

LSNReviews

From: Tripp, Christopher
Sent: Thursday, March 19, 2009 9:16 AM
To: Sippel, Timothy
Subject: Spreadsheets
Attachments: burnup_study 1-29.xls; burnup_benchmarks 1-29.xls

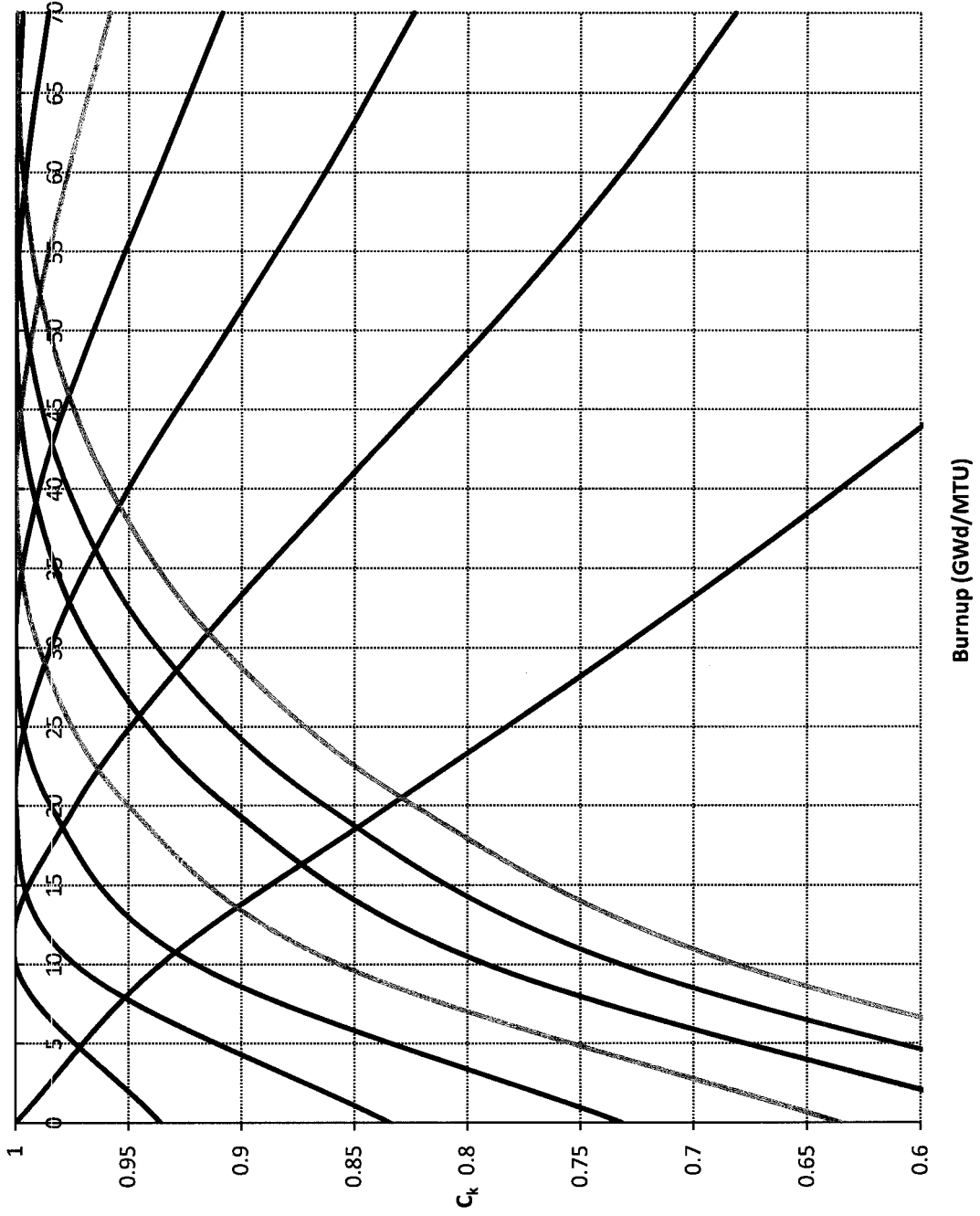
Here are two spreadsheets. The first has the calculated sensitivity coefficients for all nuclides as a function of burnup (at a 5wt% initial enrichment). The second has the calculated c_k values for all the benchmarks (CRCs as well as LCEs) for PWR and BWR fuel.

One thing I want to do with ORIGEN is figure out just how conservative (Δk_{eff}) the choice of 29 principal isotopes, with the supposedly bounding depletion parameters, is, relative to a realistic assessment of depletion. If there is substantial conservatism that would add to the subcritical margin for in-package PWR fuel.

I hope you find this useful.

Chris

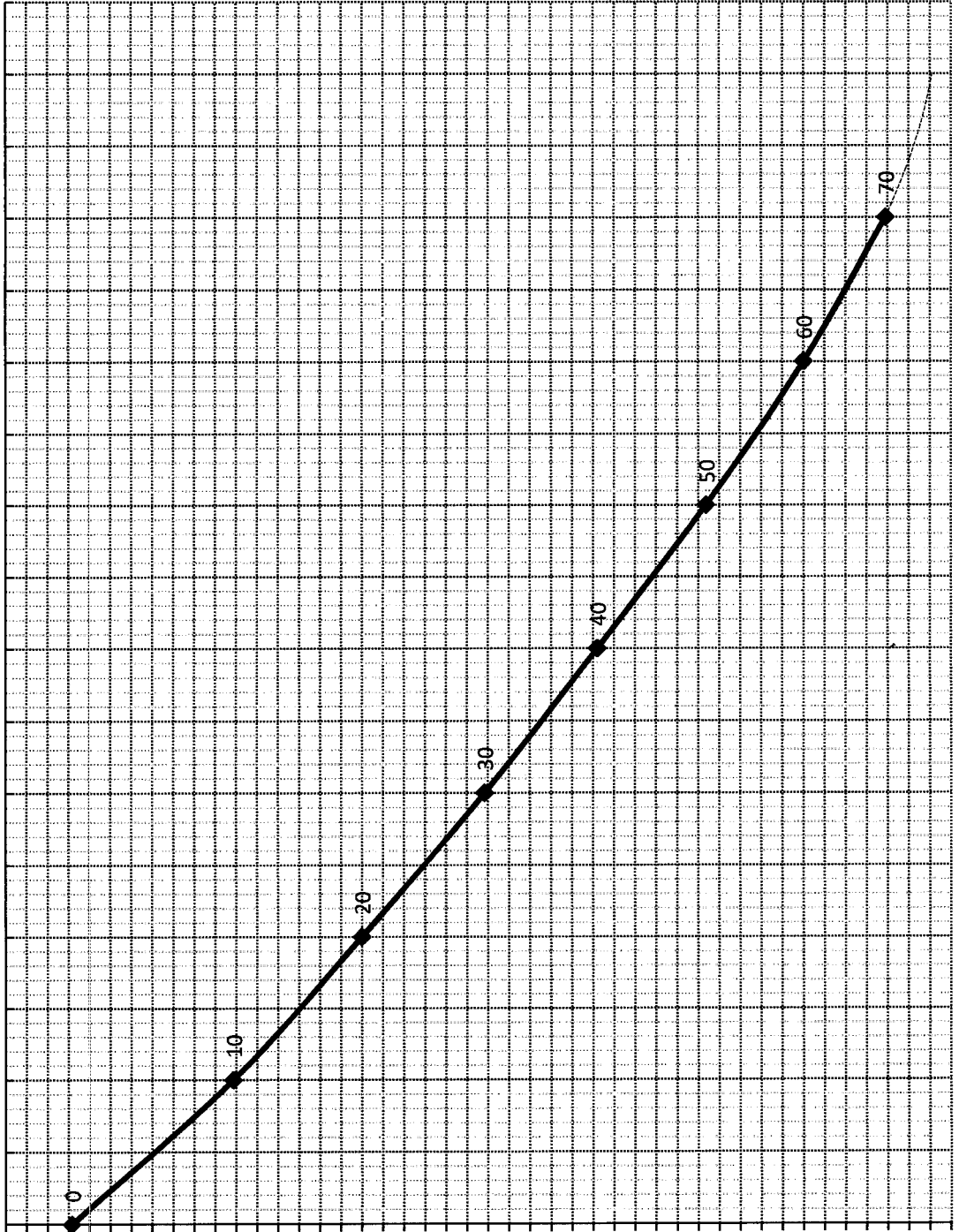
Correlation Coeff. vs. Assembly Average Burnup



- Fresh Fuel
- 10 GWd/MTU
- 20 GWd/MTU
- 30 GWd/MTU
- 40 GWd/MTU
- 50 GWd/MTU
- 60 GWd/MTU
- 70 GWd/MTU

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85

1.25
1.24
1.23
1.22
1.21
1.2
1.19
1.18
1.17
1.16
1.15
1.14
1.13
1.12
1.11
1.1
1.09
1.08
1.07
1.06
1.05
1.04
1.03
1.02
1.01
1
0.99
0.98
0.97
0.96
0.95
0.94
0.93
0.92
0.91
0.9
0.89
0.88
0.87
0.86
0.85
0.84
0.83
0.82
0.81
0.8



Series1

Burnup	0	10	20	30	40	50	60	70
0	1	0.9357	0.8342	0.7318	0.6354	0.5469	0.4731	0.4131
10	0.9357	1	0.9736	0.9203	0.8568	0.7912	0.7322	0.6816
20	0.8342	0.9736	1	0.9846	0.9501	0.9062	0.8631	0.8238
30	0.7318	0.9203	0.9846	1	0.9898	0.9657	0.9372	0.9087
40	0.6354	0.8568	0.9501	0.9898	1	0.9927	0.977	0.9584
50	0.5469	0.7912	0.9062	0.9657	0.9927	1	0.9956	0.9857
60	0.4731	0.7322	0.8631	0.9372	0.977	0.9956	1	0.9972
70	0.4131	0.6816	0.8238	0.9087	0.9584	0.9857	0.9972	1

Keff

0	1.21826
10	1.14129
20	1.08006
30	1.02154
40	0.96785
50	0.9162
60	0.86984
70	0.83098

Sensitivity by Nuclide-Master Database

Burnup/Wt%	ADen	SN	ADen	SN	ADen	SN	ADen	SN	ADen	SN	ADen	SN			
0	0	10	10	20	20	30	30	40	40						
1 o-16	4.65E-02	-6.21E-04	1 o-16	4.76E-02	-1.35E-03	1 o-16	4.73E-02	-2.14E-03	1 o-16	4.69E-02	-2.61E-03	1 o-16	4.65E-02	-2.78E-03	1 o-16
1 mo-95	1.58E-05	-6.28E-04	1 mo-95	1.58E-05	-6.28E-04	1 mo-95	3.03E-05	-1.15E-03	1 mo-95	4.38E-05	-1.61E-03	1 mo-95	5.63E-05	-2.03E-03	1 mo-95
1 tc-99	1.54E-05	-1.26E-03	1 tc-99	1.54E-05	-1.26E-03	1 tc-99	2.98E-05	-2.32E-03	1 tc-99	4.32E-05	-3.23E-03	1 tc-99	5.57E-05	-4.06E-03	1 tc-99
1 ru-101	1.32E-05	-3.81E-04	1 ru-101	1.32E-05	-3.81E-04	1 ru-101	2.62E-05	-7.61E-04	1 ru-101	3.91E-05	-1.13E-03	1 ru-101	5.17E-05	-1.49E-03	1 ru-101
1 rh-103	8.58E-06	-3.37E-03	1 rh-103	1.67E-05	-6.21E-03	1 rh-103	2.42E-05	-8.64E-03	1 rh-103	3.07E-06	-1.19E-03	1 rh-103	3.07E-05	-1.07E-02	1 rh-103
1 ag-109	5.58E-07	-2.20E-04	1 ag-109	1.66E-06	-6.48E-04	1 ag-109	1.66E-06	-6.48E-04	1 ag-109	3.07E-06	-1.19E-03	1 ag-109	4.65E-06	-1.76E-03	1 ag-109
1 nd-143	1.38E-05	-3.90E-03	1 nd-143	2.54E-05	-7.32E-03	1 nd-143	3.50E-05	-1.04E-02	1 nd-143	4.28E-05	-1.32E-02	1 nd-143	3.25E-05	-3.01E-03	1 nd-143
1 nd-145	9.44E-06	-8.71E-04	1 nd-145	1.79E-05	-1.64E-03	1 nd-145	2.56E-05	-2.36E-03	1 nd-145	2.56E-05	-2.36E-03	1 nd-145	3.25E-05	-3.01E-03	1 nd-145
1 sm-147	3.66E-06	-9.25E-04	1 sm-147	6.35E-06	-1.62E-03	1 sm-147	8.36E-06	-2.14E-03	1 sm-147	9.80E-06	-2.52E-03	1 sm-147	9.80E-06	-2.52E-03	1 sm-147
1 sm-149	1.97E-07	-1.25E-02	1 sm-149	2.15E-07	-1.39E-02	1 sm-149	2.18E-07	-1.46E-02	1 sm-149	2.18E-07	-1.46E-02	1 sm-149	2.17E-07	-1.50E-02	1 sm-149
1 sm-150	2.92E-06	-3.04E-04	1 sm-150	6.40E-06	-6.78E-04	1 sm-150	9.95E-06	-1.09E-03	1 sm-150	1.34E-05	-1.51E-03	1 sm-150	1.34E-05	-1.51E-03	1 sm-150
1 sm-151	4.65E-07	-4.02E-03	1 sm-151	6.05E-07	-5.40E-03	1 sm-151	6.99E-07	-6.54E-03	1 sm-151	7.77E-07	-7.62E-03	1 sm-151	7.77E-07	-7.62E-03	1 sm-151
1 sm-152	1.36E-06	-1.19E-03	1 sm-152	2.87E-06	-2.42E-03	1 sm-152	4.21E-06	-3.48E-03	1 sm-152	5.38E-06	-4.36E-03	1 sm-152	5.38E-06	-4.36E-03	1 sm-152
1 eu-151	1.91E-08	-1.52E-04	1 eu-151	2.49E-08	-2.01E-04	1 eu-151	2.87E-08	-2.39E-04	1 eu-151	3.19E-08	-2.74E-04	1 eu-151	3.19E-08	-2.74E-04	1 eu-151
1 eu-153	7.07E-07	-4.15E-04	1 eu-153	1.90E-06	-1.13E-03	1 eu-153	3.39E-06	-2.05E-03	1 eu-153	5.00E-06	-3.07E-03	1 eu-153	5.00E-06	-3.07E-03	1 eu-153
1 gd-155	1.85E-08	-5.94E-04	1 gd-155	4.21E-08	-1.40E-03	1 gd-155	8.03E-08	-2.82E-03	1 gd-155	1.30E-07	-4.79E-03	1 gd-155	1.30E-07	-4.79E-03	1 gd-155
1 u-233	4.80E-11	1.63E-08	1 u-233	8.36E-11	3.22E-08	1 u-233	1.09E-10	4.88E-08	1 u-233	1.26E-10	6.56E-08	1 u-233	1.26E-10	6.56E-08	1 u-233
1 u-234	9.38E-06	-2.04E-03	1 u-234	8.22E-06	-1.79E-03	1 u-234	7.23E-06	-1.58E-03	1 u-234	6.38E-06	-1.38E-03	1 u-234	6.38E-06	-1.38E-03	1 u-234
1 u-235	9.48E-04	1.74E-01	1 u-235	7.35E-04	1.58E-01	1 u-235	5.59E-04	1.47E-01	1 u-235	4.16E-04	1.33E-01	1 u-235	4.16E-04	1.33E-01	1 u-235
1 u-236	5.79E-05	-3.76E-03	1 u-236	9.77E-05	-5.55E-03	1 u-236	1.28E-04	-6.60E-03	1 u-236	1.50E-04	-7.23E-03	1 u-236	1.50E-04	-7.23E-03	1 u-236
1 u-238	2.26E-02	-1.29E-01	1 u-238	2.24E-02	-1.26E-01	1 u-238	2.22E-02	-1.25E-01	1 u-238	2.21E-02	-1.23E-01	1 u-238	2.21E-02	-1.23E-01	1 u-238
1 np-237	2.48E-06	-9.17E-04	1 np-237	6.62E-06	-2.46E-03	1 np-237	1.14E-05	-4.25E-03	1 np-237	1.64E-05	-6.16E-03	1 np-237	1.64E-05	-6.16E-03	1 np-237
1 pu-238	1.90E-07	-7.19E-05	1 pu-238	1.05E-06	-4.05E-04	1 pu-238	2.83E-06	-1.13E-03	1 pu-238	5.60E-06	-2.32E-03	1 pu-238	5.60E-06	-2.32E-03	1 pu-238
1 pu-239	1.01E-04	3.51E-02	1 pu-239	1.57E-04	6.32E-02	1 pu-239	1.87E-04	9.20E-02	1 pu-239	2.04E-04	1.23E-01	1 pu-239	2.04E-04	1.23E-01	1 pu-239
1 pu-240	9.41E-06	-1.41E-02	1 pu-240	2.45E-05	-2.49E-02	1 pu-240	4.00E-05	-3.32E-02	1 pu-240	5.42E-05	-4.00E-02	1 pu-240	5.42E-05	-4.00E-02	1 pu-240
1 pu-241	3.11E-06	1.98E-03	1 pu-241	1.18E-05	8.42E-03	1 pu-241	2.15E-05	1.79E-02	1 pu-241	3.02E-05	2.96E-02	1 pu-241	3.02E-05	2.96E-02	1 pu-241
1 pu-242	2.00E-07	-7.43E-05	1 pu-242	1.66E-06	-5.93E-04	1 pu-242	4.88E-06	-1.63E-03	1 pu-242	9.69E-06	-2.92E-03	1 pu-242	9.69E-06	-2.92E-03	1 pu-242
1 am-241	8.92E-07	-9.57E-04	1 am-241	3.56E-06	-3.76E-03	1 am-241	6.78E-06	-7.14E-03	1 am-241	9.85E-06	-1.04E-02	1 am-241	9.85E-06	-1.04E-02	1 am-241
1 am-242m	5.79E-10	3.49E-06	1 am-242m	6.51E-09	4.28E-05	1 am-242m	1.98E-08	1.48E-04	1 am-242m	3.68E-08	3.14E-04	1 am-242m	3.68E-08	3.14E-04	1 am-242m
1 am-243	1.09E-08	-5.82E-06	1 am-243	1.92E-07	-9.95E-05	1 am-243	8.60E-07	-4.29E-04	1 am-243	2.25E-06	-1.08E-03	1 am-243	2.25E-06	-1.08E-03	1 am-243
2 o-16	3.34E-02	3.26E-03	2 o-16	3.34E-02	3.26E-03	2 o-16	3.34E-02	2.58E-03	2 o-16	3.34E-02	2.58E-03	2 o-16	3.34E-02	2.37E-03	2 o-16
2 h-1	6.68E-02	1.68E-01	2 h-1	6.68E-02	1.68E-01	2 h-1	6.68E-02	1.86E-01	2 h-1	6.68E-02	1.90E-01	2 h-1	6.68E-02	1.92E-01	2 h-1
3 c	3.22E-04	-7.05E-06	3 c	3.22E-04	-7.05E-06	3 c	3.22E-04	-8.02E-06	3 c	3.22E-04	-6.89E-06	3 c	3.22E-04	-8.57E-06	3 c
3 si	1.72E-03	-3.42E-06	3 si	1.72E-03	-3.42E-06	3 si	1.72E-03	-1.30E-05	3 si	1.72E-03	-1.30E-05	3 si	1.72E-03	-1.19E-05	3 si
3 p-31	7.03E-05	-2.78E-06	3 p-31	7.03E-05	-2.78E-06	3 p-31	7.03E-05	-2.88E-06	3 p-31	7.03E-05	-2.82E-06	3 p-31	7.03E-05	-3.14E-06	3 p-31
3 crss	1.58E-02	-3.10E-03	3 crss	1.58E-02	-3.10E-03	3 crss	1.58E-02	-3.03E-03	3 crss	1.58E-02	-3.13E-03	3 crss	1.58E-02	-3.22E-03	3 crss
3 mn-55	1.76E-03	-1.84E-03	3 mn-55	1.76E-03	-1.84E-03	3 mn-55	1.76E-03	-1.96E-03	3 mn-55	1.76E-03	-2.00E-03	3 mn-55	1.76E-03	-1.93E-03	3 mn-55
3 fess	5.66E-02	-8.48E-03	3 fess	5.66E-02	-8.48E-03	3 fess	5.66E-02	-8.39E-03	3 fess	5.66E-02	-8.57E-03	3 fess	5.66E-02	-8.78E-03	3 fess
3 niss	9.89E-03	-3.13E-03	3 niss	9.89E-03	-3.13E-03	3 niss	9.89E-03	-3.10E-03	3 niss	9.89E-03	-3.17E-03	3 niss	9.89E-03	-3.15E-03	3 niss
3 mo	1.26E-03	-2.12E-03	3 mo	1.26E-03	-2.12E-03	3 mo	1.26E-03	-2.11E-03	3 mo	1.26E-03	-2.15E-03	3 mo	1.26E-03	-2.11E-03	3 mo

4 c	2.61E-04	2.66E-07	4 c	2.61E-04	1.34E-07	4 c	2.61E-04	1.48E-07	4 c	2.61E-04	1.80E-07	4 c	2.61E-04	1.61E-07	4 c
4 si	1.49E-04	6.06E-07	4 si	1.49E-04	3.92E-07	4 si	1.49E-04	5.60E-07	4 si	1.49E-04	5.24E-07	4 si	1.49E-04	4.81E-07	4 si
4 mn-55	4.76E-04	1.74E-06	4 mn-55	4.76E-04	6.76E-07	4 mn-55	4.76E-04	8.48E-07	4 mn-55	4.76E-04	1.54E-06	4 mn-55	4.76E-04	1.45E-06	4 mn-55
4 mo	7.36E-03	3.49E-05	4 mo	7.36E-03	2.65E-05	4 mo	7.36E-03	3.17E-05	4 mo	7.36E-03	2.96E-05	4 mo	7.36E-03	2.91E-05	4 mo
4 cr	2.14E-02	9.20E-05	4 cr	2.14E-02	6.34E-05	4 cr	2.14E-02	7.54E-05	4 cr	2.14E-02	7.26E-05	4 cr	2.14E-02	7.89E-05	4 cr
4 fe	3.75E-03	1.48E-05	4 fe	3.75E-03	1.21E-05	4 fe	3.75E-03	1.44E-05	4 fe	3.75E-03	1.51E-05	4 fe	3.75E-03	1.34E-05	4 fe
4 co-59	2.22E-03	5.22E-06	4 co-59	2.22E-03	2.02E-06	4 co-59	2.22E-03	2.22E-06	4 co-59	2.22E-03	2.52E-06	4 co-59	2.22E-03	-7.30E-07	4 co-59
4 ni	4.88E-02	2.16E-04	4 ni	4.88E-02	2.01E-04	4 ni	4.88E-02	2.19E-04	4 ni	4.88E-02	2.12E-04	4 ni	4.88E-02	1.99E-04	4 ni
4 w	8.54E-04	-1.11E-05	4 w	8.54E-04	-1.12E-05	4 w	8.54E-04	-1.23E-05	4 w	8.54E-04	-1.30E-05	4 w	8.54E-04	-1.17E-05	4 w
4 v	3.60E-04	1.77E-06	4 v	3.60E-04	1.05E-06	4 v	3.60E-04	1.32E-06	4 v	3.60E-04	1.27E-06	4 v	3.60E-04	1.13E-06	4 v
6 cr	7.60E-05	-9.75E-05	6 cr	7.60E-05	-8.99E-05	6 cr	7.60E-05	-9.15E-05	6 cr	7.60E-05	-9.36E-05	6 cr	7.60E-05	-9.59E-05	6 cr
6 fe	1.49E-04	-1.55E-04	6 fe	1.49E-04	-1.44E-04	6 fe	1.49E-04	-1.46E-04	6 fe	1.49E-04	-1.50E-04	6 fe	1.49E-04	-1.54E-04	6 fe
6 zr	4.25E-02	-5.35E-03	6 zr	4.25E-02	-5.45E-03	6 zr	4.25E-02	-5.67E-03	6 zr	4.25E-02	-5.92E-03	6 zr	4.25E-02	-6.08E-03	6 zr
6 sn-112	4.68E-06	-1.70E-05	6 sn-112	4.68E-06	-1.66E-05	6 sn-112	4.68E-06	-1.68E-05	6 sn-112	4.68E-06	-1.69E-05	6 sn-112	4.68E-06	-1.70E-05	6 sn-112
6 sn-114	3.14E-06	-3.03E-06	6 sn-114	3.14E-06	-2.94E-06	6 sn-114	3.14E-06	-2.98E-06	6 sn-114	3.14E-06	-3.02E-06	6 sn-114	3.14E-06	-3.06E-06	6 sn-114
6 sn-115	1.74E-06	-3.55E-05	6 sn-115	1.74E-06	-3.25E-05	6 sn-115	1.74E-06	-3.31E-05	6 sn-115	1.74E-06	-3.38E-05	6 sn-115	1.74E-06	-3.46E-05	6 sn-115
6 sn-116	7.01E-05	-8.59E-05	6 sn-116	7.01E-05	-8.44E-05	6 sn-116	7.01E-05	-8.56E-05	6 sn-116	7.01E-05	-8.69E-05	6 sn-116	7.01E-05	-8.72E-05	6 sn-116
6 sn-117	3.71E-05	-1.03E-04	6 sn-117	3.71E-05	-9.89E-05	6 sn-117	3.71E-05	-1.00E-04	6 sn-117	3.71E-05	-1.02E-04	6 sn-117	3.71E-05	-1.02E-04	6 sn-117
6 sn-118	1.17E-04	-8.31E-05	6 sn-118	1.17E-04	-8.28E-05	6 sn-118	1.17E-04	-8.38E-05	6 sn-118	1.17E-04	-8.41E-05	6 sn-118	1.17E-04	-8.44E-05	6 sn-118
6 sn-119	4.14E-05	-4.97E-05	6 sn-119	4.14E-05	-4.69E-05	6 sn-119	4.14E-05	-4.77E-05	6 sn-119	4.14E-05	-4.88E-05	6 sn-119	4.14E-05	-4.97E-05	6 sn-119
6 sn-120	1.57E-04	-2.62E-05	6 sn-120	1.57E-04	-2.68E-05	6 sn-120	1.57E-04	-2.76E-05	6 sn-120	1.57E-04	-2.84E-05	6 sn-120	1.57E-04	-2.89E-05	6 sn-120
6 sn-122	2.23E-05	-2.62E-06	6 sn-122	2.23E-05	-2.70E-06	6 sn-122	2.23E-05	-2.81E-06	6 sn-122	2.23E-05	-2.93E-06	6 sn-122	2.23E-05	-2.99E-06	6 sn-122
6 sn-124	2.79E-05	-2.12E-05	6 sn-124	2.79E-05	-2.09E-05	6 sn-124	2.79E-05	-2.11E-05	6 sn-124	2.79E-05	-2.13E-05	6 sn-124	2.79E-05	-2.15E-05	6 sn-124
6 hf	2.21E-06	-4.84E-04	6 hf	2.21E-06	-4.40E-04	6 hf	2.21E-06	-4.26E-04	6 hf	2.21E-06	-4.19E-04	6 hf	2.21E-06	-4.15E-04	6 hf
7 c	3.13E-04	-2.81E-06	7 c	3.13E-04	-3.42E-06	7 c	3.13E-04	-3.89E-06	7 c	3.13E-04	-3.40E-06	7 c	3.13E-04	-3.83E-06	7 c
7 si	1.25E-03	-2.44E-06	7 si	1.25E-03	-5.22E-06	7 si	1.25E-03	-8.61E-06	7 si	1.25E-03	-7.57E-06	7 si	1.25E-03	-8.04E-06	7 si
7 p-31	6.82E-05	-8.70E-07	7 p-31	6.82E-05	-9.79E-07	7 p-31	6.82E-05	-1.11E-06	7 p-31	6.82E-05	-1.04E-06	7 p-31	6.82E-05	-1.17E-06	7 p-31
7 mn-55	1.71E-03	-3.29E-04	7 mn-55	1.71E-03	-3.56E-04	7 mn-55	1.71E-03	-3.62E-04	7 mn-55	1.71E-03	-3.74E-04	7 mn-55	1.71E-03	-3.72E-04	7 mn-55
7 cr	1.72E-02	-6.12E-04	7 cr	1.72E-02	-6.25E-04	7 cr	1.72E-02	-6.39E-04	7 cr	1.72E-02	-6.65E-04	7 cr	1.72E-02	-6.89E-04	7 cr
7 fe	5.34E-02	-1.43E-03	7 fe	5.34E-02	-1.56E-03	7 fe	5.34E-02	-1.62E-03	7 fe	5.34E-02	-1.64E-03	7 fe	5.34E-02	-1.69E-03	7 fe
7 co-59	1.59E-04	-1.88E-04	7 co-59	1.59E-04	-1.88E-04	7 co-59	1.59E-04	-1.87E-04	7 co-59	1.59E-04	-1.93E-04	7 co-59	1.59E-04	-1.92E-04	7 co-59
7 ni	1.08E-02	-6.67E-04	7 ni	1.08E-02	-7.04E-04	7 ni	1.08E-02	-7.00E-04	7 ni	1.08E-02	-7.06E-04	7 ni	1.08E-02	-6.98E-04	7 ni
7 n-14	3.35E-04	-2.20E-05	7 n-14	3.35E-04	-2.25E-05	7 n-14	3.35E-04	-2.30E-05	7 n-14	3.35E-04	-2.27E-05	7 n-14	3.35E-04	-2.30E-05	7 n-14
7 b-10	7.22E-04	-2.16E-02	7 b-10	7.22E-04	-2.11E-02	7 b-10	7.22E-04	-2.09E-02	7 b-10	7.22E-04	-2.11E-02	7 b-10	7.22E-04	-2.10E-02	7 b-10
7 b-11	2.93E-03	-3.68E-05	7 b-11	2.93E-03	-3.94E-05	7 b-11	2.93E-03	-4.20E-05	7 b-11	2.93E-03	-3.92E-05	7 b-11	2.93E-03	-4.23E-05	7 b-11
7 s-32	4.41E-05	-1.86E-06	7 s-32	4.41E-05	-2.01E-06	7 s-32	4.41E-05	-2.09E-06	7 s-32	4.41E-05	-2.10E-06	7 s-32	4.41E-05	-2.12E-06	7 s-32
9 cr	3.80E-05	5.41E-08	9 cr	3.80E-05	1.13E-07	9 cr	3.80E-05	1.02E-07	9 cr	3.80E-05	2.13E-07	9 cr	3.80E-05	9.11E-08	9 cr
9 fe	7.43E-05	1.53E-07	9 fe	7.43E-05	2.38E-07	9 fe	7.43E-05	2.98E-07	9 fe	7.43E-05	6.62E-07	9 fe	7.43E-05	3.54E-07	9 fe
9 zr	2.13E-02	7.03E-05	9 zr	2.13E-02	8.98E-05	9 zr	2.13E-02	1.19E-04	9 zr	2.13E-02	2.55E-04	9 zr	2.13E-02	1.63E-04	9 zr
9 sn-112	2.34E-06	-5.14E-08	9 sn-112	2.34E-06	-6.64E-08	9 sn-112	2.34E-06	-5.88E-08	9 sn-112	2.34E-06	-1.73E-07	9 sn-112	2.34E-06	-1.08E-07	9 sn-112
9 sn-114	1.57E-06	-3.07E-09	9 sn-114	1.57E-06	-3.90E-09	9 sn-114	1.57E-06	-1.96E-09	9 sn-114	1.57E-06	-5.17E-09	9 sn-114	1.57E-06	-4.40E-09	9 sn-114
9 sn-115	8.69E-07	-9.02E-09	9 sn-115	8.69E-07	-1.08E-08	9 sn-115	8.69E-07	-1.21E-08	9 sn-115	8.69E-07	-2.42E-08	9 sn-115	8.69E-07	-1.70E-08	9 sn-115
9 sn-116	3.51E-05	-1.22E-07	9 sn-116	3.51E-05	-1.15E-07	9 sn-116	3.51E-05	-6.98E-08	9 sn-116	3.51E-05	-3.29E-07	9 sn-116	3.51E-05	-9.98E-08	9 sn-116

9 sn-11	1.85E-05	-2.05E-07	9 sn-117	1.85E-05	-2.73E-07	9 sn-117	1.85E-05	-2.59E-07	9 sn-117	1.85E-05	-5.62E-07	9 sn-117	1.85E-05	-4.04E-07	9 sn-117
9 sn-118	5.84E-05	-5.97E-08	9 sn-118	5.84E-05	-4.26E-08	9 sn-118	5.84E-05	1.85E-08	9 sn-118	5.84E-05	-8.47E-08	9 sn-118	5.84E-05	-6.04E-08	9 sn-118
9 sn-119	2.07E-05	1.05E-08	9 sn-119	2.07E-05	1.98E-08	9 sn-119	2.07E-05	5.31E-08	9 sn-119	2.07E-05	9.90E-08	9 sn-119	2.07E-05	5.02E-08	9 sn-119
9 sn-120	7.86E-05	2.29E-07	9 sn-120	7.86E-05	3.11E-07	9 sn-120	7.86E-05	4.10E-07	9 sn-120	7.86E-05	8.95E-07	9 sn-120	7.86E-05	5.66E-07	9 sn-120
9 sn-122	1.12E-05	4.10E-08	9 sn-122	1.12E-05	5.50E-08	9 sn-122	1.12E-05	6.95E-08	9 sn-122	1.12E-05	1.50E-07	9 sn-122	1.12E-05	9.85E-08	9 sn-122
9 sn-124	1.40E-05	-7.32E-09	9 sn-124	1.40E-05	-4.02E-09	9 sn-124	1.40E-05	-9.43E-10	9 sn-124	1.40E-05	-3.24E-09	9 sn-124	1.40E-05	3.03E-09	9 sn-124
9 hf	1.11E-06	-5.74E-07	9 hf	1.11E-06	-7.45E-07	9 hf	1.11E-06	-7.59E-07	9 hf	1.11E-06	-1.76E-06	9 hf	1.11E-06	-1.08E-06	9 hf
10 o-16	4.55E-02	8.68E-05	10 o-16	4.55E-02	6.68E-05	10 o-16	4.55E-02	7.35E-05	10 o-16	4.55E-02	8.08E-05	# o-16	4.55E-02	6.35E-05	10 o-16
10 h-1	7.87E-03	-2.18E-04	10 h-1	7.87E-03	-1.99E-04	10 h-1	7.87E-03	-2.22E-04	10 h-1	7.87E-03	-2.29E-04	# h-1	7.87E-03	-2.11E-04	10 h-1
10 si	1.73E-02	4.00E-05	10 si	1.73E-02	3.38E-05	10 si	1.73E-02	3.67E-05	10 si	1.73E-02	3.97E-05	# si	1.73E-02	3.14E-05	10 si
10 p-31	9.59E-06	2.10E-08	10 p-31	9.59E-06	1.72E-08	10 p-31	9.59E-06	1.89E-08	10 p-31	9.59E-06	2.00E-08	# p-31	9.59E-06	1.65E-08	10 p-31
10 mn-55	1.34E-05	8.46E-08	10 mn-55	1.34E-05	5.26E-08	10 mn-55	1.34E-05	7.61E-08	10 mn-55	1.34E-05	8.07E-08	# mn-55	1.34E-05	6.89E-08	10 mn-55
10 fe	1.92E-04	5.81E-07	10 fe	1.92E-04	4.69E-07	10 fe	1.92E-04	5.39E-07	10 fe	1.92E-04	5.51E-07	# fe	1.92E-04	4.63E-07	10 fe
10 al-27	3.35E-03	8.83E-06	10 al-27	3.35E-03	7.12E-06	10 al-27	3.35E-03	7.86E-06	10 al-27	3.35E-03	8.05E-06	# al-27	3.35E-03	7.04E-06	10 al-27
10 mg	4.39E-05	1.28E-07	10 mg	4.39E-05	1.02E-07	10 mg	4.39E-05	1.17E-07	10 mg	4.39E-05	1.23E-07	# mg	4.39E-05	9.37E-08	10 mg
10 ca	1.21E-04	2.56E-07	10 ca	1.21E-04	2.16E-07	10 ca	1.21E-04	2.40E-07	10 ca	1.21E-04	2.48E-07	# ca	1.21E-04	2.14E-07	10 ca
10 na-23	1.55E-03	3.54E-06	10 na-23	1.55E-03	3.03E-06	10 na-23	1.55E-03	3.07E-06	10 na-23	1.55E-03	3.48E-06	# na-23	1.55E-03	2.55E-06	10 na-23
10 k	1.40E-03	2.63E-06	10 k	1.40E-03	2.23E-06	10 k	1.40E-03	2.42E-06	10 k	1.40E-03	2.56E-06	# k	1.40E-03	2.17E-06	10 k
10 ti	1.87E-05	7.10E-08	10 ti	1.87E-05	5.92E-08	10 ti	1.87E-05	6.29E-08	10 ti	1.87E-05	6.94E-08	# ti	1.87E-05	5.38E-08	10 ti

50	50	60	60	70	70	at/b-cm	at/b-cm	nmw	
<u>ADen</u>	<u>SN</u>	<u>ADen</u>	<u>SN</u>	<u>ADen</u>	<u>SN</u>				
4.62E-02	-2.97E-03	4.58E-02	-3.43E-03	4.54E-02	-3.24E-03	U-235	2.48E-04	2.15E-04	5.83E-02
6.77E-05	-2.40E-03	7.82E-05	-2.75E-03	8.78E-05	-3.05E-03	U-236	6.51E-05	1.73E-04	1.54E-02
6.71E-05	-4.78E-03	7.74E-05	-5.48E-03	8.68E-05	-6.04E-03	U-238	2.29E-02	2.17E-02	5.45E+00
6.40E-05	-1.84E-03	7.59E-05	-2.17E-03	8.75E-05	-2.49E-03	Pu-238	1.44E-06	1.36E-05	3.43E-04
3.62E-05	-1.22E-02	4.08E-05	-1.36E-02	4.45E-05	-1.46E-02	Pu-240	1.55E-04	2.17E-04	3.70E-02
6.33E-06	-2.35E-03	8.04E-06	-2.95E-03	9.73E-06	-3.53E-03	Pu-241	3.74E-05	7.70E-05	8.98E-03
4.89E-05	-1.55E-02	5.32E-05	-1.74E-02	5.62E-05	-1.87E-02	Pu-242	1.76E-05	4.27E-05	4.24E-03
3.86E-05	-3.57E-03	4.41E-05	-4.13E-03	4.88E-05	-4.56E-03		4.62E-06	2.25E-04	1.12E-03
1.08E-05	-2.78E-03	1.13E-05	-2.94E-03	1.16E-05	-3.04E-03	U-235			1.06E-02
2.13E-07	-1.51E-02	2.09E-07	-1.53E-02	2.05E-07	-1.53E-02	Pu-239			7.16E-01
1.67E-05	-1.92E-03	1.98E-05	-2.34E-03	2.25E-05	-2.70E-03	Pu-240			1.74E-01
8.44E-07	-8.55E-03	9.00E-07	-9.48E-03	9.50E-07	-1.02E-02	Pu-241			8.20E-02
6.41E-06	-5.09E-03	7.30E-06	-5.77E-03	8.08E-06	-6.29E-03	Pu((U+Pu))			9.36E-03
3.45E-08	-3.02E-04	3.67E-08	-3.32E-04	3.87E-08	-3.56E-04				
6.60E-06	-4.06E-03	8.11E-06	-5.05E-03	9.48E-06	-5.93E-03				
1.86E-07	-7.08E-03	2.44E-07	-9.67E-03	2.99E-07	-1.21E-02				
1.36E-10	8.26E-08	1.43E-10	9.83E-08	1.46E-10	1.13E-07				
5.68E-06	-1.21E-03	5.11E-06	-1.09E-03	4.67E-06	-9.85E-04				
3.03E-04	1.18E-01	2.15E-04	9.80E-02	1.49E-04	7.86E-02				
1.64E-04	-7.50E-03	1.73E-04	-7.69E-03	1.76E-04	-7.56E-03				
2.19E-02	-1.20E-01	2.17E-02	-1.19E-01	2.14E-02	-1.15E-01				
2.13E-05	-8.01E-03	2.56E-05	-9.71E-03	2.92E-05	-1.11E-02				
9.27E-06	-3.91E-03	1.36E-05	-5.90E-03	1.83E-05	-8.04E-03				
2.13E-04	1.57E-01	2.17E-04	1.87E-01	2.18E-04	2.18E-01				
6.66E-05	-4.57E-02	7.70E-05	-5.09E-02	8.54E-05	-5.48E-02				
3.73E-05	4.31E-02	4.27E-05	5.64E-02	4.65E-05	6.98E-02				
1.57E-05	-4.21E-03	2.25E-05	-5.37E-03	2.97E-05	-6.33E-03				
1.24E-05	-1.32E-02	1.44E-05	-1.56E-02	1.59E-05	-1.73E-02				
5.34E-08	5.23E-04	6.68E-08	7.36E-04	7.63E-08	9.40E-04				
4.44E-06	-2.05E-03	7.30E-06	-3.28E-03	1.06E-05	-4.58E-03				
3.34E-02	2.36E-03	3.34E-02	1.83E-03	3.34E-02	2.29E-03				
6.68E-02	1.90E-01	6.68E-02	1.94E-01	6.68E-02	1.89E-01				
3.22E-04	-5.87E-06	3.22E-04	-7.34E-06	3.22E-04	-6.76E-06				
1.72E-03	-8.55E-06	1.72E-03	-1.06E-05	1.72E-03	-2.21E-06				
7.03E-05	-2.76E-06	7.03E-05	-2.99E-06	7.03E-05	-2.85E-06				
1.58E-02	-3.08E-03	1.58E-02	-3.19E-03	1.58E-02	-3.09E-03				
1.76E-03	-2.00E-03	1.76E-03	-1.91E-03	1.76E-03	-1.90E-03				
5.66E-02	-8.43E-03	5.66E-02	-8.68E-03	5.66E-02	-8.53E-03				
9.89E-03	-3.14E-03	9.89E-03	-3.17E-03	9.89E-03	-3.13E-03				
1.26E-03	-2.07E-03	1.26E-03	-2.11E-03	1.26E-03	-2.08E-03				

2.61E-04	1.78E-07	4 c	2.61E-04	1.49E-07	4 c	2.61E-04	1.80E-07
1.49E-04	4.65E-07	4 si	1.49E-04	4.84E-07	4 si	1.49E-04	5.23E-07
4.76E-04	1.14E-06	4 mn-55	4.76E-04	1.55E-06	4 mn-55	4.76E-04	1.75E-06
7.36E-03	3.24E-05	4 mo	7.36E-03	2.96E-05	4 mo	7.36E-03	3.06E-05
2.14E-02	6.84E-05	4 cr	2.14E-02	7.18E-05	4 cr	2.14E-02	7.71E-05
3.75E-03	1.36E-05	4 fe	3.75E-03	1.24E-05	4 fe	3.75E-03	1.30E-05
2.22E-03	2.70E-06	4 co-59	2.22E-03	2.27E-06	4 co-59	2.22E-03	3.57E-06
4.88E-02	2.08E-04	4 ni	4.88E-02	2.00E-04	4 ni	4.88E-02	1.92E-04
8.54E-04	-9.97E-06	4 w	8.54E-04	-1.03E-05	4 w	8.54E-04	-1.01E-05
3.60E-04	9.50E-07	4 v	3.60E-04	1.42E-06	4 v	3.60E-04	1.42E-06
7.60E-05	-9.77E-05	6 cr	7.60E-05	-1.00E-04	6 cr	7.60E-05	-1.01E-04
1.49E-04	-1.57E-04	6 fe	1.49E-04	-1.61E-04	6 fe	1.49E-04	-1.63E-04
4.25E-02	-6.10E-03	6 zr	4.25E-02	-6.41E-03	6 zr	4.25E-02	-6.43E-03
4.68E-06	-1.69E-05	6 sn-112	4.68E-06	-1.71E-05	6 sn-112	4.68E-06	-1.69E-05
3.14E-06	-3.08E-06	6 sn-114	3.14E-06	-3.13E-06	6 sn-114	3.14E-06	-3.14E-06
1.74E-06	-3.53E-05	6 sn-115	1.74E-06	-3.60E-05	6 sn-115	1.74E-06	-3.65E-05
7.01E-05	-8.67E-05	6 sn-116	7.01E-05	-8.69E-05	6 sn-116	7.01E-05	-8.55E-05
3.71E-05	-1.02E-04	6 sn-117	3.71E-05	-1.04E-04	6 sn-117	3.71E-05	-1.04E-04
1.17E-04	-8.36E-05	6 sn-118	1.17E-04	-8.40E-05	6 sn-118	1.17E-04	-8.33E-05
4.14E-05	-5.05E-05	6 sn-119	4.14E-05	-5.16E-05	6 sn-119	4.14E-05	-5.20E-05
1.57E-04	-2.85E-05	6 sn-120	1.57E-04	-2.97E-05	6 sn-120	1.57E-04	-2.94E-05
2.23E-05	-2.99E-06	6 sn-122	2.23E-05	-3.16E-06	6 sn-122	2.23E-05	-3.14E-06
2.79E-05	-2.12E-05	6 sn-124	2.79E-05	-2.16E-05	6 sn-124	2.79E-05	-2.15E-05
2.21E-06	-4.10E-04	6 hf	2.21E-06	-4.13E-04	6 hf	2.21E-06	-4.09E-04
3.13E-04	-3.27E-06	7 c	3.13E-04	-3.70E-06	7 c	3.13E-04	-3.61E-06
1.25E-03	-6.40E-06	7 si	1.25E-03	-8.77E-06	7 si	1.25E-03	-6.32E-06
6.82E-05	-1.02E-06	7 p-31	6.82E-05	-1.11E-06	7 p-31	6.82E-05	-1.12E-06
1.71E-03	-3.80E-04	7 mn-55	1.71E-03	-3.61E-04	7 mn-55	1.71E-03	-3.41E-04
1.72E-02	-6.50E-04	7 cr	1.72E-02	-6.96E-04	7 cr	1.72E-02	-6.75E-04
5.34E-02	-1.63E-03	7 fe	5.34E-02	-1.68E-03	7 fe	5.34E-02	-1.64E-03
1.59E-04	-1.73E-04	7 co-59	1.59E-04	-1.90E-04	7 co-59	1.59E-04	-1.79E-04
1.08E-02	-7.01E-04	7 ni	1.08E-02	-7.21E-04	7 ni	1.08E-02	-6.99E-04
3.35E-04	-2.20E-05	7 n-14	3.35E-04	-2.25E-05	7 n-14	3.35E-04	-2.28E-05
7.22E-04	-2.06E-02	7 b-10	7.22E-04	-2.09E-02	7 b-10	7.22E-04	-2.09E-02
2.93E-03	-3.78E-05	7 b-11	2.93E-03	-4.06E-05	7 b-11	2.93E-03	-4.25E-05
4.41E-05	-2.03E-06	7 s-32	4.41E-05	-2.14E-06	7 s-32	4.41E-05	-2.07E-06
3.80E-05	3.48E-08	9 cr	3.80E-05	1.16E-07	9 cr	3.80E-05	9.90E-08
7.43E-05	2.20E-07	9 fe	7.43E-05	3.10E-07	9 fe	7.43E-05	1.84E-07
2.13E-02	7.85E-05	9 zr	2.13E-02	1.23E-04	9 zr	2.13E-02	1.06E-04
2.34E-06	-5.92E-08	9 sn-112	2.34E-06	-6.43E-08	9 sn-112	2.34E-06	-6.95E-08
1.57E-06	-4.62E-09	9 sn-114	1.57E-06	-1.42E-09	9 sn-114	1.57E-06	-2.26E-09
8.69E-07	-1.06E-08	9 sn-115	8.69E-07	-1.36E-08	9 sn-115	8.69E-07	-1.16E-08
3.51E-05	-1.64E-07	9 sn-116	3.51E-05	-1.02E-07	9 sn-116	3.51E-05	-9.57E-08

1.85E-05	-2.82E-07	9 sn-117	1.85E-05	-2.60E-07	9 sn-117	1.85E-05	-2.54E-07
5.84E-05	-1.20E-07	9 sn-118	5.84E-05	3.57E-08	9 sn-118	5.84E-05	-7.90E-09
2.07E-05	8.74E-09	9 sn-119	2.07E-05	4.42E-08	9 sn-119	2.07E-05	3.47E-08
7.86E-05	2.52E-07	9 sn-120	7.86E-05	4.51E-07	9 sn-120	7.86E-05	3.68E-07
1.12E-05	4.64E-08	9 sn-122	1.12E-05	7.36E-08	9 sn-122	1.12E-05	6.29E-08
1.40E-05	-1.77E-08	9 sn-124	1.40E-05	2.05E-08	9 sn-124	1.40E-05	4.87E-09
1.11E-06	-6.32E-07	9 hf	1.11E-06	-8.80E-07	9 hf	1.11E-06	-7.71E-07
4.55E-02	6.77E-05	10 o-16	4.55E-02	6.54E-05	10 o-16	4.55E-02	6.55E-05
7.87E-03	-1.91E-04	10 h-1	7.87E-03	-2.02E-04	10 h-1	7.87E-03	-2.00E-04
1.73E-02	3.52E-05	10 si	1.73E-02	3.50E-05	10 si	1.73E-02	3.37E-05
9.59E-06	1.73E-08	10 p-31	9.59E-06	1.74E-08	10 p-31	9.59E-06	1.68E-08
1.34E-05	7.23E-08	10 mn-55	1.34E-05	5.50E-08	10 mn-55	1.34E-05	7.99E-08
1.92E-04	4.74E-07	10 fe	1.92E-04	4.63E-07	10 fe	1.92E-04	4.68E-07
3.35E-03	7.28E-06	10 al-27	3.35E-03	7.08E-06	10 al-27	3.35E-03	6.75E-06
4.39E-05	1.02E-07	10 mg	4.39E-05	9.89E-08	10 mg	4.39E-05	9.05E-08
1.21E-04	2.20E-07	10 ca	1.21E-04	2.15E-07	10 ca	1.21E-04	2.12E-07
1.55E-03	2.90E-06	10 na-23	1.55E-03	2.58E-06	10 na-23	1.55E-03	2.89E-06
1.40E-03	2.23E-06	10 k	1.40E-03	2.23E-06	10 k	1.40E-03	2.14E-06
1.87E-05	5.27E-08	10 ti	1.87E-05	6.01E-08	10 ti	1.87E-05	5.80E-08

mW

5.0/60

5.05E-02

4.08E-02

5.16E+00

3.24E-03

5.19E-02

1.85E-02

1.03E-02

5.45E-02

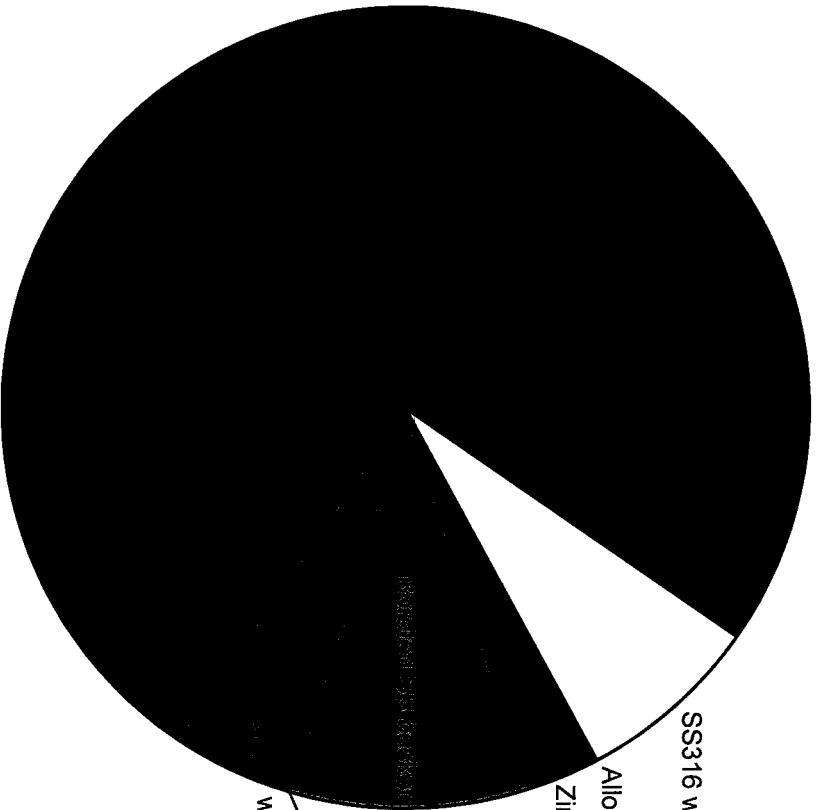
9.61E-03

3.75E-01

1.34E-01

7.44E-02

2.63E-02



SS316 wp inner shell/basket

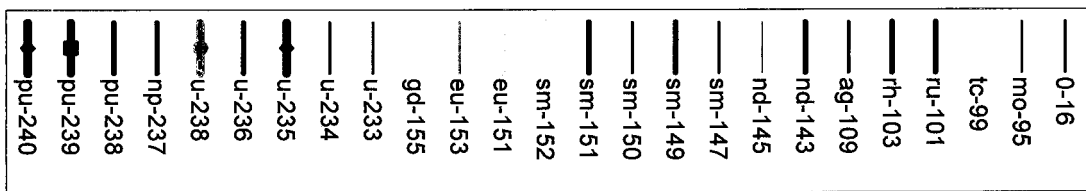
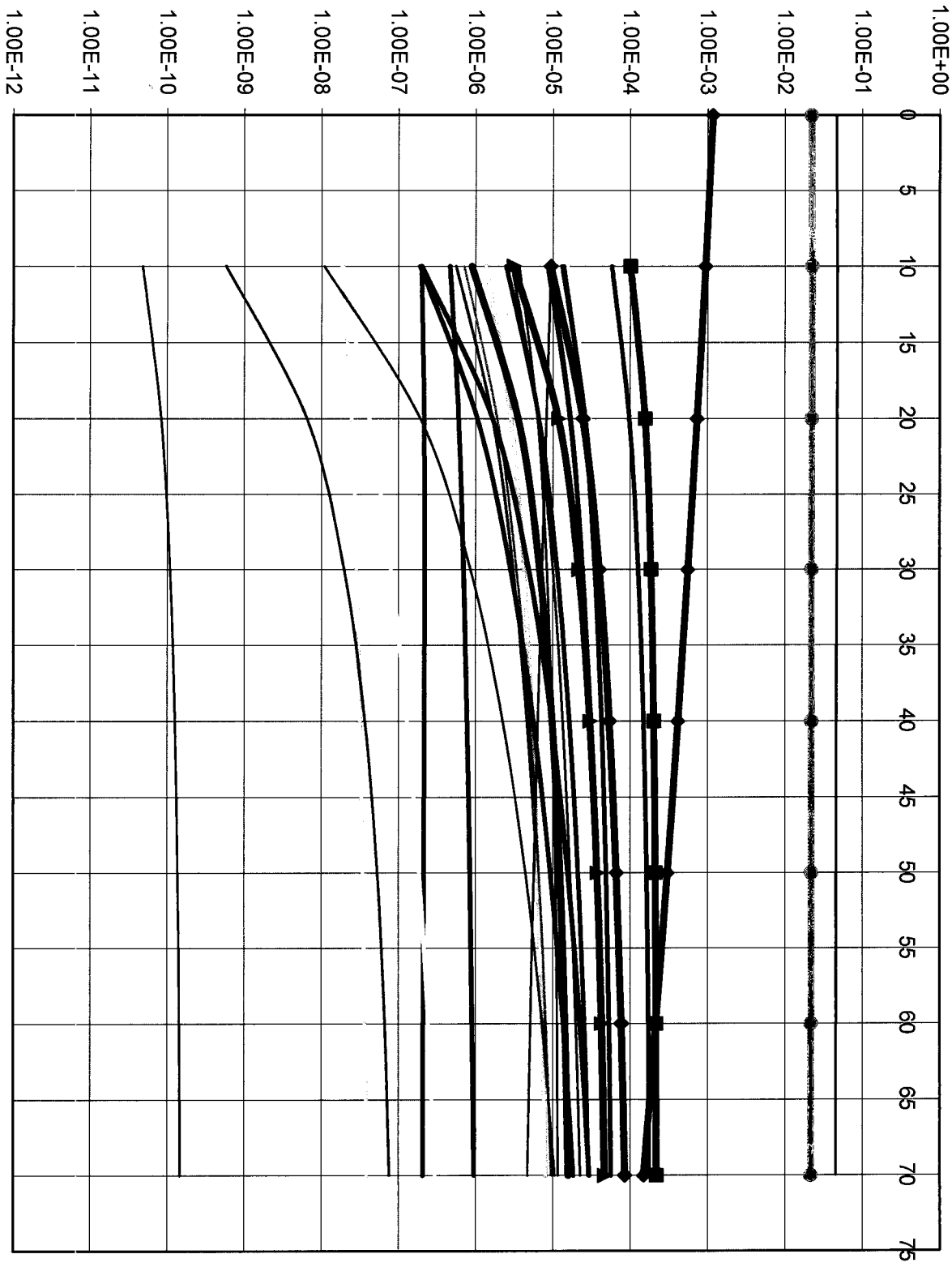
Alloy22 wp outer shell

Zirc-4 fuel clad

1/2 Den Zirc-4 top & bottom wet tuft

Sensitivity by Material

Material	Mat	0	10	20	30	40	50	60	70
SNM	1	3.714E-02	2.744E-02	1.479E-02	1.099E-02	1.266E-02	2.217E-02	2.081E-02	2.931E-02
Water in basket	2	1.675E-01	1.709E-01	1.887E-01	1.925E-01	1.941E-01	1.927E-01	1.956E-01	1.911E-01
SS316 wp inner shell/basket	3	-1.820E-02	-1.868E-02	-1.862E-02	-1.904E-02	-1.922E-02	-1.874E-02	-1.907E-02	-1.874E-02
Alloy22 wp outer shell	4	3.558E-04	2.965E-04	3.330E-04	3.227E-04	3.115E-04	3.182E-04	3.091E-04	3.099E-04
Zirc-4 fuel clad	6	-6.508E-03	-6.544E-03	-6.759E-03	-7.011E-03	-7.172E-03	-7.195E-03	-7.517E-03	-7.542E-03
Borated SS basket	7	-2.488E-02	-2.458E-02	-2.444E-02	-2.473E-02	-2.477E-02	-2.422E-02	-2.458E-02	-2.449E-02
1/2 Den Zirc-4 top & bottom	9	6.973E-05	8.931E-05	1.190E-04	2.544E-04	1.628E-04	7.774E-05	1.226E-04	1.057E-04
wet tuff	10	-7.493E-05	-8.500E-05	-9.762E-05	-9.287E-05	-1.039E-04	-7.429E-05	-8.848E-05	-8.818E-05



Sensitivity by Nuclide-Simplified
BurgWd/MTU

	SN						ADen								
	0	10	20	30	40	50	60	70	0	10	20	30	40	50	60
1 o-16	-6.21E-04	-1.35E-03	-2.14E-03	-2.61E-03	-2.78E-03	-2.97E-03	-3.43E-03	-3.24E-03	4.65E-02	4.76E-02	4.73E-02	4.69E-02	4.65E-02	4.62E-02	4.58E-02
1 mo-95		-6.28E-04	-1.15E-03	-1.61E-03	-2.03E-03	-2.40E-03	-2.75E-03	-3.05E-03	1.58E-05	3.03E-05	4.38E-05	4.38E-05	5.63E-05	6.77E-05	7.82E-05
1 tc-99		-1.26E-03	-2.32E-03	-3.23E-03	-4.06E-03	-4.78E-03	-5.48E-03	-6.04E-03	1.54E-05	2.98E-05	4.32E-05	4.32E-05	5.57E-05	6.71E-05	7.74E-05
1 ru-101		-3.81E-04	-7.61E-04	-1.13E-03	-1.49E-03	-1.84E-03	-2.17E-03	-2.49E-03	1.32E-05	2.62E-05	3.91E-05	3.91E-05	5.17E-05	6.40E-05	7.59E-05
1 rh-103		-3.37E-03	-6.21E-03	-8.64E-03	-1.07E-02	-1.22E-02	-1.36E-02	-1.46E-02	8.58E-06	1.67E-05	2.42E-05	2.42E-05	3.07E-05	3.62E-05	4.08E-05
1 ag-109		-2.20E-04	-6.48E-04	-1.19E-03	-1.76E-03	-2.35E-03	-2.95E-03	-3.53E-03	5.58E-07	1.66E-06	3.07E-06	3.07E-06	4.65E-06	6.33E-06	8.04E-06
1 nd-143		-3.90E-03	-7.32E-03	-1.04E-02	-1.32E-02	-1.55E-02	-1.74E-02	-1.87E-02	1.38E-05	2.54E-05	3.50E-05	3.50E-05	4.28E-05	4.89E-05	5.32E-05
1 nd-145		-8.71E-04	-1.64E-03	-2.36E-03	-3.01E-03	-3.57E-03	-4.13E-03	-4.56E-03	9.44E-06	1.79E-05	2.56E-05	2.56E-05	3.25E-05	3.86E-05	4.41E-05
1 sm-147		-9.25E-04	-1.62E-03	-2.14E-03	-2.52E-03	-2.78E-03	-2.94E-03	-3.04E-03	3.66E-06	6.35E-06	8.36E-06	8.36E-06	9.80E-06	1.08E-05	1.13E-05
1 sm-149		-1.25E-02	-1.39E-02	-1.46E-02	-1.50E-02	-1.51E-02	-1.53E-02	-1.53E-02	1.97E-07	2.15E-07	2.18E-07	2.18E-07	2.17E-07	2.13E-07	2.09E-07
1 sm-150		-3.04E-04	-6.78E-04	-1.09E-03	-1.51E-03	-1.92E-03	-2.34E-03	-2.70E-03	2.92E-06	6.40E-06	9.95E-06	9.95E-06	1.34E-05	1.67E-05	1.98E-05
1 sm-151		-4.02E-03	-5.40E-03	-6.54E-03	-7.62E-03	-8.55E-03	-9.48E-03	-1.02E-02	4.65E-07	6.05E-07	6.99E-07	6.99E-07	7.77E-07	8.44E-07	9.00E-07
1 sm-152		-1.19E-03	-2.42E-03	-3.48E-03	-4.36E-03	-5.09E-03	-5.77E-03	-6.29E-03	1.36E-06	2.87E-06	4.21E-06	4.21E-06	5.38E-06	6.41E-06	7.30E-06
1 eu-151		-1.52E-04	-2.01E-04	-2.39E-04	-2.74E-04	-3.02E-04	-3.32E-04	-3.56E-04	1.91E-08	2.49E-08	2.87E-08	2.87E-08	3.19E-08	3.45E-08	3.67E-08
1 eu-153		-4.15E-04	-1.13E-03	-2.05E-03	-3.07E-03	-4.06E-03	-5.05E-03	-5.93E-03	7.07E-07	1.90E-06	3.39E-06	3.39E-06	5.00E-06	6.60E-06	8.11E-06
1 gd-155		-5.94E-04	-1.40E-03	-2.82E-03	-4.79E-03	-7.08E-03	-9.67E-03	-1.21E-02	1.85E-08	4.21E-08	8.03E-08	8.03E-08	1.30E-07	1.86E-07	2.44E-07
1 u-233		1.63E-08	3.22E-08	4.88E-08	6.56E-08	8.26E-08	9.83E-08	1.13E-07	4.80E-11	8.36E-11	1.09E-10	1.28E-10	1.62E-10	1.36E-10	1.43E-10
1 u-234		-2.04E-03	-1.79E-03	-1.58E-03	-1.38E-03	-1.21E-03	-1.09E-03	-9.85E-04	9.38E-06	8.22E-06	7.23E-06	6.38E-06	6.38E-06	5.68E-06	5.11E-06
1 u-235	1.74E-01	1.74E-01	1.58E-01	1.47E-01	1.33E-01	1.18E-01	9.80E-02	7.86E-02	1.18E-03	7.35E-04	5.59E-04	4.16E-04	3.03E-04	2.15E-04	1.73E-04
1 u-236		-3.76E-03	-5.55E-03	-6.60E-03	-7.23E-03	-7.50E-03	-7.69E-03	-7.56E-03	5.79E-05	9.77E-05	1.28E-04	1.28E-04	1.50E-04	1.64E-04	1.73E-04
1 u-238	-1.36E-01	-1.29E-01	-1.26E-01	-1.25E-01	-1.23E-01	-1.20E-01	-1.19E-01	-1.15E-01	2.26E-02	2.24E-02	2.22E-02	2.22E-02	2.21E-02	2.19E-02	2.17E-02
1 np-237		-9.17E-04	-2.46E-03	-4.25E-03	-6.16E-03	-8.01E-03	-9.71E-03	-1.11E-02	2.48E-06	6.62E-06	1.14E-05	1.14E-05	1.64E-05	2.13E-05	2.56E-05
1 pu-238		-7.19E-05	-4.05E-04	-1.13E-03	-2.32E-03	-3.91E-03	-5.90E-03	-8.04E-03	1.90E-07	1.05E-06	2.83E-06	2.83E-06	5.60E-06	9.27E-06	1.36E-05
1 pu-239		3.51E-02	6.32E-02	9.20E-02	1.23E-01	1.57E-01	1.87E-01	2.18E-01	1.01E-04	1.57E-04	1.87E-04	2.04E-04	2.13E-04	2.13E-04	2.17E-04
1 pu-240		-1.41E-02	-2.49E-02	-3.32E-02	-4.00E-02	-4.57E-02	-5.09E-02	-5.48E-02	9.41E-06	2.45E-05	4.00E-05	4.00E-05	5.42E-05	6.66E-05	7.70E-05
1 pu-241		1.98E-03	8.42E-03	1.79E-02	2.96E-02	4.31E-02	5.64E-02	6.98E-02	3.11E-06	1.18E-05	2.15E-05	2.15E-05	3.02E-05	3.73E-05	4.27E-05
1 pu-242		-7.43E-05	-5.93E-04	-1.63E-03	-2.92E-03	-4.21E-03	-5.37E-03	-6.33E-03	2.00E-07	1.66E-06	4.88E-06	4.88E-06	9.69E-06	1.57E-05	2.25E-05
1 am-241		-9.57E-04	-3.76E-03	-7.14E-03	-1.04E-02	-1.32E-02	-1.56E-02	-1.73E-02	8.92E-07	3.56E-06	6.78E-06	6.78E-06	9.85E-06	1.24E-05	1.44E-05
1 am-242m		3.49E-06	4.28E-05	1.48E-04	3.14E-04	5.23E-04	7.36E-04	9.40E-04	5.79E-10	6.51E-09	1.98E-08	1.98E-08	3.66E-08	5.34E-08	6.68E-08
1 am-243		-5.82E-06	-9.95E-05	-4.29E-04	-1.08E-03	-2.05E-03	-3.28E-03	-4.58E-03	1.09E-08	1.92E-07	8.60E-07	8.60E-07	2.25E-06	4.44E-06	7.30E-06

IE	at/barrn-cm					at wt	at/barrn-cm x g/mol					wt%	
	2	3	4	5	BU		2	3	4	5			
U-233	2.39E-15	5.13E-11	8.72E-11	1.32E-10	233	5.57E-13	1.20E-08	2.03E-08	3.08E-08	0.0	0.0	0.0	0.0
U-234	3.90E-06	4.32E-06	5.49E-06	6.01E-06	234	9.13E-04	1.01E-03	1.28E-03	1.41E-03	0.0	0.0	0.0	0.0
U-235	4.85E-04	3.35E-04	3.79E-04	3.56E-04	235	1.14E-01	7.87E-02	8.91E-02	8.37E-02	2.0	1.4	1.6	1.6
U-236	2.18E-06	7.34E-05	1.11E-04	1.58E-04	236	5.14E-04	1.73E-02	2.62E-02	3.73E-02	0.0	0.3	0.5	0.7
U-238	2.35E-02	2.28E-02	2.24E-02	2.20E-02	238	5.59E+00	5.43E+00	5.33E+00	5.24E+00	98.0	98.2	97.9	97.7
Pu-238	1.70E-18	1.34E-06	3.10E-06	7.34E-06	238	4.05E-16	3.19E-04	7.38E-04	1.75E-03	0.0	0.6	1.2	2.3
Pu-239	1.90E-08	1.56E-04	1.83E-04	2.09E-04	239	4.54E-06	3.73E-02	4.37E-02	5.00E-02	100.0	73.8	69.8	64.4
Pu-240	6.09E-14	3.40E-05	4.51E-05	6.07E-05	240	1.46E-11	8.16E-03	1.08E-02	1.46E-02	0.0	16.1	17.3	18.8
Pu-241	2.54E-19	1.62E-05	2.38E-05	3.40E-05	241	6.12E-17	3.90E-03	5.74E-03	8.19E-03	0.0	7.7	9.2	10.6
Pu-242	2.08E-24	3.65E-06	6.66E-06	1.26E-05	242	5.03E-22	8.83E-04	1.61E-03	3.05E-03	0.0	1.7	2.6	3.9
Total U						5.71E+00	5.52E+00	5.45E+00	5.36E+00	0.0	0.9	1.1	1.4
Total Pu						4.54E-06	5.06E-02	6.26E-02	7.75E-02				

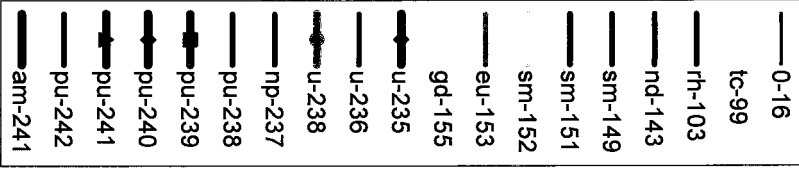
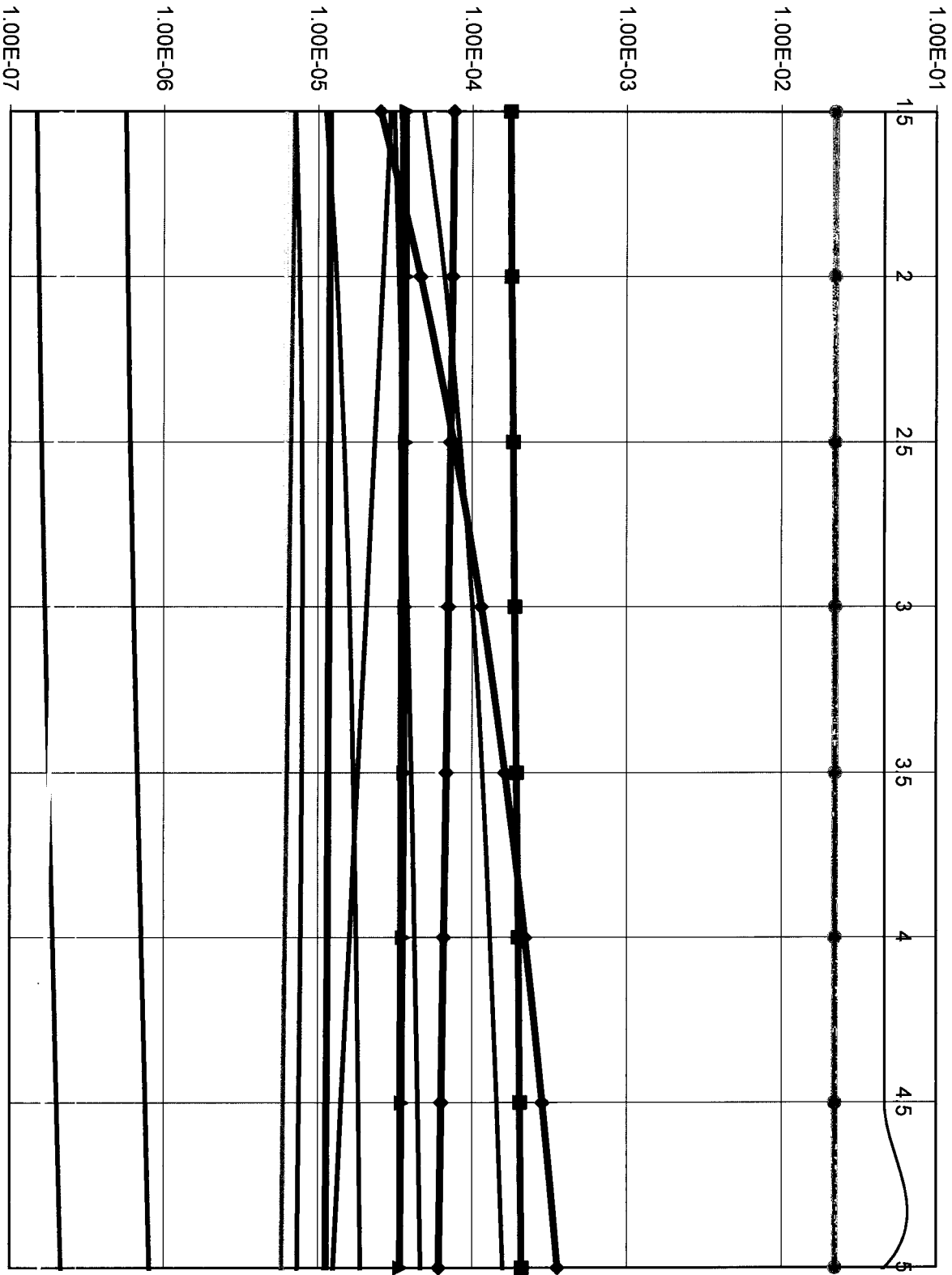
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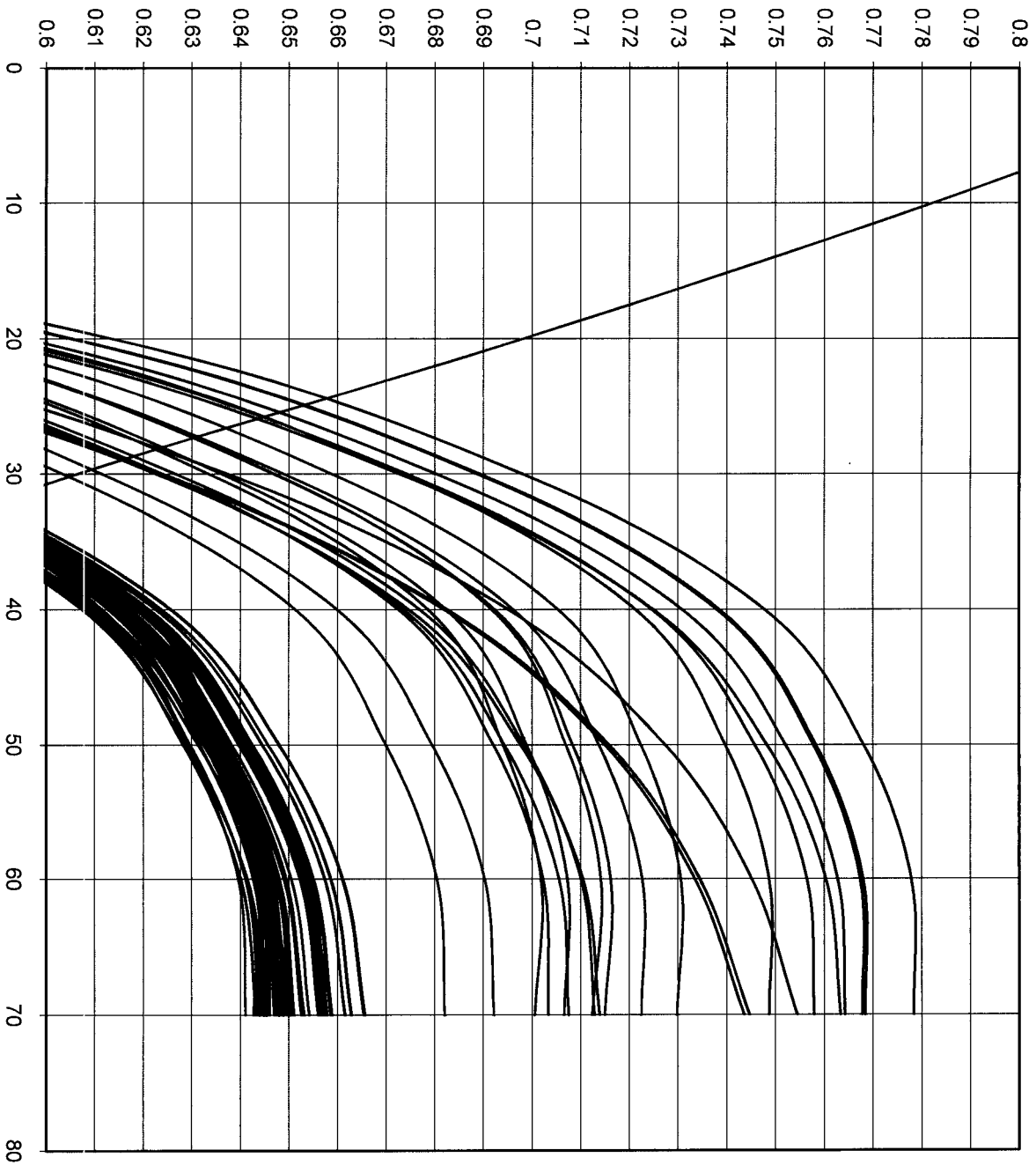
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	<u>A Den</u>	<u>1.5% IE</u>	<u>2.0% IE</u>	<u>2.5% IE</u>	<u>3.0% IE</u>	<u>3.5% IE</u>	<u>4.0% IE</u>	<u>4.5% IE</u>	<u>5.0% IE</u>	<u>5.5% IE</u>
4.54E-02	4.63E-02	4.63E-02	4.63E-02	4.63E-02	4.63E-02	4.63E-02	4.63E-02	4.64E-02	4.64E-02	4.64E-04
8.78E-05	5.24E-05	5.43E-05	5.60E-05	5.75E-05	5.89E-05	6.01E-05	6.12E-05	6.12E-05	6.21E-05	6.30E-05
8.68E-05	5.61E-05	5.70E-05	5.79E-05	5.88E-05	5.96E-05	6.03E-05	6.09E-05	6.15E-05	6.15E-05	6.20E-05
8.75E-05	5.84E-05	5.82E-05	5.81E-05	5.81E-05	5.80E-05	5.80E-05	5.79E-05	5.79E-05	5.79E-05	5.79E-05
4.45E-05	3.50E-05	3.47E-05	3.45E-05	3.43E-05	3.41E-05	3.39E-05	3.37E-05	3.36E-05	3.36E-05	3.34E-05
9.73E-06	8.92E-06	8.34E-06	7.78E-06	7.24E-06	6.74E-06	6.28E-06	5.86E-06	5.49E-06	5.15E-06	4.76E-06
5.62E-05	3.11E-05	3.34E-05	3.57E-05	3.81E-05	4.03E-05	4.24E-05	4.44E-05	4.61E-05	4.61E-05	4.76E-05
4.88E-05	2.99E-05	3.09E-05	3.19E-05	3.28E-05	3.36E-05	3.44E-05	3.51E-05	3.57E-05	3.57E-05	3.62E-05
1.16E-05	7.40E-06	7.80E-06	8.24E-06	8.69E-06	9.13E-06	9.56E-06	9.96E-06	1.03E-05	1.03E-05	1.07E-05
2.05E-07	1.49E-07	1.54E-07	1.61E-07	1.69E-07	1.79E-07	1.90E-07	2.02E-07	2.15E-07	2.15E-07	2.29E-07
2.25E-05	1.55E-05	1.55E-05	1.54E-05	1.54E-05	1.53E-05	1.53E-05	1.52E-05	1.51E-05	1.51E-05	1.50E-05
9.50E-07	5.67E-07	5.85E-07	6.09E-07	6.40E-07	6.77E-07	7.18E-07	7.63E-07	8.11E-07	8.62E-07	8.62E-07
8.08E-06	6.21E-06	6.17E-06	6.13E-06	6.09E-06	6.04E-06	6.00E-06	5.96E-06	5.91E-06	5.87E-06	5.87E-06
3.87E-08	2.28E-08	2.36E-08	2.46E-08	2.59E-08	2.75E-08	2.92E-08	3.12E-08	3.32E-08	3.54E-08	3.54E-08
9.48E-06	7.05E-06	6.88E-06	6.69E-06	6.51E-06	6.32E-06	6.14E-06	5.97E-06	5.81E-06	5.65E-06	5.55E-06
2.99E-07	2.14E-07	2.06E-07	1.98E-07	1.89E-07	1.81E-07	1.72E-07	1.65E-07	1.57E-07	1.51E-07	1.51E-07
1.46E-10	3.94E-11	5.08E-11	6.37E-11	7.58E-11	8.97E-11	1.04E-10	1.17E-10	1.32E-10	1.47E-10	1.47E-10
4.67E-06	1.33E-06	1.81E-06	2.44E-06	3.02E-06	3.74E-06	4.51E-06	5.19E-06	6.01E-06	6.87E-06	6.87E-06
1.49E-04	2.54E-05	4.62E-05	7.58E-05	1.15E-04	1.63E-04	2.20E-04	2.85E-04	3.56E-04	4.33E-04	4.33E-04
1.76E-04	4.85E-05	6.62E-05	8.38E-05	1.01E-04	1.17E-04	1.31E-04	1.45E-04	1.58E-04	1.70E-04	1.70E-04
2.14E-02	2.24E-02	2.24E-02	2.23E-02	2.23E-02	2.22E-02	2.21E-02	2.20E-02	2.20E-02	2.19E-02	2.19E-02
2.92E-05	1.12E-05	1.32E-05	1.48E-05	1.61E-05	1.70E-05	1.78E-05	1.84E-05	1.89E-05	1.93E-05	1.93E-05
1.83E-05	7.14E-06	7.63E-06	7.89E-06	7.95E-06	7.89E-06	7.74E-06	7.56E-06	7.34E-06	7.10E-06	7.10E-06
2.18E-04	1.77E-04	1.80E-04	1.85E-04	1.89E-04	1.94E-04	2.00E-04	2.04E-04	2.09E-04	2.13E-04	2.13E-04
8.54E-05	7.62E-05	7.45E-05	7.26E-05	7.04E-05	6.81E-05	6.56E-05	6.32E-05	6.07E-05	5.83E-05	5.83E-05
4.65E-05	3.72E-05	3.70E-05	3.68E-05	3.64E-05	3.60E-05	3.54E-05	3.48E-05	3.40E-05	3.32E-05	3.32E-05
2.97E-05	2.95E-05	2.64E-05	2.34E-05	2.07E-05	1.82E-05	1.61E-05	1.42E-05	1.26E-05	1.12E-05	1.12E-05
1.59E-05	1.19E-05	1.19E-05	1.19E-05	1.18E-05	1.17E-05	1.16E-05	1.14E-05	1.12E-05	1.10E-05	1.10E-05
7.63E-08	3.72E-08	3.83E-08	3.97E-08	4.12E-08	4.26E-08	4.38E-08	4.48E-08	4.54E-08	4.56E-08	4.56E-08
1.06E-05	9.97E-06	8.55E-06	7.28E-06	6.18E-06	5.24E-06	4.45E-06	3.80E-06	3.25E-06	2.80E-06	2.80E-06

delta wt% 6698					min wt%					max wt%				
	2	3	4	5	2	3	4	5	2	3	4	5		
	0	20	30	45	0	20	30	45	0	20	30	45		
1	1	1	1	1	1.0	0.4	0.6	0.6	3.0	2.4	2.6	2.6		
10	15	15	15	15	90.0	58.8	54.8	49.4	110.0	88.8	84.8	79.4		
4	4	4	4	4	-4.0	12.1	13.3	14.8	4.0	20.1	21.3	22.8		
1	1	1	1	1	-1.0	6.7	7.7	9.1	1.0	8.7	10.7	12.1		

Pu Screening Range											
Total Pu	Total U	Pu/(U+Pu)	100-delt	100+delt	wt frc Pu min	wt frac Pu max	wt% Pu min	wt% Pu max			
4.54E-06	5.71	7.95E-05	85	115	6.76E-07	9.14E-07	6.76E-05	9.14E-05			
5.06E-02	5.52	9.08E-01	80	120	7.28E-03	1.09E-02	7.28E-01	1.09E+00			
6.26E-02	5.45	1.14E+00	79.5	120.5	9.05E-03	1.37E-02	9.05E-01	1.37E+00			
7.75E-02	5.36	1.43E+00	79.5	120.5	1.14E-02	1.71E-02	1.14E+00	1.71E+00			





- msi001-01sen
- msi001-03sen
- msi001-04sen
- msi001-05sen
- msi001-07sen
- msi001-08sen
- msi001-09sen
- msi001-10sen
- msi001-13sen
- msi001-12sen
- msi001-01sen
- msi001-02sen
- msi001-03sen
- msi001-07sen
- msi001-08sen
- msi001-09sen
- msi001-10sen
- msi001-13sen
- msi001-12sen
- msi001-01sen
- msi001-02sen
- msi001-03sen
- msi001-07sen
- msi001-08sen
- msi001-09sen
- msi001-10sen
- msi001-13sen
- msi001-12sen
- psf001-01sen
- psf001-02sen
- psf001-03sen
- psf001-04sen
- psf001-05sen
- psf001-06sen
- psf003-01sen

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
158	high1	Myohyal (1997)	NA											Analogy stimuli experiments	UN solution	9.97	0	0	0		Large cylindrical tank NA	NA
159	high2	Myohyal (1997)	NA											Analogy stimuli experiments	UN solution	9.97	0	0	0		Large cylindrical tank NA	NA
200	high3	Myohyal (1997)	NA											Analogy stimuli experiments	UN solution	9.97	0	0	0		Large cylindrical tank NA	NA
201	high4	Myohyal (1997)	NA											Analogy stimuli experiments	UN solution	9.97	0	0	0		Large cylindrical tank NA	NA
202	spinh	Wahlstedt (1992)	NA											Analogy stimuli experiments	EU02F2 solution	1.006	0	0	0		Large sphere NA	NA
203	spinh	Wahlstedt (1992)	NA											Analogy stimuli experiments	EU02F2 solution	1.006	0	0	0		Large sphere NA	NA
204	spinh	Wahlstedt (1992)	NA											Analogy stimuli experiments	EU02F2 solution	1.006	0	0	0		Large sphere NA	NA
205	spinh	Wahlstedt (1992)	NA											Analogy stimuli experiments	EU02F2 solution	1.006	0	0	0		Large sphere NA	NA
206	spinh	Wahlstedt (1992)	NA											Analogy stimuli experiments	EU02F2 solution	1.006	0	0	0		Large sphere NA	NA
207	spinh	Wahlstedt (1992)	NA											Analogy stimuli experiments	EU02F2 solution	1.006	0	0	0		Large sphere NA	NA
208	spinh	Wahlstedt (1992)	NA											Analogy stimuli experiments	EU02F2 solution	1.006	0	0	0		Large sphere NA	NA
209	spinh	Wahlstedt (1992)	NA											Analogy stimuli experiments	EU02F2 solution	1.006	0	0	0		Large sphere NA	NA
210	spinh	Wahlstedt (1992)	NA											Analogy stimuli experiments	EU02F2 solution	1.006	0	0	0		Large sphere NA	NA
211	spinh	Wahlstedt (1992)	NA											Analogy stimuli experiments	EU02F2 solution	1.006	0	0	0		Large sphere NA	NA
212	spinh	Wahlstedt (1992)	NA											Analogy stimuli experiments	EU02F2 solution	1.006	0	0	0		Large sphere NA	NA
213	spinh	Wahlstedt (1992)	NA											Analogy stimuli experiments	EU02F2 solution	1.006	0	0	0		Large sphere NA	NA
214	spinh	Wahlstedt (1992)	NA											Analogy stimuli experiments	EU02F2 solution	1.006	0	0	0		Large sphere NA	NA
215	spinh	Wahlstedt (1992)	NA											Analogy stimuli experiments	EU02F2 solution	1.006	0	0	0		Large sphere NA	NA
216	HM-1	HIESSE	LR7-001	RM01cl	0.9573	0.7822	0.8981	0.6289	0.5581	0.4468	0.3937	0.3321		Analogy stimuli experiments	OEK Ridge TSN/AMI model	5	0	0	0		Large sphere NA	NA

pu239 fiss	3.40E-01
h1 scat	2.49E-01
u238 cap	1.61E-01
pu239 cap	1.23E-01
u235 fiss	9.70E-02
pu241 fiss	9.18E-02
h1 cap	6.02E-02
pu240 cap	5.60E-02
u238 fiss	4.87E-02
pu241 cap	2.20E-02
b10 cap	2.09E-02
nd143 cap	1.88E-02
u235 cap	1.84E-02
am241 cap	1.77E-02
sm149 cap	1.53E-02
rh103 cap	1.46E-02
gd155 cap	1.21E-02
np237 cap	1.15E-02
sm151 cap	1.02E-02

gPu/l	gU/l	Pu wt%
102.19	365.2	21.86397
103.37	363.66	22.13348
106.3	373.33	22.16292
107.91	379.55	22.1372
108.27	380.41	22.1556
195.61	6.5	96.78393
110.13	3.8	96.66462
58.3	2.3	96.20462
72.74	247.33	22.72628
47.08	161.72	22.54789
73.64	250.33	22.7305
74.25	251.64	22.78376
11.88	11.05	51.80986
11.73	10.78	52.11017
12.19	41.04	22.90062
172.56	262.79	39.63707
172.82	262.55	39.69497
173.22	262.88	39.72025
118.71	173.98	40.55827
119.04	174.67	40.52977
118.9	174.53	40.52074
41.69	63.38	39.67831
41.89	63.65	39.69111
41.83	63.55	39.69444