```

UNIT	USES	REGION	MIXTURE	TOTAL VOLUME
1	12	1	1	3.65432E+04 CM**3
5	4	1	2	2.01601E+03 CM**3
6	4	1	2	1.72801E+03 CM**3
7	12	1	12	3.02930E+00 CM**3
		2	2	5.56596E+03 CM**3
		3	12	1.15570E+04 CM**3
10	2	1	12	3.22321E+03 CM**3
11	2	1	12	3.22321E+03 CM**3
12	2	1	12	3.22321E+03 CM**3
13	2	1	12	3.22321E+03 CM**3
14	2	1	12	3.22321E+03 CM**3
15	2	1	12	3.22321E+03 CM**3
16	2	1	12	1.21681E+04 CM**3
20	2	1		3.85202E+04 CM**3
		2	2	8.73207E+03 CM**3
21	2	1		2.52001E+04 CM**3
		2	2	1.78936E+03 CM**3
22	2	1		2.52001E+04 CM**3

```
                                2         2             1.78936E+03 CM**3

             30      2          1        12             5.04259E+04 CM**3
                                2         2             3.66750E+04 CM**3
                                3         6             4.01456E+05 CM**3
                                4         2             1.12573E+05 CM**3
                                5         7             5.73661E+05 CM**3
                                6         2             3.12664E+04 CM**3
                                7         8             3.57203E+05 CM**3

             41     72          1         4             7.03934E+02 CM**3
                                2        10             2.79177E+04 CM**3
                                3         5             1.30515E+04 CM**3
                                4         2             2.53921E+03 CM**3
                                5        11             1.42921E+04 CM**3

             45      6          1         2             2.68921E+03 CM**3

             46      6          1         2             2.30504E+03 CM**3

             50      3          1        12             6.48058E+03 CM**3

             51      3          1        12             6.48058E+03 CM**3

             52      3          1        12             6.48058E+03 CM**3

             53      3          1        12             6.48058E+03 CM**3

             54      3          1        12             6.48058E+03 CM**3

             55      3          1        12             6.48058E+03 CM**3

             56      3          1        12             1.62313E+04 CM**3

             60      3          1                       5.13832E+04 CM**3
                                2         2             1.16479E+04 CM**3

             61      3          1                       3.36151E+04 CM**3
                                2         2             2.38688E+03 CM**3

             62      3          1                       3.36151E+04 CM**3
                                2         2             2.38688E+03 CM**3

             70      3          1        12             6.72644E+04 CM**3
                                2         2             4.93806E+04 CM**3
                                3         6             5.36492E+05 CM**3
                                4         2             1.50438E+05 CM**3
                                5         7             7.66620E+05 CM**3
                                6         2             4.17833E+04 CM**3
                                7         8             4.77353E+05 CM**3

             80      1          1         2             1.18444E+05 CM**3
                                2         8             1.02013E+05 CM**3
                                3         8             6.02374E+04 CM**3

             81      1          1         6             1.66245E+04 CM**3
                                2         2             9.57276E+04 CM**3
                                3         8             9.56257E+04 CM**3
                                4         8             5.68278E+04 CM**3

             82      1          1                       4.43436E+06 CM**3

                           TOTAL MIXTURE VOLUMES
                      MIXTURE          TOTAL VOLUME              MASS(G)
                         1          3.65432E+04 CM**3          8.13227E+04
                         2          6.81863E+05 CM**3          5.40036E+06
                         4          7.03934E+02 CM**3          4.56853E+03
                         5          1.30515E+04 CM**3          2.74083E+04
                         6          9.54572E+05 CM**3          1.08287E+07
                         7          1.34028E+06 CM**3          1.33783E-14
                         8          1.14926E+06 CM**3          1.14716E-14
                        10          2.79177E+04 CM**3          1.62435E+05
                        11          1.42921E+04 CM**3          3.81617E+04
                        12          2.15872E+05 CM**3          2.15478E-15

  ****************************************************************************************************
  ***                                                                                              ***
  ***                                     BIASING INFORMATION                                      ***
  ***                                                                                              ***
  ***     A DEFAULT WEIGHT OF    0.500 WILL BE USED FOR ALL BIAS ID'S.                             ***
  ***                                                                                              ***
  ****************************************************************************************************

                   ........    0 IO'S WERE USED IN KENO-V BEFORE TRACKING       ........

                   ........  0.01183 MINUTES WEFE USED PROCESSING DATA.        ........

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 1.45367E-02

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED WITH A FLAT DISTRIBUTION IN A CUBOID DEFINED BY:
                       +X= 4.98221E+01  -X=-4.98221E+01  +Y= 4.98221E+01  -Y=-4.98221E+01  +Z= 2.25308E+02  -Z=-2.21300E+02
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

1.31200 MINUTES WERE REQUIRED FOR STARTING.   TOTAL ELAPSED TIME IS 1.32267 MINUTES.
```

TRIGA - PREF. FLOOD CANISTER - 2 ROD FILLING CANISTER + TOLERANCE

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	972 INDEPENDENT	FISSION POINTS WERE	GENERATED	
1	8.86573E-01	1.34833E+00	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	895 INDEPENDENT	FISSION POINTS WERE	GENERATED	
2	8.96575E-01	1.37500E+00	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
3	9.46605E-01	1.39967E+00	9.46605E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	9.05069E-01	1.42717E+00	9.25837E-01	2.07680E-02	0.00000E+00	0.00000E+00
5	8.93514E-01	1.45367E+00	9.15062E-01	1.61200E-02	0.00000E+00	0.00000E+00
6	8.87426E-01	1.48017E+00	9.08153E-01	1.33291E-02	0.00000E+00	0.00000E+00
7	9.05121E-01	1.50583E+00	9.07547E-01	1.03424E-02	0.00000E+00	0.00000E+00
8	9.14380E-01	1.53333E+00	9.08686E-01	8.52102E-03	0.00000E+00	0.00000E+00
9	9.27548E-01	1.55900E+00	9.11380E-01	7.68918E-03	0.00000E+00	0.00000E+00
10	9.33538E-01	1.58633E+00	9.14150E-01	7.21207E-03	0.00000E+00	0.00000E+00
11	8.75479E-01	1.61300E+00	9.09853E-01	7.67580E-03	0.00000E+00	0.00000E+00
12	8.89903E-01	1.63950E+00	9.07858E-01	7.14943E-03	0.00000E+00	0.00000E+00
13	9.05310E-01	1.66417E+00	9.07626E-01	6.47105E-03	0.00000E+00	0.00000E+00
14	8.99313E-01	1.69067E+00	9.06934E-01	5.94772E-03	0.00000E+00	0.00000E+00
15	8.67635E-01	1.71817E+00	9.03911E-01	6.25069E-03	0.00000E+00	0.00000E+00
16	9.18474E-01	1.74383E+00	9.04951E-01	5.87977E-03	0.00000E+00	0.00000E+00
17	9.18015E-01	1.76950E+00	9.05822E-01	5.54263E-03	0.00000E+00	0.00000E+00
18	9.55121E-01	1.79600E+00	9.08903E-01	6.03113E-03	0.00000E+00	0.00000E+00
19	9.27495E-01	1.82167E+00	9.09997E-01	5.76985E-03	0.00000E+00	0.00000E+00
20	9.13119E-01	1.84733E+00	9.10170E-01	5.44263E-03	0.00000E+00	0.00000E+00
21	8.83728E-01	1.87383E+00	9.08779E-01	5.33300E-03	0.00000E+00	0.00000E+00
22	9.23650E-01	1.90133E+00	9.09522E-01	5.11368E-03	0.00000E+00	0.00000E+00
23	8.81713E-01	1.92883E+00	9.08198E-01	5.04112E-03	0.00000E+00	0.00000E+00
24	9.26039E-01	1.95533E+00	9.09009E-01	4.87445E-03	0.00000E+00	0.00000E+00
25	9.26088E-01	1.98367E+00	9.09751E-01	4.71653E-03	0.00000E+00	0.00000E+00
26	9.40076E-01	2.01017E+00	9.11015E-01	4.68917E-03	0.00000E+00	0.00000E+00
27	9.06228E-01	2.03767E+00	9.10823E-01	4.50177E-03	0.00000E+00	0.00000E+00
28	9.22137E-01	2.06417E+00	9.11259E-01	4.34699E-03	0.00000E+00	0.00000E+00
29	9.33598E-01	2.08983E+00	9.12086E-01	4.26394E-03	0.00000E+00	0.00000E+00
30	9.09525E-01	2.11550E+00	9.11994E-01	4.10985E-03	0.00000E+00	0.00000E+00
31	9.31245E-01	2.14200E+00	9.12658E-01	4.02077E-03	0.00000E+00	0.00000E+00
32	8.68747E-01	2.17050E+00	9.11195E-01	4.15106E-03	0.00000E+00	0.00000E+00
33	8.96693E-01	2.19700E+00	9.10727E-01	4.04209E-03	0.00000E+00	0.00000E+00
34	8.63080E-01	2.22450E+00	9.09238E-01	4.18740E-03	0.00000E+00	0.00000E+00
35	9.20550E-01	2.25100E+00	9.09581E-01	4.07298E-03	0.00000E+00	0.00000E+00
36	8.80113E-01	2.27750E+00	9.08714E-01	4.04530E-03	0.00000E+00	0.00000E+00
37	8.68839E-01	2.30500E+00	9.07575E-01	4.08990E-03	0.00000E+00	0.00000E+00
38	9.81777E-01	2.32967E+00	9.09636E-01	4.47733E-03	0.00000E+00	0.00000E+00
39	9.02998E-01	2.35633E+00	9.09456E-01	4.35833E-03	0.00000E+00	0.00000E+00
40	9.21249E-01	2.38367E+00	9.09767E-01	4.25343E-03	0.00000E+00	0.00000E+00
41	8.98955E-01	2.40933E+00	9.09490E-01	4.15219E-03	0.00000E+00	0.00000E+00
42	9.16342E-01	2.43583E+00	9.09661E-01	4.05068E-03	0.00000E+00	0.00000E+00
43	8.94618E-01	2.46250E+00	9.09294E-01	3.96765E-03	0.00000E+00	0.00000E+00
44	9.19541E-01	2.48983E+00	9.09538E-01	3.87971E-03	0.00000E+00	0.00000E+00
45	9.10338E-01	2.51650E+00	9.09557E-01	3.78845E-03	0.00000E+00	0.00000E+00
46	9.27432E-01	2.54383E+00	9.09963E-01	3.72358E-03	0.00000E+00	0.00000E+00
47	9.54938E-01	2.56950E+00	9.10962E-01	3.77462E-03	0.00000E+00	0.00000E+00
48	9.21564E-01	2.59617E+00	9.11193E-01	3.69884E-03	0.00000E+00	0.00000E+00
49	9.21195E-01	2.62267E+00	9.11406E-01	3.62554E-03	0.00000E+00	0.00000E+00
50	9.37939E-01	2.64833E+00	9.11958E-01	3.59199E-03	0.00000E+00	0.00000E+00
51	9.44721E-01	2.67483E+00	9.12627E-01	3.58090E-03	0.00000E+00	0.00000E+00
52	9.43395E-01	2.70050E+00	9.13242E-01	3.56210E-03	0.00000E+00	0.00000E+00
53	9.03409E-01	2.72617E+00	9.13049E-01	3.49688E-03	0.00000E+00	0.00000E+00
54	9.79075E-01	2.75167E+00	9.14319E-01	3.65651E-03	0.00000E+00	0.00000E+00
55	8.69570E-01	2.77917E+00	9.13475E-01	3.68489E-03	0.00000E+00	0.00000E+00
56	8.82250E-01	2.80567E+00	9.12897E-01	3.66195E-03	0.00000E+00	0.00000E+00
57	9.28974E-01	2.83133E+00	9.13189E-01	3.60662E-03	0.00000E+00	0.00000E+00
58	9.19140E-01	2.85783E+00	9.13295E-01	3.54322E-03	0.00000E+00	0.00000E+00
59	8.95242E-01	2.88450E+00	9.12978E-01	3.49489E-03	0.00000E+00	0.00000E+00
60	8.93794E-01	2.91100E+00	9.12648E-01	3.45000E-03	0.00000E+00	0.00000E+00
61	9.13418E-01	2.93750E+00	9.12661E-01	3.39104E-03	0.00000E+00	0.00000E+00
62	9.32754E-01	2.96417E+00	9.12996E-01	3.35082E-03	0.00000E+00	0.00000E+00
63	9.23592E-01	2.98967E+00	9.13169E-01	3.30001E-03	0.00000E+00	0.00000E+00
64	9.12051E-01	3.01717E+00	9.13151E-01	3.24640E-03	0.00000E+00	0.00000E+00
65	8.73464E-01	3.04367E+00	9.12521E-01	3.25597E-03	0.00000E+00	0.00000E+00
66	9.17888E-01	3.07033E+00	9.12605E-01	3.20579E-03	0.00000E+00	0.00000E+00
67	9.13136E-01	3.09683E+00	9.12613E-01	3.15610E-03	0.00000E+00	0.00000E+00
68	9.40430E-01	3.12250E+00	9.13035E-01	3.13636E-03	0.00000E+00	0.00000E+00
69	9.45408E-01	3.14817E+00	9.13518E-01	3.12675E-03	0.00000E+00	0.00000E+00
70	9.46323E-01	3.17367E+00	9.14000E-01	3.11797E-03	0.00000E+00	0.00000E+00
71	8.77874E-01	3.20033E+00	9.13477E-01	3.11674E-03	0.00000E+00	0.00000E+00
72	8.92626E-01	3.22767E+00	9.13179E-01	3.08630E-03	0.00000E+00	0.00000E+00
73	9.20170E-01	3.25333E+00	9.13277E-01	3.04412E-03	0.00000E+00	0.00000E+00
74	9.25709E-01	3.28000E+00	9.13450E-01	3.00650E-03	0.00000E+00	0.00000E+00
75	8.96801E-01	3.30550E+00	9.13222E-01	2.97379E-03	0.00000E+00	0.00000E+00
76	9.03788E-01	3.33217E+00	9.13095E-01	2.93610E-03	0.00000E+00	0.00000E+00
77	8.98111E-01	3.35867E+00	9.12895E-01	2.90357E-03	0.00000E+00	0.00000E+00
78	9.10537E-01	3.38517E+00	9.12864E-01	2.86527E-03	0.00000E+00	0.00000E+00
79	9.14309E-01	3.41083E+00	9.12883E-01	2.82788E-03	0.00000E+00	0.00000E+00
80	9.21505E-01	3.43733E+00	9.12993E-01	2.79358E-03	0.00000E+00	0.00000E+00
81	8.66482E-01	3.46400E+00	9.12404E-01	2.82013E-03	0.00000E+00	0.00000E+00
82	9.07877E-01	3.48950E+00	9.12348E-01	2.78523E-03	0.00000E+00	0.00000E+00
83	9.29570E-01	3.51517E+00	9.12560E-01	2.75883E-03	0.00000E+00	0.00000E+00
84	8.91949E-01	3.54167E+00	9.12309E-01	2.73655E-03	0.00000E+00	0.00000E+00
85	9.08112E-01	3.56733E+00	9.12258E-01	2.70385E-03	0.00000E+00	0.00000E+00
86	9.32694E-01	3.59300E+00	9.12502E-01	2.68252E-03	0.00000E+00	0.00000E+00
87	8.81980E-01	3.62050E+00	9.12143E-01	2.67499E-03	0.00000E+00	0.00000E+00
88	8.89171E-01	3.64700E+00	9.11876E-01	2.65716E-03	0.00000E+00	0.00000E+00
89	9.37304E-01	3.67267E+00	9.12168E-01	2.64265E-03	0.00000E+00	0.00000E+00

90	8.86836E-01	3.70017E+00	9.11880E-01	2.62826E-03	0.00000E+00	0.00000E+00
91	8.99199E-01	3.72567E+00	9.11737E-01	2.60247E-03	0.00000E+00	0.00000E+00
92	9.18743E-01	3.75233E+00	9.11815E-01	2.57456E-03	0.00000E+00	0.00000E+00
93	9.79235E-01	3.77967E+00	9.12556E-01	2.65172E-03	0.00000E+00	0.00000E+00
94	9.00994E-01	3.80633E+00	9.12431E-01	2.62574E-03	0.00000E+00	0.00000E+00
95	9.02452E-01	3.83200E+00	9.12323E-01	2.59957E-03	0.00000E+00	0.00000E+00
96	9.38238E-01	3.85933E+00	9.12599E-01	2.58650E-03	0.00000E+00	0.00000E+00
97	8.91607E-01	3.88600E+00	9.12378E-01	2.56865E-03	0.00000E+00	0.00000E+00
98	9.14741E-01	3.91250E+00	9.12403E-01	2.54188E-03	0.00000E+00	0.00000E+00
99	8.69482E-01	3.94000E+00	9.11960E-01	2.55415E-03	0.00000E+00	0.00000E+00
100	9.42607E-01	3.96650E+00	9.12273E-01	2.54723E-03	0.00000E+00	0.00000E+00
101	9.18963E-01	3.99217E+00	9.12340E-01	2.52227E-03	0.00000E+00	0.00000E+00
102	9.11021E-01	4.01950E+00	9.12327E-01	2.49696E-03	0.00000E+00	0.00000E+00
103	9.31676E-01	4.04617E+00	9.12519E-01	2.47952E-03	0.00000E+00	0.00000E+00
104	9.31187E-01	4.07183E+00	9.12702E-01	2.46190E-03	0.00000E+00	0.00000E+00
105	9.12106E-01	4.09833E+00	9.12696E-01	2.43789E-03	0.00000E+00	0.00000E+00
106	9.14433E-01	4.12583E+00	9.12713E-01	2.41439E-03	0.00000E+00	0.00000E+00
107	8.97115E-01	4.15233E+00	9.12564E-01	2.39590E-03	0.00000E+00	0.00000E+00
108	9.29588E-01	4.17800E+00	9.12725E-01	2.37862E-03	0.00000E+00	0.00000E+00
109	8.96594E-01	4.20533E+00	9.12574E-01	2.36110E-03	0.00000E+00	0.00000E+00
110	9.43979E-01	4.23200E+00	9.12865E-01	2.35714E-03	0.00000E+00	0.00000E+00
111	8.75353E-01	4.26033E+00	9.12521E-01	2.36064E-03	0.00000E+00	0.00000E+00
112	8.94002E-01	4.28783E+00	9.12352E-01	2.34513E-03	0.00000E+00	0.00000E+00
113	9.47321E-01	4.31350E+00	9.12667E-01	2.34516E-03	0.00000E+00	0.00000E+00
114	9.31552E-01	4.33900E+00	9.12836E-01	2.33024E-03	0.00000E+00	0.00000E+00
115	8.85036E-01	4.36650E+00	9.12590E-01	2.32259E-03	0.00000E+00	0.00000E+00
116	9.39129E-01	4.39217E+00	9.12823E-01	2.31387E-03	0.00000E+00	0.00000E+00
117	9.07775E-01	4.41867E+00	9.12779E-01	2.29408E-03	0.00000E+00	0.00000E+00
118	9.20362E-01	4.44433E+00	9.12844E-01	2.27515E-03	0.00000E+00	0.00000E+00
119	8.87089E-01	4.47083E+00	9.12624E-01	2.26634E-03	0.00000E+00	0.00000E+00
120	9.39109E-01	4.49650E+00	9.12849E-01	2.25823E-03	0.00000E+00	0.00000E+00
121	9.33180E-01	4.52300E+00	9.13019E-01	2.24568E-03	0.00000E+00	0.00000E+00
122	8.98252E-01	4.54967E+00	9.12896E-01	2.23029E-03	0.00000E+00	0.00000E+00
123	9.04215E-01	4.57617E+00	9.12825E-01	2.21294E-03	0.00000E+00	0.00000E+00
124	9.11441E-01	4.60183E+00	9.12813E-01	2.19476E-03	0.00000E+00	0.00000E+00
125	9.37687E-01	4.62750E+00	9.13015E-01	2.18622E-03	0.00000E+00	0.00000E+00
126	9.12857E-01	4.65400E+00	9.13014E-01	2.16851E-03	0.00000E+00	0.00000E+00
127	9.26716E-01	4.67967E+00	9.13124E-01	2.15389E-03	0.00000E+00	0.00000E+00
128	9.14491E-01	4.70617E+00	9.13135E-01	2.13675E-03	0.00000E+00	0.00000E+00
129	9.17151E-01	4.73183E+00	9.13166E-01	2.12010E-03	0.00000E+00	0.00000E+00
130	9.20122E-01	4.75733E+00	9.13221E-01	2.10417E-03	0.00000E+00	0.00000E+00
131	9.54932E-01	4.78400E+00	9.13544E-01	2.11269E-03	0.00000E+00	0.00000E+00
132	9.15704E-01	4.81050E+00	9.13561E-01	2.09644E-03	0.00000E+00	0.00000E+00
133	8.87318E-01	4.83883E+00	9.13360E-01	2.08999E-03	0.00000E+00	0.00000E+00
134	9.15454E-01	4.86550E+00	9.13376E-01	2.07416E-03	0.00000E+00	0.00000E+00
135	8.66668E-01	4.89200E+00	9.13025E-01	2.08825E-03	0.00000E+00	0.00000E+00

KENO MESSAGE NUMBER K5-132 WARNING....ONLY 992 INDEPENDENT FISSION POINTS WERE GENERATED

136	8.88865E-01	4.91850E+00	9.12845E-01	2.08043E-03	0.00000E+00	0.00000E+00
137	8.96141E-01	4.94500E+00	9.12721E-01	2.06867E-03	0.00000E+00	0.00000E+00
138	9.07659E-01	4.97167E+00	9.12684E-01	2.05374E-03	0.00000E+00	0.00000E+00
139	9.31430E-01	4.99633E+00	9.12821E-01	2.04328E-03	0.00000E+00	0.00000E+00
140	9.09886E-01	5.02283E+00	9.12799E-01	2.02853E-03	0.00000E+00	0.00000E+00
141	8.91672E-01	5.04950E+00	9.12647E-01	2.01961E-03	0.00000E+00	0.00000E+00
142	9.51248E-01	5.07500E+00	9.12923E-01	2.02400E-03	0.00000E+00	0.00000E+00
143	9.01526E-01	5.10350E+00	9.12842E-01	2.01122E-03	0.00000E+00	0.00000E+00
144	9.32889E-01	5.12900E+00	9.12983E-01	2.00199E-03	0.00000E+00	0.00000E+00
145	8.96369E-01	5.15567E+00	9.12867E-01	1.99133E-03	0.00000E+00	0.00000E+00
146	8.94883E-01	5.18217E+00	9.12742E-01	1.98140E-03	0.00000E+00	0.00000E+00
147	9.34025E-01	5.20867E+00	9.12889E-01	1.97315E-03	0.00000E+00	0.00000E+00
148	9.40990E-01	5.23433E+00	9.13081E-01	1.96902E-03	0.00000E+00	0.00000E+00
149	9.23585E-01	5.26083E+00	9.13153E-01	1.95688E-03	0.00000E+00	0.00000E+00
150	9.19423E-01	5.28650E+00	9.13195E-01	1.94408E-03	0.00000E+00	0.00000E+00
151	9.47482E-01	5.31217E+00	9.13425E-01	1.94465E-03	0.00000E+00	0.00000E+00
152	9.08613E-01	5.33783E+00	9.13393E-01	1.93191E-03	0.00000E+00	0.00000E+00
153	8.95331E-01	5.36533E+00	9.13274E-01	1.92280E-03	0.00000E+00	0.00000E+00
154	9.44444E-01	5.39183E+00	9.13479E-01	1.92108E-03	0.00000E+00	0.00000E+00
155	8.93390E-01	5.41933E+00	9.13347E-01	1.91299E-03	0.00000E+00	0.00000E+00
156	8.92057E-01	5.44483E+00	9.13209E-01	1.90555E-03	0.00000E+00	0.00000E+00
157	9.03251E-01	5.47233E+00	9.13145E-01	1.89431E-03	0.00000E+00	0.00000E+00
158	8.97884E-01	5.49883E+00	9.13047E-01	1.88467E-03	0.00000E+00	0.00000E+00
159	8.64900E-01	5.52633E+00	9.12740E-01	1.89757E-03	0.00000E+00	0.00000E+00
160	8.97223E-01	5.55383E+00	9.12642E-01	1.88808E-03	0.00000E+00	0.00000E+00
161	9.18827E-01	5.57950E+00	9.12681E-01	1.87657E-03	0.00000E+00	0.00000E+00
162	9.24453E-01	5.60600E+00	9.12755E-01	1.86625E-03	0.00000E+00	0.00000E+00
163	8.87075E-01	5.63350E+00	9.12595E-01	1.86147E-03	0.00000E+00	0.00000E+00
164	9.46600E-01	5.65817E+00	9.12805E-01	1.86182E-03	0.00000E+00	0.00000E+00
165	9.22187E-01	5.68383E+00	9.12863E-01	1.85125E-03	0.00000E+00	0.00000E+00
166	9.36622E-01	5.70850E+00	9.13008E-01	1.84563E-03	0.00000E+00	0.00000E+00
167	9.53502E-01	5.73417E+00	9.13253E-01	1.85075E-03	0.00000E+00	0.00000E+00
168	9.17649E-01	5.75983E+00	9.13279E-01	1.83976E-03	0.00000E+00	0.00000E+00
169	9.23258E-01	5.78550E+00	9.13339E-01	1.82968E-03	0.00000E+00	0.00000E+00
170	9.26120E-01	5.81100E+00	9.13415E-01	1.82035E-03	0.00000E+00	0.00000E+00
171	9.26614E-01	5.83583E+00	9.13493E-01	1.81123E-03	0.00000E+00	0.00000E+00
172	9.08422E-01	5.86317E+00	9.13464E-01	1.80079E-03	0.00000E+00	0.00000E+00
173	9.02981E-01	5.88983E+00	9.13402E-01	1.79128E-03	0.00000E+00	0.00000E+00
174	9.18104E-01	5.91550E+00	9.13430E-01	1.78105E-03	0.00000E+00	0.00000E+00
175	8.91059E-01	5.94100E+00	9.13300E-01	1.77544E-03	0.00000E+00	0.00000E+00
176	8.95988E-01	5.96850E+00	9.13201E-01	1.76800E-03	0.00000E+00	0.00000E+00
177	9.03157E-01	5.99500E+00	9.13143E-01	1.75881E-03	0.00000E+00	0.00000E+00
178	9.30350E-01	6.02067E+00	9.13241E-01	1.75152E-03	0.00000E+00	0.00000E+00
179	9.01541E-01	6.04633E+00	9.13175E-01	1.74285E-03	0.00000E+00	0.00000E+00
180	9.35730E-01	6.07200E+00	9.13302E-01	1.73766E-03	0.00000E+00	0.00000E+00
181	9.59340E-01	6.09767E+00	9.13559E-01	1.74696E-03	0.00000E+00	0.00000E+00
182	9.24043E-01	6.12417E+00	9.13617E-01	1.73820E-03	0.00000E+00	0.00000E+00
183	9.16527E-01	6.15067E+00	9.13633E-01	1.72865E-03	0.00000E+00	0.00000E+00

184	8.97510E-01	6.17717E+00	9.13545E-01	1.72140E-03	0.00000E+00	0.00000E+00
185	9.26277E-01	6.20283E+00	9.13614E-01	1.71338E-03	0.00000E+00	0.00000E+00
186	9.05086E-01	6.22850E+00	9.13568E-01	1.70468E-03	0.00000E+00	0.00000E+00
187	8.84514E-01	6.25600E+00	9.13411E-01	1.70269E-03	0.00000E+00	0.00000E+00
188	9.23112E-01	6.28167E+00	9.13463E-01	1.69432E-03	0.00000E+00	0.00000E+00
189	9.13747E-01	6.30817E+00	9.13465E-01	1.68523E-03	0.00000E+00	0.00000E+00
190	9.20376E-01	6.33383E+00	9.13501E-01	1.67665E-03	0.00000E+00	0.00000E+00
191	8.83891E-01	6.36117E+00	9.13345E-01	1.67510E-03	0.00000E+00	0.00000E+00
192	9.27817E-01	6.38683E+00	9.13421E-01	1.66800E-03	0.00000E+00	0.00000E+00
193	9.44874E-01	6.41350E+00	9.13586E-01	1.66739E-03	0.00000E+00	0.00000E+00
194	9.09017E-01	6.43900E+00	9.13562E-01	1.65886E-03	0.00000E+00	0.00000E+00
195	8.94144E-01	6.46650E+00	9.13461E-01	1.65330E-03	0.00000E+00	0.00000E+00
196	8.72850E-01	6.49300E+00	9.13252E-01	1.65803E-03	0.00000E+00	0.00000E+00
197	8.64799E-01	6.52150E+00	9.13003E-01	1.66811E-03	0.00000E+00	0.00000E+00
198	9.19588E-01	6.54433E+00	9.13037E-01	1.65992E-03	0.00000E+00	0.00000E+00
199	8.81152E-01	6.57183E+00	9.12875E-01	1.65939E-03	0.00000E+00	0.00000E+00
200	9.45768E-01	6.59650E+00	9.13041E-01	1.65932E-03	0.00000E+00	0.00000E+00
201	9.35985E-01	6.62217E+00	9.13156E-01	1.65498E-03	0.00000E+00	0.00000E+00
202	9.29791E-01	6.64783E+00	9.13240E-01	1.64878E-03	0.00000E+00	0.00000E+00
203	8.99879E-01	6.67433E+00	9.13173E-01	1.64191E-03	0.00000E+00	0.00000E+00
204	8.93893E-01	6.70083E+00	9.13078E-01	1.63654E-03	0.00000E+00	0.00000E+00
205	9.12423E-01	6.72733E+00	9.13074E-01	1.62847E-03	0.00000E+00	0.00000E+00
206	8.95375E-01	6.75400E+00	9.12988E-01	1.62278E-03	0.00000E+00	0.00000E+00
207	9.06899E-01	6.78050E+00	9.12958E-01	1.61512E-03	0.00000E+00	0.00000E+00
208	9.11243E-01	6.80700E+00	9.12950E-01	1.60728E-03	0.00000E+00	0.00000E+00
209	9.54339E-01	6.83183E+00	9.13150E-01	1.61195E-03	0.00000E+00	0.00000E+00
210	9.39832E-01	6.85733E+00	9.13278E-01	1.60930E-03	0.00000E+00	0.00000E+00
211	9.24160E-01	6.88400E+00	9.13330E-01	1.60243E-03	0.00000E+00	0.00000E+00
212	9.33426E-01	6.91050E+00	9.13426E-01	1.59765E-03	0.00000E+00	0.00000E+00
213	9.55546E-01	6.93517E+00	9.13625E-01	1.60254E-03	0.00000E+00	0.00000E+00
214	9.40680E-01	6.96183E+00	9.13753E-01	1.60006E-03	0.00000E+00	0.00000E+00
215	8.73982E-01	6.98833E+00	9.13566E-01	1.60344E-03	0.00000E+00	0.00000E+00
216	8.77587E-01	7.01583E+00	9.13398E-01	1.60476E-03	0.00000E+00	0.00000E+00
217	9.07999E-01	7.04133E+00	9.13373E-01	1.59748E-03	0.00000E+00	0.00000E+00
218	8.72392E-01	7.06800E+00	9.13183E-01	1.60134E-03	0.00000E+00	0.00000E+00
219	9.17626E-01	7.09450E+00	9.13204E-01	1.59406E-03	0.00000E+00	0.00000E+00
220	8.90346E-01	7.12100E+00	9.13099E-01	1.59021E-03	0.00000E+00	0.00000E+00
221	9.30152E-01	7.14850E+00	9.13177E-01	1.58485E-03	0.00000E+00	0.00000E+00
222	9.30915E-01	7.17600E+00	9.13257E-01	1.57968E-03	0.00000E+00	0.00000E+00
223	8.98220E-01	7.20350E+00	9.13189E-01	1.57399E-03	0.00000E+00	0.00000E+00
224	9.16913E-01	7.23083E+00	9.13206E-01	1.56698E-03	0.00000E+00	0.00000E+00
225	9.36257E-01	7.25833E+00	9.13309E-01	1.56335E-03	0.00000E+00	0.00000E+00
226	8.86142E-01	7.28400E+00	9.13188E-01	1.56108E-03	0.00000E+00	0.00000E+00
227	9.18733E-01	7.31150E+00	9.13213E-01	1.55432E-03	0.00000E+00	0.00000E+00
228	9.04503E-01	7.33883E+00	9.13174E-01	1.54791E-03	0.00000E+00	0.00000E+00
229	9.11392E-01	7.36550E+00	9.13166E-01	1.54109E-03	0.00000E+00	0.00000E+00
230	8.62658E-01	7.39300E+00	9.12945E-01	1.55023E-03	0.00000E+00	0.00000E+00
231	9.13911E-01	7.41950E+00	9.12949E-01	1.54345E-03	0.00000E+00	0.00000E+00
232	9.02364E-01	7.44700E+00	9.12903E-01	1.53741E-03	0.00000E+00	0.00000E+00
233	9.47530E-01	7.47250E+00	9.13053E-01	1.53807E-03	0.00000E+00	0.00000E+00
234	9.44243E-01	7.49817E+00	9.13187E-01	1.53731E-03	0.00000E+00	0.00000E+00
235	8.88140E-01	7.52650E+00	9.13060E-01	1.53447E-03	0.00000E+00	0.00000E+00
236	9.19263E-01	7.55217E+00	9.13106E-01	1.52813E-03	0.00000E+00	0.00000E+00
237	9.23997E-01	7.57883E+00	9.13153E-01	1.52231E-03	0.00000E+00	0.00000E+00
238	9.23856E-01	7.60433E+00	9.13198E-01	1.51653E-03	0.00000E+00	0.00000E+00
239	9.03672E-01	7.63000E+00	9.13158E-01	1.51065E-03	0.00000E+00	0.00000E+00
240	9.25109E-01	7.65467E+00	9.13208E-01	1.50513E-03	0.00000E+00	0.00000E+00
241	8.93009E-01	7.68133E+00	9.13124E-01	1.50120E-03	0.00000E+00	0.00000E+00
242	9.33327E-01	7.70783E+00	9.13208E-01	1.49730E-03	0.00000E+00	0.00000E+00
243	9.48267E-01	7.73350E+00	9.13353E-01	1.49815E-03	0.00000E+00	0.00000E+00
244	9.19141E-01	7.76000E+00	9.13377E-01	1.49214E-03	0.00000E+00	0.00000E+00
245	9.44672E-01	7.78467E+00	9.13506E-01	1.49156E-03	0.00000E+00	0.00000E+00
246	9.15887E-01	7.81033E+00	9.13516E-01	1.48546E-03	0.00000E+00	0.00000E+00
247	9.30912E-01	7.83600E+00	9.13567E-01	1.48109E-03	0.00000E+00	0.00000E+00
248	9.59002E-01	7.86067E+00	9.13771E-01	1.48657E-03	0.00000E+00	0.00000E+00
249	9.00273E-01	7.88633E+00	9.13717E-01	1.48154E-03	0.00000E+00	0.00000E+00
250	9.28078E-01	7.91383E+00	9.13775E-01	1.47669E-03	0.00000E+00	0.00000E+00
251	9.42718E-01	7.94033E+00	9.13891E-01	1.47534E-03	0.00000E+00	0.00000E+00
252	9.55589E-01	7.96600E+00	9.14058E-01	1.47886E-03	0.00000E+00	0.00000E+00
253	9.23685E-01	7.99167E+00	9.14096E-01	1.47346E-03	0.00000E+00	0.00000E+00
254	8.78260E-01	8.01817E+00	9.13954E-01	1.47447E-03	0.00000E+00	0.00000E+00
255	9.35734E-01	8.04567E+00	9.14040E-01	1.47115E-03	0.00000E+00	0.00000E+00
256	9.04964E-01	8.07217E+00	9.14004E-01	1.46579E-03	0.00000E+00	0.00000E+00
257	9.42663E-01	8.09783E+00	9.14116E-01	1.46435E-03	0.00000E+00	0.00000E+00
258	9.44797E-01	8.12350E+00	9.14236E-01	1.46353E-03	0.00000E+00	0.00000E+00
259	8.97386E-01	8.15000E+00	9.14171E-01	1.45930E-03	0.00000E+00	0.00000E+00
260	8.94212E-01	8.17750E+00	9.14093E-01	1.45569E-03	0.00000E+00	0.00000E+00
261	8.93854E-01	8.20483E+00	9.14015E-01	1.45216E-03	0.00000E+00	0.00000E+00
262	8.80088E-01	8.23233E+00	9.13885E-01	1.45244E-03	0.00000E+00	0.00000E+00
263	8.94366E-01	8.25883E+00	9.13810E-01	1.44879E-03	0.00000E+00	0.00000E+00
264	9.26458E-01	8.28550E+00	9.13858E-01	1.44406E-03	0.00000E+00	0.00000E+00
265	9.03500E-01	8.31300E+00	9.13819E-01	1.43910E-03	0.00000E+00	0.00000E+00
266	9.05842E-01	8.33950E+00	9.13789E-01	1.43395E-03	0.00000E+00	0.00000E+00
267	9.05741E-01	8.36600E+00	9.13756E-01	1.42886E-03	0.00000E+00	0.00000E+00
268	9.14516E-01	8.39250E+00	9.13761E-01	1.42348E-03	0.00000E+00	0.00000E+00
269	8.92759E-01	8.41917E+00	9.13682E-01	1.42032E-03	0.00000E+00	0.00000E+00
270	8.90366E-01	8.44650E+00	9.13595E-01	1.41768E-03	0.00000E+00	0.00000E+00
271	9.10508E-01	8.47317E+00	9.13584E-01	1.41244E-03	0.00000E+00	0.00000E+00
272	9.19783E-01	8.49967E+00	9.13607E-01	1.40739E-03	0.00000E+00	0.00000E+00
273	9.00867E-01	8.52533E+00	9.13560E-01	1.40298E-03	0.00000E+00	0.00000E+00
274	9.13967E-01	8.55367E+00	9.13561E-01	1.39781E-03	0.00000E+00	0.00000E+00
275	8.84983E-01	8.57933E+00	9.13457E-01	1.39661E-03	0.00000E+00	0.00000E+00
276	9.45233E-01	8.60583E+00	9.13573E-01	1.39633E-03	0.00000E+00	0.00000E+00
277	9.36732E-01	8.63233E+00	9.13657E-01	1.39379E-03	0.00000E+00	0.00000E+00
278	9.33689E-01	8.65800E+00	9.13730E-01	1.39062E-03	0.00000E+00	0.00000E+00

279	9.08970E-01	8.68550E+00	9.13712E-01	1.38570E-03	0.00000E+00	0.00000E+00
280	8.76328E-01	8.71300E+00	9.13578E-01	1.38724E-03	0.00000E+00	0.00000E+00
281	9.64515E-01	8.73867E+00	9.13760E-01	1.39426E-03	0.00000E+00	0.00000E+00
282	8.95538E-01	8.76417E+00	9.13695E-01	1.39080E-03	0.00000E+00	0.00000E+00
283	9.38120E-01	8.78983E+00	9.13782E-01	1.38856E-03	0.00000E+00	0.00000E+00
284	8.98166E-01	8.81917E+00	9.13727E-01	1.38474E-03	0.00000E+00	0.00000E+00
285	9.30993E-01	8.84567E+00	9.13788E-01	1.38118E-03	0.00000E+00	0.00000E+00
286	9.28540E-01	8.87217E+00	9.13840E-01	1.37729E-03	0.00000E+00	0.00000E+00
287	8.83832E-01	8.89967E+00	9.13735E-01	1.37648E-03	0.00000E+00	0.00000E+00
288	9.06707E-01	8.92633E+00	9.13710E-01	1.37188E-03	0.00000E+00	0.00000E+00
289	8.98009E-01	8.95367E+00	9.13655E-01	1.36819E-03	0.00000E+00	0.00000E+00
290	9.10563E-01	8.97933E+00	9.13645E-01	1.36347E-03	0.00000E+00	0.00000E+00
291	9.35439E-01	9.00583E+00	9.13720E-01	1.36084E-03	0.00000E+00	0.00000E+00
292	9.24570E-01	9.03250E+00	9.13757E-01	1.35665E-03	0.00000E+00	0.00000E+00
293	9.02256E-01	9.05983E+00	9.13718E-01	1.35256E-03	0.00000E+00	0.00000E+00
294	9.50070E-01	9.08550E+00	9.13842E-01	1.35366E-03	0.00000E+00	0.00000E+00
295	9.16326E-01	9.11033E+00	9.13851E-01	1.34905E-03	0.00000E+00	0.00000E+00
296	9.43632E-01	9.13583E+00	9.13952E-01	1.34827E-03	0.00000E+00	0.00000E+00
297	8.79052E-01	9.16250E+00	9.13834E-01	1.34889E-03	0.00000E+00	0.00000E+00
298	9.54132E-01	9.18800E+00	9.13970E-01	1.35120E-03	0.00000E+00	0.00000E+00
299	9.25572E-01	9.21283E+00	9.14009E-01	1.34721E-03	0.00000E+00	0.00000E+00
300	9.56927E-01	9.23933E+00	9.14153E-01	1.35038E-03	0.00000E+00	0.00000E+00
301	9.02724E-01	9.26500E+00	9.14115E-01	1.34640E-03	0.00000E+00	0.00000E+00
302	9.44560E-01	9.29067E+00	9.14216E-01	1.34574E-03	0.00000E+00	0.00000E+00
303	8.79787E-01	9.31800E+00	9.14102E-01	1.34613E-03	0.00000E+00	0.00000E+00
304	8.69867E-01	9.34550E+00	9.13955E-01	1.34964E-03	0.00000E+00	0.00000E+00
305	9.33420E-01	9.37117E+00	9.14020E-01	1.34671E-03	0.00000E+00	0.00000E+00
306	9.01636E-01	9.39767E+00	9.13979E-01	1.34289E-03	0.00000E+00	0.00000E+00
307	8.83105E-01	9.42417E+00	9.13878E-01	1.34230E-03	0.00000E+00	0.00000E+00
308	9.42584E-01	9.44983E+00	9.13972E-01	1.34119E-03	0.00000E+00	0.00000E+00
309	9.69021E-01	9.47650E+00	9.14151E-01	1.34879E-03	0.00000E+00	0.00000E+00
310	8.88058E-01	9.50300E+00	9.14066E-01	1.34707E-03	0.00000E+00	0.00000E+00
311	8.87527E-01	9.53050E+00	9.13980E-01	1.34545E-03	0.00000E+00	0.00000E+00
312	8.72847E-01	9.55883E+00	9.13848E-01	1.34765E-03	0.00000E+00	0.00000E+00
313	9.14955E-01	9.58633E+00	9.13851E-01	1.34331E-03	0.00000E+00	0.00000E+00
314	9.26581E-01	9.61283E+00	9.13892E-01	1.33962E-03	0.00000E+00	0.00000E+00
315	8.93774E-01	9.63933E+00	9.13828E-01	1.33688E-03	0.00000E+00	0.00000E+00
316	9.04703E-01	9.66683E+00	9.13799E-01	1.33293E-03	0.00000E+00	0.00000E+00
317	8.73971E-01	9.69517E+00	9.13672E-01	1.33470E-03	0.00000E+00	0.00000E+00
318	9.87092E-01	9.72000E+00	9.13905E-01	1.35060E-03	0.00000E+00	0.00000E+00
319	9.36953E-01	9.74650E+00	9.13977E-01	1.34829E-03	0.00000E+00	0.00000E+00
320	9.02684E-01	9.77400E+00	9.13942E-01	1.34452E-03	0.00000E+00	0.00000E+00
321	8.99100E-01	9.80050E+00	9.13895E-01	1.34110E-03	0.00000E+00	0.00000E+00
322	9.17986E-01	9.82617E+00	9.13908E-01	1.33697E-03	0.00000E+00	0.00000E+00
323	8.83328E-01	9.85533E+00	9.13813E-01	1.33620E-03	0.00000E+00	0.00000E+00
324	9.00061E-01	9.88200E+00	9.13770E-01	1.33272E-03	0.00000E+00	0.00000E+00
325	9.01044E-01	9.90767E+00	9.13731E-01	1.32918E-03	0.00000E+00	0.00000E+00
326	9.46564E-01	9.93317E+00	9.13832E-01	1.32894E-03	0.00000E+00	0.00000E+00
327	9.22457E-01	9.95983E+00	9.13858E-01	1.32511E-03	0.00000E+00	0.00000E+00
328	9.33945E-01	9.98633E+00	9.13920E-01	1.32247E-03	0.00000E+00	0.00000E+00
329	9.20471E-01	1.00128E+01	9.13940E-01	1.31857E-03	0.00000E+00	0.00000E+00
330	9.06509E-01	1.00403E+01	9.13917E-01	1.31474E-03	0.00000E+00	0.00000E+00
331	8.96690E-01	1.00668E+01	9.13865E-01	1.31179E-03	0.00000E+00	0.00000E+00
332	9.09415E-01	1.00935E+01	9.13852E-01	1.30787E-03	0.00000E+00	0.00000E+00
333	8.96729E-01	1.01218E+01	9.13800E-01	1.30494E-03	0.00000E+00	0.00000E+00
334	9.65757E-01	1.01475E+01	9.13956E-01	1.31038E-03	0.00000E+00	0.00000E+00
335	9.35715E-01	1.01740E+01	9.14022E-01	1.30808E-03	0.00000E+00	0.00000E+00
336	9.30031E-01	1.01997E+01	9.14070E-01	1.30503E-03	0.00000E+00	0.00000E+00
337	9.10459E-01	1.02252E+01	9.14059E-01	1.30118E-03	0.00000E+00	0.00000E+00
338	8.99454E-01	1.02518E+01	9.14015E-01	1.29803E-03	0.00000E+00	0.00000E+00
339	9.40123E-01	1.02765E+01	9.14093E-01	1.29649E-03	0.00000E+00	0.00000E+00
340	9.48698E-01	1.03030E+01	9.14195E-01	1.29669E-03	0.00000E+00	0.00000E+00
341	8.91158E-01	1.03315E+01	9.14127E-01	1.29465E-03	0.00000E+00	0.00000E+00
342	9.27387E-01	1.03570E+01	9.14166E-01	1.29142E-03	0.00000E+00	0.00000E+00
343	9.12735E-01	1.03837E+01	9.14162E-01	1.28763E-03	0.00000E+00	0.00000E+00
344	8.78610E-01	1.04110E+01	9.14058E-01	1.28807E-03	0.00000E+00	0.00000E+00
345	8.99034E-01	1.04377E+01	9.13985E-01	1.28638E-03	0.00000E+00	0.00000E+00
346	9.47418E-01	1.04652E+01	9.14082E-01	1.28631E-03	0.00000E+00	0.00000E+00
347	8.94473E-01	1.04907E+01	9.14026E-01	1.28383E-03	0.00000E+00	0.00000E+00
348	9.11660E-01	1.05182E+01	9.14019E-01	1.28014E-03	0.00000E+00	0.00000E+00
349	9.23040E-01	1.05438E+01	9.14045E-01	1.27671E-03	0.00000E+00	0.00000E+00
350	9.02013E-01	1.05703E+01	9.14010E-01	1.27350E-03	0.00000E+00	0.00000E+00
351	9.06766E-01	1.05978E+01	9.13989E-01	1.27002E-03	0.00000E+00	0.00000E+00
352	9.40376E-01	1.06225E+01	9.14065E-01	1.26862E-03	0.00000E+00	0.00000E+00
353	9.00742E-01	1.06492E+01	9.14027E-01	1.26557E-03	0.00000E+00	0.00000E+00
354	9.36849E-01	1.06765E+01	9.14092E-01	1.26364E-03	0.00000E+00	0.00000E+00
355	9.24388E-01	1.07032E+01	9.14121E-01	1.26039E-03	0.00000E+00	0.00000E+00
356	9.14130E-01	1.07278E+01	9.14121E-01	1.25683E-03	0.00000E+00	0.00000E+00
357	8.95041E-01	1.07535E+01	9.14067E-01	1.25443E-03	0.00000E+00	0.00000E+00
358	9.66788E-01	1.07782E+01	9.14215E-01	1.25964E-03	0.00000E+00	0.00000E+00
359	9.09260E-01	1.08038E+01	9.14201E-01	1.25618E-03	0.00000E+00	0.00000E+00
360	9.30507E-01	1.08303E+01	9.14247E-01	1.25350E-03	0.00000E+00	0.00000E+00
361	9.16986E-01	1.08560E+01	9.14254E-01	1.25002E-03	0.00000E+00	0.00000E+00
362	8.91497E-01	1.08817E+01	9.14191E-01	1.24815E-03	0.00000E+00	0.00000E+00
363	8.78586E-01	1.09090E+01	9.14093E-01	1.24859E-03	0.00000E+00	0.00000E+00
364	9.01561E-01	1.09347E+01	9.14058E-01	1.24561E-03	0.00000E+00	0.00000E+00
365	8.76975E-01	1.09612E+01	9.13956E-01	1.24637E-03	0.00000E+00	0.00000E+00
366	8.76950E-01	1.09868E+01	9.13854E-01	1.24709E-03	0.00000E+00	0.00000E+00
367	9.13162E-01	1.10125E+01	9.13852E-01	1.24367E-03	0.00000E+00	0.00000E+00
368	9.09250E-01	1.10382E+01	9.13840E-01	1.24033E-03	0.00000E+00	0.00000E+00
369	9.06512E-01	1.10647E+01	9.13820E-01	1.23711E-03	0.00000E+00	0.00000E+00
370	8.96960E-01	1.10922E+01	9.13774E-01	1.23460E-03	0.00000E+00	0.00000E+00
371	9.11398E-01	1.11178E+01	9.13767E-01	1.23126E-03	0.00000E+00	0.00000E+00
372	9.56947E-01	1.11435E+01	9.13884E-01	1.23344E-03	0.00000E+00	0.00000E+00
373	8.99059E-01	1.11700E+01	9.13844E-01	1.23076E-03	0.00000E+00	0.00000E+00

374	8.99473E-01	1.11975E+01	9.13805E-01	1.22805E-03	0.00000E+00	0.00000E+00
375	9.23804E-01	1.12222E+01	9.13832E-01	1.22505E-03	0.00000E+00	0.00000E+00
376	9.49264E-01	1.12468E+01	9.13927E-01	1.22544E-03	0.00000E+00	0.00000E+00
377	9.07115E-01	1.12733E+01	9.13909E-01	1.22230E-03	0.00000E+00	0.00000E+00
378	8.89644E-01	1.13000E+01	9.13844E-01	1.22076E-03	0.00000E+00	0.00000E+00
379	8.62222E-01	1.13265E+01	9.13707E-01	1.22519E-03	0.00000E+00	0.00000E+00
380	9.08018E-01	1.13530E+01	9.13692E-01	1.22204E-03	0.00000E+00	0.00000E+00
381	9.29187E-01	1.13787E+01	9.13733E-01	1.21949E-03	0.00000E+00	0.00000E+00
382	8.74807E-01	1.14043E+01	9.13631E-01	1.22059E-03	0.00000E+00	0.00000E+00
383	9.10426E-01	1.14308E+01	9.13622E-01	1.21741E-03	0.00000E+00	0.00000E+00
384	9.22945E-01	1.14583E+01	9.13647E-01	1.21446E-03	0.00000E+00	0.00000E+00
385	8.96199E-01	1.14840E+01	9.13601E-01	1.21214E-03	0.00000E+00	0.00000E+00
386	8.96304E-01	1.15105E+01	9.13556E-01	1.20982E-03	0.00000E+00	0.00000E+00
387	9.07288E-01	1.15370E+01	9.13540E-01	1.20678E-03	0.00000E+00	0.00000E+00
388	8.81735E-01	1.15645E+01	9.13457E-01	1.20647E-03	0.00000E+00	0.00000E+00
389	8.87680E-01	1.15902E+01	9.13391E-01	1.20516E-03	0.00000E+00	0.00000E+00
390	9.27316E-01	1.16177E+01	9.13427E-01	1.20259E-03	0.00000E+00	0.00000E+00
391	9.83680E-01	1.16423E+01	9.13608E-01	1.21301E-03	0.00000E+00	0.00000E+00
392	9.33104E-01	1.16680E+01	9.13658E-01	1.21093E-03	0.00000E+00	0.00000E+00
393	9.12553E-01	1.16945E+01	9.13655E-01	1.20783E-03	0.00000E+00	0.00000E+00
394	8.88733E-01	1.17220E+01	9.13591E-01	1.20642E-03	0.00000E+00	0.00000E+00
395	9.20633E-01	1.17485E+01	9.13609E-01	1.20348E-03	0.00000E+00	0.00000E+00
396	9.19766E-01	1.17760E+01	9.13625E-01	1.20053E-03	0.00000E+00	0.00000E+00
397	9.32565E-01	1.18025E+01	9.13673E-01	1.19844E-03	0.00000E+00	0.00000E+00
398	8.96231E-01	1.18290E+01	9.13629E-01	1.19622E-03	0.00000E+00	0.00000E+00
399	9.16973E-01	1.18557E+01	9.13637E-01	1.19324E-03	0.00000E+00	0.00000E+00
400	9.29953E-01	1.18822E+01	9.13678E-01	1.19094E-03	0.00000E+00	0.00000E+00
401	9.16368E-01	1.19068E+01	9.13685E-01	1.18797E-03	0.00000E+00	0.00000E+00
402	9.38027E-01	1.19335E+01	9.13746E-01	1.18656E-03	0.00000E+00	0.00000E+00
403	8.68354E-01	1.19600E+01	9.13633E-01	1.18900E-03	0.00000E+00	0.00000E+00

KENO MESSAGE NUMBER K5-123 EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

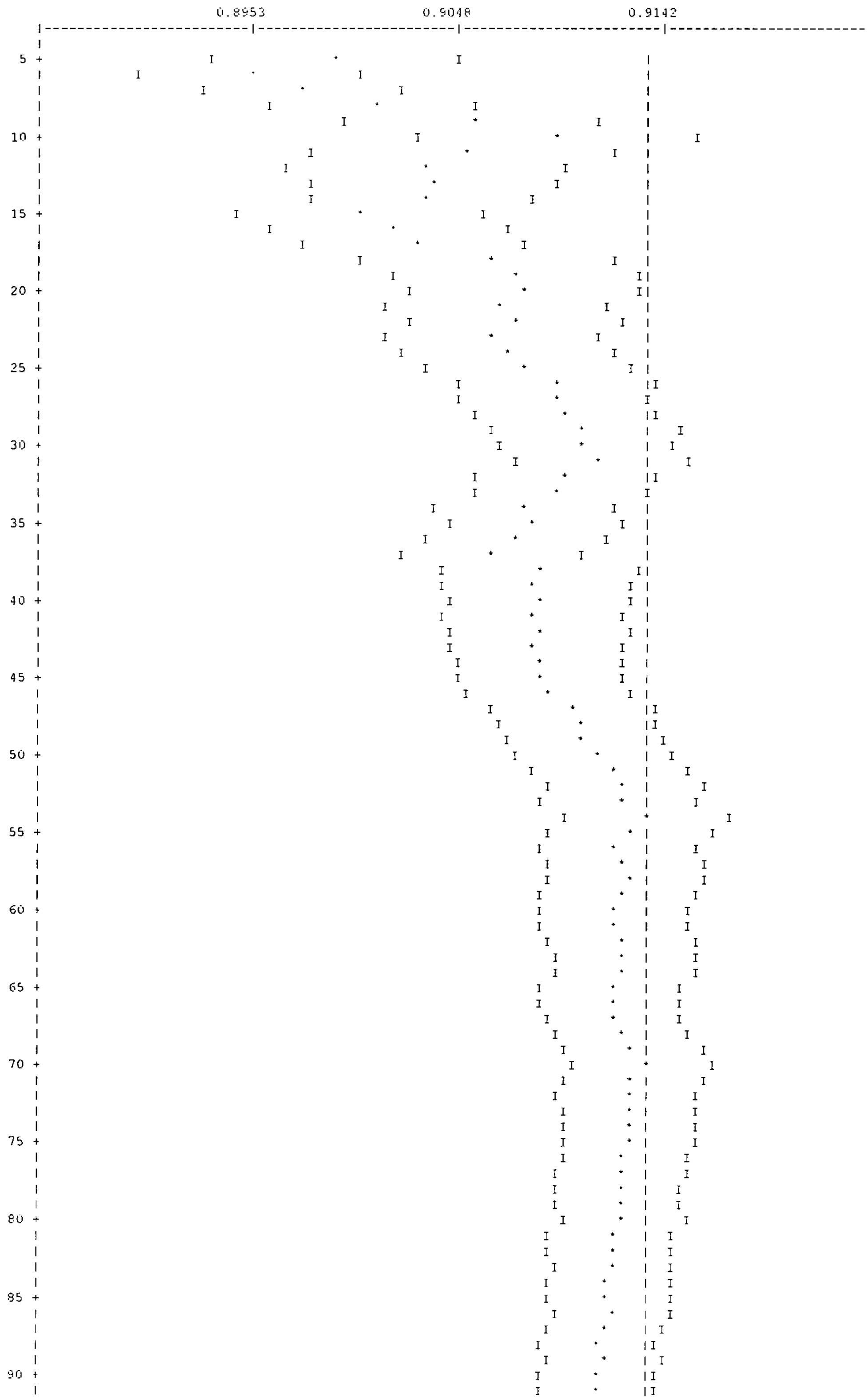
TRIGA - PREF. FLOOD CANISTER - 2 ROD FILLING CANISTER + TOLERANCE

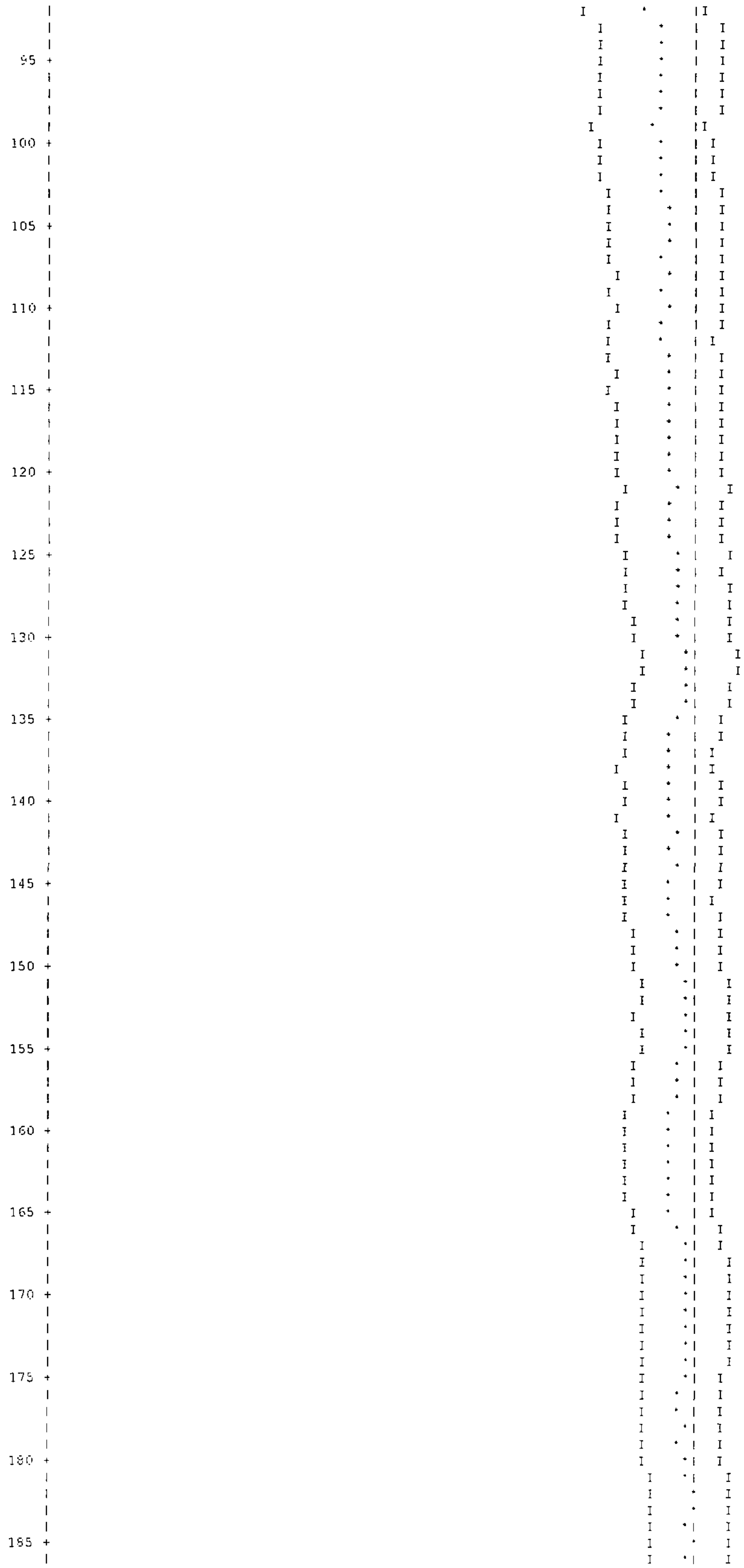
LIFETIME = 6.65183E-05 + OR - 1.55342E-07 GENERATION TIME = 2.66454E-05 + OR - 6.91541E-08
NU BAR = 2.42127E+00 + OR - 9.95371E-06 AVERAGE FISSION GROUP = 2.22457E+01 + OR - 5.44642E-03
ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION = 1.48733E-01 + OR - 5.78070E-04

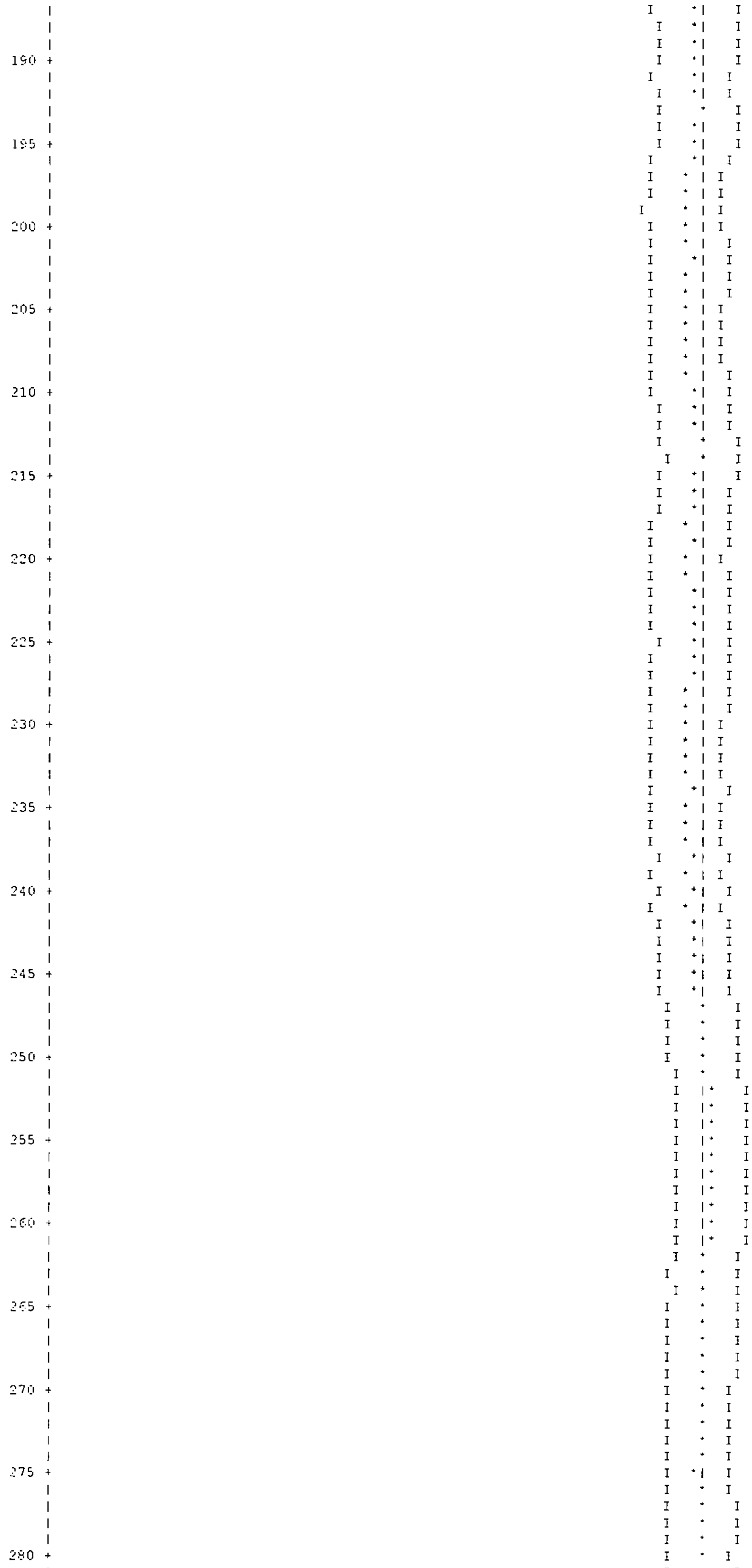
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.91355	+ OR - 0.00119	0.91236 TO 0.91474	0.91117 TO 0.91593	0.90998 TO 0.91712	400000
4	0.91357	+ OR - 0.00119	0.91238 TO 0.91476	0.91119 TO 0.91596	0.91000 TO 0.91715	399000
5	0.91362	+ OR - 0.00119	0.91243 TO 0.91482	0.91123 TO 0.91601	0.91004 TO 0.91720	398000
6	0.91369	+ OR - 0.00120	0.91249 TO 0.91488	0.91130 TO 0.91608	0.91010 TO 0.91727	397000
7	0.91371	+ OR - 0.00120	0.91251 TO 0.91491	0.91131 TO 0.91611	0.91012 TO 0.91730	396000
8	0.91371	+ OR - 0.00120	0.91251 TO 0.91491	0.91131 TO 0.91611	0.91011 TO 0.91731	395000
9	0.91367	+ OR - 0.00120	0.91247 TO 0.91488	0.91127 TO 0.91608	0.91006 TO 0.91728	394000
10	0.91362	+ OR - 0.00121	0.91242 TO 0.91483	0.91121 TO 0.91603	0.91001 TO 0.91724	393000
11	0.91372	+ OR - 0.00120	0.91251 TO 0.91492	0.91131 TO 0.91613	0.91011 TO 0.91733	392000
12	0.91378	+ OR - 0.00121	0.91257 TO 0.91499	0.91137 TO 0.91619	0.91016 TO 0.91740	391000
17	0.91394	+ OR - 0.00121	0.91272 TO 0.91515	0.91151 TO 0.91637	0.91029 TO 0.91758	386000
22	0.91385	+ OR - 0.00122	0.91263 TO 0.91507	0.91140 TO 0.91629	0.91018 TO 0.91752	381000
27	0.91382	+ OR - 0.00123	0.91259 TO 0.91505	0.91135 TO 0.91629	0.91012 TO 0.91752	376000
32	0.91383	+ OR - 0.00124	0.91259 TO 0.91507	0.91135 TO 0.91631	0.91011 TO 0.91755	371000
37	0.91421	+ OR - 0.00124	0.91297 TO 0.91545	0.91173 TO 0.91669	0.91049 TO 0.91793	366000
42	0.91407	+ OR - 0.00124	0.91283 TO 0.91531	0.91159 TO 0.91656	0.91035 TO 0.91780	361000
47	0.91397	+ OR - 0.00125	0.91272 TO 0.91522	0.91147 TO 0.91647	0.91021 TO 0.91773	356000
52	0.91369	+ OR - 0.00126	0.91243 TO 0.91495	0.91116 TO 0.91621	0.90990 TO 0.91747	351000
57	0.91370	+ OR - 0.00126	0.91245 TO 0.91496	0.91119 TO 0.91621	0.90994 TO 0.91747	346000
62	0.91374	+ OR - 0.00127	0.91247 TO 0.91501	0.91120 TO 0.91628	0.90993 TO 0.91755	341000
67	0.91383	+ OR - 0.00128	0.91255 TO 0.91511	0.91126 TO 0.91640	0.90998 TO 0.91768	336000
72	0.91373	+ OR - 0.00129	0.91244 TO 0.91501	0.91116 TO 0.91630	0.90987 TO 0.91759	331000
77	0.91380	+ OR - 0.00130	0.91250 TO 0.91511	0.91120 TO 0.91641	0.90989 TO 0.91771	326000
82	0.91395	+ OR - 0.00131	0.91264 TO 0.91527	0.91132 TO 0.91658	0.91001 TO 0.91790	321000
87	0.91403	+ OR - 0.00133	0.91271 TO 0.91536	0.91138 TO 0.91669	0.91005 TO 0.91802	316000
92	0.91416	+ OR - 0.00134	0.91282 TO 0.91550	0.91148 TO 0.91684	0.91014 TO 0.91818	311000
97	0.91402	+ OR - 0.00134	0.91268 TO 0.91536	0.91134 TO 0.91670	0.91000 TO 0.91804	306000
102	0.91407	+ OR - 0.00135	0.91272 TO 0.91542	0.91136 TO 0.91677	0.91001 TO 0.91812	301000
107	0.91401	+ OR - 0.00137	0.91264 TO 0.91538	0.91127 TO 0.91675	0.90990 TO 0.91812	296000
112	0.91412	+ OR - 0.00138	0.91274 TO 0.91550	0.91136 TO 0.91688	0.90998 TO 0.91825	291000
117	0.91398	+ OR - 0.00139	0.91259 TO 0.91537	0.91119 TO 0.91676	0.90980 TO 0.91815	286000
122	0.91395	+ OR - 0.00141	0.91254 TO 0.91535	0.91113 TO 0.91676	0.90973 TO 0.91817	281000
127	0.91386	+ OR - 0.00143	0.91243 TO 0.91529	0.91101 TO 0.91672	0.90958 TO 0.91815	276000
132	0.91367	+ OR - 0.00145	0.91222 TO 0.91511	0.91077 TO 0.91656	0.90933 TO 0.91801	271000
137	0.91410	+ OR - 0.00145	0.91264 TO 0.91555	0.91119 TO 0.91700	0.90973 TO 0.91846	266000
142	0.91401	+ OR - 0.00147	0.91254 TO 0.91548	0.91107 TO 0.91696	0.90960 TO 0.91843	261000
147	0.91405	+ OR - 0.00149	0.91256 TO 0.91555	0.91107 TO 0.91704	0.90958 TO 0.91853	256000
152	0.91378	+ OR - 0.00151	0.91226 TO 0.91529	0.91075 TO 0.91680	0.90924 TO 0.91831	251000
157	0.91394	+ OR - 0.00153	0.91241 TO 0.91547	0.91088 TO 0.91700	0.90935 TO 0.91853	246000
162	0.91422	+ OR - 0.00154	0.91267 TO 0.91576	0.91113 TO 0.91730	0.90958 TO 0.91885	241000
167	0.91390	+ OR - 0.00155	0.91234 TO 0.91545	0.91079 TO 0.91701	0.90923 TO 0.91856	236000
172	0.91376	+ OR - 0.00159	0.91217 TO 0.91534	0.91059 TO 0.91693	0.90900 TO 0.91851	231000
177	0.91401	+ OR - 0.00161	0.91240 TO 0.91563	0.91078 TO 0.91724	0.90917 TO 0.91885	226000
182	0.91365	+ OR - 0.00163	0.91201 TO 0.91528	0.91038 TO 0.91691	0.90875 TO 0.91854	221000
187	0.91382	+ OR - 0.00166	0.91216 TO 0.91548	0.91050 TO 0.91714	0.90884 TO 0.91880	216000
192	0.91382	+ OR - 0.00169	0.91213 TO 0.91552	0.91044 TO 0.91721	0.90875 TO 0.91890	211000
197	0.91423	+ OR - 0.00170	0.91253 TO 0.91592	0.91084 TO 0.91762	0.90914 TO 0.91931	206000
202	0.91402	+ OR - 0.00172	0.91231 TO 0.91574	0.91059 TO 0.91746	0.90887 TO 0.91917	201000
207	0.91434	+ OR - 0.00175	0.91259 TO 0.91609	0.91083 TO 0.91784	0.90908 TO 0.91960	196000
212	0.91386	+ OR - 0.00178	0.91208 TO 0.91564	0.91030 TO 0.91742	0.90853 TO 0.91919	191000
217	0.91393	+ OR - 0.00178	0.91215 TO 0.91572	0.91037 TO 0.91750	0.90859 TO 0.91928	186000
222	0.91409	+ OR - 0.00181	0.91228 TO 0.91590	0.91047 TO 0.91770	0.90867 TO 0.91951	181000
227	0.91417	+ OR - 0.00185	0.91232 TO 0.91601	0.91048 TO 0.91786	0.90863 TO 0.91971	176000
232	0.91461	+ OR - 0.00187	0.91274 TO 0.91649	0.91087 TO 0.91836	0.90899 TO 0.92023	171000
237	0.91431	+ OR - 0.00190	0.91241 TO 0.91622	0.91051 TO 0.91812	0.90860 TO 0.92002	166000
242	0.91427	+ OR - 0.00195	0.91232 TO 0.91622	0.91036 TO 0.91817	0.90841 TO 0.92012	161000
247	0.91370	+ OR - 0.00199	0.91172 TO 0.91569	0.90973 TO 0.91768	0.90774 TO 0.91967	156000
252	0.91293	+ OR - 0.00200	0.91093 TO 0.91493	0.90893 TO 0.91693	0.90693 TO 0.91893	151000
257	0.91279	+ OR - 0.00204	0.91075 TO 0.91482	0.90872 TO 0.91686	0.90668 TO 0.91889	146000
262	0.91317	+ OR - 0.00207	0.91110 TO 0.91524	0.90903 TO 0.91731	0.90696 TO 0.91938	141000
267	0.91339	+ OR - 0.00214	0.91125 TO 0.91553	0.90911 TO 0.91766	0.90697 TO 0.91980	136000
272	0.91369	+ OR - 0.00221	0.91148 TO 0.91589	0.90927 TO 0.91810	0.90707 TO 0.92030	131000
277	0.91358	+ OR - 0.00226	0.91132 TO 0.91584	0.90906 TO 0.91810	0.90680 TO 0.92036	126000
282	0.91349	+ OR - 0.00228	0.91121 TO 0.91577	0.90892 TO 0.91805	0.90664 TO 0.92034	121000
287	0.91338	+ OR - 0.00235	0.91104 TO 0.91573	0.90869 TO 0.91807	0.90635 TO 0.92042	116000
292	0.91331	+ OR - 0.00244	0.91087 TO 0.91574	0.90843 TO 0.91818	0.90600 TO 0.92062	111000
297	0.91307	+ OR - 0.00249	0.91058 TO 0.91556	0.90810 TO 0.91805	0.90561 TO 0.92054	106000
302	0.91190	+ OR - 0.00252	0.90938 TO 0.91441	0.90687 TO 0.91693	0.90435 TO 0.91945	101000
307	0.91285	+ OR - 0.00256	0.91030 TO 0.91541	0.90774 TO 0.91797	0.90518 TO 0.92052	96000
312	0.91290	+ OR - 0.00254	0.91036 TO 0.91544	0.90783 TO 0.91798	0.90529 TO 0.92051	91000
317	0.91349	+ OR - 0.00263	0.91086 TO 0.91612	0.90823 TO 0.91875	0.90560 TO 0.92138	86000
322	0.91255	+ OR - 0.00261	0.90993 TO 0.91516	0.90732 TO 0.91777	0.90471 TO 0.92038	81000
327	0.91267	+ OR - 0.00271	0.90996 TO 0.91537	0.90725 TO 0.91808	0.90455 TO 0.92079	76000
332	0.91261	+ OR - 0.00287	0.90974 TO 0.91549	0.90687 TO 0.91836	0.90400 TO 0.92123	71000
337	0.91147	+ OR - 0.00293	0.90853 TO 0.91440	0.90560 TO 0.91734	0.90266 TO 0.92027	66000
342	0.91066	+ OR - 0.00304	0.90762 TO 0.91370	0.90457 TO 0.91674	0.90153 TO 0.91979	61000
347	0.91121	+ OR - 0.00316	0.90805 TO 0.91437	0.90489 TO 0.91753	0.90173 TO 0.92069	56000
352	0.91067	+ OR - 0.00341	0.90726 TO 0.91408	0.90385 TO 0.91749	0.90044 TO 0.92090	51000
357	0.91028	+ OR - 0.00371	0.90657 TO 0.91399	0.90287 TO 0.91769	0.89916 TO 0.92140	46000
362	0.90873	+ OR - 0.00385	0.90488 TO 0.91258	0.90103 TO 0.91643	0.89718 TO 0.92028	41000
367	0.91141	+ OR - 0.00409	0.90732 TO 0.91549	0.90323 TO 0.91958	0.89914 TO 0.92367	36000
372	0.91063	+ OR - 0.00449	0.90614 TO 0.91512	0.90165 TO 0.91961	0.89717 TO 0.92410	31000
377	0.90965	+ OR - 0.00508	0.90457 TO 0.91473	0.89949 TO 0.91981	0.89441 TO 0.92489	26000
382	0.91367	+ OR - 0.00539	0.90828 TO 0.91906	0.90289 TO 0.92444	0.89750 TO 0.92983	21000
387	0.91587	+ OR - 0.00688	0.90898 TO 0.92275	0.90210 TO 0.92963	0.89522 TO 0.93652	16000
392	0.91274	+ OR - 0.00625	0.90650 TO 0.91899	0.90025 TO 0.92523	0.89401 TO 0.93148	11000
397	0.91098	+ OR - 0.01031	0.90067 TO 0.92130	0.89036 TO 0.93161	0.88004 TO 0.94192	6000

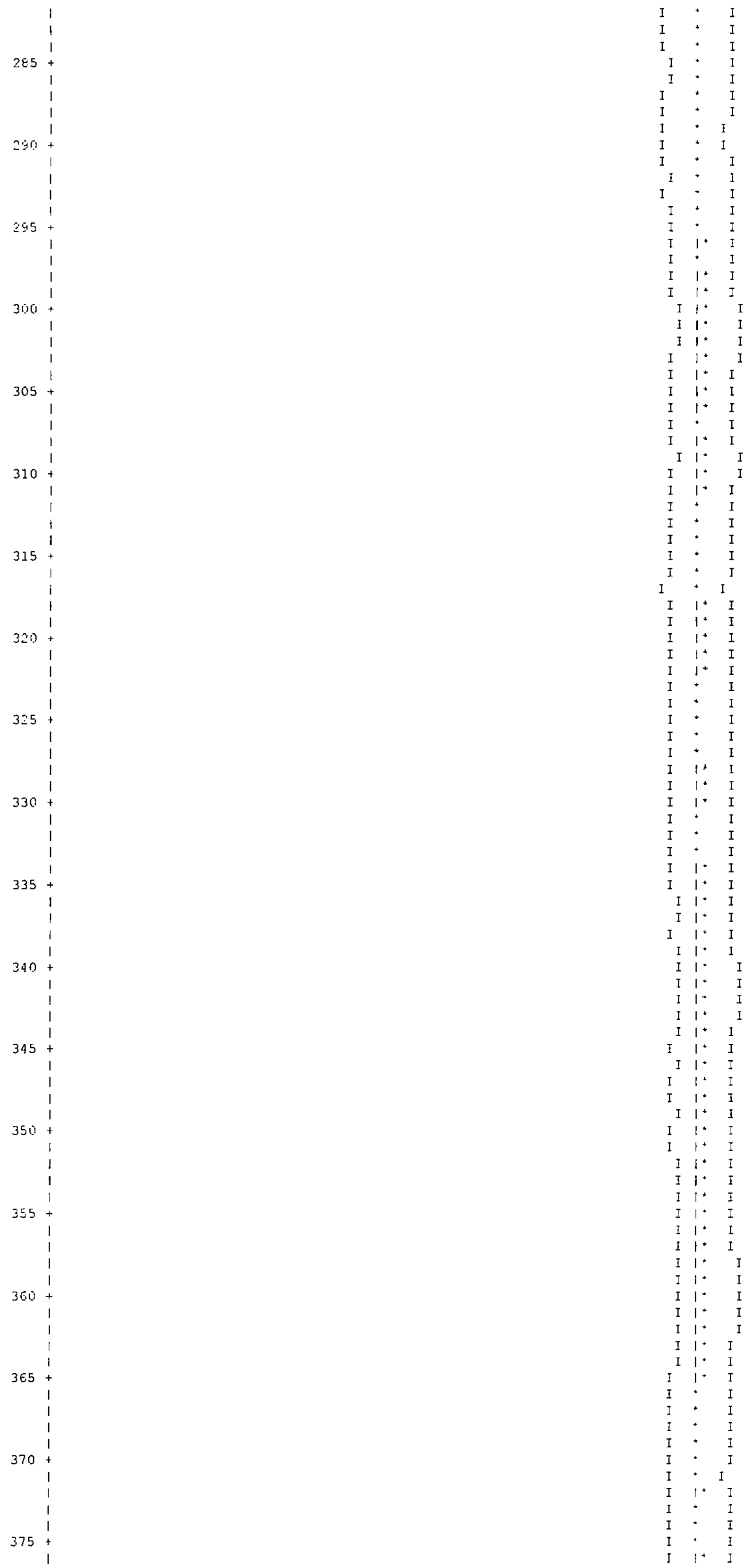
TRIGA - PREF. FLOOD CANISTER - 2 ROD FILLING CANISTER + TOLERANCE

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.9136 + OR - 0.0012 WHICH OCCURS FOR 403 GENERATIONS RUN.



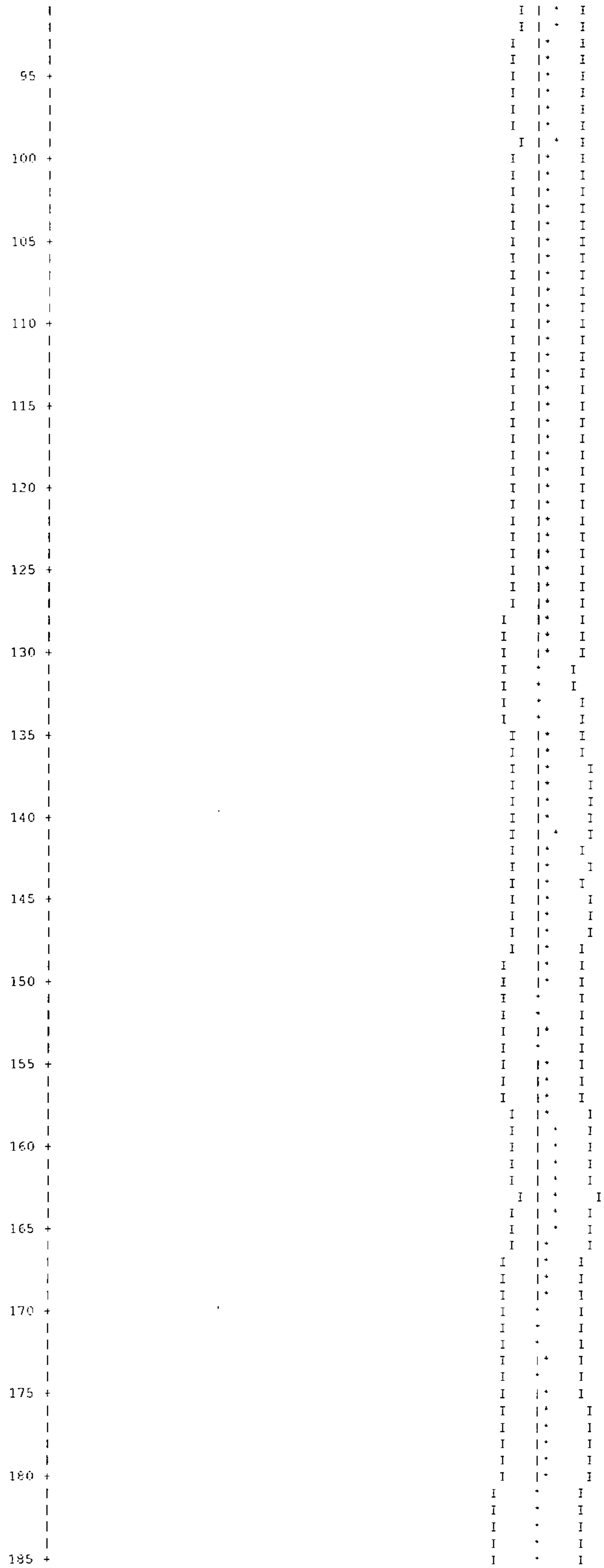

95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185

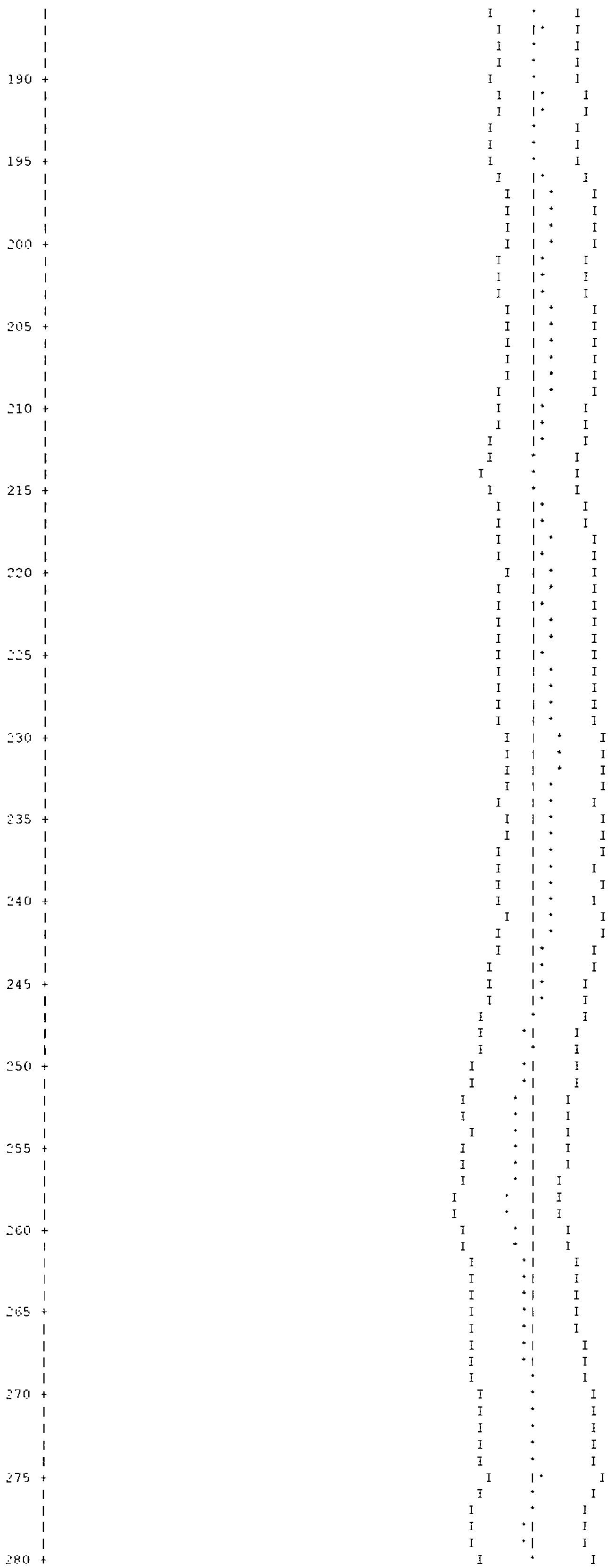

190
195
200
205
210
215
220
225
230
235
240
245
250
255
260
265
270
275
280

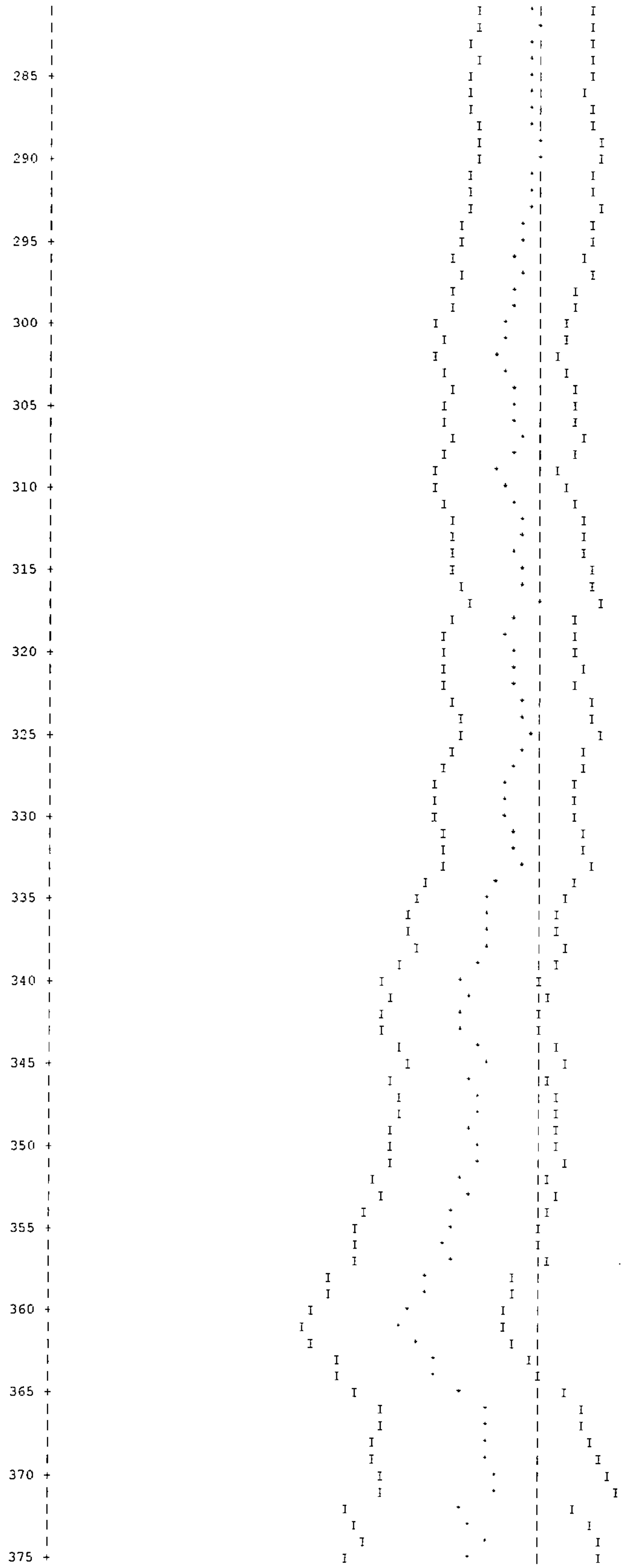

285
290
295
300
305
310
315
320
325
330
335
340
345
350
355
360
365
370
375

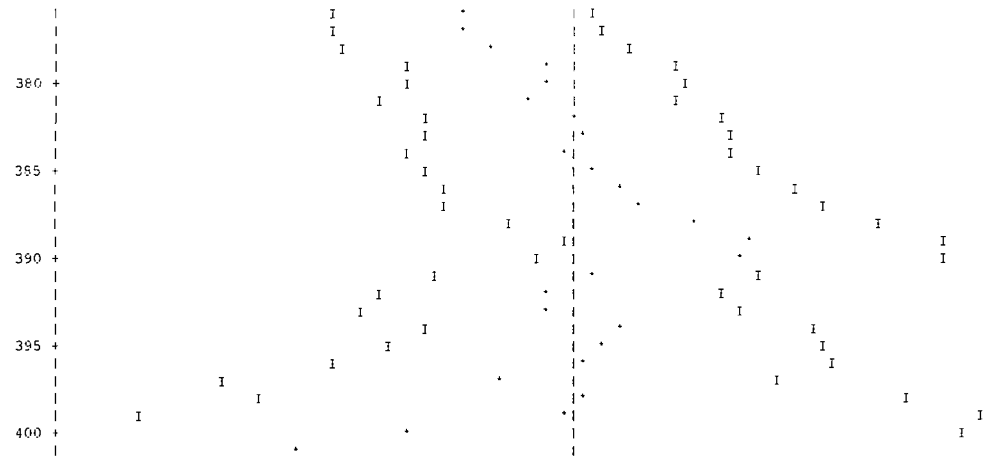

380
385
390
395
400

```
                        TRIGA - PREF. FLOOD CANISTER  - 2 ROD FILLING CANISTER + TOLERANCE

                    PLOT OF AVERAGE K-EFFECTIVE BY GENERATION SKIPPED.
 THE LINE REPRESENTS K-EFF = 0.9136 + OR -  0.0012 WHICH OCCURS FOR     3 GENERATIONS SKIPPED.

                       0.9032                   0.9117                   0.9202
     |------------------------|------------------------|------------------------|------------------------
     |
     |                                                   I   *  I
   5 +                                                   I   *  I
     |                                                    I  *   I
     |                                                    I  *   I
     |                                                    I  *   I
     |                                                    I  *   I
  10 +                                                   I   *  I
     |                                                    I  *   I
     |                                                    I  *   I
     |                                                    I  |*  I
     |                                                    I  |*  I
  15 +                                                    I  |*  I
     |                                                    I  |*  I
     |                                                    I  |*  I
     |                                                    I  |*  I
     |                                                    I  *   I
  20 +                                                    I  *   I
     |                                                    I  |*  I
     |                                                    I  |*  I
     |                                                    I  |*  I
     |                                                    I  |*  I
  25 +                                                    I  |*  I
     |                                                    I  *   I
     |                                                    I  |*  I
     |                                                    I  *   I
     |                                                    I  *   I
  30 +                                                    I  *   I
     |                                                    I  *   I
     |                                                    I  |*  I
     |                                                    I  |*  I
     |                                                    I  |*   I
  35 +                                                    I  |*   I
     |                                                     I |*   I
     |                                                     I | *  I
     |                                                     I |*   I
     |                                                     I |*   I
  40 +                                                     I |*   I
     |                                                     I |*   I
     |                                                     I |*   I
     |                                                     I |*   I
     |                                                     I |*   I
  45 +                                                     I |*   I
     |                                                     I |*   I
     |                                                    I  |*   I
     |                                                    I  |*   I
     |                                                    I  |*   I
  50 +                                                    I  |*  I
     |                                                    I  *   I
     |                                                   I   *   I
     |                                                    I  *   I
     |                                                   I   *  I
  55 +                                                   I   *   I
     |                                                    I  *   I
     |                                                    I  *   I
     |                                                   I   *   I
     |                                                    I  *   I
  60 +                                                    I  *   I
     |                                                    I  *   I
     |                                                    I  *   I
     |                                                    I  *   I
     |                                                    I  *   I
  65 +                                                    I  |*  I
     |                                                    I  |*  I
     |                                                    I  |*  I
     |                                                    I  *   I
     |                                                   I   *   I
  70 +                                                   I   *   I
     |                                                   I   *   I
     |                                                    I  *   I
     |                                                   I   *   I
     |                                                   I   *   I
  75 +                                                   I   *   I
     |                                                    I  *   I
     |                                                    I  |*  I
     |                                                    I  |*  I
     |                                                    I  |*  I
  80 +                                                    I  *   I
     |                                                    I  |*   I
     |                                                    I  |*   I
     |                                                    I  |*   I
     |                                                    I  |*   I
  85 +                                                    I  |*   I
     |                                                    I  |*   I
     |                                                    I  |*   I
     |                                                     I |*   I
     |                                                    I  |*   I
  90 +                                                     I |*   I
```


95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185


190
195
200
205
210
215
220
225
230
235
240
245
250
255
260
265
270
275
280


285
290
295
300
305
310
315
320
325
330
335
340
345
350
355
360
365
370
375



TRIGA - PREF. FLOOD CANISTER - 2 ROD FILLING CANISTER + TOLERANCE

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0004			3.78261E-04	1.7107	1.15095E-03	1.5661	0.00000E+00	0.0000
2	0.0019			1.75837E-03	0.5591	3.10796E-03	0.4703	0.00000E+00	0.0000
3	0.0025			2.28749E-03	0.5099	1.94752E-03	0.3999	0.00000E+00	0.0000
4	0.0015			1.37908E-03	0.5231	1.10253E-03	0.4127	0.00000E+00	0.0000
5	0.0021			1.94967E-03	0.4578	2.41958E-03	0.3640	0.00000E+00	0.0000
6	0.0032			2.93131E-03	0.3491	8.91355E-03	0.3460	0.00000E+00	0.0000
7	0.0039			3.60175E-03	0.2838	1.93545E-02	0.3332	0.00000E+00	0.0000
8	0.0041			3.76576E-03	0.2765	1.66521E-02	0.3506	0.00000E+00	0.0000
9	0.0057			5.16621E-03	0.2941	1.80498E-02	0.2826	0.00000E+00	0.0000
10	0.0121			1.10499E-02	0.2832	4.36278E-02	0.2806	0.00000E+00	0.0000
11	0.0257			2.35064E-02	0.2820	6.14684E-02	0.2361	0.00000E+00	0.0000
12	0.0344			3.14157E-02	0.2790	4.92024E-02	0.2293	0.00000E+00	0.0000
13	0.0313			2.85808E-02	0.2936	5.76898E-02	0.2103	0.00000E+00	0.0000
14	0.0255			2.32593E-02	0.2715	6.87534E-02	0.2560	0.00000E+00	0.0000
15	0.0050			4.54822E-03	0.3571	3.02211E-02	0.3717	0.00000E+00	0.0000
16	0.0034			3.09197E-03	0.4445	1.65618E-02	0.4372	0.00000E+00	0.0000
17	0.0052			4.73398E-03	0.6335	9.52084E-03	0.4348	0.00000E+00	0.0000
18	0.0068			6.25696E-03	0.6007	8.97307E-03	0.4118	0.00000E+00	0.0000
19	0.0084			7.65993E-03	0.5298	1.40545E-02	0.4171	0.00000E+00	0.0000
20	0.0338			3.08651E-02	0.3441	4.44361E-02	0.3445	0.00000E+00	0.0000
21	0.0177			1.61492E-02	0.4988	1.70573E-02	0.4152	0.00000E+00	0.0000
22	0.0403			3.67780E-02	0.3622	3.38568E-02	0.3256	0.00000E+00	0.0000
23	0.1157			1.05719E-01	0.2352	8.93478E-02	0.2345	0.00000E+00	0.0000
24	0.1882			1.71967E-01	0.2075	1.29114E-01	0.1984	0.00000E+00	0.0000
25	0.1537			1.40418E-01	0.2359	9.90052E-02	0.2247	0.00000E+00	0.0000
26	0.1909			1.74441E-01	0.2514	1.15238E-01	0.2552	0.00000E+00	0.0000
27	0.0765			6.98923E-02	0.3710	4.14854E-02	0.3860	0.00000E+00	0.0000
SYSTEM TOTAL =				9.13550E-01	0.1302	1.00231E+00	0.0445	0.00000E+00	0.0000

ELAPSED TIME 11.96183 MINUTES

RANDOM NUMBER= 1B2D06BC15BF

```
TRIGA - PREF. FLOOD CANISTER  - 2 ROD FILLING CANISTER + TOLERANCE

                                   FREQUENCY FOR GENERATIONS    4 TO  403
0.8577 TO 0.8660      *****
0.8660 TO 0.8743      **************
0.8743 TO 0.8825      *******************
0.8825 TO 0.8908      ************************
0.8908 TO 0.8991      ***********************************************
0.8991 TO 0.9073      *********************************************
0.9073 TO 0.9156      *********************************************
0.9156 TO 0.9239      *************************************************
0.9239 TO 0.9321      ****************************************
0.9321 TO 0.9404      *********************************
0.9404 TO 0.9487      **************************
0.9487 TO 0.9569      *************
0.9569 TO 0.9652      ***
0.9652 TO 0.9735      ***
0.9735 TO 0.9817      **
0.9817 TO 0.9900      ***

                                   FREQUENCY FOR GENERATIONS  104 TO  403
0.8577 TO 0.8660      ****
0.8660 TO 0.8743      ********
0.8743 TO 0.8825      *************
0.8825 TO 0.8908      *******************
0.8908 TO 0.8991      ************************************
0.8991 TO 0.9073      ***********************************
0.9073 TO 0.9156      *********************************
0.9156 TO 0.9239      *********************************
0.9239 TO 0.9321      ******************************
0.9321 TO 0.9404      **************************
0.9404 TO 0.9487      ********************
0.9487 TO 0.9569      ***********
0.9569 TO 0.9652      ***
0.9652 TO 0.9735      ***
0.9735 TO 0.9817
0.9817 TO 0.9900      **

                                   FREQUENCY FOR GENERATIONS  204 TO  403
0.8577 TO 0.8660      **
0.8660 TO 0.8743      ******
0.8743 TO 0.8825      ***********
0.8825 TO 0.8908      *************
0.8908 TO 0.8991      *********************
0.8991 TO 0.9073      ***************************
0.9073 TO 0.9156      *********************
0.9156 TO 0.9239      *******************
0.9239 TO 0.9321      ******************
0.9321 TO 0.9404      *****************
0.9404 TO 0.9487      *************
0.9487 TO 0.9569      ********
0.9569 TO 0.9652      **
0.9652 TO 0.9735      ***
0.9735 TO 0.9817
0.9817 TO 0.9900      **
_TRIGA - PREF. FLOOD CANISTER  - 2 ROD FILLING CANISTER + TOLERANCE

                                   FREQUENCY FOR GENERATIONS  304 TO  403
0.8577 TO 0.8660      *
0.8660 TO 0.8743      ****
0.8743 TO 0.8825      ******
0.8825 TO 0.8908      ********
0.8908 TO 0.8991      ***********
0.8991 TO 0.9073      *****************
0.9073 TO 0.9156      *************
0.9156 TO 0.9239      ***********
0.9239 TO 0.9321      ********
0.9321 TO 0.9404      **********
0.9404 TO 0.9487      ***
0.9487 TO 0.9569      ***
0.9569 TO 0.9652
0.9652 TO 0.9735      ***
0.9735 TO 0.9817
0.9817 TO 0.9900      **


********************************************************************************************************************************
*

          CONGRATULATIONS!  YOU HAVE  SUCCESSFULLY TRAVERSED THE PERILOUS PATH THROUGH KENO V IN  11.96183 MINUTES

********************************************************************************************************************************
*
_
```

Figure 6.6.5-2 Summary of CSAS25 Input/Output for NAC-LWT with TRIGA Fuel Elements – Most Reactive Poisoned Basket Configuration

```
PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
   MODULE CSAS25   WILL BE CALLED
     TRIGA - PREF. FLOOD CANISTER
     27GROUPNDF4   LATTICECELL
     'FUEL
     U-235    1 0.0 9.052980E-4 END
     U-238    1 0.0 3.849480E-4 END
     ZR       1 0.0 3.446510E-2 END
     H        1 0.0 5.514420E-2 END
     'CLAD, BASKET, AND CASK
     SS304    2 1.0 293.0 END
     'CANISTER INTERNAL MODERATOR
     H2O      3 1.0 293.0 END
     'ZIRCONIUM ROD
     ZR       4 1.0 293.0 END
     'GRAPHITE REFLETOR
     C        5 1.0 293.0 END
     'LEAD SHIELD
     PB       6 1.0 293.0 END
     'NEUTRON SHIELD
     H2O      7 1.0 293.0 END
     'CASK EXTERNAL MATERIAL
     H2O      8 1E-20 293.0 END
     'END FITTING FOR FUEL ELEMENT
     SS304    9 0.337137 293.0 END
     H2O      9 0.662863 293.0 END
     'SECOND FUEL MATERIAL FOR UN-CANISTERED
     U-235    10 0.0 9.052980E-4 END
     U-238    10 0.0 3.849480E-4 END
     ZR       10 0.0 3.446510E-2 END
     H        10 0.0 5.514420E-2 END
     'SECOND END-FITTING MATERIAL FOR UN-CANISTERED FUEL
     SS304    11 0.337137 293.0 END
     H2O      11 1.0E-20 293.0 END
     'CASK INTERIOR MODERATOR MATERIAL
     H2O      12 1.0E-20 293.0 END
     'NEUTRON ABSORBER PLATE WITH BORON
     FE      13 DEN=7.76 0.6717 293.0 END
     C       13 DEN=7.76 0.0001 293.0 END
     SI      13 DEN=7.76 0.0033 293.0 END
     MN      13 DEN=7.76 0.0060 293.0 END
     P       13 DEN=7.75 0.0001 293.0 END
     CR      13 DEN=7.76 0.1849 293.0 END
     NI      13 DEN=7.76 0.1233 293.0 END
     B-10    13 DEN=7.76 0.0073 293.0 END
     B-11    13 DEN=7.76 0.0007 293.0 END
     N       13 DEN=7.76 0.0017 293.0 END
     'NEUTRON ABSORBER PLATE WITHOUT BORON
     FE      14 DEN=7.76 0.6717 293.0 END
     C       14 DEN=7.76 0.0001 293.0 END
     SI      14 DEN=7.76 0.0033 293.0 END
     MN      14 DEN=7.76 0.0060 293.0 END
     P       14 DEN=7.75 0.0001 293.0 END
     CR      14 DEN=7.76 0.1849 293.0 END
     NI      14 DEN=7.76 0.1233 293.0 END
     N       14 DEN=7.76 0.0017 293.0 END
     END COMP
     SQUAREPITCH 4.2992 3.6449 1 3 3.7541 2 END
     MORE DATA
     RES=10  CYLINDER 1.8224 DAN(10)=8.52196E-01
     END MORE
     TRIGA - PREF. FLOOD CANISTER
     READ PARAM TME=170.0 GEN=403 NPG=1000 RUN=YES PLT=NO
     TBA=2.0 END PARAM
     READ GEOM
     UNIT 1
     COM='TRIGA FUEL ELEMENT (SCREENED)'
     CYLINDER 4 1 0.2858 2P19.05
     CYLINDER 1 1 1.8224 2P19.05
     CYLINDER 5 1 1.8224 2P27.7368
     CYLINDER 2 1 1.8771 2P27.7368
     CYLINDER 9 1 1.8771 2P36.703
     UNIT 5
     COM='3.38 in Width / 0.28 in Thickness DIVIDER CENTER STACK (SCREENED)'
     CUBOID   2 1 2P4.2926 0.7112 0.0 2P36.703
     UNIT 6
     COM='3.38 in Width / 0.24 in Thickness DIVIDER OUTSIDE STACK (SCREENED)'
     CUBOID   2 1 2P4.2926 0.6096 0.0 2P36.703
     UNIT 10
     COM='TRIGA ELEMENTS IN Top of 3.38 in x 3.38 in OPENING (SCREENED)'
     CUBOID    3 1 2P4.0267 +4.1029 -3.9505 2P36.703
     HOLE      1  +2.1495 +2.2257 0.0
     HOLE      1  -2.1495 +2.2257 0.0
     HOLE      1  -2.1495 -2.0733 0.0
     HOLE      1  +2.1495 -2.0733 0.0
     CUBOID    2 1 2P4.2164 +4.2926 -4.1402 2P36.703
     CUBOID    12 1 2P4.2926 2P4.2926 2P36.703
     UNIT 11
```

```
COM='TRIGA ELEMENTS IN Bottom of 3.38 in x 3.38 in OPENING (SCREENED)'
CUBOID    3 1 2P4.0267 +3.9505 -4.1029 2P36.703
HOLE      1  +2.1495 -2.2257 0.0
HOLE      1  -2.1495 -2.2257 0.0
HOLE      1  -2.1495 +2.0733 0.0
HOLE      1  +2.1495 +2.0733 0.0
CUBOID    2 1 2P4.2164 +4.1402 -4.2926 2P36.703
CUBOID    12 1 2P4.2926 2P4.2926 2P36.703
UNIT 12
COM='TRIGA ELEMENTS IN Bottom Right of 3.38 in x 3.38 in OPENING (SCREENED)'
CUBOID    3 1 +4.1029 -3.9505 +3.9505 -4.1029 2P36.703
HOLE      1  +2.2257 -2.2257  0.0
HOLE      1  +2.2257 +2.0733  0.0
HOLE      1  -2.0733 -2.2257  0.0
HOLE      1  -2.0733 +2.0733  0.0
CUBOID    2 1 +4.2926 -4.1402 +4.1402 -4.2926 2P36.703
CUBOID    12 1 2P4.2926 2P4.2926 2P36.703
UNIT 13
COM='TRIGA ELEMENTS IN Top Right of 3.38 in x 3.38 in OPENING (SCREENED)'
CUBOID    3 1 +4.1029 -3.9505 +4.1029 -3.9505 2P36.703
HOLE      1  +2.2257 +2.2257  0.0
HOLE      1  +2.2257 -2.0733  0.0
HOLE      1  -2.0733 +2.2257  0.0
HOLE      1  -2.0733 -2.0733  0.0
CUBOID    2 1 +4.2926 -4.1402 +4.2926 -4.1402 2P36.703
CUBOID    12 1 2P4.2926 2P4.2926 2P36.703
UNIT 14
COM='TRIGA ELEMENTS IN Bottom Left of 3.38 in x 3.38 in OPENING (SCREENED)'
CUBOID    3 1 +3.9505 -4.1029 +3.9505 -4.1029 2P36.703
HOLE      1  -2.2257 -2.2257  0.0
HOLE      1  -2.2257 +2.0733  0.0
HOLE      1  +2.0733 -2.2257  0.0
HOLE      1  +2.0733 +2.0733  0.0
CUBOID    2 1 +4.1402 -4.2926 +4.1402 -4.2926 2P36.703
CUBOID    12 1 2P4.2926 2P4.2926 2P36.703
UNIT 15
COM='TRIGA ELEMENTS IN Top Left of 3.38 in x 3.38 in OPENING (SCREENED)'
CUBOID    3 1 +3.9505 -4.1029 +4.1029 -3.9505 2P36.703
HOLE      1  -2.2257 +2.2257  0.0
HOLE      1  -2.2257 -2.0733  0.0
HOLE      1  +2.0733 +2.2257  0.0
HOLE      1  +2.0733 -2.0733  0.0
CUBOID    2 1 +4.1402 -4.2926 +4.2926 -4.1402 2P36.703
CUBOID    12 1 2P4.2926 2P4.2926 2P36.703
UNIT 16
COM='TRIGA BASKET 3.38 in x 3.38 in CENTER OPENING (SCREENED)'
CUBOID    3 1 2P4.0267 2P4.0267 2P36.703
HOLE      1  -2.1495 +2.1495  0.0
HOLE      1  -2.1495 -2.1495  0.0
HOLE      1  +2.1495 +2.1495  0.0
HOLE      1  +2.1495 -2.1495  0.0
CUBOID    2  1 2P4.2164 2P4.2164 2P36.703
CUBOID    12 1 2P4.2926 2P4.2926 2P36.703
UNIT 17
COM='HORIZONTAL X-X POISON SHEET + WATER'
CUBOID  13 1 2P3.8227 0.3175 0.0 2P34.163
CUBOID  14 1 2P4.1402 0.3175 0.0 2P34.163
CUBOID   12 1 2P4.2926 0.3175 0.0 2P36.703
UNIT 20
COM='CENTER COLUMN OF THREE OPENINGS w/ 0.28 in plate (SCREENED)'
ARRAY 1  -4.2926 -13.9065 -36.703
REPLICATE 2 1 4R0.7112 2R0.0 1
UNIT 21
COM='LEFT OUTSIDE COLUMN OF TWO OPENINGS w/ 0.12 in plate (SCREENED)'
ARRAY 2  -4.2926 -9.0488 -36.703
REPLICATE 2 1 0.0 0.3048 2R0.3048 2R0.0 1
UNIT 22
COM='RIGHT OUTSIDE COLUMN OF TWO OPENINGS w/ 0.12 in plate (SCREENED)'
ARRAY 3  -4.2926 -9.0488 -36.703
REPLICATE 2 1 0.3048 0.0 2R0.3048 2R0.0 1
UNIT 30
COM='NAC-LWT TRIGA BASKET (SCREENED)'
CYLINDER 12  1 17.1500 2P36.703
HOLE 20   0.0    0.0 0.0
HOLE 21  -9.2974 0.0 0.0
HOLE 22  +9.2974 0.0 0.0
CYLINDER 2  1 18.9103 2P37.338
CYLINDER 6  1 33.4645 2P37.338
CYLINDER 2  1 36.5188 2P37.338
CYLINDER 8  1 49.2227 2P37.338
CYLINDER 2  1 49.8221 2P37.338
CUBOID   8  1 4P49.8221 2P37.338
UNIT 41
COM='TRIGA FUEL ELEMENT'
CYLINDER 4  1 0.2858 2P19.05
CYLINDER 10 1 1.8224 2P19.05
CYLINDER 5  1 1.8224 2P27.7368
CYLINDER 2  1 1.8771 2P27.7368
CYLINDER 11 1 1.8771 2P36.703
UNIT 45
COM='3.38 in Width / 0.28 in Thickness DIVIDER CENTER STACK'
CUBOID   2 1 2P4.2926 0.7112 0.0 2P36.703
UNIT 46
COM='3.38 in Width / 0.24 in Thickness DIVIDER OUTSIDE STACK'
CUBOID   2 1 2P4.2926 0.6096 0.0 2P36.703
```

```
UNIT 50
COM='TRIGA FUEL ELEMENTS IN Top of 3.38 in x 3.38 in OPENING'
CUBOID     12 1 2P4.2926 2P4.2926 2P36.703
HOLE       41  +2.1495 +2.4154 0.0
HOLE       41  -2.1495 +2.4154 0.0
HOLE       41  -2.1495 -1.3389 0.0
HOLE       41  +2.1495 -1.3389 0.0
UNIT 51
COM='TRIGA FUEL ELEMENTS IN Bottom of 3.38 in x 3.38 in OPENING'
CUBOID     12 1 2P4.2926 2P4.2926 2P36.703
HOLE       41  +2.1495 -2.4154 0.0
HOLE       41  -2.1495 -2.4154 0.0
HOLE       41  -2.1495 +1.3389 0.0
HOLE       41  +2.1495 +1.3389 0.0
UNIT 52
COM='TRIGA FUEL ELEMENTS IN Bottom Right of 3.38 in x 3.38 in OPENING'
CUBOID     12 1 2P4.2926 2P4.2926 2P36.703
HOLE       41  +2.4154 -2.4154  0.0
HOLE       41  +2.4154 +1.3389  0.0
HOLE       41  -1.3389 -2.4154  0.0
HOLE       41  -1.3389 +1.3389  0.0
UNIT 53
COM='TRIGA FUEL ELEMENTS IN Top Right of 3.38 in x 3.38 in OPENING'
CUBOID     12 1 2P4.2926 2P4.2926 2P36.703
HOLE       41 +2.4154 +2.4154  0.0
HOLE       41 +2.4154 -1.3389  0.0
HOLE       41 -1.3389 +2.4154  0.0
HOLE       41 -1.3389 -1.3389  0.0
UNIT 54
COM='TRIGA FUEL ELEMENTS IN Bottom Left of 3.38 in x 3.38 in OPENING'
CUBOID     12 1 2P4.2926 2P4.2926 2P36.703
HOLE       41  -2.4154 -2.4154  0.0
HOLE       41  -2.4154 +1.3389  0.0
HOLE       41  +1.3389 -2.4154  0.0
HOLE       41  +1.3389 +1.3389  0.0
UNIT 55
COM='TRIGA FUEL ELEMENTS IN Top Left of 3.38 in x 3.38 in OPENING'
CUBOID     12 1 2P4.2926 2P4.2926 2P36.703
HOLE       41  -2.4154 +2.4154  0.0
HOLE       41  -2.4154 -1.3389  0.0
HOLE       41  +1.3389 +2.4154  0.0
HOLE       41  +1.3389 -1.3389  0.0
UNIT 56
COM='TRIGA BASKET 3.38 in x 3.38 in CENTER OPENING'
CUBOID     12 1 2P4.2926 2P4.2926 2P36.703
HOLE       41 +2.1495 -2.1495 0.0
HOLE       41 -2.1495 +2.1495 0.0
HOLE       41 -2.1495 -2.1495 0.0
HOLE       41 +2.1495 +2.1495 0.0
CUBOID     12 1 2P4.2926 2P4.2926 2P36.703
UNIT 60
COM='CENTER COLUMN OF THREE OPENINGS w/ 0.28 in plate'
ARRAY 11  -4.2926 -13.9065 -36.703
REPLICATE 2 1 4R0.7112 2R0.0 1
UNIT 61
COM='LEFT OUTSIDE COLUMN OF TWO OPENINGS w/ 0.12 in plate'
ARRAY 12  -4.2926 -9.0488 -36.703
REPLICATE 2 1 0.0 0.3048 2R0.3048 2R0.0 1
UNIT 62
COM='RIGHT OUTSIDE COLUMN OF TWO OPENINGS w/ 0.12 in plate'
ARRAY 13  -4.2926 -9.0488 -36.703
REPLICATE 2 1 0.3048 0.0 2R0.3048 2R0.0 1
UNIT 70
COM='NAC-LWT TRIGA BASKET'
CYLINDER 12  1 17.1500 2P36.703
HOLE 60   0.0     0.0 0.0
HOLE 61  -9.2974 0.0 0.0
HOLE 62  +9.2974 0.0 0.0
CYLINDER 2  1 18.9103 2P37.338
CYLINDER 6  1 33.4645 2P37.338
CYLINDER 2  1 36.5188 2P37.338
CYLINDER 8  1 49.2227 2P37.338
CYLINDER 2  1 49.8221 2P37.338
CUBOID   8  1 4P49.8221 2P37.338
UNIT 80
COM='SIMPLIFIED LID STRUCTURE NAC-LWT'
CYLINDER 2 1 36.5188 2P14.1351
CYLINDER 8 1 49.8221 2P14.1351
CUBOID   8 1 4P49.8221 2P14.1351
UNIT 81
COM='SIMPLIFIED CASK BOTTOM STRUCTURE NAC-LWT'
CYLINDER 6 1 26.3525 2P3.81
CYLINDER 2 1 36.6186 +13.97 -12.7
CYLINDER 8 1 49.8221 +13.97 -12.7
CUBOID   8 1 4P49.8221 +13.97 -12.7
GLOBAL UNIT 82
COM='STACK OF 5 BASKETS IN CASK'
ARRAY  20  -49.8221 -49.8221 -213.36
END GEOM
READ ARRAY
ARA=1 NUX=1 NUY=7 NUZ=1 FILL 10 5 17 16 17 5 11 END FILL
ARA=2 NUX=1 NUY=4 NUZ=1 FILL 13 17 6 12 END FILL
ARA=3 NUX=1 NUY=4 NUZ=1 FILL 15 17 6 14 END FILL
ARA=11 NUX=1 NUY=7 NUZ=1 FILL 50 45 17 56 17 45 51 END FILL
ARA=12 NUX=1 NUY=4 NUZ=1 FILL 53 17 46 52 END FILL
ARA=13 NUX=1 NUY=4 NUZ=1 FILL 55 17 46 54 END FILL
ARA=20 NUX=1 NUY=1 NUZ=7 FILL 81 30 3R70 30 80 END FILL
END ARRAY
READ BOUNDS ALL=MIR END BOUNDS
END DATA
```

```
SECONDARY MODULE 000008    HAS BEEN CALLED.

MODULE 000008    IS FINISHED. COMPLETION CODE     0. CPU TIME USED     1.87 (SECONDS).

SECONDARY MODULE 000002    HAS BEEN CALLED.

MODULE 000002    IS FINISHED. COMPLETION CODE     0. CPU TIME USED    20.60 (SECONDS).

SECONDARY MODULE 000009    HAS BEEN CALLED.

MODULE 000009    IS FINISHED. COMPLETION CODE     0. CPU TIME USED  1087.30 (SECONDS).

MODULE CSAS25    IS FINISHED. COMPLETION CODE     0. CPU TIME USED  1112.90 (SECONDS).
```

```
 CCCCCCCCCCC   SSSSSSSSSSS     AAAAAAAAA     SSSSSSSSSSS    22222222222    5555555555555
CCCCCCCCCCCCC SSSSSSSSSSSSS   AAAAAAAAAAA   SSSSSSSSSSSSS  2222222222222   5555555555555
CC         CC SS         SS  AA         AA  SS         SS 22         22    55
CC            SS             AA         AA  SS                       22    55
CC            SS             AA         AA  SS                       22    55
CC            SSSSSSSSSSSS   AAAAAAAAAAAAA  SSSSSSSSSSSS            22     555555555555
CC             SSSSSSSSSSSS  AAAAAAAAAAAAA   SSSSSSSSSSSS         22       5555555555555
CC                       SS  AA         AA             SS       22                    55
CC                       SS  AA         AA             SS     22                      55
CC         CC SS         SS  AA         AA  SS         SS 22            55            55
CCCCCCCCCCCCC SSSSSSSSSSSSS  AA         AA  SSSSSSSSSSSSS 2222222222222  5555555555555
 CCCCCCCCCCC   SSSSSSSSSSS   AA         AA   SSSSSSSSSSS  2222222222222   55555555555

 SSSSSSSSSSS   CCCCCCCCCCC     AAAAAAAAA    LL            EEEEEEEEEEEEE                 PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS CCCCCCCCCCCCC   AAAAAAAAAAA   LL            EEEEEEEEEEEEE                 PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS CC         CC  AA         AA  LL            EE                            PP         PP  CC         CC
SS            CC             AA         AA  LL            EE                            PP         PP  CC
SS            CC             AA         AA  LL            EE                            PP         PP  CC
SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL            EEEEEEEEE     -------------   PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS CC             AAAAAAAAAAAAA  LL            EEEEEEEEE     -------------   PPPPPPPPPPPP   CC
           SS CC             AA         AA  LL            EE                            PP             CC
           SS CC             AA         AA  LL            EE                            PP             CC
SS         SS CC         CC  AA         AA  LL            EE                            PP             CC         CC
SSSSSSSSSSSSS CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLLL EEEEEEEEEEEEE                 PP             CCCCCCCCCCCCC
 SSSSSSSSSSS   CCCCCCCCCCC   AA         AA  LLLLLLLLLLLLL EEEEEEEEEEEEE                 PP              CCCCCCCCCCC

      11       22222222222             //        11       5555555555555            //   99999999999     88888888888
     111      2222222222222           //        111       5555555555555           //   9999999999999   8888888888888
    1111      22         22          //        1111       55                     //    99         99   88         88
      11                 22         //           11       55                    //     99         99   88         88
      11                 22        //            11       55                   //      99         99   88         88
      11               22         //             11       555555555555        //       9999999999999    88888888888
      11             22          //              11       5555555555555      //         999999999999    88888888888
      11          22            //               11                  55     //                    99   88         88
      11        22             //                11                  55    //                     99   88         88
      11      22              //                 11       55         55   //                      99   88         88
   11111111   2222222222222  //               11111111    5555555555555  //        9999999999999   8888888888888
   11111111   2222222222222 //                11111111     55555555555  //          99999999999     88888888888

   0000000     666666666666                 22222222222   666666666666                 0000000     7777777777777
  000000000   6666666666666                2222222222222  6666666666666              000000000    777777777777
 00       00  66                 :::       22         22  66                :::     00       00   77         77
00         00 66                 :::                  22  66                :::    00         00            77
00         00 66                 :::                  22  66                :::    00         00           77
00         00 666666666666                          22    666666666666             00         00          77
00         00 6666666666666                       22      6666666666666            00         00          77
00         00 66         66      :::            22        66         66     :::    00         00         77
00         00 66         66      :::          22          66         66     :::    00         00         77
 00       00  66         66      :::        22            66         66     :::     00       00          77
  000000000   6666666666666                2222222222222  6666666666666              000000000           77
   0000000     66666666666                 2222222222222   66666666666                0000000            77
```

```
  SSSSSSSSSSS      CCCCCCCCCCC        AAAAAAAAA       LL                 EEEEEEEEEEEEE                       PPPPPPPPPPPP       CCCCCCCCCCC
 SSSSSSSSSSSSS    CCCCCCCCCCCCC      AAAAAAAAAAA      LL                 EEEEEEEEEEEEE                       PPPPPPPPPPPPP     CCCCCCCCCCCCC
SS          SS   CC          CC    AA          AA     LL                 EE                                  PP          PP   CC          CC
SS               CC                AA          AA     LL                 EE                                  PP          PP   CC
SS               CC                AA          AA     LL                 EE                                  PP          PP   CC
 SSSSSSSSSSSS    CC                AAAAAAAAAAAAA      LL                 EEEEEEEEE       -------------       PPPPPPPPPPPPP    CC
  SSSSSSSSSSSS   CC                AAAAAAAAAAAAA      LL                 EEEEEEEEE       -------------       PPPPPPPPPPPP     CC
            SS   CC                AA          AA     LL                 EE                                  PP               CC
            SS   CC                AA          AA     LL                 EE                                  PP               CC
SS          SS   CC          CC    AA          AA     LL                 EE                                  PP               CC          CC
SSSSSSSSSSSSS    CCCCCCCCCCCCC     AA          AA     LLLLLLLLLLLLL      EEEEEEEEEEEEE                       PP               CCCCCCCCCCCCC
 SSSSSSSSSSS      CCCCCCCCCCC      AA          AA     LLLLLLLLLLLLL      EEEEEEEEEEEEE                       PP                CCCCCCCCCCC


                          ***********************************************************************************
                          ***********************************************************************************
                          *****                                                                         *****
                          *****                   PROGRAM VERIFICATION INFORMATION                      *****
                          *****                                                                         *****
                          *****                  CODE SYSTEM:  SCALE-PC VERSION:  4.3                   *****
                          *****                                                                         *****
                          ***********************************************************************************
                          ***********************************************************************************
                          *****                                                                         *****
                          *****                   PROGRAM:  CSAS                                        *****
                          *****                                                                         *****
                          *****             CREATION DATE:  03/08/96                                    *****
                          *****                                                                         *****
                          *****                    VOLUME:  ENG                                         *****
                          *****                                                                         *****
                          *****                   LIBRARY:  G:\SCALE43\WIN_NT\EXE                       *****
                          *****                                                                         *****
                          *****                                                                         *****
                          *****           PRODUCTION CODE:  CSAS                                        *****
                          *****                                                                         *****
                          *****                   VERSION:  3.1                                         *****
                          *****                                                                         *****
                          *****                   JOBNAME:  SCALE-PC                                    *****
                          *****                                                                         *****
                          *****         DATE OF EXECUTION:  12/15/98                                    *****
                          *****                                                                         *****
                          *****         TIME OF EXECUTION:  06:26:07                                    *****
                          *****                                                                         *****
                          ***********************************************************************************
                          ***********************************************************************************

 **** PROBLEM PARAMETERS ****

 LIB 27GROUPNDF4  LIBRARY
 MXX           14 MIXTURES
 MSC           38 COMPOSITION SPECIFICATIONS
 IZM            3 MATERIAL ZONES
 GE  LATTICECELL  GEOMETRY
 MORE           1 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
 MSLN           0 FUEL SOLUTIONS

 **** PROBLEM GEOMETRY ****

 CTP SQUAREPITCH  CELL TYPE
 PITCH     4.2992 CM CENTER TO CENTER SPACING
 FUELOD    3.6449 CM FUEL DIAMETER OR SLAB THICKNESS
 MFUEL          1 MIXTURE NO. OF FUEL
 MMOD           3 MIXTURE NO. OF MODERATOR
 CLADOD    3.7541 CM CLAD OUTER DIAMETER
 MCLAD          2 MIXTURE NO. OF CLAD

 **** SPECIAL PARAMETERS ****

 ISN            8 ORDER OF ANGULAR QUADRATURE
 IIM           20 INNER ITERATION MAXIMUM
 ICM           25 OUTER ITERATION MAXIMUM
 SZF  1.00000E+00 SIZE FACTOR FOR SPATIAL MESH
 EPS  1.00000E-04 OVERALL PROBLEM CONVERGENCE
 PTC  1.00000E-04 SCALAR FLUX CONVERGENCE
 BKL  1.42089E+00 BUCKLING FACTOR
 IUS            0 THERMAL UPSCATTER SCALING
 BAL         FINE BALANCE TABLE PRINT FLAG
 DY   0.00000E+00 BUCKLING HEIGHT
 DZ   0.00000E+00 BUCKLING DEPTH
 IPN            0 DIFFUSION COEFFICIENT OPTION
 FRD            0 LOGICAL UNIT NUMBER TO READ FLUX GUESS
 FWR           -1 LOGICAL UNIT NUMBER TO WRITE FLUX GUESS
 MSH         2001 NUMBER OF INTERVALS FOR RES. INTGRTNS
 MLV            2 MAX LVALUE FOR RES. INTGRTNS
 AXS            0 LOGICAL UNIT NUMBER TO WRITE ANISN LIB
 RES           10 MIXTURE WITH SPECIAL RESONANCE CORRECTION
  *      CYLINDER GEOMETRY FOR SPECIAL RESONANCE CORRECTION
  *   1.82240E+00 DIMENSION (LBAR) FOR SPECIAL RESONANCE CORRECTION

 DANCOFF FACTOR SPECIFICATION
 MIXTURE     FACTOR
     10     0.85220

 ZONE SPECIFICATIONS FOR LATTICECELL GEOMETRY

                ZONE  1 IS FUEL
                ZONE  2 IS CLAD
                ZONE  3 IS MOD
```

```
KK          KK  EEEEEEEEEEEEE  NN          NN   OOOOOOOOOOO                      VV          VV
KK        KK    EEEEEEEEEEEEE  NNN         NN  OOOOOOOOOOOOO                     VV          VV
KK      KK      EE             NNNN        NN  OO         OO                     VV          VV
KK    KK        EE             NN NN       NN  OO         OO                     VV          VV
KK  KK          EE             NN  NN      NN  OO         OO                     VV          VV
KKKKKKKK        EEEEEEEEE      NN   NN     NN  OO         OO   -------------     VV          VV
KKKKKKKK        EEEEEEEEE      NN    NN    NN  OO         OO   -------------      VV        VV
KK  KK          EE             NN     NN   NN  OO         OO                       VV      VV
KK    KK        EE             NN      NN  NN  OO         OO                        VV    VV
KK      KK      EE             NN       NNNNN  OO         OO                         VV  VV
KK        KK    EEEEEEEEEEEEE  NN        NNNN  OOOOOOOOOOOOO                          VVVV
KK          KK  EEEEEEEEEEEEE  NN          NN   OOOOOOOOOOO                            V

 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL             EEEEEEEEEEEEE                  PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL             EEEEEEEEEEEEE                  PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL             EE                             PP         PP  CC         CC
SS             CC             AA         AA  LL             EE                             PP         PP  CC
SS             CC             AA         AA  LL             EE                             PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------   PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------   PPPPPPPPPPPP   CC
           SS  CC             AA         AA  LL             EE                             PP             CC
           SS  CC             AA         AA  LL             EE                             PP             CC
SS         SS  CC         CC  AA         AA  LL             EE                             PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLLL  EEEEEEEEEEEEE                  PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLLL  EEEEEEEEEEEEE                  PP              CCCCCCCCCCC

     11         22222222222            //       11        5555555555555            //   99999999999    88888888888
    111        2222222222222          //       111        5555555555555           //   9999999999999  8888888888888
   1111        22         22         //       1111        55                     //    99         99  88         88
     11                   22        //          11        55                    //     99         99  88         88
     11                   22       //           11        55                   //      99         99  88         88
     11                 22        //            11        555555555555        //       9999999999999   88888888888
     11               22         //             11        5555555555555      //         999999999999   88888888888
     11             22          //              11                   55     //                    99  88         88
     11           22           //               11                   55    //                     99  88         88
     11         22            //                11        55         55   //                      99  88         88
   11111111    2222222222222 //               11111111    5555555555555  //        9999999999999  8888888888888
   11111111    2222222222222//                11111111     55555555555  //         999999999999    88888888888

  0000000      666666666666                22222222222    666666666666               33333333333    22222222222
 000000000     6666666666666              2222222222222   6666666666666             3333333333333  2222222222222
 00     00     66                  :::    22         22   66                  :::   33         33  22         22
00       00    66                  :::               22   66                  :::              33             22
00       00    66                  :::               22   66                  :::              33             22
00       00    666666666666                        22     666666666666                        333           22
00       00    6666666666666                     22       6666666666666                       333         22
00       00    66         66       :::         22         66         66       :::              33       22
00       00    66         66       :::       22           66         66       :::              33     22
 00     00     66         66       :::     22             66         66       :::   33         33   22
 000000000     6666666666666              2222222222222   6666666666666             3333333333333  2222222222222
  0000000       66666666666               2222222222222    66666666666               33333333333   2222222222222
```

```
 SSSSSSSSSSS    CCCCCCCCCCC      AAAAAAAAA      LL              EEEEEEEEEEEEE                    PPPPPPPPPPPP      CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC    AAAAAAAAAAA     LL              EEEEEEEEEEEEE                    PPPPPPPPPPPPP    CCCCCCCCCCCCC
SS         SS  CC         CC   AA         AA    LL              EE                               PP         PP    CC         CC
SS             CC              AA         AA    LL              EE                               PP         PP    CC
SS             CC              AA         AA    LL              EE                               PP         PP    CC
SSSSSSSSSSSS   CC              AAAAAAAAAAAAA    LL              EEEEEEEEE      -------------     PPPPPPPPPPPPP    CC
 SSSSSSSSSSSS  CC              AAAAAAAAAAAAA    LL              EEEEEEEEE      -------------     PPPPPPPPPPPP     CC
           SS  CC              AA         AA    LL              EE                               PP               CC
           SS  CC              AA         AA    LL              EE                               PP               CC
SS         SS  CC         CC   AA         AA    LL              EE                               PP               CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AA         AA    LLLLLLLLLLLLL   EEEEEEEEEEEEE                    PP               CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC    AA         AA    LLLLLLLLLLLLL   EEEEEEEEEEEEE                    PP                CCCCCCCCCCC
```

```
***********************************************************************
***********************************************************************
***********************************************************************
*****                                                            *****
*****              PROGRAM VERIFICATION INFORMATION              *****
*****                                                            *****
*****             CODE SYSTEM:   SCALE-PC VERSION:   4.3         *****
*****                                                            *****
***********************************************************************
***********************************************************************
*****                                                            *****
*****                                                            *****
*****           PROGRAM:  000009                                 *****
*****                                                            *****
*****     CREATION DATE:  03/08/96                               *****
*****                                                            *****
*****            VOLUME:  ENG                                    *****
*****                                                            *****
*****           LIBRARY:  G:\SCALE43\WIN_NT\EXE                  *****
*****                                                            *****
*****                                                            *****
*****   PRODUCTION CODE:  KENOVA                                 *****
*****                                                            *****
*****           VERSION:  3.1                                    *****
*****                                                            *****
*****           JOBNAME:  SCALE-PC                               *****
*****                                                            *****
***** DATE OF EXECUTION:  12/15/98                               *****
*****                                                            *****
***** TIME OF EXECUTION:  06:26:32                               *****
*****                                                            *****
*****                                                            *****
***********************************************************************
***********************************************************************
***********************************************************************
```

```
TRIGA - PREF. FLOOD CANISTER

****** NUMERIC PARAMETERS ******

TME   MAXIMUM PROBLEM TIME (MIN)              170.00
TBA   TIME PER GENERATION (MIN)                 2.00
GEN   NUMBER OF GENERATIONS                      403
NPG   NUMBER PER GENERATION                     1000
NSK   NUMBER OF GENERATIONS TO BE SKIPPED          3
BEG   BEGINNING GENERATION NUMBER                  1
RES   GENERATIONS BETWEEN CHECKPOINTS              0
X1D   NUMBER OF EXTRA 1-D CROSS SECTIONS           1
NBK   NEUTRON BANK SIZE                         1025
XNB   EXTRA POSITIONS IN NEUTRON BANK              0
NFB   FISSION BANK SIZE                         1000
XFB   EXTRA POSITIONS IN FISSION BANK              0
WTA   DEFAULT VALUE OF WEIGHT AVERAGE         0.5000
WTH   WEIGHT HIGH FOR SPLITTING               3.0000
WTL   WEIGHT LOW FOR RUSSIAN ROULETTE         0.3333
RND   STARTING RANDOM NUMBER            BB8271000001
NB8   NUMBER OF D.A. BLOCKS ON UNIT  8           200
NL8   LENGTH OF D.A. BLOCKS ON UNIT  8           512
ADJ   MODE OF CALCULATION                    FORWARD
      INPUT DATA WRITTEN ON RESTART UNIT          NO
      BINARY DATA INTERFACE                      YES
```

```
*******************************************************************************************************************
*******************************************************************************************************************
***                                                                                                             ***
***                              TRIGA - PREF. FLOOD CANISTER                                                   ***
***                                                                                                             ***
*******************************************************************************************************************
***                               ******     LOGICAL PARAMETERS      ******                                     ***
***                                                                                                             ***
***  RUN  EXECUTE PROBLEM AFTER CHECKING DATA    YES          PLT  PLOT PICTURE MAP(S)                       NO ***
***                                                                                                             ***
***  FLX  COMPUTE FLUX                            NO          FDN  COMPUTE FISSION DENSITIES                 NO ***
***                                                                                                             ***
***  SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION    NO          NUB  COMPUTE NU-BAR & AVG FISSION GROUP       YES ***
***                                                                                                             ***
***  MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER     NO          MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION     NO ***
***                                                                                                             ***
***  CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER   NO          CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION   NO ***
***                                                                                                             ***
***  FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER   NO          FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION   NO ***
***                                                                                                             ***
***  MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER     NO          MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER      NO ***
***                                                                                                             ***
***  CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER   NO          CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER    NO ***
***                                                                                                             ***
***  FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER   NO          FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER    NO ***
***                                                                                                             ***
***  HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL    NO          HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL     NO ***
***                                                                                                             ***
***  AMX  PRINT ALL MIXED CROSS SECTIONS          NO          FAR  PRINT FIS. AND ABS. BY REGION             NO ***
***                                                                                                             ***
***  XS1  PRINT 1-D MIXTURE X-SECTIONS            NO          GAS  PRINT FAR BY GROUP                        NO ***
***                                                                                                             ***
***  XS2  PRINT 2-D MIXTURE X-SECTIONS            NO          PAX  PRINT XSEC-ALBEDO CORRELATION TABLES      NO ***
***                                                                                                             ***
***  XAP  PRINT MIXTURE ANGLES & PROBABILITIES    NO          PWT  PRINT WEIGHT AVERAGE ARRAY                NO ***
***                                                                                                             ***
***  PKI  PRINT FISSION SPECTRUM                  NO          PGM  PRINT INPUT GEOMETRY                      NO ***
***                                                                                                             ***
***  P1D  PRINT EXTRA 1-D CROSS SECTIONS          NO          BUG  PRINT DEBUG INFORMATION                   NO ***
***                                                                                                             ***
***                                                           TRK  PRINT TRACKING INFORMATION                NO ***
***                                                                                                             ***
***                                                                                                             ***
*******************************************************************************************************************
*******************************************************************************************************************
*******************************************************************************************************************
                                     PARAMETER INPUT COMPLETED

                     ........     0 IO'S WERE USED READING THE PARAMETER DATA      ........

                     *************** DATA READING COMPLETED ***************
```

```
*****************************************************************************************
***                                                                                   ***
***        TRIGA - PREF. FLOOD CANISTER                                               ***
***                                                                                   ***
*****************************************************************************************
*****************************************************************************************
***                                                                                   ***
***                          ****** ADDITIONAL INFORMATION ******                     ***
***                                                                                   ***
***  NUMBER OF ENERGY GROUPS              27       USE LATTICE GEOMETRY          YES  ***
***                                                                                   ***
***  NO. OF FISSION SPECTRUM SOURCE GROUP  1       GLOBAL ARRAY NUMBER            20  ***
***                                                                                   ***
***  NO. OF SCATTERING ANGLES IN XSECS     2       NUMBER OF UNITS IN THE GLOBAL X DIR.   1  ***
***                                                                                   ***
***  ENTRIES/NEUTRON IN THE NEUTRON BANK  24       NUMBER OF UNITS IN THE GLOBAL Y DIR.   1  ***
***                                                                                   ***
***  ENTRIES/NEUTRON IN THE FISSION BANK  17       NUMBER OF UNITS IN THE GLOBAL Z DIR.   7  ***
***                                                                                   ***
***  NUMBER OF MIXTURES USED              13       USE A GLOBAL REFLECTOR        YES  ***
***                                                                                   ***
***  NUMBER OF BIAS ID'S USED              1       USE NESTED HOLES              YES  ***
***                                                                                   ***
***  NUMBER OF DIFFERENTIAL ALBEDOS USED   0       NUMBER OF HOLES                62  ***
***                                                                                   ***
***  TOTAL INPUT GEOMETRY REGIONS         80       MAXIMUM HOLE NESTING LEVEL      2  ***
***                                                                                   ***
***  NUMBER OF GEOMETRY REGIONS USED      80       USE NESTED ARRAYS             YES  ***
***                                                                                   ***
***  LARGEST GEOMETRY UNIT NUMBER         82       NUMBER OF ARRAYS USED           7  ***
***                                                                                   ***
***  LARGEST ARRAY NUMBER                 20       MAXIMUM ARRAY NESTING LEVEL     2  ***
***                                                                                   ***
***                                                                                   ***
***  +X BOUNDARY CONDITION               MIR       -X BOUNDARY CONDITION         MIR  ***
***                                                                                   ***
***  +Y BOUNDARY CONDITION               MIR       -Y BOUNDARY CONDITION         MIR  ***
***                                                                                   ***
***  +Z BOUNDARY CONDITION               MIR       -Z BOUNDARY CONDITION         MIR  ***
***                                                                                   ***
*****************************************************************************************

           **********************************************************
           **                                                      **
           **  ARRAY     UNITS IN   UNITS IN   UNITS IN   NESTING  **
           **  NUMBER     X DIR.     Y DIR.     Z DIR.     LEVEL   **
           **                                                      **
           **    1          1          7          1          2     **
           **                                                      **
           **    2          1          4          1          2     **
           **                                                      **
           **    3          1          4          1          2     **
           **                                                      **
           **   11          1          7          1          2     **
           **                                                      **
           **   12          1          4          1          2     **
           **                                                      **
           **   13          1          4          1          2     **
           **                                                      **
           **   20 GLOBAL   1          1          7          1     **
           **                                                      **
           **********************************************************

              ........    0 IO'S WERE USED LOADING THE DATA    ........
                        TRIGA - PREF. FLOOD CANISTER
-
                MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID

                                        -----  UNIT    1  -----

TRIGA FUEL ELEMENT (SCREENED)

  1 CYLINDER         4   1  RADIUS = 0.28580    +Z =  19.050    -Z = -19.050    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  2 CYLINDER         1   1  RADIUS =  1.8224    +Z =  19.050    -Z = -19.050    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CYLINDER         5   1  RADIUS =  1.8224    +Z =  27.737    -Z = -27.737    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  4 CYLINDER         2   1  RADIUS =  1.8771    +Z =  27.737    -Z = -27.737    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  5 CYLINDER         9   1  RADIUS =  1.8771    +Z =  36.703    -Z = -36.703    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

                                        -----  UNIT    5  -----

3.38 IN WIDTH / 0.28 IN THICKNESS DIVIDER CENTER STACK (SCREENED)

  1 CUBOID           2   1      +X =  4.2926    -X = -4.2926    +Y = 0.71120    -Y = 0.00000    +Z =  36.703    -Z = -36.703

                                        -----  UNIT    6  -----
```

```
3.38 IN WIDTH / 0.24 IN THICKNESS DIVIDER OUTSIDE STACK (SCREENED)

  1 CUBOID          2  1      +X =  4.2926    -X = -4.2926    +Y = 0.60960    -Y = 0.00000    +Z =  36.703    -Z = -36.703

                                          -----  UNIT   10  -----

TRIGA ELEMENTS IN TOP OF 3.38 IN X 3.38 IN OPENING (SCREENED)

  1 CUBOID          3  1      +X =  4.0267    -X = -4.0267    +Y =  4.1029    -Y = -3.9505    +Z =  36.703    -Z = -36.703
    HOLE NUMBER     1      AT X =  2.1495     Y =  2.2257     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER     2      AT X = -2.1495     Y =  2.2257     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER     3      AT X = -2.1495     Y = -2.0733     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER     4      AT X =  2.1495     Y = -2.0733     Z = 0.00000     IS UNIT NUMBER     1
  2 CUBOID          2  1      +X =  4.2164    -X = -4.2164    +Y =  4.2926    -Y = -4.1402    +Z =  36.703    -Z = -36.703
  3 CUBOID         12  1      +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926    +Z =  36.703    -Z = -36.703
-                                  TRIGA - PREF. FLOOD CANISTER

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                          -----  UNIT   11  -----

TRIGA ELEMENTS IN BOTTOM OF 3.38 IN X 3.38 IN OPENING (SCREENED)

  1 CUBOID          3  1      +X =  4.0267    -X = -4.0267    +Y =  3.9505    -Y = -4.1029    +Z =  36.703    -Z = -36.703
    HOLE NUMBER     5      AT X =  2.1495     Y = -2.2257     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER     6      AT X = -2.1495     Y = -2.2257     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER     7      AT X = -2.1495     Y =  2.0733     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER     8      AT X =  2.1495     Y =  2.0733     Z = 0.00000     IS UNIT NUMBER     1
  2 CUBOID          2  1      +X =  4.2164    -X = -4.2164    +Y =  4.1402    -Y = -4.2926    +Z =  36.703    -Z = -36.703
  3 CUBOID         12  1      +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926    +Z =  36.703    -Z = -36.703

                                          -----  UNIT   12  -----

TRIGA ELEMENTS IN BOTTOM RIGHT OF 3.38 IN X 3.38 IN OPENING (SCREENED)

  1 CUBOID          3  1      +X =  4.1029    -X = -3.9505    +Y =  3.9505    -Y = -4.1029    +Z =  36.703    -Z = -36.703
    HOLE NUMBER     9      AT X =  2.2257     Y = -2.2257     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER    10      AT X =  2.2257     Y =  2.0733     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER    11      AT X = -2.0733     Y = -2.2257     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER    12      AT X = -2.0733     Y =  2.0733     Z = 0.00000     IS UNIT NUMBER     1
  2 CUBOID          2  1      +X =  4.2926    -X = -4.1402    +Y =  4.1402    -Y = -4.2926    +Z =  36.703    -Z = -36.703
  3 CUBOID         12  1      +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926    +Z =  36.703    -Z = -36.703

                                          -----  UNIT   13  -----

TRIGA ELEMENTS IN TOP RIGHT OF 3.38 IN X 3.38 IN OPENING (SCREENED)

  1 CUBOID          3  1      +X =  4.1029    -X = -3.9505    +Y =  4.1029    -Y = -3.9505    +Z =  36.703    -Z = -36.703
    HOLE NUMBER    13      AT X =  2.2257     Y =  2.2257     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER    14      AT X =  2.2257     Y = -2.0733     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER    15      AT X = -2.0733     Y =  2.2257     Z = 0.00000     IS UNIT NUMBER     1
    HOLE NUMBER    16      AT X = -2.0733     Y = -2.0733     Z = 0.00000     IS UNIT NUMBER     1
  2 CUBOID          2  1      +X =  4.2926    -X = -4.1402    +Y =  4.2926    -Y = -4.1402    +Z =  36.703    -Z = -36.703
  3 CUBOID         12  1      +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926    +Z =  36.703    -Z = -36.703
-                                  TRIGA - PREF. FLOOD CANISTER

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                          -----  UNIT   14  -----

TRIGA ELEMENTS IN BOTTOM LEFT OF 3.38 IN X 3.38 IN OPENING (SCREENED)

  1 CUBOID          3  1      +X =  3.9505    -X = -4.1029    +Y =  3.9505    -Y = -4.1029    +Z =  36.703    -Z = -36.703
```

```
   HOLE NUMBER    17      AT X = -2.2257     Y = -2.2257     Z = 0.00000    IS UNIT NUMBER     1
   HOLE NUMBER    18      AT X = -2.2257     Y =  2.0733     Z = 0.00000    IS UNIT NUMBER     1
   HOLE NUMBER    19      AT X =  2.0733     Y = -2.2257     Z = 0.00000    IS UNIT NUMBER     1
   HOLE NUMBER    20      AT X =  2.0733     Y =  2.0733     Z = 0.00000    IS UNIT NUMBER     1
 2 CUBOID          2  1     +X =  4.1402    -X = -4.2926    +Y =  4.1402    -Y = -4.2926    +Z =  36.703    -Z = -36.703
 3 CUBOID         12  1     +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926    +Z =  36.703    -Z = -36.703

                                       -----  UNIT   15  -----

TRIGA ELEMENTS IN TOP LEFT OF 3.38 IN X 3.38 IN OPENING (SCREENED)
 1 CUBOID          3  1     +X =  3.9505    -X = -4.1029    +Y =  4.1029    -Y = -3.9505    +Z =  36.703    -Z = -36.703
   HOLE NUMBER    21      AT X = -2.2257     Y =  2.2257     Z = 0.00000    IS UNIT NUMBER     1
   HOLE NUMBER    22      AT X = -2.2257     Y = -2.0733     Z = 0.00000    IS UNIT NUMBER     1
   HOLE NUMBER    23      AT X =  2.0733     Y =  2.2257     Z = 0.00000    IS UNIT NUMBER     1
   HOLE NUMBER    24      AT X =  2.0733     Y = -2.0733     Z = 0.00000    IS UNIT NUMBER     1
 2 CUBOID          2  1     +X =  4.1402    -X = -4.2926    +Y =  4.2926    -Y = -4.1402    +Z =  36.703    -Z = -36.703
 3 CUBOID         12  1     +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926    +Z =  36.703    -Z = -36.703

                                       -----  UNIT   16  -----

TRIGA BASKET 3.38 IN X 3.38 IN CENTER OPENING (SCREENED)
 1 CUBOID          3  1     +X =  4.0267    -X = -4.0267    +Y =  4.0267    -Y = -4.0267    +Z =  36.703    -Z = -36.703
   HOLE NUMBER    25      AT X = -2.1495     Y =  2.1495     Z = 0.00000    IS UNIT NUMBER     1
   HOLE NUMBER    26      AT X = -2.1495     Y = -2.1495     Z = 0.00000    IS UNIT NUMBER     1
   HOLE NUMBER    27      AT X =  2.1495     Y =  2.1495     Z = 0.00000    IS UNIT NUMBER     1
   HOLE NUMBER    28      AT X =  2.1495     Y = -2.1495     Z = 0.00000    IS UNIT NUMBER     1
 2 CUBOID          2  1     +X =  4.2164    -X = -4.2164    +Y =  4.2164    -Y = -4.2164    +Z =  36.703    -Z = -36.703
 3 CUBOID         12  1     +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926    +Z =  36.703    -Z = -36.703
                                    TRIGA - PREF. FLOOD CANISTER

              MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION         NUM   ID

                                       -----  UNIT   17  -----

HORIZONTAL X-X POISON SHEET + WATER
 1 CUBOID         13  1     +X =  3.8227    -X = -3.8227    +Y = 0.31750    -Y = 0.00000    +Z =  34.163    -Z = -34.163
 2 CUBOID         14  1     +X =  4.1402    -X = -4.1402    +Y = 0.31750    -Y = 0.00000    +Z =  34.163    -Z = -34.163
 3 CUBOID         12  1     +X =  4.2926    -X = -4.2926    +Y = 0.31750    -Y = 0.00000    +Z =  36.703    -Z = -36.703

                               -----  UNIT   20  EXTERNAL TO LATTICE  1  -----

CENTER COLUMN OF THREE OPENINGS W/ 0.28 IN PLATE (SCREENED)
 1 ARRAY NUMBER    1        +X =  4.2926    -X = -4.2926    +Y =  13.907    -Y = -13.906    +Z =  36.703    -Z = -36.703
 2 CUBOID          2  1     +X =  5.0038    -X = -5.0038    +Y =  14.618    -Y = -14.618    +Z =  36.703    -Z = -36.703

                               -----  UNIT   21  EXTERNAL TO LATTICE  2  -----

LEFT OUTSIDE COLUMN OF TWO OPENINGS W/ 0.12 IN PLATE (SCREENED)
 1 ARRAY NUMBER    2        +X =  4.2926    -X = -4.2926    +Y =  9.0487    -Y = -9.0488    +Z =  36.703    -Z = -36.703
 2 CUBOID          2  1     +X =  4.2926    -X = -4.5974    +Y =  9.3535    -Y = -9.3536    +Z =  36.703    -Z = -36.703

                               -----  UNIT   22  EXTERNAL TO LATTICE  3  -----

RIGHT OUTSIDE COLUMN OF TWO OPENINGS W/ 0.12 IN PLATE (SCREENED)
 1 ARRAY NUMBER    3        +X =  4.2926    -X = -4.2926    +Y =  9.0487    -Y = -9.0488    +Z =  36.703    -Z = -36.703
 2 CUBOID          2  1     +X =  4.5974    -X = -4.2926    +Y =  9.3535    -Y = -9.3536    +Z =  36.703    -Z = -36.703
                                    TRIGA - PREF. FLOOD CANISTER

              MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
```

```
REGION            NUM   ID

                                    -----  UNIT    30   -----

NAC-LWT TRIGA BASKET (SCREENED)

  1 CYLINDER        12  1  RADIUS =  17.150    +Z =  36.703    -Z = -36.703    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
    HOLE NUMBER     29       AT X =  0.00000     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER    20
    HOLE NUMBER     30       AT X = -9.2974      Y = 0.00000     Z = 0.00000    IS UNIT NUMBER    21
    HOLE NUMBER     31       AT X =  9.2974      Y = 0.00000     Z = 0.00000    IS UNIT NUMBER    22
  2 CYLINDER         2  1  RADIUS =  18.910    +Z =  37.338    -Z = -37.338    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  3 CYLINDER         6  1  RADIUS =  33.465    +Z =  37.338    -Z = -37.338    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  4 CYLINDER         2  1  RADIUS =  36.519    +Z =  37.338    -Z = -37.338    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  5 CYLINDER         8  1  RADIUS =  49.223    +Z =  37.338    -Z = -37.338    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  6 CYLINDER         2  1  RADIUS =  49.822    +Z =  37.338    -Z = -37.338    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  7 CUBOID           8  1      +X =  49.822    -X = -49.822    +Y =  49.822    -Y = -49.822      +Z =  37.338     -Z = -37.338

                                    -----  UNIT    41   -----

TRIGA FUEL ELEMENT

  1 CYLINDER         4  1  RADIUS = 0.28580    +Z =  19.050    -Z = -19.050    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  2 CYLINDER        10  1  RADIUS =  1.8224    +Z =  19.050    -Z = -19.050    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  3 CYLINDER         5  1  RADIUS =  1.8224    +Z =  27.737    -Z = -27.737    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  4 CYLINDER         2  1  RADIUS =  1.8771    +Z =  27.737    -Z = -27.737    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  5 CYLINDER        11  1  RADIUS =  1.8771    +Z =  36.703    -Z = -36.703    CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                    -----  UNIT    45   -----

3.38 IN WIDTH / 0.28 IN THICKNESS DIVIDER CENTER STACK

  1 CUBOID           2  1      +X =  4.2926    -X = -4.2926    +Y = 0.71120    -Y = 0.00000      +Z =  36.703     -Z = -36.703

                                    -----  UNIT    46   -----

3.38 IN WIDTH / 0.24 IN THICKNESS DIVIDER OUTSIDE STACK

  1 CUBOID           2  1      +X =  4.2926    -X = -4.2926    +Y = 0.60960    -Y = 0.00000      +Z =  36.703     -Z = -36.703
                                   TRIGA - PREF. FLOOD CANISTER
-
               MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION          NUM   ID

                                    -----  UNIT    50   -----

TRIGA FUEL ELEMENTS IN TOP OF 3.38 IN X 3.38 IN OPENING

  1 CUBOID          12  1      +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926      +Z =  36.703     -Z = -36.703
    HOLE NUMBER     32       AT X =  2.1495      Y =  2.4154     Z = 0.00000    IS UNIT NUMBER    41
    HOLE NUMBER     33       AT X = -2.1495      Y =  2.4154     Z = 0.00000    IS UNIT NUMBER    41
    HOLE NUMBER     34       AT X = -2.1495      Y = -1.3389     Z = 0.00000    IS UNIT NUMBER    41
    HOLE NUMBER     35       AT X =  2.1495      Y = -1.3389     Z = 0.00000    IS UNIT NUMBER    41

                                    -----  UNIT    51   -----

TRIGA FUEL ELEMENTS IN BOTTOM OF 3.38 IN X 3.38 IN OPENING

  1 CUBOID          12  1      +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926      +Z =  36.703     -Z = -36.703
    HOLE NUMBER     36       AT X =  2.1495      Y = -2.4154     Z = 0.00000    IS UNIT NUMBER    41
    HOLE NUMBER     37       AT X = -2.1495      Y = -2.4154     Z = 0.00000    IS UNIT NUMBER    41
    HOLE NUMBER     38       AT X = -2.1495      Y =  1.3389     Z = 0.00000    IS UNIT NUMBER    41
    HOLE NUMBER     39       AT X =  2.1495      Y =  1.3389     Z = 0.00000    IS UNIT NUMBER    41

                                    -----  UNIT    52   -----

TRIGA FUEL ELEMENTS IN BOTTOM RIGHT OF 3.38 IN X 3.38 IN OPENING
```

```
  1 CUBOID        12  1     +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926    +Z =  36.703    -Z = -36.703
    HOLE NUMBER    40      AT X =  2.4154     Y = -2.4154     Z = 0.00000    IS UNIT NUMBER    41
    HOLE NUMBER    41      AT X =  2.4154     Y =  1.3389     Z = 0.00000    IS UNIT NUMBER    41
    HOLE NUMBER    42      AT X = -1.3389     Y = -2.4154     Z = 0.00000    IS UNIT NUMBER    41
    HOLE NUMBER    43      AT X = -1.3389     Y =  1.3389     Z = 0.00000    IS UNIT NUMBER    41
-                                      TRIGA - PREF. FLOOD CANISTER

               MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION          NUM   ID

                                        -----  UNIT   53   -----

TRIGA FUEL ELEMENTS IN TOP RIGHT OF 3.38 IN X 3.38 IN OPENING
  1 CUBOID        12  1     +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926    +Z =  36.703    -Z = -36.703
    HOLE NUMBER    44      AT X =  2.4154     Y =  2.4154     Z = 0.00000    IS UNIT NUMBER    41
    HOLE NUMBER    45      AT X =  2.4154     Y = -1.3389     Z = 0.00000    IS UNIT NUMBER    41
    HOLE NUMBER    46      AT X = -1.3389     Y =  2.4154     Z = 0.00000    IS UNIT NUMBER    41
    HOLE NUMBER    47      AT X = -1.3389     Y = -1.3389     Z = 0.00000    IS UNIT NUMBER    41

                                        -----  UNIT   54   -----

TRIGA FUEL ELEMENTS IN BOTTOM LEFT OF 3.38 IN X 3.38 IN OPENING
  1 CUBOID        12  1     +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926    +Z =  36.703    -Z = -36.703
    HOLE NUMBER    48      AT X = -2.4154     Y = -2.4154     Z = 0.00000    IS UNIT NUMBER    41
    HOLE NUMBER    49      AT X = -2.4154     Y =  1.3389     Z = 0.00000    IS UNIT NUMBER    41
    HOLE NUMBER    50      AT X =  1.3389     Y = -2.4154     Z = 0.00000    IS UNIT NUMBER    41
    HOLE NUMBER    51      AT X =  1.3389     Y =  1.3389     Z = 0.00000    IS UNIT NUMBER    41

                                        -----  UNIT   55   -----

TRIGA FUEL ELEMENTS IN TOP LEFT OF 3.38 IN X 3.38 IN OPENING
  1 CUBOID        12  1     +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926    +Z =  36.703    -Z = -36.703
    HOLE NUMBER    52      AT X = -2.4154     Y =  2.4154     Z = 0.00000    IS UNIT NUMBER    41
    HOLE NUMBER    53      AT X = -2.4154     Y = -1.3389     Z = 0.00000    IS UNIT NUMBER    41
    HOLE NUMBER    54      AT X =  1.3389     Y =  2.4154     Z = 0.00000    IS UNIT NUMBER    41
    HOLE NUMBER    55      AT X =  1.3389     Y = -1.3389     Z = 0.00000    IS UNIT NUMBER    41
-                                      TRIGA - PREF. FLOOD CANISTER

               MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION          NUM   ID

                                        -----  UNIT   56   -----

TRIGA BASKET 3.38 IN X 3.38 IN CENTER OPENING
  1 CUBOID        12  1     +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926    +Z =  36.703    -Z = -36.703
    HOLE NUMBER    56      AT X =  2.1495     Y = -2.1495     Z = 0.00000    IS UNIT NUMBER    41
    HOLE NUMBER    57      AT X = -2.1495     Y =  2.1495     Z = 0.00000    IS UNIT NUMBER    41
    HOLE NUMBER    58      AT X = -2.1495     Y = -2.1495     Z = 0.00000    IS UNIT NUMBER    41
    HOLE NUMBER    59      AT X =  2.1495     Y =  2.1495     Z = 0.00000    IS UNIT NUMBER    41
  2 CUBOID        12  1     +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926    +Z =  36.703    -Z = -36.703

                              -----  UNIT   60  EXTERNAL TO LATTICE 11   -----

CENTER COLUMN OF THREE OPENINGS W/ 0.28 IN PLATE
  1 ARRAY NUMBER   11        +X =  4.2926    -X = -4.2926    +Y =  13.907    -Y = -13.906    +Z =  36.703    -Z = -36.703
  2 CUBOID         2  1      +X =  5.0038    -X = -5.0038    +Y =  14.618    -Y = -14.618    +Z =  36.703    -Z = -36.703

                              -----  UNIT   61  EXTERNAL TO LATTICE 12   -----

LEFT OUTSIDE COLUMN OF TWO OPENINGS W/ 0.12 IN PLATE
  1 ARRAY NUMBER   12        +X =  4.2926    -X = -4.2926    +Y =  9.0487    -Y = -9.0488    +Z =  36.703    -Z = -36.703
```

```
  2 CUBOID          2  1      +X =  4.2926    -X = -4.5974     +Y =  9.3535    -Y = -9.3536     +Z =  36.703    -Z = -36.703

                                   -----  UNIT   62  EXTERNAL TO LATTICE 13   -----

RIGHT OUTSIDE COLUMN OF TWO OPENINGS W/ 0.12 IN PLATE

  1 ARRAY NUMBER    13            +X =  4.2926    -X = -4.2926     +Y =  9.0487    -Y = -9.0488     +Z =  36.703    -Z = -36.703

  2 CUBOID          2  1      +X =  4.5974    -X = -4.2926     +Y =  9.3535    -Y = -9.3536     +Z =  36.703    -Z = -36.703
_                                  TRIGA - PREF. FLOOD CANISTER

               MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION          NUM   ID

                                         -----  UNIT    70   -----

NAC-LWT TRIGA BASKET

  1 CYLINDER       12  1  RADIUS =  17.150     +Z =  36.703    -Z = -36.703     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

    HOLE NUMBER    60       AT X = 0.00000      Y = 0.00000     Z = 0.00000     IS UNIT NUMBER     60

    HOLE NUMBER    61       AT X = -9.2974      Y = 0.00000     Z = 0.00000     IS UNIT NUMBER     61

    HOLE NUMBER    62       AT X =  9.2974      Y = 0.00000     Z = 0.00000     IS UNIT NUMBER     62

  2 CYLINDER        2  1  RADIUS =  18.910     +Z =  37.338    -Z = -37.338     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CYLINDER        6  1  RADIUS =  33.465     +Z =  37.338    -Z = -37.338     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  4 CYLINDER        2  1  RADIUS =  36.519     +Z =  37.338    -Z = -37.338     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  5 CYLINDER        8  1  RADIUS =  49.223     +Z =  37.338    -Z = -37.338     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  6 CYLINDER        2  1  RADIUS =  49.822     +Z =  37.338    -Z = -37.338     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  7 CUBOID          8  1      +X =  49.822    -X = -49.822     +Y =  49.822    -Y = -49.822     +Z =  37.338    -Z = -37.338

                                         -----  UNIT    80   -----

SIMPLIFIED LID STRUCTURE NAC-LWT

  1 CYLINDER        2  1  RADIUS =  36.519     +Z =  14.135    -Z = -14.135     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  2 CYLINDER        8  1  RADIUS =  49.822     +Z =  14.135    -Z = -14.135     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CUBOID          8  1      +X =  49.822    -X = -49.822     +Y =  49.822    -Y = -49.822     +Z =  14.135    -Z = -14.135

                                         -----  UNIT    81   -----

SIMPLIFIED CASK BOTTOM STRUCTURE NAC-LWT

  1 CYLINDER        6  1  RADIUS =  26.353     +Z =  3.8100    -Z = -3.8100     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  2 CYLINDER        2  1  RADIUS =  36.619     +Z =  13.970    -Z = -12.700     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CYLINDER        8  1  RADIUS =  49.822     +Z =  13.970    -Z = -12.700     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  4 CUBOID          8  1      +X =  49.822    -X = -49.822     +Y =  49.822    -Y = -49.822     +Z =  13.970    -Z = -12.700
_                                  TRIGA - PREF. FLOOD CANISTER

               MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION          NUM   ID

                                   ******************  GLOBAL  ******************
                                   -----  UNIT   82  EXTERNAL TO LATTICE 20   -----

STACK OF 5 BASKETS IN CASK

  1 ARRAY NUMBER    20            +X =  49.822    -X = -49.822     +Y =  49.822    -Y = -49.822     +Z =  214.96    -Z = -213.36
_                          TRIGA - PREF. FLOOD CANISTER

                -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   1          -------

Z LAYER    1, X COLUMN    1 TO    1 LEFT TO RIGHT    Y ROW    1 TO    7  BOTTOM TO TOP

 11

  5

 17

 16

 17

  5

 10
```

```
------- UNIT ORIENTATION DESCRIPTION FOR ARRAY  2        -------
Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   4  BOTTOM TO TOP
 12
  6
 17
 13
------- UNIT ORIENTATION DESCRIPTION FOR ARRAY  3        -------
Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   4  BOTTOM TO TOP
 14
  6
 17
 15
                    TRIGA - PREF. FLOOD CANISTER
------- UNIT ORIENTATION DESCRIPTION FOR ARRAY  11       -------
Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   7  BOTTOM TO TOP
 51
 45
 17
 56
 17
 45
 50
------- UNIT ORIENTATION DESCRIPTION FOR ARRAY  12       -------
Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   4  BOTTOM TO TOP
 52
 46
 17
 53
------- UNIT ORIENTATION DESCRIPTION FOR ARRAY  13       -------
Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   4  BOTTOM TO TOP
 54
 46
 17
 55
                    TRIGA - PREF. FLOOD CANISTER
------- UNIT ORIENTATION DESCRIPTION FOR ARRAY  20       -------
Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
 81
Z LAYER   2, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
 30
Z LAYER   3, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
 70
Z LAYER   4, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
 70
Z LAYER   5, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
 70
Z LAYER   6, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
 30
Z LAYER   7, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
 30
                    TRIGA - PREF. FLOOD CANISTER
          VOLUMES FOR THOSE UNITS UTILIZED IN  THIS PROBLEM
```

UNIT	REGION	GEOMETRY REGION	VOLUME	CUMULATIVE VOLUME
1	1	1	9.77686E+00 CM**3	9.77686E+00 CM**3
	2	2	3.87746E+02 CM**3	3.97523E+02 CM**3

```
             3          3          1.81270E+02 CM**3          5.78793E+02 CM**3
             4          4          3.52668E+01 CM**3          6.14060E+02 CM**3
             5          5          1.98501E+02 CM**3          8.12561E+02 CM**3

   5         1          6          4.48202E+02 CM**3          4.48202E+02 CM**3

   6         1          7          3.84173E+02 CM**3          3.84173E+02 CM**3

  10         1          8          1.51067E+03 CM**3          4.76091E+03 CM**3
             2          9          4.59145E+02 CM**3          5.22006E+03 CM**3
             3         10          1.90382E+02 CM**3          5.41044E+03 CM**3

  11         1         11          1.51067E+03 CM**3          4.76091E+03 CM**3
             2         12          4.59145E+02 CM**3          5.22006E+03 CM**3
             3         13          1.90382E+02 CM**3          5.41044E+03 CM**3

  12         1         14          1.51067E+03 CM**3          4.76091E+03 CM**3
             2         15          4.59145E+02 CM**3          5.22006E+03 CM**3
             3         16          1.90382E+02 CM**3          5.41044E+03 CM**3

  13         1         17          1.51067E+03 CM**3          4.76091E+03 CM**3
             2         18          4.59145E+02 CM**3          5.22006E+03 CM**3
             3         19          1.90382E+02 CM**3          5.41044E+03 CM**3

  14         1         20          1.51067E+03 CM**3          4.76091E+03 CM**3
             2         21          4.59145E+02 CM**3          5.22006E+03 CM**3
             3         22          1.90382E+02 CM**3          5.41044E+03 CM**3

  15         1         23          1.51067E+03 CM**3          4.76091E+03 CM**3
             2         24          4.59145E+02 CM**3          5.22006E+03 CM**3
             3         25          1.90382E+02 CM**3          5.41044E+03 CM**3

  16         1         26          1.51067E+03 CM**3          4.76091E+03 CM**3
             2         27          4.59145E+02 CM**3          5.22006E+03 CM**3
             3         28          1.90382E+02 CM**3          5.41044E+03 CM**3

  17         1         29          1.65856E+02 CM**3          1.65856E+02 CM**3
             2         30          1.37754E+01 CM**3          1.79631E+02 CM**3
             3         31          2.04593E+01 CM**3          2.00090E+02 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     32 IS AN ARRAY PLACEMENT BOUNDARY REGION

  20         1         32          1.75279E+04 CM**3          1.75279E+04 CM**3
             2         33          3.94895E+03 CM**3          2.14768E+04 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     34 IS AN ARRAY PLACEMENT BOUNDARY REGION

  21         1         34          1.14051E+04 CM**3          1.14051E+04 CM**3
             2         35          8.02729E+02 CM**3          1.22079E+04 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     36 IS AN ARRAY PLACEMENT BOUNDARY REGION

  22         1         36          1.14051E+04 CM**3          1.14051E+04 CM**3
             2         37          8.02729E+02 CM**3          1.22079E+04 CM**3

  30         1         38          2.19355E+04 CM**3          6.78281E+04 CM**3
             2         39          1.60653E+04 CM**3          8.38934E+04 CM**3
             3         40          1.78831E+05 CM**3          2.62724E+05 CM**3
             4         41          5.01461E+04 CM**3          3.12870E+05 CM**3
             5         42          2.55540E+05 CM**3          5.68410E+05 CM**3
             6         43          1.39278E+04 CM**3          5.82338E+05 CM**3
             7         44          1.59118E+05 CM**3          7.41456E+05 CM**3

  41         1         45          9.77686E+00 CM**3          9.77686E+00 CM**3
             2         46          3.87746E+02 CM**3          3.97523E+02 CM**3
             3         47          1.81270E+02 CM**3          5.78793E+02 CM**3
             4         48          3.52668E+01 CM**3          6.14060E+02 CM**3
             5         49          1.98501E+02 CM**3          8.12561E+02 CM**3

  45         1         50          4.48202E+02 CM**3          4.48202E+02 CM**3

  46         1         51          3.84173E+02 CM**3          3.84173E+02 CM**3

  50         1         52          2.16019E+03 CM**3          5.41044E+03 CM**3

  51         1         53          2.16019E+03 CM**3          5.41044E+03 CM**3

  52         1         54          2.16019E+03 CM**3          5.41044E+03 CM**3

  53         1         55          2.16019E+03 CM**3          5.41044E+03 CM**3

  54         1         56          2.16019E+03 CM**3          5.41044E+03 CM**3

  55         1         57          2.16019E+03 CM**3          5.41044E+03 CM**3

  56         1         58          2.16019E+03 CM**3          5.41044E+03 CM**3
             2         59          0.00000E+00 CM**3          5.41044E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     60 IS AN ARRAY PLACEMENT BOUNDARY REGION

  60         1         60          1.75279E+04 CM**3          1.75279E+04 CM**3
             2         61          3.94895E+03 CM**3          2.14768E+04 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     62 IS AN ARRAY PLACEMENT BOUNDARY REGION

  61         1         62          1.14051E+04 CM**3          1.14051E+04 CM**3
             2         63          8.02729E+02 CM**3          1.22079E+04 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     64 IS AN ARRAY PLACEMENT BOUNDARY REGION
```

62	1	64	1.14051E+04 CM**3	1.14051E+04 CM**3
	2	65	8.02729E+02 CM**3	1.22079E+04 CM**3
70	1	66	2.19355E+04 CM**3	6.78281E+04 CM**3
	2	67	1.60653E+04 CM**3	8.38934E+04 CM**3
	3	68	1.78831E+05 CM**3	2.62724E+05 CM**3
	4	69	5.01461E+04 CM**3	3.12870E+05 CM**3
	5	70	2.55540E+05 CM**3	5.68410E+05 CM**3
	6	71	1.39278E+04 CM**3	5.82338E+05 CM**3
	7	72	1.59118E+05 CM**3	7.41456E+05 CM**3
80	1	73	1.18444E+05 CM**3	1.18444E+05 CM**3
	2	74	1.02013E+05 CM**3	2.20456E+05 CM**3
	3	75	6.02374E+04 CM**3	2.80694E+05 CM**3
81	1	76	1.66245E+04 CM**3	1.66245E+04 CM**3
	2	77	9.57276E+04 CM**3	1.12352E+05 CM**3
	3	78	9.56257E+04 CM**3	2.07978E+05 CM**3
	4	79	5.68278E+04 CM**3	2.64806E+05 CM**3

SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 80 IS AN ARRAY PLACEMENT BOUNDARY REGION

82	1	80	4.25278E+06 CM**3	4.25278E+06 CM**3

UNIT	USES	REGION	MIXTURE	TOTAL VOLUME
1	56	1	4	5.47504E+02 CM**3
		2	1	2.17138E+04 CM**3
		3	5	1.01511E+04 CM**3
		4	2	1.97494E+03 CM**3
		5	9	1.11161E+04 CM**3
5	4	1	2	1.79281E+03 CM**3
6	4	1	2	1.53669E+03 CM**3
10	2	1	3	3.02133E+03 CM**3
		2	2	9.18290E+02 CM**3
		3	12	3.80764E+02 CM**3
11	2	1	3	3.02133E+03 CM**3
		2	2	9.18290E+02 CM**3
		3	12	3.80764E+02 CM**3
12	2	1	3	3.02133E+03 CM**3
		2	2	9.18290E+02 CM**3
		3	12	3.80764E+02 CM**3
13	2	1	3	3.02133E+03 CM**3
		2	2	9.18290E+02 CM**3
		3	12	3.80764E+02 CM**3
14	2	1	3	3.02133E+03 CM**3
		2	2	9.18290E+02 CM**3
		3	12	3.80764E+02 CM**3
15	2	1	3	3.02133E+03 CM**3
		2	2	9.18290E+02 CM**3
		3	12	3.80764E+02 CM**3
16	2	1	3	3.02133E+03 CM**3
		2	2	9.18290E+02 CM**3
		3	12	3.80764E+02 CM**3
17	20	1	13	3.31711E+03 CM**3
		2	14	2.75508E+02 CM**3
		3	12	4.09185E+02 CM**3
20	2	1		3.50558E+04 CM**3
		2	2	7.89790E+03 CM**3
21	2	1		2.28103E+04 CM**3
		2	2	1.60546E+03 CM**3
22	2	1		2.28103E+04 CM**3
		2	2	1.60546E+03 CM**3
30	2	1	12	4.38710E+04 CM**3
		2	2	3.21306E+04 CM**3
		3	6	3.57661E+05 CM**3
		4	2	1.00292E+05 CM**3
		5	8	5.11080E+05 CM**3
		6	2	2.78555E+04 CM**3
		7	8	3.18236E+05 CM**3
41	84	1	4	8.21256E+02 CM**3
		2	10	3.25707E+04 CM**3
		3	5	1.52267E+04 CM**3
		4	2	2.96242E+03 CM**3
		5	11	1.66741E+04 CM**3
45	6	1	2	2.68921E+03 CM**3
46	6	1	2	2.30504E+03 CM**3
50	3	1	12	6.48058E+03 CM**3
51	3	1	12	6.48058E+03 CM**3

52	3	1	12	6.48058E+03 CM**3
53	3	1	12	6.48058E+03 CM**3
54	3	1	12	6.48058E+03 CM**3
55	3	1	12	6.48058E+03 CM**3
56	3	1	12	6.48058E+03 CM**3
		2	12	0.00000E+00 CM**3
60	3	1		5.25837E+04 CM**3
		2	2	1.18469E+04 CM**3
61	3	1		3.42154E+04 CM**3
		2	2	2.40819E+03 CM**3
62	3	1		3.42154E+04 CM**3
		2	2	2.40819E+03 CM**3
70	3	1	12	6.58065E+04 CM**3
		2	2	4.81959E+04 CM**3
		3	6	5.36492E+05 CM**3
		4	2	1.50438E+05 CM**3
		5	8	7.66620E+05 CM**3
		6	2	4.17833E+04 CM**3
		7	8	4.77353E+05 CM**3
80	1	1	2	1.18444E+05 CM**3
		2	8	1.02013E+05 CM**3
		3	8	6.02374E+04 CM**3
81	1	1	6	1.66245E+04 CM**3
		2	2	9.57276E+04 CM**3
		3	8	9.56257E+04 CM**3
		4	8	5.68278E+04 CM**3
82	1	1		4.25278E+06 CM**3

TOTAL MIXTURE VOLUMES

MIXTURE	TOTAL VOLUME	MASS(G)
1	2.17138E+04 CM**3	1.26338E+05
2	6.62328E+05 CM**3	5.24564E+06
3	2.11493E+04 CM**3	2.11106E+04
4	1.36876E+03 CM**3	8.88326E+03
5	2.53779E+04 CM**3	5.32939E+04
6	9.10777E+05 CM**3	1.03319E+07
8	2.38799E+06 CM**3	2.38363E-14
9	1.11161E+04 CM**3	3.70362E+04
10	3.25707E+04 CM**3	1.89507E+05
11	1.66741E+04 CM**3	4.45219E+04
12	1.58116E+05 CM**3	1.57827E-15
13	3.31711E+03 CM**3	2.57176E+04
14	2.75508E+02 CM**3	2.11891E+03

```
**********************************************************************************************
***                                                                                        ***
***                                 BIASING INFORMATION                                    ***
***                                                                                        ***
***    A DEFAULT WEIGHT OF    0.500 WILL BE USED FOR ALL BIAS ID'S.                        ***
***                                                                                        ***
**********************************************************************************************

                ........  0 IO'S WERE USED IN KENO-V BEFORE TRACKING       ........

                ........  0.03200 MINUTES WERE USED PROCESSING DATA.       ........

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 1.27645E-02

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED WITH A FLAT DISTRIBUTION IN A CUBOID DEFINED BY:
            +X= 4.98221E+01  -X=-4.98221E+01  +Y= 4.98221E+01  -Y=-4.98221E+01  +Z= 2.14960E+02  -Z=-2.13360E+02
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

KENO MESSAGE NUMBER K5-105      ***** WARNING, ONLY  777 INDEPENDENT STARTING POSITIONS WERE GENERATED.  *****

  223 ADDITIONAL STARTING POINTS WERE PICKED FROM THE INITAL DISTRIBUTION.

1.79800 MINUTES WERE REQUIRED FOR STARTING.   TOTAL ELAPSED TIME IS 1.83467 MINUTES.
```

TRIGA - PREF. FLOOD CANISTER

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
1	9.04076E-01	1.87017E+00	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	8.72359E-01	1.91683E+00	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	973 INDEPENDENT FISSION POINTS WEPE GENERATED			
3	8.77401E-01	1.96083E+00	8.77401E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	8.96040E-01	2.00200E+00	8.86720E-01	9.31981E-03	0.00000E+00	0.00000E+00
5	8.93147E-01	2.04417E+00	8.88862E-01	5.79149E-03	0.00000E+00	0.00000E+00
6	8.75129E-01	2.08800E+00	8.85429E-01	5.34401E-03	0.00000E+00	0.00000E+00
7	9.12265E-01	2.12750E+00	8.90796E-01	6.77804E-03	0.00000E+00	0.00000E+00
8	9.07510E-01	2.16950E+00	8.93582E-01	6.19574E-03	0.00000E+00	0.00000E+00
9	8.90479E-01	2.21167E+00	8.93139E-01	5.25508E-03	0.00000E+00	0.00000E+00
10	9.09255E-01	2.25383E+00	8.95153E-01	4.97700E-03	0.00000E+00	0.00000E+00
11	9.08515E-01	2.29500E+00	8.96638E-01	4.63359E-03	0.00000E+00	0.00000E+00
12	8.92590E-01	2.33800E+00	8.96233E-01	4.16413E-03	0.00000E+00	0.00000E+00
13	8.79348E-01	2.37917E+00	8.94698E-01	4.06737E-03	0.00000E+00	0.00000E+00
14	8.80056E-01	2.42133E+00	8.93478E-01	3.90833E-03	0.00000E+00	0.00000E+00
15	8.85894E-01	2.46250E+00	8.92895E-01	3.64216E-03	0.00000E+00	0.00000E+00
16	9.18410E-01	2.50283E+00	8.94717E-01	3.83301E-03	0.00000E+00	0.00000E+00
17	8.84402E-01	2.54033E+00	8.94029E-01	3.63401E-03	0.00000E+00	0.00000E+00
18	8.85021E-01	2.58150E+00	8.93466E-01	3.44562E-03	0.00000E+00	0.00000E+00
19	9.74563E-01	2.61900E+00	8.98237E-01	5.76472E-03	0.00000E+00	0.00000E+00
20	9.41390E-01	2.65750E+00	9.00634E-01	5.94029E-03	0.00000E+00	0.00000E+00
21	8.89588E-01	2.69950E+00	9.00053E-01	5.64894E-03	0.00000E+00	0.00000E+00
22	8.85700E-01	2.74083E+00	8.99335E-01	5.40690E-03	0.00000E+00	0.00000E+00
23	8.81833E-01	2.78283E+00	8.98502E-01	5.21007E-03	0.00000E+00	0.00000E+00
24	8.74236E-01	2.82400E+00	8.97399E-01	5.08859E-03	0.00000E+00	0.00000E+00
25	9.22286E-01	2.86167E+00	8.98481E-01	4.98126E-03	0.00000E+00	0.00000E+00
26	8.85436E-01	2.90367E+00	8.97937E-01	4.80006E-03	0.00000E+00	0.00000E+00
27	8.89771E-01	2.94400E+00	8.97611E-01	4.61563E-03	0.00000E+00	0.00000E+00
28	9.00682E-01	2.98333E+00	8.97729E-01	4.43613E-03	0.00000E+00	0.00000E+00
29	8.93443E-01	3.02450E+00	8.97570E-01	4.27162E-03	0.00000E+00	0.00000E+00
30	8.87394E-01	3.06483E+00	8.97207E-01	4.13225E-03	0.00000E+00	0.00000E+00
31	9.42163E-01	3.10417E+00	8.98757E-01	4.27797E-03	0.00000E+00	0.00000E+00
32	9.44103E-01	3.14450E+00	9.00268E-01	4.40065E-03	0.00000E+00	0.00000E+00
33	8.96528E-01	3.18300E+00	9.00148E-01	4.25804E-03	0.00000E+00	0.00000E+00
34	9.04464E-01	3.22233E+00	9.00282E-01	4.12503E-03	0.00000E+00	0.00000E+00
35	8.62652E-01	3.26250E+00	8.99142E-01	4.15752E-03	0.00000E+00	0.00000E+00
36	8.98804E-01	3.30283E+00	8.99132E-01	4.03340E-03	0.00000E+00	0.00000E+00
37	8.91865E-01	3.34033E+00	8.98925E-01	3.92196E-03	0.00000E+00	0.00000E+00
38	9.29874E-01	3.37967E+00	8.99784E-01	3.90722E-03	0.00000E+00	0.00000E+00
39	9.12129E-01	3.41917E+00	9.00118E-01	3.81477E-03	0.00000E+00	0.00000E+00
40	8.95307E-01	3.45850E+00	8.99991E-01	3.71518E-03	0.00000E+00	0.00000E+00
41	8.84003E-01	3.49967E+00	8.99581E-01	3.64181E-03	0.00000E+00	0.00000E+00
42	9.10453E-01	3.54000E+00	8.99853E-01	3.55999E-03	0.00000E+00	0.00000E+00
43	8.98455E-01	3.57933E+00	8.99819E-01	3.47224E-03	0.00000E+00	0.00000E+00
44	9.07561E-01	3.62050E+00	9.00003E-01	3.39357E-03	0.00000E+00	0.00000E+00
45	8.94583E-01	3.65900E+00	8.99877E-01	3.31611E-03	0.00000E+00	0.00000E+00
46	8.81784E-01	3.69917E+00	8.99466E-01	3.26586E-03	0.00000E+00	0.00000E+00
47	8.53810E-01	3.74050E+00	8.98452E-01	3.34980E-03	0.00000E+00	0.00000E+00
48	9.24237E-01	3.77883E+00	8.99012E-01	3.32378E-03	0.00000E+00	0.00000E+00
49	8.84761E-01	3.82000E+00	8.98709E-01	3.26640E-03	0.00000E+00	0.00000E+00
50	9.05456E-01	3.86133E+00	8.98849E-01	3.20071E-03	0.00000E+00	0.00000E+00
51	9.03071E-01	3.90067E+00	8.98936E-01	3.13589E-03	0.00000E+00	0.00000E+00
52	8.59549E-01	3.94267E+00	8.98148E-01	3.17191E-03	0.00000E+00	0.00000E+00
53	8.88460E-01	3.98667E+00	8.97958E-01	3.11489E-03	0.00000E+00	0.00000E+00
54	8.44593E-01	4.02783E+00	8.96932E-01	3.22220E-03	0.00000E+00	0.00000E+00
55	9.15333E-01	4.06633E+00	8.97279E-01	3.17983E-03	0.00000E+00	0.00000E+00
56	8.91137E-01	4.10667E+00	8.97165E-01	3.12246E-03	0.00000E+00	0.00000E+00
57	8.94424E-01	4.14783E+00	8.97115E-01	3.06556E-03	0.00000E+00	0.00000E+00
58	9.17595E-01	4.18717E+00	8.97481E-01	3.03246E-03	0.00000E+00	0.00000E+00
59	9.14172E-01	4.22750E+00	8.97774E-01	2.99314E-03	0.00000E+00	0.00000E+00
60	9.49548E-01	4.26683E+00	8.98666E-01	3.07356E-03	0.00000E+00	0.00000E+00
61	9.66389E-01	4.30433E+00	8.99814E-01	3.23173E-03	0.00000E+00	0.00000E+00
62	9.04482E-01	4.34550E+00	8.99892E-01	3.17837E-03	0.00000E+00	0.00000E+00
63	8.86045E-01	4.38767E+00	8.99665E-01	3.13406E-03	0.00000E+00	0.00000E+00
64	9.08881E-01	4.42883E+00	8.99814E-01	3.08668E-03	0.00000E+00	0.00000E+00
65	8.84092E-01	4.47100E+00	8.99564E-01	3.04752E-03	0.00000E+00	0.00000E+00
66	9.07861E-01	4.51117E+00	8.99694E-01	3.00233E-03	0.00000E+00	0.00000E+00
67	8.81999E-01	4.55233E+00	8.99422E-01	2.96829E-03	0.00000E+00	0.00000E+00
68	9.59277E-01	4.59367E+00	9.00328E-01	3.06042E-03	0.00000E+00	0.00000E+00
69	9.03907E-01	4.63300E+00	9.00382E-01	3.01487E-03	0.00000E+00	0.00000E+00
70	8.89708E-01	4.67500E+00	9.00225E-01	2.97435E-03	0.00000E+00	0.00000E+00
71	9.28087E-01	4.71533E+00	9.00629E-01	2.95861E-03	0.00000E+00	0.00000E+00
72	9.12438E-01	4.75567E+00	9.00797E-01	2.92091E-03	0.00000E+00	0.00000E+00
73	9.21470E-01	4.79500E+00	9.01089E-01	2.89416E-03	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	999 INDEPENDENT FISSION POINTS WERE GENERATED			
74	8.95459E-01	4.83433E+00	9.01010E-01	2.85476E-03	0.00000E+00	0.00000E+00
75	8.78585E-01	4.87467E+00	9.00703E-01	2.83209E-03	0.00000E+00	0.00000E+00
76	9.28678E-01	4.91483E+00	9.01081E-01	2.81902E-03	0.00000E+00	0.00000E+00
77	9.39995E-01	4.95333E+00	9.01600E-01	2.82916E-03	0.00000E+00	0.00000E+00
78	9.44460E-01	4.99000E+00	9.02164E-01	2.84808E-03	0.00000E+00	0.00000E+00
79	9.28185E-01	5.02750E+00	9.02502E-01	2.83109E-03	0.00000E+00	0.00000E+00
80	9.24221E-01	5.06683E+00	9.02780E-01	2.80839E-03	0.00000E+00	0.00000E+00
81	9.03422E-01	5.10533E+00	9.02789E-01	2.77263E-03	0.00000E+00	0.00000E+00
82	8.94376E-01	5.14283E+00	9.02683E-01	2.73977E-03	0.00000E+00	0.00000E+00
83	9.04437E-01	5.18217E+00	9.02705E-01	2.70582E-03	0.00000E+00	0.00000E+00
84	9.30003E-01	5.22250E+00	9.03038E-01	2.69327E-03	0.00000E+00	0.00000E+00
85	8.81359E-01	5.26183E+00	9.02777E-01	2.67342E-03	0.00000E+00	0.00000E+00
86	8.86321E-01	5.30300E+00	9.02581E-01	2.64865E-03	0.00000E+00	0.00000E+00
87	8.88946E-01	5.34417E+00	9.02420E-01	2.62222E-03	0.00000E+00	0.00000E+00
88	8.74919E-01	5.38267E+00	9.02101E-01	2.61120E-03	0.00000E+00	0.00000E+00
89	8.84182E-01	5.42383E+00	9.01895E-01	2.58922E-03	0.00000E+00	0.00000E+00

90	9.51887E-01	5.46417E+00	9.02463E-01	2.62191E-03	0.00000E+00	0.00000E+00
91	9.10704E-01	5.50350E+00	9.02555E-01	2.59394E-03	0.00000E+00	0.00000E+00
92	9.55197E-01	5.54283E+00	9.03140E-01	2.63080E-03	0.00000E+00	0.00000E+00
93	9.04253E-01	5.58317E+00	9.03153E-01	2.60176E-03	0.00000E+00	0.00000E+00
94	9.29614E-01	5.62167E+00	9.03440E-01	2.58935E-03	0.00000E+00	0.00000E+00
95	9.23929E-01	5.66183E+00	9.03660E-01	2.57081E-03	0.00000E+00	0.00000E+00
96	9.16325E-01	5.70217E+00	9.03795E-01	2.54688E-03	0.00000E+00	0.00000E+00
97	8.97809E-01	5.74250E+00	9.03732E-01	2.52072E-03	0.00000E+00	0.00000E+00
98	9.07023E-01	5.78267E+00	9.03766E-01	2.49456E-03	0.00000E+00	0.00000E+00
99	9.01865E-01	5.82217E+00	9.03747E-01	2.46878E-03	0.00000E+00	0.00000E+00
100	9.05907E-01	5.86150E+00	9.03769E-01	2.44356E-03	0.00000E+00	0.00000E+00
101	8.99187E-01	5.90083E+00	9.03723E-01	2.41920E-03	0.00000E+00	0.00000E+00
102	9.36295E-01	5.93933E+00	9.04048E-01	2.41693E-03	0.00000E+00	0.00000E+00
103	9.48025E-01	5.97767E+00	9.04484E-01	2.43217E-03	0.00000E+00	0.00000E+00
104	8.99526E-01	6.01800E+00	9.04435E-01	2.40870E-03	0.00000E+00	0.00000E+00
105	9.20268E-01	6.05733E+00	9.04589E-01	2.39015E-03	0.00000E+00	0.00000E+00
106	9.20011E-01	6.09667E+00	9.04737E-01	2.37170E-03	0.00000E+00	0.00000E+00
107	9.18232E-01	6.13617E+00	9.04866E-01	2.35251E-03	0.00000E+00	0.00000E+00
108	9.29778E-01	6.17550E+00	9.05101E-01	2.34204E-03	0.00000E+00	0.00000E+00
109	8.60972E-01	6.21567E+00	9.04688E-01	2.35641E-03	0.00000E+00	0.00000E+00
110	8.66153E-01	6.25883E+00	9.04331E-01	2.36160E-03	0.00000E+00	0.00000E+00
111	8.82695E-01	6.29900E+00	9.04133E-01	2.34824E-03	0.00000E+00	0.00000E+00
112	8.96748E-01	6.33833E+00	9.04066E-01	2.32777E-03	0.00000E+00	0.00000E+00
113	9.15508E-01	6.37967E+00	9.04169E-01	2.30900E-03	0.00000E+00	0.00000E+00
114	8.74156E-01	6.41983E+00	9.03901E-01	2.30393E-03	0.00000E+00	0.00000E+00
115	8.57220E-01	6.46383E+00	9.03488E-01	2.32052E-03	0.00000E+00	0.00000E+00
116	8.94261E-01	6.50417E+00	9.03407E-01	2.30150E-03	0.00000E+00	0.00000E+00
117	9.12838E-01	6.54167E+00	9.03489E-01	2.28287E-03	0.00000E+00	0.00000E+00
118	8.82770E-01	6.58183E+00	9.03310E-01	2.27014E-03	0.00000E+00	0.00000E+00
119	9.12993E-01	6.62217E+00	9.03393E-01	2.25217E-03	0.00000E+00	0.00000E+00
120	8.95400E-01	6.66150E+00	9.03325E-01	2.23403E-03	0.00000E+00	0.00000E+00
121	8.37777E-01	6.70267E+00	9.02774E-01	2.28264E-03	0.00000E+00	0.00000E+00
122	9.12525E-01	6.74300E+00	9.02856E-01	2.26499E-03	0.00000E+00	0.00000E+00
123	8.57572E-01	6.78417E+00	9.02481E-01	2.27716E-03	0.00000E+00	0.00000E+00
124	8.84956E-01	6.82717E+00	9.02338E-01	2.26298E-03	0.00000E+00	0.00000E+00
125	8.87165E-01	6.86933E+00	9.02214E-01	2.24790E-03	0.00000E+00	0.00000E+00
126	9.30569E-01	6.91050E+00	9.02443E-01	2.24139E-03	0.00000E+00	0.00000E+00
127	9.09475E-01	6.94983E+00	9.02499E-01	2.22410E-03	0.00000E+00	0.00000E+00
128	9.20301E-01	6.98833E+00	9.02641E-01	2.21089E-03	0.00000E+00	0.00000E+00
129	9.28321E-01	7.02867E+00	9.02843E-01	2.20272E-03	0.00000E+00	0.00000E+00
130	9.33353E-01	7.06800E+00	9.03081E-01	2.19840E-03	0.00000E+00	0.00000E+00
131	8.91192E-01	7.10917E+00	9.02989E-01	2.18324E-03	0.00000E+00	0.00000E+00
132	9.13478E-01	7.15033E+00	9.03070E-01	2.16788E-03	0.00000E+00	0.00000E+00
133	8.89571E-01	7.18967E+00	9.02967E-01	2.15373E-03	0.00000E+00	0.00000E+00
134	9.04478E-01	7.23000E+00	9.02978E-01	2.13739E-03	0.00000E+00	0.00000E+00
135	9.36960E-01	7.27217E+00	9.03234E-01	2.13659E-03	0.00000E+00	0.00000E+00
136	9.11904E-01	7.31233E+00	9.03298E-01	2.12157E-03	0.00000E+00	0.00000E+00
137	9.24856E-01	7.35267E+00	9.03458E-01	2.11184E-03	0.00000E+00	0.00000E+00
138	9.33102E-01	7.39200E+00	9.03676E-01	2.10756E-03	0.00000E+00	0.00000E+00
139	8.96111E-01	7.43233E+00	9.03621E-01	2.09285E-03	0.00000E+00	0.00000E+00
140	8.78600E-01	7.47267E+00	9.03440E-01	2.08552E-03	0.00000E+00	0.00000E+00
141	8.82909E-01	7.51467E+00	9.03292E-01	2.07573E-03	0.00000E+00	0.00000E+00
142	8.85458E-01	7.55583E+00	9.03164E-01	2.06478E-03	0.00000E+00	0.00000E+00
143	8.82365E-01	7.59800E+00	9.03017E-01	2.05538E-03	0.00000E+00	0.00000E+00
144	8.84668E-01	7.63650E+00	9.02888E-01	2.04494E-03	0.00000E+00	0.00000E+00
145	8.92455E-01	7.67583E+00	9.02815E-01	2.03190E-03	0.00000E+00	0.00000E+00
146	9.09940E-01	7.71700E+00	9.02864E-01	2.01835E-03	0.00000E+00	0.00000E+00
147	8.78237E-01	7.75733E+00	9.02694E-01	2.01157E-03	0.00000E+00	0.00000E+00
148	8.81926E-01	7.79850E+00	9.02552E-01	2.00280E-03	0.00000E+00	0.00000E+00
149	9.21255E-01	7.83883E+00	9.02679E-01	1.99319E-03	0.00000E+00	0.00000E+00
150	8.79603E-01	7.87817E+00	9.02523E-01	1.98581E-03	0.00000E+00	0.00000E+00
151	9.06244E-01	7.91933E+00	9.02548E-01	1.97259E-03	0.00000E+00	0.00000E+00
152	8.61998E-01	7.96050E+00	9.02278E-01	1.97796E-03	0.00000E+00	0.00000E+00
153	8.99009E-01	8.00083E+00	9.02256E-01	1.96494E-03	0.00000E+00	0.00000E+00
154	9.16344E-01	8.04383E+00	9.02349E-01	1.95417E-03	0.00000E+00	0.00000E+00
155	9.16876E-01	8.08417E+00	9.02444E-01	1.94367E-03	0.00000E+00	0.00000E+00
156	9.04525E-01	8.12533E+00	9.02458E-01	1.93106E-03	0.00000E+00	0.00000E+00
157	8.60196E-01	8.16650E+00	9.02185E-01	1.93784E-03	0.00000E+00	0.00000E+00
158	8.74514E-01	8.20583E+00	9.02008E-01	1.93353E-03	0.00000E+00	0.00000E+00
159	8.54413E-01	8.24517E+00	9.01704E-01	1.94494E-03	0.00000E+00	0.00000E+00
160	8.67244E-01	8.28917E+00	9.01486E-01	1.94486E-03	0.00000E+00	0.00000E+00
161	8.78436E-01	8.33033E+00	9.01341E-01	1.93802E-03	0.00000E+00	0.00000E+00
162	8.86632E-01	8.37433E+00	9.01249E-01	1.92806E-03	0.00000E+00	0.00000E+00
163	9.49903E-01	8.41450E+00	9.01552E-01	1.93973E-03	0.00000E+00	0.00000E+00
164	8.98499E-01	8.45667E+00	9.01533E-01	1.92782E-03	0.00000E+00	0.00000E+00
165	8.89727E-01	8.49517E+00	9.01460E-01	1.91732E-03	0.00000E+00	0.00000E+00
166	8.67233E-01	8.53533E+00	9.01252E-01	1.91699E-03	0.00000E+00	0.00000E+00
167	8.77772E-01	8.57750E+00	9.01109E-01	1.91064E-03	0.00000E+00	0.00000E+00
168	8.76178E-01	8.61867E+00	9.00959E-01	1.90503E-03	0.00000E+00	0.00000E+00
169	8.58492E-01	8.66083E+00	9.00705E-01	1.91058E-03	0.00000E+00	0.00000E+00
170	9.16818E-01	8.70017E+00	9.00801E-01	1.90160E-03	0.00000E+00	0.00000E+00
171	8.91225E-01	8.74133E+00	9.00744E-01	1.89116E-03	0.00000E+00	0.00000E+00
172	8.88805E-01	8.78167E+00	9.00674E-01	1.88131E-03	0.00000E+00	0.00000E+00
173	9.07403E-01	8.82100E+00	9.00713E-01	1.87069E-03	0.00000E+00	0.00000E+00
174	9.09396E-01	8.85850E+00	9.00764E-01	1.86047E-03	0.00000E+00	0.00000E+00
175	9.37713E-01	8.89883E+00	9.00977E-01	1.86198E-03	0.00000E+00	0.00000E+00
176	9.37022E-01	8.93917E+00	9.01184E-01	1.86280E-03	0.00000E+00	0.00000E+00
177	8.90419E-01	8.97933E+00	9.01123E-01	1.85314E-03	0.00000E+00	0.00000E+00
178	9.48373E-01	9.01783E+00	9.01391E-01	1.86204E-03	0.00000E+00	0.00000E+00
179	9.81307E-01	9.05533E+00	9.01843E-01	1.90575E-03	0.00000E+00	0.00000E+00
180	9.23410E-01	9.09467E+00	9.01964E-01	1.89888E-03	0.00000E+00	0.00000E+00
181	8.68850E-01	9.13683E+00	9.01779E-01	1.89728E-03	0.00000E+00	0.00000E+00
182	9.32886E-01	9.17983E+00	9.01952E-01	1.89461E-03	0.00000E+00	0.00000E+00
183	8.48080E-01	9.22200E+00	9.01654E-01	1.90748E-03	0.00000E+00	0.00000E+00
184	9.23443E-01	9.26050E+00	9.01774E-01	1.90074E-03	0.00000E+00	0.00000E+00

185	8.79917E-01	9.30067E+00	9.01654E-01	1.89410E-03	0.00000E+00	0.00000E+00
186	9.41142E-01	9.34100E+00	9.01869E-01	1.89596E-03	0.00000E+00	0.00000E+00
187	8.74248E-01	9.38217E+00	9.01720E-01	1.89158E-03	0.00000E+00	0.00000E+00
188	8.97478E-01	9.42250E+00	9.01697E-01	1.88152E-03	0.00000E+00	0.00000E+00
189	9.45809E-01	9.46183E+00	9.01933E-01	1.88624E-03	0.00000E+00	0.00000E+00
190	8.97201E-01	9.50300E+00	9.01908E-01	1.87635E-03	0.00000E+00	0.00000E+00
191	8.72023E-01	9.54417E+00	9.01750E-01	1.87309E-03	0.00000E+00	0.00000E+00
192	9.11518E-01	9.58350E+00	9.01801E-01	1.86391E-03	0.00000E+00	0.00000E+00
193	9.17643E-01	9.62483E+00	9.01884E-01	1.85598E-03	0.00000E+00	0.00000E+00
194	8.98645E-01	9.66500E+00	9.01867E-01	1.84637E-03	0.00000E+00	0.00000E+00
195	9.12174E-01	9.70617E+00	9.01920E-01	1.83755E-03	0.00000E+00	0.00000E+00
196	9.17972E-01	9.74650E+00	9.02003E-01	1.82992E-03	0.00000E+00	0.00000E+00
197	9.04652E-01	9.78583E+00	9.02017E-01	1.82057E-03	0.00000E+00	0.00000E+00
198	9.30746E-01	9.82617E+00	9.02163E-01	1.81718E-03	0.00000E+00	0.00000E+00
199	9.36365E-01	9.86467E+00	9.02337E-01	1.81625E-03	0.00000E+00	0.00000E+00
200	9.11116E-01	9.90400E+00	9.02381E-01	1.80759E-03	0.00000E+00	0.00000E+00
201	9.02267E-01	9.94333E+00	9.02381E-01	1.79849E-03	0.00000E+00	0.00000E+00
202	8.97385E-01	9.98367E+00	9.02356E-01	1.78965E-03	0.00000E+00	0.00000E+00
203	9.01324E-01	1.00238E+01	9.02351E-01	1.78073E-03	0.00000E+00	0.00000E+00
204	9.35640E-01	1.00623E+01	9.02515E-01	1.77954E-03	0.00000E+00	0.00000E+00
205	9.11747E-01	1.01027E+01	9.02561E-01	1.77133E-03	0.00000E+00	0.00000E+00
206	9.28577E-01	1.01420E+01	9.02688E-01	1.76724E-03	0.00000E+00	0.00000E+00
207	8.86183E-01	1.01823E+01	9.02608E-01	1.76044E-03	0.00000E+00	0.00000E+00
208	9.13975E-01	1.02217E+01	9.02663E-01	1.75274E-03	0.00000E+00	0.00000E+00
209	9.10363E-01	1.02618E+01	9.02700E-01	1.74465E-03	0.00000E+00	0.00000E+00
210	8.70834E-01	1.03022E+01	9.02547E-01	1.74299E-03	0.00000E+00	0.00000E+00
211	8.99743E-01	1.03415E+01	9.02534E-01	1.73468E-03	0.00000E+00	0.00000E+00
212	9.01309E-01	1.03818E+01	9.02528E-01	1.72641E-03	0.00000E+00	0.00000E+00
213	9.15588E-01	1.04222E+01	9.02590E-01	1.71932E-03	0.00000E+00	0.00000E+00
214	9.01142E-01	1.04623E+01	9.02583E-01	1.71121E-03	0.00000E+00	0.00000E+00
215	9.31863E-01	1.05008E+01	9.02720E-01	1.70869E-03	0.00000E+00	0.00000E+00
216	8.80298E-01	1.05420E+01	9.02616E-01	1.70391E-03	0.00000E+00	0.00000E+00
217	8.97514E-01	1.05795E+01	9.02592E-01	1.69613E-03	0.00000E+00	0.00000E+00
218	8.67453E-01	1.06198E+01	9.02429E-01	1.69608E-03	0.00000E+00	0.00000E+00
219	9.02086E-01	1.06610E+01	9.02428E-01	1.68825E-03	0.00000E+00	0.00000E+00
220	8.76765E-01	1.07013E+01	9.02310E-01	1.68461E-03	0.00000E+00	0.00000E+00
221	8.61957E-01	1.07443E+01	9.02126E-01	1.68699E-03	0.00000E+00	0.00000E+00
222	8.85954E-01	1.07847E+01	9.02052E-01	1.68091E-03	0.00000E+00	0.00000E+00
223	9.30038E-01	1.08258E+01	9.02179E-01	1.67807E-03	0.00000E+00	0.00000E+00
224	8.59055E-01	1.08670E+01	9.01985E-01	1.68175E-03	0.00000E+00	0.00000E+00
225	8.90887E-01	1.09073E+01	9.01935E-01	1.67493E-03	0.00000E+00	0.00000E+00
226	8.67557E-01	1.09493E+01	9.01781E-01	1.67449E-03	0.00000E+00	0.00000E+00
227	8.92607E-01	1.09897E+01	9.01741E-01	1.66753E-03	0.00000E+00	0.00000E+00
228	9.04082E-01	1.10300E+01	9.01751E-01	1.66017E-03	0.00000E+00	0.00000E+00
229	9.13059E-01	1.10665E+01	9.01801E-01	1.65359E-03	0.00000E+00	0.00000E+00
230	8.44714E-01	1.11068E+01	9.01550E-01	1.66525E-03	0.00000E+00	0.00000E+00
231	9.18847E-01	1.11443E+01	9.01626E-01	1.65968E-03	0.00000E+00	0.00000E+00
232	9.20580E-01	1.11847E+01	9.01708E-01	1.65450E-03	0.00000E+00	0.00000E+00
233	9.03397E-01	1.12250E+01	9.01716E-01	1.64734E-03	0.00000E+00	0.00000E+00
234	9.25214E-01	1.12633E+01	9.01817E-01	1.64335E-03	0.00000E+00	0.00000E+00
235	9.09047E-01	1.13027E+01	9.01848E-01	1.63658E-03	0.00000E+00	0.00000E+00
236	9.03164E-01	1.13430E+01	9.01853E-01	1.62958E-03	0.00000E+00	0.00000E+00
237	8.91437E-01	1.13823E+01	9.01809E-01	1.62323E-03	0.00000E+00	0.00000E+00
238	8.98044E-01	1.14227E+01	9.01793E-01	1.61642E-03	0.00000E+00	0.00000E+00
239	8.93984E-01	1.14648E+01	9.01760E-01	1.60992E-03	0.00000E+00	0.00000E+00
240	9.03580E-01	1.15050E+01	9.01768E-01	1.60316E-03	0.00000E+00	0.00000E+00
241	8.77447E-01	1.15472E+01	9.01666E-01	1.59968E-03	0.00000E+00	0.00000E+00
242	8.90656E-01	1.15865E+01	9.01620E-01	1.59366E-03	0.00000E+00	0.00000E+00
243	9.31421E-01	1.16240E+01	9.01744E-01	1.59184E-03	0.00000E+00	0.00000E+00
244	9.15134E-01	1.16625E+01	9.01799E-01	1.58622E-03	0.00000E+00	0.00000E+00
245	9.18443E-01	1.17010E+01	9.01868E-01	1.58116E-03	0.00000E+00	0.00000E+00
246	9.12851E-01	1.17403E+01	9.01913E-01	1.57531E-03	0.00000E+00	0.00000E+00
247	8.73823E-01	1.17807E+01	9.01798E-01	1.57305E-03	0.00000E+00	0.00000E+00
248	8.83525E-01	1.18218E+01	9.01724E-01	1.56840E-03	0.00000E+00	0.00000E+00
249	9.02901E-01	1.18612E+01	9.01729E-01	1.56205E-03	0.00000E+00	0.00000E+00
250	9.14466E-01	1.19005E+01	9.01780E-01	1.55658E-03	0.00000E+00	0.00000E+00
251	8.69192E-01	1.19417E+01	9.01649E-01	1.55583E-03	0.00000E+00	0.00000E+00
252	9.56482E-01	1.19810E+01	9.01868E-01	1.56504E-03	0.00000E+00	0.00000E+00
253	9.21722E-01	1.20213E+01	9.01948E-01	1.56080E-03	0.00000E+00	0.00000E+00
254	8.89467E-01	1.20617E+01	9.01898E-01	1.55538E-03	0.00000E+00	0.00000E+00
255	8.66811E-01	1.21010E+01	9.01767E-01	1.55473E-03	0.00000E+00	0.00000E+00
256	8.66813E-01	1.21440E+01	9.01630E-01	1.55470E-03	0.00000E+00	0.00000E+00
257	8.45242E-01	1.21852E+01	9.01408E-01	1.56430E-03	0.00000E+00	0.00000E+00
258	8.81422E-01	1.22263E+01	9.01330E-01	1.56014E-03	0.00000E+00	0.00000E+00
259	8.72048E-01	1.22695E+01	9.01216E-01	1.55822E-03	0.00000E+00	0.00000E+00
260	8.94444E-01	1.23097E+01	9.01190E-01	1.55239E-03	0.00000E+00	0.00000E+00
261	8.96433E-01	1.23518E+01	9.01172E-01	1.54650E-03	0.00000E+00	0.00000E+00
262	9.00041E-01	1.23922E+01	9.01167E-01	1.54055E-03	0.00000E+00	0.00000E+00
263	9.28054E-01	1.24315E+01	9.01270E-01	1.53808E-03	0.00000E+00	0.00000E+00
264	9.04845E-01	1.24745E+01	9.01284E-01	1.53226E-03	0.00000E+00	0.00000E+00
265	8.92530E-01	1.25157E+01	9.01251E-01	1.52679E-03	0.00000E+00	0.00000E+00
266	9.23130E-01	1.25560E+01	9.01334E-01	1.52325E-03	0.00000E+00	0.00000E+00
267	9.35102E-01	1.25943E+01	9.01461E-01	1.52283E-03	0.00000E+00	0.00000E+00
268	9.23878E-01	1.26338E+01	9.01545E-01	1.51944E-03	0.00000E+00	0.00000E+00
269	9.38841E-01	1.26722E+01	9.01685E-01	1.52017E-03	0.00000E+00	0.00000E+00
270	8.77446E-01	1.27133E+01	9.01595E-01	1.51718E-03	0.00000E+00	0.00000E+00
271	8.60170E-01	1.27555E+01	9.01441E-01	1.51935E-03	0.00000E+00	0.00000E+00
272	9.26670E-01	1.27948E+01	9.01534E-01	1.51660E-03	0.00000E+00	0.00000E+00
273	9.05651E-01	1.28352E+01	9.01549E-01	1.51107E-03	0.00000E+00	0.00000E+00
274	9.26331E-01	1.28745E+01	9.01640E-01	1.50826E-03	0.00000E+00	0.00000E+00
275	9.44616E-01	1.29148E+01	9.01796E-01	1.51095E-03	0.00000E+00	0.00000E+00
276	8.99085E-01	1.29542E+01	9.01788E-01	1.50545E-03	0.00000E+00	0.00000E+00
277	9.17390E-01	1.29927E+01	9.01845E-01	1.50104E-03	0.00000E+00	0.00000E+00
278	9.07392E-01	1.30328E+01	9.01865E-01	1.49573E-03	0.00000E+00	0.00000E+00
279	8.77619E-01	1.30723E+01	9.01777E-01	1.49289E-03	0.00000E+00	0.00000E+00

280	9.80491E-01	1.31117E+01	9.01701E-01	1.48948E-03	0.00000E+00	0.00000E+00
281	8.86274E-01	1.31555E+01	9.01645E-01	1.48516E-03	0.00000E+00	0.00000E+00
282	8.87369E-01	1.31950E+01	9.01594E-01	1.48072E-03	0.00000E+00	0.00000E+00
283	8.76059E-01	1.32352E+01	9.01504E-01	1.47824E-03	0.00000E+00	0.00000E+00
284	9.24297E-01	1.32745E+01	9.01584E-01	1.47520E-03	0.00000E+00	0.00000E+00
285	8.76306E-01	1.33158E+01	9.01495E-01	1.47269E-03	0.00000E+00	0.00000E+00
286	8.99561E-01	1.33570E+01	9.01488E-01	1.46751E-03	0.00000E+00	0.00000E+00
287	9.48609E-01	1.33972E+01	9.01654E-01	1.47167E-03	0.00000E+00	0.00000E+00
288	8.96657E-01	1.34393E+01	9.01636E-01	1.46662E-03	0.00000E+00	0.00000E+00
289	8.63808E-01	1.34805E+01	9.01504E-01	1.46743E-03	0.00000E+00	0.00000E+00
290	9.33175E-01	1.35208E+01	9.01614E-01	1.46646E-03	0.00000E+00	0.00000E+00
291	9.15746E-01	1.35612E+01	9.01663E-01	1.46219E-03	0.00000E+00	0.00000E+00
292	9.05808E-01	1.36023E+01	9.01677E-01	1.45721E-03	0.00000E+00	0.00000E+00
293	8.98464E-01	1.36435E+01	9.01666E-01	1.45224E-03	0.00000E+00	0.00000E+00
294	9.04152E-01	1.36810E+01	9.01675E-01	1.44728E-03	0.00000E+00	0.00000E+00
295	9.36498E-01	1.37222E+01	9.01794E-01	1.44722E-03	0.00000E+00	0.00000E+00
296	9.24006E-01	1.37625E+01	9.01869E-01	1.44427E-03	0.00000E+00	0.00000E+00
297	8.90428E-01	1.38018E+01	9.01831E-01	1.43989E-03	0.00000E+00	0.00000E+00
298	9.25237E-01	1.38448E+01	9.01910E-01	1.43719E-03	0.00000E+00	0.00000E+00
299	9.20910E-01	1.38842E+01	9.01974E-01	1.43377E-03	0.00000E+00	0.00000E+00
300	9.56676E-01	1.39255E+01	9.02157E-01	1.44070E-03	0.00000E+00	0.00000E+00
301	8.73738E-01	1.39675E+01	9.02062E-01	1.43901E-03	0.00000E+00	0.00000E+00
302	9.09099E-01	1.40060E+01	9.02086E-01	1.43440E-03	0.00000E+00	0.00000E+00
303	9.39367E-01	1.40463E+01	9.02209E-01	1.43498E-03	0.00000E+00	0.00000E+00
304	9.32934E-01	1.40857E+01	9.02311E-01	1.43383E-03	0.00000E+00	0.00000E+00
305	8.48076E-01	1.41268E+01	9.02132E-01	1.44026E-03	0.00000E+00	0.00000E+00
306	8.96296E-01	1.41690E+01	9.02113E-01	1.43564E-03	0.00000E+00	0.00000E+00
307	9.16037E-01	1.42073E+01	9.02159E-01	1.43166E-03	0.00000E+00	0.00000E+00
308	8.97034E-01	1.42468E+01	9.02142E-01	1.42707E-03	0.00000E+00	0.00000E+00
309	9.40162E-01	1.42888E+01	9.02266E-01	1.42779E-03	0.00000E+00	0.00000E+00
310	8.89183E-01	1.43282E+01	9.02223E-01	1.42378E-03	0.00000E+00	0.00000E+00
311	8.97302E-01	1.43695E+01	9.02207E-01	1.41926E-03	0.00000E+00	0.00000E+00
312	9.31583E-01	1.44088E+01	9.02302E-01	1.41784E-03	0.00000E+00	0.00000E+00
313	9.08951E-01	1.44490E+01	9.02323E-01	1.41344E-03	0.00000E+00	0.00000E+00
314	8.84113E-01	1.44922E+01	9.02265E-01	1.41011E-03	0.00000E+00	0.00000E+00
315	8.77123E-01	1.45323E+01	9.02185E-01	1.40789E-03	0.00000E+00	0.00000E+00
316	8.66591E-01	1.45745E+01	9.02071E-01	1.40797E-03	0.00000E+00	0.00000E+00
317	9.04364E-01	1.46138E+01	9.02079E-01	1.40351E-03	0.00000E+00	0.00000E+00
318	9.05676E-01	1.46550E+01	9.02090E-01	1.39911E-03	0.00000E+00	0.00000E+00
319	9.12467E-01	1.46962E+01	9.02123E-01	1.39507E-03	0.00000E+00	0.00000E+00
320	8.99628E-01	1.47357E+01	9.02115E-01	1.39070E-03	0.00000E+00	0.00000E+00
321	9.33467E-01	1.47758E+01	9.02213E-01	1.38981E-03	0.00000E+00	0.00000E+00
322	9.08438E-01	1.48152E+01	9.02233E-01	1.38560E-03	0.00000E+00	0.00000E+00
323	9.03057E-01	1.48547E+01	9.02235E-01	1.38128E-03	0.00000E+00	0.00000E+00
324	9.38377E-01	1.48930E+01	9.02347E-01	1.38155E-03	0.00000E+00	0.00000E+00
325	8.81011E-01	1.49360E+01	9.02281E-01	1.37885E-03	0.00000E+00	0.00000E+00
326	9.22087E-01	1.49755E+01	9.02343E-01	1.37595E-03	0.00000E+00	0.00000E+00
327	9.07395E-01	1.50167E+01	9.02358E-01	1.37179E-03	0.00000E+00	0.00000E+00
328	9.16492E-01	1.50578E+01	9.02401E-01	1.36827E-03	0.00000E+00	0.00000E+00
329	9.17257E-01	1.50972E+01	9.02447E-01	1.36483E-03	0.00000E+00	0.00000E+00
330	8.62294E-01	1.51393E+01	9.02324E-01	1.36616E-03	0.00000E+00	0.00000E+00
331	8.74989E-01	1.51832E+01	9.02241E-01	1.36453E-03	0.00000E+00	0.00000E+00
332	8.43565E-01	1.52263E+01	9.02064E-01	1.37196E-03	0.00000E+00	0.00000E+00
333	9.46004E-01	1.52675E+01	9.02196E-01	1.37424E-03	0.00000E+00	0.00000E+00
334	8.56627E-01	1.53095E+01	9.02059E-01	1.37695E-03	0.00000E+00	0.00000E+00
335	8.65279E-01	1.53508E+01	9.01949E-01	1.37725E-03	0.00000E+00	0.00000E+00
336	9.19088E-01	1.53928E+01	9.02000E-01	1.37408E-03	0.00000E+00	0.00000E+00
337	9.03546E-01	1.54322E+01	9.02005E-01	1.36998E-03	0.00000E+00	0.00000E+00
338	8.79064E-01	1.54743E+01	9.01936E-01	1.36760E-03	0.00000E+00	0.00000E+00
339	9.18345E-01	1.55137E+01	9.01985E-01	1.36440E-03	0.00000E+00	0.00000E+00
340	9.14703E-01	1.55530E+01	9.02023E-01	1.36088E-03	0.00000E+00	0.00000E+00
341	8.97884E-01	1.55952E+01	9.02010E-01	1.35691E-03	0.00000E+00	0.00000E+00
342	9.05251E-01	1.56355E+01	9.02020E-01	1.35295E-03	0.00000E+00	0.00000E+00
343	8.85792E-01	1.56757E+01	9.01972E-01	1.34982E-03	0.00000E+00	0.00000E+00
344	8.99656E-01	1.57152E+01	9.01966E-01	1.34588E-03	0.00000E+00	0.00000E+00
345	8.89882E-01	1.57563E+01	9.01930E-01	1.34241E-03	0.00000E+00	0.00000E+00
346	9.40461E-01	1.57993E+01	9.02042E-01	1.34318E-03	0.00000E+00	0.00000E+00
347	8.69895E-01	1.58442E+01	9.01949E-01	1.34252E-03	0.00000E+00	0.00000E+00
348	9.42478E-01	1.58835E+01	9.02066E-01	1.34375E-03	0.00000E+00	0.00000E+00
349	8.88683E-01	1.59247E+01	9.02028E-01	1.34043E-03	0.00000E+00	0.00000E+00
350	9.15809E-01	1.59632E+01	9.02067E-01	1.33716E-03	0.00000E+00	0.00000E+00
351	9.45735E-01	1.60035E+01	9.02192E-01	1.33918E-03	0.00000E+00	0.00000E+00
352	9.06980E-01	1.60428E+01	9.02206E-01	1.33542E-03	0.00000E+00	0.00000E+00
353	8.83981E-01	1.60813E+01	9.02154E-01	1.33262E-03	0.00000E+00	0.00000E+00
354	9.45833E-01	1.61233E+01	9.02278E-01	1.33461E-03	0.00000E+00	0.00000E+00
355	9.06550E-01	1.61637E+01	9.02290E-01	1.33088E-03	0.00000E+00	0.00000E+00
356	8.55788E-01	1.62040E+01	9.02159E-01	1.33360E-03	0.00000E+00	0.00000E+00
357	8.62284E-01	1.62442E+01	9.02047E-01	1.33457E-03	0.00000E+00	0.00000E+00
358	9.13265E-01	1.62835E+01	9.02078E-01	1.33119E-03	0.00000E+00	0.00000E+00
359	9.16733E-01	1.63220E+01	9.02119E-01	1.32809E-03	0.00000E+00	0.00000E+00
360	9.34686E-01	1.63613E+01	9.02210E-01	1.32750E-03	0.00000E+00	0.00000E+00
361	9.04736E-01	1.64035E+01	9.02217E-01	1.32381E-03	0.00000E+00	0.00000E+00
362	9.54986E-01	1.64410E+01	9.02364E-01	1.32824E-03	0.00000E+00	0.00000E+00
363	8.83360E-01	1.64822E+01	9.02311E-01	1.32561E-03	0.00000E+00	0.00000E+00
364	9.04672E-01	1.65233E+01	9.02318E-01	1.32195E-03	0.00000E+00	0.00000E+00
365	8.88081E-01	1.65618E+01	9.02279E-01	1.31889E-03	0.00000E+00	0.00000E+00
366	8.85611E-01	1.66040E+01	9.02233E-01	1.31606E-03	0.00000E+00	0.00000E+00
367	9.29325E-01	1.66433E+01	9.02307E-01	1.31455E-03	0.00000E+00	0.00000E+00
368	8.68192E-01	1.66845E+01	9.02214E-01	1.31426E-03	0.00000E+00	0.00000E+00
369	9.28952E-01	1.67267E+01	9.02287E-01	1.31270E-03	0.00000E+00	0.00000E+00
370	8.92545E-01	1.67668E+01	9.02260E-01	1.30939E-03	0.00000E+00	0.00000E+00
371	9.59783E-01	1.68072E+01	9.02416E-01	1.31511E-03	0.00000E+00	0.00000E+00
372	9.17828E-01	1.68465E+01	9.02458E-01	1.31221E-03	0.00000E+00	0.00000E+00
373	9.11716E-01	1.68850E+01	9.02483E-01	1.30891E-03	0.00000E+00	0.00000E+00
374	8.58140E-01	1.69235E+01	9.02363E-01	1.31082E-03	0.00000E+00	0.00000E+00

375	9.07467E-01	1.69673E+01	9.02377E-01	1.30737E-03	0.00000E+00	0.00000E+00
376	9.07179E-01	1.70077E+01	9.02390E-01	1.30393E-03	0.00000E+00	0.00000E+00
377	8.93386E-01	1.70498E+01	9.02366E-01	1.30067E-03	0.00000E+00	0.00000E+00
378	8.78099E-01	1.70900E+01	9.02301E-01	1.29881E-03	0.00000E+00	0.00000E+00
379	8.96291E-01	1.71313E+01	9.02285E-01	1.29546E-03	0.00000E+00	0.00000E+00
380	8.96982E-01	1.71715E+01	9.02271E-01	1.29211E-03	0.00000E+00	0.00000E+00
381	8.96383E-01	1.72118E+01	9.02256E-01	1.28879E-03	0.00000E+00	0.00000E+00
382	8.83649E-01	1.72512E+01	9.02207E-01	1.28632E-03	0.00000E+00	0.00000E+00
383	8.60988E-01	1.72952E+01	9.02099E-01	1.28749E-03	0.00000E+00	0.00000E+00
384	9.19223E-01	1.73372E+01	9.02144E-01	1.28490E-03	0.00000E+00	0.00000E+00
385	9.26637E-01	1.73803E+01	9.02208E-01	1.28314E-03	0.00000E+00	0.00000E+00
386	9.09613E-01	1.74197E+01	9.02227E-01	1.27994E-03	0.00000E+00	0.00000E+00
387	9.04452E-01	1.74598E+01	9.02233E-01	1.27662E-03	0.00000E+00	0.00000E+00
388	8.78504E-01	1.74993E+01	9.02171E-01	1.27479E-03	0.00000E+00	0.00000E+00
389	8.86236E-01	1.75405E+01	9.02130E-01	1.27216E-03	0.00000E+00	0.00000E+00
390	8.85948E-01	1.75817E+01	9.02088E-01	1.26956E-03	0.00000E+00	0.00000E+00
391	8.79488E-01	1.76238E+01	9.02030E-01	1.26763E-03	0.00000E+00	0.00000E+00
392	8.81480E-01	1.76632E+01	9.01977E-01	1.26547E-03	0.00000E+00	0.00000E+00
393	8.79957E-01	1.77025E+01	9.01921E-01	1.26349E-03	0.00000E+00	0.00000E+00
394	9.56408E-01	1.77418E+01	9.02060E-01	1.26790E-03	0.00000E+00	0.00000E+00
395	8.58242E-01	1.77840E+01	9.01949E-01	1.26958E-03	0.00000E+00	0.00000E+00
396	8.88563E-01	1.78242E+01	9.01915E-01	1.26680E-03	0.00000E+00	0.00000E+00
397	8.52183E-01	1.78655E+01	9.01789E-01	1.26985E-03	0.00000E+00	0.00000E+00
398	9.47417E-01	1.79057E+01	9.01904E-01	1.27187E-03	0.00000E+00	0.00000E+00
399	9.14630E-01	1.79468E+01	9.01936E-01	1.26907E-03	0.00000E+00	0.00000E+00
400	9.09073E-01	1.79882E+01	9.01954E-01	1.26600E-03	0.00000E+00	0.00000E+00
401	9.52264E-01	1.80312E+01	9.02080E-01	1.26910E-03	0.00000E+00	0.00000E+00
402	8.98030E-01	1.80713E+01	9.02070E-01	1.26597E-03	0.00000E+00	0.00000E+00
403	9.12665E-01	1.81108E+01	9.02096E-01	1.26308E-03	0.00000E+00	0.00000E+00

KENO MESSAGE NUMBER K5-123 EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

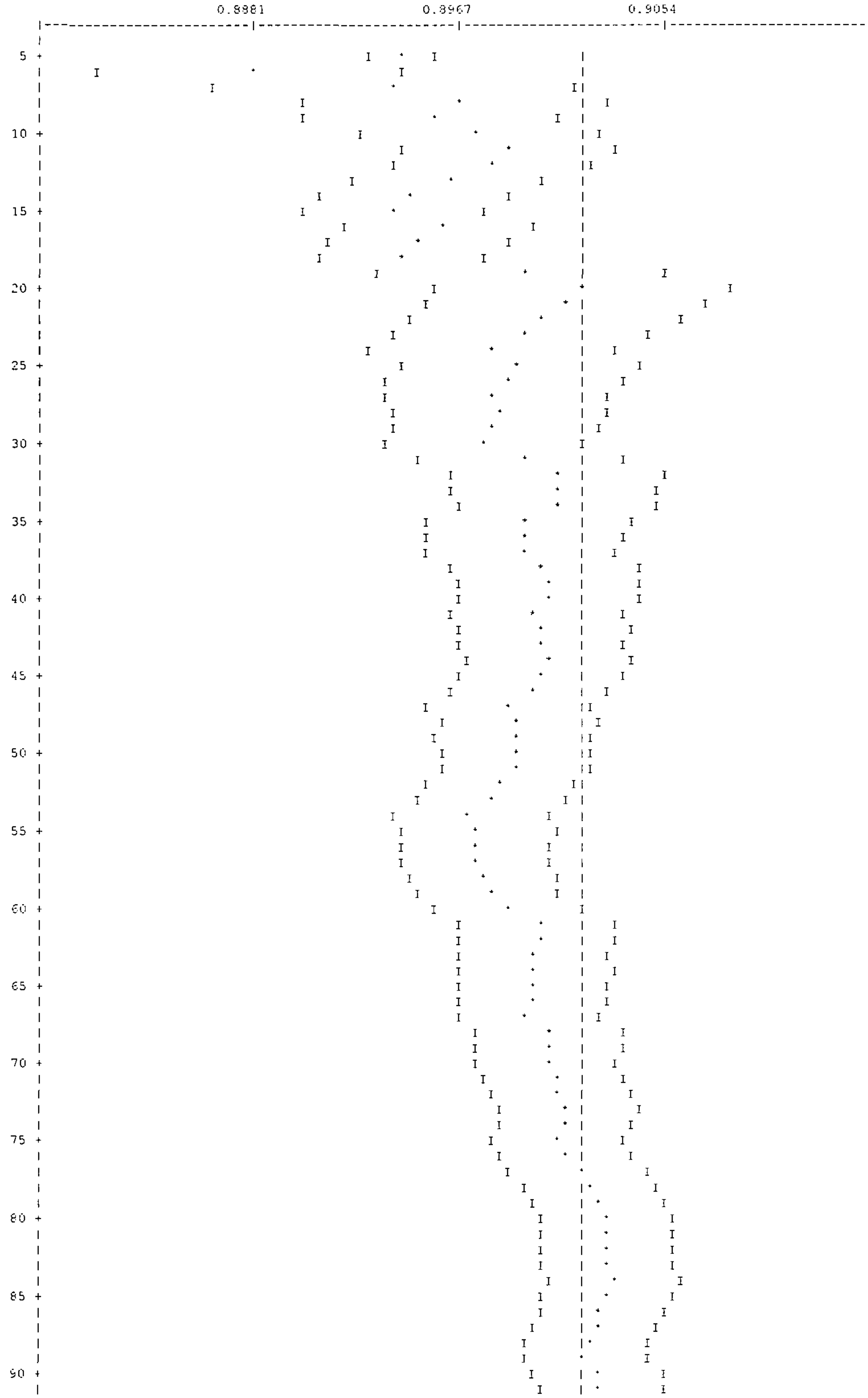
TRIGA - PREF. FLOOD CANISTER

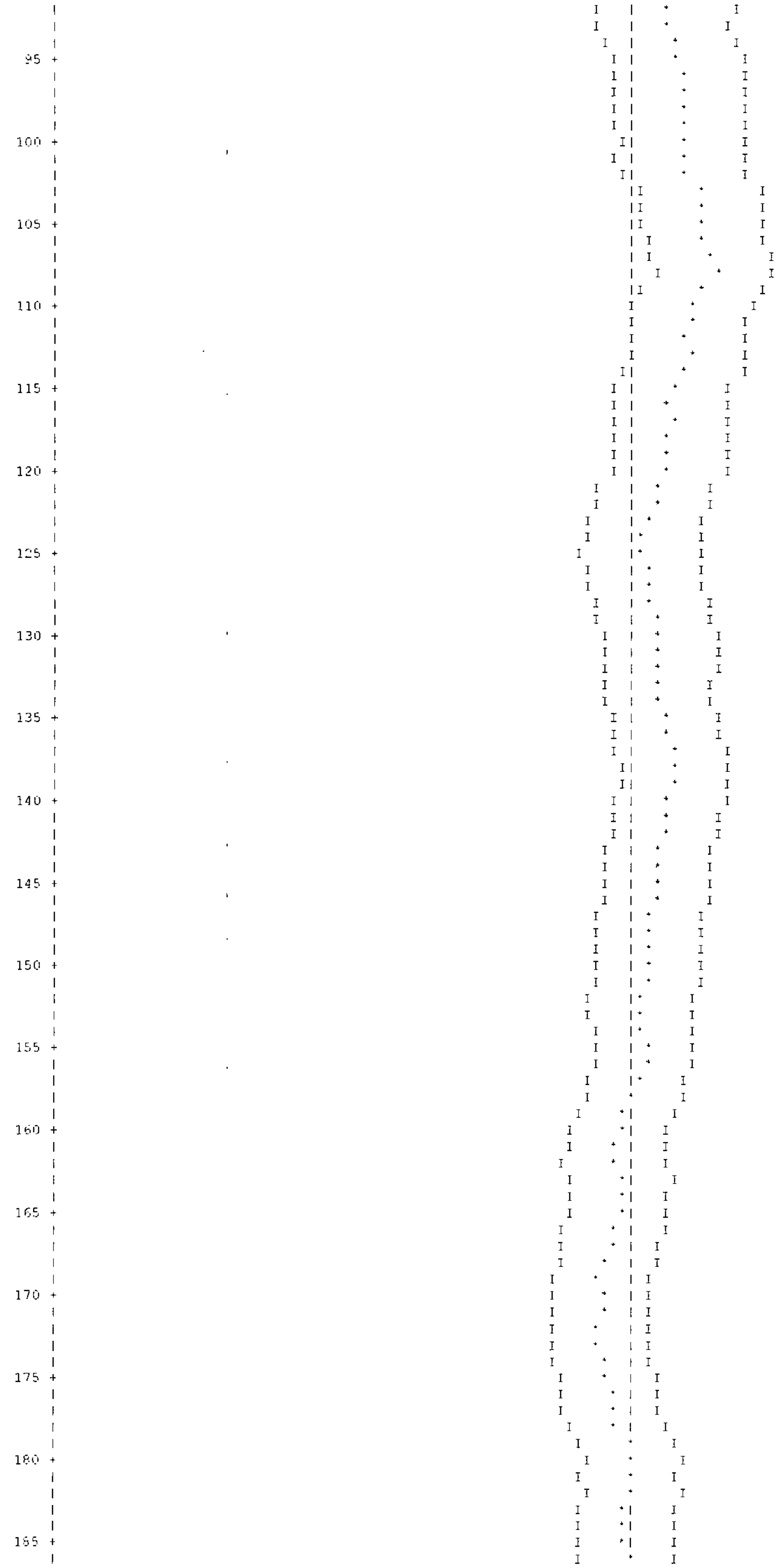
```
LIFETIME =  4.68411E-05 + OR -  1.44136E-07          GENERATION TIME =  1.71707E-05 + OR -  5.28871E-08
NU BAR   =  2.42239E+00 + OR -  1.20609E-05      AVERAGE FISSION GROUP =  2.15364E+01 + OR -  5.20178E-03
              ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION =  2.49898E-01 + OR -  9.08878E-04
```

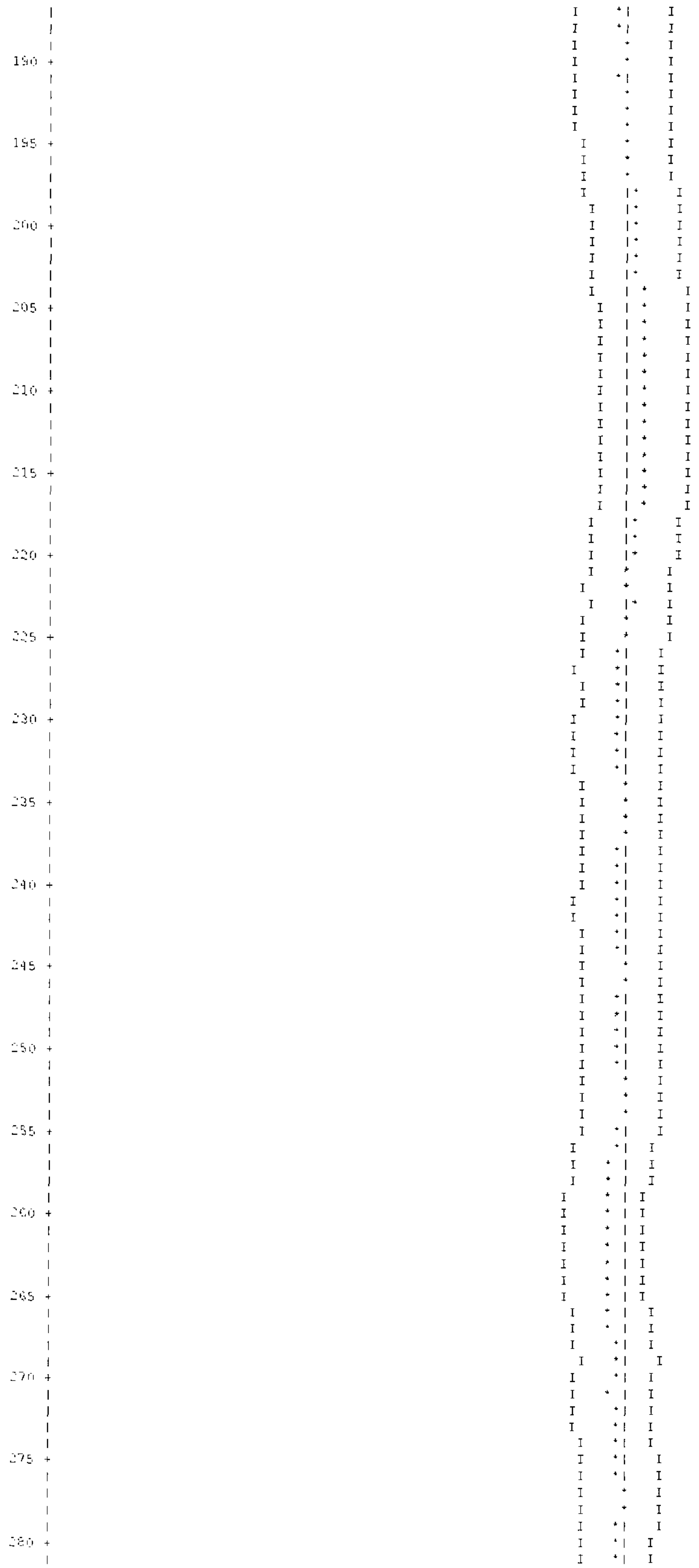
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.90216	+ OR - 0.00126	0.90089 TO 0.90342	0.89963 TO 0.90469	0.89836 TO 0.90595	400000
4	0.90217	+ OR - 0.00127	0.90091 TO 0.90344	0.89964 TO 0.90471	0.89837 TO 0.90598	399000
5	0.90220	+ OR - 0.00127	0.90093 TO 0.90347	0.89965 TO 0.90474	0.89838 TO 0.90601	398000
6	0.90226	+ OR - 0.00127	0.90099 TO 0.90354	0.89972 TO 0.90481	0.89845 TO 0.90608	397000
7	0.90224	+ OR - 0.00128	0.90096 TO 0.90351	0.89969 TO 0.90479	0.89841 TO 0.90606	396000
8	0.90223	+ OR - 0.00128	0.90095 TO 0.90350	0.89967 TO 0.90478	0.89839 TO 0.90606	395000
9	0.90226	+ OR - 0.00128	0.90097 TO 0.90354	0.89969 TO 0.90482	0.89841 TO 0.90610	394000
10	0.90224	+ OR - 0.00128	0.90095 TO 0.90352	0.89967 TO 0.90481	0.89838 TO 0.90609	393000
11	0.90222	+ OR - 0.00129	0.90093 TO 0.90351	0.89965 TO 0.90480	0.89836 TO 0.90608	392000
12	0.90225	+ OR - 0.00129	0.90096 TO 0.90354	0.89967 TO 0.90483	0.89837 TO 0.90612	391000
17	0.90241	+ OR - 0.00130	0.90111 TO 0.90371	0.89980 TO 0.90501	0.89850 TO 0.90632	386000
22	0.90224	+ OR - 0.00130	0.90094 TO 0.90354	0.89964 TO 0.90484	0.89834 TO 0.90614	381000
27	0.90239	+ OR - 0.00131	0.90108 TO 0.90371	0.89977 TO 0.90502	0.89846 TO 0.90633	376000
32	0.90224	+ OR - 0.00132	0.90092 TO 0.90356	0.89961 TO 0.90488	0.89829 TO 0.90620	371000
37	0.90240	+ OR - 0.00133	0.90107 TO 0.90373	0.89973 TO 0.90506	0.89840 TO 0.90640	366000
42	0.90234	+ OR - 0.00135	0.90100 TO 0.90369	0.89965 TO 0.90504	0.89830 TO 0.90639	361000
47	0.90256	+ OR - 0.00136	0.90120 TO 0.90391	0.89984 TO 0.90527	0.89848 TO 0.90663	356000
52	0.90266	+ OR - 0.00137	0.90129 TO 0.90403	0.89992 TO 0.90540	0.89855 TO 0.90677	351000
57	0.90289	+ OR - 0.00138	0.90151 TO 0.90427	0.90013 TO 0.90564	0.89876 TO 0.90702	346000
62	0.90248	+ OR - 0.00138	0.90111 TO 0.90386	0.89973 TO 0.90524	0.89835 TO 0.90661	341000
67	0.90261	+ OR - 0.00139	0.90122 TO 0.90401	0.89983 TO 0.90540	0.89843 TO 0.90680	336000
72	0.90237	+ OR - 0.00140	0.90097 TO 0.90377	0.89957 TO 0.90517	0.89817 TO 0.90658	331000
77	0.90221	+ OR - 0.00141	0.90080 TO 0.90362	0.89939 TO 0.90504	0.89797 TO 0.90645	326000
82	0.90195	+ OR - 0.00142	0.90053 TO 0.90337	0.89910 TO 0.90480	0.89768 TO 0.90622	321000
87	0.90201	+ OR - 0.00144	0.90057 TO 0.90345	0.89913 TO 0.90489	0.89769 TO 0.90633	316000
92	0.90179	+ OR - 0.00144	0.90035 TO 0.90324	0.89891 TO 0.90468	0.89747 TO 0.90612	311000
97	0.90159	+ OR - 0.00146	0.90013 TO 0.90305	0.89867 TO 0.90451	0.89721 TO 0.90597	306000
102	0.90145	+ OR - 0.00148	0.89997 TO 0.90293	0.89849 TO 0.90441	0.89701 TO 0.90589	301000
107	0.90111	+ OR - 0.00149	0.89962 TO 0.90261	0.89813 TO 0.90410	0.89664 TO 0.90559	296000
112	0.90135	+ OR - 0.00150	0.89985 TO 0.90285	0.89835 TO 0.90436	0.89685 TO 0.90586	291000
117	0.90154	+ OR - 0.00152	0.90002 TO 0.90305	0.89850 TO 0.90457	0.89699 TO 0.90608	286000
122	0.90177	+ OR - 0.00152	0.90025 TO 0.90330	0.89873 TO 0.90482	0.89720 TO 0.90634	281000
127	0.90191	+ OR - 0.00154	0.90038 TO 0.90345	0.89884 TO 0.90499	0.89730 TO 0.90652	276000
132	0.90163	+ OR - 0.00155	0.90007 TO 0.90318	0.89852 TO 0.90474	0.89696 TO 0.90629	271000
137	0.90141	+ OR - 0.00157	0.89983 TO 0.90298	0.89826 TO 0.90456	0.89668 TO 0.90613	266000
142	0.90152	+ OR - 0.00160	0.89993 TO 0.90312	0.89833 TO 0.90471	0.89674 TO 0.90631	261000
147	0.90176	+ OR - 0.00162	0.90014 TO 0.90338	0.89852 TO 0.90500	0.89690 TO 0.90662	256000
152	0.90199	+ OR - 0.00164	0.90035 TO 0.90363	0.89871 TO 0.90526	0.89707 TO 0.90690	251000
157	0.90204	+ OR - 0.00166	0.90038 TO 0.90370	0.89872 TO 0.90536	0.89706 TO 0.90702	246000
162	0.90266	+ OR - 0.00167	0.90099 TO 0.90433	0.89932 TO 0.90600	0.89765 TO 0.90767	241000
167	0.90279	+ OR - 0.00168	0.90110 TO 0.90447	0.89942 TO 0.90615	0.89774 TO 0.90783	236000
172	0.90314	+ OR - 0.00170	0.90144 TO 0.90484	0.89974 TO 0.90654	0.89804 TO 0.90824	231000
177	0.90285	+ OR - 0.00172	0.90113 TO 0.90457	0.89940 TO 0.90630	0.89768 TO 0.90802	226000
182	0.90221	+ OR - 0.00170	0.90052 TO 0.90391	0.89882 TO 0.90561	0.89712 TO 0.90731	221000
187	0.90242	+ OR - 0.00170	0.90072 TO 0.90412	0.89902 TO 0.90582	0.89732 TO 0.90752	216000
192	0.90236	+ OR - 0.00172	0.90064 TO 0.90408	0.89892 TO 0.90580	0.89720 TO 0.90752	211000
197	0.90217	+ OR - 0.00176	0.90041 TO 0.90393	0.89866 TO 0.90569	0.89690 TO 0.90745	206000
202	0.90184	+ OR - 0.00179	0.90005 TO 0.90363	0.89826 TO 0.90541	0.89648 TO 0.90720	201000
207	0.90156	+ OR - 0.00182	0.89974 TO 0.90338	0.89793 TO 0.90520	0.89611 TO 0.90701	196000
212	0.90162	+ OR - 0.00186	0.89977 TO 0.90348	0.89791 TO 0.90533	0.89605 TO 0.90719	191000
217	0.90152	+ OR - 0.00189	0.89963 TO 0.90342	0.89774 TO 0.90531	0.89584 TO 0.90721	186000
222	0.90215	+ OR - 0.00192	0.90023 TO 0.90407	0.89832 TO 0.90598	0.89640 TO 0.90790	181000
227	0.90255	+ OR - 0.00194	0.90061 TO 0.90449	0.89868 TO 0.90643	0.89674 TO 0.90837	176000
232	0.90262	+ OR - 0.00196	0.90066 TO 0.90458	0.89870 TO 0.90654	0.89674 TO 0.90850	171000
237	0.90250	+ OR - 0.00201	0.90049 TO 0.90452	0.89848 TO 0.90653	0.89646 TO 0.90854	166000
242	0.90281	+ OR - 0.00207	0.90074 TO 0.90487	0.89867 TO 0.90694	0.89660 TO 0.90901	161000
247	0.90256	+ OR - 0.00211	0.90045 TO 0.90468	0.89834 TO 0.90679	0.89623 TO 0.90890	156000
252	0.90247	+ OR - 0.00214	0.90034 TO 0.90461	0.89820 TO 0.90675	0.89606 TO 0.90888	151000
257	0.90330	+ OR - 0.00214	0.90116 TO 0.90544	0.89902 TO 0.90758	0.89687 TO 0.90972	146000
262	0.90381	+ OR - 0.00220	0.90161 TO 0.90601	0.89941 TO 0.90821	0.89721 TO 0.91041	141000
267	0.90333	+ OR - 0.00225	0.90108 TO 0.90559	0.89882 TO 0.90784	0.89657 TO 0.91010	136000
272	0.90326	+ OR - 0.00229	0.90097 TO 0.90554	0.89869 TO 0.90782	0.89641 TO 0.91010	131000
277	0.90265	+ OR - 0.00234	0.90031 TO 0.90498	0.89797 TO 0.90732	0.89563 TO 0.90966	126000
282	0.90326	+ OP - 0.00241	0.90085 TO 0.90567	0.89844 TO 0.90808	0.89603 TO 0.91049	121000
287	0.90318	+ OR - 0.00246	0.90073 TO 0.90564	0.89827 TO 0.90809	0.89582 TO 0.91055	116000
292	0.90319	+ OR - 0.00252	0.90067 TO 0.90571	0.89814 TO 0.90824	0.89562 TO 0.91076	111000
297	0.90284	+ OR - 0.00261	0.90022 TO 0.90545	0.89761 TO 0.90806	0.89500 TO 0.91068	106000
302	0.90213	+ OR - 0.00266	0.89947 TO 0.90479	0.89681 TO 0.90744	0.89416 TO 0.91010	101000
307	0.90190	+ OR - 0.00269	0.89921 TO 0.90459	0.89652 TO 0.90727	0.89384 TO 0.90996	96000
312	0.90140	+ OR - 0.00278	0.89862 TO 0.90418	0.89584 TO 0.90695	0.89306 TO 0.90973	91000
317	0.90216	+ OR - 0.00289	0.89927 TO 0.90505	0.89638 TO 0.90794	0.89349 TO 0.91083	86000
322	0.90156	+ OR - 0.00304	0.89852 TO 0.90460	0.89548 TO 0.90764	0.89244 TO 0.91068	81000
327	0.90098	+ OR - 0.00318	0.89780 TO 0.90416	0.89462 TO 0.90734	0.89144 TO 0.91052	76000
332	0.90225	+ OR - 0.00322	0.89903 TO 0.90547	0.89581 TO 0.90869	0.89259 TO 0.91191	71000
337	0.90256	+ OR - 0.00327	0.89929 TO 0.90583	0.89602 TO 0.90910	0.89275 TO 0.91237	66000
342	0.90252	+ OR - 0.00350	0.89902 TO 0.90603	0.89552 TO 0.90953	0.89201 TO 0.91303	61000
347	0.90300	+ OR - 0.00369	0.89931 TO 0.90669	0.89562 TO 0.91038	0.89193 TO 0.91407	56000
352	0.90134	+ OR - 0.00386	0.89748 TO 0.90520	0.89362 TO 0.90907	0.88976 TO 0.91293	51000
357	0.90248	+ OR - 0.00394	0.89854 TO 0.90641	0.89461 TO 0.91035	0.89067 TO 0.91429	46000
362	0.89975	+ OR - 0.00411	0.89564 TO 0.90385	0.89154 TO 0.90796	0.88743 TO 0.91206	41000
367	0.89996	+ OR - 0.00455	0.89541 TO 0.90452	0.89085 TO 0.90907	0.88630 TO 0.91362	36000
372	0.89778	+ OR - 0.00466	0.89313 TO 0.90244	0.88847 TO 0.90710	0.88381 TO 0.91176	31000
377	0.89821	+ OR - 0.00529	0.89292 TO 0.90350	0.88762 TO 0.90879	0.88233 TO 0.91409	26000
382	0.90010	+ OR - 0.00646	0.89364 TO 0.90655	0.88718 TO 0.91301	0.88072 TO 0.91947	21000
387	0.89882	+ OR - 0.00785	0.89097 TO 0.90666	0.88313 TO 0.91451	0.87528 TO 0.92236	16000
392	0.90631	+ OR - 0.01076	0.89555 TO 0.91708	0.88478 TO 0.92784	0.87402 TO 0.93861	11000
397	0.92235	+ OR - 0.00903	0.91332 TO 0.93137	0.90429 TO 0.94040	0.89527 TO 0.94943	6000

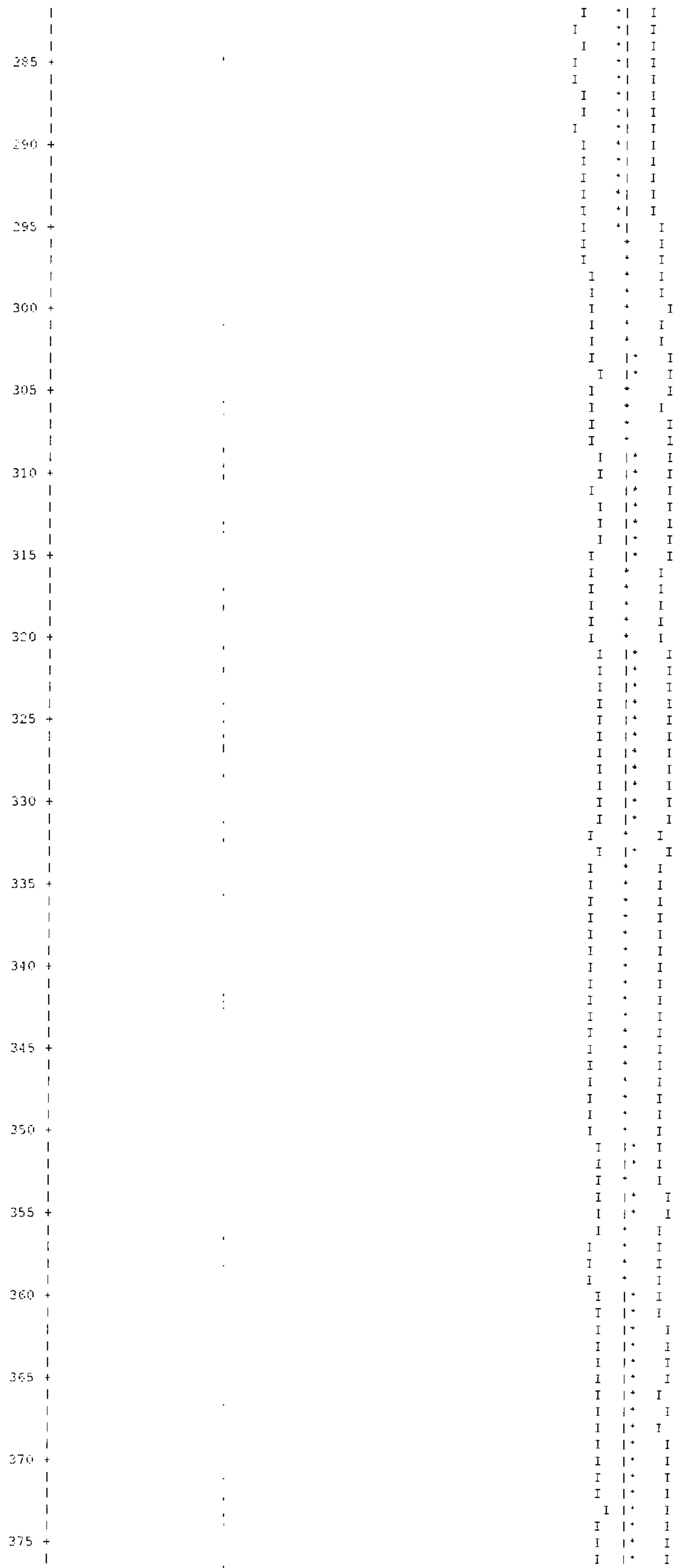
TRIGA - PREF. FLOOD CANISTER

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.9022 + OR - 0.0013 WHICH OCCURS FOR 403 GENERATIONS RUN.



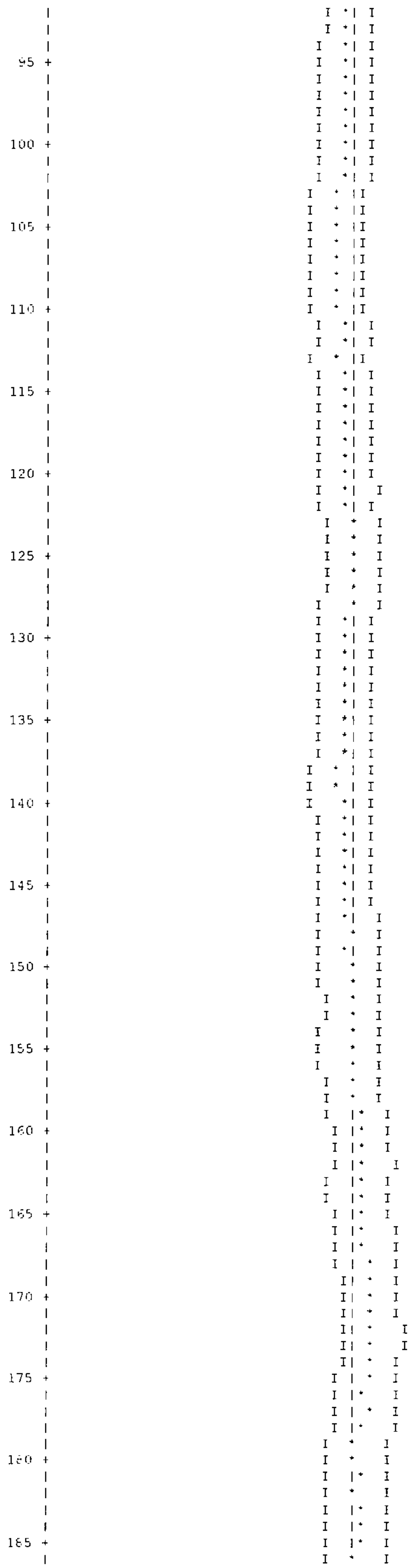

95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185

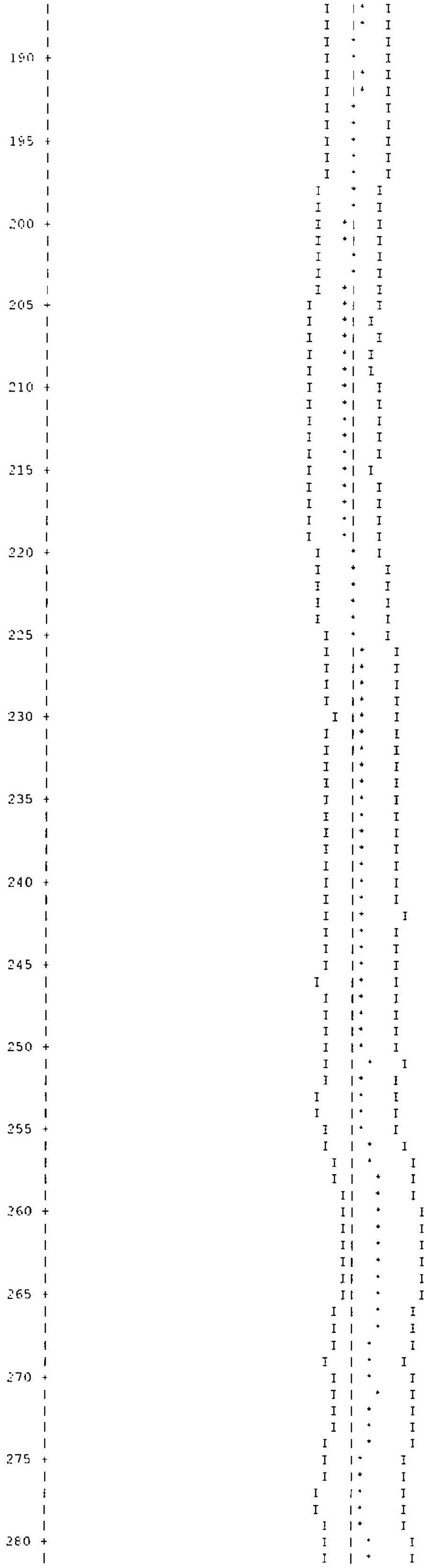

190
195
200
205
210
215
220
225
230
235
240
245
250
255
260
265
270
275
280

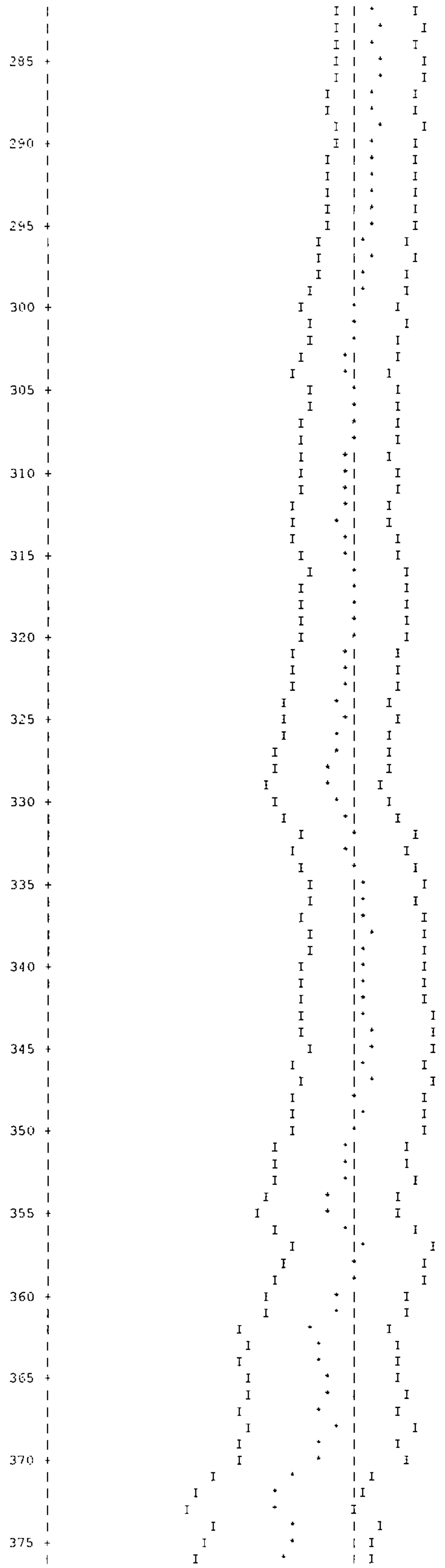

285
290
295
300
305
310
315
320
325
330
335
340
345
350
355
360
365
370
375

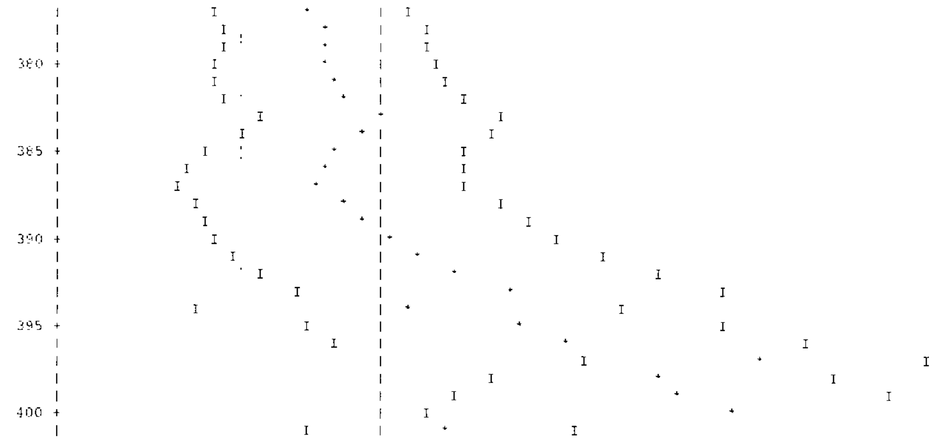
```
     |                                                             I  |*   I
     |                                                             I  |*   I
     |                                                             I  |*   I
 380 +                                                             I  |*  I
     |                                                             I  |*  I
     |                                                             I  |*  I
     |                                                            I   *   I
     |                                                             I  *   I
 385 +                                                             I  |*  I
     |                                                             I  |*  I
     |                                                             I  |*  I
     |                                                             I  *   I
     |                                                             I  *   I
 390 +                                                             I  *   I
     |                                                            I   *   I
     |                                                            I   *   I
     |                                                            I   *  I
     |                                                            I   *   I
 395 +                                                            I   *  I
     |                                                            I   *  I
     |                                                            I  *|  I
     |                                                            I   *  I
     |                                                            I   *  I
 400 +                                                            I   *  I
     |                                                            I   *   I
     |                                                            I   *   I
     |                                                             I  *   I
```

```
                          TRIGA - PREF. FLOOD CANISTER

                      PLOT OF AVERAGE K-EFFECTIVE BY GENERATION SKIPPED.
 THE LINE REPRESENTS K-EFF = 0.9022 + OR -  0.0013 WHICH OCCURS FOR     3 GENERATIONS SKIPPED.

                           0.8973                   0.9098                   0.9223
     |-------------------------|-------------------------|-------------------------|-------------------------
     |                                I *  I
   5 +                                I *  I
     |                                I *  I
     |                                I *  I
     |                                I *  I
     |                                I *  I
  10 +                                I *  I
     |                                I *  I
     |                                I *  I
     |                                I *  I
     |                                I |* I
  15 +                                I |* I
     |                                I |* I
     |                                I |* I
     |                                I |* I
     |                                I *  I
  20 +                                I *  I
     |                                I *  I
     |                                I *  I
     |                                I *  I
     |                                I |* I
  25 +                                I *  I
     |                                I |* I
     |                                I |* I
     |                                I |* I
     |                                I |* I
  30 +                                I |* I
     |                                I |* I
     |                                I *  I
     |                                I *  I
     |                                I *  I
  35 +                                I |* I
     |                                I |* I
     |                                I |* I
     |                                I *  I
     |                                I *  I
  40 +                                I *  I
     |                                I |* I
     |                                I |* I
     |                                I |* I
     |                                I |* I
  45 +                                I |* I
     |                                I |* I
     |                                I |*  I
     |                                I |*  I
     |                                I |*  I
  50 +                                I |*  I
     |                                I |*  I
     |                                I |*  I
     |                                 I|*  I
     |                                 I| * I
  55 +                                 I| * I
     |                                 I| * I
     |                                 I| * I
     |                                 I| * I
     |                                 I|*  I
  60 +                                I |*  I
     |                                I |*  I
     |                                I |*  I
     |                                I |*  I
     |                                I |*  I
  65 +                                I |*  I
     |                                I |*  I
     |                                I |*  I
     |                                I |*  I
     |                                I |*  I
  70 +                                I |*  I
     |                                I |* I
     |                                I |* I
     |                                I *  I
     |                                I |* I
  75 +                                I |* I
     |                                I |* I
     |                               I  *  I
     |                               I  *  I
     |                               I  *  I
  80 +                               I  *  I
     |                               I  *  I
     |                               I  *  I
     |                               I  *  I
     |                               I  * I
  85 +                               I  *  I
     |                               I  *  I
     |                               I  *  I
     |                               I  *  I
     |                               I  *  I
  90 +                               I  *  I
     |                               I  *  I
```


95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185




285
290
295
300
305
310
315
320
325
330
335
340
345
350
355
360
365
370
375



TRIGA - PREF. FLOOD CANISTER

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0006			5.25117E-04	1.6403	1.09426E-03	1.6064	0.00000E+00	0.0000
2	0.0027			2.44675E-03	0.4783	3.09180E-03	0.4792	0.00000E+00	0.0000
3	0.0035			3.19630E-03	0.4015	2.24915E-03	0.3565	0.00000E+00	0.0000
4	0.0021			1.92481E-03	0.4747	1.29146E-03	0.4038	0.00000E+00	0.0000
5	0.0030			2.69630E-03	0.3626	2.49810E-03	0.3219	0.00000E+00	0.0000
6	0.0043			3.83930E-03	0.2702	7.50637E-03	0.3222	0.00000E+00	0.0000
7	0.0050			4.47319E-03	0.2301	1.51095E-02	0.3541	0.00000E+00	0.0000
8	0.0051			4.63561E-03	0.2304	1.37660E-02	0.3414	0.00000E+00	0.0000
9	0.0071			6.41831E-03	0.2365	1.66960E-02	0.2673	0.00000E+00	0.0000
10	0.0151			1.35898E-02	0.2296	4.04688E-02	0.2976	0.00000E+00	0.0000
11	0.0319			2.87714E-02	0.2356	7.29025E-02	0.2655	0.00000E+00	0.0000
12	0.0418			3.77037E-02	0.2483	4.99995E-02	0.2607	0.00000E+00	0.0000
13	0.0374			3.37502E-02	0.2645	5.75641E-02	0.2679	0.00000E+00	0.0000
14	0.0302			2.72559E-02	0.2485	6.73208E-02	0.2565	0.00000E+00	0.0000
15	0.0060			5.41042E-03	0.3577	2.80413E-02	0.4811	0.00000E+00	0.0000
16	0.0041			3.66578E-03	0.4459	1.58181E-02	0.5886	0.00000E+00	0.0000
17	0.0061			5.52764E-03	0.6393	9.31682E-03	0.6235	0.00000E+00	0.0000
18	0.0082			7.42696E-03	0.6274	9.20261E-03	0.6153	0.00000E+00	0.0000
19	0.0100			8.99048E-03	0.4909	1.44742E-02	0.6135	0.00000E+00	0.0000
20	0.0399			3.59549E-02	0.3201	4.76949E-02	0.3671	0.00000E+00	0.0000
21	0.0206			1.86152E-02	0.4835	1.85951E-02	0.4952	0.00000E+00	0.0000
22	0.0468			4.22116E-02	0.4027	3.79346E-02	0.4197	0.00000E+00	0.0000
23	0.1284			1.15860E-01	0.2645	9.92098E-02	0.2428	0.00000E+00	0.0000
24	0.1877			1.69342E-01	0.2533	1.33525E-01	0.2296	0.00000E+00	0.0000
25	0.1396			1.25961E-01	0.2961	9.58818E-02	0.2492	0.00000E+00	0.0000
26	0.1566			1.41266E-01	0.3219	1.04837E-01	0.2740	0.00000E+00	0.0000
27	0.0562			5.06990E-02	0.5058	3.50944E-02	0.4716	0.00000E+00	0.0000
SYSTEM TOTAL =				9.02159E-01	0.1402	1.00117E+00	0.0449	0.00000E+00	0.0000

ELAPSED TIME 18.11267 MINUTES

RANDOM NUMBER= 676267006D12

```
TPIGA - PREF. FLOOD CANISTER

                              FREQUENCY FOR GENERATIONS    4 TO  403
0.8363 TO 0.8444     **
0.8444 TO 0.8525     ******
0.8525 TO 0.8607     *************
0.8607 TO 0.8688     *****************
0.8688 TO 0.8769     ********************
0.8769 TO 0.8850     *********************************************
0.8850 TO 0.8932     ***********************************************
0.8932 TO 0.9013     ***********************************************
0.9013 TO 0.9094     *******************************************************
0.9094 TO 0.9175     ********************************************
0.9175 TO 0.9257     *********************************
0.9257 TO 0.9338     ***************************
0.9338 TO 0.9419     *****************
0.9419 TO 0.9500     ***************
0.9500 TO 0.9582     *******
0.9582 TO 0.9663     **
0.9663 TO 0.9744     *
0.9744 TO 0.9825     **

                              FREQUENCY FOP GENERATIONS  104 TO  403
0.8363 TO 0.8444     **
0.8444 TO 0.8525     *****
0.8525 TO 0.8607     ***********
0.8607 TO 0.8688     ****************
0.8688 TO 0.8769     *****************
0.8769 TO 0.8850     ********************************
0.8850 TO 0.8932     *******************************
0.8932 TO 0.9013     **********************************
0.9013 TO 0.9094     **************************************
0.9094 TO 0.9175     ************************************
0.9175 TO 0.9257     **************************
0.9257 TO 0.9338     *********************
0.9338 TO 0.9419     **************
0.9419 TO 0.9500     **********
0.9500 TO 0.9582     *****
0.9582 TO 0.9663     *
0.9663 TO 0.9744
0.9744 TO 0.9825     *

                              FREQUENCY FOR GENERATIONS  204 TO  403
0.8363 TO 0.8444     *
0.8444 TO 0.8525     ****
0.8525 TO 0.8607     ******
0.8607 TO 0.8688     ***********
0.8688 TO 0.8769     ***********
0.8769 TO 0.8850     *******************
0.8850 TO 0.8932     *********************
0.8932 TO 0.9013     ***********************
0.9013 TO 0.9094     ******************************
0.9094 TO 0.9175     **********************
0.9175 TO 0.9257     ****************
0.9257 TO 0.9338     **************
0.9338 TO 0.9419     *********
0.9419 TO 0.9500     *******
0.9500 TO 0.9582     *****
0.9582 TO 0.9663     *
0.9663 TO 0.9744
0.9744 TO 0.9825
_TPIGA - PREF. FLOOD CANISTER

                              FREQUENCY FOR GENERATIONS  304 TO  403
0.8363 TO 0.8444     *
0.8444 TO 0.8525     **
0.8525 TO 0.8607     ****
0.8607 TO 0.8688     ******
0.8688 TO 0.8769     **
0.8769 TO 0.8850     ************
0.8850 TO 0.8932     **********
0.8932 TO 0.9013     ***********
0.9013 TO 0.9094     ****************
0.9094 TO 0.9175     ************
0.9175 TO 0.9257     *****
0.9257 TO 0.9338     ******
0.9338 TO 0.9419     ****
0.9419 TO 0.9500     *****
0.9500 TO 0.9582     ***
0.9582 TO 0.9663     *
0.9663 TO 0.9744
0.9744 TO 0.9825


********************************************************************************************************************************
*

          CONGRATULATIONS!  YOU HAVE  SUCCESSFULLY TRAVERSED THE PERILOUS PATH THROUGH KENO V IN  18.11350 MINUTES

********************************************************************************************************************************
*
_
```

Figure 6.6.5-3 Summary of CSAS Input/Output for TRIGA Benchmark Core 132

```
PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
   MODULE CSAS25    WILL BE CALLED
     TRIGA BENCHMARK CORE 132
     27GROUPNDF4  LATTICECELL
     'FUEL ELEMENT - FUEL
     U-235    1 0.0 3.682E-4 297. END
     U-238    1 0.0 1.463E-3 297. END
     ZR       1 0.0 3.502E-2 297. END
     H        1 0.0 5.778E-2 297. END
     'FUEL ELEMENT / FOLLOWER - CLAD, FUEL FOLLOWER SEPERATOR
     SS304    2 1.0 297.0 END
     'MODERATOR
     H2O      3 1.0 297.0 END
     'CORE REFLECTOR GRAPHITE SHELL, GRID PLATES, TRANSIENT TUBE, SOURCE CLAD
     AL       4 1.0 297.0 END
     'CENTER ROD
     ZR       5 1.0 297.0 END
     'GRAPHITE CORE REFLECTOR, FUEL ELEMENT REFLECTORS
     C        6 DEN=1.6 1.0 297.0 END
     'FUEL FOLLOWER - FUEL
     U-235    7 0.0 3.758E-4 297. END
     U-238    7 0.0 1.494E-3 297. END
     ZR       7 0.0 3.492E-2 297. END
     H        7 0.0 5.762E-2 297. END
     'POISON IN FUEL FOLLOWER AND AIR FOLLOWER
     B4C      8 DEN=2.48 1.0 297. END
     'MATERIAL FOR PELLET - CLAD GAP, VOID AND TRANSIENT AIR ROD
     H2O      9 DEN=1.0E-20 1.0 297. END
     'MATERIAL FOR TIPS OF STEEL FUEL ELEMENT
     H2O     10 1.0 297. END
     'MATERIAL FOR TIPS OF SOURCE ELEMENT
     H2O     11 1.0 297. END
     END COMP
     'LATTICE CELL CARD IGNORES ZIRC ROD IN MIDDLE - SUBSTITUTES FUEL MATRIX
     TRIANGPITCH 3.9775 3.6449 1 3 3.75412 2 3.65252 9 END
     MORE DATA
     RES=7 CYLINDER 1.69545 DAN(7)=5.57216E-01
     END MORE
     TRIGA BENCHMARK CORE 132
     READ PARAM TME=170.0 GEN=403 NPG=1000 RUN=YES PLT=NO
     END PARAM
     READ GEOM
     UNIT 1
     COM='TRIGA FUEL ELEMENT'
     CYLINDER  5 1 0.3175 2P19.05
     CYLINDER  1 1 1.8225 2P19.05
     CYLINDER  6 1 1.8225 +27.888 -27.864
     CYLINDER  9 1 1.8263 +27.888 -27.864
     CYLINDER  2 1 1.8771 2P30.64
     CYLINDER 10 1 1.8771 2P36.03
     UNIT 2
     COM='TRIGA FUEL FOLLOWER'
     CYLINDER  5 1 0.3175 2P19.05
     CYLINDER  7 1 1.6650 2P19.05
     CYLINDER  9 1 1.6650 +19.6850 -19.0500
     CYLINDER  2 1 1.6650 +20.9550 -21.5900
     CYLINDER  8 1 1.6650 +59.0550 -21.5900
     CYLINDER  9 1 1.6650 +59.3725 -21.5900
     CYLINDER  2 1 1.6650 +60.6424 -21.5900
     CYLINDER  9 1 1.6955 +69.1250 -36.8300
     CYLINDER  2 1 1.7463 +73.0250 -38.1000
     UNIT 3
     COM='TRIGA TRANSIENT AIR ROD + TUBE'
     CYLINDER  9 1 1.5164 2P19.05
     CYLINDER  9 1 1.5164 +19.6850 -19.0500
     CYLINDER  4 1 1.5164 +20.9550 -21.5900
     CYLINDER  8 1 1.5164 +59.0550 -21.5900
     CYLINDER  9 1 1.5164 +59.3725 -21.5900
     CYLINDER  4 1 1.5164 +60.6424 -21.5900
     CYLINDER  9 1 1.5164 +69.1250 -36.8300
     CYLINDER  4 1 1.5875 +73.0250 -38.1000
     CYLINDER  3 1 1.6000 +73.0250 -38.1000
     CYLINDER  4 1 1.9000 +73.0250 -38.1000
     UNIT 4
     COM='SOURCE ROD'
     CYLINDER  9 1 1.8263 +27.888 -27.864
     CYLINDER  4 1 1.8771 2P30.64
     CYLINDER 11 1 1.8771 2P36.03
     UNIT 5
     COM='WATER FOR EMPTY LOCATIONS'
     CYLINDER  3 1 1.8771 2P36.03
     GLOBAL UNIT 10
     COM='ACTIVE CORE CONFIGURATION'
     CYLINDER  3 1 22.06 73.025 -38.10
     'RING A
     HOLE   1     0.0000     0.0000    0.0000
     ' RING B
     HOLE   1     3.5109     2.0270    0.0000
     HOLE   1     0.0000     4.0540    0.0000
     HOLE   1    -3.5109     2.0270    0.0000
     HOLE   1    -3.5109    -2.0270    0.0000
```

```
HOLE  1     0.0000   -4.0540   0.0000
HOLE  1     3.5109   -2.0270   0.0000
' RING C
HOLE  2     7.9810    0.0000   0.0000
HOLE  1     6.9117    3.9905   0.0000
HOLE  1     3.9905    6.9117   0.0000
HOLE  1     0.0000    7.9810   0.0000
HOLE  1    -3.9905    6.9117   0.0000
HOLE  1    -6.9117    3.9905   0.0000
HOLE  3    -7.9810    0.0000   0.0000
HOLE  1    -6.9117   -3.9905   0.0000
HOLE  1    -3.9905   -6.9117   0.0000
HOLE  1     0.0000   -7.9810   0.0000
HOLE  1     3.9905   -6.9117   0.0000
HOLE  1     6.9117   -3.9905   0.0000
' RING D
HOLE  1    11.7566    2.0730   0.0000
HOLE  1    10.3386    5.9690   0.0000
HOLE  1     7.6736    9.1450   0.0000
HOLE  1     4.0830   11.2181   0.0000
HOLE  2     0.0000   11.9380   0.0000
HOLE  1    -4.0830   11.2181   0.0000
HOLE  1    -7.6736    9.1450   0.0000
HOLE  1   -10.3386    5.9690   0.0000
HOLE  1   -11.7566    2.0730   0.0000
HOLE  1   -11.7566   -2.0730   0.0000
HOLE  1   -10.3386   -5.9690   0.0000
HOLE  1    -7.6736   -9.1450   0.0000
HOLE  1    -4.0830  -11.2181   0.0000
HOLE  2     0.0000  -11.9380   0.0000
HOLE  1     4.0830  -11.2181   0.0000
HOLE  1     7.6736   -9.1450   0.0000
HOLE  1    10.3386   -5.9690   0.0000
HOLE  1    11.7566   -2.0730   0.0000
' RING E
HOLE  5    15.9160    0.0000   0.0000
HOLE  5    15.3737    4.1194   0.0000
HOLE  5    13.7837    7.9580   0.0000
HOLE  5    11.2543   11.2543   0.0000
HOLE  5     7.9580   13.7837   0.0000
HOLE  5     4.1194   15.3737   0.0000
HOLE  5     0.0000   15.9160   0.0000
HOLE  4    -4.1194   15.3737   0.0000
HOLE  5    -7.9580   13.7837   0.0000
HOLE  1   -11.2543   11.2543   0.0000
HOLE  1   -13.7837    7.9580   0.0000
HOLE  1   -15.3737    4.1194   0.0000
HOLE  1   -15.9160    0.0000   0.0000
HOLE  1   -15.3737   -4.1194   0.0000
HOLE  1   -13.7837   -7.9580   0.0000
HOLE  1   -11.2543  -11.2543   0.0000
HOLE  5    -7.9580  -13.7837   0.0000
HOLE  5    -4.1194  -15.3737   0.0000
HOLE  5     0.0000  -15.9160   0.0000
HOLE  5     4.1194  -15.3737   0.0000
HOLE  5     7.9580  -13.7837   0.0000
HOLE  5    11.2543  -11.2543   0.0000
HOLE  5    13.7837   -7.9580   0.0000
HOLE  5    15.3737   -4.1194   0.0000
' RADIAL REFLECTORS EXTENDED BEYOND FUEL FOLLOWER HEIGHT
CYLINDER 4 1 22.66 73.025 -38.10
CYLINDER 6 1 53.23 73.025 -38.10
CYLINDER 4 1 54.50 73.025 -38.10
CUBOID   3 1 4P100.0 +200.00 -100.00
END GEOM
READ BOUNDS ALL=VOID END BOUNDS
READ PLOT
TTL='X-Y PLOT OF CORE CENTER'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=300
XUL=-5.0 YUL=5.0 ZUL=0.0
XLR=5.0 YLR=-5.0 ZLR=0.0 END
TTL='X-Y PLOT OF ACTIVE CORE'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=300
XUL=-20.0 YUL=20.0 ZUL=0.0
XLR=20.0 YLR=-20.0 ZLR=0.0 END
TTL='X-Y PLOT OF CORE'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=300
XUL=-55.0 YUL=55.0 ZUL=0.0
XLR=55.0 YLR=-55.0 ZLR=0.0 END
TTL='Y-Z PLOT OF CORE'
SCR=YES PIC=MAT LPI=10
VAX=1.0 WDN=-1.0
XUL=0.0 YUL=-20.0 ZUL=30.0
XLR=0.0 YLR=+20.0 ZLR=-30.0 END
TTL='Y-Z PLOT OF CORE (INCLUDING FOLLOWER)'
SCR=YES PIC=MAT LPI=10
VAX=1.0 WDN=-1.0
XUL=0.0 YUL=-30.0 ZUL=80.0
XLR=0.0 YLR=+30.0 ZLR=-40.0 END
TTL='X-Z PLOT OF CORE'
SCR=YES PIC=MAT LPI=10
UAX=1.0 WDN=-1.0
```

```
  XUL=-20.0  YUL=0.0 ZUL=30.0
  XLR=+20.0 YLR=0.0 ZLR=-30.0
  END PLOT
  END DATA

SECONDARY MODULE 000008   HAS BEEN CALLED.

MODULE 000008   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     1.59 (SECONDS).

SECONDARY MODULE 000002   HAS BEEN CALLED.

MODULE 000002   IS FINISHED. COMPLETION CODE     0. CPU TIME USED    18.62 (SECONDS).

SECONDARY MODULE 000009   HAS BEEN CALLED.

MODULE 000009   IS FINISHED. COMPLETION CODE     0. CPU TIME USED  4709.75 (SECONDS).

MODULE CSAS25   IS FINISHED. COMPLETION CODE     0. CPU TIME USED  4732.60 (SECONDS).
```

```
 CCCCCCCCCC     SSSSSSSSSS      AAAAAAAAA     SSSSSSSSSS     2222222222    555555555555
CCCCCCCCCCCC   SSSSSSSSSSSS    AAAAAAAAAAA    SSSSSSSSSSSS   222222222222   555555555555
CC        CC   SS        SS   AA        AA   SS        SS   22        22   55
CC             SS             AA        AA   SS                       22   55
CC             SS             AA        AA   SS                       22   55
CC             SSSSSSSSSSS    AAAAAAAAAAAA   SSSSSSSSSSS             22    55555555555
CC              SSSSSSSSSSS   AAAAAAAAAAAA    SSSSSSSSSSS           22     555555555555
CC                       SS   AA        AA             SS         22                 55
CC                       SS   AA        AA             SS       22                   55
CC        CC   SS        SS   AA        AA   SS        SS     22           55        55
CCCCCCCCCCCC   SSSSSSSSSSSS   AA        AA   SSSSSSSSSSSS   222222222222   555555555555
 CCCCCCCCCC     SSSSSSSSSS    AA        AA    SSSSSSSSSS    222222222222    55555555555

 SSSSSSSSSS     CCCCCCCCCC      AAAAAAAAA     LL             EEEEEEEEEEEE                  PPPPPPPPPPP     CCCCCCCCCC
SSSSSSSSSSSS   CCCCCCCCCCCC    AAAAAAAAAAA    LL             EEEEEEEEEEEE                  PPPPPPPPPPPP   CCCCCCCCCCCC
SS        SS   CC        CC   AA        AA   LL             EE                            PP        PP   CC        CC
SS             CC             AA        AA   LL             EE                            PP        PP   CC
SS             CC             AA        AA   LL             EE                            PP        PP   CC
SSSSSSSSSSS    CC             AAAAAAAAAAAA   LL             EEEEEEEE       ------------   PPPPPPPPPPPP   CC
 SSSSSSSSSSS   CC             AAAAAAAAAAAA   LL             EEEEEEEE       ------------   PPPPPPPPPPP    CC
          SS   CC             AA        AA   LL             EE                            PP             CC
          SS   CC             AA        AA   LL             EE                            PP             CC
SS        SS   CC        CC   AA        AA   LL             EE                            PP             CC        CC
SSSSSSSSSSSS   CCCCCCCCCCCC   AA        AA   LLLLLLLLLLLL   EEEEEEEEEEEE                  PP             CCCCCCCCCCCC
 SSSSSSSSSS     CCCCCCCCCC    AA        AA   LLLLLLLLLLLL   EEEEEEEEEEEE                  PP              CCCCCCCCCC

     11             11                 //     0000000            44                 //    9999999999    777777777777
    111            111                //     000000000          444                //    999999999999   77777777777
   1111           1111               //     00       00        4444               //     99        99   77        77
     11             11              //      00       00       44 44              //      99        99            77
     11             11             //       00       00      44  44             //       99        99           77
     11             11            //        00       00     44   44            //        999999999999          77
     11             11           //         00       00    44    44           //          99999999999         77
     11             11          //          00       00   444444444444       //                    99        77
     11             11         //           00       00   444444444444      //                     99        77
     11             11        //            00       00          44        //                      99       77
  11111111       11111111    //              000000000           44       //            999999999999        77
  11111111       11111111   //                0000000            44      //             99999999999         77

     11       777777777777                   2222222222    99999999999                  0000000            11
    111       77777777777                   222222222222   999999999999                000000000          111
   1111       77        77       :::        22        22   99        99      :::      00       00        1111
     11                77        :::                  22   99        99      :::      00       00          11
     11               77         :::                  22   99        99      :::      00       00          11
     11              77                              22    999999999999               00       00          11
     11             77                             22       99999999999               00       00          11
     11            77            :::             22                  99      :::      00       00          11
     11            77            :::           22                    99      :::      00       00          11
     11            77            :::         22                      99      :::      00       00          11
  11111111         77                       222222222222   999999999999                000000000       11111111
  11111111         77                       222222222222   99999999999                  0000000        11111111
```

```
 SSSSSSSSSSS    CCCCCCCCCCC      AAAAAAAAA     LL               EEEEEEEEEEEEE                   PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC    AAAAAAAAAAA    LL               EEEEEEEEEEEEE                   PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC   AA         AA   LL               EE                              PP         PP  CC         CC
SS             CC              AA         AA   LL               EE                              PP         PP  CC
SS             CC              AA         AA   LL               EE                              PP         PP  CC
SSSSSSSSSSSS   CC              AAAAAAAAAAAAA   LL               EEEEEEEEE     -------------     PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC              AAAAAAAAAAAAA   LL               EEEEEEEEE     -------------     PPPPPPPPPPPP   CC
           SS  CC              AA         AA   LL               EE                              PP             CC
           SS  CC              AA         AA   LL               EE                              PP             CC
SS         SS  CC         CC   AA         AA   LL               EE                              PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL    EEEEEEEEEEEEE                   PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC    AA         AA   LLLLLLLLLLLLL    EEEEEEEEEEEEE                   PP              CCCCCCCCCCC
```

```
*****                                                                       *****
*****              PROGRAM VERIFICATION INFORMATION                         *****
*****                                                                       *****
*****             CODE SYSTEM:  SCALE-PC VERSION:  4.3                      *****
*****                                                                       *****
*****                                                                       *****
*****                     PROGRAM:  CSAS                                    *****
*****               CREATION DATE:  03-08-96                                *****
*****                      VOLUME:  ENG                                     *****
*****                     LIBRARY:  G:\SCALE43\EXE                          *****
*****             PRODUCTION CODE:  CSAS                                    *****
*****                     VERSION:  3.1                                     *****
*****                     JOBNAME:  SCALE-PC                                *****
*****           DATE OF EXECUTION:  11/04/97                                *****
*****           TIME OF EXECUTION:  17:29:01                                *****
*****                                                                       *****
```

```
'FUEL ELEMENT - FUEL

'FUEL ELEMENT / FOLLOWER - CLAD, FUEL FOLLOWER SEPERATOR

'MODERATOR

'CORE REFLECTOR GRAPHITE SHELL, GRID PLATES, TRANSIENT TUBE, SOURCE CLAD

'CENTER ROD

'GRAPHITE CORE REFLECTOR, FUEL ELEMENT REFLECTORS

'FUEL FOLLOWER - FUEL

'POISON IN FUEL FOLLOWER AND AIR FOLLOWER

'MATERIAL FOR PELLET - CLAD GAP, VOID AND TRANSIENT AIR ROD

'MATERIAL FOR TIPS OF STEEL FUEL ELEMENT

'MATERIAL FOR TIPS OF SOURCE ELEMENT

'LATTICE CELL CARD IGNORES ZIRC ROD IN MIDDLE - SUBSTITUTES FUEL MATRIX

'FUEL ELEMENT - FUEL
    TRIGA BENCHMARK CORE 132

    **** PROBLEM PARAMETERS ****

    LIB 27GROUPNDF4  LIBRARY
    MXX           11 MIXTURES
    MSC           17 COMPOSITION SPECIFICATIONS
    IZM            4 MATERIAL ZONES
    GE  LATTICECELL  GEOMETRY
    MORE           1 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
    MSLN           0 FUEL SOLUTIONS

    **** PROBLEM COMPOSITION DESCRIPTION ****

    SC  U-235        STANDARD COMPOSITION
    MX             1 MIXTURE NO.
    DEN   3.6820E-04 ATOMIC DENSITY
    ROTH      1.0000 THEORETICAL DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       297.0 DEG KELVIN
               92235       1.00 ATOM/MOLECULE
    END

    SC  U-238        STANDARD COMPOSITION
    MX             1 MIXTURE NO.
    DEN   1.4630E-03 ATOMIC DENSITY
    ROTH      1.0000 THEORETICAL DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       297.0 DEG KELVIN
               92238       1.00 ATOM/MOLECULE
    END

    SC  ZR           STANDARD COMPOSITION
    MX             1 MIXTURE NO.
    DEN   3.5020E-02 ATOMIC DENSITY
    ROTH      6.4900 THEORETICAL DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       297.0 DEG KELVIN
               40000       1.00 ATOM/MOLECULE
    END

    SC  H            STANDARD COMPOSITION
    MX             1 MIXTURE NO.
    DEN   5.7780E-02 ATOMIC DENSITY
    ROTH      1.0000 THEORETICAL DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       297.0 DEG KELVIN
                1001       1.00 ATOM/MOLECULE
'FUEL ELEMENT / FOLLOWER - CLAD, FUEL FOLLOWER SEPERATOR
    END

    SC  SS304        STANDARD COMPOSITION
    MX             2 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      7.9200 THEORETICAL DENSITY
    NEL            4 NO. ELEMENTS
    ICP            0 0/1 MIXTURE/COMPOUND
    TEMP       297.0 DEG KELVIN
               24304     19.000 WT-
               25055      2.000 WT-
               26304     69.500 WT-
               28304      9.500 WT-

'MODERATOR
    END
```

```
    SC  H2O         STANDARD COMPOSITION
    MX            2 MIXTURE NO.
    VF       1.0000 VOLUME FRACTION
    ROTH     0.9982 THEORETICAL DENSITY
    NEL           2 NO. ELEMENTS
    ICP           1 0/1 MIXTURE/COMPOUND
    TEMP      297.0 DEG KELVIN
               1001       2.00 ATOMS/MOLECULE
               8016       1.00 ATOM/MOLECULE

'CORE REFLECTOR GRAPHITE SHELL, GRID PLATES, TRANSIENT TUBE, SOURCE CLAD
    END

    SC  AL          STANDARD COMPOSITION
    MX            4 MIXTURE NO.
    VF       1.0000 VOLUME FRACTION
    ROTH     2.7020 THEORETICAL DENSITY
    NEL           1 NO. ELEMENTS
    ICP           1 0/1 MIXTURE/COMPOUND
    TEMP      297.0 DEG KELVIN
              13027       1.00 ATOM/MOLECULE

'CENTER ROD
    END

    SC  ZR          STANDARD COMPOSITION
    MX            5 MIXTURE NO.
    VF       1.0000 VOLUME FRACTION
    ROTH     6.4900 THEORETICAL DENSITY
    NEL           1 NO. ELEMENTS
    ICP           1 0/1 MIXTURE/COMPOUND
    TEMP      297.0 DEG KELVIN
              40000       1.00 ATOM/MOLECULE

'GRAPHITE CORE REFLECTOR, FUEL ELEMENT REFLECTORS
    END

    SC  C           STANDARD COMPOSITION
    MX            6 MIXTURE NO.
    VF       1.0000 VOLUME FRACTION
    ROTH     1.6000 SPECIFIED DENSITY
    NEL           1 NO. ELEMENTS
    ICP           1 0/1 MIXTURE/COMPOUND
    TEMP      297.0 DEG KELVIN
               6012       1.00 ATOM/MOLECULE

'FUEL FOLLOWER - FUEL
    END

    SC  U-235       STANDARD COMPOSITION
    MX            7 MIXTURE NO.
    DEN   3.7580E-04 ATOMIC DENSITY
    ROTH     1.0000 THEORETICAL DENSITY
    NEL           1 NO. ELEMENTS
    ICP           1 0/1 MIXTURE/COMPOUND
    TEMP      297.0 DEG KELVIN
              92235       1.00 ATOM/MOLECULE
    END

    SC  U-238       STANDARD COMPOSITION
    MX            7 MIXTURE NO.
    DEN   1.4940E-03 ATOMIC DENSITY
    ROTH     1.0000 THEORETICAL DENSITY
    NEL           1 NO. ELEMENTS
    ICP           1 0/1 MIXTURE/COMPOUND
    TEMP      297.0 DEG KELVIN
              92238       1.00 ATOM/MOLECULE
    END

    SC  ZR          STANDARD COMPOSITION
    MX            7 MIXTURE NO.
    DEN   3.4920E-02 ATOMIC DENSITY
    ROTH     6.4900 THEORETICAL DENSITY
    NEL           1 NO. ELEMENTS
    ICP           1 0/1 MIXTURE/COMPOUND
    TEMP      297.0 DEG KELVIN
              40000       1.00 ATOM/MOLECULE
    END

    SC  H           STANDARD COMPOSITION
    MX            7 MIXTURE NO.
    DEN   5.7620E-02 ATOMIC DENSITY
    ROTH     1.0000 THEORETICAL DENSITY
    NEL           1 NO. ELEMENTS
    ICP           1 0/1 MIXTURE/COMPOUND
    TEMP      297.0 DEG KELVIN
               1001       1.00 ATOM/MOLECULE

'POISON IN FUEL FOLLOWER AND AIR FOLLOWER
    END

    SC  B4C         STANDARD COMPOSITION
    MX            8 MIXTURE NO.
    VF       1.0000 VOLUME FRACTION
    ROTH     2.4800 SPECIFIED DENSITY
    NEL           2 NO. ELEMENTS
    ICP           1 0/1 MIXTURE/COMPOUND
    TEMP      297.0 DEG KELVIN
               5000       4.00 ATOMS/MOLECULE
```

```
                              5010     18.431 WT%
                              5011     81.569 WT%
                 6012       1.00 ATOM/MOLECULE

'MATERIAL FOR PELLET - CLAD GAP, VOID AND TRANSIENT AIR ROD
    END

    SC  H2O           STANDARD COMPOSITION
    MX              9 MIXTURE NO.
    VF         1.0000 VOLUME FRACTION
    ROTH       0.0000 SPECIFIED DENSITY
    NEL             2 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
    TEMP        297.0 DEG KELVIN
                 1001       2.00 ATOMS/MOLECULE
                 8016       1.00 ATOM/MOLECULE

'MATERIAL FOR TIPS OF STEEL FUEL ELEMENT
    END

    SC  H2O           STANDARD COMPOSITION
    MX             10 MIXTURE NO.
    VF         1.0000 VOLUME FRACTION
    ROTH       0.9982 THEORETICAL DENSITY
    NEL             2 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
    TEMP        297.0 DEG KELVIN
                 1001       2.00 ATOMS/MOLECULE
                 8016       1.00 ATOM/MOLECULE

'MATERIAL FOR TIPS OF SOURCE ELEMENT
    END

    SC  H2O           STANDARD COMPOSITION
    MX             11 MIXTURE NO.
    VF         1.0000 VOLUME FRACTION
    ROTH       0.9982 THEORETICAL DENSITY
    NEL             2 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
    TEMP        297.0 DEG KELVIN
                 1001       2.00 ATOMS/MOLECULE
                 8016       1.00 ATOM/MOLECULE
    END

    **** PROBLEM GEOMETRY ****


'LATTICE CELL CARD IGNORES ZIRC ROD IN MIDDLE - SUBSTITUTES FUEL MATRIX
    CTP TRIANGPITCH  CELL TYPE
    PITCH      3.9775 CM CENTER TO CENTER SPACING
    FUELOD     3.6449 CM FUEL DIAMETER OR SLAB THICKNESS
    MFUEL           1 MIXTURE NO. OF FUEL
    MMOD            3 MIXTURE NO. OF MODERATOR
    CLADOD     3.7541 CM CLAD OUTER DIAMETER
    MCLAD           2 MIXTURE NO. OF CLAD
    GAPOD      3.6525 CM GAP OUTER DIAMETER
    MGAP            9 MIXTURE NO. OF GAP

    **** SPECIAL PARAMETERS ****

    ISN             8 ORDER OF ANGULAR QUADRATURE
    IIM            20 INNER ITERATION MAXIMUM
    ICM            25 OUTER ITERATION MAXIMUM
    SZF  1.00000E+00 SIZE FACTOR FOR SPATIAL MESH
    EPS  1.00000E-04 OVERALL PROBLEM CONVERGENCE
    PTC  1.00000E-04 SCALAR FLUX CONVERGENCE
    BKL  1.42089E+00 BUCKLING FACTOR
    IUS             0 THERMAL UPSCATTER SCALING
    BAL          FINE BALANCE TABLE PRINT FLAG
    DY   0.00000E+00 BUCKLING HEIGHT
    DZ   0.00000E+00 BUCKLING DEPTH
    IPN             0 DIFFUSION COEFFICIENT OPTION
    FRD             0 LOGICAL UNIT NUMBER TO READ FLUX GUESS
    FWR            -1 LOGICAL UNIT NUMBER TO WRITE FLUX GUESS
    MSH          2001 NUMBER OF INTERVALS FOR RES. INTGRTNS
    MLV             2 MAX LVALUE FOR RES. INTGRTNS
    AXS             0 LOGICAL UNIT NUMBER TO WRITE ANISN LIB
    RES             7 MIXTURE WITH SPECIAL RESONANCE CORRECTION
      *      CYLINDER GEOMETRY FOR SPECIAL RESONANCE CORRECTION
      *  1.69545E+00 DIMENSION (LBAR) FOR SPECIAL RESONANCE CORRECTION

    DANCOFF FACTOR SPECIFICATION
    MIXTURE      FACTOR
          7     0.55722

    ZONE SPECIFICATIONS FOR LATTICECELL GEOMETRY

                  ZONE  1 IS FUEL
                  ZONE  2 IS GAP
                  ZONE  3 IS CLAD
                  ZONE  4 IS MOD
```

```
*******************************************************************************************************
***                                                                                                 ***
***                          TRIGA BENCHMARK CORE 132                                               ***
***                                                                                                 ***
*******************************************************************************************************
*******************************************************************************************************
***                                                                                                 ***
***                        ********** DATA LIBRARY INFORMATION **********                           ***
***                                                                                                 ***
***          UNIT                                              VOLUME                               ***
***          NUMBER             DATA SET NAME                  NAME          UNIT FUNCTION          ***
***          ------             -------------                  ----          -------------          ***
***                                                                                                 ***
***            89     G:\scale43\DATALIB\FT89F001                            STANDARD COMPOSITION LIBRARY ***
***                                                                                                 ***
***            82     G:\scale43\DATALIB\FT82F001                            CROSS SECTION LIBRARY  ***
***                                                                                                 ***
***            11     C:\PROJECTS\triga\sg61102.13.5.2\core132b\FT           SHORT CROSS SECTION LIBRARY ***
***                                                                                                 ***
***            90     C:\PROJECTS\triga\sg61102.13.5.2\core132b\FT           INPUT DATA DIRECT ACCESS ***
***                                                                                                 ***
*******************************************************************************************************
*******************************************************************************************************
***                                                                                                 ***
***                                                                                                 ***
***                          STANDARD COMPOSITION LIBRARY DATA                                      ***
***                          ---------------------------------                                      ***
***                                                                                                 ***
***            UNIT NUMBER  :  89                                                                   ***
***                                                                                                 ***
***            DATASET NAME :  G:\scale43\DATALIB\FT89F001                                          ***
***                                                                                                 ***
***            LIBRARY TITLE:  SCALE-4 STANDARD COMPOSITION LIBRARY                                 ***
***                            637 STANDARD COMPOSITIONS, 490 NUCLIDES                              ***
***                            90 ELEMENTS WITH VARIABLE ISOTOPIC DISTRBUTIONS.                     ***
***                                                                                                 ***
***            CREATION DATE:   6/30/95                                                             ***
***                                                                                                 ***
***                                                                                                 ***
***                                                                                                 ***
***                               CROSS SECTION LIBRARY DATA                                        ***
***                               --------------------------                                        ***
***                                                                                                 ***
***            UNIT NUMBER  :  82                                                                   ***
***                                                                                                 ***
***            DATASET NAME :  G:\scale43\DATALIB\FT82F001                                          ***
***                                                                                                 ***
***            LIBRARY TITLE:  SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY                           ***
***                               BASED ON ENDF-B VERSION 4 DATA                                    ***
***                                  COMPILED FOR NRC      1/27/89                                  ***
***                                     LAST UPDATED                                       08/12/94 ***
***                                        L.M.PETRIE   -    ORNL                                   ***
***                                                                                                 ***
***                                                                                                 ***
***                                                                                                 ***
***                                                                                                 ***
*******************************************************************************************************
*******************************************************************************************************

                      ........    0 IO'S WERE USED BEFORE READING KENO V DATA     ........

                      ........    0 IO'S WERE USED READING THE KENO V PARAMETER DATA     ........

'RING A

' RING B

' RING C

' RING D

' RING E

' RADIAL REFLECTORS EXTENDED BEYOND FUEL FOLLOWER HEIGHT

                     *************** DATA READING COMPLETED ***************

                      ........    0 IO'S WERE USED PREPARING THE KENO V INPUT DATA     ........

                      ........    0 IO'S WERE USED LOADING THE KENO V DATA     ........

                      ........    0 IO'S WERE USED LOADING THE DATA     ........

                      ........    0 IO'S WERE USED CHECKING THE KENO V GEOMETRY DATA     ........
                      *****  RESTART DATA HAS BEEN WRITTEN ON UNIT 95  *****

                      ........    0 IO'S WERE USED WRITING THE KENO V - CSAS DATA     ........

                      ........    0 IO'S WERE USED PROCESSING CSAS INPUT DATA     ........

 CONTROL MODULE CSAS25    IS COMPLETE.
```

```
              KK         KK  EEEEEEEEEEEEE  NN         NN   00000000000                   VV         VV
              KK        KK   EEEEEEEEEEEEE  NNN        NN  0000000000000                  VV         VV
              KK       KK    EE             NNNN       NN  00         00                  VV         VV
              KK      KK     EE             NN NN      NN  00         00                  VV         VV
              KK     KK      EE             NN  NN     NN  00         00                  VV         VV
              KKKKKKKK       EEEEEEEEE      NN   NN    NN  00         00  -------------   VV         VV
              KKKKKKKK       EEEEEEEEE      NN    NN   NN  00         00  -------------    VV       VV
              KK     KK      EE             NN     NN  NN  00         00                    VV     VV
              KK      KK     EE             NN      NN NN  00         00                     VV   VV
              KK       KK    EE             NN       NNNN  00         00                      VV VV
              KK        KK   EEEEEEEEEEEEE  NN        NNN  0000000000000                       VVV
              KK         KK  EEEEEEEEEEEEE  NN         NN   00000000000                         V

 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA   LL             EEEEEEEEEEEEE                 PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA  LL             EEEEEEEEEEEEE                 PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA LL             EE                            PP         PP  CC         CC
SS             CC             AA         AA LL             EE                            PP         PP  CC
SS             CC             AA         AA LL             EE                            PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA LL             EEEEEEEEE      -------------  PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA LL             EEEEEEEEE      -------------  PPPPPPPPPPPP   CC
           SS  CC             AA         AA LL             EE                            PP             CC
           SS  CC             AA         AA LL             EE                            PP             CC
SS         SS  CC         CC  AA         AA LL             EE                            PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA LLLLLLLLLLLLL  EEEEEEEEEEEEE                 PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA LLLLLLLLLLLLL  EEEEEEEEEEEEE                 PP              CCCCCCCCCCC

       11          11             //     0000000           44            //   99999999999    7777777777777
      111         111            //    000000000          444           //   9999999999999   777777777777
     1111        1111           //    00       00        4444          //    99         99   77        77
       11          11          //     00       00       44 44         //     99         99            77
       11          11         //      00       00      44  44        //      99         99           77
       11          11        //       00       00     44   44       //       9999999999999          77
       11          11       //        00       00    44    44      //         999999999999         77
       11          11      //         00       00   444444444444  //                    99        77
       11          11     //          00       00   444444444444 //                     99       77
       11          11    //            00     00           44   //                      99      77
    11111111    11111111 //             000000000          44  //            9999999999999     77
    11111111    11111111 //              0000000           44 //             999999999999      77

       11     7777777777777              22222222222   99999999999              22222222222    33333333333
      111     777777777777              2222222222222 9999999999999            2222222222222  3333333333333
     1111     77        77     :::      22         22 99         99    :::     22         22  33         33
       11              77      :::                 22 99         99    :::                22             33
       11             77       :::                 22 99         99    :::                22             33
       11            77                          22   9999999999999                     22             333
       11            77                        22      999999999999                   22               333
       11           77         :::          22                   99    :::          22                   33
       11           77         :::        22                     99    :::        22                     33
       11          77          :::      22                       99    :::      22            33         33
    11111111       77                   2222222222222 9999999999999            2222222222222  3333333333333
    11111111       77                   2222222222222  999999999999            2222222222222   33333333333
```

```
  SSSSSSSSSSS    CCCCCCCCCCC      AAAAAAAAA     LL              EEEEEEEEEEEEE                   PPPPPPPPPPPP    CCCCCCCCCCC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC    AAAAAAAAAAA    LL              EEEEEEEEEEEEE                   PPPPPPPPPPPPP  CCCCCCCCCCCCC
 SS         SS  CC         CC   AA         AA   LL              EE                              PP         PP  CC         CC
 SS             CC              AA         AA   LL              EE                              PP         PP  CC
 SS             CC              AA         AA   LL              EE                              PP         PP  CC
 SSSSSSSSSSSS   CC              AAAAAAAAAAAAA   LL              EEEEEEEEE       -------------   PPPPPPPPPPPPP  CC
  SSSSSSSSSSSS  CC              AAAAAAAAAAAAA   LL              EEEEEEEEE       -------------   PPPPPPPPPPPP   CC
            SS  CC              AA         AA   LL              EE                              PP             CC
            SS  CC              AA         AA   LL              EE                              PP             CC
 SS         SS  CC         CC   AA         AA   LL              EE                              PP             CC         CC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                   PP             CCCCCCCCCCCCC
  SSSSSSSSSSS    CCCCCCCCCCC    AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                   PP              CCCCCCCCCCC
```

```
******************************************************************************
******************************************************************************
******************************************************************************
*****                                                                    *****
*****                  PROGRAM VERIFICATION INFORMATION                  *****
*****                                                                    *****
*****                CODE SYSTEM:  SCALE-PC VERSION:  4.3                *****
*****                                                                    *****
******************************************************************************
******************************************************************************
*****                                                                    *****
*****                                                                    *****
*****                 PROGRAM:  000009                                   *****
*****                                                                    *****
*****           CREATION DATE:  03-08-96                                 *****
*****                                                                    *****
*****                  VOLUME:  ENG                                      *****
*****                                                                    *****
*****                 LIBRARY:  G:\SCALE43\EXE                           *****
*****                                                                    *****
*****                                                                    *****
*****         PRODUCTION CODE:  KENOVA                                   *****
*****                                                                    *****
*****                 VERSION:  3.1                                      *****
*****                                                                    *****
*****                 JOBNAME:  SCALE-PC                                 *****
*****                                                                    *****
*****       DATE OF EXECUTION:  11/04/97                                 *****
*****                                                                    *****
*****       TIME OF EXECUTION:  17:29:23                                 *****
*****                                                                    *****
*****                                                                    *****
******************************************************************************
******************************************************************************
******************************************************************************
```

```
TRIGA BENCHMARK CORE 132

****** NUMERIC PARAMETERS ******

TME   MAXIMUM PROBLEM TIME (MIN)                 170.00
TBA   TIME PER GENERATION (MIN)                    0.50
GEN   NUMBER OF GENERATIONS                         403
NPG   NUMBER PER GENERATION                        1000
NSK   NUMBER OF GENERATIONS TO BE SKIPPED             3
BEG   BEGINNING GENERATION NUMBER                     1
RES   GENERATIONS BETWEEN CHECKPOINTS                 0
X1D   NUMBER OF EXTRA 1-D CROSS SECTIONS              1
NBK   NEUTRON BANK SIZE                            1025
XNB   EXTRA POSITIONS IN NEUTRON BANK                 0
NFB   FISSION BANK SIZE                            1000
XFB   EXTRA POSITIONS IN FISSION BANK                 0
WTA   DEFAULT VALUE OF WEIGHT AVERAGE            0.5000
WTH   WEIGHT HIGH FOR SPLITTING                  3.0000
WTL   WEIGHT LOW FOR RUSSIAN ROULETTE            0.3333
RND   STARTING RANDOM NUMBER               BB827100001
NB8   NUMBER OF D.A. BLOCKS ON UNIT  8              200
NL8   LENGTH OF D.A. BLOCKS ON UNIT  8              512
ADJ   MODE OF CALCULATION                       FORWARD
      INPUT DATA WRITTEN ON RESTART UNIT             NO
      BINARY DATA INTERFACE                         YES
```

```
***************************************************************************************************************
***************************************************************************************************************
***                                                                                                         ***
***                                   TRIGA BENCHMARK CORE 132                                              ***
***                                                                                                         ***
***************************************************************************************************************
***                                  ******     LOGICAL PARAMETERS      ******                              ***
***                                                                                                         ***
***  RUN  EXECUTE PROBLEM AFTER CHECKING DATA     YES        PLT  PLOT PICTURE MAP(S)                   NO  ***
***                                                                                                         ***
***  FLX  COMPUTE FLUX                            NO         FDN  COMPUTE FISSION DENSITIES             NO  ***
***                                                                                                         ***
***  SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION    NO         NUB  COMPUTE NU-BAR & AVG FISSION GROUP   YES  ***
***                                                                                                         ***
***  MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER     NO         MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION   NO  ***
***                                                                                                         ***
***  CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER   NO         CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION NO  ***
***                                                                                                         ***
***  FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER   NO         FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION NO  ***
***                                                                                                         ***
***  MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER     NO         MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER    NO  ***
***                                                                                                         ***
***  CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER   NO         CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER  NO  ***
***                                                                                                         ***
***  FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER   NO         FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER  NO  ***
***                                                                                                         ***
***  HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL    NO         HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL   NO  ***
***                                                                                                         ***
***  AMX  PRINT ALL MIXED CROSS SECTIONS          NO         FAR  PRINT FIS. AND ABS. BY REGION           NO  ***
***                                                                                                         ***
***  XS1  PRINT 1-D MIXTURE X-SECTIONS            NO         GAS  PRINT FAR BY GROUP                      NO  ***
***                                                                                                         ***
***  XS2  PRINT 2-D MIXTURE X-SECTIONS            NO         PAX  PRINT XSEC-ALBEDO CORRELATION TABLES    NO  ***
***                                                                                                         ***
***  XAP  PRINT MIXTURE ANGLES & PROBABILITIES    NO         PWT  PRINT WEIGHT AVERAGE ARRAY              NO  ***
***                                                                                                         ***
***  PKI  PRINT FISSION SPECTRUM                  NO         PGM  PRINT INPUT GEOMETRY                    NO  ***
***                                                                                                         ***
***  P1D  PRINT EXTRA 1-D CROSS SECTIONS          NO         BUG  PRINT DEBUG INFORMATION                 NO  ***
***                                                                                                         ***
***                                                          TRK  PRINT TRACKING INFORMATION              NO  ***
***                                                                                                         ***
***                                                                                                         ***
***************************************************************************************************************
***************************************************************************************************************
***************************************************************************************************************
                                      PARAMETER INPUT COMPLETED

                 ........    0 IO'S WERE USED READING THE PARAMETER DATA      ........

                 ************** DATA READING COMPLETED **************
```

```
*****************************************************************************************************
***                                                                                               ***
***                              TRIGA BENCHMARK CORE 132                                         ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************
***                                                                                               ***
***          UNIT                                             VOLUME                              ***
***         NUMBER             DATA SET NAME                  NAME        UNIT FUNCTION           ***
***         ------             -------------                  ----        -------------           ***
***                                                                                               ***
***     XSC   14    C:\PROJECTS\triga\sg61102.13.5.2\core132b\FT           MIXED CROSS SECTIONS   ***
***                                                                                               ***
***     ALB   79    G:\scale43\DATALIB\FT79F001                            INPUT ALBEDOS          ***
***                                                                                               ***
***     WTS   80    G:\scale43\DATALIB\FT80F001                            INPUT WEIGHTS          ***
***                                                                                               ***
***     SKT   16     UNKNOWN                                               WRITE SCRATCH DATA     ***
***                                                                                               ***
***     BIN   95    C:\PROJECTS\triga\sg61102.13.5.2\core132b\FT           BINARY INPUT DATA      ***
***                                                                                               ***
***     RST   95    C:\PROJECTS\triga\sg61102.13.5.2\core132b\FT           READ RESTART DATA      ***
***                                                                                               ***
***     LIB    4    C:\PROJECTS\triga\sg61102.13.5.2\core132b\FT           INPUT AMPX WORKING LIBRARY ***
***                                                                                               ***
***            8    C:\PROJECTS\triga\sg61102.13.5.2\core132b\FT           INPUT DATA DIRECT ACCESS ***
***                                                                                               ***
***            9     UNKNOWN                                               SUPER GROUPED DIRECT ACCESS ***
***                                                                                               ***
***           10     UNKNOWN                                               XSEC MIXING DIRECT ACCESS ***
***                                                                                               ***
*****************************************************************************************************

                  ........    0 IO'S WERE USED PREPARING INPUT DATA    ........

                  CROSS SECTIONS READ FROM THE AMPX WORKING LIBRARY ON UNIT     4
```

```
                                   TRIGA BENCHMARK CORE 132

                                          MIXING TABLE

                                 NUMBER OF SCATTERING ANGLES =  2
                              CROSS SECTION MESSAGE THRESHOLD =3.0E-05


MIXTURE =      1            DENSITY(G/CC) =  6.1233
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT                NUCLIDE TITLE
   1001001  5.77800E-02  1.57889E-02   1001     1.0077     HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                UPDATED
08/12/94
   1040000  3.50200E-02  8.66297E-01  40000    91.2196     ZIRCONIUM       ENDF/B-IV MAT 7141                         UPDATED
08/12/94
   1092235  3.68200E-04  2.34691E-02  92235   235.0441     URANIUM-235     ENDF/B-IV MAT 1261                         UPDATED
08/12/94
   1092238  1.46300E-03  9.44446E-02  92238   238.0510     URANIUM-238     ENDF/B-IV MAT 1262                         UPDATED
08/12/94

MIXTURE =      2            DENSITY(G/CC) =  7.9200
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT                NUCLIDE TITLE
   2024304  1.74286E-02  1.90000E-01  24000    51.9957    CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED
08/12/94
   2025055  1.73633E-03  1.99999E-02  25055    54.9379     MANGANESE-55    ENDF/B-IV MAT 1197                         UPDATED
08/12/94
   2026304  5.93579E-02  6.95000E-01  26000    55.8447    FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED
08/12/94
   2028304  7.72070E-03  9.50001E-02  28000    58.6872    NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED
08/12/94

MIXTURE =      3            DENSITY(G/CC) = 0.99817
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT                NUCLIDE TITLE
   3001001  6.67692E-02  1.11927E-01   1001     1.0077     HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                UPDATED
08/12/94
   3008016  3.33846E-02  8.88074E-01   8016    15.9904     OXYGEN-16       ENDF/B-IV MAT 1276                         UPDATED
08/12/94

MIXTURE =      4            DENSITY(G/CC) =  2.7020
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT                NUCLIDE TITLE
   4013027  6.03066E-02  1.00000E+00  13027    26.9818    AL-27 1193 218 GP 040375(5)                          UPDATED
08/12/94

MIXTURE =      5            DENSITY(G/CC) =  6.4900
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT                NUCLIDE TITLE
   5040000  4.28457E-02  1.00000E+00  40000    91.2196     ZIRCONIUM       ENDF/B-IV MAT 7141                         UPDATED
08/12/94

MIXTURE =      6            DENSITY(G/CC) =  1.6000
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT                NUCLIDE TITLE
   6006012  8.02952E-02  1.00000E+00   6000    12.0001     CARBON-12       ENDF/B-IV MAT 1274/THRM1065                UPDATED
08/12/94

MIXTURE =      7            DENSITY(G/CC) =  6.1231
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT                NUCLIDE TITLE
   7001001  5.76200E-02  1.57457E-02   1001     1.0077     HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                UPDATED
08/12/94
   7040000  3.49200E-02  8.63851E-01  40000    91.2196     ZIRCONIUM       ENDF/B-IV MAT 7141                         UPDATED
08/12/94
   7092235  3.75800E-04  2.39543E-02  92235   235.0441     URANIUM-235     ENDF/B-IV MAT 1261                         UPDATED
08/12/94
   7092238  1.49400E-03  9.64488E-02  92238   238.0510     URANIUM-238     ENDF/B-IV MAT 1262                         UPDATED
08/12/94

MIXTURE =      8            DENSITY(G/CC) =  2.4800
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT                NUCLIDE TITLE
   8005010  2.15194E-02  1.44273E-01   5010    10.0130    B-10 1273 218NGP 042375 P-3 293K                     UPDATED
08/12/94
   8005011  8.66182E-02  6.38512E-01   5011    11.0096     BORON-11        ENDF/B-IV MAT 1160                         UPDATED
08/12/94
   8006012  2.70344E-02  2.17215E-01   6000    12.0001     CARBON-12       ENDF/B-IV MAT 1274/THRM1065                UPDATED
08/12/94

MIXTURE =      9            DENSITY(G/CC) = 0.99997E-20
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT                NUCLIDE TITLE
   9001001  6.68896E-22  1.11927E-01   1001     1.0077     HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                UPDATED
08/12/94
   9008016  3.34448E-22  8.88074E-01   8016    15.9904     OXYGEN-16       ENDF/B-IV MAT 1276                         UPDATED
08/12/94

MIXTURE =     10            DENSITY(G/CC) = 0.99817
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT                NUCLIDE TITLE
  10001001  6.67692E-02  1.11927E-01   1001     1.0077     HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                UPDATED
08/12/94
  10008016  3.33846E-02  8.88074E-01   8016    15.9904     OXYGEN-16       ENDF/B-IV MAT 1276                         UPDATED
08/12/94

MIXTURE =     11            DENSITY(G/CC) = 0.99817
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT                NUCLIDE TITLE
  11001001  6.67692E-02  1.11927E-01   1001     1.0077     HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                UPDATED
08/12/94
  11008016  3.33846E-02  8.88074E-01   8016    15.9904     OXYGEN-16       ENDF/B-IV MAT 1276                         UPDATED
08/12/94
```

```
        1001001    HYDROGEN      ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94
        3001001    HYDROGEN      ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94
        7001001    HYDROGEN      ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94
        9001001    HYDROGEN      ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94
       10001001    HYDROGEN      ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94
       11001001    HYDROGEN      ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94
        8005010   B-10 1273 215NGP 042375 P-3 293K                    UPDATED 08/12/94
        8005011    BORON-11      ENDF/B-IV MAT 1160                   UPDATED 08/12/94
        6006012    CARBON-12     ENDF/B-IV MAT 1274/THRM1065          UPDATED 08/12/94
        8006012    CARBON-12     ENDF/B-IV MAT 1274/THRM1065          UPDATED 08/12/94
        3008016    OXYGEN-16     ENDF/B-IV MAT 1276                   UPDATED 08/12/94
        9008016    OXYGEN-16     ENDF/B-IV MAT 1276                   UPDATED 08/12/94
       10008016    OXYGEN-16     ENDF/B-IV MAT 1276                   UPDATED 08/12/94
       11008016    OXYGEN-16     ENDF/B-IV MAT 1276                   UPDATED 08/12/94
        4013027   AL-27 1193 218 GP 040375(5)                         UPDATED 08/12/94
        2024304   CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'    UPDATED 08/12/94
        2025055    MANGANESE-55  ENDF/B-IV MAT 1197                   UPDATED 08/12/94
        2026304   FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'    UPDATED 08/12/94
        2028304   NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'    UPDATED 08/12/94
        1040000    ZIRCONIUM     ENDF/B-IV MAT 7141                   UPDATED 08/12/94
        5040000    ZIRCONIUM     ENDF/B-IV MAT 7141                   UPDATED 08/12/94
        7040000    ZIRCONIUM     ENDF/B-IV MAT 7141                   UPDATED 08/12/94
        1092235    URANIUM-235   ENDF/B-IV MAT 1261                   UPDATED 08/12/94
        7092235    URANIUM-235   ENDF/B-IV MAT 1261                   UPDATED 08/12/94
        1092238    URANIUM-238   ENDF/B-IV MAT 1262                   UPDATED 08/12/94
        7092238    URANIUM-238   ENDF/B-IV MAT 1262                   UPDATED 08/12/94

KENO MESSAGE NUMBER K5-222      1 TRANSFERS FOR MIXTURE     1 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222      1 TRANSFERS FOR MIXTURE     7 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222      1 TRANSFERS FOR MIXTURE     3 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222      1 TRANSFERS FOR MIXTURE     9 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222      1 TRANSFERS FOR MIXTURE    10 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222      1 TRANSFERS FOR MIXTURE    11 WERE CORRECTED FOR BAD MOMENTS.

                            ........     0 IO'S WERE USED MIXING CROSS-SECTIONS       ........

                             1-D CROSS SECTION ARRAY ID NUMBERS
                                1  2002  1452    27    18  1018

                            ........     0 IO'S WERE USED PREPARING THE CROSS SECTIONS    ........
```

```
*******************************************************************************************
***                                                                                     ***
***        TRIGA BENCHMARK CORE 132                                                     ***
***                                                                                     ***
*******************************************************************************************
*******************************************************************************************
***                                                                                     ***
***                         ****** ADDITIONAL INFORMATION ******                        ***
***                                                                                     ***
*** NUMBER OF ENERGY GROUPS               27      USE LATTICE GEOMETRY               NO ***
***                                                                                     ***
*** NO. OF FISSION SPECTRUM SOURCE GROUP   1      GLOBAL ARRAY NUMBER                 0 ***
***                                                                                     ***
*** NO. OF SCATTERING ANGLES IN XSECS      2      NUMBER OF UNITS IN THE GLOBAL X DIR. 0 ***
***                                                                                     ***
*** ENTRIES/NEUTRON IN THE NEUTRON BANK   17      NUMBER OF UNITS IN THE GLOBAL Y DIR. 0 ***
***                                                                                     ***
*** ENTRIES/NEUTRON IN THE FISSION BANK   10      NUMBER OF UNITS IN THE GLOBAL Z DIR. 0 ***
***                                                                                     ***
*** NUMBER OF MIXTURES USED               11      USE A GLOBAL REFLECTOR            YES ***
***                                                                                     ***
*** NUMBER OF BIAS ID'S USED               1      USE NESTED HOLES                   NO ***
***                                                                                     ***
*** NUMBER OF DIFFERENTIAL ALBEDOS USED    0      NUMBER OF HOLES                    61 ***
***                                                                                     ***
*** TOTAL INPUT GEOMETRY REGIONS          34      MAXIMUM HOLE NESTING LEVEL          1 ***
***                                                                                     ***
*** NUMBER OF GEOMETRY REGIONS USED       34      USE NESTED ARRAYS                  NO ***
***                                                                                     ***
*** LARGEST GEOMETRY UNIT NUMBER          10      NUMBER OF ARRAYS USED               0 ***
***                                                                                     ***
*** LARGEST ARRAY NUMBER                   1      MAXIMUM ARRAY NESTING LEVEL         0 ***
***                                                                                     ***
***                                                                                     ***
*** +X BOUNDARY CONDITION               VOID      -X BOUNDARY CONDITION            VOID ***
***                                                                                     ***
*** +Y BOUNDARY CONDITION               VOID      -Y BOUNDARY CONDITION            VOID ***
***                                                                                     ***
*** +Z BOUNDARY CONDITION               VOID      -Z BOUNDARY CONDITION            VOID ***
***                                                                                     ***
*******************************************************************************************
```

```
TRIGA BENCHMARK CORE 132

****** SPACE AND SUPERGROUP INFORMATION ******

100000 WORDS IS THE TOTAL SPACE AVAILABLE.

 30933 WORDS WERE USED FOR NON-SUPERGROUP STORAGE.

 69067 WORDS OF STORAGE ARE AVAILABLE FOR SUPERGROUPED DATA.

 99710 WORDS OF STORAGE ARE AVAILABLE FOR CONSTRUCTING THE SUPERGROUPS.

 69007 WORDS OF STORAGE ARE AVAILABLE TO EACH SUPERGROUP.

  1330 WORDS ARE NEEDED FOR THE LARGEST GROUP.

 32479 WORDS OF STORAGE IS SUFFICIENT TO RUN THIS PROBLEM.

 48281 WORDS OF STORAGE WILL ALLOW THE PROBLEM TO RUN WITH ONE SUPERGROUP.

 48288 WORDS OF STORAGE WILL BE USED TO RUN THIS PROBLEM.
```

SUPERGROUP	STARTING GROUP	ENDING GROUP	XSEC LENGTH	ALBEDO LENGTH	TOTAL LENGTH
1	1	27	3512	0	17288

```
........ 0 IO'S WERE USED IN SUPERGROUPING ........

........ 0 IO'S WERE USED LOADING THE DATA ........
```

```
                                   TRIGA BENCHMARK CORE 132

              MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION         NUM   ID

                                          -----   UNIT     1   -----

TRIGA FUEL ELEMENT

  1 CYLINDER        5  1  RADIUS = 0.31750    +Z =  19.050    -Z = -19.050    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  2 CYLINDER        1  1  RADIUS =  1.8225    +Z =  19.050    -Z = -19.050    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  3 CYLINDER        6  1  RADIUS =  1.8225    +Z =  27.886    -Z = -27.864    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  4 CYLINDER        9  1  RADIUS =  1.8263    +Z =  27.888    -Z = -27.864    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  5 CYLINDER        2  1  RADIUS =  1.8771    +Z =  30.640    -Z = -30.640    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  6 CYLINDER       10  1  RADIUS =  1.8771    +Z =  36.030    -Z = -36.030    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

                                          -----   UNIT     2   -----

TRIGA FUEL FOLLOWER

  1 CYLINDER        5  1  RADIUS = 0.31750    +Z =  19.050    -Z = -19.050    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  2 CYLINDER        7  1  RADIUS =  1.6650    +Z =  19.050    -Z = -19.050    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  3 CYLINDER        9  1  RADIUS =  1.6650    +Z =  19.685    -Z = -19.050    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  4 CYLINDER        2  1  RADIUS =  1.6650    +Z =  20.955    -Z = -21.590    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  5 CYLINDER        8  1  RADIUS =  1.6650    +Z =  59.055    -Z = -21.590    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  6 CYLINDER        9  1  RADIUS =  1.6650    +Z =  59.373    -Z = -21.590    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  7 CYLINDER        2  1  RADIUS =  1.6650    +Z =  60.642    -Z = -21.590    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  8 CYLINDER        9  1  RADIUS =  1.6955    +Z =  69.125    -Z = -36.830    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  9 CYLINDER        2  1  RADIUS =  1.7463    +Z =  73.025    -Z = -38.100    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
```

TRIGA BENCHMARK CORE 132

REGION	MEDIA NUM	BIAS ID	GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM				
			----- UNIT 3 -----				
TRIGA TRANSIENT AIR POD + TUBE							
1 CYLINDER	9	1	RADIUS = 1.5164	+Z = 19.050	-Z = -19.050	CENTERLINE IS AT X = 0.00000	Y = 0.00000
2 CYLINDER	9	1	RADIUS = 1.5164	+Z = 19.685	-Z = -19.050	CENTERLINE IS AT X = 0.00000	Y = 0.00000
3 CYLINDER	4	1	RADIUS = 1.5164	+Z = 20.955	-Z = -21.590	CENTERLINE IS AT X = 0.00000	Y = 0.00000
4 CYLINDER	8	1	RADIUS = 1.5164	+Z = 59.055	-Z = -21.590	CENTERLINE IS AT X = 0.00000	Y = 0.00000
5 CYLINDER	9	1	RADIUS = 1.5164	+Z = 59.373	-Z = -21.590	CENTERLINE IS AT X = 0.00000	Y = 0.00000
6 CYLINDER	4	1	RADIUS = 1.5164	+Z = 60.642	-Z = -21.590	CENTERLINE IS AT X = 0.00000	Y = 0.00000
7 CYLINDER	9	1	RADIUS = 1.5164	+Z = 69.125	-Z = -36.830	CENTERLINE IS AT X = 0.00000	Y = 0.00000
8 CYLINDER	4	1	RADIUS = 1.5875	+Z = 73.025	-Z = -38.100	CENTERLINE IS AT X = 0.00000	Y = 0.00000
9 CYLINDER	3	1	RADIUS = 1.6000	+Z = 73.025	-Z = -38.100	CENTERLINE IS AT X = 0.00000	Y = 0.00000
10 CYLINDER	4	1	RADIUS = 1.9000	+Z = 73.025	-Z = -38.100	CENTERLINE IS AT X = 0.00000	Y = 0.00000
			----- UNIT 4 -----				
SOURCE ROD							
1 CYLINDER	9	1	RADIUS = 1.8263	+Z = 27.888	-Z = -27.864	CENTERLINE IS AT X = 0.00000	Y = 0.00000
2 CYLINDER	4	1	RADIUS = 1.8771	+Z = 30.640	-Z = -30.640	CENTERLINE IS AT X = 0.00000	Y = 0.00000
3 CYLINDER	11	1	RADIUS = 1.8771	+Z = 36.030	-Z = -36.030	CENTERLINE IS AT X = 0.00000	Y = 0.00000
			----- UNIT 5 -----				
WATER FOR EMPTY LOCATIONS							
1 CYLINDER	3	1	RADIUS = 1.8771	+Z = 36.030	-Z = -36.030	CENTERLINE IS AT X = 0.00000	Y = 0.00000

```
                                        TRIGA BENCHMARK CORE 132

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                        ..................  GLOBAL  ..................
                                                  -----  UNIT    10   -----

ACTIVE CORE CONFIGURATION

  1 CYLINDER       3  1  RADIUS =  22.060    +Z =  73.025    -Z = -38.100    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

    HOLE NUMBER    1     AT X = 0.00000     Y = 0.00000     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER    2     AT X =  3.5109     Y =  2.0270     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER    3     AT X = 0.00000     Y =  4.0540     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER    4     AT X = -3.5109     Y =  2.0270     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER    5     AT X = -3.5109     Y = -2.0270     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER    6     AT X = 0.00000     Y = -4.0540     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER    7     AT X =  3.5109     Y = -2.0270     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER    8     AT X =  7.9810     Y = 0.00000     Z = 0.00000     IS UNIT NUMBER    2
    HOLE NUMBER    9     AT X =  6.9117     Y =  3.9905     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   10     AT X =  3.9905     Y =  6.9117     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   11     AT X = 0.00000     Y =  7.9810     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   12     AT X = -3.9905     Y =  6.9117     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   13     AT X = -6.9117     Y =  3.9905     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   14     AT X = -7.9810     Y = 0.00000     Z = 0.00000     IS UNIT NUMBER    3
    HOLE NUMBER   15     AT X = -6.9117     Y = -3.9905     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   16     AT X = -3.9905     Y = -6.9117     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   17     AT X = 0.00000     Y = -7.9810     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   18     AT X =  3.9905     Y = -6.9117     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   19     AT X =  6.9117     Y = -3.9905     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   20     AT X =  11.757     Y =  2.0730     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   21     AT X =  10.339     Y =  5.9690     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   22     AT X =  7.6736     Y =  9.1450     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   23     AT X =  4.0830     Y =  11.218     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   24     AT X = 0.00000     Y =  11.938     Z = 0.00000     IS UNIT NUMBER    2
    HOLE NUMBER   25     AT X = -4.0830     Y =  11.218     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   26     AT X = -7.6736     Y =  9.1450     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   27     AT X = -10.339     Y =  5.9690     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   28     AT X = -11.757     Y =  2.0730     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   29     AT X = -11.757     Y = -2.0730     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   30     AT X = -10.339     Y = -5.9690     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   31     AT X = -7.6736     Y = -9.1450     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   32     AT X = -4.0830     Y = -11.218     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   33     AT X = 0.00000     Y = -11.938     Z = 0.00000     IS UNIT NUMBER    2
    HOLE NUMBER   34     AT X =  4.0830     Y = -11.218     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   35     AT X =  7.6736     Y = -9.1450     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   36     AT X =  10.339     Y = -5.9690     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   37     AT X =  11.757     Y = -2.0730     Z = 0.00000     IS UNIT NUMBER    1
    HOLE NUMBER   38     AT X =  15.916     Y = 0.00000     Z = 0.00000     IS UNIT NUMBER    5
    HOLE NUMBER   39     AT X =  15.374     Y =  4.1194     Z = 0.00000     IS UNIT NUMBER    5
    HOLE NUMBER   40     AT X =  13.784     Y =  7.9580     Z = 0.00000     IS UNIT NUMBER    5
    HOLE NUMBER   41     AT X =  11.254     Y =  11.254     Z = 0.00000     IS UNIT NUMBER    5
```

```
   HOLE NUMBER      42      AT X =   7.9580      Y =   13.784      Z = 0.00000     IS UNIT NUMBER      5
   HOLE NUMBER      43      AT X =   4.1194      Y =   15.374      Z = 0.00000     IS UNIT NUMBER      5
   HOLE NUMBER      44      AT X = 0.00000       Y =   15.916      Z = 0.00000     IS UNIT NUMBER      5
   HOLE NUMBER      45      AT X = -4.1194       Y =   15.374      Z = 0.00000     IS UNIT NUMBER      4
   HOLE NUMBER      46      AT X = -7.9580       Y =   13.784      Z = 0.00000     IS UNIT NUMBER      5
   HOLE NUMBER      47      AT X = -11.254       Y =   11.254      Z = 0.00000     IS UNIT NUMBER      1
   HOLE NUMBER      48      AT X = -13.784       Y =   7.9580      Z = 0.00000     IS UNIT NUMBER      1
   HOLE NUMBER      49      AT X = -15.374       Y =   4.1194      Z = 0.00000     IS UNIT NUMBER      1
   HOLE NUMBER      50      AT X = -15.916       Y = 0.00000       Z = 0.00000     IS UNIT NUMBER      1
   HOLE NUMBER      51      AT X = -15.374       Y = -4.1194       Z = 0.00000     IS UNIT NUMBER      1
   HOLE NUMBER      52      AT X = -13.784       Y = -7.9580       Z = 0.00000     IS UNIT NUMBER      1
   HOLE NUMBER      53      AT X = -11.254       Y = -11.254       Z = 0.00000     IS UNIT NUMBER      1
   HOLE NUMBER      54      AT X = -7.9580       Y = -13.784       Z = 0.00000     IS UNIT NUMBER      5
   HOLE NUMBER      55      AT X = -4.1194       Y = -15.374       Z = 0.00000     IS UNIT NUMBER      5
   HOLE NUMBER      56      AT X = 0.00000       Y = -15.916       Z = 0.00000     IS UNIT NUMBER      5
   HOLE NUMBER      57      AT X =   4.1194      Y = -15.374       Z = 0.00000     IS UNIT NUMBER      5
   HOLE NUMBER      58      AT X =   7.9580      Y = -13.784       Z = 0.00000     IS UNIT NUMBER      5
   HOLE NUMBER      59      AT X =   11.254      Y = -11.254       Z = 0.00000     IS UNIT NUMBER      5
   HOLE NUMBER      60      AT X =   13.784      Y = -7.9580       Z = 0.00000     IS UNIT NUMBER      5
   HOLE NUMBER      61      AT X =   15.374      Y = -4.1194       Z = 0.00000     IS UNIT NUMBER      5
 2 CYLINDER          4  1  RADIUS =  22.660    +Z =   73.025    -Z = -38.100    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
 3 CYLINDER          6  1  RADIUS =  53.230    +Z =   73.025    -Z = -38.100    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
 4 CYLINDER          4  1  RADIUS =  54.500    +Z =   73.025    -Z = -38.100    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
 5 CUBOID            3  1      +X =  100.00    -X = -100.00    +Y =  100.00    -Y = -100.00     +Z =  200.00     -Z = -100.00
```

TRIGA BENCHMARK CORE 132
VOLUMES FOR THOSE UNITS UTILIZED IN THIS PROBLEM

UNIT	REGION	GEOMETRY REGION	VOLUME	CUMULATIVE VOLUME
1	1	1	1.20660E+01 CM**3	1.20660E+01 CM**3
	2	2	3.85501E+02 CM**3	3.97567E+02 CM**3
	3	3	1.84195E+02 CM**3	5.81762E+02 CM**3
	4	4	2.42853E+00 CM**3	5.84191E+02 CM**3
	5	5	9.41431E+01 CM**3	6.78334E+02 CM**3
	6	6	1.19328E+02 CM**3	7.97662E+02 CM**3
2	1	7	1.20660E+01 CM**3	1.20660E+01 CM**3
	2	8	3.19755E+02 CM**3	3.31821E+02 CM**3
	3	9	5.53033E+00 CM**3	3.37351E+02 CM**3
	4	10	3.31821E+01 CM**3	3.70533E+02 CM**3
	5	11	3.31821E+02 CM**3	7.02354E+02 CM**3
	6	12	2.76514E+00 CM**3	7.05119E+02 CM**3
	7	13	1.10598E+01 CM**3	7.16179E+02 CM**3
	8	14	2.40722E+02 CM**3	9.56901E+02 CM**3
	9	15	1.07731E+02 CM**3	1.06463E+03 CM**3
3	1	16	2.75234E+02 CM**3	2.75234E+02 CM**3
	2	17	4.58725E+00 CM**3	2.79821E+02 CM**3
	3	18	2.75234E+01 CM**3	3.07345E+02 CM**3
	4	19	2.75234E+02 CM**3	5.82579E+02 CM**3
	5	20	2.29358E+00 CM**3	5.84873E+02 CM**3
	6	21	9.17377E+00 CM**3	5.94046E+02 CM**3
	7	22	1.71372E+02 CM**3	7.65418E+02 CM**3
	8	23	1.14392E+02 CM**3	8.79810E+02 CM**3
	9	24	1.39099E+01 CM**3	8.93720E+02 CM**3
	10	25	3.66565E+02 CM**3	1.26029E+03 CM**3
4	1	26	5.84191E+02 CM**3	5.84191E+02 CM**3
	2	27	9.41431E+01 CM**3	6.78334E+02 CM**3
	3	28	1.19328E+02 CM**3	7.97662E+02 CM**3
5	1	29	7.97662E+02 CM**3	7.97662E+02 CM**3
10	1	30	1.19971E+05 CM**3	1.69892E+05 CM**3
	2	31	9.36731E+03 CM**3	1.79259E+05 CM**3
	3	32	8.09919E+05 CM**3	9.89178E+05 CM**3
	4	33	4.77641E+04 CM**3	1.03694E+06 CM**3
	5	34	1.09631E+07 CM**3	1.20000E+07 CM**3

UNIT	USES	REGION	MIXTURE	TOTAL VOLUME
1	40	1	5	4.82639E+02 CM**3
		2	1	1.54200E+04 CM**3
		3	6	7.36782E+03 CM**3
		4	9	9.71411E+01 CM**3
		5	2	3.76573E+03 CM**3
		6	10	4.77313E+03 CM**3
2	3	1	5	3.61979E+01 CM**3
		2	7	9.59264E+02 CM**3
		3	9	1.65910E+01 CM**3
		4	2	9.95462E+01 CM**3
		5	8	9.95462E+02 CM**3
		6	9	8.29541E+00 CM**3
		7	2	3.31794E+01 CM**3
		8	9	7.22167E+02 CM**3
		9	2	3.23192E+02 CM**3
3	1	1	9	2.75234E+02 CM**3
		2	9	4.58725E+00 CM**3
		3	4	2.75234E+01 CM**3
		4	8	2.75234E+02 CM**3
		5	9	2.29358E+00 CM**3
		6	4	9.17377E+00 CM**3
		7	9	1.71372E+02 CM**3
		8	4	1.14392E+02 CM**3
		9	3	1.39099E+01 CM**3
		10	4	3.66565E+02 CM**3
4	1	1	9	5.84191E+02 CM**3
		2	4	9.41431E+01 CM**3
		3	11	1.19328E+02 CM**3
5	16	1	3	1.27626E+04 CM**3
10	1	1	3	1.19971E+05 CM**3
		2	4	9.36731E+03 CM**3
		3	6	8.09919E+05 CM**3
		4	4	4.77641E+04 CM**3
		5	3	1.09631E+07 CM**3

TOTAL MIXTURE VOLUMES

MIXTURE	TOTAL VOLUME	MASS(G)
1	1.54200E+04 CM**3	9.44217E+04

```
                                        2          4.22164E+03 CM**3          3.34354E+04
                                        3          1.10958E+07 CM**3          1.10755E+07
                                        4          5.77432E+04 CM**3          1.56022E+05
                                        5          5.18837E+02 CM**3          3.36725E+03
                                        6          8.17287E+05 CM**3          1.30767E+06
                                        7          9.59264E+02 CM**3          5.87369E+03
                                        8          1.27070E+03 CM**3          3.15139E+03
                                        9          1.88187E+03 CM**3          1.68182E-17
                                       10          4.77313E+03 CM**3          4.76440E+03
                                       11          1.19328E+02 CM**3          1.19110E+02

     ***********************************************************************************************************
     ***                                                                                                     ***
     ***                                         BIASING INFORMATION                                         ***
     ***                                                                                                     ***
     ***     A DEFAULT WEIGHT OF    0.500 WILL BE USED FOR ALL BIAS ID'S.                                    ***
     ***                                                                                                     ***
     ***********************************************************************************************************

                         ........    0 IO'S WERE USED IN KENO-V BEFORE TRACKING        ........

                         ........  0.01917 MINUTES WERE USED PROCESSING DATA.         ........

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 1.36494E-03

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED UNIFORMLY THROUGHOUT THE ENTIRE VOLUME DEFINED BY THE OUTERMOST GEOMETRY CARD.
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

KENO MESSAGE NUMBER K5-105      ***** WARNING, ONLY  286 INDEPENDENT STARTING POSITIONS WERE GENERATED.  *****

  714 ADDITIONAL STARTING POINTS WERE PICKED FROM THE INITAL DISTRIBUTION.

0.45383 MINUTES WERE REQUIRED FOR STARTING.   TOTAL ELAPSED TIME IS 0.48000 MINUTES.
```

TRIGA BENCHMARK CORE 132

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
1	9.90066E-01	6.69167E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	9.54729E-01	8.73333E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
3	1.01630E+00	1.06100E+00	1.01630E+00	0.00000E+00	0.00000E+00	0.00000E+00
4	1.02972E+00	1.25133E+00	1.02301E+00	6.71005E-03	0.00000E+00	0.00000E+00
5	1.00278E+00	1.43900E+00	1.01627E+00	7.77803E-03	0.00000E+00	0.00000E+00
6	1.01937E+00	1.64600E+00	1.01704E+00	5.55454E-03	0.00000E+00	0.00000E+00
7	1.03377E+00	1.87667E+00	1.02039E+00	5.44954E-03	0.00000E+00	0.00000E+00
8	1.00198E+00	2.09817E+00	1.01732E+00	5.40470E-03	0.00000E+00	0.00000E+00
9	1.01694E+00	2.31883E+00	1.01726E+00	4.56813E-03	0.00000E+00	0.00000E+00
10	1.01818E+00	2.57600E+00	1.01738E+00	3.95778E-03	0.00000E+00	0.00000E+00
11	1.00697E+00	2.77367E+00	1.01622E+00	3.67718E-03	0.00000E+00	0.00000E+00
12	9.96509E-01	2.97333E+00	1.01425E+00	3.83451E-03	0.00000E+00	0.00000E+00
13	1.00385E+00	3.17100E+00	1.01331E+00	3.59514E-03	0.00000E+00	0.00000E+00
14	9.81735E-01	3.38517E+00	1.01067E+00	4.20624E-03	0.00000E+00	0.00000E+00
15	1.00748E+00	3.56650E+00	1.01043E+00	3.87695E-03	0.00000E+00	0.00000E+00
16	1.03674E+00	3.75050E+00	1.01231E+00	4.05174E-03	0.00000E+00	0.00000E+00
17	1.03622E+00	3.93633E+00	1.01390E+00	4.09493E-03	0.00000E+00	0.00000E+00
18	1.03617E+00	4.15150E+00	1.01529E+00	4.07554E-03	0.00000E+00	0.00000E+00
19	1.06124E+00	4.36833E+00	1.01800E+00	4.68619E-03	0.00000E+00	0.00000E+00
20	1.05429E+00	4.57250E+00	1.02001E+00	4.85647E-03	0.00000E+00	0.00000E+00
21	1.04751E+00	4.77033E+00	1.02146E+00	4.81638E-03	0.00000E+00	0.00000E+00
22	1.01609E+00	4.98817E+00	1.02119E+00	4.57711E-03	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	998 INDEPENDENT	FISSION POINTS WERE	GENERATED	
23	9.92956E-01	5.20050E+00	1.01985E+00	4.55660E-03	0.00000E+00	0.00000E+00
24	1.00897E+00	5.42200E+00	1.01935E+00	4.37258E-03	0.00000E+00	0.00000E+00
25	1.00615E+00	5.64183E+00	1.01878E+00	4.21738E-03	0.00000E+00	0.00000E+00
26	1.01045E+00	5.86050E+00	1.01843E+00	4.05272E-03	0.00000E+00	0.00000E+00
27	1.03570E+00	6.07017E+00	1.01912E+00	3.94811E-03	0.00000E+00	0.00000E+00
28	1.02711E+00	6.34667E+00	1.01943E+00	3.80563E-03	0.00000E+00	0.00000E+00
29	1.00323E+00	6.53800E+00	1.01883E+00	3.71080E-03	0.00000E+00	0.00000E+00
30	1.01250E+00	6.72100E+00	1.01860E+00	3.58296E-03	0.00000E+00	0.00000E+00
31	1.03971E+00	6.93800E+00	1.01933E+00	3.53295E-03	0.00000E+00	0.00000E+00
32	1.05112E+00	7.13933E+00	1.02039E+00	3.57380E-03	0.00000E+00	0.00000E+00
33	1.05016E+00	7.34167E+00	1.02135E+00	3.58750E-03	0.00000E+00	0.00000E+00
34	1.03762E+00	7.58800E+00	1.02186E+00	3.51056E-03	0.00000E+00	0.00000E+00
35	1.03970E+00	7.77833E+00	1.02240E+00	3.44521E-03	0.00000E+00	0.00000E+00
36	1.02001E+00	7.96517E+00	1.02233E+00	3.34309E-03	0.00000E+00	0.00000E+00
37	9.98559E-01	8.16650E+00	1.02165E+00	3.31645E-03	0.00000E+00	0.00000E+00
38	1.04102E+00	8.35317E+00	1.02219E+00	3.26760E-03	0.00000E+00	0.00000E+00
39	9.90866E-01	8.54633E+00	1.02134E+00	3.28887E-03	0.00000E+00	0.00000E+00
40	1.02550E+00	8.73400E+00	1.02145E+00	3.20302E-03	0.00000E+00	0.00000E+00
41	1.02549E+00	8.94733E+00	1.02156E+00	3.12152E-03	0.00000E+00	0.00000E+00
42	1.06222E+00	9.14967E+00	1.02257E+00	3.20781E-03	0.00000E+00	0.00000E+00
43	1.04336E+00	9.34550E+00	1.02308E+00	3.16942E-03	0.00000E+00	0.00000E+00
44	1.04717E+00	9.55617E+00	1.02365E+00	3.14577E-03	0.00000E+00	0.00000E+00
45	1.00780E+00	9.80050E+00	1.02328E+00	3.09379E-03	0.00000E+00	0.00000E+00
46	9.73152E-01	1.00128E+01	1.02214E+00	3.23026E-03	0.00000E+00	0.00000E+00
47	1.04382E+00	1.01942E+01	1.02263E+00	3.19419E-03	0.00000E+00	0.00000E+00
48	1.00242E+00	1.03955E+01	1.02219E+00	3.15471E-03	0.00000E+00	0.00000E+00
49	1.00848E+00	1.06143E+01	1.02190E+00	3.10061E-03	0.00000E+00	0.00000E+00
50	1.05426E+00	1.07983E+01	1.02257E+00	3.10931E-03	0.00000E+00	0.00000E+00
.						
.						
.						
375	1.04806E+00	7.31462E+01	1.01963E+00	1.31907E-03	0.00000E+00	0.00000E+00
376	1.02214E+00	7.33393E+01	1.01963E+00	1.31555E-03	0.00000E+00	0.00000E+00
377	1.03756E+00	7.35197E+01	1.01968E+00	1.31291E-03	0.00000E+00	0.00000E+00
378	1.01067E+00	7.37118E+01	1.01966E+00	1.30963E-03	0.00000E+00	0.00000E+00
379	1.01200E+00	7.38940E+01	1.01964E+00	1.30631E-03	0.00000E+00	0.00000E+00
380	9.67656E-01	7.40917E+01	1.01950E+00	1.31009E-03	0.00000E+00	0.00000E+00
381	9.71851E-01	7.43490E+01	1.01937E+00	1.31266E-03	0.00000E+00	0.00000E+00
382	1.01611E+00	7.45367E+01	1.01936E+00	1.30923E-03	0.00000E+00	0.00000E+00
383	1.04389E+00	7.47280E+01	1.01943E+00	1.30738E-03	0.00000E+00	0.00000E+00
384	1.04429E+00	7.49065E+01	1.01949E+00	1.30557E-03	0.00000E+00	0.00000E+00
385	1.02223E+00	7.50905E+01	1.01950E+00	1.30218E-03	0.00000E+00	0.00000E+00
386	1.01190E+00	7.52808E+01	1.01948E+00	1.29893E-03	0.00000E+00	0.00000E+00
387	9.76853E-01	7.54722E+01	1.01937E+00	1.30028E-03	0.00000E+00	0.00000E+00
388	9.80079E-01	7.56598E+01	1.01927E+00	1.30089E-03	0.00000E+00	0.00000E+00
389	9.99331E-01	7.58558E+01	1.01922E+00	1.29855E-03	0.00000E+00	0.00000E+00
390	1.01031E+00	7.60362E+01	1.01919E+00	1.29540E-03	0.00000E+00	0.00000E+00
391	1.00446E+00	7.62275E+01	1.01916E+00	1.29262E-03	0.00000E+00	0.00000E+00
392	1.01847E+00	7.64097E+01	1.01915E+00	1.28931E-03	0.00000E+00	0.00000E+00
393	1.02785E+00	7.66055E+01	1.01918E+00	1.28620E-03	0.00000E+00	0.00000E+00
394	1.00712E+00	7.67867E+01	1.01915E+00	1.28328E-03	0.00000E+00	0.00000E+00
395	1.00600E+00	7.69817E+01	1.01911E+00	1.28045E-03	0.00000E+00	0.00000E+00
396	1.00266E+00	7.71675E+01	1.01907E+00	1.27788E-03	0.00000E+00	0.00000E+00
397	1.03346E+00	7.73497E+01	1.01911E+00	1.27516E-03	0.00000E+00	0.00000E+00
398	9.94492E-01	7.75383E+01	1.01904E+00	1.27345E-03	0.00000E+00	0.00000E+00
399	1.00279E+00	7.77268E+01	1.01900E+00	1.27090E-03	0.00000E+00	0.00000E+00
400	9.95518E-01	7.79228E+01	1.01895E+00	1.26907E-03	0.00000E+00	0.00000E+00
401	1.00146E+00	7.81105E+01	1.01890E+00	1.26665E-03	0.00000E+00	0.00000E+00
402	1.01212E+00	7.83008E+01	1.01888E+00	1.26359E-03	0.00000E+00	0.00000E+00
403	1.03095E+00	7.84848E+01	1.01891E+00	1.26080E-03	0.00000E+00	0.00000E+00

KENO MESSAGE NUMBER K5-123 EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

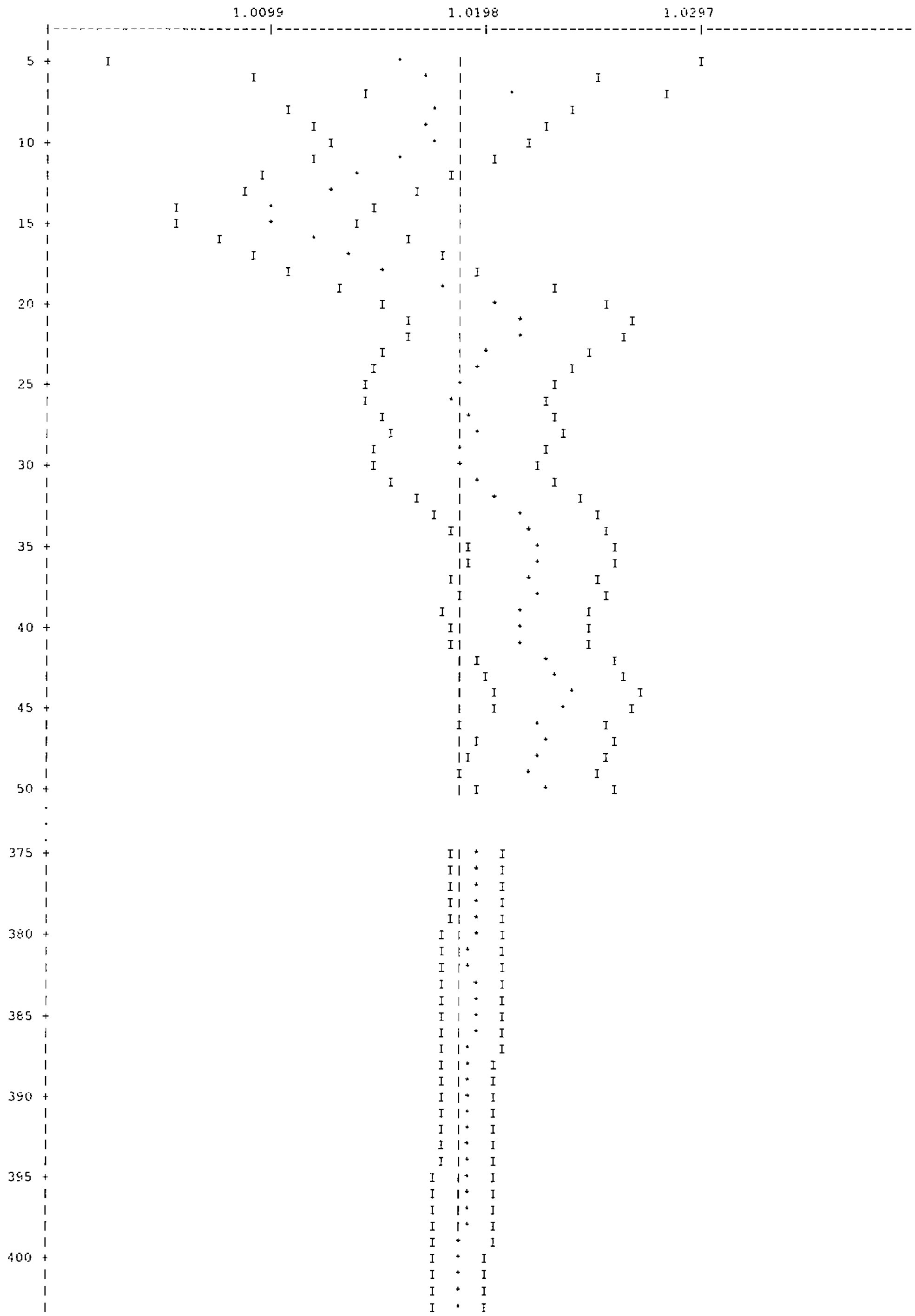
TRIGA BENCHMARK CORE 132

LIFETIME = 3.94638E-04 + OR - 1.93196E-06 GENERATION TIME = 5.91769E-05 + OR - 2.84702E-07
NU BAR = 2.42133E+00 + OR - 1.07360E-05 AVERAGE FISSION GROUP = 2.39237E+01 + OR - 1.86297E-03
ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION = 4.92227E-02 + OR - 8.38504E-05

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	1.01892	+ OR - 0.00126	1.01766 TO 1.02018	1.01639 TO 1.02145	1.01513 TO 1.02271	400000
4	1.01889	+ OR - 0.00127	1.01763 TO 1.02016	1.01636 TO 1.02143	1.01509 TO 1.02269	399000
5	1.01893	+ OR - 0.00127	1.01766 TO 1.02020	1.01640 TO 1.02147	1.01513 TO 1.02274	398000
6	1.01893	+ OR - 0.00127	1.01766 TO 1.02021	1.01639 TO 1.02148	1.01512 TO 1.02275	397000
7	1.01890	+ OR - 0.00128	1.01762 TO 1.02017	1.01635 TO 1.02145	1.01507 TO 1.02272	396000
8	1.01894	+ OR - 0.00128	1.01766 TO 1.02022	1.01638 TO 1.02149	1.01511 TO 1.02277	395000
9	1.01894	+ OR - 0.00128	1.01766 TO 1.02022	1.01638 TO 1.02151	1.01510 TO 1.02279	394000
10	1.01895	+ OR - 0.00128	1.01766 TO 1.02023	1.01638 TO 1.02151	1.01509 TO 1.02280	393000
11	1.01898	+ OR - 0.00129	1.01769 TO 1.02026	1.01640 TO 1.02155	1.01511 TO 1.02284	392000
12	1.01903	+ OR - 0.00129	1.01774 TO 1.02032	1.01646 TO 1.02161	1.01517 TO 1.02290	391000
17	1.01911	+ OR - 0.00130	1.01781 TO 1.02041	1.01651 TO 1.02171	1.01521 TO 1.02301	386000
22	1.01879	+ OR - 0.00131	1.01749 TO 1.02010	1.01618 TO 1.02141	1.01488 TO 1.02271	381000
27	1.01890	+ OR - 0.00132	1.01758 TO 1.02022	1.01626 TO 1.02154	1.01494 TO 1.02286	376000
32	1.01879	+ OR - 0.00133	1.01746 TO 1.02013	1.01613 TO 1.02146	1.01480 TO 1.02279	371000
37	1.01865	+ OR - 0.00134	1.01731 TO 1.02000	1.01596 TO 1.02134	1.01462 TO 1.02269	366000
42	1.01851	+ OR - 0.00135	1.01715 TO 1.01986	1.01580 TO 1.02122	1.01445 TO 1.02257	361000
47	1.01845	+ OR - 0.00136	1.01708 TO 1.01981	1.01572 TO 1.02117	1.01436 TO 1.02253	356000
52	1.01826	+ OR - 0.00137	1.01689 TO 1.01962	1.01552 TO 1.02099	1.01415 TO 1.02236	351000
57	1.01844	+ OR - 0.00138	1.01706 TO 1.01981	1.01568 TO 1.02119	1.01430 TO 1.02257	346000
62	1.01859	+ OR - 0.00139	1.01720 TO 1.01998	1.01582 TO 1.02136	1.01443 TO 1.02275	341000
67	1.01838	+ OR - 0.00139	1.01699 TO 1.01977	1.01559 TO 1.02117	1.01420 TO 1.02256	336000
72	1.01831	+ OR - 0.00138	1.01692 TO 1.01969	1.01554 TO 1.02108	1.01415 TO 1.02246	331000
77	1.01810	+ OR - 0.00139	1.01671 TO 1.01949	1.01531 TO 1.02089	1.01392 TO 1.02228	326000
82	1.01786	+ OR - 0.00141	1.01645 TO 1.01927	1.01504 TO 1.02068	1.01363 TO 1.02209	321000
87	1.01782	+ OR - 0.00142	1.01639 TO 1.01924	1.01497 TO 1.02066	1.01355 TO 1.02209	316000
92	1.01811	+ OR - 0.00142	1.01669 TO 1.01952	1.01526 TO 1.02094	1.01386 TO 1.02235	311000

TRIGA BENCHMARK CORE 132

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 1.0189 + OR - 0.0013 WHICH OCCURS FOR 403 GENERATIONS RUN.



TRIGA BENCHMARK CORE 132

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0007			6.81725E-04	1.4853	1.04545E-03	1.4928	1.99488E-06	100.0000
2	0.0026			2.67107E-03	0.4956	2.13243E-03	0.4103	0.00000E+00	0.0000
3	0.0029			2.98939E-03	0.3705	1.42941E-03	0.3850	4.14554E-06	70.9381
4	0.0014			1.43671E-03	0.4812	7.46236E-04	0.4800	0.00000E+00	0.0000
5	0.0011			1.08995E-03	0.3473	7.63441E-04	0.3447	0.00000E+00	0.0000
6	0.0013			1.31336E-03	0.2603	1.14364E-03	0.3140	4.51767E-06	70.8510
7	0.0014			1.37623E-03	0.2504	1.31768E-03	0.5203	2.16748E-06	100.0000
8	0.0014			1.42902E-03	0.2662	2.03957E-03	0.5155	0.00000E+00	0.0000
9	0.0020			1.99323E-03	0.2647	4.33175E-03	0.4412	0.00000E+00	0.0000
10	0.0042			4.23199E-03	0.2603	7.67783E-03	0.4133	0.00000E+00	0.0000
11	0.0089			9.10698E-03	0.2651	1.78049E-02	0.3152	0.00000E+00	0.0000
12	0.0125			1.27480E-02	0.3194	1.62040E-02	0.3492	0.00000E+00	0.0000
13	0.0123			1.24965E-02	0.3095	1.77071E-02	0.3515	0.00000E+00	0.0000
14	0.0103			1.04777E-02	0.2955	2.39434E-02	0.2961	0.00000E+00	0.0000
15	0.0020			1.99127E-03	0.3974	2.93190E-03	0.7563	0.00000E+00	0.0000
16	0.0013			1.36728E-03	0.4905	1.80865E-03	0.8180	0.00000E+00	0.0000
17	0.0021			2.15716E-03	0.7060	1.76437E-03	0.8976	0.00000E+00	0.0000
18	0.0029			2.93392E-03	0.7810	1.98813E-03	0.8501	0.00000E+00	0.0000
19	0.0035			3.57281E-03	0.5512	2.71908E-03	0.7157	0.00000E+00	0.0000
20	0.0150			1.52983E-02	0.3606	1.14311E-02	0.3683	0.00000E+00	0.0000
21	0.0084			8.59775E-03	0.5722	5.91742E-03	0.5320	0.00000E+00	0.0000
22	0.0218			2.21960E-02	0.4063	1.56538E-02	0.3761	0.00000E+00	0.0000
23	0.0934			9.51206E-02	0.2289	8.12793E-02	0.1547	0.00000E+00	0.0000
24	0.2190			2.23163E-01	0.1811	2.08073E-01	0.1064	1.08861E-06	100.0000
25	0.1994			2.03202E-01	0.1732	1.94962E-01	0.0978	1.34462E-06	100.0000
26	0.2626			2.67571E-01	0.1754	2.64169E-01	0.0991	0.00000E+00	0.0000
27	0.1057			1.07708E-01	0.2645	1.09243E-01	0.1501	0.00000E+00	0.0000
SYSTEM TOTAL =				1.01892E+00	0.1240	1.00023E+00	0.0424	1.52588E-05	35.9576

ELAPSED TIME 78.48766 MINUTES

RANDOM NUMBER= 88142D71A0C

```
TRIGA BENCHMARK CORE 132

                              FREQUENCY FOR GENEFATIONS    4 TO  403
0.9284 TO 0.9365    *
0.9365 TO 0.9446
0.9446 TO 0.9527
0.9527 TO 0.9608    ****
0.9608 TO 0.9689    *******
0.9689 TO 0.9770    ******
0.9770 TO 0.9851    *****************
0.9851 TO 0.9932    **********************
0.9932 TO 1.0013    ******************************
1.0013 TO 1.0094    ************************************************
1.0094 TO 1.0175    ***********************************************
1.0175 TO 1.0256    *****************************************
1.0256 TO 1.0337    *************************************
1.0337 TO 1.0418    ********************************************
1.0418 TO 1.0499    ****************************
1.0499 TO 1.0580    *****************
1.0580 TO 1.0661    *******
1.0661 TO 1.0742    *******
1.0742 TO 1.0823    ****
1.0823 TO 1.0904    *
1.0904 TO 1.0985    *
1.0985 TO 1.1066    *

                              FREQUENCY FOR GENERATIONS  104 TO  403
0.9284 TO 0.9365
0.9365 TO 0.9446
0.9446 TO 0.9527
0.9527 TO 0.9608    ****
0.9608 TO 0.9689    ******
0.9689 TO 0.9770    *****
0.9770 TO 0.9851    *************
0.9851 TO 0.9932    *****************
0.9932 TO 1.0013    **************************
1.0013 TO 1.0094    ***********************************
1.0094 TO 1.0175    ************************************
1.0175 TO 1.0256    *********************************
1.0256 TO 1.0337    *****************************
1.0337 TO 1.0418    ****************************
1.0418 TO 1.0499    *********************
1.0499 TO 1.0580    ************
1.0580 TO 1.0661    *****
1.0661 TO 1.0742    ****
1.0742 TO 1.0823    ****
1.0823 TO 1.0904    *
1.0904 TO 1.0985    *
1.0985 TO 1.1066

                              FREQUENCY FOR GENERATIONS  204 TO  403
0.9284 TO 0.9365
0.9365 TO 0.9446
0.9446 TO 0.9527
0.9527 TO 0.9608    ***
0.9608 TO 0.9689    *****
0.9689 TO 0.9770    ****
0.9770 TO 0.9851    ********
0.9851 TO 0.9932    ************
0.9932 TO 1.0013    **************
1.0013 TO 1.0094    **************************
1.0094 TO 1.0175    ************************
1.0175 TO 1.0256    **********************
1.0256 TO 1.0337    ******************
1.0337 TO 1.0418    ****************
1.0418 TO 1.0499    ****************
1.0499 TO 1.0580    **********
1.0580 TO 1.0661    **
1.0661 TO 1.0742    ***
1.0742 TO 1.0823    ***
1.0823 TO 1.0904
1.0904 TO 1.0985    *
1.0985 TO 1.1066


*********************************************************************************************************************
*

         CONGRATULATIONS!  YOU HAVE  SUCCESSFULLY TRAVERSED THE PERILOUS PATH THROUGH KENO V IN  75.48766 MINUTES

*********************************************************************************************************************
*
```

6.6.6 TRIGA Fuel Cluster Rods

This section contains abbreviated output files from the most reactive nonpoisoned and poisoned basket configurations for TRIGA fuel cluster rods as determined in Section 6.4.6. Also included are maximum reactivity LEU, Figure 6.6.6-3, and revised HEU fuel mass and H/Zr ratio files, Figure 6.6.6-4, used to generate the results in Section 6.4.6.5

Figure 6.6.6-1 TRIGA Fuel Cluster Rods – Base Fuel Configuration - Nonpoisoned Basket

```
PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
   MODULE CSAS25   WILL BE CALLED
     TRIGA - PREF. FLOOD CANISTER
     27GROUPNDF4  INFHOMMEDIUM
     'FUEL
     U-235    1 0.0 2.3348E-04 END
     U-238    1 0.0 1.6469E-05 END
     ZR       1 0.0 5.4438E-03 END
     H        1 0.0 8.5589E-03 END
     H2O      1 0.8402 293.0 END
     'CLAD, BASKET, AND CASK
     SS304    2 1.0 293.0 END
     'CANISTER INTERNAL MODERATOR
     H2O      3 1.0 293.0 END
     'ZIRCONIUM ROD
     ZR       4 1.0 293.0 END
     'GRAPHITE REFLETOR
     C        5 1.0 293.0 END
     'LEAD SHIELD
     PB       6 1.0 293.0 END
     'NEUTRON SHIELD
     H2O      7 1E-20 293.0 END
     'CASK EXTERNAL MATERIAL
     H2O      8 1E-20 293.0 END
     'END FITTING FOR FUEL ELEMENT
     SS304    9 0.337137 293.0 END
     H2O      9 1E-20 293.0 END
     'SECOND FUEL MATERIAL FOR UN-CANISTERED
     U-235    10 0.0 9.052980E-4 END
     U-238    10 0.0 3.849480E-4 END
     ZR       10 0.0 3.446510E-2 END
     H        10 0.0 5.514420E-2 END
     'SECOND END-FITTING MATERIAL FOR UN-CANISTERED FUEL
     SS304    11 0.337137 293.0 END
     H2O      11 1E-20 293.0 END
     'CASK INTERIOR MODERATOR MATERIAL
     H2O  12 1.0E-20 293.0 END
     'NEUTRON ABSORBER PLATE WITH BORON
     FE       13 DEN=7.76 0.6717 293.0 END
     C        13 DEN=7.76 0.0001 293.0 END
     SI       13 DEN=7.76 0.0033 293.0 END
     MN       13 DEN=7.76 0.0060 293.0 END
     P        13 DEN=7.75 0.0001 293.0 END
     CR       13 DEN=7.76 0.1849 293.0 END
     NI       13 DEN=7.76 0.1233 293.0 END
     B-10     13 DEN=7.76 0.0073 293.0 END
     B-11     13 DEN=7.76 0.0007 293.0 END
     N        13 DEN=7.76 0.0017 293.0 END
     'NEUTRON ABSORBER PLATE WITHOUT BORON
     FE       14 DEN=7.76 0.6717 293.0 END
     C        14 DEN=7.76 0.0001 293.0 END
     SI       14 DEN=7.76 0.0033 293.0 END
     MN       14 DEN=7.76 0.0060 293.0 END
     P        14 DEN=7.75 0.0001 293.0 END
     CR       14 DEN=7.76 0.1849 293.0 END
     NI       14 DEN=7.76 0.1233 293.0 END
     N        14 DEN=7.76 0.0017 293.0 END
     'FUEL FOR RODS
     U-235     21 0.0 1.46137E-03 END
     U-238     21 0.0 1.03065E-04 END
     ZR        21 0.0 3.40686E-02 END
     H         21 0.0 5.35638E-02 END
     'CLAD INCOLOY
     NI              22        0 0.028516 END
     FE              22        0 0.033820 END
     CR              22        0 0.021151 END
     C               22        0 0.000399 END
     MN              22        0 0.001306 END
     S               22        0 0.000022 END
     SI              22        0 0.001703 END
     CU              22        0 0.000560 END
     AL              22        0 0.000266 END
     TI              22        0 0.000150 END
     'CASK INTERNAL MODERATOR
     H2O  23 1.0E-20 293.0 END
     'LEAD SHIELD
     PB        26 1.0 293.0 END
     'NEUTRON SHIELD
     H2O       27 1E-20 293.0 END
     'CASK EXTERNAL MATERIAL
     H2O       28 1E-20 293.0 END
     'END FITTING FOR FUEL ELEMENT
     SS304  29 .4966 293.0 END
     H2O       29 DEN=.5031 1.0E-20 293.0 END
     ' BASKET, AND CASK NEED TO LOOK AT HOW THIS IS USED
     'AL FUEL HOLDER
     AL 30 1.0 293.0 END
```

```
END COMP
MORE DATA
RES=21  CYLINDER 0.6477 DAN(21)=.38879
END MORE
TRIGA - PREF. FLOOD CANISTER
READ PARAM TME=170.0 GEN=203 NPG=500 RUN=YES PLT=NO
TBA=2.0 END PARAM
READ GEOM
UNIT 1
COM='TRIGA FUEL (SMEARED)'
CYLINDER 1 1 3.9623 60.959 0.001
UNIT 5
COM='3.38 in Width / 0.28 in Thickness DIVIDER CENTER STACK (SEALED)'
CUBOID   2 1 2P4.2672 0.7112 0.0 +74.29 -8.255
UNIT 6
COM='3.38 in Width / 0.24 in Thickness DIVIDER OUTSIDE STACK (SEALED)'
CUBOID   2 1 2P4.2672 0.6096 0.0 +74.29 -8.255
UNIT 7
COM='SEALED CANISTER'
CYLINDER  3 1 3.9624 +60.96 0.0
HOLE       1  0.0 0.0 0.0
CYLINDER  2 1 4.1275 +63.50 -1.27
CYLINDER 12 1 4.1275 +74.29 -8.255
UNIT 10
COM='TRIGA ELEMENTS IN Top of 3.38 in x 3.38 in OPENING (SEALED)'
CUBOID     12 1 2P4.2672 2P4.2672 +74.29 -8.255
HOLE 7     0.0 0.1397 0.0
UNIT 11
COM='TRIGA ELEMENTS IN Bottom of 3.38 in x 3.38 in OPENING (SEALED)'
CUBOID     12 1 2P4.2672 2P4.2672 +74.29 -8.255
HOLE 7     0.0 -0.1397 0.0
UNIT 12
COM='TRIGA ELEMENTS IN Bottom Right of 3.38 in x 3.38 in OPENING (SEALED)'
CUBOID     12 1 2P4.2672 2P4.2672 +74.29 -8.255
HOLE 7     +0.1397 -0.1397 0.0
UNIT 13
COM='TRIGA ELEMENTS IN Top Right of 3.38 in x 3.38 in OPENING (SEALED)'
CUBOID     12 1 2P4.2672 2P4.2672 +74.29 -8.255
HOLE 7     +0.1397 +0.1397 0.0
UNIT 14
COM='TRIGA ELEMENTS IN Bottom Left of 3.38 in x 3.38 in OPENING (SEALED)'
CUBOID     12 1 2P4.2672 2P4.2672 +74.29 -8.255
HOLE 7     -0.1397 -0.1397 0.0
UNIT 15
COM='TRIGA ELEMENTS IN Top Left of 3.38 in x 3.38 in OPENING (SEALED)'
CUBOID     12 1 2P4.2672 2P4.2672 +74.29 -8.255
HOLE 7     -0.1397 +0.1397 0.0
UNIT 16
COM='TRIGA BASKET 3.38 in x 3.38 in CENTER OPENING (SEALED)'
CUBOID     12 1 2P4.2672 2P4.2672 +74.29 -8.255
UNIT 17
COM='HORIZONTAL X-X POISON SHEET + WATER'
CUBOID  13 1 2P3.8227 0.3175 0.0 +73.02 -6.985
CUBOID  14 1 2P4.1402 0.3175 0.0 +73.02 -6.985
CUBOID  12 1 2P4.2672 0.3175 0.0 +74.29 -8.255
UNIT 18
COM='HORIZONTAL X-X POISON SHEET + WATER'
CUBOID  13 1 2P3.8227 0.3175 0.0 2P34.163
CUBOID  14 1 2P4.1402 0.3175 0.0 2P34.163
CUBOID  12 1 2P4.2672 0.3175 0.0 2P36.703
UNIT 20
COM='CENTER COLUMN OF THREE OPENINGS w/ 0.28 in plate (SEALED)'
ARRAY 1  -4.2672 -13.5128 -8.255
REPLICATE 2 1 4R0.7142 2P0.0 1
UNIT 21
COM='LEFT OUTSIDE COLUMN OF TWO OPENINGS w/ 0.12 in plate (SEALED)'
ARRAY 2  -4.2672 -8.8392 -8.255
REPLICATE 2 1 0.0 0.3048 2P0.3048 2R0.0 1
UNIT 22
COM='RIGHT OUTSIDE COLUMN OF TWO OPENINGS w/ 0.12 in plate (SEALED)'
ARRAY 3  -4.2672 -8.8392 -8.255
REPLICATE 2 1 0.3048 0.0 2P0.3048 2R0.0 1
UNIT 30
COM='NAC-LWT TRIGA BASKET (SEALED)'
CYLINDER 12  1 17.1 +74.29 -8.255
HOLE 20 0.0 0.0 0.0
HOLE 21  -9.2457 0.0 0.0
HOLE 22  +9.2457 0.0 0.0
CYLINDER 2  1 18.9103 +74.93 -8.890
CYLINDER 6  1 33.4645 +74.93 -8.890
CYLINDER 2  1 36.5188 +74.93 -8.890
CYLINDER 7   1 49.2227 +74.93 -9.890
CYLINDER 2  1 49.8221 +74.93 -8.890
CUBOID   8  1 4P121.92 +74.93 -8.890
UNIT 41
COM='TRIGA FUEL ELEMENT'
CYLINDER  21 1 0.6477 2P27.94
CYLINDER  22 1 0.68834 2P27.94
CYLINDER  29 1 0.68834 43.48 -33.04
UNIT 42
COM='HORIZONTAL X-X POISON SHEET + WATER'
CUBOID   13 1 2P3.8227 0.3175 0.0 39.38 -28.94
CUBOID   14 1 2P4.1402 0.3175 0.0 39.38 -28.94
CUBOID   23  1 2P4.2672 0.3175 0.0 43.48 -33.04
UNIT 45
```

```
COM='DIVIDER CENTER STACK'
CUBOID   2 1 2P4.2672 0.7112 0.0 43.48 -33.04
UNIT 46
COM='DIVIDER OUTSIDE STACK'
CUBOID   2 1 2P4.2672 0.6096 0.0 43.48 -33.04
UNIT 410
COM='TRIGA FUEL ELEMENTS IN AL TUBE, CENTERED'
CYLINDER 23 1  0.80518  43.48 -33.04
HOLE  41  0.0 0.0 0.0
CYLINDER 30 1 0.9525  43.48 -33.04
UNIT 411
COM='TRIGA FUEL ELEMENTS IN AL TUBE, RIGHT'
CYLINDER 23 1  0.80518  43.48 -33.04
HOLE  41   0.1167  0.0 0.0
CYLINDER 30 1 0.9525  43.48 -33.04
UNIT 412
COM='TRIGA FUEL ELEMENTS IN AL TUBE, LEFT'
CYLINDER 23 1  0.80518  43.48 -33.04
HOLE  41  -0.1167  0.0 0.0
CYLINDER 30 1 0.9525  43.48 -33.04
UNIT 413
COM='TRIGA FUEL ELEMENTS IN AL TUBE, TOP'
CYLINDER 23 1  0.80518  43.48 -33.04
HOLE  41  0.0 0.1167 0.0
CYLINDER 30 1 0.9525  43.48 -33.04
UNIT 414
COM='TRIGA FUEL ELEMENTS IN AL TUBE, BOTTOM'
CYLINDER 23 1  0.80518  43.48 -33.04
HOLE  41  0.0 -0.1167 0.0
CYLINDER 30 1 0.9525  43.48 -33.04
UNIT 415
COM='TRIGA FUEL ELEMENTS IN AL TUBE, TOP RIGHT'
CYLINDER 23 1  0.80518  43.48 -33.04
HOLE  41  0.0826  0.0826 0.0
CYLINDER 30 1 0.9525  43.48 -33.04
UNIT 416
COM='TRIGA FUEL ELEMENTS IN AL TUBE, TOP LEFT'
CYLINDER 23 1  0.80518  43.48 -33.04
HOLE  41  -0.0826 0.0826 0.0
CYLINDER 30 1 0.95250  43.48 -33.04
UNIT 417
COM='TRIGA FUEL ELEMENTS IN AL TUBE, BOTTOM RIGHT'
CYLINDER 23 1  0.80518  43.48 -33.04
HOLE  41  0.0826  -0.0826 0.0
CYLINDER 30 1 0.95250  43.48 -33.04
UNIT 418
COM='TRIGA FUEL ELEMENTS IN AL TUBE, BOTTOM LEFT'
CYLINDER 23 1  0.80518  43.48 -33.04
HOLE  41  -0.0826 -0.0826 0.0
CYLINDER 30 1 0.95250  43.48 -33.04

UNIT 420
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, CENTER OPENING'
CUBOID    23 1 4P4.1529 43.48 -33.04
HOLE           415  -2.8576 -2.8576       0
HOLE           413  -0.9525 -2.8576       0
HOLE           413   0.9525 -2.8576       0
HOLE           416   2.8576 -2.8576       0
HOLE           411  -2.8576 -0.9525      0
HOLE           415  -0.9525 -0.9525      0
HOLE           416   0.9525 -0.9525      0
HOLE           412   2.8576 -0.9525      0
HOLE           411  -2.8576  0.9525      0
HOLE           417  -0.9525 0.9525      0
HOLE           418   0.9525 0.9525      0
HOLE           412   2.8576  0.9525      0
HOLE           417  -2.8576  2.8576       0
HOLE           414  -0.9525 2.8576      0
HOLE           414   0.9525 2.8576      0
HOLE           418   2.8576  2.8576       0
CUBOID    23 1 4P4.1529 43.48 -33.04
' CHECK 4.1 CM ABOVE**********************
UNIT 421
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, BOTTOM OPENING'
CUBOID    23 1 4P4.1529 43.48 -33.04
HOLE           415  -2.8576 -2.8576       0
HOLE           413  -0.9525 -2.8576       0
HOLE           413   0.9525 -2.8576       0
HOLE           416   2.8576 -2.8576       0
HOLE           411  -2.8576 -0.9525      0
HOLE           415  -0.9525 -0.9525      0
HOLE           416   0.9525 -0.9525      0
HOLE           412   2.8576 -0.9525      0
HOLE           411  -2.8576  0.9525      0
HOLE           417  -0.9525 0.9525      0
HOLE           418   0.9525 0.9525      0
HOLE           412   2.8576  0.9525      0
HOLE           417  -2.8576  2.8576       0
HOLE           414  -0.9525 2.8576      0
HOLE           414   0.9525 2.8576      0
HOLE           418   2.8576  2.8576       0
CUBOID    23 1 4P4.1529 43.48 -33.04
' CHECK 4.1 CM ABOVE**********************
UNIT 422
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, TOP OPENING'
```

```
CUBOID    23 1 4P4.1529 43.48 -33.04
HOLE          415  -2.8576 -2.8576        0
HOLE          413  -0.9525 -2.8576        0
HOLE          413   0.9525 -2.8576        0
HOLE          416   2.8576 -2.8576        0
HOLE          411  -2.8576 -0.9525      0
HOLE          415  -0.9525 -0.9525      0
HOLE          416   0.9525 -0.9525      0
HOLE          412   2.8576 -0.9525      0
HOLE          411  -2.8576  0.9525      0
HOLE          417  -0.9525 0.9525     0
HOLE          418   0.9525 0.9525     0
HOLE          412   2.8576  0.9525      0
HOLE          417  -2.8576  2.8576        0
HOLE          414  -0.9525 2.8576      0
HOLE          414   0.9525 2.8576      0
HOLE          418   2.8576  2.8576        0
CUBOID    23 1 4P4.1529 43.48 -33.04
' CHECK 4.1 CM ABOVE********************
UNIT 423
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, BOTTOM LEFT OPENING'
CUBOID    23 1 4P4.1529 43.48 -33.04
HOLE          415  -2.8576 -2.8576        0
HOLE          413  -0.9525 -2.8576        0
HOLE          413   0.9525 -2.8576        0
HOLE          416   2.8576 -2.8576        0
HOLE          411  -2.8576 -0.9525      0
HOLE          415  -0.9525 -0.9525      0
HOLE          416   0.9525 -0.9525      0
HOLE          412   2.8576 -0.9525      0
HOLE          411  -2.8576  0.9525      0
HOLE          417  -0.9525 0.9525     0
HOLE          418   0.9525 0.9525     0
HOLE          412   2.8576  0.9525      0
HOLE          417  -2.8576  2.8576        0
HOLE          414  -0.9525 2.8576      0
HOLE          414   0.9525 2.8576      0
HOLE          418   2.8576  2.8576        0
CUBOID    23 1 4P4.1529 43.48 -33.04
' CHECK 4.1 CM ABOVE********************
UNIT 424
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, TOP LEFT OPENING'
CUBOID    23 1 4P4.1529 43.48 -33.04
HOLE          415  -2.8576 -2.8576        0
HOLE          413  -0.9525 -2.8576        0
HOLE          413   0.9525 -2.8576        0
HOLE          416   2.8576 -2.8576        0
HOLE          411  -2.8576 -0.9525      0
HOLE          415  -0.9525 -0.9525      0
HOLE          416   0.9525 -0.9525      0
HOLE          412   2.8576 -0.9525      0
HOLE          411  -2.8576  0.9525      0
HOLE          417  -0.9525 0.9525     0
HOLE          418   0.9525 0.9525     0
HOLE          412   2.8576  0.9525      0
HOLE          417  -2.8576  2.8576        0
HOLE          414  -0.9525 2.8576      0
HOLE          414   0.9525 2.8576      0
HOLE          418   2.8576  2.8576        0
CUBOID    23 1 4P4.1529 43.48 -33.04
' CHECK 4.1 CM ABOVE********************
UNIT 425
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, BOTTOM RIGHT OPENING'
CUBOID    23 1 4P4.1529 43.48 -33.04
HOLE          415  -2.8576 -2.8576        0
HOLE          413  -0.9525 -2.8576        0
HOLE          413   0.9525 -2.8576        0
HOLE          416   2.8576 -2.8576        0
HOLE          411  -2.8576 -0.9525      0
HOLE          415  -0.9525 -0.9525      0
HOLE          416   0.9525 -0.9525      0
HOLE          412   2.8576 -0.9525      0
HOLE          411  -2.8576  0.9525      0
HOLE          417  -0.9525 0.9525     0
HOLE          418   0.9525 0.9525     0
HOLE          412   2.8576  0.9525      0
HOLE          417  -2.8576  2.8576        0
HOLE          414  -0.9525 2.8576      0
HOLE          414   0.9525 2.8576      0
HOLE          418   2.8576  2.8576        0
CUBOID    23 1 4P4.1529 43.48 -33.04
' CHECK 4.1 CM ABOVE********************
UNIT 426
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, TOP RIGHT OPENING'
CUBOID    23 1 4P4.1529 43.48 -33.04
HOLE          415  -2.8576 -2.8576        0
HOLE          413  -0.9525 -2.8576        0
HOLE          413   0.9525 -2.8576        0
HOLE          416   2.8576 -2.8576        0
HOLE          411  -2.8576 -0.9525      0
HOLE          415  -0.9525 -0.9525      0
HOLE          416   0.9525 -0.9525      0
HOLE          412   2.8576 -0.9525      0
HOLE          411  -2.8576  0.9525      0
HOLE          417  -0.9525 0.9525     0
```

```
HOLE          418   0.9525 0.9525      0
HOLE          412   2.8576  0.9525      0
HOLE          417  -2.8576  2.8576       0
HOLE          414  -0.9525 2.8576       0
HOLE          414   0.9525 2.8576       0
HOLE          418   2.8576  2.8576       0
CUBOID    23 1 4P4.1529 43.48 -33.04
UNIT 430
COM='FUEL INSERT IN, CENTER OPENING'
CUBOID    23 1 4P4.2672 43.48 -33.04
UNIT 431
COM='FUEL INSERT IN, BOTTOM OPENING'
CUBOID    23 1 4P4.2672 43.48 -33.04
HOLE 421   0.0 -0.1143 0.0
UNIT 432
COM='FUEL INSERT IN, TOP OPENING'
CUBOID    23 1 4P4.2672 43.48 -33.04
HOLE 422   0.0 0.1143 0.0
UNIT 433
COM='FUEL INSERT IN, BOTTOM LEFT OPENING'
CUBOID    23 1 4P4.2672 43.48 -33.04
HOLE 423   -0.1143 -0.1143 0.0
UNIT 434
COM='FUEL INSERT IN, TOP LEFT OPENING'
CUBOID    23 1 4P4.2672 43.48 -33.04
HOLE 424   -0.1143 0.1143 0.0
UNIT 435
COM='FUEL INSERT IN, BOTOM RIGHT OPENING'
CUBOID    23 1 4P4.2672 43.48 -33.04
HOLE 425   0.1143 -0.1143 0.0
UNIT 436
COM='FUEL INSERT IN, TOP RIGHT OPENING'
CUBOID    23 1 4P4.2672 43.48 -33.04
HOLE 426   0.1143 0.1143 0.0
UNIT 440
COM='CENTER COLUMN OF THREE OPENINGS'
ARRAY 41  -4.2672 -13.5128 -33.04
REPLICATE 2 1 4R0.7112 2R0.0 1
UNIT 441
COM='LEFT OUTSIDE COLUMN OF TWO OPENINGS'
ARRAY 42  -4.2672 -8.8392 -33.04
REPLICATE 2 1 0.0 0.3408 2R0.3408 2R0.0 1
UNIT 442
COM='RIGHT OUTSIDE COLUMN OF TWO OPENINGS'
ARRAY 43  -4.2672 -8.8392 -33.04
REPLICATE 2 1 0.3408 0.0 2R0.3408 2R0.0 1
UNIT 450
COM='28 TRIGA FUEL ELEMENTS IN EACH LWT BASKET'
CYLINDER 23  1 17.1500 43.485 -33.045
HOLE 440   0.0    0.0 0.0
HOLE 441  -9.2457 0.0 0.0
HOLE 442  +9.2457 0.0 0.0
CYLINDER 2  1 18.9103 43.485 -33.045
CYLINDER 26   1 33.4645 43.485 -33.045
CYLINDER 2  1 36.5188 43.485 -33.045
CYLINDER 27   1 49.2227 43.485 -33.045
CYLINDER 2  1 49.8221 43.485 -33.045
CUBOID   28   1 4P121.92 43.485 -33.045
UNIT 80
COM='SIMPLIFIED LID STRUCTURE NAC-LWT'
CYLINDER 2 1 36.5188 2P14.1351
CYLINDER 8 1 49.8221 2P14.1351
CUBOID   8 1 4P121.92 2P14.1351
UNIT 81
COM='SIMPLIFIED CASK BOTTOM STRUCTURE NAC-LWT'
CYLINDER 6 1 26.3525 2P3.81
CYLINDER 2 1 36.6188 +13.97 -12.7
CYLINDER 8 1 49.8221 +13.97 -12.7
CUBOID   8 1 4P121.92 +13.97 -12.7
GLOBAL UNIT 82
COM='STACK OF 5 BASKETS IN CASK'
ARRAY  20  -121.92 -121.92 -221.3
END GEOM
READ ARRAY
ARA=1 NUX=1 NUY=5 NUZ=1 FILL 10 5 16 5 11 END FILL
ARA=2 NUX=1 NUY=3 NUZ=1 FILL 13 6 12 END FILL
ARA=3 NUX=1 NUY=3 NUZ=1 FILL 15 6 14 END FILL
ARA=41 NUX=1 NUY=5 NUZ=1 FILL 432 45 430 45 431 END FILL
ARA=42 NUX=1 NUY=3 NUZ=1 FILL 436 46 435 END FILL
ARA=43 NUX=1 NUY=3 NUZ=1 FILL 434 46 433 END FILL
ARA=20 NUX=1 NUY=1 NUZ=7 FILL 81 30 3R450 30 80 END FILL
END ARRAY
READ BOUNDS ALL=MIR END BOUNDS
READ PLOT
TTL='X-Y PLOT OF CASK (CANISTER ELEVATION)'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=800
XUL=-50.0 YUL=50.0 ZUL=149.352
XLR=50.0 YLR=-50.0 ZLR=149.352 END
TTL='X-Y PLOT OF BASKET (CANISTER ELEVATION)'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=800
XUL=-17.2 YUL=17.2 ZUL=149.352
XLR=17.2 YLR=-17.2 ZLR=149.352 END
TTL='X-Y PLOT OF BASKET (CAVITY MID PLANE)'
```

```
    SCR=YES PIC=MAT LPI=10
    UAX=1.0 VDN=-1.0 NAX=800
    XUL=-17.2 YUL=17.2 ZUL=0.0
    XLR=17.2 YLR=-17.2 ZLR=0.0 END
    TTL='X-Y PLOT OF CENTER OPENING (CANISTER ELEVATION)'
    SCR=YES PIC=MAT LPI=10
    UAX=1.0 VDN=-1.0 NAX=800
    XUL=-7.0 YUL=7.0 ZUL=149.352
    XLR=7.0 YLR=-7.0 ZLR=149.352 END
    TTL='X-Y PLOT OF PERIPHERAL OPENING (CANISTER ELEVATION)'
    SCR=YES PIC=MAT LPI=10
    UAX=1.0 VDN=-1.0 NAX=800
    XUL=-7.0 YUL=16.0 ZUL=149.352
    XLR=7.0  YLR=4.0 ZLR=149.352 END
    TTL='Y-Z PLOT OF BASKET (CENTER OF FUEL ELEMENTS,CANISTER ELEVATION)'
    SCR=YES PIC=MAT LPI=10
    VAX=1.0 WDN=-1.0 NAX=800
    XUL=2.12 YUL=-14.0 ZUL=186.69
    XLR=2.12 YLR=-4.5 ZLR=112.014 END
    TTL='Y-Z PLOT OF BASKET (CASK)'
    SCR=YES PIC=MAT LPI=10
    VAX=1.0 WDN=-1.0 NAX=800
    XUL=2.12 YUL=-51 ZUL=220.0
    XLR=2.12 YLR=+51 ZLR=-220.0
    END PLOT
    END DATA

  SECONDARY MODULE 000008   HAS BEEN CALLED.

  MODULE 000008   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     1.38 (SECONDS).

  SECONDARY MODULE 000002   HAS BEEN CALLED.

  MODULE 000002   IS FINISHED. COMPLETION CODE     0. CPU TIME USED    15.38 (SECONDS).

  SECONDARY MODULE 000009   HAS BEEN CALLED.

  MODULE 000009   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   309.67 (SECONDS).

  MODULE CSAS25   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   327.58 (SECONDS).
```

```
 CCCCCCCCCC    SSSSSSSSSSS     AAAAAAAAA     SSSSSSSSSSS    22222222222    5555555555555
CCCCCCCCCCCC  SSSSSSSSSSSSS   AAAAAAAAAAA   SSSSSSSSSSSSS  2222222222222   5555555555555
CC        CC  SS         SS  AA         AA  SS         SS  22         22   55
CC            SS             AA         AA  SS                        22   55
CC            SS             AA         AA  SS                        22   55
CC            SSSSSSSSSSSS   AAAAAAAAAAAAA  SSSSSSSSSSSS             22    555555555555
CC             SSSSSSSSSSSS  AAAAAAAAAAAAA   SSSSSSSSSSSS          22      5555555555555
CC                       SS  AA         AA             SS       22                  55
CC                       SS  AA         AA             SS     22                    55
CC        CC  SS         SS  AA         AA  SS         SS   22             55       55
CCCCCCCCCCCC  SSSSSSSSSSSSS  AA         AA  SSSSSSSSSSSSS  2222222222222   5555555555555
 CCCCCCCCCC    SSSSSSSSSSS   AA         AA   SSSSSSSSSSS   2222222222222    55555555555

 SSSSSSSSSS    CCCCCCCCCC     AAAAAAAAA    LL            EEEEEEEEEEEEE                  PPPPPPPPPPPP    CCCCCCCCCC
SSSSSSSSSSSS  CCCCCCCCCCCC   AAAAAAAAAAA   LL            EEEEEEEEEEEEE                  PPPPPPPPPPPPP  CCCCCCCCCCCC
SS        SS  CC        CC  AA         AA  LL            EE                             PP         PP  CC        CC
SS            CC            AA         AA  LL            EE                             PP         PP  CC
SS            CC            AA         AA  LL            EE                             PP         PP  CC
SSSSSSSSSSS   CC            AAAAAAAAAAAAA  LL            EEEEEEEEE      -------------   PPPPPPPPPPPPP  CC
 SSSSSSSSSSS  CC            AAAAAAAAAAAAA  LL            EEEEEEEEE      -------------   PPPPPPPPPPPP   CC
          SS  CC            AA         AA  LL            EE                             PP             CC
          SS  CC            AA         AA  LL            EE                             PP             CC
SS        SS  CC        CC  AA         AA  LL            EE                             PP             CC        CC
SSSSSSSSSSSS  CCCCCCCCCCCC  AA         AA  LLLLLLLLLLLL  EEEEEEEEEEEEE                  PP             CCCCCCCCCCCC
 SSSSSSSSSS    CCCCCCCCCC   AA         AA  LLLLLLLLLLLL  EEEEEEEEEEEEE                  PP              CCCCCCCCCC

  0000000          11              //    0000000            44            //   99999999999    99999999999
 000000000        111             //    000000000          444           //   9999999999999  9999999999999
00       00      1111            //    00       00        4444          //    99         99  99         99
00       00        11           //     00       00       44 44         //     99         99  99         99
00       00        11          //      00       00      44  44        //      99         99  99         99
00       00        11         //       00       00     44   44       //       9999999999999  9999999999999
00       00        11        //        00       00    44    44      //         999999999999   999999999999
00       00        11       //         00       00   4444444444444 //                    99             99
00       00        11      //          00       00   4444444444444//                     99             99
 00     00         11     //            00     00           44   //                      99             99
 000000000      11111111 //             000000000           44  //        9999999999999  9999999999999
  0000000       11111111//               0000000            44 //          999999999999   999999999999

     11      666666666666                33333333333   7777777777777             0000000     33333333333
    111     6666666666666               3333333333333  777777777777             000000000   3333333333333
   1111     66                 :::      33         33  77        77    :::     00       00  33         33
     11     66                 :::                 33           77     :::     00       00             33
     11     66                 :::                 33          77      :::     00       00             33
     11     666666666666                         333          77               00       00           333
     11     6666666666666                        333         77                00       00           333
     11     66         66      :::                 33       77         :::     00       00             33
     11     66         66      :::                 33      77          :::     00       00             33
     11     66         66      :::      33         33     77           :::     00       00  33         33
  11111111  6666666666666               3333333333333    77                     000000000   3333333333333
  11111111   66666666666                 33333333333     77                      0000000     33333333333
```

```
  SSSSSSSSSSS     CCCCCCCCCCC       AAAAAAAAA      LL                EEEEEEEEEEEEE                    PPPPPPPPPPPP    CCCCCCCCCCC
 SSSSSSSSSSSSS   CCCCCCCCCCCCC     AAAAAAAAAAA     LL                EEEEEEEEEEEEE                    PPPPPPPPPPPPP  CCCCCCCCCCCCC
 SS         SS   CC         CC    AA         AA    LL                EE                               PP         PP  CC         CC
 SS              CC               AA         AA    LL                EE                               PP         PP  CC
 SS              CC               AA         AA    LL                EE                               PP         PP  CC
 SSSSSSSSSSSS    CC               AAAAAAAAAAAAA    LL                EEEEEEEEE      -------------     PPPPPPPPPPPPP  CC
  SSSSSSSSSSSS   CC               AAAAAAAAAAAAA    LL                EEEEEEEEE      -------------     PPPPPPPPPPPP   CC
           SS    CC               AA         AA    LL                EE                               PP             CC
           SS    CC               AA         AA    LL                EE                               PP             CC
 SS        SS    CC         CC    AA         AA    LL                EE                               PP             CC         CC
 SSSSSSSSSSSSS   CCCCCCCCCCCCC    AA         AA    LLLLLLLLLLLLL     EEEEEEEEEEEEE                    PP             CCCCCCCCCCCCC
  SSSSSSSSSSS     CCCCCCCCCCC     AA         AA    LLLLLLLLLLLLL     EEEEEEEEEEEEE                    PP              CCCCCCCCCCC
```

```
********************************************************************************
********************************************************************************
********************************************************************************
*****                                                                      *****
*****                     PROGRAM VERIFICATION INFORMATION                 *****
*****                                                                      *****
*****                   CODE SYSTEM:  SCALE-PC VERSION:  4.3               *****
*****                                                                      *****
********************************************************************************
********************************************************************************
*****                                                                      *****
*****                                                                      *****
*****                  PROGRAM:  CSAS                                      *****
*****                                                                      *****
*****            CREATION DATE:  03/08/96                                  *****
*****                                                                      *****
*****                   VOLUME:  ENG                                       *****
*****                                                                      *****
*****                  LIBRARY:  G:\SCALE43\WIN_NT\EXE                     *****
*****                                                                      *****
*****                                                                      *****
*****          PRODUCTION CODE:  CSAS                                      *****
*****                                                                      *****
*****                  VERSION:  3.1                                       *****
*****                                                                      *****
*****                  JOBNAME:  SCALE-PC                                  *****
*****                                                                      *****
*****        DATE OF EXECUTION:  01/04/99                                  *****
*****                                                                      *****
*****        TIME OF EXECUTION:  16:37:03                                  *****
*****                                                                      *****
*****                                                                      *****
********************************************************************************
********************************************************************************
********************************************************************************
```

```
**** PROBLEM GEOMETRY ****


**** INFINITE HOMOGENEOUS MEDIUM ****
MFUEL         1 MIXTURE NO. OF THE INFINITE HOMOGENEOUS MEDIUM

**** SPECIAL PARAMETERS ****

ISN            8 ORDER OF ANGULAR QUADRATURE
IIM           20 INNER ITERATION MAXIMUM
ICM           25 OUTER ITERATION MAXIMUM
SZF  1.00000E+00 SIZE FACTOR FOR SPATIAL MESH
EPS  1.00000E-04 OVERALL PROBLEM CONVERGENCE
PTC  1.00000E-04 SCALAR FLUX CONVERGENCE
BKL  1.42089E+00 BUCKLING FACTOR
IUS            0 THERMAL UPSCATTER SCALING
BAL         FINE BALANCE TABLE PRINT FLAG
DY   0.00000E+00 BUCKLING HEIGHT
DZ   0.00000E+00 BUCKLING DEPTH
IPN            0 DIFFUSION COEFFICIENT OPTION
FRD            0 LOGICAL UNIT NUMBER TO READ FLUX GUESS
FWR           -1 LOGICAL UNIT NUMBER TO WRITE FLUX GUESS
MSH         2001 NUMBER OF INTERVALS FOR RES. INTGRTNS
MLV            2 MAX LVALUE FOR RES. INTGRTNS
AXS            0 LOGICAL UNIT NUMBER TO WRITE ANISN LIB
RES           21 MIXTURE WITH SPECIAL RESONANCE CORRECTION
 *      CYLINDER GEOMETRY FOR SPECIAL RESONANCE CORRECTION
 *   6.47700E-01 DIMENSION (LBAR) FOR SPECIAL RESONANCE CORRECTION


DANCOFF FACTOR SPECIFICATION
MIXTURE     FACTOR
     21    0.38879
```

```
TRIGA - PREF. FLOOD CANISTER

********** DATA LIBRARY INFORMATION **********

UNIT                                                  VOLUME
NUMBER       DATA SET NAME                            NAME      UNIT FUNCTION
------       -------------                            ----      -------------

  89   G:\scale43\DATALIB\FT89F001                              STANDARD COMPOSITION LIBRARY

  82   G:\scale43\DATALIB\FT82F001                              CROSS SECTION LIBRARY

  11   D:\projects\triga\mev\moddensk\fixu_8_ala\FT             SHORT CROSS SECTION LIBRARY

  90   D:\projects\triga\mev\moddensk\fixu_8_ala\FT             INPUT DATA DIRECT ACCESS


                  STANDARD COMPOSITION LIBRARY DATA
                  ---------------------------------

UNIT NUMBER  :  89

DATASET NAME :  G:\scale43\DATALIB\FT89F001

LIBRARY TITLE:  SCALE-4 STANDARD COMPOSITION LIBRARY
                637 STANDARD COMPOSITIONS, 490 NUCLIDES
                90 ELEMENTS WITH VARIABLE ISOTOPIC DISTRBUTIONS.

CREATION DATE:   6/30/95


                     CROSS SECTION LIBRARY DATA
                     --------------------------

UNIT NUMBER  :  82

DATASET NAME :  G:\scale43\DATALIB\FT82F001

LIBRARY TITLE:  SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
                   BASED ON ENDF-B VERSION 4 DATA
                      COMPILED FOR NRC      1/27/89
                         LAST UPDATED                                        08/12/94
                            L.M.PETRIE   -    ORNL


   ........   0 IO'S WERE USED BEFORE READING KENO V DATA     ........

   ........   0 IO'S WERE USED READING THE KENO V PARAMETER DATA     ........

  ************** DATA READING COMPLETED **************

   ........   0 IO'S WERE USED PREPARING THE KENO V INPUT DATA     ........

   ........   0 IO'S WERE USED LOADING THE KENO V DATA     ........

   ........   0 IO'S WERE USED LOADING THE DATA     ........

   ........   0 IO'S WERE USED CHECKING THE KENO V GEOMETRY DATA     ........
   *****  RESTART DATA HAS BEEN WRITTEN ON UNIT 95  *****

   ........   0 IO'S WERE USED WRITING THE KENO V - CSAS DATA     ........

   ........   0 IO'S WERE USED PROCESSING CSAS INPUT DATA     ........
```

KENO -- V

SCALE -- PC

01/04/99

16:37:21

```
  SSSSSSSSSSS     CCCCCCCCCCC      AAAAAAAAA     LL              EEEEEEEEEEEEE                   PPPPPPPPPPPP     CCCCCCCCCCC
 SSSSSSSSSSSSS   CCCCCCCCCCCCC    AAAAAAAAAAA    LL              EEEEEEEEEEEEE                   PPPPPPPPPPPPP   CCCCCCCCCCCCC
 SS         SS   CC         CC   AA         AA   LL              EE                              PP         PP   CC         CC
 SS              CC              AA         AA   LL              EE                              PP         PP   CC
 SS              CC              AA         AA   LL              EE                              PP         PP   CC
 SSSSSSSSSSSS    CC              AAAAAAAAAAAAA   LL              EEEEEEEEE       -------------   PPPPPPPPPPPPP   CC
  SSSSSSSSSSSS   CC              AAAAAAAAAAAAA   LL              EEEEEEEEE       -------------   PPPPPPPPPPPP    CC
            SS   CC              AA         AA   LL              EE                              PP              CC
            SS   CC              AA         AA   LL              EE                              PP              CC
 SS         SS   CC         CC   AA         AA   LL              EE                              PP              CC         CC
 SSSSSSSSSSSSS   CCCCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                   PP              CCCCCCCCCCCCC
  SSSSSSSSSSS     CCCCCCCCCCC    AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                   PP               CCCCCCCCCCC
```

```
***************************************************************************
***************************************************************************
***************************************************************************
*****                                                                 *****
*****                 PROGRAM VERIFICATION INFORMATION                *****
*****                                                                 *****
*****               CODE SYSTEM:   SCALE-PC VERSION:   4.3            *****
*****                                                                 *****
***************************************************************************
***************************************************************************
*****                                                                 *****
*****                                                                 *****
*****                   PROGRAM:  000009                              *****
*****                                                                 *****
*****             CREATION DATE:  03/08/96                            *****
*****                                                                 *****
*****                    VOLUME:  ENG                                 *****
*****                                                                 *****
*****                   LIBRARY:  G:\SCALE43\WIN_NT\EXE               *****
*****                                                                 *****
*****                                                                 *****
*****           PRODUCTION CODE:  KENOVA                              *****
*****                                                                 *****
*****                   VERSION:  3.1                                 *****
*****                                                                 *****
*****                   JOBNAME:  SCALE-PC                            *****
*****                                                                 *****
*****         DATE OF EXECUTION:  01/04/99                            *****
*****                                                                 *****
*****         TIME OF EXECUTION:  16:37:21                            *****
*****                                                                 *****
*****                                                                 *****
***************************************************************************
***************************************************************************
***************************************************************************
```

```
*****************************************************************************************************
***                                                                                               ***
***                              TRIGA - PREF. FLOOD CANISTER                                     ***
***                                                                                               ***
*****************************************************************************************************
***                               ******      NUMERIC PARAMETERS      ******                      ***
***                                                                                               ***
***                                                                                               ***
***              TME        MAXIMUM PROBLEM TIME (MIN)                           170.00           ***
***                                                                                               ***
***              TBA        TIME PER GENERATION (MIN)                              2.00           ***
***                                                                                               ***
***              GEN        NUMBER OF GENERATIONS                                   203           ***
***                                                                                               ***
***              NPG        NUMBER PER GENERATION                                   500           ***
***                                                                                               ***
***              NSK        NUMBER OF GENERATIONS TO BE SKIPPED                       3           ***
***                                                                                               ***
***              BEG        BEGINNING GENERATION NUMBER                               1           ***
***                                                                                               ***
***              RES        GENERATIONS BETWEEN CHECKPOINTS                           0           ***
***                                                                                               ***
***              X1D        NUMBER OF EXTRA 1-D CROSS SECTIONS                        1           ***
***                                                                                               ***
***              NBK        NEUTRON BANK SIZE                                       525           ***
***                                                                                               ***
***              XNB        EXTRA POSITIONS IN NEUTRON BANK                           0           ***
***                                                                                               ***
***              NFB        FISSION BANK SIZE                                       500           ***
***                                                                                               ***
***              XFB        EXTRA POSITIONS IN FISSION BANK                           0           ***
***                                                                                               ***
***              WTA        DEFAULT VALUE OF WEIGHT AVERAGE                      0.5000           ***
***                                                                                               ***
***              WTH        WEIGHT HIGH FOR SPLITTING                            3.0000           ***
***                                                                                               ***
***              WTL        WEIGHT LOW FOR RUSSIAN ROULETTE                      0.3333           ***
***                                                                                               ***
***              RND        STARTING RANDOM NUMBER                         BB8271000001           ***
***                                                                                               ***
***              NB8        NUMBER OF D.A. BLOCKS ON UNIT  8                        200           ***
***                                                                                               ***
***              NL8        LENGTH OF D.A. BLOCKS ON UNIT  8                        512           ***
***                                                                                               ***
***              ADJ        MODE OF CALCULATION                                 FORWARD           ***
***                                                                                               ***
***                         INPUT DATA WRITTEN ON RESTART UNIT                       NO           ***
***                                                                                               ***
***                         BINARY DATA INTERFACE                                   YES           ***
***                                                                                               ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************
```

```
***********************************************************************************************
***********************************************************************************************
***                                                                                         ***
***                          TRIGA - PREF. FLOOD CANISTER                                   ***
***                                                                                         ***
***********************************************************************************************
***                            ******     LOGICAL PARAMETERS      ******                     ***
***                                                                                         ***
***  RUN  EXECUTE PROBLEM AFTER CHECKING DATA     YES          PLT  PLOT PICTURE MAP(S)                     NO ***
***                                                                                         ***
***  FLX  COMPUTE FLUX                             NO          FDN  COMPUTE FISSION DENSITIES               NO ***
***                                                                                         ***
***  SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION     NO          NUB  COMPUTE NU-BAR & AVG FISSION GROUP     YES ***
***                                                                                         ***
***  MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER      NO          MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION   NO ***
***                                                                                         ***
***  CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER    NO          CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION NO ***
***                                                                                         ***
***  FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER    NO          FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION NO ***
***                                                                                         ***
***  MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER      NO          MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER    NO ***
***                                                                                         ***
***  CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER    NO          CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER  NO ***
***                                                                                         ***
***  FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER    NO          FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER  NO ***
***                                                                                         ***
***  HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL     NO          HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL   NO ***
***                                                                                         ***
***  AMX  PRINT ALL MIXED CROSS SECTIONS           NO          FAR  PRINT FIS. AND ABS. BY REGION           NO ***
***                                                                                         ***
***  XS1  PRINT 1-D MIXTURE X-SECTIONS             NO          GAS  PRINT FAR BY GROUP                      NO ***
***                                                                                         ***
***  XS2  PRINT 2-D MIXTURE X-SECTIONS             NO          PAX  PRINT XSEC-ALBEDO CORRELATION TABLES    NO ***
***                                                                                         ***
***  XAP  PRINT MIXTURE ANGLES & PROBABILITIES     NO          PWT  PRINT WEIGHT AVERAGE ARRAY              NO ***
***                                                                                         ***
***  PKI  PRINT FISSION SPECTRUM                   NO          PGM  PRINT INPUT GEOMETRY                    NO ***
***                                                                                         ***
***  P1D  PRINT EXTRA 1-D CROSS SECTIONS           NO          BUG  PRINT DEBUG INFORMATION                 NO ***
***                                                                                         ***
***                                                            TRK  PRINT TRACKING INFORMATION              NO ***
***                                                                                         ***
***                                                                                         ***
***********************************************************************************************
***********************************************************************************************
***********************************************************************************************
                                   PARAMETER INPUT COMPLETED

                  ........    0 IO'S WERE USED READING THE PARAMETER DATA      ........

                  *************** DATA READING COMPLETED ***************
```

TRIGA - PREF. FLOOD CANISTER

****** ADDITIONAL INFORMATION ******

NUMBER OF ENERGY GROUPS	27	USE LATTICE GEOMETRY	YES
NO. OF FISSION SPECTRUM SOURCE GROUP	1	GLOBAL ARRAY NUMBER	20
NO. OF SCATTERING ANGLES IN XSECS	2	NUMBER OF UNITS IN THE GLOBAL X DIR.	1
ENTRIES/NEUTRON IN THE NEUTRON BANK	26	NUMBER OF UNITS IN THE GLOBAL Y DIR.	1
ENTRIES/NEUTRON IN THE FISSION BANK	19	NUMBER OF UNITS IN THE GLOBAL Z DIR.	7
NUMBER OF MIXTURES USED	15	USE A GLOBAL REFLECTOR	YES
NUMBER OF BIAS ID'S USED	1	USE NESTED HOLES	YES
NUMBER OF DIFFERENTIAL ALBEDOS USED	0	NUMBER OF HOLES	140
TOTAL INPUT GEOMETRY REGIONS	100	MAXIMUM HOLE NESTING LEVEL	4
NUMBER OF GEOMETRY REGIONS USED	87	USE NESTED ARRAYS	YES
LARGEST GEOMETRY UNIT NUMBER	450	NUMBER OF ARRAYS USED	7
LARGEST ARRAY NUMBER	43	MAXIMUM ARRAY NESTING LEVEL	2
+X BOUNDARY CONDITION	MIR	-X BOUNDARY CONDITION	MIR
+Y BOUNDARY CONDITION	MIR	-Y BOUNDARY CONDITION	MIR
+Z BOUNDARY CONDITION	MIR	-Z BOUNDARY CONDITION	MIR

ARRAY NUMBER	UNITS IN X DIR.	UNITS IN Y DIR.	UNITS IN Z DIR.	NESTING LEVEL
1	1	5	1	2
2	1	3	1	2
3	1	3	1	2
20 GLOBAL	1	1	7	1
41	1	5	1	2
42	1	3	1	2
43	1	3	1	2

.... 0 IO'S WERE USED LOADING THE DATA ....

```
                                          TRIGA - PREF. FLOOD CANISTER

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID


                                                      -----  UNIT     1   -----

TRIGA FUEL (SMEARED)

  1 CYLINDER          1   1  RADIUS =  3.9623     +Z =  60.959     -Z = 1.00000E-03 CENTERLINE IS AT  X = 0.00000       Y = 0.00000

                                                      -----  UNIT     5   -----

3.38 IN WIDTH / 0.28 IN THICKNESS DIVIDER CENTER STACK (SEALED)

  1 CUBOID            2   1      +X =  4.2672     -X = -4.2672     +Y = 0.71120     -Y = 0.00000     +Z =  74.290     -Z = -8.2550

                                                      -----  UNIT     6   -----

3.38 IN WIDTH / 0.24 IN THICKNESS DIVIDER OUTSIDE STACK (SEALED)

  1 CUBOID            2   1      +X =  4.2672     -X = -4.2672     +Y = 0.60960     -Y = 0.00000     +Z =  74.290     -Z = -8.2550

                                                      -----  UNIT     7   -----

SEALED CANISTER

  1 CYLINDER          3   1  RADIUS =  3.9624     +Z =  60.960     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000

    HOLE NUMBER       1        AT X = 0.00000     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER       1

  2 CYLINDER          2   1  RADIUS =  4.1275     +Z =  63.500     -Z = -1.2700     CENTERLINE IS AT  X = 0.00000       Y = 0.00000

  3 CYLINDER         12   1  RADIUS =  4.1275     +Z =  74.290     -Z = -8.2550     CENTERLINE IS AT  X = 0.00000       Y = 0.00000

                                                      -----  UNIT    10   -----

TRIGA ELEMENTS IN TOP OF 3.38 IN X 3.38 IN OPENING (SEALED)

  1 CUBOID           12   1      +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  74.290     -Z = -8.2550

    HOLE NUMBER       2        AT X = 0.00000     Y = 0.13970      Z = 0.00000     IS UNIT NUMBER       7

                                                      -----  UNIT    11   -----

TRIGA ELEMENTS IN BOTTOM OF 3.38 IN X 3.38 IN OPENING (SEALED)

  1 CUBOID           12   1      +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  74.290     -Z = -8.2550

    HOLE NUMBER       3        AT X = 0.00000     Y =-0.13970      Z = 0.00000     IS UNIT NUMBER       7
                                          TRIGA - PREF. FLOOD CANISTER

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID


                                                      -----  UNIT    12   -----

TRIGA ELEMENTS IN BOTTOM RIGHT OF 3.38 IN X 3.38 IN OPENING (SEALED)

  1 CUBOID           12   1      +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  74.290     -Z = -8.2550

    HOLE NUMBER       4        AT X = 0.13970     Y =-0.13970      Z = 0.00000     IS UNIT NUMBER       7

                                                      -----  UNIT    13   -----

TRIGA ELEMENTS IN TOP RIGHT OF 3.38 IN X 3.38 IN OPENING (SEALED)

  1 CUBOID           12   1      +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  74.290     -Z = -8.2550

    HOLE NUMBER       5        AT X = 0.13970     Y = 0.13970      Z = 0.00000     IS UNIT NUMBER       7

                                                      -----  UNIT    14   -----

TRIGA ELEMENTS IN BOTTOM LEFT OF 3.38 IN X 3.38 IN OPENING (SEALED)

  1 CUBOID           12   1      +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  74.290     -Z = -8.2550

    HOLE NUMBER       6        AT X =-0.13970     Y =-0.13970      Z = 0.00000     IS UNIT NUMBER       7

                                                      -----  UNIT    15   -----

TRIGA ELEMENTS IN TOP LEFT OF 3.38 IN X 3.38 IN OPENING (SEALED)

  1 CUBOID           12   1      +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  74.290     -Z = -8.2550
```

```
   HOLE NUMBER       7       AT X =-0.13970      Y = 0.13970       Z = 0.00000      IS UNIT NUMBER       7

                                                ----- UNIT    16   -----

TRIGA BASKET 3.38 IN X 3.38 IN CENTER OPENING (SEALED)

 1 CUBOID           12  1       +X =  4.2672    -X = -4.2672     +Y =  4.2672    -Y = -4.2672     +Z =  74.290    -Z = -8.2550

                                       -----  UNIT    20  EXTERNAL TO LATTICE  1   -----

CENTER COLUMN OF THREE OPENINGS W/ 0.28 IN PLATE (SEALED)

 1 ARRAY NUMBER      1          +X =  4.2672    -X = -4.2672     +Y =  13.513    -Y = -13.513     +Z =  74.290    -Z = -8.2550

 2 CUBOID            2  1       +X =  4.9784    -X = -4.9784     +Y =  14.224    -Y = -14.224     +Z =  74.290    -Z = -8.2550
-                                          TRIGA - PREF. FLOOD CANISTER

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                       -----  UNIT    21  EXTERNAL TO LATTICE  2   -----

LEFT OUTSIDE COLUMN OF TWO OPENINGS W/ 0.12 IN PLATE (SEALED)

 1 ARRAY NUMBER      2          +X =  4.2672    -X = -4.2672     +Y =  8.8392    -Y = -8.8392     +Z =  74.290    -Z = -8.2550

 2 CUBOID            2  1       +X =  4.2672    -X = -4.5720     +Y =  9.1440    -Y = -9.1440     +Z =  74.290    -Z = -8.2550

                                       -----  UNIT    22  EXTERNAL TO LATTICE  3   -----

RIGHT OUTSIDE COLUMN OF TWO OPENINGS W/ 0.12 IN PLATE (SEALED)

 1 ARRAY NUMBER      3          +X =  4.2672    -X = -4.2672     +Y =  8.8392    -Y = -8.8392     +Z =  74.290    -Z = -8.2550

 2 CUBOID            2  1       +X =  4.5720    -X = -4.2672     +Y =  9.1440    -Y = -9.1440     +Z =  74.290    -Z = -8.2550

                                                ----- UNIT    30   -----

NAC-LWT TRIGA BASKET (SEALED)

 1 CYLINDER         12  1  RADIUS =  17.100    +Z =  74.290    -Z = -8.2550    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

   HOLE NUMBER       8       AT X = 0.00000      Y = 0.00000       Z = 0.00000      IS UNIT NUMBER      20

   HOLE NUMBER       9       AT X = -9.2457      Y = 0.00000       Z = 0.00000      IS UNIT NUMBER      21

   HOLE NUMBER      10       AT X =  9.2457      Y = 0.00000       Z = 0.00000      IS UNIT NUMBER      22

 2 CYLINDER          2  1  RADIUS =  18.910    +Z =  74.930    -Z = -8.8900    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

 3 CYLINDER          6  1  RADIUS =  33.465    +Z =  74.930    -Z = -8.8900    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

 4 CYLINDER          2  1  RADIUS =  36.519    +Z =  74.930    -Z = -8.8900    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

 5 CYLINDER          7  1  RADIUS =  49.223    +Z =  74.930    -Z = -8.8900    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

 6 CYLINDER          2  1  RADIUS =  49.822    +Z =  74.930    -Z = -8.8900    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

 7 CUBOID            8  1       +X =  121.92    -X = -121.92     +Y =  121.92    -Y = -121.92     +Z =  74.930    -Z = -8.8900

                                                ----- UNIT    41   -----

TRIGA FUEL ELEMENT

 1 CYLINDER         21  1  RADIUS = 0.64770    +Z =  27.940    -Z = -27.940    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

 2 CYLINDER         22  1  RADIUS = 0.68834    +Z =  27.940    -Z = -27.940    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

 3 CYLINDER         29  1  RADIUS = 0.68834    +Z =  43.480    -Z = -33.040    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
-                                          TRIGA - PREF. FLOOD CANISTER

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                                ----- UNIT    45   -----

DIVIDER CENTER STACK

 1 CUBOID            2  1       +X =  4.2672    -X = -4.2672     +Y = 0.71120    -Y = 0.00000     +Z =  43.480    -Z = -33.040

                                                ----- UNIT    46   -----

DIVIDER OUTSIDE STACK

 1 CUBOID            2  1       +X =  4.2672    -X = -4.2672     +Y = 0.60960    -Y = 0.00000     +Z =  43.480    -Z = -33.040
```

```
                                        -----  UNIT   80   -----

SIMPLIFIED LID STRUCTURE NAC-LWT

  1 CYLINDER        2  1  RADIUS =  36.519     +Z =  14.135     -Z = -14.135     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  2 CYLINDER        8  1  RADIUS =  49.822     +Z =  14.135     -Z = -14.135     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  3 CUBOID          8  1      +X =  121.92     -X = -121.92     +Y =  121.92     -Y = -121.92     +Z =  14.135     -Z = -14.135

                                        -----  UNIT   81   -----

SIMPLIFIED CASK BOTTOM STRUCTURE NAC-LWT

  1 CYLINDER        6  1  RADIUS =  26.353     +Z =  3.8100     -Z = -3.8100     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  2 CYLINDER        2  1  RADIUS =  36.619     +Z =  13.970     -Z = -12.700     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  3 CYLINDER        8  1  RADIUS =  49.822     +Z =  13.970     -Z = -12.700     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  4 CUBOID          8  1      +X =  121.92     -X = -121.92     +Y =  121.92     -Y = -121.92     +Z =  13.970     -Z = -12.700

                                 ******************   GLOBAL   ******************
                                 -----  UNIT   82  EXTERNAL TO LATTICE 20   -----

STACK OF 5 BASKETS IN CASK

  1 ARRAY NUMBER   20             +X =  121.92     -X = -121.92     +Y =  121.92     -Y = -121.92     +Z =  230.87     -Z = -221.30

                                        -----  UNIT  411   -----

TRIGA FUEL ELEMENTS IN AL TUBE, RIGHT

  1 CYLINDER       23  1  RADIUS = 0.80518     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

    HOLE NUMBER    12       AT X = 0.11670      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER     41

  2 CYLINDER       30  1  RADIUS = 0.95250     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
                                 TRIGA - PREF. FLOOD CANISTER

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                        -----  UNIT  412   -----

TRIGA FUEL ELEMENTS IN AL TUBE, LEFT

  1 CYLINDER       23  1  RADIUS = 0.80518     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

    HOLE NUMBER    13       AT X =-0.11670      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER     41

  2 CYLINDER       30  1  RADIUS = 0.95250     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                        -----  UNIT  413   -----

TRIGA FUEL ELEMENTS IN AL TUBE, TOP

  1 CYLINDER       23  1  RADIUS = 0.80518     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

    HOLE NUMBER    14       AT X = 0.00000      Y = 0.11670      Z = 0.00000     IS UNIT NUMBER     41

  2 CYLINDER       30  1  RADIUS = 0.95250     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                        -----  UNIT  414   -----

TRIGA FUEL ELEMENTS IN AL TUBE, BOTTOM

  1 CYLINDER       23  1  RADIUS = 0.80518     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

    HOLE NUMBER    15       AT X = 0.00000      Y =-0.11670      Z = 0.00000     IS UNIT NUMBER     41

  2 CYLINDER       30  1  RADIUS = 0.95250     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                        -----  UNIT  415   -----

TRIGA FUEL ELEMENTS IN AL TUBE, TOP RIGHT

  1 CYLINDER       23  1  RADIUS = 0.80518     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

    HOLE NUMBER    16       AT X = 8.26000E-02  Y = 8.26000E-02  Z = 0.00000     IS UNIT NUMBER     41

  2 CYLINDER       30  1  RADIUS = 0.95250     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                        -----  UNIT  416   -----

TRIGA FUEL ELEMENTS IN AL TUBE, TOP LEFT
```

```
 1 CYLINDER        23  1  RADIUS = 0.80518     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
   HOLE NUMBER     17       AT X =-8.26000E-02  Y = 8.26000E-02  Z = 0.00000     IS UNIT NUMBER     41
 2 CYLINDER        30  1  RADIUS = 0.95250     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
                                          TRIGA - PREF. FLOOD CANISTER
-
                MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID

                                                 -----  UNIT   417   -----

TRIGA FUEL ELEMENTS IN AL TUBE, BOTTOM RIGHT
 1 CYLINDER        23  1  RADIUS = 0.80518     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
   HOLE NUMBER     18       AT X = 8.26000E-02  Y =-8.26000E-02  Z = 0.00000     IS UNIT NUMBER     41
 2 CYLINDER        30  1  RADIUS = 0.95250     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                                 -----  UNIT   418   -----

TRIGA FUEL ELEMENTS IN AL TUBE, BOTTOM LEFT
 1 CYLINDER        23  1  RADIUS = 0.80518     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
   HOLE NUMBER     19       AT X =-8.26000E-02  Y =-8.26000E-02  Z = 0.00000     IS UNIT NUMBER     41
 2 CYLINDER        30  1  RADIUS = 0.95250     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
                                          TRIGA - PREF. FLOOD CANISTER
-
                MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID

                                                 -----  UNIT   421   -----

AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, BOTTOM OPENING
 1 CUBOID          23  1      +X =   4.1529     -X = -4.1529      +Y =   4.1529     -Y = -4.1529     +Z =  43.480     -Z = -33.040
   HOLE NUMBER     36      AT X = -2.8576      Y = -2.8576       Z = 0.00000     IS UNIT NUMBER    415
   HOLE NUMBER     37      AT X =-0.95250      Y = -2.8576       Z = 0.00000     IS UNIT NUMBER    413
   HOLE NUMBER     38      AT X = 0.95250      Y = -2.8576       Z = 0.00000     IS UNIT NUMBER    413
   HOLE NUMBER     39      AT X =  2.8576      Y = -2.8576       Z = 0.00000     IS UNIT NUMBER    416
   HOLE NUMBER     40      AT X = -2.8576      Y =-0.95250       Z = 0.00000     IS UNIT NUMBER    411
   HOLE NUMBER     41      AT X =-0.95250      Y =-0.95250       Z = 0.00000     IS UNIT NUMBER    415
   HOLE NUMBER     42      AT X = 0.95250      Y =-0.95250       Z = 0.00000     IS UNIT NUMBER    416
   HOLE NUMBER     43      AT X =  2.8576      Y =-0.95250       Z = 0.00000     IS UNIT NUMBER    412
   HOLE NUMBER     44      AT X = -2.8576      Y = 0.95250       Z = 0.00000     IS UNIT NUMBER    411
   HOLE NUMBER     45      AT X =-0.95250      Y = 0.95250       Z = 0.00000     IS UNIT NUMBER    417
   HOLE NUMBER     46      AT X = 0.95250      Y = 0.95250       Z = 0.00000     IS UNIT NUMBER    418
   HOLE NUMBER     47      AT X =  2.8576      Y = 0.95250       Z = 0.00000     IS UNIT NUMBER    412
   HOLE NUMBER     48      AT X = -2.8576      Y =  2.8576       Z = 0.00000     IS UNIT NUMBER    417
   HOLE NUMBER     49      AT X =-0.95250      Y =  2.8576       Z = 0.00000     IS UNIT NUMBER    414
   HOLE NUMBER     50      AT X = 0.95250      Y =  2.8576       Z = 0.00000     IS UNIT NUMBER    414
   HOLE NUMBER     51      AT X =  2.8576      Y =  2.8576       Z = 0.00000     IS UNIT NUMBER    418
 2 CUBOID          23  1      +X =   4.1529     -X = -4.1529      +Y =   4.1529     -Y = -4.1529     +Z =  43.480     -Z = -33.040
                                          TRIGA - PREF. FLOOD CANISTER
-
                MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID

                                                 -----  UNIT   422   -----

AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, TOP OPENING
 1 CUBOID          23  1      +X =   4.1529     -X = -4.1529      +Y =   4.1529     -Y = -4.1529     +Z =  43.480     -Z = -33.040
   HOLE NUMBER     52      AT X = -2.8576      Y = -2.8576       Z = 0.00000     IS UNIT NUMBER    415
   HOLE NUMBER     53      AT X =-0.95250      Y = -2.8576       Z = 0.00000     IS UNIT NUMBER    413
   HOLE NUMBER     54      AT X = 0.95250      Y = -2.8576       Z = 0.00000     IS UNIT NUMBER    413
   HOLE NUMBER     55      AT X =  2.8576      Y = -2.8576       Z = 0.00000     IS UNIT NUMBER    416
```

```
    HOLE NUMBER     56       AT X = -2.8576      Y =-0.95250       Z = 0.00000      IS UNIT NUMBER     411
    HOLE NUMBER     57       AT X =-0.95250      Y =-0.95250       Z = 0.00000      IS UNIT NUMBER     415
    HOLE NUMBER     58       AT X = 0.95250      Y =-0.95250       Z = 0.00000      IS UNIT NUMBER     416
    HOLE NUMBER     59       AT X =  2.8576      Y =-0.95250       Z = 0.00000      IS UNIT NUMBER     412
    HOLE NUMBER     60       AT X = -2.8576      Y = 0.95250       Z = 0.00000      IS UNIT NUMBER     411
    HOLE NUMBER     61       AT X =-0.95250      Y = 0.95250       Z = 0.00000      IS UNIT NUMBER     417
    HOLE NUMBER     62       AT X = 0.95250      Y = 0.95250       Z = 0.00000      IS UNIT NUMBER     418
    HOLE NUMBER     63       AT X =  2.8576      Y = 0.95250       Z = 0.00000      IS UNIT NUMBER     412
    HOLE NUMBER     64       AT X = -2.8576      Y =  2.8576       Z = 0.00000      IS UNIT NUMBER     417
    HOLE NUMBER     65       AT X =-0.95250      Y =  2.8576       Z = 0.00000      IS UNIT NUMBER     414
    HOLE NUMBER     66       AT X = 0.95250      Y =  2.8576       Z = 0.00000      IS UNIT NUMBER     414
    HOLE NUMBER     67       AT X =  2.8576      Y =  2.8576       Z = 0.00000      IS UNIT NUMBER     418
  2 CUBOID          23  1       +X =  4.1529     -X = -4.1529     +Y =  4.1529     -Y = -4.1529     +Z =  43.480     -Z = -33.040
                                     TRIGA - PREF. FLOOD CANISTER
-
                MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID

                                                  -----  UNIT   423   -----

AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, BOTTOM LEFT OPENING

  1 CUBOID          23  1       +X =  4.1529     -X = -4.1529     +Y =  4.1529     -Y = -4.1529     +Z =  43.480     -Z = -33.040
    HOLE NUMBER     68       AT X = -2.8576      Y = -2.8576       Z = 0.00000      IS UNIT NUMBER     415
    HOLE NUMBER     69       AT X =-0.95250      Y = -2.8576       Z = 0.00000      IS UNIT NUMBER     413
    HOLE NUMBER     70       AT X = 0.95250      Y = -2.8576       Z = 0.00000      IS UNIT NUMBER     413
    HOLE NUMBER     71       AT X =  2.8576      Y = -2.8576       Z = 0.00000      IS UNIT NUMBER     416
    HOLE NUMBER     72       AT X = -2.8576      Y =-0.95250       Z = 0.00000      IS UNIT NUMBER     411
    HOLE NUMBER     73       AT X =-0.95250      Y =-0.95250       Z = 0.00000      IS UNIT NUMBER     415
    HOLE NUMBER     74       AT X = 0.95250      Y =-0.95250       Z = 0.00000      IS UNIT NUMBER     416
    HOLE NUMBER     75       AT X =  2.8576      Y =-0.95250       Z = 0.00000      IS UNIT NUMBER     412
    HOLE NUMBER     76       AT X = -2.8576      Y = 0.95250       Z = 0.00000      IS UNIT NUMBER     411
    HOLE NUMBER     77       AT X =-0.95250      Y = 0.95250       Z = 0.00000      IS UNIT NUMBER     417
    HOLE NUMBER     78       AT X = 0.95250      Y = 0.95250       Z = 0.00000      IS UNIT NUMBER     418
    HOLE NUMBER     79       AT X =  2.8576      Y = 0.95250       Z = 0.00000      IS UNIT NUMBER     412
    HOLE NUMBER     80       AT X = -2.8576      Y =  2.8576       Z = 0.00000      IS UNIT NUMBER     417
    HOLE NUMBER     81       AT X =-0.95250      Y =  2.8576       Z = 0.00000      IS UNIT NUMBER     414
    HOLE NUMBER     82       AT X = 0.95250      Y =  2.8576       Z = 0.00000      IS UNIT NUMBER     414
    HOLE NUMBER     83       AT X =  2.8576      Y =  2.8576       Z = 0.00000      IS UNIT NUMBER     418
  2 CUBOID          23  1       +X =  4.1529     -X = -4.1529     +Y =  4.1529     -Y = -4.1529     +Z =  43.480     -Z = -33.040
                                     TRIGA - PREF. FLOOD CANISTER
-
                MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID

                                                  -----  UNIT   424   -----

AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, TOP LEFT OPENING

  1 CUBOID          23  1       +X =  4.1529     -X = -4.1529     +Y =  4.1529     -Y = -4.1529     +Z =  43.480     -Z = -33.040
    HOLE NUMBER     84       AT X = -2.8576      Y = -2.8576       Z = 0.00000      IS UNIT NUMBER     415
    HOLE NUMBER     85       AT X =-0.95250      Y = -2.8576       Z = 0.00000      IS UNIT NUMBER     413
    HOLE NUMBER     86       AT X = 0.95250      Y = -2.8576       Z = 0.00000      IS UNIT NUMBER     413
    HOLE NUMBER     87       AT X =  2.8576      Y = -2.8576       Z = 0.00000      IS UNIT NUMBER     416
    HOLE NUMBER     88       AT X = -2.8576      Y =-0.95250       Z = 0.00000      IS UNIT NUMBER     411
    HOLE NUMBER     89       AT X =-0.95250      Y =-0.95250       Z = 0.00000      IS UNIT NUMBER     415
```

```
    HOLE NUMBER     90     AT X = 0.95250     Y =-0.95250     Z = 0.00000     IS UNIT NUMBER    416
    HOLE NUMBER     91     AT X =  2.8576     Y =-0.95250     Z = 0.00000     IS UNIT NUMBER    412
    HOLE NUMBER     92     AT X = -2.8576     Y = 0.95250     Z = 0.00000     IS UNIT NUMBER    411
    HOLE NUMBER     93     AT X =-0.95250     Y = 0.95250     Z = 0.00000     IS UNIT NUMBER    417
    HOLE NUMBER     94     AT X = 0.95250     Y = 0.95250     Z = 0.00000     IS UNIT NUMBER    418
    HOLE NUMBER     95     AT X =  2.8576     Y = 0.95250     Z = 0.00000     IS UNIT NUMBER    412
    HOLE NUMBER     96     AT X = -2.8576     Y =  2.8576     Z = 0.00000     IS UNIT NUMBER    417
    HOLE NUMBER     97     AT X =-0.95250     Y =  2.8576     Z = 0.00000     IS UNIT NUMBER    414
    HOLE NUMBER     98     AT X = 0.95250     Y =  2.8576     Z = 0.00000     IS UNIT NUMBER    414
    HOLE NUMBER     99     AT X =  2.8576     Y =  2.8576     Z = 0.00000     IS UNIT NUMBER    418
  2 CUBOID          23  1    +X =  4.1529    -X = -4.1529    +Y =  4.1529    -Y = -4.1529    +Z =  43.480    -Z = -33.040
                                        TRIGA - PREF. FLOOD CANISTER
-
               MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION          NUM   ID

                                                 -----  UNIT   425   -----

AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, BOTTOM RIGHT OPENING

  1 CUBOID          23  1    +X =  4.1529    -X = -4.1529    +Y =  4.1529    -Y = -4.1529    +Z =  43.480    -Z = -33.040
    HOLE NUMBER    100     AT X = -2.8576     Y = -2.8576     Z = 0.00000     IS UNIT NUMBER    415
    HOLE NUMBER    101     AT X =-0.95250     Y = -2.8576     Z = 0.00000     IS UNIT NUMBER    413
    HOLE NUMBER    102     AT X = 0.95250     Y = -2.8576     Z = 0.00000     IS UNIT NUMBER    413
    HOLE NUMBER    103     AT X =  2.8576     Y = -2.8576     Z = 0.00000     IS UNIT NUMBER    416
    HOLE NUMBER    104     AT X = -2.8576     Y =-0.95250     Z = 0.00000     IS UNIT NUMBER    411
    HOLE NUMBER    105     AT X =-0.95250     Y =-0.95250     Z = 0.00000     IS UNIT NUMBER    415
    HOLE NUMBER    106     AT X = 0.95250     Y =-0.95250     Z = 0.00000     IS UNIT NUMBER    416
    HOLE NUMBER    107     AT X =  2.8576     Y =-0.95250     Z = 0.00000     IS UNIT NUMBER    412
    HOLE NUMBER    108     AT X = -2.8576     Y = 0.95250     Z = 0.00000     IS UNIT NUMBER    411
    HOLE NUMBER    109     AT X =-0.95250     Y = 0.95250     Z = 0.00000     IS UNIT NUMBER    417
    HOLE NUMBER    110     AT X = 0.95250     Y = 0.95250     Z = 0.00000     IS UNIT NUMBER    418
    HOLE NUMBER    111     AT X =  2.8576     Y = 0.95250     Z = 0.00000     IS UNIT NUMBER    412
    HOLE NUMBER    112     AT X = -2.8576     Y =  2.8576     Z = 0.00000     IS UNIT NUMBER    417
    HOLE NUMBER    113     AT X =-0.95250     Y =  2.8576     Z = 0.00000     IS UNIT NUMBER    414
    HOLE NUMBER    114     AT X = 0.95250     Y =  2.8576     Z = 0.00000     IS UNIT NUMBER    414
    HOLE NUMBER    115     AT X =  2.8576     Y =  2.8576     Z = 0.00000     IS UNIT NUMBER    418
  2 CUBOID          23  1    +X =  4.1529    -X = -4.1529    +Y =  4.1529    -Y = -4.1529    +Z =  43.480    -Z = -33.040
                                        TRIGA - PREF. FLOOD CANISTER
-
               MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION          NUM   ID

                                                 -----  UNIT   426   -----

AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, TOP RIGHT OPENING

  1 CUBOID          23  1    +X =  4.1529    -X = -4.1529    +Y =  4.1529    -Y = -4.1529    +Z =  43.480    -Z = -33.040
    HOLE NUMBER    116     AT X = -2.8576     Y = -2.8576     Z = 0.00000     IS UNIT NUMBER    415
    HOLE NUMBER    117     AT X =-0.95250     Y = -2.8576     Z = 0.00000     IS UNIT NUMBER    413
    HOLE NUMBER    118     AT X = 0.95250     Y = -2.8576     Z = 0.00000     IS UNIT NUMBER    413
    HOLE NUMBER    119     AT X =  2.8576     Y = -2.8576     Z = 0.00000     IS UNIT NUMBER    416
    HOLE NUMBER    120     AT X = -2.8576     Y =-0.95250     Z = 0.00000     IS UNIT NUMBER    411
    HOLE NUMBER    121     AT X =-0.95250     Y =-0.95250     Z = 0.00000     IS UNIT NUMBER    415
    HOLE NUMBER    122     AT X = 0.95250     Y =-0.95250     Z = 0.00000     IS UNIT NUMBER    416
    HOLE NUMBER    123     AT X =  2.8576     Y =-0.95250     Z = 0.00000     IS UNIT NUMBER    412
    HOLE NUMBER    124     AT X = -2.8576     Y = 0.95250     Z = 0.00000     IS UNIT NUMBER    411
```

```
    HOLE NUMBER   125      AT X =-0.95250     Y = 0.95250      Z = 0.00000     IS UNIT NUMBER    417
    HOLE NUMBER   126      AT X = 0.95250     Y = 0.95250      Z = 0.00000     IS UNIT NUMBER    418
    HOLE NUMBER   127      AT X =  2.8576     Y = 0.95250      Z = 0.00000     IS UNIT NUMBER    412
    HOLE NUMBER   128      AT X = -2.8576     Y =  2.8576      Z = 0.00000     IS UNIT NUMBER    417
    HOLE NUMBER   129      AT X =-0.95250     Y =  2.8576      Z = 0.00000     IS UNIT NUMBER    414
    HOLE NUMBER   130      AT X = 0.95250     Y =  2.8576      Z = 0.00000     IS UNIT NUMBER    414
    HOLE NUMBER   131      AT X =  2.8576     Y =  2.8576      Z = 0.00000     IS UNIT NUMBER    418
  2 CUBOID          23  1      +X =  4.1529    -X = -4.1529    +Y =  4.1529    -Y = -4.1529    +Z =  43.480    -Z = -33.040

                                              -----  UNIT   430   -----

FUEL INSERT IN, CENTER OPENING
  1 CUBOID          23  1      +X =  4.2672    -X = -4.2672    +Y =  4.2672    -Y = -4.2672    +Z =  43.480    -Z = -33.040

                                              -----  UNIT   431   -----

FUEL INSERT IN, BOTTOM OPENING
  1 CUBOID          23  1      +X =  4.2672    -X = -4.2672    +Y =  4.2672    -Y = -4.2672    +Z =  43.480    -Z = -33.040
    HOLE NUMBER   132      AT X = 0.00000     Y =-0.11430      Z = 0.00000     IS UNIT NUMBER    421
                                        TRIGA - PREF. FLOOD CANISTER
-
                MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID

                                              -----  UNIT   432   -----

FUEL INSERT IN, TOP OPENING
  1 CUBOID          23  1      +X =  4.2672    -X = -4.2672    +Y =  4.2672    -Y = -4.2672    +Z =  43.480    -Z = -33.040
    HOLE NUMBER   133      AT X = 0.00000     Y = 0.11430      Z = 0.00000     IS UNIT NUMBER    422

                                              -----  UNIT   433   -----

FUEL INSERT IN, BOTTOM LEFT OPENING
  1 CUBOID          23  1      +X =  4.2672    -X = -4.2672    +Y =  4.2672    -Y = -4.2672    +Z =  43.480    -Z = -33.040
    HOLE NUMBER   134      AT X =-0.11430     Y =-0.11430      Z = 0.00000     IS UNIT NUMBER    423

                                              -----  UNIT   434   -----

FUEL INSERT IN, TOP LEFT OPENING
  1 CUBOID          23  1      +X =  4.2672    -X = -4.2672    +Y =  4.2672    -Y = -4.2672    +Z =  43.480    -Z = -33.040
    HOLE NUMBER   135      AT X =-0.11430     Y = 0.11430      Z = 0.00000     IS UNIT NUMBER    424

                                              -----  UNIT   435   -----

FUEL INSERT IN, BOTOM RIGHT OPENING
  1 CUBOID          23  1      +X =  4.2672    -X = -4.2672    +Y =  4.2672    -Y = -4.2672    +Z =  43.480    -Z = -33.040
    HOLE NUMBER   136      AT X = 0.11430     Y =-0.11430      Z = 0.00000     IS UNIT NUMBER    425

                                              -----  UNIT   436   -----

FUEL INSERT IN, TOP RIGHT OPENING
  1 CUBOID          23  1      +X =  4.2672    -X = -4.2672    +Y =  4.2672    -Y = -4.2672    +Z =  43.480    -Z = -33.040
    HOLE NUMBER   137      AT X = 0.11430     Y = 0.11430      Z = 0.00000     IS UNIT NUMBER    426

                                        -----  UNIT   440  EXTERNAL TO LATTICE 41   -----

CENTER COLUMN OF THREE OPENINGS
  1 ARRAY NUMBER    41         +X =  4.2672    -X = -4.2672    +Y =  13.513    -Y = -13.513    +Z =  43.480    -Z = -33.040
  2 CUBOID           2  1      +X =  4.9784    -X = -4.9784    +Y =  14.224    -Y = -14.224    +Z =  43.480    -Z = -33.040
                                        TRIGA - PREF. FLOOD CANISTER
-
                MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID

                                        -----  UNIT   441  EXTERNAL TO LATTICE 42   -----

LEFT OUTSIDE COLUMN OF TWO OPENINGS
```

```
  1 ARRAY NUMBER    42         +X =  4.2672     -X = -4.2672     +Y =  8.8392     -Y = -8.8392     +Z =  43.480     -Z = -33.040
  2 CUBOID           2  1      +X =  4.2672     -X = -4.6080     +Y =  9.1800     -Y = -9.1800     +Z =  43.480     -Z = -33.040

                                    -----  UNIT   442  EXTERNAL TO LATTICE 43   -----

RIGHT OUTSIDE COLUMN OF TWO OPENINGS
  1 ARRAY NUMBER    43         +X =  4.2672     -X = -4.2672     +Y =  8.8392     -Y = -8.8392     +Z =  43.480     -Z = -33.040
  2 CUBOID           2  1      +X =  4.6080     -X = -4.2672     +Y =  9.1800     -Y = -9.1800     +Z =  43.480     -Z = -33.040

                                                 -----  UNIT   450  -----

28 TRIGA FUEL ELEMENTS IN EACH LWT BASKET
  1 CYLINDER        23  1  RADIUS =  17.150     +Z =  43.485     -Z = -33.045     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
    HOLE NUMBER    138       AT X = 0.00000     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER    440
    HOLE NUMBER    139       AT X = -9.2457     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER    441
    HOLE NUMBER    140       AT X =  9.2457     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER    442
  2 CYLINDER         2  1  RADIUS =  18.910     +Z =  43.485     -Z = -33.045     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  3 CYLINDER        26  1  RADIUS =  33.465     +Z =  43.485     -Z = -33.045     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  4 CYLINDER         2  1  RADIUS =  36.519     +Z =  43.485     -Z = -33.045     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  5 CYLINDER        27  1  RADIUS =  49.223     +Z =  43.485     -Z = -33.045     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  6 CYLINDER         2  1  RADIUS =  49.822     +Z =  43.465     -Z = -33.045     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  7 CUBOID          28  1      +X =  121.92     -X = -121.92     +Y =  121.92     -Y = -121.92     +Z =  43.485     -Z = -33.045
_                              TRIGA - PREF. FLOOD CANISTER
                     -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   1        -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   5  BOTTOM TO TOP
 11
  5
 16
  5
 10
                     -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   2        -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   3  BOTTOM TO TOP
 12
  6
 13
                     -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   3        -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   3  BOTTOM TO TOP
 14
  6
 15
_                              TRIGA - PREF. FLOOD CANISTER
                     -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  20        -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
  81
Z LAYER   2, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
  30
Z LAYER   3, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
 450
Z LAYER   4, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
 450
Z LAYER   5, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
 450
Z LAYER   6, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
  30
Z LAYER   7, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
  80
                     -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  41        -------
```

```
Z LAYER    1, X COLUMN    1 TO    1 LEFT TO RIGHT    Y ROW    1 TO    5  BOTTOM TO TOP

 431

  45

 430

  45

 432
                         TRIGA - PREF. FLOOD CANISTER

            -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  42          -------

Z LAYER    1, X COLUMN    1 TO    1 LEFT TO RIGHT    Y ROW    1 TO    3  BOTTOM TO TOP

 435

  46

 436

            -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  43          -------

Z LAYER    1, X COLUMN    1 TO    1 LEFT TO RIGHT    Y ROW    1 TO    3  BOTTOM TO TOP

 433

  46

 434
```

TRIGA - PREF. FLOOD CANISTER
VOLUMES FOR THOSE UNITS UTILIZED IN THIS PROBLEM

UNIT	REGION	GEOMETRY REGION	VOLUME	CUMULATIVE VOLUME
1	1	1	3.00660E+03 CM**3	3.00660E+03 CM**3
5	1	2	5.01021E+02 CM**3	5.01021E+02 CM**3
6	1	3	4.29446E+02 CM**3	4.29446E+02 CM**3
7	1	4	2.50244E-01 CM**3	3.00685E+03 CM**3
	2	5	4.59706E+02 CM**3	3.46655E+03 CM**3
	3	6	9.51335E+02 CM**3	4.41789E+03 CM**3
10	1	7	1.59436E+03 CM**3	6.01225E+03 CM**3
11	1	8	1.59436E+03 CM**3	6.01225E+03 CM**3
12	1	9	1.59436E+03 CM**3	6.01225E+03 CM**3
13	1	10	1.59436E+03 CM**3	6.01225E+03 CM**3
14	1	11	1.59436E+03 CM**3	6.01225E+03 CM**3
15	1	12	1.59436E+03 CM**3	6.01225E+03 CM**3
16	1	13	6.01225E+03 CM**3	6.01225E+03 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 20 IS AN ARRAY PLACEMENT BOUNDARY REGION				
20	1	20	1.90388E+04 CM**3	1.90388E+04 CM**3
	2	21	4.34218E+03 CM**3	2.33810E+04 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 22 IS AN ARRAY PLACEMENT BOUNDARY REGION				
21	1	22	1.24539E+04 CM**3	1.24539E+04 CM**3
	2	23	8.89567E+02 CM**3	1.33435E+04 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 24 IS AN ARRAY PLACEMENT BOUNDARY REGION				
22	1	24	1.24539E+04 CM**3	1.24539E+04 CM**3
	2	25	8.89567E+02 CM**3	1.33435E+04 CM**3
30	1	26	2.57606E+04 CM**3	7.58286E+04 CM**3
	2	27	1.83375E+04 CM**3	9.41660E+04 CM**3
	3	28	2.00728E+05 CM**3	2.94894E+05 CM**3
	4	29	5.62864E+04 CM**3	3.51181E+05 CM**3
	5	30	2.86831E+05 CM**3	6.38011E+05 CM**3
	6	31	1.56332E+04 CM**3	6.53645E+05 CM**3
	7	32	4.33012E+06 CM**3	4.98377E+06 CM**3
41	1	33	7.36468E+01 CM**3	7.36468E+01 CM**3
	2	34	9.53190E+00 CM**3	8.31787E+01 CM**3
	3	35	3.07231E+01 CM**3	1.13902E+02 CM**3
45	1	39	4.64451E+02 CM**3	4.64451E+02 CM**3
46	1	40	3.98101E+02 CM**3	3.98101E+02 CM**3
80	1	93	1.18444E+05 CM**3	1.18444E+05 CM**3
	2	94	1.02013E+05 CM**3	2.20456E+05 CM**3
	3	95	1.46043E+06 CM**3	1.68089E+06 CM**3
81	1	96	1.66245E+04 CM**3	1.66245E+04 CM**3
	2	97	9.57276E+04 CM**3	1.12352E+05 CM**3
	3	98	9.56257E+04 CM**3	2.07978E+05 CM**3

	4	99	1.37777E+06 CM**3	1.58574E+06 CM**3

SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 100 IS AN ARRAY PLACEMENT BOUNDARY REGION

82	1	100	2.68851E+07 CM**3	2.68851E+07 CM**3
411	1	43	4.19496E+01 CM**3	1.55851E+02 CM**3
	2	44	6.22481E+01 CM**3	2.18100E+02 CM**3
412	1	45	4.19496E+01 CM**3	1.55851E+02 CM**3
	2	46	6.22481E+01 CM**3	2.18100E+02 CM**3
413	1	47	4.19496E+01 CM**3	1.55851E+02 CM**3
	2	48	6.22481E+01 CM**3	2.18100E+02 CM**3
414	1	49	4.19496E+01 CM**3	1.55851E+02 CM**3
	2	50	6.22481E+01 CM**3	2.18100E+02 CM**3
415	1	51	4.19496E+01 CM**3	1.55851E+02 CM**3
	2	52	6.22481E+01 CM**3	2.18100E+02 CM**3
416	1	53	4.19496E+01 CM**3	1.55851E+02 CM**3
	2	54	6.22481E+01 CM**3	2.18100E+02 CM**3
417	1	55	4.19496E+01 CM**3	1.55851E+02 CM**3
	2	56	6.22481E+01 CM**3	2.18100E+02 CM**3
418	1	57	4.19496E+01 CM**3	1.55851E+02 CM**3
	2	58	6.22481E+01 CM**3	2.18100E+02 CM**3
421	1	61	1.78924E+03 CM**3	5.27883E+03 CM**3
	2	62	0.00000E+00 CM**3	5.27883E+03 CM**3
422	1	63	1.78924E+03 CM**3	5.27883E+03 CM**3
	2	64	0.00000E+00 CM**3	5.27883E+03 CM**3
423	1	65	1.78924E+03 CM**3	5.27883E+03 CM**3
	2	66	0.00000E+00 CM**3	5.27883E+03 CM**3
424	1	67	1.78924E+03 CM**3	5.27883E+03 CM**3
	2	68	0.00000E+00 CM**3	5.27883E+03 CM**3
425	1	69	1.78924E+03 CM**3	5.27883E+03 CM**3
	2	70	0.00000E+00 CM**3	5.27883E+03 CM**3
426	1	71	1.78924E+03 CM**3	5.27883E+03 CM**3
	2	72	0.00000E+00 CM**3	5.27883E+03 CM**3
430	1	73	5.57341E+03 CM**3	5.57341E+03 CM**3
431	1	74	2.94576E+02 CM**3	5.57341E+03 CM**3
432	1	75	2.94576E+02 CM**3	5.57341E+03 CM**3
433	1	76	2.94576E+02 CM**3	5.57341E+03 CM**3
434	1	77	2.94576E+02 CM**3	5.57341E+03 CM**3
435	1	78	2.94576E+02 CM**3	5.57341E+03 CM**3
436	1	79	2.94576E+02 CM**3	5.57341E+03 CM**3

SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 80 IS AN ARRAY PLACEMENT BOUNDARY REGION

440	1	80	1.76491E+04 CM**3	1.76491E+04 CM**3
	2	81	4.02524E+03 CM**3	2.16744E+04 CM**3

SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 82 IS AN ARRAY PLACEMENT BOUNDARY REGION

441	1	82	1.15449E+04 CM**3	1.15449E+04 CM**3
	2	83	9.23913E+02 CM**3	1.24688E+04 CM**3

SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 84 IS AN ARRAY PLACEMENT BOUNDARY REGION

442	1	84	1.15449E+04 CM**3	1.15449E+04 CM**3
	2	85	9.23913E+02 CM**3	1.24688E+04 CM**3
450	1	86	2.41027E+04 CM**3	7.07147E+04 CM**3
	2	87	1.52615E+04 CM**3	8.59762E+04 CM**3
	3	88	1.83270E+05 CM**3	2.69247E+05 CM**3
	4	89	5.13911E+04 CM**3	3.20638E+05 CM**3
	5	90	2.61884E+05 CM**3	5.82522E+05 CM**3
	6	91	1.42735E+04 CM**3	5.96796E+05 CM**3
	7	92	3.95352E+06 CM**3	4.55032E+06 CM**3

UNIT	USES	REGION	MIXTURE	TOTAL VOLUME
1	12	1	1	3.60792E+04 CM**3
5	4	1	2	2.00408E+03 CM**3
6	4	1	2	1.71778E+03 CM**3
7	12	1	3	3.00293E+00 CM**3
		2	2	5.51647E+03 CM**3
		3	12	1.14160E+04 CM**3
10	2	1	12	3.18871E+03 CM**3

11	2	1	12	3.18871E+03 CM**3
12	2	1	12	3.18871E+03 CM**3
13	2	1	12	3.18871E+03 CM**3
14	2	1	12	3.18871E+03 CM**3
15	2	1	12	3.18871E+03 CM**3
16	2	1	12	1.20245E+04 CM**3
20	2	1		3.80776E+04 CM**3
		2	2	8.68436E+03 CM**3
21	2	1		2.49079E+04 CM**3
		2	2	1.77913E+03 CM**3
22	2	1		2.49079E+04 CM**3
		2	2	1.77913E+03 CM**3
30	2	1	12	5.15212E+04 CM**3
		2	2	3.66750E+04 CM**3
		3	6	4.01456E+05 CM**3
		4	2	1.12573E+05 CM**3
		5	7	5.73661E+05 CM**3
		6	2	3.12664E+04 CM**3
		7	8	8.66024E+06 CM**3
41	288	1	21	2.12103E+04 CM**3
		2	22	2.74519E+03 CM**3
		3	29	8.84826E+03 CM**3
45	6	1	2	2.78670E+03 CM**3
46	6	1	2	2.38860E+03 CM**3
80	1	1	2	1.18444E+05 CM**3
		2	8	1.02013E+05 CM**3
		3	8	1.46043E+06 CM**3
81	1	1	6	1.66245E+04 CM**3
		2	2	9.57276E+04 CM**3
		3	8	9.56257E+04 CM**3
		4	8	1.37777E+06 CM**3
82	1	1		2.68851E+07 CM**3
411	36	1	23	1.51018E+03 CM**3
		2	30	2.24093E+03 CM**3
412	36	1	23	1.51018E+03 CM**3
		2	30	2.24093E+03 CM**3
413	36	1	23	1.51018E+03 CM**3
		2	30	2.24093E+03 CM**3
414	36	1	23	1.51018E+03 CM**3
		2	30	2.24093E+03 CM**3
415	36	1	23	1.51018E+03 CM**3
		2	30	2.24093E+03 CM**3
416	36	1	23	1.51018E+03 CM**3
		2	30	2.24093E+03 CM**3
417	36	1	23	1.51018E+03 CM**3
		2	30	2.24093E+03 CM**3
418	36	1	23	1.51018E+03 CM**3
		2	30	2.24093E+03 CM**3
421	3	1	23	5.36772E+03 CM**3
		2	23	0.00000E+00 CM**3
422	3	1	23	5.36772E+03 CM**3
		2	23	0.00000E+00 CM**3
423	3	1	23	5.36772E+03 CM**3
		2	23	0.00000E+00 CM**3
424	3	1	23	5.36772E+03 CM**3
		2	23	0.00000E+00 CM**3
425	3	1	23	5.36772E+03 CM**3
		2	23	0.00000E+00 CM**3
426	3	1	23	5.36772E+03 CM**3
		2	23	0.00000E+00 CM**3
430	3	1	23	1.67202E+04 CM**3
431	3	1	23	8.83729E+02 CM**3
432	3	1	23	8.83729E+02 CM**3
433	3	1	23	8.83729E+02 CM**3

434	3	1	23	6.83729E+02 CM**3
435	3	1	23	8.83729E+02 CM**3
436	3	1	23	6.83729E+02 CM**3
440	3	1		5.29474E+04 CM**3
		2	2	1.20757E+04 CM**3
441	3	1		3.46348E+04 CM**3
		2	2	2.77174E+03 CM**3
442	3	1		3.46348E+04 CM**3
		2	2	2.77174E+03 CM**3
450	3	1	23	7.23080E+04 CM**3
		2	2	4.57845E+04 CM**3
		3	26	5.49811E+05 CM**3
		4	2	1.54173E+05 CM**3
		5	27	7.85653E+05 CM**3
		6	2	4.28205E+04 CM**3
		7	28	1.18606E+07 CM**3

TOTAL MIXTURE VOLUMES

MIXTURE	TOTAL VOLUME	MASS(G)
1	3.60792E+04 CM**3	6.40483E+04
2	6.81739E+05 CM**3	5.39938E+06
3	3.00293E+00 CM**3	2.99744E+00
6	4.18081E+05 CM**3	4.74271E+06
7	5.73661E+05 CM**3	5.72612E-15
8	1.16961E+07 CM**3	1.16747E-13
12	9.40940E+04 CM**3	9.39219E-16
21	2.12103E+04 CM**3	1.24319E+05
22	2.74519E+03 CM**3	2.20507E+04
23	1.38618E+05 CM**3	1.38365E-15
26	5.49811E+05 CM**3	6.23706E+06
27	7.85653E+05 CM**3	7.84216E-15
28	1.18606E+07 CM**3	1.18389E-13
29	8.84826E+03 CM**3	3.48149E+04
30	1.79275E+04 CM**3	4.84400E+04

```
*******************************************************************************************
***                                                                                     ***
***                               BIASING INFORMATION                                   ***
***                                                                                     ***
***     A DEFAULT WEIGHT OF    0.500 WILL BE USED FOR ALL BIAS ID'S.                     ***
***                                                                                     ***
*******************************************************************************************
```

.... 0 IO'S WERE USED IN KENO-V BEFORE TRACKING ....

.... 0.02367 MINUTES WERE USED PROCESSING DATA. ....

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 2.13090E-03

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED WITH A FLAT DISTRIBUTION IN A CUBOID DEFINED BY:
+X= 1.21920E+02 -X=-1.21920E+02 +Y= 1.21920E+02 -Y=-1.21920E+02 +Z= 2.30870E+02 -Z=-2.21300E+02
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

KENO MESSAGE NUMBER K5-105 ***** WARNING, ONLY 218 INDEPENDENT STARTING POSITIONS WERE GENERATED. *****

282 ADDITIONAL STARTING POINTS WERE PICKED FROM THE INITAL DISTRIBUTION.

1.79750 MINUTES WERE REQUIRED FOR STARTING. TOTAL ELAPSED TIME IS 1.82400 MINUTES.

TRIGA - PREF. FLOOD CANISTER

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
1	8.58385E-01	1.83533E+00	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	469 INDEPENDENT	FISSION POINTS WERE	GENERATED	
2	8.20013E-01	1.85267E+00	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
3	8.93171E-01	1.86833E+00	8.93171E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	8.51732E-01	1.88383E+00	8.72452E-01	2.07195E-02	0.00000E+00	0.00000E+00
5	9.56889E-01	1.89950E+00	9.00597E-01	3.05823E-02	0.00000E+00	0.00000E+00
6	8.56755E-01	1.91683E+00	8.89637E-01	2.42441E-02	0.00000E+00	0.00000E+00
7	8.99010E-01	1.93233E+00	8.91512E-01	1.98727E-02	0.00000E+00	0.00000E+00
8	8.55045E-01	1.94983E+00	8.85434E-01	1.65648E-02	0.00000E+00	0.00000E+00
9	8.17044E-01	1.96717E+00	8.75664E-01	1.70718E-02	0.00000E+00	0.00000E+00
10	8.89217E-01	1.98367E+00	8.77358E-01	1.48814E-02	0.00000E+00	0.00000E+00
11	8.79461E-01	2.00200E+00	8.77592E-01	1.31262E-02	0.00000E+00	0.00000E+00
12	8.57589E-01	2.01850E+00	8.75591E-01	1.19096E-02	0.00000E+00	0.00000E+00
13	8.97931E-01	2.03483E+00	8.77622E-01	1.09624E-02	0.00000E+00	0.00000E+00
14	8.95053E-01	2.05133E+00	8.79075E-01	1.01122E-02	0.00000E+00	0.00000E+00
15	8.46539E-01	2.06783E+00	8.76572E-01	9.63264E-03	0.00000E+00	0.00000E+00
16	8.58684E-01	2.08533E+00	8.75294E-01	9.00916E-03	0.00000E+00	0.00000E+00
17	8.95472E-01	2.10083E+00	8.76639E-01	8.49427E-03	0.00000E+00	0.00000E+00
18	8.72854E-01	2.11633E+00	8.76403E-01	7.94918E-03	0.00000E+00	0.00000E+00
19	9.02891E-01	2.13200E+00	8.77961E-01	7.62778E-03	0.00000E+00	0.00000E+00
20	8.69112E-01	2.14850E+00	8.77469E-01	7.20833E-03	0.00000E+00	0.00000E+00
21	8.67503E-01	2.16483E+00	8.76945E-01	6.83854E-03	0.00000E+00	0.00000E+00
22	8.92655E-01	2.18133E+00	8.77730E-01	6.53499E-03	0.00000E+00	0.00000E+00
23	8.57401E-01	2.19883E+00	8.76762E-01	6.29095E-03	0.00000E+00	0.00000E+00
24	8.51490E-01	2.21517E+00	8.75614E-01	6.10719E-03	0.00000E+00	0.00000E+00
25	8.34943E-01	2.23267E+00	8.73845E-01	6.09765E-03	0.00000E+00	0.00000E+00
26	8.67554E-01	2.24917E+00	8.73583E-01	5.84394E-03	0.00000E+00	0.00000E+00
27	8.79591E-01	2.26567E+00	8.73824E-01	5.61046E-03	0.00000E+00	0.00000E+00
28	9.12288E-01	2.28017E+00	8.75303E-01	5.58968E-03	0.00000E+00	0.00000E+00
29	8.77621E-01	2.29667E+00	8.75389E-01	5.37936E-03	0.00000E+00	0.00000E+00
30	8.77030E-01	2.31317E+00	8.75447E-01	5.18401E-03	0.00000E+00	0.00000E+00
31	8.76863E-01	2.32967E+00	8.75496E-01	5.00230E-03	0.00000E+00	0.00000E+00
32	8.07900E-01	2.34617E+00	8.73243E-01	5.33213E-03	0.00000E+00	0.00000E+00
33	7.94050E-01	2.36350E+00	8.70688E-01	5.75529E-03	0.00000E+00	0.00000E+00
34	9.13671E-01	2.38100E+00	8.72032E-01	5.73213E-03	0.00000E+00	0.00000E+00
35	9.09756E-01	2.39650E+00	8.73175E-01	5.67211E-03	0.00000E+00	0.00000E+00
36	8.66713E-01	2.41300E+00	8.72985E-01	5.50604E-03	0.00000E+00	0.00000E+00
37	8.91592E-01	2.43033E+00	8.73516E-01	5.37278E-03	0.00000E+00	0.00000E+00
38	8.89052E-01	2.44683E+00	8.73948E-01	5.23920E-03	0.00000E+00	0.00000E+00
39	8.53232E-01	2.46417E+00	8.73388E-01	5.12630E-03	0.00000E+00	0.00000E+00
40	8.47542E-01	2.48167E+00	8.72708E-01	5.03572E-03	0.00000E+00	0.00000E+00
41	8.32282E-01	2.49817E+00	8.71671E-01	5.01323E-03	0.00000E+00	0.00000E+00
42	8.80644E-01	2.51550E+00	8.71896E-01	4.89144E-03	0.00000E+00	0.00000E+00
43	8.46160E-01	2.53383E+00	8.71268E-01	4.81176E-03	0.00000E+00	0.00000E+00
44	8.17915E-01	2.55033E+00	8.69998E-01	4.86459E-03	0.00000E+00	0.00000E+00
45	8.47782E-01	2.56767E+00	8.69481E-01	4.77812E-03	0.00000E+00	0.00000E+00
46	8.87202E-01	2.58417E+00	8.69884E-01	4.68561E-03	0.00000E+00	0.00000E+00
47	8.98788E-01	2.60067E+00	8.70526E-01	4.62512E-03	0.00000E+00	0.00000E+00
48	8.66389E-01	2.61717E+00	8.70436E-01	4.52435E-03	0.00000E+00	0.00000E+00
49	8.62631E-01	2.63367E+00	8.70270E-01	4.43015E-03	0.00000E+00	0.00000E+00
50	9.25740E-01	2.65000E+00	8.71426E-01	4.48820E-03	0.00000E+00	0.00000E+00
51	8.58742E-01	2.66750E+00	8.71167E-01	4.40327E-03	0.00000E+00	0.00000E+00
52	8.46811E-01	2.68483E+00	8.70680E-01	4.34172E-03	0.00000E+00	0.00000E+00
53	8.82070E-01	2.70050E+00	8.70903E-01	4.26159E-03	0.00000E+00	0.00000E+00
54	9.29469E-01	2.71600E+00	8.72029E-01	4.32794E-03	0.00000E+00	0.00000E+00
55	9.03982E-01	2.73067E+00	8.72632E-01	4.28809E-03	0.00000E+00	0.00000E+00
56	8.92219E-01	2.74617E+00	8.72995E-01	4.22354E-03	0.00000E+00	0.00000E+00
57	8.80188E-01	2.76267E+00	8.73126E-01	4.14810E-03	0.00000E+00	0.00000E+00
58	8.89059E-01	2.77917E+00	8.73410E-01	4.08328E-03	0.00000E+00	0.00000E+00
59	8.53596E-01	2.79567E+00	8.73063E-01	4.02603E-03	0.00000E+00	0.00000E+00
60	9.09480E-01	2.81117E+00	8.73690E-01	4.00553E-03	0.00000E+00	0.00000E+00
61	8.90852E-01	2.82767E+00	8.73981E-01	3.94778E-03	0.00000E+00	0.00000E+00
62	8.50242E-01	2.84500E+00	8.73586E-01	3.90154E-03	0.00000E+00	0.00000E+00
63	8.97337E-01	2.86150E+00	8.73975E-01	3.85676E-03	0.00000E+00	0.00000E+00
64	8.65665E-01	2.87800E+00	8.73841E-01	3.79641E-03	0.00000E+00	0.00000E+00
65	8.43750E-01	2.89533E+00	8.73363E-01	3.76607E-03	0.00000E+00	0.00000E+00
66	8.94593E-01	2.91183E+00	8.73695E-01	3.72157E-03	0.00000E+00	0.00000E+00
67	8.51098E-01	2.92750E+00	8.73347E-01	3.68033E-03	0.00000E+00	0.00000E+00
68	8.94945E-01	2.94400E+00	8.73675E-01	3.63888E-03	0.00000E+00	0.00000E+00
69	8.58716E-01	2.96033E+00	8.73451E-01	3.59110E-03	0.00000E+00	0.00000E+00
70	9.39102E-01	2.97600E+00	8.74417E-01	3.66726E-03	0.00000E+00	0.00000E+00
71	9.04811E-01	2.99250E+00	8.74857E-01	3.64047E-03	0.00000E+00	0.00000E+00
72	8.88414E-01	3.00800E+00	8.75051E-01	3.59331E-03	0.00000E+00	0.00000E+00
73	8.60679E-01	3.02350E+00	8.74849E-01	3.54812E-03	0.00000E+00	0.00000E+00
74	9.05985E-01	3.04100E+00	8.75281E-01	3.52512E-03	0.00000E+00	0.00000E+00
75	8.47041E-01	3.05750E+00	8.74894E-01	3.49795E-03	0.00000E+00	0.00000E+00
76	8.70802E-01	3.07567E+00	8.74839E-01	3.45080E-03	0.00000E+00	0.00000E+00
77	9.12350E-01	3.09133E+00	8.75339E-01	3.44102E-03	0.00000E+00	0.00000E+00
78	8.84373E-01	3.10783E+00	8.75458E-01	3.39752E-03	0.00000E+00	0.00000E+00
79	8.15890E-01	3.12333E+00	8.74684E-01	3.44119E-03	0.00000E+00	0.00000E+00
80	8.72068E-01	3.13983E+00	8.74651E-01	3.39695E-03	0.00000E+00	0.00000E+00
81	9.60401E-01	3.15633E+00	8.75736E-01	3.52496E-03	0.00000E+00	0.00000E+00
82	8.57043E-01	3.17283E+00	8.75503E-01	3.48845E-03	0.00000E+00	0.00000E+00
83	8.97911E-01	3.18933E+00	8.75779E-01	3.45621E-03	0.00000E+00	0.00000E+00
84	8.23655E-01	3.20567E+00	8.75144E-01	3.47248E-03	0.00000E+00	0.00000E+00
85	9.14504E-01	3.22133E+00	8.75618E-01	3.46301E-03	0.00000E+00	0.00000E+00
86	8.98812E-01	3.23783E+00	8.75894E-01	3.43265E-03	0.00000E+00	0.00000E+00
87	8.83572E-01	3.25433E+00	8.75984E-01	3.39323E-03	0.00000E+00	0.00000E+00
88	8.62041E-01	3.26983E+00	8.75822E-01	3.35746E-03	0.00000E+00	0.00000E+00
89	9.12080E-01	3.28717E+00	8.76239E-01	3.34471E-03	0.00000E+00	0.00000E+00
90	9.35211E-01	3.30367E+00	8.76909E-01	3.37371E-03	0.00000E+00	0.00000E+00

```
    91       9.22995E-01    3.31933E+00    8.77427E-01    3.37554E-03    0.00000E+00    0.00000E+00
    92       8.88973E-01    3.33667E+00    8.77555E-01    3.34029E-03    0.00000E+00    0.00000E+00
    93       8.77943E-01    3.35317E+00    8.77559E-01    3.30338E-03    0.00000E+00    0.00000E+00
KENO MESSAGE NUMBER K5-132      WARNING....ONLY  489 INDEPENDENT FISSION POINTS WERE GENERATED
    94       8.30893E-01    3.36967E+00    8.77052E-01    3.30642E-03    0.00000E+00    0.00000E+00
    95       9.14119E-01    3.38600E+00    8.77451E-01    3.29487E-03    0.00000E+00    0.00000E+00
    96       9.23056E-01    3.40250E+00    8.77936E-01    3.29554E-03    0.00000E+00    0.00000E+00
    97       8.83169E-01    3.42000E+00    8.77991E-01    3.26113E-03    0.00000E+00    0.00000E+00
    98       9.13851E-01    3.43550E+00    8.78364E-01    3.24853E-03    0.00000E+00    0.00000E+00
    99       8.95378E-01    3.45100E+00    8.78540E-01    3.21965E-03    0.00000E+00    0.00000E+00
   100       9.08199E-01    3.46667E+00    8.78843E-01    3.20096E-03    0.00000E+00    0.00000E+00
   101       8.96026E-01    3.48217E+00    8.79016E-01    3.17321E-03    0.00000E+00    0.00000E+00
   102       8.34000E-01    3.49867E+00    8.78566E-01    3.17341E-03    0.00000E+00    0.00000E+00
   103       8.47904E-01    3.51517E+00    8.78262E-01    3.15647E-03    0.00000E+00    0.00000E+00
   104       7.96188E-01    3.53250E+00    8.77458E-01    3.22729E-03    0.00000E+00    0.00000E+00
   105       8.78224E-01    3.55000E+00    8.77465E-01    3.19581E-03    0.00000E+00    0.00000E+00
   106       8.60681E-01    3.56633E+00    8.77304E-01    3.16905E-03    0.00000E+00    0.00000E+00
   107       9.01017E-01    3.58100E+00    8.77530E-01    3.14683E-03    0.00000E+00    0.00000E+00
   108       8.32264E-01    3.59850E+00    8.77103E-01    3.14612E-03    0.00000E+00    0.00000E+00
   109       8.84434E-01    3.61500E+00    8.77171E-01    3.11733E-03    0.00000E+00    0.00000E+00
   110       8.87295E-01    3.63050E+00    8.77265E-01    3.08976E-03    0.00000E+00    0.00000E+00
   111       8.71837E-01    3.64883E+00    8.77215E-01    3.06168E-03    0.00000E+00    0.00000E+00
KENO MESSAGE NUMBER K5-132      WARNING....ONLY  479 INDEPENDENT FISSION POINTS WERE GENERATED
   112       8.13694E-01    3.66617E+00    8.76638E-01    3.08819E-03    0.00000E+00    0.00000E+00
   113       8.78333E-01    3.68267E+00    8.76653E-01    3.06028E-03    0.00000E+00    0.00000E+00
   114       9.43140E-01    3.69917E+00    8.77246E-01    3.09039E-03    0.00000E+00    0.00000E+00
   115       9.10904E-01    3.71567E+00    8.77544E-01    3.07736E-03    0.00000E+00    0.00000E+00
   116       8.57323E-01    3.73217E+00    8.77367E-01    3.05540E-03    0.00000E+00    0.00000E+00
   117       9.55281E-01    3.74767E+00    8.78044E-01    3.10357E-03    0.00000E+00    0.00000E+00
KENO MESSAGE NUMBER K5-132      WARNING....ONLY  495 INDEPENDENT FISSION POINTS WERE GENERATED
   118       8.45758E-01    3.76417E+00    8.77766E-01    3.08926E-03    0.00000E+00    0.00000E+00
   119       9.02391E-01    3.78067E+00    8.77977E-01    3.06997E-03    0.00000E+00    0.00000E+00
   120       8.45014E-01    3.79800E+00    8.77697E-01    3.05663E-03    0.00000E+00    0.00000E+00
   121       8.56319E-01    3.81533E+00    8.77518E-01    3.03616E-03    0.00000E+00    0.00000E+00
   122       8.19759E-01    3.83467E+00    8.77036E-01    3.04898E-03    0.00000E+00    0.00000E+00
   123       8.31123E-01    3.85117E+00    8.76657E-01    3.04739E-03    0.00000E+00    0.00000E+00
   124       8.42923E-01    3.86850E+00    8.76380E-01    3.03493E-03    0.00000E+00    0.00000E+00
   125       8.39454E-01    3.88583E+00    8.76080E-01    3.02509E-03    0.00000E+00    0.00000E+00
   126       8.43608E-01    3.90233E+00    8.75818E-01    3.01200E-03    0.00000E+00    0.00000E+00
   127       8.52193E-01    3.91883E+00    8.75629E-01    2.99378E-03    0.00000E+00    0.00000E+00
   128       8.68966E-01    3.93533E+00    8.75576E-01    2.97040E-03    0.00000E+00    0.00000E+00
   129       8.54054E-01    3.95083E+00    8.75407E-01    2.95178E-03    0.00000E+00    0.00000E+00
   130       8.49799E-01    3.96733E+00    8.75207E-01    2.93546E-03    0.00000E+00    0.00000E+00
   131       8.41240E-01    3.98567E+00    8.74944E-01    2.92449E-03    0.00000E+00    0.00000E+00
   132       8.81364E-01    4.00217E+00    8.74993E-01    2.90233E-03    0.00000E+00    0.00000E+00
   133       8.72153E-01    4.01767E+00    8.74971E-01    2.88017E-03    0.00000E+00    0.00000E+00
   134       8.74716E-01    4.03417E+00    8.74969E-01    2.85827E-03    0.00000E+00    0.00000E+00
   135       8.81139E-01    4.05067E+00    8.75016E-01    2.83707E-03    0.00000E+00    0.00000E+00
   136       9.26320E-01    4.06617E+00    8.75399E-01    2.84173E-03    0.00000E+00    0.00000E+00
   137       8.59309E-01    4.08183E+00    8.75279E-01    2.82312E-03    0.00000E+00    0.00000E+00
   138       8.90454E-01    4.09733E+00    8.75391E-01    2.80451E-03    0.00000E+00    0.00000E+00
   139       8.37620E-01    4.11383E+00    8.75115E-01    2.79758E-03    0.00000E+00    0.00000E+00
   140       8.97867E-01    4.12933E+00    8.75280E-01    2.78212E-03    0.00000E+00    0.00000E+00
   141       9.24712E-01    4.14583E+00    8.75636E-01    2.78483E-03    0.00000E+00    0.00000E+00
   142       8.98803E-01    4.16233E+00    8.75801E-01    2.76982E-03    0.00000E+00    0.00000E+00
   143       9.30603E-01    4.17700E+00    8.76190E-01    2.77743E-03    0.00000E+00    0.00000E+00
   144       8.13329E-01    4.19350E+00    8.75747E-01    2.79311E-03    0.00000E+00    0.00000E+00
   145       8.83161E-01    4.21083E+00    8.75799E-01    2.77399E-03    0.00000E+00    0.00000E+00
   146       8.00468E-01    4.22733E+00    8.75276E-01    2.80389E-03    0.00000E+00    0.00000E+00
   147       8.75398E-01    4.24383E+00    8.75277E-01    2.78449E-03    0.00000E+00    0.00000E+00
   148       8.69677E-01    4.26033E+00    8.75238E-01    2.76562E-03    0.00000E+00    0.00000E+00
   149       8.83526E-01    4.27767E+00    8.75295E-01    2.74732E-03    0.00000E+00    0.00000E+00
   150       8.46287E-01    4.29417E+00    8.75099E-01    2.73572E-03    0.00000E+00    0.00000E+00
   151       8.92387E-01    4.31150E+00    8.75215E-01    2.71978E-03    0.00000E+00    0.00000E+00
   152       8.48212E-01    4.32800E+00    8.75035E-01    2.70758E-03    0.00000E+00    0.00000E+00
   153       9.22360E-01    4.34267E+00    8.75348E-01    2.70778E-03    0.00000E+00    0.00000E+00
   154       9.11516E-01    4.35917E+00    8.75586E-01    2.70041E-03    0.00000E+00    0.00000E+00
   155       9.15952E-01    4.37467E+00    8.75850E-01    2.69565E-03    0.00000E+00    0.00000E+00
   156       8.97890E-01    4.39117E+00    8.75993E-01    2.68191E-03    0.00000E+00    0.00000E+00
   157       8.44649E-01    4.40767E+00    8.75791E-01    2.67221E-03    0.00000E+00    0.00000E+00
   158       8.66426E-01    4.42333E+00    8.75731E-01    2.65571E-03    0.00000E+00    0.00000E+00
   159       8.25915E-01    4.43967E+00    8.75414E-01    2.65774E-03    0.00000E+00    0.00000E+00
   160       9.05299E-01    4.45617E+00    8.75603E-01    2.64763E-03    0.00000E+00    0.00000E+00
   161       8.78218E-01    4.47267E+00    8.75619E-01    2.63098E-03    0.00000E+00    0.00000E+00
   162       9.11280E-01    4.48917E+00    8.75842E-01    2.62397E-03    0.00000E+00    0.00000E+00
   163       9.09611E-01    4.50567E+00    8.76052E-01    2.61604E-03    0.00000E+00    0.00000E+00
   164       8.83771E-01    4.52117E+00    8.76099E-01    2.60028E-03    0.00000E+00    0.00000E+00
   165       8.53787E-01    4.53867E+00    8.75963E-01    2.58790E-03    0.00000E+00    0.00000E+00
   166       8.73819E-01    4.55500E+00    8.75949E-01    2.57211E-03    0.00000E+00    0.00000E+00
   167       9.13407E-01    4.57067E+00    8.76176E-01    2.56653E-03    0.00000E+00    0.00000E+00
   168       9.40557E-01    4.58533E+00    8.76564E-01    2.58033E-03    0.00000E+00    0.00000E+00
   169       8.76389E-01    4.60183E+00    8.76563E-01    2.56484E-03    0.00000E+00    0.00000E+00
   170       8.93145E-01    4.61733E+00    8.76662E-01    2.55143E-03    0.00000E+00    0.00000E+00
   171       8.87750E-01    4.63383E+00    8.76728E-01    2.53714E-03    0.00000E+00    0.00000E+00
   172       8.90461E-01    4.64933E+00    8.76808E-01    2.52347E-03    0.00000E+00    0.00000E+00
   173       9.18830E-01    4.66500E+00    8.77054E-01    2.52067E-03    0.00000E+00    0.00000E+00
   174       9.09051E-01    4.68050E+00    8.77240E-01    2.51287E-03    0.00000E+00    0.00000E+00
   175       8.86993E-01    4.69700E+00    8.77297E-01    2.49894E-03    0.00000E+00    0.00000E+00
   176       8.60004E-01    4.71167E+00    8.77197E-01    2.48652E-03    0.00000E+00    0.00000E+00
   177       8.62551E-01    4.72717E+00    8.77113E-01    2.47369E-03    0.00000E+00    0.00000E+00
   178       8.22895E-01    4.74267E+00    8.76805E-01    2.47881E-03    0.00000E+00    0.00000E+00
   179       8.87612E-01    4.75917E+00    8.76866E-01    2.46552E-03    0.00000E+00    0.00000E+00
   180       8.77614E-01    4.77483E+00    8.76871E-01    2.45163E-03    0.00000E+00    0.00000E+00
   181       9.00075E-01    4.79133E+00    8.77000E-01    2.44134E-03    0.00000E+00    0.00000E+00
   182       9.02042E-01    4.80683E+00    8.77139E-01    2.43173E-03    0.00000E+00    0.00000E+00
```

183	8.18851E-01	4.82417E+00	8.76817E-01	2.43960E-03	0.00000E+00	0.00000E+00
184	8.93587E-01	4.84067E+00	8.76909E-01	2.42791E-03	0.00000E+00	0.00000E+00
185	8.64996E-01	4.85617E+00	8.76844E-01	2.41548E-03	0.00000E+00	0.00000E+00
186	8.82922E-01	4.87267E+00	8.76877E-01	2.40255E-03	0.00000E+00	0.00000E+00
187	9.09855E-01	4.88833E+00	8.77056E-01	2.39617E-03	0.00000E+00	0.00000E+00
188	8.59406E-01	4.90483E+00	8.76961E-01	2.38514E-03	0.00000E+00	0.00000E+00
189	8.93490E-01	4.92117E+00	8.77049E-01	2.37399E-03	0.00000E+00	0.00000E+00
190	9.06273E-01	4.93867E+00	8.77205E-01	2.36644E-03	0.00000E+00	0.00000E+00
191	8.69597E-01	4.95417E+00	8.77164E-01	2.35423E-03	0.00000E+00	0.00000E+00
192	8.66903E-01	4.97167E+00	8.77110E-01	2.34243E-03	0.00000E+00	0.00000E+00
193	8.32013E-01	4.98983E+00	8.76874E-01	2.34207E-03	0.00000E+00	0.00000E+00
194	8.05299E-01	5.00733E+00	8.76501E-01	2.35947E-03	0.00000E+00	0.00000E+00
195	8.87950E-01	5.02383E+00	8.76561E-01	2.34797E-03	0.00000E+00	0.00000E+00
196	8.62069E-01	5.04033E+00	8.76486E-01	2.33703E-03	0.00000E+00	0.00000E+00
197	8.19291E-01	5.05667E+00	8.76193E-01	2.34344E-03	0.00000E+00	0.00000E+00
198	8.54419E-01	5.07417E+00	8.76082E-01	2.33410E-03	0.00000E+00	0.00000E+00
199	8.75956E-01	5.09067E+00	8.76081E-01	2.32222E-03	0.00000E+00	0.00000E+00
200	8.45077E-01	5.10700E+00	8.75924E-01	2.31576E-03	0.00000E+00	0.00000E+00
201	8.59187E-01	5.12350E+00	8.75840E-01	2.30563E-03	0.00000E+00	0.00000E+00
202	8.66802E-01	5.14100E+00	8.75795E-01	2.29452E-03	0.00000E+00	0.00000E+00
203	9.14057E-01	5.15750E+00	8.75986E-01	2.29099E-03	0.00000E+00	0.00000E+00

KENO MESSAGE NUMBER K5-123 EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

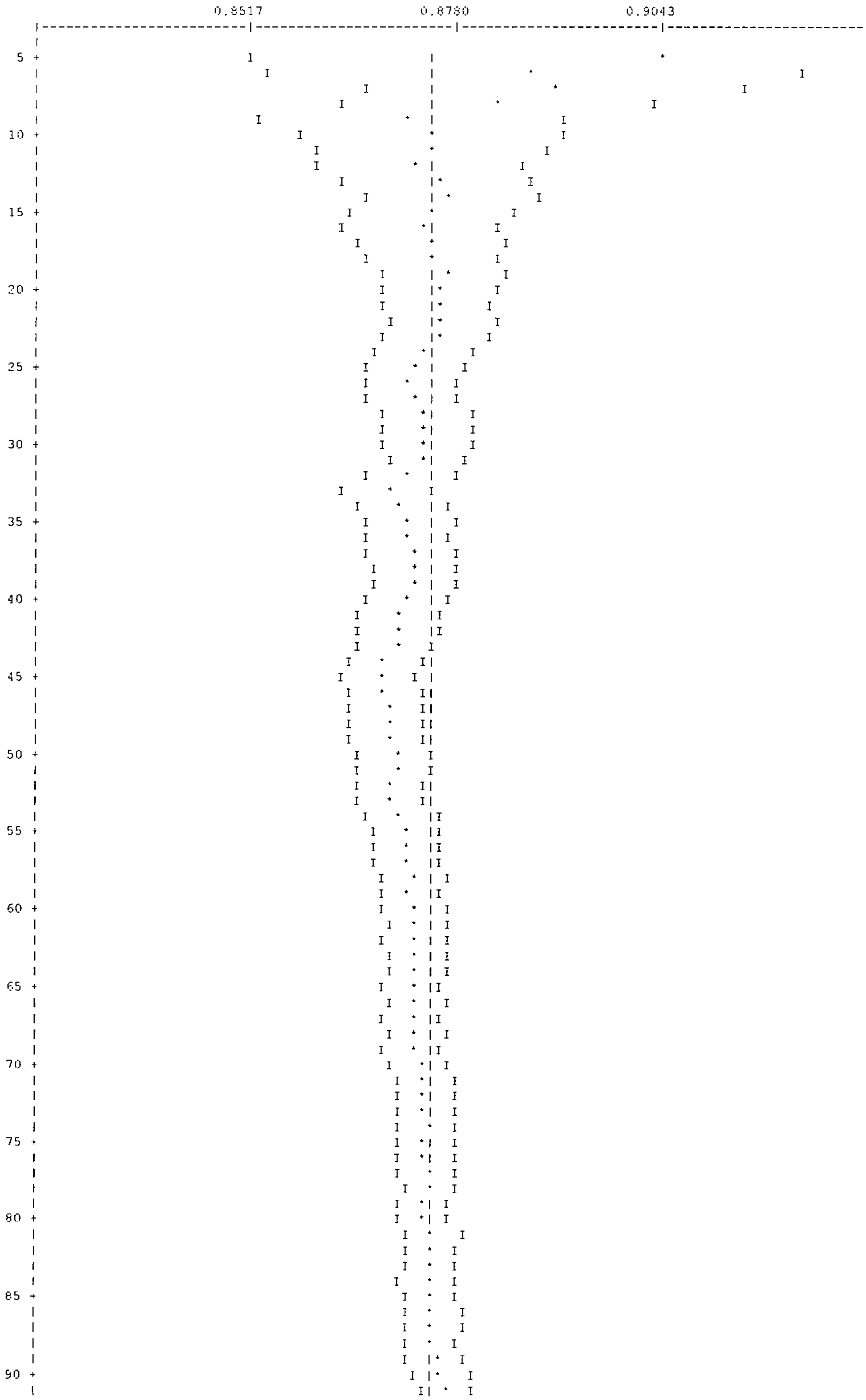
TRIGA - PREF. FLOOD CANISTER

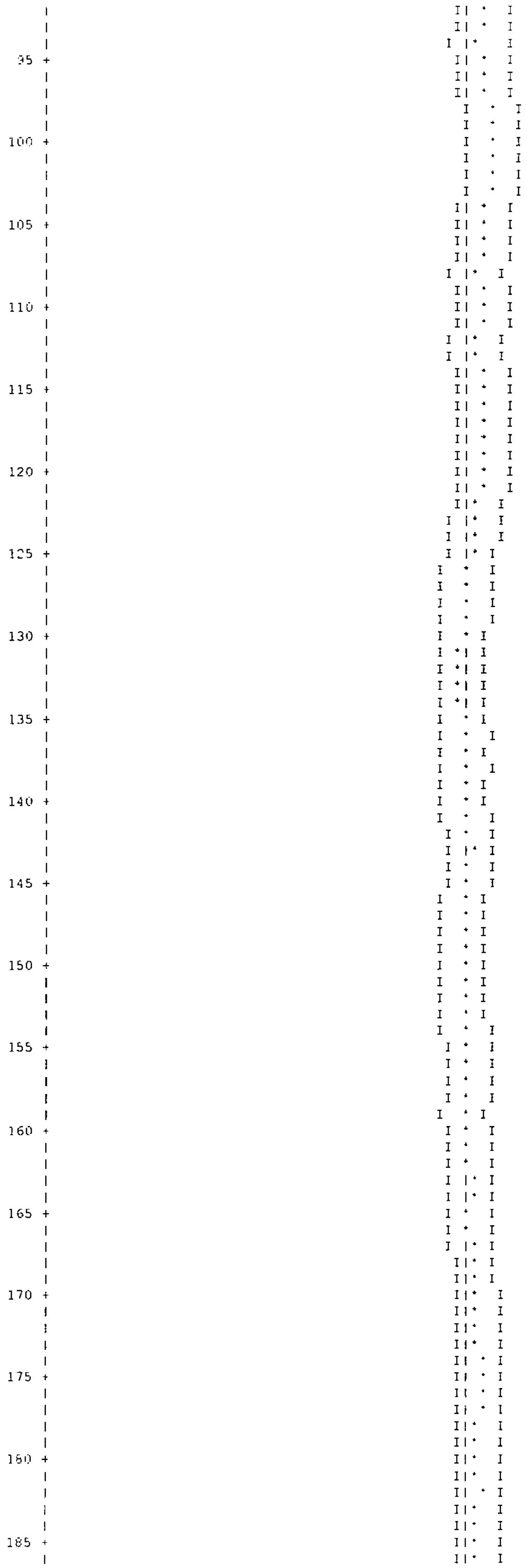
```
LIFETIME =  2.48937E-04 + OR -  2.49939E-06          GENERATION TIME =  4.88200E-05 + OR -  4.78127E-07
NU BAR   =  2.42071E+00 + OR -  1.83610E-05       AVERAGE FISSION GROUP =  2.23328E+01 + OR -  1.33962E-02
                  ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION =  1.36279E-01 + OR -  1.30059E-03
```

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.87590	+ OR - 0.00230	0.87360 TO 0.87820	0.87130 TO 0.88050	0.86900 TO 0.88280	100000
4	0.87602	+ OR - 0.00231	0.87371 TO 0.87833	0.87140 TO 0.88064	0.86909 TO 0.88295	99500
5	0.87561	+ OR - 0.00228	0.87333 TO 0.87790	0.87104 TO 0.88018	0.86876 TO 0.88247	99000
6	0.87571	+ OR - 0.00229	0.87341 TO 0.87800	0.87112 TO 0.88030	0.86883 TO 0.88259	98500
7	0.87559	+ OR - 0.00230	0.87329 TO 0.87789	0.87098 TO 0.88019	0.86868 TO 0.88250	98000
8	0.87569	+ OR - 0.00231	0.87338 TO 0.87801	0.87107 TO 0.88032	0.86876 TO 0.88263	97500
9	0.87600	+ OR - 0.00230	0.87369 TO 0.87830	0.87139 TO 0.88061	0.86909 TO 0.88291	97000
10	0.87593	+ OR - 0.00231	0.87361 TO 0.87824	0.87130 TO 0.88056	0.86898 TO 0.88287	96500
11	0.87591	+ OR - 0.00233	0.87358 TO 0.87824	0.87126 TO 0.88056	0.86893 TO 0.88289	96000
12	0.87601	+ OR - 0.00234	0.87367 TO 0.87834	0.87133 TO 0.88068	0.86899 TO 0.88302	95500
17	0.87593	+ OR - 0.00239	0.87355 TO 0.87832	0.87116 TO 0.88070	0.86878 TO 0.88309	93000
22	0.87579	+ OR - 0.00244	0.87335 TO 0.87824	0.87090 TO 0.88068	0.86846 TO 0.88313	90500
27	0.87629	+ OR - 0.00250	0.87380 TO 0.87879	0.87130 TO 0.88129	0.86880 TO 0.88378	88000
32	0.87647	+ OR - 0.00253	0.87394 TO 0.87900	0.87141 TO 0.88153	0.86888 TO 0.88406	85500
37	0.87651	+ OR - 0.00254	0.87397 TO 0.87904	0.87143 TO 0.88158	0.86889 TO 0.88412	83000
42	0.87700	+ OR - 0.00259	0.87441 TO 0.87959	0.87182 TO 0.88218	0.86923 TO 0.88477	80500
47	0.87756	+ OR - 0.00263	0.87493 TO 0.88019	0.87231 TO 0.88282	0.86968 TO 0.88544	78000
52	0.87774	+ OR - 0.00268	0.87506 TO 0.88042	0.87238 TO 0.88311	0.86970 TO 0.88579	75500
57	0.87706	+ OR - 0.00274	0.87432 TO 0.87981	0.87158 TO 0.88255	0.86883 TO 0.88529	73000
62	0.87701	+ OR - 0.00282	0.87419 TO 0.87982	0.87137 TO 0.88264	0.86856 TO 0.88546	70500
67	0.87725	+ OR - 0.00290	0.87435 TO 0.88014	0.87145 TO 0.88304	0.86856 TO 0.88593	68000
72	0.87648	+ OR - 0.00295	0.87353 TO 0.87944	0.87058 TO 0.88239	0.86762 TO 0.88534	65500
77	0.87637	+ OR - 0.00304	0.87333 TO 0.87941	0.87030 TO 0.88244	0.86726 TO 0.88548	63000
82	0.87630	+ OR - 0.00304	0.87327 TO 0.87934	0.87023 TO 0.88238	0.86719 TO 0.88542	60500
87	0.87599	+ OR - 0.00311	0.87288 TO 0.87909	0.86977 TO 0.88220	0.86667 TO 0.88531	58000
92	0.87471	+ OR - 0.00315	0.87156 TO 0.87786	0.86841 TO 0.88101	0.86526 TO 0.88417	55500
97	0.87419	+ OR - 0.00322	0.87097 TO 0.87741	0.86775 TO 0.88063	0.86453 TO 0.88384	53000
102	0.87343	+ OR - 0.00330	0.87013 TO 0.87673	0.86683 TO 0.88003	0.86353 TO 0.88333	50500
107	0.87430	+ OR - 0.00335	0.87095 TO 0.87765	0.86760 TO 0.88100	0.86425 TO 0.88435	48000
112	0.87520	+ OR - 0.00343	0.87176 TO 0.87863	0.86833 TO 0.88206	0.86490 TO 0.88550	45500
117	0.87323	+ OR - 0.00338	0.86985 TO 0.87661	0.86647 TO 0.87999	0.86309 TO 0.88338	43000
122	0.87443	+ OR - 0.00347	0.87096 TO 0.87790	0.86749 TO 0.88136	0.86403 TO 0.88483	40500
127	0.87657	+ OR - 0.00355	0.87302 TO 0.88013	0.86946 TO 0.88368	0.86591 TO 0.88724	38000
132	0.87780	+ OR - 0.00374	0.87407 TO 0.88154	0.87033 TO 0.88528	0.86659 TO 0.88901	35500
137	0.87743	+ OR - 0.00394	0.87349 TO 0.88137	0.86955 TO 0.88531	0.86561 TO 0.88925	33000
142	0.87641	+ OR - 0.00411	0.87230 TO 0.88051	0.86820 TO 0.88462	0.86409 TO 0.88872	30500
147	0.87782	+ OR - 0.00398	0.87384 TO 0.88180	0.86986 TO 0.88579	0.86587 TO 0.88977	28000
152	0.87878	+ OR - 0.00428	0.87451 TO 0.88306	0.87023 TO 0.88733	0.86596 TO 0.89161	25500
157	0.87664	+ OR - 0.00442	0.87222 TO 0.88107	0.86779 TO 0.88549	0.86337 TO 0.88991	23000
162	0.87655	+ OR - 0.00467	0.87187 TO 0.88122	0.86720 TO 0.88589	0.86253 TO 0.89057	20500
167	0.87511	+ OR - 0.00510	0.87001 TO 0.88021	0.86492 TO 0.88530	0.85982 TO 0.89040	18000
172	0.87147	+ OR - 0.00542	0.86606 TO 0.87689	0.86064 TO 0.88231	0.85522 TO 0.88773	15500
177	0.86839	+ OR - 0.00594	0.86245 TO 0.87434	0.85651 TO 0.88028	0.85057 TO 0.88622	13000
182	0.86610	+ OR - 0.00658	0.85952 TO 0.87267	0.85294 TO 0.87925	0.84636 TO 0.88583	10500
187	0.86361	+ OR - 0.00733	0.85628 TO 0.87094	0.84895 TO 0.87827	0.84163 TO 0.88560	8000
192	0.85656	+ OR - 0.00933	0.84723 TO 0.86588	0.83791 TO 0.87521	0.82858 TO 0.88453	5500
197	0.86925	+ OR - 0.00994	0.85931 TO 0.87919	0.84937 TO 0.88913	0.83943 TO 0.89907	3000

TRIGA - PREF. FLOOD CANISTER

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.8759 + OR - 0.0023 WHICH OCCURS FOR 203 GENERATIONS RUN.

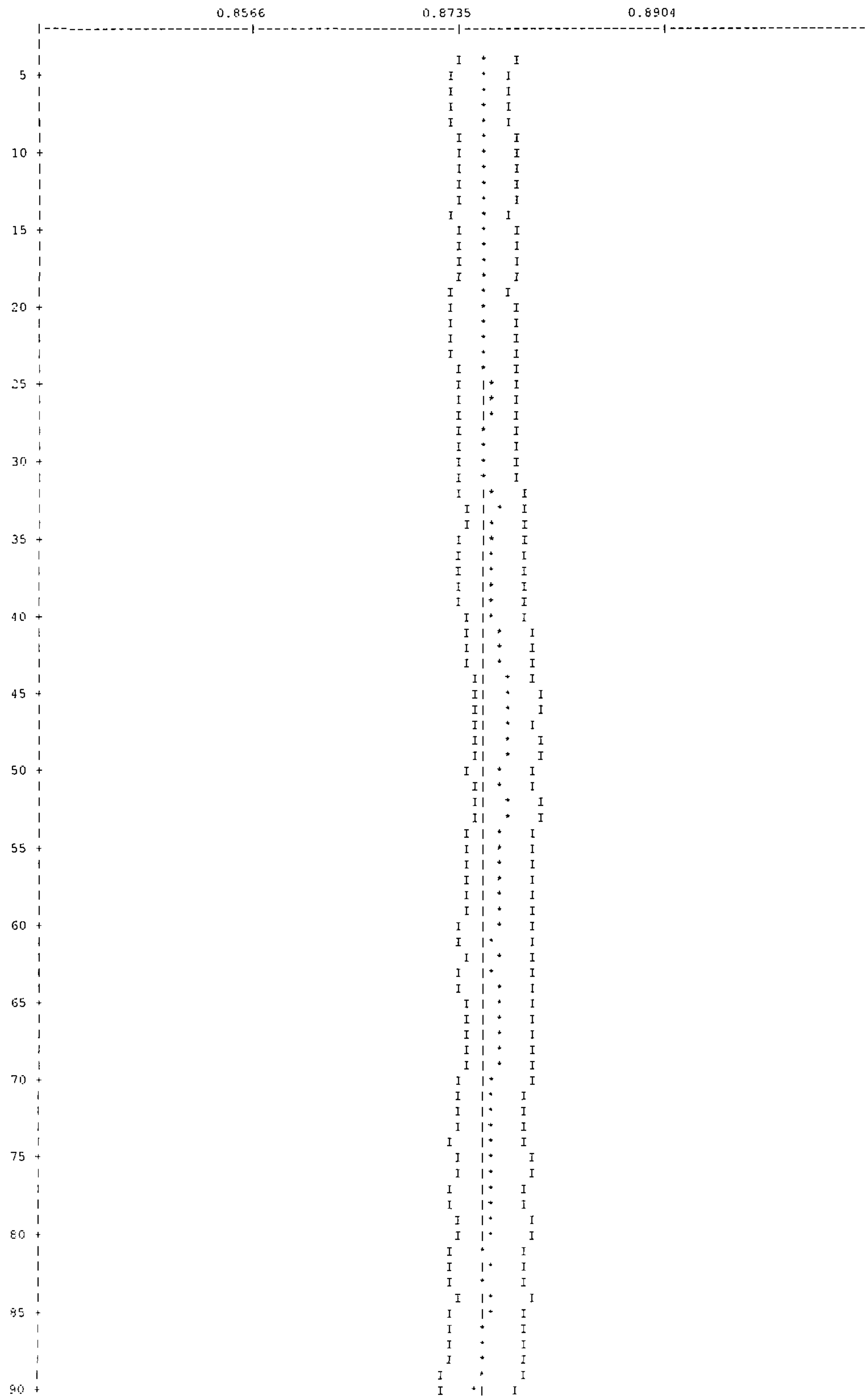


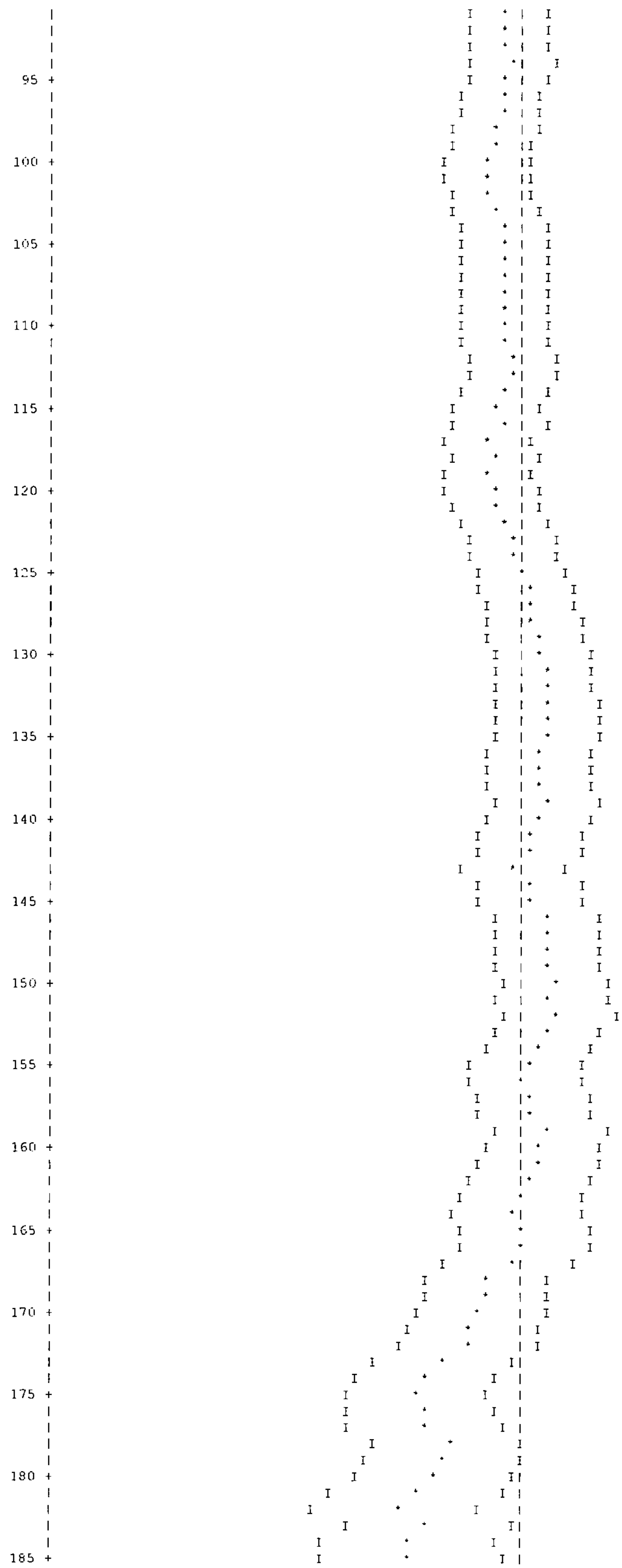

95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185

```
      |                                              I|*  I
      |                                              I|*  I
      |                                              I|*  I
  190 +                                              I| * I
      |                                              I| * I
      |                                              I| * I
      |                                              I|*  I
      |                                              I|* I
  195 +                                              I|* I
      |                                              I|* I
      |                                             I |* I
      |                                             I |* I
      |                                             I |* I
  200 +                                             I *  I
      |                                             I *  I
      |                                             I * I
      |                                             I *  I
```

TRIGA - PREF. FLOOD CANISTER

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION SKIPPED.
THE LINE REPRESENTS K-EFF = 0.8756 + OR - 0.0023 WHICH OCCURS FOR 5 GENERATIONS SKIPPED.




95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185

```
    |                            I          *          I  |
    |                        I          *          I      |
    |                        I          *           I     |
    |                    I           *           I        |
190 +               I           *           I             |
    |             I            *           I              |
    |           I             *            I              |
    |             I              *              I         |
    |                        I            *            I  |
195 +                   I             *             I     |
    |                I                *               I   |
    |                             I             *         |    I
    |                              I                 *    |           I
    |                        I                     *      |              I
200 +                                  I                  |     *                         I
    |                                        I            |                      *
```

TRIGA - PREF. FLOOD CANISTER

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0003			2.56018E-04	3.8496	1.25699E-03	3.1723	0.00000E+00	0.0000
2	0.0014			1.22398E-03	1.4507	3.43821E-03	0.9921	0.00000E+00	0.0000
3	0.0018			1.61485E-03	1.0573	1.72678E-03	0.7770	0.00000E+00	0.0000
4	0.0012			1.06025E-03	1.3116	9.63316E-04	0.9001	0.00000E+00	0.0000
5	0.0020			1.71122E-03	1.1056	2.36902E-03	0.7948	0.00000E+00	0.0000
6	0.0032			2.76174E-03	0.7774	9.11862E-03	0.7192	0.00000E+00	0.0000
7	0.0043			3.77211E-03	0.6579	2.04285E-02	0.6548	0.00000E+00	0.0000
8	0.0044			3.87077E-03	0.6914	1.71464E-02	0.6295	0.00000E+00	0.0000
9	0.0059			5.18781E-03	0.6946	1.76786E-02	0.5515	0.00000E+00	0.0000
10	0.0129			1.13315E-02	0.7029	4.47269E-02	0.5519	0.00000E+00	0.0000
11	0.0270			2.36314E-02	0.6591	5.84033E-02	0.5306	0.00000E+00	0.0000
12	0.0351			3.07643E-02	0.6089	4.62759E-02	0.5061	0.00000E+00	0.0000
13	0.0313			2.73796E-02	0.6250	5.51179E-02	0.4853	0.00000E+00	0.0000
14	0.0251			2.20157E-02	0.5789	6.43131E-02	0.5476	0.00000E+00	0.0000
15	0.0049			4.26451E-03	0.7710	3.08925E-02	0.8220	0.00000E+00	0.0000
16	0.0032			2.80705E-03	1.0406	1.72502E-02	0.8815	0.00000E+00	0.0000
17	0.0049			4.27848E-03	1.3408	9.67304E-03	0.8741	0.00000E+00	0.0000
18	0.0065			5.67280E-03	1.2992	8.93018E-03	0.8323	0.00000E+00	0.0000
19	0.0077			6.75195E-03	1.1157	1.43218E-02	0.7983	0.00000E+00	0.0000
20	0.0306			2.68092E-02	0.6428	4.39716E-02	0.6909	0.00000E+00	0.0000
21	0.0157			1.37874E-02	1.0465	1.62441E-02	0.8753	0.00000E+00	0.0000
22	0.0358			3.13575E-02	0.7425	3.18522E-02	0.7699	0.00000E+00	0.0000
23	0.1040			9.10929E-02	0.4225	8.49914E-02	0.4693	0.00000E+00	0.0000
24	0.1842			1.61359E-01	0.4232	1.29973E-01	0.4082	0.00000E+00	0.0000
25	0.1569			1.37437E-01	0.4836	1.02516E-01	0.4616	0.00000E+00	0.0000
26	0.2046			1.79249E-01	0.4884	1.23471E-01	0.5002	0.00000E+00	0.0000
27	0.0850			7.44517E-02	0.7552	4.55169E-02	0.7639	0.00000E+00	0.0000
SYSTEM TOTAL =				8.75900E-01	0.2627	1.00257E+00	0.0915	0.00000E+00	0.0000

ELAPSED TIME 5.15750 MINUTES

RANDOM NUMBER= 464866E647B1

```
TRIGA - PREF. FLOOD CANISTER

                              FREQUENCY FOR GENERATIONS    4 TO  203
0.7920 TO 0.8099     *****
0.8099 TO 0.8278     ***********
0.8278 TO 0.8457     ****************
0.8457 TO 0.8636     ****************************************
0.8636 TO 0.8815     ************************************
0.8815 TO 0.8994     ********************************************
0.8994 TO 0.9173     *****************************
0.9173 TO 0.9352     *********
0.9352 TO 0.9530     ****
0.9530 TO 0.9709     ***

                              FREQUENCY FOR GENERATIONS   54 TO  203
0.7920 TO 0.8099     ***
0.8099 TO 0.8278     *********
0.8278 TO 0.8457     **************
0.8457 TO 0.8636     **************************
0.8636 TO 0.8815     *************************
0.8815 TO 0.8994     **********************************
0.8994 TO 0.9173     *************************
0.9173 TO 0.9352     ********
0.9352 TO 0.9530     ****
0.9530 TO 0.9709     **

                              FREQUENCY FOR GENERATIONS  104 TO  203
0.7920 TO 0.8099     ***
0.8099 TO 0.8278     *******
0.8278 TO 0.8457     ***********
0.8457 TO 0.8636     *****************
0.8636 TO 0.8815     ********************
0.8815 TO 0.8994     *******************
0.8994 TO 0.9173     ***************
0.9173 TO 0.9352     *****
0.9352 TO 0.9530     **
0.9530 TO 0.9709     *

                              FREQUENCY FOR GENERATIONS  154 TO  203
0.7920 TO 0.8099     *
0.8099 TO 0.8278     ****
0.8278 TO 0.8457     ***
0.8457 TO 0.8636     *******
0.8636 TO 0.8815     **********
0.8815 TO 0.8994     ***********
0.8994 TO 0.9173     ************
0.9173 TO 0.9352     *
0.9352 TO 0.9530     *
0.9530 TO 0.9709


*******************************************************************************************************************************************
*

         CONGRATULATIONS!  YOU HAVE  SUCCESSFULLY TRAVERSED THE PERILOUS PATH THROUGH KENO V IN   5.15750 MINUTES

*******************************************************************************************************************************************
*
```

Figure 6.6.6-2 TRIGA Fuel Cluster Rods – Base Fuel Configuration - Poisoned Basket

```
      PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
MODULE CSAS25   WILL BE CALLED
  TRIGA - PREF. FLOOD CANISTER
  27GROUPNDF4  INFHOMMEDIUM
  'FUEL
  U-235    1 0.0 2.30596E-04 END
  U-238    1 0.0 1.62631E-05 END
  ZR       1 0.0 5.37586E-03 END
  H        1 0.0 8.45211E-03 END
  H2O      1 0.84220 293.0 END
  'CLAD, BASKET, AND CASK
  SS304    2 1.0 293.0 END
  'CANISTER INTERNAL MODERATOR
  H2O    3 1.0 293.0 END
  'ZIRCONIUM ROD
  ZR       4 1.0 293.0 END
  'GRAPHITE REFLETOR
  C        5 1.0 293.0 END
  'LEAD SHIELD
  PB       6 1.0 293.0 END
  'NEUTRON SHIELD
  H2O      7 1E-20 293.0 END
  'CASK EXTERNAL MATERIAL
  H2O      8 1E-20 293.0 END
  'END FITTING FOR FUEL ELEMENT
  SS304    9 0.337137 293.0 END
  H2O      9 1E-20 293.0 END
  'SECOND FUEL MATERIAL FOR UN-CANISTERED
  U-235    10 0.0 9.052980E-4 END
  U-238    10 0.0 3.849480E-4 END
  ZR       10 0.0 3.446510E-2 END
  H        10 0.0 5.514420E-2 END
  'SECOND END-FITTING MATERIAL FOR UN-CANISTERED FUEL
  SS304    11 0.337137 293.0 END
  H2O      11 DEN=0.662863 1.00E-3 293.0 END
  'CASK INTERIOR MODERATOR MATERIAL
  H2O  12 1.00E-3 293.0 END
  'NEUTRON ABSORBER PLATE WITH BORON
  FE      13 DEN=7.76 0.6717 293.0 END
  C       13 DEN=7.76 0.0001 293.0 END
  SI      13 DEN=7.76 0.0033 293.0 END
  MN      13 DEN=7.76 0.0060 293.0 END
  P       13 DEN=7.75 0.0001 293.0 END
  CR      13 DEN=7.76 0.1849 293.0 END
  NI      13 DEN=7.76 0.1233 293.0 END
  B-10    13 DEN=7.76 0.0073 293.0 END
  B-11    13 DEN=7.76 0.0007 293.0 END
  N       13 DEN=7.76 0.0017 293.0 END
  'NEUTRON ABSORBER PLATE WITHOUT BORON
  FE      14 DEN=7.76 0.6717 293.0 END
  C       14 DEN=7.76 0.0001 293.0 END
  SI      14 DEN=7.76 0.0033 293.0 END
  MN      14 DEN=7.76 0.0060 293.0 END
  P       14 DEN=7.75 0.0001 293.0 END
  CR      14 DEN=7.76 0.1849 293.0 END
  NI      14 DEN=7.76 0.1233 293.0 END
  N       14 DEN=7.76 0.0017 293.0 END
  'FUEL FOR RODS
  U-235    21 0.0 1.46137E-03 END
  U-238    21 0.0 1.03065E-04 END
  ZR       21 0.0 3.40686E-02 END
  H        21 0.0 5.35638E-02 END
  'CLAD INCOLOY
  NI               22        0 0.028516 END
  FE               22        0 0.033820 END
  CR               22        0 0.021151 END
  C                22        0 0.000399 END
  MN               22        0 0.001306 END
  S                22        0 0.000022 END
  SI               22        0 0.001703 END
  CU               22        0 0.000560 END
  AL               22        0 0.000266 END
  TI               22        0 0.000150 END
  'CASK INTERNAL MODERATOR
  H2O  23 1.00E-3 293.0 END
  'LEAD SHIELD
  PB       26 1.0 293.0 END
  'NEUTRON SHIELD
  H2O      27 1E-20 293.0 END
  'CASK EXTERNAL MATERIAL
  H2O      28 1E-20 293.0 END
  'END FITTING FOR FUEL ELEMENT
  SS304  29 .4968 293.0 END
  H2O      29 DEN=.5031 1.00E-3 293.0 END
  ' BASKET, AND CASK NEED TO LOOK AT HOW THIS IS USED
  SS304    212 1.0 293.0 END
  'NEUTRON ABSORBER PLATE WITH BORON
  FE      210 DEN=7.76 0.6717 293.0 END
  C       210 DEN=7.76 0.0001 293.0 END
```

```
SI      210 DEN=7.76 0.0033 293.0 END
MN      210 DEN=7.76 0.0060 293.0 END
P       210 DEN=7.75 0.0001 293.0 END
CR      210 DEN=7.76 0.1849 293.0 END
NI      210 DEN=7.76 0.1233 293.0 END
B-10    210 DEN=7.76 0.0073 293.0 END
B-11    210 DEN=7.76 0.0007 293.0 END
N       210 DEN=7.76 0.0017 293.0 END
'NEUTRON ABSORBER PLATE WITHOUT BORON
FE      211 DEN=7.76 0.6717 293.0 END
C       211 DEN=7.76 0.0001 293.0 END
SI      211 DEN=7.76 0.0033 293.0 END
MN      211 DEN=7.76 0.0060 293.0 END
P       211 DEN=7.75 0.0001 293.0 END
CR      211 DEN=7.76 0.1849 293.0 END
NI      211 DEN=7.76 0.1233 293.0 END
N       211 DEN=7.76 0.0017 293.0 END
'AL FUEL HOLDER
AL 215 1.0 293.0 END
END COMP
MORE DATA
RES=21  CYLINDER 0.6477 DAN(21)=.38879
END MORE
TRIGA - PREF. FLOOD CANISTER
READ PARAM TME=170.0 GEN=203 NPG=500 RUN=YES PLT=NO
TBA=2.0 END PARAM
READ GEOM
UNIT 1
COM='TRIGA FUEL (SMEARED)'
CYLINDER 1 1 3.9877 60.959 0.001
UNIT 5
COM='3.38 in Width / 0.28 in Thickness DIVIDER CENTER STACK (SEALED)'
CUBOID   2 1 2P4.2672 0.7112 0.0 +74.29 -8.255
UNIT 6
COM='3.38 in Width / 0.24 in Thickness DIVIDER OUTSIDE STACK (SEALED)'
CUBOID   2 1 2P4.2672 0.6096 0.0 +74.29 -8.255
UNIT 7
COM='SEALED CANISTER'
CYLINDER  3 1 3.9878 +60.96 0.0
HOLE      1  0.0 0.0 0.0
CYLINDER  2 1 4.1529 +63.50 -1.27
CYLINDER 12 1 4.1529 +74.29 -8.255
UNIT 10
COM='TRIGA ELEMENTS IN Top of 3.38 in x 3.38 in OPENING (SEALED)'
CUBOID    12 1 2P4.2672 2P4.2672 +74.29 -8.255
HOLE 7    0.0 0.1142 0.0
UNIT 11
COM='TRIGA ELEMENTS IN Bottom of 3.38 in x 3.38 in OPENING (SEALED)'
CUBOID    12 1 2P4.2672 2P4.2672 +74.29 -8.255
HOLE 7    0.0 -0.1142 0.0
UNIT 12
COM='TRIGA ELEMENTS IN Bottom Right of 3.38 in x 3.38 in OPENING (SEALED)'
CUBOID    12 1 2P4.2672 2P4.2672 +74.29 -8.255
HOLE 7    +0.1142 -0.1142 0.0
UNIT 13
COM='TRIGA ELEMENTS IN Top Right of 3.38 in x 3.38 in OPENING (SEALED)'
CUBOID    12 1 2P4.2672 2P4.2672 +74.29 -8.255
HOLE 7    +0.1142 +0.1142 0.0
UNIT 14
COM='TRIGA ELEMENTS IN Bottom Left of 3.38 in x 3.38 in OPENING (SEALED)'
CUBOID    12 1 2P4.2672 2P4.2672 +74.29 -8.255
HOLE 7    -0.1142 -0.1142 0.0
UNIT 15
COM='TRIGA ELEMENTS IN Top Left of 3.38 in x 3.38 in OPENING (SEALED)'
CUBOID    12 1 2P4.2672 2P4.2672 +74.29 -8.255
HOLE 7    -0.1142 +0.1142 0.0
UNIT 16
COM='TRIGA BASKET 3.38 in x 3.38 in CENTER OPENING (SEALED)'
CUBOID    12 1 2P4.2672 2P4.2672 +74.29 -8.255
HOLE       7  0.0  0.0  0.0
UNIT 17
COM='HORIZONTAL X-X POISON SHEET + WATER'
CUBOID  13 1 2P3.8227 0.3175 0.0 +73.02 -6.985
CUBOID  14 1 2P4.1402 0.3175 0.0 +73.02 -6.985
CUBOID  12 1 2P4.2672 0.3175 0.0 +74.29 -8.255
UNIT 18
COM='HORIZONTAL X-X POISON SHEET + WATER'
CUBOID  13 1 2P3.8227 0.3175 0.0 2P34.163
CUBOID  14 1 2P4.1402 0.3175 0.0 2P34.163
CUBOID  12 1 2P4.2672 0.3175 0.0 2P36.703
UNIT 20
COM='CENTER COLUMN OF THREE OPENINGS w/ 0.28 in plate (SEALED)'
ARRAY 1  -4.2672 -13.8303 -8.255
REPLICATE 2 1 4R0.7112 2R0.0 1
UNIT 21
COM='LEFT OUTSIDE COLUMN OF TWO OPENINGS w/ 0.12 in plate (SEALED)'
ARRAY 2  -4.2672 -8.9979 -8.255
REPLICATE 2 1 0.0 0.3048 2R0.3048 2R0.0 1
UNIT 22
COM='RIGHT OUTSIDE COLUMN OF TWO OPENINGS w/ 0.12 in plate (SEALED)'
ARRAY 3  -4.2672 -8.9979 -8.255
REPLICATE 2 1 0.3048 0.0 2R0.3048 2R0.0 1
UNIT 30
COM='NAC-LWT TRIGA BASKET (SEALED)'
CYLINDER 12  1 17.1 +74.29 -8.255
```

```
HOLE 20   0.0    0.0 0.0
HOLE 21  -9.2457 0.0 0.0
HOLE 22  +9.2457 0.0 0.0
CYLINDER 2  1 18.9103 +74.93 -8.890
CYLINDER 6  1 33.4645 +74.93 -8.890
CYLINDER 2  1 36.5189 +74.93 -8.890
CYLINDER 7   1 49.2227 +74.93 -8.890
CYLINDER 2  1 49.8221 +74.93 -8.890
CUBOID   8  1 4P49.8221 +74.93 -8.890
UNIT 41
COM='TRIGA FUEL ELEMENT'
CYLINDER  21 1 0.6477 2P27.94
CYLINDER  22 1 0.68834 2P27.94
CYLINDER  29 1 0.68834 43.48 -33.04
UNIT 42
COM='HORIZONTAL X-X POISON SHEET + WATER'
CUBOID   210 1 2P3.8227 0.3175 0.0 39.38 -28.94
CUBOID   211 1 2P4.1402 0.3175 0.0 39.38 -28.94
CUBOID   23  1 2P4.2672 0.3175 0.0 43.48 -33.04
UNIT 45
COM='DIVIDER CENTER STACK'
CUBOID   212 1 2P4.2672 0.7112 0.0 43.48 -33.04
UNIT 46
COM='DIVIDER OUTSIDE STACK'
CUBOID   212 1 2P4.2672 0.6096 0.0 43.48 -33.04
UNIT 410
COM='TRIGA FUEL ELEMENTS IN AL TUBE, CENTERED'
CYLINDER 23 1  0.809625  43.48 -33.04
HOLE  41  0.0 0.0 0.0
CYLINDER 215 1 0.94805  43.48 -33.04
UNIT 411
COM='TRIGA FUEL ELEMENTS IN AL TUBE, RIGHT'
CYLINDER 23 1  0.809625  43.48 -33.04
HOLE  41   0.12127  0.0 0.0
CYLINDER 215 1 0.94805  43.48 -33.04
UNIT 412
COM='TRIGA FUEL ELEMENTS IN AL TUBE, LEFT'
CYLINDER 23 1  0.809625  43.48 -33.04
HOLE  41  -0.12127  0.0 0.0
CYLINDER 215 1 0.94805  43.48 -33.04
UNIT 413
COM='TRIGA FUEL ELEMENTS IN AL TUBE, TOP'
CYLINDER 23 1  0.809625  43.48 -33.04
HOLE  41  0.0 0.12127 0.0
CYLINDER 215 1 0.94805  43.48 -33.04
UNIT 414
COM='TRIGA FUEL ELEMENTS IN AL TUBE, BOTTOM'
CYLINDER 23 1  0.809625  43.48 -33.04
HOLE  41  0.0 -0.12127 0.0
CYLINDER 215 1 0.94805  43.48 -33.04
UNIT 415
COM='TRIGA FUEL ELEMENTS IN AL TUBE, TOP RIGHT'
CYLINDER 23 1  0.809625  43.48 -33.04
HOLE  41  0.08574  0.08574 0.0
CYLINDER 215 1 0.94805  43.48 -33.04
UNIT 416
COM='TRIGA FUEL ELEMENTS IN AL TUBE, TOP LEFT'
CYLINDER 23 1  0.809625  43.48 -33.04
HOLE  41  -0.08574 0.08574 0.0
CYLINDER 215 1 0.94805  43.48 -33.04
UNIT 417
COM='TRIGA FUEL ELEMENTS IN AL TUBE, BOTTOM RIGHT'
CYLINDER 23 1  0.809625  43.48 -33.04
HOLE  41  0.08574  -0.08574 0.0
CYLINDER 215 1 0.94805  43.48 -33.04
UNIT 418
COM='TRIGA FUEL ELEMENTS IN AL TUBE, BOTTOM LEFT'
CYLINDER 23 1  0.809625  43.48 -33.04
HOLE  41  -0.08574 -0.08574 0.0
CYLINDER 215 1 0.94805  43.48 -33.04
UNIT 420
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, CENTER OPENING'
CUBOID     23 1 4P4.1529 43.48 -33.04
HOLE           415  -2.8443 -2.8443       0
HOLE           413  -0.94810 -2.8443       0
HOLE           413   0.94810 -2.8443       0
HOLE           416   2.8443 -2.8443       0
HOLE           411  -2.8443 -0.94810      0
HOLE           415  -0.94810 -0.94810      0
HOLE           416   0.94810 -0.94810      0
HOLE           412   2.8443 -0.94810      0
HOLE           411  -2.8443  0.94810      0
HOLE           417  -0.94810 0.94810      0
HOLE           418   0.94810 0.94810      0
HOLE           412   2.8443  0.94810      0
HOLE           417  -2.8443  2.8443       0
HOLE           414  -0.94810 2.8443       0
HOLE           414   0.94810 2.8443       0
HOLE           418   2.8443  2.8443       0
CUBOID     23 1 4P4.1529 43.48 -33.04
' CHECK 4.1 CM ABOVE********************
UNIT 421
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, BOTTOM OPENING'
CUBOID     23 1 4P4.1529 43.48 -33.04
HOLE           415  -2.8443 -2.8443       0
```

```
HOLE          413  -0.94810 -2.8443       0
HOLE          413   0.94810 -2.8443       0
HOLE          416   2.8443 -2.8443       0
HOLE          411  -2.8443 -0.94810      0
HOLE          415  -0.94810 -0.94810      0
HOLE          416   0.94810 -0.94810      0
HOLE          412   2.8443 -0.94810      0
HOLE          411  -2.8443  0.94810      0
HOLE          417  -0.94810 0.94810      0
HOLE          418   0.94810 0.94810      0
HOLE          412   2.8443  0.94810      0
HOLE          417  -2.8443  2.8443       0
HOLE          414  -0.94810 2.8443       0
HOLE          414   0.94810 2.8443       0
HOLE          418   2.8443  2.8443       0
CUBOID    23 1 4P4.1529 43.48 -33.04
' CHECK 4.1 CM ABOVE********************
UNIT 422
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, TOP OPENING'
CUBOID    23 1 4P4.1529 43.48 -33.04
HOLE          415  -2.8443 -2.8443       0
HOLE          413  -0.94810 -2.8443       0
HOLE          413   0.94810 -2.8443       0
HOLE          416   2.8443 -2.8443       0
HOLE          411  -2.8443 -0.94810      0
HOLE          415  -0.94810 -0.94810      0
HOLE          416   0.94810 -0.94810      0
HOLE          412   2.8443 -0.94810      0
HOLE          411  -2.8443  0.94810      0
HOLE          417  -0.94810 0.94810      0
HOLE          418   0.94810 0.94810      0
HOLE          412   2.8443  0.94810      0
HOLE          417  -2.8443  2.8443       0
HOLE          414  -0.94810 2.8443       0
HOLE          414   0.94810 2.8443       0
HOLE          418   2.8443  2.8443       0
CUBOID    23 1 4P4.1529 43.48 -33.04
' CHECK 4.1 CM ABOVE********************
UNIT 423
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, BOTTOM LEFT OPENING'
CUBOID    23 1 4P4.1529 43.48 -33.04
HOLE          415  -2.8443 -2.8443       0
HOLE          413  -0.94810 -2.8443       0
HOLE          413   0.94810 -2.8443       0
HOLE          416   2.8443 -2.8443       0
HOLE          411  -2.8443 -0.94810      0
HOLE          415  -0.94810 -0.94810      0
HOLE          416   0.94810 -0.94810      0
HOLE          412   2.8443 -0.94810      0
HOLE          411  -2.8443  0.94810      0
HOLE          417  -0.94810 0.94810      0
HOLE          418   0.94810 0.94810      0
HOLE          412   2.8443  0.94810      0
HOLE          417  -2.8443  2.8443       0
HOLE          414  -0.94810 2.8443       0
HOLE          414   0.94810 2.8443       0
HOLE          418   2.8443  2.8443       0
CUBOID    23 1 4P4.1529 43.48 -33.04
' CHECK 4.1 CM ABOVE********************
UNIT 424
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, TOP LEFT OPENING'
CUBOID    23 1 4P4.1529 43.48 -33.04
HOLE          415  -2.8443 -2.8443       0
HOLE          413  -0.94810 -2.8443       0
HOLE          413   0.94810 -2.8443       0
HOLE          416   2.8443 -2.8443       0
HOLE          411  -2.8443 -0.94810      0
HOLE          415  -0.94810 -0.94810      0
HOLE          416   0.94810 -0.94810      0
HOLE          412   2.8443 -0.94810      0
HOLE          411  -2.8443  0.94810      0
HOLE          417  -0.94810 0.94810      0
HOLE          418   0.94810 0.94810      0
HOLE          412   2.8443  0.94810      0
HOLE          417  -2.8443  2.8443       0
HOLE          414  -0.94810 2.8443       0
HOLE          414   0.94810 2.8443       0
HOLE          418   2.8443  2.8443       0
CUBOID    23 1 4P4.1529 43.48 -33.04
' CHECK 4.1 CM ABOVE********************
UNIT 425
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, BOTTOM RIGHT OPENING'
CUBOID    23 1 4P4.1529 43.48 -33.04
HOLE          415  -2.8443 -2.8443       0
HOLE          413  -0.94810 -2.8443       0
HOLE          413   0.94810 -2.8443       0
HOLE          416   2.8443 -2.8443       0
HOLE          411  -2.8443 -0.94810      0
HOLE          415  -0.94810 -0.94810      0
HOLE          416   0.94810 -0.94810      0
HOLE          412   2.8443 -0.94810      0
HOLE          411  -2.8443  0.94810      0
HOLE          417  -0.94810 0.94810      0
HOLE          418   0.94810 0.94810      0
HOLE          412   2.8443  0.94810      0
```

```
HOLE          417  -2.8443  2.8443       0
HOLE          414  -0.94810 2.8443       0
HOLE          414   0.94810 2.8443       0
HOLE          418   2.8443  2.8443       0
CUBOID    23 1 4P4.1529 43.48 -33.04
' CHECK 4.1 CM ABOVE''''''''''''''''''''
UNIT 426
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, TOP RIGHT OPENING'
CUBOID    23 1 4P4.1529 43.48 -33.04
HOLE          415  -2.8443 -2.8443       0
HOLE          413  -0.94810 -2.8443       0
HOLE          413   0.94810 -2.8443       0
HOLE          416   2.8443 -2.8443       0
HOLE          411  -2.8443 -0.94810      0
HOLE          415  -0.94810 -0.94810      0
HOLE          416   0.94810 -0.94810      0
HOLE          412   2.8443 -0.94810      0
HOLE          411  -2.8443  0.94810      0
HOLE          417  -0.94810 0.94810      0
HOLE          418   0.94810 0.94810      0
HOLE          412   2.8443  0.94810      0
HOLE          417  -2.8443  2.8443       0
HOLE          414  -0.94810 2.8443       0
HOLE          414   0.94810 2.8443       0
HOLE          418   2.8443  2.8443       0
CUBOID    23 1 4P4.1529 43.48 -33.04
UNIT 430
COM='FUEL INSERT IN, CENTER OPENING'
CUBOID    23 1 4P4.2672 43.48 -33.04
HOLE 420   0.0 0.0 0.0
UNIT 431
COM='FUEL INSERT IN, BOTTOM OPENING'
CUBOID    23 1 4P4.2672 43.48 -33.04
HOLE 421   0.0 -0.1143 0.0
UNIT 432
COM='FUEL INSERT IN, TOP OPENING'
CUBOID    23 1 4P4.2672 43.48 -33.04
HOLE 422   0.0 0.1143 0.0
UNIT 433
COM='FUEL INSERT IN, BOTTOM LEFT OPENING'
CUBOID    23 1 4P4.2672 43.48 -33.04
HOLE 423   -0.1143 -0.1143 0.0
UNIT 434
COM='FUEL INSERT IN, TOP LEFT OPENING'
CUBOID    23 1 4P4.2672 43.48 -33.04
HOLE 424   -0.1143 0.1143 0.0
UNIT 435
COM='FUEL INSERT IN, BOTOM RIGHT OPENING'
CUBOID    23 1 4P4.2672 43.48 -33.04
HOLE 425   0.1143 -0.1143 0.0
UNIT 436
COM='FUEL INSERT IN, TOP PIGHT OPENING'
CUBOID    23 1 4P4.2672 43.48 -33.04
HOLE 426   0.1143 0.1143 0.0
UNIT 440
COM='CENTER COLUMN OF THREE OPENINGS'
ARRAY 41  -4.2672 -13.8303 -33.04
REPLICATE 212 1 4R0.7112 2R0.0 1
UNIT 441
COM='LEFT OUTSIDE COLUMN OF TWO OPENINGS'
ARRAY 42  -4.2672 -8.9979 -33.04
REPLICATE 212 1 0.0 0.3408 2R0.3408 2R0.0 1
UNIT 442
COM='RIGHT OUTSIDE COLUMN OF TWO OPENINGS'
ARRAY 43  -4.2672 -8.9979 -33.04
REPLICATE 212 1 0.3408 0.0 2R0.3408 2R0.0 1
UNIT 450
COM='28 TRIGA FUEL ELEMENTS IN EACH LWT BASKET'
CYLINDER 23  1 17.1500 43.485 -33.045
HOLE 440   0.0     0.0 0.0
HOLE 441  -9.2457 0.0 0.0
HOLE 442  +9.2457 0.0 0.0
CYLINDER 212  1 18.9103 43.485 -33.045
CYLINDER 26   1 33.4645 43.485 -33.045
CYLINDER 212  1 36.5188 43.485 -33.045
CYLINDER 27   1 49.2227 43.485 -33.045
CYLINDER 212  1 49.8221 43.485 -33.045
CUBOID   28   1 4P49.8221 43.485 -33.045
UNIT 80
COM='SIMPLIFIED LID STRUCTURE NAC-LWT'
CYLINDER 2 1 36.5188 2P14.1351
CYLINDER 8 1 49.8221 2P14.1351
CUBOID   8 1 4P49.8221 2P14.1351
UNIT 81
COM='SIMPLIFIED CASK BOTTOM STRUCTUPE NAC-LWT'
CYLINDER 6 1 26.3525 2P3.81
CYLINDER 2 1 36.6188 +13.97 -12.7
CYLINDER 8 1 49.8221 +13.97 -12.7
CUBOID   8 1 4P49.8221 +13.97 -12.7
GLOBAL UNIT 82
COM='STACK OF 5 BASKETS IN CASK'
ARRAY  20  -49.8221 -49.8221 -221.3
END GEOM
READ ARRAY
ARA=1 NUX=1 NUY=7 NUZ=1 FILL 10 5 17 16 17 5 11 END FILL
```

```
ARA=2 NUX=1 NUY=4 NUZ=1 FILL 13 17 6 12 END FILL
ARA=3 NUX=1 NUY=4 NUZ=1 FILL 15 17 6 14 END FILL
ARA=41 NUX=1 NUY=7 NUZ=1 FILL 432 45 42 430 42 45 431 END FILL
ARA=42 NUX=1 NUY=4 NUZ=1 FILL 436 46 42 435 END FILL
ARA=43 NUX=1 NUY=4 NUZ=1 FILL 434 46 42 433 END FILL
ARA=20 NUX=1 NUY=1 NUZ=7 FILL 81 30 3R450 30 80 END FILL
END ARRAY
READ BOUNDS ALL=MIR END BOUNDS
READ PLOT
TTL='X-Y PLOT OF CASK (CANISTER ELEVATION)'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=800
XUL=-50.0 YUL=50.0 ZUL=149.352
XLR=50.0 YLR=-50.0 ZLR=149.352 END
TTL='X-Y PLOT OF BASKET (CANISTER ELEVATION)'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=800
XUL=-17.2 YUL=17.2 ZUL=149.352
XLR=17.2 YLR=-17.2 ZLR=149.352 END
TTL='X-Y PLOT OF BASKET (CAVITY MID PLANE)'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=800
XUL=-17.2 YUL=17.2 ZUL=0.0
XLR=17.2 YLR=-17.2 ZLR=0.0 END
TTL='X-Y PLOT OF CENTER OPENING (CANISTER ELEVATION)'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=800
XUL=-7.0 YUL=7.0 ZUL=149.352
XLR=7.0 YLR=-7.0 ZLR=149.352 END
TTL='X-Y PLOT OF PERIPHERAL OPENING (CANISTER ELEVATION)'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=800
XUL=-7.0 YUL=16.0 ZUL=149.352
XLR=7.0  YLR=4.0 ZLR=149.352 END
TTL='Y-Z PLOT OF BASKET (CENTER OF FUEL ELEMENTS,CANISTER ELEVATION)'
SCR=YES PIC=MAT LPI=10
VAX=1.0 WDN=-1.0 NAX=800
XUL=2.12 YUL=-14.0 ZUL=186.69
XLR=2.12 YLR=-4.5 ZLR=112.014 END
TTL='Y-Z PLOT OF BASKET (CASK)'
SCR=YES PIC=MAT LPI=10
VAX=1.0 WDN=-1.0 NAX=800
XUL=2.12 YUL=-51 ZUL=220.0
XLR=2.12 YLR=+51 ZLR=-220.0
END PLOT
END DATA

SECONDARY MODULE 000008   HAS BEEN CALLED.

MODULE 000008   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     1.59 (SECONDS).

SECONDARY MODULE 000002   HAS BEEN CALLED.

MODULE 000002   IS FINISHED. COMPLETION CODE     0. CPU TIME USED    15.55 (SECONDS).

SECONDARY MODULE 000009   HAS BEEN CALLED.

MODULE 000009   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   202.62 (SECONDS).

MODULE CSAS25   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   220.91 (SECONDS).
```

```
 CCCCCCCCCCC    SSSSSSSSSSS     AAAAAAAAA      SSSSSSSSSSS    22222222222    5555555555555
CCCCCCCCCCCCC  SSSSSSSSSSSSS   AAAAAAAAAAA    SSSSSSSSSSSSS  2222222222222   5555555555555
CC         CC  SS         SS  AA         AA  SS         SS  22         22   55
CC             SS             AA         AA  SS                        22   55
CC             SS             AA         AA  SS                        22   55
CC             SSSSSSSSSSSS   AAAAAAAAAAAAA  SSSSSSSSSSSS            22     555555555555
CC              SSSSSSSSSSSS  AAAAAAAAAAAAA   SSSSSSSSSSSS         22       5555555555555
CC                        SS  AA         AA             SS      22                     55
CC                        SS  AA         AA             SS    22                       55
CC         CC  SS         SS  AA         AA  SS         SS  22              55         55
CCCCCCCCCCCCC  SSSSSSSSSSSSS  AA         AA  SSSSSSSSSSSSS  2222222222222   5555555555555
 CCCCCCCCCCC    SSSSSSSSSSS   AA         AA   SSSSSSSSSSS   2222222222222    55555555555


 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL             EEEEEEEEEEEEE                  PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL             EEEEEEEEEEEEE                  PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL             EE                             PP         PP  CC         CC
SS             CC             AA         AA  LL             EE                             PP         PP  CC
SS             CC             AA         AA  LL             EE                             PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------   PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------   PPPPPPPPPPPP   CC
           SS  CC             AA         AA  LL             EE                             PP             CC
           SS  CC             AA         AA  LL             EE                             PP             CC
SS         SS  CC         CC  AA         AA  LL             EE                             PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLLL  EEEEEEEEEEEEE                  PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLLL  EEEEEEEEEEEEE                  PP              CCCCCCCCCCC


     11         22222222222            //   22222222222         11              //    99999999999     88888888888
    111        2222222222222          //   2222222222222       111             //    9999999999999   8888888888888
   1111        22         22         //    22         22      1111            //     99         99   88         88
     11                   22        //                22        11           //      99         99   88         88
     11                   22       //                 22        11          //       99         99   88         88
     11                 22        //                22          11         //        9999999999999    88888888888
     11               22         //               22            11        //          999999999999    88888888888
     11             22          //              22              11       //                     99   88         88
     11           22           //             22                11      //                      99   88         88
     11         22            //            22                  11     //                       99   88         88
  11111111     2222222222222  //            2222222222222    11111111  //               9999999999999   8888888888888
  11111111     2222222222222 //             2222222222222    11111111 //                999999999999     88888888888


  0000000      33333333333                 0000000        0000000                      5555555555555    0000000
 000000000    3333333333333               000000000      000000000                     5555555555555   000000000
00       00   33         33     :::      00       00    00       00       :::         55              00       00
00       00              33     :::      00       00    00       00       :::         55              00       00
00       00              33     :::      00       00    00       00       :::         55              00       00
00       00            333               00       00    00       00                   555555555555    00       00
00       00            333               00       00    00       00                   5555555555555   00       00
00       00              33     :::      00       00    00       00       :::                    55   00       00
00       00              33     :::      00       00    00       00       :::                    55   00       00
00       00   33         33     :::      00       00    00       00       :::         55         55   00       00
 000000000    3333333333333               000000000      000000000                    5555555555555    000000000
  0000000      33333333333                 0000000        0000000                      55555555555      0000000
```

```
  SSSSSSSSSSS    CCCCCCCCCCC       AAAAAAAAA     LL             EEEEEEEEEEEEE                      PPPPPPPPPPPP     CCCCCCCCCCC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC     AAAAAAAAAAA    LL             EEEEEEEEEEEEE                      PPPPPPPPPPPPP   CCCCCCCCCCCCC
 SS         SS  CC         CC    AA         AA   LL             EE                                 PP         PP   CC         CC
 SS             CC               AA         AA   LL             EE                                 PP         PP   CC
 SS             CC               AA         AA   LL             EE                                 PP         PP   CC
 SSSSSSSSSSSS   CC               AAAAAAAAAAAAA   LL             EEEEEEEEE        -------------     PPPPPPPPPPPPP   CC
  SSSSSSSSSSSS  CC               AAAAAAAAAAAAA   LL             EEEEEEEEE        -------------     PPPPPPPPPPPP    CC
            SS  CC               AA         AA   LL             EE                                 PP              CC
            SS  CC               AA         AA   LL             EE                                 PP              CC
 SS         SS  CC         CC    AA         AA   LL             EE                                 PP              CC         CC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC    AA         AA   LLLLLLLLLLLLL  EEEEEEEEEEEEE                      PP              CCCCCCCCCCCCC
  SSSSSSSSSSS    CCCCCCCCCCC     AA         AA   LLLLLLLLLLLLL  EEEEEEEEEEEEE                      PP               CCCCCCCCCCC


                                 ****************************************************************************
                                 ****************************************************************************
                                 ****************************************************************************
                                 *****                                                                  *****
                                 *****                 PROGRAM VERIFICATION INFORMATION                 *****
                                 *****                                                                  *****
                                 *****               CODE SYSTEM:   SCALE-PC VERSION:  4.3              *****
                                 *****                                                                  *****
                                 ****************************************************************************
                                 ****************************************************************************
                                 *****                                                                  *****
                                 *****                                                                  *****
                                 *****              PROGRAM:  CSAS                                      *****
                                 *****                                                                  *****
                                 *****        CREATION DATE:  03/08/96                                  *****
                                 *****                                                                  *****
                                 *****               VOLUME:  ENG                                       *****
                                 *****                                                                  *****
                                 *****              LIBRARY:  G:\SCALE43\WIN_NT\EXE                     *****
                                 *****                                                                  *****
                                 *****                                                                  *****
                                 *****      PRODUCTION CODE:  CSAS                                      *****
                                 *****                                                                  *****
                                 *****              VERSION:  3.1                                       *****
                                 *****                                                                  *****
                                 *****              JOBNAME:  SCALE-PC                                  *****
                                 *****                                                                  *****
                                 *****    DATE OF EXECUTION:  12/21/98                                  *****
                                 *****                                                                  *****
                                 *****    TIME OF EXECUTION:  03:00:50                                  *****
                                 *****                                                                  *****
                                 *****                                                                  *****
                                 ****************************************************************************
                                 ****************************************************************************
                                 ****************************************************************************

  **** PROBLEM PARAMETERS ****

 LIB 27GROUPNDF4  LIBRARY
 MXX           215 MIXTURES
 MSC            79 COMPOSITION SPECIFICATIONS
 IZM             1 MATERIAL ZONES
 GE  INFHOMMEDIUM GEOMETRY
 MORE            1 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
 MSLN            0 FUEL SOLUTIONS


  **** PROBLEM GEOMETRY ****


  **** INFINITE HOMOGENEOUS MEDIUM ****
 MFUEL           1 MIXTURE NO. OF THE INFINITE HOMOGENEOUS MEDIUM

  **** SPECIAL PARAMETERS ****

 ISN             8 ORDER OF ANGULAR QUADRATURE
 IIM            20 INNER ITERATION MAXIMUM
 ICM            25 OUTER ITERATION MAXIMUM
 SZF   1.00000E+00 SIZE FACTOR FOR SPATIAL MESH
 EPS   1.00000E-04 OVERALL PROBLEM CONVERGENCE
 PTC   1.00000E-04 SCALAR FLUX CONVERGENCE
 BKL   1.42089E+00 BUCKLING FACTOR
 IUS             0 THERMAL UPSCATTER SCALING
 BAL          FINE BALANCE TABLE PRINT FLAG
 DY    0.00000E+00 BUCKLING HEIGHT
 DZ    0.00000E+00 BUCKLING DEPTH
 IPN             0 DIFFUSION COEFFICIENT OPTION
 FRD             0 LOGICAL UNIT NUMBER TO READ FLUX GUESS
 FWR            -1 LOGICAL UNIT NUMBER TO WRITE FLUX GUESS
 MSH          2001 NUMBER OF INTERVALS FOR RES. INTGRTNS
 MLV             2 MAX LVALUE FOR RES. INTGRTNS
 AXS             0 LOGICAL UNIT NUMBER TO WRITE ANISN LIB
 RES            21 MIXTURE WITH SPECIAL RESONANCE CORRECTION
  *       CYLINDER GEOMETRY FOR SPECIAL RESONANCE CORRECTION
  *    6.47700E-01 DIMENSION (LBAR) FOR SPECIAL RESONANCE CORRECTION


 DANCOFF FACTOR SPECIFICATION
 MIXTURE     FACTOR
      21     0.38879
```

```
KK        KK  EEEEEEEEEEEEE  NN         NN   OOOOOOOOOOO                      VV         VV
KK       KK   EEEEEEEEEEEEE  NNN        NN  OOOOOOOOOOOOO                     VV         VV
KK      KK    EE             NNNN       NN  OO         OO                     VV         VV
KK     KK     EE             NN NN      NN  OO         OO                     VV         VV
KK    KK      EE             NN  NN     NN  OO         OO                     VV         VV
KKKKKKKK      EEEEEEEEE      NN   NN    NN  OO         OO  -------------      VV         VV
KKKKKKKK      EEEEEEEEE      NN    NN   NN  OO         OO  -------------       VV       VV
KK    KK      EE             NN     NN  NN  OO         OO                       VV     VV
KK     KK     EE             NN      NN NN  OO         OO                        VV   VV
KK      KK    EE             NN       NNNN  OO         OO                         VV VV
KK       KK   EEEEEEEEEEEEE  NN        NNN  OOOOOOOOOOOOO                          VVV
KK        KK  EEEEEEEEEEEEE  NN         NN   OOOOOOOOOOO                            V


 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL             EEEEEEEEEEEEE                  PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL             EEEEEEEEEEEEE                  PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL             EE                             PP         PP  CC         CC
SS             CC             AA         AA  LL             EE                             PP         PP  CC
SS             CC             AA         AA  LL             EE                             PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL             EEEEEEEEE       -------------  PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL             EEEEEEEEE       -------------  PPPPPPPPPPPP   CC
           SS  CC             AA         AA  LL             EE                             PP             CC
           SS  CC             AA         AA  LL             EE                             PP             CC
SS         SS  CC         CC  AA         AA  LL             EE                             PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLLL  EEEEEEEEEEEEE                  PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLLL  EEEEEEEEEEEEE                  PP              CCCCCCCCCCC


     11         22222222222          //  22222222222        11          //   99999999999    88888888888
    111        2222222222222        //  2222222222222      111         //   9999999999999  8888888888888
   1111        22         22       //   22         22     1111        //    99         99  88         88
     11                   22      //               22       11       //     99         99  88         88
     11                   22     //                22       11      //      99         99  88         88
     11                 22      //               22         11     //       9999999999999   88888888888
     11               22       //              22           11    //         999999999999   88888888888
     11             22        //             22             11   //                    99  88         88
     11           22         //            22               11  //                     99  88         88
     11         22          //           22                 11 //                      99  88         88
  11111111     2222222222222 //          2222222222222   11111111 //               9999999999999  8888888888888
  11111111     2222222222222//           2222222222222   11111111//                999999999999    88888888888


   0000000      33333333333                0000000         11                  0000000       88888888888
  000000000    3333333333333              000000000       111                 000000000     8888888888888
 00       00   33         33    :::      00       00     1111        :::     00       00    88         88
00         00             33    :::     00         00      11        :::    00         00   88         88
00         00             33    :::     00         00      11        :::    00         00   88         88
00         00          333              00         00      11               00         00    88888888888
00         00          333              00         00      11               00         00    88888888888
00         00             33    :::     00         00      11        :::    00         00   88         88
00         00             33    :::     00         00      11        :::    00         00   88         88
 00       00   33         33    :::      00       00       11        :::     00       00    88         88
  000000000    3333333333333              000000000     11111111              000000000     8888888888888
   0000000      33333333333                0000000      11111111               0000000       88888888888
```

```
 SSSSSSSSSSS    CCCCCCCCCCC      AAAAAAAAA     LL             EEEEEEEEEEEEE                      PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC    AAAAAAAAAAA    LL             EEEEEEEEEEEEE                      PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC   AA         AA   LL             EE                                 PP         PP  CC         CC
SS             CC              AA         AA   LL             EE                                 PP         PP  CC
SS             CC              AA         AA   LL             EE                                 PP         PP  CC
SSSSSSSSSSSS   CC              AAAAAAAAAAAAA   LL             EEEEEEEEE        -------------     PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC              AAAAAAAAAAAAA   LL             EEEEEEEEE        -------------     PPPPPPPPPPPP   CC
           SS  CC              AA         AA   LL             EE                                 PP             CC
           SS  CC              AA         AA   LL             EE                                 PP             CC
SS         SS  CC         CC   AA         AA   LL             EE                                 PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL  EEEEEEEEEEEEE                      PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC    AA         AA   LLLLLLLLLLLLL  EEEEEEEEEEEEE                      PP              CCCCCCCCCCC
```

```
*******************************************************************************
*******************************************************************************
*******************************************************************************
*****                                                                     *****
*****                  PROGRAM VERIFICATION INFORMATION                   *****
*****                                                                     *****
*****                  CODE SYSTEM:  SCALE-PC VERSION:  4.3               *****
*****                                                                     *****
*******************************************************************************
*******************************************************************************
*****                                                                     *****
*****                                                                     *****
*****               PROGRAM:  000009                                      *****
*****                                                                     *****
*****         CREATION DATE:  03/08/96                                    *****
*****                                                                     *****
*****                VOLUME:  ENG                                         *****
*****                                                                     *****
*****               LIBRARY:  G:\SCALE43\WIN_NT\EXE                       *****
*****                                                                     *****
*****                                                                     *****
*****       PRODUCTION CODE:  KENOVA                                      *****
*****                                                                     *****
*****               VERSION:  3.1                                         *****
*****                                                                     *****
*****               JOBNAME:  SCALE-PC                                    *****
*****                                                                     *****
*****     DATE OF EXECUTION:  12/21/98                                    *****
*****                                                                     *****
*****     TIME OF EXECUTION:  03:01:08                                    *****
*****                                                                     *****
*****                                                                     *****
*******************************************************************************
*******************************************************************************
*******************************************************************************
```

```
TRIGA - PREF. FLOOD CANISTER

****** NUMERIC PARAMETERS ******

TME   MAXIMUM PROBLEM TIME (MIN)             170.00
TBA   TIME PER GENERATION (MIN)                2.00
GEN   NUMBER OF GENERATIONS                     203
NPG   NUMBER PER GENERATION                     500
NSK   NUMBER OF GENERATIONS TO BE SKIPPED         3
BEG   BEGINNING GENERATION NUMBER                 1
RES   GENERATIONS BETWEEN CHECKPOINTS             0
X1D   NUMBER OF EXTRA 1-D CROSS SECTIONS          1
NBK   NEUTRON BANK SIZE                         525
XNB   EXTRA POSITIONS IN NEUTRON BANK             0
NFB   FISSION BANK SIZE                         500
XFB   EXTRA POSITIONS IN FISSION BANK             0
WTA   DEFAULT VALUE OF WEIGHT AVERAGE        0.5000
WTH   WEIGHT HIGH FOR SPLITTING              3.0000
WTL   WEIGHT LOW FOR RUSSIAN ROULETTE        0.3333
RND   STARTING RANDOM NUMBER           BB827100001
NB8   NUMBER OF D.A. BLOCKS ON UNIT  8          200
NL8   LENGTH OF D.A. BLOCKS ON UNIT  8          512
ADJ   MODE OF CALCULATION                   FORWARD
      INPUT DATA WRITTEN ON RESTART UNIT         NO
      BINARY DATA INTERFACE                     YES
```

```
*********************************************************************************************************
*********************************************************************************************************
***                                                                                                   ***
***                              TRIGA - PREF. FLOOD CANISTER                                         ***
***                                                                                                   ***
*********************************************************************************************************
***                              ******     LOGICAL PARAMETERS     ******                             ***
***                                                                                                   ***
*** RUN  EXECUTE PROBLEM AFTER CHECKING DATA     YES     PLT  PLOT PICTURE MAP(S)                 NO  ***
***                                                                                                   ***
*** FLX  COMPUTE FLUX                            NO      FDN  COMPUTE FISSION DENSITIES           NO  ***
***                                                                                                   ***
*** SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION    NO      NUB  COMPUTE NU-BAR & AVG FISSION GROUP  YES ***
***                                                                                                   ***
*** MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER     NO      MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION   NO  ***
***                                                                                                   ***
*** CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER   NO      CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION NO  ***
***                                                                                                   ***
*** FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER   NO      FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION NO  ***
***                                                                                                   ***
*** MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER     NO      MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER    NO  ***
***                                                                                                   ***
*** CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER   NO      CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER  NO  ***
***                                                                                                   ***
*** FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER   NO      FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER  NO  ***
***                                                                                                   ***
*** HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL    NO      HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL   NO  ***
***                                                                                                   ***
*** AMX  PRINT ALL MIXED CROSS SECTIONS          NO      FAR  PRINT FIS. AND ABS. BY REGION       NO  ***
***                                                                                                   ***
*** XS1  PRINT 1-D MIXTURE X-SECTIONS            NO      GAS  PRINT FAR BY GROUP                  NO  ***
***                                                                                                   ***
*** XS2  PRINT 2-D MIXTURE X-SECTIONS            NO      PAX  PRINT XSEC-ALBEDO CORRELATION TABLES    NO  ***
***                                                                                                   ***
*** XAP  PRINT MIXTURE ANGLES & PROBABILITIES    NO      PWT  PRINT WEIGHT AVERAGE ARRAY          NO  ***
***                                                                                                   ***
*** PKI  PRINT FISSION SPECTRUM                  NO      PGM  PRINT INPUT GEOMETRY                NO  ***
***                                                                                                   ***
*** P1D  PRINT EXTRA 1-D CROSS SECTIONS          NO      BUG  PRINT DEBUG INFORMATION             NO  ***
***                                                                                                   ***
***                                                      TRK  PRINT TRACKING INFORMATION          NO  ***
***                                                                                                   ***
***                                                                                                   ***
*********************************************************************************************************
*********************************************************************************************************
*********************************************************************************************************
                              PARAMETER INPUT COMPLETED

           .......    0 IO'S WERE USED READING THE PARAMETER DATA     .......
```

```
***********************************************************************************************
***                                                                                         ***
***          TRIGA - PREF. FLOOD CANISTER                                                   ***
***                                                                                         ***
***********************************************************************************************
***********************************************************************************************
***                                                                                         ***
***                              ****** ADDITIONAL INFORMATION ******                       ***
***                                                                                         ***
***  NUMBER OF ENERGY GROUPS                  27        USE LATTICE GEOMETRY             YES ***
***                                                                                         ***
***  NO. OF FISSION SPECTRUM SOURCE GROUP  1          GLOBAL ARRAY NUMBER               20 ***
***                                                                                         ***
***  NO. OF SCATTERING ANGLES IN XSECS       2        NUMBER OF UNITS IN THE GLOBAL X DIR.  1 ***
***                                                                                         ***
***  ENTRIES/NEUTRON IN THE NEUTRON BANK  26          NUMBER OF UNITS IN THE GLOBAL Y DIR.  1 ***
***                                                                                         ***
***  ENTRIES/NEUTRON IN THE FISSION BANK  19          NUMBER OF UNITS IN THE GLOBAL Z DIR.  7 ***
***                                                                                         ***
***  NUMBER OF MIXTURES USED                 20       USE A GLOBAL REFLECTOR             YES ***
***                                                                                         ***
***  NUMBER OF BIAS ID'S USED                 1       USE NESTED HOLES                   YES ***
***                                                                                         ***
***  NUMBER OF DIFFERENTIAL ALBEDOS USED      0       NUMBER OF HOLES                    142 ***
***                                                                                         ***
***  TOTAL INPUT GEOMETRY REGIONS           100       MAXIMUM HOLE NESTING LEVEL           4 ***
***                                                                                         ***
***  NUMBER OF GEOMETRY REGIONS USED         95       USE NESTED ARRAYS                  YES ***
***                                                                                         ***
***  LARGEST GEOMETRY UNIT NUMBER           450       NUMBER OF ARRAYS USED                7 ***
***                                                                                         ***
***  LARGEST ARRAY NUMBER                    43       MAXIMUM ARRAY NESTING LEVEL          2 ***
***                                                                                         ***
***                                                                                         ***
***  +X BOUNDARY CONDITION                  MIR       -X BOUNDARY CONDITION              MIR ***
***                                                                                         ***
***  +Y BOUNDARY CONDITION                  MIR       -Y BOUNDARY CONDITION              MIR ***
***                                                                                         ***
***  +Z BOUNDARY CONDITION                  MIR       -Z BOUNDARY CONDITION              MIR ***
***                                                                                         ***
***********************************************************************************************
```

```
-                                              TRIGA - PREF. FLOOD CANISTER

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID


                                                  -----  UNIT     1   -----

TRIGA FUEL (SMEARED)

  1 CYLINDER         1  1  RADIUS =  3.9877     +Z =  60.959     -Z = 1.00000E-03 CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                                  -----  UNIT     5   -----

3.38 IN WIDTH / 0.28 IN THICKNESS DIVIDER CENTER STACK (SEALED)

  1 CUBOID           2  1     +X =  4.2672     -X = -4.2672     +Y = 0.71120     -Y = 0.00000     +Z =  74.290     -Z = -8.2550

                                                  -----  UNIT     6   -----

3.38 IN WIDTH / 0.24 IN THICKNESS DIVIDER OUTSIDE STACK (SEALED)

  1 CUBOID           2  1     +X =  4.2672     -X = -4.2672     +Y = 0.60960     -Y = 0.00000     +Z =  74.290     -Z = -8.2550

                                                  -----  UNIT     7   -----

SEALED CANISTER

  1 CYLINDER         3  1  RADIUS =  3.9878     +Z =  60.960     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
    HOLE NUMBER      1       AT X = 0.00000     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER      1
  2 CYLINDER         2  1  RADIUS =  4.1529     +Z =  63.500     -Z = -1.2700     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  3 CYLINDER        12  1  RADIUS =  4.1529     +Z =  74.290     -Z = -8.2550     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                                  -----  UNIT    10   -----

TRIGA ELEMENTS IN TOP OF 3.38 IN X 3.38 IN OPENING (SEALED)

  1 CUBOID          12  1     +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  74.290     -Z = -8.2550
    HOLE NUMBER      2       AT X = 0.00000     Y = 0.11420      Z = 0.00000     IS UNIT NUMBER      7

                                                  -----  UNIT    11   -----

TRIGA ELEMENTS IN BOTTOM OF 3.38 IN X 3.38 IN OPENING (SEALED)

  1 CUBOID          12  1     +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  74.290     -Z = -8.2550
    HOLE NUMBER      3       AT X = 0.00000     Y =-0.11420      Z = 0.00000     IS UNIT NUMBER      7
-                                              TRIGA - PREF. FLOOD CANISTER

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID


                                                  -----  UNIT    12   -----

TRIGA ELEMENTS IN BOTTOM RIGHT OF 3.38 IN X 3.38 IN OPENING (SEALED)

  1 CUBOID          12  1     +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  74.290     -Z = -8.2550
    HOLE NUMBER      4       AT X = 0.11420     Y =-0.11420      Z = 0.00000     IS UNIT NUMBER      7

                                                  -----  UNIT    13   -----

TRIGA ELEMENTS IN TOP RIGHT OF 3.38 IN X 3.38 IN OPENING (SEALED)

  1 CUBOID          12  1     +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  74.290     -Z = -8.2550
    HOLE NUMBER      5       AT X = 0.11420     Y = 0.11420      Z = 0.00000     IS UNIT NUMBER      7

                                                  -----  UNIT    14   -----

TRIGA ELEMENTS IN BOTTOM LEFT OF 3.38 IN X 3.38 IN OPENING (SEALED)

  1 CUBOID          12  1     +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  74.290     -Z = -8.2550
    HOLE NUMBER      6       AT X =-0.11420     Y =-0.11420      Z = 0.00000     IS UNIT NUMBER      7

                                                  -----  UNIT    15   -----

TRIGA ELEMENTS IN TOP LEFT OF 3.38 IN X 3.38 IN OPENING (SEALED)

  1 CUBOID          12  1     +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  74.290     -Z = -8.2550
```

```
    HOLE NUMBER       7       AT X =-0.11420      Y = 0.11420       Z = 0.00000      IS UNIT NUMBER       7

                                                  -----  UNIT    16   -----

TRIGA BASKET 3.38 IN X 3.38 IN CENTER OPENING (SEALED)
  1 CUBOID             12  1      +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  74.290     -Z = -8.2550
    HOLE NUMBER       8       AT X = 0.00000      Y = 0.00000       Z = 0.00000      IS UNIT NUMBER       7

                                                  -----  UNIT    17   -----

HORIZONTAL X-X POISON SHEET + WATER
  1 CUBOID             13  1      +X =  3.8227     -X = -3.8227     +Y = 0.31750     -Y = 0.00000     +Z =  73.020     -Z = -6.9850
  2 CUBOID             14  1      +X =  4.1402     -X = -4.1402     +Y = 0.31750     -Y = 0.00000     +Z =  73.020     -Z = -6.9850
  3 CUBOID             12  1      +X =  4.2672     -X = -4.2672     +Y = 0.31750     -Y = 0.00000     +Z =  74.290     -Z = -8.2550
                                          TRIGA - PREF. FLOOD CANISTER
-
                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                         -----   UNIT    20  EXTERNAL TO LATTICE  1    -----

CENTER COLUMN OF THREE OPENINGS W/ 0.28 IN PLATE (SEALED)
  1 ARRAY NUMBER      1           +X =  4.2672     -X = -4.2672     +Y =  13.830     -Y = -13.830     +Z =  74.290     -Z = -8.2550
  2 CUBOID             2  1       +X =  4.9784     -X = -4.9784     +Y =  14.542     -Y = -14.542     +Z =  74.290     -Z = -8.2550

                                         -----   UNIT    21  EXTERNAL TO LATTICE  2    -----

LEFT OUTSIDE COLUMN OF TWO OPENINGS W/ 0.12 IN PLATE (SEALED)
  1 ARRAY NUMBER      2           +X =  4.2672     -X = -4.2672     +Y =  8.9980     -Y = -8.9979     +Z =  74.290     -Z = -8.2550
  2 CUBOID             2  1       +X =  4.2672     -X = -4.5720     +Y =  9.3028     -Y = -9.3027     +Z =  74.290     -Z = -8.2550

                                         -----   UNIT    22  EXTERNAL TO LATTICE  3    -----

RIGHT OUTSIDE COLUMN OF TWO OPENINGS W/ 0.12 IN PLATE (SEALED)
  1 ARRAY NUMBER      3           +X =  4.2672     -X = -4.2672     +Y =  8.9980     -Y = -8.9979     +Z =  74.290     -Z = -8.2550
  2 CUBOID             2  1       +X =  4.5720     -X = -4.2672     +Y =  9.3028     -Y = -9.3027     +Z =  74.290     -Z = -8.2550

                                                  -----  UNIT    30   -----

NAC-LWT TRIGA BASKET (SEALED)
  1 CYLINDER           12  1  RADIUS =  17.100     +Z =  74.290     -Z = -8.2550     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
    HOLE NUMBER       9       AT X = 0.00000      Y = 0.00000       Z = 0.00000      IS UNIT NUMBER      20
    HOLE NUMBER      10       AT X = -9.2457      Y = 0.00000       Z = 0.00000      IS UNIT NUMBER      21
    HOLE NUMBER      11       AT X =  9.2457      Y = 0.00000       Z = 0.00000      IS UNIT NUMBER      22
  2 CYLINDER            2  1  RADIUS =  18.310     +Z =  74.930     -Z = -8.8900     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  3 CYLINDER            6  1  RADIUS =  33.465     +Z =  74.930     -Z = -8.8900     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  4 CYLINDER            2  1  RADIUS =  36.519     +Z =  74.930     -Z = -8.8900     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  5 CYLINDER            7  1  RADIUS =  49.223     +Z =  74.930     -Z = -8.8900     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  6 CYLINDER            2  1  RADIUS =  49.822     +Z =  74.930     -Z = -8.8900     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  7 CUBOID              8  1      +X =  49.822     -X = -49.822     +Y =  49.822     -Y = -49.822     +Z =  74.930     -Z = -8.8900
                                          TRIGA - PREF. FLOOD CANISTER
-
                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                                  -----  UNIT    41   -----

TRIGA FUEL ELEMENT
  1 CYLINDER           21  1  RADIUS = 0.64770     +Z =  27.940     -Z = -27.940     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  2 CYLINDER           22  1  RADIUS = 0.68834     +Z =  27.940     -Z = -27.940     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  3 CYLINDER           29  1  RADIUS = 0.68834     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                                  -----  UNIT    42   -----
```

```
HORIZONTAL X-X POISON SHEET + WATER

  1 CUBOID         210  1      +X =  3.8227    -X = -3.8227    +Y = 0.31750    -Y = 0.00000    +Z =  39.380    -Z = -28.940

  2 CUBOID         211  1      +X =  4.1402    -X = -4.1402    +Y = 0.31750    -Y = 0.00000    +Z =  39.380    -Z = -28.940

  3 CUBOID          23  1      +X =  4.2672    -X = -4.2672    +Y = 0.31750    -Y = 0.00000    +Z =  43.480    -Z = -33.040

                                             -----  UNIT    45   -----

DIVIDER CENTER STACK

  1 CUBOID         212  1      +X =  4.2672    -X = -4.2672    +Y = 0.71120    -Y = 0.00000    +Z =  43.480    -Z = -33.040

                                             -----  UNIT    46   -----

DIVIDER OUTSIDE STACK

  1 CUBOID         212  1      +X =  4.2672    -X = -4.2672    +Y = 0.60960    -Y = 0.00000    +Z =  43.480    -Z = -33.040

                                             -----  UNIT    80   -----

SIMPLIFIED LID STRUCTURE NAC-LWT

  1 CYLINDER         2  1  RADIUS =  36.519    +Z =  14.135    -Z = -14.135    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

  2 CYLINDER         8  1  RADIUS =  49.822    +Z =  14.135    -Z = -14.135    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

  3 CUBOID           8  1      +X =  49.822    -X = -49.822    +Y =  49.822    -Y = -49.822    +Z =  14.135    -Z = -14.135
                                TRIGA - PREF. FLOOD CANISTER

                MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID

                                             -----  UNIT    81   -----

SIMPLIFIED CASK BOTTOM STRUCTURE NAC-LWT

  1 CYLINDER         6  1  RADIUS =  26.353    +Z =  3.8100    -Z = -3.8100    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

  2 CYLINDER         2  1  RADIUS =  36.619    +Z =  13.970    -Z = -12.700    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

  3 CYLINDER         8  1  RADIUS =  49.822    +Z =  13.970    -Z = -12.700    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

  4 CUBOID           8  1      +X =  49.822    -X = -49.822    +Y =  49.822    -Y = -49.822    +Z =  13.970    -Z = -12.700

                                ******************  GLOBAL   ******************
                                -----   UNIT    82  EXTERNAL TO LATTICE 20    -----

STACK OF 5 BASKETS IN CASK

  1 ARRAY NUMBER    20         +X =  49.822    -X = -49.822    +Y =  49.822    -Y = -49.822    +Z =  230.87    -Z = -221.30

                                             -----  UNIT   411   -----

TRIGA FUEL ELEMENTS IN AL TUBE, RIGHT

  1 CYLINDER        23  1  RADIUS = 0.80963    +Z =  43.480    -Z = -33.040    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

    HOLE NUMBER     13       AT X = 0.12127     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER     41

  2 CYLINDER       215  1  RADIUS = 0.94805    +Z =  43.480    -Z = -33.040    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

                                             -----  UNIT   412   -----

TRIGA FUEL ELEMENTS IN AL TUBE, LEFT

  1 CYLINDER        23  1  RADIUS = 0.80963    +Z =  43.480    -Z = -33.040    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

    HOLE NUMBER     14       AT X =-0.12127     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER     41

  2 CYLINDER       215  1  RADIUS = 0.94805    +Z =  43.480    -Z = -33.040    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

                                             -----  UNIT   413   -----

TRIGA FUEL ELEMENTS IN AL TUBE, TOP

  1 CYLINDER        23  1  RADIUS = 0.80963    +Z =  43.480    -Z = -33.040    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

    HOLE NUMBER     15       AT X = 0.00000     Y = 0.12127     Z = 0.00000    IS UNIT NUMBER     41

  2 CYLINDER       215  1  RADIUS = 0.94805    +Z =  43.480    -Z = -33.040    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
                                TRIGA - PREF. FLOOD CANISTER

                MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID
```

```
                                        -----  UNIT   414   -----
TRIGA FUEL ELEMENTS IN AL TUBE, BOTTOM
  1 CYLINDER        23  1  RADIUS = 0.80963    +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
    HOLE NUMBER     16       AT X = 0.00000     Y =-0.12127      Z = 0.00000     IS UNIT NUMBER    41
  2 CYLINDER       215  1  RADIUS = 0.94805    +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                        -----  UNIT   415   -----
TRIGA FUEL ELEMENTS IN AL TUBE, TOP RIGHT
  1 CYLINDER        23  1  RADIUS = 0.80963    +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
    HOLE NUMBER     17       AT X = 8.57400E-02  Y = 8.57400E-02  Z = 0.00000     IS UNIT NUMBER    41
  2 CYLINDER       215  1  RADIUS = 0.94805    +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                        -----  UNIT   416   -----
TRIGA FUEL ELEMENTS IN AL TUBE, TOP LEFT
  1 CYLINDER        23  1  RADIUS = 0.80963    +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
    HOLE NUMBER     18       AT X =-8.57400E-02  Y = 8.57400E-02  Z = 0.00000     IS UNIT NUMBER    41
  2 CYLINDER       215  1  RADIUS = 0.94805    +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                        -----  UNIT   417   -----
TRIGA FUEL ELEMENTS IN AL TUBE, BOTTOM RIGHT
  1 CYLINDER        23  1  RADIUS = 0.80963    +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
    HOLE NUMBER     19       AT X = 8.57400E-02  Y =-8.57400E-02  Z = 0.00000     IS UNIT NUMBER    41
  2 CYLINDER       215  1  RADIUS = 0.94805    +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                        -----  UNIT   418   -----
TRIGA FUEL ELEMENTS IN AL TUBE, BOTTOM LEFT
  1 CYLINDER        23  1  RADIUS = 0.80963    +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
    HOLE NUMBER     20       AT X =-8.57400E-02  Y =-8.57400E-02  Z = 0.00000     IS UNIT NUMBER    41
  2 CYLINDER       215  1  RADIUS = 0.94805    +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
                                   TRIGA - PREF. FLOOD CANISTER
-
               MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION          NUM   ID

                                        -----  UNIT   420   -----
AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, CENTER OPENING
  1 CUBOID          23  1       +X =   4.1529    -X = -4.1529     +Y =   4.1529     -Y = -4.1529     +Z =  43.480     -Z = -33.040
    HOLE NUMBER     21       AT X = -2.8443     Y = -2.8443      Z = 0.00000     IS UNIT NUMBER    415
    HOLE NUMBER     22       AT X =-0.94810     Y = -2.8443      Z = 0.00000     IS UNIT NUMBER    413
    HOLE NUMBER     23       AT X = 0.94810     Y = -2.8443      Z = 0.00000     IS UNIT NUMBER    413
    HOLE NUMBER     24       AT X =  2.8443     Y = -2.8443      Z = 0.00000     IS UNIT NUMBER    416
    HOLE NUMBER     25       AT X = -2.8443     Y =-0.94810      Z = 0.00000     IS UNIT NUMBER    411
    HOLE NUMBER     26       AT X =-0.94810     Y =-0.94810      Z = 0.00000     IS UNIT NUMBER    415
    HOLE NUMBER     27       AT X = 0.94810     Y =-0.94810      Z = 0.00000     IS UNIT NUMBER    416
    HOLE NUMBER     28       AT X =  2.8443     Y =-0.94810      Z = 0.00000     IS UNIT NUMBER    412
    HOLE NUMBER     29       AT X = -2.8443     Y = 0.94810      Z = 0.00000     IS UNIT NUMBER    411
    HOLE NUMBER     30       AT X =-0.94810     Y = 0.94810      Z = 0.00000     IS UNIT NUMBER    417
    HOLE NUMBER     31       AT X = 0.94810     Y = 0.94810      Z = 0.00000     IS UNIT NUMBER    418
    HOLE NUMBER     32       AT X =  2.8443     Y = 0.94810      Z = 0.00000     IS UNIT NUMBER    412
    HOLE NUMBER     33       AT X = -2.8443     Y =  2.8443      Z = 0.00000     IS UNIT NUMBER    417
    HOLE NUMBER     34       AT X =-0.94810     Y =  2.8443      Z = 0.00000     IS UNIT NUMBER    414
```

```
    HOLE NUMBER     35      AT X = 0.94810      Y =  2.8443      Z = 0.00000      IS UNIT NUMBER    414
    HOLE NUMBER     36      AT X =  2.8443      Y =  2.8443      Z = 0.00000      IS UNIT NUMBER    418
  2 CUBOID          23  1      +X =  4.1529     -X = -4.1529    +Y =  4.1529     -Y = -4.1529     +Z =  43.480     -Z = -33.040
-                                      TRIGA - PREF. FLOOD CANISTER

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                               -----  UNIT   421   -----

AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, BOTTOM OPENING
  1 CUBOID          23  1      +X =  4.1529     -X = -4.1529    +Y =  4.1529     -Y = -4.1529     +Z =  43.480     -Z = -33.040
    HOLE NUMBER     37      AT X = -2.8443      Y = -2.8443      Z = 0.00000      IS UNIT NUMBER    415
    HOLE NUMBER     38      AT X =-0.94810      Y = -2.8443      Z = 0.00000      IS UNIT NUMBER    413
    HOLE NUMBER     39      AT X = 0.94810      Y = -2.8443      Z = 0.00000      IS UNIT NUMBER    413
    HOLE NUMBER     40      AT X =  2.8443      Y = -2.8443      Z = 0.00000      IS UNIT NUMBER    416
    HOLE NUMBER     41      AT X = -2.8443      Y =-0.94810      Z = 0.00000      IS UNIT NUMBER    411
    HOLE NUMBER     42      AT X =-0.94810      Y =-0.94810      Z = 0.00000      IS UNIT NUMBER    415
    HOLE NUMBER     43      AT X = 0.94810      Y =-0.94810      Z = 0.00000      IS UNIT NUMBER    416
    HOLE NUMBER     44      AT X =  2.8443      Y =-0.94810      Z = 0.00000      IS UNIT NUMBER    412
    HOLE NUMBER     45      AT X = -2.8443      Y = 0.94810      Z = 0.00000      IS UNIT NUMBER    411
    HOLE NUMBER     46      AT X =-0.94810      Y = 0.94810      Z = 0.00000      IS UNIT NUMBER    417
    HOLE NUMBER     47      AT X = 0.94810      Y = 0.94810      Z = 0.00000      IS UNIT NUMBER    418
    HOLE NUMBER     48      AT X =  2.8443      Y = 0.94810      Z = 0.00000      IS UNIT NUMBER    412
    HOLE NUMBER     49      AT X = -2.8443      Y =  2.8443      Z = 0.00000      IS UNIT NUMBER    417
    HOLE NUMBER     50      AT X =-0.94810      Y =  2.8443      Z = 0.00000      IS UNIT NUMBER    414
    HOLE NUMBER     51      AT X = 0.94810      Y =  2.8443      Z = 0.00000      IS UNIT NUMBER    414
    HOLE NUMBER     52      AT X =  2.8443      Y =  2.8443      Z = 0.00000      IS UNIT NUMBER    418
  2 CUBOID          23  1      +X =  4.1529     -X = -4.1529    +Y =  4.1529     -Y = -4.1529     +Z =  43.480     -Z = -33.040
-                                      TRIGA - PREF. FLOOD CANISTER

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                               -----  UNIT   422   -----

AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, TOP OPENING
  1 CUBOID          23  1      +X =  4.1529     -X = -4.1529    +Y =  4.1529     -Y = -4.1529     +Z =  43.480     -Z = -33.040
    HOLE NUMBER     53      AT X = -2.8443      Y = -2.8443      Z = 0.00000      IS UNIT NUMBER    415
    HOLE NUMBER     54      AT X =-0.94810      Y = -2.8443      Z = 0.00000      IS UNIT NUMBER    413
    HOLE NUMBER     55      AT X = 0.94810      Y = -2.8443      Z = 0.00000      IS UNIT NUMBER    413
    HOLE NUMBER     56      AT X =  2.8443      Y = -2.8443      Z = 0.00000      IS UNIT NUMBER    416
    HOLE NUMBER     57      AT X = -2.8443      Y =-0.94810      Z = 0.00000      IS UNIT NUMBER    411
    HOLE NUMBER     58      AT X =-0.94810      Y =-0.94810      Z = 0.00000      IS UNIT NUMBER    415
    HOLE NUMBER     59      AT X = 0.94810      Y =-0.94810      Z = 0.00000      IS UNIT NUMBER    416
    HOLE NUMBER     60      AT X =  2.8443      Y =-0.94810      Z = 0.00000      IS UNIT NUMBER    412
    HOLE NUMBER     61      AT X = -2.8443      Y = 0.94810      Z = 0.00000      IS UNIT NUMBER    411
    HOLE NUMBER     62      AT X =-0.94810      Y = 0.94810      Z = 0.00000      IS UNIT NUMBER    417
    HOLE NUMBER     63      AT X = 0.94810      Y = 0.94810      Z = 0.00000      IS UNIT NUMBER    418
    HOLE NUMBER     64      AT X =  2.8443      Y = 0.94810      Z = 0.00000      IS UNIT NUMBER    412
    HOLE NUMBER     65      AT X = -2.8443      Y =  2.8443      Z = 0.00000      IS UNIT NUMBER    417
    HOLE NUMBER     66      AT X =-0.94810      Y =  2.8443      Z = 0.00000      IS UNIT NUMBER    414
    HOLE NUMBER     67      AT X = 0.94810      Y =  2.8443      Z = 0.00000      IS UNIT NUMBER    414
    HOLE NUMBER     68      AT X =  2.8443      Y =  2.8443      Z = 0.00000      IS UNIT NUMBER    418
  2 CUBOID          23  1      +X =  4.1529     -X = -4.1529    +Y =  4.1529     -Y = -4.1529     +Z =  43.480     -Z = -33.040
-                                      TRIGA - PREF. FLOOD CANISTER

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                               -----  UNIT   423   -----
```

```
AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, BOTTOM LEFT OPENING
  1 CUBOID          23  1      +X =  4.1529    -X = -4.1529    +Y =  4.1529    -Y = -4.1529    +Z =  43.480    -Z = -33.040
    HOLE NUMBER     69      AT X = -2.8443     Y = -2.8443     Z = 0.00000     IS UNIT NUMBER    415
    HOLE NUMBER     70      AT X =-0.94810     Y = -2.8443     Z = 0.00000     IS UNIT NUMBER    413
    HOLE NUMBER     71      AT X = 0.94810     Y = -2.8443     Z = 0.00000     IS UNIT NUMBER    413
    HOLE NUMBER     72      AT X =  2.8443     Y = -2.8443     Z = 0.00000     IS UNIT NUMBER    416
    HOLE NUMBER     73      AT X = -2.8443     Y =-0.94810     Z = 0.00000     IS UNIT NUMBER    411
    HOLE NUMBER     74      AT X =-0.94810     Y =-0.94810     Z = 0.00000     IS UNIT NUMBER    415
    HOLE NUMBER     75      AT X = 0.94810     Y =-0.94810     Z = 0.00000     IS UNIT NUMBER    416
    HOLE NUMBER     76      AT X =  2.8443     Y =-0.94810     Z = 0.00000     IS UNIT NUMBER    412
    HOLE NUMBER     77      AT X = -2.8443     Y = 0.94810     Z = 0.00000     IS UNIT NUMBER    411
    HOLE NUMBER     78      AT X =-0.94810     Y = 0.94810     Z = 0.00000     IS UNIT NUMBER    417
    HOLE NUMBER     79      AT X = 0.94810     Y = 0.94810     Z = 0.00000     IS UNIT NUMBER    418
    HOLE NUMBER     80      AT X =  2.8443     Y = 0.94810     Z = 0.00000     IS UNIT NUMBER    412
    HOLE NUMBER     81      AT X = -2.8443     Y =  2.8443     Z = 0.00000     IS UNIT NUMBER    417
    HOLE NUMBER     82      AT X =-0.94810     Y =  2.8443     Z = 0.00000     IS UNIT NUMBER    414
    HOLE NUMBER     83      AT X = 0.94810     Y =  2.8443     Z = 0.00000     IS UNIT NUMBER    414
    HOLE NUMBER     84      AT X =  2.8443     Y =  2.8443     Z = 0.00000     IS UNIT NUMBER    418
  2 CUBOID          23  1      +X =  4.1529    -X = -4.1529    +Y =  4.1529    -Y = -4.1529    +Z =  43.480    -Z = -33.040
                                        TRIGA - PREF. FLOOD CANISTER
-
                MEDIA BIAS       GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID

                                                 -----   UNIT   424   -----

AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, TOP LEFT OPENING
  1 CUBOID          23  1      +X =  4.1529    -X = -4.1529    +Y =  4.1529    -Y = -4.1529    +Z =  43.480    -Z = -33.040
    HOLE NUMBER     85      AT X = -2.8443     Y = -2.8443     Z = 0.00000     IS UNIT NUMBER    415
    HOLE NUMBER     86      AT X =-0.94810     Y = -2.8443     Z = 0.00000     IS UNIT NUMBER    413
    HOLE NUMBER     87      AT X = 0.94810     Y = -2.8443     Z = 0.00000     IS UNIT NUMBER    413
    HOLE NUMBER     88      AT X =  2.8443     Y = -2.8443     Z = 0.00000     IS UNIT NUMBER    416
    HOLE NUMBER     89      AT X = -2.8443     Y =-0.94810     Z = 0.00000     IS UNIT NUMBER    411
    HOLE NUMBER     90      AT X =-0.94810     Y =-0.94810     Z = 0.00000     IS UNIT NUMBER    415
    HOLE NUMBER     91      AT X = 0.94810     Y =-0.94810     Z = 0.00000     IS UNIT NUMBER    416
    HOLE NUMBER     92      AT X =  2.8443     Y =-0.94810     Z = 0.00000     IS UNIT NUMBER    412
    HOLE NUMBER     93      AT X = -2.8443     Y = 0.94810     Z = 0.00000     IS UNIT NUMBER    411
    HOLE NUMBER     94      AT X =-0.94810     Y = 0.94810     Z = 0.00000     IS UNIT NUMBER    417
    HOLE NUMBER     95      AT X = 0.94810     Y = 0.94810     Z = 0.00000     IS UNIT NUMBER    418
    HOLE NUMBER     96      AT X =  2.8443     Y = 0.94810     Z = 0.00000     IS UNIT NUMBER    412
    HOLE NUMBER     97      AT X = -2.8443     Y =  2.8443     Z = 0.00000     IS UNIT NUMBER    417
    HOLE NUMBER     98      AT X =-0.94810     Y =  2.8443     Z = 0.00000     IS UNIT NUMBER    414
    HOLE NUMBER     99      AT X = 0.94810     Y =  2.8443     Z = 0.00000     IS UNIT NUMBER    414
    HOLE NUMBER    100      AT X =  2.8443     Y =  2.8443     Z = 0.00000     IS UNIT NUMBER    418
  2 CUBOID          23  1      +X =  4.1529    -X = -4.1529    +Y =  4.1529    -Y = -4.1529    +Z =  43.480    -Z = -33.040
                                        TRIGA - PREF. FLOOD CANISTER
-
                MEDIA BIAS       GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID

                                                 -----   UNIT   425   -----

AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, BOTTOM RIGHT OPENING
  1 CUBOID          23  1      +X =  4.1529    -X = -4.1529    +Y =  4.1529    -Y = -4.1529    +Z =  43.480    -Z = -33.040
    HOLE NUMBER    101      AT X = -2.8443     Y = -2.8443     Z = 0.00000     IS UNIT NUMBER    415
    HOLE NUMBER    102      AT X =-0.94810     Y = -2.8443     Z = 0.00000     IS UNIT NUMBER    413
    HOLE NUMBER    103      AT X = 0.94810     Y = -2.8443     Z = 0.00000     IS UNIT NUMBER    413
    HOLE NUMBER    104      AT X =  2.8443     Y = -2.8443     Z = 0.00000     IS UNIT NUMBER    416
```

```
    HOLE NUMBER    105       AT X = -2.8443       Y =-0.94810       Z = 0.00000      IS UNIT NUMBER     411
    HOLE NUMBER    106       AT X =-0.94810       Y =-0.94810       Z = 0.00000      IS UNIT NUMBER     415
    HOLE NUMBER    107       AT X = 0.94810       Y =-0.94810       Z = 0.00000      IS UNIT NUMBER     416
    HOLE NUMBER    108       AT X =  2.8443       Y =-0.94810       Z = 0.00000      IS UNIT NUMBER     412
    HOLE NUMBER    109       AT X = -2.8443       Y = 0.94810       Z = 0.00000      IS UNIT NUMBER     411
    HOLE NUMBER    110       AT X =-0.94810       Y = 0.94810       Z = 0.00000      IS UNIT NUMBER     417
    HOLE NUMBER    111       AT X = 0.94810       Y = 0.94810       Z = 0.00000      IS UNIT NUMBER     418
    HOLE NUMBER    112       AT X =  2.8443       Y = 0.94810       Z = 0.00000      IS UNIT NUMBER     412
    HOLE NUMBER    113       AT X = -2.8443       Y =  2.8443       Z = 0.00000      IS UNIT NUMBER     417
    HOLE NUMBER    114       AT X =-0.94810       Y =  2.8443       Z = 0.00000      IS UNIT NUMBER     414
    HOLE NUMBER    115       AT X = 0.94810       Y =  2.8443       Z = 0.00000      IS UNIT NUMBER     414
    HOLE NUMBER    116       AT X =  2.8443       Y =  2.8443       Z = 0.00000      IS UNIT NUMBER     418
  2 CUBOID          23  1      +X =  4.1529     -X = -4.1529     +Y =  4.1529     -Y = -4.1529     +Z =  43.480     -Z = -33.040
                                          TRIGA - PREF. FLOOD CANISTER
-
                MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID

                                                  -----   UNIT   426   -----

AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, TOP RIGHT OPENING
  1 CUBOID          23  1      +X =  4.1529     -X = -4.1529     +Y =  4.1529     -Y = -4.1529     +Z =  43.480     -Z = -33.040
    HOLE NUMBER    117       AT X = -2.8443       Y = -2.8443       Z = 0.00000      IS UNIT NUMBER     415
    HOLE NUMBER    118       AT X =-0.94810       Y = -2.8443       Z = 0.00000      IS UNIT NUMBER     413
    HOLE NUMBER    119       AT X = 0.94810       Y = -2.8443       Z = 0.00000      IS UNIT NUMBER     413
    HOLE NUMBER    120       AT X =  2.8443       Y = -2.8443       Z = 0.00000      IS UNIT NUMBER     416
    HOLE NUMBER    121       AT X = -2.8443       Y =-0.94810       Z = 0.00000      IS UNIT NUMBER     411
    HOLE NUMBER    122       AT X =-0.94810       Y =-0.94810       Z = 0.00000      IS UNIT NUMBER     415
    HOLE NUMBER    123       AT X = 0.94810       Y =-0.94810       Z = 0.00000      IS UNIT NUMBER     416
    HOLE NUMBER    124       AT X =  2.8443       Y =-0.94810       Z = 0.00000      IS UNIT NUMBER     412
    HOLE NUMBER    125       AT X = -2.8443       Y = 0.94810       Z = 0.00000      IS UNIT NUMBER     411
    HOLE NUMBER    126       AT X =-0.94810       Y = 0.94810       Z = 0.00000      IS UNIT NUMBER     417
    HOLE NUMBER    127       AT X = 0.94810       Y = 0.94810       Z = 0.00000      IS UNIT NUMBER     418
    HOLE NUMBER    128       AT X =  2.8443       Y = 0.94810       Z = 0.00000      IS UNIT NUMBER     412
    HOLE NUMBER    129       AT X = -2.8443       Y =  2.8443       Z = 0.00000      IS UNIT NUMBER     417
    HOLE NUMBER    130       AT X =-0.94810       Y =  2.8443       Z = 0.00000      IS UNIT NUMBER     414
    HOLE NUMBER    131       AT X = 0.94810       Y =  2.8443       Z = 0.00000      IS UNIT NUMBER     414
    HOLE NUMBER    132       AT X =  2.8443       Y =  2.8443       Z = 0.00000      IS UNIT NUMBER     418
  2 CUBOID          23  1      +X =  4.1529     -X = -4.1529     +Y =  4.1529     -Y = -4.1529     +Z =  43.480     -Z = -33.040

                                                  -----   UNIT   430   -----

FUEL INSERT IN, CENTER OPENING
  1 CUBOID          23  1      +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  43.480     -Z = -33.040
    HOLE NUMBER    133       AT X = 0.00000       Y = 0.00000       Z = 0.00000      IS UNIT NUMBER     420
                                          TRIGA - PREF. FLOOD CANISTER
-
                MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID

                                                  -----   UNIT   431   -----

FUEL INSERT IN, BOTTOM OPENING
  1 CUBOID          23  1      +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  43.480     -Z = -33.040
    HOLE NUMBER    134       AT X = 0.00000       Y =-0.11430       Z = 0.00000      IS UNIT NUMBER     421

                                                  -----   UNIT   432   -----

FUEL INSERT IN, TOP OPENING
  1 CUBOID          23  1      +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  43.480     -Z = -33.040
    HOLE NUMBER    135       AT X = 0.00000       Y = 0.11430       Z = 0.00000      IS UNIT NUMBER     422
```

```
                                   -----   UNIT   433   -----

FUEL INSERT IN, BOTTOM LEFT OPENING

  1 CUBOID          23  1      +X =  4.2672    -X = -4.2672    +Y =  4.2672    -Y = -4.2672    +Z =  43.480    -Z = -33.040

    HOLE NUMBER    136       AT X =-0.11430     Y =-0.11430     Z = 0.00000    IS UNIT NUMBER    423

                                   -----   UNIT   434   -----

FUEL INSERT IN, TOP LEFT OPENING

  1 CUBOID          23  1      +X =  4.2672    -X = -4.2672    +Y =  4.2672    -Y = -4.2672    +Z =  43.480    -Z = -33.040

    HOLE NUMBER    137       AT X =-0.11430     Y = 0.11430     Z = 0.00000    IS UNIT NUMBER    424

                                   -----   UNIT   435   -----

FUEL INSERT IN, BOTOM RIGHT OPENING

  1 CUBOID          23  1      +X =  4.2672    -X = -4.2672    +Y =  4.2672    -Y = -4.2672    +Z =  43.480    -Z = -33.040

    HOLE NUMBER    138       AT X = 0.11430     Y =-0.11430     Z = 0.00000    IS UNIT NUMBER    425

                                   -----   UNIT   436   -----

FUEL INSERT IN, TOP RIGHT OPENING

  1 CUBOID          23  1      +X =  4.2672    -X = -4.2672    +Y =  4.2672    -Y = -4.2672    +Z =  43.480    -Z = -33.040

    HOLE NUMBER    139       AT X = 0.11430     Y = 0.11430     Z = 0.00000    IS UNIT NUMBER    426
-                                        TRIGA - PREF. FLOOD CANISTER

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                        -----   UNIT   440   EXTERNAL TO LATTICE 41    -----

CENTER COLUMN OF THREE OPENINGS

  1 ARRAY NUMBER    41         +X =  4.2672    -X = -4.2672    +Y =  13.830    -Y = -13.830    +Z =  43.480    -Z = -33.040

  2 CUBOID         212  1      +X =  4.9784    -X = -4.9784    +Y =  14.542    -Y = -14.542    +Z =  43.480    -Z = -33.040

                        -----   UNIT   441   EXTERNAL TO LATTICE 42    -----

LEFT OUTSIDE COLUMN OF TWO OPENINGS

  1 ARRAY NUMBER    42         +X =  4.2672    -X = -4.2672    +Y =  8.9980    -Y = -8.9979    +Z =  43.480    -Z = -33.040

  2 CUBOID         212  1      +X =  4.2672    -X = -4.6080    +Y =  9.3388    -Y = -9.3387    +Z =  43.480    -Z = -33.040

                        -----   UNIT   442   EXTERNAL TO LATTICE 43    -----

RIGHT OUTSIDE COLUMN OF TWO OPENINGS

  1 ARRAY NUMBER    43         +X =  4.2672    -X = -4.2672    +Y =  8.9980    -Y = -8.9979    +Z =  43.480    -Z = -33.040

  2 CUBOID         212  1      +X =  4.6080    -X = -4.2672    +Y =  9.3388    -Y = -9.3387    +Z =  43.480    -Z = -33.040

                                   -----   UNIT   450   -----

28 TRIGA FUEL ELEMENTS IN EACH LWT BASKET

  1 CYLINDER        23  1  RADIUS =  17.150    +Z =  43.485    -Z = -33.045    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

    HOLE NUMBER    140       AT X = 0.00000     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER    440

    HOLE NUMBER    141       AT X = -9.2457     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER    441

    HOLE NUMBER    142       AT X =  9.2457     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER    442

  2 CYLINDER       212  1  RADIUS =  18.910    +Z =  43.485    -Z = -33.045    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

  3 CYLINDER        26  1  RADIUS =  33.465    +Z =  43.485    -Z = -33.045    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

  4 CYLINDER       212  1  RADIUS =  36.519    +Z =  43.485    -Z = -33.045    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

  5 CYLINDER        27  1  RADIUS =  49.223    +Z =  43.485    -Z = -33.045    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

  6 CYLINDER       212  1  RADIUS =  49.822    +Z =  43.485    -Z = -33.045    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

  7 CUBOID          28  1      +X =  49.822    -X = -49.822    +Y =  49.822    -Y = -49.822    +Z =  43.485    -Z = -33.045
-                         TRIGA - PREF. FLOOD CANISTER

                 -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   1          -------

Z LAYER    1, X COLUMN    1 TO    1 LEFT TO RIGHT    Y ROW    1 TO    7  BOTTOM TO TOP
 11
  5
```

```
 17
 16
 17
  5
 10
                  -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   2          -------
Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   4  BOTTOM TO TOP
 12
  6
 17
 13
                  -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   3          -------
Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   4  BOTTOM TO TOP
 14
  6
 17
 15
-                         TRIGA - PREF. FLOOD CANISTER
                  -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  20          -------
Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
  81
Z LAYER   2, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
  30
Z LAYER   3, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
 450
Z LAYER   4, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
 450
Z LAYER   5, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
 450
Z LAYER   6, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
  30
Z LAYER   7, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
  80
-                         TRIGA - PREF. FLOOD CANISTER
                  -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  41          -------
Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   7  BOTTOM TO TOP
 431
  45
  42
 430
  42
  45
 432
                  -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  42          -------
Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   4  BOTTOM TO TOP
 435
  42
  46
 436
                  -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  43          -------
Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   4  BOTTOM TO TOP
 433
  42
  46
 434
```

```
                  TRIGA - PREF. FLOOD CANISTER
                 VOLUMES FOR THOSE UNITS UTILIZED IN  THIS PROBLEM

                   GEOMETRY                                   CUMULATIVE
UNIT     REGION     REGION           VOLUME                     VOLUME

  1         1          1         3.04527E+03 CM**3         3.04527E+03 CM**3

  5         1          2         5.01021E+02 CM**3         5.01021E+02 CM**3

  6         1          3         4.29446E+02 CM**3         4.29446E+02 CM**3

  7         1          4         2.52441E-01 CM**3         3.04552E+03 CM**3
            2          5         4.63830E+02 CM**3         3.50935E+03 CM**3
            3          6         9.63081E+02 CM**3         4.47243E+03 CM**3

 10         1          7         1.53981E+03 CM**3         6.01225E+03 CM**3

 11         1          8         1.53981E+03 CM**3         6.01225E+03 CM**3

 12         1          9         1.53981E+03 CM**3         6.01225E+03 CM**3

 13         1         10         1.53981E+03 CM**3         6.01225E+03 CM**3

 14         1         11         1.53981E+03 CM**3         6.01225E+03 CM**3

 15         1         12         1.53981E+03 CM**3         6.01225E+03 CM**3

 16         1         13         1.53981E+03 CM**3         6.01225E+03 CM**3

 17         1         14         1.94205E+02 CM**3         1.94205E+02 CM**3
            2         15         1.61300E+01 CM**3         2.10335E+02 CM**3
            3         16         1.33346E+01 CM**3         2.23670E+02 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     20 IS AN ARRAY PLACEMENT BOUNDARY REGION

 20         1         20         1.94861E+04 CM**3         1.94861E+04 CM**3
            2         21         4.41673E+03 CM**3         2.39029E+04 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     22 IS AN ARRAY PLACEMENT BOUNDARY REGION

 21         1         22         1.26776E+04 CM**3         1.26776E+04 CM**3
            2         23         8.97555E+02 CM**3         1.35752E+04 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     24 IS AN ARRAY PLACEMENT BOUNDARY REGION

 22         1         24         1.26776E+04 CM**3         1.26776E+04 CM**3
            2         25         8.97555E+02 CM**3         1.35752E+04 CM**3

 30         1         26         2.47754E+04 CM**3         7.58286E+04 CM**3
            2         27         1.83375E+04 CM**3         9.41660E+04 CM**3
            3         28         2.00728E+05 CM**3         2.94894E+05 CM**3
            4         29         5.62864E+04 CM**3         3.51181E+05 CM**3
            5         30         2.86831E+05 CM**3         6.38011E+05 CM**3
            6         31         1.56332E+04 CM**3         6.53645E+05 CM**3
            7         32         1.78602E+05 CM**3         8.32246E+05 CM**3

 41         1         33         7.36468E+01 CM**3         7.36468E+01 CM**3
            2         34         9.53190E+00 CM**3         8.31787E+01 CM**3
            3         35         3.07231E+01 CM**3         1.13902E+02 CM**3

 42         1         36         1.65841E+02 CM**3         1.65841E+02 CM**3
            2         37         1.37742E+01 CM**3         1.79615E+02 CM**3
            3         38         2.77290E+01 CM**3         2.07344E+02 CM**3

 45         1         39         4.64451E+02 CM**3         4.64451E+02 CM**3

 46         1         40         3.98101E+02 CM**3         3.98101E+02 CM**3

 80         1         93         1.18444E+05 CM**3         1.18444E+05 CM**3
            2         94         1.02013E+05 CM**3         2.20456E+05 CM**3
            3         95         6.02374E+04 CM**3         2.80694E+05 CM**3

 81         1         96         1.66245E+04 CM**3         1.66245E+04 CM**3
            2         97         9.57276E+04 CM**3         1.12352E+05 CM**3
            3         98         9.56257E+04 CM**3         2.07978E+05 CM**3
            4         99         5.68278E+04 CM**3         2.64806E+05 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION    100 IS AN ARRAY PLACEMENT BOUNDARY REGION

 82         1        100         4.48958E+06 CM**3         4.48958E+06 CM**3

411         1         43         4.36751E+01 CM**3         1.57577E+02 CM**3
            2         44         5.84895E+01 CM**3         2.16066E+02 CM**3

412         1         45         4.36751E+01 CM**3         1.57577E+02 CM**3
            2         46         5.84895E+01 CM**3         2.16066E+02 CM**3

413         1         47         4.36751E+01 CM**3         1.57577E+02 CM**3
            2         48         5.84895E+01 CM**3         2.16066E+02 CM**3

414         1         49         4.36751E+01 CM**3         1.57577E+02 CM**3
            2         50         5.84895E+01 CM**3         2.16066E+02 CM**3

415         1         51         4.36751E+01 CM**3         1.57577E+02 CM**3
```

```
            2        52        5.84895E+01 CM**3        2.16066E+02 CM**3

416         1        53        4.36751E+01 CM**3        1.57577E+02 CM**3
            2        54        5.84895E+01 CM**3        2.16066E+02 CM**3

417         1        55        4.36751E+01 CM**3        1.57577E+02 CM**3
            2        56        5.84895E+01 CM**3        2.16066E+02 CM**3

418         1        57        4.36751E+01 CM**3        1.57577E+02 CM**3
            2        58        5.84895E+01 CM**3        2.16066E+02 CM**3

420         1        59        1.82177E+03 CM**3        5.27883E+03 CM**3
            2        60        0.00000E+00 CM**3        5.27883E+03 CM**3

421         1        61        1.82177E+03 CM**3        5.27883E+03 CM**3
            2        62        0.00000E+00 CM**3        5.27883E+03 CM**3

422         1        63        1.82177E+03 CM**3        5.27883E+03 CM**3
            2        64        0.00000E+00 CM**3        5.27883E+03 CM**3

423         1        65        1.82177E+03 CM**3        5.27883E+03 CM**3
            2        66        0.00000E+00 CM**3        5.27883E+03 CM**3

424         1        67        1.82177E+03 CM**3        5.27883E+03 CM**3
            2        68        0.00000E+00 CM**3        5.27883E+03 CM**3

425         1        69        1.82177E+03 CM**3        5.27883E+03 CM**3
            2        70        0.00000E+00 CM**3        5.27883E+03 CM**3

426         1        71        1.82177E+03 CM**3        5.27883E+03 CM**3
            2        72        0.00000E+00 CM**3        5.27883E+03 CM**3

430         1        73        2.94576E+02 CM**3        5.57341E+03 CM**3

431         1        74        2.94576E+02 CM**3        5.57341E+03 CM**3

432         1        75        2.94576E+02 CM**3        5.57341E+03 CM**3

433         1        76        2.94576E+02 CM**3        5.57341E+03 CM**3

434         1        77        2.94576E+02 CM**3        5.57341E+03 CM**3

435         1        78        2.94576E+02 CM**3        5.57341E+03 CM**3

436         1        79        2.94576E+02 CM**3        5.57341E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     80 IS AN ARRAY PLACEMENT BOUNDARY REGION

440         1        80        1.80638E+04 CM**3        1.80638E+04 CM**3
            2        81        4.09436E+03 CM**3        2.21582E+04 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     82 IS AN ARRAY PLACEMENT BOUNDARY REGION

441         1        82        1.17523E+04 CM**3        1.17523E+04 CM**3
            2        83        9.32192E+02 CM**3        1.26845E+04 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     84 IS AN ARRAY PLACEMENT BOUNDARY REGION

442         1        84        1.17523E+04 CM**3        1.17523E+04 CM**3
            2        85        9.32192E+02 CM**3        1.26845E+04 CM**3

450         1        86        2.31876E+04 CM**3        7.07147E+04 CM**3
            2        87        1.52615E+04 CM**3        8.59762E+04 CM**3
            3        88        1.83270E+05 CM**3        2.69247E+05 CM**3
            4        89        5.13911E+04 CM**3        3.20638E+05 CM**3
            5        90        2.61884E+05 CM**3        5.82522E+05 CM**3
            6        91        1.42735E+04 CM**3        5.96796E+05 CM**3
            7        92        1.63068E+05 CM**3        7.59864E+05 CM**3


                 UNIT     USES     REGION     MIXTURE        TOTAL VOLUME

                   1       14        1           1         4.26338E+04 CM**3

                   5        4        1           2         2.00408E+03 CM**3

                   6        4        1           2         1.71778E+03 CM**3

                   7       14        1           3         3.53418E+00 CM**3
                                     2           2         6.49362E+03 CM**3
                                     3          12         1.34831E+04 CM**3

                  10        2        1          12         3.07963E+03 CM**3

                  11        2        1          12         3.07963E+03 CM**3

                  12        2        1          12         3.07963E+03 CM**3

                  13        2        1          12         3.07963E+03 CM**3

                  14        2        1          12         3.07963E+03 CM**3

                  15        2        1          12         3.07963E+03 CM**3
```

16	2	1	12	3.07963E+03 CM**3
17	8	1	13	1.55364E+03 CM**3
		2	14	1.29040E+02 CM**3
		3	12	1.06677E+02 CM**3
20	2	1		3.89722E+04 CM**3
		2	2	8.83347E+03 CM**3
21	2	1		2.53552E+04 CM**3
		2	2	1.79511E+03 CM**3
22	2	1		2.53552E+04 CM**3
		2	2	1.79511E+03 CM**3
30	2	1	12	4.95508E+04 CM**3
		2	2	3.66750E+04 CM**3
		3	6	4.01456E+05 CM**3
		4	2	1.12573E+05 CM**3
		5	7	5.73661E+05 CM**3
		6	2	3.12664E+04 CM**3
		7	8	3.57203E+05 CM**3
41	336	1	21	2.47453E+04 CM**3
		2	22	3.20272E+03 CM**3
		3	29	1.03230E+04 CM**3
42	12	1	210	1.99009E+03 CM**3
		2	211	1.65290E+02 CM**3
		3	23	3.32748E+02 CM**3
45	6	1	212	2.78670E+03 CM**3
46	6	1	212	2.38860E+03 CM**3
80	1	1	2	1.18444E+05 CM**3
		2	8	1.02013E+05 CM**3
		3	8	6.02374E+04 CM**3
81	1	1	6	1.66245E+04 CM**3
		2	2	9.57276E+04 CM**3
		3	8	9.56257E+04 CM**3
		4	8	5.68278E+04 CM**3
82	1	1		4.48958E+06 CM**3
411	42	1	23	1.83435E+03 CM**3
		2	215	2.45656E+03 CM**3
412	42	1	23	1.83435E+03 CM**3
		2	215	2.45656E+03 CM**3
413	42	1	23	1.83435E+03 CM**3
		2	215	2.45656E+03 CM**3
414	42	1	23	1.83435E+03 CM**3
		2	215	2.45656E+03 CM**3
415	42	1	23	1.83435E+03 CM**3
		2	215	2.45656E+03 CM**3
416	42	1	23	1.83435E+03 CM**3
		2	215	2.45656E+03 CM**3
417	42	1	23	1.83435E+03 CM**3
		2	215	2.45656E+03 CM**3
418	42	1	23	1.83435E+03 CM**3
		2	215	2.45656E+03 CM**3
420	3	1	23	5.46531E+03 CM**3
		2	23	0.00000E+00 CM**3
421	3	1	23	5.46531E+03 CM**3
		2	23	0.00000E+00 CM**3
422	3	1	23	5.46531E+03 CM**3
		2	23	0.00000E+00 CM**3
423	3	1	23	5.46531E+03 CM**3
		2	23	0.00000E+00 CM**3
424	3	1	23	5.46531E+03 CM**3
		2	23	0.00000E+00 CM**3
425	3	1	23	5.46531E+03 CM**3
		2	23	0.00000E+00 CM**3
426	3	1	23	5.46531E+03 CM**3
		2	23	0.00000E+00 CM**3
430	3	1	23	8.83729E+02 CM**3
431	3	1	23	8.83729E+02 CM**3

432	3	1	23	8.83729E+02 CM**3
433	3	1	23	8.83729E+02 CM**3
434	3	1	23	8.83729E+02 CM**3
435	3	1	23	8.83729E+02 CM**3
436	3	1	23	8.83729E+02 CM**3
440	3	1		5.41915E+04 CM**3
		2	212	1.22831E+04 CM**3
441	3	1		3.52568E+04 CM**3
		2	212	2.79658E+03 CM**3
442	3	1		3.52568E+04 CM**3
		2	212	2.79658E+03 CM**3
450	3	1	23	6.95629E+04 CM**3
		2	212	4.57845E+04 CM**3
		3	26	5.49811E+05 CM**3
		4	212	1.54173E+05 CM**3
		5	27	7.85653E+05 CM**3
		6	212	4.28205E+04 CM**3
		7	28	4.89205E+05 CM**3

TOTAL MIXTURE VOLUMES

MIXTURE	TOTAL VOLUME	MASS(G)
1	4.26338E+04 CM**3	7.52714E+04
2	4.17325E+05 CM**3	3.30521E+06
3	3.53418E+00 CM**3	3.52772E+00
6	4.18081E+05 CM**3	4.74271E+06
7	5.73661E+05 CM**3	5.72612E-15
8	6.71907E+05 CM**3	6.70678E-15
12	8.46980E+04 CM**3	8.45431E+01
13	1.55364E+03 CM**3	1.20454E+04
14	1.29040E+02 CM**3	9.92440E+02
21	2.47453E+04 CM**3	1.45038E+05
22	3.20272E+03 CM**3	2.57258E+04
23	1.29014E+05 CM**3	1.28778E+02
26	5.49811E+05 CM**3	6.23706E+06
27	7.85653E+05 CM**3	7.84216E-15
28	4.89205E+05 CM**3	4.88310E-15
29	1.03230E+04 CM**3	4.06226E+04
210	1.99009E+03 CM**3	1.54292E+04
211	1.65290E+02 CM**3	1.27124E+03
212	2.65830E+05 CM**3	2.10537E+06
215	1.96525E+04 CM**3	5.31009E+04

BIASING INFORMATION

A DEFAULT WEIGHT OF 0.500 WILL BE USED FOR ALL BIAS ID'S.

.... 0 IO'S WERE USED IN KENO-V BEFORE TRACKING ....

.... 0.02467 MINUTES WERE USED PROCESSING DATA. ....

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 1.50079E-02

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED WITH A FLAT DISTRIBUTION IN A CUBOID DEFINED BY:
+X= 4.98221E+01 -X=-4.98221E+01 +Y= 4.98221E+01 -Y=-4.98221E+01 +Z= 2.30870E+02 -Z=-2.21300E+02
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

0.66433 MINUTES WERE REQUIRED FOR STARTING. TOTAL ELAPSED TIME IS 0.68267 MINUTES.

TRIGA - PREF. FLOOD CANISTER

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	442 INDEPENDENT FISSION POINTS WERE GENERATED			
1	8.37539E-01	6.99333E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	488 INDEPENDENT FISSION POINTS WERE GENERATED			
2	8.52774E-01	7.14000E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
3	8.40221E-01	7.26833E-01	8.40221E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	8.80179E-01	7.40500E-01	8.60200E-01	1.99790E-02	0.00000E+00	0.00000E+00
5	8.77375E-01	7.52500E-01	8.65925E-01	1.28775E-02	0.00000E+00	0.00000E+00
6	8.52329E-01	7.65167E-01	8.62526E-01	9.71942E-03	0.00000E+00	0.00000E+00
7	8.64157E-01	7.79000E-01	8.62852E-01	7.53569E-03	0.00000E+00	0.00000E+00
8	8.52553E-01	7.91833E-01	8.61136E-01	6.38780E-03	0.00000E+00	0.00000E+00
9	8.56608E-01	8.05500E-01	8.60489E-01	5.43728E-03	0.00000E+00	0.00000E+00
10	8.10802E-01	8.19167E-01	8.54278E-01	7.79410E-03	0.00000E+00	0.00000E+00
11	8.41128E-01	8.33833E-01	8.52817E-01	7.02732E-03	0.00000E+00	0.00000E+00
12	8.19244E-01	8.48500E-01	8.49459E-01	7.12589E-03	0.00000E+00	0.00000E+00
13	8.45987E-01	8.63167E-01	8.49144E-01	6.45333E-03	0.00000E+00	0.00000E+00
14	8.71782E-01	8.76000E-01	8.51030E-01	6.18574E-03	0.00000E+00	0.00000E+00
15	8.45444E-01	8.89667E-01	8.50601E-01	5.70626E-03	0.00000E+00	0.00000E+00
16	7.71454E-01	9.03500E-01	8.44947E-01	7.73757E-03	0.00000E+00	0.00000E+00
17	8.59059E-01	9.16333E-01	8.45888E-01	7.26446E-03	0.00000E+00	0.00000E+00
18	8.37210E-01	9.29167E-01	8.45346E-01	6.81689E-03	0.00000E+00	0.00000E+00
19	8.47860E-01	9.41833E-01	8.45493E-01	6.40506E-03	0.00000E+00	0.00000E+00
20	8.54889E-01	9.53833E-01	8.46015E-01	6.06126E-03	0.00000E+00	0.00000E+00
21	8.36069E-01	9.66667E-01	8.45492E-01	5.75723E-03	0.00000E+00	0.00000E+00
22	8.28513E-01	9.79500E-01	8.44643E-01	5.52738E-03	0.00000E+00	0.00000E+00
23	8.43649E-01	9.91333E-01	8.44596E-01	5.25780E-03	0.00000E+00	0.00000E+00
24	8.99669E-01	1.00417E+00	8.47099E-01	5.60339E-03	0.00000E+00	0.00000E+00
25	8.14114E-01	1.01783E+00	8.45665E-01	5.54296E-03	0.00000E+00	0.00000E+00
26	8.57507E-01	1.03067E+00	8.46158E-01	5.32987E-03	0.00000E+00	0.00000E+00
27	8.05687E-01	1.04450E+00	8.44547E-01	5.36001E-03	0.00000E+00	0.00000E+00
28	8.80365E-01	1.05733E+00	8.45925E-01	5.33081E-03	0.00000E+00	0.00000E+00
29	8.56343E-01	1.07100E+00	8.46311E-01	5.14406E-03	0.00000E+00	0.00000E+00
30	9.08331E-01	1.08467E+00	8.48526E-01	5.42931E-03	0.00000E+00	0.00000E+00
31	8.66782E-01	1.09850E+00	8.49155E-01	5.27644E-03	0.00000E+00	0.00000E+00
32	8.40028E-01	1.11133E+00	8.48851E-01	5.10660E-03	0.00000E+00	0.00000E+00
33	8.96029E-01	1.12317E+00	8.50373E-01	5.16827E-03	0.00000E+00	0.00000E+00
34	8.15823E-01	1.13783E+00	8.49293E-01	5.11931E-03	0.00000E+00	0.00000E+00
35	7.67288E-01	1.15067E+00	8.46808E-01	5.54926E-03	0.00000E+00	0.00000E+00
36	8.30848E-01	1.16350E+00	8.46339E-01	5.40399E-03	0.00000E+00	0.00000E+00
37	8.23007E-01	1.17717E+00	8.45672E-01	5.28950E-03	0.00000E+00	0.00000E+00
38	8.26258E-01	1.19000E+00	8.45133E-01	5.16868E-03	0.00000E+00	0.00000E+00
39	8.42836E-01	1.20283E+00	8.45071E-01	5.02743E-03	0.00000E+00	0.00000E+00
40	8.29217E-01	1.21567E+00	8.44654E-01	4.91109E-03	0.00000E+00	0.00000E+00
41	8.12012E-01	1.22933E+00	8.43817E-01	4.85618E-03	0.00000E+00	0.00000E+00
42	7.91772E-01	1.24217E+00	8.42516E-01	4.90879E-03	0.00000E+00	0.00000E+00
43	7.68831E-01	1.25500E+00	8.40716E-01	5.11378E-03	0.00000E+00	0.00000E+00
44	8.31359E-01	1.26867E+00	8.40496E-01	4.99551E-03	0.00000E+00	0.00000E+00
45	8.77040E-01	1.28150E+00	8.41345E-01	4.95143E-03	0.00000E+00	0.00000E+00
46	8.86491E-01	1.29433E+00	8.42371E-01	4.94520E-03	0.00000E+00	0.00000E+00
47	8.58182E-01	1.30717E+00	8.42723E-01	4.84681E-03	0.00000E+00	0.00000E+00
48	8.53866E-01	1.32000E+00	8.42965E-01	4.74646E-03	0.00000E+00	0.00000E+00
49	8.26025E-01	1.33367E+00	8.42605E-01	4.65834E-03	0.00000E+00	0.00000E+00
50	8.31626E-01	1.34650E+00	8.42376E-01	4.56599E-03	0.00000E+00	0.00000E+00
51	8.30702E-01	1.35933E+00	8.42138E-01	4.47818E-03	0.00000E+00	0.00000E+00
52	8.43633E-01	1.37117E+00	8.42168E-01	4.38780E-03	0.00000E+00	0.00000E+00
53	8.41469E-01	1.38583E+00	8.42154E-01	4.30093E-03	0.00000E+00	0.00000E+00
54	8.06610E-01	1.39867E+00	8.41470E-01	4.27244E-03	0.00000E+00	0.00000E+00
55	8.57839E-01	1.41150E+00	8.41779E-01	4.20242E-03	0.00000E+00	0.00000E+00
56	8.56385E-01	1.42433E+00	8.42050E-01	4.13272E-03	0.00000E+00	0.00000E+00
57	8.56692E-01	1.43800E+00	8.42316E-01	4.06561E-03	0.00000E+00	0.00000E+00
58	8.08883E-01	1.45183E+00	8.41719E-01	4.03674E-03	0.00000E+00	0.00000E+00
59	8.56866E-01	1.46467E+00	8.41985E-01	3.97419E-03	0.00000E+00	0.00000E+00
60	8.14106E-01	1.47833E+00	8.41504E-01	3.93454E-03	0.00000E+00	0.00000E+00
61	7.76144E-01	1.49117E+00	8.40396E-01	4.02281E-03	0.00000E+00	0.00000E+00
62	8.09639E-01	1.50483E+00	8.39884E-01	3.98828E-03	0.00000E+00	0.00000E+00
63	8.17719E-01	1.51950E+00	8.39520E-01	3.93915E-03	0.00000E+00	0.00000E+00
64	8.20194E-01	1.53333E+00	8.39208E-01	3.88761E-03	0.00000E+00	0.00000E+00
65	8.51247E-01	1.54700E+00	8.39400E-01	3.83017E-03	0.00000E+00	0.00000E+00
66	8.74295E-01	1.56067E+00	8.39945E-01	3.80908E-03	0.00000E+00	0.00000E+00
67	8.51067E-01	1.57450E+00	8.40116E-01	3.75392E-03	0.00000E+00	0.00000E+00
68	8.13783E-01	1.58817E+00	8.39717E-01	3.71807E-03	0.00000E+00	0.00000E+00
69	8.42532E-01	1.60100E+00	8.39759E-01	3.66240E-03	0.00000E+00	0.00000E+00
70	8.28592E-01	1.61383E+00	8.39595E-01	3.61187E-03	0.00000E+00	0.00000E+00
71	8.03059E-01	1.62850E+00	8.39065E-01	3.59832E-03	0.00000E+00	0.00000E+00
72	8.25102E-01	1.64217E+00	8.38866E-01	3.55214E-03	0.00000E+00	0.00000E+00
73	8.28166E-01	1.65600E+00	8.38715E-01	3.50499E-03	0.00000E+00	0.00000E+00
74	8.50376E-01	1.66967E+00	8.38877E-01	3.45976E-03	0.00000E+00	0.00000E+00
75	8.36810E-01	1.68433E+00	8.38849E-01	3.41215E-03	0.00000E+00	0.00000E+00
76	8.55302E-01	1.69800E+00	8.39071E-01	3.37306E-03	0.00000E+00	0.00000E+00
77	8.44892E-01	1.71267E+00	8.39149E-01	3.32869E-03	0.00000E+00	0.00000E+00
78	9.18109E-01	1.72467E+00	8.40188E-01	3.44500E-03	0.00000E+00	0.00000E+00
79	8.45898E-01	1.73733E+00	8.40262E-01	3.40077E-03	0.00000E+00	0.00000E+00
80	8.66703E-01	1.75117E+00	8.40601E-01	3.37396E-03	0.00000E+00	0.00000E+00
81	9.18005E-01	1.76400E+00	8.41581E-01	3.47209E-03	0.00000E+00	0.00000E+00
82	8.75745E-01	1.77683E+00	8.42008E-01	3.45491E-03	0.00000E+00	0.00000E+00
83	7.87991E-01	1.79050E+00	8.41341E-01	3.47655E-03	0.00000E+00	0.00000E+00
84	8.46407E-01	1.80333E+00	8.41403E-01	3.43444E-03	0.00000E+00	0.00000E+00
85	8.41778E-01	1.81617E+00	8.41407E-01	3.39282E-03	0.00000E+00	0.00000E+00
86	8.30200E-01	1.82983E+00	8.41274E-01	3.35484E-03	0.00000E+00	0.00000E+00
87	8.08188E-01	1.84267E+00	8.40885E-01	3.33791E-03	0.00000E+00	0.00000E+00
88	8.08280E-01	1.85550E+00	8.40505E-01	3.32058E-03	0.00000E+00	0.00000E+00
89	8.60229E-01	1.86917E+00	8.40732E-01	3.29001E-03	0.00000E+00	0.00000E+00

90	8.58676E-01	1.88200E+00	8.40936E-01	3.25879E-03	0.00000E+00	0.00000E+00
91	8.94174E-01	1.89483E+00	8.41534E-01	3.27703E-03	0.00000E+00	0.00000E+00
92	8.29862E-01	1.90767E+00	8.41405E-01	3.24301E-03	0.00000E+00	0.00000E+00
93	8.82677E-01	1.92050E+00	8.41858E-01	3.23908E-03	0.00000E+00	0.00000E+00
94	8.51230E-01	1.93333E+00	8.41960E-01	3.20530E-03	0.00000E+00	0.00000E+00
95	8.93158E-01	1.94700E+00	8.42511E-01	3.21808E-03	0.00000E+00	0.00000E+00
96	7.90054E-01	1.96083E+00	8.41952E-01	3.23220E-03	0.00000E+00	0.00000E+00
97	8.91577E-01	1.97367E+00	8.42475E-01	3.24038E-03	0.00000E+00	0.00000E+00
98	7.91467E-01	1.98733E+00	8.41943E-01	3.25017E-03	0.00000E+00	0.00000E+00
99	8.29569E-01	2.00017E+00	8.41816E-01	3.21902E-03	0.00000E+00	0.00000E+00
100	8.59937E-01	2.01200E+00	8.42001E-01	3.19136E-03	0.00000E+00	0.00000E+00
101	8.23664E-01	2.02583E+00	8.41816E-01	3.16439E-03	0.00000E+00	0.00000E+00
102	8.40089E-01	2.03950E+00	8.41798E-01	3.13263E-03	0.00000E+00	0.00000E+00
103	7.54061E-01	2.05317E+00	8.40930E-01	3.22082E-03	0.00000E+00	0.00000E+00
104	7.79450E-01	2.06600E+00	8.40327E-01	3.24555E-03	0.00000E+00	0.00000E+00
105	8.03918E-01	2.07800E+00	8.39973E-01	3.23326E-03	0.00000E+00	0.00000E+00
106	8.19695E-01	2.08983E+00	8.39778E-01	3.20795E-03	0.00000E+00	0.00000E+00
107	8.05942E-01	2.10267E+00	8.39456E-01	3.19356E-03	0.00000E+00	0.00000E+00
108	8.62979E-01	2.11550E+00	8.39678E-01	3.17106E-03	0.00000E+00	0.00000E+00
109	8.85571E-01	2.12833E+00	8.40107E-01	3.17043E-03	0.00000E+00	0.00000E+00
110	8.46868E-01	2.14117E+00	8.40170E-01	3.14156E-03	0.00000E+00	0.00000E+00
111	8.43051E-01	2.15583E+00	8.40196E-01	3.11272E-03	0.00000E+00	0.00000E+00
112	8.60166E-01	2.16850E+00	8.40378E-01	3.08963E-03	0.00000E+00	0.00000E+00
113	8.19775E-01	2.18133E+00	8.40192E-01	3.06729E-03	0.00000E+00	0.00000E+00
114	8.00791E-01	2.19517E+00	8.39840E-01	3.06007E-03	0.00000E+00	0.00000E+00
115	8.07380E-01	2.20983E+00	8.39553E-01	3.04644E-03	0.00000E+00	0.00000E+00
116	8.06710E-01	2.22350E+00	8.39265E-01	3.03331E-03	0.00000E+00	0.00000E+00
117	9.00538E-01	2.23633E+00	8.39798E-01	3.05366E-03	0.00000E+00	0.00000E+00
118	7.96570E-01	2.25100E+00	8.39425E-01	3.05007E-03	0.00000E+00	0.00000E+00
119	8.44206E-01	2.26467E+00	8.39466E-01	3.02417E-03	0.00000E+00	0.00000E+00
120	7.89636E-01	2.27750E+00	8.39044E-01	3.02802E-03	0.00000E+00	0.00000E+00
121	8.44209E-01	2.29117E+00	8.39087E-01	3.00278E-03	0.00000E+00	0.00000E+00
122	8.46086E-01	2.30400E+00	8.39145E-01	2.97822E-03	0.00000E+00	0.00000E+00
123	8.76785E-01	2.31683E+00	8.39456E-01	2.96984E-03	0.00000E+00	0.00000E+00
124	8.09004E-01	2.33067E+00	8.39207E-01	2.95596E-03	0.00000E+00	0.00000E+00
125	8.32096E-01	2.34350E+00	8.39149E-01	2.93240E-03	0.00000E+00	0.00000E+00
126	8.05555E-01	2.35717E+00	8.38878E-01	2.92124E-03	0.00000E+00	0.00000E+00
127	8.38058E-01	2.37083E+00	8.38871E-01	2.89778E-03	0.00000E+00	0.00000E+00
128	8.21160E-01	2.38367E+00	8.38731E-01	2.87813E-03	0.00000E+00	0.00000E+00
129	8.34422E-01	2.39650E+00	8.38697E-01	2.85558E-03	0.00000E+00	0.00000E+00
130	8.47021E-01	2.41033E+00	8.38762E-01	2.83393E-03	0.00000E+00	0.00000E+00
131	7.95347E-01	2.42400E+00	8.38425E-01	2.83194E-03	0.00000E+00	0.00000E+00
132	8.65586E-01	2.43583E+00	8.38634E-01	2.81783E-03	0.00000E+00	0.00000E+00
133	8.32313E-01	2.45050E+00	8.38586E-01	2.79665E-03	0.00000E+00	0.00000E+00
134	8.32251E-01	2.46333E+00	8.38538E-01	2.77580E-03	0.00000E+00	0.00000E+00
135	8.43492E-01	2.47700E+00	8.38575E-01	2.75510E-03	0.00000E+00	0.00000E+00
136	8.67256E-01	2.48983E+00	8.38789E-01	2.74283E-03	0.00000E+00	0.00000E+00
137	8.18395E-01	2.50367E+00	8.38638E-01	2.72662E-03	0.00000E+00	0.00000E+00
138	8.72052E-01	2.51733E+00	8.38884E-01	2.71763E-03	0.00000E+00	0.00000E+00
139	8.77268E-01	2.53017E+00	8.39164E-01	2.71223E-03	0.00000E+00	0.00000E+00
140	8.21243E-01	2.54300E+00	8.39034E-01	2.69563E-03	0.00000E+00	0.00000E+00
141	8.24518E-01	2.55667E+00	8.38930E-01	2.67821E-03	0.00000E+00	0.00000E+00
142	8.42363E-01	2.57050E+00	8.38954E-01	2.65912E-03	0.00000E+00	0.00000E+00
143	7.97553E-01	2.58333E+00	8.38661E-01	2.65647E-03	0.00000E+00	0.00000E+00
144	8.76677E-01	2.59617E+00	8.38929E-01	2.65125E-03	0.00000E+00	0.00000E+00
145	8.32020E-01	2.60883E+00	8.38880E-01	2.63309E-03	0.00000E+00	0.00000E+00
146	8.17946E-01	2.62267E+00	8.38735E-01	2.61878E-03	0.00000E+00	0.00000E+00
147	8.19262E-01	2.63633E+00	8.38601E-01	2.60412E-03	0.00000E+00	0.00000E+00
148	8.22026E-01	2.64833E+00	8.38487E-01	2.58871E-03	0.00000E+00	0.00000E+00
149	8.37377E-01	2.66200E+00	8.38479E-01	2.57105E-03	0.00000E+00	0.00000E+00
150	8.46566E-01	2.67483E+00	8.38534E-01	2.55421E-03	0.00000E+00	0.00000E+00
151	7.74147E-01	2.68850E+00	8.38102E-01	2.57354E-03	0.00000E+00	0.00000E+00
152	9.01631E-01	2.70233E+00	8.38526E-01	2.59118E-03	0.00000E+00	0.00000E+00
153	8.60081E-01	2.71417E+00	8.38668E-01	2.57791E-03	0.00000E+00	0.00000E+00
154	8.95309E-01	2.72783E+00	8.39041E-01	2.58787E-03	0.00000E+00	0.00000E+00
155	8.64145E-01	2.73983E+00	8.39205E-01	2.57613E-03	0.00000E+00	0.00000E+00
156	8.24519E-01	2.75350E+00	8.39110E-01	2.56112E-03	0.00000E+00	0.00000E+00
157	8.42927E-01	2.76550E+00	8.39134E-01	2.54466E-03	0.00000E+00	0.00000E+00
158	8.07941E-01	2.77833E+00	8.38934E-01	2.53619E-03	0.00000E+00	0.00000E+00
159	8.91356E-01	2.79100E+00	8.39268E-01	2.54201E-03	0.00000E+00	0.00000E+00
160	8.78411E-01	2.80383E+00	8.39516E-01	2.53799E-03	0.00000E+00	0.00000E+00
161	8.64680E-01	2.81667E+00	8.39674E-01	2.52694E-03	0.00000E+00	0.00000E+00
162	8.41269E-01	2.82950E+00	8.39684E-01	2.51112E-03	0.00000E+00	0.00000E+00
163	8.53462E-01	2.84233E+00	8.39770E-01	2.49694E-03	0.00000E+00	0.00000E+00
164	8.29559E-01	2.85517E+00	8.39707E-01	2.48228E-03	0.00000E+00	0.00000E+00
165	8.19254E-01	2.86983E+00	8.39581E-01	2.47019E-03	0.00000E+00	0.00000E+00
166	8.46759E-01	2.88267E+00	8.39625E-01	2.45547E-03	0.00000E+00	0.00000E+00
167	8.46334E-01	2.89633E+00	8.39666E-01	2.44088E-03	0.00000E+00	0.00000E+00
168	8.42378E-01	2.91000E+00	8.39682E-01	2.42619E-03	0.00000E+00	0.00000E+00
169	8.60966E-01	2.92283E+00	8.39809E-01	2.41498E-03	0.00000E+00	0.00000E+00
170	7.61102E-01	2.93667E+00	8.39341E-01	2.44586E-03	0.00000E+00	0.00000E+00
171	8.09061E-01	2.95133E+00	8.39162E-01	2.43793E-03	0.00000E+00	0.00000E+00
172	8.40616E-01	2.96417E+00	8.39170E-01	2.42356E-03	0.00000E+00	0.00000E+00
173	8.10715E-01	2.97783E+00	8.39004E-01	2.41509E-03	0.00000E+00	0.00000E+00
174	7.81922E-01	2.99250E+00	8.38672E-01	2.42383E-03	0.00000E+00	0.00000E+00
175	8.18771E-01	3.00533E+00	8.38557E-01	2.41253E-03	0.00000E+00	0.00000E+00
176	8.25260E-01	3.01817E+00	8.38481E-01	2.39984E-03	0.00000E+00	0.00000E+00
177	8.09004E-01	3.03093E+00	8.38312E-01	2.39202E-03	0.00000E+00	0.00000E+00
178	8.47468E-01	3.04367E+00	8.38364E-01	2.37896E-03	0.00000E+00	0.00000E+00
179	8.70548E-01	3.05750E+00	8.38546E-01	2.37246E-03	0.00000E+00	0.00000E+00
180	8.77468E-01	3.07217E+00	8.38765E-01	2.36921E-03	0.00000E+00	0.00000E+00
181	7.97176E-01	3.08583E+00	8.38532E-01	2.36736E-03	0.00000E+00	0.00000E+00
182	8.25331E-01	3.09950E+00	8.38459E-01	2.35532E-03	0.00000E+00	0.00000E+00
183	8.62611E-01	3.11333E+00	8.38592E-01	2.34607E-03	0.00000E+00	0.00000E+00
184	8.46947E-01	3.12617E+00	8.38638E-01	2.33359E-03	0.00000E+00	0.00000E+00

185	8.81490E-01	3.13900E+00	8.38872E-01	2.33259E-03	0.00000E+00	0.00000E+00
186	8.06054E-01	3.15267E+00	8.38694E-01	2.32672E-03	0.00000E+00	0.00000E+00
187	8.31330E-01	3.16550E+00	8.38654E-01	2.31445E-03	0.00000E+00	0.00000E+00
188	8.50572E-01	3.17833E+00	8.38718E-01	2.30287E-03	0.00000E+00	0.00000E+00
189	8.47532E-01	3.19117E+00	8.38766E-01	2.29101E-03	0.00000E+00	0.00000E+00
190	8.18631E-01	3.20583E+00	8.38658E-01	2.28130E-03	0.00000E+00	0.00000E+00
191	8.44059E-01	3.21767E+00	8.38687E-01	2.26938E-03	0.00000E+00	0.00000E+00
192	9.00406E-01	3.23133E+00	8.39012E-01	2.28066E-03	0.00000E+00	0.00000E+00
193	8.55718E-01	3.24417E+00	8.39099E-01	2.27037E-03	0.00000E+00	0.00000E+00
194	8.18828E-01	3.25800E+00	8.38994E-01	2.26098E-03	0.00000E+00	0.00000E+00
195	8.39110E-01	3.27083E+00	8.38994E-01	2.24923E-03	0.00000E+00	0.00000E+00
196	8.78157E-01	3.28267E+00	8.39196E-01	2.24670E-03	0.00000E+00	0.00000E+00
197	8.45548E-01	3.29550E+00	8.39229E-01	2.23538E-03	0.00000E+00	0.00000E+00
198	8.57079E-01	3.30833E+00	8.39320E-01	2.22581E-03	0.00000E+00	0.00000E+00
199	8.34812E-01	3.32117E+00	8.39297E-01	2.21460E-03	0.00000E+00	0.00000E+00
200	8.44911E-01	3.33400E+00	8.39325E-01	2.20357E-03	0.00000E+00	0.00000E+00
201	8.40696E-01	3.34667E+00	8.39332E-01	2.19248E-03	0.00000E+00	0.00000E+00
202	8.72283E-01	3.35950E+00	8.39497E-01	2.18771E-03	0.00000E+00	0.00000E+00
203	8.29380E-01	3.37233E+00	8.39447E-01	2.17738E-03	0.00000E+00	0.00000E+00

KENO MESSAGE NUMBER K5-123   EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

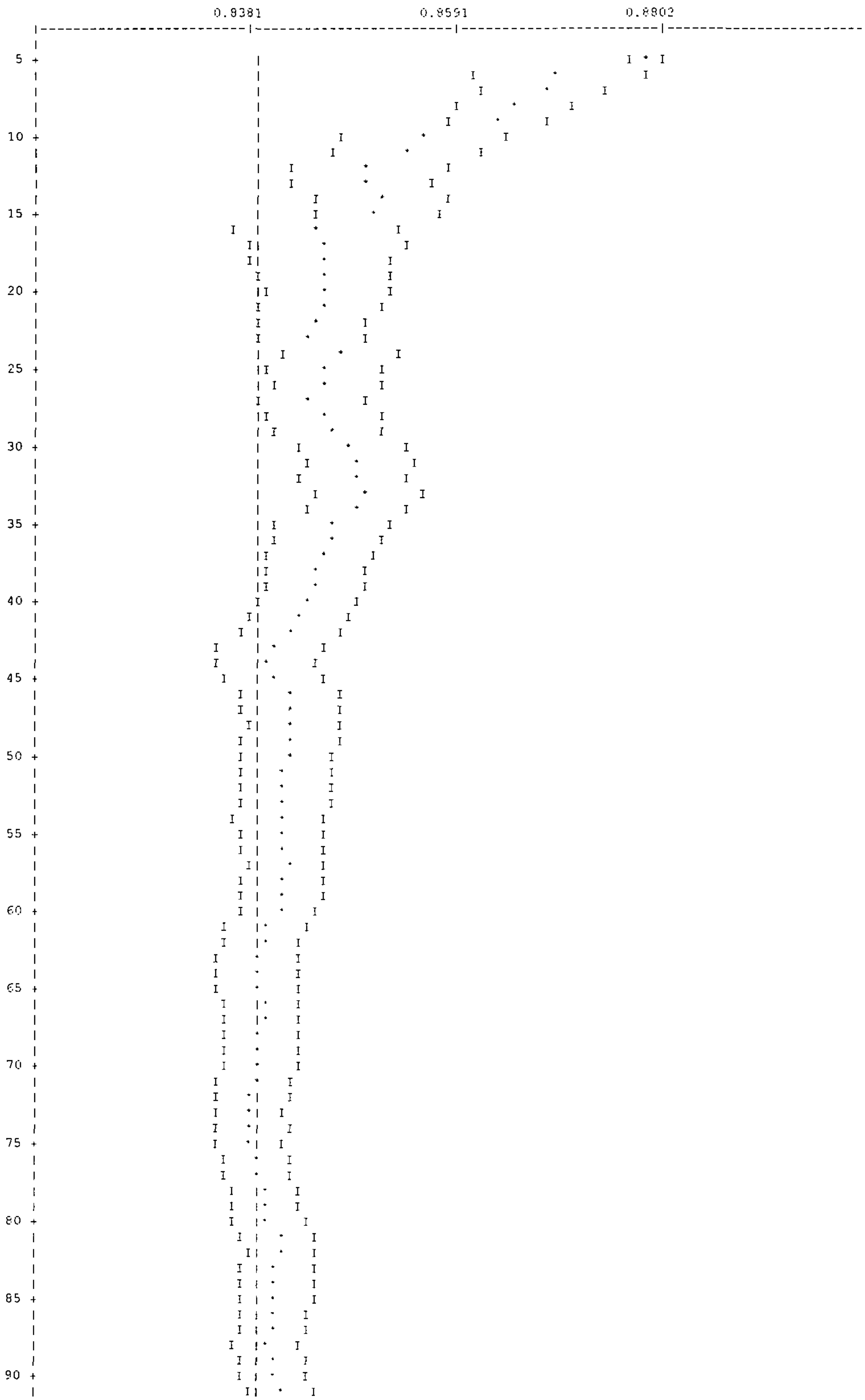
TRIGA - PREF. FLOOD CANISTER

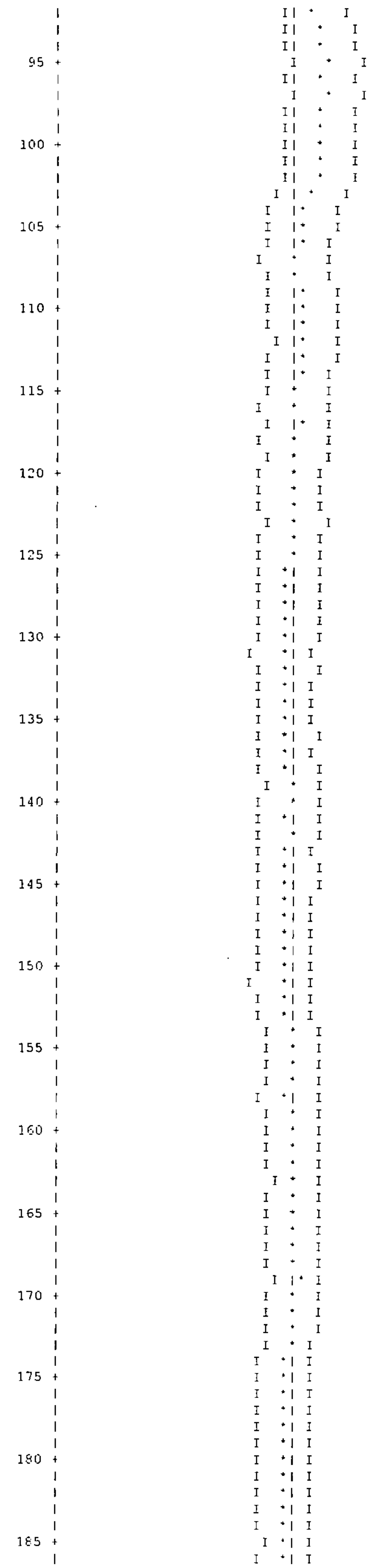
LIFETIME = 5.96130E-05 + OR - 3.37432E-07 GENERATION TIME = 2.84400E-05 + OR - 1.23388E-07
NU BAR = 2.42081E+00 + OR - 1.76618E-05 AVERAGE FISSION GROUP = 2.23764E+01 + OR - 1.22941E-02
ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION = 1.31694E-01 + OR - 1.11900E-03

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.83944	+ OR - 0.00219	0.83725 TO 0.84163	0.83507 TO 0.84382	0.83286 TO 0.84601	100000
4	0.83924	+ OR - 0.00219	0.83705 TO 0.84143	0.83486 TO 0.84362	0.83267 TO 0.84581	99500
5	0.83905	+ OR - 0.00219	0.83685 TO 0.84124	0.83466 TO 0.84343	0.83247 TO 0.84562	99000
6	0.83898	+ OR - 0.00220	0.83678 TO 0.84118	0.83457 TO 0.84338	0.83237 TO 0.84559	98500
7	0.83885	+ OR - 0.00221	0.83664 TO 0.84106	0.83443 TO 0.84327	0.83222 TO 0.84548	98000
8	0.83878	+ OR - 0.00222	0.83656 TO 0.84100	0.83434 TO 0.84322	0.83212 TO 0.84544	97500
9	0.83869	+ OR - 0.00223	0.83646 TO 0.84092	0.83423 TO 0.84315	0.83200 TO 0.84538	97000
10	0.83883	+ OR - 0.00224	0.83660 TO 0.84107	0.83436 TO 0.84330	0.83212 TO 0.84554	96500
11	0.83882	+ OR - 0.00225	0.83657 TO 0.84107	0.83432 TO 0.84332	0.83208 TO 0.84556	96000
12	0.83892	+ OR - 0.00226	0.83666 TO 0.84118	0.83441 TO 0.84344	0.83215 TO 0.84570	95500
17	0.83893	+ OR - 0.00228	0.83665 TO 0.84121	0.83437 TO 0.84349	0.83209 TO 0.84577	93000
22	0.83887	+ OR - 0.00234	0.83653 TO 0.84121	0.83419 TO 0.84355	0.83185 TO 0.84589	90500
27	0.83872	+ OR - 0.00237	0.83635 TO 0.84109	0.83399 TO 0.84346	0.83162 TO 0.84582	88000
32	0.83780	+ OR - 0.00238	0.83542 TO 0.84018	0.83304 TO 0.84256	0.83065 TO 0.84494	85500
37	0.83813	+ OR - 0.00238	0.83575 TO 0.84052	0.83337 TO 0.84290	0.83098 TO 0.84529	83000
42	0.83868	+ OR - 0.00243	0.83625 TO 0.84112	0.83382 TO 0.84355	0.83138 TO 0.84598	80500
47	0.83850	+ OR - 0.00244	0.83607 TO 0.84094	0.83363 TO 0.84337	0.83119 TO 0.84581	78000
52	0.83855	+ OR - 0.00251	0.83603 TO 0.84106	0.83352 TO 0.84357	0.83101 TO 0.84608	75500
57	0.83837	+ OR - 0.00258	0.83579 TO 0.84095	0.83321 TO 0.84352	0.83063 TO 0.84610	73000
62	0.83926	+ OR - 0.00261	0.83665 TO 0.84187	0.83404 TO 0.84448	0.83144 TO 0.84708	70500
67	0.83913	+ OR - 0.00268	0.83645 TO 0.84181	0.83377 TO 0.84449	0.83109 TO 0.84717	68000
72	0.83976	+ OR - 0.00276	0.83700 TO 0.84252	0.83424 TO 0.84527	0.83148 TO 0.84803	65500
77	0.83962	+ OR - 0.00286	0.83676 TO 0.84249	0.83390 TO 0.84535	0.83104 TO 0.84821	63000
82	0.83775	+ OR - 0.00281	0.83495 TO 0.84056	0.83214 TO 0.84336	0.82934 TO 0.84617	60500
87	0.83839	+ OR - 0.00288	0.83551 TO 0.84127	0.83263 TO 0.84416	0.82975 TO 0.84704	58000
92	0.83786	+ OR - 0.00294	0.83492 TO 0.84080	0.83197 TO 0.84374	0.82903 TO 0.84669	55500
97	0.83673	+ OR - 0.00292	0.83381 TO 0.83966	0.83088 TO 0.84258	0.82796 TO 0.84551	53000
102	0.83712	+ OR - 0.00302	0.83409 TO 0.84014	0.83107 TO 0.84317	0.82805 TO 0.84619	50500
107	0.83944	+ OR - 0.00295	0.83649 TO 0.84238	0.83354 TO 0.84533	0.83059 TO 0.84828	48000
112	0.83832	+ OR - 0.00304	0.83528 TO 0.84137	0.83223 TO 0.84441	0.82919 TO 0.84746	45500
117	0.83898	+ OR - 0.00306	0.83592 TO 0.84203	0.83286 TO 0.84509	0.82981 TO 0.84815	43000
122	0.83989	+ OR - 0.00314	0.83675 TO 0.84303	0.83361 TO 0.84617	0.83047 TO 0.84931	40500
127	0.84039	+ OR - 0.00325	0.83714 TO 0.84365	0.83389 TO 0.84690	0.83063 TO 0.85015	38000
132	0.84093	+ OR - 0.00339	0.83754 TO 0.84433	0.83415 TO 0.84772	0.83076 TO 0.85111	35500
137	0.84110	+ OR - 0.00361	0.83749 TO 0.84471	0.83389 TO 0.84831	0.83028 TO 0.85192	33000
142	0.84058	+ OR - 0.00380	0.83678 TO 0.84438	0.83297 TO 0.84818	0.82917 TO 0.85198	30500
147	0.84164	+ OR - 0.00397	0.83766 TO 0.84561	0.83369 TO 0.84958	0.82972 TO 0.85356	28000
152	0.84216	+ OR - 0.00396	0.83819 TO 0.84612	0.83423 TO 0.85008	0.83027 TO 0.85404	25500
157	0.84050	+ OR - 0.00417	0.83633 TO 0.84467	0.83216 TO 0.84883	0.82800 TO 0.85300	23000
162	0.83852	+ OR - 0.00429	0.83423 TO 0.84281	0.82995 TO 0.84709	0.82566 TO 0.85138	20500
167	0.83844	+ OR - 0.00482	0.83362 TO 0.84327	0.82879 TO 0.84809	0.82397 TO 0.85291	18000
172	0.84096	+ OR - 0.00484	0.83613 TO 0.84580	0.83129 TO 0.85063	0.82645 TO 0.85547	15500
177	0.84708	+ OR - 0.00474	0.84234 TO 0.85182	0.83760 TO 0.85657	0.83286 TO 0.86131	13000
182	0.84791	+ OR - 0.00492	0.84299 TO 0.85283	0.83807 TO 0.85775	0.83315 TO 0.86267	10500
187	0.84861	+ OR - 0.00532	0.84329 TO 0.85393	0.83797 TO 0.85924	0.83266 TO 0.86456	8000
192	0.84696	+ OR - 0.00535	0.84161 TO 0.85231	0.83626 TO 0.85766	0.83091 TO 0.86301	5500
197	0.84653	+ OR - 0.00644	0.84009 TO 0.85296	0.83366 TO 0.85940	0.82722 TO 0.86583	3000

TRIGA - PREF. FLOOD CANISTER

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.8394 + OR - 0.0022 WHICH OCCURS FOR 203 GENERATIONS RUN.

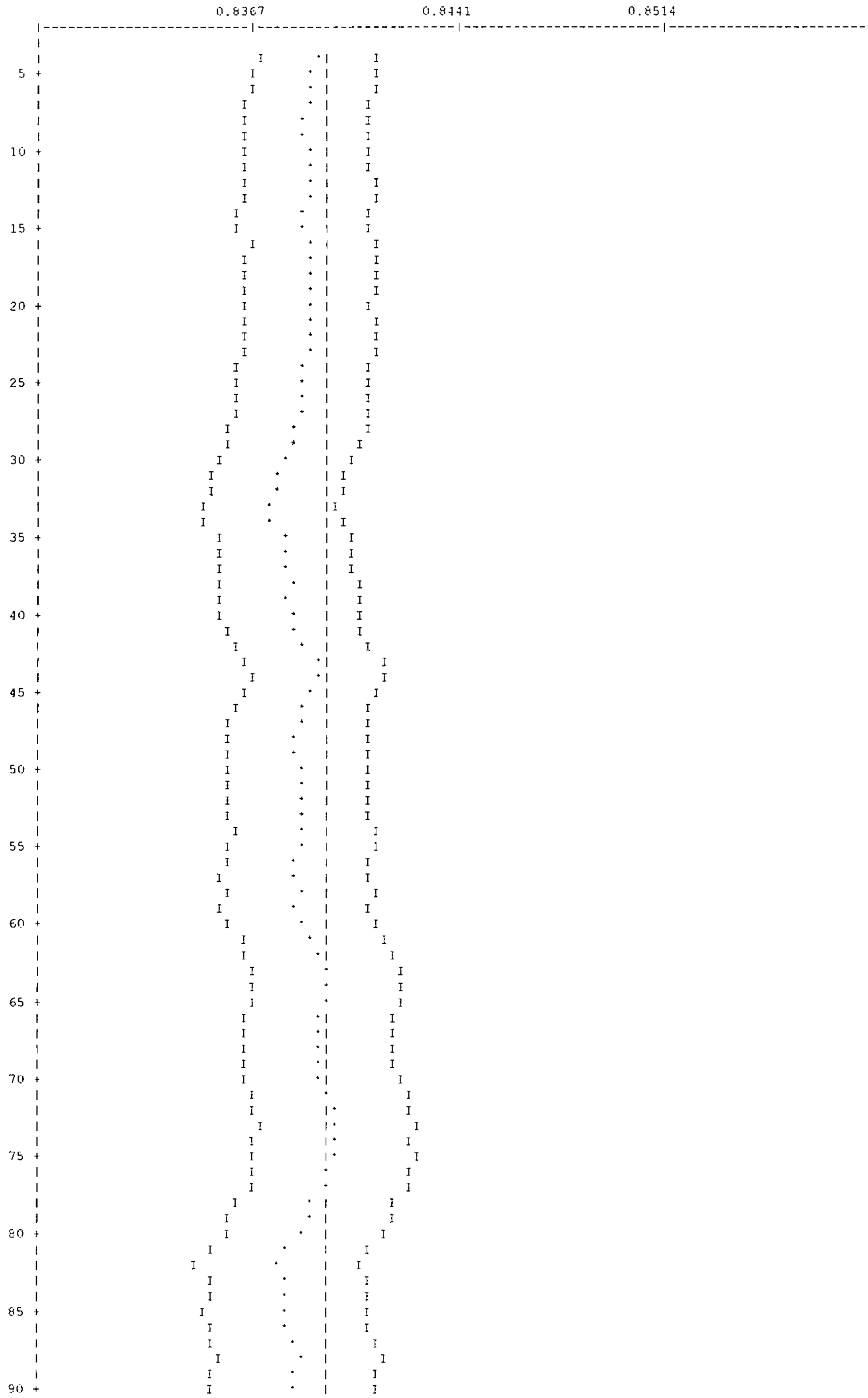


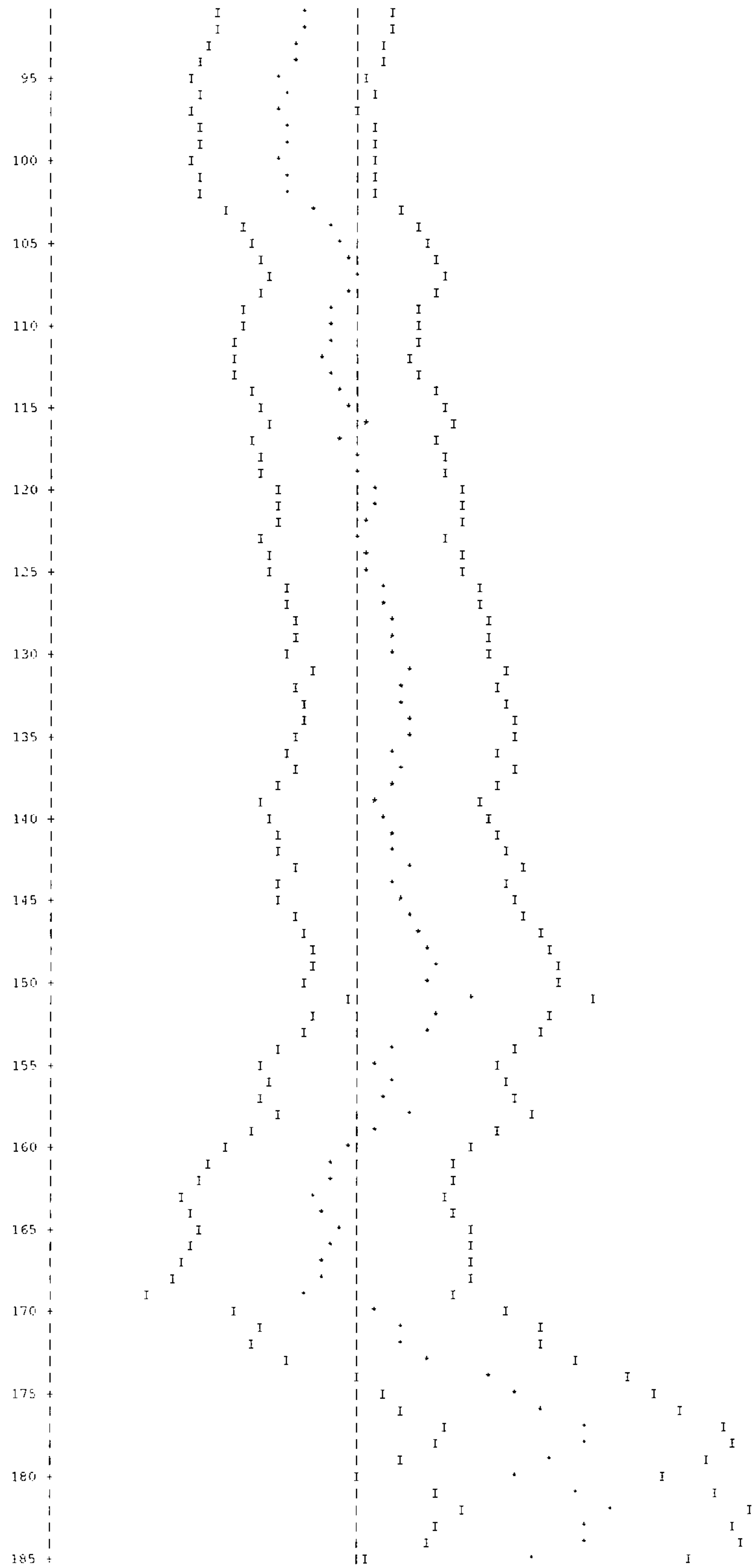

95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185

```
    |                       I  *| I
    |                       I  *| I
    |                        I *| I
190 +                       I  *| I
    |                       I  *| I
    |                        I  *  I
    |                        I  *  I
    |                        I  *  I
195 +                        I  *  I
    |                        I  *  I
    |                        I  *   I
    |                        I  *   I
    |                        I  *   I
200 +                        I  *   I
    |                        I  *   I
    |                         I *   I
    |                         I *   I
```

TRIGA - PREF. FLOOD CANISTER

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION SKIPPED.
THE LINE REPRESENTS K-EFF = 0.8394 + OR - 0.0022 WHICH OCCURS FOR 3 GENERATIONS SKIPPED.




95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185

```
      |                                  |         I                *                 I
      |                                  |            I                 *                  I
      |                   .              |          I                   *                   I
      |                                  |         I                    *                     I
  190 +                                  |                 I                    *                    I
      |                                  |                 I                      *                      I
      |                                  |      I                 *                  I
      |                                  | I                   *                   I
      |                                  |             I                  *                   I
  195 +                                  |               I                    *                     I
      |                                  |    I                 *                  I
      |                                  | I                     *                     I
      |                        I         |                *                        I
      |                           I      |                        *                               I
  200 +                I                 |                          *
      |                                  |                                      *
```

TRIGA - PREF. FLOOD CANISTER

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0003			2.73695E-04	4.0673	1.33450E-03	2.7746	0.00000E+00	0.0000
2	0.0014			1.19806E-03	1.2584	3.36609E-03	0.8709	0.00000E+00	0.0000
3	0.0020			1.68688E-03	1.1356	1.74259E-03	0.8807	0.00000E+00	0.0000
4	0.0012			1.03640E-03	1.3855	9.49928E-04	0.9596	0.00000E+00	0.0000
5	0.0020			1.67448E-03	0.9764	2.20159E-03	0.7697	0.00000E+00	0.0000
6	0.0032			2.70608E-03	0.8466	8.32387E-03	0.6833	0.00000E+00	0.0000
7	0.0043			3.59633E-03	0.7624	1.82469E-02	0.6440	0.00000E+00	0.0000
8	0.0045			3.73819E-03	0.6936	1.56090E-02	0.6187	0.00000E+00	0.0000
9	0.0060			5.06579E-03	0.6812	1.68395E-02	0.5936	0.00000E+00	0.0000
10	0.0130			1.09527E-02	0.7204	4.19924E-02	0.6180	0.00000E+00	0.0000
11	0.0272			2.28163E-02	0.7072	5.68060E-02	0.5808	0.00000E+00	0.0000
12	0.0348			2.92515E-02	0.6059	4.76650E-02	0.5639	0.00000E+00	0.0000
13	0.0312			2.61532E-02	0.5835	5.60739E-02	0.5881	0.00000E+00	0.0000
14	0.0247			2.07663E-02	0.6049	6.75119E-02	0.5850	0.00000E+00	0.0000
15	0.0046			3.89927E-03	0.8558	3.23231E-02	0.9958	0.00000E+00	0.0000
16	0.0031			2.58234E-03	1.0355	1.77169E-02	1.1768	0.00000E+00	0.0000
17	0.0047			3.93622E-03	1.4643	9.80442E-03	1.4171	0.00000E+00	0.0000
18	0.0061			5.16029E-03	1.3830	9.06051E-03	1.2102	0.00000E+00	0.0000
19	0.0072			6.04149E-03	1.1357	1.45015E-02	1.2141	0.00000E+00	0.0000
20	0.0286			2.40046E-02	0.7267	4.57621E-02	0.8699	0.00000E+00	0.0000
21	0.0149			1.24996E-02	1.1105	1.65394E-02	1.2351	0.00000E+00	0.0000
22	0.0333			2.79547E-02	0.7799	3.18266E-02	0.9733	0.00000E+00	0.0000
23	0.0999			8.38267E-02	0.4921	8.59767E-02	0.5467	0.00000E+00	0.0000
24	0.1837			1.54208E-01	0.4465	1.30478E-01	0.4240	0.00000E+00	0.0000
25	0.1591			1.33566E-01	0.4544	1.01666E-01	0.4660	0.00000E+00	0.0000
26	0.2107			1.76904E-01	0.4336	1.21586E-01	0.4318	0.00000E+00	0.0000
27	0.0681			7.39396E-02	0.6454	4.53166E-02	0.6511	0.00000E+00	0.0000
SYSTEM TOTAL =				8.39443E-01	0.2607	1.00122E+00	0.0876	0.00000E+00	0.0000

ELAPSED TIME 3.37233 MINUTES

RANDOM NUMBER= 1A4E60EC74A8

```
TRIGA - PREF. FLOOD CANISTER

                           FREQUENCY FOR GENERATIONS    4 TO  203
0.7524 TO 0.7703     ****
0.7703 TO 0.7882     ******
0.7882 TO 0.8061     ***************
0.8061 TO 0.8240     ***********************************
0.8240 TO 0.8419     *****************************************
0.8419 TO 0.8598     ****************************************************
0.8598 TO 0.8777     **************************
0.8777 TO 0.8956     *************
0.8956 TO 0.9134     ******
0.9134 TO 0.9313     **

                           FREQUENCY FOR GENERATIONS   54 TO  203
0.7524 TO 0.7703     **
0.7703 TO 0.7882     *****
0.7882 TO 0.8061     *************
0.8061 TO 0.8240     *****************************
0.8240 TO 0.8419     ****************************
0.8419 TO 0.8598     *************************************
0.8598 TO 0.8777     *********************
0.8777 TO 0.8956     **********
0.8956 TO 0.9134     ***
0.9134 TO 0.9313     **

                           FREQUENCY FOR GENERATIONS  104 TO  203
0.7524 TO 0.7703     *
0.7703 TO 0.7882     ***
0.7882 TO 0.8061     **********
0.8061 TO 0.8240     *******************
0.8240 TO 0.8419     *******************
0.8419 TO 0.8598     ***********************
0.8598 TO 0.8777     ****************
0.8777 TO 0.8956     ******
0.8956 TO 0.9134     ***
0.9134 TO 0.9313

                           FREQUENCY FOR GENERATIONS  154 TO  203
0.7524 TO 0.7703     *
0.7703 TO 0.7882     *
0.7882 TO 0.8061     **
0.8061 TO 0.8240     ********
0.8240 TO 0.8419     ***********
0.8419 TO 0.8598     **************
0.8598 TO 0.8777     *******
0.8777 TO 0.8956     *****
0.8956 TO 0.9134     *
0.9134 TO 0.9313


********************************************************************************************************************************
*

         CONGRATULATIONS!  YOU HAVE  SUCCESSFULLY TRAVERSED THE PERILOUS PATH THROUGH KENO V IN   3.37233 MINUTES
```

Figure 6.6.6-3 TRIGA Fuel Cluster Rods - Maximum Reactivity LEU Case

```
      PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
MODULE CSAS25   WILL BE CALLED
  TRIGA - REEF. FLOOD CANISTER
  ' ACCIDENT CONDITION CASK ARRAY - CASKS TOUCHING
  ' DAMGED FUEL PAYLOAD - CANISTER FLOODED AT 0.9982 G/CM^3
  ' ROD GEOMETRY - DRY CASK MOST REACTIVE CONFIGURATION
  ' CASK CAVITY MODERATOR DENSITY 1E-20 GM^3
  ' CASK EXTERIOR MODERATOR DENSITY 1E-20 GM^3
  27GROUPNDF4  MULT
  'UNCANISTERED FUEL
  U-235    1 0.0 1.7323E-03 END
  U-238    1 0.0 6.8418E-03 END
  ZR       1 0.0 2.9039E-02 END
  H        1 0.0 4.9367E-02 END
  'CLAD INCOLOY
  NI       2 0.0 0.028516 END
  FE       2 0.0 0.033820 END
  CR       2 0.0 0.021151 END
  C        2 0.0 0.000399 END
  MN       2 0.0 0.001306 END
  S        2 0.0 0.000022 END
  SI       2 0.0 0.001703 END
  CU       2 0.0 0.000560 END
  AL       2 0.0 0.000266 END
  TI       2 0.0 0.000150 END
  'CASK INTERIOR MODERATOR MATERIAL
  H2O      3 1.0E-20 293.0 END
  'END FITTING FOR FUEL ELEMENT
  SS304    4 0.4968  293.0 END
  H2O      4 1.0E-20 293.0 END
  'BASKET, AND CASK
  SS304    5 1.0 293.0 END
  'AL FUEL HOLDER
  AL       6 1.0 293.0 END
  'LEAD SHIELD
  PB       7 1.0 293.0 END
  'NEUTRON SHIELD
  H2O      8 1.0E-20 293.0 END
  'CASK EXTERNAL MATERIAL
  H2O      9 1.0E-20 293.0 END
  'MIXTURE (FUEL) FOR CANISTER
  U-235    10 0.0 2.8119E-04 END
  U-238    10 0.0 1.1105E-03 END
  ZR       10 0.0 4.7136E-03 END
  H        10 0.0 8.0131E-03 END
  H2O     10 DEN=0.8362 1.0  300.0 END
  'CANISTER INTERNAL MODERATOR
  H2O     11 DEN=0.9982 1.0  293.0 END
  ' SECONDARY CASK CAVITY MATERIAL FOR MULTICELL CARD
  H2O      12 1.0E-20 293.0 END
  END COMP
  BUCKLEDCYL WHITE REFLECTED 0.0 57.15 END
  1 0.6731 2 0.7112 3 0.80518 6 0.9525 12 1.0748 END ZONE
  TRIGA - REEF. FLOOD CANISTER
  READ PARAM TME=170.0 GEN=403 NPG=1000 RUN=YES PLT=NO
  TBA=2.0 END PARAM
  READ GEOM
  UNIT 1
  COM='TRIGA FUEL (SMEARED)'
  CYLINDER 10 1 3.9623 60.959 0.001
  UNIT 5
  COM='3.38 in Width / 0.28 in Thickness DIVIDER CENTER STACK (SEALED)'
  CUBOID   5 1 2P4.2672 0.7112 0.0 +74.29 -8.255
  UNIT 6
  COM='3.38 in Width / 0.24 in Thickness DIVIDER OUTSIDE STACK (SEALED)'
  CUBOID   5 1 2P4.2672 0.6096 0.0 +74.29 -8.255
  UNIT 7
  COM='SEALED CANISTER'
  CYLINDER 11 1 3.9624 +60.96 0.0
  HOLE      1  0.0 0.0 0.0
  CYLINDER  5 1 4.1275 +63.50 -1.27
  CYLINDER  3 1 4.1275 +74.29 -8.255
  UNIT 10
  COM='TRIGA ELEMENTS IN Top of 3.38 in x 3.38 in OPENING (SEALED)'
  CUBOID    3 1 2P4.2672 2P4.2672 +74.29 -8.255
  HOLE 7    0.0 0.1397 0.0
  UNIT 11
  COM='TRIGA ELEMENTS IN Bottom of 3.38 in x 3.38 in OPENING (SEALED)'
  CUBOID    3 1 2P4.2672 2P4.2672 +74.29 -8.255
  HOLE 7    0.0 -0.1397 0.0
  UNIT 12
  COM='TRIGA ELEMENTS IN Bottom Right of 3.38 in x 3.38 in OPENING (SEALED)'
  CUBOID    3 1 2P4.2672 2P4.2672 +74.29 -8.255
  HOLE 7    +0.1397 -0.1397 0.0
  UNIT 13
  COM='TRIGA ELEMENTS IN Top Right of 3.38 in x 3.38 in OPENING (SEALED)'
  CUBOID    3 1 2P4.2672 2P4.2672 +74.29 -8.255
  HOLE 7    +0.1397 +0.1397 0.0
  UNIT 14
  COM='TRIGA ELEMENTS IN Bottom Left of 3.38 in x 3.38 in OPENING (SEALED)'
  CUBOID    3 1 2P4.2672 2P4.2672 +74.29 -8.255
```

```
HOLE 7    -0.1397 -0.1397 0.0
UNIT 15
COM='TRIGA ELEMENTS IN Top Left of 3.38 in x 3.38 in OPENING (SEALED)'
CUBOID    3 1 2P4.2672 2P4.2672 +74.29 -8.255
HOLE 7    -0.1397 +0.1397 0.0
UNIT 16
COM='TRIGA BASKET 3.38 in x 3.38 in CENTER OPENING (SEALED)'
CUBOID    3 1 2P4.2672 2P4.2672 +74.29 -8.255
UNIT 20
COM='CENTER COLUMN OF THREE OPENINGS w/ 0.28 in plate (SEALED)'
ARRAY 1  -4.2672 -13.5128 -8.255
REPLICATE 5 1 4R0.7112 2R0.0 1
UNIT 21
COM='LEFT OUTSIDE COLUMN OF TWO OPENINGS w/ 0.12 in plate (SEALED)'
ARRAY 2  -4.2672 -8.8392 -8.255
REPLICATE 5 1 0.0 0.3048 2P0.3048 2R0.0 1
UNIT 22
COM='RIGHT OUTSIDE COLUMN OF TWO OPENINGS w/ 0.12 in plate (SEALED)'
ARRAY 3  -4.2672 -8.8392 -8.255
REPLICATE 5 1 0.3048 0.0 2R0.3048 2R0.0 1
UNIT 30
COM='NAC-LWT TRIGA BASKET (SEALED)'
CYLINDER 3  1 17.1 +74.29 -8.255
HOLE 20 0.0 0.0 0.0
HOLE 21  -9.2457 0.0 0.0
HOLE 22  +9.2457 0.0 0.0
CYLINDER 5  1 18.9103 +74.93 -8.890
CYLINDER 7  1 33.4645 +74.93 -8.890
CYLINDER 5  1 36.5188 +74.93 -8.890
CYLINDER 8   1 49.2227 +74.93 -8.890
CYLINDER 5  1 49.8221 +74.93 -8.890
CUBOID   9   1 4P49.8221 +74.93 -8.890
'  ************************************
UNIT 41
COM='TRIGA FUEL ELEMENT'
CYLINDER 1 1 0.6731 2P28.575
CYLINDER 2 1 0.7112 2P28.575
CYLINDER 4 1 0.7112 43.48 -33.04
UNIT 45
COM='DIVIDER CENTER STACK'
CUBOID   5 1 2P4.2672 0.7112 0.0 43.48 -33.04
UNIT 46
COM='DIVIDER OUTSIDE STACK'
CUBOID   5 1 2P4.2672 0.6096 0.0 43.48 -33.04
UNIT 410
COM='TRIGA FUEL ELEMENTS IN AL TUBE, CENTERED'
CYLINDER  3 1 0.80518  43.48 -33.04
HOLE  41  0.0 0.0 0.0
CYLINDER  6 1 0.9525  43.48 -33.04
UNIT 411
COM='TRIGA FUEL ELEMENTS IN AL TUBE, RIGHT'
CYLINDER 3 1  0.80518  43.48 -33.04
HOLE  41   0.0938 0.0 0.0
CYLINDER 6 1 0.9525  43.48 -33.04
UNIT 412
COM='TRIGA FUEL ELEMENTS IN AL TUBE, LEFT'
CYLINDER 3 1  0.80518  43.48 -33.04
HOLE  41   -0.0938 0.0 0.0
CYLINDER 6 1 0.9525  43.48 -33.04
UNIT 413
COM='TRIGA FUEL ELEMENTS IN AL TUBE, TOP'
CYLINDER 3 1  0.80518  43.48 -33.04
HOLE  41  0.0  0.0938 0.0
CYLINDER 6 1 0.9525  43.48 -33.04
UNIT 414
COM='TRIGA FUEL ELEMENTS IN AL TUBE, BOTTOM'
CYLINDER 3 1  0.80518  43.48 -33.04
HOLE  41  0.0  -0.0938 0.0
CYLINDER 6 1 0.9525  43.48 -33.04
UNIT 415
COM='TRIGA FUEL ELEMENTS IN AL TUBE, TOP RIGHT'
CYLINDER 3 1  0.80518  43.48 -33.04
HOLE  41  0.0662 0.0662 0.0
CYLINDER 6 1 0.9525  43.48 -33.04
UNIT 416
COM='TRIGA FUEL ELEMENTS IN AL TUBE, TOP LEFT'
CYLINDER 3 1  0.80518  43.48 -33.04
HOLE  41  -0.0662 0.0662 0.0
CYLINDER 6 1 0.9525  43.48 -33.04
UNIT 417
COM='TRIGA FUEL ELEMENTS IN AL TUBE, BOTTOM RIGHT'
CYLINDER 3 1  0.80518  43.48 -33.04
HOLE  41  0.0662 -0.0662 0.0
CYLINDER 6 1 0.9525  43.48 -33.04
UNIT 418
COM='TRIGA FUEL ELEMENTS IN AL TUBE, BOTTOM LEFT'
CYLINDER 3 1  0.80518  43.48 -33.04
HOLE  41  -0.0662 -0.0662 0.0
CYLINDER 6 1 0.9525  43.48 -33.04
'  ************************************
UNIT 420
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, CENTER OPENING'
CUBOID    3 1 4P4.1529 43.48 -33.04
HOLE            415  -2.8576 -2.8576      0
HOLE            413  -0.9525 -2.8576      0
```

```
HOLE          413  0.9525 -2.8576     0
HOLE          416  2.8576 -2.8576     0
HOLE          411 -2.8576 -0.9525     0
HOLE          415 -0.9525 -0.9525     0
HOLE          416  0.9525 -0.9525     0
HOLE          412  2.8576 -0.9525     0
HOLE          411 -2.8576  0.9525     0
HOLE          417 -0.9525  0.9525     0
HOLE          418  0.9525  0.9525     0
HOLE          412  2.8576  0.9525     0
HOLE          417 -2.8576  2.8576     0
HOLE          414 -0.9525  2.8576     0
HOLE          414  0.9525  2.8576     0
HOLE          418  2.8576  2.8576     0
CUBOID    3 1 4P4.1529 43.48 -33.04
' CHECK 4.1 CM ABOVE*******************
UNIT 421
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, BOTTOM OPENING'
CUBOID    3 1 4P4.1529 43.48 -33.04
HOLE          415 -2.8576 -2.8576     0
HOLE          413 -0.9525 -2.8576     0
HOLE          413  0.9525 -2.8576     0
HOLE          416  2.8576 -2.8576     0
HOLE          411 -2.8576 -0.9525     0
HOLE          415 -0.9525 -0.9525     0
HOLE          416  0.9525 -0.9525     0
HOLE          412  2.8576 -0.9525     0
HOLE          411 -2.8576  0.9525     0
HOLE          417 -0.9525  0.9525     0
HOLE          418  0.9525  0.9525     0
HOLE          412  2.8576  0.9525     0
HOLE          417 -2.8576  2.8576     0
HOLE          414 -0.9525  2.8576     0
HOLE          414  0.9525  2.8576     0
HOLE          418  2.8576  2.8576     0
CUBOID     3 1 4P4.1529 43.48 -33.04
' CHECK 4.1 CM ABOVE*******************
UNIT 422
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, TOP OPENING'
CUBOID     3 1 4P4.1529 43.48 -33.04
HOLE          415 -2.8576 -2.8576     0
HOLE          413 -0.9525 -2.8576     0
HOLE          413  0.9525 -2.8576     0
HOLE          416  2.8576 -2.8576     0
HOLE          411 -2.8576 -0.9525     0
HOLE          415 -0.9525 -0.9525     0
HOLE          416  0.9525 -0.9525     0
HOLE          412  2.8576 -0.9525     0
HOLE          411 -2.8576  0.9525     0
HOLE          417 -0.9525  0.9525     0
HOLE          418  0.9525  0.9525     0
HOLE          412  2.8576  0.9525     0
HOLE          417 -2.8576  2.8576     0
HOLE          414 -0.9525  2.8576     0
HOLE          414  0.9525  2.8576     0
HOLE          418  2.8576  2.8576     0
CUBOID     3 1 4P4.1529 43.48 -33.04
' CHECK 4.1 CM ABOVE*******************
UNIT 423
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, BOTTOM LEFT OPENING'
CUBOID     3 1 4P4.1529 43.48 -33.04
HOLE          415 -2.8576 -2.8576     0
HOLE          413 -0.9525 -2.8576     0
HOLE          413  0.9525 -2.8576     0
HOLE          416  2.8576 -2.8576     0
HOLE          411 -2.8576 -0.9525     0
HOLE          415 -0.9525 -0.9525     0
HOLE          416  0.9525 -0.9525     0
HOLE          412  2.8576 -0.9525     0
HOLE          411 -2.8576  0.9525     0
HOLE          417 -0.9525  0.9525     0
HOLE          418  0.9525  0.9525     0
HOLE          412  2.8576  0.9525     0
HOLE          417 -2.8576  2.8576     0
HOLE          414 -0.9525  2.8576     0
HOLE          414  0.9525  2.8576     0
HOLE          418  2.8576  2.8576     0
CUBOID     3 1 4P4.1529 43.48 -33.04
' CHECK 4.1 CM ABOVE*******************
UNIT 424
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, TOP LEFT OPENING'
CUBOID     3 1 4P4.1529 43.48 -33.04
HOLE          415 -2.8576 -2.8576     0
HOLE          413 -0.9525 -2.8576     0
HOLE          413  0.9525 -2.8576     0
HOLE          416  2.8576 -2.8576     0
HOLE          411 -2.8576 -0.9525     0
HOLE          415 -0.9525 -0.9525     0
HOLE          416  0.9525 -0.9525     0
HOLE          412  2.8576 -0.9525     0
HOLE          411 -2.8576  0.9525     0
HOLE          417 -0.9525  0.9525     0
HOLE          418  0.9525  0.9525     0
HOLE          412  2.8576  0.9525     0
HOLE          417 -2.8576  2.8576     0
```

```
HOLE          414  -0.9525  2.8576      0
HOLE          414   0.9525  2.8576      0
HOLE          418   2.8576  2.8576      0
CUBOID     3 1 4P4.1529 43.48 -33.04
' CHECK 4.1 CM ABOVE********************
UNIT 425
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, BOTTOM RIGHT OPENING'
CUBOID     3 1 4P4.1529 43.48 -33.04
HOLE          415  -2.8576 -2.8576      0
HOLE          413  -0.9525 -2.8576      0
HOLE          413   0.9525 -2.8576      0
HOLE          416   2.8576 -2.8576      0
HOLE          411  -2.8576 -0.9525      0
HOLE          415  -0.9525 -0.9525      0
HOLE          416   0.9525 -0.9525      0
HOLE          412   2.8576 -0.9525      0
HOLE          411  -2.8576  0.9525      0
HOLE          417  -0.9525  0.9525      0
HOLE          418   0.9525  0.9525      0
HOLE          412   2.8576  0.9525      0
HOLE          417  -2.8576  2.8576      0
HOLE          414  -0.9525  2.8576      0
HOLE          414   0.9525  2.8576      0
HOLE          418   2.8576  2.8576      0
CUBOID     3 1 4P4.1529 43.48 -33.04
' CHECK 4.1 CM ABOVE********************
UNIT 426
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, TOP RIGHT OPENING'
CUBOID     3 1 4P4.1529 43.48 -33.04
HOLE          415  -2.8576 -2.8576      0
HOLE          413  -0.9525 -2.8576      0
HOLE          413   0.9525 -2.8576      0
HOLE          416   2.8576 -2.8576      0
HOLE          411  -2.8576 -0.9525      0
HOLE          415  -0.9525 -0.9525      0
HOLE          416   0.9525 -0.9525      0
HOLE          412   2.8576 -0.9525      0
HOLE          411  -2.8576  0.9525      0
HOLE          417  -0.9525  0.9525      0
HOLE          418   0.9525  0.9525      0
HOLE          412   2.8576  0.9525      0
HOLE          417  -2.8576  2.8576      0
HOLE          414  -0.9525  2.8576      0
HOLE          414   0.9525  2.8576      0
HOLE          418   2.8576  2.8576      0
CUBOID     3 1 4P4.1529 43.48 -33.04
'   **********************************
UNIT 430
COM='FUEL INSERT IN, CENTER OPENING'
CUBOID     3 1 4P4.2672 43.48 -33.04
UNIT 431
COM='FUEL INSERT IN, BOTTOM OPENING'
CUBOID     3 1 4P4.2672 43.48 -33.04
HOLE 421   0.0 -0.1143 0.0
UNIT 432
COM='FUEL INSERT IN, TOP OPENING'
CUBOID     3 1 4P4.2672 43.48 -33.04
HOLE 422   0.0 0.1143 0.0
UNIT 433
COM='FUEL INSERT IN, BOTTOM LEFT OPENING'
CUBOID     3 1 4P4.2672 43.48 -33.04
HOLE 423   -0.1143 -0.1143 0.0
UNIT 434
COM='FUEL INSERT IN, TOP LEFT OPENING'
CUBOID     3 1 4P4.2672 43.48 -33.04
HOLE 424   -0.1143 0.1143 0.0
UNIT 435
COM='FUEL INSERT IN, BOTOM RIGHT OPENING'
CUBOID     3 1 4P4.2672 43.48 -33.04
HOLE 425   0.1143 -0.1143 0.0
UNIT 436
COM='FUEL INSERT IN, TOP RIGHT OPENING'
CUBOID     3 1 4P4.2672 43.48 -33.04
HOLE 426   0.1143 0.1143 0.0
'   **********************************,
UNIT 440
COM='CENTER COLUMN OF THREE OPENINGS'
ARRAY 41  -4.2672 -13.5128 -33.04
REPLICATE 5 1 4R0.7112 2R0.0 1
UNIT 441
COM='LEFT OUTSIDE COLUMN OF TWO OPENINGS'
ARRAY 42  -4.2672 -8.8392 -33.04
REPLICATE 5 1 0.0 0.3408 2R0.3408 2R0.0 1
UNIT 442
COM='RIGHT OUTSIDE COLUMN OF TWO OPENINGS'
ARRAY 43  -4.2672 -8.8392 -33.04
REPLICATE 5 1 0.3408 0.0 2R0.3408 2R0.0 1
UNIT 450
COM='96 TRIGA FUEL ELEMENTS IN EACH LWT BASKET'
CYLINDER  3 1 17.1500 43.485 -33.045
HOLE 440   0.0    0.0 0.0
HOLE 441  -9.2457 0.0 0.0
HOLE 442  +9.2457 0.0 0.0
CYLINDER 5  1 18.9103 43.485 -33.045
CYLINDER 7  1 33.4645 43.485 -33.045
```

```
CYLINDER 5  1 36.5188 43.485 -33.045
CYLINDER 8  1 49.2227 43.485 -33.045
CYLINDER 5  1 49.8221 43.485 -33.045
CUBOID   9   1 4P49.8221 43.485 -33.045
' ************************************
UNIT 80
COM='SIMPLIFIED LID STRUCTURE NAC-LWT'
CYLINDER 5 1 36.5188 2P14.1351
CYLINDER 9 1 49.8221 2P14.1351
CUBOID   9   1 4P49.8221 2P14.1351
UNIT 81
COM='SIMPLIFIED CASK BOTTOM STRUCTURE NAC-LWT'
CYLINDER 7 1 26.3525 2P3.81
CYLINDER 5 1 36.6188 +13.97 -12.7
CYLINDER 9 1 49.8221 +13.97 -12.7
CUBOID   9   1 4P49.8221 13.97 -12.7
GLOBAL UNIT 82
COM='STACK OF 5 BASKETS IN CASK'
ARRAY  20  -49.8221 -49.8221 -221.3
END GEOM
READ ARRAY
ARA=1 NUX=1 NUY=5 NUZ=1 FILL 10 5 16 5 11 END FILL
ARA=2 NUX=1 NUY=3 NUZ=1 FILL 13 6 12 END FILL
ARA=3 NUX=1 NUY=3 NUZ=1 FILL 15 6 14 END FILL
ARA=41 NUX=1 NUY=5 NUZ=1 FILL 432 45 430 45 431 END FILL
ARA=42 NUX=1 NUY=3 NUZ=1 FILL 436 46 435 END FILL
ARA=43 NUX=1 NUY=3 NUZ=1 FILL 434 46 433 END FILL
ARA=20 NUX=1 NUY=1 NUZ=7 FILL 81 30 3R450 30 80 END FILL
END ARRAY
READ BOUNDS ALL=MIR END BOUNDS
READ START XSM=-17 XSP=17 YSM=-17 YSP=17 ZSM=-200 ZSP=200 END START
READ PLOT
TTL='X-Y PLOT OF CASK (CANISTER ELEVATION)'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=800
XUL=-50.0 YUL=50.0 ZUL=149.352
XLR=50.0 YLR=-50.0 ZLR=149.352 END
TTL='X-Y PLOT OF BASKET (CANISTER ELEVATION)'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=800
XUL=-17.2 YUL=17.2 ZUL=149.352
XLR=17.2 YLR=-17.2 ZLR=149.352 END
TTL='X-Y PLOT OF BASKET (CAVITY MID PLANE)'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=800
XUL=-17.2 YUL=17.2 ZUL=0.0
XLR=17.2 YLR=-17.2 ZLR=0.0 END
TTL='X-Y PLOT OF CENTER OPENING (CANISTER ELEVATION)'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=800
XUL=-7.0 YUL=7.0 ZUL=149.352
XLR=7.0 YLR=-7.0 ZLR=149.352 END
TTL='X-Y PLOT OF PERIPHERAL OPENING (CANISTER ELEVATION)'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=800
XUL=-7.0 YUL=16.0 ZUL=149.352
XLR=7.0  YLR=4.0 ZLR=149.352 END
TTL='Y-Z PLOT OF BASKET (CENTER OF FUEL ELEMENTS,CANISTER ELEVATION)'
SCR=YES PIC=MAT LPI=10
VAX=1.0 WDN=-1.0 NAX=800
XUL=2.12 YUL=-14.0 ZUL=186.69
XLR=2.12 YLR=-4.5 ZLR=112.014 END
TTL='Y-Z PLOT OF BASKET (CASK)'
SCR=YES PIC=MAT LPI=10
VAX=1.0 WDN=-1.0 NAX=800
XUL=2.12 YUL=-51 ZUL=220.0
XLR=2.12 YLR=+51 ZLR=-220.0
END PLOT
END DATA

**** PROBLEM PARAMETERS ****

LIB 27GROUPNDF4  LIBRARY
MXX           12 MIXTURES
MSC           29 COMPOSITION SPECIFICATIONS
IZM            5 MATERIAL ZONES
GE  MULTIREGION  GEOMETRY
MORE           0 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
MSLN           0 FUEL SOLUTIONS

**** PROBLEM COMPOSITION DESCRIPTION ****

SC  U-235          STANDARD COMPOSITION
MX             1 MIXTURE NO.
DEN   1.7323E-03 ATOMIC DENSITY
ROTH      1.0000 THEORETICAL DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
          92235        1.00 ATOM/MOLECULE
END

SC  U-238          STANDARD COMPOSITION
MX             1 MIXTURE NO.
```

```
    DEN    6.8418E-03 ATOMIC DENSITY
    ROTH       1.0000 THEORETICAL DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
              92238       1.00 ATOM/MOLECULE
    END

    SC  ZR            STANDARD COMPOSITION
    MX              1 MIXTURE NO.
    DEN    2.9039E-02 ATOMIC DENSITY
    ROTH       6.4900 THEORETICAL DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
              40000       1.00 ATOM/MOLECULE
    END

    SC  H             STANDARD COMPOSITION
    MX              1 MIXTURE NO.
    DEN    4.9367E-02 ATOMIC DENSITY
    ROTH       1.0000 THEORETICAL DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
               1001       1.00 ATOM/MOLECULE

'CLAD INCOLOY
    END

    SC  NI            STANDARD COMPOSITION
    MX              2 MIXTURE NO.
    DEN    2.8516E-02 ATOMIC DENSITY
    ROTH       8.9000 THEORETICAL DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
              28000       1.00 ATOM/MOLECULE
    END

    SC  FE            STANDARD COMPOSITION
    MX              2 MIXTURE NO.
    DEN    3.3820E-02 ATOMIC DENSITY
    ROTH       7.8600 THEORETICAL DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
              26000       1.00 ATOM/MOLECULE
    END

    SC  CR            STANDARD COMPOSITION
    MX              2 MIXTURE NO.
    DEN    2.1151E-02 ATOMIC DENSITY
    ROTH       7.2000 THEORETICAL DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
              24000       1.00 ATOM/MOLECULE
    END

    SC  C             STANDARD COMPOSITION
    MX              2 MIXTURE NO.
    DEN    3.9900E-04 ATOMIC DENSITY
    ROTH       2.1000 THEORETICAL DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
               6012       1.00 ATOM/MOLECULE
    END

    SC  MN            STANDARD COMPOSITION
    MX              2 MIXTURE NO.
    DEN    1.3060E-03 ATOMIC DENSITY
    ROTH       7.2000 THEORETICAL DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
              25055       1.00 ATOM/MOLECULE
    END

    SC  S             STANDARD COMPOSITION
    MX              2 MIXTURE NO.
    DEN    2.2000E-05 ATOMIC DENSITY
    ROTH       2.0700 THEORETICAL DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
              16000       1.00 ATOM/MOLECULE
    END

    SC  SI            STANDARD COMPOSITION
    MX              2 MIXTURE NO.
    DEN    1.7030E-03 ATOMIC DENSITY
    ROTH       2.3300 THEORETICAL DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
              14000       1.00 ATOM/MOLECULE
    END

    SC  CU            STANDARD COMPOSITION
    MX              2 MIXTURE NO.
    DEN    5.6000E-04 ATOMIC DENSITY
    ROTH       8.9200 THEORETICAL DENSITY
    NEL             1 NO. ELEMENTS
```

```
    ICP              1 0/1 MIXTURE/COMPOUND
                 29000       1.00 ATOM/MOLECULE
    END

    SC  AL             STANDARD COMPOSITION
    MX               2 MIXTURE NO.
    DEN    2.6600E-04 ATOMIC DENSITY
    ROTH       2.7020 THEORETICAL DENSITY
    NEL              1 NO. ELEMENTS
    ICP              1 0/1 MIXTURE/COMPOUND
                 13027       1.00 ATOM/MOLECULE
    END

    SC  TI             STANDARD COMPOSITION
    MX               2 MIXTURE NO.
    DEN    1.5000E-04 ATOMIC DENSITY
    ROTH       4.5000 THEORETICAL DENSITY
    NEL              1 NO. ELEMENTS
    ICP              1 0/1 MIXTURE/COMPOUND
                 22000       1.00 ATOM/MOLECULE

'CASK INTERIOR MODERATOR MATERIAL
    END

    SC  H2O            STANDARD COMPOSITION
    MX               3 MIXTURE NO.
    VF          0.0000 VOLUME FRACTION
    ROTH        0.9982 THEORETICAL DENSITY
    NEL              2 NO. ELEMENTS
    ICP              1 0/1 MIXTURE/COMPOUND
    TEMP         293.0 DEG KELVIN
                  1001       2.00 ATOMS/MOLECULE
                  8016       1.00 ATOM/MOLECULE

'END FITTING FOR FUEL ELEMENT
    END

    SC  SS304          STANDARD COMPOSITION
    MX               4 MIXTURE NO.
    VF          0.4968 VOLUME FRACTION
    ROTH        7.9200 THEORETICAL DENSITY
    NEL              4 NO. ELEMENTS
    ICP              0 0/1 MIXTURE/COMPOUND
    TEMP         293.0 DEG KELVIN
                 24304     19.000 WT%
                 25055      2.000 WT%
                 26304     69.500 WT%
                 28304      9.500 WT%
    END

    SC  H2O            STANDARD COMPOSITION
    MX               4 MIXTURE NO.
    VF          0.0000 VOLUME FRACTION
    ROTH        0.9982 THEORETICAL DENSITY
    NEL              2 NO. ELEMENTS
    ICP              1 0/1 MIXTURE/COMPOUND
    TEMP         293.0 DEG KELVIN
                  1001       2.00 ATOMS/MOLECULE
                  8016       1.00 ATOM/MOLECULE

'BASKET, AND CASK
    END

    SC  SS304          STANDARD COMPOSITION
    MX               5 MIXTURE NO.
    VF          1.0000 VOLUME FRACTION
    ROTH        7.9200 THEORETICAL DENSITY
    NEL              4 NO. ELEMENTS
    ICP              0 0/1 MIXTURE/COMPOUND
    TEMP         293.0 DEG KELVIN
                 24304     19.000 WT%
                 25055      2.000 WT%
                 26304     69.500 WT%
                 28304      9.500 WT%

'AL FUEL HOLDER
    END

    SC  AL             STANDARD COMPOSITION
    MX               6 MIXTURE NO.
    VF          1.0000 VOLUME FRACTION
    ROTH        2.7020 THEORETICAL DENSITY
    NEL              1 NO. ELEMENTS
    ICP              1 0/1 MIXTURE/COMPOUND
    TEMP         293.0 DEG KELVIN
                 13027       1.00 ATOM/MOLECULE

'LEAD SHIELD
    END

    SC  PB             STANDARD COMPOSITION
    MX               7 MIXTURE NO.
    VF          1.0000 VOLUME FRACTION
    ROTH       11.3440 THEORETICAL DENSITY
    NEL              1 NO. ELEMENTS
```

```
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               82000       1.00 ATOM/MOLECULE

'NEUTRON SHIELD
    END

    SC  H2O          STANDARD COMPOSITION
    MX             8 MIXTURE NO.
    VF        0.0000 VOLUME FRACTION
    ROTH      0.9982 THEORETICAL DENSITY
    NEL            2 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
                1001       2.00 ATOMS/MOLECULE
                8016       1.00 ATOM/MOLECULE

'CASK EXTERNAL MATERIAL
    END

    SC  H2O          STANDARD COMPOSITION
    MX             9 MIXTURE NO.
    VF        0.0000 VOLUME FRACTION
    ROTH      0.9982 THEORETICAL DENSITY
    NEL            2 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
                1001       2.00 ATOMS/MOLECULE
                8016       1.00 ATOM/MOLECULE

'MIXTURE (FUEL) FOR CANISTER
    END

    SC  U-235        STANDARD COMPOSITION
    MX            10 MIXTURE NO.
    DEN   2.8119E-04 ATOMIC DENSITY
    ROTH      1.0000 THEORETICAL DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
               92235       1.00 ATOM/MOLECULE
    END

    SC  U-238        STANDARD COMPOSITION
    MX            10 MIXTURE NO.
    DEN   1.1105E-03 ATOMIC DENSITY
    ROTH      1.0000 THEORETICAL DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
               92238       1.00 ATOM/MOLECULE
    END

    SC  ZR           STANDARD COMPOSITION
    MX            10 MIXTURE NO.
    DEN   4.7136E-03 ATOMIC DENSITY
    ROTH      6.4900 THEORETICAL DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
               40000       1.00 ATOM/MOLECULE
    END

    SC  H            STANDARD COMPOSITION
    MX            10 MIXTURE NO.
    DEN   8.0131E-03 ATOMIC DENSITY
    ROTH      1.0000 THEORETICAL DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
                1001       1.00 ATOM/MOLECULE
    END

    SC  H2O          STANDARD COMPOSITION
    MX            10 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      0.8362 SPECIFIED DENSITY
    NEL            2 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       300.0 DEG KELVIN
                1001       2.00 ATOMS/MOLECULE
                8016       1.00 ATOM/MOLECULE

'CANISTER INTERNAL MODERATOR
    END

    SC  H2O          STANDARD COMPOSITION
    MX            11 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      0.9982 SPECIFIED DENSITY
    NEL            2 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
                1001       2.00 ATOMS/MOLECULE
                8016       1.00 ATOM/MOLECULE

' SECONDARY CASK CAVITY MATERIAL FOR MULTICELL CARD
    END
```

```
SC   H2O          STANDARD COMPOSITION
MX           12 MIXTURE NO.
VF       0.0000 VOLUME FRACTION
ROTH     0.9982 THEORETICAL DENSITY
NEL           2 NO. ELEMENTS
ICP           1 0/1 MIXTURE/COMPOUND
TEMP      293.0 DEG KELVIN
            1001       2.00 ATOMS/MOLECULE
            8016       1.00 ATOM/MOLECULE
END

**** PROBLEM GEOMETRY ****

CS   BUCKLEDCYL   COORDINATE SYSTEM
BR   WHITE        RIGHT BOUNDARY
BL   REFLECTED    LEFT BOUNDARY
ORGN          0.00 CM LEFT BOUNDARY LOCATION
DY           57.15 CM BUCKLING HEIGHT
DZ            0.00 CM BUCKLING DEPTH
END

ZONE NUMBER      1
MZX              1 MIXTURE NO.
RZ            0.67 CM RIGHT BOUNDARY LOCATION
XMOD               EXTERNAL MODERATOR INDEX

ZONE NUMBER      2
MZX              2 MIXTURE NO.
RZ            0.71 CM RIGHT BOUNDARY LOCATION
XMOD               EXTERNAL MODERATOR INDEX

ZONE NUMBER      3
MZX              3 MIXTURE NO.
RZ            0.81 CM RIGHT BOUNDARY LOCATION
XMOD               EXTERNAL MODERATOR INDEX

ZONE NUMBER      4
MZX              6 MIXTURE NO.
RZ            0.95 CM RIGHT BOUNDARY LOCATION
XMOD               EXTERNAL MODERATOR INDEX

ZONE NUMBER      5
MZX             12 MIXTURE NO.
RZ            1.07 CM RIGHT BOUNDARY LOCATION
XMOD               EXTERNAL MODERATOR INDEX

                    ******************************************************************************
                    ******************************************************************************
                    ******************************************************************************
                    *****                                                                    *****
                    *****                   PROGRAM VERIFICATION INFORMATION                 *****
                    *****                                                                    *****
                    *****               CODE SYSTEM:   SCALE-PC VERSION:   4.3               *****
                    *****                                                                    *****
                    ******************************************************************************
                    ******************************************************************************
                    *****                                                                    *****
                    *****                                                                    *****
                    *****              PROGRAM:  000009                                      *****
                    *****                                                                    *****
                    *****        CREATION DATE:  03/08/96                                    *****
                    *****                                                                    *****
                    *****               VOLUME:  Eng                                         *****
                    *****                                                                    *****
                    *****              LIBRARY:  M:\SCALE43\WIN_NT\EXE                       *****
                    *****                                                                    *****
                    *****                                                                    *****
                    *****      PRODUCTION CODE:  KENOVA                                      *****
                    *****                                                                    *****
                    *****              VERSION:  3.1                                         *****
                    *****                                                                    *****
                    *****              JOBNAME:  SCALE-PC                                    *****
                    *****                                                                    *****
                    *****    DATE OF EXECUTION:  11/12/07                                    *****
                    *****                                                                    *****
                    *****    TIME OF EXECUTION:  09:16:50                                    *****
                    *****                                                                    *****
                    *****                                                                    *****
                    ******************************************************************************
                    ******************************************************************************
                    ******************************************************************************
```

TRIGA - PREF. FLOOD CANISTER

****** NUMERIC PARAMETERS ******

TME	MAXIMUM PROBLEM TIME (MIN)	170.00
TBA	TIME PER GENERATION (MIN)	2.00
GEN	NUMBER OF GENERATIONS	403
NPG	NUMBER PER GENERATION	1000
NSK	NUMBER OF GENERATIONS TO BE SKIPPED	3
BEG	BEGINNING GENERATION NUMBER	1
RES	GENERATIONS BETWEEN CHECKPOINTS	0
X1D	NUMBER OF EXTRA 1-D CROSS SECTIONS	1
NBK	NEUTRON BANK SIZE	1025
XNB	EXTRA POSITIONS IN NEUTRON BANK	0
NFB	FISSION BANK SIZE	1000
XFB	EXTRA POSITIONS IN FISSION BANK	0
WTA	DEFAULT VALUE OF WEIGHT AVERAGE	0.5000
WTH	WEIGHT HIGH FOR SPLITTING	3.0000
WTL	WEIGHT LOW FOR RUSSIAN ROULETTE	0.3333
RND	STARTING RANDOM NUMBER	BB827100001
NB8	NUMBER OF D.A. BLOCKS ON UNIT 8	200
NL8	LENGTH OF D.A. BLOCKS ON UNIT 8	512
ADJ	MODE OF CALCULATION	FORWARD
	INPUT DATA WRITTEN ON RESTART UNIT	NO
	BINARY DATA INTERFACE	YES

```
*****************************************************************************************************
*****************************************************************************************************
***                                                                                               ***
***                               TRIGA - PREF. FLOOD CANISTER                                    ***
***                                                                                               ***
*****************************************************************************************************
***                           ******    LOGICAL PARAMETERS    ******                              ***
***                                                                                               ***
***  RUN  EXECUTE PROBLEM AFTER CHECKING DATA     YES        PLT  PLOT PICTURE MAP(S)          NO ***
***                                                                                               ***
***  FLX  COMPUTE FLUX                             NO        FDN  COMPUTE FISSION DENSITIES    NO ***
***                                                                                               ***
***  SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION     NO        NUB  COMPUTE NU-BAR & AVG FISSION GROUP     YES ***
***                                                                                               ***
***  MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER      NO        MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION   NO ***
***                                                                                               ***
***  CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER    NO        CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION NO ***
***                                                                                               ***
***  FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER    NO        FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION NO ***
***                                                                                               ***
***  MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER      NO        MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER    NO ***
***                                                                                               ***
***  CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER    NO        CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER  NO ***
***                                                                                               ***
***  FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER    NO        FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER  NO ***
***                                                                                               ***
***  HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL     NO        HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL   NO ***
***                                                                                               ***
***  AMX  PRINT ALL MIXED CROSS SECTIONS           NO        FAR  PRINT FIS. AND ABS. BY REGION        NO ***
***                                                                                               ***
***  XS1  PRINT 1-D MIXTURE X-SECTIONS             NO        GAS  PRINT FAR BY GROUP                   NO ***
***                                                                                               ***
***  XS2  PRINT 2-D MIXTURE X-SECTIONS             NO        PAX  PRINT XSEC-ALBEDO CORRELATION TABLES NO ***
***                                                                                               ***
***  XAP  PRINT MIXTURE ANGLES & PROBABILITIES     NO        PWT  PRINT WEIGHT AVERAGE ARRAY           NO ***
***                                                                                               ***
***  PKI  PRINT FISSION SPECTRUM                   NO        PGM  PRINT INPUT GEOMETRY                 NO ***
***                                                                                               ***
***  P1D  PRINT EXTRA 1-D CROSS SECTIONS           NO        BUG  PRINT DEBUG INFORMATION              NO ***
***                                                                                               ***
***                                                          TRK  PRINT TRACKING INFORMATION           NO ***
***                                                                                               ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************
*****************************************************************************************************
                              PARAMETER INPUT COMPLETED

                              TRIGA - PREF. FLOOD CANISTER

                                    MIXING TABLE

                          NUMBER OF SCATTERING ANGLES =  2
                     CROSS SECTION MESSAGE THRESHOLD =3.0E-05


MIXTURE =     1          DENSITY(G/CC) =  7.8619
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT               NUCLIDE TITLE
   1001001  4.93670E-02  1.05068E-02   1001     1.0077     HYDROGEN      ENDF/B-IV MAT 1269/THRM1002           UPDATED
08/12/94
   1040000  2.90390E-02  5.59490E-01  40000    91.2196     ZIRCONIUM     ENDF/B-IV MAT 7141                    UPDATED
08/12/94
   1092235  1.73230E-03  8.59993E-02  92235   235.0441     URANIUM-235   ENDF/B-IV MAT 1261                    UPDATED
08/12/94
   1092238  6.84180E-03  3.44004E-01  92238   238.0510     URANIUM-238   ENDF/B-IV MAT 1262                    UPDATED
08/12/94

MIXTURE =     2          DENSITY(G/CC) =  8.0325
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT               NUCLIDE TITLE
   2006012  3.99000E-04  9.89820E-04   6000    12.0001     CARBON-12     ENDF/B-IV MAT 1274/THRM1065           UPDATED
08/12/94
   2013027  2.66000E-04  1.48372E-03  13027    26.9818    AL-27 1193 218 GP 040375(5)                      UPDATED
08/12/94
   2014000  1.70300E-03  9.88763E-03  14000    28.0853     SILICON       ENDF/B-IV MAT 1194                    UPDATED
08/12/94
   2016000  2.20000E-05  1.45825E-04  16000    32.0634    SULFUR  LENDL MAT 7020                           UPDATED
08/12/94
   2022000  1.50000E-04  1.48470E-03  22000    47.8793     TITANIUM      ENDF/B-IV MAT 1286                    UPDATED
08/12/94
   2024000  2.11510E-02  2.27351E-01  24000    51.9957    CR 1191 218NGP WT 1/E P-3 293K SIGP=5+4 RE(042375)  UPDATED
08/12/94
   2025055  1.30600E-03  1.48325E-02  25055    54.9379     MANGANESE-55  ENDF/B-IV MAT 1197                    UPDATED
08/12/94
   2026000  3.38200E-02  3.90441E-01  26000    55.8447     IRON          ENDF/B-IV MAT 1192                    UPDATED
08/12/94
   2028000  2.85160E-02  3.45964E-01  28000    58.6872    NI 1190 218NGP WT 1/E P-3 293K SIGP=5+4 RE(042375)  UPDATED
08/12/94
   2029000  5.60000E-04  7.42031E-03  29000    64.0966     COPPER        ENDF/B-IV MAT 1295                    UPDATED
08/12/94

MIXTURE =     3          DENSITY(G/CC) = 0.99517E-20
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT               NUCLIDE TITLE
   3001001  6.67692E-22  1.11927E-01   1001     1.0077     HYDROGEN      ENDF/B-IV MAT 1269/THRM1002           UPDATED
08/12/94
```

```
   3008016  3.33846E-22  8.88073E-01    8016    15.9904      OXYGEN-16       ENDF/B-IV MAT 1276                                 UPDATED
08/12/94

MIXTURE =      4           DENSITY(G/CC) =  3.9347
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT                NUCLIDE TITLE
   4001001  6.67692E-22  2.83943E-22    1001     1.0077      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                        UPDATED
08/12/94
   4008016  3.33846E-22  2.25293E-21    8016    15.9904      OXYGEN-16       ENDF/B-IV MAT 1276                                 UPDATED
08/12/94
   4024304  8.65852E-03  1.90000E-01   24000    51.9957     CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'                    UPDATED
08/12/94
   4025055  8.62609E-04  1.99999E-02   25055    54.9379      MANGANESE-55    ENDF/B-IV MAT 1197                                 UPDATED
08/12/94
   4026304  2.94890E-02  6.95000E-01   26000    55.8447     FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'                    UPDATED
08/12/94
   4028304  3.83564E-03  9.50001E-02   28000    58.6872     NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'                    UPDATED
08/12/94

MIXTURE =      5           DENSITY(G/CC) =  7.9200
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT                NUCLIDE TITLE
   5024304  1.74286E-02  1.90000E-01   24000    51.9957     CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'                    UPDATED
08/12/94
   5025055  1.73633E-03  1.99999E-02   25055    54.9379      MANGANESE-55    ENDF/B-IV MAT 1197                                 UPDATED
08/12/94
   5026304  5.93579E-02  6.95000E-01   26000    55.8447     FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'                    UPDATED
08/12/94
   5028304  7.72070E-03  9.50001E-02   28000    58.6872     NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'                    UPDATED
08/12/94

MIXTURE =      6           DENSITY(G/CC) =  2.7020
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT                NUCLIDE TITLE
   6013027  6.03066E-02  1.00000E+00   13027    26.9818     AL-27 1193 218 GP 040375(5)                                         UPDATED
08/12/94

MIXTURE =      7           DENSITY(G/CC) =  11.344
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT                NUCLIDE TITLE
   7082000  3.29690E-02  1.00000E+00   82000   207.2100     PB   1288 218NGP 042375 P-3 293K                                    UPDATED
08/12/94

MIXTURE =      8           DENSITY(G/CC) = 0.99817E-20
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT                NUCLIDE TITLE
   8001001  6.67692E-22  1.11927E-01    1001     1.0077      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                        UPDATED
08/12/94
   8008016  3.33846E-22  8.88073E-01    8016    15.9904      OXYGEN-16       ENDF/B-IV MAT 1276                                 UPDATED
08/12/94

MIXTURE =      9           DENSITY(G/CC) = 0.99817E-20
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT                NUCLIDE TITLE
   9001001  6.67692E-22  1.11927E-01    1001     1.0077      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                        UPDATED
08/12/94
   9008016  3.33846E-22  8.88073E-01    8016    15.9904      OXYGEN-16       ENDF/B-IV MAT 1276                                 UPDATED
08/12/94

MIXTURE =     10           DENSITY(G/CC) =  2.1123
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT                NUCLIDE TITLE
  10001001  6.39462E-02  5.06550E-02    1001     1.0077      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                        UPDATED
08/12/94
  10008016  2.79665E-02  3.51554E-01    8016    15.9904      OXYGEN-16       ENDF/B-IV MAT 1276                                 UPDATED
08/12/94
  10040000  4.71360E-03  3.38015E-01   40000    91.2196      ZIRCONIUM       ENDF/B-IV MAT 7141                                 UPDATED
08/12/94
  10092235  2.81190E-04  5.19571E-02   92235   235.0441      URANIUM-235     ENDF/B-IV MAT 1261                                 UPDATED
08/12/94
  10092238  1.11050E-03  2.07818E-01   92238   238.0510      URANIUM-238     ENDF/B-IV MAT 1262                                 UPDATED
08/12/94

MIXTURE =     11           DENSITY(G/CC) = 0.99817
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT                NUCLIDE TITLE
  11001001  6.67692E-02  1.11927E-01    1001     1.0077      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                        UPDATED
08/12/94
  11008016  3.33846E-02  8.88074E-01    8016    15.9904      OXYGEN-16       ENDF/B-IV MAT 1276                                 UPDATED
08/12/94

MIXTURE =     12           DENSITY(G/CC) = 0.99817E-20
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT                NUCLIDE TITLE
  12001001  6.67692E-22  1.11927E-01    1001     1.0077      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                        UPDATED
08/12/94
  12008016  3.33846E-22  8.88073E-01    8016    15.9904      OXYGEN-16       ENDF/B-IV MAT 1276                                 UPDATED
08/12/94


                            1001001       HYDROGEN       ENDF/B-IV MAT 1269/THRM1002                 UPDATED 08/12/94
                            3001001       HYDROGEN       ENDF/B-IV MAT 1269/THRM1002                 UPDATED 08/12/94
                            4001001       HYDROGEN       ENDF/B-IV MAT 1269/THRM1002                 UPDATED 08/12/94
                            8001001       HYDROGEN       ENDF/B-IV MAT 1269/THRM1002                 UPDATED 08/12/94
                            9001001       HYDROGEN       ENDF/B-IV MAT 1269/THRM1002                 UPDATED 08/12/94
                           10001001       HYDROGEN       ENDF/B-IV MAT 1269/THRM1002                 UPDATED 08/12/94
                           11001001       HYDROGEN       ENDF/B-IV MAT 1269/THRM1002                 UPDATED 08/12/94
                           12001001       HYDROGEN       ENDF/B-IV MAT 1269/THRM1002                 UPDATED 08/12/94
                            2006012       CARBON-12      ENDF/B-IV MAT 1274/THRM1065                 UPDATED 08/12/94
                            3008016       OXYGEN-16      ENDF/B-IV MAT 1276                          UPDATED 08/12/94
                            4008016       OXYGEN-16      ENDF/B-IV MAT 1276                          UPDATED 08/12/94
                            8008016       OXYGEN-16      ENDF/B-IV MAT 1276                          UPDATED 08/12/94
                            9008016       OXYGEN-16      ENDF/B-IV MAT 1276                          UPDATED 08/12/94
```

```
 10008016    OXYGEN-16      ENDF/B-IV MAT 1276                          UPDATED 08/12/94
 11008016    OXYGEN-16      ENDF/B-IV MAT 1276                          UPDATED 08/12/94
 12008016    OXYGEN-16      ENDF/B-IV MAT 1276                          UPDATED 08/12/94
  2013027   AL-27 1193 218 GP 040375(5)                                 UPDATED 08/12/94
  6013027   AL-27 1193 218 GP 040375(5)                                 UPDATED 08/12/94
  2014000    SILICON        ENDF/B-IV MAT 1194                          UPDATED 08/12/94
  2016000   SULFUR  LENDL MAT 7020                                      UPDATED 08/12/94
  2022000    TITANIUM       ENDF/B-IV MAT 1286                          UPDATED 08/12/94
  2024000   CR 1191 218NGP WT 1/E P-3 293K SIGP=5+4 RE(042375)          UPDATED 08/12/94
  4024304   CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'            UPDATED 08/12/94
  5024304   CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'            UPDATED 08/12/94
  2025055    MANGANESE-55   ENDF/B-IV MAT 1197                          UPDATED 08/12/94
  4025055    MANGANESE-55   ENDF/B-IV MAT 1197                          UPDATED 08/12/94
  5025055    MANGANESE-55   ENDF/B-IV MAT 1197                          UPDATED 08/12/94
  2026000    IRON           ENDF/B-IV MAT 1192                          UPDATED 08/12/94
  4026304   FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'            UPDATED 08/12/94
  5026304   FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'            UPDATED 08/12/94
  2028000   NI 1190 218NGP WT 1/E P-3 293K SIGP=5+4 RE(042375)          UPDATED 08/12/94
  4028304   NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'            UPDATED 08/12/94
  5028304   NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'            UPDATED 08/12/94
  2029000    COPPER         ENDF/B-IV MAT 1295                          UPDATED 08/12/94
  1040000    ZIRCONIUM      ENDF/B-IV MAT 7141                          UPDATED 08/12/94
 10040000    ZIRCONIUM      ENDF/B-IV MAT 7141                          UPDATED 08/12/94
  7082000   PB    1288 218NGP 042375 P-3 293K                           UPDATED 08/12/94
  1092235    URANIUM-235    ENDF/B-IV MAT 1261                          UPDATED 08/12/94
 10092235    URANIUM-235    ENDF/B-IV MAT 1261                          UPDATED 08/12/94
  1092238    URANIUM-238    ENDF/B-IV MAT 1262                          UPDATED 08/12/94
 10092238    URANIUM-238    ENDF/B-IV MAT 1262                          UPDATED 08/12/94
```

```
*********************************************************************************************
***                                                                                       ***
***        TRIGA - PREF. FLOOD CANISTER                                                   ***
***                                                                                       ***
*********************************************************************************************
*********************************************************************************************
***                                                                                       ***
***                          ****** ADDITIONAL INFORMATION ******                         ***
***                                                                                       ***
*** NUMBER OF ENERGY GROUPS              27      USE LATTICE GEOMETRY                YES  ***
***                                                                                       ***
*** NO. OF FISSION SPECTRUM SOURCE GROUP  1      GLOBAL ARRAY NUMBER                  20  ***
***                                                                                       ***
*** NO. OF SCATTERING ANGLES IN XSECS     2      NUMBER OF UNITS IN THE GLOBAL X DIR.   1  ***
***                                                                                       ***
*** ENTRIES/NEUTRON IN THE NEUTRON BANK  26      NUMBER OF UNITS IN THE GLOBAL Y DIR.   1  ***
***                                                                                       ***
*** ENTRIES/NEUTRON IN THE FISSION BANK  19      NUMBER OF UNITS IN THE GLOBAL Z DIR.   7  ***
***                                                                                       ***
*** NUMBER OF MIXTURES USED              11      USE A GLOBAL REFLECTOR              YES  ***
***                                                                                       ***
*** NUMBER OF BIAS ID'S USED              1      USE NESTED HOLES                    YES  ***
***                                                                                       ***
*** NUMBER OF DIFFERENTIAL ALBEDOS USED   0      NUMBER OF HOLES                     140  ***
***                                                                                       ***
*** TOTAL INPUT GEOMETRY REGIONS         91      MAXIMUM HOLE NESTING LEVEL            4  ***
***                                                                                       ***
*** NUMBER OF GEOMETRY REGIONS USED      87      USE NESTED ARRAYS                   YES  ***
***                                                                                       ***
*** LARGEST GEOMETRY UNIT NUMBER        450      NUMBER OF ARRAYS USED                 7  ***
***                                                                                       ***
*** LARGEST ARRAY NUMBER                 43      MAXIMUM ARRAY NESTING LEVEL           2  ***
***                                                                                       ***
***                                                                                       ***
*** +X BOUNDARY CONDITION               MIR      -X BOUNDARY CONDITION               MIR  ***
***                                                                                       ***
*** +Y BOUNDARY CONDITION               MIR      -Y BOUNDARY CONDITION               MIR  ***
***                                                                                       ***
*** +Z BOUNDARY CONDITION               MIR      -Z BOUNDARY CONDITION               MIR  ***
***                                                                                       ***
*********************************************************************************************
```

ARRAY NUMBER	UNITS IN X DIR.	UNITS IN Y DIR.	UNITS IN Z DIR.	NESTING LEVEL
1	1	5	1	2
2	1	3	1	2
3	1	3	1	2
20 GLOBAL	1	1	7	1
41	1	5	1	2
42	1	3	1	2
43	1	3	1	2

.... 0 IO'S WERE USED LOADING THE DATA ....

```
                                        TRIGA - PREF. FLOOD CANISTER

                    MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION               NUM   ID

                                                       -----  UNIT     1   -----

TRIGA FUEL (SMEARED)

  1 CYLINDER        10  1  RADIUS =  3.9623     +Z =  60.959     -Z = 1.00000E-03 CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                                       -----  UNIT     5   -----

3.38 IN WIDTH / 0.28 IN THICKNESS DIVIDER CENTER STACK (SEALED)

  1 CUBOID           5  1      +X =  4.2672     -X = -4.2672     +Y = 0.71120     -Y = 0.00000     +Z =  74.290     -Z = -8.2550

                                                       -----  UNIT     6   -----

3.38 IN WIDTH / 0.24 IN THICKNESS DIVIDER OUTSIDE STACK (SEALED)

  1 CUBOID           5  1      +X =  4.2672     -X = -4.2672     +Y = 0.60960     -Y = 0.00000     +Z =  74.290     -Z = -8.2550

                                                       -----  UNIT     7   -----

SEALED CANISTER

  1 CYLINDER        11  1  RADIUS =  3.9624     +Z =  60.960     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
    HOLE NUMBER      1       AT X = 0.00000      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER      1
  2 CYLINDER         5  1  RADIUS =  4.1275     +Z =  63.500     -Z = -1.2700     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  3 CYLINDER         3  1  RADIUS =  4.1275     +Z =  74.290     -Z = -8.2550     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                                       -----  UNIT    10   -----

TRIGA ELEMENTS IN TOP OF 3.38 IN X 3.38 IN OPENING (SEALED)

  1 CUBOID           3  1      +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  74.290     -Z = -8.2550
    HOLE NUMBER      2       AT X = 0.00000      Y = 0.13970      Z = 0.00000     IS UNIT NUMBER      7

                                                       -----  UNIT    11   -----

TRIGA ELEMENTS IN BOTTOM OF 3.38 IN X 3.38 IN OPENING (SEALED)

  1 CUBOID           3  1      +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  74.290     -Z = -8.2550
    HOLE NUMBER      3       AT X = 0.00000      Y =-0.13970      Z = 0.00000     IS UNIT NUMBER      7
```

```
                                   TRIGA - PREF. FLOOD CANISTER

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                         -----   UNIT    12    -----

TRIGA ELEMENTS IN BOTTOM RIGHT OF 3.38 IN X 3.38 IN OPENING (SEALED)

  1 CUBOID            3  1       +X =  4.2672     -X = -4.2672      +Y =  4.2672     -Y = -4.2672      +Z =  74.290     -Z = -8.2550

    HOLE NUMBER       4       AT X = 0.13970      Y =-0.13970       Z = 0.00000      IS UNIT NUMBER       7

                                         -----   UNIT    13    -----

TRIGA ELEMENTS IN TOP RIGHT OF 3.38 IN X 3.38 IN OPENING (SEALED)

  1 CUBOID            3  1       +X =  4.2672     -X = -4.2672      +Y =  4.2672     -Y = -4.2672      +Z =  74.290     -Z = -8.2550

    HOLE NUMBER       5       AT X = 0.13970      Y = 0.13970       Z = 0.00000      IS UNIT NUMBER       7

                                         -----   UNIT    14    -----

TRIGA ELEMENTS IN BOTTOM LEFT OF 3.38 IN X 3.38 IN OPENING (SEALED)

  1 CUBOID            3  1       +X =  4.2672     -X = -4.2672      +Y =  4.2672     -Y = -4.2672      +Z =  74.290     -Z = -8.2550

    HOLE NUMBER       6       AT X =-0.13970      Y =-0.13970       Z = 0.00000      IS UNIT NUMBER       7

                                         -----   UNIT    15    -----

TRIGA ELEMENTS IN TOP LEFT OF 3.38 IN X 3.38 IN OPENING (SEALED)

  1 CUBOID            3  1       +X =  4.2672     -X = -4.2672      +Y =  4.2672     -Y = -4.2672      +Z =  74.290     -Z = -8.2550

    HOLE NUMBER       7       AT X =-0.13970      Y = 0.13970       Z = 0.00000      IS UNIT NUMBER       7

                                         -----   UNIT    16    -----

TRIGA BASKET 3.38 IN X 3.38 IN CENTER OPENING (SEALED)

  1 CUBOID            3  1       +X =  4.2672     -X = -4.2672      +Y =  4.2672     -Y = -4.2672      +Z =  74.290     -Z = -8.2550

                                   -----   UNIT    20   EXTERNAL TO LATTICE  1   -----

CENTER COLUMN OF THREE OPENINGS W/ 0.28 IN PLATE (SEALED)

  1 ARRAY NUMBER      1          +X =  4.2672     -X = -4.2672      +Y =  13.513     -Y = -13.513      +Z =  74.290     -Z = -8.2550

  2 CUBOID            5  1       +X =  4.9784     -X = -4.9784      +Y =  14.224     -Y = -14.224      +Z =  74.290     -Z = -8.2550
```

```
                         TRIGA - PREF. FLOOD CANISTER

              MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION         NUM   ID

                         -----  UNIT   21  EXTERNAL TO LATTICE  2   -----

LEFT OUTSIDE COLUMN OF TWO OPENINGS W/ 0.12 IN PLATE (SEALED)

  1 ARRAY NUMBER    2        +X =  4.2672    -X = -4.2672    +Y =  8.8392    -Y = -8.8392    +Z =  74.290    -Z = -8.2550

  2 CUBOID          5  1     +X =  4.2672    -X = -4.5720    +Y =  9.1440    -Y = -9.1440    +Z =  74.290    -Z = -8.2550

                         -----  UNIT   22  EXTERNAL TO LATTICE  3   -----

RIGHT OUTSIDE COLUMN OF TWO OPENINGS W/ 0.12 IN PLATE (SEALED)

  1 ARRAY NUMBER    3        +X =  4.2672    -X = -4.2672    +Y =  8.8392    -Y = -8.8392    +Z =  74.290    -Z = -8.2550

  2 CUBOID          5  1     +X =  4.5720    -X = -4.2672    +Y =  9.1440    -Y = -9.1440    +Z =  74.290    -Z = -8.2550

                                   -----  UNIT   30  -----

NAC-LWT TRIGA BASKET (SEALED)

  1 CYLINDER        3  1  RADIUS =  17.100    +Z =  74.290    -Z = -8.2550    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

    HOLE NUMBER     8       AT X = 0.00000     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER    20

    HOLE NUMBER     9       AT X = -9.2457     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER    21

    HOLE NUMBER    10       AT X =  9.2457     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER    22

  2 CYLINDER        5  1  RADIUS =  18.910    +Z =  74.930    -Z = -8.8900    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CYLINDER        7  1  RADIUS =  33.465    +Z =  74.930    -Z = -8.8900    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  4 CYLINDER        5  1  RADIUS =  36.519    +Z =  74.930    -Z = -8.8900    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  5 CYLINDER        8  1  RADIUS =  49.223    +Z =  74.930    -Z = -8.8900    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  6 CYLINDER        5  1  RADIUS =  49.822    +Z =  74.930    -Z = -8.8900    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  7 CUBOID          9  1     +X =  49.822    -X = -49.822    +Y =  49.822    -Y = -49.822    +Z =  74.930    -Z = -8.8900

                                   -----  UNIT   41  -----

TRIGA FUEL ELEMENT

  1 CYLINDER        1  1  RADIUS = 0.67310    +Z =  28.575    -Z = -28.575    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  2 CYLINDER        2  1  RADIUS = 0.71120    +Z =  28.575    -Z = -28.575    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CYLINDER        4  1  RADIUS = 0.71120    +Z =  43.480    -Z = -33.040    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
```

```
                                             TRIGA - PREF. FLOOD CANISTER

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                                          -----   UNIT    45   -----

DIVIDER CENTER STACK

  1 CUBOID             5  1      +X =  4.2672     -X = -4.2672     +Y = 0.71120     -Y = 0.00000     +Z =  43.480     -Z = -33.040

                                                          -----   UNIT    46   -----

DIVIDER OUTSIDE STACK

  1 CUBOID             5  1      +X =  4.2672     -X = -4.2672     +Y = 0.60960     -Y = 0.00000     +Z =  43.480     -Z = -33.040

                                                          -----   UNIT    80   -----

SIMPLIFIED LID STRUCTURE NAC-LWT

  1 CYLINDER           5  1  RADIUS =  36.519     +Z =  14.135     -Z = -14.135     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  2 CYLINDER           9  1  RADIUS =  49.822     +Z =  14.135     -Z = -14.135     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CUBOID             9  1      +X =  49.822     -X = -49.822     +Y =  49.822     -Y = -49.822     +Z =  14.135     -Z = -14.135

                                                          -----   UNIT    81   -----

SIMPLIFIED CASK BOTTOM STRUCTURE NAC-LWT

  1 CYLINDER           7  1  RADIUS =  26.353     +Z =  3.8100     -Z = -3.8100     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  2 CYLINDER           5  1  RADIUS =  36.619     +Z =  13.970     -Z = -12.700     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CYLINDER           9  1  RADIUS =  49.822     +Z =  13.970     -Z = -12.700     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  4 CUBOID             9  1      +X =  49.822     -X = -49.822     +Y =  49.822     -Y = -49.822     +Z =  13.970     -Z = -12.700

                                              ******************    GLOBAL    ******************
                                              -----   UNIT    82  EXTERNAL TO LATTICE 20    -----

STACK OF 5 BASKETS IN CASK

  1 ARRAY NUMBER     20          +X =  49.822     -X = -49.822     +Y =  49.822     -Y = -49.822     +Z =  230.67     -Z = -221.30

                                                          -----   UNIT   411   -----

TRIGA FUEL ELEMENTS IN AL TUBE, RIGHT

  1 CYLINDER           3  1  RADIUS = 0.80518     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

    HOLE NUMBER      12        AT X = 9.38000E-02  Y = 0.00000     Z = 0.00000     IS UNIT NUMBER     41

  2 CYLINDER           6  1  RADIUS = 0.95250     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
```

```
                              TRIGA - PREF. FLOOD CANISTER

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID


                                         -----  UNIT   412  -----

TRIGA FUEL ELEMENTS IN AL TUBE, LEFT

  1 CYLINDER         3   1  RADIUS = 0.80518     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

    HOLE NUMBER     13       AT X =-9.38000E-02  Y = 0.00000      Z = 0.00000     IS UNIT NUMBER     41

  2 CYLINDER         6   1  RADIUS = 0.95250     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                         -----  UNIT   413  -----

TRIGA FUEL ELEMENTS IN AL TUBE, TOP

  1 CYLINDER         3   1  RADIUS = 0.80518     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

    HOLE NUMBER     14       AT X = 0.00000      Y = 9.38000E-02  Z = 0.00000     IS UNIT NUMBER     41

  2 CYLINDER         6   1  RADIUS = 0.95250     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                         -----  UNIT   414  -----

TRIGA FUEL ELEMENTS IN AL TUBE, BOTTOM

  1 CYLINDER         3   1  RADIUS = 0.80518     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

    HOLE NUMBER     15       AT X = 0.00000      Y =-9.38000E-02  Z = 0.00000     IS UNIT NUMBER     41

  2 CYLINDER         6   1  RADIUS = 0.95250     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                         -----  UNIT   415  -----

TRIGA FUEL ELEMENTS IN AL TUBE, TOP RIGHT

  1 CYLINDER         3   1  RADIUS = 0.80518     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

    HOLE NUMBER     16       AT X = 6.62000E-02  Y = 6.62000E-02  Z = 0.00000     IS UNIT NUMBER     41

  2 CYLINDER         6   1  RADIUS = 0.95250     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                         -----  UNIT   416  -----

TRIGA FUEL ELEMENTS IN AL TUBE, TOP LEFT

  1 CYLINDER         3   1  RADIUS = 0.80518     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

    HOLE NUMBER     17       AT X =-6.62000E-02  Y = 6.62000E-02  Z = 0.00000     IS UNIT NUMBER     41

  2 CYLINDER         6   1  RADIUS = 0.95250     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
```

```
                                   TRIGA - PREF. FLOOD CANISTER

                  MEDIA BIAS       GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION             NUM   ID

                                               -----   UNIT   417   -----

TRIGA FUEL ELEMENTS IN AL TUBE, BOTTOM RIGHT

  1 CYLINDER         3   1  RADIUS = 0.80518     +Z =  43.480      -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

    HOLE NUMBER     18        AT X = 6.62000E-02  Y =-6.62000E-02  Z = 0.00000      IS UNIT NUMBER     41

  2 CYLINDER         6   1  RADIUS = 0.95250     +Z =  43.480      -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                               -----   UNIT   418   -----

TRIGA FUEL ELEMENTS IN AL TUBE, BOTTOM LEFT

  1 CYLINDER         3   1  RADIUS = 0.80518     +Z =  43.480      -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

    HOLE NUMBER     19        AT X =-6.62000E-02  Y =-6.62000E-02  Z = 0.00000      IS UNIT NUMBER     41

  2 CYLINDER         6   1  RADIUS = 0.95250     +Z =  43.480      -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
```

```
                               TRIGA - PREF. FLOOD CANISTER

              MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION         NUM   ID

                                        -----   UNIT   421   -----

AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, BOTTOM OPENING
  1 CUBOID          3  1     +X =  4.1529    -X = -4.1529     +Y =  4.1529     -Y = -4.1529     +Z =  43.480     -Z = -33.040
    HOLE NUMBER     36     AT X = -2.8576     Y = -2.8576      Z = 0.00000     IS UNIT NUMBER    415
    HOLE NUMBER     37     AT X =-0.95250     Y = -2.8576      Z = 0.00000     IS UNIT NUMBER    413
    HOLE NUMBER     38     AT X = 0.95250     Y = -2.8576      Z = 0.00000     IS UNIT NUMBER    413
    HOLE NUMBER     39     AT X =  2.8576     Y = -2.8576      Z = 0.00000     IS UNIT NUMBER    416
    HOLE NUMBER     40     AT X = -2.8576     Y =-0.95250      Z = 0.00000     IS UNIT NUMBER    411
    HOLE NUMBER     41     AT X =-0.95250     Y =-0.95250      Z = 0.00000     IS UNIT NUMBER    415
    HOLE NUMBER     42     AT X = 0.95250     Y =-0.95250      Z = 0.00000     IS UNIT NUMBER    416
    HOLE NUMBER     43     AT X =  2.8576     Y =-0.95250      Z = 0.00000     IS UNIT NUMBER    412
    HOLE NUMBER     44     AT X = -2.8576     Y = 0.95250      Z = 0.00000     IS UNIT NUMBER    411
    HOLE NUMBER     45     AT X =-0.95250     Y = 0.95250      Z = 0.00000     IS UNIT NUMBER    417
    HOLE NUMBER     46     AT X = 0.95250     Y = 0.95250      Z = 0.00000     IS UNIT NUMBER    418
    HOLE NUMBER     47     AT X =  2.8576     Y = 0.95250      Z = 0.00000     IS UNIT NUMBER    412
    HOLE NUMBER     48     AT X = -2.8576     Y =  2.8576      Z = 0.00000     IS UNIT NUMBER    417
    HOLE NUMBER     49     AT X =-0.95250     Y =  2.8576      Z = 0.00000     IS UNIT NUMBER    414
    HOLE NUMBER     50     AT X = 0.95250     Y =  2.8576      Z = 0.00000     IS UNIT NUMBER    414
    HOLE NUMBER     51     AT X =  2.8576     Y =  2.8576      Z = 0.00000     IS UNIT NUMBER    418
  2 CUBOID          3  1     +X =  4.1529    -X = -4.1529     +Y =  4.1529     -Y = -4.1529     +Z =  43.480     -Z = -33.040
```

```
                                   TRIGA - PREF. FLOOD CANISTER

               MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION          NUM   ID

                                               -----   UNIT   422   -----

AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, TOP OPENING

  1 CUBOID          3  1     +X =  4.1529    -X = -4.1529    +Y =  4.1529    -Y = -4.1529    +Z =  43.480    -Z = -33.040
    HOLE NUMBER     52       AT X = -2.8576    Y = -2.8576     Z = 0.00000    IS UNIT NUMBER   415
    HOLE NUMBER     53       AT X =-0.95250    Y = -2.8576     Z = 0.00000    IS UNIT NUMBER   413
    HOLE NUMBER     54       AT X = 0.95250    Y = -2.8576     Z = 0.00000    IS UNIT NUMBER   413
    HOLE NUMBER     55       AT X =  2.8576    Y = -2.8576     Z = 0.00000    IS UNIT NUMBER   416
    HOLE NUMBER     56       AT X = -2.8576    Y =-0.95250     Z = 0.00000    IS UNIT NUMBER   411
    HOLE NUMBER     57       AT X =-0.95250    Y =-0.95250     Z = 0.00000    IS UNIT NUMBER   415
    HOLE NUMBER     58       AT X = 0.95250    Y =-0.95250     Z = 0.00000    IS UNIT NUMBER   416
    HOLE NUMBER     59       AT X =  2.8576    Y =-0.95250     Z = 0.00000    IS UNIT NUMBER   412
    HOLE NUMBER     60       AT X = -2.8576    Y = 0.95250     Z = 0.00000    IS UNIT NUMBER   411
    HOLE NUMBER     61       AT X =-0.95250    Y = 0.95250     Z = 0.00000    IS UNIT NUMBER   417
    HOLE NUMBER     62       AT X = 0.95250    Y = 0.95250     Z = 0.00000    IS UNIT NUMBER   418
    HOLE NUMBER     63       AT X =  2.8576    Y = 0.95250     Z = 0.00000    IS UNIT NUMBER   412
    HOLE NUMBER     64       AT X = -2.8576    Y =  2.8576     Z = 0.00000    IS UNIT NUMBER   417
    HOLE NUMBER     65       AT X =-0.95250    Y =  2.8576     Z = 0.00000    IS UNIT NUMBER   414
    HOLE NUMBER     66       AT X = 0.95250    Y =  2.8576     Z = 0.00000    IS UNIT NUMBER   414
    HOLE NUMBER     67       AT X =  2.8576    Y =  2.8576     Z = 0.00000    IS UNIT NUMBER   418
  2 CUBOID          3  1     +X =  4.1529    -X = -4.1529    +Y =  4.1529    -Y = -4.1529    +Z =  43.480    -Z = -33.040
```

```
                                    TRIGA - PREF. FLOOD CANISTER

                 MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                                  -----   UNIT   423   -----

AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, BOTTOM LEFT OPENING

  1 CUBOID           3   1     +X =   4.1529    -X = -4.1529    +Y =   4.1529    -Y = -4.1529    +Z =  43.480    -Z = -33.040
    HOLE NUMBER     68      AT X = -2.8576     Y = -2.8576     Z = 0.00000     IS UNIT NUMBER    415
    HOLE NUMBER     69      AT X =-0.95250     Y = -2.8576     Z = 0.00000     IS UNIT NUMBER    413
    HOLE NUMBER     70      AT X = 0.95250     Y = -2.8576     Z = 0.00000     IS UNIT NUMBER    413
    HOLE NUMBER     71      AT X =  2.8576     Y = -2.8576     Z = 0.00000     IS UNIT NUMBER    416
    HOLE NUMBER     72      AT X = -2.8576     Y =-0.95250     Z = 0.00000     IS UNIT NUMBER    411
    HOLE NUMBER     73      AT X =-0.95250     Y =-0.95250     Z = 0.00000     IS UNIT NUMBER    415
    HOLE NUMBER     74      AT X = 0.95250     Y =-0.95250     Z = 0.00000     IS UNIT NUMBER    416
    HOLE NUMBER     75      AT X =  2.8576     Y =-0.95250     Z = 0.00000     IS UNIT NUMBER    412
    HOLE NUMBER     76      AT X = -2.8576     Y = 0.95250     Z = 0.00000     IS UNIT NUMBER    411
    HOLE NUMBER     77      AT X =-0.95250     Y = 0.95250     Z = 0.00000     IS UNIT NUMBER    417
    HOLE NUMBER     78      AT X = 0.95250     Y = 0.95250     Z = 0.00000     IS UNIT NUMBER    418
    HOLE NUMBER     79      AT X =  2.8576     Y = 0.95250     Z = 0.00000     IS UNIT NUMBER    412
    HOLE NUMBER     80      AT X = -2.8576     Y =  2.8576     Z = 0.00000     IS UNIT NUMBER    417
    HOLE NUMBER     81      AT X =-0.95250     Y =  2.8576     Z = 0.00000     IS UNIT NUMBER    414
    HOLE NUMBER     82      AT X = 0.95250     Y =  2.8576     Z = 0.00000     IS UNIT NUMBER    414
    HOLE NUMBER     83      AT X =  2.8576     Y =  2.8576     Z = 0.00000     IS UNIT NUMBER    418
  2 CUBOID           3   1     +X =   4.1529    -X = -4.1529    +Y =   4.1529    -Y = -4.1529    +Z =  43.480    -Z = -33.040
```

```
                              TRIGA - PREF. FLOOD CANISTER

              MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION         NUM   ID

                                         -----  UNIT   424   -----

AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, TOP LEFT OPENING

 1 CUBOID          3  1     +X =  4.1529   -X = -4.1529   +Y =  4.1529   -Y = -4.1529   +Z =  43.480   -Z = -33.040
   HOLE NUMBER    84      AT X = -2.8576    Y = -2.8576    Z = 0.00000   IS UNIT NUMBER   415
   HOLE NUMBER    85      AT X =-0.95250    Y = -2.8576    Z = 0.00000   IS UNIT NUMBER   413
   HOLE NUMBER    86      AT X = 0.95250    Y = -2.8576    Z = 0.00000   IS UNIT NUMBER   413
   HOLE NUMBER    87      AT X =  2.8576    Y = -2.8576    Z = 0.00000   IS UNIT NUMBER   416
   HOLE NUMBER    88      AT X = -2.8576    Y =-0.95250    Z = 0.00000   IS UNIT NUMBER   411
   HOLE NUMBER    89      AT X =-0.95250    Y =-0.95250    Z = 0.00000   IS UNIT NUMBER   415
   HOLE NUMBER    90      AT X = 0.95250    Y =-0.95250    Z = 0.00000   IS UNIT NUMBER   416
   HOLE NUMBER    91      AT X =  2.8576    Y =-0.95250    Z = 0.00000   IS UNIT NUMBER   412
   HOLE NUMBER    92      AT X = -2.8576    Y = 0.95250    Z = 0.00000   IS UNIT NUMBER   411
   HOLE NUMBER    93      AT X =-0.95250    Y = 0.95250    Z = 0.00000   IS UNIT NUMBER   417
   HOLE NUMBER    94      AT X = 0.95250    Y = 0.95250    Z = 0.00000   IS UNIT NUMBER   418
   HOLE NUMBER    95      AT X =  2.8576    Y = 0.95250    Z = 0.00000   IS UNIT NUMBER   412
   HOLE NUMBER    96      AT X = -2.8576    Y =  2.8576    Z = 0.00000   IS UNIT NUMBER   417
   HOLE NUMBER    97      AT X =-0.95250    Y =  2.8576    Z = 0.00000   IS UNIT NUMBER   414
   HOLE NUMBER    98      AT X = 0.95250    Y =  2.8576    Z = 0.00000   IS UNIT NUMBER   414
   HOLE NUMBER    99      AT X =  2.8576    Y =  2.8576    Z = 0.00000   IS UNIT NUMBER   418
 2 CUBOID          3  1     +X =  4.1529   -X = -4.1529   +Y =  4.1529   -Y = -4.1529   +Z =  43.480   -Z = -33.040
```

```
                                  TRIGA - PREF. FLOOD CANISTER

                MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID

                                            -----   UNIT   425   -----

AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, BOTTOM RIGHT OPENING

  1 CUBOID           3  1      +X =  4.1529    -X = -4.1529    +Y =  4.1529    -Y = -4.1529    +Z =  43.480    -Z = -33.040
    HOLE NUMBER    100      AT X = -2.8576     Y = -2.8576     Z = 0.00000     IS UNIT NUMBER    415
    HOLE NUMBER    101      AT X =-0.95250     Y = -2.8576     Z = 0.00000     IS UNIT NUMBER    413
    HOLE NUMBER    102      AT X = 0.95250     Y = -2.8576     Z = 0.00000     IS UNIT NUMBER    413
    HOLE NUMBER    103      AT X =  2.8576     Y = -2.8576     Z = 0.00000     IS UNIT NUMBER    416
    HOLE NUMBER    104      AT X = -2.8576     Y =-0.95250     Z = 0.00000     IS UNIT NUMBER    411
    HOLE NUMBER    105      AT X =-0.95250     Y =-0.95250     Z = 0.00000     IS UNIT NUMBER    415
    HOLE NUMBER    106      AT X = 0.95250     Y =-0.95250     Z = 0.00000     IS UNIT NUMBER    416
    HOLE NUMBER    107      AT X =  2.8576     Y =-0.95250     Z = 0.00000     IS UNIT NUMBER    412
    HOLE NUMBER    108      AT X = -2.8576     Y = 0.95250     Z = 0.00000     IS UNIT NUMBER    411
    HOLE NUMBER    109      AT X =-0.95250     Y = 0.95250     Z = 0.00000     IS UNIT NUMBER    417
    HOLE NUMBER    110      AT X = 0.95250     Y = 0.95250     Z = 0.00000     IS UNIT NUMBER    418
    HOLE NUMBER    111      AT X =  2.8576     Y = 0.95250     Z = 0.00000     IS UNIT NUMBER    412
    HOLE NUMBER    112      AT X = -2.8576     Y =  2.8576     Z = 0.00000     IS UNIT NUMBER    417
    HOLE NUMBER    113      AT X =-0.95250     Y =  2.8576     Z = 0.00000     IS UNIT NUMBER    414
    HOLE NUMBER    114      AT X = 0.95250     Y =  2.8576     Z = 0.00000     IS UNIT NUMBER    414
    HOLE NUMBER    115      AT X =  2.8576     Y =  2.8576     Z = 0.00000     IS UNIT NUMBER    418
  2 CUBOID           3  1      +X =  4.1529    -X = -4.1529    +Y =  4.1529    -Y = -4.1529    +Z =  43.480    -Z = -33.040
```

```
                              TRIGA - PREF. FLOOD CANISTER

              MEDIA BIAS    GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION         NUM   ID

                                            -----   UNIT   426   -----

AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, TOP RIGHT OPENING
  1 CUBOID           3  1     +X =  4.1529    -X = -4.1529    +Y =  4.1529    -Y = -4.1529    +Z =  43.480    -Z = -33.040
    HOLE NUMBER    116      AT X = -2.8576     Y = -2.8576     Z = 0.00000    IS UNIT NUMBER   415
    HOLE NUMBER    117      AT X =-0.95250     Y = -2.8576     Z = 0.00000    IS UNIT NUMBER   413
    HOLE NUMBER    118      AT X = 0.95250     Y = -2.8576     Z = 0.00000    IS UNIT NUMBER   413
    HOLE NUMBER    119      AT X =  2.8576     Y = -2.8576     Z = 0.00000    IS UNIT NUMBER   416
    HOLE NUMBER    120      AT X = -2.8576     Y =-0.95250     Z = 0.00000    IS UNIT NUMBER   411
    HOLE NUMBER    121      AT X =-0.95250     Y =-0.95250     Z = 0.00000    IS UNIT NUMBER   415
    HOLE NUMBER    122      AT X = 0.95250     Y =-0.95250     Z = 0.00000    IS UNIT NUMBER   416
    HOLE NUMBER    123      AT X =  2.8576     Y =-0.95250     Z = 0.00000    IS UNIT NUMBER   412
    HOLE NUMBER    124      AT X = -2.8576     Y = 0.95250     Z = 0.00000    IS UNIT NUMBER   411
    HOLE NUMBER    125      AT X =-0.95250     Y = 0.95250     Z = 0.00000    IS UNIT NUMBER   417
    HOLE NUMBER    126      AT X = 0.95250     Y = 0.95250     Z = 0.00000    IS UNIT NUMBER   418
    HOLE NUMBER    127      AT X =  2.8576     Y = 0.95250     Z = 0.00000    IS UNIT NUMBER   412
    HOLE NUMBER    128      AT X = -2.8576     Y =  2.8576     Z = 0.00000    IS UNIT NUMBER   417
    HOLE NUMBER    129      AT X =-0.95250     Y =  2.8576     Z = 0.00000    IS UNIT NUMBER   414
    HOLE NUMBER    130      AT X = 0.95250     Y =  2.8576     Z = 0.00000    IS UNIT NUMBER   414
    HOLE NUMBER    131      AT X =  2.8576     Y =  2.8576     Z = 0.00000    IS UNIT NUMBER   418
  2 CUBOID           3  1     +X =  4.1529    -X = -4.1529    +Y =  4.1529    -Y = -4.1529    +Z =  43.480    -Z = -33.040

                                            -----   UNIT   430   -----

FUEL INSERT IN, CENTER OPENING
  1 CUBOID           3  1     +X =  4.2672    -X = -4.2672    +Y =  4.2672    -Y = -4.2672    +Z =  43.480    -Z = -33.040

                                            -----   UNIT   431   -----

FUEL INSERT IN, BOTTOM OPENING
  1 CUBOID           3  1     +X =  4.2672    -X = -4.2672    +Y =  4.2672    -Y = -4.2672    +Z =  43.480    -Z = -33.040
    HOLE NUMBER    132      AT X = 0.00000     Y =-0.11430     Z = 0.00000    IS UNIT NUMBER   421
```

```
                                        TRIGA - PREF. FLOOD CANISTER

                  MEDIA BIAS       GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION             NUM   ID

                                                    -----  UNIT   432   -----

FUEL INSERT IN, TOP OPENING

  1 CUBOID            3   1        +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  43.480     -Z = -33.040

    HOLE NUMBER    133        AT X = 0.00000      Y = 0.11430      Z = 0.00000      IS UNIT NUMBER    422

                                                    -----  UNIT   433   -----

FUEL INSERT IN, BOTTOM LEFT OPENING

  1 CUBOID            3   1        +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  43.480     -Z = -33.040

    HOLE NUMBER    134        AT X =-0.11430      Y =-0.11430      Z = 0.00000      IS UNIT NUMBER    423

                                                    -----  UNIT   434   -----

FUEL INSERT IN, TOP LEFT OPENING

  1 CUBOID            3   1        +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  43.480     -Z = -33.040

    HOLE NUMBER    135        AT X =-0.11430      Y = 0.11430      Z = 0.00000      IS UNIT NUMBER    424

                                                    -----  UNIT   435   -----

FUEL INSERT IN, BOTOM RIGHT OPENING

  1 CUBOID            3   1        +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  43.480     -Z = -33.040

    HOLE NUMBER    136        AT X = 0.11430      Y =-0.11430      Z = 0.00000      IS UNIT NUMBER    425

                                                    -----  UNIT   436   -----

FUEL INSERT IN, TOP RIGHT OPENING

  1 CUBOID            3   1        +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  43.480     -Z = -33.040

    HOLE NUMBER    137        AT X = 0.11430      Y = 0.11430      Z = 0.00000      IS UNIT NUMBER    426

                                        -----  UNIT   440  EXTERNAL TO LATTICE 41   -----

CENTER COLUMN OF THREE OPENINGS

  1 ARRAY NUMBER     41                +X =  4.2672     -X = -4.2672     +Y =  13.513     -Y = -13.513     +Z =  43.480     -Z = -33.040

  2 CUBOID            5   1        +X =  4.9784     -X = -4.9784     +Y =  14.224     -Y = -14.224     +Z =  43.480     -Z = -33.040
```

```
                                          TRIGA - PREF. FLOOD CANISTER

                  MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION             NUM   ID

                                         -----  UNIT   441  EXTERNAL TO LATTICE 42   -----

LEFT OUTSIDE COLUMN OF TWO OPENINGS

  1 ARRAY NUMBER    42          +X =  4.2672     -X = -4.2672     +Y =  8.8392     -Y = -8.8392     +Z =  43.480     -Z = -33.040

  2 CUBOID           5  1       +X =  4.2672     -X = -4.6080     +Y =  9.1800     -Y = -9.1800     +Z =  43.480     -Z = -33.040

                                         -----  UNIT   442  EXTERNAL TO LATTICE 43   -----

RIGHT OUTSIDE COLUMN OF TWO OPENINGS

  1 ARRAY NUMBER    43          +X =  4.2672     -X = -4.2672     +Y =  8.8392     -Y = -8.8392     +Z =  43.480     -Z = -33.040

  2 CUBOID           5  1       +X =  4.6080     -X = -4.2672     +Y =  9.1800     -Y = -9.1800     +Z =  43.480     -Z = -33.040

                                                     -----  UNIT   450   -----

96 TRIGA FUEL ELEMENTS IN EACH LWT BASKET

  1 CYLINDER         3  1  RADIUS =  17.150     +Z =  43.485     -Z = -33.045     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

    HOLE NUMBER    138        AT X = 0.00000     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER    440

    HOLE NUMBER    139        AT X = -9.2457     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER    441

    HOLE NUMBER    140        AT X =  9.2457     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER    442

  2 CYLINDER         5  1  RADIUS =  18.910     +Z =  43.485     -Z = -33.045     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CYLINDER         7  1  RADIUS =  33.465     +Z =  43.485     -Z = -33.045     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  4 CYLINDER         5  1  RADIUS =  36.519     +Z =  43.485     -Z = -33.045     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  5 CYLINDER         8  1  RADIUS =  49.223     +Z =  43.485     -Z = -33.045     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  6 CYLINDER         5  1  RADIUS =  49.822     +Z =  43.485     -Z = -33.045     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  7 CUBOID           9  1       +X =  49.822     -X = -49.822     +Y =  49.822     -Y = -49.822     +Z =  43.485     -Z = -33.045
```

```
                    TRIGA - PREF. FLOOD CANISTER

              -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   1        -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   5  BOTTOM TO TOP

 11

  8

 16

  8

 10

              -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   2        -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   3  BOTTOM TO TOP

 12

  6

 13

              -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   3        -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   3  BOTTOM TO TOP

 14

  6

 15
```

```
                    TRIGA - PREF. FLOOD CANISTER

          ------- UNIT ORIENTATION DESCRIPTION FOR ARRAY  20          -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

  81
Z LAYER   2, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

  30
Z LAYER   3, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

 450
Z LAYER   4, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

 450
Z LAYER   5, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

 450
Z LAYER   6, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

  30
Z LAYER   7, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

  80

          ------- UNIT ORIENTATION DESCRIPTION FOR ARRAY  41          -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   5  BOTTOM TO TOP

 431

  45

 430

  45

 432
```

```
                    TRIGA - PREF. FLOOD CANISTER

              ------- UNIT ORIENTATION DESCRIPTION FOR ARRAY  42         -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   3 BOTTOM TO TOP

 435

  46

 436

              ------- UNIT ORIENTATION DESCRIPTION FOR ARRAY  43         -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   3 BOTTOM TO TOP

 433

  46

 434
```

```
                         TRIGA - PREF. FLOOD CANISTER
                        VOLUMES FOR THOSE UNITS UTILIZED IN  THIS PROBLEM


                                TOTAL MIXTURE VOLUMES
                           MIXTURE         TOTAL VOLUME             MASS(G)
                              1        2.34271E+04 CM**3        1.84181E+05
                              2        2.72718E+03 CM**3        2.19061E+04
                              3        2.30497E+05 CM**3        2.30076E-15
                              4        8.86453E+03 CM**3        2.48789E+04
                              5        6.81739E+05 CM**3        5.39938E+06
                              6        1.79275E+04 CM**3        4.84400E+04
                              7        9.67892E+05 CM**3        1.09798E+07
                              8        1.35931E+06 CM**3        1.35683E-14
                              9        1.16111E+06 CM**3        1.15899E-14
                             10        3.60792E+04 CM**3        7.62098E+04
                             11        3.00293E+00 CM**3        2.99744E+00

      *************************************************************************************************
      ***                                                                                           ***
      ***                                   BIASING INFORMATION                                     ***
      ***                                                                                           ***
      ***     A DEFAULT WEIGHT OF    0.500 WILL BE USED FOR ALL BIAS ID'S.                          ***
      ***                                                                                           ***
      *************************************************************************************************

                    ........    0 IO'S WERE USED IN KENO-V BEFORE TRACKING        ........

                    ........  0.00733 MINUTES WERE USED PROCESSING DATA.         ........

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 1.32543E-02

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED WITH A FLAT DISTRIBUTION IN A CUBOID DEFINED BY:
                   +X= 1.70000E+01  -X=-1.70000E+01  +Y= 1.70000E+01  -Y=-1.70000E+01  +Z= 2.00000E+02  -Z=-2.00000E+02
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

-.00233 MINUTES WERE REQUIRED FOR STARTING.   TOTAL ELAPSED TIME IS 0.01067 MINUTES.
```

TRIGA - PREF. FLOOD CANISTER

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	908 INDEPENDENT	FISSION POINTS WERE	GENERATED	
1	8.07235E-01	1.38333E-02	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	937 INDEPENDENT	FISSION POINTS WERE	GENERATED	
2	8.67507E-01	1.83333E-02	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	914 INDEPENDENT	FISSION POINTS WERE	GENERATED	
3	8.39890E-01	2.30000E-02	8.39890E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	8.46735E-01	2.75000E-02	8.43313E-01	3.42226E-03	0.00000E+00	0.00000E+00
5	8.51662E-01	3.21667E-02	8.46096E-01	3.41309E-03	0.00000E+00	0.00000E+00
6	8.36646E-01	3.66667E-02	8.44233E-01	3.04850E-03	0.00000E+00	0.00000E+00
7	8.34027E-01	4.13333E-02	8.42192E-01	3.12132E-03	0.00000E+00	0.00000E+00
8	8.40856E-01	4.58333E-02	8.41969E-01	2.55825E-03	0.00000E+00	0.00000E+00
9	8.61142E-01	5.03333E-02	8.44708E-01	3.48951E-03	0.00000E+00	0.00000E+00
10	8.85011E-01	5.50000E-02	8.49746E-01	5.87468E-03	0.00000E+00	0.00000E+00
11	8.82924E-01	5.86667E-02	8.53433E-01	6.35866E-03	0.00000E+00	0.00000E+00
12	8.41548E-01	6.31667E-02	8.52244E-01	5.81020E-03	0.00000E+00	0.00000E+00
13	8.04080E-01	6.86667E-02	8.47866E-01	6.84048E-03	0.00000E+00	0.00000E+00
14	8.09894E-01	7.33333E-02	8.44701E-01	7.00043E-03	0.00000E+00	0.00000E+00
15	8.95721E-01	7.78333E-02	8.48626E-01	7.54117E-03	0.00000E+00	0.00000E+00
16	8.65492E-01	8.15000E-02	8.49831E-01	7.08493E-03	0.00000E+00	0.00000E+00
17	8.45510E-01	8.70000E-02	8.49543E-01	6.60200E-03	0.00000E+00	0.00000E+00
18	8.28225E-01	9.16667E-02	8.48210E-01	6.31770E-03	0.00000E+00	0.00000E+00
19	8.75386E-01	9.61667E-02	8.49809E-01	6.14598E-03	0.00000E+00	0.00000E+00
20	8.53864E-01	1.00833E-01	8.50034E-01	5.79886E-03	0.00000E+00	0.00000E+00
21	8.80788E-01	1.05333E-01	8.51653E-01	5.71901E-03	0.00000E+00	0.00000E+00
22	8.32813E-01	1.09833E-01	8.50711E-01	5.50670E-03	0.00000E+00	0.00000E+00
23	8.76072E-01	1.14500E-01	8.51918E-01	5.37533E-03	0.00000E+00	0.00000E+00
24	8.22029E-01	1.19000E-01	8.50560E-01	5.30220E-03	0.00000E+00	0.00000E+00
25	8.58738E-01	1.23667E-01	8.50915E-01	5.07889E-03	0.00000E+00	0.00000E+00
26	8.24917E-01	1.28167E-01	8.49832E-01	4.98187E-03	0.00000E+00	0.00000E+00
27	8.16580E-01	1.32833E-01	8.48502E-01	4.96009E-03	0.00000E+00	0.00000E+00
28	8.62203E-01	1.37333E-01	8.49029E-01	4.79455E-03	0.00000E+00	0.00000E+00
29	8.42564E-01	1.42000E-01	8.48789E-01	4.61977E-03	0.00000E+00	0.00000E+00
30	8.65056E-01	1.46500E-01	8.49370E-01	4.48947E-03	0.00000E+00	0.00000E+00
31	8.34550E-01	1.51167E-01	8.48859E-01	4.36193E-03	0.00000E+00	0.00000E+00
32	8.32288E-01	1.55667E-01	8.48307E-01	4.25008E-03	0.00000E+00	0.00000E+00
33	8.36287E-01	1.60333E-01	8.47919E-01	4.12894E-03	0.00000E+00	0.00000E+00
34	8.39791E-01	1.64833E-01	8.47665E-01	4.00589E-03	0.00000E+00	0.00000E+00
35	8.46562E-01	1.69500E-01	8.47632E-01	3.88274E-03	0.00000E+00	0.00000E+00
36	8.51358E-01	1.74000E-01	8.47741E-01	3.76841E-03	0.00000E+00	0.00000E+00
37	8.26842E-01	1.78500E-01	8.47144E-01	3.70756E-03	0.00000E+00	0.00000E+00
38	8.42660E-01	1.83167E-01	8.47020E-01	3.60525E-03	0.00000E+00	0.00000E+00
39	8.48956E-01	1.87667E-01	8.47072E-01	3.50685E-03	0.00000E+00	0.00000E+00
40	8.30549E-01	1.92333E-01	8.46637E-01	3.44090E-03	0.00000E+00	0.00000E+00
41	8.23712E-01	1.96833E-01	8.46049E-01	3.40267E-03	0.00000E+00	0.00000E+00
42	8.43639E-01	2.01500E-01	8.45989E-01	3.31706E-03	0.00000E+00	0.00000E+00
43	8.15275E-01	2.06000E-01	8.45240E-01	3.32074E-03	0.00000E+00	0.00000E+00
44	8.30561E-01	2.11500E-01	8.44891E-01	3.25951E-03	0.00000E+00	0.00000E+00
45	8.43280E-01	2.16167E-01	8.44853E-01	3.18302E-03	0.00000E+00	0.00000E+00
46	8.88356E-01	2.20667E-01	8.45842E-01	3.26323E-03	0.00000E+00	0.00000E+00
47	8.75127E-01	2.25333E-01	8.46493E-01	3.25560E-03	0.00000E+00	0.00000E+00
48	8.70464E-01	2.29833E-01	8.47014E-01	3.22640E-03	0.00000E+00	0.00000E+00
49	9.04136E-01	2.34333E-01	8.48229E-01	3.38287E-03	0.00000E+00	0.00000E+00
50	8.22100E-01	2.39000E-01	8.47685E-01	3.35609E-03	0.00000E+00	0.00000E+00
51	8.68152E-01	2.43500E-01	8.48102E-01	3.31332E-03	0.00000E+00	0.00000E+00
52	8.91131E-01	2.47167E-01	8.48963E-01	3.35850E-03	0.00000E+00	0.00000E+00
53	8.33321E-01	2.52667E-01	8.48656E-01	3.30624E-03	0.00000E+00	0.00000E+00
54	8.40383E-01	2.57333E-01	8.48497E-01	3.24594E-03	0.00000E+00	0.00000E+00
55	8.83680E-01	2.61833E-01	8.49161E-01	3.25257E-03	0.00000E+00	0.00000E+00
56	8.48595E-01	2.66500E-01	8.49151E-01	3.19178E-03	0.00000E+00	0.00000E+00
57	8.57729E-01	2.71000E-01	8.49306E-01	3.13709E-03	0.00000E+00	0.00000E+00
58	8.16152E-01	2.75667E-01	8.48714E-01	3.13694E-03	0.00000E+00	0.00000E+00
59	8.44507E-01	2.79333E-01	8.48641E-01	3.08230E-03	0.00000E+00	0.00000E+00
60	8.69826E-01	2.84833E-01	8.49006E-01	3.05064E-03	0.00000E+00	0.00000E+00
.						
.						
.						
.						
.						
.						
347	8.53195E-01	1.61767E+00	8.48238E-01	1.16308E-03	0.00000E+00	0.00000E+00
348	8.41276E-01	1.62217E+00	8.48218E-01	1.15989E-03	0.00000E+00	0.00000E+00
349	8.61070E-01	1.62683E+00	8.48255E-01	1.15713E-03	0.00000E+00	0.00000E+00
350	8.56195E-01	1.63050E+00	8.48278E-01	1.15403E-03	0.00000E+00	0.00000E+00
351	8.52946E-01	1.63500E+00	8.48291E-01	1.15080E-03	0.00000E+00	0.00000E+00
352	8.67002E-01	1.63967E+00	8.48345E-01	1.14875E-03	0.00000E+00	0.00000E+00
353	8.44530E-01	1.64417E+00	8.48334E-01	1.14552E-03	0.00000E+00	0.00000E+00
354	8.46283E-01	1.64967E+00	8.48328E-01	1.14228E-03	0.00000E+00	0.00000E+00
355	8.43665E-01	1.65417E+00	8.48315E-01	1.13911E-03	0.00000E+00	0.00000E+00
356	8.65090E-01	1.65883E+00	8.48362E-01	1.13688E-03	0.00000E+00	0.00000E+00
357	8.67324E-01	1.66333E+00	8.48416E-01	1.13493E-03	0.00000E+00	0.00000E+00
358	8.36856E-01	1.66800E+00	8.48383E-01	1.13220E-03	0.00000E+00	0.00000E+00
359	8.55767E-01	1.67250E+00	8.48404E-01	1.12922E-03	0.00000E+00	0.00000E+00
360	8.15850E-01	1.67717E+00	8.48313E-01	1.12972E-03	0.00000E+00	0.00000E+00
361	8.29116E-01	1.68167E+00	8.48257E-01	1.12798E-03	0.00000E+00	0.00000E+00
362	8.36208E-01	1.68633E+00	8.48222E-01	1.12533E-03	0.00000E+00	0.00000E+00
363	8.40646E-01	1.69083E+00	8.48202E-01	1.12240E-03	0.00000E+00	0.00000E+00
364	8.13041E-01	1.69633E+00	8.48105E-01	1.12350E-03	0.00000E+00	0.00000E+00
365	8.12622E-01	1.70100E+00	8.48008E-01	1.12466E-03	0.00000E+00	0.00000E+00
366	8.81063E-01	1.70467E+00	8.48098E-01	1.12524E-03	0.00000E+00	0.00000E+00
367	8.66031E-01	1.70917E+00	8.48202E-01	1.12696E-03	0.00000E+00	0.00000E+00
368	8.97505E-01	1.71367E+00	8.48337E-01	1.13192E-03	0.00000E+00	0.00000E+00

369	8.26094E-01	1.71833E+00	8.48276E-01	1.13045E-03	0.00000E+00	0.00000E+00
370	8.32546E-01	1.72283E+00	8.48234E-01	1.12819E-03	0.00000E+00	0.00000E+00
371	8.54752E-01	1.72750E+00	8.48251E-01	1.12527E-03	0.00000E+00	0.00000E+00
372	8.49933E-01	1.73200E+00	8.48256E-01	1.12223E-03	0.00000E+00	0.00000E+00
373	8.72334E-01	1.73667E+00	8.48321E-01	1.12108E-03	0.00000E+00	0.00000E+00
374	8.29218E-01	1.74117E+00	8.48269E-01	1.11924E-03	0.00000E+00	0.00000E+00
375	8.03281E-01	1.74667E+00	8.48149E-01	1.12273E-03	0.00000E+00	0.00000E+00
376	8.34387E-01	1.75133E+00	8.48112E-01	1.12033E-03	0.00000E+00	0.00000E+00
377	8.40906E-01	1.75583E+00	8.48093E-01	1.11751E-03	0.00000E+00	0.00000E+00
378	8.40624E-01	1.76050E+00	8.48073E-01	1.11471E-03	0.00000E+00	0.00000E+00
379	8.40683E-01	1.76500E+00	8.48053E-01	1.11192E-03	0.00000E+00	0.00000E+00
380	8.59705E-01	1.76950E+00	8.48084E-01	1.10940E-03	0.00000E+00	0.00000E+00
381	8.66334E-01	1.77417E+00	8.48132E-01	1.10752E-03	0.00000E+00	0.00000E+00
382	8.64804E-01	1.77867E+00	8.48176E-01	1.10547E-03	0.00000E+00	0.00000E+00
383	8.34000E-01	1.78333E+00	8.48139E-01	1.10319E-03	0.00000E+00	0.00000E+00
384	8.87988E-01	1.78783E+00	8.48243E-01	1.10524E-03	0.00000E+00	0.00000E+00
385	8.51798E-01	1.79250E+00	8.48253E-01	1.10239E-03	0.00000E+00	0.00000E+00
386	8.85293E-01	1.79700E+00	8.48349E-01	1.10373E-03	0.00000E+00	0.00000E+00
387	8.45941E-01	1.80167E+00	8.48343E-01	1.10088E-03	0.00000E+00	0.00000E+00
388	8.67844E-01	1.80617E+00	8.48393E-01	1.09919E-03	0.00000E+00	0.00000E+00
389	8.40807E-01	1.81083E+00	8.48374E-01	1.09652E-03	0.00000E+00	0.00000E+00
390	8.51910E-01	1.81533E+00	8.48383E-01	1.09373E-03	0.00000E+00	0.00000E+00
391	8.57679E-01	1.82000E+00	8.48407E-01	1.09117E-03	0.00000E+00	0.00000E+00
392	8.56160E-01	1.82450E+00	8.48427E-01	1.08855E-03	0.00000E+00	0.00000E+00
393	8.90938E-01	1.82917E+00	8.48535E-01	1.09120E-03	0.00000E+00	0.00000E+00
394	7.97043E-01	1.83367E+00	8.48404E-01	1.09631E-03	0.00000E+00	0.00000E+00
395	8.77414E-01	1.83817E+00	8.48478E-01	1.09600E-03	0.00000E+00	0.00000E+00
396	8.73760E-01	1.84283E+00	8.48542E-01	1.09510E-03	0.00000E+00	0.00000E+00
397	8.81085E-01	1.84733E+00	8.48624E-01	1.09542E-03	0.00000E+00	0.00000E+00
398	8.69752E-01	1.85200E+00	8.48678E-01	1.09396E-03	0.00000E+00	0.00000E+00
399	8.74167E-01	1.85650E+00	8.48742E-01	1.09308E-03	0.00000E+00	0.00000E+00
400	8.40203E-01	1.86117E+00	8.48720E-01	1.09055E-03	0.00000E+00	0.00000E+00
401	8.12706E-01	1.86567E+00	8.48630E-01	1.09155E-03	0.00000E+00	0.00000E+00
402	8.68954E-01	1.87033E+00	8.48681E-01	1.09000E-03	0.00000E+00	0.00000E+00
403	8.54589E-01	1.87483E+00	8.48696E-01	1.08738E-03	0.00000E+00	0.00000E+00

KENO MESSAGE NUMBER K5-123 EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

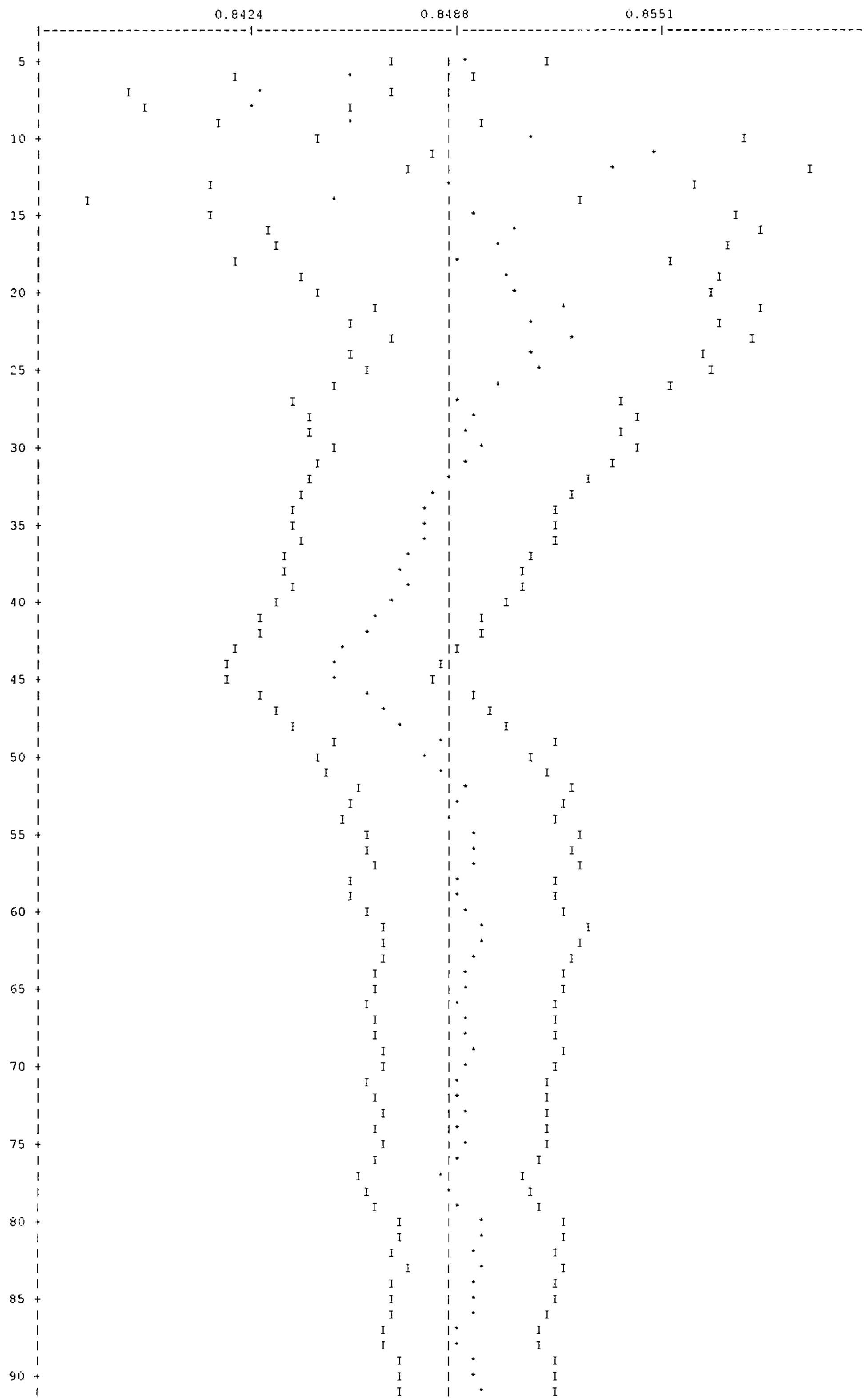
TRIGA - PREF. FLOOD CANISTER

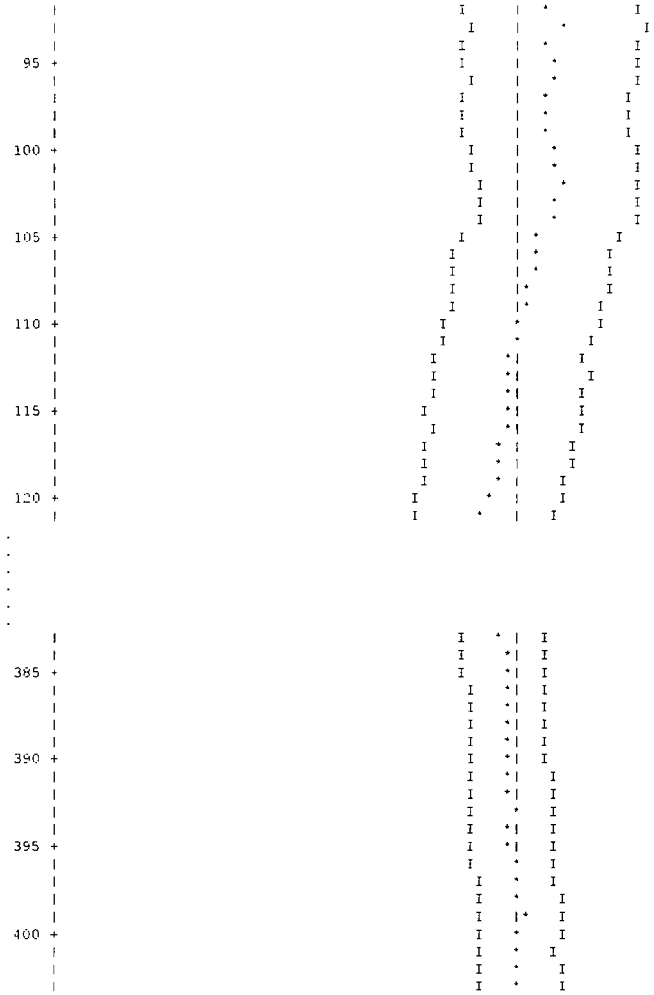
LIFETIME = 6.28682E-05 + OR - 1.56887E-07 GENERATION TIME = 2.75919E-05 + OR - 6.62512E-08
NU BAR = 2.42436E+00 + OR - 2.75467E-05 AVERAGE FISSION GROUP = 2.17509E+01 + OR - 7.91590E-03
ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION = 2.12558E-01 + OR - 1.18250E-03

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.84872	+ OR - 0.00109	0.84763 TO 0.84981	0.84654 TO 0.85090	0.84545 TO 0.85199	400000
4	0.84872	+ OR - 0.00109	0.84763 TO 0.84982	0.84654 TO 0.85091	0.84544 TO 0.85200	399000
5	0.84872	+ OR - 0.00110	0.84762 TO 0.84981	0.84652 TO 0.85091	0.84543 TO 0.85200	398000
6	0.84874	+ OR - 0.00110	0.84764 TO 0.84984	0.84655 TO 0.85094	0.84545 TO 0.85203	397000
7	0.84878	+ OR - 0.00110	0.84768 TO 0.84988	0.84658 TO 0.85098	0.84548 TO 0.85208	396000
8	0.84680	+ OR - 0.00110	0.84770 TO 0.84990	0.84659 TO 0.85100	0.84549 TO 0.85211	395000
9	0.84877	+ OR - 0.00110	0.84766 TO 0.84987	0.84656 TO 0.85098	0.84545 TO 0.85208	394000
10	0.84867	+ OR - 0.00110	0.84757 TO 0.84978	0.84647 TO 0.85088	0.84536 TO 0.85199	393000
11	0.84859	+ OR - 0.00110	0.84748 TO 0.84969	0.84638 TO 0.85079	0.84528 TO 0.85190	392000
12	0.84860	+ OR - 0.00111	0.84750 TO 0.84971	0.84639 TO 0.85082	0.84529 TO 0.85192	391000
17	0.84866	+ OR - 0.00110	0.84756 TO 0.84976	0.84646 TO 0.85087	0.84536 TO 0.85197	386000
22	0.84859	+ OR - 0.00111	0.84748 TO 0.84970	0.84637 TO 0.85081	0.84526 TO 0.85192	381000
27	0.84871	+ OR - 0.00111	0.84759 TO 0.84982	0.84648 TO 0.85094	0.84537 TO 0.85205	376000
32	0.84873	+ OR - 0.00113	0.84760 TO 0.84985	0.84648 TO 0.85098	0.84535 TO 0.85210	371000
37	0.84884	+ OR - 0.00114	0.84771 TO 0.84998	0.84657 TO 0.85112	0.84543 TO 0.85226	366000
42	0.84900	+ OR - 0.00115	0.84784 TO 0.85015	0.84669 TO 0.85130	0.84554 TO 0.85245	361000
47	0.84897	+ OR - 0.00115	0.84782 TO 0.85013	0.84667 TO 0.85128	0.84551 TO 0.85244	356000
. . . . . .						
367	0.85370	+ OR - 0.00398	0.84972 TO 0.85768	0.84574 TO 0.86165	0.84177 TO 0.86563	36000
372	0.85395	+ OR - 0.00425	0.84970 TO 0.85819	0.84545 TO 0.86244	0.84120 TO 0.86669	31000
377	0.85739	+ OR - 0.00437	0.85302 TO 0.86176	0.84865 TO 0.86613	0.84429 TO 0.87050	26000
382	0.85810	+ OR - 0.00528	0.85282 TO 0.86337	0.84754 TO 0.86865	0.84227 TO 0.87393	21000
387	0.85719	+ OR - 0.00622	0.85097 TO 0.86341	0.84475 TO 0.86963	0.83853 TO 0.87584	16000
392	0.85824	+ OR - 0.00897	0.84926 TO 0.86721	0.84029 TO 0.87618	0.83132 TO 0.88516	11000
397	0.85340	+ OR - 0.00961	0.84378 TO 0.86301	0.83417 TO 0.87262	0.82456 TO 0.88223	6000

TRIGA - PREF. FLOOD CANISTER

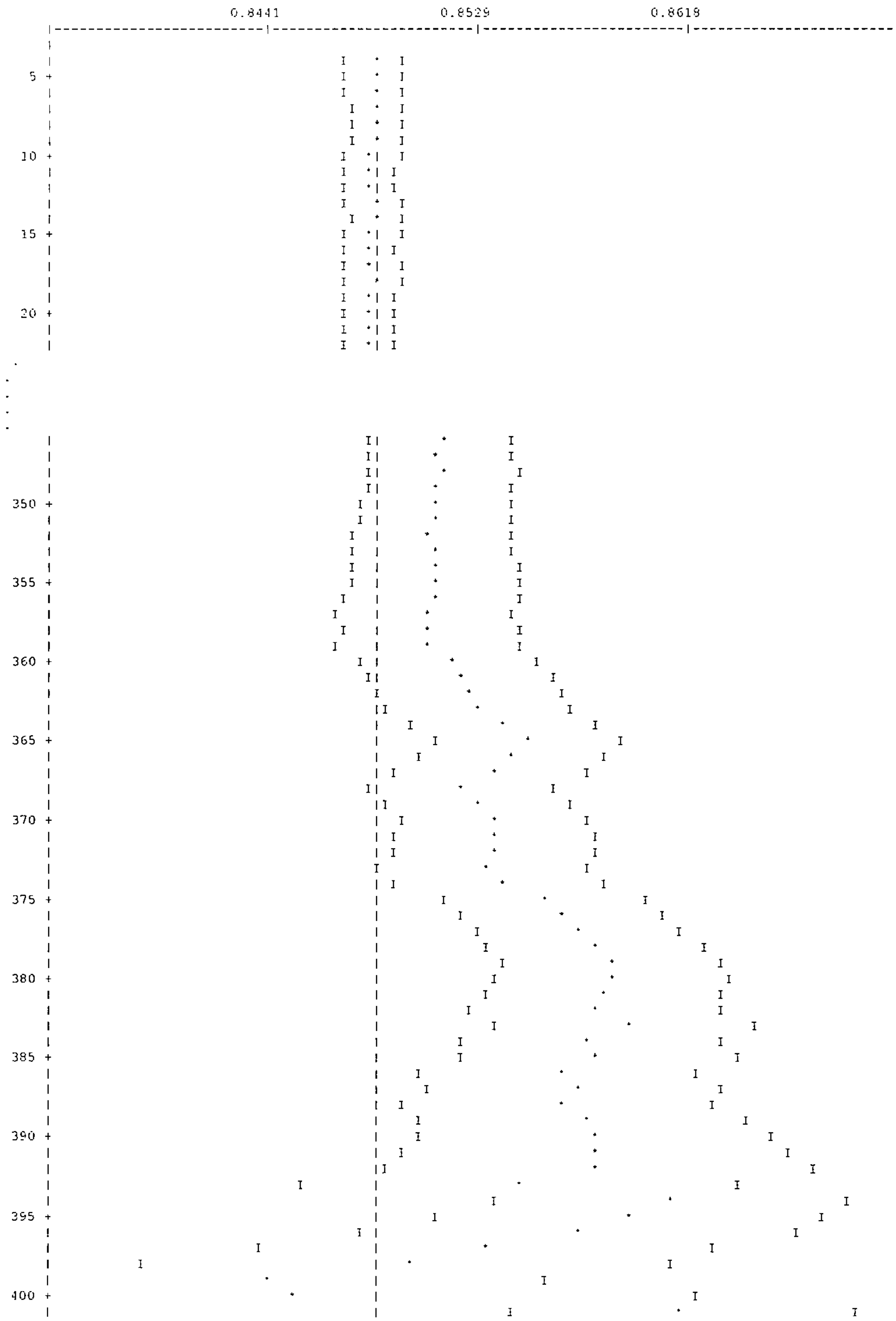
PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.8487 + OR - 0.0011 WHICH OCCURS FOR 403 GENERATIONS RUN.




95
100
105
110
115
120
385
390
395
400

TRIGA - PREF. FLOOD CANISTER

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION SKIPPED.
THE LINE REPRESENTS K-EFF = 0.8487 + OR - 0.0011 WHICH OCCURS FOR 3 GENERATIONS SKIPPED.



TRIGA - PREF. FLOOD CANISTER

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0011			9.11016E-04	2.0483	1.44722E-03	1.4308	0.00000E+00	0.0000
2	0.0049			4.13437E-03	0.6654	4.38445E-03	0.4784	0.00000E+00	0.0000
3	0.0060			5.10848E-03	0.5809	3.08989E-03	0.4698	0.00000E+00	0.0000
4	0.0031			2.59355E-03	0.6454	1.65717E-03	0.5041	0.00000E+00	0.0000
5	0.0027			2.27992E-03	0.5340	2.81194E-03	0.3798	0.00000E+00	0.0000
6	0.0041			3.45885E-03	0.4284	9.91625E-03	0.3262	0.00000E+00	0.0000
7	0.0055			4.70854E-03	0.3586	2.14216E-02	0.2862	0.00000E+00	0.0000
8	0.0057			4.82222E-03	0.3479	1.88953E-02	0.2953	0.00000E+00	0.0000
9	0.0075			6.38633E-03	0.3280	2.05380E-02	0.2566	0.00000E+00	0.0000
10	0.0162			1.37530E-02	0.3626	5.00036E-02	0.2732	0.00000E+00	0.0000
11	0.0324			2.75028E-02	0.3279	6.90049E-02	0.2278	0.00000E+00	0.0000
12	0.0397			3.36610E-02	0.3132	5.98571E-02	0.2109	0.00000E+00	0.0000
13	0.0340			2.88596E-02	0.2898	6.56003E-02	0.2109	0.00000E+00	0.0000
14	0.0256			2.16960E-02	0.2821	8.09273E-02	0.1985	0.00000E+00	0.0000
15	0.0053			4.46374E-03	0.3998	2.89047E-02	0.3705	0.00000E+00	0.0000
16	0.0035			2.94426E-03	0.4996	1.57641E-02	0.4189	0.00000E+00	0.0000
17	0.0052			4.40148E-03	0.7187	8.94175E-03	0.4698	0.00000E+00	0.0000
18	0.0068			5.74522E-03	0.6995	8.42296E-03	0.4837	0.00000E+00	0.0000
19	0.0082			6.98103E-03	0.5248	1.31466E-02	0.4587	0.00000E+00	0.0000
20	0.0323			2.73991E-02	0.3283	4.09554E-02	0.3806	0.00000E+00	0.0000
21	0.0164			1.39255E-02	0.4911	1.53079E-02	0.4510	0.00000E+00	0.0000
22	0.0366			3.10892E-02	0.3817	2.98264E-02	0.3818	0.00000E+00	0.0000
23	0.1058			8.97681E-02	0.2413	7.87515E-02	0.2410	0.00000E+00	0.0000
24	0.1783			1.51363E-01	0.2237	1.16485E-01	0.2203	0.00000E+00	0.0000
25	0.1479			1.25517E-01	0.2525	9.01161E-02	0.2404	0.00000E+00	0.0000
26	0.1886			1.60051E-01	0.2628	1.06558E-01	0.2549	0.00000E+00	0.0000
27	0.0768			6.51929E-02	0.3695	3.90816E-02	0.3829	0.00000E+00	0.0000
SYSTEM TOTAL =				8.48718E-01	0.1284	1.00182E+00	0.0457	0.00000E+00	0.0000

ELAPSED TIME 1.87483 MINUTES

RANDOM NUMBER= 4CFD05CD34A0

```
TRIGA - PREF. FLOOD CANISTER

                              FREQUENCY FOR GENERATIONS    4 TO  403
0.7929 TO 0.8010     ***
0.8010 TO 0.8091     ************
0.8091 TO 0.8172     *******************
0.8172 TO 0.8253     ****************************
0.8253 TO 0.8334     ***************************************
0.8334 TO 0.8415     **********************************************
0.8415 TO 0.8496     ******************************************************
0.8496 TO 0.8577     *******************************************************************
0.8577 TO 0.8658     ******************************************
0.8658 TO 0.8739     *******************************************
0.8739 TO 0.8820     ******************
0.8820 TO 0.8901     **************
0.8901 TO 0.8982     ***********
0.8982 TO 0.9063     ***
0.9063 TO 0.9144     *

                              FREQUENCY FOR GENERATIONS  104 TO  403
0.7929 TO 0.8010     ***
0.8010 TO 0.8091     ***********
0.8091 TO 0.8172     ***************
0.8172 TO 0.8253     *******************
0.8253 TO 0.8334     ****************************
0.8334 TO 0.8415     *********************************
0.8415 TO 0.8496     ***********************************
0.8496 TO 0.8577     *********************************************************
0.8577 TO 0.8658     *********************************
0.8658 TO 0.8739     ***********************************
0.8739 TO 0.8820     *************
0.8820 TO 0.8901     ********
0.8901 TO 0.8982     ********
0.8982 TO 0.9063     **
0.9063 TO 0.9144

                              FREQUENCY FOR GENERATIONS  204 TO  403
0.7929 TO 0.8010     ***
0.8010 TO 0.8091     ********
0.8091 TO 0.8172     **********
0.8172 TO 0.8253     **********
0.8253 TO 0.8334     *****************
0.8334 TO 0.8415     **********************
0.8415 TO 0.8496     *******************
0.8496 TO 0.8577     **********************************
0.8577 TO 0.8658     ************************
0.8658 TO 0.8739     ******************************
0.8739 TO 0.8820     *********
0.8820 TO 0.8901     ******
0.8901 TO 0.8982     ******
0.8982 TO 0.9063     **
0.9063 TO 0.9144
```

```
TRIGA - PREF. FLOOD CANISTER

                                        FREQUENCY FOR GENERATIONS  304 TO  403
0.7929 TO 0.8010     *
0.8010 TO 0.8091     **
0.8091 TO 0.8172     *******
0.8172 TO 0.8253     ***
0.8253 TO 0.8334     ******
0.8334 TO 0.8415     ****************
0.8415 TO 0.8496     *******
0.8496 TO 0.8577     *****************
0.8577 TO 0.8658     ************
0.8658 TO 0.8739     *******************
0.8739 TO 0.8820     ****
0.8820 TO 0.8901     ****
0.8901 TO 0.8982     **
0.8982 TO 0.9063
0.9063 TO 0.9144
```

Figure 6.6.6-4 TRIGA Fuel Cluster Rods – Maximum Reactivity HEU Case

```
     PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
MODULE CSAS25   WILL BE CALLED
  TRIGA - PREF. FLOOD CANISTER
  ' ACCIDENT CONDITION CASK ARRAY - CASKS TOUCHING
  ' DAMGED FUEL PAYLOAD - CANISTER FLOODED AT 0.9982 G/CM^3
  ' ROD GEOMETRY - DRY CASK MOST REACTIVE CONFIGURATION
  ' CASK CAVITY MODERATOR DENSITY 1E-20 GM^3
  ' CASK EXTERIOR MODERATOR DENSITY 1E-20 GM^3
  27GROUPNDF4  MULT
  'UNCANISTERED FUEL
  U-235    1 0.0 1.4646E-03 END
  U-238    1 0.0 7.6111E-05 END
  ZR       1 0.0 3.7145E-02 END
  H        1 0.0 6.3147E-02 END
  'CLAD INCOLOY
  NI        2 0.0 0.028516 END
  FE        2 0.0 0.033820 END
  CR        2 0.0 0.021151 END
  C         2 0.0 0.000399 END
  MN        2 0.0 0.001306 END
  S         2 0.0 0.000022 END
  SI        2 0.0 0.001703 END
  CU        2 0.0 0.000560 END
  AL        2 0.0 0.000266 END
  TI        2 0.0 0.000150 END
  'CASK INTERIOR MODERATOR MATERIAL
  H2O      3 1.0E-20 293.0 END
  'END FITTING FOR FUEL ELEMENT
  SS304    4 0.4968  293.0 END
  H2O      4 1.0E-20 293.0 END
  'BASKET, AND CASK   '
  SS304    5 1.0 293.0 END
  'AL FUEL HOLDER
  AL       6 1.0 293.0 END
  'LEAD SHIELD
  PB       7 1.0 293.0 END
  'NEUTRON SHIELD
  H2O      8 1.0E-20 293.0 END
  'CASK EXTERNAL MATERIAL
  H2O      9 1.0E-20 293.0 END
  'MIXTURE (FUEL) FOR CANISTER
  U-235    10 0.0 2.3773E-04 END
  U-238    10 0.0 1.2354E-05 END
  ZR       10 0.0 6.0293E-03 END
  H        10 0.0 1.0250E-02 END
  H2O    10 DEN=0.8362 1.0  300.0 END
  'CANISTER INTERNAL MODERATOR
  H2O    11 DEN=0.9982 1.0  293.0 END
  ' SECONDARY CASK CAVITY MATERIAL FOR MULTICELL CARD
  H2O      12 1.0E-20 293.0 END
  END COMP
  BUCKLEDCYL WHITE REFLECTED 0.0 57.15 END
  1 0.6731 2 0.7112 3 0.80518 6 0.9525 12 1.0748 END ZONE
  TRIGA - PREF. FLOOD CANISTER
  READ PARAM TME=170.0 GEN=403 NPG=1000 RUN=YES PLT=NO
  TBA=2.0 END PARAM
  READ GEOM
  UNIT 1
  COM='TRIGA FUEL (SMEARED)'
  CYLINDER 10 1 3.9623 60.959 0.001
  UNIT 5
  COM='3.38 in Width / 0.28 in Thickness DIVIDER CENTER STACK (SEALED)'
  CUBOID   5 1 2P4.2672 0.7112 0.0 +74.29 -8.255
  UNIT 6
  COM='3.38 in Width / 0.24 in Thickness DIVIDER OUTSIDE STACK (SEALED)'
  CUBOID   5 1 2P4.2672 0.6096 0.0 +74.29 -8.255
  UNIT 7
  COM='SEALED CANISTER'
  CYLINDER 11 1 3.9624 +60.96 0.0
  HOLE       1  0.0 0.0 0.0
  CYLINDER  5 1 4.1275 +63.50 -1.27
  CYLINDER  3 1 4.1275,+74.29 -8.255
  UNIT 10
  COM='TRIGA ELEMENTS IN Top of 3.38 in x 3.38 in OPENING (SEALED)'
  CUBOID     3 1 2P4.2672 2P4.2672 +74.29 -8.255
  HOLE 7     0.0 0.1397 0.0
  UNIT 11
  COM='TRIGA ELEMENTS IN Bottom of 3.38 in x 3.38 in OPENING (SEALED)'
  CUBOID     3 1 2P4.2672 2P4.2672 +74.29 -8.255
  HOLE 7     0.0 -0.1397 0.0
  UNIT 12
  COM='TRIGA ELEMENTS IN Bottom Right of 3.38 in x 3.38 in OPENING (SEALED)'
  CUBOID     3 1 2P4.2672 2P4.2672 +74.29 -8.255
  HOLE 7     +0.1397 -0.1397 0.0
  UNIT 13
  COM='TRIGA ELEMENTS IN Top Right of 3.38 in x 3.38 in OPENING (SEALED)'
  CUBOID     3 1 2P4.2672 2P4.2672 +74.29 -8.255
  HOLE 7     +0.1397 +0.1397 0.0
  UNIT 14
  COM='TRIGA ELEMENTS IN Bottom Left of 3.38 in x 3.38 in OPENING (SEALED)'
  CUBOID     3 1 2P4.2672 2P4.2672 +74.29 -8.255
```

```
HOLE 7    -0.1397 -0.1397 0.0
UNIT 15
COM='TRIGA ELEMENTS IN Top Left of 3.38 in x 3.38 in OPENING (SEALED)'
CUBOID    3 1 2P4.2672 2P4.2672 +74.29 -8.255
HOLE 7    -0.1397 +0.1397 0.0
UNIT 16
COM='TRIGA BASKET 3.38 in x 3.38 in CENTER OPENING (SEALED)'
CUBOID    3 1 2P4.2672 2P4.2672 +74.29 -8.255
UNIT 20
COM='CENTER COLUMN OF THREE OPENINGS w/ 0.28 in plate (SEALED)'
ARRAY 1  -4.2672 -13.5128 -8.255
REPLICATE 5 1 4R0.7112 2R0.0 1
UNIT 21
COM='LEFT OUTSIDE COLUMN OF TWO OPENINGS w/ 0.12 in plate (SEALED)'
ARRAY 2  -4.2672 -8.8392 -8.255
REPLICATE 5 1 0.0 0.3048 2R0.3048 2R0.0 1
UNIT 22
COM='RIGHT OUTSIDE COLUMN OF TWO OPENINGS w/ 0.12 in plate (SEALED)'
ARRAY 3  -4.2672 -8.8392 -8.255
REPLICATE 5 1 0.3048 0.0 2R0.3048 2R0.0 1
UNIT 30
COM='NAC-LWT TRIGA BASKET (SEALED)'
CYLINDER 3  1 17.1 +74.29 -8.255
HOLE 20 0.0 0.0 0.0
HOLE 21  -9.2457 0.0 0.0
HOLE 22  +9.2457 0.0 0.0
CYLINDER 5  1 18.9103 +74.93 -8.890
CYLINDER 7  1 33.4645 +74.93 -8.890
CYLINDER 5  1 36.5188 +74.93 -8.890
CYLINDER 8   1 49.2227 +74.93 -8.890
CYLINDER 5  1 49.8221 +74.93 -8.890
CUBOID   9   1 4P49.8221 +74.93 -8.890
'  ++++++++++++++++++++++++++++++++++++
UNIT 41
COM='TRIGA FUEL ELEMENT'
CYLINDER 1 1 0.6731 2P28.575
CYLINDER 2 1 0.7112 2P28.575
CYLINDER 4 1 0.7112 43.48 -33.04
UNIT 45
COM='DIVIDER CENTER STACK'
CUBOID   5 1 2P4.2672 0.7112 0.0 43.48 -33.04
UNIT 46
COM='DIVIDER OUTSIDE STACK'
CUBOID   5 1 2P4.2672 0.6096 0.0 43.48 -33.04
UNIT 410
COM='TRIGA FUEL ELEMENTS IN AL TUBE, CENTERED'
CYLINDER  3 1 0.80518  43.48 -33.04
HOLE  41  0.0 0.0 0.0
CYLINDER  6 1 0.9525  43.48 -33.04
UNIT 411
COM='TRIGA FUEL ELEMENTS IN AL TUBE, RIGHT'
CYLINDER 3 1  0.80518  43.48 -33.04
HOLE  41   0.0938 0.0 0.0
CYLINDER 6 1 0.9525  43.48 -33.04
UNIT 412
COM='TRIGA FUEL ELEMENTS IN AL TUBE, LEFT'
CYLINDER 3 1  0.80518  43.48 -33.04
HOLE  41   -0.0938 0.0 0.0
CYLINDER 6 1 0.9525  43.48 -33.04
UNIT 413
COM='TRIGA FUEL ELEMENTS IN AL TUBE, TOP'
CYLINDER 3 1  0.80518  43.48 -33.04
HOLE  41  0.0  0.0938 0.0
CYLINDER 6 1 0.9525  43.48 -33.04
UNIT 414
COM='TRIGA FUEL ELEMENTS IN AL TUBE, BOTTOM'
CYLINDER 3 1  0.80518  43.48 -33.04
HOLE  41  0.0  -0.0938 0.0
CYLINDER 6 1 0.9525  43.48 -33.04
UNIT 415
COM='TRIGA FUEL ELEMENTS IN AL TUBE, TOP RIGHT'
CYLINDER 3 1  0.80518  43.48 -33.04
HOLE  41  0.0662 0.0662 0.0
CYLINDER 6 1 0.9525  43.48 -33.04
UNIT 416
COM='TRIGA FUEL ELEMENTS IN AL TUBE, TOP LEFT'
CYLINDER 3 1  0.80518  43.48 -33.04
HOLE  41  -0.0662 0.0662 0.0
CYLINDER 6 1 0.9525  43.48 -33.04
UNIT 417
COM='TRIGA FUEL ELEMENTS IN AL TUBE, BOTTOM RIGHT'
CYLINDER 3 1  0.80518  43.48 -33.04
HOLE  41  0.0662 -0.0662 0.0
CYLINDER 6 1 0.9525  43.48 -33.04
UNIT 418
COM='TRIGA FUEL ELEMENTS IN AL TUBE, BOTTOM LEFT'
CYLINDER 3 1  0.80518  43.48 -33.04
HOLE  41  -0.0662 -0.0662 0.0
CYLINDER 6 1 0.9525  43.48 -33.04
'  ++++++++++++++++++++++++++++++++++++
UNIT 420
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, CENTER OPENING'
CUBOID    3 1 4P4.1529 43.48 -33.04
HOLE           415  -2.8576 -2.8576      0
HOLE           413  -0.9525 -2.8576      0
```

```
HOLE          413   0.9525 -2.8576     0
HOLE          416   2.8576 -2.8576     0
HOLE          411  -2.8576 -0.9525     0
HOLE          415  -0.9525 -0.9525     0
HOLE          416   0.9525 -0.9525     0
HOLE          412   2.8576 -0.9525     0
HOLE          411  -2.8576  0.9525     0
HOLE          417  -0.9525  0.9525     0
HOLE          418   0.9525  0.9525     0
HOLE          412   2.8576  0.9525     0
HOLE          417  -2.8576  2.8576     0
HOLE          414  -0.9525  2.8576     0
HOLE          414   0.9525  2.8576     0
HOLE          418   2.8576  2.8576     0
CUBOID    3 1 4P4.1529 43.48 -33.04
' CHECK 4.1 CM ABOVE*******************
UNIT 421
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, BOTTOM OPENING'
CUBOID    3 1 4P4.1529 43.48 -33.04
HOLE          415  -2.8576 -2.8576     0
HOLE          413  -0.9525 -2.8576     0
HOLE          413   0.9525 -2.8576     0
HOLE          416   2.8576 -2.8576     0
HOLE          411  -2.8576 -0.9525     0
HOLE          415  -0.9525 -0.9525     0
HOLE          416   0.9525 -0.9525     0
HOLE          412   2.8576 -0.9525     0
HOLE          411  -2.8576  0.9525     0
HOLE          417  -0.9525  0.9525     0
HOLE          418   0.9525  0.9525     0
HOLE          412   2.8576  0.9525     0
HOLE          417  -2.8576  2.8576     0
HOLE          414  -0.9525  2.8576     0
HOLE          414   0.9525  2.8576     0
HOLE          418   2.8576  2.8576     0
CUBOID    3 1 4P4.1529 43.48 -33.04
' CHECK 4.1 CM ABOVE*******************
UNIT 422
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, TOP OPENING'
CUBOID    3 1 4P4.1529 43.48 -33.04
HOLE          415  -2.8576 -2.8576     0
HOLE          413  -0.9525 -2.8576     0
HOLE          413   0.9525 -2.8576     0
HOLE          416   2.8576 -2.8576     0
HOLE          411  -2.8576 -0.9525     0
HOLE          415  -0.9525 -0.9525     0
HOLE          416   0.9525 -0.9525     0
HOLE          412   2.8576 -0.9525     0
HOLE          411  -2.8576  0.9525     0
HOLE          417  -0.9525  0.9525     0
HOLE          418   0.9525  0.9525     0
HOLE          412   2.8576  0.9525     0
HOLE          417  -2.8576  2.8576     0
HOLE          414  -0.9525  2.8576     0
HOLE          414   0.9525  2.8576     0
HOLE          418   2.8576  2.8576     0
CUBOID    3 1 4P4.1529 43.48 -33.04
' CHECK 4.1 CM ABOVE*******************
UNIT 423
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, BOTTOM LEFT OPENING'
CUBOID    3 1 4P4.1529 43.48 -33.04
HOLE          415  -2.8576 -2.8576     0
HOLE          413  -0.9525 -2.8576     0
HOLE          413   0.9525 -2.8576     0
HOLE          416   2.8576 -2.8576     0
HOLE          411  -2.8576 -0.9525     0
HOLE          415  -0.9525 -0.9525     0
HOLE          416   0.9525 -0.9525     0
HOLE          412   2.8576 -0.9525     0
HOLE          411  -2.8576  0.9525     0
HOLE          417  -0.9525  0.9525     0
HOLE          418   0.9525  0.9525     0
HOLE          412   2.8576  0.9525     0
HOLE          417  -2.8576  2.8576     0
HOLE          414  -0.9525  2.8576     0
HOLE          414   0.9525  2.8576     0
HOLE          418   2.8576  2.8576     0
CUBOID    3 1 4P4.1529 43.48 -33.04
' CHECK 4.1 CM ABOVE*******************
UNIT 424
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, TOP LEFT OPENING'
CUBOID    3 1 4P4.1529 43.48 -33.04
HOLE          415  -2.8576 -2.8576     0
HOLE          413  -0.9525 -2.8576     0
HOLE          413   0.9525 -2.8576     0
HOLE          416   2.8576 -2.8576     0
HOLE          411  -2.8576 -0.9525     0
HOLE          415  -0.9525 -0.9525     0
HOLE          416   0.9525 -0.9525     0
HOLE          412   2.8576 -0.9525     0
HOLE          411  -2.8576  0.9525     0
HOLE          417  -0.9525  0.9525     0
HOLE          418   0.9525  0.9525     0
HOLE          412   2.8576  0.9525     0
HOLE          417  -2.8576  2.8576     0
```

```
HOLE          414  -0.9525  2.8576      0
HOLE          414   0.9525  2.8576      0
HOLE          418   2.8576  2.8576      0
CUBOID    3 1 4P4.1529 43.48 -33.04
' CHECK 4.1 CM ABOVE********************
UNIT 425
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, BOTTOM RIGHT OPENING'
CUBOID    3 1 4P4.1529 43.48 -33.04
HOLE          415  -2.8576 -2.8576      0
HOLE          413  -0.9525 -2.8576      0
HOLE          413   0.9525 -2.8576      0
HOLE          416   2.8576 -2.8576      0
HOLE          411  -2.8576 -0.9525      0
HOLE          415  -0.9525 -0.9525      0
HOLE          416   0.9525 -0.9525      0
HOLE          412   2.8576 -0.9525      0
HOLE          411  -2.8576  0.9525      0
HOLE          417  -0.9525  0.9525      0
HOLE          418   0.9525  0.9525      0
HOLE          412   2.8576  0.9525      0
HOLE          417  -2.8576  2.8576      0
HOLE          414  -0.9525  2.8576      0
HOLE          414   0.9525  2.8576      0
HOLE          418   2.8576  2.8576      0
CUBOID    3 1 4P4.1529 43.48 -33.04
' CHECK 4.1 CM ABOVE********************
UNIT 426
COM='AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, TOP RIGHT OPENING'
CUBOID    3 1 4P4.1529 43.48 -33.04
HOLE          415  -2.8576 -2.8576      0
HOLE          413  -0.9525 -2.8576      0
HOLE          413   0.9525 -2.8576      0
HOLE          416   2.8576 -2.8576      0
HOLE          411  -2.8576 -0.9525      0
HOLE          415  -0.9525 -0.9525      0
HOLE          416   0.9525 -0.9525      0
HOLE          412   2.8576 -0.9525      0
HOLE          411  -2.8576  0.9525      0
HOLE          417  -0.9525  0.9525      0
HOLE          418   0.9525  0.9525      0
HOLE          412   2.8576  0.9525      0
HOLE          417  -2.8576  2.8576      0
HOLE          414  -0.9525  2.8576      0
HOLE          414   0.9525  2.8576      0
HOLE          418   2.8576  2.8576      0
CUBOID    3 1 4P4.1529 43.48 -33.04
'  ***********************************
UNIT 430
COM='FUEL INSERT IN, CENTER OPENING'
CUBOID    3 1 4P4.2672 43.48 -33.04
UNIT 431
COM='FUEL INSERT IN, BOTTOM OPENING'
CUBOID    3 1 4P4.2672 43.48 -33.04
HOLE 421   0.0 -0.1143 0.0
UNIT 432
COM='FUEL INSERT IN, TOP OPENING'
CUBOID    3 1 4P4.2672 43.48 -33.04
HOLE 422   0.0 0.1143 0.0
UNIT 433
COM='FUEL INSERT IN, BOTTOM LEFT OPENING'
CUBOID    3 1 4P4.2672 43.48 -33.04
HOLE 423   -0.1143 -0.1143 0.0
UNIT 434
COM='FUEL INSERT IN, TOP LEFT OPENING'
CUBOID    3 1 4P4.2672 43.48 -33.04
HOLE 424   -0.1143 0.1143 0.0
UNIT 435
COM='FUEL INSERT IN, BOTOM RIGHT OPENING'
CUBOID    3 1 4P4.2672 43.48 -33.04
HOLE 425   0.1143 -0.1143 0.0
UNIT 436
COM='FUEL INSERT IN, TOP RIGHT OPENING'
CUBOID    3 1 4P4.2672 43.48 -33.04
HOLE 426   0.1143 0.1143 0.0
'  ***********************************
UNIT 440
COM='CENTER COLUMN OF THREE OPENINGS'
ARRAY 41  -4.2672 -13.5128 -33.04
REPLICATE 5 1 4R0.7112 2R0.0 1
UNIT 441
COM='LEFT OUTSIDE COLUMN OF TWO OPENINGS'
ARRAY 42  -4.2672 -8.8392 -33.04
REPLICATE 5 1 0.0 0.3408 2R0.3408 2R0.0 1
UNIT 442
COM='RIGHT OUTSIDE COLUMN OF TWO OPENINGS'
ARRAY 43  -4.2672 -8.8392 -33.04
REPLICATE 5 1 0.3408 0.0 2R0.3408 2R0.0 1
UNIT 450
COM='96 TRIGA FUEL ELEMENTS IN EACH LWT BASKET'
CYLINDER  3 1 17.1500 43.485 -33.045
HOLE 440   0.0    0.0 0.0
HOLE 441  -9.2457 0.0 0.0
HOLE 442  +9.2457 0.0 0.0
CYLINDER 5  1 18.9103 43.485 -33.045
CYLINDER 7  1 33.4645 43.485 -33.045
```

```
CYLINDER 5  1 36.5188 43.485 -33.045
CYLINDER 8  1 49.2227 43.485 -33.045
CYLINDER 5  1 49.8221 43.485 -33.045
CUBOID   9   1 4P49.8221 43.485 -33.045
'  ***********************************
UNIT 80
COM='SIMPLIFIED LID STRUCTURE NAC-LWT'
CYLINDER 5 1 36.5188 2P14.1351
CYLINDEP 9 1 49.8221 2P14.1351
CUBOID   9   1 4P49.8221 2P14.1351
UNIT 81
COM='SIMPLIFIED CASK BOTTOM STRUCTURE NAC-LWT'
CYLINDER 7 1 26.3525 2P3.81
CYLINDER 5 1 36.6188 +13.97 -12.7
CYLINDER 9 1 49.8221 +13.97 -12.7
CUBOID   9   1 4P49.8221 13.97 -12.7
GLOBAL UNIT 82
COM='STACK OF 5 BASKETS IN CASK'
ARRAY  20  -49.8221 -49.8221 -221.3
END GEOM
READ ARRAY
ARA=1 NUX=1 NUY=5 NUZ=1 FILL 10 5 16 5 11 END FILL
ARA=2 NUX=1 NUY=3 NUZ=1 FILL 13 6 12 END FILL
ARA=3 NUX=1 NUY=3 NUZ=1 FILL 15 6 14 END FILL
ARA=41 NUX=1 NUY=5 NUZ=1 FILL 432 45 430 45 431 END FILL
ARA=42 NUX=1 NUY=3 NUZ=1 FILL 436 46 435 END FILL
ARA=43 NUX=1 NUY=3 NUZ=1 FILL 434 46 433 END FILL
ARA=20 NUX=1 NUY=1 NUZ=7 FILL 81 30 3R450 30 80 END FILL
END ARRAY
READ BOUNDS ALL=MIR END BOUNDS
READ START XSM=-17 XSP=17 YSM=-17 YSP=17 ZSM=-200 ZSP=200 END START
READ PLOT
TTL='X-Y PLOT OF CASK (CANISTER ELEVATION)'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=800
XUL=-50.0 YUL=50.0 ZUL=149.352
XLR=50.0 YLR=-50.0 ZLR=149.352 END
TTL='X-Y PLOT OF BASKET (CANISTER ELEVATION)'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=800
XUL=-17.2 YUL=17.2 ZUL=149.352
XLR=17.2 YLR=-17.2 ZLR=149.352 END
TTL='X-Y PLOT OF BASKET (CAVITY MID PLANE)'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=800
XUL=-17.2 YUL=17.2 ZUL=0.0
XLR=17.2 YLR=-17.2 ZLR=0.0 END
TTL='X-Y PLOT OF CENTER OPENING (CANISTER ELEVATION)'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=800
XUL=-7.0 YUL=7.0 ZUL=149.352
XLR=7.0 YLR=-7.0 ZLR=149.352 END
TTL='X-Y PLOT OF PERIPHERAL OPENING (CANISTER ELEVATION)'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=800
XUL=-7.0 YUL=16.0 ZUL=149.352
XLR=7.0  YLR=4.0 ZLR=149.352 END
TTL='Y-Z PLOT OF BASKET (CENTER OF FUEL ELEMENTS,CANISTER ELEVATION)'
SCR=YES PIC=MAT LPI=10
VAX=1.0 WDN=-1.0 NAX=800
XUL=2.12 YUL=-14.0 ZUL=186.69
XLR=2.12 YLR=-4.5 ZLR=112.014 END
TTL='Y-Z PLOT OF BASKET (CASK)'
SCR=YES PIC=MAT LPI=10
VAX=1.0 WDN=-1.0 NAX=800
XUL=2.12 YUL=-51 ZUL=220.0
XLR=2.12 YLR=+51 ZLR=-220.0
END PLOT
END DATA


**** PROBLEM PARAMETERS ****

LIB 27GROUPNDF4  LIBRARY
MXX            12 MIXTURES
MSC            29 COMPOSITION SPECIFICATIONS
IZM             5 MATERIAL ZONES
GE  MULTIREGION  GEOMETRY
MORE            0 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
MSLN            0 FUEL SOLUTIONS

**** PROBLEM COMPOSITION DESCRIPTION ****

SC  U-235         STANDARD COMPOSITION
MX              1 MIXTURE NO.
DEN    1.4646E-03 ATOMIC DENSITY
ROTH       1.0000 THEORETICAL DENSITY
NEL             1 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
           92235        1.00 ATOM/MOLECULE
END

SC  U-238         STANDARD COMPOSITION
```

```
    MX              1 MIXTURE NO.
    DEN    7.6111E-05 ATOMIC DENSITY
    ROTH       1.0000 THEORETICAL DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
                92238       1.00 ATOM/MOLECULE
    END

    SC  ZR            STANDARD COMPOSITION
    MX              1 MIXTURE NO.
    DEN    3.7145E-02 ATOMIC DENSITY
    ROTH       6.4900 THEORETICAL DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
                40000       1.00 ATOM/MOLECULE
    END

    SC  H             STANDARD COMPOSITION
    MX              1 MIXTURE NO.
    DEN    6.3147E-02 ATOMIC DENSITY
    ROTH       1.0000 THEORETICAL DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
                 1001       1.00 ATOM/MOLECULE

'CLAD INCOLOY
    END

    SC  NI            STANDARD COMPOSITION
    MX              2 MIXTURE NO.
    DEN    2.8516E-02 ATOMIC DENSITY
    ROTH       8.9000 THEORETICAL DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
                28000       1.00 ATOM/MOLECULE
    END

    SC  FE            STANDARD COMPOSITION
    MX              2 MIXTURE NO.
    DEN    3.3820E-02 ATOMIC DENSITY
    ROTH       7.8600 THEORETICAL DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
                26000       1.00 ATOM/MOLECULE
    END

    SC  CR            STANDARD COMPOSITION
    MX              2 MIXTURE NO.
    DEN    2.1151E-02 ATOMIC DENSITY
    ROTH       7.2000 THEORETICAL DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
                24000       1.00 ATOM/MOLECULE
    END

    SC  C             STANDARD COMPOSITION
    MX              2 MIXTURE NO.
    DEN    3.9900E-04 ATOMIC DENSITY
    ROTH       2.1000 THEORETICAL DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
                 6012       1.00 ATOM/MOLECULE
    END

    SC  MN            STANDARD COMPOSITION
    MX              2 MIXTURE NO.
    DEN    1.3060E-03 ATOMIC DENSITY
    ROTH       7.2000 THEORETICAL DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
                25055       1.00 ATOM/MOLECULE
    END

    SC  S             STANDARD COMPOSITION
    MX              2 MIXTURE NO.
    DEN    2.2000E-05 ATOMIC DENSITY
    ROTH       2.0700 THEORETICAL DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
                16000       1.00 ATOM/MOLECULE
    END

    SC  SI            STANDARD COMPOSITION
    MX              2 MIXTURE NO.
    DEN    1.7030E-03 ATOMIC DENSITY
    ROTH       2.3300 THEORETICAL DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
                14000       1.00 ATOM/MOLECULE
    END

    SC  CU            STANDARD COMPOSITION
    MX              2 MIXTURE NO.
    DEN    5.6000E-04 ATOMIC DENSITY
    ROTH       8.9200 THEORETICAL DENSITY
```

```
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
               29000       1.00 ATOM/MOLECULE
    END

    SC  AL           STANDARD COMPOSITION
    MX             2 MIXTURE NO.
    DEN   2.6600E-04 ATOMIC DENSITY
    ROTH      2.7020 THEORETICAL DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
               13027       1.00 ATOM/MOLECULE
    END

    SC  TI           STANDARD COMPOSITION
    MX             2 MIXTURE NO.
    DEN   1.5000E-04 ATOMIC DENSITY
    ROTH      4.5000 THEORETICAL DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
               22000       1.00 ATOM/MOLECULE

'CASK INTERIOR MODERATOR MATERIAL
    END

    SC  H2O          STANDARD COMPOSITION
    MX             3 MIXTURE NO.
    VF        0.0000 VOLUME FRACTION
    ROTH      0.9982 THEORETICAL DENSITY
    NEL            2 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
                1001       2.00 ATOMS/MOLECULE
                8016       1.00 ATOM/MOLECULE

'END FITTING FOR FUEL ELEMENT
    END

    SC  SS304        STANDARD COMPOSITION
    MX             4 MIXTURE NO.
    VF        0.4968 VOLUME FRACTION
    ROTH      7.9200 THEORETICAL DENSITY
    NEL            4 NO. ELEMENTS
    ICP            0 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               24304     19.000 WT%
               25055      2.000 WT%
               26304     69.500 WT%
               28304      9.500 WT%
    END

    SC  H2O          STANDARD COMPOSITION
    MX             4 MIXTURE NO.
    VF        0.0000 VOLUME FRACTION
    ROTH      0.9982 THEORETICAL DENSITY
    NEL            2 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
                1001       2.00 ATOMS/MOLECULE
                8016       1.00 ATOM/MOLECULE

'BASKET, AND CASK
    END

    SC  SS304        STANDARD COMPOSITION
    MX             5 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      7.9200 THEORETICAL DENSITY
    NEL            4 NO. ELEMENTS
    ICP            0 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               24304     19.000 WT%
               25055      2.000 WT%
               26304     69.500 WT%
               28304      9.500 WT%

'AL FUEL HOLDER
    END

    SC  AL           STANDARD COMPOSITION
    MX             6 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      2.7020 THEORETICAL DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               13027       1.00 ATOM/MOLECULE

'LEAD SHIELD
    END

    SC  PB           STANDARD COMPOSITION
    MX             7 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH     11.3440 THEORETICAL DENSITY
```

```
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               82000       1.00 ATOM/MOLECULE

'NEUTRON SHIELD
    END

    SC  H2O           STANDARD COMPOSITION
    MX             8 MIXTURE NO.
    VF        0.0000 VOLUME FRACTION
    ROTH      0.9982 THEORETICAL DENSITY
    NEL            2 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
                1001       2.00 ATOMS/MOLECULE
                8016       1.00 ATOM/MOLECULE

'CASK EXTERNAL MATERIAL
    END

    SC  H2O           STANDARD COMPOSITION
    MX             9 MIXTURE NO.
    VF        0.0000 VOLUME FRACTION
    ROTH      0.9982 THEORETICAL DENSITY
    NEL            2 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
                1001       2.00 ATOMS/MOLECULE
                8016       1.00 ATOM/MOLECULE

'MIXTURE (FUEL) FOR CANISTER
    END

    SC  U-235         STANDARD COMPOSITION
    MX            10 MIXTURE NO.
    DEN   2.3773E-04 ATOMIC DENSITY
    ROTH      1.0000 THEORETICAL DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
               92235       1.00 ATOM/MOLECULE
    END

    SC  U-238         STANDARD COMPOSITION
    MX            10 MIXTURE NO.
    DEN   1.2354E-05 ATOMIC DENSITY
    ROTH      1.0000 THEORETICAL DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
               92238       1.00 ATOM/MOLECULE
    END

    SC  ZR            STANDARD COMPOSITION
    MX            10 MIXTURE NO.
    DEN   6.0293E-03 ATOMIC DENSITY
    ROTH      6.4900 THEORETICAL DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
               40000       1.00 ATOM/MOLECULE
    END

    SC  H             STANDARD COMPOSITION
    MX            10 MIXTURE NO.
    DEN   1.0250E-02 ATOMIC DENSITY
    ROTH      1.0000 THEORETICAL DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
                1001       1.00 ATOM/MOLECULE
    END

    SC  H2O           STANDARD COMPOSITION
    MX            10 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      0.8362 SPECIFIED DENSITY
    NEL            2 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       300.0 DEG KELVIN
                1001       2.00 ATOMS/MOLECULE
                8016       1.00 ATOM/MOLECULE

'CANISTER INTERNAL MODERATOR
    END

    SC  H2O           STANDARD COMPOSITION
    MX            11 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      0.9982 SPECIFIED DENSITY
    NEL            2 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
                1001       2.00 ATOMS/MOLECULE
                8016       1.00 ATOM/MOLECULE

' SECONDARY CASK CAVITY MATERIAL FOR MULTICELL CARD
    END
```

```
SC   H2O          STANDARD COMPOSITION
MX            12 MIXTURE NO.
VF        0.0000 VOLUME FRACTION
ROTH      0.9982 THEORETICAL DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
            1001       2.00 ATOMS/MOLECULE
            8016       1.00 ATOM/MOLECULE
END

**** PROBLEM GEOMETRY ****

CS   BUCKLEDCYL    COORDINATE SYSTEM
BR   WHITE         RIGHT BOUNDARY
BL   REFLECTED     LEFT BOUNDARY
ORGN         0.00 CM LEFT BOUNDARY LOCATION
DY          57.15 CM BUCKLING HEIGHT
DZ           0.00 CM BUCKLING DEPTH
END

ZONE NUMBER      1
MZX              1 MIXTURE NO.
RZ            0.67 CM RIGHT BOUNDARY LOCATION
XMOD               EXTERNAL MODERATOR INDEX

ZONE NUMBER      2
MZX              2 MIXTURE NO.
RZ            0.71 CM RIGHT BOUNDARY LOCATION
XMOD               EXTERNAL MODERATOR INDEX

ZONE NUMBER      3
MZX              3 MIXTURE NO.
RZ            0.81 CM RIGHT BOUNDARY LOCATION
XMOD               EXTERNAL MODERATOR INDEX

ZONE NUMBER      4
MZX              6 MIXTURE NO.
RZ            0.95 CM RIGHT BOUNDARY LOCATION
XMOD               EXTERNAL MODERATOR INDEX

ZONE NUMBER      5
MZX             12 MIXTURE NO.
RZ            1.07 CM RIGHT BOUNDARY LOCATION
XMOD               EXTERNAL MODERATOR INDEX
```

```
********************************************************************************
********************************************************************************
********************************************************************************
*****                                                                      *****
*****                   PROGRAM VERIFICATION INFORMATION                   *****
*****                                                                      *****
*****                CODE SYSTEM:   SCALE-PC VERSION:   4.3                *****
*****                                                                      *****
********************************************************************************
********************************************************************************
*****                                                                      *****
*****                                                                      *****
*****                 PROGRAM:  000009                                     *****
*****                                                                      *****
*****           CREATION DATE:  03/08/96                                   *****
*****                                                                      *****
*****                  VOLUME:  Eng                                        *****
*****                                                                      *****
*****                 LIBRARY:  M:\SCALE43\WIN_NT\EXE                      *****
*****                                                                      *****
*****                                                                      *****
*****         PRODUCTION CODE:  KENOVA                                     *****
*****                                                                      *****
*****                 VERSION:  3.1                                        *****
*****                                                                      *****
*****                 JOBNAME:  SCALE-PC                                   *****
*****                                                                      *****
*****       DATE OF EXECUTION:  11/12/07                                   *****
*****                                                                      *****
*****       TIME OF EXECUTION:  12:28:27                                   *****
*****                                                                      *****
*****                                                                      *****
********************************************************************************
********************************************************************************
********************************************************************************
```

```
***************************************************************************************************
***                                                                                             ***
***                         TRIGA - PREF. FLOOD CANISTER                                        ***
***                                                                                             ***
***************************************************************************************************
***                          ******      NUMERIC PARAMETERS      ******                         ***
***                                                                                             ***
***                                                                                             ***
***          TME        MAXIMUM PROBLEM TIME (MIN)                          170.00              ***
***                                                                                             ***
***          TBA        TIME PER GENERATION (MIN)                             2.00              ***
***                                                                                             ***
***          GEN        NUMBER OF GENERATIONS                                  403              ***
***                                                                                             ***
***          NPG        NUMBER PER GENERATION                                 1000              ***
***                                                                                             ***
***          NSK        NUMBER OF GENERATIONS TO BE SKIPPED                      3              ***
***                                                                                             ***
***          BEG        BEGINNING GENERATION NUMBER                              1              ***
***                                                                                             ***
***          RES        GENERATIONS BETWEEN CHECKPOINTS                          0              ***
***                                                                                             ***
***          X1D        NUMBER OF EXTRA 1-D CROSS SECTIONS                       1              ***
***                                                                                             ***
***          NBK        NEUTRON BANK SIZE                                     1025              ***
***                                                                                             ***
***          XNB        EXTRA POSITIONS IN NEUTRON BANK                          0              ***
***                                                                                             ***
***          NFB        FISSION BANK SIZE                                     1000              ***
***                                                                                             ***
***          XFB        EXTRA POSITIONS IN FISSION BANK                          0              ***
***                                                                                             ***
***          WTA        DEFAULT VALUE OF WEIGHT AVERAGE                     0.5000              ***
***                                                                                             ***
***          WTH        WEIGHT HIGH FOR SPLITTING                           3.0000              ***
***                                                                                             ***
***          WTL        WEIGHT LOW FOR RUSSIAN ROULETTE                     0.3333              ***
***                                                                                             ***
***          RND        STARTING RANDOM NUMBER                        BB8271000001              ***
***                                                                                             ***
***          NB8        NUMBER OF D.A. BLOCKS ON UNIT  8                       200              ***
***                                                                                             ***
***          NL8        LENGTH OF D.A. BLOCKS ON UNIT  8                       512              ***
***                                                                                             ***
***          ADJ        MODE OF CALCULATION                                FORWARD              ***
***                                                                                             ***
***                     INPUT DATA WRITTEN ON RESTART UNIT                      NO              ***
***                                                                                             ***
***                     BINARY DATA INTERFACE                                  YES              ***
***                                                                                             ***
***                                                                                             ***
***************************************************************************************************
***************************************************************************************************
```

```
**********************************************************************************************************
**********************************************************************************************************
***                                                                                                    ***
***                                   TRIGA - PREF. FLOOD CANISTER                                     ***
***                                                                                                    ***
**********************************************************************************************************
***                           ******     LOGICAL PARAMETERS      ******                                ***
***                                                                                                    ***
***  RUN  EXECUTE PROBLEM AFTER CHECKING DATA    YES          PLT  PLOT PICTURE MAP(S)               NO ***
***                                                                                                    ***
***  FLX  COMPUTE FLUX                            NO          FDN  COMPUTE FISSION DENSITIES         NO ***
***                                                                                                    ***
***  SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION    NO          NUB  COMPUTE NU-BAR & AVG FISSION GROUP YES ***
***                                                                                                    ***
***  MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER     NO          MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION  NO ***
***                                                                                                    ***
***  CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER   NO          CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION  NO ***
***                                                                                                    ***
***  FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER   NO          FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION  NO ***
***                                                                                                    ***
***  MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER     NO          MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER   NO ***
***                                                                                                    ***
***  CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER   NO          CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER  NO ***
***                                                                                                    ***
***  FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER   NO          FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER  NO ***
***                                                                                                    ***
***  HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL    NO          HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL   NO ***
***                                                                                                    ***
***  AMX  PRINT ALL MIXED CROSS SECTIONS          NO          FAR  PRINT FIS. AND ABS. BY REGION      NO ***
***                                                                                                    ***
***  XS1  PRINT 1-D MIXTURE X-SECTIONS            NO          GAS  PRINT FAR BY GROUP                 NO ***
***                                                                                                    ***
***  XS2  PRINT 2-D MIXTURE X-SECTIONS            NO          PAX  PRINT XSEC-ALBEDO CORRELATION TABLES   NO ***
***                                                                                                    ***
***  XAP  PRINT MIXTURE ANGLES & PROBABILITIES    NO          PWT  PRINT WEIGHT AVERAGE ARRAY         NO ***
***                                                                                                    ***
***  PKI  PRINT FISSION SPECTRUM                  NO          PGM  PRINT INPUT GEOMETRY               NO ***
***                                                                                                    ***
***  P1D  PRINT EXTRA 1-D CROSS SECTIONS          NO          BUG  PRINT DEBUG INFORMATION            NO ***
***                                                                                                    ***
***                                                           TRK  PRINT TRACKING INFORMATION         NO ***
***                                                                                                    ***
***                                                                                                    ***
**********************************************************************************************************
**********************************************************************************************************
**********************************************************************************************************
                                     PARAMETER INPUT COMPLETED

                      .......     0 IO'S WERE USED READING THE PARAMETER DATA      .......

                                   TRIGA - PREF. FLOOD CANISTER

                                          MIXING TABLE

                                  NUMBER OF SCATTERING ANGLES =  2
                                CROSS SECTION MESSAGE THRESHOLD =3.0E-05


MIXTURE =      1          DENSITY(G/CC) =  6.3339
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT               NUCLIDE TITLE
   1001001  6.31470E-02  1.66819E-02   1001     1.0077      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002               UPDATED
08/12/94
   1040000  3.71450E-02  8.88318E-01  40000    91.2196      ZIRCONIUM      ENDF/B-IV MAT 7141                        UPDATED
08/12/94
   1092235  1.46460E-03  9.02502E-02  92235   235.0441      URANIUM-235    ENDF/B-IV MAT 1261                        UPDATED
08/12/94
   1092238  7.61110E-05  4.75004E-03  92238   238.0510      URANIUM-238    ENDF/B-IV MAT 1262                        UPDATED
08/12/94

MIXTURE =      2          DENSITY(G/CC) =  8.0325
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA      AWT               NUCLIDE TITLE
   2006012  3.99000E-04  9.69820E-04   6000    12.0001      CARBON-12      ENDF/B-IV MAT 1274/THRM1065               UPDATED
08/12/94
   2013027  2.66000E-04  1.48372E-03  13027    26.9818     AL-27 1193 218 GP 040375(5)                               UPDATED
08/12/94
   2014000  1.70300E-03  9.88763E-03  14000    28.0853      SILICON        ENDF/B-IV MAT 1194                        UPDATED
08/12/94
   2016000  2.20000E-05  1.45825E-04  16000    32.0634     SULFUR  LENDL MAT 7020                                    UPDATED
08/12/94
   2022000  1.50000E-04  1.48470E-03  22000    47.8793      TITANIUM       ENDF/B-IV MAT 1286                        UPDATED
08/12/94
   2024000  2.11510E-02  2.27351E-01  24000    51.9957     CR 1191 218NGP WT 1/E P-3 293K SIGP=5+4 RE(042375)        UPDATED
08/12/94
   2025055  1.30600E-03  1.48325E-02  25055    54.9379      MANGANESE-55   ENDF/B-IV MAT 1197                        UPDATED
08/12/94
   2026000  3.38200E-02  3.90441E-01  26000    55.8447      IRON           ENDF/B-IV MAT 1192                        UPDATED
08/12/94
   2028000  2.85160E-02  3.45964E-01  28000    58.6872     NI 1190 218NGP WT 1/E P-3 293K SIGP=5+4 RE(042375)        UPDATED
08/12/94
   2029000  5.60000E-04  7.42031E-03  29000    64.0966      COPPER         ENDF/B-IV MAT 1295                        UPDATED
08/12/94

MIXTURE =      3          DENSITY(G/CC) = 0.99817E-20
```

```
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT             NUCLIDE TITLE
   3001001  6.67692E-22  1.11927E-01    1001      1.0077     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED
08/12/94
   3008016  3.33846E-22  8.88073E-01    8016     15.9904     OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED
08/12/94

MIXTURE =     4          DENSITY(G/CC) =  3.9347
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT             NUCLIDE TITLE
   4001001  6.67692E-22  2.83943E-22    1001      1.0077     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED
08/12/94
   4008016  3.33846E-22  2.25293E-21    8016     15.9904     OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED
08/12/94
   4024304  8.65852E-03  1.90000E-01   24000     51.9957    CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED
08/12/94
   4025055  8.62609E-04  1.99999E-02   25055     54.9379     MANGANESE-55   ENDF/B-IV MAT 1197                       UPDATED
08/12/94
   4026304  2.94890E-02  6.95000E-01   26000     55.8447    FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED
08/12/94
   4028304  3.83564E-03  9.50001E-02   28000     58.6872    NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED
08/12/94

MIXTURE =     5          DENSITY(G/CC) =  7.9200
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT             NUCLIDE TITLE
   5024304  1.74286E-02  1.90000E-01   24000     51.9957    CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED
08/12/94
   5025055  1.73633E-03  1.99999E-02   25055     54.9379     MANGANESE-55   ENDF/B-IV MAT 1197                       UPDATED
08/12/94
   5026304  5.93579E-02  6.95000E-01   26000     55.8447    FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED
08/12/94
   5028304  7.72070E-03  9.50001E-02   28000     58.6872    NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED
08/12/94

MIXTURE =     6          DENSITY(G/CC) =  2.7020
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT             NUCLIDE TITLE
   6013027  6.03066E-02  1.00000E+00   13027     26.9818    AL-27 1193 218 GP 040375(5)                             UPDATED
08/12/94

MIXTURE =     7          DENSITY(G/CC) =  11.344
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT             NUCLIDE TITLE
   7082000  3.29690E-02  1.00000E+00   82000    207.2100    PB   1288 218NGP 042375 P-3 293K                         UPDATED
08/12/94

MIXTURE =     8          DENSITY(G/CC) = 0.99817E-20
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT             NUCLIDE TITLE
   8001001  6.67692E-22  1.11927E-01    1001      1.0077     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED
08/12/94
   8008016  3.33846E-22  8.88073E-01    8016     15.9904     OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED
08/12/94

MIXTURE =     9          DENSITY(G/CC) = 0.99817E-20
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT             NUCLIDE TITLE
   9001001  6.67692E-22  1.11927E-01    1001      1.0077     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED
08/12/94
   9008016  3.33846E-22  8.88073E-01    8016     15.9904     OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED
08/12/94

MIXTURE =    10          DENSITY(G/CC) =  1.8643
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT             NUCLIDE TITLE
  10001001  6.61831E-02  5.94016E-02    1001      1.0077     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED
08/12/94
  10008016  2.79665E-02  3.98324E-01    8016     15.9904     OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED
08/12/94
  10040000  6.02930E-03  4.89885E-01   40000     91.2196     ZIRCONIUM      ENDF/B-IV MAT 7141                       UPDATED
08/12/94
  10092235  2.37730E-04  4.97705E-02   92235    235.0441     URANIUM-235    ENDF/B-IV MAT 1261                       UPDATED
08/12/94
  10092238  1.23540E-05  2.61949E-03   92238    238.0510     URANIUM-238    ENDF/B-IV MAT 1262                       UPDATED
08/12/94

MIXTURE =    11          DENSITY(G/CC) = 0.99817
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT             NUCLIDE TITLE
  11001001  6.67692E-02  1.11927E-01    1001      1.0077     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED
08/12/94
  11008016  3.33846E-02  8.88074E-01    8016     15.9904     OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED
08/12/94

MIXTURE =    12          DENSITY(G/CC) = 0.99817E-20
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT             NUCLIDE TITLE
  12001001  6.67692E-22  1.11927E-01    1001      1.0077     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED
08/12/94
  12008016  3.33846E-22  8.88073E-01    8016     15.9904     OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED
08/12/94


                     1001001      HYDROGEN      ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94
                     3001001      HYDROGEN      ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94
                     4001001      HYDROGEN      ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94
                     8001001      HYDROGEN      ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94
                     9001001      HYDROGEN      ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94
                    10001001      HYDROGEN      ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94
                    11001001      HYDROGEN      ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94
                    12001001      HYDROGEN      ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94
                     2006012      CARBON-12     ENDF/B-IV MAT 1274/THRM1065              UPDATED 08/12/94
                     3008016      OXYGEN-16     ENDF/B-IV MAT 1276                       UPDATED 08/12/94
```

```
  4008016     OXYGEN-16       ENDF/B-IV MAT 1276                         UPDATED 08/12/94
  8008016     OXYGEN-16       ENDF/B-IV MAT 1276                         UPDATED 08/12/94
  9008016     OXYGEN-16       ENDF/B-IV MAT 1276                         UPDATED 08/12/94
 10008016     OXYGEN-16       ENDF/B-IV MAT 1276                         UPDATED 08/12/94
 11008016     OXYGEN-16       ENDF/B-IV MAT 1276                         UPDATED 08/12/94
 12008016     OXYGEN-16       ENDF/B-IV MAT 1276                         UPDATED 08/12/94
  2013027    AL-27 1193 218 GP 040375(5)                                 UPDATED 08/12/94
  6013027    AL-27 1193 218 GP 040375(5)                                 UPDATED 08/12/94
  2014000     SILICON         ENDF/B-IV MAT 1194                         UPDATED 08/12/94
  2016000    SULFUR  LENDL MAT 7020                                      UPDATED 08/12/94
  2022000     TITANIUM        ENDF/B-IV MAT 1286                         UPDATED 08/12/94
  2024000    CR 1191 218NGP WT 1/E P-3 293K SIGP=5+4 RE(042375)          UPDATED 08/12/94
  4024304    CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'            UPDATED 08/12/94
  5024304    CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'            UPDATED 08/12/94
  2025055     MANGANESE-55    ENDF/B-IV MAT 1197                         UPDATED 08/12/94
  4025055     MANGANESE-55    ENDF/B-IV MAT 1197                         UPDATED 08/12/94
  5025055     MANGANESE-55    ENDF/B-IV MAT 1197                         UPDATED 08/12/94
  2026000     IRON            ENDF/B-IV MAT 1192                         UPDATED 08/12/94
  4026304    FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'            UPDATED 08/12/94
  5026304    FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'            UPDATED 08/12/94
  2028000    NI 1190 218NGP WT 1/E P-3 293K SIGP=5+4 RE(042375)          UPDATED 08/12/94
  4028304    NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'            UPDATED 08/12/94
  5028304    NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'            UPDATED 08/12/94
  2029000     COPPER          ENDF/B-IV MAT 1295                         UPDATED 08/12/94
  1040000     ZIRCONIUM       ENDF/B-IV MAT 7141                         UPDATED 08/12/94
 10040000     ZIRCONIUM       ENDF/B-IV MAT 7141                         UPDATED 08/12/94
  7082000    PB   1288 218NGP 042375 P-3 293K                            UPDATED 08/12/94
  1092235     URANIUM-235     ENDF/B-IV MAT 1261                         UPDATED 08/12/94
 10092235     URANIUM-235     ENDF/B-IV MAT 1261                         UPDATED 08/12/94
  1092238     URANIUM-238     ENDF/B-IV MAT 1262                         UPDATED 08/12/94
 10092238     URANIUM-238     ENDF/B-IV MAT 1262                         UPDATED 08/12/94
```

```
*******************************************************************************************
***                                                                                     ***
***          TRIGA - PREF. FLOOD CANISTER                                               ***
***                                                                                     ***
*******************************************************************************************
*******************************************************************************************
***                                                                                     ***
***                         ****** ADDITIONAL INFORMATION ******                        ***
***                                                                                     ***
*** NUMBER OF ENERGY GROUPS              27     USE LATTICE GEOMETRY                YES ***
***                                                                                     ***
*** NO. OF FISSION SPECTRUM SOURCE GROUP  1     GLOBAL ARRAY NUMBER                  20 ***
***                                                                                     ***
*** NO. OF SCATTERING ANGLES IN XSECS     2     NUMBER OF UNITS IN THE GLOBAL X DIR.  1 ***
***                                                                                     ***
*** ENTRIES/NEUTRON IN THE NEUTRON BANK  26     NUMBER OF UNITS IN THE GLOBAL Y DIR.  1 ***
***                                                                                     ***
*** ENTRIES/NEUTRON IN THE FISSION BANK  19     NUMBER OF UNITS IN THE GLOBAL Z DIR.  7 ***
***                                                                                     ***
*** NUMBER OF MIXTURES USED              11     USE A GLOBAL REFLECTOR              YES ***
***                                                                                     ***
*** NUMBER OF BIAS ID'S USED              1     USE NESTED HOLES                    YES ***
***                                                                                     ***
*** NUMBER OF DIFFERENTIAL ALBEDOS USED   0     NUMBER OF HOLES                     140 ***
***                                                                                     ***
*** TOTAL INPUT GEOMETRY REGIONS         91     MAXIMUM HOLE NESTING LEVEL            4 ***
***                                                                                     ***
*** NUMBER OF GEOMETRY REGIONS USED      87     USE NESTED ARRAYS                   YES ***
***                                                                                     ***
*** LARGEST GEOMETRY UNIT NUMBER        450     NUMBER OF ARRAYS USED                 7 ***
***                                                                                     ***
*** LARGEST ARRAY NUMBER                 43     MAXIMUM ARRAY NESTING LEVEL           2 ***
***                                                                                     ***
***                                                                                     ***
*** +X BOUNDARY CONDITION               MIR     -X BOUNDARY CONDITION               MIR ***
***                                                                                     ***
*** +Y BOUNDARY CONDITION               MIR     -Y BOUNDARY CONDITION               MIR ***
***                                                                                     ***
*** +Z BOUNDARY CONDITION               MIR     -Z BOUNDARY CONDITION               MIR ***
***                                                                                     ***
*******************************************************************************************
```

ARRAY NUMBER	UNITS IN X DIR.	UNITS IN Y DIR.	UNITS IN Z DIR.	NESTING LEVEL
1	1	5	1	2
2	1	3	1	2
3	1	3	1	2
20 GLOBAL	1	1	7	1
41	1	5	1	2
42	1	3	1	2
43	1	3	1	2

.... 0 IO'S WERE USED LOADING THE DATA ....

```
                                        TRIGA - PREF. FLOOD CANISTER

                    MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION               NUM   ID

                                                   -----  UNIT     1   -----

TRIGA FUEL (SMEARED)

  1 CYLINDER          10   1  RADIUS =  3.9623     +Z =  60.959     -Z = 1.00000E-03 CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                                   -----  UNIT     5   -----

3.38 IN WIDTH / 0.28 IN THICKNESS DIVIDER CENTER STACK (SEALED)

  1 CUBOID             5   1      +X =  4.2672     -X = -4.2672     +Y = 0.71120     -Y = 0.00000     +Z =  74.290     -Z = -8.2550

                                                   -----  UNIT     6   -----

3.38 IN WIDTH / 0.24 IN THICKNESS DIVIDER OUTSIDE STACK (SEALED)

  1 CUBOID             5   1      +X =  4.2672     -X = -4.2672     +Y = 0.60960     -Y = 0.00000     +Z =  74.290     -Z = -8.2550

                                                   -----  UNIT     7   -----

SEALED CANISTER

  1 CYLINDER          11   1  RADIUS =  3.9624     +Z =  60.960     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
    HOLE NUMBER        1      AT X = 0.00000     Y = 0.00000     Z = 0.00000     IS UNIT NUMBER      1
  2 CYLINDER           5   1  RADIUS =  4.1275     +Z =  63.500     -Z = -1.2700     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  3 CYLINDER           3   1  RADIUS =  4.1275     +Z =  74.290     -Z = -8.2550     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                                   -----  UNIT    10   -----

TRIGA ELEMENTS IN TOP OF 3.38 IN X 3.38 IN OPENING (SEALED)

  1 CUBOID             3   1      +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  74.290     -Z = -8.2550
    HOLE NUMBER        2      AT X = 0.00000     Y = 0.13970     Z = 0.00000     IS UNIT NUMBER      7

                                                   -----  UNIT    11   -----

TRIGA ELEMENTS IN BOTTOM OF 3.38 IN X 3.38 IN OPENING (SEALED)

  1 CUBOID             3   1      +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  74.290     -Z = -8.2550
    HOLE NUMBER        3      AT X = 0.00000     Y =-0.13970     Z = 0.00000     IS UNIT NUMBER      7
```

```
                                              TRIGA - PREF. FLOOD CANISTER

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                                          -----  UNIT    12   -----

TRIGA ELEMENTS IN BOTTOM RIGHT OF 3.38 IN X 3.38 IN OPENING (SEALED)

  1 CUBOID            3  1      +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  74.290     -Z = -8.2550

    HOLE NUMBER       4      AT X = 0.13970     Y =-0.13970     Z = 0.00000     IS UNIT NUMBER      7

                                                          -----  UNIT    13   -----

TRIGA ELEMENTS IN TOP RIGHT OF 3.38 IN X 3.38 IN OPENING (SEALED)

  1 CUBOID            3  1      +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  74.290     -Z = -8.2550

    HOLE NUMBER       5      AT X = 0.13970     Y = 0.13970     Z = 0.00000     IS UNIT NUMBER      7

                                                          -----  UNIT    14   -----

TRIGA ELEMENTS IN BOTTOM LEFT OF 3.38 IN X 3.38 IN OPENING (SEALED)

  1 CUBOID            3  1      +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  74.290     -Z = -8.2550

    HOLE NUMBER       6      AT X =-0.13970     Y =-0.13970     Z = 0.00000     IS UNIT NUMBER      7

                                                          -----  UNIT    15   -----

TRIGA ELEMENTS IN TOP LEFT OF 3.38 IN X 3.38 IN OPENING (SEALED)

  1 CUBOID            3  1      +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  74.290     -Z = -8.2550

    HOLE NUMBER       7      AT X =-0.13970     Y = 0.13970     Z = 0.00000     IS UNIT NUMBER      7

                                                          -----  UNIT    16   -----

TRIGA BASKET 3.38 IN X 3.38 IN CENTER OPENING (SEALED)

  1 CUBOID            3  1      +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  74.290     -Z = -8.2550

                                              -----  UNIT    20  EXTERNAL TO LATTICE  1   -----

CENTER COLUMN OF THREE OPENINGS W/ 0.28 IN PLATE (SEALED)

  1 ARRAY NUMBER      1             +X =  4.2672     -X = -4.2672     +Y =  13.513     -Y = -13.513     +Z =  74.290     -Z = -8.2550

  2 CUBOID            5  1      +X =  4.9784     -X = -4.9784     +Y =  14.224     -Y = -14.224     +Z =  74.290     -Z = -8.2550
```

```
                                        TRIGA - PREF. FLOOD CANISTER

               MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION          NUM   ID

                                        -----  UNIT    21  EXTERNAL TO LATTICE  2   -----

LEFT OUTSIDE COLUMN OF TWO OPENINGS W/ 0.12 IN PLATE (SEALED)

  1 ARRAY NUMBER    2         +X =  4.2672    -X = -4.2672    +Y =  8.8392    -Y = -8.8392    +Z =  74.290    -Z = -8.2550

  2 CUBOID          5  1      +X =  4.2672    -X = -4.5720    +Y =  9.1440    -Y = -9.1440    +Z =  74.290    -Z = -8.2550

                                        -----  UNIT    22  EXTERNAL TO LATTICE  3   -----

RIGHT OUTSIDE COLUMN OF TWO OPENINGS W/ 0.12 IN PLATE (SEALED)

  1 ARRAY NUMBER    3         +X =  4.2672    -X = -4.2672    +Y =  8.8392    -Y = -8.8392    +Z =  74.290    -Z = -8.2550

  2 CUBOID          5  1      +X =  4.5720    -X = -4.2672    +Y =  9.1440    -Y = -9.1440    +Z =  74.290    -Z = -8.2550

                                                -----  UNIT    30   -----

NAC-LWT TRIGA BASKET (SEALED)

  1 CYLINDER        3  1  RADIUS =  17.100    +Z =  74.290    -Z = -8.2550    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

    HOLE NUMBER     8       AT X = 0.00000     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER     20

    HOLE NUMBER     9       AT X = -9.2457     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER     21

    HOLE NUMBER    10       AT X =  9.2457     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER     22

  2 CYLINDER        5  1  RADIUS =  18.910    +Z =  74.930    -Z = -8.8900    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CYLINDER        7  1  RADIUS =  33.465    +Z =  74.930    -Z = -8.8900    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  4 CYLINDER        5  1  RADIUS =  36.519    +Z =  74.930    -Z = -8.8900    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  5 CYLINDER        8  1  RADIUS =  49.223    +Z =  74.930    -Z = -8.8900    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  6 CYLINDER        5  1  RADIUS =  49.822    +Z =  74.930    -Z = -8.8900    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  7 CUBOID          9  1      +X =  49.822    -X = -49.822    +Y =  49.822    -Y = -49.822    +Z =  74.930    -Z = -8.8900

                                                -----  UNIT    41   -----

TRIGA FUEL ELEMENT

  1 CYLINDER        1  1  RADIUS = 0.67310    +Z =  28.575    -Z = -28.575    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  2 CYLINDER        2  1  RADIUS = 0.71120    +Z =  28.575    -Z = -28.575    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CYLINDER        4  1  RADIUS = 0.71120    +Z =  43.480    -Z = -33.040    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
```

```
                                TRIGA - PREF. FLOOD CANISTER

              MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION         NUM   ID

                                          -----  UNIT    45   -----

DIVIDER CENTER STACK

  1 CUBOID           5  1       +X =  4.2672    -X = -4.2672    +Y = 0.71120    -Y = 0.00000    +Z =  43.480    -Z = -33.040

                                          -----  UNIT    46   -----

DIVIDER OUTSIDE STACK

  1 CUBOID           5  1       +X =  4.2672    -X = -4.2672    +Y = 0.60960    -Y = 0.00000    +Z =  43.480    -Z = -33.040

                                          -----  UNIT    80   -----

SIMPLIFIED LID STRUCTURE NAC-LWT

  1 CYLINDER         5  1  RADIUS =  36.519    +Z =  14.135    -Z = -14.135    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

  2 CYLINDER         9  1  RADIUS =  49.822    +Z =  14.135    -Z = -14.135    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

  3 CUBOID           9  1       +X =  49.822    -X = -49.822    +Y =  49.822    -Y = -49.822    +Z =  14.135    -Z = -14.135

                                          -----  UNIT    81   -----

SIMPLIFIED CASK BOTTOM STRUCTURE NAC-LWT

  1 CYLINDER         7  1  RADIUS =  26.353    +Z =  3.8100    -Z = -3.8100    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

  2 CYLINDER         5  1  RADIUS =  36.619    +Z =  13.970    -Z = -12.700    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

  3 CYLINDER         9  1  RADIUS =  49.822    +Z =  13.970    -Z = -12.700    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

  4 CUBOID           9  1       +X =  49.822    -X = -49.822    +Y =  49.822    -Y = -49.822    +Z =  13.970    -Z = -12.700

                                ******************   GLOBAL   ******************
                                -----  UNIT    82  EXTERNAL TO LATTICE 20   -----

STACK OF 5 BASKETS IN CASK

  1 ARRAY NUMBER    20          +X =  49.822    -X = -49.822    +Y =  49.822    -Y = -49.822    +Z =  230.87    -Z = -221.30

                                          -----  UNIT   411   -----

TRIGA FUEL ELEMENTS IN AL TUBE, RIGHT

  1 CYLINDER         3  1  RADIUS = 0.80518    +Z =  43.480    -Z = -33.040    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

    HOLE NUMBER     12      AT X = 9.38000E-02  Y = 0.00000     Z = 0.00000    IS UNIT NUMBER     41

  2 CYLINDER         6  1  RADIUS = 0.95250    +Z =  43.480    -Z = -33.040    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
```

```
                                   TRIGA - PREF. FLOOD CANISTER

               MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION          NUM   ID

                                           -----  UNIT   412   -----

TRIGA FUEL ELEMENTS IN AL TUBE, LEFT

  1 CYLINDER        3  1  RADIUS = 0.80518     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

    HOLE NUMBER    13       AT X =-9.38000E-02  Y = 0.00000      Z = 0.00000     IS UNIT NUMBER    41

  2 CYLINDER        6  1  RADIUS = 0.95250     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                           -----  UNIT   413   -----

TRIGA FUEL ELEMENTS IN AL TUBE, TOP

  1 CYLINDER        3  1  RADIUS = 0.80518     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

    HOLE NUMBER    14       AT X = 0.00000      Y = 9.38000E-02  Z = 0.00000     IS UNIT NUMBER    41

  2 CYLINDER        6  1  RADIUS = 0.95250     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                           -----  UNIT   414   -----

TRIGA FUEL ELEMENTS IN AL TUBE, BOTTOM

  1 CYLINDER        3  1  RADIUS = 0.80518     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

    HOLE NUMBER    15       AT X = 0.00000      Y =-9.38000E-02  Z = 0.00000     IS UNIT NUMBER    41

  2 CYLINDER        6  1  RADIUS = 0.95250     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                           -----  UNIT   415   -----

TRIGA FUEL ELEMENTS IN AL TUBE, TOP RIGHT

  1 CYLINDER        3  1  RADIUS = 0.80518     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

    HOLE NUMBER    16       AT X = 6.62000E-02  Y = 6.62000E-02  Z = 0.00000     IS UNIT NUMBER    41

  2 CYLINDER        6  1  RADIUS = 0.95250     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                           -----  UNIT   416   -----

TRIGA FUEL ELEMENTS IN AL TUBE, TOP LEFT

  1 CYLINDER        3  1  RADIUS = 0.80518     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

    HOLE NUMBER    17       AT X =-6.62000E-02  Y = 6.62000E-02  Z = 0.00000     IS UNIT NUMBER    41

  2 CYLINDER        6  1  RADIUS = 0.95250     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
```

```
                                    TRIGA - PREF. FLOOD CANISTER

                  MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION             NUM   ID

                                               -----  UNIT   417   -----

TRIGA FUEL ELEMENTS IN AL TUBE, BOTTOM RIGHT

  1 CYLINDER         3  1  RADIUS = 0.80518     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

    HOLE NUMBER     18       AT X = 6.62000E-02  Y =-6.62000E-02  Z = 0.00000     IS UNIT NUMBER     41

  2 CYLINDER         6  1  RADIUS = 0.95250     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                               -----  UNIT   418   -----

TRIGA FUEL ELEMENTS IN AL TUBE, BOTTOM LEFT

  1 CYLINDER         3  1  RADIUS = 0.80518     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

    HOLE NUMBER     19       AT X =-6.62000E-02  Y =-6.62000E-02  Z = 0.00000     IS UNIT NUMBER     41

  2 CYLINDER         6  1  RADIUS = 0.95250     +Z =  43.480     -Z = -33.040     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
```

TRIGA - PREF. FLOOD CANISTER

```
                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID


                                                    -----  UNIT  421  -----

AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, BOTTOM OPENING

  1 CUBOID              3   1      +X =   4.1529    -X = -4.1529    +Y =   4.1529    -Y = -4.1529     +Z =   43.480    -Z = -33.040
    HOLE NUMBER        36      AT X = -2.8576      Y = -2.8576      Z = 0.00000     IS UNIT NUMBER    415
    HOLE NUMBER        37      AT X =-0.95250      Y = -2.8576      Z = 0.00000     IS UNIT NUMBER    413
    HOLE NUMBER        38      AT X = 0.95250      Y = -2.8576      Z = 0.00000     IS UNIT NUMBER    413
    HOLE NUMBER        39      AT X =  2.8576      Y = -2.8576      Z = 0.00000     IS UNIT NUMBER    416
    HOLE NUMBER        40      AT X = -2.8576      Y =-0.95250      Z = 0.00000     IS UNIT NUMBER    411
    HOLE NUMBER        41      AT X =-0.95250      Y =-0.95250      Z = 0.00000     IS UNIT NUMBER    415
    HOLE NUMBER        42      AT X = 0.95250      Y =-0.95250      Z = 0.00000     IS UNIT NUMBER    416
    HOLE NUMBER        43      AT X =  2.8576      Y =-0.95250      Z = 0.00000     IS UNIT NUMBER    412
    HOLE NUMBER        44      AT X = -2.8576      Y = 0.95250      Z = 0.00000     IS UNIT NUMBER    411
    HOLE NUMBER        45      AT X =-0.95250      Y = 0.95250      Z = 0.00000     IS UNIT NUMBER    417
    HOLE NUMBER        46      AT X = 0.95250      Y = 0.95250      Z = 0.00000     IS UNIT NUMBER    418
    HOLE NUMBER        47      AT X =  2.8576      Y = 0.95250      Z = 0.00000     IS UNIT NUMBER    412
    HOLE NUMBER        48      AT X = -2.8576      Y =  2.8576      Z = 0.00000     IS UNIT NUMBER    417
    HOLE NUMBER        49      AT X =-0.95250      Y =  2.8576      Z = 0.00000     IS UNIT NUMBER    414
    HOLE NUMBER        50      AT X = 0.95250      Y =  2.8576      Z = 0.00000     IS UNIT NUMBER    414
    HOLE NUMBER        51      AT X =  2.8576      Y =  2.8576      Z = 0.00000     IS UNIT NUMBER    418
  2 CUBOID              3   1      +X =   4.1529    -X = -4.1529    +Y =   4.1529    -Y = -4.1529     +Z =   43.480    -Z = -33.040
```

```
                                        TRIGA - PREF. FLOOD CANISTER

                MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID

                                                  -----  UNIT   422  -----

AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, TOP OPENING

  1 CUBOID          3  1      +X =  4.1529     -X = -4.1529     +Y =  4.1529     -Y = -4.1529     +Z =  43.480     -Z = -33.040
    HOLE NUMBER     52       AT X = -2.8576      Y = -2.8576       Z = 0.00000      IS UNIT NUMBER    415
    HOLE NUMBER     53       AT X =-0.95250      Y = -2.8576       Z = 0.00000      IS UNIT NUMBER    413
    HOLE NUMBER     54       AT X = 0.95250      Y = -2.8576       Z = 0.00000      IS UNIT NUMBER    413
    HOLE NUMBER     55       AT X =  2.8576      Y = -2.8576       Z = 0.00000      IS UNIT NUMBER    416
    HOLE NUMBER     56       AT X = -2.8576      Y =-0.95250       Z = 0.00000      IS UNIT NUMBER    411
    HOLE NUMBER     57       AT X =-0.95250      Y =-0.95250       Z = 0.00000      IS UNIT NUMBER    415
    HOLE NUMBER     58       AT X = 0.95250      Y =-0.95250       Z = 0.00000      IS UNIT NUMBER    416
    HOLE NUMBER     59       AT X =  2.8576      Y =-0.95250       Z = 0.00000      IS UNIT NUMBER    412
    HOLE NUMBER     60       AT X = -2.8576      Y = 0.95250       Z = 0.00000      IS UNIT NUMBER    411
    HOLE NUMBER     61       AT X =-0.95250      Y = 0.95250       Z = 0.00000      IS UNIT NUMBER    417
    HOLE NUMBER     62       AT X = 0.95250      Y = 0.95250       Z = 0.00000      IS UNIT NUMBER    418
    HOLE NUMBER     63       AT X =  2.8576      Y = 0.95250       Z = 0.00000      IS UNIT NUMBER    412
    HOLE NUMBER     64       AT X = -2.8576      Y =  2.8576       Z = 0.00000      IS UNIT NUMBER    417
    HOLE NUMBER     65       AT X =-0.95250      Y =  2.8576       Z = 0.00000      IS UNIT NUMBER    414
    HOLE NUMBER     66       AT X = 0.95250      Y =  2.8576       Z = 0.00000      IS UNIT NUMBER    414
    HOLE NUMBER     67       AT X =  2.8576      Y =  2.8576       Z = 0.00000      IS UNIT NUMBER    418
  2 CUBOID          3  1      +X =  4.1529     -X = -4.1529     +Y =  4.1529     -Y = -4.1529     +Z =  43.480     -Z = -33.040
```

```
                                        TRIGA - PREF. FLOOD CANISTER

                  MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION             NUM   ID

                                                   -----   UNIT   423   -----

AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, BOTTOM LEFT OPENING

  1 CUBOID            3   1      +X =   4.1529     -X = -4.1529     +Y =   4.1529     -Y = -4.1529     +Z =  43.480     -Z = -33.040
    HOLE NUMBER      68      AT X = -2.8576      Y = -2.8576      Z = 0.00000     IS UNIT NUMBER    415
    HOLE NUMBER      69      AT X =-0.95250      Y = -2.8576      Z = 0.00000     IS UNIT NUMBER    413
    HOLE NUMBER      70      AT X = 0.95250      Y = -2.8576      Z = 0.00000     IS UNIT NUMBER    413
    HOLE NUMBER      71      AT X =  2.8576      Y = -2.8576      Z = 0.00000     IS UNIT NUMBER    416
    HOLE NUMBER      72      AT X = -2.8576      Y =-0.95250      Z = 0.00000     IS UNIT NUMBER    411
    HOLE NUMBER      73      AT X =-0.95250      Y =-0.95250      Z = 0.00000     IS UNIT NUMBER    415
    HOLE NUMBER      74      AT X = 0.95250      Y =-0.95250      Z = 0.00000     IS UNIT NUMBER    416
    HOLE NUMBER      75      AT X =  2.8576      Y =-0.95250      Z = 0.00000     IS UNIT NUMBER    412
    HOLE NUMBER      76      AT X = -2.8576      Y = 0.95250      Z = 0.00000     IS UNIT NUMBER    411
    HOLE NUMBER      77      AT X =-0.95250      Y = 0.95250      Z = 0.00000     IS UNIT NUMBER    417
    HOLE NUMBER      78      AT X = 0.95250      Y = 0.95250      Z = 0.00000     IS UNIT NUMBER    418
    HOLE NUMBER      79      AT X =  2.8576      Y = 0.95250      Z = 0.00000     IS UNIT NUMBER    412
    HOLE NUMBER      80      AT X = -2.8576      Y =  2.8576      Z = 0.00000     IS UNIT NUMBER    417
    HOLE NUMBER      81      AT X =-0.95250      Y =  2.8576      Z = 0.00000     IS UNIT NUMBER    414
    HOLE NUMBER      82      AT X = 0.95250      Y =  2.8576      Z = 0.00000     IS UNIT NUMBER    414
    HOLE NUMBER      83      AT X =  2.8576      Y =  2.8576      Z = 0.00000     IS UNIT NUMBER    418
  2 CUBOID            3   1      +X =   4.1529     -X = -4.1529     +Y =   4.1529     -Y = -4.1529     +Z =  43.480     -Z = -33.040
```

TRIGA - PREF. FLOOD CANISTER

REGION	MEDIA NUM	BIAS ID	GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM					
			----- UNIT 424 -----					
AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, TOP LEFT OPENING								
1 CUBOID	3	1	+X = 4.1529	-X = -4.1529	+Y = 4.1529	-Y = -4.1529	+Z = 43.480	-Z = -33.040
HOLE NUMBER	84		AT X = -2.8576	Y = -2.8576	Z = 0.00000	IS UNIT NUMBER	415	
HOLE NUMBER	85		AT X =-0.95250	Y = -2.8576	Z = 0.00000	IS UNIT NUMBER	413	
HOLE NUMBER	86		AT X = 0.95250	Y = -2.8576	Z = 0.00000	IS UNIT NUMBER	413	
HOLE NUMBER	87		AT X = 2.8576	Y = -2.8576	Z = 0.00000	IS UNIT NUMBER	416	
HOLE NUMBER	88		AT X = -2.8576	Y =-0.95250	Z = 0.00000	IS UNIT NUMBER	411	
HOLE NUMBER	89		AT X =-0.95250	Y =-0.95250	Z = 0.00000	IS UNIT NUMBER	415	
HOLE NUMBER	90		AT X = 0.95250	Y =-0.95250	Z = 0.00000	IS UNIT NUMBER	416	
HOLE NUMBER	91		AT X = 2.8576	Y =-0.95250	Z = 0.00000	IS UNIT NUMBER	412	
HOLE NUMBER	92		AT X = -2.8576	Y = 0.95250	Z = 0.00000	IS UNIT NUMBER	411	
HOLE NUMBER	93		AT X =-0.95250	Y = 0.95250	Z = 0.00000	IS UNIT NUMBER	417	
HOLE NUMBER	94		AT X = 0.95250	Y = 0.95250	Z = 0.00000	IS UNIT NUMBER	418	
HOLE NUMBER	95		AT X = 2.8576	Y = 0.95250	Z = 0.00000	IS UNIT NUMBER	412	
HOLE NUMBER	96		AT X = -2.8576	Y = 2.8576	Z = 0.00000	IS UNIT NUMBER	417	
HOLE NUMBER	97		AT X =-0.95250	Y = 2.8576	Z = 0.00000	IS UNIT NUMBER	414	
HOLE NUMBER	98		AT X = 0.95250	Y = 2.8576	Z = 0.00000	IS UNIT NUMBER	414	
HOLE NUMBER	99		AT X = 2.8576	Y = 2.8576	Z = 0.00000	IS UNIT NUMBER	418	
2 CUBOID	3	1	+X = 4.1529	-X = -4.1529	+Y = 4.1529	-Y = -4.1529	+Z = 43.480	-Z = -33.040

TRIGA - PREF. FLOOD CANISTER

```
              MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION         NUM   ID

                                  -----  UNIT   425   -----

AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, BOTTOM RIGHT OPENING

  1 CUBOID          3  1     +X =  4.1529    -X = -4.1529    +Y =  4.1529    -Y = -4.1529    +Z =  43.480    -Z = -33.040
    HOLE NUMBER    100     AT X = -2.8576    Y = -2.8576     Z = 0.00000    IS UNIT NUMBER   415
    HOLE NUMBER    101     AT X =-0.95250    Y = -2.8576     Z = 0.00000    IS UNIT NUMBER   413
    HOLE NUMBER    102     AT X = 0.95250    Y = -2.8576     Z = 0.00000    IS UNIT NUMBER   413
    HOLE NUMBER    103     AT X =  2.8576    Y = -2.8576     Z = 0.00000    IS UNIT NUMBER   416
    HOLE NUMBER    104     AT X = -2.8576    Y =-0.95250     Z = 0.00000    IS UNIT NUMBER   411
    HOLE NUMBER    105     AT X =-0.95250    Y =-0.95250     Z = 0.00000    IS UNIT NUMBER   415
    HOLE NUMBER    106     AT X = 0.95250    Y =-0.95250     Z = 0.00000    IS UNIT NUMBER   416
    HOLE NUMBER    107     AT X =  2.8576    Y =-0.95250     Z = 0.00000    IS UNIT NUMBER   412
    HOLE NUMBER    108     AT X = -2.8576    Y = 0.95250     Z = 0.00000    IS UNIT NUMBER   411
    HOLE NUMBER    109     AT X =-0.95250    Y = 0.95250     Z = 0.00000    IS UNIT NUMBER   417
    HOLE NUMBER    110     AT X = 0.95250    Y = 0.95250     Z = 0.00000    IS UNIT NUMBER   418
    HOLE NUMBER    111     AT X =  2.8576    Y = 0.95250     Z = 0.00000    IS UNIT NUMBER   412
    HOLE NUMBER    112     AT X = -2.8576    Y =  2.8576     Z = 0.00000    IS UNIT NUMBER   417
    HOLE NUMBER    113     AT X =-0.95250    Y =  2.8576     Z = 0.00000    IS UNIT NUMBER   414
    HOLE NUMBER    114     AT X = 0.95250    Y =  2.8576     Z = 0.00000    IS UNIT NUMBER   414
    HOLE NUMBER    115     AT X =  2.8576    Y =  2.8576     Z = 0.00000    IS UNIT NUMBER   418
  2 CUBOID          3  1     +X =  4.1529    -X = -4.1529    +Y =  4.1529    -Y = -4.1529    +Z =  43.480    -Z = -33.040
```

```
                                   TRIGA - PREF. FLOOD CANISTER

                     MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION                NUM   ID

                                                  -----   UNIT   426   -----

AL TUBES WITH TRIGA FUEL, IN FUEL INSERT, TOP RIGHT OPENING
  1 CUBOID              3   1      +X =   4.1529    -X = -4.1529    +Y =   4.1529    -Y = -4.1529    +Z =  43.480    -Z = -33.040
    HOLE NUMBER     116       AT X = -2.8576      Y = -2.8576      Z = 0.00000     IS UNIT NUMBER     415
    HOLE NUMBER     117       AT X =-0.95250      Y = -2.8576      Z = 0.00000     IS UNIT NUMBER     413
    HOLE NUMBER     118       AT X = 0.95250      Y = -2.8576      Z = 0.00000     IS UNIT NUMBER     413
    HOLE NUMBER     119       AT X =  2.8576      Y = -2.8576      Z = 0.00000     IS UNIT NUMBER     416
    HOLE NUMBER     120       AT X = -2.8576      Y =-0.95250      Z = 0.00000     IS UNIT NUMBER     411
    HOLE NUMBER     121       AT X =-0.95250      Y =-0.95250      Z = 0.00000     IS UNIT NUMBER     415
    HOLE NUMBER     122       AT X = 0.95250      Y =-0.95250      Z = 0.00000     IS UNIT NUMBER     416
    HOLE NUMBER     123       AT X =  2.8576      Y =-0.95250      Z = 0.00000     IS UNIT NUMBER     412
    HOLE NUMBER     124       AT X = -2.8576      Y = 0.95250      Z = 0.00000     IS UNIT NUMBER     411
    HOLE NUMBER     125       AT X =-0.95250      Y = 0.95250      Z = 0.00000     IS UNIT NUMBER     417
    HOLE NUMBER     126       AT X = 0.95250      Y = 0.95250      Z = 0.00000     IS UNIT NUMBER     418
    HOLE NUMBER     127       AT X =  2.8576      Y = 0.95250      Z = 0.00000     IS UNIT NUMBER     412
    HOLE NUMBER     128       AT X = -2.8576      Y =  2.8576      Z = 0.00000     IS UNIT NUMBER     417
    HOLE NUMBER     129       AT X =-0.95250      Y =  2.8576      Z = 0.00000     IS UNIT NUMBER     414
    HOLE NUMBER     130       AT X = 0.95250      Y =  2.8576      Z = 0.00000     IS UNIT NUMBER     414
    HOLE NUMBER     131       AT X =  2.8576      Y =  2.8576      Z = 0.00000     IS UNIT NUMBER     418
  2 CUBOID              3   1      +X =   4.1529    -X = -4.1529    +Y =   4.1529    -Y = -4.1529    +Z =  43.480    -Z = -33.040

                                                  -----   UNIT   430   -----

FUEL INSERT IN, CENTER OPENING
  1 CUBOID              3   1      +X =   4.2672    -X = -4.2672    +Y =   4.2672    -Y = -4.2672    +Z =  43.480    -Z = -33.040

                                                  -----   UNIT   431   -----

FUEL INSERT IN, BOTTOM OPENING
  1 CUBOID              3   1      +X =   4.2672    -X = -4.2672    +Y =   4.2672    -Y = -4.2672    +Z =  43.480    -Z = -33.040
    HOLE NUMBER     132       AT X = 0.00000      Y =-0.11430      Z = 0.00000     IS UNIT NUMBER     421
```

```
                                        TRIGA - PREF. FLOOD CANISTER

                  MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION             NUM   ID

                                                  -----  UNIT   432   -----

FUEL INSERT IN, TOP OPENING

  1 CUBOID            3   1      +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  43.480     -Z = -33.040

    HOLE NUMBER    133        AT X = 0.00000      Y = 0.11430      Z = 0.00000      IS UNIT NUMBER    422

                                                  -----  UNIT   433   -----

FUEL INSERT IN, BOTTOM LEFT OPENING

  1 CUBOID            3   1      +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  43.480     -Z = -33.040

    HOLE NUMBER    134        AT X =-0.11430      Y =-0.11430      Z = 0.00000      IS UNIT NUMBER    423

                                                  -----  UNIT   434   -----

FUEL INSERT IN, TOP LEFT OPENING

  1 CUBOID            3   1      +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  43.480     -Z = -33.040

    HOLE NUMBER    135        AT X =-0.11430      Y = 0.11430      Z = 0.00000      IS UNIT NUMBER    424

                                                  -----  UNIT   435   -----

FUEL INSERT IN, BOTOM RIGHT OPENING

  1 CUBOID            3   1      +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  43.480     -Z = -33.040

    HOLE NUMBER    136        AT X = 0.11430      Y =-0.11430      Z = 0.00000      IS UNIT NUMBER    425

                                                  -----  UNIT   436   -----

FUEL INSERT IN, TOP RIGHT OPENING

  1 CUBOID            3   1      +X =  4.2672     -X = -4.2672     +Y =  4.2672     -Y = -4.2672     +Z =  43.480     -Z = -33.040

    HOLE NUMBER    137        AT X = 0.11430      Y = 0.11430      Z = 0.00000      IS UNIT NUMBER    426

                                          -----  UNIT   440  EXTERNAL TO LATTICE 41   -----

CENTER COLUMN OF THREE OPENINGS

  1 ARRAY NUMBER     41          +X =  4.2672     -X = -4.2672     +Y =  13.513     -Y = -13.513     +Z =  43.480     -Z = -33.040

  2 CUBOID            5   1      +X =  4.9784     -X = -4.9784     +Y =  14.224     -Y = -14.224     +Z =  43.480     -Z = -33.040
```

```
                              TRIGA - PREF. FLOOD CANISTER

                MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID

                              -----  UNIT   441  EXTERNAL TO LATTICE 42   -----

LEFT OUTSIDE COLUMN OF TWO OPENINGS

  1 ARRAY NUMBER    42          +X =  4.2672    -X = -4.2672    +Y =  8.8392    -Y = -8.8392    +Z =  43.480    -Z = -33.040

  2 CUBOID           5  1       +X =  4.2672    -X = -4.6080    +Y =  9.1800    -Y = -9.1800    +Z =  43.480    -Z = -33.040

                              -----  UNIT   442  EXTERNAL TO LATTICE 43   -----

RIGHT OUTSIDE COLUMN OF TWO OPENINGS

  1 ARRAY NUMBER    43          +X =  4.2672    -X = -4.2672    +Y =  8.8392    -Y = -8.8392    +Z =  43.480    -Z = -33.040

  2 CUBOID           5  1       +X =  4.6080    -X = -4.2672    +Y =  9.1800    -Y = -9.1800    +Z =  43.480    -Z = -33.040

                                           -----  UNIT   450   -----

96 TRIGA FUEL ELEMENTS IN EACH LWT BASKET

  1 CYLINDER         3  1  RADIUS =  17.150    +Z =  43.485    -Z = -33.045    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

    HOLE NUMBER    138       AT X = 0.00000     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER    440

    HOLE NUMBER    139       AT X = -9.2457     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER    441

    HOLE NUMBER    140       AT X =  9.2457     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER    442

  2 CYLINDER         5  1  RADIUS =  18.910    +Z =  43.485    -Z = -33.045    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

  3 CYLINDER         7  1  RADIUS =  33.465    +Z =  43.485    -Z = -33.045    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

  4 CYLINDER         5  1  RADIUS =  36.519    +Z =  43.485    -Z = -33.045    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

  5 CYLINDER         8  1  RADIUS =  49.223    +Z =  43.485    -Z = -33.045    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

  6 CYLINDER         5  1  RADIUS =  49.822    +Z =  43.485    -Z = -33.045    CENTERLINE IS AT  X = 0.00000    Y = 0.00000

  7 CUBOID           9  1       +X =  49.822    -X = -49.822    +Y =  49.822    -Y = -49.822    +Z =  43.485    -Z = -33.045
```

```
                    TRIGA - PREF. FLOOD CANISTER

              -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   1         -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   5  BOTTOM TO TOP

 11

  5

 16

  5

 10

              -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   2         -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   3  BOTTOM TO TOP

 12

  6

 13

              -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   3         -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   3  BOTTOM TO TOP

 14

  6

 15
```

```
                         TRIGA - PREF. FLOOD CANISTER

                  -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  20         -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

  61
Z LAYER   2, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

  30
Z LAYER   3, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

 450
Z LAYER   4, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

 450
Z LAYER   5, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

 450
Z LAYER   6, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

  30
Z LAYER   7, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

  80

                  -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  41         -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   5  BOTTOM TO TOP

 431

  45

 430

  45

 432
```

```
                    TRIGA - PREF. FLOOD CANISTER

               ------- UNIT ORIENTATION DESCRIPTION FOR ARRAY  42        -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   3  BOTTOM TO TOP

 435

  46

 436

               ------- UNIT ORIENTATION DESCRIPTION FOR ARRAY  43        -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   3  BOTTOM TO TOP

 433

  46

 434

                                        TOTAL MIXTURE VOLUMES
                                  MIXTURE        TOTAL VOLUME            MASS(G)
                                     1        2.34271E+04 CM**3       1.48384E+05
                                     2        2.72718E+03 CM**3       2.19061E+04
                                     3        2.30497E+05 CM**3       2.30076E-15
                                     4        8.86453E+03 CM**3       3.48789E+04
                                     5        6.81739E+05 CM**3       5.39938E+06
                                     6        1.79275E+04 CM**3       4.84400E+04
                                     7        9.67892E+05 CM**3       1.09798E+07
                                     8        1.35931E+06 CM**3       1.35683E-14
                                     9        1.16111E+06 CM**3       1.15899E-14
                                    10        3.60792E+04 CM**3       6.72616E+04
                                    11        3.00293E+00 CM**3       2.99744E+00

      ************************************************************************************************
      ***                                                                                          ***
      ***                                  BIASING INFORMATION                                     ***
      ***                                                                                          ***
      ***    A DEFAULT WEIGHT OF    0.500 WILL BE USED FOR ALL BIAS ID'S.                          ***
      ***                                                                                          ***
      ************************************************************************************************

                      ........   0 IO'S WERE USED IN KENO-V BEFORE TRACKING        ........

                      ........  0.01000 MINUTES WERE USED PROCESSING DATA.        ........

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 1.32543E-02

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED WITH A FLAT DISTRIBUTION IN A CUBOID DEFINED BY:
                   +X= 1.70000E+01  -X=-1.70000E+01  +Y= 1.70000E+01  -Y=-1.70000E+01  +Z= 2.00000E+02  -Z=-2.00000E+02
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

0.04600 MINUTES WERE REQUIRED FOR STARTING.   TOTAL ELAPSED TIME IS 0.05333 MINUTES.
```

TRIGA - PREF. FLOOD CANISTER

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	958 INDEPENDENT	FISSION POINTS WERE	GENERATED	
1	9.12272E-01	6.13333E-02	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	961 INDEPENDENT	FISSION POINTS WERE	GENERATED	
2	8.97578E-01	6.58333E-02	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	965 INDEPENDENT	FISSION POINTS WERE	GENERATED	
3	9.06507E-01	7.05000E-02	9.06507E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	9.60092E-01	7.50000E-02	9.33300E-01	2.67925E-02	0.00000E+00	0.00000E+00
5	9.13258E-01	7.96667E-02	9.26619E-01	1.68497E-02	0.00000E+00	0.00000E+00
6	9.41285E-01	8.41667E-02	9.30286E-01	1.24659E-02	0.00000E+00	0.00000E+00
7	9.20685E-01	8.96667E-02	9.28366E-01	9.84508E-03	0.00000E+00	0.00000E+00
8	8.75864E-01	9.41667E-02	9.19615E-01	1.18820E-02	0.00000E+00	0.00000E+00
9	9.17508E-01	9.96667E-02	9.19314E-01	1.00467E-02	0.00000E+00	0.00000E+00
10	9.05698E-01	1.04333E-01	9.17612E-01	8.86557E-03	0.00000E+00	0.00000E+00
11	9.05332E-01	1.09833E-01	9.16248E-01	7.93686E-03	0.00000E+00	0.00000E+00
12	9.08428E-01	1.14333E-01	9.15466E-01	7.14188E-03	0.00000E+00	0.00000E+00
13	9.33723E-01	1.19000E-01	9.17126E-01	6.66988E-03	0.00000E+00	0.00000E+00
14	9.37258E-01	1.23500E-01	9.18803E-01	6.31565E-03	0.00000E+00	0.00000E+00
15	9.35896E-01	1.29000E-01	9.20118E-01	5.95648E-03	0.00000E+00	0.00000E+00
16	8.78309E-01	1.33667E-01	9.17132E-01	6.27134E-03	0.00000E+00	0.00000E+00
17	8.82510E-01	1.38167E-01	9.14824E-01	6.27799E-03	0.00000E+00	0.00000E+00
18	9.14908E-01	1.42833E-01	9.14829E-01	5.87253E-03	0.00000E+00	0.00000E+00
19	8.74650E-01	1.48333E-01	9.12465E-01	6.00128E-03	0.00000E+00	0.00000E+00
20	8.92229E-01	1.52833E-01	9.11341E-01	5.76868E-03	0.00000E+00	0.00000E+00
21	9.05493E-01	1.58333E-01	9.11033E-01	5.46530E-03	0.00000E+00	0.00000E+00
22	9.22732E-01	1.62833E-01	9.11618E-01	5.21773E-03	0.00000E+00	0.00000E+00
23	9.33108E-01	1.67500E-01	9.12642E-01	5.06745E-03	0.00000E+00	0.00000E+00
24	9.48880E-01	1.72000E-01	9.14289E-01	5.10469E-03	0.00000E+00	0.00000E+00
25	9.28723E-01	1.76667E-01	9.14916E-01	4.91791E-03	0.00000E+00	0.00000E+00
26	9.06127E-01	1.82167E-01	9.14550E-01	4.72276E-03	0.00000E+00	0.00000E+00
27	9.03149E-01	1.86667E-01	9.14094E-01	4.55281E-03	0.00000E+00	0.00000E+00
28	9.06903E-01	1.91333E-01	9.13818E-01	4.38293E-03	0.00000E+00	0.00000E+00
29	9.31051E-01	1.95833E-01	9.14456E-01	4.26551E-03	0.00000E+00	0.00000E+00
30	8.78445E-01	2.01333E-01	9.13170E-01	4.30685E-03	0.00000E+00	0.00000E+00
31	8.91480E-01	2.06000E-01	9.12422E-01	4.22245E-03	0.00000E+00	0.00000E+00
32	9.22563E-01	2.10500E-01	9.12760E-01	4.09326E-03	0.00000E+00	0.00000E+00
33	9.18055E-01	2.16000E-01	9.12931E-01	3.96270E-03	0.00000E+00	0.00000E+00
34	9.29423E-01	2.20500E-01	9.13446E-01	3.87133E-03	0.00000E+00	0.00000E+00
35	9.16588E-01	2.25167E-01	9.13541E-01	3.75339E-03	0.00000E+00	0.00000E+00
36	9.31661E-01	2.29667E-01	9.14074E-01	3.68011E-03	0.00000E+00	0.00000E+00
37	8.97653E-01	2.35167E-01	9.13605E-01	3.60409E-03	0.00000E+00	0.00000E+00
38	9.13426E-01	2.39833E-01	9.13600E-01	3.50255E-03	0.00000E+00	0.00000E+00
39	9.51547E-01	2.44333E-01	9.14626E-01	3.55760E-03	0.00000E+00	0.00000E+00
40	9.05553E-01	2.49000E-01	9.14387E-01	3.47094E-03	0.00000E+00	0.00000E+00
41	8.94125E-01	2.53500E-01	9.13867E-01	3.42046E-03	0.00000E+00	0.00000E+00
42	9.15771E-01	2.59000E-01	9.13915E-01	3.33419E-03	0.00000E+00	0.00000E+00
43	8.88163E-01	2.63667E-01	9.13287E-01	3.31195E-03	0.00000E+00	0.00000E+00
44	8.99240E-01	2.69167E-01	9.12952E-01	3.24939E-03	0.00000E+00	0.00000E+00
45	9.11400E-01	2.73667E-01	9.12916E-01	3.17313E-03	0.00000E+00	0.00000E+00
46	8.77056E-01	2.78167E-01	9.12101E-01	3.20552E-03	0.00000E+00	0.00000E+00
47	9.37693E-01	2.82833E-01	9.12670E-01	3.18467E-03	0.00000E+00	0.00000E+00
48	8.88130E-01	2.88333E-01	9.12137E-01	3.16002E-03	0.00000E+00	0.00000E+00
49	9.43464E-01	2.92833E-01	9.12803E-01	3.16309E-03	0.00000E+00	0.00000E+00
50	9.02860E-01	2.97500E-01	9.12596E-01	3.10341E-03	0.00000E+00	0.00000E+00
51	9.24351E-01	3.03000E-01	9.12836E-01	3.04887E-03	0.00000E+00	0.00000E+00
52	9.30765E-01	3.07500E-01	9.13194E-01	3.00871E-03	0.00000E+00	0.00000E+00
53	8.90087E-01	3.12167E-01	9.12741E-01	2.98373E-03	0.00000E+00	0.00000E+00
54	8.95261E-01	3.16667E-01	9.12405E-01	2.94504E-03	0.00000E+00	0.00000E+00
55	9.11013E-01	3.22167E-01	9.12379E-01	2.88905E-03	0.00000E+00	0.00000E+00
56	9.27266E-01	3.26833E-01	9.12655E-01	2.84842E-03	0.00000E+00	0.00000E+00
57	9.14924E-01	3.31333E-01	9.12696E-01	2.79646E-03	0.00000E+00	0.00000E+00
58	9.05747E-01	3.36000E-01	9.12572E-01	2.74887E-03	0.00000E+00	0.00000E+00
59	9.70181E-01	3.40500E-01	9.13582E-01	2.88316E-03	0.00000E+00	0.00000E+00
60	9.13601E-01	3.46000E-01	9.13583E-01	2.83302E-03	0.00000E+00	0.00000E+00

.
.
.
.
.

347	9.32288E-01	1.73383E+00	9.10680E-01	1.26978E-03	0.00000E+00	0.00000E+00
348	9.39976E-01	1.73933E+00	9.10765E-01	1.26893E-03	0.00000E+00	0.00000E+00
349	9.26951E-01	1.74383E+00	9.10811E-01	1.26613E-03	0.00000E+00	0.00000E+00
350	9.36824E-01	1.74850E+00	9.10886E-01	1.26470E-03	0.00000E+00	0.00000E+00
351	9.31395E-01	1.75383E+00	9.10945E-01	1.26244E-03	0.00000E+00	0.00000E+00
352	9.09427E-01	1.75850E+00	9.10940E-01	1.25883E-03	0.00000E+00	0.00000E+00
353	8.91230E-01	1.76300E+00	9.10884E-01	1.25650E-03	0.00000E+00	0.00000E+00
354	8.82837E-01	1.76850E+00	9.10805E-01	1.25545E-03	0.00000E+00	0.00000E+00
355	8.94507E-01	1.77317E+00	9.10758E-01	1.25274E-03	0.00000E+00	0.00000E+00
356	9.20758E-01	1.77767E+00	9.10787E-01	1.24952E-03	0.00000E+00	0.00000E+00
357	9.21923E-01	1.78233E+00	9.10818E-01	1.24639E-03	0.00000E+00	0.00000E+00
358	8.95779E-01	1.78683E+00	9.10776E-01	1.24360E-03	0.00000E+00	0.00000E+00
359	8.92643E-01	1.79233E+00	9.10725E-01	1.24115E-03	0.00000E+00	0.00000E+00
360	8.92464E-01	1.79700E+00	9.10674E-01	1.23873E-03	0.00000E+00	0.00000E+00
361	9.36569E-01	1.80250E+00	9.10746E-01	1.23738E-03	0.00000E+00	0.00000E+00
362	9.16370E-01	1.80700E+00	9.10762E-01	1.23404E-03	0.00000E+00	0.00000E+00
363	9.19990E-01	1.81150E+00	9.10787E-01	1.23088E-03	0.00000E+00	0.00000E+00
364	8.68182E-01	1.81700E+00	9.10670E-01	1.23310E-03	0.00000E+00	0.00000E+00
365	9.09171E-01	1.82167E+00	9.10665E-01	1.22971E-03	0.00000E+00	0.00000E+00
366	9.13328E-01	1.82617E+00	9.10673E-01	1.22635E-03	0.00000E+00	0.00000E+00
367	9.26146E-01	1.83083E+00	9.10715E-01	1.22372E-03	0.00000E+00	0.00000E+00
368	9.18251E-01	1.83533E+00	9.10736E-01	1.22054E-03	0.00000E+00	0.00000E+00

369	9.27602E-01	1.84000E+00	9.10782E-01	1.21808E-03	0.00000E+00	0.00000E+00
370	9.05043E-01	1.84550E+00	9.10766E-01	1.21487E-03	0.00000E+00	0.00000E+00
371	9.10273E-01	1.85000E+00	9.10765E-01	1.21157E-03	0.00000E+00	0.00000E+00
372	8.65233E-01	1.85467E+00	9.10642E-01	1.21454E-03	0.00000E+00	0.00000E+00
373	9.29081E-01	1.85917E+00	9.10691E-01	1.21228E-03	0.00000E+00	0.00000E+00
374	9.41838E-01	1.86383E+00	9.10775E-01	1.21192E-03	0.00000E+00	0.00000E+00
375	9.13071E-01	1.86933E+00	9.10781E-01	1.20868E-03	0.00000E+00	0.00000E+00
376	8.91269E-01	1.87383E+00	9.10729E-01	1.20657E-03	0.00000E+00	0.00000E+00
377	9.11885E-01	1.87833E+00	9.10732E-01	1.20335E-03	0.00000E+00	0.00000E+00
378	9.41721E-01	1.88300E+00	9.10815E-01	1.20297E-03	0.00000E+00	0.00000E+00
379	9.08998E-01	1.88850E+00	9.10810E-01	1.19979E-03	0.00000E+00	0.00000E+00
380	9.16650E-01	1.89300E+00	9.10825E-01	1.19671E-03	0.00000E+00	0.00000E+00
381	9.38426E-01	1.89767E+00	9.10898E-01	1.19577E-03	0.00000E+00	0.00000E+00
382	8.84428E-01	1.90317E+00	9.10828E-01	1.19465E-03	0.00000E+00	0.00000E+00
383	9.13748E-01	1.90767E+00	9.10836E-01	1.19154E-03	0.00000E+00	0.00000E+00
384	9.27586E-01	1.91233E+00	9.10880E-01	1.18922E-03	0.00000E+00	0.00000E+00
385	9.32344E-01	1.91683E+00	9.10936E-01	1.18743E-03	0.00000E+00	0.00000E+00
386	9.01186E-01	1.92233E+00	9.10911E-01	1.18461E-03	0.00000E+00	0.00000E+00
387	8.94668E-01	1.92700E+00	9.10868E-01	1.18228E-03	0.00000E+00	0.00000E+00
388	9.39157E-01	1.93150E+00	9.10942E-01	1.18149E-03	0.00000E+00	0.00000E+00
389	9.35439E-01	1.93600E+00	9.11005E-01	1.18013E-03	0.00000E+00	0.00000E+00
390	9.16781E-01	1.94150E+00	9.11020E-01	1.17718E-03	0.00000E+00	0.00000E+00
391	8.54888E-01	1.94617E+00	9.10876E-01	1.18298E-03	0.00000E+00	0.00000E+00
392	9.32257E-01	1.95067E+00	9.10930E-01	1.18122E-03	0.00000E+00	0.00000E+00
393	9.15965E-01	1.95533E+00	9.10943E-01	1.17827E-03	0.00000E+00	0.00000E+00
394	9.44185E-01	1.96083E+00	9.11028E-01	1.17831E-03	0.00000E+00	0.00000E+00
395	9.41505E-01	1.96533E+00	9.11106E-01	1.17787E-03	0.00000E+00	0.00000E+00
396	9.05507E-01	1.97000E+00	9.11091E-01	1.17496E-03	0.00000E+00	0.00000E+00
397	9.23019E-01	1.97450E+00	9.11122E-01	1.17237E-03	0.00000E+00	0.00000E+00
398	8.99323E-01	1.97917E+00	9.11092E-01	1.16978E-03	0.00000E+00	0.00000E+00
399	9.50066E-01	1.98367E+00	9.11190E-01	1.17096E-03	0.00000E+00	0.00000E+00
400	9.31501E-01	1.98833E+00	9.11241E-01	1.16912E-03	0.00000E+00	0.00000E+00
401	9.40814E-01	1.99283E+00	9.11315E-01	1.16854E-03	0.00000E+00	0.00000E+00
402	8.74959E-01	1.99833E+00	9.11224E-01	1.16916E-03	0.00000E+00	0.00000E+00
403	8.91278E-01	2.00283E+00	9.11174E-01	1.16730E-03	0.00000E+00	0.00000E+00

KENO MESSAGE NUMBER K5-123   EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

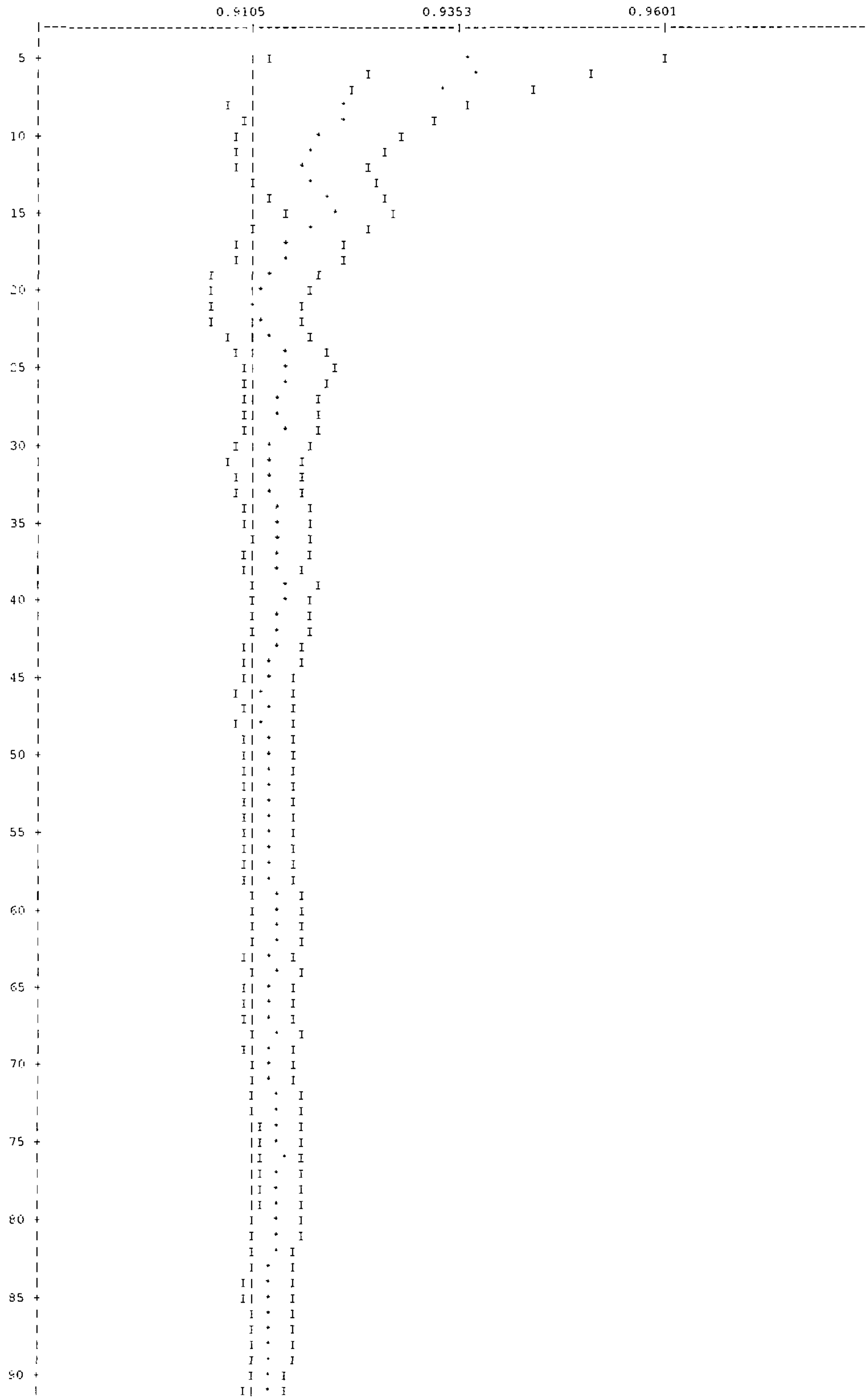
TRIGA - PREF. FLOOD CANISTER

```
LIFETIME =  6.88467E-05 + OR -  1.54921E-07            GENERATION TIME =  2.92747E-05 + OR -  7.16936E-08
NU BAR   =  2.42097E+00 + OR -  9.21427E-06       AVERAGE FISSION GROUP =  2.20445E+01 + OR -  6.79883E-03
                ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION =  1.67845E-01 + OR -  7.91367E-04
```

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.91119	+ OR - 0.00117	0.91002 TO 0.91236	0.90885 TO 0.91353	0.90768 TO 0.91470	400000
4	0.91106	+ OR - 0.00117	0.90990 TO 0.91223	0.90873 TO 0.91340	0.90756 TO 0.91456	399000
5	0.91106	+ OR - 0.00117	0.90989 TO 0.91223	0.90872 TO 0.91340	0.90755 TO 0.91457	398000
6	0.91098	+ OR - 0.00117	0.90981 TO 0.91215	0.90864 TO 0.91332	0.90747 TO 0.91449	397000
7	0.91096	+ OR - 0.00117	0.90978 TO 0.91213	0.90861 TO 0.91330	0.90744 TO 0.91448	396000
8	0.91105	+ OR - 0.00117	0.90987 TO 0.91222	0.90870 TO 0.91339	0.90753 TO 0.91456	395000
9	0.91103	+ OR - 0.00118	0.90985 TO 0.91221	0.90868 TO 0.91338	0.90750 TO 0.91456	394000
10	0.91104	+ OR - 0.00118	0.90987 TO 0.91222	0.90869 TO 0.91340	0.90751 TO 0.91458	393000
11	0.91106	+ OR - 0.00118	0.90988 TO 0.91224	0.90870 TO 0.91342	0.90751 TO 0.91460	392000
12	0.91106	+ OR - 0.00118	0.90988 TO 0.91225	0.90870 TO 0.91343	0.90751 TO 0.91462	391000
17	0.91103	+ OR - 0.00119	0.90984 TO 0.91222	0.90865 TO 0.91341	0.90747 TO 0.91460	386000
22	0.91115	+ OR - 0.00120	0.90995 TO 0.91235	0.90875 TO 0.91355	0.90755 TO 0.91475	381000
27	0.91098	+ OR - 0.00121	0.90977 TO 0.91219	0.90856 TO 0.91340	0.90736 TO 0.91461	376000
32	0.91105	+ OR - 0.00122	0.90983 TO 0.91227	0.90861 TO 0.91348	0.90739 TO 0.91470	371000
37	0.91094	+ OR - 0.00123	0.90971 TO 0.91217	0.90848 TO 0.91341	0.90725 TO 0.91464	366000
42	0.91087	+ OR - 0.00124	0.90963 TO 0.91211	0.90838 TO 0.91336	0.90714 TO 0.91460	361000
47	0.91099	+ OR - 0.00125	0.90973 TO 0.91224	0.90848 TO 0.91349	0.90723 TO 0.91474	356000
. . . . .						
367	0.91583	+ OR - 0.00386	0.91197 TO 0.91969	0.90812 TO 0.92355	0.90426 TO 0.92740	36000
372	0.91753	+ OR - 0.00412	0.91341 TO 0.92166	0.90929 TO 0.92578	0.90517 TO 0.92990	31000
377	0.91755	+ OR - 0.00470	0.91286 TO 0.92225	0.90816 TO 0.92695	0.90346 TO 0.93164	26000
382	0.91744	+ OR - 0.00538	0.91206 TO 0.92281	0.90668 TO 0.92819	0.90130 TO 0.93357	21000
387	0.91854	+ OR - 0.00677	0.91177 TO 0.92531	0.90500 TO 0.93208	0.89823 TO 0.93885	16000
392	0.91983	+ OR - 0.00741	0.91242 TO 0.92724	0.90502 TO 0.93464	0.89761 TO 0.94205	11000
397	0.91466	+ OR - 0.01235	0.90230 TO 0.92701	0.88995 TO 0.93937	0.87759 TO 0.95172	6000

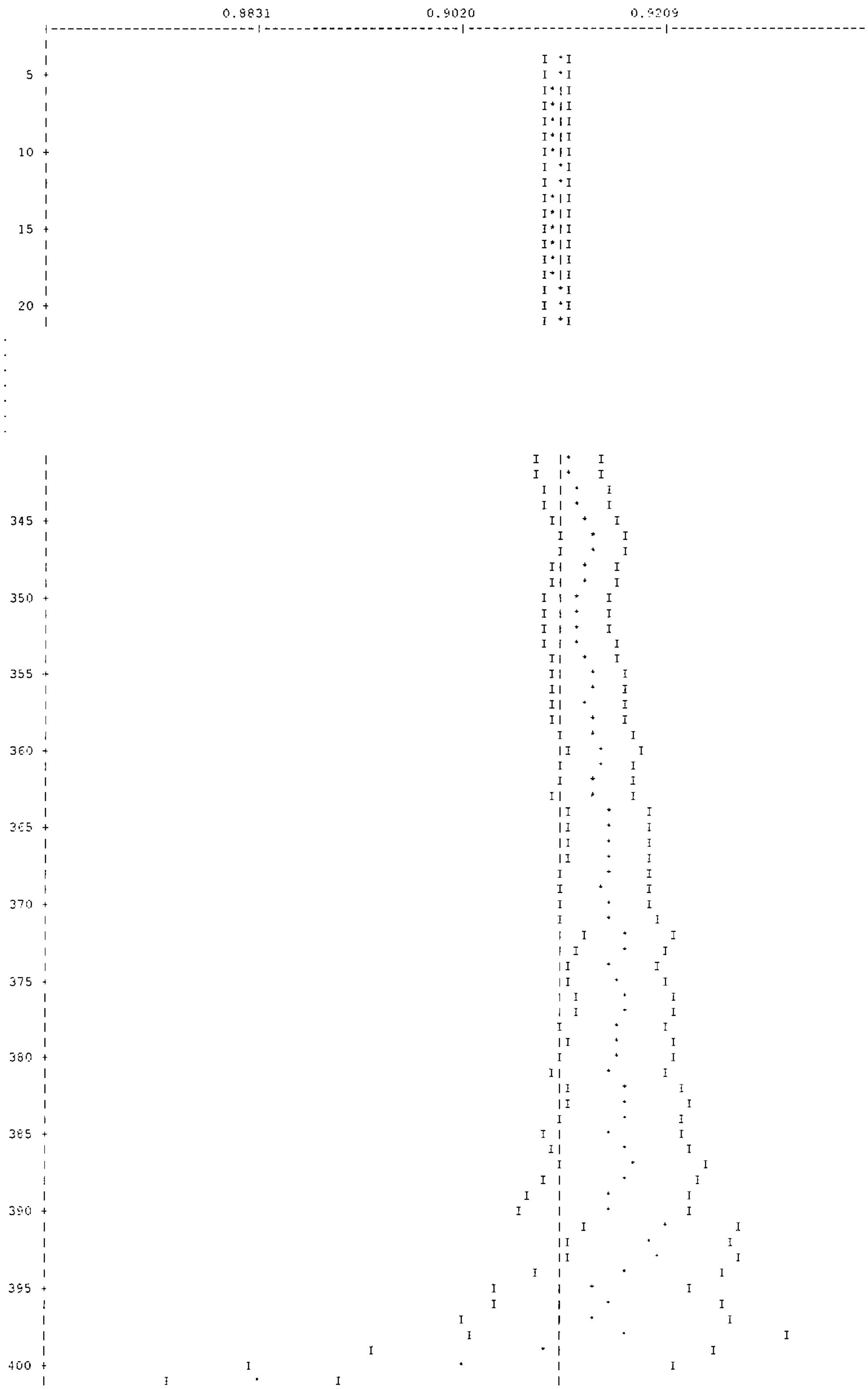
TRIGA - PREF. FLOOD CANISTER

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.9112 + OR - 0.0012 WHICH OCCURS FOR 403 GENERATIONS RUN.



```
      |                       I|  *  I
      |                       I|  *  I
      |                       I|  *  I
  95  +                        I  *  I
      |                        I  *  I
      |                       I|  *  I
      |                        I  *  I
      |                        I  *  I
 100  +                        I  *  I
      |                        I  *  I
      |                        I  *  I
      |                        I  *  I
      |                        I  *  I
 105  +                        I  *  I
      |                        I  *    I
      |                        I  *    I
      |                        I  *    I
      |                        I  *  I
 110  +                        I  *  I
      |                        I  *  I
      |                        I  *  I
      |                        I  *  I
      |                        I  *  I
 115  +                        I  *  I
      |                       I|*    I
      |                       I|*  I
      |                       I|*  I
      |                       I|*  I
 120  +                       I|*  I
      |                       I|*  I
      |                       I|*  I
.
.
.
.
.
.
      |                       I*I
 385  +                       I*I
      |                       I*I
      |                       I*I
      |                       I*I
      |                       I*I
 390  +                       I*I
      |                       I*I
      |                       I*I
      |                       I*I
      |                       I*I
 395  +                       I*I
      |                       I*I
      |                       I*I
      |                       I*I
      |                       I*I
 400  +                       I*I
      |                       I* I
      |                       I*I
      |                       I*I
```

```
                TRIGA - PREF. FLOOD CANISTER

              PLOT OF AVERAGE K-EFFECTIVE BY GENERATION SKIPPED.
THE LINE REPRESENTS K-EFF = 0.9111 + OR -  0.0012 WHICH OCCURS FOR     4 GENERATIONS SKIPPED.
```



TRIGA - PREF. FLOOD CANISTER

SHIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0003			2.63496E-04	1.9031	1.29360E-03	1.4083	0.00000E+00	0.0000
2	0.0016			1.41686E-03	0.6296	3.41264E-03	0.4423	0.00000E+00	0.0000
3	0.0021			1.91174E-03	0.5343	1.85564E-03	0.3922	0.00000E+00	0.0000
4	0.0014			1.23455E-03	0.5902	1.05460E-03	0.4228	0.00000E+00	0.0000
5	0.0022			1.97527E-03	0.5128	2.47901E-03	0.3603	0.00000E+00	0.0000
6	0.0035			3.19311E-03	0.3708	9.28203E-03	0.3281	0.00000E+00	0.0000
7	0.0046			4.20300E-03	0.3053	2.01369E-02	0.3109	0.00000E+00	0.0000
8	0.0048			4.33301E-03	0.3190	1.69557E-02	0.3274	0.00000E+00	0.0000
9	0.0064			5.86971E-03	0.3129	1.80217E-02	0.2698	0.00000E+00	0.0000
10	0.0140			1.27575E-02	0.2781	4.46620E-02	0.2905	0.00000E+00	0.0000
11	0.0292			2.65849E-02	0.3108	5.97859E-02	0.2609	0.00000E+00	0.0000
12	0.0379			3.45597E-02	0.2912	4.79199E-02	0.2395	0.00000E+00	0.0000
13	0.0340			3.09422E-02	0.3038	5.62476E-02	0.2495	0.00000E+00	0.0000
14	0.0275			2.50167E-02	0.2791	6.45882E-02	0.2650	0.00000E+00	0.0000
15	0.0053			4.85847E-03	0.3936	3.04517E-02	0.3715	0.00000E+00	0.0000
16	0.0036			3.27596E-03	0.4464	1.68993E-02	0.4071	0.00000E+00	0.0000
17	0.0053			4.85898E-03	0.6615	9.66689E-03	0.4238	0.00000E+00	0.0000
18	0.0072			6.51798E-03	0.7127	9.24759E-03	0.4621	0.00000E+00	0.0000
19	0.0087			7.89008E-03	0.5201	1.45394E-02	0.4346	0.00000E+00	0.0000
20	0.0344			3.13456E-02	0.3415	4.58006E-02	0.3527	0.00000E+00	0.0000
21	0.0175			1.59595E-02	0.5092	1.73339E-02	0.4036	0.00000E+00	0.0000
22	0.0397			3.61509E-02	0.3631	3.41677E-02	0.3508	0.00000E+00	0.0000
23	0.1115			1.01637E-01	0.2349	8.94561E-02	0.2346	0.00000E+00	0.0000
24	0.1831			1.66854E-01	0.2104	1.29711E-01	0.2009	0.00000E+00	0.0000
25	0.1501			1.36737E-01	0.2458	9.95705E-02	0.2382	0.00000E+00	0.0000
26	0.1882			1.71487E-01	0.2681	1.16429E-01	0.2624	0.00000E+00	0.0000
27	0.0761			6.93315E-02	0.3782	4.18532E-02	0.3919	0.00000E+00	0.0000
SYSTEM TOTAL =				9.11186E-01	0.1284	1.00282E+00	0.0434	0.00000E+00	0.0000

ELAPSED TIME 2.00283 MINUTES

RANDOM NUMBER= 750E700F5DF1

```
TRIGA - PREF. FLOOD CANISTER

                          FREQUENCY FOR GENERATIONS    4 TO  403
0.8423 TO 0.8540     ***
0.8540 TO 0.8656     ************
0.8656 TO 0.8773     ********************
0.8773 TO 0.8889     **********************************
0.8889 TO 0.9006     ***************************************************
0.9006 TO 0.9123     *******************************************************************************
0.9123 TO 0.9239     **********************************************************************
0.9239 TO 0.9356     **************************************************************
0.9356 TO 0.9472     ****************************************
0.9472 TO 0.9589     ****************
0.9589 TO 0.9705     ******

                          FREQUENCY FOR GENERATIONS  104 TO  403
0.8423 TO 0.8540     ***
0.8540 TO 0.8656     **********
0.8656 TO 0.8773     ****************
0.8773 TO 0.8889     **************************
0.8889 TO 0.9006     ******************************************
0.9006 TO 0.9123     *********************************************************
0.9123 TO 0.9239     *************************************************
0.9239 TO 0.9356     **********************************************
0.9356 TO 0.9472     *********************************
0.9472 TO 0.9589     *************
0.9589 TO 0.9705     ***

                          FREQUENCY FOR GENERATIONS  204 TO  403
0.8423 TO 0.8540     **
0.8540 TO 0.8656     ********
0.8656 TO 0.8773     *********
0.8773 TO 0.8889     ********************
0.8889 TO 0.9006     **************************
0.9006 TO 0.9123     *********************************
0.9123 TO 0.9239     ************************************
0.9239 TO 0.9356     *******************************
0.9356 TO 0.9472     ************************
0.9472 TO 0.9589     **********
0.9589 TO 0.9705     *

                          FREQUENCY FOR GENERATIONS  304 TO  403
0.8423 TO 0.8540     *
0.8540 TO 0.8656     ****
0.8656 TO 0.8773     *****
0.8773 TO 0.8889     ********
0.8889 TO 0.9006     **************
0.9006 TO 0.9123     ***************
0.9123 TO 0.9239     ******************
0.9239 TO 0.9356     **************
0.9356 TO 0.9472     *****************
0.9472 TO 0.9589     ***
0.9589 TO 0.9705     *
```

6.6.7 MTR Fuel Bounding Configuration

An evaluation was performed to extend limits of enrichment for MTR fuel elements. This section provides the summarized input/output data for the MTR fuel finite cask model in the accident condition. This case represents HEU fuel at 94 wt % enrichment with 414 g ^{235}U in 23 fuel plates. Also included is the bounding HEU case for the 460 g ^{235}U with 23 plates of 20 g ^{235}U per plate.

Figure 6.6.7-1 MTR Finite Cask Model

```
PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
   MODULE CSAS25   WILL BE CALLED
     LWT MTR INPUT FOR CASK MODEL - PLATES IN CLOSE & PLATES @ FULL PITCH
     'MIN BASKET PLATE - COMMENT CARD REFERS TO NOMINAL PLATE SIZE
     '23 PLATES - 18 GRAM 235U PER PLATE
     'FUEL SHIFT AXIAL ALTERNATING
     '56 CM ACTIVE FUEL HEIGHT
     27GROUPNDF4  LATTICECELL
     URANIUM  1 DEN=19.05 0.03626 293 92235 94. 92238 6. END
     AL        1 DEN=2.702 0.25566 293 END
     AL     2 1.0     293.0 END
     H2O    3 1.0     293.0 END
     AL     4 1.0     293.0 END
     SS304  5 1.0     293.0 END
     PB     6 1.0     293.0 END
     H2O    7 1.E-20 293.0 END
     H2O    8 1.E-20 293.0 END
     END COMP
     SYMMSLABCELL 0.3919 0.075 1 3 0.115 2 END

     READ PARAM TBA=5 RUN=YES PLT=NO GEN=803 NPG=1000 END PARAM
     READ GEOM
     '
     ' FUEL PLATE CELL UNITS
     '
     UNIT 1
     COM='MIDDLE FUEL PLATE CELL'
     CUBOID 1 1 2P3.3000 2P0.0375 56.7 0.7
     CUBOID 2 1 2P3.3000 2P0.0575 57.4 0.0
     CUBOID 3 1 2P3.3000 2P0.1959 57.4 0.0
     UNIT 2
     COM='TOP FUEL PLATE CELL'
     CUBOID 1 1 2P3.3000 2P0.0375 56.7 0.7
     CUBOID 2 1 2P3.3000 2P0.0575 57.4 0.0
     CUBOID 3 1 2P3.3000 0.0575 -0.1959 57.4 0.0
     UNIT 3
     COM='BOTTOM FUEL PLATE CELL'
     CUBOID 1 1 2P3.3000 2P0.0375 56.7 0.7
     CUBOID 2 1 2P3.3000 2P0.0575 57.4 0.0
     CUBOID 3 1 2P3.3000 0.1959 -0.0575 57.4 0.0
     '
     UNIT 4
     COM='SIDE PLATE'
     CUBOID 2 1 2P0.2 2P3.75 57.4 0.0
     '
     ' PLATES AT BOTTOM OF BASKET OPENING
     '
     ' BASKET CENTER ROW ARRAY ELEMENTS
     '
     UNIT 10
     COM='FUEL PATE ARRAY - PLATES IN 5/16 IN. WEB CENTER'
     ARRAY  1 -3.3000 -4.3688 0.0
     CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
     HOLE   4 -4.1687 0.0 0.0
     HOLE   4  4.1687 0.0 0.0
     REPLICATE 5 1 2R0.3556 4R0.0 1
     UNIT 11
     COM='FUEL ARRAY 20 PLATES IN 5/16 IN. WEB RIGHT'
     ARRAY  1 -3.9686 -4.3688 0.0
     CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
     HOLE   4 -4.1687 0.0 0.0
     HOLE   4  4.1687 0.0 0.0
     REPLICATE 5 1 2R0.3556 4R0.0 1
     UNIT 12
     COM='FUEL ARRAY 20 PLATES IN 5/16 IN. WEB LEFT'
     ARRAY  1 -2.6314 -4.3688 0.0
     CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
     HOLE   4 -4.1687 0.0 0.0
     HOLE   4  4.1687 0.0 0.0
     REPLICATE 5 1 2R0.3556 4R0.0 1
     '
     ' BASKET TOP ROW ARRAY ELEMENTS
     '
     UNIT 20
     COM='FUEL ARRAY WITH HALF OF 1/4 PLATE ON RIGHT -  TOP STACK'
     ARRAY  1 -2.6314 -4.3688 0.0
     CUBOID 3 1 2P4.3688 2P4.3698 73.152 0.0
     HOLE   4 -4.1687 0.0 0.0
     HOLE   4  4.1687 0.0 0.0
     REPLICATE 5 1 0.3048 5R0.0 1
     UNIT 21
     COM='FUEL WITH HALF OF 1/4 IN. PLATE ON LEFT  TOP STACK'
     ARRAY  1 -3.9686 -4.3688 0.0
     CUBOID 3 1 2P4.3688 2P4.3685 73.152 0.0
     HOLE   4 -4.1687 0.0 0.0
     HOLE   4  4.1687 0.0 0.0
     REPLICATE 5 1 0.0 0.3048 4R0.0 1
     '
     ' BASKET BOTTOM ROW ARRAY ELEMENTS
```

```
'
UNIT 30
COM='FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON RIGHT -  BOTTOM STACK'
ARRAY  1 -2.6314 -4.3688 0.0
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 0.0   ,
HOLE   4  4.1687 0.0 0.0
REPLICATE 5 1 0.3048 5R0.0 1
UNIT 31
COM='FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON LEFT - BOTTOM STACK'
ARRAY  1 -3.9686 -4.3688 0.0
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 0.0
HOLE   4  4.1687 0.0 0.0
REPLICATE 5 1 0.0 0.3048 4R0.0 1
'
' CONSTRUCTION BASKET ROWS
'
UNIT 40
COM='2 UNIT ARRAY WITH 1/4 IN. PLATE ON TOP AND SIDES'
ARRAY 2 -9.0428 -4.3688 0.0
REPLICATE 5 1 3R0.3048 0.0 2R0.0 1
UNIT 41
COM='3 UNIT ARRAY WITH REST OF 5/16 WEB'
ARRAY 3 -14.1738 -4.3688 0.0
REPLICATE 5 1 2R0.3556 2R0.7112 2R0.0 1
UNIT 42
COM='2 UNIT ARRAY WITH 1/4 IN. PLATE ON BOTTOM AND SIDES'
ARRAY 4 -9.0428 -4.3688 0.0
REPLICATE 5 1 2R0.3048 0.0 0.3048 2R0.0 1
'
' BASKET UNIT
'
UNIT 50
COM='7 MTR ELEMENTS IN THE LWT'
CYLINDER 3 1 17.0500 73.152 0.0
HOLE 40 0.0 +9.4489 0.0
HOLE 41 0.0  0.0    0.0
HOLE 42 0.0 -9.4489 0.0
CYLINDER 5 1 18.8913   73.152 -1.27
CYLINDER 6 1 33.4963   73.152 -1.27
CYLINDER 5 1 36.5443   73.152 -1.27
CYLINDER 7 1 49.2443   73.152 -1.27
CYLINDER 5 1 49.8539   73.152 -1.27
CUBOID   8 1 4P49.8539 73.152 -1.27
'
' PLATES AT TOP OF BASKET OPENING
'
' BASKET CENTER ROW ARRAY ELEMENTS
'
UNIT 110
COM='FUEL PATE ARRAY - PLATES IN 5/16 IN. WEB CENTER'
ARRAY  1 -3.3000 -4.3688 15.752
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 15.752
HOLE   4  4.1687 0.0 15.752
REPLICATE 5 1 2R0.3556 4R0.0 1
UNIT 111
COM='FUEL ARRAY 20 PLATES IN 5/16 IN. WEB RIGHT'
ARRAY  1 -3.9686 -4.3688 15.752
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 15.752
HOLE   4  4.1687 0.0 15.752
REPLICATE 5 1 2R0.3556 4R0.0 1
UNIT 112
COM='FUEL ARRAY 20 PLATES IN 5/16 IN. WEB LEFT'
ARRAY  1 -2.6314 -4.3688 15.752
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 15.752
HOLE   4  4.1687 0.0 15.752
REPLICATE 5 1 2R0.3556 4R0.0 1
'
' BASKET TOP ROW ARRAY ELEMENTS
'
UNIT 120
COM='FUEL ARRAY WITH HALF OF 1/4 PLATE ON RIGHT -  TOP STACK'
ARRAY  1 -2.6314 -4.3688 15.752
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 15.752
HOLE   4  4.1687 0.0 15.752
REPLICATE 5 1 0.3048 5R0.0 1
UNIT 121
COM='FUEL WITH HALF OF 1/4 IN. PLATE ON LEFT  TOP STACK'
ARRAY  1 -3.9686 -4.3688 15.752
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 15.752
HOLE   4  4.1687 0.0 15.752
REPLICATE 5 1 0.0 0.3048 4R0.0 1
'
' BASKET BOTTOM ROW ARRAY ELEMENTS
'
UNIT 130
COM='FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON RIGHT -  BOTTOM STACK'
ARRAY  1 -2.6314 -4.3688 15.752
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
```

```
HOLE   4 -4.1687 0.0 15.752
HOLE   4  4.1687 0.0 15.752
REPLICATE 5 1 0.3048 5R0.0 1
UNIT 131
COM='FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON LEFT - BOTTOM STACK'
ARRAY  1 -3.9686 -4.3688 15.752
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 15.752
HOLE   4  4.1687 0.0 15.752
REPLICATE 5 1 0.0 0.3048 4R0.0 1
'
' CONSTRUCTION BASKET ROWS
'
UNIT 140
COM='2 UNIT ARRAY WITH 1/4 IN. PLATE ON TOP AND SIDES'
ARRAY 12 -9.0428 -4.3688 0.0
REPLICATE 5 1 3R0.3048 0.0 2R0.0 1
UNIT 141
COM='3 UNIT ARRAY WITH REST OF 5/16 WEB'
ARRAY 13 -14.1738 -4.3688 0.0
REPLICATE 5 1 2R0.3556 2R0.7112 2R0.0 1
UNIT 142
COM='2 UNIT ARRAY WITH 1/4 IN. PLATE ON BOTTOM AND SIDES'
ARRAY 14 -9.0428 -4.3688 0.0
REPLICATE 5 1 2R0.3048 0.0 0.3048 2R0.0 1
'
' BASKET UNIT
'
UNIT 150
COM='7 MTR ELEMENTS IN THE LWT'
CYLINDER 3 1 17.0500 73.152 0.0
HOLE 140 0.0 +9.4489 0.0
HOLE 141 0.0  0.0    0.0
HOLE 142 0.0 -9.4489 0.0
CYLINDER 5 1 18.8913   73.152 -1.27
CYLINDER 6 1 33.4963   73.152 -1.27
CYLINDER 5 1 36.5443   73.152 -1.27
CYLINDER 7 1 49.2443   73.152 -1.27
CYLINDER 5 1 49.8539   73.152 -1.27
CUBOID   8 1 4P49.8539 73.152 -1.27
'
' CASK LID AND BOTTOM STRUCTURE
'
UNIT 60
COM='SIMPLIFIED LID STRUCTURE NAC-LWT'
CYLINDER 5 1 36.5188   13.6775 -14.1351
CYLINDER 8 1 49.8539   13.6775 -14.1351
CUBOID   8 1 4P49.8539 13.6775 -14.1351
UNIT 61
COM='SIMPLIFIED CASK BOTTOM STRUCTURE NAC-LWT'
CYLINDER 6 1 26.3525 2P3.81
CYLINDER 5 1 36.6188 +13.36 -12.7
CYLINDER 8 1 49.8539 +13.36 -12.7
CUBOID   8 1 4P49.8539 +13.36 -12.7
UNIT 62
COM='THIN TOP AND BOTTOM SHELL OF NEUTRON SHIELD - SUBTRACTED FROM LID MODEL'
CYLINDER 5 1 49.8539 0.61 0.0
CUBOID   8 1 4P49.8539 0.61 0.0
'
' STACK OF BASKETS WITH CASK LID AND BOTTOM
'
GLOBAL UNIT 70
COM='STACK OF 6 BASKETS IN CASK WITH LID AND BOTTOM'
ARRAY  10  -49.8539 -49.8539 0.0
END GEOM
READ ARRAY
'
' FUEL ELEMENT PLATE ARRAY
'
ARA=1 NUX=1 NUY=23 NUZ=1 FILL 3 21R1 2 END FILL
'
' ARRAYS OF BASKET OPENINGS (TOP, MIDDLE, BOTTOM)
' PLATES AT BOTTOM OF OPENING
'
ARA=2 NUX=2 NUY=1 NUZ=1 FILL 20 21 END FILL
ARA=3 NUX=3 NUY=1 NUZ=1 FILL 12 10 11 END FILL
ARA=4 NUX=2 NUY=1 NUZ=1 FILL 30 31 END FILL
'
' ARRAYS OF BASKET OPENINGS (TOP, MIDDLE, BOTTOM)
' PLATES AT TOP OF OPENING
'
ARA=12 NUX=2 NUY=1 NUZ=1 FILL 120 121 END FILL
ARA=13 NUX=3 NUY=1 NUZ=1 FILL 112 110 111 END FILL
ARA=14 NUX=2 NUY=1 NUZ=1 FILL 130 131 END FILL
'
' ARRAY OF BASKETS WITH LID AND BOTTOM
'
ARA=10 NUX=1 NUY=1 NUZ=10 FILL 61 62 150 50 150 50 150 50 62 60 END FILL
END ARRAY
READ BOUNDS ALL=MIR END BOUNDS
READ PLOT
TTL='X-Y PLOT OF CENTER ELEMENT - FUEL ELEVATION'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=1500
XUL=-5.0 YUL=5.0 ZUL=50.0
```

```
XLR=5.0 YLR=-5.0 ZLR=50.0 END
TTL='X-Y PLOT OF BASKET - FUEL ELEVATION'
UAX=1.0 VDN=-1.0 NAX=1500
XUL=-17.0 YUL=17.0 ZUL=50.0
XLR=17.0 YLR=-17.0 ZLR=50.0 END
TTL='X-Y PLOT OF CASK - FUEL ELEVATION'
UAX=1.0 VDN=-1.0 NAX=1500
XUL=-65.0 YUL=65.0 ZUL=50.0
XLR=65.0 YLR=-65.0 ZLR=50.0 END
TTL='Y-Z (X=0) PLOT OF BOTTOM BASKET - CENTER SECTION'
VAX=1.0 WDN=-1.0
XUL=0.0 YUL=-5.0 ZUL=55.0
XLR=0.0 YLR=5.0 ZLR=50.0 END
TTL='Y-Z (X=0) PLOT OF BOTTOM BASKET - CENTER FUEL ELEMENT'
VAX=1.0 WDN=-1.0
XUL=0.0 YUL=-5.0 ZUL=101.1
XLR=0.0 YLR=5.0 ZLR=26.6 END
TTL='Y-Z (X=-2) PLOT OF BOTTOM BASKET'
VAX=1.0 WDN=-1.0
XUL=-2.0 YUL=-15.0 ZUL=101.1
XLR=-2.0 YLR=15.0 ZLR=26.6 END
TTL='Y-Z (X=-2) PLOT OF CASK - R=17.0'
LPI=5 NAX=1000
VAX=1.0 WDN=-1.0
XUL=-2.0 YUL=-17.0 ZUL=502.0
XLR=-2.0 YLR=17.0 ZLR=-1.0 END
TTL='Y-Z (X=-2) PLOT OF CASK - R=51.0'
VAX=1.0 WDN=-1.0
XUL=-2.0 YUL=-51.0 ZUL=502.0
XLR=-2.0 YLR=51.0 ZLR=-1.0 END
END PLOT
END DATA

SECONDARY MODULE 000008   HAS BEEN CALLED.

MODULE 000008   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     0.61 (SECONDS).

SECONDARY MODULE 000002   HAS BEEN CALLED.

MODULE 000002   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     4.83 (SECONDS).

SECONDARY MODULE 000009   HAS BEEN CALLED.

MODULE 000009   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   742.04 (SECONDS).

MODULE CSAS25   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   749.95 (SECONDS).
```

```
 CCCCCCCCCC     SSSSSSSSSS      AAAAAAAAA      SSSSSSSSSS     2222222222     5555555555555
CCCCCCCCCCCC   SSSSSSSSSSSS    AAAAAAAAAAA    SSSSSSSSSSSS   222222222222    5555555555555
CC        CC   SS        SS   AA         AA   SS        SS   22        22    55
CC             SS             AA         AA   SS                       22    55
CC             SS             AA         AA   SS                       22    55
CC             SSSSSSSSSSS    AAAAAAAAAAAAA   SSSSSSSSSSS             22     555555555555
CC              SSSSSSSSSSS   AAAAAAAAAAAAA    SSSSSSSSSSS          22       5555555555555
CC                       SS   AA         AA             SS       22                     55
CC                       SS   AA         AA             SS     22                       55
CC        CC   SS        SS   AA         AA   SS        SS   22              55         55
CCCCCCCCCCCC   SSSSSSSSSSSS   AA         AA   SSSSSSSSSSSS   222222222222    5555555555555
 CCCCCCCCCC     SSSSSSSSSS    AA         AA    SSSSSSSSSS    222222222222     55555555555


 SSSSSSSSSS     CCCCCCCCCC      AAAAAAAAA     LL             EEEEEEEEEEEE                     PPPPPPPPPPP     CCCCCCCCCC
SSSSSSSSSSSS   CCCCCCCCCCCC    AAAAAAAAAAA    LL             EEEEEEEEEEEE                     PPPPPPPPPPPP   CCCCCCCCCCCC
SS        SS   CC        CC   AA         AA   LL             EE                               PP        PP   CC        CC
SS             CC             AA         AA   LL             EE                               PP        PP   CC
SS             CC             AA         AA   LL             EE                               PP        PP   CC
SSSSSSSSSSS    CC             AAAAAAAAAAAAA   LL             EEEEEEEEE       -------------    PPPPPPPPPPPPP  CC
 SSSSSSSSSSS   CC             AAAAAAAAAAAAA   LL             EEEEEEEEE       -------------    PPPPPPPPPPP    CC
          SS   CC             AA         AA   LL             EE                               PP             CC
          SS   CC             AA         AA   LL             EE                               PP             CC
SS        SS   CC        CC   AA         AA   LL             EE                               PP             CC        CC
SSSSSSSSSSSS   CCCCCCCCCCCC   AA         AA   LLLLLLLLLLLL   EEEEEEEEEEEE                     PP             CCCCCCCCCCCC
 SSSSSSSSSS     CCCCCCCCCC    AA         AA   LLLLLLLLLLLL   EEEEEEEEEEEE                     PP              CCCCCCCCCC


     11           0000000              //          11        2222222222             //        0000000        0000000
    111          000000000            //          111       222222222222           //        000000000      000000000
   1111         00       00          //          1111       22        22          //        00       00    00       00
     11         00       00         //             11                 22         //         00       00    00       00
     11         00       00        //              11                 22        //          00       00    00       00
     11         00       00       //               11               22         //           00       00    00       00
     11         00       00      //                11             22          //            00       00    00       00
     11         00       00     //                 11           22           //             00       00    00       00
     11         00       00    //                  11         22            //              00       00    00       00
     11          00     00    //                   11       22             //                00     00      00     00
  11111111       000000000   //                 11111111    222222222222   //                000000000      000000000
  11111111        0000000   //                  11111111    222222222222  //                  0000000        0000000


     11               44                           11       777777777777                      3333333333     2222222222
    111              444                          111       777777777777                     333333333333   222222222222
   1111             4444            :::          1111       77        77        :::          33        33   22        22
     11            44 44            :::            11                77         :::                    33             22
     11           44  44            :::            11               77          :::                    33             22
     11          44   44                           11              77                                 333           22
     11         44    44                           11              77                                 333         22
     11         444444444444        :::            11             77            :::                    33       22
     11         444444444444        :::            11             77            :::                    33     22
     11                 44          :::            11            77             :::          33        33   22
  11111111              44                      11111111         77                          333333333333   222222222222
  11111111              44                      11111111         77                           3333333333    222222222222
```

```
 SSSSSSSSSSS     CCCCCCCCCCC       AAAAAAAAA     LL               EEEEEEEEEEEEE                     PPPPPPPPPPPP      CCCCCCCCCCC
SSSSSSSSSSSSS   CCCCCCCCCCCCC     AAAAAAAAAAA    LL               EEEEEEEEEEEEE                     PPPPPPPPPPPPP    CCCCCCCCCCCCC
SS         SS   CC         CC    AA         AA   LL               EE                                PP         PP    CC         CC
SS              CC               AA         AA   LL               EE                                PP         PP    CC
SS              CC               AA         AA   LL               EE                                PP         PP    CC
SSSSSSSSSSSS    CC               AAAAAAAAAAAAA   LL               EEEEEEEEE        -------------    PPPPPPPPPPPPP    CC
 SSSSSSSSSSSS   CC               AAAAAAAAAAAAA   LL               EEEEEEEEE        -------------    PPPPPPPPPPPP     CC
           SS   CC               AA         AA   LL               EE                                PP               CC
           SS   CC               AA         AA   LL               EE                                PP               CC
SS         SS   CC         CC    AA         AA   LL               EE                                PP               CC         CC
SSSSSSSSSSSSS   CCCCCCCCCCCCC    AA         AA   LLLLLLLLLLLLL    EEEEEEEEEEEEE                     PP               CCCCCCCCCCCCC
 SSSSSSSSSSS     CCCCCCCCCCC     AA         AA   LLLLLLLLLLLLL    EEEEEEEEEEEEE                     PP                CCCCCCCCCCC
```

```
**************************************************************************
**************************************************************************
**************************************************************************
*****                                                                *****
*****              PROGRAM VERIFICATION INFORMATION                  *****
*****                                                                *****
*****             CODE SYSTEM:  SCALE-PC VERSION:  4.3               *****
*****                                                                *****
**************************************************************************
**************************************************************************
*****                                                                *****
*****                                                                *****
*****           PROGRAM:  CSAS                                       *****
*****                                                                *****
*****     CREATION DATE:  03/08/96                                   *****
*****                                                                *****
*****            VOLUME:  ENG                                        *****
*****                                                                *****
*****           LIBRARY:  G:\SCALE43\WIN_NT\EXE                      *****
*****                                                                *****
*****                                                                *****
*****   THIS IS NOT A SCALE-PC CONFIGURATION CONTROLLED CODE         *****
*****                                                                *****
*****           JOBNAME:  SCALE-PC                                   *****
*****                                                                *****
*****   DATE OF EXECUTION:  10/12/00                                 *****
*****                                                                *****
*****   TIME OF EXECUTION:  14:17:32                                 *****
*****                                                                *****
*****                                                                *****
**************************************************************************
**************************************************************************
**************************************************************************
```

```
'MIN BASKET PLATE - COMMENT CARD REFERS TO NOMINAL PLATE SIZE

'23 PLATES - 18 GRAM 235U PER PLATE

'FUEL SHIFT AXIAL ALTERNATING

'56 CM ACTIVE FUEL HEIGHT

'MIN BASKET PLATE - COMMENT CARD REFERS TO NOMINAL PLATE SIZE

'23 PLATES - 18 GRAM 235U PER PLATE

'FUEL SHIFT AXIAL ALTERNATING

'56 CM ACTIVE FUEL HEIGHT
    LWT MTR INPUT FOR CASK MODEL - PLATES IN CLOSE & PLATES @ FULL PITCH


    **** PROBLEM PARAMETERS ****

    LIB 27GROUPNDF4  LIBRARY
    MXX            8 MIXTURES
    MSC            9 COMPOSITION SPECIFICATIONS
    IZM            3 MATERIAL ZONES
    GE  LATTICECELL  GEOMETRY
    MORE           0 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
    MSLN           0 FUEL SOLUTIONS


    **** PROBLEM COMPOSITION DESCRIPTION ****

    SC  URANIUM      STANDARD COMPOSITION
    MX             1 MIXTURE NO.
    VF        0.0363 VOLUME FRACTION
    ROTH     19.0500 SPECIFIED DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               92000      1.00 ATOM/MOLECULE
                                92235     94.000 WT%
                                92238      6.000 WT%
    END

    SC  AL           STANDARD COMPOSITION
    MX             1 MIXTURE NO.
    VF        0.2557 VOLUME FRACTION
    ROTH      2.7020 SPECIFIED DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               13027      1.00 ATOM/MOLECULE
    END

    SC  AL           STANDARD COMPOSITION
    MX             2 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      2.7020 THEORETICAL DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               13027      1.00 ATOM/MOLECULE
    END

    SC  H2O          STANDARD COMPOSITION
    MX             3 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      0.9982 THEORETICAL DENSITY
    NEL            2 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
                1001      2.00 ATOMS/MOLECULE
                8016      1.00 ATOM/MOLECULE
    END

    SC  AL           STANDARD COMPOSITION
    MX             4 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      2.7020 THEORETICAL DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               13027      1.00 ATOM/MOLECULE
    END

    SC  SS304        STANDARD COMPOSITION
    MX             5 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      7.9200 THEORETICAL DENSITY
    NEL            4 NO. ELEMENTS
    ICP            0 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               24304     19.000 WT%
               25055      2.000 WT%
               26304     69.500 WT%
```

```
             28304      9.500 WT%
END

SC  PB             STANDARD COMPOSITION
MX                6 MIXTURE NO.
VF           1.0000 VOLUME FRACTION
ROTH        11.3440 THEORETICAL DENSITY
NEL               1 NO. ELEMENTS
ICP               1 0/1 MIXTURE/COMPOUND
TEMP          293.0 DEG KELVIN
              82000         1.00 ATOM/MOLECULE
END

SC  H2O            STANDARD COMPOSITION
MX                7 MIXTURE NO.
VF           0.0000 VOLUME FRACTION
ROTH         0.9982 THEORETICAL DENSITY
NEL               2 NO. ELEMENTS
ICP               1 0/1 MIXTURE/COMPOUND
TEMP          293.0 DEG KELVIN
               1001         2.00 ATOMS/MOLECULE
               8016         1.00 ATOM/MOLECULE
END

SC  H2O            STANDARD COMPOSITION
MX                8 MIXTURE NO.
VF           0.0000 VOLUME FRACTION
ROTH         0.9982 THEORETICAL DENSITY
NEL               2 NO. ELEMENTS
ICP               1 0/1 MIXTURE/COMPOUND
TEMP          293.0 DEG KELVIN
               1001         2.00 ATOMS/MOLECULE
               8016         1.00 ATOM/MOLECULE
END

**** PROBLEM GEOMETRY ****

CTP SYMMSLABCELL CELL TYPE
PITCH      0.3919 CM CENTER TO CENTER SPACING
FUELOD     0.0750 CM FUEL DIAMETER OR SLAB THICKNESS
MFUEL           1 MIXTURE NO. OF FUEL
MMOD            3 MIXTURE NO. OF MODERATOR
CLADOD     0.1150 CM CLAD OUTER DIAMETER
MCLAD           2 MIXTURE NO. OF CLAD


ZONE SPECIFICATIONS FOR LATTICECELL GEOMETRY

               ZONE  1 IS FUEL
               ZONE  2 IS CLAD
               ZONE  3 IS MOD
```

```
*******************************************************************************************************
***                                                                                                 ***
***                   LWT MTR INPUT FOR CASK MODEL - PLATES IN CLOSE & PLATES @ FULL PITCH          ***
***                                                                                                 ***
*******************************************************************************************************
*******************************************************************************************************
***                                                                                                 ***
***                           ********** DATA LIBRARY INFORMATION **********                        ***
***                                                                                                 ***
***      UNIT                                         VOLUME                                        ***
***     NUMBER            DATA SET NAME                NAME        UNIT FUNCTION                    ***
***     ------            -------------                ----        -------------                    ***
***                                                                                                 ***
***       89    G:\scale43\DATALIB\FT89F001                        STANDARD COMPOSITION LIBRARY     ***
***                                                                                                 ***
***       82    G:\scale43\DATALIB\FT82F001                        CROSS SECTION LIBRARY            ***
***                                                                                                 ***
***       11    D:\hjp\23p-18g-as-56h\FT11F001                     SHORT CROSS SECTION LIBRARY      ***
***                                                                                                 ***
***       90    D:\hjp\23p-18g-as-56h\FT90F001                     INPUT DATA DIRECT ACCESS         ***
***                                                                                                 ***
*******************************************************************************************************
*******************************************************************************************************
***                                                                                                 ***
***                                                                                                 ***
***                              STANDARD COMPOSITION LIBRARY DATA                                  ***
***                              ---------------------------------                                  ***
***                                                                                                 ***
***      UNIT NUMBER  :  89                                                                         ***
***                                                                                                 ***
***      DATASET NAME :  G:\scale43\DATALIB\FT89F001                                                ***
***                                                                                                 ***
***      LIBRARY TITLE:  SCALE-4 STANDARD COMPOSITION LIBRARY                                       ***
***                      637 STANDARD COMPOSITIONS, 490 NUCLIDES                                    ***
***                      90 ELEMENTS WITH VARIABLE ISOTOPIC DISTRBUTIONS.                           ***
***                                                                                                 ***
***      CREATION DATE:   6/30/95                                                                   ***
***                                                                                                 ***
***                                                                                                 ***
***                                                                                                 ***
***                                  CROSS SECTION LIBRARY DATA                                     ***
***                                ---------------------------                                      ***
***                                                                                                 ***
***      UNIT NUMBER  :  82                                                                         ***
***                                                                                                 ***
***      DATASET NAME :  G:\scale43\DATALIB\FT82F001                                                ***
***                                                                                                 ***
***      LIBRARY TITLE:  SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY                                 ***
***                         BASED ON ENDF-B VERSION 4 DATA                                          ***
***                            COMPILED FOR NRC     1/27/89                                         ***
***                               LAST UPDATED                                            08/12/94  ***
***                                  L.M.PETRIE   -    ORNL                                         ***
***                                                                                                 ***
***                                                                                                 ***
***                                                                                                 ***
***                                                                                                 ***
*******************************************************************************************************
*******************************************************************************************************
```

```
BBBBBBBBBBB    OOOOOOOOOOO    NN          NN                      AAAAAAAAA     MM          MM   IIIIIIIIIII    22222222222
BBBBBBBBBBBB  OOOOOOOOOOOOO   NNN         NN                     AAAAAAAAAAA    MMM        MMM   IIIIIIIIIII   2222222222222
BB        BB  OO         OO   NNNN        NN                    AA         AA   MMMM      MMMM       II        22          22
BB        BB  OO         OO   NN NN       NN                    AA         AA   MM MM    MM MM       II                    22
BB        BB  OO         OO   NN  NN      NN                    AA         AA   MM  MM  MM  MM       II                    22
BBBBBBBBBBB   OO         OO   NN   NN     NN  -------------     AAAAAAAAAAAAA   MM   MMMM   MM       II                   22
BBBBBBBBBBB   OO         OO   NN    NN    NN  -------------     AAAAAAAAAAAAA   MM    MM    MM       II                 22
BB        BB  OO         OO   NN     NN   NN                    AA         AA   MM          MM       II               22
BB        BB  OO         OO   NN      NN  NN                    AA         AA   MM          MM       II             22
BB        BB  OO         OO   NN       NNNN                     AA         AA   MM          MM       II           22
BBBBBBBBBBBB  OOOOOOOOOOOOO   NN        NNN                     AA         AA   MM          MM   IIIIIIIIIII   2222222222222
BBBBBBBBBBB    OOOOOOOOOOO    NN         NN                     AA         AA   MM          MM   IIIIIIIIIII   2222222222222


 SSSSSSSSSS     CCCCCCCCCCC     AAAAAAAAA     LL             EEEEEEEEEEEEE                   PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSS   CCCCCCCCCCCCC   AAAAAAAAAAA    LL             EEEEEEEEEEEEE                   PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS        SS   CC         CC  AA         AA   LL             EE                              PP         PP  CC         CC
SS             CC             AA         AA   LL             EE                              PP         PP  CC
SS             CC             AA         AA   LL             EE                              PP         PP  CC
SSSSSSSSSSS    CC             AAAAAAAAAAAAA   LL             EEEEEEEEE     -------------     PPPPPPPPPPPPP  CC
 SSSSSSSSSSS   CC             AAAAAAAAAAAAA   LL             EEEEEEEEE     -------------     PPPPPPPPPPPP   CC
          SS   CC             AA         AA   LL             EE                              PP             CC
          SS   CC             AA         AA   LL             EE                              PP             CC
SS        SS   CC         CC  AA         AA   LL             EE                              PP             CC         CC
SSSSSSSSSSSS   CCCCCCCCCCCCC  AA         AA   LLLLLLLLLLLLL  EEEEEEEEEEEEE                   PP             CCCCCCCCCCCCC
 SSSSSSSSSS     CCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL  EEEEEEEEEEEEE                   PP              CCCCCCCCCCC


      11         0000000             //        11       22222222222           //     0000000        0000000
     111        000000000           //        111      2222222222222         //     000000000      000000000
    1111       00       00         //        1111      22         22        //     00       00    00       00
      11       00       00        //           11                 22       //      00       00    00       00
      11       00       00       //            11                 22      //       00       00    00       00
      11       00       00      //             11               22       //        00       00    00       00
      11       00       00     //              11             22        //         00       00    00       00
      11       00       00    //               11           22         //          00       00    00       00
      11       00       00   //                11         22          //           00       00    00       00
      11       00       00  //                 11       22           //            00       00    00       00
   11111111     000000000  //               11111111   2222222222222 //             000000000      000000000
   11111111      0000000  //                11111111   2222222222222//               0000000        0000000


      11               44                      11      7777777777777             33333333333            44
     111              444                     111      7777777777777            3333333333333          444
    1111             4444         :::        1111      77         77     :::    33         33         4444
      11            44 44         :::          11                 77     :::               33        44 44
      11           44  44         :::          11                77      :::               33       44  44
      11          44   44                      11               77                        333      44   44
      11         44    44                      11              77                         333     44    44
      11        444444444444      :::          11             77         :::               33    444444444444
      11        444444444444      :::          11             77         :::               33    444444444444
      11               44         :::          11            77          :::    33         33           44
   11111111            44                   11111111         77                 3333333333333           44
   11111111            44                   11111111         77                  33333333333            44
```

```
  SSSSSSSSSS     CCCCCCCCCC       AAAAAAAAA      LL             EEEEEEEEEEEEE                    PPPPPPPPPPPP    CCCCCCCCCC
 SSSSSSSSSSSS   CCCCCCCCCCCC     AAAAAAAAAAA     LL             EEEEEEEEEEEEE                    PPPPPPPPPPPPP  CCCCCCCCCCCC
 SS        SS   CC        CC    AA         AA    LL             EE                               PP         PP  CC        CC
 SS             CC              AA         AA    LL             EE                               PP         PP  CC
 SS             CC              AA         AA    LL             EE                               PP         PP  CC
 SSSSSSSSSSS    CC              AAAAAAAAAAAAA    LL             EEEEEEEEE       -------------    PPPPPPPPPPPPP  CC
  SSSSSSSSSSS   CC              AAAAAAAAAAAAA    LL             EEEEEEEEE       -------------    PPPPPPPPPPPP   CC
           SS   CC              AA         AA    LL             EE                               PP             CC
           SS   CC              AA         AA    LL             EE                               PP             CC
 SS        SS   CC        CC    AA         AA    LL             EE                               PP             CC        CC
 SSSSSSSSSSSS   CCCCCCCCCCCC    AA         AA    LLLLLLLLLLLL   EEEEEEEEEEEEE                    PP             CCCCCCCCCCCC
  SSSSSSSSSS     CCCCCCCCCC     AA         AA    LLLLLLLLLLLL   EEEEEEEEEEEEE                    PP              CCCCCCCCCC
```

```
*****                                                                  *****
*****              PROGRAM VERIFICATION INFORMATION                    *****
*****                                                                  *****
*****            CODE SYSTEM:   SCALE-PC VERSION:   4.3                *****
*****                                                                  *****
*****                                                                  *****
*****                                                                  *****
*****          PROGRAM:  000008                                        *****
*****                                                                  *****
*****    CREATION DATE:  09/15/95                                      *****
*****                                                                  *****
*****           VOLUME:  ENG                                           *****
*****                                                                  *****
*****          LIBRARY:  G:\SCALE43\WIN_NT\EXE                         *****
*****                                                                  *****
*****                                                                  *****
*****  THIS IS NOT A SCALE-PC CONFIGURATION CONTROLLED CODE             *****
*****                                                                  *****
*****          JOBNAME:  SCALE-PC                                      *****
*****                                                                  *****
*****  DATE OF EXECUTION:  10/12/00                                    *****
*****                                                                  *****
*****  TIME OF EXECUTION:  14:17:34                                    *****
*****                                                                  *****
*****                                                                  *****
```

```
-1Q ARRAY HAS      1 ENTRIES.

 0Q ARRAY HAS      4 ENTRIES.

 1Q ARRAY HAS      6 ENTRIES.

 2Q ARRAY HAS      2 ENTRIES.
```

```
LOGICAL ASSIGNMENTS

MASTER LIBRARY    11
WORKING LIBRARY    0
SCRATCH FILE      18
NEW LIBRARY        1

P R O B L E M   D E S C R I P T I O N

IGR--GEOMETRY (0/1/2/3--INF MED/SLAB/CYL/SPHERE              1

IZM--NUMBER OF ZONES OR MATERIAL REGIONS                     8

MS--MIXING TABLE LENGTH                                     16

IBL--SHIELDED CROSS SECTION EDIT OPTION (0/1--NO/YES)        0

IBR--BONDARENKO FACTOR EDIT OPTION (0/1--NO/YES)             0

ISSOPT--DANCOFF FACTOR OPTION                                0

CONVERGENCE CRITERION     1.00000E-03

GEOMETRY CORRECTION FACTOR FOR WIGNER RATIONAL APPROXIMATION  1.000E+00

        3Q ARRAY HAS     16 ENTRIES.

        4Q ARRAY HAS     16 ENTRIES.

        5Q ARRAY HAS     16 ENTRIES.

        6Q ARRAY HAS      8 ENTRIES.

        7Q ARRAY HAS      8 ENTRIES.

        8Q ARRAY HAS      8 ENTRIES.

        9Q ARRAY HAS      8 ENTRIES.

       10Q ARRAY HAS     16 ENTRIES.

       11Q ARRAY HAS      8 ENTRIES.

M I X I N G   T A B L E

ENTRY    MIXTURE    ISOTOPE    NUMBER DENSITY    NEW IDENTIFIER
   1        1        92235      1.66361E-03          1092235
   2        1        92238      1.04847E-04          1092238
   3        1        13027      1.54180E-02          1013027
   4        2        13027      6.03066E-02          2013027
   5        4        13027      6.03066E-02          4013027
   6        3         1001      6.67692E-02          3001001
   7        7         1001      6.67692E-22          7001001
   8        8         1001      6.67692E-22          8001001
   9        3         8016      3.33846E-02          3008016
  10        7         8016      3.33846E-22          7008016
  11        8         8016      3.33846E-22          8008016
  12        5        24304      1.74286E-02          5024304
  13        5        25055      1.73633E-03          5025055
  14        5        26304      5.93579E-02          5026304
  15        5        28304      7.72070E-03          5028304
  16        6        82000      3.29690E-02          6082000

GEOMETRY AND MATERIAL DESCRIPTION

ZONE   MIXTURE   OUTER DIMENSION    TEMPERATURE       EXTRA XS    TYPE (0/1--FUEL/MOD)
   1      1         3.75000E-02     2.93000E+02     2.62093E+00            0
   2      2         5.75000E-02     2.93000E+02     0.00000E+00            0
   3      3         1.95950E-01     2.93000E+02     0.00000E+00            0
   4      4         5.19595E+00     2.93000E+02     0.00000E+00            0
   5      5         1.01959E+01     2.93000E+02     0.00000E+00            0
   6      6         1.51959E+01     2.93000E+02     0.00000E+00            0
   7      7         2.01959E+01     2.93000E+02     0.00000E+00            0
   8      8         2.51959E+01     2.93000E+02     0.00000E+00            0
     3609 LOCATIONS OF    100000 AVAILABLE ARE REQUIRED TO MAKE A NEW MASTER CONTAINING THE SELF-SHIELDED VALUES

NO NUCLIDES IN YOUR PROBLEM HAVE BONDARENKO FACTOR DATA**BONAMI WILL COPY FROM LOGICAL 11 TO LOGICAL  1

COPY      1001    HYDROGEN          FROM LOG 11 TO LOG 18     BONDARENKO TRIGGER 0

COPY      1001    HYDROGEN          FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY      1001    HYDROGEN          FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY      1001    HYDROGEN          FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY      8016    OXYGEN-16         FROM LOG 11 TO LOG 18     BONDARENKO TRIGGER 0

COPY      8016    OXYGEN-16         FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY      8016    OXYGEN-16         FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY      8016    OXYGEN-16         FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY     13027    AL-27 1193 218 G FROM LOG 11 TO LOG 18     BONDARENKO TRIGGER 0
```

```
COPY     13027  AL-27 1193 218 G FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY     13027  AL-27 1193 218 G FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY     13027  AL-27 1193 218 G FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY     24304  CR 1191 WT SS-30 FROM LOG 11 TO LOG  1    BONDARENKO TRIGGER 0
COPY     25055   MANGANESE-55    FROM LOG 11 TO LOG  1    BONDARENKO TRIGGER 0
COPY     26304  FE 1192 WT SS-30 FROM LOG 11 TO LOG  1    BONDARENKO TRIGGER 0
COPY     28304  NI 1190 WT SS-30 FROM LOG 11 TO LOG  1    BONDARENKO TRIGGER 0
COPY     82000  PB   1288 218NGP FROM LOG 11 TO LOG  1    BONDARENKO TRIGGER 0
COPY     92235   URANIUM-235     FROM LOG 11 TO LOG  1    BONDARENKO TRIGGER 0
COPY     92238   URANIUM-238     FROM LOG 11 TO LOG  1    BONDARENKO TRIGGER 0
```

```
SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
   BASED ON ENDF-B VERSION 4 DATA
     COMPILED FOR NRC      1/27/89
        LAST UPDATED                                               08/12/94
           L.M.PETRIE    -    ORNL
    TAPE ID                            4321         NUMBER OF NUCLIDES                 16
    NUMBER OF NEUTRON GROUPS             27         NUMBER OF GAMMA GROUPS              0
    FIRST THERMAL GROUP                  15         LOGICAL UNIT                        1
                              TABLE OF CONTENTS
   HYDROGEN       ENDF/B-IV MAT 1269/THPM1002             UPDATED 08/12/94      ID    3001001
   HYDROGEN       ENDF/B-IV MAT 1269/THPM1002             UPDATED 08/12/94      ID    7001001
   HYDROGEN       ENDF/B-IV MAT 1269/THPM1002             UPDATED 08/12/94      ID    8001001
   OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94      ID    3008016
   OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94      ID    7008016
   OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94      ID    8008016
  AL-27 1193 218 GP 040375(5)                             UPDATED 08/12/94      ID    1013027
  AL-27 1193 218 GP 040375(5)                             UPDATED 08/12/94      ID    2013027
  AL-27 1193 218 GP 040375(5)                             UPDATED 08/12/94      ID    4013027
  CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94      ID    5024304
   MANGANESE-55   ENDF/B-IV MAT 1197                      UPDATED 08/12/94      ID    5025055
  FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94      ID    5026304
  NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94      ID    5028304
  PB   1288 218NGP 042375 P-3 293K                        UPDATED 08/12/94      ID    6082000
   URANIUM-235    ENDF/B-IV MAT 1261                      UPDATED 08/12/94      ID    1092235
   URANIUM-238    ENDF/B-IV MAT 1262                      UPDATED 08/12/94      ID    1092238

    TAPE COPY USED       0 I/O'S, AND TOOK     0.17 SECONDS
```

```
KK         KK EEEEEEEEEEEEE NN         NN  00000000000                  VV         VV
KK        KK  EEEEEEEEEEEEE NNN        NN 0000000000000                 VV         VV
KK      KK    EE            NNNN       NN 00         00                 VV         VV
KK     KK     EE            NN NN      NN 00         00                 VV         VV
KK    KK      EE            NN  NN     NN 00         00                 VV         VV
KKKKKKKK      EEEEEEEEE     NN   NN    NN 00         00 -------------   VV         VV
KKKKKKKK      EEEEEEEEE     NN    NN   NN 00         00 -------------    VV       VV
KK    KK      EE            NN     NN  NN 00         00                   VV     VV
KK     KK     EE            NN      NN NN 00         00                    VV   VV
KK      KK    EE            NN       NNNN 00         00                     VV VV
KK        KK  EEEEEEEEEEEEE NN        NNN 0000000000000                      VVV
KK         KK EEEEEEEEEEEEE NN         NN  00000000000                        V

 SSSSSSSSSSS   CCCCCCCCCCC    AAAAAAAAA    LL              EEEEEEEEEEEEE                  PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS CCCCCCCCCCCCC  AAAAAAAAAAA   LL              EEEEEEEEEEEEE                  PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS CC         CC AA         AA  LL              EE                             PP         PP  CC         CC
SS            CC            AA         AA  LL              EE                             PP         PP  CC
SS            CC            AA         AA  LL              EE                             PP         PP  CC
SSSSSSSSSSSS  CC            AAAAAAAAAAAAA  LL              EEEEEEEEE     -------------    PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS CC            AAAAAAAAAAAAA  LL              EEEEEEEEE     -------------    PPPPPPPPPPPP   CC
           SS CC            AA         AA  LL              EE                             PP             CC
           SS CC            AA         AA  LL              EE                             PP             CC
SS         SS CC         CC AA         AA  LL              EE                             PP             CC         CC
SSSSSSSSSSSSS CCCCCCCCCCCCC AA         AA  LLLLLLLLLLLLL   EEEEEEEEEEEEE                  PP             CCCCCCCCCCCCC
 SSSSSSSSSSS   CCCCCCCCCCC  AA         AA  LLLLLLLLLLLLL   EEEEEEEEEEEEE                  PP              CCCCCCCCCCC

      11       0000000           //       11       22222222222          //     0000000      0000000
     111      000000000         //       111      2222222222222        //     000000000    000000000
    1111     00       00       //       1111      22         22       //     00       00  00       00
      11     00       00      //          11                 22      //     00       00  00       00
      11     00       00     //           11                22      //     00       00  00       00
      11     00       00    //            11              22       //     00       00  00       00
      11     00       00   //             11            22        //     00       00  00       00
      11     00       00  //              11          22         //     00       00  00       00
      11     00       00 //               11        22          //     00       00  00       00
      11      00     00 //                11      22           //       00     00    00     00
  11111111   000000000 //             11111111  2222222222222  //        000000000    000000000
  11111111    0000000  //             11111111  2222222222222  //         0000000      0000000

      11           44                     11      7777777777777                  44    0000000
     111          444                    111      777777777777                  444   000000000
    1111         4444      :::          1111      77        77      :::        4444   00       00
      11        44 44      :::            11               77       :::       44 44   00       00
      11       44  44      :::            11              77        :::      44  44   00       00
      11      44   44                     11             77                 44   44   00       00
      11     44    44                     11            77                 44    44   00       00
      11     444444444444  :::            11           77           :::    444444444444 00       00
      11     444444444444  :::            11           77           :::    444444444444 00       00
      11           44      :::            11          77            :::          44    00       00
  11111111         44                 11111111        77                         44     000000000
  11111111         44                 11111111        77                         44      0000000
```

```
 SSSSSSSSSSS     CCCCCCCCCCC       AAAAAAAAA     LL               EEEEEEEEEEEEE                     PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS   CCCCCCCCCCCCC     AAAAAAAAAAA    LL               EEEEEEEEEEEEE                     PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS   CC         CC    AA         AA   LL               EE                                PP         PP  CC         CC
SS              CC               AA         AA   LL               EE                                PP         PP  CC
SS              CC               AA         AA   LL               EE                                PP         PP  CC
SSSSSSSSSSSS    CC               AAAAAAAAAAAAA   LL               EEEEEEEEE      -------------      PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS   CC               AAAAAAAAAAAAA   LL               EEEEEEEEE      -------------      PPPPPPPPPPPP   CC
           SS   CC               AA         AA   LL               EE                                PP             CC
           SS   CC               AA         AA   LL               EE                                PP             CC
SS         SS   CC         CC    AA         AA   LL               EE                                PP             CC         CC
SSSSSSSSSSSSS   CCCCCCCCCCCCC    AA         AA   LLLLLLLLLLLLL    EEEEEEEEEEEEE                     PP             CCCCCCCCCCCCC
 SSSSSSSSSSS     CCCCCCCCCCC     AA         AA   LLLLLLLLLLLLL    EEEEEEEEEEEEE                     PP              CCCCCCCCCCC
```

```
****************************************************************************
****************************************************************************
****************************************************************************
*****                                                                  *****
*****                 PROGRAM VERIFICATION INFORMATION                 *****
*****                                                                  *****
*****                CODE SYSTEM:  SCALE-PC VERSION:  4.3              *****
*****                                                                  *****
****************************************************************************
****************************************************************************
*****                                                                  *****
*****                                                                  *****
*****             PROGRAM:  000009                                     *****
*****                                                                  *****
*****       CREATION DATE:  03/08/96                                   *****
*****                                                                  *****
*****             VOLUME:   ENG                                        *****
*****                                                                  *****
*****             LIBRARY:  G:\SCALE43\WIN_NT\EXE                      *****
*****                                                                  *****
*****                                                                  *****
*****    THIS IS NOT A SCALE-PC CONFIGURATION CONTROLLED CODE          *****
*****                                                                  *****
*****             JOBNAME:  SCALE-PC                                   *****
*****                                                                  *****
*****    DATE OF EXECUTION:  10/12/00                                  *****
*****                                                                  *****
*****    TIME OF EXECUTION:  14:17:40                                  *****
*****                                                                  *****
*****                                                                  *****
****************************************************************************
****************************************************************************
****************************************************************************
```

```
**********************************************************************************************************
***                                                                                                    ***
***                                                                                                    ***
***                                                                                                    ***
**********************************************************************************************************
***                            ******     NUMERIC PARAMETERS     ******                                ***
***                                                                                                    ***
***                                                                                                    ***
***              TME        MAXIMUM PROBLEM TIME (MIN)                              30.00              ***
***                                                                                                    ***
***              TBA        TIME PER GENERATION (MIN)                                5.00              ***
***                                                                                                    ***
***              GEN        NUMBER OF GENERATIONS                                     803              ***
***                                                                                                    ***
***              NPG        NUMBER PER GENERATION                                    1000              ***
***                                                                                                    ***
***              NSK        NUMBER OF GENERATIONS TO BE SKIPPED                         3              ***
***                                                                                                    ***
***              BEG        BEGINNING GENERATION NUMBER                                 1              ***
***                                                                                                    ***
***              RES        GENERATIONS BETWEEN CHECKPOINTS                             0              ***
***                                                                                                    ***
***              X1D        NUMBER OF EXTRA 1-D CROSS SECTIONS                          1              ***
***                                                                                                    ***
***              NBK        NEUTRON BANK SIZE                                        1025              ***
***                                                                                                    ***
***              XNB        EXTRA POSITIONS IN NEUTRON BANK                             0              ***
***                                                                                                    ***
***              NFB        FISSION BANK SIZE                                        1000              ***
***                                                                                                    ***
***              XFB        EXTRA POSITIONS IN FISSION BANK                             0              ***
***                                                                                                    ***
***              WTA        DEFAULT VALUE OF WEIGHT AVERAGE                        0.5000              ***
***                                                                                                    ***
***              WTH        WEIGHT HIGH FOR SPLITTING                              3.0000              ***
***                                                                                                    ***
***              WTL        WEIGHT LOW FOR RUSSIAN ROULETTE                        0.3333              ***
***                                                                                                    ***
***              RND        STARTING RANDOM NUMBER                             BB827100001              ***
***                                                                                                    ***
***              NB8        NUMBER OF D.A. BLOCKS ON UNIT  8                          200              ***
***                                                                                                    ***
***              NL8        LENGTH OF D.A. BLOCKS ON UNIT  8                          512              ***
***                                                                                                    ***
***              ADJ        MODE OF CALCULATION                                   FORWARD              ***
***                                                                                                    ***
***                         INPUT DATA WRITTEN ON RESTART UNIT                         NO              ***
***                                                                                                    ***
***                         BINARY DATA INTERFACE                                     YES              ***
***                                                                                                    ***
***                                                                                                    ***
**********************************************************************************************************
**********************************************************************************************************
```

```
*****************************************************************************************************
*****************************************************************************************************
***                                                                                               ***
***                                                                                               ***
***                                                                                               ***
*****************************************************************************************************
***                          ******    LOGICAL PARAMETERS       ******                            ***
***                                                                                               ***
*** RUN  EXECUTE PROBLEM AFTER CHECKING DATA    YES         PLT  PLOT PICTURE MAP(S)            NO ***
***                                                                                               ***
*** FLX  COMPUTE FLUX                            NO         FDN  COMPUTE FISSION DENSITIES      NO ***
***                                                                                               ***
*** SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION    NO         NUB  COMPUTE NU-BAR & AVG FISSION GROUP  YES ***
***                                                                                               ***
*** MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER     NO         MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION  NO ***
***                                                                                               ***
*** CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER   NO         CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION  NO ***
***                                                                                               ***
*** FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER   NO         FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION  NO ***
***                                                                                               ***
*** MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER     NO         MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER     NO ***
***                                                                                               ***
*** CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER   NO         CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER   NO ***
***                                                                                               ***
*** FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER   NO         FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER   NO ***
***                                                                                               ***
*** HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL    NO         HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL    NO ***
***                                                                                               ***
*** AMX  PRINT ALL MIXED CROSS SECTIONS          NO         FAR  PRINT FIS. AND ABS. BY REGION            NO ***
***                                                                                               ***
*** XS1  PRINT 1-D MIXTURE X-SECTIONS            NO         GAS  PRINT FAR BY GROUP                       NO ***
***                                                                                               ***
*** XS2  PRINT 2-D MIXTURE X-SECTIONS            NO         PAX  PRINT XSEC-ALBEDO CORRELATION TABLES     NO ***
***                                                                                               ***
*** XAP  PRINT MIXTURE ANGLES & PROBABILITIES    NO         PWT  PRINT WEIGHT AVERAGE ARRAY               NO ***
***                                                                                               ***
*** PKI  PRINT FISSION SPECTRUM                  NO         PGM  PRINT INPUT GEOMETRY                     NO ***
***                                                                                               ***
*** P1D  PRINT EXTRA 1-D CROSS SECTIONS          NO         BUG  PRINT DEBUG INFORMATION                  NO ***
***                                                                                               ***
***                                                         TRK  PRINT TRACKING INFORMATION               NO ***
***                                                                                               ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************
*****************************************************************************************************
                                   PARAMETER INPUT COMPLETED

                   .......     0 IO'S WERE USED READING THE PARAMETER DATA      .......

                   ************** DATA READING COMPLETED **************
```

```
**************************************************************************************************
***                                                                                            ***
***                                                                                            ***
***                                                                                            ***
**************************************************************************************************
**************************************************************************************************
***                                                                                            ***
***        UNIT                                                VOLUME                          ***
***       NUMBER                DATA SET NAME                   NAME     UNIT FUNCTION         ***
***       ------                -------------                   ----     -------------         ***
***                                                                                            ***
***   XSC  14    D:\hjp\23p-18g-as-56h\FT14F001                          MIXED CROSS SECTIONS  ***
***                                                                                            ***
***   ALB  79    G:\scale43\DATALIB\FT79F001                             INPUT ALBEDOS         ***
***                                                                                            ***
***   WTS  80    G:\scale43\DATALIB\FT80F001                             INPUT WEIGHTS         ***
***                                                                                            ***
***   SKT  16     UNKNOWN                                                WRITE SCRATCH DATA    ***
***                                                                                            ***
***   BIN  95    D:\hjp\23p-18g-as-56h\FT95F001                          BINARY INPUT DATA     ***
***                                                                                            ***
***   RST  95    D:\hjp\23p-18g-as-56h\FT95F001                          READ RESTART DATA     ***
***                                                                                            ***
***   LIB   4    D:\hjp\23p-18g-as-56h\FT04F001                          INPUT AMPX WORKING LIBRARY ***
***                                                                                            ***
***         8    D:\hjp\23p-18g-as-56h\FT08F001                          INPUT DATA DIRECT ACCESS ***
***                                                                                            ***
***         9     UNKNOWN                                                SUPER GROUPED DIRECT ACCESS ***
***                                                                                            ***
***        10     UNKNOWN                                                XSEC MIXING DIRECT ACCESS ***
***                                                                                            ***
**************************************************************************************************

                ........    0 IO'S WERE USED PREPARING INPUT DATA    ........

                 CROSS SECTIONS READ FROM THE AMPX WORKING LIBRARY ON UNIT    4
```

```
                                   MIXING TABLE

                           NUMBER OF SCATTERING ANGLES =  2
                       CROSS SECTION MESSAGE THRESHOLD =3.0E-05


MIXTURE =      1         DENSITY(G/CC) =  1.3815
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT               NUCLIDE TITLE
   1013027  1.54180E-02  5.00014E-01   13027    26.9818     AL-27 1193 218 GP 040375(5)                                   UPDATED
08/12/94
   1092235  1.66361E-03  4.69986E-01   92235   235.0441      URANIUM-235     ENDF/B-IV MAT 1261                           UPDATED
08/12/94
   1092238  1.04847E-04  2.99991E-02   92238   238.0510      URANIUM-238     ENDF/B-IV MAT 1262                           UPDATED
08/12/94

MIXTURE =      2         DENSITY(G/CC) =  2.7020
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT               NUCLIDE TITLE
   2013027  6.03066E-02  1.00000E+00   13027    26.9818     AL-27 1193 218 GP 040375(5)                                   UPDATED
08/12/94

MIXTURE =      3         DENSITY(G/CC) = 0.99817
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT               NUCLIDE TITLE
   3001001  6.67692E-02  1.11927E-01    1001     1.0077      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                  UPDATED
08/12/94
   3008016  3.33846E-02  8.88074E-01    8016    15.9904      OXYGEN-16       ENDF/B-IV MAT 1276                           UPDATED
08/12/94

MIXTURE =      4         DENSITY(G/CC) =  2.7020
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT               NUCLIDE TITLE
   4013027  6.03066E-02  1.00000E+00   13027    26.9818     AL-27 1193 218 GP 040375(5)                                   UPDATED
08/12/94

MIXTURE =      5         DENSITY(G/CC) =  7.9200
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT               NUCLIDE TITLE
   5024304  1.74286E-02  1.90000E-01   24000    51.9957     CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'              UPDATED
08/12/94
   5025055  1.73633E-03  1.99999E-02   25055    54.9379      MANGANESE-55    ENDF/B-IV MAT 1197                           UPDATED
08/12/94
   5026304  5.93579E-02  6.95000E-01   26000    55.8447     FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'              UPDATED
08/12/94
   5028304  7.72070E-03  9.50001E-02   28000    58.6872     NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'              UPDATED
08/12/94

MIXTURE =      6         DENSITY(G/CC) =  11.344
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT               NUCLIDE TITLE
   6082000  3.29690E-02  1.00000E+00   82000   207.2100     PB   1288 218NGP 042375 P-3 293K                              UPDATED
08/12/94

MIXTURE =      7         DENSITY(G/CC) = 0.99817E-20
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT               NUCLIDE TITLE
   7001001  6.67692E-22  1.11927E-01    1001     1.0077      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                  UPDATED
08/12/94
   7008016  3.33846E-22  8.88073E-01    8016    15.9904      OXYGEN-16       ENDF/B-IV MAT 1276                           UPDATED
08/12/94

MIXTURE =      8         DENSITY(G/CC) = 0.99817E-20
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT               NUCLIDE TITLE
   8001001  6.67692E-22  1.11927E-01    1001     1.0077      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                  UPDATED
08/12/94
   8008016  3.33846E-22  8.88073E-01    8016    15.9904      OXYGEN-16       ENDF/B-IV MAT 1276                           UPDATED
08/12/94


                              3001001      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94
                              7001001      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94
                              8001001      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94
                              3008016      OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94
                              7008016      OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94
                              8008016      OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94
                              1013027     AL-27 1193 218 GP 040375(5)                          UPDATED 08/12/94
                              2013027     AL-27 1193 218 GP 040375(5)                          UPDATED 08/12/94
                              4013027     AL-27 1193 218 GP 040375(5)                          UPDATED 08/12/94
                              5024304     CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED 08/12/94
                              5025055      MANGANESE-55   ENDF/B-IV MAT 1197                   UPDATED 08/12/94
                              5026304     FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED 08/12/94
                              5028304     NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED 08/12/94
                              6082000     PB   1288 218NGP 042375 P-3 293K                     UPDATED 08/12/94
                              1092235      URANIUM-235    ENDF/B-IV MAT 1261                   UPDATED 08/12/94
                              1092238      URANIUM-238    ENDF/B-IV MAT 1262                   UPDATED 08/12/94

KENO MESSAGE NUMBER K5-222        1 TRANSFERS FOR MIXTURE     3 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222        1 TRANSFERS FOR MIXTURE     7 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222        1 TRANSFERS FOR MIXTURE     8 WERE CORRECTED FOR BAD MOMENTS.

                              ........    0 IO'S WERE USED MIXING CROSS-SECTIONS       ........

                                 1-D CROSS SECTION ARRAY ID NUMBERS
                                   1  2002  1452    27    18  1018

                              ........    0 IO'S WERE USED PREPARING THE CROSS SECTIONS    ........
```

```
********************************************************************************
***                                                                          ***
***                                                                          ***
***                                                                          ***
********************************************************************************
********************************************************************************
***                                                                          ***
***                     ****** ADDITIONAL INFORMATION ******                  ***
***                                                                          ***
***  NUMBER OF ENERGY GROUPS                27      USE LATTICE GEOMETRY                YES ***
***                                                                          ***
***  NO. OF FISSION SPECTRUM SOURCE GROUP   1       GLOBAL ARRAY NUMBER                  10 ***
***                                                                          ***
***  NO. OF SCATTERING ANGLES IN XSECS      2       NUMBER OF UNITS IN THE GLOBAL X DIR.  1 ***
***                                                                          ***
***  ENTRIES/NEUTRON IN THE NEUTRON BANK    28      NUMBER OF UNITS IN THE GLOBAL Y DIR.  1 ***
***                                                                          ***
***  ENTRIES/NEUTRON IN THE FISSION BANK    21      NUMBER OF UNITS IN THE GLOBAL Z DIR. 10 ***
***                                                                          ***
***  NUMBER OF MIXTURES USED                7       USE A GLOBAL REFLECTOR              YES ***
***                                                                          ***
***  NUMBER OF BIAS ID'S USED               1       USE NESTED HOLES                    YES ***
***                                                                          ***
***  NUMBER OF DIFFERENTIAL ALBEDOS USED    0       NUMBER OF HOLES                      34 ***
***                                                                          ***
***  TOTAL INPUT GEOMETRY REGIONS           88      MAXIMUM HOLE NESTING LEVEL            2 ***
***                                                                          ***
***  NUMBER OF GEOMETRY REGIONS USED        88      USE NESTED ARRAYS                   YES ***
***                                                                          ***
***  LARGEST GEOMETRY UNIT NUMBER          150      NUMBER OF ARRAYS USED                 8 ***
***                                                                          ***
***  LARGEST ARRAY NUMBER                   14      MAXIMUM ARRAY NESTING LEVEL           3 ***
***                                                                          ***
***                                                                          ***
***  +X BOUNDARY CONDITION                 MIR      -X BOUNDARY CONDITION               MIR ***
***                                                                          ***
***  +Y BOUNDARY CONDITION                 MIR      -Y BOUNDARY CONDITION               MIR ***
***                                                                          ***
***  +Z BOUNDARY CONDITION                 MIR      -Z BOUNDARY CONDITION               MIR ***
***                                                                          ***
********************************************************************************
```

```
                MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID

                                                ----- UNIT    1  -----

MIDDLE FUEL PLATE CELL

  1 CUBOID         1   1     +X =   3.3000    -X = -3.3000     +Y = 3.75000E-02 -Y =-3.75000E-02 +Z =  56.700    -Z = 0.70000

  2 CUBOID         2   1     +X =   3.3000    -X = -3.3000     +Y = 5.75000E-02 -Y =-5.75000E-02 +Z =  57.400    -Z = 0.00000

  3 CUBOID         3   1     +X =   3.3000    -X = -3.3000     +Y = 0.19590     -Y =-0.19590     +Z =  57.400    -Z = 0.00000

                                                ----- UNIT    2  -----

TOP FUEL PLATE CELL

  1 CUBOID         1   1     +X =   3.3000    -X = -3.3000     +Y = 3.75000E-02 -Y =-3.75000E-02 +Z =  56.700    -Z = 0.70000

  2 CUBOID         2   1     +X =   3.3000    -X = -3.3000     +Y = 5.75000E-02 -Y =-5.75000E-02 +Z =  57.400    -Z = 0.00000

  3 CUBOID         3   1     +X =   3.3000    -X = -3.3000     +Y = 5.75000E-02 -Y =-0.19590     +Z =  57.400    -Z = 0.00000

                                                ----- UNIT    3  -----

BOTTOM FUEL PLATE CELL

  1 CUBOID         1   1     +X =   3.3000    -X = -3.3000     +Y = 3.75000E-02 -Y =-3.75000E-02 +Z =  56.700    -Z = 0.70000

  2 CUBOID         2   1     +X =   3.3000    -X = -3.3000     +Y = 5.75000E-02 -Y =-5.75000E-02 +Z =  57.400    -Z = 0.00000

  3 CUBOID         3   1     +X =   3.3000    -X = -3.3000     +Y = 0.19590     -Y =-5.75000E-02 +Z =  57.400    -Z = 0.00000

                                                ----- UNIT    4  -----

SIDE PLATE

  1 CUBOID         2   1     +X = 0.20000     -X =-0.20000     +Y =  3.7500     -Y = -3.7500     +Z =  57.400    -Z = 0.00000

                                        ----- UNIT   10  EXTERNAL TO LATTICE  1   -----

FUEL PATE ARRAY - PLATES IN 5/16 IN. WEB CENTER

  1 ARRAY NUMBER   1         +X =   3.3000    -X = -3.3000     +Y =  4.3658     -Y = -4.3688     +Z =  57.400    -Z = 0.00000

  2 CUBOID         3   1     +X =   4.3688    -X = -4.3688     +Y =  4.3688     -Y = -4.3688     +Z =  73.152    -Z = 0.00000

    HOLE NUMBER    1      AT X = -4.1687      Y = 0.00000      Z = 0.00000      IS UNIT NUMBER     4

    HOLE NUMBER    2      AT X =  4.1687      Y = 0.00000      Z = 0.00000      IS UNIT NUMBER     4

  3 CUBOID         5   1     +X =   4.7244    -X = -4.7244     +Y =  4.3688     -Y = -4.3688     +Z =  73.152    -Z = 0.00000
```

```
                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                        -----   UNIT    11  EXTERNAL TO LATTICE  1   -----

FUEL ARRAY 20 PLATES IN 5/16 IN. WEB RIGHT

  1 ARRAY NUMBER      1         +X =  2.6314    -X = -3.9686    +Y =  4.3658    -Y = -4.3688    +Z =  57.400    -Z = 0.00000
  2 CUBOID            3  1      +X =  4.3688    -X = -4.3688    +Y =  4.3688    -Y = -4.3688    +Z =  73.152    -Z = 0.00000
    HOLE NUMBER       3       AT X = -4.1687     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER     4
    HOLE NUMBER       4       AT X =  4.1687     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER     4
  3 CUBOID            5  1      +X =  4.7244    -X = -4.7244    +Y =  4.3688    -Y = -4.3688    +Z =  73.152    -Z = 0.00000

                                        -----   UNIT    12  EXTERNAL TO LATTICE  1   -----

FUEL ARRAY 20 PLATES IN 5/16 IN. WEB LEFT

  1 ARRAY NUMBER      1         +X =  3.9686    -X = -2.6314    +Y =  4.3658    -Y = -4.3688    +Z =  57.400    -Z = 0.00000
  2 CUBOID            3  1      +X =  4.3688    -X = -4.3688    +Y =  4.3688    -Y = -4.3688    +Z =  73.152    -Z = 0.00000
    HOLE NUMBER       5       AT X = -4.1687     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER     4
    HOLE NUMBER       6       AT X =  4.1687     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER     4
  3 CUBOID            5  1      +X =  4.7244    -X = -4.7244    +Y =  4.3688    -Y = -4.3688    +Z =  73.152    -Z = 0.00000

                                        -----   UNIT    20  EXTERNAL TO LATTICE  1   -----

FUEL ARRAY WITH HALF OF 1/4 PLATE ON RIGHT -  TOP STACK

  1 ARRAY NUMBER      1         +X =  3.9686    -X = -2.6314    +Y =  4.3658    -Y = -4.3688    +Z =  57.400    -Z = 0.00000
  2 CUBOID            3  1      +X =  4.3688    -X = -4.3688    +Y =  4.3688    -Y = -4.3688    +Z =  73.152    -Z = 0.00000
    HOLE NUMBER       7       AT X = -4.1687     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER     4
    HOLE NUMBER       8       AT X =  4.1687     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER     4
  3 CUBOID            5  1      +X =  4.6736    -X = -4.3688    +Y =  4.3688    -Y = -4.3688    +Z =  73.152    -Z = 0.00000
```

```
                  MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION             NUM   ID

                                  -----   UNIT    21  EXTERNAL TO LATTICE  1   -----

FUEL WITH HALF OF 1/4 IN. PLATE ON LEFT  TOP STACK

  1 ARRAY NUMBER      1         +X =  2.6314    -X = -3.9686     +Y =  4.3658     -Y = -4.3688     +Z =  57.400     -Z = 0.00000

  2 CUBOID            3  1      +X =  4.3688    -X = -4.3688     +Y =  4.3688     -Y = -4.3688     +Z =  73.152     -Z = 0.00000

    HOLE NUMBER       9       AT X = -4.1687     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER      4

    HOLE NUMBER      10       AT X =  4.1687     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER      4

  3 CUBOID            5  1      +X =  4.3688    -X = -4.6736     +Y =  4.3688     -Y = -4.3688     +Z =  73.152     -Z = 0.00000

                                  -----   UNIT    30  EXTERNAL TO LATTICE  1   -----

FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON RIGHT -  BOTTOM STACK

  1 ARRAY NUMBER      1         +X =  3.9686    -X = -2.6314     +Y =  4.3658     -Y = -4.3688     +Z =  57.400     -Z = 0.00000

  2 CUBOID            3  1      +X =  4.3688    -X = -4.3688     +Y =  4.3688     -Y = -4.3688     +Z =  73.152     -Z = 0.00000

    HOLE NUMBER      11       AT X = -4.1687     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER      4

    HOLE NUMBER      12       AT X =  4.1687     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER      4

  3 CUBOID            5  1      +X =  4.6736    -X = -4.3688     +Y =  4.3688     -Y = -4.3688     +Z =  73.152     -Z = 0.00000

                                  -----   UNIT    31  EXTERNAL TO LATTICE  1   -----

FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON LEFT - BOTTOM STACK

  1 ARRAY NUMBER      1         +X =  2.6314    -X = -3.9686     +Y =  4.3658     -Y = -4.3688     +Z =  57.400     -Z = 0.00000

  2 CUBOID            3  1      +X =  4.3688    -X = -4.3688     +Y =  4.3688     -Y = -4.3688     +Z =  73.152     -Z = 0.00000

    HOLE NUMBER      13       AT X = -4.1687     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER      4

    HOLE NUMBER      14       AT X =  4.1687     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER      4

  3 CUBOID            5  1      +X =  4.3688    -X = -4.6736     +Y =  4.3688     -Y = -4.3688     +Z =  73.152     -Z = 0.00000

                                  -----   UNIT    40  EXTERNAL TO LATTICE  2   -----

2 UNIT ARRAY WITH 1/4 IN. PLATE ON TOP AND SIDES

  1 ARRAY NUMBER      2         +X =  9.0420    -X = -9.0428     +Y =  4.3688     -Y = -4.3688     +Z =  73.152     -Z = 0.00000

  2 CUBOID            5  1      +X =  9.3468    -X = -9.3476     +Y =  4.6736     -Y = -4.3688     +Z =  73.152     -Z = 0.00000
```

```
                  MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION             NUM   ID

                                    -----   UNIT    41  EXTERNAL TO LATTICE  3   -----

3 UNIT ARRAY WITH REST OF 5/16 WEB
  1 ARRAY NUMBER      3          +X =   14.173    -X = -14.174    +Y =   4.3688    -Y = -4.3688    +Z =   73.152    -Z = 0.00000
  2 CUBOID            5   1      +X =   14.528    -X = -14.529    +Y =   5.0800    -Y = -5.0800    +Z =   73.152    -Z = 0.00000

                                    -----   UNIT    42  EXTERNAL TO LATTICE  4   -----

2 UNIT ARRAY WITH 1/4 IN. PLATE ON BOTTOM AND SIDES
  1 ARRAY NUMBER      4          +X =   9.0420    -X = -9.0428    +Y =   4.3688    -Y = -4.3698    +Z =   73.152    -Z = 0.00000
  2 CUBOID            5   1      +X =   9.3468    -X = -9.3476    +Y =   4.3688    -Y = -4.6736    +Z =   73.152    -Z = 0.00000

                                                -----   UNIT    50   -----

7 MTR ELEMENTS IN THE LWT
  1 CYLINDER          3   1  RADIUS =   17.050    +Z =   73.152    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
    HOLE NUMBER      15        AT X = 0.00000      Y =  9.4489      Z = 0.00000    IS UNIT NUMBER     40
    HOLE NUMBER      16        AT X = 0.00000      Y = 0.00000      Z = 0.00000    IS UNIT NUMBER     41
    HOLE NUMBER      17        AT X = 0.00000      Y = -9.4489      Z = 0.00000    IS UNIT NUMBER     42
  2 CYLINDER          5   1  RADIUS =   18.891    +Z =   73.152    -Z = -1.2700    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  3 CYLINDER          6   1  RADIUS =   33.496    +Z =   73.152    -Z = -1.2700    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  4 CYLINDER          5   1  RADIUS =   36.544    +Z =   73.152    -Z = -1.2700    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  5 CYLINDER          7   1  RADIUS =   49.244    +Z =   73.152    -Z = -1.2700    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  6 CYLINDER          5   1  RADIUS =   49.854    +Z =   73.152    -Z = -1.2700    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  7 CUBOID            8   1      +X =   49.854    -X = -49.854    +Y =   49.854    -Y = -49.854    +Z =   73.152    -Z = -1.2700

                                                -----   UNIT    60   -----

SIMPLIFIED LID STRUCTURE NAC-LWT
  1 CYLINDER          5   1  RADIUS =   36.519    +Z =   13.677    -Z = -14.135    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  2 CYLINDER          8   1  RADIUS =   49.854    +Z =   13.677    -Z = -14.135    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  3 CUBOID            8   1      +X =   49.854    -X = -49.854    +Y =   49.854    -Y = -49.854    +Z =   13.677    -Z = -14.135
```

```
                MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID

                                            -----   UNIT    61   -----

SIMPLIFIED CASK BOTTOM STRUCTURE NAC-LWT

  1 CYLINDER          6   1  RADIUS =  26.353     +Z =   3.8100     -Z = -3.8100     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  2 CYLINDER          5   1  RADIUS =  36.619     +Z =  13.360      -Z = -12.700     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  3 CYLINDER          8   1  RADIUS =  49.854     +Z =  13.360      -Z = -12.700     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  4 CUBOID            8   1      +X =  49.854     -X = -49.854     +Y =  49.854     -Y = -49.854      +Z =  13.360     -Z = -12.700

                                            -----   UNIT    62   -----

THIN TOP AND BOTTOM SHELL OF NEUTRON SHIELD - SUBTRACTED FROM LID MODEL

  1 CYLINDER          5   1  RADIUS =  49.854     +Z = 0.61000      -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  2 CUBOID            8   1      +X =  49.854     -X = -49.854     +Y =  49.854     -Y = -49.854      +Z = 0.61000     -Z = 0.00000

                                *******************    GLOBAL    *******************
                                -----   UNIT    70  EXTERNAL TO LATTICE 10    -----

STACK OF 6 BASKETS IN CASK WITH LID AND BOTTOM

  1 ARRAY NUMBER     10          +X =  49.854     -X = -49.854     +Y =  49.854     -Y = -49.854      +Z =  501.62     -Z = 0.00000

                                -----   UNIT   110  EXTERNAL TO LATTICE  1    -----

FUEL PATE ARRAY - PLATES IN 5/16 IN. WEB CENTER

  1 ARRAY NUMBER      1          +X =  3.3000     -X = -3.3000     +Y =  4.3658     -Y = -4.3688      +Z =  73.152     -Z =  15.752

  2 CUBOID            3   1      +X =  4.3688     -X = -4.3688     +Y =  4.3688     -Y = -4.3688      +Z =  73.152     -Z = 0.00000

    HOLE NUMBER      18        AT X = -4.1687      Y = 0.00000      Z =  15.752     IS UNIT NUMBER      4

    HOLE NUMBER      19        AT X =  4.1687      Y = 0.00000      Z =  15.752     IS UNIT NUMBER      4

  3 CUBOID            5   1      +X =  4.7244     -X = -4.7244     +Y =  4.3688     -Y = -4.3688      +Z =  73.152     -Z = 0.00000
```

```
                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                          -----   UNIT   111  EXTERNAL TO LATTICE  1   -----

FUEL ARRAY 20 PLATES IN 5/16 IN. WEB RIGHT

  1 ARRAY NUMBER      1          +X =  2.6314    -X = -3.9686     +Y =  4.3658     -Y = -4.3688     +Z =  73.152     -Z =  15.752

  2 CUBOID            3  1       +X =  4.3688    -X = -4.3688     +Y =  4.3688     -Y = -4.3688     +Z =  73.152     -Z = 0.00000

    HOLE NUMBER      20         AT X = -4.1687     Y = 0.00000      Z =  15.752     IS UNIT NUMBER      4

    HOLE NUMBER      21         AT X =  4.1687     Y = 0.00000      Z =  15.752     IS UNIT NUMBER      4

  3 CUBOID            5  1       +X =  4.7244    -X = -4.7244     +Y =  4.3688     -Y = -4.3688     +Z =  73.152     -Z = 0.00000

                                          -----   UNIT   112  EXTERNAL TO LATTICE  1   -----

FUEL ARRAY 20 PLATES IN 5/16 IN. WEB LEFT

  1 ARRAY NUMBER      1          +X =  3.9686    -X = -2.6314     +Y =  4.3658     -Y = -4.3688     +Z =  73.152     -Z =  15.752

  2 CUBOID            3  1       +X =  4.3688    -X = -4.3688     +Y =  4.3688     -Y = -4.3688     +Z =  73.152     -Z = 0.00000

    HOLE NUMBER      22         AT X = -4.1687     Y = 0.00000      Z =  15.752     IS UNIT NUMBER      4

    HOLE NUMBER      23         AT X =  4.1687     Y = 0.00000      Z =  15.752     IS UNIT NUMBER      4

  3 CUBOID            5  1       +X =  4.7244    -X = -4.7244     +Y =  4.3688     -Y = -4.3688     +Z =  73.152     -Z = 0.00000

                                          -----   UNIT   120  EXTERNAL TO LATTICE  1   -----

FUEL ARRAY WITH HALF OF 1/4 PLATE ON RIGHT -  TOP STACK

  1 ARRAY NUMBER      1          +X =  3.9686    -X = -2.6314     +Y =  4.3658     -Y = -4.3688     +Z =  73.152     -Z =  15.752

  2 CUBOID            3  1       +X =  4.3688    -X = -4.3688     +Y =  4.3688     -Y = -4.3688     +Z =  73.152     -Z = 0.00000

    HOLE NUMBER      24         AT X = -4.1687     Y = 0.00000      Z =  15.752     IS UNIT NUMBER      4

    HOLE NUMBER      25         AT X =  4.1697     Y = 0.00000      Z =  15.752     IS UNIT NUMBER      4

  3 CUBOID            5  1       +X =  4.6736    -X = -4.3688     +Y =  4.3688     -Y = -4.3688     +Z =  73.152     -Z = 0.00000
```

```
                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                 -----   UNIT   121  EXTERNAL TO LATTICE  1   -----

FUEL WITH HALF OF 1/4 IN. PLATE ON LEFT  TOP STACK

  1 ARRAY NUMBER      1          +X =  2.6314    -X = -3.9686     +Y =  4.3658    -Y = -4.3688     +Z =  73.152     -Z =  15.752

  2 CUBOID            3  1       +X =  4.3688    -X = -4.3688     +Y =  4.3688    -Y = -4.3688     +Z =  73.152     -Z = 0.00000

    HOLE NUMBER      26        AT X = -4.1687     Y = 0.00000      Z =  15.752    IS UNIT NUMBER      4

    HOLE NUMBER      27        AT X =  4.1687     Y = 0.00000      Z =  15.752    IS UNIT NUMBER      4

  3 CUBOID            5  1       +X =  4.3688    -X = -4.6736     +Y =  4.3688    -Y = -4.3688     +Z =  73.152     -Z = 0.00000

                                 -----   UNIT   130  EXTERNAL TO LATTICE  1   -----

FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON RIGHT -  BOTTOM STACK

  1 ARRAY NUMBER      1          +X =  3.9686    -X = -2.6314     +Y =  4.3658    -Y = -4.3688     +Z =  73.152     -Z =  15.752

  2 CUBOID            3  1       +X =  4.3688    -X = -4.3688     +Y =  4.3688    -Y = -4.3688     +Z =  73.152     -Z = 0.00000

    HOLE NUMBER      28        AT X = -4.1687     Y = 0.00000      Z =  15.752    IS UNIT NUMBER      4

    HOLE NUMBER      29        AT X =  4.1687     Y = 0.00000      Z =  15.752    IS UNIT NUMBER      4

  3 CUBOID            5  1       +X =  4.6736    -X = -4.3688     +Y =  4.3688    -Y = -4.3688     +Z =  73.152     -Z = 0.00000

                                 -----   UNIT   131  EXTERNAL TO LATTICE  1   -----

FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON LEFT - BOTTOM STACK

  1 ARRAY NUMBER      1          +X =  2.6314    -X = -3.9686     +Y =  4.3658    -Y = -4.3688     +Z =  73.152     -Z =  15.752

  2 CUBOID            3  1       +X =  4.3688    -X = -4.3688     +Y =  4.3688    -Y = -4.3688     +Z =  73.152     -Z = 0.00000

    HOLE NUMBER      30        AT X = -4.1687     Y = 0.00000      Z =  15.752    IS UNIT NUMBER      4

    HOLE NUMBER      31        AT X =  4.1687     Y = 0.00000      Z =  15.752    IS UNIT NUMBER      4

  3 CUBOID            5  1       +X =  4.3688    -X = -4.6736     +Y =  4.3688    -Y = -4.3688     +Z =  73.152     -Z = 0.00000

                                 -----   UNIT   140  EXTERNAL TO LATTICE 12   -----

2 UNIT ARRAY WITH 1/4 IN. PLATE ON TOP AND SIDES

  1 ARRAY NUMBER     12          +X =  9.0420    -X = -9.0428     +Y =  4.3688    -Y = -4.3688     +Z =  73.152     -Z = 0.00000

  2 CUBOID            5  1       +X =  9.3468    -X = -9.3476     +Y =  4.6736    -Y = -4.3688     +Z =  73.152     -Z = 0.00000
```

```
                    MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION               NUM   ID

                                              -----   UNIT   141  EXTERNAL TO LATTICE 13   -----

3 UNIT ARRAY WITH REST OF 5/16 WEB

  1 ARRAY NUMBER     13         +X =  14.173    -X = -14.174     +Y =  4.3688     -Y = -4.3688     +Z =  73.152     -Z = 0.00000

  2 CUBOID            5  1      +X =  14.528    -X = -14.529     +Y =  5.0800     -Y = -5.0800     +Z =  73.152     -Z = 0.00000

                                              -----   UNIT   142  EXTERNAL TO LATTICE 14   -----

2 UNIT ARRAY WITH 1/4 IN. PLATE ON BOTTOM AND SIDES

  1 ARRAY NUMBER     14         +X =  9.0420    -X = -9.0428     +Y =  4.3688     -Y = -4.3688     +Z =  73.152     -Z = 0.00000

  2 CUBOID            5  1      +X =  9.3468    -X = -9.3476     +Y =  4.3688     -Y = -4.6736     +Z =  73.152     -Z = 0.00000

                                                           -----   UNIT   150   -----

7 MTR ELEMENTS IN THE LWT

  1 CYLINDER          3  1  RADIUS =  17.050     +Z =  73.152     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

    HOLE NUMBER      32        AT X = 0.00000     Y =  9.4489      Z = 0.00000     IS UNIT NUMBER    140

    HOLE NUMBER      33        AT X = 0.00000     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER    141

    HOLE NUMBER      34        AT X = 0.00000     Y = -9.4489      Z = 0.00000     IS UNIT NUMBER    142

  2 CYLINDER          5  1  RADIUS =  18.891     +Z =  73.152     -Z = -1.2700     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  3 CYLINDER          6  1  RADIUS =  33.496     +Z =  73.152     -Z = -1.2700     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  4 CYLINDER          5  1  RADIUS =  36.544     +Z =  73.152     -Z = -1.2700     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  5 CYLINDER          7  1  RADIUS =  49.244     +Z =  73.152     -Z = -1.2700     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  6 CYLINDER          5  1  RADIUS =  49.854     +Z =  73.152     -Z = -1.2700     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  7 CUBOID            8  1      +X =  49.854    -X = -49.854     +Y =  49.854     -Y = -49.854     +Z =  73.152     -Z = -1.2700
```

```
------- UNIT ORIENTATION DESCRIPTION FOR ARRAY  1        -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO  23  BOTTOM TO TOP

 2

 1

 1

 1

 1

 1

 1

 1

 1

 1

 1

 1

 1

 1

 1

 1

 1

 1

 1

 1

 1

 1

 3
------- UNIT ORIENTATION DESCRIPTION FOR ARRAY  2        -------

Z LAYER   1, X COLUMN   1 TO   2 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

 20 21
```

```
------- UNIT ORIENTATION DESCRIPTION FOR ARRAY   3        -------

Z LAYER   1, X COLUMN   1 TO   3 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

 12 10 11

------- UNIT ORIENTATION DESCRIPTION FOR ARRAY   4        -------

Z LAYER   1, X COLUMN   1 TO   2 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

 30 31
```

```
                 -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  10          -------

Z LAYER    1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

  61
Z LAYER    2, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

  62
Z LAYER    3, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

 150
Z LAYER    4, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

  50
Z LAYER    5, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

 150
Z LAYER    6, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

  50
Z LAYER    7, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

 150
Z LAYER    8, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

  50
Z LAYER    9, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

  62
Z LAYER   10, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

  60
```

```
                  -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  12          -------

Z LAYER    1, X COLUMN    1 TO    2 LEFT TO RIGHT    Y ROW    1 TO    1  BOTTOM TO TOP

 120 121

                  -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  13          -------

Z LAYER    1, X COLUMN    1 TO    3 LEFT TO RIGHT    Y ROW    1 TO    1  BOTTOM TO TOP

 112 110 111

                  -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  14          -------

Z LAYER    1, X COLUMN    1 TO    2 LEFT TO RIGHT    Y ROW    1 TO    1  BOTTOM TO TOP

 130 131
```

VOLUMES FOR THOSE UNITS UTILIZED IN THIS PROBLEM

UNIT	REGION	GEOMETRY REGION	VOLUME	CUMULATIVE VOLUME
1	1	1	2.77200E+01 CM**3	2.77200E+01 CM**3
	2	2	1.58466E+01 CM**3	4.35666E+01 CM**3
	3	3	1.04863E+02 CM**3	1.48430E+02 CM**3
2	1	4	2.77200E+01 CM**3	2.77200E+01 CM**3
	2	5	1.58466E+01 CM**3	4.35666E+01 CM**3
	3	6	5.24315E+01 CM**3	9.59981E+01 CM**3
3	1	7	2.77200E+01 CM**3	2.77200E+01 CM**3
	2	8	1.58466E+01 CM**3	4.35666E+01 CM**3
	3	9	5.24315E+01 CM**3	9.59981E+01 CM**3
4	1	10	1.72200E+02 CM**3	1.72200E+02 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 11 IS AN ARRAY PLACEMENT BOUNDARY REGION				
10	1	11	3.30902E+03 CM**3	3.30902E+03 CM**3
	2	12	1.93142E+03 CM**3	5.58484E+03 CM**3
	3	13	4.54580E+02 CM**3	6.03942E+03 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 14 IS AN ARRAY PLACEMENT BOUNDARY REGION				
11	1	14	3.30902E+03 CM**3	3.30902E+03 CM**3
	2	15	1.93142E+03 CM**3	5.58484E+03 CM**3
	3	16	4.54580E+02 CM**3	6.03942E+03 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 17 IS AN ARRAY PLACEMENT BOUNDARY REGION				
12	1	17	3.30902E+03 CM**3	3.30902E+03 CM**3
	2	18	1.93142E+03 CM**3	5.58484E+03 CM**3
	3	19	4.54580E+02 CM**3	6.03942E+03 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 20 IS AN ARRAY PLACEMENT BOUNDARY REGION				
20	1	20	3.30902E+03 CM**3	3.30902E+03 CM**3
	2	21	1.93142E+03 CM**3	5.58484E+03 CM**3
	3	22	1.94820E+02 CM**3	5.77966E+03 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 23 IS AN ARRAY PLACEMENT BOUNDARY REGION				
21	1	23	3.30902E+03 CM**3	3.30902E+03 CM**3
	2	24	1.93142E+03 CM**3	5.58484E+03 CM**3
	3	25	1.94820E+02 CM**3	5.77966E+03 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 26 IS AN ARRAY PLACEMENT BOUNDARY REGION				
30	1	26	3.30902E+03 CM**3	3.30902E+03 CM**3
	2	27	1.93142E+03 CM**3	5.58484E+03 CM**3
	3	28	1.94820E+02 CM**3	5.77966E+03 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 29 IS AN ARRAY PLACEMENT BOUNDARY REGION				
31	1	29	3.30902E+03 CM**3	3.30902E+03 CM**3
	2	30	1.93142E+03 CM**3	5.58484E+03 CM**3
	3	31	1.94820E+02 CM**3	5.77966E+03 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 32 IS AN ARRAY PLACEMENT BOUNDARY REGION				
40	1	32	1.15593E+04 CM**3	1.15593E+04 CM**3
	2	33	8.06464E+02 CM**3	1.23658E+04 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 34 IS AN ARRAY PLACEMENT BOUNDARY REGION				
41	1	34	1.81183E+04 CM**3	1.81183E+04 CM**3
	2	35	3.47806E+03 CM**3	2.15963E+04 CM**3
SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 36 IS AN ARRAY PLACEMENT BOUNDARY REGION				
42	1	36	1.15593E+04 CM**3	1.15593E+04 CM**3
	2	37	8.06464E+02 CM**3	1.23658E+04 CM**3
50	1	38	2.04796E+04 CM**3	6.68074E+04 CM**3
	2	39	1.66327E+04 CM**3	8.34401E+04 CM**3
	3	40	1.78888E+05 CM**3	2.62328E+05 CM**3
	4	41	4.99133E+04 CM**3	3.12241E+05 CM**3
	5	42	2.54733E+05 CM**3	5.66974E+05 CM**3
	6	43	1.41241E+04 CM**3	5.81098E+05 CM**3
	7	44	1.58779E+05 CM**3	7.39877E+05 CM**3
60	1	79	1.16526E+05 CM**3	1.16526E+05 CM**3
	2	80	1.00639E+05 CM**3	2.17165E+05 CM**3
	3	81	5.93381E+04 CM**3	2.76503E+05 CM**3
61	1	82	1.66245E+04 CM**3	1.66245E+04 CM**3
	2	83	9.31579E+04 CM**3	1.09782E+05 CM**3
	3	84	9.36980E+04 CM**3	2.03480E+05 CM**3
	4	85	5.55989E+04 CM**3	2.59079E+05 CM**3
62	1	86	4.76297E+03 CM**3	4.76297E+03 CM**3

```
                 2         87          1.30143E+03 CM**3          6.06440E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     88 IS AN ARRAY PLACEMENT BOUNDARY REGION

 70              1         88          4.98697E+06 CM**3          4.98697E+06 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     45 IS AN ARRAY PLACEMENT BOUNDARY REGION

110              1         45          3.30902E+03 CM**3          3.30902E+03 CM**3
                 2         46          1.93142E+03 CM**3          5.58484E+03 CM**3
                 3         47          4.54580E+02 CM**3          6.03942E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     48 IS AN ARRAY PLACEMENT BOUNDARY REGION

111              1         48          3.30902E+03 CM**3          3.30902E+03 CM**3
                 2         49          1.93142E+03 CM**3          5.58484E+03 CM**3
                 3         50          4.54580E+02 CM**3          6.03942E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     51 IS AN ARRAY PLACEMENT BOUNDARY REGION

112              1         51          3.30902E+03 CM**3          3.30902E+03 CM**3
                 2         52          1.93142E+03 CM**3          5.58484E+03 CM**3
                 3         53          4.54580E+02 CM**3          6.03942E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     54 IS AN ARRAY PLACEMENT BOUNDARY REGION

120              1         54          3.30902E+03 CM**3          3.30902E+03 CM**3
                 2         55          1.93142E+03 CM**3          5.58484E+03 CM**3
                 3         56          1.94820E+02 CM**3          5.77966E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     57 IS AN ARRAY PLACEMENT BOUNDARY REGION

121              1         57          3.30902E+03 CM**3          3.30902E+03 CM**3
                 2         58          1.93142E+03 CM**3          5.58484E+03 CM**3
                 3         59          1.94820E+02 CM**3          5.77966E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     60 IS AN ARRAY PLACEMENT BOUNDARY REGION

130              1         60          3.30902E+03 CM**3          3.30902E+03 CM**3
                 2         61          1.93142E+03 CM**3          5.58484E+03 CM**3
                 3         62          1.94820E+02 CM**3          5.77966E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     63 IS AN ARRAY PLACEMENT BOUNDARY REGION

131              1         63          3.30902E+03 CM**3          3.30902E+03 CM**3
                 2         64          1.93142E+03 CM**3          5.58484E+03 CM**3
                 3         65          1.94820E+02 CM**3          5.77966E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     66 IS AN ARRAY PLACEMENT BOUNDARY REGION

140              1         66          1.15593E+04 CM**3          1.15593E+04 CM**3
                 2         67          8.06464E+02 CM**3          1.23658E+04 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     68 IS AN ARRAY PLACEMENT BOUNDARY REGION

141              1         68          1.81183E+04 CM**3          1.81183E+04 CM**3
                 2         69          3.47806E+03 CM**3          2.15963E+04 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     70 IS AN ARRAY PLACEMENT BOUNDARY REGION

142              1         70          1.15593E+04 CM**3          1.15593E+04 CM**3
                 2         71          8.06464E+02 CM**3          1.23658E+04 CM**3

150              1         72          2.04796E+04 CM**3          6.68074E+04 CM**3
                 2         73          1.66327E+04 CM**3          8.34401E+04 CM**3
                 3         74          1.78888E+05 CM**3          2.62328E+05 CM**3
                 4         75          4.99133E+04 CM**3          3.12241E+05 CM**3
                 5         76          2.54733E+05 CM**3          5.66974E+05 CM**3
                 6         77          1.41241E+04 CM**3          5.81098E+05 CM**3
                 7         78          1.58779E+05 CM**3          7.39877E+05 CM**3


                     UNIT      USES     REGION      MIXTURE         TOTAL VOLUME

                       1        882        1            1         2.44490E+04 CM**3
                                           2            2         1.39767E+04 CM**3
                                           3            3         9.24891E+04 CM**3

                       2         42        1            1         1.16424E+03 CM**3
                                           2            2         6.65557E+02 CM**3
                                           3            3         2.20212E+03 CM**3

                       3         42        1            1         1.16424E+03 CM**3
                                           2            2         6.65557E+02 CM**3
                                           3            3         2.20212E+03 CM**3

                       4         84        1            2         1.44648E+04 CM**3

                      10          3        1                      9.92705E+03 CM**3
                                           2            3         5.79427E+03 CM**3
                                           3            5         1.36374E+03 CM**3

                      11          3        1                      9.92705E+03 CM**3
                                           2            3         5.79427E+03 CM**3
```

		3	5	1.36374E+03 CM**3
12	3	1		9.92705E+03 CM**3
		2	3	5.79427E+03 CM**3
		3	5	1.36374E+03 CM**3
20	3	1		9.92705E+03 CM**3
		2	3	5.79427E+03 CM**3
		3	5	5.84459E+02 CM**3
21	3	1		9.92705E+03 CM**3
		2	3	5.79427E+03 CM**3
		3	5	5.84459E+02 CM**3
30	3	1		9.92705E+03 CM**3
		2	3	5.79427E+03 CM**3
		3	5	5.84459E+02 CM**3
31	3	1		9.92705E+03 CM**3
		2	3	5.79427E+03 CM**3
		3	5	5.84459E+02 CM**3
40	3	1		3.46779E+04 CM**3
		2	5	2.41939E+03 CM**3
41	3	1		5.43548E+04 CM**3
		2	5	1.04342E+04 CM**3
42	3	1		3.46779E+04 CM**3
		2	5	2.41939E+03 CM**3
50	3	1	3	6.14387E+04 CM**3
		2	5	4.98980E+04 CM**3
		3	6	5.36664E+05 CM**3
		4	5	1.49740E+05 CM**3
		5	7	7.64198E+05 CM**3
		6	5	4.23722E+04 CM**3
		7	8	4.76337E+05 CM**3
60	1	1	5	1.16526E+05 CM**3
		2	8	1.00639E+05 CM**3
		3	8	5.93381E+04 CM**3
61	1	1	6	1.66245E+04 CM**3
		2	5	9.31579E+04 CM**3
		3	8	9.36980E+04 CM**3
		4	8	5.55989E+04 CM**3
62	2	1	5	9.52594E+03 CM**3
		2	8	2.60286E+03 CM**3
70	1	1		4.98697E+06 CM**3
110	3	1		9.92705E+03 CM**3
		2	3	5.79427E+03 CM**3
		3	5	1.36374E+03 CM**3
111	3	1		9.92705E+03 CM**3
		2	3	5.79427E+03 CM**3
		3	5	1.36374E+03 CM**3
112	3	1		9.92705E+03 CM**3
		2	3	5.79427E+03 CM**3
		3	5	1.36374E+03 CM**3
120	3	1		9.92705E+03 CM**3
		2	3	5.79427E+03 CM**3
		3	5	5.84459E+02 CM**3
121	3	1		9.92705E+03 CM**3
		2	3	5.79427E+03 CM**3
		3	5	5.84459E+02 CM**3
130	3	1		9.92705E+03 CM**3
		2	3	5.79427E+03 CM**3
		3	5	5.84459E+02 CM**3
131	3	1		9.92705E+03 CM**3
		2	3	5.79427E+03 CM**3
		3	5	5.84459E+02 CM**3
140	3	1		3.46779E+04 CM**3
		2	5	2.41939E+03 CM**3
141	3	1		5.43548E+04 CM**3
		2	5	1.04342E+04 CM**3
142	3	1		3.46779E+04 CM**3
		2	5	2.41939E+03 CM**3
150	3	1	3	6.14387E+04 CM**3
		2	5	4.98980E+04 CM**3
		3	6	5.36664E+05 CM**3
		4	5	1.49740E+05 CM**3
		5	7	7.64198E+05 CM**3

```
                          6          5          4.23722E+04 CM**3
                          7          8          4.76337E+05 CM**3


                     TOTAL MIXTURE VOLUMES
                 MIXTURE       TOTAL VOLUME              MASS(G)
                    1       2.67775E+04 CM**3       3.69944E+04
                    2       2.97726E+04 CM**3       8.04456E+04
                    3       3.00890E+05 CM**3       3.00340E+05
                    5       7.46635E+05 CM**3       5.91335E+06
                    6       1.08995E+06 CM**3       1.23644E+07
                    7       1.52840E+06 CM**3       1.52560E-14
                    8       1.26455E+06 CM**3       1.26224E-14

*****************************************************************************************************
***                                                                                               ***
***                                    BIASING INFORMATION                                        ***
***                                                                                               ***
***     A DEFAULT WEIGHT OF    0.500 WILL BE USED FOR ALL BIAS ID'S.                              ***
***                                                                                               ***
*****************************************************************************************************

               ........   0 IO'S WERE USED IN KENO-V BEFORE TRACKING       ........

               ........  0.00733 MINUTES WERE USED PROCESSING DATA.        ........

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 5.36949E-03

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED WITH A FLAT DISTRIBUTION IN A CUBOID DEFINED BY:
                      +X= 4.98539E+01  -X=-4.98539E+01  +Y= 4.98539E+01  -Y=-4.98539E+01  +Z= 5.01625E+02  -Z= 0.00000E+00
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

KENO MESSAGE NUMBER K5-105      ***** WARNING, ONLY  745 INDEPENDENT STARTING POSITIONS WERE GENERATED.  *****

  255 ADDITIONAL STARTING POINTS WERE PICKED FROM THE INITAL DISTRIBUTION.

4.49700 MINUTES WERE REQUIRED FOR STARTING.   TOTAL ELAPSED TIME IS 4.51200 MINUTES.
```

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	999 INDEPENDENT	FISSION POINTS WERE	GENERATED	
1	9.05782E-01	4.51683E+00	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	998 INDEPENDENT	FISSION POINTS WERE	GENERATED	
2	9.10251E-01	4.52683E+00	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
3	8.90695E-01	4.53683E+00	8.90695E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	9.19914E-01	4.54700E+00	9.05304E-01	1.46094E-02	0.00000E+00	0.00000E+00
5	9.19734E-01	4.55700E+00	9.10114E-01	9.70976E-03	0.00000E+00	0.00000E+00
6	9.21886E-01	4.56617E+00	9.13057E-01	7.47003E-03	0.00000E+00	0.00000E+00
7	9.53605E-01	4.57633E+00	9.21167E-01	9.96223E-03	0.00000E+00	0.00000E+00
8	9.08830E-01	4.58550E+00	9.19111E-01	8.38999E-03	0.00000E+00	0.00000E+00
9	8.89421E-01	4.59633E+00	9.14869E-01	8.26250E-03	0.00000E+00	0.00000E+00
10	9.25939E-01	4.60550E+00	9.16253E-01	7.28810E-03	0.00000E+00	0.00000E+00
11	9.27039E-01	4.61567E+00	9.17451E-01	6.53828E-03	0.00000E+00	0.00000E+00
12	9.70198E-01	4.62483E+00	9.22726E-01	7.87535E-03	0.00000E+00	0.00000E+00
13	9.40410E-01	4.63483E+00	9.24334E-01	7.30267E-03	0.00000E+00	0.00000E+00
14	9.66821E-01	4.64400E+00	9.27874E-01	7.54829E-03	0.00000E+00	0.00000E+00
15	9.03005E-01	4.65400E+00	9.25961E-01	7.20213E-03	0.00000E+00	0.00000E+00
16	9.21764E-01	4.66417E+00	9.25662E-01	6.67462E-03	0.00000E+00	0.00000E+00
17	9.31197E-01	4.67417E+00	9.26031E-01	6.22468E-03	0.00000E+00	0.00000E+00
18	9.35219E-01	4.68333E+00	9.26605E-01	5.85090E-03	0.00000E+00	0.00000E+00
19	8.98210E-01	4.69350E+00	9.24935E-01	5.74417E-03	0.00000E+00	0.00000E+00
20	9.19709E-01	4.70350E+00	9.24644E-01	5.42344E-03	0.00000E+00	0.00000E+00
21	9.81539E-01	4.71267E+00	9.27639E-01	5.94005E-03	0.00000E+00	0.00000E+00
22	8.89901E-01	4.72267E+00	9.25752E-01	5.94273E-03	0.00000E+00	0.00000E+00
23	9.08486E-01	4.73283E+00	9.24930E-01	5.71215E-03	0.00000E+00	0.00000E+00
24	9.24379E-01	4.74283E+00	9.24905E-01	5.44638E-03	0.00000E+00	0.00000E+00
25	9.22234E-01	4.75200E+00	9.24788E-01	5.20549E-03	0.00000E+00	0.00000E+00
26	9.44589E-01	4.76117E+00	9.25613E-01	5.05170E-03	0.00000E+00	0.00000E+00
27	9.35349E-01	4.77133E+00	9.26003E-01	4.86105E-03	0.00000E+00	0.00000E+00
28	9.10675E-01	4.78133E+00	9.25413E-01	4.70740E-03	0.00000E+00	0.00000E+00
29	9.48476E-01	4.79133E+00	9.26268E-01	4.60954E-03	0.00000E+00	0.00000E+00
30	9.44440E-01	4.80050E+00	9.26917E-01	4.48903E-03	0.00000E+00	0.00000E+00
31	9.54902E-01	4.81067E+00	9.27882E-01	4.43766E-03	0.00000E+00	0.00000E+00
32	8.96797E-01	4.82067E+00	9.26845E-01	4.41062E-03	0.00000E+00	0.00000E+00
33	9.50450E-01	4.82983E+00	9.27607E-01	4.33340E-03	0.00000E+00	0.00000E+00
34	9.13527E-01	4.83983E+00	9.27167E-01	4.21880E-03	0.00000E+00	0.00000E+00
35	9.14272E-01	4.85000E+00	9.26776E-01	4.10759E-03	0.00000E+00	0.00000E+00
36	9.52428E-01	4.85917E+00	9.27531E-01	4.05573E-03	0.00000E+00	0.00000E+00

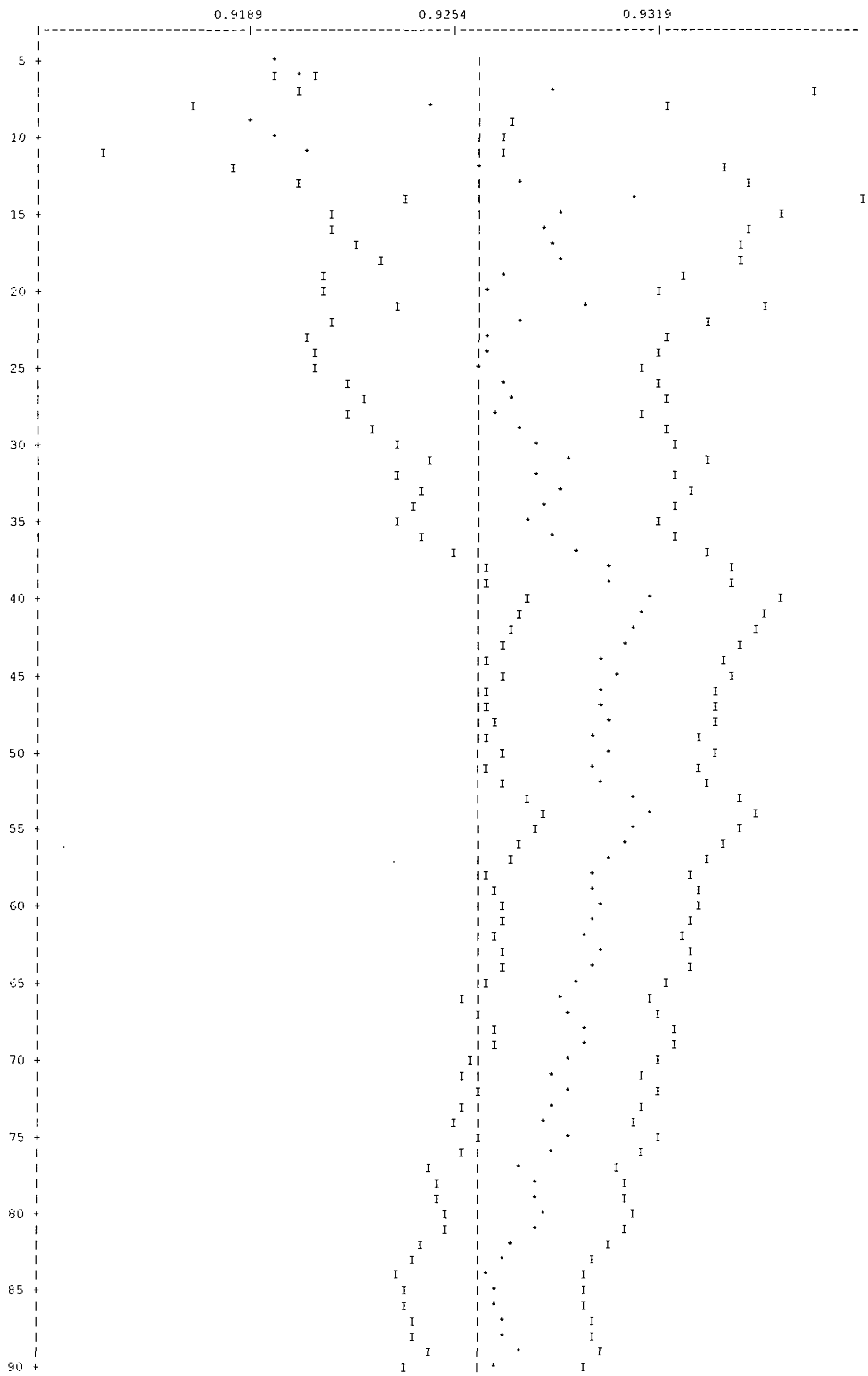
761	9.21736E-01	1.19400E+01	9.26718E-01	9.64740E-04	0.00000E+00	0.00000E+00
762	9.02916E-01	1.19500E+01	9.26687E-01	9.63979E-04	0.00000E+00	0.00000E+00
763	9.20364E-01	1.19600E+01	9.26679E-01	9.62747E-04	0.00000E+00	0.00000E+00
764	9.33754E-01	1.19692E+01	9.26688E-01	9.61528E-04	0.00000E+00	0.00000E+00
765	9.07859E-01	1.19793E+01	9.26663E-01	9.60584E-04	0.00000E+00	0.00000E+00
766	9.41903E-01	1.19893E+01	9.26683E-01	9.59533E-04	0.00000E+00	0.00000E+00
767	9.23249E-01	1.19995E+01	9.26679E-01	9.58289E-04	0.00000E+00	0.00000E+00
768	8.95873E-01	1.20095E+01	9.26638E-01	9.57881E-04	0.00000E+00	0.00000E+00
769	9.44687E-01	1.20197E+01	9.26662E-01	9.56921E-04	0.00000E+00	0.00000E+00
770	8.95803E-01	1.20287E+01	9.26622E-01	9.56519E-04	0.00000E+00	0.00000E+00
771	9.40899E-01	1.20388E+01	9.26640E-01	9.55454E-04	0.00000E+00	0.00000E+00
772	9.03765E-01	1.20480E+01	9.26611E-01	9.54675E-04	0.00000E+00	0.00000E+00
773	8.97725E-01	1.20580E+01	9.26573E-01	9.54172E-04	0.00000E+00	0.00000E+00
774	9.07220E-01	1.20672E+01	9.26548E-01	9.53265E-04	0.00000E+00	0.00000E+00
775	9.50358E-01	1.20773E+01	9.26579E-01	9.52529E-04	0.00000E+00	0.00000E+00
776	9.05261E-01	1.20873E+01	9.26551E-01	9.51696E-04	0.00000E+00	0.00000E+00
777	9.27607E-01	1.20965E+01	9.26553E-01	9.50469E-04	0.00000E+00	0.00000E+00
778	9.42900E-01	1.21065E+01	9.26574E-01	9.49477E-04	0.00000E+00	0.00000E+00
779	9.41042E-01	1.21167E+01	9.26593E-01	9.48437E-04	0.00000E+00	0.00000E+00
780	9.23276E-01	1.21267E+01	9.26588E-01	9.47227E-04	0.00000E+00	0.00000E+00
781	8.90843E-01	1.21368E+01	9.26543E-01	9.47122E-04	0.00000E+00	0.00000E+00
782	9.24456E-01	1.21458E+01	9.26540E-01	9.45911E-04	0.00000E+00	0.00000E+00
783	9.37806E-01	1.21560E+01	9.26554E-01	9.44809E-04	0.00000E+00	0.00000E+00
784	9.00231E-01	1.21660E+01	9.26521E-01	9.44200E-04	0.00000E+00	0.00000E+00
785	9.60546E-01	1.21762E+01	9.26564E-01	9.43994E-04	0.00000E+00	0.00000E+00
786	9.24507E-01	1.21853E+01	9.26561E-01	9.42793E-04	0.00000E+00	0.00000E+00
787	9.09256E-01	1.21953E+01	9.26539E-01	9.41849E-04	0.00000E+00	0.00000E+00
788	9.19815E-01	1.22053E+01	9.26531E-01	9.40689E-04	0.00000E+00	0.00000E+00
789	9.16692E-01	1.22155E+01	9.26518E-01	9.39576E-04	0.00000E+00	0.00000E+00
790	9.34050E-01	1.22255E+01	9.26528E-01	9.38432E-04	0.00000E+00	0.00000E+00
791	9.28294E-01	1.22347E+01	9.26530E-01	9.37244E-04	0.00000E+00	0.00000E+00
792	9.51657E-01	1.22448E+01	9.26562E-01	9.36597E-04	0.00000E+00	0.00000E+00
793	9.43198E-01	1.22548E+01	9.26583E-01	9.35649E-04	0.00000E+00	0.00000E+00
794	9.30817E-01	1.22640E+01	9.26588E-01	9.34482E-04	0.00000E+00	0.00000E+00
795	8.90619E-01	1.22740E+01	9.26543E-01	9.34405E-04	0.00000E+00	0.00000E+00
796	9.10460E-01	1.22832E+01	9.26523E-01	9.33447E-04	0.00000E+00	0.00000E+00
797	8.97591E-01	1.22933E+01	9.26486E-01	9.32982E-04	0.00000E+00	0.00000E+00
798	9.08117E-01	1.23033E+01	9.26463E-01	9.32095E-04	0.00000E+00	0.00000E+00
799	9.07942E-01	1.23135E+01	9.26440E-01	9.31215E-04	0.00000E+00	0.00000E+00
800	9.21666E-01	1.23227E+01	9.26434E-01	9.30066E-04	0.00000E+00	0.00000E+00
801	9.31197E-01	1.23327E+01	9.26440E-01	9.28921E-04	0.00000E+00	0.00000E+00
802	9.30922E-01	1.23427E+01	9.26446E-01	9.27776E-04	0.00000E+00	0.00000E+00
803	8.88743E-01	1.23528E+01	9.26399E-01	9.27811E-04	0.00000E+00	0.00000E+00

KENO MESSAGE NUMBER K5-123 EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

```
LIFETIME =  7.96468E-05 + OR -  1.28891E-07          GENERATION TIME =  3.85994E-05 + OR -  6.32864E-08
NU BAR   =  2.42036E+00 + OR -  1.14075E-05     AVERAGE FISSION GROUP =  2.34826E+01 + OR -  4.40629E-03
                 ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION =  6.75831E-02 + OR -  2.21596E-04
```

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.92644	+ OR - 0.00093	0.92552 TO 0.92737	0.92459 TO 0.92830	0.92366 TO 0.92923	800000
4	0.92645	+ OR - 0.00093	0.92552 TO 0.92738	0.92459 TO 0.92831	0.92366 TO 0.92924	799000
5	0.92646	+ OP - 0.00093	0.92553 TO 0.92739	0.92460 TO 0.92832	0.92367 TO 0.92925	798000
6	0.92647	+ OR - 0.00093	0.92553 TO 0.92740	0.92460 TO 0.92833	0.92367 TO 0.92926	797000
7	0.92643	+ OR - 0.00093	0.92550 TO 0.92736	0.92457 TO 0.92830	0.92364 TO 0.92923	796000
8	0.92645	+ OR - 0.00093	0.92552 TO 0.92739	0.92459 TO 0.92832	0.92366 TO 0.92925	795000
9	0.92650	+ OR - 0.00093	0.92557 TO 0.92743	0.92463 TO 0.92837	0.92370 TO 0.92930	794000
10	0.92650	+ OR - 0.00093	0.92557 TO 0.92743	0.92463 TO 0.92837	0.92370 TO 0.92930	793000
11	0.92650	+ OR - 0.00094	0.92557 TO 0.92744	0.92463 TO 0.92837	0.92369 TO 0.92931	792000
12	0.92644	+ OR - 0.00093	0.92551 TO 0.92738	0.92458 TO 0.92831	0.92364 TO 0.92925	791000
17	0.92641	+ OR - 0.00094	0.92547 TO 0.92734	0.92453 TO 0.92828	0.92359 TO 0.92922	786000
22	0.92642	+ OR - 0.00094	0.92548 TO 0.92735	0.92454 TO 0.92829	0.92360 TO 0.92923	781000
27	0.92641	+ OR - 0.00095	0.92547 TO 0.92736	0.92452 TO 0.92830	0.92358 TO 0.92925	776000
32	0.92638	+ OR - 0.00095	0.92543 TO 0.92733	0.92448 TO 0.92828	0.92353 TO 0.92923	771000
37	0.92631	+ OR - 0.00095	0.92535 TO 0.92726	0.92440 TO 0.92821	0.92345 TO 0.92916	766000
42	0.92620	+ OR - 0.00095	0.92524 TO 0.92715	0.92429 TO 0.92811	0.92333 TO 0.92906	761000
702	0.92470	+ OR - 0.00219	0.92251 TO 0.92689	0.92032 TO 0.92908	0.91813 TO 0.93127	101000
707	0.92432	+ OR - 0.00223	0.92209 TO 0.92655	0.91987 TO 0.92877	0.91764 TO 0.93100	96000
712	0.92431	+ OR - 0.00229	0.92202 TO 0.92660	0.91973 TO 0.92889	0.91744 TO 0.93118	91000
717	0.92428	+ OR - 0.00233	0.92195 TO 0.92661	0.91962 TO 0.92894	0.91729 TO 0.93127	86000
722	0.92525	+ OR - 0.00238	0.92288 TO 0.92763	0.92050 TO 0.93001	0.91812 TO 0.93239	81000
727	0.92385	+ OR - 0.00240	0.92145 TO 0.92625	0.91905 TO 0.92865	0.91665 TO 0.93105	76000
732	0.92456	+ OR - 0.00252	0.92204 TO 0.92708	0.91952 TO 0.92960	0.91700 TO 0.93212	71000
737	0.92459	+ OR - 0.00268	0.92191 TO 0.92727	0.91924 TO 0.92995	0.91656 TO 0.93263	66000
742	0.92491	+ OR - 0.00280	0.92211 TO 0.92772	0.91930 TO 0.93052	0.91650 TO 0.93332	61000
747	0.92537	+ OR - 0.00300	0.92237 TO 0.92837	0.91936 TO 0.93138	0.91636 TO 0.93438	56000
752	0.92380	+ OP - 0.00316	0.92064 TO 0.92697	0.91747 TO 0.93013	0.91431 TO 0.93329	51000
757	0.92301	+ OR - 0.00305	0.91996 TO 0.92605	0.91691 TO 0.92910	0.91387 TO 0.93214	46000
762	0.92105	+ OR - 0.00296	0.91809 TO 0.92401	0.91514 TO 0.92697	0.91218 TO 0.92993	41000
767	0.92045	+ OR - 0.00328	0.91716 TO 0.92373	0.91388 TO 0.92701	0.91060 TO 0.93029	36000
772	0.92113	+ OR - 0.00345	0.91768 TO 0.92458	0.91423 TO 0.92803	0.91079 TO 0.93147	31000
777	0.92179	+ OR - 0.00375	0.91804 TO 0.92555	0.91429 TO 0.92930	0.91054 TO 0.93305	26000
782	0.92115	+ OR - 0.00419	0.91696 TO 0.92534	0.91278 TO 0.92952	0.90859 TO 0.93371	21000
787	0.91949	+ OR - 0.00452	0.91497 TO 0.92400	0.91045 TO 0.92852	0.90593 TO 0.93304	16000
792	0.91466	+ OR - 0.00548	0.90918 TO 0.92015	0.90369 TO 0.92563	0.89821 TO 0.93112	11000
797	0.91476	+ OR - 0.00670	0.90806 TO 0.92146	0.90137 TO 0.92816	0.89467 TO 0.93486	6000

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.9264 + OR - 0.0009 WHICH OCCURS FOR 803 GENERATIONS RUN.



```
740 +                                                      I  |*   I
    |                                                       I  |*   I
    |                                                       I  |*   I
    |                                                       I  |*   I
    |                                                       I  |*   I
745 +                                                       I  |*  I
    |                                                       I  |*  I
    |                                                       I  |*  I
    |                                                       I  |*   I
    |                                                       I  |*   I
750 +                                                       I  |*   I
    |                                                       I  |*   I
    |                                                       I  |*   I
    |                                                       I  |*   I
    |                                                       I  |*   I
755 +                                                       I  |*   I
    |                                                        I |*   I
    |                                                        I |*   I
    |                                                        I |*   I
    |                                                        I |  * I
760 +                                                        I |  * I
    |                                                        I |  * I
    |                                                        I |  * I
    |                                                        I |*   I
    |                                                        I |  * I
765 +                                                        I |*   I
    |                                                        I |  * I
    |                                                        I |*   I
    |                                                        I |*   I
    |                                                        I |*   I
770 +                                                        I |*   I
    |                                                        I |*   I
    |                                                        I |*   I
    |                                                       I  |*   I
    |                                                       I  |*   I
775 +                                                       I  |*   I
    |                                                       I  |*   I
    |                                                       I  |*   I
    |                                                       I  |*   I
    |                                                        I |*   I
780 +                                                        I |*   I
    |                                                       I  |*   I
    |                                                       I  |*   I
    |                                                       I  |*   I
    |                                                       I  |*   I
785 +                                                       I  |*   I
    |                                                       I  |*   I
    |                                                       I  |*   I
    |                                                       I  |*   I
    |                                                       I  |*  I
790 +                                                       I  |*   I
    |                                                       I  |*   I
    |                                                       I  |*   I
    |                                                        I |*   I
    |                                                        I |*   I
795 +                                                       I  |*   I
    |                                                       I  |*  I
    |                                                       I  |*  I
    |                                                       I  |*  I
    |                                                       I  |*  I
800 +                                                       I  |*  I
    |                                                       I  |*  I
    |                                                       I  |*  I
    |                                                       I  *   I
```

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0003			2.76261E-04	3.3995	1.43894E-03	0.9698	0.00000E+00	0.0000
2	0.0014			1.33374E-03	1.0362	3.28433E-03	0.3305	0.00000E+00	0.0000
3	0.0018			1.64813E-03	0.8673	1.11443E-03	0.5432	0.00000E+00	0.0000
4	0.0010			9.43052E-04	1.1806	5.85020E-04	0.8038	0.00000E+00	0.0000
5	0.0014			1.30958E-03	0.9350	1.06813E-03	0.5493	0.00000E+00	0.0000
6	0.0019			1.76704E-03	0.6925	2.84069E-03	0.3908	0.00000E+00	0.0000
7	0.0019			1.78654E-03	0.7230	4.80578E-03	0.4113	0.00000E+00	0.0000
8	0.0020			1.85710E-03	1.0723	4.17631E-03	0.4601	0.00000E+00	0.0000
9	0.0028			2.60413E-03	1.1712	4.65358E-03	0.4959	0.00000E+00	0.0000
10	0.0059			5.50223E-03	1.1171	1.10633E-02	0.4949	0.00000E+00	0.0000
11	0.0131			1.21635E-02	0.9260	1.68813E-02	0.4983	0.00000E+00	0.0000
12	0.0178			1.65352E-02	0.8811	1.73134E-02	0.5908	0.00000E+00	0.0000
13	0.0170			1.57646E-02	0.8717	2.10273E-02	0.5340	0.00000E+00	0.0000
14	0.0146			1.35151E-02	0.9027	2.44601E-02	0.4544	0.00000E+00	0.0000
15	0.0029			2.67349E-03	1.8035	1.08525E-02	0.5227	0.00000E+00	0.0000
16	0.0019			1.74669E-03	2.6311	6.41294E-03	0.6061	0.00000E+00	0.0000
17	0.0032			2.93053E-03	2.3384	4.27639E-03	0.9743	0.00000E+00	0.0000
18	0.0041			3.80840E-03	2.4299	4.25856E-03	1.1451	0.00000E+00	0.0000
19	0.0051			4.75188E-03	2.0026	6.74256E-03	0.7563	0.00000E+00	0.0000
20	0.0209			1.93777E-02	0.9376	2.47722E-02	0.4593	0.00000E+00	0.0000
21	0.0119			1.10034E-02	1.3987	1.10177E-02	0.7502	0.00000E+00	0.0000
22	0.0286			2.65082E-02	0.8958	2.53200E-02	0.5355	0.00000E+00	0.0000
23	0.1058			9.80401E-02	0.4254	1.01658E-01	0.2336	0.00000E+00	0.0000
24	0.2177			2.01695E-01	0.2852	2.10402E-01	0.1515	0.00000E+00	0.0000
25	0.1894			1.75473E-01	0.3129	1.80973E-01	0.1588	0.00000E+00	0.0000
26	0.2376			2.20153E-01	0.2780	2.23276E-01	0.1535	0.00000E+00	0.0000
27	0.0877			8.12749E-02	0.4616	7.72601E-02	0.2863	0.00000E+00	0.0000
SYSTEM TOTAL =				9.26443E-01	0.1002	1.00194E+00	0.0216	0.00000E+00	0.0000

ELAPSED TIME 12.35367 MINUTES

RANDOM NUMBER= 653C16DB7132

```
                    FREQUENCY FOR GENERATIONS    4 TO  803
0.8243 TO 0.8292    *
0.8292 TO 0.8341
0.8341 TO 0.8390    *
0.8390 TO 0.8439    *
0.8439 TO 0.8487    *
0.8487 TO 0.8536
0.8536 TO 0.8585    **
0.8585 TO 0.8634    ****
0.8634 TO 0.8683    *
0.8683 TO 0.8732    *****
0.8732 TO 0.8781    ******
0.8781 TO 0.8830    ****************
0.8830 TO 0.8878    ****************
0.8878 TO 0.8927    ***********************
0.8927 TO 0.8976    ***************************
0.8976 TO 0.9025    ***********************************
0.9025 TO 0.9074    ******************************************
0.9074 TO 0.9123    **********************************************************
0.9123 TO 0.9172    ************************************************
0.9172 TO 0.9220    *******************************************************
0.9220 TO 0.9269    ***************************************************************
0.9269 TO 0.9318    *************************************************************
0.9318 TO 0.9367    *****************************************************************
0.9367 TO 0.9416    *****************************************
0.9416 TO 0.9465    **********************************************************
0.9465 TO 0.9514    *******************************************
0.9514 TO 0.9563    **************************
0.9563 TO 0.9611    *******************
0.9611 TO 0.9660    ****************************
0.9660 TO 0.9709    ********************
0.9709 TO 0.9758    *********
0.9758 TO 0.9807    ***********
0.9807 TO 0.9856    ***
0.9856 TO 0.9905    *****
0.9905 TO 0.9954    ***
0.9954 TO 1.0002    *
1.0002 TO 1.0051    *
1.0051 TO 1.0100    *
```

```
                                    FREQUENCY FOR GENERATIONS  204 TO  603
0.8243 TO 0.8292     *
0.8292 TO 0.8341
0.8341 TO 0.8390     *
0.8390 TO 0.8439     *
0.8439 TO 0.8487     *
0.8487 TO 0.8536
0.8536 TO 0.8585     **
0.8585 TO 0.8634     ***
0.8634 TO 0.8683     *
0.8683 TO 0.8732     ****
0.8732 TO 0.8781     *****
0.8781 TO 0.8830     **********
0.8830 TO 0.8878     ***********
0.8878 TO 0.8927     ******************
0.8927 TO 0.8976     **************
0.8976 TO 0.9025     ***************************
0.9025 TO 0.9074     ******************************
0.9074 TO 0.9123     ********************************************
0.9123 TO 0.9172     ************************************
0.9172 TO 0.9220     ****************************************
0.9220 TO 0.9269     ***************************************************
0.9269 TO 0.9318     *********************************************
0.9318 TO 0.9367     ******************************************************
0.9367 TO 0.9416     ***********************************
0.9416 TO 0.9465     *******************************************
0.9465 TO 0.9514     *******************************
0.9514 TO 0.9563     ******************
0.9563 TO 0.9611     *************
0.9611 TO 0.9660     **********************
0.9660 TO 0.9709     ******************
0.9709 TO 0.9758     ******
0.9758 TO 0.9807     *******
0.9807 TO 0.9856     *
0.9856 TO 0.9905     ***
0.9905 TO 0.9954     **
0.9954 TO 1.0002
1.0002 TO 1.0051     *
1.0051 TO 1.0100     *
```

```
                          FREQUENCY FOR GENERATIONS  404 TO  803
0.8243 TO 0.8292     *
0.8292 TO 0.8341
0.8341 TO 0.8390
0.8390 TO 0.8439     *
0.8439 TO 0.8487     *
0.8487 TO 0.8536
0.8536 TO 0.8585     **
0.8585 TO 0.8634     *
0.8634 TO 0.8683
0.8683 TO 0.8732     **
0.8732 TO 0.8781     ***
0.8781 TO 0.8830     *******
0.8830 TO 0.8878     ******
0.8878 TO 0.8927     ********
0.8927 TO 0.8976     **********
0.8976 TO 0.9025     ****************
0.9025 TO 0.9074     *******************
0.9074 TO 0.9123     *******************************
0.9123 TO 0.9172     ************************
0.9172 TO 0.9220     *********************
0.9220 TO 0.9269     ************************************
0.9269 TO 0.9318     ***********************************
0.9318 TO 0.9367     ************************************
0.9367 TO 0.9416     ****************************
0.9416 TO 0.9465     ***************************
0.9465 TO 0.9514     *********************
0.9514 TO 0.9563     ***********
0.9563 TO 0.9611     ********
0.9611 TO 0.9660     ***************
0.9660 TO 0.9709     ************
0.9709 TO 0.9758     ****
0.9758 TO 0.9807     ******
0.9807 TO 0.9856     *
0.9856 TO 0.9905     ***
0.9905 TO 0.9954     **
0.9954 TO 1.0002
1.0002 TO 1.0051     *
1.0051 TO 1.0100     *
```

```
                          FREQUENCY FOR GENERATIONS  604 TO  803
0.8243 TO 0.8292
0.8292 TO 0.8341
0.8341 TO 0.8390
0.8390 TO 0.8439
0.8439 TO 0.8487
0.8487 TO 0.8536
0.8536 TO 0.8585     *
0.8585 TO 0.8634
0.8634 TO 0.8683
0.8683 TO 0.8732
0.8732 TO 0.8781     *
0.8781 TO 0.8830     ****
0.8830 TO 0.8878     ****
0.8878 TO 0.8927     *****
0.8927 TO 0.8976     *****
0.8976 TO 0.9025     **********
0.9025 TO 0.9074     *************
0.9074 TO 0.9123     *************
0.9123 TO 0.9172     *********
0.9172 TO 0.9220     **************
0.9220 TO 0.9269     ***************
0.9269 TO 0.9318     ********************
0.9318 TO 0.9367     ********************
0.9367 TO 0.9416     ***************
0.9416 TO 0.9465     **************
0.9465 TO 0.9514     **********
0.9514 TO 0.9563     *******
0.9563 TO 0.9611     ***
0.9611 TO 0.9660     *****
0.9660 TO 0.9709     ****
0.9709 TO 0.9758     *
0.9758 TO 0.9807     ***
0.9807 TO 0.9856     *
0.9856 TO 0.9905     *
0.9905 TO 0.9954
0.9954 TO 1.0002
1.0002 TO 1.0051     *
1.0051 TO 1.0100     *
```

Figure 6.6.7-2 HEU MTR Finite Cask Model (460 g ^{235}U)

```
PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
   MODULE CSAS25    WILL BE CALLED
     LWT MTR INPUT FOR CASK MODEL - PLATES IN CLOSE & PLATES @ FULL PITCH
     'MIN BASKET PLATE - COMMENT CARD REFERS TO NOMINAL PLATE SIZE
     '23 PLATES - 20 GRAM 235U PER PLATE
     'FUEL SHIFT AXIAL ALTERNATING
     '56 CM ACTIVE FUEL HEIGHT
     'MODIIIED TO 1.23 CM PLATE THICKNESS / 2 CM OFFSET
     27GROUPNDF4  LATTICECELL
     URANIUM  1 DEN=19.05 0.03650 293 92235 94. 92238 6. END
     AL         1 DEN=2.702 0.25666 293 END
     AL     2 1.0     293.0 END
     H2O    3 1.0     293.0 END
     AL     4 1.0     293.0 END
     SS304  5 1.0     293.0 END
     PB     6 1.0     293.0 END
     H2O    7 1.E-20 293.0 END
     H2O    8 1.E-20 293.0 END
     END COMP
     SYMMSLABCELL 0.3915 0.083 1 3 0.123 2 END

     READ PARAM TBA=5 RUN=YES PLT=NO GEN=803 NPG=1000 END PARAM
     READ GEOM
     '
     ' FUEL PLATE CELL UNITS
     '
     UNIT 1
     COM='MIDDLE FUEL PLATE CELL'
     CUBOID 1 1 2P3.3000 2P0.0415 58.0 2.0
     CUBOID 2 1 2P3.3000 2P0.0615 60.0 0.0
     CUBOID 3 1 2P3.3000 2P0.1957 60.0 0.0
     UNIT 2
     COM='TOP FUEL PLATE CELL'
     CUBOID 1 1 2P3.3000 2P0.0415 58.0 2.0
     CUBOID 2 1 2P3.3000 2P0.0615 60.0 0.0
     CUBOID 3 1 2P3.3000 0.0615 -0.1957 60.0 0.0
     UNIT 3
     COM='BOTTOM FUEL PLATE CELL'
     CUBOID 1 1 2P3.3000 2P0.0415 58.0 2.0
     CUBOID 2 1 2P3.3000 2P0.0615 60.0 0.0
     CUBOID 3 1 2P3.3000 0.1957 -0.0615 60.0 0.0
     '
     UNIT 4
     COM='SIDE PLATE'
     CUBOID 2 1 2P0.2 2P3.75 60.0 0.0
     '
     ' PLATES AT BOTTOM OF BASKET OPENING
     '
     ' BASKET CENTER ROW ARRAY ELEMENTS
     '
     UNIT 10
     COM='FUEL PATE ARRAY - PLATES IN 5/16 IN. WEB CENTER'
     ARRAY  1 -3.3000 -4.3688 0.0
     CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
     HOLE   4 -4.1687 0.0 0.0
     HOLE   4  4.1687 0.0 0.0
     REPLICATE 5 1 2R0.3556 4R0.0 1
     UNIT 11
     COM='FUEL ARRAY 20 PLATES IN 5/16 IN. WEB RIGHT'
     ARRAY  1 -3.9686 -4.3688 0.0
     CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
     HOLE   4 -4.1687 0.0 0.0
     HOLE   4  4.1687 0.0 0.0
     REPLICATE 5 1 2R0.3556 4R0.0 1
     UNIT 12
     COM='FUEL ARRAY 20 PLATES IN 5/16 IN. WEB LEFT'
     ARRAY  1 -2.6314 -4.3688 0.0
     CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
     HOLE   4 -4.1687 0.0 0.0
     HOLE   4  4.1687 0.0 0.0
     REPLICATE 5 1 2R0.3556 4R0.0 1
     '
     ' BASKET TOP ROW ARRAY ELEMENTS
     '
     UNIT 20
     COM='FUEL ARRAY WITH HALF OF 1/4 PLATE ON RIGHT -  TOP STACK'
     ARRAY  1 -2.6314 -4.3688 0.0
     CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
     HOLE   4 -4.1687 0.0 0.0
     HOLE   4  4.1687 0.0 0.0
     REPLICATE 5 1 0.3048 5R0.0 1
     UNIT 21
     COM='FUEL WITH HALF OF 1/4 IN. PLATE ON LEFT  TOP STACK'
     ARRAY  1 -3.9686 -4.3688 0.0
     CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
     HOLE   4 -4.1687 0.0 0.0
     HOLE   4  4.1687 0.0 0.0
     REPLICATE 5 1 0.0 0.3048 4R0.0 1
```

```
'
' BASKET BOTTOM ROW ARRAY ELEMENTS
'
UNIT 30
COM='FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON RIGHT -  BOTTOM STACK'
ARRAY  1 -2.6314 -4.3688 0.0
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 0.0
HOLE   4  4.1687 0.0 0.0
REPLICATE 5 1 0.3048 5R0.0 1
UNIT 31
COM='FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON LEFT - BOTTOM STACK'
ARRAY  1 -3.9686 -4.3688 0.0
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 0.0
HOLE   4  4.1687 0.0 0.0
REPLICATE 5 1 0.0 0.3048 4R0.0 1
'
' CONSTRUCTION BASKET ROWS
'
UNIT 40
COM='2 UNIT ARRAY WITH 1/4 IN. PLATE ON TOP AND SIDES'
ARRAY 2 -9.0428 -4.3688 0.0
REPLICATE 5 1 3R0.3048 0.0 2R0.0 1
UNIT 41
COM='3 UNIT ARRAY WITH REST OF 5/16 WEB'
ARRAY 3 -14.1738 -4.3688 0.0
REPLICATE 5 1 2R0.3556 2R0.7112 2R0.0 1
UNIT 42
COM='2 UNIT ARRAY WITH 1/4 IN. PLATE ON BOTTOM AND SIDES'
ARRAY 4 -9.0428 -4.3688 0.0
REPLICATE 5 1 2R0.3048 0.0 0.3048 2R0.0 1
'
' BASKET UNIT
'
UNIT 50
COM='7 MTR ELEMENTS IN THE LWT'
CYLINDER 3 1 17.0500 73.152 0.0
HOLE 40 0.0 +9.4489 0.0
HOLE 41 0.0  0.0    0.0
HOLE 42 0.0 -9.4489 0.0
CYLINDER 5 1 18.8913   73.152 -1.27
CYLINDER 6 1 33.4963   73.152 -1.27
CYLINDER 5 1 36.5443   73.152 -1.27
CYLINDER 7 1 49.2443   73.152 -1.27
CYLINDER 5 1 49.8539   73.152 -1.27
CUBOID   8 1 4P49.8539 73.152 -1.27
'
' PLATES AT TOP OF BASKET OPENING
'
' BASKET CENTER ROW ARRAY ELEMENTS
'
UNIT 110
COM='FUEL PATE ARRAY - PLATES IN 5/16 IN. WEB CENTER'
ARRAY  1 -3.3000 -4.3688 13.152
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 13.152
HOLE   4  4.1687 0.0 13.152
REPLICATE 5 1 2R0.3556 4R0.0 1
UNIT 111
COM='FUEL ARRAY 20 PLATES IN 5/16 IN. WEB RIGHT'
ARRAY  1 -3.9686 -4.3688 13.152
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 13.152
HOLE   4  4.1687 0.0 13.152
REPLICATE 5 1 2R0.3556 4R0.0 1
UNIT 112
COM='FUEL ARRAY 20 PLATES IN 5/16 IN. WEB LEFT'
ARRAY  1 -2.6314 -4.3688 13.152
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 13.152
HOLE   4  4.1687 0.0 13.152
REPLICATE 5 1 2R0.3556 4R0.0 1
'
' BASKET TOP ROW ARRAY ELEMENTS
'
UNIT 120
COM='FUEL ARRAY WITH HALF OF 1/4 PLATE ON RIGHT -  TOP STACK'
ARRAY  1 -2.6314 -4.3688 13.152
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 13.152
HOLE   4  4.1687 0.0 13.152
REPLICATE 5 1 0.3048 5R0.0 1
UNIT 121
COM='FUEL WITH HALF OF 1/4 IN. PLATE ON LEFT  TOP STACK'
ARRAY  1 -3.9686 -4.3688 13.152
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 13.152
HOLE   4  4.1687 0.0 13.152
REPLICATE 5 1 0.0 0.3048 4R0.0 1
'
' BASKET BOTTOM ROW ARRAY ELEMENTS
'
UNIT 130
COM='FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON RIGHT -  BOTTOM STACK'
```

```
ARRAY  1 -2.6314 -4.3688 13.152
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 13.152
HOLE   4  4.1687 0.0 13.152
REPLICATE 5 1 0.3048 5R0.0 1
UNIT 131
COM='FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON LEFT - BOTTOM STACK'
ARRAY  1 -3.9686 -4.3688 13.152
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 13.152
HOLE   4  4.1687 0.0 13.152
REPLICATE 5 1 0.0 0.3048 4R0.0 1
'
' CONSTRUCTION BASKET ROWS
'
UNIT 140
COM='2 UNIT ARRAY WITH 1/4 IN. PLATE ON TOP AND SIDES'
ARRAY 12 -9.0428 -4.3688 0.0
REPLICATE 5 1 3R0.3048 0.0 2R0.0 1
UNIT 141
COM='3 UNIT ARRAY WITH REST OF 5/16 WEB'
ARRAY 13 -14.1738 -4.3688 0.0
REPLICATE 5 1 2R0.3556 2R0.7112 2R0.0 1
UNIT 142
COM='2 UNIT ARRAY WITH 1/4 IN. PLATE ON BOTTOM AND SIDES'
ARRAY 14 -9.0428 -4.3688 0.0
REPLICATE 5 1 2R0.3048 0.0 0.3048 2R0.0 1
'
' BASKET UNIT
'
UNIT 150
COM='7 MTR ELEMENTS IN THE LWT'
CYLINDER 3 1 17.0500 73.152 0.0
HOLE 140 0.0 +9.4489 0.0
HOLE 141 0.0  0.0    0.0
HOLE 142 0.0 -9.4489 0.0
CYLINDER 5 1 18.8913   73.152 -1.27
CYLINDER 6 1 33.4963   73.152 -1.27
CYLINDER 5 1 36.5443   73.152 -1.27
CYLINDER 7 1 49.2443   73.152 -1.27
CYLINDER 5 1 49.8539   73.152 -1.27
CUBOID   8 1 4P49.8539 73.152 -1.27
'
' CASK LID AND BOTTOM STRUCTURE
'
UNIT 60
COM='SIMPLIFIED LID STRUCTURE NAC-LWT'
CYLINDER 5 1 36.5188   13.6775 -14.1351
CYLINDER 8 1 49.8539   13.6775 -14.1351
CUBOID   8 1 4P49.8539 13.6775 -14.1351
UNIT 61
COM='SIMPLIFIED CASK BOTTOM STRUCTURE NAC-LWT'
CYLINDER 6 1 26.3525 2P3.81
CYLINDER 5 1 36.6188 +13.36 -12.7
CYLINDER 8 1 49.8539 +13.36 -12.7
CUBOID   8 1 4P49.8539 +13.36 -12.7
UNIT 62
COM='THIN TOP AND BOTTOM SHELL OF NEUTRON SHIELD - SUBTRACTED FROM LID MODEL'
CYLINDER 5 1 49.8539 0.61 0.0
CUBOID   8 1 4P49.8539 0.61 0.0
'
' STACK OF BASKETS WITH CASK LID AND BOTTOM
'
GLOBAL UNIT 70
COM='STACK OF 6 BASKETS IN CASK WITH LID AND BOTTOM'
ARRAY 10  -49.8539 -49.8539 0.0
END GEOM
READ ARRAY
'
' FUEL ELEMENT PLATE ARRAY
'
ARA=1 NUX=1 NUY=23 NUZ=1 FILL 3 21R1 2 END FILL
'
' ARRAYS OF BASKET OPENINGS (TOP, MIDDLE, BOTTOM)
' PLATES AT BOTTOM OF OPENING
'
ARA=2 NUX=2 NUY=1 NUZ=1 FILL 20 21 END FILL
ARA=3 NUX=3 NUY=1 NUZ=1 FILL 12 10 11 END FILL
ARA=4 NUX=2 NUY=1 NUZ=1 FILL 30 31 END FILL
'
' ARRAYS OF BASKET OPENINGS (TOP, MIDDLE, BOTTOM)
' PLATES AT TOP OF OPENING
'
ARA=12 NUX=2 NUY=1 NUZ=1 FILL 120 121 END FILL
ARA=13 NUX=3 NUY=1 NUZ=1 FILL 112 110 111 END FILL
ARA=14 NUX=2 NUY=1 NUZ=1 FILL 130 131 END FILL
'
' ARRAY OF BASKETS WITH LID AND BOTTOM
'
ARA=10 NUX=1 NUY=1 NUZ=10 FILL 61 62 150 50 150 50 150 50 62 60 END FILL
END ARRAY
READ BOUNDS ALL=MIR END BOUNDS
READ PLOT
TTL='X-Y PLOT OF CENTER ELEMENT - FUEL ELEVATION'
SCR=YES PIC=MAT LPI=10
```

```
    UAX=1.0 VDN=-1.0 NAX=1500
    XUL=-5.0 YUL=5.0 ZUL=50.0
    XLR=5.0 YLR=-5.0 ZLR=50.0 END
    TTL='X-Y PLOT OF BASKET - FUEL ELEVATION'
    UAX=1.0 VDN=-1.0 NAX=1500
    XUL=-17.0 YUL=17.0 ZUL=50.0
    XLR=17.0 YLR=-17.0 ZLR=50.0 END
    TTL='X-Y PLOT OF CASK - FUEL ELEVATION'
    UAX=1.0 VDN=-1.0 NAX=1500
    XUL=-65.0 YUL=65.0 ZUL=50.0
    XLR=65.0 YLR=-65.0 ZLR=50.0 END
    TTL='Y-Z (X=0) PLOT OF BOTTOM BASKET - CENTER SECTION'
    VAX=1.0 WDN=-1.0
    XUL=0.0 YUL=-5.0 ZUL=55.0
    XLR=0.0 YLR=5.0 ZLR=50.0 END
    TTL='Y-Z (X=0) PLOT OF BOTTOM BASKET - CENTER FUEL ELEMENT'
    VAX=1.0 WDN=-1.0
    XUL=0.0 YUL=-5.0 ZUL=101.1
    XLR=0.0 YLR=5.0 ZLR=26.6 END
    TTL='Y-Z (X=-2) PLOT OF BOTTOM BASKET'
    VAX=1.0 WDN=-1.0
    XUL=-2.0 YUL=-15.0 ZUL=101.1
    XLR=-2.0 YLR=15.0 ZLR=26.6 END
    TTL='Y-Z (X=-2) PLOT OF CASK - R=17.0'
    LPI=5 NAX=1000
    VAX=1.0 WDN=-1.0
    XUL=-2.0 YUL=-17.0 ZUL=502.0
    XLR=-2.0 YLR=17.0 ZLR=-1.0 END
    TTL='Y-Z (X=-2) PLOT OF CASK - R=51.0'
    VAX=1.0 WDN=-1.0
    XUL=-2.0 YUL=-51.0 ZUL=502.0
    XLR=-2.0 YLR=51.0 ZLR=-1.0 END
    END PLOT
    END DATA

  SECONDARY MODULE 000008   HAS BEEN CALLED.

  MODULE 000008   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     0.55 (SECONDS).

  SECONDARY MODULE 000002   HAS BEEN CALLED.

  MODULE 000002   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     3.29 (SECONDS).

  SECONDARY MODULE 000009   HAS BEEN CALLED.

  MODULE 000009   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   745.01 (SECONDS).

  MODULE CSAS25   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   751.44 (SECONDS).
```

```
 CCCCCCCCCC     SSSSSSSSSS      AAAAAAAA      SSSSSSSSSS     2222222222    555555555555
CCCCCCCCCCCC   SSSSSSSSSSSS    AAAAAAAAAA    SSSSSSSSSSSS   222222222222   555555555555
CC        CC   SS        SS   AA        AA   SS        SS   22        22   55
CC             SS             AA        AA   SS                       22   55
CC             SS             AA        AA   SS                       22   55
CC             SSSSSSSSSSS    AAAAAAAAAAAA   SSSSSSSSSSS             22    55555555555
CC              SSSSSSSSSSS   AAAAAAAAAAAA    SSSSSSSSSSS           22     555555555555
CC                       SS   AA        AA             SS         22                 55
CC                       SS   AA        AA             SS       22                   55
CC        CC   SS        SS   AA        AA   SS        SS     22         55        55
CCCCCCCCCCCC   SSSSSSSSSSSS   AA        AA   SSSSSSSSSSSS   222222222222   555555555555
 CCCCCCCCCC     SSSSSSSSSS    AA        AA    SSSSSSSSSS    222222222222    5555555555


 SSSSSSSSSS     CCCCCCCCCC      AAAAAAAA     LL             EEEEEEEEEEEE                  PPPPPPPPPPP     CCCCCCCCCC
SSSSSSSSSSSS   CCCCCCCCCCCC    AAAAAAAAAA    LL             EEEEEEEEEEEE                  PPPPPPPPPPPP   CCCCCCCCCCCC
SS        SS   CC        CC   AA        AA   LL             EE                            PP        PP   CC        CC
SS             CC             AA        AA   LL             EE                            PP        PP   CC
SS             CC             AA        AA   LL             EE                            PP        PP   CC
SSSSSSSSSSS    CC             AAAAAAAAAAAA   LL             EEEEEEEEE      ------------   PPPPPPPPPPPP   CC
 SSSSSSSSSSS   CC             AAAAAAAAAAAA   LL             EEEEEEEEE      ------------   PPPPPPPPPPP    CC
          SS   CC             AA        AA   LL             EE                            PP             CC
          SS   CC             AA        AA   LL             EE                            PP             CC
SS        SS   CC        CC   AA        AA   LL             EE                            PP             CC        CC
SSSSSSSSSSSS   CCCCCCCCCCCC   AA        AA   LLLLLLLLLLLL   EEEEEEEEEEEE                  PP             CCCCCCCCCCCC
 SSSSSSSSSS     CCCCCCCCCC    AA        AA   LLLLLLLLLLLL   EEEEEEEEEEEE                  PP              CCCCCCCCCC


   0000000      2222222222            //    2222222222     66666666666            //       0000000          11
  000000000    222222222222          //    222222222222   666666666666           //       000000000        111
 00       00   22        22         //     22        22   66                    //       00       00      1111
00        00             22        //                22   66                   //       00        00        11
00        00             22       //                 22   66                  //        00        00        11
00        00            22       //                 22    66666666666        //         00        00        11
00        00          22        //                22      666666666666      //          00        00        11
00        00        22         //               22        66        66     //           00        00        11
00        00      22          //              22          66        66    //            00        00        11
 00      00     22           //             22            66        66   //              00      00         11
  000000000    222222222222 //             222222222222   666666666666  //                000000000      11111111
   0000000     222222222222//              222222222222    6666666666  //                  0000000       11111111


   0000000      9999999999                      11        8888888888                       44             44
  000000000    999999999999                    111       888888888888                     444            444
 00       00   99        99      :::          1111       88        88      :::           4444           4444
00        00   99        99      :::            11       88        88      :::          44 44          44 44
00        00   99        99      :::            11       88        88      :::         44  44         44  44
00        00   999999999999                     11        8888888888                  44   44        44   44
00        00    99999999999                     11        8888888888                 44    44       44    44
00        00             99      :::            11       88        88      :::      44444444444    44444444444
00        00             99      :::            11       88        88      :::     444444444444   444444444444
 00      00              99      :::            11       88        88      :::             44             44
  000000000    999999999999                  11111111    888888888888                      44             44
   0000000      9999999999                   11111111     8888888888                       44             44
```

```
 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL               EEEEEEEEEEEEE                   PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL               EEEEEEEEEEEEE                   PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL               EE                              PP         PP  CC         CC
SS             CC             AA         AA  LL               EE                              PP         PP  CC
SS             CC             AA         AA  LL               EE                              PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL               EEEEEEEEE       -------------   PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL               EEEEEEEEE       -------------   PPPPPPPPPPPP   CC
           SS  CC             AA         AA  LL               EE                              PP             CC
           SS  CC             AA         AA  LL               EE                              PP             CC
SS         SS  CC         CC  AA         AA  LL               EE                              PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLLL    EEEEEEEEEEEEE                   PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLLL    EEEEEEEEEEEEE                   PP              CCCCCCCCCCC
```

```
*******************************************************************************
*******************************************************************************
*******************************************************************************
*****                                                                     *****
*****                 PROGRAM VERIFICATION INFORMATION                    *****
*****                                                                     *****
*****               CODE SYSTEM:  SCALE-PC VERSION:  4.3                  *****
*****                                                                     *****
*******************************************************************************
*******************************************************************************
*****                                                                     *****
*****                                                                     *****
*****              PROGRAM:  CSAS                                         *****
*****                                                                     *****
*****        CREATION DATE:  03/08/96                                     *****
*****                                                                     *****
*****              VOLUME:  ENG                                           *****
*****                                                                     *****
*****              LIBRARY:  G:\SCALE43\WIN_NT\EXE                        *****
*****                                                                     *****
*****                                                                     *****
*****    THIS IS NOT A SCALE-PC CONFIGURATION CONTROLLED CODE             *****
*****                                                                     *****
*****              JOBNAME:  SCALE-PC                                     *****
*****                                                                     *****
*****    DATE OF EXECUTION:  02/26/01                                     *****
*****                                                                     *****
*****    TIME OF EXECUTION:  09:18:44                                     *****
*****                                                                     *****
*****                                                                     *****
*******************************************************************************
*******************************************************************************
*******************************************************************************
```

```
'MIN BASKET PLATE - COMMENT CARD REFERS TO NOMINAL PLATE SIZE

'23 PLATES - 20 GRAM 235U PER PLATE

'FUEL SHIFT AXIAL ALTERNATING

'56 CM ACTIVE FUEL HEIGHT

'MODIIIED TO 1.33 CM PLATE THICKNESS / 2 CM OFFSET

'MIN BASKET PLATE - COMMENT CARD REFERS TO NOMINAL PLATE SIZE

'23 PLATES - 20 GRAM 235U PER PLATE

'FUEL SHIFT AXIAL ALTERNATING

'56 CM ACTIVE FUEL HEIGHT

'MODIIIED TO 1.33 CM PLATE THICKNESS / 2 CM OFFSET
    LWT MTR INPUT FOR CASK MODEL - PLATES IN CLOSE & PLATES @ FULL PITCH


    **** PROBLEM PARAMETERS ****

    LIB 27GROUPNDF4  LIBRARY
    MXX              8 MIXTURES
    MSC              9 COMPOSITION SPECIFICATIONS
    IZM              3 MATERIAL ZONES
    GE  LATTICECELL  GEOMETRY
    MORE             0 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
    MSLN             0 FUEL SOLUTIONS


    **** PROBLEM COMPOSITION DESCRIPTION ****

    SC  URANIUM      STANDARD COMPOSITION
    MX               1 MIXTURE NO.
    VF          0.0365 VOLUME FRACTION
    ROTH       19.0500 SPECIFIED DENSITY
    NEL              1 NO. ELEMENTS
    ICP              1 0/1 MIXTURE/COMPOUND
    TEMP         293.0 DEG KELVIN
                 92000       1.00 ATOM/MOLECULE
                                  92235     94.000 WT%
                                  92238      6.000 WT%
    END

    SC  AL           STANDARD COMPOSITION
    MX               1 MIXTURE NO.
    VF          0.2567 VOLUME FRACTION
    ROTH        2.7020 SPECIFIED DENSITY
    NEL              1 NO. ELEMENTS
    ICP              1 0/1 MIXTURE/COMPOUND
    TEMP         293.0 DEG KELVIN
                 13027       1.00 ATOM/MOLECULE
    END

    SC  AL           STANDARD COMPOSITION
    MX               2 MIXTURE NO.
    VF          1.0000 VOLUME FRACTION
    ROTH        2.7020 THEORETICAL DENSITY
    NEL              1 NO. ELEMENTS
    ICP              1 0/1 MIXTURE/COMPOUND
    TEMP         293.0 DEG KELVIN
                 13027       1.00 ATOM/MOLECULE
    END

    SC  H2O          STANDARD COMPOSITION
    MX               3 MIXTURE NO.
    VF          1.0000 VOLUME FRACTION
    ROTH        0.9982 THEORETICAL DENSITY
    NEL              2 NO. ELEMENTS
    ICP              1 0/1 MIXTURE/COMPOUND
    TEMP         293.0 DEG KELVIN
                  1001       2.00 ATOMS/MOLECULE
                  8016       1.00 ATOM/MOLECULE
    END

    SC  AL           STANDARD COMPOSITION
    MX               4 MIXTURE NO.
    VF          1.0000 VOLUME FRACTION
    ROTH        2.7020 THEORETICAL DENSITY
    NEL              1 NO. ELEMENTS
    ICP              1 0/1 MIXTURE/COMPOUND
    TEMP         293.0 DEG KELVIN
                 13027       1.00 ATOM/MOLECULE
    END

    SC  SS304        STANDARD COMPOSITION
    MX               5 MIXTURE NO.
    VF          1.0000 VOLUME FRACTION
    ROTH        7.9200 THEORETICAL DENSITY
    NEL              4 NO. ELEMENTS
    ICP              0 0/1 MIXTURE/COMPOUND
```

```
TEMP        293.0 DEG KELVIN
            24304      19.000 WT%
            25055       2.000 WT%
            26304      69.500 WT%
            28304       9.500 WT%
END

SC  PB            STANDARD COMPOSITION
MX              6 MIXTURE NO.
VF         1.0000 VOLUME FRACTION
ROTH      11.3440 THEORETICAL DENSITY
NEL             1 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
            82000        1.00 ATOM/MOLECULE
END

SC  H2O           STANDARD COMPOSITION
MX              7 MIXTURE NO.
VF         0.0000 VOLUME FRACTION
ROTH       0.9982 THEORETICAL DENSITY
NEL             2 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
             1001        2.00 ATOMS/MOLECULE
             8016        1.00 ATOM/MOLECULE
END

SC  H2O           STANDARD COMPOSITION
MX              8 MIXTURE NO.
VF         0.0000 VOLUME FRACTION
ROTH       0.9982 THEORETICAL DENSITY
NEL             2 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
             1001        2.00 ATOMS/MOLECULE
             8016        1.00 ATOM/MOLECULE
END

**** PROBLEM GEOMETRY ****

CTP SYMMSLABCELL CELL TYPE
PITCH      0.3915 CM CENTER TO CENTER SPACING
FUELOD     0.0830 CM FUEL DIAMETER OR SLAB THICKNESS
MFUEL           1 MIXTURE NO. OF FUEL
MMOD            3 MIXTURE NO. OF MODERATOR
CLADOD     0.1230 CM CLAD OUTER DIAMETER
MCLAD           2 MIXTURE NO. OF CLAD

ZONE SPECIFICATIONS FOR LATTICECELL GEOMETRY

               ZONE  1 IS FUEL
               ZONE  2 IS CLAD
               ZONE  3 IS MOD
```

```
**********************************************************************************************************
***                                                                                                    ***
***                    LWT MTR INPUT FOR CASK MODEL - PLATES IN CLOSE & PLATES @ FULL PITCH            ***
***                                                                                                    ***
**********************************************************************************************************
**********************************************************************************************************
***                                                                                                    ***
***                          ********** DATA LIBRARY INFORMATION **********                            ***
***                                                                                                    ***
***       UNIT                                              VOLUME                                     ***
***       NUMBER           DATA SET NAME                    NAME         UNIT FUNCTION                 ***
***       ------           -------------                    ----         -------------                 ***
***                                                                                                    ***
***         89      G:\scale43\DATALIB\FT89F001                          STANDARD COMPOSITION LIBRARY  ***
***                                                                                                    ***
***         82      G:\scale43\DATALIB\FT82F001                          CROSS SECTION LIBRARY         ***
***                                                                                                    ***
***         11      I:\PROJECTS\sts-proj\mtr\141000~1.2\HIGH-U~1         SHORT CROSS SECTION LIBRARY   ***
***                                                                                                    ***
***         90      I:\PROJECTS\sts-proj\mtr\141000~1.2\HIGH-U~1         INPUT DATA DIRECT ACCESS      ***
***                                                                                                    ***
**********************************************************************************************************
**********************************************************************************************************
***                                                                                                    ***
***                                                                                                    ***
***                             STANDARD COMPOSITION LIBRARY DATA                                      ***
***                             ---------------------------------                                      ***
***                                                                                                    ***
***         UNIT NUMBER  :  89                                                                         ***
***                                                                                                    ***
***         DATASET NAME :  G:\scale43\DATALIB\FT89F001                                                ***
***                                                                                                    ***
***         LIBRARY TITLE:  SCALE-4 STANDARD COMPOSITION LIBRARY                                       ***
***                         637 STANDARD COMPOSITIONS, 490 NUCLIDES                                    ***
***                         90 ELEMENTS WITH VARIABLE ISOTOPIC DISTRBUTIONS.                           ***
***                                                                                                    ***
***         CREATION DATE:   6/30/95                                                                   ***
***                                                                                                    ***
***                                                                                                    ***
***                                                                                                    ***
***                                   CROSS SECTION LIBRARY DATA                                       ***
***                                   --------------------------                                       ***
***                                                                                                    ***
***         UNIT NUMBER  :  82                                                                         ***
***                                                                                                    ***
***         DATASET NAME :  G:\scale43\DATALIB\FT82F001                                                ***
***                                                                                                    ***
***         LIBRARY TITLE:  SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY                                 ***
***                            BASED ON ENDF-B VERSION 4 DATA                                          ***
***                               COMPILED FOR NRC      1/27/89                                        ***
***                                  LAST UPDATED                                          08/12/94    ***
***                                     L.M.PETRIE    -    ORNL                                        ***
***                                                                                                    ***
***                                                                                                    ***
***                                                                                                    ***
***                                                                                                    ***
**********************************************************************************************************
**********************************************************************************************************

                 ........    0 IO'S WERE USED BEFORE READING KENO V DATA     ........

                 ........    0 IO'S WERE USED READING THE KENO V PARAMETER DATA     ........


 CONTROL MODULE CSAS25    IS COMPLETE.
```

```
BBBBBBBBBBB    00000000000   NN        NN                  AAAAAAAAA    MM       MM  IIIIIIIIIII   22222222222
BBBBBBBBBBBB   0000000000000 NNN       NN                 AAAAAAAAAAA   MMM     MMM  IIIIIIIIIII  2222222222222
BB        BB   00         00 NNNN      NN                AA         AA  MMMM   MMMM      II       22         22
BB        BB   00         00 NN NN     NN                AA         AA  MM MM MM MM      II                  22
BB        BB   00         00 NN  NN    NN                AA         AA  MM  MMM  MM      II                  22
BBBBBBBBBBB    00         00 NN   NN   NN -------------  AAAAAAAAAAAAA  MM   MMM MM      II                22
BBBBBBBBBBB    00         00 NN    NN  NN -------------  AAAAAAAAAAAAA  MM    M  MM      II              22
BB        BB   00         00 NN     NN NN                AA         AA  MM       MM      II            22
BB        BB   00         00 NN      NNNN                AA         AA  MM       MM      II          22
BB        BB   00         00 NN       NNN                AA         AA  MM       MM      II        22
BBBBBBBBBBBB   0000000000000 NN        NN                AA         AA  MM       MM  IIIIIIIIIII  2222222222222
BBBBBBBBBBB    00000000000   NN        NN                AA         AA  MM       MM  IIIIIIIIIII  2222222222222

 SSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL            EEEEEEEEEEEEE                PPPPPPPPPPPP   CCCCCCCCCCC
SSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL            EEEEEEEEEEEEE                PPPPPPPPPPPPP CCCCCCCCCCCCC
SS        SS  CC         CC  AA         AA  LL            EE                           PP         PP CC         CC
SS            CC             AA         AA  LL            EE                           PP         PP CC
SS            CC             AA         AA  LL            EE                           PP         PP CC
SSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL            EEEEEEEEE    -------------   PPPPPPPPPPPPP CC
 SSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL            EEEEEEEEE    -------------   PPPPPPPPPPPP  CC
          SS  CC             AA         AA  LL            EE                           PP            CC
          SS  CC             AA         AA  LL            EE                           PP            CC
SS        SS  CC         CC  AA         AA  LL            EE                           PP            CC         CC
SSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLLL EEEEEEEEEEEEE                PP            CCCCCCCCCCCCC
 SSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLLL EEEEEEEEEEEEE                PP             CCCCCCCCCCC

  0000000      22222222222            //   22222222222   666666666666            //     0000000        11
 000000000    2222222222222          //   2222222222222  6666666666666          //     000000000      111
00       00   22         22         //    22         22  66                    //     00       00    1111
00       00              22        //                22  66                   //      00       00      11
00       00              22       //                 22  66                  //       00       00      11
00       00            22        //                22    666666666666       //        00       00      11
00       00          22         //               22      6666666666666     //         00       00      11
00       00        22          //              22        66         66    //          00       00      11
00       00      22           //             22          66         66   //           00       00      11
 00     00     22            //            22            66         66  //             00     00       11
 000000000    2222222222222 //            2222222222222  6666666666666 //               000000000   11111111
  0000000     2222222222222//             2222222222222   66666666666 //                 0000000    11111111

  0000000      99999999999               11       88888888888                 44   5555555555555
 000000000    9999999999999             111      8888888888888               444   5555555555555
00       00   99         99    :::     1111      88         88    :::       4444   55
00       00   99         99    :::       11      88         88    :::      44 44   55
00       00   99         99    :::       11      88         88    :::     44  44   55
00       00   9999999999999              11       88888888888            44   44   555555555555
00       00    999999999999              11       88888888888           44    44   5555555555555
00       00              99    :::       11      88         88    :::  4444444444444            55
00       00              99    :::       11      88         88    :::  4444444444444            55
 00     00               99    :::       11      88         88    :::             44   55       55
 000000000    9999999999999           11111111   8888888888888                    44   5555555555555
  0000000     999999999999            11111111    88888888888                     44    55555555555
```

```
  SSSSSSSSSS    CCCCCCCCCCC    AAAAAAAAA    LL          EEEEEEEEEEEEE                PPPPPPPPPPPP    CCCCCCCCCCC
 SSSSSSSSSSSS  CCCCCCCCCCCCC  AAAAAAAAAAA   LL          EEEEEEEEEEEEE                PPPPPPPPPPPPP  CCCCCCCCCCCCC
 SS        SS  CC         CC  AA        AA  LL          EE                           PP         PP  CC         CC
 SS            CC             AA        AA  LL          EE                           PP         PP  CC
 SS            CC             AA        AA  LL          EE                           PP         PP  CC
 SSSSSSSSSSS   CC             AAAAAAAAAAAA  LL          EEEEEEEEE    -------------   PPPPPPPPPPPPP  CC
  SSSSSSSSSSS  CC             AAAAAAAAAAAA  LL          EEEEEEEEE    -------------   PPPPPPPPPPPP   CC
           SS  CC             AA        AA  LL          EE                           PP             CC
           SS  CC             AA        AA  LL          EE                           PP             CC
 SS        SS  CC         CC  AA        AA  LL          EE                           PP             CC         CC
 SSSSSSSSSSSS  CCCCCCCCCCCCC  AA        AA  LLLLLLLLLLLL  EEEEEEEEEEEEE              PP             CCCCCCCCCCCCC
  SSSSSSSSSS    CCCCCCCCCCC   AA        AA  LLLLLLLLLLLL  EEEEEEEEEEEEE              PP              CCCCCCCCCCC
```

```
*******************************************************************************
*******************************************************************************
*******************************************************************************
*****                                                                     *****
*****                  PROGRAM VERIFICATION INFORMATION                   *****
*****                                                                     *****
*****                CODE SYSTEM:  SCALE-PC VERSION:  4.3                 *****
*****                                                                     *****
*******************************************************************************
*******************************************************************************
*****                                                                     *****
*****                                                                     *****
*****              PROGRAM:  000008                                       *****
*****                                                                     *****
*****        CREATION DATE:  09/15/95                                     *****
*****                                                                     *****
*****               VOLUME:  ENG                                          *****
*****                                                                     *****
*****              LIBRARY:  G:\SCALE43\WIN_NT\EXE                        *****
*****                                                                     *****
*****                                                                     *****
*****    THIS IS NOT A SCALE-PC CONFIGURATION CONTROLLED CODE             *****
*****                                                                     *****
*****              JOBNAME:  SCALE-PC                                     *****
*****                                                                     *****
*****    DATE OF EXECUTION:  02/26/01                                     *****
*****                                                                     *****
*****    TIME OF EXECUTION:  09:18:45                                     *****
*****                                                                     *****
*****                                                                     *****
*******************************************************************************
*******************************************************************************
*******************************************************************************
```

```
-1Q ARRAY HAS      1 ENTRIES.
 0Q ARRAY HAS      4 ENTRIES.
 1Q ARRAY HAS      6 ENTRIES.
 2Q ARRAY HAS      2 ENTRIES.
```

```
LOGICAL ASSIGNMENTS

MASTER LIBRARY    11
WORKING LIBRARY    0
SCRATCH FILE      18
NEW LIBRARY        1

P R O B L E M   D E S C R I P T I O N

IGR--GEOMETRY (0/1/2/3--INF MED/SLAB/CYL/SPHERE                    1

IZM--NUMBER OF ZONES OR MATERIAL REGIONS                           8

MS--MIXING TABLE LENGTH                                           16

IBL--SHIELDED CROSS SECTION EDIT OPTION (0/1--NO/YES)              0

IBR--BONDARENKO FACTOR EDIT OPTION (0/1--NO/YES)                   0

ISSOPT--DANCOFF FACTOR OPTION                                      0

CONVERGENCE CRITERION     1.00000E-03

GEOMETRY CORRECTION FACTOR FOR WIGNER RATIONAL APPROXIMATION  1.000E+00

        3Q ARRAY HAS     16 ENTRIES.

        4Q ARRAY HAS     16 ENTRIES.

        5Q ARRAY HAS     16 ENTRIES.

        6Q ARRAY HAS      8 ENTRIES.

        7Q ARRAY HAS      8 ENTRIES.

        8Q ARRAY HAS      8 ENTRIES.

        9Q ARRAY HAS      8 ENTRIES.

       10Q ARRAY HAS     16 ENTRIES.

       11Q ARRAY HAS      8 ENTRIES.
```

M I X I N G   T A B L E

ENTRY	MIXTURE	ISOTOPE	NUMBER DENSITY	NEW IDENTIFIER
1	1	92235	1.67462E-03	1092235
2	1	92238	1.05541E-04	1092238
3	1	13027	1.54783E-02	1013027
4	2	13027	6.03066E-02	2013027
5	4	13027	6.03066E-02	4013027
6	3	1001	6.67692E-02	3001001
7	7	1001	6.67692E-22	7001001
8	8	1001	6.67692E-22	8001001
9	3	8016	3.33846E-02	3008016
10	7	8016	3.33846E-22	7008016
11	8	8016	3.33846E-22	8008016
12	5	24304	1.74286E-02	5024304
13	5	25055	1.73633E-03	5025055
14	5	26304	5.93579E-02	5026304
15	5	28304	7.72070E-03	5028304
16	6	82000	3.29690E-02	6082000

GEOMETRY AND MATERIAL DESCRIPTION

ZONE	MIXTURE	OUTER DIMENSION	TEMPERATURE	EXTRA XS	TYPE (0/1--FUEL/MOD)
1	1	4.15000E-02	2.93000E+02	2.35465E+00	0
2	2	6.15000E-02	2.93000E+02	0.00000E+00	0
3	3	1.95750E-01	2.93000E+02	0.00000E+00	0
4	4	5.19575E+00	2.93000E+02	0.00000E+00	0
5	5	1.01958E+01	2.93000E+02	0.00000E+00	0
6	6	1.51958E+01	2.93000E+02	0.00000E+00	0
7	7	2.01958E+01	2.93000E+02	0.00000E+00	0
8	8	2.51958E+01	2.93000E+02	0.00000E+00	0

```
     3609 LOCATIONS OF    100000 AVAILABLE ARE REQUIRED TO MAKE A NEW MASTER CONTAINING THE SELF-SHIELDED VALUES

NO NUCLIDES IN YOUR PROBLEM HAVE BONDARENKO FACTOR DATA**BONAMI WILL COPY FROM LOGICAL 11 TO LOGICAL  1

COPY       1001    HYDROGEN          FROM LOG 11 TO LOG 18     BONDARENKO TRIGGER 0

COPY       1001    HYDROGEN          FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY       1001    HYDROGEN          FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY       1001    HYDROGEN          FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY       8016    OXYGEN-16         FROM LOG 11 TO LOG 18     BONDARENKO TRIGGER 0

COPY       8016    OXYGEN-16         FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY       8016    OXYGEN-16         FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY       8016    OXYGEN-16         FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY      13027  AL-27 1193 218 G FROM LOG 11 TO LOG 18     BONDARENKO TRIGGER 0
```

```
COPY     13027  AL-27 1193 218 G FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0
COPY     13027  AL-27 1193 218 G FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0
COPY     13027  AL-27 1193 218 G FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0
COPY     24304  CR 1191 WT SS-30 FROM LOG 11 TO LOG  1     BONDARENKO TRIGGER 0
COPY     25055   MANGANESE-55    FROM LOG 11 TO LOG  1     BONDARENKO TRIGGER 0
COPY     26304  FE 1192 WT SS-30 FROM LOG 11 TO LOG  1     BONDARENKO TRIGGER 0
COPY     28304  NI 1190 WT SS-30 FROM LOG 11 TO LOG  1     BONDARENKO TRIGGER 0
COPY     82000  PB   1288 218NGP FROM LOG 11 TO LOG  1     BONDARENKO TRIGGER 0
COPY     92235   URANIUM-235     FROM LOG 11 TO LOG  1     BONDARENKO TRIGGER 0
COPY     92238   URANIUM-238     FROM LOG 11 TO LOG  1     BONDARENKO TRIGGER 0
```

```
SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
   BASED ON ENDF-B VERSION 4 DATA
      COMPILED FOR NRC      1/27/89
         LAST UPDATED                                        08/12/94
            L.M.PETRIE   -   ORNL
    TAPE ID                            4321         NUMBER OF NUCLIDES              16
    NUMBER OF NEUTRON GROUPS             27         NUMBER OF GAMMA GROUPS           0
    FIRST THERMAL GROUP                  15         LOGICAL UNIT                     1
                              TABLE OF CONTENTS
   HYDROGEN      ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94       ID    3001001
   HYDROGEN      ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94       ID    7001001
   HYDROGEN      ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94       ID    8001001
   OXYGEN-16     ENDF/B-IV MAT 1276                      UPDATED 08/12/94       ID    3008016
   OXYGEN-16     ENDF/B-IV MAT 1276                      UPDATED 08/12/94       ID    7008016
   OXYGEN-16     ENDF/B-IV MAT 1276                      UPDATED 08/12/94       ID    8008016
  AL-27 1193 218 GP 040375(5)                            UPDATED 08/12/94       ID    1013027
  AL-27 1193 218 GP 040375(5)                            UPDATED 08/12/94       ID    2013027
  AL-27 1193 218 GP 040375(5)                            UPDATED 08/12/94       ID    4013027
  CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94       ID    5024304
   MANGANESE-55  ENDF/B-IV MAT 1197                      UPDATED 08/12/94       ID    5025055
  FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94       ID    5026304
  NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94       ID    5028304
  PB   1288 218NGP 042375 P-3 293K                       UPDATED 08/12/94       ID    6082000
   URANIUM-235   ENDF/B-IV MAT 1261                      UPDATED 08/12/94       ID    1092235
   URANIUM-238   ENDF/B-IV MAT 1262                      UPDATED 08/12/94       ID    1092238

    TAPE COPY USED       0 I/O'S, AND TOOK     0.11 SECONDS
```

```
                NN          NN  IIIIIIIIIIII    TTTTTTTTTTTT      AAAAAAAAA     WW         WW   LL
                NNN         NN  IIIIIIIIIIII    TTTTTTTTTTTT     AAAAAAAAAAA    WW         WW   LL
                NNNN        NN       II              TT         AA         AA   WW         WW   LL
                NN NN       NN       II              TT         AA         AA   WW         WW   LL
                NN  NN      NN       II              TT         AA         AA   WW         WW   LL
                NN   NN     NN       II              TT         AAAAAAAAAAAAA   WW    W    WW   LL
                NN    NN    NN       II              TT         AAAAAAAAAAAAA   WW   WWW   WW   LL
                NN     NN   NN       II              TT         AA         AA   WW  WW WW  WW   LL
                NN      NN  NN       II              TT         AA         AA   WW WW   WW WW   LL
                NN       NN NN       II              TT         AA         AA   WWWW     WWWW   LL
                NN        NNNN  IIIIIIIIIIII         TT         AA         AA   WWW       WWW   LLLLLLLLLLLL
                NN         NNN  IIIIIIIIIIII         TT         AA         AA   WW         WW   LLLLLLLLLLLL


 SSSSSSSSSS      CCCCCCCCCC       AAAAAAAAA     LL              EEEEEEEEEEEE                    PPPPPPPPPPP      CCCCCCCCCC
SSSSSSSSSSSS    CCCCCCCCCCCC     AAAAAAAAAAA    LL              EEEEEEEEEEEE                    PPPPPPPPPPPP    CCCCCCCCCCCC
SS        SS    CC        CC    AA         AA   LL              EE                              PP        PP    CC        CC
SS              CC              AA         AA   LL              EE                              PP        PP    CC
SS              CC              AA         AA   LL              EE                              PP        PP    CC
SSSSSSSSSSS     CC              AAAAAAAAAAAAA   LL              EEEEEEEEE       -------------   PPPPPPPPPPPP    CC
 SSSSSSSSSSS    CC              AAAAAAAAAAAAA   LL              EEEEEEEEE       -------------   PPPPPPPPPPP     CC
          SS    CC              AA         AA   LL              EE                              PP              CC
          SS    CC              AA         AA   LL              EE                              PP              CC
SS        SS    CC        CC    AA         AA   LL              EE                              PP              CC        CC
SSSSSSSSSSSS    CCCCCCCCCCCC    AA         AA   LLLLLLLLLLLL    EEEEEEEEEEEE                    PP              CCCCCCCCCCCC
 SSSSSSSSSS      CCCCCCCCCC     AA         AA   LLLLLLLLLLLL    EEEEEEEEEEEE                    PP               CCCCCCCCCC


  0000000        2222222222             //       2222222222     666666666666             //       0000000           11
 000000000      222222222222           //       222222222222    666666666666            //       000000000         111
00       00     22        22          //        22        22    66                     //       00       00       1111
00       00               22         //                   22    66                    //        00       00         11
00       00               22        //                    22    66                   //         00       00         11
00       00              22        //                    22     66666666666         //          00       00         11
00       00            22         //                   22       666666666666       //           00       00         11
00       00          22          //                  22         66        66      //            00       00         11
00       00        22           //                 22           66        66     //             00       00         11
00       00      22            //                22             66        66    //              00       00         11
 000000000      222222222222  //                222222222222    666666666666   //                000000000     11111111
  0000000       222222222222 //                 222222222222     66666666666  //                  0000000      11111111


  0000000        9999999999                          11          8888888888                           44    666666666666
 000000000      999999999999                        111         888888888888                         444    666666666666
00       00     99        99         :::           1111         88        88        :::             4444    66
00       00     99        99         :::             11         88        88        :::            44 44    66
00       00     99        99         :::             11         88        88        :::           44  44    66
00       00     999999999999                         11          8888888888                      44   44    66666666666
00       00      99999999999                         11          8888888888                     44    44    666666666666
00       00               99         :::             11         88        88        :::         444444444444    66        66
00       00               99         :::             11         88        88        :::         444444444444    66        66
00       00               99         :::             11         88        88        :::                 44    66        66
 000000000      999999999999                      11111111      888888888888                            44    666666666666
  0000000        9999999999                       11111111       8888888888                             44     66666666666
```

```
 SSSSSSSSSSS   CCCCCCCCCCC     AAAAAAAAA    LL               EEEEEEEEEEEEE                  PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS CCCCCCCCCCCCC   AAAAAAAAAAA   LL               EEEEEEEEEEEEE                  PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS CC          CC AA         AA  LL               EE                             PP          PP CC          CC
SS            CC             AA         AA  LL               EE                             PP          PP CC
SS            CC             AA         AA  LL               EE                             PP          PP CC
SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL               EEEEEEEEE      -------------   PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS CC             AAAAAAAAAAAAA  LL               EEEEEEEEE      -------------   PPPPPPPPPPPP   CC
           SS CC             AA         AA  LL               EE                             PP             CC
           SS CC             AA         AA  LL               EE                             PP             CC
SS         SS CC          CC AA         AA  LL               EE                             PP             CC          CC
SSSSSSSSSSSSS CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLLL    EEEEEEEEEEEEE                  PP             CCCCCCCCCCCCC
 SSSSSSSSSSS   CCCCCCCCCCC   AA         AA  LLLLLLLLLLLLL    EEEEEEEEEEEEE                  PP              CCCCCCCCCCC
```

```
*******************************************************************************
*******************************************************************************
*******************************************************************************
*****                                                                     *****
*****                    PROGRAM VERIFICATION INFORMATION                 *****
*****                                                                     *****
*****                 CODE SYSTEM:  SCALE-PC VERSION:  4.3                *****
*****                                                                     *****
*******************************************************************************
*******************************************************************************
*****                                                                     *****
*****                                                                     *****
*****                PROGRAM:  000002                                     *****
*****                                                                     *****
*****          CREATION DATE:  09/28/95                                   *****
*****                                                                     *****
*****                 VOLUME:  ENG                                        *****
*****                                                                     *****
*****                LIBRARY:  G:\SCALE43\WIN_NT\EXE                      *****
*****                                                                     *****
*****                                                                     *****
*****    THIS IS NOT A SCALE-PC CONFIGURATION CONTROLLED CODE             *****
*****                                                                     *****
*****                JOBNAME:  SCALE-PC                                   *****
*****                                                                     *****
*****      DATE OF EXECUTION:  02/26/01                                   *****
*****                                                                     *****
*****      TIME OF EXECUTION:  09:18:46                                   *****
*****                                                                     *****
*****                                                                     *****
*******************************************************************************
*******************************************************************************
*******************************************************************************
```

```
      -1Q ARRAY HAS       1 ENTRIES.

       0Q ARRAY HAS       9 ENTRIES.

       1Q ARRAY HAS      12 ENTRIES.

SELECT 16 NUCLIDES FROM THE MASTER  LIBRARY ON LOGICAL  1
       0 NUCLIDES FROM THE WORKING LIBRARY ON LOGICAL  2
       0 NUCLIDES FROM THE WORKING LIBRARY ON LOGICAL  3
         TO CREATE THE NEW WORKING LIBRARY ON LOGICAL  4

       3 RESONANCE CALCULATIONS HAVE BEEN REQUESTED
      -1 OUTPUT OPTION FOR AMPX FORMATTED CROSS SECTION DATA
    2001 MAXIMUM NUMBER OF RESONANCE MESH INTERVALS
       2 ORDER OF RESONANCE LEVEL PROCESSING

THE STORAGE ALLOCATED FOR THIS CASE IS    100000 WORDS

       2Q ARRAY HAS      16 ENTRIES.

       3Q ARRAY HAS      45 ENTRIES.

       4Q ARRAY HAS      16 ENTRIES.

 GENERAL INFORMATION CONCERNING CROSS SECTION LIBRARY
   TAPE IDENTIFICATION NUMBER                4321
   NUMBER OF NUCLIDES ON TAPE                  16
   NUMBER OF NEUTRON ENERGY GROUPS             27
   FIRST THERMAL NEUTRON ENERGY GROUP          15
   NUMBER OF GAMMA ENERGY GROUPS                0

   DIRECT ACCESS UNIT NUMBER  9 REQUIRES 117 BLOCKS OF LENGTH  1650 WORDS
XSDRN TAPE    4321
                        SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
                           BASED ON ENDF-B VERSION 4 DATA
                              COMPILED FOR NRC      1/27/89
                                 LAST UPDATED                                                08/12/94
                                    L.M.PETRIE    -   ORNL

 NUCLIDES FROM XSDRN TAPE
    1      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94      3001001
    2      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94      7001001
    3      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94      8001001
    4      OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED 08/12/94      3008016
    5      OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED 08/12/94      7008016
    6      OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED 08/12/94      8008016
    7     AL-27 1193 218 GP 040375(5)                              UPDATED 08/12/94      1013027
    8     AL-27 1193 218 GP 040375(5)                              UPDATED 08/12/94      2013027
    9     AL-27 1193 218 GP 040375(5)                              UPDATED 08/12/94      4013027
   10     CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94      5024304
   11      MANGANESE-55   ENDF/B-IV MAT 1197                       UPDATED 08/12/94      5025055
   12     FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94      5026304
   13     NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94      5028304
   14     PB   1288 218NGP 042375 P-3 293K                         UPDATED 08/12/94      6082000
   15      URANIUM-235    ENDF/B-IV MAT 1261                       UPDATED 08/12/94      1092235
   16      URANIUM-238    ENDF/B-IV MAT 1262                       UPDATED 08/12/94      1092238

 HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94    3001001      TEMPERATURE=   293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94    7001001      TEMPERATURE=   293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94    8001001      TEMPERATURE=   293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94    3008016      TEMPERATURE=   293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94    7008016      TEMPERATURE=   293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94    8008016      TEMPERATURE=   293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

AL-27 1193 218 GP 040375(5)                          UPDATED 08/12/94    1013027      TEMPERATURE=   293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

AL-27 1193 218 GP 040375(5)                          UPDATED 08/12/94    2013027      TEMPERATURE=   293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

AL-27 1193 218 GP 040375(5)                          UPDATED 08/12/94    4013027      TEMPERATURE=   293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED 08/12/94    5024304      TEMPERATURE=   293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 MANGANESE-55   ENDF/B-IV MAT 1197                   UPDATED 08/12/94    5025055      TEMPERATURE=   293.00

GEOMETRY HAS BEEN SET TO HOMOGENEOUS AS LBAR IS   0.0000E+00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)          =    54.466             TEMPERATURE(KELVIN)        =    293.000
```

```
POTENTIAL SCATTER SIGMA  =     2.590            LUMPED NUCLEAR DENSITY    = 1.7363295E-03

SPIN FACTOR (G)          =    14.448            LUMP DIMENSION (A-BAR)    = 0.0000000E+00

INNER RADIUS             = 0.0000000E+00        DANCOFF CORRECTION (C)    = 0.0000000E+00

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1    =    55.845            SIGMA(PER ABSORBER ATOM)= 3.4663022E+02

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2    =    55.925            SIGMA(PER ABSORBER ATOM)= 1.2557598E+02

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 0-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP       RES ABS         RES FISS        RES SCAT
  8      -5.518788E-04   0.000000E+00   -3.944190E-01
  9      -2.797993E-03   0.000000E+00   -2.293471E+00
 10      -3.291452E-01   0.000000E+00   -3.820862E+01
 11      -2.680562E+00   0.000000E+00   -1.159996E+02

EXCESS RESONANCE INTEGRALS

                  RESOLVED

ABSORPTION      3.33719E+00
FISSION         0.00000E+00
                                                      PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94   5026304     TEMPERATURE=   293.00
                                                      PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94   5028304     TEMPERATURE=   293.00
                                                      PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

PB   1288 218NGP 042375 P-3 293K                        UPDATED 08/12/94   6082000     TEMPERATURE=   293.00
                                                      PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 URANIUM-235    ENDF/B-IV MAT 1261                      UPDATED 08/12/94   1092235     TEMPERATURE=   293.00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)          =   233.025            TEMPERATURE(KELVIN)       =   293.000

POTENTIAL SCATTER SIGMA  =    11.500            LUMPED NUCLEAR DENSITY    = 1.6746225E-03

SPIN FACTOR (G)          = 15171.100            LUMP DIMENSION (A-BAR)    = 8.2999997E-02

INNER RADIUS             = 0.0000000E+00        DANCOFF CORRECTION (C)    = 5.1177365E-01

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1    =    26.982            SIGMA(PER ABSORBER ATOM)= 1.2445693E+01

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2    =   238.051            SIGMA(PER ABSORBER ATOM)= 7.7685076E-01

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 1-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP       RES ABS         RES FISS        RES SCAT
 12      -3.991273E+00  -2.455652E+00   -1.020250E-01
 13      -1.148550E+01  -5.609972E+00   -2.579727E-01
 14      -8.385537E+00  -4.924647E+00   -6.251335E-02
 15      -4.888190E-04  -3.721843E-04    4.008032E-06

EXCESS RESONANCE INTEGRALS

                  RESOLVED

ABSORPTION      2.00383E+02
FISSION         1.20157E+02
                                                      PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 URANIUM-238    ENDF/B-IV MAT 1262                      UPDATED 08/12/94   1092238     TEMPERATURE=   293.00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)          =   236.006            TEMPERATURE(KELVIN)       =   293.000

POTENTIAL SCATTER SIGMA  =    10.599            LUMPED NUCLEAR DENSITY    = 1.0554063E-04

SPIN FACTOR (G)          =   656.527            LUMP DIMENSION (A-BAR)    = 8.2999997E-02

INNER RADIUS             = 0.0000000E+00        DANCOFF CORRECTION (C)    = 5.1177365E-01
```

```
THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1     =     26.982             SIGMA(PER ABSORBER ATOM)= 1.9747691E+02

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2     =    235.044             SIGMA(PER ABSORBER ATOM)= 1.8865785E+02

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 1-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP        RES ABS          RES FISS         RES SCAT
  9      -3.221209E-04    0.000000E+00    -3.615814E-03
 10      -1.701700E-02   -9.645751E-08    -1.233430E-01
 11      -7.790445E-01    0.000000E+00    -2.481573E+00
 12      -7.111002E+00    0.000000E+00    -8.512491E+00
 13      -8.282583E+00    0.000000E+00    -2.746092E+00
 14      -1.524248E+01    0.000000E+00    -8.966302E-01
 15      -5.454276E-09    0.000000E+00     6.277273E-09

EXCESS RESONANCE INTEGRALS

                  RESOLVED

ABSORPTION        2.35741E+02
FISSION           5.33533E-04
                                                              PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00
```

```
THIS XSDRN WORKING TAPE WAS CREATED 02/26/01 AT 09:18:46
THE TITLE OF THE PARENT CASE IS AS FOLLOWS
SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
   BASED ON ENDF-B VERSION 4 DATA
      COMPILED FOR NRC      1/27/89
    TAPE ID                               4321         NUMBER OF NUCLIDES                  16
    NUMBER OF NEUTRON GROUPS                27         NUMBER OF GAMMA GROUPS               0
    FIRST THERMAL GROUP                     15         LOGICAL UNIT                         4
                                  TABLE OF CONTENTS
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94       ID   3001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94       ID   7001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94       ID   8001001
   OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED 08/12/94       ID   3008016
   OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED 08/12/94       ID   7008016
   OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED 08/12/94       ID   8008016
  AL-27 1193 218 GP 040375(5)                              UPDATED 08/12/94       ID   1013027
  AL-27 1193 218 GP 040375(5)                              UPDATED 08/12/94       ID   2013027
  AL-27 1193 218 GP 040375(5)                              UPDATED 08/12/94       ID   4013027
  CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94       ID   5024304
   MANGANESE-55   ENDF/B-IV MAT 1197                       UPDATED 08/12/94       ID   5025055
  FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94       ID   5026304
  NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94       ID   5028304
  PB   1288 218NGP 042375 P-3 293K                         UPDATED 08/12/94       ID   6082000
   URANIUM-235    ENDF/B-IV MAT 1261                       UPDATED 08/12/94       ID   1092235
   URANIUM-238    ENDF/B-IV MAT 1262                       UPDATED 08/12/94       ID   1092238

    TAPE COPY USED       0 I/O'S, AND TOOK     0.11 SECONDS
```

```
KK        KK   EEEEEEEEEEEEE  NN         NN   00000000000                  VV         VV
KK       KK    EEEEEEEEEEEEE  NNN        NN  0000000000000                 VV         VV
KK      KK     EE             NNNN       NN  00         00                 VV         VV
KK     KK      EE             NN NN      NN  00         00                 VV         VV
KK    KK       EE             NN  NN     NN  00         00                 VV         VV
KKKKKKKK       EEEEEEEEE      NN   NN    NN  00         00  -------------  VV         VV
KKKKKKKK       EEEEEEEEE      NN    NN   NN  00         00  -------------   VV       VV
KK    KK       EE             NN     NN  NN  00         00                   VV     VV
KK     KK      EE             NN      NN NN  00         00                    VV   VV
KK      KK     EE             NN       NNNN  00         00                     VV VV
KK       KK    EEEEEEEEEEEEE  NN        NNN  0000000000000                      VVV
KK        KK   EEEEEEEEEEEEE  NN         NN   00000000000                        V

 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL             EEEEEEEEEEEEE                 PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL             EEEEEEEEEEEEE                 PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL             EE                            PP         PP  CC         CC
SS             CC             AA         AA  LL             EE                            PP         PP  CC
SS             CC             AA         AA  LL             EE                            PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------  PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------  PPPPPPPPPPPP   CC
           SS  CC             AA         AA  LL             EE                            PP             CC
           SS  CC             AA         AA  LL             EE                            PP             CC
SS         SS  CC         CC  AA         AA  LL             EE                            PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLLL  EEEEEEEEEEEEE                 PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLLL  EEEEEEEEEEEEE                 PP              CCCCCCCCCCC

   0000000      22222222222             //   22222222222    666666666666             //      0000000          11
  000000000    2222222222222           //   2222222222222  6666666666666            //      000000000        111
 00       00   22         22          //    22         22  66                      //      00       00      1111
00         00             22         //                22  66                     //      00         00       11
00         00             22        //                 22  66                    //       00         00       11
00         00            22        //                 22   666666666666         //        00         00       11
00         00          22         //                22     6666666666666       //         00         00       11
00         00        22          //               22       66         66      //          00         00       11
00         00      22           //              22         66         66     //           00         00       11
 00       00     22            //             22           66         66    //             00       00        11
  000000000    2222222222222  //            2222222222222  6666666666666   //               000000000     11111111
   0000000     2222222222222 //             2222222222222   66666666666   //                 0000000      11111111

   0000000      99999999999                       11        88888888888                        44       99999999999
  000000000    9999999999999                     111       8888888888888                      444      9999999999999
 00       00   99         99       :::          1111       88         88       :::           4444      99         99
00         00  99         99       :::            11       88         88       :::          44 44      99         99
00         00  99         99       :::            11       88         88       :::         44  44      99         99
00         00  9999999999999                      11        88888888888                   44   44      9999999999999
00         00   999999999999                      11        88888888888                  44    44       999999999999
00         00             99       :::            11       88         88       :::      444444444444               99
00         00             99       :::            11       88         88       :::      4444444444444              99
 00       00              99       :::            11       88         88       :::              44                 99
  000000000    9999999999999                   11111111    8888888888888                        44      9999999999999
   0000000      99999999999                    11111111     88888888888                         44       99999999999
```

```
  SSSSSSSSSSS    CCCCCCCCCCC      AAAAAAAAA      LL              EEEEEEEEEEEEE                  PPPPPPPPPPPP    CCCCCCCCCCC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC    AAAAAAAAAAA     LL              EEEEEEEEEEEEE                  PPPPPPPPPPPPP  CCCCCCCCCCCCC
 SS         SS  CC         CC   AA         AA    LL              EE                             PP         PP  CC         CC
 SS             CC              AA         AA    LL              EE                             PP         PP  CC
 SS             CC              AA         AA    LL              EE                             PP         PP  CC
 SSSSSSSSSSSS   CC              AAAAAAAAAAAAA    LL              EEEEEEEEE     -------------    PPPPPPPPPPPPP  CC
  SSSSSSSSSSSS  CC              AAAAAAAAAAAAA    LL              EEEEEEEEE     -------------    PPPPPPPPPPPP   CC
            SS  CC              AA         AA    LL              EE                             PP             CC
            SS  CC              AA         AA    LL              EE                             PP             CC
 SS         SS  CC         CC   AA         AA    LL              EE                             PP             CC         CC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC   AA         AA    LLLLLLLLLLLLL   EEEEEEEEEEEEE                  PP             CCCCCCCCCCCCC
  SSSSSSSSSSS    CCCCCCCCCCC    AA         AA    LLLLLLLLLLLLL   EEEEEEEEEEEEE                  PP              CCCCCCCCCCC
```

```
*****************************************************************************
*****************************************************************************
*****************************************************************************
*****                                                                   *****
*****                  PROGRAM VERIFICATION INFORMATION                 *****
*****                                                                   *****
*****                 CODE SYSTEM:  SCALE-PC VERSION:  4.3              *****
*****                                                                   *****
*****************************************************************************
*****************************************************************************
*****                                                                   *****
*****                                                                   *****
*****              PROGRAM:  000009                                     *****
*****                                                                   *****
*****        CREATION DATE:  03/08/96                                   *****
*****                                                                   *****
*****               VOLUME:  ENG                                        *****
*****                                                                   *****
*****              LIBRARY:  G:\SCALE43\WIN_NT\EXE                      *****
*****                                                                   *****
*****                                                                   *****
*****    THIS IS NOT A SCALE-PC CONFIGURATION CONTROLLED CODE           *****
*****                                                                   *****
*****              JOBNAME:  SCALE-PC                                   *****
*****                                                                   *****
*****    DATE OF EXECUTION:  02/26/01                                   *****
*****                                                                   *****
*****    TIME OF EXECUTION:  09:18:49                                   *****
*****                                                                   *****
*****                                                                   *****
*****************************************************************************
*****************************************************************************
*****************************************************************************
```

```
***   NUMERIC PARAMETERS   ***

TME    MAXIMUM PROBLEM TIME (MIN)                 30.00
TBA    TIME PER GENERATION (MIN)                   5.00
GEN    NUMBER OF GENERATIONS                        803
NPG    NUMBER PER GENERATION                       1000
NSK    NUMBER OF GENERATIONS TO BE SKIPPED            3
BEG    BEGINNING GENERATION NUMBER                    1
RES    GENERATIONS BETWEEN CHECKPOINTS                0
X1D    NUMBER OF EXTRA 1-D CROSS SECTIONS             1
NBK    NEUTRON BANK SIZE                           1025
XNB    EXTRA POSITIONS IN NEUTRON BANK                0
NFB    FISSION BANK SIZE                           1000
XFB    EXTRA POSITIONS IN FISSION BANK                0
WTA    DEFAULT VALUE OF WEIGHT AVERAGE           0.5000
WTH    WEIGHT HIGH FOR SPLITTING                 3.0000
WTL    WEIGHT LOW FOR RUSSIAN ROULETTE           0.3333
RND    STARTING RANDOM NUMBER               BB827100001
NB8    NUMBER OF D.A. BLOCKS ON UNIT  8             200
NL8    LENGTH OF D.A. BLOCKS ON UNIT  8             512
ADJ    MODE OF CALCULATION                      FORWARD
       INPUT DATA WRITTEN ON RESTART UNIT            NO
       BINARY DATA INTERFACE                        YES
```

```
*******************************************************************************************************************
*******************************************************************************************************************
***                                                                                                             ***
***                                                                                                             ***
***                                                                                                             ***
*******************************************************************************************************************
***                               ******    LOGICAL PARAMETERS      ******                                      ***
***                                                                                                             ***
*** RUN  EXECUTE PROBLEM AFTER CHECKING DATA     YES        PLT  PLOT PICTURE MAP(S)                         NO ***
***                                                                                                             ***
*** FLX  COMPUTE FLUX                            NO         FDN  COMPUTE FISSION DENSITIES                   NO ***
***                                                                                                             ***
*** SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION    NO         NUB  COMPUTE NU-BAR & AVG FISSION GROUP         YES ***
***                                                                                                             ***
*** MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER     NO         MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION       NO ***
***                                                                                                             ***
*** CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER   NO         CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION     NO ***
***                                                                                                             ***
*** FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER   NO         FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION     NO ***
***                                                                                                             ***
*** MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER     NO         MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER        NO ***
***                                                                                                             ***
*** CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER   NO         CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER      NO ***
***                                                                                                             ***
*** FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER   NO         FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER      NO ***
***                                                                                                             ***
*** HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL    NO         HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL       NO ***
***                                                                                                             ***
*** AMX  PRINT ALL MIXED CROSS SECTIONS          NO         FAR  PRINT FIS. AND ABS. BY REGION               NO ***
***                                                                                                             ***
*** XS1  PRINT 1-D MIXTURE X-SECTIONS            NO         GAS  PRINT FAR BY GROUP                          NO ***
***                                                                                                             ***
*** XS2  PRINT 2-D MIXTURE X-SECTIONS            NO         PAX  PRINT XSEC-ALBEDO CORRELATION TABLES        NO ***
***                                                                                                             ***
*** XAP  PRINT MIXTURE ANGLES & PROBABILITIES    NO         PWT  PRINT WEIGHT AVERAGE ARRAY                  NO ***
***                                                                                                             ***
*** PKI  PRINT FISSION SPECTRUM                  NO         PGM  PRINT INPUT GEOMETRY                        NO ***
***                                                                                                             ***
*** P1D  PRINT EXTRA 1-D CROSS SECTIONS          NO         BUG  PRINT DEBUG INFORMATION                     NO ***
***                                                                                                             ***
***                                                         TRK  PRINT TRACKING INFORMATION                  NO ***
***                                                                                                             ***
***                                                                                                             ***
*******************************************************************************************************************
*******************************************************************************************************************
*******************************************************************************************************************
                                         PARAMETER INPUT COMPLETED

                              ........    0 IO'S WERE USED READING THE PARAMETER DATA     ........

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 5.94224E-03

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED WITH A FLAT DISTRIBUTION IN A CUBOID DEFINED BY:
                      +X= 4.98539E+01  -X=-4.98539E+01  +Y= 4.98539E+01  -Y=-4.98539E+01  +Z= 5.01625E+02  -Z= 0.00000E+00
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

KENO MESSAGE NUMBER K5-105     ***** WARNING, ONLY  905 INDEPENDENT STARTING POSITIONS WERE GENERATED.  *****

   95 ADDITIONAL STARTING POINTS WERE PICKED FROM THE INITAL DISTRIBUTION.

4.49693 MINUTES WERE REQUIRED FOR STARTING.   TOTAL ELAPSED TIME IS 4.51200 MINUTES.
```

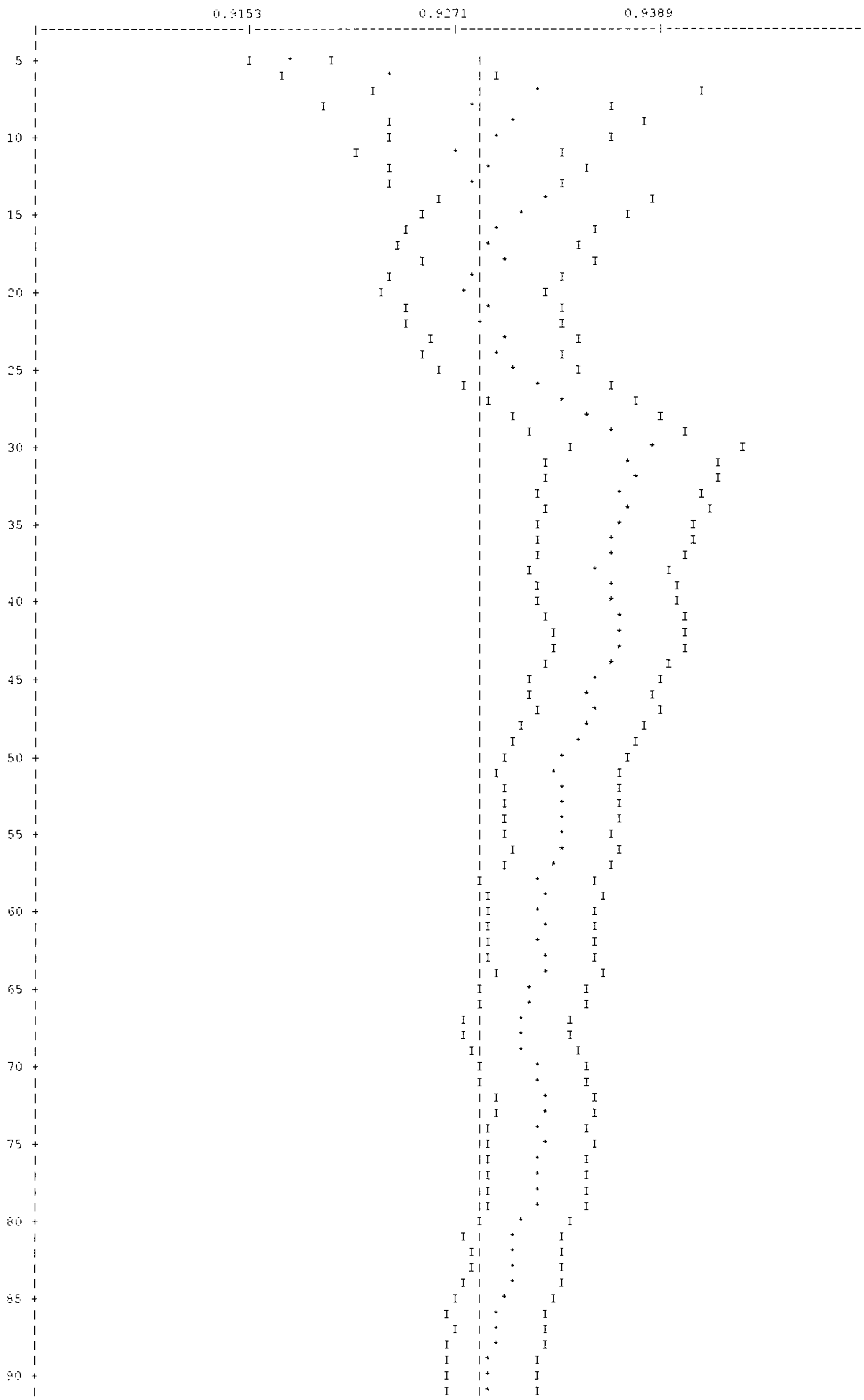
GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	937 INDEPENDENT	FISSION POINTS WERE	GENERATED	
1	8.55343E-01	4.51767E+00	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	9.52762E-01	4.52683E+00	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
3	9.43276E-01	4.53600E+00	9.43276E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	9.15340E-01	4.54600E+00	9.29308E-01	1.39679E-02	0.00000E+00	0.00000E+00
5	9.20312E-01	4.55517E+00	9.26310E-01	8.60381E-03	0.00000E+00	0.00000E+00
6	9.35103E-01	4.56533E+00	9.28508E-01	6.46878E-03	0.00000E+00	0.00000E+00
7	9.57650E-01	4.57533E+00	9.34336E-01	7.68620E-03	0.00000E+00	0.00000E+00
8	9.12494E-01	4.58450E+00	9.30696E-01	7.25517E-03	0.00000E+00	0.00000E+00
9	9.43531E-01	4.59450E+00	9.32529E-01	6.40001E-03	0.00000E+00	0.00000E+00
10	9.24840E-01	4.60467E+00	9.31568E-01	5.62531E-03	0.00000E+00	0.00000E+00
11	9.10585E-01	4.61383E+00	9.29237E-01	5.48160E-03	0.00000E+00	0.00000E+00
12	9.43642E-01	4.62383E+00	9.30677E-01	5.11014E-03	0.00000E+00	0.00000E+00
13	9.20175E-01	4.63383E+00	9.29722E-01	4.71987E-03	0.00000E+00	0.00000E+00
14	9.75696E-01	4.64400E+00	9.33554E-01	5.76559E-03	0.00000E+00	0.00000E+00
15	9.16658E-01	4.65317E+00	9.32254E-01	5.46050E-03	0.00000E+00	0.00000E+00
16	9.12942E-01	4.66417E+00	9.30875E-01	5.24025E-03	0.00000E+00	0.00000E+00
17	9.19028E-01	4.67417E+00	9.30085E-01	4.94192E-03	0.00000E+00	0.00000E+00
18	9.46357E-01	4.68333E+00	9.31102E-01	4.73330E-03	0.00000E+00	0.00000E+00
19	9.01398E-01	4.69333E+00	9.29354E-01	4.77717E-03	0.00000E+00	0.00000E+00
20	9.20218E-01	4.70250E+00	9.28847E-01	4.53247E-03	0.00000E+00	0.00000E+00
21	9.47900E-01	4.71267E+00	9.29850E-01	4.40301E-03	0.00000E+00	0.00000E+00
22	9.26415E-01	4.72267E+00	9.29678E-01	4.18059E-03	0.00000E+00	0.00000E+00
23	9.54758E-01	4.73283E+00	9.30872E-01	4.15200E-03	0.00000E+00	0.00000E+00
24	9.15572E-01	4.74200E+00	9.30177E-01	4.01940E-03	0.00000E+00	0.00000E+00
25	9.51173E-01	4.75200E+00	9.31090E-01	3.94767E-03	0.00000E+00	0.00000E+00
26	9.68620E-01	4.76200E+00	9.32653E-01	4.09033E-03	0.00000E+00	0.00000E+00
27	9.63570E-01	4.77117E+00	9.33890E-01	4.11359E-03	0.00000E+00	0.00000E+00
28	9.63525E-01	4.78133E+00	9.35030E-01	4.11329E-03	0.00000E+00	0.00000E+00
29	9.73742E-01	4.79133E+00	9.36464E-01	4.20971E-03	0.00000E+00	0.00000E+00
30	1.00936E+00	4.80050E+00	9.39067E-01	4.82014E-03	0.00000E+00	0.00000E+00
31	8.97393E-01	4.81067E+00	9.37630E-01	4.86791E-03	0.00000E+00	0.00000E+00
32	9.42504E-01	4.82067E+00	9.37793E-01	4.70565E-03	0.00000E+00	0.00000E+00
33	9.12839E-01	4.82983E+00	9.36988E-01	4.62196E-03	0.00000E+00	0.00000E+00
34	9.49503E-01	4.83983E+00	9.37379E-01	4.49225E-03	0.00000E+00	0.00000E+00
35	9.22407E-01	4.85000E+00	9.36925E-01	4.37757E-03	0.00000E+00	0.00000E+00
36	9.26712E-01	4.85917E+00	9.36625E-01	4.25747E-03	0.00000E+00	0.00000E+00
37	9.28231E-01	4.86917E+00	9.36385E-01	4.14099E-03	0.00000E+00	0.00000E+00
38	9.15251E-01	4.87833E+00	9.35798E-01	4.06691E-03	0.00000E+00	0.00000E+00
39	9.56362E-01	4.88833E+00	9.36354E-01	3.99433E-03	0.00000E+00	0.00000E+00
40	9.39974E-01	4.89750E+00	9.36449E-01	3.88896E-03	0.00000E+00	0.00000E+00
41	9.49166E-01	4.90767E+00	9.36775E-01	3.80194E-03	0.00000E+00	0.00000E+00
42	9.50192E-01	4.91767E+00	9.37110E-01	3.72082E-03	0.00000E+00	0.00000E+00
43	9.28187E-01	4.92783E+00	9.36893E-01	3.63546E-03	0.00000E+00	0.00000E+00
44	9.10787E-01	4.93783E+00	9.36271E-01	3.60188E-03	0.00000E+00	0.00000E+00
45	9.02307E-01	4.94783E+00	9.35481E-01	3.60472E-03	0.00000E+00	0.00000E+00
46	9.24200E-01	4.95800E+00	9.35225E-01	3.53116E-03	0.00000E+00	0.00000E+00
47	9.56755E-01	4.96717E+00	9.35703E-01	3.48480E-03	0.00000E+00	0.00000E+00
48	8.98639E-01	4.97717E+00	9.34898E-01	3.50215E-03	0.00000E+00	0.00000E+00
49	9.12026E-01	4.98733E+00	9.34411E-01	3.46121E-03	0.00000E+00	0.00000E+00
50	9.09649E-01	4.99733E+00	9.33895E-01	3.42738E-03	0.00000E+00	0.00000E+00
784	8.94491E-01	1.22155E+01	9.28832E-01	9.01006E-04	0.00000E+00	0.00000E+00
785	9.08315E-01	1.22255E+01	9.28806E-01	9.00236E-04	0.00000E+00	0.00000E+00
786	8.88725E-01	1.22357E+01	9.28755E-01	9.00539E-04	0.00000E+00	0.00000E+00
787	9.49059E-01	1.22465E+01	9.28781E-01	8.99763E-04	0.00000E+00	0.00000E+00
788	9.75643E-01	1.22557E+01	9.28841E-01	9.00593E-04	0.00000E+00	0.00000E+00
789	9.74076E-01	1.22658E+01	9.28898E-01	9.01283E-04	0.00000E+00	0.00000E+00
790	8.89811E-01	1.22768E+01	9.28848E-01	9.01504E-04	0.00000E+00	0.00000E+00
791	9.17117E-01	1.22860E+01	9.28834E-01	9.00484E-04	0.00000E+00	0.00000E+00
792	9.30645E-01	1.22960E+01	9.28836E-01	8.99346E-04	0.00000E+00	0.00000E+00
793	9.19421E-01	1.23052E+01	9.28824E-01	8.98287E-04	0.00000E+00	0.00000E+00
794	9.41785E-01	1.23152E+01	9.28840E-01	8.97301E-04	0.00000E+00	0.00000E+00
795	9.60725E-01	1.23253E+01	9.28881E-01	8.97071E-04	0.00000E+00	0.00000E+00
796	8.98373E-01	1.23345E+01	9.28842E-01	8.96764E-04	0.00000E+00	0.00000E+00
797	9.13509E-01	1.23445E+01	9.28823E-01	8.95843E-04	0.00000E+00	0.00000E+00
798	8.86803E-01	1.23547E+01	9.28770E-01	8.96272E-04	0.00000E+00	0.00000E+00
799	9.61447E-01	1.23647E+01	9.28811E-01	8.96086E-04	0.00000E+00	0.00000E+00
800	9.72897E-01	1.23747E+01	9.28866E-01	8.96665E-04	0.00000E+00	0.00000E+00
801	9.47415E-01	1.23857E+01	9.28890E-01	8.95843E-04	0.00000E+00	0.00000E+00
802	9.51550E-01	1.23958E+01	9.28918E-01	8.95171E-04	0.00000E+00	0.00000E+00
803	9.57784E-01	1.24050E+01	9.28954E-01	8.94779E-04	0.00000E+00	0.00000E+00

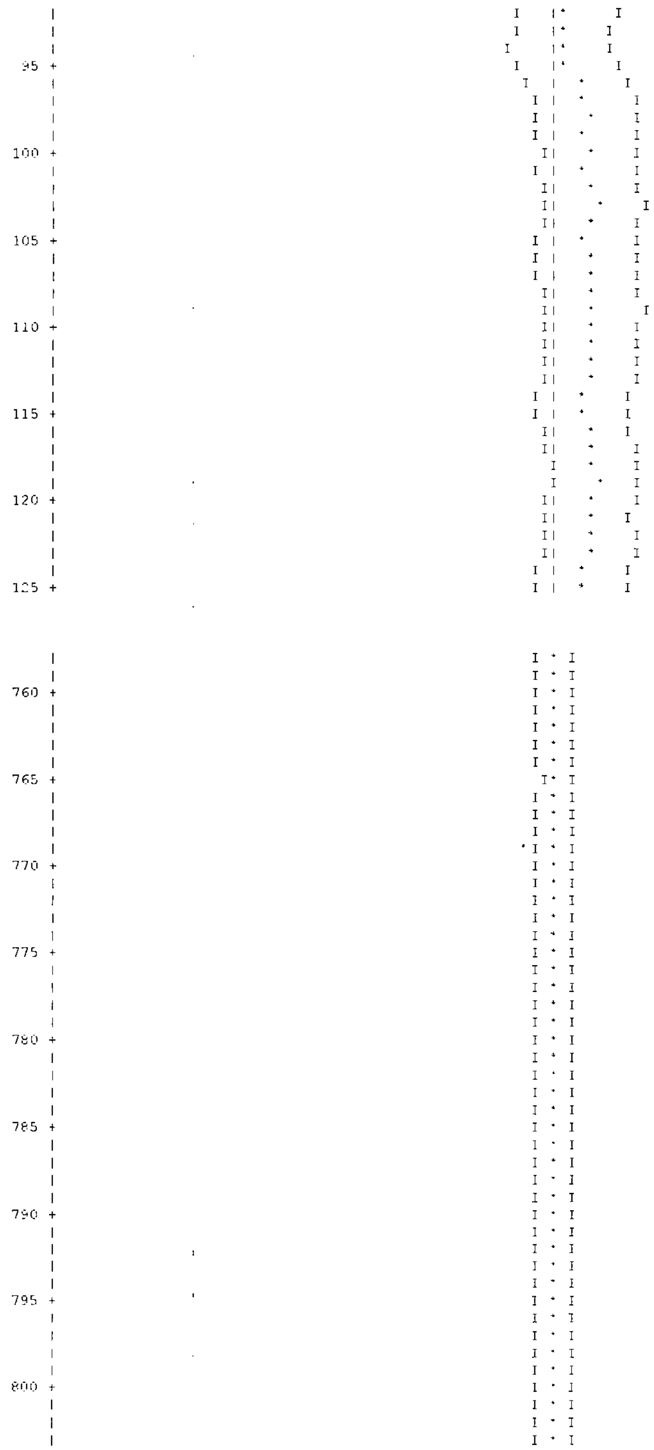
KENO MESSAGE NUMBER K5-123 EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

LIFETIME = 7.89581E-05 + OR - 1.41168E-07 GENERATION TIME = 3.69606E-05 + OR - 6.24488E-08
NU BAR = 2.42056E+00 + OR - 1.23157E-05 AVERAGE FISSION GROUP = 2.33314E+01 + OR - 4.51865E-03
ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION = 7.56224E-02 + OR - 2.51308E-04

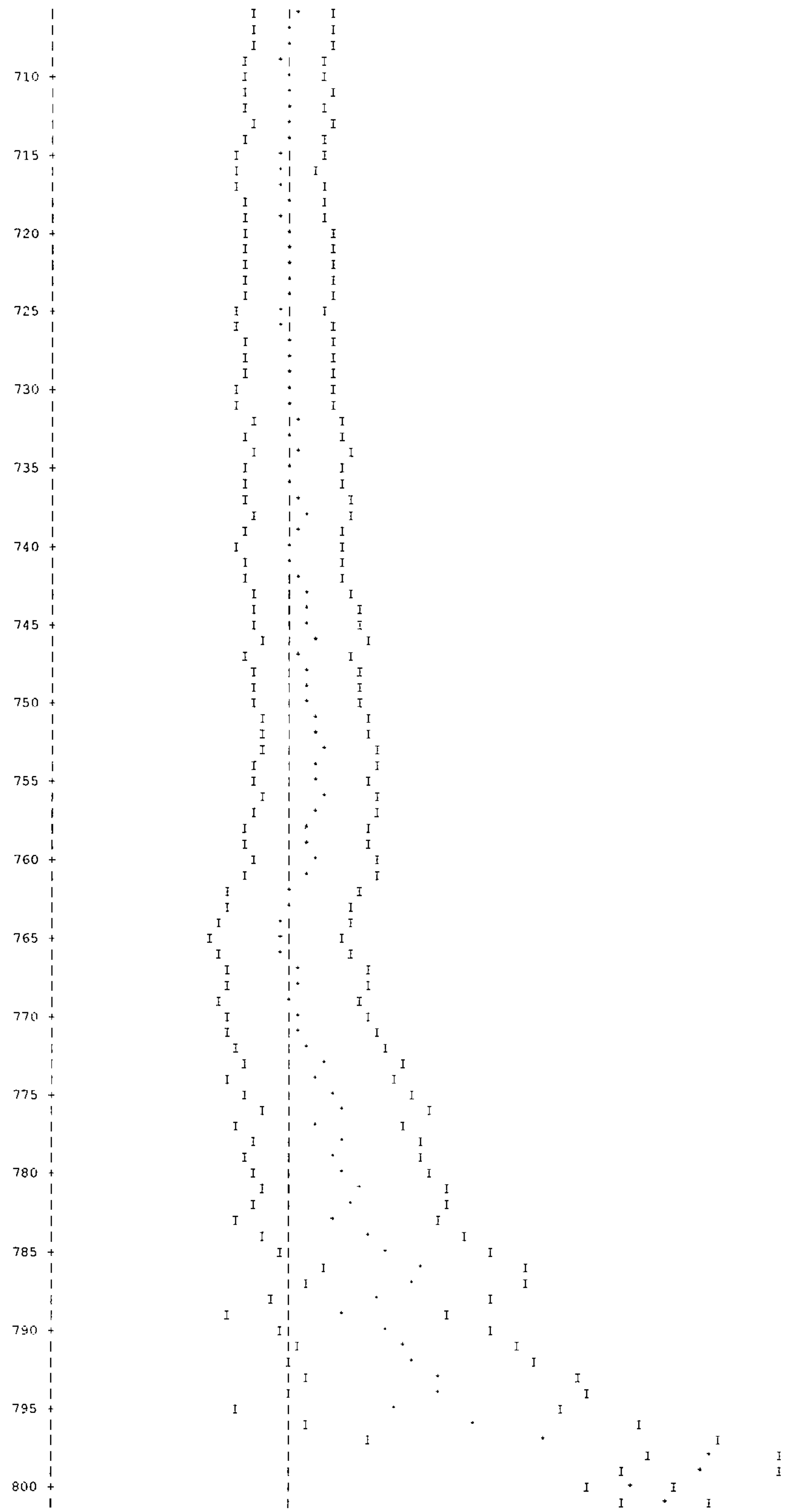
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.92894	+ OR - 0.00090	0.92804 TO 0.92983	0.92714 TO 0.93073	0.92625 TO 0.93162	800000
4	0.92895	+ OR - 0.00090	0.92806 TO 0.92985	0.92716 TO 0.93075	0.92626 TO 0.93164	799000
5	0.92896	+ OR - 0.00090	0.92807 TO 0.92986	0.92717 TO 0.93076	0.92627 TO 0.93166	798000
6	0.92896	+ OR - 0.00090	0.92806 TO 0.92985	0.92716 TO 0.93075	0.92626 TO 0.93165	797000
7	0.92892	+ OR - 0.00090	0.92802 TO 0.92982	0.92712 TO 0.93072	0.92622 TO 0.93162	796000
8	0.92894	+ OR - 0.00090	0.92804 TO 0.92984	0.92714 TO 0.93074	0.92624 TO 0.93164	795000
9	0.92892	+ OR - 0.00090	0.92802 TO 0.92982	0.92712 TO 0.93072	0.92622 TO 0.93163	794000
10	0.92893	+ OR - 0.00090	0.92803 TO 0.92983	0.92712 TO 0.93073	0.92622 TO 0.93163	793000
11	0.92895	+ OR - 0.00090	0.92805 TO 0.92985	0.92714 TO 0.93076	0.92624 TO 0.93166	792000
12	0.92893	+ OR - 0.00090	0.92803 TO 0.92984	0.92712 TO 0.93074	0.92622 TO 0.93164	791000
17	0.92893	+ OR - 0.00091	0.92803 TO 0.92984	0.92712 TO 0.93075	0.92621 TO 0.93165	786000
22	0.92894	+ OR - 0.00091	0.92802 TO 0.92985	0.92711 TO 0.93076	0.92620 TO 0.93167	781000
27	0.92879	+ OR - 0.00091	0.92788 TO 0.92971	0.92697 TO 0.93062	0.92605 TO 0.93154	776000
32	0.92861	+ OR - 0.00091	0.92770 TO 0.92952	0.92679 TO 0.93043	0.92588 TO 0.93134	771000
37	0.92861	+ OR - 0.00092	0.92770 TO 0.92953	0.92678 TO 0.93044	0.92587 TO 0.93136	766000
42	0.92853	+ OR - 0.00092	0.92761 TO 0.92944	0.92669 TO 0.93036	0.92577 TO 0.93128	761000
47	0.92855	+ OR - 0.00092	0.92763 TO 0.92948	0.92671 TO 0.93040	0.92578 TO 0.93132	756000
52	0.92864	+ OR - 0.00093	0.92771 TO 0.92957	0.92679 TO 0.93050	0.92586 TO 0.93142	751000
57	0.92862	+ OR - 0.00093	0.92769 TO 0.92956	0.92676 TO 0.93049	0.92583 TO 0.93142	746000
772	0.93019	+ OR - 0.00534	0.92485 TO 0.93552	0.91951 TO 0.94086	0.91417 TO 0.94620	31000
777	0.93071	+ OR - 0.00572	0.92499 TO 0.93643	0.91926 TO 0.94216	0.91354 TO 0.94788	26000
782	0.93322	+ OR - 0.00670	0.92652 TO 0.93993	0.91982 TO 0.94663	0.91311 TO 0.95334	21000
787	0.93744	+ OR - 0.00753	0.92990 TO 0.94497	0.92237 TO 0.95251	0.91483 TO 0.96004	16000
792	0.93743	+ OR - 0.00858	0.92885 TO 0.94601	0.92027 TO 0.95458	0.91169 TO 0.96316	11000
797	0.94632	+ OR - 0.01243	0.93388 TO 0.95875	0.92145 TO 0.97118	0.90902 TO 0.98362	6000

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.9289 + OR - 0.0009 WHICH OCCURS FOR 803 GENERATIONS RUN.




95
100
105
110
115
120
125
760
765
770
775
780
785
790
795
800

```
                      PLOT OF AVERAGE K-EFFECTIVE BY GENERATION SKIPPED.
 THE LINE REPRESENTS K-EFF = 0.9289 + OR -  0.0009 WHICH OCCURS FOR      3 GENERATIONS SKIPPED.

                           0.9276                  0.9430                  0.9582
      |------------------------|-----------------------|-----------------------|-----------------------
      |
      |                        I* I
    5 +                        I* I
      |                        I* I
      |                        I* I
      |                        I* I
      |                        I* I
   10 +                        I* I
      |                        I* I
      |                        I* I
      |                        I* I
      |                        I* I
   15 +                        I* I
      |                        I* I
      |                        I* I
      |                        I* I
      |                        I* I
   20 +                        I* I
      |                        I* I
      |                        I* I
      |                        I* I
      |                        I* I
   25 +                        I* I
      |                        I* I
      |                        I* I
      |                        I* I
      |                       I *I
   30 +                       I *I
      |                       I *I
      |                       I *I
      |                       I *I
      |                       I *I
   35 +                       I *I
      |                       I *I
      |                       I *I
      |                       I *I
      |                       I *I
   40 +                       I *I
      |                       I *I
      |                       I *I
      |                       I *I
      |                       I *I
   45 +                       I *I
      |                       I *I
      |                       I *I
      |                       I *I
      |                       I *I
   50 +                       I *I
      |                       I *I
      |                       I *I
      |                       I *I
      |                       I *I
   55 +                       I *I
      |                       I *I
      |                       I *I
      |                       I * I
      |                       I *I
   60 +                       I *I
      |                       I *I
      |                       I *I
      |                       I *I
      |                       I *I
   65 +                       I * I
      |                       I * I
      |                        I* I
      |                        I* I
      |                        I* I
   70 +                       I *I
      |                       I *I
      |                       I *I
      |                       I *I
      |                       I *I
   75 +                       I *I
      |                       I *I
      |                       I *I
      |                       I *I
      |                       I *I
   80 +                       I * I
      |                       I * I
      |                       I * I
      |                       I * I
      |                        I* I
   85 +                        I* I
      |                        I* I
      |                        I* I
      |                        I* I


      |                     I   *  I
      |                     I   *   I
      |                     I   |*  I
  705 +                     I   |*  I
```


710
715
720
725
730
735
740
745
750
755
760
765
770
775
780
785
790
795
800

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0003			3.08599E-04	3.2806	1.45027E-03	1.0089	0.00000E+00	0.0000
2	0.0016			1.46285E-03	1.0429	3.34241E-03	0.3409	0.00000E+00	0.0000
3	0.0020			1.82688E-03	0.8427	1.18930E-03	0.5459	0.00000E+00	0.0000
4	0.0011			1.05761E-03	1.1461	6.32283E-04	0.8050	0.00000E+00	0.0000
5	0.0016			1.45380E-03	0.9568	1.13056E-03	0.5669	0.00000E+00	0.0000
6	0.0021			1.94135E-03	0.7005	2.95458E-03	0.3781	0.00000E+00	0.0000
7	0.0021			1.98165E-03	0.7377	5.02578E-03	0.3877	0.00000E+00	0.0000
8	0.0023			2.10841E-03	0.9509	4.39348E-03	0.4452	0.00000E+00	0.0000
9	0.0031			2.83491E-03	1.1509	4.85365E-03	0.5306	0.00000E+00	0.0000
10	0.0067			6.19361E-03	1.0243	1.16847E-02	0.4715	0.00000E+00	0.0000
11	0.0142			1.31987E-02	0.8508	1.77136E-02	0.4712	0.00000E+00	0.0000
12	0.0190			1.76164E-02	0.8312	1.81847E-02	0.5562	0.00000E+00	0.0000
13	0.0182			1.69247E-02	0.8974	2.19290E-02	0.5596	0.00000E+00	0.0000
14	0.0157			1.45530E-02	0.8694	2.55460E-02	0.4510	0.00000E+00	0.0000
15	0.0030			2.79913E-03	1.6979	1.10108E-02	0.5184	0.00000E+00	0.0000
16	0.0021			1.94710E-03	2.2898	6.54953E-03	0.5876	0.00000E+00	0.0000
17	0.0033			3.02592E-03	2.2997	4.35406E-03	0.9772	0.00000E+00	0.0000
18	0.0046			4.28783E-03	2.1737	4.51204E-03	1.0749	0.00000E+00	0.0000
19	0.0056			5.21682E-03	1.8496	7.03214E-03	0.7471	0.00000E+00	0.0000
20	0.0234			2.17310E-02	0.9062	2.60732E-02	0.4375	0.00000E+00	0.0000
21	0.0127			1.17969E-02	1.2310	1.13868E-02	0.6969	0.00000E+00	0.0000
22	0.0307			2.85500E-02	0.8799	2.63312E-02	0.5384	0.00000E+00	0.0000
23	0.1087			1.00964E-01	0.4455	1.02819E-01	0.2386	0.00000E+00	0.0000
24	0.2182			2.02681E-01	0.2924	2.10037E-01	0.1542	0.00000E+00	0.0000
25	0.1858			1.72586E-01	0.3061	1.78378E-01	0.1595	0.00000E+00	0.0000
26	0.2292			2.12900E-01	0.2855	2.18767E-01	0.1605	0.00000E+00	0.0000
27	0.0829			7.69878E-02	0.4909	7.46563E-02	0.2891	0.00000E+00	0.0000
SYSTEM TOTAL =				9.28936E-01	0.0964	1.00194E+00	0.0244	0.00000E+00	0.0000

ELAPSED TIME 12.40683 MINUTES

RANDOM NUMBER= 1BC744B1029D

```
                              FREQUENCY FOR GENERATIONS    4 TO  803
0.8495 TO 0.8552     *
0.8552 TO 0.8609     ***
0.8609 TO 0.8666     **
0.8666 TO 0.8723     **
0.8723 TO 0.8780     *******
0.8780 TO 0.8836     ************
0.8836 TO 0.8893     ***************
0.8893 TO 0.8950     ************************
0.8950 TO 0.9007     ********************************************
0.9007 TO 0.9064     **************************************
0.9064 TO 0.9120     ********************************************************
0.9120 TO 0.9177     ********************************************************************
0.9177 TO 0.9234     ******************************************************************
0.9234 TO 0.9291     *****************************************************************
0.9291 TO 0.9348     *************************************************************
0.9348 TO 0.9405     ********************************************
0.9405 TO 0.9461     *****************************************************************
0.9461 TO 0.9518     ***************************************************************
0.9518 TO 0.9575     *****************************************
0.9575 TO 0.9632     *******************************
0.9632 TO 0.9689     **************************
0.9689 TO 0.9746     **************
0.9746 TO 0.9802     *****************
0.9802 TO 0.9859     ********
0.9859 TO 0.9916     ***
0.9916 TO 0.9973
0.9973 TO 1.0030     *
1.0030 TO 1.0086
1.0086 TO 1.0143     ***
```

```
                         FREQUENCY FOR GENEPATIONS  204 TO  803
0.8495 TO 0.8552     *
0.8552 TO 0.8609     **
0.8609 TO 0.8666     **
0.8666 TO 0.8723     *
0.8723 TO 0.8780     *****
0.8780 TO 0.8836     ********
0.8836 TO 0.8893     **************
0.8893 TO 0.8950     *******************
0.8950 TO 0.9007     **************************************
0.9007 TO 0.9064     *****************************
0.9064 TO 0.9120     *******************************************
0.9120 TO 0.9177     ****************************************************
0.9177 TO 0.9234     *****************************************************
0.9234 TO 0.9291     ******************************************
0.9291 TO 0.9348     ***************************************************
0.9348 TO 0.9405     *****************************
0.9405 TO 0.9461     **********************************************
0.9461 TO 0.9518     ***********************************************
0.9518 TO 0.9575     ********************************
0.9575 TO 0.9632     *****************************
0.9632 TO 0.9689     *******************
0.9689 TO 0.9746     **********
0.9746 TO 0.9802     ***************
0.9802 TO 0.9859     *******
0.9859 TO 0.9916     ***
0.9916 TO 0.9973
0.9973 TO 1.0030     *
1.0030 TO 1.0086
1.0086 TO 1.0143     **
```

```
                              FREQUENCY FOR GENERATIONS  404 TO  803
0.8495 TO 0.8552     *
0.8552 TO 0.8609     **
0.8609 TO 0.8666     *
0.8666 TO 0.8723     *
0.8723 TO 0.8780     ***
0.8780 TO 0.8836     ******
0.8836 TO 0.8893     ************
0.8893 TO 0.8950     ***************
0.8950 TO 0.9007     ******************************
0.9007 TO 0.9064     ******************
0.9064 TO 0.9120     *************************
0.9120 TO 0.9177     ******************************
0.9177 TO 0.9234     *****************************
0.9234 TO 0.9291     ********************************
0.9291 TO 0.9348     *****************************************
0.9348 TO 0.9405     ***************
0.9405 TO 0.9461     **********************************
0.9461 TO 0.9518     ****************************
0.9518 TO 0.9575     ***********************
0.9575 TO 0.9632     *****************
0.9632 TO 0.9689     ************
0.9689 TO 0.9746     ******
0.9746 TO 0.9802     ************
0.9802 TO 0.9859     ****
0.9859 TO 0.9916     **
0.9916 TO 0.9973
0.9973 TO 1.0030     *
1.0030 TO 1.0086
1.0086 TO 1.0143
```

```
                                        FREQUENCY FOR GENERATIONS  604 TO  803
0.8495 TO 0.8552
0.8552 TO 0.8609     *
0.8609 TO 0.8666
0.8666 TO 0.8723
0.8723 TO 0.8780     ***
0.8780 TO 0.8836     ***
0.8836 TO 0.8893     *****
0.8893 TO 0.8950     *********
0.8950 TO 0.9007     **************
0.9007 TO 0.9064     *******
0.9064 TO 0.9120     *******************
0.9120 TO 0.9177     **************
0.9177 TO 0.9234     *****************
0.9234 TO 0.9291     **********
0.9291 TO 0.9348     *************
0.9348 TO 0.9405     ******
0.9405 TO 0.9461     *********************
0.9461 TO 0.9518     ******************
0.9518 TO 0.9575     ***************
0.9575 TO 0.9632     *********
0.9632 TO 0.9689     ****
0.9689 TO 0.9746     ***
0.9746 TO 0.9802     ********
0.9802 TO 0.9859     *
0.9859 TO 0.9916
0.9916 TO 0.9973
0.9973 TO 1.0030
1.0030 TO 1.0086
1.0086 TO 1.0143


****************************************************************************************************************************************************
*

           CONGRATULATIONS!  YOU HAVE  SUCCESSFULLY TRAVERSED THE PERILOUS PATH THROUGH KENO V IN  12.40683 MINUTES

****************************************************************************************************************************************************
*
```

6.6.8 DIDO Fuel Assemblies

This section contains abbreviated output files from the most reactive normal condition and accident condition moderator density variation cases.

Figure 6.6.8-1 Maximum Reactivity DIDO Configuration – Eight Cask Array

```
.
NAC International
QSCALENT Banner Generation Utility v3.6 (20010221)
+-----------------+
I JOB INFORMATION I
+-----------------+
.
Output File Name:            eight-cask-void_ext.out
Start Date:                  February 21, 2001
Start Time:                  18:17:21
.
+----------------------+
I SOFTWARE INFORMATION I
+----------------------+
.
Program Name:                Scale 4.3 for Windows NT 4.0
Version:                     4.3.1
Installation Date:           June 10, 1998
Code Verification Package #: EA913-1010-94, Rev. 0
Code Verification Date:      June 10, 1998
Program Location:            G:\scale43\win_nt\exe
.
+--------------------+
I SYSTEM INFORMATION I
+--------------------+
.
Computer Type:               Dell Precision 410
Operating System:            Windows NT Version 4.0
Computer ID:                 57NTY (MAC# 00C04F600F94)
Serial Number:               57NTY
Login ID:                    zjr
System Verification Date:    July 3, 2000
.
```

```
        PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
  MODULE CSAS25   WILL BE CALLED
    LWT with Loose DIDO HEU Fuel, Accident Condition, Radial Shift Pattern - Centere
    'Fuel Tube Thick - Nominal  Fuel Tube OD - Nominal  Fuel Tube Height - Nominal
    'Fuel Base  Plate - Nominal  Fuel Plate Diameter - Nominal  Fuel Plate Thickness
    'Fuel Plate Clad Thickness - Min  Active Fuel Length - Min  Fuel Element Height
    'U235 Fuel Mass - Max  Uranium Weight Fraction - Max  Cylinder Pitch - Outer_Fix
    27GROUPNDF4  LATTICECELL
    'Material Description for LWT Analysis - DIDO HEU Fuel
    URANIUM  1  DEN=0.5477  1.0  293.0  92235 94.0   92238 06.0  END
    AL  1  DEN=1.7930  1.0  293.0        END
    AL  2  1.00  293.0        END
    H2O  3  DEN=0.9998  1.00  293.0        END
    ARBMGLC  0.9437  3  0  1  0
      6012  2  1001  6  8016  2
      4  0.5840        END
    H2O  4  0.4160  293.0        END
    PB  5  1.00  293.0        END
    SS304  6  1.00  293.0        END
    AL  7  1.00  293.0        END
    SS304  8  1.00  293.0        END
    H2O  9  DEN=0.0001  1.00  293.0        END
    END COMP
    SYMMSLABCELL  0.9800  0.0650  1  3  0.1300  2  END

    READ PARAM  TBA=5  TME=90  RUN=YES  PLT=NO
      GEN=1203  NPG=1000        END PARAM
    READ START  XSM=-16.85  XSP=16.85  YSM=16.85  YSP=-16.85
      ZSM=26.67  ZSP=473.35        END START
    READ GEOM
    UNIT  1
    COM='Fueled Annular Sections      Tube  1  Loose    '
    'Fuel Annulus     1
    CYLINDER  3  1  3.0300  58.7500  0.0000  ORIGIN  0.0000  0.0000
    CYLINDER  2  1  3.0625  58.7500  0.0000  ORIGIN  0.0000  0.0000
    CYLINDER  1  1  3.1275  58.7500  0.0000  ORIGIN  0.0000  0.0000
    CYLINDER  2  1  3.1600  58.7500  0.0000  ORIGIN  0.0000  0.0000
    'Fuel Annulus     2
    CYLINDER  3  1  3.5300  58.7500  0.0000  ORIGIN  0.0000  0.0000
    CYLINDER  2  1  3.5625  58.7500  0.0000  ORIGIN  0.0000  0.0000
    CYLINDER  1  1  3.6275  58.7500  0.0000  ORIGIN  0.0000  0.0000
    CYLINDER  2  1  3.6600  58.7500  0.0000  ORIGIN  0.0000  0.0000
    'Fuel Annulus     3
    CYLINDER  3  1  4.0300  58.7500  0.0000  ORIGIN  0.0000  0.0000
    CYLINDER  2  1  4.0625  58.7500  0.0000  ORIGIN  0.0000  0.0000
    CYLINDER  1  1  4.1275  58.7500  0.0000  ORIGIN  0.0000  0.0000
    CYLINDER  2  1  4.1600  58.7500  0.0000  ORIGIN  0.0000  0.0000
    'Fuel Annulus     4
    CYLINDER  3  1  4.5300  58.7500  0.0000
    CYLINDER  2  1  4.5625  58.7500  0.0000
    CYLINDER  1  1  4.6275  58.7500  0.0000
    CYLINDER  2  1  4.6599  58.7500  0.0000
    UNIT  2
    COM='Axial Clad Sections      Tube  1  Loose    '
    'Clad Axial End Piece     1
    CYLINDER  3  1  3.0300  1.3750  0.0000  ORIGIN  0.0000  0.0000
    CYLINDER  2  1  3.1600  1.3750  0.0000  ORIGIN  0.0000  0.0000
    'Clad Axial End Piece     2
    CYLINDER  3  1  3.5300  1.3750  0.0000  ORIGIN  0.0000  0.0000
    CYLINDER  2  1  3.6600  1.3750  0.0000  ORIGIN  0.0000  0.0000
    'Clad Axial End Piece     3
    CYLINDER  3  1  4.0300  1.3750  0.0000  ORIGIN  0.0000  0.0000
    CYLINDER  2  1  4.1600  1.3750  0.0000  ORIGIN  0.0000  0.0000
    'Clad Axial End Piece     4
    CYLINDER  3  1  4.5300  1.3750  0.0000
    CYLINDER  2  1  4.6599  1.3750  0.0000
    UNIT  3
    COM='Fuel Element     Tube  1'
    CYLINDER  3  1  4.6600  61.5000  0.0000
    HOLE  2  0.0000  0.0000  0.0000
    HOLE  1  0.0000  0.0000  1.3750
    HOLE  2  0.0000  0.0000  60.1250
    UNIT  4
    COM='Basket Fuel Tube - Fuel Down        Radial Centered'
    CYLINDER  3  1  5.0927  73.1773  0.0000
    HOLE  3  0.0000  0.0000  0.0000
    CYLINDER  2  1  5.3974  73.1773  0.0000
    UNIT  5
    COM='Basket Fuel Tube - Fuel Up        Radial Centered'
    CYLINDER  3  1  5.0927  73.1773  0.0000
    HOLE  3  0.0000  0.0000  11.6772
    CYLINDER  2  1  5.3974  73.1773  0.0000
    UNIT  6
    COM='Basket Bottom Plate Hole '
    CYLINDER  3  1  1.27  1.2698  0.0000
    UNIT  7
    COM='Basket Bottom Plate '
    CYLINDER  6  1  16.8466  1.2698  0.0000
    HOLE  6  0.0000  0.0000  0.0000
    HOLE  6  10.7950  0.0000  0.0000
    HOLE  6  5.3975  9.3487  0.0000
    HOLE  6  -5.3975  9.3487  0.0000
    HOLE  6  -10.7950  0.0000  0.0000
    HOLE  6  -5.3975  -9.3487  0.0000
    HOLE  6  5.3975  -9.3487  0.0000
    UNIT  8
    COM='Heat Transfer Bar / Rod '
    CYLINDER  7  1  0.3165  73.1773  0.0000
    UNIT  9
    COM='Basket Fuel Down'
    CYLINDER  3  1  16.1926  73.1773  0.0000
    HOLE  4  0.0000  0.0000  0.0000
    HOLE  4  10.7950  0.0000  0.0000
    HOLE  8  4.9493  2.8575  0.0000
    HOLE  8  4.6024  3.3881  0.0000
    HOLE  8  5.2354  2.2917  0.0000
    HOLE  4  5.3975  9.3487  0.0000
    HOLE  8  0.0000  5.7150  0.0000
```

```
HOLE 8 -0.6330 5.6798 0.0000
HOLE 8 0.6330 5.6798 0.0000
HOLE 4 -5.3975 9.3487 0.0000
HOLE 8 -4.9493 2.8575 0.0000
HOLE 8 -5.2354 2.2917 0.0000
HOLE 8 -4.6024 3.3881 0.0000
HOLE 4 -10.7950 0.0000 0.0000
HOLE 8 -4.9493 -2.8575 0.0000
HOLE 8 -4.6024 -3.3881 0.0000
HOLE 8 -5.2354 -2.2917 0.0000
HOLE 4 -5.3975 -9.3487 0.0000
HOLE 8 0.0000 -5.7150 0.0000
HOLE 8 0.6330 -5.6798 0.0000
HOLE 8 -0.6330 -5.6798 0.0000
HOLE 4 5.3975 -9.3487 0.0000
HOLE 8 4.9493 -2.8575 0.0000
HOLE 8 5.2354 -2.2917 0.0000
HOLE 8 4.6024 -3.3881 0.0000
CYLINDER 7 1 16.6688 73.1773 0.0000
CYLINDER 3 1 16.8466 73.1773 0.0000
UNIT 10
COM='Basket Fuel Up'
CYLINDER 3 1 16.1926 73.1773 0.0000
HOLE 5 0.0000 0.0000 0.0000
HOLE 5 10.7950 0.0000 0.0000
HOLE 8 4.9493 2.8575 0.0000
HOLE 8 4.6024 3.3881 0.0000
HOLE 8 5.2354 2.2917 0.0000
HOLE 5 5.3975 9.3487 0.0000
HOLE 8 0.0000 5.7150 0.0000
HOLE 8 -0.6330 5.6798 0.0000
HOLE 8 0.6330 5.6798 0.0000
HOLE 5 -5.3975 9.3487 0.0000
HOLE 8 -4.9493 2.8575 0.0000
HOLE 8 -5.2354 2.2917 0.0000
HOLE 8 -4.6024 3.3881 0.0000
HOLE 5 -10.7950 0.0000 0.0000
HOLE 8 -4.9493 -2.8575 0.0000
HOLE 8 -4.6024 -3.3881 0.0000
HOLE 8 -5.2354 -2.2917 0.0000
HOLE 5 -5.3975 -9.3487 0.0000
HOLE 8 0.0000 -5.7150 0.0000
HOLE 8 0.6330 -5.6798 0.0000
HOLE 8 -0.6330 -5.6798 0.0000
HOLE 5 5.3975 -9.3487 0.0000
HOLE 8 4.9493 -2.8575 0.0000
HOLE 8 5.2354 -2.2917 0.0000
HOLE 8 4.6024 -3.3881 0.0000
CYLINDER 7 1 16.6688 73.1773 0.0000
CYLINDER 3 1 16.8466 73.1773 0.0000
UNIT 11
COM='Cask Cavity '
CYLINDER 3 1 16.9863 446.6844 0.0000
HOLE 7 0.0000 0.0000 0.0001
HOLE 10 0.0000 0.0000 1.2700
HOLE 7 0.0000 0.0000 74.4475
HOLE 9 0.0000 0.0000 75.7174
HOLE 7 0.0000 0.0000 148.8949
HOLE 10 0.0000 0.0000 150.1648
HOLE 7 0.0000 0.0000 223.3423
HOLE 9 0.0000 0.0000 224.6122
HOLE 7 0.0000 0.0000 297.7897
HOLE 10 0.0000 0.0000 299.0596
HOLE 7 0.0000 0.0000 372.2371
HOLE 9 0.0000 0.0000 373.5070
UNIT 12
COM='Cask Shield Radial Configuration '
CYLINDER 3 1 16.9863 446.6844 0.0000
HOLE 11 0.0000 0.0000 0.0000
CYLINDER 8 1 18.9103 446.6844 0.0000
CYLINDER 5 1 33.4645 446.6844 0.0000
CYLINDER 8 1 36.5189 446.6844 0.0000
CYLINDER 9 1 49.2189 446.6844 0.0000
CYLINDER 8 1 49.8183 446.6844 0.0000
UNIT 13
COM='LWT Lid '
CYLINDER 8 1 36.5189 28.5750 0.5994
CYLINDER 9 1 49.8183 28.5750 0.5994
CYLINDER 8 1 49.8183 28.5750 0.0000
UNIT 14
COM='LWT Bottom Weldment '
CYLINDER 5 1 26.3525 16.5100 8.8900
CYLINDER 8 1 36.5189 26.0706 0.0000
CYLINDER 9 1 49.8183 26.0706 0.0000
CYLINDER 8 1 49.8183 26.6700 0.0000
UNIT 15
COM='LWT Cask '
CYLINDER 9 1 49.8183 501.9297 0.0000
HOLE 14 0.0000 0.0000 0.0000
HOLE 12 0.0000 0.0000 26.6701
HOLE 13 0.0000 0.0000 473.3546
Global UNIT 16
COM='Finite Cask Array 8 Casks'
CUBOID 3 1 199.2744 -149.4558 2P136.1066 501.9297 0.0000
HOLE 15 0.0000 0.0000 0.0000
HOLE 15 99.6368 0.0000 0.0000
HOLE 15 49.8184 86.2880 0.0000
HOLE 15 -49.8184 86.2880 0.0000
HOLE 15 -99.6368 0.0000 0.0000
HOLE 15 -49.8184 -86.2880 0.0000
HOLE 15 49.8184 -86.2880 0.0000
HOLE 15 149.4552 -86.2880 0.0000
END GEOM
READ BOUNDS    ALL=H2O    END BOUNDS
READ PLOT
TTL='X-Y PLOT OF CASK ARRAY'
SCR=YES  PIC=MAT  LPI=10
UAX=1.0  VDN=-1.0  NAX=1500
```

```
  XUL=-200  YUL=200  ZUL=57.4
  XLR=200  YLR=-200  ZLR=57.4  END
  END PLOT
  END DATA

SECONDARY MODULE 000008   HAS BEEN CALLED.

MODULE 000008   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     0.77 (SECONDS).

SECONDARY MODULE 000002   HAS BEEN CALLED.

MODULE 000002   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     4.67 (SECONDS).

SECONDARY MODULE 000009   HAS BEEN CALLED.

MODULE 000009   IS FINISHED. COMPLETION CODE     0. CPU TIME USED  1727.35 (SECONDS).

MODULE CSAS25   IS FINISHED. COMPLETION CODE     0. CPU TIME USED  1735.75 (SECONDS).
```

```
CSAS25
SCALE-PC
02/21/01
18:17:25
```

```
 SSSSSSSSSSS    CCCCCCCCCCC      AAAAAAAAA     LL               EEEEEEEEEEEEE                        PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC    AAAAAAAAAAA    LL               EEEEEEEEEEEEE                        PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC   AA         AA   LL               EE                                   PP         PP  CC         CC
SS             CC              AA         AA   LL               EE                                   PP         PP  CC
SS             CC              AA         AA   LL               EE                                   PP         PP  CC
SSSSSSSSSSSS   CC              AAAAAAAAAAAAA   LL               EEEEEEEEE         -------------      PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC              AAAAAAAAAAAAA   LL               EEEEEEEEE         -------------      PPPPPPPPPPPP   CC
           SS  CC              AA         AA   LL               EE                                   PP             CC
           SS  CC              AA         AA   LL               EE                                   PP             CC
SS         SS  CC         CC   AA         AA   LL               EE                                   PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL    EEEEEEEEEEEEE                        PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC    AA         AA   LLLLLLLLLLLLL    EEEEEEEEEEEEE                        PP              CCCCCCCCCCC
```

```
********************************************************************************
********************************************************************************
********************************************************************************
*****                                                                      *****
*****                  PROGRAM VERIFICATION INFORMATION                    *****
*****                                                                      *****
*****                 CODE SYSTEM:   SCALE-PC VERSION:  4.3                *****
*****                                                                      *****
********************************************************************************
********************************************************************************
*****                                                                      *****
*****                                                                      *****
*****               PROGRAM:  CSAS                                         *****
*****                                                                      *****
*****         CREATION DATE:  03/08/96                                     *****
*****                                                                      *****
*****                VOLUME:  ENG                                          *****
*****                                                                      *****
*****               LIBRARY:  G:\SCALE43\WIN_NT\EXE                        *****
*****                                                                      *****
*****                                                                      *****
*****    THIS IS NOT A SCALE-PC CONFIGURATION CONTROLLED CODE              *****
*****                                                                      *****
*****               JOBNAME:  SCALE-PC                                     *****
*****                                                                      *****
*****     DATE OF EXECUTION:  02/21/01                                     *****
*****                                                                      *****
*****     TIME OF EXECUTION:  18:17:25                                     *****
*****                                                                      *****
*****                                                                      *****
********************************************************************************
********************************************************************************
********************************************************************************
```

```
'Fuel Tube Thick - Nominal  Fuel Tube OD - Nominal  Fuel Tube Height - Nominal
'Fuel Base  Plate - Nominal  Fuel Plate Diameter - Nominal  Fuel Plate Thickness
'Fuel Plate Clad Thickness - Min  Active Fuel Length - Min  Fuel Element Height
'U235 Fuel Mass - Max  Uranium Weight Fraction - Max  Cylinder Pitch - Outer_Fix
'Material Description for LWT Analysis - DIDO HEU Fuel
'Fuel Tube Thick - Nominal  Fuel Tube OD - Nominal  Fuel Tube Height - Nominal
'Fuel Base  Plate - Nominal  Fuel Plate Diameter - Nominal  Fuel Plate Thickness
'Fuel Plate Clad Thickness - Min  Active Fuel Length - Min  Fuel Element Height
'U235 Fuel Mass - Max  Uranium Weight Fraction - Max  Cylinder Pitch - Outer_Fix
'Material Description for LWT Analysis - DIDO HEU Fuel
    LWT WITH LOOSE DIDO HEU FUEL, ACCIDENT CONDITION, RADIAL SHIFT PATTERN - CENTERE

    **** PROBLEM PARAMETERS ****

    LIB 27GROUPNDF4  LIBRARY
    MXX            9 MIXTURES
    MSC           11 COMPOSITION SPECIFICATIONS
    IZM            3 MATERIAL ZONES
    GE  LATTICECELL  GEOMETRY
    MORE           0 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
    MSLN           0 FUEL SOLUTIONS

    **** PROBLEM COMPOSITION DESCRIPTION ****

    SC  URANIUM      STANDARD COMPOSITION
    MX             1 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      0.5477 SPECIFIED DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               92000      1.00 ATOM/MOLECULE
                               92235    94.000 WT%
                               92238     6.000 WT%
    END

    SC  AL           STANDARD COMPOSITION
    MX             1 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      1.7930 SPECIFIED DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               13027      1.00 ATOM/MOLECULE
    END

    SC  AL           STANDARD COMPOSITION
    MX             2 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      2.7020 THEORETICAL DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               13027      1.00 ATOM/MOLECULE
    END

    SC  H2O          STANDARD COMPOSITION
    MX             3 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      0.9998 SPECIFIED DENSITY
    NEL            2 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
                1001      2.00 ATOMS/MOLECULE
                8016      1.00 ATOM/MOLECULE
    END

    SC  ARBMGLC      STANDARD COMPOSITION
    MX             4 MIXTURE NO.
    VF        0.5840 VOLUME FRACTION
    ROTH      0.9437 SPECIFIED DENSITY
    NEL            3 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
                6012      2.00 ATOMS/MOLECULE
                1001      6.00 ATOMS/MOLECULE
                8016      2.00 ATOMS/MOLECULE
    END

    SC  H2O          STANDARD COMPOSITION
    MX             4 MIXTURE NO.
    VF        0.4160 VOLUME FRACTION
    ROTH      0.9982 THEORETICAL DENSITY
    NEL            2 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
                1001      2.00 ATOMS/MOLECULE
                8016      1.00 ATOM/MOLECULE
    END

    SC  PB           STANDARD COMPOSITION
    MX             5 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH     11.3440 THEORETICAL DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
```

```
            82000      1.00 ATOM/MOLECULE
END

SC  SS304         STANDARD COMPOSITION
MX              6 MIXTURE NO.
VF         1.0000 VOLUME FRACTION
ROTH       7.9200 THEORETICAL DENSITY
NEL             4 NO. ELEMENTS
ICP             0 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
            24304    19.000 WT%
            25055     2.000 WT%
            26304    69.500 WT%
            28304     9.500 WT%
END

SC  AL            STANDARD COMPOSITION
MX              7 MIXTURE NO.
VF         1.0000 VOLUME FRACTION
ROTH       2.7020 THEORETICAL DENSITY
NEL             1 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
            13027      1.00 ATOM/MOLECULE
END

SC  SS304         STANDARD COMPOSITION
MX              8 MIXTURE NO.
VF         1.0000 VOLUME FRACTION
ROTH       7.9200 THEORETICAL DENSITY
NEL             4 NO. ELEMENTS
ICP             0 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
            24304    19.000 WT%
            25055     2.000 WT%
            26304    69.500 WT%
            28304     9.500 WT%
END

SC  H2O           STANDARD COMPOSITION
MX              9 MIXTURE NO.
VF         1.0000 VOLUME FRACTION
ROTH       0.0001 SPECIFIED DENSITY
NEL             2 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
             1001      2.00 ATOMS/MOLECULE
             8016      1.00 ATOM/MOLECULE
END

**** PROBLEM GEOMETRY ****

CTP SYMMSLABCELL CELL TYPE
PITCH      0.9800 CM CENTER TO CENTER SPACING
FUELOD     0.0650 CM FUEL DIAMETER OR SLAB THICKNESS
MFUEL           1 MIXTURE NO. OF FUEL
MMOD            3 MIXTURE NO. OF MODERATOR
CLADOD     0.1300 CM CLAD OUTER DIAMETER
MCLAD           2 MIXTURE NO. OF CLAD

ZONE SPECIFICATIONS FOR LATTICECELL GEOMETRY

               ZONE  1 IS FUEL
               ZONE  2 IS CLAD
               ZONE  3 IS MOD
```

```
*********************************************************************************************************************
***                                                                                                               ***
***                        LWT WITH LOOSE DIDO HEU FUEL, ACCIDENT CONDITION, RADIAL SHIFT PATTERN - CENTERE***
***                                                                                                               ***
*********************************************************************************************************************
*********************************************************************************************************************
***                                                                                                               ***
***                            ********** DATA LIBRARY INFORMATION **********                                     ***
***                                                                                                               ***
***         UNIT                                                   VOLUME                                         ***
***        NUMBER              DATA SET NAME                        NAME       UNIT FUNCTION                      ***
***        ------              -------------                        ----       -------------                      ***
***                                                                                                               ***
***          89       G:\scale43\DATALIB\FT89F001                              STANDARD COMPOSITION LIBRARY       ***
***                                                                                                               ***
***          82       G:\scale43\DATALIB\FT82F001                              CROSS SECTION LIBRARY              ***
***                                                                                                               ***
***          11       T:\PROJECTS\sts-proj\DIDO\14110--1\v1.8\HEU\             SHORT CROSS SECTION LIBRARY        ***
***                                                                                                               ***
***          90       T:\PROJECTS\sts-proj\DIDO\14110--1\v1.8\HEU\             INPUT DATA DIRECT ACCESS           ***
***                                                                                                               ***
*********************************************************************************************************************
*********************************************************************************************************************
***                                                                                                               ***
***                                                                                                               ***
***                                   STANDARD COMPOSITION LIBRARY DATA                                           ***
***                                   ---------------------------------                                           ***
***                                                                                                               ***
***          UNIT NUMBER  :  89                                                                                   ***
***                                                                                                               ***
***          DATASET NAME :  G:\scale43\DATALIB\FT89F001                                                          ***
***                                                                                                               ***
***          LIBRARY TITLE:  SCALE-4 STANDARD COMPOSITION LIBRARY                                                 ***
***                          637 STANDARD COMPOSITIONS, 490 NUCLIDES                                              ***
***                          90 ELEMENTS WITH VARIABLE ISOTOPIC DISTRBUTIONS.                                     ***
***                                                                                                               ***
***          CREATION DATE:   6/30/95                                                                             ***
***                                                                                                               ***
***                                                                                                               ***
***                                                                                                               ***
***                                       CROSS SECTION LIBRARY DATA                                              ***
***                                       --------------------------                                              ***
***                                                                                                               ***
***          UNIT NUMBER  :  82                                                                                   ***
***                                                                                                               ***
***          DATASET NAME :  G:\scale43\DATALIB\FT82F001                                                          ***
***                                                                                                               ***
***          LIBRARY TITLE:  SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY                                           ***
***                             BASED ON ENDF-B VERSION 4 DATA                                                    ***
***                                COMPILED FOR NRC      1/27/89                                                  ***
***                                   LAST UPDATED                                               08/12/94         ***
***                                      L.M.PETRIE    -    ORNL                                                  ***
***                                                                                                               ***
***                                                                                                               ***
***                                                                                                               ***
***                                                                                                               ***
*********************************************************************************************************************
*********************************************************************************************************************

                        ........    0 IO'S WERE USED BEFORE READING KENO V DATA     ........

                        ........    0 IO'S WERE USED READING THE KENO V PARAMETER DATA    ......

'Fuel Annulus     1

'Fuel Annulus     2

'Fuel Annulus     3

'Fuel Annulus     4

'Clad Axial End Piece     1

'Clad Axial End Piece     2

'Clad Axial End Piece     3

'Clad Axial End Piece     4

                       ************** DATA READING COMPLETED **************

                        ........    0 IO'S WERE USED PREPARING THE KENO V INPUT DATA     ......

                        ........    0 IO'S WERE USED LOADING THE KENO V DATA     ........

                        ........    0 IO'S WERE USED LOADING THE DATA     ........

                        ........    0 IO'S WERE USED CHECKING THE KENO V GEOMETRY DATA     ........
                        *****  RESTART DATA HAS BEEN WRITTEN ON UNIT 95  *****

                        ........    0 IO'S WERE USED WRITING THE KENO V - CSAS DATA     ......

                        ........    0 IO'S WERE USED PROCESSING CSAS INPUT DATA     ........

 CONTROL MODULE CSAS25    IS COMPLETE.
```

```
BBBBBBBBBBBB   00000000000   NN        NN                     AAAAAAAAA    MM           MM  IIIIIIIIIIII   22222222222
BBBBBBBBBBBBB  0000000000000 NNN       NN                    AAAAAAAAAAA   MMM         MMM  IIIIIIIIIIII  2222222222222
BB         BB  00         00 NNNN      NN                   AA         AA  MMMM       MMMM       II       22          22
BB         BB  00         00 NN NN     NN                   AA         AA  MM MM     MM MM       II                   22
BB         BB  00         00 NN  NN    NN                   AA         AA  MM  MM MM   MM        II                   22
BBBBBBBBBBBB   00         00 NN   NN   NN   -------------   AAAAAAAAAAAAA  MM   MMM    MM        II                  22
BBBBBBBBBBBB   00         00 NN    NN  NN   -------------   AAAAAAAAAAAAA  MM    M     MM        II                22
BB         BB  00         00 NN     NN NN                   AA         AA  MM          MM        II              22
BB         BB  00         00 NN      NN NN                  AA         AA  MM          MM        II            22
BB         BB  00         00 NN       NNNN                  AA         AA  MM          MM        II          22
BBBBBBBBBBBBB  0000000000000 NN        NNN                  AA         AA  MM          MM  IIIIIIIIIIII  2222222222222
BBBBBBBBBBBB    00000000000  NN         NN                  AA         AA  MM          MM  IIIIIIIIIIII  2222222222222

 SSSSSSSSSSS    CCCCCCCCCCC    AAAAAAAAA    LL            EEEEEEEEEEEEE                  PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AAAAAAAAAAA   LL            EEEEEEEEEEEEE                  PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA       AA   LL            EE                             PP         PP  CC         CC
SS             CC             AA       AA   LL            EE                             PP         PP  CC
SS             CC             AA       AA   LL            EE                             PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA LL            EEEEEEEEE     -------------    PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA LL            EEEEEEEEE     -------------    PPPPPPPPPPPP   CC
           SS  CC             AA       AA   LL            EE                             PP             CC
           SS  CC             AA       AA   LL            EE                             PP             CC
SS         SS  CC         CC  AA       AA   LL            EE                             PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA       AA   LLLLLLLLLLLLL EEEEEEEEEEEEE                  PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA       AA   LLLLLLLLLLLLL EEEEEEEEEEEEE                  PP              CCCCCCCCCCC

   0000000     22222222222            //  22222222222        11             //     0000000         11
  000000000   2222222222222          //  2222222222222      111            //     000000000       111
 00       00  22          22        //   22          22    1111           //     00       00     1111
00         00             22       //                22      11          //     00         00      11
00         00             22      //                 22      11         //      00         00      11
00         00            22      //                 22       11        //       00         00      11
00         00          22       //                22         11       //        00         00      11
00         00        22        //               22           11      //         00         00      11
00         00      22         //              22             11     //          00         00      11
 00       00     22          //             22               11    //            00       00       11
  000000000   2222222222222 //           2222222222222    11111111 //             000000000     11111111
   0000000    2222222222222 //           2222222222222    11111111 //              0000000      11111111

      11       88888888888            11       7777777777777         22222222222    666666666666
     111      8888888888888          111       777777777777         2222222222222  6666666666666
    1111      88         88    :::  1111       77          77  :::  22          22 66
      11      88         88    :::    11                   77  :::              22 66
      11      88         88    :::    11                  77   :::              22 66
      11       88888888888            11                 77                    22  666666666666
      11       88888888888            11                77                   22    6666666666666
      11      88         88    :::    11               77      :::          22     66         66
      11      88         88    :::    11              77       :::        22       66         66
      11      88         88    :::    11             77        :::      22         66         66
   11111111   8888888888888        11111111         77              2222222222222  6666666666666
   11111111    88888888888         11111111         77              2222222222222   66666666666
```

```
 SSSSSSSSSSS    CCCCCCCCCCC      AAAAAAAAA     LL            EEEEEEEEEEEEE              PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC    AAAAAAAAAAA    LL            EEEEEEEEEEEEE              PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC   AA         AA   LL            EE                         PP         PP  CC         CC
SS             CC              AA         AA   LL            EE                         PP         PP  CC
SS             CC              AA         AA   LL            EE                         PP         PP  CC
SSSSSSSSSSSS   CC              AAAAAAAAAAAAA   LL            EEEEEEEEE    -------------  PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC              AAAAAAAAAAAAA   LL            EEEEEEEEE    -------------  PPPPPPPPPPPP   CC
           SS  CC              AA         AA   LL            EE                         PP             CC
           SS  CC              AA         AA   LL            EE                         PP             CC
SS         SS  CC         CC   AA         AA   LL            EE                         PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL EEEEEEEEEEEEE              PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC    AA         AA   LLLLLLLLLLLLL EEEEEEEEEEEEE              PP              CCCCCCCCCCC
```

```
********************************************************************************
********************************************************************************
********************************************************************************
*****                                                                      *****
*****                  PROGRAM VERIFICATION INFORMATION                    *****
*****                                                                      *****
*****                CODE SYSTEM:  SCALE-PC VERSION:  4.3                  *****
*****                                                                      *****
********************************************************************************
********************************************************************************
*****                                                                      *****
*****                                                                      *****
*****              PROGRAM:  000008                                        *****
*****                                                                      *****
*****        CREATION DATE:  09/15/95                                      *****
*****                                                                      *****
*****               VOLUME:  ENG                                           *****
*****                                                                      *****
*****              LIBRARY:  G:\SCALE43\WIN_NT\EXE                         *****
*****                                                                      *****
*****                                                                      *****
*****    THIS IS NOT A SCALE-PC CONFIGURATION CONTROLLED CODE              *****
*****                                                                      *****
*****              JOBNAME:  SCALE-PC                                      *****
*****                                                                      *****
*****    DATE OF EXECUTION:  02/21/01                                      *****
*****                                                                      *****
*****    TIME OF EXECUTION:  18:17:26                                      *****
*****                                                                      *****
*****                                                                      *****
********************************************************************************
********************************************************************************
********************************************************************************
```

```
-1Q ARRAY HAS      1 ENTRIES.
 0Q ARRAY HAS      4 ENTRIES.
 1Q ARRAY HAS      6 ENTRIES.
 2Q ARRAY HAS      2 ENTRIES.
```

```
LOGICAL ASSIGNMENTS

MASTER LIBRARY   11
WORKING LIBRARY   0
SCRATCH FILE     18
NEW LIBRARY       1

P R O B L E M   D E S C R I P T I O N

IGR--GEOMETRY (0/1/2/3--INF MED/SLAB/CYL/SPHERE            1

IZM--NUMBER OF ZONES OR MATERIAL REGIONS                   9

MS--MIXING TABLE LENGTH                                   21

IBL--SHIELDED CROSS SECTION EDIT OPTION (0/1--NO/YES)      0

IBR--BONDARENKO FACTOR EDIT OPTION (0/1--NO/YES)           0

ISSOPT--DANCOFF FACTOR OPTION                              0

CONVERGENCE CRITERION    1.00000E-03

GEOMETRY CORRECTION FACTOR FOR WIGNER RATIONAL APPROXIMATION  1.000E+00

        3Q ARRAY HAS    21 ENTRIES.

        4Q ARRAY HAS    21 ENTRIES.

        5Q ARRAY HAS    21 ENTRIES.

        6Q ARRAY HAS     9 ENTRIES.

        7Q ARRAY HAS     9 ENTRIES.

        8Q ARRAY HAS     9 ENTRIES.

        9Q ARRAY HAS     9 ENTRIES.

       10Q ARRAY HAS    21 ENTRIES.

       11Q ARRAY HAS     9 ENTRIES.

M I X I N G   T A B L E

ENTRY   MIXTURE    ISOTOPE   NUMBER DENSITY   NEW IDENTIFIER
   1       1        92235     1.31908E-03        1092235
   2       1        92238     8.31332E-05        1092238
   3       1        13027     4.00184E-02        1013027
   4       2        13027     6.03066E-02        2013027
   5       7        13027     6.03066E-02        7013027
   6       3         1001     6.68762E-02        3001001
   7       4         1001     5.98801E-02        4001001
   8       9         1001     6.68896E-06        9001001
   9       3         8016     3.34381E-02        3008016
  10       4         8016     2.45894E-02        4008016
  11       9         8016     3.34448E-06        9008016
  12       4         6012     1.07014E-02        4006012
  13       5        82000     3.29690E-02        5082000
  14       6        24304     1.74286E-02        6024304
  15       8        24304     1.74286E-02        8024304
  16       6        25055     1.73633E-03        6025055
  17       8        25055     1.73633E-03        8025055
  18       6        26304     5.93579E-02        6026304
  19       8        26304     5.93579E-02        8026304
  20       6        28304     7.72070E-03        6028304
  21       8        28304     7.72070E-03        8028304

GEOMETRY AND MATERIAL DESCRIPTION

ZONE   MIXTURE   OUTER DIMENSION   TEMPERATURE      EXTRA XS   TYPE (0/1--FUEL/MOD)
  1      1         3.25000E-02     2.93000E+02    4.53946E+00          0
  2      2         6.50000E-02     2.93000E+02    0.00000E+00          0
  3      3         4.90000E-01     2.93000E+02    0.00000E+00          0
  4      4         5.49000E+00     2.93000E+02    0.00000E+00          0
  5      5         1.04900E+01     2.93000E+02    0.00000E+00          0
  6      6         1.54900E+01     2.93000E+02    0.00000E+00          0
  7      7         2.04900E+01     2.93000E+02    0.00000E+00          0
  8      8         2.54900E+01     2.93000E+02    0.00000E+00          0
  9      9         3.04900E+01     2.93000E+02    0.00000E+00          0
     4087 LOCATIONS OF    100000 AVAILABLE ARE REQUIRED TO MAKE A NEW MASTER CONTAINING THE SELF-SHIELDED VALUES

NO NUCLIDES IN YOUR PROBLEM HAVE BONDARENKO FACTOR DATA**BONAMI WILL COPY FROM LOGICAL 11 TO LOGICAL  1

COPY       1001   HYDROGEN          FROM LOG 11 TO LOG 18     BONDARENKO TRIGGER 0

COPY       1001   HYDROGEN          FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY       1001   HYDROGEN          FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY       1001   HYDROGEN          FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY       6012   CARBON-12         FROM LOG 11 TO LOG  1     BONDARENKO TRIGGER 0

COPY       8016   OXYGEN-16         FROM LOG 11 TO LOG 18     BONDARENKO TRIGGER 0

COPY       8016   OXYGEN-16         FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY       8016   OXYGEN-16         FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY       8016   OXYGEN-16         FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY      13027   AL-27 1193 218 G FROM LOG 11 TO LOG 18     BONDARENKO TRIGGER 0

COPY      13027   AL-27 1193 218 G FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY      13027   AL-27 1193 218 G FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0
```

```
COPY     13027  AL-27 1193 218 G FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY     24304  CR 1191 WT SS-30 FROM LOG 11 TO LOG 18    BONDARENKO TRIGGER 0
COPY     24304  CR 1191 WT SS-30 FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY     24304  CR 1191 WT SS-30 FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY     25055   MANGANESE-55    FROM LOG 11 TO LOG 18    BONDARENKO TRIGGER 0
COPY     25055   MANGANESE-55    FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY     25055   MANGANESE-55    FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY     26304  FE 1192 WT SS-30 FROM LOG 11 TO LOG 18    BONDARENKO TRIGGER 0
COPY     26304  FE 1192 WT SS-30 FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY     26304  FE 1192 WT SS-30 FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY     28304  NI 1190 WT SS-30 FROM LOG 11 TO LOG 18    BONDARENKO TRIGGER 0
COPY     28304  NI 1190 WT SS-30 FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY     28304  NI 1190 WT SS-30 FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY     82000  PB   1288 218NGP FROM LOG 11 TO LOG  1    BONDARENKO TRIGGER 0
COPY     92235   URANIUM-235     FROM LOG 11 TO LOG  1    BONDARENKO TRIGGER 0
COPY     92238   URANIUM-238     FROM LOG 11 TO LOG  1    BONDARENKO TRIGGER 0
```

```
SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
   BASED ON ENDF-B VERSION 4 DATA
      COMPILED FOR NRC      1/27/89
         LAST UPDATED                                               08/12/94
            L.M.PETRIE   -    ORNL
    TAPE ID                            4321          NUMBER OF NUCLIDES                21
    NUMBER OF NEUTRON GROUPS             27          NUMBER OF GAMMA GROUPS             0
    FIRST THERMAL GROUP                  15          LOGICAL UNIT                       1
                                  TABLE OF CONTENTS
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94      ID     3001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94      ID     4001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94      ID     9001001
   CARBON-12      ENDF/B-IV MAT 1274/THRM1065             UPDATED 08/12/94      ID     4006012
   OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94      ID     3008016
   OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94      ID     4008016
   OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94      ID     9008016
  AL-27 1193 218 GP 040375(5)                             UPDATED 08/12/94      ID     1013027
  AL-27 1193 218 GP 040375(5)                             UPDATED 08/12/94      ID     2013027
  AL-27 1193 218 GP 040375(5)                             UPDATED 08/12/94      ID     7013027
  CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94      ID     6024304
  CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94      ID     8024304
   MANGANESE-55   ENDF/B-IV MAT 1197                      UPDATED 08/12/94      ID     6025055
   MANGANESE-55   ENDF/B-IV MAT 1197                      UPDATED 08/12/94      ID     8025055
  FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94      ID     6026304
  FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94      ID     8026304
  NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94      ID     6028304
  NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94      ID     8028304
  PB   1288 218NGP 042375 P-3 293K                        UPDATED 08/12/94      ID     5082000
   URANIUM-235    ENDF/B-IV MAT 1261                      UPDATED 08/12/94      ID     1092235
   URANIUM-238    ENDF/B-IV MAT 1262                      UPDATED 08/12/94      ID     1092238

    TAPE COPY USED       0 I/O'S, AND TOOK     0.17 SECONDS
```

```
NN        NN  IIIIIIIIIIII  TTTTTTTTTTTT    AAAAAAAAA    WW        WW  LL
NNN       NN  IIIIIIIIIIII  TTTTTTTTTTTT   AAAAAAAAAAA   WW        WW  LL
NNNN      NN       II            TT       AA         AA  WW        WW  LL
NN NN     NN       II            TT       AA         AA  WW        WW  LL
NN  NN    NN       II            TT       AA         AA  WW        WW  LL
NN   NN   NN       II            TT       AAAAAAAAAAAAA  WW    W   WW  LL
NN    NN  NN       II            TT       AAAAAAAAAAAAA  WW   WWW  WW  LL
NN     NN NN       II            TT       AA         AA  WW  WW WW WW  LL
NN      NNNN       II            TT       AA         AA  WW WW   WW WW LL
NN       NNN       II            TT       AA         AA  WWWW     WWWW LL
NN        NN  IIIIIIIIIIII       TT       AA         AA  WWW       WWW LLLLLLLLLLLL
NN        NN  IIIIIIIIIIII       TT       AA         AA  WW        WW  LLLLLLLLLLLL

  SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL            EEEEEEEEEEEEE                 PPPPPPPPPPPP     CCCCCCCCCCC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL            EEEEEEEEEEEEE                 PPPPPPPPPPPPP   CCCCCCCCCCCCC
 SS         SS  CC         CC  AA         AA  LL            EE                            PP         PP   CC         CC
 SS             CC             AA         AA  LL            EE                            PP         PP   CC
 SS             CC             AA         AA  LL            EE                            PP         PP   CC
 SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL            EEEEEEEEE     -------------   PPPPPPPPPPPPP   CC
  SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL            EEEEEEEEE     -------------   PPPPPPPPPPPP    CC
            SS  CC             AA         AA  LL            EE                            PP              CC
            SS  CC             AA         AA  LL            EE                            PP              CC
 SS         SS  CC         CC  AA         AA  LL            EE                            PP              CC         CC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLL  EEEEEEEEEEEEE                 PP              CCCCCCCCCCCCC
  SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLL  EEEEEEEEEEEEE                 PP               CCCCCCCCCCC

   0000000      22222222222           //   22222222222        11              //      0000000          11
  000000000    2222222222222         //   2222222222222      111             //      000000000        111
 00       00   22         22        //    22         22     1111            //      00       00      1111
 00       00              22       //                22       11           //       00       00        11
 00       00              22      //                 22       11          //        00       00        11
 00       00             22      //                 22        11         //         00       00        11
 00       00           22       //                22          11        //          00       00        11
 00       00         22        //               22            11       //           00       00        11
 00       00       22         //              22              11      //            00       00        11
 00       00     22          //             22                11     //             00       00        11
  000000000    2222222222222 //             2222222222222   11111111 //              000000000      11111111
   0000000     2222222222222//              2222222222222   11111111//                0000000       11111111

      11        88888888888                  11       7777777777777            22222222222   7777777777777
     111       8888888888888                111       777777777777            2222222222222  777777777777
    1111       88         88     :::       1111       77         77    :::    22         22  77         77
      11       88         88     :::         11                 77     :::               22           77
      11       88         88     :::         11                77      :::               22          77
      11        88888888888                  11               77                       22           77
      11        88888888888                  11              77                      22            77
      11       88         88     :::         11             77         :::         22              77
      11       88         88     :::         11             77         :::       22                77
      11       88         88     :::         11            77          :::     22                  77
   11111111    8888888888888              11111111         77                2222222222222         77
   11111111     88888888888               11111111         77                2222222222222         77
```

```
 SSSSSSSSSSS    CCCCCCCCCCC      AAAAAAAAA     LL              EEEEEEEEEEEEE                   PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC    AAAAAAAAAAA    LL              EEEEEEEEEEEEE                   PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC   AA         AA   LL              EE                              PP         PP  CC         CC
SS             CC              AA         AA   LL              EE                              PP         PP  CC
SS             CC              AA         AA   LL              EE                              PP         PP  CC
SSSSSSSSSSSS   CC              AAAAAAAAAAAAA   LL              EEEEEEEEE      -------------    PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC              AAAAAAAAAAAAA   LL              EEEEEEEEE      -------------    PPPPPPPPPPPP   CC
           SS  CC              AA         AA   LL              EE                              PP             CC
           SS  CC              AA         AA   LL              EE                              PP             CC
SS         SS  CC         CC   AA         AA   LL              EE                              PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                   PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC    AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                   PP              CCCCCCCCCCC
```

```
******************************************************************************
******************************************************************************
******************************************************************************
*****                                                                    *****
*****                 PROGRAM VERIFICATION INFORMATION                   *****
*****                                                                    *****
*****              CODE SYSTEM:   SCALE-PC VERSION:   4.3                *****
*****                                                                    *****
******************************************************************************
******************************************************************************
*****                                                                    *****
*****                                                                    *****
*****                PROGRAM:   000002                                   *****
*****                                                                    *****
*****          CREATION DATE:   09/28/95                                 *****
*****                                                                    *****
*****                 VOLUME:   ENG                                      *****
*****                                                                    *****
*****                LIBRARY:   G:\SCALE43\WIN_NT\EXE                    *****
*****                                                                    *****
*****                                                                    *****
*****    THIS IS NOT A SCALE-PC CONFIGURATION CONTROLLED CODE            *****
*****                                                                    *****
*****                JOBNAME:   SCALE-PC                                 *****
*****                                                                    *****
*****      DATE OF EXECUTION:   02/21/01                                 *****
*****                                                                    *****
*****      TIME OF EXECUTION:   18:17:27                                 *****
*****                                                                    *****
*****                                                                    *****
******************************************************************************
******************************************************************************
******************************************************************************
```

```
       -1Q ARRAY HAS      1 ENTRIES.

        0Q ARRAY HAS      9 ENTRIES.

        1Q ARRAY HAS     12 ENTRIES.

SELECT 21 NUCLIDES FROM THE MASTER  LIBRARY ON LOGICAL  1
        0 NUCLIDES FROM THE WORKING LIBRARY ON LOGICAL  2
        0 NUCLIDES FROM THE WORKING LIBRARY ON LOGICAL  3
          TO CREATE THE NEW WORKING LIBRARY ON LOGICAL  4

        4 RESONANCE CALCULATIONS HAVE BEEN REQUESTED
       -1 OUTPUT OPTION FOR AMPX FORMATTED CROSS SECTION DATA
     2001 MAXIMUM NUMBER OF RESONANCE MESH INTERVALS
        2 ORDER OF RESONANCE LEVEL PROCESSING

THE STORAGE ALLOCATED FOR THIS CASE IS    100000 WORDS

        2Q ARRAY HAS     21 ENTRIES.

        3Q ARRAY HAS     60 ENTRIES.

        4Q ARRAY HAS     21 ENTRIES.

 GENERAL INFORMATION CONCERNING CROSS SECTION LIBRARY
   TAPE IDENTIFICATION NUMBER               4321
   NUMBER OF NUCLIDES ON TAPE                 21
   NUMBER OF NEUTRON ENERGY GROUPS            27
   FIRST THERMAL NEUTRON ENERGY GROUP         15
   NUMBER OF GAMMA ENERGY GROUPS               0

   DIRECT ACCESS UNIT NUMBER  9 REQUIRES 117 BLOCKS OF LENGTH  1680 WORDS
 XSDRN TAPE   4321
                        SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
                           BASED ON ENDF-B VERSION 4 DATA
                              COMPILED FOR NRC     1/27/89
                                 LAST UPDATED                                                 08/12/94
                                    L.M.PETRIE   -   ORNL

 NUCLIDES FROM XSDRN TAPE
    1      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94     3001001
    2      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94     4001001
    3      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94     9001001
    4      CARBON-12       ENDF/B-IV MAT 1274/THRM1065              UPDATED 08/12/94     4006012
    5      OXYGEN-16       ENDF/B-IV MAT 1276                       UPDATED 08/12/94     3008016
    6      OXYGEN-16       ENDF/B-IV MAT 1276                       UPDATED 08/12/94     4008016
    7      OXYGEN-16       ENDF/B-IV MAT 1276                       UPDATED 08/12/94     9008016
    8     AL-27 1193 218 GP 040375(5)                               UPDATED 08/12/94     1013027
    9     AL-27 1193 218 GP 040375(5)                               UPDATED 08/12/94     2013027
   10     AL-27 1193 218 GP 040375(5)                               UPDATED 08/12/94     7013027
   11     CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED 08/12/94     6024304
   12     CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED 08/12/94     8024304
   13      MANGANESE-55    ENDF/B-IV MAT 1197                       UPDATED 08/12/94     6025055
   14      MANGANESE-55    ENDF/B-IV MAT 1197                       UPDATED 08/12/94     8025055
   15     FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED 08/12/94     6026304
   16     FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED 08/12/94     8026304
   17     NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED 08/12/94     6028304
   18     NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED 08/12/94     8028304
   19     PB   1288 218NGP 042375 P-3 293K                          UPDATED 08/12/94     5082000
   20      URANIUM-235     ENDF/B-IV MAT 1261                       UPDATED 08/12/94     1092235
   21      URANIUM-238     ENDF/B-IV MAT 1262                       UPDATED 08/12/94     1092238
 HYDROGEN       ENDF/B-IV MAT 1269/THRM1002            UPDATED 08/12/94    3001001      TEMPERATURE=    293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 HYDROGEN       ENDF/B-IV MAT 1269/THRM1002            UPDATED 08/12/94    4001001      TEMPERATURE=    293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 HYDROGEN       ENDF/B-IV MAT 1269/THRM1002            UPDATED 08/12/94    9001001      TEMPERATURE=    293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 CARBON-12      ENDF/B-IV MAT 1274/THRM1065            UPDATED 08/12/94    4006012      TEMPERATURE=    293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                     UPDATED 08/12/94    3008016      TEMPERATURE=    293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                     UPDATED 08/12/94    4008016      TEMPERATURE=    293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                     UPDATED 08/12/94    9008016      TEMPERATURE=    293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

AL-27 1193 218 GP 040375(5)                            UPDATED 08/12/94    1013027      TEMPERATURE=    293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

AL-27 1193 218 GP 040375(5)                            UPDATED 08/12/94    2013027      TEMPERATURE=    293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

AL-27 1193 218 GP 040375(5)                            UPDATED 08/12/94    7013027      TEMPERATURE=    293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94    6024304      TEMPERATURE=    293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94    8024304      TEMPERATURE=    293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 MANGANESE-55   ENDF/B-IV MAT 1197                     UPDATED 08/12/94    6025055      TEMPERATURE=    293.00

GEOMETRY HAS BEEN SET TO HOMOGENEOUS AS LBAR IS  0.0000E+00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)          =     54.466          TEMPERATURE(KELVIN)       =   293.000

POTENTIAL SCATTER SIGMA  =      2.590          LUMPED NUCLEAR DENSITY    = 1.7363295E-03
```

```
SPIN FACTOR (G)          =    14.448              LUMP DIMENSION (A-BAR)      = 0.0000000E+00

INNER RADIUS             = 0.0000000E+00          DANCOFF CORRECTION (C)      = 0.0000000E+00

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1      =    55.845            SIGMA(PER ABSORBER ATOM)= 3.4663022E+02

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2      =    55.925            SIGMA(PER ABSORBER ATOM)= 1.2557598E+02

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 0-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP         RES ABS         RES FISS         RES SCAT
  8       -5.518788E-04    0.000000E+00    -3.944190E-01
  9       -2.797993E-03    0.000000E+00    -2.293471E+00
 10       -3.291452E-01    0.000000E+00    -3.820862E+01
 11       -2.680562E+00    0.000000E+00    -1.159996E+02

EXCESS RESONANCE INTEGRALS

                    RESOLVED

ABSORPTION        3.33719E+00
FISSION           0.00000E+00
                                                       PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 MANGANESE-55   ENDF/B-IV MAT 1197                UPDATED 08/12/94    8025055      TEMPERATURE=    293.00

GEOMETRY HAS BEEN SET TO HOMOGENEOUS AS LBAR IS  0.0000E+00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)          =    54.466              TEMPERATURE(KELVIN)         =   293.000

POTENTIAL SCATTER SIGMA  =     2.590              LUMPED NUCLEAR DENSITY      = 1.7363295E-03

SPIN FACTOR (G)          =    14.448              LUMP DIMENSION (A-BAR)      = 0.0000000E+00

INNER RADIUS             = 0.0000000E+00          DANCOFF CORRECTION (C)      = 0.0000000E+00

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1      =    55.845            SIGMA(PER ABSORBER ATOM)= 3.4663022E+02

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2      =    55.925            SIGMA(PER ABSORBER ATOM)= 1.2557598E+02

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 0-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP         RES ABS         RES FISS         RES SCAT
  8       -5.518788E-04    0.000000E+00    -3.944190E-01
  9       -2.797993E-03    0.000000E+00    -2.293471E+00
 10       -3.291452E-01    0.000000E+00    -3.820862E+01
 11       -2.680562E+00    0.000000E+00    -1.159996E+02

EXCESS RESONANCE INTEGRALS

                    RESOLVED

ABSORPTION        3.33719E+00
FISSION           0.00000E+00
                                                       PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED 08/12/94    6026304      TEMPERATURE=    293.00
                                                       PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED 08/12/94    8026304      TEMPERATURE=    293.00
                                                       PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED 08/12/94    6028304      TEMPERATURE=    293.00
                                                       PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED 08/12/94    8028304      TEMPERATURE=    293.00
                                                       PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

PB   1288 218NGP 042375 P-3 293K                       UPDATED 08/12/94    5082000      TEMPERATURE=    293.00
                                                       PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 URANIUM-235    ENDF/B-IV MAT 1261                UPDATED 08/12/94    1092235      TEMPERATURE=    293.00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)          =   233.025              TEMPERATURE(KELVIN)         =   293.000

POTENTIAL SCATTER SIGMA  =    11.500              LUMPED NUCLEAR DENSITY      = 1.3190822E-03

SPIN FACTOR (G)          = 15171.100              LUMP DIMENSION (A-BAR)      = 6.4999998E-02

INNER RADIUS             = 0.0000000E+00          DANCOFF CORRECTION (C)      = 1.5211706E-01

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1      =    26.982            SIGMA(PER ABSORBER ATOM)= 4.0850834E+01

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.
```

```
MASS OF MODERATOR-2     =    238.051              SIGMA(PER ABSORBER ATOM)= 7.7685082E-01

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 1-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP        RES ABS          RES FISS         RES SCAT
 12      -1.712865E+00    -1.053512E+00    -4.421081E-02
 13      -5.191924E+00    -2.544281E+00    -1 184106E-01
 14      -3.743466E+00    -2.214335E+00    -2.824813E-02
 15      -2.253279E-04    -1.715397E-04     1.537884E-06

EXCESS RESONANCE INTEGRALS

                 RESOLVED

ABSORPTION       2.15925E+02
FISSION          1.28649E+02
                                                     PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 URANIUM-238    ENDF/B-IV MAT 1262                UPDATED 08/12/94   1092238      TEMPERATURE=   293.00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)          =    236.006            TEMPERATURE(KELVIN)        =   293.000

POTENTIAL SCATTER SIGMA  =     10.599            LUMPED NUCLEAR DENSITY     = 8.3133229E-05

SPIN FACTOR (G)          =    656.527            LUMP DIMENSION (A-BAR)     = 6.4999998E-02

INNER RADIUS             = 0.0000000E+00         DANCOFF CORRECTION (C)     = 1.5211706E-01

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1     =     26.982              SIGMA(PER ABSORBER ATOM)= 6.4818372E+02

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2     =    235.044              SIGMA(PER ABSORBER ATOM)= 1.8885785E+02

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 1-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP        RES ABS          RES FISS         RES SCAT
  9      -1.309125E-04     0.000000E+00    -1.475272E-03
 10      -7.025824E-03    -3.903629E-08    -5.099698E-02
 11      -3.303697E-01     0.000000E+00    -1.054719E+00
 12      -3.107242E+00     0.000000E+00    -3.725560E+00
 13      -3.585465E+00     0.000000E+00    -1.189779E+00
 14      -6.584399E+00     0.000000E+00    -3.875874E-01
 15      -4.155954E-09     0.000000E+00     3.752471E-09

EXCESS RESONANCE INTEGRALS

                 RESOLVED

ABSORPTION       2.57082E+02
FISSION          5.33631E-04
                                                     PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00
```

```
THIS XSDRN WORKING TAPE WAS CREATED 02/21/01 AT 18:17:27
THE TITLE OF THE PARENT CASE IS AS FOLLOWS
SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
   BASED ON ENDF-B VERSION 4 DATA
      COMPILED FOR NRC     1/27/89
    TAPE ID                          4321          NUMBER OF NUCLIDES                        21
    NUMBER OF NEUTRON GROUPS           27          NUMBER OF GAMMA GROUPS                     0
    FIRST THERMAL GROUP                15          LOGICAL UNIT                               4
                                  TABLE OF CONTENTS
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002            UPDATED 08/12/94       ID    3001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002            UPDATED 08/12/94       ID    4001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002            UPDATED 08/12/94       ID    9001001
   CARBON-12      ENDF/B-IV MAT 1274/THRM1065            UPDATED 08/12/94       ID    4006012
   OXYGEN-16      ENDF/B-IV MAT 1276                     UPDATED 08/12/94       ID    3008016
   OXYGEN-16      ENDF/B-IV MAT 1276                     UPDATED 08/12/94       ID    4008016
   OXYGEN-16      ENDF/B-IV MAT 1276                     UPDATED 08/12/94       ID    9008016
  AL-27 1193 218 GP 040375(5)                            UPDATED 08/12/94       ID    1013027
  AL-27 1193 218 GP 040375(5)                            UPDATED 08/12/94       ID    2013027
  AL-27 1193 218 GP 040375(5)                            UPDATED 08/12/94       ID    7013027
  CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94       ID    6024304
  CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94       ID    8024304
   MANGANESE-55   ENDF/B-IV MAT 1197                     UPDATED 08/12/94       ID    6025055
   MANGANESE-55   ENDF/B-IV MAT 1197                     UPDATED 08/12/94       ID    8025055
  FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94       ID    6026304
  FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94       ID    8026304
  NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94       ID    6028304
  NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94       ID    8028304
  PB   1288 218NGP 042375 P-3 293K                       UPDATED 08/12/94       ID    5082000
   URANIUM-235    ENDF/B-IV MAT 1261                     UPDATED 08/12/94       ID    1092235
   URANIUM-238    ENDF/B-IV MAT 1262                     UPDATED 08/12/94       ID    1092238

    TAPE COPY USED      0 I/O'S, AND TOOK    0.16 SECONDS
```

```
               KK         KK  EEEEEEEEEEEEE  NN         NN   00000000000                     VV         VV
               KK        KK   EEEEEEEEEEEEE  NNN        NN  0000000000000                    VV         VV
               KK       KK    EE             NNNN       NN  00         00                    VV         VV
               KK      KK     EE             NN NN      NN  00         00                    VV         VV
               KK     KK      EE             NN  NN     NN  00         00                    VV         VV
               KKKKKKKK       EEEEEEEEE      NN   NN    NN  00         00  -------------     VV         VV
               KKKKKKKK       EEEEEEEEE      NN    NN   NN  00         00  -------------      VV       VV
               KK     KK      EE             NN     NN  NN  00         00                      VV     VV
               KK      KK     EE             NN      NN NN  00         00                       VV   VV
               KK       KK    EE             NN       NNNN  00         00                        VV VV
               KK        KK   EEEEEEEEEEEEE  NN        NNN  0000000000000                         VVV
               KK         KK  EEEEEEEEEEEEE  NN         NN   00000000000                           V

  SSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL             EEEEEEEEEEEEE                 PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA    LL             EEEEEEEEEEEEE                 PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS        SS  CC         CC  AA         AA   LL             EE                            PP         PP  CC         CC
SS            CC             AA         AA   LL             EE                            PP         PP  CC
SS            CC             AA         AA   LL             EE                            PP         PP  CC
SSSSSSSSSSSS  CC             AAAAAAAAAAAAA   LL             EEEEEEEEE      -------------  PPPPPPPPPPPPP  CC
 SSSSSSSSSSS  CC             AAAAAAAAAAAAA   LL             EEEEEEEEE      -------------  PPPPPPPPPPPP   CC
          SS  CC             AA         AA   LL             EE                            PP             CC
          SS  CC             AA         AA   LL             EE                            PP             CC
SS        SS  CC         CC  AA         AA   LL             EE                            PP             CC         CC
SSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA   LLLLLLLLLLLLL  EEEEEEEEEEEEE                 PP             CCCCCCCCCCCCC
 SSSSSSSSSS    CCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL  EEEEEEEEEEEEE                 PP              CCCCCCCCCCC

   0000000     22222222222            //   22222222222         11              //     0000000          11
  000000000   2222222222222          //   2222222222222       111             //     000000000        111
 00       00  22         22         //    22         22      1111            //     00       00      1111
00         00            22        //                22        11           //     00         00       11
00         00            22       //                 22        11          //      00         00       11
00         00          22        //                22          11         //       00         00       11
00         00        22         //               22            11        //        00         00       11
00         00      22          //              22              11       //         00         00       11
00         00    22           //             22                11      //          00         00       11
 00       00  22             //           22                   11     //            00       00        11
  000000000   2222222222222 //            2222222222222     11111111 //              000000000      11111111
   0000000    2222222222222 //            2222222222222     11111111 //               0000000       11111111

      11      88888888888                 11       7777777777777                  33333333333    22222222222
     111     8888888888888                111      777777777777                  3333333333333  2222222222222
    1111     88         88      :::      1111      77         77          :::    33         33  22         22
      11     88         88      :::        11               77            :::               33             22
      11     88         88      :::        11              77             :::               33             22
      11      88888888888                  11             77                             333             22
      11      88888888888                  11             77                             333           22
      11     88         88      :::        11            77               :::               33       22
      11     88         88      :::        11            77               :::               33     22
      11     88         88      :::        11            77               :::    33         33   22
   11111111  8888888888888              11111111         77                      3333333333333  2222222222222
   11111111   88888888888               11111111         77                       33333333333   2222222222222
```

```
 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL              EEEEEEEEEEEEE                   PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL              EEEEEEEEEEEEE                   PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL              EE                              PP         PP  CC         CC
SS             CC             AA         AA  LL              EE                              PP         PP  CC
SS             CC             AA         AA  LL              EE                              PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL              EEEEEEEEE      -------------    PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL              EEEEEEEEE      -------------    PPPPPPPPPPPP   CC
           SS  CC             AA         AA  LL              EE                              PP             CC
           SS  CC             AA         AA  LL              EE                              PP             CC
SS         SS  CC         CC  AA         AA  LL              EE                              PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLLL   EEEEEEEEEEEEE                   PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLLL   EEEEEEEEEEEEE                   PP              CCCCCCCCCCC
```

```
*******************************************************************************
*******************************************************************************
*******************************************************************************
*****                                                                     *****
*****                  PROGRAM VERIFICATION INFORMATION                   *****
*****                                                                     *****
*****                 CODE SYSTEM:  SCALE-PC VERSION:  4.3                *****
*****                                                                     *****
*******************************************************************************
*******************************************************************************
*****                                                                     *****
*****                                                                     *****
*****              PROGRAM:  000009                                       *****
*****                                                                     *****
*****        CREATION DATE:  03/08/96                                     *****
*****                                                                     *****
*****               VOLUME:  ENG                                          *****
*****                                                                     *****
*****              LIBRARY:  G:\SCALE43\WIN_NT\EXE                        *****
*****                                                                     *****
*****                                                                     *****
*****   THIS IS NOT A SCALE-PC CONFIGURATION CONTROLLED CODE              *****
*****                                                                     *****
*****              JOBNAME:  SCALE-PC                                     *****
*****                                                                     *****
*****    DATE OF EXECUTION:  02/21/01                                     *****
*****                                                                     *****
*****    TIME OF EXECUTION:  18:17:32                                     *****
*****                                                                     *****
*****                                                                     *****
*******************************************************************************
*******************************************************************************
*******************************************************************************
```

```
*********************************************************************************************
***                                                                                       ***
***                                                                                       ***
***                                                                                       ***
*********************************************************************************************
***                          ******     NUMERIC PARAMETERS     ******                     ***
***                                                                                       ***
***                                                                                       ***
***                 TME      MAXIMUM PROBLEM TIME (MIN)                       90.00       ***
***                                                                                       ***
***                 TBA      TIME PER GENERATION (MIN)                         5.00       ***
***                                                                                       ***
***                 GEN      NUMBER OF GENERATIONS                             1203       ***
***                                                                                       ***
***                 NPG      NUMBER PER GENERATION                             1000       ***
***                                                                                       ***
***                 NSK      NUMBER OF GENERATIONS TO BE SKIPPED                  3       ***
***                                                                                       ***
***                 BEG      BEGINNING GENERATION NUMBER                          1       ***
***                                                                                       ***
***                 RES      GENERATIONS BETWEEN CHECKPOINTS                      0       ***
***                                                                                       ***
***                 X1D      NUMBER OF EXTRA 1-D CROSS SECTIONS                   1       ***
***                                                                                       ***
***                 NBK      NEUTRON BANK SIZE                                 1025       ***
***                                                                                       ***
***                 XNB      EXTRA POSITIONS IN NEUTRON BANK                      0       ***
***                                                                                       ***
***                 NFB      FISSION BANK SIZE                                 1000       ***
***                                                                                       ***
***                 XFB      EXTRA POSITIONS IN FISSION BANK                      0       ***
***                                                                                       ***
***                 WTA      DEFAULT VALUE OF WEIGHT AVERAGE                 0.5000       ***
***                                                                                       ***
***                 WTH      WEIGHT HIGH FOR SPLITTING                       3.0000       ***
***                                                                                       ***
***                 WTL      WEIGHT LOW FOR RUSSIAN ROULETTE                 0.3333       ***
***                                                                                       ***
***                 RND      STARTING RANDOM NUMBER                    BB827100001        ***
***                                                                                       ***
***                 NB8      NUMBER OF D.A. BLOCKS ON UNIT  8                   200       ***
***                                                                                       ***
***                 NL8      LENGTH OF D.A. BLOCKS ON UNIT  8                   512       ***
***                                                                                       ***
***                 ADJ      MODE OF CALCULATION                            FORWARD       ***
***                                                                                       ***
***                          INPUT DATA WRITTEN ON RESTART UNIT                  NO       ***
***                                                                                       ***
***                          BINARY DATA INTERFACE                              YES       ***
***                                                                                       ***
***                                                                                       ***
*********************************************************************************************
*********************************************************************************************
```

```
*****************************************************************************************************************
*****************************************************************************************************************
***                                                                                                           ***
***                                                                                                           ***
***                                                                                                           ***
*****************************************************************************************************************
***                                 ******     LOGICAL PARAMETERS        ******                               ***
***                                                                                                           ***
***  RUN  EXECUTE PROBLEM AFTER CHECKING DATA    YES           PLT  PLOT PICTURE MAP(S)                   NO  ***
***                                                                                                           ***
***  FLX  COMPUTE FLUX                            NO           FDN  COMPUTE FISSION DENSITIES             NO  ***
***                                                                                                           ***
***  SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION    NO           NUB  COMPUTE NU-BAR & AVG FISSION GROUP   YES  ***
***                                                                                                           ***
***  MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER     NO           MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION NO  ***
***                                                                                                           ***
***  CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER   NO           CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION NO ***
***                                                                                                           ***
***  FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER   NO           FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION NO ***
***                                                                                                           ***
***  MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER     NO           MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER  NO  ***
***                                                                                                           ***
***  CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER   NO           CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER NO ***
***                                                                                                           ***
***  FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER   NO           FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER NO ***
***                                                                                                           ***
***  HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL    NO           HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL NO  ***
***                                                                                                           ***
***  AMX  PRINT ALL MIXED CROSS SECTIONS          NO           FAR  PRINT FIS. AND ABS. BY REGION         NO  ***
***                                                                                                           ***
***  XS1  PRINT 1-D MIXTURE X-SECTIONS            NO           GAS  PRINT FAR BY GROUP                    NO  ***
***                                                                                                           ***
***  XS2  PRINT 2-D MIXTURE X-SECTIONS            NO           PAX  PRINT XSEC-ALBEDO CORRELATION TABLES  NO  ***
***                                                                                                           ***
***  XAP  PRINT MIXTURE ANGLES & PROBABILITIES    NO           PWT  PRINT WEIGHT AVERAGE ARRAY            NO  ***
***                                                                                                           ***
***  PKI  PRINT FISSION SPECTRUM                  NO           PGM  PRINT INPUT GEOMETRY                  NO  ***
***                                                                                                           ***
***  P1D  PRINT EXTRA 1-D CROSS SECTIONS          NO           BUG  PRINT DEBUG INFORMATION               NO  ***
***                                                                                                           ***
***                                                            TRK  PRINT TRACKING INFORMATION            NO  ***
***                                                                                                           ***
***                                                                                                           ***
*****************************************************************************************************************
*****************************************************************************************************************
*****************************************************************************************************************
                                    PARAMETER INPUT COMPLETED

                       ........    0 IO'S WERE USED READING THE PARAMETER DATA      ........

                    *************** DATA READING COMPLETED ***************
```

```
***************************************************************************************************************
***                                                                                                         ***
***                                                                                                         ***
***                                                                                                         ***
***************************************************************************************************************
***************************************************************************************************************
***                                                                                                         ***
***        UNIT                                                        VOLUME                               ***
***       NUMBER              DATA SET NAME                             NAME      UNIT FUNCTION             ***
***       ------              -------------                             ----      -------------             ***
***                                                                                                         ***
***     XSC  14    T:\PROJECTS\sts-proj\DIDO\14110--1\v1.8\HEU\                   MIXED CROSS SECTIONS      ***
***                                                                                                         ***
***     ALB  79    G:\scale43\DATALIB\FT79F001                                    INPUT ALBEDOS             ***
***                                                                                                         ***
***     WTS  80    G:\scale43\DATALIB\FT80F001                                    INPUT WEIGHTS             ***
***                                                                                                         ***
***     SKT  16     UNKNOWN                                                       WRITE SCRATCH DATA        ***
***                                                                                                         ***
***     BIN  95    T:\PROJECTS\sts-proj\DIDO\14110--1\v1.8\HEU\                   BINARY INPUT DATA         ***
***                                                                                                         ***
***     RST  95    T:\PROJECTS\sts-proj\DIDO\14110--1\v1.8\HEU\                   READ RESTART DATA         ***
***                                                                                                         ***
***     LIB   4    T:\PROJECTS\sts-proj\DIDO\14110--1\v1.8\HEU\                   INPUT AMPX WORKING LIBRARY ***
***                                                                                                         ***
***           8    T:\PROJECTS\sts-proj\DIDO\14110--1\v1.8\HEU\                   INPUT DATA DIRECT ACCESS  ***
***                                                                                                         ***
***           9     UNKNOWN                                                       SUPER GROUPED DIRECT ACCESS ***
***                                                                                                         ***
***          10     UNKNOWN                                                       XSEC MIXING DIRECT ACCESS ***
***                                                                                                         ***
***************************************************************************************************************

                      ........    0 IO'S WERE USED PREPARING INPUT DATA    ........

                       CROSS SECTIONS READ FROM THE AMPX WORKING LIBRARY ON UNIT    4
```

```
                                   MIXING TABLE

                          NUMBER OF SCATTERING ANGLES =  2
                       CROSS SECTION MESSAGE THRESHOLD =3.0E-05

MIXTURE =     1           DENSITY(G/CC) =  2.3407
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA       AWT              NUCLIDE TITLE
   1013027  4.00184E-02  7.66010E-01  13027    26.9818    AL-27 1193 218 GP 040375(5)                                   UPDATED
08/12/94
   1092235  1.31908E-03  2.19951E-01  92235   235.0441     URANIUM-235     ENDF/B-IV MAT 1261                           UPDATED
08/12/94
   1092238  8.31332E-05  1.40394E-02  92238   238.0510     URANIUM-238     ENDF/B-IV MAT 1262                           UPDATED
08/12/94

MIXTURE =     2           DENSITY(G/CC) =  2.7020
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA       AWT              NUCLIDE TITLE
   2013027  6.03066E-02  1.00000E+00  13027    26.9818    AL-27 1193 218 GP 040375(5)                                   UPDATED
08/12/94

MIXTURE =     3           DENSITY(G/CC) = 0.99977
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA       AWT              NUCLIDE TITLE
   3001001  6.68762E-02  1.11927E-01   1001     1.0077     HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                  UPDATED
08/12/94
   3008016  3.34381E-02  8.88074E-01   8016    15.9904     OXYGEN-16       ENDF/B-IV MAT 1276                           UPDATED
08/12/94

MIXTURE =     4           DENSITY(G/CC) = 0.96635
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA       AWT              NUCLIDE TITLE
   4001001  5.98801E-02  1.03684E-01   1001     1.0077     HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                  UPDATED
08/12/94
   4006012  1.07014E-02  2.20668E-01   6000    12.0001     CARBON-12       ENDF/B-IV MAT 1274/THRM1065                  UPDATED
08/12/94
   4008016  2.45894E-02  6.75649E-01   8016    15.9904     OXYGEN-16       ENDF/B-IV MAT 1276                           UPDATED
08/12/94

MIXTURE =     5           DENSITY(G/CC) =  11.344
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA       AWT              NUCLIDE TITLE
   5082000  3.29690E-02  1.00000E+00  82000   207.2100    PB    1288 218NGP 042375 P-3 293K                             UPDATED
08/12/94

MIXTURE =     6           DENSITY(G/CC) =  7.9200
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA       AWT              NUCLIDE TITLE
   6024304  1.74286E-02  1.90000E-01  24000    51.9957    CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED
08/12/94
   6025055  1.73633E-03  1.99999E-02  25055    54.9379     MANGANESE-55    ENDF/B-IV MAT 1197                           UPDATED
08/12/94
   6026304  5.93579E-02  6.95000E-01  26000    55.8447    FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED
08/12/94
   6028304  7.72070E-03  9.50001E-02  28000    58.6872    NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED
08/12/94

MIXTURE =     7           DENSITY(G/CC) =  2.7020
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA       AWT              NUCLIDE TITLE
   7013027  6.03066E-02  1.00000E+00  13027    26.9818    AL-27 1193 218 GP 040375(5)                                   UPDATED
08/12/94

MIXTURE =     8           DENSITY(G/CC) =  7.9200
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA       AWT              NUCLIDE TITLE
   8024304  1.74286E-02  1.90000E-01  24000    51.9957    CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED
08/12/94
   8025055  1.73633E-03  1.99999E-02  25055    54.9379     MANGANESE-55    ENDF/B-IV MAT 1197                           UPDATED
08/12/94
   8026304  5.93579E-02  6.95000E-01  26000    55.8447    FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED
08/12/94
   8028304  7.72070E-03  9.50001E-02  28000    58.6872    NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED
08/12/94

MIXTURE =     9           DENSITY(G/CC) = 0.99997E-04
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA       AWT              NUCLIDE TITLE
   9001001  6.68896E-06  1.11927E-01   1001     1.0077     HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                  UPDATED
08/12/94
   9008016  3.34448E-06  8.88074E-01   8016    15.9904     OXYGEN-16       ENDF/B-IV MAT 1276                           UPDATED
08/12/94


                         3001001     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94
                         4001001     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94
                         9001001     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94
                         4006012     CARBON-12      ENDF/B-IV MAT 1274/THRM1065             UPDATED 08/12/94
                         3008016     OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94
                         4008016     OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94
                         9008016     OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94
                         1013027    AL-27 1193 218 GP 040375(5)                             UPDATED 08/12/94
                         2013027    AL-27 1193 218 GP 040375(5)                             UPDATED 08/12/94
                         7013027    AL-27 1193 218 GP 040375(5)                             UPDATED 08/12/94
                         6024304    CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94
                         8024304    CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94
                         6025055     MANGANESE-55   ENDF/B-IV MAT 1197                      UPDATED 08/12/94
                         8025055     MANGANESE-55   ENDF/B-IV MAT 1197                      UPDATED 08/12/94
                         6026304    FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94
                         8026304    FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94
                         6028304    NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94
                         8028304    NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94
                         5082000    PB    1288 218NGP 042375 P-3 293K                       UPDATED 08/12/94
                         1092235     URANIUM-235    ENDF/B-IV MAT 1261                      UPDATED 08/12/94
                         1092238     URANIUM-238    ENDF/B-IV MAT 1262                      UPDATED 08/12/94

KENO MESSAGE NUMBER K5-222       1 TRANSFERS FOR MIXTURE     3 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222       1 TRANSFERS FOR MIXTURE     4 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222       1 TRANSFERS FOR MIXTURE     9 WERE CORRECTED FOR BAD MOMENTS.

                     ........    0 IO'S WERE USED MIXING CROSS-SECTIONS         .......
```

```
1-D CROSS SECTION ARRAY ID NUMBERS
    1  2002  1452     27     18  1018

........    0 IO'S WERE USED PREPARING THE CROSS SECTIONS    ........
```

```
*******************************************************************************************************
***                                                                                                 ***
***                                                                                                 ***
***                                                                                                 ***
*******************************************************************************************************
*******************************************************************************************************
***                                                                                                 ***
***                              ****** ADDITIONAL INFORMATION ******                               ***
***                                                                                                 ***
***  NUMBER OF ENERGY GROUPS                27      USE LATTICE GEOMETRY                      NO    ***
***                                                                                                 ***
***  NO. OF FISSION SPECTRUM SOURCE GROUP   1       GLOBAL ARRAY NUMBER                        0    ***
***                                                                                                 ***
***  NO. OF SCATTERING ANGLES IN XSECS      2       NUMBER OF UNITS IN THE GLOBAL X DIR.       0    ***
***                                                                                                 ***
***  ENTRIES/NEUTRON IN THE NEUTRON BANK   24       NUMBER OF UNITS IN THE GLOBAL Y DIR.       0    ***
***                                                                                                 ***
***  ENTRIES/NEUTRON IN THE FISSION BANK   17       NUMBER OF UNITS IN THE GLOBAL Z DIR.       0    ***
***                                                                                                 ***
***  NUMBER OF MIXTURES USED                8       USE A GLOBAL REFLECTOR                    YES   ***
***                                                                                                 ***
***  NUMBER OF BIAS ID'S USED               1       USE NESTED HOLES                          YES   ***
***                                                                                                 ***
***  NUMBER OF DIFFERENTIAL ALBEDOS USED    1       NUMBER OF HOLES                           86    ***
***                                                                                                 ***
***  TOTAL INPUT GEOMETRY REGIONS          54       MAXIMUM HOLE NESTING LEVEL                 7    ***
***                                                                                                 ***
***  NUMBER OF GEOMETRY REGIONS USED       54       USE NESTED ARRAYS                         NO    ***
***                                                                                                 ***
***  LARGEST GEOMETRY UNIT NUMBER          16       NUMBER OF ARRAYS USED                      0    ***
***                                                                                                 ***
***  LARGEST ARRAY NUMBER                   1       MAXIMUM ARRAY NESTING LEVEL                0    ***
***                                                                                                 ***
***                                                                                                 ***
***  +X BOUNDARY CONDITION                H2O       -X BOUNDARY CONDITION                    H2O    ***
***                                                                                                 ***
***  +Y BOUNDARY CONDITION                H2O       -Y BOUNDARY CONDITION                    H2O    ***
***                                                                                                 ***
***  +Z BOUNDARY CONDITION                H2O       -Z BOUNDARY CONDITION                    H2O    ***
***                                                                                                 ***
*******************************************************************************************************
```

```
****** SPACE AND SUPERGROUP INFORMATION ******

100000 WORDS IS THE TOTAL SPACE AVAILABLE.

 46861 WORDS WERE USED FOR NON-SUPERGROUP STORAGE.

 53139 WORDS OF STORAGE ARE AVAILABLE FOR SUPERGROUPED DATA.

 99444 WORDS OF STORAGE ARE AVAILABLE FOR CONSTRUCTING THE SUPERGROUPS.

 53078 WORDS OF STORAGE ARE AVAILABLE TO EACH SUPERGROUP.

  1369 WORDS ARE NEEDED FOR THE LARGEST GROUP.

 48473 WORDS OF STORAGE IS SUFFICIENT TO RUN THIS PROBLEM.

 60385 WORDS OF STORAGE WILL ALLOW THE PROBLEM TO RUN WITH ONE SUPERGROUP.

 60576 WORDS OF STORAGE WILL BE USED TO RUN THIS PROBLEM.
```

SUPERGROUP	STARTING GROUP	ENDING GROUP	XSEC LENGTH	ALBEDO LENGTH	TOTAL LENGTH
1	1	27	2010	544	13595

```
........   0 IO'S WERE USED IN SUPERGROUPING   ........

........   0 IO'S WERE USED LOADING THE DATA   ........
```

```
                    MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION               NUM   ID

                                                  -----   UNIT     1   -----

FUELED ANNULAR SECTIONS         TUBE  1  LOOSE
  1 CYLINDER          3   1   RADIUS =  3.0300     +Z =  58.750     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  2 CYLINDER          2   1   RADIUS =  3.0625     +Z =  58.750     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  3 CYLINDER          1   1   RADIUS =  3.1275     +Z =  58.750     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  4 CYLINDER          2   1   RADIUS =  3.1600     +Z =  58.750     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  5 CYLINDER          3   1   RADIUS =  3.5300     +Z =  58.750     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  6 CYLINDER          2   1   RADIUS =  3.5625     +Z =  58.750     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  7 CYLINDER          1   1   RADIUS =  3.6275     +Z =  58.750     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  8 CYLINDER          2   1   RADIUS =  3.6600     +Z =  58.750     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  9 CYLINDER          3   1   RADIUS =  4.0300     +Z =  58.750     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
 10 CYLINDER          2   1   RADIUS =  4.0625     +Z =  58.750     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
 11 CYLINDER          1   1   RADIUS =  4.1275     +Z =  58.750     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
 12 CYLINDER          2   1   RADIUS =  4.1600     +Z =  58.750     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
 13 CYLINDER          3   1   RADIUS =  4.5300     +Z =  58.750     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
 14 CYLINDER          2   1   RADIUS =  4.5625     +Z =  58.750     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
 15 CYLINDER          1   1   RADIUS =  4.6275     +Z =  58.750     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
 16 CYLINDER          2   1   RADIUS =  4.6599     +Z =  58.750     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
```

```
                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                                      -----  UNIT     2   -----

AXIAL CLAD SECTIONS        TUBE  1  LOOSE

  1 CYLINDER          3  1  RADIUS =  3.0300    +Z =  1.3750    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  2 CYLINDER          2  1  RADIUS =  3.1600    +Z =  1.3750    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  3 CYLINDER          3  1  RADIUS =  3.5300    +Z =  1.3750    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  4 CYLINDER          2  1  RADIUS =  3.6600    +Z =  1.3750    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  5 CYLINDER          3  1  RADIUS =  4.0300    +Z =  1.3750    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  6 CYLINDER          2  1  RADIUS =  4.1600    +Z =  1.3750    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  7 CYLINDER          3  1  RADIUS =  4.5300    +Z =  1.3750    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  8 CYLINDER          2  1  RADIUS =  4.6599    +Z =  1.3750    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

                                                      -----  UNIT     3   -----

FUEL ELEMENT     TUBE  1

  1 CYLINDER          3  1  RADIUS =  4.6600    +Z =  61.500    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
    HOLE NUMBER       1       AT X = 0.00000     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER      2
    HOLE NUMBER       2       AT X = 0.00000     Y = 0.00000     Z =  1.3750    IS UNIT NUMBER      1
    HOLE NUMBER       3       AT X = 0.00000     Y = 0.00000     Z =  60.125    IS UNIT NUMBER      2

                                                      -----  UNIT     4   -----

BASKET FUEL TUBE - FUEL DOWN        RADIAL CENTERED

  1 CYLINDER          3  1  RADIUS =  5.0927    +Z =  73.177    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
    HOLE NUMBER       4       AT X = 0.00000     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER      3
  2 CYLINDER          2  1  RADIUS =  5.3974    +Z =  73.177    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

                                                      -----  UNIT     5   -----

BASKET FUEL TUBE - FUEL UP        RADIAL CENTERED

  1 CYLINDER          3  1  RADIUS =  5.0927    +Z =  73.177    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
    HOLE NUMBER       5       AT X = 0.00000     Y = 0.00000     Z =  11.677    IS UNIT NUMBER      3
  2 CYLINDER          2  1  RADIUS =  5.3974    +Z =  73.177    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000
```

```
               MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION          NUM   ID

                                                    -----  UNIT    6  -----

BASKET BOTTOM PLATE HOLE
  1 CYLINDER       3  1  RADIUS =  1.2700    +Z =  1.2698     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                                    -----  UNIT    7  -----

BASKET BOTTOM PLATE
  1 CYLINDER       6  1  RADIUS =  16.847    +Z =  1.2698     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
    HOLE NUMBER    6       AT X = 0.00000     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER      6
    HOLE NUMBER    7       AT X =  10.795     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER      6
    HOLE NUMBER    8       AT X =  5.3975     Y =  9.3487      Z = 0.00000     IS UNIT NUMBER      6
    HOLE NUMBER    9       AT X = -5.3975     Y =  9.3487      Z = 0.00000     IS UNIT NUMBER      6
    HOLE NUMBER   10       AT X = -10.795     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER      6
    HOLE NUMBER   11       AT X = -5.3975     Y = -9.3487      Z = 0.00000     IS UNIT NUMBER      6
    HOLE NUMBER   12       AT X =  5.3975     Y = -9.3487      Z = 0.00000     IS UNIT NUMBER      6

                                                    -----  UNIT    8  -----

HEAT TRANSFER BAR / ROD
  1 CYLINDER       7  1  RADIUS = 0.31650    +Z =  73.177     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
```

```
                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                              -----  UNIT    9  -----

BASKET FUEL DOWN
  1 CYLINDER        3   1  RADIUS =  16.193    +Z =  73.177    -Z = 0.00000   CENTERLINE IS AT  X = 0.00000    Y = 0.00000
    HOLE NUMBER    13      AT X = 0.00000     Y = 0.00000     Z = 0.00000   IS UNIT NUMBER    4
    HOLE NUMBER    14      AT X =  10.795     Y = 0.00000     Z = 0.00000   IS UNIT NUMBER    4
    HOLE NUMBER    15      AT X =  4.9493     Y =  2.8575     Z = 0.00000   IS UNIT NUMBER    8
    HOLE NUMBER    16      AT X =  4.6024     Y =  3.3881     Z = 0.00000   IS UNIT NUMBER    8
    HOLE NUMBER    17      AT X =  5.2354     Y =  2.2917     Z = 0.00000   IS UNIT NUMBER    8
    HOLE NUMBER    18      AT X =  5.3975     Y =  9.3487     Z = 0.00000   IS UNIT NUMBER    4
    HOLE NUMBER    19      AT X = 0.00000     Y =  5.7150     Z = 0.00000   IS UNIT NUMBER    8
    HOLE NUMBER    20      AT X =-0.63300     Y =  5.6798     Z = 0.00000   IS UNIT NUMBER    8
    HOLE NUMBER    21      AT X = 0.63300     Y =  5.6798     Z = 0.00000   IS UNIT NUMBER    8
    HOLE NUMBER    22      AT X = -5.3975     Y =  9.3487     Z = 0.00000   IS UNIT NUMBER    4
    HOLE NUMBER    23      AT X = -4.9493     Y =  2.8575     Z = 0.00000   IS UNIT NUMBER    8
    HOLE NUMBER    24      AT X = -5.2354     Y =  2.2917     Z = 0.00000   IS UNIT NUMBER    8
    HOLE NUMBER    25      AT X = -4.6024     Y =  3.3881     Z = 0.00000   IS UNIT NUMBER    8
    HOLE NUMBER    26      AT X = -10.795     Y = 0.00000     Z = 0.00000   IS UNIT NUMBER    4
    HOLE NUMBER    27      AT X = -4.9493     Y = -2.8575     Z = 0.00000   IS UNIT NUMBER    8
    HOLE NUMBER    28      AT X = -4.6024     Y = -3.3881     Z = 0.00000   IS UNIT NUMBER    8
    HOLE NUMBER    29      AT X = -5.2354     Y = -2.2917     Z = 0.00000   IS UNIT NUMBER    8
    HOLE NUMBER    30      AT X = -5.3975     Y = -9.3487     Z = 0.00000   IS UNIT NUMBER    4
    HOLE NUMBER    31      AT X = 0.00000     Y = -5.7150     Z = 0.00000   IS UNIT NUMBER    8
    HOLE NUMBER    32      AT X = 0.63300     Y = -5.6798     Z = 0.00000   IS UNIT NUMBER    8
    HOLE NUMBER    33      AT X =-0.63300     Y = -5.6798     Z = 0.00000   IS UNIT NUMBER    8
    HOLE NUMBER    34      AT X =  5.3975     Y = -9.3487     Z = 0.00000   IS UNIT NUMBER    4
    HOLE NUMBER    35      AT X =  4.9493     Y = -2.8575     Z = 0.00000   IS UNIT NUMBER    8
    HOLE NUMBER    36      AT X =  5.2354     Y = -2.2917     Z = 0.00000   IS UNIT NUMBER    8
    HOLE NUMBER    37      AT X =  4.6024     Y = -3.3881     Z = 0.00000   IS UNIT NUMBER    8
  2 CYLINDER        7   1  RADIUS =  16.669    +Z =  73.177    -Z = 0.00000   CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  3 CYLINDER        3   1  RADIUS =  16.847    +Z =  73.177    -Z = 0.00000   CENTERLINE IS AT  X = 0.00000    Y = 0.00000
```

```
                MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID

                                                ----- UNIT   10  -----

BASKET FUEL UP
  1 CYLINDER          3  1  RADIUS =  16.193     +Z =  73.177     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
    HOLE NUMBER      38       AT X = 0.00000      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER      5
    HOLE NUMBER      39       AT X =  10.795      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER      5
    HOLE NUMBER      40       AT X =  4.9493      Y =  2.8575      Z = 0.00000     IS UNIT NUMBER      8
    HOLE NUMBER      41       AT X =  4.6024      Y =  3.3881      Z = 0.00000     IS UNIT NUMBER      8
    HOLE NUMBER      42       AT X =  5.2354      Y =  2.2917      Z = 0.00000     IS UNIT NUMBER      8
    HOLE NUMBER      43       AT X =  5.3975      Y =  9.3487      Z = 0.00000     IS UNIT NUMBER      5
    HOLE NUMBER      44       AT X = 0.00000      Y =  5.7150      Z = 0.00000     IS UNIT NUMBER      8
    HOLE NUMBER      45       AT X =-0.63300      Y =  5.6798      Z = 0.00000     IS UNIT NUMBER      8
    HOLE NUMBER      46       AT X = 0.63300      Y =  5.6798      Z = 0.00000     IS UNIT NUMBER      8
    HOLE NUMBER      47       AT X = -5.3975      Y =  9.3487      Z = 0.00000     IS UNIT NUMBER      5
    HOLE NUMBER      48       AT X = -4.9493      Y =  2.8575      Z = 0.00000     IS UNIT NUMBER      8
    HOLE NUMBER      49       AT X = -5.2354      Y =  2.2917      Z = 0.00000     IS UNIT NUMBER      8
    HOLE NUMBER      50       AT X = -4.6024      Y =  3.3881      Z = 0.00000     IS UNIT NUMBER      8
    HOLE NUMBER      51       AT X = -10.795      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER      5
    HOLE NUMBER      52       AT X = -4.9493      Y = -2.8575      Z = 0.00000     IS UNIT NUMBER      8
    HOLE NUMBER      53       AT X = -4.6024      Y = -3.3881      Z = 0.00000     IS UNIT NUMBER      8
    HOLE NUMBER      54       AT X = -5.2354      Y = -2.2917      Z = 0.00000     IS UNIT NUMBER      8
    HOLE NUMBER      55       AT X = -5.3975      Y = -9.3487      Z = 0.00000     IS UNIT NUMBER      5
    HOLE NUMBER      56       AT X = 0.00000      Y = -5.7150      Z = 0.00000     IS UNIT NUMBER      8
    HOLE NUMBER      57       AT X = 0.63300      Y = -5.6798      Z = 0.00000     IS UNIT NUMBER      8
    HOLE NUMBER      58       AT X =-0.63300      Y = -5.6798      Z = 0.00000     IS UNIT NUMBER      8
    HOLE NUMBER      59       AT X =  5.3975      Y = -9.3487      Z = 0.00000     IS UNIT NUMBER      5
    HOLE NUMBER      60       AT X =  4.9493      Y = -2.8575      Z = 0.00000     IS UNIT NUMBER      8
    HOLE NUMBER      61       AT X =  5.2354      Y = -2.2917      Z = 0.00000     IS UNIT NUMBER      8
    HOLE NUMBER      62       AT X =  4.6024      Y = -3.3881      Z = 0.00000     IS UNIT NUMBER      8
  2 CYLINDER          7  1  RADIUS =  16.669     +Z =  73.177     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  3 CYLINDER          3  1  RADIUS =  16.847     +Z =  73.177     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
```

```
                    MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION               NUM   ID

                                             -----  UNIT    11   -----

CASK CAVITY
  1 CYLINDER          3  1  RADIUS =  16.986    +Z =  446.68    -Z = 0.00000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
    HOLE NUMBER      63       AT X = 0.00000    Y = 0.00000     Z = 1.00000E-04 IS UNIT NUMBER     7
    HOLE NUMBER      64       AT X = 0.00000    Y = 0.00000     Z =  1.2700     IS UNIT NUMBER    10
    HOLE NUMBER      65       AT X = 0.00000    Y = 0.00000     Z =  74.448     IS UNIT NUMBER     7
    HOLE NUMBER      66       AT X = 0.00000    Y = 0.00000     Z =  75.717     IS UNIT NUMBER     9
    HOLE NUMBER      67       AT X = 0.00000    Y = 0.00000     Z =  148.89     IS UNIT NUMBER     7
    HOLE NUMBER      68       AT X = 0.00000    Y = 0.00000     Z =  150.16     IS UNIT NUMBER    10
    HOLE NUMBER      69       AT X = 0.00000    Y = 0.00000     Z =  223.34     IS UNIT NUMBER     7
    HOLE NUMBER      70       AT X = 0.00000    Y = 0.00000     Z =  224.61     IS UNIT NUMBER     9
    HOLE NUMBER      71       AT X = 0.00000    Y = 0.00000     Z =  297.79     IS UNIT NUMBER     7
    HOLE NUMBER      72       AT X = 0.00000    Y = 0.00000     Z =  299.06     IS UNIT NUMBER    10
    HOLE NUMBER      73       AT X = 0.00000    Y = 0.00000     Z =  372.24     IS UNIT NUMBER     7
    HOLE NUMBER      74       AT X = 0.00000    Y = 0.00000     Z =  373.51     IS UNIT NUMBER     9

                                             -----  UNIT    12   -----

CASK SHIELD RADIAL CONFIGURATION
  1 CYLINDER          3  1  RADIUS =  16.986    +Z =  446.68    -Z = 0.00000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
    HOLE NUMBER      75       AT X = 0.00000    Y = 0.00000     Z = 0.00000     IS UNIT NUMBER    11
  2 CYLINDER          8  1  RADIUS =  18.910    +Z =  446.68    -Z = 0.00000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  3 CYLINDER          5  1  RADIUS =  33.465    +Z =  446.68    -Z = 0.00000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  4 CYLINDER          8  1  RADIUS =  36.519    +Z =  446.68    -Z = 0.00000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  5 CYLINDER          9  1  RADIUS =  49.219    +Z =  446.68    -Z = 0.00000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  6 CYLINDER          8  1  RADIUS =  49.818    +Z =  446.68    -Z = 0.00000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
```

```
                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                                    -----  UNIT    13   -----
LWT LID
  1 CYLINDER        8   1   RADIUS =  36.519    +Z =  28.575    -Z = 0.59940    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  2 CYLINDER        9   1   RADIUS =  49.818    +Z =  28.575    -Z = 0.59940    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  3 CYLINDER        8   1   RADIUS =  49.818    +Z =  28.575    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                                    -----  UNIT    14   -----
LWT BOTTOM WELDMENT
  1 CYLINDER        5   1   RADIUS =  26.353    +Z =  16.510    -Z =  8.8900    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  2 CYLINDER        8   1   RADIUS =  36.519    +Z =  26.071    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  3 CYLINDER        9   1   RADIUS =  49.818    +Z =  26.071    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  4 CYLINDER        8   1   RADIUS =  49.818    +Z =  26.670    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000      Y = 0.00000

                                                    -----  UNIT    15   -----
LWT CASK
  1 CYLINDER        9   1   RADIUS =  49.818    +Z =  501.93    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000      Y = 0.00000
    HOLE NUMBER    76         AT X = 0.00000     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER     14
    HOLE NUMBER    77         AT X = 0.00000     Y = 0.00000     Z =  26.670    IS UNIT NUMBER     12
    HOLE NUMBER    78         AT X = 0.00000     Y = 0.00000     Z =  473.35    IS UNIT NUMBER     13
```

```
                    MEDIA BIAS       GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION               NUM   ID

                                           ****************** GLOBAL  ******************
                                                       -----  UNIT    16   -----

FINITE CASK ARRAY 8 CASKS

  1 CUBOID              3  1     +X =  199.27     -X = -149.46     +Y =  136.11     -Y = -136.11     +Z =  501.93     -Z = 0.00000
    HOLE NUMBER        79      AT X = 0.00000      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER     15
    HOLE NUMBER        80      AT X =  99.637      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER     15
    HOLE NUMBER        81      AT X =  49.818      Y =  86.288      Z = 0.00000     IS UNIT NUMBER     15
    HOLE NUMBER        82      AT X = -49.818      Y =  86.288      Z = 0.00000     IS UNIT NUMBER     15
    HOLE NUMBER        83      AT X = -99.637      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER     15
    HOLE NUMBER        84      AT X = -49.818      Y = -86.288      Z = 0.00000     IS UNIT NUMBER     15
    HOLE NUMBER        85      AT X =  49.818      Y = -86.288      Z = 0.00000     IS UNIT NUMBER     15
    HOLE NUMBER        86      AT X =  149.46      Y = -86.288      Z = 0.00000     IS UNIT NUMBER     15
```

VOLUMES FOR THOSE UNITS UTILIZED IN THIS PROBLEM

UNIT	REGION	GEOMETRY REGION	VOLUME	CUMULATIVE VOLUME
1	1	1	1.69451E+03 CM**3	1.69451E+03 CM**3
	2	2	3.65458E+01 CM**3	1.73105E+03 CM**3
	3	3	7.42612E+01 CM**3	1.80531E+03 CM**3
	4	4	3.77155E+01 CM**3	1.84303E+03 CM**3
	5	5	4.56862E+02 CM**3	2.29989E+03 CM**3
	6	6	4.25442E+01 CM**3	2.34243E+03 CM**3
	7	7	8.62583E+01 CM**3	2.42869E+03 CM**3
	8	8	4.37139E+01 CM**3	2.47241E+03 CM**3
	9	9	5.25153E+02 CM**3	2.99756E+03 CM**3
	10	10	4.85422E+01 CM**3	3.04610E+03 CM**3
	11	11	9.82551E+01 CM**3	3.14436E+03 CM**3
	12	12	4.97122E+01 CM**3	3.19407E+03 CM**3
	13	13	5.93444E+02 CM**3	3.78751E+03 CM**3
	14	14	5.45405E+01 CM**3	3.84205E+03 CM**3
	15	15	1.10252E+02 CM**3	3.95231E+03 CM**3
	16	16	5.55391E+01 CM**3	4.00785E+03 CM**3
2	1	17	3.96586E+01 CM**3	3.96586E+01 CM**3
	2	18	3.47606E+00 CM**3	4.31347E+01 CM**3
	3	19	1.06925E+01 CM**3	5.38272E+01 CM**3
	4	20	4.03762E+00 CM**3	5.78648E+01 CM**3
	5	21	1.22908E+01 CM**3	7.01557E+01 CM**3
	6	22	4.59916E+00 CM**3	7.47548E+01 CM**3
	7	23	1.38891E+01 CM**3	8.86439E+01 CM**3
	8	24	5.15671E+00 CM**3	9.38006E+01 CM**3
3	1	25	1.79337E-01 CM**3	4.19563E+03 CM**3
4	1	26	1.76679E+03 CM**3	5.96242E+03 CM**3
	2	27	7.34815E+02 CM**3	6.69723E+03 CM**3
5	1	28	1.76679E+03 CM**3	5.96242E+03 CM**3
	2	29	7.34815E+02 CM**3	6.69723E+03 CM**3
6	1	30	6.43417E+00 CM**3	6.43417E+00 CM**3
7	1	31	1.08713E+03 CM**3	1.13216E+03 CM**3
8	1	32	2.30289E+01 CM**3	2.30289E+01 CM**3
9	1	33	1.29829E+04 CM**3	6.02781E+04 CM**3
	2	34	3.59751E+03 CM**3	6.38756E+04 CM**3
	3	35	1.36994E+03 CM**3	6.52455E+04 CM**3
10	1	36	1.29829E+04 CM**3	6.02781E+04 CM**3
	2	37	3.59751E+03 CM**3	6.38756E+04 CM**3
	3	38	1.36994E+03 CM**3	6.52455E+04 CM**3
11	1	39	6.63421E+03 CM**3	4.04900E+05 CM**3
12	1	40	0.00000E+00 CM**3	4.04900E+05 CM**3
	2	41	9.69190E+04 CM**3	5.01819E+05 CM**3
	3	42	1.06970E+06 CM**3	1.57152E+06 CM**3
	4	43	2.99966E+05 CM**3	1.87148E+06 CM**3
	5	44	1.52801E+06 CM**3	3.39950E+06 CM**3
	6	45	8.33038E+04 CM**3	3.48280E+06 CM**3
13	1	46	1.17210E+05 CM**3	1.17210E+05 CM**3
	2	47	1.00916E+05 CM**3	2.18126E+05 CM**3
	3	48	4.67352E+03 CM**3	2.22799E+05 CM**3
14	1	49	1.66245E+04 CM**3	1.66245E+04 CM**3
	2	50	9.26041E+04 CM**3	1.09229E+05 CM**3
	3	51	9.40439E+04 CM**3	2.03273E+05 CM**3
	4	52	4.67353E+03 CM**3	2.07946E+05 CM**3
15	1	53	2.42188E+00 CM**3	3.91355E+06 CM**3
16	1	54	1.63393E+07 CM**3	4.76477E+07 CM**3

UNIT	USES	REGION	MIXTURE	TOTAL VOLUME
1	336	1	3	5.69354E+05 CM**3
		2	2	1.22794E+04 CM**3
		3	1	2.49518E+04 CM**3
		4	2	1.26724E+04 CM**3
		5	3	1.53506E+05 CM**3
		6	2	1.42948E+04 CM**3
		7	1	2.89828E+04 CM**3
		8	2	1.46879E+04 CM**3
		9	3	1.76452E+05 CM**3
		10	2	1.63102E+04 CM**3
		11	1	3.30137E+04 CM**3
		12	2	1.67033E+04 CM**3
		13	3	1.99397E+05 CM**3
		14	2	1.83256E+04 CM**3
		15	1	3.70448E+04 CM**3
		16	2	1.86611E+04 CM**3
2	672	1	3	2.66506E+04 CM**3
		2	2	2.33591E+03 CM**3
		3	3	7.18538E+03 CM**3
		4	2	2.71328E+03 CM**3
		5	3	8.25943E+03 CM**3
		6	2	3.09064E+03 CM**3
		7	3	9.33348E+03 CM**3
		8	2	3.46531E+03 CM**3
3	336	1	3	6.02571E+01 CM**3

```
            4          168           1             3              2.96821E+05 CM**3
                                     2             2              1.23449E+05 CM**3

            5          168           1             3              2.96821E+05 CM**3
                                     2             2              1.23449E+05 CM**3

            6          336           1             3              2.16188E+03 CM**3

            7           48           1             6              5.21820E+04 CM**3

            8          864           1             7              1.98970E+04 CM**3

            9           24           1             3              3.11591E+05 CM**3
                                     2             7              8.63402E+04 CM**3
                                     3             3              3.28785E+04 CM**3

           10           24           1             3              3.11591E+05 CM**3
                                     2             7              8.63402E+04 CM**3
                                     3             3              3.28785E+04 CM**3

           11            8           1             3              5.30737E+04 CM**3

           12            8           1             3              0.00000E+00 CM**3
                                     2             8              7.75352E+05 CM**3
                                     3             5              8.55759E+06 CM**3
                                     4             8              2.39973E+06 CM**3
                                     5             9              1.22241E+07 CM**3
                                     6             8              6.66430E+05 CM**3

           13            8           1             8              9.37680E+05 CM**3
                                     2             9              8.07326E+05 CM**3
                                     3             8              3.73881E+04 CM**3

           14            8           1             5              1.32996E+05 CM**3
                                     2             8              7.40833E+05 CM**3
                                     3             9              7.52351E+05 CM**3
                                     4             8              3.73883E+04 CM**3

           15            8           1             9              1.93750E+01 CM**3

           16            1           1             3              1.63393E+07 CM**3


                          TOTAL MIXTURE VOLUMES
                  MIXTURE        TOTAL VOLUME                MASS(G)
                     1         1.23993E+05 CM**3           2.90231E+05
                     2         3.82438E+05 CM**3           1.03335E+06
                     3         1.88273E+07 CM**3           1.88230E+07
                     5         8.69059E+06 CM**3           9.85860E+07
                     6         5.21820E+04 CM**3           4.13282E+05
                     7         1.92577E+05 CM**3           5.20344E+05
                     8         5.59480E+06 CM**3           4.43108E+07
                     9         1.37838E+07 CM**3           1.37834E+03

 ***********************************************************************************************************************
 ***                                                                                                                 ***
 ***                                            BIASING INFORMATION                                                  ***
 ***                                                                                                                 ***
 ***     A DEFAULT WEIGHT OF    0.500 WILL BE USED FOR ALL BIAS ID'S.                                                ***
 ***                                                                                                                 ***
 ***********************************************************************************************************************

                  ........   0 IO'S WERE USED IN KENO-V BEFORE TRACKING        ........

                  ........  0.01267 MINUTES WERE USED PROCESSING DATA.         ........

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 2.60229E-03

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED WITH A FLAT DISTRIBUTION IN A CUBOID DEFINED BY:
                       +X= 1.68500E+01  -X=-1.68500E+01  +Y=-1.68500E+01  -Y= 1.68500E+01  +Z= 4.73350E+02  -Z= 2.66700E+01
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

0.11100 MINUTES WERE REQUIRED FOR STARTING.   TOTAL ELAPSED TIME IS 0.11733 MINUTES.
```

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	961 INDEPENDENT	FISSION POINTS WERE	GENERATED	
1	8.58773E-01	1.46333E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	9.33771E-01	1.68333E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	957 INDEPENDENT	FISSION POINTS WERE	GENERATED	
3	8.63486E-01	1.93000E-01	8.63486E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	8.78581E-01	2.16000E-01	8.71034E-01	7.54768E-03	0.00000E+00	0.00000E+00
5	9.04679E-01	2.39833E-01	8.82249E-01	1.20320E-02	0.00000E+00	0.00000E+00
6	9.24609E-01	2.62667E-01	8.92839E-01	1.35843E-02	0.00000E+00	0.00000E+00
7	9.17145E-01	2.84667E-01	8.97700E-01	1.15910E-02	0.00000E+00	0.00000E+00
8	9.05527E-01	3.08500E-01	8.99005E-01	9.55350E-03	0.00000E+00	0.00000E+00
9	9.23056E-01	3.32167E-01	9.02441E-01	8.77483E-03	0.00000E+00	0.00000E+00
10	9.21692E-01	3.56000E-01	9.04847E-01	7.97116E-03	0.00000E+00	0.00000E+00
11	9.00007E-01	3.79833E-01	9.04309E-01	7.05044E-03	0.00000E+00	0.00000E+00
12	8.57565E-01	4.04500E-01	8.99635E-01	7.84969E-03	0.00000E+00	0.00000E+00
13	8.57721E-01	4.28333E-01	8.95824E-01	8.05812E-03	0.00000E+00	0.00000E+00
14	9.43923E-01	4.51167E-01	8.99833E-01	8.37718E-03	0.00000E+00	0.00000E+00
15	9.09837E-01	4.74167E-01	9.00602E-01	7.74422E-03	0.00000E+00	0.00000E+00
16	9.19908E-01	4.97000E-01	9.01981E-01	7.30116E-03	0.00000E+00	0.00000E+00
17	9.33907E-01	5.21667E-01	9.04110E-01	7.12246E-03	0.00000E+00	0.00000E+00
18	8.70579E-01	5.44667E-01	9.02014E-01	6.98426E-03	0.00000E+00	0.00000E+00
19	9.15282E-01	5.68333E-01	9.02794E-01	6.60683E-03	0.00000E+00	0.00000E+00
20	8.77815E-01	5.93167E-01	9.01407E-01	6.38169E-03	0.00000E+00	0.00000E+00
21	9.26908E-01	6.16000E-01	9.02749E-01	6.18389E-03	0.00000E+00	0.00000E+00
22	8.79347E-01	6.41667E-01	9.01579E-01	5.98210E-03	0.00000E+00	0.00000E+00
23	9.13359E-01	6.65500E-01	9.02140E-01	5.71770E-03	0.00000E+00	0.00000E+00
24	8.82892E-01	6.89167E-01	9.01265E-01	5.52137E-03	0.00000E+00	0.00000E+00
25	9.10070E-01	7.13000E-01	9.01648E-01	5.28972E-03	0.00000E+00	0.00000E+00
26	8.56690E-01	7.37833E-01	8.99774E-01	5.39986E-03	0.00000E+00	0.00000E+00
27	8.64557E-01	7.62500E-01	8.98366E-01	5.36752E-03	0.00000E+00	0.00000E+00
28	9.22162E-01	7.85333E-01	8.99281E-01	5.23753E-03	0.00000E+00	0.00000E+00
29	8.95370E-01	8.08167E-01	8.99136E-01	5.04190E-03	0.00000E+00	0.00000E+00
30	8.96834E-01	8.33833E-01	8.99054E-01	4.85919E-03	0.00000E+00	0.00000E+00
31	8.81740E-01	8.57667E-01	8.98457E-01	4.72650E-03	0.00000E+00	0.00000E+00
32	8.88292E-01	8.81500E-01	8.98118E-01	4.57879E-03	0.00000E+00	0.00000E+00
33	8.98466E-01	9.06167E-01	8.98129E-01	4.42863E-03	0.00000E+00	0.00000E+00
34	9.31577E-01	9.29000E-01	8.99175E-01	4.41356E-03	0.00000E+00	0.00000E+00
35	8.80767E-01	9.52833E-01	8.98617E-01	4.31394E-03	0.00000E+00	0.00000E+00
36	9.21118E-01	9.76667E-01	8.99278E-01	4.23714E-03	0.00000E+00	0.00000E+00
37	8.52259E-01	1.00050E+00	8.97935E-01	4.32807E-03	0.00000E+00	0.00000E+00
38	8.69525E-01	1.02433E+00	8.97146E-01	4.27953E-03	0.00000E+00	0.00000E+00
39	9.03040E-01	1.04817E+00	8.97305E-01	4.16530E-03	0.00000E+00	0.00000E+00
40	8.81602E-01	1.07183E+00	8.96892E-01	4.07522E-03	0.00000E+00	0.00000E+00
41	8.62374E-01	1.09667E+00	8.96007E-01	4.06682E-03	0.00000E+00	0.00000E+00
42	9.02090E-01	1.12133E+00	8.96159E-01	3.96677E-03	0.00000E+00	0.00000E+00
43	8.94155E-01	1.14517E+00	8.96110E-01	3.86911E-03	0.00000E+00	0.00000E+00
44	9.02857E-01	1.16900E+00	8.96271E-01	3.77929E-03	0.00000E+00	0.00000E+00
45	9.40155E-01	1.19083E+00	8.97291E-01	3.82887E-03	0.00000E+00	0.00000E+00
46	8.79557E-01	1.21467E+00	8.96888E-01	3.76249E-03	0.00000E+00	0.00000E+00
47	9.17170E-01	1.23850E+00	8.97339E-01	3.70544E-03	0.00000E+00	0.00000E+00
48	9.17262E-01	1.26233E+00	8.97772E-01	3.64978E-03	0.00000E+00	0.00000E+00
49	9.12876E-01	1.28617E+00	8.98093E-01	3.58571E-03	0.00000E+00	0.00000E+00
50	8.99770E-01	1.31083E+00	8.98128E-01	3.51039E-03	0.00000E+00	0.00000E+00
51	8.66263E-01	1.33467E+00	8.97478E-01	3.49896E-03	0.00000E+00	0.00000E+00
52	8.75319E-01	1.35933E+00	8.97035E-01	3.45680E-03	0.00000E+00	0.00000E+00
53	8.80759E-01	1.38317E+00	8.96716E-01	3.40333E-03	0.00000E+00	0.00000E+00
54	8.67570E-01	1.40783E+00	8.96155E-01	3.38398E-03	0.00000E+00	0.00000E+00
55	9.51958E-01	1.43250E+00	8.97208E-01	3.48250E-03	0.00000E+00	0.00000E+00
56	9.09210E-01	1.45550E+00	8.97430E-01	3.42462E-03	0.00000E+00	0.00000E+00
57	9.07998E-01	1.47933E+00	8.97623E-01	3.36726E-03	0.00000E+00	0.00000E+00
58	8.73204E-01	1.50400E+00	8.97186E-01	3.33521E-03	0.00000E+00	0.00000E+00
59	9.10378E-01	1.52783E+00	8.97418E-01	3.28434E-03	0.00000E+00	0.00000E+00
60	8.92000E-01	1.55150E+00	8.97325E-01	3.22857E-03	0.00000E+00	0.00000E+00
61	8.89776E-01	1.57633E+00	8.97197E-01	3.17596E-03	0.00000E+00	0.00000E+00
62	8.55916E-01	1.60100E+00	8.96509E-01	3.19747E-03	0.00000E+00	0.00000E+00
63	9.32555E-01	1.62300E+00	8.97099E-01	3.19966E-03	0.00000E+00	0.00000E+00
64	9.25066E-01	1.64583E+00	8.97551E-01	3.17978E-03	0.00000E+00	0.00000E+00
65	8.77079E-01	1.67050E+00	8.97226E-01	3.14573E-03	0.00000E+00	0.00000E+00
66	9.09881E-01	1.69433E+00	8.97423E-01	3.10250E-03	0.00000E+00	0.00000E+00
67	8.76992E-01	1.71817E+00	8.97109E-01	3.07052E-03	0.00000E+00	0.00000E+00
68	9.21783E-01	1.74100E+00	8.97483E-01	3.04667E-03	0.00000E+00	0.00000E+00
69	9.05453E-01	1.76483E+00	8.97602E-01	3.00321E-03	0.00000E+00	0.00000E+00
70	9.24480E-01	1.78783E+00	8.97997E-01	2.98500E-03	0.00000E+00	0.00000E+00
71	8.63590E-01	1.81250E+00	8.97498E-01	2.98339E-03	0.00000E+00	0.00000E+00
72	9.37983E-01	1.83533E+00	8.98077E-01	2.99680E-03	0.00000E+00	0.00000E+00
73	8.79989E-01	1.85917E+00	8.97822E-01	2.96525E-03	0.00000E+00	0.00000E+00
74	8.83123E-01	1.88300E+00	8.97618E-01	2.93090E-03	0.00000E+00	0.00000E+00
75	9.15389E-01	1.90683E+00	8.97861E-01	2.90070E-03	0.00000E+00	0.00000E+00
76	8.74826E-01	1.93233E+00	8.97550E-01	2.87812E-03	0.00000E+00	0.00000E+00
77	8.80442E-01	1.95533E+00	8.97322E-01	2.84863E-03	0.00000E+00	0.00000E+00
78	8.80627E-01	1.97817E+00	8.97102E-01	2.81947E-03	0.00000E+00	0.00000E+00
79	9.12211E-01	2.00200E+00	8.97298E-01	2.78952E-03	0.00000E+00	0.00000E+00
80	8.44802E-01	2.02667E+00	8.96625E-01	2.83459E-03	0.00000E+00	0.00000E+00
81	8.98826E-01	2.05050E+00	8.96653E-01	2.79862E-03	0.00000E+00	0.00000E+00
82	8.72723E-01	2.07433E+00	8.96354E-01	2.77955E-03	0.00000E+00	0.00000E+00
83	8.83782E-01	2.09717E+00	8.96199E-01	2.74941E-03	0.00000E+00	0.00000E+00
84	8.99513E-01	2.12183E+00	8.96239E-01	2.71597E-03	0.00000E+00	0.00000E+00
85	9.24791E-01	2.14567E+00	8.96583E-01	2.70501E-03	0.00000E+00	0.00000E+00
86	8.74108E-01	2.16850E+00	8.96316E-01	2.68598E-03	0.00000E+00	0.00000E+00
87	9.23002E-01	2.19233E+00	8.96630E-01	2.67269E-03	0.00000E+00	0.00000E+00
88	9.00543E-01	2.21717E+00	8.96675E-01	2.64182E-03	0.00000E+00	0.00000E+00
89	8.82276E-01	2.24083E+00	8.96510E-01	2.61652E-03	0.00000E+00	0.00000E+00
90	8.56795E-01	2.26467E+00	8.96058E-01	2.62569E-03	0.00000E+00	0.00000E+00
91	8.99466E-01	2.28850E+00	8.96097E-01	2.59631E-03	0.00000E+00	0.00000E+00
92	8.66877E-01	2.31317E+00	8.95772E-01	2.58774E-03	0.00000E+00	0.00000E+00
93	8.74085E-01	2.33700E+00	8.95534E-01	2.57022E-03	0.00000E+00	0.00000E+00
94	9.21830E-01	2.36083E+00	8.95820E-01	2.55815E-03	0.00000E+00	0.00000E+00
95	9.10253E-01	2.38367E+00	8.95975E-01	2.53525E-03	0.00000E+00	0.00000E+00
96	9.00694E-01	2.40750E+00	8.96025E-01	2.50863E-03	0.00000E+00	0.00000E+00
97	9.26241E-01	2.43133E+00	8.96343E-01	2.50238E-03	0.00000E+00	0.00000E+00
98	8.86651E-01	2.45417E+00	8.96242E-01	2.47824E-03	0.00000E+00	0.00000E+00
99	8.99097E-01	2.47883E+00	8.96272E-01	2.45273E-03	0.00000E+00	0.00000E+00
100	9.44858E-01	2.50183E+00	8.96767E-01	2.47768E-03	0.00000E+00	0.00000E+00
101	8.97823E-01	2.52550E+00	8.96778E-01	2.45255E-03	0.00000E+00	0.00000E+00
102	9.16019E-01	2.54850E+00	8.96970E-01	2.43551E-03	0 00000E+00	0.00000E+00

103	9.08980E-01	2.57233E+00	8.97089E-01	2.41421E-03	0.00000E+00	0.00000E+00
104	8.86222E-01	2.59600E+00	8.96983E-01	2.39280E-03	0.00000E+00	0.00000E+00
105	9.21146E-01	2.61983E+00	8.97217E-01	2.38104E-03	0.00000E+00	0.00000E+00
106	8.86269E-01	2.64283E+00	8.97112E-01	2.36038E-03	0.00000E+00	0.00000E+00
107	9.49570E-01	2.66650E+00	8.97612E-01	2.39058E-03	0.00000E+00	0.00000E+00
108	8.80226E-01	2.69033E+00	8.97448E-01	2.37359E-03	0.00000E+00	0.00000E+00
109	8.79681E-01	2.71317E+00	8.97282E-01	2.35716E-03	0.00000E+00	0.00000E+00
110	8.90503E-01	2.73617E+00	8.97219E-01	2.33608E-03	0.00000E+00	0.00000E+00
111	9.24128E-01	2.76000E+00	8.97466E-01	2.32768E-03	0.00000E+00	0.00000E+00
112	9.04722E-01	2.78367E+00	8.97532E-01	2.30736E-03	0.00000E+00	0.00000E+00
113	8.95747E-01	2.80850E+00	8.97516E-01	2.28654E-03	0.00000E+00	0.00000E+00
114	8.68503E-01	2.83233E+00	8.97257E-01	2.28079E-03	0.00000E+00	0.00000E+00
115	9.27085E-01	2.85600E+00	8.97521E-01	2.27587E-03	0.00000E+00	0.00000E+00
116	8.80557E-01	2.87900E+00	8.97372E-01	2.26072E-03	0.00000E+00	0.00000E+00
117	8.99169E-01	2.90267E+00	8.97387E-01	2.24103E-03	0.00000E+00	0.00000E+00
118	9.34573E-01	2.92567E+00	8.97708E-01	2.24464E-03	0.00000E+00	0.00000E+00
119	9.18461E-01	2.94850E+00	8.97885E-01	2.23243E-03	0.00000E+00	0.00000E+00
120	8.64606E-01	2.97233E+00	8.97603E-01	2.23132E-03	0.00000E+00	0.00000E+00
121	9.13743E-01	2.99617E+00	8.97739E-01	2.21665E-03	0.00000E+00	0.00000E+00
122	9.13687E-01	3.01983E+00	8.97872E-01	2.20211E-03	0.00000E+00	0.00000E+00
123	8.71706E-01	3.04283E+00	8.97656E-01	2.19452E-03	0.00000E+00	0.00000E+00
124	8.73371E-01	3.06750E+00	8.97457E-01	2.18554E-03	0.00000E+00	0.00000E+00
125	8.61744E-01	3.09133E+00	8.97166E-01	2.18705E-03	0.00000E+00	0.00000E+00
126	8.87808E-01	3.11417E+00	8.97091E-01	2.17066E-03	0.00000E+00	0.00000E+00
127	8.46442E-01	3.13900E+00	8.96686E-01	2.19101E-03	0.00000E+00	0.00000E+00
128	8.63348E-01	3.16367E+00	8.96421E-01	2.18960E-03	0.00000E+00	0.00000E+00
129	8.53674E-01	3.18833E+00	8.96084E-01	2.19821E-03	0.00000E+00	0.00000E+00
130	9.09836E-01	3.21217E+00	8.96192E-01	2.18362E-03	0.00000E+00	0.00000E+00
131	8.96024E-01	3.23600E+00	8.96190E-01	2.16662E-03	0.00000E+00	0.00000E+00
132	8.98081E-01	3.25983E+00	8.96205E-01	2.14994E-03	0.00000E+00	0.00000E+00
133	8.88058E-01	3.28350E+00	8.96143E-01	2.13437E-03	0.00000E+00	0.00000E+00
134	9.16562E-01	3.30833E+00	8.96298E-01	2.12378E-03	0.00000E+00	0.00000E+00
135	8.81358E-01	3.33200E+00	8.96185E-01	2.11075E-03	0.00000E+00	0.00000E+00
136	8.88469E-01	3.35583E+00	8.96128E-01	2.09573E-03	0.00000E+00	0.00000E+00
137	8.84176E-01	3.37967E+00	8.96039E-01	2.08203E-03	0.00000E+00	0.00000E+00
138	9.08892E-01	3.40350E+00	8.96134E-01	2.06882E-03	0.00000E+00	0.00000E+00
139	9.07285E-01	3.42817E+00	8.96215E-01	2.05528E-03	0.00000E+00	0.00000E+00
140	8.79684E-01	3.45200E+00	8.96095E-01	2.04384E-03	0.00000E+00	0.00000E+00
141	8.87105E-01	3.47583E+00	8.96031E-01	2.03012E-03	0.00000E+00	0.00000E+00
142	8.94803E-01	3.49867E+00	8.96022E-01	2.01558E-03	0.00000E+00	0.00000E+00
143	9.08305E-01	3.52150E+00	8.96109E-01	2.00313E-03	0.00000E+00	0.00000E+00
144	8.55544E-01	3.54533E+00	8.95823E-01	2.00939E-03	0.00000E+00	0.00000E+00
145	8.85286E-01	3.56833E+00	8.95749E-01	1.99664E-03	0.00000E+00	0.00000E+00
146	8.92547E-01	3.59200E+00	8.95727E-01	1.98285E-03	0.00000E+00	0.00000E+00
147	8.52651E-01	3.61683E+00	8.95430E-01	1.99142E-03	0.00000E+00	0.00000E+00
148	9.24393E-01	3.64050E+00	8.95629E-01	1.98765E-03	0.00000E+00	0.00000E+00
149	9.03056E-01	3.66533E+00	8.95679E-01	1.97473E-03	0.00000E+00	0.00000E+00
150	9.16130E-01	3.68817E+00	8.95817E-01	1.96621E-03	0.00000E+00	0.00000E+00
151	9.09824E-01	3.71200E+00	8.95911E-01	1.95523E-03	0.00000E+00	0.00000E+00
152	8.96596E-01	3.73483E+00	8.95916E-01	1.94215E-03	0.00000E+00	0.00000E+00
153	8.98241E-01	3.75767E+00	8.95931E-01	1.92931E-03	0.00000E+00	0.00000E+00
154	9.12544E-01	3.78150E+00	8.96041E-01	1.91969E-03	0.00000E+00	0.00000E+00
155	9.37176E-01	3.80450E+00	8.96309E-01	1.92596E-03	0.00000E+00	0.00000E+00
156	9.42169E-01	3.82817E+00	8.96607E-01	1.93645E-03	0.00000E+00	0.00000E+00
157	8.91191E-01	3.85300E+00	8.96572E-01	1.92423E-03	0.00000E+00	0.00000E+00
158	9.08956E-01	3.87583E+00	8.96652E-01	1.91350E-03	0.00000E+00	0.00000E+00
159	8.95884E-01	3.89967E+00	8.96647E-01	1.90128E-03	0.00000E+00	0.00000E+00
160	8.98953E-01	3.92350E+00	8.96661E-01	1.88927E-03	0.00000E+00	0.00000E+00
161	8.96101E-01	3.94717E+00	8.96658E-01	1.87735E-03	0.00000E+00	0.00000E+00
162	8.83021E-01	3.97100E+00	8.96573E-01	1.86753E-03	0.00000E+00	0.00000E+00
163	9.16210E-01	3.99583E+00	8.96695E-01	1.85989E-03	0.00000E+00	0.00000E+00
164	8.58566E-01	4.01950E+00	8.96459E-01	1.86330E-03	0.00000E+00	0.00000E+00
165	9.21076E-01	4.04333E+00	8.96610E-01	1.85798E-03	0.00000E+00	0.00000E+00
166	8.95743E-01	4.06533E+00	8.96605E-01	1.84663E-03	0.00000E+00	0.00000E+00
167	8.88705E-01	4.09000E+00	8.96557E-01	1.83602E-03	0.00000E+00	0.00000E+00
168	8.83226E-01	4.11383E+00	8.96477E-01	1.82670E-03	0.00000E+00	0.00000E+00
169	8.78492E-01	4.13767E+00	8.96369E-01	1.81892E-03	0.00000E+00	0.00000E+00
170	8.94948E-01	4.16150E+00	8.96361E-01	1.80808E-03	0.00000E+00	0.00000E+00
171	8.81945E-01	4.18517E+00	8.96275E-01	1.79937E-03	0.00000E+00	0.00000E+00
172	9.10233E-01	4.20817E+00	8.96357E-01	1.79064E-03	0.00000E+00	0.00000E+00
173	9.23181E-01	4.23283E+00	8.96514E-01	1.78703E-03	0.00000E+00	0.00000E+00
174	9.22740E-01	4.25483E+00	8.96667E-01	1.78314E-03	0.00000E+00	0.00000E+00
175	9.10878E-01	4.27950E+00	8.96749E-01	1.77471E-03	0.00000E+00	0.00000E+00
176	9.17149E-01	4.30333E+00	8.96866E-01	1.76837E-03	0.00000E+00	0.00000E+00
177	8.88689E-01	4.32617E+00	8.96819E-01	1.75886E-03	0.00000E+00	0.00000E+00
178	8.99471E-01	4.35100E+00	8.96834E-01	1.74890E-03	0.00000E+00	0.00000E+00
179	9.09166E-01	4.37383E+00	8.96904E-01	1.74039E-03	0.00000E+00	0.00000E+00
180	8.35989E-01	4.39850E+00	8.96562E-01	1.76409E-03	0.00000E+00	0.00000E+00
181	8.69753E-01	4.42233E+00	8.96412E-01	1.76059E-03	0.00000E+00	0.00000E+00
182	9.01969E-01	4.44700E+00	8.96443E-01	1.75106E-03	0.00000E+00	0.00000E+00
183	8.91836E-01	4.47083E+00	8.96418E-01	1.74154E-03	0.00000E+00	0.00000E+00
184	9.17951E-01	4.49550E+00	8.96536E-01	1.73598E-03	0.00000E+00	0.00000E+00
185	8.99231E-01	4.51933E+00	8.96551E-01	1.72653E-03	0.00000E+00	0.00000E+00
186	8.84331E-01	4.54233E+00	8.96484E-01	1.71841E-03	0.00000E+00	0.00000E+00
187	9.16742E-01	4.56700E+00	8.96594E-01	1.71260E-03	0.00000E+00	0.00000E+00
188	8.71679E-01	4.59167E+00	8.96460E-01	1.70862E-03	0.00000E+00	0.00000E+00
189	8.58782E-01	4.61550E+00	8.96258E-01	1.71136E-03	0.00000E+00	0.00000E+00
190	8.96294E-01	4.63933E+00	8.96258E-01	1.70224E-03	0.00000E+00	0.00000E+00
191	8.59250E-01	4.66217E+00	8.96063E-01	1.70449E-03	0.00000E+00	0.00000E+00
192	8.84561E-01	4.68500E+00	8.96002E-01	1.69658E-03	0.00000E+00	0.00000E+00
193	9.31881E-01	4.70883E+00	8.96190E-01	1.69809E-03	0.00000E+00	0.00000E+00
194	8.75438E-01	4.73450E+00	8.96082E-01	1.69268E-03	0.00000E+00	0.00000E+00
195	9.27613E-01	4.75733E+00	8.96245E-01	1.69179E-03	0.00000E+00	0.00000E+00
196	8.86960E-01	4.78117E+00	8.96197E-01	1.68373E-03	0.00000E+00	0.00000E+00
197	8.78513E-01	4.80500E+00	8.96107E-01	1.67753E-03	0.00000E+00	0.00000E+00
198	8.43970E-01	4.83150E+00	8.95841E-01	1.69001E-03	0.00000E+00	0.00000E+00
199	8.93770E-01	4.85633E+00	8.95830E-01	1.68145E-03	0.00000E+00	0.00000E+00
200	8.99111E-01	4.87917E+00	8.95847E-01	1.67301E-03	0.00000E+00	0.00000E+00
201	9.19939E-01	4.90200E+00	8.95968E-01	1.66898E-03	0.00000E+00	0.00000E+00
202	9.30312E-01	4.92483E+00	8.96140E-01	1.66947E-03	0.00000E+00	0.00000E+00
203	8.90682E-01	4.94967E+00	8.96112E-01	1.66137E-03	0.00000E+00	0.00000E+00
204	8.33278E-01	4.97533E+00	8.95801E-01	1.68213E-03	0.00000E+00	0.00000E+00
205	8.94063E-01	4.99900E+00	8.95793E-01	1.67385E-03	0.00000E+00	0.00000E+00
206	8.93316E-01	5.02200E+00	8.95781E-01	1.66567E-03	0.00000E+00	0.00000E+00
207	9.06016E-01	5.04667E+00	8.95831E-01	1.65827E-03	0.00000E+00	0.00000E+00
208	9.00892E-01	5.06950E+00	8.95855E-01	1.65039E-03	0.00000E+00	0.00000E+00
209	9.42164E-01	5.09250E+00	8.96079E-01	1.65756E-03	0.00000E+00	0.00000E+00
210	8.75255E-01	5.11800E+00	8.95979E-01	1.65261E-03	0.00000E+00	0.00000E+00

211	8.89688E-01	5.14183E+00	8.95949E-01	1.64496E-03	0.00000E+00	0.00000E+00
212	8.90783E-01	5.16483E+00	8.95924E-01	1.63729E-03	0.00000E+00	0.00000E+00
213	8.93693E-01	5.18850E+00	8.95913E-01	1.62955E-03	0.00000E+00	0.00000E+00
214	8.65067E-01	5.21333E+00	8.95768E-01	1.62836E-03	0.00000E+00	0.00000E+00
215	8.67362E-01	5.23617E+00	8.95635E-01	1.62617E-03	0.00000E+00	0.00000E+00
216	8.88983E-01	5.26000E+00	8.95603E-01	1.61885E-03	0.00000E+00	0.00000E+00
217	9.22045E-01	5.28383E+00	8.95726E-01	1.61599E-03	0.00000E+00	0.00000E+00
218	9.43618E-01	5.30750E+00	8.95948E-01	1.62370E-03	0.00000E+00	0.00000E+00
219	8.66742E-01	5.33133E+00	8.95814E-01	1.62180E-03	0.00000E+00	0.00000E+00
220	8.71369E-01	5.35517E+00	8.95701E-01	1.61823E-03	0.00000E+00	0.00000E+00
221	8.55960E-01	5.37983E+00	8.95520E-01	1.62101E-03	0.00000E+00	0.00000E+00
222	9.12158E-01	5.40283E+00	8.95596E-01	1.61540E-03	0.00000E+00	0.00000E+00
223	8.95254E-01	5.42650E+00	8.95594E-01	1.60807E-03	0.00000E+00	0.00000E+00
224	8.60585E-01	5.45033E+00	8.95436E-01	1.60856E-03	0.00000E+00	0.00000E+00
225	8.74524E-01	5.47417E+00	8.95343E-01	1.60408E-03	0.00000E+00	0.00000E+00
226	9.14818E-01	5.49700E+00	8.95430E-01	1.59926E-03	0.00000E+00	0.00000E+00
227	9.31760E-01	5.52083E+00	8.95591E-01	1.60031E-03	0.00000E+00	0.00000E+00
228	8.65724E-01	5.54550E+00	8.95459E-01	1.59868E-03	0.00000E+00	0.00000E+00
229	9.18458E-01	5.56850E+00	8.95560E-01	1.59485E-03	0.00000E+00	0.00000E+00
230	9.06092E-01	5.59317E+00	8.95606E-01	1.58851E-03	0.00000E+00	0.00000E+00
231	9.21820E-01	5.61600E+00	8.95721E-01	1.58569E-03	0.00000E+00	0.00000E+00
232	8.93586E-01	5.64167E+00	8.95712E-01	1.57881E-03	0.00000E+00	0.00000E+00
233	9.10990E-01	5.66450E+00	8.95778E-01	1.57335E-03	0.00000E+00	0.00000E+00
234	9.12836E-01	5.68833E+00	8.95851E-01	1.56828E-03	0.00000E+00	0.00000E+00
235	9.13126E-01	5.71033E+00	8.95925E-01	1.56329E-03	0.00000E+00	0.00000E+00
236	9.25522E-01	5.73417E+00	8.96052E-01	1.56173E-03	0.00000E+00	0.00000E+00
237	8.87379E-01	5.75883E+00	8.96015E-01	1.55551E-03	0.00000E+00	0.00000E+00
238	8.68187E-01	5.78350E+00	8.95897E-01	1.55338E-03	0.00000E+00	0.00000E+00
239	8.60217E-01	5.80917E+00	8.95746E-01	1.55412E-03	0.00000E+00	0.00000E+00
240	8.69248E-01	5.83217E+00	8.95635E-01	1.55158E-03	0.00000E+00	0.00000E+00
241	8.98512E-01	5.85583E+00	8.95647E-01	1.54512E-03	0.00000E+00	0.00000E+00
242	9.11914E-01	5.87883E+00	8.95715E-01	1.54016E-03	0.00000E+00	0.00000E+00
243	8.77626E-01	5.90167E+00	8.95640E-01	1.53559E-03	0.00000E+00	0.00000E+00
244	8.84961E-01	5.92550E+00	8.95596E-01	1.52987E-03	0.00000E+00	0.00000E+00
245	9.15886E-01	5.94933E+00	8.95679E-01	1.52585E-03	0.00000E+00	0.00000E+00
246	8.46228E-01	5.97400E+00	8.95477E-01	1.53304E-03	0.00000E+00	0.00000E+00
247	9.17179E-01	5.99783E+00	8.95565E-01	1.52934E-03	0.00000E+00	0.00000E+00
248	8.59401E-01	6.02167E+00	8.95418E-01	1.53018E-03	0.00000E+00	0.00000E+00
249	8.95811E-01	6.04533E+00	8.95420E-01	1.52398E-03	0.00000E+00	0.00000E+00
250	8.92145E-01	6.06917E+00	8.95407E-01	1.51788E-03	0.00000E+00	0.00000E+00
251	9.48130E-01	6.09200E+00	8.95618E-01	1.52653E-03	0.00000E+00	0.00000E+00
252	8.78052E-01	6.11583E+00	8.95548E-01	1.52203E-03	0.00000E+00	0.00000E+00
253	9.35664E-01	6.13967E+00	8.95708E-01	1.52436E-03	0.00000E+00	0.00000E+00
254	8.93427E-01	6.16533E+00	8.95699E-01	1.51832E-03	0.00000E+00	0.00000E+00
255	8.96659E-01	6.18817E+00	8.95703E-01	1.51231E-03	0.00000E+00	0.00000E+00
256	9.01249E-01	6.21200E+00	8.95724E-01	1.50651E-03	0.00000E+00	0.00000E+00
257	9.24391E-01	6.23483E+00	8.95837E-01	1.50479E-03	0.00000E+00	0.00000E+00
258	8.77010E-01	6.25783E+00	8.95763E-01	1.50070E-03	0.00000E+00	0.00000E+00
259	9.03217E-01	6.28067E+00	8.95792E-01	1.49513E-03	0.00000E+00	0.00000E+00
260	8.79833E-01	6.30633E+00	8.95730E-01	1.49061E-03	0.00000E+00	0.00000E+00
261	9.02200E-01	6.33017E+00	8.95755E-01	1.48506E-03	0.00000E+00	0.00000E+00
262	8.80712E-01	6.35383E+00	8.95698E-01	1.48046E-03	0.00000E+00	0.00000E+00
263	9.17152E-01	6.37683E+00	8.95780E-01	1.47707E-03	0.00000E+00	0.00000E+00
264	8.63141E-01	6.40150E+00	8.95655E-01	1.47669E-03	0.00000E+00	0.00000E+00
265	8.95414E-01	6.42533E+00	8.95654E-01	1.47106E-03	0.00000E+00	0.00000E+00
266	9.00271E-01	6.44817E+00	8.95672E-01	1.46558E-03	0.00000E+00	0.00000E+00
267	8.75753E-01	6.47383E+00	8.95597E-01	1.46197E-03	0.00000E+00	0.00000E+00
268	9.23365E-01	6.49767E+00	8.95701E-01	1.46020E-03	0.00000E+00	0.00000E+00
269	8.88812E-01	6.52317E+00	8.95675E-01	1.45495E-03	0.00000E+00	0.00000E+00
270	9.20117E-01	6.54617E+00	8.95766E-01	1.45238E-03	0.00000E+00	0.00000E+00
271	9.11885E-01	6.57000E+00	8.95826E-01	1.44821E-03	0.00000E+00	0.00000E+00
272	9.21993E-01	6.59367E+00	8.95923E-01	1.44609E-03	0.00000E+00	0.00000E+00
273	8.49401E-01	6.61850E+00	8.95752E-01	1.45093E-03	0.00000E+00	0.00000E+00
274	8.95063E-01	6.64217E+00	8.95749E-01	1.44559E-03	0.00000E+00	0.00000E+00
275	8.66475E-01	6.66700E+00	8.95642E-01	1.44427E-03	0.00000E+00	0.00000E+00
276	8.65963E-01	6.69267E+00	8.95533E-01	1.44306E-03	0.00000E+00	0.00000E+00
277	8.87114E-01	6.71550E+00	8.95503E-01	1.43813E-03	0.00000E+00	0.00000E+00
278	8.90469E-01	6.73933E+00	8.95485E-01	1.43303E-03	0.00000E+00	0.00000E+00
279	9.05177E-01	6.76317E+00	8.95520E-01	1.42827E-03	0.00000E+00	0.00000E+00
280	9.07149E-01	6.78783E+00	8.95561E-01	1.42374E-03	0.00000E+00	0.00000E+00
281	8.55320E-01	6.81167E+00	8.95417E-01	1.42594E-03	0.00000E+00	0.00000E+00
282	8.62157E-01	6.83450E+00	8.95298E-01	1.42580E-03	0.00000E+00	0.00000E+00
283	9.01137E-01	6.85917E+00	8.95319E-01	1.42087E-03	0.00000E+00	0.00000E+00
284	8.77530E-01	6.88300E+00	8.95256E-01	1.41722E-03	0.00000E+00	0.00000E+00
285	8.60813E-01	6.90683E+00	8.95134E-01	1.41744E-03	0.00000E+00	0.00000E+00
286	8.66350E-01	6.93150E+00	8.95033E-01	1.41607E-03	0.00000E+00	0.00000E+00
287	8.76397E-01	6.95533E+00	8.94968E-01	1.41261E-03	0.00000E+00	0.00000E+00
288	8.82161E-01	6.97817E+00	8.94923E-01	1.40838E-03	0.00000E+00	0.00000E+00
289	8.65790E-01	7.00200E+00	8.94821E-01	1.40713E-03	0.00000E+00	0.00000E+00
290	9.37929E-01	7.02483E+00	8.94971E-01	1.41020E-03	0.00000E+00	0.00000E+00
291	9.29246E-01	7.04867E+00	8.95090E-01	1.41031E-03	0.00000E+00	0.00000E+00
292	9.10414E-01	7.07150E+00	8.95143E-01	1.40643E-03	0.00000E+00	0.00000E+00
293	8.82829E-01	7.09533E+00	8.95100E-01	1.40222E-03	0.00000E+00	0.00000E+00
294	8.63260E-01	7.12100E+00	8.94991E-01	1.40166E-03	0.00000E+00	0.00000E+00
295	9.20586E-01	7.14383E+00	8.95079E-01	1.39960E-03	0.00000E+00	0.00000E+00
296	9.41261E-01	7.16683E+00	8.95236E-01	1.40365E-03	0.00000E+00	0.00000E+00
297	8.84594E-01	7.19150E+00	8.95200E-01	1.39935E-03	0.00000E+00	0.00000E+00
298	9.17430E-01	7.21533E+00	8.95275E-01	1.39663E-03	0.00000E+00	0.00000E+00
299	8.83992E-01	7.23917E+00	8.95237E-01	1.39244E-03	0.00000E+00	0.00000E+00
300	8.89306E-01	7.26200E+00	8.95217E-01	1.38790E-03	0.00000E+00	0.00000E+00
301	9.06865E-01	7.28667E+00	8.95256E-01	1.38380E-03	0.00000E+00	0.00000E+00
302	9.43762E-01	7.31050E+00	8.95417E-01	1.38862E-03	0.00000E+00	0.00000E+00
303	9.18035E-01	7.33433E+00	8.95493E-01	1.38604E-03	0.00000E+00	0.00000E+00
304	8.98479E-01	7.35717E+00	8.95502E-01	1.38148E-03	0.00000E+00	0.00000E+00
305	9.04385E-01	7.38000E+00	8.95532E-01	1.37723E-03	0.00000E+00	0.00000E+00
306	9.10615E-01	7.40383E+00	8.95581E-01	1.37358E-03	0.00000E+00	0.00000E+00
307	9.18945E-01	7.42767E+00	8.95658E-01	1.37121E-03	0.00000E+00	0.00000E+00
308	8.87790E-01	7.45150E+00	8.95632E-01	1.36697E-03	0.00000E+00	0.00000E+00
309	8.94523E-01	7.47433E+00	8.95629E-01	1.36251E-03	0.00000E+00	0.00000E+00
310	8.91631E-01	7.49917E+00	8.95616E-01	1.35814E-03	0.00000E+00	0.00000E+00
311	8.99515E-01	7.52283E+00	8.95628E-01	1.35380E-03	0.00000E+00	0.00000E+00
312	9.39045E-01	7.54483E+00	8.95768E-01	1.35667E-03	0.00000E+00	0.00000E+00
313	8.85895E-01	7.56867E+00	8.95737E-01	1.35268E-03	0.00000E+00	0.00000E+00
314	8.78723E-01	7.59250E+00	8.95682E-01	1.34944E-03	0.00000E+00	0.00000E+00
315	8.64668E-01	7.61717E+00	8.95583E-01	1.34876E-03	0.00000E+00	0.00000E+00
316	9.02749E-01	7.64100E+00	8.95606E-01	1.34466E-03	0.00000E+00	0.00000E+00
317	8.67690E-01	7.66667E+00	8.95517E-01	1.34331E-03	0.00000E+00	0.00000E+00
318	8.97839E-01	7.69033E+00	8.95524E-01	1.33907E-03	0.00000E+00	0.00000E+00

319	9.31740E-01	7.71417E+00	8.95639E-01	1.33972E-03	0.00000E+00	0.00000E+00
320	9.15333E-01	7.73800E+00	8.95701E-01	1.33693E-03	0.00000E+00	0.00000E+00
321	8.97757E-01	7.76267E+00	8.95707E-01	1.33275E-03	0.00000E+00	0.00000E+00
322	9.07318E-01	7.78650E+00	8.95743E-01	1.32908E-03	0.00000E+00	0.00000E+00
323	9.00348E-01	7.81033E+00	8.95758E-01	1.32501E-03	0.00000E+00	0.00000E+00
324	8.93546E-01	7.83317E+00	8.95751E-01	1.32090E-03	0.00000E+00	0.00000E+00
325	9.13417E-01	7.85700E+00	8.95806E-01	1.31794E-03	0.00000E+00	0.00000E+00
326	8.67137E-01	7.88167E+00	8.95717E-01	1.31684E-03	0.00000E+00	0.00000E+00
327	9.11058E-01	7.90733E+00	8.95764E-01	1.31363E-03	0.00000E+00	0.00000E+00
328	8.93492E-01	7.93117E+00	8.95757E-01	1.30962E-03	0.00000E+00	0.00000E+00
329	8.58242E-01	7.95400E+00	8.95643E-01	1.31064E-03	0.00000E+00	0.00000E+00
330	8.87510E-01	7.97883E+00	8.95618E-01	1.30687E-03	0.00000E+00	0.00000E+00
331	8.84861E-01	8.00167E+00	8.95585E-01	1.30330E-03	0.00000E+00	0.00000E+00
332	9.20879E-01	8.02550E+00	8.95662E-01	1.30161E-03	0.00000E+00	0.00000E+00
333	8.92014E-01	8.04933E+00	8.95651E-01	1.29771E-03	0.00000E+00	0.00000E+00
334	8.98793E-01	8.07483E+00	8.95660E-01	1.29383E-03	0.00000E+00	0.00000E+00
335	9.05699E-01	8.09867E+00	8.95690E-01	1.29029E-03	0.00000E+00	0.00000E+00
336	8.77431E-01	8.12250E+00	8.95636E-01	1.28759E-03	0.00000E+00	0.00000E+00
337	9.39878E-01	8.14533E+00	8.95768E-01	1.29051E-03	0.00000E+00	0.00000E+00
338	8.97092E-01	8.16917E+00	8.95772E-01	1.28667E-03	0.00000E+00	0.00000E+00
339	8.92360E-01	8.19117E+00	8.95762E-01	1.28289E-03	0.00000E+00	0.00000E+00
340	8.63111E-01	8.21583E+00	8.95665E-01	1.28273E-03	0.00000E+00	0.00000E+00
341	8.56991E-01	8.24050E+00	8.95551E-01	1.28402E-03	0.00000E+00	0.00000E+00
342	8.54876E-01	8.26433E+00	8.95431E-01	1.28581E-03	0.00000E+00	0.00000E+00
343	9.22585E-01	8.28817E+00	8.95511E-01	1.28451E-03	0.00000E+00	0.00000E+00
344	9.04882E-01	8.31100E+00	8.95538E-01	1.28104E-03	0.00000E+00	0.00000E+00
345	8.62203E-01	8.33483E+00	8.95441E-01	1.28099E-03	0.00000E+00	0.00000E+00
346	8.91068E-01	8.35867E+00	8.95428E-01	1.27733E-03	0.00000E+00	0.00000E+00
347	8.77276E-01	8.38333E+00	8.95376E-01	1.27470E-03	0.00000E+00	0.00000E+00
348	8.80922E-01	8.40717E+00	8.95334E-01	1.27170E-03	0.00000E+00	0.00000E+00
349	8.87942E-01	8.43000E+00	8.95313E-01	1.26821E-03	0.00000E+00	0.00000E+00
350	9.08687E-01	8.45483E+00	8.95351E-01	1.26514E-03	0.00000E+00	0.00000E+00
351	8.55023E-01	8.47950E+00	8.95236E-01	1.26680E-03	0.00000E+00	0.00000E+00
352	9.10473E-01	8.50333E+00	8.95279E-01	1.26392E-03	0.00000E+00	0.00000E+00
353	9.23391E-01	8.52617E+00	8.95359E-01	1.26286E-03	0.00000E+00	0.00000E+00
354	8.92780E-01	8.55000E+00	8.95352E-01	1.25929E-03	0.00000E+00	0.00000E+00
355	8.80755E-01	8.57283E+00	8.95311E-01	1.25639E-03	0.00000E+00	0.00000E+00
356	8.95925E-01	8.59767E+00	8.95312E-01	1.25284E-03	0.00000E+00	0.00000E+00
357	9.49281E-01	8.62050E+00	8.95464E-01	1.25852E-03	0.00000E+00	0.00000E+00
358	8.91730E-01	8.64433E+00	8.95454E-01	1.25503E-03	0.00000E+00	0.00000E+00
359	8.82525E-01	8.66817E+00	8.95418E-01	1.25203E-03	0.00000E+00	0.00000E+00
360	9.10724E-01	8.69183E+00	8.95460E-01	1.24926E-03	0.00000E+00	0.00000E+00
361	9.29336E-01	8.71383E+00	8.95555E-01	1.24934E-03	0.00000E+00	0.00000E+00
362	9.19163E-01	8.73667E+00	8.95620E-01	1.24759E-03	0.00000E+00	0.00000E+00
363	8.90057E-01	8.75967E+00	8.95605E-01	1.24423E-03	0.00000E+00	0.00000E+00
364	8.68297E-01	8.78350E+00	8.95529E-01	1.24308E-03	0.00000E+00	0.00000E+00
365	8.95902E-01	8.80817E+00	8.95530E-01	1.23965E-03	0.00000E+00	0.00000E+00
366	8.53996E-01	8.83283E+00	8.95416E-01	1.24149E-03	0.00000E+00	0.00000E+00
367	8.95485E-01	8.85750E+00	8.95417E-01	1.23809E-03	0.00000E+00	0.00000E+00
368	8.70299E-01	8.88233E+00	8.95348E-01	1.23660E-03	0.00000E+00	0.00000E+00
369	9.39315E-01	8.90517E+00	8.95468E-01	1.23904E-03	0.00000E+00	0.00000E+00
370	8.42743E-01	8.92983E+00	8.95324E-01	1.24394E-03	0.00000E+00	0.00000E+00
371	9.00029E-01	8.95367E+00	8.95337E-01	1.24063E-03	0.00000E+00	0.00000E+00
372	8.88064E-01	8.97650E+00	8.95318E-01	1.23743E-03	0.00000E+00	0.00000E+00
373	8.96316E-01	8.99950E+00	8.95320E-01	1.23409E-03	0.00000E+00	0.00000E+00
374	8.80433E-01	9.02333E+00	8.95280E-01	1.23142E-03	0.00000E+00	0.00000E+00
375	9.32961E-01	9.04617E+00	8.95381E-01	1.23226E-03	0.00000E+00	0.00000E+00
376	8.60609E-01	9.07083E+00	8.95288E-01	1.23248E-03	0.00000E+00	0.00000E+00
377	8.89423E-01	9.09567E+00	8.95273E-01	1.22929E-03	0.00000E+00	0.00000E+00
378	9.17431E-01	9.11750E+00	8.95332E-01	1.22743E-03	0.00000E+00	0.00000E+00
379	8.90763E-01	9.14133E+00	8.95319E-01	1.22423E-03	0.00000E+00	0.00000E+00
380	9.05093E-01	9.16517E+00	8.95345E-01	1.22126E-03	0.00000E+00	0.00000E+00
381	9.02580E-01	9.18983E+00	8.95364E-01	1.21818E-03	0.00000E+00	0.00000E+00
382	9.12075E-01	9.21367E+00	8.95408E-01	1.21577E-03	0.00000E+00	0.00000E+00
383	8.65641E-01	9.23750E+00	8.95330E-01	1.21509E-03	0.00000E+00	0.00000E+00
384	8.66290E-01	9.26217E+00	8.95254E-01	1.21428E-03	0.00000E+00	0.00000E+00
385	8.89759E-01	9.28683E+00	8.95240E-01	1.21119E-03	0.00000E+00	0.00000E+00
386	9.14192E-01	9.31067E+00	8.95289E-01	1.20904E-03	0.00000E+00	0.00000E+00
387	9.17638E-01	9.33367E+00	8.95347E-01	1.20729E-03	0.00000E+00	0.00000E+00
388	9.25979E-01	9.35733E+00	8.95427E-01	1.20677E-03	0.00000E+00	0.00000E+00
389	9.32704E-01	9.38033E+00	8.95523E-01	1.20750E-03	0.00000E+00	0.00000E+00
390	9.03165E-01	9.40417E+00	8.95543E-01	1.20455E-03	0.00000E+00	0.00000E+00
391	9.46238E-01	9.42783E+00	8.95673E-01	1.20849E-03	0.00000E+00	0.00000E+00
392	9.08953E-01	9.45267E+00	8.95707E-01	1.20587E-03	0.00000E+00	0.00000E+00
393	9.64028E-01	9.47550E+00	8.95882E-01	1.21541E-03	0.00000E+00	0.00000E+00
394	9.09928E-01	9.50017E+00	8.95918E-01	1.21283E-03	0.00000E+00	0.00000E+00
395	8.59672E-01	9.52500E+00	8.95825E-01	1.21325E-03	0.00000E+00	0.00000E+00
396	8.69255E-01	9.54867E+00	8.95758E-01	1.21205E-03	0.00000E+00	0.00000E+00
397	8.91838E-01	9.57250E+00	8.95748E-01	1.20902E-03	0.00000E+00	0.00000E+00
398	9.24188E-01	9.59533E+00	8.95820E-01	1.20810E-03	0.00000E+00	0.00000E+00
399	8.94896E-01	9.61917E+00	8.95817E-01	1.20505E-03	0.00000E+00	0.00000E+00
400	9.11581E-01	9.64400E+00	8.95857E-01	1.20267E-03	0.00000E+00	0.00000E+00
401	8.91078E-01	9.66767E+00	8.95845E-01	1.19971E-03	0.00000E+00	0.00000E+00
402	8.95141E-01	9.69150E+00	8.95843E-01	1.19671E-03	0.00000E+00	0.00000E+00
403	9.06940E-01	9.71533E+00	8.95871E-01	1.19405E-03	0.00000E+00	0.00000E+00
404	8.85631E-01	9.73917E+00	8.95846E-01	1.19134E-03	0.00000E+00	0.00000E+00
405	9.18539E-01	9.76300E+00	8.95902E-01	1.18972E-03	0.00000E+00	0.00000E+00
406	9.11942E-01	9.78583E+00	8.95942E-01	1.18743E-03	0.00000E+00	0.00000E+00
407	9.70086E-01	9.80967E+00	8.96125E-01	1.19856E-03	0.00000E+00	0.00000E+00
408	9.04730E-01	9.83350E+00	8.96146E-01	1.19579E-03	0.00000E+00	0.00000E+00
409	8.94946E-01	9.85717E+00	8.96143E-01	1.19286E-03	0.00000E+00	0.00000E+00
410	9.05643E-01	9.88200E+00	8.96166E-01	1.19016E-03	0.00000E+00	0.00000E+00
411	9.16808E-01	9.90567E+00	8.96217E-01	1.18831E-03	0.00000E+00	0.00000E+00
412	8.86415E-01	9.92950E+00	8.96193E-01	1.18565E-03	0.00000E+00	0.00000E+00
413	9.08300E-01	9.95333E+00	8.96222E-01	1.18313E-03	0.00000E+00	0.00000E+00
414	8.38968E-01	9.97717E+00	8.96083E-01	1.18841E-03	0.00000E+00	0.00000E+00
415	9.04074E-01	9.99917E+00	8.96103E-01	1.18569E-03	0.00000E+00	0.00000E+00
416	9.34861E-01	1.00220E+01	8.96196E-01	1.18652E-03	0.00000E+00	0.00000E+00
417	9.10037E-01	1.00458E+01	8.96230E-01	1.18413E-03	0.00000E+00	0.00000E+00
418	9.15567E-01	1.00697E+01	8.96276E-01	1.18219E-03	0.00000E+00	0.00000E+00
419	9.55204E-01	1.00925E+01	8.96417E-01	1.18779E-03	0.00000E+00	0.00000E+00
420	8.82081E-01	1.01163E+01	8.96383E-01	1.18544E-03	0.00000E+00	0.00000E+00
421	9.08086E-01	1.01402E+01	8.96411E-01	1.18294E-03	0.00000E+00	0.00000E+00
422	9.12650E-01	1.01648E+01	8.96450E-01	1.18075E-03	0.00000E+00	0.00000E+00
423	8.54102E-01	1.01895E+01	8.96349E-01	1.18223E-03	0.00000E+00	0.00000E+00
424	9.08926E-01	1.02123E+01	8.96379E-01	1.17980E-03	0.00000E+00	0.00000E+00
425	9.35580E-01	1.02343E+01	8.96472E-01	1.18065E-03	0.00000E+00	0.00000E+00
426	8.81976E-01	1.02582E+01	8.96437E-01	1.17836E-03	0.00000E+00	0.00000E+00

427	8.94689E-01	1.02820E+01	8.96433E-01	1.17559E-03	0.00000E+00	0.00000E+00
428	9.27000E-01	1.03058E+01	8.96505E-01	1.17502E-03	0.00000E+00	0.00000E+00
429	8.87504E-01	1.03295E+01	8.96484E-01	1.17246E-03	0.00000E+00	0.00000E+00
430	9.34985E-01	1.03525E+01	8.96574E-01	1.17317E-03	0.00000E+00	0.00000E+00
431	9.17721E-01	1.03753E+01	8.96623E-01	1.17147E-03	0.00000E+00	0.00000E+00
432	9.03182E-01	1.03992E+01	8.96638E-01	1.16884E-03	0.00000E+00	0.00000E+00
433	9.94514E-01	1.04212E+01	8.96865E-01	1.18803E-03	0.00000E+00	0.00000E+00
434	8.97109E-01	1.04450E+01	8.96866E-01	1.18528E-03	0.00000E+00	0.00000E+00
435	8.68383E-01	1.04697E+01	8.96800E-01	1.18436E-03	0.00000E+00	0.00000E+00
436	9.04481E-01	1.04935E+01	8.96818E-01	1.18176E-03	0.00000E+00	0.00000E+00
437	9.18522E-01	1.05153E+01	8.96868E-01	1.18010E-03	0.00000E+00	0.00000E+00
438	9.03273E-01	1.05392E+01	8.96883E-01	1.17748E-03	0.00000E+00	0.00000E+00
439	9.03496E-01	1.05622E+01	8.96898E-01	1.17488E-03	0.00000E+00	0.00000E+00
440	8.87313E-01	1.05868E+01	8.96876E-01	1.17240E-03	0.00000E+00	0.00000E+00
441	8.70212E-01	1.06115E+01	8.96815E-01	1.17130E-03	0.00000E+00	0.00000E+00
442	8.58089E-01	1.06353E+01	8.96727E-01	1.17195E-03	0.00000E+00	0.00000E+00
443	8.91367E-01	1.06582E+01	8.96715E-01	1.16935E-03	0.00000E+00	0.00000E+00
444	9.07255E-01	1.06820E+01	8.96739E-01	1.16694E-03	0.00000E+00	0.00000E+00
445	8.76624E-01	1.07058E+01	8.96693E-01	1.16519E-03	0.00000E+00	0.00000E+00
446	8.79254E-01	1.07297E+01	8.96654E-01	1.16323E-03	0.00000E+00	0.00000E+00
447	8.80421E-01	1.07535E+01	8.96618E-01	1.16118E-03	0.00000E+00	0.00000E+00
448	8.92619E-01	1.07772E+01	8.96609E-01	1.15861E-03	0.00000E+00	0.00000E+00
449	8.87123E-01	1.08010E+01	8.96587E-01	1.15621E-03	0.00000E+00	0.00000E+00
450	8.93978E-01	1.08238E+01	8.96582E-01	1.15364E-03	0.00000E+00	0.00000E+00
451	8.74146E-01	1.08477E+01	8.96532E-01	1.15216E-03	0.00000E+00	0.00000E+00
452	9.10700E-01	1.08707E+01	8.96563E-01	1.15002E-03	0.00000E+00	0.00000E+00
453	9.24132E-01	1.08935E+01	8.96624E-01	1.14910E-03	0.00000E+00	0.00000E+00
454	9.01100E-01	1.09173E+01	8.96634E-01	1.14660E-03	0.00000E+00	0.00000E+00
455	9.23492E-01	1.09402E+01	8.96693E-01	1.14560E-03	0.00000E+00	0.00000E+00
456	9.05902E-01	1.09640E+01	8.96714E-01	1.14325E-03	0.00000E+00	0.00000E+00
457	9.00037E-01	1.09878E+01	8.96721E-01	1.14076E-03	0.00000E+00	0.00000E+00
458	8.78071E-01	1.10125E+01	8.96680E-01	1.13899E-03	0.00000E+00	0.00000E+00
459	8.78601E-01	1.10363E+01	8.96641E-01	1.13718E-03	0.00000E+00	0.00000E+00
460	8.74789E-01	1.10602E+01	8.96593E-01	1.13570E-03	0.00000E+00	0.00000E+00
461	9.11807E-01	1.10838E+01	8.96626E-01	1.13371E-03	0.00000E+00	0.00000E+00
462	9.08229E-01	1.11077E+01	8.96651E-01	1.13152E-03	0.00000E+00	0.00000E+00
463	8.95114E-01	1.11315E+01	8.96648E-01	1.12907E-03	0.00000E+00	0.00000E+00
464	8.93458E-01	1.11562E+01	8.96641E-01	1.12664E-03	0.00000E+00	0.00000E+00
465	8.78004E-01	1.11800E+01	8.96601E-01	1.12493E-03	0.00000E+00	0.00000E+00
466	8.81664E-01	1.12028E+01	8.96569E-01	1.12296E-03	0.00000E+00	0.00000E+00
467	9.22024E-01	1.12267E+01	8.96623E-01	1.12188E-03	0.00000E+00	0.00000E+00
468	8.74849E-01	1.12505E+01	8.96577E-01	1.12044E-03	0.00000E+00	0.00000E+00
469	9.07953E-01	1.12743E+01	8.96601E-01	1.11831E-03	0.00000E+00	0.00000E+00
470	9.00350E-01	1.12990E+01	8.96609E-01	1.11595E-03	0.00000E+00	0.00000E+00
471	8.92630E-01	1.13237E+01	8.96600E-01	1.11360E-03	0.00000E+00	0.00000E+00
472	8.84763E-01	1.13475E+01	8.96575E-01	1.11151E-03	0.00000E+00	0.00000E+00
473	8.92004E-01	1.13713E+01	8.96566E-01	1.10919E-03	0.00000E+00	0.00000E+00
474	8.79063E-01	1.13960E+01	8.96528E-01	1.10746E-03	0.00000E+00	0.00000E+00
475	8.93526E-01	1.14198E+01	8.96522E-01	1.10513E-03	0.00000E+00	0.00000E+00
476	8.97703E-01	1.14437E+01	8.96525E-01	1.10280E-03	0.00000E+00	0.00000E+00
477	8.82148E-01	1.14665E+01	8.96494E-01	1.10089E-03	0.00000E+00	0.00000E+00
478	8.80307E-01	1.14895E+01	8.96460E-01	1.09910E-03	0.00000E+00	0.00000E+00
479	9.40191E-01	1.15123E+01	8.96552E-01	1.10062E-03	0.00000E+00	0.00000E+00
480	8.67054E-01	1.15370E+01	8.96490E-01	1.10005E-03	0.00000E+00	0.00000E+00
481	8.84586E-01	1.15598E+01	8.96465E-01	1.09803E-03	0.00000E+00	0.00000E+00
482	8.77404E-01	1.15837E+01	8.96426E-01	1.09646E-03	0.00000E+00	0.00000E+00
483	9.26403E-01	1.16075E+01	8.96488E-01	1.09595E-03	0.00000E+00	0.00000E+00
484	9.10083E-01	1.16313E+01	8.96516E-01	1.09404E-03	0.00000E+00	0.00000E+00
485	9.16693E-01	1.16542E+01	8.96558E-01	1.09257E-03	0.00000E+00	0.00000E+00
486	8.49247E-01	1.16788E+01	8.96460E-01	1.09469E-03	0.00000E+00	0.00000E+00
487	8.83473E-01	1.17027E+01	8.96433E-01	1.09275E-03	0.00000E+00	0.00000E+00
488	9.26183E-01	1.17265E+01	8.96495E-01	1.09222E-03	0.00000E+00	0.00000E+00
489	8.57221E-01	1.17512E+01	8.96414E-01	1.09295E-03	0.00000E+00	0.00000E+00
490	9.06872E-01	1.17750E+01	8.96435E-01	1.09092E-03	0.00000E+00	0.00000E+00
491	9.17416E-01	1.17988E+01	8.96478E-01	1.08953E-03	0.00000E+00	0.00000E+00
492	8.94006E-01	1.18227E+01	8.96473E-01	1.08732E-03	0.00000E+00	0.00000E+00
493	9.14281E-01	1.18465E+01	8.96510E-01	1.08571E-03	0.00000E+00	0.00000E+00
494	9.52789E-01	1.18693E+01	8.96624E-01	1.08952E-03	0.00000E+00	0.00000E+00
495	8.69660E-01	1.18940E+01	8.96569E-01	1.08868E-03	0.00000E+00	0.00000E+00
496	9.11134E-01	1.19170E+01	8.96599E-01	1.08688E-03	0.00000E+00	0.00000E+00
497	9.20718E-01	1.19398E+01	8.96648E-01	1.08577E-03	0.00000E+00	0.00000E+00
498	8.96202E-01	1.19645E+01	8.96647E-01	1.08358E-03	0.00000E+00	0.00000E+00
499	9.02916E-01	1.19873E+01	8.96659E-01	1.08147E-03	0.00000E+00	0.00000E+00
500	8.85633E-01	1.20122E+01	8.96637E-01	1.07953E-03	0.00000E+00	0.00000E+00
501	9.25873E-01	1.20360E+01	8.96696E-01	1.07895E-03	0.00000E+00	0.00000E+00
502	8.97125E-01	1.20597E+01	8.96697E-01	1.07679E-03	0.00000E+00	0.00000E+00
503	8.73163E-01	1.20835E+01	8.96650E-01	1.07567E-03	0.00000E+00	0.00000E+00
504	8.86625E-01	1.21083E+01	8.96630E-01	1.07371E-03	0.00000E+00	0.00000E+00
505	9.03667E-01	1.21320E+01	8.96644E-01	1.07166E-03	0.00000E+00	0.00000E+00
506	8.93322E-01	1.21568E+01	8.96637E-01	1.06956E-03	0.00000E+00	0.00000E+00
507	9.20239E-01	1.21805E+01	8.96684E-01	1.06846E-03	0.00000E+00	0.00000E+00
508	8.97849E-01	1.22035E+01	8.96686E-01	1.06635E-03	0.00000E+00	0.00000E+00
509	9.03579E-01	1.22273E+01	8.96700E-01	1.06433E-03	0.00000E+00	0.00000E+00
510	9.41743E-01	1.22510E+01	8.96788E-01	1.06593E-03	0.00000E+00	0.00000E+00
511	9.09846E-01	1.22748E+01	8.96814E-01	1.06414E-03	0.00000E+00	0.00000E+00
512	9.02922E-01	1.22977E+01	8.96826E-01	1.06212E-03	0.00000E+00	0.00000E+00
513	8.83000E-01	1.23215E+01	8.96799E-01	1.06038E-03	0.00000E+00	0.00000E+00
514	8.94430E-01	1.23453E+01	8.96794E-01	1.05832E-03	0.00000E+00	0.00000E+00
515	8.46309E-01	1.23710E+01	8.96696E-01	1.06083E-03	0.00000E+00	0.00000E+00
516	9.29154E-01	1.23930E+01	8.96759E-01	1.06065E-03	0.00000E+00	0.00000E+00
517	8.75636E-01	1.24177E+01	8.96718E-01	1.05938E-03	0.00000E+00	0.00000E+00
518	9.25388E-01	1.24415E+01	8.96774E-01	1.05878E-03	0.00000E+00	0.00000E+00
519	9.01574E-01	1.24643E+01	8.96783E-01	1.05677E-03	0.00000E+00	0.00000E+00
520	8.93721E-01	1.24872E+01	8.96777E-01	1.05475E-03	0.00000E+00	0.00000E+00
521	8.85690E-01	1.25110E+01	8.96756E-01	1.05293E-03	0.00000E+00	0.00000E+00
522	8.43889E-01	1.25358E+01	8.96654E-01	1.05581E-03	0.00000E+00	0.00000E+00
523	8.99307E-01	1.25595E+01	8.96659E-01	1.05379E-03	0.00000E+00	0.00000E+00
524	9.39461E-01	1.25833E+01	8.96741E-01	1.05496E-03	0.00000E+00	0.00000E+00
525	9.13382E-01	1.26080E+01	8.96773E-01	1.05343E-03	0.00000E+00	0.00000E+00
526	9.20663E-01	1.26310E+01	8.96818E-01	1.05240E-03	0.00000E+00	0.00000E+00
527	9.11607E-01	1.26548E+01	8.96847E-01	1.05077E-03	0.00000E+00	0.00000E+00
528	8.89681E-01	1.26785E+01	8.96833E-01	1.04886E-03	0.00000E+00	0.00000E+00
529	9.28580E-01	1.27015E+01	8.96893E-01	1.04860E-03	0.00000E+00	0.00000E+00
530	8.65511E-01	1.27262E+01	8.96834E-01	1.04830E-03	0.00000E+00	0.00000E+00
531	9.11819E-01	1.27508E+01	8.96862E-01	1.04670E-03	0.00000E+00	0.00000E+00
532	8.78168E-01	1.27747E+01	8.96827E-01	1.04532E-03	0.00000E+00	0.00000E+00
533	8.34391E-01	1.27985E+01	8.96709E-01	1.04995E-03	0.00000E+00	0.00000E+00
534	9.08869E-01	1.28223E+01	8.96732E-01	1.04823E-03	0.00000E+00	0.00000E+00

535	8.64387E-01	1.28460E+01	8.96671E-01	1.04802E-03	0.00000E+00	0.00000E+00
536	8.99302E-01	1.28698E+01	8.96676E-01	1.04606E-03	0.00000E+00	0.00000E+00
537	9.32684E-01	1.28937E+01	8.96744E-01	1.04627E-03	0.00000E+00	0.00000E+00
538	8.79891E-01	1.29183E+01	8.96712E-01	1.04479E-03	0.00000E+00	0.00000E+00
539	9.14136E-01	1.29413E+01	8.96745E-01	1.04335E-03	0.00000E+00	0.00000E+00
540	9.01656E-01	1.29642E+01	8.96754E-01	1.04145E-03	0.00000E+00	0.00000E+00
541	8.75015E-01	1.29898E+01	8.96713E-01	1.04030E-03	0.00000E+00	0.00000E+00
542	8.68825E-01	1.30127E+01	8.96662E-01	1.03965E-03	0.00000E+00	0.00000E+00
543	8.82160E-01	1.30373E+01	8.96635E-01	1.03807E-03	0.00000E+00	0.00000E+00
544	8.95750E-01	1.30622E+01	8.96633E-01	1.03616E-03	0.00000E+00	0.00000E+00
545	9.08330E-01	1.30842E+01	8.96655E-01	1.03447E-03	0.00000E+00	0.00000E+00
546	9.23595E-01	1.31078E+01	8.96704E-01	1.03376E-03	0 00000E+00	0.00000E+00
547	8.70013E-01	1.31327E+01	8.96655E-01	1.03302E-03	0.00000E+00	0.00000E+00
548	8.93271E-01	1.31563E+01	8.96649E-01	1.03114E-03	0.00000E+00	0.00000E+00
549	8.97267E-01	1.31802E+01	8.96650E-01	1.02926E-03	0.00000E+00	0.00000E+00
550	8.46308E-01	1.32040E+01	8.96558E-01	1.03148E-03	0.00000E+00	0.00000E+00
551	8.93473E-01	1.32278E+01	8.96553E-01	1.02961E-03	0.00000E+00	0.00000E+00
552	8.52139E-01	1.32525E+01	8.96472E-01	1.03091E-03	0.00000E+00	0.00000E+00
553	8.77510E-01	1.32772E+01	8.96438E-01	1.02961E-03	0.00000E+00	0.00000E+00
554	9.29491E-01	1.33002E+01	8.96498E-01	1.02948E-03	0.00000E+00	0.00000E+00
555	8.98625E-01	1.33240E+01	8.96501E-01	1.02763E-03	0.00000E+00	0.00000E+00
556	9.12137E-01	1.33477E+01	8.96530E-01	1.02616E-03	0.00000E+00	0.00000E+00
557	8.86835E-01	1.33707E+01	8.96512E-01	1.02446E-03	0.00000E+00	0.00000E+00
558	8.75002E-01	1.33935E+01	8.96473E-01	1.02335E-03	0.00000E+00	0.00000E+00
559	8.99338E-01	1.34163E+01	8.96479E-01	1.02152E-03	0.00000E+00	0.00000E+00
560	8.55454E-01	1.34412E+01	8.96405E-01	1.02233E-03	0.00000E+00	0.00000E+00
561	8.86954E-01	1.34648E+01	8.96388E-01	1.02064E-03	0.00000E+00	0.00000E+00
562	8.93705E-01	1.34887E+01	8.96383E-01	1.01883E-03	0.00000E+00	0.00000E+00
563	9.00043E-01	1.35125E+01	8.96390E-01	1.01703E-03	0.00000E+00	0.00000E+00
564	9.35165E-01	1.35363E+01	8.96459E-01	1.01756E-03	0.00000E+00	0.00000E+00
565	9.18707E-01	1.35602E+01	8.96498E-01	1.01652E-03	0.00000E+00	0.00000E+00
566	9.02933E-01	1.35838E+01	8.96510E-01	1.01478E-03	0.00000E+00	0.00000E+00
567	9.02138E-01	1.36077E+01	8.96520E-01	1.01304E-03	0.00000E+00	0.00000E+00
568	8.84605E-01	1.36315E+01	8.96499E-01	1.01146E-03	0.00000E+00	0.00000E+00
569	8.65252E-01	1.36562E+01	8.96444E-01	1.01118E-03	0.00000E+00	0.00000E+00
570	8.59762E-01	1.36800E+01	8.96379E-01	1.01146E-03	0.00000E+00	0.00000E+00
571	8.85772E-01	1.37038E+01	8.96360E-01	1.00986E-03	0.00000E+00	0.00000E+00
572	9.05816E-01	1.37267E+01	8.96377E-01	1.00822E-03	0.00000E+00	0.00000E+00
573	9.24165E-01	1.37505E+01	8.96426E-01	1.00763E-03	0.00000E+00	0.00000E+00
574	9.12854E-01	1.37733E+01	8.96454E-01	1.00627E-03	0.00000E+00	0.00000E+00
575	9.04969E-01	1.37972E+01	8.96469E-01	1.00463E-03	0.00000E+00	0.00000E+00
576	9.22231E-01	1.38202E+01	8.96514E-01	1.00388E-03	0.00000E+00	0.00000E+00
577	9.18564E-01	1.38430E+01	8.96552E-01	1.00286E-03	0.00000E+00	0.00000E+00
578	9.22708E-01	1.38668E+01	8.96598E-01	1.00215E-03	0.00000E+00	0.00000E+00
579	9.49538E-01	1.38915E+01	8.96690E-01	1.00461E-03	0.00000E+00	0.00000E+00
580	9.11573E-01	1.39135E+01	8.96715E-01	1.00320E-03	0.00000E+00	0.00000E+00
581	9.09612E-01	1.39373E+01	8.96738E-01	1.00172E-03	0.00000E+00	0.00000E+00
582	8.74688E-01	1.39610E+01	8.96700E-01	1.00071E-03	0.00000E+00	0.00000E+00
583	9.06132E-01	1.39848E+01	8.96716E-01	9.99118E-04	0.00000E+00	0.00000E+00
584	9.00629E-01	1.40078E+01	8.96723E-01	9.97422E-04	0.00000E+00	0.00000E+00
585	9.05499E-01	1.40315E+01	8.96738E-01	9.95824E-04	0.00000E+00	0.00000E+00
586	9.03479E-01	1.40545E+01	8.96749E-01	9.94184E-04	0.00000E+00	0.00000E+00
587	9.06552E-01	1.40782E+01	8.96766E-01	9.92624E-04	0.00000E+00	0.00000E+00
588	8.59516E-01	1.41012E+01	8.96702E-01	9.92966E-04	0.00000E+00	0.00000E+00
589	9.16276E-01	1.41240E+01	8.96736E-01	9.91834E-04	0.00000E+00	0.00000E+00
590	8.65798E-01	1.41487E+01	8.96683E-01	9.91542E-04	0.00000E+00	0.00000E+00
591	9.13283E-01	1.41717E+01	8.96711E-01	9.90259E-04	0.00000E+00	0.00000E+00
592	8.79095E-01	1.41963E+01	8.96681E-01	9.89030E-04	0.00000E+00	0.00000E+00
593	8.85133E-01	1.42202E+01	8.96662E-01	9.87548E-04	0.00000E+00	0.00000E+00
594	8.80839E-01	1.42440E+01	8.96635E-01	9.86241E-04	0.00000E+00	0.00000E+00
595	8.86666E-01	1.42677E+01	8.96618E-01	9.84720E-04	0.00000E+00	0.00000E+00
596	8.84925E-01	1.42933E+01	8.96599E-01	9.83258E-04	0.00000E+00	0.00000E+00
597	8.77997E-01	1.43182E+01	8.96567E-01	9.82101E-04	0.00000E+00	0.00000E+00
598	9.12672E-01	1.43428E+01	8.96594E-01	9.80824E-04	0.00000E+00	0.00000E+00
599	8.74607E-01	1.43667E+01	8.96558E-01	9.79873E-04	0.00000E+00	0.00000E+00
600	8.75190E-01	1.43913E+01	8.96522E-01	9.78885E-04	0.00000E+00	0.00000E+00
601	9.26165E-01	1.44142E+01	8.96571E-01	9.78502E-04	0.00000E+00	0.00000E+00
602	8.63866E-01	1.44390E+01	8.96517E-01	9.78389E-04	0.00000E+00	0.00000E+00
603	9.43383E-01	1.44627E+01	8.96595E-01	9.79868E-04	0.00000E+00	0.00000E+00
604	9.09885E-01	1.44857E+01	8.96617E-01	9.78488E-04	0.00000E+00	0.00000E+00
605	9.12432E-01	1.45103E+01	8.96643E-01	9.77216E-04	0.00000E+00	0.00000E+00
606	8.77274E-01	1.45342E+01	8.96611E-01	9.76123E-04	0.00000E+00	0.00000E+00
607	9.14951E-01	1.45570E+01	8.96641E-01	9.74980E-04	0.00000E+00	0.00000E+00
608	9.17347E-01	1.45808E+01	8.96676E-01	9.73969E-04	0.00000E+00	0.00000E+00
609	9.24481E-01	1.46037E+01	8.96721E-01	9.73442E-04	0.00000E+00	0.00000E+00
610	9.21725E-01	1.46267E+01	8.96762E-01	9.72709E-04	0.00000E+00	0.00000E+00
611	8.77816E-01	1.46503E+01	8.96731E-01	9.71609E-04	0.00000E+00	0.00000E+00
612	9.16235E-01	1.46752E+01	8 96763E-01	9.70541E-04	0.00000E+00	0.00000E+00
613	8.83370E-01	1.46988E+01	8.96741E-01	9.69199E-04	0.00000E+00	0.00000E+00
614	8.99418E-01	1.47227E+01	8.96746E-01	9.67624E-04	0.00000E+00	0.00000E+00
615	8.86865E-01	1.47465E+01	8.96730E-01	9.66179E-04	0.00000E+00	0.00000E+00
616	8.66860E-01	1.47693E+01	8.96681E-01	9.65830E-04	0.00000E+00	0.00000E+00
617	9.38340E-01	1.47932E+01	8.96749E-01	9.66635E-04	0.00000E+00	0.00000E+00
618	8.96360E-01	1.48170E+01	8.96748E-01	9.65065E-04	0.00000E+00	0.00000E+00
619	8.64843E-01	1.48408E+01	8.96696E-01	9.64886E-04	0.00000E+00	0.00000E+00
620	9.07567E-01	1.48647E+01	8.96714E-01	9.63484E-04	0.00000E+00	0.00000E+00
621	8.85979E-01	1.48875E+01	8.96697E-01	9.62082E-04	0.00000E+00	0.00000E+00
622	8.92642E-01	1.49113E+01	8.96690E-01	9.60552E-04	0.00000E+00	0.00000E+00
623	8.90951E-01	1.49342E+01	8.96681E-01	9.59048E-04	0.00000E+00	0.00000E+00
624	9.12984E-01	1.49570E+01	8.96707E-01	9.57864E-04	0.00000E+00	0.00000E+00
625	9.03836E-01	1.49808E+01	8.96719E-01	9.56393E-04	0.00000E+00	0.00000E+00
626	8.87053E-01	1.50047E+01	8.96703E-01	9.54985E-04	0.00000E+00	0.00000E+00
627	9.01798E-01	1.50275E+01	8.96711E-01	9.53491E-04	0.00000E+00	0.00000E+00
628	8.71258E-01	1.50513E+01	8.96671E-01	9.52834E-04	0.00000E+00	0.00000E+00
629	8.80493E-01	1.50742E+01	8.96645E-01	9.51663E-04	0.00000E+00	0.00000E+00
630	9.01947E-01	1.50980E+01	8.96653E-01	9.50184E-04	0.00000E+00	0.00000E+00
631	8.69068E-01	1.51227E+01	8.96609E-01	9.49685E-04	0.00000E+00	0.00000E+00
632	9.03954E-01	1.51465E+01	8.96621E-01	9.48248E-04	0.00000E+00	0.00000E+00
633	8.90630E-01	1.51703E+01	8.96612E-01	9.46792E-04	0.00000E+00	0.00000E+00
634	8.87538E-01	1.51950E+01	8.96597E-01	9.45402E-04	0.00000E+00	0.00000E+00
635	8.79876E-01	1.52188E+01	8.96571E-01	9.44277E-04	0.00000E+00	0.00000E+00
636	8.34785E-01	1.52435E+01	8.96473E-01	9.47809E-04	0.00000E+00	0.00000E+00
637	8.28974E-01	1.52683E+01	8.96367E-01	9.52267E-04	0.00000E+00	0.00000E+00
638	9.04197E-01	1.52922E+01	8.96379E-01	9.50848E-04	0.00000E+00	0.00000E+00
639	8.53858E-01	1.53158E+01	8.96313E-01	9.51699E-04	0.00000E+00	0.00000E+00
640	8.76145E-01	1.53407E+01	8.96281E-01	9.50731E-04	0.00000E+00	0.00000E+00
641	8.65992E-01	1.53645E+01	8.96234E-01	9.50425E-04	0.00000E+00	0.00000E+00
642	8.94271E-01	1.53892E+01	8.96230E-01	9.48944E-04	0.00000E+00	0.00000E+00

643	8.87355E-01	1.54130E+01	8.96217E-01	9.47563E-04	0.00000E+00	0.00000E+00
644	9.05501E-01	1.54367E+01	8.96231E-01	9.46197E-04	0.00000E+00	0.00000E+00
645	9.02579E-01	1.54605E+01	8.96241E-01	9.44776E-04	0.00000E+00	0.00000E+00
646	8.95672E-01	1.54843E+01	8.96240E-01	9.43308E-04	0.00000E+00	0.00000E+00
647	8.79846E-01	1.55072E+01	8.96215E-01	9.42187E-04	0.00000E+00	0.00000E+00
648	9.08793E-01	1.55302E+01	8.96234E-01	9.40929E-04	0.00000E+00	0.00000E+00
649	9.13886E-01	1.55538E+01	8.96261E-01	9.39870E-04	0.00000E+00	0.00000E+00
650	8.74276E-01	1.55777E+01	8.96227E-01	9.39031E-04	0.00000E+00	0.00000E+00
651	8.80085E-01	1.56015E+01	8.96203E-01	9.37913E-04	0.00000E+00	0.00000E+00
652	9.01869E-01	1.56243E+01	8.96211E-01	9.36510E-04	0.00000E+00	0.00000E+00
653	8.84645E-01	1.56482E+01	8.96194E-01	9.35239E-04	0.00000E+00	0.00000E+00
654	8.47322E-01	1.56728E+01	8.96119E-01	9.36807E-04	0.00000E+00	0.00000E+00
655	8.66875E-01	1.56967E+01	8.96074E-01	9.36443E-04	0.00000E+00	0.00000E+00
656	9.05990E-01	1.57197E+01	8.96089E-01	9.35132E-04	0.00000E+00	0.00000E+00
657	8.75003E-01	1.57433E+01	8.96057E-01	9.34259E-04	0.00000E+00	0.00000E+00
658	8.78428E-01	1.57672E+01	8.96030E-01	9.33220E-04	0.00000E+00	0.00000E+00
659	8.82439E-01	1.57920E+01	8.96009E-01	9.32028E-04	0.00000E+00	0.00000E+00
660	8.75620E-01	1.58157E+01	8.95978E-01	9.31127E-04	0.00000E+00	0.00000E+00
661	9.00068E-01	1.58405E+01	8.95984E-01	9.29733E-04	0.00000E+00	0.00000E+00
662	8.88360E-01	1.58642E+01	8.95973E-01	9.28395E-04	0.00000E+00	0.00000E+00
663	8.80138E-01	1.58890E+01	8.95949E-01	9.27299E-04	0.00000E+00	0.00000E+00
664	9.30244E-01	1.59118E+01	8.96001E-01	9.27346E-04	0.00000E+00	0.00000E+00
665	8.98375E-01	1.59347E+01	8.96004E-01	9.25953E-04	0.00000E+00	0.00000E+00
666	8.78347E-01	1.59585E+01	8.95978E-01	9.24940E-04	0.00000E+00	0.00000E+00
667	9.29099E-01	1.59813E+01	8.96028E-01	9.24890E-04	0.00000E+00	0.00000E+00
668	9.12020E-01	1.60052E+01	8.96052E-01	9.23812E-04	0.00000E+00	0.00000E+00
669	8.53710E-01	1.60300E+01	8.95988E-01	9.24608E-04	0.00000E+00	0.00000E+00
670	9.10854E-01	1.60537E+01	8.96010E-01	9.23491E-04	0.00000E+00	0.00000E+00
671	9.15832E-01	1.60775E+01	8.96040E-01	9.22585E-04	0.00000E+00	0.00000E+00
672	9.03861E-01	1.61013E+01	8.96052E-01	9.21281E-04	0.00000E+00	0.00000E+00
673	9.01234E-01	1.61260E+01	8.96059E-01	9.19940E-04	0.00000E+00	0.00000E+00
674	8.88334E-01	1.61498E+01	8.96048E-01	9.18642E-04	0.00000E+00	0.00000E+00
675	9.03907E-01	1.61745E+01	8.96060E-01	9.17350E-04	0.00000E+00	0.00000E+00
676	8.77962E-01	1.61983E+01	8.96033E-01	9.16381E-04	0.00000E+00	0.00000E+00
677	8.38561E-01	1.62240E+01	8.95948E-01	9.18975E-04	0.00000E+00	0.00000E+00
678	8.93554E-01	1.62478E+01	8.95944E-01	9.17622E-04	0.00000E+00	0.00000E+00
679	9.01517E-01	1.62707E+01	8.95952E-01	9.16302E-04	0.00000E+00	0.00000E+00
680	8.86653E-01	1.62953E+01	8.95939E-01	9.15053E-04	0.00000E+00	0.00000E+00
681	8.89348E-01	1.63192E+01	8.95929E-01	9.13756E-04	0.00000E+00	0.00000E+00
682	8.88747E-01	1.63430E+01	8.95918E-01	9.12472E-04	0.00000E+00	0.00000E+00
683	9.01776E-01	1.63668E+01	8.95927E-01	9.11172E-04	0.00000E+00	0.00000E+00
684	9.01454E-01	1.63907E+01	8.95935E-01	9.09871E-04	0.00000E+00	0.00000E+00
685	9.32153E-01	1.64143E+01	8.95988E-01	9.10084E-04	0.00000E+00	0.00000E+00
686	9.12537E-01	1.64373E+01	8.96012E-01	9.09074E-04	0.00000E+00	0.00000E+00
687	8.72577E-01	1.64620E+01	8.95978E-01	9.08391E-04	0.00000E+00	0.00000E+00
688	9.01912E-01	1.64848E+01	8.95987E-01	9.07107E-04	0.00000E+00	0.00000E+00
689	8.75728E-01	1.65097E+01	8.95957E-01	9.06265E-04	0.00000E+00	0.00000E+00
690	8.56792E-01	1.65343E+01	8.95900E-01	9.06736E-04	0.00000E+00	0.00000E+00
691	9.18720E-01	1.65582E+01	8.95933E-01	9.06024E-04	0.00000E+00	0.00000E+00
692	9.40426E-01	1.65810E+01	8.95998E-01	9.07005E-04	0.00000E+00	0.00000E+00
693	9.41321E-01	1.66038E+01	8.96063E-01	9.08064E-04	0.00000E+00	0.00000E+00
694	8.95081E-01	1.66287E+01	8.96062E-01	9.06752E-04	0.00000E+00	0.00000E+00
695	9.36425E-01	1.66515E+01	8.96120E-01	9.07314E-04	0.00000E+00	0.00000E+00
696	9.24387E-01	1.66743E+01	8.96161E-01	9.06921E-04	0.00000E+00	0.00000E+00
697	8.90040E-01	1.66973E+01	8.96152E-01	9.05657E-04	0.00000E+00	0.00000E+00
698	8.92430E-01	1.67210E+01	8.96147E-01	9.04371E-04	0.00000E+00	0.00000E+00
699	9.44390E-01	1.67430E+01	8.96216E-01	9.05721E-04	0.00000E+00	0.00000E+00
700	8.87635E-01	1.67678E+01	8.96204E-01	9.04506E-04	0.00000E+00	0.00000E+00
701	8.85004E-01	1.67915E+01	8.96188E-01	9.03354E-04	0.00000E+00	0.00000E+00
702	9.32628E-01	1.68145E+01	8.96240E-01	9.03563E-04	0.00000E+00	0.00000E+00
703	9.11362E-01	1.68365E+01	8.96261E-01	9.02531E-04	0.00000E+00	0.00000E+00
704	9.09693E-01	1.68602E+01	8.96280E-01	9.01447E-04	0.00000E+00	0.00000E+00
705	9.00177E-01	1.68832E+01	8.96286E-01	9.00181E-04	0.00000E+00	0.00000E+00
706	9.22326E-01	1.69068E+01	8.96323E-01	8.99662E-04	0.00000E+00	0.00000E+00
707	8.86457E-01	1.69317E+01	8.96309E-01	8.98494E-04	0.00000E+00	0.00000E+00
708	8.87745E-01	1.69555E+01	8.96297E-01	8.97303E-04	0.00000E+00	0.00000E+00
709	9.06482E-01	1.69792E+01	8.96311E-01	8.96148E-04	0.00000E+00	0.00000E+00
710	8.94310E-01	1.70030E+01	8.96308E-01	8.94886E-04	0.00000E+00	0.00000E+00
711	8.83331E-01	1.70277E+01	8.96290E-01	8.93811E-04	0.00000E+00	0.00000E+00
712	9.23554E-01	1.70525E+01	8.96329E-01	8.93376E-04	0.00000E+00	0.00000E+00
713	9.40958E-01	1.70753E+01	8.96391E-01	8.94325E-04	0.00000E+00	0.00000E+00
714	8.73210E-01	1.70992E+01	8.96359E-01	8.93661E-04	0.00000E+00	0.00000E+00
715	9.02008E-01	1.71230E+01	8.96367E-01	8.92442E-04	0.00000E+00	0.00000E+00
716	8.89512E-01	1.71458E+01	8.96357E-01	8.91243E-04	0.00000E+00	0.00000E+00
717	9.28326E-01	1.71697E+01	8.96402E-01	8.91118E-04	0.00000E+00	0.00000E+00
718	9.11495E-01	1.71925E+01	8.96423E-01	8.90122E-04	0.00000E+00	0.00000E+00
719	9.22444E-01	1.72172E+01	8.96459E-01	8.89620E-04	0.00000E+00	0.00000E+00
720	8.98003E-01	1.72410E+01	8.96461E-01	8.88383E-04	0.00000E+00	0.00000E+00
721	8.83291E-01	1.72648E+01	8.96443E-01	8.87336E-04	0.00000E+00	0.00000E+00
722	8.58316E-01	1.72895E+01	8.96390E-01	8.87683E-04	0.00000E+00	0.00000E+00
723	9.11684E-01	1.73143E+01	8.96411E-01	8.86705E-04	0.00000E+00	0.00000E+00
724	8.89329E-01	1.73380E+01	8.96401E-01	8.85530E-04	0.00000E+00	0.00000E+00
725	9.22263E-01	1.73618E+01	8.96437E-01	8.85028E-04	0.00000E+00	0.00000E+00
726	9.06097E-01	1.73867E+01	8.96451E-01	8.83905E-04	0.00000E+00	0.00000E+00
727	8.88787E-01	1.74095E+01	8.96440E-01	8.82749E-04	0.00000E+00	0.00000E+00
728	9.12740E-01	1.74333E+01	8.96462E-01	8.81818E-04	0.00000E+00	0.00000E+00
729	9.21494E-01	1.74570E+01	8.96497E-01	8.81277E-04	0.00000E+00	0.00000E+00
730	9.06084E-01	1.74818E+01	8.96510E-01	8.80164E-04	0.00000E+00	0.00000E+00
731	8.44856E-01	1.75075E+01	8.96439E-01	8.81807E-04	0.00000E+00	0.00000E+00
732	9.13042E-01	1.75312E+01	8.96462E-01	8.80892E-04	0.00000E+00	0.00000E+00
733	9.27032E-01	1.75550E+01	8.96504E-01	8.80680E-04	0.00000E+00	0.00000E+00
734	8.87729E-01	1.75788E+01	8.96492E-01	8.79557E-04	0.00000E+00	0.00000E+00
735	8.87608E-01	1.76027E+01	8.96480E-01	8.78440E-04	0.00000E+00	0.00000E+00
736	8.87589E-01	1.76265E+01	8.96468E-01	8.77326E-04	0.00000E+00	0.00000E+00
737	9.40468E-01	1.76502E+01	8.96527E-01	8.78175E-04	0.00000E+00	0.00000E+00
738	8.80430E-01	1.76750E+01	8.96506E-01	8.77253E-04	0.00000E+00	0.00000E+00
739	9.27698E-01	1.76988E+01	8.96548E-01	8.77084E-04	0.00000E+00	0.00000E+00
740	9.19151E-01	1.77217E+01	8.96578E-01	8.76430E-04	0 00000E+00	0.00000E+00
741	8 92995E-01	1.77455E+01	8.96574E-01	8.75257E-04	0.00000E+00	0.00000E+00
742	9.21454E-01	1.77692E+01	8.96607E-01	8.74719E-04	0.00000E+00	0.00000E+00
743	9.21646E-01	1.77930E+01	8.96641E-01	8.74192E-04	0.00000E+00	0.00000E+00
744	8.62474E-01	1.78178E+01	8.96595E-01	8.74226E-04	0.00000E+00	0.00000E+00
745	8.78658E-01	1.78415E+01	8.96571E-01	8.73382E-04	0.00000E+00	0.00000E+00
746	8.95708E-01	1.78653E+01	8.96570E-01	8.72209E-04	0.00000E+00	0.00000E+00
747	9.28713E-01	1.78892E+01	8.96613E-01	8.72105E-04	0.00000E+00	0.00000E+00
748	9.44537E-01	1.79130E+01	8.96677E-01	8.73301E-04	0.00000E+00	0.00000E+00
749	9.25454E-01	1.79368E+01	8.96716E-01	8.72982E-04	0.00000E+00	0.00000E+00
750	9.07206E-01	1.79597E+01	8.96730E-01	8.71927E-04	0.00000E+00	0.00000E+00

751	9.24168E-01	1.79835E+01	8.96766E-01	8.71532E-04	0.00000E+00	0.00000E+00
752	8.69112E-01	1.80082E+01	8.96729E-01	8.71150E-04	0.00000E+00	0.00000E+00
753	9.19546E-01	1.80310E+01	8.96760E-01	8.70519E-04	0.00000E+00	0.00000E+00
754	9.11653E-01	1.80548E+01	8.96780E-01	8.69587E-04	0.00000E+00	0.00000E+00
755	8.89243E-01	1.80795E+01	8.96770E-01	8.68489E-04	0.00000E+00	0.00000E+00
756	8.91823E-01	1.81025E+01	8.96763E-01	8.67361E-04	0.00000E+00	0.00000E+00
757	8.33849E-01	1.81272E+01	8.96680E-01	8.70210E-04	0.00000E+00	0.00000E+00
758	9.41370E-01	1.81500E+01	8.96739E-01	8.71067E-04	0.00000E+00	0.00000E+00
759	8.49148E-01	1.81738E+01	8.96676E-01	8.72184E-04	0.00000E+00	0.00000E+00
760	9.24990E-01	1.81977E+01	8.96713E-01	8.71833E-04	0.00000E+00	0.00000E+00
761	9.23285E-01	1.82205E+01	8.96748E-01	8.71387E-04	0.00000E+00	0.00000E+00
762	9.10927E-01	1.82443E+01	8.96767E-01	8.70440E-04	0.00000E+00	0.00000E+00
763	9.42739E-01	1.82672E+01	8.96827E-01	8.71392E-04	0.00000E+00	0.00000E+00
764	9.13939E-01	1.82902E+01	8.96850E-01	8.70537E-04	0.00000E+00	0.00000E+00
765	9.01541E-01	1.83148E+01	8.96856E-01	8.69417E-04	0.00000E+00	0.00000E+00
766	8.89058E-01	1.83377E+01	8.96846E-01	8.68338E-04	0.00000E+00	0.00000E+00
767	9.43874E-01	1.83615E+01	8.96907E-01	8.69379E-04	0.00000E+00	0.00000E+00
768	8.99420E-01	1.83853E+01	8.96911E-01	8.68249E-04	0.00000E+00	0.00000E+00
769	8.78321E-01	1.84092E+01	8.96886E-01	8.67455E-04	0.00000E+00	0.00000E+00
770	8.93033E-01	1.84320E+01	8.96881E-01	8.66340E-04	0.00000E+00	0.00000E+00
771	8.60661E-01	1.84577E+01	8.96834E-01	8.66493E-04	0.00000E+00	0.00000E+00
772	8.41810E-01	1.84823E+01	8.96763E-01	8.68313E-04	0.00000E+00	0.00000E+00
773	9.00824E-01	1.85052E+01	8.96768E-01	8.67202E-04	0.00000E+00	0.00000E+00
774	8.52743E-01	1.85300E+01	8.96711E-01	8.67953E-04	0.00000E+00	0.00000E+00
775	9.13975E-01	1.85547E+01	8.96733E-01	8.67117E-04	0.00000E+00	0.00000E+00
776	8.84565E-01	1.85793E+01	8.96718E-01	8.66139E-04	0.00000E+00	0.00000E+00
777	8.97693E-01	1.86042E+01	8.96719E-01	8.65022E-04	0.00000E+00	0.00000E+00
778	9.14455E-01	1.86278E+01	8.96742E-01	8.64208E-04	0.00000E+00	0.00000E+00
779	9.20641E-01	1.86508E+01	8.96772E-01	8.63643E-04	0.00000E+00	0.00000E+00
780	8.92296E-01	1.86737E+01	8.96767E-01	8.62552E-04	0.00000E+00	0.00000E+00
781	8.77353E-01	1.86983E+01	8.96742E-01	8.61804E-04	0.00000E+00	0.00000E+00
782	8.83960E-01	1.87232E+01	8.96725E-01	8.60855E-04	0.00000E+00	0.00000E+00
783	8.86227E-01	1.87468E+01	8.96712E-01	8.59857E-04	0.00000E+00	0.00000E+00
784	8.98030E-01	1.87717E+01	8.96714E-01	8.58758E-04	0.00000E+00	0.00000E+00
785	9.14458E-01	1.87945E+01	8.96736E-01	8.57960E-04	0.00000E+00	0.00000E+00
786	9.54414E-01	1.88183E+01	8.96810E-01	8.60017E-04	0.00000E+00	0.00000E+00
787	9.06428E-01	1.88422E+01	8.96822E-01	8.59009E-04	0.00000E+00	0.00000E+00
788	8.68680E-01	1.88660E+01	8.96786E-01	8.58662E-04	0.00000E+00	0.00000E+00
789	8.95655E-01	1.88897E+01	8.96785E-01	8.57571E-04	0.00000E+00	0.00000E+00
790	9.21673E-01	1.89127E+01	8.96816E-01	8.57064E-04	0.00000E+00	0.00000E+00
791	8.98787E-01	1.89373E+01	8.96819E-01	8.55981E-04	0.00000E+00	0.00000E+00
792	9.21291E-01	1.89612E+01	8.96850E-01	8.55458E-04	0.00000E+00	0.00000E+00
793	9.00681E-01	1.89850E+01	8.96855E-01	8.54390E-04	0.00000E+00	0.00000E+00
794	9.07533E-01	1.90087E+01	8.96868E-01	8.53417E-04	0.00000E+00	0.00000E+00
795	9.26335E-01	1.90325E+01	8.96905E-01	8.53149E-04	0.00000E+00	0.00000E+00
796	9.22731E-01	1.90553E+01	8.96938E-01	8.52695E-04	0.00000E+00	0.00000E+00
797	8.68620E-01	1.90802E+01	8.96902E-01	8.52366E-04	0.00000E+00	0.00000E+00
798	8.60341E-01	1.91040E+01	8.96856E-01	8.52533E-04	0.00000E+00	0.00000E+00
799	9.05900E-01	1.91268E+01	8.96868E-01	8.51538E-04	0.00000E+00	0.00000E+00
800	8.50813E-01	1.91507E+01	8.96810E-01	8.52426E-04	0.00000E+00	0.00000E+00
801	8.84755E-01	1.91743E+01	8.96795E-01	8.51492E-04	0.00000E+00	0.00000E+00
802	9.60932E-01	1.91973E+01	8.96875E-01	8.54198E-04	0.00000E+00	0.00000E+00
803	8.76828E-01	1.92212E+01	8.96850E-01	8.53498E-04	0.00000E+00	0.00000E+00
804	8.62301E-01	1.92458E+01	8.96807E-01	8.53521E-04	0.00000E+00	0.00000E+00
805	8.76213E-01	1.92705E+01	8.96781E-01	8.52843E-04	0.00000E+00	0.00000E+00
806	8.74276E-01	1.92943E+01	8.96753E-01	8.52241E-04	0.00000E+00	0.00000E+00
807	8.93648E-01	1.93182E+01	8.96749E-01	8.51191E-04	0.00000E+00	0.00000E+00
808	8.65924E-01	1.93420E+01	8.96711E-01	8.50994E-04	0.00000E+00	0.00000E+00
809	9.52415E-01	1.93648E+01	8.96780E-01	8.52737E-04	0.00000E+00	0.00000E+00
810	9.08650E-01	1.93895E+01	8.96795E-01	8.51808E-04	0.00000E+00	0.00000E+00
811	9.41810E-01	1.94115E+01	8.96851E-01	8.52572E-04	0.00000E+00	0.00000E+00
812	9.06418E-01	1.94343E+01	8.96862E-01	8.51601E-04	0.00000E+00	0.00000E+00
813	8.92819E-01	1.94582E+01	8.96857E-01	8.50564E-04	0.00000E+00	0.00000E+00
814	8.98339E-01	1.94820E+01	8.96859E-01	8.49518E-04	0.00000E+00	0.00000E+00
815	8.77347E-01	1.95058E+01	8.96835E-01	8.48812E-04	0.00000E+00	0.00000E+00
816	8.87159E-01	1.95297E+01	8.96823E-01	8.47852E-04	0.00000E+00	0.00000E+00
817	9.42640E-01	1.95525E+01	8.96880E-01	8.48675E-04	0.00000E+00	0.00000E+00
818	8.70783E-01	1.95782E+01	8.96848E-01	8.48237E-04	0.00000E+00	0.00000E+00
819	9.40829E-01	1.96010E+01	8.96901E-01	8.48907E-04	0.00000E+00	0.00000E+00
820	9.16201E-01	1.96238E+01	8.96925E-01	8.48197E-04	0.00000E+00	0.00000E+00
821	8.66118E-01	1.96487E+01	8.96887E-01	8.47995E-04	0.00000E+00	0.00000E+00
822	9.34448E-01	1.96723E+01	8.96933E-01	8.48198E-04	0.00000E+00	0.00000E+00
823	9.11216E-01	1.96962E+01	8.96951E-01	8.47343E-04	0.00000E+00	0.00000E+00
824	9.02826E-01	1.97192E+01	8.96958E-01	8.46342E-04	0.00000E+00	0.00000E+00
825	9.08861E-01	1.97420E+01	8.96972E-01	8.45437E-04	0.00000E+00	0.00000E+00
826	9.03117E-01	1.97667E+01	8.96980E-01	8.44443E-04	0.00000E+00	0.00000E+00
827	8.83126E-01	1.97905E+01	8.96963E-01	8.43586E-04	0.00000E+00	0.00000E+00
828	8.81592E-01	1.98143E+01	8.96944E-01	8.42769E-04	0.00000E+00	0.00000E+00
829	8.73749E-01	1.98363E+01	8.96916E-01	8.42217E-04	0.00000E+00	0.00000E+00
830	8.87441E-01	1.98610E+01	8.96905E-01	8.41277E-04	0.00000E+00	0.00000E+00
831	9.38631E-01	1.98848E+01	8.96955E-01	8.41768E-04	0.00000E+00	0.00000E+00
832	9.11097E-01	1.99095E+01	8.96972E-01	8.40926E-04	0.00000E+00	0.00000E+00
833	9.35022E-01	1.99323E+01	8.97018E-01	8.41160E-04	0.00000E+00	0.00000E+00
834	9.17385E-01	1.99553E+01	8.97042E-01	8.40505E-04	0.00000E+00	0.00000E+00
835	9.02165E-01	1.99790E+01	8.97049E-01	8.39518E-04	0.00000E+00	0.00000E+00
836	9.05111E-01	2.00028E+01	8.97058E-01	8.38567E-04	0.00000E+00	0.00000E+00
837	9.03150E-01	2.00277E+01	8.97066E-01	8.37593E-04	0.00000E+00	0.00000E+00
838	9.14907E-01	2.00505E+01	8.97087E-01	8.36863E-04	0.00000E+00	0.00000E+00
839	9.11821E-01	2.00733E+01	8.97104E-01	8.36048E-04	0.00000E+00	0.00000E+00
840	8.32084E-01	2.00980E+01	8.97027E-01	8.38647E-04	0.00000E+00	0.00000E+00
841	8.96703E-01	2.01228E+01	8.97026E-01	8.37647E-04	0.00000E+00	0.00000E+00
842	8.86132E-01	2.01467E+01	8.97014E-01	8.36749E-04	0.00000E+00	0.00000E+00
843	9.30081E-01	2.01703E+01	8.97053E-01	8.36678E-04	0.00000E+00	0.00000E+00
844	8.79857E-01	2.01942E+01	8.97032E-01	8.35933E-04	0.00000E+00	0.00000E+00
845	9.24139E-01	2.02180E+01	8.97065E-01	8.35560E-04	0.00000E+00	0.00000E+00
846	8.89679E-01	2.02418E+01	8.97056E-01	8.34615E-04	0.00000E+00	0.00000E+00
847	8.78686E-01	2.02657E+01	8.97034E-01	8.33911E-04	0.00000E+00	0.00000E+00
848	9.00913E-01	2.02885E+01	8.97039E-01	8.32937E-04	0.00000E+00	0.00000E+00
849	9.03616E-01	2.03123E+01	8.97046E-01	8.31989E-04	0.00000E+00	0.00000E+00
850	8.87309E-01	2.03362E+01	8.97035E-01	8.31087E-04	0.00000E+00	0.00000E+00
851	8.86621E-01	2.03608E+01	8.97023E-01	8.30198E-04	0.00000E+00	0.00000E+00
852	9.28976E-01	2.03855E+01	8.97060E-01	8.30072E-04	0.00000E+00	0.00000E+00
853	9.17824E-01	2.04093E+01	8.97085E-01	8.29455E-04	0.00000E+00	0.00000E+00
854	8.91841E-01	2.04332E+01	8.97079E-01	8.28504E-04	0.00000E+00	0.00000E+00
855	8.97408E-01	2.04570E+01	8.97079E-01	8.27532E-04	0.00000E+00	0.00000E+00
856	9.00859E-01	2.04825E+01	8.97083E-01	8.26575E-04	0.00000E+00	0.00000E+00
857	8.89706E-01	2.05055E+01	8.97075E-01	8.25652E-04	0.00000E+00	0.00000E+00
858	9.27852E-01	2.05302E+01	8.97111E-01	8.25471E-04	0.00000E+00	0.00000E+00

859	9.12221E-01	2.05540E+01	8.97128E-01	8.24695E-04	0.00000E+00	0.00000E+00
860	8.77890E-01	2.05787E+01	8.97106E-01	8.24039E-04	0.00000E+00	0.00000E+00
861	9.06913E-01	2.06025E+01	8.97117E-01	8.23158E-04	0.00000E+00	0.00000E+00
862	9.07860E-01	2.06263E+01	8.97130E-01	8.22295E-04	0.00000E+00	0.00000E+00
863	9.02653E-01	2.06500E+01	8.97136E-01	8.21365E-04	0.00000E+00	0.00000E+00
864	9.23429E-01	2.06730E+01	8.97167E-01	8.20978E-04	0.00000E+00	0.00000E+00
865	9.04582E-01	2.06958E+01	8.97175E-01	8.20071E-04	0.00000E+00	0.00000E+00
866	8.95726E-01	2.07205E+01	8.97174E-01	8.19123E-04	0.00000E+00	0.00000E+00
867	9.08764E-01	2.07443E+01	8.97187E-01	8.18285E-04	0.00000E+00	0.00000E+00
868	8.87258E-01	2.07682E+01	8.97176E-01	8.17420E-04	0.00000E+00	0.00000E+00
869	8.66767E-01	2.07920E+01	8.97140E-01	8.17230E-04	0.00000E+00	0.00000E+00
870	9.38072E-01	2.08140E+01	8.97188E-01	8.17649E-04	0.00000E+00	0.00000E+00
871	8.62568E-01	2.08377E+01	8.97148E-01	8.17679E-04	0.00000E+00	0.00000E+00
872	9.20281E-01	2.08615E+01	8.97174E-01	8.17171E-04	0.00000E+00	0.00000E+00
873	9.34936E-01	2.08853E+01	8.97218E-01	8.17383E-04	0.00000E+00	0.00000E+00
874	9.13250E-01	2.09092E+01	8.97236E-01	8.16652E-04	0.00000E+00	0.00000E+00
875	8.47220E-01	2.09338E+01	8.97179E-01	8.17725E-04	0.00000E+00	0.00000E+00
876	8.80179E-01	2.09585E+01	8.97159E-01	8.17021E-04	0.00000E+00	0.00000E+00
877	8.80312E-01	2.09833E+01	8.97140E-01	8.16313E-04	0.00000E+00	0.00000E+00
878	9.40622E-01	2.10062E+01	8.97190E-01	8.16891E-04	0.00000E+00	0.00000E+00
879	8.53698E-01	2.10308E+01	8.97140E-01	8.17464E-04	0.00000E+00	0.00000E+00
880	8.85290E-01	2.10557E+01	8.97127E-01	8.16644E-04	0.00000E+00	0.00000E+00
881	8.62659E-01	2.10803E+01	8.97087E-01	8.16657E-04	0.00000E+00	0.00000E+00
882	8.77399E-01	2.11050E+01	8.97065E-01	8.16035E-04	0.00000E+00	0.00000E+00
883	8.96399E-01	2.11298E+01	8.97064E-01	8.15108E-04	0.00000E+00	0.00000E+00
884	8.85206E-01	2.11545E+01	8.97051E-01	8.14295E-04	0.00000E+00	0.00000E+00
885	9.08646E-01	2.11783E+01	8.97064E-01	8.13478E-04	0.00000E+00	0.00000E+00
886	9.08222E-01	2.12012E+01	8.97077E-01	8.12655E-04	0.00000E+00	0.00000E+00
887	9.04370E-01	2.12258E+01	8.97085E-01	8.11778E-04	0.00000E+00	0.00000E+00
888	8.91415E-01	2.12507E+01	8.97078E-01	8.10887E-04	0.00000E+00	0.00000E+00
889	8.79315E-01	2.12753E+01	8.97058E-01	8.10220E-04	0.00000E+00	0.00000E+00
890	9.09294E-01	2.12992E+01	8.97072E-01	8.09424E-04	0.00000E+00	0.00000E+00
891	9.35346E-01	2.13220E+01	8.97115E-01	8.09658E-04	0.00000E+00	0.00000E+00
892	8.63768E-01	2.13467E+01	8.97078E-01	8.09616E-04	0.00000E+00	0.00000E+00
893	8.79302E-01	2.13715E+01	8.97058E-01	8.08952E-04	0.00000E+00	0.00000E+00
894	8.56139E-01	2.13952E+01	8.97012E-01	8.09346E-04	0.00000E+00	0.00000E+00
895	8.47750E-01	2.14200E+01	8.96957E-01	8.10319E-04	0.00000E+00	0.00000E+00
896	8.89862E-01	2.14438E+01	8.96949E-01	8.09451E-04	0.00000E+00	0.00000E+00
897	8.60465E-01	2.14685E+01	8.96908E-01	8.09573E-04	0.00000E+00	0.00000E+00
898	9.24712E-01	2.14923E+01	8.96939E-01	8.09264E-04	0.00000E+00	0.00000E+00
899	8.65832E-01	2.15160E+01	8.96904E-01	8.09105E-04	0.00000E+00	0.00000E+00
900	8.92025E-01	2.15398E+01	8.96899E-01	8.08222E-04	0.00000E+00	0.00000E+00
901	8.90804E-01	2.15647E+01	8.96892E-01	8.07351E-04	0.00000E+00	0.00000E+00
902	9.21082E-01	2.15875E+01	8.96919E-01	8.06901E-04	0.00000E+00	0.00000E+00
903	8.89179E-01	2.16113E+01	8.96911E-01	8.06051E-04	0.00000E+00	0.00000E+00
904	9.00549E-01	2.16360E+01	8.96915E-01	8.05167E-04	0.00000E+00	0.00000E+00
905	8.83174E-01	2.16598E+01	8.96899E-01	8.04419E-04	0.00000E+00	0.00000E+00
906	8.83253E-01	2.16837E+01	8.96884E-01	8.03670E-04	0.00000E+00	0.00000E+00
907	8.29947E-01	2.17083E+01	8.96810E-01	8.06182E-04	0.00000E+00	0.00000E+00
908	8.53567E-01	2.17322E+01	8.96763E-01	8.06705E-04	0.00000E+00	0.00000E+00
909	9.33725E-01	2.17558E+01	8.96803E-01	8.06844E-04	0.00000E+00	0.00000E+00
910	9.07859E-01	2.17797E+01	8.96816E-01	8.06047E-04	0.00000E+00	0.00000E+00
911	8.69146E-01	2.18045E+01	8.96785E-01	8.05735E-04	0.00000E+00	0.00000E+00
912	9.33907E-01	2.18282E+01	8.96826E-01	8.05883E-04	0.00000E+00	0.00000E+00
913	8.68292E-01	2.18512E+01	8.96795E-01	8.05607E-04	0.00000E+00	0.00000E+00
914	8.88328E-01	2.18758E+01	8.96785E-01	8.04776E-04	0.00000E+00	0.00000E+00
915	9.14710E-01	2.18997E+01	8.96805E-01	8.04134E-04	0.00000E+00	0.00000E+00
916	8.92708E-01	2.19225E+01	8.96800E-01	8.03266E-04	0.00000E+00	0.00000E+00
917	8.72728E-01	2.19472E+01	8.96774E-01	8.02819E-04	0.00000E+00	0.00000E+00
918	9.03811E-01	2.19702E+01	8.96782E-01	8.01979E-04	0.00000E+00	0.00000E+00
919	8.74917E-01	2.19948E+01	8.96758E-01	8.01459E-04	0.00000E+00	0.00000E+00
920	8.66324E-01	2.20195E+01	8.96725E-01	8.01271E-04	0.00000E+00	0.00000E+00
921	8.83617E-01	2.20443E+01	8.96711E-01	8.00526E-04	0.00000E+00	0.00000E+00
922	9.22406E-01	2.20672E+01	8.96738E-01	8.00143E-04	0.00000E+00	0.00000E+00
923	8.66842E-01	2.20918E+01	8.96706E-01	7.99933E-04	0.00000E+00	0.00000E+00
924	8.89395E-01	2.21157E+01	8.96698E-01	7.99104E-04	0.00000E+00	0.00000E+00
925	8.36655E-01	2.21395E+01	8.96633E-01	8.00884E-04	0.00000E+00	0.00000E+00
926	8.95882E-01	2.21652E+01	8.96632E-01	8.00017E-04	0.00000E+00	0.00000E+00
927	8.56521E-01	2.21898E+01	8.96589E-01	8.00327E-04	0.00000E+00	0.00000E+00
928	8.76121E-01	2.22145E+01	8.96567E-01	7.99768E-04	0.00000E+00	0.00000E+00
929	8.49620E-01	2.22383E+01	8.96516E-01	8.00509E-04	0.00000E+00	0.00000E+00
930	8.52140E-01	2.22630E+01	8.96468E-01	8.01074E-04	0.00000E+00	0.00000E+00
931	9.00874E-01	2.22878E+01	8.96473E-01	8.00225E-04	0.00000E+00	0.00000E+00
932	9.05055E-01	2.23115E+01	8.96482E-01	7.99418E-04	0.00000E+00	0.00000E+00
933	9.16334E-01	2.23353E+01	8.96504E-01	7.98843E-04	0.00000E+00	0.00000E+00
934	8.26662E-01	2.23602E+01	8.96429E-01	8.01496E-04	0.00000E+00	0.00000E+00
935	8.64593E-01	2.23848E+01	8.96395E-01	8.01364E-04	0.00000E+00	0.00000E+00
936	8.73175E-01	2.24095E+01	8.96370E-01	8.00891E-04	0.00000E+00	0.00000E+00
937	8.66541E-01	2.24342E+01	8.96338E-01	8.00670E-04	0.00000E+00	0.00000E+00
938	8.98576E-01	2.24572E+01	8.96340E-01	7.99818E-04	0.00000E+00	0.00000E+00
939	8.94220E-01	2.24810E+01	8.96338E-01	7.98967E-04	0.00000E+00	0.00000E+00
940	9.23132E-01	2.25047E+01	8.96366E-01	7.98626E-04	0.00000E+00	0.00000E+00
941	8.92493E-01	2.25285E+01	8.96362E-01	7.97785E-04	0.00000E+00	0.00000E+00
942	8.71159E-01	2.25523E+01	8.96335E-01	7.97387E-04	0.00000E+00	0.00000E+00
943	9.16876E-01	2.25762E+01	8.96357E-01	7.96838E-04	0.00000E+00	0.00000E+00
944	8.93818E-01	2.26000E+01	8.96355E-01	7.95996E-04	0.00000E+00	0.00000E+00
945	9.11905E-01	2.26237E+01	8.96371E-01	7.95323E-04	0.00000E+00	0.00000E+00
946	8.74771E-01	2.26485E+01	8.96348E-01	7.94809E-04	0.00000E+00	0.00000E+00
947	9.16302E-01	2.26713E+01	8.96369E-01	7.94249E-04	0.00000E+00	0.00000E+00
948	8.71349E-01	2.26952E+01	8.96343E-01	7.93849E-04	0.00000E+00	0.00000E+00
949	8.56971E-01	2.27180E+01	8.96301E-01	7.94100E-04	0.00000E+00	0.00000E+00
950	8.88669E-01	2.27418E+01	8.96293E-01	7.93302E-04	0.00000E+00	0.00000E+00
951	8.90950E-01	2.27657E+01	8.96288E-01	7.92486E-04	0.00000E+00	0.00000E+00
952	9.28767E-01	2.27895E+01	8.96322E-01	7.92389E-04	0.00000E+00	0.00000E+00
953	8.58953E-01	2.28132E+01	8.96283E-01	7.92530E-04	0.00000E+00	0.00000E+00
954	9.59375E-01	2.28370E+01	8.96349E-01	7.94466E-04	0.00000E+00	0.00000E+00
955	8.57345E-01	2.28608E+01	8.96308E-01	7.94687E-04	0.00000E+00	0.00000E+00
956	9.13339E-01	2.28837E+01	8.96326E-01	7.94054E-04	0.00000E+00	0.00000E+00
957	9.04645E-01	2.29075E+01	8.96334E-01	7.93270E-04	0.00000E+00	0.00000E+00
958	9.21641E-01	2.29313E+01	8.96361E-01	7.92882E-04	0.00000E+00	0.00000E+00
959	8.77621E-01	2.29552E+01	8.96341E-01	7.92295E-04	0.00000E+00	0.00000E+00
960	9.04417E-01	2.29798E+01	8.96350E-01	7.91512E-04	0.00000E+00	0.00000E+00
961	8.91568E-01	2.30045E+01	8.96345E-01	7.90702E-04	0.00000E+00	0.00000E+00
962	9.21566E-01	2.30283E+01	8.96371E-01	7.90315E-04	0.00000E+00	0.00000E+00
963	8.82102E-01	2.30530E+01	8.96356E-01	7.89632E-04	0.00000E+00	0.00000E+00
964	8.66841E-01	2.30778E+01	8.96326E-01	7.89407E-04	0.00000E+00	0.00000E+00
965	9.07051E-01	2.31025E+01	8.96337E-01	7.88666E-04	0.00000E+00	0.00000E+00
966	9.17604E-01	2.31272E+01	8.96359E-01	7.88156E-04	0.00000E+00	0.00000E+00

967	8.55027E-01	2.31520E+01	8.96316E-01	7.88503E-04	0.00000E+00	0.00000E+00
968	8.85794E-01	2.31757E+01	8.96305E-01	7.87761E-04	0.00000E+00	0.00000E+00
969	8.90583E-01	2.31995E+01	8.96299E-01	7.86969E-04	0.00000E+00	0.00000E+00
970	8.84951E-01	2.32225E+01	8.96287E-01	7.86243E-04	0.00000E+00	0.00000E+00
971	8.98120E-01	2.32462E+01	8.96289E-01	7.85433E-04	0.00000E+00	0.00000E+00
972	9.26559E-01	2.32692E+01	8.96320E-01	7.85243E-04	0.00000E+00	0.00000E+00
973	8.53054E-01	2.32928E+01	8.96276E-01	7.85699E-04	0.00000E+00	0.00000E+00
974	8.45202E-01	2.33185E+01	8.96223E-01	7.86647E-04	0.00000E+00	0.00000E+00
975	8.92275E-01	2.33423E+01	8.96219E-01	7.85848E-04	0.00000E+00	0.00000E+00
976	8.96983E-01	2.33652E+01	8.96220E-01	7.85041E-04	0.00000E+00	0.00000E+00
977	9.23888E-01	2.33900E+01	8.96248E-01	7.84749E-04	0.00000E+00	0.00000E+00
978	9.03130E-01	2.34128E+01	8.96256E-01	7.83976E-04	0.00000E+00	0.00000E+00
979	8.89610E-01	2.34367E+01	8.96249E-01	7.83203E-04	0.00000E+00	0.00000E+00
980	9.08651E-01	2.34605E+01	8.96261E-01	7.82505E-04	0.00000E+00	0.00000E+00
981	9.23001E-01	2.34852E+01	8.96289E-01	7.82182E-04	0.00000E+00	0.00000E+00
982	9.34685E-01	2.35090E+01	8.96328E-01	7.82365E-04	0.00000E+00	0.00000E+00
983	8.80812E-01	2.35328E+01	8.96312E-01	7.81727E-04	0.00000E+00	0.00000E+00
984	8.90980E-01	2.35557E+01	8.96307E-01	7.80950E-04	0.00000E+00	0.00000E+00
985	8.89848E-01	2.35803E+01	8.96300E-01	7.80182E-04	0.00000E+00	0.00000E+00
986	9.14138E-01	2.36032E+01	8.96318E-01	7.79600E-04	0.00000E+00	0.00000E+00
987	9.17277E-01	2.36280E+01	8.96339E-01	7.79099E-04	0.00000E+00	0.00000E+00
988	9.20812E-01	2.36508E+01	8.96364E-01	7.78704E-04	0.00000E+00	0.00000E+00
989	8.90277E-01	2.36755E+01	8.96358E-01	7.77939E-04	0.00000E+00	0.00000E+00
990	8.61549E-01	2.36993E+01	8.96323E-01	7.77949E-04	0.00000E+00	0.00000E+00
991	9.06464E-01	2.37222E+01	8.96333E-01	7.77230E-04	0.00000E+00	0.00000E+00
992	8.76428E-01	2.37460E+01	8.96313E-01	7.76705E-04	0.00000E+00	0.00000E+00
993	8.98159E-01	2.37708E+01	8.96315E-01	7.75923E-04	0.00000E+00	0.00000E+00
994	8.77262E-01	2.37937E+01	8.96296E-01	7.75378E-04	0.00000E+00	0.00000E+00
995	8.86444E-01	2.38193E+01	8.96286E-01	7.74660E-04	0.00000E+00	0.00000E+00
996	9.29766E-01	2.38422E+01	8.96319E-01	7.74613E-04	0.00000E+00	0.00000E+00
997	9.17535E-01	2.38642E+01	8.96341E-01	7.74128E-04	0.00000E+00	0.00000E+00
998	9.15832E-01	2.38870E+01	8.96360E-01	7.73598E-04	0.00000E+00	0.00000E+00
999	9.35707E-01	2.39108E+01	8.96400E-01	7.73829E-04	0.00000E+00	0.00000E+00
1000	8.65155E-01	2.39337E+01	8.96369E-01	7.73687E-04	0.00000E+00	0.00000E+00
1001	8.84044E-01	2.39567E+01	8.96356E-01	7.73010E-04	0.00000E+00	0.00000E+00
1002	8.68562E-01	2.39813E+01	8.96328E-01	7.72737E-04	0.00000E+00	0.00000E+00
1003	8.88865E-01	2.40052E+01	8.96321E-01	7.72001E-04	0.00000E+00	0.00000E+00
1004	8.80088E-01	2.40288E+01	8.96305E-01	7.71400E-04	0.00000E+00	0.00000E+00
1005	8.86939E-01	2.40527E+01	8.96295E-01	7.70687E-04	0.00000E+00	0.00000E+00
1006	9.02762E-01	2.40765E+01	8.96302E-01	7.69946E-04	0.00000E+00	0.00000E+00
1007	8.64564E-01	2.41012E+01	8.96270E-01	7.69827E-04	0.00000E+00	0.00000E+00
1008	9.00696E-01	2.41250E+01	8.96275E-01	7.69074E-04	0.00000E+00	0.00000E+00
1009	9.00350E-01	2.41497E+01	8.96279E-01	7.68321E-04	0.00000E+00	0.00000E+00
1010	9.00566E-01	2.41735E+01	8.96283E-01	7.67570E-04	0.00000E+00	0.00000E+00
1011	8.91664E-01	2.41973E+01	8.96278E-01	7.66823E-04	0.00000E+00	0.00000E+00
1012	8.97271E-01	2.42230E+01	8.96279E-01	7.66064E-04	0.00000E+00	0.00000E+00
1013	9.16475E-01	2.42458E+01	8.96299E-01	7.65566E-04	0.00000E+00	0.00000E+00
1014	8.97566E-01	2.42707E+01	8.96301E-01	7.64810E-04	0.00000E+00	0.00000E+00
1015	8.86673E-01	2.42943E+01	8.96291E-01	7.64114E-04	0.00000E+00	0.00000E+00
1016	8.87857E-01	2.43173E+01	8.96283E-01	7.63406E-04	0.00000E+00	0.00000E+00
1017	9.22095E-01	2.43410E+01	8.96308E-01	7.63077E-04	0.00000E+00	0.00000E+00
1018	9.01253E-01	2.43648E+01	8.96313E-01	7.62341E-04	0.00000E+00	0.00000E+00
1019	9.23257E-01	2.43897E+01	8.96340E-01	7.62052E-04	0.00000E+00	0.00000E+00
1020	8.96923E-01	2.44125E+01	8.96340E-01	7.61303E-04	0.00000E+00	0.00000E+00
1021	8.97407E-01	2.44363E+01	8.96341E-01	7.60556E-04	0.00000E+00	0.00000E+00
1022	9.07315E-01	2.44592E+01	8.96352E-01	7.59886E-04	0.00000E+00	0.00000E+00
1023	8.95572E-01	2.44838E+01	8.96351E-01	7.59142E-04	0.00000E+00	0.00000E+00
1024	9.07718E-01	2.45087E+01	8.96362E-01	7.58481E-04	0.00000E+00	0.00000E+00
1025	9.02544E-01	2.45323E+01	8.96368E-01	7.57763E-04	0.00000E+00	0.00000E+00
1026	8.94517E-01	2.45553E+01	8.96367E-01	7.57025E-04	0.00000E+00	0.00000E+00
1027	8.87744E-01	2.45800E+01	8.96358E-01	7.56332E-04	0.00000E+00	0.00000E+00
1028	8.91779E-01	2.46038E+01	8.96354E-01	7.55608E-04	0.00000E+00	0.00000E+00
1029	8.81953E-01	2.46277E+01	8.96340E-01	7.55002E-04	0.00000E+00	0.00000E+00
1030	8.91379E-01	2.46523E+01	8.96335E-01	7.54283E-04	0.00000E+00	0.00000E+00
1031	8.97679E-01	2.46762E+01	8.96336E-01	7.53551E-04	0.00000E+00	0.00000E+00
1032	8.77777E-01	2.47000E+01	8.96318E-01	7.53034E-04	0.00000E+00	0.00000E+00
1033	8.83846E-01	2.47247E+01	8.96306E-01	7.52401E-04	0.00000E+00	0.00000E+00
1034	8.79761E-01	2.47475E+01	8.96290E-01	7.51842E-04	0.00000E+00	0.00000E+00
1035	8.97991E-01	2.47713E+01	8.96292E-01	7.51116E-04	0.00000E+00	0.00000E+00
1036	8.89629E-01	2.47952E+01	8.96285E-01	7.50417E-04	0.00000E+00	0.00000E+00
1037	8.66763E-01	2.48180E+01	8.96257E-01	7.50234E-04	0.00000E+00	0.00000E+00
1038	8.84214E-01	2.48437E+01	8.96245E-01	7.49600E-04	0.00000E+00	0.00000E+00
1039	9.15908E-01	2.48683E+01	8.96264E-01	7.49116E-04	0.00000E+00	0.00000E+00
1040	9.21075E-01	2.48922E+01	8.96288E-01	7.48776E-04	0.00000E+00	0.00000E+00
1041	8.55317E-01	2.49168E+01	8.96248E-01	7.49094E-04	0.00000E+00	0.00000E+00
1042	8.96144E-01	2.49407E+01	8.96248E-01	7.48373E-04	0.00000E+00	0.00000E+00
1043	9.08740E-01	2.49645E+01	8.96260E-01	7.47750E-04	0.00000E+00	0.00000E+00
1044	8.51237E-01	2.49883E+01	8.96217E-01	7.48281E-04	0.00000E+00	0.00000E+00
1045	8.96748E-01	2.50130E+01	8.96218E-01	7.47563E-04	0.00000E+00	0.00000E+00
1046	8.54888E-01	2.50377E+01	8.96178E-01	7.47895E-04	0.00000E+00	0.00000E+00
1047	8.85638E-01	2.50625E+01	8.96168E-01	7.47247E-04	0.00000E+00	0.00000E+00
1048	8.88498E-01	2.50872E+01	8.96161E-01	7.46568E-04	0.00000E+00	0.00000E+00
1049	9.04067E-01	2.51118E+01	8.96168E-01	7.45893E-04	0.00000E+00	0.00000E+00
1050	8.65492E-01	2.51365E+01	8.96139E-01	7.45756E-04	0.00000E+00	0.00000E+00
1051	8.89499E-01	2.51595E+01	8.96133E-01	7.45071E-04	0.00000E+00	0.00000E+00
1052	8.95148E-01	2.51833E+01	8.96132E-01	7.44362E-04	0.00000E+00	0.00000E+00
1053	9.21011E-01	2.52070E+01	8.96155E-01	7.44030E-04	0.00000E+00	0.00000E+00
1054	8.79649E-01	2.52300E+01	8.96140E-01	7.43488E-04	0.00000E+00	0.00000E+00
1055	8.94670E-01	2.52538E+01	8.96138E-01	7.42783E-04	0.00000E+00	0.00000E+00
1056	9.09842E-01	2.52775E+01	8.96151E-01	7.42192E-04	0.00000E+00	0.00000E+00
1057	9.12909E-01	2.53023E+01	8.96167E-01	7.41658E-04	0.00000E+00	0.00000E+00
1058	9.31263E-01	2.53242E+01	8.96200E-01	7.41701E-04	0.00000E+00	0.00000E+00
1059	9.05228E-01	2.53480E+01	8.96209E-01	7.41048E-04	0.00000E+00	0.00000E+00
1060	9.40802E-01	2.53710E+01	8.96251E-01	7.41546E-04	0.00000E+00	0.00000E+00
1061	8.74881E-01	2.53947E+01	8.96231E-01	7.41120E-04	0.00000E+00	0.00000E+00
1062	9.05753E-01	2.54177E+01	8.96240E-01	7.40475E-04	0.00000E+00	0.00000E+00
1063	8.88956E-01	2.54413E+01	8.96233E-01	7.39809E-04	0.00000E+00	0.00000E+00
1064	9.42077E-01	2.54643E+01	8.96276E-01	7.40371E-04	0.00000E+00	0.00000E+00
1065	9.24862E-01	2.54882E+01	8.96303E-01	7.40163E-04	0.00000E+00	0.00000E+00
1066	8.55677E-01	2.55118E+01	8.96265E-01	7.40452E-04	0.00000E+00	0.00000E+00
1067	8.85195E-01	2.55357E+01	8.96254E-01	7.39830E-04	0.00000E+00	0.00000E+00
1068	8.49246E-01	2.55595E+01	8.96210E-01	7.40450E-04	0.00000E+00	0.00000E+00
1069	8.85453E-01	2.55842E+01	8.96200E-01	7.39824E-04	0.00000E+00	0.00000E+00
1070	8.44168E-01	2.56080E+01	8.96152E-01	7.40735E-04	0.00000E+00	0.00000E+00
1071	9.04609E-01	2.56327E+01	8.96159E-01	7.40084E-04	0.00000E+00	0.00000E+00
1072	8.84240E-01	2.56565E+01	8.96148E-01	7.39476E-04	0.00000E+00	0.00000E+00
1073	8.44388E-01	2.56803E+01	8.96100E-01	7.40364E-04	0.00000E+00	0.00000E+00
1074	8.84394E-01	2.57042E+01	8.96089E-01	7.39754E-04	0.00000E+00	0.00000E+00

1075	8.84275E-01	2.57280E+01	8.96078E-01	7.39146E-04	0.00000E+00	0.00000E+00
1076	8.82604E-01	2.57527E+01	8.96066E-01	7.38564E-04	0.00000E+00	0.00000E+00
1077	9.01255E-01	2.57755E+01	8.96070E-01	7.37892E-04	0.00000E+00	0.00000E+00
1078	9.15737E-01	2.57993E+01	8.96089E-01	7.37433E-04	0.00000E+00	0.00000E+00
1079	8.98836E-01	2.58232E+01	8.96091E-01	7.36752E-04	0.00000E+00	0.00000E+00
1080	8.66644E-01	2.58478E+01	8.96064E-01	7.36575E-04	0.00000E+00	0.00000E+00
1081	8.58190E-01	2.58725E+01	8.96029E-01	7.36729E-04	0.00000E+00	0.00000E+00
1082	8.92714E-01	2.58973E+01	8.96026E-01	7.36053E-04	0.00000E+00	0.00000E+00
1083	8.54882E-01	2.59212E+01	8.95988E-01	7.36356E-04	0.00000E+00	0.00000E+00
1084	9.02746E-01	2.59448E+01	8.95994E-01	7.35702E-04	0.00000E+00	0.00000E+00
1085	9.08642E-01	2.59678E+01	8.96006E-01	7.35115E-04	0.00000E+00	0.00000E+00
1086	8.88831E-01	2.59917E+01	8.95999E-01	7.34466E-04	0.00000E+00	0.00000E+00
1087	9.28360E-01	2.60145E+01	8.96029E-01	7.34395E-04	0.00000E+00	0.00000E+00
1088	8.89307E-01	2.60392E+01	8.96023E-01	7.33744E-04	0.00000E+00	0.00000E+00
1089	9.13454E-01	2.60630E+01	8.96039E-01	7.33244E-04	0.00000E+00	0.00000E+00
1090	9.16673E-01	2.60868E+01	8.96058E-01	7.32816E-04	0.00000E+00	0.00000E+00
1091	8.74491E-01	2.61097E+01	8.96038E-01	7.32410E-04	0.00000E+00	0.00000E+00
1092	9.01690E-01	2.61335E+01	8.96043E-01	7.31756E-04	0.00000E+00	0.00000E+00
1093	8.46123E-01	2.61582E+01	8.95997E-01	7.32516E-04	0.00000E+00	0.00000E+00
1094	9.08212E-01	2.61820E+01	8.96008E-01	7.31930E-04	0.00000E+00	0.00000E+00
1095	8.98488E-01	2.62058E+01	8.96011E-01	7.31264E-04	0.00000E+00	0.00000E+00
1096	9.09170E-01	2.62287E+01	8.96023E-01	7.30694E-04	0.00000E+00	0.00000E+00
1097	8.90699E-01	2.62533E+01	8.96018E-01	7.30042E-04	0.00000E+00	0.00000E+00
1098	8.81684E-01	2.62763E+01	8.96005E-01	7.29493E-04	0.00000E+00	0.00000E+00
1099	8.94330E-01	2.63010E+01	8.96003E-01	7.28830E-04	0.00000E+00	0.00000E+00
1100	8.61453E-01	2.63257E+01	8.95972E-01	7.28845E-04	0.00000E+00	0.00000E+00
1101	8.77511E-01	2.63495E+01	8.95955E-01	7.28375E-04	0.00000E+00	0.00000E+00
1102	8.96574E-01	2.63733E+01	8.95956E-01	7.27713E-04	0.00000E+00	0.00000E+00
1103	8.74184E-01	2.63980E+01	8.95936E-01	7.27321E-04	0.00000E+00	0.00000E+00
1104	8.78485E-01	2.64218E+01	8.95920E-01	7.26833E-04	0.00000E+00	0.00000E+00
1105	9.01330E-01	2.64465E+01	8.95925E-01	7.26190E-04	0.00000E+00	0.00000E+00
1106	9.34887E-01	2.64703E+01	8.95960E-01	7.26390E-04	0.00000E+00	0.00000E+00
1107	8.93618E-01	2.64942E+01	8.95958E-01	7.25735E-04	0.00000E+00	0.00000E+00
1108	9.02750E-01	2.65170E+01	8.95964E-01	7.25105E-04	0.00000E+00	0.00000E+00
1109	9.18999E-01	2.65408E+01	8.95985E-01	7.24748E-04	0.00000E+00	0.00000E+00
1110	8.98118E-01	2.65637E+01	8.95987E-01	7.24097E-04	0.00000E+00	0.00000E+00
1111	8.98897E-01	2.65875E+01	8.95989E-01	7.23448E-04	0.00000E+00	0.00000E+00
1112	9.08947E-01	2.66113E+01	8.96001E-01	7.22890E-04	0.00000E+00	0.00000E+00
1113	9.26974E-01	2.66352E+01	8.96029E-01	7.22777E-04	0.00000E+00	0.00000E+00
1114	8.71905E-01	2.66590E+01	8.96007E-01	7.22453E-04	0.00000E+00	0.00000E+00
1115	8.96963E-01	2.66827E+01	8.96008E-01	7.21804E-04	0.00000E+00	0.00000E+00
1116	8.71165E-01	2.67057E+01	8.95986E-01	7.21500E-04	0.00000E+00	0.00000E+00
1117	8.90311E-01	2.67295E+01	8.95981E-01	7.20871E-04	0.00000E+00	0.00000E+00
1118	8.99518E-01	2.67542E+01	8.95984E-01	7.20232E-04	0.00000E+00	0.00000E+00
1119	8.91354E-01	2.67780E+01	8.95980E-01	7.19599E-04	0.00000E+00	0.00000E+00
1120	9.17347E-01	2.68017E+01	8.95999E-01	7.19209E-04	0.00000E+00	0.00000E+00
1121	8.77721E-01	2.68255E+01	8.95983E-01	7.18751E-04	0.00000E+00	0.00000E+00
1122	9.00307E-01	2.68485E+01	8.95986E-01	7.18120E-04	0.00000E+00	0.00000E+00
1123	8.69085E-01	2.68713E+01	8.95962E-01	7.17880E-04	0.00000E+00	0.00000E+00
1124	8.69200E-01	2.68952E+01	8.95939E-01	7.17636E-04	0.00000E+00	0.00000E+00
1125	9.31893E-01	2.69180E+01	8.95971E-01	7.17711E-04	0.00000E+00	0.00000E+00
1126	9.03385E-01	2.69427E+01	8.95977E-01	7.17103E-04	0.00000E+00	0.00000E+00
1127	8.59036E-01	2.69665E+01	8.95944E-01	7.17217E-04	0.00000E+00	0.00000E+00
1128	9.04152E-01	2.69903E+01	8.95952E-01	7.16617E-04	0.00000E+00	0.00000E+00
1129	9.12474E-01	2.70132E+01	8.95966E-01	7.16131E-04	0.00000E+00	0.00000E+00
1130	8.60995E-01	2.70378E+01	8.95935E-01	7.16167E-04	0.00000E+00	0.00000E+00
1131	8.71672E-01	2.70627E+01	8.95914E-01	7.15855E-04	0.00000E+00	0.00000E+00
1132	9.26681E-01	2.70865E+01	8.95941E-01	7.15740E-04	0.00000E+00	0.00000E+00
1133	8.94016E-01	2.71102E+01	8.95939E-01	7.15109E-04	0.00000E+00	0.00000E+00
1134	8.93460E-01	2.71350E+01	8.95937E-01	7.14480E-04	0.00000E+00	0.00000E+00
1135	9.08239E-01	2.71578E+01	8.95948E-01	7.13932E-04	0.00000E+00	0.00000E+00
1136	8.62759E-01	2.71825E+01	8.95919E-01	7.13902E-04	0.00000E+00	0.00000E+00
1137	8.77150E-01	2.72063E+01	8.95902E-01	7.13464E-04	0.00000E+00	0.00000E+00
1138	9.16201E-01	2.72302E+01	8.95920E-01	7.13060E-04	0.00000E+00	0.00000E+00
1139	9.28077E-01	2.72522E+01	8.95948E-01	7.12994E-04	0.00000E+00	0.00000E+00
1140	9.15754E-01	2.72768E+01	8.95966E-01	7.12579E-04	0.00000E+00	0.00000E+00
1141	8.83411E-01	2.72997E+01	8.95955E-01	7.12039E-04	0.00000E+00	0.00000E+00
1142	8.69228E-01	2.73263E+01	8.95931E-01	7.11800E-04	0.00000E+00	0.00000E+00
1143	8.85366E-01	2.73492E+01	8.95922E-01	7.11236E-04	0.00000E+00	0.00000E+00
1144	8.86207E-01	2.73738E+01	8.95914E-01	7.10664E-04	0.00000E+00	0.00000E+00
1145	9.06083E-01	2.73968E+01	8.95922E-01	7.10098E-04	0.00000E+00	0.00000E+00
1146	8.85198E-01	2.74215E+01	8.95913E-01	7.09539E-04	0.00000E+00	0.00000E+00
1147	9.09287E-01	2.74443E+01	8.95925E-01	7.09015E-04	0.00000E+00	0.00000E+00
1148	9.23632E-01	2.74682E+01	8.95949E-01	7.08809E-04	0.00000E+00	0.00000E+00
1149	9.00286E-01	2.74920E+01	8.95953E-01	7.08200E-04	0.00000E+00	0.00000E+00
1150	8.69474E-01	2.75167E+01	8.95930E-01	7.07959E-04	0.00000E+00	0.00000E+00
1151	8.50941E-01	2.75395E+01	8.95891E-01	7.08426E-04	0.00000E+00	0.00000E+00
1152	8.59734E-01	2.75652E+01	8.95859E-01	7.08507E-04	0.00000E+00	0.00000E+00
1153	8.87615E-01	2.75890E+01	8.95852E-01	7.07928E-04	0.00000E+00	0.00000E+00
1154	8.40925E-01	2.76128E+01	8.95804E-01	7.08918E-04	0.00000E+00	0.00000E+00
1155	8.68554E-01	2.76367E+01	8.95781E-01	7.08697E-04	0.00000E+00	0.00000E+00
1156	9.28105E-01	2.76595E+01	8.95809E-01	7.08637E-04	0.00000E+00	0.00000E+00
1157	8.83594E-01	2.76833E+01	8.95798E-01	7.08102E-04	0.00000E+00	0.00000E+00
1158	9.12399E-01	2.77062E+01	8.95812E-01	7.07635E-04	0.00000E+00	0.00000E+00
1159	9.17283E-01	2.77290E+01	8.95831E-01	7.07266E-04	0.00000E+00	0.00000E+00
1160	8.97163E-01	2.77520E+01	8.95832E-01	7.06656E-04	0.00000E+00	0.00000E+00
1161	9.02969E-01	2.77757E+01	8.95838E-01	7.06073E-04	0.00000E+00	0.00000E+00
1162	8.64871E-01	2.77995E+01	8.95812E-01	7.05969E-04	0.00000E+00	0.00000E+00
1163	8.51225E-01	2.78243E+01	8.95773E-01	7.06405E-04	0.00000E+00	0.00000E+00
1164	9.14045E-01	2.78480E+01	8.95789E-01	7.05972E-04	0.00000E+00	0.00000E+00
1165	9.02196E-01	2.78710E+01	8.95794E-01	7.05386E-04	0.00000E+00	0.00000E+00
1166	8.64393E-01	2.78948E+01	8.95767E-01	7.05296E-04	0.00000E+00	0.00000E+00
1167	8.72484E-01	2.79185E+01	8.95747E-01	7.04974E-04	0.00000E+00	0.00000E+00
1168	9.08082E-01	2.79415E+01	8.95758E-01	7.04449E-04	0.00000E+00	0.00000E+00
1169	8.61882E-01	2.79662E+01	8.95729E-01	7.04443E-04	0.00000E+00	0.00000E+00
1170	8.85325E-01	2.79900E+01	8.95720E-01	7.03896E-04	0.00000E+00	0.00000E+00
1171	8.91575E-01	2.80128E+01	8.95717E-01	7.03303E-04	0.00000E+00	0.00000E+00
1172	8.73048E-01	2.80367E+01	8.95697E-01	7.02968E-04	0.00000E+00	0.00000E+00
1173	8.62656E-01	2.80595E+01	8.95669E-01	7.02934E-04	0.00000E+00	0.00000E+00
1174	8.58240E-01	2.80852E+01	8.95637E-01	7.03060E-04	0.00000E+00	0.00000E+00
1175	9.06722E-01	2.81090E+01	8.95646E-01	7.02524E-04	0.00000E+00	0.00000E+00
1176	9.05635E-01	2.81328E+01	8.95655E-01	7.01977E-04	0.00000E+00	0.00000E+00
1177	9.41449E-01	2.81557E+01	8.95694E-01	7.02461E-04	0.00000E+00	0.00000E+00
1178	8.96015E-01	2.81785E+01	8.95694E-01	7.01863E-04	0.00000E+00	0.00000E+00
1179	9.18680E-01	2.82033E+01	8.95714E-01	7.01539E-04	0.00000E+00	0.00000E+00
1180	9.09530E-01	2.82270E+01	8.95725E-01	7.01041E-04	0.00000E+00	0.00000E+00
1181	9.22157E-01	2.82518E+01	8.95748E-01	7.00805E-04	0.00000E+00	0.00000E+00
1182	9.17719E-01	2.82755E+01	8.95767E-01	7.00458E-04	0.00000E+00	0.00000E+00

1183	8.68359E-01	2.82993E+01	8.95743E-01	7.00250E-04	0.00000E+00	0.00000E+00
1184	9.04160E-01	2.83232E+01	8.95750E-01	6.99693E-04	0.00000E+00	0.00000E+00
1185	9.23835E-01	2.83470E+01	8.95774E-01	6.99504E-04	0.00000E+00	0.00000E+00
1186	9.16994E-01	2.83708E+01	8.95792E-01	6.99143E-04	0.00000E+00	0.00000E+00
1187	9.20446E-01	2.83955E+01	8.95813E-01	6.98863E-04	0.00000E+00	0.00000E+00
1188	9.08031E-01	2.84183E+01	8.95823E-01	6.98349E-04	0.00000E+00	0.00000E+00
1189	9.27445E-01	2.84422E+01	8.95850E-01	6.98269E-04	0.00000E+00	0.00000E+00
1190	8.84641E-01	2.84668E+01	8.95840E-01	6.97745E-04	0.00000E+00	0.00000E+00
1191	9.12230E-01	2.84917E+01	8.95854E-01	6.97294E-04	0.00000E+00	0.00000E+00
1192	9.27426E-01	2.85145E+01	8.95881E-01	6.97213E-04	0.00000E+00	0.00000E+00
1193	8.89833E-01	2.85373E+01	8.95876E-01	6.96645E-04	0.00000E+00	0.00000E+00
1194	9.27713E-01	2.85603E+01	8.95902E-01	6.96573E-04	0.00000E+00	0.00000E+00
1195	9.52418E-01	2.85840E+01	8.95950E-01	6.97599E-04	0.00000E+00	0.00000E+00
1196	8.74577E-01	2.86078E+01	8.95932E-01	6.97245E-04	0.00000E+00	0.00000E+00
1197	8.51631E-01	2.86317E+01	8.95895E-01	6.97647E-04	0.00000E+00	0.00000E+00
1198	8.98460E-01	2.86555E+01	8.95897E-01	6.97066E-04	0.00000E+00	0.00000E+00
1199	8.77306E-01	2.86802E+01	8.95881E-01	6.96657E-04	0.00000E+00	0.00000E+00
1200	9.21877E-01	2.87040E+01	8.95903E-01	6.96413E-04	0.00000E+00	0.00000E+00
1201	8.84406E-01	2.87287E+01	8.95893E-01	6.95898E-04	0.00000E+00	0.00000E+00
1202	9.26636E-01	2.87517E+01	8.95919E-01	6.95790E-04	0.00000E+00	0.00000E+00
1203	9.09364E-01	2.87753E+01	8.95930E-01	6.95300E-04	0.00000E+00	0.00000E+00

KENO MESSAGE NUMBER K5-123 EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

```
LIFETIME =  1.45824E-04 + OR -  1.69663E-07          GENERATION TIME =  9.91010E-05 + OR -  1.05326E-07
NU BAR   =  2.41915E+00 + OR -  3.80479E-06      AVERAGE FISSION GROUP =  2.45928E+01 + OR -  2.26697E-03
                  ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION =  3.06273E-02 + OR -  6.87042E-05
```

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.89596	+ OR - 0.00070	0.89526 TO 0.89665	0.89457 TO 0.89735	0.89387 TO 0.89804	1200000
4	0.89597	+ OR - 0.00070	0.89528 TO 0.89667	0.89458 TO 0.89736	0.89388 TO 0.89806	1199000
5	0.89596	+ OR - 0.00070	0.89527 TO 0.89666	0.89457 TO 0.89736	0.89388 TO 0.89805	1198000
6	0.89594	+ OR - 0.00070	0.89524 TO 0.89664	0.89455 TO 0.89733	0.89385 TO 0.89803	1197000
7	0.89592	+ OR - 0.00070	0.89523 TO 0.89662	0.89453 TO 0.89732	0.89383 TO 0.89801	1196000
8	0.89591	+ OR - 0.00070	0.89522 TO 0.89661	0.89452 TO 0.89731	0.89382 TO 0.89801	1195000
9	0.89589	+ OR - 0.00070	0.89519 TO 0.89659	0.89450 TO 0.89729	0.89380 TO 0.89798	1194000
10	0.89587	+ OR - 0.00070	0.89517 TO 0.89657	0.89447 TO 0.89727	0.89378 TO 0.89796	1193000
11	0.89587	+ OR - 0.00070	0.89517 TO 0.89657	0.89447 TO 0.89726	0.89377 TO 0.89796	1192000
12	0.89590	+ OR - 0.00070	0.89520 TO 0.89660	0.89450 TO 0.89730	0.89380 TO 0.89799	1191000
17	0.89583	+ OR - 0.00070	0.89513 TO 0.89653	0.89443 TO 0.89722	0.89373 TO 0.89792	1186000
22	0.89583	+ OR - 0.00070	0.89513 TO 0.89653	0.89443 TO 0.89723	0.89374 TO 0.89793	1181000
27	0.89588	+ OR - 0.00070	0.89518 TO 0.89658	0.89448 TO 0.89728	0.89378 TO 0.89798	1176000
32	0.89587	+ OR - 0.00070	0.89517 TO 0.89658	0.89447 TO 0.89728	0.89376 TO 0.89799	1171000
37	0.89587	+ OR - 0.00070	0.89517 TO 0.89657	0.89446 TO 0.89728	0.89376 TO 0.89798	1166000
42	0.89592	+ OR - 0.00071	0.89522 TO 0.89663	0.89451 TO 0.89734	0.89380 TO 0.89804	1161000
47	0.89588	+ OR - 0.00071	0.89517 TO 0.89658	0.89446 TO 0.89729	0.89375 TO 0.89800	1156000
52	0.89588	+ OR - 0.00071	0.89517 TO 0.89659	0.89446 TO 0.89730	0.89375 TO 0.89801	1151000
57	0.89585	+ OR - 0.00071	0.89514 TO 0.89656	0.89443 TO 0.89727	0.89372 TO 0.89798	1146000
62	0.89590	+ OR - 0.00071	0.89519 TO 0.89661	0.89447 TO 0.89733	0.89376 TO 0.89804	1141000
67	0.89586	+ OR - 0.00071	0.89515 TO 0.89658	0.89443 TO 0.89729	0.89372 TO 0.89801	1136000
72	0.89580	+ OR - 0.00071	0.89508 TO 0.89651	0.89437 TO 0.89723	0.89365 TO 0.89794	1131000
77	0.89584	+ OR - 0.00072	0.89512 TO 0.89655	0.89440 TO 0.89727	0.89369 TO 0.89799	1126000
82	0.89590	+ OR - 0.00072	0.89518 TO 0.89662	0.89446 TO 0.89734	0.89374 TO 0.89806	1121000
87	0.89588	+ OR - 0.00072	0.89516 TO 0.89660	0.89444 TO 0.89732	0.89372 TO 0.89804	1116000
92	0.89594	+ OR - 0.00072	0.89522 TO 0.89667	0.89450 TO 0.89739	0.89378 TO 0.89811	1111000

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
97	0.89589	+ OR - 0.00072	0.89517 TO 0.89662	0.89445 TO 0.89734	0.89372 TO 0.89807	1106000
102	0.89584	+ OR - 0.00073	0.89511 TO 0.89656	0.89438 TO 0.89729	0.89366 TO 0.89801	1101000
107	0.89577	+ OR - 0.00073	0.89504 TO 0.89650	0.89432 TO 0.89722	0.89359 TO 0.89795	1096000
112	0.89577	+ OR - 0.00073	0.89504 TO 0.89650	0.89431 TO 0.89723	0.89358 TO 0.89796	1091000
117	0.89578	+ OR - 0.00073	0.89504 TO 0.89651	0.89431 TO 0.89724	0.89358 TO 0.89797	1086000
122	0.89571	+ OR - 0.00073	0.89498 TO 0.89645	0.89425 TO 0.89718	0.89352 TO 0.89791	1081000
127	0.89584	+ OR - 0.00073	0.89511 TO 0.89658	0.89438 TO 0.89731	0.89364 TO 0.89804	1076000
132	0.89590	+ OR - 0.00074	0.89516 TO 0.89663	0.89443 TO 0.89737	0.89369 TO 0.89810	1071000
137	0.89592	+ OR - 0.00074	0.89518 TO 0.89665	0.89444 TO 0.89739	0.89370 TO 0.89813	1066000
142	0.89592	+ OR - 0.00074	0.89518 TO 0.89666	0.89444 TO 0.89740	0.89369 TO 0.89814	1061000
147	0.89600	+ OR - 0.00074	0.89526 TO 0.89674	0.89451 TO 0.89748	0.89377 TO 0.89823	1056000
152	0.89593	+ OR - 0.00074	0.89519 TO 0.89668	0.89444 TO 0.89742	0.89370 TO 0.89817	1051000
157	0.89584	+ OR - 0.00075	0.89509 TO 0.89658	0.89434 TO 0.89733	0.89360 TO 0.89807	1046000
162	0.89583	+ OR - 0.00075	0.89508 TO 0.89658	0.89433 TO 0.89733	0.89358 TO 0.89808	1041000
167	0.89583	+ OR - 0.00075	0.89508 TO 0.89658	0.89433 TO 0.89733	0.89358 TO 0.89808	1036000
172	0.89586	+ OR - 0.00075	0.89511 TO 0.89661	0.89435 TO 0.89737	0.89360 TO 0.89812	1031000
177	0.89578	+ OR - 0.00076	0.89502 TO 0.89654	0.89426 TO 0.89729	0.89351 TO 0.89805	1026000
182	0.89584	+ OR - 0.00076	0.89508 TO 0.89660	0.89432 TO 0.89736	0.89357 TO 0.89811	1021000
187	0.89581	+ OR - 0.00076	0.89505 TO 0.89657	0.89429 TO 0.89733	0.89353 TO 0.89809	1016000
192	0.89592	+ OR - 0.00076	0.89515 TO 0.89668	0.89439 TO 0.89744	0.89363 TO 0.89820	1011000
197	0.89590	+ OR - 0.00076	0.89513 TO 0.89666	0.89437 TO 0.89742	0.89360 TO 0.89819	1006000
202	0.89589	+ OR - 0.00076	0.89512 TO 0.89665	0.89436 TO 0.89742	0.89359 TO 0.89818	1001000
207	0.89595	+ OR - 0.00077	0.89518 TO 0.89672	0.89442 TO 0.89748	0.89365 TO 0.89825	996000
212	0.89593	+ OR - 0.00077	0.89516 TO 0.89670	0.89440 TO 0.89747	0.89363 TO 0.89824	991000
217	0.89597	+ OR - 0.00077	0.89520 TO 0.89675	0.89443 TO 0.89752	0.89366 TO 0.89829	986000
222	0.89601	+ OR - 0.00077	0.89523 TO 0.89678	0.89446 TO 0.89755	0.89369 TO 0.89832	981000
227	0.89601	+ OR - 0.00077	0.89524 TO 0.89678	0.89446 TO 0.89755	0.89369 TO 0.89833	976000

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
232	0.89598	+ OR - 0.00077	0.89521 TO 0.89676	0.89443 TO 0.89753	0.89366 TO 0.89831	971000
237	0.89591	+ OR - 0.00078	0.89513 TO 0.89669	0.89435 TO 0.89746	0.89358 TO 0.89824	966000
242	0.89598	+ OR - 0.00078	0.89520 TO 0.89676	0.89442 TO 0.89754	0.89365 TO 0.89832	961000
247	0.89602	+ OR - 0.00078	0.89524 TO 0.89680	0.89446 TO 0.89759	0.89368 TO 0.89837	956000
252	0.89603	+ OR - 0.00078	0.89525 TO 0.89681	0.89447 TO 0.89759	0.89368 TO 0.89838	951000
257	0.89596	+ OR - 0.00078	0.89517 TO 0.89674	0.89439 TO 0.89752	0.89360 TO 0.89831	946000
262	0.89599	+ OR - 0.00079	0.89521 TO 0.89678	0.89442 TO 0.89757	0.89363 TO 0.89836	941000
267	0.89602	+ OR - 0.00079	0.89523 TO 0.89682	0.89444 TO 0.89761	0.89365 TO 0.89840	936000
272	0.89593	+ OR - 0.00079	0.89514 TO 0.89673	0.89435 TO 0.89752	0.89355 TO 0.89831	931000
277	0.89606	+ OR - 0.00079	0.89526 TO 0.89685	0.89447 TO 0.89765	0.89367 TO 0.89844	926000
282	0.89612	+ OR - 0.00080	0.89533 TO 0.89692	0.89453 TO 0.89772	0.89373 TO 0.89851	921000
287	0.89623	+ OR - 0.00080	0.89543 TO 0.89703	0.89463 TO 0.89783	0.89383 TO 0.89863	916000
292	0.89618	+ OR - 0.00080	0.89538 TO 0.89698	0.89458 TO 0.89778	0.89378 TO 0.89858	911000
297	0.89617	+ OR - 0.00080	0.89537 TO 0.89697	0.89457 TO 0.89777	0.89376 TO 0.89857	906000
302	0.89610	+ OR - 0.00080	0.89530 TO 0.89690	0.89449 TO 0.89771	0.89369 TO 0.89851	901000
307	0.89602	+ OR - 0.00081	0.89522 TO 0.89683	0.89441 TO 0.89764	0.89360 TO 0.89844	896000
312	0.89599	+ OR - 0.00081	0.89518 TO 0.89680	0.89437 TO 0.89761	0.89356 TO 0.89842	891000
317	0.89608	+ OR - 0.00081	0.89526 TO 0.89689	0.89445 TO 0.89770	0.89364 TO 0.89852	886000
322	0.89600	+ OR - 0.00082	0.89518 TO 0.89681	0.89437 TO 0.89763	0.89355 TO 0.89845	881000
327	0.89599	+ OR - 0.00082	0.89517 TO 0.89681	0.89435 TO 0.89763	0.89353 TO 0.89845	876000
332	0.89603	+ OR - 0.00082	0.89521 TO 0.89685	0.89439 TO 0.89768	0.89356 TO 0.89850	871000
337	0.89599	+ OR - 0.00083	0.89517 TO 0.89682	0.89434 TO 0.89764	0.89352 TO 0.89847	866000
342	0.89613	+ OR - 0.00083	0.89530 TO 0.89695	0.89447 TO 0.89778	0.89365 TO 0.89861	861000
347	0.89615	+ OR - 0.00083	0.89532 TO 0.89698	0.89449 TO 0.89781	0.89366 TO 0.89864	856000
352	0.89620	+ OR - 0.00083	0.89537 TO 0.89703	0.89453 TO 0.89786	0.89370 TO 0.89870	851000
357	0.89613	+ OR - 0.00083	0.89529 TO 0.89696	0.89446 TO 0.89779	0.89362 TO 0.89863	846000
362	0.89606	+ OR - 0.00084	0.89523 TO 0.89690	0.89439 TO 0.89774	0.89355 TO 0.89858	841000

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
367	0.89615	+ OR - 0.00084	0.89531 TO 0.89699	0.89447 TO 0.89784	0.89363 TO 0.89868	836000
372	0.89620	+ OR - 0.00084	0.89536 TO 0.89704	0.89452 TO 0.89788	0.89368 TO 0.89873	831000
377	0.89623	+ OR - 0.00084	0.89539 TO 0.89707	0.89454 TO 0.89792	0.89370 TO 0.89876	826000
382	0.89617	+ OR - 0.00085	0.89532 TO 0.89702	0.89448 TO 0.89787	0.89363 TO 0.89871	821000
387	0.89621	+ OR - 0.00085	0.89535 TO 0.89706	0.89450 TO 0.89791	0.89365 TO 0.89876	816000
392	0.89604	+ OR - 0.00085	0.89519 TO 0.89689	0.89433 TO 0.89774	0.89348 TO 0.89859	811000
397	0.89602	+ OR - 0.00085	0.89517 TO 0.89687	0.89432 TO 0.89772	0.89347 TO 0.89857	806000
402	0.89597	+ OR - 0.00085	0.89512 TO 0.89683	0.89426 TO 0.89768	0.89341 TO 0.89854	801000
407	0.89583	+ OR - 0.00085	0.89498 TO 0.89669	0.89412 TO 0.89754	0.89327 TO 0.89839	796000
412	0.89579	+ OR - 0.00086	0.89494 TO 0.89665	0.89408 TO 0.89751	0.89322 TO 0.89837	791000
417	0.89577	+ OR - 0.00086	0.89491 TO 0.89663	0.89405 TO 0.89749	0.89319 TO 0.89835	786000
422	0.89565	+ OR - 0.00086	0.89479 TO 0.89651	0.89393 TO 0.89737	0.89307 TO 0.89823	781000
427	0.89565	+ OR - 0.00086	0.89479 TO 0.89652	0.89393 TO 0.89738	0.89307 TO 0.89824	776000
432	0.89554	+ OR - 0.00087	0.89467 TO 0.89640	0.89380 TO 0.89727	0.89294 TO 0.89813	771000
437	0.89540	+ OR - 0.00086	0.89454 TO 0.89626	0.89368 TO 0.89712	0.89282 TO 0.89798	766000
442	0.89547	+ OR - 0.00086	0.89461 TO 0.89633	0.89374 TO 0.89720	0.89288 TO 0.89806	761000
447	0.89553	+ OR - 0.00087	0.89466 TO 0.89639	0.89379 TO 0.89726	0.89292 TO 0.89813	756000
452	0.89555	+ OR - 0.00087	0.89468 TO 0.89642	0.89381 TO 0.89730	0.89293 TO 0.89817	751000
457	0.89545	+ OR - 0.00088	0.89457 TO 0.89632	0.89369 TO 0.89720	0.89282 TO 0.89808	746000
462	0.89548	+ OR - 0.00088	0.89460 TO 0.89636	0.89372 TO 0.89725	0.89284 TO 0.89813	741000
467	0.89549	+ OR - 0.00089	0.89461 TO 0.89638	0.89372 TO 0.89726	0.89283 TO 0.89815	736000
472	0.89552	+ OR - 0.00089	0.89462 TO 0.89641	0.89373 TO 0.89730	0.89284 TO 0.89819	731000
477	0.89556	+ OR - 0.00090	0.89466 TO 0.89646	0.89377 TO 0.89736	0.89287 TO 0.89825	726000
482	0.89560	+ OR - 0.00090	0.89470 TO 0.89650	0.89380 TO 0.89740	0.89290 TO 0.89830	721000
487	0.89559	+ OR - 0.00090	0.89469 TO 0.89649	0.89379 TO 0.89739	0.89288 TO 0.89829	716000
492	0.89556	+ OR - 0.00090	0.89465 TO 0.89646	0.89375 TO 0.89737	0.89284 TO 0.89827	711000
497	0.89543	+ OR - 0.00091	0.89452 TO 0.89633	0.89362 TO 0.89724	0.89271 TO 0.89814	706000

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
502	0.89538	+ OR - 0.00091	0.89447 TO 0.89629	0.89356 TO 0.89721	0.89265 TO 0.89812	701000
507	0.89538	+ OR - 0.00092	0.89447 TO 0.89630	0.89355 TO 0.89722	0.89264 TO 0.89813	696000
512	0.89527	+ OR - 0.00092	0.89435 TO 0.89619	0.89343 TO 0.89711	0.89251 TO 0.89803	691000
517	0.89534	+ OR - 0.00092	0.89442 TO 0.89626	0.89350 TO 0.89718	0.89257 TO 0.89810	686000
522	0.89538	+ OR - 0.00092	0.89445 TO 0.89630	0.89353 TO 0.89723	0.89261 TO 0.89815	681000
527	0.89522	+ OR - 0.00093	0.89429 TO 0.89615	0.89336 TO 0.89707	0.89244 TO 0.89800	676000
532	0.89522	+ OR - 0.00093	0.89429 TO 0.89615	0.89336 TO 0.89708	0.89243 TO 0.89801	671000
537	0.89528	+ OR - 0.00093	0.89435 TO 0.89621	0.89342 TO 0.89714	0.89249 TO 0.89807	666000
542	0.89533	+ OR - 0.00094	0.89440 TO 0.89627	0.89346 TO 0.89720	0.89253 TO 0.89814	661000
547	0.89533	+ OR - 0.00094	0.89439 TO 0.89627	0.89345 TO 0.89721	0.89251 TO 0.89815	656000
552	0.89547	+ OR - 0.00094	0.89453 TO 0.89641	0.89359 TO 0.89736	0.89265 TO 0.89830	651000
557	0.89543	+ OR - 0.00095	0.89448 TO 0.89638	0.89354 TO 0.89732	0.89259 TO 0.89827	646000
562	0.89553	+ OR - 0.00095	0.89458 TO 0.89649	0.89363 TO 0.89744	0.89268 TO 0.89839	641000
567	0.89541	+ OR - 0.00096	0.89445 TO 0.89636	0.89349 TO 0.89732	0.89254 TO 0.89828	636000
572	0.89553	+ OR - 0.00096	0.89457 TO 0.89649	0.89361 TO 0.89745	0.89264 TO 0.89841	631000
577	0.89536	+ OR - 0.00097	0.89439 TO 0.89632	0.89343 TO 0.89729	0.89246 TO 0.89825	626000
582	0.89521	+ OR - 0.00097	0.89425 TO 0.89618	0.89328 TO 0.89715	0.89231 TO 0.89811	621000
587	0.89514	+ OR - 0.00097	0.89416 TO 0.89611	0.89319 TO 0.89708	0.89221 TO 0.89806	616000
592	0.89520	+ OR - 0.00098	0.89423 TO 0.89618	0.89325 TO 0.89716	0.89227 TO 0.89814	611000
597	0.89530	+ OR - 0.00098	0.89432 TO 0.89629	0.89334 TO 0.89727	0.89235 TO 0.89826	606000
602	0.89534	+ OR - 0.00099	0.89436 TO 0.89633	0.89337 TO 0.89732	0.89238 TO 0.89831	601000
607	0.89521	+ OR - 0.00099	0.89422 TO 0.89620	0.89323 TO 0.89719	0.89223 TO 0.89818	596000
612	0.89507	+ OR - 0.00100	0.89407 TO 0.89607	0.89308 TO 0.89706	0.89208 TO 0.89806	591000
617	0.89507	+ OR - 0.00100	0.89407 TO 0.89607	0.89307 TO 0.89707	0.89207 TO 0.89807	586000
622	0.89512	+ OR - 0.00101	0.89411 TO 0.89613	0.89310 TO 0.89713	0.89210 TO 0.89814	581000
627	0.89508	+ OR - 0.00102	0.89407 TO 0.89610	0.89305 TO 0.89711	0.89204 TO 0.89813	576000
632	0.89517	+ OR - 0.00102	0.89415 TO 0.89619	0.89312 TO 0.89721	0.89210 TO 0.89823	571000

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
637	0.89544	+ OR - 0.00102	0.89442 TO 0.89646	0.89340 TO 0.89748	0.89239 TO 0.89849	566000
642	0.89559	+ OR - 0.00102	0.89457 TO 0.89661	0.89354 TO 0.89763	0.89252 TO 0.89865	561000
647	0.89560	+ OR - 0.00103	0.89457 TO 0.89663	0.89354 TO 0.89766	0.89251 TO 0.89869	556000
652	0.89560	+ OR - 0.00104	0.89456 TO 0.89664	0.89352 TO 0.89768	0.89248 TO 0.89871	551000
657	0.89578	+ OR - 0.00104	0.89474 TO 0.89682	0.89370 TO 0 89786	0.89265 TO 0.89890	546000
662	0.89588	+ OR - 0.00105	0.89483 TO 0.89693	0.89378 TO 0.89798	0.89273 TO 0.89903	541000
667	0.89581	+ OR - 0.00105	0.89475 TO 0.89686	0.89370 TO 0.89792	0.89265 TO 0.89897	536000
672	0.89578	+ OR - 0.00106	0.89472 TO 0.89684	0.89366 TO 0.89790	0.89260 TO 0.89896	531000
677	0.89591	+ OR - 0.00106	0.89484 TO 0.89697	0.89378 TO 0.89804	0.89272 TO 0.89910	526000
682	0.89595	+ OR - 0.00107	0.89487 TO 0.89702	0.89380 TO 0.89809	0.89272 TO 0.89917	521000
687	0.89587	+ OR - 0.00108	0.89479 TO 0.89695	0.89371 TO 0.89803	0.89263 TO 0.89911	516000
692	0.89584	+ OR - 0.00108	0.89476 TO 0.89692	0.89367 TO 0.89800	0.89259 TO 0.89909	511000
697	0.89563	+ OR - 0.00109	0.89454 TO 0.89671	0.89345 TO 0.89780	0.89237 TO 0.89888	506000
702	0.89550	+ OR - 0.00109	0.89441 TO 0.89659	0.89332 TO 0.89768	0.89223 TO 0.89877	501000
707	0.89539	+ OR - 0.00110	0.89429 TO 0.89649	0.89320 TO 0.89759	0.89210 TO 0.89868	496000
712	0.89535	+ OR - 0.00111	0.89425 TO 0.89646	0.89314 TO 0.89757	0.89203 TO 0.89867	491000
717	0.89524	+ OR - 0.00111	0.89413 TO 0.89635	0.89301 TO 0.89746	0.89190 TO 0.89857	486000
722	0.89524	+ OR - 0.00112	0.89412 TO 0.89636	0.89301 TO 0.89748	0.89189 TO 0.89860	481000
727	0.89515	+ OR - 0.00113	0.89403 TO 0.89628	0.89290 TO 0.89741	0.89177 TO 0.89854	476000
732	0.89511	+ OR - 0.00113	0.89398 TO 0.89624	0.89284 TO 0.89737	0.89171 TO 0.89850	471000
737	0.89499	+ OR - 0.00114	0.89385 TO 0.89613	0.89271 TO 0.89726	0.89158 TO 0.89840	466000
742	0.89484	+ OR - 0.00114	0.89370 TO 0.89599	0.89256 TO 0.89713	0.89141 TO 0.89828	461000
747	0.89482	+ OR - 0.00115	0.89367 TO 0.89596	0.89252 TO 0.89711	0.89137 TO 0.89826	456000
752	0.89460	+ OR - 0.00115	0.89345 TO 0.89575	0.89230 TO 0.89690	0.89115 TO 0.89806	451000
757	0.89466	+ OR - 0.00115	0.89351 TO 0.89582	0.89235 TO 0.89697	0.89120 TO 0.89812	446000
762	0.89449	+ OR - 0.00115	0.89333 TO 0.89564	0.89218 TO 0.89680	0.89103 TO 0.89795	441000
767	0.89422	+ OR - 0.00115	0.89306 TO 0.89537	0.89191 TO 0.89653	0.89075 TO 0.89768	436000

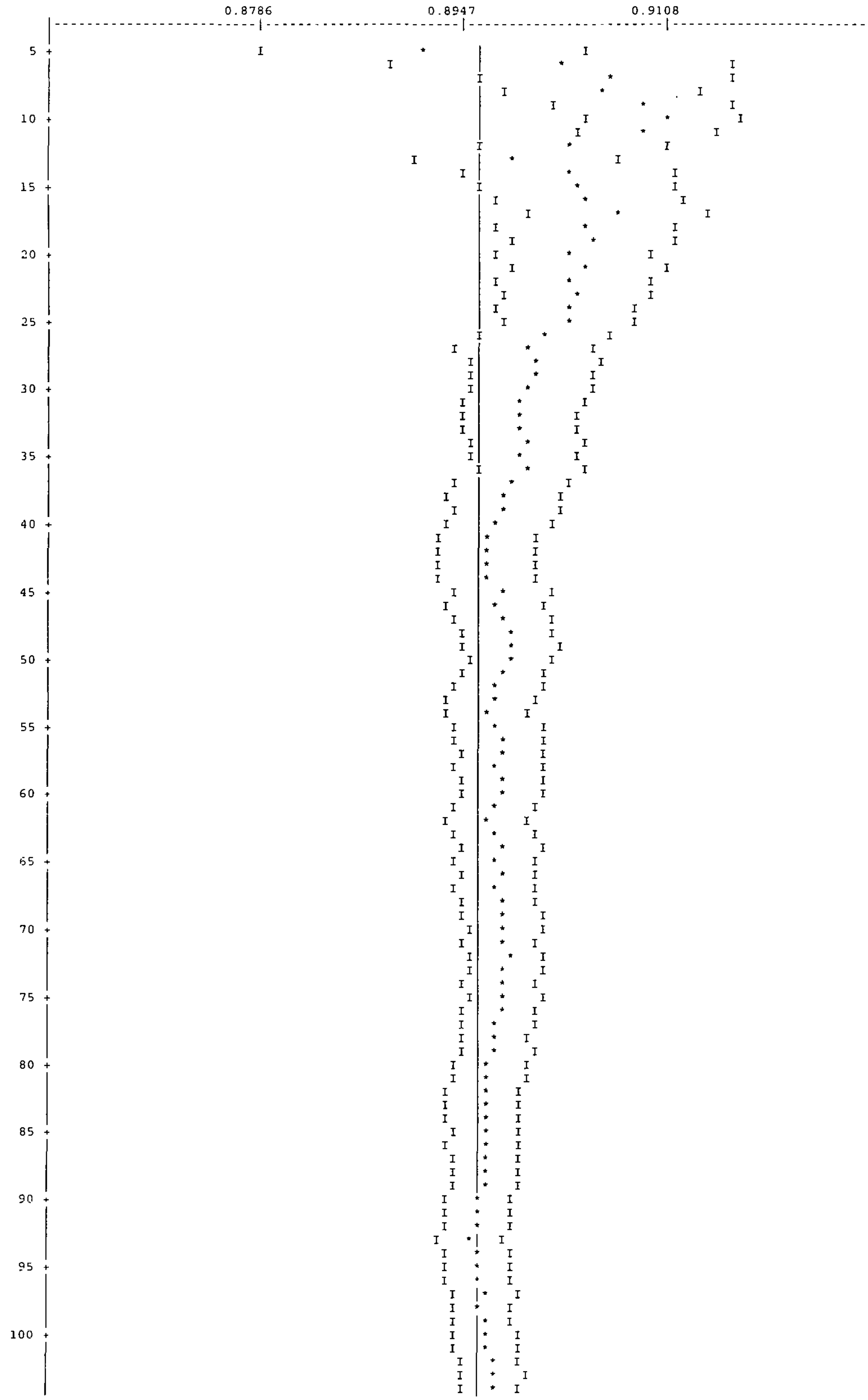
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
772	0.89444	+ OR - 0.00116	0.89328 TO 0.89560	0.89213 TO 0.89676	0.89097 TO 0.89792	431000
777	0.89450	+ OR - 0.00117	0.89333 TO 0.89566	0.89216 TO 0.89683	0.89100 TO 0.89800	426000
782	0.89446	+ OR - 0.00118	0.89328 TO 0.89563	0.89210 TO 0.89681	0.89093 TO 0.89799	421000
787	0.89425	+ OR - 0.00118	0.89307 TO 0.89543	0.89189 TO 0.89661	0.89070 TO 0.89779	416000
792	0.89416	+ OR - 0.00119	0.89297 TO 0.89535	0.89178 TO 0.89654	0.89059 TO 0.89773	411000
797	0.89403	+ OR - 0.00120	0.89283 TO 0.89522	0.89163 TO 0.89642	0.89043 TO 0.89762	406000
802	0.89405	+ OR - 0.00119	0.89285 TO 0.89524	0.89166 TO 0.89643	0.89047 TO 0.89762	401000
807	0.89426	+ OR - 0.00120	0.89306 TO 0.89547	0.89186 TO 0.89667	0.89066 TO 0.89787	396000
812	0.89400	+ OR - 0.00120	0.89280 TO 0.89520	0.89160 TO 0.89640	0.89040 TO 0.89760	391000
817	0.89393	+ OR - 0.00121	0.89272 TO 0.89513	0.89151 TO 0.89634	0.89030 TO 0.89755	386000
822	0.89377	+ OR - 0.00121	0.89256 TO 0.89498	0.89136 TO 0.89619	0.89015 TO 0.89739	381000
827	0.89366	+ OR - 0.00122	0.89244 TO 0.89489	0.89122 TO 0.89611	0.89000 TO 0.89733	376000
832	0.89360	+ OR - 0.00123	0.89237 TO 0.89483	0.89114 TO 0.89606	0.88991 TO 0.89729	371000
837	0.89334	+ OR - 0.00124	0.89210 TO 0.89458	0.89086 TO 0.89582	0.88963 TO 0.89705	366000
842	0.89341	+ OR - 0.00124	0.89217 TO 0.89465	0.89093 TO 0.89589	0.88969 TO 0.89713	361000
847	0.89331	+ OR - 0.00125	0.89206 TO 0.89456	0.89081 TO 0.89581	0.88956 TO 0.89706	356000
852	0.89319	+ OR - 0.00126	0.89193 TO 0.89446	0.89067 TO 0.89572	0.88941 TO 0.89698	351000
857	0.89310	+ OR - 0.00128	0.89182 TO 0.89438	0.89055 TO 0.89566	0.88927 TO 0.89694	346000
862	0.89291	+ OR - 0.00129	0.89162 TO 0.89419	0.89033 TO 0.89548	0.88904 TO 0.89677	341000
867	0.89269	+ OR - 0.00130	0.89139 TO 0.89400	0.89009 TO 0.89530	0.88878 TO 0.89661	336000
872	0.89266	+ OR - 0.00131	0.89135 TO 0.89397	0.89004 TO 0.89528	0.88873 TO 0.89659	331000
877	0.89268	+ OR - 0.00131	0.89137 TO 0.89400	0.89006 TO 0.89531	0.88875 TO 0.89662	326000
882	0.89282	+ OR - 0.00131	0.89151 TO 0.89413	0.89019 TO 0.89545	0.88888 TO 0.89676	321000
887	0.89270	+ OR - 0.00133	0.89136 TO 0.89403	0.89003 TO 0.89536	0.88870 TO 0.89669	316000
892	0.89265	+ OR - 0.00134	0.89130 TO 0.89399	0.88996 TO 0.89533	0.88862 TO 0.89667	311000
897	0.89307	+ OR - 0.00135	0.89172 TO 0.89442	0.89038 TO 0.89576	0.88903 TO 0.89711	306000
902	0.89297	+ OR - 0.00136	0.89162 TO 0.89433	0.89026 TO 0.89569	0.88890 TO 0.89705	301000

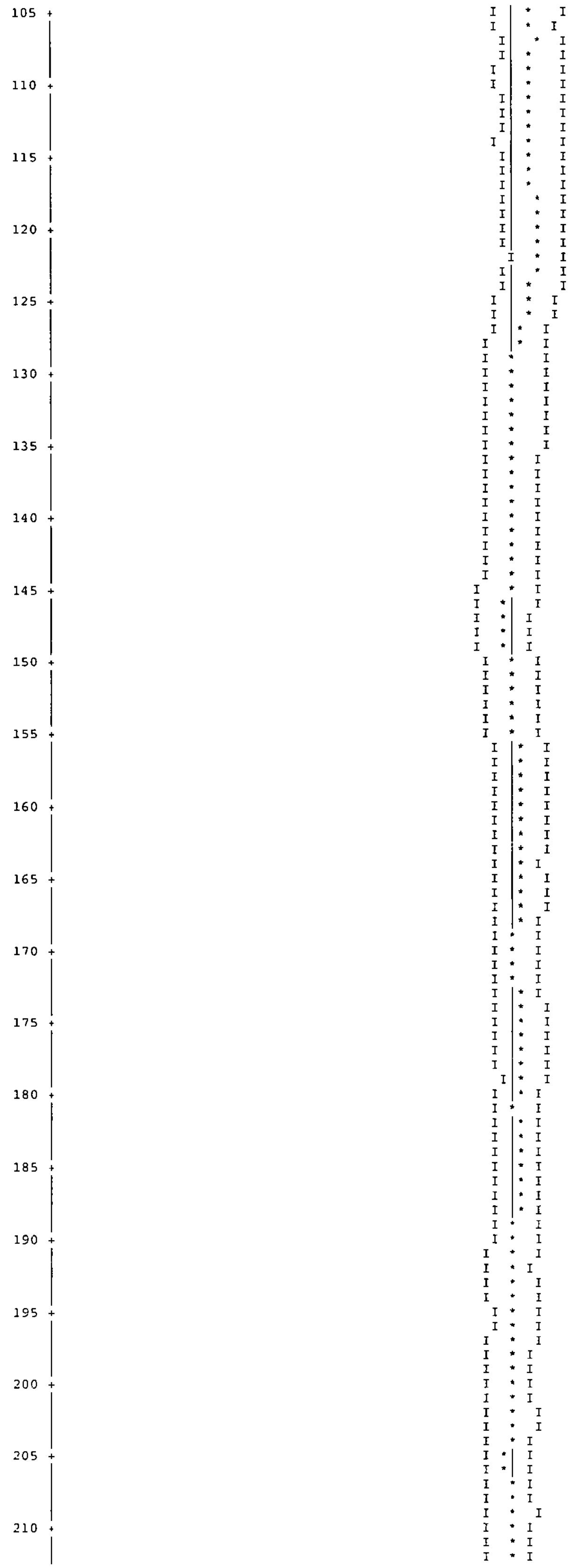
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
907	0.89324	+ OR - 0.00136	0.89188 TO 0.89460	0.89051 TO 0.89597	0.88915 TO 0.89733	296000
912	0.89313	+ OR - 0.00136	0.89177 TO 0.89449	0.89041 TO 0.89585	0.88904 TO 0.89722	291000
917	0.89323	+ OR - 0.00138	0.89185 TO 0.89461	0.89047 TO 0.89599	0.88909 TO 0.89737	286000
922	0.89328	+ OR - 0.00139	0.89189 TO 0.89468	0.89050 TO 0.89607	0.88910 TO 0.89747	281000
927	0.89372	+ OR - 0.00139	0.89233 TO 0.89512	0.89093 TO 0.89651	0.88954 TO 0.89791	276000
932	0.89404	+ OR - 0.00140	0.89264 TO 0.89544	0.89124 TO 0.89684	0.88984 TO 0.89824	271000
937	0.89450	+ OR - 0.00139	0.89311 TO 0.89589	0.89172 TO 0.89728	0.89033 TO 0.89867	266000
942	0.89447	+ OR - 0.00141	0.89306 TO 0.89588	0.89165 TO 0.89729	0.89024 TO 0.89870	261000
947	0.89431	+ OR - 0.00143	0.89288 TO 0.89574	0.89145 TO 0.89717	0.89003 TO 0.89859	256000
952	0.89445	+ OR - 0.00144	0.89301 TO 0.89589	0.89157 TO 0.89733	0.89013 TO 0.89877	251000
957	0.89436	+ OR - 0.00143	0.89293 TO 0.89579	0.89151 TO 0.89721	0.89008 TO 0.89864	246000
962	0.89417	+ OR - 0.00145	0.89273 TO 0.89562	0.89128 TO 0.89706	0.88984 TO 0.89851	241000
967	0.89435	+ OR - 0.00146	0.89290 TO 0.89581	0.89144 TO 0.89727	0.88998 TO 0.89872	236000
972	0.89429	+ OR - 0.00148	0.89281 TO 0.89577	0.89133 TO 0.89725	0.88985 TO 0.89873	231000
977	0.89456	+ OR - 0.00148	0.89308 TO 0.89604	0.89160 TO 0.89752	0.89012 TO 0.89900	226000
982	0.89417	+ OR - 0.00149	0.89267 TO 0.89566	0.89118 TO 0.89716	0.88968 TO 0.89865	221000
987	0.89406	+ OR - 0.00152	0.89254 TO 0.89559	0.89102 TO 0.89711	0.88950 TO 0.89863	216000
992	0.89413	+ OR - 0.00154	0.89259 TO 0.89568	0.89105 TO 0.89722	0.88951 TO 0.89876	211000
997	0.89395	+ OR - 0.00156	0.89239 TO 0.89551	0.89082 TO 0.89707	0.88926 TO 0.89863	206000
1002	0.89395	+ OR - 0.00157	0.89238 TO 0.89552	0.89081 TO 0.89709	0.88924 TO 0.89866	201000
1007	0.89419	+ OR - 0.00160	0.89259 TO 0.89579	0.89098 TO 0.89739	0.88938 TO 0.89899	196000
1012	0.89408	+ OR - 0.00164	0.89244 TO 0.89573	0.89080 TO 0.89737	0.88916 TO 0.89901	191000
1017	0.89387	+ OR - 0.00167	0.89219 TO 0.89554	0.89052 TO 0.89722	0.88884 TO 0.89889	186000
1022	0.89355	+ OR - 0.00171	0.89184 TO 0.89527	0.89013 TO 0.89698	0.88842 TO 0.89869	181000
1027	0.89344	+ OR - 0.00176	0.89168 TO 0.89520	0.88993 TO 0.89695	0.88817 TO 0.89871	176000
1032	0.89359	+ OR - 0.00180	0.89179 TO 0.89540	0.88999 TO 0.89720	0.88818 TO 0.89901	171000
1037	0.89390	+ OR - 0.00185	0.89205 TO 0.89574	0.89020 TO 0.89759	0.88835 TO 0.89944	166000

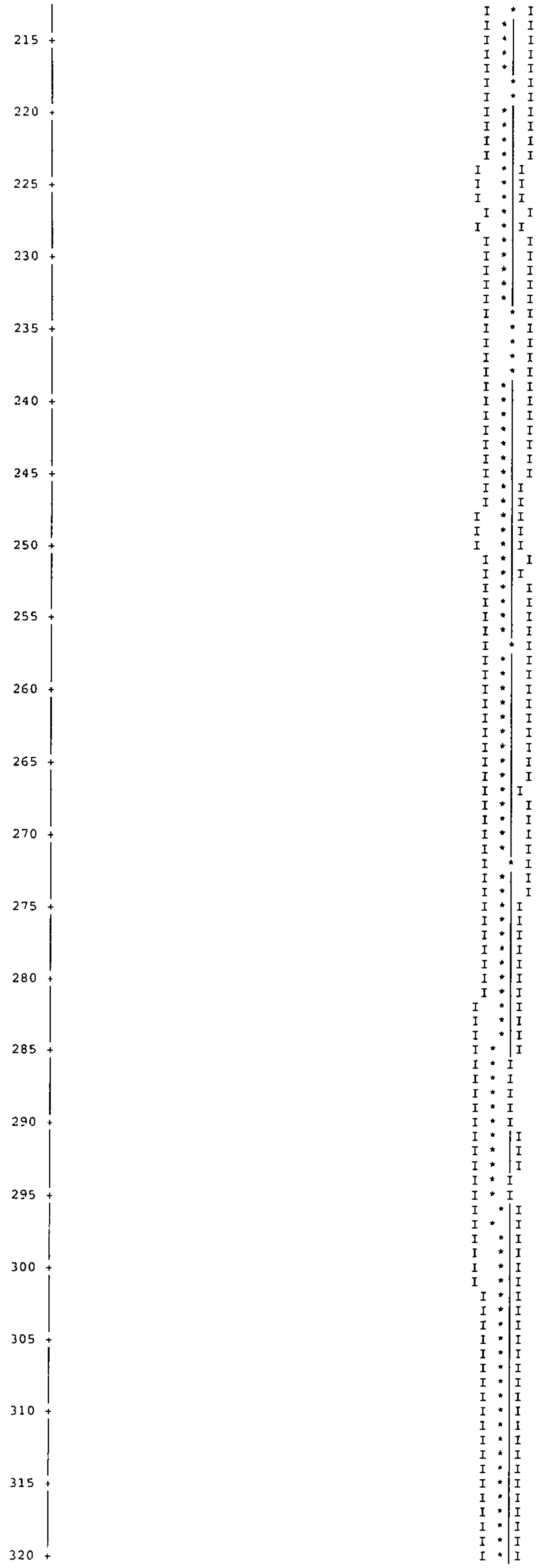
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
1042	0.89388	+ OR - 0.00188	0.89200 TO 0.89575	0.89012 TO 0.89763	0.88824 TO 0.89951	161000
1047	0.89434	+ OR - 0.00190	0.89244 TO 0.89624	0.89054 TO 0.89813	0.88864 TO 0.90003	156000
1052	0.89453	+ OR - 0.00195	0.89258 TO 0.89648	0.89063 TO 0.89843	0.88868 TO 0.90038	151000
1057	0.89422	+ OR - 0.00200	0.89222 TO 0.89622	0.89022 TO 0.89822	0.88822 TO 0.90022	146000
1062	0.89360	+ OR - 0.00202	0.89159 TO 0.89562	0.88957 TO 0.89764	0.88755 TO 0.89966	141000
1067	0.89339	+ OR - 0.00203	0.89136 TO 0.89542	0.88934 TO 0.89745	0.88731 TO 0.89948	136000
1072	0.89415	+ OR - 0.00204	0.89211 TO 0.89619	0.89007 TO 0.89823	0.88803 TO 0.90027	131000
1077	0.89474	+ OR - 0.00208	0.89266 TO 0.89681	0.89058 TO 0.89889	0.88851 TO 0.90096	126000
1082	0.89508	+ OR - 0.00212	0.89296 TO 0.89720	0.89084 TO 0.89932	0.88872 TO 0.90144	121000
1087	0.89501	+ OR - 0.00216	0.89285 TO 0.89717	0.89069 TO 0.89933	0.88853 TO 0.90149	116000
1092	0.89482	+ OR - 0.00223	0.89259 TO 0.89706	0.89035 TO 0.89929	0.88812 TO 0.90153	111000
1097	0.89503	+ OR - 0.00229	0.89274 TO 0.89731	0.89045 TO 0.89960	0.88817 TO 0.90189	106000
1102	0.89566	+ OR - 0.00237	0.89329 TO 0.89802	0.89092 TO 0.90039	0.88856 TO 0.90275	101000
1107	0.89561	+ OR - 0.00244	0.89317 TO 0.89805	0.89074 TO 0.90049	0.88830 TO 0.90293	96000
1112	0.89507	+ OR - 0.00255	0.89251 TO 0.89762	0.88996 TO 0.90017	0.88741 TO 0.90272	91000
1117	0.89527	+ OR - 0.00265	0.89263 TO 0.89792	0.88998 TO 0.90057	0.88733 TO 0.90322	86000
1122	0.89515	+ OR - 0.00279	0.89236 TO 0.89794	0.88958 TO 0.90073	0.88679 TO 0.90352	81000
1127	0.89572	+ OR - 0.00285	0.89287 TO 0.89857	0.89002 TO 0.90142	0.88717 TO 0.90427	76000
1132	0.89576	+ OR - 0.00295	0.89281 TO 0.89871	0.88986 TO 0.90165	0.88692 TO 0.90460	71000
1137	0.89641	+ OR - 0.00311	0.89330 TO 0.89952	0.89019 TO 0.90264	0.88708 TO 0.90575	66000
1142	0.89591	+ OR - 0.00326	0.89265 TO 0.89917	0.88939 TO 0.90243	0.88613 TO 0.90569	61000
1147	0.89604	+ OR - 0.00352	0.89252 TO 0.89957	0.88899 TO 0.90309	0.88547 TO 0.90662	56000
1152	0.89754	+ OR - 0.00361	0.89392 TO 0.90115	0.89031 TO 0.90476	0.88669 TO 0.90838	51000
1157	0.89925	+ OR - 0.00367	0.89558 TO 0.90292	0.89191 TO 0.90659	0.88824 TO 0.91026	46000
1162	0.89929	+ OR - 0.00400	0.89529 TO 0.90329	0.89129 TO 0.90728	0.88730 TO 0.91128	41000
1167	0.90185	+ OR - 0.00413	0.89772 TO 0.90598	0.89359 TO 0.91011	0.88946 TO 0.91424	36000
1172	0.90473	+ OR - 0.00445	0.90028 TO 0.90918	0.89583 TO 0.91362	0.89139 TO 0.91807	31000

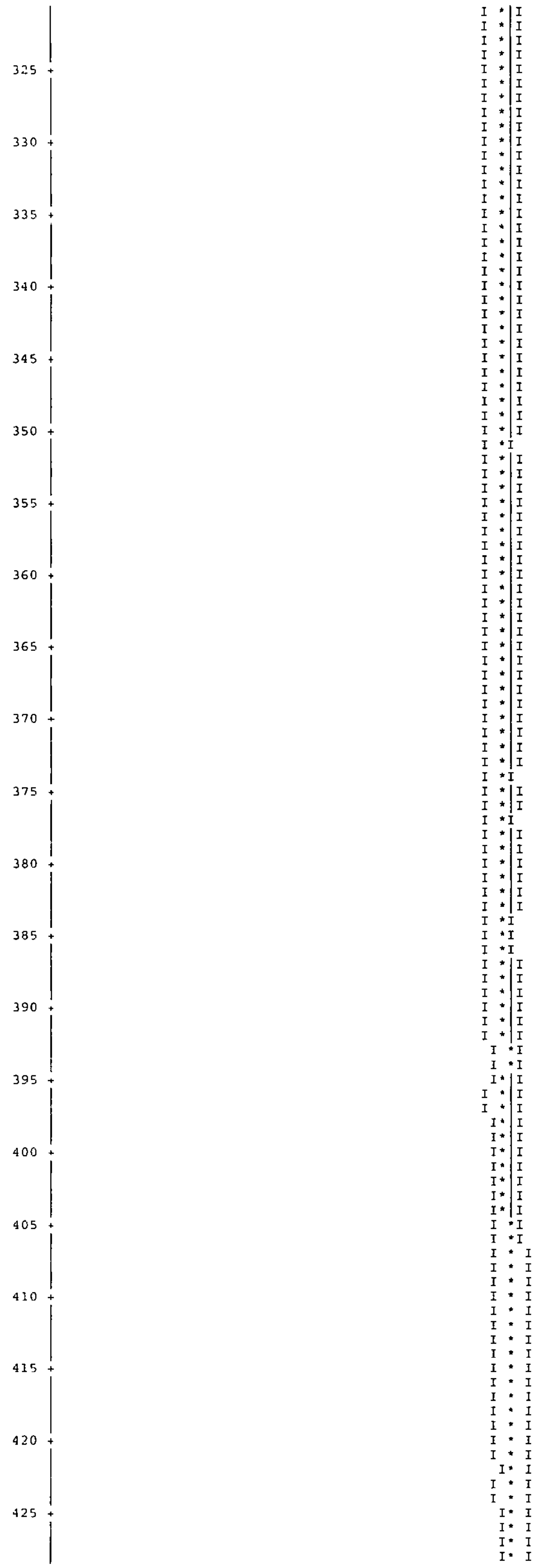
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
1177	0.90661	+ OR - 0.00447	0.90214 TO 0.91109	0.89766 TO 0.91556	0.89319 TO 0.92003	26000
1182	0.90513	+ OR - 0.00542	0.89971 TO 0.91055	0.89429 TO 0.91597	0.88887 TO 0.92139	21000
1187	0.90462	+ OR - 0.00654	0.89809 TO 0.91116	0.89155 TO 0.91770	0.88501 TO 0.92423	16000
1192	0.90129	+ OR - 0.00885	0.89244 TO 0.91015	0.88359 TO 0.91900	0.87473 TO 0.92785	11000
1197	0.90301	+ OR - 0.00813	0.89488 TO 0.91114	0.88675 TO 0.91926	0.87862 TO 0.92739	6000

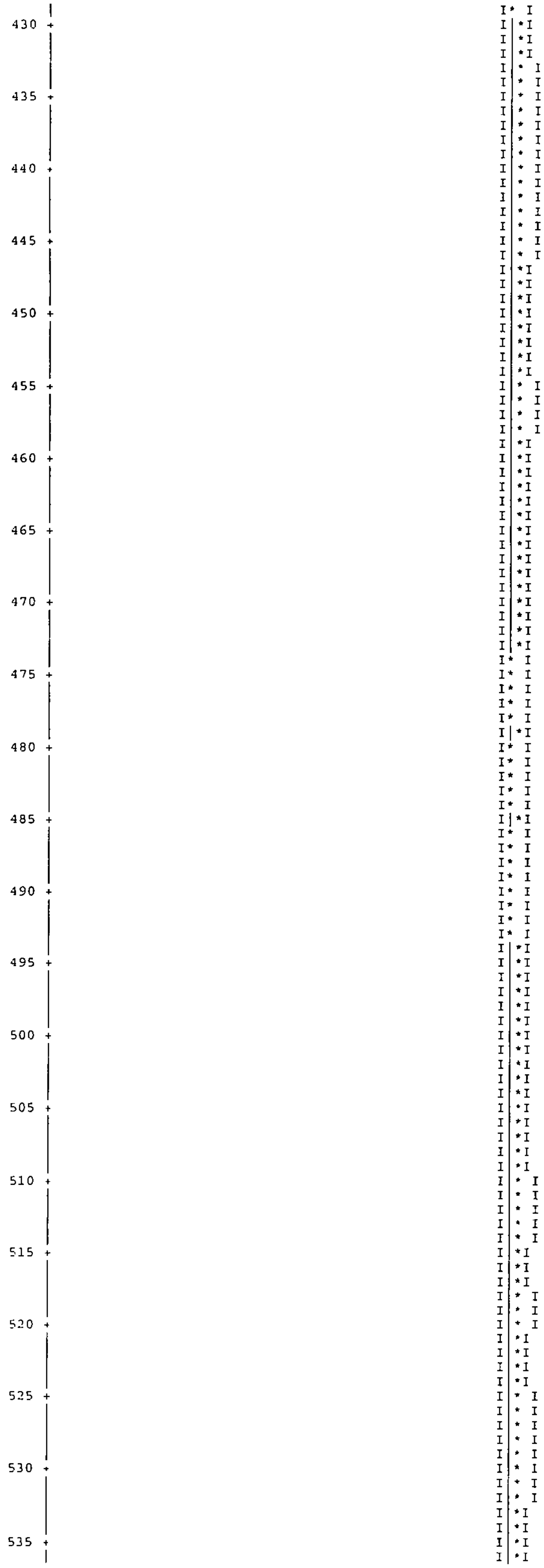
PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.8960 + OR - 0.0007 WHICH OCCURS FOR 1203 GENERATIONS RUN.

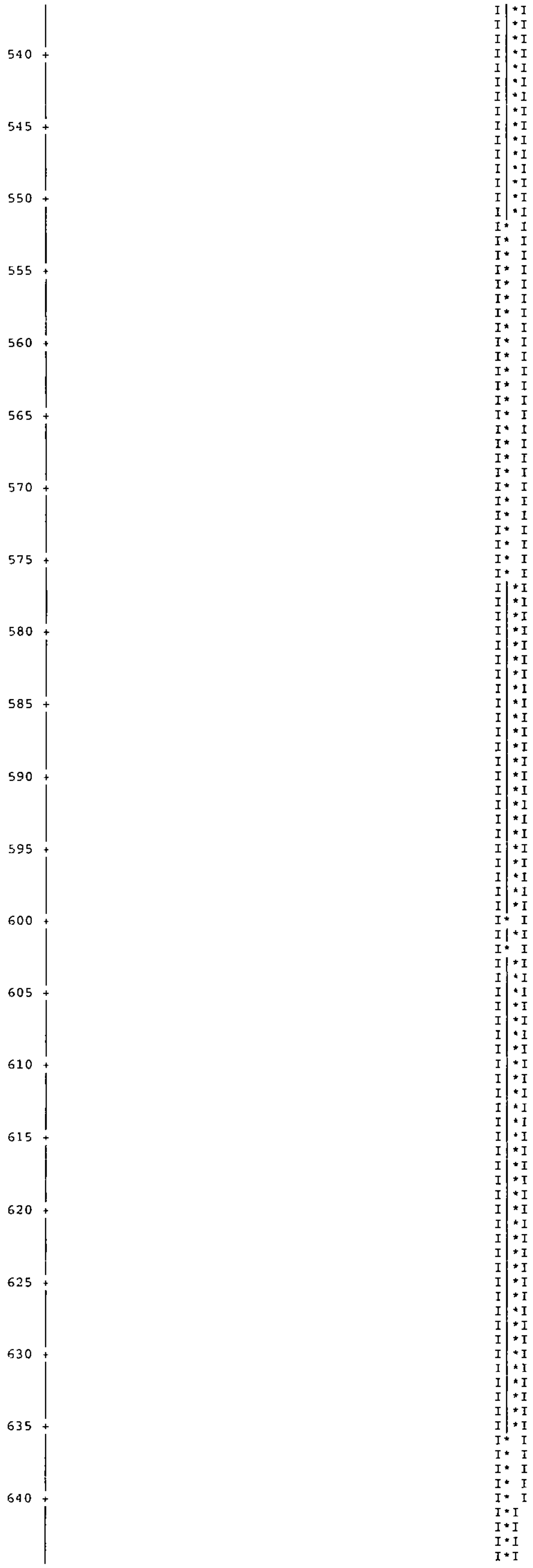


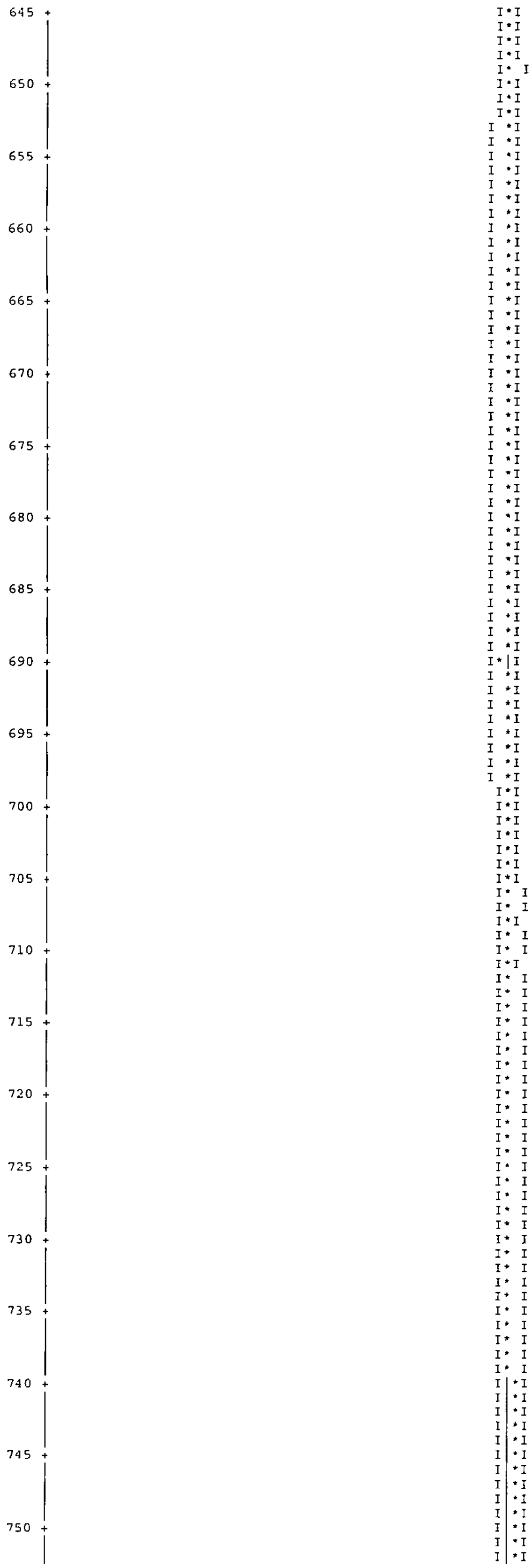

105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185
190
195
200
205
210


215
220
225
230
235
240
245
250
255
260
265
270
275
280
285
290
295
300
305
310
315
320

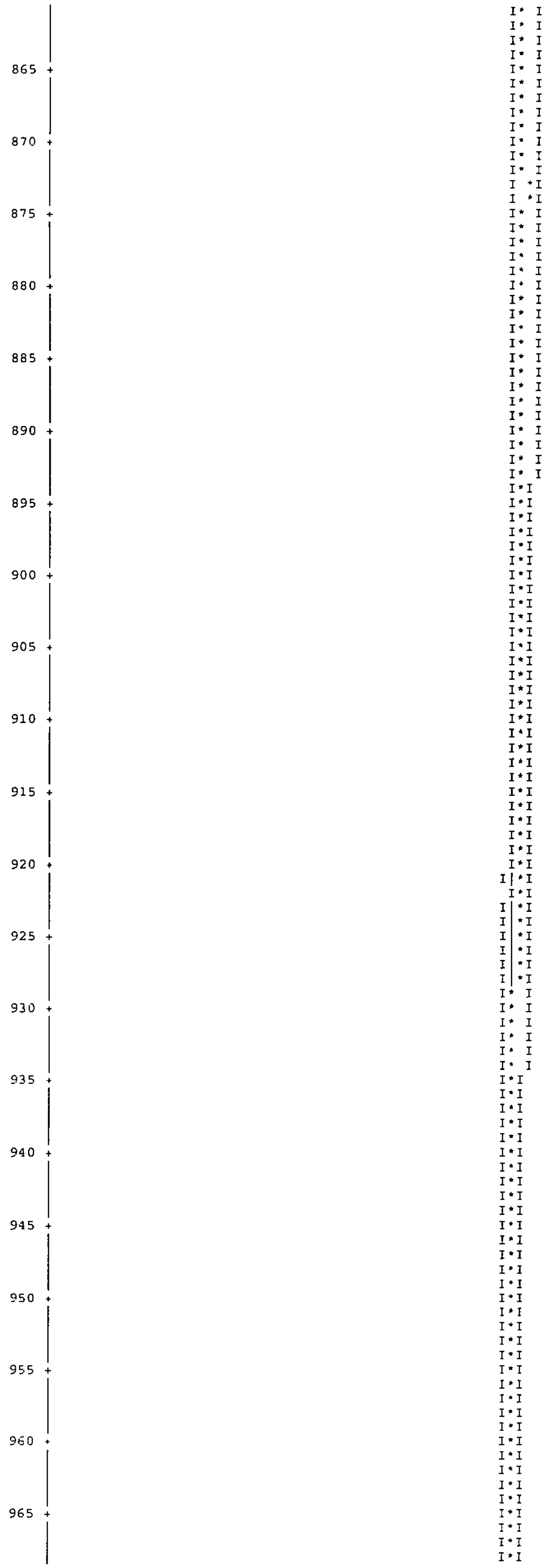

325
330
335
340
345
350
355
360
365
370
375
380
385
390
395
400
405
410
415
420
425



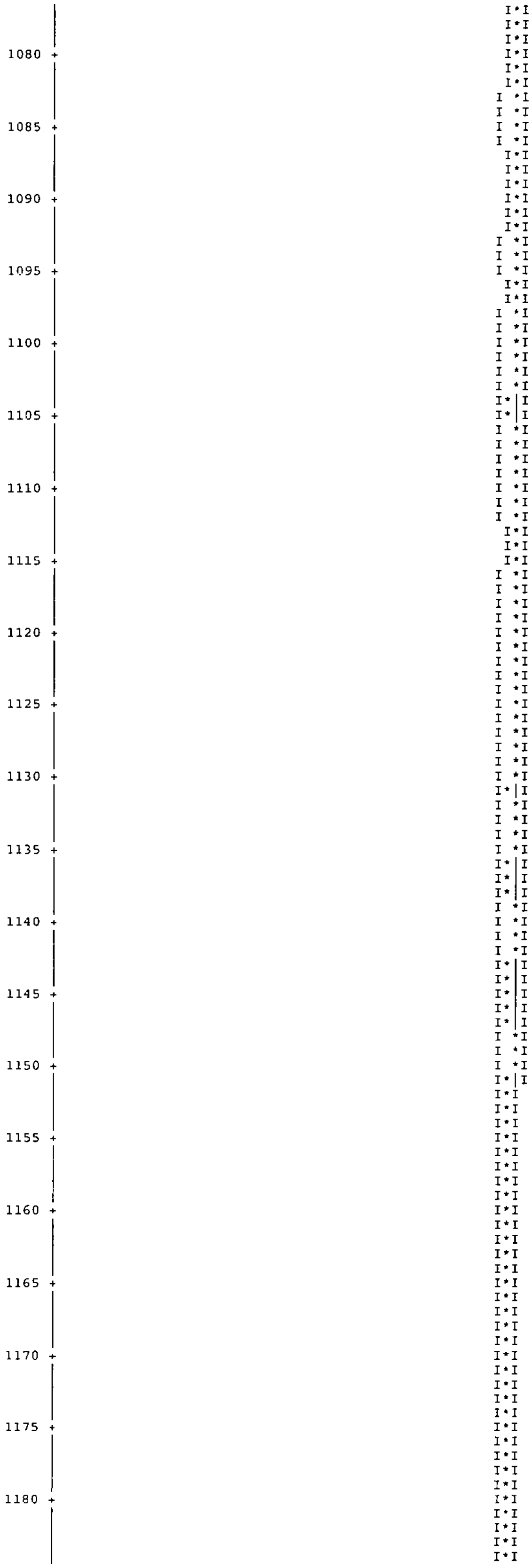

540
545
550
555
560
565
570
575
580
585
590
595
600
605
610
615
620
625
630
635
640



```
    |                                       I|*I
    |                                       I|*I
755 +                                       I|*I
    |                                       I|*I
    |                                       I|*I
    |                                       I|*I
    |                                       I|*I
760 +                                       I|*I
    |                                       I|*I
    |                                       I|*I
    |                                        I*I
    |                                        I*I
765 +                                        I*I
    |                                        I*I
    |                                        I*I
    |                                        I*I
    |                                        I*I
770 +                                        I*I
    |                                        I*I
    |                                       I|*I
    |                                       I|*I
    |                                       I|*I
775 +                                       I|*I
    |                                       I|*I
    |                                       I|*I
    |                                       I|*I
    |                                       I|*I
780 +                                       I|*I
    |                                       I|*I
    |                                       I|*I
    |                                       I|*I
    |                                       I|*I
785 +                                       I|*I
    |                                        I*I
    |                                        I*I
    |                                        I*I
    |                                        I*I
790 +                                        I*I
    |                                        I*I
    |                                        I*I
    |                                        I*I
    |                                        I*I
795 +                                        I*I
    |                                        I*I
    |                                        I*I
    |                                        I*I
    |                                        I*I
800 +                                        I*I
    |                                        I*I
    |                                        I*I
    |                                        I*I
    |                                        I*I
805 +                                        I*I
    |                                       I|*I
    |                                       I|*I
    |                                       I|*I
    |                                        I*I
810 +                                        I*I
    |                                        I*I
    |                                        I*I
    |                                        I*I
    |                                        I*I
815 +                                        I*I
    |                                        I*I
    |                                        I*I
    |                                        I*I
    |                                        I*I
820 +                                        I*I
    |                                        I*I
    |                                        I*I
    |                                        I*I
    |                                        I*I
825 +                                        I*I
    |                                        I*I
    |                                        I*I
    |                                        I*I
    |                                        I*I
830 +                                        I*I
    |                                        I*I
    |                                        I*I
    |                                        I* I
    |                                        I* I
835 +                                        I* I
    |                                        I* I
    |                                        I* I
    |                                        I* I
    |                                        I* I
840 +                                        I* I
    |                                        I* I
    |                                        I* I
    |                                        I* I
    |                                        I* I
845 +                                        I* I
    |                                        I* I
    |                                        I* I
    |                                        I* I
    |                                        I* I
850 +                                        I* I
    |                                        I* I
    |                                        I* I
    |                                        I* I
    |                                        I* I
855 +                                        I* I
    |                                        I* I
    |                                        I* I
    |                                        I* I
    |                                        I* I
860 +                                        I* I
```


865
870
875
880
885
890
895
900
905
910
915
920
925
930
935
940
945
950
955
960
965

```
     |                    I*I
 970 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
 975 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
 980 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
 985 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
 990 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
 995 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1000 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1005 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1010 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1015 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1020 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1025 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1030 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1035 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1040 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1045 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1050 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1055 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1060 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1065 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1070 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1075 +                    I*I
     |                    I*I
```

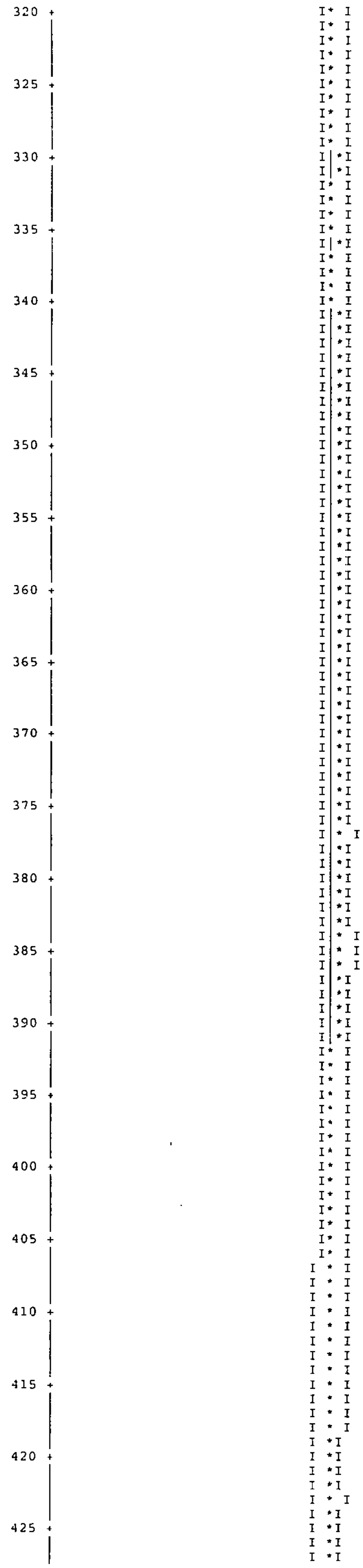


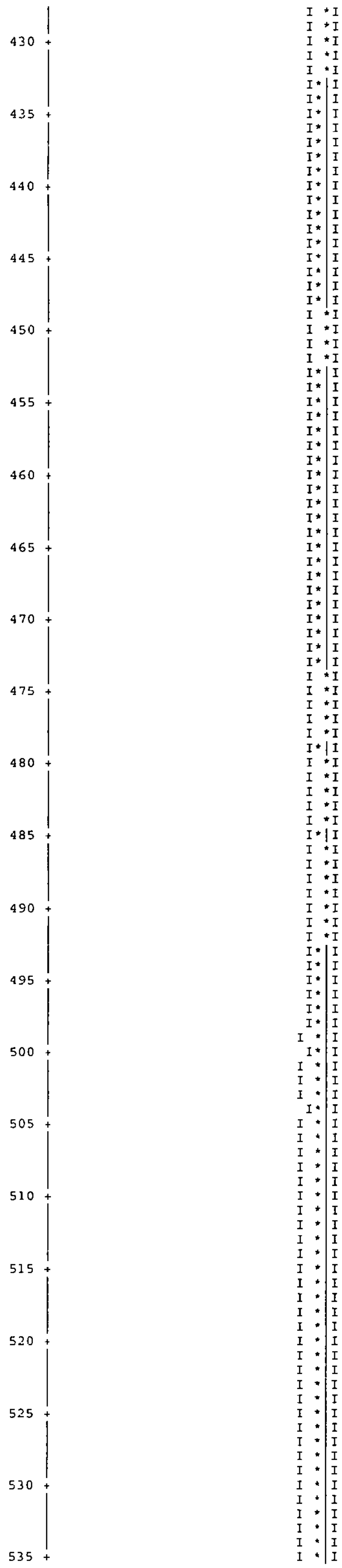
```
1185 +                                   I*I
     |                                   I*I
     |                                   I*I
     |                                   I*I
     |                                   I*I
1190 +                                   I*I
     |                                   I*I

     |                                   I*|I
     |                                   I*|I
     |                                   I*|I
1195 +                                   I *I
     |                                   I *I
     |                                   I*|I
     |                                   I*|I
     |                                   I*|I
1200 +                                   I*|I
     |                                   I*|I
     |                                   I*|I
     |                                   I *I
```

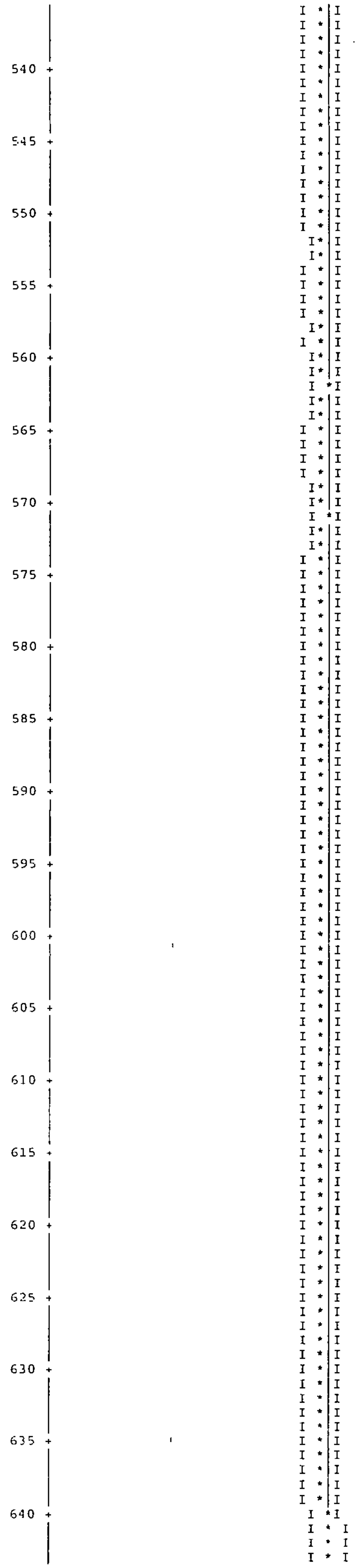
```
                 PLOT OF AVERAGE K-EFFECTIVE BY GENERATION SKIPPED.
   THE LINE REPRESENTS K-EFF = 0.8960 + OR -  0.0007 WHICH OCCURS FOR     3 GENERATIONS SKIPPED.

                           0.8925                   0.9052                   0.9180
     |-------------------------|------------------------|------------------------|------------------------
     |
     |                               I* I
   5 +                               I* I
     |                               I* I
     |                               I* I
     |                               I* I
     |                               I* I
  10 +                               I* I
     |                               I* I
     |                               I* I
     |                               I* I
     |                               I* I
  15 +                               I* I
     |                               I* I
     |                               I*I
     |                               I*I
     |                               I*I
  20 +                               I*I
     |                               I*I
     |                               I*I
     |                               I*I
     |                               I*I
  25 +                               I*I
     |                               I*I
     |                               I* I
     |                               I* I
     |                               I* I
  30 +                               I* I
     |                               I* I
     |                               I* I
     |                               I* I
     |                               I*I
  35 +                               I* I
     |                               I*I
     |                               I* I
     |                               I* I
     |                               I* I
  40 +                               I* I
     |                               I* I
     |                               I* I
     |                               I* I
     |                               I* I
  45 +                               I* I
     |                               I* I
     |                               I* I
     |                               I* I
     |                               I*I
  50 +                               I*I
     |                               I* I
     |                               I* I
     |                               I* I
     |                               I* I
  55 +                               I* I
     |                               I* I
     |                               I* I
     |                               I* I
     |                               I* I
  60 +                               I* I
     |                               I* I
     |                               I* I
     |                               I* I
     |                               I* I
  65 +                               I* I
     |                               I* I
     |                               I* I
     |                               I* I
     |                               I*I
  70 +                               I*I
     |                               I*I
     |                               I*I
     |                               I*I
     |                               I*I
  75 +                               I*I
     |                               I*I
     |                               I* I
     |                               I* I
     |                               I* I
  80 +                               I* I
     |                               I* I
     |                               I* I
     |                               I* I
     |                               I* I
  85 +                               I* I
     |                               I* I
     |                               I* I
     |                               I* I
     |                               I* I
  90 +                               I* I
     |                               I* I
     |                               I* I
     |                               I* I
     |                               I* I
  95 +                               I* I
     |                               I* I
     |                               I* I
     |                               I* I
     |                               I* I
 100 +                               I* I
     |                               I* I
     |                               I* I
     |                               I*I
```

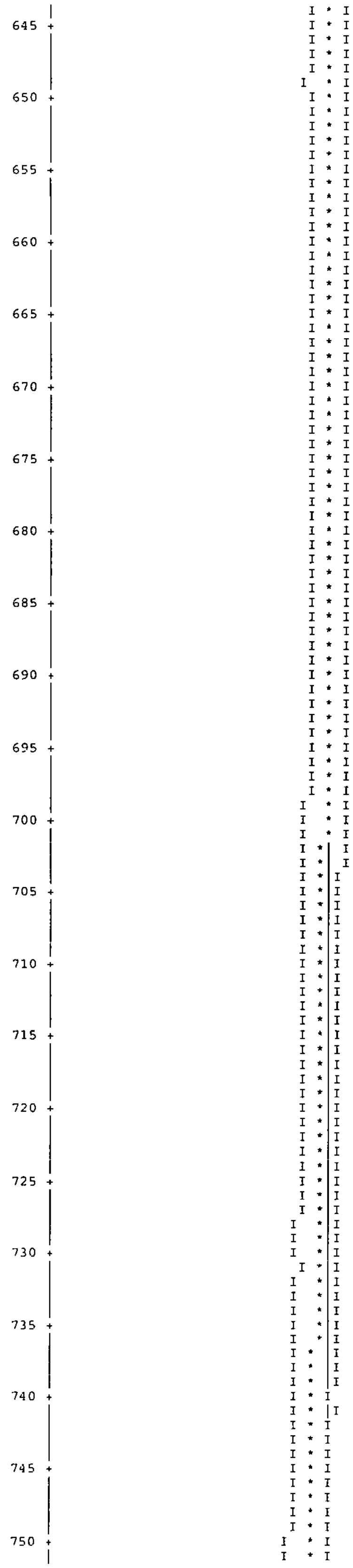
```
        |                         I* I
    105 +                         I*I
        |                         I*I
        |                         I*I
        |                         I*I
        |                         I*I
    110 +                         I*I
        |                         I*I
        |                         I*I
        |                         I*I
        |                         I*I
    115 +                         I*I
        |                         I*I
        |                         I*I
        |                        I *I
        |                        I *I
    120 +                        I *I
        |                        I *I
        |                        I *I
        |                        I *I
        |                         I*I
    125 +                         I*I
        |                         I*I
        |                         I* I
        |                         I* I
        |                         I* I
    130 +                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
    135 +                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
    140 +                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
    145 +                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
    150 +                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
    155 +                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
    160 +                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
    165 +                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
    170 +                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
    175 +                         I*I
        |                        I *I
        |                        I *I
        |                        I *I
        |                        I *I
    180 +                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
    185 +                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
    190 +                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
    195 +                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
    200 +                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
    205 +                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
        |                         I* I
    210 +                         I* I
        |                         I* I
```

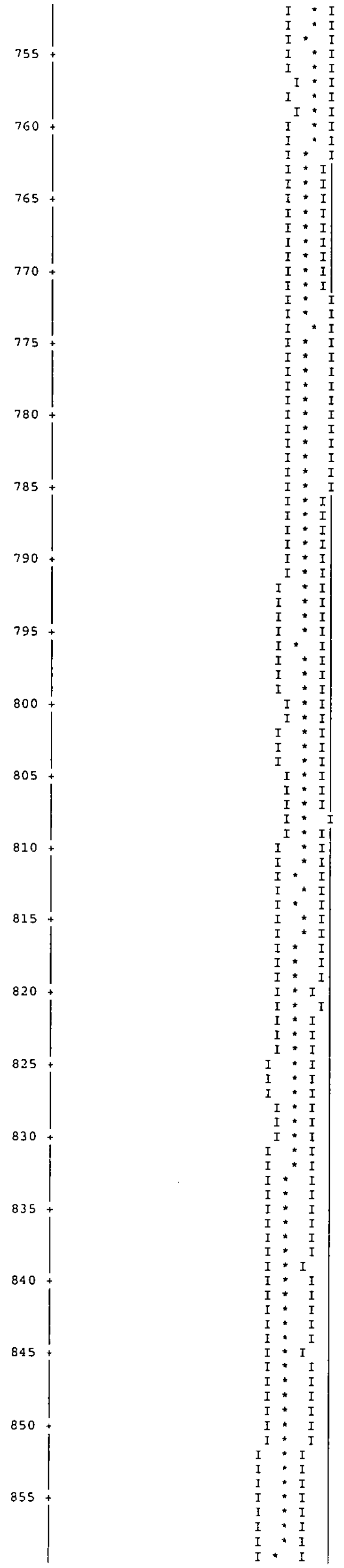
```
    |                              I* I
    |                              I* I
    |                              I* I
215 +                              I* I
    |                              I* I
    |                              I* I
    |                              I* I
    |                              I* I
220 +                              I* I
    |                              I* I
    |                              I* I
    |                              I* I
    |                              I* I
225 +                              I|*I
    |                              I|*I
    |                              I* I
    |                              I* I
    |                              I* I
230 +                              I* I
    |                              I* I
    |                              I* I
    |                              I* I
    |                              I* I
235 +                              I* I
    |                              I* I
    |                              I* I
    |                              I* I
    |                              I* I
240 +                              I* I
    |                              I* I
    |                              I* I
    |                              I* I
    |                              I* I
245 +                              I* I
    |                              I|*I
    |                              I* I
    |                              I|*I
    |                              I|*I
250 +                              I|*I
    |                              I* I
    |                              I* I
    |                              I* I
    |                              I* I
255 +                              I* I
    |                              I* I
    |                              I* I
    |                              I* I
    |                              I* I
260 +                              I* I
    |                              I* I
    |                              I* I
    |                              I* I
    |                              I* I
265 +                              I* I
    |                              I* I
    |                              I* I
    |                              I* I
    |                              I* I
270 +                              I* I
    |                              I* I
    |                              I* I
    |                              I* I
    |                              I* I
275 +                              I* I
    |                              I|*I
    |                              I|*I
    |                              I|*I
    |                              I|*I
280 +                              I* I
    |                              I|*I
    |                              I|*I
    |                              I|*I
    |                              I|*I
285 +                              I|*I
    |                              I|*I
    |                              I|*I
    |                              I|*I
    |                              I|* I
290 +                              I|*I
    |                              I|*I
    |                              I|*I
    |                              I|*I
    |                              I|*I
295 +                              I|*I
    |                              I|*I
    |                              I|*I
    |                              I|*I
    |                              I|*I
300 +                              I|*I
    |                              I|*I
    |                              I|*I
    |                              I|*I
    |                              I|*I
305 +                              I|*I
    |                              I|*I
    |                              I* I
    |                              I* I
    |                              I* I
310 +                              I* I
    |                              I* I
    |                              I* I
    |                              I* I
    |                              I* I
315 +                              I|*I
    |                              I|*I
    |                              I|*I
    |                              I|*I
    |                              I* I
```

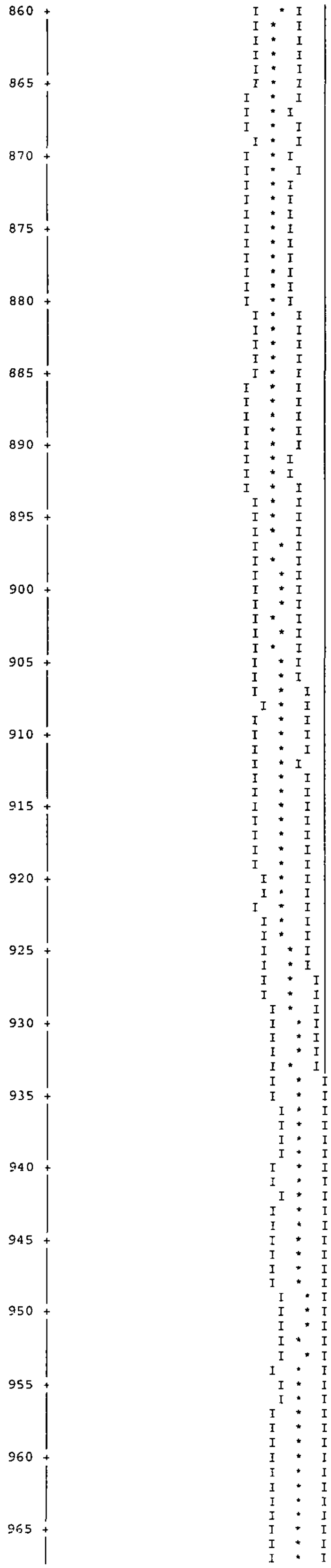


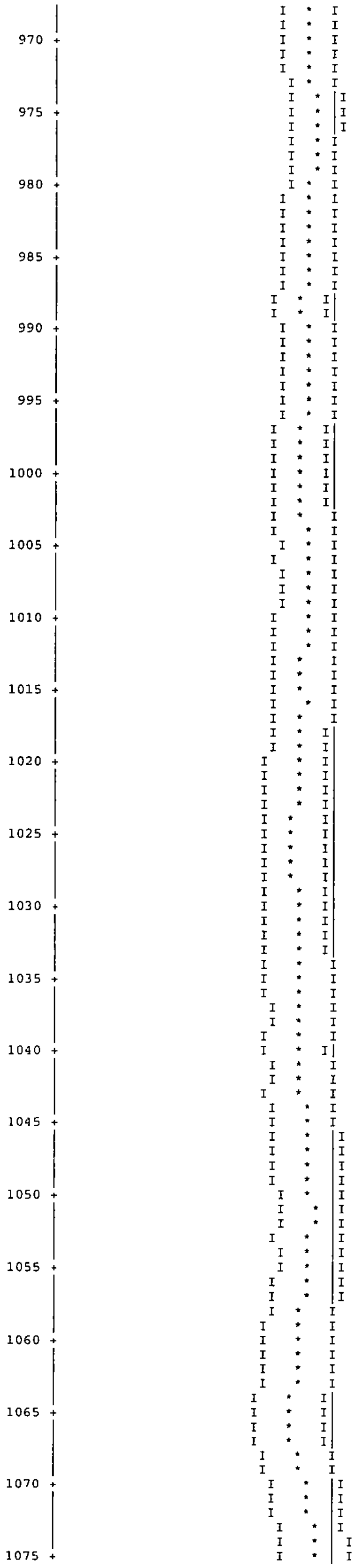

430
435
440
445
450
455
460
465
470
475
480
485
490
495
500
505
510
515
520
525
530
535

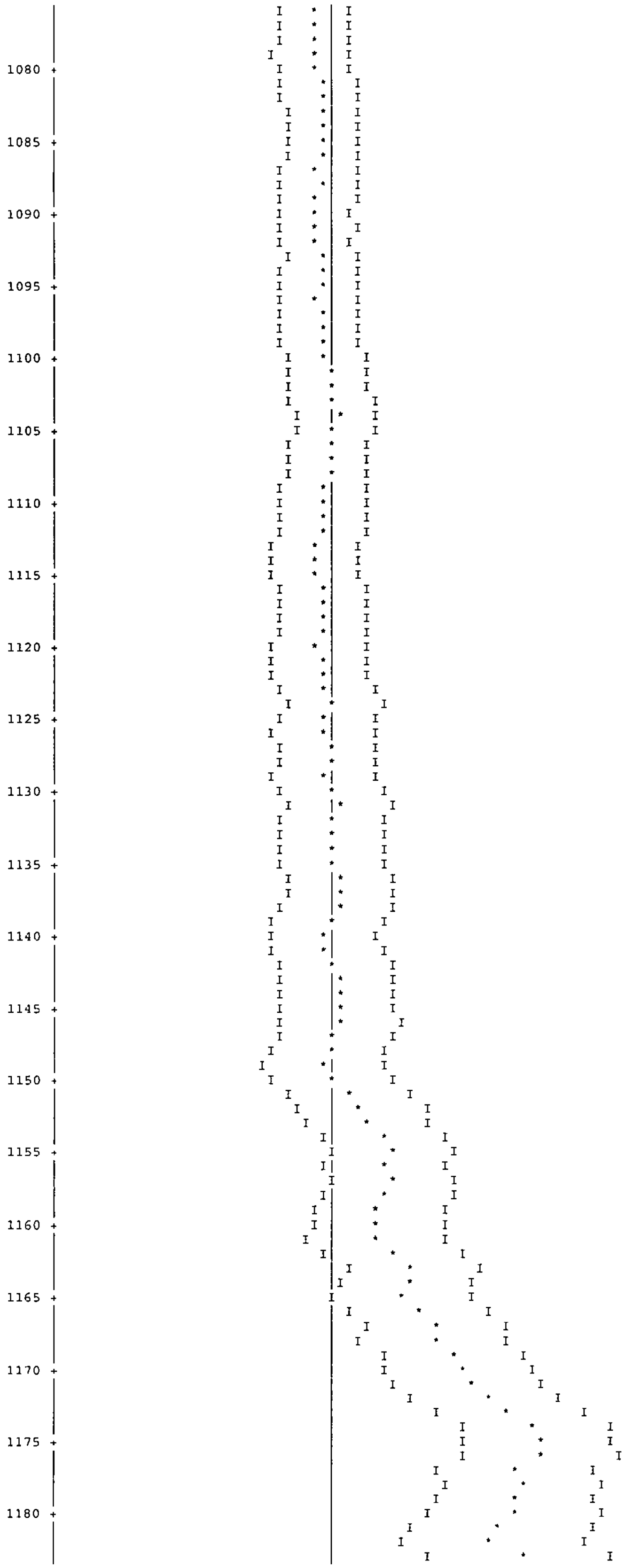

540
545
550
555
560
565
570
575
580
585
590
595
600
605
610
615
620
625
630
635
640

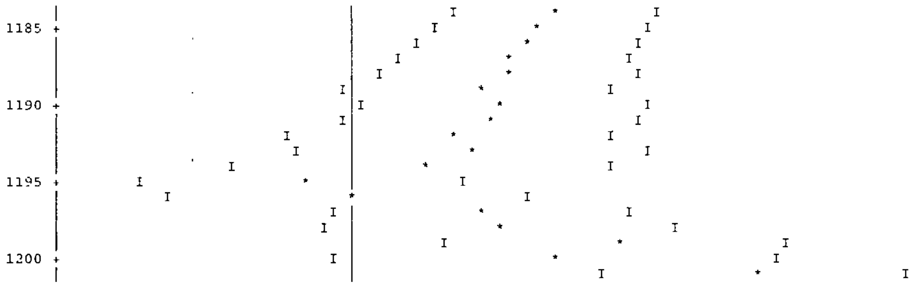

645
650
655
660
665
670
675
680
685
690
695
700
705
710
715
720
725
730
735
740
745
750


755
760
765
770
775
780
785
790
795
800
805
810
815
820
825
830
835
840
845
850
855


860
865
870
875
880
885
890
895
900
905
910
915
920
925
930
935
940
945
950
955
960
965




1080
1085
1090
1095
1100
1105
1110
1115
1120
1125
1130
1135
1140
1145
1150
1155
1160
1165
1170
1175
1180


1185
1190
1195
1200

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0001			1.15906E-04	2.6399	1.24682E-03	0.8113	0.00000E+00	0.0000
2	0.0006			5.30927E-04	0.8489	2.58406E-03	0.2550	0.00000E+00	0.0000
3	0.0007			6.37244E-04	0.7231	5.16051E-04	0.4371	0.00000E+00	0.0000
4	0.0004			3.61739E-04	0.9316	2.75979E-04	0.5533	0.00000E+00	0.0000
5	0.0006			4.95953E-04	0.7663	5.19655E-04	0.4174	0.00000E+00	0.0000
6	0.0007			6.30678E-04	0.5838	1.17802E-03	0.3372	0.00000E+00	0.0000
7	0.0007			6.17082E-04	0.6394	1.33636E-03	0.3352	0.00000E+00	0.0000
8	0.0007			6.51906E-04	1.0317	1.32331E-03	0.4530	0.00000E+00	0.0000
9	0.0010			8.76805E-04	1.2629	1.70744E-03	0.5290	0.00000E+00	0.0000
10	0.0020			1.82750E-03	1.2042	3.48738E-03	0.5153	0.00000E+00	0.0000
11	0.0046			4.13279E-03	1.0065	5.82339E-03	0.5354	0.00000E+00	0.0000
12	0.0065			5.83378E-03	1.0512	6.36455E-03	0.6660	0.00000E+00	0.0000
13	0.0067			5.97500E-03	1.0600	8.36976E-03	0.6245	0.00000E+00	0.0000
14	0.0057			5.07462E-03	1.0934	1.06577E-02	0.5148	0.00000E+00	0.0000
15	0.0011			9.72058E-04	1.9130	5.36482E-03	0.5775	0.00000E+00	0.0000
16	0.0008			6.81455E-04	2.5720	3.37848E-03	0.6513	0.00000E+00	0.0000
17	0.0012			1.04935E-03	2.8709	2.08826E-03	0.9768	0.00000E+00	0.0000
18	0.0016			1.43756E-03	2.7740	2.11158E-03	1.0450	0.00000E+00	0.0000
19	0.0019			1.72396E-03	2.3100	3.60815E-03	0.7272	0.00000E+00	0.0000
20	0.0085			7.58284E-03	1.2034	1.42955E-02	0.4725	0.00000E+00	0.0000
21	0.0048			4.27904E-03	1.7006	5.99441E-03	0.7166	0.00000E+00	0.0000
22	0.0128			1.15042E-02	0.9810	1.47838E-02	0.4785	0.00000E+00	0.0000
23	0.0757			6.78354E-02	0.4004	8.37234E-02	0.1931	0.00000E+00	0.0000
24	0.2228			1.99619E-01	0.2243	2.20541E-01	0.1080	0.00000E+00	0.0000
25	0.2184			1.95709E-01	0.2293	2.06575E-01	0.1129	0.00000E+00	0.0000
26	0.3012			2.69875E-01	0.1764	2.75820E-01	0.0920	0.00000E+00	0.0000
27	0.1182			1.05926E-01	0.3261	1.05296E-01	0.1776	0.00000E+00	0.0000
SYSTEM TOTAL =				8.95957E-01	0.0776	9.88970E-01	0.0233	0.00000E+00	0.0000

THE WEIGHT LOST IN THE ALBEDO PORTION OF THE PROBLEM = 1.2370E-02 + OR - 0.0001

ELAPSED TIME 28.77900 MINUTES

RANDOM NUMBER= 415C58355882

```
                         FREQUENCY FOR GENERATIONS    4 TO 1203
0.8240 TO 0.8274     *
0.8274 TO 0.8309     **
0.8309 TO 0.8343     ***
0.8343 TO 0.8377     ****
0.8377 TO 0.8411     ***
0.8411 TO 0.8445     ******
0.8445 TO 0.8480     ***********
0.8480 TO 0.8514     *********
0.8514 TO 0.8548     **************
0.8548 TO 0.8582     *************************
0.8582 TO 0.8616     ***********************
0.8616 TO 0.8650     ***************************
0.8650 TO 0.8685     ***************************************
0.8685 TO 0.8719     *******************************
0.8719 TO 0.8753     **********************************
0.8753 TO 0.8787     ****************************************************
0.8787 TO 0.8821     **************************************************
0.8821 TO 0.8855     **********************************************************
0.8855 TO 0.8890     ********************************************************************
0.8890 TO 0.8924     *****************************************************************
0.8924 TO 0.8958     ******************************************************************
0.8958 TO 0.8992     *****************************************************************
0.8992 TO 0.9026     ****************************************************************
0.9026 TO 0.9060     ******************************************************************
0.9060 TO 0.9095     *************************************************************
0.9095 TO 0.9129     *************************************************************
0.9129 TO 0.9163     *********************************************
0.9163 TO 0.9197     *********************************************
0.9197 TO 0.9231     *************************************************
0.9231 TO 0.9265     ****************************************
0.9265 TO 0.9300     ****************************
0.9300 TO 0.9334     ***************
0.9334 TO 0.9368     *****************
0.9368 TO 0.9402     ************
0.9402 TO 0.9436     *******************
0.9436 TO 0.9470     *******
0.9470 TO 0.9505     ****
0.9505 TO 0.9539     ****
0.9539 TO 0.9573     **
0.9573 TO 0.9607     *
0.9607 TO 0.9641     **
0.9641 TO 0.9675
0.9675 TO 0.9710     *
0.9710 TO 0.9744
0.9744 TO 0.9778
0.9778 TO 0.9812
0.9812 TO 0.9846
0.9846 TO 0.9880
0.9880 TO 0.9915
0.9915 TO 0.9949     *
```

```
                         FREQUENCY FOR GENERATIONS  304 TO 1203
0.8240 TO 0.8274     *
0.8274 TO 0.8309     **
0.8309 TO 0.8343     **
0.8343 TO 0.8377     ***
0.8377 TO 0.8411     ***
0.8411 TO 0.8445     *****
0.8445 TO 0.8480     ********
0.8480 TO 0.8514     ********
0.8514 TO 0.8548     ***********
0.8548 TO 0.8582     *****************
0.8582 TO 0.8616     ****************
0.8616 TO 0.8650     ******************
0.8650 TO 0.8685     ***************************
0.8685 TO 0.8719     ***********************
0.8719 TO 0.8753     **************************
0.8753 TO 0.8787     **************************************
0.8787 TO 0.8821     *********************************
0.8821 TO 0.8855     *******************************************
0.8855 TO 0.8890     ******************************************************
0.8890 TO 0.8924     *****************************************************
0.8924 TO 0.8958     **************************************************
0.8958 TO 0.8992     ***********************************************
0.8992 TO 0.9026     *************************************************
0.9026 TO 0.9060     ********************************************************
0.9060 TO 0.9095     **************************************************
0.9095 TO 0.9129     ********************************************
0.9129 TO 0.9163     *********************************
0.9163 TO 0.9197     ********************************
0.9197 TO 0.9231     ********************************
0.9231 TO 0.9265     *****************************
0.9265 TO 0.9300     ************************
0.9300 TO 0.9334     **********
0.9334 TO 0.9368     **************
0.9368 TO 0.9402     ********
0.9402 TO 0.9436     ***************
0.9436 TO 0.9470     ****
0.9470 TO 0.9505     **
0.9505 TO 0.9539     ***
0.9539 TO 0.9573     **
0.9573 TO 0.9607     *
0.9607 TO 0.9641     **
0.9641 TO 0.9675
0.9675 TO 0.9710     *
0.9710 TO 0.9744
0.9744 TO 0.9778
0.9778 TO 0.9812
0.9812 TO 0.9846
0.9846 TO 0.9880
0.9880 TO 0.9915
0.9915 TO 0.9949     *
```

```
                        FREQUENCY FOR GENERATIONS  604 TO 1203
0.8240 TO 0.8274     *
0.8274 TO 0.8309     **
0.8309 TO 0.8343     **
0.8343 TO 0.8377     **
0.8377 TO 0.8411     **
0.8411 TO 0.8445     ***
0.8445 TO 0.8480     ******
0 8480 TO 0.8514     *******
0.8514 TO 0.8548     ********
0.8548 TO 0.8582     ***********
0.8582 TO 0.8616     ***********
0.8616 TO 0.8650     *************
0.8650 TO 0.8685     *****************
0.8685 TO 0.8719     *****************
0.8719 TO 0.8753     *****************
0.8753 TO 0.8787     ***************************
0.8787 TO 0.8821     *******************
0.8821 TO 0.8855     ********************************
0.8855 TO 0.8890     *************************************
0.8890 TO 0.8924     ***************************************
0.8924 TO 0.8958     ***************************
0.8958 TO 0.8992     ********************************
0.8992 TO 0.9026     **********************************
0.9026 TO 0.9060     *********************************
0.9060 TO 0.9095     ***********************************
0.9095 TO 0.9129     **********************
0.9129 TO 0.9163     ************************
0.9163 TO 0.9197     ********************
0.9197 TO 0.9231     ************************
0.9231 TO 0.9265     *****************
0.9265 TO 0.9300     *******************
0.9300 TO 0.9334     ******
0.9334 TO 0.9368     **********
0.9368 TO 0.9402     ***
0.9402 TO 0.9436     *************
0.9436 TO 0.9470     ***
0.9470 TO 0.9505
0.9505 TO 0.9539     **
0.9539 TO 0.9573     *
0.9573 TO 0.9607     *
0.9607 TO 0.9641     *
0.9641 TO 0.9675
0.9675 TO 0.9710
0.9710 TO 0.9744
0.9744 TO 0.9778
0.9778 TO 0.9812
0.9812 TO 0.9846
0.9846 TO 0.9880
0.9880 TO 0.9915
0.9915 TO 0.9949
```

```
                                   FREQUENCY FOR GENERATIONS  904 TO 1203
0.8240 TO 0.8274      *
0.8274 TO 0.8309      *
0.8309 TO 0.8343
0.8343 TO 0.8377      *
0.8377 TO 0.8411      *
0.8411 TO 0.8445      **
0.8445 TO 0.8480      **
0.8480 TO 0.8514      *****
0.8514 TO 0.8548      ****
0.8548 TO 0.8582      *********
0.8582 TO 0.8616      *******
0.8616 TO 0.8650      *******
0.8650 TO 0.8685      **********
0.8685 TO 0.8719      ***********
0.8719 TO 0.8753      ***********
0.8753 TO 0.8787      **********
0.8787 TO 0.8821      *******
0.8821 TO 0.8855      *******************
0.8855 TO 0.8890      **************
0.8890 TO 0.8924      ********************
0.8924 TO 0.8958      *************
0.8958 TO 0.8992      *********************
0.8992 TO 0.9026      **************
0.9026 TO 0.9060      *****************
0.9060 TO 0.9095      ******************
0.9095 TO 0.9129      ******
0.9129 TO 0.9163      ***********
0.9163 TO 0.9197      **************
0.9197 TO 0.9231      ***********
0.9231 TO 0.9265      ******
0.9265 TO 0.9300      ************
0.9300 TO 0.9334      **
0.9334 TO 0.9368      *****
0.9368 TO 0.9402
0.9402 TO 0.9436      ***
0.9436 TO 0.9470
0.9470 TO 0.9505
0.9505 TO 0.9539      *
0.9539 TO 0.9573
0.9573 TO 0.9607      *
0.9607 TO 0.9641
0.9641 TO 0.9675
0.9675 TO 0.9710
0.9710 TO 0.9744
0.9744 TO 0.9778
0.9778 TO 0.9812
0.9812 TO 0.9846
0.9846 TO 0.9880
0.9880 TO 0.9915
0.9915 TO 0.9949


*****************************************************************************************************************************
*
          CONGRATULATIONS!  YOU HAVE  SUCCESSFULLY TRAVERSED THE PERILOUS PATH THROUGH KENO V IN  28.77900 MINUTES
*****************************************************************************************************************************
*
```

Figure 6.6.8-2 Maximum Reactivity DIDO Configuration – Infinite Array

```
NAC International
QSCALENT Banner Generation Utility v3.6 (20010221)
+-----------------+
I JOB INFORMATION I
+-----------------+

Working Directory:           D:\HJP\PLATEMIN_THCLAMIN_FUELLMIN_HTELEMIN_UM-MAX_UWMAX_OCFMAX\
Output File Name:            plateMin_thclaMin_fuellMin_hteleMin_um-Max_uwMax_OCFMax.out
Start Date:                  February 21, 2001
Start Time:                  17:18:06

+----------------------+
I SOFTWARE INFORMATION I
+----------------------+

Program Name:                Scale 4.3 for Windows NT 4.0
Version:                     4.3.1
Installation Date:           June 10, 1998
Code Verification Package #: EA913-1010-94, Rev. 0
Code Verification Date:      June 10, 1998
Program Location:            G:\scale43\win_nt\exe

+--------------------+
I SYSTEM INFORMATION I
+--------------------+

Computer Type:               Dell Precision 410
Operating System:            Windows NT Version 4.0
Computer ID:                 57NTY (MAC# 00C04F600F94)
Serial Number:               57NTY
Login ID:                    zjr
System Verification Date:    July 3, 2000
```

```
      PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
 MODULE CSAS25   WILL BE CALLED
   LWT with Loose DIDO HEU Fuel, Accident Condition, Radial Shift Pattern - Centere
   'Fuel Tube Thick - Nominal  Fuel Tube OD - Nominal  Fuel Tube Height - Nominal
   'Fuel Base  Plate - Nominal  Fuel Plate Diameter - Nominal  Fuel Plate Thickness
   'Fuel Plate Clad Thickness - Min  Active Fuel Length - Min  Fuel Element Height
   'U235 Fuel Mass - Max  Uranium Weight Fraction - Max  Cylinder Pitch - Outer_Fix
   27GROUPNDF4  LATTICECELL
   'Material Description for LWT Analysis - DIDO HEU Fuel
   URANIUM  1  DEN=0.5477  1.0  293.0  92235 94.0   92238 06.0  END
   AL  1  DEN=1.7930  1.0  293.0        END
   AL  2  1.00  293.0         END
   H2O  3  DEN=0.9998  1.00  293.0        END
   ARBMGLC  0.9437  3  0  1  0
     6012  2  1001  6  8016  2
     4  0.5840           END
   H2O  4  0.4160  293.0          END
   PB  5  1.00  293.0         END
   SS304  6  1.00  293.0          END
   AL  7  1.00  293.0         END
   SS304  8  1.00  293.0          END
   H2O  9  DEN=0.0001  1.00  293.0        END
   END COMP
   SYMMSLABCELL  0.9800  0.0650  1  3  0.1300  2  END

   READ PARAM  TBA=5  TME=90  RUN=YES  PLT=NO
     GEN=1203  NPG=1000         END PARAM
   READ START  XSM=-16.85  XSP=16.85  YSM=16.85  YSP=-16.85
     ZSM=26.67  ZSP=473.35          END START
   READ GEOM
   UNIT  1
   COM='Fueled Annular Sections       Tube  1  Loose     '
   'Fuel Annulus     1
   CYLINDER  3  1  3.0300  58.7500  0.0000  ORIGIN  0.0000  0.0000
   CYLINDER  2  1  3.0625  58.7500  0.0000  ORIGIN  0.0000  0.0000
   CYLINDER  1  1  3.1275  58.7500  0.0000  ORIGIN  0.0000  0.0000
   CYLINDER  2  1  3.1600  58.7500  0.0000  ORIGIN  0.0000  0.0000
   'Fuel Annulus     2
   CYLINDER  3  1  3.5300  58.7500  0.0000  ORIGIN  0.0000  0.0000
   CYLINDER  2  1  3.5625  58.7500  0.0000  ORIGIN  0.0000  0.0000
   CYLINDER  1  1  3.6275  58.7500  0.0000  ORIGIN  0.0000  0.0000
   CYLINDER  2  1  3.6600  58.7500  0.0000  ORIGIN  0.0000  0.0000
   'Fuel Annulus     3
   CYLINDER  3  1  4.0300  58.7500  0.0000  ORIGIN  0.0000  0.0000
   CYLINDER  2  1  4.0625  58.7500  0.0000  ORIGIN  0.0000  0.0000
   CYLINDER  1  1  4.1275  58.7500  0.0000  ORIGIN  0.0000  0.0000
   CYLINDER  2  1  4.1600  58.7500  0.0000  ORIGIN  0.0000  0.0000
   'Fuel Annulus     4
   CYLINDER  3  1  4.5300  58.7500  0.0000
   CYLINDER  2  1  4.5625  58.7500  0.0000
   CYLINDER  1  1  4.6275  58.7500  0.0000
   CYLINDER  2  1  4.6599  58.7500  0.0000
   UNIT  2
   COM='Axial Clad Sections       Tube  1  Loose     '
   'Clad Axial End Piece     1
   CYLINDER  3  1  3.0300  1.3750  0.0000  ORIGIN  0.0000  0.0000
   CYLINDER  2  1  3.1600  1.3750  0.0000  ORIGIN  0.0000  0.0000
   'Clad Axial End Piece     2
   CYLINDER  3  1  3.5300  1.3750  0.0000  ORIGIN  0.0000  0.0000
   CYLINDER  2  1  3.6600  1.3750  0.0000  ORIGIN  0.0000  0.0000
   'Clad Axial End Piece     3
   CYLINDER  3  1  4.0300  1.3750  0.0000  ORIGIN  0.0000  0.0000
   CYLINDER  2  1  4.1600  1.3750  0.0000  ORIGIN  0.0000  0.0000
   'Clad Axial End Piece     4
   CYLINDER  3  1  4.5300  1.3750  0.0000
   CYLINDER  2  1  4.6599  1.3750  0.0000
   UNIT  3
   COM='Fuel Element      Tube  1'
   CYLINDER  3  1  4.6600  61.5000  0.0000
   HOLE  2  0.0000  0.0000  0.0000
   HOLE  1  0.0000  0.0000  1.3750
   HOLE  2  0.0000  0.0000  60.1250
   UNIT  4
   COM='Basket Fuel Tube - Fuel Down         Radial Centered'
   CYLINDER  3  1  5.0927  73.1773  0.0000
   HOLE  3  0.0000  0.0000  0.0000
   CYLINDER  2  1  5.3974  73.1773  0.0000
   UNIT  5
   COM='Basket Fuel Tube - Fuel Up        Radial Centered'
   CYLINDER  3  1  5.0927  73.1773  0.0000
   HOLE  3  0.0000  0.0000  11.6772
   CYLINDER  2  1  5.3974  73.1773  0.0000
   UNIT  6
   COM='Basket Bottom Plate Hole '
   CYLINDER  3  1  1.27  1.2698  0.0000
   UNIT  7
   COM='Basket Bottom Plate '
   CYLINDER  6  1  16.8466  1.2698  0.0000
   HOLE  6  0.0000  0.0000  0.0000
   HOLE  6  10.7950  0.0000  0.0000
   HOLE  6  5.3975  9.3487  0.0000
   HOLE  6  -5.3975  9.3487  0.0000
   HOLE  6  -10.7950  0.0000  0.0000
   HOLE  6  -5.3975  -9.3487  0.0000
   HOLE  6  5.3975  -9.3487  0.0000
   UNIT  8
   COM='Heat Transfer Bar / Rod '
   CYLINDER  7  1  0.3165  73.1773  0.0000
   UNIT  9
   COM='Basket Fuel Down'
   CYLINDER  3  1  16.1926  73.1773  0.0000
   HOLE  4  0.0000  0.0000  0.0000
   HOLE  4  10.7950  0.0000  0.0000
   HOLE  8  4.9493  2.8575  0.0000
   HOLE  8  4.6024  3.3881  0.0000
   HOLE  8  5.2354  2.2917  0.0000
   HOLE  4  5.3975  9.3487  0.0000
   HOLE  8  0.0000  5.7150  0.0000
```

```
HOLE  8  -0.6330  5.6798  0.0000
HOLE  8  0.6330  5.6798  0.0000
HOLE  4  -5.3975  9.3487  0.0000
HOLE  8  -4.9493  2.8575  0.0000
HOLE  8  -5.2354  2 2917  0.0000
HOLE  8  -4.6024  3.3881  0.0000
HOLE  4  -10.7950  0.0000  0.0000
HOLE  8  -4.9493  -2.8575  0.0000
HOLE  8  -4.6024  -3.3881  0.0000
HOLE  8  -5.2354  -2.2917  0.0000
HOLE  4  -5.3975  -9.3487  0.0000
HOLE  8  0.0000  -5.7150  0.0000
HOLE  8  0.6330  -5.6798  0.0000
HOLE  8  -0.6330  -5.6798  0.0000
HOLE  4  5.3975  -9.3487  0.0000
HOLE  8  4.9493  -2.8575  0.0000
HOLE  8  5.2354  -2.2917  0.0000
HOLE  8  4.6024  -3.3881  0.0000
CYLINDER  7  1  16.6688  73.1773  0.0000
CYLINDER  3  1  16.8466  73.1773  0.0000
UNIT  10
COM='Basket Fuel Up'
CYLINDER  3  1  16.1926  73.1773  0.0000
HOLE  5  0.0000  0.0000  0.0000
HOLE  5  10.7950  0.0000  0.0000
HOLE  8  4.9493  2.8575  0.0000
HOLE  8  4.6024  3.3881  0.0000
HOLE  8  5.2354  2.2917  0.0000
HOLE  5  5.3975  9.3487  0.0000
HOLE  8  0.0000  5.7150  0.0000
HOLE  8  -0.6330  5.6798  0.0000
HOLE  8  0.6330  5.6798  0.0000
HOLE  5  -5.3975  9.3487  0.0000
HOLE  8  -4.9493  2.8575  0.0000
HOLE  8  -5.2354  2.2917  0.0000
HOLE  8  -4.6024  3.3881  0.0000
HOLE  5  -10.7950  0.0000  0.0000
HOLE  8  -4.9493  -2.8575  0.0000
HOLE  8  -4.6024  -3.3881  0.0000
HOLE  8  -5.2354  -2.2917  0.0000
HOLE  5  -5.3975  -9.3487  0.0000
HOLE  8  0.0000  -5.7150  0.0000
HOLE  8  0.6330  -5.6798  0.0000
HOLE  8  -0.6330  -5.6798  0.0000
HOLE  5  5.3975  -9.3487  0.0000
HOLE  8  4.9493  -2.8575  0.0000
HOLE  8  5.2354  -2.2917  0.0000
HOLE  8  4.6024  -3.3881  0.0000
CYLINDER  7  1  16.6688  73.1773  0.0000
CYLINDER  3  1  16.8466  73.1773  0.0000
UNIT  11
COM='Cask Cavity '
CYLINDER  3  1  16.9863  446.6844  0.0000
HOLE  7  0.0000  0.0000  0.0001
HOLE  10  0.0000  0.0000  1.2700
HOLE  7  0.0000  0.0000  74.4475
HOLE  9  0.0000  0.0000  75.7174
HOLE  7  0.0000  0.0000  148.8949
HOLE  10  0.0000  0.0000  150.1648
HOLE  7  0.0000  0.0000  223.3423
HOLE  9  0.0000  0.0000  224.6122
HOLE  7  0.0000  0.0000  297.7897
HOLE  10  0.0000  0.0000  299.0596
HOLE  7  0.0000  0.0000  372.2371
HOLE  9  0.0000  0.0000  373.5070
UNIT  12
COM='Cask Shield Radial Configuration '
CYLINDER  3  1  16.9863  446.6844  0.0000
HOLE  11  0.0000  0.0000  0.0000
CYLINDER  8  1  18.9103  446.6844  0.0000
CYLINDER  5  1  33.4645  446.6844  0.0000
CYLINDER  8  1  36.5189  446.6844  0.0000
CYLINDER  9  1  49.2189  446.6844  0.0000
CYLINDER  8  1  49.8183  446.6844  0.0000
CUBOID  9  1  4P49.8183  446.6844  0.0000
UNIT  13
COM='LWT Lid '
CYLINDER  8  1  36.5189  28.5750  0.5994
CYLINDER  9  1  49.8183  28.5750  0.5994
CYLINDER  8  1  49.8183  28.5750  0.0000
CUBOID  9  1  4P49.8183  28.5750  0.0000
UNIT  14
COM='LWT Bottom Weldment '
CYLINDER  5  1  26.3525  16.5100  8.8900
CYLINDER  8  1  36.5189  26.0706  0.0000
CYLINDER  9  1  49.8183  26.0706  0.0000
CYLINDER  8  1  49.8183  26.6700  0.0000
CUBOID  9  1  4P49.8183  26.6700  0.0000
GLOBAL UNIT  15
COM='LWT Cask '
ARRAY  1  -49.8183  -49.8183  0.0000
END GEOM
READ ARRAY
ARA=1  NUX=1  NUY=1  NUZ=3  FILL  14 12 13  END FILL
END ARRAY
READ BOUNDS    ALL=MIRROR    END BOUNDS
READ PLOT
TTL='X-Y PLOT OF CENTER ELEMENT - FUEL ELEVATION  '
SCR=YES  PIC=MAT  LPI=10
UAX=1.0  VDN=-1.0  NAX=1500
XUL=-5.4  YUL=5.4  ZUL=57.4
XLR=5.4  YLR=-5.4  ZLR=57.4  END
TTL='X-Y PLOT OF BASKET - FUEL ELEVATION '
SCR=YES  PIC=MAT  LPI=10
UAX=1.0  VDN=-1.0  NAX=1500
XUL=-17.0  YUL=17.0  ZUL=57.4
XLR=17.0  YLR=-17.0  ZLR=57.4  END
TTL='X-Y PLOT OF CASK - FUEL ELEVATION'
```

```
  SCR=YES  PIC=MAT  LPI=10
  UAX=1.0  VDN=-1.0  NAX=1500
  XUL=-49.8  YUL=49.8  ZUL=57.4
  XLR=49.8  YLR=-49.8  ZLR=57.4  END
  TTL='X-Z PLOT OF BOTTOM BASKET - CENTER FUEL ELEMENT CROSS SECTION '
  SCR=YES  PIC=MAT  LPI=10
  UAX=1.0  WDN=-1.0  NAX=1500
  XUL=-5.4  YUL=0.0  ZUL=77.4
  XLR=5.4  YLR=0.0  ZLR=57.4  END
  TTL='X-Z PLOT OF BOTTOM BASKET - CENTER FUEL ELEMENT ROW '
  SCR=YES  PIC=MAT  LPI=10
  UAX=1.0  WDN=-1.0  NAX=1500
  XUL=-17.0  YUL=0.0  ZUL=101.1
  XLR=17.0  YLR=0.0  ZLR=26.7  END
  TTL='Y-Z (X=0) PLOT OF BOTTOM BASKET '
  SCR=YES  PIC=MAT  LPI=10
  VAX=1.0  WDN=-1.0  NAX=1500
  XUL=0.0  YUL=-17.0  ZUL=101.1
  XLR=0.0  YLR=17.0  ZLR=26.7  END
  TTL='X-Z PLOT OF BOTTOM BASKET - TOP FUEL ELEMENT ROW '
  SCR=YES  PIC=MAT  LPI=10
  UAX=1.0  WDN=-1.0  NAX=1500
  XUL=-17.0  YUL=9.3  ZUL=101.1
  XLR=17.0  YLR=9.3  ZLR=26.7  END
  TTL='X-Z  PLOT OF CASK CAVITY '
  SCR=YES  PIC=MAT  LPI=5
  UAX=1.0  WDN=-1.0  NAX=1500
  XUL=-17.0  YUL=0.0  ZUL=474.4
  XLR=17.0  YLR=0.0  ZLR=25.7  END
  TTL='X-Z  PLOT OF CASK '
  SCR=YES  PIC=MAT  LPI=5
  UAX=1.0  WDN=-1.0  NAX=1500
  XUL=-49.8  YUL=0.0  ZUL=502.9
  XLR=49.8  YLR=0.0  ZLR=0.0  END
  END PLOT
  END DATA

SECONDARY MODULE 000008   HAS BEEN CALLED.

MODULE 000008   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     0.88 (SECONDS).

SECONDARY MODULE 000002   HAS BEEN CALLED.

MODULE 000002   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     4.28 (SECONDS).

SECONDARY MODULE 000009   HAS BEEN CALLED.

MODULE 000009   IS FINISHED. COMPLETION CODE     0. CPU TIME USED  1748.06 (SECONDS).

MODULE CSAS25   IS FINISHED. COMPLETION CODE     0. CPU TIME USED  1755.97 (SECONDS).
```

```
 CCCCCCCCCCC    SSSSSSSSSSS     AAAAAAAAA     SSSSSSSSSSS    22222222222   5555555555555
CCCCCCCCCCCCC  SSSSSSSSSSSSS   AAAAAAAAAAA   SSSSSSSSSSSSS  2222222222222  5555555555555
CC         CC  SS         SS  AA         AA  SS         SS  22         22  55
CC             SS             AA         AA  SS                        22  55
CC             SS             AA         AA  SS                        22  55
CC             SSSSSSSSSSSS   AAAAAAAAAAAAA  SSSSSSSSSSSS             22   555555555555
CC              SSSSSSSSSSSS  AAAAAAAAAAAAA   SSSSSSSSSSSS          22     5555555555555
CC                        SS  AA         AA             SS        22                  55
CC                        SS  AA         AA             SS      22                    55
CC         CC  SS         SS  AA         AA  SS         SS    22           55         55
CCCCCCCCCCCCC  SSSSSSSSSSSSS  AA         AA  SSSSSSSSSSSSS  2222222222222  5555555555555
 CCCCCCCCCCC    SSSSSSSSSSS   AA         AA   SSSSSSSSSSS   2222222222222   55555555555

 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL             EEEEEEEEEEEEE                 PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL             EEEEEEEEEEEEE                 PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL             EE                            PP         PP  CC         CC
SS             CC             AA         AA  LL             EE                            PP         PP  CC
SS             CC             AA         AA  LL             EE                            PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------  PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------  PPPPPPPPPPPP   CC
           SS  CC             AA         AA  LL             EE                            PP             CC
           SS  CC             AA         AA  LL             EE                            PP             CC
SS         SS  CC         CC  AA         AA  LL             EE                            PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLLL  EEEEEEEEEEEEE                 PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLLL  EEEEEEEEEEEEE                 PP              CCCCCCCCCCC

   0000000      22222222222              //   22222222222        11                   //     0000000          11
  000000000    2222222222222            //   2222222222222      111                  //     000000000        111
 00       00   22         22           //    22         22     1111                 //     00       00      1111
00         00             22          //                22       11                //     00         00       11
00         00             22         //                 22       11               //      00         00       11
00         00            22         //                 22        11              //       00         00       11
00         00          22          //                22          11             //        00         00       11
00         00        22           //               22            11            //         00         00       11
00         00      22            //              22              11           //          00         00       11
 00       00     22             //             22                11          //            00       00        11
  000000000    2222222222222   //            2222222222222    11111111      //              000000000      11111111
   0000000     2222222222222  //             2222222222222    11111111     //                0000000       11111111

     11        7777777777777                      11        88888888888                        11           0000000
    111        777777777777                      111        8888888888888                     111          000000000
   1111        77      77          :::          1111        88         88       :::          1111         00       00
     11               77           :::            11        88         88       :::            11        00         00
     11               77           :::            11        88         88       :::            11        00         00
     11              77                           11         88888888888                       11        00         00
     11              77                           11         88888888888                       11        00         00
     11             77             :::            11        88         88       :::            11        00         00
     11             77             :::            11        88         88       :::            11        00         00
     11            77              :::            11        88         88       :::            11         00       00
  11111111         77                          11111111     8888888888888                   11111111       000000000
  11111111         77                          11111111     88888888888                     11111111        0000000
```

```
  SSSSSSSSSSS    CCCCCCCCCCC      AAAAAAAAA     LL               EEEEEEEEEEEEE                  PPPPPPPPPPPP    CCCCCCCCCCC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC    AAAAAAAAAAA    LL               EEEEEEEEEEEEE                  PPPPPPPPPPPPP  CCCCCCCCCCCCC
 SS         SS  CC         CC   AA         AA   LL               EE                             PP         PP  CC         CC
 SS             CC              AA         AA   LL               EE                             PP         PP  CC
 SS             CC              AA         AA   LL               EE                             PP         PP  CC
 SSSSSSSSSSSS   CC              AAAAAAAAAAAAA   LL               EEEEEEEEE     -------------    PPPPPPPPPPPPP  CC
  SSSSSSSSSSSS  CC              AAAAAAAAAAAAA   LL               EEEEEEEEE     -------------    PPPPPPPPPPPP   CC
            SS  CC              AA         AA   LL               EE                             PP             CC
            SS  CC              AA         AA   LL               EE                             PP             CC
 SS         SS  CC         CC   AA         AA   LL               EE                             PP             CC         CC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL    EEEEEEEEEEEEE                  PP             CCCCCCCCCCCCC
  SSSSSSSSSSS    CCCCCCCCCCC    AA         AA   LLLLLLLLLLLLL    EEEEEEEEEEEEE                  PP              CCCCCCCCCCC
```

```
*******************************************************************************
*******************************************************************************
*******************************************************************************
*****                                                                     *****
*****                  PROGRAM VERIFICATION INFORMATION                   *****
*****                                                                     *****
*****                CODE SYSTEM:  SCALE-PC VERSION:  4.3                 *****
*****                                                                     *****
*******************************************************************************
*******************************************************************************
*****                                                                     *****
*****                                                                     *****
*****              PROGRAM:  CSAS                                         *****
*****                                                                     *****
*****        CREATION DATE:  03/08/96                                     *****
*****                                                                     *****
*****               VOLUME:  ENG                                          *****
*****                                                                     *****
*****              LIBRARY:  G:\SCALE43\WIN_NT\EXE                        *****
*****                                                                     *****
*****                                                                     *****
*****    THIS IS NOT A SCALE-PC CONFIGURATION CONTROLLED CODE             *****
*****                                                                     *****
*****              JOBNAME:  SCALE-PC                                     *****
*****                                                                     *****
*****    DATE OF EXECUTION:  02/21/01                                     *****
*****                                                                     *****
*****    TIME OF EXECUTION:  17:18:10                                     *****
*****                                                                     *****
*****                                                                     *****
*******************************************************************************
*******************************************************************************
*******************************************************************************
```

```
'Fuel Tube Thick - Nominal  Fuel Tube OD - Nominal  Fuel Tube Height - Nominal
'Fuel Base  Plate - Nominal  Fuel Plate Diameter - Nominal  Fuel Plate Thickness
'Fuel Plate Clad Thickness - Min  Active Fuel Length - Min  Fuel Element Height
'U235 Fuel Mass - Max  Uranium Weight Fraction - Max  Cylinder Pitch - Outer_Fix
'Material Description for LWT Analysis - DIDO HEU Fuel
'Fuel Tube Thick - Nominal  Fuel Tube OD - Nominal  Fuel Tube Height - Nominal
'Fuel Base  Plate - Nominal  Fuel Plate Diameter - Nominal  Fuel Plate Thickness
'Fuel Plate Clad Thickness - Min  Active Fuel Length - Min  Fuel Element Height
'U235 Fuel Mass - Max  Uranium Weight Fraction - Max  Cylinder Pitch - Outer_Fix
'Material Description for LWT Analysis - DIDO HEU Fuel
   LWT WITH LOOSE DIDO HEU FUEL, ACCIDENT CONDITION, RADIAL SHIFT PATTERN - CENTERE

   **** PROBLEM PARAMETERS ****

   LIB 27GROUPNDF4  LIBRARY
   MXX             9 MIXTURES
   MSC            11 COMPOSITION SPECIFICATIONS
   IZM             3 MATERIAL ZONES
   GE  LATTICECELL  GEOMETRY
   MORE            0 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
   MSLN            0 FUEL SOLUTIONS

   **** PROBLEM COMPOSITION DESCRIPTION ****

   SC  URANIUM      STANDARD COMPOSITION
   MX              1 MIXTURE NO.
   VF         1.0000 VOLUME FRACTION
   ROTH       0.5477 SPECIFIED DENSITY
   NEL             1 NO. ELEMENTS
   ICP             1 0/1 MIXTURE/COMPOUND
   TEMP        293.0 DEG KELVIN
              92000       1.00 ATOM/MOLECULE
                               92235    94.000 WT%
                               92238     6.000 WT%
   END

   SC  AL           STANDARD COMPOSITION
   MX              1 MIXTURE NO.
   VF         1.0000 VOLUME FRACTION
   ROTH       1.7930 SPECIFIED DENSITY
   NEL             1 NO. ELEMENTS
   ICP             1 0/1 MIXTURE/COMPOUND
   TEMP        293.0 DEG KELVIN
              13027       1.00 ATOM/MOLECULE
   END

   SC  AL           STANDARD COMPOSITION
   MX              2 MIXTURE NO.
   VF         1.0000 VOLUME FRACTION
   ROTH       2.7020 THEORETICAL DENSITY
   NEL             1 NO. ELEMENTS
   ICP             1 0/1 MIXTURE/COMPOUND
   TEMP        293.0 DEG KELVIN
              13027       1.00 ATOM/MOLECULE
   END

   SC  H2O          STANDARD COMPOSITION
   MX              3 MIXTURE NO.
   VF         1.0000 VOLUME FRACTION
   ROTH       0.9998 SPECIFIED DENSITY
   NEL             2 NO. ELEMENTS
   ICP             1 0/1 MIXTURE/COMPOUND
   TEMP        293.0 DEG KELVIN
               1001       2.00 ATOMS/MOLECULE
               8016       1.00 ATOM/MOLECULE
   END

   SC  ARBMGLC      STANDARD COMPOSITION
   MX              4 MIXTURE NO.
   VF         0.5840 VOLUME FRACTION
   ROTH       0.9437 SPECIFIED DENSITY
   NEL             3 NO. ELEMENTS
   ICP             1 0/1 MIXTURE/COMPOUND
               6012       2.00 ATOMS/MOLECULE
               1001       6.00 ATOMS/MOLECULE
               8016       2.00 ATOMS/MOLECULE
   END

   SC  H2O          STANDARD COMPOSITION
   MX              4 MIXTURE NO.
   VF         0.4160 VOLUME FRACTION
   ROTH       0.9982 THEORETICAL DENSITY
   NEL             2 NO. ELEMENTS
   ICP             1 0/1 MIXTURE/COMPOUND
   TEMP        293.0 DEG KELVIN
               1001       2.00 ATOMS/MOLECULE
               8016       1.00 ATOM/MOLECULE
   END

   SC  PB           STANDARD COMPOSITION
   MX              5 MIXTURE NO.
   VF         1.0000 VOLUME FRACTION
   ROTH      11.3440 THEORETICAL DENSITY
   NEL             1 NO. ELEMENTS
   ICP             1 0/1 MIXTURE/COMPOUND
```

```
TEMP          293.0 DEG KELVIN
              82000        1.00 ATOM/MOLECULE
END

SC   SS304          STANDARD COMPOSITION
MX                6 MIXTURE NO.
VF           1.0000 VOLUME FRACTION
ROTH         7.9200 THEORETICAL DENSITY
NEL               4 NO. ELEMENTS
ICP               0 0/1 MIXTURE/COMPOUND
TEMP          293.0 DEG KELVIN
              24304     19.000 WT%
              25055      2.000 WT%
              26304     69.500 WT%
              28304      9.500 WT%
END

SC   AL             STANDARD COMPOSITION
MX                7 MIXTURE NO.
VF           1.0000 VOLUME FRACTION
ROTH         2.7020 THEORETICAL DENSITY
NEL               1 NO. ELEMENTS
ICP               1 0/1 MIXTURE/COMPOUND
TEMP          293.0 DEG KELVIN
              13027        1.00 ATOM/MOLECULE
END

SC   SS304          STANDARD COMPOSITION
MX                8 MIXTURE NO.
VF           1.0000 VOLUME FRACTION
ROTH         7.9200 THEORETICAL DENSITY
NEL               4 NO. ELEMENTS
ICP               0 0/1 MIXTURE/COMPOUND
TEMP          293.0 DEG KELVIN
              24304     19.000 WT%
              25055      2.000 WT%
              26304     69.500 WT%
              28304      9.500 WT%
END

SC   H2O            STANDARD COMPOSITION
MX                9 MIXTURE NO.
VF           1.0000 VOLUME FRACTION
ROTH         0.0001 SPECIFIED DENSITY
NEL               2 NO. ELEMENTS
ICP               1 0/1 MIXTURE/COMPOUND
TEMP          293.0 DEG KELVIN
               1001        2.00 ATOMS/MOLECULE
               8016        1.00 ATOM/MOLECULE
END

**** PROBLEM GEOMETRY ****

CTP SYMMSLABCELL CELL TYPE
PITCH        0.9800 CM CENTER TO CENTER SPACING
FUELOD       0.0650 CM FUEL DIAMETER OR SLAB THICKNESS
MFUEL             1 MIXTURE NO. OF FUEL
MMOD              3 MIXTURE NO. OF MODERATOR
CLADOD       0.1300 CM CLAD OUTER DIAMETER
MCLAD             2 MIXTURE NO. OF CLAD

ZONE SPECIFICATIONS FOR LATTICECELL GEOMETRY

               ZONE  1 IS FUEL
               ZONE  2 IS CLAD
               ZONE  3 IS MOD
```

```
*****************************************************************************************************************
***                                                                                                          ***
***                      LWT WITH LOOSE DIDO HEU FUEL, ACCIDENT CONDITION, RADIAL SHIFT PATTERN - CENTERE***
***                                                                                                          ***
*****************************************************************************************************************
*****************************************************************************************************************
***                                                                                                          ***
***                           ********** DATA LIBRARY INFORMATION **********                                 ***
***                                                                                                          ***
***          UNIT                                                   VOLUME                                   ***
***         NUMBER             DATA SET NAME                         NAME       UNIT FUNCTION                ***
***         ------             -------------                         ----       -------------                ***
***                                                                                                          ***
***           89      G:\scale43\DATALIB\FT89F001                               STANDARD COMPOSITION LIBRARY  ***
***                                                                                                          ***
***           82      G:\scale43\DATALIB\FT82F001                               CROSS SECTION LIBRARY         ***
***                                                                                                          ***
***           11      D:\hjp\plateMin_thclaMin_fuel1Min_hteleMin_u              SHORT CROSS SECTION LIBRARY   ***
***                                                                                                          ***
***           90      D:\hjp\plateMin_thclaMin_fuel1Min_hteleMin_u              INPUT DATA DIRECT ACCESS      ***
***                                                                                                          ***
*****************************************************************************************************************
*****************************************************************************************************************
***                                                                                                          ***
***                                                                                                          ***
***                                 STANDARD COMPOSITION LIBRARY DATA                                        ***
***                                 ---------------------------------                                        ***
***                                                                                                          ***
***            UNIT NUMBER  :  89                                                                            ***
***                                                                                                          ***
***            DATASET NAME :  G:\scale43\DATALIB\FT89F001                                                   ***
***                                                                                                          ***
***            LIBRARY TITLE:  SCALE-4 STANDARD COMPOSITION LIBRARY                                          ***
***                            637 STANDARD COMPOSITIONS, 490 NUCLIDES                                       ***
***                            90 ELEMENTS WITH VARIABLE ISOTOPIC DISTRBUTIONS.                              ***
***                                                                                                          ***
***            CREATION DATE:   6/30/95                                                                      ***
***                                                                                                          ***
***                                                                                                          ***
***                                                                                                          ***
***                                     CROSS SECTION LIBRARY DATA                                           ***
***                                     --------------------------                                           ***
***                                                                                                          ***
***            UNIT NUMBER  :  82                                                                            ***
***                                                                                                          ***
***            DATASET NAME :  G:\scale43\DATALIB\FT82F001                                                   ***
***                                                                                                          ***
***            LIBRARY TITLE:  SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY                                    ***
***                               BASED ON ENDF-B VERSION 4 DATA                                             ***
***                                  COMPILED FOR NRC      1/27/89                                           ***
***                                     LAST UPDATED                                            08/12/94     ***
***                                        L.M.PETRIE   -    ORNL                                            ***
***                                                                                                          ***
***                                                                                                          ***
***                                                                                                          ***
***                                                                                                          ***
*****************************************************************************************************************
*****************************************************************************************************************

                         ........   0 IO'S WERE USED BEFORE READING KENO V DATA    ........

                         ........   0 IO'S WERE USED READING THE KENO V PARAMETER DATA    ........

'Fuel Annulus     1

'Fuel Annulus     2

'Fuel Annulus     3

'Fuel Annulus     4

'Clad Axial End Piece     1

'Clad Axial End Piece     2

'Clad Axial End Piece     3

'Clad Axial End Piece     4

                        *************** DATA READING COMPLETED ***************

                         ........   0 IO'S WERE USED PREPARING THE KENO V INPUT DATA    ........

                         ........   0 IO'S WERE USED LOADING THE KENO V DATA    ........

                         ........   0 IO'S WERE USED LOADING THE DATA    ........

                         ........   0 IO'S WERE USED CHECKING THE KENO V GEOMETRY DATA    ........
                         *****  RESTART DATA HAS BEEN WRITTEN ON UNIT 95  *****

                         ........   0 IO'S WERE USED WRITING THE KENO V - CSAS DATA    ........

                         ........   0 IO'S WERE USED PROCESSING CSAS INPUT DATA    ........

 CONTROL MODULE CSAS25    IS COMPLETE.
```

```
BON-AMI2
SCALE-PC
02/21/01
17:18:12
```

```
  SSSSSSSSSSS     CCCCCCCCCCC      AAAAAAAAA      LL              EEEEEEEEEEEEE                    PPPPPPPPPPPP    CCCCCCCCCCC
 SSSSSSSSSSSSS   CCCCCCCCCCCCC    AAAAAAAAAAA     LL              EEEEEEEEEEEEE                    PPPPPPPPPPPPP  CCCCCCCCCCCCC
 SS         SS   CC         CC   AA         AA    LL              EE                               PP         PP  CC         CC
 SS              CC              AA         AA    LL              EE                               PP         PP  CC
 SS              CC              AA         AA    LL              EE                               PP         PP  CC
 SSSSSSSSSSSS    CC              AAAAAAAAAAAAA    LL              EEEEEEEEE      -------------     PPPPPPPPPPPPP  CC
  SSSSSSSSSSSS   CC              AAAAAAAAAAAAA    LL              EEEEEEEEE      -------------     PPPPPPPPPPPP   CC
            SS   CC              AA         AA    LL              EE                               PP             CC
            SS   CC              AA         AA    LL              EE                               PP             CC
 SS         SS   CC         CC   AA         AA    LL              EE                               PP             CC         CC
 SSSSSSSSSSSSS   CCCCCCCCCCCCC   AA         AA    LLLLLLLLLLLLL   EEEEEEEEEEEEE                    PP             CCCCCCCCCCCCC
  SSSSSSSSSSS     CCCCCCCCCCC    AA         AA    LLLLLLLLLLLLL   EEEEEEEEEEEEE                    PP              CCCCCCCCCCC
```

```
******************************************************************************
******************************************************************************
******************************************************************************
*****                                                                    *****
*****                  PROGRAM VERIFICATION INFORMATION                  *****
*****                                                                    *****
*****                 CODE SYSTEM:   SCALE-PC VERSION:  4.3              *****
*****                                                                    *****
******************************************************************************
******************************************************************************
*****                                                                    *****
*****                                                                    *****
*****                 PROGRAM:  000008                                   *****
*****                                                                    *****
*****           CREATION DATE:  09/15/95                                 *****
*****                                                                    *****
*****                  VOLUME:  ENG                                      *****
*****                                                                    *****
*****                 LIBRARY:  G:\SCALE43\WIN_NT\EXE                    *****
*****                                                                    *****
*****                                                                    *****
*****   THIS IS NOT A SCALE-PC CONFIGURATION CONTROLLED CODE             *****
*****                                                                    *****
*****                 JOBNAME:  SCALE-PC                                 *****
*****                                                                    *****
*****       DATE OF EXECUTION:  02/21/01                                 *****
*****                                                                    *****
*****       TIME OF EXECUTION:  17:18:12                                 *****
*****                                                                    *****
*****                                                                    *****
******************************************************************************
******************************************************************************
******************************************************************************
```

```
-1Q ARRAY HAS      1 ENTRIES.
 0Q ARRAY HAS      4 ENTRIES.
 1Q ARRAY HAS      6 ENTRIES.
 2Q ARRAY HAS      2 ENTRIES.
```

```
LOGICAL ASSIGNMENTS

MASTER LIBRARY    11
WORKING LIBRARY    0
SCRATCH FILE      18
NEW LIBRARY        1

P R O B L E M   D E S C R I P T I O N

IGR--GEOMETRY (0/1/2/3--INF MED/SLAB/CYL/SPHERE               1

IZM--NUMBER OF ZONES OR MATERIAL REGIONS                      9

MS--MIXING TABLE LENGTH                                      21

IBL--SHIELDED CROSS SECTION EDIT OPTION (0/1--NO/YES)         0

IBR--BONDARENKO FACTOR EDIT OPTION (0/1--NO/YES)              0

ISSOPT--DANCOFF FACTOR OPTION                                 0

CONVERGENCE CRITERION    1.00000E-03

GEOMETRY CORRECTION FACTOR FOR WIGNER RATIONAL APPROXIMATION  1.000E+00

        3Q ARRAY HAS     21 ENTRIES.

        4Q ARRAY HAS     21 ENTRIES.

        5Q ARRAY HAS     21 ENTRIES.

        6Q ARRAY HAS      9 ENTRIES.

        7Q ARRAY HAS      9 ENTRIES.

        8Q ARRAY HAS      9 ENTRIES.

        9Q ARRAY HAS      9 ENTRIES.

       10Q ARRAY HAS     21 ENTRIES.

       11Q ARRAY HAS      9 ENTRIES.

M I X I N G   T A B L E

ENTRY   MIXTURE    ISOTOPE    NUMBER DENSITY   NEW IDENTIFIER
   1       1        92235      1.31908E-03        1092235
   2       1        92238      8.31332E-05        1092238
   3       1        13027      4.00184E-02        1013027
   4       2        13027      6.03066E-02        2013027
   5       7        13027      6.03066E-02        7013027
   6       3         1001      6.68762E-02        3001001
   7       4         1001      5.98801E-02        4001001
   8       9         1001      6.68896E-06        9001001
   9       3         8016      3.34381E-02        3008016
  10       4         8016      2.45894E-02        4008016
  11       9         8016      3.34448E-06        9008016
  12       4         6012      1.07014E-02        4006012
  13       5        82000      3.29690E-02        5082000
  14       6        24304      1.74286E-02        6024304
  15       8        24304      1.74286E-02        8024304
  16       6        25055      1.73633E-03        6025055
  17       8        25055      1.73633E-03        8025055
  18       6        26304      5.93579E-02        6026304
  19       8        26304      5.93579E-02        8026304
  20       6        28304      7.72070E-03        6028304
  21       8        28304      7.72070E-03        8028304

GEOMETRY AND MATERIAL DESCRIPTION

ZONE   MIXTURE   OUTER DIMENSION   TEMPERATURE      EXTRA XS    TYPE (0/1--FUEL/MOD)
  1       1        3.25000E-02     2.93000E+02    4.53946E+00         0
  2       2        6.50000E-02     2.93000E+02    0.00000E+00         0
  3       3        4.90000E-01     2.93000E+02    0.00000E+00         0
  4       4        5.49000E+00     2.93000E+02    0.00000E+00         0
  5       5        1.04900E+01     2.93000E+02    0.00000E+00         0
  6       6        1.54900E+01     2.93000E+02    0.00000E+00         0
  7       7        2.04900E+01     2.93000E+02    0.00000E+00         0
  8       8        2.54900E+01     2.93000E+02    0.00000E+00         0
  9       9        3.04900E+01     2.93000E+02    0.00000E+00         0
     4087 LOCATIONS OF    100000 AVAILABLE ARE REQUIRED TO MAKE A NEW MASTER CONTAINING THE SELF-SHIELDED VALUES

NO NUCLIDES IN YOUR PROBLEM HAVE BONDARENKO FACTOR DATA**BONAMI WILL COPY FROM LOGICAL 11 TO LOGICAL  1

COPY       1001   HYDROGEN          FROM LOG 11 TO LOG 18     BONDARENKO TRIGGER 0

COPY       1001   HYDROGEN          FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY       1001   HYDROGEN          FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY       1001   HYDROGEN          FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY       6012   CARBON-12         FROM LOG 11 TO LOG  1     BONDARENKO TRIGGER 0

COPY       8016   OXYGEN-16         FROM LOG 11 TO LOG 18     BONDARENKO TRIGGER 0

COPY       8016   OXYGEN-16         FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY       8016   OXYGEN-16         FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY       8016   OXYGEN-16         FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY      13027   AL-27 1193 218 G FROM LOG 11 TO LOG 18     BONDARENKO TRIGGER 0

COPY      13027   AL-27 1193 218 G FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0

COPY      13027   AL-27 1193 218 G FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0
```

```
COPY     13027  AL-27 1193 218 G FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0
COPY     24304  CR 1191 WT SS-30 FROM LOG 11 TO LOG 18     BONDARENKO TRIGGER 0
COPY     24304  CR 1191 WT SS-30 FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0
COPY     24304  CR 1191 WT SS-30 FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0
COPY     25055   MANGANESE-55    FROM LOG 11 TO LOG 18     BONDARENKO TRIGGER 0
COPY     25055   MANGANESE-55    FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0
COPY     25055   MANGANESE-55    FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0
COPY     26304  FE 1192 WT SS-30 FROM LOG 11 TO LOG 18     BONDARENKO TRIGGER 0
COPY     26304  FE 1192 WT SS-30 FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0
COPY     26304  FE 1192 WT SS-30 FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0
COPY     28304  NI 1190 WT SS-30 FROM LOG 11 TO LOG 18     BONDARENKO TRIGGER 0
COPY     28304  NI 1190 WT SS-30 FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0
COPY     28304  NI 1190 WT SS-30 FROM LOG 18 TO LOG  1     BONDARENKO TRIGGER 0
COPY     82000  PB   1288 218NGP FROM LOG 11 TO LOG  1     BONDARENKO TRIGGER 0
COPY     92235   URANIUM-235     FROM LOG 11 TO LOG  1     BONDARENKO TRIGGER 0
COPY     92238   URANIUM-238     FROM LOG 11 TO LOG  1     BONDARENKO TRIGGER 0
```

```
SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
   BASED ON ENDF-B VERSION 4 DATA
      COMPILED FOR NRC      1/27/89
         LAST UPDATED                                                  08/12/94
            L.M.PETRIE   -   ORNL
    TAPE ID                            4321         NUMBER OF NUCLIDES                   21
    NUMBER OF NEUTRON GROUPS             27         NUMBER OF GAMMA GROUPS                0
    FIRST THERMAL GROUP                  15         LOGICAL UNIT                          1
                                  TABLE OF CONTENTS
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002            UPDATED 08/12/94       ID    3001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002            UPDATED 08/12/94       ID    4001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002            UPDATED 08/12/94       ID    9001001
   CARBON-12      ENDF/B-IV MAT 1274/THRM1065            UPDATED 08/12/94       ID    4006012
   OXYGEN-16      ENDF/B-IV MAT 1276                     UPDATED 08/12/94       ID    3008016
   OXYGEN-16      ENDF/B-IV MAT 1276                     UPDATED 08/12/94       ID    4008016
   OXYGEN-16      ENDF/B-IV MAT 1276                     UPDATED 08/12/94       ID    9008016
  AL-27 1193 218 GP 040375(5)                            UPDATED 08/12/94       ID    1013027
  AL-27 1193 218 GP 040375(5)                            UPDATED 08/12/94       ID    2013027
  AL-27 1193 218 GP 040375(5)                            UPDATED 08/12/94       ID    7013027
  CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94       ID    6024304
  CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94       ID    8024304
   MANGANESE-55   ENDF/B-IV MAT 1197                     UPDATED 08/12/94       ID    6025055
   MANGANESE-55   ENDF/B-IV MAT 1197                     UPDATED 08/12/94       ID    8025055
  FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94       ID    6026304
  FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94       ID    8026304
  NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94       ID    6028304
  NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94       ID    8028304
  PB   1288 218NGP 042375 P-3 293K                       UPDATED 08/12/94       ID    5082000
   URANIUM-235    ENDF/B-IV MAT 1261                     UPDATED 08/12/94       ID    1092235
   URANIUM-238    ENDF/B-IV MAT 1262                     UPDATED 08/12/94       ID    1092238

    TAPE COPY USED       0 I/O'S, AND TOOK     0.27 SECONDS
```

```
NN          NN  IIIIIIIIIIII  TTTTTTTTTTTT    AAAAAAAAA    WW          WW  LL
NNN         NN  IIIIIIIIIIII  TTTTTTTTTTTT   AAAAAAAAAAA   WW          WW  LL
NNNN        NN       II            TT       AA         AA  WW          WW  LL
NN NN       NN       II            TT       AA         AA  WW          WW  LL
NN  NN      NN       II            TT       AA         AA  WW          WW  LL
NN   NN     NN       II            TT       AAAAAAAAAAAAA  WW    W     WW  LL
NN    NN    NN       II            TT       AAAAAAAAAAAAA  WW   WWW    WW  LL
NN     NN   NN       II            TT       AA         AA  WW  WW WW   WW  LL
NN      NN  NN       II            TT       AA         AA  WW WW   WW WW  LL
NN       NNNN       II            TT       AA         AA  WWWW     WWWW  LL
NN        NNN  IIIIIIIIIIII       TT       AA         AA  WWW       WWW  LLLLLLLLLLLL
NN         NN  IIIIIIIIIIII       TT       AA         AA  WW         WW  LLLLLLLLLLLL

 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL            EEEEEEEEEEEEE                   PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL            EEEEEEEEEEEEE                   PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL            EE                              PP         PP  CC         CC
SS             CC             AA         AA  LL            EE                              PP         PP  CC
SS             CC             AA         AA  LL            EE                              PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL            EEEEEEEEE       -------------   PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL            EEEEEEEEE       -------------   PPPPPPPPPPPP   CC
           SS  CC             AA         AA  LL            EE                              PP             CC
           SS  CC             AA         AA  LL            EE                              PP             CC
SS         SS  CC         CC  AA         AA  LL            EE                              PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLL  EEEEEEEEEEEEE                   PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLL  EEEEEEEEEEEEE                   PP              CCCCCCCCCCC

  0000000     22222222222           //   22222222222       11             //     0000000         11
 000000000   2222222222222         //   2222222222222     111            //     000000000       111
00       00  22         22        //    22         22    1111           //     00       00     1111
00       00             22       //                22      11          //      00       00       11
00       00             22      //                 22      11         //       00       00       11
00       00           22       //                22        11        //        00       00       11
00       00         22        //               22          11       //         00       00       11
00       00       22         //              22            11      //          00       00       11
00       00     22          //             22              11     //           00       00       11
00       00   22           //            22                11    //            00       00       11
 000000000   2222222222222  //           2222222222222  11111111  //            000000000     11111111
  0000000    2222222222222 //            2222222222222  11111111 //              0000000      11111111

    11      7777777777777            11      88888888888               11      22222222222
   111      777777777777            111     8888888888888             111     2222222222222
  1111      77         77    :::   1111     88         88    :::     1111     22         22
    11                77     :::     11     88         88    :::       11                22
    11               77      :::     11     88         88    :::       11                22
    11              77               11      88888888888               11              22
    11             77                11      88888888888               11            22
    11            77         :::     11     88         88    :::       11          22
    11           77          :::     11     88         88    :::       11        22
    11          77           :::     11     88         88    :::       11      22
 11111111       77                11111111  8888888888888           11111111  2222222222222
 11111111       77                11111111   88888888888            11111111  2222222222222
```

```
 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA     LL               EEEEEEEEEEEEE                 PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA    LL               EEEEEEEEEEEEE                 PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA   LL               EE                            PP         PP  CC         CC
SS             CC             AA         AA   LL               EE                            PP         PP  CC
SS             CC             AA         AA   LL               EE                            PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA   LL               EEEEEEEEE     -------------   PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA   LL               EEEEEEEEE     -------------   PPPPPPPPPPPP   CC
           SS  CC             AA         AA   LL               EE                            PP             CC
           SS  CC             AA         AA   LL               EE                            PP             CC
SS         SS  CC         CC  AA         AA   LL               EE                            PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA   LLLLLLLLLLLLL    EEEEEEEEEEEEE                 PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL    EEEEEEEEEEEEE                 PP              CCCCCCCCCCC
```

```
********************************************************************************
********************************************************************************
********************************************************************************
*****                                                                      *****
*****                    PROGRAM VERIFICATION INFORMATION                  *****
*****                                                                      *****
*****                 CODE SYSTEM:   SCALE-PC VERSION:   4.3               *****
*****                                                                      *****
********************************************************************************
********************************************************************************
*****                                                                      *****
*****                                                                      *****
*****                PROGRAM:  000002                                      *****
*****                                                                      *****
*****          CREATION DATE:  09/28/95                                    *****
*****                                                                      *****
*****                 VOLUME:  ENG                                         *****
*****                                                                      *****
*****                LIBRARY:  G:\SCALE43\WIN_NT\EXE                       *****
*****                                                                      *****
*****                                                                      *****
*****     THIS IS NOT A SCALE-PC CONFIGURATION CONTROLLED CODE             *****
*****                                                                      *****
*****                JOBNAME:  SCALE-PC                                    *****
*****                                                                      *****
*****      DATE OF EXECUTION:  02/21/01                                    *****
*****                                                                      *****
*****      TIME OF EXECUTION:  17:18:12                                    *****
*****                                                                      *****
*****                                                                      *****
********************************************************************************
********************************************************************************
********************************************************************************
```

```
       -1Q ARRAY HAS      1 ENTRIES.

        0Q ARRAY HAS      9 ENTRIES.

        1Q ARRAY HAS     12 ENTRIES.

SELECT 21 NUCLIDES FROM THE MASTER  LIBRARY ON LOGICAL  1
        0 NUCLIDES FROM THE WORKING LIBRARY ON LOGICAL  2
        0 NUCLIDES FROM THE WORKING LIBRARY ON LOGICAL  3
          TO CREATE THE NEW WORKING LIBRARY ON LOGICAL  4

        4 RESONANCE CALCULATIONS HAVE BEEN REQUESTED
       -1 OUTPUT OPTION FOR AMPX FORMATTED CROSS SECTION DATA
     2001 MAXIMUM NUMBER OF RESONANCE MESH INTERVALS
        2 ORDER OF RESONANCE LEVEL PROCESSING

THE STORAGE ALLOCATED FOR THIS CASE IS    100000 WORDS

        2Q ARRAY HAS     21 ENTRIES.

        3Q ARRAY HAS     60 ENTRIES.

        4Q ARRAY HAS     21 ENTRIES.

 GENERAL INFORMATION CONCERNING CROSS SECTION LIBRARY
   TAPE IDENTIFICATION NUMBER                4321
   NUMBER OF NUCLIDES ON TAPE                  21
   NUMBER OF NEUTRON ENERGY GROUPS             27
   FIRST THERMAL NEUTRON ENERGY GROUP          15
   NUMBER OF GAMMA ENERGY GROUPS                0

   DIRECT ACCESS UNIT NUMBER  9 REQUIRES 117 BLOCKS OF LENGTH  1680 WORDS
 XSDRN TAPE   4321
                        SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
                           BASED ON ENDF-B VERSION 4 DATA
                              COMPILED FOR NRC     1/27/89
                                 LAST UPDATED                                          08/12/94
                                    L.M.PETRIE   -   ORNL

 NUCLIDES FROM XSDRN TAPE
    1     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94     3001001
    2     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94     4001001
    3     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94     9001001
    4     CARBON-12      ENDF/B-IV MAT 1274/THRM1065              UPDATED 08/12/94     4006012
    5     OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED 08/12/94     3008016
    6     OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED 08/12/94     4008016
    7     OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED 08/12/94     9008016
    8    AL-27 1193 218 GP 040375(5)                              UPDATED 08/12/94     1013027
    9    AL-27 1193 218 GP 040375(5)                              UPDATED 08/12/94     2013027
   10    AL-27 1193 218 GP 040375(5)                              UPDATED 08/12/94     7013027
   11    CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94     6024304
   12    CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94     8024304
   13     MANGANESE-55   ENDF/B-IV MAT 1197                       UPDATED 08/12/94     6025055
   14     MANGANESE-55   ENDF/B-IV MAT 1197                       UPDATED 08/12/94     8025055
   15    FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94     6026304
   16    FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94     8026304
   17    NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94     6028304
   18    NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94     8028304
   19    PB    1288 218NGP 042375 P-3 293K                        UPDATED 08/12/94     5082000
   20     URANIUM-235    ENDF/B-IV MAT 1261                       UPDATED 08/12/94     1092235
   21     URANIUM-238    ENDF/B-IV MAT 1262                       UPDATED 08/12/94     1092238
 HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94    3001001      TEMPERATURE=    293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94    4001001      TEMPERATURE=    293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94    9001001      TEMPERATURE=    293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 CARBON-12      ENDF/B-IV MAT 1274/THRM1065          UPDATED 08/12/94    4006012      TEMPERATURE=    293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94    3008016      TEMPERATURE=    293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94    4008016      TEMPERATURE=    293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94    9008016      TEMPERATURE=    293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

AL-27 1193 218 GP 040375(5)                          UPDATED 08/12/94    1013027      TEMPERATURE=    293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

AL-27 1193 218 GP 040375(5)                          UPDATED 08/12/94    2013027      TEMPERATURE=    293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

AL-27 1193 218 GP 040375(5)                          UPDATED 08/12/94    7013027      TEMPERATURE=    293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED 08/12/94    6024304      TEMPERATURE=    293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED 08/12/94    8024304      TEMPERATURE=    293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 MANGANESE-55   ENDF/B-IV MAT 1197                   UPDATED 08/12/94    6025055      TEMPERATURE=    293.00
GEOMETRY HAS BEEN SET TO HOMOGENEOUS AS LBAR IS  0.0000E+00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)          =     54.466          TEMPERATURE(KELVIN)        =   293.000

POTENTIAL SCATTER SIGMA  =      2.590          LUMPED NUCLEAR DENSITY     = 1.7363295E-03
```

```
SPIN FACTOR (G)          =    14.448             LUMP DIMENSION (A-BAR)     = 0.0000000E+00

INNER RADIUS             = 0.0000000E+00         DANCOFF CORRECTION (C)     = 0.0000000E+00

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1    =    55.845            SIGMA(PER ABSORBER ATOM)= 3.4663022E+02

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2    =    55.925            SIGMA(PER ABSORBER ATOM)= 1.2557598E+02


MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 0-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP       RES ABS         RES FISS        RES SCAT
  8      -5.518788E-04    0.000000E+00   -3.944190E-01
  9      -2.797993E-03    0.000000E+00   -2.293471E+00
 10      -3.291452E-01    0.000000E+00   -3.820862E+01
 11      -2.680562E+00    0.000000E+00   -1.159996E+02

EXCESS RESONANCE INTEGRALS

                 RESOLVED

ABSORPTION      3.33719E+00
FISSION         0.00000E+00
                                                        PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 MANGANESE-55   ENDF/B-IV MAT 1197                 UPDATED 08/12/94    8025055      TEMPERATURE=    293.00

GEOMETRY HAS BEEN SET TO HOMOGENEOUS AS LBAR IS  0.0000E+00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)          =    54.466             TEMPERATURE(KELVIN)        =   293.000

POTENTIAL SCATTER SIGMA  =     2.590             LUMPED NUCLEAR DENSITY     = 1.7363295E-03

SPIN FACTOR (G)          =    14.448             LUMP DIMENSION (A-BAR)     = 0.0000000E+00

INNER RADIUS             = 0.0000000E+00         DANCOFF CORRECTION (C)     = 0.0000000E+00

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1    =    55.845            SIGMA(PER ABSORBER ATOM)= 3.4663022E+02

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2    =    55.925            SIGMA(PER ABSORBER ATOM)= 1.2557598E+02

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 0-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP       RES ABS         RES FISS        RES SCAT
  8      -5.518788E-04    0.000000E+00   -3.944190E-01
  9      -2.797993E-03    0.000000E+00   -2.293471E+00
 10      -3.291452E-01    0.000000E+00   -3.820862E+01
 11      -2.680562E+00    0.000000E+00   -1.159996E+02

EXCESS RESONANCE INTEGRALS

                 RESOLVED

ABSORPTION      3.33719E+00
FISSION         0.00000E+00
                                                        PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'   UPDATED 08/12/94    6026304      TEMPERATURE=    293.00
                                                        PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'   UPDATED 08/12/94    8026304      TEMPERATURE=    293.00
                                                        PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'   UPDATED 08/12/94    6028304      TEMPERATURE=    293.00
                                                        PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'   UPDATED 08/12/94    8028304      TEMPERATURE=    293.00
                                                        PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

PB   1288 218NGP 042375 P-3 293K                   UPDATED 08/12/94    5082000      TEMPERATURE=    293.00
                                                        PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 URANIUM-235    ENDF/B-IV MAT 1261                 UPDATED 08/12/94    1092235      TEMPERATURE=    293.00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)          =   233.025             TEMPERATURE(KELVIN)        =   293.000

POTENTIAL SCATTER SIGMA  =    11.500             LUMPED NUCLEAR DENSITY     = 1.3190822E-03

SPIN FACTOR (G)          = 15171.100             LUMP DIMENSION (A-BAR)     = 6.4999998E-02

INNER RADIUS             = 0.0000000E+00         DANCOFF CORRECTION (C)     = 1.5211706E-01

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1    =    26.982            SIGMA(PER ABSORBER ATOM)= 4.0850834E+01

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.
```

```
MASS OF MODERATOR-2      =    238.051              SIGMA(PER ABSORBER ATOM)= 7.7685082E-01

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 1-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP        RES ABS         RES FISS        RES SCAT
 12      -1.712865E+00   -1.053512E+00   -4.421081E-02
 13      -5.191924E+00   -2.544281E+00   -1.184106E-01
 14      -3.743466E+00   -2.214335E+00   -2.824813E-02
 15      -2.253279E-04   -1.715397E-04    1.537884E-06

EXCESS RESONANCE INTEGRALS

                  RESOLVED

ABSORPTION       2.15925E+02
FISSION          1.28649E+02
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 URANIUM-238     ENDF/B-IV MAT 1262                    UPDATED 08/12/94    1092238      TEMPERATURE=    293.00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)            =    236.006              TEMPERATURE(KELVIN)        =    293.000

POTENTIAL SCATTER SIGMA  =     10.599              LUMPED NUCLEAR DENSITY     = 8.3133229E-05

SPIN FACTOR (G)            =    656.527              LUMP DIMENSION (A-BAR)     = 6.4999998E-02

INNER RADIUS               = 0.0000000E+00          DANCOFF CORRECTION (C)     = 1.5211706E-01

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1      =     26.982              SIGMA(PER ABSORBER ATOM)= 6.4818372E+02

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2      =    235.044              SIGMA(PER ABSORBER ATOM)= 1.8885785E+02

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 1-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP        RES ABS         RES FISS        RES SCAT
  9      -1.309125E-04    0.000000E+00   -1.475272E-03
 10      -7.025824E-03   -3.903629E-08   -5.099698E-02
 11      -3.303697E-01    0.000000E+00   -1.054719E+00
 12      -3.107242E+00    0.000000E+00   -3.725560E+00
 13      -3.585465E+00    0.000000E+00   -1.189779E+00
 14      -6.584399E+00    0.000000E+00   -3.875874E-01
 15      -4.155954E-09    0.000000E+00    3.752471E-09

EXCESS RESONANCE INTEGRALS

                  RESOLVED

ABSORPTION       2.57082E+02
FISSION          5.33631E-04
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00
```

```
THIS XSDRN WORKING TAPE WAS CREATED 02/21/01 AT 17:18:13
THE TITLE OF THE PARENT CASE IS AS FOLLOWS
SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
   BASED ON ENDF-B VERSION 4 DATA
      COMPILED FOR NRC      1/27/89
    TAPE ID                             4321          NUMBER OF NUCLIDES                      21
    NUMBER OF NEUTRON GROUPS              27          NUMBER OF GAMMA GROUPS                   0
    FIRST THERMAL GROUP                   15          LOGICAL UNIT                             4
                                  TABLE OF CONTENTS
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94        ID    3001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94        ID    4001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94        ID    9001001
   CARBON-12      ENDF/B-IV MAT 1274/THRM1065              UPDATED 08/12/94        ID    4006012
   OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED 08/12/94        ID    3008016
   OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED 08/12/94        ID    4008016
   OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED 08/12/94        ID    9008016
  AL-27 1193 218 GP 040375(5)                              UPDATED 08/12/94        ID    1013027
  AL-27 1193 218 GP 040375(5)                              UPDATED 08/12/94        ID    2013027
  AL-27 1193 218 GP 040375(5)                              UPDATED 08/12/94        ID    7013027
  CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94        ID    6024304
  CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94        ID    8024304
   MANGANESE-55   ENDF/B-IV MAT 1197                       UPDATED 08/12/94        ID    6025055
   MANGANESE-55   ENDF/B-IV MAT 1197                       UPDATED 08/12/94        ID    8025055
  FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94        ID    6026304
  FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94        ID    8026304
  NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94        ID    6028304
  NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94        ID    8028304
  PB   1288 218NGP 042375 P-3 293K                         UPDATED 08/12/94        ID    5082000
   URANIUM-235    ENDF/B-IV MAT 1261                       UPDATED 08/12/94        ID    1092235
   URANIUM-238    ENDF/B-IV MAT 1262                       UPDATED 08/12/94        ID    1092238

    TAPE COPY USED       0 I/O'S, AND TOOK     0.11 SECONDS
```

```
                KK          KK  EEEEEEEEEEEEE  NN          NN   00000000000                  VV          VV
                KK         KK   EEEEEEEEEEEEE  NNN         NN  0000000000000                 VV          VV
                KK        KK    EE             NNNN        NN  00         00                 VV          VV
                KK       KK     EE             NN NN       NN  00         00                 VV          VV
                KK      KK      EE             NN  NN      NN  00         00                 VV          VV
                KKKKKKKK        EEEEEEEEE      NN   NN     NN  00         00  -------------  VV          VV
                KKKKKKKK        EEEEEEEEE      NN    NN    NN  00         00  -------------   VV        VV
                KK      KK      EE             NN     NN   NN  00         00                   VV      VV
                KK       KK     EE             NN      NN  NN  00         00                    VV    VV
                KK        KK    EE             NN       NNNN   00         00                     VV VV
                KK         KK   EEEEEEEEEEEEE  NN        NNN   0000000000000                      VVV
                KK          KK  EEEEEEEEEEEEE  NN         NN    00000000000                        V

  SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA     LL               EEEEEEEEEEEEE                 PPPPPPPPPPPP    CCCCCCCCCCC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA    LL               EEEEEEEEEEEEE                 PPPPPPPPPPPPP  CCCCCCCCCCCCC
 SS         SS  CC         CC  AA         AA   LL               EE                            PP         PP  CC         CC
 SS             CC             AA         AA   LL               EE                            PP         PP  CC
 SS             CC             AA         AA   LL               EE                            PP         PP  CC
 SSSSSSSSSSSS   CC             AAAAAAAAAAAAA   LL               EEEEEEEEE      -------------  PPPPPPPPPPPPP  CC
  SSSSSSSSSSSS  CC             AAAAAAAAAAAAA   LL               EEEEEEEEE      -------------  PPPPPPPPPPPP   CC
            SS  CC             AA         AA   LL               EE                            PP             CC
            SS  CC             AA         AA   LL               EE                            PP             CC
 SS         SS  CC         CC  AA         AA   LL               EE                            PP             CC         CC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA   LLLLLLLLLLLLL    EEEEEEEEEEEEE                 PP             CCCCCCCCCCCCC
  SSSSSSSSSSS    CCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL    EEEEEEEEEEEEE                 PP              CCCCCCCCCCC

   0000000       22222222222             //   22222222222         11               //     0000000          11
  000000000     2222222222222           //   2222222222222       111              //     000000000        111
 00       00    22         22          //    22         22      1111             //     00       00      1111
 00       00               22         //                22        11            //      00       00        11
 00       00               22        //                 22        11           //       00       00        11
 00       00              22        //                 22         11          //        00       00        11
 00       00            22         //                22           11         //         00       00        11
 00       00          22          //               22             11        //          00       00        11
 00       00        22           //              22               11       //           00       00        11
 00       00      22            //             22                 11      //            00       00        11
  000000000     2222222222222  //            2222222222222     11111111  //              000000000      11111111
   0000000      2222222222222 //             2222222222222     11111111 //                0000000       11111111

      11        7777777777777                  11         88888888888                  11        7777777777777
     111        777777777777                  111        8888888888888                111        777777777777
    1111        77         77       :::      1111        88         88      :::      1111        77         77
      11                  77        :::        11        88         88      :::        11                  77
      11                 77         :::        11        88         88      :::        11                 77
      11                77                     11         88888888888                  11                77
      11               77                      11         88888888888                  11               77
      11              77            :::        11        88         88      :::        11              77
      11             77             :::        11        88         88      :::        11             77
      11            77              :::        11        88         88      :::        11            77
   11111111         77                      11111111     8888888888888              11111111          77
   11111111         77                      11111111      88888888888               11111111          77
```

```
 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL              EEEEEEEEEEEEE                   PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL              EEEEEEEEEEEEE                   PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL              EE                              PP         PP  CC         CC
SS             CC             AA         AA  LL              EE                              PP         PP  CC
SS             CC             AA         AA  LL              EE                              PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL              EEEEEEEEE       -------------   PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL              EEEEEEEEE       -------------   PPPPPPPPPPPP   CC
           SS  CC             AA         AA  LL              EE                              PP             CC
           SS  CC             AA         AA  LL              EE                              PP             CC
SS         SS  CC         CC  AA         AA  LL              EE                              PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLLL   EEEEEEEEEEEEE                   PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLLL   EEEEEEEEEEEEE                   PP              CCCCCCCCCCC
```

```
********************************************************************************
********************************************************************************
********************************************************************************
*****                                                                      *****
*****                    PROGRAM VERIFICATION INFORMATION                  *****
*****                                                                      *****
*****                 CODE SYSTEM:   SCALE-PC VERSION:   4.3               *****
*****                                                                      *****
********************************************************************************
********************************************************************************
*****                                                                      *****
*****                                                                      *****
*****              PROGRAM:  000009                                        *****
*****                                                                      *****
*****        CREATION DATE:  03/08/96                                      *****
*****                                                                      *****
*****               VOLUME:  ENG                                           *****
*****                                                                      *****
*****              LIBRARY:  G:\SCALE43\WIN_NT\EXE                         *****
*****                                                                      *****
*****                                                                      *****
*****    THIS IS NOT A SCALE-PC CONFIGURATION CONTROLLED CODE              *****
*****                                                                      *****
*****              JOBNAME:  SCALE-PC                                      *****
*****                                                                      *****
*****    DATE OF EXECUTION:  02/21/01                                      *****
*****                                                                      *****
*****    TIME OF EXECUTION:  17:18:17                                      *****
*****                                                                      *****
*****                                                                      *****
********************************************************************************
********************************************************************************
********************************************************************************
```

****** NUMERIC PARAMETERS ******

TME	MAXIMUM PROBLEM TIME (MIN)	90.00
TBA	TIME PER GENERATION (MIN)	5.00
GEN	NUMBER OF GENERATIONS	1203
NPG	NUMBER PER GENERATION	1000
NSK	NUMBER OF GENERATIONS TO BE SKIPPED	3
BEG	BEGINNING GENERATION NUMBER	1
RES	GENERATIONS BETWEEN CHECKPOINTS	0
X1D	NUMBER OF EXTRA 1-D CROSS SECTIONS	1
NBK	NEUTRON BANK SIZE	1025
XNB	EXTRA POSITIONS IN NEUTRON BANK	0
NFB	FISSION BANK SIZE	1000
XFB	EXTRA POSITIONS IN FISSION BANK	0
WTA	DEFAULT VALUE OF WEIGHT AVERAGE	0.5000
WTH	WEIGHT HIGH FOR SPLITTING	3.0000
WTL	WEIGHT LOW FOR RUSSIAN ROULETTE	0.3333
RND	STARTING RANDOM NUMBER	BB827100001
NB8	NUMBER OF D.A. BLOCKS ON UNIT 8	200
NL8	LENGTH OF D.A. BLOCKS ON UNIT 8	512
ADJ	MODE OF CALCULATION	FORWARD
	INPUT DATA WRITTEN ON RESTART UNIT	NO
	BINARY DATA INTERFACE	YES

```
*********************************************************************************************************************
*********************************************************************************************************************
***                                                                                                               ***
***                                                                                                               ***
***                                                                                                               ***
*********************************************************************************************************************
***                                    ******      LOGICAL PARAMETERS       ******                                ***
***                                                                                                               ***
***  RUN  EXECUTE PROBLEM AFTER CHECKING DATA    YES          PLT  PLOT PICTURE MAP(S)                      NO  ***
***                                                                                                               ***
***  FLX  COMPUTE FLUX                            NO          FDN  COMPUTE FISSION DENSITIES                NO  ***
***                                                                                                               ***
***  SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION    NO          NUB  COMPUTE NU-BAR & AVG FISSION GROUP      YES  ***
***                                                                                                               ***
***  MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER     NO          MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION    NO  ***
***                                                                                                               ***
***  CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER   NO          CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION  NO  ***
***                                                                                                               ***
***  FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER   NO          FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION  NO  ***
***                                                                                                               ***
***  MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER     NO          MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER     NO  ***
***                                                                                                               ***
***  CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER   NO          CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER   NO  ***
***                                                                                                               ***
***  FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER   NO          FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER   NO  ***
***                                                                                                               ***
***  HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL    NO          HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL    NO  ***
***                                                                                                               ***
***  AMX  PRINT ALL MIXED CROSS SECTIONS          NO          FAR  PRINT FIS. AND ABS. BY REGION            NO  ***
***                                                                                                               ***
***  XS1  PRINT 1-D MIXTURE X-SECTIONS            NO          GAS  PRINT FAR BY GROUP                       NO  ***
***                                                                                                               ***
***  XS2  PRINT 2-D MIXTURE X-SECTIONS            NO          PAX  PRINT XSEC-ALBEDO CORRELATION TABLES     NO  ***
***                                                                                                               ***
***  XAP  PRINT MIXTURE ANGLES & PROBABILITIES    NO          PWT  PRINT WEIGHT AVERAGE ARRAY               NO  ***
***                                                                                                               ***
***  PKI  PRINT FISSION SPECTRUM                  NO          PGM  PRINT INPUT GEOMETRY                     NO  ***
***                                                                                                               ***
***  P1D  PRINT EXTRA 1-D CROSS SECTIONS          NO          BUG  PRINT DEBUG INFORMATION                  NO  ***
***                                                                                                               ***
***                                                           TRK  PRINT TRACKING INFORMATION               NO  ***
***                                                                                                               ***
***                                                                                                               ***
*********************************************************************************************************************
*********************************************************************************************************************
*********************************************************************************************************************
                                   PARAMETER INPUT COMPLETED

                    ........     0 IO'S WERE USED READING THE PARAMETER DATA        ........

                    ************** DATA READING COMPLETED **************
```

```
*******************************************************************************************************************
***                                                                                                             ***
***                                                                                                             ***
***                                                                                                             ***
*******************************************************************************************************************
*******************************************************************************************************************
***                                                                                                             ***
***         UNIT                                                    VOLUME                                      ***
***        NUMBER                DATA SET NAME                       NAME       UNIT FUNCTION                   ***
***        ------                -------------                       ----       -------------                   ***
***                                                                                                             ***
***     XSC  14     D:\hjp\plateMin_thclaMin_fuellMin_hteleMin_u                MIXED CROSS SECTIONS            ***
***                                                                                                             ***
***     ALB  79     G:\scale43\DATALIB\FT79F001                                 INPUT ALBEDOS                   ***
***                                                                                                             ***
***     WTS  80     G:\scale43\DATALIB\FT80F001                                 INPUT WEIGHTS                   ***
***                                                                                                             ***
***     SKT  16      UNKNOWN                                                    WRITE SCRATCH DATA              ***
***                                                                                                             ***
***     BIN  95     D:\hjp\plateMin_thclaMin_fuellMin_hteleMin_u                BINARY INPUT DATA               ***
***                                                                                                             ***
***     RST  95     D:\hjp\plateMin_thclaMin_fuellMin_hteleMin_u                READ RESTART DATA               ***
***                                                                                                             ***
***     LIB   4     D:\hjp\plateMin_thclaMin_fuellMin_hteleMin_u                INPUT AMPX WORKING LIBRARY      ***
***                                                                                                             ***
***           8     D:\hjp\plateMin_thclaMin_fuellMin_hteleMin_u                INPUT DATA DIRECT ACCESS        ***
***                                                                                                             ***
***           9      UNKNOWN                                                    SUPER GROUPED DIRECT ACCESS     ***
***                                                                                                             ***
***          10      UNKNOWN                                                    XSEC MIXING DIRECT ACCESS       ***
***                                                                                                             ***
*******************************************************************************************************************

                        ........   0 IO'S WERE USED PREPARING INPUT DATA    ........


                         CROSS SECTIONS READ FROM THE AMPX WORKING LIBRARY ON UNIT     4
```

```
                                          MIXING TABLE

                                 NUMBER OF SCATTERING ANGLES =  2
                             CROSS SECTION MESSAGE THRESHOLD =3.0E-05

MIXTURE =     1          DENSITY(G/CC) =  2.3407
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT              NUCLIDE TITLE
   1013027  4.00184E-02  7.66010E-01  13027   26.9818     AL-27 1193 218 GP 040375(5)                         UPDATED
08/12/94
   1092235  1.31908E-03  2.19951E-01  92235   235.0441     URANIUM-235     ENDF/B-IV MAT 1261                 UPDATED
08/12/94
   1092238  8.31332E-05  1.40394E-02  92238   238.0510     URANIUM-238     ENDF/B-IV MAT 1262                 UPDATED
08/12/94

MIXTURE =     2          DENSITY(G/CC) =  2.7020
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT              NUCLIDE TITLE
   2013027  6.03066E-02  1.00000E+00  13027   26.9818     AL-27 1193 218 GP 040375(5)                         UPDATED
08/12/94

MIXTURE =     3          DENSITY(G/CC) = 0.99977
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT              NUCLIDE TITLE
   3001001  6.68762E-02  1.11927E-01   1001    1.0077      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002        UPDATED
08/12/94
   3008016  3.34381E-02  8.88074E-01   8016   15.9904      OXYGEN-16       ENDF/B-IV MAT 1276                 UPDATED
08/12/94

MIXTURE =     4          DENSITY(G/CC) = 0.96635
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT              NUCLIDE TITLE
   4001001  5.98801E-02  1.03684E-01   1001    1.0077      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002        UPDATED
08/12/94
   4006012  1.07014E-02  2.20668E-01   6000   12.0001      CARBON-12       ENDF/B-IV MAT 1274/THRM1065        UPDATED
08/12/94
   4008016  2.45894E-02  6.75649E-01   8016   15.9904      OXYGEN-16       ENDF/B-IV MAT 1276                 UPDATED
08/12/94

MIXTURE =     5          DENSITY(G/CC) =  11.344
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT              NUCLIDE TITLE
   5082000  3.29690E-02  1.00000E+00  82000  207.2100     PB     1288 218NGP 042375 P-3 293K                  UPDATED
08/12/94

MIXTURE =     6          DENSITY(G/CC) =  7.9200
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT              NUCLIDE TITLE
   6024304  1.74286E-02  1.90000E-01  24000   51.9957     CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'    UPDATED
08/12/94
   6025055  1.73633E-03  1.99999E-02  25055   54.9379      MANGANESE-55    ENDF/B-IV MAT 1197                 UPDATED
08/12/94
   6026304  5.93579E-02  6.95000E-01  26000   55.8447     FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'    UPDATED
08/12/94
   6028304  7.72070E-03  9.50001E-02  28000   58.6872     NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'    UPDATED
08/12/94

MIXTURE =     7          DENSITY(G/CC) =  2.7020
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT              NUCLIDE TITLE
   7013027  6.03066E-02  1.00000E+00  13027   26.9818     AL-27 1193 218 GP 040375(5)                         UPDATED
08/12/94

MIXTURE =     8          DENSITY(G/CC) =  7.9200
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT              NUCLIDE TITLE
   8024304  1.74286E-02  1.90000E-01  24000   51.9957     CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'    UPDATED
08/12/94
   8025055  1.73633E-03  1.99999E-02  25055   54.9379      MANGANESE-55    ENDF/B-IV MAT 1197                 UPDATED
08/12/94
   8026304  5.93579E-02  6.95000E-01  26000   55.8447     FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'    UPDATED
08/12/94
   8028304  7.72070E-03  9.50001E-02  28000   58.6872     NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'    UPDATED
08/12/94

MIXTURE =     9          DENSITY(G/CC) = 0.99997E-04
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT              NUCLIDE TITLE
   9001001  6.68896E-06  1.11927E-01   1001    1.0077      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002        UPDATED
08/12/94
   9008016  3.34448E-06  8.88074E-01   8016   15.9904      OXYGEN-16       ENDF/B-IV MAT 1276                 UPDATED
08/12/94


                     3001001      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002            UPDATED 08/12/94
                     4001001      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002            UPDATED 08/12/94
                     9001001      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002            UPDATED 08/12/94
                     4006012      CARBON-12      ENDF/B-IV MAT 1274/THRM1065            UPDATED 08/12/94
                     3008016      OXYGEN-16      ENDF/B-IV MAT 1276                     UPDATED 08/12/94
                     4008016      OXYGEN-16      ENDF/B-IV MAT 1276                     UPDATED 08/12/94
                     9008016      OXYGEN-16      ENDF/B-IV MAT 1276                     UPDATED 08/12/94
                     1013027     AL-27 1193 218 GP 040375(5)                            UPDATED 08/12/94
                     2013027     AL-27 1193 218 GP 040375(5)                            UPDATED 08/12/94
                     7013027     AL-27 1193 218 GP 040375(5)                            UPDATED 08/12/94
                     6024304     CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94
                     8024304     CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94
                     6025055      MANGANESE-55   ENDF/B-IV MAT 1197                     UPDATED 08/12/94
                     8025055      MANGANESE-55   ENDF/B-IV MAT 1197                     UPDATED 08/12/94
                     6026304     FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94
                     8026304     FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94
                     6028304     NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94
                     8028304     NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94
                     5082000     PB    1288 218NGP 042375 P-3 293K                      UPDATED 08/12/94
                     1092235      URANIUM-235    ENDF/B-IV MAT 1261                     UPDATED 08/12/94
                     1092238      URANIUM-238    ENDF/B-IV MAT 1262                     UPDATED 08/12/94

KENO MESSAGE NUMBER K5-222        1 TRANSFERS FOR MIXTURE      3 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222        1 TRANSFERS FOR MIXTURE      4 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222        1 TRANSFERS FOR MIXTURE      9 WERE CORRECTED FOR BAD MOMENTS.

                         ........    0 IO'S WERE USED MIXING CROSS-SECTIONS       ........
```

```
1-D CROSS SECTION ARRAY ID NUMBERS
   1  2002  1452    27    18  1018

........    0 IO'S WERE USED PREPARING THE CROSS SECTIONS    ........
```

```
*********************************************************************************************
***                                                                                       ***
***                                                                                       ***
***                                                                                       ***
*********************************************************************************************
*********************************************************************************************
***                                                                                       ***
***                          ****** ADDITIONAL INFORMATION ******                         ***
***                                                                                       ***
***  NUMBER OF ENERGY GROUPS              27      USE LATTICE GEOMETRY                YES ***
***                                                                                       ***
***  NO. OF FISSION SPECTRUM SOURCE GROUP  1      GLOBAL ARRAY NUMBER                   1 ***
***                                                                                       ***
***  NO. OF SCATTERING ANGLES IN XSECS     2      NUMBER OF UNITS IN THE GLOBAL X DIR.  1 ***
***                                                                                       ***
***  ENTRIES/NEUTRON IN THE NEUTRON BANK  22      NUMBER OF UNITS IN THE GLOBAL Y DIR.  1 ***
***                                                                                       ***
***  ENTRIES/NEUTRON IN THE FISSION BANK  15      NUMBER OF UNITS IN THE GLOBAL Z DIR.  3 ***
***                                                                                       ***
***  NUMBER OF MIXTURES USED               8      USE A GLOBAL REFLECTOR              YES ***
***                                                                                       ***
***  NUMBER OF BIAS ID'S USED              1      USE NESTED HOLES                    YES ***
***                                                                                       ***
***  NUMBER OF DIFFERENTIAL ALBEDOS USED   0      NUMBER OF HOLES                      75 ***
***                                                                                       ***
***  TOTAL INPUT GEOMETRY REGIONS         56      MAXIMUM HOLE NESTING LEVEL            5 ***
***                                                                                       ***
***  NUMBER OF GEOMETRY REGIONS USED      56      USE NESTED ARRAYS                    NO ***
***                                                                                       ***
***  LARGEST GEOMETRY UNIT NUMBER         15      NUMBER OF ARRAYS USED                 1 ***
***                                                                                       ***
***  LARGEST ARRAY NUMBER                  1      MAXIMUM ARRAY NESTING LEVEL           1 ***
***                                                                                       ***
***                                                                                       ***
***  +X BOUNDARY CONDITION            MIRROR      -X BOUNDARY CONDITION            MIRROR ***
***                                                                                       ***
***  +Y BOUNDARY CONDITION            MIRROR      -Y BOUNDARY CONDITION            MIRROR ***
***                                                                                       ***
***  +Z BOUNDARY CONDITION            MIRROR      -Z BOUNDARY CONDITION            MIRROR ***
***                                                                                       ***
*********************************************************************************************
```

```
****************************************************************************************
***                                                                                  ***
***                                                                                  ***
***                                                                                  ***
****************************************************************************************
****************************************************************************************
***                                                                                  ***
***                    ****** SPACE AND SUPERGROUP INFORMATION ******                ***
***                                                                                  ***
***      100000 WORDS IS THE TOTAL SPACE AVAILABLE.                                  ***
***                                                                                  ***
***       42609 WORDS WERE USED FOR NON-SUPERGROUP STORAGE.                          ***
***                                                                                  ***
***       57391 WORDS OF STORAGE ARE AVAILABLE FOR SUPERGROUPED DATA.                ***
***                                                                                  ***
***       99738 WORDS OF STORAGE ARE AVAILABLE FOR CONSTRUCTING THE SUPERGROUPS.     ***
***                                                                                  ***
***       57331 WORDS OF STORAGE ARE AVAILABLE TO EACH SUPERGROUP.                   ***
***                                                                                  ***
***        1037 WORDS ARE NEEDED FOR THE LARGEST GROUP.                              ***
***                                                                                  ***
***       43862 WORDS OF STORAGE IS SUFFICIENT TO RUN THIS PROBLEM.                  ***
***                                                                                  ***
***       53220 WORDS OF STORAGE WILL ALLOW THE PROBLEM TO RUN WITH ONE SUPERGROUP.  ***
***                                                                                  ***
***       53408 WORDS OF STORAGE WILL BE USED TO RUN THIS PROBLEM.                   ***
***                                                                                  ***
****************************************************************************************
****************************************************************************************
***                                                                                  ***
***                   STARTING      ENDING      XSEC       ALBEDO      TOTAL         ***
***    SUPERGROUP      GROUP         GROUP      LENGTH     LENGTH      LENGTH        ***
***                                                                                  ***
***                                                                                  ***
***        1             1            27         2010         0        10551         ***
***                                                                                  ***
****************************************************************************************

            ........    0 IO'S WERE USED IN SUPERGROUPING    ........

            ........    0 IO'S WERE USED LOADING THE DATA    ........
```

```
                    MEDIA BIAS       GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION               NUM   ID

                                                         -----  UNIT     1   -----

FUELED ANNULAR SECTIONS        TUBE  1  LOOSE
  1 CYLINDER          3  1  RADIUS =  3.0300    +Z =  58.750    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  2 CYLINDER          2  1  RADIUS =  3.0625    +Z =  58.750    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  3 CYLINDER          1  1  RADIUS =  3.1275    +Z =  58.750    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  4 CYLINDER          2  1  RADIUS =  3.1600    +Z =  58.750    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  5 CYLINDER          3  1  RADIUS =  3.5300    +Z =  58.750    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  6 CYLINDER          2  1  RADIUS =  3.5625    +Z =  58.750    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  7 CYLINDER          1  1  RADIUS =  3.6275    +Z =  58.750    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  8 CYLINDER          2  1  RADIUS =  3.6600    +Z =  58.750    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  9 CYLINDER          3  1  RADIUS =  4.0300    +Z =  58.750    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
 10 CYLINDER          2  1  RADIUS =  4.0625    +Z =  58.750    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
 11 CYLINDER          1  1  RADIUS =  4.1275    +Z =  58.750    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
 12 CYLINDER          2  1  RADIUS =  4.1600    +Z =  58.750    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
 13 CYLINDER          3  1  RADIUS =  4.5300    +Z =  58.750    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
 14 CYLINDER          2  1  RADIUS =  4.5625    +Z =  58.750    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
 15 CYLINDER          1  1  RADIUS =  4.6275    +Z =  58.750    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
 16 CYLINDER          2  1  RADIUS =  4.6599    +Z =  58.750    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
```

```
                 MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                                ----- UNIT    2  -----
AXIAL CLAD SECTIONS        TUBE  1  LOOSE
  1 CYLINDER      3  1  RADIUS =  3.0300    +Z =  1.3750    -Z = 0.00000   CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  2 CYLINDER      2  1  RADIUS =  3.1600    +Z =  1.3750    -Z = 0.00000   CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  3 CYLINDER      3  1  RADIUS =  3.5300    +Z =  1.3750    -Z = 0.00000   CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  4 CYLINDER      2  1  RADIUS =  3.6600    +Z =  1.3750    -Z = 0.00000   CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  5 CYLINDER      3  1  RADIUS =  4.0300    +Z =  1.3750    -Z = 0.00000   CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  6 CYLINDER      2  1  RADIUS =  4.1600    +Z =  1.3750    -Z = 0.00000   CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  7 CYLINDER      3  1  RADIUS =  4.5300    +Z =  1.3750    -Z = 0.00000   CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  8 CYLINDER      2  1  RADIUS =  4.6599    +Z =  1.3750    -Z = 0.00000   CENTERLINE IS AT  X = 0.00000    Y = 0.00000

                                                ----- UNIT    3  -----
FUEL ELEMENT     TUBE  1
  1 CYLINDER      3  1  RADIUS =  4.6600    +Z =  61.500    -Z = 0.00000   CENTERLINE IS AT  X = 0.00000    Y = 0.00000
    HOLE NUMBER   1       AT X = 0.00000    Y = 0.00000     Z = 0.00000    IS UNIT NUMBER     2
    HOLE NUMBER   2       AT X = 0.00000    Y = 0.00000     Z =  1.3750    IS UNIT NUMBER     1
    HOLE NUMBER   3       AT X = 0.00000    Y = 0.00000     Z =  60.125    IS UNIT NUMBER     2

                                                ----- UNIT    4  -----
BASKET FUEL TUBE - FUEL DOWN       RADIAL CENTERED
  1 CYLINDER      3  1  RADIUS =  5.0927    +Z =  73.177    -Z = 0.00000   CENTERLINE IS AT  X = 0.00000    Y = 0.00000
    HOLE NUMBER   4       AT X = 0.00000    Y = 0.00000     Z = 0.00000    IS UNIT NUMBER     3
  2 CYLINDER      2  1  RADIUS =  5.3974    +Z =  73.177    -Z = 0.00000   CENTERLINE IS AT  X = 0.00000    Y = 0.00000

                                                ----- UNIT    5  -----
BASKET FUEL TUBE - FUEL UP       RADIAL CENTERED
  1 CYLINDER      3  1  RADIUS =  5.0927    +Z =  73.177    -Z = 0.00000   CENTERLINE IS AT  X = 0.00000    Y = 0.00000
    HOLE NUMBER   5       AT X = 0.00000    Y = 0.00000     Z =  11.677    IS UNIT NUMBER     3
  2 CYLINDER      2  1  RADIUS =  5.3974    +Z =  73.177    -Z = 0.00000   CENTERLINE IS AT  X = 0.00000    Y = 0.00000
```

```
                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                                   -----   UNIT     6   -----

BASKET BOTTOM PLATE HOLE

  1 CYLINDER        3  1  RADIUS =  1.2700    +Z =  1.2698     -Z = 0 00000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000

                                                   -----   UNIT     7   -----

BASKET BOTTOM PLATE

  1 CYLINDER        6  1  RADIUS =  16.847    +Z =  1.2698     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
    HOLE NUMBER     6       AT X = 0.00000     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER     6
    HOLE NUMBER     7       AT X =  10.795     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER     6
    HOLE NUMBER     8       AT X =  5.3975     Y =  9.3487      Z = 0.00000     IS UNIT NUMBER     6
    HOLE NUMBER     9       AT X = -5.3975     Y =  9.3487      Z = 0.00000     IS UNIT NUMBER     6
    HOLE NUMBER    10       AT X = -10.795     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER     6
    HOLE NUMBER    11       AT X = -5.3975     Y = -9.3487      Z = 0.00000     IS UNIT NUMBER     6
    HOLE NUMBER    12       AT X =  5.3975     Y = -9.3487      Z = 0.00000     IS UNIT NUMBER     6

                                                   -----   UNIT     8   -----

HEAT TRANSFER BAR / ROD

  1 CYLINDER        7  1  RADIUS = 0.31650    +Z =  73.177     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
```

```
                 MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                                    -----   UNIT     9   -----

BASKET FUEL DOWN
  1 CYLINDER         3   1  RADIUS =  16.193     +Z =   73.177     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
    HOLE NUMBER     13        AT X = 0.00000      Y = 0.00000       Z = 0.00000     IS UNIT NUMBER     4
    HOLE NUMBER     14        AT X =  10.795      Y = 0.00000       Z = 0.00000     IS UNIT NUMBER     4
    HOLE NUMBER     15        AT X =  4.9493      Y =   2.8575      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER     16        AT X =  4.6024      Y =   3.3881      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER     17        AT X =  5.2354      Y =   2.2917      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER     18        AT X =  5.3975      Y =   9.3487      Z = 0.00000     IS UNIT NUMBER     4
    HOLE NUMBER     19        AT X = 0.00000      Y =   5.7150      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER     20        AT X =-0.63300      Y =   5.6798      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER     21        AT X = 0.63300      Y =   5.6798      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER     22        AT X = -5.3975      Y =   9.3487      Z = 0.00000     IS UNIT NUMBER     4
    HOLE NUMBER     23        AT X = -4.9493      Y =   2.8575      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER     24        AT X = -5.2354      Y =   2.2917      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER     25        AT X = -4.6024      Y =   3.3881      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER     26        AT X = -10.795      Y = 0.00000       Z = 0.00000     IS UNIT NUMBER     4
    HOLE NUMBER     27        AT X = -4.9493      Y =  -2.8575      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER     28        AT X = -4.6024      Y =  -3.3881      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER     29        AT X = -5.2354      Y =  -2.2917      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER     30        AT X = -5.3975      Y =  -9.3487      Z = 0.00000     IS UNIT NUMBER     4
    HOLE NUMBER     31        AT X = 0.00000      Y =  -5.7150      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER     32        AT X = 0.63300      Y =  -5.6798      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER     33        AT X =-0.63300      Y =  -5.6798      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER     34        AT X =  5.3975      Y =  -9.3487      Z = 0.00000     IS UNIT NUMBER     4
    HOLE NUMBER     35        AT X =  4.9493      Y =  -2.8575      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER     36        AT X =  5.2354      Y =  -2.2917      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER     37        AT X =  4.6024      Y =  -3.3881      Z = 0.00000     IS UNIT NUMBER     8
  2 CYLINDER         7   1  RADIUS =  16.669     +Z =   73.177     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  3 CYLINDER         3   1  RADIUS =  16.847     +Z =   73.177     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
```

```
                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                              -----  UNIT   10  -----

BASKET FUEL UP
  1 CYLINDER        3  1  RADIUS =  16.193     +Z =   73.177     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
    HOLE NUMBER    38       AT X = 0.00000      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER     5
    HOLE NUMBER    39       AT X =  10.795      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER     5
    HOLE NUMBER    40       AT X =  4.9493      Y =  2.8575      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER    41       AT X =  4.6024      Y =  3.3881      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER    42       AT X =  5.2354      Y =  2.2917      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER    43       AT X =  5.3975      Y =  9.3487      Z = 0.00000     IS UNIT NUMBER     5
    HOLE NUMBER    44       AT X = 0.00000      Y =  5.7150      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER    45       AT X =-0.63300      Y =  5.6798      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER    46       AT X = 0.63300      Y =  5.6798      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER    47       AT X = -5.3975      Y =  9.3487      Z = 0.00000     IS UNIT NUMBER     5
    HOLE NUMBER    48       AT X = -4.9493      Y =  2.8575      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER    49       AT X = -5.2354      Y =  2.2917      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER    50       AT X = -4.6024      Y =  3.3881      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER    51       AT X = -10.795      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER     5
    HOLE NUMBER    52       AT X = -4.9493      Y = -2.8575      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER    53       AT X = -4.6024      Y = -3.3881      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER    54       AT X = -5.2354      Y = -2.2917      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER    55       AT X = -5.3975      Y = -9.3487      Z = 0.00000     IS UNIT NUMBER     5
    HOLE NUMBER    56       AT X = 0.00000      Y = -5.7150      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER    57       AT X = 0.63300      Y = -5.6798      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER    58       AT X =-0.63300      Y = -5.6798      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER    59       AT X =  5.3975      Y = -9.3487      Z = 0.00000     IS UNIT NUMBER     5
    HOLE NUMBER    60       AT X =  4.9493      Y = -2.8575      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER    61       AT X =  5.2354      Y = -2.2917      Z = 0.00000     IS UNIT NUMBER     8
    HOLE NUMBER    62       AT X =  4.6024      Y = -3.3881      Z = 0.00000     IS UNIT NUMBER     8
  2 CYLINDER        7  1  RADIUS =  16.669     +Z =   73.177     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  3 CYLINDER        3  1  RADIUS =  16.847     +Z =   73.177     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000     Y = 0.00000
```

```
               MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION          NUM   ID

                                                  -----  UNIT    11   -----
CASK CAVITY
  1 CYLINDER       3  1  RADIUS =  16.986    +Z =  446.68     -Z = 0.00000      CENTERLINE IS AT  X = 0.00000      Y = 0.00000
    HOLE NUMBER   63       AT X = 0.00000     Y = 0.00000      Z = 1.00000E-04 IS UNIT NUMBER     7
    HOLE NUMBER   64       AT X = 0.00000     Y = 0.00000      Z =  1.2700      IS UNIT NUMBER    10
    HOLE NUMBER   65       AT X = 0.00000     Y = 0.00000      Z =  74.448      IS UNIT NUMBER     7
    HOLE NUMBER   66       AT X = 0.00000     Y = 0.00000      Z =  75.717      IS UNIT NUMBER     9
    HOLE NUMBER   67       AT X = 0.00000     Y = 0.00000      Z =  148.89      IS UNIT NUMBER     7
    HOLE NUMBER   68       AT X = 0.00000     Y = 0.00000      Z =  150.16      IS UNIT NUMBER    10
    HOLE NUMBER   69       AT X = 0.00000     Y = 0.00000      Z =  223.34      IS UNIT NUMBER     7
    HOLE NUMBER   70       AT X = 0.00000     Y = 0.00000      Z =  224.61      IS UNIT NUMBER     9
    HOLE NUMBER   71       AT X = 0.00000     Y = 0.00000      Z =  297.79      IS UNIT NUMBER     7
    HOLE NUMBER   72       AT X = 0.00000     Y = 0.00000      Z =  299.06      IS UNIT NUMBER    10
    HOLE NUMBER   73       AT X = 0.00000     Y = 0.00000      Z =  372.24      IS UNIT NUMBER     7
    HOLE NUMBER   74       AT X = 0.00000     Y = 0.00000      Z =  373.51      IS UNIT NUMBER     9

                                                  -----  UNIT    12   -----
CASK SHIELD RADIAL CONFIGURATION
  1 CYLINDER       3  1  RADIUS =  16.986    +Z =  446.68     -Z = 0.00000      CENTERLINE IS AT  X = 0.00000      Y = 0.00000
    HOLE NUMBER   75       AT X = 0.00000     Y = 0.00000      Z = 0.00000      IS UNIT NUMBER    11
  2 CYLINDER       8  1  RADIUS =  18.910    +Z =  446.68     -Z = 0.00000      CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  3 CYLINDER       5  1  RADIUS =  33.465    +Z =  446.68     -Z = 0.00000      CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  4 CYLINDER       8  1  RADIUS =  36.519    +Z =  446.68     -Z = 0.00000      CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  5 CYLINDER       9  1  RADIUS =  49.219    +Z =  446.68     -Z = 0.00000      CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  6 CYLINDER       8  1  RADIUS =  49.818    +Z =  446.68     -Z = 0.00000      CENTERLINE IS AT  X = 0.00000      Y = 0.00000
  7 CUBOID         9  1      +X =  49.818    -X = -49.818     +Y =  49.818      -Y = -49.818      +Z =  446.68      -Z = 0.00000
```

```
                   MEDIA BIAS       GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION              NUM   ID

                                                    -----  UNIT    13   -----

LWT LID

  1 CYLINDER         8  1  RADIUS =  36.519     +Z =   28.575      -Z = 0.59940     CENTERLINE IS AT  X = 0.00000       Y = 0.00000
  2 CYLINDER         9  1  RADIUS =  49.818     +Z =   28.575      -Z = 0.59940     CENTERLINE IS AT  X = 0.00000       Y = 0.00000
  3 CYLINDER         8  1  RADIUS =  49.818     +Z =   28.575      -Z = 0.00000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000
  4 CUBOID           9  1      +X =  49.818     -X = -49.818       +Y =   49.818    -Y = -49.818      +Z =   28.575     -Z = 0.00000

                                                    -----  UNIT    14   -----

LWT BOTTOM WELDMENT

  1 CYLINDER         5  1  RADIUS =  26.353     +Z =   16.510      -Z =   8.8900    CENTERLINE IS AT  X = 0.00000       Y = 0.00000
  2 CYLINDER         8  1  RADIUS =  36.519     +Z =   26.071      -Z = 0.00000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000
  3 CYLINDER         9  1  RADIUS =  49.818     +Z =   26.071      -Z = 0.00000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000
  4 CYLINDER         8  1  RADIUS =  49.818     +Z =   26.670      -Z = 0.00000     CENTERLINE IS AT  X = 0.00000       Y = 0.00000
  5 CUBOID           9  1      +X =  49.818     -X = -49.818       +Y =   49.818    -Y = -49.818      +Z =   26.670     -Z = 0.00000

                                        *******************   GLOBAL   *******************
                                        -----   UNIT    15  EXTERNAL TO LATTICE  1   -----

LWT CASK

  1 ARRAY NUMBER     1         +X =  49.818     -X = -49.818       +Y =   49.818    -Y = -49.818      +Z =   501.93     -Z = 0.00000
```

```
        -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   1          -------
Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
 14
Z LAYER   2, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
 12
Z LAYER   3, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP
 13
```

VOLUMES FOR THOSE UNITS UTILIZED IN THIS PROBLEM

UNIT	REGION	GEOMETRY REGION	VOLUME	CUMULATIVE VOLUME
1	1	1	1.69451E+03 CM**3	1.69451E+03 CM**3
	2	2	3.65458E+01 CM**3	1.73105E+03 CM**3
	3	3	7.42612E+01 CM**3	1.80531E+03 CM**3
	4	4	3.77155E+01 CM**3	1.84303E+03 CM**3
	5	5	4.56862E+02 CM**3	2.29989E+03 CM**3
	6	6	4.25442E+01 CM**3	2.34243E+03 CM**3
	7	7	8.62583E+01 CM**3	2.42869E+03 CM**3
	8	8	4.37139E+01 CM**3	2.47241E+03 CM**3
	9	9	5.25153E+02 CM**3	2.99756E+03 CM**3
	10	10	4.85422E+01 CM**3	3.04610E+03 CM**3
	11	11	9.82551E+01 CM**3	3.14436E+03 CM**3
	12	12	4.97122E+01 CM**3	3.19407E+03 CM**3
	13	13	5.93444E+02 CM**3	3.78751E+03 CM**3
	14	14	5.45405E+01 CM**3	3.84205E+03 CM**3
	15	15	1.10252E+02 CM**3	3.95231E+03 CM**3
	16	16	5.55391E+01 CM**3	4.00785E+03 CM**3
2	1	17	3.96586E+01 CM**3	3.96586E+01 CM**3
	2	18	3.47606E+00 CM**3	4.31347E+01 CM**3
	3	19	1.06925E+01 CM**3	5.38272E+01 CM**3
	4	20	4.03762E+00 CM**3	5.78648E+01 CM**3
	5	21	1.22908E+01 CM**3	7.01557E+01 CM**3
	6	22	4.59916E+00 CM**3	7.47548E+01 CM**3
	7	23	1.38891E+01 CM**3	8.86439E+01 CM**3
	8	24	5.15671E+00 CM**3	9.38006E+01 CM**3
3	1	25	1.79337E-01 CM**3	4.19563E+03 CM**3
4	1	26	1.76679E+03 CM**3	5.96242E+03 CM**3
	2	27	7.34815E+02 CM**3	6.69723E+03 CM**3
5	1	28	1.76679E+03 CM**3	5.96242E+03 CM**3
	2	29	7.34815E+02 CM**3	6.69723E+03 CM**3
6	1	30	6.43417E+00 CM**3	6.43417E+00 CM**3
7	1	31	1.08713E+03 CM**3	1.13216E+03 CM**3
8	1	32	2.30289E+01 CM**3	2.30289E+01 CM**3
9	1	33	1.29829E+04 CM**3	6.02781E+04 CM**3
	2	34	3.59751E+03 CM**3	6.38756E+04 CM**3
	3	35	1.36994E+03 CM**3	6.52455E+04 CM**3
10	1	36	1.29829E+04 CM**3	6.02781E+04 CM**3
	2	37	3.59751E+03 CM**3	6.38756E+04 CM**3
	3	38	1.36994E+03 CM**3	6.52455E+04 CM**3
11	1	39	6.63421E+03 CM**3	4.04900E+05 CM**3
12	1	40	0.00000E+00 CM**3	4.04900E+05 CM**3
	2	41	9.69190E+04 CM**3	5.01819E+05 CM**3
	3	42	1.06970E+06 CM**3	1.57152E+06 CM**3
	4	43	2.99966E+05 CM**3	1.87148E+06 CM**3
	5	44	1.52801E+06 CM**3	3.39950E+06 CM**3
	6	45	8.33038E+04 CM**3	3.48280E+06 CM**3
	7	46	9.51639E+05 CM**3	4.43444E+06 CM**3
13	1	47	1.17210E+05 CM**3	1.17210E+05 CM**3
	2	48	1.00916E+05 CM**3	2.18126E+05 CM**3
	3	49	4.67352E+03 CM**3	2.22799E+05 CM**3
	4	50	6.08776E+04 CM**3	2.83677E+05 CM**3
14	1	51	1.66245E+04 CM**3	1.66245E+04 CM**3
	2	52	9.26041E+04 CM**3	1.09229E+05 CM**3
	3	53	9.40439E+04 CM**3	2.03273E+05 CM**3
	4	54	4.67353E+03 CM**3	2.07946E+05 CM**3
	5	55	5.68191E+04 CM**3	2.64765E+05 CM**3

SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 56 IS AN ARRAY PLACEMENT BOUNDARY REGION

15	1	56	4.98288E+06 CM**3	4.98288E+06 CM**3

UNIT	USES	REGION	MIXTURE	TOTAL VOLUME
1	42	1	3	7.11692E+04 CM**3
		2	2	1.53492E+03 CM**3
		3	1	3.11897E+03 CM**3
		4	2	1.58405E+03 CM**3
		5	3	1.91882E+04 CM**3
		6	2	1.78686E+03 CM**3
		7	1	3.62285E+03 CM**3
		8	2	1.83598E+03 CM**3
		9	3	2.20564E+04 CM**3
		10	2	2.03877E+03 CM**3
		11	1	4.12672E+03 CM**3
		12	2	2.08791E+03 CM**3
		13	3	2.49247E+04 CM**3
		14	2	2.29070E+03 CM**3
		15	1	4.63060E+03 CM**3
		16	2	2.33264E+03 CM**3
2	84	1	3	3.33133E+03 CM**3
		2	2	2.91989E+02 CM**3
		3	3	8.98172E+02 CM**3
		4	2	3.39160E+02 CM**3
		5	3	1.03243E+03 CM**3
		6	2	3.86329E+02 CM**3
		7	3	1.16669E+03 CM**3
		8	2	4.33163E+02 CM**3

```
  3      42       1          3          7.53214E+00 CM**3

  4      21       1          3          3.71026E+04 CM**3
                  2          2          1.54311E+04 CM**3

  5      21       1          3          3.71026E+04 CM**3
                  2          2          1.54311E+04 CM**3

  6      42       1          3          2.70235E+02 CM**3

  7       6       1          6          6.52275E+03 CM**3

  8     108       1          7          2.48712E+03 CM**3

  9       3       1          3          3.89488E+04 CM**3
                  2          7          1.07925E+04 CM**3
                  3          3          4.10981E+03 CM**3

 10       3       1          3          3.89488E+04 CM**3
                  2          7          1.07925E+04 CM**3
                  3          3          4.10981E+03 CM**3

 11       1       1          3          6.63421E+03 CM**3

 12       1       1          3          0.00000E+00 CM**3
                  2          8          9.69190E+04 CM**3
                  3          5          1.06970E+06 CM**3
                  4          8          2.99966E+05 CM**3
                  5          9          1.52801E+06 CM**3
                  6          8          8.33038E+04 CM**3
                  7          9          9.51639E+05 CM**3

 13       1       1          8          1.17210E+05 CM**3
                  2          9          1.00916E+05 CM**3
                  3          8          4.67352E+03 CM**3
                  4          9          6.08776E+04 CM**3

 14       1       1          5          1.66245E+04 CM**3
                  2          8          9.26041E+04 CM**3
                  3          9          9.40439E+04 CM**3
                  4          8          4.67353E+03 CM**3
                  5          9          5.68191E+04 CM**3

 15       1       1                     4.98288E+06 CM**3


                   TOTAL MIXTURE VOLUMES
           MIXTURE      TOTAL VOLUME              MASS(G)
              1       1.54991E+04 CM**3         3.62788E+04
              2       4.78047E+04 CM**3         1.29168E+05
              3       3.11002E+05 CM**3         3.10931E+05
              5       1.08632E+06 CM**3         1.23233E+07
              6       6.52275E+03 CM**3         5.16602E+04
              7       2.40722E+04 CM**3         6.50430E+04
              8       6.99350E+05 CM**3         5.53885E+06
              9       2.79231E+06 CM**3         2.79223E+02

**************************************************************************************************************
***                                                                                                        ***
***                                          BIASING INFORMATION                                           ***
***                                                                                                        ***
***     A DEFAULT WEIGHT OF    0.500 WILL BE USED FOR ALL BIAS ID'S.                                       ***
***                                                                                                        ***
**************************************************************************************************************

                ........   0 IO'S WERE USED IN KENO-V BEFORE TRACKING         ........

                ........  0.01100 MINUTES WERE USED PROCESSING DATA.         ........

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 3.11048E-03

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED WITH A FLAT DISTRIBUTION IN A CUBOID DEFINED BY:
                         +X= 1.68500E+01  -X=-1.68500E+01  +Y=-1.68500E+01  -Y= 1.68500E+01  +Z= 4.73350E+02  -Z= 2.66700E+01
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

0.93233 MINUTES WERE REQUIRED FOR STARTING.   TOTAL ELAPSED TIME IS 0.93867 MINUTES.
```

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
1	9.49538E-01	9.66667E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	9.17465E-01	9.90500E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
3	9.25396E-01	1.01433E+00	9.25396E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	9.74601E-01	1.03717E+00	9.49998E-01	2.46028E-02	0.00000E+00	0.00000E+00
5	9.07974E-01	1.06100E+00	9.35990E-01	1.99497E-02	0.00000E+00	0.00000E+00
6	9.58538E-01	1.08383E+00	9.41627E-01	1.51911E-02	0.00000E+00	0.00000E+00
7	9.45317E-01	1.10683E+00	9.42365E-01	1.17901E-02	0.00000E+00	0.00000E+00
8	9.27517E-01	1.13067E+00	9.39890E-01	9.93954E-03	0.00000E+00	0.00000E+00
9	9.71780E-01	1.15250E+00	9.44446E-01	9.55624E-03	0.00000E+00	0.00000E+00
10	9.06022E-01	1.17633E+00	9.39643E-01	9.56871E-03	0.00000E+00	0.00000E+00
11	9.35873E-01	1.20117E+00	9.39224E-01	8.44920E-03	0.00000E+00	0.00000E+00
12	9.12748E-01	1.22400E+00	9.36577E-01	8.00758E-03	0.00000E+00	0.00000E+00
13	9.34845E-01	1.24783E+00	9.36419E-01	7.24484E-03	0.00000E+00	0.00000E+00
14	9.15009E-01	1.27067E+00	9.34635E-01	6.85004E-03	0.00000E+00	0.00000E+00
15	9.62264E-01	1.29450E+00	9.36760E-01	6.64988E-03	0.00000E+00	0.00000E+00
16	9.41319E-01	1.31733E+00	9.37086E-01	6.16520E-03	0.00000E+00	0.00000E+00
17	9.05721E-01	1.34117E+00	9.34995E-01	6.10851E-03	0.00000E+00	0.00000E+00
18	9.35457E-01	1.36583E+00	9.35024E-01	5.71406E-03	0.00000E+00	0.00000E+00
19	9.73335E-01	1.38883E+00	9.37277E-01	5.82133E-03	0.00000E+00	0.00000E+00
20	9.36168E-01	1.41250E+00	9.37216E-01	5.48875E-03	0.00000E+00	0.00000E+00
21	9.18860E-01	1.43733E+00	9.36250E-01	5.28096E-03	0.00000E+00	0.00000E+00
22	9.40510E-01	1.46100E+00	9.36463E-01	5.01448E-03	0.00000E+00	0.00000E+00
23	9.45995E-01	1.48400E+00	9.36917E-01	4.79127E-03	0.00000E+00	0.00000E+00
24	9.49764E-01	1.50783E+00	9.37501E-01	4.60547E-03	0.00000E+00	0.00000E+00
25	9.13888E-01	1.53067E+00	9.36474E-01	4.51885E-03	0.00000E+00	0.00000E+00
26	9.37879E-01	1.55450E+00	9.36532E-01	4.32687E-03	0.00000E+00	0.00000E+00
27	9.80078E-01	1.57633E+00	9.38274E-01	4.50088E-03	0.00000E+00	0.00000E+00
28	8.93904E-01	1.60117E+00	9.36568E-01	4.64886E-03	0.00000E+00	0.00000E+00
29	9.35162E-01	1.62400E+00	9.36516E-01	4.47367E-03	0.00000E+00	0.00000E+00
30	9.07047E-01	1.64683E+00	9.35463E-01	4.43755E-03	0.00000E+00	0.00000E+00
31	9.15548E-01	1.67067E+00	9.34776E-01	4.33652E-03	0.00000E+00	0.00000E+00
32	9.11447E-01	1.69450E+00	9.33999E-01	4.26104E-03	0.00000E+00	0.00000E+00
33	9.42132E-01	1.71833E+00	9.34261E-01	4.12963E-03	0.00000E+00	0.00000E+00
34	9.73521E-01	1.74033E+00	9.35488E-01	4.18249E-03	0.00000E+00	0.00000E+00
35	9.12017E-01	1.76400E+00	9.34777E-01	4.11569E-03	0.00000E+00	0.00000E+00
36	9.48197E-01	1.78783E+00	9.35171E-01	4.01226E-03	0.00000E+00	0.00000E+00
37	9.47007E-01	1.81167E+00	9.35510E-01	3.91059E-03	0.00000E+00	0.00000E+00
38	9.50145E-01	1.83450E+00	9.35916E-01	3.82209E-03	0.00000E+00	0.00000E+00
39	9.31024E-01	1.85833E+00	9.35784E-01	3.71971E-03	0.00000E+00	0.00000E+00
40	8.87928E-01	1.88300E+00	9.34525E-01	3.83328E-03	0.00000E+00	0.00000E+00
41	9.50054E-01	1.90683E+00	9.34923E-01	3.75487E-03	0.00000E+00	0.00000E+00
42	9.24555E-01	1.92983E+00	9.34664E-01	3.66896E-03	0.00000E+00	0.00000E+00
43	9.51347E-01	1.95267E+00	9.35071E-01	3.60142E-03	0.00000E+00	0.00000E+00
44	9.12795E-01	1.97733E+00	9.34540E-01	3.55442E-03	0.00000E+00	0.00000E+00
45	9.30073E-01	2.00117E+00	9.34436E-01	3.47233E-03	0.00000E+00	0.00000E+00
46	9.45772E-01	2.02500E+00	9.34694E-01	3.40226E-03	0.00000E+00	0.00000E+00
47	9.21591E-01	2.04783E+00	9.34403E-01	3.33852E-03	0.00000E+00	0.00000E+00
48	9.44161E-01	2.07067E+00	9.34615E-01	3.27202E-03	0.00000E+00	0.00000E+00
49	9.44982E-01	2.09367E+00	9.34835E-01	3.20923E-03	0.00000E+00	0.00000E+00
50	9.45684E-01	2.11750E+00	9.35061E-01	3.14978E-03	0.00000E+00	0.00000E+00
51	9.57844E-01	2.14033E+00	9.35526E-01	3.11967E-03	0.00000E+00	0.00000E+00
52	9.32145E-01	2.16317E+00	9.35459E-01	3.05739E-03	0.00000E+00	0.00000E+00
53	1.00046E+00	2.18517E+00	9.36733E-01	3.25659E-03	0.00000E+00	0.00000E+00
54	9.76345E-01	2.20900E+00	9.37495E-01	3.28295E-03	0.00000E+00	0.00000E+00
55	9.33856E-01	2.23183E+00	9.37426E-01	3.22114E-03	0.00000E+00	0.00000E+00
56	9.18827E-01	2.25383E+00	9.37082E-01	3.17964E-03	0.00000E+00	0.00000E+00
57	9.33764E-01	2.27667E+00	9.37022E-01	3.12187E-03	0.00000E+00	0.00000E+00
58	9.50672E-01	2.30050E+00	9.37265E-01	3.07529E-03	0.00000E+00	0.00000E+00
59	9.34552E-01	2.32433E+00	9.37218E-01	3.02123E-03	0.00000E+00	0.00000E+00
60	9.62475E-01	2.34817E+00	9.37653E-01	3.00046E-03	0.00000E+00	0.00000E+00
61	9.76074E-01	2.37200E+00	9.38304E-01	3.02020E-03	0.00000E+00	0.00000E+00
62	9.37632E-01	2.39383E+00	9.38293E-01	2.96946E-03	0.00000E+00	0.00000E+00
63	9.41751E-01	2.41683E+00	9.38350E-01	2.92092E-03	0.00000E+00	0.00000E+00
64	9.59089E-01	2.43867E+00	9.38684E-01	2.89283E-03	0.00000E+00	0.00000E+00
65	9.70014E-01	2.46250E+00	9.39182E-01	2.88965E-03	0.00000E+00	0.00000E+00
66	9.45509E-01	2.48550E+00	9.39281E-01	2.84586E-03	0.00000E+00	0.00000E+00
67	8.79076E-01	2.50917E+00	9.38354E-01	2.95087E-03	0.00000E+00	0.00000E+00
68	9.18401E-01	2.53217E+00	9.38052E-01	2.92150E-03	0.00000E+00	0.00000E+00
69	9.40542E-01	2.55600E+00	9.38089E-01	2.87781E-03	0.00000E+00	0.00000E+00
70	9.83618E-01	2.57783E+00	9.38759E-01	2.91316E-03	0.00000E+00	0.00000E+00
71	9.30024E-01	2.60167E+00	9.38632E-01	2.87342E-03	0.00000E+00	0.00000E+00
72	9.66689E-01	2.62450E+00	9.39033E-01	2.86029E-03	0.00000E+00	0.00000E+00
73	9.07280E-01	2.64933E+00	9.38586E-01	2.85496E-03	0.00000E+00	0.00000E+00
74	9.27001E-01	2.67400E+00	9.38425E-01	2.81963E-03	0.00000E+00	0.00000E+00
75	9.21773E-01	2.69683E+00	9.38197E-01	2.79007E-03	0.00000E+00	0.00000E+00
76	9.45134E-01	2.71983E+00	9.38290E-01	2.75371E-03	0.00000E+00	0.00000E+00
77	9.50359E-01	2.74350E+00	9.38451E-01	2.72151E-03	0.00000E+00	0.00000E+00
78	9.26346E-01	2.76550E+00	9.38292E-01	2.69018E-03	0.00000E+00	0.00000E+00
79	9.65130E-01	2.78933E+00	9.38641E-01	2.67779E-03	0.00000E+00	0.00000E+00
80	9.06211E-01	2.81317E+00	9.38225E-01	2.67574E-03	0.00000E+00	0.00000E+00
81	9.64141E-01	2.83517E+00	9.38553E-01	2.66194E-03	0.00000E+00	0.00000E+00
82	9.59074E-01	2.85900E+00	9.38809E-01	2.64094E-03	0.00000E+00	0.00000E+00
83	9.28865E-01	2.88183E+00	9.38687E-01	2.61102E-03	0.00000E+00	0.00000E+00
84	9.42305E-01	2.90567E+00	9.38731E-01	2.57936E-03	0.00000E+00	0.00000E+00
85	9.54830E-01	2.92933E+00	9.38925E-01	2.55547E-03	0.00000E+00	0.00000E+00
86	9.07779E-01	2.95233E+00	9.38554E-01	2.55194E-03	0.00000E+00	0.00000E+00
87	9.23838E-01	2.97700E+00	9.38381E-01	2.52767E-03	0.00000E+00	0.00000E+00
88	9.22466E-01	2.99900E+00	9.38196E-01	2.50496E-03	0.00000E+00	0.00000E+00
89	9.51520E-01	3.02283E+00	9.38349E-01	2.48073E-03	0.00000E+00	0.00000E+00
90	9.20859E-01	3.04567E+00	9.38150E-01	2.46042E-03	0.00000E+00	0.00000E+00
91	9.30163E-01	3.07033E+00	9.38060E-01	2.43427E-03	0.00000E+00	0.00000E+00
92	9.03638E-01	3.09417E+00	9.37678E-01	2.43727E-03	0.00000E+00	0.00000E+00
93	9.63904E-01	3.11700E+00	9.37966E-01	2.42750E-03	0.00000E+00	0.00000E+00
94	9.40290E-01	3.14000E+00	9.37991E-01	2.40110E-03	0.00000E+00	0.00000E+00
95	9.67088E-01	3.16200E+00	9.38304E-01	2.39566E-03	0.00000E+00	0.00000E+00
96	9.28079E-01	3.18567E+00	9.38195E-01	2.37254E-03	0.00000E+00	0.00000E+00
97	9.16710E-01	3.20950E+00	9.37969E-01	2.35830E-03	0.00000E+00	0.00000E+00
98	9.04349E-01	3.23333E+00	9.37619E-01	2.35974E-03	0.00000E+00	0.00000E+00
99	9.45791E-01	3.25717E+00	9.37703E-01	2.33680E-03	0.00000E+00	0.00000E+00
100	9.22640E-01	3.28100E+00	9.37550E-01	2.31793E-03	0.00000E+00	0.00000E+00
101	9.47696E-01	3.30383E+00	9.37652E-01	2.29669E-03	0.00000E+00	0.00000E+00
102	9.21694E-01	3.32667E+00	9.37493E-01	2.27920E-03	0.00000E+00	0.00000E+00
103	9.27957E-01	3.34967E+00	9.37398E-01	2.25850E-03	0.00000E+00	0.00000E+00
104	9.61926E-01	3.37333E+00	9.37639E-01	2.24914E-03	0.00000E+00	0.00000E+00

105	9.38029E-01	3.39717E+00	9.37642E-01	2.22720E-03	0.00000E+00	0.00000E+00
106	9.61417E-01	3.42100E+00	9.37871E-01	2.21749E-03	0.00000E+00	0.00000E+00
107	9.17091E-01	3.44483E+00	9.37673E-01	2.20517E-03	0.00000E+00	0.00000E+00
108	9.09695E-01	3.46950E+00	9.37409E-01	2.20016E-03	0.00000E+00	0.00000E+00
109	9.09150E-01	3.49333E+00	9.37145E-01	2.19544E-03	0.00000E+00	0.00000E+00
110	8.82745E-01	3.51617E+00	9.36641E-01	2.23258E-03	0.00000E+00	0.00000E+00
111	9.72105E-01	3.54000E+00	9.36967E-01	2.23580E-03	0.00000E+00	0.00000E+00
112	9.43321E-01	3.56283E+00	9.37024E-01	2.21614E-03	0.00000E+00	0.00000E+00
113	9.39161E-01	3.58767E+00	9.37044E-01	2.19617E-03	0.00000E+00	0.00000E+00
114	9.82694E-01	3.60950E+00	9.37451E-01	2.21431E-03	0.00000E+00	0.00000E+00
115	9.44917E-01	3.63333E+00	9.37517E-01	2.19562E-03	0.00000E+00	0.00000E+00
116	9.35272E-01	3.65633E+00	9.37498E-01	2.17636E-03	0.00000E+00	0.00000E+00
117	9.58157E-01	3.68000E+00	9.37677E-01	2.16482E-03	0.00000E+00	0.00000E+00
118	9.67329E-01	3.70300E+00	9.37933E-01	2.16125E-03	0.00000E+00	0.00000E+00
119	9.56101E-01	3.72667E+00	9.38088E-01	2.14831E-03	0.00000E+00	0.00000E+00
120	9.25867E-01	3.75050E+00	9.37985E-01	2.13255E-03	0.00000E+00	0.00000E+00
121	9.54698E-01	3.77433E+00	9.38125E-01	2.11921E-03	0.00000E+00	0.00000E+00
122	9.52020E-01	3.79717E+00	9.38241E-01	2.10466E-03	0.00000E+00	0.00000E+00
123	9.57472E-01	3.82017E+00	9.38400E-01	2.09324E-03	0.00000E+00	0.00000E+00
124	9.01513E-01	3.84400E+00	9.38097E-01	2.09791E-03	0.00000E+00	0.00000E+00
125	9.23868E-01	3.86683E+00	9.37982E-01	2.08400E-03	0.00000E+00	0.00000E+00
126	9.42828E-01	3.88967E+00	9.38021E-01	2.06749E-03	0.00000E+00	0.00000E+00
127	9.25702E-01	3.91250E+00	9.37922E-01	2.05325E-03	0.00000E+00	0.00000E+00
128	9.27309E-01	3.93550E+00	9.37838E-01	2.03863E-03	0.00000E+00	0.00000E+00
129	9.37097E-01	3.95933E+00	9.37832E-01	2.02253E-03	0.00000E+00	0.00000E+00
130	9.27498E-01	3.98400E+00	9.37752E-01	2.00829E-03	0.00000E+00	0.00000E+00
131	9.58525E-01	4.00683E+00	9.37913E-01	1.99915E-03	0.00000E+00	0.00000E+00
132	9.68885E-01	4.02983E+00	9.38151E-01	1.99797E-03	0.00000E+00	0.00000E+00
133	9.52461E-01	4.05450E+00	9.38260E-01	1.98567E-03	0.00000E+00	0.00000E+00
134	9.24990E-01	4.07917E+00	9.38160E-01	1.97313E-03	0.00000E+00	0.00000E+00
135	9.10651E-01	4.10300E+00	9.37953E-01	1.96913E-03	0.00000E+00	0.00000E+00
136	9.25992E-01	4.12583E+00	9.37863E-01	1.95642E-03	0.00000E+00	0.00000E+00
137	9.20223E-01	4.15067E+00	9.37733E-01	1.94626E-03	0.00000E+00	0.00000E+00
138	9.41400E-01	4.17433E+00	9.37760E-01	1.93209E-03	0.00000E+00	0.00000E+00
139	9.15200E-01	4.19733E+00	9.37595E-01	1.92499E-03	0.00000E+00	0.00000E+00
140	9.17256E-01	4.22100E+00	9.37448E-01	1.91667E-03	0.00000E+00	0.00000E+00
141	9.58561E-01	4.24400E+00	9.37600E-01	1.90888E-03	0.00000E+00	0.00000E+00
142	9.54807E-01	4.26683E+00	9.37722E-01	1.89918E-03	0.00000E+00	0.00000E+00
143	9.37850E-01	4.29067E+00	9.37723E-01	1.88566E-03	0.00000E+00	0.00000E+00
144	9.51011E-01	4.31350E+00	9.37817E-01	1.87467E-03	0.00000E+00	0.00000E+00
145	9.08446E-01	4.33733E+00	9.37612E-01	1.87281E-03	0.00000E+00	0.00000E+00
146	9.33168E-01	4.36117E+00	9.37581E-01	1.86002E-03	0.00000E+00	0.00000E+00
147	9.39235E-01	4.38400E+00	9.37592E-01	1.84718E-03	0.00000E+00	0.00000E+00
148	9.44775E-01	4.40683E+00	9.37641E-01	1.83514E-03	0.00000E+00	0.00000E+00
149	9.33997E-01	4.42983E+00	9.37617E-01	1.82278E-03	0.00000E+00	0.00000E+00
150	9.29083E-01	4.45367E+00	9.37559E-01	1.81134E-03	0.00000E+00	0.00000E+00
151	9.53913E-01	4.47650E+00	9.37669E-01	1.80249E-03	0.00000E+00	0.00000E+00
152	9.15940E-01	4.50033E+00	9.37524E-01	1.79628E-03	0.00000E+00	0.00000E+00
153	9.32896E-01	4.52400E+00	9.37493E-01	1.78461E-03	0.00000E+00	0.00000E+00
154	9.22501E-01	4.54700E+00	9.37394E-01	1.77557E-03	0.00000E+00	0.00000E+00
155	9.45032E-01	4.56900E+00	9.37444E-01	1.76464E-03	0.00000E+00	0.00000E+00
156	9.63012E-01	4.59267E+00	9.37610E-01	1.76099E-03	0.00000E+00	0.00000E+00
157	9.65988E-01	4.61567E+00	9.37794E-01	1.75914E-03	0.00000E+00	0.00000E+00
158	9.11861E-01	4.63950E+00	9.37627E-01	1.75571E-03	0.00000E+00	0.00000E+00
159	9.48924E-01	4.66233E+00	9.37699E-01	1.74598E-03	0.00000E+00	0.00000E+00
160	9.37244E-01	4.68517E+00	9.37696E-01	1.73490E-03	0.00000E+00	0.00000E+00
161	9.26593E-01	4.70983E+00	9.37627E-01	1.72536E-03	0.00000E+00	0.00000E+00
162	9.49352E-01	4.73367E+00	9.37700E-01	1.71611E-03	0.00000E+00	0.00000E+00
163	9.53957E-01	4.75667E+00	9.37801E-01	1.70841E-03	0.00000E+00	0.00000E+00
164	9.49314E-01	4.77950E+00	9.37872E-01	1.69931E-03	0.00000E+00	0.00000E+00
165	9.46746E-01	4.80333E+00	9.37926E-01	1.68973E-03	0.00000E+00	0.00000E+00
166	9.76021E-01	4.82617E+00	9.38159E-01	1.69539E-03	0.00000E+00	0.00000E+00
167	9.42887E-01	4.84900E+00	9.38187E-01	1.68533E-03	0.00000E+00	0.00000E+00
168	9.19916E-01	4.87100E+00	9.38077E-01	1.67875E-03	0.00000E+00	0.00000E+00
169	9.42499E-01	4.89483E+00	9.38104E-01	1.66888E-03	0.00000E+00	0.00000E+00
170	9.67871E-01	4.91767E+00	9.38281E-01	1.66835E-03	0.00000E+00	0.00000E+00
171	9.31285E-01	4.94067E+00	9.38239E-01	1.65897E-03	0.00000E+00	0.00000E+00
172	9.23169E-01	4.96433E+00	9.38151E-01	1.65156E-03	0.00000E+00	0.00000E+00
173	1.00631E+00	4.98633E+00	9.38549E-01	1.68956E-03	0.00000E+00	0.00000E+00
174	9.56174E-01	5.00933E+00	9.38652E-01	1.68283E-03	0.00000E+00	0.00000E+00
175	9.44454E-01	5.03300E+00	9.38685E-01	1.67341E-03	0.00000E+00	0.00000E+00
176	9.28782E-01	5.05683E+00	9.38628E-01	1.66474E-03	0.00000E+00	0.00000E+00
177	9.53540E-01	5.07967E+00	9.38714E-01	1.65739E-03	0.00000E+00	0.00000E+00
178	9.69673E-01	5.10350E+00	9.38890E-01	1.65731E-03	0.00000E+00	0.00000E+00
179	9.65518E-01	5.12650E+00	9.39040E-01	1.65477E-03	0.00000E+00	0.00000E+00
180	9.45176E-01	5.14933E+00	9.39074E-01	1.64581E-03	0.00000E+00	0.00000E+00
181	9.16883E-01	5.17217E+00	9.38950E-01	1.64128E-03	0.00000E+00	0.00000E+00
182	9.24655E-01	5.19600E+00	9.38871E-01	1.63407E-03	0.00000E+00	0.00000E+00
183	9.76833E-01	5.21883E+00	9.39081E-01	1.63849E-03	0.00000E+00	0.00000E+00
184	9.41853E-01	5.24083E+00	9.39096E-01	1.62954E-03	0.00000E+00	0.00000E+00
185	9.45393E-01	5.26467E+00	9.39130E-01	1.62097E-03	0.00000E+00	0.00000E+00
186	9.31129E-01	5.28750E+00	9.39087E-01	1.61272E-03	0.00000E+00	0.00000E+00
187	9.40526E-01	5.31233E+00	9.39095E-01	1.60400E-03	0.00000E+00	0.00000E+00
188	9.19446E-01	5.33600E+00	9.38989E-01	1.59885E-03	0.00000E+00	0.00000E+00
189	9.51800E-01	5.35900E+00	9.39058E-01	1.59175E-03	0.00000E+00	0.00000E+00
190	9.22636E-01	5.38183E+00	9.38970E-01	1.58567E-03	0.00000E+00	0.00000E+00
191	9.66691E-01	5.40467E+00	9.39117E-01	1.58406E-03	0.00000E+00	0.00000E+00
192	9.62568E-01	5.42850E+00	9.39240E-01	1.58053E-03	0.00000E+00	0.00000E+00
193	9.36855E-01	5.45233E+00	9.39228E-01	1.57228E-03	0.00000E+00	0.00000E+00
194	8.67588E-01	5.47700E+00	9.38855E-01	1.60796E-03	0.00000E+00	0.00000E+00
195	9.37215E-01	5.50000E+00	9.38846E-01	1.59963E-03	0.00000E+00	0.00000E+00
196	8.97593E-01	5.52367E+00	9.38634E-01	1.60551E-03	0.00000E+00	0.00000E+00
197	9.06624E-01	5.54667E+00	9.38469E-01	1.60567E-03	0.00000E+00	0.00000E+00
198	9.76595E-01	5.56950E+00	9.38664E-01	1.60925E-03	0.00000E+00	0.00000E+00
199	9.11062E-01	5.59233E+00	9.38524E-01	1.60718E-03	0.00000E+00	0.00000E+00
200	8.97753E-01	5.61617E+00	9.38318E-01	1.61225E-03	0.00000E+00	0.00000E+00
201	9.37698E-01	5.64000E+00	9.38315E-01	1.60413E-03	0.00000E+00	0.00000E+00
202	9.92385E-01	5.66200E+00	9.38585E-01	1.61882E-03	0.00000E+00	0.00000E+00
203	9.69492E-01	5.68583E+00	9.38739E-01	1.61807E-03	0.00000E+00	0.00000E+00
204	9.46732E-01	5.70867E+00	9.38779E-01	1.61053E-03	0.00000E+00	0.00000E+00
205	9.24176E-01	5.73250E+00	9.38707E-01	1.60419E-03	0.00000E+00	0.00000E+00
206	9.67610E-01	5.75533E+00	9.38848E-01	1.60258E-03	0.00000E+00	0.00000E+00
207	9.27192E-01	5.77817E+00	9.38791E-01	1.59576E-03	0.00000E+00	0.00000E+00
208	9.96263E-01	5.80117E+00	9.39070E-01	1.61231E-03	0.00000E+00	0.00000E+00
209	9.44437E-01	5.82483E+00	9.39096E-01	1.60472E-03	0.00000E+00	0.00000E+00
210	9.42144E-01	5.84783E+00	9.39111E-01	1.59705E-03	0.00000E+00	0.00000E+00
211	9.84103E-01	5.87167E+00	9.39326E-01	1.60390E-03	0.00000E+00	0.00000E+00
212	9.27594E-01	5.89533E+00	9.39270E-01	1.59722E-03	0.00000E+00	0.00000E+00

213	9.47447E-01	5.91917E+00	9.39309E-01	1.59011E-03	0.00000E+00	0.00000E+00
214	9.50908E-01	5.94383E+00	9.39364E-01	1.58353E-03	0.00000E+00	0.00000E+00
215	9.58715E-01	5.96683E+00	9.39455E-01	1.57870E-03	0.00000E+00	0.00000E+00
216	9.24961E-01	5.99150E+00	9.39387E-01	1.57276E-03	0.00000E+00	0.00000E+00
217	9.19465E-01	6.01433E+00	9.39294E-01	1.56817E-03	0.00000E+00	0.00000E+00
218	9.71157E-01	6.03817E+00	9.39442E-01	1.56785E-03	0.00000E+00	0.00000E+00
219	9.76932E-01	6.06100E+00	9.39615E-01	1.57014E-03	0.00000E+00	0.00000E+00
220	9.13037E-01	6.08483E+00	9.39493E-01	1.56767E-03	0.00000E+00	0.00000E+00
221	9.41447E-01	6.10867E+00	9.39502E-01	1.56052E-03	0.00000E+00	0.00000E+00
222	9.23828E-01	6.13250E+00	9.39430E-01	1.55504E-03	0.00000E+00	0.00000E+00
223	8.88887E-01	6.15633E+00	9.39202E-01	1.56480E-03	0.00000E+00	0.00000E+00
224	9.14007E-01	6.18100E+00	9.39088E-01	1.56186E-03	0.00000E+00	0.00000E+00
225	9.32980E-01	6.20483E+00	9.39061E-01	1.55508E-03	0.00000E+00	0.00000E+00
226	9.81846E-01	6.22683E+00	9.39252E-01	1.55986E-03	0.00000E+00	0.00000E+00
227	9.68973E-01	6.24867E+00	9.39384E-01	1.55852E-03	0.00000E+00	0.00000E+00
228	8.94740E-01	6.27433E+00	9.39186E-01	1.56413E-03	0.00000E+00	0.00000E+00
229	9.18278E-01	6.29733E+00	9.39094E-01	1.55995E-03	0.00000E+00	0.00000E+00
230	9.44474E-01	6.32017E+00	9.39118E-01	1.55327E-03	0.00000E+00	0.00000E+00
231	9.73623E-01	6.34400E+00	9.39268E-01	1.55380E-03	0.00000E+00	0.00000E+00
232	9.32279E-01	6.36600E+00	9.39238E-01	1.54733E-03	0.00000E+00	0.00000E+00
233	9.49064E-01	6.38967E+00	9.39281E-01	1.54120E-03	0.00000E+00	0.00000E+00
234	9.92940E-01	6.41267E+00	9.39512E-01	1.55187E-03	0.00000E+00	0.00000E+00
235	9.29619E-01	6.43550E+00	9.39469E-01	1.54578E-03	0.00000E+00	0.00000E+00
236	9.30159E-01	6.45933E+00	9.39430E-01	1.53968E-03	0.00000E+00	0.00000E+00
237	8.90670E-01	6.48400E+00	9.39222E-01	1.54709E-03	0.00000E+00	0.00000E+00
238	9.61941E-01	6.50683E+00	9.39318E-01	1.54352E-03	0.00000E+00	0.00000E+00
239	9.84050E-01	6.52983E+00	9.39507E-01	1.54854E-03	0.00000E+00	0.00000E+00
240	9.18877E-01	6.55267E+00	9.39421E-01	1.54446E-03	0.00000E+00	0.00000E+00
241	9.90503E-01	6.57650E+00	9.39634E-01	1.55276E-03	0.00000E+00	0.00000E+00
242	9.16239E-01	6.59933E+00	9.39537E-01	1.54935E-03	0.00000E+00	0.00000E+00
243	9.17816E-01	6.62317E+00	9.39447E-01	1.54554E-03	0.00000E+00	0.00000E+00
244	9.08668E-01	6.64600E+00	9.39319E-01	1.54438E-03	0.00000E+00	0.00000E+00
245	9.68559E-01	6.66983E+00	9.39440E-01	1.54271E-03	0.00000E+00	0.00000E+00
246	9.51985E-01	6.69267E+00	9.39491E-01	1.53724E-03	0.00000E+00	0.00000E+00
247	9.54398E-01	6.71467E+00	9.39552E-01	1.53216E-03	0.00000E+00	0.00000E+00
248	9.23769E-01	6.73850E+00	9.39488E-01	1.52727E-03	0.00000E+00	0.00000E+00
249	9.75270E-01	6.76050E+00	9.39633E-01	1.52795E-03	0.00000E+00	0.00000E+00
250	8.94501E-01	6.78433E+00	9.39451E-01	1.53262E-03	0.00000E+00	0.00000E+00
251	9.48733E-01	6.80800E+00	9.39488E-01	1.52691E-03	0.00000E+00	0.00000E+00
252	9.35980E-01	6.83100E+00	9.39474E-01	1.52085E-03	0.00000E+00	0.00000E+00
253	9.79347E-01	6.85483E+00	9.39633E-01	1.52309E-03	0.00000E+00	0.00000E+00
254	9.10337E-01	6.87850E+00	9.39517E-01	1.52148E-03	0.00000E+00	0.00000E+00
255	9.55501E-01	6.90150E+00	9.39580E-01	1.51677E-03	0.00000E+00	0.00000E+00
256	9.31794E-01	6.92517E+00	9.39549E-01	1.51110E-03	0.00000E+00	0.00000E+00
257	9.50651E-01	6.94817E+00	9.39593E-01	1.50579E-03	0.00000E+00	0.00000E+00
258	9.65015E-01	6.97200E+00	9.39692E-01	1.50318E-03	0.00000E+00	0.00000E+00
259	9.34965E-01	6.99483E+00	9.39674E-01	1.49744E-03	0.00000E+00	0.00000E+00
260	9.30063E-01	7.01867E+00	9.39636E-01	1.49208E-03	0.00000E+00	0.00000E+00
261	9.63928E-01	7.04150E+00	9.39730E-01	1.48927E-03	0.00000E+00	0.00000E+00
262	9.10698E-01	7.06533E+00	9.39618E-01	1.48773E-03	0.00000E+00	0.00000E+00
263	9.55887E-01	7.08917E+00	9.39681E-01	1.48333E-03	0.00000E+00	0.00000E+00
264	9.53464E-01	7.11200E+00	9.39733E-01	1.47859E-03	0.00000E+00	0.00000E+00
265	8.97046E-01	7.13583E+00	9.39571E-01	1.48187E-03	0.00000E+00	0.00000E+00
266	9.28045E-01	7.16050E+00	9.39527E-01	1.47689E-03	0.00000E+00	0.00000E+00
267	9.09391E-01	7.18433E+00	9.39414E-01	1.47570E-03	0.00000E+00	0.00000E+00
268	9.85255E-01	7.20717E+00	9.39586E-01	1.48021E-03	0.00000E+00	0.00000E+00
269	9.32915E-01	7.23100E+00	9.39561E-01	1.47486E-03	0.00000E+00	0.00000E+00
270	9.41335E-01	7.25383E+00	9.39568E-01	1.46937E-03	0.00000E+00	0.00000E+00
271	9.18650E-01	7.27867E+00	9.39490E-01	1.46596E-03	0.00000E+00	0.00000E+00
272	9.50063E-01	7.30233E+00	9.39529E-01	1.46104E-03	0.00000E+00	0.00000E+00
273	9.43201E-01	7.32617E+00	9.39543E-01	1.45570E-03	0.00000E+00	0.00000E+00
274	9.06694E-01	7.34917E+00	9.39422E-01	1.45536E-03	0.00000E+00	0.00000E+00
275	9.51824E-01	7.37200E+00	9.39467E-01	1.45073E-03	0.00000E+00	0.00000E+00
276	9.17806E-01	7.39667E+00	9.39388E-01	1.44759E-03	0.00000E+00	0.00000E+00
277	9.10898E-01	7.42050E+00	9.39285E-01	1.44603E-03	0.00000E+00	0.00000E+00
278	9.52998E-01	7.44333E+00	9.39334E-01	1.44164E-03	0.00000E+00	0.00000E+00
279	9.62492E-01	7.46633E+00	9.39418E-01	1.43886E-03	0.00000E+00	0.00000E+00
280	9.57823E-01	7.49000E+00	9.39484E-01	1.43520E-03	0.00000E+00	0.00000E+00
281	9.39945E-01	7.51383E+00	9.39486E-01	1.43005E-03	0.00000E+00	0.00000E+00
282	9.52223E-01	7.53667E+00	9.39531E-01	1.42566E-03	0.00000E+00	0.00000E+00
283	9.64879E-01	7.55967E+00	9.39621E-01	1.42343E-03	0.00000E+00	0.00000E+00
284	9.70561E-01	7.58350E+00	9.39731E-01	1.42261E-03	0.00000E+00	0.00000E+00
285	9.78155E-01	7.60633E+00	9.39867E-01	1.42407E-03	0.00000E+00	0.00000E+00
286	9.64362E-01	7.62917E+00	9.39953E-01	1.42166E-03	0.00000E+00	0.00000E+00
287	9.11106E-01	7.65300E+00	9.39852E-01	1.42028E-03	0.00000E+00	0.00000E+00
288	8.89182E-01	7.67683E+00	9.39675E-01	1.42635E-03	0.00000E+00	0.00000E+00
289	9.95390E-01	7.69967E+00	9.39869E-01	1.43456E-03	0.00000E+00	0.00000E+00
290	8.88753E-01	7.72350E+00	9.39691E-01	1.44055E-03	0.00000E+00	0.00000E+00
291	9.34134E-01	7.74733E+00	9.39672E-01	1.43569E-03	0.00000E+00	0.00000E+00
292	9.33624E-01	7.77017E+00	9.39651E-01	1.43088E-03	0.00000E+00	0.00000E+00
293	9.16708E-01	7.79400E+00	9.39573E-01	1.42813E-03	0.00000E+00	0.00000E+00
294	8.90530E-01	7.81783E+00	9.39405E-01	1.43311E-03	0.00000E+00	0.00000E+00
295	9.48421E-01	7.84067E+00	9.39435E-01	1.42854E-03	0.00000E+00	0.00000E+00
296	9.39398E-01	7.86450E+00	9.39435E-01	1.42367E-03	0.00000E+00	0.00000E+00
297	9.47277E-01	7.88833E+00	9.39462E-01	1.41909E-03	0.00000E+00	0.00000E+00
298	9.41025E-01	7.91200E+00	9.39467E-01	1.41429E-03	0.00000E+00	0.00000E+00
299	9.29999E-01	7.93500E+00	9.39435E-01	1.40988E-03	0.00000E+00	0.00000E+00
300	9.39157E-01	7.95883E+00	9.39434E-01	1.40515E-03	0.00000E+00	0.00000E+00
301	9.42934E-01	7.98167E+00	9.39446E-01	1.40049E-03	0.00000E+00	0.00000E+00
302	9.39666E-01	8.00450E+00	9.39447E-01	1.39581E-03	0.00000E+00	0.00000E+00
303	9.31815E-01	8.02733E+00	9.39421E-01	1.39140E-03	0.00000E+00	0.00000E+00
304	9.46213E-01	8.05117E+00	9.39444E-01	1.38697E-03	0.00000E+00	0.00000E+00
305	9.14904E-01	8.07600E+00	9.39363E-01	1.38475E-03	0.00000E+00	0.00000E+00
306	9.23716E-01	8.09967E+00	9.39311E-01	1.38115E-03	0.00000E+00	0.00000E+00
307	9.45717E-01	8.12267E+00	9.39332E-01	1.37677E-03	0.00000E+00	0.00000E+00
308	9.63413E-01	8.14467E+00	9.39411E-01	1.37452E-03	0.00000E+00	0.00000E+00
309	9.18006E-01	8.16833E+00	9.39341E-01	1.37181E-03	0.00000E+00	0.00000E+00
310	8.92698E-01	8.19217E+00	9.39190E-01	1.37571E-03	0.00000E+00	0.00000E+00
311	9.67557E-01	8.21500E+00	9.39282E-01	1.37432E-03	0.00000E+00	0.00000E+00
312	9.57126E-01	8.23800E+00	9.39339E-01	1.37109E-03	0.00000E+00	0.00000E+00
313	9.31290E-01	8.26083E+00	9.39313E-01	1.36692E-03	0.00000E+00	0.00000E+00
314	9.44222E-01	8.28467E+00	9.39329E-01	1.36262E-03	0.00000E+00	0.00000E+00
315	9.41217E-01	8.30750E+00	9.39335E-01	1.35827E-03	0.00000E+00	0.00000E+00
316	9.53593E-01	8.33133E+00	9.39381E-01	1.35470E-03	0.00000E+00	0.00000E+00
317	9.31452E-01	8.35417E+00	9.39355E-01	1.35063E-03	0.00000E+00	0.00000E+00
318	9.08266E-01	8.37717E+00	9.39257E-01	1.34994E-03	0.00000E+00	0.00000E+00
319	9.37460E-01	8.40083E+00	9.39251E-01	1.34568E-03	0.00000E+00	0.00000E+00

320	9.38285E-01	8.42467E+00	9.39248E-01	1.34145E-03	0.00000E+00	0.00000E+00
321	9.13572E-01	8.44767E+00	9.39168E-01	1.33966E-03	0.00000E+00	0.00000E+00
322	9.49265E-01	8.47133E+00	9.39199E-01	1.33584E-03	0.00000E+00	0.00000E+00
323	9.39618E-01	8.49517E+00	9.39201E-01	1.33167E-03	0.00000E+00	0.00000E+00
324	9.11437E-01	8.51983E+00	9.39114E-01	1.33032E-03	0.00000E+00	0.00000E+00
325	9.97960E-01	8.54283E+00	9.39297E-01	1.33865E-03	0.00000E+00	0.00000E+00
326	9.52573E-01	8.56567E+00	9.39338E-01	1.33515E-03	0.00000E+00	0.00000E+00
327	9.20705E-01	8.58950E+00	9.39280E-01	1.33226E-03	0.00000E+00	0.00000E+00
328	9.07825E-01	8.61333E+00	9.39184E-01	1.33167E-03	0.00000E+00	0.00000E+00
329	9.31026E-01	8.63717E+00	9.39159E-01	1.32783E-03	0.00000E+00	0.00000E+00
330	9.70184E-01	8.66000E+00	9.39253E-01	1.32715E-03	0.00000E+00	0.00000E+00
331	9.42351E-01	8.68283E+00	9.39263E-01	1.32314E-03	0.00000E+00	0.00000E+00
332	9.50763E-01	8.70667E+00	9.39298E-01	1.31959E-03	0.00000E+00	0.00000E+00
333	9.82450E-01	8.72867E+00	9.39428E-01	1.32204E-03	0.00000E+00	0.00000E+00
334	9.18881E-01	8.75250E+00	9.39366E-01	1.31950E-03	0.00000E+00	0.00000E+00
335	9.38450E-01	8.77533E+00	9.39363E-01	1.31554E-03	0.00000E+00	0.00000E+00
336	9.21143E-01	8.79917E+00	9.39309E-01	1.31273E-03	0.00000E+00	0.00000E+00
337	9.14949E-01	8.82383E+00	9.39236E-01	1.31082E-03	0.00000E+00	0.00000E+00
338	9.36758E-01	8.84667E+00	9.39229E-01	1.30693E-03	0.00000E+00	0.00000E+00
339	9.45463E-01	8.87050E+00	9.39247E-01	1.30318E-03	0.00000E+00	0.00000E+00
340	9.28761E-01	8.89333E+00	9.39216E-01	1.29969E-03	0.00000E+00	0.00000E+00
341	9.07910E-01	8.91717E+00	9.39124E-01	1.29914E-03	0.00000E+00	0.00000E+00
342	9.27775E-01	8.94100E+00	9.39091E-01	1.29574E-03	0.00000E+00	0.00000E+00
343	9.24335E-01	8.96483E+00	9.39047E-01	1.29266E-03	0.00000E+00	0.00000E+00
344	9.34777E-01	8.98683E+00	9.39035E-01	1.28893E-03	0.00000E+00	0.00000E+00
345	9.43687E-01	9.00967E+00	9.39048E-01	1.28524E-03	0.00000E+00	0.00000E+00
346	9.11846E-01	9.03433E+00	9.38969E-01	1.28394E-03	0.00000E+00	0.00000E+00
347	9.10129E-01	9.05817E+00	9.38886E-01	1.28294E-03	0.00000E+00	0.00000E+00
348	9.22555E-01	9.08283E+00	9.38838E-01	1.28009E-03	0.00000E+00	0.00000E+00
349	9.21278E-01	9.10667E+00	9.38788E-01	1.27740E-03	0.00000E+00	0.00000E+00
350	9.46399E-01	9.12967E+00	9.38810E-01	1.27392E-03	0.00000E+00	0.00000E+00
351	9.41957E-01	9.15250E+00	9.38819E-01	1.27029E-03	0.00000E+00	0.00000E+00
352	9.43312E-01	9.17533E+00	9.38832E-01	1.26672E-03	0.00000E+00	0.00000E+00
353	9.44722E-01	9.19917E+00	9.38848E-01	1.26322E-03	0.00000E+00	0.00000E+00
354	9.21439E-01	9.22383E+00	9.38799E-01	1.26060E-03	0.00000E+00	0.00000E+00
355	9.33778E-01	9.24683E+00	9.38785E-01	1.25710E-03	0.00000E+00	0.00000E+00
356	9.41920E-01	9.27150E+00	9.38794E-01	1.25358E-03	0.00000E+00	0.00000E+00
357	9.32474E-01	9.29433E+00	9.38776E-01	1.25017E-03	0.00000E+00	0.00000E+00
358	9.79291E-01	9.31717E+00	9.38890E-01	1.25183E-03	0.00000E+00	0.00000E+00
359	9.55704E-01	9.34100E+00	9.38937E-01	1.24921E-03	0.00000E+00	0.00000E+00
360	9.57182E-01	9.36400E+00	9.38988E-01	1.24676E-03	0.00000E+00	0.00000E+00
361	9.53013E-01	9.38683E+00	9.39027E-01	1.24389E-03	0.00000E+00	0.00000E+00
362	9.07709E-01	9.41067E+00	9.38940E-01	1.24348E-03	0.00000E+00	0.00000E+00
363	9.61226E-01	9.43350E+00	9.39001E-01	1.24157E-03	0.00000E+00	0.00000E+00
364	9.06823E-01	9.45733E+00	9.38913E-01	1.24132E-03	0.00000E+00	0.00000E+00
365	9.23508E-01	9.48117E+00	9.38870E-01	1.23862E-03	0.00000E+00	0.00000E+00
366	9.59195E-01	9.50400E+00	9.38926E-01	1.23648E-03	0.00000E+00	0.00000E+00
367	9.34420E-01	9.52783E+00	9.38914E-01	1.23315E-03	0.00000E+00	0.00000E+00
368	9.68963E-01	9.55067E+00	9.38996E-01	1.23251E-03	0.00000E+00	0.00000E+00
369	9.50643E-01	9.57450E+00	9.39027E-01	1.22956E-03	0.00000E+00	0.00000E+00
370	9.54914E-01	9.59733E+00	9.39071E-01	1.22697E-03	0.00000E+00	0.00000E+00
371	9.46119E-01	9.62033E+00	9.39090E-01	1.22379E-03	0.00000E+00	0.00000E+00
372	9.34350E-01	9.64317E+00	9.39077E-01	1.22054E-03	0.00000E+00	0.00000E+00
373	8.95746E-01	9.66783E+00	9.38960E-01	1.22284E-03	0.00000E+00	0.00000E+00
374	9.14995E-01	9.69067E+00	9.38896E-01	1.22125E-03	0.00000E+00	0.00000E+00
375	9.25020E-01	9.71367E+00	9.38858E-01	1.21854E-03	0.00000E+00	0.00000E+00
376	9.52837E-01	9.73750E+00	9.38896E-01	1.21585E-03	0.00000E+00	0.00000E+00
377	9.06733E-01	9.76033E+00	9.38810E-01	1.21563E-03	0.00000E+00	0.00000E+00
378	9.26923E-01	9.78417E+00	9.38778E-01	1.21281E-03	0.00000E+00	0.00000E+00
379	9.48775E-01	9.80700E+00	9.38805E-01	1.20988E-03	0.00000E+00	0.00000E+00
380	9.03598E-01	9.83083E+00	9.38712E-01	1.21026E-03	0.00000E+00	0.00000E+00
381	9.09665E-01	9.85467E+00	9.38635E-01	1.20950E-03	0.00000E+00	0.00000E+00
382	9.40097E-01	9.87833E+00	9.38639E-01	1.20631E-03	0.00000E+00	0.00000E+00
383	9.67118E-01	9.90033E+00	9.38714E-01	1.20546E-03	0.00000E+00	0.00000E+00
384	9.08400E-01	9.92417E+00	9.38634E-01	1.20492E-03	0.00000E+00	0.00000E+00
385	9.35608E-01	9.94700E+00	9.38627E-01	1.20180E-03	0.00000E+00	0.00000E+00
386	9.36297E-01	9.97083E+00	9.38620E-01	1.19868E-03	0.00000E+00	0.00000E+00
387	9.42066E-01	9.99367E+00	9.38629E-01	1.19559E-03	0.00000E+00	0.00000E+00
388	9.35191E-01	1.00175E+01	9.38621E-01	1.19253E-03	0.00000E+00	0.00000E+00
389	8.97222E-01	1.00413E+01	9.38514E-01	1.19424E-03	0.00000E+00	0.00000E+00
390	9.30595E-01	1.00642E+01	9.38493E-01	1.19133E-03	0.00000E+00	0.00000E+00
391	9.25689E-01	1.00880E+01	9.38460E-01	1.18872E-03	0.00000E+00	0.00000E+00
392	9.62236E-01	1.01128E+01	9.38521E-01	1.18724E-03	0.00000E+00	0.00000E+00
393	9.65988E-01	1.01365E+01	9.38591E-01	1.18628E-03	0.00000E+00	0.00000E+00
394	9.54448E-01	1.01585E+01	9.38632E-01	1.18394E-03	0.00000E+00	0.00000E+00
395	9.72413E-01	1.01813E+01	9.38718E-01	1.18405E-03	0.00000E+00	0.00000E+00
396	9.49476E-01	1.02043E+01	9.38745E-01	1.18135E-03	0.00000E+00	0.00000E+00
397	9.28210E-01	1.02282E+01	9.38718E-01	1.17866E-03	0.00000E+00	0.00000E+00
398	9.87399E-01	1.02518E+01	9.38841E-01	1.18209E-03	0.00000E+00	0.00000E+00
399	9.36637E-01	1.02757E+01	9.38836E-01	1.17912E-03	0.00000E+00	0.00000E+00
400	9.34826E-01	1.02985E+01	9.38826E-01	1.17620E-03	0.00000E+00	0.00000E+00
401	8.83044E-01	1.03233E+01	9.38686E-01	1.18155E-03	0.00000E+00	0.00000E+00
402	9.58315E-01	1.03462E+01	9.38735E-01	1.17961E-03	0.00000E+00	0.00000E+00
403	9.47168E-01	1.03690E+01	9.38756E-01	1.17685E-03	0.00000E+00	0.00000E+00
404	9.40690E-01	1.03928E+01	9.38761E-01	1.17393E-03	0.00000E+00	0.00000E+00
405	9.24255E-01	1.04167E+01	9.38725E-01	1.17157E-03	0.00000E+00	0.00000E+00
406	9.26128E-01	1.04395E+01	9.38694E-01	1.16908E-03	0.00000E+00	0.00000E+00
407	9.04208E-01	1.04643E+01	9.38609E-01	1.16930E-03	0.00000E+00	0.00000E+00
408	9.22815E-01	1.04880E+01	9.38570E-01	1.16706E-03	0.00000E+00	0.00000E+00
409	9.67198E-01	1.05110E+01	9.38640E-01	1.16631E-03	0.00000E+00	0.00000E+00
410	9.27545E-01	1.05348E+01	9.38613E-01	1.16377E-03	0.00000E+00	0.00000E+00
411	9.17396E-01	1.05577E+01	9.38561E-01	1.16208E-03	0.00000E+00	0.00000E+00
412	9.41994E-01	1.05805E+01	9.38569E-01	1.15927E-03	0.00000E+00	0.00000E+00
413	9.31300E-01	1.06043E+01	9.38552E-01	1.15658E-03	0.00000E+00	0.00000E+00
414	9.43036E-01	1.06282E+01	9.38563E-01	1.15382E-03	0.00000E+00	0.00000E+00
415	1.00201E+00	1.06510E+01	9.38716E-01	1.16123E-03	0.00000E+00	0.00000E+00
416	9.21520E-01	1.06748E+01	9.38675E-01	1.15917E-03	0.00000E+00	0.00000E+00
417	9.34770E-01	1.06987E+01	9.38665E-01	1.15641E-03	0 00000E+00	0.00000E+00
418	9.07589E-01	1.07225E+01	9.38590E-01	1 15604E-03	0.00000E+00	0.00000E+00
419	9.08249E-01	1.07462E+01	9.38518E-01	1.15556E-03	0.00000E+00	0.00000E+00
420	9.46312E-01	1.07710E+01	9.38536E-01	1.15294E-03	0.00000E+00	0.00000E+00
421	9.58714E-01	1.07938E+01	9.38585E-01	1.15120E-03	0.00000E+00	0.00000E+00
422	9.00820E-01	1.08185E+01	9.38495E-01	1.15197E-03	0.00000E+00	0.00000E+00
423	9.37089E-01	1.08415E+01	9.38491E-01	1.14923E-03	0.00000E+00	0.00000E+00
424	9.86161E-01	1.08633E+01	9.38604E-01	1.15206E-03	0.00000E+00	0.00000E+00
425	9.77884E-01	1.08863E+01	9.38697E-01	1.15307E-03	0.00000E+00	0.00000E+00
426	9.66077E-01	1 09092E+01	9.38762E-01	1.15216E-03	0.00000E+00	0.00000E+00
427	9.48712E-01	1.09320E+01	9.38785E-01	1.14969E-03	0.00000E+00	0.00000E+00

428	9.68704E-01	1.09558E+01	9.38855E-01	1.14913E-03	0.00000E+00	0.00000E+00
429	9.55306E-01	1.09787E+01	9.38894E-01	1.14709E-03	0.00000E+00	0.00000E+00
430	9.19911E-01	1.10035E+01	9.38849E-01	1.14526E-03	0.00000E+00	0.00000E+00
431	9.27123E-01	1.10263E+01	9.38822E-01	1.14292E-03	0.00000E+00	0.00000E+00
432	9.99755E-01	1.10492E+01	9.38964E-01	1.14903E-03	0.00000E+00	0.00000E+00
433	9.60097E-01	1.10730E+01	9.39013E-01	1.14741E-03	0.00000E+00	0.00000E+00
434	9.31431E-01	1.10977E+01	9.38995E-01	1.14488E-03	0.00000E+00	0.00000E+00
435	9.24593E-01	1.11215E+01	9.38962E-01	1.14272E-03	0.00000E+00	0.00000E+00
436	9.46137E-01	1.11445E+01	9.38979E-01	1.14020E-03	0.00000E+00	0.00000E+00
437	9.50072E-01	1.11673E+01	9.39004E-01	1.13786E-03	0.00000E+00	0.00000E+00
438	9.50420E-01	1.11902E+01	9.39030E-01	1.13555E-03	0.00000E+00	0.00000E+00
439	9.15100E-01	1.12150E+01	9.38976E-01	1.13427E-03	0.00000E+00	0.00000E+00
440	9.56027E-01	1.12387E+01	9.39014E-01	1.13235E-03	0.00000E+00	0.00000E+00
441	9.57646E-01	1.12625E+01	9.39057E-01	1.13057E-03	0.00000E+00	0.00000E+00
442	9.46629E-01	1.12863E+01	9.39074E-01	1.12812E-03	0.00000E+00	0.00000E+00
443	9.42689E-01	1.13102E+01	9.39082E-01	1.12559E-03	0.00000E+00	0.00000E+00
444	9.06844E-01	1.13340E+01	9.39009E-01	1.12541E-03	0.00000E+00	0.00000E+00
445	8.90291E-01	1.13587E+01	9.38899E-01	1.12824E-03	0.00000E+00	0.00000E+00
446	9.33697E-01	1.13825E+01	9.38888E-01	1.12576E-03	0.00000E+00	0.00000E+00
447	9.54983E-01	1.14053E+01	9.38924E-01	1.12381E-03	0.00000E+00	0.00000E+00
448	9.69413E-01	1.14292E+01	9.38992E-01	1.12337E-03	0.00000E+00	0.00000E+00
449	9.71913E-01	1.14520E+01	9.39066E-01	1.12327E-03	0.00000E+00	0.00000E+00
450	9.31640E-01	1.14767E+01	9.39049E-01	1.12088E-03	0.00000E+00	0.00000E+00
451	9.08462E-01	1.14997E+01	9.38981E-01	1.12045E-03	0.00000E+00	0.00000E+00
452	9.55838E-01	1.15235E+01	9.39019E-01	1.11859E-03	0.00000E+00	0.00000E+00
453	8.95889E-01	1.15463E+01	9.38923E-01	1.12019E-03	0.00000E+00	0.00000E+00
454	9.18999E-01	1.15702E+01	9.38879E-01	1.11858E-03	0.00000E+00	0.00000E+00
455	8.80548E-01	1.15938E+01	9.38750E-01	1.12351E-03	0.00000E+00	0.00000E+00
456	9.27797E-01	1.16177E+01	9.38726E-01	1.12129E-03	0.00000E+00	0.00000E+00
457	9.22671E-01	1.16415E+01	9.38691E-01	1.11938E-03	0.00000E+00	0.00000E+00
458	9.66367E-01	1.16653E+01	9.38751E-01	1.11857E-03	0.00000E+00	0.00000E+00
459	9.26899E-01	1.16900E+01	9.38725E-01	1.11643E-03	0.00000E+00	0.00000E+00
460	8.95283E-01	1.17138E+01	9.38631E-01	1.11802E-03	0.00000E+00	0.00000E+00
461	9.08385E-01	1.17377E+01	9.38565E-01	1.11752E-03	0.00000E+00	0.00000E+00
462	9.46708E-01	1.17605E+01	9.38582E-01	1.11523E-03	0.00000E+00	0.00000E+00
463	9.07869E-01	1.17852E+01	9.38516E-01	1.11480E-03	0.00000E+00	0.00000E+00
464	8.98300E-01	1.18082E+01	9.38429E-01	1.11579E-03	0.00000E+00	0.00000E+00
465	9.45685E-01	1.18320E+01	9.38444E-01	1.11348E-03	0.00000E+00	0.00000E+00
466	9.61955E-01	1.18567E+01	9.38495E-01	1.11224E-03	0.00000E+00	0.00000E+00
467	8.89168E-01	1.18805E+01	9.38389E-01	1.11490E-03	0.00000E+00	0.00000E+00
468	9.54388E-01	1.19033E+01	9.38423E-01	1.11303E-03	0.00000E+00	0.00000E+00
469	9.26787E-01	1.19272E+01	9.38398E-01	1.11093E-03	0.00000E+00	0.00000E+00
470	9.01678E-01	1.19510E+01	9.38320E-01	1.11133E-03	0.00000E+00	0.00000E+00
471	9.50547E-01	1.19738E+01	9.38346E-01	1.10926E-03	0.00000E+00	0.00000E+00
472	9.52515E-01	1.19967E+01	9.38376E-01	1.10731E-03	0.00000E+00	0.00000E+00
473	9.44461E-01	1.20195E+01	9.38389E-01	1.10503E-03	0.00000E+00	0.00000E+00
474	9.10779E-01	1.20443E+01	9.38331E-01	1.10424E-03	0.00000E+00	0.00000E+00
475	8.98324E-01	1.20682E+01	9.38246E-01	1.10514E-03	0.00000E+00	0.00000E+00
476	9.83666E-01	1.20910E+01	9.38342E-01	1.10696E-03	0.00000E+00	0.00000E+00
477	9.23606E-01	1.21148E+01	9.38311E-01	1.10506E-03	0.00000E+00	0.00000E+00
478	9.53784E-01	1.21377E+01	9.38343E-01	1.10322E-03	0.00000E+00	0.00000E+00
479	9.16858E-01	1.21623E+01	9.38298E-01	1.10183E-03	0.00000E+00	0.00000E+00
480	9.49425E-01	1.21853E+01	9.38322E-01	1.09976E-03	0.00000E+00	0.00000E+00
481	8.95088E-01	1.22090E+01	9.38231E-01	1.10117E-03	0.00000E+00	0.00000E+00
482	9.06154E-01	1.22328E+01	9.38165E-01	1.10090E-03	0.00000E+00	0.00000E+00
483	9.79822E-01	1.22548E+01	9.38251E-01	1.10202E-03	0.00000E+00	0.00000E+00
484	9.26159E-01	1.22787E+01	9.38226E-01	1.10002E-03	0.00000E+00	0.00000E+00
485	9.45075E-01	1.23007E+01	9.38240E-01	1.09783E-03	0.00000E+00	0.00000E+00
486	9.68298E-01	1.23235E+01	9.38302E-01	1.09732E-03	0.00000E+00	0.00000E+00
487	9.34389E-01	1.23473E+01	9.38294E-01	1.09508E-03	0.00000E+00	0.00000E+00
488	9.55932E-01	1.23702E+01	9.38331E-01	1.09343E-03	0.00000E+00	0.00000E+00
489	9.07645E-01	1.23948E+01	9.38268E-01	1.09300E-03	0.00000E+00	0.00000E+00
490	9.57325E-01	1.24178E+01	9.38307E-01	1.09146E-03	0.00000E+00	0.00000E+00
491	9.02099E-01	1.24425E+01	9.38233E-01	1.09174E-03	0.00000E+00	0.00000E+00
492	9.82575E-01	1.24645E+01	9.38323E-01	1.09326E-03	0.00000E+00	0.00000E+00
493	9.51446E-01	1.24873E+01	9.38350E-01	1.09136E-03	0.00000E+00	0.00000E+00
494	9.53624E-01	1.25120E+01	9.38381E-01	1.08958E-03	0.00000E+00	0.00000E+00
495	9.79774E-01	1.25340E+01	9.38465E-01	1.09060E-03	0.00000E+00	0.00000E+00
496	9.54342E-01	1.25570E+01	9.38497E-01	1.08887E-03	0.00000E+00	0.00000E+00
497	9.28966E-01	1.25807E+01	9.38478E-01	1.08684E-03	0.00000E+00	0.00000E+00
498	9.59628E-01	1.26037E+01	9.38520E-01	1.08548E-03	0.00000E+00	0.00000E+00
499	9.19447E-01	1.26275E+01	9.38482E-01	1.08397E-03	0.00000E+00	0.00000E+00
500	9.11680E-01	1.26512E+01	9.38428E-01	1.08313E-03	0.00000E+00	0.00000E+00
501	9.70748E-01	1.26750E+01	9.38493E-01	1.08290E-03	0.00000E+00	0.00000E+00
502	9.27489E-01	1.26988E+01	9.38471E-01	1.08096E-03	0.00000E+00	0.00000E+00
503	9.69445E-01	1.27217E+01	9.38533E-01	1.08057E-03	0.00000E+00	0.00000E+00
504	9.34773E-01	1.27465E+01	9.38525E-01	1.07844E-03	0.00000E+00	0.00000E+00
505	9.15393E-01	1.27693E+01	9.38479E-01	1.07727E-03	0.00000E+00	0.00000E+00
506	9.31199E-01	1.27932E+01	9.38465E-01	1.07523E-03	0.00000E+00	0.00000E+00
507	9.25936E-01	1.28160E+01	9.38440E-01	1.07339E-03	0.00000E+00	0.00000E+00
508	9.49934E-01	1.28388E+01	9.38463E-01	1.07150E-03	0.00000E+00	0.00000E+00
509	9.35312E-01	1.28627E+01	9.38456E-01	1.06941E-03	0.00000E+00	0.00000E+00
510	9.42506E-01	1.28855E+01	9.38464E-01	1.06733E-03	0.00000E+00	0.00000E+00
511	8.88290E-01	1.29103E+01	9.38366E-01	1.06978E-03	0.00000E+00	0.00000E+00
512	9.33835E-01	1.29332E+01	9.38357E-01	1.06772E-03	0.00000E+00	0.00000E+00
513	9.12717E-01	1.29570E+01	9.38307E-01	1.06681E-03	0.00000E+00	0.00000E+00
514	9.74707E-01	1.29790E+01	9.38378E-01	1.06709E-03	0.00000E+00	0.00000E+00
515	9.28346E-01	1.30027E+01	9.38358E-01	1.06519E-03	0.00000E+00	0.00000E+00
516	9.28062E-01	1.30257E+01	9.38338E-01	1.06330E-03	0.00000E+00	0.00000E+00
517	9.40332E-01	1.30495E+01	9.38342E-01	1.06124E-03	0.00000E+00	0.00000E+00
518	9.43171E-01	1.30732E+01	9.38352E-01	1.05923E-03	0.00000E+00	0.00000E+00
519	9.33438E-01	1.30962E+01	9.38342E-01	1.05722E-03	0.00000E+00	0.00000E+00
520	9.40989E-01	1.31190E+01	9.38347E-01	1.05519E-03	0.00000E+00	0.00000E+00
521	9.27610E-01	1.31428E+01	9.38326E-01	1.05336E-03	0.00000E+00	0.00000E+00
522	9.55027E-01	1.31657E+01	9.38359E-01	1.05182E-03	0.00000E+00	0.00000E+00
523	9.49024E-01	1.31885E+01	9.38379E-01	1.05000E-03	0.00000E+00	0.00000E+00
524	9.45034E-01	1.32123E+01	9.38392E-01	1.04806E-03	0.00000E+00	0.00000E+00
525	9.57488E-01	1.32343E+01	9.38428E-01	1.04669E-03	0.00000E+00	0.00000E+00
526	8.88605E-01	1.32582E+01	9.38333E-01	1.04901E-03	0.00000E+00	0.00000E+00
527	9.01363E-01	1.32820E+01	9.38263E-01	1.04938E-03	0.00000E+00	0.00000E+00
528	9.01442E-01	1.33058E+01	9.38193E-01	1.04972E-03	0.00000E+00	0.00000E+00
529	9.02342E-01	1.33295E+01	9.38125E-01	1.04993E-03	0.00000E+00	0.00000E+00
530	9.69731E-01	1.33525E+01	9.38185E-01	1.04965E-03	0.00000E+00	0.00000E+00
531	9.54672E-01	1.33753E+01	9.38216E-01	1.04813E-03	0.00000E+00	0.00000E+00
532	9.20068E-01	1.33982E+01	9.38182E-01	1.04671E-03	0.00000E+00	0.00000E+00
533	9.40693E-01	1.34220E+01	9.38186E-01	1.04474E-03	0.00000E+00	0.00000E+00
534	9.40306E-01	1.34458E+01	9.38190E-01	1.04279E-03	0.00000E+00	0.00000E+00
535	9.13337E-01	1.34705E+01	9.38144E-01	1.04187E-03	0.00000E+00	0.00000E+00

536	9.35768E-01	1.34943E+01	9.38139E-01	1.03993E-03	0.00000E+00	0.00000E+00
537	9.27914E-01	1.35182E+01	9.38120E-01	1.03816E-03	0.00000E+00	0.00000E+00
538	9.12905E-01	1.35428E+01	9.38073E-01	1.03729E-03	0.00000E+00	0.00000E+00
539	9.57329E-01	1.35657E+01	9.38109E-01	1.03597E-03	0.00000E+00	0.00000E+00
540	9.42952E-01	1.35887E+01	9.38118E-01	1.03409E-03	0.00000E+00	0.00000E+00
541	9.01678E-01	1.36133E+01	9.38050E-01	1.03438E-03	0.00000E+00	0.00000E+00
542	9.52520E-01	1.36362E+01	9.38077E-01	1.03281E-03	0.00000E+00	0.00000E+00
543	9.40350E-01	1.36592E+01	9.38081E-01	1.03091E-03	0.00000E+00	0.00000E+00
544	9.69920E-01	1.36820E+01	9.38140E-01	1.03068E-03	0.00000E+00	0.00000E+00
545	9.72675E-01	1.37048E+01	9.38204E-01	1.03074E-03	0.00000E+00	0.00000E+00
546	9.82117E-01	1.37287E+01	9.38284E-01	1.03201E-03	0.00000E+00	0.00000E+00
547	9.36257E-01	1.37515E+01	9.38281E-01	1.03012E-03	0.00000E+00	0.00000E+00
548	9.29249E-01	1.37753E+01	9.38264E-01	1.02836E-03	0.00000E+00	0.00000E+00
549	9.15145E-01	1.37983E+01	9.38222E-01	1.02735E-03	0.00000E+00	0.00000E+00
550	9.28437E-01	1.38220E+01	9.38204E-01	1.02563E-03	0.00000E+00	0.00000E+00
551	9.42862E-01	1.38458E+01	9.38212E-01	1.02380E-03	0.00000E+00	0.00000E+00
552	9.34042E-01	1.38697E+01	9.38205E-01	1.02196E-03	0.00000E+00	0.00000E+00
553	9.14296E-01	1.38935E+01	9.38161E-01	1.02103E-03	0.00000E+00	0.00000E+00
554	9.69382E-01	1.39163E+01	9.38218E-01	1.02074E-03	0.00000E+00	0.00000E+00
555	9.13431E-01	1.39392E+01	9.38173E-01	1.01988E-03	0.00000E+00	0.00000E+00
556	9.45486E-01	1.39612E+01	9.38186E-01	1.01812E-03	0.00000E+00	0.00000E+00
557	9.59166E-01	1.39850E+01	9.38224E-01	1.01699E-03	0.00000E+00	0.00000E+00
558	9.87518E-01	1.40070E+01	9.38313E-01	1.01902E-03	0.00000E+00	0.00000E+00
559	9.28154E-01	1.40308E+01	9.38295E-01	1.01736E-03	0.00000E+00	0.00000E+00
560	9.29636E-01	1.40545E+01	9.38279E-01	1.01565E-03	0.00000E+00	0.00000E+00
561	9.68078E-01	1.40775E+01	9.38332E-01	1.01523E-03	0.00000E+00	0.00000E+00
562	9.30675E-01	1.41013E+01	9.38319E-01	1.01351E-03	0.00000E+00	0.00000E+00
563	9.13440E-01	1.41250E+01	9.38274E-01	1.01267E-03	0.00000E+00	0.00000E+00
564	9.45130E-01	1.41470E+01	9.38287E-01	1.01094E-03	0.00000E+00	0.00000E+00
565	9.26970E-01	1.41708E+01	9.38266E-01	1.00935E-03	0.00000E+00	0.00000E+00
566	9.29468E-01	1.41947E+01	9.38251E-01	1.00768E-03	0.00000E+00	0.00000E+00
567	9.07029E-01	1.42193E+01	9.38196E-01	1.00741E-03	0.00000E+00	0.00000E+00
568	9.11395E-01	1.42432E+01	9.38148E-01	1.00674E-03	0.00000E+00	0.00000E+00
569	9.36097E-01	1.42660E+01	9.38145E-01	1.00497E-03	0.00000E+00	0.00000E+00
570	9.77811E-01	1.42898E+01	9.38214E-01	1.00563E-03	0.00000E+00	0.00000E+00
571	9.54758E-01	1.43127E+01	9.38244E-01	1.00428E-03	0.00000E+00	0.00000E+00
572	9.47146E-01	1.43357E+01	9.38259E-01	1.00264E-03	0.00000E+00	0.00000E+00
573	9.28991E-01	1.43585E+01	9.38243E-01	1.00101E-03	0.00000E+00	0.00000E+00
574	8.87358E-01	1.43823E+01	9.38154E-01	1.00321E-03	0.00000E+00	0.00000E+00
575	9.75028E-01	1.44052E+01	9.38218E-01	1.00352E-03	0.00000E+00	0.00000E+00
576	9.77525E-01	1.44272E+01	9.38287E-01	1.00411E-03	0.00000E+00	0.00000E+00
577	9.18977E-01	1.44518E+01	9.38253E-01	1.00293E-03	0.00000E+00	0.00000E+00
578	9.32075E-01	1.44748E+01	9.38243E-01	1.00124E-03	0.00000E+00	0.00000E+00
579	9.25098E-01	1.44977E+01	9.38220E-01	9.99764E-04	0.00000E+00	0.00000E+00
580	9.21433E-01	1.45223E+01	9.38191E-01	9.98456E-04	0.00000E+00	0.00000E+00
581	9.40642E-01	1.45452E+01	9.38195E-01	9.96739E-04	0.00000E+00	0.00000E+00
582	9.79132E-01	1.45682E+01	9.38266E-01	9.97519E-04	0.00000E+00	0.00000E+00
583	9.82711E-01	1.45910E+01	9.38342E-01	9.98734E-04	0.00000E+00	0.00000E+00
584	9.41636E-01	1.46138E+01	9.38348E-01	9.97033E-04	0.00000E+00	0.00000E+00
585	9.32929E-01	1.46377E+01	9.38338E-01	9.95365E-04	0.00000E+00	0.00000E+00
586	9.42901E-01	1.46615E+01	9.38346E-01	9.93690E-04	0.00000E+00	0.00000E+00
587	9.11376E-01	1.46853E+01	9.38300E-01	9.93060E-04	0.00000E+00	0.00000E+00
588	9.65887E-01	1.47073E+01	9.38347E-01	9.92481E-04	0.00000E+00	0.00000E+00
589	9.68138E-01	1.47310E+01	9.38398E-01	9.92088E-04	0.00000E+00	0.00000E+00
590	9.36696E-01	1.47548E+01	9.38395E-01	9.90404E-04	0.00000E+00	0.00000E+00
591	8.92257E-01	1.47797E+01	9.38317E-01	9.91819E-04	0.00000E+00	0.00000E+00
592	9.52667E-01	1.48033E+01	9.38341E-01	9.90435E-04	0.00000E+00	0.00000E+00
593	1.01253E+00	1.48263E+01	9.38467E-01	9.96694E-04	0.00000E+00	0.00000E+00
594	9.72563E-01	1.48492E+01	9.38524E-01	9.96674E-04	0.00000E+00	0.00000E+00
595	9.46801E-01	1.48712E+01	9.38538E-01	9.95090E-04	0.00000E+00	0.00000E+00
596	9.15585E-01	1.48950E+01	9.38499E-01	9.94164E-04	0.00000E+00	0.00000E+00
597	9.18616E-01	1.49187E+01	9.38466E-01	9.93055E-04	0.00000E+00	0.00000E+00
598	9.29666E-01	1.49425E+01	9.38451E-01	9.91497E-04	0.00000E+00	0.00000E+00
599	8.82997E-01	1.49663E+01	9.38358E-01	9.94184E-04	0.00000E+00	0.00000E+00
600	9.96421E-01	1.49892E+01	9.38455E-01	9.97258E-04	0.00000E+00	0.00000E+00
601	9.49348E-01	1.50122E+01	9.38474E-01	9.95757E-04	0.00000E+00	0.00000E+00
602	9.30217E-01	1.50358E+01	9.38460E-01	9.94192E-04	0.00000E+00	0.00000E+00
603	9.20505E-01	1.50588E+01	9.38430E-01	9.92986E-04	0.00000E+00	0.00000E+00
604	9.56219E-01	1.50817E+01	9.38460E-01	9.91775E-04	0.00000E+00	0.00000E+00
605	9.85087E-01	1.51045E+01	9.38537E-01	9.93144E-04	0.00000E+00	0.00000E+00
606	9.23140E-01	1.51283E+01	9.38511E-01	9.91826E-04	0.00000E+00	0.00000E+00
607	9.39363E-01	1.51512E+01	9.38513E-01	9.90186E-04	0.00000E+00	0.00000E+00
608	9.45778E-01	1.51742E+01	9.38525E-01	9.88623E-04	0.00000E+00	0.00000E+00
609	9.19351E-01	1.51980E+01	9.38493E-01	9.87499E-04	0.00000E+00	0.00000E+00
610	9.52071E-01	1.52208E+01	9.38516E-01	9.86126E-04	0.00000E+00	0.00000E+00
611	9.79187E-01	1.52437E+01	9.38582E-01	9.86768E-04	0.00000E+00	0.00000E+00
612	9.50653E-01	1.52675E+01	9.38602E-01	9.85348E-04	0.00000E+00	0.00000E+00
613	9.44038E-01	1.52913E+01	9.38611E-01	9.83774E-04	0.00000E+00	0.00000E+00
614	9.44213E-01	1.53142E+01	9.38620E-01	9.82208E-04	0.00000E+00	0.00000E+00
615	9.33929E-01	1.53380E+01	9.38613E-01	9.80634E-04	0.00000E+00	0.00000E+00
616	9.31973E-01	1.53618E+01	9.38602E-01	9.79095E-04	0.00000E+00	0.00000E+00
617	9.07024E-01	1.53857E+01	9.38550E-01	9.78850E-04	0.00000E+00	0.00000E+00
618	9.98090E-01	1.54085E+01	9.38647E-01	9.82028E-04	0.00000E+00	0.00000E+00
619	9.62230E-01	1.54305E+01	9.38685E-01	9.81179E-04	0.00000E+00	0.00000E+00
620	9.21974E-01	1.54543E+01	9.38658E-01	9.79964E-04	0.00000E+00	0.00000E+00
621	9.16871E-01	1.54780E+01	9.38623E-01	9.79012E-04	0.00000E+00	0.00000E+00
622	9.23423E-01	1.55018E+01	9.38598E-01	9.77739E-04	0.00000E+00	0.00000E+00
623	8.95480E-01	1.55257E+01	9.38529E-01	9.78630E-04	0.00000E+00	0.00000E+00
624	9.71361E-01	1.55485E+01	9.38582E-01	9.78480E-04	0.00000E+00	0.00000E+00
625	9.53844E-01	1.55723E+01	9.38606E-01	9.77215E-04	0.00000E+00	0.00000E+00
626	9.30552E-01	1.55962E+01	9.38593E-01	9.75733E-04	0.00000E+00	0.00000E+00
627	9.35378E-01	1.56200E+01	9.38588E-01	9.74184E-04	0.00000E+00	0.00000E+00
628	9.44078E-01	1.56420E+01	9.38597E-01	9.72666E-04	0.00000E+00	0.00000E+00
629	9.54964E-01	1.56657E+01	9.38623E-01	9.71465E-04	0.00000E+00	0.00000E+00
630	9.27703E-01	1.56887E+01	9.38606E-01	9.70072E-04	0.00000E+00	0.00000E+00
631	1.00296E+00	1.57123E+01	9.38708E-01	9.73917E-04	0.00000E+00	0.00000E+00
632	9.31571E-01	1.57362E+01	9.38697E-01	9.72436E-04	0.00000E+00	0.00000E+00
633	9.69320E-01	1.57600E+01	9.38745E-01	9.72106E-04	0.00000E+00	0.00000E+00
634	9.89042E-01	1.57828E+01	9.38825E-01	9.73824E-04	0.00000E+00	0.00000E+00
635	9.32962E-01	1.58058E+01	9.38816E-01	9.72329E-04	0.00000E+00	0.00000E+00
636	9.40863E-01	1.58295E+01	9.38819E-01	9.70799E-04	0.00000E+00	0.00000E+00
637	8.92825E-01	1.58543E+01	9.38746E-01	9.71972E-04	0.00000E+00	0.00000E+00
638	9.20157E-01	1.58782E+01	9.38717E-01	9.70882E-04	0.00000E+00	0.00000E+00
639	9.96603E-01	1.59000E+01	9.38808E-01	9.73607E-04	0.00000E+00	0.00000E+00
640	9.60582E-01	1.59230E+01	9.38842E-01	9.72679E-04	0.00000E+00	0.00000E+00
641	9.70939E-01	1.59468E+01	9.38892E-01	9.72453E-04	0.00000E+00	0.00000E+00
642	9.42895E-01	1.59705E+01	9.38899E-01	9.70953E-04	0.00000E+00	0.00000E+00
643	9.51506E-01	1.59935E+01	9.38918E-01	9.69637E-04	0.00000E+00	0.00000E+00

644	9.27407E-01	1.60172E+01	9.38900E-01	9.68291E-04	0.00000E+00	0.00000E+00
645	9.29923E-01	1.60410E+01	9.38886E-01	9.66885E-04	0.00000E+00	0.00000E+00
646	9.30328E-01	1.60640E+01	9.38873E-01	9.65474E-04	0.00000E+00	0.00000E+00
647	9.44038E-01	1.60877E+01	9.38881E-01	9.64009E-04	0.00000E+00	0.00000E+00
648	9.21504E-01	1.61115E+01	9.38854E-01	9.62891E-04	0.00000E+00	0.00000E+00
649	9.43148E-01	1.61343E+01	9.38861E-01	9.61425E-04	0.00000E+00	0.00000E+00
650	9.64703E-01	1.61582E+01	9.38901E-01	9.60768E-04	0.00000E+00	0.00000E+00
651	9.08608E-01	1.61812E+01	9.38854E-01	9.60421E-04	0.00000E+00	0.00000E+00
652	9.23426E-01	1.62048E+01	9.38830E-01	9.59236E-04	0.00000E+00	0.00000E+00
653	9.53679E-01	1.62287E+01	9.38853E-01	9.58033E-04	0.00000E+00	0.00000E+00
654	9.56435E-01	1.62517E+01	9.38880E-01	9.56943E-04	0.00000E+00	0.00000E+00
655	9.40723E-01	1.62745E+01	9.38883E-01	9.55480E-04	0.00000E+00	0.00000E+00
656	9.25284E-01	1.62973E+01	9.38862E-01	9.54245E-04	0 00000E+00	0.00000E+00
657	9.08590E-01	1.63212E+01	9.38816E-01	9.53907E-04	0.00000E+00	0.00000E+00
658	9.26671E-01	1.63440E+01	9.38797E-01	9.52632E-04	0.00000E+00	0.00000E+00
659	9.01560E-01	1.63688E+01	9.38741E-01	9.52868E-04	0.00000E+00	0.00000E+00
660	9.77940E-01	1.63917E+01	9.38800E-01	9.53282E-04	0.00000E+00	0.00000E+00
661	9.58119E-01	1.64155E+01	9.38830E-01	9.52286E-04	0.00000E+00	0.00000E+00
662	9.42903E-01	1.64383E+01	9.38836E-01	9.50862E-04	0.00000E+00	0.00000E+00
663	9.34902E-01	1.64622E+01	9.38830E-01	9.49441E-04	0.00000E+00	0.00000E+00
664	9.29915E-01	1.64850E+01	9.38816E-01	9.48101E-04	0.00000E+00	0.00000E+00
665	9.24465E-01	1.65078E+01	9.38795E-01	9.46917E-04	0.00000E+00	0.00000E+00
666	9.34045E-01	1.65317E+01	9.38788E-01	9.45517E-04	0.00000E+00	0.00000E+00
667	9.49178E-01	1.65555E+01	9.38803E-01	9.44224E-04	0.00000E+00	0.00000E+00
668	9.39517E-01	1.65775E+01	9.38804E-01	9.42805E-04	0.00000E+00	0.00000E+00
669	9.40568E-01	1.66013E+01	9.38807E-01	9.41395E-04	0.00000E+00	0.00000E+00
670	9.65484E-01	1.66242E+01	9.38847E-01	9.40832E-04	0.00000E+00	0.00000E+00
671	9.38007E-01	1.66480E+01	9.38846E-01	9.39426E-04	0.00000E+00	0.00000E+00
672	9.41043E-01	1.66718E+01	9.38849E-01	9.38028E-04	0.00000E+00	0.00000E+00
673	9.48740E-01	1.66947E+01	9.38864E-01	9.36745E-04	0.00000E+00	0.00000E+00
674	9.22209E-01	1.67185E+01	9.38839E-01	9.35679E-04	0.00000E+00	0.00000E+00
675	9.64288E-01	1.67423E+01	9.38877E-01	9.35052E-04	0.00000E+00	0.00000E+00
676	9.29147E-01	1.67642E+01	9.38862E-01	9.33775E-04	0.00000E+00	0.00000E+00
677	9.75030E-01	1.67880E+01	9.38916E-01	9.33929E-04	0.00000E+00	0.00000E+00
678	9.36713E-01	1.68118E+01	9.38913E-01	9.32552E-04	0.00000E+00	0.00000E+00
679	9.47822E-01	1.68347E+01	9.38926E-01	9.31267E-04	0.00000E+00	0.00000E+00
680	9.67767E-01	1.68585E+01	9.38968E-01	9.30865E-04	0.00000E+00	0.00000E+00
681	9.78379E-01	1.68813E+01	9.39026E-01	9.31303E-04	0.00000E+00	0.00000E+00
682	9.30224E-01	1.69052E+01	9.39013E-01	9.30023E-04	0.00000E+00	0.00000E+00
683	9.52216E-01	1.69290E+01	9.39033E-01	9.28859E-04	0.00000E+00	0.00000E+00
684	9.07414E-01	1.69518E+01	9.38986E-01	9.28654E-04	0.00000E+00	0.00000E+00
685	9.76482E-01	1.69748E+01	9.39041E-01	9.28917E-04	0.00000E+00	0.00000E+00
686	9.61002E-01	1.69967E+01	9.39073E-01	9.28113E-04	0.00000E+00	0.00000E+00
687	9.48217E-01	1.70205E+01	9.39087E-01	9.26853E-04	0.00000E+00	0.00000E+00
688	9.19925E-01	1.70443E+01	9.39059E-01	9.25923E-04	0.00000E+00	0.00000E+00
689	9.18225E-01	1.70672E+01	9.39028E-01	9.25071E-04	0.00000E+00	0.00000E+00
690	9.29547E-01	1.70920E+01	9.39015E-01	9.23828E-04	0.00000E+00	0.00000E+00
691	9.74512E-01	1.71148E+01	9.39066E-01	9.23924E-04	0.00000E+00	0.00000E+00
692	9.23995E-01	1.71387E+01	9.39044E-01	9.22843E-04	0.00000E+00	0.00000E+00
693	9.44968E-01	1.71625E+01	9.39053E-01	9.21546E-04	0.00000E+00	0.00000E+00
694	9.37986E-01	1.71862E+01	9.39051E-01	9.20215E-04	0.00000E+00	0.00000E+00
695	8.71771E-01	1.72110E+01	9.38954E-01	9.24000E-04	0.00000E+00	0.00000E+00
696	9.57521E-01	1.72338E+01	9.38981E-01	9.23056E-04	0.00000E+00	0.00000E+00
697	9.11858E-01	1.72577E+01	9.38942E-01	9.22553E-04	0.00000E+00	0.00000E+00
698	9.74981E-01	1.72805E+01	9.38994E-01	9.22680E-04	0.00000E+00	0.00000E+00
699	9.47938E-01	1.73043E+01	9.39007E-01	9.21445E-04	0.00000E+00	0.00000E+00
700	9.30839E-01	1.73282E+01	9.38995E-01	9.20198E-04	0.00000E+00	0.00000E+00
701	9.56392E-01	1.73520E+01	9.39020E-01	9.19218E-04	0.00000E+00	0.00000E+00
702	9.04129E-01	1.73748E+01	9.38970E-01	9.19256E-04	0.00000E+00	0.00000E+00
703	9.04947E-01	1.73987E+01	9.38921E-01	9.19226E-04	0.00000E+00	0.00000E+00
704	9.35171E-01	1.74225E+01	9.38916E-01	9.17931E-04	0.00000E+00	0.00000E+00
705	9.61477E-01	1.74453E+01	9.38948E-01	9.17186E-04	0.00000E+00	0.00000E+00
706	9.14978E-01	1.74700E+01	9.38914E-01	9.16515E-04	0.00000E+00	0.00000E+00
707	9.25121E-01	1.74938E+01	9.38895E-01	9.15423E-04	0.00000E+00	0.00000E+00
708	9.46967E-01	1.75167E+01	9.38906E-01	9.14197E-04	0.00000E+00	0.00000E+00
709	9.40055E-01	1.75405E+01	9.38908E-01	9.12904E-04	0.00000E+00	0.00000E+00
710	9.35305E-01	1.75633E+01	9.38903E-01	9.11628E-04	0.00000E+00	0.00000E+00
711	9.73473E-01	1.75872E+01	9.38951E-01	9.11647E-04	0.00000E+00	0.00000E+00
712	9.70251E-01	1.76100E+01	9.38995E-01	9.11428E-04	0.00000E+00	0.00000E+00
713	9.19442E-01	1.76330E+01	9.38968E-01	9.10561E-04	0.00000E+00	0.00000E+00
714	9.04699E-01	1.76568E+01	9.38920E-01	9.10554E-04	0.00000E+00	0.00000E+00
715	9.45347E-01	1.76805E+01	9.38929E-01	9.09321E-04	0.00000E+00	0.00000E+00
716	9.01123E-01	1.77035E+01	9.38876E-01	9.09589E-04	0.00000E+00	0.00000E+00
717	9.61063E-01	1.77273E+01	9.38907E-01	9.08846E-04	0.00000E+00	0.00000E+00
718	9.36848E-01	1.77502E+01	9.38904E-01	9.07580E-04	0.00000E+00	0.00000E+00
719	9.01023E-01	1.77740E+01	9.38851E-01	9.07852E-04	0.00000E+00	0.00000E+00
720	9.34268E-01	1.77987E+01	9.38845E-01	9.06609E-04	0.00000E+00	0.00000E+00
721	9.08481E-01	1.78215E+01	9.38803E-01	9.06332E-04	0.00000E+00	0.00000E+00
722	9.29685E-01	1.78453E+01	9.38790E-01	9.05161E-04	0.00000E+00	0.00000E+00
723	9.11574E-01	1.78692E+01	9.38752E-01	9.04692E-04	0.00000E+00	0.00000E+00
724	9.83318E-01	1.78920E+01	9.38814E-01	9.05544E-04	0.00000E+00	0.00000E+00
725	9.66869E-01	1.79150E+01	9.38853E-01	9.05123E-04	0.00000E+00	0.00000E+00
726	9.18746E-01	1.79378E+01	9.38825E-01	9.04299E-04	0.00000E+00	0.00000E+00
727	9.17843E-01	1.79625E+01	9.38796E-01	9.03514E-04	0.00000E+00	0.00000E+00
728	9.60154E-01	1.79863E+01	9.38825E-01	9.02748E-04	0.00000E+00	0.00000E+00
729	9.68030E-01	1.80092E+01	9.38866E-01	9.02400E-04	0.00000E+00	0.00000E+00
730	9.64705E-01	1.80330E+01	9.38901E-01	9.01859E-04	0.00000E+00	0.00000E+00
731	9.46238E-01	1.80558E+01	9.38911E-01	9.00677E-04	0.00000E+00	0.00000E+00
732	9.50756E-01	1.80788E+01	9.38927E-01	8.99589E-04	0.00000E+00	0.00000E+00
733	9.17882E-01	1.81017E+01	9.38899E-01	8.98818E-04	0.00000E+00	0.00000E+00
734	9.20579E-01	1.81255E+01	9.38874E-01	8.97938E-04	0.00000E+00	0.00000E+00
735	9.46260E-01	1.81483E+01	9.38884E-01	8.96769E-04	0.00000E+00	0.00000E+00
736	9.64619E-01	1.81722E+01	9.38919E-01	8.96233E-04	0.00000E+00	0.00000E+00
737	9.51975E-01	1.81950E+01	9.38936E-01	8.95189E-04	0.00000E+00	0.00000E+00
738	9.41043E-01	1.82180E+01	9.38939E-01	8.93976E-04	0.00000E+00	0.00000E+00
739	9.45898E-01	1.82417E+01	9.38949E-01	8.92812E-04	0.00000E+00	0.00000E+00
740	9.65496E-01	1.82655E+01	9.38985E-01	8.92327E-04	0.00000E+00	0.00000E+00
741	9.13476E-01	1.82893E+01	9.38950E-01	8.91787E-04	0.00000E+00	0.00000E+00
742	9.18150E-01	1.83132E+01	9.38922E-01	8.91025E-04	0.00000E+00	0.00000E+00
743	9.26568E-01	1.83370E+01	9.38905E-01	8.89978E-04	0.00000E+00	0.00000E+00
744	9.18823E-01	1.83607E+01	9.38878E-01	8.89189E-04	0.00000E+00	0.00000E+00
745	9.49542E-01	1.83845E+01	9.38893E-01	8.88108E-04	0.00000E+00	0.00000E+00
746	9.54471E-01	1.84083E+01	9.38914E-01	8.87160E-04	0.00000E+00	0.00000E+00
747	9.36317E-01	1.84322E+01	9.38910E-01	8.85976E-04	0.00000E+00	0.00000E+00
748	9.31862E-01	1.84550E+01	9.38901E-01	8.84838E-04	0.00000E+00	0.00000E+00
749	9.36146E-01	1.84778E+01	9.38897E-01	8.83660E-04	0.00000E+00	0.00000E+00
750	9.62301E-01	1.85017E+01	9.38928E-01	8.83032E-04	0.00000E+00	0.00000E+00
751	9.90744E-01	1.85247E+01	9.38997E-01	8.84562E-04	0.00000E+00	0.00000E+00

752	9.38020E-01	1.85475E+01	9.38996E-01	8.83383E-04	0.00000E+00	0.00000E+00
753	9.26880E-01	1.85713E+01	9.38980E-01	8.82353E-04	0.00000E+00	0.00000E+00
754	9.26182E-01	1.85950E+01	9.38963E-01	8.81343E-04	0.00000E+00	0.00000E+00
755	9.36353E-01	1.86180E+01	9.38960E-01	8.80179E-04	0.00000E+00	0.00000E+00
756	9.03621E-01	1.86418E+01	9.38913E-01	8.80259E-04	0.00000E+00	0.00000E+00
757	9.57084E-01	1.86637E+01	9.38937E-01	8.79422E-04	0.00000E+00	0.00000E+00
758	9.31246E-01	1.86875E+01	9.38927E-01	8.78317E-04	0.00000E+00	0.00000E+00
759	9.35875E-01	1.87113E+01	9.38923E-01	8.77165E-04	0.00000E+00	0.00000E+00
760	9.86561E-01	1.87352E+01	9.38985E-01	8.78259E-04	0.00000E+00	0.00000E+00
761	9.25748E-01	1.87580E+01	9.38968E-01	8.77274E-04	0.00000E+00	0.00000E+00
762	9.39688E-01	1.87818E+01	9.38969E-01	8.76120E-04	0.00000E+00	0.00000E+00
763	9.55200E-01	1.88057E+01	9.38990E-01	8.75228E-04	0.00000E+00	0.00000E+00
764	9.67303E-01	1.88295E+01	9.39027E-01	8.74868E-04	0.00000E+00	0.00000E+00
765	9.60331E-01	1.88523E+01	9.39055E-01	8.74166E-04	0.00000E+00	0.00000E+00
766	9.58079E-01	1.88762E+01	9.39080E-01	8.73376E-04	0.00000E+00	0.00000E+00
767	9.92942E-01	1.88990E+01	9.39151E-01	8.75071E-04	0.00000E+00	0.00000E+00
768	9.36634E-01	1.89218E+01	9.39147E-01	8.73934E-04	0.00000E+00	0.00000E+00
769	9.69284E-01	1.89448E+01	9.39187E-01	8.73678E-04	0.00000E+00	0.00000E+00
770	9.02905E-01	1.89685E+01	9.39139E-01	8.73818E-04	0.00000E+00	0.00000E+00
771	9.31800E-01	1.89923E+01	9.39130E-01	8.72733E-04	0.00000E+00	0.00000E+00
772	9.20422E-01	1.90153E+01	9.39106E-01	8.71937E-04	0.00000E+00	0.00000E+00
773	9.70387E-01	1.90382E+01	9.39146E-01	8.71750E-04	0.00000E+00	0.00000E+00
774	9.01684E-01	1.90620E+01	9.39098E-01	8.71972E-04	0.00000E+00	0.00000E+00
775	9.38387E-01	1.90848E+01	9.39097E-01	8.70843E-04	0.00000E+00	0.00000E+00
776	9.01963E-01	1.91077E+01	9.39049E-01	8.71040E-04	0.00000E+00	0.00000E+00
777	9.48430E-01	1.91325E+01	9.39061E-01	8.69999E-04	0.00000E+00	0.00000E+00
778	9.19217E-01	1.91562E+01	9.39035E-01	8.69254E-04	0.00000E+00	0.00000E+00
779	9.26475E-01	1.91792E+01	9.39019E-01	8.68285E-04	0.00000E+00	0.00000E+00
780	9.92574E-01	1.92020E+01	9.39088E-01	8.69896E-04	0.00000E+00	0.00000E+00
781	9.34852E-01	1.92248E+01	9.39082E-01	8.68795E-04	0.00000E+00	0.00000E+00
782	9.24003E-01	1.92487E+01	9.39063E-01	8.67896E-04	0.00000E+00	0.00000E+00
783	9.25178E-01	1.92733E+01	9.39045E-01	8.66966E-04	0.00000E+00	0.00000E+00
784	9.45854E-01	1.92963E+01	9.39054E-01	8.65901E-04	0.00000E+00	0.00000E+00
785	9.53401E-01	1.93192E+01	9.39072E-01	8.64988E-04	0.00000E+00	0.00000E+00
786	9.93710E-01	1.93430E+01	9.39142E-01	8.66691E-04	0.00000E+00	0.00000E+00
787	9.39756E-01	1.93658E+01	9.39143E-01	8.65586E-04	0.00000E+00	0.00000E+00
788	9.40221E-01	1.93888E+01	9.39144E-01	8.64486E-04	0.00000E+00	0.00000E+00
789	9.26972E-01	1.94117E+01	9.39129E-01	8.63525E-04	0.00000E+00	0.00000E+00
790	9.19882E-01	1.94355E+01	9.39104E-01	8.62774E-04	0.00000E+00	0.00000E+00
791	9.36054E-01	1.94583E+01	9.39100E-01	8.61689E-04	0.00000E+00	0.00000E+00
792	9.57824E-01	1.94822E+01	9.39124E-01	8.60923E-04	0.00000E+00	0.00000E+00
793	9.56740E-01	1.95060E+01	9.39146E-01	8.60123E-04	0.00000E+00	0.00000E+00
794	9.60888E-01	1.95288E+01	9.39174E-01	8.59475E-04	0.00000E+00	0.00000E+00
795	9.37800E-01	1.95517E+01	9.39172E-01	8.58392E-04	0.00000E+00	0.00000E+00
796	9.25421E-01	1.95755E+01	9.39155E-01	8.57485E-04	0.00000E+00	0.00000E+00
797	9.09263E-01	1.95983E+01	9.39117E-01	8.57231E-04	0.00000E+00	0.00000E+00
798	9.52050E-01	1.96213E+01	9.39133E-01	8.56307E-04	0.00000E+00	0.00000E+00
799	9.12904E-01	1.96460E+01	9.39101E-01	8.55865E-04	0.00000E+00	0.00000E+00
800	9.36917E-01	1.96698E+01	9.39098E-01	8.54796E-04	0.00000E+00	0.00000E+00
801	9.70928E-01	1.96927E+01	9.39138E-01	8.54655E-04	0.00000E+00	0.00000E+00
802	9.10008E-01	1.97165E+01	9.39101E-01	8.54362E-04	0.00000E+00	0.00000E+00
803	9.26777E-01	1.97403E+01	9.39086E-01	8.53433E-04	0.00000E+00	0.00000E+00
804	9.24964E-01	1.97640E+01	9.39068E-01	8.52550E-04	0.00000E+00	0.00000E+00
805	9.37624E-01	1.97870E+01	9.39066E-01	8.51490E-04	0.00000E+00	0.00000E+00
806	9.05660E-01	1.98108E+01	9.39025E-01	8.51445E-04	0.00000E+00	0.00000E+00
807	9.06057E-01	1.98355E+01	9.38984E-01	8.51372E-04	0.00000E+00	0.00000E+00
808	9.19422E-01	1.98583E+01	9.38960E-01	8.50661E-04	0.00000E+00	0.00000E+00
809	9.18639E-01	1.98822E+01	9.38934E-01	8.49980E-04	0.00000E+00	0.00000E+00
810	9.19503E-01	1.99068E+01	9.38910E-01	8.49268E-04	0.00000E+00	0.00000E+00
811	9.26878E-01	1.99298E+01	9.38896E-01	8.48348E-04	0.00000E+00	0.00000E+00
812	9.43545E-01	1.99527E+01	9.38901E-01	8.47319E-04	0.00000E+00	0.00000E+00
813	9.55380E-01	1.99755E+01	9.38922E-01	8.46517E-04	0.00000E+00	0.00000E+00
814	9.11339E-01	2.00003E+01	9.38888E-01	8.46156E-04	0.00000E+00	0.00000E+00
815	9.09312E-01	2.00240E+01	9.38851E-01	8.45898E-04	0.00000E+00	0.00000E+00
816	9.37536E-01	2.00470E+01	9.38850E-01	8.44859E-04	0.00000E+00	0.00000E+00
817	9.70622E-01	2.00688E+01	9.38889E-01	8.44722E-04	0.00000E+00	0.00000E+00
818	9.57916E-01	2.00918E+01	9.38912E-01	8.44008E-04	0.00000E+00	0.00000E+00
819	9.27445E-01	2.01157E+01	9.38898E-01	8.43092E-04	0.00000E+00	0.00000E+00
820	9.44088E-01	2.01385E+01	9.38904E-01	8.42084E-04	0.00000E+00	0.00000E+00
821	9.30320E-01	2.01623E+01	9.38894E-01	8.41121E-04	0.00000E+00	0.00000E+00
822	9.32914E-01	2.01862E+01	9.38887E-01	8.40126E-04	0.00000E+00	0.00000E+00
823	9.30894E-01	2.02090E+01	9.38877E-01	8.39159E-04	0.00000E+00	0.00000E+00
824	9.30168E-01	2.02337E+01	9.38866E-01	8.38204E-04	0.00000E+00	0.00000E+00
825	9.22243E-01	2.02575E+01	9.38846E-01	8.37428E-04	0.00000E+00	0.00000E+00
826	9.66003E-01	2.02803E+01	9.38879E-01	8.37061E-04	0.00000E+00	0.00000E+00
827	9.29377E-01	2.03042E+01	9.38867E-01	8.36125E-04	0.00000E+00	0.00000E+00
828	9.55647E-01	2.03262E+01	9.38888E-01	8.35359E-04	0.00000E+00	0.00000E+00
829	9.13633E-01	2.03500E+01	9.38857E-01	8.34907E-04	0.00000E+00	0.00000E+00
830	9.50101E-01	2.03737E+01	9.38871E-01	8.34009E-04	0.00000E+00	0.00000E+00
831	9.48961E-01	2.03967E+01	9.38883E-01	8.33091E-04	0.00000E+00	0.00000E+00
832	9.48862E-01	2.04205E+01	9.38895E-01	8.32173E-04	0.00000E+00	0.00000E+00
833	9.41736E-01	2.04433E+01	9.38898E-01	8.31178E-04	0.00000E+00	0.00000E+00
834	9.37363E-01	2.04680E+01	9.38897E-01	8.30181E-04	0.00000E+00	0.00000E+00
835	9.66748E-01	2.04910E+01	9.38930E-01	8.29857E-04	0.00000E+00	0.00000E+00
836	1.01260E+00	2.05138E+01	9.39018E-01	8.33555E-04	0.00000E+00	0.00000E+00
837	9.00539E-01	2.05367E+01	9.38972E-01	8.33830E-04	0.00000E+00	0.00000E+00
838	9.62066E-01	2.05605E+01	9.39000E-01	8.33290E-04	0.00000E+00	0.00000E+00
839	9.10203E-01	2.05833E+01	9.38965E-01	8.33005E-04	0.00000E+00	0.00000E+00
840	9.38133E-01	2.06072E+01	9.38964E-01	8.32011E-04	0.00000E+00	0.00000E+00
841	9.02632E-01	2.06300E+01	9.38921E-01	8.32146E-04	0.00000E+00	0.00000E+00
842	9.67458E-01	2.06530E+01	9.38955E-01	8.31849E-04	0.00000E+00	0.00000E+00
843	9.28494E-01	2.06758E+01	9.38943E-01	8.30952E-04	0.00000E+00	0.00000E+00
844	9.21864E-01	2.07005E+01	9.38922E-01	8.30213E-04	0.00000E+00	0.00000E+00
845	9.43201E-01	2.07235E+01	9.38927E-01	8.29243E-04	0.00000E+00	0.00000E+00
846	9.35636E-01	2.07463E+01	9.38924E-01	8.28269E-04	0.00000E+00	0.00000E+00
847	9.09182E-01	2.07710E+01	9.38888E-01	8.28037E-04	0.00000E+00	0.00000E+00
848	9.36806E-01	2.07940E+01	9.38886E-01	8.27061E-04	0.00000E+00	0.00000E+00
849	8.90424E-01	2.08177E+01	9.38829E-01	8.28063E-04	0.00000E+00	0.00000E+00
850	9.36661E-01	2.08425E+01	9.38826E-01	8.27090E-04	0.00000E+00	0.00000E+00
851	9.57491E-01	2.08653E+01	9.38848E-01	8.26407E-04	0.00000E+00	0.00000E+00
852	9.41807E-01	2.08873E+01	9.38852E-01	8.25442E-04	0.00000E+00	0.00000E+00
853	9.48774E-01	2.09102E+01	9.38863E-01	8.24554E-04	0.00000E+00	0.00000E+00
854	9.42531E-01	2.09330E+01	9.38868E-01	8.23597E-04	0.00000E+00	0.00000E+00
855	9.02756E-01	2.09568E+01	9.38825E-01	8.23719E-04	0.00000E+00	0.00000E+00
856	9.06990E-01	2.09798E+01	9.38788E-01	8.23598E-04	0.00000E+00	0.00000E+00
857	9.91736E-01	2.10027E+01	9.38850E-01	8.24962E-04	0.00000E+00	0.00000E+00
858	9.72841E-01	2.10273E+01	9.38890E-01	8.24954E-04	0.00000E+00	0.00000E+00
859	9.29756E-01	2.10512E+01	9.38879E-01	8.24060E-04	0.00000E+00	0.00000E+00

860	9.35268E-01	2.10740E+01	9.38875E-01	8.23109E-04	0.00000E+00	0.00000E+00
861	9.34254E-01	2.10970E+01	9.38869E-01	8.22168E-04	0.00000E+00	0.00000E+00
862	9.33841E-01	2.11207E+01	9.38863E-01	8.21233E-04	0.00000E+00	0.00000E+00
863	9.20073E-01	2.11437E+01	9.38842E-01	8.20568E-04	0.00000E+00	0.00000E+00
864	9.22744E-01	2.11665E+01	9.38823E-01	8.19829E-04	0.00000E+00	0.00000E+00
865	9.26794E-01	2.11903E+01	9.38809E-01	8.18997E-04	0.00000E+00	0.00000E+00
866	9.08680E-01	2.12142E+01	9.38774E-01	8.18791E-04	0.00000E+00	0.00000E+00
867	9.27036E-01	2.12370E+01	9.38761E-01	8.17957E-04	0.00000E+00	0.00000E+00
868	1.00571E+00	2.12580E+01	9.38838E-01	8.20661E-04	0.00000E+00	0.00000E+00
869	9.37281E-01	2.12810E+01	9.38836E-01	8.19715E-04	0.00000E+00	0.00000E+00
870	9.50696E-01	2.13047E+01	9.38850E-01	8.18885E-04	0.00000E+00	0.00000E+00
871	9.35703E-01	2.13285E+01	9.38846E-01	8.17950E-04	0.00000E+00	0.00000E+00
872	9.30543E-01	2.13523E+01	9.38837E-01	8.17065E-04	0.00000E+00	0.00000E+00
873	9.11515E-01	2.13762E+01	9.38805E-01	8.16729E-04	0.00000E+00	0.00000E+00
874	9.64393E-01	2.13990E+01	9.38835E-01	8.16319E-04	0.00000E+00	0.00000E+00
875	9.15660E-01	2.14237E+01	9.38808E-01	8.15816E-04	0.00000E+00	0.00000E+00
876	9.69804E-01	2.14467E+01	9.38844E-01	8.15653E-04	0.00000E+00	0.00000E+00
877	9.24031E-01	2.14705E+01	9.38827E-01	8.14896E-04	0.00000E+00	0.00000E+00
878	9.13524E-01	2.14942E+01	9.38798E-01	8.14478E-04	0.00000E+00	0.00000E+00
879	9.21083E-01	2.15172E+01	9.38778E-01	8.13799E-04	0.00000E+00	0.00000E+00
880	8.98358E-01	2.15418E+01	9.38731E-01	8.14174E-04	0.00000E+00	0.00000E+00
881	9.44424E-01	2.15647E+01	9.38738E-01	8.13273E-04	0.00000E+00	0.00000E+00
882	9.32353E-01	2.15885E+01	9.38731E-01	8.12381E-04	0.00000E+00	0.00000E+00
883	9.86574E-01	2.16123E+01	9.38785E-01	8.13273E-04	0.00000E+00	0.00000E+00
884	8.83376E-01	2.16352E+01	9.38722E-01	8.14776E-04	0.00000E+00	0.00000E+00
885	9.04659E-01	2.16590E+01	9.38684E-01	8.14767E-04	0.00000E+00	0.00000E+00
886	9.26387E-01	2.16828E+01	9.38670E-01	8.13964E-04	0.00000E+00	0.00000E+00
887	9.05810E-01	2.17067E+01	9.38633E-01	8.13891E-04	0.00000E+00	0.00000E+00
888	9.09202E-01	2.17303E+01	9.38599E-01	8.13650E-04	0.00000E+00	0.00000E+00
889	9.47268E-01	2.17542E+01	9.38609E-01	8.12791E-04	0.00000E+00	0.00000E+00
890	9.51634E-01	2.17772E+01	9.38624E-01	8.12007E-04	0.00000E+00	0.00000E+00
891	9.47755E-01	2.18008E+01	9.38634E-01	8.11159E-04	0.00000E+00	0.00000E+00
892	9.63209E-01	2.18247E+01	9.38662E-01	8.10717E-04	0.00000E+00	0.00000E+00
893	9.34602E-01	2.18467E+01	9.38657E-01	8.09819E-04	0.00000E+00	0.00000E+00
894	9.24959E-01	2.18695E+01	9.38642E-01	8.09057E-04	0.00000E+00	0.00000E+00
895	9.20309E-01	2.18933E+01	9.38621E-01	8.08411E-04	0.00000E+00	0.00000E+00
896	9.12534E-01	2.19172E+01	9.38592E-01	8.08033E-04	0.00000E+00	0.00000E+00
897	9.60613E-01	2.19410E+01	9.38617E-01	8.07505E-04	0.00000E+00	0.00000E+00
898	9.07657E-01	2.19648E+01	9.38582E-01	8.07343E-04	0.00000E+00	0.00000E+00
899	9.47533E-01	2.19885E+01	9.38592E-01	8.06504E-04	0.00000E+00	0.00000E+00
900	8.98525E-01	2.20123E+01	9.38547E-01	8.06840E-04	0.00000E+00	0.00000E+00
901	9.36608E-01	2.20352E+01	9.38545E-01	8.05945E-04	0.00000E+00	0.00000E+00
902	9.48771E-01	2.20582E+01	9.38557E-01	8.05129E-04	0.00000E+00	0.00000E+00
903	9.61735E-01	2.20828E+01	9.38582E-01	8.04646E-04	0.00000E+00	0.00000E+00
904	9.57278E-01	2.21057E+01	9.38603E-01	8.04021E-04	0.00000E+00	0.00000E+00
905	9.42837E-01	2.21295E+01	9.38608E-01	8.03144E-04	0.00000E+00	0.00000E+00
906	9.06335E-01	2.21533E+01	9.38572E-01	8.03049E-04	0.00000E+00	0.00000E+00
907	9.27818E-01	2.21772E+01	9.38560E-01	8.02249E-04	0.00000E+00	0.00000E+00
908	9.33947E-01	2.22000E+01	9.38555E-01	8.01379E-04	0.00000E+00	0.00000E+00
909	9.72791E-01	2.22228E+01	9.38593E-01	8.01385E-04	0.00000E+00	0.00000E+00
910	9.22613E-01	2.22458E+01	9.38575E-01	8.00695E-04	0.00000E+00	0.00000E+00
911	9.27260E-01	2.22697E+01	9.38563E-01	7.99911E-04	0.00000E+00	0.00000E+00
912	9.40504E-01	2.22933E+01	9.38565E-01	7.99034E-04	0.00000E+00	0.00000E+00
913	9.27604E-01	2.23163E+01	9.38553E-01	7.98247E-04	0.00000E+00	0.00000E+00
914	9.32108E-01	2.23400E+01	9.38546E-01	7.97403E-04	0.00000E+00	0.00000E+00
915	9.39948E-01	2.23638E+01	9.38547E-01	7.96530E-04	0.00000E+00	0.00000E+00
916	9.07274E-01	2.23887E+01	9.38513E-01	7.96394E-04	0.00000E+00	0.00000E+00
917	9.60385E-01	2.24115E+01	9.38537E-01	7.95882E-04	0.00000E+00	0.00000E+00
918	9.38172E-01	2.24353E+01	9.38537E-01	7.95013E-04	0.00000E+00	0.00000E+00
919	9.27022E-01	2.24582E+01	9.38524E-01	7.94244E-04	0.00000E+00	0.00000E+00
920	9.34728E-01	2.24820E+01	9.38520E-01	7.93390E-04	0.00000E+00	0.00000E+00
921	9.46692E-01	2.25058E+01	9.38529E-01	7.92576E-04	0.00000E+00	0.00000E+00
922	9.23109E-01	2.25287E+01	9.38512E-01	7.91891E-04	0.00000E+00	0.00000E+00
923	8.87189E-01	2.25525E+01	9.38456E-01	7.92991E-04	0.00000E+00	0.00000E+00
924	9.61856E-01	2.25753E+01	9.38482E-01	7.92537E-04	0.00000E+00	0.00000E+00
925	9.20343E-01	2.26000E+01	9.38462E-01	7.91922E-04	0.00000E+00	0.00000E+00
926	9.84631E-01	2.26230E+01	9.38512E-01	7.92641E-04	0.00000E+00	0.00000E+00
927	9.28523E-01	2.26450E+01	9.38501E-01	7.91857E-04	0.00000E+00	0.00000E+00
928	9.23518E-01	2.26697E+01	9.38485E-01	7.91167E-04	0.00000E+00	0.00000E+00
929	9.56012E-01	2.26925E+01	9.38504E-01	7.90539E-04	0.00000E+00	0.00000E+00
930	9.47862E-01	2.27163E+01	9.38514E-01	7.89751E-04	0.00000E+00	0.00000E+00
931	1.00085E+00	2.27383E+01	9.38581E-01	7.91749E-04	0.00000E+00	0.00000E+00
932	9.32273E-01	2.27622E+01	9.38574E-01	7.90926E-04	0.00000E+00	0.00000E+00
933	9.59697E-01	2.27850E+01	9.38597E-01	7.90402E-04	0.00000E+00	0.00000E+00
934	9.74502E-01	2.28088E+01	9.38636E-01	7.90492E-04	0.00000E+00	0.00000E+00
935	9.19740E-01	2.28325E+01	9.38615E-01	7.89904E-04	0.00000E+00	0.00000E+00
936	9.30225E-01	2.28563E+01	9.38606E-01	7.89109E-04	0.00000E+00	0.00000E+00
937	9.02700E-01	2.28812E+01	9.38568E-01	7.89200E-04	0.00000E+00	0.00000E+00
938	9.81155E-01	2.29040E+01	9.38613E-01	7.89668E-04	0.00000E+00	0.00000E+00
939	9.71186E-01	2.29268E+01	9.38648E-01	7.89590E-04	0.00000E+00	0.00000E+00
940	9.17643E-01	2.29488E+01	9.38626E-01	7.89066E-04	0.00000E+00	0.00000E+00
941	9.70050E-01	2.29708E+01	9.38659E-01	7.88935E-04	0.00000E+00	0.00000E+00
942	8.94729E-01	2.29947E+01	9.38613E-01	7.89480E-04	0.00000E+00	0.00000E+00
943	9.46672E-01	2.30183E+01	9.38621E-01	7.88687E-04	0.00000E+00	0.00000E+00
944	9.37264E-01	2.30422E+01	9.38620E-01	7.87851E-04	0.00000E+00	0.00000E+00
945	9.42056E-01	2.30660E+01	9.38623E-01	7.87023E-04	0.00000E+00	0.00000E+00
946	9.09905E-01	2.30898E+01	9.38593E-01	7.86777E-04	0.00000E+00	0.00000E+00
947	9.44193E-01	2.31137E+01	9.38599E-01	7.85967E-04	0.00000E+00	0.00000E+00
948	9.35474E-01	2.31373E+01	9.38596E-01	7.85142E-04	0.00000E+00	0.00000E+00
949	9.61784E-01	2.31612E+01	9.38620E-01	7.84695E-04	0.00000E+00	0.00000E+00
950	9.39951E-01	2.31842E+01	9.38621E-01	7.83868E-04	0.00000E+00	0.00000E+00
951	9.60090E-01	2.32070E+01	9.38644E-01	7.83368E-04	0.00000E+00	0.00000E+00
952	9.40739E-01	2.32298E+01	9.38646E-01	7.82547E-04	0.00000E+00	0.00000E+00
953	9.60578E-01	2.32528E+01	9.38669E-01	7.82063E-04	0.00000E+00	0.00000E+00
954	9.25059E-01	2.32757E+01	9.38655E-01	7.81372E-04	0.00000E+00	0.00000E+00
955	9.35311E-01	2.32995E+01	9.38652E-01	7.80560E-04	0.00000E+00	0.00000E+00
956	9.60339E-01	2.33215E+01	9.38674E-01	7.80072E-04	0.00000E+00	0.00000E+00
957	9.10698E-01	2.33462E+01	9.38645E-01	7.79806E-04	0.00000E+00	0.00000E+00
958	9.43670E-01	2.33690E+01	9.38650E-01	7.79007E-04	0.00000E+00	0.00000E+00
959	9.20223E-01	2.33928E+01	9.38631E-01	7.78431E-04	0.00000E+00	0.00000E+00
960	9.60063E-01	2.34157E+01	9.38653E-01	7.77940E-04	0.00000E+00	0.00000E+00
961	9.27028E-01	2.34395E+01	9.38641E-01	7.77223E-04	0.00000E+00	0.00000E+00
962	9.13701E-01	2.34633E+01	9.38615E-01	7.76847E-04	0.00000E+00	0.00000E+00
963	9.78438E-01	2.34853E+01	9.38657E-01	7.77144E-04	0.00000E+00	0.00000E+00
964	9.62132E-01	2.35090E+01	9.38681E-01	7.76719E-04	0.00000E+00	0.00000E+00
965	9.22775E-01	2.35338E+01	9.38665E-01	7.76088E-04	0.00000E+00	0.00000E+00
966	9.08247E-01	2.35567E+01	9.38633E-01	7.75924E-04	0.00000E+00	0.00000E+00
967	9.01881E-01	2.35813E+01	9.38595E-01	7.76055E-04	0.00000E+00	0.00000E+00

968	9.35932E-01	2.36052E+01	9.38592E-01	7.75256E-04	0.00000E+00	0.00000E+00
969	9.31346E-01	2.36290E+01	9.38585E-01	7.74490E-04	0.00000E+00	0.00000E+00
970	9.59867E-01	2.36518E+01	9.38607E-01	7.74002E-04	0.00000E+00	0.00000E+00
971	9.30092E-01	2.36757E+01	9.38598E-01	7.73253E-04	0.00000E+00	0.00000E+00
972	9.25621E-01	2.36985E+01	9.38584E-01	7.72571E-04	0.00000E+00	0.00000E+00
973	8.99646E-01	2.37223E+01	9.38544E-01	7.72816E-04	0.00000E+00	0.00000E+00
974	9.13953E-01	2.37462E+01	9.38519E-01	7.72435E-04	0.00000E+00	0.00000E+00
975	9.71791E-01	2.37700E+01	9.38553E-01	7.72398E-04	0.00000E+00	0.00000E+00
976	9.52036E-01	2.37928E+01	9.38567E-01	7.71729E-04	0.00000E+00	0.00000E+00
977	9.03184E-01	2.38167E+01	9.38531E-01	7.71790E-04	0.00000E+00	0.00000E+00
978	9.51272E-01	2.38405E+01	9.38544E-01	7.71110E-04	0.00000E+00	0.00000E+00
979	9.86197E-01	2.38625E+01	9.38593E-01	7.71863E-04	0.00000E+00	0.00000E+00
980	9.35043E-01	2.38862E+01	9.38589E-01	7.71082E-04	0.00000E+00	0.00000E+00
981	9.29248E-01	2.39092E+01	9.38580E-01	7.70353E-04	0.00000E+00	0.00000E+00
982	9.33718E-01	2.39338E+01	9.38575E-01	7.69582E-04	0.00000E+00	0.00000E+00
983	9.42042E-01	2.39567E+01	9.38578E-01	7.68805E-04	0.00000E+00	0.00000E+00
984	8.88027E-01	2.39805E+01	9.38527E-01	7.69745E-04	0.00000E+00	0.00000E+00
985	9.14078E-01	2.40043E+01	9.38502E-01	7.69364E-04	0.00000E+00	0.00000E+00
986	9.70847E-01	2.40282E+01	9.38535E-01	7.69284E-04	0.00000E+00	0.00000E+00
987	9.29961E-01	2.40510E+01	9.38526E-01	7.68552E-04	0.00000E+00	0.00000E+00
988	9.53439E-01	2.40748E+01	9.38541E-01	7.67921E-04	0.00000E+00	0.00000E+00
989	9.33792E-01	2.40987E+01	9.38536E-01	7.67158E-04	0.00000E+00	0.00000E+00
990	9.49253E-01	2.41223E+01	9.38547E-01	7.66458E-04	0.00000E+00	0.00000E+00
991	9.62434E-01	2.41472E+01	9.38571E-01	7.66063E-04	0.00000E+00	0.00000E+00
992	8.98207E-01	2.41710E+01	9.38530E-01	7.66374E-04	0.00000E+00	0.00000E+00
993	9.59347E-01	2.41938E+01	9.38551E-01	7.65889E-04	0.00000E+00	0.00000E+00
994	9.10898E-01	2.42167E+01	9.38524E-01	7.65624E-04	0.00000E+00	0.00000E+00
995	9.39084E-01	2.42405E+01	9.38524E-01	7.64853E-04	0.00000E+00	0.00000E+00
996	9.33349E-01	2.42643E+01	9.38519E-01	7.64101E-04	0.00000E+00	0.00000E+00
997	9.87495E-01	2.42872E+01	9.38568E-01	7.64918E-04	0.00000E+00	0.00000E+00
998	9.25661E-01	2.43100E+01	9.38555E-01	7.64259E-04	0.00000E+00	0.00000E+00
999	9.34588E-01	2.43338E+01	9.38551E-01	7.63503E-04	0.00000E+00	0.00000E+00
1000	9.45410E-01	2.43568E+01	9.38558E-01	7.62768E-04	0.00000E+00	0.00000E+00
1001	9.39255E-01	2.43805E+01	9.38559E-01	7.62005E-04	0.00000E+00	0.00000E+00
1002	9.32947E-01	2.44043E+01	9.38553E-01	7.61263E-04	0.00000E+00	0.00000E+00
1003	9.12819E-01	2.44282E+01	9.38527E-01	7.60936E-04	0.00000E+00	0.00000E+00
1004	9.73663E-01	2.44510E+01	9.38563E-01	7.60985E-04	0.00000E+00	0.00000E+00
1005	9.47157E-01	2.44758E+01	9.38571E-01	7.60274E-04	0.00000E+00	0.00000E+00
1006	9.54433E-01	2.44987E+01	9.38587E-01	7.59681E-04	0.00000E+00	0.00000E+00
1007	9.36710E-01	2.45225E+01	9.38585E-01	7.58927E-04	0.00000E+00	0.00000E+00
1008	9.69821E-01	2.45453E+01	9.38616E-01	7.58808E-04	0.00000E+00	0.00000E+00
1009	9.67534E-01	2.45682E+01	9.38645E-01	7.58597E-04	0.00000E+00	0.00000E+00
1010	9.60390E-01	2.45920E+01	9.38666E-01	7.58151E-04	0.00000E+00	0.00000E+00
1011	9.39272E-01	2.46148E+01	9.38667E-01	7.57400E-04	0.00000E+00	0.00000E+00
1012	9.50145E-01	2.46387E+01	9.38678E-01	7.56735E-04	0.00000E+00	0.00000E+00
1013	9.53153E-01	2.46617E+01	9.38693E-01	7.56122E-04	0.00000E+00	0.00000E+00
1014	9.23548E-01	2.46863E+01	9.38678E-01	7.55522E-04	0.00000E+00	0.00000E+00
1015	9.16007E-01	2.47092E+01	9.38655E-01	7.55108E-04	0.00000E+00	0.00000E+00
1016	9.35179E-01	2.47330E+01	9.38652E-01	7.54371E-04	0.00000E+00	0.00000E+00
1017	9.56556E-01	2.47558E+01	9.38670E-01	7.53833E-04	0.00000E+00	0.00000E+00
1018	9.18734E-01	2.47807E+01	9.38650E-01	7.53347E-04	0.00000E+00	0.00000E+00
1019	9.16668E-01	2.48035E+01	9.38628E-01	7.52916E-04	0.00000E+00	0.00000E+00
1020	9.25423E-01	2.48273E+01	9.38615E-01	7.52288E-04	0.00000E+00	0.00000E+00
1021	9.14754E-01	2.48502E+01	9.38592E-01	7.51914E-04	0.00000E+00	0.00000E+00
1022	9.07734E-01	2.48748E+01	9.38562E-01	7.51785E-04	0.00000E+00	0.00000E+00
1023	9.56991E-01	2.48968E+01	9.38580E-01	7.51265E-04	0.00000E+00	0.00000E+00
1024	8.95227E-01	2.49207E+01	9.38537E-01	7.51728E-04	0.00000E+00	0.00000E+00
1025	9.12037E-01	2.49453E+01	9.38511E-01	7.51439E-04	0.00000E+00	0.00000E+00
1026	8.98296E-01	2.49683E+01	9.38472E-01	7.51732E-04	0.00000E+00	0.00000E+00
1027	9.21735E-01	2.49920E+01	9.38456E-01	7.51175E-04	0.00000E+00	0.00000E+00
1028	9.64811E-01	2.50150E+01	9.38481E-01	7.50882E-04	0.00000E+00	0.00000E+00
1029	9.36293E-01	2.50388E+01	9.38479E-01	7.50154E-04	0.00000E+00	0.00000E+00
1030	9.53964E-01	2.50625E+01	9.38494E-01	7.49575E-04	0.00000E+00	0.00000E+00
1031	9.18974E-01	2.50855E+01	9.38475E-01	7.49087E-04	0.00000E+00	0.00000E+00
1032	1.00510E+00	2.51083E+01	9.38540E-01	7.51150E-04	0.00000E+00	0.00000E+00
1033	8.88793E-01	2.51312E+01	9.38492E-01	7.51970E-04	0.00000E+00	0.00000E+00
1034	9.14311E-01	2.51560E+01	9.38468E-01	7.51607E-04	0.00000E+00	0.00000E+00
1035	9.29491E-01	2.51788E+01	9.38460E-01	7.50929E-04	0.00000E+00	0.00000E+00
1036	9.04914E-01	2.52017E+01	9.38427E-01	7.50904E-04	0.00000E+00	0.00000E+00
1037	9.42794E-01	2.52255E+01	9.38432E-01	7.50190E-04	0.00000E+00	0.00000E+00
1038	9.38853E-01	2.52483E+01	9.38432E-01	7.49465E-04	0.00000E+00	0.00000E+00
1039	9.30046E-01	2.52722E+01	9.38424E-01	7.48786E-04	0.00000E+00	0.00000E+00
1040	9.86186E-01	2.52960E+01	9.38470E-01	7.49478E-04	0.00000E+00	0.00000E+00
1041	9.20355E-01	2.53188E+01	9.38452E-01	7.48959E-04	0.00000E+00	0.00000E+00
1042	9.61868E-01	2.53427E+01	9.38475E-01	7.48577E-04	0.00000E+00	0.00000E+00
1043	9.53092E-01	2.53655E+01	9.38489E-01	7.47990E-04	0.00000E+00	0.00000E+00
1044	9.07531E-01	2.53893E+01	9.38459E-01	7.47862E-04	0.00000E+00	0.00000E+00
1045	9.15629E-01	2.54132E+01	9.38437E-01	7.47465E-04	0.00000E+00	0.00000E+00
1046	1.02357E+00	2.54360E+01	9.38519E-01	7.51188E-04	0.00000E+00	0.00000E+00
1047	8.82422E-01	2.54608E+01	9.38465E-01	7.52386E-04	0.00000E+00	0.00000E+00
1048	9.25004E-01	2.54837E+01	9.38452E-01	7.51777E-04	0.00000E+00	0.00000E+00
1049	9.45780E-01	2.55075E+01	9.38459E-01	7.51091E-04	0.00000E+00	0.00000E+00
1050	8.74873E-01	2.55322E+01	9.38399E-01	7.52823E-04	0.00000E+00	0.00000E+00
1051	9.35099E-01	2.55560E+01	9.38396E-01	7.52111E-04	0.00000E+00	0.00000E+00
1052	9.23574E-01	2.55798E+01	9.38381E-01	7.51527E-04	0.00000E+00	0.00000E+00
1053	8.74252E-01	2.56045E+01	9.38320E-01	7.53287E-04	0.00000E+00	0.00000E+00
1054	9.85759E-01	2.56265E+01	9.38365E-01	7.53921E-04	0.00000E+00	0.00000E+00
1055	9.45428E-01	2.56493E+01	9.38372E-01	7.53234E-04	0.00000E+00	0.00000E+00
1056	9.43343E-01	2.56722E+01	9.38377E-01	7.52534E-04	0.00000E+00	0.00000E+00
1057	9.64986E-01	2.56952E+01	9.38402E-01	7.52243E-04	0.00000E+00	0.00000E+00
1058	9.30655E-01	2.57188E+01	9.38395E-01	7.51567E-04	0.00000E+00	0.00000E+00
1059	9.61544E-01	2.57418E+01	9.38417E-01	7.51175E-04	0.00000E+00	0.00000E+00
1060	9.57602E-01	2.57657E+01	9.38435E-01	7.50683E-04	0.00000E+00	0.00000E+00
1061	9.25422E-01	2.57885E+01	9.38423E-01	7.50075E-04	0.00000E+00	0.00000E+00
1062	9.67254E-01	2.58123E+01	9.38450E-01	7.49860E-04	0.00000E+00	0.00000E+00
1063	9.89360E-01	2.58352E+01	9.38498E-01	7.50688E-04	0.00000E+00	0.00000E+00
1064	8.97188E-01	2.58590E+01	9.38459E-01	7.50989E-04	0.00000E+00	0.00000E+00
1065	9.55907E-01	2.58818E+01	9.38475E-01	7.50462E-04	0.00000E+00	0.00000E+00
1066	8.90272E-01	2.59065E+01	9.38430E-01	7.51124E-04	0.00000E+00	0.00000E+00
1067	9.24183E-01	2.59295E+01	9.38417E-01	7.50537E-04	0.00000E+00	0.00000E+00
1068	8.95895E-01	2.59533E+01	9.38377E-01	7.50893E-04	0.00000E+00	0.00000E+00
1069	9.38783E-01	2.59762E+01	9.38377E-01	7.50189E-04	0.00000E+00	0.00000E+00
1070	9.51304E-01	2.59990E+01	9.38389E-01	7.49584E-04	0.00000E+00	0.00000E+00
1071	9.36803E-01	2.60238E+01	9.38388E-01	7.48884E-04	0.00000E+00	0.00000E+00
1072	9.04873E-01	2.60475E+01	9.38356E-01	7.48839E-04	0.00000E+00	0.00000E+00
1073	9.17795E-01	2.60705E+01	9.38337E-01	7.48386E-04	0.00000E+00	0.00000E+00
1074	9.50613E-01	2.60942E+01	9.38349E-01	7.47775E-04	0.00000E+00	0.00000E+00
1075	9.30687E-01	2.61180E+01	9.38341E-01	7.47112E-04	0.00000E+00	0.00000E+00

1076	9.32428E-01	2.61410E+01	9.38336E-01	7.46436E-04	0.00000E+00	0.00000E+00
1077	9.48388E-01	2.61638E+01	9.38345E-01	7.45800E-04	0.00000E+00	0.00000E+00
1078	9.21246E-01	2.61877E+01	9.38329E-01	7.45276E-04	0.00000E+00	0.00000E+00
1079	9.22593E-01	2.62123E+01	9.38315E-01	7.44727E-04	0.00000E+00	0.00000E+00
1080	9.16644E-01	2.62352E+01	9.38295E-01	7.44308E-04	0.00000E+00	0.00000E+00
1081	9.18269E-01	2.62590E+01	9.38276E-01	7.43849E-04	0.00000E+00	0.00000E+00
1082	9.55646E-01	2.62828E+01	9.38292E-01	7.43334E-04	0.00000E+00	0.00000E+00
1083	9.44325E-01	2.63057E+01	9.38298E-01	7.42667E-04	0.00000E+00	0.00000E+00
1084	9.25116E-01	2.63295E+01	9.38286E-01	7.42080E-04	0.00000E+00	0.00000E+00
1085	9.03483E-01	2.63533E+01	9.38253E-01	7.42091E-04	0.00000E+00	0.00000E+00
1086	9.44617E-01	2.63772E+01	9.38259E-01	7.41429E-04	0.00000E+00	0.00000E+00
1087	9.16163E-01	2.64008E+01	9.38239E-01	7.41026E-04	0.00000E+00	0.00000E+00
1088	9.07352E-01	2.64247E+01	9.38211E-01	7.40889E-04	0.00000E+00	0.00000E+00
1089	9.43691E-01	2.64485E+01	9.38216E-01	7.40224E-04	0.00000E+00	0.00000E+00
1090	9.03327E-01	2.64723E+01	9.38184E-01	7.40238E-04	0.00000E+00	0.00000E+00
1091	8.88026E-01	2.64980E+01	9.38137E-01	7.40991E-04	0.00000E+00	0.00000E+00
1092	9.54301E-01	2.65208E+01	9.38152E-01	7.40460E-04	0.00000E+00	0.00000E+00
1093	9.83354E-01	2.65455E+01	9.38194E-01	7.40940E-04	0.00000E+00	0.00000E+00
1094	9.30533E-01	2.65693E+01	9.38187E-01	7.40294E-04	0.00000E+00	0.00000E+00
1095	8.99736E-01	2.65932E+01	9.38152E-01	7.40453E-04	0.00000E+00	0.00000E+00
1096	9.45797E-01	2.66170E+01	9.38159E-01	7.39809E-04	0.00000E+00	0.00000E+00
1097	9.46175E-01	2.66388E+01	9.38166E-01	7.39169E-04	0.00000E+00	0.00000E+00
1098	9.66585E-01	2.66618E+01	9.38192E-01	7.38949E-04	0.00000E+00	0.00000E+00
1099	8.97523E-01	2.66857E+01	9.38155E-01	7.39206E-04	0.00000E+00	0.00000E+00
1100	9.75841E-01	2.67093E+01	9.38189E-01	7.39329E-04	0.00000E+00	0.00000E+00
1101	9.90322E-01	2.67323E+01	9.38236E-01	7.40178E-04	0.00000E+00	0.00000E+00
1102	9.22798E-01	2.67552E+01	9.38222E-01	7.39638E-04	0.00000E+00	0.00000E+00
1103	9.27561E-01	2.67772E+01	9.38213E-01	7.39029E-04	0.00000E+00	0.00000E+00
1104	9.31462E-01	2.68010E+01	9.38207E-01	7.38384E-04	0.00000E+00	0.00000E+00
1105	9.63463E-01	2.68238E+01	9.38230E-01	7.38069E-04	0.00000E+00	0.00000E+00
1106	9.54171E-01	2.68467E+01	9.38244E-01	7.37542E-04	0.00000E+00	0.00000E+00
1107	9.37351E-01	2.68697E+01	9.38243E-01	7.36874E-04	0.00000E+00	0.00000E+00
1108	9.05554E-01	2.68933E+01	9.38214E-01	7.36801E-04	0.00000E+00	0.00000E+00
1109	9.05221E-01	2.69182E+01	9.38184E-01	7.36738E-04	0.00000E+00	0.00000E+00
1110	9.85107E-01	2.69402E+01	9.38226E-01	7.37290E-04	0.00000E+00	0.00000E+00
1111	9.12616E-01	2.69648E+01	9.38203E-01	7.36987E-04	0.00000E+00	0.00000E+00
1112	9.67415E-01	2.69877E+01	9.38229E-01	7.36793E-04	0.00000E+00	0.00000E+00
1113	9.12251E-01	2.70115E+01	9.38206E-01	7.36501E-04	0.00000E+00	0.00000E+00
1114	9.62824E-01	2.70362E+01	9.38228E-01	7.36171E-04	0.00000E+00	0.00000E+00
1115	9.18163E-01	2.70592E+01	9.38210E-01	7.35730E-04	0.00000E+00	0.00000E+00
1116	9.22717E-01	2.70828E+01	9.38196E-01	7.35201E-04	0.00000E+00	0.00000E+00
1117	9.57151E-01	2.71058E+01	9.38213E-01	7.34738E-04	0.00000E+00	0.00000E+00
1118	9.74900E-01	2.71297E+01	9.38246E-01	7.34815E-04	0.00000E+00	0.00000E+00
1119	9.64975E-01	2.71525E+01	9.38270E-01	7.34547E-04	0.00000E+00	0.00000E+00
1120	9.47854E-01	2.71753E+01	9.38279E-01	7.33940E-04	0.00000E+00	0.00000E+00
1121	8.98628E-01	2.72000E+01	9.38243E-01	7.34139E-04	0.00000E+00	0.00000E+00
1122	9.10932E-01	2.72248E+01	9.38219E-01	7.33888E-04	0.00000E+00	0.00000E+00
1123	9.24210E-01	2.72487E+01	9.38206E-01	7.33340E-04	0.00000E+00	0.00000E+00
1124	9.16405E-01	2.72723E+01	9.38187E-01	7.32944E-04	0.00000E+00	0.00000E+00
1125	9.38150E-01	2.72962E+01	9.38187E-01	7.32291E-04	0.00000E+00	0.00000E+00
1126	9.58066E-01	2.73190E+01	9.38204E-01	7.31853E-04	0.00000E+00	0.00000E+00
1127	9.10032E-01	2.73428E+01	9.38179E-01	7.31631E-04	0.00000E+00	0.00000E+00
1128	9.10568E-01	2.73677E+01	9.38155E-01	7.31392E-04	0.00000E+00	0.00000E+00
1129	9.11948E-01	2.73913E+01	9.38132E-01	7.31112E-04	0.00000E+00	0.00000E+00
1130	9.35171E-01	2.74143E+01	9.38129E-01	7.30469E-04	0.00000E+00	0.00000E+00
1131	9.33174E-01	2.74380E+01	9.38125E-01	7.29834E-04	0.00000E+00	0.00000E+00
1132	9.55790E-01	2.74610E+01	9.38140E-01	7.29356E-04	0.00000E+00	0.00000E+00
1133	9.43953E-01	2.74848E+01	9.38145E-01	7.28729E-04	0.00000E+00	0.00000E+00
1134	9.17241E-01	2.75085E+01	9.38127E-01	7.28319E-04	0.00000E+00	0.00000E+00
1135	9.29098E-01	2.75323E+01	9.38119E-01	7.27720E-04	0.00000E+00	0.00000E+00
1136	9.31610E-01	2.75553E+01	9.38113E-01	7.27100E-04	0.00000E+00	0.00000E+00
1137	9.31269E-01	2.75782E+01	9.38107E-01	7.26484E-04	0.00000E+00	0.00000E+00
1138	9.69908E-01	2.76010E+01	9.38135E-01	7.26384E-04	0.00000E+00	0.00000E+00
1139	9.45357E-01	2.76238E+01	9.38142E-01	7.25773E-04	0.00000E+00	0.00000E+00
1140	8.99880E-01	2.76468E+01	9.38108E-01	7.25914E-04	0.00000E+00	0.00000E+00
1141	9.18903E-01	2.76707E+01	9.38091E-01	7.25472E-04	0.00000E+00	0.00000E+00
1142	9.57568E-01	2.76935E+01	9.38108E-01	7.25037E-04	0.00000E+00	0.00000E+00
1143	9.66128E-01	2.77163E+01	9.38133E-01	7.24817E-04	0.00000E+00	0.00000E+00
1144	9.84791E-01	2.77393E+01	9.38174E-01	7.25334E-04	0.00000E+00	0.00000E+00
1145	9.45275E-01	2.77630E+01	9.38180E-01	7.24726E-04	0.00000E+00	0.00000E+00
1146	9.25944E-01	2.77860E+01	9.38169E-01	7.24171E-04	0.00000E+00	0.00000E+00
1147	9.37324E-01	2.78107E+01	9.38168E-01	7.23538E-04	0.00000E+00	0.00000E+00
1148	9.13569E-01	2.78345E+01	9.38147E-01	7.23225E-04	0.00000E+00	0.00000E+00
1149	9.56348E-01	2.78573E+01	9.38163E-01	7.22769E-04	0.00000E+00	0.00000E+00
1150	9.30874E-01	2.78802E+01	9.38156E-01	7.22167E-04	0.00000E+00	0.00000E+00
1151	9.42039E-01	2.79032E+01	9.38160E-01	7.21546E-04	0.00000E+00	0.00000E+00
1152	9.08727E-01	2.79278E+01	9.38134E-01	7.21372E-04	0.00000E+00	0.00000E+00
1153	9.44263E-01	2.79517E+01	9.38140E-01	7.20765E-04	0.00000E+00	0.00000E+00
1154	9.56480E-01	2.79745E+01	9.38155E-01	7.20315E-04	0.00000E+00	0.00000E+00
1155	9.50713E-01	2.79973E+01	9.38166E-01	7.19773E-04	0.00000E+00	0.00000E+00
1156	9.14870E-01	2.80203E+01	9.38146E-01	7.19432E-04	0.00000E+00	0.00000E+00
1157	9.40514E-01	2.80442E+01	9.38148E-01	7.18812E-04	0.00000E+00	0.00000E+00
1158	9.67724E-01	2.80670E+01	9.38174E-01	7.18645E-04	0.00000E+00	0.00000E+00
1159	9.04789E-01	2.80908E+01	9.38145E-01	7.18603E-04	0.00000E+00	0.00000E+00
1160	9.67256E-01	2.81137E+01	9.38170E-01	7.18422E-04	0.00000E+00	0.00000E+00
1161	9.71579E-01	2.81375E+01	9.38199E-01	7.18381E-04	0.00000E+00	0.00000E+00
1162	9.04867E-01	2.81622E+01	9.38170E-01	7.18336E-04	0.00000E+00	0.00000E+00
1163	9.36354E-01	2.81860E+01	9.38169E-01	7.17719E-04	0.00000E+00	0.00000E+00
1164	9.26787E-01	2.82098E+01	9.38159E-01	7.17168E-04	0.00000E+00	0.00000E+00
1165	9.48700E-01	2.82337E+01	9.38168E-01	7.16608E-04	0.00000E+00	0.00000E+00
1166	9.28933E-01	2.82573E+01	9.38160E-01	7.16036E-04	0.00000E+00	0.00000E+00
1167	9.48152E-01	2.82803E+01	9.38168E-01	7.15473E-04	0.00000E+00	0.00000E+00
1168	9.48642E-01	2.83032E+01	9.38177E-01	7.14915E-04	0.00000E+00	0.00000E+00
1169	9.45000E-01	2.83260E+01	9.38183E-01	7.14326E-04	0.00000E+00	0.00000E+00
1170	8.99952E-01	2.83498E+01	9.38151E-01	7.14465E-04	0.00000E+00	0.00000E+00
1171	9.35812E-01	2.83727E+01	9.38149E-01	7.13856E-04	0.00000E+00	0.00000E+00
1172	9.25186E-01	2.83965E+01	9.38138E-01	7.13332E-04	0.00000E+00	0.00000E+00
1173	9.19110E-01	2.84203E+01	9.38121E-01	7.12908E-04	0.00000E+00	0.00000E+00
1174	9.42315E-01	2.84432E+01	9.38125E-01	7.12308E-04	0.00000E+00	0.00000E+00
1175	9.04755E-01	2.84670E+01	9.38096E-01	7.12269E-04	0.00000E+00	0.00000E+00
1176	9.66406E-01	2.84898E+01	9.38121E-01	7.12070E-04	0.00000E+00	0.00000E+00
1177	9.55823E-01	2.85137E+01	9.38136E-01	7.11624E-04	0.00000E+00	0.00000E+00
1178	9.47044E-01	2.85375E+01	9.38143E-01	7.11058E-04	0.00000E+00	0.00000E+00
1179	9.15941E-01	2.85603E+01	9.38124E-01	7.10705E-04	0.00000E+00	0.00000E+00
1180	9.59063E-01	2.85833E+01	9.38142E-01	7.10323E-04	0.00000E+00	0.00000E+00
1181	9.03423E-01	2.86070E+01	9.38113E-01	7.10331E-04	0.00000E+00	0.00000E+00
1182	9.16915E-01	2.86308E+01	9.38095E-01	7.09956E-04	0.00000E+00	0.00000E+00
1183	9.05548E-01	2.86547E+01	9.38067E-01	7.09890E-04	0.00000E+00	0.00000E+00

1184	9.47179E-01	2.86785E+01	9.38075E-01	7.09331E-04	0.00000E+00	0.00000E+00
1185	9.60084E-01	2.87013E+01	9.38093E-01	7.08975E-04	0.00000E+00	0.00000E+00
1186	9.56989E-01	2.87243E+01	9.38109E-01	7.08556E-04	0.00000E+00	0.00000E+00
1187	9.08298E-01	2.87472E+01	9.38084E-01	7.08405E-04	0.00000E+00	0.00000E+00
1188	9.48080E-01	2.87710E+01	9.38093E-01	7.07857E-04	0.00000E+00	0.00000E+00
1189	9.44883E-01	2.87957E+01	9.38098E-01	7.07284E-04	0.00000E+00	0.00000E+00
1190	9.18628E-01	2.88203E+01	9.38082E-01	7.06878E-04	0.00000E+00	0.00000E+00
1191	9.34015E-01	2.88433E+01	9.38079E-01	7.06292E-04	0.00000E+00	0.00000E+00
1192	9.63594E-01	2.88670E+01	9.38100E-01	7.06024E-04	0.00000E+00	0.00000E+00
1193	9.68365E-01	2.88908E+01	9.38125E-01	7.05888E-04	0.00000E+00	0.00000E+00
1194	9.39015E-01	2.89137E+01	9.38126E-01	7.05296E-04	0.00000E+00	0.00000E+00
1195	9.56916E-01	2.89375E+01	9.38142E-01	7.04881E-04	0.00000E+00	0.00000E+00
1196	9.53049E-01	2.89605E+01	9.38154E-01	7.04401E-04	0.00000E+00	0.00000E+00
1197	9.20751E-01	2.89842E+01	9.38140E-01	7.03962E-04	0.00000E+00	0.00000E+00
1198	9.36968E-01	2.90072E+01	9.38139E-01	7.03374E-04	0.00000E+00	0.00000E+00
1199	9.03918E-01	2.90310E+01	9.38110E-01	7.03367E-04	0.00000E+00	0.00000E+00
1200	9.39716E-01	2.90538E+01	9.38112E-01	7.02781E-04	0.00000E+00	0.00000E+00
1201	9.27605E-01	2.90777E+01	9.38103E-01	7.02249E-04	0.00000E+00	0.00000E+00
1202	9.20185E-01	2.91005E+01	9.38088E-01	7.01823E-04	0.00000E+00	0.00000E+00
1203	9.79878E-01	2.91225E+01	9.38123E-01	7.02101E-04	0.00000E+00	0.00000E+00

KENO MESSAGE NUMBER K5-123 EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

```
LIFETIME =  1.29025E-04 + OR -  1.25620E-07            GENERATION TIME =  1.00056E-04 + OR -  1.07505E-07
NU BAR   =  2.41912E+00 + OR -  3.78543E-06        AVERAGE FISSION GROUP =  2.46004E+01 + OR -  2.21850E-03
                 ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION =  3.04781E-02 + OR -  6.68436E-05
```

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.93813	+ OR - 0.00070	0.93743 TO 0.93884	0.93673 TO 0.93954	0.93603 TO 0.94024	1200000
4	0.93810	+ OR - 0.00070	0.93740 TO 0.93881	0.93670 TO 0.93951	0.93600 TO 0.94021	1199000
5	0.93813	+ OR - 0.00070	0.93743 TO 0.93883	0.93672 TO 0.93953	0.93602 TO 0.94024	1198000
6	0.93811	+ OR - 0.00070	0.93741 TO 0.93881	0.93670 TO 0.93952	0.93600 TO 0.94022	1197000
7	0.93810	+ OR - 0.00070	0.93740 TO 0.93881	0.93670 TO 0.93951	0.93599 TO 0.94022	1196000
8	0.93811	+ OR - 0.00070	0.93741 TO 0.93882	0.93671 TO 0.93952	0.93600 TO 0.94023	1195000
9	0.93809	+ OR - 0.00070	0.93738 TO 0.93879	0.93668 TO 0.93949	0.93597 TO 0.94020	1194000
10	0.93811	+ OR - 0.00070	0.93741 TO 0.93882	0.93670 TO 0.93952	0.93600 TO 0.94023	1193000
11	0.93811	+ OR - 0.00070	0.93741 TO 0.93882	0.93670 TO 0.93952	0.93600 TO 0.94023	1192000
12	0.93814	+ OR - 0.00071	0.93743 TO 0.93884	0.93673 TO 0.93955	0.93602 TO 0.94025	1191000
17	0.93816	+ OR - 0.00071	0.93746 TO 0.93887	0.93675 TO 0.93958	0.93604 TO 0.94028	1186000
22	0.93815	+ OR - 0.00071	0.93744 TO 0.93886	0.93673 TO 0.93957	0.93602 TO 0.94028	1181000
27	0.93812	+ OR - 0.00071	0.93741 TO 0.93883	0.93670 TO 0.93954	0.93599 TO 0.94025	1176000
32	0.93823	+ OR - 0.00071	0.93752 TO 0.93894	0.93680 TO 0.93965	0.93609 TO 0.94036	1171000
37	0.93820	+ OR - 0.00071	0.93749 TO 0.93891	0.93677 TO 0.93963	0.93606 TO 0.94034	1166000
42	0.93824	+ OR - 0.00072	0.93753 TO 0.93896	0.93681 TO 0.93967	0.93610 TO 0.94039	1161000
47	0.93827	+ OR - 0.00072	0.93755 TO 0.93899	0.93683 TO 0.93970	0.93611 TO 0.94042	1156000
52	0.93824	+ OR - 0.00072	0.93752 TO 0.93896	0.93680 TO 0.93968	0.93608 TO 0.94040	1151000
57	0.93818	+ OR - 0.00072	0.93745 TO 0.93890	0.93673 TO 0.93962	0.93601 TO 0.94034	1146000
62	0.93811	+ OR - 0.00072	0.93739 TO 0.93884	0.93667 TO 0.93956	0.93595 TO 0.94028	1141000
67	0.93811	+ OR - 0.00072	0.93739 TO 0.93883	0.93666 TO 0.93956	0.93594 TO 0.94028	1136000
72	0.93807	+ OR - 0.00072	0.93734 TO 0.93879	0.93662 TO 0.93952	0.93589 TO 0.94024	1131000
77	0.93810	+ OR - 0.00073	0.93737 TO 0.93883	0.93665 TO 0.93955	0.93592 TO 0.94028	1126000
82	0.93807	+ OR - 0.00073	0.93735 TO 0.93880	0.93662 TO 0.93953	0.93589 TO 0.94026	1121000
87	0.93810	+ OR - 0.00073	0.93737 TO 0.93883	0.93664 TO 0.93956	0.93591 TO 0.94030	1116000
92	0.93816	+ OR - 0.00073	0.93743 TO 0.93889	0.93669 TO 0.93962	0.93596 TO 0.94036	1111000

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
97	0.93814	+ OR - 0.00074	0.93740 TO 0.93887	0.93667 TO 0.93961	0.93593 TO 0.94034	1106000
102	0.93818	+ OR - 0.00074	0.93744 TO 0.93892	0.93670 TO 0.93966	0.93597 TO 0.94039	1101000
107	0.93817	+ OR - 0.00074	0.93743 TO 0.93891	0.93669 TO 0.93965	0.93595 TO 0.94039	1096000
112	0.93823	+ OR - 0.00074	0.93749 TO 0.93897	0.93675 TO 0.93971	0.93601 TO 0.94045	1091000
117	0.93817	+ OR - 0.00074	0.93743 TO 0.93891	0.93669 TO 0.93965	0.93594 TO 0.94040	1086000
122	0.93811	+ OR - 0.00074	0.93736 TO 0.93885	0.93662 TO 0.93960	0.93588 TO 0.94034	1081000
127	0.93815	+ OR - 0.00075	0.93740 TO 0.93889	0.93665 TO 0.93964	0.93591 TO 0.94039	1076000
132	0.93812	+ OR - 0.00075	0.93737 TO 0.93887	0.93662 TO 0.93962	0.93587 TO 0.94037	1071000
137	0.93817	+ OR - 0.00075	0.93742 TO 0.93892	0.93667 TO 0.93968	0.93592 TO 0.94043	1066000
142	0.93818	+ OR - 0.00075	0.93742 TO 0.93893	0.93667 TO 0.93968	0.93591 TO 0.94044	1061000
147	0.93820	+ OR - 0.00076	0.93744 TO 0.93895	0.93668 TO 0.93971	0.93592 TO 0.94047	1056000
152	0.93821	+ OR - 0.00076	0.93745 TO 0.93897	0.93669 TO 0.93973	0.93593 TO 0.94049	1051000
157	0.93817	+ OR - 0.00076	0.93741 TO 0.93893	0.93665 TO 0.93970	0.93588 TO 0.94046	1046000
162	0.93819	+ OR - 0.00077	0.93742 TO 0.93895	0.93666 TO 0.93972	0.93589 TO 0.94049	1041000
167	0.93811	+ OR - 0.00077	0.93734 TO 0.93888	0.93658 TO 0.93965	0.93581 TO 0.94042	1036000
172	0.93812	+ OR - 0.00077	0.93735 TO 0.93889	0.93658 TO 0.93966	0.93580 TO 0.94043	1031000
177	0.93802	+ OR - 0.00077	0.93725 TO 0.93879	0.93648 TO 0.93957	0.93571 TO 0.94034	1026000
182	0.93799	+ OR - 0.00077	0.93722 TO 0.93876	0.93644 TO 0.93954	0.93567 TO 0.94031	1021000
187	0.93795	+ OR - 0.00078	0.93717 TO 0.93872	0.93639 TO 0.93950	0.93561 TO 0.94028	1016000
192	0.93791	+ OR - 0.00078	0.93713 TO 0.93869	0.93635 TO 0.93947	0.93557 TO 0.94025	1011000
197	0.93806	+ OR - 0.00078	0.93728 TO 0.93883	0.93650 TO 0.93961	0.93572 TO 0.94039	1006000
202	0.93803	+ OR - 0.00078	0.93725 TO 0.93881	0.93647 TO 0.93959	0.93570 TO 0.94036	1001000
207	0.93799	+ OR - 0.00078	0.93720 TO 0.93877	0.93642 TO 0.93955	0.93564 TO 0.94033	996000
212	0.93788	+ OR - 0.00078	0.93710 TO 0.93866	0.93632 TO 0.93944	0.93554 TO 0.94022	991000
217	0.93787	+ OR - 0.00078	0.93708 TO 0.93865	0.93630 TO 0.93944	0.93552 TO 0.94022	986000
222	0.93783	+ OR - 0.00079	0.93704 TO 0.93862	0.93626 TO 0.93940	0.93547 TO 0.94019	981000
227	0.93783	+ OR - 0.00079	0.93705 TO 0.93862	0.93626 TO 0.93940	0.93547 TO 0.94019	976000

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
232	0.93786	+ OR - 0.00079	0.93707 TO 0.93865	0.93628 TO 0.93943	0.93550 TO 0.94022	971000
237	0.93786	+ OR - 0.00079	0.93707 TO 0.93864	0.93628 TO 0.93943	0.93549 TO 0.94022	966000
242	0.93777	+ OR - 0.00079	0.93698 TO 0.93856	0.93619 TO 0.93934	0.93541 TO 0.94013	961000
247	0.93776	+ OR - 0.00079	0.93697 TO 0.93855	0.93618 TO 0.93934	0.93539 TO 0.94013	956000
252	0.93777	+ OR - 0.00079	0.93698 TO 0.93856	0.93618 TO 0.93935	0.93539 TO 0.94014	951000
257	0.93773	+ OR - 0.00079	0.93693 TO 0.93852	0.93614 TO 0.93931	0.93535 TO 0.94011	946000
262	0.93771	+ OR - 0.00080	0.93691 TO 0.93851	0.93612 TO 0.93930	0.93532 TO 0.94010	941000
267	0.93776	+ OR - 0.00080	0.93696 TO 0.93856	0.93616 TO 0.93935	0.93536 TO 0.94015	936000
272	0.93771	+ OR - 0.00080	0.93691 TO 0.93852	0.93611 TO 0.93932	0.93531 TO 0.94012	931000
277	0.93778	+ OR - 0.00080	0.93697 TO 0.93858	0.93617 TO 0.93938	0.93537 TO 0.94019	926000
282	0.93769	+ OR - 0.00081	0.93689 TO 0.93850	0.93608 TO 0.93931	0.93528 TO 0.94011	921000
287	0.93758	+ OR - 0.00081	0.93678 TO 0.93839	0.93597 TO 0.93920	0.93516 TO 0.94001	916000
292	0.93764	+ OR - 0.00081	0.93683 TO 0.93844	0.93602 TO 0.93925	0.93522 TO 0.94005	911000
297	0.93769	+ OR - 0.00081	0.93688 TO 0.93849	0.93607 TO 0.93930	0.93526 TO 0.94011	906000
302	0.93768	+ OR - 0.00081	0.93687 TO 0.93849	0.93606 TO 0.93931	0.93525 TO 0.94012	901000
307	0.93771	+ OR - 0.00082	0.93689 TO 0.93853	0.93608 TO 0.93934	0.93526 TO 0.94016	896000
312	0.93770	+ OR - 0.00082	0.93688 TO 0.93852	0.93606 TO 0.93933	0.93525 TO 0.94015	891000
317	0.93768	+ OR - 0.00082	0.93686 TO 0.93851	0.93604 TO 0.93933	0.93522 TO 0.94015	886000
322	0.93773	+ OR - 0.00083	0.93691 TO 0.93856	0.93608 TO 0.93938	0.93526 TO 0.94021	881000
327	0.93769	+ OR - 0.00083	0.93687 TO 0.93852	0.93604 TO 0.93935	0.93522 TO 0.94017	876000
332	0.93768	+ OR - 0.00083	0.93685 TO 0.93851	0.93602 TO 0.93934	0.93519 TO 0.94016	871000
337	0.93769	+ OR - 0.00083	0.93686 TO 0.93852	0.93603 TO 0.93935	0.93520 TO 0.94019	866000
342	0.93774	+ OR - 0.00084	0.93691 TO 0.93858	0.93607 TO 0.93941	0.93523 TO 0.94025	861000
347	0.93782	+ OR - 0.00084	0.93698 TO 0.93865	0.93614 TO 0.93949	0.93530 TO 0.94033	856000
352	0.93783	+ OR - 0.00084	0.93699 TO 0.93867	0.93614 TO 0.93952	0.93530 TO 0.94036	851000
357	0.93785	+ OR - 0.00085	0.93700 TO 0.93870	0.93615 TO 0.93954	0.93531 TO 0.94039	846000
362	0.93777	+ OR - 0.00085	0.93692 TO 0.93862	0.93607 TO 0.93947	0.93522 TO 0.94032	841000

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
367	0.93778	+ OR - 0.00085	0.93692 TO 0.93863	0.93607 TO 0.93948	0.93522 TO 0.94034	836000
372	0.93770	+ OR - 0.00086	0.93684 TO 0.93855	0.93598 TO 0.93941	0.93513 TO 0.94027	831000
377	0.93781	+ OR - 0.00086	0.93695 TO 0.93867	0.93609 TO 0.93953	0.93523 TO 0.94039	826000
382	0.93788	+ OR - 0.00086	0.93702 TO 0.93875	0.93616 TO 0.93961	0.93530 TO 0.94047	821000
387	0.93788	+ OR - 0.00087	0.93702 TO 0.93875	0.93615 TO 0.93962	0.93529 TO 0.94048	816000
392	0.93793	+ OR - 0.00087	0.93706 TO 0.93880	0.93619 TO 0.93967	0.93532 TO 0.94054	811000
397	0.93783	+ OR - 0.00087	0.93696 TO 0.93870	0.93609 TO 0.93958	0.93521 TO 0.94045	806000
402	0.93782	+ OR - 0.00087	0.93694 TO 0.93869	0.93607 TO 0.93956	0.93520 TO 0.94044	801000
407	0.93788	+ OR - 0.00088	0.93700 TO 0.93875	0.93612 TO 0.93963	0.93524 TO 0.94051	796000
412	0.93789	+ OR - 0.00088	0.93701 TO 0.93877	0.93613 TO 0.93965	0.93525 TO 0.94053	791000
417	0.93784	+ OR - 0.00088	0.93695 TO 0.93872	0.93607 TO 0.93960	0.93519 TO 0.94048	786000
422	0.93792	+ OR - 0.00088	0.93704 TO 0.93881	0.93615 TO 0.93969	0.93527 TO 0.94058	781000
427	0.93776	+ OR - 0.00089	0.93687 TO 0.93865	0.93599 TO 0.93953	0.93510 TO 0.94042	776000
432	0.93765	+ OR - 0.00089	0.93677 TO 0.93854	0.93588 TO 0.93943	0.93499 TO 0.94031	771000
437	0.93762	+ OR - 0.00089	0.93673 TO 0.93851	0.93584 TO 0.93940	0.93495 TO 0.94030	766000
442	0.93757	+ OR - 0.00090	0.93668 TO 0.93847	0.93578 TO 0.93936	0.93489 TO 0.94026	761000
447	0.93765	+ OR - 0.00090	0.93675 TO 0.93855	0.93585 TO 0.93945	0.93496 TO 0.94035	756000
452	0.93759	+ OR - 0.00090	0.93669 TO 0.93849	0.93578 TO 0.93939	0.93488 TO 0.94029	751000
457	0.93778	+ OR - 0.00090	0.93688 TO 0.93868	0.93597 TO 0.93958	0.93507 TO 0.94048	746000
462	0.93784	+ OR - 0.00090	0.93693 TO 0.93874	0.93603 TO 0.93964	0.93513 TO 0.94055	741000
467	0.93795	+ OR - 0.00090	0.93705 TO 0.93886	0.93615 TO 0.93976	0.93524 TO 0.94067	736000
472	0.93796	+ OR - 0.00091	0.93705 TO 0.93887	0.93614 TO 0.93978	0.93524 TO 0.94068	731000
477	0.93800	+ OR - 0.00091	0.93709 TO 0.93891	0.93618 TO 0.93982	0.93527 TO 0.94073	726000
482	0.93809	+ OR - 0.00091	0.93718 TO 0.93901	0.93627 TO 0.93992	0.93536 TO 0.94083	721000
487	0.93801	+ OR - 0.00092	0.93709 TO 0.93892	0.93618 TO 0.93984	0.93526 TO 0.94075	716000
492	0.93798	+ OR - 0.00092	0.93707 TO 0.93890	0.93615 TO 0.93982	0.93524 TO 0.94073	711000
497	0.93787	+ OR - 0.00092	0.93695 TO 0.93879	0.93603 TO 0.93971	0.93511 TO 0.94063	706000

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
502	0.93787	+ OR - 0.00092	0.93695 TO 0.93880	0.93603 TO 0.93972	0.93510 TO 0.94065	701000
507	0.93789	+ OR - 0.00093	0.93696 TO 0.93882	0.93604 TO 0.93975	0.93511 TO 0.94068	696000
512	0.93795	+ OR - 0.00093	0.93702 TO 0.93888	0.93609 TO 0.93981	0.93515 TO 0.94075	691000
517	0.93796	+ OR - 0.00094	0.93702 TO 0.93889	0.93608 TO 0.93983	0.93515 TO 0.94077	686000
522	0.93794	+ OR - 0.00094	0.93700 TO 0.93889	0.93606 TO 0.93983	0.93511 TO 0.94077	681000
527	0.93801	+ OR - 0.00094	0.93707 TO 0.93896	0.93612 TO 0.93990	0.93518 TO 0.94085	676000
532	0.93808	+ OR - 0.00095	0.93713 TO 0.93902	0.93618 TO 0.93997	0.93523 TO 0.94092	671000
537	0.93812	+ OR - 0.00095	0.93717 TO 0.93908	0.93622 TO 0.94003	0.93526 TO 0.94098	666000
542	0.93816	+ OR - 0.00096	0.93720 TO 0.93912	0.93624 TO 0.94007	0.93529 TO 0.94103	661000
547	0.93799	+ OR - 0.00096	0.93703 TO 0.93895	0.93607 TO 0.93991	0.93511 TO 0.94087	656000
552	0.93805	+ OR - 0.00097	0.93709 TO 0.93902	0.93612 TO 0.93999	0.93515 TO 0.94095	651000
557	0.93804	+ OR - 0.00097	0.93707 TO 0.93901	0.93609 TO 0.93998	0.93512 TO 0.94095	646000
562	0.93795	+ OR - 0.00097	0.93698 TO 0.93892	0.93600 TO 0.93990	0.93503 TO 0.94087	641000
567	0.93806	+ OR - 0.00098	0.93708 TO 0.93904	0.93610 TO 0.94002	0.93512 TO 0.94099	636000
572	0 93800	+ OR - 0.00098	0.93702 TO 0.93898	0.93603 TO 0.93997	0.93505 TO 0.94095	631000
577	0.93800	+ OR - 0.00098	0.93702 TO 0.93899	0.93604 TO 0.93997	0.93505 TO 0.94095	626000
582	0.93799	+ OR - 0.00099	0.93700 TO 0.93898	0.93601 TO 0.93997	0.93502 TO 0.94095	621000
587	0.93795	+ OR - 0.00099	0.93696 TO 0.93895	0.93597 TO 0.93994	0.93498 TO 0.94093	616000
592	0.93791	+ OR - 0.00100	0.93692 TO 0.93891	0.93592 TO 0.93990	0.93492 TO 0.94090	611000
597	0.93779	+ OR - 0.00099	0.93679 TO 0.93878	0.93580 TO 0.93977	0.93481 TO 0.94077	606000
602	0.93779	+ OR - 0.00099	0.93679 TO 0.93878	0.93580 TO 0.93977	0.93481 TO 0.94076	601000
607	0.93773	+ OR - 0.00100	0.93673 TO 0.93872	0.93573 TO 0.93972	0.93474 TO 0.94072	596000
612	0.93763	+ OR - 0.00100	0.93663 TO 0.93863	0.93563 TO 0.93963	0.93462 TO 0.94063	591000
617	0.93767	+ OR - 0.00101	0.93667 TO 0.93868	0.93566 TO 0.93969	0.93465 TO 0.94070	586000
622	0.93761	+ OR - 0.00101	0.93661 TO 0.93862	0.93560 TO 0.93963	0.93459 TO 0.94064	581000
627	0.93762	+ OR - 0.00101	0.93660 TO 0.93863	0.93559 TO 0.93964	0.93458 TO 0.94066	576000
632	0.93749	+ OR - 0.00101	0.93647 TO 0.93850	0.93546 TO 0.93952	0.93444 TO 0.94053	571000

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
637	0.93742	+ OR - 0.00102	0.93641 TO 0.93844	0.93539 TO 0.93945	0.93438 TO 0.94047	566000
642	0.93724	+ OR - 0.00102	0.93622 TO 0.93825	0.93521 TO 0.93927	0.93419 TO 0.94028	561000
647	0.93724	+ OR - 0.00102	0.93622 TO 0.93827	0.93519 TO 0.93929	0.93417 TO 0.94032	556000
652	0.93729	+ OR - 0.00103	0.93626 TO 0.93832	0.93523 TO 0.93935	0.93420 TO 0.94038	551000
657	0.93729	+ OR - 0.00104	0.93625 TO 0.93833	0.93522 TO 0.93936	0.93418 TO 0.94040	546000
662	0.93725	+ OR - 0.00104	0.93621 TO 0.93829	0.93517 TO 0.93933	0.93413 TO 0.94037	541000
667	0.93728	+ OR - 0.00105	0.93623 TO 0.93833	0.93518 TO 0.93938	0.93413 TO 0.94043	536000
672	0.93721	+ OR - 0.00106	0.93615 TO 0.93826	0.93509 TO 0.93932	0.93403 TO 0.94038	531000
677	0.93710	+ OR - 0.00106	0.93604 TO 0.93817	0.93498 TO 0.93923	0.93391 TO 0.94030	526000
682	0.93696	+ OR - 0.00107	0.93589 TO 0.93803	0.93482 TO 0.93910	0.93375 TO 0.94017	521000
687	0.93684	+ OR - 0.00107	0.93577 TO 0.93792	0.93470 TO 0.93899	0.93362 TO 0.94006	516000
692	0.93688	+ OR - 0.00108	0.93580 TO 0.93796	0.93472 TO 0.93904	0.93364 TO 0.94012	511000
697	0.93700	+ OR - 0.00108	0.93592 TO 0.93808	0.93483 TO 0.93916	0.93375 TO 0.94024	506000
702	0.93694	+ OR - 0.00109	0.93585 TO 0.93803	0.93477 TO 0.93911	0.93368 TO 0.94020	501000
707	0.93703	+ OR - 0.00109	0.93593 TO 0.93812	0.93484 TO 0.93921	0.93375 TO 0.94031	496000
712	0.93686	+ OR - 0.00110	0.93576 TO 0.93796	0.93466 TO 0.93906	0.93356 TO 0.94016	491000
717	0.93697	+ OR - 0.00110	0.93586 TO 0.93807	0.93476 TO 0.93918	0.93365 TO 0.94028	486000
722	0.93712	+ OR - 0.00111	0.93601 TO 0.93824	0.93490 TO 0.93935	0.93379 TO 0.94046	481000
727	0.93710	+ OR - 0.00112	0.93598 TO 0.93821	0.93487 TO 0.93933	0.93375 TO 0.94044	476000
732	0.93688	+ OR - 0.00112	0.93575 TO 0.93800	0.93463 TO 0.93912	0.93351 TO 0.94024	471000
737	0.93684	+ OR - 0.00113	0.93571 TO 0.93797	0.93458 TO 0.93910	0.93345 TO 0.94023	466000
742	0.93684	+ OR - 0.00114	0.93570 TO 0.93798	0.93456 TO 0.93912	0.93342 TO 0.94026	461000
747	0.93684	+ OR - 0.00115	0.93569 TO 0.93799	0.93454 TO 0.93914	0.93339 TO 0.94028	456000
752	0.93667	+ OR - 0.00115	0.93552 TO 0.93782	0.93436 TO 0.93898	0.93321 TO 0.94013	451000
757	0.93674	+ OR - 0.00116	0.93558 TO 0.93791	0.93442 TO 0.93907	0.93325 TO 0.94024	446000
762	0.93666	+ OR - 0.00117	0.93549 TO 0.93784	0.93432 TO 0.93901	0.93315 TO 0.94018	441000
767	0.93632	+ OR - 0.00117	0.93515 TO 0.93749	0.93397 TO 0.93866	0.93280 TO 0.93984	436000

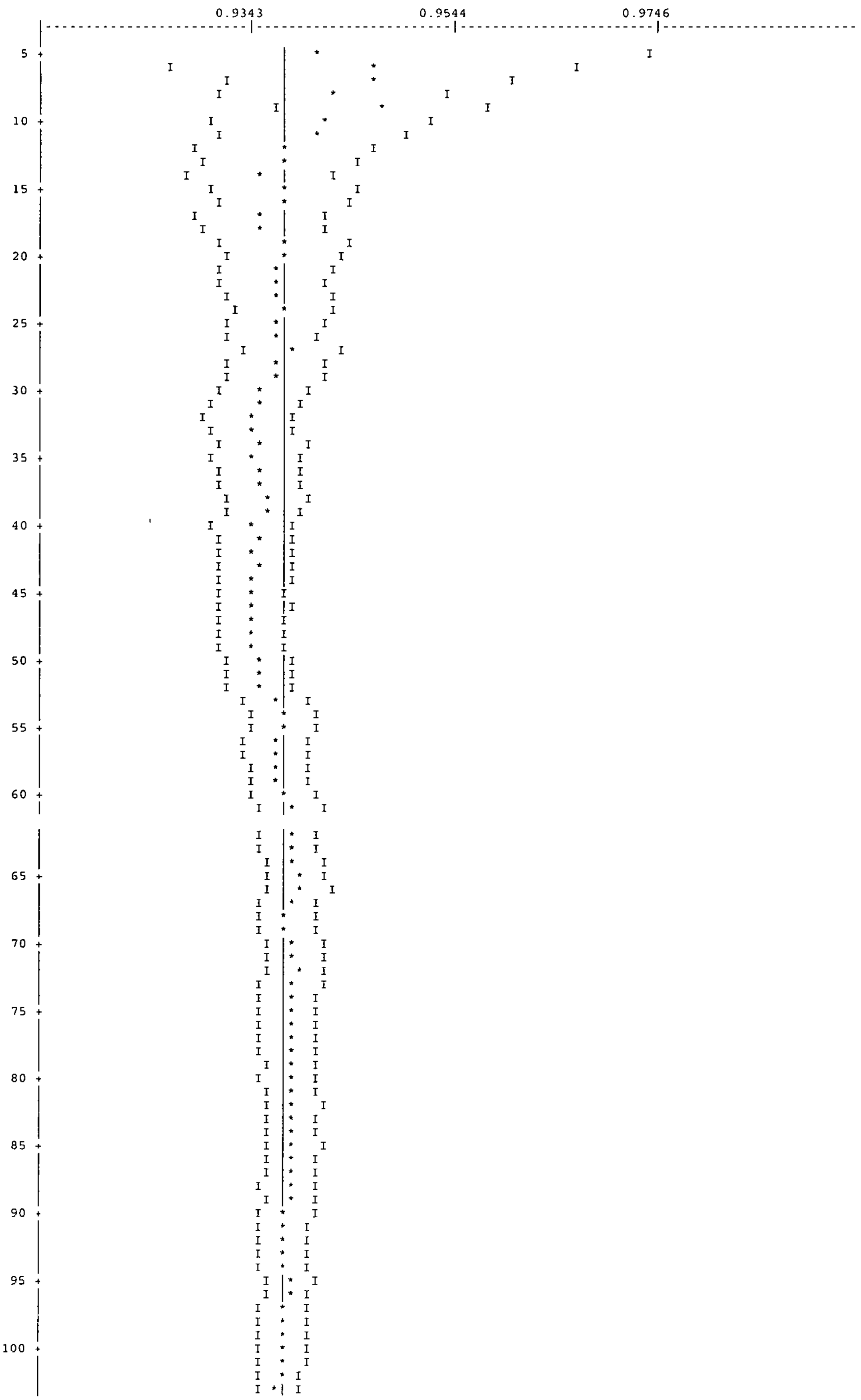
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
772	0.93637	+ OR - 0.00118	0.93519 TO 0.93755	0.93401 TO 0.93873	0.93283 TO 0.93991	431000
777	0.93642	+ OR - 0.00119	0.93523 TO 0.93760	0.93404 TO 0.93879	0.93286 TO 0.93997	426000
782	0.93638	+ OR - 0.00119	0.93519 TO 0.93757	0.93400 TO 0.93876	0.93281 TO 0.93995	421000
787	0.93620	+ OR - 0.00120	0.93500 TO 0.93739	0.93381 TO 0.93859	0.93261 TO 0.93979	416000
792	0.93620	+ OR - 0.00121	0.93499 TO 0.93741	0.93378 TO 0.93861	0.93257 TO 0.93982	411000
797	0.93618	+ OR - 0.00122	0.93496 TO 0.93739	0.93374 TO 0.93861	0.93252 TO 0.93983	406000
802	0.93617	+ OR - 0.00123	0.93494 TO 0.93740	0.93372 TO 0.93862	0.93249 TO 0.93985	401000
807	0.93637	+ OR - 0.00124	0.93513 TO 0.93761	0.93390 TO 0.93885	0.93266 TO 0.94008	396000
812	0.93651	+ OR - 0.00125	0.93526 TO 0.93776	0.93401 TO 0.93901	0.93276 TO 0.94026	391000
817	0.93651	+ OR - 0.00126	0.93525 TO 0.93776	0.93399 TO 0.93902	0.93273 TO 0.94028	386000
822	0.93648	+ OR - 0.00127	0.93520 TO 0.93775	0.93393 TO 0.93903	0.93266 TO 0.94030	381000
827	0.93649	+ OR - 0.00129	0.93520 TO 0.93778	0.93391 TO 0.93906	0.93263 TO 0.94035	376000
832	0.93639	+ OR - 0.00130	0.93509 TO 0.93770	0.93379 TO 0.93900	0.93249 TO 0.94030	371000
837	0.93618	+ OR - 0.00130	0.93489 TO 0.93748	0.93359 TO 0.93878	0.93230 TO 0.94007	366000
842	0.93619	+ OR - 0.00130	0.93488 TO 0.93749	0.93358 TO 0.93879	0.93228 TO 0.94010	361000
847	0.93631	+ OR - 0.00132	0.93499 TO 0.93762	0.93367 TO 0.93894	0.93235 TO 0.94026	356000
852	0.93636	+ OR - 0.00133	0.93503 TO 0.93769	0.93370 TO 0.93902	0.93237 TO 0.94035	351000
857	0.93633	+ OR - 0.00133	0.93499 TO 0.93766	0.93366 TO 0.93899	0.93233 TO 0.94032	346000
862	0.93625	+ OR - 0.00135	0.93491 TO 0.93760	0.93356 TO 0.93895	0.93221 TO 0.94030	341000
867	0.93648	+ OR - 0.00136	0.93512 TO 0.93784	0.93375 TO 0.93921	0.93239 TO 0.94057	336000
872	0.93625	+ OR - 0.00137	0.93488 TO 0.93761	0.93351 TO 0.93898	0.93215 TO 0.94035	331000
877	0.93623	+ OR - 0.00138	0.93486 TO 0.93761	0.93348 TO 0.93899	0.93210 TO 0.94037	326000
882	0.93646	+ OR - 0.00139	0.93506 TO 0.93785	0.93367 TO 0.93924	0.93228 TO 0.94063	321000
887	0.93669	+ OR - 0.00139	0.93531 TO 0.93808	0.93392 TO 0.93947	0.93254 TO 0.94085	316000
892	0.93658	+ OR - 0.00140	0.93518 TO 0.93798	0.93378 TO 0.93938	0.93238 TO 0.94079	311000
897	0.93668	+ OR - 0.00142	0.93526 TO 0.93810	0.93384 TO 0.93952	0.93242 TO 0.94093	306000
902	0.93683	+ OR - 0.00143	0.93539 TO 0.93826	0.93396 TO 0.93969	0.93253 TO 0.94112	301000

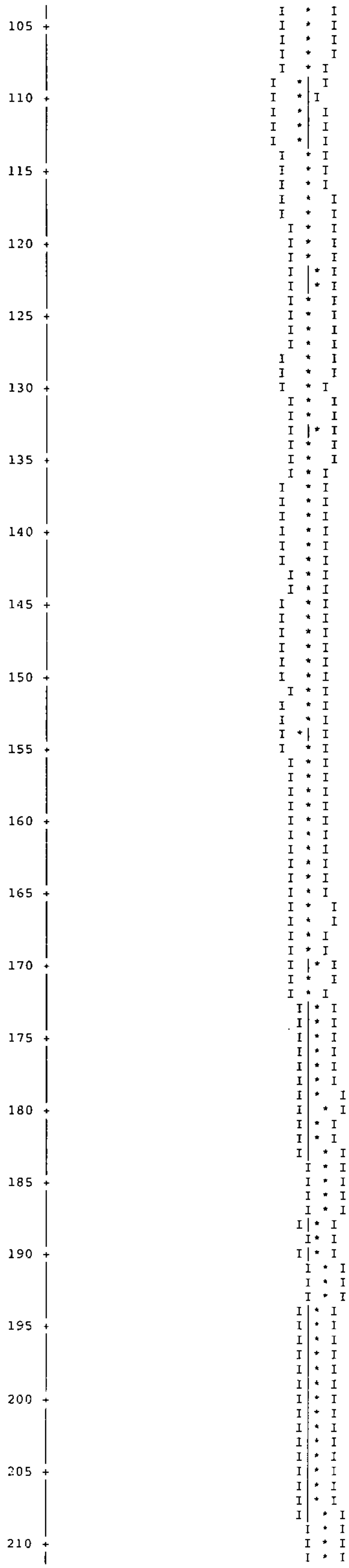
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
907	0.93678	+ OR - 0.00145	0.93534 TO 0.93823	0.93389 TO 0.93968	0.93244 TO 0.94113	296000
912	0.93674	+ OR - 0.00147	0.93527 TO 0.93821	0.93381 TO 0.93967	0.93234 TO 0.94114	291000
917	0.93680	+ OR - 0.00149	0.93531 TO 0.93828	0.93382 TO 0.93977	0.93234 TO 0.94126	286000
922	0.93685	+ OR - 0.00151	0.93534 TO 0.93836	0.93383 TO 0.93987	0.93231 TO 0.94138	281000
927	0.93685	+ OR - 0.00151	0.93534 TO 0.93837	0.93383 TO 0.93988	0.93231 TO 0.94140	276000
932	0.93657	+ OR - 0.00152	0.93505 TO 0.93809	0.93353 TO 0.93961	0.93201 TO 0.94113	271000
937	0.93656	+ OR - 0.00153	0.93502 TO 0.93809	0.93349 TO 0.93962	0.93196 TO 0.94116	266000
942	0.93636	+ OR - 0.00153	0.93483 TO 0.93789	0.93329 TO 0.93942	0.93176 TO 0.94095	261000
947	0.93636	+ OR - 0.00156	0.93481 TO 0.93792	0.93325 TO 0.93948	0.93169 TO 0.94104	256000
952	0.93614	+ OR - 0.00158	0.93456 TO 0.93772	0.93298 TO 0.93931	0.93139 TO 0.94089	251000
957	0.93610	+ OR - 0.00160	0.93449 TO 0.93770	0.93289 TO 0.93930	0.93128 TO 0.94091	246000
962	0.93616	+ OR - 0.00163	0.93453 TO 0.93779	0.93290 TO 0.93942	0.93127 TO 0.94105	241000
967	0.93619	+ OR - 0.00164	0.93455 TO 0.93783	0.93291 TO 0.93947	0.93127 TO 0.94111	236000
972	0.93618	+ OR - 0.00167	0.93451 TO 0.93785	0.93284 TO 0.93953	0.93117 TO 0.94120	231000
977	0.93636	+ OR - 0.00168	0.93468 TO 0.93804	0.93300 TO 0.93973	0.93132 TO 0.94141	226000
982	0.93612	+ OR - 0.00170	0.93442 TO 0.93782	0.93271 TO 0.93953	0.93101 TO 0.94123	221000
987	0.93628	+ OR - 0.00172	0.93457 TO 0.93800	0.93285 TO 0.93972	0.93113 TO 0.94144	216000
992	0.93621	+ OR - 0.00174	0.93447 TO 0.93795	0.93273 TO 0.93969	0.93098 TO 0.94144	211000
997	0.93597	+ OR - 0.00176	0.93421 TO 0.93773	0.93245 TO 0.93949	0.93070 TO 0.94125	206000
1002	0.93598	+ OR - 0.00180	0.93418 TO 0.93778	0.93238 TO 0.93958	0.93058 TO 0.94138	201000
1007	0.93575	+ OR - 0.00183	0.93392 TO 0.93758	0.93209 TO 0.93941	0.93026 TO 0.94124	196000
1012	0.93518	+ OR - 0.00186	0.93333 TO 0.93704	0.93147 TO 0.93889	0.92962 TO 0.94075	191000
1017	0.93514	+ OR - 0.00190	0.93324 TO 0.93703	0.93135 TO 0.93893	0.92945 TO 0.94082	186000
1022	0.93565	+ OR - 0.00193	0.93372 TO 0.93758	0.93178 TO 0.93951	0.92985 TO 0.94145	181000
1027	0.93618	+ OR - 0.00195	0.93423 TO 0.93814	0.93228 TO 0.94009	0.93033 TO 0.94204	176000
1032	0.93561	+ OR - 0.00196	0.93365 TO 0.93756	0.93170 TO 0.93952	0.92974 TO 0.94148	171000
1037	0.93620	+ OR - 0.00198	0.93422 TO 0.93818	0.93224 TO 0.94016	0.93026 TO 0.94214	166000

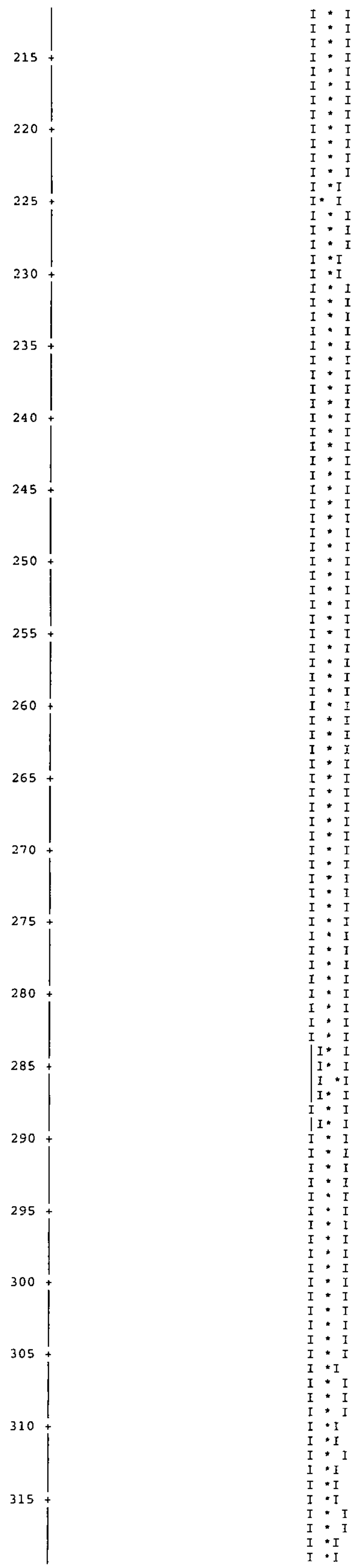
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
1042	0.93585	+ OR - 0.00201	0.93384 TO 0.93786	0.93183 TO 0.93987	0.92982 TO 0.94187	161000
1047	0.93583	+ OR - 0.00195	0.93388 TO 0.93778	0.93193 TO 0.93973	0.92998 TO 0.94168	156000
1052	0.93632	+ OR - 0.00197	0.93435 TO 0.93829	0.93239 TO 0.94026	0.93042 TO 0.94223	151000
1057	0.93610	+ OR - 0.00195	0.93415 TO 0.93805	0.93220 TO 0.94000	0.93025 TO 0.94195	146000
1062	0.93566	+ OR - 0.00199	0.93367 TO 0.93766	0.93168 TO 0.93965	0.92969 TO 0.94164	141000
1067	0.93582	+ OR - 0.00197	0.93385 TO 0.93779	0.93188 TO 0.93976	0.92991 TO 0.94173	136000
1072	0.93621	+ OR - 0.00201	0.93421 TO 0.93822	0.93220 TO 0.94022	0.93020 TO 0.94223	131000
1077	0.93622	+ OR - 0.00207	0.93415 TO 0.93830	0.93208 TO 0.94037	0.93000 TO 0.94245	126000
1082	0.93661	+ OR - 0.00214	0.93447 TO 0.93875	0.93234 TO 0.94088	0.93020 TO 0.94302	121000
1087	0.93703	+ OR - 0.00220	0.93484 TO 0.93923	0.93264 TO 0.94143	0.93044 TO 0.94363	116000
1092	0.93783	+ OR - 0.00221	0.93562 TO 0.94004	0.93341 TO 0.94225	0.93120 TO 0.94446	111000
1097	0.93768	+ OR - 0.00224	0.93544 TO 0.93992	0.93319 TO 0.94216	0.93095 TO 0.94440	106000
1102	0.93704	+ OR - 0.00220	0.93483 TO 0.93924	0.93263 TO 0.94144	0.93043 TO 0.94364	101000
1107	0.93674	+ OR - 0.00229	0.93445 TO 0.93903	0.93216 TO 0.94132	0.92987 TO 0.94361	96000
1112	0.93682	+ OR - 0.00226	0.93456 TO 0.93909	0.93229 TO 0.94135	0.93003 TO 0.94362	91000
1117	0.93695	+ OR - 0.00233	0.93462 TO 0.93928	0.93228 TO 0.94161	0.92995 TO 0.94395	86000
1122	0.93679	+ OR - 0.00233	0.93446 TO 0.93913	0.93213 TO 0.94146	0.92980 TO 0.94379	81000
1127	0.93728	+ OR - 0.00242	0.93486 TO 0.93971	0.93243 TO 0.94213	0.93001 TO 0.94456	76000
1132	0.93784	+ OR - 0.00253	0.93531 TO 0.94037	0.93279 TO 0.94290	0.93026 TO 0.94543	71000
1137	0.93839	+ OR - 0.00269	0.93570 TO 0.94108	0.93300 TO 0.94378	0.93031 TO 0.94647	66000
1142	0.93839	+ OR - 0.00276	0.93564 TO 0.94115	0.93288 TO 0.94391	0.93012 TO 0.94667	61000
1147	0.93719	+ OR - 0.00283	0.93436 TO 0.94002	0.93153 TO 0.94285	0.92870 TO 0.94568	56000
1152	0.93786	+ OR - 0.00299	0.93487 TO 0.94086	0.93188 TO 0.94385	0.92889 TO 0.94684	51000
1157	0.93748	+ OR - 0.00324	0.93424 TO 0.94072	0.93100 TO 0.94396	0.92776 TO 0.94720	46000
1162	0.93678	+ OR - 0.00318	0.93360 TO 0.93996	0.93041 TO 0.94315	0.92723 TO 0.94633	41000
1167	0.93664	+ OR - 0.00358	0.93306 TO 0.94022	0.92947 TO 0.94381	0.92589 TO 0.94739	36000
1172	0.93756	+ OR - 0.00394	0.93362 TO 0.94151	0.92968 TO 0.94545	0.92573 TO 0.94939	31000

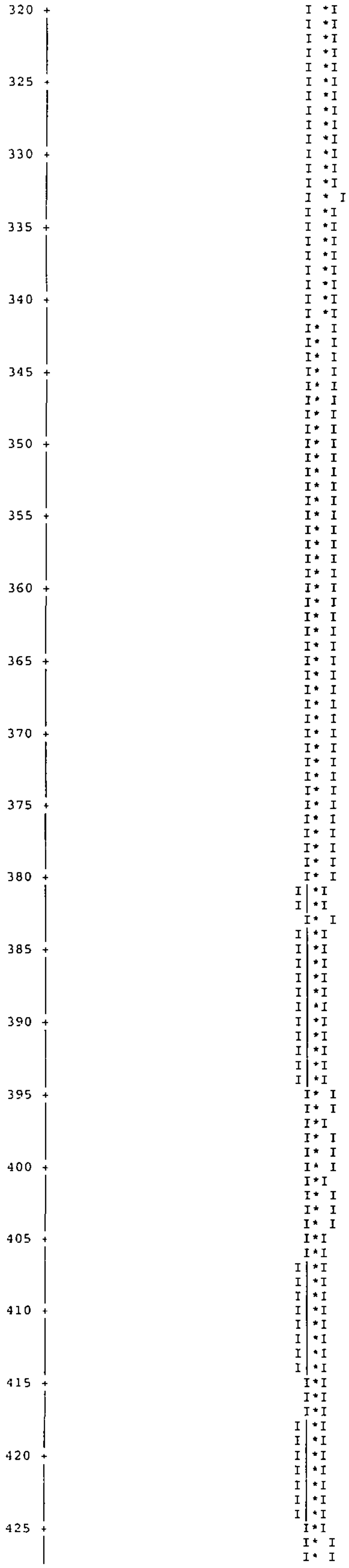
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
1177	0.93754	+ OR - 0.00427	0.93327 TO 0.94181	0.92900 TO 0.94608	0.92473 TO 0.95035	26000
1182	0.93970	+ OR - 0.00467	0 93503 TO 0.94437	0.93036 TO 0.94903	0.92569 TO 0.95370	21000
1187	0.94097	+ OR - 0.00508	0.93589 TO 0.94606	0.93080 TO 0.95114	0.92572 TO 0.95623	16000
1192	0.94058	+ OR - 0.00679	0.93379 TO 0.94737	0.92699 TO 0.95417	0.92020 TO 0.96096	11000
1197	0.93471	+ OR - 0.01046	0.92426 TO 0.94517	0.91380 TO 0.95562	0.90334 TO 0.96608	6000

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.9381 + OR - 0.0007 WHICH OCCURS FOR 1203 GENERATIONS RUN.








320
325
330
335
340
345
350
355
360
365
370
375
380
385
390
395
400
405
410
415
420
425

```
    |                          I*  I
    |                          I*  I
430 +                          I*  I
    |                          I*  I
    |                          I*  I
    |                          I*  I
    |                          I*  I
435 +                          I*  I
    |                          I*  I
    |                          I*  I
    |                          I*  I
    |                          I*  I
440 +                          I*  I
    |                          I*  I
    |                          I*  I
    |                          I*  I
    |                          I*  I
445 +                          I*  I
    |                          I*  I
    |                          I*  I
    |                          I*  I
    |                          I*  I
450 +                          I*  I
    |                          I*  I
    |                          I*  I
    |                          I*  I
    |                          I*  I
455 +                          I*I
    |                          I*I
    |                          I*I
    |                          I*I
    |                          I*I
460 +                          I*I
    |                         I|*I
    |                         I|*I
    |                         I|*I
    |                         I|*I
465 +                         I|*I
    |                         I|*I
    |                         I|*I
    |                         I|*I
    |                         I|*I
470 +                         I|*I
    |                         I|*I
    |                         I|*I
    |                         I|*I
    |                         I|*I
475 +                         I* I
    |                         I|*I
    |                         I|*I
    |                         I|*I
    |                         I* I
480 +                         I|*I
    |                         I* I
    |                         I* I
    |                         I* I
    |                         I* I
485 +                         I* I
    |                         I|*I
    |                         I* I
    |                         I|*I
    |                         I* I
490 +                         I|*I
    |                         I* I
    |                         I|*I
    |                         I|*I
    |                         I|*I
495 +                         I|*I
    |                         I|*I
    |                         I|*I
    |                         I|*I
    |                         I|*I
500 +                         I|*I
    |                         I|*I
    |                         I|*I
    |                         I|*I
    |                         I|*I
505 +                         I|*I
    |                         I|*I
    |                         I|*I
    |                         I|*I
    |                         I|*I
510 +                         I|*I
    |                         I|*I
    |                         I|*I
    |                         I|*I
    |                         I|*I
515 +                         I|*I
    |                         I|*I
    |                         I|*I
    |                         I|*I
    |                         I|*I
520 +                         I|*I
    |                         I|*I
    |                         I|*I
    |                         I|*I
    |                         I|*I
525 +                         I|*I
    |                         I|*I
    |                         I* I
    |                         I* I
    |                         I* I
530 +                         I* I
    |                         I* I
    |                         I* I
    |                         I* I
    |                         I* I
535 +                         I* I
```

```
    |                         I* I
    |                         I* I
    |                         I* I
    |                         I* I
540 +                         I* I
    |                         I*I
    |                         I* I
    |                         I* I
    |                         I* I
545 +                         I* I
    |                         I* I
    |                         I* I
    |                         I* I
    |                         I* I
550 +                         I* I
    |                         I* I
    |                         I* I
    |                         I* I
    |                         I* I
555 +                         I* I
    |                         I* I
    |                         I* I
    |                         I|*I
    |                         I* I
560 +                         I* I
    |                         I|*I
    |                         I|*I
    |                         I* I
    |                         I* I
565 +                         I* I
    |                         I* I
    |                         I* I
    |                         I* I
    |                         I* I
570 +                         I* I
    |                         I* I
    |                         I* I
    |                         I* I
    |                         I* I
575 +                         I* I
    |                         I* I
    |                         I* I
    |                         I* I
    |                         I* I
580 +                         I* I
    |                         I* I
    |                         I* I
    |                         I|*I
    |                         I|*I
585 +                         I|*I
    |                         I|*I
    |                         I* I
    |                         I|*I
    |                         I|*I
590 +                         I|*I
    |                         I|*I
    |                         I|*I
    |                         I|*I
    |                          I*I
595 +                          I*I
    |                          I*I
    |                         I|*I
    |                         I|*I
    |                         I|*I
600 +                         I|*I
    |                         I|*I
    |                         I|*I
    |                         I|*I
    |                         I|*I
605 +                          I*I
    |                          I*I
    |                          I*I
    |                          I*I
    |                          I*I
610 +                          I*I
    |                          I*I
    |                          I*I
    |                          I*I
    |                          I*I
615 +                          I*I
    |                          I*I
    |                          I*I
    |                          I*I
    |                          I*I
620 +                          I*I
    |                          I*I
    |                          I*I
    |                          I*I
    |                          I*I
625 +                          I*I
    |                          I*I
    |                          I*I
    |                          I*I
    |                          I*I
630 +                          I*I
    |                          I*I
    |                          I*I
    |                          I*I
    |                          I*I
635 +                          I*I
    |                          I*I
    |                          I*I
    |                          I*I
    |                          I*I
640 +                          I*I
    |                          I*I
    |                          I*I
    |                          I*I
```

```
     |                        I*I
 645 +                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
 650 +                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
 655 +                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
 660 +                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
 665 +                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
 670 +                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
 675 +                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
 680 +                        I*I
     |                        I* I
     |                        I* I
     |                        I* I
     |                        I*I
 685 +                        I* I
     |                        I* I
     |                        I* I
     |                        I* I
     |                        I* I
 690 +                        I* I
     |                        I* I
     |                        I* I
     |                        I* I
     |                        I* I
 695 +                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
     |                        I* I
 700 +                        I*I
     |                        I* I
     |                        I*I
     |                        I*I
     |                        I*I
 705 +                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
 710 +                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
 715 +                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
 720 +                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
 725 +                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
 730 +                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
 735 +                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
 740 +                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
 745 +                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
     |                        I*I
 750 +                        I*I
     |                        I*I
```

```
    |                    I*I
    |                    I*I
    |                    I*I
755 +                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
760 +                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
765 +                    I* I
    |                    I* I
    |                    I *I
    |                    I *I
    |                   |I*I
770 +                    I *I
    |                    I *I
    |                    I* I
    |                    I *I
    |                    I* I
775 +                    I* I
    |                    I* I
    |                    I* I
    |                    I*I
    |                    I*I
780 +                    I* I
    |                    I* I
    |                    I* I
    |                    I*I
    |                    I* I
785 +                    I* I
    |                    I *I
    |                    I *I
    |                    I *I
    |                    I *I
790 +                    I* I
    |                    I* I
    |                    I *I
    |                    I *I
    |                   |I*I
795 +                   |I*I
    |                    I *I
    |                    I *I
    |                    I *I
    |                    I* I
800 +                    I* I
    |                    I *I
    |                    I* I
    |                    I* I
    |                    I* I
805 +                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
810 +                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
815 +                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
820 +                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
825 +                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
830 +                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
835 +                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
840 +                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
845 +                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
850 +                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
855 +                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
    |                    I*I
```

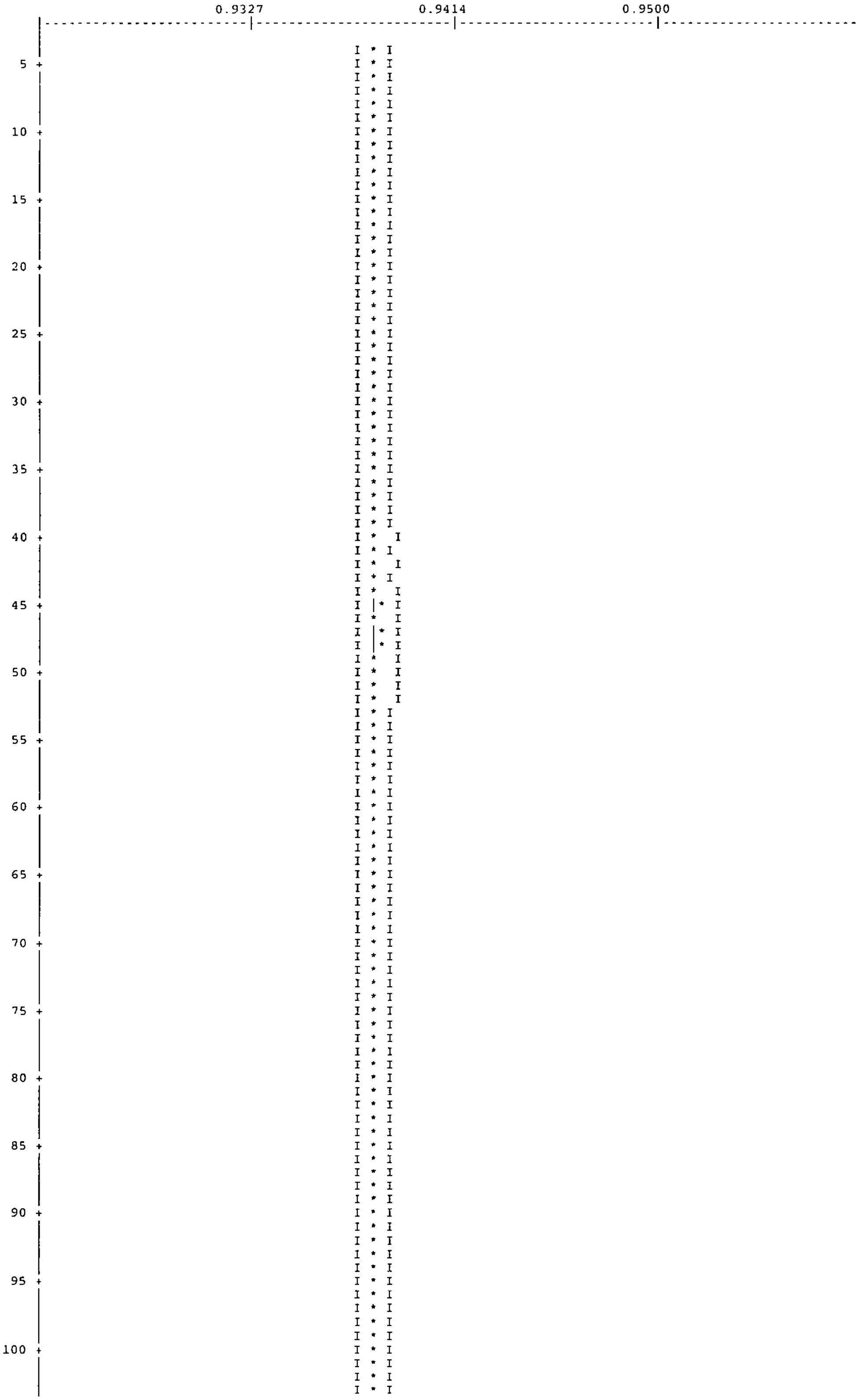
```
860 +                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
865 +                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
870 +                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
875 +                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
880 +                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
885 +                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
890 +                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
895 +                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
900 +                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
905 +                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
910 +                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
915 +                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
920 +                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
925 +                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
930 +                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
935 +                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
940 +                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
945 +                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
950 +                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
955 +                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
960 +                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
    |                                I*I
965 +                                I*I
    |                                I*I
    |                                I*I
```

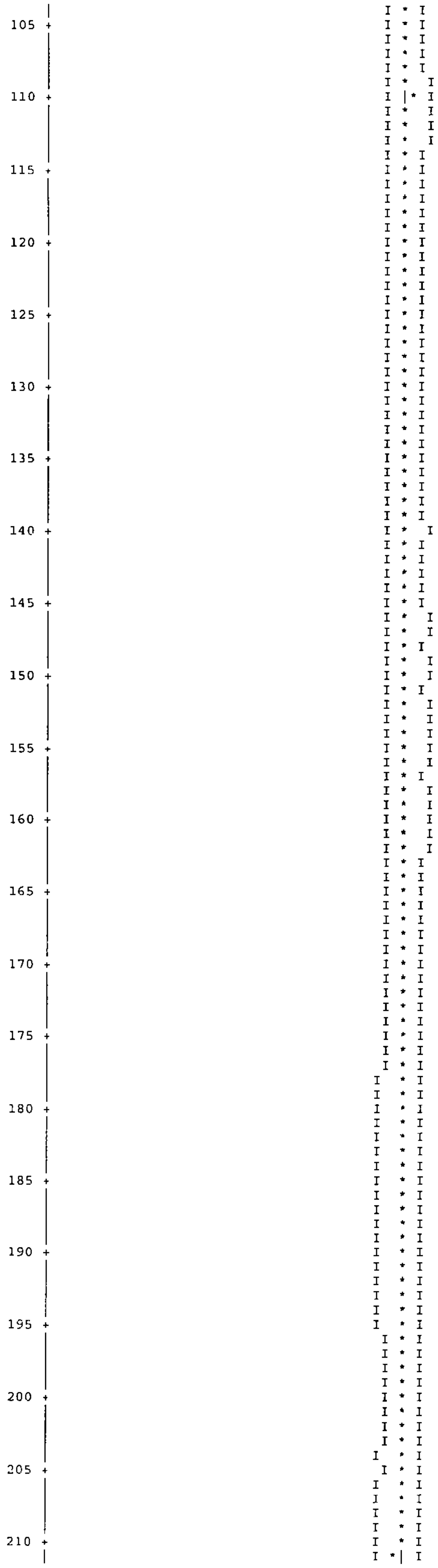
```
     |                    I*I
     |                    I*I
 970 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
 975 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
 980 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
 985 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
 990 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
 995 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1000 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1005 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1010 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1015 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1020 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1025 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1030 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1035 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1040 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1045 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1050 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*
     |                    I*I
1055 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1060 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1065 +                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
     |                    I*I
1070 +                    I*I
     |                    I*I
     |                    I*
     |                    I*
     |                    I*
1075 +                    I*
```

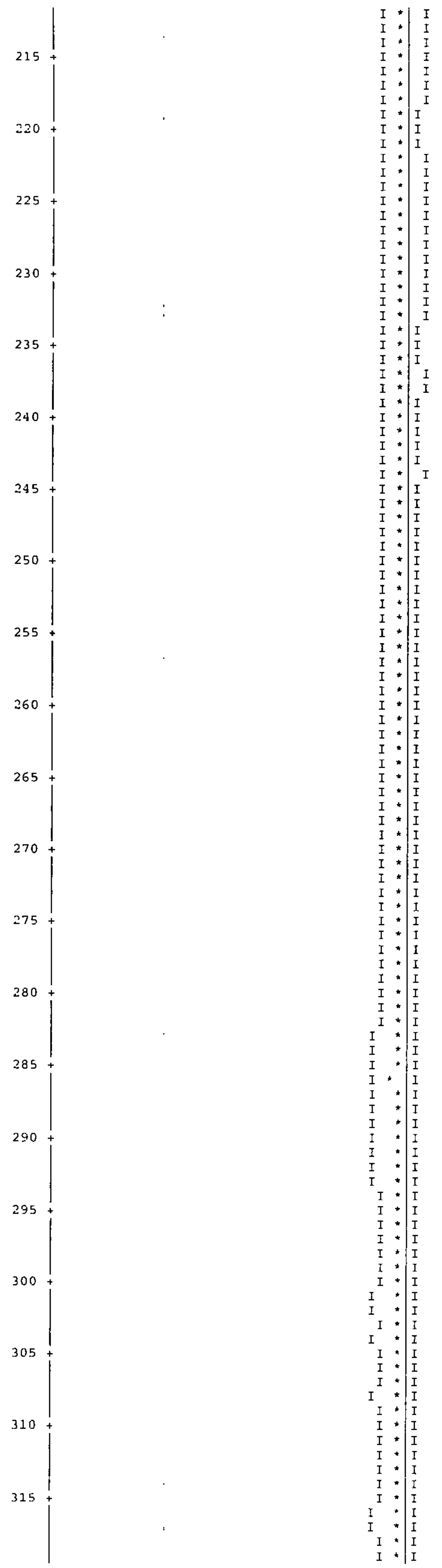
```
      |                          I*
      |                          I*
      |                          I*
      |                          I*
 1080 +                          *I
      |                          *I
      |                          *I
      |                          *I
      |                          *I
 1085 +                          *I
      |                          *I
      |                         I*I
      |                         I*I
      |                         I*I
 1090 +                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
 1095 +                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
 1100 +                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
 1105 +                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
 1110 +                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
 1115 +                         I*I
      |                         I*I
      |                         I*I
      |                          *I
      |                          *I
 1120 +                          *I
      |                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
 1125 +                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
 1130 +                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
 1135 +                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
 1140 +                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
 1145 +                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
 1150 +                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
 1155 +                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
 1160 +                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
 1165 +                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
 1170 +                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
 1175 +                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
 1180 +                         I*I
      |                         I*I
      |                         I*I
      |                         I*I
```

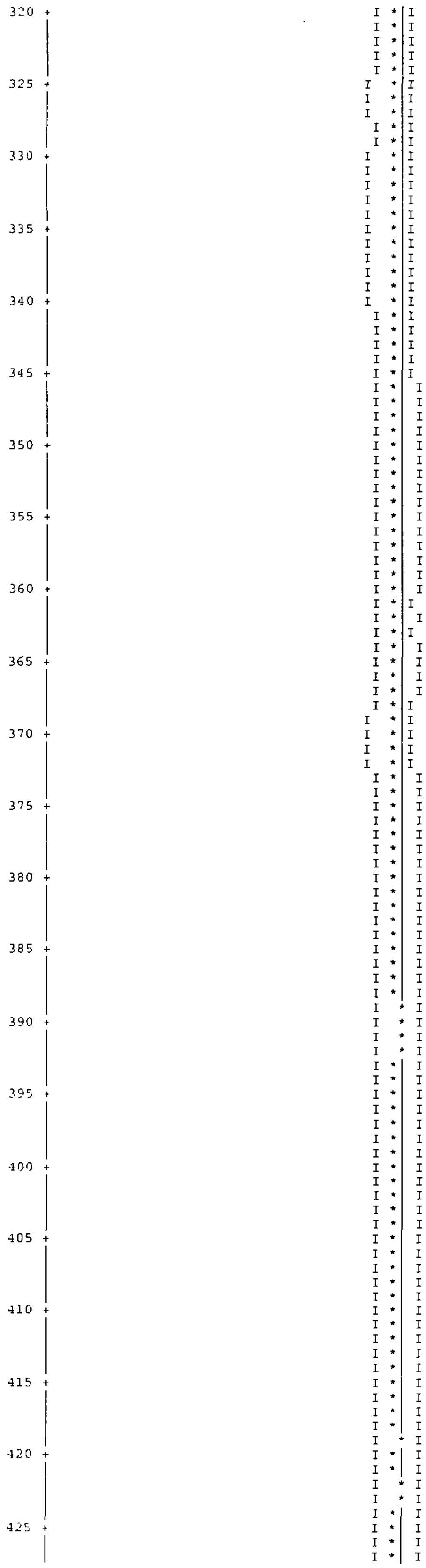
```
     |                               I*I
1185 +                               I*I
     |                               I*I
     |                               I*I
     |                               I*I
     |                               I*I
1190 +                               I*I
     |                               I*I
     |                               I*I
     |                               I*I
     |                               I*I
1195 +                               I*I
     |                               I*I
     |                               I*I
     |                               I*I
     |                               I*I
1200 +                               I*I
     |                               I*I
     |                               I*I
     |                               I*I
```

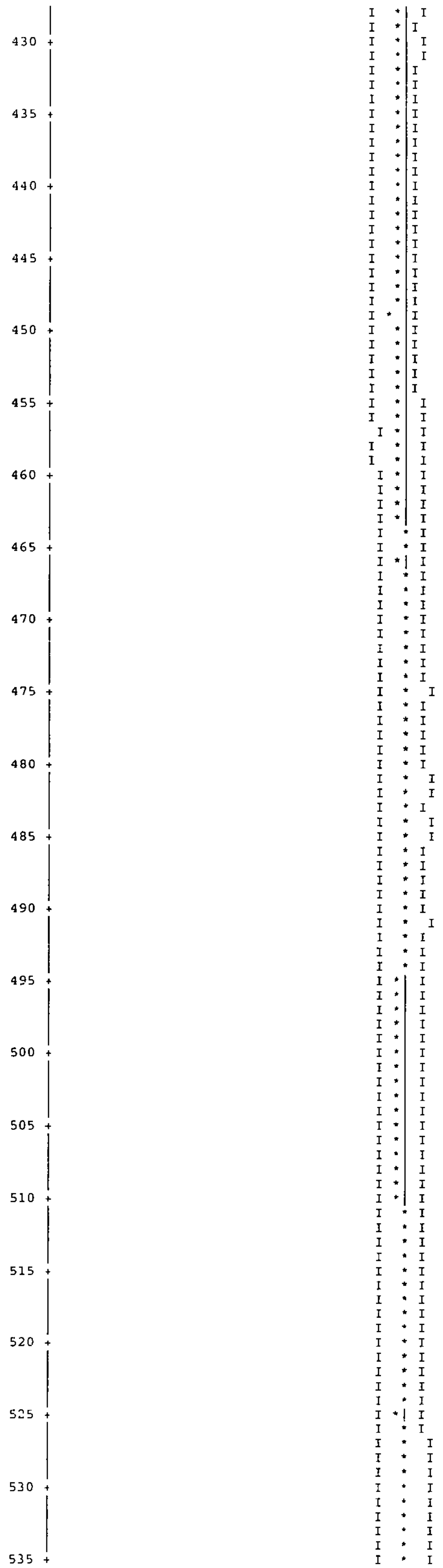
PLOT OF AVERAGE K-EFFECTIVE BY GENERATION SKIPPED.
THE LINE REPRESENTS K-EFF = 0.9381 + OR - 0.0007 WHICH OCCURS FOR 4 GENERATIONS SKIPPED.

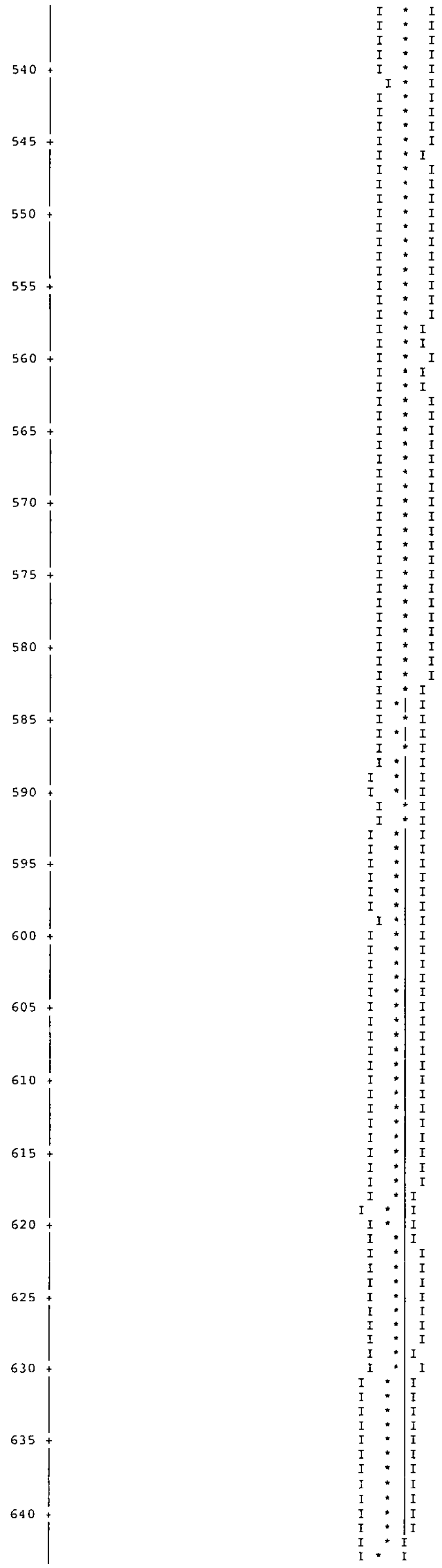


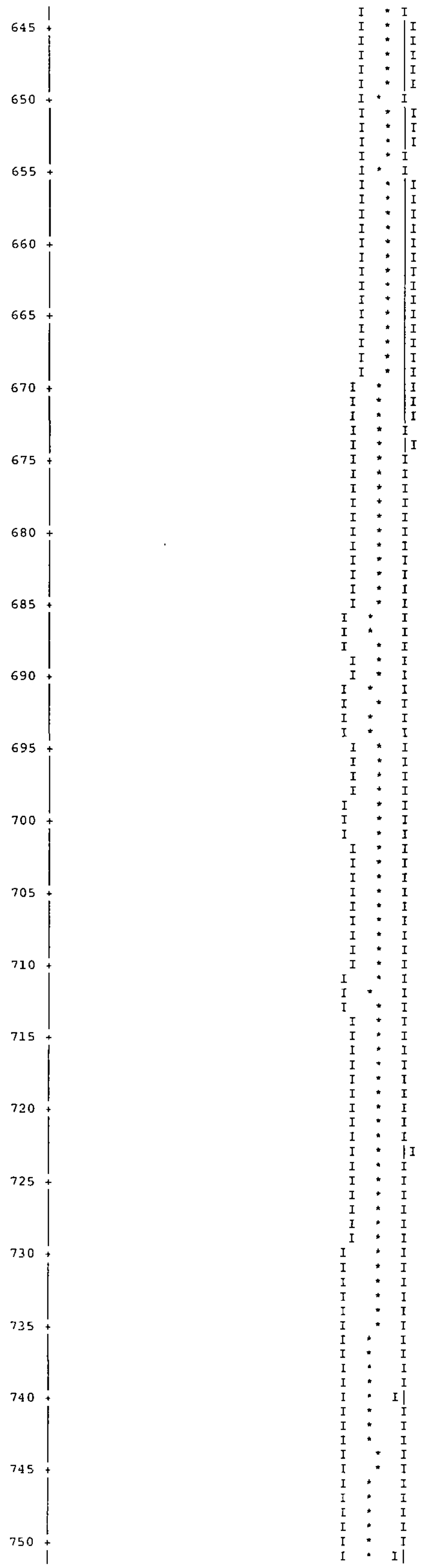

105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185
190
195
200
205
210

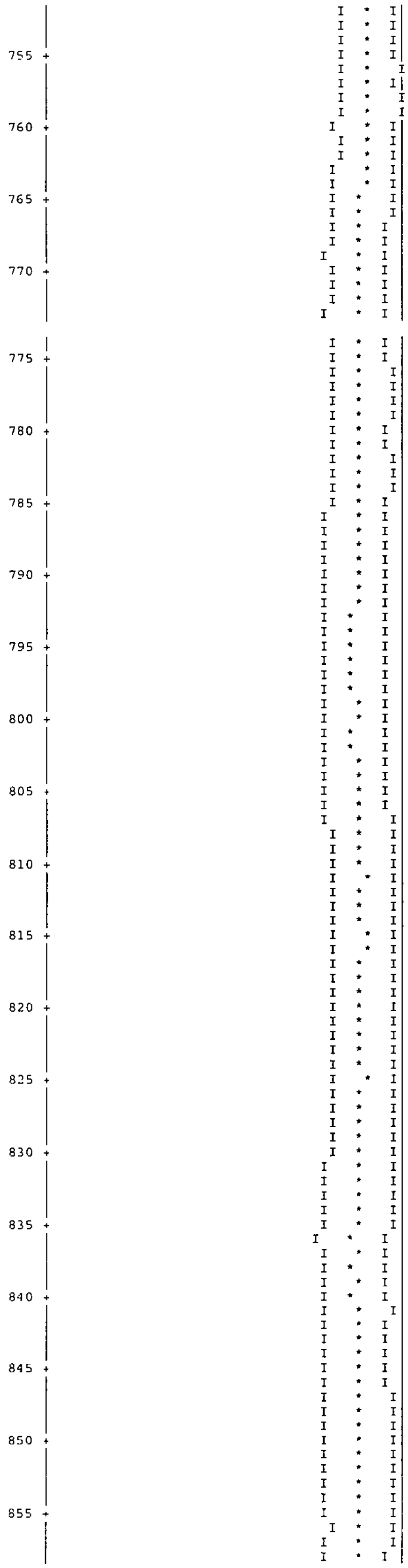

215
220
225
230
235
240
245
250
255
260
265
270
275
280
285
290
295
300
305
310
315

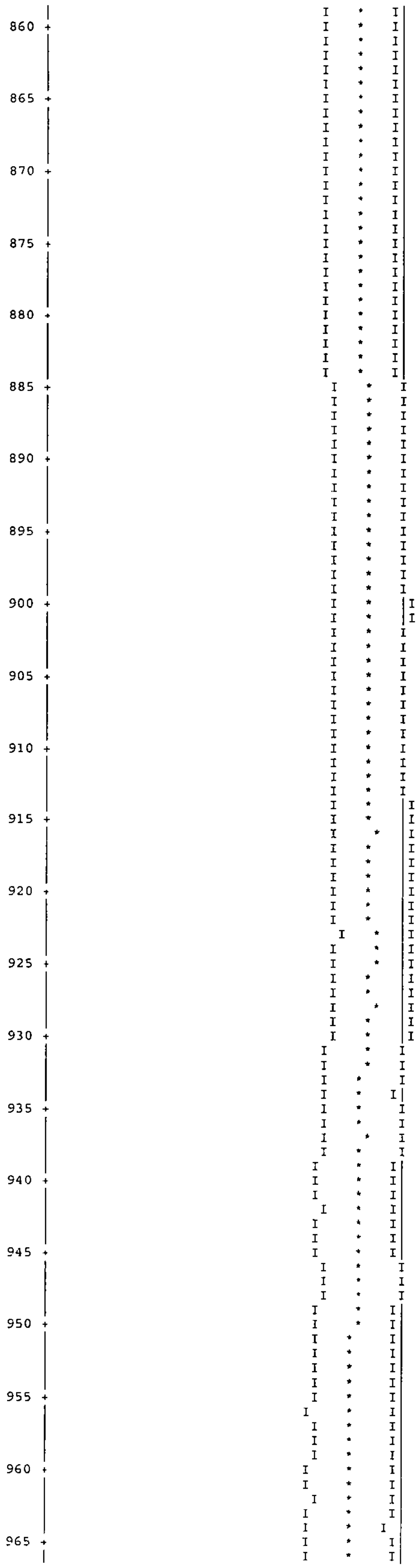

320
325
330
335
340
345
350
355
360
365
370
375
380
385
390
395
400
405
410
415
420
425

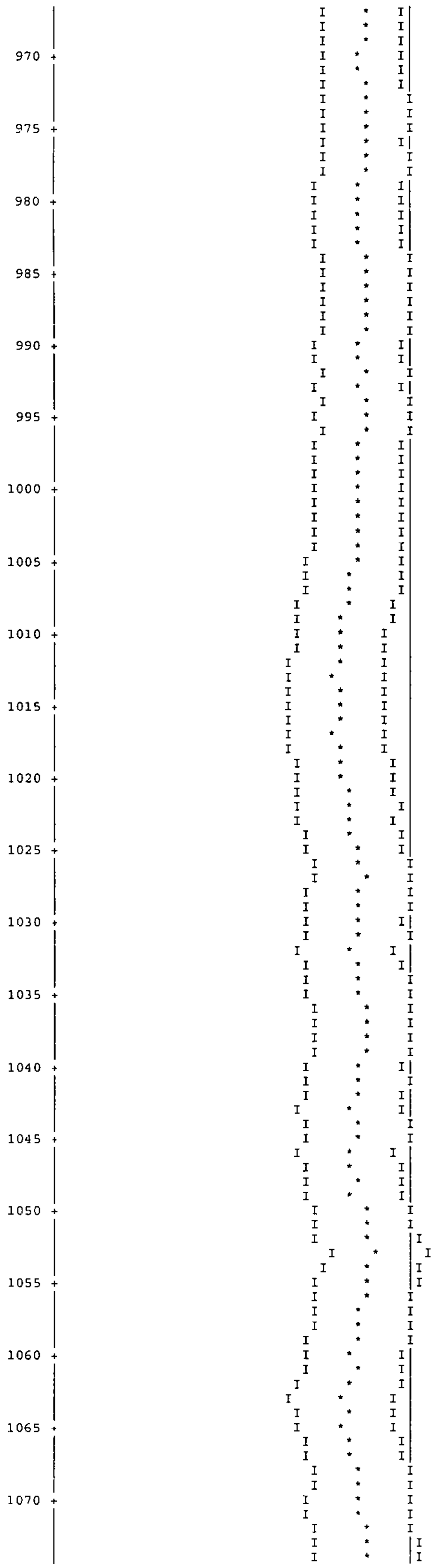

430
435
440
445
450
455
460
465
470
475
480
485
490
495
500
505
510
515
520
525
530
535

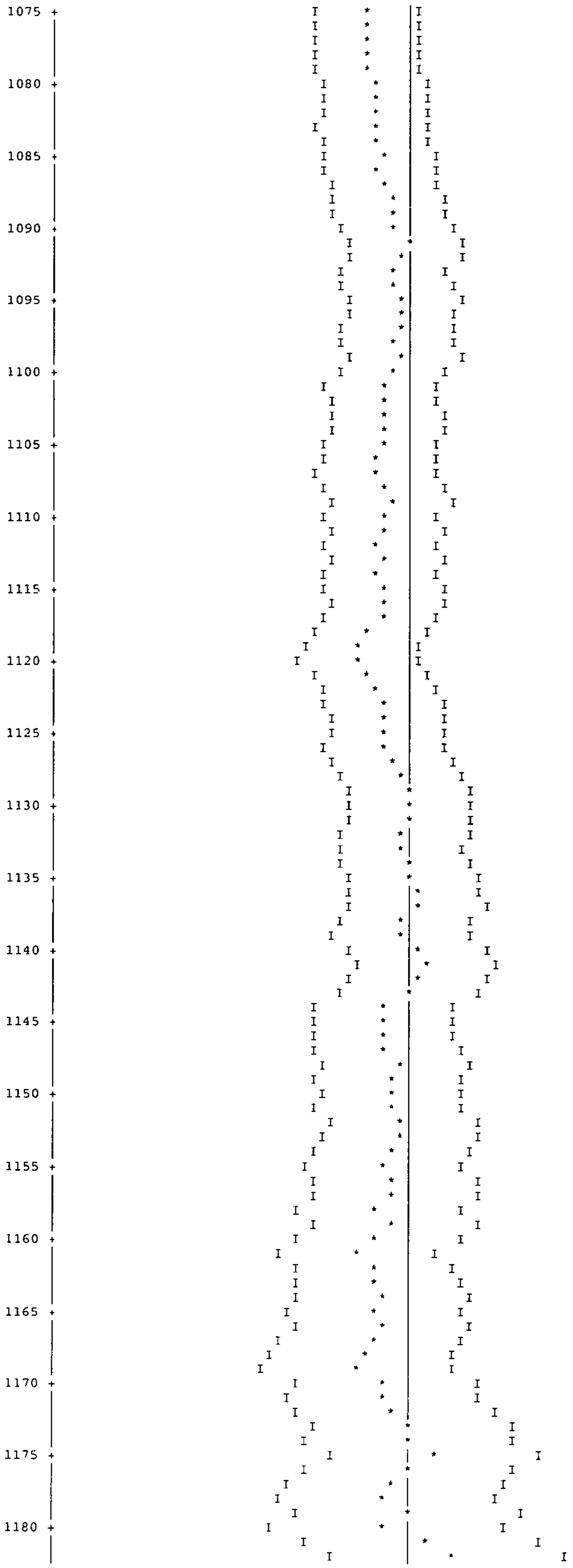

540
545
550
555
560
565
570
575
580
585
590
595
600
605
610
615
620
625
630
635
640

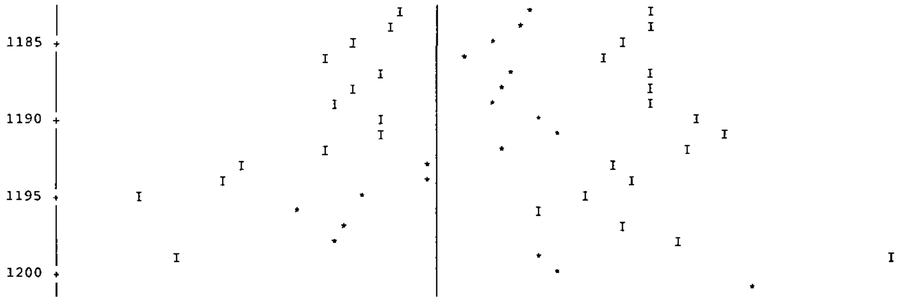



755
760
765
770
775
780
785
790
795
800
805
810
815
820
825
830
835
840
845
850
855


860
865
870
875
880
885
890
895
900
905
910
915
920
925
930
935
940
945
950
955
960
965


970
975
980
985
990
995
1000
1005
1010
1015
1020
1025
1030
1035
1040
1045
1050
1055
1060
1065
1070


1075
1080
1085
1090
1095
1100
1105
1110
1115
1120
1125
1130
1135
1140
1145
1150
1155
1160
1165
1170
1175
1180


1185
1190
1195
1200

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0001			1.16021E-04	2.7239	1.28235E-03	0.8058	0.00000E+00	0.0000
2	0.0006			5.37105E-04	0.8501	2.61916E-03	0.2615	0.00000E+00	0.0000
3	0.0007			6.36084E-04	0.7171	5.64053E-04	0.4240	0.00000E+00	0.0000
4	0.0004			3.65024E-04	0.9455	3.10795E-04	0.5413	0.00000E+00	0.0000
5	0.0005			4.85982E-04	0.7449	6.75654E-04	0.3927	0.00000E+00	0.0000
6	0.0007			6.37578E-04	0.5699	2.36923E-03	0.3594	0.00000E+00	0.0000
7	0.0007			6.46534E-04	0.6280	4.51992E-03	0.3858	0.00000E+00	0.0000
8	0.0007			6.55531E-04	0.9764	3.63595E-03	0.4314	0.00000E+00	0.0000
9	0.0010			8.92779E-04	1.2147	3.58812E-03	0.4163	0.00000E+00	0.0000
10	0.0021			1.93895E-03	1.1809	9.08369E-03	0.4190	0.00000E+00	0.0000
11	0.0045			4.25875E-03	1.0450	1.16783E-02	0.4192	0.00000E+00	0.0000
12	0.0065			6.08684E-03	1.0529	1.03751E-02	0.4893	0.00000E+00	0.0000
13	0.0065			6.06546E-03	1.0763	1.32515E-02	0.4720	0.00000E+00	0.0000
14	0.0058			5.39501E-03	1.0500	1.70211E-02	0.3958	0.00000E+00	0.0000
15	0.0011			1.02704E-03	1.8212	8.80660E-03	0.4769	0.00000E+00	0.0000
16	0.0007			6.78870E-04	2.4958	5.05885E-03	0.5069	0.00000E+00	0.0000
17	0.0011			1.05328E-03	2.8411	2.85075E-03	0.7361	0.00000E+00	0.0000
18	0.0016			1.50301E-03	2.6453	2.74035E-03	0.8076	0.00000E+00	0.0000
19	0.0019			1.78180E-03	2.2783	4.58632E-03	0.6086	0.00000E+00	0.0000
20	0.0085			7.96153E-03	1.1565	1.62386E-02	0.4304	0.00000E+00	0.0000
21	0.0048			4.51121E-03	1.6031	6.50981E-03	0.6547	0.00000E+00	0.0000
22	0.0131			1.22697E-02	1.0000	1.52535E-02	0.4896	0.00000E+00	0.0000
23	0.0755			7.08406E-02	0.3751	8.10936E-02	0.1957	0.00000E+00	0.0000
24	0.2215			2.07785E-01	0.2114	2.11288E-01	0.1123	0.00000E+00	0.0000
25	0.2199			2.06269E-01	0.2137	1.99371E-01	0.1168	0.00000E+00	0.0000
26	0.3015			2.82848E-01	0.1849	2.65750E-01	0.1040	0.00000E+00	0.0000
27	0.1182			1.10886E-01	0.3190	1.00796E-01	0.1880	0.00000E+00	0.0000
SYSTEM TOTAL =				9.38133E-01	0.0749	1.00132E+00	0.0184	0.00000E+00	0.0000

ELAPSED TIME 29.12517 MINUTES

RANDOM NUMBER= 3BD444363C0D

```
                              FREQUENCY FOR GENERATIONS    4 TO 1203
0.8664 TO 0.8692     *
0.8692 TO 0.8721     *
0.8721 TO 0.8749     **
0.8749 TO 0.8777
0.8777 TO 0.8806     **
0.8806 TO 0.8834     *****
0.8834 TO 0.8862
0.8862 TO 0.8891     **********
0.8891 TO 0.8919     *******
0.8919 TO 0.8948     *******
0.8948 TO 0.8976     ***********
0.8976 TO 0.9004     *************
0.9004 TO 0.9033     ********************
0.9033 TO 0.9061     **************************
0.9061 TO 0.9089     *****************************************
0.9089 TO 0.9118     ********************************
0.9118 TO 0.9146     *******************************
0.9146 TO 0.9174     *********************************
0.9174 TO 0.9203     ************************************************
0.9203 TO 0.9231     **************************************
0.9231 TO 0.9259     *************************************************
0.9259 TO 0.9288     *********************************************************
0.9288 TO 0.9316     ************************************************************
0.9316 TO 0.9344     ***********************************************
0.9344 TO 0.9373     *****************************************************************
0.9373 TO 0.9401     ********************************************
0.9401 TO 0.9429     ********************************************************
0.9429 TO 0.9458     **********************************************************
0.9458 TO 0.9486     *********************************************
0.9486 TO 0.9514     ************************************************
0.9514 TO 0.9543     *************************************
0.9543 TO 0.9571     ********************************************
0.9571 TO 0.9600     ************************************
0.9600 TO 0.9628     ************************************
0.9628 TO 0.9656     ************************
0.9656 TO 0.9685     *********************************
0.9685 TO 0.9713     ******************************
0.9713 TO 0.9741     ****************
0.9741 TO 0.9770     *****************
0.9770 TO 0.9798     ************
0.9798 TO 0.9826     ********
0.9826 TO 0.9855     *************
0.9855 TO 0.9883     *********
0.9883 TO 0.9911     *****
0.9911 TO 0.9940     ******
0.9940 TO 0.9968     ****
0.9968 TO 0.9996     **
0.9996 TO 1.0025     ****
1.0025 TO 1.0053     **
1.0053 TO 1.0081     **
1.0081 TO 1.0110
1.0110 TO 1.0138     **
1.0138 TO 1.0167
1.0167 TO 1.0195
1.0195 TO 1.0223
1.0223 TO 1.0252     *
```

```
                              FREQUENCY FOR GENERATIONS  304 TO 1203
0.8664 TO 0.8692
0.8692 TO 0.8721     *
0.8721 TO 0.8749     **
0.8749 TO 0.8777
0.8777 TO 0.8806     *
0.8806 TO 0.8834     ****
0.8834 TO 0.8862
0.8862 TO 0.8891     *******
0.8891 TO 0.8919     ****
0.8919 TO 0.8948     ****
0.8948 TO 0.8976     **********
0.8976 TO 0.9004     ***********
0.9004 TO 0.9033     *******************
0.9033 TO 0.9061     **********************
0.9061 TO 0.9089     ********************************
0.9089 TO 0.9118     **********************
0.9118 TO 0.9146     ************************
0.9146 TO 0.9174     ***********************
0.9174 TO 0.9203     ************************************
0.9203 TO 0.9231     ******************************
0.9231 TO 0.9259     *************************************
0.9259 TO 0.9288     *********************************************
0.9288 TO 0.9316     ***********************************************
0.9316 TO 0.9344     **********************************
0.9344 TO 0.9373     ****************************************************
0.9373 TO 0.9401     *********************************
0.9401 TO 0.9429     **************************************
0.9429 TO 0.9458     *****************************************
0.9458 TO 0.9486     ***********************************
0.9486 TO 0.9514     *********************************
0.9514 TO 0.9543     *************************
0.9543 TO 0.9571     ************************************
0.9571 TO 0.9600     **************************
0.9600 TO 0.9628     *****************************
0.9628 TO 0.9656     ***************
0.9656 TO 0.9685     **************************
0.9685 TO 0.9713     **********************
0.9713 TO 0.9741     ***********
0.9741 TO 0.9770     *********
0.9770 TO 0.9798     **********
0.9798 TO 0.9826     ******
0.9826 TO 0.9855     ********
0.9855 TO 0.9883     *********
0.9883 TO 0.9911     ****
0.9911 TO 0.9940     ****
0.9940 TO 0.9968     **
0.9968 TO 0.9996     **
0.9996 TO 1.0025     ***
1.0025 TO 1.0053     **
1.0053 TO 1.0081     *
1.0081 TO 1.0110
1.0110 TO 1.0138     **
1.0138 TO 1.0167
1.0167 TO 1.0195
1.0195 TO 1.0223
1.0223 TO 1.0252     *
```

```
                                FREQUENCY FOR GENERATIONS  604 TO 1203
0.8664 TO 0.8692
0.8692 TO 0.8721      *
0.8721 TO 0.8749      **
0.8749 TO 0.8777
0.8777 TO 0.8806
0.8806 TO 0.8834      **
0.8834 TO 0.8862
0.8862 TO 0.8891      ****
0.8891 TO 0.8919      **
0.8919 TO 0.8948      **
0.8948 TO 0.8976      *****
0.8976 TO 0.9004      *********
0.9004 TO 0.9033      ************
0.9033 TO 0.9061      ********************
0.9061 TO 0.9089      ****************
0.9089 TO 0.9118      ***************
0.9118 TO 0.9146      ****************
0.9146 TO 0.9174      **************
0.9174 TO 0.9203      ****************************
0.9203 TO 0.9231      ********************
0.9231 TO 0.9259      ****************************
0.9259 TO 0.9288      *************************
0.9288 TO 0.9316      ********************************
0.9316 TO 0.9344      **********************
0.9344 TO 0.9373      *************************************
0.9373 TO 0.9401      ****************************
0.9401 TO 0.9429      ********************
0.9429 TO 0.9458      **************************
0.9458 TO 0.9486      *************************
0.9486 TO 0.9514      *******************
0.9514 TO 0.9543      ****************
0.9543 TO 0.9571      ***********************
0.9571 TO 0.9600      ***************
0.9600 TO 0.9628      *************************
0.9628 TO 0.9656      **************
0.9656 TO 0.9685      ****************
0.9685 TO 0.9713      *************
0.9713 TO 0.9741      *******
0.9741 TO 0.9770      *******
0.9770 TO 0.9798      ****
0.9798 TO 0.9826      **
0.9826 TO 0.9855      ******
0.9855 TO 0.9883      ******
0.9883 TO 0.9911      ****
0.9911 TO 0.9940      ****
0.9940 TO 0.9968      *
0.9968 TO 0.9996      *
0.9996 TO 1.0025      *
1.0025 TO 1.0053      **
1.0053 TO 1.0081      *
1.0081 TO 1.0110
1.0110 TO 1.0138      *
1.0138 TO 1.0167
1.0167 TO 1.0195
1.0195 TO 1.0223
1.0223 TO 1.0252      *
```

```
                                        FREQUENCY FOR GENERATIONS  904 TO 1203
0.8664 TO 0.8692
0.8692 TO 0.8721
0.8721 TO 0.8749      **
0.8749 TO 0.8777
0.8777 TO 0.8806
0.8806 TO 0.8834      *
0.8834 TO 0.8862
0.8862 TO 0.8891      ****
0.8891 TO 0.8919      *
0.8919 TO 0.8948      *
0.8948 TO 0.8976      ****
0.8976 TO 0.9004      *******
0.9004 TO 0.9033      ***
0.9033 TO 0.9061      ************
0.9061 TO 0.9089      ********
0.9089 TO 0.9118      ******
0.9118 TO 0.9146      **********
0.9146 TO 0.9174      ***********
0.9174 TO 0.9203      ************
0.9203 TO 0.9231      **********
0.9231 TO 0.9259      **************
0.9259 TO 0.9288      **********
0.9288 TO 0.9316      ***************
0.9316 TO 0.9344      ***********
0.9344 TO 0.9373      ****************
0.9373 TO 0.9401      *************
0.9401 TO 0.9429      *********
0.9429 TO 0.9458      **************
0.9458 TO 0.9486      *************
0.9486 TO 0.9514      ********
0.9514 TO 0.9543      *******
0.9543 TO 0.9571      *************
0.9571 TO 0.9600      *********
0.9600 TO 0.9628      *************
0.9628 TO 0.9656      ******
0.9656 TO 0.9685      *********
0.9685 TO 0.9713      *****
0.9713 TO 0.9741      ****
0.9741 TO 0.9770      ***
0.9770 TO 0.9798      *
0.9798 TO 0.9826      **
0.9826 TO 0.9855      ****
0.9855 TO 0.9883      ****
0.9883 TO 0.9911      **
0.9911 TO 0.9940
0.9940 TO 0.9968
0.9968 TO 0.9996
0.9996 TO 1.0025      *
1.0025 TO 1.0053      *
1.0053 TO 1.0081
1.0081 TO 1.0110
1.0110 TO 1.0138
1.0138 TO 1.0167
1.0167 TO 1.0195
1.0195 TO 1.0223
1.0223 TO 1.0252      *


**********************************************************************************************************************************************************************
*

            CONGRATULATIONS!  YOU HAVE  SUCCESSFULLY TRAVERSED THE PERILOUS PATH THROUGH KENO V IN  29.12517 MINUTES

**********************************************************************************************************************************************************************
*
```

6.6.9 General Atomics Irradiated Fuel Material

This section contains the output file for the most reactive configuration of GA IFM in the NAC-LWT cask.

Figure 6.6.9-1 Maximum Reactivity GA IFM Configuration

```
.
NAC International
QSCALENT Banner Generation Utility v5.1 (20020221)
+------------------+
I JOB INFORMATION I
+------------------+
.
Working Directory:            gaifm_173ps_000i_100h_000e_068t
Output File Name:             gaifm_173ps_000i_100h_000e_068t.out
Start Date:
Fri 05/16/2003
Start Time:
11:02a
.
+-----------------------+
I SOFTWARE INFORMATION I
+-----------------------+
.
Program Name:                 Scale 4.3 for Windows NT 4.0/2000
Installation Date:            June 10, 1998
Code Verification Package #:  EA9131010-127, Rev. 0
Code Verification Date:       June 10, 1998
Program Location:             G:\SCALE4.3\WIN_NT\EXE
.
+---------------------+
I SYSTEM INFORMATION I
+---------------------+
.
Computer Type:                Dell Precision 530
Operating System:             Windows 2000
Computer ID:                  ROSEZ1-IT1215
Serial Number:                3VTCR01
Login ID:                     rosez1
System Verification Date:     January 10, 2002
.
```

```
      PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
 MODULE CSAS25   WILL BE CALLED
   LWT WITH GA IFM
   27GROUPNDF4 INFHOMMEDIUM
   ' RERTR TRIGA FUEL - HOMOGENIZED (NO CLAD)
   H2O    1 0.6816 293.0 END
   U-235 1 DEN=0.10624 1.0 END
   U-238 1 DEN=0.43306 1.0 END
   ZR     1 DEN=0.94133 1.0 END
   H      1 DEN=0.01625 1.0 END
   C      1 DEN=0.00216 1.0 END
   ' HTGR FUEL MATRIX
   H2O    3 1.0000 293.0 END
   C      3 DEN=0.74050 1.0 END
   TH     3 DEN=0.20480 1.0 END
   SI     3 DEN=0.14739 1.0 END
   O      3 DEN=0.00234 1.0 END
   U-235 3 DEN=0.01997 1.0 END
   U-238 3 DEN=0.00147 1.0 END
   ' CASK INTERIOR MODERATOR
   H2O    4 0.0001 293.0 END
   ' CASK EXTERIOR MODERATOR
   H2O    5 0.0001 293.0 END
   ' LEAD SHIELD
   PB     6 1.0000 293.0 END
   ' NEUTRON SHIELD
   H2O    7 0.0001 293.0 END
   ' STAINLESS STEEL
   SS304 8 1.0000 293.0 END
   ' WATER
   H2O    9 1.0000 293.0 END
   END COMP
   LWT WITH GA IFM
   READ PARAM RUN=YES PLT=NO TME=5000 GEN=803 NPG=1000 TBA=5 END PARAM
   READ GEOM
   UNIT 1
   COM='TRIGA/RERTR FHU - NO BASKET'
   CYLINDER 1 1 5.0927 2P28.0000
   CYLINDER 8 1 5.3975 2P28.0000
   CYLINDER 4 1 5.7277 2P28.0000
   CYLINDER 8 1 6.0325 2P28.0000
   UNIT 2
   COM='HTGR FHU - NO BASKET'
   CYLINDER 3 1 5.7277 2P28.0000
   CYLINDER 8 1 6.0325 2P28.0000
   CYLINDER 4 1 6.3627 2P28.0000
   CYLINDER 8 1 6.6675 2P28.0000
   GLOBAL UNIT 5
   COM='ASSEMBLED LWT'
   CYLINDER 4 1 17.1500 2P28.0000
   HOLE 1 0.0000 6.0325 0.0000
   HOLE 2 0.0000 -6.6675 0.0000
   CYLINDER 8 1 18.9103 2P28.0000
   CYLINDER 6 1 33.4645 2P28.0000
   CYLINDER 8 1 36.5188 2P28.0000
   CYLINDER 7 1 49.2227 2P28.0000
   CYLINDER 8 1 49.8221 2P28.0000
   CUBOID 5 1 4P49.8221 2P28.0000
   END GEOM
   READ BOUNDS ALL=MIP END BOUNDS
   READ PLOT
   TTL='XY SLICE OF CASK'
   SCR=YES PIC=MAT LPI=10
   XUL=-50.0 YUL=50.0 ZUL=0.0 XLR=50.0 YLR=-50.0 ZLR=0.0
   UAX=1.0 VDN=-1.0 NAX=1500 END
   END PLOT
   END DATA

 SECONDARY MODULE 000008   HAS BEEN CALLED.

 MODULE 000008   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     0.44 (SECONDS).

 SECONDARY MODULE 000002   HAS BEEN CALLED.

 MODULE 000002   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     4.45 (SECONDS).

 SECONDARY MODULE 000009   HAS BEEN CALLED.

 MODULE 000009   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   538.87 (SECONDS).

 MODULE CSAS25   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   544.75 (SECONDS).

THE FOLLOWING DATA CARDS PRECEDE AN = CARD
```

```
CSAS25
SCALE-PC
05/16/03
11:02:32
```

```
  SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL          EEEEEEEEEEEEE                PPPPPPPPPPPP    CCCCCCCCCCC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL          EEEEEEEEEEEEE                PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL          EE                           PP         PP  CC         CC
SS             CC             AA         AA  LL          EE                           PP         PP  CC
SS             CC             AA         AA  LL          EE                           PP         PP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL          EEEEEEEEE    -------------   PPPPPPPPPPPPP  CC
  SSSSSSSSSSSS CC             AAAAAAAAAAAAA  LL          EEEEEEEEE    -------------   PPPPPPPPPPPP   CC
           SS  CC             AA         AA  LL          EE                           PP             CC
           SS  CC             AA         AA  LL          EE                           PP             CC
SS         SS  CC         CC  AA         AA  LL          EE                           PP             CC         CC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLL  EEEEEEEEEEEEE                PP              CCCCCCCCCCCCC
  SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLL  EEEEEEEEEEEEE                PP               CCCCCCCCCCC
```

```
********************************************************************************
********************************************************************************
********************************************************************************
*****                                                                      *****
*****                   PROGRAM VERIFICATION INFORMATION                   *****
*****                                                                      *****
*****                CODE SYSTEM:   SCALE-PC VERSION:   4.3                *****
*****                                                                      *****
********************************************************************************
********************************************************************************
*****                                                                      *****
*****                                                                      *****
*****                    PROGRAM:  CSAS                                    *****
*****                                                                      *****
*****              CREATION DATE:  03/08/96                                *****
*****                                                                      *****
*****                     VOLUME:  Eng                                     *****
*****                                                                      *****
*****                    LIBRARY:  M:\SCALE43\WIN_NT\EXE                   *****
*****                                                                      *****
*****                                                                      *****
*****            PRODUCTION CODE:  CSAS                                    *****
*****                                                                      *****
*****                    VERSION:  3.1                                     *****
*****                                                                      *****
*****                    JOBNAME:  SCALE-PC                                *****
*****                                                                      *****
*****          DATE OF EXECUTION:  05/16/03                                *****
*****                                                                      *****
*****          TIME OF EXECUTION:  11:02:32                                *****
*****                                                                      *****
*****                                                                      *****
********************************************************************************
********************************************************************************
********************************************************************************
```

```
' RERTR TRIGA FUEL - HOMOGENIZED (NO CLAD)

' HTGR FUEL MATRIX

' CASK INTERIOR MODERATOR

' CASK EXTERIOR MODERATOR

' LEAD SHIELD

' NEUTRON SHIELD

' STAINLESS STEEL

' WATER

' RERTR TRIGA FUEL - HOMOGENIZED (NO CLAD)
   LWT WITH GA IFM

   **** PROBLEM PARAMETERS ****

   LIB 27GROUPNDF4  LIBRARY
   MXX           9 MIXTURES
   MSC          19 COMPOSITION SPECIFICATIONS
   IZM           1 MATERIAL ZONES
   GE  INFHOMMEDIUM GEOMETRY
   MORE          0 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
   MSLN          0 FUEL SOLUTIONS

   **** PROBLEM COMPOSITION DESCRIPTION ****

   SC  H2O          STANDARD COMPOSITION
   MX            1 MIXTURE NO.
   VF       0.6816 VOLUME FRACTION
   ROTH     0.9982 THEORETICAL DENSITY
   NEL           2 NO. ELEMENTS
   ICP           1 0/1 MIXTURE/COMPOUND
   TEMP      293.0 DEG KELVIN
              1001       2.00 ATOMS/MOLECULE
              8016       1.00 ATOM/MOLECULE
   END

   SC  U-235        STANDARD COMPOSITION
   MX            1 MIXTURE NO.
   VF       1.0000 VOLUME FRACTION
   ROTH     0.1062 SPECIFIED DENSITY
   NEL           1 NO. ELEMENTS
   ICP           1 0/1 MIXTURE/COMPOUND
             92235       1.00 ATOM/MOLECULE
   END

   SC  U-238        STANDARD COMPOSITION
   MX            1 MIXTURE NO.
   VF       1.0000 VOLUME FRACTION
   ROTH     0.4331 SPECIFIED DENSITY
   NEL           1 NO. ELEMENTS
   ICP           1 0/1 MIXTURE/COMPOUND
             92238       1.00 ATOM/MOLECULE
   END

   SC  ZR           STANDARD COMPOSITION
   MX            1 MIXTURE NO.
   VF       1.0000 VOLUME FRACTION
   ROTH     0.9413 SPECIFIED DENSITY
   NEL           1 NO. ELEMENTS
   ICP           1 0/1 MIXTURE/COMPOUND
             40000       1.00 ATOM/MOLECULE
   END

   SC  H            STANDARD COMPOSITION
   MX            1 MIXTURE NO.
   VF       1.0000 VOLUME FRACTION
   ROTH     0.0162 SPECIFIED DENSITY
   NEL           1 NO. ELEMENTS
   ICP           1 0/1 MIXTURE/COMPOUND
              1001       1.00 ATOM/MOLECULE
   END

   SC  C            STANDARD COMPOSITION
   MX            1 MIXTURE NO.
   VF       1.0000 VOLUME FRACTION
   ROTH     0.0022 SPECIFIED DENSITY
   NEL           1 NO. ELEMENTS
   ICP           1 0/1 MIXTURE/COMPOUND
              6012       1.00 ATOM/MOLECULE

' HTGR FUEL MATRIX
   END

   SC  H2O          STANDARD COMPOSITION
   MX            3 MIXTURE NO.
   VF       1.0000 VOLUME FRACTION
```

```
    ROTH       0.9982 THEORETICAL DENSITY
    NEL             2 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
    TEMP        293.0 DEG KELVIN
                 1001        2.00 ATOMS/MOLECULE
                 8016        1.00 ATOM/MOLECULE
    END

    SC  C             STANDARD COMPOSITION
    MX              3 MIXTURE NO.
    VF         1.0000 VOLUME FRACTION
    ROTH       0.7405 SPECIFIED DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
                 6012        1.00 ATOM/MOLECULE
    END

    SC  TH            STANDARD COMPOSITION
    MX              3 MIXTURE NO.
    VF         1.0000 VOLUME FRACTION
    ROTH       0.2048 SPECIFIED DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
                90000        1.00 ATOM/MOLECULE
                                      90232   100.000 WT%
    END

    SC  SI            STANDARD COMPOSITION
    MX              3 MIXTURE NO.
    VF         1.0000 VOLUME FRACTION
    ROTH       0.1474 SPECIFIED DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
                14000        1.00 ATOM/MOLECULE
    END

    SC  O             STANDARD COMPOSITION
    MX              3 MIXTURE NO.
    VF         1.0000 VOLUME FRACTION
    ROTH       0.0023 SPECIFIED DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
                 8016        1.00 ATOM/MOLECULE
    END

    SC  U-235         STANDARD COMPOSITION
    MX              3 MIXTURE NO.
    VF         1.0000 VOLUME FRACTION
    ROTH       0.0200 SPECIFIED DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
                92235        1.00 ATOM/MOLECULE
    END

    SC  U-238         STANDARD COMPOSITION
    MX              3 MIXTURE NO.
    VF         1.0000 VOLUME FRACTION
    ROTH       0.0015 SPECIFIED DENSITY
    NEL             1 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
                92238        1.00 ATOM/MOLECULE
' CASK INTERIOR MODERATOR
    END

    SC  H2O           STANDARD COMPOSITION
    MX              4 MIXTURE NO.
    VF         0.0001 VOLUME FRACTION
    ROTH       0.9982 THEORETICAL DENSITY
    NEL             2 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
    TEMP        293.0 DEG KELVIN
                 1001        2.00 ATOMS/MOLECULE
                 8016        1.00 ATOM/MOLECULE
' CASK EXTERIOR MODERATOR
    END

    SC  H2O           STANDARD COMPOSITION
    MX              5 MIXTURE NO.
    VF         0.0001 VOLUME FRACTION
    ROTH       0.9982 THEORETICAL DENSITY
    NEL             2 NO. ELEMENTS
    ICP             1 0/1 MIXTURE/COMPOUND
    TEMP        293.0 DEG KELVIN
                 1001        2.00 ATOMS/MOLECULE
                 8016        1.00 ATOM/MOLECULE
' LEAD SHIELD
    END

    SC  PB            STANDARD COMPOSITION
    MX              6 MIXTURE NO.
    VF         1.0000 VOLUME FRACTION
    ROTH      11.3440 THEORETICAL DENSITY
```

```
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               82000       1.00 ATOM/MOLECULE

' NEUTRON SHIELD
    END

    SC  H2O          STANDARD COMPOSITION
    MX             7 MIXTURE NO.
    VF        0.0001 VOLUME FRACTION
    ROTH      0.9982 THEORETICAL DENSITY
    NEL            2 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
                1001       2.00 ATOMS/MOLECULE
                8016       1.00 ATOM/MOLECULE

' STAINLESS STEEL
    END

    SC  SS304        STANDARD COMPOSITION
    MX             8 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      7.9200 THEORETICAL DENSITY
    NEL            4 NO. ELEMENTS
    ICP            0 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               24304     19.000 WT%
               25055      2.000 WT%
               26304     69.500 WT%
               28304      9.500 WT%

' WATER
    END

    SC  H2O          STANDARD COMPOSITION
    MX             9 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      0.9982 THEORETICAL DENSITY
    NEL            2 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
                1001       2.00 ATOMS/MOLECULE
                8016       1.00 ATOM/MOLECULE
    END

    **** PROBLEM GEOMETRY ****


    **** INFINITE HOMOGENEOUS MEDIUM ****
    MFUEL          1 MIXTURE NO. OF THE INFINITE HOMOGENEOUS MEDIUM

MIP MESSAGE NUMBER MP-22 FOLLOWS:
**WARNING**   STANDARD COMPOSITION SPECIFICATION CARD(S) MISSING
              FOR MIXTURE NUMBER  2
```

```
*****************************************************************************************************
***                                                                                               ***
***                        LWT WITH GA IFM                                                        ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************
***                                                                                               ***
***                     ********** DATA LIBRARY INFORMATION **********                            ***
***                                                                                               ***
***          UNIT                                               VOLUME                            ***
***          NUMBER                DATA SET NAME                NAME        UNIT FUNCTION         ***
***          ------                -------------                ----        -------------         ***
***                                                                                               ***
***            89      M:\scale43\DATALIB\FT89F001                          STANDARD COMPOSITION LIBRARY  ***
***                                                                                               ***
***            82      M:\scale43\DATALIB\FT82F001                          CROSS SECTION LIBRARY ***
***                                                                                               ***
***            11      D:\cjr\Lwt\GAIFM\Crit\DAMAGED\gaifm_173ps_00         SHORT CROSS SECTION LIBRARY  ***
***                                                                                               ***
***            90      D:\cjr\Lwt\GAIFM\Crit\DAMAGED\gaifm_173ps_00         INPUT DATA DIRECT ACCESS  ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************
***                                                                                               ***
***                                                                                               ***
***                          STANDARD COMPOSITION LIBRARY DATA                                    ***
***                          ---------------------------------                                    ***
***                                                                                               ***
***          UNIT NUMBER  :  89                                                                   ***
***                                                                                               ***
***          DATASET NAME :  M:\scale43\DATALIB\FT89F001                                          ***
***                                                                                               ***
***          LIBRARY TITLE:  SCALE-4 STANDARD COMPOSITION LIBRARY                                 ***
***                          637 STANDARD COMPOSITIONS, 490 NUCLIDES                              ***
***                          90 ELEMENTS WITH VARIABLE ISOTOPIC DISTRBUTIONS.                     ***
***                                                                                               ***
***          CREATION DATE:   6/30/95                                                             ***
***                                                                                               ***
***                                                                                               ***
***                                                                                               ***
***                              CROSS SECTION LIBRARY DATA                                       ***
***                              --------------------------                                       ***
***                                                                                               ***
***          UNIT NUMBER  :  82                                                                   ***
***                                                                                               ***
***          DATASET NAME :  M:\scale43\DATALIB\FT82F001                                          ***
***                                                                                               ***
***          LIBRARY TITLE:  SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY                           ***
***                             BASED ON ENDF-B VERSION 4 DATA                                    ***
***                                COMPILED FOR NRC      1/27/89                                  ***
***                                   LAST UPDATED                                     08/12/94   ***
***                                      L.M.PETRIE    -    ORNL                                  ***
***                                                                                               ***
***                                                                                               ***
***                                                                                               ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************

                ........    0 IO'S WERE USED BEFORE READING KENO V DATA     ........

                ........    0 IO'S WERE USED READING THE KENO V PARAMETER DATA     ........

               ************** DATA READING COMPLETED **************

                ........    0 IO'S WERE USED PREPARING THE KENO V INPUT DATA     ........

                ........    0 IO'S WERE USED LOADING THE KENO V DATA     ........

                ........    0 IO'S WERE USED LOADING THE DATA     ........

                ........    0 IO'S WERE USED CHECKING THE KENO V GEOMETRY DATA     ........
                *****  RESTART DATA HAS BEEN WRITTEN ON UNIT 95  *****

                ........    0 IO'S WERE USED WRITING THE KENO V - CSAS DATA     ........

                ........    0 IO'S WERE USED PROCESSING CSAS INPUT DATA     ........

 CONTROL MODULE CSAS25    IS COMPLETE.
```

```
BBBBBBBBBBB    OOOOOOOOOO    NN        NN                   AAAAAAAAA    MM        MM  IIIIIIIIIIII   2222222222
BBBBBBBBBBBB  OOOOOOOOOOOO   NNN       NN                  AAAAAAAAAAA   MMM      MMM  IIIIIIIIIIII  222222222222
BB        BB  OO        OO   NNNN      NN                 AA        AA   MMMM    MMMM       II       22        22
BB        BB  OO        OO   NN NN     NN                 AA        AA   MM MM  MM MM       II                 22
BB        BB  OO        OO   NN  NN    NN                 AA        AA   MM  MMMM  MM       II                 22
BBBBBBBBBBB   OO        OO   NN   NN   NN  -------------  AAAAAAAAAAAA   MM   MMM  MM       II                22
BBBBBBBBBBB   OO        OO   NN    NN  NN  -------------  AAAAAAAAAAAA   MM    M   MM       II              22
BB        BB  OO        OO   NN     NN NN                 AA        AA   MM        MM       II            22
BB        BB  OO        OO   NN      NNNN                 AA        AA   MM        MM       II          22
BB        BB  OO        OO   NN       NNN                 AA        AA   MM        MM       II        22
BBBBBBBBBBBB  OOOOOOOOOOOO   NN        NN                 AA        AA   MM        MM  IIIIIIIIIIII  222222222222
BBBBBBBBBBB    OOOOOOOOOO    NN        NN                 AA        AA   MM        MM  IIIIIIIIIIII  222222222222


 SSSSSSSSSS    CCCCCCCCCC      AAAAAAAAA    LL            EEEEEEEEEEEE                 PPPPPPPPPPP    CCCCCCCCCC
SSSSSSSSSSSS  CCCCCCCCCCCC    AAAAAAAAAAA   LL            EEEEEEEEEEEE                 PPPPPPPPPPPP  CCCCCCCCCCCC
SS        SS  CC        CC   AA        AA   LL            EE                           PP        PP  CC        CC
SS            CC             AA        AA   LL            EE                           PP        PP  CC
SS            CC             AA        AA   LL            EE                           PP        PP  CC
SSSSSSSSSSS   CC             AAAAAAAAAAAA   LL            EEEEEEEEE     -------------  PPPPPPPPPPPP  CC
 SSSSSSSSSSS  CC             AAAAAAAAAAAA   LL            EEEEEEEEE     -------------  PPPPPPPPPPP   CC
          SS  CC             AA        AA   LL            EE                           PP            CC
          SS  CC             AA        AA   LL            EE                           PP            CC
SS        SS  CC        CC   AA        AA   LL            EE                           PP            CC        CC
SSSSSSSSSSSS  CCCCCCCCCCCC   AA        AA   LLLLLLLLLLLL  EEEEEEEEEEEE                 PP            CCCCCCCCCCCC
 SSSSSSSSSS    CCCCCCCCCC    AA        AA   LLLLLLLLLLLL  EEEEEEEEEEEE                 PP             CCCCCCCCCC


   0000000    5555555555555           //        11        666666666666          //     0000000      3333333333
  000000000   5555555555555          //        111        666666666666         //     000000000    333333333333
 00     00    55                    //        1111        66                  //     00       00   33        33
00       00   55                   //           11        66                 //      00       00             33
00       00   55                  //            11        66                //       00       00             33
00       00   555555555555       //             11        666666666666     //        00       00            333
00       00   5555555555555     //              11        666666666666    //         00       00            333
00       00             55     //               11        66        66   //          00       00             33
00       00             55    //                11        66        66  //           00       00             33
 00     00    55        55   //                 11        66        66 //             00     00    33        33
  000000000   5555555555555 //             11111111       666666666666 //              000000000   333333333333
   0000000    55555555555  //              11111111        6666666666 //                0000000     3333333333


     11           11                         0000000      2222222222                3333333333     2222222222
    111          111                        000000000    222222222222              333333333333   222222222222
   1111         1111        :::            00       00   22        22      :::     33        33   22        22
     11           11        :::            00       00             22      :::               33             22
     11           11        :::            00       00             22      :::               33             22
     11           11                       00       00            22                        333            22
     11           11                       00       00          22                          333          22
     11           11        :::            00       00        22           :::               33        22
     11           11        :::            00       00      22             :::               33      22
     11           11        :::            00       00    22               :::     33        33    22
  11111111     11111111                     000000000    222222222222              333333333333   222222222222
  11111111     11111111                      0000000     222222222222               3333333333    222222222222
```

```
  SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA     LL              EEEEEEEEEEEEE                      PPPPPPPPPPPP     CCCCCCCCCCC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA    LL              EEEEEEEEEEEEE                      PPPPPPPPPPPPP   CCCCCCCCCCCCC
 SS         SS  CC         CC  AA         AA   LL              EE                                 PP         PP   CC         CC
 SS             CC             AA         AA   LL              EE                                 PP         PP   CC
 SS             CC             AA         AA   LL              EE                                 PP         PP   CC
 SSSSSSSSSSSS   CC             AAAAAAAAAAAAA   LL              EEEEEEEEE       -------------      PPPPPPPPPPPPP   CC
  SSSSSSSSSSSS  CC             AAAAAAAAAAAAA   LL              EEEEEEEEE       -------------      PPPPPPPPPPPP    CC
            SS  CC             AA         AA   LL              EE                                 PP              CC
            SS  CC             AA         AA   LL              EE                                 PP              CC
 SS         SS  CC         CC  AA         AA   LL              EE                                 PP              CC         CC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                      PP              CCCCCCCCCCCCC
  SSSSSSSSSSS    CCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                      PP               CCCCCCCCCCC
```

```
*************************************************************************
*************************************************************************
*************************************************************************
*****                                                               *****
*****                PROGRAM VERIFICATION INFORMATION               *****
*****                                                               *****
*****               CODE SYSTEM:  SCALE-PC VERSION:  4.3            *****
*****                                                               *****
*************************************************************************
*************************************************************************
*****                                                               *****
*****                                                               *****
*****             PROGRAM:  000008                                  *****
*****                                                               *****
*****       CREATION DATE:  09/16/95                                *****
*****                                                               *****
*****              VOLUME:  Eng                                     *****
*****                                                               *****
*****             LIBRARY:  M:\SCALE43\WIN_NT\EXE                   *****
*****                                                               *****
*****                                                               *****
*****   THIS IS NOT A SCALE-PC CONFIGURATION CONTROLLED CODE        *****
*****                                                               *****
*****             JOBNAME:  SCALE-PC                                *****
*****                                                               *****
*****   DATE OF EXECUTION:  05/16/03                                *****
*****                                                               *****
*****   TIME OF EXECUTION:  11:02:32                                *****
*****                                                               *****
*****                                                               *****
*************************************************************************
*************************************************************************
*************************************************************************
```

```
-1Q ARRAY HAS      1 ENTRIES.
 0Q ARRAY HAS      4 ENTRIES.
 1Q ARRAY HAS      6 ENTRIES.
 2Q ARRAY HAS      2 ENTRIES.
```

LOGICAL ASSIGNMENTS

MASTER LIBRARY 11
WORKING LIBRARY 0
SCRATCH FILE 18
NEW LIBRARY 1

P R O B L E M   D E S C R I P T I O N

IGR--GEOMETRY (0/1/2/3--INF MED/SLAB/CYL/SPHERE 1

IZM--NUMBER OF ZONES OR MATERIAL REGIONS 9

MS--MIXING TABLE LENGTH 26

IBL--SHIELDED CROSS SECTION EDIT OPTION (0/1--NO/YES) 0

IBR--BONDARENKO FACTOR EDIT OPTION (0/1--NO/YES) 0

ISSOPT--DANCOFF FACTOR OPTION 0

CONVERGENCE CRITERION 1.00000E-03

GEOMETRY CORRECTION FACTOR FOR WIGNER RATIONAL APPROXIMATION 1.000E+00

3Q ARRAY HAS 26 ENTRIES.

4Q ARRAY HAS 26 ENTRIES.

5Q ARRAY HAS 26 ENTRIES.

6Q ARRAY HAS 9 ENTRIES.

7Q ARRAY HAS 9 ENTRIES.

8Q ARRAY HAS 9 ENTRIES.

9Q ARRAY HAS 9 ENTRIES.

10Q ARRAY HAS 26 ENTRIES.

11Q ARRAY HAS 9 ENTRIES.

M I X I N G   T A B L E

ENTRY	MIXTURE	ISOTOPE	NUMBER DENSITY	NEW IDENTIFIER
1	1	1001	5.52201E-02	1001001
2	3	1001	6.67692E-02	3001001
3	4	1001	6.67692E-06	4001001
4	5	1001	6.67692E-06	5001001
5	7	1001	6.67692E-06	7001001
6	9	1001	6.67692E-02	9001001
7	1	8016	2.27549E-02	1008016
8	3	8016	3.34727E-02	3008016
9	4	8016	3.33846E-06	4008016
10	5	8016	3.33846E-06	5008016
11	7	8016	3.33846E-06	7008016
12	9	8016	3.33846E-02	9008016
13	1	92235	2.72201E-04	1092235
14	3	92235	5.11657E-05	3092235
15	1	92238	1.09554E-03	1092238
16	3	92238	3.71876E-06	3092238
17	1	40000	6.21447E-03	1040000
18	1	6012	1.08398E-04	1006012
19	3	6012	3.71616E-02	3006012
20	3	90232	5.31533E-04	3090232
21	3	14000	3.16038E-03	3014000
22	6	82000	3.29690E-02	6082000
23	8	24304	1.74286E-02	8024304
24	8	25055	1.73633E-03	8025055
25	8	26304	5.93579E-02	8026304
26	8	28304	7.72070E-03	8028304

GEOMETRY AND MATERIAL DESCRIPTION

ZONE	MIXTURE	OUTER DIMENSION	TEMPERATURE	EXTRA XS	TYPE (0/1--FUEL/MOD)
1	1	1.00000E+00	2.93000E+02	0.00000E+00	0
2	2	6.00000E+00	-2.93000E+02	0.00000E+00	0
3	3	1.10000E+01	2.93000E+02	0.00000E+00	0
4	4	1.60000E+01	2.93000E+02	0.00000E+00	0
5	5	2.10000E+01	2.93000E+02	0.00000E+00	0
6	6	2.60000E+01	2.93000E+02	0.00000E+00	0
7	7	3.10000E+01	2.93000E+02	0.00000E+00	0
8	8	3.60000E+01	2.93000E+02	0.00000E+00	0
9	9	4.10000E+01	2.93000E+02	0.00000E+00	0

4532 LOCATIONS OF 100000 AVAILABLE ARE REQUIRED TO MAKE A NEW MASTER CONTAINING THE SELF-SHIELDED VALUES

NO NUCLIDES IN YOUR PROBLEM HAVE BONDARENKO FACTOR DATA**BONAMI WILL COPY FROM LOGICAL 11 TO LOGICAL 1

COPY 1001 HYDROGEN FROM LOG 11 TO LOG 18 BONDARENKO TRIGGER 0

COPY 1001 HYDROGEN FROM LOG 18 TO LOG 1 BONDARENKO TRIGGER 0

COPY 1001 HYDROGEN FROM LOG 18 TO LOG 1 BONDARENKO TRIGGER 0

```
COPY      1001   HYDROGEN       FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY      1001   HYDROGEN       FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY      1001   HYDROGEN       FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY      1001   HYDROGEN       FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY      6012   CARBON-12      FROM LOG 11 TO LOG 18    BONDARENKO TRIGGER 0
COPY      6012   CARBON-12      FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY      6012   CARBON-12      FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY      8016   OXYGEN-16      FROM LOG 11 TO LOG 18    BONDARENKO TRIGGER 0
COPY      8016   OXYGEN-16      FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY      8016   OXYGEN-16      FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY      8016   OXYGEN-16      FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY      8016   OXYGEN-16      FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY      8016   OXYGEN-16      FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY      8016   OXYGEN-16      FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY     14000   SILICON        FROM LOG 11 TO LOG  1    BONDARENKO TRIGGER 0
COPY     24304  CR 1191 WT SS-30 FROM LOG 11 TO LOG  1    BONDARENKO TRIGGER 0
COPY     25055   MANGANESE-55   FROM LOG 11 TO LOG  1    BONDARENKO TRIGGER 0
COPY     26304  FE 1192 WT SS-30 FROM LOG 11 TO LOG  1    BONDARENKO TRIGGER 0
COPY     28304  NI 1190 WT SS-30 FROM LOG 11 TO LOG  1    BONDARENKO TRIGGER 0
COPY     40000   ZIRCONIUM      FROM LOG 11 TO LOG  1    BONDARENKO TRIGGER 0
COPY     82000  PB   1288 218NGP FROM LOG 11 TO LOG  1    BONDARENKO TRIGGER 0
COPY     90232   THORIUM-232    FROM LOG 11 TO LOG  1    BONDARENKO TRIGGER 0
COPY     92235   URANIUM-235    FROM LOG 11 TO LOG 18    BONDARENKO TRIGGER 0
COPY     92235   URANIUM-235    FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY     92235   URANIUM-235    FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY     92238   URANIUM-238    FROM LOG 11 TO LOG 18    BONDARENKO TRIGGER 0
COPY     92238   URANIUM-238    FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY     92238   URANIUM-238    FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
```

```
SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
   BASED ON ENDF-B VERSION 4 DATA
      COMPILED FOR NRC     1/27/89
         LAST UPDATED                                                   08/12/94
            L.M.PETRIE   -   ORNL
    TAPE ID                                4321       NUMBER OF NUCLIDES                   26
    NUMBER OF NEUTRON GROUPS                 27       NUMBER OF GAMMA GROUPS                0
    FIRST THERMAL GROUP                      15       LOGICAL UNIT                          1
                                 TABLE OF CONTENTS
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94      ID   1001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94      ID   3001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94      ID   4001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94      ID   5001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94      ID   7001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94      ID   9001001
   CARBON-12      ENDF/B-IV MAT 1274/THRM1065          UPDATED 08/12/94      ID   1006012
   CARBON-12      ENDF/B-IV MAT 1274/THRM1065          UPDATED 08/12/94      ID   3006012
   OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94      ID   1008016
   OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94      ID   3008016
   OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94      ID   4008016
   OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94      ID   5008016
   OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94      ID   7008016
   OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94      ID   9008016
   SILICON        ENDF/B-IV MAT 1194                   UPDATED 08/12/94      ID   3014000
  CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED 08/12/94      ID   8024304
   MANGANESE-55   ENDF/B-IV MAT 1197                   UPDATED 08/12/94      ID   8025055
  FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED 08/12/94      ID   8026304
  NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED 08/12/94      ID   8028304
   ZIRCONIUM      ENDF/B-IV MAT 7141                   UPDATED 08/12/94      ID   1040000
  PB   1288 218NGP 042375 P-3 293K                     UPDATED 08/12/94      ID   6082000
   THORIUM-232    ENDF/B-IV MAT 1296                   UPDATED 08/12/94      ID   3090232
   URANIUM-235    ENDF/B-IV MAT 1261                   UPDATED 08/12/94      ID   1092235
   URANIUM-235    ENDF/B-IV MAT 1261                   UPDATED 08/12/94      ID   3092235
   URANIUM-238    ENDF/B-IV MAT 1262                   UPDATED 08/12/94      ID   1092238
   URANIUM-238    ENDF/B-IV MAT 1262                   UPDATED 08/12/94      ID   3092238

    TAPE COPY USED       0 I/O'S, AND TOOK     0.17 SECONDS
```

```
NN         NN  IIIIIIIIIIII    TTTTTTTTTTTT     AAAAAAAAA    WW           WW  LL
NNN        NN  IIIIIIIIIIII    TTTTTTTTTTTT    AAAAAAAAAAA   WW           WW  LL
NNNN       NN       II              TT        AA         AA  WW           WW  LL
NN NN      NN       II              TT        AA         AA  WW           WW  LL
NN  NN     NN       II              TT        AA         AA  WW           WW  LL
NN   NN    NN       II              TT        AAAAAAAAAAAAA  WW     W     WW  LL
NN    NN   NN       II              TT        AAAAAAAAAAAAA  WW    WWW    WW  LL
NN     NN  NN       II              TT        AA         AA  WW  WW WW    WW  LL
NN      NN NN       II              TT        AA         AA  WW WW    WW WW   LL
NN       NNNN       II              TT        AA         AA  WWWW      WWWW   LL
NN        NNN  IIIIIIIIIIII         TT        AA         AA  WWW        WWW   LLLLLLLLLLLL
NN         NN  IIIIIIIIIIII         TT        AA         AA  WW          WW   LLLLLLLLLLLL


  SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL              EEEEEEEEEEEEE                   PPPPPPPPPPPP     CCCCCCCCCCC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL              EEEEEEEEEEEEE                   PPPPPPPPPPPPP   CCCCCCCCCCCCC
 SS         SS  CC         CC  AA         AA  LL              EE                              PP         PP   CC         CC
 SS             CC             AA         AA  LL              EE                              PP         PP   CC
 SS             CC             AA         AA  LL              EE                              PP         PP   CC
 SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL              EEEEEEEEE       -------------   PPPPPPPPPPPPP   CC
  SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL              EEEEEEEEE       -------------   PPPPPPPPPPPP    CC
            SS  CC             AA         AA  LL              EE                              PP              CC
            SS  CC             AA         AA  LL              EE                              PP              CC
 SS         SS  CC         CC  AA         AA  LL              EE                              PP              CC         CC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLL    EEEEEEEEEEEEE                   PP              CCCCCCCCCCCCC
  SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLL    EEEEEEEEEEEEE                   PP               CCCCCCCCCCC


   0000000     5555555555555          //        11        666666666666           //      0000000      33333333333
  000000000    5555555555555         //        111        6666666666666         //      000000000    3333333333333
 00       00   55                   //        1111        66                   //      00       00   33         33
 00       00   55                  //           11        66                  //       00       00              33
 00       00   55                 //            11        66                 //        00       00              33
 00       00   555555555555      //             11        666666666666      //         00       00             333
 00       00   5555555555555    //              11        6666666666666    //          00       00             333
 00       00              55   //               11        66         66   //           00       00              33
 00       00              55  //                11        66         66  //            00       00              33
 00       00   55         55 //                 11        66         66 //             00       00   33         33
  000000000    5555555555555//               11111111     6666666666666//               000000000    3333333333333
   0000000      55555555555//                11111111      66666666666//                 0000000      33333333333


      11            11                         0000000    22222222222                  33333333333    33333333333
     111           111                        000000000  2222222222222                3333333333333  3333333333333
    1111          1111         :::           00       00 22         22       :::      33         33  33         33
      11            11         :::           00       00            22       :::                 33             33
      11            11         :::           00       00            22       :::                 33             33
      11            11                       00       00          22                            333            333
      11            11                       00       00        22                              333            333
      11            11         :::           00       00      22             :::                 33             33
      11            11         :::           00       00    22               :::                 33             33
      11            11         :::           00       00  22                 :::      33         33  33         33
   11111111      11111111                     000000000  2222222222222                3333333333333  3333333333333
   11111111      11111111                      0000000   2222222222222                 33333333333    33333333333
```

```
 SSSSSSSSSSS    CCCCCCCCCCC      AAAAAAAAA     LL             EEEEEEEEEEEEE                   PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC    AAAAAAAAAAA    LL             EEEEEEEEEEEEE                   PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC   AA       AA     LL             EE                              PP         PP  CC         CC
SS             CC              AA       AA     LL             EE                              PP         PP  CC
SS             CC              AA       AA     LL             EE                              PP         PP  CC
SSSSSSSSSSSS   CC              AAAAAAAAAAAAA   LL             EEEEEEEEE      -------------    PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC              AAAAAAAAAAAAA   LL             EEEEEEEEE      -------------    PPPPPPPPPPPP   CC
           SS  CC              AA       AA     LL             EE                              PP             CC
           SS  CC              AA       AA     LL             EE                              PP             CC
SS         SS  CC         CC   AA       AA     LL             EE                              PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AA       AA     LLLLLLLLLLLLL  EEEEEEEEEEEEE                   PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC    AA       AA     LLLLLLLLLLLLL  EEEEEEEEEEEEE                   PP              CCCCCCCCCCC
```

```
*****                                                                       *****
*****                  PROGRAM VERIFICATION INFORMATION                     *****
*****                                                                       *****
*****                CODE SYSTEM:  SCALE-PC VERSION:  4.3                   *****
*****                                                                       *****
*****                                                                       *****
*****                                                                       *****
*****                PROGRAM:  000002                                       *****
*****                                                                       *****
*****          CREATION DATE:  09/28/95                                     *****
*****                                                                       *****
*****                 VOLUME:  Eng                                          *****
*****                                                                       *****
*****                LIBRARY:  M:\SCALE43\WIN_NT\EXE                        *****
*****                                                                       *****
*****                                                                       *****
*****        PRODUCTION CODE:  NITAWL                                       *****
*****                                                                       *****
*****                VERSION:  3.0                                          *****
*****                                                                       *****
*****                JOBNAME:  SCALE-PC                                     *****
*****                                                                       *****
*****      DATE OF EXECUTION:  05/16/03                                     *****
*****                                                                       *****
*****      TIME OF EXECUTION:  11:02:33                                     *****
*****                                                                       *****
*****                                                                       *****
```

```
       -1Q ARRAY HAS      1 ENTRIES.

        0Q ARRAY HAS      9 ENTRIES.

        1Q ARRAY HAS     12 ENTRIES.

SELECT 26 NUCLIDES FROM THE MASTER  LIBRARY ON LOGICAL  1
        0 NUCLIDES FROM THE WORKING LIBRARY ON LOGICAL  2
        0 NUCLIDES FROM THE WORKING LIBRARY ON LOGICAL  3
          TO CREATE THE NEW WORKING LIBRARY ON LOGICAL  4

        6 RESONANCE CALCULATIONS HAVE BEEN REQUESTED
       -1 OUTPUT OPTION FOR AMPX FORMATTED CROSS SECTION DATA
     2001 MAXIMUM NUMBER OF RESONANCE MESH INTERVALS
        2 ORDER OF RESONANCE LEVEL PROCESSING

THE STORAGE ALLOCATED FOR THIS CASE IS    100000 WORDS

        2Q ARRAY HAS     26 ENTRIES.

        3Q ARRAY HAS     90 ENTRIES.

        4Q ARRAY HAS     26 ENTRIES.

 GENERAL INFORMATION CONCERNING CROSS SECTION LIBRARY
   TAPE IDENTIFICATION NUMBER              4321
   NUMBER OF NUCLIDES ON TAPE                26
   NUMBER OF NEUTRON ENERGY GROUPS           27
   FIRST THERMAL NEUTRON ENERGY GROUP        15
   NUMBER OF GAMMA ENERGY GROUPS              0

   DIRECT ACCESS UNIT NUMBER  9 REQUIRES 117 BLOCKS OF LENGTH  1680 WORDS
 XSDRN TAPE    4321
                        SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
                           BASED ON ENDF-B VERSION 4 DATA
                              COMPILED FOR NRC      1/27/89
                                 LAST UPDATED                                              08/12/94
                                    L.M.PETRIE    -   ORNL

 NUCLIDES FROM XSDRN TAPE
    1      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002           UPDATED 08/12/94     1001001
    2      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002           UPDATED 08/12/94     3001001
    3      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002           UPDATED 08/12/94     4001001
    4      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002           UPDATED 08/12/94     5001001
    5      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002           UPDATED 08/12/94     7001001
    6      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002           UPDATED 08/12/94     9001001
    7      CARBON-12      ENDF/B-IV MAT 1274/THRM1065           UPDATED 08/12/94     1006012
    8      CARBON-12      ENDF/B-IV MAT 1274/THRM1065           UPDATED 08/12/94     3006012
    9      OXYGEN-16      ENDF/B-IV MAT 1276                    UPDATED 08/12/94     1008016
   10      OXYGEN-16      ENDF/B-IV MAT 1276                    UPDATED 08/12/94     3008016
   11      OXYGEN-16      ENDF/B-IV MAT 1276                    UPDATED 08/12/94     4008016
   12      OXYGEN-16      ENDF/B-IV MAT 1276                    UPDATED 08/12/94     5008016
   13      OXYGEN-16      ENDF/B-IV MAT 1276                    UPDATED 08/12/94     7008016
   14      OXYGEN-16      ENDF/B-IV MAT 1276                    UPDATED 08/12/94     9008016
   15      SILICON        ENDF/B-IV MAT 1194                    UPDATED 08/12/94     3014000
   16     CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'      UPDATED 08/12/94     8024304
   17      MANGANESE-55   ENDF/B-IV MAT 1197                    UPDATED 08/12/94     8025055
   18     FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'      UPDATED 08/12/94     8026304
   19     NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'      UPDATED 08/12/94     8028304
   20      ZIRCONIUM      ENDF/B-IV MAT 7141                    UPDATED 08/12/94     1040000
   21     PB   1288 218NGP 042375 P-3 293K                      UPDATED 08/12/94     6082000
   22      THORIUM-232    ENDF/B-IV MAT 1296                    UPDATED 08/12/94     3090232
   23      URANIUM-235    ENDF/B-IV MAT 1261                    UPDATED 08/12/94     1092235
   24      URANIUM-235    ENDF/B-IV MAT 1261                    UPDATED 08/12/94     3092235
   25      URANIUM-238    ENDF/B-IV MAT 1262                    UPDATED 08/12/94     1092238
   26      URANIUM-238    ENDF/B-IV MAT 1262                    UPDATED 08/12/94     3092238

 HYDROGEN      ENDF/B-IV MAT 1269/THRM1002        UPDATED 08/12/94   1001001     TEMPERATURE=   293.00
                                                       PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 HYDROGEN      ENDF/B-IV MAT 1269/THRM1002        UPDATED 08/12/94   3001001     TEMPERATURE=   293.00
                                                       PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 HYDROGEN      ENDF/B-IV MAT 1269/THRM1002        UPDATED 08/12/94   4001001     TEMPERATURE=   293.00
                                                       PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 HYDROGEN      ENDF/B-IV MAT 1269/THRM1002        UPDATED 08/12/94   5001001     TEMPERATURE=   293.00
                                                       PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 HYDROGEN      ENDF/B-IV MAT 1269/THRM1002        UPDATED 08/12/94   7001001     TEMPERATURE=   293.00
                                                       PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 HYDROGEN      ENDF/B-IV MAT 1269/THRM1002        UPDATED 08/12/94   9001001     TEMPERATURE=   293.00
                                                       PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 CARBON-12     ENDF/B-IV MAT 1274/THRM1065        UPDATED 08/12/94   1006012     TEMPERATURE=   293.00
                                                       PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 CARBON-12     ENDF/B-IV MAT 1274/THRM1065        UPDATED 08/12/94   3006012     TEMPERATURE=   293.00
                                                       PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 OXYGEN-16     ENDF/B-IV MAT 1276                 UPDATED 08/12/94   1008016     TEMPERATURE=   293.00
                                                       PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00
```

```
 OXYGEN-16      ENDF/B-IV MAT 1276                  UPDATED 08/12/94   3008016     TEMPERATURE=   293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                  UPDATED 08/12/94   4008016     TEMPERATURE=   293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                  UPDATED 08/12/94   5008016     TEMPERATURE=   293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                  UPDATED 08/12/94   7008016     TEMPERATURE=   293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                  UPDATED 08/12/94   9008016     TEMPERATURE=   293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 SILICON        ENDF/B-IV MAT 1194                  UPDATED 08/12/94   3014000     TEMPERATURE=   293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=     0.00

CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'    UPDATED 08/12/94   8024304     TEMPERATURE=   293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 MANGANESE-55   ENDF/B-IV MAT 1197                  UPDATED 08/12/94   8025055     TEMPERATURE=   293.00

GEOMETRY HAS BEEN SET TO HOMOGENEOUS AS LBAR IS  0.0000E+00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)          =    54.466            TEMPERATURE(KELVIN)        =   293.000

POTENTIAL SCATTER SIGMA  =     2.590            LUMPED NUCLEAR DENSITY     = 1.7363295E-03

SPIN FACTOR (G)          =    14.448            LUMP DIMENSION (A-BAR)     = 0.0000000E+00

INNER RADIUS             = 0.0000000E+00        DANCOFF CORRECTION (C)     = 0.0000000E+00

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1     =    55.845           SIGMA(PER ABSORBER ATOM)= 3.4663022E+02

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2     =    55.925           SIGMA(PER ABSORBER ATOM)= 1.2557598E+02

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 0-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP        RES ABS         RES FISS        RES SCAT
  8       -5.518788E-04    0.000000E+00   -3.944190E-01
  9       -2.797993E-03    0.000000E+00   -2.293471E+00
 10       -3.291452E-01    0.000000E+00   -3.820862E+01
 11       -2.680562E+00    0.000000E+00   -1.159996E+02

EXCESS RESONANCE INTEGRALS

                  RESOLVED

ABSORPTION       3.33719E+00
FISSION          0.00000E+00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'    UPDATED 08/12/94   8026304     TEMPERATURE=   293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'    UPDATED 08/12/94   8028304     TEMPERATURE=   293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 ZIRCONIUM      ENDF/B-IV MAT 7141                  UPDATED 08/12/94   1040000     TEMPERATURE=   293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

PB   1288 218NGF 042375 P-3 293K                    UPDATED 08/12/94   6082000     TEMPERATURE=   293.00
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 THORIUM-232    ENDF/B-IV MAT 1296                  UPDATED 08/12/94   3090232     TEMPERATURE=   293.00

GEOMETRY HAS BEEN SET TO HOMOGENEOUS AS LBAR IS  0.0000E+00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)          =   230.040            TEMPERATURE(KELVIN)        =   293.000

POTENTIAL SCATTER SIGMA  =    10.150            LUMPED NUCLEAR DENSITY     = 5.3153303E-04

SPIN FACTOR (G)          =   666.678            LUMP DIMENSION (A-BAR)     = 0.0000000E+00

INNER RADIUS             = 0.0000000E+00        DANCOFF CORRECTION (C)     = 0.0000000E+00

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1     =     1.008           SIGMA(PER ABSORBER ATOM)= 2.5601689E+03

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.
```

MASS OF MODERATOR-2 = 13.617 SIGMA(PER ABSORBER ATOM)= 5.8951794E+02

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 0-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP	RES ABS	RES FISS	RES SCAT
9	-1.537706E-03	0.000000E+00	-1.274133E-02
10	-9.518421E-02	0.000000E+00	-5.100160E-01
11	-1.724563E+00	0.000000E+00	-2.284316E+00
12	-5.948936E+00	0.000000E+00	-9.034661E+00
13	-1.168305E+01	0.000000E+00	-1.439534E+00

EXCESS RESONANCE INTEGRALS

RESOLVED

ABSORPTION 5.75991E+01
FISSION 0.00000E+00

PROCESS NUMBER 1007 IS AT TEMPERATURE= 293.00

URANIUM-235 ENDF/B-IV MAT 1261 UPDATED 08/12/94 1092235 TEMPERATURE= 293.00

GEOMETRY HAS BEEN SET TO HOMOGENEOUS AS LBAR IS 0.0000E+00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A) = 233.025 TEMPERATURE(KELVIN) = 293.000

POTENTIAL SCATTER SIGMA = 11.500 LUMPED NUCLEAR DENSITY = 2.7220073E-04

SPIN FACTOR (G) = 15171.100 LUMP DIMENSION (A-BAR) = 0.0000000E+00

INNER RADIUS = 0.0000000E+00 DANCOFF CORRECTION (C) = 0.0000000E+00

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1 = 1.008 SIGMA(PER ABSORBER ATOM)= 4.1345737E+03

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2 = 23.697 SIGMA(PER ABSORBER ATOM)= 5.2259918E+02

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 0-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP	RES ABS	RES FISS	RES SCAT
12	-1.562050E+00	-9.584369E-01	-4.085827E-02
13	-5.262661E+00	-2.581354E+00	-1.213858E-01
14	-3.765349E+00	-2.255217E+00	-2.806130E-02
15	-1.919643E-04	-1.459400E-04	1.329683E-06

EXCESS RESONANCE INTEGRALS

RESOLVED

ABSORPTION 2.15993E+02
FISSION 1.28668E+02

PROCESS NUMBER 1007 IS AT TEMPERATURE= 293.00

URANIUM-235 ENDF/B-IV MAT 1261 UPDATED 08/12/94 3092235 TEMPERATURE= 293.00

GEOMETRY HAS BEEN SET TO HOMOGENEOUS AS LBAR IS 0.0000E+00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A) = 233.025 TEMPERATURE(KELVIN) = 293.000

POTENTIAL SCATTER SIGMA = 11.500 LUMPED NUCLEAR DENSITY = 5.1165749E-05

SPIN FACTOR (G) = 15171.100 LUMP DIMENSION (A-BAR) = 0.0000000E+00

INNER RADIUS = 0.0000000E+00 DANCOFF CORRECTION (C) = 0.0000000E+00

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1 = 1.008 SIGMA(PER ABSORBER ATOM)= 2.6596197E+04

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2 = 13.920 SIGMA(PER ABSORBER ATOM)= 6.2625801E+03

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 0-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP	RES ABS	RES FISS	RES SCAT
12	-2.344056E-01	-1.438800E-01	-6.240554E-03

```
 13      -8.441902E-01   -4.162556E-01   -1.976475E-02
 14      -5.930282E-01   -3.583517E-01   -4.437619E-03
 15      -6.245016E-05   -4.746152E-05    3.750866E-08

EXCESS RESONANCE INTEGRALS

                 RESOLVED

ABSORPTION      2.26514E+02
FISSION         1.34455E+02
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 URANIUM-238    ENDF/B-IV MAT 1262                    UPDATED 08/12/94   1092238     TEMPERATURE=   293.00

GEOMETRY HAS BEEN SET TO HOMOGENEOUS AS LBAR IS  0.0000E+00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)          =   236.006          TEMPERATURE(KELVIN)       =   293.000

POTENTIAL SCATTER SIGMA  =    10.599          LUMPED NUCLEAR DENSITY    = 1.0955411E-03

SPIN FACTOR (G)          =   656.527          LUMP DIMENSION (A-BAR)    = 0.0000000E+00

INNER RADIUS             = 0.0000000E+00      DANCOFF CORRECTION (C)    = 0.0000000E+00

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1     =     1.008          SIGMA(PER ABSORBER ATOM)= 1.0272860E+03

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2     =    22.105          SIGMA(PER ABSORBER ATOM)= 1.2047719E+02

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 0-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP       RES ABS        RES FISS        RES SCAT
  9      -5.670995E-03    0.000000E+00   -6.271562E-02
 10      -2.582614E-01   -1.776290E-06   -1.805436E+00
 11      -5.712295E+00    0.000000E+00   -1.704868E+01
 12      -3.260907E+01    0.000000E+00   -3.853433E+01
 13      -4.122983E+01    0.000000E+00   -1.360831E+01
 14      -7.892720E+01    0.000000E+00   -4.614881E+00
 15      -5.014865E-08    0.000000E+00    9.319286E-08

EXCESS RESONANCE INTEGRALS

                 RESOLVED

ABSORPTION      8.34181E+01
FISSION         5.30689E-04
                                                          PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 URANIUM-238    ENDF/B-IV MAT 1262                    UPDATED 08/12/94   3092238     TEMPERATURE=   293.00

GEOMETRY HAS BEEN SET TO HOMOGENEOUS AS LBAR IS  0.0000E+00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)          =   236.006          TEMPERATURE(KELVIN)       =   293.000

POTENTIAL SCATTER SIGMA  =    10.599          LUMPED NUCLEAR DENSITY    = 3.7187583E-06

SPIN FACTOR (G)          =   656.527          LUMP DIMENSION (A-BAR)    = 0.0000000E+00

INNER RADIUS             = 0.0000000E+00      DANCOFF CORRECTION (C)    = 0.0000000E+00

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1     =     1.008          SIGMA(PER ABSORBER ATOM)= 3.6593247E+05

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2     =    13.944          SIGMA(PER ABSORBER ATOM)= 8.6317188E+04

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 0-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP       RES ABS        RES FISS        RES SCAT
  9      -1.458856E-05    0.000000E+00   -1.704482E-04
 10      -8.678175E-04   -4.383982E-09   -6.304161E-03
 11      -5.092458E-02    0.000000E+00   -1.643915E-01
 12      -5.565513E-01    0.000000E+00   -6.664960E-01
 13      -6.091141E-01    0.000000E+00   -2.016093E-01
 14      -1.094999E+00    0.000000E+00   -6.417535E-02
 15      -3.734067E-09    0.000000E+00    2.932041E-09

EXCESS RESONANCE INTEGRALS
```

```
                    RESOLVED

ABSORPTION          2.70632E+02
FISSION             5.33689E-04
                                           PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00
```

```
THIS XSDRN WORKING TAPE WAS CREATED 05/16/03 AT 11:02:33
THE TITLE OF THE PARENT CASE IS AS FOLLOWS
SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
   BASED ON ENDF-B VERSION 4 DATA
      COMPILED FOR NRC      1/27/89
    TAPE ID                              4321         NUMBER OF NUCLIDES                     26
    NUMBER OF NEUTRON GROUPS               27         NUMBER OF GAMMA GROUPS                  0
    FIRST THERMAL GROUP                    15         LOGICAL UNIT                            4
                                 TABLE OF CONTENTS
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94        ID   1001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94        ID   3001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94        ID   4001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94        ID   5001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94        ID   7001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94        ID   9001001
   CARBON-12      ENDF/B-IV MAT 1274/THRM1065             UPDATED 08/12/94        ID   1006012
   CARBON-12      ENDF/B-IV MAT 1274/THRM1065             UPDATED 08/12/94        ID   3006012
   OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94        ID   1008016
   OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94        ID   3008016
   OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94        ID   4008016
   OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94        ID   5008016
   OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94        ID   7008016
   OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94        ID   9008016
   SILICON        ENDF/B-IV MAT 1194                      UPDATED 08/12/94        ID   3014000
  CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94        ID   8024304
   MANGANESE-55   ENDF/B-IV MAT 1197                      UPDATED 08/12/94        ID   8025055
  FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94        ID   8026304
  NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94        ID   8028304
   ZIRCONIUM      ENDF/B-IV MAT 7141                      UPDATED 08/12/94        ID   1040000
  PB   1288 218NGP 042375 P-3 293K                        UPDATED 08/12/94        ID   6082000
   THORIUM-232    ENDF/B-IV MAT 1296                      UPDATED 08/12/94        ID   3090232
   URANIUM-235    ENDF/B-IV MAT 1261                      UPDATED 08/12/94        ID   1092235
   URANIUM-235    ENDF/B-IV MAT 1261                      UPDATED 08/12/94        ID   3092235
   URANIUM-238    ENDF/B-IV MAT 1262                      UPDATED 08/12/94        ID   1092238
   URANIUM-238    ENDF/B-IV MAT 1262                      UPDATED 08/12/94        ID   3092238

    TAPE COPY USED       0 I/O'S, AND TOOK     0.11 SECONDS
```

KENO-V

SCALE-PC

05/16/03

11:02:37

```
 SSSSSSSSSSS    CCCCCCCCCCC      AAAAAAAAA     LL              EEEEEEEEEEEEE                  PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC    AAAAAAAAAAA    LL              EEEEEEEEEEEEE                  PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC   AA         AA   LL              EE                             PP         PP  CC         CC
SS             CC              AA         AA   LL              EE                             PP         PP  CC
SS             CC              AA         AA   LL              EE                             PP         PP  CC
SSSSSSSSSSSS   CC              AAAAAAAAAAAAA   LL              EEEEEEEEE     -------------    PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC              AAAAAAAAAAAAA   LL              EEEEEEEEE     -------------    PPPPPPPPPPPP   CC
           SS  CC              AA         AA   LL              EE                             PP             CC
           SS  CC              AA         AA   LL              EE                             PP             CC
SS         SS  CC         CC   AA         AA   LL              EE                             PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                  PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC    AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                  PP              CCCCCCCCCCC
```

```
*****                                                     *****
*****          PROGRAM VERIFICATION INFORMATION           *****
*****                                                     *****
*****        CODE SYSTEM:  SCALE-PC VERSION:  4.3         *****
*****                                                     *****

*****                                                     *****
*****                                                     *****
*****              PROGRAM:  000009                       *****
*****                                                     *****
*****        CREATION DATE:  03/08/96                     *****
*****                                                     *****
*****               VOLUME:  Eng                          *****
*****                                                     *****
*****              LIBRARY:  M:\SCALE43\WIN_NT\EXE        *****
*****                                                     *****
*****                                                     *****
*****      PRODUCTION CODE:  KENOVA                       *****
*****                                                     *****
*****              VERSION:  3.1                          *****
*****                                                     *****
*****              JOBNAME:  SCALE-PC                     *****
*****                                                     *****
*****    DATE OF EXECUTION:  05/16/03                     *****
*****                                                     *****
*****    TIME OF EXECUTION:  11:02:37                     *****
*****                                                     *****
*****                                                     *****
```

```
**********************************************************************************************
***                                                                                        ***
***                     LWT WITH GA IFM                                                    ***
***                                                                                        ***
**********************************************************************************************
***                        ******      NUMERIC PARAMETERS      ******                      ***
***                                                                                        ***
***                                                                                        ***
***          TME        MAXIMUM PROBLEM TIME (MIN)                       ******            ***
***                                                                                        ***
***          TBA        TIME PER GENERATION (MIN)                          5.00            ***
***                                                                                        ***
***          GEN        NUMBER OF GENERATIONS                               803            ***
***                                                                                        ***
***          NPG        NUMBER PER GENERATION                              1000            ***
***                                                                                        ***
***          NSK        NUMBER OF GENERATIONS TO BE SKIPPED                   3            ***
***                                                                                        ***
***          BEG        BEGINNING GENERATION NUMBER                           1            ***
***                                                                                        ***
***          RES        GENERATIONS BETWEEN CHECKPOINTS                       0            ***
***                                                                                        ***
***          X1D        NUMBER OF EXTRA 1-D CROSS SECTIONS                    1            ***
***                                                                                        ***
***          NBK        NEUTRON BANK SIZE                                  1025            ***
***                                                                                        ***
***          XNB        EXTRA POSITIONS IN NEUTRON BANK                       0            ***
***                                                                                        ***
***          NFB        FISSION BANK SIZE                                  1000            ***
***                                                                                        ***
***          XFB        EXTRA POSITIONS IN FISSION BANK                       0            ***
***                                                                                        ***
***          WTA        DEFAULT VALUE OF WEIGHT AVERAGE                  0.5000            ***
***                                                                                        ***
***          WTH        WEIGHT HIGH FOR SPLITTING                        3.0000            ***
***                                                                                        ***
***          WTL        WEIGHT LOW FOR RUSSIAN ROULETTE                  0.3333            ***
***                                                                                        ***
***          RND        STARTING RANDOM NUMBER                     BB827100001             ***
***                                                                                        ***
***          NB8        NUMBER OF D.A. BLOCKS ON UNIT  8                    200            ***
***                                                                                        ***
***          NL8        LENGTH OF D.A. BLOCKS ON UNIT  8                    512            ***
***                                                                                        ***
***          ADJ        MODE OF CALCULATION                             FORWARD            ***
***                                                                                        ***
***                     INPUT DATA WRITTEN ON RESTART UNIT                   NO            ***
***                                                                                        ***
***                     BINARY DATA INTERFACE                               YES            ***
***                                                                                        ***
***                                                                                        ***
**********************************************************************************************
**********************************************************************************************
```

```
***                                                                                                 ***
***                                LWT WITH GA IFM                                                  ***
***                                                                                                 ***
***                         ******      LOGICAL PARAMETERS        ******                            ***
***                                                                                                 ***
***  RUN  EXECUTE PROBLEM AFTER CHECKING DATA     YES        FLT  PLOT PICTURE MAP(S)              NO ***
***  FLX  COMPUTE FLUX                             NO        FDN  COMPUTE FISSION DENSITIES        NO ***
***  SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION     NO        NUB  COMPUTE NU-BAR & AVG FISSION GROUP  YES ***
***  MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER      NO        MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION   NO ***
***  CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER    NO        CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION NO ***
***  FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER    NO        FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION NO ***
***  MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER      NO        MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER    NO ***
***  CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER    NO        CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER  NO ***
***  FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER    NO        FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER  NO ***
***  HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL     NO        HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL   NO ***
***  AMX  PRINT ALL MIXED CROSS SECTIONS           NO        FAR  PRINT FIS. AND ABS. BY REGION           NO ***
***  XS1  PRINT 1-D MIXTURE X-SECTIONS             NO        GAS  PRINT FAR BY GROUP                      NO ***
***  XS2  PRINT 2-D MIXTURE X-SECTIONS             NO        PAX  PRINT XSEC-ALBEDO CORRELATION TABLES    NO ***
***  XAP  PRINT MIXTURE ANGLES & PROBABILITIES     NO        PWT  PRINT WEIGHT AVERAGE ARRAY              NO ***
***  PKI  PRINT FISSION SPECTRUM                   NO        PGM  PRINT INPUT GEOMETRY                    NO ***
***  P1D  PRINT EXTRA 1-D CROSS SECTIONS           NO        BUG  PRINT DEBUG INFORMATION                 NO ***
***                                                          TRK  PRINT TRACKING INFORMATION              NO ***
***                                                                                                 ***

                           PARAMETER INPUT COMPLETED

              ........     0 IO'S WERE USED READING THE PARAMETER DATA     ........

              *************** DATA READING COMPLETED ***************
```

```
*************************************************************************************************
***                                                                                           ***
***                               LWT WITH GA IFM                                             ***
***                                                                                           ***
*************************************************************************************************
*************************************************************************************************
***                                                                                           ***
***        UNIT                                           VOLUME                              ***
***       NUMBER               DATA SET NAME               NAME       UNIT FUNCTION           ***
***       ------               -------------               ----       -------------           ***
***                                                                                           ***
***    XSC  14    D:\zjr\Lwt\GAIFM\Crit\DAMAGED\gaifm_173ps_00          MIXED CROSS SECTIONS  ***
***                                                                                           ***
***    ALB  79    M:\scale43\DATALIB\FT79F001                           INPUT ALBEDOS         ***
***                                                                                           ***
***    WTS  80    M:\scale43\DATALIB\FT80F001                           INPUT WEIGHTS         ***
***                                                                                           ***
***    SKT  16     UNKNOWN                                              WRITE SCRATCH DATA    ***
***                                                                                           ***
***    BIN  95    D:\zjr\Lwt\GAIFM\Crit\DAMAGED\gaifm_173ps_00          BINARY INPUT DATA     ***
***                                                                                           ***
***    RST  95    D:\zjr\Lwt\GAIFM\Crit\DAMAGED\gaifm_173ps_00          READ RESTART DATA     ***
***                                                                                           ***
***    LIB   4    D:\zjr\Lwt\GAIFM\Crit\DAMAGED\gaifm_173ps_00          INPUT AMPX WORKING LIBRARY ***
***                                                                                           ***
***          8    D:\zjr\Lwt\GAIFM\Crit\DAMAGED\gaifm_173ps_00          INPUT DATA DIRECT ACCESS ***
***                                                                                           ***
***          9     UNKNOWN                                              SUPER GROUPED DIRECT ACCESS ***
***                                                                                           ***
***         10     UNKNOWN                                              XSEC MIXING DIRECT ACCESS ***
***                                                                                           ***
*************************************************************************************************

                 ........    0 IO'S WERE USED PREPARING INPUT DATA    ........


                 CROSS SECTIONS READ FROM THE AMPX WORKING LIBRARY ON UNIT     4
```

```
                                   LWT WITH GA IFM

                                          MIXING TABLE

                                   NUMBER OF SCATTERING ANGLES =  2
                                 CROSS SECTION MESSAGE THRESHOLD =3.0E-05


MIXTURE =       1           DENSITY(G/CC) =  2.1794
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT                NUCLIDE TITLE
   1001001  5.52201E-02  4.23959E-02   1001     1.0077       HYDROGEN       ENDF/B-IV MAT 1269/THRM1002                UPDATED
08/12/94
   1006012  1.08398E-04  9.91110E-04   6000    12.0001       CARBON-12      ENDF/B-IV MAT 1274/THRM1065                UPDATED
08/12/94
   1008016  2.27549E-02  2.77235E-01   8016    15.9904       OXYGEN-16      ENDF/B-IV MAT 1276                         UPDATED
08/12/94
   1040000  6.21447E-03  4.31923E-01  40000    91.2196       ZIRCONIUM      ENDF/B-IV MAT 7141                         UPDATED
08/12/94
   1092235  2.72201E-04  4.87476E-02  92235   235.0441       URANIUM-235    ENDF/B-IV MAT 1261                         UPDATED
08/12/94
   1092238  1.09554E-03  1.98707E-01  92238   238.0510       URANIUM-238    ENDF/B-IV MAT 1262                         UPDATED
08/12/94

MIXTURE =       3           DENSITY(G/CC) =  2.1146
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT                NUCLIDE TITLE
   3001001  6.67692E-02  5.28324E-02   1001     1.0077       HYDROGEN       ENDF/B-IV MAT 1269/THRM1002                UPDATED
08/12/94
   3006012  3.71616E-02  3.50179E-01   6000    12.0001       CARBON-12      ENDF/B-IV MAT 1274/THRM1065                UPDATED
08/12/94
   3008016  3.34727E-02  4.20302E-01   8016    15.9904       OXYGEN-16      ENDF/B-IV MAT 1276                         UPDATED
08/12/94
   3014000  3.16038E-03  6.96995E-02  14000    28.0853       SILICON        ENDF/B-IV MAT 1194                         UPDATED
08/12/94
   3090232  5.31533E-04  9.68483E-02  90232   232.0333       THORIUM-232    ENDF/B-IV MAT 1296                         UPDATED
08/12/94
   3092235  5.11657E-05  9.44366E-03  92235   235.0441       URANIUM-235    ENDF/B-IV MAT 1261                         UPDATED
08/12/94
   3092238  3.71876E-06  6.95152E-04  92238   238.0510       URANIUM-238    ENDF/B-IV MAT 1262                         UPDATED
08/12/94

MIXTURE =       4           DENSITY(G/CC) = 0.99817E-04
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT                NUCLIDE TITLE
   4001001  6.67692E-06  1.11927E-01   1001     1.0077       HYDROGEN       ENDF/B-IV MAT 1269/THRM1002                UPDATED
08/12/94
   4008016  3.33846E-06  8.88074E-01   8016    15.9904       OXYGEN-16      ENDF/B-IV MAT 1276                         UPDATED
08/12/94

MIXTURE =       5           DENSITY(G/CC) = 0.99817E-04
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT                NUCLIDE TITLE
   5001001  6.67692E-06  1.11927E-01   1001     1.0077       HYDROGEN       ENDF/B-IV MAT 1269/THRM1002                UPDATED
08/12/94
   5008016  3.33846E-06  8.88074E-01   8016    15.9904       OXYGEN-16      ENDF/B-IV MAT 1276                         UPDATED
08/12/94

MIXTURE =       6           DENSITY(G/CC) =  11.344
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT                NUCLIDE TITLE
   6082000  3.29690E-02  1.00000E+00  82000   207.2100     PB   1288 218NGP 042375 P-3 293K                        UPDATED
08/12/94

MIXTURE =       7           DENSITY(G/CC) = 0.99817E-04
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT                NUCLIDE TITLE
   7001001  6.67692E-06  1.11927E-01   1001     1.0077       HYDROGEN       ENDF/B-IV MAT 1269/THRM1002                UPDATED
08/12/94
   7008016  3.33846E-06  8.88074E-01   8016    15.9904       OXYGEN-16      ENDF/B-IV MAT 1276                         UPDATED
08/12/94

MIXTURE =       8           DENSITY(G/CC) =  7.9200
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT                NUCLIDE TITLE
   8024304  1.74286E-02  1.90000E-01  24000    51.9957     CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED
08/12/94
   8025055  1.73633E-03  1.99999E-02  25055    54.9379      MANGANESE-55   ENDF/B-IV MAT 1197                        UPDATED
08/12/94
   8026304  5.93579E-02  6.95000E-01  26000    55.8447     FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED
08/12/94
   8028304  7.72070E-03  9.50001E-02  28000    58.6872     NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED
08/12/94

MIXTURE =       9           DENSITY(G/CC) = 0.99817
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT                NUCLIDE TITLE
   9001001  6.67692E-02  1.11927E-01   1001     1.0077       HYDROGEN       ENDF/B-IV MAT 1269/THRM1002                UPDATED
08/12/94
   9008016  3.33846E-02  8.88074E-01   8016    15.9904       OXYGEN-16      ENDF/B-IV MAT 1276                         UPDATED
08/12/94


                         1001001      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94
                         3001001      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94
                         4001001      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94
                         5001001      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94
                         7001001      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94
                         9001001      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94
                         1006012      CARBON-12      ENDF/B-IV MAT 1274/THRM1065          UPDATED 08/12/94
                         3006012      CARBON-12      ENDF/B-IV MAT 1274/THRM1065          UPDATED 08/12/94
                         1008016      OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94
```

```
3008016    OXYGEN-16     ENDF/B-IV MAT 1276                          UPDATED 08/12/94
4008016    OXYGEN-16     ENDF/B-IV MAT 1276                          UPDATED 08/12/94
5008016    OXYGEN-16     ENDF/B-IV MAT 1276                          UPDATED 08/12/94
7008016    OXYGEN-16     ENDF/B-IV MAT 1276                          UPDATED 08/12/94
9008016    OXYGEN-16     ENDF/B-IV MAT 1276                          UPDATED 08/12/94
3014000    SILICON       ENDF/B-IV MAT 1194                          UPDATED 08/12/94
8024304   CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'           UPDATED 08/12/94
8025055    MANGANESE-55  ENDF/B-IV MAT 1197                          UPDATED 08/12/94
8026304   FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'           UPDATED 08/12/94
8028304   NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'           UPDATED 08/12/94
1040000    ZIRCONIUM     ENDF/B-IV MAT 7141                          UPDATED 08/12/94
6082000   PB   1288 218GP 042375 P-3 293K                            UPDATED 08/12/94
3090232    THORIUM-232   ENDF/B-IV MAT 1296                          UPDATED 08/12/94
1092235    URANIUM-235   ENDF/B-IV MAT 1261                          UPDATED 08/12/94
3092235    URANIUM-235   ENDF/B-IV MAT 1261                          UPDATED 08/12/94
1092238    URANIUM-238   ENDF/B-IV MAT 1262                          UPDATED 08/12/94
3092238    URANIUM-238   ENDF/B-IV MAT 1262                          UPDATED 08/12/94

KENO MESSAGE NUMBER K5-222      2 TRANSFERS FOR MIXTURE     1 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222      2 TRANSFERS FOR MIXTURE     3 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222      2 TRANSFERS FOR MIXTURE     4 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222      2 TRANSFERS FOR MIXTURE     5 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222      2 TRANSFERS FOR MIXTURE     7 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222      1 TRANSFERS FOR MIXTURE     9 WERE CORRECTED FOR BAD MOMENTS.

                          ........     0 IO'S WERE USED MIXING CROSS-SECTIONS       ........

                            1-D CROSS SECTION ARRAY ID NUMBERS
                               1  2002  1452    27    18  1018

                          ........     0 IO'S WERE USED PREPARING THE CROSS SECTIONS     ........
```

```
******************************************************************************************
***                                                                                    ***
***          LWT WITH GA IFM                                                           ***
***                                                                                    ***
******************************************************************************************
******************************************************************************************
***                                                                                    ***
***                          ****** ADDITIONAL INFORMATION ******                      ***
***                                                                                    ***
***  NUMBER OF ENERGY GROUPS                27       USE LATTICE GEOMETRY            NO ***
***                                                                                    ***
***  NO. OF FISSION SPECTRUM SOURCE GROUP    1       GLOBAL ARRAY NUMBER              0 ***
***                                                                                    ***
***  NO. OF SCATTERING ANGLES IN XSECS       2       NUMBER OF UNITS IN THE GLOBAL X DIR.  0 ***
***                                                                                    ***
***  ENTRIES/NEUTRON IN THE NEUTRON BANK    17       NUMBER OF UNITS IN THE GLOBAL Y DIR.  0 ***
***                                                                                    ***
***  ENTRIES/NEUTRON IN THE FISSION BANK    10       NUMBER OF UNITS IN THE GLOBAL Z DIR.  0 ***
***                                                                                    ***
***  NUMBER OF MIXTURES USED                 7       USE A GLOBAL REFLECTOR         YES ***
***                                                                                    ***
***  NUMBER OF BIAS ID'S USED                1       USE NESTED HOLES                NO ***
***                                                                                    ***
***  NUMBER OF DIFFERENTIAL ALBEDOS USED     0       NUMBER OF HOLES                  2 ***
***                                                                                    ***
***  TOTAL INPUT GEOMETRY REGIONS           15       MAXIMUM HOLE NESTING LEVEL       1 ***
***                                                                                    ***
***  NUMBER OF GEOMETRY REGIONS USED        15       USE NESTED ARRAYS               NO ***
***                                                                                    ***
***  LARGEST GEOMETRY UNIT NUMBER            5       NUMBER OF ARRAYS USED            0 ***
***                                                                                    ***
***  LARGEST ARRAY NUMBER                    1       MAXIMUM ARRAY NESTING LEVEL      0 ***
***                                                                                    ***
***                                                                                    ***
***  +X BOUNDARY CONDITION                 MIR       -X BOUNDARY CONDITION          MIR ***
***                                                                                    ***
***  +Y BOUNDARY CONDITION                 MIR       -Y BOUNDARY CONDITION          MIR ***
***                                                                                    ***
***  +Z BOUNDARY CONDITION                 MIR       -Z BOUNDARY CONDITION          MIR ***
***                                                                                    ***
******************************************************************************************
```

```
LWT WITH GA IFM

****** SPACE AND SUPERGROUP INFORMATION ******

100000 WORDS IS THE TOTAL SPACE AVAILABLE.

30617 WORDS WERE USED FOR NON-SUPERGROUP STORAGE.

69383 WORDS OF STORAGE ARE AVAILABLE FOR SUPERGROUPED DATA.

99796 WORDS OF STORAGE ARE AVAILABLE FOR CONSTRUCTING THE SUPERGROUPS.

69323 WORDS OF STORAGE ARE AVAILABLE TO EACH SUPERGROUP.

1022 WORDS ARE NEEDED FOR THE LARGEST GROUP.

31855 WORDS OF STORAGE IS SUFFICIENT TO RUN THIS PROBLEM.

43309 WORDS OF STORAGE WILL ALLOW THE PROBLEM TO RUN WITH ONE SUPERGROUP.

43680 WORDS OF STORAGE WILL BE USED TO RUN THIS PROBLEM.
```

SUPERGROUP	STARTING GROUP	ENDING GROUP	XSEC LENGTH	ALBEDO LENGTH	TOTAL LENGTH
1	1	27	2591	0	12632

```
........ 0 IO'S WERE USED IN SUPERGROUPING ........

........ 0 IO'S WERE USED LOADING THE DATA ........
```

LWT WITH GA IFM

REGION	MEDIA NUM	BIAS ID	GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM					
					----- UNIT 1 -----			
TRIGA/RERTR FHU - NO BASKET								
1 CYLINDER	1	1	RADIUS = 5.0927	+Z = 28.000	-Z = -28.000	CENTERLINE IS AT	X = 0.00000	Y = 0.00000
2 CYLINDER	8	1	RADIUS = 5.3975	+Z = 28.000	-Z = -28.000	CENTERLINE IS AT	X = 0.00000	Y = 0.00000
3 CYLINDER	4	1	RADIUS = 5.7277	+Z = 28.000	-Z = -28.000	CENTERLINE IS AT	X = 0.00000	Y = 0.00000
4 CYLINDER	8	1	RADIUS = 6.0325	+Z = 28.000	-Z = -28.000	CENTERLINE IS AT	X = 0.00000	Y = 0.00000
					----- UNIT 2 -----			
HTGR FHU - NO BASKET								
1 CYLINDER	3	1	RADIUS = 5.7277	+Z = 28.000	-Z = -28.000	CENTERLINE IS AT	X = 0.00000	Y = 0.00000
2 CYLINDER	8	1	RADIUS = 6.0325	+Z = 28.000	-Z = -28.000	CENTERLINE IS AT	X = 0.00000	Y = 0.00000
3 CYLINDER	4	1	RADIUS = 6.3627	+Z = 28.000	-Z = -28.000	CENTERLINE IS AT	X = 0.00000	Y = 0.00000
4 CYLINDER	8	1	RADIUS = 6.6675	+Z = 28.000	-Z = -28.000	CENTERLINE IS AT	X = 0.00000	Y = 0.00000
					****************** GLOBAL ****************** ----- UNIT 5 -----			
ASSEMBLED LWT								
1 CYLINDER	4	1	RADIUS = 17.150	+Z = 28.000	-Z = -28.000	CENTERLINE IS AT	X = 0.00000	Y = 0.00000
HOLE NUMBER	1		AT X = 0.00000	Y = 6.0325	Z = 0.00000	IS UNIT NUMBER	1	
HOLE NUMBER	2		AT X = 0.00000	Y = -6.6675	Z = 0.00000	IS UNIT NUMBER	2	
2 CYLINDER	8	1	RADIUS = 18.910	+Z = 28.000	-Z = -28.000	CENTERLINE IS AT	X = 0.00000	Y = 0.00000
3 CYLINDER	6	1	RADIUS = 33.465	+Z = 28.000	-Z = -28.000	CENTERLINE IS AT	X = 0.00000	Y = 0.00000
4 CYLINDER	8	1	RADIUS = 36.519	+Z = 28.000	-Z = -28.000	CENTERLINE IS AT	X = 0.00000	Y = 0.00000
5 CYLINDER	7	1	RADIUS = 49.223	+Z = 28.000	-Z = -28.000	CENTERLINE IS AT	X = 0.00000	Y = 0.00000
6 CYLINDER	8	1	RADIUS = 49.822	+Z = 28.000	-Z = -28.000	CENTERLINE IS AT	X = 0.00000	Y = 0.00000
7 CUBOID	5	1	+X = 49.822	-X = -49.822	+Y = 49.822	-Y = -49.822	+Z = 28.000	-Z = -28.000

LWT WITH GA IFM
VOLUMES FOR THOSE UNITS UTILIZED IN THIS PROBLEM

UNIT	REGION	GEOMETRY REGION	VOLUME	CUMULATIVE VOLUME
1	1	1	4.56283E+03 CM**3	4.56283E+03 CM**3
	2	2	5.62519E+02 CM**3	5.12535E+03 CM**3
	3	3	6.46283E+02 CM**3	5.77163E+03 CM**3
	4	4	6.30619E+02 CM**3	6.40225E+03 CM**3
2	1	5	5.77163E+03 CM**3	5.77163E+03 CM**3
	2	6	6.30619E+02 CM**3	6.40225E+03 CM**3
	3	7	7.20060E+02 CM**3	7.12231E+03 CM**3
	4	8	6.98721E+02 CM**3	7.82103E+03 CM**3
5	1	9	3.75214E+04 CM**3	5.17447E+04 CM**3
	2	10	1.11674E+04 CM**3	6.29122E+04 CM**3
	3	11	1.34106E+05 CM**3	1.97018E+05 CM**3
	4	12	3.76048E+04 CM**3	2.34623E+05 CM**3
	5	13	1.91631E+05 CM**3	4.26254E+05 CM**3
	6	14	1.04445E+04 CM**3	4.36699E+05 CM**3
	7	15	1.19323E+05 CM**3	5.56022E+05 CM**3

UNIT	USES	REGION	MIXTURE	TOTAL VOLUME
1	1	1	1	4.56283E+03 CM**3
		2	8	5.62519E+02 CM**3
		3	4	6.46283E+02 CM**3
		4	8	6.30619E+02 CM**3
2	1	1	3	5.77163E+03 CM**3
		2	8	6.30619E+02 CM**3
		3	4	7.20060E+02 CM**3
		4	8	6.98721E+02 CM**3
5	1	1	4	3.75214E+04 CM**3
		2	8	1.11674E+04 CM**3
		3	6	1.34106E+05 CM**3
		4	8	3.76048E+04 CM**3
		5	7	1.91631E+05 CM**3
		6	8	1.04445E+04 CM**3
		7	5	1.19323E+05 CM**3

TOTAL MIXTURE VOLUMES

MIXTURE	TOTAL VOLUME	MASS(G)
1	4.56283E+03 CM**3	9.94419E+03
3	5.77163E+03 CM**3	1.22050E+04
4	3.88878E+04 CM**3	3.88167E+00
5	1.19323E+05 CM**3	1.19105E+01
6	1.34106E+05 CM**3	1.52130E+06
7	1.91631E+05 CM**3	1.91281E+01
8	6.17393E+04 CM**3	4.88975E+05

```
***********************************************************************************************************
***                                                                                                     ***
***                                       BIASING INFORMATION                                           ***
***                                                                                                     ***
***    A DEFAULT WEIGHT OF    0.500 WILL BE USED FOR ALL BIAS ID'S.                                     ***
***                                                                                                     ***
***********************************************************************************************************
```

.... 0 ID'S WERE USED IN KENO-V BEFORE TRACKING ....

.... 0.00550 MINUTES WERE USED PROCESSING DATA. ....

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 1.85864E-02

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED UNIFORMLY THROUGHOUT THE ENTIRE VOLUME DEFINED BY THE OUTERMOST GEOMETRY CARD.
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

1.49067 MINUTES WERE REQUIRED FOR STARTING. TOTAL ELAPSED TIME IS 1.50400 MINUTES.

LWT WITH GA IFM

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	752 INDEPENDENT	FISSION POINTS WERE	GENERATED	
1	6.83685E-01	1.51050E+00	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	773 INDEPENDENT	FISSION POINTS WERE	GENERATED	
2	6.90002E-01	1.52050E+00	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	809 INDEPENDENT	FISSION POINTS WERE	GENERATED	
3	7.23529E-01	1.52967E+00	7.23529E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	7.41132E-01	1.53783E+00	7.32331E-01	8.80119E-03	0.00000E+00	0.00000E+00
5	7.14495E-01	1.54800E+00	7.26385E-01	7.82097E-03	0.00000E+00	0.00000E+00
6	7.14133E-01	1.55717E+00	7.23322E-01	6.32186E-03	0.00000E+00	0.00000E+00
7	7.15718E-01	1.56633E+00	7.21801E-01	5.12763E-03	0.00000E+00	0.00000E+00
8	7.35289E-01	1.57550E+00	7.24049E-01	4.75198E-03	0.00000E+00	0.00000E+00
9	7.25221E-01	1.58450E+00	7.24217E-01	4.01964E-03	0.00000E+00	0.00000E+00
10	7.27787E-01	1.59367E+00	7.24663E-01	3.50960E-03	0.00000E+00	0.00000E+00
11	7.22119E-01	1.60383E+00	7.24380E-01	3.10806E-03	0.00000E+00	0.00000E+00
12	7.48817E-01	1.61300E+00	7.26824E-01	3.70127E-03	0.00000E+00	0.00000E+00
13	7.24320E-01	1.62217E+00	7.26596E-01	3.35565E-03	0.00000E+00	0.00000E+00
14	7.45940E-01	1.63133E+00	7.28208E-01	3.46152E-03	0.00000E+00	0.00000E+00
15	7.16945E-01	1.64033E+00	7.27342E-01	3.29990E-03	0.00000E+00	0.00000E+00
16	7.30916E-01	1.64950E+00	7.27597E-01	3.06576E-03	0.00000E+00	0.00000E+00
17	6.88560E-01	1.65867E+00	7.24995E-01	3.86247E-03	0.00000E+00	0.00000E+00
18	7.26335E-01	1.66783E+00	7.25078E-01	3.61398E-03	0.00000E+00	0.00000E+00
19	7.12447E-01	1.67700E+00	7.24335E-01	3.47510E-03	0.00000E+00	0.00000E+00
20	7.32608E-01	1.68717E+00	7.24795E-01	3.30843E-03	0.00000E+00	0.00000E+00
21	7.24642E-01	1.69633E+00	7.24787E-01	3.12947E-03	0.00000E+00	0.00000E+00
22	7.04239E-01	1.70533E+00	7.23760E-01	3.14162E-03	0.00000E+00	0.00000E+00
23	7.38077E-01	1.71450E+00	7.24441E-01	3.06506E-03	0.00000E+00	0.00000E+00
24	7.03708E-01	1.72367E+00	7.23499E-01	3.07062E-03	0.00000E+00	0.00000E+00
25	7.20492E-01	1.73283E+00	7.23368E-01	2.93699E-03	0.00000E+00	0.00000E+00
26	7.47220E-01	1.74300E+00	7.24362E-01	2.98241E-03	0.00000E+00	0.00000E+00
27	6.86648E-01	1.75217E+00	7.22853E-01	3.23403E-03	0.00000E+00	0.00000E+00
28	7.29513E-01	1.76117E+00	7.23110E-01	3.11770E-03	0.00000E+00	0.00000E+00
29	7.28965E-01	1.77033E+00	7.23326E-01	3.00784E-03	0.00000E+00	0.00000E+00
30	7.22443E-01	1.77950E+00	7.23295E-01	2.89860E-03	0.00000E+00	0.00000E+00
31	7.34518E-01	1.78867E+00	7.23682E-01	2.82351E-03	0.00000E+00	0.00000E+00
32	7.42341E-01	1.79783E+00	7.24304E-01	2.79778E-03	0.00000E+00	0.00000E+00
33	7.25865E-01	1.80700E+00	7.24354E-01	2.70649E-03	0.00000E+00	0.00000E+00
34	7.38221E-01	1.81617E+00	7.24788E-01	2.65614E-03	0.00000E+00	0.00000E+00
35	7.32307E-01	1.82533E+00	7.25015E-01	2.58445E-03	0.00000E+00	0.00000E+00
36	7.06762E-01	1.83450E+00	7.24479E-01	2.56412E-03	0.00000E+00	0.00000E+00
37	7.40806E-01	1.84367E+00	7.24945E-01	2.53311E-03	0.00000E+00	0.00000E+00
38	7.45111E-01	1.85283E+00	7.25505E-01	2.52467E-03	0.00000E+00	0.00000E+00
39	7.24951E-01	1.86200E+00	7.25490E-01	2.45553E-03	0.00000E+00	0.00000E+00
40	7.23367E-01	1.87200E+00	7.25434E-01	2.39069E-03	0.00000E+00	0.00000E+00
41	7.62480E-01	1.88033E+00	7.26384E-01	2.51487E-03	0.00000E+00	0.00000E+00
42	7.19762E-01	1.88933E+00	7.26219E-01	2.45678E-03	0.00000E+00	0.00000E+00
43	6.95096E-01	1.89850E+00	7.25460E-01	2.51348E-03	0.00000E+00	0.00000E+00
44	7.06250E-01	1.90867E+00	7.25002E-01	2.49518E-03	0.00000E+00	0.00000E+00
45	7.21876E-01	1.91783E+00	7.24929E-01	2.43755E-03	0.00000E+00	0.00000E+00
46	7.25800E-01	1.92700E+00	7.24949E-01	2.38159E-03	0.00000E+00	0.00000E+00
47	7.10344E-01	1.93617E+00	7.24625E-01	2.35058E-03	0.00000E+00	0.00000E+00
48	7.45183E-01	1.94533E+00	7.25072E-01	2.34195E-03	0.00000E+00	0.00000E+00
49	7.19422E-01	1.95433E+00	7.24951E-01	2.29473E-03	0.00000E+00	0.00000E+00
50	7.31561E-01	1.96350E+00	7.25089E-01	2.25063E-03	0.00000E+00	0.00000E+00
51	7.13145E-01	1.97367E+00	7.24845E-01	2.21766E-03	0.00000E+00	0.00000E+00
52	7.12367E-01	1.98283E+00	7.24596E-01	2.18714E-03	0.00000E+00	0.00000E+00
53	7.25705E-01	1.99200E+00	7.24618E-01	2.14393E-03	0.00000E+00	0.00000E+00
54	7.28151E-01	2.00117E+00	7.24686E-01	2.10340E-03	0.00000E+00	0.00000E+00
55	7.32886E-01	2.01017E+00	7.24840E-01	2.06912E-03	0.00000E+00	0.00000E+00
56	7.27373E-01	2.01933E+00	7.24887E-01	2.03098E-03	0.00000E+00	0.00000E+00
57	7.30672E-01	2.02850E+00	7.24992E-01	1.99649E-03	0.00000E+00	0.00000E+00
58	7.64964E-01	2.03767E+00	7.25706E-01	2.08640E-03	0.00000E+00	0.00000E+00
59	7.10690E-01	2.04683E+00	7.25443E-01	2.06634E-03	0.00000E+00	0.00000E+00
60	7.16296E-01	2.05517E+00	7.25285E-01	2.03651E-03	0.00000E+00	0.00000E+00
61	7.06627E-01	2.06517E+00	7.24969E-01	2.02652E-03	0.00000E+00	0.00000E+00
62	7.37613E-01	2.07433E+00	7.25179E-01	2.00357E-03	0.00000E+00	0.00000E+00
63	6.94466E-01	2.08433E+00	7.24676E-01	2.03377E-03	0.00000E+00	0.00000E+00
64	7.18753E-01	2.09350E+00	7.24580E-01	2.00298E-03	0.00000E+00	0.00000E+00
65	7.30344E-01	2.10267E+00	7.24672E-01	1.97305E-03	0.00000E+00	0.00000E+00
66	7.25085E-01	2.11183E+00	7.24678E-01	1.94199E-03	0.00000E+00	0.00000E+00
67	7.05691E-01	2.12100E+00	7.24386E-01	1.93406E-03	0.00000E+00	0.00000E+00
68	6.95387E-01	2.13017E+00	7.23947E-01	1.95456E-03	0.00000E+00	0.00000E+00
69	7.35146E-01	2.13933E+00	7.24114E-01	1.93241E-03	0.00000E+00	0.00000E+00
70	6.96014E-01	2.14850E+00	7.23701E-01	1.94811E-03	0.00000E+00	0.00000E+00
.						
.						
.						
721	7.57513E-01	8.21767E+00	7.22303E-01	7.13515E-04	0.00000E+00	0.00000E+00
722	7.42350E-01	8.22683E+00	7.22331E-01	7.13067E-04	0.00000E+00	0.00000E+00
723	7.12217E-01	8.23600E+00	7.22316E-01	7.12216E-04	0.00000E+00	0.00000E+00
724	7.12637E-01	8.24517E+00	7.22303E-01	7.11355E-04	0.00000E+00	0.00000E+00
725	6.93314E-01	8.25433E+00	7.22263E-01	7.11501E-04	0.00000E+00	0.00000E+00
726	7.18909E-01	8.26350E+00	7.22258E-01	7.10533E-04	0.00000E+00	0.00000E+00
727	7.17417E-01	8.27350E+00	7.22252E-01	7.09583E-04	0.00000E+00	0.00000E+00
728	7.39636E-01	8.28267E+00	7.22276E-01	7.09010E-04	0.00000E+00	0.00000E+00
729	7.28333E-01	8.29183E+00	7.22284E-01	7.08083E-04	0.00000E+00	0.00000E+00
730	7.37924E-01	8.30100E+00	7.22305E-01	7.07436E-04	0.00000E+00	0.00000E+00
731	6.88150E-01	8.31017E+00	7.22259E-01	7.08017E-04	0.00000E+00	0.00000E+00
732	6.96444E-01	8.32033E+00	7.22223E-01	7.07930E-04	0.00000E+00	0.00000E+00
733	6.94301E-01	8.32950E+00	7.22185E-01	7.07992E-04	0.00000E+00	0.00000E+00
734	7.42358E-01	8.33850E+00	7.22213E-01	7.07561E-04	0.00000E+00	0.00000E+00
735	7.14699E-01	8.34867E+00	7.22202E-01	7.06669E-04	0.00000E+00	0.00000E+00

736	7.08865E-01	8.35683E+00	7.22184E-01	7.05940E-04	0.00000E+00	0.00000E+00
737	6.97861E-01	8.36600E+00	7.22151E-01	7.05755E-04	0.00000E+00	0.00000E+00
738	7.14015E-01	8.37517E+00	7.22140E-01	7.04882E-04	0.00000E+00	0.00000E+00
739	7.48313E-01	8.38433E+00	7.22176E-01	7.04820E-04	0.00000E+00	0.00000E+00
740	7.16405E-01	8.39350E+00	7.22168E-01	7.03908E-04	0.00000E+00	0.00000E+00
741	7.17382E-01	8.40350E+00	7.22161E-01	7.02985E-04	0.00000E+00	0.00000E+00
742	7.08630E-01	8.41267E+00	7.22143E-01	7.02272E-04	0.00000E+00	0.00000E+00
743	7.48760E-01	8.42183E+00	7.22179E-01	7.02243E-04	0.00000E+00	0.00000E+00
744	7.05792E-01	8.43100E+00	7.22157E-01	7.01644E-04	0.00000E+00	0.00000E+00
745	6.88416E-01	8.44017E+00	7.22111E-01	7.02169E-04	0.00000E+00	0.00000E+00
746	7.47754E-01	8.44933E+00	7.22146E-01	7.02071E-04	0.00000E+00	0.00000E+00
747	7.47333E-01	8.45850E+00	7.22180E-01	7.01943E-04	0.00000E+00	0.00000E+00
748	7.45001E-01	8.46667E+00	7.22210E-01	7.01668E-04	0.00000E+00	0.00000E+00
749	7.06693E-01	8.47583E+00	7.22189E-01	7.01036E-04	0.00000E+00	0.00000E+00
750	7.28547E-01	8.48500E+00	7.22198E-01	7.00150E-04	0.00000E+00	0.00000E+00
751	7.44589E-01	8.49417E+00	7.22228E-01	6.99853E-04	0.00000E+00	0.00000E+00
752	7.34765E-01	8.50333E+00	7.22245E-01	6.99119E-04	0.00000E+00	0.00000E+00
753	7.24710E-01	8.51250E+00	7.22248E-01	6.98195E-04	0.00000E+00	0.00000E+00
754	7.06538E-01	8.52167E+00	7.22227E-01	6.97579E-04	0.00000E+00	0.00000E+00
755	7.08145E-01	8.53083E+00	7.22208E-01	6.96903E-04	0.00000E+00	0.00000E+00
756	7.10409E-01	8.54083E+00	7.22193E-01	6.96154E-04	0.00000E+00	0.00000E+00
757	7.22536E-01	8.54917E+00	7.22193E-01	6.95232E-04	0.00000E+00	0.00000E+00
758	7.46064E-01	8.55917E+00	7.22225E-01	6.95029E-04	0.00000E+00	0.00000E+00
759	7.32577E-01	8.56833E+00	7.22238E-01	6.94245E-04	0.00000E+00	0.00000E+00
760	7.62131E-01	8.57750E+00	7.22291E-01	6.95323E-04	0.00000E+00	0.00000E+00
761	7.14714E-01	8.58567E+00	7.22281E-01	6.94478E-04	0.00000E+00	0.00000E+00
762	6.93322E-01	8.59483E+00	7.22243E-01	6.94610E-04	0.00000E+00	0.00000E+00
763	6.90859E-01	8.60400E+00	7.22202E-01	6.94921E-04	0.00000E+00	0.00000E+00
764	6.89029E-01	8.61417E+00	7.22158E-01	6.95373E-04	0.00000E+00	0.00000E+00
765	7.40473E-01	8.62333E+00	7.22182E-01	6.94875E-04	0.00000E+00	0.00000E+00
766	6.97511E-01	8.63150E+00	7.22150E-01	6.94716E-04	0.00000E+00	0.00000E+00
767	7.08889E-01	8.64067E+00	7.22132E-01	6.94024E-04	0.00000E+00	0.00000E+00
768	7.29606E-01	8.64983E+00	7.22142E-01	6.93186E-04	0.00000E+00	0.00000E+00
769	7.04155E-01	8.65983E+00	7.22119E-01	6.92679E-04	0.00000E+00	0.00000E+00
770	7.19046E-01	8.66817E+00	7.22115E-01	6.91788E-04	0.00000E+00	0.00000E+00
771	6.99645E-01	8.67817E+00	7.22086E-01	6.91505E-04	0.00000E+00	0.00000E+00
772	7.20975E-01	8.68733E+00	7.22084E-01	6.90608E-04	0.00000E+00	0.00000E+00
773	7.34212E-01	8.69650E+00	7.22100E-01	6.89891E-04	0.00000E+00	0.00000E+00
774	7.23828E-01	8.70567E+00	7.22102E-01	6.89000E-04	0.00000E+00	0.00000E+00
775	7.08155E-01	8.71483E+00	7.22084E-01	6.88345E-04	0.00000E+00	0.00000E+00
776	7.58171E-01	8.72400E+00	7.22131E-01	6.89034E-04	0.00000E+00	0.00000E+00
777	7.23155E-01	8.73317E+00	7.22132E-01	6.88146E-04	0.00000E+00	0.00000E+00
778	7.22573E-01	8.74233E+00	7.22133E-01	6.87259E-04	0.00000E+00	0.00000E+00
779	7.50599E-01	8.75150E+00	7.22169E-01	6.87351E-04	0.00000E+00	0.00000E+00
780	6.86529E-01	8.76067E+00	7.22123E-01	6.87994E-04	0.00000E+00	0.00000E+00
781	7.09853E-01	8.76967E+00	7.22108E-01	6.87290E-04	0.00000E+00	0.00000E+00
782	7.15874E-01	8.77983E+00	7.22100E-01	6.86455E-04	0.00000E+00	0.00000E+00
783	7.24166E-01	8.78900E+00	7.22102E-01	6.85581E-04	0.00000E+00	0.00000E+00
784	7.21670E-01	8.79817E+00	7.22102E-01	6.84704E-04	0.00000E+00	0.00000E+00
785	6.92098E-01	8.80733E+00	7.22063E-01	6.84902E-04	0.00000E+00	0.00000E+00
786	7.49026E-01	8.81650E+00	7.22098E-01	6.84891E-04	0.00000E+00	0.00000E+00
787	7.03746E-01	8.82567E+00	7.22074E-01	6.84418E-04	0.00000E+00	0.00000E+00
788	6.94186E-01	8.83467E+00	7.22039E-01	6.84467E-04	0.00000E+00	0.00000E+00
789	7.23685E-01	8.84483E+00	7.22041E-01	6.83600E-04	0.00000E+00	0.00000E+00
790	6.97640E-01	8.85300E+00	7.22010E-01	6.83433E-04	0.00000E+00	0.00000E+00
791	7.19260E-01	8.86317E+00	7.22007E-01	6.82576E-04	0.00000E+00	0.00000E+00
792	7.02020E-01	8.87233E+00	7.21981E-01	6.82180E-04	0.00000E+00	0.00000E+00
793	7.24258E-01	8.88150E+00	7.21984E-01	6.81323E-04	0.00000E+00	0.00000E+00
794	6.97537E-01	8.89050E+00	7.21953E-01	6.81162E-04	0.00000E+00	0.00000E+00
795	7.59961E-01	8.89967E+00	7.22001E-01	6.81989E-04	0.00000E+00	0.00000E+00
796	7.00746E-01	8.90800E+00	7.21974E-01	6.81655E-04	0.00000E+00	0.00000E+00
797	7.19767E-01	8.91800E+00	7.21972E-01	6.80803E-04	0.00000E+00	0.00000E+00
798	7.00395E-01	8.92817E+00	7.21945E-01	6.80487E-04	0.00000E+00	0.00000E+00
799	7.55817E-01	8.93817E+00	7.21967E-01	6.80961E-04	0.00000E+00	0.00000E+00
800	7.35244E-01	8.94833E+00	7.22004E-01	6.80310E-04	0.00000E+00	0.00000E+00
801	7.11048E-01	8.95733E+00	7.21990E-01	6.79596E-04	0.00000E+00	0.00000E+00
802	6.96909E-01	8.96650E+00	7.21959E-01	6.79470E-04	0.00000E+00	0.00000E+00
803	7.46393E-01	8.97667E+00	7.21989E-01	6.79306E-04	0.00000E+00	0.00000E+00

KENO MESSAGE NUMBER K5-123 EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

LWT WITH GA IFM

LIFETIME = 1.17843E-04 + OR - 1.60373E-07 GENERATION TIME = 5.55083E-05 + OR - 8.38097E-08
NU BAR = 2.42082E+00 + OR - 7.82673E-06 AVERAGE FISSION GROUP = 2.38836E+01 + OR - 1.52646E-03
ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION = 4.80629E-02 + OR - 6.19113E-05

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.72199	+ OR - 0.00068	0.72131 TO 0.72267	0.72063 TO 0.72335	0.71995 TO 0.72403	800000
4	0.72196	+ OR - 0.00068	0.72128 TO 0.72264	0.72060 TO 0.72332	0.71992 TO 0.72400	799000
5	0.72197	+ OR - 0.00068	0.72129 TO 0.72265	0.72061 TO 0.72334	0.71993 TO 0.72402	798000
6	0.72198	+ OR - 0.00068	0.72130 TO 0.72266	0.72062 TO 0.72335	0.71994 TO 0.72403	797000
7	0.72199	+ OR - 0.00068	0.72131 TO 0.72267	0.72062 TO 0.72336	0.71994 TO 0.72404	796000
8	0.72197	+ OR - 0.00068	0.72129 TO 0.72266	0.72061 TO 0.72334	0.71992 TO 0.72402	795000
9	0.72197	+ OR - 0.00068	0.72129 TO 0.72265	0.72060 TO 0.72334	0.71992 TO 0.72402	794000
10	0.72196	+ OR - 0.00069	0.72128 TO 0.72265	0.72059 TO 0.72333	0.71991 TO 0.72402	793000
11	0.72196	+ OR - 0.00069	0.72128 TO 0.72265	0.72059 TO 0.72333	0.71990 TO 0.72402	792000
12	0.72193	+ OR - 0.00069	0.72124 TO 0.72261	0.72056 TO 0.72330	0.71987 TO 0.72399	791000
17	0.72193	+ OR - 0.00069	0.72124 TO 0.72262	0.72055 TO 0.72331	0.71987 TO 0.72400	786000
22	0.72194	+ OR - 0.00069	0.72125 TO 0.72264	0.72056 TO 0.72333	0.71987 TO 0.72402	781000
27	0.72196	+ OR - 0.00069	0.72127 TO 0.72265	0.72057 TO 0.72335	0.71988 TO 0.72404	776000
32	0.72190	+ OR - 0.00070	0.72120 TO 0.72260	0.72050 TO 0.72329	0.71981 TO 0.72399	771000
37	0.72185	+ OR - 0.00070	0.72115 TO 0.72255	0.72045 TO 0.72326	0.71975 TO 0.72396	766000
42	0.72177	+ OR - 0.00070	0.72106 TO 0.72247	0.72036 TO 0.72317	0.71966 TO 0.72387	761000
47	0.72183	+ OR - 0.00071	0.72113 TO 0.72254	0.72042 TO 0.72324	0.71971 TO 0.72395	756000
52	0.72182	+ OR - 0.00071	0.72111 TO 0.72253	0.72040 TO 0.72323	0.71969 TO 0.72394	751000
57	0.72177	+ OR - 0.00071	0.72105 TO 0.72248	0.72034 TO 0.72320	0.71963 TO 0.72391	746000
62	0.72173	+ OR - 0.00072	0.72102 TO 0.72245	0.72030 TO 0.72316	0.71958 TO 0.72388	741000
67	0.72178	+ OR - 0.00072	0.72106 TO 0.72250	0.72034 TO 0.72322	0.71962 TO 0.72393	736000
72	0.72187	+ OR - 0.00072	0.72115 TO 0.72259	0.72043 TO 0.72331	0.71971 TO 0.72403	731000
77	0.72177	+ OR - 0.00072	0.72105 TO 0.72250	0.72033 TO 0.72322	0.71961 TO 0.72394	726000
82	0.72182	+ OR - 0.00073	0.72110 TO 0.72255	0.72037 TO 0.72328	0.71964 TO 0.72400	721000
87	0.72187	+ OR - 0.00073	0.72114 TO 0.72260	0.72041 TO 0.72333	0.71968 TO 0.72406	716000
92	0.72181	+ OR - 0.00073	0.72108 TO 0.72254	0.72035 TO 0.72328	0.71961 TO 0.72401	711000

LWT WITH GA IFM

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
97	0.72181	+ OR - 0.00074	0.72108 TO 0.72255	0.72034 TO 0.72329	0.71960 TO 0.72402	706000
102	0.72184	+ OR - 0.00074	0.72110 TO 0.72258	0.72036 TO 0.72332	0.71962 TO 0.72406	701000
107	0.72190	+ OR - 0.00074	0.72116 TO 0.72264	0.72042 TO 0.72338	0.71968 TO 0.72413	696000
112	0.72200	+ OR - 0.00074	0.72125 TO 0.72274	0.72051 TO 0.72348	0.71977 TO 0.72422	691000
117	0.72196	+ OR - 0.00075	0.72121 TO 0.72270	0.72046 TO 0.72345	0.71971 TO 0.72420	686000
122	0.72196	+ OR - 0.00075	0.72121 TO 0.72271	0.72046 TO 0.72346	0.71970 TO 0.72421	681000
127	0.72197	+ OR - 0.00076	0.72122 TO 0.72273	0.72046 TO 0.72349	0.71971 TO 0.72424	676000
132	0.72198	+ OR - 0.00076	0.72122 TO 0.72274	0.72046 TO 0.72350	0.71970 TO 0.72426	671000
137	0.72192	+ OR - 0.00076	0.72116 TO 0.72268	0.72040 TO 0.72345	0.71964 TO 0.72421	666000
142	0.72191	+ OR - 0.00077	0.72115 TO 0.72268	0.72038 TO 0.72344	0.71962 TO 0.72421	661000
147	0.72185	+ OR - 0.00077	0.72108 TO 0.72261	0.72031 TO 0.72338	0.71955 TO 0.72415	656000
152	0.72198	+ OR - 0.00077	0.72122 TO 0.72275	0.72045 TO 0.72352	0.71968 TO 0.72429	651000
157	0.72199	+ OR - 0.00077	0.72122 TO 0.72276	0.72045 TO 0.72354	0.71967 TO 0.72431	646000
162	0.72195	+ OR - 0.00078	0.72118 TO 0.72273	0.72040 TO 0.72351	0.71962 TO 0.72428	641000
167	0.72203	+ OR - 0.00078	0.72125 TO 0.72281	0.72047 TO 0.72359	0.71969 TO 0.72437	636000
172	0.72218	+ OR - 0.00078	0.72140 TO 0.72296	0.72062 TO 0.72375	0.71983 TO 0.72453	631000
177	0.72225	+ OR - 0.00079	0.72146 TO 0.72303	0.72067 TO 0.72382	0.71988 TO 0.72461	626000
182	0.72227	+ OR - 0.00079	0.72148 TO 0.72306	0.72069 TO 0.72385	0.71990 TO 0.72464	621000
187	0.72226	+ OR - 0.00080	0.72146 TO 0.72305	0.72067 TO 0.72385	0.71987 TO 0.72464	616000
192	0.72234	+ OR - 0.00080	0.72154 TO 0.72314	0.72074 TO 0.72394	0.71994 TO 0.72474	611000
197	0.72243	+ OR - 0.00080	0.72163 TO 0.72323	0.72082 TO 0.72403	0.72002 TO 0.72484	606000
202	0.72239	+ OR - 0.00081	0.72158 TO 0.72320	0.72077 TO 0.72400	0.71997 TO 0.72481	601000
207	0.72246	+ OR - 0.00081	0.72165 TO 0.72327	0.72084 TO 0.72409	0.72003 TO 0.72490	596000
212	0.72236	+ OR - 0.00081	0.72155 TO 0.72317	0.72074 TO 0.72399	0.71992 TO 0.72480	591000
217	0.72246	+ OR - 0.00081	0.72164 TO 0.72327	0.72083 TO 0.72408	0.72001 TO 0.72490	586000
222	0.72248	+ OR - 0.00082	0.72166 TO 0.72330	0.72084 TO 0.72412	0.72002 TO 0.72494	581000
227	0.72243	+ OR - 0.00083	0.72161 TO 0.72326	0.72078 TO 0.72409	0.71996 TO 0.72491	576000

LWT WITH GA IFM

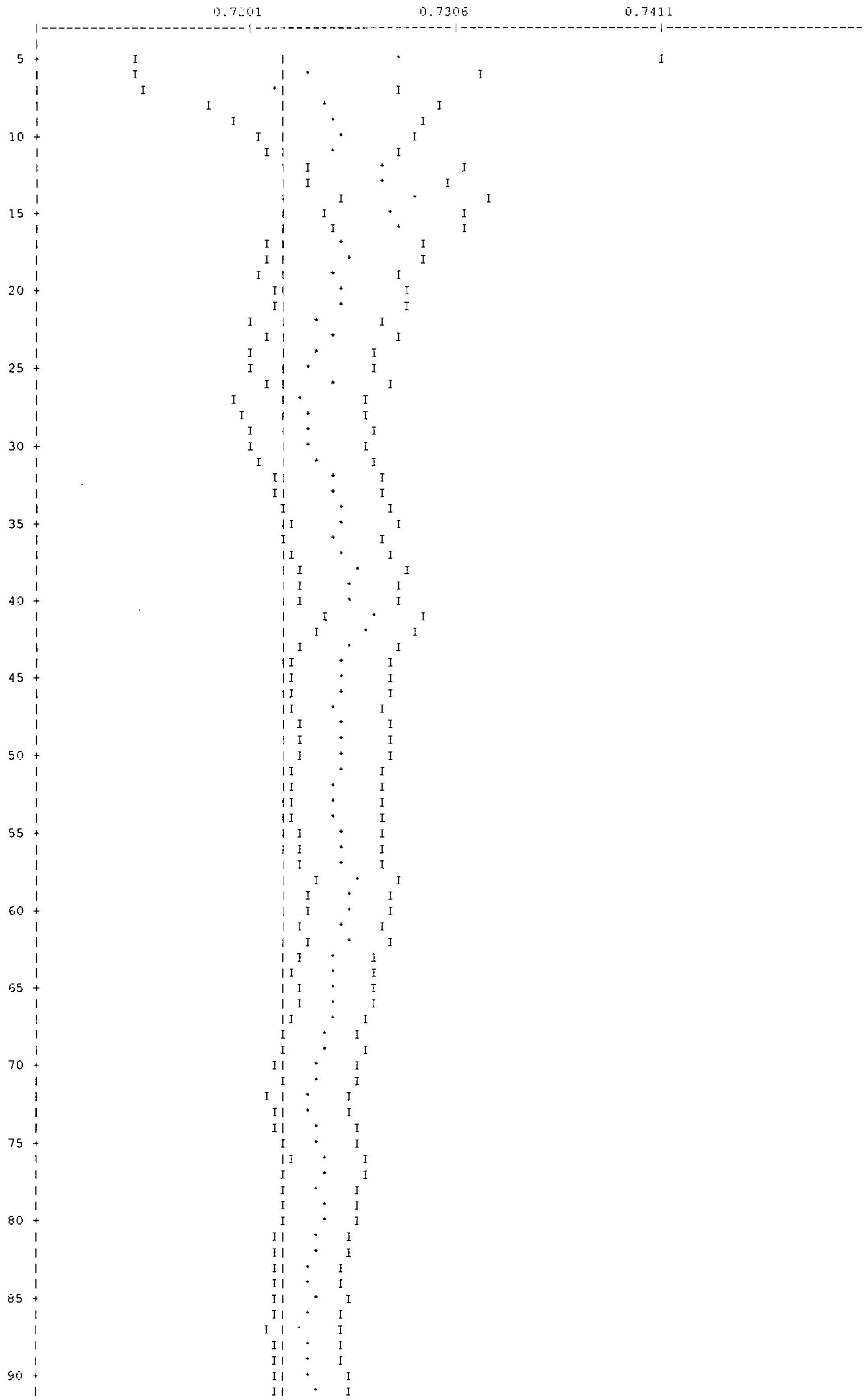
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
637	0.72076	+ OR - 0.00156	0.71920 TO 0.72231	0.71764 TO 0.72387	0.71609 TO 0.72543	166000
642	0.72062	+ OR - 0.00159	0.71903 TO 0.72221	0.71744 TO 0.72380	0.71585 TO 0.72539	161000
647	0.72102	+ OR - 0.00160	0.71942 TO 0.72262	0.71782 TO 0.72422	0.71622 TO 0.72582	156000
652	0.72100	+ OR - 0.00163	0.71937 TO 0.72262	0.71774 TO 0.72425	0.71612 TO 0.72588	151000
657	0.72156	+ OR - 0.00163	0.71993 TO 0.72318	0.71830 TO 0.72481	0.71668 TO 0.72644	146000
662	0.72127	+ OR - 0.00167	0.71960 TO 0.72295	0.71793 TO 0.72462	0.71626 TO 0.72629	141000
667	0.72109	+ OR - 0.00172	0.71938 TO 0.72281	0.71766 TO 0.72453	0.71595 TO 0.72624	136000
672	0.72085	+ OR - 0.00176	0.71909 TO 0.72261	0.71733 TO 0.72438	0.71557 TO 0.72614	131000
677	0.72067	+ OR - 0.00182	0.71885 TO 0.72249	0.71702 TO 0.72432	0.71520 TO 0.72614	126000
682	0.72036	+ OR - 0.00189	0.71848 TO 0.72225	0.71659 TO 0.72414	0.71470 TO 0.72603	121000
687	0.72069	+ OR - 0.00189	0.71880 TO 0.72258	0.71691 TO 0.72447	0.71502 TO 0.72636	116000
692	0.72086	+ OR - 0.00197	0.71890 TO 0.72283	0.71693 TO 0.72480	0.71496 TO 0.72677	111000
697	0.72029	+ OR - 0.00203	0.71826 TO 0.72232	0.71623 TO 0.72436	0.71420 TO 0.72639	106000
702	0.72032	+ OR - 0.00208	0.71824 TO 0.72240	0.71616 TO 0.72448	0.71408 TO 0.72656	101000
707	0.72002	+ OR - 0.00217	0.71785 TO 0.72218	0.71569 TO 0.72435	0.71352 TO 0.72652	96000
712	0.71981	+ OR - 0.00224	0.71758 TO 0.72205	0.71534 TO 0.72428	0.71310 TO 0.72652	91000
717	0.71915	+ OR - 0.00225	0.71691 TO 0.72140	0.71466 TO 0.72364	0.71242 TO 0.72589	86000
722	0.71895	+ OR - 0.00221	0.71674 TO 0.72116	0.71453 TO 0.72337	0.71232 TO 0.72558	81000
727	0.71948	+ OR - 0.00233	0.71716 TO 0.72181	0.71483 TO 0.72414	0.71250 TO 0.72647	76000
732	0.71958	+ OR - 0.00240	0.71719 TO 0.72198	0.71479 TO 0.72438	0.71239 TO 0.72677	71000
737	0.72019	+ OR - 0.00250	0.71769 TO 0.72268	0.71519 TO 0.72518	0.71269 TO 0.72768	66000
742	0.72012	+ OR - 0.00265	0.71747 TO 0.72278	0.71482 TO 0.72543	0.71216 TO 0.72808	61000
747	0.71945	+ OR - 0.00269	0.71677 TO 0.72214	0.71408 TO 0.72482	0.71140 TO 0.72751	56000
752	0.71823	+ OR - 0.00283	0.71541 TO 0.72106	0.71258 TO 0.72388	0.70975 TO 0.72671	51000
757	0.71864	+ OR - 0.00311	0.71553 TO 0.72175	0.71243 TO 0.72486	0.70932 TO 0.72797	46000
762	0.71729	+ OR - 0.00317	0.71412 TO 0.72045	0.71096 TO 0.72362	0.70779 TO 0.72678	41000
767	0.71894	+ OR - 0.00331	0.71563 TO 0.72226	0.71232 TO 0.72557	0.70900 TO 0.72888	36000

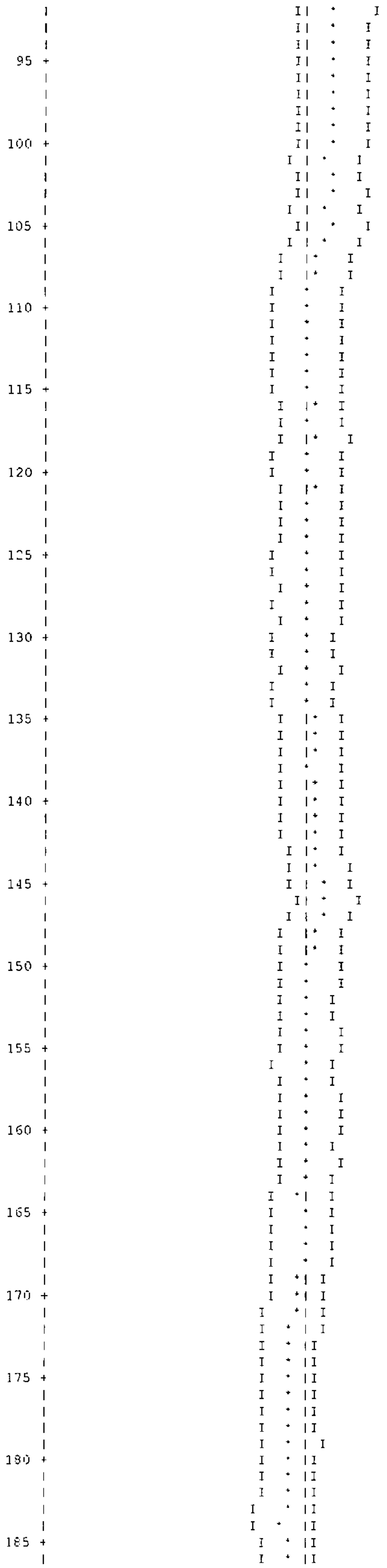
LWT WITH GA IFM

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
772	0.71963	+ OR - 0.00375	0.71587 TO 0.72338	0.71212 TO 0.72714	0.70837 TO 0.73089	31000
777	0.71773	+ OR - 0.00414	0.71359 TO 0.72187	0.70944 TO 0.72602	0.70530 TO 0.73016	26000
782	0.71788	+ OR - 0.00463	0.71325 TO 0.72252	0.70862 TO 0.72715	0.70399 TO 0.73178	21000
787	0.71780	+ OR - 0.00545	0.71235 TO 0.72325	0.70691 TO 0.72870	0.70146 TO 0.73415	16000
792	0.72255	+ OR - 0.00715	0.71540 TO 0.72971	0.70825 TO 0.73686	0.70109 TO 0.74401	11000
797	0.72430	+ OR - 0.01016	0.71414 TO 0.73446	0.70398 TO 0.74463	0.69381 TO 0.75479	6000

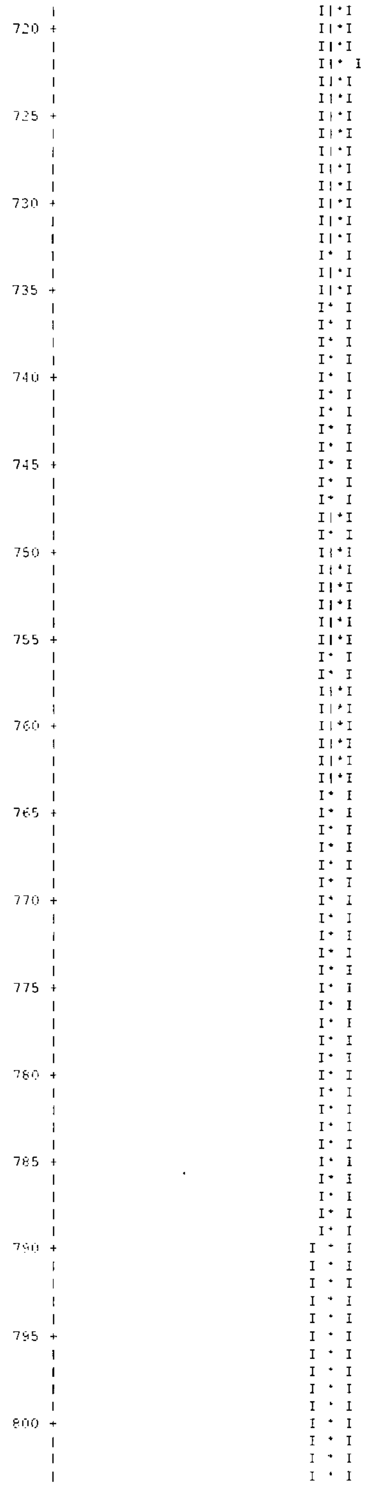
LWT WITH GA IFM

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.7220 + OR - 0.0007 WHICH OCCURS FOR 803 GENERATIONS RUN.



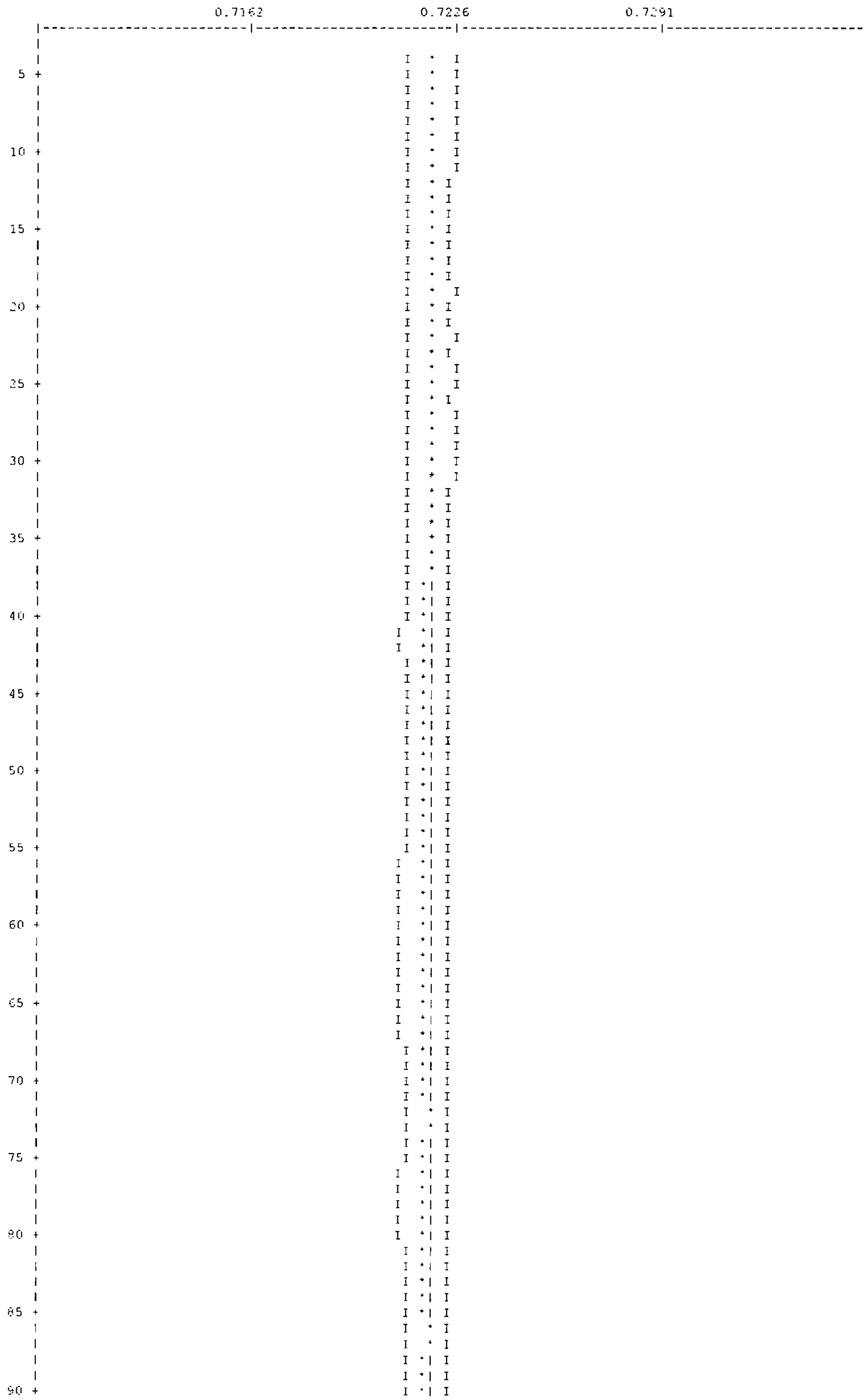

95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185

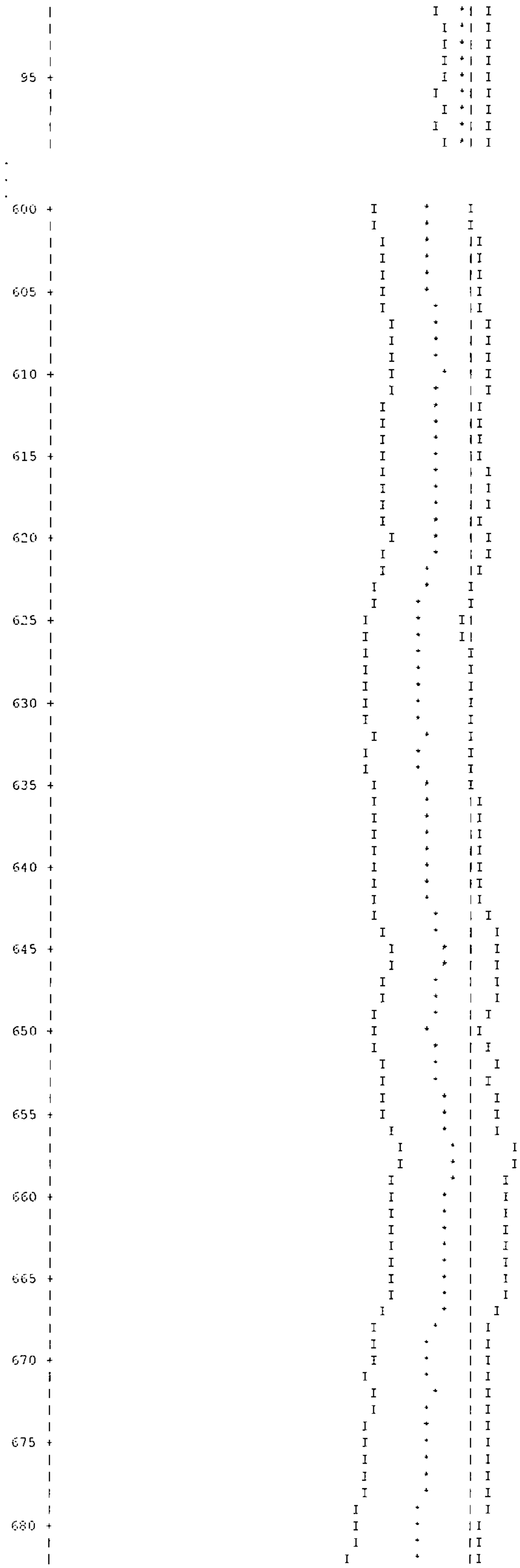
```
     |                         I   * |I
     |                         I   * |I
     |                         I   * |I
 190 +                        I  *   I
     |                        I  *   I
     |                        I  *   I
     |                        I  *   I
     |                         I   * |I
 195 +                        I  *   I
     |                        I  *   I
     |                        I  *   I
     |                        I  *   I
     |                        I  *   I
 200 +                        I  *   I
     |                        I  *   I
     |                        I  *   I
     |                        I  *   I
     |                        I  *   I
 205 +                        I  *   I
     |                        I  *   I
     |                        I  *   I
     |                        I  *  I|
     |                        I  *  I|
 210 +                        I  *   I
     |                        I  *   I
     |                         I *   I
     |                        I  *   I
     |                        I  *   I
 215 +                        I  *   I
     |                        I  *   I
     |                        I  *   I
     |                        I  *   I
     |                        I  *   I
 220 +                        I  *   I
     |                        I  *   I
     |                        I  *   I
     |                        I  *   I
     |                        I  *   I
 225 +                        I  *   I
     |                        I  *   I
     |                        I  *   I
     |                         I  * I
     |                         I *   I
 230 +                         I *   I
     |                         I *   I
     |                        I  *   I
     |                        I  *   I
     |                        I  *   I
 235 +                        I  *   I
     |                        I  *   I
     |                        I  *   I
     |                        I  *   I
     |                        I  *  I|
 240 +                        I  *  I|
     |                        I  *  I|
     |                        I  *  I|
     |                        I  *  I|
     |                        I  *  I|
 245 +                        I *   I|
     |                        I *   I|
     |                        I *   I|
     |                       I  *   I|
     |                       I  *   I|
 250 +                       I  * I  |
     |                       I  * I  |
     |                       I  * I  |
     |                       I  * I  |
     |                       I  * I  |
 255 +                       I  * I  |
     |                       I  *   I|
     |                       I  *   I|
     |                       I  *   I|
     |                        I *   I|
.
.
.
 700 +                              I* I
     |                              I|*I
     |                              I|*I
     |                              I|*I
     |                              I|*I
 705 +                              I|*I
     |                              I|*I
     |                              I|*I
     |                              I|*I
     |                              I|*I
 710 +                              I|*I
     |                              I|*I
     |                              I|*I
     |                              I|* I
     |                              I|*I
 715 +                              I|* I
     |                              I|* I
     |                              I|* I
     |                              I|*I
```

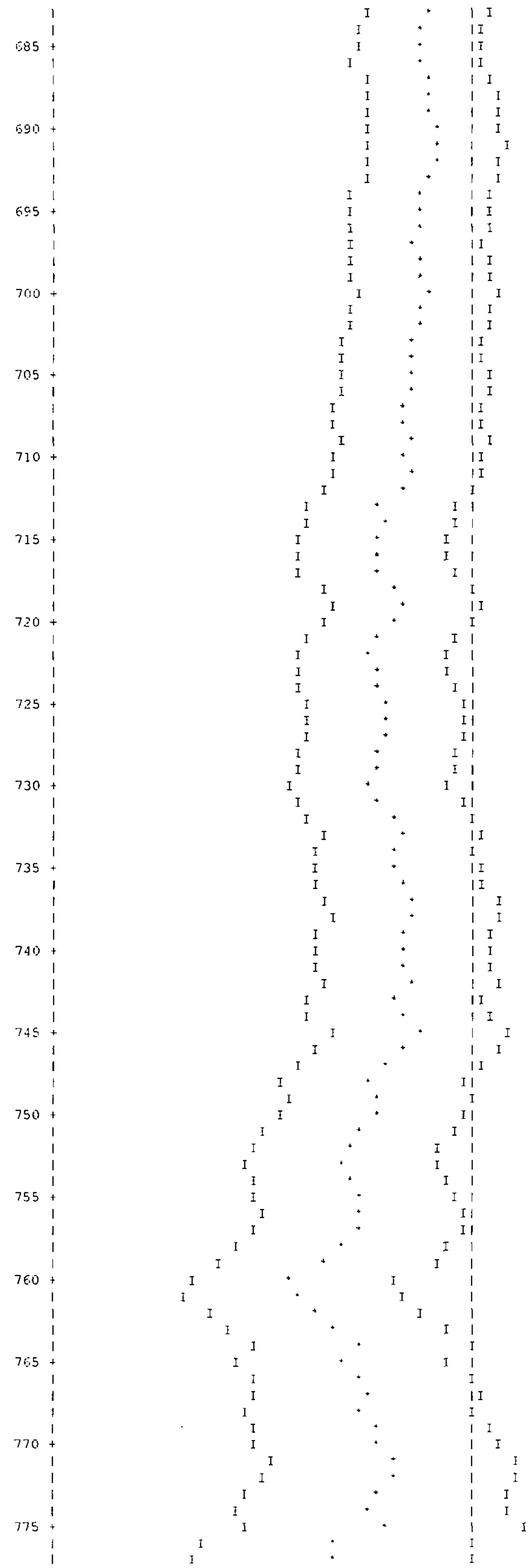

720
725
730
735
740
745
750
755
760
765
770
775
780
785
790
795
800

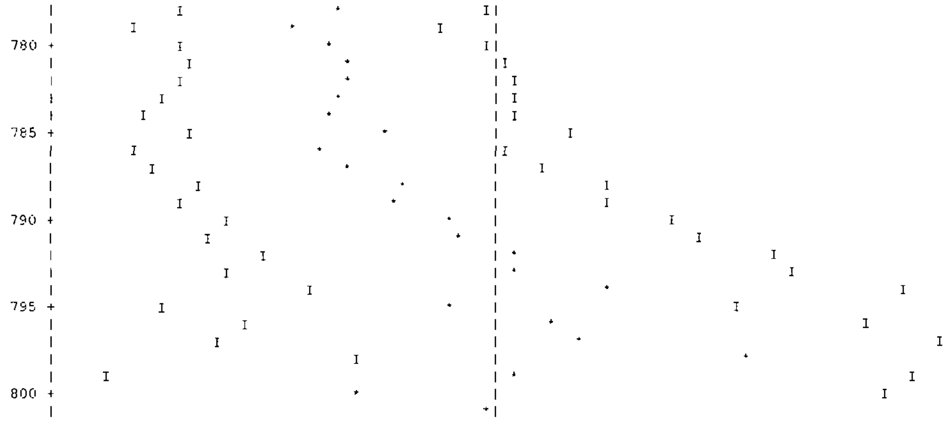
LWT WITH GA IFM

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION SKIPPED.
THE LINE REPRESENTS K-EFF = 0.7220 + OR - 0.0007 WHICH OCCURS FOR 3 GENERATIONS SKIPPED.




95
600
605
610
615
620
625
630
635
640
645
650
655
660
665
670
675
680


685
690
695
700
705
710
715
720
725
730
735
740
745
750
755
760
765
770
775


780
785
790
795
800

LWT WITH GA IFM

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0006			4.00192E-04	1.2672	1.27462E-03	0.9486	0.00000E+00	0.0000
2	0.0022			1.59620E-03	0.4160	3.02760E-03	0.3251	0.00000E+00	0.0000
3	0.0025			1.82061E-03	0.3354	1.55179E-03	0.2726	0.00000E+00	0.0000
4	0.0012			8.62742E-04	0.3730	8.32470E-04	0.2807	0.00000E+00	0.0000
5	0.0009			6.76402E-04	0.2862	1.74872E-03	0.2795	0.00000E+00	0.0000
6	0.0013			9.13395E-04	0.2168	7.38533E-03	0.2572	0.00000E+00	0.0000
7	0.0015			1.08146E-03	0.1791	1.48384E-02	0.2389	0.00000E+00	0.0000
8	0.0016			1.14697E-03	0.1791	1.20744E-02	0.2599	0.00000E+00	0.0000
9	0.0022			1.58067E-03	0.1807	1.21250E-02	0.2548	0.00000E+00	0.0000
10	0.0047			3.42751E-03	0.1860	3.03179E-02	0.2487	0.00000E+00	0.0000
11	0.0104			7.47447E-03	0.1748	4.07010E-02	0.2030	0.00000E+00	0.0000
12	0.0146			1.05204E-02	0.1891	3.32275E-02	0.1821	0.00000E+00	0.0000
13	0.0142			1.02616E-02	0.1907	4.31473E-02	0.1706	0.00000E+00	0.0000
14	0.0117			8.45094E-03	0.1787	5.28353E-02	0.2124	0.00000E+00	0.0000
15	0.0022			1.56657E-03	0.2617	2.40140E-02	0.3384	0.00000E+00	0.0000
16	0.0015			1.05366E-03	0.3224	1.32672E-02	0.3664	0.00000E+00	0.0000
17	0.0023			1.64657E-03	0.4663	6.76399E-03	0.3719	0.00000E+00	0.0000
18	0.0031			2.25149E-03	0.4738	6.20648E-03	0.3773	0.00000E+00	0.0000
19	0.0038			2.70772E-03	0.3751	1.06971E-02	0.3856	0.00000E+00	0.0000
20	0.0158			1.13935E-02	0.2345	3.32724E-02	0.3217	0.00000E+00	0.0000
21	0.0089			6.40846E-03	0.3567	1.18196E-02	0.3676	0.00000E+00	0.0000
22	0.0221			1.59248E-02	0.2701	2.38316E-02	0.3046	0.00000E+00	0.0000
23	0.0871			6.28856E-02	0.1617	8.17318E-02	0.1725	0.00000E+00	0.0000
24	0.2046			1.47719E-01	0.1240	1.59106E-01	0.1190	0.00000E+00	0.0000
25	0.1939			1.40005E-01	0.1273	1.37342E-01	0.1176	0.00000E+00	0.0000
26	0.2695			1.94597E-01	0.1268	1.74117E-01	0.1224	0.00000E+00	0.0000
27	0.1158			8.36149E-02	0.1690	6.46415E-02	0.1785	0.00000E+00	0.0000
SYSTEM TOTAL =				7.21987E-01	0.0942	1.00190E+00	0.0315	0.00000E+00	0.0000

ELAPSED TIME 8.97750 MINUTES

RANDOM NUMBER= 23A12AE52FEC

```
LWT WITH GA IFM

                                        FPEQUENCY FOR GENEPATIONS    4 TO  803
0.6657 TO 0.6687     **
0.6687 TO 0.6717
0.6717 TO 0.6747     ****
0.6747 TO 0.6778     *
0.6778 TO 0.6808
0.6808 TO 0.6838     ******
0.6838 TO 0.6868     **************
0.6868 TO 0.6899     ***********
0.6899 TO 0.6929     ********************
0.6929 TO 0.6959     ************************
0.6959 TO 0.6990     ********************
0.6990 TO 0.7020     **********************
0.7020 TO 0.7050     **************************
0.7050 TO 0.7080     *************************************
0.7080 TO 0.7111     *****************************************
0.7111 TO 0.7141     **************************************************
0.7141 TO 0.7171     **************************************************
0.7171 TO 0.7201     ************************************
0.7201 TO 0.7232     ***********************************************************
0.7232 TO 0.7262     ********************************************
0.7262 TO 0.7292     ***************************************************
0.7292 TO 0.7322     *************************************************
0.7322 TO 0.7353     *************************************
0.7353 TO 0.7383     **********************************
0.7383 TO 0.7413     *************************
0.7413 TO 0.7444     ****************************
0.7444 TO 0.7474     ***********************************
0.7474 TO 0.7504     *************************
0.7504 TO 0.7534     *************
0.7534 TO 0.7565     *********
0.7565 TO 0.7595     *******
0.7595 TO 0.7625     ***
0.7625 TO 0.7655     *****
0.7655 TO 0.7686     ******
0.7686 TO 0.7716     ****
0.7716 TO 0.7746     *
0.7746 TO 0.7776     *
```

```
LWT WITH GA IFM

                                  FREQUENCY FOR GENERATIONS  204 TO  803
0.6657 TO 0.6687      **
0.6687 TO 0.6717
0.6717 TO 0.6747      ****
0.6747 TO 0.6778      *
0.6778 TO 0.6808
0.6808 TO 0.6838      *****
0.6838 TO 0.6868      ***********
0.6868 TO 0.6899      ********
0.6899 TO 0.6929      *************
0.6929 TO 0.6959      ******************
0.6959 TO 0.6990      **************
0.6990 TO 0.7020      ****************
0.7020 TO 0.7050      *******************
0.7050 TO 0.7080      ***************************
0.7080 TO 0.7111      *****************************
0.7111 TO 0.7141      *****************************************
0.7141 TO 0.7171      ************************************
0.7171 TO 0.7201      *************************
0.7201 TO 0.7232      **********************************************
0.7232 TO 0.7262      *****************************
0.7262 TO 0.7292      **************************************
0.7292 TO 0.7322      **************************************
0.7322 TO 0.7353      **************************
0.7353 TO 0.7383      *************************
0.7383 TO 0.7413      ******************
0.7413 TO 0.7444      **********************
0.7444 TO 0.7474      ************************
0.7474 TO 0.7504      *********************
0.7504 TO 0.7534      ************
0.7534 TO 0.7565      ********
0.7565 TO 0.7595      *******
0.7595 TO 0.7625      **
0.7625 TO 0.7655      ***
0.7655 TO 0.7686      ******
0.7686 TO 0.7716      ****
0.7716 TO 0.7746      *
0.7746 TO 0.7776      *
```

```
LWT WITH GA IFM

                              FREQUENCY FOR GENERATIONS  404 TO  803
0.6657 TO 0.6687     **
0.6687 TO 0.6717
0.6717 TO 0.6747     **
0.6747 TO 0.6778
0.6778 TO 0.6808
0.6808 TO 0.6838     **
0.6838 TO 0.6868     ********
0.6868 TO 0.6899     *******
0.6899 TO 0.6929     ********
0.6929 TO 0.6959     *************
0.6959 TO 0.6990     **********
0.6990 TO 0.7020     *********
0.7020 TO 0.7050     **************
0.7050 TO 0.7080     ****************
0.7080 TO 0.7111     *********************
0.7111 TO 0.7141     ***************************
0.7141 TO 0.7171     ****************************
0.7171 TO 0.7201     ******************
0.7201 TO 0.7232     *********************************
0.7232 TO 0.7262     *******************
0.7262 TO 0.7292     ***************************
0.7292 TO 0.7322     *********************
0.7322 TO 0.7353     ******************
0.7353 TO 0.7383     ************
0.7383 TO 0.7413     ***********
0.7413 TO 0.7444     ****************
0.7444 TO 0.7474     ****************
0.7474 TO 0.7504     *************
0.7504 TO 0.7534     *********
0.7534 TO 0.7565     ***
0.7565 TO 0.7595     ******
0.7595 TO 0.7625     **
0.7625 TO 0.7655     **
0.7655 TO 0.7686     ***
0.7686 TO 0.7716     **
0.7716 TO 0.7746     *
0.7746 TO 0.7776     *
```

```
LWT WITH GA IFM

                                        FREQUENCY FOR GENERATIONS  604 TO  803
0.6657 TO 0.6687      **
0.6687 TO 0.6717
0.6717 TO 0.6747
0.6747 TO 0.6778
0.6778 TO 0.6808
0.6808 TO 0.6838      *
0.6838 TO 0.6868      *****
0.6868 TO 0.6899      ***
0.6899 TO 0.6929      ****
0.6929 TO 0.6959      ********
0.6959 TO 0.6990      *******
0.6990 TO 0.7020      ****
0.7020 TO 0.7050      *******
0.7050 TO 0.7080      **********
0.7080 TO 0.7111      **************
0.7111 TO 0.7141      ************
0.7141 TO 0.7171      ************
0.7171 TO 0.7201      **********
0.7201 TO 0.7232      ************
0.7232 TO 0.7262      ***********
0.7262 TO 0.7292      ***************
0.7292 TO 0.7322      ******
0.7322 TO 0.7353      *********
0.7353 TO 0.7383      *****
0.7383 TO 0.7413      ******
0.7413 TO 0.7444      ********
0.7444 TO 0.7474      *********
0.7474 TO 0.7504      *******
0.7504 TO 0.7534      *****
0.7534 TO 0.7565      **
0.7565 TO 0.7595      ***
0.7595 TO 0.7625      **
0.7625 TO 0.7655
0.7655 TO 0.7686
0.7686 TO 0.7716
0.7716 TO 0.7746      *
0.7746 TO 0.7776


************************************************************************************************************************************
*

             CONGRATULATIONS!  YOU HAVE  SUCCESSFULLY TRAVERSED THE PERILOUS PATH THROUGH KENO V IN   8.97750 MINUTES

************************************************************************************************************************************
*
```

6.6.10 Damaged Fuel Rods in a Rod Holder

This section contains a sample output file from the evaluation of 25 fuel rods in a rod holder in which up to 14 of the fuel rods are classified as damaged. The output file is shown in Figure 6.6.10-1.

Figure 6.6.10-1 Damaged BWR Rods in a Rod Holder

```
PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
MODULE CSAS25 WILL BE CALLED
NAC-LWT, BWR, DAMAGED-SMALLER PIN SIZE, NO BASKET
27GROUPNDF4 LATTICECELL
UO2        1 0.95 293.0 92235 5.0 92238 95.0 END
H2O        2 1.0000 293.0 END
ZIRCALLOY  3 1.0000 293.0 END
H2O        4 1.0000 293.0 END
H2O        5 0.0001 293.0 END
PB         6 1.0000 293.0 END
H2O        7 0.0001 293.0 END
SS304      8 1.0000 293.0 END
END COMP
TRIANGPITCH 2.15289 0.7968 1 4 END
NAC-LWT, BWR, DAMAGED-SMALLER PIN SIZE, NO BASKET
READ PARAM RUN=YES PLT=NO TME=5000 GEN=803 NPG=1000 TBA=5 END PARAM
READ GEOM
UNIT 1
COM='LWR FUEL ROD-NO CLAD'
CYLINDER 1 1 0.3984 2P10.0000
CYLINDER 4 1 0.4049 2P10.0000
GLOBAL UNIT 2
CYLINDER 4 1 9.0166 2P10.0000
HOLE 1 0.0000 0.0000 0.0000
HOLE 1 2.1529 0.0000 0.0000
HOLE 1 1.0764 1.8645 0.0000
HOLE 1 -1.0764 1.8645 0.0000
HOLE 1 -2.1529 0.0000 0.0000
HOLE 1 -1.0764 -1.8645 0.0000
HOLE 1 1.0764 -1.8645 0.0000
HOLE 1 3.2293 -1.8645 0.0000
HOLE 1 4.3058 0.0000 0.0000
HOLE 1 3.2293 1.8645 0.0000
HOLE 1 2.1529 3.7289 0.0000
HOLE 1 0.0000 3.7289 0.0000
HOLE 1 -2.1529 3.7289 0.0000
HOLE 1 -3.2293 1.8645 0.0000
HOLE 1 -4.3058 0.0000 0.0000
HOLE 1 -3.2293 -1.8645 0.0000
HOLE 1 -2.1529 -3.7289 0.0000
HOLE 1 0.0000 -3.7289 0.0000
HOLE 1 2.1529 -3.7289 0.0000
HOLE 1 4.3058 -3.7289 0.0000
HOLE 1 5.3822 1.8645 0.0000
HOLE 1 1.0764 5.5934 0.0000
HOLE 1 -4.3058 3.7289 0.0000
HOLE 1 -5.3822 -1.8645 0.0000
HOLE 1 -1.0764 -5.5934 0.0000
HOLE 1 1.0764 -5.5934 0.0000
HOLE 1 4.3058 3.7289 0.0000
HOLE 1 3.2293 5.5934 0.0000
HOLE 1 -1.0764 5.5934 0.0000
HOLE 1 -4.3058 -3.7289 0.0000
HOLE 1 -3.2293 -5.5934 0.0000
HOLE 1 3.2293 -5.5934 0.0000
HOLE 1 5.3822 -1.8645 0.0000
HOLE 1 -3.2293 5.5934 0.0000
HOLE 1 -5.3822 1.8645 0.0000
HOLE 1 6.4587 0.0000 0.0000
HOLE 1 -6.4587 0.0000 0.0000
HOLE 1 0.0000 -7.4578 0.0000
HOLE 1 2.1529 -7.4578 0.0000
HOLE 1 4.3058 -7.4578 0.0000
HOLE 1 5.3822 -5.5934 0.0000
HOLE 1 6.4587 -3.7289 0.0000
HOLE 1 7.5351 -1.8645 0.0000
HOLE 1 8.6116 0.0000 0.0000
HOLE 1 7.5351 1.8645 0.0000
HOLE 1 6.4587 3.7289 0.0000
HOLE 1 5.3822 5.5934 0.0000
HOLE 1 4.3058 7.4578 0.0000
HOLE 1 2.1529 7.4578 0.0000
HOLE 1 0.0000 7.4578 0.0000
HOLE 1 -2.1529 7.4578 0.0000
HOLE 1 -4.3058 7.4578 0.0000
HOLE 1 -5.3822 5.5934 0.0000
HOLE 1 -6.4587 3.7289 0.0000
HOLE 1 -7.5351 1.8645 0.0000
HOLE 1 -8.6116 0.0000 0.0000
HOLE 1 -7.5351 -1.8645 0.0000
HOLE 1 -6.4587 -3.7289 0.0000
HOLE 1 -5.3822 -5.5934 0.0000
HOLE 1 -4.3058 -7.4578 0.0000
HOLE 1 -2.1529 -7.4578 0.0000
CYLINDER 5 1 16.9863 2P10.0000
CYLINDER 8 1 18.8976 2P10.0000
CYLINDER 6 1 33.5026 2P10.0000
CYLINDER 8 1 36.5506 2P10.0000
CYLINDER 7 1 49.2443 2P10.0000
CYLINDER 8 1 49.8221 2P10.0000
```

```
    CUBOID 5 1 4P49.8221 2P10.0000
    END GEOM
    READ BOUNDS ALL=MIR END BOUNDS
    READ PLOT
    TTL='XY SLICE OF CASK'
    SCR=YES PIC=MAT LPI=10
    XUL=-50.0 YUL=50.0 ZUL=0.0 XLR=50.0 YLR=-50.0 ZLR=0.0
    UAX=1.0 VDN=-1.0 NAX=1500 END
    END PLOT
    END DATA

  SECONDARY MODULE 000008   HAS BEEN CALLED.

  MODULE 000008   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     0.33 (SECONDS).

  SECONDARY MODULE 000002   HAS BEEN CALLED.

  MODULE 000002   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     2.30 (SECONDS).

  SECONDARY MODULE 000009   HAS BEEN CALLED.

  MODULE 000009   IS FINISHED. COMPLETION CODE     0. CPU TIME USED  1721.70 (SECONDS).

  MODULE CSAS25   IS FINISHED. COMPLETION CODE     0. CPU TIME USED  1725.59 (SECONDS).

 THE FOLLOWING DATA CARDS PRECEDE AN = CARD

  EXECUTION TERMINATED DUE TO ERRORS

 CCCCCCCCCCC     SSSSSSSSSSS      AAAAAAAAA      SSSSSSSSSSS     22222222222    5555555555555
CCCCCCCCCCCCC   SSSSSSSSSSSSS    AAAAAAAAAAA    SSSSSSSSSSSSS   2222222222222   5555555555555
CC         CC   SS         SS   AA         AA   SS         SS   22         22   55
CC              SS              AA         AA   SS                         22   55
CC              SS              AA         AA   SS                         22   55
CC              SSSSSSSSSSSS    AAAAAAAAAAAAA   SSSSSSSSSSSS             22     555555555555
CC               SSSSSSSSSSSS   AAAAAAAAAAAAA    SSSSSSSSSSSS          22       5555555555555
CC                         SS   AA         AA              SS        22                    55
CC                         SS   AA         AA              SS      22                      55
CC         CC   SS         SS   AA         AA   SS         SS    22             55         55
CCCCCCCCCCCCC   SSSSSSSSSSSSS   AA         AA   SSSSSSSSSSSSS   2222222222222   5555555555555
 CCCCCCCCCCC     SSSSSSSSSSS    AA         AA    SSSSSSSSSSS    2222222222222    55555555555


 SSSSSSSSSSS     CCCCCCCCCCC      AAAAAAAAA     LL              EEEEEEEEEEEEE                   PPPPPPPPPPPP     CCCCCCCCCCC
SSSSSSSSSSSSS   CCCCCCCCCCCCC    AAAAAAAAAAA    LL              EEEEEEEEEEEEE                   PPPPPPPPPPPPP   CCCCCCCCCCCCC
SS         SS   CC         CC   AA         AA   LL              EE                              PP         PP   CC         CC
SS              CC              AA         AA   LL              EE                              PP         PP   CC
SS              CC              AA         AA   LL              EE                              PP         PP   CC
SSSSSSSSSSSS    CC              AAAAAAAAAAAAA   LL              EEEEEEEEE       -------------   PPPPPPPPPPPPP   CC
 SSSSSSSSSSSS   CC              AAAAAAAAAAAAA   LL              EEEEEEEEE       -------------   PPPPPPPPPPPP    CC
           SS   CC              AA         AA   LL              EE                              PP              CC
           SS   CC              AA         AA   LL              EE                              PP              CC
SS         SS   CC         CC   AA         AA   LL              EE                              PP              CC         CC
SSSSSSSSSSSSS   CCCCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                   PP              CCCCCCCCCCCCC
 SSSSSSSSSSS     CCCCCCCCCCC    AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                   PP               CCCCCCCCCCC


   0000000           11                    //    22222222222     99999999999               //      0000000       33333333333
  000000000         111                   //    2222222222222   9999999999999             //      000000000     3333333333333
 00       00       1111                  //     22         22   99         99            //      00       00    33         33
00         00        11                 //                 22   99         99           //      00         00              33
00         00        11                //                  22   99         99          //       00         00              33
00         00        11               //                 22     9999999999999         //        00         00             333
00         00        11              //                22        999999999999        //         00         00             333
00         00        11             //               22                    99       //          00         00              33
00         00        11            //              22                      99      //           00         00              33
 00       00         11           //             22                        99     //             00       00    33         33
  000000000       11111111       //             2222222222222   9999999999999    //               000000000     3333333333333
   0000000        11111111      //              2222222222222   999999999999    //                 0000000       33333333333


     11              11                            0000000       22222222222                     22222222222     33333333333
    111             111                           000000000     2222222222222                   2222222222222   3333333333333
   1111            1111              :::         00       00    22         22        :::        22         22   33         33
     11              11              :::        00         00              22        :::                   22              33
     11              11              :::        00         00              22        :::                   22              33
     11              11                         00         00            22                              22               333
     11              11                         00         00          22                              22                 333
     11              11              :::        00         00        22              :::             22                    33
     11              11              :::        00         00      22                :::           22                      33
     11              11              :::         00       00     22                  :::         22             33         33
  11111111        11111111                        000000000     2222222222222                   2222222222222   3333333333333
  11111111        11111111                         0000000      2222222222222                   2222222222222    33333333333
```

```
 SSSSSSSSSSS     CCCCCCCCCCC       AAAAAAAAA      LL              EEEEEEEEEEEEE                         PPPPPPPPPPPP      CCCCCCCCCCC
SSSSSSSSSSSSS   CCCCCCCCCCCCC     AAAAAAAAAAA     LL              EEEEEEEEEEEEE                         PPPPPPPPPPPPP    CCCCCCCCCCCCC
SS         SS   CC         CC    AA         AA    LL              EE                                    PP         PP    CC         CC
SS              CC               AA         AA    LL              EE                                    PP         PP    CC
SS              CC               AA         AA    LL              EE                                    PP         PP    CC
SSSSSSSSSSSS    CC               AAAAAAAAAAAAA    LL              EEEEEEEEE        -------------        PPPPPPPPPPPPP    CC
 SSSSSSSSSSSS   CC               AAAAAAAAAAAAA    LL              EEEEEEEEE        -------------        PPPPPPPPPPPP     CC
           SS   CC               AA         AA    LL              EE                                    PP               CC
           SS   CC               AA         AA    LL              EE                                    PP               CC
SS         SS   CC         CC    AA         AA    LL              EE                                    PP               CC         CC
SSSSSSSSSSSSS   CCCCCCCCCCCCC    AA         AA    LLLLLLLLLLLLL   EEEEEEEEEEEEE                         PP               CCCCCCCCCCCCC
 SSSSSSSSSSS     CCCCCCCCCCC     AA         AA    LLLLLLLLLLLLL   EEEEEEEEEEEEE                         PP                CCCCCCCCCCC


                    ******************************************************************************
                    ******************************************************************************
                    ******************************************************************************
                    *****                                                                    *****
                    *****                  PROGRAM VERIFICATION INFORMATION                  *****
                    *****                                                                    *****
                    *****               CODE SYSTEM:   SCALE-PC VERSION:   4.3               *****
                    *****                                                                    *****
                    ******************************************************************************
                    ******************************************************************************
                    *****                                                                    *****
                    *****                                                                    *****
                    *****                 PROGRAM:  CSAS                                     *****
                    *****                                                                    *****
                    *****           CREATION DATE:  03/08/96                                 *****
                    *****                                                                    *****
                    *****                  VOLUME:  Eng                                      *****
                    *****                                                                    *****
                    *****                 LIBRARY:  M:\SCALE43\WIN_NT\EXE                    *****
                    *****                                                                    *****
                    *****                                                                    *****
                    *****         PRODUCTION CODE:  CSAS                                     *****
                    *****                                                                    *****
                    *****                 VERSION:  3.1                                      *****
                    *****                                                                    *****
                    *****                 JOBNAME:  SCALE-PC                                 *****
                    *****                                                                    *****
                    *****       DATE OF EXECUTION:  01/29/03                                 *****
                    *****                                                                    *****
                    *****       TIME OF EXECUTION:  11:02:23                                 *****
                    *****                                                                    *****
                    *****                                                                    *****
                    ******************************************************************************
                    ******************************************************************************
                    ******************************************************************************

NAC-LWT, BWR, DAMAGED-SMALLER PIN SIZE, NO BASKET

 **** PROBLEM PARAMETERS ****

 LIB 27GROUPNDF4  LIBRARY
 MXX            8 MIXTURES
 MSC            8 COMPOSITION SPECIFICATIONS
 IZM            2 MATERIAL ZONES
 GE  LATTICECELL  GEOMETRY
 MORE           0 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
 MSLN           0 FUEL SOLUTIONS

 **** PROBLEM COMPOSITION DESCRIPTION ****

 SC  UO2            STANDARD COMPOSITION
 MX             1 MIXTURE NO.
 VF        0.9500 VOLUME FRACTION
 ROTH     10.9600 THEORETICAL DENSITY
 NEL            2 NO. ELEMENTS
 ICP            1 0/1 MIXTURE/COMPOUND
 TEMP       293.0 DEG KELVIN
            92000       1.00 ATOM/MOLECULE
                             92235      5.000 WT%
                             92238     95.000 WT%
             8016       2.00 ATOMS/MOLECULE
 END

 SC  H2O            STANDARD COMPOSITION
 MX             2 MIXTURE NO.
 VF        1.0000 VOLUME FRACTION
 ROTH      0.9982 THEORETICAL DENSITY
 NEL            2 NO. ELEMENTS
 ICP            1 0/1 MIXTURE/COMPOUND
 TEMP       293.0 DEG KELVIN
             1001       2.00 ATOMS/MOLECULE
             8016       1.00 ATOM/MOLECULE
 END

 SC  ZIRCALLOY      STANDARD COMPOSITION
```

```
MX           3 MIXTURE NO.
VF      1.0000 VOLUME FRACTION
ROTH    6.5600 THEORETICAL DENSITY
NEL          1 NO. ELEMENTS
ICP          1 0/1 MIXTURE/COMPOUND
TEMP     293.0 DEG KELVIN
         40302        1.00 ATOM/MOLECULE
END

SC  H2O         STANDARD COMPOSITION
MX           4 MIXTURE NO.
VF      1.0000 VOLUME FRACTION
ROTH    0.9982 THEORETICAL DENSITY
NEL          2 NO. ELEMENTS
ICP          1 0/1 MIXTURE/COMPOUND
TEMP     293.0 DEG KELVIN
          1001        2.00 ATOMS/MOLECULE
          8016        1.00 ATOM/MOLECULE
END

SC  H2O         STANDARD COMPOSITION
MX           5 MIXTURE NO.
VF      0.0001 VOLUME FRACTION
ROTH    0.9982 THEORETICAL DENSITY
NEL          2 NO. ELEMENTS
ICP          1 0/1 MIXTURE/COMPOUND
TEMP     293.0 DEG KELVIN
          1001        2.00 ATOMS/MOLECULE
          8016        1.00 ATOM/MOLECULE
END

SC  PB          STANDARD COMPOSITION
MX           6 MIXTURE NO.
VF      1.0000 VOLUME FRACTION
ROTH   11.3440 THEORETICAL DENSITY
NEL          1 NO. ELEMENTS
ICP          1 0/1 MIXTURE/COMPOUND
TEMP     293.0 DEG KELVIN
         82000        1.00 ATOM/MOLECULE
END

SC  H2O         STANDARD COMPOSITION
MX           7 MIXTURE NO.
VF      0.0001 VOLUME FRACTION
ROTH    0.9982 THEORETICAL DENSITY
NEL          2 NO. ELEMENTS
ICP          1 0/1 MIXTURE/COMPOUND
TEMP     293.0 DEG KELVIN
          1001        2.00 ATOMS/MOLECULE
          8016        1.00 ATOM/MOLECULE
END

SC  SS304       STANDARD COMPOSITION
MX           8 MIXTURE NO.
VF      1.0000 VOLUME FRACTION
ROTH    7.9200 THEORETICAL DENSITY
NEL          4 NO. ELEMENTS
ICP          0 0/1 MIXTURE/COMPOUND
TEMP     293.0 DEG KELVIN
         24304     19.000 WT%
         25055      2.000 WT%
         26304     69.500 WT%
         28304      9.500 WT%
END


**** PROBLEM GEOMETRY ****

CTP TRIANGPITCH  CELL TYPE
PITCH     2.1529 CM CENTER TO CENTER SPACING
FUELOD    0.7968 CM FUEL DIAMETER OR SLAB THICKNESS
MFUEL          1 MIXTURE NO. OF FUEL
MMOD           4 MIXTURE NO. OF MODERATOR


ZONE SPECIFICATIONS FOR LATTICECELL GEOMETRY

               ZONE  1 IS FUEL
               ZONE  2 IS MOD
```

```
*****************************************************************************************************
***                                                                                               ***
***                      NAC-LWT, BWR, DAMAGED-SMALLER PIN SIZE, NO BASKET                        ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************
***                                                                                               ***
***                        ********** DATA LIBRARY INFORMATION **********                         ***
***                                                                                               ***
***      UNIT                                                 VOLUME                              ***
***     NUMBER              DATA SET NAME                      NAME       UNIT FUNCTION           ***
***     ------              -------------                      ----       -------------           ***
***                                                                                               ***
***       89      M:\scale43\DATALIB\FT89F001                             STANDARD COMPOSITION LIBRARY ***
***                                                                                               ***
***       82      M:\scale43\DATALIB\FT82F001                             CROSS SECTION LIBRARY   ***
***                                                                                               ***
***       11      D:\zjr\Lwt\Rods\Crit\DPSZ61\bwr_dpsz_100i_00            SHORT CROSS SECTION LIBRARY ***
***                                                                                               ***
***       90      D:\zjr\Lwt\Rods\Crit\DPSZ61\bwr_dpsz_100i_00            INPUT DATA DIRECT ACCESS ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************
***                                                                                               ***
***                                                                                               ***
***                          STANDARD COMPOSITION LIBRARY DATA                                    ***
***                          ---------------------------------                                    ***
***                                                                                               ***
***        UNIT NUMBER  :  89                                                                     ***
***                                                                                               ***
***        DATASET NAME :  M:\scale43\DATALIB\FT89F001                                            ***
***                                                                                               ***
***        LIBRARY TITLE:  SCALE-4 STANDARD COMPOSITION LIBRARY                                   ***
***                        637 STANDARD COMPOSITIONS, 490 NUCLIDES                                ***
***                        90 ELEMENTS WITH VARIABLE ISOTOPIC DISTREBUTIONS.                      ***
***                                                                                               ***
***        CREATION DATE:   6/30/95                                                               ***
***                                                                                               ***
***                                                                                               ***
***                                                                                               ***
***                              CROSS SECTION LIBRARY DATA                                       ***
***                              --------------------------                                       ***
***                                                                                               ***
***        UNIT NUMBER  :  82                                                                     ***
***                                                                                               ***
***        DATASET NAME :  M:\scale43\DATALIB\FT82F001                                            ***
***                                                                                               ***
***        LIBRARY TITLE:  SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY                             ***
***                           BASED ON ENDF-B VERSION 4 DATA                                      ***
***                              COMPILED FOR NRC       1/27/89                                   ***
***                                 LAST UPDATED                                       08/12/94   ***
***                                    L.M.PETRIE   -    ORNL                                     ***
***                                                                                               ***
***                                                                                               ***
***                                                                                               ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************

                     ........   0 IO'S WERE USED BEFORE READING KENO V DATA    ........

                     ........   0 IO'S WERE USED READING THE KENO V PARAMETER DATA    ........

                    ************** DATA READING COMPLETED **************

                     ........   0 IO'S WERE USED PREPARING THE KENO V INPUT DATA    ........

                     ........   0 IO'S WERE USED LOADING THE KENO V DATA    ........

                     ........   0 IO'S WERE USED LOADING THE DATA    ........

                     ........   0 IO'S WERE USED CHECKING THE KENO V GEOMETRY DATA    ........
                     *****  RESTART DATA HAS BEEN WRITTEN ON UNIT 95  *****

                     ........   0 IO'S WERE USED WRITING THE KENO V - CSAS DATA    ........

                     ........   0 IO'S WERE USED PROCESSING CSAS INPUT DATA    ........

CONTROL MODULE CSAS25    IS COMPLETE.
```

```
BON-AMI2
SCALE-PC
01/29/03
11:02:24
```

```
 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL               EEEEEEEEEEEEE                  PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL               EEEEEEEEEEEEE                  PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL               EE                             PP         PP  CC         CC
SS             CC             AA         AA  LL               EE                             PP         PP  CC
SS             CC             AA         AA  LL               EE                             PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL               EEEEEEEEE     -------------    PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL               EEEEEEEEE     -------------    PPPPPPPPPPPP   CC
           SS  CC             AA         AA  LL               EE                             PP             CC
           SS  CC             AA         AA  LL               EE                             PP             CC
SS         SS  CC         CC  AA         AA  LL               EE                             PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLLL    EEEEEEEEEEEEE                  PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLLL    EEEEEEEEEEEEE                  PP              CCCCCCCCCCC
```

```
*****************************************************************************
*****************************************************************************
*****************************************************************************
*****                                                                   *****
*****                PROGRAM VERIFICATION INFORMATION                   *****
*****                                                                   *****
*****              CODE SYSTEM:  SCALE-PC VERSION:  4.3                 *****
*****                                                                   *****
*****************************************************************************
*****************************************************************************
*****                                                                   *****
*****                                                                   *****
*****                PROGRAM:  000008                                   *****
*****                                                                   *****
*****          CREATION DATE:  09/15/95                                 *****
*****                                                                   *****
*****                 VOLUME:  Eng                                      *****
*****                                                                   *****
*****                LIBRARY:  M:\SCALE43\WIN_NT\EXE                    *****
*****                                                                   *****
*****                                                                   *****
*****        PRODUCTION CODE:  BONAMI                                   *****
*****                                                                   *****
*****                VERSION:  3.0                                      *****
*****                                                                   *****
*****                JOBNAME:  SCALE-PC                                 *****
*****                                                                   *****
*****      DATE OF EXECUTION:  01/29/03                                 *****
*****                                                                   *****
*****      TIME OF EXECUTION:  11:02:24                                 *****
*****                                                                   *****
*****                                                                   *****
*****************************************************************************
*****************************************************************************
*****************************************************************************
```

```
LOGICAL ASSIGNMENTS

MASTER LIBRARY    11
WORKING LIBRARY    0
SCRATCH FILE      18
NEW LIBRARY        1

P R O B L E M   D E S C R I P T I O N

IGR--GEOMETRY (0/1/2/3--INF MED/SLAB/CYL/SPHERE                2

IZM--NUMBER OF ZONES OR MATERIAL REGIONS                       8

MS--MIXING TABLE LENGTH                                       17

IBL--SHIELDED CROSS SECTION EDIT OPTION (0/1--NO/YES)          0

IBR--BONDARENKO FACTOR EDIT OPTION (0/1--NO/YES)               0

ISSOPT--DANCOFF FACTOR OPTION                                  0

CONVERGENCE CRITERION     1.00000E-03

GEOMETRY CORRECTION FACTOR FOR WIGNER RATIONAL APPROXIMATION  1.350E+00

        3Q ARRAY HAS      17 ENTRIES.

        4Q ARRAY HAS      17 ENTRIES.

        5Q ARRAY HAS      17 ENTRIES.

        6Q ARRAY HAS       8 ENTRIES.

        7Q ARRAY HAS       6 ENTRIES.

        8Q ARRAY HAS       5 ENTRIES.

        9Q ARRAY HAS       8 ENTRIES.

       10Q ARRAY HAS      17 ENTRIES.
```

11Q ARRAY HAS 8 ENTRIES.

M I X I N G   T A B L E

ENTRY	MIXTURE	ISOTOPE	NUMBER DENSITY	NEW IDENTIFIER
1	1	92235	1.17578E-03	1092235
2	1	92238	2.20577E-02	1092238
3	1	8016	4.64669E-02	1008016
4	2	8016	3.33846E-02	2008016
5	4	8016	3.33846E-02	4008016
6	5	8016	3.33846E-06	5008016
7	7	8016	3.33846E-06	7008016
8	2	1001	6.67692E-02	2001001
9	4	1001	6.67692E-02	4001001
10	5	1001	6.67692E-06	5001001
11	7	1001	6.67692E-06	7001001
12	3	40302	4.33078E-02	3040302
13	6	82000	3.29690E-02	6082000
14	8	24304	1.74286E-02	8024304
15	8	25055	1.73633E-03	8025055
16	8	26304	5.93579E-02	8026304
17	8	28304	7.72070E-03	8028304

GEOMETRY AND MATERIAL DESCRIPTION

ZONE	MIXTURE	OUTER DIMENSION	TEMPERATURE	EXTRA XS	TYPE (0/1--FUEL/MOD)
1	1	3.98400E-01	2.93000E+02	1.83118E+00	0
2	4	1.13035E+00	2.93000E+02	0.00000E+00	0
3	2	6.13035E+00	2.93000E+02	0.00000E+00	0
4	3	1.11303E+01	2.93000E+02	0.00000E+00	0
5	5	1.61303E+01	2.93000E+02	0.00000E+00	0
6	6	2.11303E+01	2.93000E+02	0.00000E+00	0
7	7	2.61303E+01	2.93000E+02	0.00000E+00	0
8	8	3.11303E+01	2.93000E+02	0.00000E+00	0

3698 LOCATIONS OF 100000 AVAILABLE ARE REQUIRED TO MAKE A NEW MASTER CONTAINING THE SELF-SHIELDED VALUES

NO NUCLIDES IN YOUR PROBLEM HAVE BONDARENKO FACTOR DATA**BONAMI WILL COPY FROM LOGICAL 11 TO LOGICAL 1

SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
BASED ON ENDF-B VERSION 4 DATA
COMPILED FOR NRC 1/27/89
LAST UPDATED 08/12/94
L.M.PETRIE - ORNL

TAPE ID	4321	NUMBER OF NUCLIDES	17
NUMBER OF NEUTRON GROUPS	27	NUMBER OF GAMMA GROUPS	0
FIRST THERMAL GROUP	15	LOGICAL UNIT	1

TABLE OF CONTENTS

HYDROGEN	ENDF/B-IV MAT 1269/THRM1002	UPDATED 08/12/94	ID 2001001
HYDROGEN	ENDF/B-IV MAT 1269/THRM1002	UPDATED 08/12/94	ID 4001001
HYDROGEN	ENDF/B-IV MAT 1269/THRM1002	UPDATED 08/12/94	ID 5001001
HYDROGEN	ENDF/B-IV MAT 1269/THRM1002	UPDATED 08/12/94	ID 7001001
OXYGEN-16	ENDF/B-IV MAT 1276	UPDATED 08/12/94	ID 1008016
OXYGEN-16	ENDF/B-IV MAT 1276	UPDATED 08/12/94	ID 2008016
OXYGEN-16	ENDF/B-IV MAT 1276	UPDATED 08/12/94	ID 4008016
OXYGEN-16	ENDF/B-IV MAT 1276	UPDATED 08/12/94	ID 5008016
OXYGEN-16	ENDF/B-IV MAT 1276	UPDATED 08/12/94	ID 7008016
CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'		UPDATED 08/12/94	ID 8024304
MANGANESE-55	ENDF/B-IV MAT 1197	UPDATED 08/12/94	ID 8025055
FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'		UPDATED 08/12/94	ID 8026304
NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'		UPDATED 08/12/94	ID 8028304
ZIRCALLOY	ENDF/B-IV MAT 1284	UPDATED 08/12/94	ID 3040302
PB 1288 218NGP 042375 P-3 293K		UPDATED 08/12/94	ID 6082000
URANIUM-235	ENDF/B-IV MAT 1261	UPDATED 08/12/94	ID 1092235
URANIUM-238	ENDF/B-IV MAT 1262	UPDATED 08/12/94	ID 1092238

TAPE COPY USED 0 I/O'S, AND TOOK 0.11 SECONDS

```
NN         NN  IIIIIIIIIIII   TTTTTTTTTTTT     AAAAAAAAA     WW         WW  LL
NNN        NN  IIIIIIIIIIII   TTTTTTTTTTTT    AAAAAAAAAAA    WW         WW  LL
NNNN       NN       II             TT        AA         AA   WW         WW  LL
NN NN      NN       II             TT        AA         AA   WW         WW  LL
NN  NN     NN       II             TT        AA         AA   WW         WW  LL
NN   NN    NN       II             TT        AAAAAAAAAAAAA   WW    W    WW  LL
NN    NN   NN       II             TT        AAAAAAAAAAAAA   WW   WWW   WW  LL
NN     NN  NN       II             TT        AA         AA   WW  WW WW  WW  LL
NN      NN NN       II             TT        AA         AA   WW WW   WW WW  LL
NN       NNNN       II             TT        AA         AA   WWWW     WWWW  LL
NN        NNN  IIIIIIIIIIII        TT        AA         AA   WWW       WWW  LLLLLLLLLLLL
NN         NN  IIIIIIIIIIII        TT        AA         AA   WW         WW  LLLLLLLLLLLL
```

```
 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL             EEEEEEEEEEEEE                  PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL             EEEEEEEEEEEEE                  PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL             EE                             PP         PP  CC         CC
SS             CC             AA         AA  LL             EE                             PP         PP  CC
SS             CC             AA         AA  LL             EE                             PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------   PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------   PPPPPPPPPPPP   CC
           SS  CC             AA         AA  LL             EE                             PP             CC
           SS  CC             AA         AA  LL             EE                             PP             CC
SS         SS  CC         CC  AA         AA  LL             EE                             PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLL   EEEEEEEEEEEEE                  PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLL   EEEEEEEEEEEEE                  PP              CCCCCCCCCCC
```

```
  0000000          11              //   22222222222    99999999999               //    0000000      33333333333
 000000000        111             //   2222222222222  9999999999999             //    000000000    3333333333333
00       00      1111            //    22         22  99         99            //    00       00   33         33
00       00        11           //                22  99         99           //     00       00              33
00       00        11          //                 22  99         99          //      00       00              33
00       00        11         //                22    9999999999999         //       00       00             333
00       00        11        //               22       999999999999        //        00       00             333
00       00        11       //              22                   99       //         00       00              33
00       00        11      //             22                     99      //          00       00              33
00       00        11     //            22                       99     //           00       00   33         33
 000000000      11111111 //             2222222222222  9999999999999   //             000000000    3333333333333
  0000000       11111111 //             2222222222222  999999999999   //               0000000      33333333333
```

```
      11             11                  0000000      22222222222                   22222222222    5555555555555
     111            111                 000000000    2222222222222                 2222222222222   5555555555555
    1111           1111        :::     00       00   22         22       :::       22         22   55
      11             11        :::     00       00              22       :::                  22   55
      11             11        :::     00       00              22       :::                  22   55
      11             11                00       00            22                            22     555555555555
      11             11                00       00          22                            22       5555555555555
      11             11        :::     00       00        22             :::            22                    55
      11             11        :::     00       00      22               :::          22                      55
      11             11        :::     00       00    22                 :::        22             55         55
   11111111       11111111              000000000    2222222222222                 2222222222222   5555555555555
   11111111       11111111               0000000     2222222222222                 2222222222222    55555555555
```

```
 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA     LL              EEEEEEEEEEEEE                   PPPPPPPPPPPP     CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA    LL              EEEEEEEEEEEEE                   PPPPPPPPPPPPP   CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA   LL              EE                              PP         PP   CC         CC
SS             CC             AA         AA   LL              EE                              PP         PP   CC
SS             CC             AA         AA   LL              EE                              PP         PP   CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA   LL              EEEEEEEEE      -------------    PPPPPPPPPPPPP   CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA   LL              EEEEEEEEE      -------------    PPPPPPPPPPPP    CC
           SS  CC             AA         AA   LL              EE                              PP              CC
           SS  CC             AA         AA   LL              EE                              PP              CC
SS         SS  CC         CC  AA         AA   LL              EE                              PP              CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                   PP              CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                   PP               CCCCCCCCCCC
```

```
*******************************************************************************
*******************************************************************************
*******************************************************************************
*****                                                                     *****
*****                    PROGRAM VERIFICATION INFORMATION                 *****
*****                                                                     *****
*****                 CODE SYSTEM:  SCALE-PC VERSION:  4.3                *****
*****                                                                     *****
*******************************************************************************
*******************************************************************************
*****                                                                     *****
*****                                                                     *****
*****               PROGRAM:  000002                                      *****
*****                                                                     *****
*****         CREATION DATE:  09/28/95                                    *****
*****                                                                     *****
*****                VOLUME:  Eng                                         *****
*****                                                                     *****
*****               LIBRARY:  M:\SCALE43\WIN_NT\EXE                       *****
*****                                                                     *****
*****                                                                     *****
*****       PRODUCTION CODE:  NITAWL                                      *****
*****                                                                     *****
*****               VERSION:  3.0                                         *****
*****                                                                     *****
*****               JOBNAME:  SCALE-PC                                    *****
*****                                                                     *****
*****     DATE OF EXECUTION:  01/29/03                                    *****
*****                                                                     *****
*****     TIME OF EXECUTION:  11:02:25                                    *****
*****                                                                     *****
*****                                                                     *****
*******************************************************************************
*******************************************************************************
*******************************************************************************

        -1Q ARRAY HAS      1 ENTRIES.

         0Q ARRAY HAS      9 ENTRIES.

         1Q ARRAY HAS     12 ENTRIES.

SELECT 17 NUCLIDES FROM THE MASTER  LIBRARY ON LOGICAL  1
        0 NUCLIDES FROM THE WORKING LIBRARY ON LOGICAL  2
        0 NUCLIDES FROM THE WORKING LIBRARY ON LOGICAL  3
          TO CREATE THE NEW WORKING LIBRARY ON LOGICAL  4

        4 RESONANCE CALCULATIONS HAVE BEEN REQUESTED
       -1 OUTPUT OPTION FOR AMPX FORMATTED CROSS SECTION DATA
     2001 MAXIMUM NUMBER OF RESONANCE MESH INTERVALS
        2 ORDER OF RESONANCE LEVEL PROCESSING

THE STORAGE ALLOCATED FOR THIS CASE IS    100000 WORDS

         2Q ARRAY HAS     17 ENTRIES.

         3Q ARRAY HAS     60 ENTRIES.

         4Q ARRAY HAS     17 ENTRIES.

 GENERAL INFORMATION CONCERNING CROSS SECTION LIBRARY
   TAPE IDENTIFICATION NUMBER               4321
   NUMBER OF NUCLIDES ON TAPE                 17
   NUMBER OF NEUTRON ENERGY GROUPS            27
   FIRST THERMAL NEUTRON ENERGY GROUP         15
   NUMBER OF GAMMA ENERGY GROUPS               0

   DIRECT ACCESS UNIT NUMBER  9 REQUIRES 117 BLOCKS OF LENGTH  1680 WORDS
 XSDRN TAPE    4321
                        SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
                           BASED ON ENDF-B VERSION 4 DATA
                              COMPILED FOR NRC      1/27/89
                                 LAST UPDATED                                                08/12/94
                                    L.M.PETRIE    -    ORNL

 NUCLIDES FROM XSDRN TAPE
    1      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94     2001001
```

```
    2      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002                 UPDATED 08/12/94      4001001
    3      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002                 UPDATED 08/12/94      5001001
    4      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002                 UPDATED 08/12/94      7001001
    5      OXYGEN-16      ENDF/B-IV MAT 1276                          UPDATED 08/12/94      1008016
    6      OXYGEN-16      ENDF/B-IV MAT 1276                          UPDATED 08/12/94      2008016
    7      OXYGEN-16      ENDF/B-IV MAT 1276                          UPDATED 08/12/94      4008016
    8      OXYGEN-16      ENDF/B-IV MAT 1276                          UPDATED 08/12/94      5008016
    9      OXYGEN-16      ENDF/B-IV MAT 1276                          UPDATED 08/12/94      7008016
   10     CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'            UPDATED 08/12/94      8024304
   11      MANGANESE-55   ENDF/B-IV MAT 1197                          UPDATED 08/12/94      8025055
   12     FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'            UPDATED 08/12/94      8026304
   13     NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'            UPDATED 08/12/94      8028304
   14      ZIRCALLOY      ENDF/B-IV MAT 1284                          UPDATED 08/12/94      3040302
   15     PB   1288 218NGP 042375 P-3 293K                            UPDATED 08/12/94      6082000
   16      URANIUM-235    ENDF/B-IV MAT 1261                          UPDATED 08/12/94      1092235
   17      URANIUM-238    ENDF/B-IV MAT 1262                          UPDATED 08/12/94      1092238

 HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94    2001001      TEMPERATURE=    293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94    4001001      TEMPERATURE=    293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94    5001001      TEMPERATURE=    293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94    7001001      TEMPERATURE=    293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94    1008016      TEMPERATURE=    293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94    2008016      TEMPERATURE=    293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94    4008016      TEMPERATURE=    293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94    5008016      TEMPERATURE=    293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94    7008016      TEMPERATURE=    293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED 08/12/94    8024304      TEMPERATURE=    293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 MANGANESE-55   ENDF/B-IV MAT 1197                   UPDATED 08/12/94    8025055      TEMPERATURE=    293.00

GEOMETRY HAS BEEN SET TO HOMOGENEOUS AS LBAR IS  0.0000E+00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)           =    54.466         TEMPERATURE(KELVIN)       =   293.000

POTENTIAL SCATTER SIGMA  =     2.590          LUMPED NUCLEAR DENSITY    = 1.7363295E-03

SPIN FACTOR (G)           =    14.448         LUMP DIMENSION (A-BAR)    = 0.0000000E+00

INNER RADIUS              = 0.0000000E+00     DANCOFF CORRECTION (C)    = 0.0000000E+00

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1    =    55.845           SIGMA(PER ABSORBER ATOM)= 3.4663022E+02

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2    =    55.925           SIGMA(PER ABSORBER ATOM)= 1.2557598E+02

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 0-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP        RES ABS         RES FISS        RES SCAT
  8      -5.518788E-04    0.000000E+00   -3.944190E-01
  9      -2.797993E-03    0.000000E+00   -2.293471E+00
 10      -3.291452E-01    0.000000E+00   -3.820862E+01
 11      -2.680562E+00    0.000000E+00   -1.159996E+02

EXCESS RESONANCE INTEGRALS

                  RESOLVED

ABSORPTION       3.33719E+00
FISSION          0.00000E+00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED 08/12/94    8026304      TEMPERATURE=    293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED 08/12/94    8028304      TEMPERATURE=    293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00
```

```
 ZIRCALLOY      ENDF/B-IV MAT 1284                    UPDATED 08/12/94   3040302     TEMPERATURE=   293.00

GEOMETRY HAS BEEN SET TO HOMOGENEOUS AS LBAR IS  0.0000E+00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)           =    90.436             TEMPERATURE(KELVIN)        =   293.000

POTENTIAL SCATTER SIGMA  =     6.385             LUMPED NUCLEAR DENSITY     = 4.3307818E-02

SPIN FACTOR (G)           =     1.079             LUMP DIMENSION (A-BAR)     = 0.0000000E+00

INNER RADIUS              = 0.0000000E+00         DANCOFF CORRECTION (C)     = 0.0000000E+00

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 0-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP        RES ABS          RES FISS          RES SCAT
  8      -2.531564E-03    0.000000E+00    -2.069429E+00
  9      -7.143981E-02    0.000000E+00    -3.266492E+00
 10      -7.703653E-02    0.000000E+00    -1.746459E+00
 11      -1.954898E-01    0.000000E+00    -8.103043E-01

EXCESS RESONANCE INTEGRALS

                   RESOLVED

ABSORPTION       1.75363E-01
FISSION          0.00000E+00
                                                        PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

PB   1288 218NGP 042375 P-3 293K                      UPDATED 08/12/94   6082000     TEMPERATURE=   293.00
                                                        PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 URANIUM-235    ENDF/B-IV MAT 1261                    UPDATED 08/12/94   1092235     TEMPERATURE=   293.00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)           =   233.025             TEMPERATURE(KELVIN)        =   293.000

POTENTIAL SCATTER SIGMA  =    11.500             LUMPED NUCLEAR DENSITY     = 1.1757837E-03

SPIN FACTOR (G)           = 15171.100             LUMP DIMENSION (A-BAR)     = 3.9840001E-01

INNER RADIUS              = 0.0000000E+00         DANCOFF CORRECTION (C)     = 2.8592249E-02

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1     =    15.991             SIGMA(PER ABSORBER ATOM)= 1.5361255E+02

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2     =   238.051             SIGMA(PER ABSORBER ATOM)= 2.3124234E+02

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 2-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP        RES ABS          RES FISS          RES SCAT
 12      -3.622922E+00    -2.226327E+00    -8.895820E-02
 13      -1.149924E+01    -5.618038E+00    -2.515855E-01
 14      -8.514027E+00    -5.049669E+00    -5.936050E-02
 15      -4.509439E-04    -3.428886E-04     3.897996E-06

EXCESS RESONANCE INTEGRALS

                   RESOLVED

ABSORPTION       2.00620E+02
FISSION          1.20254E+02
                                                        PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 URANIUM-238    ENDF/B-IV MAT 1262                    UPDATED 08/12/94   1092238     TEMPERATURE=   293.00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)           =   236.006             TEMPERATURE(KELVIN)        =   293.000

POTENTIAL SCATTER SIGMA  =    10.599             LUMPED NUCLEAR DENSITY     = 2.2057686E-02

SPIN FACTOR (G)           =   656.527             LUMP DIMENSION (A-BAR)     = 3.9840001E-01

INNER RADIUS              = 0.0000000E+00         DANCOFF CORRECTION (C)     = 2.8592249E-02

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1     =    15.991             SIGMA(PER ABSORBER ATOM)= 8.1883067E+00

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.
```

```
MASS OF MODERATOR-2     =    235.044              SIGMA(PER ABSORBER ATOM)= 6.3446152E-01

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 2-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP        RES ABS          RES FISS          RES SCAT
  9      -4.049280E-02    0.000000E+00    -4.083463E-01
 10      -1.062502E+00   -1.845288E-05    -6.511882E+00
 11      -9.720816E+00    0.000000E+00    -2.674516E+01
 12      -4.265190E+01    0.000000E+00    -4.960673E+01
 13      -5.341822E+01    0.000000E+00    -1.754942E+01
 14      -1.033681E+02    0.000000E+00    -6.023543E+00
 15      -5.894847E-07    0.000000E+00     1.142021E-06

EXCESS RESONANCE INTEGRALS

                  RESOLVED

ABSORPTION       2.10256E+01
FISSION          5.02353E-04
                                                PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00
     THIS XSDRN WORKING TAPE WAS CREATED 01/29/03 AT 11:02:25
     THE TITLE OF THE PARENT CASE IS AS FOLLOWS
     SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
        BASED ON ENDF-B VERSION 4 DATA
           COMPILED FOR NRC      1/27/89
         TAPE ID                          4321          NUMBER OF NUCLIDES                  17
         NUMBER OF NEUTRON GROUPS           27          NUMBER OF GAMMA GROUPS               0
         FIRST THERMAL GROUP                15          LOGICAL UNIT                         4
                                  TABLE OF CONTENTS
        HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94        ID   2001001
        HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94        ID   4001001
        HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94        ID   5001001
        HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94        ID   7001001
        OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94        ID   1008016
        OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94        ID   2008016
        OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94        ID   4008016
        OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94        ID   5008016
        OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94        ID   7008016
       CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED 08/12/94        ID   8024304
        MANGANESE-55   ENDF/B-IV MAT 1197                   UPDATED 08/12/94        ID   8025055
       FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED 08/12/94        ID   8026304
       NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED 08/12/94        ID   8028304
        ZIRCALLOY      ENDF/B-IV MAT 1284                   UPDATED 08/12/94        ID   3040302
       PB   1288 218NGP 042375 P-3 293K                     UPDATED 08/12/94        ID   6082000
        URANIUM-235    ENDF/B-IV MAT 1261                   UPDATED 08/12/94        ID   1092235
        URANIUM-238    ENDF/B-IV MAT 1262                   UPDATED 08/12/94        ID   1092238

         TAPE COPY USED       0 I/O'S, AND TOOK     0.05 SECONDS
```

```
KK          KK  EEEEEEEEEEEE  NN          NN   00000000000              VV          VV
KK         KK   EEEEEEEEEEEE  NNN         NN  0000000000000             VV          VV
KK        KK    EE            NNNN        NN  00         00             VV          VV
KK       KK     EE            NN NN       NN  00         00             VV          VV
KK      KK      EE            NN  NN      NN  00         00             VV          VV
KKKKKKKK        EEEEEEEEE     NN   NN     NN  00         00  ---------  VV          VV
KKKKKKKK        EEEEEEEEE     NN    NN    NN  00         00  ---------   VV        VV
KK      KK      EE            NN     NN   NN  00         00               VV      VV
KK       KK     EE            NN      NN  NN  00         00                VV    VV
KK        KK    EE            NN       NNNN   00         00                 VV  VV
KK         KK   EEEEEEEEEEEE  NN        NNN   0000000000000                  VVV
KK          KK  EEEEEEEEEEEE  NN         NN    00000000000                    V

 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL             EEEEEEEEEEEE                PPPPPPPPPPPP     CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL             EEEEEEEEEEEE                PPPPPPPPPPPPP   CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL             EE                          PP         PP   CC         CC
SS             CC             AA         AA  LL             EE                          PP         PP   CC
SS             CC             AA         AA  LL             EE                          PP         PP   CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL             EEEEEEEEE    -------------  PPPPPPPPPPPPP   CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL             EEEEEEEEE    -------------  PPPPPPPPPPPP    CC
          SS   CC             AA         AA  LL             EE                          PP              CC
          SS   CC             AA         AA  LL             EE                          PP              CC
SS         SS  CC         CC  AA         AA  LL             EE                          PP              CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLLL  EEEEEEEEEEEE                PP              CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLLL  EEEEEEEEEEEE                PP               CCCCCCCCCCC

   0000000         11            //   22222222222   99999999999         //    0000000     33333333333
  000000000       111           //   2222222222222  9999999999999      //    000000000   3333333333333
 00       00     1111          //    22          22 99         99     //    00       00  33         33
00         00      11         //                 22 99         99    //    00         00            33
00         00      11        //                  22 99         99   //     00         00            33
00         00      11       //                  22  9999999999999  //      00         00           333
00         00      11      //                 22     999999999999 //       00         00           333
00         00      11     //                22                 99//        00         00            33
00         00      11    //               22                   99/         00         00            33
 00       00       11   //              22                     99           00       00  33         33
  000000000     11111111 //             2222222222222 9999999999999  //      000000000   3333333333333
   0000000      11111111//              2222222222222 999999999999  //        0000000     33333333333

    11           11                   0000000      22222222222                22222222222   7777777777777
   111          111                  000000000    2222222222222              2222222222222  777777777777
  1111         1111          :::    00       00  22          22      :::    22          22  77        77
    11           11          :::    00       00              22      :::                22           77
    11           11          :::    00       00              22      :::                22          77
    11           11                 00       00            22                         22           77
    11           11                 00       00          22                         22             77
    11           11          :::    00       00        22            :::          22              77
    11           11          :::    00       00      22              :::        22                77
    11           11          :::     00     00     22                :::      22                 77
 11111111     11111111               000000000   2222222222222              2222222222222         77
 11111111     11111111                0000000    2222222222222              2222222222222         77
```

```
 SSSSSSSSSSS    CCCCCCCCCCC      AAAAAAAAA     LL              EEEEEEEEEEEEE                  PPPPPPPPPPPP     CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC    AAAAAAAAAAA    LL              EEEEEEEEEEEEE                  PPPPPPPPPPPPP   CCCCCCCCCCCCC
SS         SS  CC         CC   AA         AA   LL              EE                             PP         PP   CC         CC
SS             CC              AA         AA   LL              EE                             PP         PP   CC
SS             CC              AA         AA   LL              EE                             PP         PP   CC
SSSSSSSSSSSS   CC              AAAAAAAAAAAAA   LL              EEEEEEEEE      -------------   PPPPPPPPPPPPP   CC
 SSSSSSSSSSSS  CC              AAAAAAAAAAAAA   LL              EEEEEEEEE      -------------   PPPPPPPPPPPP    CC
           SS  CC              AA         AA   LL              EE                             PP              CC
           SS  CC              AA         AA   LL              EE                             PP              CC
SS         SS  CC         CC   AA         AA   LL              EE                             PP              CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                  PP              CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC    AA         AA   LLLLLLLLLLLLL   EEEEEEEEEEEEE                  PP               CCCCCCCCCCC
```

PROGRAM VERIFICATION INFORMATION

CODE SYSTEM: SCALE-PC VERSION: 4.3

PROGRAM:	000009
CREATION DATE:	03/08/96
VOLUME:	Eng
LIBRARY:	M:\SCALE43\WIN_NT\EXE
PRODUCTION CODE:	KENOVA
VERSION:	3.1
JOBNAME:	SCALE-PC
DATE OF EXECUTION:	01/29/03
TIME OF EXECUTION:	11:02:27

NAC-LWT, BWR, DAMAGED-SMALLER PIN SIZE, NO BASKET

****** NUMERIC PARAMETERS ******

TME	MAXIMUM PROBLEM TIME (MIN)	******
TBA	TIME PER GENERATION (MIN)	5.00
GEN	NUMBER OF GENERATIONS	803
NPG	NUMBER PER GENERATION	1000
NSK	NUMBER OF GENERATIONS TO BE SKIPPED	3
BEG	BEGINNING GENERATION NUMBER	1
RES	GENERATIONS BETWEEN CHECKPOINTS	0
X1D	NUMBER OF EXTRA 1-D CROSS SECTIONS	1
NBK	NEUTRON BANK SIZE	1025
XNB	EXTRA POSITIONS IN NEUTRON BANK	0
NFB	FISSION BANK SIZE	1000
XFB	EXTRA POSITIONS IN FISSION BANK	0
WTA	DEFAULT VALUE OF WEIGHT AVERAGE	0.5000
WTH	WEIGHT HIGH FOR SPLITTING	3.0000
WTL	WEIGHT LOW FOR RUSSIAN ROULETTE	0.3333
RND	STARTING RANDOM NUMBER	EB827100001
NB8	NUMBER OF D.A. BLOCKS ON UNIT 8	200
NL8	LENGTH OF D.A. BLOCKS ON UNIT 8	512
ADJ	MODE OF CALCULATION	FORWARD
	INPUT DATA WRITTEN ON RESTART UNIT	NO
	BINARY DATA INTERFACE	YES

```
***************************************************************************************************************
***************************************************************************************************************
***                                                                                                         ***
***                                NAC-LWT, BWR, DAMAGED-SMALLER PIN SIZE, NO BASKET                        ***
***                                                                                                         ***
***************************************************************************************************************
***                              ******       LOGICAL PARAMETERS       ******                               ***
***                                                                                                         ***
***  RUN  EXECUTE PROBLEM AFTER CHECKING DATA    YES          PLT  PLOT PICTURE MAP(S)                  NO ***
***                                                                                                         ***
***  FLX  COMPUTE FLUX                            NO          FDN  COMPUTE FISSION DENSITIES             NO ***
***                                                                                                         ***
***  SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION    NO          NUB  COMPUTE NU-BAR & AVG FISSION GROUP   YES ***
***                                                                                                         ***
***  MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER     NO          MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION NO ***
***                                                                                                         ***
***  CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER   NO          CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION NO ***
***                                                                                                         ***
***  FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER   NO          FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION NO ***
***                                                                                                         ***
***  MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER     NO          MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER  NO ***
***                                                                                                         ***
***  CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER   NO          CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER NO ***
***                                                                                                         ***
***  FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER   NO          FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER NO ***
***                                                                                                         ***
***  HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL    NO          HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL NO ***
***                                                                                                         ***
***  AMX  PRINT ALL MIXED CROSS SECTIONS          NO          FAR  PRINT FIS. AND ABS. BY REGION         NO ***
***                                                                                                         ***
***  XS1  PRINT 1-D MIXTURE X-SECTIONS            NO          GAS  PRINT FAR BY GROUP                    NO ***
***                                                                                                         ***
***  XS2  PRINT 2-D MIXTURE X-SECTIONS            NO          PAX  PRINT XSEC-ALBEDO CORRELATION TABLES  NO ***
***                                                                                                         ***
***  XAP  PRINT MIXTURE ANGLES & PROBABILITIES    NO          PWT  PRINT WEIGHT AVERAGE ARRAY            NO ***
***                                                                                                         ***
***  PKI  PRINT FISSION SPECTRUM                  NO          PGM  PRINT INPUT GEOMETRY                  NO ***
***                                                                                                         ***
***  P1D  PRINT EXTRA 1-D CROSS SECTIONS          NO          BUG  PRINT DEBUG INFORMATION               NO ***
***                                                                                                         ***
***                                                           TRK  PRINT TRACKING INFORMATION            NO ***
***                                                                                                         ***
***                                                                                                         ***
***************************************************************************************************************
***************************************************************************************************************
***************************************************************************************************************
                                        PARAMETER INPUT COMPLETED

                       ........    0 IO'S WERE USED READING THE PARAMETER DATA      ........

                        ************** DATA READING COMPLETED **************
                              NAC-LWT, BWR, DAMAGED-SMALLER PIN SIZE, NO BASKET

                                              MIXING TABLE

                                      NUMBER OF SCATTERING ANGLES =  2
                                    CROSS SECTION MESSAGE THRESHOLD =3.0E-05


MIXTURE =      1          DENSITY(G/CC) =  10.412
   NUCLIDE    ATOM-DENS.   WGT. FRAC.      ZA        AWT                NUCLIDE TITLE
   1008016  4.64669E-02  1.18500E-01     8016     15.9904        OXYGEN-16        ENDF/B-IV MAT 1276                          UPDATED
08/12/94
   1092235  1.17578E-03  4.40750E-02    92235    235.0441        URANIUM-235      ENDF/B-IV MAT 1261                          UPDATED
08/12/94
   1092238  2.20577E-02  8.37425E-01    92238    238.0510        URANIUM-238      ENDF/B-IV MAT 1262                          UPDATED
08/12/94

MIXTURE =      2          DENSITY(G/CC) =  0.99817
   NUCLIDE    ATOM-DENS.   WGT. FRAC.      ZA        AWT                NUCLIDE TITLE
   2001001  6.67692E-02  1.11927E-01     1001      1.0077        HYDROGEN         ENDF/B-IV MAT 1269/THRM1002                 UPDATED
08/12/94
   2008016  3.33846E-02  8.88074E-01     8016     15.9904        OXYGEN-16        ENDF/B-IV MAT 1276                          UPDATED
08/12/94

MIXTURE =      3          DENSITY(G/CC) =  6.5600
   NUCLIDE    ATOM-DENS.   WGT. FRAC.      ZA        AWT                NUCLIDE TITLE
   3040302  4.33078E-02  1.00000E+00    40000     91.2196        ZIRCALLOY        ENDF/B-IV MAT 1284                          UPDATED
08/12/94

MIXTURE =      4          DENSITY(G/CC) =  0.99817
   NUCLIDE    ATOM-DENS.   WGT. FRAC.      ZA        AWT                NUCLIDE TITLE
   4001001  6.67692E-02  1.11927E-01     1001      1.0077        HYDROGEN         ENDF/B-IV MAT 1269/THRM1002                 UPDATED
08/12/94
   4008016  3.33846E-02  8.88074E-01     8016     15.9904        OXYGEN-16        ENDF/B-IV MAT 1276                          UPDATED
08/12/94

MIXTURE =      5          DENSITY(G/CC) =  0.99817E-04
   NUCLIDE    ATOM-DENS.   WGT. FRAC.      ZA        AWT                NUCLIDE TITLE
   5001001  6.67692E-06  1.11927E-01     1001      1.0077        HYDROGEN         ENDF/B-IV MAT 1269/THRM1002                 UPDATED
08/12/94
   5008016  3.33846E-06  8.88074E-01     8016     15.9904        OXYGEN-16        ENDF/B-IV MAT 1276                          UPDATED
08/12/94
```

```
MIXTURE =      6          DENSITY(G/CC) =  11.344
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT                  NUCLIDE TITLE
   6082000  3.29690E-02  1.00000E+00   82000   207.2100     PB   1288 218NGP 042375 P-3 293K                            UPDATED
08/12/94

MIXTURE =      7          DENSITY(G/CC) = 0.99817E-04
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT                  NUCLIDE TITLE
   7001001  6.67692E-06  1.11927E-01    1001     1.0077      HYDROGEN       ENDF/B-IV MAT 1269/THRM1002                 UPDATED
08/12/94
   7008016  3.33846E-06  8.88074E-01    8016    15.9904      OXYGEN-16      ENDF/B-IV MAT 1276                          UPDATED
08/12/94

MIXTURE =      8          DENSITY(G/CC) =  7.9200
   NUCLIDE   ATOM-DENS.   WGT. FRAC.     ZA       AWT                  NUCLIDE TITLE
   8024304  1.74286E-02  1.90000E-01   24000    51.9957     CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED
08/12/94
   8025055  1.73633E-03  1.99999E-02   25055    54.9379      MANGANESE-55   ENDF/B-IV MAT 1197                          UPDATED
08/12/94
   8026304  5.93579E-02  6.95000E-01   26000    55.8447     FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED
08/12/94
   8028304  7.72070E-03  9.50001E-02   28000    58.6872     NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED
08/12/94


                          2001001     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94
                          4001001     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94
                          5001001     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94
                          7001001     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94
                          1008016     OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94
                          2008016     OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94
                          4008016     OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94
                          5008016     OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94
                          7008016     OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94
                          8024304    CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94
                          8025055     MANGANESE-55   ENDF/B-IV MAT 1197                      UPDATED 08/12/94
                          8026304    FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94
                          8028304    NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94
                          3040302     ZIRCALLOY      ENDF/B-IV MAT 1284                      UPDATED 08/12/94
                          6082000    PB   1288 218NGP 042375 P-3 293K                        UPDATED 08/12/94
                          1092235     URANIUM-235    ENDF/B-IV MAT 1261                      UPDATED 08/12/94
                          1092238     URANIUM-238    ENDF/B-IV MAT 1262                      UPDATED 08/12/94

KENO MESSAGE NUMBER K5-222       1 TRANSFERS FOR MIXTURE     2 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222       1 TRANSFERS FOR MIXTURE     4 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222       2 TRANSFERS FOR MIXTURE     5 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222       2 TRANSFERS FOR MIXTURE     7 WERE CORRECTED FOR BAD MOMENTS.

                            ........     0 IO'S WERE USED MIXING CROSS-SECTIONS       ........

                              1-D CROSS SECTION ARRAY ID NUMBERS
                                1  2002  1452    27    18  1018

                            ........     0 IO'S WERE USED PREPARING THE CROSS SECTIONS    ........
          ****************************************************************************************
          ***                                                                                  ***
          ***          NAC-LWT, BWR, DAMAGED-SMALLER PIN SIZE, NO BASKET                       ***
          ***                                                                                  ***
          ****************************************************************************************
          ****************************************************************************************
          ***                                                                                  ***
          ***                          ****** ADDITIONAL INFORMATION ******                    ***
          ***                                                                                  ***
          ***  NUMBER OF ENERGY GROUPS              27      USE LATTICE GEOMETRY           NO  ***
          ***                                                                                  ***
          ***  NO. OF FISSION SPECTRUM SOURCE GROUP  1      GLOBAL ARRAY NUMBER             0  ***
          ***                                                                                  ***
          ***  NO. OF SCATTERING ANGLES IN XSECS     2      NUMBER OF UNITS IN THE GLOBAL X DIR.   0  ***
          ***                                                                                  ***
          ***  ENTRIES/NEUTRON IN THE NEUTRON BANK  17      NUMBER OF UNITS IN THE GLOBAL Y DIR.   0  ***
          ***                                                                                  ***
          ***  ENTRIES/NEUTRON IN THE FISSION BANK  10      NUMBER OF UNITS IN THE GLOBAL Z DIR.   0  ***
          ***                                                                                  ***
          ***  NUMBER OF MIXTURES USED               6      USE A GLOBAL REFLECTOR        YES  ***
          ***                                                                                  ***
          ***  NUMBER OF BIAS ID'S USED              1      USE NESTED HOLES               NO  ***
          ***                                                                                  ***
          ***  NUMBER OF DIFFERENTIAL ALBEDOS USED   0      NUMBER OF HOLES                61  ***
          ***                                                                                  ***
          ***  TOTAL INPUT GEOMETRY REGIONS         10      MAXIMUM HOLE NESTING LEVEL      1  ***
          ***                                                                                  ***
          ***  NUMBER OF GEOMETRY REGIONS USED      10      USE NESTED ARRAYS              NO  ***
          ***                                                                                  ***
          ***  LARGEST GEOMETRY UNIT NUMBER          2      NUMBER OF ARRAYS USED           0  ***
          ***                                                                                  ***
          ***  LARGEST ARRAY NUMBER                  1      MAXIMUM ARRAY NESTING LEVEL     0  ***
          ***                                                                                  ***
          ***                                                                                  ***
          ***  +X BOUNDARY CONDITION               MIR      -X BOUNDARY CONDITION         MIR  ***
          ***                                                                                  ***
          ***  +Y BOUNDARY CONDITION               MIR      -Y BOUNDARY CONDITION         MIR  ***
```

```
***                                                                                   ***
***  +Z BOUNDARY CONDITION          MIR        -Z BOUNDARY CONDITION            MIR  ***
***                                                                                   ***
*****************************************************************************************
```

```
                                         NAC-LWT, BWR, DAMAGED-SMALLER PIN SIZE, NO BASKET

                   MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION              NUM   ID

                                                     -----  UNIT     1   -----

LWR FUEL ROD-NO CLAD

  1 CYLINDER          1   1  RADIUS = 0.39840     +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  2 CYLINDER          4   1  RADIUS = 0.40490     +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
                                         NAC-LWT, BWR, DAMAGED-SMALLER PIN SIZE, NO BASKET

                   MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION              NUM   ID

                                         ******************  GLOBAL  *****************
                                                     -----  UNIT     2   -----

  1 CYLINDER          4   1  RADIUS =  9.0166     +Z =  10.000     -Z = -10.000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000
    HOLE NUMBER       1        AT X = 0.00000      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER       2        AT X =  2.1529      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER       3        AT X =  1.0764      Y =  1.8645      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER       4        AT X = -1.0764      Y =  1.8645      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER       5        AT X = -2.1529      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER       6        AT X = -1.0764      Y = -1.8645      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER       7        AT X =  1.0764      Y = -1.8645      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER       8        AT X =  3.2293      Y = -1.8645      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER       9        AT X =  4.3058      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      10        AT X =  3.2293      Y =  1.8645      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      11        AT X =  2.1529      Y =  3.7289      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      12        AT X = 0.00000      Y =  3.7289      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      13        AT X = -2.1529      Y =  3.7289      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      14        AT X = -3.2293      Y =  1.8645      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      15        AT X = -4.3058      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      16        AT X = -3.2293      Y = -1.8645      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      17        AT X = -2.1529      Y = -3.7289      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      18        AT X = 0.00000      Y = -3.7289      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      19        AT X =  2.1529      Y = -3.7289      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      20        AT X =  4.3058      Y = -3.7289      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      21        AT X =  5.3822      Y =  1.8645      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      22        AT X =  1.0764      Y =  5.5934      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      23        AT X = -4.3058      Y =  3.7289      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      24        AT X = -5.3822      Y = -1.8645      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      25        AT X = -1.0764      Y = -5.5934      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      26        AT X =  1.0764      Y = -5.5934      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      27        AT X =  4.3058      Y =  3.7289      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      28        AT X =  3.2293      Y =  5.5934      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      29        AT X = -1.0764      Y =  5.5934      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      30        AT X = -4.3058      Y = -3.7289      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      31        AT X = -3.2293      Y = -5.5934      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      32        AT X =  3.2293      Y = -5.5934      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      33        AT X =  5.3822      Y = -1.8645      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      34        AT X = -3.2293      Y =  5.5934      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      35        AT X = -5.3822      Y =  1.8645      Z = 0.00000     IS UNIT NUMBER        1
    HOLE NUMBER      36        AT X =  6.4587      Y = 0.00000      Z = 0.00000     IS UNIT NUMBER        1
```

```
    HOLE NUMBER    37      AT X = -6.4587     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER      1
    HOLE NUMBER    38      AT X = 0.00000     Y = -7.4578      Z = 0.00000     IS UNIT NUMBER      1
    HOLE NUMBER    39      AT X =  2.1529     Y = -7.4578      Z = 0.00000     IS UNIT NUMBER      1
    HOLE NUMBER    40      AT X =  4.3058     Y = -7.4578      Z = 0.00000     IS UNIT NUMBER      1
    HOLE NUMBER    41      AT X =  5.3822     Y = -5.5934      Z = 0.00000     IS UNIT NUMBER      1
    HOLE NUMBER    42      AT X =  6.4587     Y = -3.7289      Z = 0.00000     IS UNIT NUMBER      1
    HOLE NUMBER    43      AT X =  7.5351     Y = -1.8645      Z = 0.00000     IS UNIT NUMBER      1
    HOLE NUMBER    44      AT X =  8.6116     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER      1
    HOLE NUMBER    45      AT X =  7.5351     Y =   1.8645     Z = 0.00000     IS UNIT NUMBER      1
    HOLE NUMBER    46      AT X =  6.4587     Y =   3.7289     Z = 0.00000     IS UNIT NUMBER      1
    HOLE NUMBER    47      AT X =  5.3822     Y =   5.5934     Z = 0.00000     IS UNIT NUMBER      1
    HOLE NUMBER    48      AT X =  4.3058     Y =   7.4578     Z = 0.00000     IS UNIT NUMBER      1
    HOLE NUMBER    49      AT X =  2.1529     Y =   7.4578     Z = 0.00000     IS UNIT NUMBER      1
    HOLE NUMBER    50      AT X = 0.00000     Y =   7.4578     Z = 0.00000     IS UNIT NUMBER      1
    HOLE NUMBER    51      AT X = -2.1529     Y =   7.4578     Z = 0.00000     IS UNIT NUMBER      1
    HOLE NUMBER    52      AT X = -4.3058     Y =   7.4578     Z = 0.00000     IS UNIT NUMBER      1
    HOLE NUMBER    53      AT X = -5.3822     Y =   5.5934     Z = 0.00000     IS UNIT NUMBER      1
    HOLE NUMBER    54      AT X = -6.4587     Y =   3.7289     Z = 0.00000     IS UNIT NUMBER      1
    HOLE NUMBER    55      AT X = -7.5351     Y =   1.8645     Z = 0.00000     IS UNIT NUMBER      1
    HOLE NUMBER    56      AT X = -8.6116     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER      1
    HOLE NUMBER    57      AT X = -7.5351     Y = -1.8645      Z = 0.00000     IS UNIT NUMBER      1
    HOLE NUMBER    58      AT X = -6.4587     Y = -3.7289      Z = 0.00000     IS UNIT NUMBER      1
    HOLE NUMBER    59      AT X = -5.3822     Y = -5.5934      Z = 0.00000     IS UNIT NUMBER      1
    HOLE NUMBER    60      AT X = -4.3058     Y = -7.4578      Z = 0.00000     IS UNIT NUMBER      1
    HOLE NUMBER    61      AT X = -2.1529     Y = -7.4578      Z = 0.00000     IS UNIT NUMBER      1
  2 CYLINDER        5   1  RADIUS =  16.986    +Z =  10.000    -Z = -10.000   CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  3 CYLINDER        8   1  RADIUS =  16.898    +Z =  10.000    -Z = -10.000   CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  4 CYLINDER        6   1  RADIUS =  33.503    +Z =  10.000    -Z = -10.000   CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  5 CYLINDER        8   1  RADIUS =  36.551    +Z =  10.000    -Z = -10.000   CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  6 CYLINDER        7   1  RADIUS =  49.244    +Z =  10.000    -Z = -10.000   CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  7 CYLINDER        8   1  RADIUS =  49.822    +Z =  10.000    -Z = -10.000   CENTERLINE IS AT  X = 0.00000     Y = 0.00000
  8 CUBOID          5   1      +X =  49.822    -X = -49.822    +Y =  49.822   -Y = -49.822     +Z =  10.000    -Z = -10.000

                                         NAC-LWT, BWR, DAMAGED-SMALLER PIN SIZE, NO BASKET
                                        VOLUMES FOR THOSE UNITS UTILIZED IN  THIS PROBLEM

                                   GEOMETRY                                   CUMULATIVE
                 UNIT    REGION     REGION          VOLUME                      VOLUME

                  1         1         1         9.97283E+00 CM**3         9.97283E+00 CM**3
                            2         2         3.28074E-01 CM**3         1.03009E+01 CM**3

                  2         1         3         4.47982E+03 CM**3         5.10817E+03 CM**3
                            2         4         1.30210E+04 CM**3         1.81291E+04 CM**3
                            3         5         4.30932E+03 CM**3         2.24385E+04 CM**3
                            4         6         4.80855E+04 CM**3         7.05240E+04 CM**3
                            5         7         1.34160E+04 CM**3         8.39400E+04 CM**3
                            6         8         6.84274E+04 CM**3         1.52367E+05 CM**3
                            7         9         3.59652E+03 CM**3         1.55964E+05 CM**3
                            8        10         4.26155E+04 CM**3         1.98579E+05 CM**3


                                        UNIT      USES     REGION      MIXTURE        TOTAL VOLUME

                                          1        61        1            1         6.08343E+02 CM**3
                                                             2            4         2.00125E+01 CM**3

                                          2         1        1            4         4.47982E+03 CM**3
                                                             2            5         1.30210E+04 CM**3
                                                             3            8         4.30932E+03 CM**3
                                                             4            6         4.80855E+04 CM**3
                                                             5            8         1.34160E+04 CM**3
                                                             6            7         6.84274E+04 CM**3
```

7	8	3.59652E+03 CM**3
8	5	4.26155E+04 CM**3

TOTAL MIXTURE VOLUMES

MIXTURE	TOTAL VOLUME	MASS(G)
1	6.08343E+02 CM**3	6.33405E+03
4	4.49984E+03 CM**3	4.49161E+03
5	5.56365E+04 CM**3	5.55347E+00
6	4.60855E+04 CM**3	5.45482E+05
7	6.84274E+04 CM**3	6.83022E+00
8	2.13218E+04 CM**3	1.68869E+05

```
**********************************************************************************************
***                                                                                        ***
***                                  BIASING INFORMATION                                   ***
***                                                                                        ***
***   A DEFAULT WEIGHT OF    0.500 WILL BE USED FOR ALL BIAS ID'S.                         ***
***                                                                                        ***
**********************************************************************************************
```

.... 0 IO'S WERE USED IN KENO-V BEFORE TRACKING ....

.... 0.00450 MINUTES WERE USED PROCESSING DATA. ....

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 3.06347E-03

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED UNIFORMLY THROUGHOUT THE ENTIRE VOLUME DEFINED BY THE OUTERMOST GEOMETRY CARD.
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

KENO MESSAGE NUMBER K5-105 ***** WARNING, ONLY 481 INDEPENDENT STARTING POSITIONS WERE GENERATED. *****

519 ADDITIONAL STARTING POINTS WERE PICKED FROM THE INITAL DISTRIBUTION.

4.49650 MINUTES WERE REQUIRED FOR STARTING. TOTAL ELAPSED TIME IS 4.50133 MINUTES.

NAC-LWT, BWR, DAMAGED-SMALLER PIN SIZE, NO BASKET

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	908 INDEPENDENT FISSION POINTS WERE GENERATED			
1	8.45376E-01	4.52667E+00	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	897 INDEPENDENT FISSION POINTS WERE GENERATED			
2	8.37583E-01	4.55700E+00	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	955 INDEPENDENT FISSION POINTS WERE GENERATED			
3	8.80673E-01	4.58617E+00	8.80673E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	8.86922E-01	4.61650E+00	8.83798E-01	3.12465E-03	0.00000E+00	0.00000E+00
5	8.45497E-01	4.64667E+00	8.71031E-01	1.28937E-02	0.00000E+00	0.00000E+00
6	8.83555E-01	4.67683E+00	8.74162E-01	9.63994E-03	0.00000E+00	0.00000E+00
7	9.28339E-01	4.70800E+00	8.84997E-01	1.31591E-02	0.00000E+00	0.00000E+00
8	8.58053E-01	4.73817E+00	8.80507E-01	1.16450E-02	0.00000E+00	0.00000E+00
9	8.74480E-01	4.76833E+00	8.79646E-01	9.87945E-03	0.00000E+00	0.00000E+00
10	8.70549E-01	4.79767E+00	8.78509E-01	8.63108E-03	0.00000E+00	0.00000E+00
11	8.33818E-01	4.82883E+00	8.73543E-01	9.08838E-03	0.00000E+00	0.00000E+00
12	9.03332E-01	4.85817E+00	8.76522E-01	8.65753E-03	0.00000E+00	0.00000E+00
13	9.06360E-01	4.88733E+00	8.79234E-01	8.28752E-03	0.00000E+00	0.00000E+00
14	8.74883E-01	4.91767E+00	8.78872E-01	7.57412E-03	0.00000E+00	0.00000E+00
15	8.60739E-01	4.94783E+00	8.77477E-01	7.10543E-03	0.00000E+00	0.00000E+00
16	8.56786E-01	4.97800E+00	8.75999E-01	6.74233E-03	0.00000E+00	0.00000E+00
17	8.46416E-01	5.00817E+00	8.74027E-01	6.57931E-03	0.00000E+00	0.00000E+00
18	8.79714E-01	5.03750E+00	8.74382E-01	6.16463E-03	0.00000E+00	0.00000E+00
19	8.77155E-01	5.06867E+00	8.74545E-01	5.79296E-03	0.00000E+00	0.00000E+00
20	8.90755E-01	5.09883E+00	8.75446E-01	5.53540E-03	0.00000E+00	0.00000E+00
21	8.41781E-01	5.12900E+00	8.73674E-01	5.52762E-03	0.00000E+00	0.00000E+00
22	8.74472E-01	5.15833E+00	8.73714E-01	5.24411E-03	0.00000E+00	0.00000E+00
23	8.71497E-01	5.18850E+00	8.73608E-01	4.98926E-03	0.00000E+00	0.00000E+00
24	8.52134E-01	5.21883E+00	8.72632E-01	4.85619E-03	0.00000E+00	0.00000E+00
25	8.74281E-01	5.24983E+00	8.72704E-01	4.64080E-03	0.00000E+00	0.00000E+00
26	8.85942E-01	5.28017E+00	8.73256E-01	4.47733E-03	0.00000E+00	0.00000E+00
27	8.85020E-01	5.30933E+00	8.73726E-01	4.32021E-03	0.00000E+00	0.00000E+00
28	8.79802E-01	5.34600E+00	8.73960E-01	4.15730E-03	0.00000E+00	0.00000E+00
29	9.00154E-01	5.37433E+00	8.74930E-01	4.11632E-03	0.00000E+00	0.00000E+00
30	8.77230E-01	5.40467E+00	8.75012E-01	3.96744E-03	0.00000E+00	0.00000E+00
31	8.74786E-01	5.43483E+00	8.75004E-01	3.82820E-03	0.00000E+00	0.00000E+00
32	8.66097E-01	5.46500E+00	8.74707E-01	3.71029E-03	0.00000E+00	0.00000E+00
33	9.01664E-01	5.49617E+00	8.75577E-01	3.69246E-03	0.00000E+00	0.00000E+00
34	8.85437E-01	5.52633E+00	8.75885E-01	3.58846E-03	0.00000E+00	0.00000E+00
35	9.13722E-01	5.55750E+00	8.77032E-01	3.66213E-03	0.00000E+00	0.00000E+00
36	8.81820E-01	5.58950E+00	8.77173E-01	3.55558E-03	0.00000E+00	0.00000E+00
37	8.77272E-01	5.62067E+00	8.77175E-01	3.45250E-03	0.00000E+00	0.00000E+00
38	8.67048E-01	5.65083E+00	8.76894E-01	3.36700E-03	0.00000E+00	0.00000E+00
39	8.51994E-01	5.68200E+00	8.76221E-01	3.34317E-03	0.00000E+00	0.00000E+00
40	9.11647E-01	5.71133E+00	8.77153E-01	3.38492E-03	0.00000E+00	0.00000E+00
41	8.45714E-01	5.74233E+00	8.76347E-01	3.39410E-03	0.00000E+00	0.00000E+00
42	9.01285E-01	5.77350E+00	8.76971E-01	3.36640E-03	0.00000E+00	0.00000E+00
43	8.62713E-01	5.80367E+00	8.76623E-01	3.30163E-03	0.00000E+00	0.00000E+00
44	8.57230E-01	5.83483E+00	8.76161E-01	3.25498E-03	0.00000E+00	0.00000E+00
45	9.20496E-01	5.86500E+00	8.77192E-01	3.34143E-03	0.00000E+00	0.00000E+00
46	9.16825E-01	5.89533E+00	8.78093E-01	3.38659E-03	0.00000E+00	0.00000E+00
47	8.94214E-01	5.92550E+00	8.78451E-01	3.32981E-03	0.00000E+00	0.00000E+00
48	8.80536E-01	5.95567E+00	8.78497E-01	3.25693E-03	0.00000E+00	0.00000E+00

49	9.20884E-01	5.98583E+00	8.79398E-01	3.31203E-03	0.00000E+00	0.00000E+00
50	8.65345E-01	6.01700E+00	8.79106E-01	3.25549E-03	0.00000E+00	0.00000E+00
51	8.61374E-01	6.04717E+00	8.78744E-01	3.20883E-03	0.00000E+00	0.00000E+00
52	9.03797E-01	6.07750E+00	8.79245E-01	3.18367E-03	0.00000E+00	0.00000E+00
53	8.88499E-01	6.10767E+00	8.79426E-01	3.12590E-03	0.00000E+00	0.00000E+00
54	8.80169E-01	6.13783E+00	8.79441E-01	3.06523E-03	0.00000E+00	0.00000E+00
55	8.39095E-01	6.16817E+00	8.78679E-01	3.10170E-03	0.00000E+00	0.00000E+00
56	9.04921E-01	6.19733E+00	8.79165E-01	3.08227E-03	0.00000E+00	0.00000E+00
57	8.69452E-01	6.22767E+00	8.78989E-01	3.03086E-03	0.00000E+00	0.00000E+00
58	8.66438E-01	6.25783E+00	8.78765E-01	2.98467E-03	0.00000E+00	0.00000E+00
59	8.71472E-01	6.28800E+00	8.78637E-01	2.93463E-03	0.00000E+00	0.00000E+00
60	8.70936E-01	6.31817E+00	8.78504E-01	2.88665E-03	0.00000E+00	0.00000E+00
61	8.59501E-01	6.35300E+00	8.78182E-01	2.85552E-03	0.00000E+00	0.00000E+00
62	8.79164E-01	6.38233E+00	8.78198E-01	2.80757E-03	0.00000E+00	0.00000E+00
63	8.97505E-01	6.41350E+00	8.78515E-01	2.77924E-03	0.00000E+00	0.00000E+00
64	8.66248E-01	6.44367E+00	8.78317E-01	2.74120E-03	0.00000E+00	0.00000E+00
65	8.85619E-01	6.47383E+00	8.78433E-01	2.69983E-03	0.00000E+00	0.00000E+00
66	8.67912E-01	6.50400E+00	8.78268E-01	2.66239E-03	0.00000E+00	0.00000E+00
67	9.00522E-01	6.53433E+00	8.78611E-01	2.64337E-03	0.00000E+00	0.00000E+00
68	9.17615E-01	6.56350E+00	8.79202E-01	2.66926E-03	0.00000E+00	0.00000E+00
69	8.36897E-01	6.59383E+00	8.78570E-01	2.70387E-03	0.00000E+00	0.00000E+00
70	8.83156E-01	6.62400E+00	8.78638E-01	2.66467E-03	0.00000E+00	0.00000E+00
71	8.40439E-01	6.65333E+00	8.78084E-01	2.68349E-03	0.00000E+00	0.00000E+00
72	8.57176E-01	6.68350E+00	8.77785E-01	2.66169E-03	0.00000E+00	0.00000E+00
73	9.00485E-01	6.71367E+00	8.78105E-01	2.64334E-03	0.00000E+00	0.00000E+00

.
.
.
.

761	8.95618E-01	2.74152E+01	8.84167E-01	8.22052E-04	0.00000E+00	0.00000E+00
762	9.04177E-01	2.74443E+01	8.84194E-01	8.21392E-04	0.00000E+00	0.00000E+00
763	8.59740E-01	2.74747E+01	8.84161E-01	8.20941E-04	0.00000E+00	0.00000E+00
764	8.96777E-01	2.75048E+01	8.84178E-01	8.20030E-04	0.00000E+00	0.00000E+00
765	8.62650E-01	2.75350E+01	8.84150E-01	8.19441E-04	0.00000E+00	0.00000E+00
766	8.74845E-01	2.75662E+01	8.84138E-01	8.18458E-04	0.00000E+00	0.00000E+00
767	9.18491E-01	2.75955E+01	8.84183E-01	8.18620E-04	0.00000E+00	0.00000E+00
768	8.79583E-01	2.76265E+01	8.84177E-01	8.17573E-04	0.00000E+00	0.00000E+00
769	8.77626E-01	2.76568E+01	8.84168E-01	8.16551E-04	0.00000E+00	0.00000E+00
770	8.90662E-01	2.76870E+01	8.84176E-01	8.15531E-04	0.00000E+00	0.00000E+00
771	8.44109E-01	2.77163E+01	8.84124E-01	8.16134E-04	0.00000E+00	0.00000E+00
772	9.07444E-01	2.77465E+01	8.84155E-01	8.15636E-04	0.00000E+00	0.00000E+00
773	8.93137E-01	2.77767E+01	8.84166E-01	8.14661E-04	0.00000E+00	0.00000E+00
774	8.72167E-01	2.78060E+01	8.84151E-01	8.13754E-04	0.00000E+00	0.00000E+00
775	8.45577E-01	2.78362E+01	8.84101E-01	8.14231E-04	0.00000E+00	0.00000E+00
776	8.58480E-01	2.78655E+01	8.84068E-01	8.13851E-04	0.00000E+00	0.00000E+00
777	8.88107E-01	2.78967E+01	8.84073E-01	8.12817E-04	0.00000E+00	0.00000E+00
778	8.34017E-01	2.79268E+01	8.84008E-01	8.14328E-04	0.00000E+00	0.00000E+00
779	8.79187E-01	2.79570E+01	8.84002E-01	8.13303E-04	0.00000E+00	0.00000E+00
780	8.97408E-01	2.79863E+01	8.84019E-01	8.12440E-04	0.00000E+00	0.00000E+00
781	8.97252E-01	2.80165E+01	8.84036E-01	8.11574E-04	0.00000E+00	0.00000E+00
782	8.57075E-01	2.80467E+01	8.84002E-01	8.11270E-04	0.00000E+00	0.00000E+00
783	8.38060E-01	2.80760E+01	8.83943E-01	8.12363E-04	0.00000E+00	0.00000E+00
784	8.60428E-01	2.81053E+01	8.83913E-01	8.11880E-04	0.00000E+00	0.00000E+00
785	8.86224E-01	2.81365E+01	8.83916E-01	8.10848E-04	0.00000E+00	0.00000E+00
786	8.86131E-01	2.81657E+01	8.83919E-01	8.09818E-04	0.00000E+00	0.00000E+00
787	9.04482E-01	2.81950E+01	8.83945E-01	8.09210E-04	0.00000E+00	0.00000E+00
788	8.67352E-01	2.82262E+01	8.83924E-01	8.08456E-04	0.00000E+00	0.00000E+00
789	8.77743E-01	2.82555E+01	8.83916E-01	8.07466E-04	0.00000E+00	0.00000E+00
790	8.79401E-01	2.82857E+01	8.83910E-01	8.06461E-04	0.00000E+00	0.00000E+00
791	8.92073E-01	2.83150E+01	8.83921E-01	8.05504E-04	0.00000E+00	0.00000E+00
792	8.42610E-01	2.83533E+01	8.83868E-01	8.06182E-04	0.00000E+00	0.00000E+00
793	9.08908E-01	2.83845E+01	8.83900E-01	8.05784E-04	0.00000E+00	0.00000E+00
794	9.13945E-01	2.84147E+01	8.83938E-01	8.05660E-04	0.00000E+00	0.00000E+00
795	8.71704E-01	2.84450E+01	8.83922E-01	8.04791E-04	0.00000E+00	0.00000E+00
796	8.87139E-01	2.84752E+01	8.83927E-01	8.03787E-04	0.00000E+00	0.00000E+00
797	9.24523E-01	2.85063E+01	8.83978E-01	8.04398E-04	0.00000E+00	0.00000E+00
798	9.03145E-01	2.85365E+01	8.84002E-01	8.03747E-04	0.00000E+00	0.00000E+00
799	8.61744E-01	2.85667E+01	8.83974E-01	8.03224E-04	0.00000E+00	0.00000E+00
800	8.82639E-01	2.85978E+01	8.83972E-01	8.02218E-04	0.00000E+00	0.00000E+00
801	8.97474E-01	2.86280E+01	8.83989E-01	8.01392E-04	0.00000E+00	0.00000E+00
802	9.02853E-01	2.86582E+01	8.84013E-01	8.00737E-04	0.00000E+00	0.00000E+00
803	8.68867E-01	2.86893E+01	8.83994E-01	7.99960E-04	0.00000E+00	0.00000E+00

KENO MESSAGE NUMBER K5-123 EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

NAC-LWT, BWR, DAMAGED-SMALLER PIN SIZE, NO BASKET

LIFETIME = 1.15441E-04 + OR - 1.79468E-07 GENERATION TIME = 6.46672E-05 + OR - 9.48936E-08
NU BAR = 2.42733E+00 + OR - 3.91487E-05 AVERAGE FISSION GROUP = 2.36688E+01 + OR - 2.79417E-03
ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION = 6.78645E-02 + OR - 1.70118E-04

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.88400	+ OR - 0.00080	0.88320 TO 0.88480	0.88240 TO 0.88560	0.88159 TO 0.88640	800000
4	0.88399	+ OR - 0.00080	0.88319 TO 0.88480	0.88239 TO 0.88560	0.88159 TO 0.88640	799000
5	0.88404	+ OR - 0.00080	0.88324 TO 0.88484	0.88244 TO 0.88565	0.88164 TO 0.88645	798000
6	0.88404	+ OR - 0.00080	0.88324 TO 0.88485	0.88244 TO 0.88565	0.88164 TO 0.88645	797000
7	0.88399	+ OR - 0.00080	0.88319 TO 0.88479	0.88238 TO 0.88559	0.88158 TO 0.88639	796000

8	0.88402	+ OR - 0.00080	0.88322 TO 0.88482	0.88242 TO 0.88562	0.88161 TO 0.88643	795000
9	0.88403	+ OR - 0.00080	0.88323 TO 0.88483	0.88243 TO 0.88564	0.88162 TO 0.88644	794000
10	0.88405	+ OR - 0.00080	0.88325 TO 0.88485	0.88244 TO 0.88566	0.88164 TO 0.88646	793000
11	0.88411	+ OR - 0.00080	0.88331 TO 0.88491	0.88251 TO 0.88572	0.88171 TO 0.88652	792000
12	0.88409	+ OR - 0.00080	0.88329 TO 0.88489	0.88248 TO 0.88569	0.88168 TO 0.88650	791000
17	0.88418	+ OR - 0.00080	0.88338 TO 0.88499	0.88257 TO 0.88579	0.88177 TO 0.88660	786000
22	0.88426	+ OR - 0.00081	0.88345 TO 0.88506	0.88264 TO 0.88587	0.88183 TO 0.88668	781000
27	0.88432	+ OR - 0.00081	0.88351 TO 0.88514	0.88270 TO 0.88595	0.88189 TO 0.88676	776000
32	0.88435	+ OR - 0.00082	0.88354 TO 0.88517	0.88272 TO 0.88599	0.88191 TO 0.88680	771000
37	0.88431	+ OR - 0.00082	0.88349 TO 0.88513	0.88266 TO 0.88595	0.88184 TO 0.88677	766000
42	0.88436	+ OR - 0.00082	0.88354 TO 0.88518	0.88272 TO 0.88601	0.88190 TO 0.88683	761000
47	0.88432	+ OR - 0.00082	0.88350 TO 0.88515	0.88268 TO 0.88597	0.88185 TO 0.88679	756000
52	0.88431	+ OR - 0.00083	0.88348 TO 0.88514	0.88266 TO 0.88596	0.88183 TO 0.88679	751000
57	0.88436	+ OR - 0.00083	0.88353 TO 0.88519	0.88271 TO 0.88602	0.88188 TO 0.88685	746000
62	0.88446	+ OR - 0.00083	0.88363 TO 0.88530	0.88280 TO 0.88613	0.88197 TO 0.88696	741000
67	0.88447	+ OR - 0.00084	0.88363 TO 0.88531	0.88280 TO 0.88614	0.88196 TO 0.88698	736000
72	0.88459	+ OR - 0.00084	0.88375 TO 0.88542	0.88292 TO 0.88626	0.88208 TO 0.88710	731000
77	0.88456	+ OR - 0.00084	0.88372 TO 0.88540	0.88289 TO 0.88624	0.88205 TO 0.88707	726000
82	0.88454	+ OR - 0.00084	0.88370 TO 0.88538	0.88286 TO 0.88622	0.88202 TO 0.88706	721000
87	0.88460	+ OR - 0.00085	0.88375 TO 0.88545	0.88291 TO 0.88629	0.88206 TO 0.88714	716000
92	0.88455	+ OR - 0.00085	0.88370 TO 0.88539	0.88285 TO 0.88624	0.88201 TO 0.88708	711000

NAC-LWT, BWR, DAMAGED-SMALLER PIN SIZE, NO BASKET

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
97	0.88453	+ OR - 0.00085	0.88368 TO 0.88538	0.88283 TO 0.88623	0.88198 TO 0.88707	706000
102	0.88458	+ OR - 0.00085	0.88373 TO 0.88544	0.88288 TO 0.88629	0.88202 TO 0.88714	701000
107	0.88454	+ OR - 0.00086	0.88368 TO 0.88539	0.88282 TO 0.88625	0.88196 TO 0.88711	696000
112	0.88448	+ OR - 0.00086	0.88362 TO 0.88534	0.88276 TO 0.88620	0.88190 TO 0.88706	691000
117	0.88453	+ OR - 0.00086	0.88367 TO 0.88539	0.88280 TO 0.88626	0.88194 TO 0.88712	686000
122	0.88440	+ OR - 0.00087	0.88354 TO 0.88527	0.88267 TO 0.88613	0.88180 TO 0.88700	681000
127	0.88446	+ OR - 0.00087	0.88359 TO 0.88533	0.88272 TO 0.88620	0.88185 TO 0.88707	676000
132	0.88446	+ OR - 0.00087	0.88359 TO 0.88534	0.88271 TO 0.88621	0.88184 TO 0.88708	671000
137	0.88452	+ OR - 0.00088	0.88364 TO 0.88540	0.88277 TO 0.88628	0.88189 TO 0.88716	666000
142	0.88450	+ OR - 0.00088	0.88362 TO 0.88538	0.88274 TO 0.88626	0.88186 TO 0.88714	661000
147	0.88442	+ OR - 0.00088	0.88354 TO 0.88531	0.88265 TO 0.88619	0.88177 TO 0.88708	656000
642	0.88538	+ OR - 0.00178	0.88360 TO 0.88716	0.88182 TO 0.88894	0.88004 TO 0.89072	161000
647	0.88504	+ OR - 0.00181	0.88323 TO 0.88685	0.88143 TO 0.88866	0.87962 TO 0.89047	156000
652	0.88545	+ OR - 0.00182	0.88363 TO 0.88727	0.88180 TO 0.88909	0.87998 TO 0.89092	151000
657	0.88593	+ OR - 0.00185	0.88408 TO 0.88778	0.88223 TO 0.88963	0.88038 TO 0.89149	146000
662	0.88551	+ OR - 0.00187	0.88364 TO 0.88737	0.88178 TO 0.88924	0.87991 TO 0.89110	141000
667	0.88551	+ OR - 0.00192	0.88358 TO 0.88743	0.88166 TO 0.88936	0.87974 TO 0.89128	136000
672	0.88579	+ OR - 0.00197	0.88382 TO 0.88777	0.88185 TO 0.88974	0.87988 TO 0.89171	131000
677	0.88515	+ OR - 0.00200	0.88316 TO 0.88715	0.88116 TO 0.88914	0.87916 TO 0.89114	126000
682	0.88487	+ OR - 0.00206	0.88281 TO 0.88693	0.88075 TO 0.88898	0.87870 TO 0.89104	121000
687	0.88419	+ OR - 0.00212	0.88207 TO 0.88631	0.87995 TO 0.88842	0.87783 TO 0.89054	116000
692	0.88499	+ OR - 0.00217	0.88282 TO 0.88717	0.88065 TO 0.88934	0.87847 TO 0.89152	111000
697	0.88424	+ OR - 0.00225	0.88199 TO 0.88649	0.87974 TO 0.88874	0.87749 TO 0.89099	106000
702	0.88430	+ OR - 0.00231	0.88199 TO 0.88660	0.87968 TO 0.88891	0.87736 TO 0.89121	101000

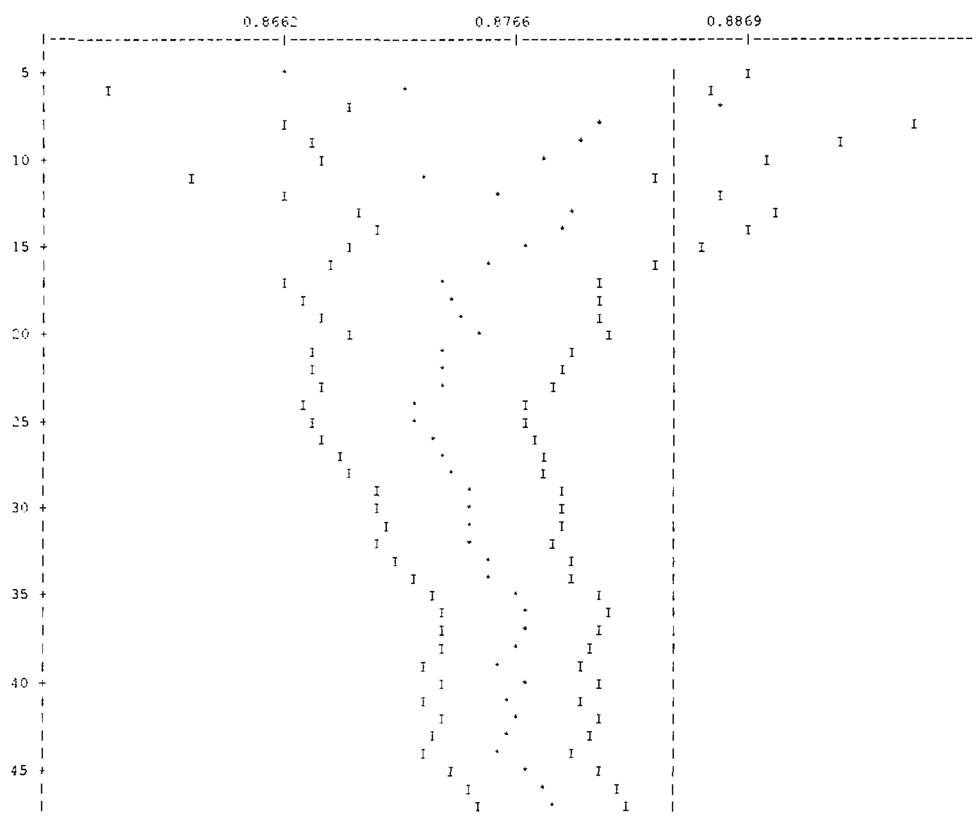
707	0.88423	+ OR - 0.00240	0.88183 TO 0.88663	0.87943 TO 0.88902	0.87704 TO 0.89142	96000
712	0.88351	+ OR - 0.00246	0.88105 TO 0.88597	0.87860 TO 0.88843	0.87614 TO 0.89088	91000
717	0.88344	+ OR - 0.00255	0.88089 TO 0.88600	0.87833 TO 0.88855	0.87578 TO 0.89110	86000
722	0.88327	+ OR - 0.00255	0.88072 TO 0.88583	0.87817 TO 0.88838	0.87561 TO 0.89094	81000
727	0.88329	+ OR - 0.00256	0.88073 TO 0.88585	0.87816 TO 0.88841	0.87560 TO 0.89098	76000
732	0.88370	+ OR - 0.00265	0.88104 TO 0.88635	0.87839 TO 0.88901	0.87573 TO 0.89166	71000
737	0.88308	+ OR - 0.00272	0.88036 TO 0.88580	0.87764 TO 0.88852	0.87492 TO 0.89125	66000
742	0.88201	+ OR - 0.00276	0.87925 TO 0.88477	0.87649 TO 0.88752	0.87373 TO 0.89028	61000
747	0.88043	+ OR - 0.00289	0.87754 TO 0.88333	0.87464 TO 0.88622	0.87175 TO 0.88912	56000
752	0.87991	+ OR - 0.00314	0.87677 TO 0.88305	0.87363 TO 0.88619	0.87050 TO 0.88932	51000
757	0.88013	+ OR - 0.00333	0.87680 TO 0.88346	0.87348 TO 0.88678	0.87015 TO 0.89011	46000
762	0.88029	+ OR - 0.00352	0.87677 TO 0.88380	0.87325 TO 0.88732	0.86973 TO 0.89084	41000
767	0.87998	+ OR - 0.00376	0.87622 TO 0.88374	0.87246 TO 0.88750	0.86871 TO 0.89125	36000

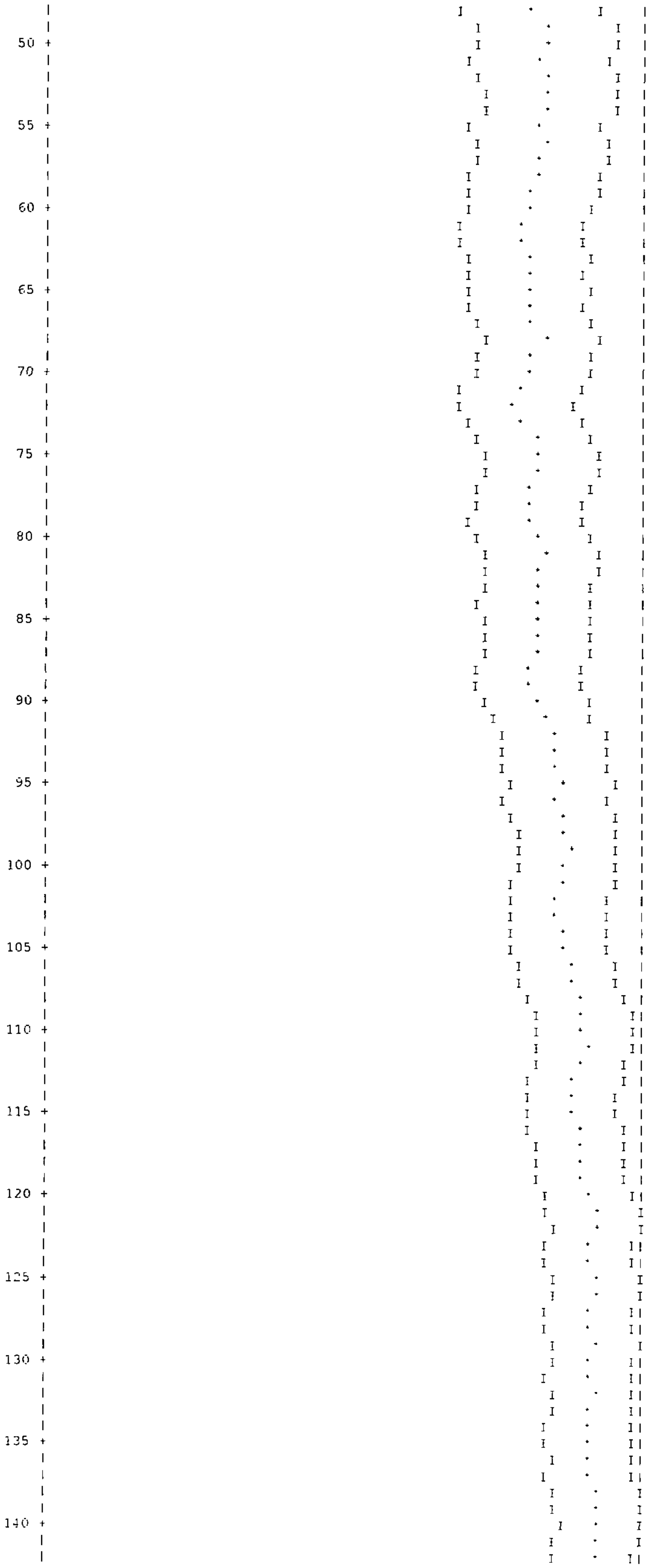
NAC-LWT, BWR, DAMAGED-SMALLER PIN SIZE, NO BASKET

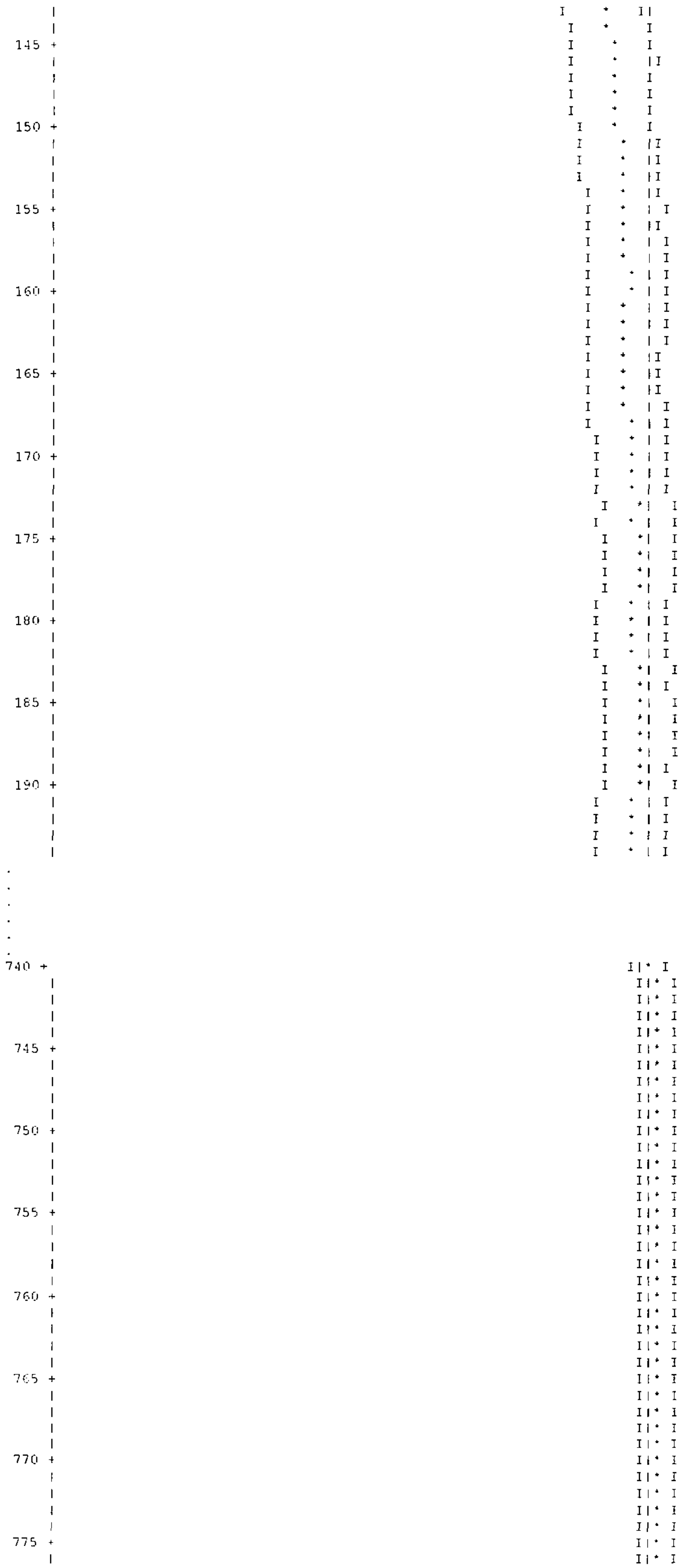
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
772	0.88000	+ OR - 0.00410	0.87590 TO 0.88410	0.87180 TO 0.88820	0.86770 TO 0.89230	31000
777	0.88163	+ OR - 0.00458	0.87705 TO 0.88621	0.87248 TO 0.89078	0.86790 TO 0.89536	26000
782	0.88369	+ OR - 0.00492	0.87877 TO 0.88861	0.87385 TO 0.89352	0.86893 TO 0.89844	21000
787	0.88638	+ OR - 0.00539	0.88099 TO 0.89177	0.87560 TO 0.89716	0.87021 TO 0.90256	16000
792	0.89299	+ OR - 0.00608	0.88692 TO 0.89907	0.88084 TO 0.90515	0.87477 TO 0.91122	11000
797	0.88612	+ OR - 0.00731	0.87881 TO 0.89343	0.87150 TO 0.90074	0.86419 TO 0.90805	6000

NAC-LWT, BWR, DAMAGED-SMALLER PIN SIZE, NO BASKET

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.8840 + OR - 0.0008 WHICH OCCURS FOR 803 GENERATIONS RUN.

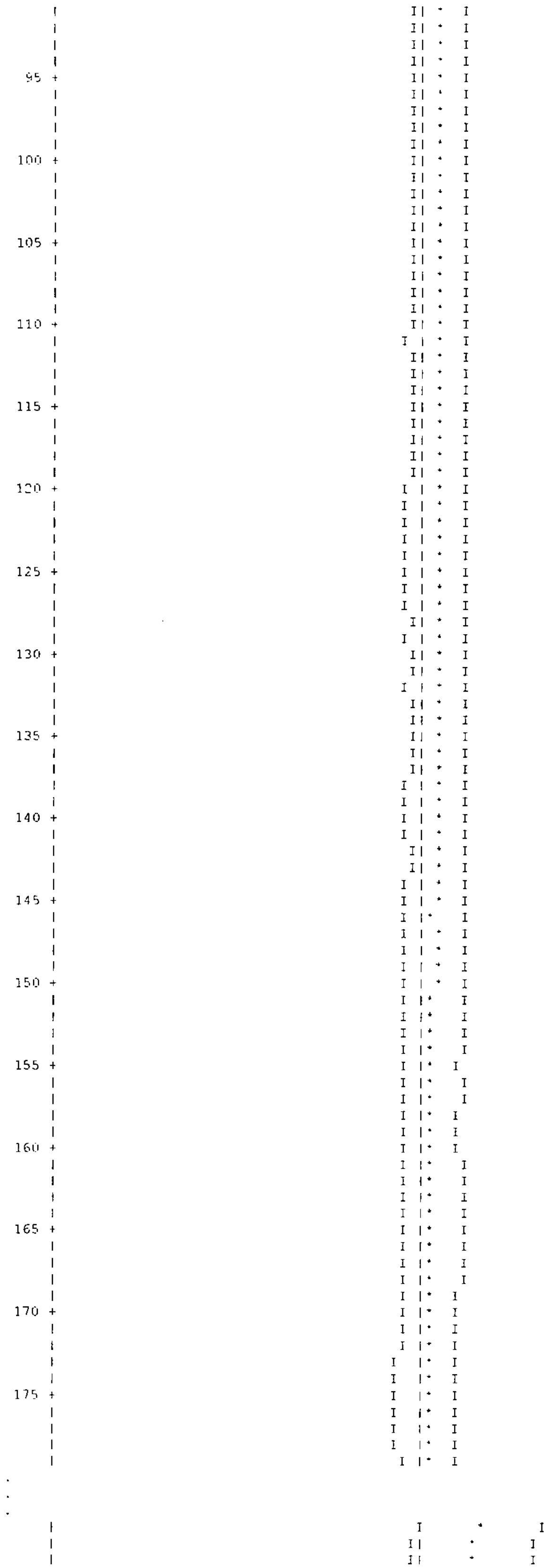


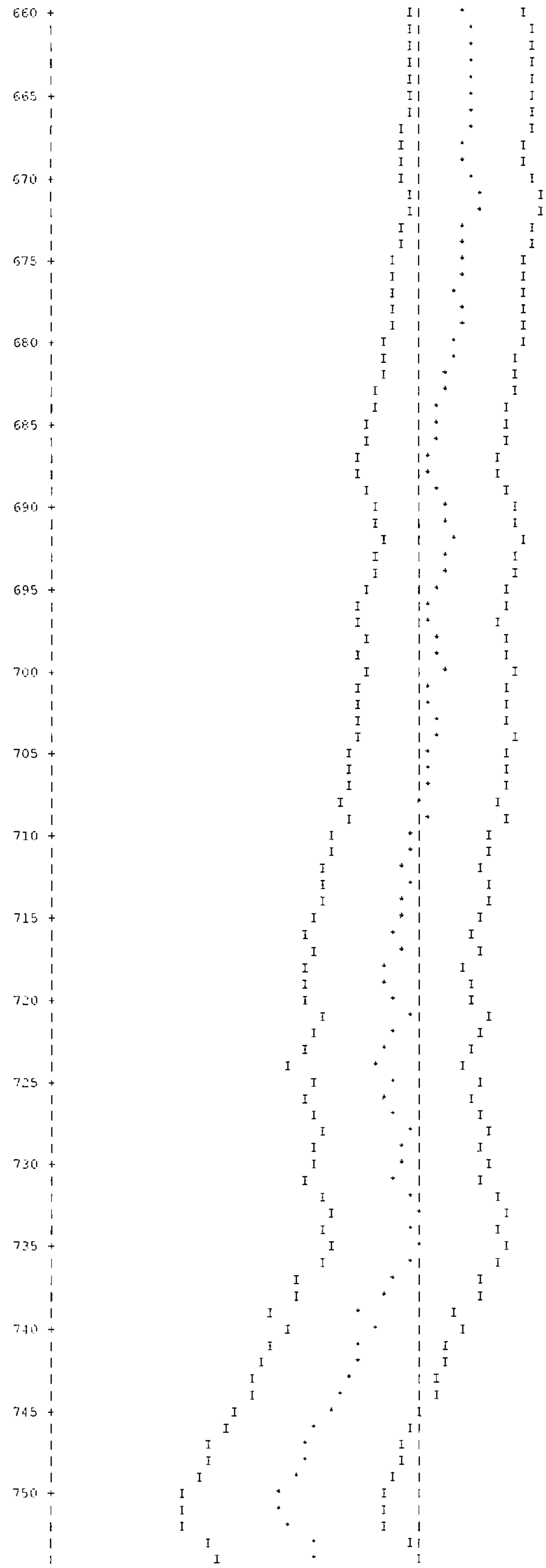

50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
125
130
135
140

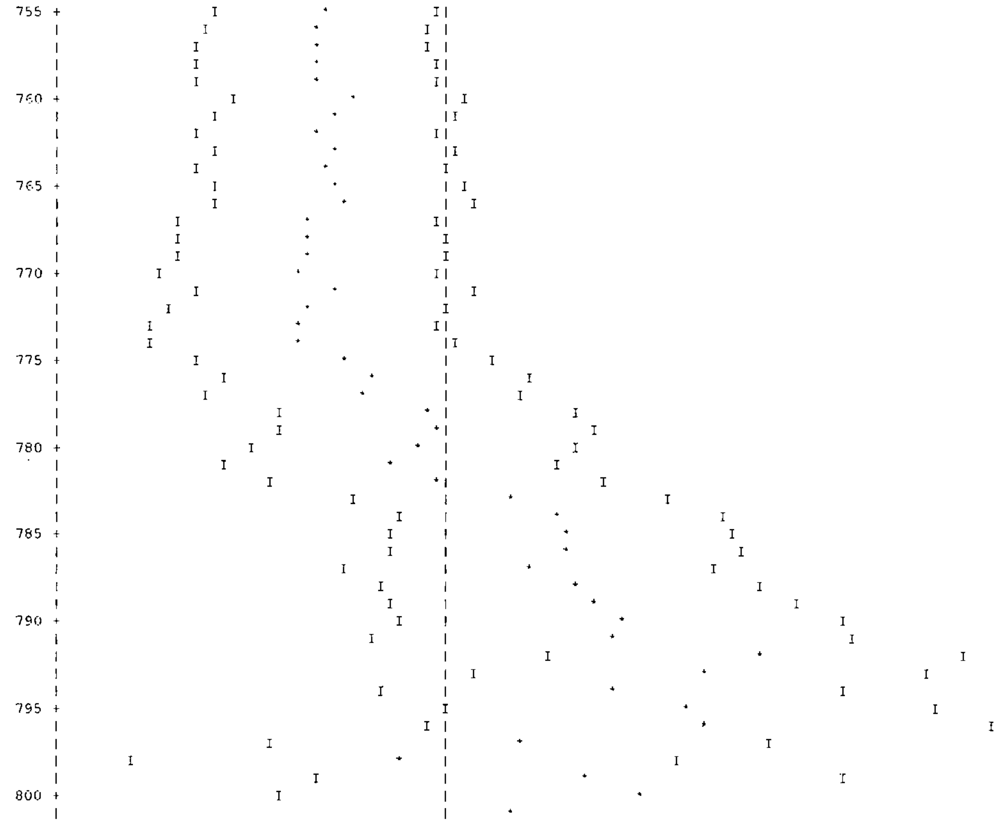

145
150
155
160
165
170
175
180
185
190
740
745
750
755
760
765
770
775

```
     |                                                                  I|* I
     |                                                                  I* I
     |                                                                 I * I
 780 +                                                                  I|*I
     |                                                                  I|* I
     |                                                                 I * I
     |                                                                 I * I
     |                                                                 I * I
 785 +                                                                 I * I
     |                                                                 I * I
     |                                                                 I * I
     |                                                                 I * I
     |                                                                 I * I
 790 +                                                                 I * I
     |                                                                 I * I
     |                                                                 I * I
     |                                                                 I * I
     |                                                                 I * I
 795 +                                                                 I * I
     |                                                                 I * I
     |                                                                 I * I
     |                                                                  I* I
     |                                                                 I * I
 800 +                                                                 I * I
     |                                                                 I * I
     |                                                                  I* I
     |                                                                  I* I
```

```
                          NAC-LWT, BWR, DAMAGED-SMALLER PIN SIZE, NO BASKET

                      PLOT OF AVERAGE K-EFFECTIVE BY GENERATION SKIPPED.
     THE LINE REPRESENTS K-EFF = 0.8840 + OR -  0.0008 WHICH OCCURS FOR     3 GENERATIONS SKIPPED.

                          0.8796                    0.8863                   0.8930
     |------------------------|------------------------|------------------------|------------------------
     |
     |                                     I  *  I
   5 +                                     I  *  I
     |                                     I  *  I
     |                                     I  *  I
     |                                     I  *  I
     |                                     I  *  I
  10 +                                     I  *  I
     |                                     I  *  I
     |                                     I  *  I
     |                                     I  *  I
     |                                     I  *  I
  15 +                                     I  *  I
     |                                      I |*  I
     |                                      I |*  I
     |                                      I |*  I
     |                                      I |*  I
  20 +                                      I |*  I
     |                                      I |*  I
     |                                      I |*  I
     |                                      I |*  I
     |                                      I |*  I
  25 +                                      I |*  I
     |                                      I |*  I
     |                                      I |*  I
     |                                      I |*  I
     |                                      I |*  I
  30 +                                      I |*  I
     |                                      I |*  I
     |                                      I |*  I
     |                                      I |*  I
     |                                      I |*  I
  35 +                                      I |*  I
     |                                      I |*  I
     |                                      I |*  I
     |                                      I |*  I
     |                                      I |*  I
  40 +                                      I |*  I
     |                                      I |*   I
     |                                      I |*  I
     |                                      I |*   I
     |                                       I| *  I
  45 +                                      I |*   I
     |                                      I |*  I
     |                                      I |*  I
     |                                      I |*  I
     |                                      I |*  I
  50 +                                      I |*  I
     |                                      I |*  I
     |                                      I |*  I
     |                                      I |*  I
     |                                      I |*  I
  55 +                                      I |*  I
     |                                      I |*  I
     |                                      I |*  I
     |                                      I |*   I
     |                                      I | *  I
  60 +                                       I| *  I
     |                                       I| *  I
     |                                       I| *  I
     |                                       I| *  I
     |                                       I| *  I
  65 +                                       I| *  I
     |                                       I| *  I
     |                                       I| *  I
     |                                      I | *  I
     |                                       I| *  I
  70 +                                       I| *  I
     |                                       I| *  I
     |                                       I| *  I
     |                                       I| *  I
     |                                       I| *  I
  75 +                                       I| *  I
     |                                       I| *  I
     |                                       I| *  I
     |                                       I| *  I
     |                                       I| *  I
  80 +                                       I| *  I
     |                                       I| *  I
     |                                       I| *  I
     |                                       I| *  I
     |                                       I| *  I
  85 +                                       I| *  I
     |                                       I| *  I
     |                                       I| *  I
     |                                       I|  *  I
     |                                       I|  *  I
  90 +                                       I| *  I
```


95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175


660
665
670
675
680
685
690
695
700
705
710
715
720
725
730
735
740
745
750



NAC-LWT, BWR, DAMAGED-SMALLER PIN SIZE, NO BASKET

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0022			1.96658E-03	1.7589	1.58278E-03	1.0608	0.00000E+00	0.0000
2	0.0090			7.96142E-03	0.5398	5.30037E-03	0.3750	0.00000E+00	0.0000
3	0.0096			8.52892E-03	0.5386	3.98226E-03	0.4683	0.00000E+00	0.0000
4	0.0040			3.49285E-03	0.6101	1.92198E-03	0.5162	0.00000E+00	0.0000
5	0.0014			1.21726E-03	0.4944	2.01274E-03	0.3204	0.00000E+00	0.0000
6	0.0013			1.12736E-03	0.4022	6.53290E-03	0.2624	0.00000E+00	0.0000
7	0.0013			1.11593E-03	0.3686	1.20121E-02	0.2564	0.00000E+00	0.0000
8	0.0012			1.06475E-03	0.4426	1.03186E-02	0.2874	0.00000E+00	0.0000
9	0.0016			1.45123E-03	0.4863	1.10415E-02	0.2762	0.00000E+00	0.0000
10	0.0036			3.18924E-03	0.4918	2.52182E-02	0.2730	0.00000E+00	0.0000
11	0.0078			6.85543E-03	0.5029	3.20578E-02	0.2575	0.00000E+00	0.0000
12	0.0104			9.21294E-03	0.5644	2.77887E-02	0.3086	0.00000E+00	0.0000
13	0.0100			8.87556E-03	0.5948	3.26728E-02	0.2939	0.00000E+00	0.0000
14	0.0082			7.23419E-03	0.5289	4.57709E-02	0.2864	0.00000E+00	0.0000
15	0.0018			1.57602E-03	0.9421	1.92787E-02	0.3773	0.00000E+00	0.0000
16	0.0012			1.08857E-03	1.2149	1.07028E-02	0.4169	0.00000E+00	0.0000
17	0.0019			1.64785E-03	1.5877	5.63296E-03	0.4683	0.00000E+00	0.0000
18	0.0025			2.21153E-03	1.6749	5.19957E-03	0.5349	0.00000E+00	0.0000
19	0.0032			2.80070E-03	1.3072	8.96525E-03	0.4679	0.00000E+00	0.0000
20	0.0131			1.15860E-02	0.7014	2.84619E-02	0.3722	0.00000E+00	0.0000
21	0.0072			6.40408E-03	1.1817	1.04813E-02	0.5451	0.00000E+00	0.0000

22	0.0185	1.63857E-02	0.7540	2.17849E-02	0.4255	0.00000E+00	0.0000
23	0.0909	8.03774E-02	0.3495	8.51048E-02	0.2295	0.00000E+00	0.0000
24	0.2335	2.06453E-01	0.2134	1.82086E-01	0.1451	0.00000E+00	0.0000
25	0.2127	1.88054E-01	0.2450	1.57630E-01	0.1659	0.00000E+00	0.0000
26	0.2613	2.30964E-01	0.2164	1.90054E-01	0.1541	0.00000E+00	0.0000
27	0.0805	7.11557E-02	0.4296	5.86644E-02	0.3103	0.00000E+00	0.0000
SYSTEM TOTAL =		8.83998E-01	0.0906	1.00226E+00	0.0275	0.00000E+00	0.0000

ELAPSED TIME 28.69033 MINUTES
RANDOM NUMBER= 5C3FF945F3

```
NAC-LWT, BWR, DAMAGED-SMALLER PIN SIZE, NO BASKET

                                FREQUENCY FOR GENERATIONS    4 TO  803
0.8018 TO 0.8054    *
0.8054 TO 0.8090    *
0.8090 TO 0.8126
0.8126 TO 0.8161    *
0.8161 TO 0.8197    *
0.8197 TO 0.8233    **
0.8233 TO 0.8269
0.8269 TO 0.8304    *
0.8304 TO 0.8340    ****
0.8340 TO 0.8376    ********
0.8376 TO 0.8412    ********
0.8412 TO 0.8447    ***********
0.8447 TO 0.8483    *************
0.8483 TO 0.8519    ***********
0.8519 TO 0.8555    **********************
0.8555 TO 0.8590    ******************
0.8590 TO 0.8626    *********************************
0.8626 TO 0.8662    *************************************
0.8662 TO 0.8698    ******************************************
0.8698 TO 0.8733    ****************************************
0.8733 TO 0.8769    *****************************************
0.8769 TO 0.8805    ********************************************************
0.8805 TO 0.8841    *******************************************
0.8841 TO 0.8876    ***********************************
0.8876 TO 0.8912    *****************************************
0.8912 TO 0.8948    *************************************************
0.8948 TO 0.8984    **********************************************
0.8984 TO 0.9020    ********************************************
0.9020 TO 0.9055    ********************************************
0.9055 TO 0.9091    ***************************
0.9091 TO 0.9127    *********************
0.9127 TO 0.9163    ****************************
0.9163 TO 0.9198    ********************
0.9198 TO 0.9234    ************
0.9234 TO 0.9270    *******
0.9270 TO 0.9306    ********
0.9306 TO 0.9341    ****
0.9341 TO 0.9377    **
0.9377 TO 0.9413    *
0.9413 TO 0.9449    **
0.9449 TO 0.9484
0.9484 TO 0.9520    *
```

NAC-LWT, BWR, DAMAGED-SMALLER PIN SIZE, NO BASKET

FREQUENCY FOR GENERATIONS 204 TO 803

0.8018 TO 0.8054	*
0.8054 TO 0.8090	*
0.8090 TO 0.8126	
0.8126 TO 0.8161	*
0.8161 TO 0.8197	*
0.8197 TO 0.8233	**
0.8233 TO 0.8269	
0.8269 TO 0.8304	*
0.8304 TO 0.8340	***
0.8340 TO 0.8376	******
0.8376 TO 0.8412	******
0.8412 TO 0.8447	*********
0.8447 TO 0.8483	*******
0.8483 TO 0.8519	********
0.8519 TO 0.8555	****************
0.8555 TO 0.8590	************
0.8590 TO 0.8626	***********************
0.8626 TO 0.8662	******************************
0.8662 TO 0.8698	*******************************
0.8698 TO 0.8733	********************************
0.8733 TO 0.8769	****************************
0.8769 TO 0.8805	**
0.8805 TO 0.8841	********************************
0.8841 TO 0.8876	*************************
0.8876 TO 0.8912	**********************************
0.8912 TO 0.8948	***************************************
0.8948 TO 0.8984	*************************************
0.8984 TO 0.9020	**********************************
0.9020 TO 0.9055	***********************************
0.9055 TO 0.9091	*********************
0.9091 TO 0.9127	****************
0.9127 TO 0.9163	*************************
0.9163 TO 0.9198	***************
0.9198 TO 0.9234	********
0.9234 TO 0.9270	****
0.9270 TO 0.9306	*****
0.9306 TO 0.9341	***
0.9341 TO 0.9377	*
0.9377 TO 0.9413	*
0.9413 TO 0.9449	**
0.9449 TO 0.9484	
0.9484 TO 0.9520	*

```
NAC-LWT, BWR, DAMAGED-SMALLER PIN SIZE, NO BASKET

                                          FREQUENCY FOR GENERATIONS  404 TO  803
0.8018 TO 0.8054
0.8054 TO 0.8090    *
0.8090 TO 0.8126
0.8126 TO 0.8161
0.8161 TO 0.8197
0.8197 TO 0.8233    **
0.8233 TO 0.8269
0.8269 TO 0.8304    *
0.8304 TO 0.8340    **
0.8340 TO 0.8376    ***
0.8376 TO 0.8412    *****
0.8412 TO 0.8447    ******
0.8447 TO 0.8483    ***
0.8483 TO 0.8519    ****
0.8519 TO 0.8555    ********
0.8555 TO 0.8590    **********
0.8590 TO 0.8626    *****************
0.8626 TO 0.8662    *****************
0.8662 TO 0.8698    ********************
0.8698 TO 0.8733    ****************
0.8733 TO 0.8769    *********************
0.8769 TO 0.8805    **********************************
0.8805 TO 0.8841    *******************
0.8841 TO 0.8876    ****************
0.8876 TO 0.8912    ***********************
0.8912 TO 0.8948    *************************
0.8948 TO 0.8984    ************************
0.8984 TO 0.9020    ***********************
0.9020 TO 0.9055    *******************************
0.9055 TO 0.9091    ****************
0.9091 TO 0.9127    **********
0.9127 TO 0.9163    ******************
0.9163 TO 0.9198    *********
0.9198 TO 0.9234    ****
0.9234 TO 0.9270    ****
0.9270 TO 0.9306    ***
0.9306 TO 0.9341    **
0.9341 TO 0.9377
0.9377 TO 0.9413    *
0.9413 TO 0.9449    **
0.9449 TO 0.9484
0.9484 TO 0.9520

NAC-LWT, BWR, DAMAGED-SMALLER PIN SIZE, NO BASKET

                                          FREQUENCY FOR GENERATIONS  604 TO  803
0.8018 TO 0.8054
0.8054 TO 0.8090
0.8090 TO 0.8126
0.8126 TO 0.8161
0.8161 TO 0.8197
0.8197 TO 0.8233    *
0.8233 TO 0.8269
0.8269 TO 0.8304    *
0.8304 TO 0.8340    *
0.8340 TO 0.8376    **
0.8376 TO 0.8412    ***
0.8412 TO 0.8447    ***
0.8447 TO 0.8483    **
0.8483 TO 0.8519    ****
0.8519 TO 0.8555    ****
0.8555 TO 0.8590    ******
0.8590 TO 0.8626    ********
0.8626 TO 0.8662    *******
0.8662 TO 0.8698    ********
0.8698 TO 0.8733    ******
0.8733 TO 0.8769    **********
0.8769 TO 0.8805    ****************
0.8805 TO 0.8841    ********
0.8841 TO 0.8876    ******
0.8876 TO 0.8912    ************
0.8912 TO 0.8948    **********
0.8948 TO 0.8984    **************
0.8984 TO 0.9020    ***********
0.9020 TO 0.9055    ***********************
0.9055 TO 0.9091    ***********
0.9091 TO 0.9127    **
0.9127 TO 0.9163    ********
0.9163 TO 0.9198    ***
0.9198 TO 0.9234    ***
0.9234 TO 0.9270    **
0.9270 TO 0.9306    **
0.9306 TO 0.9341    **
0.9341 TO 0.9377
0.9377 TO 0.9413
0.9413 TO 0.9449    *
0.9449 TO 0.9484
0.9484 TO 0.9520

****************************************************************************************************************************
*
```

```
CONGRATULATIONS!  YOU HAVE  SUCCESSFULLY TRAVEPSED THE PEPILOUS PATH THROUGH KENO V IN  28.69033 MINUTES
***************************************************************************************************************
*
```

6.6.11 PULSTAR Fuel Elements in the LWT Cask

This section contains a sample output file from the evaluation of PULSTAR fuel elements in the LWT cask. The output file is shown in Figure 6.6.11-1.

Figure 6.6.11-1 Maximum Reactivity PULSTAR Configuration

```
      PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
MODULE CSAS25   WILL BE CALLED
  NAC-LWT INPUT FOR HOMOGENIZED PULSTAR ELEMENTS IN CAN & INTACT ASSEMBLIES
  'MIN BASKET PLATE THICKNESS & OPENING
  '33 GRAMS U-235 PER ELEMENT
  'AXIAL ALTERNATING SHIFT
  '24.1-INCH ACTIVE FUEL HEIGHT
  27GROUPNDF4  LATTICECELL
  UO2       1 DEN=10.38 1.0 293.0 92235 6.5 92238 93.5 END
  ZIRCALLOY 2 1.0 293.0 END
  H2O       3 1.E-20 293.0 END
  AL        4 1.0 293.0 END
  SS304     5 1.0 293.0 END
  PB        6 1.0 293.0 END
  H2O       7 1.E-20 293.0 END
  H2O       8 1.E-20 293.0 END
  H2O       9 1.0 293.0 END
  H2O       10 1.0 293.0 END
  UO2       11 DEN=10.38 0.2592 293.0 92235 6.5 92238 93.5 END
  ZIRCALLOY 11 0.0484 293.0 END
  H2O       11 0.6924 293.0 END
  END COMP
  SQUAREPITCH 1.54178 1.07442 1 3 1.1938 2 1.09982 9 END
  READ PARAM TBA=5 RUN=YES PLT=NO GEN=803 NPG=1000 END PARAM
  READ GEOM
  UNIT 1
  COM='PULSTAR FUEL ELEMENT'
  CYLINDER 1 1 0.5372 63.8810 2.6670
  CYLINDER 9 1 0.5499 63.8810 2.6670
  CYLINDER 2 1 0.5969 66.5480 0.0000
  CUBOID 3 1 2P0.7709 2P0.6668 66.5480 0.0000
  UNIT 5
  COM='DIVIDER CENTER STACK'
  CUBOID 5 1 2P4.2926 0.7112 0.0000 110.49 0
  UNIT 6
  COM='DIVIDER OUTSIDE STACK'
  CUBOID 5 1 2P4.2926 0.6096 0.0000 110.49 0
  'TOP BASKET (CANNED ELEMENTS)
  UNIT 10
  COM='HOMOGENIZED PULSTAR FUEL - TOP OPENING'
  CUBOID 11 1 2P4.1910 2P4.1910 76.2000 0.0000
  CUBOID 3 1 4P4.2926 110.4900 0.0000
  UNIT 11
  COM='HOMOGENIZED PULSTAR FUEL - BOTTOM OPENING'
  CUBOID 11 1 2P4.1910 2P4.1910 76.2000 0.0000
  CUBOID 3 1 4P4.2926 110.4900 0.0000
  UNIT 12
  COM='HOMOGENIZED PULSTAR FUEL - BOTTOM RIGHT'
  CUBOID 11 1 2P4.1910 2P4.1910 76.2000 0.0000
  CUBOID 3 1 4P4.2926 110.4900 0.0000
  UNIT 13
  COM='HOMOGENIZED PULSTAR FUEL - TOP RIGHT'
  CUBOID 11 1 2P4.1910 2P4.1910 76.2000 0.0000
  CUBOID 3 1 4P4.2926 110.4900 0.0000
  UNIT 14
  COM='HOMOGENIZED PULSTAR FUEL - BOTTOM LEFT'
  CUBOID 11 1 2P4.1910 2P4.1910 76.2000 0.0000
  CUBOID 3 1 4P4.2926 110.4900 0.0000
  UNIT 15
  COM='HOMOGENIZED PULSTAR FUEL - TOP LEFT'
  CUBOID 11 1 2P4.1910 2P4.1910 76.2000 0.0000
  CUBOID 3 1 4P4.2926 110.4900 0.0000
  UNIT 16
  COM='HOMOGENIZED PULSTAR FUEL - CENTER OPENING'
  CUBOID 11 1 2P4.1910 2P4.1910 76.2000 0.0000
  CUBOID 3 1 4P4.2926 110.4900 0.0000
  UNIT 20
  COM='CENTER COLUMN OF THREE OPENINGS'
  ARRAY 2 -4.2926 -13.5890 0.0000
  REPLICATE 5 1 4R0.7112 2R0.0 1
  UNIT 21
  COM='LEFT OUTSIDE COLUMN OF TWO OPENINGS'
  ARRAY 4 -4.2926 -8.8900 0.0000
  REPLICATE 5 1 0.0000 0.3048 2R0.3048 2R0.0 1
  UNIT 22
  COM='RIGHT OUTSIDE COLUMN OF TWO OPENINGS'
  ARRAY 3 -4.2926 -8.8900 0.0000
  REPLICATE 5 1 0.3048 0.0000 2R0.3048 2R0.0 1
  UNIT 30
  COM='MTR 7-ASSY BASKET'
  CYLINDER 3 1 17.0500 110.4900 0.0000
  HOLE 20 0.0000 0.0000 0.0000
  HOLE 21 -9.2974 0.0000 0.0000
  HOLE 22 9.2974 0.0000 0.0000
  CYLINDER 5 1 18.8913 110.4900 -1.2700
  CYLINDER 6 1 33.4963 110.4900 -1.2700
  CYLINDER 5 1 36.5443 110.4900 -1.2700
  CYLINDER 7 1 49.2443 110.4900 -1.2700
  CYLINDER 5 1 49.8539 110.4900 -1.2700
  CUBOID 8 1 4P49.8539 110.4900 -1.2700
  'TOP MIDDLE BASKET (INTACT ASSEMBLIES)
```

```
UNIT 110
COM='PULSTAR ASSEMBLY - TOP OPENING'
ARRAY 1 -3.8545 -3.3338 43.9420
CUBOID 2 1 2P4.0069 2P3.4862 110.4900 43.9420
CUBOID 3 1 4P4.2926 110.4900 0.0000
UNIT 111
COM='PULSTAR ASSEMBLY - BOTTOM OPENING'
ARRAY 1 -3.8545 -3.3338 43.9420
CUBOID 2 1 2P4.0069 2P3.4862 110.4900 43.9420
CUBOID 3 1 4P4.2926 110.4900 0.0000
UNIT 112
COM='PULSTAR ASSEMBLY - BOTTOM RIGHT'
ARRAY 1 -3.8545 -3.3338 43.9420
CUBOID 2 1 2P4.0069 2P3.4862 110.4900 43.9420
CUBOID 3 1 4P4.2926 110.4900 0.0000
UNIT 113
COM='PULSTAR ASSEMBLY - TOP RIGHT'
ARRAY 1 -3.8545 -3.3338 43.9420
CUBOID 2 1 2P4.0069 2P3.4862 110.4900 43.9420
CUBOID 3 1 4P4.2926 110.4900 0.0000
UNIT 114
COM='PULSTAR ASSEMBLY - BOTTOM LEFT'
ARRAY 1 -3.8545 -3.3338 43.9420
CUBOID 2 1 2P4.0069 2P3.4862 110.4900 43.9420
CUBOID 3 1 4P4.2926 110.4900 0.0000
UNIT 115
COM='PULSTAR ASSEMBLY - TOP LEFT'
ARRAY 1 -3.8545 -3.3338 43.9420
CUBOID 2 1 2P4.0069 2P3.4862 110.4900 43.9420
CUBOID 3 1 4P4.2926 110.4900 0.0000
UNIT 116
COM='PULSTAR ASSEMBLY - CENTER OPENING'
ARRAY 1 -3.8545 -3.3338 43.9420
CUBOID 2 1 2P4.0069 2P3.4862 110.4900 43.9420
CUBOID 3 1 4P4.2926 110.4900 0.0000
UNIT 120
COM='CENTER COLUMN OF THREE OPENINGS'
ARRAY 12 -4.2926 -13.5890 0.0000
REPLICATE 5 1 4R0.7112 2R0.0 1
UNIT 121
COM='LEFT OUTSIDE COLUMN OF TWO OPENINGS'
ARRAY 14 -4.2926 -8.8900 0.0000
REPLICATE 5 1 0.0000 0.3048 2R0.3048 2R0.0 1
UNIT 122
COM='RIGHT OUTSIDE COLUMN OF TWO OPENINGS'
ARRAY 13 -4.2926 -8.8900 0.0000
REPLICATE 5 1 0.3048 0.0000 2R0.3048 2R0.0 1
UNIT 130
COM='MTR 7-ASSY BASKET'
CYLINDER 3 1 17.0500 110.4900 0.0000
HOLE 120 0.0000 0.0000 0.0000
HOLE 121 -9.2974 0.0000 0.0000
HOLE 122 9.2974 0.0000 0.0000
CYLINDER 5 1 18.8913 110.4900 -1.2700
CYLINDER 6 1 33.4963 110.4900 -1.2700
CYLINDER 5 1 36.5443 110.4900 -1.2700
CYLINDER 7 1 49.2443 110.4900 -1.2700
CYLINDER 5 1 49.8539 110.4900 -1.2700
CUBOID 8 1 4P49.8539 110.4900 -1.2700
'BOTTOM MIDDLE BASKET (INTACT ASSEMBLIES)
UNIT 210
COM='PULSTAR ASSEMBLY - TOP OPENING'
ARRAY 1 -3.8545 -3.3338 0.0000
CUBOID 2 1 2P4.0069 2P3.4862 66.5480 0.0000
CUBOID 3 1 4P4.2926 110.4900 0.0000
UNIT 211
COM='PULSTAR ASSEMBLY - BOTTOM OPENING'
ARRAY 1 -3.8545 -3.3338 0.0000
CUBOID 2 1 2P4.0069 2P3.4862 66.5480 0.0000
CUBOID 3 1 4P4.2926 110.4900 0.0000
UNIT 212
COM='PULSTAR ASSEMBLY - BOTTOM RIGHT'
ARRAY 1 -3.8545 -3.3338 0.0000
CUBOID 2 1 2P4.0069 2P3.4862 66.5480 0.0000
CUBOID 3 1 4P4.2926 110.4900 0.0000
UNIT 213
COM='PULSTAR ASSEMBLY - TOP RIGHT'
ARRAY 1 -3.8545 -3.3338 0.0000
CUBOID 2 1 2P4.0069 2P3.4862 66.5480 0.0000
CUBOID 3 1 4P4.2926 110.4900 0.0000
UNIT 214
COM='PULSTAR ASSEMBLY - BOTTOM LEFT'
ARRAY 1 -3.8545 -3.3338 0.0000
CUBOID 2 1 2P4.0069 2P3.4862 66.5480 0.0000
CUBOID 3 1 4P4.2926 110.4900 0.0000
UNIT 215
COM='PULSTAR ASSEMBLY - TOP LEFT'
ARRAY 1 -3.8545 -3.3338 0.0000
CUBOID 2 1 2P4.0069 2P3.4862 66.5480 0.0000
CUBOID 3 1 4P4.2926 110.4900 0.0000
UNIT 216
COM='PULSTAR ASSEMBLY - CENTER OPENING'
ARRAY 1 -3.8545 -3.3338 0.0000
CUBOID 2 1 2P4.0069 2P3.4862 66.5480 0.0000
CUBOID 3 1 4P4.2926 110.4900 0.0000
```

```
UNIT 220
COM='CENTER COLUMN OF THREE OPENINGS'
ARRAY 22 -4.2926 -13.5890 0.0000
REPLICATE 5 1 4R0.7112 2R0.0 1
UNIT 221
COM='LEFT OUTSIDE COLUMN OF TWO OPENINGS'
ARRAY 24 -4.2926 -8.8900 0.0000
REPLICATE 5 1 0.0000 0.3048 2R0.3048 2R0.0 1
UNIT 222
COM='RIGHT OUTSIDE COLUMN OF TWO OPENINGS'
ARRAY 23 -4.2926 -8.8900 0.0000
REPLICATE 5 1 0.3048 0.0000 2R0.3048 2R0.0 1
UNIT 230
COM='MTR 7-ASSY BASKET'
CYLINDER 3 1 17.0500 110.4900 0.0000
HOLE 220 0.0000 0.0000 0.0000
HOLE 221 -9.2974 0.0000 0.0000
HOLE 222 9.2974 0.0000 0.0000
CYLINDER 5 1 18.8913 110.4900 -1.2700
CYLINDER 6 1 33.4963 110.4900 -1.2700
CYLINDER 5 1 36.5443 110.4900 -1.2700
CYLINDER 7 1 49.2443 110.4900 -1.2700
CYLINDER 5 1 49.8539 110.4900 -1.2700
CUBOID 8 1 4P49.8539 110.4900 -1.2700
'BOTTOM BASKET (CANNED ELEMENTS)
UNIT 310
COM='HOMOGENIZED PULSTAR FUEL - TOP OPENING'
CUBOID 11 1 2P4.1910 2P4.1910 110.4900 34.2900
CUBOID 3 1 4P4.2926 110.4900 0.0000
UNIT 311
COM='HOMOGENIZED PULSTAR FUEL - BOTTOM OPENING'
CUBOID 11 1 2P4.1910 2P4.1910 110.4900 34.2900
CUBOID 3 1 4P4.2926 110.4900 0.0000
UNIT 312
COM='HOMOGENIZED PULSTAR FUEL - BOTTOM RIGHT'
CUBOID 11 1 2P4.1910 2P4.1910 110.4900 34.2900
CUBOID 3 1 4P4.2926 110.4900 0.0000
UNIT 313
COM='HOMOGENIZED PULSTAR FUEL - TOP RIGHT'
CUBOID 11 1 2P4.1910 2P4.1910 110.4900 34.2900
CUBOID 3 1 4P4.2926 110.4900 0.0000
UNIT 314
COM='HOMOGENIZED PULSTAR FUEL - BOTTOM LEFT'
CUBOID 11 1 2P4.1910 2P4.1910 110.4900 34.2900
CUBOID 3 1 4P4.2926 110.4900 0.0000
UNIT 315
COM='HOMOGENIZED PULSTAR FUEL - TOP LEFT'
CUBOID 11 1 2P4.1910 2P4.1910 110.4900 34.2900
CUBOID 3 1 4P4.2926 110.4900 0.0000
UNIT 316
COM='HOMOGENIZED PULSTAR FUEL - CENTER OPENING'
CUBOID 11 1 2P4.1910 2P4.1910 110.4900 34.2900
CUBOID 3 1 4P4.2926 110.4900 0.0000
UNIT 320
COM='CENTER COLUMN OF THREE OPENINGS'
ARRAY 32 -4.2926 -13.5890 0.0000
REPLICATE 5 1 4R0.7112 2R0.0 1
UNIT 321
COM='LEFT OUTSIDE COLUMN OF TWO OPENINGS'
ARRAY 34 -4.2926 -8.8900 0.0000
REPLICATE 5 1 0.0000 0.3048 2R0.3048 2R0.0 1
UNIT 322
COM='RIGHT OUTSIDE COLUMN OF TWO OPENINGS'
ARRAY 33 -4.2926 -8.8900 0.0000
REPLICATE 5 1 0.3048 0.0000 2R0.3048 2R0.0 1
UNIT 330
COM='MTR 7-ASSY BASKET'
CYLINDER 3 1 17.0500 110.4900 0.0000
HOLE 320 0.0000 0.0000 0.0000
HOLE 321 -9.2974 0.0000 0.0000
HOLE 322 9.2974 0.0000 0.0000
CYLINDER 5 1 18.8913 110.4900 -1.2700
CYLINDER 6 1 33.4963 110.4900 -1.2700
CYLINDER 5 1 36.5443 110.4900 -1.2700
CYLINDER 7 1 49.2443 110.4900 -1.2700
CYLINDER 5 1 49.8539 110.4900 -1.2700
CUBOID 8 1 4P49.8539 110.4900 -1.2700
UNIT 40
COM='SIMPLIFIED LID STRUCTURE NAC-LWT'
CYLINDER 5 1 36.5188   13.6775 -14.1351
CYLINDER 8 1 49.8539   13.6775 -14.1351
CUBOID   8 1 4P49.8539 13.6775 -14.1351
UNIT 41
COM='SIMPLIFIED CASK BOTTOM STRUCTUPE NAC-LWT'
CYLINDER 6 1 26.3525 2P3.81
CYLINDER 5 1 36.6188 +13.36 -12.7
CYLINDER 8 1 49.8539 +13.36 -12.7
CUBOID   8 1 4P49.8539 +13.36 -12.7
UNIT 42
COM='THIN TOP AND BOTTOM SHELL OF NEUTRON SHIELD - SUBTRACTED FROM LID MODEL'
CYLINDER 5 1 49.8539 0.61 0.0
CUBOID   8 1 4P49.8539 0.61 0.0
UNIT 70
COM='STACK OF 4 BASKETS IN CASK WITH LID AND BOTTOM'
ARRAY  10  -49.8539 -49.8539 0.0
```

```
GLOBAL UNIT 80
COM='3 CASKS IN TRIANGULAR PITCH'
CUBOID   8 1 4P101.0 502.2 0.0
HOLE 70   0.0  50.0 0.0
HOLE 70 -50.0 -50.0 0.0
HOLE 70  50.0 -50.0 0.0
END GEOM
READ ARRAY
ARA=1 NUX=5 NUY=5 NUZ=1 FILL 25R1 END FILL
ARA=2 NUX=1 NUY=5 NUZ=1 FILL 11 5 16 5 10 END FILL
ARA=3 NUX=1 NUY=3 NUZ=1 FILL 12 6 13 END FILL
ARA=4 NUX=1 NUY=3 NUZ=1 FILL 14 6 15 END FILL
ARA=12 NUX=1 NUY=5 NUZ=1 FILL 111 5 116 5 110 END FILL
ARA=13 NUX=1 NUY=3 NUZ=1 FILL 112 6 113 END FILL
ARA=14 NUX=1 NUY=3 NUZ=1 FILL 114 6 115 END FILL
ARA=22 NUX=1 NUY=5 NUZ=1 FILL 211 5 216 5 210 END FILL
ARA=23 NUX=1 NUY=3 NUZ=1 FILL 212 6 213 END FILL
ARA=24 NUX=1 NUY=3 NUZ=1 FILL 214 6 215 END FILL
ARA=32 NUX=1 NUY=5 NUZ=1 FILL 311 5 316 5 310 END FILL
ARA=33 NUX=1 NUY=3 NUZ=1 FILL 312 6 313 END FILL
ARA=34 NUX=1 NUY=3 NUZ=1 FILL 314 6 315 END FILL
ARA=10 NUX=1 NUY=1 NUZ=8 FILL 41 42 330 230 130 30 42 40 END FILL
END ARRAY
READ BOUNDS ALL=H2O END BOUNDS
READ PLOT
TTL='X-Y PLOT OF CENTER ELEMENT - FUEL ELEVATION'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=1500
XUL=-5.0 YUL=5.0 ZUL=100.0
XLR=5.0 YLR=-5.0 ZLR=100.0 END
TTL='X-Y PLOT OF BASKET - FUEL ELEVATION'
UAX=1.0 VDN=-1.0 NAX=1500
XUL=-17.0 YUL=17.0 ZUL=100.0
XLR=17.0 YLR=-17.0 ZLR=100.0 END
TTL='X-Y PLOT OF CASK - FUEL ELEVATION'
UAX=1.0 VDN=-1.0 NAX=1500
XUL=-65.0 YUL=65.0 ZUL=100.0
XLR=65.0 YLR=-65.0 ZLR=100.0 END
TTL='Y-Z (X=0) PLOT OF BOTTOM BASKET - CENTER SECTION'
VAX=1.0 WDN=-1.0
XUL=0.0 YUL=-5.0 ZUL=55.0
XLR=0.0 YLR=5.0 ZLR=50.0 END
TTL='Y-Z (X=0) PLOT OF BOTTOM BASKET - CENTER FUEL ELEMENT'
VAX=1.0 WDN=-1.0
XUL=0.0 YUL=-5.0 ZUL=176.1
XLR=0.0 YLR=5.0 ZLR=26.6 END
TTL='Y-Z (X=-2) PLOT OF BOTTOM BASKET'
VAX=1.0 WDN=-1.0
XUL=-2.0 YUL=-15.0 ZUL=176.1
XLR=-2.0 YLR=15.0 ZLR=26.6 END
TTL='Y-Z (X=-2) PLOT OF CASK - R=17.0'
LPI=5 NAX=1000
VAX=1.0 WDN=-1.0
XUL=-2.0 YUL=-17.0 ZUL=502.0
XLR=-2.0 YLR=17.0 ZLR=-1.0 END
TTL='Y-Z (X=-2) PLOT OF CASK - R=51.0'
VAX=1.0 WDN=-1.0
XUL=-2.0 YUL=-51.0 ZUL=502.0
XLR=-2.0 YLR=51.0 ZLR=-1.0 END
END PLOT
END DATA

SECONDARY MODULE 000008   HAS BEEN CALLED.

MODULE 000008   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     0.77 (SECONDS).

SECONDARY MODULE 000002   HAS BEEN CALLED.

MODULE 000002   IS FINISHED. COMPLETION CODE     0. CPU TIME USED     4.77 (SECONDS).

SECONDARY MODULE 000009   HAS BEEN CALLED.

MODULE 000009   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   307.04 (SECONDS).

MODULE CSAS25   IS FINISHED. COMPLETION CODE     0. CPU TIME USED   314.94 (SECONDS).
```

```
 CCCCCCCCCC    SSSSSSSSSS     AAAAAAAA     SSSSSSSSSS    2222222222   555555555555
CCCCCCCCCCCC  SSSSSSSSSSSS   AAAAAAAAAA   SSSSSSSSSSSS  222222222222  555555555555
CC        CC  SS        SS  AA        AA  SS        SS  22        22  55
CC            SS            AA        AA  SS                      22  55
CC            SS            AA        AA  SS                      22  55
CC            SSSSSSSSSSS   AAAAAAAAAAAA  SSSSSSSSSSS            22   55555555555
CC             SSSSSSSSSSS  AAAAAAAAAAAA   SSSSSSSSSSS          22    555555555555
CC                      SS  AA        AA            SS        22                55
CC                      SS  AA        AA            SS      22                  55
CC        CC  SS        SS  AA        AA  SS        SS    22          55        55
CCCCCCCCCCCC  SSSSSSSSSSSS  AA        AA  SSSSSSSSSSSS  222222222222  555555555555
 CCCCCCCCCC    SSSSSSSSSS   AA        AA   SSSSSSSSSS   222222222222   5555555555


 SSSSSSSSSS    CCCCCCCCCC     AAAAAAAA     LL            EEEEEEEEEEEE                PPPPPPPPPPP    CCCCCCCCCC
SSSSSSSSSSSS  CCCCCCCCCCCC   AAAAAAAAAA   LL            EEEEEEEEEEEE                PPPPPPPPPPPP  CCCCCCCCCCCC
SS        SS  CC        CC  AA        AA  LL            EE                          PP        PP  CC        CC
SS            CC            AA        AA  LL            EE                          PP        PP  CC
SS            CC            AA        AA  LL            EE                          PP        PP  CC
SSSSSSSSSSS   CC            AAAAAAAAAAAA  LL            EEEEEEEEE     ------------  PPPPPPPPPPPP  CC
 SSSSSSSSSSS  CC            AAAAAAAAAAAA  LL            EEEEEEEEE     ------------  PPPPPPPPPPP   CC
          SS  CC            AA        AA  LL            EE                          PP            CC
          SS  CC            AA        AA  LL            EE                          PP            CC
SS        SS  CC        CC  AA        AA  LL            EE                          PP            CC        CC
SSSSSSSSSSSS  CCCCCCCCCCCC  AA        AA  LLLLLLLLLLLL  EEEEEEEEEEEE                PP            CCCCCCCCCCCC
 SSSSSSSSSS    CCCCCCCCCC   AA        AA  LLLLLLLLLLLL  EEEEEEEEEEEE                PP             CCCCCCCCCC


  0000000     99999999999             //       11              44            //     0000000             44
 000000000    999999999999           //       111             444           //     000000000           444
00       00   99        99          //       1111            4444          //     00       00         4444
00       00   99        99         //          11           44 44         //      00       00        44 44
00       00   99        99        //           11          44  44        //       00       00       44  44
00       00   999999999999       //            11         44   44       //        00       00      44   44
00       00    99999999999      //             11        44    44      //         00       00     44    44
00       00             99     //              11       44444444444   //          00       00    44444444444
00       00             99    //               11      444444444444  //           00       00   444444444444
 00     00              99   //                11              44   //             00     00            44
 000000000    999999999999  //              11111111           44  //               000000000           44
  0000000     99999999999  //               11111111           44 //                 0000000            44


     11     555555555555                555555555555      11                  555555555555          44
    111     555555555555                555555555555     111                  555555555555         444
   1111     55                 :::      55              1111         :::      55                  4444
     11     55                 :::      55                11         :::      55                 44 44
     11     55                 :::      55                11         :::      55                44  44
     11     55555555555                 55555555555       11                  55555555555      44   44
     11     555555555555                555555555555      11                  555555555555    44    44
     11               55       :::                55      11         :::                55   44444444444
     11               55       :::                55      11         :::                55  444444444444
     11     55        55       :::      55        55      11         :::      55        55          44
  11111111  555555555555                555555555555   11111111               555555555555          44
  11111111   5555555555                  5555555555    11111111                5555555555           44


 SSSSSSSSSS    CCCCCCCCCC     AAAAAAAA     LL            EEEEEEEEEEEE                PPPPPPPPPPP    CCCCCCCCCC
SSSSSSSSSSSS  CCCCCCCCCCCC   AAAAAAAAAA   LL            EEEEEEEEEEEE                PPPPPPPPPPPP  CCCCCCCCCCCC
SS        SS  CC        CC  AA        AA  LL            EE                          PP        PP  CC        CC
SS            CC            AA        AA  LL            EE                          PP        PP  CC
SS            CC            AA        AA  LL            EE                          PP        PP  CC
SSSSSSSSSSS   CC            AAAAAAAAAAAA  LL            EEEEEEEEE     ------------  PPPPPPPPPPPP  CC
 SSSSSSSSSSS  CC            AAAAAAAAAAAA  LL            EEEEEEEEE     ------------  PPPPPPPPPPP   CC
          SS  CC            AA        AA  LL            EE                          PP            CC
          SS  CC            AA        AA  LL            EE                          PP            CC
SS        SS  CC        CC  AA        AA  LL            EE                          PP            CC        CC
SSSSSSSSSSSS  CCCCCCCCCCCC  AA        AA  LLLLLLLLLLLL  EEEEEEEEEEEE                PP            CCCCCCCCCCCC
 SSSSSSSSSS    CCCCCCCCCC   AA        AA  LLLLLLLLLLLL  EEEEEEEEEEEE                PP             CCCCCCCCCC


                    ..........................................................................
                    ..........................................................................
                    ..........................................................................
                    .....                                                                .....
                    .....                  PROGRAM VERIFICATION INFORMATION              .....
                    .....                                                                .....
                    .....                 CODE SYSTEM:  SCALE-PC VERSION:  4.3           .....
                    .....                                                                .....
                    ..........................................................................
                    ..........................................................................
                    .....                                                                .....
                    .....                                                                .....
                    .....                  PROGRAM:  CSAS                                .....
                    .....                                                                .....
                    .....            CREATION DATE:  03/08/96                            .....
                    .....                                                                .....
                    .....                   VOLUME:  Eng                                 .....
                    .....                                                                .....
                    .....                  LIBRARY:  M:\SCALE43\WIN_NT\EXE               .....
                    .....                                                                .....
                    .....                                                                .....
                    .....          PRODUCTION CODE:  CSAS                                .....
```

```
*****                                                                   *****
*****                VERSION:  3.1                                       *****
*****                JOBNAME:  SCALE-PC                                  *****
*****                                                                   *****
*****     DATE OF EXECUTION:  09/14/04                                   *****
*****                                                                   *****
*****     TIME OF EXECUTION:  15:51:54                                   *****
*****                                                                   *****
*****                                                                   *****
*****************************************************************************
*****************************************************************************
*****************************************************************************


'MIN BASKET PLATE THICKNESS & OPENING

'33 GRAMS U-235 PER ELEMENT

'AXIAL ALTERNATING SHIFT

'24.1-INCH ACTIVE FUEL HEIGHT

'MIN BASKET PLATE THICKNESS & OPENING

'33 GRAMS U-235 PER ELEMENT

'AXIAL ALTERNATING SHIFT

'24.1-INCH ACTIVE FUEL HEIGHT
    NAC-LWT INPUT FOR HOMOGENIZED PULSTAR ELEMENTS IN CAN & INTACT ASSEMBLIES

    **** PROBLEM PARAMETERS ****

    LIB 27GROUPNDF4  LIBRARY
    MXX           11 MIXTURES
    MSC           13 COMPOSITION SPECIFICATIONS
    IZM            4 MATERIAL ZONES
    GE  LATTICECELL  GEOMETRY
    MORE           0 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
    MSLN           0 FUEL SOLUTIONS

    **** PROBLEM COMPOSITION DESCRIPTION ****

    SC  UO2          STANDARD COMPOSITION
    MX             1 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH     10.3800 SPECIFIED DENSITY
    NEL            2 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               92000       1.00 ATOM/MOLECULE
                                 92235      6.500 WT%
                                 92238     93.500 WT%
                8016       2.00 ATOMS/MOLECULE
    END

    SC  ZIRCALLOY    STANDARD COMPOSITION
    MX             2 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      6.5600 THEORETICAL DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               40302       1.00 ATOM/MOLECULE
    END

    SC  H2O          STANDARD COMPOSITION
    MX             3 MIXTURE NO.
    VF        0.0000 VOLUME FRACTION
    ROTH      0.9982 THEORETICAL DENSITY
    NEL            2 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
                1001       2.00 ATOMS/MOLECULE
                8016       1.00 ATOM/MOLECULE
    END

    SC  AL           STANDARD COMPOSITION
    MX             4 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      2.7020 THEORETICAL DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               13027       1.00 ATOM/MOLECULE
    END

    SC  SS304        STANDARD COMPOSITION
    MX             5 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      7.9200 THEORETICAL DENSITY
    NEL            4 NO. ELEMENTS
    ICP            0 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               24304    19.000 WT%
```

```
            25055      2.000 WT%
            26304     69.500 WT%
            28304      9.500 WT%
END
SC  PB           STANDARD COMPOSITION
MX              6 MIXTURE NO.
VF         1.0000 VOLUME FRACTION
ROTH      11.3440 THEORETICAL DENSITY
NEL             1 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
            82000       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX              7 MIXTURE NO.
VF         0.0000 VOLUME FRACTION
ROTH       0.9982 THEORETICAL DENSITY
NEL             2 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
             1001       2.00 ATOMS/MOLECULE
             8016       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX              8 MIXTURE NO.
VF         0.0000 VOLUME FRACTION
ROTH       0.9982 THEORETICAL DENSITY
NEL             2 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
             1001       2.00 ATOMS/MOLECULE
             8016       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX              9 MIXTURE NO.
VF         1.0000 VOLUME FRACTION
ROTH       0.9982 THEORETICAL DENSITY
NEL             2 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
             1001       2.00 ATOMS/MOLECULE
             8016       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX             10 MIXTURE NO.
VF         1.0000 VOLUME FRACTION
ROTH       0.9982 THEORETICAL DENSITY
NEL             2 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
             1001       2.00 ATOMS/MOLECULE
             8016       1.00 ATOM/MOLECULE
END

SC  UO2          STANDARD COMPOSITION
MX             11 MIXTURE NO.
VF         0.2592 VOLUME FRACTION
ROTH      10.3800 SPECIFIED DENSITY
NEL             2 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
            92000       1.00 ATOM/MOLECULE
                                  92235      6.500 WT%
                                  92238     93.500 WT%
             8016       2.00 ATOMS/MOLECULE
END

SC  ZIRCALLOY    STANDARD COMPOSITION
MX             11 MIXTURE NO.
VF         0.0484 VOLUME FRACTION
ROTH       6.5600 THEORETICAL DENSITY
NEL             1 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
            40302       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX             11 MIXTURE NO.
VF         0.6924 VOLUME FRACTION
ROTH       0.9982 THEORETICAL DENSITY
NEL             2 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
             1001       2.00 ATOMS/MOLECULE
             8016       1.00 ATOM/MOLECULE
END

**** PROBLEM GEOMETRY ****
CTP SQUAREPITCH  CELL TYPE
PITCH     1.5418 CM CENTER TO CENTER SPACING
```

```
FUELOD     1.0744 CM FUEL DIAMETER OR SLAB THICKNESS
MFUEL           1 MIXTURE NO. OF FUEL
MMOD            3 MIXTURE NO. OF MODERATOR
CLADOD     1.1938 CM CLAD OUTER DIAMETER
MCLAD           2 MIXTURE NO. OF CLAD
GAPOD      1.0996 CM GAP OUTER DIAMETER
MGAP            9 MIXTURE NO. OF GAP
ZONE SPECIFICATIONS FOR LATTICECELL GEOMETRY

               ZONE  1 IS FUEL
               ZONE  2 IS GAP
               ZONE  3 IS CLAD
               ZONE  4 IS MOD

NAC-LWT INPUT FOR HOMOGENIZED PULSTAR ELEMENTS IN CAN & INTACT ASSEMBLIES

********** DATA LIBRARY INFORMATION **********

 UNIT                                               VOLUME
NUMBER             DATA SET NAME                     NAME       UNIT FUNCTION
------             -------------                     ----       -------------

  89    M:\scale43\DATALIB\FT89F001                             STANDARD COMPOSITION LIBRARY

  82    M:\scale43\DATALIB\FT82F001                             CROSS SECTION LIBRARY

  11    W:\Zjr\Lwt\Pulstar\KENOVA\Aych\lwtAych2_xl_r            SHORT CROSS SECTION LIBRARY

  90    W:\Zjr\Lwt\Pulstar\KENOVA\Aych\lwtAych2_xl_r            INPUT DATA DIRECT ACCESS

                    STANDARD COMPOSITION LIBRARY DATA
                    ---------------------------------

UNIT NUMBER  :  89

DATASET NAME :  M:\scale43\DATALIB\FT89F001

LIBRARY TITLE:  SCALE-4 STANDARD COMPOSITION LIBRARY
                637 STANDARD COMPOSITIONS, 490 NUCLIDES
                90 ELEMENTS WITH VARIABLE ISOTOPIC DISTRBUTIONS.

CREATION DATE:   6/30/95

                        CROSS SECTION LIBRARY DATA
                        ---------------------------

UNIT NUMBER  :  82

DATASET NAME :  M:\scale43\DATALIB\FT82F001

LIBRARY TITLE:  SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
                   BASED ON ENDF-B VERSION 4 DATA
                      COMPILED FOR NRC      1/27/89
                         LAST UPDATED                              08/12/94
                            L.M.PETRIE   -   ORNL

........    0 IO'S WERE USED BEFORE READING KENO V DATA    ........

........    0 IO'S WERE USED READING THE KENO V PARAMETER DATA    ........

'TOP BASKET (CANNED ELEMENTS)

'TOP MIDDLE BASKET (INTACT ASSEMBLIES)

'BOTTOM MIDDLE BASKET (INTACT ASSEMBLIES)

'BOTTOM BASKET (CANNED ELEMENTS)

************** DATA READING COMPLETED **************

........    0 IO'S WERE USED PREPARING THE KENO V INPUT DATA    ........

........    0 IO'S WERE USED LOADING THE KENO V DATA    ........

........    0 IO'S WERE USED LOADING THE DATA    ........

........    0 IO'S WERE USED CHECKING THE KENO V GEOMETRY DATA    ........
*****  RESTART DATA HAS BEEN WRITTEN ON UNIT 95  *****
```

```
........    0 IO'S WERE USED WRITING THE KENO V - CSAS DATA    ........
........    0 IO'S WERE USED PROCESSING CSAS INPUT DATA    ........

CONTROL MODULE CSAS25    IS COMPLETE.
```

```
BBBBBBBBBBB    00000000000    NN         NN                AAAAAAAAA     MM         MM  IIIIIIIIIII   22222222222
BBBBBBBBBBBB   0000000000000  NNN        NN               AAAAAAAAAAA    MMM       MMM  IIIIIIIIIII  2222222222222
BB        BB   00         00  NNNN       NN              AA         AA   MMMM     MMMM      II       22          22
BB        BB   00         00  NN NN      NN              AA         AA   MM MM   MM MM      II                   22
BB        BB   00         00  NN  NN     NN              AA         AA   MM  MM MM  MM      II                   22
BBBBBBBBBBB    00         00  NN   NN    NN  ----------- AAAAAAAAAAAAA   MM   MMM   MM      II                  22
BBBBBBBBBBB    00         00  NN    NN   NN  ----------- AAAAAAAAAAAAA   MM    M    MM      II                22
BB        BB   00         00  NN     NN  NN              AA         AA   MM         MM      II              22
BB        BB   00         00  NN      NN NN              AA         AA   MM         MM      II            22
BB        BB   00         00  NN       NNNN              AA         AA   MM         MM      II          22
BBBBBBBBBBBB   0000000000000  NN        NNN              AA         AA   MM         MM  IIIIIIIIIII  2222222222222
BBBBBBBBBBB    00000000000    NN         NN              AA         AA   MM         MM  IIIIIIIIIII  2222222222222

 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL           EEEEEEEEEEEEE                 PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL           EEEEEEEEEEEEE                 PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL           EE                            PP         PP  CC         CC
SS             CC             AA         AA  LL           EE                            PP         PP  CC
SS             CC             AA         AA  LL           EE                            PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL           EEEEEEEEE      -----------    PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL           EEEEEEEEE      -----------    PPPPPPPPPPPP   CC
           SS  CC             AA         AA  LL           EE                            PP             CC
           SS  CC             AA         AA  LL           EE                            PP             CC
SS         SS  CC         CC  AA         AA  LL           EE                            PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLL EEEEEEEEEEEEE                 PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLL EEEEEEEEEEEEE                 PP              CCCCCCCCCCC

   0000000     99999999999           //        11             44          //     0000000            44
  000000000   9999999999999         //        111            444         //     000000000          444
 00       00  99         99        //        1111           4444        //     00       00        4444
00         00 99         99       //           11          44 44       //     00         00      44 44
00         00 99         99      //            11         44  44      //      00         00     44  44
00         00 9999999999999     //             11        44   44     //       00         00    44   44
00         00  999999999999    //              11       44    44    //        00         00   44    44
00         00            99   //               11      444444444444 //        00         00  444444444444
00         00            99  //                11      444444444444//         00         00  444444444444
 00       00             99 //                 11             44  //           00       00          44
  000000000   9999999999999//              11111111           44 //             000000000           44
   0000000    999999999999//               11111111           44//               0000000            44

     11       5555555555555             5555555555555      11              5555555555555   666666666666
    111       5555555555555             5555555555555     111              5555555555555  6666666666666
   1111       55              :::       55               1111      :::     55             66
     11       55              :::       55                 11      :::     55             66
     11       55              :::       55                 11      :::     55             66
     11       555555555555              555555555555       11              555555555555   666666666666
     11       5555555555555             5555555555555      11              5555555555555  6666666666666
     11                  55   :::                  55      11      :::                55  66         66
     11                  55   :::                  55      11      :::                55  66         66
     11       55         55   :::       55         55      11      :::     55         55  66         66
  11111111    5555555555555             5555555555555   11111111           5555555555555  6666666666666
  11111111     55555555555               55555555555    11111111            55555555555    66666666666

 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL           EEEEEEEEEEEEE                 PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL           EEEEEEEEEEEEE                 PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL           EE                            PP         PP  CC         CC
SS             CC             AA         AA  LL           EE                            PP         PP  CC
SS             CC             AA         AA  LL           EE                            PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL           EEEEEEEEE      -----------    PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL           EEEEEEEEE      -----------    PPPPPPPPPPPP   CC
           SS  CC             AA         AA  LL           EE                            PP             CC
           SS  CC             AA         AA  LL           EE                            PP             CC
SS         SS  CC         CC  AA         AA  LL           EE                            PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLL EEEEEEEEEEEEE                 PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLL EEEEEEEEEEEEE                 PP              CCCCCCCCCCC
```

```
**************************************************************************
**************************************************************************
**************************************************************************
*****                                                                *****
*****                PROGRAM VERIFICATION INFORMATION                *****
*****                                                                *****
*****               CODE SYSTEM:   SCALE-PC VERSION:   4.3           *****
*****                                                                *****
**************************************************************************
**************************************************************************
*****                                                                *****
*****                                                                *****
*****                  PROGRAM:  000008                              *****
*****                                                                *****
*****            CREATION DATE:  09/16/95                            *****
*****                                                                *****
*****                   VOLUME:  Eng                                 *****
*****                                                                *****
*****                  LIBRARY:  M:\SCALE43\WIN_NT\EXE               *****
*****                                                                *****
*****                                                                *****
*****       THIS IS NOT A SCALE-PC CONFIGURATION CONTROLLED CODE     *****
*****                                                                *****
*****                  JOBNAME:  SCALE-PC                            *****
*****                                                                *****
*****        DATE OF EXECUTION:  09/14/04                            *****
*****                                                                *****
*****        TIME OF EXECUTION:  15:51:56                            *****
*****                                                                *****
**************************************************************************
**************************************************************************
**************************************************************************

       -1Q ARRAY HAS      1 ENTRIES.

        0Q ARRAY HAS      4 ENTRIES.

        1Q ARRAY HAS      6 ENTRIES.

        2Q ARRAY HAS      2 ENTRIES.
LOGICAL ASSIGNMENTS

MASTER LIBRARY    11
WORKING LIBRARY    0
SCRATCH FILE      18
NEW LIBRARY        1

P R O B L E M   D E S C R I P T I O N

IGR--GEOMETRY (0/1/2/3--INF MED/SLAB/CYL/SPHERE             2

IZM--NUMBER OF ZONES OR MATERIAL REGIONS                   11

MS--MIXING TABLE LENGTH                                    25

IBL--SHIELDED CROSS SECTION EDIT OPTION (0/1--NO/YES)       0

IBR--BONDARENKO FACTOR EDIT OPTION (0/1--NO/YES)            0

ISSOPT--DANCOFF FACTOR OPTION                               0

CONVERGENCE CRITERION     1.00000E-03

GEOMETRY CORRECTION FACTOR FOR WIGNER RATIONAL APPROXIMATION  1.350E+00

        3Q ARRAY HAS     25 ENTRIES.

        4Q ARRAY HAS     25 ENTRIES.

        5Q ARRAY HAS     25 ENTRIES.

        6Q ARRAY HAS     11 ENTRIES.

        7Q ARRAY HAS     11 ENTRIES.

        8Q ARRAY HAS     11 ENTRIES.

        9Q ARRAY HAS     11 ENTRIES.

       10Q ARRAY HAS     25 ENTRIES.

       11Q ARRAY HAS     11 ENTRIES.

M I X I N G   T A B L E

ENTRY   MIXTURE   ISOTOPE   NUMBER DENSITY   NEW IDENTIFIER
   1       1       92235     1.52378E-03        1092235
   2      11       92235     3.94965E-04       11092235
   3       1       92238     2.16422E-02        1092238
   4      11       92238     5.60966E-03       11092238
   5       1        8016     4.63320E-02        1008016
   6       3        8016     3.33846E-22        3008016
   7       7        8016     3.33846E-22        7008016
   8       8        8016     3.33846E-22        8008016
```

9	9	8016	3.33846E-02	9008016
10	10	8016	3.33846E-02	10008016
11	11	8016	3.51247E-02	11008016
12	2	40302	4.33078E-02	2040302
13	11	40302	2.09610E-03	11040302
14	3	1001	6.67692E-22	3001001
15	7	1001	6.67692E-22	7001001
16	8	1001	6.67692E-22	8001001
17	9	1001	6.67692E-02	9001001
18	10	1001	6.67692E-02	10001001
19	11	1001	4.62310E-02	11001001
20	4	13027	6.03066E-02	4013027
21	5	24304	1.74286E-02	5024304
22	5	25055	1.73633E-03	5025055
23	5	26304	5.93579E-02	5026304
24	5	28304	7.72070E-03	5028304
25	6	82000	3.29690E-02	6082000

GEOMETRY AND MATERIAL DESCRIPTION

ZONE	MIXTURE	OUTER DIMENSION	TEMPERATURE	EXTRA XS	TYPE (0/1--FUEL/MOD)
1	1	5.37210E-01	2.93000E+02	3.24169E-02	0
2	9	5.49910E-01	2.93000E+02	0.00000E+00	0
3	2	5.96900E-01	2.93000E+02	2.51346E+00	0
4	3	8.69856E-01	2.93000E+02	0.00000E+00	0
5	4	5.86986E+00	2.93000E+02	0.00000E+00	0
6	5	1.08699E+01	2.93000E+02	0.00000E+00	0
7	6	1.58699E+01	2.93000E+02	0.00000E+00	0
8	7	2.08699E+01	2.93000E+02	0.00000E+00	0
9	8	2.58699E+01	2.93000E+02	0.00000E+00	0
10	10	3.08699E+01	2.93000E+02	0.00000E+00	0
11	11	3.58699E+01	2.93000E+02	0.00000E+00	0

4509 LOCATIONS OF 100000 AVAILABLE ARE REQUIRED TO MAKE A NEW MASTER CONTAINING THE SELF-SHIELDED VALUES

NO NUCLIDES IN YOUR PROBLEM HAVE BONDARENKO FACTOR DATA**BONAMI WILL COPY FROM LOGICAL 11 TO LOGICAL 1

```
COPY      1001   HYDROGEN          FROM LOG 11 TO LOG 18    BONDARENKO TRIGGER 0
COPY      1001   HYDROGEN          FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY      1001   HYDROGEN          FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY      1001   HYDROGEN          FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY      1001   HYDROGEN          FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY      1001   HYDROGEN          FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY      1001   HYDROGEN          FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY      8016   OXYGEN-16         FROM LOG 11 TO LOG 18    BONDARENKO TRIGGER 0
COPY      8016   OXYGEN-16         FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY      8016   OXYGEN-16         FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY      8016   OXYGEN-16         FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY      8016   OXYGEN-16         FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY      8016   OXYGEN-16         FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY      8016   OXYGEN-16         FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY      8016   OXYGEN-16         FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY     13027  AL-27 1193 218 G   FROM LOG 11 TO LOG  1    BONDARENKO TRIGGER 0
COPY     24304  CR 1191 WT SS-30   FROM LOG 11 TO LOG  1    BONDARENKO TRIGGER 0
COPY     25055   MANGANESE-55      FROM LOG 11 TO LOG  1    BONDARENKO TRIGGER 0
COPY     26304  FE 1192 WT SS-30   FROM LOG 11 TO LOG  1    BONDARENKO TRIGGER 0
COPY     28304  NI 1190 WT SS-30   FROM LOG 11 TO LOG  1    BONDARENKO TRIGGER 0
COPY     40302   ZIRCALLOY         FROM LOG 11 TO LOG 18    BONDARENKO TRIGGER 0
COPY     40302   ZIRCALLOY         FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY     40302   ZIRCALLOY         FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY     82000  PB    1288 218NGP  FROM LOG 11 TO LOG  1    BONDARENKO TRIGGER 0
COPY     92235   URANIUM-235       FROM LOG 11 TO LOG 18    BONDARENKO TRIGGER 0
COPY     92235   URANIUM-235       FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY     92235   URANIUM-235       FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY     92238   URANIUM-238       FROM LOG 11 TO LOG 18    BONDARENKO TRIGGER 0
COPY     92238   URANIUM-238       FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
COPY     92238   URANIUM-238       FROM LOG 18 TO LOG  1    BONDARENKO TRIGGER 0
```

```
SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
   BASED ON ENDF-B VERSION 4 DATA
      COMPILED FOR NRC      1/27/89
         LAST UPDATED                                                       08/12/94
            L.M.PETRIE    -    ORNL
    TAPE ID                                    4321          NUMBER OF NUCLIDES                    25
    NUMBER OF NEUTRON GROUPS                     27          NUMBER OF GAMMA GROUPS                 0
    FIRST THERMAL GROUP                          15          LOGICAL UNIT                           1
                                    TABLE OF CONTENTS
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002            UPDATED 08/12/94        ID    3001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002            UPDATED 08/12/94        ID    7001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002            UPDATED 08/12/94        ID    8001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002            UPDATED 08/12/94        ID    9001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002            UPDATED 08/12/94        ID   10001001
   HYDROGEN       ENDF/B-IV MAT 1269/THRM1002            UPDATED 08/12/94        ID   11001001
   OXYGEN-16      ENDF/B-IV MAT 1276                     UPDATED 08/12/94        ID    1008016
   OXYGEN-16      ENDF/B-IV MAT 1276                     UPDATED 08/12/94        ID    3008016
   OXYGEN-16      ENDF/B-IV MAT 1276                     UPDATED 08/12/94        ID    7008016
   OXYGEN-16      ENDF/B-IV MAT 1276                     UPDATED 08/12/94        ID    8008016
   OXYGEN-16      ENDF/B-IV MAT 1276                     UPDATED 08/12/94        ID    9008016
   OXYGEN-16      ENDF/B-IV MAT 1276                     UPDATED 08/12/94        ID   10008016
   OXYGEN-16      ENDF/B-IV MAT 1276                     UPDATED 08/12/94        ID   11008016
  AL-27 1193 218 GP 040375(5)                            UPDATED 08/12/94        ID    4013027
  CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94        ID    5024304
   MANGANESE-55   ENDF/B-IV MAT 1197                     UPDATED 08/12/94        ID    5025055
  FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94        ID    5026304
  NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94        ID    5028304
   ZIRCALLOY      ENDF/B-IV MAT 1284                     UPDATED 08/12/94        ID    2040302
   ZIRCALLOY      ENDF/B-IV MAT 1284                     UPDATED 08/12/94        ID   11040302
  PB    1288 218NGP 042375 P-3 293K                      UPDATED 08/12/94        ID    6082000
   URANIUM-235    ENDF/B-IV MAT 1261                     UPDATED 08/12/94        ID    1092235
   URANIUM-235    ENDF/B-IV MAT 1261                     UPDATED 08/12/94        ID   11092235
   URANIUM-238    ENDF/B-IV MAT 1262                     UPDATED 08/12/94        ID    1092238
   URANIUM-238    ENDF/B-IV MAT 1262                     UPDATED 08/12/94        ID   11092238

    TAPE COPY USED       0 I/O'S, AND TOOK     0.17 SECONDS

          NN         NN IIIIIIIIIII   TTTTTTTTTTT     AAAAAAAAA    WW          WW  LL
          NNN        NN IIIIIIIIIII   TTTTTTTTTTT    AAAAAAAAAAA   WW          WW  LL
          NNNN       NN     II            TT        AA         AA  WW          WW  LL
          NN NN      NN     II            TT        AA         AA  WW          WW  LL
          NN  NN     NN     II            TT        AA         AA  WW          WW  LL
          NN   NN    NN     II            TT        AAAAAAAAAAAAA  WW    W     WW  LL
          NN    NN   NN     II            TT        AAAAAAAAAAAAA  WW   WWW    WW  LL
          NN     NN  NN     II            TT        AA         AA  WW  WW WW   WW  LL
          NN      NN NN     II            TT        AA         AA  WW WW   WW WW  LL
          NN       NNNN     II            TT        AA         AA  WWWW     WWWW  LL
          NN        NNN IIIIIIIIIII       TT        AA         AA  WWW       WWW  LLLLLLLLLLLL
          NN         NN IIIIIIIIIII       TT        AA         AA  WW         WW  LLLLLLLLLLLL

  SSSSSSSSSSS   CCCCCCCCCCC    AAAAAAAAA    LL           EEEEEEEEEEEEE                 PPPPPPPPPPPP    CCCCCCCCCCC
 SSSSSSSSSSSSS CCCCCCCCCCCCC  AAAAAAAAAAA   LL           EEEEEEEEEEEEE                 PPPPPPPPPPPPP  CCCCCCCCCCCCC
 SS         SS CC         CC  AA         AA LL           EE                            PP          PP CC         CC
 SS            CC             AA         AA LL           EE                            PP          PP CC
 SS            CC             AA         AA LL           EE                            PP          PP CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA LL           EEEEEEEEE      -------------  PPPPPPPPPPPPP  CC
  SSSSSSSSSSSS CC             AAAAAAAAAAAAA LL           EEEEEEEEE      -------------  PPPPPPPPPPPP   CC
            SS CC             AA         AA LL           EE                            PP             CC
            SS CC             AA         AA LL           EE                            PP             CC
 SS         SS CC         CC  AA         AA LL           EE                            PP             CC         CC
 SSSSSSSSSSSSS CCCCCCCCCCCCC  AA         AA LLLLLLLLLLLL EEEEEEEEEEEEE                 PP              CCCCCCCCCCCCC
  SSSSSSSSSSS   CCCCCCCCCCC   AA         AA LLLLLLLLLLLL EEEEEEEEEEEEE                 PP               CCCCCCCCCCC

   0000000     99999999999           //      11          44          //    0000000           44
  000000000   9999999999999         //      111         444         //    000000000         444
 00       00  99         99        //      1111        4444        //    00       00       4444
 00       00  99         99       //         11       44 44       //     00       00      44 44
 00       00  99         99      //          11      44  44      //      00       00     44  44
 00       00  9999999999999     //           11     44   44     //       00       00    44   44
 00       00   999999999999    //            11    44    44    //        00       00   44    44
 00       00             99   //             11   444444444444 //         00       00  444444444444
 00       00             99  //              11   444444444444//          00       00  444444444444
 00       00             99 //               11          44   //          00       00          44
  000000000   9999999999999//           11111111         44  //            000000000           44
   0000000     99999999999 //           11111111         44 //              0000000            44

       11     5555555555555              5555555555555       11             5555555555555   666666666666
      111     5555555555555              5555555555555      111             5555555555555   6666666666666
     1111     55                 :::     55                1111      :::    55              66
       11     55                 :::     55                  11      :::    55              66
       11     55                 :::     55                  11      :::    55              66
       11     555555555555               555555555555        11             555555555555    666666666666
       11     5555555555555              5555555555555       11             5555555555555   6666666666666
       11                55      :::                55       11      :::               55   66         66
       11                55      :::                55       11      :::               55   66         66
       11     55         55      :::     55         55       11      :::    55         55   66         66
    11111111  5555555555555              5555555555555    11111111          5555555555555   6666666666666
    11111111   55555555555                55555555555     11111111           55555555555     66666666666
```

```
  SSSSSSSSSSS    CCCCCCCCCCC       AAAAAAAAA      LL                EEEEEEEEEEEEE                        PPPPPPPPPPPP     CCCCCCCCCCC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC     AAAAAAAAAAA     LL                EEEEEEEEEEEEE                        PPPPPPPPPPPPP   CCCCCCCCCCCCC
 SS         SS  CC         CC    AA         AA    LL                EE                                   PP         PP   CC         CC
 SS             CC               AA         AA    LL                EE                                   PP         PP   CC
 SS             CC               AA         AA    LL                EE                                   PP         PP   CC
 SSSSSSSSSSSS   CC               AAAAAAAAAAAAA    LL                EEEEEEEEE      -------------         PPPPPPPPPPPPP   CC
  SSSSSSSSSSSS  CC               AAAAAAAAAAAAA    LL                EEEEEEEEE      -------------         PPPPPPPPPPPP    CC
            SS  CC               AA         AA    LL                EE                                   PP              CC
            SS  CC               AA         AA    LL                EE                                   PP              CC
 SS         SS  CC         CC    AA         AA    LL                EE                                   PP              CC         CC
 SSSSSSSSSSSSS  CCCCCCCCCCCCC    AA         AA    LLLLLLLLLLLLL     EEEEEEEEEEEEE                        PP              CCCCCCCCCCCCC
  SSSSSSSSSSS    CCCCCCCCCCC     AA         AA    LLLLLLLLLLLLL     EEEEEEEEEEEEE                        PP               CCCCCCCCCCC

                       ******************************************************************************
                       ******************************************************************************
                       *****                                                                    *****
                       *****                   PROGRAM VERIFICATION INFORMATION                 *****
                       *****                                                                    *****
                       *****      .          CODE SYSTEM:  SCALE-PC VERSION:  4.3               *****
                       *****                                                                    *****
                       ******************************************************************************
                       ******************************************************************************
                       *****                                                                    *****
                       *****                                                                    *****
                       *****              PROGRAM:  000002                                      *****
                       *****                                                                    *****
                       *****        CREATION DATE:  09/28/95                                    *****
                       *****                                                                    *****
                       *****               VOLUME:  Eng                                         *****
                       *****                                                                    *****
                       *****              LIBRARY:  M:\SCALE43\WIN_NT\EXE                       *****
                       *****                                                                    *****
                       *****                                                                    *****
                       *****      PRODUCTION CODE:  NITAWL                                      *****
                       *****                                                                    *****
                       *****              VERSION:  3.0                                         *****
                       *****                                                                    *****
                       *****              JOBNAME:  SCALE-PC                                    *****
                       *****                                                                    *****
                       *****    DATE OF EXECUTION:  09/14/04                                    *****
                       *****                                                                    *****
                       *****    TIME OF EXECUTION:  15:51:56                                    *****
                       *****                                                                    *****
                       ******************************************************************************
                       ******************************************************************************

       -1Q ARRAY HAS      1 ENTRIES.

        0Q ARRAY HAS      9 ENTRIES.

        1Q ARRAY HAS     12 ENTRIES.

SELECT 25 NUCLIDES FROM THE MASTER  LIBRARY ON LOGICAL  1
        0 NUCLIDES FROM THE WORKING LIBRARY ON LOGICAL  2
        0 NUCLIDES FROM THE WORKING LIBRARY ON LOGICAL  3
          TO CREATE THE NEW WORKING LIBRARY ON LOGICAL  4

        7 RESONANCE CALCULATIONS HAVE BEEN REQUESTED
       -1 OUTPUT OPTION FOR AMPX FORMATTED CROSS SECTION DATA
     2001 MAXIMUM NUMBER OF RESONANCE MESH INTERVALS
        2 ORDER OF RESONANCE LEVEL PROCESSING

THE STORAGE ALLOCATED FOR THIS CASE IS     100000 WORDS

        2Q ARRAY HAS     25 ENTRIES.

        3Q ARRAY HAS    105 ENTRIES.

        4Q ARRAY HAS     25 ENTRIES.

 GENERAL INFORMATION CONCERNING CROSS SECTION LIBRARY
   TAPE IDENTIFICATION NUMBER                 4321
   NUMBER OF NUCLIDES ON TAPE                   25
   NUMBER OF NEUTRON ENERGY GROUPS              27
   FIRST THERMAL NEUTRON ENERGY GROUP           15
   NUMBER OF GAMMA ENERGY GROUPS                 0

   DIRECT ACCESS UNIT NUMBER  9 REQUIRES 117 BLOCKS OF LENGTH  1680 WORDS
 XSDRN TAPE    4321
                         SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
                            BASED ON ENDF-B VERSION 4 DATA
                               COMPILED FOR NRC      1/27/89
                                  LAST UPDATED                                                 08/12/94
                                     L.M.PETRIE    -    ORNL

 NUCLIDES FROM XSDRN TAPE
     1        HYDROGEN        ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94      3001001
     2        HYDROGEN        ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94      7001001
     3        HYDROGEN        ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94      8001001
     4        HYDROGEN        ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94      9001001
     5        HYDROGEN        ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94     10001001
     6        HYDROGEN        ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94     11001001
     7        OXYGEN-16       ENDF/B-IV MAT 1276                       UPDATED 08/12/94      1008016
     8        OXYGEN-16       ENDF/B-IV MAT 1276                       UPDATED 08/12/94      3008016
     9        OXYGEN-16       ENDF/B-IV MAT 1276                       UPDATED 08/12/94      7008016
```

```
   10    OXYGEN-16      ENDF/B-IV MAT 1276                            UPDATED 08/12/94      8008016
   11    OXYGEN-16      ENDF/B-IV MAT 1276                            UPDATED 08/12/94      9008016
   12    OXYGEN-16      ENDF/B-IV MAT 1276                            UPDATED 08/12/94     10008016
   13    OXYGEN-16      ENDF/B-IV MAT 1276                            UPDATED 08/12/94     11008016
   14   AL-27 1193 218 GP 040375(5)                                   UPDATED 08/12/94      4013027
   15   CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'              UPDATED 08/12/94      5024304
   16    MANGANESE-55   ENDF/B-IV MAT 1197                            UPDATED 08/12/94      5025055
   17   FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'              UPDATED 08/12/94      5026304
   18   NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'              UPDATED 08/12/94      5028304
   19    ZIRCALLOY      ENDF/B-IV MAT 1284                            UPDATED 08/12/94      2040302
   20    ZIRCALLOY      ENDF/B-IV MAT 1284                            UPDATED 08/12/94     11040302
   21   PB   1288 218NGP 042375 P-3 293K                              UPDATED 08/12/94      6082000
   22    URANIUM-235    ENDF/B-IV MAT 1261                            UPDATED 08/12/94      1092235
   23    URANIUM-235    ENDF/B-IV MAT 1261                            UPDATED 08/12/94     11092235
   24    URANIUM-238    ENDF/B-IV MAT 1262                            UPDATED 08/12/94      1092238
   25    URANIUM-238    ENDF/B-IV MAT 1262                            UPDATED 08/12/94     11092238

 HYDROGEN       ENDF/B-IV MAT 1269/THRM1002               UPDATED 08/12/94    3001001      TEMPERATURE=    293.00
                                                               PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 HYDROGEN       ENDF/B-IV MAT 1269/THRM1002               UPDATED 08/12/94    7001001      TEMPERATURE=    293.00
                                                               PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 HYDROGEN       ENDF/B-IV MAT 1269/THRM1002               UPDATED 08/12/94    8001001      TEMPERATURE=    293.00
                                                               PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 HYDROGEN       ENDF/B-IV MAT 1269/THRM1002               UPDATED 08/12/94    9001001      TEMPERATURE=    293.00
                                                               PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 HYDROGEN       ENDF/B-IV MAT 1269/THRM1002               UPDATED 08/12/94   10001001      TEMPERATURE=    293.00
                                                               PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 HYDROGEN       ENDF/B-IV MAT 1269/THRM1002               UPDATED 08/12/94   11001001      TEMPERATURE=    293.00
                                                               PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                        UPDATED 08/12/94    1008016      TEMPERATURE=    293.00
                                                               PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                        UPDATED 08/12/94    3008016      TEMPERATURE=    293.00
                                                               PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                        UPDATED 08/12/94    7008016      TEMPERATURE=    293.00
                                                               PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                        UPDATED 08/12/94    8008016      TEMPERATURE=    293.00
                                                               PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                        UPDATED 08/12/94    9008016      TEMPERATURE=    293.00
                                                               PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                        UPDATED 08/12/94   10008016      TEMPERATURE=    293.00
                                                               PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 OXYGEN-16      ENDF/B-IV MAT 1276                        UPDATED 08/12/94   11008016      TEMPERATURE=    293.00
                                                               PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

AL-27 1193 218 GP 040375(5)                               UPDATED 08/12/94    4013027      TEMPERATURE=    293.00
                                                               PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED 08/12/94    5024304      TEMPERATURE=    293.00
                                                               PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 MANGANESE-55   ENDF/B-IV MAT 1197                        UPDATED 08/12/94    5025055      TEMPERATURE=    293.00

GEOMETRY HAS BEEN SET TO HOMOGENEOUS AS LBAR IS  0.0000E+00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)          =    54.466          TEMPERATURE(KELVIN)        =   293.000

POTENTIAL SCATTER SIGMA  =     2.590          LUMPED NUCLEAR DENSITY     = 1.7363295E-03

SPIN FACTOR (G)          =    14.448          LUMP DIMENSION (A-BAR)     = 0.0000000E+00

INNER RADIUS             = 0.0000000E+00      DANCOFF CORRECTION (C)     = 0.0000000E+00

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1     =    55.845            SIGMA(PER ABSORBER ATOM)= 3.4663022E+02

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2     =    55.925            SIGMA(PER ABSORBER ATOM)= 1.2557598E+02

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 0-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP        RES ABS          RES FISS         RES SCAT
  8       -5.518788E-04    0.000000E+00    -3.944190E-01
  9       -2.797993E-03    0.000000E+00    -2.293471E+00
 10       -3.291452E-01    0.000000E+00    -3.820862E+01
 11       -2.680562E+00    0.000000E+00    -1.159996E+02
```

EXCESS RESONANCE INTEGRALS

```
                  RESOLVED
ABSORPTION       3.33719E+00
FISSION          0.00000E+00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94    5026304     TEMPERATURE=   293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'       UPDATED 08/12/94    5028304     TEMPERATURE=   293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 ZIRCALLOY      ENDF/B-IV MAT 1284                     UPDATED 08/12/94    2040302     TEMPERATURE=   293.00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)          =     90.436          TEMPERATURE(KELVIN)        =    293.000

POTENTIAL SCATTER SIGMA  =     6.385           LUMPED NUCLEAR DENSITY     = 4.3307818E-02

SPIN FACTOR (G)          =     1.079           LUMP DIMENSION (A-BAR)     = 5.9689999E-01

INNER RADIUS             = 5.4991001E-01       DANCOFF CORRECTION (C)     = 7.8146917E-01

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 2-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP        RES ABS          RES FISS         RES SCAT
  8      -5.981358E-04    0.000000E+00    -4.731437E-01
  9      -3.409349E-02    0.000000E+00    -1.425288E+00
 10      -3.610238E-02    0.000000E+00    -8.147648E-01
 11      -1.129208E-01    0.000000E+00    -5.208245E-01

EXCESS RESONANCE INTEGRALS

                  RESOLVED

ABSORPTION       4.65199E-01
FISSION          0.00000E+00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 ZIRCALLOY      ENDF/B-IV MAT 1284                     UPDATED 08/12/94   11040302     TEMPERATURE=   293.00

GEOMETRY HAS BEEN SET TO HOMOGENEOUS AS LBAR IS  0.0000E+00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)          =     90.436          TEMPERATURE(KELVIN)        =    293.000

POTENTIAL SCATTER SIGMA  =     6.385           LUMPED NUCLEAR DENSITY     = 2.0960984E-03

SPIN FACTOR (G)          =     1.079           LUMP DIMENSION (A-BAR)     = 0.0000000E+00

INNER RADIUS             = 0.0000000E+00       DANCOFF CORRECTION (C)     = 0.0000000E+00

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1      =      1.008          SIGMA(PER ABSORBER ATOM)= 4.4951505E+02

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2      =     24.072          SIGMA(PER ABSORBER ATOM)= 1.0036559E+02

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 0-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP        RES ABS          RES FISS         RES SCAT
  8      -8.728580E-05    0.000000E+00    -6.961700E-02
  9      -8.536950E-03    0.000000E+00    -3.447169E-01
 10      -7.519929E-03    0.000000E+00    -1.797771E-01
 11      -3.148421E-02    0.000000E+00    -1.579333E-01

EXCESS RESONANCE INTEGRALS

                  RESOLVED

ABSORPTION       6.97865E-01
FISSION          0.00000E+00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

PB   1288 218NGP 042375 P-3 293K                       UPDATED 08/12/94    6082000     TEMPERATURE=   293.00
                                                            PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 URANIUM-235    ENDF/B-IV MAT 1261                     UPDATED 08/12/94    1092235     TEMPERATURE=   293.00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)          =    233.025          TEMPERATURE(KELVIN)        =    293.000

POTENTIAL SCATTER SIGMA  =    11.500           LUMPED NUCLEAR DENSITY     = 1.5237845E-03
```

```
SPIN FACTOR (G)          = 15171.100             LUMP DIMENSION (A-BAR)    = 5.3720999E-01
INNER RADIUS             = 0.0000000E+00         DANCOFF CORRECTION (C)    = 9.6557754E-01

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1     =     15.991             SIGMA(PER ABSORBER ATOM)= 1.1818631E+02

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2     =    238.051             SIGMA(PER ABSORBER ATOM)= 1.7507033E+02

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 2-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP        RES ABS         RES FISS        RES SCAT
 12       -1.555963E+01   -9.675939E+00   -2.151408E-01
 13       -3.600886E+01   -1.766607E+01   -4.584523E-01
 14       -2.840306E+01   -1.602412E+01   -2.987270E-02
 15       -4.645758E-03   -3.516320E-03    5.461928E-05

EXCESS RESONANCE INTEGRALS

                  RESOLVED

ABSORPTION       1.28067E+02
FISSION          8.02641E+01
                                                       PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 URANIUM-235    ENDF/B-IV MAT 1261               UPDATED 08/12/94   11092235      TEMPERATURE=   293.00

GEOMETRY HAS BEEN SET TO HOMOGENEOUS AS LBAR IS  0.0000E+00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)          =    233.025            TEMPERATURE(KELVIN)        =   293.000

POTENTIAL SCATTER SIGMA  =     11.500            LUMPED NUCLEAR DENSITY     = 3.9496494E-04

SPIN FACTOR (G)          = 15171.100             LUMP DIMENSION (A-BAR)     = 0.0000000E+00

INNER RADIUS             = 0.0000000E+00         DANCOFF CORRECTION (C)     = 0.0000000E+00

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1     =      1.008             SIGMA(PER ABSORBER ATOM)= 2.3855984E+03

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2     =     24.751             SIGMA(PER ABSORBER ATOM)= 5.5561206E+02

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 0-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP        RES ABS         RES FISS        RES SCAT
 12       -2.393958E+00   -1.469064E+00   -6.167160E-02
 13       -7.766139E+00   -3.800209E+00   -1.755016E-01
 14       -5.629828E+00   -3.356100E+00   -4.021226E-02
 15       -2.967298E-04   -2.254224E-04    2.470951E-06

EXCESS RESONANCE INTEGRALS

                  RESOLVED

ABSORPTION       2.09811E+02
FISSION          1.25281E+02
                                                       PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 URANIUM-238    ENDF/B-IV MAT 1262               UPDATED 08/12/94    1092238      TEMPERATURE=   293.00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)          =    236.006            TEMPERATURE(KELVIN)        =   293.000

POTENTIAL SCATTER SIGMA  =     10.599            LUMPED NUCLEAR DENSITY     = 2.1642193E-02

SPIN FACTOR (G)          =    656.527            LUMP DIMENSION (A-BAR)     = 5.3720999E-01

INNER RADIUS             = 0.0000000E+00         DANCOFF CORRECTION (C)     = 9.6557754E-01

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1     =     15.991             SIGMA(PER ABSORBER ATOM)= 8.3212671E+00

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2     =    235.044             SIGMA(PER ABSORBER ATOM)= 8.3803099E-01

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.
```

```
THIS RESONANCE MATERIAL WILL BE TREATED AS A 2-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000
GROUP        RES ABS         RES FISS          RES SCAT
  9       -8.077708E-02    0.000000E+00    -7.508340E-01
 10       -1.511387E+00   -6.826579E-05    -8.800206E+00
 11       -1.072418E+01    0.000000E+00    -2.896896E+01
 12       -4.483370E+01    0.000000E+00    -5.115822E+01
 13       -5.540449E+01    0.000000E+00    -1.743188E+01
 14       -1.076379E+02    0.000000E+00    -5.433709E+00
 15       -8.253445E-05    0.000000E+00     1.604975E-04

EXCESS RESONANCE INTEGRALS
                  RESOLVED

ABSORPTION       6.64320E+00
FISSION          4.16267E-04
                                                               PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 URANIUM-238     ENDF/B-IV MAT 1262                       UPDATED 08/12/94   11092238      TEMPERATURE=   293.00

GEOMETRY HAS BEEN SET TO HOMOGENEOUS AS LBAR IS  0.0000E+00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)            =   236.006            TEMPERATURE(KELVIN)         =   293.000

POTENTIAL SCATTER SIGMA  =    10.599             LUMPED NUCLEAR DENSITY      = 5.6096567E-03

SPIN FACTOR (G)            =   656.527            LUMP DIMENSION (A-BAR)      = 0.0000000E+00

INNER RADIUS               = 0.0000000E+00        DANCOFF CORRECTION (C)      = 0.0000000E+00

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1      =      1.008            SIGMA(PER ABSORBER ATOM)= 1.6796532E+02

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2      =     17.862            SIGMA(PER ABSORBER ATOM)= 2.7631227E+01

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 0-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP        RES ABS         RES FISS          RES SCAT
  9       -2.448317E-02    0.000000E+00    -2.558519E-01
 10       -7.653835E-01   -9.584553E-06    -4.906636E+00
 11       -8.693248E+00    0.000000E+00    -2.447922E+01
 12       -4.042473E+01    0.000000E+00    -4.730249E+01
 13       -5.096339E+01    0.000000E+00    -1.676821E+01
 14       -9.847737E+01    0.000000E+00    -5.734400E+00
 15       -3.066651E-07    0.000000E+00     5.920313E-07

EXCESS RESONANCE INTEGRALS
                  RESOLVED

ABSORPTION       3.42804E+01
FISSION          5.17445E-04
                                                               PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00
     THIS XSDRN WORKING TAPE WAS CREATED 09/14/04 AT 15:51:57
     THE TITLE OF THE PARENT CASE IS AS FOLLOWS
     SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
        BASED ON ENDF-B VERSION 4 DATA
           COMPILED FOR NRC      1/27/89
         TAPE ID                               4321          NUMBER OF NUCLIDES                 25
         NUMBER OF NEUTRON GROUPS                27          NUMBER OF GAMMA GROUPS              0
         FIRST THERMAL GROUP                     15          LOGICAL UNIT                        4
                                      TABLE OF CONTENTS
        HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94        ID   3001001
        HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94        ID   7001001
        HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94        ID   8001001
        HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94        ID   9001001
        HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94        ID  10001001
        HYDROGEN       ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94        ID  11001001
        OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94        ID   1008016
        OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94        ID   3008016
        OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94        ID   7008016
        OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94        ID   8008016
        OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94        ID   9008016
        OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94        ID  10008016
        OXYGEN-16      ENDF/B-IV MAT 1276                   UPDATED 08/12/94        ID  11008016
       AL-27 1193 218 GP 040375(5)                          UPDATED 08/12/94        ID   4013027
       CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED 08/12/94        ID   5024304
        MANGANESE-55   ENDF/B-IV MAT 1197                   UPDATED 08/12/94        ID   5025055
       FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED 08/12/94        ID   5026304
       NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'     UPDATED 08/12/94        ID   5028304
        ZIRCALLOY      ENDF/B-IV MAT 1284                   UPDATED 08/12/94        ID   2040302
        ZIRCALLOY      ENDF/B-IV MAT 1284                   UPDATED 08/12/94        ID  11040302
       PB   1288 218NGP 042375 P-3 293K                     UPDATED 08/12/94        ID   6082000
        URANIUM-235    ENDF/B-IV MAT 1261                   UPDATED 08/12/94        ID   1092235
        URANIUM-235    ENDF/B-IV MAT 1261                   UPDATED 08/12/94        ID  11092235
```

```
URANIUM-238    ENDF/B-IV MAT 1262                UPDATED 08/12/94      ID   1092238
URANIUM-238    ENDF/B-IV MAT 1262                UPDATED 08/12/94      ID  11092238

 TAPE COPY USED       0 I/O'S, AND TOOK     0.11 SECONDS
```

```
               KK        KK   EEEEEEEEEEEEE  NN         NN   OOOOOOOOOOO                  VV         VV
               KK       KK    EEEEEEEEEEEEE  NNN        NN  OOOOOOOOOOOOO                 VV         VV
               KK      KK     EE             NNNN       NN  OO         OO                 VV         VV
               KK     KK      EE             NN NN      NN  OO         OO                 VV         VV
               KK    KK       EE             NN  NN     NN  OO         OO                 VV         VV
               KKKKKKK        EEEEEEEEE      NN   NN    NN  OO         OO  -------------  VV         VV
               KKKKKKK        EEEEEEEEE      NN    NN   NN  OO         OO  -------------   VV       VV
               KK    KK       EE             NN     NN  NN  OO         OO                   VV     VV
               KK     KK      EE             NN      NN NN  OO         OO                    VV   VV
               KK      KK     EE             NN       NNNN  OO         OO                     VV VV
               KK       KK    EEEEEEEEEEEEE  NN        NNN  OOOOOOOOOOOOO                      VVV
               KK        KK   EEEEEEEEEEEEE  NN         NN   OOOOOOOOOOO                        V

 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL             EEEEEEEEEEEEE                 PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL             EEEEEEEEEEEEE                 PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL             EE                            PP         PP  CC         CC
SS             CC             AA         AA  LL             EE                            PP         PP  CC
SS             CC             AA         AA  LL             EE                            PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------  PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------  PPPPPPPPPPPP   CC
           SS  CC             AA         AA  LL             EE                            PP             CC
           SS  CC             AA         AA  LL             EE                            PP             CC
SS         SS  CC         CC  AA         AA  LL             EE                            PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLL   EEEEEEEEEEEEE                 PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLL   EEEEEEEEEEEEE                 PP              CCCCCCCCCCC

   0000000      99999999999              //       11                 44             //     0000000              44
  000000000    9999999999999            //       111                444            //     000000000            444
 00       00   99         99           //       1111               4444           //     00       00          4444
00         00  99         99          //          11              44 44          //     00         00        44 44
00         00  99         99         //           11             44  44         //      00         00       44  44
00         00  9999999999999        //            11            44   44        //       00         00      44   44
00         00   999999999999       //             11           44    44       //        00         00     44    44
00         00             99      //              11         4444444444444   //         00         00  4444444444444
00         00             99     //               11         4444444444444  //          00         00  4444444444444
 00       00              99    //                11                 44    //            00       00            44
  000000000    9999999999999   //              11111111              44   //              000000000             44
   0000000     999999999999   //               11111111              44  //                0000000              44

     11        5555555555555                 5555555555555   22222222222                   0000000          11
    111        5555555555555                 5555555555555  2222222222222                 000000000        111
   1111        55                  :::       55             22         22       :::      00       00      1111
     11        55                  :::       55                        22       :::     00         00       11
     11        55                  :::       55                        22       :::     00         00       11
     11        555555555555                  555555555555             22                00         00       11
     11        5555555555555                 5555555555555           22                 00         00       11
     11                   55       :::                  55         22           :::     00         00       11
     11                   55       :::                  55       22             :::     00         00       11
     11        55         55       :::       55         55     22               :::      00       00        11
  11111111     5555555555555                 5555555555555  2222222222222                 000000000      11111111
  11111111      55555555555                   55555555555   2222222222222                  0000000       11111111

 SSSSSSSSSSS    CCCCCCCCCCC     AAAAAAAAA    LL             EEEEEEEEEEEEE                 PPPPPPPPPPPP    CCCCCCCCCCC
SSSSSSSSSSSSS  CCCCCCCCCCCCC   AAAAAAAAAAA   LL             EEEEEEEEEEEEE                 PPPPPPPPPPPPP  CCCCCCCCCCCCC
SS         SS  CC         CC  AA         AA  LL             EE                            PP         PP  CC         CC
SS             CC             AA         AA  LL             EE                            PP         PP  CC
SS             CC             AA         AA  LL             EE                            PP         PP  CC
SSSSSSSSSSSS   CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------  PPPPPPPPPPPPP  CC
 SSSSSSSSSSSS  CC             AAAAAAAAAAAAA  LL             EEEEEEEEE      -------------  PPPPPPPPPPPP   CC
           SS  CC             AA         AA  LL             EE                            PP             CC
           SS  CC             AA         AA  LL             EE                            PP             CC
SS         SS  CC         CC  AA         AA  LL             EE                            PP             CC         CC
SSSSSSSSSSSSS  CCCCCCCCCCCCC  AA         AA  LLLLLLLLLLLL   EEEEEEEEEEEEE                 PP             CCCCCCCCCCCCC
 SSSSSSSSSSS    CCCCCCCCCCC   AA         AA  LLLLLLLLLLLL   EEEEEEEEEEEEE                 PP              CCCCCCCCCCC
```

```
PROGRAM VERIFICATION INFORMATION

CODE SYSTEM:  SCALE-PC VERSION:  4.3

          PROGRAM:  000009
    CREATION DATE:  03/08/96
           VOLUME:  Eng
          LIBRARY:  M:\SCALE43\WIN_NT\EXE

  PRODUCTION CODE:  KENOVA
          VERSION:  3.1
          JOBNAME:  SCALE-PC
DATE OF EXECUTION:  09/14/04
TIME OF EXECUTION:  15:52:01
```

```
                  ******     NUMERIC PARAMETERS     ******

TME    MAXIMUM PROBLEM TIME (MIN)                      30.00
TBA    TIME PER GENERATION (MIN)                        5.00
GEN    NUMBER OF GENERATIONS                             803
NPG    NUMBER PER GENERATION                            1000
NSK    NUMBER OF GENERATIONS TO BE SKIPPED                 3
BEG    BEGINNING GENERATION NUMBER                         1
RES    GENERATIONS BETWEEN CHECKPOINTS                     0
X1D    NUMBER OF EXTRA 1-D CROSS SECTIONS                  1
NBK    NEUTRON BANK SIZE                                1025
XNB    EXTRA POSITIONS IN NEUTRON BANK                     0
NFB    FISSION BANK SIZE                                1000
XFB    EXTRA POSITIONS IN FISSION BANK                     0
WTA    DEFAULT VALUE OF WEIGHT AVERAGE                0.5000
WTH    WEIGHT HIGH FOR SPLITTING                      3.0000
WTL    WEIGHT LOW FOR RUSSIAN ROULETTE                0.3333
RND    STARTING RANDOM NUMBER                   BB8271000001
NB8    NUMBER OF D.A. BLOCKS ON UNIT  8                  200
NL8    LENGTH OF D.A. BLOCKS ON UNIT  8                  512
ADJ    MODE OF CALCULATION                           FORWARD
       INPUT DATA WRITTEN ON RESTART UNIT                 NO
       BINARY DATA INTERFACE                             YES
```

```
*******************************************************************************************************************
*******************************************************************************************************************
***                                                                                                             ***
***                                                                                                             ***
*******************************************************************************************************************
***                                  ******     LOGICAL PARAMETERS        ******                                ***
***                                                                                                             ***
***  RUN  EXECUTE PROBLEM AFTER CHECKING DATA     YES          PLT  PLOT PICTURE MAP(S)                      NO ***
***                                                                                                             ***
***  FLX  COMPUTE FLUX                             NO          FDN  COMPUTE FISSION DENSITIES                NO ***
***                                                                                                             ***
***  SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION     NO          NUB  COMPUTE NU-BAR & AVG FISSION GROUP      YES ***
***                                                                                                             ***
***  MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER      NO          MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION    NO ***
***                                                                                                             ***
***  CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER    NO          CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION  NO ***
***                                                                                                             ***
***  FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER    NO          FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION  NO ***
***                                                                                                             ***
***  MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER      NO          MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER     NO ***
***                                                                                                             ***
***  CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER    NO          CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER   NO ***
***                                                                                                             ***
***  FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER    NO          FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER   NO ***
***                                                                                                             ***
***  HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL     NO          HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL    NO ***
***                                                                                                             ***
***  AMX  PRINT ALL MIXED CROSS SECTIONS           NO          FAR  PRINT FIS. AND ABS. BY REGION            NO ***
***                                                                                                             ***
***  XS1  PRINT 1-D MIXTURE X-SECTIONS             NO          GAS  PRINT FAR BY GROUP                       NO ***
***                                                                                                             ***
***  XS2  PRINT 2-D MIXTURE X-SECTIONS             NO          PAX  PRINT XSEC-ALBEDO CORRELATION TABLES     NO ***
***                                                                                                             ***
***  XAP  PRINT MIXTURE ANGLES & PROBABILITIES     NO          PWT  PRINT WEIGHT AVERAGE ARRAY               NO ***
***                                                                                                             ***
***  PKI  PRINT FISSION SPECTRUM                   NO          PGM  PRINT INPUT GEOMETRY                     NO ***
***                                                                                                             ***
***  P1D  PRINT EXTRA 1-D CROSS SECTIONS           NO          BUG  PRINT DEBUG INFORMATION                  NO ***
***                                                                                                             ***
***                                                            TRK  PRINT TRACKING INFORMATION               NO ***
***                                                                                                             ***
***                                                                                                             ***
*******************************************************************************************************************
*******************************************************************************************************************
                                     PARAMETER INPUT COMPLETED

                      ........     0 IO'S WERE USED READING THE PARAMETER DATA       ........

                        ************** DATA READING COMPLETED **************
*******************************************************************************************************************
***                                                                                                             ***
***                                                                                                             ***
*******************************************************************************************************************
*******************************************************************************************************************
***                                                                                                             ***
***        UNIT                                                VOLUME                                           ***
***       NUMBER               DATA SET NAME                    NAME          UNIT FUNCTION                     ***
***       ------               -------------                    ----          -------------                     ***
***                                                                                                             ***
***     XSC  14   W:\Zjr\Lwt\Pulstar\KENOVA\Aych\lwtAych2_x1_r                MIXED CROSS SECTIONS              ***
***                                                                                                             ***
***     ALB  79   M:\scale43\DATALIB\FT79F001                                 INPUT ALBEDOS                     ***
***                                                                                                             ***
***     WTS  80   M:\scale43\DATALIB\FT80F001                                 INPUT WEIGHTS                     ***
***                                                                                                             ***
***     SKT  16    UNKNOWN                                                    WRITE SCRATCH DATA                ***
***                                                                                                             ***
***     BIN  95   W:\Zjr\Lwt\Pulstar\KENOVA\Aych\lwtAych2_x1_r                BINARY INPUT DATA                 ***
***                                                                                                             ***
***     RST  95   W:\Zjr\Lwt\Pulstar\KENOVA\Aych\lwtAych2_x1_r                READ RESTART DATA                 ***
***                                                                                                             ***
***     LIB   4   W:\Zjr\Lwt\Pulstar\KENOVA\Aych\lwtAych2_x1_r                INPUT AMPX WORKING LIBRARY        ***
***                                                                                                             ***
***           8   W:\Zjr\Lwt\Pulstar\KENOVA\Aych\lwtAych2_x1_r                INPUT DATA DIRECT ACCESS          ***
***                                                                                                             ***
***           9    UNKNOWN                                                    SUPER GROUPED DIRECT ACCESS       ***
***                                                                                                             ***
***          10    UNKNOWN                                                    XSEC MIXING DIRECT ACCESS         ***
***                                                                                                             ***
*******************************************************************************************************************

                      ........     0 IO'S WERE USED PREPARING INPUT DATA     ........

                       CROSS SECTIONS READ FROM THE AMPX WORKING LIBRARY ON UNIT     4


                                             MIXING TABLE

                                    NUMBER OF SCATTERING ANGLES =  2
                                  CROSS SECTION MESSAGE THRESHOLD =3.0E-05
```

```
MIXTURE =     1          DENSITY(G/CC) =  10.380
   NUCLIDE  ATOM-DENS.  WGT. FRAC.    ZA      AWT               NUCLIDE TITLE
   1008016  4.63320E-02 1.18520E-01   8016    15.9904     OXYGEN-16     ENDF/B-IV MAT 1276                         UPDATED
08/12/94
   1092235  1.52378E-03 5.72962E-02  92235   235.0441     URANIUM-235   ENDF/B-IV MAT 1261                         UPDATED
08/12/94
   1092238  2.16422E-02 8.24184E-01  92238   238.0510     URANIUM-238   ENDF/B-IV MAT 1262                         UPDATED
08/12/94

MIXTURE =     2          DENSITY(G/CC) =  6.5600
   NUCLIDE  ATOM-DENS.  WGT. FRAC.    ZA      AWT               NUCLIDE TITLE
   2040302  4.33078E-02 1.00000E+00  40000    91.2196     ZIRCALLOY     ENDF/B-IV MAT 1284                         UPDATED
08/12/94

MIXTURE =     3          DENSITY(G/CC) = 0.99817E-20
   NUCLIDE  ATOM-DENS.  WGT. FRAC.    ZA      AWT               NUCLIDE TITLE
   3001001  6.67692E-22 1.11927E-01   1001     1.0077     HYDROGEN      ENDF/B-IV MAT 1269/THRM1002                UPDATED
08/12/94
   3008016  3.33846E-22 8.88073E-01   8016    15.9904     OXYGEN-16     ENDF/B-IV MAT 1276                         UPDATED
08/12/94

MIXTURE =     4          DENSITY(G/CC) =  2.7020
   NUCLIDE  ATOM-DENS.  WGT. FRAC.    ZA      AWT               NUCLIDE TITLE
   4013027  6.03066E-02 1.00000E+00  13027    26.9818    AL-27 1193 218 GP 040375(5)                         UPDATED
08/12/94

MIXTURE =     5          DENSITY(G/CC) =  7.9200
   NUCLIDE  ATOM-DENS.  WGT. FRAC.    ZA      AWT               NUCLIDE TITLE
   5024304  1.74286E-02 1.90000E-01  24000    51.9957    CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'    UPDATED
08/12/94
   5025055  1.73633E-03 1.99999E-02  25055    54.9379     MANGANESE-55  ENDF/B-IV MAT 1197                         UPDATED
08/12/94
   5026304  5.93579E-02 6.95000E-01  26000    55.8447    FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'    UPDATED
08/12/94
   5028304  7.72070E-03 9.50001E-02  28000    58.6872    NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'    UPDATED
08/12/94

MIXTURE =     6          DENSITY(G/CC) =  11.344
   NUCLIDE  ATOM-DENS.  WGT. FRAC.    ZA      AWT               NUCLIDE TITLE
   6082000  3.29690E-02 1.00000E+00  82000   207.2100    PB   1288 218NGP 042375 P-3 293K                       UPDATED
08/12/94

MIXTURE =     7          DENSITY(G/CC) = 0.99817E-20
   NUCLIDE  ATOM-DENS.  WGT. FRAC.    ZA      AWT               NUCLIDE TITLE
   7001001  6.67692E-22 1.11927E-01   1001     1.0077     HYDROGEN      ENDF/B-IV MAT 1269/THRM1002                UPDATED
08/12/94
   7008016  3.33846E-22 8.88073E-01   8016    15.9904     OXYGEN-16     ENDF/B-IV MAT 1276                         UPDATED
08/12/94

MIXTURE =     8          DENSITY(G/CC) = 0.99817E-20
   NUCLIDE  ATOM-DENS.  WGT. FRAC.    ZA      AWT               NUCLIDE TITLE
   8001001  6.67692E-22 1.11927E-01   1001     1.0077     HYDROGEN      ENDF/B-IV MAT 1269/THRM1002                UPDATED
08/12/94
   8008016  3.33846E-22 8.88073E-01   8016    15.9904     OXYGEN-16     ENDF/B-IV MAT 1276                         UPDATED
08/12/94

MIXTURE =     9          DENSITY(G/CC) = 0.99817
   NUCLIDE  ATOM-DENS.  WGT. FRAC.    ZA      AWT               NUCLIDE TITLE
   9001001  6.67692E-02 1.11927E-01   1001     1.0077     HYDROGEN      ENDF/B-IV MAT 1269/THRM1002                UPDATED
08/12/94
   9008016  3.33846E-02 8.88074E-01   8016    15.9904     OXYGEN-16     ENDF/B-IV MAT 1276                         UPDATED
08/12/94

MIXTURE =    10          DENSITY(G/CC) = 0.99817
   NUCLIDE  ATOM-DENS.  WGT. FRAC.    ZA      AWT               NUCLIDE TITLE
  10001001  6.67692E-02 1.11927E-01   1001     1.0077     HYDROGEN      ENDF/B-IV MAT 1269/THRM1002                UPDATED
08/12/94
  10008016  3.33846E-02 8.88074E-01   8016    15.9904     OXYGEN-16     ENDF/B-IV MAT 1276                         UPDATED
08/12/94

MIXTURE =    11          DENSITY(G/CC) =  3.6991
   NUCLIDE  ATOM-DENS.  WGT. FRAC.    ZA      AWT               NUCLIDE TITLE
  11001001  4.62310E-02 2.09120E-02   1001     1.0077     HYDROGEN      ENDF/B-IV MAT 1269/THRM1002                UPDATED
08/12/94
  11008016  3.51247E-02 2.52128E-01   8016    15.9904     OXYGEN-16     ENDF/B-IV MAT 1276                         UPDATED
08/12/94
  11040302  2.09610E-03 8.58321E-02  40000    91.2196     ZIRCALLOY     ENDF/B-IV MAT 1284                         UPDATED
08/12/94
  11092235  3.94965E-04 4.16733E-02  92235   235.0441     URANIUM-235   ENDF/B-IV MAT 1261                         UPDATED
08/12/94
  11092238  5.60966E-03 5.99454E-01  92238   238.0510     URANIUM-238   ENDF/B-IV MAT 1262                         UPDATED
08/12/94

                             3001001     HYDROGEN      ENDF/B-IV MAT 1269/THRM1002           UPDATED 08/12/94
                             7001001     HYDROGEN      ENDF/B-IV MAT 1269/THRM1002           UPDATED 08/12/94
                             8001001     HYDROGEN      ENDF/B-IV MAT 1269/THRM1002           UPDATED 08/12/94
                             9001001     HYDROGEN      ENDF/B-IV MAT 1269/THRM1002           UPDATED 08/12/94
                            10001001     HYDROGEN      ENDF/B-IV MAT 1269/THRM1002           UPDATED 08/12/94
                            11001001     HYDROGEN      ENDF/B-IV MAT 1269/THRM1002           UPDATED 08/12/94
                             1008016     OXYGEN-16     ENDF/B-IV MAT 1276                    UPDATED 08/12/94
                             3008016     OXYGEN-16     ENDF/B-IV MAT 1276                    UPDATED 08/12/94
                             7008016     OXYGEN-16     ENDF/B-IV MAT 1276                    UPDATED 08/12/94
                             8008016     OXYGEN-16     ENDF/B-IV MAT 1276                    UPDATED 08/12/94
                             9008016     OXYGEN-16     ENDF/B-IV MAT 1276                    UPDATED 08/12/94
```

```
                     10008016     OXYGEN-16     , ENDF/B-IV MAT 1276                       UPDATED 08/12/94
                     11008016     OXYGEN-16       ENDF/B-IV MAT 1276                       UPDATED 08/12/94
                      4013027    AL-27 1193 218 GP 040375(5)                               UPDATED 08/12/94
                      5024304    CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED 08/12/94
                      5025055     MANGANESE-55    ENDF/B-IV MAT 1197                       UPDATED 08/12/94
                      5026304    FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED 08/12/94
                      5028304    NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED 08/12/94
                      2040302     ZIRCALLOY       ENDF/B-IV MAT 1284                       UPDATED 08/12/94
                     11040302     ZIRCALLOY       ENDF/B-IV MAT 1284                       UPDATED 08/12/94
                      6082000    PB   1288 218NGP 042375 P-3 293K                          UPDATED 08/12/94
                      1092235     URANIUM-235     ENDF/B-IV MAT 1261                       UPDATED 08/12/94
                     11092235     URANIUM-235     ENDF/B-IV MAT 1261                       UPDATED 08/12/94
                      1092238     URANIUM-238     ENDF/B-IV MAT 1262                       UPDATED 08/12/94
                     11092238     URANIUM-238     ENDF/B-IV MAT 1262                       UPDATED 08/12/94

KENO MESSAGE NUMBER K5-222       1 TRANSFERS FOR MIXTURE    11 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222       1 TRANSFERS FOR MIXTURE     3 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222       1 TRANSFERS FOR MIXTURE     7 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222       1 TRANSFERS FOR MIXTURE     8 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222       1 TRANSFERS FOR MIXTURE     9 WERE CORRECTED FOR BAD MOMENTS.

KENO MESSAGE NUMBER K5-222       1 TRANSFERS FOR MIXTURE    10 WERE CORRECTED FOR BAD MOMENTS.

                           ........   0 IO'S WERE USED MIXING CROSS-SECTIONS       ........

                             1-D CROSS SECTION ARRAY ID NUMBERS
                                1  2002  1452    27    18  1018

                           ........   0 IO'S WERE USED PREPARING THE CROSS SECTIONS     ........
             ****************************************************************************************************
             ***                                                                                             ***
             ***                                                                                             ***
             ***                                                                                             ***
             ****************************************************************************************************
             ****************************************************************************************************
             ***                                                                                             ***
             ***                              ****** ADDITIONAL INFORMATION ******                           ***
             ***                                                                                             ***
             ***  NUMBER OF ENERGY GROUPS                27      USE LATTICE GEOMETRY                   YES  ***
             ***                                                                                             ***
             ***  NO. OF FISSION SPECTRUM SOURCE GROUP  1        GLOBAL ARRAY NUMBER                      0  ***
             ***                                                                                             ***
             ***  NO. OF SCATTERING ANGLES IN XSECS      2       NUMBER OF UNITS IN THE GLOBAL X DIR.     0  ***
             ***                                                                                             ***
             ***  ENTRIES/NEUTRON IN THE NEUTRON BANK   28       NUMBER OF UNITS IN THE GLOBAL Y DIR.     0  ***
             ***                                                                                             ***
             ***  ENTRIES/NEUTRON IN THE FISSION BANK   21       NUMBER OF UNITS IN THE GLOBAL Z DIR.     0  ***
             ***                                                                                             ***
             ***  NUMBER OF MIXTURES USED                9       USE A GLOBAL REFLECTOR                 YES  ***
             ***                                                                                             ***
             ***  NUMBER OF BIAS ID'S USED               1       USE NESTED HOLES                       YES  ***
             ***                                                                                             ***
             ***  NUMBER OF DIFFERENTIAL ALBEDOS USED    1       NUMBER OF HOLES                         15  ***
             ***                                                                                             ***
             ***  TOTAL INPUT GEOMETRY REGIONS         139       MAXIMUM HOLE NESTING LEVEL               2  ***
             ***                                                                                             ***
             ***  NUMBER OF GEOMETRY REGIONS USED      139       USE NESTED ARRAYS                      YES  ***
             ***                                                                                             ***
             ***  LARGEST GEOMETRY UNIT NUMBER         330       NUMBER OF ARRAYS USED                   14  ***
             ***                                                                                             ***
             ***  LARGEST ARRAY NUMBER                  34       MAXIMUM ARRAY NESTING LEVEL              3  ***
             ***                                                                                             ***
             ***                                                                                             ***
             ***  +X BOUNDARY CONDITION                H2O       -X BOUNDARY CONDITION                  H2O  ***
             ***                                                                                             ***
             ***  +Y BOUNDARY CONDITION                H2O       -Y BOUNDARY CONDITION                  H2O  ***
             ***                                                                                             ***
             ***  +Z BOUNDARY CONDITION                H2O       -Z BOUNDARY CONDITION                  H2O  ***
             ***                                                                                             ***
             ****************************************************************************************************
             ****************************************************************************************************
                  ***                                                                                        ***
                  ***                         ****** SPACE AND SUPERGROUP INFORMATION ******                 ***
                  ***                                                                                        ***
                  ***        100000 WORDS IS THE TOTAL SPACE AVAILABLE.                                      ***
                  ***                                                                                        ***
                  ***         58243 WORDS WERE USED FOR NON-SUPERGROUP STORAGE.                              ***
                  ***                                                                                        ***
                  ***         41757 WORDS OF STORAGE ARE AVAILABLE FOR SUPERGROUPED DATA.                    ***
                  ***                                                                                        ***
                  ***         99508 WORDS OF STORAGE ARE AVAILABLE FOR CONSTRUCTING THE SUPERGROUPS.         ***
                  ***                                                                                        ***
                  ***         41696 WORDS OF STORAGE ARE AVAILABLE TO EACH SUPERGROUP.                       ***
                  ***                                                                                        ***
                  ***          1640 WORDS ARE NEEDED FOR THE LARGEST GROUP.                                  ***
                  ***                                                                                        ***
                  ***         60126 WORDS OF STORAGE IS SUFFICIENT TO RUN THIS PROBLEM.                      ***
                  ***                                                                                        ***
                  ***         76294 WORDS OF STORAGE WILL ALLOW THE PROBLEM TO RUN WITH ONE SUPERGROUP.      ***
                  ***                                                                                        ***
                  ***         76448 WORDS OF STORAGE WILL BE USED TO RUN THIS PROBLEM.                       ***
```

SUPERGROUP	STARTING GROUP	ENDING GROUP	XSEC LENGTH	ALBEDO LENGTH	TOTAL LENGTH
1	1	27	3081	544	18122

.... 0 IO'S WERE USED IN SUPERGROUPING ....

ARRAY NUMBER	UNITS IN X DIR.	UNITS IN Y DIR.	UNITS IN Z DIR.	NESTING LEVEL
1	5	5	1	3
2	1	5	1	2
3	1	3	1	2
4	1	3	1	2
10	1	1	8	1
12	1	5	1	2
13	1	3	1	2
14	1	3	1	2
22	1	5	1	2
23	1	3	1	2
24	1	3	1	2
32	1	5	1	2
33	1	3	1	2
34	1	3	1	2

.... 0 IO'S WERE USED LOADING THE DATA ....

GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM

REGION	MEDIA NUM	BIAS ID						
----- UNIT 1 -----								
PULSTAR FUEL ELEMENT								
1 CYLINDER	1	1	RADIUS = 0.53720	+Z = 63.881	-Z = 2.6670	CENTERLINE IS AT	X = 0.00000	Y = 0.00000
2 CYLINDER	9	1	RADIUS = 0.54990	+Z = 63.881	-Z = 2.6670	CENTERLINE IS AT	X = 0.00000	Y = 0.00000
3 CYLINDER	2	1	RADIUS = 0.59690	+Z = 66.548	-Z = 0.00000	CENTERLINE IS AT	X = 0.00000	Y = 0.00000
4 CUBOID	3	1	+X = 0.77090	-X =-0.77090	+Y = 0.66680	-Y =-0.66680	+Z = 66.548	-Z = 0.00000
----- UNIT 5 -----								
DIVIDER CENTER STACK								
1 CUBOID	5	1	+X = 4.2926	-X = -4.2926	+Y = 0.71120	-Y = 0.00000	+Z = 110.49	-Z = 0.00000
----- UNIT 6 -----								
DIVIDER OUTSIDE STACK								
1 CUBOID	5	1	+X = 4.2926	-X = -4.2926	+Y = 0.60960	-Y = 0.00000	+Z = 110.49	-Z = 0.00000
----- UNIT 10 -----								
HOMOGENIZED PULSTAR FUEL - TOP OPENING								
1 CUBOID	11	1	+X = 4.1910	-X = -4.1910	+Y = 4.1910	-Y = -4.1910	+Z = 76.200	-Z = 0.00000
2 CUBOID	3	1	+X = 4.2926	-X = -4.2926	+Y = 4.2926	-Y = -4.2926	+Z = 110.49	-Z = 0.00000
----- UNIT 11 -----								
HOMOGENIZED PULSTAR FUEL - BOTTOM OPENING								
1 CUBOID	11	1	+X = 4.1910	-X = -4.1910	+Y = 4.1910	-Y = -4.1910	+Z = 76.200	-Z = 0.00000
2 CUBOID	3	1	+X = 4.2926	-X = -4.2926	+Y = 4.2926	-Y = -4.2926	+Z = 110.49	-Z = 0.00000
----- UNIT 12 -----								
HOMOGENIZED PULSTAR FUEL - BOTTOM RIGHT								
1 CUBOID	11	1	+X = 4.1910	-X = -4.1910	+Y = 4.1910	-Y = -4.1910	+Z = 76.200	-Z = 0.00000
2 CUBOID	3	1	+X = 4.2926	-X = -4.2926	+Y = 4.2926	-Y = -4.2926	+Z = 110.49	-Z = 0.00000

```
                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                            -----  UNIT    13   -----

HOMOGENIZED PULSTAR FUEL - TOP RIGHT

  1 CUBOID           11  1      +X =  4.1910    -X = -4.1910    +Y =  4.1910    -Y = -4.1910     +Z =  76.200     -Z = 0.00000
  2 CUBOID            3  1      +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926     +Z =  110.49     -Z = 0.00000

                                            -----  UNIT    14   -----

HOMOGENIZED PULSTAR FUEL - BOTTOM LEFT

  1 CUBOID           11  1      +X =  4.1910    -X = -4.1910    +Y =  4.1910    -Y = -4.1910     +Z =  76.200     -Z = 0.00000
  2 CUBOID            3  1      +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926     +Z =  110.49     -Z = 0.00000

                                            -----  UNIT    15   -----

HOMOGENIZED PULSTAR FUEL - TOP LEFT

  1 CUBOID           11  1      +X =  4.1910    -X = -4.1910    +Y =  4.1910    -Y = -4.1910     +Z =  76.200     -Z = 0.00000
  2 CUBOID            3  1      +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926     +Z =  110.49     -Z = 0.00000

                                            -----  UNIT    16   -----

HOMOGENIZED PULSTAR FUEL - CENTER OPENING

  1 CUBOID           11  1      +X =  4.1910    -X = -4.1910    +Y =  4.1910    -Y = -4.1910     +Z =  76.200     -Z = 0.00000
  2 CUBOID            3  1      +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926     +Z =  110.49     -Z = 0.00000

                                -----  UNIT    20  EXTERNAL TO LATTICE  2   -----

CENTER COLUMN OF THREE OPENINGS

  1 ARRAY NUMBER      2         +X =  4.2926    -X = -4.2926    +Y =  13.589    -Y = -13.589     +Z =  110.49     -Z = 0.00000
  2 CUBOID            5  1      +X =  5.0038    -X = -5.0038    +Y =  14.300    -Y = -14.300     +Z =  110.49     -Z = 0.00000

                                -----  UNIT    21  EXTERNAL TO LATTICE  4   -----

LEFT OUTSIDE COLUMN OF TWO OPENINGS

  1 ARRAY NUMBER      4         +X =  4.2926    -X = -4.2926    +Y =  8.8900    -Y = -8.8900     +Z =  110.49     -Z = 0.00000
  2 CUBOID            5  1      +X =  4.2926    -X = -4.5974    +Y =  9.1948    -Y = -9.1948     +Z =  110.49     -Z = 0.00000

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                -----  UNIT    22  EXTERNAL TO LATTICE  3   -----

RIGHT OUTSIDE COLUMN OF TWO OPENINGS

  1 ARRAY NUMBER      3         +X =  4.2926    -X = -4.2926    +Y =  8.8900    -Y = -8.8900     +Z =  110.49     -Z = 0.00000
  2 CUBOID            5  1      +X =  4.5974    -X = -4.2926    +Y =  9.1948    -Y = -9.1948     +Z =  110.49     -Z = 0.00000

                                            -----  UNIT    30   -----

MTR 7-ASSY BASKET

  1 CYLINDER          3  1  RADIUS =  17.050    +Z =  110.49    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
    HOLE NUMBER       1        AT X = 0.00000    Y = 0.00000     Z = 0.00000    IS UNIT NUMBER    20
    HOLE NUMBER       2        AT X = -9.2974    Y = 0.00000     Z = 0.00000    IS UNIT NUMBER    21
    HOLE NUMBER       3        AT X =  9.2974    Y = 0.00000     Z = 0.00000    IS UNIT NUMBER    22
  2 CYLINDER          5  1  RADIUS =  18.891    +Z =  110.49    -Z = -1.2700    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  3 CYLINDER          6  1  RADIUS =  33.496    +Z =  110.49    -Z = -1.2700    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  4 CYLINDER          5  1  RADIUS =  36.544    +Z =  110.49    -Z = -1.2700    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  5 CYLINDER          7  1  RADIUS =  49.244    +Z =  110.49    -Z = -1.2700    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  6 CYLINDER          5  1  RADIUS =  49.854    +Z =  110.49    -Z = -1.2700    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  7 CUBOID            8  1      +X =  49.854    -X = -49.854    +Y =  49.854    -Y = -49.854     +Z =  110.49     -Z = -1.2700
```

```
                                          -----   UNIT    40   -----

SIMPLIFIED LID STRUCTURE NAC-LWT

  1 CYLINDER        5  1  RADIUS =  36.519    +Z =  13.677    -Z = -14.135    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  2 CYLINDER        8  1  RADIUS =  49.854    +Z =  13.677    -Z = -14.135    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CUBOID          8  1      +X =  49.654    -X = -49.854    +Y =  49.854    -Y = -49.854     +Z =  13.677     -Z = -14.135

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                          -----   UNIT    41   -----

SIMPLIFIED CASK BOTTOM STRUCTURE NAC-LWT

  1 CYLINDER        6  1  RADIUS =  26.353    +Z =  3.8100    -Z = -3.8100    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  2 CYLINDER        5  1  RADIUS =  36.619    +Z =  13.360    -Z = -12.700    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  3 CYLINDER        8  1  RADIUS =  49.854    +Z =  13.360    -Z = -12.700    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  4 CUBOID          8  1      +X =  49.854    -X = -49.854    +Y =  49.854    -Y = -49.854     +Z =  13.360     -Z = -12.700

                                          -----   UNIT    42   -----

THIN TOP AND BOTTOM SHELL OF NEUTRON SHIELD - SUBTRACTED FROM LID MODEL

  1 CYLINDER        5  1  RADIUS =  49.854    +Z = 0.61000    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000     Y = 0.00000

  2 CUBOID          8  1      +X =  49.854    -X = -49.854    +Y =  49.854    -Y = -49.854     +Z = 0.61000     -Z = 0.00000

                                 -----   UNIT    70  EXTERNAL TO LATTICE 10   -----

STACK OF 4 BASKETS IN CASK WITH LID AND BOTTOM

  1 ARRAY NUMBER    10            +X =  49.854    -X = -49.854    +Y =  49.854    -Y = -49.854     +Z =  502.13     -Z = 0.00000

                                 ******************    GLOBAL    ******************
                                          -----   UNIT    80   -----

3 CASKS IN TRIANGULAR PITCH

  1 CUBOID          8  1      +X =  101.00    -X = -101.00    +Y =  101.00    -Y = -101.00     +Z =  502.20     -Z = 0.00000

    HOLE NUMBER     13      AT X = 0.00000     Y =  50.000     Z = 0.00000    IS UNIT NUMBER    70

    HOLE NUMBER     14      AT X = -50.000     Y = -50.000     Z = 0.00000    IS UNIT NUMBER    70

    HOLE NUMBER     15      AT X =  50.000     Y = -50.000     Z = 0.00000    IS UNIT NUMBER    70

                                 -----   UNIT   110  EXTERNAL TO LATTICE  1   -----

PULSTAR ASSEMBLY - TOP OPENING

  1 ARRAY NUMBER    1             +X =  3.8545    -X = -3.8545    +Y =  3.3342    -Y = -3.3338     +Z =  110.49     -Z =  43.942

  2 CUBOID          2  1      +X =  4.0069    -X = -4.0069    +Y =  3.4862    -Y = -3.4862     +Z =  110.49     -Z =  43.942

  3 CUBOID          3  1      +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926     +Z =  110.49     -Z = 0.00000

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                 -----   UNIT   111  EXTERNAL TO LATTICE  1   -----

PULSTAR ASSEMBLY - BOTTOM OPENING

  1 ARRAY NUMBER    1             +X =  3.8545    -X = -3.8545    +Y =  3.3342    -Y = -3.3338     +Z =  110.49     -Z =  43.942

  2 CUBOID          2  1      +X =  4.0069    -X = -4.0069    +Y =  3.4862    -Y = -3.4862     +Z =  110.49     -Z =  43.942

  3 CUBOID          3  1      +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926     +Z =  110.49     -Z = 0.00000

                                 -----   UNIT   112  EXTERNAL TO LATTICE  1   -----

PULSTAR ASSEMBLY - BOTTOM RIGHT

  1 ARRAY NUMBER    1             +X =  3.8545    -X = -3.8545    +Y =  3.3342    -Y = -3.3338     +Z =  110.49     -Z =  43.942

  2 CUBOID          2  1      +X =  4.0069    -X = -4.0069    +Y =  3.4862    -Y = -3.4862     +Z =  110.49     -Z =  43.942

  3 CUBOID          3  1      +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926     +Z =  110.49     -Z = 0.00000

                                 -----   UNIT   113  EXTERNAL TO LATTICE  1   -----

PULSTAR ASSEMBLY - TOP RIGHT
```

```
 1 ARRAY NUMBER    1        +X =  3.8545   -X = -3.8545   +Y =  3.3342   -Y = -3.3338   +Z =  110.49   -Z =  43.942
 2 CUBOID          2  1     +X =  4.0069   -X = -4.0069   +Y =  3.4862   -Y = -3.4862   +Z =  110.49   -Z =  43.942
 3 CUBOID          3  1     +X =  4.2926   -X = -4.2926   +Y =  4.2926   -Y = -4.2926   +Z =  110.49   -Z = 0.00000

                                  -----  UNIT   114  EXTERNAL TO LATTICE  1   -----

PULSTAR ASSEMBLY - BOTTOM LEFT
 1 ARRAY NUMBER    1        +X =  3.8545   -X = -3.8545   +Y =  3.3342   -Y = -3.3338   +Z =  110.49   -Z =  43.942
 2 CUBOID          2  1     +X =  4.0069   -X = -4.0069   +Y =  3.4862   -Y = -3.4862   +Z =  110.49   -Z =  43.942
 3 CUBOID          3  1     +X =  4.2926   -X = -4.2926   +Y =  4.2926   -Y = -4.2926   +Z =  110.49   -Z = 0.00000

                                  -----  UNIT   115  EXTERNAL TO LATTICE  1   -----

PULSTAR ASSEMBLY - TOP LEFT
 1 ARRAY NUMBER    1        +X =  3.8545   -X = -3.8545   +Y =  3.3342   -Y = -3.3338   +Z =  110.49   -Z =  43.942
 2 CUBOID          2  1     +X =  4.0069   -X = -4.0069   +Y =  3.4862   -Y = -3.4862   +Z =  110.49   -Z =  43.942
 3 CUBOID          3  1     +X =  4.2926   -X = -4.2926   +Y =  4.2926   -Y = -4.2926   +Z =  110.49   -Z = 0.00000

                MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID

                                  -----  UNIT   116  EXTERNAL TO LATTICE  1   -----

PULSTAR ASSEMBLY - CENTER OPENING
 1 ARRAY NUMBER    1        +X =  3.8545   -X = -3.8545   +Y =  3.3342   -Y = -3.3338   +Z =  110.49   -Z =  43.942
 2 CUBOID          2  1     +X =  4.0069   -X = -4.0069   +Y =  3.4862   -Y = -3.4862   +Z =  110.49   -Z =  43.942
 3 CUBOID          3  1     +X =  4.2926   -X = -4.2926   +Y =  4.2926   -Y = -4.2926   +Z =  110.49   -Z = 0.00000

                                  -----  UNIT   120  EXTERNAL TO LATTICE 12   -----

CENTER COLUMN OF THREE OPENINGS
 1 ARRAY NUMBER   12        +X =  4.2926   -X = -4.2926   +Y =  13.589   -Y = -13.589   +Z =  110.49   -Z = 0.00000
 2 CUBOID          5  1     +X =  5.0038   -X = -5.0038   +Y =  14.300   -Y = -14.300   +Z =  110.49   -Z = 0.00000

                                  -----  UNIT   121  EXTERNAL TO LATTICE 14   -----

LEFT OUTSIDE COLUMN OF TWO OPENINGS
 1 ARRAY NUMBER   14        +X =  4.2926   -X = -4.2926   +Y =  8.8900   -Y = -8.8900   +Z =  110.49   -Z = 0.00000
 2 CUBOID          5  1     +X =  4.2926   -X = -4.5974   +Y =  9.1948   -Y = -9.1948   +Z =  110.49   -Z = 0.00000

                                  -----  UNIT   122  EXTERNAL TO LATTICE 13   -----

RIGHT OUTSIDE COLUMN OF TWO OPENINGS
 1 ARRAY NUMBER   13        +X =  4.2926   -X = -4.2926   +Y =  8.8900   -Y = -8.8900   +Z =  110.49   -Z = 0.00000
 2 CUBOID          5  1     +X =  4.5974   -X = -4.2926   +Y =  9.1948   -Y = -9.1948   +Z =  110.49   -Z = 0.00000

                MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION           NUM   ID

                                          -----  UNIT   130   -----

MTR 7-ASSY BASKET
 1 CYLINDER        3  1  RADIUS =  17.050    +Z =  110.49    -Z = 0.00000    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
   HOLE NUMBER     4       AT X = 0.00000     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER    120
   HOLE NUMBER     5       AT X = -9.2974     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER    121
   HOLE NUMBER     6       AT X =  9.2974     Y = 0.00000     Z = 0.00000    IS UNIT NUMBER    122
 2 CYLINDER        5  1  RADIUS =  18.891    +Z =  110.49    -Z = -1.2700    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
 3 CYLINDER        6  1  RADIUS =  33.496    +Z =  110.49    -Z = -1.2700    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
 4 CYLINDER        5  1  RADIUS =  36.544    +Z =  110.49    -Z = -1.2700    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
 5 CYLINDER        7  1  RADIUS =  49.244    +Z =  110.49    -Z = -1.2700    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
 6 CYLINDER        5  1  RADIUS =  49.854    +Z =  110.49    -Z = -1.2700    CENTERLINE IS AT  X = 0.00000    Y = 0.00000
```

```
 7 CUBOID          8  1      +X =  49.854     -X = -49.854     +Y =  49.854     -Y = -49.854     +Z =  110.49     -Z = -1.2700
```

```
                                   -----   UNIT   210   EXTERNAL TO LATTICE   1   -----

PULSTAR ASSEMBLY - TOP OPENING

  1 ARRAY NUMBER    1         +X =  3.8545    -X = -3.8545    +Y =  3.3342    -Y = -3.3338    +Z =  66.548    -Z = 0.00000
  2 CUBOID          2  1      +X =  4.0069    -X = -4.0069    +Y =  3.4862    -Y = -3.4862    +Z =  66.548    -Z = 0.00000
  3 CUBOID          3  1      +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926    +Z =  110.49    -Z = 0.00000

                                   -----   UNIT   211   EXTERNAL TO LATTICE   1   -----

PULSTAR ASSEMBLY - BOTTOM OPENING

  1 ARRAY NUMBER    1         +X =  3.8545    -X = -3.8545    +Y =  3.3342    -Y = -3.3338    +Z =  66.548    -Z = 0.00000
  2 CUBOID          2  1      +X =  4.0069    -X = -4.0069    +Y =  3.4862    -Y = -3.4862    +Z =  66.548    -Z = 0.00000
  3 CUBOID          3  1      +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926    +Z =  110.49    -Z = 0.00000

                 MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                   -----   UNIT   212   EXTERNAL TO LATTICE   1   -----

PULSTAR ASSEMBLY - BOTTOM RIGHT

  1 ARRAY NUMBER    1         +X =  3.8545    -X = -3.8545    +Y =  3.3342    -Y = -3.3338    +Z =  66.548    -Z = 0.00000
  2 CUBOID          2  1      +X =  4.0069    -X = -4.0069    +Y =  3.4862    -Y = -3.4862    +Z =  66.548    -Z = 0.00000
  3 CUBOID          3  1      +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926    +Z =  110.49    -Z = 0.00000

                                   -----   UNIT   213   EXTERNAL TO LATTICE   1   -----

PULSTAR ASSEMBLY - TOP RIGHT

  1 ARRAY NUMBER    1         +X =  3.8545    -X = -3.8545    +Y =  3.3342    -Y = -3.3338    +Z =  66.548    -Z = 0.00000
  2 CUBOID          2  1      +X =  4.0069    -X = -4.0069    +Y =  3.4862    -Y = -3.4862    +Z =  66.548    -Z = 0.00000
  3 CUBOID          3  1      +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926    +Z =  110.49    -Z = 0.00000

                                   -----   UNIT   214   EXTERNAL TO LATTICE   1   -----

PULSTAR ASSEMBLY - BOTTOM LEFT

  1 ARRAY NUMBER    1         +X =  3.8545    -X = -3.8545    +Y =  3.3342    -Y = -3.3338    +Z =  66.548    -Z = 0.00000
  2 CUBOID          2  1      +X =  4.0069    -X = -4.0069    +Y =  3.4862    -Y = -3.4862    +Z =  66.548    -Z = 0.00000
  3 CUBOID          3  1      +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926    +Z =  110.49    -Z = 0.00000

                                   -----   UNIT   215   EXTERNAL TO LATTICE   1   -----

PULSTAR ASSEMBLY - TOP LEFT

  1 ARRAY NUMBER    1         +X =  3.8545    -X = -3.8545    +Y =  3.3342    -Y = -3.3338    +Z =  66.548    -Z = 0.00000
  2 CUBOID          2  1      +X =  4.0069    -X = -4.0069    +Y =  3.4862    -Y = -3.4862    +Z =  66.548    -Z = 0.00000
  3 CUBOID          3  1      +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926    +Z =  110.49    -Z = 0.00000

                                   -----   UNIT   216   EXTERNAL TO LATTICE   1   -----

PULSTAR ASSEMBLY - CENTER OPENING

  1 ARRAY NUMBER    1         +X =  3.8545    -X = -3.8545    +Y =  3.3342    -Y = -3.3338    +Z =  66.548    -Z = 0.00000
  2 CUBOID          2  1      +X =  4.0069    -X = -4.0069    +Y =  3.4862    -Y = -3.4862    +Z =  66.548    -Z = 0.00000
  3 CUBOID          3  1      +X =  4.2926    -X = -4.2926    +Y =  4.2926    -Y = -4.2926    +Z =  110.49    -Z = 0.00000
```

```
                  MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION             NUM   ID

                                       -----   UNIT   220  EXTERNAL TO LATTICE 22   -----

CENTER COLUMN OF THREE OPENINGS

  1 ARRAY NUMBER    22         +X =  4.2926     -X = -4.2926     +Y =  13.589    -Y = -13.589     +Z =  110.49     -Z = 0.00000

  2 CUBOID           5  1      +X =  5.0038     -X = -5.0038     +Y =  14.300    -Y = -14.300     +Z =  110.49     -Z = 0.00000

                                       -----   UNIT   221  EXTERNAL TO LATTICE 24   -----

LEFT OUTSIDE COLUMN OF TWO OPENINGS

  1 ARRAY NUMBER    24         +X =  4.2926     -X = -4.2926     +Y =  8.8900    -Y = -8.8900     +Z =  110.49     -Z = 0.00000

  2 CUBOID           5  1      +X =  4.2926     -X = -4.5974     +Y =  9.1948    -Y = -9.1948     +Z =  110.49     -Z = 0.00000

                                       -----   UNIT   222  EXTERNAL TO LATTICE 23   -----

RIGHT OUTSIDE COLUMN OF TWO OPENINGS

  1 ARRAY NUMBER    23         +X =  4.2926     -X = -4.2926     +Y =  8.8900    -Y = -8.8900     +Z =  110.49     -Z = 0.00000

  2 CUBOID           5  1      +X =  4.5974     -X = -4.2926     +Y =  9.1948    -Y = -9.1948     +Z =  110.49     -Z = 0.00000

                                                  -----   UNIT   230   -----

MTR 7-ASSY BASKET

  1 CYLINDER         3  1  RADIUS =  17.050    +Z =  110.49     -Z = 0.00000     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

    HOLE NUMBER      7       AT X = 0.00000     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER    220

    HOLE NUMBER      8       AT X = -9.2974     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER    221

    HOLE NUMBER      9       AT X =  9.2974     Y = 0.00000      Z = 0.00000     IS UNIT NUMBER    222

  2 CYLINDER         5  1  RADIUS =  18.891    +Z =  110.49     -Z = -1.2700     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  3 CYLINDER         6  1  RADIUS =  33.496    +Z =  110.49     -Z = -1.2700     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  4 CYLINDER         5  1  RADIUS =  36.544    +Z =  110.49     -Z = -1.2700     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  5 CYLINDER         7  1  RADIUS =  49.244    +Z =  110.49     -Z = -1.2700     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  6 CYLINDER         5  1  RADIUS =  49.854    +Z =  110.49     -Z = -1.2700     CENTERLINE IS AT  X = 0.00000      Y = 0.00000

  7 CUBOID           8  1      +X =  49.854     -X = -49.854     +Y =  49.854    -Y = -49.854     +Z =  110.49     -Z = -1.2700

                  MEDIA BIAS      GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION             NUM   ID

                                                  -----   UNIT   310   -----

HOMOGENIZED PULSTAR FUEL - TOP OPENING

  1 CUBOID          11  1      +X =  4.1910     -X = -4.1910     +Y =  4.1910    -Y = -4.1910     +Z =  110.49     -Z =  34.290

  2 CUBOID           3  1      +X =  4.2926     -X = -4.2926     +Y =  4.2926    -Y = -4.2926     +Z =  110.49     -Z = 0.00000

                                                  -----   UNIT   311   -----

HOMOGENIZED PULSTAR FUEL - BOTTOM OPENING

  1 CUBOID          11  1      +X =  4.1910     -X = -4.1910     +Y =  4.1910    -Y = -4.1910     +Z =  110.49     -Z =  34.290

  2 CUBOID           3  1      +X =  4.2926     -X = -4.2926     +Y =  4.2926    -Y = -4.2926     +Z =  110.49     -Z = 0.00000

                                                  -----   UNIT   312   -----

HOMOGENIZED PULSTAR FUEL - BOTTOM RIGHT

  1 CUBOID          11  1      +X =  4.1910     -X = -4.1910     +Y =  4.1910    -Y = -4.1910     +Z =  110.49     -Z =  34.290

  2 CUBOID           3  1      +X =  4.2926     -X = -4.2926     +Y =  4.2926    -Y = -4.2926     +Z =  110.49     -Z = 0.00000

                                                  -----   UNIT   313   -----

HOMOGENIZED PULSTAR FUEL - TOP RIGHT

  1 CUBOID          11  1      +X =  4.1910     -X = -4.1910     +Y =  4.1910    -Y = -4.1910     +Z =  110.49     -Z =  34.290

  2 CUBOID           3  1      +X =  4.2926     -X = -4.2926     +Y =  4.2926    -Y = -4.2926     +Z =  110.49     -Z = 0.00000
```

```
                                        -----  UNIT   314   -----
HOMOGENIZED PULSTAR FUEL - BOTTOM LEFT
  1 CUBOID         11  1    +X =  4.1910   -X = -4.1910   +Y =  4.1910   -Y = -4.1910   +Z =  110.49   -Z =  34.290
  2 CUBOID          3  1    +X =  4.2926   -X = -4.2926   +Y =  4.2926   -Y = -4.2926   +Z =  110.49   -Z = 0.00000
                                        -----  UNIT   315   -----
HOMOGENIZED PULSTAR FUEL - TOP LEFT
  1 CUBOID         11  1    +X =  4.1910   -X = -4.1910   +Y =  4.1910   -Y = -4.1910   +Z =  110.49   -Z =  34.290
  2 CUBOID          3  1    +X =  4.2926   -X = -4.2926   +Y =  4.2926   -Y = -4.2926   +Z =  110.49   -Z = 0.00000

                 MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                        -----  UNIT   316   -----
HOMOGENIZED PULSTAR FUEL - CENTER OPENING
  1 CUBOID         11  1    +X =  4.1910   -X = -4.1910   +Y =  4.1910   -Y = -4.1910   +Z =  110.49   -Z =  34.290
  2 CUBOID          3  1    +X =  4.2926   -X = -4.2926   +Y =  4.2926   -Y = -4.2926   +Z =  110.49   -Z = 0.00000

                              -----  UNIT   320  EXTERNAL TO LATTICE 32   -----
CENTER COLUMN OF THREE OPENINGS
  1 ARRAY NUMBER    32      +X =  4.2926   -X = -4.2926   +Y =  13.589   -Y = -13.589   +Z =  110.49   -Z = 0.00000
  2 CUBOID          5  1    +X =  5.0038   -X = -5.0038   +Y =  14.300   -Y = -14.300   +Z =  110.49   -Z = 0.00000

                              -----  UNIT   321  EXTERNAL TO LATTICE 34   -----
LEFT OUTSIDE COLUMN OF TWO OPENINGS
  1 ARRAY NUMBER    34      +X =  4.2926   -X = -4.2926   +Y =  8.8900   -Y = -8.8900   +Z =  110.49   -Z = 0.00000
  2 CUBOID          5  1    +X =  4.2926   -X = -4.5974   +Y =  9.1948   -Y = -9.1948   +Z =  110.49   -Z = 0.00000

                              -----  UNIT   322  EXTERNAL TO LATTICE 33   -----
RIGHT OUTSIDE COLUMN OF TWO OPENINGS
  1 ARRAY NUMBER    33      +X =  4.2926   -X = -4.2926   +Y =  8.8900   -Y = -8.8900   +Z =  110.49   -Z = 0.00000
  2 CUBOID          5  1    +X =  4.5974   -X = -4.2926   +Y =  9.1948   -Y = -9.1948   +Z =  110.49   -Z = 0.00000

                 MEDIA BIAS     GEOMETRY DESCRIPTION FOR THOSE UNITS UTILIZED IN THIS PROBLEM
REGION            NUM   ID

                                        -----  UNIT   330   -----
MTR 7-ASSY BASKET
  1 CYLINDER        3  1  RADIUS =  17.050    +Z =  110.49    -Z = 0.00000   CENTERLINE IS AT  X = 0.00000    Y = 0.00000
    HOLE NUMBER    10       AT X = 0.00000     Y = 0.00000     Z = 0.00000   IS UNIT NUMBER    320
    HOLE NUMBER    11       AT X = -9.2974     Y = 0.00000     Z = 0.00000   IS UNIT NUMBER    321
    HOLE NUMBER    12       AT X =  9.2974     Y = 0.00000     Z = 0.00000   IS UNIT NUMBER    322
  2 CYLINDER        5  1  RADIUS =  18.891    +Z =  110.49    -Z = -1.2700   CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  3 CYLINDER        6  1  RADIUS =  33.496    +Z =  110.49    -Z = -1.2700   CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  4 CYLINDER        5  1  RADIUS =  36.544    +Z =  110.49    -Z = -1.2700   CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  5 CYLINDER        7  1  RADIUS =  49.244    +Z =  110.49    -Z = -1.2700   CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  6 CYLINDER        5  1  RADIUS =  49.854    +Z =  110.49    -Z = -1.2700   CENTERLINE IS AT  X = 0.00000    Y = 0.00000
  7 CUBOID          8  1    +X =  49.854   -X = -49.854   +Y =  49.854   -Y = -49.854   +Z =  110.49   -Z = -1.2700

                 -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   1          -------
Z LAYER    1, X COLUMN    1 TO    5 LEFT TO RIGHT    Y ROW    1 TO    5   BOTTOM TO TOP
 1 1 1 1 1
 1 1 1 1 1
 1 1 1 1 1
```

```
 1 1 1 1 1

 1 1 1 1 1
                 -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   2         -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   5  BOTTOM TO TOP

 10

  5

 16

  5

 11
                 -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   3         -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   3  BOTTOM TO TOP

 13

  6

 12

                 -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY   4         -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   3  BOTTOM TO TOP

 15

  6

 14

                 -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  10         -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

  41
Z LAYER   2, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

  42
Z LAYER   3, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

 330
Z LAYER   4, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

 230
Z LAYER   5, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

 130
Z LAYER   6, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

  30
Z LAYER   7, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

  42
Z LAYER   8, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   1  BOTTOM TO TOP

  40

                 -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  12         -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   5  BOTTOM TO TOP

 110

   5

 116

   5

 111
                 -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  13         -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   3  BOTTOM TO TOP

 113

   6

 112
                 -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  14         -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   3  BOTTOM TO TOP
```

```
115

  6

114
              -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  22         -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   5  BOTTOM TO TOP

210

  5

216

  5

211
              -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  23         -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   3  BOTTOM TO TOP

213

  6

212
              -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  24         -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   3  BOTTOM TO TOP

215

  6

214
              -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  32         -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   5  BOTTOM TO TOP

310

  5

316

  5

311
              -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  33         -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   3  BOTTOM TO TOP

313

  6

312
              -------  UNIT ORIENTATION DESCRIPTION FOR ARRAY  34         -------

Z LAYER   1, X COLUMN   1 TO   1 LEFT TO RIGHT   Y ROW   1 TO   3  BOTTOM TO TOP

315

  6

314
```

VOLUMES FOR THOSE UNITS UTILIZED IN THIS PROBLEM

UNIT	REGION	GEOMETRY REGION	VOLUME	CUMULATIVE VOLUME
1	1	1	5.54974E+01 CM**3	5.54974E+01 CM**3
	2	2	2.65506E+00 CM**3	5.81525E+01 CM**3
	3	3	1.63358E+01 CM**3	7.44883E+01 CM**3
	4	4	6.23440E+01 CM**3	1.36832E+02 CM**3
5	1	5	6.74629E+02 CM**3	6.74629E+02 CM**3
6	1	6	5.78254E+02 CM**3	5.78254E+02 CM**3
10	1	7	5.35365E+03 CM**3	5.35365E+03 CM**3
	2	8	2.79009E+03 CM**3	8.14374E+03 CM**3
11	1	9	5.35365E+03 CM**3	5.35365E+03 CM**3
	2	10	2.79009E+03 CM**3	8.14374E+03 CM**3
12	1	11	5.35365E+03 CM**3	5.35365E+03 CM**3
	2	12	2.79009E+03 CM**3	8.14374E+03 CM**3
13	1	13	5.35365E+03 CM**3	5.35365E+03 CM**3
	2	14	2.79009E+03 CM**3	8.14374E+03 CM**3
14	1	15	5.35365E+03 CM**3	5.35365E+03 CM**3

```
          2        16        2.79009E+03 CM**3          8.14374E+03 CM**3

 15       1        17        5.35365E+03 CM**3          5.35365E+03 CM**3
          2        18        2.79009E+03 CM**3          8.14374E+03 CM**3

 16       1        19        5.35365E+03 CM**3          5.35365E+03 CM**3
          2        20        2.79009E+03 CM**3          8.14374E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     21 IS AN ARRAY PLACEMENT BOUNDARY REGION

 20       1        21        2.57805E+04 CM**3          2.57805E+04 CM**3
          2        22        5.84413E+03 CM**3          3.16246E+04 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     23 IS AN ARRAY PLACEMENT BOUNDARY REGION

 21       1        23        1.68657E+04 CM**3          1.68657E+04 CM**3
          2        24        1.19757E+03 CM**3          1.80633E+04 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     25 IS AN ARRAY PLACEMENT BOUNDARY REGION

 22       1        25        1.68657E+04 CM**3          1.68657E+04 CM**3
          2        26        1.19757E+03 CM**3          1.80633E+04 CM**3

 30       1        27        3.31559E+04 CM**3          1.00907E+05 CM**3
          2        28        2.43955E+04 CM**3          1.25303E+05 CM**3
          3        29        2.68637E+05 CM**3          3.93940E+05 CM**3
          4        30        7.49551E+04 CM**3          4.68895E+05 CM**3
          5        31        3.82534E+05 CM**3          8.51429E+05 CM**3
          6        32        2.12103E+04 CM**3          8.72639E+05 CM**3
          7        33        2.38439E+05 CM**3          1.11108E+06 CM**3

 40       1       129        1.16526E+05 CM**3          1.16526E+05 CM**3
          2       130        1.00639E+05 CM**3          2.17165E+05 CM**3
          3       131        5.93381E+04 CM**3          2.76503E+05 CM**3

 41       1       132        1.66245E+04 CM**3          1.66245E+04 CM**3
          2       133        9.31579E+04 CM**3          1.09782E+05 CM**3
          3       134        9.36980E+04 CM**3          2.03480E+05 CM**3
          4       135        5.55989E+04 CM**3          2.59079E+05 CM**3

 42       1       136        4.76297E+03 CM**3          4.76297E+03 CM**3
          2       137        1.30143E+03 CM**3          6.06440E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION    138 IS AN ARRAY PLACEMENT BOUNDARY REGION

 70       1       138        4.99202E+06 CM**3          4.99202E+06 CM**3

 80       1       139        5.51570E+06 CM**3          2.04918E+07 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     34 IS AN ARRAY PLACEMENT BOUNDARY REGION

110       1        34        3.42081E+03 CM**3          3.42081E+03 CM**3
          2        35        2.97590E+02 CM**3          3.71840E+03 CM**3
          3        36        4.42534E+03 CM**3          8.14374E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     37 IS AN ARRAY PLACEMENT BOUNDARY REGION

111       1        37        3.42081E+03 CM**3          3.42081E+03 CM**3
          2        38        2.97590E+02 CM**3          3.71840E+03 CM**3
          3        39        4.42534E+03 CM**3          8.14374E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     40 IS AN ARRAY PLACEMENT BOUNDARY REGION

112       1        40        3.42081E+03 CM**3          3.42081E+03 CM**3
          2        41        2.97590E+02 CM**3          3.71840E+03 CM**3
          3        42        4.42534E+03 CM**3          8.14374E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     43 IS AN ARRAY PLACEMENT BOUNDARY REGION

113       1        43        3.42081E+03 CM**3          3.42081E+03 CM**3
          2        44        2.97590E+02 CM**3          3.71840E+03 CM**3
          3        45        4.42534E+03 CM**3          8.14374E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     46 IS AN ARRAY PLACEMENT BOUNDARY REGION

114       1        46        3.42081E+03 CM**3          3.42081E+03 CM**3
          2        47        2.97590E+02 CM**3          3.71840E+03 CM**3
          3        48        4.42534E+03 CM**3          8.14374E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     49 IS AN ARRAY PLACEMENT BOUNDARY REGION

115       1        49        3.42081E+03 CM**3          3.42081E+03 CM**3
          2        50        2.97590E+02 CM**3          3.71840E+03 CM**3
          3        51        4.42534E+03 CM**3          8.14374E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     52 IS AN ARRAY PLACEMENT BOUNDARY REGION

116       1        52        3.42081E+03 CM**3          3.42081E+03 CM**3
          2        53        2.97590E+02 CM**3          3.71840E+03 CM**3
          3        54        4.42534E+03 CM**3          8.14374E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     55 IS AN ARRAY PLACEMENT BOUNDARY REGION

120       1        55        2.57805E+04 CM**3          2.57805E+04 CM**3
          2        56        5.84413E+03 CM**3          3.16246E+04 CM**3
```

```
SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     57 IS AN ARRAY PLACEMENT BOUNDARY REGION

121          1        57       1.68657E+04 CM**3         1.68657E+04 CM**3
             2        58       1.19757E+03 CM**3         1.80633E+04 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     59 IS AN ARRAY PLACEMENT BOUNDARY REGION

122          1        59       1.68657E+04 CM**3         1.68657E+04 CM**3
             2        60       1.19757E+03 CM**3         1.80633E+04 CM**3
130          1        61       3.31559E+04 CM**3         1.00907E+05 CM**3
             2        62       2.43955E+04 CM**3         1.25303E+05 CM**3
             3        63       2.68637E+05 CM**3         3.93940E+05 CM**3
             4        64       7.49551E+04 CM**3         4.68895E+05 CM**3
             5        65       3.82534E+05 CM**3         8.51429E+05 CM**3
             6        66       2.12103E+04 CM**3         8.72639E+05 CM**3
             7        67       2.38439E+05 CM**3         1.11108E+06 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     68 IS AN ARRAY PLACEMENT BOUNDARY REGION
210          1        68       3.42081E+03 CM**3         3.42081E+03 CM**3
             2        69       2.97590E+02 CM**3         3.71840E+03 CM**3
             3        70       4.42534E+03 CM**3         8.14374E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     71 IS AN ARRAY PLACEMENT BOUNDARY REGION

211          1        71       3.42081E+03 CM**3         3.42081E+03 CM**3
             2        72       2.97590E+02 CM**3         3.71840E+03 CM**3
             3        73       4.42534E+03 CM**3         8.14374E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     74 IS AN ARRAY PLACEMENT BOUNDARY REGION

212          1        74       3.42081E+03 CM**3         3.42081E+03 CM**3
             2        75       2.97590E+02 CM**3         3.71840E+03 CM**3
             3        76       4.42534E+03 CM**3         8.14374E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     77 IS AN ARRAY PLACEMENT BOUNDARY REGION

213          1        77       3.42081E+03 CM**3         3.42081E+03 CM**3
             2        78       2.97590E+02 CM**3         3.71840E+03 CM**3
             3        79       4.42534E+03 CM**3         8.14374E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     80 IS AN ARRAY PLACEMENT BOUNDARY REGION

214          1        80       3.42081E+03 CM**3         3.42081E+03 CM**3
             2        81       2.97590E+02 CM**3         3.71840E+03 CM**3
             3        82       4.42534E+03 CM**3         8.14374E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     83 IS AN ARRAY PLACEMENT BOUNDARY REGION

215          1        83       3.42081E+03 CM**3         3.42081E+03 CM**3
             2        84       2.97590E+02 CM**3         3.71840E+03 CM**3
             3        85       4.42534E+03 CM**3         8.14374E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     86 IS AN ARRAY PLACEMENT BOUNDARY REGION

216          1        86       3.42081E+03 CM**3         3.42081E+03 CM**3
             2        87       2.97590E+02 CM**3         3.71840E+03 CM**3
             3        88       4.42534E+03 CM**3         8.14374E+03 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     89 IS AN ARRAY PLACEMENT BOUNDARY REGION

220          1        89       2.57805E+04 CM**3         2.57805E+04 CM**3
             2        90       5.84413E+03 CM**3         3.16246E+04 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     91 IS AN ARRAY PLACEMENT BOUNDARY REGION

221          1        91       1.68657E+04 CM**3         1.68657E+04 CM**3
             2        92       1.19757E+03 CM**3         1.80633E+04 CM**3

SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION     93 IS AN ARRAY PLACEMENT BOUNDARY REGION

222          1        93       1.68657E+04 CM**3         1.68657E+04 CM**3
             2        94       1.19757E+03 CM**3         1.80633E+04 CM**3

230          1        95       3.31559E+04 CM**3         1.00907E+05 CM**3
             2        96       2.43955E+04 CM**3         1.25303E+05 CM**3
             3        97       2.68637E+05 CM**3         3.93940E+05 CM**3
             4        98       7.49551E+04 CM**3         4.68895E+05 CM**3
             5        99       3.82534E+05 CM**3         8.51429E+05 CM**3
             6       100       2.12103E+04 CM**3         8.72639E+05 CM**3
             7       101       2.38439E+05 CM**3         1.11108E+06 CM**3

310          1       102       5.35365E+03 CM**3         5.35365E+03 CM**3
             2       103       2.79009E+03 CM**3         8.14374E+03 CM**3

311          1       104       5.35365E+03 CM**3         5.35365E+03 CM**3
             2       105       2.79009E+03 CM**3         8.14374E+03 CM**3

312          1       106       5.35365E+03 CM**3         5.35365E+03 CM**3
             2       107       2.79009E+03 CM**3         8.14374E+03 CM**3

313          1       108       5.35365E+03 CM**3         5.35365E+03 CM**3
             2       109       2.79009E+03 CM**3         8.14374E+03 CM**3

314          1       110       5.35365E+03 CM**3         5.35365E+03 CM**3
```

```
               2        111         2.79009E+03 CM**3          8.14374E+03 CM**3

 315           1        112         5.35365E+03 CM**3          5.35365E+03 CM**3
               2        113         2.79009E+03 CM**3          8.14374E+03 CM**3

 316           1        114         5.35365E+03 CM**3          5.35365E+03 CM**3
               2        115         2.79009E+03 CM**3          8.14374E+03 CM**3

 SURROUNDING GEOMETRY VOLUMES -   GEOMETRY REGION    116 IS AN ARRAY PLACEMENT BOUNDARY REGION

 320           1        116         2.57805E+04 CM**3          2.57805E+04 CM**3
               2        117         5.84413E+03 CM**3          3.16246E+04 CM**3
 SURROUNDING GEOMETRY VOLUMES -   GEOMETRY REGION    118 IS AN ARRAY PLACEMENT BOUNDARY REGION
 321           1        118         1.68657E+04 CM**3          1.68657E+04 CM**3
               2        119         1.19757E+03 CM**3          1.80633E+04 CM**3

 SURROUNDING GEOMETRY VOLUMES -   GEOMETRY REGION    120 IS AN ARRAY PLACEMENT BOUNDARY REGION
 322           1        120         1.68657E+04 CM**3          1.68657E+04 CM**3
               2        121         1.19757E+03 CM**3          1.80633E+04 CM**3

 330           1        122         3.31559E+04 CM**3          1.00907E+05 CM**3
               2        123         2.43955E+04 CM**3          1.25303E+05 CM**3
               3        124         2.68637E+05 CM**3          3.93940E+05 CM**3
               4        125         7.49551E+04 CM**3          4.68895E+05 CM**3
               5        126         3.82534E+05 CM**3          8.51429E+05 CM**3
               6        127         2.12103E+04 CM**3          8.72639E+05 CM**3
               7        128         2.38439E+05 CM**3          1.11108E+06 CM**3

                     UNIT     USES     REGION     MIXTURE        TOTAL VOLUME

                       1      1050       1           1          5.82723E+04 CM**3
                                         2           9          2.78782E+03 CM**3
                                         3           2          1.71526E+04 CM**3
                                         4           3          6.54612E+04 CM**3

                       5        24       1           5          1.61911E+04 CM**3

                       6        24       1           5          1.38781E+04 CM**3

                      10         3       1          11          1.60610E+04 CM**3
                                         2           3          8.37026E+03 CM**3

                      11         3       1          11          1.60610E+04 CM**3
                                         2           3          8.37026E+03 CM**3

                      12         3       1          11          1.60610E+04 CM**3
                                         2           3          8.37026E+03 CM**3

                      13         3       1          11          1.60610E+04 CM**3
                                         2           3          8.37026E+03 CM**3

                      14         3       1          11          1.60610E+04 CM**3
                                         2           3          8.37026E+03 CM**3

                      15         3       1          11          1.60610E+04 CM**3
                                         2           3          8.37026E+03 CM**3

                      16         3       1          11          1.60610E+04 CM**3
                                         2           3          8.37026E+03 CM**3

                      20         3       1                      7.73414E+04 CM**3
                                         2           5          1.75324E+04 CM**3

                      21         3       1                      5.05972E+04 CM**3
                                         2           5          3.59271E+03 CM**3

                      22         3       1                      5.05972E+04 CM**3
                                         2           5          3.59271E+03 CM**3

                      30         3       1           3          9.94676E+04 CM**3
                                         2           5          7.31865E+04 CM**3
                                         3           6          8.05912E+05 CM**3
                                         4           5          2.24865E+05 CM**3
                                         5           7          1.14760E+06 CM**3
                                         6           5          6.36308E+04 CM**3
                                         7           8          7.15318E+05 CM**3

                      40         3       1           5          3.49579E+05 CM**3
                                         2           8          3.01916E+05 CM**3
                                         3           8          1.78014E+05 CM**3

                      41         3       1           6          4.98735E+04 CM**3
                                         2           5          2.79474E+05 CM**3
                                         3           8          2.81094E+05 CM**3
                                         4           8          1.66797E+05 CM**3

                      42         6       1           5          2.85778E+04 CM**3
                                         2           8          7.80859E+03 CM**3

                      70         3       1                      1.49761E+07 CM**3

                      80         1       1           8          5.51570E+06 CM**3

                     110         3       1                      1.02624E+04 CM**3
                                         2           2          8.92769E+02 CM**3
```

		3	3	1.32760E+04 CM**3
111	3	1		1.02624E+04 CM**3
		2	2	8.92769E+02 CM**3
		3	3	1.32760E+04 CM**3
112	3	1		1.02624E+04 CM**3
		2	2	8.92769E+02 CM**3
		3	3	1.32760E+04 CM**3
113	3	1		1.02624E+04 CM**3
		2	2	8.92769E+02 CM**3
		3	3	1.32760E+04 CM**3
114	3	1		1.02624E+04 CM**3
		2	2	8.92769E+02 CM**3
		3	3	1.32760E+04 CM**3
115	3	1		1.02624E+04 CM**3
		2	2	8.92769E+02 CM**3
		3	3	1.32760E+04 CM**3
116	3	1		1.02624E+04 CM**3
		2	2	8.92769E+02 CM**3
		3	3	1.32760E+04 CM**3
120	3	1		7.73414E+04 CM**3
		2	5	1.75324E+04 CM**3
121	3	1		5.05972E+04 CM**3
		2	5	3.59271E+03 CM**3
122	3	1		5.05972E+04 CM**3
		2	5	3.59271E+03 CM**3
130	3	1	3	9.94676E+04 CM**3
		2	5	7.31865E+04 CM**3
		3	6	8.05912E+05 CM**3
		4	5	2.24865E+05 CM**3
		5	7	1.14760E+06 CM**3
		6	5	6.36308E+04 CM**3
		7	8	7.15318E+05 CM**3
210	3	1		1.02624E+04 CM**3
		2	2	8.92769E+02 CM**3
		3	3	1.32760E+04 CM**3
211	3	1		1.02624E+04 CM**3
		2	2	8.92769E+02 CM**3
		3	3	1.32760E+04 CM**3
212	3	1		1.02624E+04 CM**3
		2	2	8.92769E+02 CM**3
		3	3	1.32760E+04 CM**3
213	3	1		1.02624E+04 CM**3
		2	2	8.92769E+02 CM**3
		3	3	1.32760E+04 CM**3
214	3	1		1.02624E+04 CM**3
		2	2	8.92769E+02 CM**3
		3	3	1.32760E+04 CM**3
215	3	1		1.02624E+04 CM**3
		2	2	8.92769E+02 CM**3
		3	3	1.32760E+04 CM**3
216	3	1		1.02624E+04 CM**3
		2	2	8.92769E+02 CM**3
		3	3	1.32760E+04 CM**3
220	3	1		7.73414E+04 CM**3
		2	5	1.75324E+04 CM**3
221	3	1		5.05972E+04 CM**3
		2	5	3.59271E+03 CM**3
222	3	1		5.05972E+04 CM**3
		2	5	3.59271E+03 CM**3
230	3	1	3	9.94676E+04 CM**3
		2	5	7.31865E+04 CM**3
		3	6	8.05912E+05 CM**3
		4	5	2.24865E+05 CM**3
		5	7	1.14760E+06 CM**3
		6	5	6.36308E+04 CM**3
		7	8	7.15318E+05 CM**3
310	3	1	11	1.60610E+04 CM**3
		2	3	8.37026E+03 CM**3
311	3	1	11	1.60610E+04 CM**3
		2	3	8.37026E+03 CM**3
312	3	1	11	1.60610E+04 CM**3

		2	3	8.37026E+03 CM**3
313	3	1	11	1.60610E+04 CM**3
		2	3	8.37026E+03 CM**3
314	3	1	11	1.60610E+04 CM**3
		2	3	8.37026E+03 CM**3
315	3	1	11	1.60610E+04 CM**3
		2	3	8.37026E+03 CM**3
316	3	1	11	1.60610E+04 CM**3
		2	3	8.37026E+03 CM**3
320	3	1		7.73414E+04 CM**3
		2	5	1.75324E+04 CM**3
321	3	1		5.05972E+04 CM**3
		2	5	3.59271E+03 CM**3
322	3	1		5.05972E+04 CM**3
		2	5	3.59271E+03 CM**3
330	3	1	3	9.94676E+04 CM**3
		2	5	7.31865E+04 CM**3
		3	6	8.05912E+05 CM**3
		4	5	2.24865E+05 CM**3
		5	7	1.14760E+06 CM**3
		6	5	6.36308E+04 CM**3
		7	8	7.15318E+05 CM**3

TOTAL MIXTURE VOLUMES

MIXTURE	TOTAL VOLUME	MASS(G)
1	5.82723E+04 CM**3	6.04865E+05
2	2.96514E+04 CM**3	1.94513E+05
3	7.66380E+05 CM**3	7.64978E-15
5	2.23330E+06 CM**3	1.76878E+07
6	3.27352E+06 CM**3	3.71348E+07
7	4.59040E+06 CM**3	4.58201E-14
8	9.31260E+06 CM**3	9.29557E-14
9	2.78782E+03 CM**3	2.78272E+03
11	2.24853E+05 CM**3	8.31762E+05

```
***                            BIASING INFORMATION                                    ***
***                                                                                   ***
***   A DEFAULT WEIGHT OF   0.500 WILL BE USED FOR ALL BIAS ID'S.                     ***
*****************************************************************************************
              .......   0 IO'S WERE USED IN KENO-V BEFORE TRACKING        .......
              ....... 0.01283 MINUTES WERE USED PROCESSING DATA.          .......
```

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 1.89052E-02
START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED WITH A FLAT DISTRIBUTION IN A CUBOID DEFINED BY:
+X= 1.01000E+02 -X=-1.01000E+02 +Y= 1.01000E+02 -Y=-1.01000E+02 +Z= 5.02200E+02 -Z= 0.00000E+00
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

2.18000 MINUTES WERE REQUIRED FOR STARTING. TOTAL ELAPSED TIME IS 2.18667 MINUTES.

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	809 INDEPENDENT	FISSION POINTS WERE	GENERATED	
1	7.20764E-01	2.19533E+00	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	942 INDEPENDENT	FISSION POINTS WERE	GENERATED	
2	8.23482E-01	2.19883E+00	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	951 INDEPENDENT	FISSION POINTS WERE	GENERATED	
3	8.55166E-01	2.20250E+00	8.55166E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	8.75370E-01	2.20617E+00	8.65268E-01	1.01020E-02	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	983 INDEPENDENT	FISSION POINTS WERE	GENERATED	
5	8.34339E-01	2.21083E+00	8.54959E-01	1.18453E-02	0.00000E+00	0.00000E+00
6	8.47771E-01	2.21450E+00	8.53162E-01	8.56641E-03	0.00000E+00	0.00000E+00
7	8.45447E-01	2.21717E+00	8.51619E-01	6.81253E-03	0.00000E+00	0.00000E+00
8	8.70304E-01	2.22183E+00	8.54733E-01	6.37486E-03	0.00000E+00	0.00000E+00
9	8.45910E-01	2.22550E+00	8.53473E-01	5.53321E-03	0.00000E+00	0.00000E+00
10	8.40482E-01	2.22817E+00	8.51849E-01	5.05958E-03	0.00000E+00	0.00000E+00
11	8.87736E-01	2.23183E+00	8.55836E-01	5.98416E-03	0.00000E+00	0.00000E+00
12	8.51713E-01	2.23550E+00	8.55424E-01	5.36825E-03	0.00000E+00	0.00000E+00
13	9.21948E-01	2.23917E+00	8.61472E-01	7.75578E-03	0.00000E+00	0.00000E+00
14	8.45112E-01	2.24283E+00	8.60108E-01	7.21009E-03	0.00000E+00	0.00000E+00
15	8.62149E-01	2.24650E+00	8.60265E-01	6.63417E-03	0.00000E+00	0.00000E+00
16	8.53052E-01	2.24933E+00	8.59750E-01	6.16362E-03	0.00000E+00	0.00000E+00
17	8.67530E-01	2.25300E+00	8.60269E-01	5.76141E-03	0.00000E+00	0.00000E+00
18	8.56833E-01	2.25750E+00	8.60054E-01	5.39358E-03	0.00000E+00	0.00000E+00
19	8.67107E-01	2.26117E+00	8.61645E-01	5.31043E-03	0.00000E+00	0.00000E+00
20	8.84104E-01	2.26483E+00	8.62893E-01	5.15985E-03	0.00000E+00	0.00000E+00
21	9.03339E-01	2.26750E+00	8.65022E-01	5.32477E-03	0.00000E+00	0.00000E+00
22	8.55583E-01	2.27117E+00	8.64550E-01	5.07352E-03	0.00000E+00	0.00000E+00
23	8.45629E-01	2.27483E+00	8.63649E-01	4.90926E-03	0.00000E+00	0.00000E+00
24	8.56385E-01	2.27850E+00	8.63319E-01	4.69243E-03	0.00000E+00	0.00000E+00
25	8.71259E-01	2.28217E+00	8.63664E-01	4.49704E-03	0.00000E+00	0.00000E+00
26	9.12665E-01	2.28583E+00	8.65706E-01	4.76551E-03	0.00000E+00	0.00000E+00
27	8.43542E-01	2.28950E+00	8.64820E-01	4.65610E-03	0.00000E+00	0.00000E+00
28	8.84859E-01	2.29317E+00	8.65591E-01	4.53935E-03	0.00000E+00	0.00000E+00
29	8.96228E-01	2.29600E+00	8.66725E-01	4.51297E-03	0.00000E+00	0.00000E+00
30	8.47332E-01	2.29967E+00	8.66033E-01	4.40362E-03	0.00000E+00	0.00000E+00

31	8.89415E-01	2.30417E+00	8.66839E-01	4.32488E-03	0.00000E+00	0.00000E+00
32	8.36875E-01	2.30700E+00	8.65840E-01	4.29595E-03	0.00000E+00	0.00000E+00
33	8.53170E-01	2.31150E+00	8.65431E-01	4.17512E-03	0.00000E+00	0.00000E+00
34	8.40621E-01	2.31433E+00	8.64656E-01	4.11622E-03	0.00000E+00	0.00000E+00
35	8.82549E-01	2.31800E+00	8.65198E-01	4.02621E-03	0.00000E+00	0.00000E+00
36	8.36297E-01	2.32150E+00	8.64346E-01	3.99742E-03	0.00000E+00	0.00000E+00
37	9.41271E-01	2.32517E+00	8.66546E-01	4.46056E-03	0.00000E+00	0.00000E+00
38	8.54531E-01	2.32883E+00	8.66212E-01	4.34772E-03	0.00000E+00	0.00000E+00
39	8.79939E-01	2.33250E+00	8.66583E-01	4.24482E-03	0.00000E+00	0.00000E+00
40	8.51472E-01	2.33617E+00	8.66186E-01	4.15070E-03	0.00000E+00	0.00000E+00
41	8.91896E-01	2.33983E+00	8.66845E-01	4.09627E-03	0.00000E+00	0.00000E+00
42	9.07719E-01	2.34350E+00	8.67867E-01	4.12124E-03	0.00000E+00	0.00000E+00
43	8.88803E-01	2.34717E+00	8.68377E-01	4.05177E-03	0.00000E+00	0.00000E+00
44	8.97750E-01	2.35083E+00	8.69077E-01	4.01549E-03	0.00000E+00	0.00000E+00
45	8.85392E-01	2.35450E+00	8.69456E-01	3.93931E-03	0.00000E+00	0.00000E+00
46	8.68511E-01	2.35733E+00	8.69435E-01	3.84880E-03	0.00000E+00	0.00000E+00
47	8.36269E-01	2.36100E+00	8.68698E-01	3.83381E-03	0.00000E+00	0.00000E+00
48	8.64056E-01	2.36467E+00	8.68597E-01	3.75090E-03	0.00000E+00	0.00000E+00
49	8.78176E-01	2.36833E+00	8.68801E-01	3.67588E-03	0.00000E+00	0.00000E+00
50	8.51390E-01	2.37200E+00	8.68438E-01	3.61672E-03	0.00000E+00	0.00000E+00
51	8.93813E-01	2.37650E+00	8.68956E-01	3.57979E-03	0.00000E+00	0.00000E+00
52	8.59953E-01	2.38117E+00	8.68776E-01	3.51209E-03	0.00000E+00	0.00000E+00
53	8.79682E-01	2.38467E+00	8.68990E-01	3.44917E-03	0.00000E+00	0.00000E+00
54	8.78173E-01	2.38933E+00	8.69166E-01	3.38680E-03	0.00000E+00	0.00000E+00
55	8.79294E-01	2.39300E+00	8.69357E-01	3.32777E-03	0.00000E+00	0.00000E+00
56	8.87232E-01	2.39750E+00	8.69688E-01	3.28230E-03	0.00000E+00	0.00000E+00
57	8.98351E-01	2.40217E+00	8.70209E-01	3.26394E-03	0.00000E+00	0.00000E+00
58	9.00600E-01	2.40667E+00	8.70752E-01	3.25074E-03	0.00000E+00	0.00000E+00
59	8.46073E-01	2.41033E+00	8.70319E-01	3.22242E-03	0.00000E+00	0.00000E+00
60	8.74956E-01	2.41400E+00	8.70399E-01	3.16739E-03	0.00000E+00	0.00000E+00
61	8.72670E-01	2.41767E+00	8.70438E-01	3.11348E-03	0.00000E+00	0.00000E+00
62	8.67262E-01	2.42133E+00	8.70385E-01	3.06160E-03	0.00000E+00	0.00000E+00
63	9.12934E-01	2.42500E+00	8.71082E-01	3.09074E-03	0.00000E+00	0.00000E+00
64	8.30858E-01	2.42867E+00	8.70433E-01	3.10892E-03	0.00000E+00	0.00000E+00
65	8.70281E-01	2.43233E+00	8.70431E-01	3.05918E-03	0.00000E+00	0.00000E+00
66	8.64499E-01	2.43600E+00	8.70338E-01	3.01243E-03	0.00000E+00	0.00000E+00
67	8.83555E-01	2.43967E+00	8.70542E-01	2.97268E-03	0.00000E+00	0.00000E+00
68	8.73341E-01	2.44333E+00	8.70584E-01	2.92760E-03	0.00000E+00	0.00000E+00
69	8.56942E-01	2.44700E+00	8.70380E-01	2.89075E-03	0.00000E+00	0.00000E+00
70	8.51362E-01	2.44967E+00	8.70101E-01	2.86163E-03	0.00000E+00	0.00000E+00
71	8.44781E-01	2.45433E+00	8.69734E-01	2.84362E-03	0.00000E+00	0.00000E+00
72	8.59084E-01	2.45800E+00	8.69582E-01	2.80683E-03	0.00000E+00	0.00000E+00
73	9.18005E-01	2.46167E+00	8.70264E-01	2.84983E-03	0.00000E+00	0.00000E+00
761	8.61197E-01	4.95717E+00	8.69380E-01	8.25227E-04	0.00000E+00	0.00000E+00
762	8.92065E-01	4.96083E+00	8.69410E-01	8.24681E-04	0.00000E+00	0.00000E+00
763	8.50692E-01	4.96433E+00	8.69385E-01	8.23964E-04	0.00000E+00	0.00000E+00
764	8.85868E-01	4.96717E+00	8.69407E-01	8.23166E-04	0.00000E+00	0.00000E+00
765	8.42081E-01	4.97083E+00	8.69371E-01	8.22866E-04	0.00000E+00	0.00000E+00
766	8.58689E-01	4.97450E+00	8.69357E-01	8.21907E-04	0.00000E+00	0.00000E+00
767	9.05490E-01	4.97817E+00	8.69404E-01	8.22190E-04	0.00000E+00	0.00000E+00
768	8.64580E-01	4.98267E+00	8.69398E-01	8.21140E-04	0.00000E+00	0.00000E+00
769	8.68360E-01	4.98550E+00	8.69396E-01	8.20070E-04	0.00000E+00	0.00000E+00
770	8.65633E-01	4.98917E+00	8.69392E-01	8.19016E-04	0.00000E+00	0.00000E+00
771	8.65426E-01	4.99283E+00	8.69386E-01	8.17967E-04	0.00000E+00	0.00000E+00
772	8.73557E-01	4.99650E+00	8.69392E-01	8.16922E-04	0.00000E+00	0.00000E+00
773	8.85453E-01	4.99917E+00	8.69413E-01	8.16127E-04	0.00000E+00	0.00000E+00
774	8.40495E-01	5.00283E+00	8.69375E-01	8.15930E-04	0.00000E+00	0.00000E+00
775	9.19942E-01	5.00650E+00	8.69441E-01	8.17495E-04	0.00000E+00	0.00000E+00
776	8.19185E-01	5.01017E+00	8.69376E-01	8.19016E-04	0.00000E+00	0.00000E+00
777	8.72182E-01	5.01383E+00	8.69379E-01	8.17966E-04	0.00000E+00	0.00000E+00
778	8.94099E-01	5.01667E+00	8.69411E-01	8.17532E-04	0.00000E+00	0.00000E+00
779	8.76642E-01	5.02033E+00	8.69420E-01	8.16533E-04	0.00000E+00	0.00000E+00
780	8.80966E-01	5.02483E+00	8.69435E-01	8.15617E-04	0.00000E+00	0.00000E+00
781	8.74986E-01	5.02850E+00	8.69442E-01	8.14601E-04	0.00000E+00	0.00000E+00
782	9.05142E-01	5.03217E+00	8.69488E-01	8.14842E-04	0.00000E+00	0.00000E+00
783	8.82577E-01	5.03583E+00	8.69505E-01	8.13971E-04	0.00000E+00	0.00000E+00
784	9.01262E-01	5.03950E+00	8.69546E-01	8.13943E-04	0.00000E+00	0.00000E+00
785	8.39892E-01	5.04217E+00	8.69508E-01	8.13784E-04	0.00000E+00	0.00000E+00
786	8.25676E-01	5.04583E+00	8.69452E-01	8.14666E-04	0.00000E+00	0.00000E+00
787	8.74663E-01	5.04950E+00	8.69458E-01	8.13655E-04	0.00000E+00	0.00000E+00
788	8.53603E-01	5.05317E+00	8.69438E-01	8.12870E-04	0.00000E+00	0.00000E+00
789	8.95869E-01	5.05683E+00	8.69472E-01	8.12530E-04	0.00000E+00	0.00000E+00
790	8.54885E-01	5.06050E+00	8.69453E-01	8.11710E-04	0.00000E+00	0.00000E+00
791	9.17470E-01	5.06417E+00	8.69514E-01	8.12961E-04	0.00000E+00	0.00000E+00
792	9.05597E-01	5.06783E+00	8.69560E-01	8.13215E-04	0.00000E+00	0.00000E+00
793	8.71160E-01	5.07150E+00	8.69562E-01	8.12189E-04	0.00000E+00	0.00000E+00
794	8.92208E-01	5.07517E+00	8.69591E-01	8.11667E-04	0.00000E+00	0.00000E+00
795	8.83034E-01	5.07883E+00	8.69607E-01	8.10820E-04	0.00000E+00	0.00000E+00
796	8.68376E-01	5.08250E+00	8.69606E-01	8.09800E-04	0.00000E+00	0.00000E+00
797	8.56340E-01	5.08617E+00	8.69589E-01	8.08952E-04	0.00000E+00	0.00000E+00
798	8.99654E-01	5.08983E+00	8.69627E-01	8.08818E-04	0.00000E+00	0.00000E+00
799	8.46349E-01	5.09350E+00	8.69598E-01	8.08330E-04	0.00000E+00	0.00000E+00
800	9.03032E-01	5.09717E+00	8.69640E-01	8.08403E-04	0.00000E+00	0.00000E+00
801	8.43871E-01	5.10083E+00	8.69607E-01	8.08035E-04	0.00000E+00	0.00000E+00
802	8.52464E-01	5.10450E+00	8.69566E-01	8.07308E-04	0.00000E+00	0.00000E+00
803	8.76863E-01	5.10817E+00	8.69595E-01	8.06351E-04	0.00000E+00	0.00000E+00

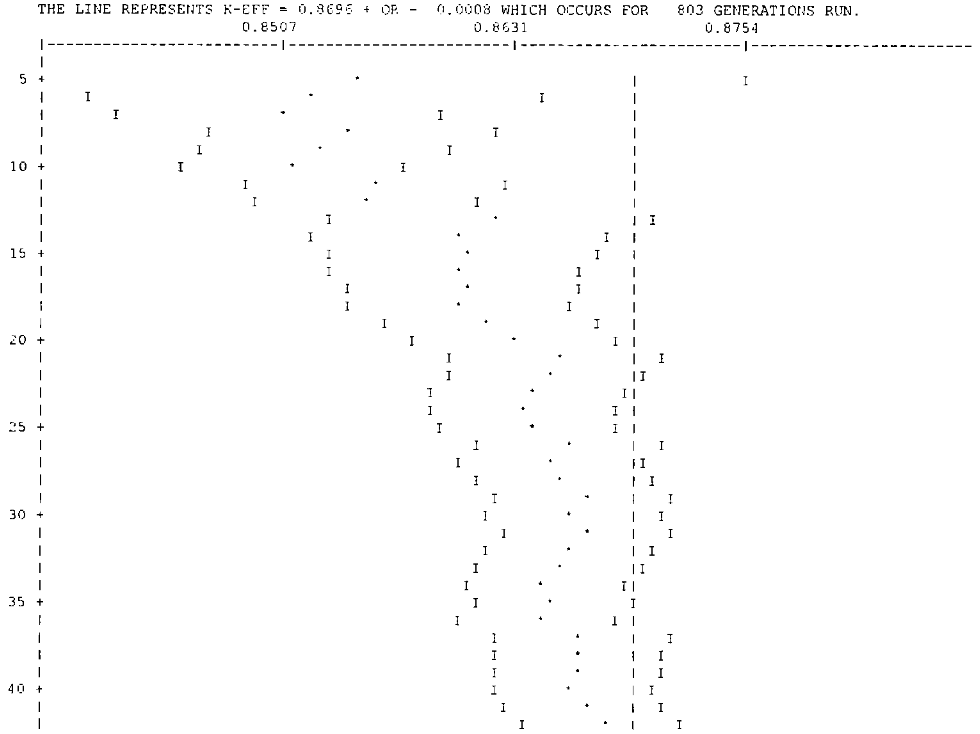
```
KENO MESSAGE NUMBER K5-123        EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

LIFETIME =  2.24743E-04 + OR -  9.75418E-07            GENERATION TIME =  1.91383E-05 + OR -  3.66801E-08
NU BAR   =  2.43406E+00 + OR -  4.19565E-05        AVERAGE FISSION GROUP =  2.16647E+01 + OR -  3.35227E-03
                    ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION =  2.57117E-01 + OR -  6.83592E-04

NO. OF INITIAL
```

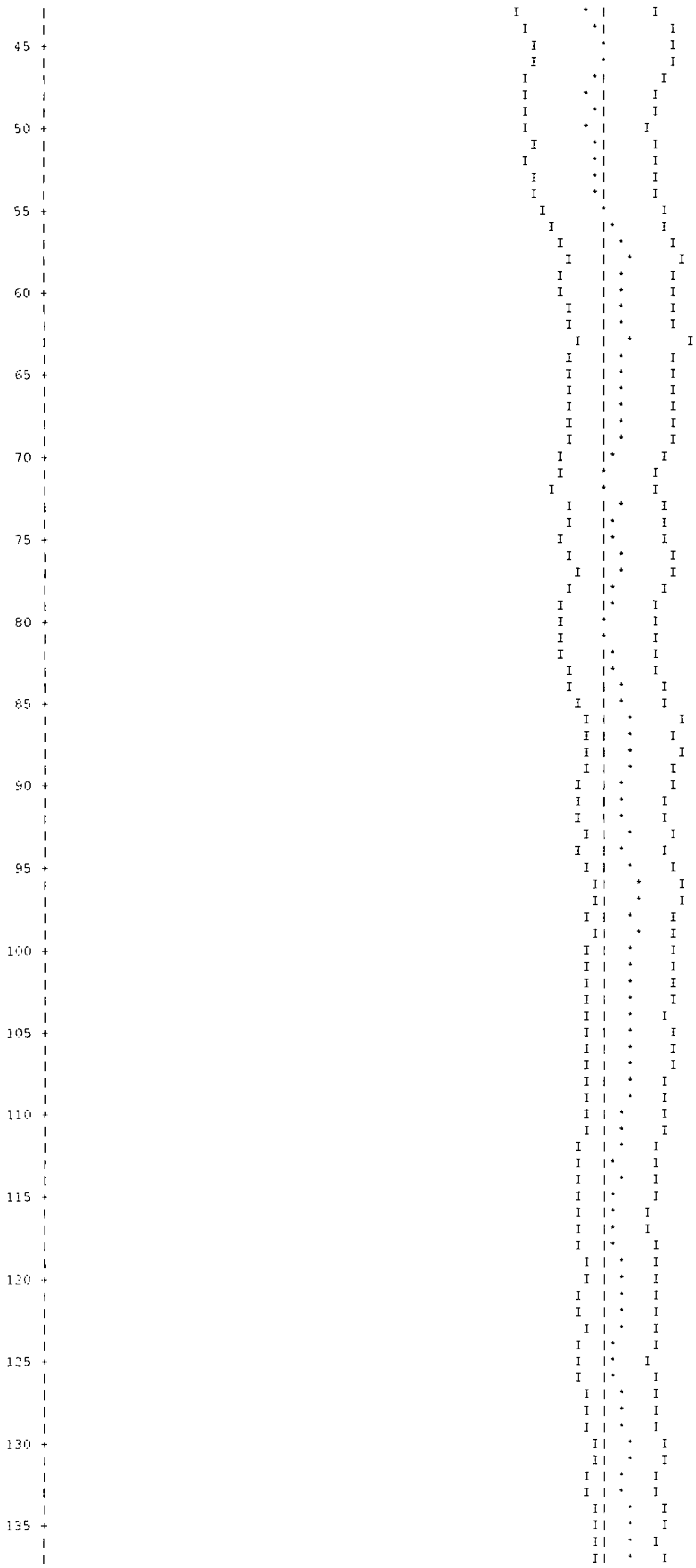
GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.86961	+ OR - 0.00081	0.86881 TO 0.87042	0.86800 TO 0.87123	0.86719 TO 0.87203	800000
4	0.86961	+ OR - 0.00081	0.86880 TO 0.87041	0.86799 TO 0.87122	0.86718 TO 0.87203	799000
5	0.86965	+ OR - 0.00081	0.86884 TO 0.87046	0.86803 TO 0.87127	0.86723 TO 0.87207	798000
6	0.86968	+ OR - 0.00081	0.86887 TO 0.87049	0.86806 TO 0.87129	0.86725 TO 0.87210	797000
7	0.86971	+ OR - 0.00081	0.86890 TO 0.87052	0.86809 TO 0.87133	0.86728 TO 0.87213	796000
8	0.86971	+ OR - 0.00081	0.86890 TO 0.87052	0.86809 TO 0.87133	0.86728 TO 0.87214	795000
9	0.86974	+ OR - 0.00081	0.86893 TO 0.87055	0.86812 TO 0.87136	0.86731 TO 0.87217	794000
10	0.86977	+ OR - 0.00081	0.86896 TO 0.87058	0.86815 TO 0.87140	0.86734 TO 0.87221	793000
11	0.86975	+ OR - 0.00081	0.86894 TO 0.87056	0.86813 TO 0.87137	0.86732 TO 0.87219	792000
12	0.86977	+ OR - 0.00081	0.86896 TO 0.87059	0.86815 TO 0.87140	0.86734 TO 0.87221	791000
17	0.86977	+ OR - 0.00081	0.86896 TO 0.87059	0.86815 TO 0.87140	0.86733 TO 0.87221	786000
22	0.86972	+ OR - 0.00082	0.86891 TO 0.87054	0.86809 TO 0.87136	0.86727 TO 0.87217	781000
27	0.86975	+ OR - 0.00082	0.86893 TO 0.87057	0.86811 TO 0.87139	0.86729 TO 0.87220	776000
32	0.86974	+ OR - 0.00082	0.86892 TO 0.87056	0.86810 TO 0.87138	0.86728 TO 0.87220	771000
37	0.86973	+ OR - 0.00082	0.86892 TO 0.87055	0.86810 TO 0.87137	0.86728 TO 0.87219	766000
42	0.86969	+ OR - 0.00082	0.86886 TO 0.87051	0.86804 TO 0.87133	0.86722 TO 0.87215	761000
47	0.86965	+ OR - 0.00082	0.86882 TO 0.87047	0.86800 TO 0.87130	0.86718 TO 0.87212	756000
52	0.86965	+ OR - 0.00083	0.86882 TO 0.87048	0.86799 TO 0.87131	0.86716 TO 0.87213	751000
57	0.86955	+ OR - 0.00083	0.86872 TO 0.87038	0.86789 TO 0.87121	0.86705 TO 0.87205	746000
62	0.86953	+ OR - 0.00084	0.86869 TO 0.87037	0.86786 TO 0.87120	0.86702 TO 0.87204	741000
67	0.86951	+ OR - 0.00084	0.86867 TO 0.87035	0.86784 TO 0.87119	0.86700 TO 0.87203	736000
72	0.86960	+ OR - 0.00084	0.86875 TO 0.87044	0.86791 TO 0.87128	0.86707 TO 0.87212	731000
77	0.86949	+ OR - 0.00084	0.86865 TO 0.87034	0.86781 TO 0.87118	0.86696 TO 0.87203	726000
82	0.86956	+ OR - 0.00085	0.86872 TO 0.87041	0.86787 TO 0.87126	0.86702 TO 0.87211	721000
87	0.86943	+ OR - 0.00085	0.86858 TO 0.87028	0.86773 TO 0.87113	0.86688 TO 0.87198	716000
92	0.86950	+ OR - 0.00085	0.86864 TO 0.87035	0.86779 TO 0.87120	0.86694 TO 0.87206	711000

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
97	0.86934	+ OR - 0.00085	0.86849 TO 0.87020	0.86764 TO 0.87105	0.86678 TO 0.87190	706000
102	0.86937	+ OR - 0.00086	0.86851 TO 0.87023	0.86766 TO 0.87109	0.86680 TO 0.87195	701000
107	0.86937	+ OR - 0.00086	0.86851 TO 0.87024	0.86765 TO 0.87110	0.86678 TO 0.87196	696000
112	0.86945	+ OR - 0.00087	0.86859 TO 0.87032	0.86772 TO 0.87119	0.86685 TO 0.87206	691000
117	0.86951	+ OR - 0.00087	0.86864 TO 0.87038	0.86777 TO 0.87125	0.86689 TO 0.87212	686000
122	0.86945	+ OR - 0.00087	0.86857 TO 0.87032	0.86770 TO 0.87119	0.86682 TO 0.87207	681000
127	0.86944	+ OR - 0.00088	0.86856 TO 0.87031	0.86768 TO 0.87119	0.86680 TO 0.87207	676000
132	0.86937	+ OR - 0.00088	0.86849 TO 0.87025	0.86761 TO 0.87114	0.86673 TO 0.87202	671000
137	0.86933	+ OR - 0.00089	0.86844 TO 0.87021	0.86755 TO 0.87110	0.86666 TO 0.87199	666000
142	0.86927	+ OR - 0.00089	0.86838 TO 0.87016	0.86749 TO 0.87105	0.86659 TO 0.87194	661000
147	0.86923	+ OR - 0.00090	0.86834 TO 0.87013	0.86744 TO 0.87103	0.86655 TO 0.87192	656000
642	0.87123	+ OR - 0.00178	0.86945 TO 0.87300	0.86768 TO 0.87478	0.86590 TO 0.87656	161000
647	0.87152	+ OR - 0.00181	0.86970 TO 0.87333	0.86789 TO 0.87514	0.86607 TO 0.87696	156000
652	0.87096	+ OR - 0.00185	0.86910 TO 0.87281	0.86725 TO 0.87466	0.86540 TO 0.87652	151000
657	0.87098	+ OR - 0.00190	0.86909 TO 0.87288	0.86719 TO 0.87478	0.86529 TO 0.87668	146000
662	0.87127	+ OR - 0.00193	0.86934 TO 0.87321	0.86741 TO 0.87514	0.86548 TO 0.87707	141000
667	0.87187	+ OR - 0.00197	0.86990 TO 0.87384	0.86793 TO 0.87581	0.86596 TO 0.87779	136000
672	0.87189	+ OR - 0.00198	0.86991 TO 0.87388	0.86792 TO 0.87586	0.86594 TO 0.87784	131000
677	0.87221	+ OR - 0.00205	0.87017 TO 0.87426	0.86812 TO 0.87631	0.86608 TO 0.87835	126000

NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
682	0.87159	+ OR - 0.00202	0.86957 TO 0.87360	0.86755 TO 0.87562	0.86554 TO 0.87763	121000
687	0.87202	+ OR - 0.00206	0.86996 TO 0.87408	0.86790 TO 0.87614	0.86584 TO 0.87821	116000
692	0.87282	+ OR - 0.00212	0.87071 TO 0.87494	0.86859 TO 0.87706	0.86647 TO 0.87918	111000
697	0.87318	+ OR - 0.00219	0.87099 TO 0.87536	0.86881 TO 0.87755	0.86662 TO 0.87974	106000
702	0.87338	+ OR - 0.00226	0.87112 TO 0.87564	0.86886 TO 0.87790	0.86659 TO 0.88016	101000
707	0.87352	+ OR - 0.00235	0.87117 TO 0.87586	0.86882 TO 0.87821	0.86648 TO 0.88056	96000
712	0.87273	+ OR - 0.00243	0.87030 TO 0.87517	0.86787 TO 0.87760	0.86544 TO 0.88003	91000
717	0.87386	+ OR - 0.00242	0.87144 TO 0.87628	0.86902 TO 0.87870	0.86660 TO 0.88112	86000
722	0.87397	+ OR - 0.00254	0.87143 TO 0.87651	0.86889 TO 0.87905	0.86635 TO 0.88158	81000
727	0.87331	+ OR - 0.00267	0.87064 TO 0.87598	0.86796 TO 0.87866	0.86529 TO 0.88133	76000
732	0.87344	+ OR - 0.00281	0.87063 TO 0.87626	0.86781 TO 0.87907	0.86500 TO 0.88189	71000
737	0.87254	+ OR - 0.00281	0.86973 TO 0.87534	0.86693 TO 0.87815	0.86412 TO 0.88095	66000
742	0.87197	+ OR - 0.00302	0.86895 TO 0.87499	0.86593 TO 0.87801	0.86291 TO 0.88103	61000
747	0.87207	+ OR - 0.00326	0.86880 TO 0.87533	0.86554 TO 0.87859	0.86228 TO 0.88185	56000
752	0.87366	+ OR - 0.00342	0.87024 TO 0.87708	0.86682 TO 0.88050	0.86339 TO 0.88393	51000
757	0.87403	+ OR - 0.00369	0.87034 TO 0.87772	0.86665 TO 0.88141	0.86297 TO 0.88510	46000
762	0.87303	+ OR - 0.00381	0.86922 TO 0.87684	0.86541 TO 0.88066	0.86160 TO 0.88447	41000
767	0.87365	+ OR - 0.00408	0.86958 TO 0.87773	0.86550 TO 0.88181	0.86142 TO 0.88588	36000
772	0.87464	+ OR - 0.00471	0.86993 TO 0.87936	0.86522 TO 0.88407	0.86050 TO 0.88878	31000
777	0.87603	+ OR - 0.00467	0.87135 TO 0.88070	0.86668 TO 0.88537	0.86201 TO 0.89005	26000
782	0.87356	+ OR - 0.00554	0.86803 TO 0.87910	0.86249 TO 0.88464	0.85696 TO 0.89017	21000
787	0.87630	+ OR - 0.00594	0.87036 TO 0.88224	0.86441 TO 0.88818	0.85847 TO 0.89412	16000
792	0.87212	+ OR - 0.00630	0.86582 TO 0.87843	0.85952 TO 0.88473	0.85321 TO 0.89103	11000
797	0.87037	+ OR - 0.01090	0.85947 TO 0.88128	0.84857 TO 0.89218	0.83766 TO 0.90308	6000

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.8695 + OR - 0.0008 WHICH OCCURS FOR 803 GENERATIONS RUN.

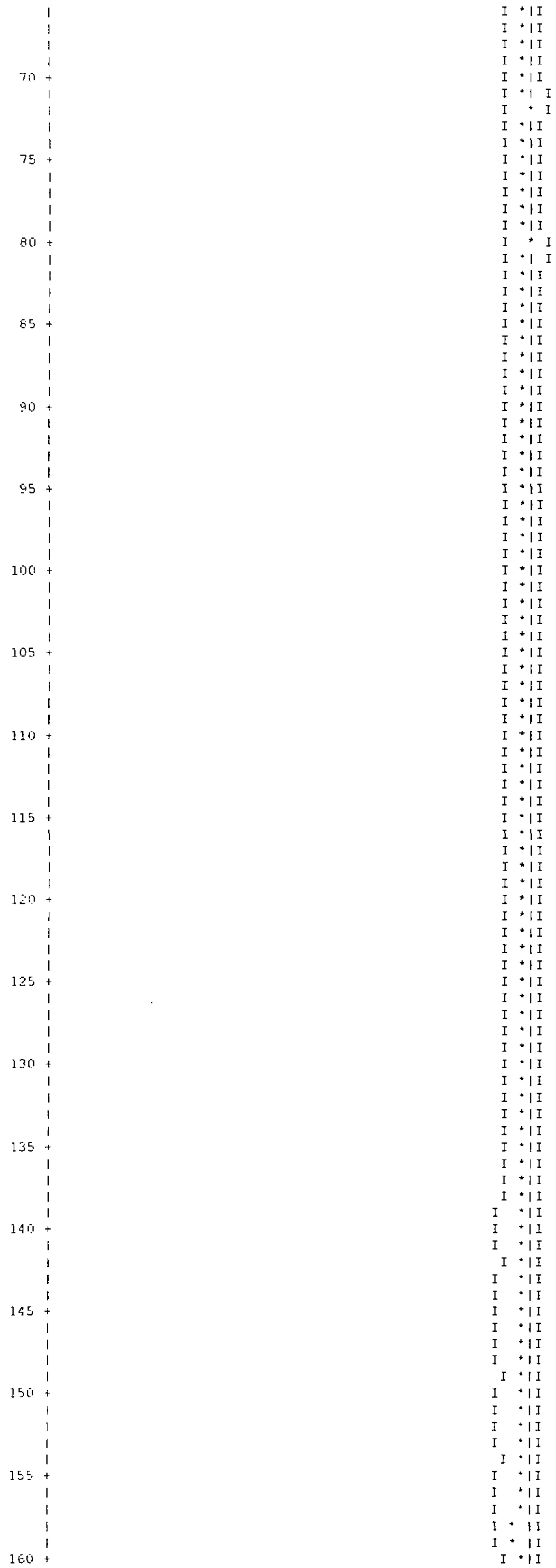


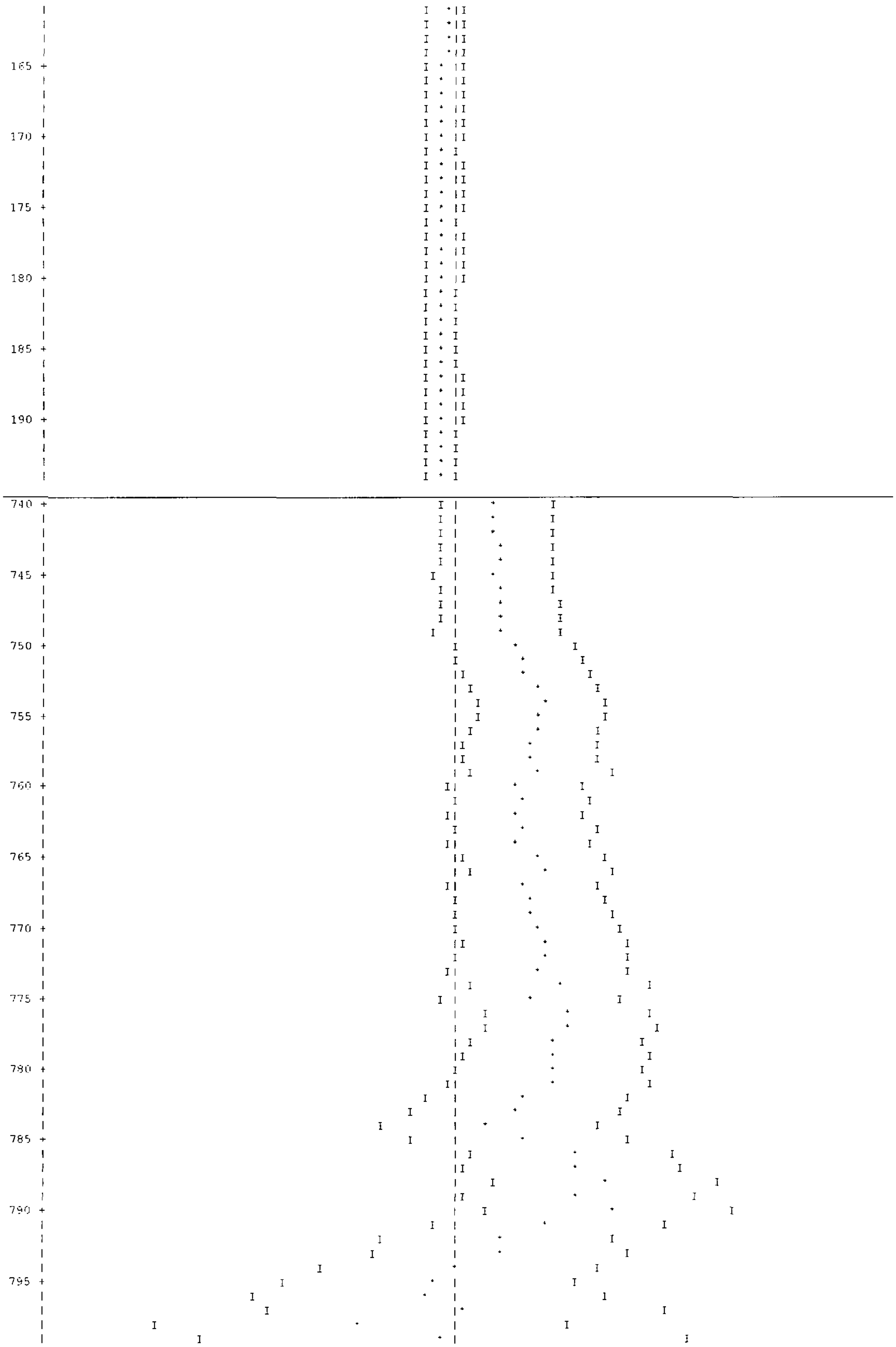

45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
125
130
135

```
    |                              I|  *   I
    |                               I  *   I
140 +                              I|  *   I
    |                              I|  *   I
    |                              I|  *   I
    |                              I|  *   I
    |                              I|  *   I
145 +                              I|  *   I
    |                               I   *  I
    |                               I  *   I
    |                              I|  *   I
    |                              I|  *   I
150 +                              I|  *   I
    |                               I  *   I
    |                               I  *   I
    |                              I|  *   I
    |                              I|  *  I
155 +                              I|  *  I
    |                              I|  *  I
    |                              I|  *  I
    |                               I  *   I
    |                               I  *   I
160 +                              I| *   I
    |                              I|  *   I
    |                              I|  *   I
    |                              I|  *   I
    |                              I|  *   I
165 +                               I  *   I
    |                               I  *   I
    |                               I  *   I
    |                               I  *   I
    |                               I  *   I
170 +                               I   *  I
    |                               I   *  I
    |                               I  *   I
    |                               I  *   I
    |                               I  *   I
175 +                               I  *   I
    |                               I   *  I
    |                               I  *   I
    |                               I  *   I
    |                               I   *  I
180 +                               I  *   I
    |                               I   *  I
    |                               I   *  I
    |                               I   *  I
    |                               |I  *  I
185 +                               I   *  I
    |                               I   *  I
    |                               I  *   I
    |                               I  *  I
    |                               I  *   I
190 +                               I  *   I
    |                               I  *   I
    |                               I  *   I
    |                               I   *  I
    |                               |I  *  I
```

```
740 +                             I*|I
    |                             I*|I
    |                             I*|I
    |                             I*|I
    |                             I*|I
745 +                             I*|I
    |                             I*|I
    |                             I*|I
    |                             I*|I
    |                             I*|I
750 +                             I*|I
    |                             I*|I
    |                             I*|I
    |                             I*|I
    |                            I *|I
755 +                             I*|I
    |                             I*|I
    |                             I*|I
    |                             I*|I
    |                             I*|I
760 +                             I*|I
    |                             I*|I
    |                             I*|I
    |                             I*|I
    |                             I*|I
765 +                             I*|I
    |                             I*|I
    |                             I*|I
    |                             I*|I
    |                             I*|I
770 +                             I*|I
    |                             I*|I
    |                             I*|I
    |                             I*|I
    |                             I*|I
775 +                             I *I
    |                             I*|I
```

```
      |                                                  I*|I
      |                                                  I*|I
      |                                                  I*|I
  780 +                                                  I*|I
      |                                                  I *I
      |                                                  I *I
      |                                                  I *I
      |                                                  I *I
  785 +                                                  I *I
      |                                                  I *I
      |                                                  I *I
      |                                                  I*|I
      |                                                  I *I
  790 +                                                  I *I
      |                                                  I *I
      |                                                  I *I
      |                                                  I *I
      |                                                  I *I
  795 +                                                  I *I
      |                                                  I *I
      |                                                  I *I
      |                                                  I * I
      |                                                  I *I
  800 +                                                  I * I
      |                                                  I *I
      |                                                  I *I
      |                                                  I *I

                 PLOT OF AVERAGE K-EFFECTIVE BY GENERATION SKIPPED.
      THE LINE REPRESENTS K-EFF = 0.8696 + OR -  0.0008 WHICH OCCURS FOR      3 GENERATIONS SKIPPED.
                       0.8577                  0.8680                  0.8782
      |------------------------|------------------------|------------------------|------------------------
      |
      |                                           I * I
    5 +                                           I * I
      |                                           I * I
      |                                           I * I
      |                                           I * I
      |                                           I * I
   10 +                                           I * I
      |                                           I * I
      |                                           I * I
      |                                           I * I
      |                                           I * I
   15 +                                           I * I
      |                                           I * I
      |                                           I * I
      |                                           I * I
      |                                           I * I
   20 +                                           I * I
      |                                           I * I
      |                                           I * I
      |                                           I * I
      |                                           I * I
   25 +                                           I * I
      |                                           I * I
      |                                           I * I
      |                                           I * I
      |                                           I * I
   30 +                                           I * I
      |                                           I * I
      |                                           I * I
      |                                           I * I
      |                                           I * I
   35 +                                           I * I
      |                                           I * I
      |                                           I * I
      |                                           I * I
      |                                           I * I
   40 +                                           I * I
      |                                           I * I
      |                                           I * I
      |                                           I * I
      |                                           I * I
   45 +                                           I * I
      |                                           I * I
      |                                           I * I
      |                                           I * I
      |                                           I * I
   50 +                                           I * I
      |                                           I * I
      |                                           I * I
      |                                           I * I
      |                                           I * I
   55 +                                           I * I
      |                                          I *| I
      |                                          I *|I
      |                                          I *|I
      |                                          I *|I
   60 +                                          I *|I
      |                                          I *|I
      |                                          I *|I
      |                                          I *|I
      |                                          I *|I
   65 +                                          I *|I
```


70
75
80
85
90
95
100
105
110
115
120
125
130
135
140
145
150
155
160


165
170
175
180
185
190
740
745
750
755
760
765
770
775
780
785
790
795

800 + * I |

SKIPPING 3 GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0036			3.16101E-03	1.0708	2.07689E-03	0.9611	0.00000E+00	0.0000
2	0.0149			1.29140E-02	0.3253	7.41767E-03	0.2988	0.00000E+00	0.0000
3	0.0171			1.48700E-02	0.2519	6.55451E-03	0.2380	0.00000E+00	0.0000
4	0.0075			6.50931E-03	0.2913	3.24606E-03	0.2726	0.00000E+00	0.0000
5	0.0032			2.79252E-03	0.2354	2.80208E-03	0.2136	0.00000E+00	0.0000
6	0.0037			3.25030E-03	0.2309	5.61286E-03	0.2124	0.00000E+00	0.0000
7	0.0042			3.63493E-03	0.2597	6.91825E-03	0.2376	0.00000E+00	0.0000
8	0.0042			3.67098E-03	0.2411	8.70636E-03	0.2327	0.00000E+00	0.0000
9	0.0056			4.87620E-03	0.2244	1.27518E-02	0.2084	0.00000E+00	0.0000
10	0.0121			1.04961E-02	0.2204	2.37704E-02	0.1808	0.00000E+00	0.0000
11	0.0243			2.10948E-02	0.1815	4.05073E-02	0.1513	0.00000E+00	0.0000
12	0.0311			2.70160E-02	0.1737	4.56024E-02	0.1538	0.00000E+00	0.0000
13	0.0284			2.46836E-02	0.1721	4.52290E-02	0.1578	0.00000E+00	0.0000
14	0.0218			1.89165E-02	0.1629	6.16347E-02	0.1515	0.00000E+00	0.0000
15	0.0043			3.76369E-03	0.2554	1.01315E-02	0.3870	0.00000E+00	0.0000
16	0.0029			2.53896E-03	0.3287	5.95737E-03	0.4673	0.00000E+00	0.0000
17	0.0045			3.89405E-03	0.4239	4.40758E-03	0.4139	0.00000E+00	0.0000
18	0.0061			5.28540E-03	0.4146	4.62657E-03	0.3853	0.00000E+00	0.0000
19	0.0073			6.35321E-03	0.3296	6.83232E-03	0.3807	0.00000E+00	0.0000
20	0.0304			2.64104E-02	0.2043	2.61778E-02	0.2538	0.00000E+00	0.0000
21	0.0165			1.43336E-02	0.3200	1.19840E-02	0.3077	0.00000E+00	0.0000
22	0.0386			3.35259E-02	0.2289	2.66332E-02	0.2288	0.00000E+00	0.0000
23	0.1140			9.91690E-02	0.1555	7.58196E-02	0.1542	0.00000E+00	0.0000
24	0.1886			1.63996E-01	0.1480	1.15808E-01	0.1356	0.00000E+00	0.0000
25	0.1514			1.31646E-01	0.1596	9.03125E-02	0.1474	0.00000E+00	0.0000
26	0.1832			1.59314E-01	0.1740	1.11489E-01	0.1635	0.00000E+00	0.0000
27	0.0707			6.14960E-02	0.2729	6.97655E-02	0.2298	0.00000E+00	0.0000
SYSTEM TOTAL =				8.69613E-01	0.0928	8.32776E-01	0.0524	0.00000E+00	0.0000

THE WEIGHT LOST IN THE ALBEDO PORTION OF THE PROBLEM = 1.6990E-01 + OR - 0.0003

ELAPSED TIME 5.10900 MINUTES
RANDOM NUMBER= 74DA6F694404

```
                          FREQUENCY FOR GENERATIONS    4 TO  803
0.7930 TO 0.7967     *
0.7967 TO 0.8004
0.8004 TO 0.8040     *
0.8040 TO 0.8077
0.8077 TO 0.8114
0.8114 TO 0.8151     ***
0.8151 TO 0.8187     **
0.8187 TO 0.8224     *******
0.8224 TO 0.8261     *******
0.8261 TO 0.8298     **********
0.8298 TO 0.8334     ****************
0.8334 TO 0.8371     *****************
0.8371 TO 0.8408     *****************
0.8408 TO 0.8445     **************************
0.8445 TO 0.8481     ************************************
0.8481 TO 0.8518     ********************************************
0.8518 TO 0.8555     *************************************
0.8555 TO 0.8592     **********************************************
0.8592 TO 0.8628     ***********************************************
0.8628 TO 0.8665     ************************************
0.8665 TO 0.8702     ****************************************************
0.8702 TO 0.8739     **********************************************
0.8739 TO 0.8775     ****************************************************
0.8775 TO 0.8812     ***************************************************
0.8812 TO 0.8849     ***********************************
0.8849 TO 0.8886     **********************************************
0.8886 TO 0.8922     ************************************
0.8922 TO 0.8959     ***************************
0.8959 TO 0.8996     ************************
0.8996 TO 0.9033     ************************
0.9033 TO 0.9069     ****************
0.9069 TO 0.9106     **********
0.9106 TO 0.9143     ********
0.9143 TO 0.9179     *********
0.9179 TO 0.9216     ****
0.9216 TO 0.9253     *
0.9253 TO 0.9290     **
0.9290 TO 0.9326     *
0.9326 TO 0.9363
0.9363 TO 0.9400     **
0.9400 TO 0.9437     *

                          FREQUENCY FOR GENERATIONS  204 TO  803
0.7930 TO 0.7967
0.7967 TO 0.8004
0.8004 TO 0.8040     *
0.8040 TO 0.8077
0.8077 TO 0.8114
0.8114 TO 0.8151     ***
```

```
0.8151 TO 0.8187     **
0.8187 TO 0.8224     ******
0.8224 TO 0.8261     ******
0.8261 TO 0.8298     **********
0.8298 TO 0.8334     *************
0.8334 TO 0.8371     ***********
0.8371 TO 0.8408     *************
0.8408 TO 0.8445     ***********************
0.8445 TO 0.8481     ************************
0.8481 TO 0.8518     *******************************
0.8518 TO 0.8555     **************************
0.8555 TO 0.8592     *************************************
0.8592 TO 0.8628     *****************************************
0.8628 TO 0.8665     ***************************
0.8665 TO 0.8702     **********************************
0.8702 TO 0.8739     ***********************************
0.8739 TO 0.8775     *******************************************
0.8775 TO 0.8812     ***************************************
0.8812 TO 0.8849     **************************
0.8849 TO 0.8886     *********************************
0.8886 TO 0.8922     **********************
0.8922 TO 0.8959     **********************
0.8959 TO 0.8996     ****************
0.8996 TO 0.9033     *****************
0.9033 TO 0.9069     ***************
0.9069 TO 0.9106     *********
0.9106 TO 0.9143     ****
0.9143 TO 0.9179     ******
0.9179 TO 0.9216     *
0.9216 TO 0.9253
0.9253 TO 0.9290     *
0.9290 TO 0.9326     *
0.9326 TO 0.9363
0.9363 TO 0.9400     **
0.9400 TO 0.9437

                         FREQUENCY FOR GENERATIONS  404 TO  803
0.7930 TO 0.7967
0.7967 TO 0.8004
0.8004 TO 0.8040
0.8040 TO 0.8077
0.8077 TO 0.8114
0.8114 TO 0.8151     ***
0.8151 TO 0.8187     **
0.8187 TO 0.8224     ***
0.8224 TO 0.8261     ***
0.8261 TO 0.8298     *******
0.8298 TO 0.8334     *******
0.8334 TO 0.8371     ********
0.8371 TO 0.8408     ********
0.8408 TO 0.8445     *****************
0.8445 TO 0.8481     **************
0.8481 TO 0.8518     **********************
0.8518 TO 0.8555     *******************
0.8555 TO 0.8592     *********************
0.8592 TO 0.8628     *********************
0.8628 TO 0.8665     *******************
0.8665 TO 0.8702     *********************
0.8702 TO 0.8739     ***********************
0.8739 TO 0.8775     *******************************
0.8775 TO 0.8812     *********************************
0.8812 TO 0.8849     *********************
0.8849 TO 0.8886     ***********************
0.8886 TO 0.8922     *************
0.8922 TO 0.8959     *************
0.8959 TO 0.8996     **********
0.8996 TO 0.9033     ************
0.9033 TO 0.9069     **********
0.9069 TO 0.9106     ******
0.9106 TO 0.9143     *
0.9143 TO 0.9179     ****
0.9179 TO 0.9216     *
0.9216 TO 0.9253
0.9253 TO 0.9290     *
0.9290 TO 0.9326     *
0.9326 TO 0.9363
0.9363 TO 0.9400     **
0.9400 TO 0.9437

                         FREQUENCY FOR GENERATIONS  604 TO  803
0.7930 TO 0.7967
0.7967 TO 0.8004
0.8004 TO 0.8040
0.8040 TO 0.8077
0.8077 TO 0.8114
0.8114 TO 0.8151     *
0.8151 TO 0.8187
0.8187 TO 0.8224     *
0.8224 TO 0.8261     **
0.8261 TO 0.8298     ***
0.8298 TO 0.8334     ***
0.8334 TO 0.8371     ***
0.8371 TO 0.8408     ****
0.8408 TO 0.8445     *********
0.8445 TO 0.8481     *****
```

```
0.8481 TO 0.8518       *******
0.8518 TO 0.8555       ***********
0.8555 TO 0.8592       ************
0.8592 TO 0.8628       *********
0.8628 TO 0.8665       *********
0.8665 TO 0.8702       **********
0.8702 TO 0.8739       *************
0.8739 TO 0.8775       **************
0.8775 TO 0.8812       ***************
0.8812 TO 0.8849       ************
0.8849 TO 0.8886       ****************
0.8886 TO 0.8922       *******
0.8922 TO 0.8959       ********
0.8959 TO 0.8996       ***
0.8996 TO 0.9033       ********
0.9033 TO 0.9069       *****
0.9069 TO 0.9106       ***
0.9106 TO 0.9143
0.9143 TO 0.9179       ***
0.9179 TO 0.9216       *
0.9216 TO 0.9253
0.9253 TO 0.9290       *
0.9290 TO 0.9326       *
0.9326 TO 0.9363
0.9363 TO 0.9400       *
0.9400 TO 0.9437

******************************************************************************************************************************************************
           CONGRATULATIONS!  YOU HAVE  SUCCESSFULLY TRAVERSED THE PERILOUS PATH THROUGH KENO V IN   5.10900 MINUTES
******************************************************************************************************************************************************
```

6.6.12 Spiral Fuel Assemblies in the LWT Cask

This section contains a truncated sample output file from the evaluation of spiral fuel assemblies in the LWT cask. The output file is shown in Figure 6.6.12-1.

Figure 6.6.12-1 Maximum Reactivity Spiral Fuel Assembly Configuration

```
     PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
MODULE CSAS25   WILL BE CALLED
  LWT w/ HIFAR Mark III Fuel, Accident, Radial - In, Axial - Alternating
  ' Basket Configuration
  '  Fuel Tube Thick - Min  Fuel Tube OD - Max
  '  Fuel Tube Height - Min  Fuel Base  Plate - Min
  ' Fuel Plate Configuration  Fuel Plate Thickness - Min  Fuel Plate Clad Thicknes
  '  Active Fuel Length - Min  Fuel Element Height - Nominal
  '  Plate Location - H/U Ratio - Max
  ' Material Description
  '  U235 Fuel Mass - Max  Uranium Weight Fraction - Max
  27GROUPNDF4  LATTICECELL
  'Material Description for LWT Analysis - DIDO HIFAR Mark III Fuel
  URANIUM  1  DEN=0.4084  1.0  293.0  92235 85.0   92238 15.0  END
  AL  1  DEN=0.2957  1.0  293.0      END
  AL  2  1.00  293.0         END
  H2O  3  DEN=0.9998  1.00  293.0       END
  AREMGLC  0.9437  3  0  1  0
    6012  2  1001  6  8016  2
    4  0.5840          END
  H2O  4  0.4160  293.0         END
  PB  5  1.00  293.0         END
  SS304  6  1.00  293.0         END
  AL  7  1.00  293.0         END
  SS304  8  1.00  293.0         END
  H2O  9  DEN=0.0001  1.00  293.0       END
  END COMP
  SYMMSLABCELL  0.6342  0.1039  1  3  0.1239  2  END

  READ PARAM  TBA=5  TME=90  RUN=YES  PLT=NO
    GEN=1203  NPG=1000         END PARAM
  READ START  XSM=-16.85  XSP=16.85  YSM=16.85  YSP=-16.85
    ZSM=26.67  ZSP=472.14         END START
  READ GEOM
  UNIT  1
  COM='Fueled Annular Sections       Tube  1  '
  'Aluminum Inner
  CYLINDER  3  1  2.9100  59.0750  0.0000
  CYLINDER  2  1  2.911  59.0750  0.0000
  'Fuel Annulus     1
  CYLINDER  3  1  3.0994  59.0750  0.0000
  CYLINDER  2  1  3.1094  59.0750  0.0000
  CYLINDER  1  1  3.2133  59.0750  0.0000
  CYLINDER  2  1  3.2233  59.0750  0.0000
  'Fuel Annulus     2
  CYLINDER  3  1  3.9218  59.0750  0.0000
  CYLINDER  2  1  3.9318  59.0750  0.0000
  CYLINDER  1  1  4.0357  59.0750  0.0000
  CYLINDER  2  1  4.0457  59.0750  0.0000
  'Fuel Annulus     3
  CYLINDER  3  1  4.7442  59.0750  0.0000
  CYLINDER  2  1  4.7542  59.0750  0.0000
  CYLINDER  1  1  4.8581  59.0750  0.0000
  CYLINDER  2  1  4.8681  59.0750  0.0000
  'Aluminum Outer
  CYLINDER  3  1  5.0700  59.0750  0.0000
  CYLINDER  2  1  5.0799  59.0750  0.0000
  UNIT  2
  COM='Axial Clad Sections       Tube  1  '
  'Aluminum Inner
  CYLINDER  3  1  2.9100  0.0005  0.0000
  CYLINDER  2  1  2.911  0.0005  0.0000
  'Clad Axial End Piece     1
  CYLINDER  3  1  3.0994  0.0005  0.0000
  CYLINDER  2  1  3.2233  0.0005  0.0000
  'Clad Axial End Piece     2
  CYLINDER  3  1  3.9218  0.0005  0.0000
  CYLINDER  2  1  4.0457  0.0005  0.0000
  'Clad Axial End Piece     3
  CYLINDER  3  1  4.7442  0.0005  0.0000
  CYLINDER  2  1  4.8681  0.0005  0.0000
  'Aluminum Outer
  CYLINDER  3  1  5.0700  0.0005  0.0000
  CYLINDER  2  1  5.0799  0.0005  0.0000
  UNIT  3
  COM='Fuel Element      Tube  1     '
  CYLINDER  3  1  5.0800  59.0763  0.0000
  HOLE  2  0.0000  0.0000  0.0000
  HOLE  1  0.0000  0.0000  0.0006
  HOLE  2  0.0000  0.0000  59.0757
  UNIT  4
  COM='Basket Fuel Tube - Fuel Down        Radial Shifted toward    0  Degrees'
  CYLINDER  3  1  5.2578  73.0249  0.0000
  HOLE  3  0.0000  0.0000  0.0000
  CYLINDER  6  1  5.57510  73.0249  0.0000
  UNIT  5
  COM='Basket Fuel Tube - Fuel Up        Radial Shifted toward    0  Degrees'
  CYLINDER  3  1  5.2578  73.0249  0.0000
  HOLE  3  0.0000  0.0000  13.9484
  CYLINDER  6  1  5.57510  73.0249  0.0000
  UNIT  6
  COM='Fueled Annular Sections       Tube  2  '
```

```
'Aluminum Inner
CYLINDER  3  1  2.9100  59.0750  0.0000
CYLINDER  2  1  2.911  59.0750  0.0000
'Fuel Annulus    1
CYLINDER  3  1  3.0994  59.0750  0.0000
CYLINDER  2  1  3.1094  59.0750  0.0000
CYLINDER  1  1  3.2133  59.0750  0.0000
CYLINDER  2  1  3.2233  59.0750  0.0000
'Fuel Annulus    2
CYLINDER  3  1  3.9218  59.0750  0.0000
CYLINDER  2  1  3.9318  59.0750  0.0000
CYLINDER  1  1  4.0357  59.0750  0.0000
CYLINDER  2  1  4.0457  59.0750  0.0000
'Fuel Annulus    3
CYLINDER  3  1  4.7442  59.0750  0.0000
CYLINDER  2  1  4.7542  59.0750  0.0000
CYLINDER  1  1  4.8581  59.0750  0.0000
CYLINDER  2  1  4.8681  59.0750  0.0000
'Aluminum Outer
CYLINDER  3  1  5.0700  59.0750  0.0000
CYLINDER  2  1  5.0799  59.0750  0.0000
UNIT  7
COM='Axial Clad Sections      Tube  2  '
'Aluminum Inner
CYLINDER  3  1  2.9100  0.0005  0.0000
CYLINDER  2  1  2.911  0.0005  0.0000
'Clad Axial End Piece    1
CYLINDER  3  1  3.0994  0.0005  0.0000
CYLINDER  2  1  3.2233  0.0005  0.0000
'Clad Axial End Piece    2
CYLINDER  3  1  3.9218  0.0005  0.0000
CYLINDER  2  1  4.0457  0.0005  0.0000
'Clad Axial End Piece    3
CYLINDER  3  1  4.7442  0.0005  0.0000
CYLINDER  2  1  4.8681  0.0005  0.0000
'Aluminum Outer
CYLINDER  3  1  5.0700  0.0005  0.0000
CYLINDER  2  1  5.0799  0.0005  0.0000
UNIT  8
COM='Fuel Element     Tube  2'
CYLINDER  3  1  5.0800  59.0763  0.0000
HOLE  7  0.0000  0.0000  0.0000
HOLE  6  0.0000  0.0000  0.0006
HOLE  7  0.0000  0.0000  59.0757
UNIT  9
COM='Basket Fuel Tube - Fuel Down       Radial Shifted toward    180  Degrees'
CYLINDER  3  1  5.2578  73.0249  0.0000
HOLE  8  -0.1777  0.0000  0.0000
CYLINDER  6  1  5.57510  73.0249  0.0000
UNIT  10
COM='Basket Fuel Tube - Fuel Up       Radial Shifted toward    180  Degrees'
CYLINDER  3  1  5.2578  73.0249  0.0000
HOLE  8  -0.1777  0.0000  13.9484
CYLINDER  6  1  5.57510  73.0249  0.0000
UNIT  11
COM='Fueled Annular Sections      Tube  3  '
'Aluminum Inner
CYLINDER  3  1  2.9100  59.0750  0.0000
CYLINDER  2  1  2.911  59.0750  0.0000
'Fuel Annulus    1
CYLINDER  3  1  3.0994  59.0750  0.0000
CYLINDER  2  1  3.1094  59.0750  0.0000
CYLINDER  1  1  3.2133  59.0750  0.0000
CYLINDER  2  1  3.2233  59.0750  0.0000
'Fuel Annulus    2
CYLINDER  3  1  3.9218  59.0750  0.0000
CYLINDER  2  1  3.9318  59.0750  0.0000
CYLINDER  1  1  4.0357  59.0750  0.0000
CYLINDER  2  1  4.0457  59.0750  0.0000
'Fuel Annulus    3
CYLINDER  3  1  4.7442  59.0750  0.0000
CYLINDER  2  1  4.7542  59.0750  0.0000
CYLINDER  1  1  4.8581  59.0750  0.0000
CYLINDER  2  1  4.8681  59.0750  0.0000
'Aluminum Outer
CYLINDER  3  1  5.0700  59.0750  0.0000
CYLINDER  2  1  5.0799  59.0750  0.0000
UNIT  12
COM='Axial Clad Sections      Tube  3  '
'Aluminum Inner
CYLINDER  3  1  2.9100  0.0005  0.0000
CYLINDER  2  1  2.911  0.0005  0.0000
'Clad Axial End Piece    1
CYLINDER  3  1  3.0994  0.0005  0.0000
CYLINDER  2  1  3.2233  0.0005  0.0000
'Clad Axial End Piece    2
CYLINDER  3  1  3.9218  0.0005  0.0000
CYLINDER  2  1  4.0457  0.0005  0.0000
'Clad Axial End Piece    3
CYLINDER  3  1  4.7442  0.0005  0.0000
CYLINDER  2  1  4.8681  0.0005  0.0000
'Aluminum Outer
CYLINDER  3  1  5.0700  0.0005  0.0000
CYLINDER  2  1  5.0799  0.0005  0.0000
UNIT  13
COM='Fuel Element     Tube  3'
```

```
CYLINDER  3  1  5.0800  59.0763  0.0000
HOLE  12  0.0000  0.0000  0.0000
HOLE  11  0.0000  0.0000  0.0006
HOLE  12  0.0000  0.0000  59.0757
UNIT  14
COM='Basket Fuel Tube - Fuel Down        Radial Shifted toward    240  Degrees'
CYLINDER  3  1  5.2578  73.0249  0.0000
HOLE  13  -0.0889  -0.1539  0.0000
CYLINDER  6  1  5.57510  73.0249  0.0000
UNIT  15
COM='Basket Fuel Tube - Fuel Up        Radial Shifted toward    240  Degrees'
CYLINDER  3  1  5.2578  73.0249  0.0000
HOLE  13  -0.0889  -0.1539  13.9484
CYLINDER  6  1  5.57510  73.0249  0.0000
UNIT  16
COM='Fueled Annular Sections       Tube  4  '
'Aluminum Inner
CYLINDER  3  1  2.9100  59.0750  0.0000
CYLINDER  2  1  2.911  59.0750  0.0000
'Fuel Annulus     1
CYLINDER  3  1  3.0994  59.0750  0.0000
CYLINDER  2  1  3.1094  59.0750  0.0000
CYLINDER  1  1  3.2133  59.0750  0.0000
CYLINDER  2  1  3.2233  59.0750  0.0000
'Fuel Annulus     2
CYLINDER  3  1  3.9218  59.0750  0.0000
CYLINDER  2  1  3.9318  59.0750  0.0000
CYLINDER  1  1  4.0357  59.0750  0.0000
CYLINDER  2  1  4.0457  59.0750  0.0000
'Fuel Annulus     3
CYLINDER  3  1  4.7442  59.0750  0.0000
CYLINDER  2  1  4.7542  59.0750  0.0000
CYLINDER  1  1  4.8581  59.0750  0.0000
CYLINDER  2  1  4.8681  59.0750  0.0000
'Aluminum Outer
CYLINDER  3  1  5.0700  59.0750  0.0000
CYLINDER  2  1  5.0799  59.0750  0.0000
UNIT  17
COM='Axial Clad Sections       Tube  4  '
'Aluminum Inner
CYLINDER  3  1  2.9100  0.0005  0.0000
CYLINDER  2  1  2.911  0.0005  0.0000
'Clad Axial End Piece     1
CYLINDER  3  1  3.0994  0.0005  0.0000
CYLINDER  2  1  3.2233  0.0005  0.0000
'Clad Axial End Piece     2
CYLINDER  3  1  3.9218  0.0005  0.0000
CYLINDER  2  1  4.0457  0.0005  0.0000
'Clad Axial End Piece     3
CYLINDER  3  1  4.7442  0.0005  0.0000
CYLINDER  2  1  4.8681  0.0005  0.0000
'Aluminum Outer
CYLINDER  3  1  5.0700  0.0005  0.0000
CYLINDER  2  1  5.0799  0.0005  0.0000
UNIT  18
COM='Fuel Element      Tube  4'
CYLINDER  3  1  5.0800  59.0763  0.0000
HOLE  17  0.0000  0.0000  0.0000
HOLE  16  0.0000  0.0000  0.0006
HOLE  17  0.0000  0.0000  59.0757
UNIT  19
COM='Basket Fuel Tube - Fuel Down        Radial Shifted toward    300  Degrees'
CYLINDER  3  1  5.2578  73.0249  0.0000
HOLE  18  0.0889  -0.1539  0.0000
CYLINDER  6  1  5.57510  73.0249  0.0000
UNIT  20
COM='Basket Fuel Tube - Fuel Up        Radial Shifted toward    300  Degrees'
CYLINDER  3  1  5.2578  73.0249  0.0000
HOLE  18  0.0889  -0.1539  13.9484
CYLINDER  6  1  5.57510  73.0249  0.0000
UNIT  21
COM='Fueled Annular Sections       Tube  5  '
'Aluminum Inner
CYLINDER  3  1  2.9100  59.0750  0.0000
CYLINDER  2  1  2.911  59.0750  0.0000
'Fuel Annulus     1
CYLINDER  3  1  3.0994  59.0750  0.0000
CYLINDER  2  1  3.1094  59.0750  0.0000
CYLINDER  1  1  3.2133  59.0750  0.0000
CYLINDER  2  1  3.2233  59.0750  0.0000
'Fuel Annulus     2
CYLINDER  3  1  3.9218  59.0750  0.0000
CYLINDER  2  1  3.9318  59.0750  0.0000
CYLINDER  1  1  4.0357  59.0750  0.0000
CYLINDER  2  1  4.0457  59.0750  0.0000
'Fuel Annulus     3
CYLINDER  3  1  4.7442  59.0750  0.0000
CYLINDER  2  1  4.7542  59.0750  0.0000
CYLINDER  1  1  4.8581  59.0750  0.0000
CYLINDER  2  1  4.8681  59.0750  0.0000
'Aluminum Outer
CYLINDER  3  1  5.0700  59.0750  0.0000
CYLINDER  2  1  5.0799  59.0750  0.0000
UNIT  22
COM='Axial Clad Sections       Tube  5  '
'Aluminum Inner
```

```
CYLINDER  3  1  2.9100  0.0005  0.0000
CYLINDER  2  1  2.911  0.0005  0.0000
'Clad Axial End Piece    1
CYLINDER  3  1  3.0994  0.0005  0.0000
CYLINDER  2  1  3.2233  0.0005  0.0000
'Clad Axial End Piece    2
CYLINDER  3  1  3.9218  0.0005  0.0000
CYLINDER  2  1  4.0457  0.0005  0.0000
'Clad Axial End Piece    3
CYLINDER  3  1  4.7442  0.0005  0.0000
CYLINDER  2  1  4.8681  0.0005  0.0000
'Aluminum Outer
CYLINDER  3  1  5.0700  0.0005  0.0000
CYLINDER  2  1  5.0799  0.0005  0.0000
UNIT  23
COM='Fuel Element     Tube  5'
CYLINDER  3  1  5.0800  59.0763  0.0000
HOLE  22  0.0000  0.0000  0.0000
HOLE  21  0.0000  0.0000  0.0006
HOLE  22  0.0000  0.0000  59.0757
UNIT  24
COM='Basket Fuel Tube - Fuel Down       Radial Shifted toward    0  Degrees'
CYLINDER  3  1  5.2578  73.0249  0.0000
HOLE  23  0.1777  0.0000  0.0000
CYLINDER  6  1  5.57510  73.0249  0.0000
UNIT  25
COM='Basket Fuel Tube - Fuel Up       Radial Shifted toward    0  Degrees'
CYLINDER  3  1  5.2578  73.0249  0.0000
HOLE  23  0.1777  0.0000  13.9484
CYLINDER  6  1  5.57510  73.0249  0.0000
UNIT  26
COM='Fueled Annular Sections       Tube  6  '
'Aluminum Inner
CYLINDER  3  1  2.9100  59.0750  0.0000
CYLINDER  2  1  2.911  59.0750  0.0000
'Fuel Annulus    1
CYLINDER  3  1  3.0994  59.0750  0.0000
CYLINDER  2  1  3.1094  59.0750  0.0000
CYLINDER  1  1  3.2133  59.0750  0.0000
CYLINDER  2  1  3.2233  59.0750  0.0000
'Fuel Annulus    2
CYLINDER  3  1  3.9218  59.0750  0.0000
CYLINDER  2  1  3.9318  59.0750  0.0000
CYLINDER  1  1  4.0357  59.0750  0.0000
CYLINDER  2  1  4.0457  59.0750  0.0000
'Fuel Annulus    3
CYLINDER  3  1  4.7442  59.0750  0.0000
CYLINDER  2  1  4.7542  59.0750  0.0000
CYLINDER  1  1  4.8581  59.0750  0.0000
CYLINDER  2  1  4.8681  59.0750  0.0000
'Aluminum Outer
CYLINDER  3  1  5.0700  59.0750  0.0000
CYLINDER  2  1  5.0799  59.0750  0.0000
UNIT  27
COM='Axial Clad Sections       Tube  6  '
'Aluminum Inner
CYLINDER  3  1  2.9100  0.0005  0.0000
CYLINDER  2  1  2.911  0.0005  0.0000
'Clad Axial End Piece    1
CYLINDER  3  1  3.0994  0.0005  0.0000
CYLINDER  2  1  3.2233  0.0005  0.0000
'Clad Axial End Piece    2
CYLINDER  3  1  3.9218  0.0005  0.0000
CYLINDER  2  1  4.0457  0.0005  0.0000
'Clad Axial End Piece    3
CYLINDER  3  1  4.7442  0.0005  0.0000
CYLINDER  2  1  4.8681  0.0005  0.0000
'Aluminum Outer
CYLINDER  3  1  5.0700  0.0005  0.0000
CYLINDER  2  1  5.0799  0.0005  0.0000
UNIT  28
COM='Fuel Element     Tube  6'
CYLINDER  3  1  5.0800  59.0763  0.0000
HOLE  27  0.0000  0.0000  0.0000
HOLE  26  0.0000  0.0000  0.0006
HOLE  27  0.0000  0.0000  59.0757
UNIT  29
COM='Basket Fuel Tube - Fuel Down       Radial Shifted toward    60  Degrees'
CYLINDER  3  1  5.2578  73.0249  0.0000
HOLE  28  0.0889  0.1539  0.0000
CYLINDER  6  1  5.57510  73.0249  0.0000
UNIT  30
COM='Basket Fuel Tube - Fuel Up       Radial Shifted toward    60  Degrees'
CYLINDER  3  1  5.2578  73.0249  0.0000
HOLE  28  0.0889  0.1539  13.9484
CYLINDER  6  1  5.57510  73.0249  0.0000
UNIT  31
COM='Fueled Annular Sections       Tube  7  '
'Aluminum Inner
CYLINDER  3  1  2.9100  59.0750  0.0000
CYLINDER  2  1  2.911  59.0750  0.0000
'Fuel Annulus    1
CYLINDER  3  1  3.0994  59.0750  0.0000
CYLINDER  2  1  3.1094  59.0750  0.0000
CYLINDER  1  1  3.2133  59.0750  0.0000
CYLINDER  2  1  3.2233  59.0750  0.0000
```

```
'Fuel Annulus    2
CYLINDER  3  1  3.9218  59.0750  0.0000
CYLINDER  2  1  3.9318  59.0750  0.0000
CYLINDER  1  1  4.0357  59.0750  0.0000
CYLINDER  2  1  4.0457  59.0750  0.0000
'Fuel Annulus    3
CYLINDER  3  1  4.7442  59.0750  0.0000
CYLINDER  2  1  4.7542  59.0750  0.0000
CYLINDER  1  1  4.8581  59.0750  0.0000
CYLINDER  2  1  4.8681  59.0750  0.0000
'Aluminum Outer
CYLINDER  3  1  5.0700  59.0750  0.0000
CYLINDER  2  1  5.0799  59.0750  0.0000
UNIT  32
COM='Axial Clad Sections      Tube  7  '
'Aluminum Inner
CYLINDER  3  1  2.9100  0.0005  0.0000
CYLINDER  2  1  2.911  0.0005  0.0000
'Clad Axial End Piece    1
CYLINDER  3  1  3.0994  0.0005  0.0000
CYLINDER  2  1  3.2233  0.0005  0.0000
'Clad Axial End Piece    2
CYLINDER  3  1  3.9218  0.0005  0.0000
CYLINDER  2  1  4.0457  0.0005  0.0000
'Clad Axial End Piece    3
CYLINDER  3  1  4.7442  0.0005  0.0000
CYLINDER  2  1  4.8681  0.0005  0.0000
'Aluminum Outer
CYLINDER  3  1  5.0700  0.0005  0.0000
CYLINDER  2  1  5.0799  0.0005  0.0000
UNIT  33
COM='Fuel Element     Tube  7'
CYLINDER  3  1  5.0800  59.0763  0.0000
HOLE  32  0.0000  0.0000  0.0000
HOLE  31  0.0000  0.0000  0.0006
HOLE  32  0.0000  0.0000  59.0757
UNIT  34
COM='Basket Fuel Tube - Fuel Down       Radial Shifted toward    120  Degrees'
CYLINDER  3  1  5.2578  73.0249  0.0000
HOLE  33  -0.0889  0.1539  0.0000
CYLINDER  6  1  5.57510  73.0249  0.0000
UNIT  35
COM='Basket Fuel Tube - Fuel Up       Radial Shifted toward    120  Degrees'
CYLINDER  3  1  5.2578  73.0249  0.0000
HOLE  33  -0.0889  0.1539  13.9484
CYLINDER  6  1  5.57510  73.0249  0.0000
UNIT  36
COM='Basket Bottom Plate Hole '
CYLINDER  3  1  1.27  1.2190  0.0000
UNIT  37
COM='Basket Bottom Plate '
CYLINDER  6  1  16.8466  1.2190  0.0000
HOLE  36  0.0000  0.0000  0.0000
HOLE  36  11.1506  0.0000  0.0000
HOLE  36  5.5753  9.6567  0.0000
HOLE  36  -5.5753  9.6567  0.0000
HOLE  36  -11.1506  0.0000  0.0000
HOLE  36  -5.5753  -9.6567  0.0000
HOLE  36  5.5753  -9.6567  0.0000
UNIT  38
COM='Basket Fuel Down'
CYLINDER  3  1  16.7260  73.0249  0.0000
HOLE  4  0.0000  0.0000  0.0000
HOLE  9  11.1506  0.0000  0.0000
HOLE  14  5.5753  9.6567  0.0000
HOLE  19  -5.5753  9.6567  0.0000
HOLE  24  -11.1506  0.0000  0.0000
HOLE  29  -5.5753  -9.6567  0.0000
HOLE  34  5.5753  -9.6567  0.0000
CYLINDER  3  1  16.8466  73.0249  0.0000
UNIT  39
COM='Basket Fuel Up'
CYLINDER  3  1  16.7260  73.0249  0.0000
HOLE  5  0.0000  0.0000  0.0000
HOLE  10  11.1506  0.0000  0.0000
HOLE  15  5.5753  9.6567  0.0000
HOLE  20  -5.5753  9.6567  0.0000
HOLE  25  -11.1506  0.0000  0.0000
HOLE  30  -5.5753  -9.6567  0.0000
HOLE  35  5.5753  -9.6567  0.0000
CYLINDER  3  1  16.8466  73.0249  0.0000
UNIT  40
COM='Cask Cavity '
CYLINDER  3  1  16.9863  445.4652  0.0000
HOLE  37  0.0000  0.0000  0.0001
HOLE  39  0.0000  0.0000  1.2192
HOLE  37  0.0000  0.0000  74.2443
HOLE  38  0.0000  0.0000  75.4634
HOLE  37  0.0000  0.0000  148.4885
HOLE  39  0.0000  0.0000  149.7076
HOLE  37  0.0000  0.0000  222.7327
HOLE  38  0.0000  0.0000  223.9518
HOLE  37  0.0000  0.0000  296.9769
HOLE  39  0.0000  0.0000  298.1960
HOLE  37  0.0000  0.0000  371.2211
HOLE  38  0.0000  0.0000  372.4402
```

```
 UNIT  41
 COM='Cask Shield Radial Configuration '
 CYLINDER  3  1  16.9863  445.4652  0.0000
 HOLE  40  0.0000  0.0000  0.0000
 CYLINDER  8  1  18.9102  445.4652  0.0000
 CYLINDER  5  1  33.4645  445.4652  0.0000
 CYLINDER  8  1  36.5189  445.4652  0.0000
 CYLINDER  9  1  49.2169  445.4652  0.0000
 CYLINDER  8  1  49.8183  445.4652  0.0000
 CUBOID  9  1  4P49.8183  445.4652  0.0000
 UNIT  42
 COM='LWT Lid '
 CYLINDER  8  1  36.5189  28.5750  0.5994
 CYLINDER  9  1  49.8183  28.5750  0.5994
 CYLINDER  8  1  49.8183  28.5750  0.0000
 CUBOID  9  1  4P49.8183  28.5750  0.0000
 UNIT  43
 COM='LWT Bottom Weldment '
 CYLINDER  5  1  26.3525  16.5100  8.8900
 CYLINDER  8  1  36.5189  26.0706  0.0000
 CYLINDER  9  1  49.8183  26.0706  0.0000
 CYLINDER  8  1  49.8183  26.6700  0.0000
 CUBOID  9  1  4P49.8183  26.6700  0.0000
 GLOBAL UNIT  44
 COM='LWT Cask '
 ARRAY  1  -49.8183  -49.8183  0.0000
 END GEOM
 READ ARRAY
 ARA=1  NUX=1  NUY=1  NUZ=3  FILL  43 41 42  END FILL
 END ARRAY
 READ BOUNDS    ALL=MIRROR    END BOUNDS
 END DATA


**** PROBLEM PARAMETERS ****

LIB 27GROUPNDF4  LIBRARY
MXX            9 MIXTURES
MSC           11 COMPOSITION SPECIFICATIONS
IZM            3 MATERIAL ZONES
GE  LATTICECELL  GEOMETRY
MORE           0 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
MSLN           0 FUEL SOLUTIONS

**** PROBLEM COMPOSITION DESCRIPTION ****

SC  URANIUM      STANDARD COMPOSITION
MX             1 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      0.4084 SPECIFIED DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           92000       1.00 ATOM/MOLECULE
                             92235     85.000 WT%
                             92238     15.000 WT%
END

SC  AL           STANDARD COMPOSITION
MX             1 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      0.2957 SPECIFIED DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           13027       1.00 ATOM/MOLECULE
END

SC  AL           STANDARD COMPOSITION
MX             2 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      2.7020 THEORETICAL DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           13027       1.00 ATOM/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX             3 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      0.9998 SPECIFIED DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
            1001       2.00 ATOMS/MOLECULE
            8016       1.00 ATOM/MOLECULE
END

SC  ARBMGLC      STANDARD COMPOSITION
MX             4 MIXTURE NO.
VF        0.5640 VOLUME FRACTION
ROTH      0.9437 SPECIFIED DENSITY
NEL            3 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
            6012       1.00 ATOMS/MOLECULE
```

```
            1001      6.00 ATOMS/MOLECULE
            8016      2.00 ATOMS/MOLECULE
END

SC  H2O          STANDARD COMPOSITION
MX             4 MIXTURE NO.
VF        0.4160 VOLUME FRACTION
ROTH      0.9982 THEORETICAL DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
            1001      2.00 ATOMS/MOLECULE
            8016      1.00 ATOM/MOLECULE
END

SC  PB           STANDARD COMPOSITION
MX             5 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH     11.3440 THEORETICAL DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           82000      1.00 ATOM/MOLECULE
END

SC  SS304        STANDARD COMPOSITION
MX             6 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      7.9200 THEORETICAL DENSITY
NEL            4 NO. ELEMENTS
ICP            0 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           24304    19.000 WT%
           25055     2.000 WT%
           26304    69.500 WT%
           28304     9.500 WT%
END

SC  AL           STANDARD COMPOSITION
MX             7 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      2.7020 THEORETICAL DENSITY
NEL            1 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           13027      1.00 ATOM/MOLECULE
END

SC  SS304        STANDARD COMPOSITION
MX             8 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      7.9200 THEORETICAL DENSITY
NEL            4 NO. ELEMENTS
ICP            0 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
           24304    19.000 WT%
           25055     2.000 WT%
           26304    69.500 WT%
           28304     9.500 WT%
END

SC  H2O          STANDARD COMPOSITION
MX             9 MIXTURE NO.
VF        1.0000 VOLUME FRACTION
ROTH      0.0001 SPECIFIED DENSITY
NEL            2 NO. ELEMENTS
ICP            1 0/1 MIXTURE/COMPOUND
TEMP       293.0 DEG KELVIN
            1001      2.00 ATOMS/MOLECULE
            8016      1.00 ATOM/MOLECULE
END

**** PROBLEM GEOMETRY ****

CTP SYMMSLABCELL CELL TYPE
PITCH     0.6342 CM CENTER TO CENTER SPACING
FUELOD    0.1039 CM FUEL DIAMETER OR SLAB THICKNESS
MFUEL          1 MIXTURE NO. OF FUEL
MMOD           3 MIXTURE NO. OF MODERATOR
CLADOD    0.1239 CM CLAD OUTER DIAMETER
MCLAD          2 MIXTURE NO. OF CLAD

ZONE SPECIFICATIONS FOR LATTICECELL GEOMETRY

               ZONE  1 IS FUEL
               ZONE  2 IS CLAD
               ZONE  3 IS MOD
```

```
*******************************************************************************************************************
        ***
***
        ***                    LWT W/ HIFAR MARK III FUEL, ACCIDENT, RADIAL - IN, AXIAL - ALTERNATING
***
        ***
***
*******************************************************************************************************************
*******************************************************************************************************************
        ***
***
        ***                    ********** DATA LIBRARY INFORMATION **********
***
        ***
***
        ***     UNIT                                           VOLUME
***
        ***    NUMBER             DATA SET NAME                 NAME        UNIT FUNCTION
***
        ***    ------             -------------                 ----        -------------
***
        ***
***
        ***      89     M:\scale43\DATALIB\FT89F001                         STANDARD COMPOSITION LIBRARY
***
        ***
***
        ***      82     M:\scale43\DATALIB\FT82F001                         CROSS SECTION LIBRARY
***
        ***
***
        ***      11     K:\HJP\LWT\ANSTO\Crit\HIFAR Mark III_v1.1\Ac        SHORT CROSS SECTION LIBRARY
***
        ***
***
        ***      90     K:\HJP\LWT\ANSTO\Crit\HIFAR Mark III_v1.1\Ac        INPUT DATA DIRECT ACCESS
***
        ***
***
*******************************************************************************************************************
*******************************************************************************************************************
        ***
***
        ***
***
        ***                           STANDARD COMPOSITION LIBRARY DATA
***
        ***                           ---------------------------------
***
        ***
***
        ***       UNIT NUMBER   :  89
***
        ***
***
        ***       DATASET NAME  :  M:\scale43\DATALIB\FT89F001
***
        ***
***
        ***       LIBRARY TITLE:  SCALE-4 STANDARD COMPOSITION LIBRARY
***
        ***                       637 STANDARD COMPOSITIONS, 490 NUCLIDES
***
        ***                       90 ELEMENTS WITH VARIABLE ISOTOPIC DISTRBUTIONS.
***
        ***
***
        ***       CREATION DATE:   6/30/95
***
        ***
***
        ***
***
        ***
***
        ***                              CROSS SECTION LIBRARY DATA
***
        ***                             --------------------------
***
        ***
***
        ***       UNIT NUMBER   :  82
***
        ***
***
        ***       DATASET NAME  :  M:\scale43\DATALIB\FT82F001
***
        ***
***
        ***       LIBRARY TITLE:  SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
***
```

```
      ***                          BASED ON ENDF-B VERSION 4 DATA
***
      ***                            COMPILED FOR NRC     1/27/89
***
      ***                              LAST UPDATED                                          08/12/94
***
      ***                                L.M.PETRIE   -   ORNL
***
      ***
***
      ***
***
      ***
***
      ***
***
*********************************************************************************************************
*********************************************************************************************************
```

M I X I N G   T A B L E

ENTRY	MIXTURE	ISOTOPE	NUMBER DENSITY	NEW IDENTIFIER
1	1	92235	8.89418E-04	1092235
2	1	92238	1.54974E-04	1092238
3	1	13027	6.59980E-03	1013027
4	2	13027	6.03066E-02	2013027
5	7	13027	6.03066E-02	7013027
6	3	1001	6.68762E-02	3001001
7	4	1001	5.98801E-02	4001001
8	9	1001	6.68896E-06	9001001
9	3	8016	3.34381E-02	3008016
10	4	8016	2.45894E-02	4008016
11	9	8016	3.34448E-06	9008016
12	4	6012	1.07014E-02	4006012
13	5	82000	3.29690E-02	5082000
14	6	24304	1.74286E-02	6024304
15	8	24304	1.74286E-02	8024304
16	6	25055	1.73633E-03	6025055
17	8	25055	1.73633E-03	8025055
18	6	26304	5.93579E-02	6026304
19	8	26304	5.93579E-02	8026304
20	6	28304	7.72070E-03	6028304
21	8	28304	7.72070E-03	8028304

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 3.89437E-03

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED WITH A FLAT DISTRIBUTION IN A CUBOID DEFINED BY:
+X= 1.68500E+01 -X=-1.68500E+01 +Y=-1.68500E+01 -Y= 1.68500E+01 +Z= 4.72140E+02 -Z=
2.66700E+01
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

0.72350 MINUTES WERE REQUIRED FOR STARTING.   TOTAL ELAPSED TIME IS 0.90000 MINUTES.

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	791 INDEPENDENT FISSION POINTS WERE GENERATED			
1	7.09889E-01	8.01833E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	791 INDEPENDENT FISSION POINTS WERE GENERATED			
2	7.07974E-01	8.05500E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	818 INDEPENDENT FISSION POINTS WERE GENERATED			
3	7.28123E-01	8.09167E-01	7.28123E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	6.99889E-01	8.12833E-01	7.14006E-01	1.41169E-02	0.00000E+00	0.00000E+00
5	7.45916E-01	8.16500E-01	7.24642E-01	1.34002E-02	0.00000E+00	0.00000E+00
6	7.24359E-01	8.20167E-01	7.24572E-01	9.47566E-03	0.00000E+00	0.00000E+00
7	7.18195E-01	8.23833E-01	7.23296E-01	7.44978E-03	0.00000E+00	0.00000E+00
8	7.14250E-01	8.27500E-01	7.21789E-01	6.26678E-03	0.00000E+00	0.00000E+00
9	7.20630E-01	8.31167E-01	7.21623E-01	5.29899E-03	0.00000E+00	0.00000E+00
10	7.14943E-01	8.34833E-01	7.20788E-01	4.66441E-03	0.00000E+00	0.00000E+00
11	7.40037E-01	8.38500E-01	7.22927E-01	4.63641E-03	0.00000E+00	0.00000E+00
12	7.51910E-01	8.42167E-01	7.25825E-01	5.05936E-03	0.00000E+00	0.00000E+00
13	7.06498E-01	8.45833E-01	7.24068E-01	4.90206E-03	0.00000E+00	0.00000E+00
14	7.52900E-01	8.49500E-01	7.26471E-01	5.07915E-03	0.00000E+00	0.00000E+00
15	6.88658E-01	8.53167E-01	7.23562E-01	5.50359E-03	0.00000E+00	0.00000E+00
16	7.37354E-01	8.56833E-01	7.24547E-01	5.18969E-03	0.00000E+00	0.00000E+00
17	7.21124E-01	8.60500E-01	7.24319E-01	4.83673E-03	0.00000E+00	0.00000E+00
18	7.52855E-01	8.63167E-01	7.26102E-01	4.86318E-03	0.00000E+00	0.00000E+00
19	7.21886E-01	8.66833E-01	7.25854E-01	4.57489E-03	0.00000E+00	0.00000E+00
20	7.15449E-01	8.70500E-01	7.25276E-01	4.35182E-03	0.00000E+00	0.00000E+00
21	7.45817E-01	8.74167E-01	7.26357E-01	4.25600E-03	0.00000E+00	0.00000E+00
22	6.99200E-01	8.77833E-01	7.25000E-01	4.25981E-03	0.00000E+00	0.00000E+00
23	7.23050E-01	8.81500E-01	7.24907E-01	4.05295E-03	0.00000E+00	0.00000E+00
24	7.03529E-01	8.85167E-01	7.23935E-01	3.98463E-03	0.00000E+00	0.00000E+00
25	7.51812E-01	8.88833E-01	7.25147E-01	3.99570E-03	0.00000E+00	0.00000E+00
26	6.72410E-01	8.92500E-01	7.22950E-01	4.41175E-03	0.00000E+00	0.00000E+00
27	7.41152E-01	8.96167E-01	7.23678E-01	4.29379E-03	0.00000E+00	0.00000E+00
28	6.84907E-01	8.99833E-01	7.22187E-01	4.38657E-03	0.00000E+00	0.00000E+00
29	7.62803E-01	9.03500E-01	7.23691E-01	4.48103E-03	0.00000E+00	0.00000E+00
30	7.34032E-01	9.07167E-01	7.24060E-01	4.33379E-03	0.00000E+00	0.00000E+00
31	7.44923E-01	9.10833E-01	7.24780E-01	4.24311E-03	0.00000E+00	0.00000E+00
32	7.49358E-01	9.13500E-01	7.25599E-01	4.18031E-03	0.00000E+00	0.00000E+00
33	7.39990E-01	9.17167E-01	7.26063E-01	4.06978E-03	0.00000E+00	0.00000E+00
34	7.15728E-01	9.20833E-01	7.25740E-01	3.95376E-03	0.00000E+00	0.00000E+00
35	7.13413E-01	9.25500E-01	7.25367E-01	3.85024E-03	0.00000E+00	0.00000E+00
36	7.58703E-01	9.28167E-01	7.26347E-01	3.86182E-03	0.00000E+00	0.00000E+00
37	7.34892E-01	9.31833E-01	7.26591E-01	3.75780E-03	0.00000E+00	0.00000E+00
38	7.94697E-01	9.35500E-01	7.28483E-01	4.11285E-03	0.00000E+00	0.00000E+00
39	7.23480E-01	9.39167E-01	7.28348E-01	4.00243E-03	0.00000E+00	0.00000E+00
40	7.30759E-01	9.42833E-01	7.28411E-01	3.89620E-03	0.00000E+00	0.00000E+00
41	7.34901E-01	9.46500E-01	7.28578E-01	3.79863E-03	0.00000E+00	0.00000E+00
42	7.39935E-01	9.49167E-01	7.28862E-01	3.71331E-03	0.00000E+00	0.00000E+00
43	7.48304E-01	9.52833E-01	7.29336E-01	3.65253E-03	0.00000E+00	0.00000E+00
44	7.17041E-01	9.56500E-01	7.29043E-01	3.57650E-03	0.00000E+00	0.00000E+00
45	7.17662E-01	9.60167E-01	7.28778E-01	3.50235E-03	0.00000E+00	0.00000E+00
46	7.25939E-01	9.63833E-01	7.28714E-01	3.42244E-03	0.00000E+00	0.00000E+00
47	7.47779E-01	9.68500E-01	7.29138E-01	3.37224E-03	0.00000E+00	0.00000E+00
48	7.16671E-01	9.71167E-01	7.28867E-01	3.30923E-03	0.00000E+00	0.00000E+00
49	7.05373E-01	9.74833E-01	7.28367E-01	3.27641E-03	0.00000E+00	0.00000E+00
50	6.93529E-01	9.78500E-01	7.27641E-01	3.28852E-03	0.00000E+00	0.00000E+00
51	7.34499E-01	9.82167E-01	7.27781E-01	3.22375E-03	0.00000E+00	0.00000E+00
52	7.09665E-01	9.85833E-01	7.27419E-01	3.17932E-03	0.00000E+00	0.00000E+00
53	7.51152E-01	9.89500E-01	7.27884E-01	3.15091E-03	0.00000E+00	0.00000E+00
54	7.31311E-01	9.93167E-01	7.27950E-01	3.09043E-03	0.00000E+00	0.00000E+00
55	7.07805E-01	9.96833E-01	7.27570E-01	3.05529E-03	0.00000E+00	0.00000E+00

.
.
.
.
.

1185	7.39458E-01	5.71767E+00	7.26398E-01	6.71494E-04	0.00000E+00	0.00000E+00
1186	7.76993E-01	5.72233E+00	7.26441E-01	6.72286E-04	0.00000E+00	0.00000E+00
1187	7.42277E-01	5.72683E+00	7.26455E-01	6.71852E-04	0.00000E+00	0.00000E+00
1188	7.23662E-01	5.73233E+00	7.26452E-01	6.71289E-04	0.00000E+00	0.00000E+00
1189	6.93317E-01	5.73600E+00	7.26424E-01	6.71304E-04	0.00000E+00	0.00000E+00
1190	7.45434E-01	5.73967E+00	7.26440E-01	6.70929E-04	0.00000E+00	0.00000E+00
1191	7.33420E-01	5.74600E+00	7.26446E-01	6.70391E-04	0.00000E+00	0.00000E+00
1192	7.00802E-01	5.75067E+00	7.26425E-01	6.70174E-04	0.00000E+00	0.00000E+00
1193	7.01500E-01	5.75800E+00	7.26404E-01	6.69938E-04	0.00000E+00	0.00000E+00
1194	7.14325E-01	5.76167E+00	7.26394E-01	6.69452E-04	0.00000E+00	0.00000E+00
1195	7.37661E-01	5.76617E+00	7.26403E-01	6.68957E-04	0.00000E+00	0.00000E+00
1196	7.54176E-01	5.77167E+00	7.26426E-01	6.68802E-04	0.00000E+00	0.00000E+00
1197	7.13691E-01	5.77533E+00	7.26416E-01	6.68327E-04	0.00000E+00	0.00000E+00
1198	7.17434E-01	5.78000E+00	7.26408E-01	6.67810E-04	0.00000E+00	0.00000E+00
1199	7.49003E-01	5.78633E+00	7.26427E-01	6.67519E-04	0.00000E+00	0.00000E+00
1200	7.16163E-01	5.79000E+00	7.26418E-01	6.67016E-04	0.00000E+00	0.00000E+00
1201	7.40547E-01	5.79467E+00	7.26430E-01	6.66564E-04	0.00000E+00	0.00000E+00
1202	6.80678E-01	5.80017E+00	7.26392E-01	6.67099E-04	0.00000E+00	0.00000E+00
1203	7.42750E-01	5.80550E+00	7.26406E-01	6.66682E-04	0.00000E+00	0.00000E+00

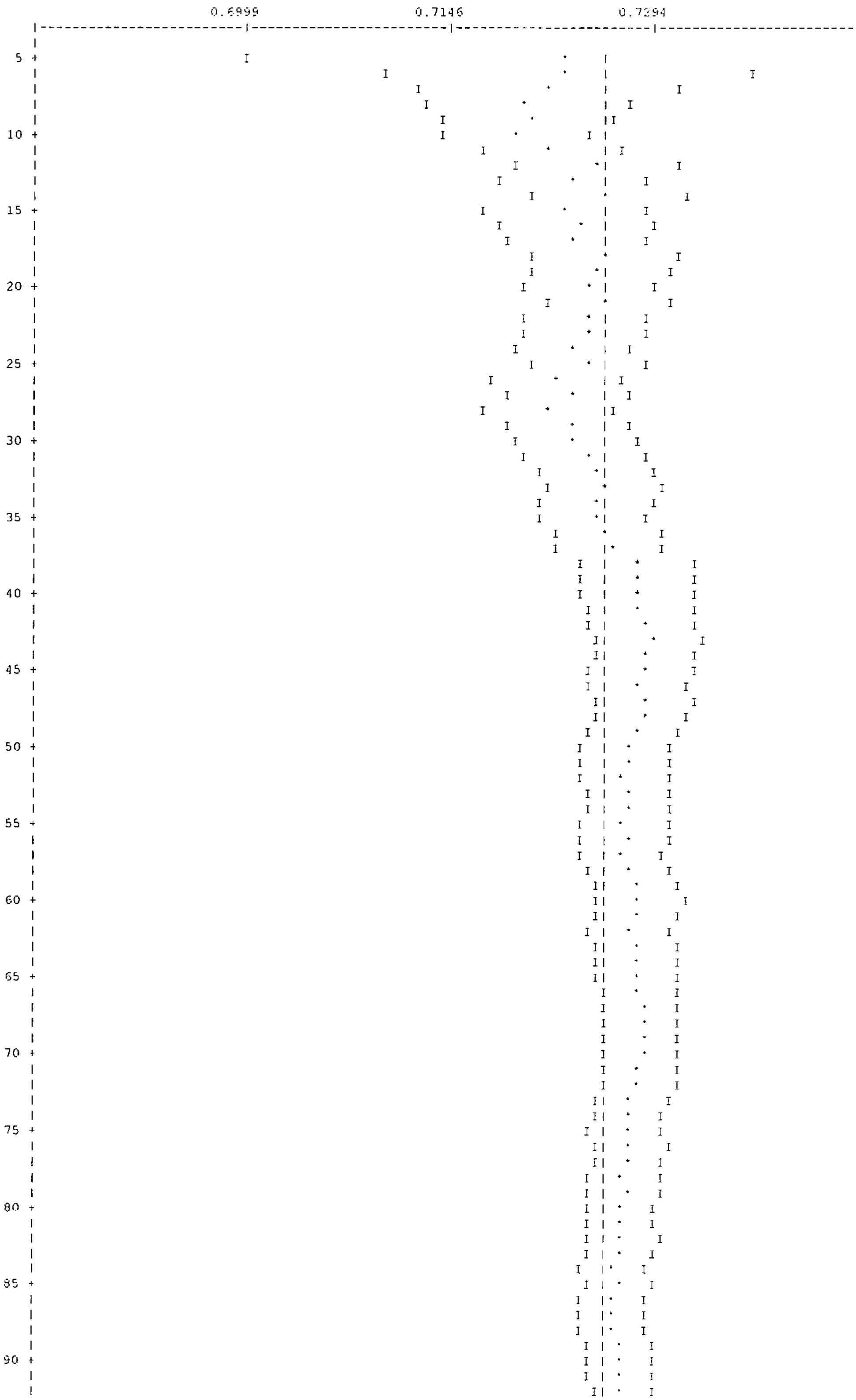
KENO MESSAGE NUMBER K5-123 EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

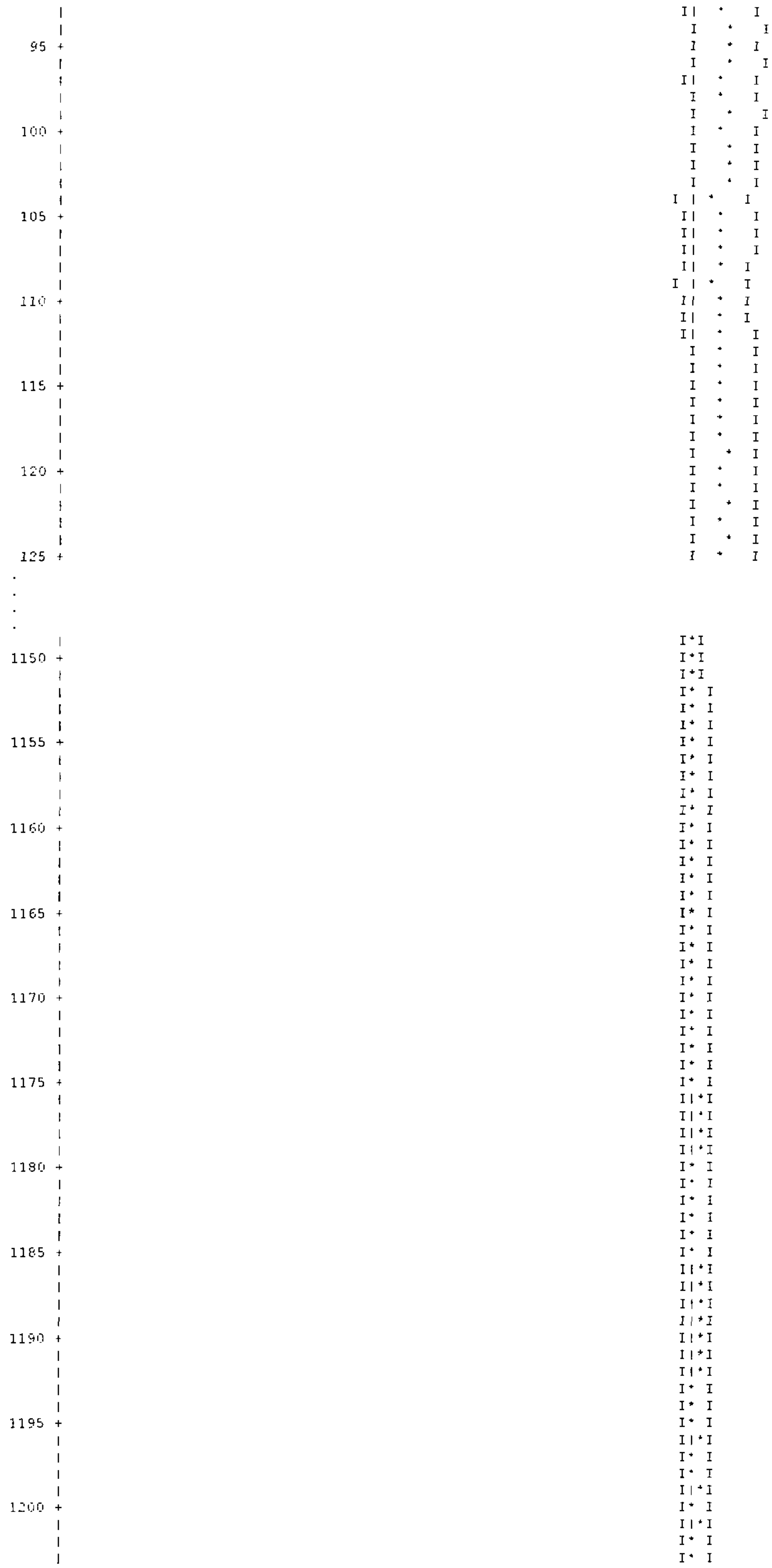
```
LIFETIME =  1.12919E-04 + OR -  1.14508E-07          GENERATION TIME =  8.97425E-05 + OR -  1.08694E-07
NU BAR   =  2.41917E+00 + OR -  7.72772E-06     AVERAGE FISSION GROUP =  2.45962E+01 + OR -  2.74778E-03
                 ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION =  3.03848E-02 + OR -  7.72864E-05
```

NO. OF INITIAL GENERATIONS OF SKIPPED HISTORIES	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER
3	0.72640	+ OR - 0.00067	0.72574 TO 0.72707	0.72507 TO 0.72774	0.72440 TO 0.72841	1200000
4	0.72643	+ OR - 0.00067	0.72576 TO 0.72709	0.72509 TO 0.72776	0.72442 TO 0.72843	1199000
5	0.72641	+ OR - 0.00067	0.72574 TO 0.72708	0.72507 TO 0.72775	0.72441 TO 0.72841	1198000
6	0.72641	+ OR - 0.00067	0.72574 TO 0.72708	0.72508 TO 0.72775	0.72441 TO 0.72842	1197000
7	0.72642	+ OR - 0.00067	0.72575 TO 0.72709	0.72508 TO 0.72776	0.72441 TO 0.72843	1196000
8	0.72643	+ OR - 0.00067	0.72576 TO 0.72710	0.72509 TO 0.72777	0.72442 TO 0.72844	1195000
9	0.72643	+ OR - 0.00067	0.72576 TO 0.72710	0.72509 TO 0.72777	0.72442 TO 0.72844	1194000
10	0.72644	+ OR - 0.00067	0.72577 TO 0.72711	0.72510 TO 0.72778	0.72443 TO 0.72845	1193000
11	0.72643	+ OR - 0.00067	0.72576 TO 0.72710	0.72509 TO 0.72777	0.72442 TO 0.72844	1192000
12	0.72641	+ OR - 0.00067	0.72574 TO 0.72708	0.72507 TO 0.72775	0.72440 TO 0.72842	1191000
17	0.72643	+ OR - 0.00067	0.72576 TO 0.72710	0.72509 TO 0.72778	0.72441 TO 0.72845	1186000
22	0.72643	+ OR - 0.00067	0.72576 TO 0.72710	0.72508 TO 0.72778	0.72441 TO 0.72845	1181000
27	0.72646	+ OR - 0.00067	0.72579 TO 0.72714	0.72511 TO 0.72781	0.72444 TO 0.72849	1176000
32	0.72643	+ OR - 0.00068	0.72575 TO 0.72710	0.72508 TO 0.72778	0.72440 TO 0.72845	1171000
37	0.72640	+ OR - 0.00068	0.72572 TO 0.72708	0.72504 TO 0.72776	0.72437 TO 0.72843	1166000
42	0.72632	+ OR - 0.00068	0.72564 TO 0.72700	0.72497 TO 0.72768	0.72429 TO 0.72835	1161000
47	0.72630	+ OR - 0.00068	0.72562 TO 0.72698	0.72494 TO 0.72766	0.72426 TO 0.72834	1156000
52	0.72636	+ OR - 0.00068	0.72568 TO 0.72704	0.72500 TO 0.72773	0.72432 TO 0.72841	1151000
57	0.72637	+ OR - 0.00068	0.72569 TO 0.72705	0.72500 TO 0.72774	0.72432 TO 0.72842	1146000
. . . .						
1127	0.72607	+ OR - 0.00255	0.72352 TO 0.72862	0.72097 TO 0.73117	0.71842 TO 0.73372	76000
1132	0.72554	+ OR - 0.00252	0.72302 TO 0.72807	0.72050 TO 0.73059	0.71798 TO 0.73311	71000
1137	0.72634	+ OR - 0.00267	0.72368 TO 0.72901	0.72101 TO 0.73168	0.71834 TO 0.73434	66000
1142	0.72825	+ OR - 0.00270	0.72556 TO 0.73095	0.72286 TO 0.73364	0.72017 TO 0.73634	61000
1147	0.72781	+ OR - 0.00288	0.72493 TO 0.73069	0.72205 TO 0.73356	0.71917 TO 0.73644	56000
1152	0.72812	+ OR - 0.00281	0.72531 TO 0.73093	0.72250 TO 0.73374	0.71969 TO 0.73656	51000
1157	0.72726	+ OR - 0.00306	0.72420 TO 0.73033	0.72114 TO 0.73339	0.71807 TO 0.73645	46000
1162	0.72760	+ OR - 0.00327	0.72433 TO 0.73087	0.72106 TO 0.73415	0.71778 TO 0.73742	41000
1167	0.72818	+ OR - 0.00344	0.72473 TO 0.73162	0.72129 TO 0.73506	0.71784 TO 0.73851	36000
1172	0.72670	+ OR - 0.00377	0.72293 TO 0.73047	0.71917 TO 0.73423	0.71540 TO 0.73800	31000

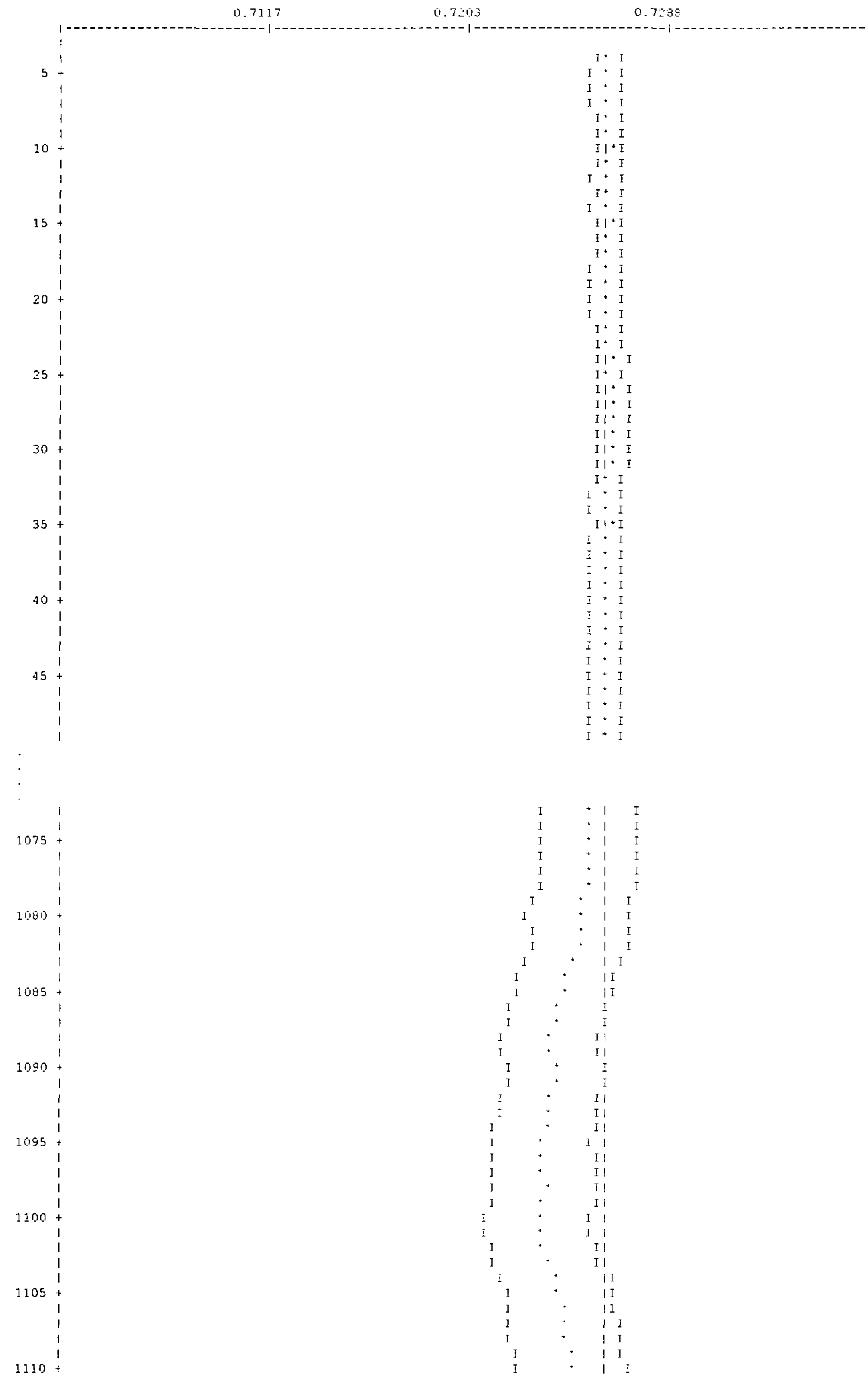
NO. OF INITIAL GENERATIONS OF SKIPPED HISTORIES	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER
1177	0.72557	+ OR - 0.00416	0.72142 TO 0.72973	0.71726 TO 0.73389	0.71310 TO 0.73805	26000
1182	0.72724	+ OR - 0.00502	0.72222 TO 0.73227	0.71719 TO 0.73729	0.71217 TO 0.74232	21000
1187	0.72279	+ OR - 0.00542	0.71737 TO 0.72820	0.71195 TO 0.73362	0.70654 TO 0.73903	16000
1192	0.72436	+ OR - 0.00676	0.71759 TO 0.73112	0.71083 TO 0.73789	0.70406 TO 0.74465	11000
1197	0.72443	+ OR - 0.01038	0.71405 TO 0.73481	0.70367 TO 0.74518	0.69330 TO 0.75556	6000

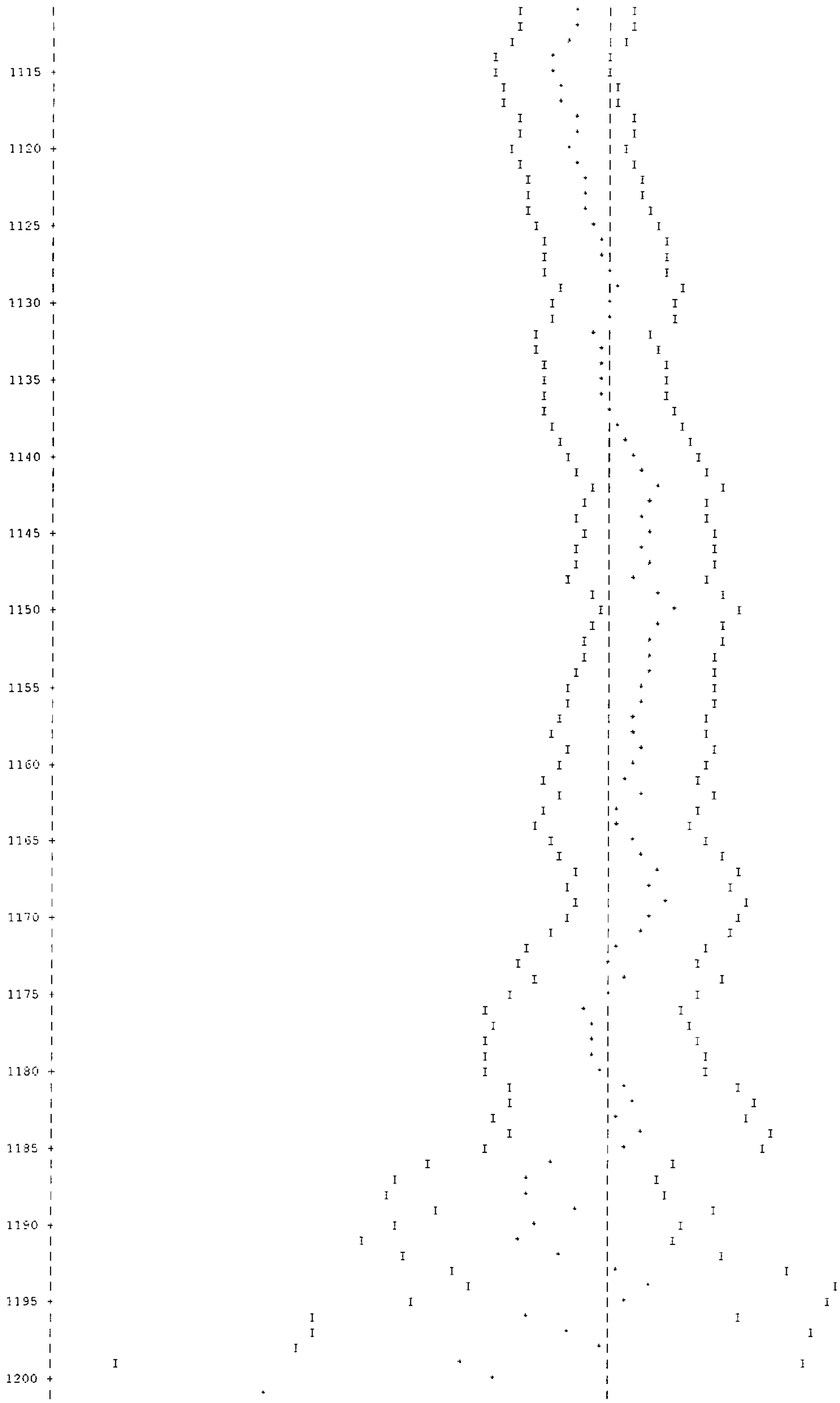
PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.7264 + OR - 0.0007 WHICH OCCURS FOR 1203 GENERATIONS RUN.




95
100
105
110
115
120
125
1150
1155
1160
1165
1170
1175
1180
1185
1190
1195
1200

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION SKIPPED.
THE LINE REPRESENTS K-EFF = 0.7264 + OR - 0.0007 WHICH OCCURS FOR 3 GENERATIONS SKIPPED.




1115
1120
1125
1130
1135
1140
1145
1150
1155
1160
1165
1170
1175
1180
1185
1190
1195
1200

```
                        FREQUENCY FOR GENERATIONS    4 TO 1203
0.6386 TO 0.6415    *
0.6415 TO 0.6444
0.6444 TO 0.6472
0.6472 TO 0.6501
0.6501 TO 0.6530    *
0.6530 TO 0.6558    **
0.6559 TO 0.6587    **
0.6587 TO 0.6616
0.6616 TO 0.6644    *
0.6644 TO 0.6673    ***
0.6673 TO 0.6702    ****
0.6702 TO 0.6730    ***
0.6730 TO 0.6759    *
0.6759 TO 0.6788    ******
0.6788 TO 0.6816    *********
0.6816 TO 0.6845    *****
0.6845 TO 0.6874    *********
0.6874 TO 0.6902    **********
0.6902 TO 0.6931    ***************
0.6931 TO 0.6960    **************************
0.6960 TO 0.6988    ******************************
0.6988 TO 0.7017    *************************************
0.7017 TO 0.7045    *********************************************
0.7045 TO 0.7074    **********************************************
0.7074 TO 0.7103    *************************************
0.7103 TO 0.7131    ***********************************************
0.7131 TO 0.7160    ***********************************************************
0.7160 TO 0.7189    **********************************************************
0.7189 TO 0.7217    **********************************************
0.7217 TO 0.7246    *************************************************************
0.7246 TO 0.7275    ****************************************************************
0.7275 TO 0.7303    *****************************************************
0.7303 TO 0.7332    **********************************************
0.7332 TO 0.7361    *********************************************************************
0.7361 TO 0.7389    ******************************************************
0.7389 TO 0.7418    ******************************************
0.7418 TO 0.7447    ***************************************************
0.7447 TO 0.7475    *********************************************
0.7475 TO 0.7504    **************************************
0.7504 TO 0.7533    *****************************************
0.7533 TO 0.7561    ************************
0.7561 TO 0.7590    *******************
0.7590 TO 0.7619    ****************
0.7619 TO 0.7647    ************
0.7647 TO 0.7676    ***************
0.7676 TO 0.7705    ********
0.7705 TO 0.7733    *******
0.7733 TO 0.7762    *********
0.7762 TO 0.7791    **********
0.7791 TO 0.7819    ****
0.7819 TO 0.7848    *
0.7848 TO 0.7877    ***
0.7877 TO 0.7905    ***
0.7905 TO 0.7934    *
0.7934 TO 0.7963    *
```

```
                                FREQUENCY FOR GENERATIONS  304 TO 1203
0.6386 TO 0.6415     *
0.6415 TO 0.6444
0.6444 TO 0.6472
0.6472 TO 0.6501
0.6501 TO 0.6530
0.6530 TO 0.6558     **
0.6558 TO 0.6587     **
0.6587 TO 0.6616
0.6616 TO 0.6644     *
0.6644 TO 0.6673     **
0.6673 TO 0.6702     ***
0.6702 TO 0.6730     **
0.6730 TO 0.6759     *
0.6759 TO 0.6788     *****
0.6788 TO 0.6816     ********
0.6816 TO 0.6845     ****
0.6845 TO 0.6874     ********
0.6874 TO 0.6902     *********
0.6902 TO 0.6931     **************
0.6931 TO 0.6960     ***********************
0.6960 TO 0.6988     **********************
0.6988 TO 0.7017     *************************
0.7017 TO 0.7045     *************************************
0.7045 TO 0.7074     **********************************
0.7074 TO 0.7103     **************************
0.7103 TO 0.7131     **************************************
0.7131 TO 0.7160     *******************************************
0.7160 TO 0.7189     *********************************************
0.7189 TO 0.7217     ************************************
0.7217 TO 0.7246     **********************************************
0.7246 TO 0.7275     ******************************************
0.7275 TO 0.7303     ******************************************
0.7303 TO 0.7332     ************************************
0.7332 TO 0.7361     *******************************************
0.7361 TO 0.7389     ***************************************
0.7389 TO 0.7418     *******************************
0.7418 TO 0.7447     ****************************************
0.7447 TO 0.7475     ***********************************
0.7475 TO 0.7504     ****************************
0.7504 TO 0.7533     ****************************
0.7533 TO 0.7561     ***************
0.7561 TO 0.7590     *************
0.7590 TO 0.7619     **************
0.7619 TO 0.7647     *********
0.7647 TO 0.7676     *********
0.7676 TO 0.7705     *******
0.7705 TO 0.7733     ******
0.7733 TO 0.7762     *********
0.7762 TO 0.7791     ********
0.7791 TO 0.7819     **
0.7819 TO 0.7848     *
0.7848 TO 0.7877     ***
0.7877 TO 0.7905     **
0.7905 TO 0.7934     *
0.7934 TO 0.7963
```

```
                              FREQUENCY FOR GENERATIONS  604 TO 1203
0.6386 TO 0.6415     *
0.6415 TO 0.6444
0.6444 TO 0.6472
0.6472 TO 0.6501
0.6501 TO 0.6530
0.6530 TO 0.6558     *
0.6558 TO 0.6587     **
0.6587 TO 0.6616
0.6616 TO 0.6644
0.6644 TO 0.6673     **
0.6673 TO 0.6702     **
0.6702 TO 0.6730     *
0.6730 TO 0.6759
0.6759 TO 0.6788     ****
0.6788 TO 0.6816     ****
0.6816 TO 0.6845     *
0.6845 TO 0.6874     ******
0.6874 TO 0.6902     *****
0.6902 TO 0.6931     *******
0.6931 TO 0.6960     ***************
0.6960 TO 0.6988     ******************
0.6988 TO 0.7017     ********************
0.7017 TO 0.7045     ******************************
0.7045 TO 0.7074     ************************
0.7074 TO 0.7103     ****************
0.7103 TO 0.7131     ***************************
0.7131 TO 0.7160     ****************************
0.7160 TO 0.7189     *****************************
0.7189 TO 0.7217     *************************
0.7217 TO 0.7246     *************************************
0.7246 TO 0.7275     *************************
0.7275 TO 0.7303     *****************************
0.7303 TO 0.7332     *****************
0.7332 TO 0.7361     *****************************
0.7361 TO 0.7389     *****************************
0.7389 TO 0.7418     **********************
0.7418 TO 0.7447     ***********************
0.7447 TO 0.7475     ********************
0.7475 TO 0.7504     *******************
0.7504 TO 0.7533     ******************
0.7533 TO 0.7561     **********
0.7561 TO 0.7590     ******
0.7590 TO 0.7619     ********
0.7619 TO 0.7647     ******
0.7647 TO 0.7676     *******
0.7676 TO 0.7705     ***
0.7705 TO 0.7733     *****
0.7733 TO 0.7762     ******
0.7762 TO 0.7791     *****
0.7791 TO 0.7819     *
0.7819 TO 0.7848     *
0.7848 TO 0.7877     ***
0.7877 TO 0.7905     **
0.7905 TO 0.7934     *
0.7934 TO 0.7963
```

```
                                     FREQUENCY FOR GENERATIONS  904 TO 1203
0.6386 TO 0.6415    *
0.6415 TO 0.6444
0.6444 TO 0.6472
0.6472 TO 0.6501
0.6501 TO 0.6530
0.6530 TO 0.6558
0.6558 TO 0.6587    **
0.6587 TO 0.6616
0.6616 TO 0.6644
0.6644 TO 0.6673    *
0.6673 TO 0.6702    **
0.6702 TO 0.6730    *
0.6730 TO 0.6759
0.6759 TO 0.6788    ***
0.6788 TO 0.6816    ***
0.6816 TO 0.6845    *
0.6845 TO 0.6874    ***
0.6874 TO 0.6902    ****
0.6902 TO 0.6931    ***
0.6931 TO 0.6960    *****
0.6960 TO 0.6988    ****
0.6988 TO 0.7017    **************
0.7017 TO 0.7045    ****************
0.7045 TO 0.7074    ************
0.7074 TO 0.7103    ******
0.7103 TO 0.7131    ****************
0.7131 TO 0.7160    ************
0.7160 TO 0.7189    ******************
0.7189 TO 0.7217    ***********
0.7217 TO 0.7246    ****************
0.7246 TO 0.7275    ********
0.7275 TO 0.7303    *****************
0.7303 TO 0.7332    *****
0.7332 TO 0.7361    ****************
0.7361 TO 0.7389    *************
0.7389 TO 0.7418    *************
0.7418 TO 0.7447    ***********
0.7447 TO 0.7475    *************
0.7475 TO 0.7504    ********
0.7504 TO 0.7533    **********
0.7533 TO 0.7561    *****
0.7561 TO 0.7590    ***
0.7590 TO 0.7619    *****
0.7619 TO 0.7647    ***
0.7647 TO 0.7676    ****
0.7676 TO 0.7705    *
0.7705 TO 0.7733    ***
0.7733 TO 0.7762    ***
0.7762 TO 0.7791    ***
0.7791 TO 0.7819
0.7819 TO 0.7848
0.7848 TO 0.7877
0.7877 TO 0.7905    *
0.7905 TO 0.7934    *
0.7934 TO 0.7963
```

6.6.13 MOATA Plate Bundles in the LWT Cask

This section contains a truncated sample output file from the evaluation of MOATA plate bundles in the LWT cask. The output file is shown in Figure 6.6.13-1.

Figure 6.6.13-1 Maximum Reactivity MOATA Plate Bundle Configuration

```
      PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
MODULE CSAS25   WILL BE CALLED
  LWT w/ MOATA Mark II Fuel, Accident, Radial - In, Axial - Alternating
  ' Basket Configuration
  '       Fuel Tube OD - Nominal  Fuel Tube Height - Min
  '       Fuel Tube Thick - Min  Fuel Base  Plate - Min
  ' Fuel Plate Configuration
  '       Fuel Plate Width - Max  Fuel Plate Thickness - Nominal
  '       Clad Thickness - Min
  '       Active Fuel Width - Max  Active Fuel Length - Nominal
  '       Fuel Element Height - Min
  ' Spacer/Assembly
  '       Plate Spacer Thickness- Max
  '       Side Plate Thickness - Nominal  Side Plate Width - Nominal
  ' Material Description
  '        U-235 Fuel Mass - Max  Uranium Weight Fraction - Max
  27GROUPNDF4  LATTICECELL
  'Material Description for LWT Analysis - MOATA Mark II Fuel
  URANIUM  1  DEN=0.3093  1.0  293.0  92235 92.0   92238 08.0  END
  AL  1  DEN=0.7718  1.0  293.0       END
  AL  2  1.00  293.0        END
  H2O  3  DEN=0.9998  1.00  293.0       END
  ARBMGLC  0.9437  3  0  1  0
    6012  2  1001  6  8016  2
    4  0.5840          END
  H2O  4  0.4160  293.0        END
  PB  5  1.00  293.0        END
  SS304  6  1.00  293.0        END
  AL  7  1.00  293.0        END
  SS304  8  1.00  293.0        END
  H2O  9  DEN=0.0001  1.00  293.0       END
  END COMP
  SYMMSLABCELL  0.3832  0.1832  1  3  0.2032  2  END

  READ PARAM  TBA=5  TME=90  RUN=YES  PLT=NO
    GEN=1023  NPG=1000        END PARAM
  READ START  XSM=-16.85  XSP=16.85  YSM=16.85  YSP=-16.85
    ZSM=26.67  ZSP=472.14        END START
  READ GEOM
  UNIT  1
  COM='Fuel Plate'
  CUBOID  1  1  2P0.0916  2P3.6608  58.4200  0.0000
  CUBOID  2  1  2P0.1016  2P3.8291  58.4200  0.0000
  CUBOID  3  1  2P0.1916  2P3.9334  58.4200  0.0000
  UNIT  2
  COM='Cavity Material Replacement - Side Plate'
  CUBOID  3  1  2P0.3175  2P3.9334  58.4200  0.0000
  UNIT  3
  COM='Water Gap to Side Plate '
  CUBOID  3  1  2P0.0450  2P3.9334  58.4200  0.0000
  UNIT  4
  COM='Plate Bundle'
  ARRAY  11  -3.4074  -3.9334  0.0000
  UNIT  5
  COM='Fuel Plate'
  CUBOID  1  1  2P3.6608  2P0.0916  58.4200  0.0000
  CUBOID  2  1  2P3.8291  2P0.1016  58.4200  0.0000
  CUBOID  3  1  2P3.9334  2P0.1916  58.4200  0.0000
  UNIT  6
  COM='Cavity Material Replacement - Side Plate'
  CUBOID  3  1  2P3.9334  2P0.3175  58.4200  0.0000
  UNIT  7
  COM='Water Gap to Side Plate'
  CUBOID  3  1  2P3.9334  2P0.0450  58.4200  0.0000
  UNIT  8
  COM='Plate Bundle'
  ARRAY  12  -3.9334  -3.4074  0.0000
  UNIT  9
  COM='Tube 1 - Fuel Down        Radial Shifted toward    0  '
  CYLINDER  3  1  5.2388  73.0240  0.0000
  HOLE  4  0.0000  0.0000  0.0000
  CYLINDER  6  1  5.55525  73.0240  0.0000
  UNIT  10
  COM='Tube 1 - Fuel Up        Radial Shifted toward    0  '
  CYLINDER  3  1  5.2388  73.0240  0.0000
  HOLE  4  0.0000  0.0000  14.6030
  CYLINDER  6  1  5.55525  73.0240  0.0000
  UNIT  11
  COM='Tube 2 - Fuel Down        Radial Shifted toward    180  '
  CYLINDER  3  1  5.2388  73.0240  0.0000
  HOLE  4  -0.0508  0.0000  0.0000
  CYLINDER  6  1  5.55525  73.0240  0.0000
  UNIT  12
  COM='Tube 2 - Fuel Up        Radial Shifted toward    180  '
  CYLINDER  3  1  5.2388  73.0240  0.0000
  HOLE  4  -0.0508  0.0000  14.6030
  CYLINDER  6  1  5.55525  73.0240  0.0000
  UNIT  13
  COM='Tube 3 - Fuel Down        Radial Shifted toward    240  '
  CYLINDER  3  1  5.2388  73.0240  0.0000
  HOLE  8  -0.0164  -0.0299  0.0000
  CYLINDER  6  1  5.55525  73.0240  0.0000
  UNIT  14
```

```
COM='Tube 3 - Fuel Up        Radial Shifted toward    240  '
CYLINDER  3  1  5.2388  73.0240  0.0000
HOLE  8  -0.0164  -0.0298  14.6030
CYLINDER  6  1  5.55525  73.0240  0.0000
UNIT  15
COM='Tube 4 - Fuel Down        Radial Shifted toward    300  '
CYLINDER  3  1  5.2388  73.0240  0.0000
HOLE  8  0.0164  -0.0298  0.0000
CYLINDER  6  1  5.55525  73.0240  0.0000
UNIT  16
COM='Tube 4 - Fuel Up        Radial Shifted toward    300  '
CYLINDER  3  1  5.2388  73.0240  0.0000
HOLE  8  0.0164  -0.0298  14.6030
CYLINDER  6  1  5.55525  73.0240  0.0000
UNIT  17
COM='Tube 5 - Fuel Down        Radial Shifted toward    0  '
CYLINDER  3  1  5.2388  73.0240  0.0000
HOLE  4  0.0508  0.0000  0.0000
CYLINDER  6  1  5.55525  73.0240  0.0000
UNIT  18
COM='Tube 5 - Fuel Up        Radial Shifted toward    0  '
CYLINDER  3  1  5.2388  73.0240  0.0000
HOLE  4  0.0508  0.0000  14.6030
CYLINDER  6  1  5.55525  73.0240  0.0000
UNIT  19
COM='Tube 6 - Fuel Down        Radial Shifted toward    60  '
CYLINDER  3  1  5.2388  73.0240  0.0000
HOLE  8  0.0164  0.0298  0.0000
CYLINDER  6  1  5.55525  73.0240  0.0000
UNIT  20
COM='Tube 6 - Fuel Up        Radial Shifted toward    60  '
CYLINDER  3  1  5.2388  73.0240  0.0000
HOLE  8  0.0164  0.0298  14.6030
CYLINDER  6  1  5.55525  73.0240  0.0000
UNIT  21
COM='Tube 7 - Fuel Down        Radial Shifted toward    120  '
CYLINDER  3  1  5.2388  73.0240  0.0000
HOLE  8  -0.0164  0.0298  0.0000
CYLINDER  6  1  5.55525  73.0240  0.0000
UNIT  22
COM='Tube 7 - Fuel Up        Radial Shifted toward    120  '
CYLINDER  3  1  5.2388  73.0240  0.0000
HOLE  8  -0.0164  0.0298  14.6030
CYLINDER  6  1  5.55525  73.0240  0.0000
UNIT  23
COM='Basket Bottom Plate Hole '
CYLINDER  3  1  1.27  1.2172  0.0000
UNIT  24
COM='Basket Bottom Plate '
CYLINDER  6  1  16.8466  1.2172  0.0000
HOLE  23  0.0000  0.0000  0.0000
HOLE  23  11.1125  0.0000  0.0000
HOLE  23  5.5563  9.6237  0.0000
HOLE  23  -5.5563  9.6237  0.0000
HOLE  23  -11.1125  0.0000  0.0000
HOLE  23  -5.5563  -9.6237  0.0000
HOLE  23  5.5562  -9.6237  0.0000
UNIT  25
COM='Basket Fuel Down'
CYLINDER  3  1  16.6698  73.0240  0.0000
HOLE  9  0.0000  0.0000  0.0000
HOLE  11  11.1125  0.0000  0.0000
HOLE  13  5.5563  9.6237  0.0000
HOLE  15  -5.5563  9.6237  0.0000
HOLE  17  -11.1125  0.0000  0.0000
HOLE  19  -5.5563  -9.6237  0.0000
HOLE  21  5.5562  -9.6237  0.0000
CYLINDER  3  1  16.8466  73.0240  0.0000
UNIT  26
COM='Basket Fuel Up'
CYLINDER  3  1  16.6698  73.0240  0.0000
HOLE  10  0.0000  0.0000  0.0000
HOLE  12  11.1125  0.0000  0.0000
HOLE  14  5.5563  9.6237  0.0000
HOLE  16  -5.5563  9.6237  0.0000
HOLE  18  -11.1125  0.0000  0.0000
HOLE  20  -5.5563  -9.6237  0.0000
HOLE  22  5.5562  -9.6237  0.0000
CYLINDER  3  1  16.8466  73.0240  0.0000
UNIT  27
COM='Cask Cavity '
CYLINDER  3  1  16.9863  445.4652  0.0000
HOLE  24  0.0000  0.0000  0.0010
HOLE  26  0.0000  0.0000  1.2192
HOLE  24  0.0000  0.0000  74.2452
HOLE  25  0.0000  0.0000  75.4634
HOLE  24  0.0000  0.0000  148.4894
HOLE  26  0.0000  0.0000  149.7076
HOLE  24  0.0000  0.0000  222.7336
HOLE  25  0.0000  0.0000  223.9518
HOLE  24  0.0000  0.0000  296.9778
HOLE  26  0.0000  0.0000  298.1960
HOLE  24  0.0000  0.0000  371.2220
HOLE  25  0.0000  0.0000  372.4402
UNIT  28
COM='Cask Shield Radial Configuration '
CYLINDER  3  1  16.9863  445.4652  0.0000
```

```
HOLE  27  0.0000  0.0000  0.0000
CYLINDER  8  1  18.9103  445.4652  0.0000
CYLINDER  5  1  33.4645  445.4652  0.0000
CYLINDER  8  1  36.5189  445.4652  0.0000
CYLINDER  9  1  49.2189  445.4652  0.0000
CYLINDER  8  1  49.8183  445.4652  0.0000
CUBOID  9  1  4P49.8183  445.4652  0.0000
UNIT  29
COM='LWT Lid '
CYLINDER  8  1  36.5189  28.5750  0.5994
CYLINDER  9  1  49.8183  28.5750  0.5994
CYLINDER  8  1  49.8183  28.5750  0.0000
CUBOID  9  1  4P49.8183  28.5750  0.0000
UNIT  30
COM='LWT Bottom Weldment '
CYLINDER  5  1  26.3525  16.5100  8.8900
CYLINDER  8  1  36.5189  26.0706  0.0000
CYLINDER  9  1  49.8183  26.0706  0.0000
CYLINDER  8  1  49.8183  26.6700  0.0000
CUBOID  9  1  4P49.8183  26.6700  0.0000
GLOBAL UNIT  31
COM='LWT Cask '
ARRAY  1  -49.8183  -49.8183  0.0000
END GEOM
READ ARRAY
ARA=1  NUX=1  NUY=1  NUZ=3  FILL  30 28 29  END FILL
ARA=11  NUX=18  NUY=1  NUZ=1  FILL  2 3 14R1 3 2  END FILL
ARA=12  NUX=1  NUY=18  NUZ=1  FILL  6 7 14R5 7 6  END FILL
END ARRAY
READ BOUNDS    ALL=MIRROR    END BOUNDS
END DATA

'      U-235 Fuel Mass - Max  Uranium Weight Fraction - Max

'Material Description for LWT Analysis - MOATA Mark II Fuel
    LWT W/ MOATA MARK II FUEL, ACCIDENT, RADIAL - IN, AXIAL - ALTERNATING


    **** PROBLEM PARAMETERS ****

    LIB 27GROUPNDF4  LIBRARY
    MXX            9 MIXTURES
    MSC           11 COMPOSITION SPECIFICATIONS
    IZM            3 MATERIAL ZONES
    GE  LATTICECELL  GEOMETRY
    MORE           0 0/1 DO NOT READ/READ OPTIONAL PARAMETER DATA
    MSLN           0 FUEL SOLUTIONS


    **** PROBLEM COMPOSITION DESCRIPTION ****

    SC  URANIUM      STANDARD COMPOSITION
    MX             1 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      0.3093 SPECIFIED DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               92000       1.00 ATOM/MOLECULE
                                 92235     92.000 WT%
                                 92238      8.000 WT%
    END

    SC  AL           STANDARD COMPOSITION
    MX             1 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      0.7718 SPECIFIED DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               13027       1.00 ATOM/MOLECULE
    END

    SC  AL           STANDARD COMPOSITION
    MX             2 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      2.7020 THEORETICAL DENSITY
    NEL            1 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
               13027       1.00 ATOM/MOLECULE
    END

    SC  H2O          STANDARD COMPOSITION
    MX             3 MIXTURE NO.
    VF        1.0000 VOLUME FRACTION
    ROTH      0.9998 SPECIFIED DENSITY
    NEL            2 NO. ELEMENTS
    ICP            1 0/1 MIXTURE/COMPOUND
    TEMP       293.0 DEG KELVIN
                1001       2.00 ATOMS/MOLECULE
                8016       1.00 ATOM/MOLECULE
    END

    SC  ARBMGLC      STANDARD COMPOSITION
    MX             4 MIXTURE NO.
    VF        0.5840 VOLUME FRACTION
```

```
ROTH       0.9437 SPECIFIED DENSITY
NEL             3 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
             6012        2.00 ATOMS/MOLECULE
             1001        6.00 ATOMS/MOLECULE
             8016        2.00 ATOMS/MOLECULE
END

SC  H2O           STANDARD COMPOSITION
MX              4 MIXTURE NO.
VF         0.4160 VOLUME FRACTION
ROTH       0.9982 THEORETICAL DENSITY
NEL             2 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
             1001        2.00 ATOMS/MOLECULE
             8016        1.00 ATOM/MOLECULE
END

SC  PB            STANDARD COMPOSITION
MX              5 MIXTURE NO.
VF         1.0000 VOLUME FRACTION
ROTH      11.3440 THEORETICAL DENSITY
NEL             1 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
            82000        1.00 ATOM/MOLECULE
END

SC  SS304         STANDARD COMPOSITION
MX              6 MIXTURE NO.
VF         1.0000 VOLUME FRACTION
ROTH       7.9200 THEORETICAL DENSITY
NEL             4 NO. ELEMENTS
ICP             0 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
            24304     19.000 WT%
            25055      2.000 WT%
            26304     69.500 WT%
            28304      9.500 WT%
END

SC  AL            STANDARD COMPOSITION
MX              7 MIXTURE NO.
VF         1.0000 VOLUME FRACTION
ROTH       2.7020 THEORETICAL DENSITY
NEL             1 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
            13027        1.00 ATOM/MOLECULE
END

SC  SS304         STANDARD COMPOSITION
MX              8 MIXTURE NO.
VF         1.0000 VOLUME FRACTION
ROTH       7.9200 THEORETICAL DENSITY
NEL             4 NO. ELEMENTS
ICP             0 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
            24304     19.000 WT%
            25055      2.000 WT%
            26304     69.500 WT%
            28304      9.500 WT%
END

SC  H2O           STANDARD COMPOSITION
MX              9 MIXTURE NO.
VF         1.0000 VOLUME FRACTION
ROTH       0.0001 SPECIFIED DENSITY
NEL             2 NO. ELEMENTS
ICP             1 0/1 MIXTURE/COMPOUND
TEMP        293.0 DEG KELVIN
             1001        2.00 ATOMS/MOLECULE
             8016        1.00 ATOM/MOLECULE
END

**** PROBLEM GEOMETRY ****

CTP SYMMSLABCELL CELL TYPE
PITCH      0.3832 CM CENTER TO CENTER SPACING
FUELOD     0.1832 CM FUEL DIAMETER OR SLAB THICKNESS
MFUEL           1 MIXTURE NO. OF FUEL
MMOD            3 MIXTURE NO. OF MODERATOR
CLADOD     0.2032 CM CLAD OUTER DIAMETER
MCLAD           2 MIXTURE NO. OF CLAD

ZONE SPECIFICATIONS FOR LATTICECELL GEOMETRY

                ZONE  1 IS FUEL
                ZONE  2 IS CLAD
                ZONE  3 IS MOD
```

M I X I N G   T A B L E

ENTRY	MIXTURE	ISOTOPE	NUMBER DENSITY	NEW IDENTIFIER
1	1	92235	7.29070E-04	1092235
2	1	92238	6.25966E-05	1092238
3	1	13027	1.72260E-02	1013027
4	2	13027	6.03066E-02	2013027
5	7	13027	6.03066E-02	7013027
6	3	1001	6.68762E-02	3001001
7	4	1001	5.98801E-02	4001001
8	9	1001	6.68896E-06	9001001
9	3	8016	3.34381E-02	3008016
10	4	8016	2.45894E-02	4008016
11	9	8016	3.34448E-06	9008016
12	4	6012	1.07014E-02	4006012
13	5	82000	3.29690E-02	5082000
14	6	24304	1.74286E-02	6024304
15	8	24304	1.74286E-02	8024304
16	6	25055	1.73633E-03	6025055
17	8	25055	1.73633E-03	8025055
18	6	26304	5.93579E-02	6026304
19	8	26304	5.93579E-02	8026304
20	6	28304	7.72070E-03	6028304
21	8	28304	7.72070E-03	8028304

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 9.26928E-03

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED WITH A FLAT DISTRIBUTION IN A CUBOID DEFINED BY:
+X= 1.68500E+01 -X=-1.68500E+01 +Y=-1.68500E+01 -Y= 1.68500E+01 +Z= 4.72140E+02 -Z= 2.66700E+01
THE FLAG TO START NEUTRONS IN THE REFLECTOR WAS TURNED OFF

0.31133 MINUTES WERE REQUIRED FOR STARTING. TOTAL ELAPSED TIME IS 0.37333 MINUTES.

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	806 INDEPENDENT	FISSION POINTS WERE	GENERATED	
1	7.31623E-01	3.79000E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	740 INDEPENDENT	FISSION POINTS WERE	GENERATED	
2	6.87897E-01	3.82667E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	861 INDEPENDENT	FISSION POINTS WERE	GENERATED	
3	7.62074E-01	3.85500E-01	7.62074E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	7.55989E-01	3.89167E-01	7.59032E-01	3.04273E-03	0.00000E+00	0.00000E+00
5	7.68824E-01	3.92833E-01	7.62296E-01	3.70674E-03	0.00000E+00	0.00000E+00
6	7.66991E-01	3.96500E-01	7.63469E-01	2.87188E-03	0.00000E+00	0.00000E+00
7	7.59518E-01	4.00167E-01	7.62679E-01	2.36076E-03	0.00000E+00	0.00000E+00
8	7.90893E-01	4.02833E-01	7.67381E-01	5.08200E-03	0.00000E+00	0.00000E+00
9	7.29438E-01	4.06500E-01	7.61961E-01	6.91587E-03	0.00000E+00	0.00000E+00
10	7.25050E-01	4.10167E-01	7.57347E-01	7.56037E-03	0.00000E+00	0.00000E+00
11	7.08347E-01	4.13833E-01	7.51903E-01	8.60810E-03	0.00000E+00	0.00000E+00
12	7.33306E-01	4.17500E-01	7.50043E-01	7.92073E-03	0.00000E+00	0.00000E+00
13	7.41343E-01	4.21167E-01	7.49252E-01	7.20809E-03	0.00000E+00	0.00000E+00
14	7.64793E-01	4.24833E-01	7.50547E-01	6.70629E-03	0.00000E+00	0.00000E+00
15	7.94944E-01	4.27500E-01	7.53962E-01	7.05111E-03	0.00000E+00	0.00000E+00
16	7.52601E-01	4.31167E-01	7.53865E-01	6.52879E-03	0.00000E+00	0.00000E+00
17	7.48314E-01	4.34833E-01	7.53495E-01	6.08923E-03	0.00000E+00	0.00000E+00
18	7.30448E-01	4.38500E-01	7.52054E-01	5.87526E-03	0.00000E+00	0.00000E+00
19	7.60018E-01	4.42167E-01	7.52523E-01	5.53869E-03	0.00000E+00	0.00000E+00
20	7.76509E-01	4.45000E-01	7.53856E-01	5.38927E-03	0.00000E+00	0.00000E+00
21	7.56157E-01	4.48667E-01	7.53977E-01	5.09918E-03	0.00000E+00	0.00000E+00
22	7.48444E-01	4.52333E-01	7.53700E-01	4.84541E-03	0.00000E+00	0.00000E+00
23	7.54437E-01	4.56000E-01	7.53735E-01	4.60904E-03	0.00000E+00	0.00000E+00
24	7.45199E-01	4.59667E-01	7.53347E-01	4.41164E-03	0.00000E+00	0.00000E+00
25	7.03146E-01	4.62333E-01	7.51164E-01	4.74701E-03	0.00000E+00	0.00000E+00
26	7.75307E-01	4.66000E-01	7.52170E-01	4.65492E-03	0.00000E+00	0.00000E+00
27	6.97750E-01	4.69667E-01	7.49994E-01	4.96722E-03	0.00000E+00	0.00000E+00
28	7.50911E-01	4.73333E-01	7.50029E-01	4.77248E-03	0.00000E+00	0.00000E+00
29	7.58368E-01	4.76000E-01	7.50338E-01	4.60270E-03	0.00000E+00	0.00000E+00
30	7.75055E-01	4.79667E-01	7.51220E-01	4.52227E-03	0.00000E+00	0.00000E+00
31	7.59545E-01	4.83333E-01	7.51508E-01	4.37298E-03	0.00000E+00	0.00000E+00
32	7.87068E-01	4.87000E-01	7.52693E-01	4.38783E-03	0.00000E+00	0.00000E+00
33	7.59780E-01	4.90667E-01	7.52921E-01	4.25008E-03	0.00000E+00	0.00000E+00
34	7.30985E-01	4.94333E-01	7.52236E-01	4.17183E-03	0.00000E+00	0.00000E+00
35	7.86816E-01	4.97167E-01	7.53284E-01	4.17701E-03	0.00000E+00	0.00000E+00
36	6.89861E-01	5.00833E-01	7.51418E-01	4.46103E-03	0.00000E+00	0.00000E+00
37	7.51420E-01	5.04500E-01	7.51418E-01	4.33169E-03	0.00000E+00	0.00000E+00
38	7.41461E-01	5.08167E-01	7.51142E-01	4.21873E-03	0.00000E+00	0.00000E+00
39	7.52616E-01	5.11833E-01	7.51182E-01	4.10332E-03	0.00000E+00	0.00000E+00
40	7.87241E-01	5.15500E-01	7.52131E-01	4.10506E-03	0.00000E+00	0.00000E+00
41	7.44746E-01	5.19167E-01	7.51941E-01	4.00290E-03	0.00000E+00	0.00000E+00
42	7.71586E-01	5.21833E-01	7.52432E-01	3.93233E-03	0.00000E+00	0.00000E+00
43	7.13124E-01	5.25500E-01	7.51474E-01	3.95324E-03	0.00000E+00	0.00000E+00
44	7.45383E-01	5.29167E-01	7.51329E-01	3.86069E-03	0.00000E+00	0.00000E+00
45	7.63992E-01	5.32833E-01	7.51623E-01	3.78132E-03	0.00000E+00	0.00000E+00
46	7.50626E-01	5.35667E-01	7.51600E-01	3.69446E-03	0.00000E+00	0.00000E+00
47	7.07328E-01	5.39167E-01	7.50617E-01	3.74304E-03	0.00000E+00	0.00000E+00
48	7.26958E-01	5.42833E-01	7.50102E-01	3.69671E-03	0.00000E+00	0.00000E+00
49	7.42864E-01	5.46500E-01	7.49948E-01	3.62048E-03	0.00000E+00	0.00000E+00
50	7.79316E-01	5.50167E-01	7.50560E-01	3.59665E-03	0.00000E+00	0.00000E+00
51	7.38988E-01	5.53000E-01	7.50324E-01	3.53042E-03	0.00000E+00	0.00000E+00
52	7.57247E-01	5.56667E-01	7.50462E-01	3.46186E-03	0.00000E+00	0.00000E+00
53	7.73838E-01	5.60333E-01	7.50921E-01	3.42411E-03	0.00000E+00	0.00000E+00
54	7.65306E-01	5.64000E-01	7.51197E-01	3.36900E-03	0.00000E+00	0.00000E+00
55	6.97184E-01	5.67667E-01	7.50178E-01	3.45839E-03	0.00000E+00	0.00000E+00
56	7.39188E-01	5.70333E-01	7.49975E-01	3.39984E-03	0.00000E+00	0.00000E+00
57	7.70477E-01	5.74000E-01	7.50348E-01	3.35620E-03	0.00000E+00	0.00000E+00
58	7.52446E-01	5.77667E-01	7.50385E-01	3.29790E-03	0.00000E+00	0.00000E+00
59	7.33142E-01	5.81333E-01	7.50082E-01	3.25362E-03	0.00000E+00	0.00000E+00
60	7.68338E-01	5.84167E-01	7.50397E-01	3.21249E-03	0.00000E+00	0.00000E+00
61	7.65693E-01	5.87833E-01	7.50656E-01	3.16519E-03	0.00000E+00	0.00000E+00
62	7.31627E-01	5.91500E-01	7.50339E-01	3.13105E-03	0.00000E+00	0.00000E+00
.						
.						
.						
.						
977	6.79375E-01	3.81467E+00	7.42792E-01	8.31736E-04	0.00000E+00	0.00000E+00
978	7.04463E-01	3.81833E+00	7.42753E-01	8.31811E-04	0.00000E+00	0.00000E+00
979	7.13813E-01	3.82200E+00	7.42723E-01	8.31486E-04	0.00000E+00	0.00000E+00
980	7.52117E-01	3.82567E+00	7.42733E-01	8.30691E-04	0.00000E+00	0.00000E+00
981	7.98334E-01	3.82933E+00	7.42789E-01	8.31784E-04	0.00000E+00	0.00000E+00
982	7.37944E-01	3.83200E+00	7.42784E-01	8.30949E-04	0.00000E+00	0.00000E+00
983	7.18047E-01	3.83567E+00	7.42759E-01	8.30485E-04	0.00000E+00	0.00000E+00
984	7.10727E-01	3.83933E+00	7.42727E-01	8.30279E-04	0.00000E+00	0.00000E+00
985	7.38439E-01	3.84217E+00	7.42722E-01	8.29446E-04	0.00000E+00	0.00000E+00
986	7.17007E-01	3.84583E+00	7.42696E-01	8.29015E-04	0.00000E+00	0.00000E+00
987	7.68514E-01	3.84950E+00	7.42722E-01	8.28587E-04	0.00000E+00	0.00000E+00
988	7.91476E-01	3.85317E+00	7.42772E-01	8.29222E-04	0.00000E+00	0.00000E+00
989	7.01679E-01	3.85667E+00	7.42730E-01	8.29427E-04	0.00000E+00	0.00000E+00
990	7.59538E-01	3.85950E+00	7.42747E-01	8.28762E-04	0.00000E+00	0.00000E+00
991	7.52235E-01	3.86317E+00	7.42757E-01	8.27979E-04	0.00000E+00	0.00000E+00
992	7.52038E-01	3.86683E+00	7.42766E-01	8.27195E-04	0.00000E+00	0.00000E+00
993	7.53727E-01	3.87050E+00	7.42777E-01	8.26434E-04	0.00000E+00	0.00000E+00
994	7.83910E-01	3.87417E+00	7.42819E-01	8.26641E-04	0.00000E+00	0.00000E+00
995	7.18682E-01	3.87783E+00	7.42794E-01	8.26166E-04	0.00000E+00	0.00000E+00
996	7.48482E-01	3.88050E+00	7.42800E-01	8.25354E-04	0.00000E+00	0.00000E+00
997	7.30613E-01	3.88417E+00	7.42788E-01	8.24615E-04	0.00000E+00	0.00000E+00
998	7.71883E-01	3.88783E+00	7.42817E-01	8.24305E-04	0.00000E+00	0.00000E+00
999	7.54841E-01	3.89150E+00	7.42829E-01	8.23566E-04	0.00000E+00	0.00000E+00

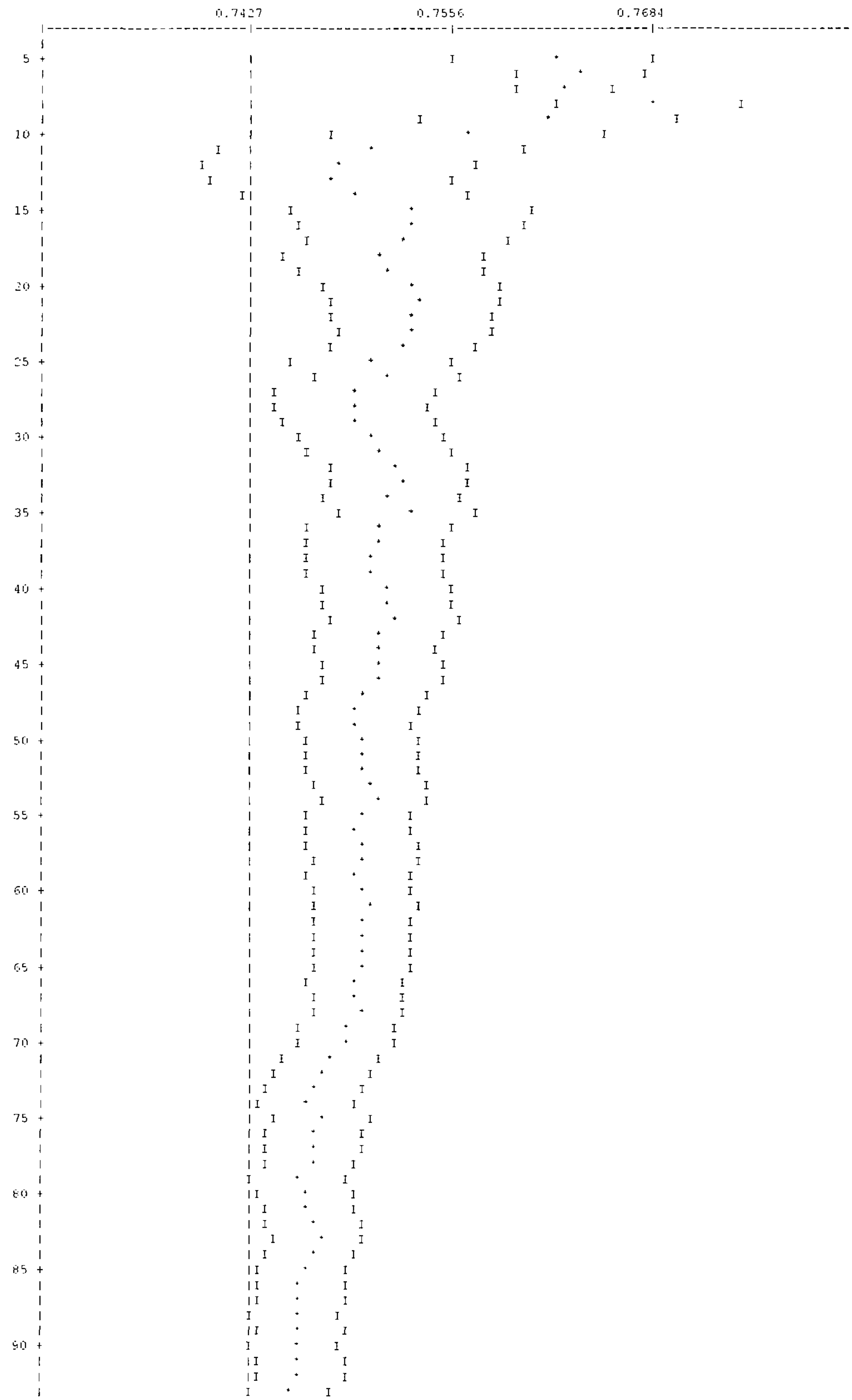
1000	7.30416E-01	3.89433E+00	7.42817E-01	8.22834E-04	0.00000E+00	0.00000E+00
1001	7.37220E-01	3.89800E+00	7.42811E-01	8.22029E-04	0.00000E+00	0.00000E+00
1002	7.71580E-01	3.90167E+00	7.42840E-01	8.21711E-04	0.00000E+00	0.00000E+00
1003	7.45144E-01	3.90533E+00	7.42842E-01	8.20892E-04	0.00000E+00	0.00000E+00
1004	7.55448E-01	3.90900E+00	7.42855E-01	8.20169E-04	0.00000E+00	0.00000E+00
1005	7.41935E-01	3.91167E+00	7.42854E-01	8.19352E-04	0.00000E+00	0.00000E+00
1006	7.23444E-01	3.91533E+00	7.42834E-01	8.18763E-04	0.00000E+00	0.00000E+00
1007	7.76276E-01	3.91900E+00	7.42868E-01	8.18625E-04	0.00000E+00	0.00000E+00
1008	7.75243E-01	3.92267E+00	7.42900E-01	8.18444E-04	0.00000E+00	0.00000E+00
1009	7.63803E-01	3.92533E+00	7.42921E-01	8.17894E-04	0.00000E+00	0.00000E+00
1010	7.56903E-01	3.92900E+00	7.42934E-01	8.17200E-04	0.00000E+00	0.00000E+00
1011	7.09754E-01	3.93267E+00	7.42902E-01	8.17052E-04	0.00000E+00	0.00000E+00
1012	7.80382E-01	3.93633E+00	7.42939E-01	8.17085E-04	0.00000E+00	0.00000E+00
1013	7.59572E-01	3.94000E+00	7.42955E-01	8.16443E-04	0.00000E+00	0.00000E+00
1014	7.02572E-01	3.94367E+00	7.42915E-01	8.16611E-04	0.00000E+00	0.00000E+00
1015	7.05531E-01	3.94733E+00	7.42878E-01	8.16639E-04	0.00000E+00	0.00000E+00
1016	7.59689E-01	3.95017E+00	7.42895E-01	8.16001E-04	0.00000E+00	0.00000E+00
1017	7.54767E-01	3.95383E+00	7.42907E-01	8.15281E-04	0.00000E+00	0.00000E+00
1018	7.52696E-01	3.95750E+00	7.42916E-01	8.14535E-04	0.00000E+00	0.00000E+00
1019	7.33079E-01	3.96117E+00	7.42907E-01	8.13791E-04	0.00000E+00	0.00000E+00
1020	7.23735E-01	3.96483E+00	7.42888E-01	8.13210E-04	0.00000E+00	0.00000E+00
1021	6.93952E-01	3.96850E+00	7.42840E-01	8.13829E-04	0.00000E+00	0.00000E+00
1022	7.26085E-01	3.97217E+00	7.42823E-01	8.13197E-04	0.00000E+00	0.00000E+00
1023	7.84354E-01	3.97583E+00	7.42864E-01	8.13418E-04	0.00000E+00	0.00000E+00

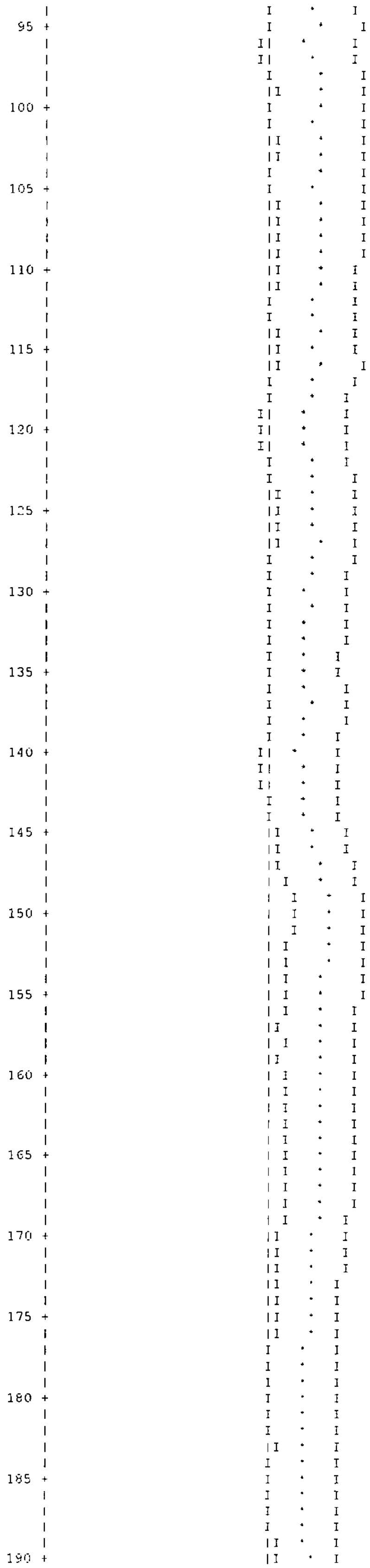
KENO MESSAGE NUMBER K5-123 EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

```
LIFETIME =  9.69309E-05 + OR -  1.11719E-07          GENERATION TIME =  6.01750E-05 + OR -  8.80249E-08
NU BAR   =  2.42029E+00 + OR -  8.55604E-06     AVERAGE FISSION GROUP =  2.38131E+01 + OR -  3.65186E-03
                   ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION =  5.55885E-02 + OR -  1.61291E-04
```

NO. OF INITIAL GENERATIONS OF SKIPPED HISTORIES	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER
3	0.74285	+ OR - 0.00081	0.74203 TO 0.74366	0.74122 TO 0.74447	0.74040 TO 0.74529	1020000
4	0.74283	+ OR - 0.00081	0.74202 TO 0.74365	0.74120 TO 0.74446	0.74039 TO 0.74528	1019000
5	0.74281	+ OR - 0.00082	0.74199 TO 0.74362	0.74118 TO 0.74444	0.74036 TO 0.74525	1018000
6	0.74278	+ OR - 0.00082	0.74197 TO 0.74360	0.74115 TO 0.74441	0.74034 TO 0.74523	1017000
7	0.74277	+ OR - 0.00082	0.74195 TO 0.74358	0.74113 TO 0.74440	0.74032 TO 0.74521	1016000
8	0.74272	+ OR - 0.00082	0.74190 TO 0.74353	0.74109 TO 0.74435	0.74027 TO 0.74517	1015000
9	0.74273	+ OR - 0.00082	0.74192 TO 0.74355	0.74110 TO 0.74436	0.74028 TO 0.74518	1014000
10	0.74275	+ OR - 0.00082	0.74193 TO 0.74357	0.74112 TO 0.74438	0.74030 TO 0.74520	1013000
11	0.74278	+ OR - 0.00082	0.74197 TO 0.74360	0.74115 TO 0.74442	0.74033 TO 0.74523	1012000
12	0.74279	+ OR - 0.00082	0.74198 TO 0.74361	0.74116 TO 0.74443	0.74034 TO 0.74525	1011000
17	0.74271	+ OR - 0.00082	0.74189 TO 0.74353	0.74107 TO 0.74435	0.74025 TO 0.74516	1006000
22	0.74265	+ OR - 0.00082	0.74182 TO 0.74347	0.74100 TO 0.74429	0.74018 TO 0.74512	1001000
27	0.74269	+ OR - 0.00082	0.74186 TO 0.74351	0.74104 TO 0.74433	0.74021 TO 0.74516	996000
32	0.74257	+ OR - 0.00083	0.74174 TO 0.74339	0.74091 TO 0.74422	0.74009 TO 0.74504	991000
37	0.74256	+ OR - 0.00083	0.74173 TO 0.74339	0.74091 TO 0.74421	0.74008 TO 0.74504	986000
42	0.74247	+ OR - 0.00083	0.74164 TO 0.74330	0.74082 TO 0.74413	0.73999 TO 0.74496	981000
47	0.74251	+ OR - 0.00083	0.74167 TO 0.74334	0.74084 TO 0.74417	0.74001 TO 0.74500	976000
52	0.74247	+ OR - 0.00083	0.74164 TO 0.74331	0.74080 TO 0.74414	0.73997 TO 0.74498	971000
57	0.74244	+ OR - 0.00084	0.74160 TO 0.74327	0.74076 TO 0.74411	0.73993 TO 0.74495	966000
62	0.74240	+ OR - 0.00084	0.74156 TO 0.74324	0.74072 TO 0.74408	0.73988 TO 0.74492	961000
67	0.74238	+ OR - 0.00084	0.74153 TO 0.74322	0.74069 TO 0.74406	0.73984 TO 0.74491	956000
72	0.74250	+ OR - 0.00084	0.74166 TO 0.74334	0.74081 TO 0.74419	0.73997 TO 0.74503	951000
77	0.74252	+ OR - 0.00085	0.74168 TO 0.74337	0.74083 TO 0.74422	0.73999 TO 0.74506	946000
82	0.74249	+ OR - 0.00085	0.74165 TO 0.74334	0.74080 TO 0.74419	0.73995 TO 0.74503	941000
.						
.						
932	0.74135	+ OR - 0.00275	0.73860 TO 0.74410	0.73585 TO 0.74685	0.73310 TO 0.74960	91000
937	0.74132	+ OR - 0.00282	0.73850 TO 0.74414	0.73569 TO 0.74695	0.73287 TO 0.74977	86000
942	0.74064	+ OR - 0.00285	0.73778 TO 0.74349	0.73493 TO 0.74634	0.73208 TO 0.74920	81000
947	0.74235	+ OR - 0.00293	0.73942 TO 0.74528	0.73650 TO 0.74821	0.73357 TO 0.75113	76000
952	0.74183	+ OR - 0.00307	0.73876 TO 0.74490	0.73569 TO 0.74797	0.73262 TO 0.75103	71000
957	0.74267	+ OR - 0.00325	0.73942 TO 0.74592	0.73617 TO 0.74917	0.73291 TO 0.75243	66000
962	0.74310	+ OR - 0.00348	0.73963 TO 0.74658	0.73615 TO 0.75006	0.73267 TO 0.75354	61000
967	0.74237	+ OR - 0.00373	0.73864 TO 0.74610	0.73491 TO 0.74983	0.73118 TO 0.75356	56000
972	0.74114	+ OR - 0.00389	0.73725 TO 0.74503	0.73336 TO 0.74892	0.72947 TO 0.75281	51000
977	0.74439	+ OR - 0.00393	0.74046 TO 0.74832	0.73653 TO 0.75226	0.73260 TO 0.75619	46000
982	0.74477	+ OR - 0.00402	0.74075 TO 0.74878	0.73674 TO 0.75280	0.73272 TO 0.75681	41000
987	0.74674	+ OR - 0.00428	0.74246 TO 0.75102	0.73819 TO 0.75530	0.73391 TO 0.75957	36000
992	0.74599	+ OR - 0.00449	0.74150 TO 0.75049	0.73700 TO 0.75498	0.73251 TO 0.75947	31000
997	0.74578	+ OR - 0.00501	0.74077 TO 0.75079	0.73577 TO 0.75580	0.73076 TO 0.76080	26000
1002	0.74402	+ OR - 0.00587	0.73814 TO 0.74989	0.73227 TO 0.75577	0.72639 TO 0.76164	21000
1007	0.74263	+ OR - 0.00732	0.73531 TO 0.74995	0.72799 TO 0.75727	0.72067 TO 0.76459	16000
1012	0.73600	+ OR - 0.00861	0.72739 TO 0.74461	0.71878 TO 0.75323	0.71017 TO 0.76184	11000
1017	0.73565	+ OR - 0.01244	0.72321 TO 0.74809	0.71077 TO 0.76053	0.69833 TO 0.77297	6000

PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.7428 + OR - 0.0008 WHICH OCCURS FOR 1023 GENERATIONS RUN.

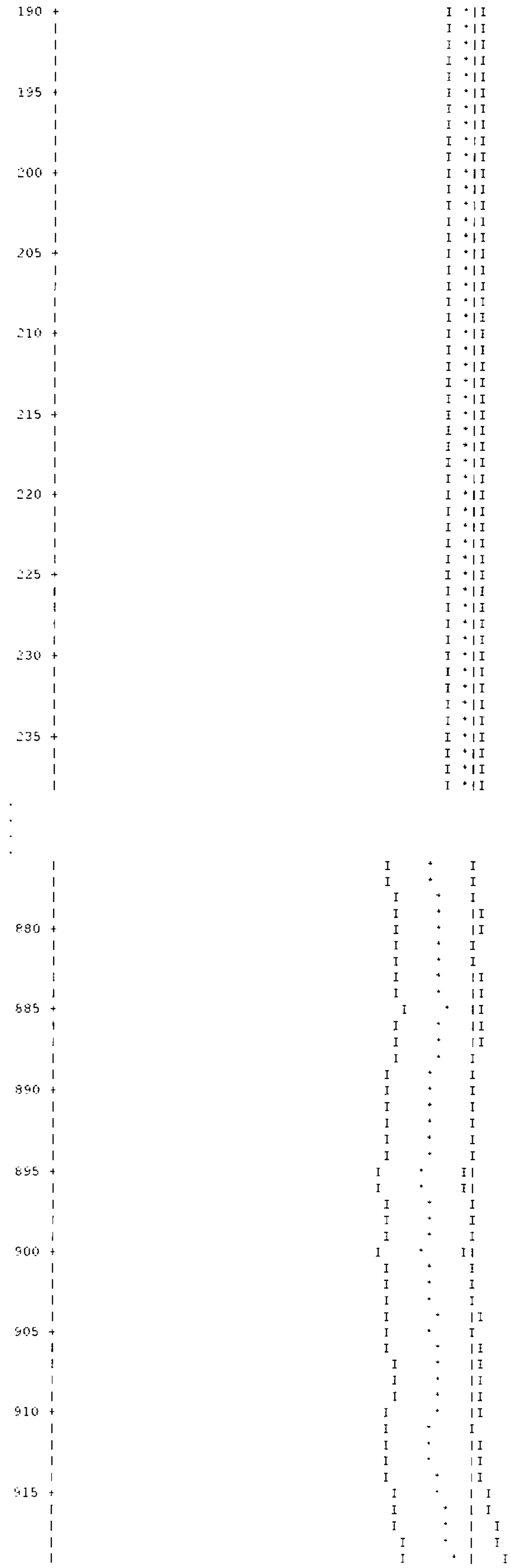


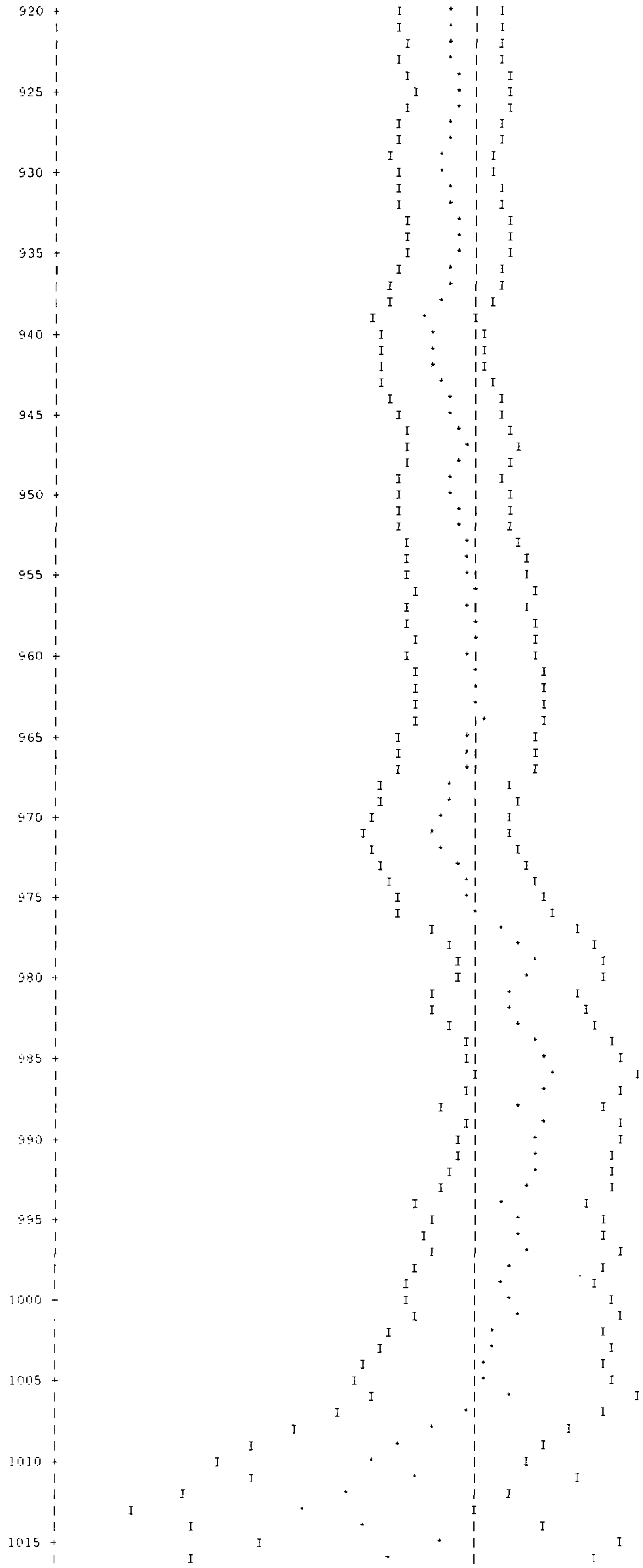

95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185
190

```
       |                        |I   *  I
       |                        |I   *  I
       |                        |I  *   I
       |                        I   *   I
   195 +                        I   *   I
       |                        |I  *   I
       |                        |I  *   I
       |                        |I  *   I
       |                        |I  *   I
   200 +                        |I  *   I
       |                        I   *  I
       |                        I   *  I
       |                        I   *  I
       |                        I  *   I
   205 +                        I  *   I
       |                        I  *   I
       |                       I|  *  I
       |                       I|  *  I
       |                        I  *   I
   210 +                        I  *  I
       |                        I  *  I
       |                        I  *  I
       |                        I  *   I
       |                        I  *  I
   215 +                       I|  *  I
       |                        I  *  I
       |                       I|  *  I
       |                       I|  *  I
       |                       I| *   I
   220 +                       I| *   I
       |                       I|  *  I
       |                       I|  *  I
       |                       I|  *  I
       |                       I| *   I
   225 +                       I| *  I
       |                      I | *  I
       |                      I |*   I
       |                      I |*   I
       |                      I |*   I
   230 +                      I |*  I
       |                      I |*  I
       |                      I |*   I
       |                      I |*  I
       |                      I |*   I
   235 +                      I |*  I
       |                      I |*  I
       |                      I |*   I
       |                      I |*   I
       |                      I |*  I
   .
   .
   .
   .
       |                      I *I
       |                      I *I
   995 +                      I *I
       |                      I *I
       |                      I *I
       |                      I *I
       |                      I *I
  1000 +                      I *I
       |                      I *I
       |                      I *I
       |                      I *I
       |                      I *I
  1005 +                      I *I
       |                      I *I
       |                      I *I
       |                      I *I
       |                      I * I
  1010 +                      I * I
       |                      I *I
       |                      I * I
       |                      I * I
       |                      I * I
  1015 +                      I *I
       |                      I *I
       |                      I *I
       |                      I * I
       |                      I *I
  1020 +                      I *I
       |                      I *I
       |                      I *I
       |                      I *I
```

```
                    PLOT OF AVERAGE K-EFFECTIVE BY GENERATION SKIPPED.
     THE LINE REPRESENTS K-EFF = 0.7428 + OR -  0.0008 WHICH OCCURS FOR     3 GENERATIONS SKIPPED.

                       0.7320                  0.7436                  0.7552
       |-----------------------|-----------------------|-----------------------|------------------------
       |
       |                                        I * I
     5 +                                        I *I
       |                                        I *I
       |                                        I *I
       |                                        I *I
       |                                        I *I
    10 +                                        I *I
       |                                        I *I
       |                                        I *I
       |                                        I *I
       |                                        I *I
    15 +                                        I *I
       |                                        I *I
       |                                        I *I
       |                                        I *I
       |                                        I *I
    20 +                                        I*|I
       |                                        I*|I
       |                                        I*|I
       |                                        I*|I
       |                                        I*|I
    25 +                                        I*|I
       |                                        I*|I
       |                                        I*|I
       |                                        I*|I
       |                                        I*|I
    30 +                                        I*|I
       |                                        I*|I
       |                                       I *|I
       |                                       I *|I
       |                                       I *|I
    35 +                                       I *|I
       |                                       I *|I
       |                                       I *|I
       |                                       I *|I
       |                                       I *|I
    40 +                                       I *|I
       |                                       I *|I
       |                                       I *|I
       |                                       I *|I
       |                                       I *|I
    45 +                                       I *|I
       |                                       I *|I
       |                                       I *|I
       |                                       I *|I
       |                                       I *|I
    50 +                                       I *|I
       |                                       I *|I
       |                                       I *|I
       |                                       I *|I
       |                                       I *|I
    55 +                                       I *|I
       |                                       I *|I
       |                                       I *|I
       |                                       I *|I
       |                                       I *|I
    60 +                                       I *|I
       |                                       I *|I
       |                                       I *|I
       |                                       I *|I
       |                                       I *|I
    65 +                                       I *|I
       |                                       I *|I
       |                                       I *|I
       |                                       I *|I
       |                                       I *|I
    70 +                                       I *|I
       |                                       I *|I
       |                                       I *|I
       |                                       I *|I
       |                                       I *|I
    75 +                                       I *|I
       |                                       I *|I
       |                                       I *|I
       |                                       I *|I
       |                                       I *|I
    80 +                                       I *|I
       |                                       I *|I
       |                                       I *|I
       |                                       I *|I
       |                                       I *|I
    85 +                                       I *|I
       |                                       I *|I
       |                                       I *|I
       |                                       I *|I
       |                                       I *|I
    90 +                                       I *|I
       |                                       I *|I
       |                                       I *|I
```

```
     |                                        I *|I
     |                                        I *|I
  95 +                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
 100 +                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
 105 +                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
 110 +                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
 115 +                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
 120 +                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
 125 +                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
 130 +                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
 135 +                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
 140 +                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
 145 +                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *I
 150 +                                        I *I
     |                                        I *I
     |                                        I *I
     |                                        I *I
     |                                        I *I
 155 +                                        I *I
     |                                        I *I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
 160 +                                        I *I
     |                                        I *I
     |                                        I *|I
     |                                        I *|I
     |                                        I *I
 165 +                                        I *I
     |                                        I *I
     |                                        I* I
     |                                        I *I
     |                                        I *|I
 170 +                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
 175 +                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
 180 +                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
 185 +                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
     |                                        I *|I
```


190
195
200
205
210
215
220
225
230
235
880
885
890
895
900
905
910
915


920
925
930
935
940
945
950
955
960
965
970
975
980
985
990
995
1000
1005
1010
1015

```
          |   I                   .       |         I
          |                   .           |       I
          |                   .           |            I
    1020 +                        .       |                           I
          |        I                      |                 .
```

SKIPPING 3

GENERATIONS

GROUP	FISSION FRACTION	UNIT	REGION	FISSIONS	PERCENT DEVIATION	ABSORPTIONS	PERCENT DEVIATION	LEAKAGE	PERCENT DEVIATION
1	0.0003			2.19740E-04	2.4717	1.31432E-03	0.8817	0.00000E+00	0.0000
2	0.0015			1.09341E-03	0.7322	3.04811E-03	0.2835	0.00000E+00	0.0000
3	0.0017			1.27237E-03	0.6133	9.33984E-04	0.3950	0.00000E+00	0.0000
4	0.0010			7.40677E-04	0.7926	4.99404E-04	0.5404	0.00000E+00	0.0000
5	0.0013			1.00055E-03	0.6716	9.52746E-04	0.3953	0.00000E+00	0.0000
6	0.0017			1.26781E-03	0.5040	2.77494E-03	0.3459	0.00000E+00	0.0000
7	0.0016			1.21258E-03	0.5687	4.91185E-03	0.3810	0.00000E+00	0.0000
8	0.0016			1.19645E-03	0.8956	4.05080E-03	0.4096	0.00000E+00	0.0000
9	0.0022			1.60512E-03	1.0841	4.23075E-03	0.4270	0.00000E+00	0.0000
10	0.0046			3.40837E-03	0.9865	1.04716E-02	0.4109	0.00000E+00	0.0000
11	0.0100			7.45951E-03	0.8650	1.44686E-02	0.4018	0.00000E+00	0.0000
12	0.0133			9.91099E-03	0.9117	1.33269E-02	0.5005	0.00000E+00	0.0000
13	0.0125			9.27553E-03	0.9477	1.64557E-02	0.4665	0.00000E+00	0.0000
14	0.0109			8.08484E-03	0.9065	2.07470E-02	0.3954	0.00000E+00	0.0000
15	0.0022			1.64837E-03	1.7851	1.03632E-02	0.4465	0.00000E+00	0.0000
16	0.0016			1.15611E-03	2.3160	6.16176E-03	0.5040	0.00000E+00	0.0000
17	0.0024			1.77984E-03	2.5360	3.63968E-03	0.8226	0.00000E+00	0.0000
18	0.0032			2.38678E-03	2.3920	3.54809E-03	0.8982	0.00000E+00	0.0000
19	0.0040			2.97879E-03	1.9978	5.90096E-03	0.6187	0.00000E+00	0.0000
20	0.0173			1.28169E-02	1.0271	2.15421E-02	0.3959	0.00000E+00	0.0000
21	0.0095			7.05344E-03	1.4434	8.85516E-03	0.6566	0.00000E+00	0.0000
22	0.0236			1.75389E-02	0.9264	2.03161E-02	0.4664	0.00000E+00	0.0000
23	0.0997			7.40734E-02	0.4269	9.33826E-02	0.2008	0.00000E+00	0.0000
24	0.2310			1.71624E-01	0.2731	2.15314E-01	0.1242	0.00000E+00	0.0000
25	0.2024			1.50360E-01	0.2927	1.90295E-01	0.1263	0.00000E+00	0.0000
26	0.2502			1.85851E-01	0.2641	2.39684E-01	0.1202	0.00000E+00	0.0000
27	0.0886			6.58290E-02	0.4449	8.46067E-02	0.2090	0.00000E+00	0.0000
SYSTEM TOTAL =				7.42845E-01	0.1096	1.00179E+00	0.0220	0.00000E+00	0.0000

ELAPSED TIME 3.98033 MINUTES

RANDOM NUMBER= 2DAD49504B4B

```
                                   FREQUENCY FOR GENERATIONS     4 TO 1023
0.6577 TO 0.6612     *
0.6612 TO 0.6648
0.6648 TO 0.6683
0.6683 TO 0.6719     **
0.6719 TO 0.6754
0.6754 TO 0.6790     **
0.6790 TO 0.6825     **
0.6825 TO 0.6861     ****
0.6861 TO 0.6896     **********
0.6896 TO 0.6931     *****
0.6931 TO 0.6967     *************
0.6967 TO 0.7002     ******************
0.7002 TO 0.7038     *************
0.7038 TO 0.7073     ********************
0.7073 TO 0.7109     **************************
0.7109 TO 0.7144     ************************
0.7144 TO 0.7180     *******************************************
0.7180 TO 0.7215     ****************************************
0.7215 TO 0.7251     ***************************************
0.7251 TO 0.7286     ******************************************
0.7286 TO 0.7322     ***********************************************
0.7322 TO 0.7357     **********************************************
0.7357 TO 0.7393     ***************************************************
0.7393 TO 0.7428     ***************************************************************
0.7428 TO 0.7464     **********************************************************
0.7464 TO 0.7499     ************************************************
0.7499 TO 0.7534     **************************************************
0.7534 TO 0.7570     ***************************************************
0.7570 TO 0.7605     *******************************************
0.7605 TO 0.7641     **********************************
0.7641 TO 0.7676     ******************************************
0.7676 TO 0.7712     *******************************
0.7712 TO 0.7747     ******************************
0.7747 TO 0.7783     *********************************
0.7783 TO 0.7818     **************************
0.7818 TO 0.7854     *********************
0.7854 TO 0.7889     *********
0.7889 TO 0.7925     ******
0.7925 TO 0.7960     *******
0.7960 TO 0.7996     *******
0.7996 TO 0.8031     *****
0.8031 TO 0.8067     *
0.8067 TO 0.8102     ****
0.8102 TO 0.8137     *
0.8137 TO 0.8173     *
0.8173 TO 0.8208
0.8208 TO 0.8244
0.8244 TO 0.8279     *
```

```
                              FREQUENCY FOR GENERATIONS  259 TO 1023
0.6577 TO 0.6612     *
0.6612 TO 0.6648
0.6648 TO 0.6683
0.6683 TO 0.6719     **
0.6719 TO 0.6754
0.6754 TO 0.6790     **
0.6790 TO 0.6825     **
0.6825 TO 0.6861     ****
0.6861 TO 0.6896     ******
0.6896 TO 0.6931     ***
0.6931 TO 0.6967     *********
0.6967 TO 0.7002     ***********
0.7002 TO 0.7038     ********
0.7038 TO 0.7073     ******************
0.7073 TO 0.7109     *********************
0.7109 TO 0.7144     *************
0.7144 TO 0.7180     **********************************
0.7180 TO 0.7215     ******************************
0.7215 TO 0.7251     ********************************
0.7251 TO 0.7286     ******************************
0.7286 TO 0.7322     ***********************************
0.7322 TO 0.7357     *******************************
0.7357 TO 0.7393     ***********************************
0.7393 TO 0.7428     *********************************************
0.7428 TO 0.7464     *************************************
0.7464 TO 0.7499     *********************************
0.7499 TO 0.7534     ********************************
0.7534 TO 0.7570     ***************************************
0.7570 TO 0.7605     ***************************
0.7605 TO 0.7641     ************************
0.7641 TO 0.7676     ************************
0.7676 TO 0.7712     ******************
0.7712 TO 0.7747     **********************
0.7747 TO 0.7783     ***********************
0.7783 TO 0.7818     *********************
0.7818 TO 0.7854     *******************
0.7854 TO 0.7889     ******
0.7889 TO 0.7925     *****
0.7925 TO 0.7960     *****
0.7960 TO 0.7996     ******
0.7996 TO 0.8031     *****
0.8031 TO 0.8067     *
0.8067 TO 0.8102     **
0.8102 TO 0.8137
0.8137 TO 0.8173     *
0.8173 TO 0.8208
0.8208 TO 0.8244
0.8244 TO 0.8279
```

```
                                FREQUENCY FOR GENERATIONS  514 TO 1023
0.6577 TO 0.6612
0.6612 TO 0.6648
0.6648 TO 0.6683
0.6683 TO 0.6719     **
0.6719 TO 0.6754
0.6754 TO 0.6790     *
0.6790 TO 0.6825     *
0.6825 TO 0.6861     ***
0.6861 TO 0.6896     ***
0.6896 TO 0.6931     ***
0.6931 TO 0.6967     ******
0.6967 TO 0.7002     *********
0.7002 TO 0.7038     ******
0.7038 TO 0.7073     ***************
0.7073 TO 0.7109     ***************
0.7109 TO 0.7144     ********
0.7144 TO 0.7180     ************************
0.7180 TO 0.7215     ***********************
0.7215 TO 0.7251     ************************
0.7251 TO 0.7286     **********************
0.7286 TO 0.7322     **************************
0.7322 TO 0.7357     *************************
0.7357 TO 0.7393     *********************
0.7393 TO 0.7428     ****************************
0.7428 TO 0.7464     ******************************
0.7464 TO 0.7499     *********************
0.7499 TO 0.7534     ***************************
0.7534 TO 0.7570     *******************************
0.7570 TO 0.7605     ******************
0.7605 TO 0.7641     ****************
0.7641 TO 0.7676     *****************
0.7676 TO 0.7712     ***********
0.7712 TO 0.7747     **************
0.7747 TO 0.7783     ******************
0.7783 TO 0.7818     **********
0.7818 TO 0.7854     **************
0.7854 TO 0.7889     ****
0.7889 TO 0.7925     **
0.7925 TO 0.7960     **
0.7960 TO 0.7996     *****
0.7996 TO 0.8031     ****
0.8031 TO 0.8067
0.8067 TO 0.8102     *
0.8102 TO 0.8137
0.8137 TO 0.8173
0.8173 TO 0.8208
0.8208 TO 0.8244
0.8244 TO 0.8279
```

```
                                   FREQUENCY FOR GENERATIONS  769 TO 1023
0.6577 TO 0.6612
0.6612 TO 0.6648
0.6648 TO 0.6683
0.6683 TO 0.6719
0.6719 TO 0.6754
0.6754 TO 0.6790    *
0.6790 TO 0.6825    *
0.6825 TO 0.6861    *
0.6861 TO 0.6896    ***
0.6896 TO 0.6931    *
0.6931 TO 0.6967    **
0.6967 TO 0.7002    **
0.7002 TO 0.7038    ***
0.7038 TO 0.7073    *********
0.7073 TO 0.7109    *******
0.7109 TO 0.7144    ***
0.7144 TO 0.7180    **********
0.7180 TO 0.7215    ************
0.7215 TO 0.7251    ******************
0.7251 TO 0.7286    *************
0.7286 TO 0.7322    *************
0.7322 TO 0.7357    ********
0.7357 TO 0.7393    *******
0.7393 TO 0.7428    *************
0.7428 TO 0.7464    ***************
0.7464 TO 0.7499    *********
0.7499 TO 0.7534    **************
0.7534 TO 0.7570    *****************
0.7570 TO 0.7605    *******
0.7605 TO 0.7641    ********
0.7641 TO 0.7676    *********
0.7676 TO 0.7712    ******
0.7712 TO 0.7747    ********
0.7747 TO 0.7783    **********
0.7783 TO 0.7818    ******
0.7818 TO 0.7854    *******
0.7854 TO 0.7889    ***
0.7889 TO 0.7925    *
0.7925 TO 0.7960
0.7960 TO 0.7996    ***
0.7996 TO 0.8031    ****
0.8031 TO 0.8067
0.8067 TO 0.8102    *
0.8102 TO 0.8137
0.8137 TO 0.8173
0.8173 TO 0.8208
0.8208 TO 0.8244
0.8244 TO 0.8279
```

6.6.14 High Fissile Mass LEU (32 g ^{235}U per Plate) MTR Fuel Elements

This section contains a sample input file for the evaluation of high fissile mass LEU MTR fuel elements. The file contains partially loaded top and bottom baskets containing the high fissile mass LEU MTR fuel elements and filled (seven elements) intermediate baskets containing maximum reactivity HEU MTR fuel elements.

Figure 6.6.14-1 High Fissile Mass LEU MTR Sample Input

```
=CSAS25
LWT MTR INPUT FOR CASK MODEL - PLATES IN CLOSE & PLATES @ FULL PITCH
'MIN BASKET PLATE - COMMENT CARD REFERS TO NOMINAL PLATE SIZE
' TYPE A FUEL - FULL BASKETS
'     23 PLATES - 20 GRAM U-235 PER PLATE
'     0.123 CM PLATE THICKNESS; 6.6 CM FUEL WIDTH; 56 CM FUEL HEIGHT
'     HEU FUEL COMPOSITION 30 WT%U - 94 WT 235U
' TYPE B FUEL - FULL/PARTIAL BASKETS
'     23 PLATES - 32 GRAM U-235 PER PLATE
'     0.115 CM PLATE THICKNESS; 7.3 CM FUEL WIDTH; 56 CM FUEL HEIGHT
'     LEU FUEL COMPOSITION 75 WT%U - 25 WT%235U
'FUEL SHIFT AXIAL ALTERNATING
27GROUPNDF4  LATTICECELL
' TYPE B FUEL - FULL/PARTIAL BASKET FUEL MATERIAL
URANIUM  1 DEN=19.05 0.21915 293 92235 25 92238 75 END
AL       1 DEN=2.702 0.51503 293 END
' CLAD, MODERATOR, AND CASK MATERIALS
AL    2 1.0     293.0 END
H2O   3 1     293.0 END
AL    4 1.0     293.0 END
SS304 5 1.0     293.0 END
PB    6 1.0     293.0 END
H2O   7 1.E-20 293.0 END
H2O   8 1.E-20 293.0 END
H2O   9 1.0     293.0 END
' TYPE A FUEL - FULL BASKET FUEL MATERIAL
URANIUM  10 DEN=19.05 0.0364 293 92235 94 92238 6 END
AL       10 DEN=2.702 0.59889 293 END
' SPACER MATERIAL
AL    11 1.0     293.0 END
END COMP
SYMMSLABCELL 0.3917 0.075 1 3 0.115 2 END
' DANCOFF CORRECTION FACTOR FOR TYPE A FUEL- FULL BASKET FUEL DEFINITION
MORE DATA DAN(10)=0.5119  RES=10 SLAB 0.083 END MORE

READ PARAM TBA=10 RUN=YES PLT=NO GEN=803 NPG=1000 RND=ABCD1234 END PARAM
READ GEOM
'
' FUEL PLATE CELL UNITS - FULL BASKETS - TYPE A FUEL
'
UNIT 1
COM='MIDDLE FUEL PLATE CELL'
CUBOID 10 1 2P3.3000 2P0.0415 58 2
CUBOID 2 1 2P3.3000 2P0.0615 60 0.0
CUBOID 3 1 2P3.3000 2P0.1957 60 0.0
UNIT 2
COM='TOP FUEL PLATE CELL'
CUBOID 10 1 2P3.3000 2P0.0415 58 2
CUBOID 2 1 2P3.3000 2P0.0615 60 0.0
CUBOID 3 1 2P3.3000 0.0615 -0.1957 60 0.0
UNIT 3
COM='BOTTOM FUEL PLATE CELL'
CUBOID 10 1 2P3.3000 2P0.0415 58 2
CUBOID 2 1 2P3.3000 2P0.0615 60 0.0
CUBOID 3 1 2P3.3000 0.1957 -0.0615 60 0.0
'
UNIT 4
COM='SIDE PLATE'
CUBOID 2 1 2P0.2 2P3.75 60 0.0
'
'FUEL PLATE CELL UNITS - FULL/PARTIAL BASKET -  TYPE B FUEL
'
UNIT 5
COM='MIDDLE FUEL PLATE CELL'
CUBOID 1 1 2P3.6500 2P0.0375 56.7 0.7
CUBOID 2 1 2P3.6500 2P0.0575 57.4 0.0
CUBOID 3 1 2P3.6500 2P0.19585 57.4 0.0
UNIT 6
COM='TOP FUEL PLATE CELL'
CUBOID 1 1 2P3.6500 2P0.0375 56.7 0.7
CUBOID 2 1 2P3.6500 2P0.0575 57.4 0.0
CUBOID 3 1 2P3.6500 0.0575 -0.19585 57.4 0.0
UNIT 7
COM='BOTTOM FUEL PLATE CELL'
CUBOID 1 1 2P3.6500 2P0.0375 56.7 0.7
CUBOID 2 1 2P3.6500 2P0.0575 57.4 0.0
CUBOID 3 1 2P3.6500 0.19585 -0.0575 57.4 0.0
'
UNIT 8
COM='SIDE PLATE'
CUBOID 2 1 2P0.2 2P3.75 57.4 0.0
'
' UNITS 10 TO 100 ELEMENTES SHIFTED DOWN IN BASKET
'
'
' BASKET CENTER ROW ARRAY ELEMENTS
'
UNIT 10
COM='FUEL PLATE ARRAY - PLATES IN 5/16 IN. WEB CENTER'
ARRAY  1 -3.3000 -4.3688 0.0
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 0.0
HOLE   4  4.1687 0.0 0.0
```

```
REPLICATE 5 1 2R0.3556 4R0.0 1
UNIT 11
COM='FUEL ARRAY PLATES IN 5/16 IN. WEB RIGHT'
ARRAY  1 -3.9686 -4.3688 0.0
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 0.0
HOLE   4  4.1687 0.0 0.0
REPLICATE 5 1 2R0.3556 4R0.0 1
UNIT 12
COM='FUEL ARRAY PLATES IN 5/16 IN. WEB LEFT'
ARRAY  1 -2.6314 -4.3688 0.0
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 0.0
HOLE   4  4.1687 0.0 0.0
REPLICATE 5 1 2R0.3556 4R0.0 1
'
' BASKET TOP ROW ARRAY ELEMENTS
'
UNIT 20
COM='FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON RIGHT -  TOP STACK'
ARRAY  1 -2.6314 -4.3688 0.0
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 0.0
HOLE   4  4.1687 0.0 0.0
REPLICATE 5 1 0.3048 5R0.0 1
UNIT 21
COM='FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON LEFT  - TOP STACK'
ARRAY  1 -3.9686 -4.3688 0.0
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 0.0
HOLE   4  4.1687 0.0 0.0
REPLICATE 5 1 0.0 0.3048 4R0.0 1
'
' BASKET BOTTOM ROW ARRAY ELEMENTS
'
UNIT 30
COM='FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON RIGHT -  BOTTOM STACK'
ARRAY  1 -2.6314 -4.3688 0.0
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 0.0
HOLE   4  4.1687 0.0 0.0
REPLICATE 5 1 0.3048 5R0.0 1
UNIT 31
COM='FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON LEFT - BOTTOM STACK'
ARRAY  1 -3.9686 -4.3688 0.0
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 0.0
HOLE   4  4.1687 0.0 0.0
REPLICATE 5 1 0.0 0.3048 4R0.0 1
'
' CONSTRUCTION OF BASKET ROWS
'
UNIT 40
COM='2 UNIT ARRAY WITH 1/4 IN. PLATE ON TOP AND SIDES'
ARRAY 2 -9.0428 -4.3688 0.0
REPLICATE 5 1 3R0.3048 0.0 2R0.0 1
UNIT 41
COM='3 UNIT ARRAY WITH REST OF 5/16 WEB'
ARRAY 3 -14.1738 -4.3688 0.0
REPLICATE 5 1 2R0.3556 2R0.7112 2R0.0 1
UNIT 42
COM='2 UNIT ARRAY WITH 1/4 IN. PLATE ON BOTTOM AND SIDES'
ARRAY 4 -9.0428 -4.3688 0.0
REPLICATE 5 1 2R0.3048 0.0 0.3048 2R0.0 1
'
' BASKET UNIT
'
UNIT 50
COM='7 MTR ELEMENTS IN THE LWT'
CYLINDER 3 1 17.0500 73.152 0.0
HOLE 40 0.0 +9.4489 0.0
HOLE 41 0.0  0.0    0.0
HOLE 42 0.0 -9.4489 0.0
CYLINDER 5 1 18.8913   73.152 -1.27
CYLINDER 6 1 33.4963   73.152 -1.27
CYLINDER 5 1 36.5443   73.152 -1.27
CYLINDER 7 1 49.2443   73.152 -1.27
CYLINDER 5 1 49.8539   73.152 -1.27
CUBOID   8 1 4P49.8539 73.152 -1.27
'
' UNITS 110 TO 150 ELEMENTES SHIFTED UP IN BASKET
'
' BASKET CENTER ROW ARRAY ELEMENTS
'
UNIT 110
COM='FUEL PLATE ARRAY - PLATES IN 5/16 IN. WEB CENTER'
ARRAY  1 -3.3000 -4.3688 13.152
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 13.152
HOLE   4  4.1687 0.0 13.152
REPLICATE 5 1 2R0.3556 4R0.0 1
UNIT 111
COM='FUEL ARRAY PLATES IN 5/16 IN. WEB RIGHT'
ARRAY  1 -3.9686 -4.3688 13.152
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 13.152
HOLE   4  4.1687 0.0 13.152
```

```
REPLICATE 5 1 2R0.3556 4R0.0 1
UNIT 112
COM='FUEL ARRAY PLATES IN 5/16 IN. WEB LEFT'
ARRAY  1 -2.6314 -4.3688 13.152
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 13.152
HOLE   4  4.1687 0.0 13.152
REPLICATE 5 1 2R0.3556 4R0.0 1
'
' BASKET TOP ROW ARRAY ELEMENTS
'
UNIT 120
COM='FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON RIGHT -  TOP STACK'
ARRAY  1 -2.6314 -4.3688 13.152
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 13.152
HOLE   4  4.1687 0.0 13.152
REPLICATE 5 1 0.3048 5R0.0 1
UNIT 121
COM='FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON LEFT - TOP STACK'
ARRAY  1 -3.9686 -4.3688 13.152
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 13.152
HOLE   4  4.1687 0.0 13.152
REPLICATE 5 1 0.0 0.3048 4R0.0 1
'
' BASKET BOTTOM ROW ARRAY ELEMENTS
'
UNIT 130
COM='FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON RIGHT -  BOTTOM STACK'
ARRAY  1 -2.6314 -4.3688 13.152
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 13.152
HOLE   4  4.1687 0.0 13.152
REPLICATE 5 1 0.3048 5R0.0 1
UNIT 131
COM='FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON LEFT - BOTTOM STACK'
ARRAY  1 -3.9686 -4.3688 13.152
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   4 -4.1687 0.0 13.152
HOLE   4  4.1687 0.0 13.152
REPLICATE 5 1 0.0 0.3048 4R0.0 1
'
' CONSTRUCTION OF BASKET ROWS
'
UNIT 140
COM='2 UNIT ARRAY WITH 1/4 IN. PLATE ON TOP AND SIDES'
ARRAY 5 -9.0428 -4.3688 0.0
REPLICATE 5 1 3R0.3048 0.0 2R0.0 1
UNIT 141
COM='3 UNIT ARRAY WITH REST OF 5/16 WEB'
ARRAY 6 -14.1738 -4.3688 0.0
REPLICATE 5 1 2R0.3556 2R0.7112 2R0.0 1
UNIT 142
COM='2 UNIT ARRAY WITH 1/4 IN. PLATE ON BOTTOM AND SIDES'
ARRAY 7 -9.0428 -4.3688 0.0
REPLICATE 5 1 2R0.3048 0.0 0.3048 2R0.0 1
'
' BASKET UNIT
'
UNIT 150
COM='7 MTR ELEMENTS IN THE LWT'
CYLINDER 3 1 17.0500 73.152 0.0
HOLE 140 0.0 +9.4489 0.0
HOLE 141 0.0  0.0     0.0
HOLE 142 0.0 -9.4489 0.0
CYLINDER 5 1 18.8913   73.152 -1.27
CYLINDER 6 1 33.4963   73.152 -1.27
CYLINDER 5 1 36.5443   73.152 -1.27
CYLINDER 7 1 49.2443   73.152 -1.27
CYLINDER 5 1 49.8539   73.152 -1.27
CUBOID   8 1 4P49.8539 73.152 -1.27
'
' UNITS 210 TO 250 ELEMENTS SHIFTED DOWN IN BASKET - NO FUEL IN CENTER ROW
'
' BASKET CENTER ROW ARRAY ELEMENTS
'
UNIT 210
COM='FUEL PLATE ARRAY - PLATES IN 5/16 IN. WEB CENTER'
CYLINDER 3 1 3.81 73.152 0.0
CYLINDER 11 1 4.1275 73.152 0.0
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
REPLICATE 5 1 2R0.3556 4R0.0 1
UNIT 211
COM='FUEL ARRAY PLATES IN 5/16 IN. WEB RIGHT'
CYLINDER 3 1 3.81 73.152 0.0
CYLINDER 11 1 4.1275 73.152 0.0
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
REPLICATE 5 1 2R0.3556 4R0.0 1
UNIT 212
COM='FUEL ARRAY PLATES IN 5/16 IN. WEB LEFT'
CYLINDER 3 1 3.81 73.152 0.0
CYLINDER 11 1 4.1275 73.152 0.0
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
REPLICATE 5 1 2R0.3556 4R0.0 1
'
' BASKET TOP ROW ARRAY ELEMENTS
```

```
'
UNIT 220
COM='FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON RIGHT -  TOP STACK'
ARRAY  11 -3.3314 -4.3688 0.0
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   8 -4.1687 0.0 0.0
HOLE   8  4.1687 0.0 0.0
REPLICATE 5 1 0.3048 5R0.0 1
UNIT 221
COM='FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON LEFT  - TOP STACK'
ARRAY  11 -3.9686 -4.3688 0.0
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   8 -4.1687 0.0 0.0
HOLE   8  4.1687 0.0 0.0
REPLICATE 5 1 0.0 0.3048 4R0.0 1
'
' BASKET BOTTOM ROW ARRAY ELEMENTS
'
UNIT 230
COM='FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON RIGHT -  BOTTOM STACK'
ARRAY  11 -3.3314 -4.3688 0.0
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   8 -4.1687 0.0 0.0
HOLE   8  4.1687 0.0 0.0
REPLICATE 5 1 0.3048 5R0.0 1
UNIT 231
COM='FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON LEFT - BOTTOM STACK'
ARRAY  11 -3.9686 -4.3688 0.0
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   8 -4.1687 0.0 0.0
HOLE   8  4.1687 0.0 0.0
REPLICATE 5 1 0.0 0.3048 4R0.0 1
'
' CONSTRUCTION OF BASKET ROWS
'
UNIT 240
COM='2 UNIT ARRAY WITH 1/4 IN. PLATE ON TOP AND SIDES'
ARRAY 12 -9.0428 -4.3688 0.0
REPLICATE 5 1 3R0.3048 0.0 2R0.0 1
UNIT 241
COM='3 UNIT ARRAY WITH REST OF 5/16 WEB'
ARRAY 13 -14.1738 -4.3688 0.0
REPLICATE 5 1 2R0.3556 2R0.7112 2R0.0 1
UNIT 242
COM='2 UNIT ARRAY WITH 1/4 IN. PLATE ON BOTTOM AND SIDES'
ARRAY 14 -9.0428 -4.3688 0.0
REPLICATE 5 1 2R0.3048 0.0 0.3048 2R0.0 1
'
' BASKET UNIT
'
UNIT 250
COM='7 MTR ELEMENTS IN THE LWT'
CYLINDER 3 1 17.0500 73.152 0.0
HOLE 240 0.0 +9.4489 0.0
HOLE 241 0.0  0.0     0.0
HOLE 242 0.0 -9.4489 0.0
CYLINDER 5 1 18.8913   73.152 -1.27
CYLINDER 6 1 33.4963   73.152 -1.27
CYLINDER 5 1 36.5443   73.152 -1.27
CYLINDER 7 1 49.2443   73.152 -1.27
CYLINDER 5 1 49.8539   73.152 -1.27
CUBOID   8 1 4P49.8539 73.152 -1.27
'
' UNITS 310 TO 350 ELEMENTS SHIFTED UP IN BASKET - NO FUEL IN CENTER ROW
'
' BASKET CENTER ROW ARRAY ELEMENTS
'
UNIT 310
COM='FUEL PLATE ARRAY - PLATES IN 5/16 IN. WEB CENTER'
CYLINDER 3 1 3.81 73.152 0.0
CYLINDER 11 1 4.1275 73.152 0.0
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
REPLICATE 5 1 2R0.3556 4R0.0 1
UNIT 311
COM='FUEL ARRAY PLATES IN 5/16 IN. WEB RIGHT'
CYLINDER 3 1 3.81 73.152 0.0
CYLINDER 11 1 4.1275 73.152 0.0
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
REPLICATE 5 1 2R0.3556 4R0.0 1
UNIT 312
COM='FUEL ARRAY PLATES IN 5/16 IN. WEB LEFT'
CYLINDER 3 1 3.81 73.152 0.0
CYLINDER 11 1 4.1275 73.152 0.0
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
REPLICATE 5 1 2R0.3556 4R0.0 1
'
' BASKET TOP ROW ARRAY ELEMENTS
'
UNIT 320
COM='FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON RIGHT -  TOP STACK'
ARRAY  11 -3.3314 -4.3688 15.752
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   8 -4.1687 0.0 15.752
HOLE   8  4.1687 0.0 15.752
REPLICATE 5 1 0.3048 5R0.0 1
UNIT 321
COM='FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON LEFT - TOP STACK'
```

```
ARRAY  11 -3.9686 -4.3688 15.752
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   8 -4.1687 0.0 15.752
HOLE   8  4.1687 0.0 15.752
REPLICATE 5 1 0.0 0.3048 4R0.0 1
'
' BASKET BOTTOM ROW ARRAY ELEMENTS
'
UNIT 330
COM='FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON RIGHT -  BOTTOM STACK'
ARRAY  11 -3.3314 -4.3688 15.752
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   8 -4.1687 0.0 15.752
HOLE   8  4.1687 0.0 15.752
REPLICATE 5 1 0.3048 5R0.0 1
UNIT 331
COM='FUEL ARRAY WITH HALF OF 1/4 IN. PLATE ON LEFT - BOTTOM STACK'
ARRAY  11 -3.9686 -4.3688 15.752
CUBOID 3 1 2P4.3688 2P4.3688 73.152 0.0
HOLE   8 -4.1687 0.0 15.752
HOLE   8  4.1687 0.0 15.752
REPLICATE 5 1 0.0 0.3048 4R0.0 1
'
' CONSTRUCTION OF BASKET ROWS
'
UNIT 340
COM='2 UNIT ARRAY WITH 1/4 IN. PLATE ON TOP AND SIDES'
ARRAY 15 -9.0428 -4.3688 0.0
REPLICATE 5 1 3R0.3048 0.0 2R0.0 1
UNIT 341
COM='3 UNIT ARRAY WITH REST OF 5/16 WEB'
ARRAY 16 -14.1738 -4.3688 0.0
REPLICATE 5 1 2R0.3556 2R0.7112 2R0.0 1
UNIT 342
COM='2 UNIT ARRAY WITH 1/4 IN. PLATE ON BOTTOM AND SIDES'
ARRAY 17 -9.0428 -4.3688 0.0
REPLICATE 5 1 2R0.3048 0.0 0.3048 2R0.0 1
'
' BASKET UNIT
'
UNIT 350
COM='7 MTR ELEMENTS IN THE LWT'
CYLINDER 3 1 17.0500 73.152 0.0
HOLE 340 0.0 +9.4489 0.0
HOLE 341 0.0  0.0    0.0
HOLE 342 0.0 -9.4489 0.0
CYLINDER 5 1 18.8913   73.152 -1.27
CYLINDER 6 1 33.4963   73.152 -1.27
CYLINDER 5 1 36.5443   73.152 -1.27
CYLINDER 7 1 49.2443   73.152 -1.27
CYLINDER 5 1 49.8539   73.152 -1.27
CUBOID   8 1 4P49.8539 73.152 -1.27
'
' CASK LID AND BOTTOM STRUCTURE
'
UNIT 460
COM='SIMPLIFIED LID STRUCTURE NAC-LWT'
CYLINDER 5 1 36.5188   13.6775 -14.1351
CYLINDER 8 1 49.8539   13.6775 -14.1351
CUBOID   8 1 4P49.8539 13.6775 -14.1351
UNIT 461
COM='SIMPLIFIED CASK BOTTOM STRUCTURE NAC-LWT'
CYLINDER 6 1 26.3525 2P3.81
CYLINDER 5 1 36.6188 +13.36 -12.7
CYLINDER 8 1 49.8539 +13.36 -12.7
CUBOID   8 1 4P49.8539 +13.36 -12.7
UNIT 462
COM='THIN TOP AND BOTTOM SHELL OF NEUTRON SHIELD - SUBTRACTED FROM LID MODEL'
CYLINDER 5 1 49.8539 0.61 0.0
CUBOID   8 1 4P49.8539 0.61 0.0
'
' STACK OF BASKETS WITH CASK LID AND BOTTOM
'
GLOBAL UNIT 470
COM='STACK OF 6 BASKETS IN CASK WITH LID AND BOTTOM'
ARRAY  40  -49.8539 -49.8539 0.0
END GEOM
READ ARRAY
'
' ARRAYS FOR TYPE A BASKETS
'
' FUEL ELEMENT PLATE ARRAY
'
ARA=1 NUX=1 NUY=23 NUZ=1 FILL 3 21R1 2 END FILL
'
' ARRAYS OF BASKET OPENINGS (TOP, MIDDLE, BOTTOM)
' PLATES AT BOTTOM OF OPENING
'
ARA=2 NUX=2 NUY=1 NUZ=1 FILL 20 21 END FILL
ARA=3 NUX=3 NUY=1 NUZ=1 FILL 12 10 11 END FILL
ARA=4 NUX=2 NUY=1 NUZ=1 FILL 30 31 END FILL
'
' ARRAYS OF BASKET OPENINGS (TOP, MIDDLE, BOTTOM)
' PLATES AT TOP OF OPENING
'
ARA=5 NUX=2 NUY=1 NUZ=1 FILL 120 121 END FILL
ARA=6 NUX=3 NUY=1 NUZ=1 FILL 112 110 111 END FILL
```

```
ARA=7 NUX=2 NUY=1 NUZ=1 FILL 130 131 END FILL
'
' ARRAYS FOR TYPE B  BASKETS
'
ARA=11 NUX=1 NUY=23 NUZ=1 FILL 7 21R5 6 END FILL
'
' ARRAYS OF BASKET OPENINGS (TOP, MIDDLE, BOTTOM)
' PLATES AT BOTTOM OF OPENING
'
ARA=12 NUX=2 NUY=1 NUZ=1 FILL 220 221 END FILL
ARA=13 NUX=3 NUY=1 NUZ=1 FILL 212 210 211 END FILL
ARA=14 NUX=2 NUY=1 NUZ=1 FILL 230 231 END FILL
'
' ARRAYS OF BASKET OPENINGS (TOP, MIDDLE, BOTTOM)
' PLATES AT TOP OF OPENING
'
ARA=15 NUX=2 NUY=1 NUZ=1 FILL 320 321 END FILL
ARA=16 NUX=3 NUY=1 NUZ=1 FILL 312 310 311 END FILL
ARA=17 NUX=2 NUY=1 NUZ=1 FILL 330 331 END FILL
'
' ARRAY OF BASKETS WITH LID AND BOTTOM
'
ARA=40 NUX=1 NUY=1 NUZ=10 FILL 461 462 350 50 150 50 150 250 462 460 END FILL
END ARRAY
READ BOUNDS ALL=MIR END BOUNDS
READ START NST=0 XSM=-17 XSP=17 YSM=-17 YSP=17 ZSM=25 ZSP=475  END BOUNDS
READ PLOT
TTL='X-Y PLOT OF CENTER ELEMENT - FUEL ELEVATION'
SCR=YES PIC=MAT LPI=10
UAX=1.0 VDN=-1.0 NAX=1500
XUL=-5.0 YUL=5.0 ZUL=150.0
XLR=5.0 YLR=-5.0 ZLR=150.0 END
TTL='X-Y PLOT OF BASKET - FUEL ELEVATION'
UAX=1.0 VDN=-1.0 NAX=1500
XUL=-17.0 YUL=17.0 ZUL=50.0
XLR=17.0 YLR=-17.0 ZLR=50.0 END
TTL='X-Y PLOT OF BASKET - FUEL ELEVATION - MIDDLE BASKET'
UAX=1.0 VDN=-1.0 NAX=1500
XUL=-17.0 YUL=17.0 ZUL=150.0
XLR=17.0 YLR=-17.0 ZLR=150.0 END
TTL='X-Y PLOT OF CASK - FUEL ELEVATION'
UAX=1.0 VDN=-1.0 NAX=1500
XUL=-65.0 YUL=65.0 ZUL=150.0
XLR=65.0 YLR=-65.0 ZLR=150.0 END
TTL='Y-Z (X=0) PLOT OF MIDDLE BASKET - CENTER SECTION'
VAX=1.0 WDN=-1.0
XUL=0.0 YUL=-5.0 ZUL=155.0
XLR=0.0 YLR=5.0 ZLR=150.0 END
TTL='Y-Z (X=0) PLOT OF MIDDLE BASKET - CENTER FUEL ELEMENT'
VAX=1.0 WDN=-1.0
XUL=0.0 YUL=-5.0 ZUL=180.0
XLR=0.0 YLR=5.0 ZLR=100.0 END
TTL='Y-Z (X=-2) PLOT OF MIDDLE BASKET'
VAX=1.0 WDN=-1.0
XUL=-2.0 YUL=-15.0 ZUL=180
XLR=-2.0 YLR=15.0 ZLR=100.00 END
TTL='Y-Z (X=-2) PLOT OF CASK - R=17.0'
LPI=5 NAX=1000
VAX=1.0 WDN=-1.0
XUL=-2.0 YUL=-17.0 ZUL=502.0
XLR=-2.0 YLR=17.0 ZLR=-1.0 END
TTL='Y-Z (X=-2) PLOT OF CASK - R=51.0'
VAX=1.0 WDN=-1.0
XUL=-2.0 YUL=-51.0 ZUL=502.0
XLR=-2.0 YLR=51.0 ZLR=-1.0 END
END PLOT
END DATA
END
```

6.6.15 PWR MOX Fuel Rods

This section contains truncated sample output files from the evaluation of MOX fuel rods in the NAC-LWT cask. The output files are shown in Figure 6.6.15-1 (MOX Services fuel composition in a hexagonal pitch) and Figure 6.6.15-2 (hexagonal pitch ^{241}Pu fuel composition). Included as Figure 6.6.15-3 is the MOX Services fuel composition case containing a square pitch rod lattice (3.8 cm pitch).

Figure 6.6.15-1 Hexagonal Pitch MOX Rods – MOX Services Fuel Composition

```
Thread Name & Version = MCNP5_RSICC, 1.30

+---------------------------------------------------------------------+
|  This program was prepared by the Regents of the University of     |
|California at Los Alamos National Laboratory (the University) under |
|  contract number W-7405-ENG-36 with the U.S. Department of Energy  |
|(DoE).  The University has certain rights in the program pursuant to|
|  the contract and the program should not be copied or distributed  |
| outside your organization.  All rights in the program are reserved |
|by the DoE and the University.  Neither the U.S. Government nor the |
| University makes any warranty, express or implied, or assumes any  |
|      liability or responsibility for the use of this software.     |
+---------------------------------------------------------------------+

1mcnp     version 5     ld=06212004                    10/25/07 21:05:56
*************************************************************************                probid =  10/25/07 21:05:56
name=MS_Acc_NACCoC_c1.00_g0.00_e0.00_d0.01cm_HP_36mm.inp host=amdengl-itl458

NAC-LWT Cask - MOX Experiments - Accident Transport Conditions
C
C EXCEL File Version: v2.00
C Run Version: v2.00
C
C Fissile Material Type: MOX Services
C Rod Interior Void Moderator Density: 0.9982 g/cc
C Canister Interior Moderator Density: 0.9982 g/cc
C Canister to Cask Gap Moderator Density: 0.0001 g/cc
C Cask Exterior Moderator Density: 0.0001 g/cc
C Boundary Condition / Distance:  Reflected / 0.01 cm
C
C Fuel Rod Pitch: 3.6 cm
C Fuel Rod Pitch Cofiguration: Hexagonal
C Number of Rods: 16
C
C Base Fuel Parameters: NACCoC
C
c Cells - Fuel Rod - NACCoC
1 1 -10.555 -1    u=3 $ Fuel
2 2 -0.9982 -2 +1  u=3 $ Plenum + Fuel to Clad Gap
3 3 -6.56 -3 +2  u=3 $ Clad + End Plugs
4 4 -0.9982 +3   u=3 $ Outside Fuel Rod
C 16 Rods - Hexagonal Pitch
10 4 -0.9982 -10
           *trcl=( 0.9000 -1.5588 0.0000 )
           lat=2 u=2 fill=-7:6 -5:5 0:0
      2 2 2 2 2 2 2 2 2 2 2 2 2 2
      2 2 2 2 2 2 2 2 2 2 2 2 2 2
      2 2 2 2 2 2 2 2 2 2 2 2 2 2
      2 2 2 2 2 2 2 3 2 2 2 2 2 2
      2 2 2 2 2 2 3 3 3 2 2 2 2 2
      2 2 2 2 2 3 3 3 3 3 2 2 2 2
      2 2 2 2 2 3 3 3 3 2 2 2 2 2
      2 2 2 2 2 3 3 3 2 2 2 2 2 2
      2 2 2 2 2 2 2 2 2 2 2 2 2 2
      2 2 2 2 2 2 2 2 2 2 2 2 2 2
      2 2 2 2 2 2 2 2 2 2 2 2 2 2
C PWR Basket - Cells
20  4 -0.9982 -20   fill=2  u=1 $ Rod Array Container
21  5 -0.0001 +20 -21    u=1 $ Basket Cavity
22  7 -2.7020 -22 +21    u=1 $ Basket Body
23  5 -0.0001 +22      u=1 $ Outside
C Cells - LWT Cask Accident Conditions
40 8 -11.344 -43      u=0 $ BotPb
41 5 -0.0001 -42 fill=1    u=0 $ Cavity
42 9 -7.9400 -41 +43    u=0 $ Bottom
43 9 -7.9400 -40 +41 +45 +48 +42 u=0 $ OuterShell
44 9 -7.9400 -44 +47 +42   u=0 $ InnerShellTaper
45 9 -7.9400 -46 +42    u=0 $ InnerShell
46 8 -11.344 -47 +46    u=0 $ Lead
47 8 -11.344 -45 +44 +47   u=0 $ LeadTaper
48 0         -48 +47    u=0 $ LeadGap
49 6 -0.0001 -49 +40    u=0 $ Gap to Reflector
50 0          +49    u=0 $ Boundary

c Surfaces - Fuel Rod - NACCoC
1 RCC 0.0000 0.0000 10.5207 0.0000 0.0000 389.8900 0.4781   $ Fuel pellet stack
2 RCC 0.0000 0.0000 6.3990 0.0000 0.0000 409.4227 0.4876   $ Annulus + Plenum
3 RCC 0.0000 0.0000 5.0800 0.0000 0.0000 411.8226 0.5588   $ Clad + End-Caps
c Surfaces - Pitch - NACCoC
10 RHP 0.0000 0.0000 -1.0000 0.0000 0.0000 454.12 1.8000 0.0000 0.0000 $ Lattice
C PWR Basket - Surfaces
20 1 RPP -7.4148 7.4148 -7.4148 7.4148 0.0000 452.1200  $ Array Container
21 1 RPP -11.2713 11.2713 -11.2713 11.2713 0.0000 452.1200  $ Basket Opening
22  RCC 0.0000 0.0000 0.0000 0.0000 0.0000 452.1200 16.83512 $ Basket Outer Body
C Surfaces - LWT Cask Accident Conditions
40 RCC 0.0000 0.0000 -26.6700 0.0000 0.0000 507.3650 36.5189 $ Lwt Body
41 RCC 0.0000 0.0000 -26.6700 0.0000 0.0000 26.6700 36.5189 $ Bottom
42 RCC 0.0000 0.0000 0.0000 0.0000 0.0000 452.1200 16.9863 $ Cavity
```

```
43 RCC 0.0000 0.0000 -17.7800 0.0000 0.0000 7.6200 26.3525 $ Bottom gamma shield
44 RCC 0.0000 0.0000 0.0000 0.0000 0.0000 444.5000 20.1740 $ Lead id - taper
45 RCC 0.0000 0.0000 0.0000 0.0000 0.0000 444.5000 31.5976 $ Lead od - taper
46 RCC 0.0000 0.0000 13.8176 0.0000 0.0000 416.8648 18.9103 $ Lead id
47 RCC 0.0000 0.0000 13.8176 0.0000 0.0000 416.8648 33.3271 $ Lead od
48 RCC 0.0000 0.0000 13.8176 0.0000 0.0000 416.8648 33.4645 $ Lead gap
*49 RPP -36.5289 36.5289 -36.5289 36.5289 -26.6800 480.7050  $ Container

c
c Materials List
c
C MOX Material Composition Fuel
m1     92235 -5.6994E-03
       92238 -8.0851E-01
       94238 -3.3724E-05
       94239 -6.4076E-02
       94240 -3.0352E-03
       94241 -2.6980E-04
       94242 -3.3724E-05
        8016 -1.1835E-01
C Rod Interior Void Material
m2     1001 2
       8016 1
mt2      lwtr.01
c Clad Material
m3 26054 -7.063E-05 24050 -4.179E-05 7014 -4.980E-04
       26056 -1.149E-03 24052 -8.370E-04 7015 -1.981E-06
       26057 -2.702E-05 24053 -9.673E-05
       26058 -3.631E-06 24054 -2.448E-05
       40000 -9.823E-01 50000 -1.500E-02
C Canister Interior Non-Fuel Space
m4     1001 2
       8016 1
mt4      lwtr.01
C Canister to Cask Gap Material
m5     1001 2
       8016 1
mt5      lwtr.01
C Cask Exterior Material
m6     1001 2
       8016 1
mt6      lwtr.01
c Aluminum
m7 13027 -1.000E+00
C Water/Glycol
m10    1001 -1.03651E-01
warning. material  10 is not used in the problem.
       8016 -6.75619E-01
       6000 -2.20730E-01
mt10     lwtr.01
warning. material  10 is not used in the problem.
c Lead
m8 82206 -2.534E-01
       82207 -2.207E-01
       82208 -5.259E-01
c SS304
m9 24050 -7.939E-03 26054 -3.927E-02 28058 -6.384E-02
       24052 -1.590E-01 26056 -6.387E-01 28060 -2.543E-02
       24053 -1.838E-02 26057 -1.502E-02 28061 -1.124E-03
       24054 -4.652E-03 26058 -2.019E-03 28062 -3.639E-03
           28064 -9.623E-04
       25055 -2.000E-02
C Aluminum Honeycomb Impact Limiter
m11    13027 -1.0
warning. material  11 is not used in the problem.
C Mode
mode n
C Cell Importances
imp:n 1 18r 0
C
C Criticality Controls
kcode 1000 0.80 30 530
C
C Starting Source Definition
sdef cell=41:20:10:1
       erg=d1
       pos=0 0 10.5207
       rad=d2
       axs=0 0 1
       ext=d3
sp1    -3
si2 0.0000 0.4781
sp2 -21 1
si3 0.0000 389.8900
sp3 0 1
C Print Control
print
C Random Number Generator
rand gen=2 seed=19073486328125 stride=152917 hist=1
c
c Rotation Matrix
*TR1 0.0 0.0 0.0 -30 60 90 -120 -30 90 90 90 0  $ z-rotation -30 degrees

1source                                                              print table 10

 values of defaulted or explicitly defined source variables
```

```
    sur         0.0000E+00
    tme         0.0000E+00
    dir         isotropic
    pos         0.0000E+00   0.0000E+00   1.0521E+01
    x           0.0000E+00
    y           0.0000E+00
    z           0.0000E+00
    axs         0.0000E+00   0.0000E+00   1.0000E+00
    vec         0.0000E+00   0.0000E+00   0.0000E+00
    ccc         0.0000E+00
    nrm         1.0000E+00
    ara         0.0000E+00
    wgt         1.0000E+00
    eff         1.0000E-02
    par         0.0000E+00
    tr          0.0000E+00


 probability distribution   1 for source variable erg
 energy function 3:  watt (fission) spectrum (endf law 10)

     f(e)=c*exp(-e/a)*sinh(sqrt(b*e))
     a = 9.6500E-01      b = 2.2900E+00      c = 4.5270E-01

     the mean of source distribution   1 is  1.9806E+00


 probability distribution   2 for source variable rad
 power law 21:      f(x)=c*abs(x)**k          k = 1.0000E+00


 probability distribution   3 for source variable ext
 unbiased histogram distribution

 source         source             cumulative          probability
  entry          value             probability           of bin

    1        0.00000E+00         0.000000E+00         0.000000E+00
    2        3.89890E+02         1.000000E+00         1.000000E+00

     the mean of source distribution   3 is  1.9494E+02


 order of sampling source variables.
 cel axs rad ext pos erg tme

 comment. total fission nubar data are being used.
1material composition                                                                   print table 40

 the sum of the fractions of material    2 was 3.000000E+00

 the sum of the fractions of material    3 was 1.000050E+00

 the sum of the fractions of material    4 was 3.000000E+00

 the sum of the fractions of material    5 was 3.000000E+00

 the sum of the fractions of material    6 was 3.000000E+00

 the sum of the fractions of material    9 was 9.999753E-01

 material
  number     component nuclide, atom fraction

    1          92235, 2.18414E-03      92238, 3.05926E-01      94238, 1.27607E-05      94239, 2.41437E-02
               94240, 1.13889E-03      94241, 1.00815E-04      94242, 1.25493E-05       8016, 6.66481E-01
    2           1001, 6.66667E-01       8016, 3.33333E-01
 associated thermal s(a,b) data sets:   lwtr.01t
    3          26054, 1.19346E-04      24050, 7.62600E-05       7014, 3.24139E-03      26056, 1.87224E-03
               24052, 1.46874E-03       7015, 1.20369E-05      26057, 4.32542E-05      24053, 1.66532E-04
               26058, 5.71247E-06      24054, 4.13652E-05      40000, 9.81436E-01      50000, 1.15166E-02
    4           1001, 6.66667E-01       8016, 3.33333E-01
 associated thermal s(a,b) data sets:   lwtr.01t
    5           1001, 6.66667E-01       8016, 3.33333E-01
 associated thermal s(a,b) data sets:   lwtr.01t
    6           1001, 6.66667E-01       8016, 3.33333E-01
 associated thermal s(a,b) data sets:   lwtr.01t
    7          13027, 1.00000E+00
    8          82206, 2.54963E-01      82207, 2.20987E-01      82208, 5.24050E-01
    9          24050, 8.79087E-03      26054, 4.02643E-02      28058, 6.09419E-02      24052, 1.69300E-01
               26056, 6.31511E-01      28060, 2.34673E-02      24053, 1.92010E-02      26057, 1.45900E-02
               28061, 1.02022E-03      24054, 4.76985E-03      26058, 1.92741E-03      28062, 3.24982E-03
               28064, 8.32505E-04      25055, 2.01337E-02
1material                                                                               print table 40
  number     component nuclide, mass fraction

    1          92235, 5.69936E-03      92238, 8.08504E-01      94238, 3.37237E-05      94239, 6.40755E-02
               94240, 3.03518E-03      94241, 2.69798E-04      94242, 3.37237E-05       8016, 1.18349E-01
    2           1001, 1.11915E-01       8016, 8.88085E-01
    3          26054, 7.06265E-05      24050, 4.17879E-05       7014, 4.97975E-04      26056, 1.14894E-03
               24052, 8.36958E-04       7015, 1.98090E-06      26057, 2.70186E-05      24053, 9.67251E-05
               26058, 3.63062E-06      24054, 2.44788E-05      40000, 9.82251E-01      50000, 1.49992E-02
    4           1001, 1.11915E-01       8016, 8.88085E-01
    5           1001, 1.11915E-01       8016, 8.88085E-01
```

```
    6           1001, 1.11915E-01        8016, 8.88085E-01
    7          13027, 1.00000E+00
    8          82206, 2.53400E-01       82207, 2.20700E-01       82208, 5.25900E-01
    9          24050, 7.93920E-03       26054, 3.92710E-02       28058, 6.38416E-02       24052, 1.59004E-01
               26056, 6.38716E-01       28060, 2.54306E-02       24053, 1.83805E-02       26057, 1.50204E-02
               28061, 1.12403E-03       24054, 4.65211E-03       26058, 2.01905E-03       28062, 3.63909E-03
               28064, 9.62324E-04       25055, 2.00005E-02

 warning.   6 materials had unnormalized fractions. print table 40.
1cell volumes and masses                                                                            print table 50

         cell     atom         gram         input       calculated                              reason volume
                 density      density       volume        volume        mass        pieces    not calculated

     1      1  7.05663E-02  1.05550E+01  0.00000E+00  2.79982E+02  2.95521E+03       1
     2      2  1.00128E-01  9.98200E-01  0.00000E+00  2.58267E+01  2.57802E+01       1
     3      3  4.33411E-02  6.56000E+00  0.00000E+00  9.81838E+01  6.44086E+02       1
     4      4  1.00128E-01  9.98200E-01  0.00000E+00  0.00000E+00  0.00000E+00       0      infinite
     5     10  1.00128E-01  9.98200E-01  0.00000E+00  5.09690E+03  5.08773E+03       0
     6     20  1.00128E-01  9.98200E-01  0.00000E+00  9.94289E+04  9.92499E+04       0
     7     21  1.00309E-05  1.00000E-04  0.00000E+00  1.30324E+05  1.30324E+01       0
     8     22  6.03063E-02  2.70200E+00  0.00000E+00  0.00000E+00  0.00000E+00       0      asymmetric
     9     23  1.00309E-05  1.00000E-04  0.00000E+00  0.00000E+00  0.00000E+00       0      infinite
    10     40  3.29629E-02  1.13440E+01  0.00000E+00  1.66245E+04  1.88588E+05       1
    11     41  1.00309E-05  1.00000E-04  0.00000E+00  4.09828E+05  4.09828E+01       1
    12     42  8.64586E-02  7.94000E+00  0.00000E+00  9.51154E+04  7.55216E+05       1
    13     43  8.64586E-02  7.94000E+00  0.00000E+00  4.53784E+05  3.60304E+06       1
    14     44  8.64586E-02  7.94000E+00  0.00000E+00  1.02842E+04  8.16563E+04       2
    15     45  8.64586E-02  7.94000E+00  0.00000E+00  9.04489E+04  7.18165E+05       1
    16     46  3.29629E-02  1.13440E+01  0.00000E+00  9.86269E+05  1.11882E+07       1
    17     47  3.29629E-02  1.13440E+01  0.00000E+00  5.13461E+04  5.82470E+05       2
    18     48  0.00000E+00  0.00000E+00  0.00000E+00  1.20186E+04  0.00000E+00       1
    19     49  1.00309E-05  1.00000E-04  0.00000E+00  0.00000E+00  0.00000E+00       0      asymmetric
    20     50  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00       0      infinite

 warning.    2 cells appear to consist of more than one piece.
1surface areas                                                                                      print table 50

          surface    input      calculated    reason area
                     area          area       not calculated

     2        1.1  0.00000E+00  1.17123E+03
     3        1.2  0.00000E+00  7.18104E-01
     4        1.3  0.00000E+00  7.18104E-01
     6        2.1  0.00000E+00  1.25434E+03
     7        2.2  0.00000E+00  7.46925E-01
     8        2.3  0.00000E+00  7.46925E-01
    10        3.1  0.00000E+00  1.44593E+03
    11        3.2  0.00000E+00  9.80986E-01
    12        3.3  0.00000E+00  9.80986E-01
    14       10.1  0.00000E+00  0.00000E+00   not a boundary
    15       10.2  0.00000E+00  0.00000E+00   not a boundary
    16       10.3  0.00000E+00  0.00000E+00   not a boundary
    17       10.4  0.00000E+00  0.00000E+00   not a boundary
    18       10.5  0.00000E+00  0.00000E+00   not a boundary
    19       10.6  0.00000E+00  0.00000E+00   not a boundary
    20       10.7  0.00000E+00  1.12237E+01
    21       10.8  0.00000E+00  1.12237E+01
    23       20.1  0.00000E+00  6.70476E+03
    24       20.2  0.00000E+00  6.70476E+03
    25       20.3  0.00000E+00  6.70476E+03
    26       20.4  0.00000E+00  6.70476E+03
    27       20.5  0.00000E+00  0.00000E+00   asymmetric
    28       20.6  0.00000E+00  0.00000E+00   asymmetric
    30       21.1  0.00000E+00  1.01920E+04
    31       21.2  0.00000E+00  1.01920E+04
    32       21.3  0.00000E+00  1.01920E+04
    33       21.4  0.00000E+00  1.01920E+04
    37       22.1  0.00000E+00  4.78244E+04
    41       40.1  0.00000E+00  1.16417E+05
    42       40.2  0.00000E+00  4.18972E+03
    43       40.3  0.00000E+00  4.18972E+03
    49       42.1  0.00000E+00  4.82539E+04
    53       43.1  0.00000E+00  1.26170E+03
    54       43.2  0.00000E+00  2.18169E+03
    55       43.3  0.00000E+00  2.18169E+03
    57       44.1  0.00000E+00  3.50295E+03
    58       44.2  0.00000E+00  2.23013E+03
    61       45.1  0.00000E+00  5.48652E+03
    65       46.1  0.00000E+00  4.95306E+04
    66       46.2  0.00000E+00  2.61173E+03
    67       46.3  0.00000E+00  2.61173E+03
    69       47.1  0.00000E+00  8.72916E+04
    73       48.1  0.00000E+00  8.76515E+04
    77       49.1  0.00000E+00  3.70684E+04
    78       49.2  0.00000E+00  3.70684E+04
    79       49.3  0.00000E+00  3.70684E+04
    80       49.4  0.00000E+00  3.70684E+04
    81       49.5  0.00000E+00  5.33744E+03
    82       49.6  0.00000E+00  5.33744E+03
    84    10010.1  0.00000E+00  9.43871E+02
    85    10010.2  0.00000E+00  9.43871E+02
    86    10010.3  0.00000E+00  9.43871E+02
    87    10010.4  0.00000E+00  9.43871E+02
    88    10010.5  0.00000E+00  9.43871E+02
    89    10010.6  0.00000E+00  9.43871E+02
1cells                                                                                              print table 60
```

```
                       atom        gram                                       neutron
      cell  mat     density     density      volume        mass   pieces importance

   1     1    1  7.05663E-02 1.05550E+01 2.79982E+02 2.95521E+03      1  1.0000E+00
   2     2   2s  1.00128E-01 9.98200E-01 2.58267E+01 2.57802E+01      1  1.0000E+00
   3     3    3  4.33411E-02 6.56000E+00 9.81838E+01 6.44086E+02      1  1.0000E+00
   4     4   4s  1.00128E-01 9.98200E-01 0.00000E+00 0.00000E+00      0  1.0000E+00
   5    10   4s  1.00128E-01 9.98200E-01 5.09690E+03 5.08773E+03      0  1.0000E+00
   6    20   4s  1.00128E-01 9.98200E-01 9.94289E+04 9.92499E+04      0  1.0000E+00
   7    21   5s  1.00309E-05 1.00000E-04 1.30324E+05 1.30324E+01      0  1.0000E+00
   8    22    7  6.03063E-02 2.70200E+00 0.00000E+00 0.00000E+00      0  1.0000E+00
   9    23   5s  1.00309E-05 1.00000E-04 0.00000E+00 0.00000E+00      0  1.0000E+00
  10    40    8  3.29629E-02 1.13440E+01 1.66245E+04 1.88588E+05      1  1.0000E+00
  11    41   5s  1.00309E-05 1.00000E-04 4.09828E+05 4.09828E+01      1  1.0000E+00
  12    42    9  8.64586E-02 7.94000E+00 9.51154E+04 7.55216E+05      1  1.0000E+00
  13    43    9  8.64586E-02 7.94000E+00 4.53784E+05 3.60304E+06      1  1.0000E+00
  14    44    9  8.64586E-02 7.94000E+00 1.02842E+04 8.16563E+04      2  1.0000E+00
  15    45    9  8.64586E-02 7.94000E+00 9.04489E+04 7.18165E+05      1  1.0000E+00
  16    46    8  3.29629E-02 1.13440E+01 9.86269E+05 1.11882E+07      1  1.0000E+00
  17    47    8  3.29629E-02 1.13440E+01 5.13461E+04 5.82470E+05      2  1.0000E+00
  18    48    0  0.00000E+00 0.00000E+00 1.20186E+04 0.00000E+00      1  1.0000E+00
  19    49   6s  1.00309E-05 1.00000E-04 0.00000E+00 0.00000E+00      0  1.0000E+00
  20    50    0  0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00      0  0.0000E+00

 total                                   2.36097E+06 1.72254E+07
1surfaces                                                                                  print table 70

       surface      trans  type   surface coefficients

   1       1               rcc
   2       1.1             cz     4.7810000E-01
   3       1.2             pz     4.0041070E+02
   4       1.3             p      0.0000000E+00   0.0000000E+00  -1.0000000E+00  -1.0520700E+01
   5       2               rcc
   6       2.1             cz     4.8760000E-01
   7       2.2             pz     4.1582170E+02
   8       2.3             p      0.0000000E+00   0.0000000E+00  -1.0000000E+00  -6.3990000E+00
   9       3               rcc
  10       3.1             cz     5.5880000E-01
  11       3.2             pz     4.1690260E+02
  12       3.3             p      0.0000000E+00   0.0000000E+00  -1.0000000E+00  -5.0800000E+00
  13      10               rhp
  14      10.1             px     1.8000000E+00
  15      10.2             p     -1.0000000E+00   0.0000000E+00   0.0000000E+00   1.8000000E+00
  16      10.3             p      5.0000000E-01   8.6602540E-01   0.0000000E+00   1.8000000E+00
  17      10.4             p     -5.0000000E-01  -8.6602540E-01   0.0000000E+00   1.8000000E+00
  18      10.5             p     -5.0000000E-01   8.6602540E-01   0.0000000E+00   1.8000000E+00
  19      10.6             p      5.0000000E-01  -8.6602540E-01   0.0000000E+00   1.8000000E+00
  20      10.7             pz     4.5312000E+02
  21      10.8             p      0.0000000E+00   0.0000000E+00  -1.0000000E+00   1.0000000E+00
  22      20               rpp
  23      20.1          1  p      8.6602540E-01   5.0000000E-01   0.0000000E+00   7.4148000E+00
  24      20.2          1  p     -8.6602540E-01  -5.0000000E-01   0.0000000E+00   7.4148000E+00
  25      20.3          1  p     -5.0000000E-01   8.6602540E-01   0.0000000E+00   7.4148000E+00
  26      20.4          1  p      5.0000000E-01  -8.6602540E-01   0.0000000E+00   7.4148000E+00
  27      20.5          1  pz     4.5212000E+02
  28      20.6          1  p      0.0000000E+00   0.0000000E+00  -1.0000000E+00   0.0000000E+00
  29      21               rpp
  30      21.1          1  p      8.6602540E-01   5.0000000E-01   0.0000000E+00   1.1271300E+01
  31      21.2          1  p     -8.6602540E-01  -5.0000000E-01   0.0000000E+00   1.1271300E+01
  32      21.3          1  p     -5.0000000E-01   8.6602540E-01   0.0000000E+00   1.1271300E+01
  33      21.4          1  p      5.0000000E-01  -8.6602540E-01   0.0000000E+00   1.1271300E+01
  36      22               rcc
  37      22.1             cz     1.6835120E+01
  40      40               rcc
  41      40.1             cz     3.6518900E+01
  42      40.2             pz     4.8069500E+02
  43      40.3             p      0.0000000E+00   0.0000000E+00  -1.0000000E+00   2.6670000E+01
  44      41               rcc
  48      42               rcc
  49      42.1             cz     1.6986300E+01
  52      43               rcc
  53      43.1             cz     2.6352500E+01
  54      43.2             pz    -1.0160000E+01
  55      43.3             p      0.0000000E+00   0.0000000E+00  -1.0000000E+00   1.7780000E+01
  56      44               rcc
  57      44.1             cz     2.0174000E+01
  58      44.2             pz     4.4450000E+02
  60      45               rcc
  61      45.1             cz     3.1597600E+01
  64      46               rcc
  65      46.1             cz     1.8910300E+01
  66      46.2             pz     4.3068240E+02
  67      46.3             p      0.0000000E+00   0.0000000E+00  -1.0000000E+00  -1.3817600E+01
  68      47               rcc
  69      47.1             cz     3.3327100E+01
  72      48               rcc
  73      48.1             cz     3.3464500E+01
  76      49   refl.       rpp
  77      49.1 refl.       px     3.6528900E+01
  78      49.2 refl.       p     -1.0000000E+00   0.0000000E+00   0.0000000E+00   3.6528900E+01
  79      49.3 refl.       py     3.6528900E+01
  80      49.4 refl.       p      0.0000000E+00  -1.0000000E+00   0.0000000E+00   3.6528900E+01
  81      49.5 refl.       pz     4.8070500E+02
  82      49.6 refl.       p      0.0000000E+00   0.0000000E+00  -1.0000000E+00   2.6680000E+01
  83   10010               rhp
```

```
    84  10010.1        1001   px    2.7000000E+00
    85  10010.2        1001   p    -1.0000000E+00   0.0000000E+00   0.0000000E+00   9.0000000E-01
    86  10010.3        1001   p     5.0000000E-01   8.6602540E-01   0.0000000E+00   9.0003960E-01
    87  10010.4        1001   p    -5.0000000E-01  -8.6602540E-01   0.0000000E+00   2.6999604E+00
    88  10010.5        1001   p    -5.0000000E-01   8.6602540E-01   0.0000000E+00   3.9600581E-05
    89  10010.6        1001   p     5.0000000E-01  -8.6602540E-01   0.0000000E+00   3.5999604E+00
1  identical surfaces                                                                                print table 70

   master surface     identical surfaces

      10.7            10010.7
      10.8            10010.8
      20.5               21.5        22.2        42.2
      20.6               21.6        22.3        41.2        42.3        44.3        45.3
      40.1               41.1
      40.3               41.3
      44.2               45.2
      46.2               47.2        48.2
      46.3               47.3        48.3


   surface coefficients for identical surfaces not used.

         surface      trans  type   surface coefficients

    90  10010.7        1001   pz    4.5312000E+02
    91  10010.8        1001   p     0.0000000E+00   0.0000000E+00  -1.0000000E+00   1.0000000E+00
    34     21.5           1   pz    4.5212000E+02
    38     22.2               pz    4.5212000E+02
    50     42.2               pz    4.5212000E+02
    35     21.6           1   p     0.0000000E+00   0.0000000E+00  -1.0000000E+00   0.0000000E+00
    39     22.3               p     0.0000000E+00   0.0000000E+00  -1.0000000E+00   0.0000000E+00
    46     41.2               pz    0.0000000E+00
    51     42.3               p     0.0000000E+00   0.0000000E+00  -1.0000000E+00   0.0000000E+00
    59     44.3               p     0.0000000E+00   0.0000000E+00  -1.0000000E+00   0.0000000E+00
    63     45.3               p     0.0000000E+00   0.0000000E+00  -1.0000000E+00   0.0000000E+00
    45     41.1               cz    3.6518900E+01
    47     41.3               p     0.0000000E+00   0.0000000E+00  -1.0000000E+00   2.6670000E+01
    62     45.2               pz    4.4450000E+02
    70     47.2               pz    4.3068240E+02
    74     48.2               pz    4.3068240E+02
    71     47.3               p     0.0000000E+00   0.0000000E+00  -1.0000000E+00  -1.3817600E+01
    75     48.3               p     0.0000000E+00   0.0000000E+00  -1.0000000E+00  -1.3817600E+01
1  cell temperatures in mev for the free-gas thermal neutron treatment.                              print table 72

   all non-zero importance cells with materials have a temperature for thermal neutrons of 2.5300E-08 mev.

 ******************************************************
 * Random Number Generator  =                   2 *
 * Random Number Seed       =      19073486328125 *
 * Random Number Multiplier = 9219741426499971445 *
 * Random Number Adder      =                   1 *
 * Random Number Bits Used  =                  63 *
 * Random Number Stride     =              152917 *
 ******************************************************


         5 warning messages so far.
1physical constants                                                                                  print table 98


   name                   value     description

   huge     1.0000000000000E+36     infinity
    pie     3.1415926535898E+00     pi
  euler     5.7721566490153E-01     euler constant
 avogad     6.0220434469282E+23     avogadro number (molecules/mole)
  aneut     1.0086649670000E+00     neutron mass (amu)
  avgdn     5.9703109000000E-01     avogadro number/neutron mass (1.e-24*molecules/mole/amu)
  slite     2.9979250000000E+02     speed of light (cm/shake)
 planck     4.1357320000000E-13     planck constant (mev shake)
  fscon     1.3703930000000E+02     inverse fine structure constant h*c/(2*pi*e**2)
 gpt(1)     9.3958000000000E+02     neutron mass (mev)
 gpt(3)     5.1100800000000E-01     electron mass (mev)


 fission q-values:      nuclide    q(mev)   nuclide    q(mev)
                          90232    171.91     91233    175.57
                          92233    180.84     92234    179.45
                          92235    180.88     92236    179.50
                          92237    180.40     92238    181.31
                          92239    180.40     92240    180.40
                          93237    183.67     94238    186.65
                          94239    189.44     94240    186.36
                          94241    188.99     94242    185.98
                          94243    187.48     95241    190.83
                          95242    190.54     95243    190.25
                          96242    190.49     96244    190.49
                          other    180.00


 the following compilation options were used:

     cheap
     dec
     plot
     mcplot
```

```
 xlib
 default datapath: C:\Program Files\LANL\MCNPDATA
                   C:\Progra~1\LANL\MCNPdata
1cross-section tables                                                                                   print table 100

     table    length

                        tables from file actia

   1001.62c     5202  1-h-1 at 293.6K from endf-vi.8 njoy99.50                          mat 125      12/05/01
   7014.62c    67462  7-n-14 at 293.6K from endf-vi.8 njoy99.50                         mat 725      12/05/01
   8016.62c   170541  8-o-16 at 293.6K from endf-vi.8 njoy99.50                         mat 825      12/05/01
  13027.62c    75363  13-al-27 at 293.6K from endf-vi.8 njoy99.50                       mat1325      12/17/01
  24050.62c   194445  24-cr-50 at 293.6K from endf-vi.8 njoy99.50                       mat2425      12/20/01
  24052.62c   174773  24-cr-52 at 293.6K from endf-vi.8 njoy99.50                       mat2431      12/20/01
  24053.62c   147286  24-cr-53 at 293.6K from endf-vi.8 njoy99.50                       mat2434      12/20/01
  24054.62c   132737  24-cr-54 at 293.6K from endf-vi.8 njoy99.50                       mat2437      12/20/01
  25055.62c   134565  25-mn-55 at 293.6K from endf/b-vi.8 njoy99.50                     mat2525      02/11/02
  26054.62c   143370  26-fe-54 at 293.6K from endf-vi.8 njoy99.50                       mat2625      12/20/01
  26056.62c   230655  26-fe-56 at 293.6K from endf-vi.8 njoy99.50                       mat2631      12/20/01
  26057.62c   148842  26-fe-57 at 293.6K from endf-vi.8 njoy99.50                       mat2634      12/20/01
  26058.62c    87569  26-fe-58 at 293.6K from endf-vi.8 njoy99.50                       mat2637      12/20/01
  28058.62c   235403  28-ni-58 at 293.6K from endf-vi.8 njoy99.50                       mat2825      12/20/01
  28060.62c   158305  28-ni-60 at 293.6K from endf-vi.8 njoy99.50                       mat2831      12/20/01
  28061.62c   112032  28-ni-61 at 293.6K from endf-vi.8 njoy99.50                       mat2834      12/20/01
  28062.62c   104386  28-ni-62 at 293.6K from endf-vi.8 njoy99.50                       mat2837      12/20/01
  28064.62c    97689  28-ni-64 at 293.6K from endf-vi.8 njoy99.50                       mat2843      12/20/01

                        tables from file endf66a

   7015.66c    19013  7-n-15 at 293.6K from endf-vi.0 njoy99.50                         mat 728      07/13/01

                        tables from file endf66b

  40000.66c    98524  40-zr-0 at 293.6K from endf-vi.1 njoy99.50                        mat4000      07/24/01

                        tables from file endl92

  50000.42c   141628   ENDL library name:  nd920609  LANL/XTM modified:  951222                    911219
                    temperature = 2.5860E-08 adjusted to 2.5300E-08

                        tables from file endf66c

  82206.66c   219368  82-pb-206 at 293.6K from endf-vi.6 njoy99.50                      mat8231      08/13/01
  82207.66c   134389  82-pb-207 at 293.6K from endf-vi.6 njoy99.50                      mat8234      08/13/01
  82208.66c   135105  82-pb-208 at 293.6K from endf-vi.x njoy99.50                      mat8237      03/16/02
  94238.66c    53256  94-pu-238 at 293.6K from endf-vi.0 njoy99.50        total nu      mat9434      09/06/01
                      probability tables used from 2.0000E-04 to 1.0000E-02 mev.
  94240.66c   309518  94-pu-240 at 293.6K from endf-vi.2 njoy99.50        total nu      mat9440      09/06/01
                      probability tables used from 5.7000E-03 to 4.0000E-02 mev.
  94241.66c   126607  94-pu-241 at 293.6K from endf-vi.3 njoy99.50        total nu      mat9443      09/06/01
                      probability tables used from 3.0000E-04 to 4.0200E-02 mev.
  94242.66c   107114  94-pu-242 at 293.6K from endf-vi.0 njoy99.50        total nu      mat9446      09/06/01
                      probability tables used from 9.8600E-04 to 1.0000E-02 mev.

                        tables from file t16_2003

  92235.69c   587997  92-u-235 at 293.6K from t16 u235la9d njoy99.50      total nu      mat9228      07/02/03
                      probability tables used from 2.2500E-03 to 2.5000E-02 mev.
  92238.69c   713320  92-u-238 at 293.6K from t16 u238la8h njoy99.50      total nu      mat9237      07/02/03
                      probability tables used from 1.0000E-02 to 1.4903E-01 mev.
  94239.69c   506320  94-pu-239 at 293.6K from t16 pu239la7d njoy99.50    total nu      mat9437      07/02/03
                      probability tables used from 2.5000E-03 to 3.0000E-02 mev.

                        tables from file tmccs

   lwtr.01t    10193  hydrogen in light water at 300 degrees kelvin                  1001      0     010/22/85

  total     5582977

 warning. neutron energy cutoff is below some cross-section tables.

 comment.   1 cross sections modified by free gas thermal treatment.
1assignment of s(a,b) data to nuclides.                                                                 print table 102

       mat          nuclide          s(a,b)
         2          1001.62c         lwtr.01t
         4          1001.62c         lwtr.01t
         5          1001.62c         lwtr.01t
         6          1001.62c         lwtr.01t

 ..........................................................................................................................
 dump no.    1 on file MS_Acc_NACCoC_c1.00_g0.00_e0.00_d0.01cm_HP_36mm.inpr      nps =          0     coll =              0
 ctm =        0.00   nrn =                  0

       6 warning messages so far.
1estimated keff results by cycle                                                                        print table 175

 cycle     1    k(collision)  0.662630    prompt removal lifetime(abs)  8.1191E+03    source points generated     844

 cycle     2    k(collision)  0.622585    prompt removal lifetime(abs)  8.6526E+03    source points generated     928

 cycle     3    k(collision)  0.744636    prompt removal lifetime(abs)  8.5012E+03    source points generated    1189

 cycle     4    k(collision)  0.686479    prompt removal lifetime(abs)  7.9407E+03    source points generated     916
```

```
cycle     5    k(collision)  0.671615    prompt removal lifetime(abs)  8.8591E+03    source points generated    972
cycle     6    k(collision)  0.675550    prompt removal lifetime(abs)  8.2834E+03    source points generated    999
cycle     7    k(collision)  0.693864    prompt removal lifetime(abs)  8.1740E+03    source points generated   1052
cycle     8    k(collision)  0.702859    prompt removal lifetime(abs)  8.6663E+03    source points generated   1006
.
.
.
.
.
 estimator       cycle   526   ave of   496 cycles      combination          simple average    combined average    corr
k(collision)       0.741770       0.703646 0.0016     k(col/abs)           0.703392 0.0015    0.703372 0.0015   0.7953
k(absorption)      0.756647       0.703139 0.0016     k(abs/tk ln)         0.703262 0.0016    0.703196 0.0015   0.4218
k(trk length)      0.717143       0.703386 0.0022     k(tk ln/col)         0.703516 0.0017    0.703605 0.0016   0.5823
rem life(col)    8.4284E+03     8.4718E+03 0.0017     k(col/abs/tk ln)     0.703390 0.0015    0.703328 0.0015
rem life(abs)    8.3911E+03     8.4726E+03 0.0016     life(col/abs/tl)   8.4742E+03 0.0015  8.4796E+03 0.0013
source points generated    1046

 estimator       cycle   527   ave of   497 cycles      combination          simple average    combined average    corr
k(collision)       0.643842       0.703525 0.0016     k(col/abs)           0.703297 0.0015    0.703275 0.0015   0.7960
k(absorption)      0.668059       0.703068 0.0016     k(abs/tk ln)         0.703158 0.0016    0.703110 0.0015   0.4250
k(trk length)      0.634707       0.703247 0.0022     k(tk ln/col)         0.703386 0.0017    0.703482 0.0016   0.5863
rem life(col)    8.2199E+03     8.4713E+03 0.0017     k(col/abs/tk ln)     0.703280 0.0015    0.703227 0.0015
rem life(abs)    8.1559E+03     8.4720E+03 0.0016     life(col/abs/tl)   8.4737E+03 0.0015  8.4793E+03 0.0013
source points generated     869

 estimator       cycle   528   ave of   498 cycles      combination          simple average    combined average    corr
k(collision)       0.717239       0.703553 0.0016     k(col/abs)           0.703307 0.0015    0.703282 0.0015   0.7956
k(absorption)      0.699228       0.703060 0.0016     k(abs/tk ln)         0.703150 0.0016    0.703102 0.0015   0.4250
k(trk length)      0.699455       0.703240 0.0022     k(tk ln/col)         0.703396 0.0017    0.703504 0.0016   0.5860
rem life(col)    8.7750E+03     8.4719E+03 0.0017     k(col/abs/tk ln)     0.703284 0.0015    0.703229 0.0015
rem life(abs)    8.6882E+03     8.4724E+03 0.0016     life(col/abs/tl)   8.4741E+03 0.0015  8.4795E+03 0.0013
source points generated    1119

 estimator       cycle   529   ave of   499 cycles      combination          simple average    combined average    corr
k(collision)       0.699031       0.703544 0.0016     k(col/abs)           0.703286 0.0015    0.703261 0.0015   0.7954
k(absorption)      0.686971       0.703028 0.0016     k(abs/tk ln)         0.703156 0.0016    0.703088 0.0015   0.4238
k(trk length)      0.725578       0.703285 0.0022     k(tk ln/col)         0.703414 0.0017    0.703503 0.0016   0.5854
rem life(col)    8.4836E+03     8.4719E+03 0.0017     k(col/abs/tk ln)     0.703286 0.0015    0.703216 0.0015
rem life(abs)    8.6100E+03     8.4727E+03 0.0016     life(col/abs/tl)   8.4744E+03 0.0015  8.4804E+03 0.0013
source points generated     961

 estimator       cycle   530   ave of   500 cycles      combination          simple average    combined average    corr
k(collision)       0.702529       0.703542 0.0016     k(col/abs)           0.703276 0.0015    0.703251 0.0015   0.7954
k(absorption)      0.694516       0.703011 0.0015     k(abs/tk ln)         0.703094 0.0016    0.703049 0.0015   0.4238
k(trk length)      0.649825       0.703178 0.0022     k(tk ln/col)         0.703360 0.0017    0.703485 0.0016   0.5841
rem life(col)    8.2172E+03     8.4714E+03 0.0017     k(col/abs/tk ln)     0.703244 0.0015    0.703190 0.0015
rem life(abs)    8.3284E+03     8.4724E+03 0.0016     life(col/abs/tl)   8.4741E+03 0.0015  8.4802E+03 0.0013
source points generated    1018

source distribution written to file MS_Acc_NACCoC_c1.00_g0.00_e0.00_d0.01cm_HP_36mm.inps         cycle =    530
1problem summary (active cycles only)               source particle weight for summary table normalization =       500000.00

     run terminated when    530   kcode cycles were done.
+                                                                                               10/25/07 21:18:09
     NAC-LWT Cask - MOX Experiments - Accident Transport Conditions                   probid =  10/25/07 21:05:56
0
neutron creation     tracks      weight        energy             neutron loss        tracks       weight          energy
                                 (per source particle)                                            (per source particle)

source               500502    1.0000E+00    2.1043E+00           escape                   0     0.              0.
                                                                  energy cutoff            0     0.              0.
                                                                  time cutoff              0     0.              0.
weight window             0    0.            0.                   weight window            0     0.              0.
cell importance           0    0.            0.                   cell importance          0     0.              0.
weight cutoff             0    1.0592E-01    4.8768E-06           weight cutoff       500977     1.0547E-01      4.3336E-06
e or t importance         0    0.            0.                   e or t importance        0     0.              0.
dxtran                    0    0.            0.                   dxtran                   0     0.              0.
forced collisions         0    0.            0.                   forced collisions        0     0.              0.
exp. transform            0    0.            0.                   exp. transform           0     0.              0.
upscattering              0    0.            2.2571E-07           downscattering           0     0.              2.0393E+00
photonuclear              0    0.            0.                   capture                  0     7.5486E-01      3.4580E-02
(n,xn)                  949    1.6722E-03    1.5347E-03           loss to (n,xn)         474     8.3532E-04      8.0905E-03
prompt fission            0    0.            0.                   loss to fission          0     2.4643E-01      2.3925E-02
delayed fission           0    0.            0.
    total            501451    1.1076E+00    2.1059E+00               total           501451     1.1076E+00      2.1059E+00

  number of neutrons banked                       501        average time of (shakes)              cutoffs
  neutron tracks per source particle     1.0029E+00          escape            0.0000E+00         tco   1.0000E+33
  neutron collisions per source particle 1.5353E+02          capture           9.4388E+03         eco   0.0000E+00
  total neutron collisions                 76766227          capture or escape 9.4388E+03         wc1  -5.0000E-01
  net multiplication              1.0008E+00 0.0000          any termination   9.7365E+03         wc2  -2.5000E-01

computer time so far in this run    12.12 minutes            maximum number ever in bank         2
computer time in mcrun              11.96 minutes            bank overflows to backup file       0
source particles per minute           4.4359E+04
random numbers generated               776053288             most random numbers used was       12401 in history       255214

range of sampled source weights = 8.4104E-01 to 1.1848E+00

source efficiency = 1.0000  in cell     1

source efficiency = 0.1042  in cell    10

source efficiency = 1.0000  in cell    20
```

source efficiency = 1.0000 in cell 41
1neutron activity in each cell print table 126

	cell	tracks entering	population	collisions	collisions * weight (per history)	number weighted energy	flux weighted energy	average track weight (relative)	average track mfp (cm)
1	1	1255010	500853	588249	9.5138E-01	1.2434E-03	1.1278E+00	9.1668E-01	2.6471E+00
2	2	1783820	500855	71781	1.0077E-01	4.1502E-04	8.2308E-01	8.3190E-01	1.8137E+00
3	3	1923591	500862	78833	1.3909E-01	5.6258E-04	8.8063E-01	8.8178E-01	3.8130E+00
4	4	4738894	500933	23063782	3.3926E+01	1.9840E-04	5.3541E-01	8.2904E-01	1.3620E+00
5	10	1421751	373841	6076166	8.6070E+00	1.3853E-04	3.5425E-01	7.9418E-01	1.1032E+00
6	20	0	0	0	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
7	21	1663360	374111	1888	2.7445E-03	4.9624E-04	4.1450E-01	8.2621E-01	1.3160E+04
8	22	2075969	374082	2123010	3.6862E+00	5.4141E-04	3.4564E-01	8.1935E-01	9.7325E+00
9	23	2178870	357717	98	1.4370E-04	5.9979E-04	3.0426E-01	8.1703E-01	1.1977E+04
10	40	26756	5352	105825	1.4813E-01	3.0621E-03	1.0020E-01	7.1747E-01	3.2033E+00
11	41	0	0	0	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
12	42	117397	15536	1374254	1.8224E+00	2.6104E-03	1.0374E-01	7.2074E-01	2.5082E+00
13	43	3367057	211757	13287925	1.9309E+01	3.4664E-03	1.7878E-01	7.8829E-01	2.7581E+00
14	44	42780	15974	147895	2.0621E-01	8.2779E-04	1.6867E-01	7.5443E-01	2.3675E+00
15	45	2192206	356597	5325642	8.0534E+00	9.0372E-04	3.0289E-01	8.1723E-01	2.5854E+00
16	46	2661735	296813	24149944	3.7756E+01	1.6531E-03	2.2215E-01	8.0496E-01	3.5572E+00
17	47	88453	20419	366868	5.3434E-01	1.7669E-03	1.3640E-01	7.4778E-01	3.3059E+00
18	48	3155968	210444	0	0.0000E+00	2.8143E-03	1.8703E-01	7.9827E-01	0.0000E+00
19	49	1754788	180075	4067	6.0877E-03	3.8995E-03	1.8293E-01	7.8977E-01	1.0874E+04
total		30448425	4796221	76766227	1.1525E+02				

print table 128 requires 1067 decimal words of dynamically allocated storage.
1neutron weight balance in each cell print table 130

cell index	1	2	3	4	5	6	7	8	9
cell number	1	2	3	4	10	20	21	22	23
external events:									
entering	1.2681E+00	3.1938E+00	3.4204E+00	7.9797E+00	2.3195E+00	0.0000E+00	2.7616E+00	3.4266E+00	3.5712E+00
source	1.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
energy cutoff	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
time cutoff	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
exiting	-1.8832E+00	-3.1934E+00	-3.4192E+00	-7.8425E+00	-2.2857E+00	0.0000E+00	-2.7616E+00	-3.3873E+00	-3.5712E+00
total	3.8488E-01	3.6018E-04	1.1827E-03	1.3724E-01	3.3874E-02	0.0000E+00	6.3609E-06	3.9247E-02	2.1550E-07
variance reduction events:									
weight window	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
cell importance	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
weight cutoff	2.8229E-05	2.7032E-06	-9.7040E-06	-1.9749E-05	-4.7973E-05	0.0000E+00	-9.9564E-07	5.7430E-05	0.0000E+00
e or t importance	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
dxtran	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
forced collisions	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
exp. transform	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
total	2.8229E-05	2.7032E-06	-9.7040E-06	-1.9749E-05	-4.7973E-05	0.0000E+00	-9.9564E-07	5.7430E-05	0.0000E+00
physical events:									
capture	-1.3879E-01	-3.6289E-04	-1.1985E-03	-1.3722E-01	-3.3826E-02	0.0000E+00	-5.3652E-06	-3.9305E-02	-2.1550E-07
(n,xn)	6.2341E-04	0.0000E+00	5.0860E-05	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
loss to (n,xn)	-3.1093E-04	0.0000E+00	-2.5430E-05	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
fission	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
loss to fission	-2.4643E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
photonuclear	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
total	-3.8491E-01	-3.6289E-04	-1.1730E-03	-1.3722E-01	-3.3826E-02	0.0000E+00	-5.3652E-06	-3.9305E-02	-2.1550E-07
total	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

cell index	10	11	12	13	14	15	16	17	18
cell number	40	41	42	43	44	45	46	47	48
external events:									
entering	3.8410E-02	0.0000E+00	1.7109E-01	5.3543E+00	6.4450E-02	3.6004E+00	4.2962E+00	1.3246E-01	5.0388E+00
source	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
energy cutoff	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
time cutoff	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
exiting	-3.8338E-02	0.0000E+00	-1.5873E-01	-5.2124E+00	-6.0345E-02	-3.3858E+00	-4.2663E+00	-1.3214E-01	-5.0388E+00
total	7.1248E-05	0.0000E+00	1.2354E-02	1.4185E-01	4.1045E-03	2.1458E-01	2.9932E-02	3.1701E-04	0.0000E+00
variance reduction events:									
weight window	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
cell importance	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
weight cutoff	5.9575E-07	0.0000E+00	-3.9444E-05	1.7827E-04	8.9663E-06	2.2838E-04	5.6942E-05	7.6461E-06	0.0000E+00
e or t importance	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
dxtran	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
forced collisions	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
exp. transform	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
total	5.9575E-07	0.0000E+00	-3.9444E-05	1.7827E-04	8.9663E-06	2.2838E-04	5.6942E-05	7.6461E-06	0.0000E+00
physical events:									
capture	-7.1844E-05	0.0000E+00	-1.2315E-02	-1.4204E-01	-4.1135E-03	-2.1481E-01	-3.0482E-02	-3.2465E-04	0.0000E+00
(n,xn)	0.0000E+00	0.0000E+00	0.0000E+00	6.9717E-06	0.0000E+00	6.6859E-06	9.8428E-04	0.0000E+00	0.0000E+00
loss to (n,xn)	0.0000E+00	0.0000E+00	0.0000E+00	-3.4859E-06	0.0000E+00	-3.3429E-06	-4.9214E-04	0.0000E+00	0.0000E+00

```
         fission  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
 loss to fission  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
    photonuclear  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
                  ----------  ----------  ----------  ----------  ----------  ----------  ----------  ----------  ----------
           total -7.1644E-05  0.0000E+00 -1.2315E-02 -1.4203E-01 -4.1135E-03 -2.1481E-01 -2.9989E-02 -3.2465E-04  0.0000E+00

                  ----------  ----------  ----------  ----------  ----------  ----------  ----------  ----------  ----------
           total  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00


      cell index        19
     cell number        49        total

 external events:
        entering  2.7677E+00  4.9405E+01
          source  0.0000E+00  1.0000E+00
   energy cutoff  0.0000E+00  0.0000E+00
     time cutoff  0.0000E+00  0.0000E+00
         exiting -2.7677E+00 -4.9405E+01
                  ----------  ----------
           total  9.6082E-07  1.0000E+00

 variance reduction events:
   weight window  0.0000E+00  0.0000E+00
 cell importance  0.0000E+00  0.0000E+00
   weight cutoff  5.0063E-07  4.5179E-04
e or t importance 0.0000E+00  0.0000E+00
          dxtran  0.0000E+00  0.0000E+00
forced collisions 0.0000E+00  0.0000E+00
   exp. transform  0.0000E+00  0.0000E+00
                  ----------  ----------
           total  5.0063E-07  4.5179E-04

 physical events:
         capture -1.4614E-06 -7.5486E-01
          (n,xn)  0.0000E+00  1.6722E-03
  loss to (n,xn)  0.0000E+00 -8.3532E-04
         fission  0.0000E+00  0.0000E+00
 loss to fission  0.0000E+00 -2.4643E-01
    photonuclear  0.0000E+00  0.0000E+00
                  ----------  ----------
           total -1.4614E-06 -1.0005E+00

                  ----------  ----------
           total  0.0000E+00  0.0000E+00
```

1neutron activity of each nuclide in each cell, per source particle   print table 140

cell index	cell name	nuclides	atom fraction	total collisions	collisions * weight	wgt. lost to capture	wgt. gain by fission	wgt. gain by (n,xn)	photons produced	photon wgt produced	avg photon energy
1	1	92235.69c	2.18E-03	13149	1.8238E-02	2.6523E-03	1.3545E-02	0.0000E+00	0	0.0000E+00	0.0000E+00
		92238.69c	3.06E-01	186994	3.3548E-01	2.5440E-02	5.4986E-03	3.0727E-04	0	0.0000E+00	0.0000E+00
		94238.66c	1.28E-05	67	9.7812E-05	7.8916E-05	4.0561E-06	0.0000E+00	0	0.0000E+00	0.0000E+00
		94239.69c	2.41E-02	247900	3.4650E-01	9.9448E-02	2.2599E-01	5.2057E-06	0	0.0000E+00	0.0000E+00
		94240.66c	1.14E-03	7457	1.1940E-02	1.0232E-02	1.0428E-04	0.0000E+00	0	0.0000E+00	0.0000E+00
		94241.66c	1.01E-04	1305	1.8084E-03	4.2713E-04	1.2840E-03	0.0000E+00	0	0.0000E+00	0.0000E+00
		94242.66c	1.25E-05	36	6.0894E-05	3.7138E-05	1.8504E-06	0.0000E+00	0	0.0000E+00	0.0000E+00
		8016.62c	6.66E-01	131341	2.3725E-01	4.7184E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
2	2	1001.62c	6.67E-01	66694	9.2467E-02	3.5248E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		8016.62c	3.33E-01	5087	8.3067E-03	1.0409E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
3	3	26054.62c	1.19E-04	4	7.4446E-06	8.2238E-07	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24050.62c	7.63E-05	8	1.1117E-05	5.2938E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		7014.62c	3.24E-03	270	4.2214E-04	2.9134E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26056.62c	1.87E-03	172	2.7365E-04	1.5704E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24052.62c	1.47E-03	60	1.0627E-04	4.4084E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		7015.66c	1.20E-05	1	2.0715E-06	4.3673E-12	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26057.62c	4.33E-05	3	5.7570E-06	2.7967E-09	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24053.62c	1.67E-04	20	3.0965E-05	7.3217E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26058.62c	5.71E-06	1	1.4554E-06	3.1973E-07	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24054.62c	4.14E-05	1	2.0725E-06	6.0645E-10	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		40000.66c	9.81E-01	77568	1.3693E-01	1.0679E-03	0.0000E+00	2.5430E-05	0	0.0000E+00	0.0000E+00
		50000.42c	1.15E-02	725	1.2911E-03	6.7541E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
4	4	1001.62c	6.67E-01	21628102	3.1581E+01	1.3528E-01	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		8016.62c	3.33E-01	1435680	2.3453E+00	1.9355E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
5	10	1001.62c	6.67E-01	5707107	8.0275E+00	3.3538E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		8016.62c	3.33E-01	369059	5.7955E-01	2.8754E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
6	20	1001.62c	6.67E-01	0	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		8016.62c	3.33E-01	0	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
7	21	1001.62c	6.67E-01	1732	2.5018E-03	5.3619E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		8016.62c	3.33E-01	156	2.4270E-04	3.2713E-09	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
8	22	13027.62c	1.00E+00	2123010	3.6862E+00	3.9305E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
9	23	1001.62c	6.67E-01	88	1.2864E-04	2.1542E-07	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		8016.62c	3.33E-01	10	1.5062E-05	8.2269E-11	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
10	40	82206.66c	2.55E-01	25173	3.4731E-02	2.7307E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		82207.66c	2.21E-01	23283	3.2961E-02	4.1971E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		82208.66c	5.24E-01	57369	8.0440E-02	2.5667E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00

11	41	1001.62c	6.67E-01	0	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		8016.62c	3.33E-01	0	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
12	42	24050.62c	8.79E-03	22634	3.5886E-02	5.0263E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26054.62c	4.03E-02	43963	7.0549E-02	4.1183E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28058.62c	6.09E-02	185596	2.3990E-01	1.0944E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24052.62c	1.69E-01	95848	1.4109E-01	7.2604E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26056.62c	6.32E-01	808702	1.0013E+00	6.0096E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28060.62c	2.35E-02	27885	4.6516E-02	2.8672E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24053.62c	1.92E-02	65788	9.9650E-02	1.2037E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26057.62c	1.46E-02	17938	2.8790E-02	2.1264E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28061.62c	1.02E-03	1327	1.8701E-03	1.6196E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24054.62c	4.77E-03	3571	5.5204E-03	1.2960E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26058.62c	1.93E-03	1926	3.0589E-03	2.7125E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28062.62c	3.25E-03	14955	2.2767E-02	1.4098E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28064.62c	8.33E-04	1172	2.0355E-03	5.1368E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		25055.62c	2.01E-02	82949	1.2342E-01	1.6648E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
13	43	24050.62c	8.79E-03	224394	3.7208E-01	5.8811E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26054.62c	4.03E-02	457333	7.7117E-01	4.8990E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28058.62c	6.09E-02	1729500	2.4409E+00	1.3150E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24052.62c	1.69E-01	1032660	1.6563E+00	8.0696E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26056.62c	6.32E-01	7735666	1.0652E+01	7.0255E-02	0.0000E+00	1.5751E-06	0	0.0000E+00	0.0000E+00
		28060.62c	2.35E-02	284768	4.9380E-01	3.3119E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24053.62c	1.92E-02	635953	1.0153E+00	1.4020E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26057.62c	1.46E-02	187135	3.1564E-01	2.2517E-03	0.0000E+00	1.9108E-06	0	0.0000E+00	0.0000E+00
		28061.62c	1.02E-03	13567	2.0961E-02	1.7693E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24054.62c	4.77E-03	37002	6.1565E-02	1.1488E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26058.62c	1.93E-03	19846	3.3234E-02	2.9139E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28062.62c	3.25E-03	144771	2.3200E-01	1.7147E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28064.62c	8.33E-04	12360	2.2167E-02	6.2663E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		25055.62c	2.01E-02	772970	1.2215E+00	1.7836E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
14	44	24050.62c	8.79E-03	2257	3.6357E-03	1.7986E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26054.62c	4.03E-02	4235	6.9394E-03	1.3937E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28058.62c	6.09E-02	19754	2.6772E-02	3.8375E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24052.62c	1.69E-01	10363	1.5850E-02	2.0913E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26056.62c	6.32E-01	90447	1.1985E-01	2.1525E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28060.62c	2.35E-02	2541	4.3191E-03	8.9712E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24053.62c	1.92E-02	6508	1.0115E-02	4.1602E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26057.62c	1.46E-02	1792	2.9469E-03	5.7133E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28061.62c	1.02E-03	113	1.6337E-04	2.9738E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24054.62c	4.77E-03	329	5.3342E-04	2.5471E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26058.62c	1.93E-03	182	2.8460E-04	4.0371E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28062.62c	3.25E-03	1520	2.4171E-03	5.6784E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28064.62c	8.33E-04	111	1.9873E-04	2.0767E-07	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		25055.62c	2.01E-02	7743	1.2184E-02	4.1947E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
15	45	24050.62c	8.79E-03	81095	1.3624E-01	9.6184E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26054.62c	4.03E-02	163277	2.8221E-01	6.7571E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28058.62c	6.09E-02	685869	1.0095E+00	2.0192E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24052.62c	1.69E-01	396986	6.5384E-01	9.5378E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26056.62c	6.32E-01	3259168	4.7321E+00	1.1291E-01	0.0000E+00	3.3429E-06	0	0.0000E+00	0.0000E+00
		28060.62c	2.35E-02	92241	1.6289E-01	4.6046E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24053.62c	1.92E-02	232819	3.7911E-01	2.3610E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26057.62c	1.46E-02	66241	1.1455E-01	2.6634E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28061.62c	1.02E-03	5093	8.0726E-03	1.8482E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24054.62c	4.77E-03	12749	2.1779E-02	1.3347E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26058.62c	1.93E-03	6698	1.1451E-02	2.0600E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28062.62c	3.25E-03	51276	8.5061E-02	3.1530E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28064.62c	8.33E-04	3626	6.6497E-03	8.9188E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		25055.62c	2.01E-02	268504	4.4997E-01	2.1151E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
16	46	82206.66c	2.55E-01	5804104	8.9875E+00	6.8570E-03	0.0000E+00	6.0193E-05	0	0.0000E+00	0.0000E+00
		82207.66c	2.21E-01	5361381	8.4381E+00	2.2860E-02	0.0000E+00	1.4604E-04	0	0.0000E+00	0.0000E+00
		82208.66c	5.24E-01	12984459	2.0331E+01	7.6484E-04	0.0000E+00	2.8591E-04	0	0.0000E+00	0.0000E+00
17	47	82206.66c	2.55E-01	88291	1.2688E-01	7.9354E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		82207.66c	2.21E-01	80596	1.1838E-01	2.3687E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		82208.66c	5.24E-01	197981	2.8908E-01	8.4289E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
19	49	1001.62c	6.67E-01	3648	5.4226E-03	1.4610E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		8016.62c	3.33E-01	419	6.6504E-04	3.9930E-10	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
total				76766227	1.1525E+02	7.5486E-01	2.4643E-01	8.3685E-04	0	0.0000E+00	0.0000E+00

total over all cells by nuclide	total collisions	collisions * weight	wgt. lost to capture	wgt. gain by fission	wgt. gain by (n,xn)	photons produced	photon wgt produced	avg photon energy
1001.62c	27407371	3.9709E+01	1.6918E-01	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
7014.62c	270	4.2214E-04	2.9134E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
7015.66c	1	2.0715E-06	4.3673E-12	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
8016.62c	1941752	3.1714E+00	2.7053E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
13027.62c	2123010	3.6862E+00	3.9305E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
24050.62c	330388	5.4785E-01	1.6187E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
24052.62c	1535917	2.4672E+00	1.8547E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
24053.62c	941088	1.5042E+00	3.9257E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
24054.62c	53652	8.9400E-02	2.6385E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
25055.62c	1132166	1.8071E+00	4.1071E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
26054.62c	668812	1.1309E+00	1.2208E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
26056.62c	11894155	1.6506E+01	1.9134E-01	0.0000E+00	4.9180E-06	0	0.0000E+00	0.0000E+00
26057.62c	273109	4.6193E-01	5.1849E-03	0.0000E+00	1.9108E-06	0	0.0000E+00	0.0000E+00
26058.62c	28653	4.8030E-02	5.2887E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
28058.62c	2620719	3.7171E+00	3.4821E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
28060.62c	407435	7.0753E-01	8.2929E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
28061.62c	20100	3.1067E-02	3.8093E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00

```
                28062.62c              212522  3.4224E-01  5.0655E-03  0.0000E+00  0.0000E+00            0  0.0000E+00  0.0000E+00
                28064.62c               17269  3.1051E-02  1.5720E-04  0.0000E+00  0.0000E+00            0  0.0000E+00  0.0000E+00
                40000.66c               77568  1.3693E-01  1.0679E-03  0.0000E+00  2.5430E-05            0  0.0000E+00  0.0000E+00
                50000.42c                 725  1.2911E-03  6.7541E-05  0.0000E+00  0.0000E+00            0  0.0000E+00  0.0000E+00
                82206.66c             5917568  9.1491E+00  6.9637E-03  0.0000E+00  6.0193E-05            0  0.0000E+00  0.0000E+00
                82207.66c             5465260  8.5894E+00  2.3138E-02  0.0000E+00  1.4604E-04            0  0.0000E+00  0.0000E+00
                82208.66c            13239809  2.0700E+01  7.7584E-04  0.0000E+00  2.8591E-04            0  0.0000E+00  0.0000E+00
                92235.69c               13149  1.8238E-02  2.6523E-03  1.3545E-02  0.0000E+00            0  0.0000E+00  0.0000E+00
                92238.69c              186994  3.3548E-01  2.5440E-02  5.4986E-03  3.0727E-04            0  0.0000E+00  0.0000E+00
                94238.66c                  67  9.7812E-05  7.8916E-05  4.0561E-06  0.0000E+00            0  0.0000E+00  0.0000E+00
                94239.69c              247900  3.4650E-01  9.9448E-02  2.2599E-01  5.2057E-06            0  0.0000E+00  0.0000E+00
                94240.66c                7457  1.1940E-02  1.0232E-02  1.0428E-04  0.0000E+00            0  0.0000E+00  0.0000E+00
                94241.66c                1305  1.8084E-03  4.2713E-04  1.2840E-03  0.0000E+00            0  0.0000E+00  0.0000E+00
                94242.66c                  36  6.0894E-05  3.7138E-05  1.8504E-06  0.0000E+00            0  0.0000E+00  0.0000E+00
1keff results for: NAC-LWT Cask - MOX Experiments - Accident Transport Conditions                         probid =  10/25/07
21:05:56


 the initial fission neutron source distribution was generated from a general sdef source description.
 the criticality problem was scheduled to skip  30 cycles and run a total of  530 cycles with nominally     1000 neutrons per
cycle.
 this problem has run  30 inactive cycles with     29983 neutron histories and  500 active cycles with      500502 neutron
histories.


 this calculation has completed the requested number of keff cycles using a total of       530485 fission neutron source
histories.
 all cells with fissionable material were sampled and had fission neutron source points.


 the results of the w test for normality applied to the individual collision, absorption, and track-length keff cycle values are:

          the k( collision) cycle values appear normally distributed at the 95 percent confidence level
          the k(absorption) cycle values appear normally distributed at the 95 percent confidence level
          the k(trk length) cycle values appear normally distributed at the 95 percent confidence level


 ---------------------------------------------------------------------------------------------------------------------------------
---
 |
 |
 | the final estimated combined collision/absorption/track-length keff = 0.70319 with an estimated standard deviation of 0.00102
 |
 |
 |
 | the estimated 68, 95, & 99 percent keff confidence intervals are 0.70216 to 0.70422, 0.70115 to 0.70523, and 0.70048 to
0.70590 |
 |
 |
 | the final combined (col/abs/tl) prompt removal lifetime = 8.4802E-05 seconds with an estimated standard deviation of 1.0633E-
07 |
 |
 |
 | the average neutron energy causing fission = 9.7087E-02 mev
 |
 | the energy corresponding to the average neutron lethargy causing fission = 1.2505E-07 mev
 |
 |
 |
 | the percentages of fissions caused by neutrons in the thermal, intermediate, and fast neutron ranges are:
 |
 |         (<0.625 ev):  91.72%         (0.625 ev - 100 kev):   4.76%          (>100 kev):   3.52%
 |
 |
 |
 | the average fission neutrons produced per neutron absorbed (capture + fission) in all cells with fission = 1.8263E+00
 |
 | the average fission neutrons produced per neutron absorbed (capture + fission) in all the geometry cells = 7.0264E-01
 |
 |
 |
 | the average number of neutrons produced per fission = 2.855
 |
 |
 |
 ---------------------------------------------------------------------------------------------------------------------------------
---


 the estimated average keffs, one standard deviations, and 68, 95, and 99 percent confidence intervals are:

        keff estimator        keff     standard deviation       68% confidence          95% confidence          99% confidence
corr

             collision      0.70354         0.00111          0.70243 to 0.70465     0.70133 to 0.70575     0.70061 to 0.70648
            absorption      0.70301         0.00109          0.70192 to 0.70410     0.70084 to 0.70518     0.70013 to 0.70589
          track length      0.70318         0.00152          0.70165 to 0.70470     0.70014 to 0.70621     0.69915 to 0.70720
            col/absorp      0.70325         0.00104          0.70221 to 0.70430     0.70117 to 0.70533     0.70049 to 0.70601
0.7954
           abs/trk len      0.70305         0.00104          0.70201 to 0.70409     0.70098 to 0.70512     0.70031 to 0.70579
0.4238
           col/trk len      0.70349         0.00109          0.70239 to 0.70458     0.70130 to 0.70567     0.70059 to 0.70638
0.5841
       col/abs/trk len      0.70319         0.00102          0.70216 to 0.70422     0.70115 to 0.70523     0.70048 to 0.70590
```

if the largest of each keff occurred on the next cycle, the keff results and 68, 95, and 99 percent confidence intervals would be:

keff estimator	keff	standard deviation	68% confidence	95% confidence	99% confidence
collision	0.70369	0.00112	0.70257 to 0.70481	0.70146 to 0.70592	0.70073 to 0.70664
absorption	0.70314	0.00110	0.70205 to 0.70424	0.70096 to 0.70532	0.70025 to 0.70604
track length	0.70339	0.00154	0.70186 to 0.70493	0.70034 to 0.70645	0.69934 to 0.70745
col/abs/trk len	0.70334	0.00103	0.70231 to 0.70437	0.70128 to 0.70540	0.70061 to 0.70607

the estimated average prompt removal lifetimes, one standard deviations, and 68, 95, and 99 percent confidence intervals are (sec):

estimator	lifetime	std. dev.	68% confidence	95% confidence	99% confidence	corr
collision	8.47143E-05	1.42417E-07	8.4572E-05 to 8.4857E-05	8.4431E-05 to 8.4998E-05	8.4338E-05 to 8.5091E-05	
absorption	8.47241E-05	1.37731E-07	8.4586E-05 to 8.4862E-05	8.4450E-05 to 8.4998E-05	8.4360E-05 to 8.5088E-05	
track length	8.47846E-05	1.07925E-07	8.4677E-05 to 8.4893E-05	8.4570E-05 to 8.5000E-05	8.4499E-05 to 8.5070E-05	
col/absorp	8.47240E-05	1.37879E-07	8.4586E-05 to 8.4862E-05	8.4449E-05 to 8.4999E-05	8.4360E-05 to 8.5088E-05	0.9665
abs/trk len	8.48024E-05	1.06263E-07	8.4696E-05 to 8.4909E-05	8.4591E-05 to 8.5014E-05	8.4522E-05 to 8.5083E-05	0.8746
col/trk len	8.47991E-05	1.06906E-07	8.4692E-05 to 8.4906E-05	8.4586E-05 to 8.5012E-05	8.4517E-05 to 8.5082E-05	0.8399
col/abs/trk len	8.48016E-05	1.06329E-07	8.4695E-05 to 8.4908E-05	8.4590E-05 to 8.5013E-05	8.4521E-05 to 8.5083E-05	

absorption estimates of prompt lifetimes (sec):

	escape	capture	fission	removal
fraction	0.00000E+00	7.53886E-01	2.46114E-01	1.00000E+00
lifetime(abs)	0.00000E+00	1.12383E-04	3.44248E-04	8.47241E-05
lifetime(c/a/t)	0.00000E+00	1.12486E-04	3.44563E-04	8.48016E-05

1average keff results summed over 10 cycles each to form 50 batch values of keff   print table 178

batch number	start cycle	end cycle	keff estimators by batch k(coll)	k(abs)	k(track)	average keff estimators and deviations k(coll)	st dev	k(abs)	st dev	k(track)	st dev	col/abs/tl keff k(c/a/t)	st dev
1	31	40	0.69464	0.70858	0.69703								
2	41	50	0.69991	0.69995	0.71175	0.69728	0.00264	0.70427	0.00431	0.70439	0.00736		
3	51	60	0.69908	0.70175	0.71143	0.69788	0.00164	0.70343	0.00263	0.70674	0.00485		
4	61	70	0.70512	0.70586	0.70015	0.69969	0.00215	0.70404	0.00195	0.70509	0.00381	0.70399	0.00052
5	71	80	0.70990	0.71146	0.70550	0.70173	0.00263	0.70552	0.00212	0.70517	0.00295	0.70603	0.00173
6	81	90	0.70562	0.70888	0.70384	0.70238	0.00225	0.70608	0.00182	0.70495	0.00242	0.70627	0.00132
7	91	100	0.69488	0.69474	0.70383	0.70131	0.00218	0.70446	0.00223	0.70479	0.00205	0.70515	0.00189
8	101	110	0.70672	0.69958	0.71642	0.70198	0.00201	0.70385	0.00203	0.70624	0.00229	0.70565	0.00159
9	111	120	0.70039	0.70157	0.69025	0.70181	0.00178	0.70360	0.00181	0.70447	0.00269	0.70369	0.00169
10	121	130	0.70465	0.70223	0.69620	0.70209	0.00162	0.70346	0.00162	0.70364	0.00255	0.70323	0.00141
11	131	140	0.70238	0.70619	0.69735	0.70212	0.00146	0.70371	0.00149	0.70307	0.00237	0.70321	0.00127
12	141	150	0.70607	0.70232	0.71159	0.70245	0.00137	0.70359	0.00136	0.70378	0.00228	0.70344	0.00115
13	151	160	0.70037	0.70040	0.70984	0.70229	0.00127	0.70335	0.00128	0.70424	0.00215	0.70340	0.00107
14	161	170	0.72037	0.71651	0.71747	0.70358	0.00175	0.70429	0.00151	0.70519	0.00220	0.70471	0.00143
15	171	180	0.69433	0.69238	0.70387	0.70296	0.00174	0.70349	0.00162	0.70510	0.00205	0.70426	0.00148
16	181	190	0.70269	0.70088	0.69643	0.70295	0.00163	0.70333	0.00152	0.70456	0.00199	0.70381	0.00139
17	191	200	0.70976	0.70864	0.70773	0.70335	0.00158	0.70364	0.00146	0.70475	0.00188	0.70410	0.00132
18	201	210	0.70393	0.71074	0.69819	0.70338	0.00149	0.70404	0.00143	0.70438	0.00181	0.70423	0.00125
19	211	220	0.70859	0.70134	0.70737	0.70365	0.00144	0.70389	0.00136	0.70454	0.00172	0.70417	0.00117
20	221	230	0.69003	0.68724	0.68572	0.70297	0.00152	0.70306	0.00154	0.70360	0.00168	0.70321	0.00143
21	231	240	0.69404	0.69697	0.70617	0.70255	0.00151	0.70277	0.00149	0.70372	0.00180	0.70307	0.00138
22	241	250	0.70290	0.70303	0.70274	0.70256	0.00144	0.70278	0.00142	0.70368	0.00171	0.70307	0.00131
23	251	260	0.69744	0.70080	0.69572	0.70234	0.00139	0.70270	0.00136	0.70333	0.00167	0.70288	0.00127
24	261	270	0.68944	0.68842	0.69940	0.70180	0.00144	0.70210	0.00143	0.70317	0.00161	0.70253	0.00130
25	271	280	0.71173	0.70875	0.69470	0.70220	0.00144	0.70237	0.00140	0.70283	0.00158	0.70256	0.00123
26	281	290	0.69046	0.69795	0.68252	0.70175	0.00145	0.70220	0.00136	0.70205	0.00171	0.70218	0.00125

27	291	300	0.69890	0.70547	0.69782	0.70164	0.00140	0.70232	0.00131	0.70189	0.00165	0.70221	0.00121
28	301	310	0.72067	0.71493	0.72845	0.70232	0.00151	0.70277	0.00134	0.70284	0.00185	0.70287	0.00131
29	311	320	0.71248	0.71290	0.70837	0.70267	0.00150	0.70312	0.00134	0.70303	0.00180	0.70318	0.00130
30	321	330	0.70552	0.71034	0.68928	0.70277	0.00145	0.70336	0.00132	0.70257	0.00180	0.70322	0.00126
31	331	340	0.70673	0.70583	0.72029	0.70290	0.00141	0.70344	0.00128	0.70314	0.00183	0.70344	0.00124
32	341	350	0.71397	0.70181	0.72231	0.70324	0.00141	0.70339	0.00124	0.70374	0.00187	0.70352	0.00119
33	351	360	0.69317	0.69015	0.70837	0.70294	0.00140	0.70299	0.00126	0.70388	0.00182	0.70330	0.00119
34	361	370	0.70051	0.70177	0.69207	0.70287	0.00136	0.70295	0.00123	0.70353	0.00180	0.70316	0.00116
35	371	380	0.72093	0.70273	0.70370	0.70338	0.00142	0.70295	0.00119	0.70354	0.00174	0.70307	0.00112
36	381	390	0.70896	0.71222	0.71827	0.70354	0.00139	0.70320	0.00119	0.70395	0.00174	0.70338	0.00114
37	391	400	0.70283	0.69897	0.68309	0.70352	0.00135	0.70309	0.00116	0.70339	0.00179	0.70316	0.00113
38	401	410	0.71038	0.71680	0.71233	0.70370	0.00132	0.70345	0.00118	0.70362	0.00176	0.70351	0.00114
39	411	420	0.70453	0.69894	0.71991	0.70372	0.00129	0.70333	0.00116	0.70404	0.00176	0.70351	0.00112
40	421	430	0.71224	0.71442	0.70680	0.70393	0.00128	0.70361	0.00116	0.70411	0.00172	0.70375	0.00111
41	431	440	0.71180	0.70908	0.70762	0.70412	0.00126	0.70374	0.00114	0.70419	0.00168	0.70388	0.00109
42	441	450	0.69886	0.70084	0.70113	0.70400	0.00123	0.70368	0.00112	0.70412	0.00164	0.70380	0.00107
43	451	460	0.70033	0.69292	0.70745	0.70391	0.00121	0.70343	0.00112	0.70420	0.00160	0.70366	0.00106
44	461	470	0.70894	0.70544	0.69422	0.70403	0.00119	0.70347	0.00109	0.70397	0.00158	0.70365	0.00103
45	471	480	0.70260	0.70505	0.69236	0.70400	0.00116	0.70351	0.00107	0.70371	0.00157	0.70361	0.00101
46	481	490	0.69987	0.69934	0.69771	0.70391	0.00114	0.70342	0.00105	0.70358	0.00154	0.70351	0.00099
47	491	500	0.70292	0.70173	0.71993	0.70389	0.00111	0.70338	0.00103	0.70393	0.00154	0.70356	0.00097
48	501	510	0.69558	0.69375	0.68100	0.70371	0.00110	0.70318	0.00103	0.70345	0.00159	0.70332	0.00099
49	511	520	0.69737	0.69503	0.71016	0.70358	0.00109	0.70301	0.00102	0.70359	0.00156	0.70322	0.00097
50	521	530	0.70154	0.70293	0.68301	0.70354	0.00107	0.70301	0.00100	0.70318	0.00158	0.70313	0.00096

average keff results summed over 20 cycles each to form 25 batch values of keff

batch	start	end	keff estimators by batch			average keff estimators and deviations						col/abs/tl keff	
number	cycle	cycle	k(coll)	k(abs)	k(track)	k(coll)	st dev	k(abs)	st dev	k(track)	st dev	k(c/a/t)	st dev
1	31	50	0.69728	0.70427	0.70439								
2	51	70	0.70210	0.70381	0.70579	0.69969	0.00241	0.70404	0.00023	0.70509	0.00070		
3	71	90	0.70776	0.71017	0.70467	0.70238	0.00303	0.70608	0.00205	0.70495	0.00043		
4	91	110	0.70080	0.69716	0.71013	0.70198	0.00218	0.70385	0.00266	0.70624	0.00133	0.70631	0.00037
5	111	130	0.70252	0.70190	0.69323	0.70209	0.00169	0.70346	0.00210	0.70364	0.00280	0.70281	0.00204
6	131	150	0.70423	0.70425	0.70447	0.70245	0.00143	0.70359	0.00172	0.70378	0.00229	0.70309	0.00154
7	151	170	0.71037	0.70846	0.71366	0.70358	0.00165	0.70429	0.00161	0.70519	0.00240	0.70431	0.00181
8	171	190	0.69851	0.69663	0.70015	0.70295	0.00157	0.70333	0.00169	0.70456	0.00217	0.70344	0.00178
9	191	210	0.70685	0.70969	0.70296	0.70338	0.00145	0.70404	0.00165	0.70438	0.00192	0.70383	0.00158
10	211	230	0.69931	0.69429	0.69654	0.70297	0.00136	0.70306	0.00177	0.70360	0.00189	0.70311	0.00148
11	231	250	0.69847	0.70000	0.70446	0.70256	0.00129	0.70278	0.00162	0.70368	0.00171	0.70287	0.00138
12	251	270	0.69344	0.69461	0.69756	0.70180	0.00140	0.70210	0.00163	0.70317	0.00164	0.70228	0.00149
13	271	290	0.70110	0.70335	0.68861	0.70175	0.00129	0.70220	0.00150	0.70205	0.00188	0.70186	0.00137
14	291	310	0.70978	0.71020	0.71314	0.70232	0.00133	0.70277	0.00150	0.70284	0.00191	0.70245	0.00143
15	311	330	0.70900	0.71162	0.69883	0.70277	0.00131	0.70336	0.00152	0.70257	0.00180	0.70275	0.00138
16	331	350	0.71035	0.70382	0.72130	0.70324	0.00132	0.70339	0.00142	0.70374	0.00205	0.70337	0.00137
17	351	370	0.69684	0.69596	0.70022	0.70287	0.00129	0.70295	0.00141	0.70353	0.00194	0.70300	0.00135
18	371	390	0.71494	0.70748	0.71099	0.70354	0.00139	0.70320	0.00135	0.70395	0.00187	0.70342	0.00133

19	391	410	0.70660	0.70788	0.69771	0.70370	0.00133	0.70345	0.00130	0.70362	0.00180	0.70352	0.00126
20	411	430	0.70839	0.70668	0.71336	0.70393	0.00128	0.70361	0.00124	0.70411	0.00178	0.70376	0.00122
21	431	450	0.70533	0.70496	0.70437	0.70400	0.00122	0.70368	0.00118	0.70412	0.00169	0.70381	0.00116
22	451	470	0.70464	0.69918	0.70084	0.70403	0.00116	0.70347	0.00115	0.70397	0.00162	0.70369	0.00112
23	471	490	0.70124	0.70219	0.69504	0.70391	0.00112	0.70342	0.00110	0.70358	0.00159	0.70355	0.00108
24	491	510	0.69925	0.69774	0.70046	0.70371	0.00109	0.70318	0.00108	0.70345	0.00153	0.70335	0.00106
25	511	530	0.69946	0.69898	0.69658	0.70354	0.00106	0.70301	0.00105	0.70318	0.00150	0.70317	0.00103

average keff results summed over 25 cycles each to form 20 batch values of keff

batch number	start cycle	end cycle	keff estimators by batch k(coll)	k(abs)	k(track)	average keff estimators and deviations k(coll)	st dev	k(abs)	st dev	k(track)	st dev	col/abs/tl keff k(c/a/t)	st dev
1	31	55	0.69657	0.70340	0.70573								
2	56	80	0.70689	0.70764	0.70461	0.70173	0.00516	0.70552	0.00212	0.70517	0.00056		
3	81	105	0.70330	0.70294	0.70696	0.70225	0.00303	0.70466	0.00150	0.70577	0.00068		
4	106	130	0.70161	0.69985	0.69725	0.70209	0.00215	0.70346	0.00160	0.70364	0.00218	0.70307	0.00279
5	131	155	0.70351	0.70440	0.70454	0.70238	0.00169	0.70365	0.00125	0.70382	0.00170	0.70330	0.00181
6	156	180	0.70590	0.70272	0.71151	0.70296	0.00150	0.70349	0.00104	0.70510	0.00189	0.70355	0.00140
7	181	205	0.70925	0.70930	0.70200	0.70386	0.00155	0.70432	0.00121	0.70466	0.00166	0.70439	0.00124
8	206	230	0.69675	0.69424	0.69617	0.70297	0.00161	0.70306	0.00164	0.70360	0.00178	0.70322	0.00165
9	231	255	0.69816	0.69762	0.70089	0.70244	0.00152	0.70246	0.00157	0.70330	0.00160	0.70281	0.00153
10	256	280	0.70007	0.70157	0.69860	0.70220	0.00138	0.70237	0.00140	0.70283	0.00151	0.70247	0.00138
11	281	305	0.69993	0.70605	0.69500	0.70199	0.00126	0.70270	0.00131	0.70212	0.00154	0.70230	0.00127
12	306	330	0.71128	0.71058	0.70758	0.70277	0.00139	0.70336	0.00137	0.70257	0.00148	0.70296	0.00134
13	331	355	0.70623	0.70055	0.71508	0.70303	0.00131	0.70314	0.00128	0.70353	0.00166	0.70325	0.00123
14	356	380	0.70789	0.70037	0.70362	0.70338	0.00126	0.70295	0.00120	0.70354	0.00154	0.70318	0.00113
15	381	405	0.70582	0.70761	0.70172	0.70354	0.00118	0.70326	0.00116	0.70342	0.00144	0.70335	0.00106
16	406	430	0.70975	0.70893	0.71445	0.70393	0.00117	0.70361	0.00114	0.70411	0.00151	0.70379	0.00110
17	431	455	0.70786	0.70519	0.71145	0.70416	0.00112	0.70370	0.00107	0.70454	0.00149	0.70397	0.00106
18	456	480	0.70116	0.70015	0.68966	0.70400	0.00107	0.70351	0.00103	0.70371	0.00163	0.70369	0.00104
19	481	505	0.70176	0.70044	0.70559	0.70398	0.00102	0.70334	0.00099	0.70381	0.00154	0.70357	0.00099
20	506	530	0.69715	0.69667	0.69113	0.70354	0.00103	0.70301	0.00100	0.70318	0.00159	0.70324	0.00101

average keff results summed over 50 cycles each to form 10 batch values of keff

batch number	start cycle	end cycle	keff estimators by batch k(coll)	k(abs)	k(track)	average keff estimators and deviations k(coll)	st dev	k(abs)	st dev	k(track)	st dev	col/abs/tl keff k(c/a/t)	st dev
1	31	80	0.70173	0.70552	0.70517								
2	81	130	0.70245	0.70140	0.70211	0.70209	0.00036	0.70346	0.00206	0.70364	0.00153		
3	131	180	0.70471	0.70356	0.70803	0.70296	0.00090	0.70349	0.00119	0.70510	0.00171		
4	181	230	0.70300	0.70177	0.69909	0.70297	0.00063	0.70306	0.00095	0.70360	0.00193	0.70287	0.00055
5	231	280	0.69911	0.69960	0.69975	0.70220	0.00092	0.70237	0.00101	0.70283	0.00168	0.70213	0.00111
6	281	330	0.70561	0.70832	0.70129	0.70277	0.00094	0.70336	0.00129	0.70257	0.00140	0.70271	0.00120
7	331	380	0.70706	0.70046	0.70935	0.70338	0.00100	0.70295	0.00117	0.70354	0.00153	0.70322	0.00106
8	381	430	0.70779	0.70827	0.70808	0.70393	0.00103	0.70361	0.00121	0.70411	0.00144	0.70384	0.00113
9	431	480	0.70451	0.70267	0.70056	0.70400	0.00091	0.70351	0.00107	0.70371	0.00133	0.70380	0.00099
10	481	530	0.69946	0.69855	0.69836	0.70354	0.00093	0.70301	0.00108	0.70318	0.00130	0.70336	0.00104

average keff results summed over 100 cycles each to form 5 batch values of keff

```
  batch  start    end     keff estimators by batch               average keff estimators and deviations                   col/abs/tl
keff
 number  cycle  cycle     k(coll)  k(abs)  k(track)         k(coll)  st dev     k(abs)  st dev    k(track) st dev        k(c/a/t) st
dev

      1     31    130     0.70209  0.70346  0.70364
      2    131    230     0.70385  0.70266  0.70356        0.70297 0.00088   0.70306 0.00040   0.70360 0.00004
      3    231    330     0.70236  0.70396  0.70052        0.70277 0.00055   0.70336 0.00038   0.70257 0.00103
      4    331    430     0.70742  0.70436  0.70872        0.70393 0.00123   0.70361 0.00037   0.70411 0.00170        0.70359
0.00063
      5    431    530     0.70198  0.70061  0.69946        0.70354 0.00103   0.70301 0.00066   0.70318 0.00161        0.70330
0.00075


 average keff results summed over 125 cycles each to form  4 batch values of keff

  batch  start    end     keff estimators by batch               average keff estimators and deviations                   col/abs/tl
keff
 number  cycle  cycle     k(coll)  k(abs)  k(track)         k(coll)  st dev     k(abs)  st dev    k(track) st dev        k(c/a/t) st
dev

      1     31    155     0.70238  0.70365  0.70382
      2    156    280     0.70202  0.70109  0.70183        0.70220 0.00018   0.70237 0.00128   0.70283 0.00099
      3    281    405     0.70623  0.70503  0.70460        0.70354 0.00135   0.70326 0.00115   0.70342 0.00082
      4    406    530     0.70354  0.70227  0.70246        0.70354 0.00095   0.70301 0.00035   0.70318 0.00063        0.70379
0.00031


 average keff results summed over 250 cycles each to form  2 batch values of keff

  batch  start    end     keff estimators by batch               average keff estimators and deviations
 number  cycle  cycle     k(coll)  k(abs)  k(track)         k(coll)  st dev     k(abs)  st dev    k(track) st dev

      1     31    280     0.70220  0.70237  0.70283
      2    281    530     0.70488  0.70365  0.70353        0.70354 0.00134   0.70301 0.00064   0.70318 0.00035
1average individual and combined collision/absorption/track-length keff results for 10 different batch sizes

 cycles per  number of    average keff estimators and deviations      normality  average k(c/a/t)    k(c/a/t) confidence
intervals
 keff batch  k batches  k(col) st dev  k(abs) st dev  k(trk) st dev   co/ab/trk  k(c/a/t) st dev    95% confidence    99%
confidence

        1         500  |  0.7035 0.0011  0.7030 0.0011  0.7032 0.0015  |95/95/95|  0.70319 0.00102   0.70115-0.70523   0.70048-
0.70590
        2         250  |  0.7035 0.0011  0.7030 0.0010  0.7032 0.0016  |95/95/95|  0.70319 0.00101   0.70119-0.70520   0.70054-
0.70585
        4         125  |  0.7035 0.0010  0.7030 0.0010  0.7032 0.0015  |99/95/95|  0.70316 0.00096   0.70125-0.70507   0.70063-
0.70570
        5         100  |  0.7035 0.0010  0.7030 0.0010  0.7032 0.0016  |95/95/95|  0.70315 0.00096   0.70125-0.70506   0.70063-
0.70568
       10          50  |  0.7035 0.0011  0.7030 0.0010  0.7032 0.0016  |95/95/95|  0.70313 0.00096   0.70121-0.70506   0.70057-
0.70570
       20          25  |  0.7035 0.0011  0.7030 0.0010  0.7032 0.0015  |95/95/95|  0.70317 0.00103   0.70102-0.70531   0.70025-
0.70608
       25          20  |  0.7035 0.0010  0.7030 0.0010  0.7032 0.0016  |95/95/95|  0.70324 0.00101   0.70110-0.70537   0.70031-
0.70616
       50          10  |  0.7035 0.0009  0.7030 0.0011  0.7032 0.0013  |95/95/95|  0.70336 0.00104   0.70091-0.70581   0.69973-
0.70699
      100           5  |  0.7035 0.0010  0.7030 0.0007  0.7032 0.0016  |95/95/95|  0.70330 0.00075   0.70010-0.70651   0.69591-
0.71070
      125           4  |  0.7035 0.0010  0.7030 0.0009  0.7032 0.0006  |95/95/95|  0.70379 0.00031   0.69989-0.70769   0.68426-
0.72332
 -------------------------------------------------------------------------------------------------------------------------------
---
1individual and average keff estimator results by cycle

  keff      neutron    keff estimators by cycle          average keff estimators and deviations                average k(c/a/t)
 cycle    histories   k(coll)  k(abs)  k(track)      k(coll)  st dev     k(abs)  st dev    k(track) st dev     k(c/a/t)  st dev     fom

      1        1000 | 0.66263  0.67157  0.66002  |
      2         844 | 0.62259  0.63335  0.60633  |
      3         928 | 0.74464  0.73878  0.73696  |
      4        1189 | 0.68648  0.69320  0.71005  |
      5         916 | 0.67162  0.67449  0.66605  |
      6         972 | 0.67555  0.69125  0.65326  |
      7         999 | 0.69386  0.68906  0.66118  |
      8        1052 | 0.70286  0.67585  0.73216  |
      9        1006 | 0.69990  0.70969  0.76966  |
     10        1024 | 0.69455  0.70359  0.71872  |
 -------------------------------------------------------------------------------------------------------------------------------
---
     11         992 | 0.71945  0.72461  0.77486  |
     12        1044 | 0.74157  0.74571  0.71944  |
     13        1026 | 0.71667  0.70198  0.67162  |
     14         971 | 0.68381  0.69304  0.65735  |
     15         972 | 0.67127  0.68589  0.70914  |
     16         980 | 0.70348  0.68749  0.72402  |
     17        1075 | 0.67107  0.68658  0.63445  |
     18         942 | 0.69601  0.70231  0.71773  |
     19        1027 | 0.70549  0.71679  0.64485  |
     20        1045 | 0.77572  0.74148  0.75166  |
 -------------------------------------------------------------------------------------------------------------------------------
---
     21        1103 | 0.69297  0.68583  0.72338  |
     22         898 | 0.67206  0.66187  0.67595  |
```

```
   23          949 | 0.71079  0.69071  0.73845  |
   24         1052 | 0.68395  0.66337  0.74105  |
   25          970 | 0.68790  0.69966  0.67099  |
   26         1010 | 0.70855  0.69614  0.70095  |
   27         1009 | 0.67223  0.64488  0.68232  |
   28          973 | 0.73330  0.74610  0.69315  |
   29         1080 | 0.69622  0.71162  0.68492  |
   30          935 | 0.73041  0.69416  0.74775  |
 ------------------  begin active keff cycles  ------------------------------------------------------------------
---
   31         1047 | 0.71428  0.73079  0.71371  |
   32          971 | 0.69249  0.71990  0.70235  |  0.70338 0.01089   0.72534 0.00544   0.70803 0.00568  |
   33          981 | 0.69778  0.70563  0.66827  |  0.70151 0.00656   0.71877 0.00728   0.69478 0.01365  |
   34          994 | 0.68924  0.69195  0.69822  |  0.69845 0.00556   0.71207 0.00846   0.69564 0.00969  |   0.69375 0.01721
8655
   35          994 | 0.68162  0.70872  0.64083  |  0.69508 0.00547   0.71140 0.00658   0.68468 0.01329  |   0.69941 0.01388
10969
   36          977 | 0.71544  0.70426  0.72827  |  0.69847 0.00561   0.71021 0.00551   0.69194 0.01306  |   0.70431 0.00742
33097
   37         1037 | 0.73287  0.74246  0.72458  |  0.70339 0.00683   0.71481 0.00655   0.69660 0.01198  |   0.70980 0.01000
16163
   38         1015 | 0.69058  0.70612  0.77117  |  0.70179 0.00612   0.71373 0.00577   0.70593 0.01395  |   0.70945 0.00924
16573
   39          956 | 0.66418  0.66719  0.62670  |  0.69761 0.00683   0.70856 0.00726   0.69712 0.01513  |   0.70110 0.01044
10967
   40          956 | 0.66792  0.70877  0.69622  |  0.69464 0.00679   0.70858 0.00649   0.69703 0.01353  |   0.70301 0.00977
11412
 ---------------------------------------------------------------------------------------------------------------
---
.
.
.
.
----------------------------------------------------------------------------------------------------------------
--
  511          928 | 0.75910  0.74259  0.75416  |  0.70383 0.00113   0.70326 0.00111   0.70356 0.00154  |   0.70348 0.00104
20679
  512         1183 | 0.67984  0.69205  0.72746  |  0.70378 0.00113   0.70324 0.00111   0.70361 0.00154  |   0.70346 0.00104
20711
  513          892 | 0.68107  0.68076  0.70320  |  0.70373 0.00113   0.70319 0.00111   0.70361 0.00153  |   0.70342 0.00104
20724
  514         1007 | 0.69072  0.68108  0.70462  |  0.70370 0.00112   0.70315 0.00111   0.70361 0.00153  |   0.70339 0.00104
20741
  515         1027 | 0.64762  0.66328  0.62331  |  0.70359 0.00113   0.70306 0.00111   0.70344 0.00154  |   0.70328 0.00104
20556
  516          932 | 0.68972  0.68472  0.71744  |  0.70356 0.00113   0.70303 0.00111   0.70347 0.00153  |   0.70326 0.00104
20586
  517         1052 | 0.74062  0.71731  0.75135  |  0.70364 0.00113   0.70305 0.00111   0.70357 0.00153  |   0.70331 0.00104
20573
  518         1053 | 0.70672  0.69771  0.68843  |  0.70364 0.00112   0.70304 0.00110   0.70354 0.00153  |   0.70330 0.00104
20612
  519          938 | 0.67005  0.67215  0.67557  |  0.70357 0.00112   0.70298 0.00110   0.70348 0.00153  |   0.70323 0.00104
20571
  520          937 | 0.70825  0.71869  0.75603  |  0.70358 0.00112   0.70301 0.00110   0.70359 0.00153  |   0.70327 0.00104
20596
 ---------------------------------------------------------------------------------------------------------------
---
  521         1058 | 0.71063  0.71456  0.63479  |  0.70360 0.00112   0.70304 0.00110   0.70345 0.00153  |   0.70327 0.00103
20634
  522         1009 | 0.68556  0.69318  0.65900  |  0.70356 0.00112   0.70302 0.00110   0.70336 0.00153  |   0.70323 0.00103
20648
  523          969 | 0.67996  0.70849  0.66781  |  0.70351 0.00112   0.70303 0.00110   0.70329 0.00153  |   0.70321 0.00103
20690
  524          978 | 0.72088  0.70570  0.70327  |  0.70355 0.00111   0.70303 0.00109   0.70329 0.00153  |   0.70322 0.00103
20730
  525         1035 | 0.71400  0.70193  0.73850  |  0.70357 0.00111   0.70303 0.00109   0.70336 0.00153  |   0.70324 0.00103
20767
  526         1006 | 0.74177  0.75665  0.71714  |  0.70365 0.00111   0.70314 0.00110   0.70339 0.00152  |   0.70333 0.00103
20676
  527         1046 | 0.64384  0.66806  0.63471  |  0.70353 0.00112   0.70307 0.00110   0.70325 0.00153  |   0.70323 0.00103
20527
  528          869 | 0.71724  0.69923  0.69946  |  0.70355 0.00112   0.70306 0.00109   0.70324 0.00152  |   0.70323 0.00103
20572
  529         1119 | 0.69903  0.68697  0.72558  |  0.70354 0.00111   0.70303 0.00109   0.70328 0.00152  |   0.70322 0.00103
20601
  530          961 | 0.70253  0.69452  0.64982  |  0.70354 0.00111   0.70301 0.00109   0.70318 0.00152  |   0.70319 0.00102
20625
 ---------------------------------------------------------------------------------------------------------------
---


  the largest active cycle keffs by estimator are:                        the smallest active cycle keffs by estimator
are:

                    collision 0.77667 on cycle 250                                           collision 0.63361 on cycle 397
                   absorption 0.76931 on cycle 201                                          absorption 0.63388 on cycle 510
                 track length 0.81127 on cycle 331                                        track length 0.60593 on cycle 445
1plot of the estimated col/abs/track-length keff one standard deviation interval versus cycle number (| = final keff =  0.70319)

    cycle    active 0.69                             0.70                            0.71                            0.72
   number    cycles |-------------------------------|-------------------------------|-------------------------------|
      40        10  |       (------------------------------k-------------------------------)                       |
      45        15  |                    (----------------k-|--------------)                                        |
      50        20  |                 (--------------k--------|------)                                             |
      55        25  |                 (------------k----------|--)                                                 |
      60        30  |                (-------------k----------|---)                                                |
      65        35  |                  (-----------k---------|--)                                                  |
```

```
   70      40  |                          (----------k---|------)                                                 |
   75      45  |                                (--------|-k---------)                                            |
   80      50  |                                  (------|--k--------)                                            |
   85      55  +                                   (-----|--k---------)                                           +
   90      60  |                                   (-----|--k----------)                                          |
   95      65  |                                (--------k--------)                                               |
  100      70  |                               (--------k|-------)                                                |
  105      75  |                                  (------|k--------)                                              |
  110      80  |                                 (-------k--------)                                               |
  115      85  |                                (-------k|-------)                                                |
  120      90  |                                (-------k|------)                                                 |
  125      95  |                                  (------k-------)                                                |
  130     100  |                                 (------k|------)                                                 |
  135     105  +                                 (------k|-----)                                                  +
  140     110  |                                 (------k|-----)                                                  |
  145     115  |                                    (----|-k-----)                                                |
  150     120  |                                   (-----k------)                                                 |
  155     125  |                                   (-----k------)                                                 |
  160     130  |                                   (-----k-----)                                                  |
  165     135  |                                    (----|-k-----)                                                |
  170     140  |                                      (--|---k-----)                                              |
  175     145  |                                      (--|--k-----)                                               |
  180     150  |                                     (---|-k-----)                                                |
  185     155  +                                   (-----k-----)                                                  +
  190     160  |                                    (----|k-----)                                                 |
  195     165  |                                     (---|k-----)                                                 |
  200     170  |                                      (--|-k-----)                                                |
  205     175  |                                       (-|---k-----)                                              |
  210     180  |                                      (--|--k----)                                                |
  215     185  |                                      (--|--k----)                                                |
  220     190  |                                      (--|--k----)                                                |
  225     195  |                                     (---|-k----)                                                 |
  230     200  |                                    (----k----)                                                   |
  235     205  +                                   (----k|---)                                                    +
  240     210  |                                   (----k|----)                                                   |
  245     215  |                                   (----k|---)                                                    |
  250     220  |                                   (----k|---)                                                    |
  255     225  |                                  (----k-|---)                                                    |
  260     230  |                                   (----k|---)                                                    |
  265     235  |                                  (----k-|--)                                                     |
  270     240  |                                 (----k--|-)                                                      |
  275     245  |                                 (----k--|)                                                       |
  280     250  |                                  (----k-|--)                                                     |
  285     255  +                                 (----k--|)                                                       +
  290     260  |                                 (---k---|)                                                       |
  295     265  |                                (----k---|                                                        |
  300     270  |                                 (---k---|)                                                       |
  305     275  |                                  (---k--|-)                                                      |
  310     280  |                                   (----k|--)                                                     |
  315     285  |                                   (----k|--)                                                     |
  320     290  |                                    (----k---)                                                    |
  325     295  |                                    (----k---)                                                    |
  330     300  |                                    (----k---)                                                    |
  335     305  +                                     (---k----)                                                   +
  340     310  |                                     (---k----)                                                   |
  345     315  |                                     (---k----)                                                   |
  350     320  |                                      (--|k---)                                                   |
  355     325  |                                     (---k----)                                                   |
  360     330  |                                     (---k---)                                                    |
  365     335  |                                     (---k---)                                                    |
  370     340  |                                     (---k---)                                                    |
  375     345  |                                     (---k---)                                                    |
  380     350  |                                     (---k----)                                                   |
  385     355  +                                      (--|k---)                                                   +
  390     360  |                                      (--|k---)                                                   |
  395     365  |                                      (--|k---)                                                   |
  400     370  |                                      (--|k---)                                                   |
  405     375  |                                      (--|k---)                                                   |
  410     380  |                                       (-|-k---)                                                  |
  415     385  |                                       (-|-k---)                                                  |
  420     390  |                                       (-|-k---)                                                  |
  425     395  |                                        (|-k---)                                                  |
  430     400  |                                        (|--k--)                                                  |
  435     405  +                                        (|-k---)                                                  +
  440     410  |                                        (|--k---)                                                 |
  445     415  |                                       (-|-k---)                                                  |
  450     420  |                                        (|--k--)                                                  |
  455     425  |                                        (|--k---)                                                 |
  460     430  |                                       (-|-k--)                                                   |
  465     435  |                                       (-|-k---)                                                  |
  470     440  |                                        (|-k---)                                                  |
  475     445  |                                        (|-k---)                                                  |
  480     450  |                                        (|-k---)                                                  |
  485     455  +                                       (-|-k--)                                                   +
  490     460  |                                       (-|-k--)                                                   |
  495     465  |                                       (-|-k--)                                                   |
  500     470  |                                       (-|-k--)                                                   |
  505     475  |                                       (-|-k--)                                                   |
  510     480  |                                       (-|k---)                                                   |
  515     485  |                                      (--|k--)                                                    |
  520     490  |                                      (--|k--)                                                    |
  525     495  |                                      (--|k--)                                                    |
  530     500  |                                      (--k---)                                                    |
               |-------------------------------|--------------------------------|--------------------------------|
             0.69                            0.70                             0.71                             0.72
1individual and collision/absorption/track-length keffs for different numbers of inactive cycles skipped for fission source
settling
```

```
   skip  active      active    average keff estimators and deviations     normality average k(c/a/t)   k(c/a/t) confidence
intervals
  cycles cycles    neutrons  k(col) st dev  k(abs) st dev  k(trk) st dev  co/ab/tl  k(c/a/t) st dev   95% confidence   99%
confidence

     0    530        530485| 0.7032 0.0011  0.7026 0.0011  0.7030 0.0015 |95/95/95| 0.70281 0.00101  0.70081-0.70482  0.70015-
0.70547
     1    529        529485| 0.7033 0.0011  0.7026 0.0011  0.7030 0.0015 |95/95/95| 0.70288 0.00101  0.70088-0.70488  0.70022-
0.70554
     2    528        528641| 0.7034 0.0011  0.7028 0.0011  0.7032 0.0015 |95/95/95| 0.70303 0.00100  0.70104-0.70502  0.70039-
0.70566
     3    527        527713| 0.7034 0.0011  0.7027 0.0011  0.7032 0.0015 |95/95/95| 0.70296 0.00100  0.70097-0.70495  0.70033-
0.70559
     4    526        526524| 0.7034 0.0011  0.7027 0.0011  0.7031 0.0015 |95/95/95| 0.70298 0.00100  0.70099-0.70497  0.70034-
0.70562
     5    525        525608| 0.7034 0.0011  0.7028 0.0011  0.7032 0.0015 |95/95/95| 0.70304 0.00100  0.70105-0.70503  0.70040-
0.70568
     6    524        524636| 0.7035 0.0011  0.7028 0.0011  0.7033 0.0015 |95/95/95| 0.70308 0.00100  0.70109-0.70507  0.70044-
0.70572
     7    523        523637| 0.7035 0.0011  0.7028 0.0011  0.7034 0.0015 |95/95/95| 0.70311 0.00100  0.70112-0.70511  0.70047-
0.70576
     8    522        522585| 0.7035 0.0011  0.7029 0.0011  0.7033 0.0015 |95/95/95| 0.70313 0.00100  0.70113-0.70513  0.70048-
0.70578
     9    521        521579| 0.7035 0.0011  0.7029 0.0011  0.7032 0.0015 |95/95/95| 0.70310 0.00100  0.70110-0.70510  0.70045-
0.70576
    10    520        520555| 0.7035 0.0011  0.7029 0.0011  0.7032 0.0015 |95/95/95| 0.70310 0.00101  0.70110-0.70511  0.70044-
0.70576
 ----------------------------------------------------------------------------------------------------------------------------
---
    11    519        519563| 0.7035 0.0011  0.7028 0.0011  0.7030 0.0015 |95/95/95| 0.70305 0.00101  0.70104-0.70505  0.70038-
0.70571
    12    518        518519| 0.7034 0.0011  0.7027 0.0011  0.7030 0.0015 |95/95/95| 0.70297 0.00101  0.70097-0.70498  0.70031-
0.70563
    13    517        517493| 0.7034 0.0011  0.7027 0.0011  0.7031 0.0015 |95/95/95| 0.70298 0.00101  0.70097-0.70499  0.70031-
0.70564
    14    516        516522| 0.7035 0.0011  0.7028 0.0011  0.7032 0.0015 |95/95/95| 0.70301 0.00101  0.70100-0.70502  0.70035-
0.70568
    15    515        515550| 0.7035 0.0011  0.7028 0.0011  0.7031 0.0015 |95/95/95| 0.70305 0.00101  0.70104-0.70506  0.70038-
0.70572
    16    514        514570| 0.7035 0.0011  0.7028 0.0011  0.7031 0.0015 |95/95/95| 0.70306 0.00101  0.70104-0.70508  0.70036-
0.70573
    17    513        513495| 0.7036 0.0011  0.7028 0.0011  0.7032 0.0015 |95/95/95| 0.70312 0.00101  0.70110-0.70514  0.70044-
0.70580
    18    512        512553| 0.7036 0.0011  0.7028 0.0011  0.7032 0.0015 |95/95/95| 0.70312 0.00102  0.70110-0.70514  0.70044-
0.70580
    19    511        511526| 0.7036 0.0011  0.7028 0.0011  0.7033 0.0015 |95/95/95| 0.70312 0.00102  0.70109-0.70515  0.70043-
0.70581
    20    510        510481| 0.7034 0.0011  0.7027 0.0011  0.7032 0.0015 |95/95/95| 0.70303 0.00101  0.70101-0.70505  0.70035-
0.70571
 ----------------------------------------------------------------------------------------------------------------------------
---
.
.
.
.
.
 ----------------------------------------------------------------------------------------------------------------------------
---
   475     55         55110| 0.6995 0.0033  0.6991 0.0032  0.6982 0.0046 |95/95/95| 0.69904 0.00308  0.69285-0.70523  0.69079-
0.70729
   480     50         50070| 0.6995 0.0034  0.6986 0.0034  0.6984 0.0049 |95/95/95| 0.69873 0.00330  0.69209-0.70538  0.68986-
0.70761
   485     45         45025| 0.6998 0.0038  0.6990 0.0037  0.6998 0.0053 |95/95/95| 0.69932 0.00362  0.69201-0.70663  0.68955-
0.70909
   490     40         40100| 0.6994 0.0039  0.6984 0.0038  0.6985 0.0056 |95/95/95| 0.69858 0.00374  0.69100-0.70617  0.68842-
0.70875
   495     35         34999| 0.6989 0.0043  0.6970 0.0041  0.6955 0.0062 |95/95/95| 0.69704 0.00414  0.68861-0.70547  0.68571-
0.70838
   500     30         29990| 0.6982 0.0049  0.6972 0.0046  0.6914 0.0068 |95/95/95| 0.69647 0.00484  0.68655-0.70640  0.68307-
0.70987
   505     25         25031| 0.6972 0.0057  0.6967 0.0053  0.6911 0.0079 |95/95/95| 0.69586 0.00554  0.68436-0.70735  0.68023-
0.71148
   510     20         19989| 0.6995 0.0066  0.6990 0.0052  0.6966 0.0092 |95/95/95| 0.69852 0.00542  0.68707-0.70996  0.68279-
0.71424
   515     15         14962| 0.7021 0.0066  0.7013 0.0055  0.6946 0.0104 |95/95/95| 0.70061 0.00608  0.68736-0.71386  0.68203-
0.71919
   520     10         10050| 0.7015 0.0085  0.7029 0.0072  0.6830 0.0122 |95/95/95| 0.69931 0.00934  0.67722-0.72141  0.66662-
0.73201
 ----------------------------------------------------------------------------------------------------------------------------
---
   525      5          5001| 0.7009 0.0161  0.7011 0.0149  0.6853 0.0182 |95/95/95| 0.69614 0.02351  0.59496-0.79732  0.46277-
0.92951
   527      3          2949| 0.7063 0.0056  0.6936 0.0036  0.6916 0.0222 |
   528      2          2080| 0.7008 0.0017  0.6907 0.0038  0.6877 0.0379 |
```

the minimum estimated standard deviation for the col/abs/tl keff estimator occurs with 3 inactive cycles and 527 active cycles.

the first active half of the problem skips 30 cycles and uses 250 active cycles; the second half skips 280 and uses 250 cycles.
the col/abs/trk-len keff, one standard deviation, and 68, 95, and 99 percent intervals for each active half of the problem are:

problem	keff	standard deviation	68% confidence	95% confidence	99% confidence
first half	0.70239	0.00143	0.70096 to 0.70381	0.69954 to 0.70523	0.69862 to 0.70616

second half	0.70385	0.00147	0.70238 to 0.70532	0.70092 to 0.70678	0.69997 to 0.70773
final result	0.70319	0.00102	0.70216 to 0.70422	0.70115 to 0.70523	0.70046 to 0.70590

the first and second half values of k(collision/absorption/track length) appear to be the same at the 68 percent confidence level.
1plot of the estimated col/abs/track-length keff one standard deviation interval by active cycle number (| = final keff = .0.70319)

```
inactive   active 0.68                            0.69                             0.70                               0.71
  cycles   cycles |-------------------------------|--------------------------------|----------------------------------|
       0      530 |                                                                      (---k|-)                     |
       5      525 |                                                                       (--k|--)                    |
      10      520 |                                                                       (---k--)                    |
      15      515 |                                                                       (--k|--)                    |
      20      510 |                                                                       (--k|--)                    |
      25      505 |                                                                       (---k--)                    |
      30      500 .                                                                       (---k--)                    .
      35      495 |                                                                       (---k--)                    |
      40      490 |                                                                       (---k--)                    |
      45      485 +                                                                       (---k--)                    +
      50      480 |                                                                       (---k--)                    |
      55      475 |                                                                       (---k---)                   |
      60      470 |                                                                       (---k--)                    |
      65      465 |                                                                       (---k---)                   |
      70      460 |                                                                       (---k--)                    |
      75      455 |                                                                       (--k|--)                    |
      80      450 |                                                                       (--k|--)                    |
      85      445 |                                                                      (---k|--)                    |
      90      440 |                                                                      (---k|--)                    |
      95      435 +                                                                       (--k|--)                    +
     100      430 |                                                                       (--k|--)                    |
     105      425 |                                                                      (---k|--)                    |
     110      420 |                                                                       (--k|--)                    |
     115      415 |                                                                       (--k|--)                    |
     120      410 |                                                                       (---k--)                    |
     125      405 |                                                                       (--k|--)                    |
     130      400 |                                                                       (---k---)                   |
     135      395 |                                                                       (---k--)                    |
     140      390 |                                                                       (---k---)                   |
     145      385 +                                                                      (---k|--)                    +
     150      380 |                                                                       (---k---)                   |
     155      375 |                                                                      (----k---)                   |
     160      370 |                                                                       (---k---)                   |
     165      365 |                                                                      (---k|--)                    |
     170      360 |                                                                     (---k-|-)                     |
     175      355 |                                                                     (----k|--)                    |
     180      350 |                                                                      (---k|--)                    |
     185      345 |                                                                       (---k---)                   |
     190      340 |                                                                      (---k|---)                   |
     195      335 +                                                                      (---k|--)                    +
     200      330 |                                                                     (----k|--)                    |
     205      325 |                                                                    (----k-|-)                     |
     210      320 |                                                                     (---k-|--)                    |
     215      315 |                                                                     (---k-|--)                    |
     220      310 |                                                                     (---k-|--)                    |
     225      305 |                                                                     (----k|--)                    |
     230      300 |                                                                      (----k---)                   |
     235      295 |                                                                       (---|k---)                  |
     240      290 |                                                                       (---k----)                  |
     245      285 +                                                                       (---|k---)                  +
     250      280 |                                                                       (---k----)                  |
     255      275 |                                                                        (--|k----)                 |
     260      270 |                                                                       (---|k---)                  |
     265      265 |                                                                        (--|-k---)                 |
     270      260 |                                                                         (-|--k---)                |
     275      255 |                                                                         (-|--k----)               |
     280      250 |                                                                        (--|-k----)                |
     285      245 |                                                                         (-|--k----)               |
     290      240 |                                                                         (-|--k----)               |
     295      235 +                                                                          (|---k----)              +
     300      230 |                                                                         (-|--k----)               |
     305      225 |                                                                        (--|-k----)                |
     310      220 |                                                                       (---|k----)                 |
     315      215 |                                                                       (---|k----)                 |
     320      210 |                                                                     (-----k----)                  |
     325      205 |                                                                     (-----k----)                  |
     330      200 |                                                                     (----k|----)                  |
     335      195 |                                                                    (----k-|---)                   |
     340      190 |                                                                    (----k-|---)                   |
     345      185 +                                                                    (-----k|---)                   +
     350      180 |                                                                   (-----k-|---)                   |
     355      175 |                                                                    (-----k|----)                  |
     360      170 |                                                                     (-----k-----)                 |
     365      165 |                                                                     (-----k-----)                 |
     370      160 |                                                                     (-----k-----)                 |
     375      155 |                                                                    (-----k|-----)                 |
     380      150 |                                                                    (------k-----)                 |
     385      145 |                                                                  (-----k--|---)                   |
     390      140 |                                                                  (------k-|---)                   |
     395      135 +                                                                 (------k--|---)                   +
     400      130 |                                                                   (------k|-----)                 |
     405      125 |                                                                 (------k--|---)                   |
     410      120 |                                                               (------k----|-)                     |
     415      115 |                                                              (-------k----|-)                     |
     420      110 |                                                              (------k-----|-)                     |
     425      105 |                                                           (------k------) |                       |
     430      100 |                                                          (------k-------) |                       |
```

```
     435       95 |                                                     (-------k-------) |                     |
     440       90 |                                                   (-------k--------)  |                     |
     445       85 +                                                    (--------k-------) |                     +
     450       80 |                                                   (-------k--------)  |                     |
     455       75 |                                               (--------k--------)     |                     |
     460       70 |                                                   (--------k--------) |                     |
     465       65 |                                                   (---------k-------) |                     |
     470       60 |                                                 (---------k--------)  |                     |
     475       55 |                                                (---------k---------)  |                     |
     480       50 |                                              (----------k----------)  |                     |
     485       45 |                                               (-----------k----------)|                     |
     490       40 |                                            (-----------k------------) |                     |
     495       35 +                                      (------------k-------------)     |                     +
     500       30 |                                  (---------------k---------------)    |                     |
     505       25 |                              (----------------k-----------------)     |                     |
     510       20 |                                      (----------------k---------------|-)                   |
     515       15 |                                           (------------------k--------|----------)          |
     520       10 |                             (---------------------------k-------------|-----------------)   |
                  |-----------------------------|------------------------------|-------------------------------|
                0.68                          0.69                           0.70                            0.71

 ***********************************************************************************************************
 dump no.    2 on file MS_Acc_NACCoC_c1.00_g0.00_e0.00_d0.01cm_HP_36mm.inpr      nps =      530485    coll =       76766227
ctm =        11.96   nrn =          776053288


         6 warning messages so far.


 run terminated when   530   kcode cycles were done.

 computer time =   12.12 minutes

 mcnp     version 5     06212004                    10/25/07 21:18:09                    probid =  10/25/07 21:05:56
```

Figure 6.6.15-2 Hexagonal Pitch MOX Rods – ^{241}Pu Fuel Composition

```
Thread Name & Version = MCNP5_RSICC, 1.30
```



```
1mcnp     version 5     ld=06212004                    10/25/07 23:04:59
*************************************************************     probid =  10/25/07 23:04:59
 name=P1_Acc_NACCoC_c1.00_g0.00_e0.00_d0.01cm_HP_36mm.inp host=amdeng2-it1459

          NAC-LWT Cask - MOX Experiments - Accident Transport Conditions
          C
          C EXCEL File Version: v2.00
          C Run Version: v2.00
          C
          C Fissile Material Type: All Pu-241
          C Rod Interior Void Moderator Density: 0.9982 g/cc
          C Canister Interior Moderator Density: 0.9982 g/cc
          C Canister to Cask Gap Moderator Density: 0.0001 g/cc
          C Cask Exterior Moderator Density: 0.0001 g/cc
          C Boundary Condition / Distance:  Reflected / 0.01 cm
          C
          C Fuel Rod Pitch: 3.6 cm
          C Fuel Rod Pitch Cofiguration: Hexagonal
          C Number of Rods: 16
          C
          C Base Fuel Parameters: NACCoC
          C
          c Cells - Fuel Rod - NACCoC
          1 1 -10.554 -1    u=3 $ Fuel
          2 2 -0.9982 -2 +1  u=3 $ Plenum + Fuel to Clad Gap
          3 3 -6.56 -3 +2  u=3 $ Clad + End Plugs
          4 4 -0.9982 +3   u=3 $ Outside Fuel Rod
          C 16 Rods - Hexagonal Pitch
          10 4 -0.9982 -10
                     *trcl=( 0.9000 -1.5588 0.0000 )
                     lat=2 u=2 fill=-7:6 -5:5 0:0
                2 2 2 2 2 2 2 2 2 2 2 2 2 2
                2 2 2 2 2 2 2 2 2 2 2 2 2 2
                2 2 2 2 2 2 2 2 2 2 2 2 2 2
                2 2 2 2 2 2 2 3 2 2 2 2 2 2
                2 2 2 2 2 2 3 3 3 2 2 2 2 2
                2 2 2 2 2 3 3 3 3 3 2 2 2 2
                2 2 2 2 2 3 3 3 3 2 2 2 2 2
                2 2 2 2 2 3 3 3 2 2 2 2 2 2
                2 2 2 2 2 2 2 2 2 2 2 2 2 2
                2 2 2 2 2 2 2 2 2 2 2 2 2 2
                2 2 2 2 2 2 2 2 2 2 2 2 2 2
          C PWR Basket - Cells
          20  4 -0.9982 -20   fill=2  u=1 $ Rod Array Container
          21  5 -0.0001 +20 -21    u=1 $ Basket Cavity
          22  7 -2.7020 -22 +21    u=1 $ Basket Body
          23  5 -0.0001 +22      u=1 $ Outside
          C Cells - LWT Cask Accident Conditions
          40 8 -11.344 -43      u=0 $ BotPb
          41 5 -0.0001 -42 fill=1    u=0 $ Cavity
          42 9 -7.9400 -41 +43    u=0 $ Bottom
          43 9 -7.9400 -40 +41 +45 +48 +42 u=0 $ OuterShell
          44 9 -7.9400 -44 +47 +42   u=0 $ InnerShellTaper
          45 9 -7.9400 -46 +42    u=0 $ InnerShell
          46 8 -11.344 -47 +46    u=0 $ Lead
          47 8 -11.344 -45 +44 +47   u=0 $ LeadTaper
          48 0         -45 +47    u=0 $ LeadGap
          49 6 -0.0001 -49 +40    u=0 $ Gap to Reflector
          50 0           +49    u=0 $ Boundary

          c Surfaces - Fuel Rod - NACCoC
          1 RCC 0.0000 0.0000 10.5207 0.0000 0.0000 389.8900 0.4781   $ Fuel pellet stack
          2 RCC 0.0000 0.0000 6.3990 0.0000 0.0000 409.4227 0.4876   $ Annulus + Plenum
          3 RCC 0.0000 0.0000 5.0800 0.0000 0.0000 411.8226 0.5588   $ Clad + End-Caps
          c Surfaces - Pitch - NACCoC
          10 RHP 0.0000 0.0000 -1.0000 0.0000 0.0000 454.12 1.8000 0.0000 0.0000 $ Lattice
          C PWR Basket - Surfaces
          20 1 RPP -7.4148 7.4148 -7.4148 7.4148 0.0000 452.1200  $ Array Container
          21 1 RPP -11.2713 11.2713 -11.2713 11.2713 0.0000 452.1200  $ Basket Opening
          22  RCC 0.0000 0.0000 0.0000 0.0000 0.0000 452.1200 16.83512 $ Basket Outer Body
          C Surfaces - LWT Cask Accident Conditions
          40 RCC 0.0000 0.0000 -26.6700 0.0000 0.0000 507.3650 36.5189 $ Lwt Body
          41 RCC 0.0000 0.0000 -26.6700 0.0000 0.0000 26.6700 36.5189 $ Bottom
```

```
        42 RCC 0.0000 0.0000 0.0000 0.0000 0.0000 452.1200 16.9863 $ Cavity
        43 RCC 0.0000 0.0000 -17.7800 0.0000 0.0000 7.6200 26.3525 $ Bottom gamma shield
        44 RCC 0.0000 0.0000 0.0000 0.0000 0.0000 444.5000 20.1740 $ Lead id - taper
        45 RCC 0.0000 0.0000 0.0000 0.0000 0.0000 444.5000 31.5976 $ Lead od - taper
        46 RCC 0.0000 0.0000 13.8176 0.0000 0.0000 416.8648 18.9103 $ Lead id
        47 RCC 0.0000 0.0000 13.8176 0.0000 0.0000 416.8648 33.3271 $ Lead od
        48 RCC 0.0000 0.0000 13.8176 0.0000 0.0000 416.8648 33.4645 $ Lead gap
        *49 RPP -36.5289 36.5289 -36.5289 36.5289 -26.6800 480.7050  $ Container

        c
        c Materials List
        c
        C MOX Material Composition Fuel
        m1     92235 -5.7210E-03
               92238 -8.1157E-01
               94238 -6.4417E-10
               94239 -6.4417E-10
               94240 -6.4417E-10
               94241 -6.4417E-02
               94242 -6.4417E-10
                8016 -1.1829E-01
        C Rod Interior Void Material
        m2     1001 2
               8016 1
        mt2      lwtr.01
        c Clad Material
        m3 26054 -7.063E-05 24050 -4.179E-05 7014 -4.980E-04
               26056 -1.149E-03 24052 -8.370E-04 7015 -1.981E-06
               26057 -2.702E-05 24053 -9.673E-05
               26058 -3.631E-06 24054 -2.448E-05
               40000 -9.823E-01 50000 -1.500E-02
        C Canister Interior Non-Fuel Space
        m4     1001 2
               8016 1
        mt4      lwtr.01
        C Canister to Cask Gap Material
        m5     1001 2
               8016 1
        mt5      lwtr.01
        C Cask Exterior Material
        m6     1001 2
               8016 1
        mt6      lwtr.01
        c Aluminum
        m7 13027 -1.000E+00
        C Water/Glycol
        m10    1001 -1.03651E-01
warning. material  10 is not used in the problem.
               8016 -6.75619E-01
               6000 -2.20730E-01
        mt10     lwtr.01
warning. material  10 is not used in the problem.
        c Lead
        m8 82206 -2.534E-01
               82207 -2.207E-01
               82208 -5.259E-01
        c SS304
        m9 24050 -7.939E-03 26054 -3.927E-02 28058 -6.384E-02
               24052 -1.590E-01 26056 -6.387E-01 28060 -2.543E-02
               24053 -1.838E-02 26057 -1.502E-02 28061 -1.124E-03
               24054 -4.652E-03 26058 -2.019E-03 28062 -3.639E-03
                   28064 -9.623E-04
               25055 -2.000E-02
        C Aluminum Honeycomb Impact Limiter
        m11    13027 -1.0
warning. material  11 is not used in the problem.
        C Mode
        mode n
        C Cell Importances
        imp:n 1 18r 0
        C
        C Criticality Controls
        kcode 1000 0.80 30 530
        C
        C Starting Source Definition
        sdef cell=41:20:10:1
               erg=d1
               pos=0 0 10.5207
               rad=d2
               axs=0 0 1
               ext=d3
        sp1    -3
        si2 0.0000 0.4781
        sp2 -21 1
        si3 0.0000 389.8900
        sp3 0 1
        C Print Control
        print
        C Random Number Generator
        rand gen=2 seed=19073486328125 stride=152917 hist=1
        c
        c Rotation Matrix
        *TR1 0.0 0.0 0.0 -30 60 90 -120 -30 90 90 90 0  $ z-rotation -30 degrees

1source                                                                      print table 10

 values of defaulted or explicitly defined source variables
```

```
    sur        0.0000E+00
    tme        0.0000E+00
    dir        isotropic
    pos        0.0000E+00    0.0000E+00    1.0521E+01
    x          0.0000E+00
    y          0.0000E+00
    z          0.0000E+00
    axs        0.0000E+00    0.0000E+00    1.0000E+00
    vec        0.0000E+00    0.0000E+00    0.0000E+00
    ccc        0.0000E+00
    nrm        1.0000E+00
    ara        0.0000E+00
    wgt        1.0000E+00
    eff        1.0000E-02
    par        0.0000E+00
    tr         0.0000E+00


 probability distribution    1 for source variable erg
 energy function 3:  watt (fission) spectrum (endf law 10)

     f(e)=c*exp(-e/a)*sinh(sqrt(b*e))
     a = 9.6500E-01      b = 2.2900E+00      c = 4.5270E-01

     the mean of source distribution   1 is  1.9806E+00


 probability distribution    2 for source variable rad
 power law 21:     f(x)=c*abs(x)**k          k = 1.0000E+00


 probability distribution    3 for source variable ext
 unbiased histogram distribution

 source          source            cumulative           probability
  entry           value            probability            of bin

    1        0.00000E+00        0.000000E+00         0.000000E+00
    2        3.69890E+02        1.000000E+00         1.000000E+00

     the mean of source distribution   3 is  1.9494E+02


 order of sampling source variables.
 cel axs rad ext pos erg tme

 comment. total fission nubar data are being used.
1material composition                                                                          print table 40

 the sum of the fractions of material    2 was 3.000000E+00

 the sum of the fractions of material    3 was 1.000050E+00

 the sum of the fractions of material    4 was 3.000000E+00

 the sum of the fractions of material    5 was 3.000000E+00

 the sum of the fractions of material    6 was 3.000000E+00

 the sum of the fractions of material    9 was 9.999753E-01

 material
  number      component nuclide, atom fraction

     1          92235, 2.19354E-03      92238, 3.07241E-01      94238, 2.43869E-10      94239, 2.42846E-10
                94240, 2.41833E-10      94241, 2.40826E-02      94242, 2.39829E-10       8016, 6.66483E-01
     2           1001, 6.66667E-01       8016, 3.33333E-01
 associated thermal s(a,b) data sets:   lwtr.01t
     3          26054, 1.19346E-04      24050, 7.62600E-05       7014, 3.24139E-03      26056, 1.87224E-03
                24052, 1.46874E-03       7015, 1.20369E-05      26057, 4.32542E-05      24053, 1.66532E-04
                26058, 5.71247E-06      24054, 4.13652E-05      40000, 9.81436E-01      50000, 1.15166E-02
     4           1001, 6.66667E-01       8016, 3.33333E-01
 associated thermal s(a,b) data sets:   lwtr.01t
     5           1001, 6.66667E-01       8016, 3.33333E-01
 associated thermal s(a,b) data sets:   lwtr.01t
     6           1001, 6.66667E-01       8016, 3.33333E-01
 associated thermal s(a,b) data sets:   lwtr.01t
     7          13027, 1.00000E+00
     8          82206, 2.54963E-01      82207, 2.20987E-01      82208, 5.24050E-01
     9          24050, 8.79087E-03      26054, 4.02643E-02      28058, 6.09419E-02      24052, 1.69300E-01
                26056, 6.31511E-01      28060, 2.34673E-02      24053, 1.92010E-02      26057, 1.45900E-02
                28061, 1.02022E-03      24054, 4.76985E-03      26058, 1.92741E-03      28062, 3.24982E-03
                28064, 8.32505E-04      25055, 2.01337E-02
1material                                                                                      print table 40
  number      component nuclide, mass fraction

     1          92235, 5.72101E-03      92238, 8.11572E-01      94238, 6.44171E-10      94239, 6.44171E-10
                94240, 6.44171E-10      94241, 6.44171E-02      94242, 6.44171E-10       8016, 1.18290E-01
     2           1001, 1.11915E-01       8016, 8.88085E-01
     3          26054, 7.06265E-05      24050, 4.17879E-05       7014, 4.97975E-04      26056, 1.14894E-03
                24052, 8.36958E-04       7015, 1.98090E-06      26057, 2.70186E-05      24053, 9.67251E-05
                26058, 3.63082E-06      24054, 2.44788E-05      40000, 9.82251E-01      50000, 1.49992E-02
     4           1001, 1.11915E-01       8016, 8.88085E-01
```

```
 5          1001, 1.11915E-01       8016, 8.88085E-01
 6          1001, 1.11915E-01       8016, 8.88085E-01
 7         13027, 1.00000E+00
 8         82206, 2.53400E-01      82207, 2.20700E-01      82208, 5.25900E-01
 9         24050, 7.93920E-03      26054, 3.92710E-02      28058, 6.38416E-02      24052, 1.59004E-01
           26056, 6.38716E-01      28060, 2.54306E-02      24053, 1.83805E-02      26057, 1.50204E-02
           28061, 1.12403E-03      24054, 4.65211E-03      26058, 2.01905E-03      28062, 3.63909E-03
           28064, 9.62324E-04      25055, 2.00005E-02

 warning.   6 materials had unnormalized fractions. print table 40.
1cell volumes and masses                                                                     print table 50
```

	cell	atom density	gram density	input volume	calculated volume	mass	pieces	reason volume not calculated
1	1	7.05243E-02	1.05540E+01	0.00000E+00	2.79982E+02	2.95493E+03	1	
2	2	1.00128E-01	9.98200E-01	0.00000E+00	2.58267E+01	2.57802E+01	1	
3	3	4.33411E-02	6.56000E+00	0.00000E+00	9.81838E+01	6.44086E+02	1	
4	4	1.00128E-01	9.98200E-01	0.00000E+00	0.00000E+00	0.00000E+00	0	infinite
5	10	1.00128E-01	9.98200E-01	0.00000E+00	5.09690E+03	5.08773E+03	0	
6	20	1.00128E-01	9.98200E-01	0.00000E+00	9.94289E+04	9.92499E+04	0	
7	21	1.00309E-05	1.00000E-04	0.00000E+00	1.30324E+05	1.30324E+01	0	
8	22	6.03063E-02	2.70200E+00	0.00000E+00	0.00000E+00	0.00000E+00	0	asymmetric
9	23	1.00309E-05	1.00000E-04	0.00000E+00	0.00000E+00	0.00000E+00	0	infinite
10	40	3.29629E-02	1.13440E+01	0.00000E+00	1.66245E+04	1.88588E+05	1	
11	41	1.00309E-05	1.00000E-04	0.00000E+00	4.09828E+05	4.09828E+01	1	
12	42	8.64586E-02	7.94000E+00	0.00000E+00	9.51154E+04	7.55216E+05	1	
13	43	8.64586E-02	7.94000E+00	0.00000E+00	4.53784E+05	3.60304E+06	1	
14	44	8.64586E-02	7.94000E+00	0.00000E+00	1.02842E+04	8.16563E+04	2	
15	45	8.64586E-02	7.94000E+00	0.00000E+00	9.04489E+04	7.18165E+05	1	
16	46	3.29629E-02	1.13440E+01	0.00000E+00	9.86269E+05	1.11882E+07	1	
17	47	3.29629E-02	1.13440E+01	0.00000E+00	5.13461E+04	5.82470E+05	2	
18	48	0.00000E+00	0.00000E+00	0.00000E+00	1.20186E+04	0.00000E+00	1	
19	49	1.00309E-05	1.00000E-04	0.00000E+00	0.00000E+00	0.00000E+00	0	asymmetric
20	50	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0	infinite

```
 warning.   2 cells appear to consist of more than one piece.
1surface areas                                                                               print table 50
```

	surface	input area	calculated area	reason area not calculated
2	1.1	0.00000E+00	1.17123E+03	
3	1.2	0.00000E+00	7.18104E-01	
4	1.3	0.00000E+00	7.18104E-01	
6	2.1	0.00000E+00	1.25434E+03	
7	2.2	0.00000E+00	7.46925E-01	
8	2.3	0.00000E+00	7.46925E-01	
10	3.1	0.00000E+00	1.44593E+03	
11	3.2	0.00000E+00	9.80986E-01	
12	3.3	0.00000E+00	9.80986E-01	
14	10.1	0.00000E+00	0.00000E+00	not a boundary
15	10.2	0.00000E+00	0.00000E+00	not a boundary
16	10.3	0.00000E+00	0.00000E+00	not a boundary
17	10.4	0.00000E+00	0.00000E+00	not a boundary
18	10.5	0.00000E+00	0.00000E+00	not a boundary
19	10.6	0.00000E+00	0.00000E+00	not a boundary
20	10.7	0.00000E+00	1.12237E+01	
21	10.8	0.00000E+00	1.12237E+01	
23	20.1	0.00000E+00	6.70476E+03	
24	20.2	0.00000E+00	6.70476E+03	
25	20.3	0.00000E+00	6.70476E+03	
26	20.4	0.00000E+00	6.70476E+03	
27	20.5	0.00000E+00	0.00000E+00	asymmetric
28	20.6	0.00000E+00	0.00000E+00	asymmetric
30	21.1	0.00000E+00	1.01920E+04	
31	21.2	0.00000E+00	1.01920E+04	
32	21.3	0.00000E+00	1.01920E+04	
33	21.4	0.00000E+00	1.01920E+04	
37	22.1	0.00000E+00	4.78244E+04	
41	40.1	0.00000E+00	1.16417E+05	
42	40.2	0.00000E+00	4.18972E+03	
43	40.3	0.00000E+00	4.18972E+03	
49	42.1	0.00000E+00	4.82539E+04	
53	43.1	0.00000E+00	1.26170E+03	
54	43.2	0.00000E+00	2.18169E+03	
55	43.3	0.00000E+00	2.18169E+03	
57	44.1	0.00000E+00	3.50295E+03	
58	44.2	0.00000E+00	2.23013E+03	
61	45.1	0.00000E+00	5.48652E+03	
65	46.1	0.00000E+00	4.95306E+04	
66	46.2	0.00000E+00	2.61173E+03	
67	46.3	0.00000E+00	2.61173E+03	
69	47.1	0.00000E+00	6.72916E+04	
73	48.1	0.00000E+00	8.76515E+04	
77	49.1	0.00000E+00	3.70684E+04	
78	49.2	0.00000E+00	3.70684E+04	
79	49.3	0.00000E+00	3.70684E+04	
80	49.4	0.00000E+00	3.70684E+04	
81	49.5	0.00000E+00	5.33744E+03	
82	49.6	0.00000E+00	5.33744E+03	
84	10010.1	0.00000E+00	9.43871E+02	
85	10010.2	0.00000E+00	9.43871E+02	
86	10010.3	0.00000E+00	9.43871E+02	
87	10010.4	0.00000E+00	9.43871E+02	
88	10010.5	0.00000E+00	9.43871E+02	
89	10010.6	0.00000E+00	9.43871E+02	

```
1cells                                                                                          print table 60

                     atom        gram                                       neutron
      cell  mat    density     density      volume       mass       pieces importance

   1     1    1  7.05243E-02 1.05540E+01 2.79982E+02 2.95493E+03     1   1.0000E+00
   2     2   2s  1.00128E-01 9.98200E-01 2.58267E+01 2.57802E+01     1   1.0000E+00
   3     3    3  4.33411E-02 6.56000E+00 9.81838E+01 6.44086E+02     1   1.0000E+00
   4     4   4s  1.00128E-01 9.98200E-01 0.00000E+00 0.00000E+00     0   1.0000E+00
   5    10   4s  1.00128E-01 9.98200E-01 5.09690E+03 5.08773E+03     0   1.0000E+00
   6    20   4s  1.00128E-01 9.98200E-01 9.94289E+04 9.92499E+04     0   1.0000E+00
   7    21   5s  1.00309E-05 1.00000E-04 1.30324E+05 1.30324E+01     0   1.0000E+00
   8    22   7   6.03063E-02 2.70200E+00 0.00000E+00 0.00000E+00     0   1.0000E+00
   9    23   5s  1.00309E-05 1.00000E-04 0.00000E+00 0.00000E+00     0   1.0000E+00
  10    40   8   3.29629E-02 1.13440E+01 1.66245E+04 1.88588E+05     1   1.0000E+00
  11    41   5s  1.00309E-05 1.00000E-04 4.09828E+05 4.09828E+01     1   1.0000E+00
  12    42   9   8.64586E-02 7.94000E+00 9.51154E+04 7.55216E+05     1   1.0000E+00
  13    43   9   8.64586E-02 7.94000E+00 4.53784E+05 3.60304E+06     1   1.0000E+00
  14    44   9   8.64586E-02 7.94000E+00 1.02842E+04 8.16563E+04     2   1.0000E+00
  15    45   9   8.64586E-02 7.94000E+00 9.04489E+04 7.18165E+05     1   1.0000E+00
  16    46   8   3.29629E-02 1.13440E+01 9.86269E+05 1.11882E+07     1   1.0000E+00
  17    47   8   3.29629E-02 1.13440E+01 5.13461E+04 5.82470E+05     2   1.0000E+00
  18    48   0   0.00000E+00 0.00000E+00 1.20186E+04 0.00000E+00     1   1.0000E+00
  19    49   6s  1.00309E-05 1.00000E-04 0.00000E+00 0.00000E+00     0   1.0000E+00
  20    50   0   0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00     0   0.0000E+00

 total                                   2.36097E+06 1.72254E+07
1surfaces                                                                                       print table 70

       surface     trans  type   surface coefficients

   1      1                rcc
   2      1.1              cz     4.7810000E-01
   3      1.2              pz     4.0041070E+02
   4      1.3              p      0.0000000E+00   0.0000000E+00  -1.0000000E+00  -1.0520700E+01
   5      2                rcc
   6      2.1              cz     4.8760000E-01
   7      2.2              pz     4.1582170E+02
   8      2.3              p      0.0000000E+00   0.0000000E+00  -1.0000000E+00  -6.3990000E+00
   9      3                rcc
  10      3.1              cz     5.5880000E-01
  11      3.2              pz     4.1690260E+02
  12      3.3              p      0.0000000E+00   0.0000000E+00  -1.0000000E+00  -5.0800000E+00
  13     10                rhp
  14     10.1              px     1.8000000E+00
  15     10.2              p     -1.0000000E+00   0.0000000E+00   0.0000000E+00   1.8000000E+00
  16     10.3              p      5.0000000E-01   8.6602540E-01   0.0000000E+00   1.8000000E+00
  17     10.4              p     -5.0000000E-01  -8.6602540E-01   0.0000000E+00   1.8000000E+00
  18     10.5              p     -5.0000000E-01   8.6602540E-01   0.0000000E+00   1.8000000E+00
  19     10.6              p      5.0000000E-01  -8.6602540E-01   0.0000000E+00   1.8000000E+00
  20     10.7              pz     4.5312000E+02
  21     10.8              p      0.0000000E+00   0.0000000E+00  -1.0000000E+00   1.0000000E+00
  22     20                rpp
  23     20.1          1   p      8.6602540E-01   5.0000000E-01   0.0000000E+00   7.4148000E+00
  24     20.2          1   p     -8.6602540E-01  -5.0000000E-01   0.0000000E+00   7.4148000E+00
  25     20.3          1   p     -5.0000000E-01   8.6602540E-01   0.0000000E+00   7.4148000E+00
  26     20.4          1   p      5.0000000E-01  -8.6602540E-01   0.0000000E+00   7.4148000E+00
  27     20.5          1   pz     4.5212000E+02
  28     20.6          1   p      0.0000000E+00   0.0000000E+00  -1.0000000E+00   0.0000000E+00
  29     21                rpp
  30     21.1          1   p      8.6602540E-01   5.0000000E-01   0.0000000E+00   1.1271300E+01
  31     21.2          1   p     -8.6602540E-01  -5.0000000E-01   0.0000000E+00   1.1271300E+01
  32     21.3          1   p     -5.0000000E-01   8.6602540E-01   0.0000000E+00   1.1271300E+01
  33     21.4          1   p      5.0000000E-01  -8.6602540E-01   0.0000000E+00   1.1271300E+01
  36     22                rcc
  37     22.1              cz     1.6835120E+01
  40     40                rcc
  41     40.1              cz     3.6518900E+01
  42     40.2              pz     4.8069500E+02
  43     40.3              p      0.0000000E+00   0.0000000E+00  -1.0000000E+00   2.6670000E+01
  44     41                rcc
  48     42                rcc
  49     42.1              cz     1.6986300E+01
  52     43                rcc
  53     43.1              cz     2.6352500E+01
  54     43.2              pz    -1.0160000E+01
  55     43.3              p      0.0000000E+00   0.0000000E+00  -1.0000000E+00   1.7780000E+01
  56     44                rcc
  57     44.1              cz     2.0174000E+01
  58     44.2              pz     4.4450000E+02
  60     45                rcc
  61     45.1              cz     3.1597600E+01
  64     46                rcc
  65     46.1              cz     1.8910300E+01
  66     46.2              pz     4.3068240E+02
  67     46.3              p      0.0000000E+00   0.0000000E+00  -1.0000000E+00  -1.3817600E+01
  68     47                rcc
  69     47.1              cz     3.3327100E+01
  72     48                rcc
  73     48.1              cz     3.3464500E+01
  76     49   refl.        rpp
  77     49.1 refl.        px     3.6528900E+01
  78     49.2 refl.        p     -1.0000000E+00   0.0000000E+00   0.0000000E+00   3.6528900E+01
  79     49.3 refl.        py     3.6528900E+01
  80     49.4 refl.        p      0.0000000E+00  -1.0000000E+00   0.0000000E+00   3.6528900E+01
  81     49.5 refl.        pz     4.8070500E+02
  82     49.6 refl.        p      0.0000000E+00   0.0000000E+00  -1.0000000E+00   2.6680000E+01
```

```
    83  10010               rhp
    84  10010.1       1001  px     2.7000000E+00
    85  10010.2       1001  p     -1.0000000E+00   0.0000000E+00   0.0000000E+00   9.0000000E-01
    86  10010.3       1001  p      5.0000000E-01   8.6602540E-01   0.0000000E+00   9.0003960E-01
    87  10010.4       1001  p     -5.0000000E-01  -8.6602540E-01   0.0000000E+00   2.6999604E+00
    88  10010.5       1001  p     -5.0000000E-01   8.6602540E-01   0.0000000E+00   3.9600581E-05
    89  10010.6       1001  p      5.0000000E-01  -8.6602540E-01   0.0000000E+00   3.5999604E+00
1  identical surfaces                                                                          print table 70

   master surface     identical surfaces

       10.7           10010.7
       10.8           10010.8
       20.5              21.5      22.2      42.2
       20.6              21.6      22.3      41.2      42.3      44.3      45.3
       40.1              41.1
       40.3              41.3
       44.2              45.2
       46.2              47.2      48.2
       46.3              47.3      48.3


   surface coefficients for identical surfaces not used.

         surface      trans  type   surface coefficients

    90  10010.7       1001  pz     4.5312000E+02
    91  10010.8       1001  p      0.0000000E+00   0.0000000E+00  -1.0000000E+00   1.0000000E+00
    34     21.5          1  pz     4.5212000E+02
    38     22.2             pz     4.5212000E+02
    50     42.2             pz     4.5212000E+02
    35     21.6          1  p      0.0000000E+00   0.0000000E+00  -1.0000000E+00   0.0000000E+00
    39     22.3             p      0.0000000E+00   0.0000000E+00  -1.0000000E+00   0.0000000E+00
    46     41.2             pz     0.0000000E+00
    51     42.3             p      0.0000000E+00   0.0000000E+00  -1.0000000E+00   0.0000000E+00
    59     44.3             p      0.0000000E+00   0.0000000E+00  -1.0000000E+00   0.0000000E+00
    63     45.3             p      0.0000000E+00   0.0000000E+00  -1.0000000E+00   0.0000000E+00
    45     41.1             cz     3.6518900E+01
    47     41.3             p      0.0000000E+00   0.0000000E+00  -1.0000000E+00   2.6670000E+01
    62     45.2             pz     4.4450000E+02
    70     47.2             pz     4.3068240E+02
    74     48.2             pz     4.3068240E+02
    71     47.3             p      0.0000000E+00   0.0000000E+00  -1.0000000E+00  -1.3817600E+01
    75     48.3             p      0.0000000E+00   0.0000000E+00  -1.0000000E+00  -1.3817600E+01
1  cell temperatures in mev for the free-gas thermal neutron treatment.                        print table 72

   all non-zero importance cells with materials have a temperature for thermal neutrons of 2.5300E-08 mev.

 ***********************************************
 * Random Number Generator  =                 2 *
 * Random Number Seed       =    19073486328125 *
 * Random Number Multiplier = 9219741426499971445 *
 * Random Number Adder      =                 1 *
 * Random Number Bits Used  =                63 *
 * Random Number Stride     =            152917 *
 ***********************************************


         5 warning messages so far.
1physical constants                                                                            print table 98


   name                  value       description

   huge     1.0000000000000E+36      infinity
    pie     3.1415926535898E+00      pi
  euler     5.7721566490153E-01      euler constant
 avogad     6.0220434469282E+23      avogadro number (molecules/mole)
  aneut     1.0086649670000E+00      neutron mass (amu)
  avgdn     5.9703109000000E-01      avogadro number/neutron mass (1.e-24*molecules/mole/amu)
  slite     2.9979250000000E+02      speed of light (cm/shake)
 planck     4.1357320000000E-13      planck constant (mev shake)
  fscon     1.3703930000000E+02      inverse fine structure constant h*c/(2*pi*e**2)
 gpt(1)     9.3958000000000E+02      neutron mass (mev)
 gpt(3)     5.1100800000000E-01      electron mass (mev)


 fission q-values:     nuclide    q(mev)   nuclide    q(mev)
                         90232    171.91     91233    175.57
                         92233    180.84     92234    179.45
                         92235    180.88     92236    179.50
                         92237    180.40     92238    181.31
                         92239    180.40     92240    180.40
                         93237    183.67     94238    186.65
                         94239    189.44     94240    186.36
                         94241    188.99     94242    185.98
                         94243    187.48     95241    190.83
                         95242    190.54     95243    190.25
                         96242    190.49     96244    190.49
                         other    180.00


 the following compilation options were used:

     cheap
     dec
     plot
```

```
     mcplot
     xlib
     default datapath: C:\Program Files\LANL\MCNPDATA
                       C:\Progra~1\LANL\MCNPdata
1cross-section tables                                                                       print table 100

     table    length

                        tables from file actia

   1001.62c     5202  1-h-1 at 293.6K from endf-vi.8 njoy99.50                       mat 125     12/05/01
   7014.62c    67462  7-n-14 at 293.6K from endf-vi.8 njoy99.50                      mat 725     12/05/01
   8016.62c   170541  8-o-16 at 293.6K from endf-vi.8 njoy99.50                      mat 825     12/05/01
  13027.62c    75363  13-al-27 at 293.6K from endf-vi.8 njoy99.50                    mat1325     12/17/01
  24050.62c   194445  24-cr-50 at 293.6K from endf-vi.8 njoy99.50                    mat2425     12/20/01
  24052.62c   174773  24-cr-52 at 293.6K from endf-vi.8 njoy99.50                    mat2431     12/20/01
  24053.62c   147286  24-cr-53 at 293.6K from endf-vi.8 njoy99.50                    mat2434     12/20/01
  24054.62c   132737  24-cr-54 at 293.6K from endf-vi.8 njoy99.50                    mat2437     12/20/01
  25055.62c   134565  25-mn-55 at 293.6K from endf/b-vi.8 njoy99.50                  mat2525     02/11/02
  26054.62c   143370  26-fe-54 at 293.6K from endf-vi.8 njoy99.50                    mat2625     12/20/01
  26056.62c   230655  26-fe-56 at 293.6K from endf-vi.8 njoy99.50                    mat2631     12/20/01
  26057.62c   148842  26-fe-57 at 293.6K from endf-vi.8 njoy99.50                    mat2634     12/20/01
  26058.62c    87569  26-fe-58 at 293.6K from endf-vi.8 njoy99.50                    mat2637     12/20/01
  28058.62c   235403  28-ni-58 at 293.6K from endf-vi.8 njoy99.50                    mat2825     12/20/01
  28060.62c   158305  28-ni-60 at 293.6K from endf-vi.8 njoy99.50                    mat2831     12/20/01
  28061.62c   112032  28-ni-61 at 293.6K from endf-vi.8 njoy99.50                    mat2834     12/20/01
  28062.62c   104386  28-ni-62 at 293.6K from endf-vi.8 njoy99.50                    mat2837     12/20/01
  28064.62c    97689  28-ni-64 at 293.6K from endf-vi.8 njoy99.50                    mat2843     12/20/01

                        tables from file endf66a

   7015.66c    19013  7-n-15 at 293.6K from endf-vi.0 njoy99.50                      mat 728     07/13/01

                        tables from file endf66b

  40000.66c    98524  40-zr-0 at 293.6K from endf-vi.1 njoy99.50                     mat4000     07/24/01

                        tables from file endl92

  50000.42c   141628   ENDL library name:  nd920609  LANL/XTM modified:  951222       .          911219
                      temperature = 2.5860E-08 adjusted to 2.5300E-08

                        tables from file endf66c

  82206.66c   219368  82-pb-206 at 293.6K from endf-vi.6 njoy99.50                   mat8231     08/13/01
  82207.66c   134389  82-pb-207 at 293.6K from endf-vi.6 njoy99.50                   mat8234     08/13/01
  82208.66c   135105  82-pb-208 at 293.6K from endf-vi.x njoy99.50                   mat8237     03/16/02
  94238.66c    53256  94-pu-238 at 293.6K from endf-vi.0 njoy99.50       total nu    mat9434     09/06/01
                      probability tables used from 2.0000E-04 to 1.0000E-02 mev.
  94240.66c   309518  94-pu-240 at 293.6K from endf-vi.2 njoy99.50       total nu    mat9440     09/06/01
                      probability tables used from 5.7000E-03 to 4.0000E-02 mev.
  94241.66c   126607  94-pu-241 at 293.6K from endf-vi.3 njoy99.50       total nu    mat9443     09/06/01
                      probability tables used from 3.0000E-04 to 4.0200E-02 mev.
  94242.66c   107114  94-pu-242 at 293.6K from endf-vi.0 njoy99.50       total nu    mat9446     09/06/01
                      probability tables used from 9.8600E-04 to 1.0000E-02 mev.

                        tables from file t16_2003

  92235.69c   587997  92-u-235 at 293.6K from t16 u235la9d njoy99.50     total nu    mat9228     07/02/03
                      probability tables used from 2.2500E-03 to 2.5000E-02 mev.
  92238.69c   713320  92-u-238 at 293.6K from t16 u238la8h njoy99.50     total nu    mat9237     07/02/03
                      probability tables used from 1.0000E-02 to 1.4903E-01 mev.
  94239.69c   506320  94-pu-239 at 293.6K from t16 pu239la7d njoy99.50  total nu    mat9437     07/02/03
                      probability tables used from 2.5000E-03 to 3.0000E-02 mev.

                        tables from file tmccs

   lwtr.01t    10193  hydrogen in light water at 300 degrees kelvin              1001     0     010/22/85

  total      5582977

 warning.  neutron energy cutoff is below some cross-section tables.

 comment.    1 cross sections modified by free gas thermal treatment.
1assignment of s(a,b) data to nuclides.                                                     print table 102

       mat          nuclide          s(a,b)
         2          1001.62c         lwtr.01t
         4          1001.62c         lwtr.01t
         5          1001.62c         lwtr.01t
         6          1001.62c         lwtr.01t

1estimated keff results by cycle                                                            print table 175

 cycle     1     k(collision)  0.773576    prompt removal lifetime(abs)  7.9159E+03    source points generated    986

 cycle     2     k(collision)  0.761973    prompt removal lifetime(abs)  8.7479E+03    source points generated   1002

 cycle     3     k(collision)  0.792952    prompt removal lifetime(abs)  8.6388E+03    source points generated   1019

 cycle     4     k(collision)  0.798553    prompt removal lifetime(abs)  8.0609E+03    source points generated   1013

 cycle     5     k(collision)  0.846007    prompt removal lifetime(abs)  8.0976E+03    source points generated   1058

 cycle     6     k(collision)  0.778445    prompt removal lifetime(abs)  8.7756E+03    source points generated    927
```

```
cycle      7    k(collision)  0.852315    prompt removal lifetime(abs)  8.2963E+03    source points generated    1086

cycle      8    k(collision)  0.776196    prompt removal lifetime(abs)  8.4369E+03    source points generated     916
.
.
.
.
.

 estimator      cycle   526   ave of   496 cycles      combination         simple average    combined average     corr
k(collision)       0.813156         0.812679 0.0016    k(col/abs)           0.811904 0.0015    0.811535 0.0015   0.8154
k(absorption)      0.811817         0.811128 0.0015    k(abs/tk ln)         0.811770 0.0015    0.811387 0.0014   0.4631
k(trk length)      0.745849         0.812412 0.0021    k(tk ln/col)         0.812546 0.0017    0.812633 0.0016   0.6279
rem life(col)   8.6684E+03      8.3853E+03 0.0016    k(col/abs/tk ln)     0.812073 0.0015    0.811477 0.0014
rem life(abs)   8.6270E+03      8.3849E+03 0.0016    life(col/abs/tl)  8.3888E+03 0.0014   8.3982E+03 0.0012
source points generated   1039

 estimator      cycle   527   ave of   497 cycles      combination         simple average    combined average     corr
k(collision)       0.809185         0.812672 0.0016    k(col/abs)           0.811898 0.0015    0.811530 0.0015   0.8154
k(absorption)      0.809090         0.811124 0.0015    k(abs/tk ln)         0.811777 0.0015    0.811387 0.0014   0.4630
k(trk length)      0.821169         0.812430 0.0021    k(tk ln/col)         0.812551 0.0017    0.812630 0.0016   0.6278
rem life(col)   8.0102E+03      8.3845E+03 0.0016    k(col/abs/tk ln)     0.812075 0.0015    0.811477 0.0014
rem life(abs)   8.0245E+03      8.3841E+03 0.0016    life(col/abs/tl)  8.3881E+03 0.0014   8.3977E+03 0.0012
source points generated   1005

 estimator      cycle   528   ave of   498 cycles      combination         simple average    combined average     corr
k(collision)       0.821391         0.812690 0.0016    k(col/abs)           0.811905 0.0015    0.811532 0.0015   0.8153
k(absorption)      0.809602         0.811121 0.0015    k(abs/tk ln)         0.811753 0.0015    0.811376 0.0014   0.4629
k(trk length)      0.790409         0.812386 0.0021    k(tk ln/col)         0.812538 0.0017    0.812636 0.0016   0.6272
rem life(col)   7.9693E+03      8.3837E+03 0.0016    k(col/abs/tk ln)     0.812066 0.0015    0.811468 0.0014
rem life(abs)   8.0772E+03      8.3835E+03 0.0016    life(col/abs/tl)  8.3875E+03 0.0014   8.3975E+03 0.0012
source points generated   1027

 estimator      cycle   529   ave of   499 cycles      combination         simple average    combined average     corr
k(collision)       0.788892         0.812642 0.0016    k(col/abs)           0.811869 0.0015    0.811499 0.0015   0.8154
k(absorption)      0.798522         0.811096 0.0015    k(abs/tk ln)         0.811733 0.0015    0.811352 0.0014   0.4630
k(trk length)      0.804736         0.812370 0.0021    k(tk ln/col)         0.812506 0.0017    0.812594 0.0016   0.6271
rem life(col)   8.4590E+03      8.3839E+03 0.0016    k(col/abs/tk ln)     0.812036 0.0015    0.811442 0.0014
rem life(abs)   8.4459E+03      8.3837E+03 0.0016    life(col/abs/tl)  8.3878E+03 0.0014   8.3979E+03 0.0012
source points generated    969

 estimator      cycle   530   ave of   500 cycles      combination         simple average    combined average     corr
k(collision)       0.864442         0.812746 0.0016    k(col/abs)           0.811973 0.0015    0.811603 0.0015   0.8166
k(absorption)      0.862854         0.811199 0.0015    k(abs/tk ln)         0.811816 0.0015    0.811450 0.0014   0.4642
k(trk length)      0.843483         0.812433 0.0021    k(tk ln/col)         0.812589 0.0017    0.812690 0.0016   0.6276
rem life(col)   8.0058E+03      8.3831E+03 0.0016    k(col/abs/tk ln)     0.812126 0.0015    0.811537 0.0014
rem life(abs)   8.0790E+03      8.3830E+03 0.0016    life(col/abs/tl)  8.3872E+03 0.0014   8.3977E+03 0.0012
source points generated   1088

source distribution written to file P1_Acc_NACCoC_c1.00_g0.00_e0.00_d0.01cm_HP_36mm.inps        cycle =   530
1problem summary (active cycles only)            source particle weight for summary table normalization =        500000.00

     run terminated when    530   kcode cycles were done.
+                                                                                              10/25/07 23:17:01
     NAC-LWT Cask - MOX Experiments - Accident Transport Conditions                 probid =  10/25/07 23:04:59
0
neutron creation     tracks      weight        energy             neutron loss        tracks      weight        energy
                                 (per source particle)                                            (per source particle)

source               500798    1.0000E+00    2.0304E+00           escape                   0    0.            0.
                                                                  energy cutoff            0    0.            0.
                                                                  time cutoff              0    0.            0.
weight window             0    0.            0.                   weight window            0    0.            0.
cell importance           0    0.            0.                   cell importance          0    0.            0.
weight cutoff             0    1.0507E-01    4.7424E-06           weight cutoff       501256    1.0507E-01    4.2477E-06
e or t importance         0    0.            0.                   e or t importance        0    0.            0.
dxtran                    0    0.            0.                   dxtran                   0    0.            0.
forced collisions         0    0.            0.                   forced collisions        0    0.            0.
exp. transform            0    0.            0.                   exp. transform           0    0.            0.
upscattering              0    0.            2.2358E-07           downscattering           0    0.            1.9694E+00
photonuclear              0    0.            0.                   capture                  0    7.2325E-01    3.3293E-02
(n,xn)                  914    1.5938E-03    1.3448E-03           loss to (n,xn)         456    7.9510E-04    7.6641E-03
prompt fission            0    0.            0.                   loss to fission          0    2.7755E-01    2.1466E-02
delayed fission           0    0.            0.
    total            501712    1.1067E+00    2.0318E+00               total           501712    1.1067E+00    2.0318E+00

  number of neutrons banked                       487        average time of (shakes)              cutoffs
  neutron tracks per source particle     1.0034E+00          escape            0.0000E+00          tco   1.0000E+33
  neutron collisions per source particle 1.5178E+02          capture           9.5720E+03          eco   0.0000E+00
  total neutron collisions                 75888898          capture or escape 9.5720E+03          wc1  -5.0000E-01
  net multiplication              1.0008E+00 0.0000          any termination   9.6263E+03          wc2  -2.5000E-01

computer time so far in this run    11.91 minutes            maximum number ever in bank         2
computer time in mcrun              11.75 minutes            bank overflows to backup file       0
source particles per minute           4.5171E+04
random numbers generated               769937194             most random numbers used was       12106 in history      314654

range of sampled source weights = 8.5106E-01 to 1.1655E+00

source efficiency = 1.0000  in cell     1

source efficiency = 0.1042  in cell    10

source efficiency = 1.0000  in cell    20

source efficiency = 1.0000  in cell    41
1neutron  activity in each cell                                                                          print table 126
```

	cell	tracks entering	population	collisions	collisions * weight (per history)	number weighted energy	flux weighted energy	average track weight (relative)	average track mfp (cm)
1	1	1241569	501146	586077	9.5153E-01	1.3646E-03	1.1014E+00	9.2266E-01	2.6346E+00
2	2	1753661	501152	72734	1.0239E-01	4.0488E-04	7.9744E-01	8.3249E-01	1.7794E+00
3	3	1892568	501155	78060	1.3835E-01	5.6811E-04	8.5842E-01	8.8595E-01	3.7904E+00
4	4	4675755	501209	22767197	3.3677E+01	1.9441E-04	5.2073E-01	8.3143E-01	1.3415E+00
5	10	1405445	371543	6018259	8.5610E+00	1.3456E-04	3.4232E-01	7.9570E-01	1.0857E+00
6	20	0	0	0	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
7	21	1643189	371205	1813	2.6501E-03	4.8443E-04	4.0398E-01	8.2611E-01	1.3004E+04
8	22	2050981	371181	2086136	3.6199E+00	5.2913E-04	3.3678E-01	8.1901E-01	9.7847E+00
9	23	2153778	354933	90	1.4430E-04	5.8421E-04	2.9581E-01	8.1614E-01	1.1843E+04
10	40	25792	5252	101677	1.4356E-01	3.2300E-03	1.0644E-01	7.2359E-01	3.2337E+00
11	41	0	0	0	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
12	42	115694	15185	1342637	1.7759E+00	2.6306E-03	1.0677E-01	7.2112E-01	2.5371E+00
13	43	3325425	208962	13169115	1.9143E+01	3.4252E-03	1.7553E-01	7.8816E-01	2.7485E+00
14	44	42149	15682	143930	2.0099E-01	8.1919E-04	1.6869E-01	7.5553E-01	2.3693E+00
15	45	2163315	353876	5282663	7.9853E+00	8.7776E-04	2.9482E-01	8.1629E-01	2.5676E+00
16	46	2626045	293982	23873147	3.7303E+01	1.6270E-03	2.1773E-01	8.0445E-01	3.5473E+00
17	47	87444	20018	361275	5.2806E-01	1.8325E-03	1.3891E-01	7.5094E-01	3.3232E+00
18	48	3117979	207568	0	0.0000E+00	2.7619E-03	1.8387E-01	7.9764E-01	0.0000E+00
19	49	1731775	177414	4088	6.0903E-03	3.8532E-03	1.7945E-01	7.8941E-01	1.0816E+04
total		30052564	4771463	75888898	1.1414E+02				

1neutron weight balance in each cell   print table 130

cell index	1	2	3	4	5	6	7	8	9
cell number	1	2	3	4	10	20	21	22	23
external events:									
entering	1.2512E+00	3.1557E+00	3.3816E+00	7.8956E+00	2.2976E+00	0.0000E+00	2.7283E+00	3.3845E+00	3.5279E+00
source	1.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
energy cutoff	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
time cutoff	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
exiting	-1.8614E+00	-3.1553E+00	-3.3804E+00	-7.7598E+00	-2.2640E+00	0.0000E+00	-2.7283E+00	-3.3455E+00	-3.5279E+00
total	3.8978E-01	3.6619E-04	1.1670E-03	1.3572E-01	3.3608E-02	0.0000E+00	6.9143E-06	3.9023E-02	1.3065E-07
variance reduction events:									
weight window	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
cell importance	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
weight cutoff	1.1135E-04	3.7032E-06	1.9991E-06	4.5624E-05	-1.5941E-05	0.0000E+00	-1.4890E-06	-4.0693E-05	0.0000E+00
e or t importance	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
dxtran	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
forced collisions	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
exp. transform	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
total	1.1135E-04	3.7032E-06	1.9991E-06	4.5624E-05	-1.5941E-05	0.0000E+00	-1.4890E-06	-4.0693E-05	0.0000E+00
physical events:									
capture	-1.1266E-01	-3.6990E-04	-1.1822E-03	-1.3576E-01	-3.3593E-02	0.0000E+00	-5.4253E-06	-3.8983E-02	-1.3065E-07
(n,xn)	6.2734E-04	0.0000E+00	2.6371E-05	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
loss to (n,xn)	-3.1285E-04	0.0000E+00	-1.3185E-05	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
fission	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
loss to fission	-2.7755E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
photonuclear	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
total	-3.8989E-01	-3.6990E-04	-1.1690E-03	-1.3576E-01	-3.3593E-02	0.0000E+00	-5.4253E-06	-3.8983E-02	-1.3065E-07
total	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

cell index	10	11	12	13	14	15	16	17	18
cell number	40	41	42	43	44	45	46	47	48
external events:									
entering	3.7341E-02	0.0000E+00	1.6904E-01	5.2877E+00	6.3487E-02	3.5504E+00	4.2362E+00	1.3150E-01	4.9768E+00
source	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
energy cutoff	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
time cutoff	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
exiting	-3.7270E-02	0.0000E+00	-1.5693E-01	-5.1469E+00	-5.9514E-02	-3.3370E+00	-4.2065E+00	-1.3116E-01	-4.9768E+00
total	7.0996E-05	0.0000E+00	1.2111E-02	1.4074E-01	3.9735E-03	2.1336E-01	2.9727E-02	3.4420E-04	0.0000E+00
variance reduction events:									
weight window	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
cell importance	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
weight cutoff	-2.4210E-06	0.0000E+00	9.0859E-05	-3.1358E-04	-1.0418E-05	1.3278E-04	2.2441E-05	-1.8057E-05	0.0000E+00
e or t importance	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
dxtran	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
forced collisions	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
exp. transform	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
total	-2.4210E-06	0.0000E+00	9.0859E-05	-3.1358E-04	-1.0418E-05	1.3278E-04	2.2441E-05	-1.8057E-05	0.0000E+00
physical events:									
capture	-6.8575E-05	0.0000E+00	-1.2202E-02	-1.4044E-01	-3.9631E-03	-2.1350E-01	-3.0195E-02	-3.2989E-04	0.0000E+00
(n,xn)	0.0000E+00	0.0000E+00	0.0000E+00	1.4057E-05	0.0000E+00	2.9429E-05	8.8912E-04	7.4907E-06	0.0000E+00
loss to (n,xn)	0.0000E+00	0.0000E+00	0.0000E+00	-7.0285E-06	0.0000E+00	-1.4715E-05	-4.4358E-04	-3.7454E-06	0.0000E+00
fission	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
loss to fission	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
photonuclear	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
total	-6.8575E-05	0.0000E+00	-1.2202E-02	-1.4043E-01	-3.9631E-03	-2.1349E-01	-2.9750E-02	-3.2614E-04	0.0000E+00

```
          ----------  ----------  ----------  ----------  ----------  ----------  ----------  ----------  ----------
    total  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00


       cell index        19
      cell number        49        total

external events:
         entering  2.7311E+00  4.8806E+01
           source  0.0000E+00  1.0000E+00
    energy cutoff  0.0000E+00  0.0000E+00
      time cutoff  0.0000E+00  0.0000E+00
          exiting -2.7311E+00 -4.8806E+01
                   ----------  ----------
            total  1.4036E-06  1.0000E+00

variance reduction events:
    weight window  0.0000E+00  0.0000E+00
  cell importance  0.0000E+00  0.0000E+00
    weight cutoff  0.0000E+00  6.1524E-06
e or t importance  0.0000E+00  0.0000E+00
           dxtran  0.0000E+00  0.0000E+00
 forced collisions  0.0000E+00  0.0000E+00
   exp. transform  0.0000E+00  0.0000E+00
                   ----------  ----------
            total  0.0000E+00  6.1524E-06

physical events:
          capture -1.4036E-06 -7.2325E-01
           (n,xn)  0.0000E+00  1.5938E-03
    loss to (n,xn)  0.0000E+00 -7.9510E-04
          fission  0.0000E+00  0.0000E+00
   loss to fission  0.0000E+00 -2.7755E-01
     photonuclear  0.0000E+00  0.0000E+00
                   ----------  ----------
            total -1.4036E-06 -1.0000E+00

                   ----------  ----------
            total  0.0000E+00  0.0000E+00
```

1neutron activity of each nuclide in each cell, per source particle — print table 140

cell index	cell name	nuclides	atom fraction	total collisions	collisions * weight	wgt. lost to capture	wgt. gain by fission	wgt. gain by (n,xn)	photons produced	photon wgt produced	avg photon energy
1	1	92235.69c	2.19E-03	11604	1.6516E-02	2.3773E-03	1.2018E-02	1.2382E-06	0	0.0000E+00	0.0000E+00
		92238.69c	3.07E-01	182793	3.3056E-01	2.3571E-02	5.1778E-03	2.8296E-04	0	0.0000E+00	0.0000E+00
		94238.66c	2.44E-10	0	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		94239.69c	2.43E-10	0	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		94240.66c	2.42E-10	0	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		94241.66c	2.41E-02	261894	3.6794E-01	8.6289E-02	2.6036E-01	3.0294E-05	0	0.0000E+00	0.0000E+00
		94242.66c	2.40E-10	0	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		8016.62c	6.66E-01	129786	2.3652E-01	4.2088E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
2	2	1001.62c	6.67E-01	67564	9.4009E-02	3.5973E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		8016.62c	3.33E-01	5170	8.3772E-03	1.0168E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
3	3	26054.62c	1.19E-04	8	1.3417E-05	2.1703E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24050.62c	7.63E-05	8	1.5666E-05	3.9708E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		7014.62c	3.24E-03	267	4.4474E-04	2.3671E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26056.62c	1.87E-03	192	3.0462E-04	2.1713E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24052.62c	1.47E-03	61	1.1116E-04	3.5581E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		7015.66c	1.20E-05	1	2.0596E-06	1.1114E-12	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26057.62c	4.33E-05	9	1.5459E-05	1.0398E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24053.62c	1.67E-04	32	4.9398E-05	9.4886E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26058.62c	5.71E-06	0	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24054.62c	4.14E-05	2	4.1326E-06	3.8278E-08	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		40000.66c	9.81E-01	76724	1.3605E-01	1.0591E-03	0.0000E+00	1.3185E-05	0	0.0000E+00	0.0000E+00
		50000.42c	1.15E-02	756	1.3400E-03	5.7434E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
4	4	1001.62c	6.67E-01	21345331	3.1346E+01	1.3390E-01	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		8016.62c	3.33E-01	1421866	2.3311E+00	1.8663E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
5	10	1001.62c	6.67E-01	5653062	7.9858E+00	3.3326E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		8016.62c	3.33E-01	365197	5.7522E-01	2.6681E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
6	20	1001.62c	6.67E-01	0	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		8016.62c	3.33E-01	0	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
7	21	1001.62c	6.67E-01	1675	2.4240E-03	5.4231E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		8016.62c	3.33E-01	138	2.2604E-04	2.2451E-09	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
8	22	13027.62c	1.00E+00	2086136	3.6199E+00	3.8983E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
9	23	1001.62c	6.67E-01	83	1.3264E-04	1.3062E-07	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		8016.62c	3.33E-01	7	1.1663E-05	2.8285E-11	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
10	40	82206.66c	2.55E-01	24516	3.4087E-02	2.7874E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		82207.66c	2.21E-01	22486	3.2056E-02	3.8462E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		82208.66c	5.24E-01	54675	7.7416E-02	2.2389E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
11	41	1001.62c	6.67E-01	0	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		8016.62c	3.33E-01	0	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
12	42	24050.62c	8.79E-03	21758	3.4511E-02	4.7860E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26054.62c	4.03E-02	42532	6.8094E-02	4.1345E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00

		28058.62c	6.09E-02	181784	2.3443E-01	1.0840E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24052.62c	1.69E-01	93120	1.3676E-01	6.9642E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26056.62c	6.32E-01	791641	9.7764E-01	6.0022E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28060.62c	2.35E-02	26722	4.4624E-02	2.8130E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24053.62c	1.92E-02	64103	9.6929E-02	1.1944E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26057.62c	1.46E-02	17618	2.8309E-02	2.0807E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28061.62c	1.02E-03	1322	1.6890E-03	1.4576E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24054.62c	4.77E-03	3470	5.4180E-03	9.0993E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26058.62c	1.93E-03	1803	2.8359E-03	2.7057E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28062.62c	3.25E-03	14741	2.2397E-02	1.4380E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28064.62c	8.33E-04	1134	1.9718E-03	6.5208E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		25055.62c	2.01E-02	80889	1.2014E-01	1.6420E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
13	43	24050.62c	8.79E-03	221175	3.6703E-01	5.7475E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26054.62c	4.03E-02	451871	7.6283E-01	4.7802E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28058.62c	6.09E-02	1715612	2.4243E+00	1.2971E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24052.62c	1.69E-01	1019845	1.6356E+00	7.9758E-03	0.0000E+00	1.8340E-06	0	0.0000E+00	0.0000E+00
		26056.62c	6.32E-01	7666679	1.0557E+01	6.9499E-02	0.0000E+00	2.0166E-06	0	0.0000E+00	0.0000E+00
		28060.62c	2.35E-02	283261	4.9171E-01	3.2930E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24053.62c	1.92E-02	630863	1.0081E+00	1.3984E-02	0.0000E+00	1.5387E-06	0	0.0000E+00	0.0000E+00
		26057.62c	1.46E-02	185000	3.1223E-01	2.2263E-03	0.0000E+00	1.6393E-06	0	0.0000E+00	0.0000E+00
		28061.62c	1.02E-03	13468	2.0832E-02	1.7934E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24054.62c	4.77E-03	36356	6.0531E-02	1.2171E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26058.62c	1.93E-03	19406	3.2608E-02	2.6030E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28062.62c	3.25E-03	144976	2.3288E-01	1.6922E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28064.62c	8.33E-04	12230	2.1954E-02	7.1773E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		25055.62c	2.01E-02	768373	1.2152E+00	1.7635E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
14	44	24050.62c	8.79E-03	2269	3.6509E-03	1.8711E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26054.62c	4.03E-02	4128	6.7625E-03	1.1885E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28058.62c	6.09E-02	19305	2.6369E-02	3.6453E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24052.62c	1.69E-01	9781	1.5040E-02	1.7043E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26056.62c	6.32E-01	87969	1.1668E-01	2.1107E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28060.62c	2.35E-02	2542	4.3148E-03	8.3706E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24053.62c	1.92E-02	6286	9.7393E-03	4.0739E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26057.62c	1.46E-02	1769	2.9096E-03	5.1876E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28061.62c	1.02E-03	127	1.8882E-04	4.4798E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24054.62c	4.77E-03	325	5.1374E-04	2.4205E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26058.62c	1.93E-03	178	2.8855E-04	2.4763E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28062.62c	3.25E-03	1408	2.2061E-03	5.8112E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28064.62c	8.33E-04	92	1.6133E-04	2.3044E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		25055.62c	2.01E-02	7751	1.2164E-02	3.9874E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
15	45	24050.62c	8.79E-03	80564	1.3531E-01	9.5234E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26054.62c	4.03E-02	160789	2.7759E-01	6.8030E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28058.62c	6.09E-02	681315	1.0027E+00	2.0061E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24052.62c	1.69E-01	391001	6.4399E-01	9.4778E-03	0.0000E+00	1.6111E-06	0	0.0000E+00	0.0000E+00
		26056.62c	6.32E-01	3234714	4.6943E+00	1.1239E-01	0.0000E+00	8.7451E-06	0	0.0000E+00	0.0000E+00
		28060.62c	2.35E-02	91514	1.6155E-01	4.5728E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24053.62c	1.92E-02	231983	3.7789E-01	2.3538E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		26057.62c	1.46E-02	64846	1.1199E-01	2.6033E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28061.62c	1.02E-03	5128	8.0158E-03	2.0266E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		24054.62c	4.77E-03	12710	2.1748E-02	1.3227E-04	0.0000E+00	4.3583E-06	0	0.0000E+00	0.0000E+00
		26058.62c	1.93E-03	6657	1.1330E-02	1.9784E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28062.62c	3.25E-03	51037	8.4785E-02	3.0676E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		28064.62c	8.33E-04	3627	6.6572E-03	7.6507E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		25055.62c	2.01E-02	266778	4.4741E-01	2.0862E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
16	46	82206.66c	2.55E-01	5741763	8.8860E+00	6.7912E-03	0.0000E+00	6.4064E-05	0	0.0000E+00	0.0000E+00
		82207.66c	2.21E-01	5300449	8.3363E+00	2.2654E-02	0.0000E+00	1.2740E-04	0	0.0000E+00	0.0000E+00
		82208.66c	5.24E-01	12830935	2.0081E+01	7.5043E-04	0.0000E+00	2.5407E-04	0	0.0000E+00	0.0000E+00
17	47	82206.66c	2.55E-01	86445	1.2471E-01	8.9207E-05	0.0000E+00	1.9156E-06	0	0.0000E+00	0.0000E+00
		82207.66c	2.21E-01	79902	1.1779E-01	2.3046E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		82208.66c	5.24E-01	194928	2.8556E-01	1.0224E-05	0.0000E+00	1.8298E-06	0	0.0000E+00	0.0000E+00
19	49	1001.62c	6.67E-01	3653	5.3988E-03	1.4029E-06	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
		8016.62c	3.33E-01	435	6.9146E-04	6.3757E-10	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
total				75888898	1.1414E+02	7.2325E-01	2.7755E-01	7.9870E-04	0	0.0000E+00	0.0000E+00

total over all cells by nuclide	total collisions	collisions * weight	wgt. lost to capture	wgt. gain by fission	wgt. gain by (n,xn)	photons produced	photon wgt produced	avg photon energy
1001.62c	27071368	3.9433E+01	1.6759E-01	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
7014.62c	267	4.4474E-04	2.3671E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
7015.66c	1	2.0596E-06	1.1114E-12	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
8016.62c	1922599	3.1521E+00	2.5641E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
13027.62c	2086136	3.6199E+00	3.8983E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
24050.62c	325774	5.4051E-01	1.5941E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
24052.62c	1513808	2.4315E+00	1.8324E-02	0.0000E+00	3.4452E-06	0	0.0000E+00	0.0000E+00
24053.62c	933267	1.4927E+00	3.9133E-02	0.0000E+00	1.5387E-06	0	0.0000E+00	0.0000E+00
24054.62c	52863	8.8215E-02	2.6554E-04	0.0000E+00	4.3583E-06	0	0.0000E+00	0.0000E+00
25055.62c	1123791	1.7949E+00	4.0537E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
26054.62c	659328	1.1153E+00	1.2118E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
26056.62c	11781195	1.6346E+01	1.9002E-01	0.0000E+00	1.0762E-05	0	0.0000E+00	0.0000E+00
26057.62c	269242	4.5546E-01	5.0906E-03	0.0000E+00	1.6393E-06	0	0.0000E+00	0.0000E+00
26058.62c	28044	4.7062E-02	4.8768E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
28058.62c	2598016	3.6878E+00	3.4481E-02	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
28060.62c	404039	7.0220E-01	8.2308E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
28061.62c	20045	3.0926E-02	4.0105E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
28062.62c	212162	3.4226E-01	4.9617E-03	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
28064.62c	17083	3.0744E-02	1.5711E-04	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
40000.66c	76724	1.3605E-01	1.0591E-03	0.0000E+00	1.3185E-05	0	0.0000E+00	0.0000E+00
50000.42c	756	1.3400E-03	5.7434E-05	0.0000E+00	0.0000E+00	0	0.0000E+00	0.0000E+00
82206.66c	5852724	9.0448E+00	6.9083E-03	0.0000E+00	6.5980E-05	0	0.0000E+00	0.0000E+00

```
           82207.66c            5402837  8.4862E+00  2.2923E-02  0.0000E+00  1.2740E-04              0  0.0000E+00  0.0000E+00
           82208.66c           13080538  2.0444E+01  7.6289E-04  0.0000E+00  2.5590E-04              0  0.0000E+00  0.0000E+00
           92235.69c              11604  1.6516E-02  2.3773E-03  1.2018E-02  1.2382E-06              0  0.0000E+00  0.0000E+00
           92238.69c             182793  3.3056E-01  2.3571E-02  5.1778E-03  2.8296E-04              0  0.0000E+00  0.0000E+00
           94238.66c                  0  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00              0  0.0000E+00  0.0000E+00
           94239.69c                  0  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00              0  0.0000E+00  0.0000E+00
           94240.66c                  0  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00              0  0.0000E+00  0.0000E+00
           94241.66c             261894  3.6794E-01  8.6289E-02  2.6036E-01  3.0294E-05              0  0.0000E+00  0.0000E+00
           94242.66c                  0  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00              0  0.0000E+00  0.0000E+00
1keff results for: NAC-LWT Cask - MOX Experiments - Accident Transport Conditions              probid =  10/25/07
23:04:59


 the initial fission neutron source distribution was generated from a general sdef source description.
 the criticality problem was scheduled to skip  30 cycles and run a total of  530 cycles with nominally     1000 neutrons per
cycle.
 this problem has run  30 inactive cycles with    30072 neutron histories and  500 active cycles with      500798 neutron
histories.


 this calculation has completed the requested number of keff cycles using a total of      530870 fission neutron source
histories.
 all cells with fissionable material were sampled and had fission neutron source points.


 the results of the w test for normality applied to the individual collision, absorption, and track-length keff cycle values are:

          the k( collision) cycle values appear normally distributed at the 95 percent confidence level
          the k(absorption) cycle values appear normally distributed at the 95 percent confidence level
          the k(trk length) cycle values appear normally distributed at the 95 percent confidence level


 ------------------------------------------------------------------------------------------------------------------------------
---
 |
|
 | the final estimated combined collision/absorption/track-length keff = 0.81154 with an estimated standard deviation of 0.00116
|
 |
|
 | the estimated 68, 95, & 99 percent keff confidence intervals are 0.81038 to 0.81269, 0.80923 to 0.81384, and 0.80848 to
0.81459 |
 |
|
 | the final combined (col/abs/tl) prompt removal lifetime = 8.3977E-05 seconds with an estimated standard deviation of 1.0227E-
07 |
 |
|
 | the average neutron energy causing fission = 7.7342E-02 mev
|
 | the energy corresponding to the average neutron lethargy causing fission = 1.3304E-07 mev
|
 |
|
 | the percentages of fissions caused by neutrons in the thermal, intermediate, and fast neutron ranges are:
|
 |        (<0.625 ev):  89.17%         (0.625 ev - 100 kev):   7.97%          (>100 kev):   2.86%
|
 |
|
 | the average fission neutrons produced per neutron absorbed (capture + fission) in all cells with fission = 2.0828E+00
|
 | the average fission neutrons produced per neutron absorbed (capture + fission) in all the geometry cells = 8.1209E-01
|
 |
|
 | the average number of neutrons produced per fission = 2.928
|
 |
|
 ------------------------------------------------------------------------------------------------------------------------------
---


 the estimated average keffs, one standard deviations, and 68, 95, and 99 percent confidence intervals are:

        keff estimator        keff      standard deviation       68% confidence          95% confidence          99% confidence
corr

             collision      0.81275          0.00130          0.81144 to 0.81405     0.81015 to 0.81534     0.80930 to 0.81619
            absorption      0.81120          0.00119          0.81001 to 0.81239     0.80883 to 0.81357     0.80805 to 0.81435
          track length      0.81243          0.00169          0.81074 to 0.81412     0.80907 to 0.81579     0.80797 to 0.81689
            col/absorp      0.81160          0.00118          0.81042 to 0.81279     0.80925 to 0.81396     0.80848 to 0.81472
0.8166
           abs/trk len      0.81145          0.00115          0.81030 to 0.81260     0.80916 to 0.81374     0.80841 to 0.81449
0.4642
           col/trk len      0.81269          0.00128          0.81141 to 0.81397     0.81013 to 0.81525     0.80930 to 0.81608
0.6276
       col/abs/trk len      0.81154          0.00116          0.81038 to 0.81269     0.80923 to 0.81384     0.80848 to 0.81459

 if the largest of each keff occurred on the next cycle, the keff results and 68, 95, and 99 percent confidence intervals would
be:

        keff estimator        keff      standard deviation       68% confidence          95% confidence          99% confidence

             collision      0.81294          0.00132          0.81162 to 0.81426     0.81032 to 0.81556     0.80947 to 0.81642
```

absorption	0.81135	0.00120	0.81015 to 0.81255	0.80896 to 0.81374	0.80818 to 0.81452
track length	0.81269	0.00170	0.81098 to 0.81439	0.80929 to 0.81608	0.80819 to 0.81719
col/abs/trk len	0.81169	0.00117	0.81053 to 0.81286	0.80937 to 0.81402	0.80861 to 0.81478

the estimated average prompt removal lifetimes, one standard deviations, and 68, 95, and 99 percent confidence intervals are (sec):

estimator	lifetime	std. dev.	68% confidence	95% confidence	99% confidence	corr
collision	8.38310E-05	1.35781E-07	8.3695E-05 to 8.3967E-05	8.3561E-05 to 8.4102E-05	8.3472E-05 to 8.4190E-05	
absorption	8.38304E-05	1.31414E-07	8.3699E-05 to 8.3962E-05	8.3569E-05 to 8.4092E-05	8.3483E-05 to 8.4178E-05	
track length	8.39544E-05	1.02540E-07	8.3852E-05 to 8.4057E-05	8.3750E-05 to 8.4159E-05	8.3684E-05 to 8.4225E-05	
col/absorp	8.38305E-05	1.31533E-07	8.3699E-05 to 8.3962E-05	8.3568E-05 to 8.4092E-05	8.3483E-05 to 8.4178E-05	0.9641
abs/trk len	8.39766E-05	1.02177E-07	8.3874E-05 to 8.4079E-05	8.3773E-05 to 8.4180E-05	8.3707E-05 to 8.4247E-05	0.8463
col/trk len	8.39708E-05	1.02352E-07	8.3868E-05 to 8.4073E-05	8.3767E-05 to 8.4175E-05	8.3700E-05 to 8.4241E-05	0.8149
col/abs/trk len	8.39767E-05	1.02267E-07	8.3874E-05 to 8.4079E-05	8.3773E-05 to 8.4180E-05	8.3706E-05 to 8.4247E-05	

absorption estimates of prompt lifetimes (sec):

	escape	capture	fission	removal
fraction	0.00000E+00	7.22671E-01	2.77329E-01	1.00000E+00
lifetime(abs)	0.00000E+00	1.16001E-04	3.02278E-04	8.38304E-05
lifetime(c/a/t)	0.00000E+00	1.16203E-04	3.02805E-04	8.39767E-05

1average keff results summed over 10 cycles each to form 50 batch values of keff print table 178

batch number	start cycle	end cycle	keff estimators by batch k(coll)	k(abs)	k(track)	average keff estimators and deviations k(coll)	st dev	k(abs)	st dev	k(track)	st dev	col/abs/tl keff k(c/a/t)	st dev
1	31	40	0.82966	0.83432	0.81935								
2	41	50	0.81388	0.81282	0.81550	0.82177	0.00789	0.82357	0.01075	0.81743	0.00193		
3	51	60	0.81591	0.81479	0.81007	0.81981	0.00496	0.82065	0.00686	0.81497	0.00269		
4	61	70	0.82413	0.82314	0.81926	0.82089	0.00367	0.82127	0.00489	0.81605	0.00218	0.81694	0.00574
5	71	80	0.82191	0.82228	0.81994	0.82110	0.00285	0.82147	0.00379	0.81683	0.00186	0.81825	0.00362
6	81	90	0.81341	0.81903	0.80153	0.81982	0.00265	0.82107	0.00312	0.81428	0.00297	0.81800	0.00617
7	91	100	0.81570	0.80876	0.80207	0.81923	0.00232	0.81931	0.00317	0.81253	0.00306	0.81900	0.00447
8	101	110	0.82256	0.81550	0.81347	0.81964	0.00205	0.81883	0.00279	0.81265	0.00265	0.81916	0.00422
9	111	120	0.82739	0.81588	0.82961	0.82050	0.00200	0.81850	0.00248	0.81453	0.00300	0.82101	0.00377
10	121	130	0.81189	0.80694	0.79886	0.81964	0.00199	0.81735	0.00250	0.81297	0.00311	0.82178	0.00370
11	131	140	0.81512	0.81798	0.81439	0.81923	0.00184	0.81741	0.00226	0.81310	0.00282	0.82030	0.00312
12	141	150	0.81892	0.80779	0.81619	0.81921	0.00168	0.81660	0.00222	0.81335	0.00258	0.82018	0.00294
13	151	160	0.81253	0.80385	0.81782	0.81869	0.00163	0.81562	0.00226	0.81370	0.00240	0.81873	0.00276
14	161	170	0.82293	0.81659	0.81584	0.81900	0.00154	0.81569	0.00210	0.81385	0.00223	0.81876	0.00269
15	171	180	0.81782	0.81307	0.81272	0.81892	0.00144	0.81552	0.00196	0.81378	0.00208	0.81870	0.00256
16	181	190	0.81490	0.80501	0.83582	0.81667	0.00137	0.81486	0.00195	0.81515	0.00238	0.81813	0.00211
17	191	200	0.80059	0.80287	0.80113	0.81760	0.00167	0.81416	0.00196	0.81433	0.00238	0.81579	0.00232
18	201	210	0.80941	0.79895	0.80353	0.81715	0.00164	0.81331	0.00203	0.81373	0.00233	0.81600	0.00240
19	211	220	0.81458	0.82191	0.81115	0.81701	0.00155	0.81376	0.00197	0.81359	0.00220	0.81590	0.00210
20	221	230	0.79879	0.80440	0.80211	0.81610	0.00173	0.81330	0.00193	0.81302	0.00217	0.81416	0.00206
21	231	240	0.82474	0.82558	0.81525	0.81651	0.00170	0.81388	0.00193	0.81312	0.00207	0.81450	0.00204
22	241	250	0.80621	0.81446	0.80174	0.81604	0.00169	0.81391	0.00184	0.81261	0.00204	0.81398	0.00192
23	251	260	0.80096	0.81176	0.80767	0.81539	0.00174	0.81381	0.00176	0.81239	0.00196	0.81344	0.00172
24	261	270	0.81023	0.80779	0.80387	0.81517	0.00168	0.81356	0.00170	0.81204	0.00191	0.81322	0.00170
25	271	280	0.82492	0.81865	0.82710	0.81556	0.00166	0.81377	0.00165	0.81264	0.00193	0.81362	0.00168
26	281	290	0.80925	0.81282	0.80933	0.81532	0.00161	0.81373	0.00158	0.81251	0.00186	0.81349	0.00160
27	291	300	0.81000	0.80975	0.80467	0.81512	0.00156	0.81358	0.00153	0.81222	0.00181	0.81331	0.00156
28	301	310	0.79874	0.79355	0.81099	0.81454	0.00162	0.81287	0.00164	0.81218	0.00174	0.81258	0.00155
29	311	320	0.81086	0.81598	0.80630	0.81441	0.00156	0.81298	0.00159	0.81197	0.00169	0.81254	0.00149

30	321	330	0.80031	0.80718	0.80098	0.81394	0.00158	0.81278	0.00154	0.81161	0.00168	0.81215	0.00145
31	331	340	0.80388	0.79876	0.81420	0.81362	0.00156	0.81233	0.00156	0.81169	0.00162	0.81188	0.00140
32	341	350	0.81724	0.82617	0.81614	0.81373	0.00152	0.81276	0.00157	0.81183	0.00158	0.81229	0.00138
33	351	360	0.83520	0.81845	0.85451	0.81438	0.00161	0.81293	0.00153	0.81312	0.00200	0.81299	0.00149
34	361	370	0.80886	0.80069	0.80539	0.81422	0.00157	0.81257	0.00153	0.81290	0.00196	0.81279	0.00150
35	371	380	0.81531	0.81537	0.82615	0.81425	0.00152	0.81265	0.00149	0.81328	0.00194	0.81301	0.00145
36	381	390	0.81009	0.80545	0.81262	0.81413	0.00149	0.81245	0.00146	0.81326	0.00188	0.81287	0.00142
37	391	400	0.81143	0.80964	0.80847	0.81406	0.00145	0.81238	0.00142	0.81313	0.00184	0.81279	0.00138
38	401	410	0.82492	0.81788	0.80537	0.81435	0.00144	0.81252	0.00139	0.81292	0.00180	0.81280	0.00136
39	411	420	0.80586	0.80407	0.81463	0.81413	0.00142	0.81231	0.00137	0.81297	0.00175	0.81263	0.00133
40	421	430	0.80978	0.79689	0.81285	0.81402	0.00139	0.81192	0.00139	0.81296	0.00171	0.81250	0.00133
41	431	440	0.80815	0.81161	0.81895	0.81388	0.00136	0.81191	0.00136	0.81311	0.00167	0.81253	0.00128
42	441	450	0.79458	0.80377	0.79193	0.81342	0.00140	0.81172	0.00134	0.81261	0.00171	0.81208	0.00128
43	451	460	0.81535	0.81672	0.81120	0.81346	0.00137	0.81184	0.00131	0.81257	0.00167	0.81215	0.00125
44	461	470	0.80700	0.81373	0.79954	0.81332	0.00135	0.81188	0.00128	0.81228	0.00166	0.81206	0.00122
45	471	480	0.79961	0.80600	0.81020	0.81301	0.00135	0.81175	0.00126	0.81223	0.00162	0.81191	0.00118
46	481	490	0.80546	0.79821	0.80770	0.81285	0.00133	0.81145	0.00127	0.81213	0.00159	0.81171	0.00119
47	491	500	0.82768	0.80894	0.82950	0.81316	0.00134	0.81140	0.00124	0.81250	0.00160	0.81175	0.00117
48	501	510	0.79942	0.80020	0.81243	0.81288	0.00134	0.81117	0.00124	0.81250	0.00156	0.81156	0.00115
49	511	520	0.81145	0.80954	0.81694	0.81285	0.00132	0.81113	0.00121	0.81259	0.00153	0.81157	0.00113
50	521	530	0.80779	0.81443	0.80466	0.81275	0.00129	0.81120	0.00119	0.81243	0.00151	0.81156	0.00110

average keff results summed over 20 cycles each to form 25 batch values of keff

batch number	start cycle	end cycle	keff estimators by batch k(coll)	k(abs)	k(track)	average keff estimators and deviations k(coll)	st dev	k(abs)	st dev	k(track)	st dev	col/abs/tl keff k(c/a/t)	st dev
1	31	50	0.82177	0.82357	0.81743								
2	51	70	0.82002	0.81897	0.81466	0.82089	0.00088	0.82127	0.00230	0.81605	0.00138		
3	71	90	0.81766	0.82066	0.81074	0.81982	0.00119	0.82107	0.00135	0.81428	0.00194		
4	91	110	0.81913	0.81213	0.80777	0.81964	0.00086	0.81883	0.00243	0.81265	0.00213	0.82491	0.00351
5	111	130	0.81964	0.81141	0.81424	0.81964	0.00067	0.81735	0.00240	0.81297	0.00168	0.82164	0.00234
6	131	150	0.81702	0.81289	0.81529	0.81921	0.00070	0.81660	0.00209	0.81335	0.00142	0.81897	0.00199
7	151	170	0.81773	0.81022	0.81683	0.81900	0.00063	0.81569	0.00199	0.81385	0.00130	0.81868	0.00149
8	171	190	0.81636	0.80904	0.82427	0.81867	0.00063	0.81486	0.00191	0.81515	0.00172	0.81847	0.00100
9	191	210	0.80500	0.80091	0.80233	0.81715	0.00162	0.81331	0.00229	0.81373	0.00206	0.81665	0.00310
10	211	230	0.80668	0.81316	0.80663	0.81610	0.00179	0.81330	0.00205	0.81302	0.00199	0.81400	0.00245
11	231	250	0.81547	0.82003	0.80849	0.81604	0.00162	0.81391	0.00195	0.81261	0.00185	0.81404	0.00220
12	251	270	0.80559	0.80977	0.80577	0.81517	0.00171	0.81356	0.00181	0.81204	0.00178	0.81292	0.00199
13	271	290	0.81708	0.81574	0.81822	0.81532	0.00158	0.81373	0.00168	0.81251	0.00171	0.81341	0.00181
14	291	310	0.80437	0.80165	0.80783	0.81454	0.00166	0.81287	0.00178	0.81218	0.00162	0.81242	0.00178
15	311	330	0.80558	0.81158	0.80364	0.81394	0.00166	0.81278	0.00166	0.81161	0.00161	0.81191	0.00166
16	331	350	0.81056	0.81246	0.81517	0.81373	0.00157	0.81276	0.00155	0.81183	0.00152	0.81217	0.00147
17	351	370	0.82203	0.80957	0.82995	0.81422	0.00155	0.81257	0.00147	0.81290	0.00178	0.81256	0.00144
18	371	390	0.81270	0.81041	0.81938	0.81413	0.00146	0.81245	0.00139	0.81326	0.00172	0.81267	0.00133
19	391	410	0.81617	0.81376	0.80692	0.81435	0.00140	0.81252	0.00132	0.81292	0.00166	0.81265	0.00129
20	411	430	0.80782	0.80048	0.81374	0.81402	0.00137	0.81192	0.00139	0.81296	0.00157	0.81232	0.00130

21	431	450	0.80137	0.80769	0.80544	0.81342	0.00143	0.81172	0.00133	0.81261	0.00154	0.81189	0.00121
22	451	470	0.81117	0.81523	0.80537	0.81332	0.00137	0.81188	0.00128	0.81228	0.00150	0.81185	0.00114
23	471	490	0.80253	0.80211	0.80895	0.81285	0.00139	0.81145	0.00130	0.81213	0.00145	0.81149	0.00112
24	491	510	0.81355	0.80457	0.82096	0.81288	0.00133	0.81117	0.00127	0.81250	0.00143	0.81149	0.00108
25	511	530	0.80962	0.81198	0.81080	0.81275	0.00128	0.81120	0.00122	0.81243	0.00137	0.81151	0.00102

average keff results summed over 25 cycles each to form 20 batch values of keff

batch	start	end	keff estimators by batch			average keff estimators and deviations						col/abs/tl keff	
number	cycle	cycle	k(coll)	k(abs)	k(track)	k(coll)	st dev	k(abs)	st dev	k(track)	st dev	k(c/a/t)	st dev
1	31	55	0.82053	0.82250	0.81285								
2	56	80	0.82167	0.82044	0.82080	0.82110	0.00057	0.82147	0.00103	0.81683	0.00397		
3	81	105	0.81838	0.81434	0.80979	0.82019	0.00096	0.81909	0.00245	0.81448	0.00328		
4	106	130	0.81800	0.81211	0.80842	0.81964	0.00087	0.81735	0.00246	0.81297	0.00277	0.82224	0.00032
5	131	155	0.81447	0.81041	0.81672	0.81861	0.00124	0.81596	0.00236	0.81372	0.00227	0.81922	0.00207
6	156	180	0.82046	0.81331	0.81407	0.81892	0.00106	0.81552	0.00198	0.81378	0.00186	0.81883	0.00216
7	181	205	0.80757	0.80137	0.81314	0.81730	0.00185	0.81350	0.00262	0.81368	0.00157	0.81729	0.00252
8	206	230	0.80773	0.81189	0.80835	0.81610	0.00200	0.81330	0.00228	0.81302	0.00152	0.81355	0.00221
9	231	255	0.81254	0.81725	0.80802	0.81571	0.00181	0.81374	0.00206	0.81246	0.00145	0.81295	0.00186
10	256	280	0.81428	0.81405	0.81423	0.81556	0.00162	0.81377	0.00184	0.81264	0.00131	0.81313	0.00159
11	281	305	0.80535	0.80546	0.80570	0.81463	0.00174	0.81301	0.00183	0.81201	0.00134	0.81211	0.00165
12	306	330	0.80631	0.81025	0.80721	0.81394	0.00173	0.81278	0.00168	0.81161	0.00129	0.81160	0.00145
13	331	355	0.81434	0.81294	0.82462	0.81397	0.00159	0.81279	0.00155	0.81261	0.00155	0.81274	0.00144
14	356	380	0.81786	0.81084	0.82194	0.81425	0.00150	0.81265	0.00144	0.81328	0.00158	0.81291	0.00138
15	381	405	0.81727	0.81240	0.81194	0.81445	0.00141	0.81264	0.00134	0.81319	0.00148	0.81288	0.00131
16	406	430	0.80757	0.80117	0.80963	0.81402	0.00139	0.81192	0.00145	0.81296	0.00140	0.81260	0.00138
17	431	455	0.80436	0.80922	0.80511	0.81345	0.00142	0.81176	0.00137	0.81250	0.00139	0.81203	0.00128
18	456	480	0.80551	0.81151	0.80762	0.81301	0.00141	0.81175	0.00129	0.81223	0.00134	0.81185	0.00116
19	481	505	0.81200	0.80345	0.81795	0.81296	0.00134	0.81131	0.00130	0.81253	0.00130	0.81180	0.00112
20	506	530	0.80872	0.80907	0.81054	0.81275	0.00129	0.81120	0.00123	0.81243	0.00124	0.81169	0.00105

average keff results summed over 50 cycles each to form 10 batch values of keff

batch	start	end	keff estimators by batch			average keff estimators and deviations						col/abs/tl keff	
number	cycle	cycle	k(coll)	k(abs)	k(track)	k(coll)	st dev	k(abs)	st dev	k(track)	st dev	k(c/a/t)	st dev
1	31	80	0.82110	0.82147	0.81683								
2	81	130	0.81819	0.81322	0.80911	0.81964	0.00145	0.81735	0.00412	0.81297	0.00386		
3	131	180	0.81746	0.81186	0.81539	0.81892	0.00111	0.81552	0.00300	0.81378	0.00237		
4	181	230	0.80765	0.80663	0.81075	0.81610	0.00292	0.81330	0.00307	0.81302	0.00184	0.81410	0.00461
5	231	280	0.81341	0.81565	0.81112	0.81556	0.00233	0.81377	0.00243	0.81264	0.00147	0.81288	0.00269
6	281	330	0.80583	0.80766	0.80646	0.81394	0.00250	0.81278	0.00221	0.81161	0.00158	0.81120	0.00232
7	331	380	0.81610	0.81189	0.82328	0.81425	0.00213	0.81265	0.00187	0.81328	0.00214	0.81255	0.00226
8	381	430	0.81242	0.80678	0.81079	0.81402	0.00186	0.81192	0.00178	0.81296	0.00188	0.81238	0.00219
9	431	480	0.80494	0.81037	0.80636	0.81301	0.00193	0.81175	0.00158	0.81223	0.00181	0.81170	0.00170
10	481	530	0.81036	0.80626	0.81424	0.81275	0.00174	0.81120	0.00152	0.81243	0.00163	0.81151	0.00155

average keff results summed over 100 cycles each to form 5 batch values of keff

batch	start	end	keff estimators by batch			average keff estimators and deviations						col/abs/tl keff	
number	cycle	cycle	k(coll)	k(abs)	k(track)	k(coll)	st dev	k(abs)	st dev	k(track)	st dev	k(c/a/t)	st dev
1	31	130	0.81964	0.81735	0.81297								

```
      2    131    230     0.81256  0.80924  0.81307        0.81610 0.00354   0.81330 0.00405   0.81302 0.00005
      3    231    330     0.80962  0.81175  0.80879        0.81394 0.00297   0.81278 0.00240   0.81161 0.00141
      4    331    430     0.81426  0.80934  0.81703        0.81402 0.00210   0.81192 0.00190   0.81296 0.00168         0.81086
0.00109
      5    431    530     0.80765  0.80831  0.81030        0.81275 0.00207   0.81120 0.00164   0.81243 0.00141         0.81084
0.00058


 average keff results summed over 125 cycles each to form  4 batch values of keff

  batch  start    end     keff estimators by batch              average keff estimators and deviations               col/abs/tl
keff
 number  cycle  cycle     k(coll)  k(abs)  k(track)        k(coll)  st dev    k(abs)  st dev   k(track) st dev       k(c/a/t) st
dev

      1     31    155     0.81861  0.81596  0.81372
      2    156    280     0.81252  0.81157  0.81156        0.81556 0.00305   0.81377 0.00219   0.81264 0.00108
      3    281    405     0.81223  0.81038  0.81428        0.81445 0.00208   0.81264 0.00170   0.81319 0.00083
      4    406    530     0.80763  0.80689  0.81017        0.81275 0.00225   0.81120 0.00187   0.81243 0.00095         0.80866
0.00201


 average keff results summed over 250 cycles each to form  2 batch values of keff

  batch  start    end     keff estimators by batch              average keff estimators and deviations
 number  cycle  cycle     k(coll)  k(abs)  k(track)        k(coll)  st dev    k(abs)  st dev   k(track) st dev

      1     31    280     0.81556  0.81377  0.81264
      2    281    530     0.80993  0.80863  0.81223        0.81275 0.00282   0.81120 0.00257   0.81243 0.00021
1average individual and combined collision/absorption/track-length keff results for 10 different batch sizes

 cycles per  number of    average keff estimators and deviations      normality  average k(c/a/t)    k(c/a/t) confidence
intervals
 keff batch  k batches  k(col) st dev  k(abs) st dev  k(trk) st dev   co/ab/trk  k(c/a/t) st dev    95% confidence    99%
confidence

        1         500  |  0.8127 0.0013  0.8112 0.0012  0.8124 0.0017  |95/95/95|  0.81154 0.00116   0.80923-0.81384   0.80848-
0.81459
        2         250  |  0.8127 0.0013  0.8112 0.0012  0.8124 0.0016  |95/95/95|  0.81152 0.00115   0.80924-0.81381   0.80849-
0.81456
        4         125  |  0.8127 0.0012  0.8112 0.0011  0.8124 0.0016  |95/95/95|  0.81150 0.00104   0.80943-0.81356   0.80876-
0.81424
        5         100  |  0.8127 0.0013  0.8112 0.0011  0.8124 0.0016  |95/95/95|  0.81156 0.00109   0.80939-0.81373   0.80868-
0.81444
       10          50  |  0.8127 0.0013  0.8112 0.0012  0.8124 0.0015  |95/95/no|  0.81156 0.00110   0.80935-0.81378   0.80861-
0.81452
       20          25  |  0.8127 0.0013  0.8112 0.0012  0.8124 0.0014  |95/95/95|  0.81151 0.00102   0.80939-0.81363   0.80863-
0.81439
       25          20  |  0.8127 0.0013  0.8112 0.0012  0.8124 0.0012  |95/95/95|  0.81169 0.00105   0.80946-0.81391   0.80863-
0.81475
       50          10  |  0.8127 0.0017  0.8112 0.0015  0.8124 0.0016  |95/95/95|  0.81151 0.00155   0.80785-0.81518   0.80610-
0.81693
      100           5  |  0.8127 0.0021  0.8112 0.0016  0.8124 0.0014  |95/95/95|  0.81084 0.00058   0.80835-0.81333   0.80510-
0.81658
      125           4  |  0.8127 0.0023  0.8112 0.0019  0.8124 0.0010  |95/95/95|  0.80866 0.00201   0.78307-0.83424   0.68049-
0.93682
 ------------------------------------------------------------------------------------------------------------------------------
---
1individual and average keff estimator results by cycle

  keff      neutron    keff estimators by cycle            average keff estimators and deviations                average k(c/a/t)
 cycle    histories   k(coll)  k(abs)  k(track)       k(coll)  st dev    k(abs)  st dev   k(track) st dev    k(c/a/t)  st dev    fom

     1         1000 | 0.77358  0.79932  0.74740  |
     2          986 | 0.76197  0.79060  0.75265  |
     3         1002 | 0.79295  0.77210  0.82091  |
     4         1019 | 0.79855  0.80426  0.80619  |
     5         1013 | 0.84601  0.85820  0.82484  |
     6         1058 | 0.77844  0.75337  0.72031  |
     7          927 | 0.85231  0.84192  0.83283  |
     8         1086 | 0.77620  0.80320  0.77936  |
     9          916 | 0.79294  0.79449  0.78476  |
    10         1021 | 0.81179  0.81686  0.82052  |
 ------------------------------------------------------------------------------------------------------------------------------
---
    11         1034 | 0.77867  0.78231  0.75394  |
    12          960 | 0.81982  0.81026  0.73652  |
    13         1046 | 0.80821  0.82129  0.79494  |
    14          986 | 0.78548  0.78599  0.78331  |
    15          966 | 0.85796  0.85715  0.80780  |
    16         1101 | 0.79257  0.77507  0.78607  |
    17          912 | 0.82974  0.83238  0.82775  |
    18         1038 | 0.80387  0.79760  0.88017  |
    19          966 | 0.81923  0.79387  0.86437  |
    20         1014 | 0.82715  0.80886  0.80226  |
 ------------------------------------------------------------------------------------------------------------------------------
---
    21         1014 | 0.82259  0.85874  0.80640  |
    22          992 | 0.86693  0.86026  0.84444  |
    23         1050 | 0.84547  0.83464  0.84392  |
    24          963 | 0.76921  0.78395  0.77723  |
    25          914 | 0.86921  0.85248  0.88038  |
    26         1121 | 0.80505  0.83543  0.81121  |
    27          939 | 0.83546  0.81099  0.88213  |
    28         1027 | 0.80724  0.82615  0.77292  |
```

```
   29        976 | 0.83872  0.81914  0.85585  |
   30       1025 | 0.79872  0.80144  0.84044  |
 ------------------ begin active keff cycles ------------------------------------------------------------------------
---
   31        985 | 0.79769  0.81254  0.77994  |
   32       1003 | 0.78199  0.79373  0.78218  |  0.78984 0.00785   0.80313 0.00940   0.78106 0.00112  |
   33        999 | 0.82857  0.82168  0.80760  |  0.80275 0.01368   0.80931 0.00823   0.78991 0.00887  |
   34       1051 | 0.82903  0.85712  0.80382  |  0.80932 0.01170   0.82127 0.01329   0.79339 0.00717  |  0.78247 0.01718
14266
   35       1009 | 0.83682  0.82981  0.86441  |  0.81482 0.01060   0.82298 0.01044   0.80759 0.01525  |  0.81913 0.01641
14997
   36       1023 | 0.84764  0.83567  0.83147  |  0.82029 0.01024   0.82509 0.00878   0.81157 0.01307  |  0.82250 0.01228
22601
   37       1023 | 0.82213  0.82044  0.81896  |  0.82055 0.00866   0.82443 0.00745   0.81263 0.01110  |  0.82202 0.00976
30546
   38        974 | 0.83130  0.84804  0.85184  |  0.82190 0.00762   0.82738 0.00710   0.81753 0.01079  |  0.82559 0.00890
32910
   39       1015 | 0.82956  0.84174  0.80362  |  0.82275 0.00677   0.82897 0.00646   0.81598 0.00964  |  0.82631 0.00820
34663
   40        969 | 0.89183  0.88243  0.84970  |  0.82966 0.00919   0.83432 0.00787   0.81935 0.00926  |  0.82988 0.00961
23195
 --------------------------------------------------------------------------------------------------------------------
---
.
.
.
.
.
 --------------------------------------------------------------------------------------------------------------------
---
  511       1007 | 0.81678  0.82585  0.81586  |  0.81288 0.00132   0.81120 0.00120   0.81251 0.00170  |  0.81156 0.00116
30004
  512       1001 | 0.76297  0.75270  0.73827  |  0.81278 0.00132   0.81108 0.00121   0.81235 0.00171  |  0.81144 0.00117
29684
  513        943 | 0.80793  0.79311  0.77191  |  0.81277 0.00132   0.81104 0.00120   0.81227 0.00170  |  0.81140 0.00117
29688
  514       1074 | 0.84159  0.85901  0.82520  |  0.81283 0.00131   0.81114 0.00121   0.81230 0.00170  |  0.81149 0.00117
29623
  515       1059 | 0.79077  0.77557  0.83553  |  0.81278 0.00131   0.81106 0.00121   0.81234 0.00170  |  0.81145 0.00117
29618
  516        943 | 0.83794  0.82702  0.82522  |  0.81284 0.00131   0.81110 0.00120   0.81237 0.00170  |  0.81148 0.00116
29655
  517       1087 | 0.80995  0.82004  0.78851  |  0.81283 0.00131   0.81112 0.00120   0.81232 0.00169  |  0.81148 0.00116
29721
  518        968 | 0.89895  0.87356  0.93949  |  0.81301 0.00132   0.81124 0.00121   0.81258 0.00171  |  0.81162 0.00117
29252
  519       1102 | 0.78411  0.80850  0.85787  |  0.81295 0.00132   0.81124 0.00120   0.81268 0.00171  |  0.81163 0.00117
29329
  520        875 | 0.76352  0.75999  0.77152  |  0.81285 0.00132   0.81113 0.00121   0.81259 0.00171  |  0.81153 0.00117
29162
 --------------------------------------------------------------------------------------------------------------------
---
  521        989 | 0.80518  0.81700  0.80918  |  0.81283 0.00131   0.81115 0.00120   0.81258 0.00170  |  0.81154 0.00117
29234
  522       1062 | 0.82496  0.84155  0.83930  |  0.81286 0.00131   0.81121 0.00120   0.81264 0.00170  |  0.81160 0.00117
29242
  523       1036 | 0.82159  0.83155  0.85448  |  0.81287 0.00131   0.81125 0.00120   0.81272 0.00170  |  0.81165 0.00116
29266
  524        975 | 0.75715  0.77727  0.77199  |  0.81276 0.00131   0.81118 0.00120   0.81264 0.00170  |  0.81157 0.00116
29207
  525        920 | 0.77191  0.78500  0.76597  |  0.81268 0.00131   0.81113 0.00120   0.81255 0.00170  |  0.81150 0.00116
29183
  526       1036 | 0.81316  0.81182  0.74585  |  0.81268 0.00131   0.81113 0.00120   0.81241 0.00170  |  0.81148 0.00116
29223
  527       1039 | 0.80919  0.80909  0.82117  |  0.81267 0.00131   0.81112 0.00119   0.81243 0.00170  |  0.81148 0.00116
29277
  528       1005 | 0.82139  0.80960  0.79041  |  0.81269 0.00130   0.81112 0.00119   0.81239 0.00169  |  0.81147 0.00116
29327
  529       1027 | 0.78889  0.79852  0.80474  |  0.81264 0.00130   0.81110 0.00119   0.81237 0.00169  |  0.81144 0.00115
29371
  530        969 | 0.86444  0.86285  0.84348  |  0.81275 0.00130   0.81120 0.00119   0.81243 0.00169  |  0.81154 0.00116
29242
 --------------------------------------------------------------------------------------------------------------------
---


  the largest active cycle keffs by estimator are:                              the smallest active cycle keffs by estimator
are:

                    collision 0.91061 on cycle 312                                             collision 0.73198 on cycle 226
                  absorption 0.88814 on cycle 312                                            absorption 0.72474 on cycle 226
                track length 0.93949 on cycle 518                                          track length 0.71577 on cycle 390
1plot of the estimated col/abs/track-length keff one standard deviation interval versus cycle number (| = final keff =  0.81154)

    cycle    active 0.81                            0.82                            0.83                           0.84
   number    cycles  |------------------------------|------------------------------|------------------------------|
      40        10   |   |                           (-----------------------------k------------------------------)  |
      45        15   |   |                   (------------------------k-------------------------)                    |
      50        20   |   |         (-----------------------k-----------------------)                                 |
      55        25   |   |    (-------------------k-------------------)                                              |
      60        30   |   |      (----------------k----------------)                                                  |
      65        35   |   |            (---------------k----------------)                                             |
      70        40   |   |            (--------------k-------------)                                                 |
      75        45   |   |               (-------------k-------------)                                               |
      80        50   |   |              (-------------k------------)                                                 |
      85        55   +   |             (------------k------------)                                                   +
      90        60   |   |             (-----------k-----------)                                                     |
```

```
 95     65  |   |      (-----------k-----------)                                          |
100     70  |   |        (-----------k----------)                                         |
105     75  |   |          (----------k----------)                                        |
110     80  |   |         (---------k---------)                                           |
115     85  |   |        (----------k---------)                                           |
120     90  |   |           (---------k---------)                                         |
125     95  |   |          (---------k--------)                                           |
130    100  |   |        (--------k--------)                                              |
135    105  +   |         (--------k--------)                                             +
140    110  |   |        (--------k-------)                                               |
145    115  |   |       (--------k-------)                                                |
150    120  |   |     (--------k-------)                                                  |
155    125  |   |    (-------k--------)                                                   |
160    130  |   |    (-------k-------)                                                    |
165    135  |   |     (-------k------)                                                    |
170    140  |   |    (-------k-------)                                                    |
175    145  |   |    (-------k------)                                                     |
180    150  |   |    (------k------)                                                      |
185    155  +   |      (-------k------)                                                   +
190    160  |   |    (------k-------)                                                     |
195    165  |   |   (------k------)                                                       |
200    170  |   |  (-----k------)                                                         |
205    175  |   |(------k------)                                                          |
210    180  |   |------k------)                                                           |
215    185  |   |(-----k------)                                                           |
220    190  |   |(------k-----)                                                           |
225    195  |   | (-----k------)                                                          |
230    200  |   |-----k------)                                                            |
235    205  +   |-----k------)                                                            +
240    210  |   |(------k-----)                                                           |
245    215  |   | (-----k-----)                                                           |
250    220  |   |(-----k-----)                                                            |
255    225  |   |-----k-----)                                                             |
260    230  |   |(----k-----)                                                             |
265    235  |   |(----k-----)                                                             |
270    240  |   |-----k----)                                                              |
275    245  |   |(-----k----)                                                             |
280    250  |   |(-----k----)                                                             |
285    255  +   | (-----k----)                                                            +
290    260  |   |(----k-----)                                                             |
295    265  |   |(----k-----)                                                             |
300    270  |   |(----k----)                                                              |
305    275  |  (|---k----)                                                                |
310    280  |  (|---k----)                                                                |
315    285  |  (|---k----)                                                                |
320    290  |  (|---k----)                                                                |
325    295  | (-|--k----)                                                                 |
330    300  | (-|--k----)                                                                 |
335    305  + (-|--k----)                                                                 +
340    310  |(--|-k----)                                                                  |
345    315  | (-|--k----)                                                                 |
350    320  |  (|--k----)                                                                 |
355    325  |  (|---k----)                                                                |
360    330  |   |---k----)                                                                |
365    335  |  (|---k----)                                                                |
370    340  |  (|--k----)                                                                 |
375    345  |  (|---k---)                                                                 |
380    350  |  (|---k----)                                                                |
385    355  +  (|---k---)                                                                 +
390    360  |  (|--k----)                                                                 |
395    365  |  (|---k---)                                                                 |
400    370  |  (|--k----)                                                                 |
405    375  |   |---k---)                                                                 |
410    380  |  (|---k---)                                                                 |
415    385  |  (|--k----)                                                                 |
420    390  |  (|--k---)                                                                  |
425    395  | (-|-k---)                                                                   |
430    400  | (-|-k---)                                                                   |
435    405  + (-|-k---)                                                                   +
440    410  | (-|-k---)                                                                   |
445    415  | (-|-k---)                                                                   |
450    420  |(--|k---)                                                                    |
455    425  |(--|k---)                                                                    |
460    430  |(--|k----)                                                                   |
465    435  |(--|k---)                                                                    |
470    440  |(--|k---)                                                                    |
475    445  |(--|k---)                                                                    |
480    450  |(--|k---)                                                                    |
485    455  +---k---)                                                                     +
490    460  |---k---)                                                                     |
495    465  |---k---)                                                                     |
500    470  |---k---)                                                                     |
505    475  |---k---)                                                                     |
510    480  |---k--)                                                                      |
515    485  |--k|--)                                                                      |
520    490  |---k--)                                                                      |
525    495  |---k--)                                                                      |
530    500  |---k--)                                                                      |
            |------------------------------|------------------------------|------------------------------|
          0.81                           0.82                           0.83                           0.84
```

1individual and collision/absorption/track-length keffs for different numbers of inactive cycles skipped for fission source settling

```
  skip  active    active    average keff estimators and deviations     normality average k(c/a/t)   k(c/a/t) confidence
intervals
  cycles cycles   neutrons  k(col) st dev  k(abs) st dev  k(trk) st dev  co/ab/tl  k(c/a/t) st dev   95  confidence   99%
confidence
```

```
     0     530         530870| 0.8127 0.0013  0.8113 0.0012  0.8122 0.0017 |95/95/95| 0.81157 0.00113  0.80932-0.81381  0.80859-
0.81454
     1     529         529870| 0.8128 0.0013  0.8113 0.0012  0.8123 0.0017 |95/95/95| 0.81162 0.00113  0.80937-0.81386  0.80864-
0.81459
     2     528         528884| 0.8129 0.0013  0.8114 0.0012  0.8124 0.0016 |95/95/95| 0.81168 0.00113  0.80943-0.81393  0.80870-
0.81466
     3     527         527882| 0.8129 0.0013  0.8114 0.0012  0.8124 0.0017 |95/95/95| 0.81173 0.00113  0.80948-0.81398  0.80875-
0.81471
     4     526         526863| 0.8130 0.0013  0.8114 0.0012  0.8124 0.0017 |95/95/95| 0.81175 0.00113  0.80949-0.81400  0.80876-
0.81473
     5     525         525850| 0.8129 0.0013  0.8114 0.0012  0.8124 0.0017 |95/95/95| 0.81167 0.00113  0.80941-0.81392  0.80868-
0.81465
     6     524         524792| 0.8130 0.0013  0.8115 0.0012  0.8126 0.0017 |95/95/95| 0.81177 0.00113  0.80952-0.81401  0.80879-
0.81474
     7     523         523865| 0.8129 0.0013  0.8114 0.0012  0.8125 0.0017 |95/95/95| 0.81172 0.00113  0.80947-0.81396  0.80874-
0.81469
     8     522         522779| 0.8129 0.0013  0.8114 0.0012  0.8126 0.0017 |95/95/95| 0.81175 0.00113  0.80950-0.81400  0.80877-
0.81473
     9     521         521863| 0.8130 0.0013  0.8115 0.0012  0.8126 0.0017 |95/95/95| 0.81179 0.00113  0.80953-0.81404  0.80880-
0.81477
    10     520         520842| 0.8130 0.0013  0.8114 0.0012  0.8126 0.0017 |95/95/95| 0.81177 0.00113  0.80952-0.81403  0.80878-
0.81477
 ------------------------------------------------------------------------------------------------------------------------------
---
    11     519         519808| 0.8131 0.0013  0.8115 0.0012  0.8127 0.0017 |95/95/95| 0.81184 0.00113  0.80959-0.81410  0.80885-
0.81484
    12     518         518848| 0.8130 0.0013  0.8115 0.0012  0.8129 0.0017 |95/95/95| 0.81187 0.00113  0.80961-0.81413  0.80887-
0.81487
    13     517         517802| 0.8131 0.0013  0.8115 0.0012  0.8129 0.0017 |95/95/95| 0.81186 0.00114  0.80960-0.81413  0.80886-
0.81487
    14     516         516816| 0.8131 0.0013  0.8115 0.0012  0.8130 0.0017 |95/95/95| 0.81191 0.00114  0.80965-0.81418  0.80891-
0.81492
    15     515         515850| 0.8130 0.0013  0.8114 0.0012  0.8130 0.0017 |95/95/95| 0.81184 0.00114  0.80958-0.81411  0.80884-
0.81485
    16     514         514749| 0.8131 0.0013  0.8115 0.0012  0.8130 0.0017 |95/95/95| 0.81190 0.00114  0.80964-0.81417  0.80890-
0.81491
    17     513         513837| 0.8130 0.0013  0.8115 0.0012  0.8130 0.0017 |95/95/95| 0.81187 0.00114  0.80959-0.81414  0.80885-
0.81488
    18     512         512799| 0.8130 0.0013  0.8115 0.0012  0.8129 0.0017 |95/95/95| 0.81186 0.00114  0.80959-0.81414  0.80885-
0.81488
    19     511         511833| 0.8130 0.0013  0.8115 0.0012  0.8128 0.0017 |95/95/95| 0.81187 0.00114  0.80959-0.81415  0.80885-
0.81489
    20     510         510819| 0.8130 0.0013  0.8115 0.0012  0.8128 0.0017 |95/95/95| 0.81187 0.00115  0.80959-0.81416  0.80885-
0.81490
 ------------------------------------------------------------------------------------------------------------------------------
---
 .
 .
 .
 .
 .
 ------------------------------------------------------------------------------------------------------------------------------
---
   475      55          55160| 0.8091 0.0040  0.8061 0.0037  0.8134 0.0053 |95/95/95| 0.80765 0.00368  0.80025-0.81504  0.79780-
0.81750
   480      50          50124| 0.8104 0.0043  0.8063 0.0039  0.8142 0.0058 |95/95/95| 0.80785 0.00405  0.79971-0.81599  0.79698-
0.81871
   485      45          45138| 0.8117 0.0047  0.8075 0.0042  0.8169 0.0058 |95/95/95| 0.80926 0.00443  0.80032-0.81820  0.79731-
0.82121
   490      40          40182| 0.8116 0.0051  0.8083 0.0044  0.8159 0.0064 |95/95/95| 0.80894 0.00466  0.79949-0.81839  0.79628-
0.82160
   495      35          35116| 0.8117 0.0056  0.8094 0.0049  0.8181 0.0071 |95/95/95| 0.81015 0.00517  0.79962-0.82067  0.79600-
0.82429
   500      30          30049| 0.8062 0.0056  0.8081 0.0053  0.8113 0.0074 |95/95/95| 0.80779 0.00552  0.79646-0.81911  0.79250-
0.82308
   505      25          25133| 0.8087 0.0064  0.8091 0.0061  0.8105 0.0086 |95/95/95| 0.80898 0.00634  0.79583-0.82214  0.79110-
0.82687
   510      20          20117| 0.8096 0.0078  0.8120 0.0073  0.8108 0.0104 |95/95/95| 0.81175 0.00785  0.79518-0.82833  0.78898-
0.83452
   515      15          15033| 0.8115 0.0097  0.8156 0.0077  0.8153 0.0125 |95/95/95| 0.81902 0.00788  0.80185-0.83620  0.79494-
0.84311
   520      10          10058| 0.8078 0.0095  0.8144 0.0081  0.8047 0.0114 |95/95/95| 0.82210 0.01244  0.79269-0.85152  0.77857-
0.86564
 ------------------------------------------------------------------------------------------------------------------------------
---
   525       5           5076| 0.8194 0.0125  0.8184 0.0114  0.8011 0.0164 |95/99/95| 0.81633 0.01852  0.73663-0.89603  0.63251-
1.00015
   527       3           3001| 0.8249 0.0219  0.8237 0.0199  0.8129 0.0159 |
   528       2           1996| 0.8267 0.0378  0.8307 0.0322  0.8241 0.0194 |

 the minimum estimated standard deviation for the col/abs/tl keff estimator occurs with    0 inactive cycles and  530 active
cycles.


 the first active half of the problem skips 30 cycles and uses 250 active cycles; the second half skips 280 and uses 250 cycles.
 the col/abs/trk-len keff, one standard deviation, and 66, 95, and 99 percent intervals for each active half of the problem are:

            problem        keff      standard deviation       68% confidence         95% confidence          99% confidence

          first half     0.81362          0.00164            0.81198 to 0.81526     0.81035 to 0.81688     0.80929 to 0.81794
         second half     0.80936          0.00164            0.80771 to 0.81100     0.80608 to 0.81263     0.80501 to 0.81370
        final result     0.81154          0.00116            0.81038 to 0.81269     0.80923 to 0.81384     0.80848 to 0.81459

 the first and second half values of k(collision/absorption/track length) appear to be the same at the 95 percent confidence
level.
```

```
1plot of the estimated col/abs/track-length keff one standard deviation interval by active cycle number (| = final keff =
0.81154)

inactive   active 0.80                    0.81                    0.82                    0.83                    0.84
  cycles   cycles |-----------------------|-----------------------|-----------------------|-----------------------|
       0      530 |                       (-k--)                                                                  |
       5      525 |                       (-|k-)                                                                  |
      10      520 |                       (-|k--)                                                                 |
      15      515 |                       (-|k--)                                                                 |
      20      510 |                       (-|k--)                                                                 |
      25      505 |                       (-|k-)                                                                  |
      30      500 .                      (--k--)                                                                  .
      35      495 |                      (--k--)                                                                  |
      40      490 |                     (--k|-)                                                                   |
      45      485 +                     (--k|-)                                                                   +
      50      480 |                     (--k|-)                                                                   |
      55      475 |                     (--k|-)                                                                   |
      60      470 |                     (--k|-)                                                                   |
      65      465 |                     (--k|-)                                                                   |
      70      460 |                    (--k-|)                                                                    |
      75      455 |                    (--k-|)                                                                    |
      80      450 |                    (--k-|)                                                                    |
      85      445 |                    (--k-|)                                                                    |
      90      440 |                   (---k-|)                                                                    |
      95      435 +                    (--k-|)                                                                    +
     100      430 |                    (--k-|)                                                                    |
     105      425 |                   (--k--|                                                                     |
     110      420 |                   (--k--|                                                                     |
     115      415 |                   (--k--|                                                                     |
     120      410 |                   (--k--|                                                                     |
     125      405 |                   (--k--|                                                                     |
     130      400 |                   (--k--|                                                                     |
     135      395 |                  (---k--|                                                                     |
     140      390 |                  (---k--|                                                                     |
     145      385 +                  (---k--|                                                                     +
     150      380 |                  (---k--|                                                                     |
     155      375 |                  (---k--|                                                                     |
     160      370 |                  (---k--|                                                                     |
     165      365 |                  (--k---|                                                                     |
     170      360 |                  (--k---|                                                                     |
     175      355 |                  (--k--)|                                                                     |
     180      350 |                  (--k--)|                                                                     |
     185      345 |                 (--k---)|                                                                     |
     190      340 |                 (---k--)|                                                                     |
     195      335 +                  (--k---|                                                                     +
     200      330 |                  (---k--|                                                                     |
     205      325 |                   (--k--|)                                                                    |
     210      320 |                   (--k--|)                                                                    |
     215      315 |                  (---k--|)                                                                    |
     220      310 |                  (---k--|                                                                     |
     225      305 |                 (---k---|                                                                     |
     230      300 |                  (---k--|)                                                                    |
     235      295 |                  (---k--|                                                                     |
     240      290 |                 (---k---|                                                                     |
     245      285 +                 (--k---)|                                                                     +
     250      280 |                 (---k--)|                                                                     |
     255      275 |                 (---k---|                                                                     |
     260      270 |                 (---k---|                                                                     |
     265      265 |                 (---k---|                                                                     |
     270      260 |                 (---k---|                                                                     |
     275      255 |                (---k---)|                                                                     |
     280      250 |                (---k---)|                                                                     |
     285      245 |               (---k---) |                                                                     |
     290      240 |               (----k---)|                                                                     |
     295      235 +               (---k----)|                                                                     +
     300      230 |               (----k---)|                                                                     |
     305      225 |                (----k---|                                                                     |
     310      220 |                (----k---|                                                                     |
     315      215 |                (----k---|                                                                     |
     320      210 |                (---k----|                                                                     |
     325      205 |                 (----k--|)                                                                    |
     330      200 |                (----k---|)                                                                    |
     335      195 |                (----k---|)                                                                    |
     340      190 |                 (----k--|-)                                                                   |
     345      185 +                (---k----|                                                                     +
     350      180 |               (----k----|                                                                     |
     355      175 |              (----k----)|                                                                     |
     360      170 |             (----k----) |                                                                     |
     365      165 |              (----k----)|                                                                     |
     370      160 |              (----k----)|                                                                     |
     375      155 |             (----k-----)|                                                                     |
     380      150 |             (----k----) |                                                                     |
     385      145 |            (----k-----) |                                                                     |
     390      140 |             (----k-----)|                                                                     |
     395      135 +            (----k-----) |                                                                     +
     400      130 |            (-----k-----)|                                                                     |
     405      125 |          (-----k-----)  |                                                                     |
     410      120 |          (-----k-----)  |                                                                     |
     415      115 |          (-----k-----)  |                                                                     |
     420      110 |          (-----k------) |                                                                     |
     425      105 |            (-----k------|                                                                     |
     430      100 |           (------k------|                                                                     |
     435       95 |           (------k------|                                                                     |
     440       90 |          (-------k------)|                                                                    |
     445       85 +          (-------k------|                                                                     +
     450       80 |           (-------k-----|-)                                                                   |
     455       75 |          (--------k-----|-)                                                                   |
```

```
      460        70  |          (-------k-------|                                                                         |
      465        65  |           (-------k------|)                                                                        |
      470        60  |         (-------k--------|                                                                         |
      475        55  |       (---------k--------|                                                                         |
      480        50  |       (---------k--------|)                                                                        |
      485        45  |          (----------k----|-----)                                                                   |
      490        40  |        (-----------k-----|-----)                                                                   |
      495        35  +          (------------k--|---------)                                                               +
      500        30  |   (-------------k--------|----)                                                                    |
      505        25  |    (---------------k-----|---------)                                                               |
      510        20  |       (------------------|k------------------)                                                     |
      515        15  |                         (|-----------------k------------------)                                    |
      520        10  |                      (---|-------------------------k-----------------------------)               |
                     |-----------------------|-----------------------|-----------------------|-----------------------|
                    0.80                    0.81                    0.82                    0.83                    0.84

 ************************************************************************************************************************
 dump no.    2 on file P1_Acc_NACCoC_c1.00_g0.00_e0.00_d0.01cm_HP_36mm.inpr     nps =       530870     coll =       75888898
ctm =       11.75   nrn =           769937194


          6 warning messages so far.


 run terminated when   530   kcode cycles were done.

 computer time =   11.91 minutes

 mcnp     version 5     06212004                    10/25/07 23:17:01                     probid =  10/25/07 23:04:59
```

Figure 6.6.15-3 Square Pitch MOX Rods – MOX Services Fuel Composition

```
NAC-LWT Cask - MOX Experiments - Accident Transport Conditions
C
C EXCEL File Version: v2.00
C Run Version: v2.00
C
C Fissile Material Type: MOX Services
C Rod Interior Void Moderator Density: 0.9982 g/cc
C Canister Interior Moderator Density: 0.9982 g/cc
C Canister to Cask Gap Moderator Density: 0.9982 g/cc
C Cask Exterior Moderator Density: 0.0001 g/cc
C Boundary Condition / Distance:  Reflected / 0.01 cm
C
C Fuel Rod Pitch: 3.8 cm
C Fuel Rod Pitch Cofiguration: Square
C Number of Rods: 16
C
C Base Fuel Parameters: NACCoC
C
c Cells - Fuel Rod - NACCoC
1 1 -10.555 -1   u=3 $ Fuel
2 2 -0.9982 -2 +1  u=3 $ Plenum + Fuel to Clad Gap
3 3 -6.56 -3 +2  u=3 $ Clad + End Plugs
4 4 -0.9982 +3   u=3 $ Outside Fuel Rod
C 16 Rods - Square Pitch
10 4 -0.9982 -10
          *trcl=( 1.9000 1.9000 0.0000 )
          lat=1 u=2 fill=-3:3 -3:3 0:0
      2 2 2 2 2 2 2
      2 3 3 3 3 2 2
      2 3 3 3 3 2 2
      2 3 3 3 3 2 2
      2 3 3 3 3 2 2
      2 2 2 2 2 2 2
      2 2 2 2 2 2 2
C PWR Basket - Cells
20  4 -0.9982 -20   fill=2  u=1 $ Rod Array Container
21  5 -0.9982 +20 -21    u=1 $ Basket Cavity
22  7 -2.7020 -22 +21    u=1 $ Basket Body
23  5 -0.9982 +22     u=1 $ Outside
C Cells - LWT Cask Accident Conditions
40 8 -11.344 -43     u=0 $ BotPb
41 5 -0.9982 -42 fill=1    u=0 $ Cavity
42 9 -7.9400 -41 +43    u=0 $ Bottom
43 9 -7.9400 -40 +41 +45 +48 +42 u=0 $ OuterShell
44 9 -7.9400 -44 +47 +42   u=0 $ InnerShellTaper
45 9 -7.9400 -46 +42    u=0 $ InnerShell
46 8 -11.344 -47 +46    u=0 $ Lead
47 8 -11.344 -45 +44 +47   u=0 $ LeadTaper
48 0         -48 +47    u=0 $ LeadGap
49 6 -0.0001 -49 +40    u=0 $ Gap to Reflector
50 0          +49    u=0 $ Boundary

c Surfaces - Fuel Rod - NACCoC
1 RCC 0.0000 0.0000 10.5207 0.0000 0.0000 389.8900 0.4781   $ Fuel pellet stack
2 RCC 0.0000 0.0000 6.3990 0.0000 0.0000 409.4227 0.4876   $ Annulus + Plenum
3 RCC 0.0000 0.0000 5.0800 0.0000 0.0000 411.8226 0.5588   $ Clad + End-Caps
c Surfaces - Pitch - NACCoC
10 RPP -1.9000 1.9000 -1.9000 1.9000 -1.0000 453.12    $ Lattice Cell Boundaries
C PWR Basket - Surfaces
20  RPP -6.9294 6.9294 -6.9294 6.9294 0.0000 452.1200  $ Array Container
21  RPP -11.2713 11.2713 -11.2713 11.2713 0.0000 452.1200  $ Basket Opening
22  RCC 0.0000 0.0000 0.0000 0.0000 0.0000 452.1200 16.83512 $ Basket Outer Body
C Surfaces - LWT Cask Accident Conditions
40 RCC 0.0000 0.0000 -26.6700 0.0000 0.0000 507.3650 36.5189 $ Lwt Body
41 RCC 0.0000 0.0000 -26.6700 0.0000 0.0000 26.6700 36.5189 $ Bottom
42 RCC 0.0000 0.0000 0.0000 0.0000 0.0000 452.1200 16.9863 $ Cavity
43 RCC 0.0000 0.0000 -17.7800 0.0000 0.0000 7.6200 26.3525 $ Bottom gamma shield
44 RCC 0.0000 0.0000 0.0000 0.0000 0.0000 444.5000 20.1740 $ Lead id - taper
45 RCC 0.0000 0.0000 0.0000 0.0000 0.0000 444.5000 31.5976 $ Lead od - taper
46 RCC 0.0000 0.0000 13.8176 0.0000 0.0000 416.8648 18.9103 $ Lead id
47 RCC 0.0000 0.0000 13.8176 0.0000 0.0000 416.8648 33.3271 $ Lead od
48 RCC 0.0000 0.0000 13.8176 0.0000 0.0000 416.8648 33.4645 $ Lead gap
*49 RPP -36.5289 36.5289 -36.5289 36.5289 -26.6800 480.7050  $ Container

c
c Materials List
c
C MOX Material Composition Fuel
m1    92235 -5.6994E-03
      92238 -8.0851E-01
      94238 -3.3724E-05
      94239 -6.4076E-02
      94240 -3.0352E-03
      94241 -2.6980E-04
      94242 -3.3724E-05
       8016 -1.1835E-01
C Rod Interior Void Material
m2    1001 2
      8016 1
mt2    lwtr.01
```

```
c Clad Material
m3 26054 -7.063E-05 24050 -4.179E-05 7014 -4.980E-04
      26056 -1.149E-03 24052 -8.370E-04 7015 -1.981E-06
      26057 -2.702E-05 24053 -9.673E-05
      26058 -3.631E-06 24054 -2.448E-05
      40000 -9.823E-01 50000 -1.500E-02
C Canister Interior Non-Fuel Space
m4    1001 2
      8016 1
mt4     lwtr.01
C Canister to Cask Gap Material
m5    1001 2
      8016 1
mt5     lwtr.01
C Cask Exterior Material
m6    1001 2
      8016 1
mt6     lwtr.01
c Aluminum
m7 13027 -1.000E+00
C Water/Glycol
m10   1001 -1.03651E-01
      8016 -6.75619E-01
      6000 -2.20730E-01
mt10    lwtr.01
c Lead
m8 82206 -2.534E-01
      82207 -2.207E-01
      82208 -5.259E-01
c SS304
m9 24050 -7.939E-03 26054 -3.927E-02 28058 -6.384E-02
      24052 -1.590E-01 26056 -6.387E-01 28060 -2.543E-02
      24053 -1.838E-02 26057 -1.502E-02 28061 -1.124E-03
      24054 -4.652E-03 26058 -2.019E-03 28062 -3.639E-03
          28064 -9.623E-04
      25055 -2.000E-02
C Aluminum Honeycomb Impact Limiter
m11   13027 -1.0
C Mode
mode n
C Cell Importances
imp:n 1 18r 0
C
C Criticality Controls
kcode 1000 0.80 30 530
C
C Starting Source Definition
sdef cell=41:20:10:1
      erg=d1
      pos=0 0 10.5207
      rad=d2
      axs=0 0 1
      ext=d3
sp1   -3
si2 0.0000 0.4781
sp2 -21 1
si3 0.0000 389.8900
sp3 0 1
C Print Control
print
C Random Number Generator
rand gen=2 seed=19073486328125 stride=152917 hist=1
c
c Rotation Matrix
*TR1 0.0 0.0 0.0 -30 60 90 -120 -30 90 90 90 0  $ z-rotation -30 degrees
```

6.6.16 ANSTO/DIDO Combined Basket Payload

This section contains input and output files from the evaluation of the combined DIDO and ANSTO fuel models. These files are shown in Figure 6.6.16-1.

Figure 6.6.16-1 Combined DIDO and ANSTO Basket Sample Input/Output

```
       PRIMARY MODULE ACCESS AND INPUT RECORD ( SCALE DRIVER - 95/03/29 - 09:06:37 )
MODULE CSAS25   WILL BE CALLED
  LWT 5 DIDO with DIDO, 1 ANSTO with Moata load
  '
  27GROUPNDF4 LATTICECELL

  'Material Description for DIDO HEU Fuel
  URANIUM  1  DEN=0.4450  1.00  293.0  92235 94.0   92238 06.0  END
  AL       1  DEN=1.4568  1.00  293.0       END
  AL       2              1.00  293.0       END
  H2O      3  DEN=0.9998  1.00  293.0       END

  'Material Description for MOATA Mark II Fuel
  URANIUM  11  DEN=0.3093  1.00  293.0  92235 92.0   92238 08.0  END
  AL       11  DEN=0.7718  1.00  293.0       END
  AL       12              1.00  293.0       END
  H2O      13  DEN=0.9998  1.00  293.0       END

  'Material Description for DIDO HIFAR Mark III Fuel
  URANIUM  21  DEN=0.4084  1.00  293.0  92235 85.0   92238 15.0  END
  AL       21  DEN=0.2957  1.00  293.0       END
  AL       22              1.00  293.0       END
  H2O      23  DEN=0.9998  1.00  293.0       END

  'General Material Description
  H2O      4  DEN=0.9998  1.00  293.0       END
  PB       5              1.00  293.0       END
  SS304    6              1.00  293.0       END
  AL       7              1.00  293.0       END
  SS304    8              1.00  293.0       END
  H2O      9  DEN=0.0001  1.00  293.0       END
  H2O      10 DEN=0.9998  1.00  293.0       END

  END COMP

  'Used to find the Dancoff factor for Mark II fuel:
  'SYMMSLABCELL  0.3832  0.1832  11  13  0.2032  12  END

  'Used to find the Dancoff factor for Mark III fuel:
  'SYMMSLABCELL  0.6342  0.1039  21  23  0.1239  22  END

  SYMMSLABCELL  1.0000  0.0800  1  3  0.1300  2  END
  MORE DATA
  RES=11  SLAB 0.1832  DAN(11)=0.44644913
  RES=21  SLAB 0.1039  DAN(21)=0.30363533  END

  READ PARAM
  TBA=5  TME=90  RUN=YES  GEN=1203  NPG=1000
  END PARAM

  READ START
  XSM=-16.85  XSP=16.85  YSM=16.85  YSP=-16.85  ZSM=26.67  ZSP=473.35
  END START

  READ GEOM
  UNIT  1
      COM='DIDO Fueled Annular Sections DIDO Tube  1  Loose'
  '   DIDO Fuel Annulus     1
      CYLINDER  3  1  3.0300  58.7500  0.0000  ORIGIN  0.0000  0.0000
      CYLINDER  2  1  3.0550  58.7500  0.0000  ORIGIN  0.0000  0.0000
      CYLINDER  1  1  3.1350  58.7500  0.0000  ORIGIN  0.0000  0.0000
      CYLINDER  2  1  3.1600  58.7500  0.0000  ORIGIN  0.0000  0.0000
  '   DIDO Fuel Annulus     2
      CYLINDER  3  1  3.5300  58.7500  0.0000  ORIGIN  0.0000  0.0000
      CYLINDER  2  1  3.5550  58.7500  0.0000  ORIGIN  0.0000  0.0000
      CYLINDER  1  1  3.6350  58.7500  0.0000  ORIGIN  0.0000  0.0000
      CYLINDER  2  1  3.6600  58.7500  0.0000  ORIGIN  0.0000  0.0000
  '   DIDO Fuel Annulus     3
      CYLINDER  3  1  4.0300  58.7500  0.0000  ORIGIN  0.0000  0.0000
      CYLINDER  2  1  4.0550  58.7500  0.0000  ORIGIN  0.0000  0.0000
      CYLINDER  1  1  4.1350  58.7500  0.0000  ORIGIN  0.0000  0.0000
      CYLINDER  2  1  4.1600  58.7500  0.0000  ORIGIN  0.0000  0.0000
  '   DIDO Fuel Annulus     4
      CYLINDER  3  1  4.5300  58.7500  0.0000
      CYLINDER  2  1  4.5550  58.7500  0.0000
      CYLINDER  1  1  4.6350  58.7500  0.0000
      CYLINDER  2  1  4.6599  58.7500  0.0000
  UNIT  2
      COM='DIDO Axial Clad Sections DIDO Tube  1  Loose'
  '   DIDO Clad Axial End Piece     1
      CYLINDER  3  1  3.0300  1.3750  0.0000  ORIGIN  0.0000  0.0000
      CYLINDER  2  1  3.1600  1.3750  0.0000  ORIGIN  0.0000  0.0000
  '   DIDO Clad Axial End Piece     2
      CYLINDER  3  1  3.5300  1.3750  0.0000  ORIGIN  0.0000  0.0000
      CYLINDER  2  1  3.6600  1.3750  0.0000  ORIGIN  0.0000  0.0000
  '   DIDO Clad Axial End Piece     3
      CYLINDER  3  1  4.0300  1.3750  0.0000  ORIGIN  0.0000  0.0000
      CYLINDER  2  1  4.1600  1.3750  0.0000  ORIGIN  0.0000  0.0000
  '   DIDO Clad Axial End Piece     4
      CYLINDER  3  1  4.5300  1.3750  0.0000
      CYLINDER  2  1  4.6599  1.3750  0.0000
  UNIT  3
      COM='DIDO Fuel Element DIDO Tube  1'
      CYLINDER  3  1  4.6600  61.5000  0.0000
      HOLE  2  0.0000  0.0000  0.0000
      HOLE  1  0.0000  0.0000  1.3750
      HOLE  2  0.0000  0.0000  60.1250
  UNIT  4
      COM='DIDO Basket Fuel Tube - Fuel Down        Radial Centered'
      CYLINDER  4  1  5.0927  73.1773  0.0000
      HOLE  3  0.0000  0.0000  0.0000
      CYLINDER  6  1  5.3974  73.1773  0.0000
  UNIT  5
      COM='DIDO Basket Fuel Tube - Fuel Up       Radial Centered'
      CYLINDER  4  1  5.0927  73.1773  0.0000
      HOLE  3  0.0000  0.0000  11.6772
```

```
        CYLINDER  6  1  5.3974  73.1773  0.0000
    UNIT  6
        COM='DIDO Basket Bottom Plate Hole'
        CYLINDER  4  1  1.27  1.2698  0.0000
    UNIT  7
        COM='DIDO Basket Bottom Plate'
        CYLINDER  6  1  16.8466  1.2698  0.0000
        HOLE  6  0.0000  0.0000  0.0000
        HOLE  6  10.7950  0.0000  0.0000
        HOLE  6  5.3975  9.3487  0.0000
        HOLE  6  -5.3975  9.3487  0.0000
        HOLE  6  -10.7950  0.0000  0.0000
        HOLE  6  -5.3975  -9.3487  0.0000
        HOLE  6  5.3975  -9.3487  0.0000
    UNIT  8
        COM='DIDO Heat Transfer Bar / Rod'
        CYLINDER  7  1  0.3165  73.1773  0.0000
    UNIT  9
        COM='DIDO Basket Fuel Down'
        CYLINDER  4  1  16.1926  73.1773  0.0000
        HOLE  4  0.0000  0.0000  0.0000
        HOLE  4  10.7950  0.0000  0.0000
        HOLE  8  4.9493  2.8575  0.0000
        HOLE  8  4.6024  3.3881  0.0000
        HOLE  8  5.2354  2.2917  0.0000
        HOLE  4  5.3975  9.3487  0.0000
        HOLE  8  0.0000  5.7150  0.0000
        HOLE  8  -0.6330  5.6798  0.0000
        HOLE  8  0.6330  5.6798  0.0000
        HOLE  4  -5.3975  9.3487  0.0000
        HOLE  8  -4.9493  2.8575  0.0000
        HOLE  8  -5.2354  2.2917  0.0000
        HOLE  8  -4.6024  3.3881  0.0000
        HOLE  4  -10.7950  0.0000  0.0000
        HOLE  8  -4.9493  -2.8575  0.0000
        HOLE  8  -4.6024  -3.3881  0.0000
        HOLE  8  -5.2354  -2.2917  0.0000
        HOLE  4  -5.3975  -9.3487  0.0000
        HOLE  8  0.0000  -5.7150  0.0000
        HOLE  8  0.6330  -5.6798  0.0000
        HOLE  8  -0.6330  -5.6798  0.0000
        HOLE  4  5.3975  -9.3487  0.0000
        HOLE  8  4.9493  -2.8575  0.0000
        HOLE  8  5.2354  -2.2917  0.0000
        HOLE  8  4.6024  -3.3881  0.0000
        CYLINDER  6  1  16.6688  73.1773  0.0000
        CYLINDER  4  1  16.8466  73.1773  0.0000
    UNIT  10
        COM='DIDO Basket Fuel Up'
        CYLINDER  4  1  16.1926  73.1773  0.0000
        HOLE  5  0.0000  0.0000  0.0000
        HOLE  5  10.7950  0.0000  0.0000
        HOLE  8  4.9493  2.8575  0.0000
        HOLE  8  4.6024  3.3881  0.0000
        HOLE  8  5.2354  2.2917  0.0000
        HOLE  5  5.3975  9.3487  0.0000
        HOLE  8  0.0000  5.7150  0.0000
        HOLE  8  -0.6330  5.6798  0.0000
        HOLE  8  0.6330  5.6798  0.0000
        HOLE  5  -5.3975  9.3487  0.0000
        HOLE  8  -4.9493  2.8575  0.0000
        HOLE  8  -5.2354  2.2917  0.0000
        HOLE  8  -4.6024  3.3881  0.0000
        HOLE  5  -10.7950  0.0000  0.0000
        HOLE  8  -4.9493  -2.8575  0.0000
        HOLE  8  -4.6024  -3.3881  0.0000
        HOLE  8  -5.2354  -2.2917  0.0000
        HOLE  5  -5.3975  -9.3487  0.0000
        HOLE  8  0.0000  -5.7150  0.0000
        HOLE  8  0.6330  -5.6798  0.0000
        HOLE  8  -0.6330  -5.6798  0.0000
        HOLE  5  5.3975  -9.3487  0.0000
        HOLE  8  4.9493  -2.8575  0.0000
        HOLE  8  5.2354  -2.2917  0.0000
        HOLE  8  4.6024  -3.3881  0.0000
        CYLINDER  6  1  16.6688  73.1773  0.0000
        CYLINDER  4  1  16.8466  73.1773  0.0000

    UNIT  101
        COM='Mark II Fuel Plate'
        CUBOID  11  1  2P0.0916  2P3.6608  58.4200  0.0000
        CUBOID  12  1  2P0.1016  2P3.8291  58.4200  0.0000
        CUBOID  13  1  2P0.1916  2P3.9334  58.4200  0.0000
    UNIT  102
        COM='Mark II Fuel Cavity Material Replacement - Side Plate'
        CUBOID  13  1  2P0.3175  2P3.9334  58.4200  0.0000
    UNIT  103
        COM='Mark II Fuel Water Gap to Side Plate'
        CUBOID  13  1  2P0.0450  2P3.9334  58.4200  0.0000
    UNIT  104
        COM='Mark II Plate Bundle'
        ARRAY  111  -3.4074  -3.9334  0.0000
    UNIT  105
        COM='Mark II Fuel Plate'
        CUBOID  11  1  2P3.6608  2P0.0916  58.4200  0.0000
        CUBOID  12  1  2P3.8291  2P0.1016  58.4200  0.0000
        CUBOID  13  1  2P3.9334  2P0.1916  58.4200  0.0000
    UNIT  106
        COM='Mark II Fuel Cavity Material Replacement - Side Plate'
        CUBOID  13  1  2P3.9334  2P0.3175  58.4200  0.0000
    UNIT  107
        COM='Mark II Fuel Water Gap to Side Plate'
        CUBOID  13  1  2P3.9334  2P0.0450  58.4200  0 0000
    UNIT  108
        COM='Mark II Plate Bundle'
        ARRAY  112  -3.9334  -3.4074  0.0000
    UNIT  109
        COM='Mark II Tube 1 - Fuel Down        Radial Shifted toward    0  '
        CYLINDER  13  1  5.2388  73.0240  0.0000
        HOLE  104  0.0000  0.0000  0.0000
```

```
     CYLINDER  6  1  5.55525  73.0240  0.0000
UNIT  111
     COM='Mark II Tube 2 - Fuel Down        Radial Shifted toward   180  '
     CYLINDER  13  1  5.2388  73.0240  0.0000
     HOLE  104  -0.0508  0.0000  0.0000
     CYLINDER  6  1  5.55525  73.0240  0.0000
UNIT  113
     COM='Mark II Tube 3 - Fuel Down        Radial Shifted toward   240  '
     CYLINDER  13  1  5.2388  73.0240  0.0000
     HOLE  108  -0.0164  -0.0298  0.0000
     CYLINDER  6  1  5.55525  73.0240  0.0000
UNIT  115
     COM='Mark II Tube 4 - Fuel Down        Radial Shifted toward   300  '
     CYLINDER  13  1  5.2388  73.0240  0.0000
     HOLE  108  0.0164  -0.0298  0.0000
     CYLINDER  6  1  5.55525  73.0240  0.0000
UNIT  117
     COM='Mark II Tube 5 - Fuel Down        Radial Shifted toward   0  '
     CYLINDER  13  1  5.2388  73.0240  0.0000
     HOLE  104  0.0508  0.0000  0.0000
     CYLINDER  6  1  5.55525  73.0240  0.0000
UNIT  119
     COM='Mark II Tube 6 - Fuel Down        Radial Shifted toward   60  '
     CYLINDER  13  1  5.2388  73.0240  0.0000
     HOLE  108  0.0164  0.0298  0.0000
     CYLINDER  6  1  5.55525  73.0240  0.0000
UNIT  121
     COM='Mark II Tube 7 - Fuel Down        Radial Shifted toward   120  '
     CYLINDER  13  1  5.2388  73.0240  0.0000
     HOLE  108  -0.0164  0.0298  0.0000
     CYLINDER  6  1  5.55525  73.0240  0.0000

UNIT  201
     COM='Mark III Fueled Annular Sections       Tube  1  '
'    Mark III Aluminum Inner
     CYLINDER  23  1  2.9100  59.0750  0.0000
     CYLINDER  22  1  2.911  59.0750  0.0000
'    Mark III Fuel Annulus      1
     CYLINDER  23  1  3.0994  59.0750  0.0000
     CYLINDER  22  1  3.1094  59.0750  0.0000
     CYLINDER  21  1  3.2133  59.0750  0.0000
     CYLINDER  22  1  3.2233  59.0750  0.0000
'    Mark III Fuel Annulus      2
     CYLINDER  23  1  3.9218  59.0750  0.0000
     CYLINDER  22  1  3.9318  59.0750  0.0000
     CYLINDER  21  1  4.0357  59.0750  0.0000
     CYLINDER  22  1  4.0457  59.0750  0.0000
'    Mark III Fuel Annulus      3
     CYLINDER  23  1  4.7442  59.0750  0.0000
     CYLINDER  22  1  4.7542  59.0750  0.0000
     CYLINDER  21  1  4.8581  59.0750  0.0000
     CYLINDER  22  1  4.8681  59.0750  0.0000
'    Mark III Aluminum Outer
     CYLINDER  23  1  5.0700  59.0750  0.0000
     CYLINDER  22  1  5.0799  59.0750  0.0000
UNIT  202
     COM='Mark III Axial Clad Sections       Tube  1  '
'    Mark III Aluminum Inner
     CYLINDER  23  1  2.9100  0.0005  0.0000
     CYLINDER  22  1  2.911  0.0005  0.0000
'    Mark III Clad Axial End Piece     1
     CYLINDER  23  1  3.0994  0.0005  0.0000
     CYLINDER  22  1  3.2233  0.0005  0.0000
'    Mark III Clad Axial End Piece     2
     CYLINDER  23  1  3.9218  0.0005  0.0000
     CYLINDER  22  1  4.0457  0.0005  0.0000
'    Mark III Clad Axial End Piece     3
     CYLINDER  23  1  4.7442  0.0005  0.0000
     CYLINDER  22  1  4.8681  0.0005  0.0000
'    Mark III Aluminum Outer
     CYLINDER  23  1  5.0700  0.0005  0.0000
     CYLINDER  22  1  5.0799  0.0005  0.0000
UNIT  203
     COM='Mark III Fuel Element     Tube  1 '
     CYLINDER  23  1  5.0800  59.0763  0.0000
     HOLE  202  0.0000  0.0000  0.0000
     HOLE  201  0.0000  0.0000  0.0006
     HOLE  202  0.0000  0.0000  59.0757
UNIT  204
     COM='Mark III Basket Fuel Tube - Fuel Down Radial Shift toward 0 Deg'
     CYLINDER  4  1  5.2578  73.0249  0.0000
     HOLE  203  0.0000  0.0000  0.0000
     CYLINDER  6  1  5.57510  73.0249  0.0000
UNIT  206
     COM='Mark III Fueled Annular Sections       Tube  2  '
'    Mark III Aluminum Inner
     CYLINDER  23  1  2.9100  59.0750  0.0000
     CYLINDER  22  1  2.911  59.0750  0.0000
'    Mark III Fuel Annulus      1
     CYLINDER  23  1  3.0994  59.0750  0.0000
     CYLINDER  22  1  3.1094  59.0750  0.0000
     CYLINDER  21  1  3.2133  59.0750  0.0000
     CYLINDER  22  1  3.2233  59.0750  0.0000
'    Mark III Fuel Annulus      2
     CYLINDER  23  1  3.9218  59.0750  0.0000
     CYLINDER  22  1  3.9318  59.0750  0.0000
     CYLINDER  21  1  4.0357  59.0750  0.0000
     CYLINDER  22  1  4.0457  59.0750  0.0000
'    Mark III Fuel Annulus      3
     CYLINDER  23  1  4.7442  59.0750  0.0000
     CYLINDER  22  1  4.7542  59.0750  0.0000
     CYLINDER  21  1  4.8581  59.0750  0.0000
     CYLINDER  22  1  4.8681  59.0750  0.0000
'    Mark III Aluminum Outer
     CYLINDER  23  1  5.0700  59.0750  0.0000
     CYLINDER  22  1  5.0799  59.0750  0.0000
UNIT  207
     COM='Mark III Axial Clad Sections       Tube  2  '
'    Mark III Aluminum Inner
     CYLINDER  23  1  2.9100  0.0005  0.0000
```

```
      CYLINDER  22  1  2.911   0.0005  0.0000
 '    Mark III Clad Axial End Piece    1
      CYLINDER  23  1  3.0994  0.0005  0.0000
      CYLINDER  22  1  3.2233  0.0005  0.0000
 '    Mark III Clad Axial End Piece    2
      CYLINDER  23  1  3.9218  0.0005  0.0000
      CYLINDER  22  1  4.0457  0.0005  0.0000
 '    Mark III Clad Axial End Piece    3
      CYLINDER  23  1  4.7442  0.0005  0.0000
      CYLINDER  22  1  4.8681  0.0005  0.0000
 '    Mark III Aluminum Outer
      CYLINDER  23  1  5.0700  0.0005  0.0000
      CYLINDER  22  1  5.0799  0.0005  0.0000
UNIT  208
      COM='Mark III Fuel Element     Tube  2'
      CYLINDER  23  1  5.0800  59.0763  0.0000
      HOLE  207  0.0000  0.0000  0.0000
      HOLE  206  0.0000  0.0000  0.0006
      HOLE  207  0.0000  0.0000  59.0757
UNIT  209
      COM='Mark III Basket Fuel Tube - Fuel Down  Radial Shift toward 180 Deg'
      CYLINDER  4  1  5.2578  73.0249  0.0000
      HOLE  208  -0.1777  0.0000  0.0000
      CYLINDER  6  1  5.57510  73.0249  0.0000
UNIT  211
      COM='Mark III Fueled Annular Sections       Tube  3  '
 '    Mark III Aluminum Inner
      CYLINDER  23  1  2.9100  59.0750  0.0000
      CYLINDER  22  1  2.911  59.0750  0.0000
 '    Mark III Fuel Annulus    1
      CYLINDER  23  1  3.0994  59.0750  0.0000
      CYLINDER  22  1  3.1094  59.0750  0.0000
      CYLINDER  21  1  3.2133  59.0750  0.0000
      CYLINDER  22  1  3.2233  59.0750  0.0000
 '    Mark III Fuel Annulus    2
      CYLINDER  23  1  3.9218  59.0750  0.0000
      CYLINDER  22  1  3.9318  59.0750  0.0000
      CYLINDER  21  1  4.0357  59.0750  0.0000
      CYLINDER  22  1  4.0457  59.0750  0.0000
 '    Mark III Fuel Annulus    3
      CYLINDER  23  1  4.7442  59.0750  0.0000
      CYLINDER  22  1  4.7542  59.0750  0.0000
      CYLINDER  21  1  4.8581  59.0750  0.0000
      CYLINDER  22  1  4.8681  59.0750  0.0000
 '    Mark III Aluminum Outer
      CYLINDER  23  1  5.0700  59.0750  0.0000
      CYLINDER  22  1  5.0799  59.0750  0.0000
UNIT  212
      COM='Mark III Axial Clad Sections       Tube  3  '
 '    Mark III Aluminum Inner
      CYLINDER  23  1  2.9100  0.0005  0.0000
      CYLINDER  22  1  2.911  0.0005  0.0000
 '    Mark III Clad Axial End Piece    1
      CYLINDER  23  1  3.0994  0.0005  0.0000
      CYLINDER  22  1  3.2233  0.0005  0.0000
 '    Mark III Clad Axial End Piece    2
      CYLINDER  23  1  3.9218  0.0005  0.0000
      CYLINDER  22  1  4.0457  0.0005  0.0000
 '    Mark III Clad Axial End Piece    3
      CYLINDER  23  1  4.7442  0.0005  0.0000
      CYLINDER  22  1  4.8681  0.0005  0.0000
 '    Mark III Aluminum Outer
      CYLINDER  23  1  5.0700  0.0005  0.0000
      CYLINDER  22  1  5.0799  0.0005  0.0000
UNIT  213
      COM='Mark III Fuel Element     Tube  3'
      CYLINDER  23  1  5.0800  59.0763  0.0000
      HOLE  212  0.0000  0.0000  0.0000
      HOLE  211  0.0000  0.0000  0.0006
      HOLE  212  0.0000  0.0000  59.0757
UNIT  214
      COM='Mark III Basket Fuel Tube - Fuel Down  Radial Shift toward 240 Deg'
      CYLINDER  4  1  5.2578  73.0249  0.0000
      HOLE  213  -0.0889  -0.1539  0.0000
      CYLINDER  6  1  5.57510  73.0249  0.0000
UNIT  216
      COM='Mark III Fueled Annular Sections       Tube  4  '
 '    Mark III Aluminum Inner
      CYLINDER  23  1  2.9100  59.0750  0.0000
      CYLINDER  22  1  2.911  59.0750  0.0000
 '    Mark III Fuel Annulus    1
      CYLINDER  23  1  3.0994  59.0750  0.0000
      CYLINDER  22  1  3.1094  59.0750  0.0000
      CYLINDER  21  1  3.2133  59.0750  0.0000
      CYLINDER  22  1  3.2233  59.0750  0.0000
 '    Mark III Fuel Annulus    2
      CYLINDER  23  1  3.9218  59.0750  0.0000
      CYLINDER  22  1  3.9318  59.0750  0.0000
      CYLINDER  21  1  4.0357  59.0750  0.0000
      CYLINDER  22  1  4.0457  59.0750  0.0000
 '    Mark III Fuel Annulus    3
      CYLINDER  23  1  4.7442  59.0750  0.0000
      CYLINDER  22  1  4.7542  59.0750  0.0000
      CYLINDER  21  1  4.8581  59.0750  0.0000
      CYLINDER  22  1  4.8681  59.0750  0.0000
 '    Mark III Aluminum Outer
      CYLINDER  23  1  5.0700  59.0750  0.0000
      CYLINDER  22  1  5.0799  59.0750  0.0000
UNIT  217
      COM='Mark III Axial Clad Sections       Tube  4  '
 '    Mark III Aluminum Inner
      CYLINDER  23  1  2.9100  0.0005  0.0000
      CYLINDER  22  1  2.911  0.0005  0.0000
 '    Mark III Clad Axial End Piece    1
      CYLINDER  23  1  3.0994  0.0005  0.0000
      CYLINDER  22  1  3.2233  0.0005  0.0000
 '    Mark III Clad Axial End Piece    2
      CYLINDER  23  1  3.9218  0.0005  0.0000
      CYLINDER  22  1  4.0457  0.0005  0.0000
 '    Mark III Clad Axial End Piece    3
```

```
      CYLINDER  23  1  4.7442  0.0005  0.0000
      CYLINDER  22  1  4.8681  0.0005  0.0000
    '  Mark III Aluminum Outer
      CYLINDER  23  1  5.0700  0.0005  0.0000
      CYLINDER  22  1  5.0799  0.0005  0.0000
  UNIT  218
      COM='Mark III Fuel Element     Tube  4'
      CYLINDER  23  1  5.0800  59.0763  0.0000
      HOLE  217  0.0000  0.0000  0.0000
      HOLE  216  0.0000  0.0000  0.0006
      HOLE  217  0.0000  0.0000  59.0757
  UNIT  219
      COM='Mark III Basket Fuel Tube - Fuel Down  Radial Shift toward 300 Deg'
      CYLINDER  4  1  5.2578  73.0249  0.0000
      HOLE  218  0.0889  -0.1539  0.0000
      CYLINDER  6  1  5.57510  73.0249  0.0000
  UNIT  221
      COM='Mark III Fueled Annular Sections      Tube  5  '
    '  Mark III Aluminum Inner
      CYLINDER  23  1  2.9100  59.0750  0.0000
      CYLINDER  22  1  2.911  59.0750  0.0000
    '  Mark III Fuel Annulus     1
      CYLINDER  23  1  3.0994  59.0750  0.0000
      CYLINDER  22  1  3.1094  59.0750  0.0000
      CYLINDER  21  1  3.2133  59.0750  0.0000
      CYLINDER  22  1  3.2233  59.0750  0.0000
    '  Mark III Fuel Annulus     2
      CYLINDER  23  1  3.9218  59.0750  0.0000
      CYLINDER  22  1  3.9318  59.0750  0.0000
      CYLINDER  21  1  4.0357  59.0750  0.0000
      CYLINDER  22  1  4.0457  59.0750  0.0000
    '  Mark III Fuel Annulus     3
      CYLINDER  23  1  4.7442  59.0750  0.0000
      CYLINDER  22  1  4.7542  59.0750  0.0000
      CYLINDER  21  1  4.8581  59.0750  0.0000
      CYLINDER  22  1  4.8681  59.0750  0.0000
    '  Mark III Aluminum Outer
      CYLINDER  23  1  5.0700  59.0750  0.0000
      CYLINDER  22  1  5.0799  59.0750  0.0000
  UNIT  222
      COM='Mark III Axial Clad Sections      Tube  5  '
    '  Mark III Aluminum Inner
      CYLINDER  23  1  2.9100  0.0005  0.0000
      CYLINDER  22  1  2.911  0.0005  0.0000
    '  Mark III Clad Axial End Piece    1
      CYLINDER  23  1  3.0994  0.0005  0.0000
      CYLINDER  22  1  3.2233  0.0005  0.0000
    '  Mark III Clad Axial End Piece    2
      CYLINDER  23  1  3.9218  0.0005  0.0000
      CYLINDER  22  1  4.0457  0.0005  0.0000
    '  Mark III Clad Axial End Piece    3
      CYLINDER  23  1  4.7442  0.0005  0.0000
      CYLINDER  22  1  4.8681  0.0005  0.0000
    '  Mark III Aluminum Outer
      CYLINDER  23  1  5.0700  0.0005  0.0000
      CYLINDER  22  1  5.0799  0.0005  0.0000
  UNIT  223
      COM='Mark III Fuel Element     Tube  5'
      CYLINDER  23  1  5.0800  59.0763  0.0000
      HOLE  222  0.0000  0.0000  0.0000
      HOLE  221  0.0000  0.0000  0.0006
      HOLE  222  0.0000  0.0000  59.0757
  UNIT  224
      COM='Mark III Basket Fuel Tube - Fuel Down  Radial Shift toward 0 Deg'
      CYLINDER  4  1  5.2578  73.0249  0.0000
      HOLE  223  0.1777  0.0000  0.0000
      CYLINDER  6  1  5.57510  73.0249  0.0000
  UNIT  226
      COM='Mark III Fueled Annular Sections      Tube  6  '
    '  Mark III Aluminum Inner
      CYLINDER  23  1  2.9100  59.0750  0.0000
      CYLINDER  22  1  2.911  59.0750  0.0000
    '  Mark III Fuel Annulus     1
      CYLINDER  23  1  3.0994  59.0750  0.0000
      CYLINDER  22  1  3.1094  59.0750  0.0000
      CYLINDER  21  1  3.2133  59.0750  0.0000
      CYLINDER  22  1  3.2233  59.0750  0.0000
    '  Mark III Fuel Annulus     2
      CYLINDER  23  1  3.9218  59.0750  0.0000
      CYLINDER  22  1  3.9318  59.0750  0.0000
      CYLINDER  21  1  4.0357  59.0750  0.0000
      CYLINDER  22  1  4.0457  59.0750  0.0000
    '  Mark III Fuel Annulus     3
      CYLINDER  23  1  4.7442  59.0750  0.0000
      CYLINDER  22  1  4.7542  59.0750  0.0000
      CYLINDER  21  1  4.8581  59.0750  0.0000
      CYLINDER  22  1  4.8681  59.0750  0.0000
    '  Mark III Aluminum Outer
      CYLINDER  23  1  5.0700  59.0750  0.0000
      CYLINDER  22  1  5.0799  59.0750  0.0000
  UNIT  227
      COM='Mark III Axial Clad Sections      Tube  6  '
    '  Mark III Aluminum Inner
      CYLINDER  23  1  2.9100  0.0005  0.0000
      CYLINDER  22  1  2.911  0.0005  0.0000
    '  Mark III Clad Axial End Piece    1
      CYLINDER  23  1  3.0994  0.0005  0.0000
      CYLINDER  22  1  3.2233  0.0005  0.0000
    '  Mark III Clad Axial End Piece    2
      CYLINDER  23  1  3.9218  0.0005  0.0000
      CYLINDER  22  1  4.0457  0.0005  0.0000
    '  Mark III Clad Axial End Piece    3
      CYLINDER  23  1  4.7442  0.0005  0.0000
      CYLINDER  22  1  4.8681  0.0005  0.0000
    '  Mark III Aluminum Outer
      CYLINDER  23  1  5.0700  0.0005  0.0000
      CYLINDER  22  1  5.0799  0.0005  0.0000
  UNIT  228
      COM='Mark III Fuel Element     Tube  6'
      CYLINDER  23  1  5.0800  59.0763  0.0000
```

```
        HOLE  227  0.0000  0.0000  0.0000
        HOLE  226  0.0000  0.0000  0.0006
        HOLE  227  0.0000  0.0000  59.0757
    UNIT  229
        COM='Mark III Basket Fuel Tube - Fuel Down  Radial Shift toward 60 Deg'
        CYLINDER  4  1  5.2578  73.0249  0.0000
        HOLE  228  0.0889  0.1539  0.0000
        CYLINDER  6  1  5.57510  73.0249  0.0000
    UNIT  231
        COM='Mark III Fueled Annular Sections       Tube  7'
    '   Mark III Aluminum Inner
        CYLINDER  23  1  2.9100  59.0750  0 0000
        CYLINDER  22  1  2.911  59.0750  0.0000
    '   Mark III Fuel Annulus     1
        CYLINDER  23  1  3.0994  59.0750  0.0000
        CYLINDER  22  1  3.1094  59.0750  0.0000
        CYLINDER  21  1  3.2133  59.0750  0.0000
        CYLINDER  22  1  3.2233  59.0750  0.0000
    '   Mark III Fuel Annulus     2
        CYLINDER  23  1  3.9218  59.0750  0.0000
        CYLINDER  22  1  3.9318  59.0750  0.0000
        CYLINDER  21  1  4.0357  59.0750  0.0000
        CYLINDER  22  1  4.0457  59.0750  0.0000
    '   Mark III Fuel Annulus     3
        CYLINDER  23  1  4.7442  59.0750  0.0000
        CYLINDER  22  1  4.7542  59.0750  0.0000
        CYLINDER  21  1  4.8581  59.0750  0.0000
        CYLINDER  22  1  4.8681  59.0750  0.0000
    '   Mark III Aluminum Outer
        CYLINDER  23  1  5.0700  59.0750  0.0000
        CYLINDER  22  1  5.0799  59.0750  0.0000
    UNIT  232
        COM='Mark III Axial Clad Sections       Tube  7  '
    '   Mark III Aluminum Inner
        CYLINDER  23  1  2.9100  0.0005  0.0000
        CYLINDER  22  1  2.911  0.0005  0.0000
    '   Mark III Clad Axial End Piece    1
        CYLINDER  23  1  3.0994  0.0005  0.0000
        CYLINDER  22  1  3.2233  0.0005  0.0000
    '   Mark III Clad Axial End Piece    2
        CYLINDER  23  1  3.9218  0.0005  0.0000
        CYLINDER  22  1  4.0457  0.0005  0.0000
    '   Mark III Clad Axial End Piece    3
        CYLINDER  23  1  4.7442  0.0005  0.0000
        CYLINDER  22  1  4.8681  0.0005  0.0000
    '   Mark III Aluminum Outer
        CYLINDER  23  1  5.0700  0.0005  0.0000
        CYLINDER  22  1  5.0799  0.0005  0.0000
    UNIT  233
        COM='Mark III Fuel Element     Tube  7'
        CYLINDER  23  1  5.0800  59.0763  0.0000
        HOLE  232  0.0000  0.0000  0.0000
        HOLE  231  0.0000  0.0000  0.0006
        HOLE  232  0.0000  0.0000  59.0757
    UNIT  234
        COM='Mark III Basket Fuel Tube - Fuel Down  Radial Shift toward 120 Deg'
        CYLINDER  4  1  5.2578  73.0249  0.0000
        HOLE  233  -0.0889  0.1539  0.0000
        CYLINDER  6  1  5.57510  73.0249  0.0000

    UNIT  301
        COM='DIDO Fueled Annular Sections ANSTO Tube  1  Loose'
    '   DIDO Fuel Annulus     1
        CYLINDER  3  1  3.0300  58.7500  0.0000  ORIGIN  0.0000  0.0000
        CYLINDER  2  1  3.0550  58.7500  0.0000  ORIGIN  0.0000  0.0000
        CYLINDER  1  1  3.1350  58.7500  0.0000  ORIGIN  0.0000  0.0000
        CYLINDER  2  1  3.1600  58.7500  0.0000  ORIGIN  0.0000  0.0000
    '   DIDO Fuel Annulus     2
        CYLINDER  3  1  3.5300  58.7500  0.0000  ORIGIN  0.0000  0.0000
        CYLINDER  2  1  3.5550  58.7500  0.0000  ORIGIN  0.0000  0.0000
        CYLINDER  1  1  3.6350  58.7500  0.0000  ORIGIN  0.0000  0.0000
        CYLINDER  2  1  3.6600  58.7500  0.0000  ORIGIN  0.0000  0.0000
    '   DIDO Fuel Annulus     3
        CYLINDER  3  1  4.0300  58.7500  0.0000  ORIGIN  0.0000  0.0000
        CYLINDER  2  1  4.0550  58.7500  0.0000  ORIGIN  0.0000  0.0000
        CYLINDER  1  1  4.1350  58.7500  0.0000  ORIGIN  0.0000  0.0000
        CYLINDER  2  1  4.1600  58.7500  0.0000  ORIGIN  0.0000  0.0000
    '   DIDO Fuel Annulus     4
        CYLINDER  3  1  4.5300  58.7500  0.0000
        CYLINDER  2  1  4.5550  58.7500  0.0000
        CYLINDER  1  1  4.6350  58.7500  0.0000
        CYLINDER  2  1  4.6599  58.7500  0.0000
    UNIT  302
        COM='DIDO Axial Clad Sections ANSTO Tube  1  Loose'
    '   DIDO Clad Axial End Piece     1
        CYLINDER  3  1  3.0300  1.3750  0.0000  ORIGIN  0.0000  0.0000
        CYLINDER  2  1  3.1600  1.3750  0.0000  ORIGIN  0.0000  0.0000
    '   DIDO Clad Axial End Piece     2
        CYLINDER  3  1  3.5300  1.3750  0.0000  ORIGIN  0.0000  0.0000
        CYLINDER  2  1  3.6600  1.3750  0.0000  ORIGIN  0.0000  0.0000
    '   DIDO Clad Axial End Piece     3
        CYLINDER  3  1  4.0300  1.3750  0.0000  ORIGIN  0.0000  0.0000
        CYLINDER  2  1  4.1600  1.3750  0.0000  ORIGIN  0.0000  0.0000
    '   DIDO Clad Axial End Piece     4
        CYLINDER  3  1  4.5300  1.3750  0.0000
        CYLINDER  2  1  4.6599  1.3750  0.0000
    UNIT  303
        COM='DIDO Fuel Element ANSTO Tube  1'
        CYLINDER  3  1  5.0800  61.5000  0.0000
        HOLE  302  0.0000  0.0000  0.0000
        HOLE  301  0.0000  0.0000  1.3750
        HOLE  302  0.0000  0.0000  60.1250
    UNIT  304
        COM='ANSTO Basket DIDO Fuel Tube - Fuel Down'
        CYLINDER  4  1  5.2578  73.0249  0.0000
        HOLE  303  0.0000  0.0000  0.0000
        CYLINDER  6  1  5.57510  73.0249  0.0000

    UNIT  305
        COM='Mark II Fuel Plate With Can'
```

```
      CUBOID  11  1  2P0.0916  2P3.6608  58.4200  0.0000
      CUBOID  12  1  2P0.1016  2P3.8291  58.4200  0.0000
      CUBOID  10  1  2P0.2200  2P3.8311  58.4200  0.0000
  UNIT  306
      COM='Mark II Plate Bundle With Can'
      ARRAY  311  -3.0869  -3.8311  0.0000
  UNIT  307
      COM='Mark II Fuel Plate With Can'
      CUBOID  11  1  2P3.6608  2P0.0916  58.4200  0.0000
      CUBOID  12  1  2P3.8291  2P0.1016  58.4200  0.0000
      CUBOID  10  1  2P3.9334  2P0.2070  58.4200  0.0000
  UNIT  308
      COM='Mark II Plate Bundle With Can'
      ARRAY  312  -3.9334  -2.8500  0.0000
  UNIT  309
      COM='Mark II Tube 1 - Fuel Down - In DFC - Radial Centered'
      CYLINDER  10  1  4.9200  70.0000  0.0000
      HOLE  306  0.0000  0.0000  0.0000
      CYLINDER  7  1  5.0800  70.0000  0.0000
      CYLINDER  4  1  5.2388  73.0240  0.0000
      CYLINDER  6  1  5.55525  73.0240  0.0000
  UNIT  310
      COM='Mark II Tube 1 - Fuel Down - In DFC - Radial Centered'
      CYLINDER  10  1  4.9200  70.0000  0.0000
      HOLE  308  0.0000  0.0000  0.0000
      CYLINDER  7  1  5.0800  70.0000  0.0000
      CYLINDER  4  1  5.2388  73.0240  0.0000
      CYLINDER  6  1  5.55525  73.0240  0.0000

  UNIT  311
      COM='Mark III Fuel Plate'
      CUBOID  21  1  2P0.0735  2P3.0000  58.4200  0.0000
      CUBOID  23  1  2P0.3875  2P3.0010  58.4200  0.0000
  UNIT  312
      COM='Mark III Plate Bundle'
      ARRAY  321  -3.8750  -3.0000  0.0000
  UNIT  313
      COM='Mark III Fuel Plate'
      CUBOID  21  1  2P3.0000  2P0.0735  58.4200  0.0000
      CUBOID  23  1  2P3.0010  2P0.3875  58.4200  0.0000
  UNIT  314
      COM='Mark III Plate Bundle'
      ARRAY  322  -3.0000  -3.8750  0.0000
  UNIT  315
      COM='Mark III Tube 1 - Fuel Down - In DFC -  Radial Centered'
      CYLINDER  10  1  4.9200  70.0000  0.0000
      HOLE  312  0.0000  0.0000  0.0000
      CYLINDER  7  1  5.0800  70.0000  0.0000
      CYLINDER  4  1  5.2388  73.0240  0.0000
      CYLINDER  6  1  5.55525  73.0240  0.0000

  UNIT  316
      COM='DIDO Fueled Annular Sections ANSTO Tube  1  Loose'
   '  DIDO Fuel Annulus    1
      CYLINDER  10  1  3.0300  58.7500  0.0000  ORIGIN  0.0000  0.0000
      CYLINDER  2  1  3.0550  58.7500  0.0000  ORIGIN  0.0000  0.0000
      CYLINDER  1  1  3.1350  58.7500  0.0000  ORIGIN  0.0000  0.0000
      CYLINDER  2  1  3.1600  58.7500  0.0000  ORIGIN  0.0000  0.0000
   '  DIDO Fuel Annulus    2
      CYLINDER  10  1  3.5300  58.7500  0.0000  ORIGIN  0.0000  0.0000
      CYLINDER  2  1  3.5550  58.7500  0.0000  ORIGIN  0.0000  0.0000
      CYLINDER  1  1  3.6350  58.7500  0.0000  ORIGIN  0.0000  0.0000
      CYLINDER  2  1  3.6600  58.7500  0.0000  ORIGIN  0.0000  0.0000
   '  DIDO Fuel Annulus    3
      CYLINDER  10  1  4.0300  58.7500  0.0000  ORIGIN  0.0000  0.0000
      CYLINDER  2  1  4.0550  58.7500  0.0000  ORIGIN  0.0000  0.0000
      CYLINDER  1  1  4.1350  58.7500  0.0000  ORIGIN  0.0000  0.0000
      CYLINDER  2  1  4.1600  58.7500  0.0000  ORIGIN  0.0000  0.0000
   '  DIDO Fuel Annulus    4
      CYLINDER  10  1  4.5300  58.7500  0.0000
      CYLINDER  2  1  4.5550  58.7500  0.0000
      CYLINDER  1  1  4.6350  58.7500  0.0000
      CYLINDER  2  1  4.6599  58.7500  0.0000
  UNIT  317
      COM='DIDO Axial Clad Sections ANSTO Tube  1  Loose'
   '  DIDO Clad Axial End Piece    1
      CYLINDER  10  1  3.0300  1.3750  0.0000  ORIGIN  0.0000  0.0000
      CYLINDER  2  1  3.1600  1.3750  0.0000  ORIGIN  0.0000  0.0000
   '  DIDO Clad Axial End Piece    2
      CYLINDER  10  1  3.5300  1.3750  0.0000  ORIGIN  0.0000  0.0000
      CYLINDER  2  1  3.6600  1.3750  0.0000  ORIGIN  0.0000  0.0000
   '  DIDO Clad Axial End Piece    3
      CYLINDER  10  1  4.0300  1.3750  0.0000  ORIGIN  0.0000  0.0000
      CYLINDER  2  1  4.1600  1.3750  0.0000  ORIGIN  0.0000  0.0000
   '  DIDO Clad Axial End Piece    4
      CYLINDER  10  1  4.5300  1.3750  0.0000
      CYLINDER  2  1  4.6599  1.3750  0.0000
  UNIT  318
      COM='DIDO Fuel Element ANSTO Tube  1'
      CYLINDER  10  1  4.9200  70.0000  0.0000
      HOLE  317  0.0000  0.0000  0.0000
      HOLE  316  0.0000  0.0000  1.3750
      HOLE  317  0.0000  0.0000  60.1250
      CYLINDER  7  1  5.0800  70.0000  0.0000
  UNIT  319
      COM='ANSTO Basket DIDO Fuel Tube - Fuel Down'
      CYLINDER  4  1  5.2578  73.0249  0.0000
      HOLE  318  0.0000  0.0000  0.0000
      CYLINDER  6  1  5.57510  73.0249  0.0000

  UNIT  320
      COM='Empty ANSTO Basket Tube'
      CYLINDER  4  1  5.2578  73.0249  0.0000
      CYLINDER  6  1  5.5751  73.0249  0.0000

  UNIT  321
      COM='Mark II Fuel Plate Cut 7 cm'
      CUBOID  11  1  2P0.0916  2P3.6608  51.4200  0 0000
      CUBOID  12  1  2P0.1016  2P3.8291  51.4200  0.0000
      CUBOID  13  1  2P0.2450  2P3.9334  51.4200  0 0000
```

```
UNIT 322
    COM='Mark II Plate Bundle Cut 7 cm'
    ARRAY 313 -3.4074 -3.9334 0.0000
UNIT 323
    COM='Mark II Fuel Plate Cut 7 cm'
    CUBOID 11 1 2P3.6608 2P0.0916 51.4200 0.0000
    CUBOID 12 1 2P3.8291 2P0.1016 51.4200 0.0000
    CUBOID 13 1 2P3.9334 2P0.2450 51.4200 0.0000
UNIT 324
    COM='Mark II Plate Bundle Cut 7 cm'
    ARRAY 314 -3.9334 -3.4074 0.0000
UNIT 325
    COM='Mark II Tube 1 - Fuel Down - Cut 7 cm - Radial Centered'
    CYLINDER 4 1 5.2388 73.0240 0.0000
    HOLE 322 0.0000 0.0000 0.0000
    CYLINDER 6 1 5.55525 73.0240 0.0000
UNIT 326
    COM='Mark II Tube 1 - Fuel Down - Cut 7 cm - Radial Centered'
    CYLINDER 4 1 5.2388 73.0240 0.0000
    HOLE 324 0.0000 0.0000 0.0000
    CYLINDER 6 1 5.55525 73.0240 0.0000

UNIT 327
    COM='Mark II Fuel Plate With Can - Cut'
    CUBOID 11 1 2P0.0916 2P3.6608 29.2100 0.0000
    CUBOID 12 1 2P0.1016 2P3.8291 29.2100 0.0000
    CUBOID 10 1 2P0.1100 2P3.8311 29.2100 0.0000
UNIT 328
    COM='Mark II Plate Bundle With Can - Cut'
    ARRAY 315 -3.0800 -3.8311 0.0000
UNIT 329
    COM='Mark II Fuel Plate With Can'
    CUBOID 11 1 2P3.6608 2P0.0916 51.4200 0.0000
    CUBOID 12 1 2P3.8291 2P0.1016 51.4200 0.0000
    CUBOID 10 1 2P3.9334 2P0.2070 51.4200 0.0000
UNIT 330
    COM='Mark II Plate Bundle With Can - Cut'
    ARRAY 316 -3.9334 -2.8500 0.0000
UNIT 331
    COM='Mark II Tube 1 - Fuel Down - In DFC - Cut - Radial Centered'
    CYLINDER 10 1 4.9200 70.0000 0.0000
    HOLE 328 0.0000 0.0000 0.0000
    CYLINDER 7 1 5.0800 70.0000 0.0000
    CYLINDER 4 1 5.2388 73.0240 0.0000
    CYLINDER 6 1 5.55525 73.0240 0.0000
UNIT 332
    COM='Mark II Tube 1 - Fuel Down - In DFC - Cut - Radial Centered'
    CYLINDER 10 1 4.9200 70.0000 0.0000
    HOLE 330 0.0000 0.0000 0.0000
    CYLINDER 7 1 5.0800 70.0000 0.0000
    CYLINDER 4 1 5.2388 73.0240 0.0000
    CYLINDER 6 1 5.55525 73.0240 0.0000

UNIT 333
    COM='Mark II Fuel Plate'
    CUBOID 11 1 2P0.0916 2P3.6608 58.4200 0.0000
    CUBOID 12 1 2P0.1016 2P3.8291 58.4200 0.0000
    CUBOID 13 1 2P0.2668 2P3.8311 58.4200 0.0000
UNIT 334
    COM='Mark II Left Outer Fuel Plate'
    CUBOID 11 1 2P0.0916 2P3.6608 58.4200 0.0000
    CUBOID 12 1 2P0.1016 2P3.8291 58.4200 0.0000
    CUBOID 13 1 0.2668 -0.1016 2P3.8311 58.4200 0.0000
UNIT 335
    COM='Mark II Right Outer Fuel Plate'
    CUBOID 11 1 2P0.0916 2P3.6608 58.4200 0.0000
    CUBOID 12 1 2P0.1016 2P3.8291 58.4200 0.0000
    CUBOID 13 1 0.1016 -0.2668 2P3.8311 58.4200 0.0000
UNIT 336
    COM='Mark II Plate Bundle'
    ARRAY 317 -3.5700 -3.8311 0.0000


UNIT 337
    COM='Mark III Left Fuel Plate'
    CUBOID 21 1 2P0.0735 2P3.0000 58.4200 0.0000
    CUBOID 23 1 0.4685 -0.0735 2P3.0010 58.4200 0.0000
UNIT 338
    COM='Mark III Right Fuel Plate'
    CUBOID 21 1 2P0.0735 2P3.0000 58.4200 0.0000
    CUBOID 23 1 0.0735 -0.4685 2P3.0010 58.4200 0.0000
UNIT 339
    COM='Mark III Fuel Plate'
    CUBOID 21 1 2P0.0735 2P3.0000 58.4200 0.0000
    CUBOID 23 1 2P0.4685 2P3.0010 58.4200 0.0000
UNIT 340
    COM='Mark III Plate Bundle'
    ARRAY 319 -4.2900 -3.0000 0.0000
UNIT 341
    COM='Mark III Tube 1 - Fuel Down       Radial Centered'
    CYLINDER 4 1 5.2388 73.0240 0.0000
    HOLE 340 0.0000 0.0000 0.0000
    CYLINDER 6 1 5.55525 73.0240 0.0000
UNIT 342
    COM='Mark III Tube 2 - Fuel Down       Shifted Toward 180'
    CYLINDER 4 1 5.2388 73.0240 0.0000
    HOLE 340 -0.0012 0.0000 0.0000
    CYLINDER 6 1 5.55525 73.0240 0.0000
UNIT 343
    COM='Mark III Tube 3 - Fuel Down       Shifted Toward 240'
    CYLINDER 4 1 5.2388 73.0240 0.0000
    HOLE 340 0.0000 -0.0005 0.0000
    CYLINDER 6 1 5.55525 73.0240 0.0000
UNIT 344
    COM='Mark III Tube 4 - Fuel Down       Shifted Toward 300'
    CYLINDER 4 1 5.2388 73.0240 0.0000
    HOLE 340 0.0000 -0.0005 0.0000
    CYLINDER 6 1 5.55525 73.0240 0.0000
UNIT 345
    COM='Mark III Tube 5 - Fuel Down       Shifted Toward 0'
```

```
        CYLINDER  4  1  5.2388  73.0240  0.0000
        HOLE  340  0.0012  0.0000  0.0000
        CYLINDER  6  1  5.55525  73.0240  0.0000
    UNIT  346
        COM='Mark III Tube 6 - Fuel Down        Shifted Toward 60'
        CYLINDER  4  1  5.2388  73.0240  0.0000
        HOLE  340  0.0000  0.0005  0.0000
        CYLINDER  6  1  5.55525  73.0240  0.0000
    UNIT  347
        COM='Mark III Tube 7 - Fuel Down        Shifted Toward 120'
        CYLINDER  4  1  5.2388  73.0240  0.0000
        HOLE  340  0.0000  0.0005  0.0000
        CYLINDER  6  1  5.55525  73.0240  0.0000

    UNIT  348
        COM='Mark II Tube 1 - Fuel Down        Radial Centered'
        CYLINDER  4  1  5.2388  73.0240  0.0000
        HOLE  336  0.0000  0.0000  0.0000
        CYLINDER  6  1  5.55525  73.0240  0.0000
    UNIT  349
        COM='Mark II Tube 2 - Fuel Down        Shifted Toward 180'
        CYLINDER  4  1  5.2388  73.0240  0.0000
        HOLE  336  0.0000  0.0000  0.0000
        CYLINDER  6  1  5.55525  73.0240  0.0000
    UNIT  350
        COM='Mark II Tube 3 - Fuel Down        Shifted Toward 240'
        CYLINDER  4  1  5.2388  73.0240  0.0000
        HOLE  336  0.0000  0.0000  0.0000
        CYLINDER  6  1  5.55525  73.0240  0.0000
    UNIT  351
        COM='Mark II Tube 4 - Fuel Down        Shifted Toward 300'
        CYLINDER  4  1  5.2388  73.0240  0.0000
        HOLE  336  0.0000  0.0000  0.0000
        CYLINDER  6  1  5.55525  73.0240  0.0000
    UNIT  352
        COM='Mark II Tube 5 - Fuel Down        Shifted Toward 0'
        CYLINDER  4  1  5.2388  73.0240  0.0000
        HOLE  336  0.0000  0.0000  0.0000
        CYLINDER  6  1  5.55525  73.0240  0.0000
    UNIT  353
        COM='Mark II Tube 6 - Fuel Down        Shifted Toward 60'
        CYLINDER  4  1  5.2388  73.0240  0.0000
        HOLE  336  0.0000  0.0000  0.0000
        CYLINDER  6  1  5.55525  73.0240  0.0000
    UNIT  354
        COM='Mark II Tube 7 - Fuel Down        Shifted Toward 120'
        CYLINDER  4  1  5.2388  73.0240  0.0000
        HOLE  336  0.0000  0.0000  0.0000
        CYLINDER  6  1  5.55525  73.0240  0.0000

    UNIT  401
        COM='ANSTO Basket Fuel Down'
        CYLINDER  4  1  16.7260  73.0249  0.0000
        HOLE  348    0.0000   0.0000  0.0000
        HOLE  349   11.1506   0.0000  0.0000
        HOLE  350    5.5753   9.6567  0.0000
        HOLE  351   -5.5753   9.6567  0.0000
        HOLE  352  -11.1506   0.0000  0.0000
        HOLE  353   -5.5753  -9.6567  0.0000
        HOLE  354    5.5753  -9.6567  0.0000
        CYLINDER  4  1  16.8466  73.0249  0.0000
    UNIT 402
        COM='ANSTO Basket Bottom Plate Hole'
        CYLINDER  4  1  1.27  1.2172  0.0000
    UNIT 403
        COM='Basket Bottom Plate '
        CYLINDER  6  1  16.8466  1.2172  0.0000
        HOLE  402  0.0000  0.0000  0.0000
        HOLE  402  11.1125  0.0000  0.0000
        HOLE  402  5.5563  9.6237  0.0000
        HOLE  402  -5.5563  9.6237  0.0000
        HOLE  402  -11.1125  0.0000  0.0000
        HOLE  402  -5.5563  -9.6237  0.0000
        HOLE  402  5.5562  -9.6237  0.0000
    UNIT  404
        COM='Cask Cavity '
        CYLINDER  4  1  16.9863  446.6844  0.0000
        HOLE  7    0.0000  0.0000  0.0001
        HOLE  10   0.0000  0.0000  1.2700
        HOLE  7    0.0000  0.0000  74.4475
        HOLE  9    0.0000  0.0000  75.7174
        HOLE  7    0.0000  0.0000  148.8949
        HOLE  10   0.0000  0.0000  150.1648
        HOLE  7    0.0000  0.0000  223.3423
        HOLE  9    0.0000  0.0000  224.6122
        HOLE  7    0.0000  0.0000  297.7897
        HOLE  10   0.0000  0.0000  299 0596
        HOLE  403  0.0000  0.0000  372.2371
        HOLE  401  0.0000  0.0000  373.4548
    UNIT  405
        COM='Cask Shield Radial Configuration'
        CYLINDER  4  1  16.9863  446.6844  0.0000
        HOLE  404  0.0000  0.0000  0.0000
        CYLINDER  8  1  18.9103  446.6844  0.0000
        CYLINDER  5  1  33.4645  446.6844  0.0000
        CYLINDER  8  1  36.5189  446.6844  0.0000
        CYLINDER  9  1  49.2189  446.6844  0.0000
        CYLINDER  8  1  49.8183  446.6844  0.0000
        CUBOID  9  1  4P49.8183  446.6844  0.0000
    UNIT  406
        COM='LWT Lid '
        CYLINDER  8  1  36.5189  28.5750  0.5994
        CYLINDER  9  1  49.8183  28.5750  0.5994
        CYLINDER  8  1  49.8183  28.5750  0.0000
        CUBOID  9  1  4P49.8183  28.5750  0.0000
    UNIT  407
        COM='LWT Bottom Weldment '
        CYLINDER  5  1  26.3525  16.5100  8.8900
        CYLINDER  8  1  36.5189  26.0706  0.0000
        CYLINDER  9  1  49.8183  26.0706  0.0000
```

```
    CYLINDER  8  1  49.8183  26.6700  0.0000
    CUBOID  9  1  4P49.8183  26.6700  0.0000
Global UNIT  408
    COM='LWT Cask '
    ARRAY  401  -49.8183  -49.8183  0.0000
END GEOM

READ ARRAY
ARA=111  NUX=18  NUY=1   NUZ=1  FILL  102  103  14R101  103  102  END FILL
ARA=112  NUX=1   NUY=18  NUZ=1  FILL  106  107  14R105  107  106  END FILL
ARA=311  NUX=14  NUY=1   NUZ=1  FILL  14R305  END FILL
ARA=312  NUX=1   NUY=14  NUZ=1  FILL  14R307  END FILL
ARA=313  NUX=14  NUY=1   NUZ=1  FILL  14R321  END FILL
ARA=314  NUX=1   NUY=14  NUZ=1  FILL  14R323  END FILL
ARA=315  NUX=28  NUY=1   NUZ=1  FILL  28R327  END FILL
ARA=316  NUX=1   NUY=14  NUZ=1  FILL  14R329  END FILL
ARA=317  NUX=14  NUY=1   NUZ=1  FILL  334  12R333  335  END FILL
ARA=319  NUX=10  NUY=1   NUZ=1  FILL  337   8R339  338  END FILL
ARA=320  NUX=1   NUY=10  NUZ=1  FILL  10R341  END FILL
ARA=321  NUX=10  NUY=1   NUZ=1  FILL  10R311  END FILL
ARA=322  NUX=1   NUY=10  NUZ=1  FILL  10R313  END FILL
ARA=401  NUX=1   NUY=1   NUZ=3  FILL  407 405 406  END FILL
END ARRAY

READ BOUNDS    ALL=MIRROR    END BOUNDS

READ PLOT
PLT=no
TTL='X-Y PLOT OF CENTER ELEMENT - FUEL ELEVATION'
SCR=YES  PIC=MAT  LPI=10
UAX=1.0  VDN=-1.0  NAX=1500
XUL=-5.4  YUL=5.4  ZUL=57.4
XLR=5.4  YLR=-5.4  ZLR=57.4  END
TTL='X-Y PLOT OF BASKET - FUEL ELEVATION'
SCR=YES  PIC=MAT  LPI=10
UAX=1.0  VDN=-1.0  NAX=1500
XUL=-17.0  YUL=17.0  ZUL=57.4
XLR=17.0  YLR=-17.0  ZLR=57.4  END
TTL='X-Y PLOT OF CASK - FUEL ELEVATION'
SCR=YES  PIC=MAT  LPI=10
UAX=1.0  VDN=-1.0  NAX=1500
XUL=-49.8  YUL=49.8  ZUL=57.4
XLR=49.8  YLR=-49.8  ZLR=57.4  END
TTL='X-Z PLOT OF BOTTOM BASKET - CENTER FUEL ELEMENT CROSS SECTION'
SCR=YES  PIC=MAT  LPI=10
UAX=1.0  WDN=-1.0  NAX=1500
XUL=-5.4  YUL=0.0  ZUL=77.4
XLR=5.4  YLR=0.0  ZLR=57.4  END
TTL='X-Z PLOT OF BOTTOM BASKET - CENTER FUEL ELEMENT ROW'
SCR=YES  PIC=MAT  LPI=10
UAX=1.0  WDN=-1.0  NAX=1500
XUL=-17.0  YUL=0.0  ZUL=101.1
XLR=17.0  YLR=0.0  ZLR=26.7  END
TTL='Y-Z (X=0) PLOT OF BOTTOM BASKET'
SCR=YES  PIC=MAT  LPI=10
VAX=1.0  WDN=-1.0  NAX=1500
XUL=0.0  YUL=-17.0  ZUL=101.1
XLR=0.0  YLR=17.0  ZLR=26.7  END
TTL='X-Z PLOT OF BOTTOM BASKET - TOP FUEL ELEMENT ROW'
SCR=YES  PIC=MAT  LPI=10
UAX=1.0  WDN=-1.0  NAX=1500
XUL=-17.0  YUL=9.3  ZUL=101.1
XLR=17.0  YLR=9.3  ZLR=26.7  END
TTL='X-Z  PLOT OF CASK CAVITY'
SCR=YES  PIC=MAT  LPI=5
UAX=1.0  WDN=-1.0  NAX=1500
XUL=-17.0  YUL=0.0  ZUL=474.4
XLR=17.0  YLR=0.0  ZLR=25.7  END
TTL='X-Z  PLOT OF CASK '
SCR=YES  PIC=MAT  LPI=5
UAX=1.0  WDN=-1.0  NAX=1500
XUL=-49.8  YUL=0.0  ZUL=502.9
XLR=49.8  YLR=0.0  ZLR=0.0  END

'Plots of TOP BASKET fuel
TTL='X-Y PLOT OF CENTER ELEMENT - TOP FUEL ELEVATION'
SCR=YES  PIC=MAT  LPI=10
UAX=1.0  VDN=-1.0  NAX=1500
XUL=-5.4  YUL=5.4  ZUL=435
XLR=5.4  YLR=-5.4  ZLR=435  END
TTL='X-Y PLOT OF BASKET - TOP FUEL ELEVATION'
SCR=YES  PIC=MAT  LPI=10
UAX=1.0  VDN=-1.0  NAX=1500
XUL=-17.0  YUL=17.0  ZUL=435
XLR=17.0  YLR=-17.0  ZLR=435  END
TTL='X-Y PLOT OF CASK - TOP FUEL ELEVATION'
SCR=YES  PIC=MAT  LPI=10
UAX=1.0  VDN=-1.0  NAX=1500
XUL=-49.8  YUL=49.8  ZUL=435
XLR=49.8  YLR=-49.8  ZLR=435  END

END PLOT
END DATA

SECONDARY MODULE 000008   HAS BEEN CALLED.

MODULE 000008   IS FINISHED. COMPLETION CODE    0. CPU TIME USED     0.33 (SECONDS).

SECONDARY MODULE 000002   HAS BEEN CALLED.

MODULE 000002   IS FINISHED. COMPLETION CODE    0. CPU TIME USED     1.98 (SECONDS).

SECONDARY MODULE 000009   HAS BEEN CALLED.

MODULE 000009   IS FINISHED. COMPLETION CODE    0. CPU TIME USED   305.16 (SECONDS).

MODULE CSAS25   IS FINISHED. COMPLETION CODE    0. CPU TIME USED   308.57 (SECONDS).
```

```
***************************************************************************
***************************************************************************
***************************************************************************
*****                                                                *****
*****                 PROGRAM VERIFICATION INFORMATION               *****
*****                                                                *****
*****                 CODE SYSTEM:  SCALE-PC VERSION:  4.3           *****
*****                                                                *****
***************************************************************************
***************************************************************************
*****                                                                *****
*****                                                                *****
*****               PROGRAM:  CSAS                                   *****
*****                                                                *****
*****         CREATION DATE:  03/08/96                               *****
*****                                                                *****
*****                VOLUME:  Eng                                    *****
*****                                                                *****
*****               LIBRARY:  M:\SCALE43\WIN_NT\EXE                  *****
*****                                                                *****
*****                                                                *****
*****       PRODUCTION CODE:  CSAS                                   *****
*****                                                                *****
*****               VERSION:  3.1                                    *****
*****                                                                *****
*****               JOBNAME:  SCALE-PC                               *****
*****                                                                *****
*****     DATE OF EXECUTION:  08/05/08                               *****
*****                                                                *****
*****     TIME OF EXECUTION:  16:15:53                               *****
*****                                                                *****
*****                                                                *****
***************************************************************************
***************************************************************************
***************************************************************************
```

```
***************************************************************************
***************************************************************************
***************************************************************************
*****                                                                *****
*****                 PROGRAM VERIFICATION INFORMATION               *****
*****                                                                *****
*****                 CODE SYSTEM:  SCALE-PC VERSION:  4.3           *****
*****                                                                *****
***************************************************************************
***************************************************************************
*****                                                                *****
*****                                                                *****
*****               PROGRAM:  000008                                 *****
*****                                                                *****
*****         CREATION DATE:  09/16/95                               *****
*****                                                                *****
*****                VOLUME:  Eng                                    *****
*****                                                                *****
*****               LIBRARY:  M:\SCALE43\WIN_NT\EXE                  *****
*****                                                                *****
*****                                                                *****
*****     THIS IS NOT A SCALE-PC CONFIGURATION CONTROLLED CODE       *****
*****                                                                *****
*****               JOBNAME:  SCALE-PC                               *****
*****                                                                *****
*****     DATE OF EXECUTION:  08/05/08                               *****
*****                                                                *****
*****     TIME OF EXECUTION:  16:15:53                               *****
*****                                                                *****
*****                                                                *****
***************************************************************************
***************************************************************************
***************************************************************************
```

P R O B L E M   D E S C R I P T I O N

IGR--GEOMETRY (0/1/2/3--INF MED/SLAB/CYL/SPHERE 1

IZM--NUMBER OF ZONES OR MATERIAL REGIONS 23

MS--MIXING TABLE LENGTH 34

IBL--SHIELDED CROSS SECTION EDIT OPTION (0/1--NO/YES) 0

IBR--BONDARENKO FACTOR EDIT OPTION (0/1--NO/YES) 0

ISSOPT--DANCOFF FACTOR OPTION 0

CONVERGENCE CRITERION 1.00000E-03

GEOMETRY CORRECTION FACTOR FOR WIGNER RATIONAL APPROXIMATION 1.000E+00

M I X I N G   T A B L E

ENTRY	MIXTURE	ISOTOPE	NUMBER DENSITY	NEW IDENTIFIER
1	1	92235	1.07174E-03	1092235
2	11	92235	7.29070E-04	11092235
3	21	92235	8.89418E-04	21092235
4	1	92238	6.75448E-05	1092238
5	11	92238	6.25966E-05	11092238
6	21	92238	1.54974E-04	21092238
7	1	13027	3.25147E-02	1013027
8	2	13027	6.03066E-02	2013027
9	11	13027	1.72260E-02	11013027
10	12	13027	6.03066E-02	12013027
11	21	13027	6.59980E-03	21013027
12	22	13027	6.03066E-02	22013027
13	7	13027	6.03066E-02	7013027
14	3	1001	6.68762E-02	3001001

```
 15     13          1001     6.68762E-02          13001001
 16     23          1001     6.68762E-02          23001001
 17      4          1001     6.68762E-02           4001001
 18      9          1001     6.68896E-06           9001001
 19     10          1001     6.68762E-02          10001001
 20      3          8016     3.34381E-02           3008016
 21     13          8016     3.34381E-02          13008016
 22     23          8016     3.34381E-02          23008016
 23      4          8016     3.34381E-02           4008016
 24      9          8016     3.34448E-06           9008016
 25     10          8016     3.34381E-02          10008016
 26      5         82000     3.29690E-02           5082000
 27      6         24304     1.74286E-02           6024304
 28      8         24304     1.74286E-02           8024304
 29      6         25055     1.73633E-03           6025055
 30      8         25055     1.73633E-03           8025055
 31      6         26304     5.93579E-02           6026304
 32      8         26304     5.93579E-02           8026304
 33      6         28304     7.72070E-03           6028304
 34      8         28304     7.72070E-03           8028304

GEOMETRY AND MATERIAL DESCRIPTION

ZONE   MIXTURE   OUTER DIMENSION   TEMPERATURE        EXTRA XS    TYPE (0/1--FUEL/MOD)
  1       1        4.00000E-02     2.93000E+02     3.70526E+00          0
  2       2        6.50000E-02     2.93000E+02     0.00000E+00          0
  3       3        5.00000E-01     2.93000E+02     0.00000E+00          0
  4       4        5.50000E+00     2.93000E+02     0.00000E+00          0
  5       5        1.05000E+01     2.93000E+02     0.00000E+00          0
  6       6        1.55000E+01     2.93000E+02     0.00000E+00          0
  7       7        2.05000E+01     2.93000E+02     0.00000E+00          0
  8       8        2.55000E+01     2.93000E+02     0.00000E+00          0
  9       9        3.05000E+01     2.93000E+02     0.00000E+00          0
 10      10        3.55000E+01     2.93000E+02     0.00000E+00          0
 11      11        4.05000E+01     2.93000E+02     1.21399E+00          0
 12      12        4.55000E+01     2.93000E+02     0.00000E+00          0
 13      13        5.05000E+01     2.93000E+02     0.00000E+00          0
 14      14        5.55000E+01    -2.93000E+02     0.00000E+00          0
 15      15        6.05000E+01    -2.93000E+02     0.00000E+00          0
 16      16        6.55000E+01    -2.93000E+02     0.00000E+00          0
 17      17        7.05000E+01    -2.93000E+02     0.00000E+00          0
 18      18        7.55000E+01    -2.93000E+02     0.00000E+00          0
 19      19        8.05000E+01    -2.93000E+02     0.00000E+00          0
 20      20        8.55000E+01    -2.93000E+02     0.00000E+00          0
 21      21        9.05000E+01     2.93000E+02     2.35338E+00          0
 22      22        9.55000E+01     2.93000E+02     0.00000E+00          0
 23      23        1.00500E+02     2.93000E+02     0.00000E+00          0

                         *****************************************************************************
                         *****************************************************************************
                         *****************************************************************************
                         *****                                                                   *****
                         *****                   PROGRAM VERIFICATION INFORMATION                *****
                         *****                                                                   *****
                         *****                 CODE SYSTEM:   SCALE-PC VERSION:  4.3             *****
                         *****                                                                   *****
                         *****************************************************************************
                         *****************************************************************************
                         *****                                                                   *****
                         *****                                                                   *****
                         *****               PROGRAM:  000002                                    *****
                         *****                                                                   *****
                         *****         CREATION DATE:  09/28/95                                  *****
                         *****                                                                   *****
                         *****                VOLUME:  Eng                                       *****
                         *****                                                                   *****
                         *****               LIBRARY:  M:\SCALE43\WIN_NT\EXE                     *****
                         *****                                                                   *****
                         *****                                                                   *****
                         *****       PRODUCTION CODE:  NITAWL                                    *****
                         *****                                                                   *****
                         *****               VERSION:  3.0                                       *****
                         *****                                                                   *****
                         *****               JOBNAME:  SCALE-PC                                  *****
                         *****                                                                   *****
                         *****     DATE OF EXECUTION:  08/05/08                                  *****
                         *****                                                                   *****
                         *****     TIME OF EXECUTION:  16:15:54                                  *****
                         *****                                                                   *****
                         *****                                                                   *****
                         *****************************************************************************
                         *****************************************************************************
                         *****************************************************************************

        -1Q ARRAY HAS       1 ENTRIES.

         0Q ARRAY HAS       9 ENTRIES.

         1Q ARRAY HAS      12 ENTRIES.

SELECT 34 NUCLIDES FROM THE MASTER  LIBRARY ON LOGICAL  1
        0 NUCLIDES FROM THE WORKING LIBRARY ON LOGICAL  2
        0 NUCLIDES FROM THE WORKING LIBRARY ON LOGICAL  3
          TO CREATE THE NEW WORKING LIBRARY ON LOGICAL  4

        8 RESONANCE CALCULATIONS HAVE BEEN REQUESTED
       -1 OUTPUT OPTION FOR AMPX FORMATTED CROSS SECTION DATA
     2001 MAXIMUM NUMBER OF RESONANCE MESH INTERVALS
        2 ORDER OF RESONANCE LEVEL PROCESSING

THE STORAGE ALLOCATED FOR THIS CASE IS     100000 WORDS

         2Q ARRAY HAS      34 ENTRIES.

         3Q ARRAY HAS     120 ENTRIES.

         4Q ARRAY HAS      34 ENTRIES.

 GENERAL INFORMATION CONCERNING CROSS SECTION LIBRARY
```

```
   TAPE IDENTIFICATION NUMBER                 4321
   NUMBER OF NUCLIDES ON TAPE                   34
   NUMBER OF NEUTRON ENERGY GROUPS              27
   FIRST THERMAL NEUTRON ENERGY GROUP           15
   NUMBER OF GAMMA ENERGY GROUPS                 0

   DIRECT ACCESS UNIT NUMBER  9 REQUIRES 117 BLOCKS OF LENGTH  1680 WORDS
 XSDRN TAPE    4321
                        SCALE 4.2 - 27 GROUP NEUTRON GROUP LIBRARY
                           BASED ON ENDF-B VERSION 4 DATA
                              COMPILED FOR NRC      1/27/89
                                 LAST UPDATED                                        08/12/94
                                    L.M.PETRIE   -   ORNL

 NUCLIDES FROM XSDRN TAPE
    1     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94     3001001
    2     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94    13001001
    3     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94    23001001
    4     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94     4001001
    5     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94     9001001
    6     HYDROGEN       ENDF/B-IV MAT 1269/THRM1002             UPDATED 08/12/94    10001001
    7     OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94     3008016
    8     OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94    13008016
    9     OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94    23008016
   10     OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94     4008016
   11     OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94     9008016
   12     OXYGEN-16      ENDF/B-IV MAT 1276                      UPDATED 08/12/94    10008016
   13    AL-27 1193 218 GP 040375(5)                             UPDATED 08/12/94     1013027
   14    AL-27 1193 218 GP 040375(5)                             UPDATED 08/12/94     2013027
   15    AL-27 1193 218 GP 040375(5)                             UPDATED 08/12/94    11013027
   16    AL-27 1193 218 GP 040375(5)                             UPDATED 08/12/94    12013027
   17    AL-27 1193 218 GP 040375(5)                             UPDATED 08/12/94    21013027
   18    AL-27 1193 218 GP 040375(5)                             UPDATED 08/12/94    22013027
   19    AL-27 1193 218 GP 040375(5)                             UPDATED 08/12/94     7013027
   20    CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94     6024304
   21    CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94     8024304
   22     MANGANESE-55   ENDF/B-IV MAT 1197                      UPDATED 08/12/94     6025055
   23     MANGANESE-55   ENDF/B-IV MAT 1197                      UPDATED 08/12/94     8025055
   24    FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94     6026304
   25    FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94     8026304
   26    NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94     6028304
   27    NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'        UPDATED 08/12/94     8028304
   28    PB    1288 218NGP 042375 P-3 293K                       UPDATED 08/12/94     5082000
   29     URANIUM-235    ENDF/B-IV MAT 1261                      UPDATED 08/12/94     1092235
   30     URANIUM-235    ENDF/B-IV MAT 1261                      UPDATED 08/12/94    11092235
   31     URANIUM-235    ENDF/B-IV MAT 1261                      UPDATED 08/12/94    21092235
   32     URANIUM-238    ENDF/B-IV MAT 1262                      UPDATED 08/12/94     1092238
   33     URANIUM-238    ENDF/B-IV MAT 1262                      UPDATED 08/12/94    11092238
   34     URANIUM-238    ENDF/B-IV MAT 1262                      UPDATED 08/12/94    21092238

 HYDROGEN        ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94    3001001      TEMPERATURE=    293.00
                                                           PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 HYDROGEN        ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94   13001001      TEMPERATURE=    293.00
                                                           PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 HYDROGEN        ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94   23001001      TEMPERATURE=    293.00
                                                           PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 HYDROGEN        ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94    4001001      TEMPERATURE=    293.00
                                                           PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 HYDROGEN        ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94    9001001      TEMPERATURE=    293.00
                                                           PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 HYDROGEN        ENDF/B-IV MAT 1269/THRM1002          UPDATED 08/12/94   10001001      TEMPERATURE=    293.00
                                                           PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 OXYGEN-16       ENDF/B-IV MAT 1276                   UPDATED 08/12/94    3008016      TEMPERATURE=    293.00
                                                           PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 OXYGEN-16       ENDF/B-IV MAT 1276                   UPDATED 08/12/94   13008016      TEMPERATURE=    293.00
                                                           PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 OXYGEN-16       ENDF/B-IV MAT 1276                   UPDATED 08/12/94   23008016      TEMPERATURE=    293.00
                                                           PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 OXYGEN-16       ENDF/B-IV MAT 1276                   UPDATED 08/12/94    4008016      TEMPERATURE=    293.00
                                                           PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 OXYGEN-16       ENDF/B-IV MAT 1276                   UPDATED 08/12/94    9008016      TEMPERATURE=    293.00
                                                           PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 OXYGEN-16       ENDF/B-IV MAT 1276                   UPDATED 08/12/94   10008016      TEMPERATURE=    293.00
                                                           PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

AL-27 1193 218 GP 040375(5)                           UPDATED 08/12/94    1013027      TEMPERATURE=    293.00
                                                           PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

AL-27 1193 218 GP 040375(5)                           UPDATED 08/12/94    2013027      TEMPERATURE=    293.00
                                                           PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

AL-27 1193 218 GP 040375(5)                           UPDATED 08/12/94   11013027      TEMPERATURE=    293.00
                                                           PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

AL-27 1193 218 GP 040375(5)                           UPDATED 08/12/94   12013027      TEMPERATURE=    293.00
                                                           PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

AL-27 1193 218 GP 040375(5)                           UPDATED 08/12/94   21013027      TEMPERATURE=    293.00
                                                           PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

AL-27 1193 218 GP 040375(5)                           UPDATED 08/12/94   22013027      TEMPERATURE=    293.00
                                                           PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

AL-27 1193 218 GP 040375(5)                           UPDATED 08/12/94    7013027      TEMPERATURE=    293.00
                                                           PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'      UPDATED 08/12/94    6024304      TEMPERATURE=    293.00
                                                           PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00
```

```
CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED 08/12/94   8024304     TEMPERATURE=    293.00
                                                                 PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 MANGANESE-55   ENDF/B-IV MAT 1197                        UPDATED 08/12/94   6025055     TEMPERATURE=    293.00

GEOMETRY HAS BEEN SET TO HOMOGENEOUS AS LBAR IS  0.0000E+00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)           =     54.466            TEMPERATURE(KELVIN)         =   293.000

POTENTIAL SCATTER SIGMA  =      2.590            LUMPED NUCLEAR DENSITY      = 1.7363295E-03

SPIN FACTOR (G)           =     14.448            LUMP DIMENSION (A-BAR)      = 0.0000000E+00

INNER RADIUS              = 0.0000000E+00         DANCOFF CORRECTION (C)      = 0.0000000E+00

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1     =     55.845            SIGMA(PER ABSORBER ATOM)= 3.4663022E+02

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2     =     55.925            SIGMA(PER ABSORBER ATOM)= 1.2557598E+02

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 0-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP        RES ABS          RES FISS        RES SCAT
  8       -5.518788E-04    0.000000E+00    -3.944190E-01
  9       -2.797993E-03    0.000000E+00    -2.293471E+00
 10       -3.291452E-01    0.000000E+00    -3.820862E+01
 11       -2.680562E+00    0.000000E+00    -1.159996E+02

EXCESS RESONANCE INTEGRALS

                  RESOLVED

ABSORPTION      3.33719E+00
FISSION         0.00000E+00
                                                                 PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 MANGANESE-55   ENDF/B-IV MAT 1197                        UPDATED 08/12/94   8025055     TEMPERATURE=    293.00

GEOMETRY HAS BEEN SET TO HOMOGENEOUS AS LBAR IS  0.0000E+00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)           =     54.466            TEMPERATURE(KELVIN)         =   293.000

POTENTIAL SCATTER SIGMA  =      2.590            LUMPED NUCLEAR DENSITY      = 1.7363295E-03

SPIN FACTOR (G)           =     14.448            LUMP DIMENSION (A-BAR)      = 0.0000000E+00

INNER RADIUS              = 0.0000000E+00         DANCOFF CORRECTION (C)      = 0.0000000E+00

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1     =     55.845            SIGMA(PER ABSORBER ATOM)= 3.4663022E+02

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2     =     55.925            SIGMA(PER ABSORBER ATOM)= 1.2557598E+02

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 0-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP        RES ABS          RES FISS        RES SCAT
  8       -5.518788E-04    0.000000E+00    -3.944190E-01
  9       -2.797993E-03    0.000000E+00    -2.293471E+00
 10       -3.291452E-01    0.000000E+00    -3.820862E+01
 11       -2.680562E+00    0.000000E+00    -1.159996E+02

EXCESS RESONANCE INTEGRALS

                  RESOLVED

ABSORPTION      3.33719E+00
FISSION         0.00000E+00
                                                                 PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED 08/12/94   6026304     TEMPERATURE=    293.00
                                                                 PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED 08/12/94   8026304     TEMPERATURE=    293.00
                                                                 PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED 08/12/94   6028304     TEMPERATURE=    293.00
                                                                 PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'          UPDATED 08/12/94   8028304     TEMPERATURE=    293.00
                                                                 PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

PB   1288 218NGP 042375 P-3 293K                          UPDATED 08/12/94   5082000     TEMPERATURE=    293.00
                                                                 PROCESS NUMBER 1007 IS AT TEMPERATURE=    293.00

 URANIUM-235    ENDF/B-IV MAT 1261                        UPDATED 08/12/94   1092235     TEMPERATURE=    293.00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)           =    233.025            TEMPERATURE(KELVIN)         =   293.000

POTENTIAL SCATTER SIGMA  =     11.500            LUMPED NUCLEAR DENSITY      = 1.0717391E-03
```

```
SPIN FACTOR (G)          = 15171.100          LUMP DIMENSION (A-BAR)     = 7.9999998E-02

INNER RADIUS             = 0.0000000E+00      DANCOFF CORRECTION (C)     = 1.4650537E-01

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1    =     26.982          SIGMA(PER ABSORBER ATOM)= 4.0851063E+01

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2    =    238.051          SIGMA(PER ABSORBER ATOM)= 7.7685082E-01

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 1-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP        RES ABS         RES FISS        RES SCAT
 12      -1.704016E+00   -1.048080E+00   -4.398005E-02
 13      -5.163832E+00   -2.530548E+00   -1.177652E-01
 14      -3.723215E+00   -2.202300E+00   -2.809409E-02
 15      -2.244852E-04   -1.708981E-04    1.529968E-06

EXCESS RESONANCE INTEGRALS

                 RESOLVED

ABSORPTION      2.15992E+02
FISSION         1.28685E+02
                                                  PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 URANIUM-235    ENDF/B-IV MAT 1261              UPDATED 08/12/94  11092235     TEMPERATURE=   293.00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)          =   233.025          TEMPERATURE(KELVIN)        =   293.000

POTENTIAL SCATTER SIGMA  =    11.500          LUMPED NUCLEAR DENSITY     = 7.2906964E-04

SPIN FACTOR (G)          = 15171.100          LUMP DIMENSION (A-BAR)     = 1.8320000E-01

INNER RADIUS             = 0.0000000E+00      DANCOFF CORRECTION (C)     = 4.4644913E-01

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1    =     26.982          SIGMA(PER ABSORBER ATOM)= 3.1814728E+01

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2    =    238.051          SIGMA(PER ABSORBER ATOM)= 1.0583184E+00

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 1-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP        RES ABS         RES FISS        RES SCAT
 12      -3.443092E+00   -2.117629E+00   -8.826129E-02
 13      -1.008169E+01   -4.926846E+00   -2.272950E-01
 14      -7.340443E+00   -4.320512E+00   -5.476373E-02
 15      -4.198233E-04   -3.196314E-04    3.368596E-06

EXCESS RESONANCE INTEGRALS

                 RESOLVED

ABSORPTION      2.03902E+02
FISSION         1.22076E+02
                                                  PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

 URANIUM-235    ENDF/B-IV MAT 1261              UPDATED 08/12/94  21092235     TEMPERATURE=   293.00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A)          =   233.025          TEMPERATURE(KELVIN)        =   293.000

POTENTIAL SCATTER SIGMA  =    11.500          LUMPED NUCLEAR DENSITY     = 8.8941806E-04

SPIN FACTOR (G)          = 15171.100          LUMP DIMENSION (A-BAR)     = 1.0390000E-01

INNER RADIUS             = 0.0000000E+00      DANCOFF CORRECTION (C)     = 3.0363533E-01

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1    =     26.982          SIGMA(PER ABSORBER ATOM)= 9.9916658E+00

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2    =    238.051          SIGMA(PER ABSORBER ATOM)= 2.1477635E+00

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 1-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP        RES ABS         RES FISS        RES SCAT
 12      -2.174708E+00   -1.338090E+00   -5.598649E-02
 13      -6.530482E+00   -3.199709E+00   -1.485872E-01
 14      -4.716246E+00   -2.786873E+00   -3.558919E-02
 15      -2.805605E-04   -2.136031E-04    2.053226E-06

EXCESS RESONANCE INTEGRALS

                 RESOLVED

ABSORPTION      2.12660E+02
FISSION         1.26857E+02
```

PROCESS NUMBER 1007 IS AT TEMPERATURE= 293.00

URANIUM-238 ENDF/B-IV MAT 1262 UPDATED 08/12/94 1092238 TEMPERATURE= 293.00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A) = 236.006 TEMPERATURE(KELVIN) = 293.000

POTENTIAL SCATTER SIGMA = 10.599 LUMPED NUCLEAR DENSITY = 6.7544795E-05

SPIN FACTOR (G) = 656.527 LUMP DIMENSION (A-BAR) = 7.9999998E-02

INNER RADIUS = 0.0000000E+00 DANCOFF CORRECTION (C) = 1.4650537E-01

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1 = 26.982 SIGMA(PER ABSORBER ATOM)= 6.4818732E+02

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2 = 235.044 SIGMA(PER ABSORBER ATOM)= 1.8885783E+02

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 1-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP	RES ABS	RES FISS	RES SCAT
9	-1.303381E-04	0.000000E+00	-1.468809E-03
10	-6.994279E-03	-3.886728E-08	-5.076653E-02
11	-3.286570E-01	0.000000E+00	-1.049223E+00
12	-3.090056E+00	0.000000E+00	-3.705011E+00
13	-3.566053E+00	0.000000E+00	-1.183352E+00
14	-6.549177E+00	0.000000E+00	-3.855168E-01
15	-4.152076E-09	0.000000E+00	3.744929E-09

EXCESS RESONANCE INTEGRALS

	RESOLVED
ABSORPTION	2.57170E+02
FISSION	5.33631E-04

PROCESS NUMBER 1007 IS AT TEMPERATURE= 293.00

URANIUM-238 ENDF/B-IV MAT 1262 UPDATED 08/12/94 11092238 TEMPERATURE= 293.00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A) = 236.006 TEMPERATURE(KELVIN) = 293.000

POTENTIAL SCATTER SIGMA = 10.599 LUMPED NUCLEAR DENSITY = 6.2596569E-05

SPIN FACTOR (G) = 656.527 LUMP DIMENSION (A-BAR) = 1.8320000E-01

INNER RADIUS = 0.0000000E+00 DANCOFF CORRECTION (C) = 4.4644913E-01

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1 = 26.982 SIGMA(PER ABSORBER ATOM)= 3.7054990E+02

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2 = 235.044 SIGMA(PER ABSORBER ATOM)= 1.3862970E+02

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

THIS RESONANCE MATERIAL WILL BE TREATED AS A 1-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP	RES ABS	RES FISS	RES SCAT
9	-3.620582E-04	0.000000E+00	-4.064494E-03
10	-1.913557E-02	-1.082530E-07	-1.386904E-01
11	-8.633477E-01	0.000000E+00	-2.746832E+00
12	-7.765469E+00	0.000000E+00	-9.294101E+00
13	-9.083701E+00	0.000000E+00	-3.011560E+00
14	-1.674567E+01	0.000000E+00	-9.847641E-01
15	-5.750381E-09	0.000000E+00	6.853097E-09

EXCESS RESONANCE INTEGRALS

	RESOLVED
ABSORPTION	2.32087E+02
FISSION	5.33513E-04

PROCESS NUMBER 1007 IS AT TEMPERATURE= 293.00

URANIUM-238 ENDF/B-IV MAT 1262 UPDATED 08/12/94 21092238 TEMPERATURE= 293.00

RESONANCE DATA FOR THIS NUCLIDE

MASS NUMBER (A) = 236.006 TEMPERATURE(KELVIN) = 293.000

POTENTIAL SCATTER SIGMA = 10.599 LUMPED NUCLEAR DENSITY = 1.5497355E-04

SPIN FACTOR (G) = 656.527 LUMP DIMENSION (A-BAR) = 1.0390000E-01

INNER RADIUS = 0.0000000E+00 DANCOFF CORRECTION (C) = 3.0363533E-01

THE ABSORBER WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-1 = 26.982 SIGMA(PER ABSORBER ATOM)= 5.7343777E+01

MODERATOR-1 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

MASS OF MODERATOR-2 = 235.044 SIGMA(PER ABSORBER ATOM)= 6.8310303E+01

MODERATOR-2 WILL BE TREATED BY THE NORDHEIM INTEGRAL METHOD.

```
THIS RESONANCE MATERIAL WILL BE TREATED AS A 1-DIMENSIONAL OBJECT.

VOLUME FRACTION OF LUMP IN CELL USED TO ACCOUNT FOR SPATIAL SELF-SHIELDING=1.00000

GROUP       RES ABS          RES FISS        RES SCAT
  9      -4.686594E-04    0.000000E+00   -5.222821E-03
 10      -2.346429E-02   -1.449519E-07   -1.687880E-01
 11      -9.533950E-01    0.000000E+00   -3.024348E+00
 12      -8.307403E+00    0.000000E+00   -9.952425E+00
 13      -9.787482E+00    0.000000E+00   -3.248145E+00
 14      -1.810307E+01    0.000000E+00   -1.065493E+00
 15      -6.534871E-09    0.000000E+00    8.378668E-09

EXCESS RESONANCE INTEGRALS

                  RESOLVED

ABSORPTION       2.28848E+02
FISSION          5.33451E-04
                                              PROCESS NUMBER 1007 IS AT TEMPERATURE=   293.00

PROGRAM VERIFICATION INFORMATION

CODE SYSTEM:  SCALE-PC VERSION:  4.3

          PROGRAM:  000009
    CREATION DATE:  03/08/96
           VOLUME:  Eng
          LIBRARY:  M:\SCALE43\WIN_NT\EXE

  PRODUCTION CODE:  KENOVA
          VERSION:  3.1
          JOBNAME:  SCALE-PC
DATE OF EXECUTION:  08/05/08
TIME OF EXECUTION:  16:15:56
```

****** NUMERIC PARAMETERS ******

TME	MAXIMUM PROBLEM TIME (MIN)	90.00
TBA	TIME PER GENERATION (MIN)	5.00
GEN	NUMBER OF GENERATIONS	1203
NPG	NUMBER PER GENERATION	1000
NSK	NUMBER OF GENERATIONS TO BE SKIPPED	3
BEG	BEGINNING GENERATION NUMBER	1
RES	GENERATIONS BETWEEN CHECKPOINTS	0
X1D	NUMBER OF EXTRA 1-D CROSS SECTIONS	1
NBK	NEUTRON BANK SIZE	1025
XNB	EXTRA POSITIONS IN NEUTRON BANK	0
NFB	FISSION BANK SIZE	1000
XFB	EXTRA POSITIONS IN FISSION BANK	0
WTA	DEFAULT VALUE OF WEIGHT AVERAGE	0.5000
WTH	WEIGHT HIGH FOR SPLITTING	3.0000
WTL	WEIGHT LOW FOR RUSSIAN ROULETTE	0.3333
RND	STARTING RANDOM NUMBER	BB827100001
NB8	NUMBER OF D.A. BLOCKS ON UNIT 8	200
NL8	LENGTH OF D.A. BLOCKS ON UNIT 8	512
ADJ	MODE OF CALCULATION	FORWARD
	INPUT DATA WRITTEN ON RESTART UNIT	NO
	BINARY DATA INTERFACE	YES

```
*****************************************************************************************************
*****************************************************************************************************
*****************************************************************************************************
***                                                                                               ***
***                                                                                               ***
***                                                                                               ***
*****************************************************************************************************
***                              ******    LOGICAL PARAMETERS      ******                         ***
***                                                                                               ***
***  RUN  EXECUTE PROBLEM AFTER CHECKING DATA    YES          PLT  PLOT PICTURE MAP(S)          NO ***
***                                                                                               ***
***  FLX  COMPUTE FLUX                            NO          FDN  COMPUTE FISSION DENSITIES     NO ***
***                                                                                               ***
***  SMU  COMPUTE AVG UNIT SELF-MULTIPLICATION    NO          NUB  COMPUTE NU-BAR & AVG FISSION GROUP  YES ***
***                                                                                               ***
***  MKU  COMPUTE MATRIX K-EFF BY UNIT NUMBER     NO          MKP  COMPUTE MATRIX K-EFF BY UNIT LOCATION   NO ***
***                                                                                               ***
***  CKU  COMPUTE COFACTOR K-EFF BY UNIT NUMBER   NO          CKP  COMPUTE COFACTOR K-EFF BY UNIT LOCATION NO ***
***                                                                                               ***
***  FMU  PRINT FISS PROD MATRIX BY UNIT NUMBER   NO          FMP  PRINT FISS PROD MATRIX BY UNIT LOCATION NO ***
***                                                                                               ***
***  MKH  COMPUTE MATRIX K-EFF BY HOLE NUMBER     NO          MKA  COMPUTE MATRIX K-EFF BY ARRAY NUMBER    NO ***
***                                                                                               ***
***  CKH  COMPUTE COFACTOR K-EFF BY HOLE NUMBER   NO          CKA  COMPUTE COFACTOR K-EFF BY ARRAY NUMBER  NO ***
***                                                                                               ***
***  FMH  PRINT FISS PROD MATRIX BY HOLE NUMBER   NO          FMA  PRINT FISS PROD MATRIX BY ARRAY NUMBER  NO ***
***                                                                                               ***
***  HHL  COLLECT MATRIX BY HIGHEST HOLE LEVEL    NO          HAL  COLLECT MATRIX BY HIGHEST ARRAY LEVEL   NO ***
***                                                                                               ***
***  AMX  PRINT ALL MIXED CROSS SECTIONS          NO          FAR  PRINT FIS. AND ABS. BY REGION  NO ***
***                                                                                               ***
***  XS1  PRINT 1-D MIXTURE X-SECTIONS            NO          GAS  PRINT FAR BY GROUP            NO ***
***                                                                                               ***
***  XS2  PRINT 2-D MIXTURE X-SECTIONS            NO          PAX  PRINT XSEC-ALBEDO CORRELATION TABLES    NO ***
***                                                                                               ***
***  XAP  PRINT MIXTURE ANGLES & PROBABILITIES    NO          PWT  PRINT WEIGHT AVERAGE ARRAY    NO ***
***                                                                                               ***
***  PKI  PRINT FISSION SPECTRUM                  NO          PGM  PRINT INPUT GEOMETRY          NO ***
***                                                                                               ***
***  P1D  PRINT EXTRA 1-D CROSS SECTIONS          NO          BUG  PRINT DEBUG INFORMATION       NO ***
***                                                                                               ***
***                                                           TRK  PRINT TRACKING INFORMATION    NO ***
***                                                                                               ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************
*****************************************************************************************************
                                    PARAMETER INPUT COMPLETED

                        ........    0 IO'S WERE USED READING THE PARAMETER DATA      ........

                        ************** DATA READING COMPLETED **************
*****************************************************************************************************
***                                                                                               ***
***                                                                                               ***
***                                                                                               ***
*****************************************************************************************************
*****************************************************************************************************
***                                                                                               ***
***      UNIT                                                 VOLUME                              ***
***     NUMBER              DATA SET NAME                      NAME       UNIT FUNCTION           ***
***     ------              -------------                      ----       -------------           ***
***                                                                                               ***
***   XSC  14    D:\RAA\LWT ANSTO input\f_12_P_5336\FT14F001              MIXED CROSS SECTIONS    ***
***                                                                                               ***
***   ALB  79    M:\scale43\DATALIB\FT79F001                              INPUT ALBEDOS           ***
***                                                                                               ***
***   WTS  80    M:\scale43\DATALIB\FT80F001                              INPUT WEIGHTS           ***
***                                                                                               ***
***   SKT  16     UNKNOWN                                                 WRITE SCRATCH DATA      ***
***                                                                                               ***
***   BIN  95    D:\RAA\LWT ANSTO input\f_12_P_5336\FT95F001              BINARY INPUT DATA       ***
***                                                                                               ***
***   RST  95    D:\RAA\LWT ANSTO input\f_12_P_5336\FT95F001              READ RESTART DATA       ***
***                                                                                               ***
***   LIB   4    D:\RAA\LWT ANSTO input\f_12_P_5336\FT04F001              INPUT AMPX WORKING LIBRARY   ***
***                                                                                               ***
***         8    D:\RAA\LWT ANSTO input\f_12_P_5336\FT08F001              INPUT DATA DIRECT ACCESS     ***
***                                                                                               ***
***         9     UNKNOWN                                                 SUPER GROUPED DIRECT ACCESS  ***
***                                                                                               ***
***        10     UNKNOWN                                                 XSEC MIXING DIRECT ACCESS    ***
***                                                                                               ***
*****************************************************************************************************

                        ........    0 IO'S WERE USED PREPARING INPUT DATA      ........


                         CROSS SECTIONS READ FROM THE AMPX WORKING LIBRARY ON UNIT     4


                                          MIXING TABLE

                                  NUMBER OF SCATTERING ANGLES =  2
                                CROSS SECTION MESSAGE THRESHOLD =3.0E-05


MIXTURE =       1          DENSITY(G/CC)  =   1.9018
   NUCLIDE    ATOM-DENS.   WGT. FRAC.     ZA       AWT                NUCLIDE TITLE
   1013027  3.25147E-02  7.66011E-01   13027    26.9818      AL-27 1193 218 GP 040375(5)                        UPDATED
08/12/94
   1092235  1.07174E-03  2.19950E-01   92235   235.0441       URANIUM-235     ENDF/B-IV MAT 1261                 UPDATED
08/12/94
   1092238  6.75448E-05  1.40393E-02   92238   238.0510       URANIUM-238     ENDF/B-IV MAT 1262                 UPDATED
08/12/94
```

```
MIXTURE =      2         DENSITY(G/CC) =  2.7020
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT              NUCLIDE TITLE
   2013027  6.03066E-02  1.00000E+00  13027    26.9818     AL-27 1193 218 GP 040375(5)                                  UPDATED
08/12/94

MIXTURE =      3         DENSITY(G/CC) = 0.99977
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT              NUCLIDE TITLE
   3001001  6.68762E-02  1.11927E-01   1001     1.0077      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                 UPDATED
08/12/94
   3008016  3.34381E-02  8.88074E-01   8016    15.9904      OXYGEN-16       ENDF/B-IV MAT 1276                          UPDATED
08/12/94

MIXTURE =      4         DENSITY(G/CC) = 0.99977
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT              NUCLIDE TITLE
   4001001  6.68762E-02  1.11927E-01   1001     1.0077      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                 UPDATED
08/12/94
   4008016  3.34381E-02  8.88074E-01   8016    15.9904      OXYGEN-16       ENDF/B-IV MAT 1276                          UPDATED
08/12/94

MIXTURE =      5         DENSITY(G/CC) =  11.344
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT              NUCLIDE TITLE
   5082000  3.29690E-02  1.00000E+00  82000   207.2100     PB   1288 218NGP 042375 P-3 293K                             UPDATED
08/12/94

MIXTURE =      6         DENSITY(G/CC) =  7.9200
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT              NUCLIDE TITLE
   6024304  1.74286E-02  1.90000E-01  24000    51.9957     CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'             UPDATED
08/12/94
   6025055  1.73633E-03  1.99999E-02  25055    54.9379      MANGANESE-55    ENDF/B-IV MAT 1197                          UPDATED
08/12/94
   6026304  5.93579E-02  6.95000E-01  26000    55.8447     FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'             UPDATED
08/12/94
   6028304  7.72070E-03  9.50001E-02  28000    58.6872     NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'             UPDATED
08/12/94

MIXTURE =      7         DENSITY(G/CC) =  2.7020
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT              NUCLIDE TITLE
   7013027  6.03066E-02  1.00000E+00  13027    26.9818     AL-27 1193 218 GP 040375(5)                                  UPDATED
08/12/94

MIXTURE =      8         DENSITY(G/CC) =  7.9200
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT              NUCLIDE TITLE
   8024304  1.74286E-02  1.90000E-01  24000    51.9957     CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'             UPDATED
08/12/94
   8025055  1.73633E-03  1.99999E-02  25055    54.9379      MANGANESE-55    ENDF/B-IV MAT 1197                          UPDATED
08/12/94
   8026304  5.93579E-02  6.95000E-01  26000    55.8447     FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'             UPDATED
08/12/94
   8028304  7.72070E-03  9.50001E-02  28000    58.6872     NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'             UPDATED
08/12/94

MIXTURE =      9         DENSITY(G/CC) = 0.99997E-04
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT              NUCLIDE TITLE
   9001001  6.68896E-06  1.11927E-01   1001     1.0077      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                 UPDATED
08/12/94
   9008016  3.34448E-06  8.88074E-01   8016    15.9904      OXYGEN-16       ENDF/B-IV MAT 1276                          UPDATED
08/12/94

MIXTURE =     10         DENSITY(G/CC) = 0.99977
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT              NUCLIDE TITLE
  10001001  6.68762E-02  1.11927E-01   1001     1.0077      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                 UPDATED
08/12/94
  10008016  3.34381E-02  8.88074E-01   8016    15.9904      OXYGEN-16       ENDF/B-IV MAT 1276                          UPDATED
08/12/94

MIXTURE =     11         DENSITY(G/CC) =  1.0811
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT              NUCLIDE TITLE
  11013027  1.72260E-02  7.13902E-01  13027    26.9818     AL-27 1193 218 GP 040375(5)                                  UPDATED
08/12/94
  11092235  7.29070E-04  2.63210E-01  92235   235.0441      URANIUM-235     ENDF/B-IV MAT 1261                          UPDATED
08/12/94
  11092238  6.25966E-05  2.28878E-02  92238   238.0510      URANIUM-238     ENDF/B-IV MAT 1262                          UPDATED
08/12/94

MIXTURE =     12         DENSITY(G/CC) =  2.7020
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT              NUCLIDE TITLE
  12013027  6.03066E-02  1.00000E+00  13027    26.9818     AL-27 1193 218 GP 040375(5)                                  UPDATED
08/12/94

MIXTURE =     13         DENSITY(G/CC) = 0.99977
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT              NUCLIDE TITLE
  13001001  6.68762E-02  1.11927E-01   1001     1.0077      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                 UPDATED
08/12/94
  13008016  3.34381E-02  8.88074E-01   8016    15.9904      OXYGEN-16       ENDF/B-IV MAT 1276                          UPDATED
08/12/94

MIXTURE =     21         DENSITY(G/CC) = 0.70410
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT              NUCLIDE TITLE
  21013027  6.59980E-03  4.19969E-01  13027    26.9818     AL-27 1193 218 GP 040375(5)                                  UPDATED
08/12/94
  21092235  8.89418E-04  4.93027E-01  92235   235.0441      URANIUM-235     ENDF/B-IV MAT 1261                          UPDATED
08/12/94
  21092238  1.54974E-04  8.70047E-02  92238   238.0510      URANIUM-238     ENDF/B-IV MAT 1262                          UPDATED
08/12/94

MIXTURE =     22         DENSITY(G/CC) =  2.7020
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT              NUCLIDE TITLE
  22013027  6.03066E-02  1.00000E+00  13027    26.9818     AL-27 1193 218 GP 040375(5)                                  UPDATED
08/12/94

MIXTURE =     23         DENSITY(G/CC) = 0.99977
   NUCLIDE   ATOM-DENS.   WGT. FRAC.    ZA      AWT              NUCLIDE TITLE
  23001001  6.68762E-02  1.11927E-01   1001     1.0077      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002                 UPDATED
08/12/94
  23008016  3.34381E-02  8.88074E-01   8016    15.9904      OXYGEN-16       ENDF/B-IV MAT 1276                          UPDATED
08/12/94

                          3001001      HYDROGEN        ENDF/B-IV MAT 1269/THRM1002           UPDATED 08/12/94
```

```
 13001001    HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94
 23001001    HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94
  4001001    HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94
  9001001    HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94
 10001001    HYDROGEN       ENDF/B-IV MAT 1269/THRM1002              UPDATED 08/12/94
  3008016    OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED 08/12/94
 13008016    OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED 08/12/94
 23008016    OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED 08/12/94
  4008016    OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED 08/12/94
  9008016    OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED 08/12/94
 10008016    OXYGEN-16      ENDF/B-IV MAT 1276                       UPDATED 08/12/94
  1013027   AL-27 1193 218 GP 040375(5)                              UPDATED 08/12/94
  2013027   AL-27 1193 218 GP 040375(5)                              UPDATED 08/12/94
 11013027   AL-27 1193 218 GP 040375(5)                              UPDATED 08/12/94
 12013027   AL-27 1193 218 GP 040375(5)                              UPDATED 08/12/94
 21013027   AL-27 1193 218 GP 040375(5)                              UPDATED 08/12/94
 22013027   AL-27 1193 218 GP 040375(5)                              UPDATED 08/12/94
  7013027   AL-27 1193 218 GP 040375(5)                              UPDATED 08/12/94
  6024304   CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94
  8024304   CR 1191 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94
  6025055    MANGANESE-55   ENDF/B-IV MAT 1197                       UPDATED 08/12/94
  8025055    MANGANESE-55   ENDF/B-IV MAT 1197                       UPDATED 08/12/94
  6026304   FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94
  8026304   FE 1192 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94
  6028304   NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94
  8028304   NI 1190 WT SS-304(1/EST) P-3 293K SP=5+4(42375)'         UPDATED 08/12/94
  5082000   PB    1288 218NGP 042375 P-3 293K                        UPDATED 08/12/94
  1092235    URANIUM-235    ENDF/B-IV MAT 1261                       UPDATED 08/12/94
 11092235    URANIUM-235    ENDF/B-IV MAT 1261                       UPDATED 08/12/94
 21092235    URANIUM-235    ENDF/B-IV MAT 1261                       UPDATED 08/12/94
  1092238    URANIUM-238    ENDF/B-IV MAT 1262                       UPDATED 08/12/94
 11092238    URANIUM-238    ENDF/B-IV MAT 1262                       UPDATED 08/12/94
 21092238    URANIUM-238    ENDF/B-IV MAT 1262                       UPDATED 08/12/94

                  VOLUMES FOR THOSE UNITS UTILIZED IN  THIS PROBLEM

                        GEOMETRY                                  CUMULATIVE
  UNIT     REGION        REGION         VOLUME                      VOLUME

    1         1            1        1.69451E+03 CM**3          1.69451E+03 CM**3
              2            2        2.80775E+01 CM**3          1.72258E+03 CM**3
              3            3        9.13984E+01 CM**3          1.81398E+03 CM**3
              4            4        2.90465E+01 CM**3          1.84303E+03 CM**3
              5            5        4.56862E+02 CM**3          2.29989E+03 CM**3
              6            6        3.26919E+01 CM**3          2.33258E+03 CM**3
              7            7        1.06164E+02 CM**3          2.43875E+03 CM**3
              8            8        3.36606E+01 CM**3          2.47241E+03 CM**3
              9            9        5.25153E+02 CM**3          2.99756E+03 CM**3
             10           10        3.73052E+01 CM**3          3.03487E+03 CM**3
             11           11        1.20930E+02 CM**3          3.15580E+03 CM**3
             12           12        3.82744E+01 CM**3          3.19407E+03 CM**3
             13           13        5.93444E+02 CM**3          3.78751E+03 CM**3
             14           14        4.19194E+01 CM**3          3.82943E+03 CM**3
             15           15        1.35695E+02 CM**3          3.96513E+03 CM**3
             16           16        4.27173E+01 CM**3          4.00785E+03 CM**3

    2         1           17        3.96586E+01 CM**3          3.96586E+01 CM**3
              2           18        3.47606E+00 CM**3          4.31347E+01 CM**3
              3           19        1.06925E+01 CM**3          5.38272E+01 CM**3
              4           20        4.03762E+00 CM**3          5.78648E+01 CM**3
              5           21        1.22908E+01 CM**3          7.01557E+01 CM**3
              6           22        4.59916E+00 CM**3          7.47548E+01 CM**3
              7           23        1.38891E+01 CM**3          8.86439E+01 CM**3
              8           24        5.15671E+00 CM**3          9.38006E+01 CM**3

    3         1           25        1.79337E-01 CM**3          4.19563E+03 CM**3

    4         1           26        1.76679E+03 CM**3          5.96242E+03 CM**3
              2           27        7.34815E+02 CM**3          6.69723E+03 CM**3

    5         1           28        1.76679E+03 CM**3          5.96242E+03 CM**3
              2           29        7.34815E+02 CM**3          6.69723E+03 CM**3

    6         1           30        6.43417E+00 CM**3          6.43417E+00 CM**3

    7         1           31        1.08713E+03 CM**3          1.13216E+03 CM**3

    8         1           32        2.30289E+01 CM**3          2.30289E+01 CM**3

    9         1           33        1.29829E+04 CM**3          6.02781E+04 CM**3
              2           34        3.59751E+03 CM**3          6.38756E+04 CM**3
              3           35        1.36994E+03 CM**3          6.52455E+04 CM**3

   10         1           36        1.29829E+04 CM**3          6.02781E+04 CM**3
              2           37        3.59751E+03 CM**3          6.38756E+04 CM**3
              3           38        1.36994E+03 CM**3          6.52455E+04 CM**3

  333         1          379        7.83597E+01 CM**3          7.83597E+01 CM**3
              2          380        1.25503E+01 CM**3          9.09101E+01 CM**3
              3          381        1.47943E+02 CM**3          2.38853E+02 CM**3

  334         1          382        7.83597E+01 CM**3          7.83597E+01 CM**3
              2          383        1.25503E+01 CM**3          9.09101E+01 CM**3
              3          384        7.39952E+01 CM**3          1.64905E+02 CM**3

  335         1          385        7.83597E+01 CM**3          7.83597E+01 CM**3
              2          386        1.25503E+01 CM**3          9.09101E+01 CM**3
              3          387        7.39952E+01 CM**3          1.64905E+02 CM**3

  SURROUNDING GEOMETRY VOLUMES -  GEOMETRY REGION    388 IS AN ARRAY PLACEMENT BOUNDARY REGION

  336         1          388        3.19605E+03 CM**3          3.19605E+03 CM**3

  348         1          410        3.10016E+03 CM**3          6.29621E+03 CM**3
              2          411        7.83619E+02 CM**3          7.07983E+03 CM**3

  349         1          412        3.10016E+03 CM**3          6.29621E+03 CM**3
              2          413        7.83619E+02 CM**3          7.07983E+03 CM**3
```

350	1	414	3.10016E+03 CM**3	6.29621E+03 CM**3
	2	415	7.83619E+02 CM**3	7.07983E+03 CM**3
351	1	416	3.10016E+03 CM**3	6.29621E+03 CM**3
	2	417	7.83619E+02 CM**3	7.07983E+03 CM**3
352	1	418	3.10016E+03 CM**3	6.29621E+03 CM**3
	2	419	7.83619E+02 CM**3	7.07983E+03 CM**3
353	1	420	3.10016E+03 CM**3	6.29621E+03 CM**3
	2	421	7.83619E+02 CM**3	7.07983E+03 CM**3
354	1	422	3.10016E+03 CM**3	6.29621E+03 CM**3
	2	423	7.83619E+02 CM**3	7.07983E+03 CM**3
401	1	424	1.46220E+04 CM**3	6.41808E+04 CM**3
	2	425	9.28867E+02 CM**3	6.51097E+04 CM**3
402	1	426	6.16764E+00 CM**3	6.16764E+00 CM**3
403	1	427	1.04209E+03 CM**3	1.08527E+03 CM**3
404	1	428	6.81699E+03 CM**3	4.04900E+05 CM**3
405	1	429	0.00000E+00 CM**3	4.04900E+05 CM**3
	2	430	9.69190E+04 CM**3	5.01819E+05 CM**3
	3	431	1.06970E+06 CM**3	1.57152E+06 CM**3
	4	432	2.99966E+05 CM**3	1.87148E+06 CM**3
	5	433	1.52801E+06 CM**3	3.39950E+06 CM**3
	6	434	8.33038E+04 CM**3	3.48280E+06 CM**3
	7	435	9.51639E+05 CM**3	4.43444E+06 CM**3
406	1	436	1.17210E+05 CM**3	1.17210E+05 CM**3
	2	437	1.00916E+05 CM**3	2.18126E+05 CM**3
	3	438	4.67352E+03 CM**3	2.22799E+05 CM**3
	4	439	6.08776E+04 CM**3	2.83677E+05 CM**3
407	1	440	1.66245E+04 CM**3	1.66245E+04 CM**3
	2	441	9.26041E+04 CM**3	1.09229E+05 CM**3
	3	442	9.40439E+04 CM**3	2.03273E+05 CM**3
	4	443	4.67353E+03 CM**3	2.07946E+05 CM**3
	5	444	5.68191E+04 CM**3	2.64765E+05 CM**3

SURROUNDING GEOMETRY VOLUMES - GEOMETRY REGION 445 IS AN ARRAY PLACEMENT BOUNDARY REGION

408	1	445	4.98288E+06 CM**3	4.98288E+06 CM**3

UNIT	USES	REGION	MIXTURE	TOTAL VOLUME
1	35	1	3	5.93077E+04 CM**3
		2	2	9.82713E+02 CM**3
		3	1	3.19895E+03 CM**3
		4	2	1.01663E+03 CM**3
		5	3	1.59902E+04 CM**3
		6	2	1.14422E+03 CM**3
		7	1	3.71573E+03 CM**3
		8	2	1.17812E+03 CM**3
		9	3	1.83804E+04 CM**3
		10	2	1.30568E+03 CM**3
		11	1	4.23255E+03 CM**3
		12	2	1.33960E+03 CM**3
		13	3	2.07705E+04 CM**3
		14	2	1.46718E+03 CM**3
		15	1	4.74934E+03 CM**3
		16	2	1.49510E+03 CM**3
2	70	1	3	2.77610E+03 CM**3
		2	2	2.43324E+02 CM**3
		3	3	7.48477E+02 CM**3
		4	2	2.82633E+02 CM**3
		5	3	8.60358E+02 CM**3
		6	2	3.21941E+02 CM**3
		7	3	9.72238E+02 CM**3
		8	2	3.60970E+02 CM**3
3	35	1	3	6.27678E+00 CM**3
4	14	1	4	2.47351E+04 CM**3
		2	6	1.02874E+04 CM**3
5	21	1	4	3.71026E+04 CM**3
		2	6	1.54311E+04 CM**3
6	35	1	4	2.25196E+02 CM**3
7	5	1	6	5.43563E+03 CM**3
8	90	1	7	2.07260E+03 CM**3
9	2	1	4	2.59659E+04 CM**3
		2	6	7.19502E+03 CM**3
		3	4	2.73988E+03 CM**3
10	3	1	4	3.89488E+04 CM**3
		2	6	1.07925E+04 CM**3
		3	4	4.10981E+03 CM**3
333	84	1	11	6.58222E+03 CM**3
		2	12	1.05423E+03 CM**3
		3	13	1.24272E+04 CM**3
334	7	1	11	5.48518E+02 CM**3
		2	12	8.78522E+01 CM**3
		3	13	5.17967E+02 CM**3
335	7	1	11	5.48518E+02 CM**3
		2	12	8.78522E+01 CM**3
		3	13	5.17967E+02 CM**3

336	7	1		2.23723E+04 CM**3
348	1	1	4	3.10016E+03 CM**3
		2	6	7.83619E+02 CM**3
349	1	1	4	3.10016E+03 CM**3
		2	6	7.83619E+02 CM**3
350	1	1	4	3.10016E+03 CM**3
		2	6	7.83619E+02 CM**3
351	1	1	4	3.10016E+03 CM**3
		2	6	7.83619E+02 CM**3
352	1	1	4	3.10016E+03 CM**3
		2	6	7.83619E+02 CM**3
353	1	1	4	3.10016E+03 CM**3
		2	6	7.83619E+02 CM**3
354	1	1	4	3.10016E+03 CM**3
		2	6	7.83619E+02 CM**3
401	1	1	4	1.46220E+04 CM**3
		2	4	9.28867E+02 CM**3
402	7	1	4	4.31735E+01 CM**3
403	1	1	6	1.04209E+03 CM**3
404	1	1	4	6.81699E+03 CM**3
405	1	1	4	0.00000E+00 CM**3
		2	8	9.69190E+04 CM**3
		3	5	1.06970E+06 CM**3
		4	8	2.99966E+05 CM**3
		5	9	1.52801E+06 CM**3
		6	8	8.33038E+04 CM**3
		7	9	9.51639E+05 CM**3
406	1	1	8	1.17210E+05 CM**3
		2	9	1.00916E+05 CM**3
		3	8	4.67352E+03 CM**3
		4	9	6.08776E+04 CM**3
407	1	1	5	1.66245E+04 CM**3
		2	8	9.26041E+04 CM**3
		3	9	9.40439E+04 CM**3
		4	8	4.67353E+03 CM**3
		5	9	5.68191E+04 CM**3
408	1	1		4.98288E+06 CM**3

TOTAL MIXTURE VOLUMES

MIXTURE	TOTAL VOLUME	MASS(G)
1	1.58966E+04 CM**3	3.02321E+04
2	1.11381E+04 CM**3	3.00952E+04
3	1.19812E+05 CM**3	1.19785E+05
4	1.77939E+05 CM**3	1.77899E+05
5	1.08632E+06 CM**3	1.23233E+07
6	5.56691E+04 CM**3	4.40900E+05
7	2.07260E+03 CM**3	5.60017E+03
8	6.99350E+05 CM**3	5.53885E+06
9	2.79231E+06 CM**3	2.79223E+02
11	7.67925E+03 CM**3	8.30204E+03
12	1.22993E+03 CM**3	3.32327E+03
13	1.34631E+04 CM**3	1.34601E+04

```
*********************************************************************************************************
***                                                                                                   ***
***                                       BIASING INFORMATION                                         ***
***                                                                                                   ***
***     A DEFAULT WEIGHT OF     0.500 WILL BE USED FOR ALL BIAS ID'S.                                 ***
***                                                                                                   ***
*********************************************************************************************************
```

.... 0 IO'S WERE USED IN KENO-V BEFORE TRACKING ....

.... 0.00367 MINUTES WERE USED PROCESSING DATA. ....

VOLUME FRACTION OF FISSILE MATERIAL IN THE CORE= 4.73136E-03

START TYPE 0 WAS USED.

THE NEUTRONS WERE STARTED WITH A FLAT DISTRIBUTION IN A CUBOID DEFINED BY:
+X= 1.68500E+01 -X=-1.68500E+01 +Y=-1.68500E+01 -Y= 1.68500E+01 +Z= 4.73350E+02 -Z= 2.66700E+01

GENERATION	GENERATION K-EFFECTIVE	ELAPSED TIME MINUTES	AVERAGE K-EFFECTIVE	AVG K-EFF DEVIATION	MATRIX K-EFFECTIVE	MATRIX K-EFF DEVIATION
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	827 INDEPENDENT FISSION POINTS WERE GENERATED			
1	7.50359E-01	5.93167E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	860 INDEPENDENT FISSION POINTS WERE GENERATED			
2	7.82334E-01	5.96833E-01	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
KENO MESSAGE NUMBER K5-132		WARNING....ONLY	875 INDEPENDENT FISSION POINTS WERE GENERATED			
3	7.83747E-01	6.01333E-01	7.83747E-01	0.00000E+00	0.00000E+00	0.00000E+00
4	7.45056E-01	6.05000E-01	7 64402E-01	1.93453E-02	0.00000E+00	0.00000E+00
5	8.19328E-01	6.08667E-01	7.82710E-01	2.14466E-02	0.00000E+00	0.00000E+00
6	8.47645E-01	6.12333E-01	7.98944E-01	2.22152E-02	0.00000E+00	0.00000E+00
7	7.94256E-01	6.17000E-01	7.98006E-01	1.72333E-02	0.00000E+00	0.00000E+00
8	8.09936E-01	6.20667E-01	7.99995E-01	1.42107E-02	0.00000E+00	0.00000E+00
9	7.71958E-01	6.24333E-01	7.95989E-01	1.26605E-02	0.00000E+00	0.00000E+00
10	7.74480E-01	6.28000E-01	7.93301E-01	1.12892E-02	0.00000E+00	0.00000E+00
11	8.11229E-01	6.31667E-01	7.95293E-01	1.01535E-02	0.00000E+00	0.00000E+00
12	8.29979E-01	6.36167E-01	7.98761E-01	9.72141E-03	0.00000E+00	0.00000E+00
13	7.63073E-01	6.39833E-01	7.95517E-01	9.37277E-03	0.00000E+00	0.00000E+00

14	8.03280E-01	6.43500E-01	7.96164E-01	8.58055E-03	0.00000E+00	0.00000E+00
15	8.34718E-01	6.47167E-01	7.99130E-01	8.43174E-03	0.00000E+00	0.00000E+00
16	7.79338E-01	6.50833E-01	7.97716E-01	7.93325E-03	0.00000E+00	0.00000E+00
17	7.93468E-01	6.55333E-01	7.97433E-01	7.39088E-03	0.00000E+00	0.00000E+00
18	7.71581E-01	6.59000E-01	7.95817E-01	7.09983E-03	0.00000E+00	0.00000E+00
19	8.34116E-01	6.62667E-01	7.98070E-01	7.03937E-03	0.00000E+00	0.00000E+00
20	8.09109E-01	6.66333E-01	7.98683E-01	6.66505E-03	0.00000E+00	0.00000E+00
21	7.92570E-01	6.71000E-01	7.98361E-01	6.31271E-03	0.00000E+00	0.00000E+00
22	7.75841E-01	6.74667E-01	7.97235E-01	6.09371E-03	0.00000E+00	0.00000E+00
23	8.25693E-01	6.78333E-01	7.98590E-01	5.95257E-03	0.00000E+00	0.00000E+00
24	8.13923E-01	6.82000E-01	7.99287E-01	5.71818E-03	0.00000E+00	0.00000E+00
25	8.14694E-01	6.86500E-01	7.99957E-01	5.50482E-03	0.00000E+00	0.00000E+00
26	7.65619E-01	6.90167E-01	7.98527E-01	5.46121E-03	0.00000E+00	0.00000E+00
27	7.77418E-01	6.93833E-01	7.97682E-01	5.30583E-03	0.00000E+00	0.00000E+00
28	7.64078E-01	6.97500E-01	7.96390E-01	5.25897E-03	0.00000E+00	0.00000E+00
29	8.07263E-01	7.01167E-01	7.96792E-01	5.07644E-03	0.00000E+00	0.00000E+00
30	7.78546E-01	7.04833E-01	7.96141E-01	4.93499E-03	0.00000E+00	0.00000E+00
31	7.81461E-01	7.08500E-01	7.95635E-01	4.78861E-03	0.00000E+00	0.00000E+00
32	7.91193E-01	7.13000E-01	7.95486E-01	4.62861E-03	0.00000E+00	0.00000E+00
33	8.64093E-01	7.16667E-01	7.97700E-01	4.99397E-03	0.00000E+00	0.00000E+00
34	8.21471E-01	7.20333E-01	7.98442E-01	4.89212E-03	0.00000E+00	0.00000E+00
35	8.04735E-01	7.24000E-01	7.98633E-01	4.74539E-03	0.00000E+00	0.00000E+00
36	7.80656E-01	7.27667E-01	7.98104E-01	4.63397E-03	0.00000E+00	0.00000E+00
37	7.99842E-01	7.31333E-01	7.98154E-01	4.49990E-03	0.00000E+00	0.00000E+00
38	7.88168E-01	7.36000E-01	7.97877E-01	4.38190E-03	0.00000E+00	0.00000E+00
39	8.41407E-01	7.39667E-01	7.99053E-01	4.42123E-03	0.00000E+00	0.00000E+00
40	7.72077E-01	7.43333E-01	7.98343E-01	4.36148E-03	0.00000E+00	0.00000E+00

.
.
.
.

1182	8.31447E-01	5.00367E+00	8.09463E-01	7.36443E-04	0.00000E+00	0.00000E+00
1183	8.14944E-01	5.00733E+00	8.09468E-01	7.35834E-04	0.00000E+00	0.00000E+00
1184	8.34418E-01	5.01100E+00	8.09489E-01	7.35514E-04	0.00000E+00	0.00000E+00
1185	7.81893E-01	5.01467E+00	8.09465E-01	7.35262E-04	0.00000E+00	0.00000E+00
1186	8.35161E-01	5.01833E+00	8.09487E-01	7.34962E-04	0.00000E+00	0.00000E+00
1187	8.09147E-01	5.02200E+00	8.09487E-01	7.34341E-04	0.00000E+00	0.00000E+00
1188	8.55458E-01	5.02567E+00	8.09526E-01	7.34745E-04	0.00000E+00	0.00000E+00
1189	7.93934E-01	5.02933E+00	8.09512E-01	7.34243E-04	0.00000E+00	0.00000E+00
1190	8.42446E-01	5.03300E+00	8.09540E-01	7.34148E-04	0.00000E+00	0.00000E+00
1191	7.91687E-01	5.03667E+00	8.09525E-01	7.33684E-04	0.00000E+00	0.00000E+00
1192	8.02959E-01	5.04117E+00	8.09520E-01	7.33088E-04	0.00000E+00	0.00000E+00
1193	8.37834E-01	5.04483E+00	8.09543E-01	7.32858E-04	0.00000E+00	0.00000E+00
1194	8.27174E-01	5.04850E+00	8.09558E-01	7.32393E-04	0.00000E+00	0.00000E+00
1195	8.29739E-01	5.05217E+00	8.09575E-01	7.31974E-04	0.00000E+00	0.00000E+00
1196	8.09184E-01	5.05583E+00	8.09575E-01	7.31361E-04	0.00000E+00	0.00000E+00
1197	8.45144E-01	5.05950E+00	8.09605E-01	7.31354E-04	0.00000E+00	0.00000E+00
1198	7.82475E-01	5.06317E+00	8.09582E-01	7.31095E-04	0.00000E+00	0.00000E+00
1199	8.24244E-01	5.06683E+00	8.09594E-01	7.30586E-04	0.00000E+00	0.00000E+00
1200	8.19320E-01	5.07050E+00	8.09602E-01	7.30021E-04	0.00000E+00	0.00000E+00
1201	7.87654E-01	5.07417E+00	8.09584E-01	7.29642E-04	0.00000E+00	0.00000E+00
1202	8.18055E-01	5.07783E+00	8.09591E-01	7.29068E-04	0.00000E+00	0.00000E+00
1203	8.37256E-01	5.08150E+00	8.09614E-01	7.28825E-04	0.00000E+00	0.00000E+00

KENO MESSAGE NUMBER K5-123 EXECUTION TERMINATED DUE TO COMPLETION OF THE SPECIFIED NUMBER OF GENERATIONS.

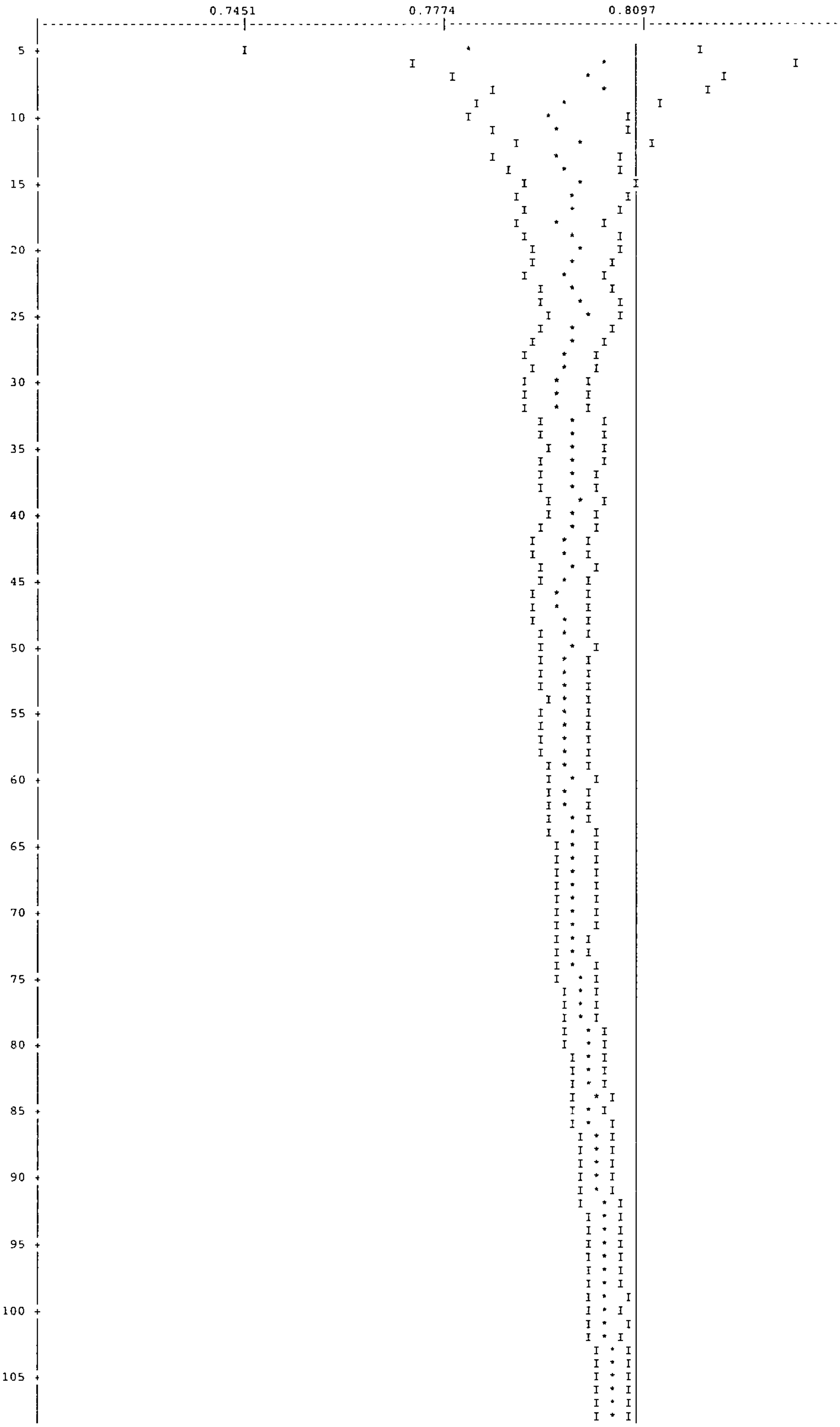
LIFETIME = 9.36018E-05 + OR - 1.03393E-07 GENERATION TIME = 6.57371E-05 + OR - 8.96054E-08
NU BAR = 2.41961E+00 + OR - 5.68813E-06 AVERAGE FISSION GROUP = 2.41990E+01 + OR - 2.98182E-03
ENERGY(EV) OF THE AVERAGE LETHARGY CAUSING FISSION = 4.07645E-02 + OR - 1.06361E-04

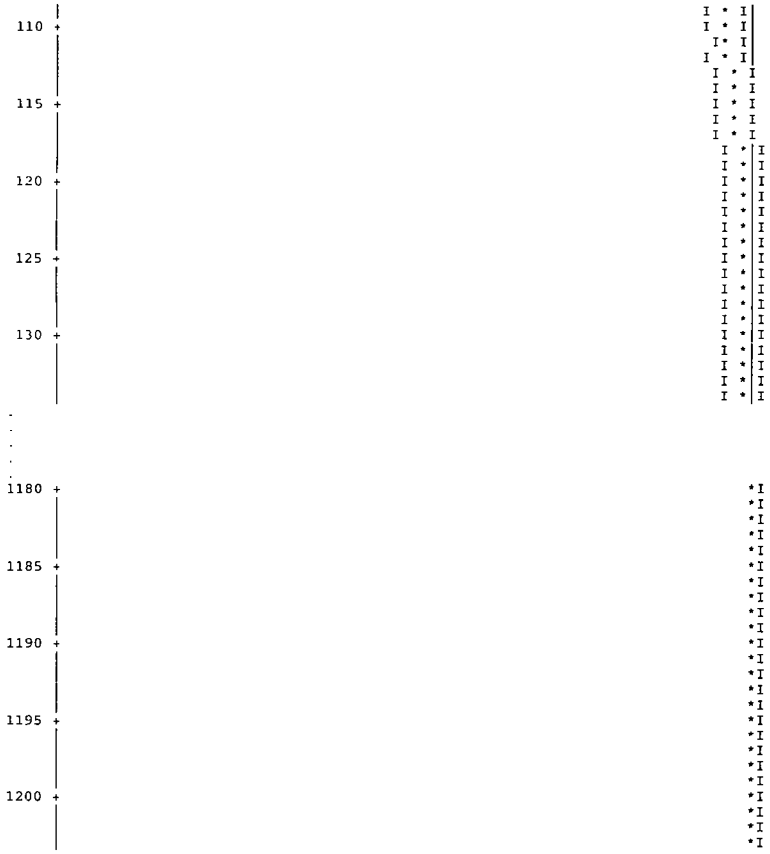
NO. OF INITIAL GENERATIONS SKIPPED	AVERAGE K-EFFECTIVE	DEVIATION	67 PER CENT CONFIDENCE INTERVAL	95 PER CENT CONFIDENCE INTERVAL	99 PER CENT CONFIDENCE INTERVAL	NUMBER OF HISTORIES
3	0.80964	+ OR - 0.00073	0.80891 TO 0.81036	0.80818 TO 0.81109	0.80745 TO 0.81182	1200000
4	0.80969	+ OR - 0.00073	0.80896 TO 0.81042	0.80823 TO 0.81114	0.80751 TO 0.81187	1199000
5	0.80968	+ OR - 0.00073	0.80895 TO 0.81041	0.80822 TO 0.81114	0.80750 TO 0.81187	1198000
6	0.80965	+ OR - 0.00073	0.80892 TO 0.81038	0.80819 TO 0.81111	0.80747 TO 0.81183	1197000
7	0.80966	+ OR - 0.00073	0.80893 TO 0.81039	0.80821 TO 0.81112	0.80748 TO 0.81185	1196000
8	0.80966	+ OR - 0.00073	0.80893 TO 0.81039	0.80820 TO 0.81112	0.80747 TO 0.81185	1195000
9	0.80969	+ OR - 0.00073	0.80896 TO 0.81042	0.80824 TO 0.81115	0.80751 TO 0.81188	1194000
10	0.80972	+ OR - 0.00073	0.80899 TO 0.81045	0.80826 TO 0.81118	0.80754 TO 0.81191	1193000
11	0.80972	+ OR - 0.00073	0.80899 TO 0.81045	0.80826 TO 0.81118	0.80753 TO 0.81191	1192000
12	0.80971	+ OR - 0.00073	0.80897 TO 0.81044	0.80824 TO 0.81117	0.80751 TO 0.81190	1191000
17	0.80977	+ OR - 0.00073	0.80904 TO 0.81050	0.80831 TO 0.81123	0.80757 TO 0.81196	1186000
22	0.80982	+ OR - 0.00073	0.80909 TO 0.81056	0.80836 TO 0.81129	0.80763 TO 0.81202	1181000
27	0.80987	+ OR - 0.00073	0.80913 TO 0.81060	0.80840 TO 0.81134	0.80766 TO 0.81207	1176000
32	0.80998	+ OR - 0.00074	0.80924 TO 0.81071	0.80851 TO 0.81145	0.80777 TO 0.81218	1171000
37	0.80996	+ OR - 0.00074	0.80922 TO 0.81069	0.80849 TO 0.81143	0.80775 TO 0.81217	1166000

.
.
.
.

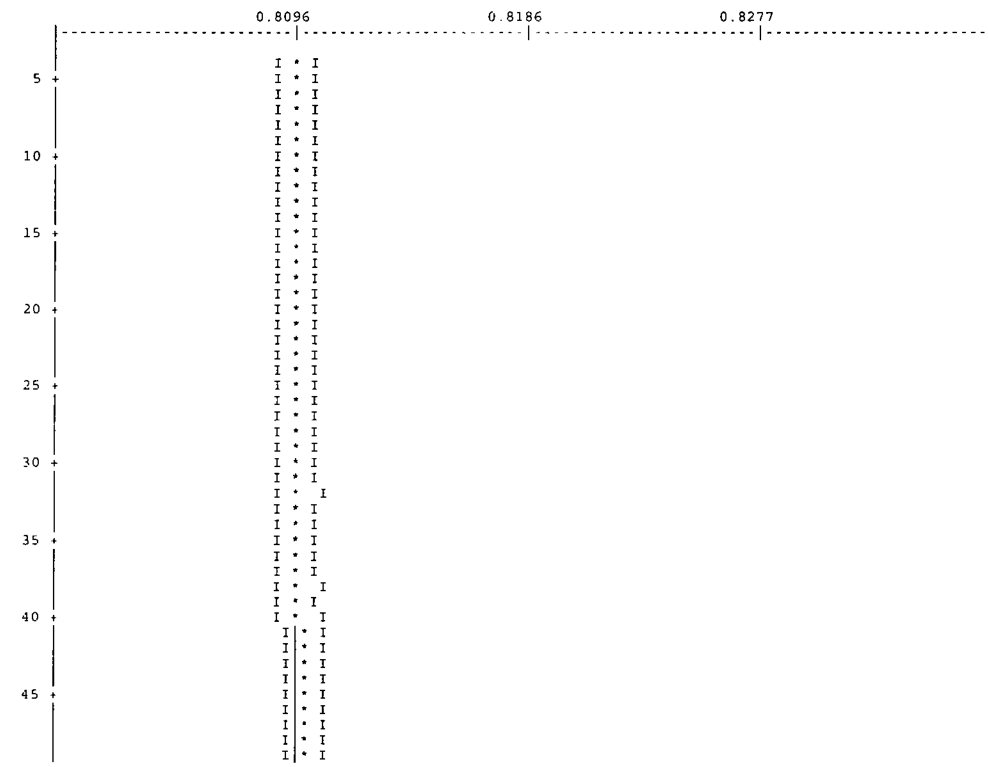
1177	0.81530	+ OR - 0.00452	0.81078 TO 0.81982	0.80626 TO 0.82434	0.80174 TO 0.82886	26000
1182	0.81810	+ OR - 0.00475	0.81335 TO 0.82285	0.80860 TO 0.82760	0.80385 TO 0.83235	21000
1187	0.81904	+ OR - 0.00559	0.81344 TO 0.82463	0.80785 TO 0.83022	0.80226 TO 0.83581	16000
1192	0.81983	+ OR - 0.00602	0.81380 TO 0.82585	0.80778 TO 0.83187	0.80176 TO 0.83789	11000
1197	0.81150	+ OR - 0.00883	0.80267 TO 0.82033	0.79383 TO 0.82917	0.78500 TO 0.83800	6000

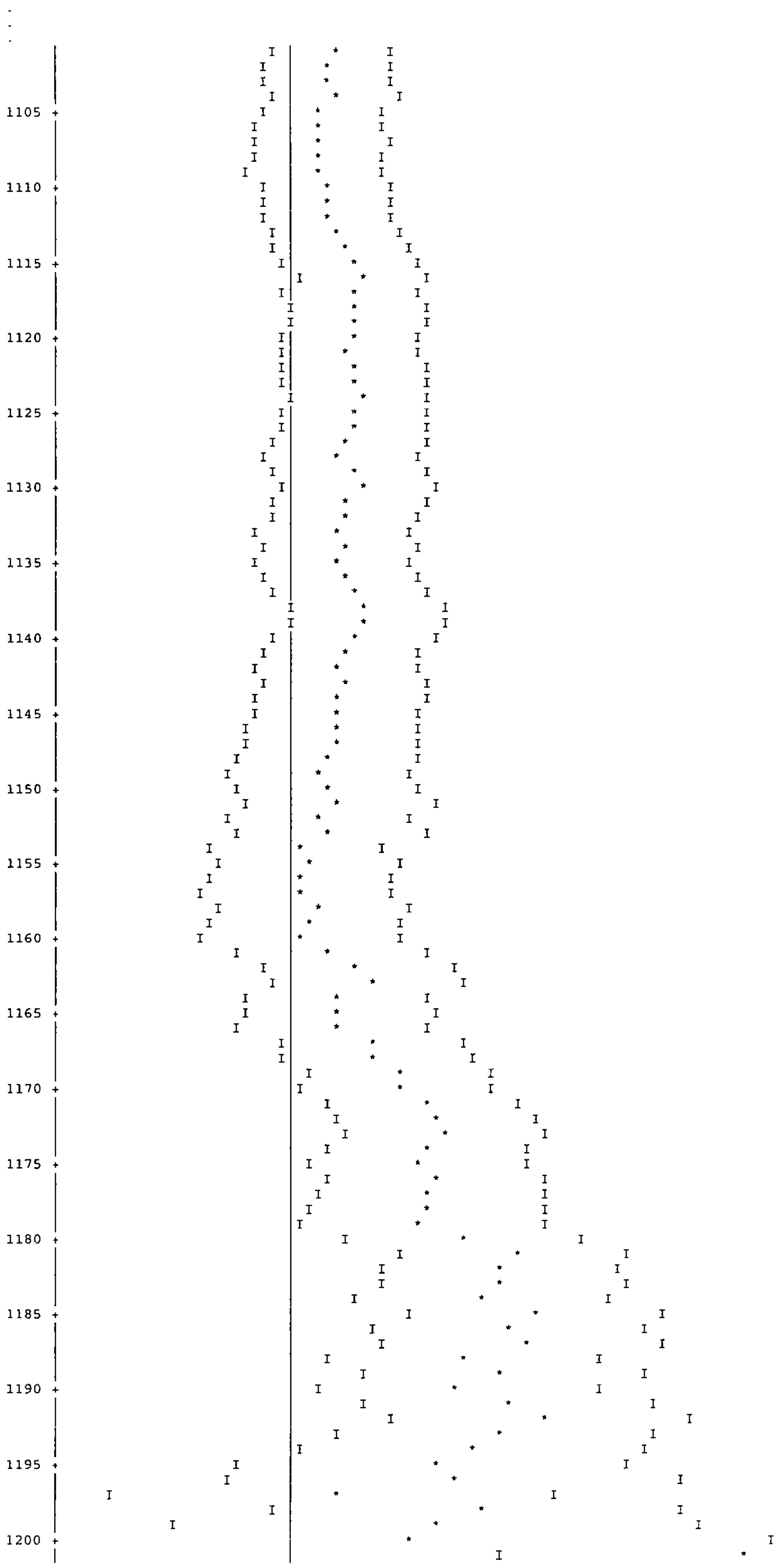
PLOT OF AVERAGE K-EFFECTIVE BY GENERATION RUN.
THE LINE REPRESENTS K-EFF = 0.8096 + OR - 0.0007 WHICH OCCURS FOR 1203 GENERATIONS RUN.





PLOT OF AVERAGE K-EFFECTIVE BY GENERATION SKIPPED.
THE LINE REPRESENTS K-EFF = 0.8097 + OR - 0.0007 WHICH OCCURS FOR 4 GENERATIONS SKIPPED.





SKIPPING 3 GENERATIONS

FREQUENCY FOR GENERATIONS 4 TO 1203

0.7286 TO 0.7319 *

```
0.7319 TO 0.7351
0.7351 TO 0.7384     *
0.7384 TO 0.7416     *
0.7416 TO 0.7449
0.7449 TO 0.7481     ***
0.7481 TO 0.7514     *****
0.7514 TO 0.7546     *******
0.7546 TO 0.7578     ******
0.7578 TO 0.7611     *******
0.7611 TO 0.7643     *************
0.7643 TO 0.7676     ***********
0.7676 TO 0.7708     *****************
0.7708 TO 0.7741     *****************************
0.7741 TO 0.7773     ********************
0.7773 TO 0.7806     ***********************************
0.7806 TO 0.7838     ***********************************
0.7838 TO 0.7871     *************************************
0.7871 TO 0.7903     ****************************************
0.7903 TO 0.7936     ********************************************
0.7936 TO 0.7968     ***********************************************
0.7968 TO 0.8001     ********************************************************
0.8001 TO 0.8033     **************************************************************
0.8033 TO 0.8066     ***************************************************
0.8066 TO 0.8098     **************************************************************
0.8098 TO 0.8130     *******************************************************************
0.8130 TO 0.8163     **************************************************************
0.8163 TO 0.8195     **************************************************************
0.8195 TO 0.8228     *************************************************************
0.8228 TO 0.8260     ***************************************************************
0.8260 TO 0.8293     **************************************************
0.8293 TO 0.8325     ***************************************
0.8325 TO 0.8358     *************************************
0.8358 TO 0.8390     ********************************
0.8390 TO 0.8423     *****************************
0.8423 TO 0.8455     *********************
0.8455 TO 0.8488     ****************
0.8488 TO 0.8520     ***************
0.8520 TO 0.8553     ************
0.8553 TO 0.8585     *************
0.8585 TO 0.8617     ****
0.8617 TO 0.8650     *********
0.8650 TO 0.8682     ***
0.8682 TO 0.8715     ***
0.8715 TO 0.8747     ***
0.8747 TO 0.8780     ***
0.8780 TO 0.8812
0.8812 TO 0.8845     *
0.8845 TO 0.8877     *
0.8877 TO 0.8910     *
0.8910 TO 0.8942
0.8942 TO 0.8975
0.8975 TO 0.9007     *
0.9007 TO 0.9040     *
0.9040 TO 0.9072
0.9072 TO 0.9105
0.9105 TO 0.9137
0.9137 TO 0.9169
0.9169 TO 0.9202     *

                               FREQUENCY FOR GENERATIONS  304 TO 1203
0.7286 TO 0.7319     *
0.7319 TO 0.7351
0.7351 TO 0.7384     *
0.7384 TO 0.7416     *
0.7416 TO 0.7449
0.7449 TO 0.7481     *
0.7481 TO 0.7514     ****
0.7514 TO 0.7546     *****
0.7546 TO 0.7578     ***
0.7578 TO 0.7611     *****
0.7611 TO 0.7643     ***********
0.7643 TO 0.7676     *********
0.7676 TO 0.7708     *********
0.7708 TO 0.7741     *******************
0.7741 TO 0.7773     **************
0.7773 TO 0.7806     *************************
0.7806 TO 0.7838     **************************
0.7838 TO 0.7871     **************************
0.7871 TO 0.7903     ********************************
0.7903 TO 0.7936     *******************************
0.7936 TO 0.7968     *********************************
0.7968 TO 0.8001     *******************************************
0.8001 TO 0.8033     **********************************************
0.8033 TO 0.8066     ************************************
0.8066 TO 0.8098     *************************************************
0.8098 TO 0.8130     ******************************************************
0.8130 TO 0.8163     *************************************************
0.8163 TO 0.8195     **********************************************
0.8195 TO 0.8228     **********************************************
0.8228 TO 0.8260     ************************************************
0.8260 TO 0.8293     ****************************************
0.8293 TO 0.8325     *******************************
0.8325 TO 0.8358     ***************************
0.8358 TO 0.8390     ************************
0.8390 TO 0.8423     *********************
0.8423 TO 0.8455     *****************
0.8455 TO 0.8488     *********
0.8488 TO 0.8520     **********
0.8520 TO 0.8553     ************
0.8553 TO 0.8585     ***********
0.8585 TO 0.8617     ****
0.8617 TO 0.8650     *******
0.8650 TO 0.8682     **
0.8682 TO 0.8715     ***
0.8715 TO 0.8747     **
0.8747 TO 0.8780     ***
0.8780 TO 0.8812
0.8812 TO 0.8845     *
0.8845 TO 0.8877
```

```
0.8877 TO 0.8910     *
0.8910 TO 0.8942
0.8942 TO 0.8975
0.8975 TO 0.9007
0.9007 TO 0.9040     *
0.9040 TO 0.9072
0.9072 TO 0.9105
0.9105 TO 0.9137
0.9137 TO 0.9169
0.9169 TO 0.9202     *


                     FREQUENCY FOR GENERATIONS  604 TO 1203
0.7286 TO 0.7319
0.7319 TO 0.7351
0.7351 TO 0.7384     *
0.7384 TO 0.7416
0.7416 TO 0.7449
0.7449 TO 0.7481     *
0.7481 TO 0.7514     **
0.7514 TO 0.7546     ****
0.7546 TO 0.7578     ***
0.7578 TO 0.7611     **
0.7611 TO 0.7643     ******
0.7643 TO 0.7676     ****
0.7676 TO 0.7708     ******
0.7708 TO 0.7741     *************
0.7741 TO 0.7773     ***********
0.7773 TO 0.7806     ******************
0.7806 TO 0.7838     *****************
0.7838 TO 0.7871     ****************
0.7871 TO 0.7903     *********************
0.7903 TO 0.7936     ************************
0.7936 TO 0.7968     **************************
0.7968 TO 0.8001     ************************
0.8001 TO 0.8033     **************************
0.8033 TO 0.8066     ***********************
0.8066 TO 0.8098     *********************************
0.8098 TO 0.8130     *************************************
0.8130 TO 0.8163     ***************************
0.8163 TO 0.8195     *****************************
0.8195 TO 0.8228     *****************************
0.8228 TO 0.8260     ********************************
0.8260 TO 0.8293     ****************************
0.8293 TO 0.8325     *******************
0.8325 TO 0.8358     ******************
0.8358 TO 0.8390     *******************
0.8390 TO 0.8423     **************
0.8423 TO 0.8455     **************
0.8455 TO 0.8488     *****
0.8488 TO 0.8520     *******
0.8520 TO 0.8553     *********
0.8553 TO 0.8585     ********
0.8585 TO 0.8617     ***
0.8617 TO 0.8650     *******
0.8650 TO 0.8682     **
0.8682 TO 0.8715     ***
0.8715 TO 0.8747     **
0.8747 TO 0.8780     ***
0.8780 TO 0.8812
0.8812 TO 0.8845     *
0.8845 TO 0.8877
0.8877 TO 0.8910     *
0.8910 TO 0.8942
0.8942 TO 0.8975
0.8975 TO 0.9007
0.9007 TO 0.9040     *
0.9040 TO 0.9072
0.9072 TO 0.9105
0.9105 TO 0.9137
0.9137 TO 0.9169
0.9169 TO 0.9202     *


                     FREQUENCY FOR GENERATIONS  904 TO 1203
0.7286 TO 0.7319
0.7319 TO 0.7351
0.7351 TO 0.7384     *
0.7384 TO 0.7416
0.7416 TO 0.7449
0.7449 TO 0.7481     *
0.7481 TO 0.7514     *
0.7514 TO 0.7546     ***
0.7546 TO 0.7578     **
0.7578 TO 0.7611     *
0.7611 TO 0.7643     **
0.7643 TO 0.7676     ***
0.7676 TO 0.7708     ****
0.7708 TO 0.7741     ******
0.7741 TO 0.7773     ******
0.7773 TO 0.7806     *********
0.7806 TO 0.7838     *********
0.7838 TO 0.7871     *******
0.7871 TO 0.7903     ************
0.7903 TO 0.7936     *************
0.7936 TO 0.7968     ************
0.7968 TO 0.8001     ********
0.8001 TO 0.8033     *************
0.8033 TO 0.8066     **********
0.8066 TO 0.8098     ****************
0.8098 TO 0.8130     *************
0.8130 TO 0.8163     ***********
0.8163 TO 0.8195     ***************
0.8195 TO 0.8228     ************
0.8228 TO 0.8260     ***************
0.8260 TO 0.8293     *************
0.8293 TO 0.8325     **********
0.8325 TO 0.8358     ***********
0.8358 TO 0.8390     **************
0.8390 TO 0.8423     ***********
```

```
0.8423 TO 0.8455      **********
0.8455 TO 0.8488      **
0.8488 TO 0.8520      ***
0.8520 TO 0.8553      ****
0.8553 TO 0.8585      *****
0.8585 TO 0.8617      **
0.8617 TO 0.8650      ****
0.8650 TO 0.8682
0.8682 TO 0.8715
0.8715 TO 0.8747      *
0.8747 TO 0.8780      ***
0.8780 TO 0.8812
0.8812 TO 0.8845
0.8845 TO 0.8877
0.8877 TO 0.8910      *
0.8910 TO 0.8942
0.8942 TO 0.8975
0.8975 TO 0.9007
0.9007 TO 0.9040
0.9040 TO 0.9072
0.9072 TO 0.9105
0.9105 TO 0.9137
0.9137 TO 0.9169
0.9169 TO 0.9202      *
```

6.6.17 SLOWPOKE Fuel MCNP Input

This section contains sample input files from the evaluation of SLOWPOKE fuel elements in the LWT cask. The input files are shown in Figures 6.6.17-1 and 6.6.17-2.

Figure 6.6.17-1 Maximum Reactivity Input for Undamaged SLOWPOKE Fuel

```
NAC-LWT Cask - Accident Transport Conditions
C SlowPoke Fuel - Fuel in Aluminum Tubes
C Fuel Assembly Cells
1  1  -3.4570  -1  2  -3        u=8  $ Fuel Meat
2  2  -2.7000  -4  1  +2  -3    u=8  $ Clad
3  2  -2.7000  -5  3          u=8  $ Top Cap
4  2  -2.7000  -5  -2          u=8  $ Bottom Cap
5  3  -0.9982  #1 #2 #3 #4          u=8  $ Outside Rod
C Canister Related Cells
c Aluminum Tubes - Centerered
31  3  -0.9982  -31          u=7  $ Tube ID
32  5  -2.7000  -32  +31        u=7  $ Tube OD
33  3  -0.9982  32          u=7  $ Outside Tube
c Tube array
41  3  -0.9982  -33  +34  -35  +36      $ Tube Array
       trcl=(0 0 0.635)      lat=1  u=6  fill=-3:3 -3:3 0:0
       6  6  6  6  6  6  6
       6  7  7  7  7  7  6
       6  7  7  7  7  7  6
       6  7  7  7  7  7  6
       6  7  7  7  7  7  6
       6  7  7  7  7  7  6
       6  6  6  6  6  6  6
51  5  -2.7000  -38  -37        u=5  $ Base Plate for Array
52  3  -0.9982  -41  fill=8  trcl = ( -2.6834 2.6834 0.6351 )     u=5  $ Fuel Rod 1
53  like  52  but  fill=8  trcl = ( -1.4134 2.6834 0.6351 )     u=5  $ Fuel Rod 2
54  like  52  but  fill=8  trcl = ( 0.0000 2.7429 0.6351 )     u=5  $ Fuel Rod 3
55  like  52  but  fill=8  trcl = ( 1.4134 2.6834 0.6351 )     u=5  $ Fuel Rod 4
56  like  52  but  fill=8  trcl = ( 2.6834 2.6834 0.6351 )     u=5  $ Fuel Rod 5
57  like  52  but  fill=8  trcl = ( -2.6834 1.4134 0.6351 )     u=5  $ Fuel Rod 6
58  like  52  but  fill=8  trcl = ( -1.4134 1.4134 0.6351 )     u=5  $ Fuel Rod 7
59  like  52  but  fill=8  trcl = ( 0.0000 1.4729 0.6351 )     u=5  $ Fuel Rod 8
60  like  52  but  fill=8  trcl = ( 1.4134 1.4134 0.6351 )     u=5  $ Fuel Rod 9
61  like  52  but  fill=8  trcl = ( 2.6834 1.4134 0.6351 )     u=5  $ Fuel Rod 10
62  like  52  but  fill=8  trcl = ( -2.7429 0.0000 0.6351 )     u=5  $ Fuel Rod 11
63  like  52  but  fill=8  trcl = ( -1.4729 0.0000 0.6351 )     u=5  $ Fuel Rod 12
64  like  52  but  fill=8  trcl = ( 0.0000 0.0000 0.6351 )     u=5  $ Fuel Rod 13
65  like  52  but  fill=8  trcl = ( 1.4729 0.0000 0.6351 )     u=5  $ Fuel Rod 14
66  like  52  but  fill=8  trcl = ( 2.7429 0.0000 0.6351 )     u=5  $ Fuel Rod 15
67  like  52  but  fill=8  trcl = ( -2.6834 -1.4134 0.6351 )     u=5  $ Fuel Rod 16
68  like  52  but  fill=8  trcl = ( -1.4134 -1.4134 0.6351 )     u=5  $ Fuel Rod 17
69  like  52  but  fill=8  trcl = ( 0.0000 -1.4729 0.6351 )     u=5  $ Fuel Rod 18
70  like  52  but  fill=8  trcl = ( 1.4134 -1.4134 0.6351 )     u=5  $ Fuel Rod 19
71  like  52  but  fill=8  trcl = ( 2.6834 -1.4134 0.6351 )     u=5  $ Fuel Rod 20
72  like  52  but  fill=8  trcl = ( -2.6834 -2.6834 0.6351 )     u=5  $ Fuel Rod 21
73  like  52  but  fill=8  trcl = ( -1.4134 -2.6834 0.6351 )     u=5  $ Fuel Rod 22
74  like  52  but  fill=8  trcl = ( 0.0000 -2.7429 0.6351 )     u=5  $ Fuel Rod 23
75  like  52  but  fill=8  trcl = ( 1.4134 -2.6834 0.6351 )     u=5  $ Fuel Rod 24
76  like  52  but  fill=8  trcl = ( 2.6834 -2.6834 0.6351 )     u=5  $ Fuel Rod 25
77  3  -0.9982  -38  +37
                #52 #53 #54 #55 #56 #57 #58 #59 #60 #61 #62 #63 #64 #65
                #66 #67 #68 #69 #70 #71 #72 #73 #74 #75 #76
                fill=6          u=5  $ Tube Array Arround Fuel Rods
78  3  -0.9982  +38          u=5  $ Tube Array Exterior
c Canister for four tube arrays
81  5  -2.7000  -40  +39          u=4  $ Can Base and Shell
82  3  -0.9982  -38  fill=5  trcl = ( 0.0000 0.0000 0.9652 )     u=4  $ Tube Assy 1
83  like  82  but  fill=5  trcl = ( 0.0000 0.0000 25.0952 )     u=4  $ Tube Assy 2
84  like  82  but  fill=5  trcl = ( 0.0000 0.0000 49.2252 )     u=4  $ Tube Assy 3
85  like  82  but  fill=5  trcl = ( 0.0000 0.0000 73.3552 )     u=4  $ Tube Assy 4
86  3  -0.9982  -39  #82 #83 #84 #85          u=4  $ Canister Cavity
87  4  -0.0001  40          u=4  $ Canister Exterior
C Cells - MTR 7 Element Basket
91  6  -7.9400  -91  +94 +95 +96 +97 +98 +99 +100        u=3  $ Base plate
92  6  -7.9400  -92  +101 +105        u=3  $ Support plate
93  6  -7.9400  -93  +101 +105        u=3  $ Support plate
94  6  -7.9400  -101  +102  #91 #92 #93        u=3  $ Center column
95  6  -7.9400  -103  #91 #92 #93          u=3  $ Center divider upper
96  6  -7.9400  -104  #91 #92 #93          u=3  $ Center divider lower
97  6  -7.9400  -105  +106  +101  #91 #92 #93      u=3  $ Small side
98  6  -7.9400  -107  #91 #92 #93          u=3  $ Left divider
99  6  -7.9400  -108  #91 #92 #93          u=3  $ Right divider
100  4  -0.0001  #91 #92 #93 #94 #95 #96 #97 #98 #99          u=3  $ Cask Cavity Material
C Cells - Basket Cell Opening
151  4  -0.0001  -151  fill=4  trcl = ( -9.3503 4.5222 1.2700 )      u=2  $ UL
152  like  151  but    trcl = ( -9.3503 -4.5222 1.2700 )      u=2  $ LL
153  like  151  but    trcl = ( 9.3503 4.5222 1.2700 )      u=2  $ UR
154  like  151  but    trcl = ( 9.3503 -4.5222 1.2700 )      u=2  $ LR
155  4  -0.0001  #151 #152 #153 #154          fill=3  u=2  $ Basket Materials
C Cells - LWT Cavity
201  4  -0.0001  -201  fill=3  ( 0.0000 0.0000 3.8100 )      u=1
202  4  -0.0001  -202  fill=3  ( 0.0000 0.0000 115.5700 )      u=1
203  4  -0.0001  -203  fill=2  ( 0.0000 0.0000 227.3300 )      u=1
204  4  -0.0001  -204  fill=2  ( 0.0000 0.0000 339.0900 )      u=1
205  4  -0.0001  #201 #202 #203 #204          u=1
C Cells - LWT Cask Accident Conditions
301  7  -11.344  -304              $ BotPb
302  4  -0.0001  -303  fill=1          $ Cavity
303  6  -7.9400  -302  +304          $ Bottom
304  6  -7.9400  -301  +302  +306  +309  +303    $ OuterShell
305  6  -7.9400  -305  +308  +303        $ InnerShellTaper
306  6  -7.9400  -307  +303          $ InnerShell
307  7  -11.344  -308  +307          $ Lead
```

```
308  7  -11.344  -306  +305  +308        $ LeadTaper
309  0           -309  +308          $ LeadGap
310  9  -0.0001  +301  -310          $ Gap To Reflector
311  0           +310            $ Outside

C Fuel Assembly Surfaces
1  CZ  0.2110              $ Fuel Meat
2  PZ  0.4150              $ Lower Meat Elevation
3  PZ  22.4150              $ Upper Meat Elevation
4  CZ  0.2620              $ Clad
5  RCC  0.0000  0.0000  0.0000  0.0000  0.0000  22.8300  0.3051  $ Rod Outline
C Canister Surfaces
c Aluminum Tubes
31  CZ  0.5080              $ Tube ID
32  CZ  0.6350              $ Tube OD
33  PX  0.6350
34  PX  -0.6350
35  PY  0.6350
36  PY  -0.6350              $ Tube Pitch Box
c Tube array base and outer envelope
37  PZ   0.6351              $ Base Plate Top Elevation
38  RPP  -3.1750  3.1750  -3.1750  3.1750  0.0000  24.1300    $ Tube Container
c Canister for four tube arrays
39  RPP  -3.5560  3.5560  -3.5560  3.5560  0.9652  100.1776    $ Can Cavity
40  RPP  -4.1910  4.1910  -4.1910  4.1910  0.0000  101.1428    $ Can Outer
41  RCC  0.0000  0.0000  0.0000  0.0000  0.0000  22.8300  0.3050  $ Rod Outline
C Surfaces - MTR 7 Element Basket
91  RCC  0.0000  0.0000  0.0000  0.0000  0.0000  1.2700  16.8466  $ Base plate
92  RCC  0.0000  0.0000  52.0700  0.0000  0.0000  1.2700  16.8466  $ Support plate
93  RCC  0.0000  0.0000  104.1400  0.0000  0.0000  1.2700  16.8466  $ Support plate
94  CZ  1.2700              $ Hole CC
95  C/Z  0.0000  9.5250  1.2700         $ Hole UC
96  C/Z  0.0000  -9.5250  1.2700         $ Hole LC
97  C/Z  -9.5250  4.6990  1.2700         $ Hole UL
98  C/Z  -9.5250  -4.6990  1.2700         $ Hole LL
99  C/Z  9.5250  4.6990  1.2700         $ Hole UR
100  C/Z  9.5250  -4.6990  1.2700         $ Hole LR
101  RPP  -5.1604  5.1604  -14.6939  14.6939  1.2700  111.7600    $ Center column outer
102  RPP  -4.3667  4.3667  -13.9002  13.9002  1.2700  111.7600    $ Center column inner
103  RPP  -4.3667  4.3667  4.3688  5.1626  1.2700  111.7600    $ Center divider upper
104  RPP  -4.3667  4.3667  -5.1626  -4.3688  1.2700  111.7600    $ Center divider lower
105  RPP  -14.1986  14.1986  -9.3599  9.3599  1.2700  111.7600    $ Small side outer
106  RPP  -13.8938  13.8938  -9.0551  9.0551  1.2700  111.7600    $ Small side inner
107  RPP  -13.8938  -5.1604  -0.3175  0.3175  1.2700  111.7600    $ Left divider
108  RPP  5.1604  13.8938  -0.3175  0.3175  1.2700  111.7600    $ Right divider
C Surfaces - Basket Cell Opening
151  RPP  -4.1909  4.1911  -4.1909  4.1911  1.2700  111.7600    $ Opening in Basket
C Surfaces - LWT Cavity
201  RCC  0.0000  0.0000  3.8100  0.0000  0.0000  111.7600  16.8467  $ Basket
202  RCC  0.0000  0.0000  115.5700  0.0000  0.0000  111.7600  16.8467  $ Basket
203  RCC  0.0000  0.0000  227.3300  0.0000  0.0000  111.7600  16.8467  $ Basket
204  RCC  0.0000  0.0000  339.0900  0.0000  0.0000  111.7600  16.8467  $ Basket
C Surfaces - LWT Cask Accident Conditions
301  RCC  0.0000  0.0000  -26.6700  0.0000  0.0000  507.3650  36.5189  $ Lwt
302  RCC  0.0000  0.0000  -26.6700  0.0000  0.0000  26.6700  36.5189  $ Bottom
303  RCC  0.0000  0.0000  0.0000  0.0000  0.0000  452.1200  16.9863  $ Cavity
304  RCC  0.0000  0.0000  -17.7800  0.0000  0.0000  7.6200  26.3525  $ Bottom gamma shield
305  RCC  0.0000  0.0000  0.0000  0.0000  0.0000  444.5000  20.1740  $ Lead id - taper
306  RCC  0.0000  0.0000  0.0000  0.0000  0.0000  444.5000  31.5976  $ Lead od - taper
307  RCC  0.0000  0.0000  13.8176  0.0000  0.0000  416.8648  18.9103  $ Lead id
308  RCC  0.0000  0.0000  13.8176  0.0000  0.0000  416.8648  33.3271  $ Lead od
309  RCC  0.0000  0.0000  13.8176  0.0000  0.0000  416.8648  33.4645  $ Lead gap
*310  RCC  0.0000  0.0000  -27.1700  0.0000  0.0000  508.3650  37.0189  $ Container

C
C Materials List
C
C - U-Al
m1  92235  -2.6400E-01
       92238  -1.3000E-02
       13027  -7.2300E-01
C Aluminum / Clad
m2  13027  -1.0
C Canister Water
m3  1001  6.6667E-01  8016  3.3333E-01
mt3  lwtr.01
C Cask Cavity Water
m4  1001  6.6667E-01  8016  3.3333E-01
mt4  lwtr.01
C Aluminum
m5  13027  -1.0
C Stainless Steel 304
m6  26000  -0.695  24000  -0.190  28000  -0.095
       25055  -0.020
C Lead
m7  82000  -1.0
C Aluminum Honeycomb Impact Limiter
m8  13027  -1.0
C Water/Glycol - Cask Neutron Shield
m10  1001  -1.03651E-01  8016  -6.75619E-01  6000  -2.20730E-01
C Cask Exterior (Water at Various Densities)
m9  1001  6.6667E-01  8016  3.3333E-01
mt9  lwtr.01
C
C Cell Importances
imp:n 1 73r 0
c
```

```
c Criticality Controls
c
kcode  2000  1.00  30  530
c
c Source Distribution for Initial Generation
SDEF  CEL=  302:D4:D5:D6:D7:-1
       ERG=  D1
       POS=  0.0000  0.00  0.4150
       RAD=  D2
       AXS=  0.00  0.00  1.00
       EXT=  D3
C - Neutron Source Energy Source Distribution
#          SP1
       -3
C - Uniform Radial Distribution in Fuel Rod
#  SI2  SP2
       0.0000  -21
       0.2110  1
C - Axial Source Profile
#  SI3  SP3
       0  0.0
       22  1.0
C - Two Baskets With Fuel in Cask
#     SI4          SP4
           1          d
       203  1
       204  1
C - Four Openings in Basket with Fuel
#     SI5          SP5
           1          d
       151  1
       152  1
       153  1
       154  1
C - Four Tube Arrays per Canister
#     SI6          SP6
           1          d
       82  1
       83  1
       84  1
       85  1
C - 25 Fuel Rods
#     SI7          SP7
           1          d
       52  1
       53  1
       54  1
       55  1
       56  1
       57  1
       58  1
       59  1
       60  1
       61  1
       62  1
       63  1
       64  1
       65  1
       66  1
       67  1
       68  1
       69  1
       70  1
       71  1
       72  1
       73  1
       74  1
       75  1
       76  1
C Print Control
prdmp  -30 -60 1 2
print
C Random Number Generator
rand  gen=2  1.90735E+13  stride=152917  hist=1
```

Figure 6.6.17-2 Maximum Reactivity Input for Damaged SLOWPOKE Fuel

```
NAC-LWT Cask - Accident Transport Conditions
C SlowPoke Fuel - Fuel in Aluminum Tubes
C Canister Related Cells
c Aluminum Tubes - Centerered
31  1  -1.2795  -31           u=7  $ Tube ID
32  5  -2.7000  -32  +31         u=7  $ Tube OD
33  1  -1.2795  32          u=7  $ Outside Tube
c Tube array
41  1  -1.2795  -33  +34  -35  +36      $ Tube Array
       trcl=(0 0 0.635)      lat=1  u=6  fill=-3:3 -3:3 0:0
       6  6  6  6  6  6  6
       6  7  7  7  7  7  6
       6  7  7  7  7  7  6
       6  7  7  7  7  7  6
       6  7  7  7  7  7  6
       6  7  7  7  7  7  6
       6  6  6  6  6  6  6
51  5  -2.7000  -38  -37         u=5  $ Base Plate for Array
52  1  -1.2795  -38  +37
            fill=6          u=5  $ Tube Array Arround Fuel Rods
53  1  -1.2795  +38          u=5  $ Tube Array Exterior
c Canister for four tube arrays
81  5  -2.7000  -40  +39         u=4  $ Can Base and Shell
82  1  -1.2795  -38  fill=5  trcl = ( 0.0000 0.0000 0.9652 )      u=4  $ Tube Assy 1
83  like  82  but  fill=5  trcl = ( 0.0000 0.0000 25.0952 )      u=4  $ Tube Assy 2
84  like  82  but  fill=5  trcl = ( 0.0000 0.0000 49.2252 )      u=4  $ Tube Assy 3
85  like  82  but  fill=5  trcl = ( 0.0000 0.0000 73.3552 )      u=4  $ Tube Assy 4
86  1  -1.2795  -39  #82 #83 #84 #85          u=4  $ Canister Cavity
87  4  -0.0001  40          u=4  $ Canister Exterior
C Cells - MTR 7 Element Basket
91  6  -7.9400  -91  +94 +95 +96 +97 +98 +99 +100        u=3  $ Base plate
92  6  -7.9400  -92  +101 +105        u=3  $ Support plate
93  6  -7.9400  -93  +101 +105        u=3  $ Support plate
94  6  -7.9400  -101  +102  #91 #92 #93        u=3  $ Center column
95  6  -7.9400  -103  #91 #92 #93        u=3  $ Center divider upper
96  6  -7.9400  -104  #91 #92 #93        u=3  $ Center divider lower
97  6  -7.9400  -105  +106  +101  #91 #92 #93     u=3  $ Small side
98  6  -7.9400  -107  #91 #92 #93        u=3  $ Left divider
99  6  -7.9400  -108  #91 #92 #93        u=3  $ Right divider
100  4  -0.0001  #91 #92 #93 #94 #95 #96 #97 #98 #99        u=3  $ Cask Cavity Material
C Cells - Basket Cell Opening
151  4  -0.0001  -151  fill=4  trcl = ( -9.3503 4.5222 1.2700 )      u=2  $ UL
152  like  151  but    trcl = ( -9.3503 -4.5222 1.2700 )      u=2  $ LL
153  like  151  but    trcl = ( 9.3503 4.5222 1.2700 )      u=2  $ UR
154  like  151  but    trcl = ( 9.3503 -4.5222 1.2700 )      u=2  $ LR
155  4  -0.0001  #151 #152 #153 #154          fill=3  u=2  $ Basket Materials
C Cells - LWT Cavity
201  4  -0.0001  -201  fill=3  ( 0.0000 0.0000 3.8100 )      u=1
202  4  -0.0001  -202  fill=3  ( 0.0000 0.0000 115.5700 )      u=1
203  4  -0.0001  -203  fill=2  ( 0.0000 0.0000 227.3300 )      u=1
204  4  -0.0001  -204  fill=2  ( 0.0000 0.0000 339.0900 )      u=1
205  4  -0.0001  #201 #202 #203 #204          u=1
C Cells - LWT Cask Accident Conditions
301  7  -11.344  -304             $ BotPb
302  4  -0.0001  -303  fill=1          $ Cavity
303  6  -7.9400  -302  +304           $ Bottom
304  6  -7.9400  -301  +302  +306  +309  +303    $ OuterShell
305  6  -7.9400  -305  +308  +303         $ InnerShellTaper
306  6  -7.9400  -307  +303            $ InnerShell
307  7  -11.344  -308  +307            $ Lead
308  7  -11.344  -306  +305  +308          $ LeadTaper
309  0           -309  +308            $ LeadGap
310  9  -0.0001  +301  -310            $ Gap To Reflector
311  0           +310             $ Outside

C Canister Surfaces
c Aluminum Tubes
31  CZ  0.5080             $ Tube ID
32  CZ  0.6350             $ Tube OD
33  PX  0.6350
34  PX  -0.6350
35  PY  0.6350
36  PY  -0.6350             $ Tube Pitch Box
c Tube array base and outer envelope
37  PZ   0.6351             $ Base Plate Top Elevation
38  RPP  -3.1750  3.1750  -3.1750  3.1750  0.0000  24.1300    $ Tube Container
c Canister for four tube arrays
39  RPP  -3.5560  3.5560  -3.5560  3.5560  0.9652  100.1776    $ Can Cavity
40  RPP  -4.1910  4.1910  -4.1910  4.1910  0.0000  101.1428    $ Can Outer
41  RCC  0.0000  0.0000  0.0000  0.0000  0.0000  22.8300  0.3050  $ Rod Outline
C Surfaces - MTR 7 Element Basket
91  RCC  0.0000  0.0000  0.0000  0.0000  0.0000  1.2700  16.8466  $ Base plate
92  RCC  0.0000  0.0000  52.0700  0.0000  0.0000  1.2700  16.8466  $ Support plate
93  RCC  0.0000  0.0000  104.1400  0.0000  0.0000  1.2700  16.8466  $ Support plate
94  CZ  1.2700              $ Hole CC
95  C/Z  0.0000  9.5250  1.2700          $ Hole UC
96  C/Z  0.0000  -9.5250  1.2700          $ Hole LC
97  C/Z  -9.5250  4.6990  1.2700          $ Hole UL
98  C/Z  -9.5250  -4.6990  1.2700          $ Hole LL
99  C/Z  9.5250  4.6990  1.2700          $ Hole UR
100  C/Z  9.5250  -4.6990  1.2700          $ Hole LR
101  RPP  -5.1604  5.1604  -14.6939  14.6939  1.2700  111.7600    $ Center column outer
102  RPP  -4.3667  4.3667  -13.9002  13.9002  1.2700  111.7600    $ Center column inner
```

```
103  RPP  -4.3667  4.3667  4.3688  5.1626  1.2700  111.7600    $ Center divider upper
104  RPP  -4.3667  4.3667  -5.1626  -4.3688  1.2700  111.7600    $ Center divider lower
105  RPP  -14.1986  14.1986  -9.3599  9.3599  1.2700  111.7600    $ Small side outer
106  RPP  -13.8938  13.8938  -9.0551  9.0551  1.2700  111.7600    $ Small side inner
107  RPP  -13.8938  -5.1604  -0.3175  0.3175  1.2700  111.7600    $ Left divider
108  RPP  5.1604  13.8938  -0.3175  0.3175  1.2700  111.7600    $ Right divider
C Surfaces - Basket Cell Opening
151  RPP  -4.1909  4.1911  -4.1909  4.1911  1.2700  111.7600    $ Opening in Basket
C Surfaces - LWT Cavity
201  RCC  0.0000  0.0000  3.8100  0.0000  0.0000  111.7600  16.8467  $ Basket
202  RCC  0.0000  0.0000  115.5700  0.0000  0.0000  111.7600  16.8467  $ Basket
203  RCC  0.0000  0.0000  227.3300  0.0000  0.0000  111.7600  16.8467  $ Basket
204  RCC  0.0000  0.0000  339.0900  0.0000  0.0000  111.7600  16.8467  $ Basket
C Surfaces - LWT Cask Accident Conditions
301  RCC  0.0000  0.0000  -26.6700  0.0000  0.0000  507.3650  36.5189  $ Lwt
302  RCC  0.0000  0.0000  -26.6700  0.0000  0.0000  26.6700  36.5189  $ Bottom
303  RCC  0.0000  0.0000  0.0000  0.0000  0.0000  452.1200  16.9863  $ Cavity
304  RCC  0.0000  0.0000  -17.7800  0.0000  0.0000  7.6200  26.3525  $ Bottom gamma shield
305  RCC  0.0000  0.0000  0.0000  0.0000  0.0000  444.5000  20.1740  $ Lead id - taper
306  RCC  0.0000  0.0000  0.0000  0.0000  0.0000  444.5000  31.5976  $ Lead od - taper
307  RCC  0.0000  0.0000  13.8176  0.0000  0.0000  416.8648  18.9103  $ Lead id
308  RCC  0.0000  0.0000  13.8176  0.0000  0.0000  416.8648  33.3271  $ Lead od
309  RCC  0.0000  0.0000  13.8176  0.0000  0.0000  416.8648  33.4645  $ Lead gap
*310  RCC  0.0000  0.0000  -27.1700  0.0000  0.0000  508.3650  37.0189  $ Container

C
C Materials List
C
C - U-Al_H2O
m1  92235  -5.7000E-02  1001  -7.5000E-02
       92238  -3.0000E-03  8016  -6.0400E-01
       13027  -2.6100E-01
C Aluminum / Clad
m2  13027  -1.0
C Canister Water
m3  1001  6.6667E-01  8016  3.3333E-01
mt3  lwtr.01
C Cask Cavity Water
m4  1001  6.6667E-01  8016  3.3333E-01
mt4  lwtr.01
C Aluminum
m5  13027  -1.0
C Stainless Steel 304
m6  26000  -0.695  24000  -0.190  28000  -0.095
       25055  -0.020
C Lead
m7  82000  -1.0
C Aluminum Honeycomb Impact Limiter
m8  13027  -1.0
C Water/Glycol - Cask Neutron Shield
m10  1001  -1.03651E-01  8016  -6.75619E-01  6000  -2.20730E-01
C Cask Exterior (Water at Various Densities)
m9  1001  6.6667E-01  8016  3.3333E-01
mt9  lwtr.01
C
C Cell Importances
imp:n 1 43r 0
c
c Criticality Controls
c
kcode  2000  1.00  30  530
c
c Source Distribution for Initial Generation
SDEF  CEL=  302:D4:D5:D6
       ERG=  D1
       POS=  0.0000  0.00  0.4150
       RAD=  D2
       AXS=  0.00  0.00  1.00
       EXT=  D3
C - Neutron Source Energy Source Distribution
#         SP1
       -3
C - Uniform Radial Distribution in Fuel Rod
#  SI2  SP2
       0.0000  -21
       3.5560  1
C - Axial Source Profile
#  SI3  SP3
       0  0.0
       100  1.0
C - Two Baskets With Fuel in Cask
#     SI4         SP4
           1          d
       203  1
       204  1
C - Four Openings in Basket with Fuel
#     SI5         SP5
           1          d
       151  1
       152  1
       153  1
       154  1
C - Four Tube Arrays per Canister
#     SI6         SP6
           1          d
       82  1
       83  1
```

```
       84  1
       85  1
C Print Control
prdmp  -30 -60 1 2
print
C Random Number Generator
rand  gen=2  1.90735E+13  stride=152917  hist=1
```

Table of Contents

List of Figures

7 OPERATING PROCEDURES

This chapter describes the generic operating procedures for loading, unloading and preparing the NAC-LWT package for transport. These procedures shall be implemented to ensure the package is used in accordance with Certificate of Compliance (CoC) No. 9225 for the NAC-LWT packaging.

These procedures are based on generic site conditions and assume that the package arrives at the handling site with the appropriate internals installed in the cask. Additional operations and/or modifications (i.e., sequence of operations, use of parallel operations, etc.) to these procedures to address site-specific conditions may be required for each user's facility. These additional operations and/or modifications will be documented in site-specific procedures.

In addition, site-specific procedures may incorporate signoffs for activities or operational sequences as they are performed. Oversight organizations, such as Quality Assurance or Quality Control, may participate in certain package handling operations. The use of signoffs can assist the user in assuring that critical steps are not overlooked, that the package is handled in accordance with the CoC and Safety Analysis Report (SAR), and that appropriate records are retained as required by 10 CFR 71.91.

The NAC-LWT package is designed and certified to transport numerous fissile and radioactive contents, as described in the CoC, as a Type B(U)F-96 package. Certain radioactive contents, as described in the CoC, are required to be transported in a NAC-LWT assembled and tested in a leaktight containment configuration. The leaktight containment can be provided by either the Alernate port cover design with a Viton O-ring seal or by the Alternate B port cover design with a metallic seal.

The NAC-LWT is also certified for the transport of Tritium Producing Burnable Absorber Rod (TPBAR) contents, as described in the CoC, as a Type B(M)-96 package. NAC-LWT cask units designated for the transport of TPBAR contents require both leaktight containment and a high-pressure capable containment barrier. NAC-LWT casks for the leaktight transport of TPBAR contents shall be configured with Alternate B vent and drain port covers in accordance with the license drawings, and subjected to the additional hydrostatic test per the requirements of Section 8.1.2.

Loaded shipments received at U.S. Department of Energy (DOE) facilities shall be receipt surveyed and monitored in accordance with DOE regulations. As required, the shipper will be notified of any survey or shipping discrepancy and the shipper will ensure appropriate regulatory notifications are completed.

When the package is handled in accordance with the procedures provided herein, and is loaded within the conditions of the CoC and the SAR, the resulting occupational exposures will be maintained as low as reasonably achievable (ALARA), as required by 10 CFR 20.

7.1 Procedures for Loading Packages

For the shipment of loaded packages, the cavity shall be dry, the contents and nameplate package identification, corresponding to the contents, shall be verified as correct, and the other applicable conditions of the Certificate of Compliance (CoC) shall be verified as met. Site-specific procedures for dry handling, when required, and loading of fuel assemblies and other authorized contents will be prepared to incorporate the dry transfer system components required to safely and efficiently load the NAC-LWT at each loading facility. Dry loading and transfer procedures are not specifically described in the individual loading procedures due to these facility and required equipment variations. Content configurations may require spacers, baskets, basket inserts, canisters, etc., to support and/or control the content geometry during transport. The transport configurations identifying the specific contents and components required are specified in the license drawings. Solid, irradiated and contaminated hardware will generally be loaded wet utilizing the procedure guidance of Section 7.1.1. Alternatively, the solid, irradiated and contaminated hardware can be loaded dry utilizing dry loading procedures (i.e., per Section 7.1.2) modified to the requirements of the dry loading facilities.

Two port cover designs are available for use. The alternate port cover has an O-ring along the barrel and a Viton® O-ring on the inner end of the port cover. The alternate port cover was developed to provide a leaktight containment boundary and to facilitate ease of installation. The second port cover design is the Alternate B port cover that has two face seals on the inner end of the port cover. The Alternate B port cover was developed to provide a high-pressure and leaktight containment boundary and is required to be installed for the transport of TPBAR contents. Both the Alternate and Alternate B port covers provide the capability to establish a leaktight containment boundary and, therefore, the two port cover designs can be used interchangeably for authorized contents not requiring a high-pressure containment boundary capability.

The alternate port cover bolts are torqued to 100 ± 10 inch-pounds. The Alternate B port cover bolts are torqued to 285 ± 15 inch-pounds to ensure compression of the metallic containment O-ring seal.

As required for the specific contents, applicable procedures will specify the use of the Alternate B port covers. In these loading procedures, the Alternate B port cover helium leakage rate testing is described. For other content loading procedures, either port cover design can be used. However, if the Alternate B port covers are used, the metallic O-ring seal will be replaced for each transport following component removal and the helium maintenance leakage rate test is required to be performed.

For cask loading operations performed under water or when water is introduced into the cask cavity, the cask cavity is required to be blown down to remove the cavity water, vacuum dried, verified as dry, and helium backfilled prior to final closure and leakage testing. The cavity is vacuum dried by attaching a vacuum pump to the vent and/or drain port and evacuating the cavity to a pressure of less than 10 torr (13 mbar), and continuing to vacuum pump for an additional 15 minutes. If the cavity pressure rise is less than 5 torr (6.7 mbar) during a 10-minute isolation and hold period, there is no free water in the cavity and the cask cavity is verified as dry. Final containment closure and leakage testing operations in preparation for transport can proceed. If the pressure rise is >5 torr (6.7 mbar), the vacuum drying will be continued until the dryness verification criteria are met. The successful performance of the dryness verification and backfilling the cavity with helium ensures that there is no free water in the cavity and oxidation of the cask's contents is precluded. When the cask is loaded in a dry cell or under other conditions where no water is introduced into the cask cavity, the procedure sequences for cavity blow down, vacuum drying and dryness verification can be eliminated and the loading sequence can proceed directly to final closure, containment boundary leakage testing and helium backfill operations.

7.1.1 Procedures for Wet Loading of LWR Fuel Assemblies and Canistered LWR Fuel Rods

The procedures for wet loading the NAC-LWT with LWR fuel are as follows:

1. Perform a receipt inspection of the empty cask and trailer/ISO container, inspecting for transport damage.
2. Position the trailer in the designated cask unloading area. Set the trailer brakes and chock the wheels to prevent unintended movement. If site-specific conditions exist that require the trailer to move to allow the cask to be uprighted on its rotation trunnions, release brakes and remove the chocks when required to complete uprighting operations. If an ISO container is used, it may be removed from the trailer and secured in the unloading area.
3. Remove the personnel barrier or the roof and roof cross-members from the ISO container.

   Note: Verify that the package nameplate displays the correct package identification number in accordance with the CoC.
4. Perform a Health Physics survey of the cask and adjacent surfaces of the trailer.

   Note: A receiving survey of the cask and transporter must be performed as soon as practicable after arrival at the site to assure compliance with 10 CFR 20, 10 CFR 71.87(i) and 10 CFR 71.47, and to assure timely reporting of any reportable noncompliance.

5. Remove the top and bottom impact limiters.
6. Remove the cask tie-down strap.
7. Using the lifting yoke with the guides removed, engage the lifting trunnions. Raise the cask to vertical by rotating the cask rotation sockets on the rear cask supports, moving the crane and/or trailer as required to keep the lift yoke engaged to the trunnions and the cask engaged in the rear supports. When the cask is fully vertical, lift the cask from the supports and remove it from the trailer/container.
8. Place the cask in the cask preparation area or other designated location. Disengage the lifting yoke. Clean cask surfaces of road dirt as required for entry into the spent fuel pool.
9. Visually inspect the neutron shield tank fill, drain and level inspection plugs for signs of neutron shield fluid leakage.
10. Remove the vent and drain valve port covers. Prior to reinstallation of the port covers, carefully inspect the valve port cover O-ring seals and, if the O-rings show any damage, replace them with approved spares. Ensure that the replacement O-rings are properly installed and seated. Visually inspect the valved quick-disconnect nipples and replace them, if necessary.

    Note: For Alternate B port covers, replace the metallic O-ring with an approved spare prior to reinstallation.
11. Remove closure lid bolts. Attach the lid lift slings to the closure lid. Remove the closure lid and set it on a support that is suitable for radiological control and for maintaining the cleanliness of the closure lid. Prior to reinstallation of the lid, carefully inspect the Teflon O-ring seal in the underside of the closure lid and, if it shows any damage, replace it. Remove the metallic O-ring and replace it with an approved spare. Ensure that the replacement O-rings are properly installed and seated. Inspect the lid bolts and replace any that are damaged.
12. Visually inspect the inner cavity for foreign material or damage. Install or verify the presence of the proper drain tube and basket assembly.
13. Fill the cask cavity with clean water.
14. Install lift yoke arm guides and remote actuation component on the cask lifting yoke.
15. Engage the cask lifting yoke with the cask lifting trunnions and pick up the cask. Carefully lower the cask to the bottom of the cask loading area. Rinse the cask surfaces with clean water to minimize cask surface contamination.
16. Disengage the lifting yoke from the cask and remove the yoke from the pool, if necessary, to provide fuel loading clearance.
17. Identify the fuel assembly(ies) or canistered LWR fuel rods to be loaded. Verify the identified materials comply with the content conditions and authorized quantities as specified in the CoC.
18. Pick up the fuel assembly or transport canister containing individual fuel rods, using the required grapple system.

    Note: See Section 7.1.8 procedures for instructions for loading and preparing PWR or BWR rods and nonfuel-bearing components in a transport canister.

19. Position the fuel contents over the cask and carefully lower them into the cask to avoid damage to the cask sealing surfaces. Confirm that the fuel assembly (or transport canister and insert, or material container) is fully seated, then release the grapple from the fuel assembly (or transport canister and insert) and raise the grapple to the full up position. Repeat this step as necessary to load multiple assemblies or containers (if required).
20. Position the cask lifting yoke over the cask closure lid. Attach the slings to the closure lid and cask lifting yoke. Lower the yoke over the cask.
21. Position the closure lid over the cask and slowly lower it into place using the cask and lid match marks as guides. Visually confirm that the closure lid is seated.
22. Lower the cask handling yoke to slack the closure lid cables. Engage the cask lifting trunnions with the yoke and begin lifting.

    Note: Visually verify the yoke engagement before lifting the cask.
23. Raise the cask until the lid is slightly above the surface of the pool. At the option of the licensee/user, a number of closure lid bolts (i.e., 4 to 12) may be installed hand tight.
24. Raise the cask clear of the pool, rinsing the yoke and cask with clean water.
25. Transfer the cask to the decontamination pit or other work area. Remove the yoke and lid lift slings.
26. Install and tighten the 12 closure lid bolts to 260 ± 20 ft-lb in three passes, using the torque sequence stamped on the closure lid.
27. At the option of the licensee/user, a 25 to 50 gallon clean water flush of the cask cavity may be performed by connecting a valved, clean water line to the drain valve and a valved drain line to the vent valve. After the cavity flushing is completed, if performed, disconnect the water supply and drain lines.
28. Connect a gas supply line to the vent valve and the drain line to the drain valve.
29. Open the nitrogen or helium gas supply valve and pressurize the cask cavity (< 30 psig) to force any residual water out the drain line. Continue to supply pressurized gas to the cask for a minimum of five minutes after the last residual free water discharges from the drain. Remove the drain and gas supply lines and attach a vacuum drying system (VDS) to the vent.
30. Evacuate the cask cavity to less than or equal to 10 torr (13 mbar) and continue vacuum pumping for a minimum of 15 minutes.
31. At the end of the vacuum pumping period, isolate the cask cavity from the vacuum pump and stop the vacuum pump. Monitor the cask cavity pressure for a minimum of 10 minutes. If the pressure rise is less than 5 torr (6.7 mbar), the cavity is verified as dry of free water. If the pressure rise is >5 torr (6.7 mbar), repeat vacuum drying until the dryness verification results are satisfactory.
32. Backfill the cask cavity with helium to 0 psig (1 atmosphere, absolute), +1, -0 psi and disconnect the VDS from the vent valve.
33. Perform a helium leakage test of the closure lid containment O-ring using a Helium Mass Spectrometer Leak Detector (He MSLD) in accordance with the procedural requirements of Section 8.1.3.1, Steps 3 through 10.

34. Install the vent and drain alternate port covers and torque the bolts to 100 ±10 inch-pounds.
35. If an alternate port cover containment O-ring seal was replaced, perform a helium leakage test on the affected port cover using a He MSLD in accordance with the requirements of Section 8.1.3.2.2.
36. If the alternate port cover containment seal was inspected and accepted for reuse, perform a gas pressure drop leakage test on the affected port cover as follows.
    a. Install a pressure test fixture to the port cover test port, including a calibrated pressure gauge with a minimum sensitivity of 0.25 psi.
    b. Pressurize the port cover seal annulus to 15 psig, +1, -0 psi.
    c. Isolate the gas supply and observe the pressure gauge for a minimum of five minutes.
    d. The acceptance criterion for the test is no measurable drop in pressure during the minimum test time. An acceptable test assures that the minimum assembly verification leakage test sensitivity is achieved.

    Note: Alternate B port covers, if used, require the satisfactory completion of a helium maintenance leakage rate test. Install the Alternate B port cover and perform the maintenance leakage rate test per the requirements of Section 8.1.3.3.2.
37. Decontaminate the cask surfaces. Survey the cask for surface contamination and radiation dose rates.

    Note: Ensure compliance with 10 CFR 71.87(i) and 10 CFR 71.47.
38. Remove lift yoke arm guides. Engage the cask lifting yoke to the lifting trunnions.
39. Lift the cask and position the cask rotation sockets in the rear rotation trunnions of the rear support structure. Carefully lower the cask to the horizontal transport orientation resting on the front saddle by moving the crane and/or the trailer as required to maintain cask engagement to the rear supports.
40. Disengage the lifting yoke from the lifting trunnions and remove it from the area.
41. Install the cask tie-down strap. Install the top and bottom impact limiters.
42. Install tamper-indicating device (TID) to an attachment point on the top impact limiter.
43. Install ISO container bracing and lid or personnel barrier.
44. Complete radiation and contamination surveys of the external surfaces of the package and record the data. Ensure removable contamination and radiation dose rate survey results comply with the limits specified in 10 CFR 71.87(i) and (j).
45. Measure the dose rate in millirems per hour at one meter from the package surface to determine the Transport Index (TI). Indicate the TI on the Radioactive Material labels applied to the package in accordance with 49 CFR 172, Subpart E.
46. Determine the appropriate Criticality Safety Index (CSI) assigned to the package contents in accordance with the CoC, and indicate the correct CSI on the Fissile Material label applied to the package per 49 CFR 172, Subpart E.
47. Apply appropriate placards to the transport vehicle in accordance with 49 CFR 172, Subpart F.

48. Complete the shipping documents and provide the carrier with instructions regarding the requirements for maintaining an exclusive use shipment.

7.1.2 Procedures for Dry Loading of Metallic Fuel

The procedures for dry loading the package with metallic fuel are as follows:

1. Perform a receipt inspection of the empty cask and trailer/ISO container, inspecting for transport damage.
2. Position the trailer in the designated cask unloading area. Set the trailer brakes and chock the wheels to prevent unintended movement. If site-specific conditions exist that require the trailer to move to allow the cask to be uprighted on its rotation trunnions, release brakes and remove the chocks when required to complete uprighting operations. If an ISO container is used, it may be removed from the trailer and secured in the unloading area.
3. Remove the roof from the ISO container and open the front and rear ISO doors. Remove roof cross-members, if installed.

   Note: Verify that the package nameplate displays the correct package identification number in accordance with the CoC.
4. Perform a Health Physics survey of the cask and adjacent surfaces of the container.

   Note: A receiving survey of the cask and transporter must be performed as soon as practicable after arrival at the site to ensure compliance with 10 CFR 20, 10 CFR 71.87(i) and 10 CFR 71.47, and to ensure timely reporting of any reportable noncompliance.
5. Remove the top and bottom impact limiters.
6. Remove the cask tie-down strap.
7. Using the lifting yoke with the guides removed, engage the lifting trunnions. Raise the cask to vertical by rotating the cask rotation sockets on the rear cask supports, moving the crane and/or trailer as required to keep the lift yoke engaged to the trunnions and the cask engaged in the rear supports. When the cask is fully vertical, lift the cask from the supports and remove it from the trailer/container.
8. Place the cask in the dry loading stand. Disengage the lifting yoke.
9. Remove the vent and drain valve port covers. Prior to reinstallation of the port covers, carefully inspect the O-rings and, if the O-rings show any damage, replace them with approved spares. Ensure that the replacement O-rings are properly installed and seated. Visually inspect the valved quick-disconnect nipples and replace them, if necessary.

   Note: For Alternate B port covers, replace the metallic O-ring with an approved spare prior to reinstallation.
10. Remove closure lid bolts. Attach the lid lift slings to the closure lid. Remove the closure lid and set it on a support that is suitable for radiological control and for maintaining the cleanliness of the closure lid. Prior to reinstallation of the lid, carefully inspect the Teflon O-ring seal in the underside of the closure lid and, if it shows any damage, replace it. Remove the metallic O-ring and replace it with an

approved spare. Ensure that the replacement O-rings are properly installed and seated. Inspect the lid bolts and replace any that are damaged.

11. Visually inspect the inner cavity for foreign material or damage. Install, or verify the presence of the proper drain tube assembly and basket, as required.
12. Install the required dry transfer system components to the top of the cask.
13. Position the shielded transfer cask system components for fuel loading, as appropriate.
14. Identify the fuel to be loaded and verify that the fuel contents comply with the content conditions and authorized quantities as specified in the CoC. Up to five sound metallic fuel rods may be placed in an unsealed canister. Damaged rods may be placed in a sealed 2.75-inch or 4.0-inch failed fuel canister (FFC). Up to 10 filters containing oxide powder from severely damaged metallic fuel rods may be placed in one FFC. The FFC(s) containing filters may be loaded with up to two FFCs containing failed fuel rods to fill the three–element basket. The FFCs must be vacuum dried and sealed as described in Section 7.1.3.
15. Load the shielded transfer cask with the selected fuel contents.
16. Place the shielded transfer cask, containing a fuel canister, onto the dry transfer system components positioned on the top of the cask.
17. Lower the fuel canister from the transfer cask into the shipping cask.
18. Repeat the loading and transfer of fuel canisters until the approved cask loading plan is completed.
19. Install the closure lid onto the cask. Visually verify that the lid is properly seated.
20. Remove the dry transfer system components from the top of the cask.
21. Install and tighten the 12 closure lid bolts to 260 ± 20 ft-lb in three passes, using the torque sequence stamped on the closure lid.
22. This step applies only if the cask contains damaged metallic fuel or severely damaged metallic fuel.
    a. Attach the vacuum pump to the cask vent valve.
    b. Evacuate the cask cavity to ≤ 10 torr (13 mbar) and maintain for a minimum of 15 minutes.
    c. Stop the vacuum pump and monitor pressure for a minimum of 10 minutes. If the pressure rise is less than 5 torr (6.5 mbar), the cask is adequately dried for shipment. If not, repeat vacuum drying and pressure rise verification.
    d. Remove the vacuum pump and backfill the cask cavity with helium to 1 atmosphere (absolute) +1, -0 psi.
    e. Remove the gas supply line.
23. Perform the helium mass spectrometer leakage rate test on the cask lid in accordance with the requirements of Section 8.1.3.1, Steps 3 through 10.
24. Install the vent and drain alternate port covers and torque the bolts to 100 ±10 inch-pounds.
25. If an alternate port cover containment O-ring seal was replaced, perform a helium leakage test on the affected port cover using a He MSLD in accordance with the requirements of Section 8.1.3.2.2.

26. If the alternate port cover containment seal was inspected and accepted for reuse, perform a gas pressure drop leakage test on the affected port cover as follows.
    a. Install a pressure test fixture to the port cover test port, including a calibrated pressure gauge with a minimum sensitivity of 0.25 psi.
    b. Pressurize the port cover seal annulus to 15 psig, +1, -0 psi.
    c. Isolate the gas supply and observe the pressure gauge for a minimum of five minutes.
    d. The acceptance criterion for the test is no measurable drop in pressure during the minimum test time. An acceptable test assures that the minimum assembly verification leakage test sensitivity is achieved.

    Note: Alternate B port covers, if used, require the satisfactory completion of a helium maintenance leakage rate test. Install the Alternate B port cover and perform the maintenance leakage rate test per the requirements of Section 8.1.3.3.2.
27. Decontaminate the cask. Survey the cask for surface contamination and radiation dose rates.

    Note: Ensure compliance with 10 CFR 71.87(i) and 10 CFR 71.47.
28. Remove lift yoke arm guides. Engage the cask lifting yoke to the lifting trunnions.
29. Lift the cask and position the cask rotation sockets in the rear rotation trunnions of the rear support structure. Carefully lower the cask to the horizontal transport orientation resting on the front saddle by moving the crane and/or the trailer as required to maintain cask engagement to the rear supports.
30. Disengage the lifting yoke from the lifting trunnions and remove it from the area.
31. Install the cask tie-down strap. Install the top and bottom impact limiters.
32. Install a TID to an attachment point on the top impact limiter.
33. Install ISO container bracing and lid or personnel barrier.
34. Complete radiation and contamination surveys of the external surfaces of the package and record the data. Ensure removable contamination and radiation dose rate survey results comply with the limits specified in 10 CFR 71.87(i) and (j).
35. Measure the dose rate in millirems per hour at one meter from the package surface to determine the Transport Index (TI). Indicate the TI on the Radioactive Material labels applied to the package in accordance with 49 CFR 172, Subpart E.
36. Determine the appropriate Criticality Safety Index (CSI) assigned to the package contents in accordance with the CoC, and indicate the correct CSI on the Fissile Material label applied to the package per 49 CFR 172, Subpart E.
37. Apply appropriate placards to the transport vehicle in accordance with 49 CFR 172, Subpart F.
38. Complete the shipping documents and provide the carrier with instructions regarding the requirements for maintaining an exclusive use shipment.

7.1.3 Procedures for Loading Metallic Fuel and Filters Containing Severely Damaged Metallic Fuel into Damaged Fuel Canisters

7.1.3.1 Small Diameter Canisters (Damaged Metallic Fuel)

1. Examine the small diameter failed fuel canister (FFC) and check it for damage.
2. Place the FFC inside the containment barrier portion of the pool. Position the FFC in the failed rod loading station.
3. After verifying the accountability records, place the designated failed fuel rod into the FFC. If the rod is broken into two or more pieces, verify that the lid thread and seal area is not fouled during rod insertion.
4. When the can is loaded, install the lid using the FFC Lid Installation Tool.
5. Using the FFC handling tool, move the loaded FFC through the containment barrier door and place the FFC horizontally into the upender.
6. Operate the hand winch to move the FFC to the vertical position.
7. Torque the FFC lid to 100 ± 10 ft-lb for the small canister.
8. Connect the nitrogen supply line to the vent valve.
9. Open nitrogen supply valve and pressurize the FFC to force out the water. Blow gas through the FFC for at least 5 minutes after the first visible bubbles appear. Remove the gas supply line.
10. Invert the FFC in the upender and install the pipe plug.
11. Reinvert the FFC in the upender.
12. Attach the vacuum pump to the FFC vent valve. Evacuate the FFC to a pressure below 25 torr (33 mbar) for a minimum of 15 minutes. Remove the vacuum pump and backfill with nitrogen.
13. Remove the FFC from the upender and place it into temporary storage.

7.1.3.2 Large Diameter Canisters (Damaged Metallic Fuel)

1. Examine the large diameter FFC and check it for damage.
2. Place the FFC inside the containment barrier portion of the pool. Position the FFC in the failed rod loading station.
3. This step is to be used when loading up to three uncanned or canned fuel rods into the large diameter canister. After verifying the accountability records, remove the ceramic filter from the top of the original failed rod can. Position the can plug with aluminum screen onto the open can. Install the plug.
4. Verify the accountability records for the fuel to be loaded.
5. Place the designated fuel into the FFC. If the rod is broken into two or more pieces, verify that the lid thread and seal area is not fouled during rod or can insertion. If more than one failed rod is to be installed, repeat steps 3 through 5.
6. After the canister is loaded with fuel, install the lid using the FFC Lid Installation Tool.

7. Using the FFC handling tool, move the loaded FFC through the containment barrier door and place the FFC horizontally into the upender.
8. Operate the hand winch to move the FFC to the vertical position.
9. Torque the FFC lid to 130 ± 10 ft-lb for the large canister.
10. Connect the nitrogen supply line to the vent valve.
11. Open the nitrogen supply valve and pressurize the FFC to force out the water. Blow gas through the FFC for at least 5 minutes after the first visible traces of bubbles appear. Remove the gas supply line.
12. Invert the FFC in the upender and install the pipe plug.
13. Reinvert the FFC in the upender.
14. Attach the vacuum pump to the FFC vent valve. Evacuate the FFC to a pressure below 25 torr (33 mbar) for a minimum of 15 minutes. Remove the vacuum pump and backfill with nitrogen.
15. Remove the FFC from the upender and place it into temporary storage.

7.1.3.3 Large Diameter Canisters (Severely Damaged Metallic Fuel)

1. Examine the large diameter FFC and check it for damage.
2. Place the FFC inside the containment barrier portion of the pool. Position the FFC in the failed rod loading station.
3. Verify the accountability records for the fuel in the filter set (up to 10 filters) to be loaded into the FFC.
4. After verifying the accountability records, load the filter set into the FFC and place aluminum wool on top of the last filter.
5. Verify that the lid thread and seal area is not fouled during insertion of the filter set.
6. After the canister is loaded with fuel, insert the lid using the FFC Lid Installation Tool.
7. Using the FFC handling tool, move the loaded FFC through the containment barrier door and place the FFC horizontally into the upender.
8. Operate the hand winch to move the FFC to the vertical position.
9. Torque the FFC lid to 130 ± 10 ft-lb for the large canister.
10. Connect the nitrogen supply line to the vent valve.
11. Open the nitrogen supply valve and pressurize the FFC to force out the water. Continue to blow gas through the FFC for at least 5 minutes after the first visible traces of bubbles appear. Remove the gas supply line.
12. Invert the FFC in the upender and install the pipe plug.
13. Reinvert the FFC in the upender.
14. Attach the vacuum pump to the FFC vent valve. Evacuate the FFC to a pressure below 25 torr (33 mbar) for a minimum of 15 minutes. Remove the vacuum pump and backfill with nitrogen.
15. Remove the FFC from the upender and place it into temporary storage.

7.1.4 Procedures for Dry Loading of DIDO, Spiral, MOATA and MTR Fuel Elements in Basket Modules into the NAC-LWT Cask

This procedure presents the steps for dry loading of fuel basket modules into the NAC-LWT cask using a transfer cask, which can contain various types of aluminum clad reactor fuel elements such as MTR, DIDO, spiral and plate assemblies (i.e., MOATA elements). Aluminum clad fuel elements shall be transported in a leaktight NAC-LWT cask. The design, materials, use and function of the various modular fuel basket assemblies such as MTR, DIDO and ANSTO are similar, and all can be loaded into the NAC-LWT utilizing these procedures.

The modular fuel basket assemblies all consist of three types of modules: a base module, intermediate modules, and a top module. Each basket module contains seven fuel element locations, consisting of a center cell and six peripheral cells. The top basket module interfaces with the cask lid to limit the axial movement of the basket assembly. The base module interfaces with the bottom of the cask cavity. The base and intermediate modules are provided with guide pins to provide for and maintain the proper alignment between basket modules. Each of the basket module types is provided with a guide bar assembly to provide for the proper interface of the basket assembly with the drain tube assembly.

Depending on the fuel type, the basket assembly may consist of 4, 5 or 6 modules, with a varying number of intermediate modules. For the DIDO, MOATA and spiral fuel types, the DIDO basket assembly, the ANSTO basket assembly (the basket assembly identification for MOATA and spiral fuel types) and the ANSTO-DIDO combination basket assemblies consist of a top module, four intermediate modules and a base module. For the ANSTO-DIDO combination basket assembly, the top module is an ANSTO module and the remaining five modules are DIDO modules.

In the case of MTR fuel elements, the basket assembly can include 2, 3 or 4 intermediate modules, depending on the length and conditions of the fuel contents. Axial fuel spacers and plates may be used as dunnage to axially position the MTR fuel elements in the basket module to facilitate fuel unloading operations. Degraded clad of MTR elements shall be limited to a maximum of 5% of fuel element surface area.

The fuel content condition (i.e., heat load, fissile mass, minimum cool time, etc.) limits for the various fuel types are discussed or referenced in the following paragraphs.

MTR fuel elements shall be selected and loaded in accordance with the MTR General and Preferential Loading Procedures in Section 7.1.5. The MTR plate canister, if required, shall be loaded in accordance with Section 7.1.4.1.

DIDO fuel elements shall meet the following loading conditions:

- The maximum decay heat for DIDO fuel shall not exceed 25 W per element and 1.05 kW per loaded DIDO basket assembly when a top spacer is utilized (see NAC Drawing No. 315-40-113).
- The maximum decay heat for DIDO fuel elements loaded in a DIDO top module without a lid spacer installed shall not exceed 18 W per element.
- The maximum decay heat load for DIDO fuel elements loaded into an ANSTO top basket module with or without a damaged fuel can (DFC) shall not exceed 10 W.
- The heat load for each DIDO fuel element shall be verified by use of cool time versus burnup (MWd/MTU) curves in Figure 7.1-8 (LEU fuel), Figure 7.1-9 (MEU fuel), and Figure 7.1-10 (HEU fuel) or by use of minimum cool time versus ^{235}U depletion curves in Figure 7.1-11 (generic for LEU, MEU and HEU fuels), or by facility decay heat calculations. Note that significantly lower uranium content for a loaded assembly compared to the design basis assembly may result in a loaded assembly calculated burnup higher than that included in Figure 7.1-8 through Figure 7.1-10. Use of Figure 7.1-11 ^{235}U depletion curves is required for fuel assemblies in this category.
- Spiral, MOATA and DIDO fuel elements with corrosion and/or mechanically damaged cladding (i.e., degraded ANSTO fuel elements) may be loaded, provided that the total surface area of through-clad corrosion and/or mechanical damage does not exceed 5% per element, and the elements, or disassembled plates, are placed in an ANSTO DFC in the upper ANSTO basket module of an ANSTO basket assembly or ANSTO-DIDO combination basket assembly.

Spiral, MOATA and DIDO fuel elements shall meet the content conditions specified in the CoC for loading into the ANSTO basket assembly and the ANSTO-DIDO combination basket assembly. In ANSTO basket assemblies, full spiral fuel loads or mixed spiral, MOATA and DIDO fuel loads are authorized. DIDO fuel elements are limited to loading into the top ANSTO basket module. MOATA, spiral and DIDO fuel elements with degraded cladding or disassembled elements shall be placed into damaged fuel cans (DFCs) prior to loading into an ANSTO top basket module. DFCs containing MOATA, spiral or DIDO fuel elements may be loaded into the top ANSTO module of either an ANSTO basket assembly or an ANSTO-DIDO combination basket assembly. The maximum heat load of spiral or DIDO fuel elements to be placed in DFCs is 10 W per element. The procedures for loading degraded clad or disassembled MOATA, spiral or DIDO fuel elements in DFCs prior to loading into the basket modules are provided in Section 7.1.4.2. The remaining basket modules in the ANSTO basket assembly may only be loaded with intact MOATA and/or spiral fuel elements. The remaining basket modules in the ANSTO-DIDO combination basket may only be loaded with intact DIDO fuel elements.

The procedures for loading the NAC-LWT cask with MTR, DIDO or ANSTO fuel baskets in a dry configuration or using a dry transfer system are as follows:

1. Perform a receipt inspection of the empty cask and trailer/ISO container, inspecting for transport damage.
2. Position the trailer in the designated cask unloading area. Set the trailer brakes and chock the wheels to prevent unintended movement. If site-specific conditions exist that require the trailer to move to allow the cask to be uprighted on its rotation trunnions, release brakes and remove the chocks when required to complete uprighting operations. If an ISO container is used, it may be removed from the trailer and secured in the unloading area.
3. Remove the personnel barrier or the roof and roof cross-members from the ISO container.

Note: Verify that the package nameplate displays the correct package identification number in accordance with the CoC.

4. Perform a Health Physics survey of the cask and adjacent surfaces of the trailer.

   Note: A receiving survey of the cask and transporter must be performed as soon as practicable after arrival at the site to assure compliance with 10 CFR 20, 10 CFR 71.87(i) and 10 CFR 71.47, and to assure timely reporting of any reportable noncompliance.

5. Remove the top and bottom impact limiters.
6. Remove the cask tie-down strap.
7. Using the lifting yoke with the guides removed, engage the lifting trunnions. Raise the cask to vertical by rotating the cask rotation sockets on the rear cask supports, moving the crane and/or trailer as required to keep the lift yoke engaged to the trunnions and the cask engaged in the rear supports. When the cask is fully vertical, lift the cask from the supports and remove it from the trailer/container.
8. Place the cask onto the dry loading station/stand. Disengage the lifting yoke and move clear.
9. Visually inspect the neutron shield tank fill, drain and level inspection plugs for signs of neutron shield fluid leakage.
10. Remove the vent and drain valve port covers. Prior to reinstallation of the port covers, carefully inspect the O-ring seals and, if the O-rings show any damage, replace them with approved spares. Ensure that the replacement O-rings are properly installed and seated. Visually inspect the valved quick-disconnect nipples and replace them, if necessary.

    Note: For Alternate B port covers, replace the metallic O-ring with an approved spare prior to reinstallation.

11. Remove closure lid bolts. Attach the lid lift slings to the closure lid. Remove the closure lid and set it on a support that is suitable for radiological control and for maintaining the cleanliness of the closure lid. Prior to reinstallation of the lid, carefully inspect the Teflon O-ring seal in the underside of the closure lid and, if it shows any damage, replace it. Remove the metallic O-ring and replace it with an approved spare. Ensure that the replacement O-rings are properly installed and seated. Inspect the lid bolts and replace any that are damaged.

12. Visually inspect the inner cavity for foreign material or damage. Install or verify presence of a proper drain tube including drain tube alignment ring, as required.
13. Install the required dry transfer system components on the top of the cask.
14. Position the shielded transfer cask system components for fuel loading, as appropriate.
15. Identify the fuel to be loaded into each fuel basket module. Fuel elements loaded into each basket and/or module shall comply with the approved content conditions specified in Condition 5.(b)(1) and 5.(b)(2) of CoC No. 9225. Specific guidance on fuel selection, use of loading diagrams and preferential loading procedures is provided in Section 7.1.5. Perform an independent verification of the loading diagrams and fuel loading operations per Section 7.1.5.3. MTR plate canister loading shall be in accordance with Section 7.1.4.1 and ANSTO DFC loading shall be in accordance with Section 7.1.4.2.

    Note: If a basket module is to be loaded with a LEU MTR fuel element having ^{235}U content >490 g (>23.5 g ^{235}U per plate), cell block spacers, as shown on Drawing 315-40-085, shall be installed in basket module cell positions 1, 2 and 3 to prevent inadvertent loading of more than four LEU MTR fuel elements.

    Note: For the loading of HEU MTR fuel elements having ^{235}U content >380 g, a minimum of 2.0 cm of nonfuel hardware and /or spacer plates shall be provided at both ends of the fuel element to meet criticality control analysis requirements.
16. Load the shielded transfer cask and basket module with the selected fuel contents.
17. Place the shielded transfer cask containing a loaded fuel basket module onto the dry transfer system components positioned on the top of the cask.
18. Lower the loaded basket module from the transfer cask into the shipping cask.
19. Repeat the loading and transfer of loaded basket modules until the approved cask loading plan is completed.
20. Install the closure lid onto the cask using the dry transfer system. Visually verify that the lid is properly seated.
21. Remove the dry transfer system components from the top of the cask.
22. Install and tighten the 12 closure bolts to 260 ± 20 ft-lb in three passes, using the sequence stamped on the lid.
23. Connect a gas supply line to the vent valve and the drain line to the drain valve.
24. Open the air, nitrogen or helium gas supply valve and pressurize the cask cavity (< 30 psig) to force any residual water out the drain line. Continue to supply pressurized gas to the cask for a minimum of five minutes after the last residual free water discharges from the drain. Remove the drain and gas supply lines and attach a vacuum drying system (VDS) to the vent.
25. Evacuate the cask cavity to less than or equal to 10 torr (13 mbar) and continue vacuum pumping for a minimum of 15 minutes.
26. At the end of the vacuum pumping period, isolate the cask cavity from the vacuum pump and stop the vacuum pump. Monitor the cask cavity pressure for a minimum of 10 minutes. If the pressure rise is less than 5 torr (6.7 mbar), the cavity is verified as dry of free water. If pressure rise is >5 torr (6.7 mbar), repeat vacuum drying until the dryness verification results are satisfactory.

27. Backfill the cask cavity with helium to 0 psig (1 atmosphere, absolute), +1, -0 psi and disconnect the VDS from the vent valve.
28. Perform a helium leakage test of the closure lid containment O-ring using a Helium Mass Spectrometer Leak Detector (He MSLD) in accordance with the procedural requirements of Section 8.1.3.1, Steps 3 through 10.
29. Install the vent and drain alternate port covers and torque the bolts to 100 ±10 inch-pounds.
30. If an alternate port cover containment O-ring seal was replaced, perform a helium leakage test on the affected port cover using a He MSLD in accordance with the requirements of 8.1.3.2.2.
31. If the alternate port cover containment seal was inspected and accepted for reuse, perform a gas pressure drop leakage test on the affected port cover as follows.
    a. Install a pressure test fixture to the port cover test port including a calibrated pressure gauge with a minimum sensitivity of 0.25 psi.
    b. Pressurize the port cover seal annulus to 15 psig, +1, -0 psi.
    c. Isolate the gas supply and observe the pressure gauge for a minimum of five minutes.
    d. The acceptance criterion for the test is no measurable drop in pressure during the minimum test time. An acceptable test assures that the minimum assembly verification leakage test sensitivity is achieved.

    Note: Alternate B port covers, if used, require the satisfactory completion of a helium maintenance leakage rate test to confirm a leaktight seal condition for each loaded transport. Install the Alternate B port cover and perform the maintenance leakage rate test per the requirements of Section 8.1.3.3.2.
32. Decontaminate the cask surfaces. Survey the cask for surface contamination and radiation dose rates.

    Note: Ensure compliance with 10 CFR 71.87(i) and 10 CFR 71.47
33. Remove lift yoke arm guides. Engage the cask lifting yoke to the lifting trunnions.
34. Lift the cask and position the cask rotation sockets in the rear rotation trunnions of the rear support structure. Carefully lower the cask to the horizontal transport orientation resting on the front saddle by moving the crane and/or the trailer as required to maintain cask engagement to the rear supports.
35. Disengage the lifting yoke from the lifting trunnions and remove it from the area.
36. Install the cask tie-down strap. Install the top and bottom impact limiters.
37. Install a TID to an attachment point on the top impact limiter.
38. Install ISO container bracing and lid, or personnel barrier.
39. Complete radiation and contamination surveys of the external surfaces of the package and record the data. Ensure removable contamination and radiation dose rate survey results comply with the limits specified in 10 CFR 71.87(i) and (j).
40. Measure the dose rate in millirems per hour at one meter from the package surface to determine the Transport Index (TI). Indicate the TI on the Radioactive Material labels applied to the package in accordance with 49 CFR 172, Subpart E.

41. Determine the appropriate Criticality Safety Index (CSI) assigned to the package contents in accordance with the CoC, and indicate the correct CSI on the Fissile Material label applied to the package per 49 CFR 172, Subpart E.
42. Apply appropriate placards to the transport vehicle in accordance with 49 CFR 172, Subpart F.
43. Complete the shipping documents and provide the carrier with instructions regarding the requirements for maintaining an exclusive use shipment.

7.1.4.1 Procedure for Loading MTR Fuel Plates into MTR Plate Canister

1. Examine the MTR plate canister and inspect for damage. Visually verify that one end of the canister is installed, the six associated bolts are installed and the other end is removed.
2. Place the can in the loading fixture.
3. Load the fuel plates into the canister. Verify that the number of fuel plates in the canister is no more than the maximum number of plates in an intact MTR fuel element of its type.
4. Install the lid and lid bolts.

7.1.4.2 Procedure for Loading MOATA, Spiral and DIDO Fuel Elements into ANSTO Damaged Fuel Can (DFC)

1. Examine the ANSTO DFC per Figure 1.2.3-18, and inspect for damage. Visually verify that the bottom ring with aluminum mesh screen is installed in the base of the DFC tube.
2. Place the DFC in a facility loading fixture.
3. Load the MOATA fuel plates, spiral fuel plates or DIDO fuel plates/element into the DFC. Ensure that the fuel elements or plates loaded into the DFC comply with the fuel quantity and heat load conditions of the CoC.
4. Install the lid with aluminum mesh screen and rotate the lid into the locked position.
5. At the appropriate point in the NAC-LWT cask loading process, load the loaded DFC into the top ANSTO fuel basket module.
6. Position loaded ANSTO module onto the ANSTO basket assembly or the ANSTO-DIDO combination basket assembly.

7.1.5 MTR General and Preferential Loading Procedures

Up to 42 LEU, MEU, and HEU MTR fuel elements may be loaded into the NAC-LWT MTR Fuel Basket, i.e., 7 fuel elements per basket module × 6 basket modules per fuel basket, except for LEU MTR fuel elements with greater than 490 g ^{235}U (or greater than 23.5 g ^{235}U per plate), which are limited to 4 elements per basket module as detailed in the following paragraphs. Each MTR basket module has 7 fuel element positions. The MTR basket module loading diagram presented in Figure 7.1-1 has a center position (Position 1), two exterior positions (Positions 2 and 3) that are in line with the center position, and four exterior positions (Positions 4, 5, 6, and

7) that are adjacent to the center row positions. The basket module's fuel element locations are specifically identified to ensure loading of each location with the appropriate fuel element. Ensuring MTR fuel loadings are performed in strict accordance with the procedures presented herein will ensure that the MTR fuel content conditions of the CoC are met and that the analyses presented in this SAR are bounding.

MTR fuel elements are selected for loading into specific fuel element locations based on the decay heat of each individual fuel element at the time of loading. Figure 7.1-2 through Figure 7.1-5 and Figure 7.1-12 through Figure 7.1-13 are provided to assist in determining the acceptability of a MTR fuel element for loading in a 30 W uniform loading pattern depending on enrichment (i.e., LEU, MEU or HEU) or ^{235}U content (i.e. 380 or 460 grams). For determining the acceptability of higher heat load HEU fuel elements, Figure 7.1-6 and Figure 7.1-7 are provided for 380 and 460 grams of ^{235}U, respectively. For determining the acceptability of higher heat load LEU fuel elements, Figure 7.1-13 is provided for 490 grams of ^{235}U. Curves are provided in this figure at 10, 20, 30, and 40 W maximum heat load for maximum flexibility in the preferentially loaded basket. The use of the fuel element cool time versus fuel burnup figures are described in Section 7.1.5.4. LEU MTR fuel elements with a ^{235}U content greater than 23.5 grams per plate (490 g ^{235}U per element), but not exceeding 32 grams ^{235}U per plate (640 g ^{235}U per element), are restricted to baskets containing a maximum of four fuel elements (or an equivalent number of fuel plates per opening). The four element per basket module is in effect even if only one LEU MTR assembly exceeds 23.5 grams ^{235}U per plate (490 g ^{235}U per element). Specific basket locations and restrictions for the high load LEU elements are described in Section 7.1.5.1.

The procedural steps and sequence to ensure the MTR fuel loading and content condition limits are met are: 1) determine ^{235}U content weight per element; 2) determine fuel element decay heat load per Section 7.1.5.4; 3) determine basket module loading position for each element and overall basket loading pattern; and 4) individual basket module loading and assembly of the fuel basket in the NAC-LWT. Each of these steps shall be independently verified.

Attention to the overall cask loading pattern allows the decay heat load of the cask to be maintained as uniform, as is practical, and within CoC total heat load limits. Loading diagrams for each individual module and the complete cask assembly shall be developed and used during the basket module and cask loading operations. After the decay heat load of each of the MTR fuel elements to be loaded and transported is calculated or determined and verified, the loading and content considerations of Sections 7.1.5.1 through 7.1.5.3 shall be met or complied with to establish the final acceptable loading pattern and sequence.

7.1.5.1 General Loading Requirements

1. The maximum decay heat load per MTR fuel basket module shall not exceed 210 W and the maximum decay heat load per cask (package) shall not exceed 1.26 kW. A MTR fuel element with a decay heat greater than 120 W shall not be loaded. The minimum allowed cool time for an MTR element/plate shall be 90 days.
2. LEU, MEU and HEU MTR fuel elements with decay heat not exceeding 30 W per element may be loaded in any basket module fuel element location in any combination.
3. HEU MTR fuel elements with decay heats exceeding 30 W shall be preferentially loaded in a basket module in decreasing decay heat order according to the loading diagram in Figure 7.1-1, with the highest heat load element loaded in fuel location one. Fuel elements with heat loads of up to 120 W shall only be loaded in the center fuel element location of any MTR fuel basket module. The decay heat of the fuel element in either of the two fuel element locations (i.e., number 2 or 3), in line with the center fuel element location of a MTR fuel basket module, shall not exceed 70 W.
4. LEU MTR fuel elements (or canistered fuel plates) with a ^{235}U content greater than 23.5 g per plate (>490 g ^{235}U per element), and not exceeding 32 g per plate ($\leq$ 640 g ^{235}U per element), shall only be loaded into basket positions 4, 5, 6 and 7 shown in Figure 7.1-1. In order to ensure that baskets containing the high fissile mass LEU MTR elements (>23.5 g ^{235}U per plate, >490 g ^{235}U per element) will not be loaded with fuel elements (or fuel plates) in basket opening positions 1, 2 and 3, a cell block spacer shall be installed in each of these three basket openings. The cell block spacer, as shown on Drawing 315-40-085, is of sufficient height and diameter to ensure that LEU MTR fuel elements are prevented from being placed in these openings. The capacity limitation of a maximum of four MTR fuel elements per module is in effect even if a single LEU MTR fuel elements (or canistered fuel plates) having >23.5 g ^{235}U per plate (>490 g ^{235}U per element) is to be loaded.
5. LEU MTR fuel elements with decay heats exceeding 30 W shall be preferentially loaded in a basket module in decreasing decay heat order according to the loading diagram in Figure 7.1-1. The total decay heat load of any individual basket with 40 W preferentially loaded assemblies is 210 W.
6. An MTR plate canister may be loaded into any fuel basket module fuel element location. The contents of each plate canister shall be limited to the number of fuel plates, dimensions and masses of an equivalent intact MTR fuel element.
7. MTR fuel elements with corrosion and/or mechanically damaged cladding may be loaded, provided that the total surface area of through-clad corrosion and/or mechanical damage does not exceed 5% of the elements cross-sectional area.

7.1.5.2 Determination of Basket Module Loading Pattern

1. Perform an evaluation of the full inventory of fuel elements to be loaded into the NAC-LWT cask(s) and develop an overall loading plan that minimizes overall dose rates to minimize general population dose and operator dose. The loading of LEU MTR fuel elements with greater than 23.5 g ^{235}U per plate (>490 g ^{235}U per element) shall be governed by the loading restrictions in item 4 of Section 7.1.5.1, and cell

block spacers shall be placed in basket loading positions 1, 2 and 3 to prevent inadvertent loading of more than four high fissile mass LEU MTR elements.

2. Select up to seven MTR fuel elements to be loaded in a basket module meeting the general loading requirements of Section 7.1.5.1. Identify if spacers or spacer plates are required to properly position the MTR elements axially in the basket module.
3. Rank the fuel elements in order of decreasing decay heat load from 1 to 7. (i.e., the assembly with the highest decay heat is designated number 1.)
4. Generate loading diagrams for each basket module based on Figure 7.1-1, by placing the numbered assemblies in the matching numbered basket module positions, except that fuel elements ranked 4,5,6 or 7 may be loaded in any of the outer (i.e., 4-7) basket module positions.
5. Repeat steps 1 through 4 for all of the basket modules to be loaded.
6. Independently verify the basket module loading diagrams.
7. The loading diagrams shall be used to direct the loading of the basket modules per Section 7.1.5.3.

Once the basket module loading charts are complete, they are used to direct the loading of the basket modules.

7.1.5.3 Basket Loading Procedure

1. Locate the MTR fuel element to be loaded into the basket module per the loading diagram prepared for that module type (i.e., base, intermediate or top).
2. Independently verify the element identification.
3. Load the element into the predetermined fuel basket module fuel element location using the loading diagram. Ensure spacers are installed in positions 1, 2 and 3 of any basket module containing a high fissile mass LEU MTR element (>23.5 g ^{235}U per plate, >490 g ^{235}U per element).
4. Independently verify that the fuel element and spacer loading in the basket module complies with the loading diagram.
5. Repeat steps 1 through 4 until all identified fuel elements have been loaded into basket modules in compliance with the loading diagrams.

7.1.5.4 Estimating Assembly Decay Heat

When the decay heat of a fuel element is not known, the assembly burnup (MWd/MTU) and cooling time (years) can be used to define the allowable basket module positions using Figure 7.1-2 through Figure 7.1-7 and Figure 7.1-12 through Figure 7.1-13, depending on fuel enrichment (i.e., LEU, MEU or HEU) or ^{235}U content.

When using the load curves, placing the data point above a curve results in the fuel element being acceptable for loading at the heat load for which the curve was generated. Fuel elements with characteristics locating the point below the curve results in the fuel element not being acceptable for loading at the heat load for which the curve was generated. Uncertainties associated with burnup/depletion assignment for use with the load curves must be taken into account. Should an element be near the minimum load time determined by the load curves, or maximum burnup applicable to the curve, uncertainties in reading the curves must be taken into account.

HEU MTR fuel elements may be loaded with heat loads greater than 30 W. HEU elements exceeding 30 W shall be preferentially loaded, and Figure 7.1-6 and Figure 7.1-7 identify the appropriate cooling times and burnup limits for 120 W, 70 W and 20 W HEU elements, having a ^{235}U mass of up to 380 grams and a ^{235}U mass of up to 460 grams, respectively. The following steps are used to develop the appropriate loading patterns.

1. Locate the point on Figure 7.1-6 or Figure 7.1-7 for the fuel element burnup and cooling time, and ^{235}U content.
2. If the located point is above the 20 W line, there are no restrictions on fuel element placement in the basket module.
3. If the located point is between the 20 W and 70 W lines, the element is loaded as a 70 W element.
4. If the located point is between the 70 W and 120 W lines, the element is loaded as a 120 W element.
5. If the located point is below the 120 W line, the element shall not be loaded in the NAC-LWT cask.
6. The maximum total decay heat load for a preferentially loaded basket module shall not exceed 210 W and 1.26 kW for a loaded NAC-LWT cask.
7. Each shipper shall ensure that the Certificate of Compliance maximum decay heat load limits of 210 W per basket module and 1.26 kW per cask are not exceeded.

LEU MTR fuel elements may be loaded with heat loads greater than 30 W. LEU elements exceeding 30 W but not exceeding 40 W shall be preferentially loaded, and Figure 7.1-13 identifies the appropriate cooling times and burnup limits for 40 W, 30 W, 20 W and 10 W LEU elements, having a ^{235}U mass of up to 490 grams (up to 23.5 ^{235}U gram per plate). The following steps are used to develop the appropriate loading patterns.

1. Locate the point on Figure 7.1-13 for the fuel element burnup and cooling time.
2. If the located point is above the 10 W line, there are no restrictions on fuel element placement in the basket module.
3. If the located point is between the 10 W and 20 W lines, the element is loaded as a 20 W element. If the located point is above the 20 W line and beyond the 10 W line (i.e., element has a higher depletion than plotted for the 10 W line) the element is loaded as a 20 W element.
4. If the located point is between the 20 W and 30 W lines, the element is loaded as a 30 W element.
5. If the located point is between the 30 W and 40 W lines, the element is loaded as a 40 W element.
6. If the located point is below the 40 W line, the element shall not be loaded in the NAC-LWT cask.

7. The maximum total decay heat load for a LEU preferentially loaded basket module shall not exceed 210 W and 1.26 kW for a loaded NAC-LWT cask.
8. Each shipper shall ensure that the Certificate of Compliance maximum decay heat load limits of 210 W per basket module and 1.26 kW per cask are not exceeded.

Figure 7.1-1 MTR Fuel Basket Module Loading Pattern (Top View)

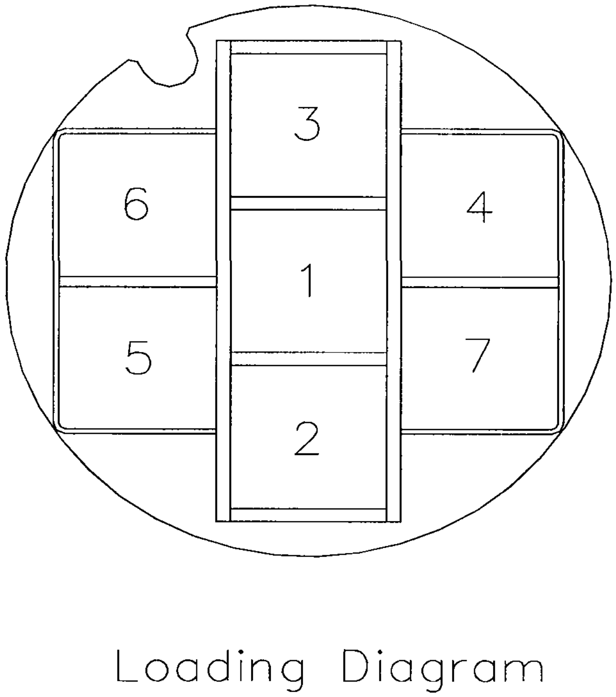


Figure 7.1-2 LEU MTR Fuel Basket Loading Guidelines for 30 W Uniform Loading – Maximum 470 grams ^{235}U

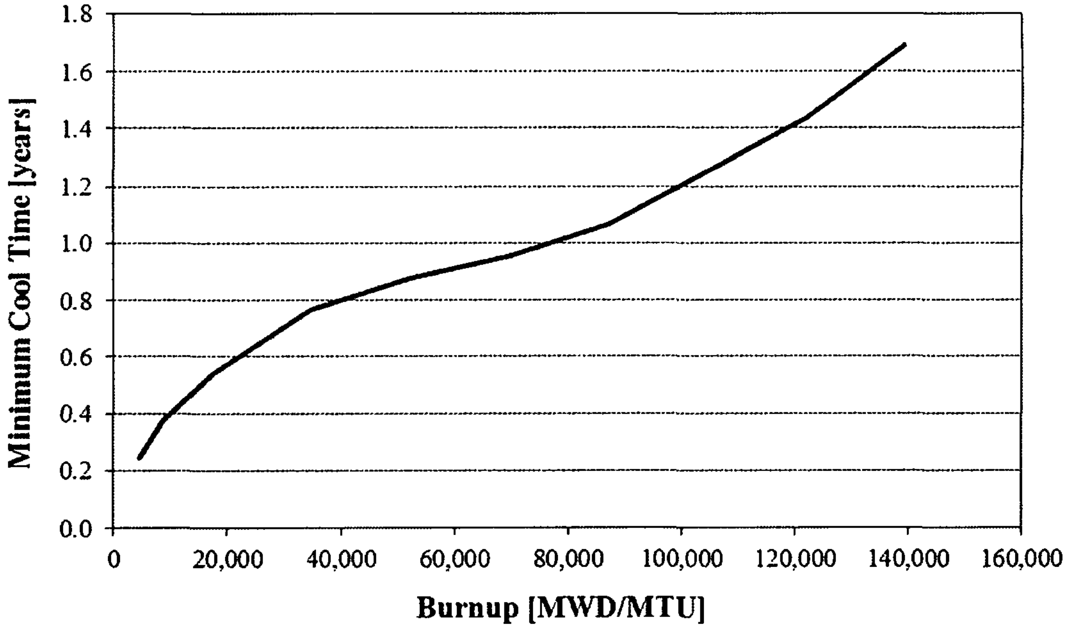


Figure 7.1-3 MEU MTR Fuel Basket Loading Guidelines for 30 W Uniform Loading

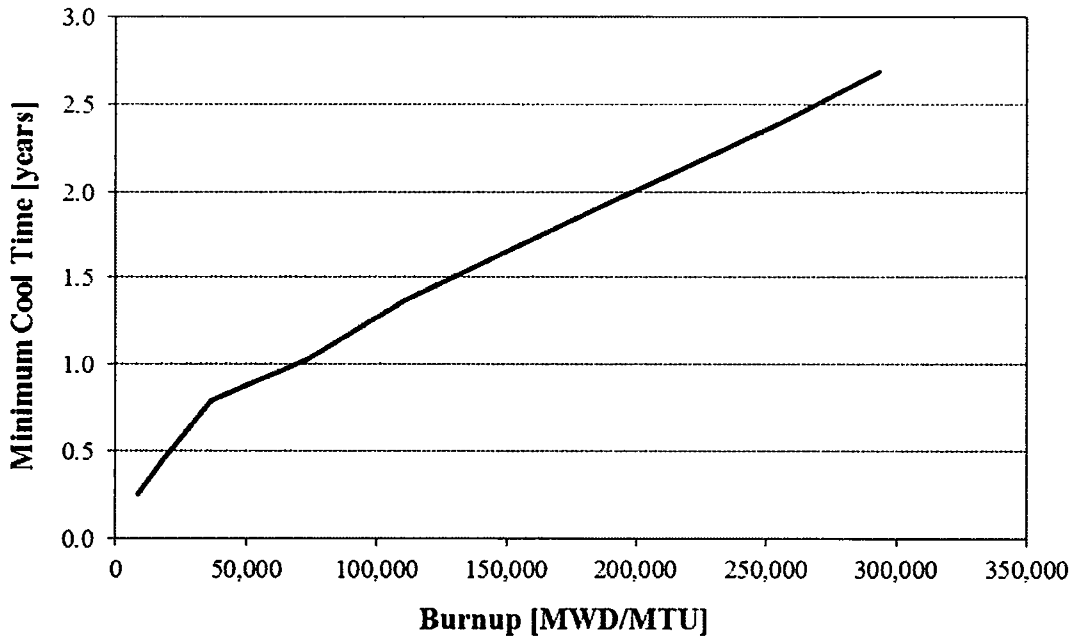


Figure 7.1-4 HEU MTR Fuel Basket Loading Guidelines for 30 W Uniform Loading – Maximum 380 grams ^{235}U

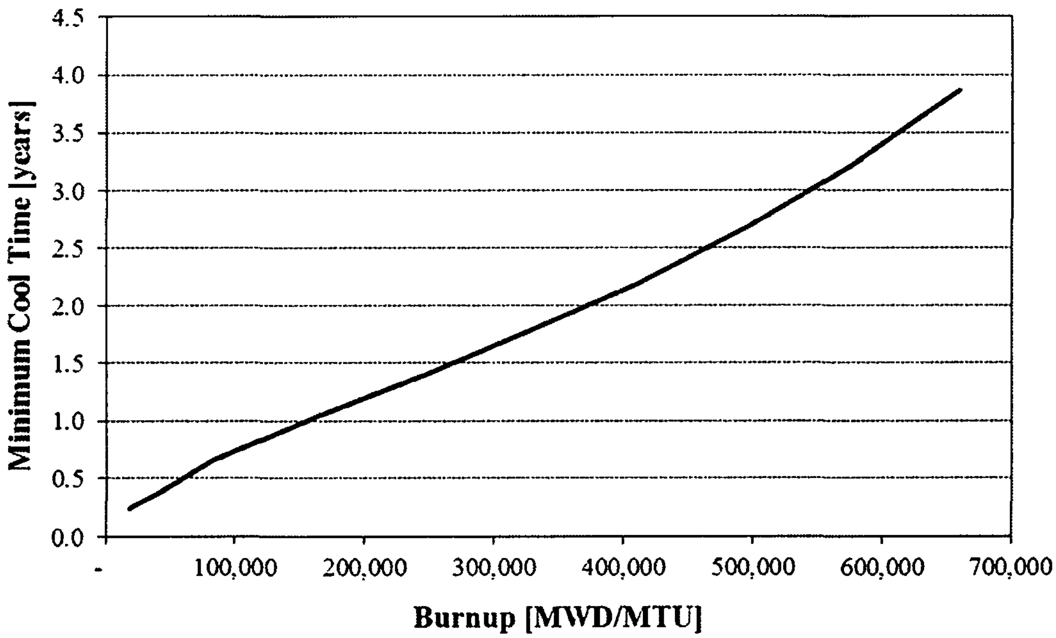


Figure 7.1-5 HEU MTR Fuel Basket Loading Guidelines for 30 W Uniform Loading – Maximum 460 grams ^{235}U

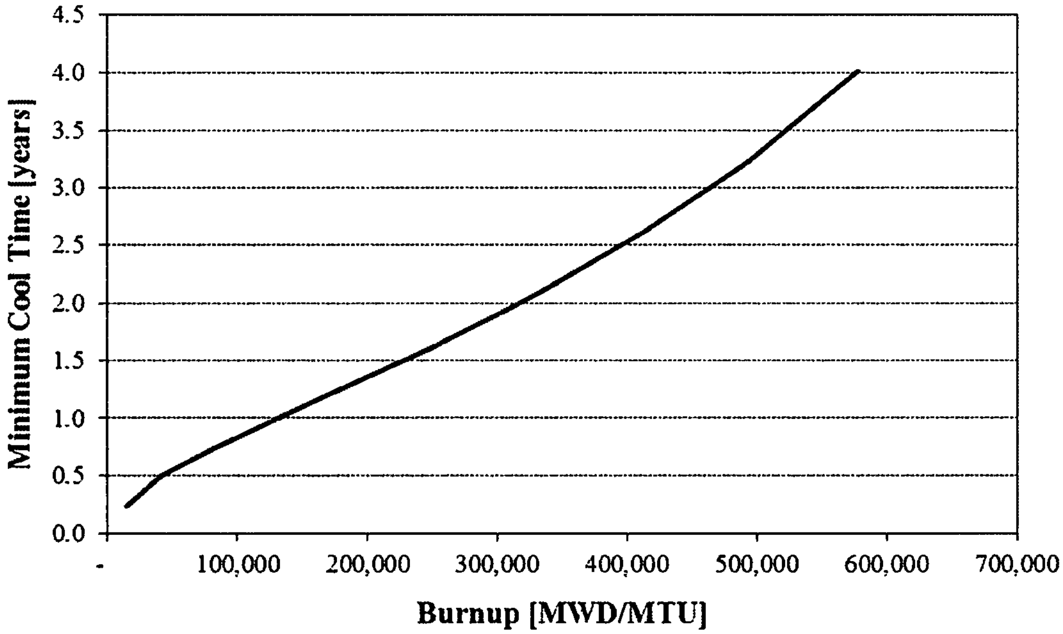


Figure 7.1-6 HEU MTR Fuel Basket Loading Guidelines for Preferential Loading – Maximum 380 grams ^{235}U

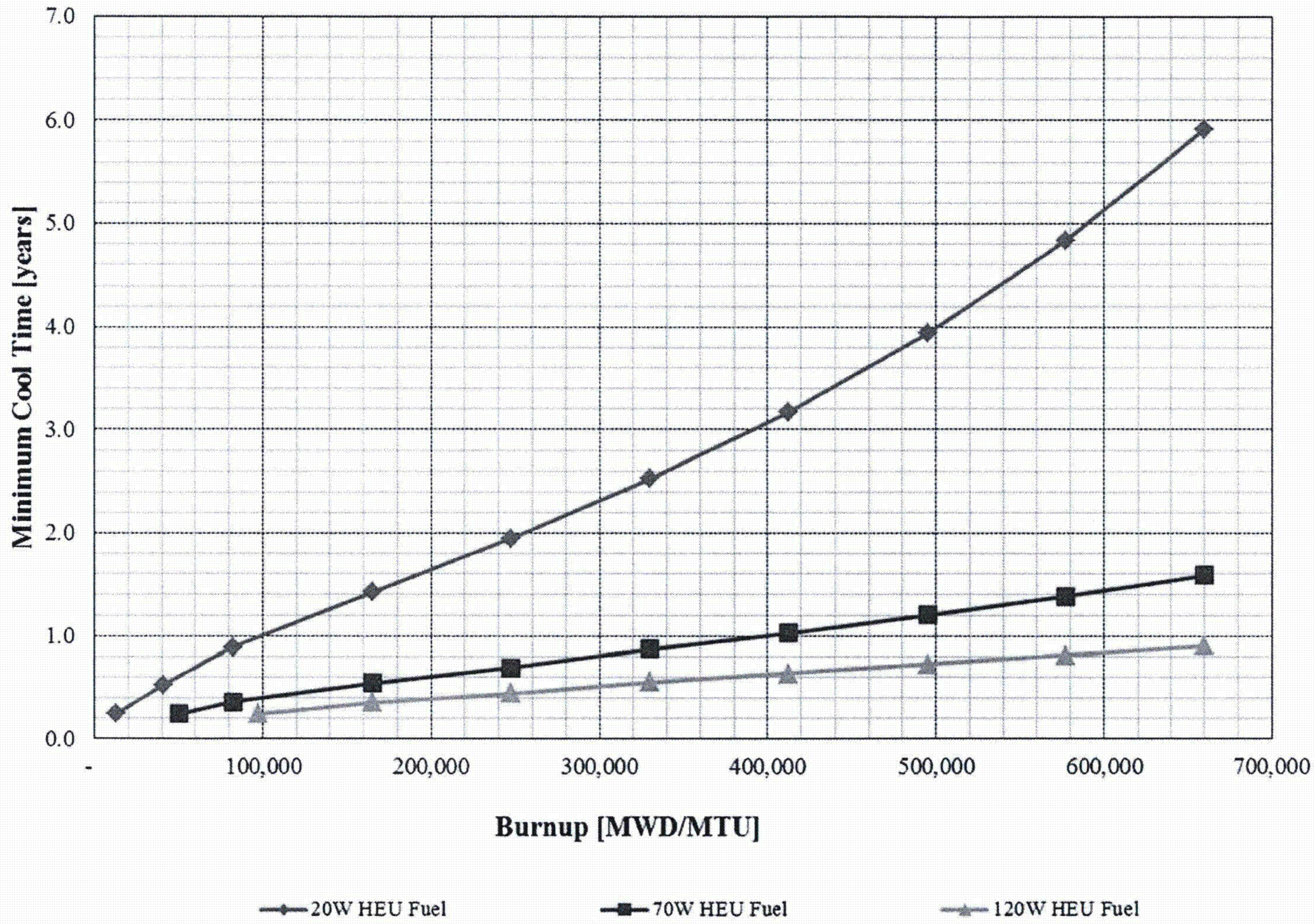


Figure 7.1-7 HEU MTR Fuel Basket Loading Guidelines for Preferential Loading – Maximum 460 grams ^{235}U

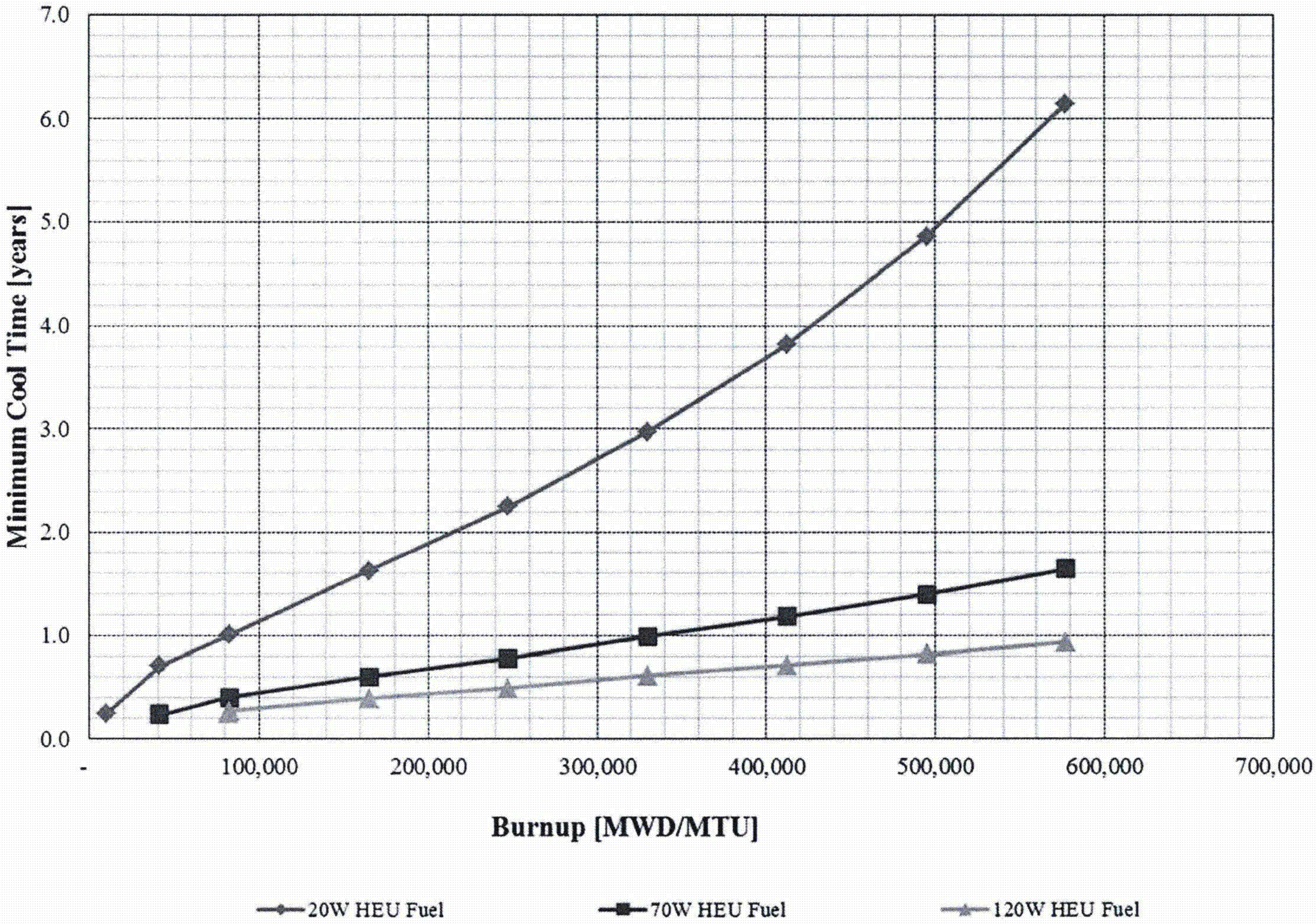


Figure 7.1-8 DIDO LEU Cooling Time vs. Fuel Burnup Basket Module Loading Guidelines for Uniform Loading

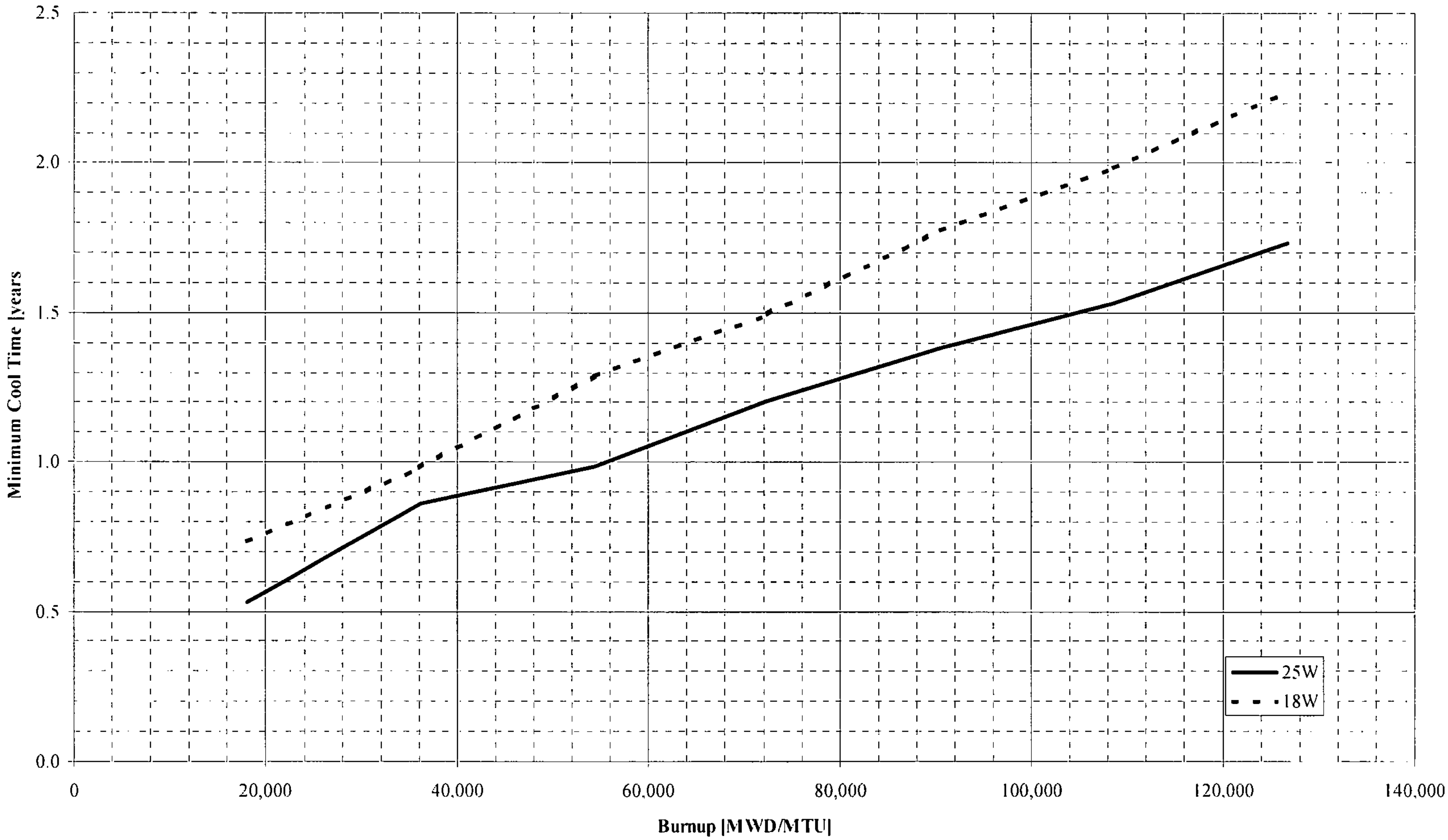


Figure 7.1-9 DIDO MEU Cooling Time vs. Fuel Burnup Basket Module Loading Guidelines for Uniform Loading

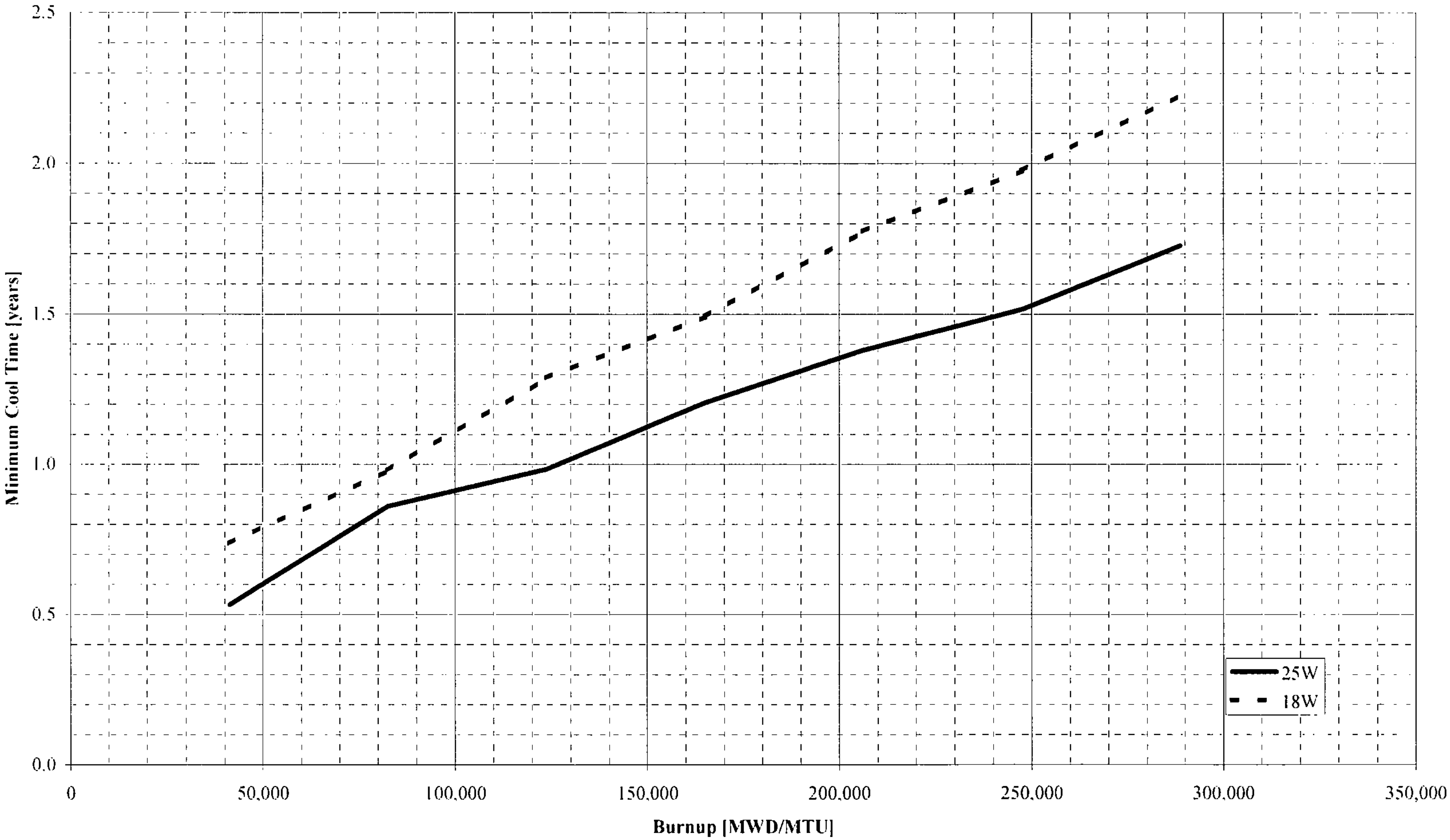


Figure 7.1-10 DIDO HEU Cooling Time vs. Fuel Burnup Basket Module Loading Guidelines for Uniform Loading

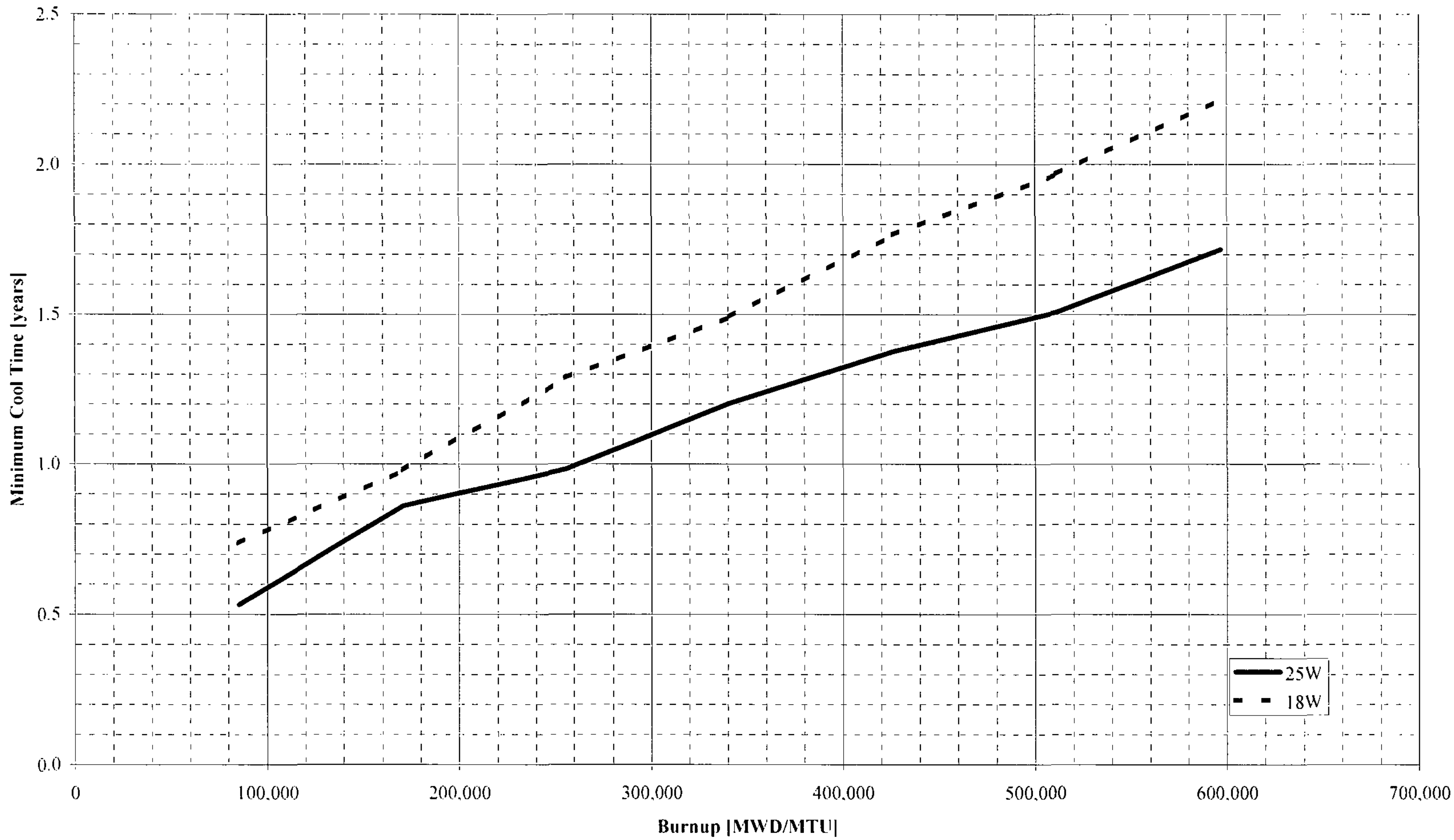


Figure 7.1-11 Bounding DIDO Element Minimum Cool Time vs. wt % ^{235}U Depletion

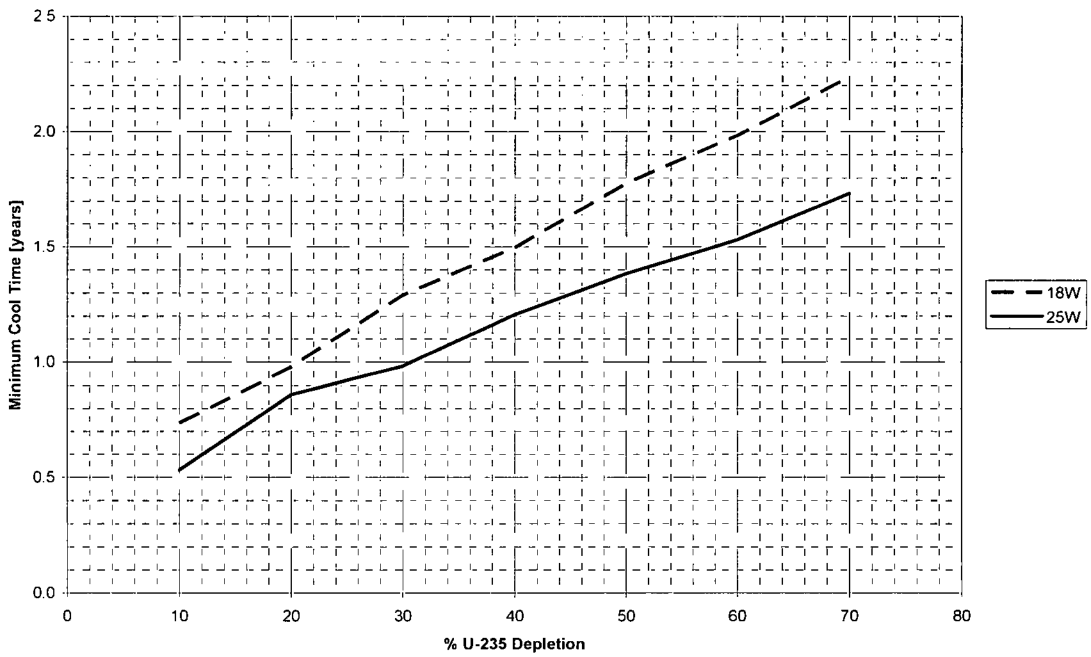


Figure 7.1-12 LEU MTR Fuel Basket Loading Guidelines for 30 W Uniform Loading - Maximum 640 grams ^{235}U

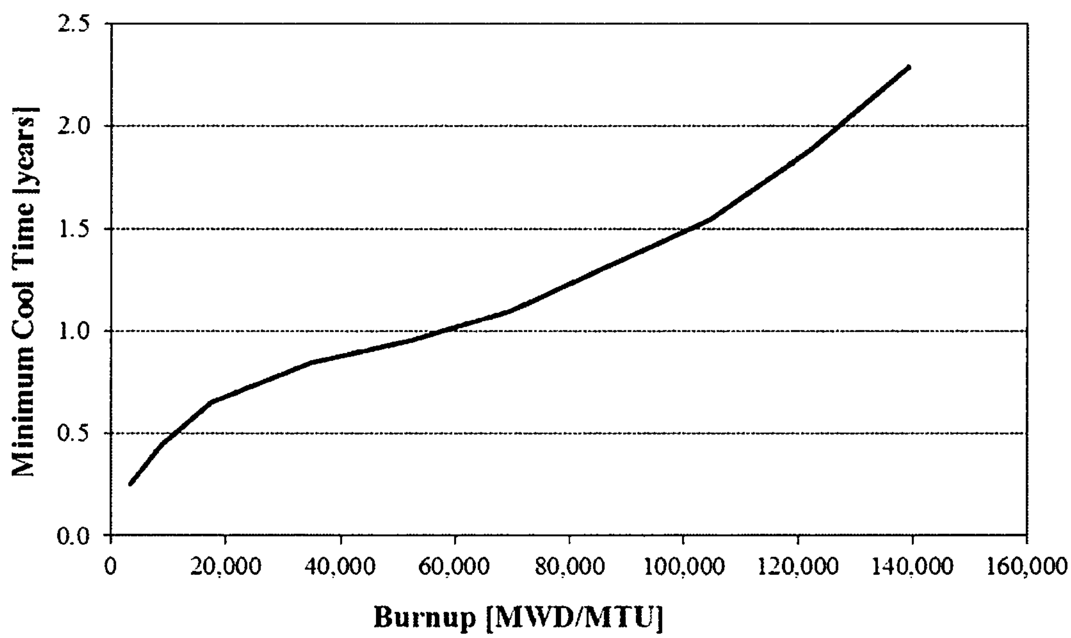
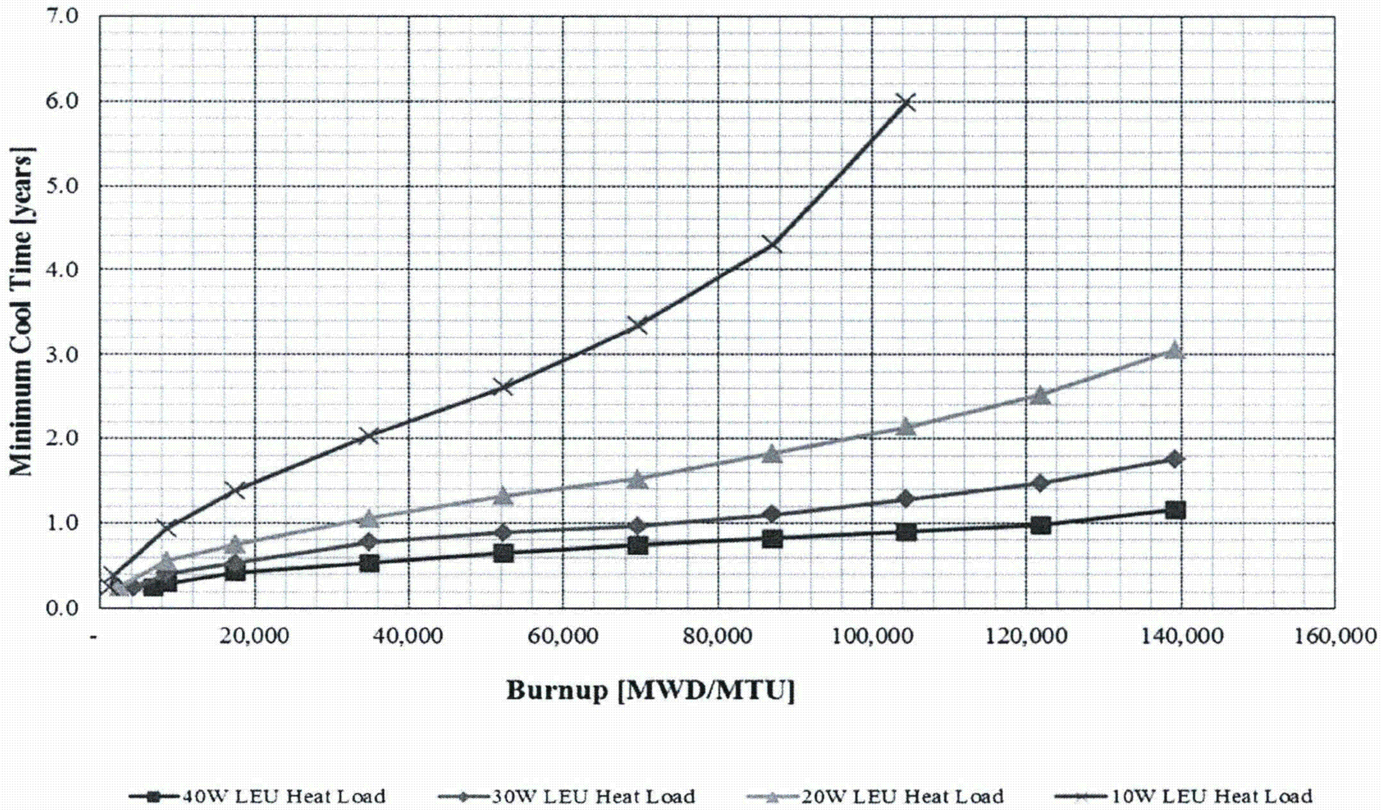


Figure 7.1-13 LEU MTR Fuel Basket Loading Guidelines for 40 W Preferential Loading - Maximum 490 grams ^{235}U



Note: Maximum burnup allowed is 139.3 GWd/MTU and minimum cool time is 90 days

7.1.6 Procedure for Dry Loading of TRIGA Fuel Basket Modules and GA IFM Modules into the NAC-LWT Cask

This procedure presents the steps for dry loading, using a transfer cask, of the nonpoisoned or poisoned TRIGA fuel basket modules into the NAC-LWT. For transport, five TRIGA fuel basket modules, consisting of a top module, a base module, and three intermediate modules must be loaded into the NAC-LWT. An alternative loading option is available for the poisoned TRIGA basket modules. This configuration, Configuration 2, consists of 1 base module and 4 intermediate modules. A spacer attached to the underside of the NAC-LWT lid is used with Configuration 2. Each basket module consists of seven cells, a center cell, and six peripheral cells. The center cell of the nonpoisoned basket design is blocked and cannot be loaded. Each unblocked cell may contain up to four TRIGA fuel elements, or up to 16 TRIGA fuel cluster rods within a fuel rod insert placed into the cell prior to loading. The maximum decay heat load of any TRIGA fuel element is 7.5 watts, while the maximum decay heat load of a TRIGA fuel cluster rod is 1.875 watts. An alternative loading option is available for the General Atomics (GA) Irradiated Fuel Material (IFM) Fuel Handling Units (FHU). This configuration consists of one GA IFM top module and one GA IFM spacer. The GA IFM top module, based on the TRIGA basket design, has two canister storage tubes that hold the GA IFM FHU.

TRIGA fuel elements may be transported directly in the basket module cell, or in a sealed damaged fuel can (DFC). TRIGA fuel cluster rods may be transported within the fuel rod insert in a basket cell, or a sealed DFC. The sealed DFCs fit in a module cell. The sealed DFC holds up to two equivalent TRIGA elements as damaged fuel or fuel debris, or up to six equivalent TRIGA fuel cluster rods as damaged rods or fuel debris. Damaged TRIGA fuel and fuel debris are contained in sealed DFCs.

When loading TRIGA fuel elements directly into the basket cells of a TRIGA basket module, the fuel elements may be loaded with either 4 elements per cell, or one element per cell, without shoring. If a basket cell is loaded with 2 or 3 intact elements, dummy rods will be inserted as necessary to fill the remaining space in the cell.

Each nonpoisoned basket module may contain up to 24 TRIGA fuel elements for a total of 120 elements, up to 96 TRIGA fuel cluster rods for a total of 480 rods per basket assembly, or a mixed loading in separate cells of the basket module of TRIGA fuel elements and TRIGA fuel cluster rods.

For the loading of the following TRIGA fuel elements, a maximum of three intact fuel elements are authorized for loading in each cell of a nonpoisoned top or bottom basket module. A dummy TRIGA spacer tube, as shown on Drawing No. 315-40-085, shall be inserted into the open position prior to fuel element loading to ensure that the maximum number of three TRIGA fuel elements is not exceeded:

- TRIGA Stainless Steel (SS) LEU fuel elements having > 169 g ^{235}U < 275 g ^{235}U; or
- TRIGA SS HEU fuel elements having > 138 g ^{235}U < 175 g ^{235}U

The licensee's approved fuel loading plan shall ensure compliance with all fuel loading restrictions.

Each poisoned basket module may contain up to 28 TRIGA fuel elements for a total of 140 elements, or up to 112 TRIGA fuel cluster rods for a total of 560 rods per basket assembly.

Damaged TRIGA fuel elements and cluster rods and fuel debris are required to be loaded into sealed DFCs. The sealed DFCs are provided in two lengths. The short sealed DFC may be used in the base or top basket module. The long sealed DFC may be used in only the top module. The sealed DFCs are vacuum dried prior to loading into a TRIGA fuel basket (see sealed DFC loading procedure in Section 7.1.7).

There are two separate GA IFM FHU designs. One FHU is designed to hold research reactor fuel and the other is designed to hold High-Temperature Gas-Cooled Reactor fuel pellets. Each FHU consists of a sealed inner canister within a sealed outer canister. Each FHU contains irradiated fuel materials as described in Chapter 1. When loading the GA IFM FHUs, each individual sealed FHU will be loaded separately into a single GA IFM basket. This single basket containing two GA IFM FHUs and a spacer will comprise the entire cask load. Loading of the GA IFM basket into the NAC-LWT cask will utilize the TRIGA dry configuration loading procedure that is described in the following paragraphs.

TRIGA fuel elements that can be loaded into the cask are limited to a maximum decay heat of 7.5 watts per element, as discussed in Section 1.2.3. The decay heat load of the element must be calculated, and verified to be equal to or less than 7.5 watts per element prior to loading. TRIGA fuel cluster rods that can be loaded into the cask are limited to a maximum decay heat of 1.875 watts per element, as discussed in Section 1.2.3 (by reference to Table 5.1.1). The decay heat load of the fuel cluster rod must be calculated, and verified to be equal to or less than 1.875 watts per element prior to loading.

The procedure for loading the package with TRIGA fuel in a dry configuration is as follows:

1. Perform a receipt inspection of the empty cask and trailer/ISO container, inspecting for transport damage.
2. Position the trailer in the designated cask unloading area. Set the trailer brakes and chock the wheels to prevent unintended movement. If site-specific conditions exist that require the trailer to move to allow the cask to be uprighted on its rotation trunnions, release brakes and remove the chocks when required to complete uprighting

operations. If an ISO container is used, it may be removed from the trailer and secured in the unloading area.

3. Remove the personnel barrier or the roof and roof cross-members from the ISO container.

   Note: Verify that the package nameplate displays the correct package identification number in accordance with the CoC.

4. Perform a Health Physics survey of the cask and adjacent surfaces of the trailer.

   Note: A receiving survey of the cask and transporter must be performed as soon as practicable after arrival at the site to assure compliance with 10 CFR 20, 10 CFR 71.87(i) and 10 CFR 71.47, and to assure timely reporting of any reportable noncompliance.

5. Remove the top and bottom impact limiters.
6. Remove the cask tie-down strap.
7. Using the lifting yoke with the guides removed, engage the lifting trunnions. Raise the cask to vertical by rotating the cask rotation sockets on the rear cask supports, moving the crane and/or trailer as required to keep the lift yoke engaged to the trunnions and the cask engaged in the rear supports. When the cask is fully vertical, lift the cask from the supports and remove it from the trailer/container.
8. Place the cask onto the dry loading station. Disengage the lifting yoke and move clear.
9. Visually inspect the neutron shield tank fill, drain and level inspection plugs for signs of neutron shield fluid leakage.
10. Remove the vent and drain valve port covers. Prior to reinstallation of the port covers, carefully inspect the O-rings and, if the O-rings show any damage, replace them with approved spares. Ensure that the replacement O-rings are properly installed and seated. Visually inspect the valve quick-disconnect nipples and replace them, if necessary.

    Note: For Alternate B port covers, replace the metallic O-ring with an approved spare prior to reinstallation.

11. Remove closure lid bolts. Attach the lid lift slings to the closure lid. Remove the closure lid and set it on a support that is suitable for radiological control and for maintaining the cleanliness of the closure lid. Prior to reinstallation of the lid, carefully inspect the Teflon O-ring seal in the underside of the closure lid and, if it shows any damage, replace it. Remove the metallic O-ring and replace it with an approved spare. Ensure that the replacement O-rings are properly installed and seated. Inspect the lid bolts and replace any that are damaged.
12. Visually inspect the inner cavity for foreign material or damage. Install, or verify the presence of the proper drain tube and drain alignment ring.
13. Install the required dry transfer system components on the top of the cask.
14. Position the shielded transfer cask system components for fuel loading, as appropriate.
15. Identify the TRIGA fuel basket modules to be loaded. Modular baskets consisting of one base unit, three intermediate units, and one top unit, may be loaded into the cask cavity. The base unit must be the first unit loaded and the top unit must be the last unit loaded. The intermediate modules may be loaded in any of the other loading

operations. If the poisoned basket Configuration 2 is used, ensure that the TRIGA spacer is bolted and torqued to 40 ft-lbs to the underside of the NAC-LWT lid. If TRIGA fuel cluster rods are to be transported, ensure that fuel rod inserts are placed into each cell location that will contain fuel cluster rods. For the GA IFM basket load, install the GA IFM spacer, shown on NAC drawing 315-40-123, prior to inserting the loaded GA IFM top module.

Notes:
a. When utilizing nonpoisoned TRIGA baskets, visually verify that the center blocking plate is welded in place on each basket module.
b. When utilizing poisoned TRIGA baskets, visually inspect each cell of each basket module for foreign material or damage and verify the presence of the neutron poison material (borated stainless steel plates) as shown on NAC Drawings 315-40-080, -081, and -082.
c. When utilizing the GA IFM top module, follow the TRIGA loading procedure below, noting that this is a single basket load.

16. Identify the TRIGA fuel elements and TRIGA fuel cluster rods to be loaded into each fuel basket module. Fuel elements and rods to be loaded into each basket module shall comply with the applicable approved content conditions specified in Condition 5.(b)(1) and 5.(b)(2) of CoC No. 9225.

    If a top or bottom basket module cell is to be loaded with a TRIGA LEU SS fuel element having > 169 g ^{235}U, or a TRIGA HEU SS fuel element > 138 g ^{235}U, a dummy TRIGA spacer tube, as shown on NAC Drawing 315-40-085, shall be preinstalled in the module cell prior to fuel loading to prevent inadvertent loading of more than three high ^{235}U content TRIGA fuel elements per cell. High ^{235}U content TRIGA fuel elements are further restricted to loading in the top and bottom basket modules of a nonpoisoned basket only.

17. Perform an independent verification that the TRIGA fuel elements, fuel cluster rods and dummy TRIGA spacer tubes loaded in the basket module comply with the approved loading plan and the CoC content conditions including fuel parameters, heat load, enrichment, minimum cooling period, etc.
18. Load a TRIGA fuel basket module into the shielded transfer cask.
19. Place the shielded transfer cask containing the loaded basket module onto the dry transfer system components positioned on the top of the cask.
20. Lower the fuel basket from the shielded transfer cask into the shipping cask.
21. Repeat the loading and transfer of loaded basket modules until the approved cask loading plan is completed.
22. Install the closure lid onto the cask. Visually verify that the lid is properly seated.
23. Remove the dry transfer system components from the top of the cask.
24. Install and tighten the 12 closure bolts to 260 ± 20 ft-lbs in three passes, using the torque sequence stamped on the closure lid.
25. Connect a gas supply line to the vent valve and the drain line to the drain valve.
26. Open the air, nitrogen or helium gas supply valve and pressurize the cask cavity (< 30 psig) to force any residual water out the drain line. Continue to supply pressurized gas to the cask for a minimum of five minutes after the last residual free

water discharges from the drain. Remove the drain and gas supply lines and attach a vacuum drying system (VDS) to the vent.

27. Evacuate the cask cavity to less than or equal to 10 torr (13 mbar) and continue vacuum pumping for a minimum of 15 minutes.
28. At the end of the vacuum pumping period, isolate the cask cavity from the vacuum pump and stop the vacuum pump. Monitor the cask cavity pressure for a minimum of ten minutes. If the pressure rise is less than 5 torr (6.7 mbar), the cavity is verified as dry of free water. If pressure rise is >5 torr (6.7 mbar), repeat vacuum drying until the dryness verification results are satisfactory.
29. Backfill the cask cavity with helium to 0 psig (1 atmosphere, absolute), +1, -0 psi and disconnect the VDS from the vent valve.
30. Perform a helium leakage test of the closure lid containment O-ring using a Helium Mass Spectrometer Leak Detector (He MSLD) in accordance with the procedural requirements of Section 8.1.3.1, Steps 3 through 10.
31. Install the vent and drain alternate port covers and torque the bolts to 100 ±10 inch-pounds.
32. If an alternate port cover containment O-ring seal was replaced, perform a helium leakage test on the affected port cover using a He MSLD in accordance with the requirements of 8.1.3.2.2.
33. If the alternate port cover containment seal was inspected and accepted for reuse, perform a gas pressure drop leakage test on the affected port cover as follows.
    a. Install a pressure test fixture to the port cover test port including a calibrated pressure gauge with a minimum sensitivity of 0.25 psi.
    b. Pressurize the port cover seal annulus to 15 psig, +1, -0 psi.
    c. Isolate the gas supply and observe the pressure gauge for a minimum of five minutes.
    d. The acceptance criterion for the test is no measurable drop in pressure during the minimum test time. An acceptable test assures that the minimum assembly verification leakage test sensitivity is achieved.

    Note: Alternate B port covers, if used, shall have a helium maintenance leakage rate test performed to confirm a leaktight containment closure. Install the Alternate B port cover and perform the maintenance leakage rate test per the requirements of Section 8.1.3.3.2.
34. Decontaminate the cask surfaces. Survey the cask for surface contamination and radiation dose rates.

    Note: Ensure compliance with 10 CFR 71.87(i) and 10 CFR 71.47.
35. Engage the cask lifting yoke to the lifting trunnions.
36. Lift the cask and position the cask rotation sockets in the rear rotation trunnions of the rear support structure. Carefully lower the cask to the horizontal transport orientation resting on the front saddle by moving the crane and/or the trailer as required to maintain cask engagement to the rear supports.

37. Disengage the lifting yoke from the lifting trunnions and remove it from the area. Install the cask tie-down strap. Install the top and bottom impact limiters. Install a TID to an attachment point on the top impact limiter.
38. Install ISO container bracing and lid, or personnel barrier.
39. Complete radiation and contamination surveys of the external surfaces of the package and record the data. Ensure removable contamination and radiation dose rate survey results comply with the limits specified in 10 CFR 71.87(i) and (j).
40. Measure the dose rate in millirems per hour at one meter from the package surface to determine the Transport Index (TI). Indicate the TI on the Radioactive Material labels applied to the package in accordance with 49 CFR 172, Subpart E.
41. Determine the appropriate Criticality Safety Index (CSI) assigned to the package contents in accordance with the CoC, and indicate the correct CSI on the Fissile Material label applied to the package per 49 CFR 172, Subpart E.
42. Apply appropriate placards to the transport vehicle in accordance with 49 CFR 172, Subpart F.
43. Complete the shipping documents and provide the carrier with instructions regarding the requirements for maintaining an exclusive use shipment.

7.1.7 Procedure for Loading TRIGA Damaged Fuel or Fuel Debris into a TRIGA Sealed Damaged Fuel Can (DFC)

1. Examine the sealed damaged fuel can (DFC) body and inspect for damage. Verify that the lid sealing surface is clean and free of defects. Visually verify that the drain plug seal is installed and the drain plug is partially threaded into the drain plug adapter to allow for draining.
2. Lower the DFC into the pool and position it for fuel loading.
3. Load the damaged TRIGA fuel cluster rods or fuel debris into the DFC. Verify that no more than the equivalent of 2 design base fuel elements, or 6 fuel cluster rods, as damaged fuel or fuel debris are loaded into the sealed DFC as specified in the CoC. Visually verify that there is no debris in the lid sealing surface and thread areas.
4. Examine the DFC lid and inspect for damage. Visually verify that the sealing surface is clean and free of defects. Lubricate the lid bolts, install the lid seal and verify that the lid valve is in the open position and the valve lock set screw is retracted.
5. Attach the testing hose to the lid test connection and ensure that the fitting is properly seated.
6. Install the lid and torque the lid bolts to 150 ± 10 inch-pound.

   Note: Torque any two diametrically opposed bolts first, then torque the remaining two bolts. Complete the torque sequence by verifying the torque of all four bolts in a clockwise direction.
7. Pressurize the sealed DFC with air or helium to 5-15 psig to remove the water. Continue the purge for at least 5 minutes after bubbles appear from the base of the DFC.
8. Access and torque the DFC drain plug to 50 ± 2 ft-lbs.

9. Evacuate the DFC to a pressure below 10 torr (13 mbar) and continue vacuum pumping for 10 minutes.
10. Stop and isolate the vacuum pump and monitor the DFC vacuum pressure for a minimum of 10 minutes. If the pressure rise is <5 torr (6.7 mbar) in 10 minutes, the DFC is verified as dry of free water. If the pressure rise is >5 torr (6.7 mbar) in 10 minutes or less, the DFC is not considered dry of free water. Repeat vacuum drying and pressure rise testing until the dryness verification results are satisfactory.
11. Backfill the DFC with helium to a pressure of 1 atmosphere (0 psig), +1, -0 psi.
12. Shut and lock the lid diaphragm valve. The DFC is now sealed, dried and backfilled.
13. Disconnect the testing hose from the lid test connection.
14. The sealed DFC is now ready for loading into a TRIGA basket module.

7.1.8 Procedure for Wet Loading of PWR/BWR Fuel Rods or TPBARs into the PWR/BWR Transport Canister

For the shipment of PWR and BWR fuel rods and nonfuel-bearing components (e.g., PWR guide tubes or BWR water rods), the PWR/BWR transport canister has three configurations: sealed canister, screened canister, and free-flow canister. All three canister configurations may be used to contain either intact or damaged fuel rods, or a combination of both damaged and intact fuel rods. The loaded transport canisters are loaded into the NAC-LWT cask containing a LWT PWR basket assembly with an appropriate bottom weldment spacer. For transport canisters containing any damaged fuel rod contents, a can and an insert spacer are required to be installed and bolted to the underside of the closure lid to limit the axial movement of the canister. The use of the can and insert spacer requires the use of the PWR basket assembly fitted with the Alternate B spacer. Transport canisters containing intact rods may be placed in any of the three types of PWR basket assemblies. For the transport of a mixed loading of PWR or BWR fuel rods with nonfuel-bearing components, a modified 5×5 insert with 21 fuel rod locations and a larger tube position for the larger diameter nonfuel-bearing component (up to a nominal diameter of 1.3 inches) is required to be used with the PWR/BWR transport canister.

For the shipment of TPBARs, only the screened or free flow PWR/BWR Rod Transport Canister containing the 5 × 5 rod insert may be used.

Upon completion of loading the transport canister, the canister and the insert spacer are loaded, either together or individually, into the basket assembly in a manner similar to loading a PWR assembly.

1. If the transport canister is to be shipped in a sealed configuration, verify the five drain plugs are installed and torqued to 50 ± 2 foot-pound. If the transport canister is to be shipped in the free flow configuration, verify the five drain plugs are not installed. If the transport canister is to be shipped in the screened configuration, verify the screened plugs are installed and torqued to 50 ± 2 foot-pound in the bottom of the canister.

2. Lower the transport canister (and insert) into the fuel pool for loading.
3. Load the spent fuel rods into the transport canister in accordance with site-specific procedures. Separate failed fuel rod capsules may be used to contain either intact or damaged fuel rods within the canister. The capsules are intended to limit dispersal of radioactive material to the canister internals. Visually upon completion of loading, verify that there is no debris on the lid sealing surface and threaded areas.
4. Using the appropriate lid (sealed, screened or free-flow), examine and inspect for damage. Visually verify that the sealing surface is clean and free of defects. Lubricate the lid bolts.
5. Install the lid and torque the lid bolts to 35 ± 5 inch-pound.

   Note: Torque any two diametrically opposed bolts first, then torque the remaining six bolts. Complete the torque sequence by verifying the torque of all eight bolts in a clockwise direction.
6. If the transport canister is being shipped in either the screened or free-flow configuration, it is now ready for shipment. To ship PWR and BWR rods and nonfuel-bearing components, the transport canister shall be loaded into the NAC-LWT cask in accordance with Section 7.1.1, Procedures for Wet Loading of LWR Fuel Assemblies and Canistered LWR Fuel Rods. To ship TPBARs, the transport canister shall be loaded in accordance with Section 7.1.9, Procedure for Wet Loading of TPBAR Consolidation Canister or PWR/BWR Rod Transport Canister into the NAC-LWT Cask. If the transport canister is being shipped in the sealed configuration, complete steps 7-14 of this section.
7. Connect vent and drain lines to the respective quick-disconnect fittings on the sealed transport canister lid. The drain hose discharge should be directed to the plant drain system for radiological wastewater or another appropriate collection point.
8. Pressurize and purge the transport canister using helium. (Caution do not exceed 25 psig. while dewatering the transport canister.) Secure the purge once no fluid is observed exiting the discharge for at least 10 minutes.
9. Connect the vent line to a suitable vacuum pump. Maintain connection of drain line to the can, but isolate the line to allow vacuum drying of the sealed failed fuel can.
10. Evacuate the can to a pressure below 10 torr (13 mbar) and continue vacuum pumping for 10 minutes.
11. Stop and isolate the vacuum pump and monitor the cask cavity vacuum pressure for a minimum of 10 minutes. If the pressure rise is less than 5 torr (6.7 mbar), the cavity is verified as dry of free water. If the pressure rise is >5 torr (6.7 mbar), repeat vacuum drying until the dryness verification results are satisfactory.
12. Backfill the transport canister cavity with helium to 1 atmosphere (absolute), +1, -0 psi.
13. Disconnect the vent and drain lines from the transport canister.
14. The sealed transport canister is now ready for shipment and may be loaded into the NAC-LWT cask in accordance with Section 7.1.1.

7.1.9 Procedure for Wet Loading of TPBAR Consolidation Canister or PWR/BWR Rod Transport Canister into the NAC-LWT Cask

This section describes the procedures for loading the NAC-LWT with a TPBAR consolidation canister or with a screened or free flow PWR/BWR Rod Transport Canister. The consolidation canister can contain up to 300 TPBARs, two of which may be prefailed. Dunnage (i.e., spacer grids, stainless steel tubes, etc.) may be used in consolidation canisters containing fewer than 300 TPBARs. The total weight and volume of the contents (i.e., dunnage and reduced number of TPBARs) must be less than, or equal to, the weight and volume of the full load of 300 TPBARs.

The PWR/BWR Rod Transport Canister may contain up to 25 TPBARs.

Appropriate radiological controls and procedures addressing tritium shall be utilized by the licensee, including appropriate personnel monitoring for tritium exposure.

NAC-LWT casks to be used to transport the TPBAR consolidation canisters shall be configured as shown on Drawing No. 315-40-128, including Alternate B port covers. NAC-LWT casks to be used to transport a PWR/BWR Rod Transport Canister shall be configured as shown on Drawing No. 315-40-104, Assembly 95, including Alternate B port covers.

1. Perform a receiving survey of the empty cask and inspect for damage. Verify, by cask serial number, that the cask is approved for TPBAR shipment.
2. Position a trailer in the designated cask unloading area. Set the trailer brakes and chock the wheels to prevent unintended movement. If site-specific conditions exist that require the trailer to move to allow the cask to be uprighted on its rotation trunnions, release brakes and remove the chocks when required to complete uprighting operations. If an ISO is used, it may be removed from the trailer and secured in the unloading area.
3. Remove the roof from the ISO container and open the front and rear ISO doors. Remove roof cross-members, if installed.

Note: Verify that the package nameplate displays the package identification number, USA/9225/B(M)-96, as required by the CoC for TPBAR contents.

4. Perform a Health Physics survey of the cask and adjacent surfaces of the trailer.

   Note: A receiving survey of the cask and transporter must be performed as soon as practical after arrival at the site to assure compliance with 10 CFR 71.87(i) and 10 CFR 71.47, and to assure timely reporting of any reportable noncompliance.
5. Remove the top and bottom impact limiters.
6. Remove the cask tie-down strap.
7. Using the lifting yoke with the guides removed, engage the lifting trunnions. Raise the cask to vertical by rotating the cask rotation sockets on the rear cask supports, moving the crane and/or trailer as required to keep the lift yoke engaged to the trunnions and the cask engaged in the rear supports. When the cask is fully vertical, lift the cask from the supports and remove it from the trailer/container.

8. Place the cask in the decontamination pit or other designated area. Disengage the lifting yoke. Clean cask surfaces of road dirt as required for entry into the spent fuel pool.
9. Visually inspect the neutron shield tank fill, drain and level inspection plugs for signs of neutron shield fluid leakage.
10. Remove the Alternate B vent and drain valve port covers. Prior to reinstallation of the port covers, replace the metallic O-ring seal with an approved spare and inspect the Viton® O-ring seal for each port cover. If the Viton® O-ring shows any damage, replace it. Ensure that the replacement O-rings are properly installed and seated. Store the port covers to protect the seal surfaces. Visually inspect the valved quick-disconnect nipples and replace them, if necessary.
11. Remove closure lid bolts. Attach the lid lift slings to the closure lid. Remove the closure lid and set it on a support that is suitable for radiological control and for maintaining the cleanliness of the closure lid. Prior to reinstallation of the lid, carefully inspect the Teflon O-ring seal in the underside of the closure lid. If the O-ring shows any damage, replace it. Remove the metallic O-ring and replace it with an approved spare. Ensure that the replacement O-rings are properly installed and seated. Inspect the lid bolts and replace any that are damaged. Ensure that the TPBAR spacer is installed on the bottom of the cask lid for consolidation canister transports and not damaged when the lid is set down.
12. Visually inspect the inner cavity for foreign material or damage. Install or verify the presence of the standard drain tube and the TPBAR basket assembly (Drawing No. 315-40-10, Assembly 96 or Assembly 95) for loading of the consolidation canister; or the standard drain tube, TPBAR basket assembly (Drawing No. 315-40-10, Assembly 95), and the PWR Insert (Drawing No. 315-40-105, Assembly 99) for the loading of the PWR/BWR Rod Transport Canister containing TPBARs.

    Note: The PWR inset may be installed during the placement of the loaded PWR/BWR Rod Transport Canister into the NAC-LWT cask.

13 Fill the cask cavity with clean water. Install lift yoke arm guides and remote actuation components on the cask lifting yoke.
14. Engage the cask lifting yoke with the cask lifting trunnions and pick up the cask. Carefully lower the cask to the bottom of the cask loading area while spraying the cask down with clean water.
15. Disengage the lifting yoke from the cask and remove the yoke from the pool.
16. Identify the TPBAR consolidation canister or the PWR/BWR Rod Transport Canister containing TPBARs to be loaded.
17. Pick up the consolidation canister or the PWR/BWR Rod Transport Canister using the required grapple system.
18. Position the container over the cask and then carefully lower it into the cask to avoid damage to the cask sealing surfaces. Orient the consolidation canister bail so that it is aligned with the drain tube location. Confirm that the container is fully seated, then release and raise the grapple to the full up position.
19. Position the cask lifting yoke over the cask closure lid. Attach the slings to the closure lid and cask lifting yoke. Lower the yoke over the cask.

20. Position the closure lid over the cask and slowly lower it into place. For the consolidation canister, ensure the bail is properly aligned to the TPBAR spacer on the bottom of the lid. Use the cask and lid match marks as guides to properly align the lid. Visually confirm that the closure lid is seated.
21. Lower the cask handling yoke to slack the closure lid cables. Engage the lift yoke to the lifting trunnions and begin lifting.

    Note: Visually verify the yoke engagement before lifting the cask.
22. Raise the cask until the lid is slightly above the surface of the pool. At the option of the licensee/user, a number of closure lid bolts (4 to 12) may be installed hand tight.
23. Raise the cask clear of the pool, rinsing the yoke and cask with clean water.
24. Transfer the cask to the decontamination pit or other work area. Remove the yoke and lid lift slings.
25. Install and tighten the 12 closure lid bolts to 260 ± 20 ft-lb in three passes, using the torque sequence stamped on the closure lid.
26. At the option of the licensee/user, a 25 to 50 gallon clean water flush of the cask cavity may be performed by connecting a valved clean water line to the drain valve and a valved drain line to the vent valve. After the cavity flushing is completed, if performed, disconnect the water supply and drain lines.
27. Connect a gas supply line to the vent valve and the drain line to the drain valve.
28. Open the air, nitrogen or helium gas supply valve and pressurize the cask cavity (<30 psig) to force out the water. Continue to supply pressurized gas to the cask for a minimum of five minutes after the last residual free water discharges from the drain line. Remove the drain and gas supply lines and attach a vacuum drying system (VDS) to the cask vent valve.
29. Evacuate the cask cavity to a vacuum pressure of less than 10 torr (13 mbar) and continue vacuum pumping for a minimum of 15 minutes.
30. At the end of the vacuum pumping period, isolate the cask cavity from the vacuum pump and stop the pump. Monitor the cask cavity pressure for a minimum of ten (10) minutes. If the pressure rise is less than 5 torr (6.7 mbar), the cavity is verified as dry of free water. If the pressure rise >5 torr (6.7 mbar), repeat vacuum drying until the dryness verification results are satisfactory.
31. Backfill the cask cavity with helium to 0 psig (1 atmosphere, absolute), +1, -0 psi. Disconnect the VDS.
32. Perform the helium leakage test of the closure lid containment O-ring using a Helium Mass Spectrometer Leak Detector (He MSLD) in accordance with the requirements of Section 8.1.3.1, Steps 3 through 10.
33. Install and helium leakage test the Alternate B vent and drain port covers to leaktight criteria in accordance with Section 8.1.3.3.2.
34. Decontaminate the cask. Survey the cask for surface contamination and radiation dose rates.

    Note: Ensure compliance with 10 CFR 71.87(i) and 10 CFR 71.47.
35. Remove lift yoke arm guides. Engage the cask lifting yoke to the lifting trunnions.

36. Lift the cask and position the cask rotation sockets in the rear rotation trunnions of the rear support structure. Carefully lower the cask to the horizontal transport orientation resting on the front saddle by moving the crane and/or trailer, as required, to maintain cask engagement to the rear supports.
37. Disengage the cask lifting yoke from the cask lifting trunnions and remove it from the area.
38. Install the cask tie-down strap. Install the top and bottom impact limiters.
39. Install a TID to an attachment point of the top impact limiter.
40. Install roof cross-members, close ISO container doors, and replace ISO container roof.
41. Complete radiation and contamination surveys of the external surfaces of the package and record the data. Ensure removable contamination and radiation dose rate survey results comply with the limits specified in 10 CFR 71.87(i) and (j).
42. Measure the dose rate in millirems per hour at one meter from the package surface to determine the Transport Index (TI). Indicate the TI on the Radioactive Material labels applied to the package in accordance with 49 CFR 172, Subpart E.
43. Determine the appropriate Criticality Safety Index (CSI) assigned to the package contents in accordance with the CoC, and indicate the correct CSI on the Fissile Material label applied to the package per 49 CFR 172, Subpart E.
44. Apply appropriate placards to the transport vehicle in accordance with 49 CFR 172, Subpart F.
45. Complete the shipping documents and provide the carrier with instructions regarding the requirements for maintaining an exclusive use shipment.

7.1.10 Procedure for the Dry Loading of PULSTAR Fuel Into the NAC-LWT Cask

This section describes the procedures for loading the NAC-LWT cask with intact PULSTAR fuel assemblies, intact PULSTAR fuel rods in fuel rod inserts, and intact or damaged PULSTAR fuel assemblies, fuel rods, fuel debris, and nonfuel components of PULSTAR fuel assemblies in either sealed or screened PULSTAR cans. Up to 28 PULSTAR fuel assemblies, rod inserts, and sealed or screened cans can be loaded in the 28 MTR (four module × seven cells/module) basket assembly. The 28 MTR basket assembly consists of a base module, two intermediate modules, and a top module.

Damaged PULSTAR fuel assemblies, damaged fuel rods, fuel debris, and nonfuel components of fuel assemblies are required to be loaded in either a sealed failed fuel or screened PULSTAR can. Intact PULSTAR fuel rods may be loaded into either one of the cans at the option of the licensee. The PULSTAR cans are limited to being loaded in any cell in either the top or the base module. The top and base basket modules can also contain intact PULSTAR fuel assemblies and fuel rod inserts containing intact PULSTAR fuel rods.

The NAC-LWT cask will be loaded dry, utilizing a transfer cask for loading each of the four basket modules. The basket modules will be preloaded with the PULSTAR fuel contents. The damaged fuel cans will be preloaded, closed, drained and dried, if applicable, prior to loading in either the top or base basket module. The PULSTAR cans shall be loaded and prepared for transport in accordance with the applicable steps of Section 7.1.7.

The NAC-LWT dry PULSTAR fuel loading and preparation for transport procedures are as follows.

1. Perform a receipt inspection of the empty cask and trailer/ISO container, inspecting for transport damage.
2. Position the trailer in the designated cask unloading area. Set the trailer brakes and chock the wheels to prevent unintended movement. If site-specific conditions exist that require the trailer to move to allow the cask to be uprighted on its rotation trunnions, release brakes and remove the chocks when required to complete uprighting operations. If an ISO container is used, it may be removed from the trailer and secured in the unloading area.
3. Remove the lid/top of the ISO container and remove any bracing.

   Note: Verify that the package nameplate displays the correct package identification number in accordance with the CoC.
4. Perform a Health Physics survey of the cask and adjacent surfaces of the trailer.

   Note: A receiving survey of the cask and transporter must be performed as soon as practical after arrival at the site to assure compliance with 10 CFR 71.87(i) and 10 CFR 71.47, and to assure timely reporting of any reportable noncompliance.
5. Remove the top and bottom impact limiters.
6. Remove the cask tie-down strap.
7. Using the lifting yoke with the guides removed, engage the lifting trunnions. Raise the cask to vertical by rotating the cask rotation sockets on the rear cask supports, moving the crane and/or trailer as required to keep the lift yoke engaged to the trunnions and the cask engaged in the rear supports. When the cask is fully vertical, lift the cask from the supports and remove it from the trailer/container.
8. Place the cask into the dry loading station.
9. Disengage the lift yoke.
10. Visually inspect the neutron shield tank fill, drain and level inspection plugs for signs of neutron shield fluid leakage.
11. Remove the vent and drain port covers. Prior to reinstallation of the port covers, carefully inspect the port cover O-ring seals and, if the O-rings show any damage, replace them with approved spares. Ensure that the replacement O-rings are properly installed and seated. Visually inspect the vent and drain quick-disconnect nipples and replace them, if necessary.

    Note: For Alternate B port covers, replace the metallic O-ring with an approved spare prior to reinstallation.

12. Remove closure lid bolts. Attach the lid lift slings to the closure lid. Remove the closure lid and set it on a support that is suitable for radiological control and for maintaining the cleanliness of the closure lid. Prior to reinstallation of the lid, carefully inspect the Teflon O-ring seal in the underside of the closure lid. If the O-ring shows any damage, replace it. Remove the metallic O-ring and replace it with an approved spare. Ensure that the replacement O-rings are properly installed and seated. Inspect the lid bolts and replace any that are damaged.
13. Visually inspect the cask cavity for foreign material or damage. Clean as necessary. Install or verify the presence of a correct drain tube assembly including alignment ring.
14. Install the required dry transfer system components to the top of the cask.
15. Position the shielded transfer cask components for basket module loading, as appropriate.
16. Identify the PULSTAR fuel assemblies, fuel rod holders, and fuel cans to be loaded, and verify that the PULSTAR fuel contents comply with the authorized content, heat load and quantity conditions of the CoC. Four basket modules (e.g., one base module, two intermediate modules, and a top module) constitute the 28 MTR basket assembly. Spacers will be used as provided to position the PULSTAR fuel contents, as required.
17. Each module is capable of containing up to seven intact fuel assemblies, fuel rod inserts or a PULSTAR fuel can. Fuel cans are restricted to being loaded into the top and base modules, where the cans may be loaded with intact fuel assemblies or fuel rod holders without loading preference. There are no limitations on loading location for intact fuel assemblies or fuel rod holders in any of the four basket modules.

    The base module is loaded into the cask first, followed by the two intermediate modules and the top module is loaded last.
18. Load the shielded transfer cask with the loaded base basket module.
19. Place the shielded transfer cask containing the base module unit onto the dry transfer system components positioned on the top of the cask.
20. Lower the fuel basket from the transfer cask into the NAC-LWT cask cavity.
21. Repeat the loading and transfer of loaded basket modules until the approved cask loading plan is completed.
22. Install the closure lid onto the cask using the dry transfer system. Visually verify that the lid is properly seated.
23. Remove the dry transfer cask system components from the top of the cask.
24. Install and torque the 12 closure lid bolts to 260 ± 20 ft-lb in three passes using the torquing sequence stamped on the lid.
25. Connect a gas supply line to the vent valve and a drain line to the drain valve.
26. Open the nitrogen or helium gas supply valve and pressurize the cask cavity (< 30 psig) to force any residual water out the drain line. Continue to supply pressurized gas to the cask for a minimum of five minutes after the last residual free water discharges form the drain. Remove the drain and gas supply lines and attach a vacuum drying system (VDS) to the vent.

27. Evacuate the cask cavity to less than or equal to 10 torr (13 mbar) and continue vacuum pumping for a minimum of 15 minutes.
28. At the end of the vacuum pumping period, isolate the cask cavity from the vacuum pump and stop the vacuum pump, and monitor the cask cavity pressure for a minimum of 10 minutes. If the pressure rise is less than 5 torr (6.7 torr), the cavity is verified dry of free water. If the pressure rise is >5 torr (6.7 mbar), continue vacuum drying until the dryness verification is completed satisfactorily.
29. Backfill the cask cavity with helium to 0 psig (1 atmosphere, absolute), +1, -0 psi. Disconnect the VDS from the vent valve.
30. Perform the helium leakage test of the closure lid containment O-ring using a Helium Mass Spectrometer Leak Detector (He MSLD) in accordance with the requirements of Section 8.1.3.1, Steps 3 through 10.
31. Install the vent and drain alternate port covers and torque the bolts to 100 ±10 inch-pounds.
32. If an alternate port cover containment O-ring seal was replaced, perform a helium leakage test on the affected port cover using a He MSLD in accordance with the requirements of Section 8.1.3.2.2.
33. If the alternate port cover containment seal was inspected and accepted for reuse, perform an air pressure drop leakage test on the affected port cover as follows.
    a. Install a pressure test fixture to the port cover test port, including a calibrated pressure gauge with a minimum sensitivity of 0.25 psi.
    b. Pressurize the port cover seal annulus to 15 psig, +1, -0 psi.
    c. Isolate the gas supply and observe the pressure gauge for a minimum of five minutes.
    d. The acceptance criterion for the test is no measurable drop in pressure during the minimum test time. An acceptable test assures that the minimum assembly verification leakage test sensitivity is achieved.

    Note: Alternate B port covers, if used, require the satisfactory completion of a helium maintenance leakage rate test for each loaded transport. Install the Alternate B port cover and perform the maintenance leakage rate test per the requirements of 8.1.3.3.2.
34. Decontaminate the cask. Survey the cask for surface contamination and radiation dose rates.

    Note: Ensure compliance with 10 CFR 71.87(i) and 10 CFR 71.47.
35. Engage the cask lifting yoke to the lifting trunnions.
36. Lift the cask and position the cask rotation sockets in the rear rotation trunnions of the rear support structure. Carefully lower the cask to the horizontal transport orientation resting on the front saddle by moving the crane and/or the trailer as required to maintain cask engagement to the rear supports.
37. Disengage the lifting yoke from the lifting trunnions and remove it from the area.
38. Install the cask tie-down strap. Install the top and bottom impact limiters.
39. Install a TID to an attachment point on the top impact limiter.

40. Install ISO container bracing and lid.
41. Complete radiation and contamination surveys of the external surfaces of the package and record the data. Ensure removable contamination and radiation dose rate survey results comply with the limits specified in 10 CFR 71.87(i) and (j).
42. Measure the dose rate in millirems per hour at one meter from the package surface to determine the Transport Index (TI). Indicate the TI on the Radioactive Material labels applied to the package in accordance with 49 CFR 172, Subpart E.
43. Determine the appropriate Criticality Safety Index (CSI) assigned to the package contents in accordance with the Certificate of Compliance, and indicate the correct CSI on the Fissile Material label applied to the package per 49 CFR 172, Subpart E.
44. Apply appropriate placards to the transport vehicle in accordance with 49 CFR 172, Subpart F.
45. Complete the shipping documents and provide the carrier with instructions regarding the requirements for maintaining an exclusive use shipment.

7.1.11 Procedure for Dry Loading of TPBAR Waste Container

This section describes the procedure for the loading of a TPBAR Waste Container into a NAC-LWT cask in a dry loading facility. Appropriate radiological controls and procedures addressing tritium shall be utilized by the licensee, including appropriate monitoring for tritium exposure.

NAC-LWT casks to be used for the transport of TPBARs shall be configured as shown on Drawing No. 315-40-128, including Alternate B port covers.

1. Perform a receiving survey of the ISO and trailer, and inspect for damage.
2. Position the trailer in the designated cask unloading area. Set the trailer brakes and chock the wheels to prevent unintended movement. If site-specific conditions exist that require the trailer to move to allow the cask to be uprighted on its rotation trunnions, release the brakes and remove the chocks when required to complete the uprighting operations. If necessary, the ISO container may be removed from the trailer and secured in the unloading area.
3. Licensees shall receive and survey the package for radiation and removable contamination (for both gross beta-gamma and tritium) per 10 CFR 20 and 49 CFR 173. Record the survey results. If radiation or contamination levels exceed the limits of 49 CFR 173.441 or 173.443, respectively, the licensee shall notify the shipper and ensure the appropriate notifications are completed.
4. Remove the roof from the ISO container and open the front and rear ISO doors. Remove the ISO roof cross members, if installed.
5. Remove the top and bottom impact limiters.
6. Remove the cask tie-down strap. Complete the radiation and contamination surveys of the package as additional surfaces become accessible. Clean the cask surfaces as required for entry into the dry loading facility.
7. Using the cask lifting yoke with lift yoke arm guides removed, engage the lifting trunnions of the front end of the cask. Raise the cask to a vertical position on the rear

cask supports, moving the crane and/or trailer, as required, to keep the cask engaged in the rear cask supports and the crane cable vertical. When the cask is vertical, block the trailer wheels and lift the cask from the container.

8. Place the cask in a transfer cart or a loading fixture. Disengage the lifting yoke.
9. Remove the Alternate B vent and drain valve port covers. Replace the metallic seal with an approved spare and inspect the Viton® O-ring seal on each cover. If the Viton® O-ring shows any damage, replace it. Ensure the replacement O-rings are properly installed and seated. Store the port cover to protect the seal surfaces. Visually inspect the vent and drain valved quick-disconnect nipples and replace, if necessary.
10. Loosen and remove all closure lid bolts.
11. Attach the lid removal fixture to the closure lid.
12. Use a transfer cart or loading fixture and move the cask into the loading position.
13. Remove the closure lid and set it on a support that is suitable for radiological control and for maintaining the cleanliness of the closure lid. Carefully inspect the Teflon O-ring seal in the underside of the closure lid. If the O-ring shows any damage, replace it. Remove the metallic O-ring and replace it with an approved spare. Ensure the replacement O-rings are properly installed and seated. Inspect the lid bolts and replace any that are damaged. Verify that the TPBAR spacer is installed on the bottom of the cask lid and not damaged when the lid is set down.
14. Install the seal surface protector in the lid cavity, if required.
15. Load the TPBAR Waste Container into the TPBAR basket positioned in the cask cavity using the required grapple or handling system. Verify the contents of the Waste Container comply with the CoC content conditions.
16. Remove the cask seal surface protector, if used, and install the cask closure lid.
17. Use the transfer cart or loading fixture and remove the cask from the loading area.
18. Inspect, install and tighten all 12 closure lid bolts to 260 ± 20 ft-lbs in three passes using the torque sequence indicated on the closure lid.
19. Connect a vacuum pump to the cask vent valve.
20. Perform the helium mass spectrometer maintenance leakage rate test on the cask lid to leaktight criteria in accordance with the requirements of Section 8.1.3.1, Steps 3 through 10.
21. Following successful completion of the helium backfill and helium leak testing of the lid seal, monitor the cavity volume for tritium and record the results.

    Note: Tritium monitoring system shall have a minimum sensitivity of 5×10^{-3} micro curies/cc.
22. Install Alternate B port covers on the vent and drain openings and torque each port cover bolt to 285 ± 15 in-lbs. Perform a helium leakage rate test on each port cover to leaktight criteria in accordance with Section 8.1.3.3.2.
23. Decontaminate the cask. Survey the cask surface for gross beta-gamma and tritium removable contamination levels, and radiation dose rates.

    Note: Removable contamination levels and radiation levels shall comply with 49 CFR 173.443 and 173.441, respectively.

24. Using the cask lifting yoke with the guide arms removed, lift and position the cask in the rear cask supports on the ISO/trailer. Engage the trunnion pockets in the bottom end of the cask with the rotation trunnions. Lower the cask to rest on the front tiedown saddle, moving the crane, and/or trailer, as required, to keep the crane cables vertical. Disengage the cask lifting yoke from the cask lifting trunnions and set it aside.
25. Install and attach the cask tiedown strap. Install the cask top and bottom impact limiters.
26. Install a TID to an attachment point on the top impact limiter.
27. Install roof cross members, close ISO container doors, and replace ISO container roof.
28. Complete a Health Physics survey on the external surface of the package and record the results. Complete dose rate measurements at the cask surface, at 1 meter from the cask surface, and at 2 meters from the vertical plane of the side of the transport vehicle. The maximum dose rate at 1 meter from the cask is the transport index (TI). Ensure compliance with 10 CFR 71.87(i) and observe the following criteria.
    - If the dose rate is less than 2 mSv/h (200 mrem/hr) at all accessible points on the external surface of the cask, and the TI is less than 10, the package must meet the requirements of 10 CFR 71.47 (a).
    - If the dose rate is greater than 2 mSv/h (200 mrem/hr), but is less than 10 mSv/h (1000 mrem/hr) at any point on the external surface of the package, or the TI is greater than 10, the package must be shipped as "exclusive use" and meet the requirements of 10 CFR 71.47 (b), (c) and (d). If the dose rate and shipping requirements of 10 CFR 71.47 (b), (1), (2), (3) and (4) cannot be met, the package cannot be shipped.

    Note: 10 CFR 71.47 (c) and (d) require the shipper to provide the carrier with written instructions for maintenance of the exclusive use shipment. The instructions must be included with the shipping paper information. The instructions must be sufficient so that, when followed, they cause the carrier to avoid actions that unnecessarily delay delivery or unnecessarily result in increased radiation levels or radiation exposures to transport workers or members of the general public.

    - If the dose rate is > 10 mSv/h (1000 mrem/hr) at any point on the external surface of the cask, the cask exceeds the limits of 10 CFR 71.47 and cannot be shipped.
29. Complete the shipping document, carrier instructions (if required), and apply appropriate placards and labels.

7.1.12 Procedure for Wet Loading PWR MOX Fuel Rods in a Transport Canister Into the NAC-LWT Cask

PWR MOX fuel rods (or combinations of PWR MOX and UO_2 PWR fuel rods) are required to be loaded into a screened or free flow PWR/BWR Rod Transport Canister prior to loading into the NAC-LWT cask for transport. Although a maximum quantity of 16 MOX fuel rods may be shipped, it is required that the 5 × 5 rod insert be used to position the rods in the transport canister (i.e., the 4 × 4 insert is not authorized for use for the transport of MOX fuel rods).

In order to satisfy the increased potential for release of significant quantities of radioactive materials, and as recommended by NUREG-1617, Supplement 1, the NAC-LWT cask assembly specified for the transport of PWR MOX fuel rods contained in a transport canister provides a leaktight containment boundary.

The screened or free flow transport canister with a 5 × 5 rod insert will be loaded with up to 16 PWR MOX fuel rods (or a combination of up to 16 PWR MOX and UO_2 PWR fuel rods). In addition to the 16 PWR MOX fuel rods, up to 9 zirconium alloy-based burnable poison rods (BPRs) may be loaded into the unused insert openings.

NAC-LWT casks to be used for the transport of MOX fuel rods shall be configured as shown on Drawing No. 315-40-104, Assembly 97.

1. Perform a receiving survey of the empty cask and inspect for damage.
2. Position a trailer in the designated cask unloading area. Set the trailer brakes and chock the wheels to prevent unintended movement. If site-specific conditions exist that require the trailer to move to allow the cask to be uprighted on its rotation trunnions, release brakes and remove the chocks when required to complete uprighting operations. If an ISO is used, it may be removed from the trailer and secured in the unloading area.
3. Remove the roof from the ISO container and open the front and rear ISO doors. Remove roof cross-members, if installed.

   Note: Verify that the package nameplate displays the package identification number, USA/9225/B(U)F-96, as required by the CoC for PWR MOX fuel rods.
4. Perform a Health Physics survey of the cask and adjacent surfaces of the trailer.

   Note: A receiving survey of the cask and transporter must be performed as soon as practical after arrival at the site to assure compliance with 10 CFR 71.87(i) and 10 CFR 71.47, and to assure timely reporting of any reportable noncompliance.
5. Remove the top and bottom impact limiters.
6. Remove the cask tie-down strap.
7. Using the lifting yoke with the guides removed, engage the lifting trunnions. Raise the cask to vertical by rotating the cask rotation sockets on the rear cask supports, moving the crane and/or trailer as required to maintain the lift yoke engaged to the trunnions and the cask engaged in the rear supports. When the cask is fully vertical, lift the cask from the supports and remove it from the trailer/container.
8. Place the cask in the decontamination pit or other designated area. Disengage the lifting yoke. Clean cask surfaces of road dirt, as required, for entry into the spent fuel pool.
9. Visually inspect the neutron shield tank fill, drain and level inspection plugs for signs of neutron shield fluid leakage.
10. Remove the vent and drain valve port covers. Prior to reinstallation of the port covers, carefully inspect the valve port cover O-ring seals and, if the O-rings show any

damage, replace them with approved spares. Ensure that the replacement O-rings are properly installed and seated. Visually inspect the valved quick-disconnect nipples and replace them, if necessary.

Note: For Alternate B port covers, replace the metallic O-ring with an approved spare prior to reinstallation.

11. Remove closure lid bolts. Attach the lid lift slings to the closure lid. Remove the closure lid and set it on a support that is suitable for radiological control and for maintaining the cleanliness of the closure lid. Prior to reinstallation of the lid, carefully inspect the Teflon O-ring seal in the underside of the closure lid. If the O-ring shows any damage, replace it. Remove the metallic O-ring and replace it with an approved spare. Ensure that the replacement O-ring(s) is properly installed and seated. Inspect the lid bolts and replace any that are damaged. Ensure that the Rod Transport Canister spacer is not damaged when the lid is set down.
12. Visually inspect the inner cavity for foreign material or damage. Install or verify the presence of the drain tube and the PWR basket assembly.
13 Fill the cask cavity with clean water. Install lift yoke arm guides and remote actuation components on the cask lifting yoke.
14. Engage the cask lifting yoke with the cask lifting trunnions and pick up the cask. Carefully lower the cask to the bottom of the cask loading area while spraying the cask down with clean water.
15. Disengage the lifting yoke from the cask and remove the yoke from the pool.
16. Identify the PWR/BWR Rod Transport Canister to be loaded and verify that a 5 × 5 rod insert is located in the canister.
17. Identify the PWR MOX fuel rods (and standard PWR rods and BPRs, as applicable) to be loaded into the PWR/BWR Rod Transport Canister. Verify that the fuel rods and BPRs comply with the content type, form, heat load, minimum cooling time and quantity conditions of the NAC-LWT CoC. Load the screened or free flow PWR/BWR transport canister with up to 16 PWR MOX fuel rods, a combination of MOX and standard PWR rods, and up to 9 BPRs in the open tube locations in the 5 × 5 insert. Perform an independent verification of the fuel rod selection and loading process.
18. Install the transport canister lid and torque the lid bolts to 35 ± 5 inch-pounds.
19. Position the loaded PWR/BWR Rod Transport Canister over the cask and then carefully lower it into the cask to avoid damage to the cask sealing surfaces. Note that the transport canister may be loaded into the cask with the PWR basket insert.
20. Position the cask lifting yoke over the cask closure lid. Attach the slings to the closure lid and cask lifting yoke. Lower the yoke over the cask.
21. Position the closure lid over the cask and verify that the appropriate lid spacer is installed per the approved PWR MOX fuel rod transport arrangement in Drawing 315-40-104, Section 1.4. Lower the closure lid into the lid recess using the lid match marks as guides to align the lid. Visually confirm that the closure lid is flush with the top of the cask and properly seated.
22. Lower the cask handling yoke to slack the closure lid cables. Engage the lift yoke to the lifting trunnions and begin lifting the cask.

Note: Visually verify the yoke engagement before lifting the cask.

23. Raise the cask until the lid is slightly above the surface of the pool. At the option of the licensee/user, a number of closure lid bolts (4 to 12) may be installed hand tight.
24. Raise the cask clear of the pool, rinsing the yoke and cask with clean water and transfer the cask to the decontamination pit or other work area. Remove the yoke and lid lift slings.
25. Install and tighten the 12 closure lid bolts to 260 ± 20 ft-lb in three passes, using the torque sequence stamped on the closure lid.
26. At the option of the licensee/user, a 25 to 50 gallon clean water flush of the cask cavity may be performed by connecting a valved clean water line to the drain valve and a valved drain line to the vent valve. After the cavity flushing is completed, if performed, disconnect the water supply and drain lines.
27. Connect a nitrogen or helium gas supply line to the vent valve and the drain line to the drain valve.
28. Open the nitrogen or helium gas supply valve and pressurize the cask cavity (<30 psig) to force out the water. Continue to supply pressurized helium to the cask for a minimum of five minutes after the last residual free water discharges from the drain line. Remove the drain and gas supply lines and attach a vacuum drying system (VDS) to the cask vent valve.
29. Evacuate the cask cavity to a vacuum pressure of less than 10 torr (13 mbar) and continue vacuum pumping for a minimum of 15 minutes.
30. At the end of the vacuum pumping period, isolate the cask cavity from the vacuum pump and stop the pump. Monitor the cask cavity pressure for a minimum of 10 minutes. If the pressure rise is less than 5 torr (6.7 mbar), the cavity is verified as dry of free water. If the pressure rise is greater than 5 torr (6.7 mbar), repeat vacuum drying until the dryness verification results are satisfactory.
31. Backfill the cask cavity with helium to 0 psig (1 atmosphere, absolute), +2, -0 psi. Disconnect the VDS.
32. Perform the helium leakage test of the closure lid containment O-ring using a Helium Mass Spectrometer Leak Detector (He MSLD) in accordance with the requirements of Section 8.1.3.1, Steps 6 through 10.
33. Install the vent and drain port covers and torque the bolts to 100 ± 10 inch-pounds.
34. If an alternate port cover containment O-ring seal was replaced, perform a helium leakage test on the affected port cover using a He MSLD in accordance with the requirements of Section 8.1.3.2.2.
35. If the alternate port cover containment seal was inspected and accepted for reuse, perform a gas pressure drop leakage test on the affected port cover as follows.
    a. Install a pressure test fixture to the port cover test port, including a calibrated pressure gauge with a minimum sensitivity of 0.25 psi.
    b. Pressurize the port cover seal annulus to 15 psig, +1, -0 psi.
    c. Isolate the gas supply and observe the pressure gauge for a minimum of five minutes.

d. The acceptance criterion for the test is no measurable drop in pressure during the minimum test time. An acceptable test assures that the minimum assembly verification leakage test sensitivity is achieved.

Note: Alternate B port covers, if used, require the satisfactory completion of a helium maintenance leakage rate test to confirm a leaktight seal condition for each loaded transport. Install the Alternate B port cover and perform the maintenance leakage rate test per the requirements of Section 8.1.3.3.2.

36. Decontaminate the cask. Survey the cask for surface contamination and radiation dose rates.

    Note: Ensure compliance with 10 CFR 71.87(i) and 10 CFR 71.47.

37. Remove lift yoke arm guides. Engage the cask lifting yoke to the lifting trunnions.
38. Lift the cask and position the cask rotation sockets in the rear rotation trunnions of the rear support structure. Carefully lower the cask to the horizontal transport orientation resting on the front saddle by moving the crane and/or trailer, as required, to maintain cask engagement to the rear supports.
39. Disengage the cask lifting yoke from the cask lifting trunnions and remove it from the area.
40. Install the cask tie-down strap. Install the top and bottom impact limiters.
41. Install a TID to an attachment point on the top impact limiter.
42. Install roof cross-members, close ISO container doors, and replace ISO container roof.
43. Complete radiation and contamination surveys of the external surfaces of the package and record the data. Ensure removable contamination and radiation dose rate survey results comply with the limits specified in 10 CFR 71.87(i) and (j).
44 Measure the dose rate in millirems per hour at one meter from the package surface to determine the Transport Index (TI). Indicate the TI on the Radioactive Material labels applied to the package in accordance with 49 CFR 172, Subpart E.
45. Determine the appropriate Criticality Safety Index (CSI) assigned to the package contents in accordance with the CoC, and indicate the correct CSI on the Fissile Material label applied to the package per 49 CFR 172, Subpart E.
46. Apply appropriate placards to the transport vehicle in accordance with 49 CFR 172, Subpart F.
47. Complete the shipping documents and provide the carrier with instructions regarding the requirements for maintaining an exclusive use shipment.

7.1.13 Procedures for Dry Loading of MTR-28 Basket Modules Containing SLOWPOKE Fuel Canisters into the NAC-LWT Cask

This section presents the steps for dry loading, using a transfer cask, of the MTR-28 basket modules containing SLOWPOKE Fuel Canisters into the NAC-LWT cask. For transport, two MTR-28 basket modules, consisting of a top module and upper intermediate module, and two empty MTR-28 modules (lower intermediate and bottom modules) must be loaded into the NAC-LWT cask. Only the top and upper intermediate MTR-28 basket modules can each contain up to a maximum of four (4) SLOWPOKE Fuel Canisters. The three central fuel cells of these two modules are blocked with cell block spacers. Therefore, the maximum payload for a single NAC-LWT cask is a maximum of eight SLOWPOKE Fuel Canisters. The two empty lower MTR-28 basket modules are used to ensure proper axial positioning of the complete basket assembly in the NAC-LWT cavity.

For the transport of SLOWPOKE Fuel Canisters, the NAC-LWT package shall be assembled for transport and identified as specified on NAC License Drawing 315-40-158.

The maximum decay heat load of a single SLOWPOKE Fuel Canister is 0.625 Watts and the maximum package decay heat load is 5 Watts.

The procedure for loading the NAC-LWT package with AECL SLOWPOKE Fuel Rods in a dry configuration is as follows:

1. Perform a receiving survey of the ISO and trailer, and inspect for damage. The cask user shall verify by reference to the NAC provided Certificate of Conformance(s) that the identified NAC-LWT cask and associated lift yoke are within the allowable annual maintenance period specified on the certificate(s) prior to loading and release for transport.
2. Position the trailer in the designated cask unloading area. Level the trailer. Set the trailer brakes and chock the wheels to prevent unintended movement. If site-specific conditions exist that require the trailer to move to allow the cask to be uprighted on its rotation trunnions, release the brakes, and remove the chocks when required to complete the uprighting operations. Prior to cask removal, the ISO container may be removed from the trailer and secured in the unloading area, if required.
3. Licensees shall receive and survey the NAC-LWT cask for radiation and removable contamination (for both gross beta-gamma and alpha) per 10 CFR 20 and 49 CFR 173. Open the ISO container front and/or rear doors and record the survey results. If radiation or contamination levels exceed the limits of 49 CFR 173.441 or 173.443, respectively, the user/licensee shall notify the shipper, NAC, and ensure the appropriate notifications are completed.
4. Undo tiedowns and remove the roof from the ISO container. Remove the ISO roof cross members, if installed.
5. Remove the top and bottom impact limiters; collect any TIDs that may be present.
6. Remove the cask tie-down strap. Complete the radiation and contamination surveys of the cask as additional surfaces become accessible. Clean the cask surfaces, as required.
7. Remove the Alt. vent valve port cover. Store the Alt port cover to protect the seal surfaces. Visually inspect the vent valve quick-disconnect nipple and replace if necessary. Prior to installation, inspect the Viton® O-ring seal on the Alt. port cover, and if the O-ring shows any damage, replace it.
8. Install the cask lifting yoke to a crane of sufficient capacity in accordance with the user facilities' heavy lifting program and engage the two lifting trunnions at the front end of the cask. Raise and rotate the cask to a vertical position on the rear cask

supports, moving the crane and/or trailer, as required, to maintain the cask engaged in the rear cask supports. When the cask is vertical, lift the cask from the ISO container.

9. Move and place the cask on a base plate, if required. Connect the base plate to the cask's attachment points using chains and take up slack with the tensioners. Disengage the lifting yoke.
10. Loosen and remove all closure lid bolts. Prior to installation, inspect the lid bolts and replace any that are damaged.
11. Remove the closure lid and set it on a support that is suitable for radiological control and for maintaining the cleanliness of the closure lid. Prior to installation, carefully inspect the Teflon O-ring seal in the underside of the closure lid. If the O-ring shows any damage, replace it. Remove the metallic O-ring from the groove and discard. Clean and visually inspect the groove and lid recess seating surfaces for cleanliness, damage, or degradation. If the groove and lid recess seating surfaces are acceptable, install a new metallic O-ring with an approved spare. Ensure the replacement O-rings are properly installed and seated.
12. Visually inspect the inner cavity for foreign material, free water, or damage. Note deficiencies and correct as required. Remove any shipping dunnage as necessary. Clean all accessible surfaces to include lid sealing surface. Install, or verify the presence of the drain tube and drain alignment ring.
13. Install the LWT internal shield ring.
14. Lift and install the Dry Transfer System (DTS) transfer cask adapter onto the cask. Attach the four retention clamps around the LWT lift trunnions.
15. Verify the proper installation, or install, the empty bottom and lower intermediate MTR-28 basket modules.
16. Identify the top and upper intermediate MTR-28 basket modules to be loaded with SLOWPOKE Fuel Canisters. The mandatory basket module loading sequence is as follows: load or verify installed empty bottom and lower intermediate MTR-28 basket modules; load upper intermediate basket module containing up to four (4) SLOWPOKE Fuel Canisters; and, finally, load the top basket module containing up to four (4) SLOWPOKE Fuel Canisters. The top and upper intermediate MTR-28 basket modules shall each have three (3) cell block spacers installed in the three central fuel cells to prevent inadvertent fuel canister loading. All transports shall consist of all four MTR-28 basket modules assembled in accordance with the mandatory loading sequence.
17. For the initial SLOWPOKE Fuel Canister basket module loading, place the upper intermediate basket module in the Intermediate Transfer System (ITS) inner shield.
18. Move the ITS inner shield into position in the hot cell for the transfer of the loaded SLOWPOKE Fuel Canisters (loaded in accordance with the procedures of Section 7.1.14).
19. Lift the SLOWPOKE Fuel Canister using the handle and lower the Fuel Canister into one of the open (unblocked) fuel cells of the MTR-28 basket module in the ITS inner shield. Disengage the Fuel Canister handling tool. Repeat as required to load up to four (4) SLOWPOKE Fuel Canisters into the basket module.
20. Install the inner shield lid.

21. Move the ITS inner shield assembly containing the loaded MTR-28 basket module to the pre-staged transfer system location.
22. Lift the inner shield assembly containing the loaded MTR-28 basket module and place it through the ITS shield assembly adapter and into the outer shield of the ITS.
23. Disengage the inner shield lid. Lift and remove the inner shield lid through the shield assembly adapter and close the shield assembly adapter gate.
24. Place the DTS transfer cask onto the ITS shield assembly adapter.
25. Open the DTS transfer cask gate.
26. Open the ITS shield assembly adapter gate.
27. Lower the transfer cask grapple into the ITS and engage the MTR-28 basket module.
28. Retract grapple and loaded MTR-28 basket module into the transfer cask.
29. Close the DTS transfer cask shield gate.
30. Lift the DTS transfer cask and place it on the cask adapter assembly positioned on top of the NAC-LWT cask.
31. Open the cask adapter shield gate.
32. Open the DTS transfer shield cask gate and lower the loaded MTR-28 basket module into the NAC-LWT cask cavity.
33. Disengage grapple and retract back into the transfer cask.

    Note: Grapple release can be verified by checking cable for tension.
34. Verify grapple is fully retracted.

    Note: Indication will be physical indicator attached to cable.
35. Close cask adapter shield gate.
36. Repeat steps 17-35 for the top MTR-28 basket module.
37. Perform an independent verification that the loaded AECL fuel rod contents loaded are in full compliance with the NAC-LWT CoC content conditions.
38. Install shield plug and remove shield ring/plug assembly through the cask adapter.
39. Carefully lower the closure lid into position through the cask adapter and visually verify that it is properly seated.
40. Inspect and install lid bolts hand tight.
41. Remove four retention clamps from the cask trunnions and carefully remove transfer cask adapter and position for subsequent decontamination.
42. Tighten all 12 closure lid bolts to 260 ± 20 ft-lbs in three passes using the torque sequence indicated on the closure lid.

    Note: If water was introduced to cask cavity during dry loading operations (due to weather conditions, i.e. snow rain, etc), the NAC LWT cask may be "blown-down" using compressed air or gas in the vertical orientation.

    Note: At the option of the user, the NAC-LWT cask can be placed in a horizontal position in the ISO at this point in the procedure in accordance with Step 49.
43. Connect a vacuum pump to the cask vent valve and evacuate the cask cavity to less than or equal to 10 torr (13 mbar) and continue vacuum pumping for a minimum of 15 minutes.

44. At the end of the vacuum pumping period, isolate the cask cavity from the vacuum pump and stop the vacuum pump. Monitor the cask cavity pressure for a minimum of 10 minutes. If the pressure rise is less than 5 torr (6.7 mbar), the cavity is verified as dry of free water. If the pressure rise is greater than 5 torr (6.7 mbar), repeat the vacuum drying until the dryness verification results are satisfactory.
45. Backfill the cask cavity with helium to 0 psig (1 atmosphere, absolute), +1, -0 psi and disconnect the VDS from the vent valve.
46. Perform a helium leakage rate test of the closure lid containment O-ring using a Helium Mass Spectrometer Leak Detector in accordance with the procedural requirements of Section 8.1.3.1, Steps 3 through 10.
47. Install Alt. port cover in the vent port and torque each port cover bolt to 100, +10,-0 in-lbs.
48. Survey the cask surface for gross beta-gamma and tritium removable contamination levels, and radiation dose rates. Decontaminate the cask, if required.

    Note: Removable contamination levels and radiation levels shall comply with 49 CFR 173.443 and 173.441, respectively.
49. Using the cask lifting yoke, lift, and position the cask in the rear cask supports on the ISO/trailer. Engage the trunnion pockets in the bottom end of the cask with the rotation trunnions. Lower the cask to rest on the front tie-down saddle, moving the crane, and/or trailer, as required. Disengage the cask lifting yoke from the cask lifting trunnions and set it aside.
50. Install and attach the cask tie-down strap. Install the cask top and bottom impact limiters.
51. Install a tamper-indicating seal to one of the top impact limiter ball lock pins.
52. Install roof cross-members, if used; replace ISO container roof and close ISO container doors.
53. Complete a Health Physics survey on the external surface of the package and record the results. Complete dose rate measurements at the cask surface, at 1 meter from the cask surface, and at 2 meters from the vertical plane of the side of the transport vehicle. The maximum dose rate at 1 meter from the cask is the transport index (TI). Ensure compliance with 10 CFR 71.87(i) and observe the following criteria.

    - If the dose rate is less than 2 mSv/h (200 mrem/hr) at all accessible points on the external surface of the cask, and the TI is less than 10, the package meets the requirements of 10 CFR 71.47 (a).
    - If the dose rate is greater than 2 mSv/h (200 mrem/hr), but is less than 10 mSv/h (1000 mrem/hr) at any point on the external surface of the package, or the TI is greater than 10, the package must be shipped as "exclusive use" and meet the requirements of 10 CFR 71.47 (b), (c) and (d). If the dose rate and shipping requirements of 10 CFR 71.47 (b), (1), (2), (3) and (4) cannot be met, the package cannot be shipped.

Note: 10 CFR 71.47 (c) and (d) require the shipper to provide the carrier with written instructions for maintenance of the exclusive use shipment. The instructions must be included with the shipping paper information. The instructions must be sufficient so that, when followed, they cause the carrier to avoid actions that unnecessarily delay delivery or unnecessarily result in increased radiation levels or radiation exposures to transport workers or members of the general public.

- If the dose rate is > 10 mSv/h (1000 mrem/hr) at any point on the external surface of the cask, the cask exceeds the limits of 10 CFR 71.47 and cannot be shipped.

54. Complete the shipping document, carrier instructions (if required), and apply appropriate placards and labels.

7.1.14 Procedure for the Dry Loading of NRU/NRX Fuel Into the NAC-LWT Cask

This section describes the procedures for loading the NAC-LWT cask with NRU or NRX fuel assemblies/rods. Up to a maximum of 18 NRU or NRX fuel assemblies or the equivalent number of loose fuel rods may be loaded into an NRU/NRX basket assembly (one basket × 18 cells/basket). The NRU/NRX basket assembly consists of a NRU/NRX basket with 18 fuel cell openings and a bolted lid, and a bottom basket spacer to position the basket at the top of the cask cavity.

All NRX fuel assemblies/rods are required to be placed into a fuel assembly/rod caddy assembly within each basket cell. Loose NRU fuel rods may also be placed into fuel caddy assemblies for handling.

NRU and NRX fuel types shall not be loaded in the same basket (e.g., only a single fuel type is to be loaded into a NAC-LWT packaging).

The maximum decay heat load of a loaded NRU/NRX basket shall be ≤640 Watts.

The maximum content weight (fuel rods and fuel caddy assembly) per basket cell shall be ≤ 20 lbs.

The NAC-LWT cask will be loaded dry, utilizing a transfer cask to place each loaded NRU/NRX basket into the NAC-LWT cask cavity. The bottom basket spacer will be preloaded into the cask cavity prior to loading a NRU/NRX fuel basket.

The procedure for dry-loading and preparation for transport of the NAC-LWT with NRU/NRX fuel is as follows:

1. Perform a receiving survey of the ISO and trailer, and inspect for damage. The cask user shall verify by reference to the NAC provided Certificate(s) of Conformance that the identified NAC-LWT cask and associated lift yoke are within the allowable annual

maintenance period specified on the certificate(s) prior to loading and release for transport.

2. Position the trailer in the designated cask unloading area. Level the trailer. Set the trailer brakes and chock the wheels to prevent unintended movement. If site-specific conditions exist that require the trailer to move to allow the cask to be uprighted on its rotation trunnions, release the brakes, and remove the chocks when required to complete the uprighting operations. Prior to cask removal, the ISO container may be removed from the trailer and secured in the unloading area, if required.

   Note: Lifting loaded containers from the top corner fitting with forces applied other than vertically is not permitted; use of an approved container lifting spreader, frame or bottom lift container slings is required.

3. Licensees shall receive and survey the NAC-LWT cask for radiation and removable contamination (for both gross beta-gamma and alpha) per 10 CFR 20 and 49 CFR 173. Open the ISO container front and/or rear doors and record the survey results. If radiation or contamination levels exceed the limits of 49 CFR 173.441 or 173.443, respectively, the user/licensee shall notify the shipper, NAC, and ensure the appropriate notifications are completed.

   Note: Verify that the package nameplate displays the correct package identification number in accordance with the CoC.

4. Remove the roof from the ISO container and cross members, if installed.

5. Remove the top and bottom impact limiters, and remove any TIDs that may be present.

6. Remove the cask tie-down strap. Complete the radiation and contamination surveys of the cask as additional surfaces become accessible. Clean the cask surfaces, as required.

7. Remove the alternate vent and drain port covers. Store the alternate port covers to protect the seal surfaces. Visually inspect the vent valve quick-disconnect nipples and replace if necessary. Prior to installation, inspect the Viton® O-ring seals on the alternate port covers, and if any O-ring shows any damage, replace it.

8. Install the cask lifting yoke with the guides removed to a crane of sufficient capacity in accordance with the user facilities' heavy lifting program and engage the two lifting trunnions at the front end of the cask. Raise and rotate the cask to a vertical position on the rear cask supports, moving the crane and/or trailer, as required, to maintain the cask engaged in the rear cask supports. When the cask is vertical, lift the cask from the ISO container.

9. Move and place the cask on a base plate, if required, at the intended loading station. Connect the base plate to the cask's attachment points using chains and take up slack with the tensioners. Disengage the lifting yoke.

10. Visually inspect the neutron shield tank fill, drain, and level inspection plugs for signs of neutron shield fluid leakage. If leakage is detected or suspected, verify shield tank fluid level and correct, as required.

11. Loosen and remove all closure lid bolts. Prior to installation, inspect the lid bolts and replace any that are damaged.

12. Attach lid lifting slings, or equivalent lid removal fixture, to the closure lid. Remove the closure lid and set it on a support that is suitable for radiological control and for maintaining the cleanliness of the closure lid. Prior to installation, carefully inspect the Teflon O-ring seal in the underside of the closure lid. If the O-ring shows any damage, replace it. Remove the metallic O-ring from the groove and discard. Clean and visually inspect the groove and lid recess seating surfaces for cleanliness, damage, or degradation. If the groove and lid recess seating surfaces are acceptable, install a new metallic O-ring with an approved spare. Ensure the replacement O-rings are properly installed and seated.
13. Visually inspect the inner cavity for foreign material, free water, or damage. Note deficiencies and correct as required. Remove any shipping dunnage as necessary. Clean all accessible surfaces, including the lid sealing surface. Install, or verify the presence of the drain tube and drain alignment ring.
14. Verify the proper installation of, or install, the NRU/NRX bottom basket spacer.
15. Install the required dry transfer system components on the top of the cask.
16. Position the Dry Transfer System (DTS) components for fuel loading, as appropriate.
17. Identify the NRU or NRX fuel assemblies/rods to be loaded, and verify that they comply with the authorized content, heat load and quantity conditions of the CoC.
18. Load the basket module with up to 18 fuel assemblies or the equivalent number or fuel rods of either NRU or NRX fuel (NRU and NRX fuel types shall not be loaded in the same basket). All NRX fuel assemblies/rods are required to be placed into fuel rod caddy assemblies within each basket cell, while loose NRU fuel rods may also be placed into caddies for handling.
19. Perform an independent verification of the fuel selection and loading process.
20. Install the NRU/NRX basket lid assembly and torque bolts to 20 +/- 2 ft-lbs.
21. Load the shielded transfer cask with the loaded basket.
22. Place the transfer cask containing the basket onto the dry transfer system components positioned on the top of the cask.
23. Lower the loaded NRU/NRX fuel basket from the transfer cask into the NAC-LWT cask cavity.
24. Remove the transfer cask from the dry transfer system adapter.
25. Using the dry transfer system adapter components, install temporary shield plug. Remove shield ring/plug assembly through the dry transfer system adapter.
26. Install the closure lid onto the cask using the dry transfer system. Visually verify that the lid is properly seated.
27. Install lid bolts hand tight.
28. Remove dry transfer system components from the top of the cask.
29. Tighten all 12 closure lid bolts to 260 ± 20 ft-lbs in three passes using the torque sequence indicated on the closure lid.
30. Connect a gas supply line to the vent valve and the drain line to the drain valve.

31. Open the air, nitrogen, or helium gas supply valve and pressurize the cask cavity (< 30 psig) to force any residual water out the drain line. Continue to supply pressurized gas to the cask for a minimum of five minutes after the last residual free water discharges from the drain. Remove the drain and gas supply lines and attach a vacuum drying system (VDS) to the vent.

    Note: At the option of the user, the NAC-LWT cask can be placed in a horizontal position in the ISO at this point in the procedure in accordance with Step 40.

32. Connect the Vacuum Drying System (VDS) to the cask vent valve and evacuate the cask cavity by vacuum pump to less than or equal to 10 torr (13 mbar) and continue vacuum pumping for a minimum of 15 minutes.
33. At the end of the evacuation period, isolate the cask cavity from the vacuum pump and monitor the cask cavity pressure for a minimum of 10 minutes. If the pressure rise is less than 5 torr (6.7 mbar), the cavity is verified as dry of free water. If the pressure rise is greater than 5 torr (6.7 mbar), resume vacuum drying until the dryness verification results are satisfactory.
34. Backfill the cask cavity with helium to 0 psig (1 atmosphere, absolute), +1, -0 psi and disconnect the VDS from the vent valve.
35. Perform a helium leakage test of the closure lid containment O-ring using a Helium Mass Spectrometer Leak Detector (MSLD) in accordance with the requirements of SAR Section 8.1.3.1.
36. Install the vent and drain alternate port covers and torque the bolts to 100 ±10 inch-pounds.
37. If an alternate port cover containment O-ring seal was replaced, perform a helium leakage test on the affected port cover using a He MSLD in accordance with the requirements of SAR Section 8.1.3.2.2.
38. If the alternate port cover containment seal was inspected and accepted for reuse, perform an air pressure drop leakage test on the affected port cover as follows.
    a. Install a pressure test fixture to the port cover test port, including a calibrated pressure gauge with a minimum sensitivity of 0.25 psi.
    b. Pressurize the port cover seal annulus to 15 psig, +1, -0 psi.
    c. Isolate the gas supply and observe the pressure gauge for a minimum of five minutes.
    d. The acceptance criterion for the test is no measurable drop in pressure during the minimum test time. An acceptable test assures that the minimum assembly verification leakage test sensitivity is achieved.
39. Survey the cask surface for removable contamination and radiation dose rates. Decontaminate the cask, if required.

    Note: Removable contamination levels and radiation levels shall comply with 49 CFR 173.443 and 173.441, respectively.

40. Using the cask lifting yoke with guides removed, lift and position the cask in the rear cask supports on the ISO/trailer. Engage the trunnion pockets in the bottom end of the cask with the rotation trunnions. Lower the cask to rest on the front tie-down saddle, moving the crane, and/or trailer, as required.
41. Disengage the cask lifting yoke from the cask lifting trunnions and set it aside.
42. Install and attach the cask tie-down strap. Install the cask top and bottom impact limiters.
43. Install a TID to one of the top impact limiter ball lock pins. Record TID identification number on the loading/shipping documentation.
44. Install roof cross-members, if used and replace ISO container roof.
45. Complete a Health Physics survey on the external surfaces of the package and record the results. Complete dose rate measurements at the package surface, at 1 meter from the package surface, and at 2 meters from the vertical plane of the side of the transport vehicle. The maximum dose rate at 1 meter from the package is the transport index (TI). Ensure compliance with 10 CFR 71.87(i) and observe the following criteria.
    a. If the dose rate is less than 2 mSv/h (200 mrem/hr) at all accessible points on the external surface of the package, and the TI is less than 10, the package meets the requirements of 10 CFR 71.47 (a).
    b. If the dose rate is greater than 2 mSv/h (200 mrem/hr), but is less than 10 mSv/h (1000 mrem/hr) at any point on the external surface of the package, or the TI is greater than 10, the package must be shipped as "exclusive use" and meet the requirements of 10 CFR 71.47 (b), (c) and (d). If the dose rate and shipping requirements of 10 CFR 71.47 (b), (1), (2), (3) and (4) cannot be met, the package cannot be shipped.
    c. If the dose rate is > 10 mSv/h (1000 mrem/hr) at any point on the external surface of the package, the package exceeds the limits of 10 CFR 71.47 and cannot be shipped.
46. Determine the appropriate Criticality Safety Index (CSI) assigned to the package contents in accordance with the CoC, and indicate the correct CSI on the Fissile Material label applied to the package per 49 CFR 172, Subpart E.
47. Complete the shipping documents, carrier instructions (as required), and apply appropriate placards and labels.

7.1.15 Procedure for Loading AECL SLOWPOKE Fuel Rod Contents Into the SLOWPOKE Fuel Canister

The following general procedures provide guidance for the loading of AECL SLOWPOKE fuel rod contents into individual fuel can inserts, which are then subsequently placed into a SLOWPOKE Fuel Canister. The Fuel Canister is subsequently loaded into a MTR-28 upper intermediate or top basket module for dry transferred into the NAC-LWT cask using the Dry Transfer System (DTS).

The SLOWPOKE Fuel Canister includes a welded fuel canister body into which four (4) 5 x 5 inserts (assembled of 0.40 inch nominal internal diameter insert tubes for intact SLOWPOKE

Fuel Rods) and/or four (4) 4 x 4 inserts (assembled of 0.53 inch nominal internal diameter insert tubes for damaged SLOWPOKE Fuel Rods) are stacked to allow for the placement of up to 100 fuel rods in each SLOWPOKE Fuel Canister. The Fuel Canister is closed by a lockable, spring-loaded lid assembly, which incorporates a lid handle for loaded Fuel Canister handling. The lid assembly incorporates two lid latch bolts with lock washers and torque to 30 ± 5 in-lbs, which prevent inadvertent lid removal during shipment and handling. The SLOWPOKE Fuel Canister is provided with an aluminum bottom screened opening and two upper side aluminum screened openings to allow for the self-draining of the Fuel Canister if stored in water at the receiving facility prior to final processing. Each of the insert tubes is notched at the base of the tube to facilitate draining of each insert tube through the bottom screened opening. The screened openings and tight fitting lid retains fuel debris and minimizes the potential for release of fuel debris from the SLOWPOKE Fuel Canister to the NAC-LWT internal cavity.

The SLOWPOKE Fuel Canisters are visually inspected, load tested, and the welds examined following fabrication prior to acceptance for use. The AECL SLOWPOKE fuel rod contents shall be verified as meeting the quantity, decay heat and fissile content limits of the NRC Certificate of Compliance (CoC) prior to loading. The radioactive materials to be loaded in each SLOWPOKE Fuel Canister shall be identified and recorded as part of the packaging manifest for the cask shipment. Independent confirmation of the identification and location of the radioactive materials shall be made during the loading operations.

The procedure for loading AECL SLOWPOKE fuel rod contents into the Fuel Canister is as follows:

1. Verify the specific AECL SLOWPOKE Fuel Rod contents to be loaded into the 5 x 5 or 4 x 4 canister insert meet the content condition limits of the CoC for quantity, maximum mass, maximum decay heat, maximum fissile content and waste form. Damaged fuel rods shall be placed in 4 x 4 rod insert assemblies, as required.
2. Verify the SLOWPOKE Fuel Canister and insert assemblies comply with the requirements of NAC Drawing 315-40-156.
3. Visually inspect the Fuel Canister, Lid and rod insert assemblies and verify the components condition do not show signs of damage—e.g., bulging or buckling, breaching, and does not have rips, tears, holes or pointed dents that could affect packaging or transport operations. Record the SLOWPOKE Fuel Canister serial number and the results of the visual inspection on the Cask Loading Report.
4. Position the appropriate 5 x 5 or 4 x 4 insert assembly in the hot cell.
5. Individually load the AECL SLOWPOKE fuel rods into the designated insert assembly.
6. After completion of loading the designated fuel rods, lift and place the loaded fuel rod insert into the SLOWPOKE Fuel Canister.
7. Repeat Steps 5 through 7 until a total of four (4) fuel rod insert assemblies are loaded and positioned in the SLOWPOKE Fuel Canister.

8. With the spring plunger in the unlocked position, insert the self-locking lid assembly into the top of the Fuel Canister. Torque the two lid latch bolts and lock washers to 30 ± 5 inch-pounds.
9. Lift the filled SLOWPOKE Fuel Canister and place it into the MTR-28 upper intermediate or top basket module per the procedures in 7.1.13.

7.2 Procedures for Unloading Package

In general, the procedure for unloading the package is the reverse of that presented for loading the package (Section 7.1). Specific generic procedures are provided in this section for the wet and dry unloading of various authorized contents from the NAC-LWT cask. As required to accommodate specific facilities and equipment, site-specific procedures shall be prepared and utilized for the unloading operations as appropriate to the contents.

7.2.1 Procedures for Wet Unloading of LWR Fuel and PWR, PWR MOX and BWR Fuel Rods in Transport Canisters

The procedures for unloading the package are as follows:

1. Perform a receipt inspection of the cask and trailer/ISO container, inspecting for transport damage.
2. Position the trailer in the designated cask unloading area. Set the trailer brakes and chock the wheels to prevent unintended movement. If site-specific conditions exist that require the trailer to move to allow the cask to be uprighted on its rotation trunnions, release brakes and remove the chocks when required to complete uprighting operations. If an ISO container is used, it may be removed from the trailer and secured in the unloading area.
3. Remove the lid/top of the ISO container and remove any bracing, or the personnel barrier.

   Note: Verify that the package nameplate displays the correct package identification number in accordance with the CoC.
4. Licensees shall monitor the package for radioactive contamination and radiation levels in accordance with 10 CFR 20.1906. If contamination levels exceed 10 CFR 71.87(i) or radiation levels exceed the limits of 10 CFR 71.47, the licensee shall notify the NRC Operations Center.
5. Verify the TID identification number on the top impact limiter and confirm tampering with the package did not occur.
6. Remove the top and bottom impact limiters.
7. Remove the cask tie-down strap.
8. Using the lifting yoke with the guides removed, engage the lifting trunnions. Raise the cask to vertical by rotating the cask rotation sockets on the rear cask supports, moving the crane and/or trailer as required to keep the lift yoke engaged to the trunnions and the cask engaged in the rear supports. When the cask is fully vertical, lift the cask from the supports and remove it from the trailer/container.
9. Place the cask in the decontamination pit or other designated area. Disengage the lifting yoke. Clean cask surfaces of road dirt as required for entry into the spent fuel pool.

10. Remove the vent and drain valve port covers. Connect a pressure gauge and isolation valve assembly to the cask vent valve.
11. Connect vent and clean water fill lines to the vent and drain valves.
12. Open the water supply valve to allow water to slowly enter the cask cavity.

    Note: The hot gases exiting from the vent valve could be highly radioactive. The exhaust gases must, therefore, be routed to an off-gas process system. The cask cavity does not contain a relief valve; therefore, any system for cooling down the package must be provided with a pressure relief device set so that the maximum pressure in the cask cavity does not exceed 100 psig. Coolant flow rates should be controlled to avoid thermal shock to the cask internals.
13. Continue the filling procedure until the cask cavity is filled with water. Remove fill and vent lines.
14. Loosen and remove the closure lid bolts. At the option of licensee/user, some bolts (i.e., 4-12) may be left installed hand tight for the cask movement to the spent fuel pool.
15. Engage the cask lifting yoke (with slings, yoke arm guides and remote actuation system components attached) with the cask lifting trunnions and connect the closure lid to the lifting yoke slings.
16. Position the cask over the spent fuel pool and lower the cask until the top of the cask is at an elevation that permits access to the closure lid bolts.
17. Remove any remaining closure lid bolts.
18. Carefully lower the cask to rest on the bottom of the cask unloading area while spraying the cask's exterior surfaces with clean water to minimize contamination.
19. Disengage the lifting yoke from the cask and slowly raise the yoke until the closure lid is raised clear of the cask. Remove the yoke from the vicinity of the cask to provide clearance for unloading the cask.
20. Unload the contents of the cask cavity (i.e., fuel assemblies or Rod Transport Canister containing PWR or BWR fuel rods and nonfuel-bearing components, if applicable) using the required grapple system. Verify that the unloaded contents conform to the contents described in the cask loading report. Place the fuel assemblies or transport canisters into storage or prepare them for further processing.
21. Position the cask lifting yoke with the cask closure lid over the cask cavity and slowly lower it into place using the cask and closure lid match marks as guides. Visually confirm that the closure lid is seated.
22. Engage the cask lifting yoke with the cask trunnions and raise the cask.

    Note: Verify yoke engagement before lifting the cask.
23. Raise the cask until the lid is slightly above the surface of the pool. At the option of the licensee/user, several of the closure lid bolts (i.e., 4-12) may be installed hand tight.
24. Raise the cask clear of the pool, rinsing the yoke and cask with clean water.

25. Transfer the cask to the decontamination pit or other work area. Remove the yoke and lid lift slings.
26. Install and tighten all 12 closure lid bolts to 260 ± 20 ft-lb in three passes, using the torque sequence stamped on the closure lid.
27. At the option of the licensee/user, a 25 to 50 gallon clean water flush of the cask cavity may be performed by connecting a valved, clean water line to the drain valve and a valved drain line to the vent valve. After the cavity flushing is completed, if performed, disconnect the water supply and drain lines.
28. Connect a gas (air, nitrogen or helium) supply line to the vent valve and the drain line to the drain valve.
29. Open the gas supply valve and pressurize the cask cavity (<30 psig) to force out the water. Continue to supply gas to the cask cavity for a minimum of five minutes after the last residual free water discharges from the drain line.
30. Remove the gas supply and drain lines.
31. Install the alternate port covers over the vent and drain valves and tighten the port cover bolts to 100 ± 10 inch-pounds. For Alternate B port covers, install and torque the high-strength bolts to 285 ± 15 inch-pounds.

    Note: It is not necessary to inspect or replace the port cover seals. Seal inspection and replacement, if required, will be performed prior to the next loaded transport.

7.2.2 Procedures for Wet Unloading of Metallic Fuel

The procedure for unloading the metallic fuel from the package in a spent fuel pool is as follows.

1. Perform a receipt inspection of the cask and trailer/ISO container, inspecting for transport damage.
2. Position the trailer in the designated cask unloading area. Set the trailer brakes and chock the wheels to prevent unintended movement. If site-specific conditions exist that require the trailer to move to allow the cask to be uprighted on its rotation trunnions, release brakes and remove the chocks when required to complete uprighting operations. If an ISO container is used, it may be removed from the trailer and secured in the unloading area.
3. Remove the lid/top of the ISO container and remove any bracing, or the personnel barrier.

    Note: Verify that the package nameplate displays the correct package identification number in accordance with the CoC.
4. Licensees shall monitor the package for radioactive contamination and radiation levels in accordance with 10 CFR 20.1906. If contamination levels exceed 10 CFR 71.87(i) or radiation levels exceed the limits of 10 CFR 71.47, the licensee shall notify the NRC Operations Center.
5. Verify the TID identification number on the top impact limiter to confirm tampering with the package did not occur.

6. Remove the top and bottom impact limiters.
7. Remove the cask tie-down strap.
8. Using the lifting yoke with the guides removed, engage the lifting trunnions. Raise the cask to vertical by rotating the cask rotation sockets on the rear cask supports, moving the crane and/or trailer as required to keep the lift yoke engaged to the trunnions and the cask engaged in the rear supports. When the cask is fully vertical, lift the cask from the supports and remove it from the trailer/container.
9. Place the cask in the decontamination pit or other designated area. Disengage the lifting yoke. Clean cask surfaces of road dirt as required for entry into the spent fuel pool.
10. Remove the vent valve and drain valve port covers. Connect a pressure gauge and isolation valve assembly to the cask vent valve. Open the isolation valve and record the internal pressure reading (if any). Using a suitable air line and the gauge/valve assembly, vent the cask cavity to an off-gas handling unit.
11. Connect vent and clean water fill lines to the vent and drain valves.
12. Open the water supply valve to allow water to slowly enter the cask cavity.

    Note: The hot gases exiting from the vent valve could be highly radioactive. The exhaust gases must, therefore, be routed to an off-gas process system. The cask cavity does not contain a relief valve; therefore, any system for cooling down the package must be provided with a pressure relief device set so that the maximum pressure in the cask cavity does not exceed 100 psig. Coolant flow rates should be controlled to avoid thermal shock to the cask internals.
13. Continue the filling procedure until the cask cavity is filled with water. Remove fill and vent lines.
14. Loosen and remove the 12 closure lid bolts. At the option of licensee/user, some bolts (i.e., 4-12) may be left installed hand tight for the cask movement to the spent fuel pool.
15. Engage the cask lifting yoke (with slings, lift yoke arm guides and remote actuation system components attached) with the cask lifting trunnions and connect the closure lid to the lifting yoke slings.
16. Position the cask over the spent fuel pool and lower the cask until the top of the cask is at an elevation, which permits access to the closure lid bolts.
17. Remove any remaining closure lid bolts, inspect and store.
18. Carefully lower the cask to rest on the bottom of the cask unloading area while spraying the exterior surfaces of the cask with clean water to minimize contamination.
19. Disengage the lifting yoke from the cask and slowly raise the yoke until the closure lid is raised clear of the cask. Remove the yoke from the vicinity of the cask to provide clearance for unloading the cask.

    Note: Closure lid may be brought out of the pool and later assembled to the empty cask.
20. Unload the contents of the cask cavity using the required grapple system.

21. Position the cask lifting yoke with the cask closure lid over the cask cavity and slowly lower it into place using the cask and closure lid match marks as guides. Visually confirm that the closure lid is seated.
22. Engage the cask lifting yoke with the cask trunnions and raise the cask.
23. Raise the cask until the lid is slightly above the surface of the pool. At the option of the licensee/user, several of the closure lid bolts (i.e., 4-12) may be installed hand tight.
24. Raise the cask clear of the pool, rinsing the yoke and cask with clean water.
25. Transfer the cask to the decontamination pit or other work area. Remove the yoke and lid lift slings.
26. Install and tighten the 12 closure lid bolts to 260 ± 20 ft-lb in three passes, using the torque sequence stamped on the closure lid.
27. At the option of the licensee/user, a 25 to 50 gallon clean water flush of the cask cavity may be performed by connecting a valved, clean water line to the drain valve and a valved drain line to the vent valve. After the cavity flushing is completed, if performed, disconnect the water supply and drain lines.
28. Connect a gas (air, nitrogen or helium) supply line to the vent valve and the drain line to the drain valve.
29. Open the gas supply valve and pressurize the cask cavity (<30 psig) to force out the water. Continue to supply gas to the cask cavity for a minimum of five minutes after the last residual free water discharges from the drain line.
30. Remove the gas supply and drain lines.
31. Install the alternate port covers over the vent and drain valves and tighten the port cover bolts to 100 ± 10 in-lb. For Alternate B port covers, install and torque the high-strength bolts to 285 ± 15 inch-pound.

    Note: It is not necessary to inspect or replace the port cover seals. Seal inspection and replacement, if required, will be performed prior to the next loaded transport.

7.2.3 Procedure for Wet Unloading of MTR, TRIGA, DIDO, ANSTO, PULSTAR, or SLOWPOKE Fuel Basket Contents

The procedure for the unloading of MTR, TRIGA, DIDO, ANSTO, ANSTO-DIDO, PULSTAR, or SLOWPOKE fuel basket contents from the package in a spent fuel pool is as follows:

1. Perform a receiving survey of the cask and inspect for transport damage.
2. Position the trailer in the designated cask unloading area. Set the trailer brakes and chock the wheels to prevent unintended movement. If site-specific conditions exist that require the trailer to move to allow the cask to be uprighted on its rotation trunnions, release the brakes and remove the chocks when required to complete the uprighting operations. If an ISO container is used, it may be removed from the trailer and secured in the loading area.
3. Remove the roof from the ISO container, and open the front and rear ISO doors. Remove roof cross-members, if installed.

Note: Verify that the package nameplate displays the correct package identification number in accordance with the CoC.

4. Licensees shall monitor the package for radioactive contamination and radiation levels in accordance with 10 CFR 20.1906. If contamination levels exceed 10 CFR 71.87(i) or radiation levels exceed the limits of 10 CFR 71.47, the licensee shall notify the NRC Operations Center.
5. Verify the TID identification number on the top impact limiter to confirm tampering with the package did not occur.
6. Remove the top and bottom impact limiters.
7. Remove the cask tie-down strap.
8. Using the cask lifting yoke with left yoke arm guides removed, engage the lifting trunnions of the front end of the cask. Raise the cask to a vertical position on the rear cask support, moving the crane as necessary to keep the cask engaged in the rear rotation supports and the crane cable vertical. When the cask is vertical, lift the cask from the container supports.
9. Place the cask in the decontamination pit or other site designated area. Disengage the lifting yoke. Clean cask surfaces of road dirt as required for entry into the spent fuel pool.
10. Remove the vent valve and drain valve port covers. Connect a pressure gauge and isolation valve assembly to the cask vent valve. Open the isolation valve and record the internal pressure reading (if any). Using a suitable air line and the gauge/valve assembly, vent the cask cavity to an off-gas handling unit.
11. Connect vent and clean water fill lines to the vent and drain valves.
12. Open the water supply valve to allow water to slowly enter the cask cavity.

    Note: Gases or steam exiting the vent may be radioactive. The vent line should be routed to an off-gas process system or a HEPA filter. The system for cooling down the package shall contain a pressure relief device set to ensure that the cask internal pressure is maintained below 100 psig. Coolant flow rates are to be controlled to avoid thermal shock to the fuel contents.
13. Continue the filling procedure until the cask cavity is filled with water. Remove fill and vent lines.
14. Loosen and remove the 12 closure lid bolts. At the option of licensee/user, some bolts (i.e., 4-12) may be left installed hand tight for the cask movement to the spent fuel pool.
15. Engage the cask lifting yoke (with slings, yoke arm guides and remote actuation system components attached) with the cask lifting trunnions and connect the closure lid to the lifting yoke slings.
16. Position the cask over the spent fuel storage pool and lower the cask until the top of the cask is at an elevation which allows access for the removal of the closure lid bolts.
17. Remove any remaining closure lid bolts, inspect and store.
18. Carefully lower the cask to rest on the bottom of the cask unloading area while spraying the exterior surfaces of the cask with clean water to minimize contamination.

Disengage the lifting yoke from the lifting trunnions and slowly raise the yoke until the closure lid is raised clear of the cask. Remove the yoke from the vicinity of the cask to provide for clearance for unloading the cask.

Note: The closure lid may be brought out of the pool and later assembled to the empty cask.

19. Unload the MTR, TRIGA, DIDO, spiral, MOATA plate, PULSTAR, or SLOWPOKE fuel assemblies, plate canisters or fuel canisters from the top basket module using the appropriate grapple or handling system. As required, remove empty basket modules from the cask cavity to allow access to the next basket module. Continue fuel unloading operations until all fuel assemblies, plate canisters, fuel canisters and empty basket modules are removed from the cavity. Alternatively, each basket module containing fuel assemblies, plate canisters or fuel canisters may be unloaded from the cask cavity and stored in the spent fuel pool. Continue unloading until all basket modules have been removed.
20. Position the cask lifting yoke with guide arms and remote actuation components installed over the cask closure lid. Attach the slings to the cask closure lid and cask lifting yoke.
21. Position the cask lifting yoke and closure lid over the cask cavity and slowly lower it into place using the cask and closure lid match marks as guides. Visually confirm that the closure lid is seated.

    Note: The closure lid may be installed separately after the empty cask is removed from the spent fuel pool.
22. Engage the cask lifting yoke with the cask trunnions and raise the cask.
23. Raise the cask until the lid is slightly above the surface of the pool. At the option of the licensee/user, several of the closure lid bolts (i.e., 4-12) may be installed hand tight.
24. Raise the cask clear of the pool, rinsing the yoke and cask with clean water.
25. Transfer the cask to the decontamination pit or other work area. Remove the yoke and lid lift slings.
26. Install and tighten four closure lid bolts to 100 ± 10 ft-lb using the torque sequence stamped on the closure lid.
27. At the option of the licensee/user, a 25 to 50 gallon clean water flush of the cask cavity may be performed by connecting a valved, clean water line to the drain valve and a valved drain line to the vent valve. After the cavity flushing is completed, if performed, disconnect the water supply and drain lines.
28. Connect a gas (air, nitrogen or helium) supply line to the vent valve and the drain line to the drain valve.
29. Open the gas supply valve and pressurize the cask cavity (<30 psig) to force out the water. Continue to supply gas to the cask cavity for a minimum of five minutes after the last residual free water discharges from the drain line.
30. Remove the gas supply and water drain lines.
31. Remove the four closure lid bolts and lift the lid clear of the cask.

Note: It is not necessary to inspect or replace the closure lid metallic seal. A new metallic seal will be installed and tested prior to the next loaded transport.

32. Remove the drain tube assembly and drain tube alignment ring from the cask cavity.
33. Reinstall the closure lid and install the 12 closure lid bolts. Torque the bolts to 260 ± 20 ft-lbs in three passes using the torque sequence indicated in the closure lid.
34. Install the alternate port covers over the vent and drain valves and tighten the port cover bolts to 100 ± 10 in-lb. For Alternate B port covers, install and torque the high-strength bolts to 285 ± 15 inch-pound.

    Note: It is not necessary to inspect or replace the port cover seals. Seal inspection and replacement, if required, will be performed prior to the next loaded transport.

7.2.4 Procedure for Dry Unloading of MTR, TRIGA, DIDO, ANSTO, PULSTAR, SLOWPOKE, or NRU/NRX Fuel Contents

This section describes the procedure for unloading of MTR, TRIGA, DIDO, ANSTO, ANSTO-DIDO, PULSTAR, SLOWPOKE, or NRU/NRX fuel basket contents from the NAC-LWT in a cell or a dry unloading fixture.

1. Perform a receiving survey of the cask and inspect for transport damage.
2. Position the trailer in the designated cask unloading area. Set the trailer brakes and chock the wheels to prevent unintended movement. If site-specific conditions exist that require the trailer to move to allow the cask to be uprighted on its rotation trunnions, release the brakes and remove the chocks when required to complete the uprighting operations. If an ISO container is used, the ISO container may be removed from the trailer and secured in the unloading area.
3. Remove the roof from the ISO container and open the front and rear ISO doors. Remove roof cross members, if installed.

    Note: Verify that the package nameplate displays the correct package identification number in accordance with the CoC.

4. Licensees shall monitor the package for radioactive contamination and radiation levels in accordance with 10 CFR 20.1906. If contamination levels exceed 10 CFR 71.87(i) or radiation levels exceed the limits of 10 CFR 71.47, the licensee shall notify the NRC Operations Center.
5. Verify the TID identification number on the top impact limiter to confirm tampering with the package did not occur. Remove TID.
6. Remove the top and bottom impact limiters.
7. Remove the cask tie-down strap. Clean the cask surfaces as required for entry into the hot cell.
8. Using the cask lifting yoke with lift yoke arm guides removed, engage the lifting trunnions of the front end of the cask. Raise the cask to a vertical position on the rear cask support, moving the crane and/or trailer, as required, to keep the cask engaged in the rear rotation supports and the crane cable vertical. When the cask is vertical, block the trailer wheels and lift the cask from the container.

9. Place the cask in the cell transfer cart or unloading fixture. Disengage the lifting yoke.
10. Remove the vent valve port cover.
11. Connect vent line to the vent valve.

    Note: The hot gases exiting from the vent may be highly radioactive and the exhaust gas should be routed to an off-gas process system or to a HEPA filter.
12. Allow the cask to vent. Remove vent line.
13. Loosen and remove the 12 closure lid bolts. Visually inspect and store the bolts.
14. Attach the lid removal fixture.
15. Using the hot cell transfer cart or unloading fixture, move the cask into the unloading position.
16. Remove the cask lid.

    Note: It is not necessary to inspect or replace the closure lid metallic seal. A new metallic seal will be installed and tested prior to the next loaded shipment.
17. Install the seal surface protector in the lid cavity, if required.
18. Unload the MTR, TRIGA, DIDO, ANSTO, PULSTAR, SLOWPOKE, or NRU/NRX fuel basket modules from the cask cavity using the required grapple or dry transfer handling system.
19. Remove the cask seal surface protector, if installed, and replace the cask lid.
20. Using the cell transfer cart or unloading fixture, remove the cask.
21. Remove the lid from the cask and remove the drain tube and drain tube alignment ring.
22. Replace the cask lid and remove the lid removal fixture.
23. Install and tighten all 12 closure lid bolts to 260 ± 20 ft-lbs in three passes using the torque sequence indicated on the closure lid.
24. Install the port covers over the vent and drain valves and tighten the port cover bolts to 100 ±10 inch-pounds. For Alternate B port covers, install and torque the high-strength bolts to 285 ±10 inch-pounds.

    Note: It is not necessary to inspect or replace the port cover seals. Seal inspection replacement and leak testing will be performed prior to the next loaded transport.

7.2.5 Procedure for Dry Unloading of TPBAR Contents

This section describes the procedure for the unloading of a consolidation canister, a PWR/BWR Rod Transport Canister or waste container that contains TPBARs from the NAC-LWT in a dry unloading facility.

1. Perform a receiving survey of the ISO container and trailer, and inspect for damage.
2. Position the trailer in the designated cask unloading area. Set the trailer brakes and chock the wheels to prevent unintended movement. If site-specific conditions exist that require the trailer to move to allow the cask to be uprighted on its rotation trunnions, release the brakes and remove the chocks when required to complete the uprighting operations. If necessary, the ISO container may be removed from the trailer and secured in the unloading area.

3. Licensees shall receive and survey the package for radiation and removable contamination (for both gross beta-gamma and tritium) per 10 CFR 20 and 49 CFR 173. Record the survey results. If radiation or contamination levels exceed the limits of 49 CFR 173.441 or 173.443, respectively, the licensee shall notify the shipper and ensure the appropriate notifications are completed.
4. Remove the roof from the ISO container and open the front and rear ISO doors. Remove the ISO roof cross members, if installed.
5. Verify the TID identification number on the top impact limiter to confirm tampering with the package did not occur.
6. Remove the top and bottom impact limiters.
7. Remove the cask tie-down strap. Complete the radiation and contamination surveys of the package as additional surfaces become accessible. Clean the cask surfaces as required for entry into the dry unloading facility.
8. Using the cask lifting yoke with lift yoke arm guides removed; engage the lifting trunnions of the front end of the cask. Raise the cask to a vertical position on the rear cask support, moving the crane and/or trailer, as required, to keep the cask engaged in the rear rotation supports and the crane cable vertical. When the cask is vertical, block the trailer wheels and lift the cask from the container.
9. Place the cask in a transfer cart or an unloading fixture. Disengage the lifting yoke.
10. Remove the vent valve port covers.
11. Remove the drain valve port cover
12. Connect a tritium monitoring system to the vent and drain quick-disconnect valves, and operate the device in accordance with the manufacturer's instructions. The tritium monitoring system shall have a minimum sensitivity of 5×10^{-3} micro curie/cc.
13. Monitor the cavity gas for tritium. If the gas sample measurement indicates a tritium gas concentration greater than 1×10^{-2} micro curie/cc, the cask internals must be decontaminated after unloading is completed and prior to subsequent use in transporting non-TPBAR contents.

    Note: The gases exiting from the cavity may be radioactive and contaminated with tritium, and at an elevated temperature. Cavity gases should be controlled per the site requirements.
14. Vent the cask cavity. Remove the gas lines and monitoring system from the vent and drain valves.
15. Loosen and remove all closure lid bolts.
16. Attach the lid removal fixture.
17. Use a transfer cart or unloading fixture and move the cask into the unloading position.
18. Remove the cask lid.

    Note: Replacement of the closure lid metallic seal is not required. A new metallic seal will be installed and leak tested prior to the next loaded shipment.
19. Install the seal surface protector in the lid cavity, if required.

20. Unload the TPBAR contents from the cask cavity using the required grapple or handling system.
21. Using the transfer cart or unloading fixture, remove the cask from the unloading area.
22. Collect an ambient air sample near the cask cavity opening. If the measured tritium gas concentration exceeds 1×10^{-2} micro curie/cc, the cask cavity must be decontaminated after unloading and prior to subsequent use in transporting non-TPBAR contents.
23. Survey the accessible inside surfaces of the cask cavity and internal components (i.e., upper 2 feet) for tritium contamination. If measured tritium removable contamination is greater than $2.2 \times 10^{+4}$ dpm/100 cm^2, the cask must be decontaminated after unloading is completed and prior to subsequent use in transporting non-TPBAR contents.

    Note: If significantly higher tritium contamination levels and the need for repeated decontamination become indicative of residual tritium contamination in the crystalline structure of the cask interior with potential for weeping, NAC will notify the NRC of the condition and its action.
24. Remove the cask seal surface protector, if used, and install the cask lid.
25. Inspect, install and tighten all 12 closure lid bolts to 260 ± 20 ft-lbs in three passes using the torque sequence indicated on the closure lid.

    Note: Replacement of the vent and drain port cover metallic seals is not required. New metallic seals will be installed and leak tested prior to the next loaded shipment.
26. Install the port covers on the vent and drain ports and torque the port cover bolts to 285 ± 15 inch-pounds.

7.2.6 Procedure for Dry Unloading of PWR/BWR/MOX Fuel Rod Contents

This section describes the procedure for the unloading of a PWR/BWR Rod Transport Canister from the NAC-LWT cask in a dry unloading facility.

1. Perform a receiving survey of the ISO container and trailer, and inspect for damage.
2. Position the trailer in the designated cask unloading area. Set the trailer brakes and chock the wheels to prevent unintended movement. If site-specific conditions exist that require the trailer to move to allow the cask to be uprighted on its rotation trunnions, release the brakes and remove the chocks when required to complete the uprighting operations. If necessary, the ISO container may be removed from the trailer and secured in the unloading area.
3. Licensees shall receive and survey the package for radiation and removable contamination per 10 CFR 20 and 49 CFR 173. Record the survey results. If radiation or contamination levels exceed the limits of 49 CFR 173.441 or 173.443, respectively, the licensee shall notify the shipper and ensure the appropriate notifications are completed.
4. Remove the roof from the ISO container and open the front and rear ISO doors. Remove the ISO roof cross members, if installed.
5. Verify the TID identification number on the top impact limiter to confirm tampering of the package did not occur.

6. Remove the top and bottom impact limiters.
7. Remove the cask tie-down straps. Complete the radiation and contamination surveys of the package as additional surfaces become accessible. Clean the cask surfaces as required for entry into the dry unloading facility.
8. Using the cask lifting yoke with lift yoke arm guides removed, engage the lifting trunnions of the front end of the cask. Raise the cask to a vertical position on the rear cask support, moving the crane and/or trailer, as required, to keep the cask engaged in the rear rotation supports and the crane cable vertical. When the cask is vertical, block the trailer wheels and lift the cask from the container.
9. Place the cask in a transfer cart or an unloading fixture. Disengage the lifting yoke.
10. Remove the vent and drain valve port covers.
11. Connect the vent line with pressure gauge and isolation valve to the vent port quick disconnect coupling.

    Note: At the discretion of the receiving facility, a gas sample may be taken prior to cavity venting to determine if leakage from the fuel rods occurred during transport.

    Note: The gases exiting from the cavity may be radioactive and at an elevated temperature and pressure. Cavity gases should be controlled and vented to radioactive gas treatment systems per site requirements.
12. Vent the cask cavity. Remove the vent line from the vent valves.
13. Attach the lid removal fixture.
14. Loosen and remove all closure lid bolts.
15. Use the transfer cart or unloading fixture and move the cask into the unloading position.
16. Remove the cask lid.

    Note: Replacement of the closure lid metallic seal is not required. A new metallic seal will be installed and leak tested prior to the next loaded shipment.
17. Install the seal surface protector in the lid cavity, if required.
18. Unload the PWR/BWR Rod Transport Canister and/or its contents, including PWR, PWR MOX or BWR fuel rods and nonfuel-bearing components, if applicable, using the appropriate grapple or handling system.
19. Using the transfer cart or unloading fixture, remove the cask from the unloading area.
20. Remove the cask seal surface protector, if used, and install the cask lid.
21. Inspect, install and tighten all 12 closure lid bolts to 260 ± 20 ft-lbs in three passes using the torque sequence indicated on the closure lid.

    Note: Inspection or replacement of the vent and drain port cover metallic seals is not required. New metallic seals will be installed and leak tested prior to the next loaded shipment.
22. Install the port covers on the vent and drain ports and torque the port cover bolts to 100 ± 10 inch-pounds for the alternate port covers or 285 ± 15 inch-pounds for the Alternate B port covers.

Table of Contents

List of Figures

List of Tables

8 ACCEPTANCE TESTS AND MAINTENANCE PROGRAM

This chapter discusses the acceptance test and maintenance program to be used for the NAC-LWT cask, in compliance with 10 CFR 71, Subpart H.

Where required, specific procedures for testing will be developed in conjunction with the cask fabrication, in accordance with an approved Quality Assurance program.

8.1 Acceptance Tests

This section discusses the tests to be performed prior to first use of the cask.

Two leaktight port cover designs are available for use. The alternate port cover has a face seal containment boundary Viton® O-ring seal and a secondary test boundary O-ring seal on the barrel of the port cover. The alternate port cover was developed to provide a leaktight configuration and to facilitate operations in the field. The Alternate B port cover has two face seals on the inner end of the port cover, one metallic containment boundary seal and one Viton® test boundary seal. The Alternate B port cover was developed to provide a high pressure containment boundary for TPBAR contents. The Alternate B port covers utilize higher strength bolts and a higher installed torque value. Both port cover designs provide a leaktight containment boundary.

To simplify the testing procedures below, when "port cover" or "port cover O-ring" is mentioned, it is intended to mean the port cover which has been chosen for that specific fabrication or cask configuration, either the alternate or the Alternate B and their respective O-rings. The different testing procedures are described in the applicable sections.

8.1.1 Visual Inspection

All components making up the cask lid, body, and baskets are to be visually inspected. This inspection verifies that all items are properly cleaned, free of nicks, gouges and damage, and are assembled in accordance with the license drawings. Each item is compared to the appropriate drawing to verify that it is in the correct orientation, position, and location.

All dirt, oil residue, metal chips or other forms of debris are removed by appropriate cleaning methods. Any entrapped water is removed. Any component found to deviate from its drawing is re-installed, replaced, or otherwise reworked as necessary in order to bring it into conformance.

Acceptance criteria require complete cask cleanliness, that foreign objects are removed, and that nicks or gouges that might preclude sealing or cask closure are not permitted. Valve and system components are visually inspected for leaks during pressure checks. Leaks are not permitted. Any case of noncompliance shall be corrected prior to final acceptance. All welds are visually inspected in accordance with the methods of Article 9, Section V of the "ASME Boiler and Pressure Vessel Code." The acceptance criteria are in accordance with part NB-4424, Section III, and parts UW-35 or UW-36, Section VIII, of the "ASME Boiler and Pressure Vessel Code."

8.1.2 Structural and Pressure Tests

Following completion of fabrication, a hydrostatic test is performed on the cask cavity in accordance with the "ASME Boiler and Pressure Vessel Code," Section III, Subsection NB, Article NB-6000, to 209 (+5/-0) psig. This test is performed in accordance with a procedure prepared by the fabricator and approved by NAC International (NAC). For casks intended for transport of TPBARs, an additional post-fabrication hydrostatic test is performed to 450 +15/-0 psig (1.5 × MNOP of 289 psig = 434 psig). Alternate B port covers are installed for the 450 +15/-0 psig test. The test requirements and acceptance criteria for both tests are described below.

The cask cavity is hydrostatically tested using demineralized water. The test is conducted with the closure lid and valve port covers installed in accordance with the cask handling procedure for loaded casks, but with the quick-disconnect valves removed. During these two 30-minute pressure tests (conducted alternately with one port cover installed and the other removed for access to the cavity), an inspection is made to detect any visual or other evidence of leakage. Any evidence of leakage, including drop of gauge pressure, is cause for rejection.

Following the hydrostatic test, the cask cavity, lid, and port covers are dried and made ready for visual and dye penetrant testing (PT) inspections.

The cask cavity (containment boundary including lid and port covers) is visually inspected. All accessible welds within the cask cavity are examined by PT in accordance with ASME Code, Section V, Article 6, with acceptance criteria in accordance with ASME Code, Section III, Subsection NB, Article NB-5350. Any evidence of cracking, permanent deformation, or exceeding of material yield strength is cause for rejection.

Following completion of the fabrication pressure test or the postfabrication TPBAR-required pressure test, the cask containment boundary is leakage tested in accordance with the requirements of Section 8.1.3.

The neutron shield tank and the expansion tank are hydrostatically tested simultaneously, since they are joined by a siphon tube. The test is in accordance with the "ASME Boiler and Pressure Vessel Code," Section VIII, Division 1, to 248 (+5/-0) psig (165 psig maximum hypothetical accident pressure × 1.5). The neutron shield relief valve is replaced by a plug during the test. All tank seams and joints are inspected for evidence of leakage. The pressure is monitored by use of a pressure gauge. Any evidence of leakage or drop in pressure is cause for rejection. All accessible welds on the neutron shield structure are PT examined following the hydrostatic test.

Each of the two pairs of the cask lift trunnions is load tested. The load test is performed for one pair and, then, repeated for the other pair.

The test consists of applying a vertical load of 159,375 lbs + 3,000 lbs, -0 lbs (300 % of the maximum service load), to each trunnion pair. The load is applied in a vertical direction and equally distributed between the two trunnions.

This test may be carried out by the use of calibrated hydraulic rams combined with a beam, or the cask lifting yoke, and appropriate dead weight attached to the trunnion pair. The load is held for a minimum of 10 minutes.

Following the load test, all welds and material are visually inspected for plastic deformation and cracking and liquid penetrant inspected in accordance with the "ASME Boiler and Pressure Vessel Code," Section V, Article 6, and Section III, Division I, Subsection NF, Article NF-5350, as called for in ANSI N14.6-1993.

Any evidence of permanent deformation or any evidence of cracking, galling, or exceeding of yield strength is cause for rejection of that item.

The rotation sockets at the lower end of the cask are not load tested, being monolithic steel block with a suitably machined opening. Prior to first use, each socket is visually inspected for cleanliness and signs of deformation or other unsuitability. Accessible welds are inspected in accordance with the standards for the cask trunnions.

8.1.3 Leak Tests

The cask containment boundary is subjected to a fabrication leakage rate test, as described in the sections below, to verify containment following fabrication. The test is performed using helium inside the cask cavity and a helium mass spectrometer connected to the test port of the lid or one of the port covers. The mass spectrometer has a minimum sensitivity such that it is capable of detecting a leak rate of at least 1×10^{-9} ref cm^3/sec and is calibrated before and after the test with a standard having a known leak rate between 4×10^{-7} and 1×10^{-9} ref cm^3/sec. The procedure is performed between 40°F and 125°F and is temperature corrected. New O-rings are to be used. The basic procedures for the cask lid and for the vent and drain port covers are provided in the following sections.

A required maintenance leakage rate test adheres to the criteria listed above and follows the replacement of any containment component or seal. Containment components having single-use metallic containment seals (i.e., closure lid and Alternate B port covers) require a maintenance leakage rate test prior to each loaded transport if the component is removed. All containment components shall be subjected to a periodic leakage rate test annually while the cask is in service, or prior to returning the cask to service if the period since the last leakage rate test exceeds 12 months. The acceptance criteria for the fabrication, maintenance, and periodic leakage rate tests appear in the following sections.

8.1.3.1 Closure Lid Leakage Rate Test

The following procedure shall be used to perform the fabrication, maintenance, periodic and pre-shipment leakage rate tests on the closure lid. Steps 1 and 2 are not performed for the pre-shipment leakage rate test performed during cask loading operations as described in Chapter 7.

1. Remove the vent and drain port covers and install the closure lid fitted with a new metallic seal on the cask body.
2. Install the 12 lid bolts and torque them to 260 ± 20 ft-lb in three passes, using the torque sequence stamped on the lid.
3. Connect the vacuum pump to the vent valve and evacuate the cask cavity to a pressure ≤100 torr (130 mbar).
4. Backfill the cask cavity with 99.9% (minimum) pure helium to atmospheric pressure.
5. Repeat Steps 3 and 4 to ensure that the cask cavity helium concentration is approximately 98%.
6. Remove the test port plug from the lid.
7. Connect a helium mass spectrometer leak detector (MSLD) to the cask lid test port. Start the helium MSLD.

   Note: The specific test procedure depends on the helium MSLD used. The test commences when a vacuum is pulled on the test port by the MSLD and the MSLD is placed in the "test" mode.

8. Monitor the test leakage rate until the leakage rate is stable or a minimum of 30 seconds.
9. The acceptance criterion for the closure lid helium leakage test for the NAC-LWT is that the measured leakage rate shall be $\leq 2 \times 10^{-7}$ cm^3/s (helium) (i.e., leaktight per ANSI N14.5-1997 under the test conditions).
10. Remove helium MSLD from test port plug and reinstall port plug and torque to 60 ± 6 inch-pounds.

8.1.3.2 Alternate Port Cover Leakage Rate Tests

8.1.3.2.1 Fabrication and Periodic Leakage Rate Tests

The following procedure shall be used to perform the fabrication and periodic leakage rate tests on the alternate port covers.

1. If the port cover leakage rate tests are not performed immediately following the closure lid leakage rate test of Section 8.1.3.1, evacuate the cask cavity to ≤ 100 torr (130 mbar) and backfill to atmospheric pressure with 99.9% (minimum) pure helium. Reevacuate to ≤ 100 torr (130 mbar) and perform the final helium backfill to atmospheric pressure.
2. Install new O-rings on the port cover.
3. Remove the port valve (either vent or drain valve) and install the port cover.
4. Install and torque the port cover bolts to 100 ± 10 inch-pounds.
5. Remove the test port plug from the port cover.
6. Connect a helium MSLD to the test port. Start the helium MSLD.
7. Monitor the test leakage rate until the leakage rate is stable or for a minimum of 30 seconds.
8. The acceptance criterion for the helium leakage rate test shall be $\leq 2 \times 10^{-7}$ cm^3/s (helium) (i.e., leaktight per ANSI N14.5-1997 under the test conditions).
9. Remove helium MSLD from the test port and reinstall port plug and torque to 60 ± 6 inch-pounds.
10. Repeat Steps 1 through 8 for the second port cover.

8.1.3.2.2 Maintenance Leakage Rate Test

The following procedure shall be used to perform the maintenance leakage rate test on the alternate port covers following the field replacement of a port cover Viton O-ring containment face seal during cask loading operations.

1. Replace the affected seal(s).
2. Insert port cover in a plastic test bag and seal the bag to the cask body around the port opening using suitable tape.
3. Evacuate test bag and backfill with 99.9% (minimum) pure helium to one atmosphere absolute.
4. Reevacuate test bag and perform final helium backfill to one atmosphere absolute.
5. Without breaking the seal of the plastic bag to the cask body, insert the port cover into the port opening and hand tighten the bolts.
6. Torque the bolts to 100 ± 10 inch-pounds. Remove the plastic bag.
7. Remove the test port plug from the port plug.

8. Attach helium MSLD to the port cover test port and evacuate the volume between the seals.
9. Monitor the test leakage rate until stable or for a minimum of 30 seconds.
10. The test is acceptable if the measured leakage rate is $\leq 2 \times 10^{-7}$ cm^3/s (helium) (i.e., leaktight per ANSI N14.5-1997 under the test conditions).
11. Remove helium MSLD from test port and reinstall the test port plug and torque to 60 ± 6 inch-pounds.

8.1.3.3 Alternate B Port Cover Leakage Rate Tests

8.1.3.3.1 Fabrication and Periodic Leakage Rate Tests

The following test procedure shall be used to perform the fabrication and periodic leakage rate tests for the Alternate B port cover. For NAC-LWT casks to be used to transport TPBARS, the fabrication leakage rate test shall be performed immediately following the post-fabrication hydrostatic test to 450 +15/-0 psig required for transport of TPBAR contents. The Alternate B port covers shall be installed for the 450 +15/-0 psig hydrostatic test. The periodic leakage rate test will be performed as part of a cask's annual maintenance and certification program.

1. If the Alternate B port cover leakage rate tests are not performed immediately after the closure lid leakage rate test in Section 8.1.3.1, evacuate the cask cavity to ≤ 100 torr (130 mbar) and perform the final helium backfill to atmospheric pressure with 99.9% (minimum) pure helium. Reevacuate to ≤ 100 torr (130 mbar) and perform final helium backfill to atmospheric pressure.
2. Install the new metallic O-ring on the Alternate B port cover.
3. Remove the port nipple (either vent or drain valve) and install the Alternate B port cover.
4. Install and torque the port cover bolts to 285 ± 15 inch-pounds.
5. Remove the test port plug from the port cover.
6. Connect a helium MSLD to the test port. Start the helium MSLD.
7. Monitor the test leakage rate until the leakage rate is stable or for a minimum of 30 seconds.
8. The test is acceptable if the measured leakage rate is $\leq 2 \times 10^{-7} cm^3/s$ (helium) (i.e., leaktight per ANSI N14.5-1997 under the test conditions).
9. Remove helium MSLD from the test port and reinstall the test port plug and torque to 60 ± 6 inch-pounds.
10. Repeat Steps 1 through 8 for the second Alternate B port cover.

8.1.3.3.2 Maintenance and Preshipment Leakage Rate Tests

The following maintenance leakage rate test procedure for the Alternate B port cover is used after metallic O-ring replacement during each cask loading operation if the port cover is removed, or if another containment component of an Alternate B port cover is replaced.

1. Replace metallic seal.
2. Insert Alternate B port cover in plastic test bag and seal to cask body around port opening with suitable tape.
3. Evacuate test bag and backfill with 99.9% (minimum) pure helium to one atmosphere absolute.
4. Reevacuate test bag and perform final helium backfill to one atmosphere absolute.
5. Without breaking seal of plastic bag to the cask body, insert the Alternate B port cover into the port opening and tighten bolts hand tight.
6. Remove plastic bag and torque bolts to 285 ± 15 inch-pounds.
7. Remove test port plug from the Alternate B port cover.
8. Attach helium mass spectrometer to the Alternate B port cover test port and evacuate the volume between the seals.
9. Monitor the leakage rate test until stable or a minimum of 30 seconds.
10. The test is acceptable if the measured leakage rate is $\leq 2 \times 10^{-7}$ cm^3/s (helium) (i.e., leaktight per ANSI N14.5-1997 under test conditions).
11. Repeat Steps 1 through 10 for the second Alternate B port cover.

8.1.4 Component Tests

Tests performed on individual components are designed to ensure that the components meet the design requirements for correct operation of the cask system.

Acceptance criteria are functions of the purpose of the component being tested.

8.1.4.1 Valves, Pressure Relief Device, and Fluid Transport Devices

Overpressurization protection is afforded the neutron shield tank in the form of a relief valve that is designed to open at 165 psig (plus or minus 10 percent), and reseat. The relief valve is removed from the cask and hydraulically pressure tested using a calibrated system to verify relief valve opening and closing pressures. Failure to operate within tolerance is cause for rejection. Rejected valves are rebuilt or replaced and retested prior to use.

The cask cavity does not contain overpressurization protection because the maximum pressures developed in the worst case (fuel or TPBAR rupture) are well below the structural capability of the cask structure, lid, port covers, and seals.

The cask ports for vent/drain operations (two ports) contain valved quick disconnect fittings. These valves do not require testing to verify valved operation, because no credit is taken for these valves in the cask analyses. The valves provide a convenient method of attaching lines and fixtures, but serve no safety-related function.

The NAC-LWT cask package does not use rupture disks.

A siphon tube is used to connect the neutron shield tank to the neutron shield expansion tank. The tube is a passive device and allows expanding fluid to enter the expansion tank and returns the fluid as the liquid cools. It contains no moving parts and cannot be inspected after installation. The tube will be inspected for cleanliness and to verify that its passage is free of debris and clear prior to installation.

8.1.4.2 Gaskets

Cask closure lid and port cover O-rings will be hydrostatically pressure tested to verify suitability for use and for operation in the Maximum Normal Operating Pressure (MNOP) condition. The O-rings are arranged in pairs with an annulus between them. The annulus is connected by a drilled passageway to a test port. In the acceptance test, each of the three O-ring sets (one closure lid set, one vent port cover set, and one drain port cover set) is pressurized to 209 (+5/-0) psig for 30 minutes. Casks having TPBARs as approved contents are subjected to additional hydrostatic tests at 450 +15/-0 psig (one with the vent cover installed and one with the drain port cover installed). Loss of pressure or any other sign of leakage is cause for rejection.

8.1.4.3 Sealed Canisters

Prior to underwater application of sealed canisters, each design shall be qualified by testing to demonstrate the ability of the canister to be vacuum dried and to stay sealed during subsequent underwater handling and storage. The qualification tests performed will simulate underwater vacuum drying and subsequent handling/storage. Acceptance criteria include no residual water in, or water ingress to, the sealed canister.

8.1.4.4 Miscellaneous

The cask impact limiter structures contain a two-part, aluminum honeycomb that is fabricated to have dynamic crush strengths of 3,500 psi. (plus 5 percent, minus 10 percent) and 250 psi (plus 10 percent, minus 10 percent), respectively. Sample lots of honeycomb material are subjected to dynamic crush testing to verify the crush strength of the impact limiter material. A dynamic crush strength of a sample outside of the allowable variation is cause for rejection of the batch lot of honeycomb material.

8.1.5 Tests for Shielding Integrity

A gamma scan inspection of all steel and lead shielding is conducted in order to verify shielding integrity. This inspection is performed on the cask body, including the cask bottom.

The test is conducted by continuous scanning or probing over 100 percent of all accessible surfaces, using a 3-inch detector and a ^{60}Co source of sufficient strength to produce a count rate that equals or exceeds three times the background count rate.

Scan path spacing is 2.5 inches. Scan speed is 4.5 feet-per-minute or less. All probing is on a 2-inch grid pattern (when using a 3-inch detector) and the count time is a minimum of one minute.

Acceptance is based on a lead and steel mock-up, where the material thicknesses are equivalent to the minimum thicknesses specified by the drawings. The lead and steel mock-up is produced using the same pouring technique as that approved for the cask.

Any area that produces a count rate over that established by the mock-up is considered rejected and must be corrected and retested prior to use.

Test equipment is checked before and after each use to ensure that shield test results are accurate.

8.1.6 Thermal Acceptance Tests

8.1.6.1 Thermal Test

A heat transfer acceptance test is conducted to test the integrity of the lead/stainless steel interface and to establish the heat rejection capability of the cask. The test is conducted with the neutron shield tank full[1] and the pressurized water reactor (PWR) basket located in the dry cask cavity.

[1] The neutron shield tank is filled with a liquid consisting of 58 weight percent ethylene glycol, 39 weight percent demineralized water and 3 weight percent potassium tetraborate ($K_2B_4O_7$).

The cask is internally heated at a rate of 8,500 BTU per hour (± 1,000 BTU per hour). A minimum of 12 internal and 12 external temperatures on the cask are measured with thermocouples. A test closure lid is used to allow penetrations for electric heaters and thermocouples. The steady state heat rate, transient cask temperatures, and ambient temperature are recorded. The test is conducted with the cask 3 feet (approximately) above the ground, horizontal and in still air.

8.1.6.2 Retest

If any equipment should fail during the test, such that the test must be aborted, the test is repeated.

8.1.6.3 Heat Source

The heat source for the thermal test is an electrical heater (cal-rod type) with an active length of 144 to 150 inches and is capable of generating at least 2.5 kilowatts.

8.1.7 Neutron Absorber Tests

8.1.7.1 General

Neutron absorber material in the form of borated stainless steel sheets is used in the TRIGA poison basket modules. After manufacturing, test samples from each batch of neutron absorber (poison) sheets shall be tested using neutron absorption techniques to verify the presence, proper distribution, and minimum weight percent of enriched boron. The tests shall be performed in accordance with approved written procedures.

8.1.7.2 Preparation of Samples for Spectroscopic Examination

Detailed written procedures to perform neutron absorption tests of each batch of neutron absorber sheets shall be established by the manufacturer and approved by NAC. For each batch of neutron absorber sheets, a sample shall be taken from each sheet. The samples shall be indelibly marked and recorded for identification.

At least 2 percent of the sheets in a batch shall be tested using a grid pattern of locations covering the entire surface of the sheet. Each of the remaining sheets in a batch shall be tested at one random location to ensure the presence of boron.

8.1.7.3 Neutron Absorption Test Performance

An approved facility with a neutron source and neutron detection capability shall be selected to perform the described tests. The tests will assure that the neutron absorption capacity of the material tested is equal to, or higher than, the given reference value and will verify the uniformity of boron distribution of a batch of neutron absorber sheets. The principle of measurement of neutron absorption is that the presence of boron results in a slowing down of neutron flux between the neutron sources, the reflector, and the neutron detector – depending on the material thickness and boron content.

Typical test equipment will consist of a neutron source/neutron detector, a reflector, and a counting instrument. The test equipment is calibrated using approved reference sheet(s), whose ^{10}B content has been checked and verified by an independent method such as chemical analysis. The highest permissible counting rate is determined from the neutron counting rates of the reference sheet(s), which should be ground to the minimum allowable plate thickness. This calibration process shall be repeated daily (at least once every 24 hours) while tests are being performed.

8.1.7.4 Acceptance Criteria

The neutron absorption test shall be considered acceptable if the neutron count determined for each test specimen is less than or equal to the highest permissible neutron count rate determined from the reference sheet(s). The poison sheets shall have a minimum of 1.04 weight-percent enriched boron content, with ^{10}B being a minimum of 93.88 atom percent. Any specimen not meeting the acceptance criteria for maximum neutron count shall be rejected and all of the sheets from that lot shall be similarly rejected.

8.2 Maintenance Program

Each NAC-LWT cask is subjected to a series of tests and inspections prior to each loaded shipment and annually, as shown in the Maintenance Program Schedule (Table 8.2-1).

Prior to each loaded transport, the metallic O-rings of the closure lid and Alternate B port covers, if used, are replaced. The O-ring seals of the alternate port covers are inspected and replaced as necessary. The cask cavity, trunnions, and all removable components (i.e., closure lid, port covers, attachment bolts, impact limiters, etc.) are visually inspected for damage. Following loading, the closure lid and port covers are installed and the bolting torqued. Leakage rate tests are performed on the closure lid and port covers as detailed in the cask loading procedures of Chapter 7.1.

The completion of the annual maintenance and test program is required for each NAC-LWT cask while it is in service. The completion of the annual maintenance is documented on an annual inspection certification document. Each NAC-LWT cask must have a current annual certification before it can be used. The required annual cask maintenance test program is performed during or before the calendar month in which the annual program is due, but it is required to be performed no later than 30 days following the due date. During periods when the cask is not in use, the annual maintenance program may be deferred provided that the annual maintenance is completed and documented prior to the cask's next use.

For NAC-LWT casks to be used to transport TPBAR contents, a one-time post-fabrication hydrostatic test of the cask containment boundary, including Alternate B port covers, shall be performed to a pressure of 450 + 15/-0 psig.

Helium leakage rate testing to the leaktight criteria of ANSI N14.5-1997 is performed on the closure lid, and alternate and Alternate B port cover containment seals.

The annual maintenance program certification documentation shall specifically identify that a NAC-LWT packaging has been qualified by testing for TPBAR contents.

Engineering approval is required prior to making any repairs of damaged areas or areas that need refurbishing as a result of normal wear and tear. All such repairs shall be fully documented in accordance with NAC's approved Quality Assurance program. The replacement of valves, fittings, seals, thread fasteners, or use of calibrated pressure gauges are considered normal maintenance and do not require engineering approval.

Testing of the cask shielding and heat rejection capabilities is conducted during original packaging acceptance testing. The structures that provide shielding and heat rejection are passive and do not require verification during routine use of the package. Consequently, the efficiency of these systems is not tested during the annual maintenance program. Radiation surveys conducted at the time of cask loading provide verification of continued shielding effectiveness.

Testing of the neutron absorber material utilized in TRIGA poisoned basket modules are conducted prior to fabrication of the basket modules. The neutron absorber material is in the form of borated stainless steel sheets that are visually inspected for wear or damage prior to each use, and do not require routine maintenance.

8.2.1 Authorized Repairs

Repairs are authorized to correct cracks and blemishes resulting from normal wear and tear of the components of the NAC-LWT packaging. Performance of authorized repairs will result in an as-licensed configuration. The specific weld repair procedure for the impact limiter attachment lugs is described in Section 8.2.1.1.

8.2.1.1 Impact Limiter Attachment Lug Repairs

Impact limiter lugs shall be visually examined prior to each transport to ensure that the impact limiters can be attached to the NAC-LWT cask body in accordance with the Transport Cask Assembly drawings presented in Chapter 1. During annual NAC-LWT packaging maintenance, the impact limiter attachment lugs and the welds sealing the impact limiter shell to the lugs are visually examined with acceptance criteria in accordance with ANSI/AWS Code D1.2, Paragraph 8.8.1. If defects in the impact limiter shell-to-lug welds or in the lug base material are identified, the weld is repaired in accordance with the applicable License Drawing requirements.

Defects in the shell-to-lug weld are removed by grinding, and the shell is rewelded to the lug. If the lug base material has a defect or is broken in two pieces, the lug base material is prepared to allow completion of a full-penetration weld. The weld repairs shall be performed by qualified welders utilizing approved welding procedures prepared, approved and qualified in accordance with ASME Code, Section IX, or ANSI/AWS D1.2. Approved lug repair welding procedures will validate that the axial load path minimum yield strength and ultimate strength of the completed repair will be 10.0 ksi and 20.0 ksi, respectively, or greater, and that the maximum temperature in the base lug material local (within 0.5 inch) to the weld repaired is maintained less than 350°F during the welding process. Following shell-to-lug weld repairs or completion of the full-penetration welding of the lug base material, the weld shall be examined by liquid penetrant examination in accordance with ASME Code, Section V, Article 6, or ANSI/AWS D1.2. Weld acceptance criteria for the liquid penetrant examination shall be in accordance with the ASME Code, Section VIII, Division 1, Appendix 8, or ANSI/AWS D1.2, Paragraph 6.17, as applicable.

Inspection and weld repair documentation shall be maintained as part of the maintenance records for the specific NAC-LWT packaging.

Table 8.2-1 Maintenance Program Schedule

Cask Cavity (Including Port Cover and Lid Seals)	
Annually	Visual Inspection Lid and Port Cover Seal Replacement Periodic Helium Leak Tests (per Section 8.1.3)
Valve Port Covers	
Each Loaded Shipment	Visual Inspection Air Pressure Drop Test at 15 +1/-0 psig (Alternate port covers) Maintenance Helium Leakage Testing (Alternate B port covers) Seal Replacement as Necessary[1]
Drain Line Gasket	
Each Shipment	Seal Replacement as Necessary
Annually	Seal Replacement
Water Jacket and Expansion Tank	
Annually	Visual Inspection Check Fluid Level, Specific Gravity, and Boron Concentration[2]
Each Shipment	Visually Inspect Fill, Drain and Inspection Port Plugs for Leakage
Cask Lid Bolts	
Each Shipment	Visually Inspect for Damage and Replace, as required.
Long Term Maintenance	Bolt replacement upon reaching 20-year life or 550 operational cycles.

[1] Helium leak testing (per Section 8.1.3.2.2) is required following replacement of alternate port cover containment (i.e., face) O-ring seals. For Alternate B port covers, seal replacement and leak testing are required for each shipment per the requirements specified in the Operating Procedures in Chapter 7 and Section 8.1.3.3.2.

[2] The neutron shield fluid must be verified to contain greater than 1.0 wt % boron and the specific gravity must be such that the solution does not freeze at temperatures above -40°F.

Table 8.2-1 Maintenance Program Schedule (continued)

Water Jacket Relief Valve	
Annually	Replace With New Pre-set Valve, or Verify Opening and Reseating Pressure (Allowable variation is ± 10 psig of Nominal Valve Opening Pressure, 165 psig)
Fasteners, Valved Nipples, Washers, Reusable O-rings, and Helicoils	
Each Shipment	Inspect and Replace as necessary
Lid and Alternate B Port Cover Metallic O-rings	
Each Loaded Shipment	Replace and perform helium leakage rate testing to the criteria specified in Section 8.1.3.

8.3 Appendix

This appendix describes the lead pour procedure used to create the lead wall between the inner and outer shells of the LWT cask. This lead wall provides the gamma shielding in the cask and is subject to tests verifying its shielding integrity.

8.3.1 General Description

Basically, this procedure consists of pouring molten lead in the annular space between the inner and outer shells followed by the controlled cooling of the lead. Electrical heaters and gas burners are used to heat the cask body prior to and during the lead pour. To cool the lead in a controlled manner, water is sprayed on the cask surfaces while simultaneously switching off the electrical heaters and gas burners.

The lead used in this procedure complies with the ASTM Standard B29, chemical copper grade.

8.3.2 Preparation

The cask must be placed in the vertical position (Figure 8.3-1) for the lead pour. It must also be perfectly level and stable.

Stiffening bars are placed inside the cask to prevent distortion of the cask body assembly as a result of the expansion and/or shrinkage expected during the pouring and cooling of the lead. An auxiliary ring is welded on the upper edge of the outer shell to be used as a guide in reaching the required level of lead. This ring is later removed by machining.

The cask body is checked for cleanliness, especially inside the annular space, but also on all outer surfaces. It is important to remove any foreign matter that when heated might be harmful to the surface material.

A Dimensional Verification of the cask body is performed, especially checking the tolerances of the annular space between the inner and outer shells.

The cask body is heated by using a combination of electrical resistances arranged inside the cask and gas burners as rings located at spaced levels surrounding the outer surface of the cask. Prior to the lead pour, the top flange area of the cask is heated with hand burners to approximately 572°F (300°C).

The actual temperatures of the cask walls are measured by thermocouples attached to the inner and outer surfaces of the cask. In addition, the temperature is also measured at random by contact thermocouples. The temperatures are monitored during the complete operation and recorded on charts.

8.3.3 Pouring Procedure

Approximately 27,533 pounds of lead per cask is melted in the appropriate kettles and kept at a temperature in the range of 698°F (370°C) to 790°F (421°C).

The cask body is heated in a steady and uniform manner at a rate not exceeding 90°F per hour (50°C/hour). Once the cask body reaches the holding temperature of 550°F to 650°F (288°C – 343°C) and this temperature appears stabilized, the lead pouring can begin. Note that particular attention must be given to the method and procedure of heating to ensure that the cask surface does not reach 800°F (427°C) maximum during heating or pouring.

The lead pour should not be interrupted and should take as short a time as possible. The pouring is carried out by using filling tubes of different lengths that are changed in the course of the pouring as the level of molten lead rises in the cask. The open end of the filling tubes is kept below the surface of the lead pool during pouring.

The lead is checked during pouring using steel rods to ensure no solidification occurs.

8.3.4 Cooling Process

Once the required level of lead is reached, it is again checked using steel rods to ensure that no solidification has started anywhere in the molten lead volume.

The cooling is controlled by simultaneously turning off the inside electrical heaters and the gas burners outside the cask. This process begins by switching off the heating band at the lowest end of the cask (while keeping the rest of the heaters and burners on) and continues progressively upwards as the solidification of the lead progresses. Water is injected into the gas burners (rings) and then sprayed on the outside surface of the cask to regulate and accelerate the cooling.

During the solidification, the lead is checked using steel rods to ensure that the difference in height in any part of the solid surface of the annular space is not greater than 2 inches (Figure 8.3-2). To meet this requirement, the heaters and burners (sprayers) must be regulated as necessary. The top surface should be kept molten until the rest of the cask has solidified.

Figure 8.3-1 Lead Pour Configuration

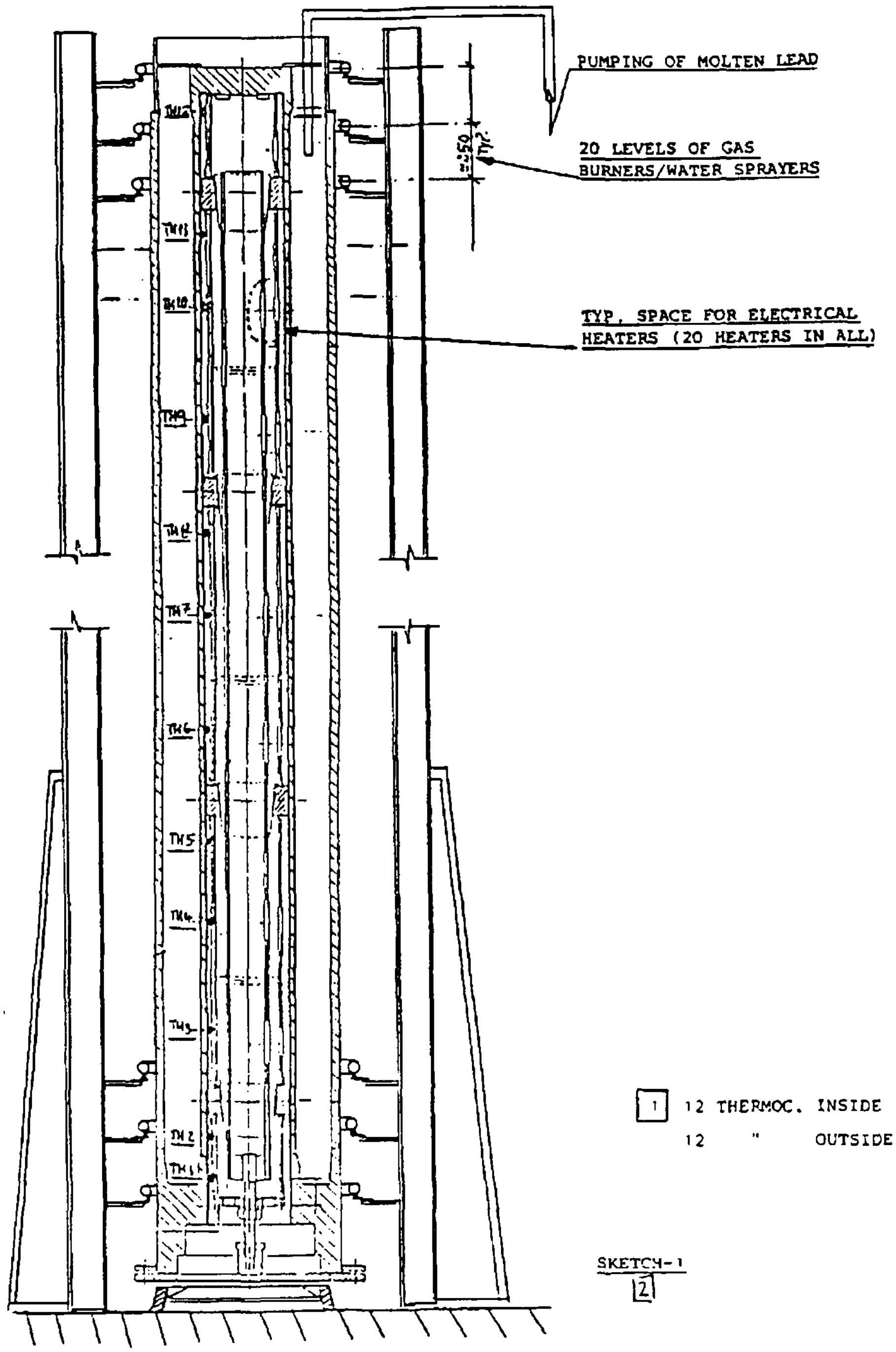


Figure 8.3-2 Allowable Height Difference

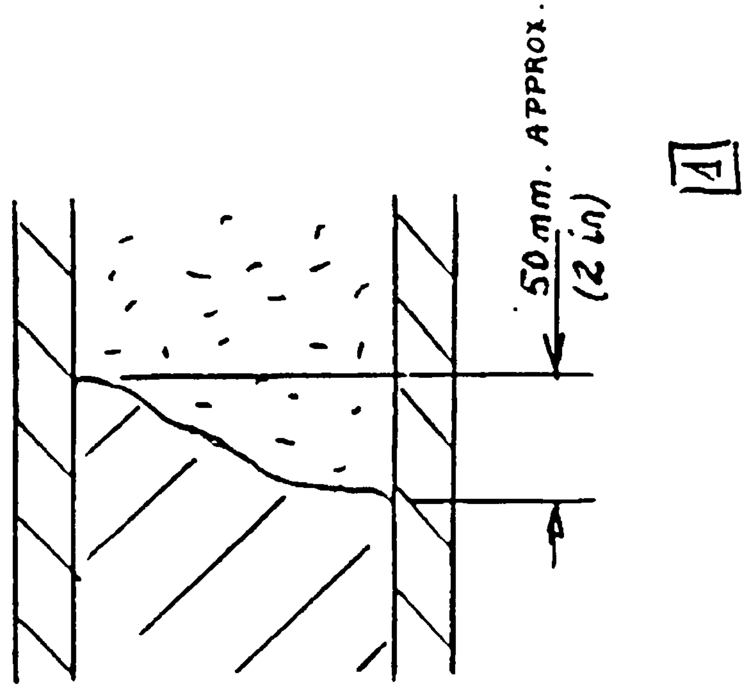


Table of Contents

9 REFERENCES

"AISC Manual of Steel Construction," 8th Edition, The American Institute of Steel Construction, Inc., 1990.

Alcoa Aluminum Handbook, Pittsburgh, PA, Aluminum Company of America, 1959.

"Aluminum Construction Manual," 2nd Edition, Section 3, The Aluminum Association, Washington, D.C., 1972.

"Annual Book of ASTM Standards," Section 3, Volume 03.01, American Society for Testing and Materials, 1986.

"'ANSYS' Computer Code for Large-Scale General Purpose Engineering Analysis," Swanson Analysis Systems, Inc., Houston, PA.

"ASME Boiler and Pressure Vessel Code," Section III, Subsection NG – Core Support Structures and Subsection NH – Class 1 – Components in Elevated Temperature Service, The American Society of Mechanical Engineers, 1995 with Addenda through 1997.

Baker, E.H., L. Kovalevsky, and F.L. Rish, Structural Analysis of Shells, New York, McGraw-Hill Book Co., December 1966.

Bates, O.K., "Thermal Conductivities of Aqueous Ethylene Glycol Solutions," St. Lawrence University, Canton, NY.

Baumeister, T. and L.S. Marks, Standard Handbook for Mechanical Engineers, 7th Edition, New York, McGraw-Hill Book Co., December 1966.

BAW-246, "NULIF – A Neutron Spectrum Generator, Few-Group Constant Calculator, and Depletion Code," Babcock & Wilcox, August 1976.

Bevington, P.R., Data Reduction and Error Analysis for the Physical Sciences, New York, McGraw-Hill Book Company.

Biggs, J.M., Introduction to Structural Dynamics, New York, McGraw-Hill Book Co., 1964.

Blake, A., "Charts Simplify Calculations for Moments and Deflections of Circular Arches," Machine Design, Cleveland, Penton Publishing Co., December 25, 1958.

Blodgett, O.W., Design of Welded Structures, Cleveland, James F. Lincoln Arc Welding Foundation, 1972.

Book of Standards, Part 7, American Society for Testing and Materials, 1970.

Bruhn, E.F., Analysis and Design of Flight Vehicle Structures, 1st Edition, Cincinnati, Tri-State Offset, Co., 1965.

Bucholz, J.A., "Scoping Design Analyses for Optimized Shipping Casks Containing 1-, 2-, 3-, 5-, 7-, or 10-year old PWR Spent Fuel," Oak Ridge National Laboratory, ORNL/CSD/TM-149, January 1983.

Bucholz, J.A., "XSDOSE: A Module for Calculating Fluxes and Dose Rates at Points Outside A Shield," Vol. 2, Sect. F4 of SCALE-4, August 1981.

Bucholz, J.A., et. Al., "SAS1: A One-Dimensional Shielding Analysis Module."

Cain, V.R. and R.E. Malenfant, "QAD-CG, The Combinatorial Geometry Version of the QAD-P5A Point Kernam Shielding Code," Bechtel Power Corporation, July 1977.

CCC-545, "SCALE-4, A Modular Code System for Performing Standardized Computer Analysis of Licensing Evaluation," ORNL, June 1990.

Chun, R., M. Witte, and M. Schwartz, "Dynamic Impact Effects on Spent Fuel Assemblies," UCID-21246, Lawrence Livermore National Laboratory, October 1987.

"Coefficient of Cubical Expansion for Glycol, Water, and Glycol-Water Solutions," E.I. du Pont de Nemours & Co., Inc., Wilmington, DE, 1963.

Cook, I. And R.S. Peckover, "Effective Thermal Conductivity of Debris Beds," Post Accident Debris Cooling, Proceedings of the Fifth Post Accident Heat Removal Information Exchange Meeting, 40-45, 1982.

Cragoe, C.S., "Properties of Ethylene Glycol and Its Aqueous Solutions," National Bureau of Standards.

DOE/ET/34014-10, "Extended Fuel Burnup Demonstration Program," U.S. Department of Energy, September 1983.

Ebner, M. A., "Stability of Uranium-Zirconium Hydride Spent Fuel in Wet Storage," INEL Report MAE-03-94, July, 1994.

Gallagher, C., "NL Industries Internal Test Report on Tensile Properties of Chemical Lead at Elevated Temperatures," Central Research Laboratory, Highstown, NJ, February 1976.

General Atomics Report UZR-28, "Uranium-Zirconium Hydride Fuels for TRIGA Reactors," 1997.

Gerard, G. and H. Becker, "Handbook of Structural Stability," Part III, TN3783, National Advisory Committee for Aeronautics, 1957.

Greene, N.M., J.L. Lucius, L.M. Petrie, W.E. Ford III, J.E. White, and R.Q. Wright, "AMPX – A Modular Code System for Generating Multigroup Neutron-Gamma Libraries from ENDF/B," ORNL/TM-3706, Oak Ridge National Laboratory, March 1976.

Greene, N.M. and L.M. Petrie, "XSDRNPM-S: A One-Dimensional Discrete Ordinates Code for Transport Analysis," Vol. 2, Sect. F3 of SCALE-4, January 1983.

Handbook of Chemistry and Physics, 49th Edition, Cleveland, OH, The Chemical Rubber Company, 1968.

Hermann, O.W. and R.M. Westfall, "ORIGEN-S: SCALE System Module to Calculate Fuel Depletion, Actinide Transmutation, Fission Product Buildup and Decay and Associated Radiation Source Terms," Vol. 2, Sect. F7 of SCALE-4, February 1989.

Hermann, O.W., "SAS2(H): A Coupled One-Dimensional Depletion and Shielding Analysis Code," Vol. 1, Sect. S2 of SCALE-4, June 1990.

IAEA Transportation Safety Standards (TS-R-1), "Regulations for the Safe Transport of Radioactive Material," June 2000.

Johnson, E.B. and R.K. Reedy, "Critical Experiments with SPERT-D Fuel Elements," ORNL-TM-1207, July 14, 1965.

Jordan, W.C., N.F. Landers, and L.M. Petrie, "Validation of KENO-Va Comparison with Critical Experiments," ORNL/CSD/TM-238, December 1986.

Juvinall, R.C., Stress, Strain, and Strength, New York, McGraw-Hill Book Co., 1967.

Kinsey, R., "Data Formats and Procedures for the Evaluated Nuclear Data File, ENDF," ENDF-102, Second Edition, Brookhaven National Laboratory, 1979.

Kreith, F., Principles of Heat Transfer, 2nd Edition, Scranton, PA, International Textbook Company, 1965.

Manual of Steel Construction, 8th Edition, New York, American Institute of Steel Construction, Inc., 1990.

Mark's Standard Handbook for Mechanical Engineers, 9th Edition, McGraw-Hill Book Company, New York.

Merritt, F.S., Standard Handbook for Civil Engineers, McGraw-Hill Book Company, New York, 1968.

Metals Handbook, 9th Edition, American Society of Metals.

MIL-HDBK-5A, "Metallic Materials and Elements for Aerospace Vehicle Structures," Department of Defense, February 1966.

MIL-HDBK-5C, "Metallic Materials and Elements for Aerospace Vehicle Structures," Department of Defense, December 1978.

MIL-HDBK-5E, "Metallic Materials and Elements for Aerospace Vehicle Structures," Department of Defense, May 1989.

MIL-HDBK-5G, "Metallic Materials and Elements for Aerospace Vehicle Structures," Department of Defense, November 1994.

Nelms, H.A., "Effects of Jacket Physical Properties and Curvature on Puncture Resistance," Structural Analysis of Shipping Casks, Volume 3, ORNL/TM-1312, Oak Ridge National Laboratory, June 1968.

"Nuclear Systems Materials Handbook," Volume 1, Revision 1, Hanford Engineering Development Laboratories, Richland, WA, March 10, 1976.

NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," U.S. Nuclear Regulatory Commission, July 1980.

NUREG-1617, Supplement 1, "Standard Review Plan for Transportation Packages for MOX Spent Nuclear Fuel," U.S. Nuclear Regulatory Commission, September 2005.

NUREG/CR-0733, "Critical Separation Between Sub-Critical Clusters of 4.29 w/o U^{235} Enriched UO_2 Rods in Water with Fixed Neutron Poisons," S.R. Bierman, B.M. Durst, E.D. Clayton, Battelle Pacific Northwest Laboratories, May 1978.

NUREG/CR-0200, Volume 2, Section F2, "SCALE-2 NITAWL-S, Resonance Self-Shielding by the Nordheim Method," N. M. Green and L. M. Petrie, Oak Ridge National Laboratory, October 1981.

NUREG/CR-6361, "Criticality Benchmark Guide for Light-Water-Reactor Fuel in Transportation and Storage Packages," U.S. Nuclear Regulatory Commission, March 1997.

NUREG/CR-6487, Anderson, B.L., Carlson, R.W., and Fisher, L.E., "Containment Analysis for Type B Packages Used to Transport Various Contents," Lawrence Livermore Laboratory, 1996.

NUREG/CR-0200, Volume 2, Section F3, "SCALE-2 XSDRNMP-S, A One Dimensional Discrete Ordinates Program for Transport Analysis," R.M. Westfall, L.M. Petrie, N.M. Greene, J.L. Lucius, Oak Ridge National Laboratory, June 1983.

NUREG/CR-0481, "An Assessment of Stress-Strain Data Suitable for Finite-Element Elastic-Plastic Analysis of Shipping Containers," H.J. Rack and G.A. Knorovsky, Sandia Laboratories, SAND77-1872, September 1978.

NUREG/CR-0796 PNL-2827, "Criticality Experiments with Sub-Critical Clusters of 2.35 and 4.29 w/o U^{235} Enriched $U0_2$ Rods in Water with Uranium or Lead Reflecting Walls," S.R. Bierman, B.M. Durst, E.D. Clayton, Battelle Pacific Northwest Laboratories, April 1979.

Paxton, H.C., Critical Dimensions of Systems Containing U^{235}, Pu^{239}, and U^{233}," TID-7028, June 1964.

Peery, D.J., Aircraft Structures, New York, McGraw-Hill Book Company, 1950.

Petrie, L.M. and N.F. Cross, "KENO-IV: An Improved Monte Carlo Criticality Program," ORNL-4938, Oak Ridge National Laboratory, November 1975.

PNL-2438, "Critical Separation Between Sub-Critical Clusters of 2.35 w/o U^{235} Enriched UO_2, Rods in Water with Fixed Neutron Poisons," S.R. Bierman, E.D. Clayton, B.M. Durst, Battelle Pacific Northwest Laboratories, October 1977.

Radiological Health Handbook, U.S. Department of Health, Education and Welfare, Rockville, MD, January 1970.

"Regulations for the Safe Transport of Radioactive Materials," Safety Series No. 6, Revised Edition, International Atomic Energy Agency, 1973.

"Research and Advanced Development Applied Mechanics," Volume 1, Engineering Data Sheets, Avco Corporation, 1962.

Resnick, R. and D. Halliday, Physics, 3rd Edition, Part 1, New York, John Wiley & Sons, 1977.

Roark, R.J., Formulas for Stress and Strain, 4th Edition, New York, McGraw-Hill, Inc., 1965.

Roark, R.J., and W.C. Young, Formulas for Stress and Strain, 5th Edition, New York, McGraw-Hill, Inc., 1975; 6th Edition, 1989.

Roddy, J.W., H.C. Claiborne, R.C. Ashline, P.J. Johnson, B.T. Rhyne, "Physical and Decay Characteristics of Commercial LWR Spent Fuel," ORNL/TM-9591/VI-RI, Oak Ridge National Laboratory, January 1986.

"Safety Analysis Report for the NLI-1/2 Spent Fuel Shipping Cask," Nuclear Assurance Corporation, USA/9010/B()F, December 12, 1985.

Schaeffer, N.M., Reactor Engineering for Nuclear Engineers, Springfield, VA, 1984.

"Screw-Thread Standards for Federal Services," U.S. Department of Commerce, 1957.

Shamban TFE O-Ring Seals, Spec. 22-53, Part No. S11214-460, W.S. Shamban & Co., Fort Wayne, IN, 1966.

Shappert, L.B., "Cask Designer's Guide: A Guide for the Design, Fabrication, and Operation of Shipping Casks for Nuclear Applications," ORNL-NSIC-68, Oak Ridge National Laboratories, February 1970.

Shappert, L.B., and W.D. Box, "The Drop Test Facility at the Oak Ridge National Laboratory: A Facility Available to Private Industry," Oak Ridge National Laboratory, Oak Ridge, TN.

Shigley, J.E., Mechanical Engineering Design, 3rd Edition, New York, McGraw-Hill, Inc., 1977.

Shigley, J.E., and C.R. Mischke, Standard Handbook of Machine Design, New York, 1986.

Singer, F.L., Strength of Materials, New York, Harper & Brothers, 1951.

"Table Speeds Calculation of Strength of Threads," Product Engineering, November 27, 1961.

Tang, J.S. "SAS4: A Monte Carlo Cask Shielding Analysis Module Using An Automated Biasing Procedure," March 1989.

"Test Plan: LWT Quarter-Scale Model Drop Tests," Document No. 315-P-01. Nuclear Assurance Corporation, May 31, 1988.

Tietz, T.E., "Determination of the Mechanical Properties of High Purity Lead and a 0.058% Copper-Lead Alloy," Stanford Research Institute, Menlo Park, CA, WADC Technical Report 57-695, ASTIA Document No. 151165, April 1958.

Timoshenko, S., Strength of Materials, 3rd Edition, New York, R. E. Krieger Publishing Co., 1976.

Timoshenko, S., Theory of Plates and Shells, 1st Edition, New York, McGraw-Hill Book Co., 1940.

Timoshenko and Gere, Theory of Elastic Stability, 2nd Edition, New York, McGraw-Hill, Inc., 1961.

Timoshenko, S. and Young, Theory of Structures, New York, McGraw-Hill Book Co., 1965.

Turner, W.D., D.C. Elrod, and I.I. Simon-Tov, "HEATING 5 - An IBM 360 Heat Conduction Program," Oak Ridge National Laboratory, ORNL/CSD/TM-15, March 1977.

Williamson, R.A. and R.R. Alvy, "Impact Effect of Fragments Striking Structural Elements," Holmes and Harver, Inc., 1973.

Childs, K.W., HEATING 7.2 User's Manual, Oak Ridge National Laboratory, ORNL/NUREG/CSD-2/V2/R5, September 1995.

Avallone, E. and T. Baumeister, Marks' Standard Handbook for Mechanical Engineers, 9th Edition, New York, McGraw-Hill Book Company, 1987.

"SCALE 4.3 Modular Code System for Performing Standardized Computer Analyses for Licensing Evaluation for Workstations and Personal Computers," CCC-545, September 1995.

Herman, O.W., "SAS2H: A Coupled One-Dimensional Depletion and Shielding Analysis Module," and C.V. Parks, ORNL/NUREG/CSD-2/V1/R5, Volume 1, Section S2, September. 1995.

Tang, S., "SAS4: A Monte Carlo Cask Shielding Analysis Module Using an Automated Biasing Procedure," ORNL/NUREG/CSD-2/V1/R5, Volume 1, Section S4, September, 1995.

Bucholz, J.A., Landers, N.F., and Petrie, L.M., ORNL/NUREG/CSD-2/V3/R5, Section M7, "The Material Information Processor For Scale," September 1995.

Greene, M., Westfall, R.M., and L.M. Petrie, ORNL/NUREG/CSD-2/V2/R5, "NITAWL-II: Scale System Module For Performing Resonance Shielding And Working Library Production" September 1995.

Jordan, W.C., ORNL/NUREG/CSD-2/V3/R5, Section M4, "Scale Cross-Section Libraries," September 1995.

Landers, N. F., and Petrie L.M, ORNL/NUREG/CSD-2/V1/R5, Section C4, "CSAS: Control Module For Enhanced Criticality Safety Analysis Sequences," September 1995.

Mele, Ravink and Trkov, "TRIGA Mark II Benchmark Experiment, Part I Steady State Operation," Jozef Stefan Institute, Nuclear Technology, Vol. 105, January 1994.

Petrie L.M., and Landers, N.F., ORNL/NUREG/CSD-2/V2/R5, Section F11, "KENO-Va: An Improved Monte Carlo Criticality Program with Supergrouping," September 1995.

Tomsio, M., "Characterization of Triga Fuel," ORNL/Sub/86-22047/3, GA-C18542, Oak Ridge National Laboratory, Oak Ridge, Tennessee, October 1986.

Krieth, F., and Bohn, M.S., "Principals of Heat Transfer," 5th Edition, West Publishing Company, 1993.

Incropera, F.P., and DeWitt, D.P., "Fundamentals of Heat and Mass Transfer," 4th Edition, John Wiley and Sons, 1996.

Owen, D.B., "Factors for One-Sided Tolerance Limits and for Variables Sampling Plans," SCR-607, 1963.

ANSI N14.5-1987, "American National Standard for Radioactive Materials - Leakage Tests on Packages for Shipment," American National Standards Institute, 1987.

ANSI/ANS - 8.1-1983, "Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors."

ANSI/ANS - 8.17-1984, "Criticality Safety Criteria for the Handling, Storage, and Transportation of LWR Fuel Outside Reactors."

Bierman, S.R., Clayton, E.D., "Criticality Experiments with Subcritical Clusters of 2.35 w/o and 4.31 w/o ^{235}U Enriched UO_2 Rods in Water at a Water-to-Fuel Volume Ratio of 1.6," NUREG/CR-1547, July 1980.

Baldwin, N.M., Hoovler, G.S., Eng, R.L., and Welfare, F.G., "Critical Experiments Supporting Close Proximity Water Storage of Power Reactor Fuel," B&W-1484-7, July 1979.

Bierman, S.R., and E.D. Clayton, "Criticality Experiments with Subcritical Clusters of 2.35 w/o and 4.31 w/o ^{235}U Enriched UO_2 Rods in Water with Steel Reflecting Walls," Nuclear Technology, Volume 54, pp. 131-144, August 1981.

Bierman, S.R., Durst, B.M., and Clayton, E.D., "Criticality Experiments with Subcritical Clusters of 2.35 and 4.31 w/o ^{235}U Enriched UO_2 Rods in Water with Uranium or Lead Reflecting Walls," NUREG/CR-0796, April 1979.

Bierman, S.R., "Criticality Experiments to Provide Benchmark Data on Neutron Flux Traps," PNL-6205/UC-714, June 1988.

Manaranche, J.C. et al, "Dissolution and Storage Experiment with 4.75 w/o ^{235}U Enriched UO_2 Rods," Nuclear Technology, Volume 50, September 1980.

Machinery's Handbook, 25th Edition, Industrial Press, Inc., New York, NY, 1996.

BISCO Products Data, "FPC Fireblock Silicone Foam," BISCO Products, Inc., Park Ridge, IL, February 1988.

Letter from Rogers Corporation, Bisco Materials Unit, dated February 2, 1999, from Daniel J. Kubrick.

Interim Staff Guidance-11 (ISG-11), Revision 3, "Cladding Considerations for the Transportation and Storage of Spent Fuel," U.S. Nuclear Regulatory Commission, November 2003.

Holometrix Micromet test report NCN-2, dated May 2000.

Ugural, A.C. and Fenster, S.K., "Advanced Strength and Applied Elasticity," Second Edition, Elsevier Science Publishing Company, New York, New York, 1987.

NAC Specification 315-S-09, "O-Ring Temperature Testing for the LWT Alternate Port Cover," Revision 0, February 2000.

"HTGR/RERTR Fuel Materials Characterization and Packaging Report," PC-00384/1, General Atomics, San Diego, CA, April 2002.

UNIFRAX Product Specifications, Fiberfrax® Ceramic Fiber Paper, C-1423, Unifrax Corporation, Niagara Falls, NY, June 1996.

LLNL Report UCRL-53441, "Review of Hydrogen Isotope Permeability Through Materials"

RSIC Computer Code Collection, *ORIGEN2.1; Isotope Generation and Depletion Code – Matrix Exponential Method*, CCC-371, Oak Ridge National Laboratory, Oak Ridge TN, 1996.

Y.K. Sakamoto and M. Sugisaki, "Fusion Science and Technology," Vol. 41, pp 912-914, May 2002.

"Aluminum Standards and Data," Table 2.2, The Aluminum Association, Washington, DC, 1997.

Blake, Alexander, "Practical Stress Analysis in Engineering Design," 2nd Edition, Marcel Dekker Inc., New York, 1990.

ORNL/TM-12667, "Validation of the SCALE System for PWR Spent Fuel Isotopic Composition Analyses," Oak Ridge National Laboratory, March 1995.

ORNL/TM-13317, "An Extension of the Validation of SCALE (SAS2H) Isotopic Prediction for PWR Spent Fuel," Oak Ridge National Laboratory, September 1996.

NUREG/CR-6798, "Isotopic Analysis of High Burnup PWR Spent Fuel Samples from the Takahama-3 Reactor," US Nuclear Regulatory Commission, January 2003.

ORNL/TM-13315, "Validation of SCALE (SAS2H) Isotopic Predictions for BWR Spent Fuel," Oak Ridge National Laboratory, September 1998.

ORNL/TM-13687, "Prediction of the Isotopic Composition of UO_2 Fuel from a BWR: Analysis of the DU1 Sample from the Dodewaard Reactor," Oak Ridge National Laboratory, October 1998.

Westinghouse Savannah River Company, WSRC-TR-98-00317, "Bases for Containment Analysis for Transportation of Aluminum-Based Spent Nuclear Fuel," October 1998.

ASME Boiler and Pressure Vessel Code, Section V, "Nondestructive Examination," American Society of Mechanical Engineers, New York, NY, 2001 Edition with 2003 Addenda.

ASME Boiler and Pressure Vessel Code, Section VIII, "Rules for Construction of Pressure Vessels," American Society of Mechanical Engineers, New York, NY, 2001 Edition with 2003 Addenda.

ASME Boiler and Pressure Vessel Code, Section IX, "Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators," American Society of Mechanical Engineers, New York, NY, 2001 Edition with 2003 Addenda.

AWS D1.2, "Structural Welding Code–Aluminum," The American Welding Society, Miami, FL, 2003.