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Neutron Exposure Parameters For Capsule 10.05 in the Heavy-Section Steel Irradiation Program Tenth Irradiation Series

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Prepared for
U.S. Nuclear Regulatory Commission

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Abstract

This report describes the computational methodology for the least-squares adjustment of dosimetry data from the HSSI 10.05 capsule with neutronics calculations. It presents exposure parameters for the metallurgical specimens irradiated in the capsule. The exposure parameters reported are the neutron fluence greater than 1.0 MeV, fluence greater than 0.1 MeV, and displacements per atom. Exposure parameter distributions are also described in terms of three-dimensional fitting functions. When fitting functions are used, it is recommended that an uncertainty of 6% (1σ) be associated with the exposure parameters.

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Foreword

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This report is designated HSSI Report 18. Reports in this series are listed below:

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Neutron Exposure Parameters for Capsule 10.05 in the Heavy-Section Steel Irradiation Program Tenth Irradiation Series

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Introduction

A variety of experiments and analyses for assessing the effects of neutron irradiation on metallurgical test specimens have been sponsored by the U.S. Nuclear Regulatory Commission (NRC). Results from these investigations provide information that will lead to an improved understanding of the processes of neutron damage to pressure vessels and other structural materials. Thus, the lifetime of many nuclear reactors may be extended through knowledge gained from these experiments, and confidence in the accuracy of information relative to the integrity of reactor pressure vessels and of related components should be enhanced.

Capsules in the Heavy-Section Steel Irradiation (HSSI) program Tenth Series are being irradiated at a new facility installed at the University of Michigan's Ford Nuclear Reactor in Ann Arbor, Michigan. Initially, an extensive dosimetry experiment (HSSI 10.0D) was carried out in the facility to assess the neutron irradiation exposure rates and their distributions. The dosimetry experiment included a steel block that simulated a typical metallurgical capsule with a comprehensive set of dosimeters placed in key locations throughout the block. Following the dosimetry experiment, capsule HSSI 10.05 was irradiated. It contained an assortment of Charpy and compact tension [C(T)] specimens as well as neutron dosimeters. The capsule was irradiated for a total of 3596 hours at the full reactor core power of 2 MW. The accumulated neutron fluence (E > 1 MeV) at the locations of the crack tips and V-notches of the metallurgical specimens ranged from 3.5×10^{18} cm^{-2} to 1.6×10^{19} cm^{-2}.

This report describes the computational methodology for the least-squares adjustment of the dosimetry data from the HSSI 10.05 capsule with neutronics calculations. For the metallurgical specimens contained in the capsule, exposure parameters are reported in terms of the neutron fluence greater than 1.0 MeV, fluence greater than 0.1 MeV, and displacements per atom (dpa).

Experiment Description

The HSSI 10.05 capsule contained an assortment of metallurgical specimens and neutron dosimeters arranged in a steel frame assembly as shown in Figs. 1 and 2. The steel frame was constructed in such a way as to form 16 cells, each identified by its column (A-D) and row (1-4) number. The metallurgical complement in the capsule consisted of Charpy specimens that were 1 in. thick [1T C(T)] and 0.5 in. thick [0.5T C(T)]. The neutron dosimetry in the capsule included radiometric monitors in the form of iron gradient wires and fission-radiometric dosimetry sets (FRDSs). Each FRDS contained two epithermal dosimeters (^{59}Co and ^{109}Ag), two fission dosimeters (^{237}Np and ^{238}U), and three threshold dosimeters (^{58}Ni, ^{54}Fe, and ^{63}Cu), all covered with a 0.89-mm-thick (0.035-in.-thick) gadolinium cover. Three FRDSs were included in the capsule. One was placed in the vertical plate between cells B-1 and C-1, and the other two were placed in the horizontal plate between cells B-2 and B-3. The locations of the iron gradient wires are illustrated in Fig. 2. Some of the gradient wires were placed in the aligned

ORNL-DWG 98-3485

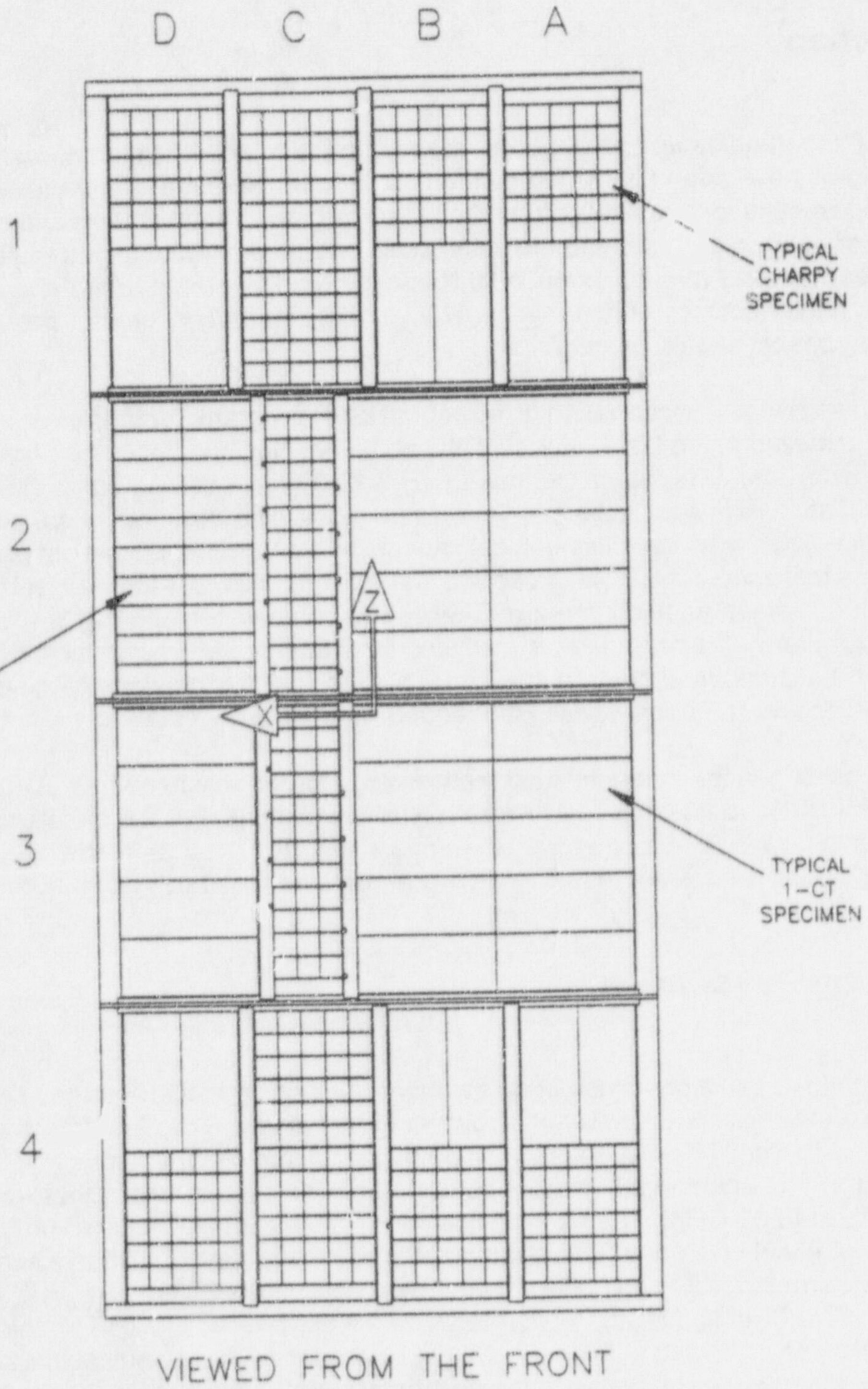

Figure 1. Arrangement of metallurgical specimens in the HSSI 10.05 capsule.

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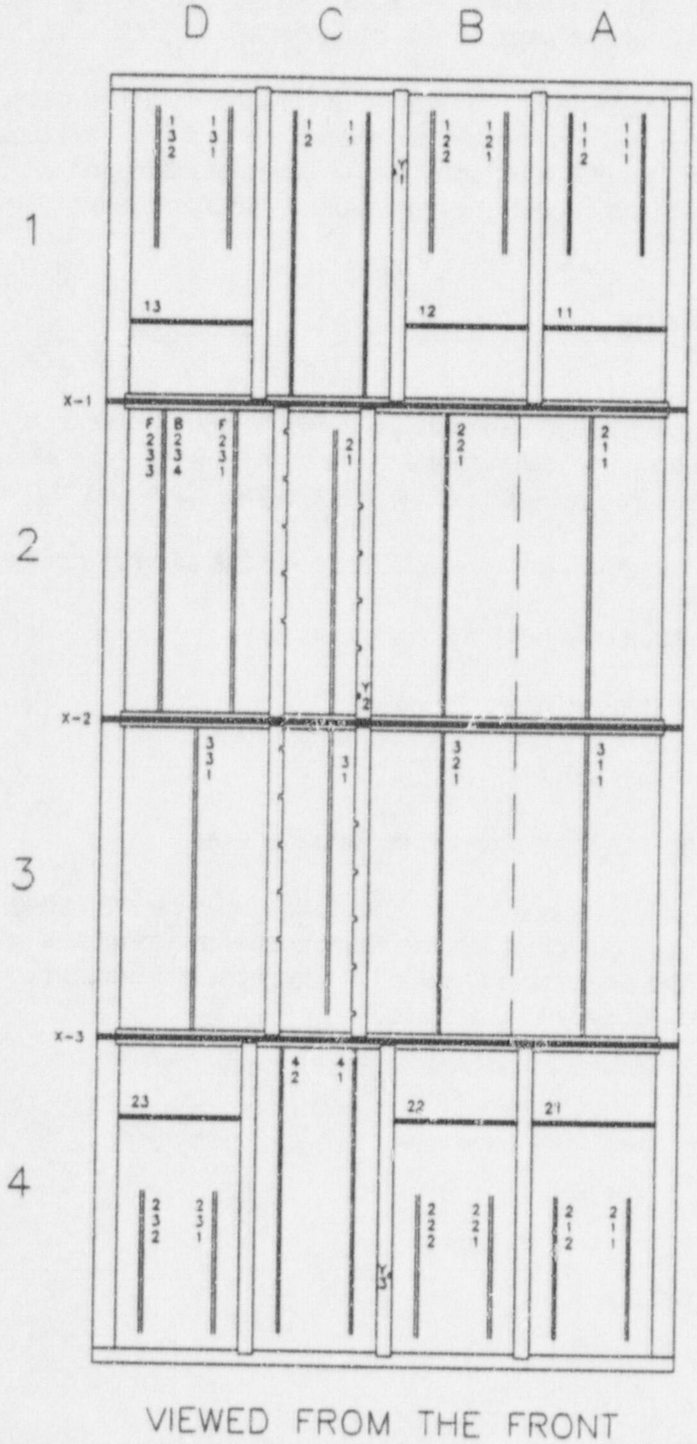

Figure 2. Arrangement of gradient wires in the HSSI 10.05 capsule.

notches of the metallurgical specimens, as close to the notch tips as possible. Other gradient wires were incorporated into the frame of the capsule to provide additional information about the neutron flux distribution.

In addition to the dosimetry inside the capsule, Fe and Co/Al gradient wires were irradiated in small tubes placed just behind the thermal shield on each side of the capsule (see Fig. 3). These removable dosimeter tubes (RDTs) can be withdrawn and replaced as desired during the capsule irradiation and are included to assess variations in fluence rate magnitude, which could be caused if there were significant changes in the core loading. For capsule 10.05, the RDTs were replaced once, approximately halfway through the capsule irradiation period.

The relative location of the capsule with respect to the reactor core is shown in Figs. 3 and 4. Various materials between the core and the capsule are shown in Fig. 5. The coordinate system shown in Figs. 3 and 4 is used throughout this report where activities or irradiation exposure parameters are listed and is consistent with the coordinate system used in the analysis of the HSSI 10.0D capsule.[1]

Analysis Methodology

To determine the neutron irradiation exposure parameters, a neutron spectrum adjustment procedure was used that combines transport calculations of the neutron field and measurements using radiometric monitors. The input data required in this analysis consisted of the following:

- neutron fluence rate spectrum from transport calculations at each dosimetry location,
- measured activity of each dosimeter,
- cross section for each dosimetry reaction used,
- location of each dosimetry set, and
- response function for each irradiation exposure parameter.

For each of the dosimetry locations in the capsule, a 47-group neutron spectrum was calculated using a flux-synthesis method that combines the results of two-dimensional and one-dimensional transport-theory calculations. For the analysis of the HSSI 10.05 capsule, transport calculations performed by Williams* for the HSSI 10.0D capsule were used.[1]

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*M. L. Williams, Louisiana State University, Nuclear Science Center, personal communication to F. B. K. Kam.

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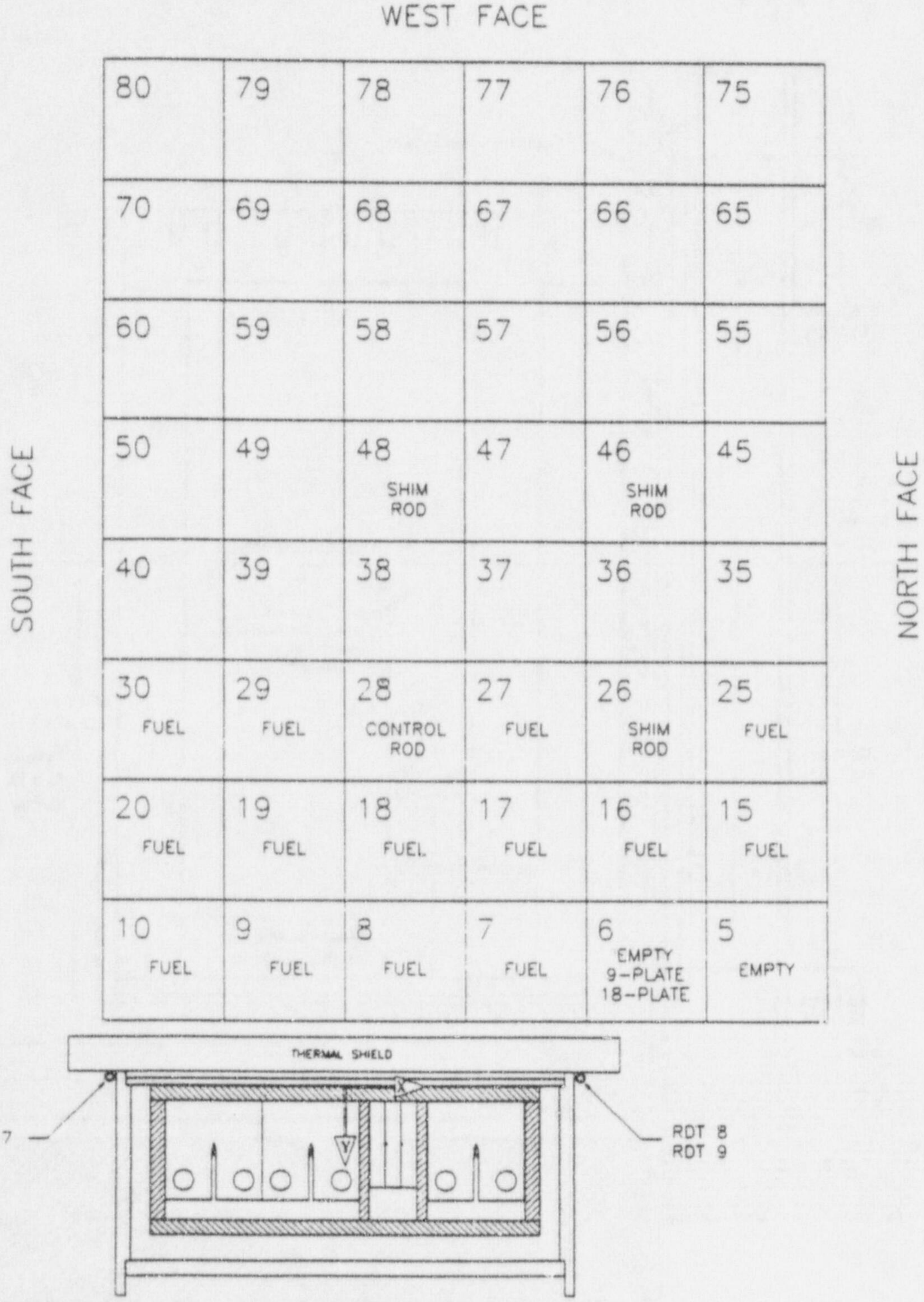

Figure 3. Location of the HSSI 10.05 capsule relative to the reactor core—horizontal cross section.

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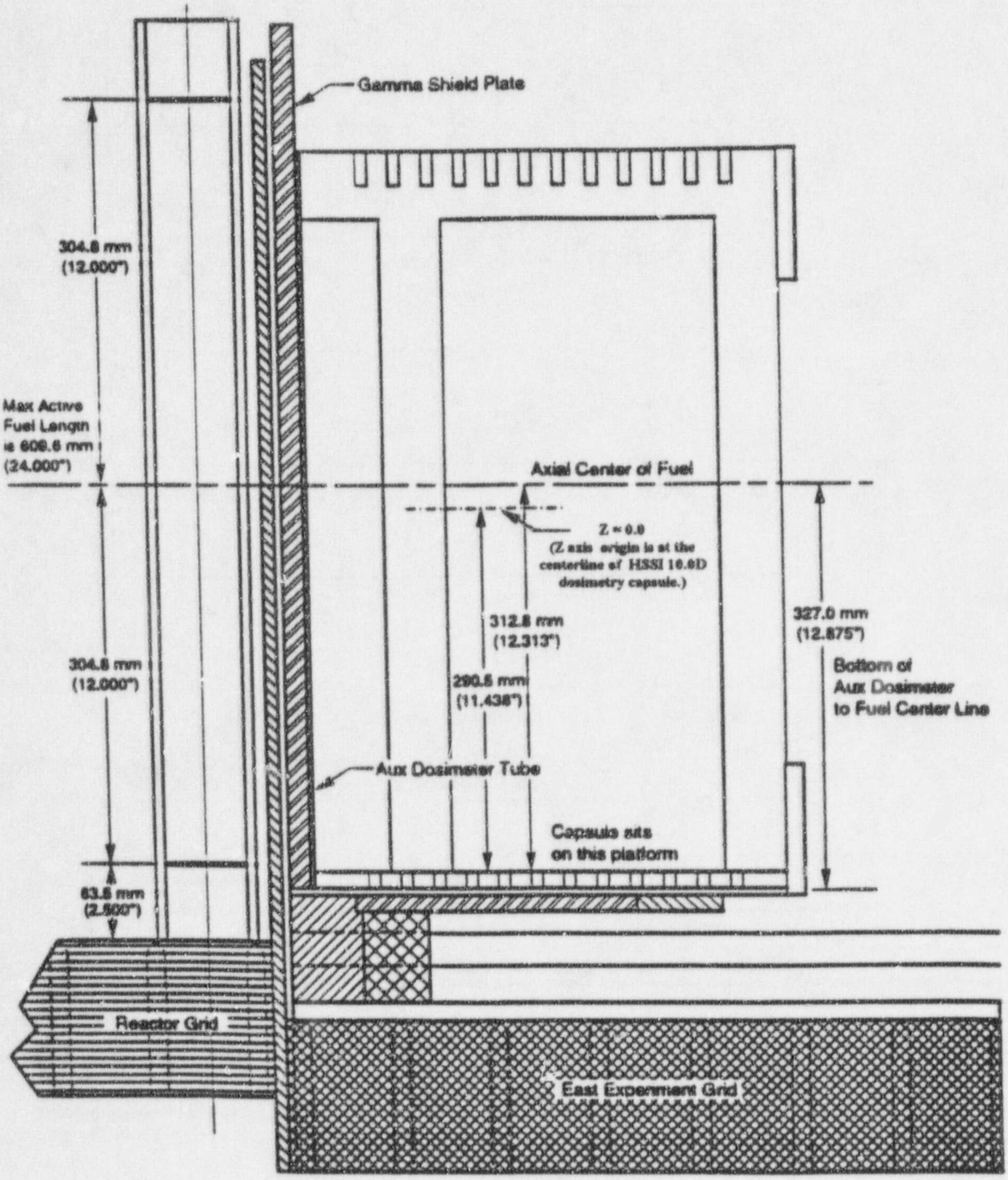

Figure 4. Location of the HSSI 10.05 capsule relative to the reactor core—vertical cross section.

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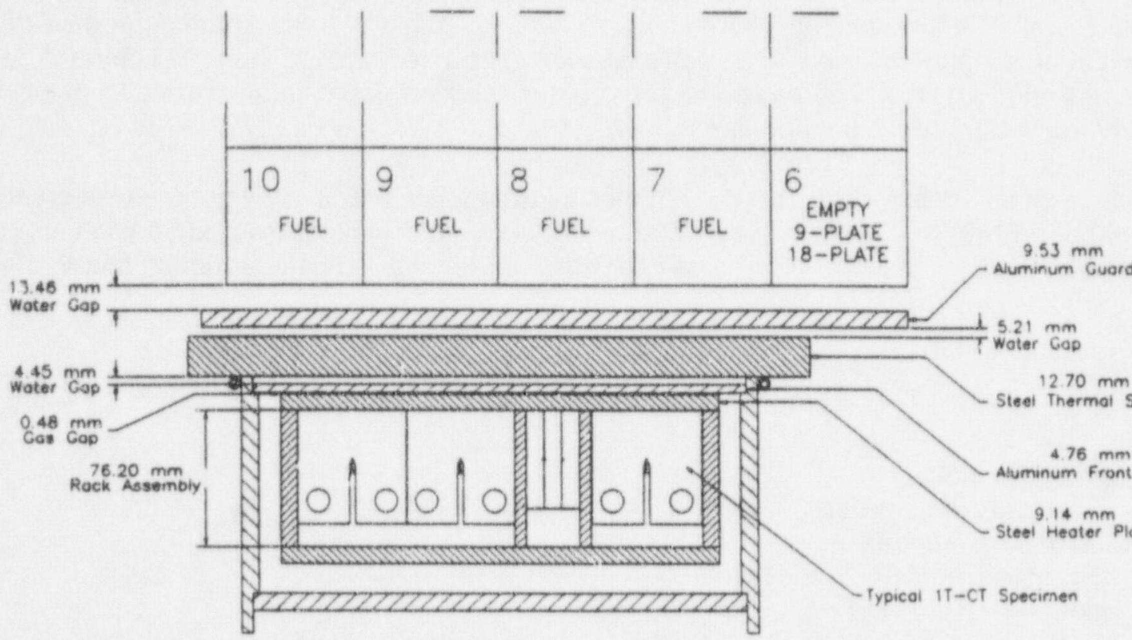

Figure 5. Materials between the core and the HSSI 10.05 capsule.

During capsule disassembly one gradient wire from cell A-1 was lost and the center horizontal gradient wire, X-2, jammed in its groove and could not be removed. All remaining dosimeters were recovered and measured. Before being counted with a high-resolution gamma-ray spectrometer, the gradient wires were cut into 2.54-cm (1-in.) or 1.27-cm (0.5-in.) pieces and weighed. Dosimeters in the FRDSs were precut and weighed before irradiation and required no additional preparation. The specific activities of the neutron dosimeters at the end of irradiation are given in the Appendix. The identifiers (IDs) for the gradient wires irradiated in the notches of the metallurgical specimens consist of the cell ID followed by the wire number and the piece number (e.g., A1-111-1 is a wire from cell A1, the wire number is 111, and the piece number is 1; this wire is shown in Fig. 2 in the top right corner of the capsule). IDs of wires irradiated inside the steel frame of the capsule consist of wire ID and piece number only. Table A.1 in the Appendix lists for each dosimeter the ID, the coordinates (x, y, and z), and the specific activity at the end of irradiation.

The 1T C(T) and 0.5T C(T) specimens used in the HSSI 10.05 capsule had chevron notches, as shown in Fig. 6. Because of the chevron shape of the notch, the thickness of steel between a gradient wire and the face of the capsule changes along the notch. Therefore, gradient wires located in the C(T) specimen notch tips experience a varying neutron flux caused by attenuation in the steel. The result is that the activation of the wire is greater than it would have been if the gap had been filled with steel. In the neutronics calculations, the interior of the capsule was modeled as a solid block of steel. If the presence of the gap were neglected in the adjustment calculations, the irradiation parameters derived from the procedure would be overestimated. To circumvent this difficulty, "effective" Y coordinates were calculated for gradient wires located in the C(T) specimen notch tips. The effective Y coordinates were obtained by using the average thickness of the steel in front of the gradient wires. The effective Y coordinate used for each dosimeter is listed in a footnote to Table A.1. The introduction of the effective coordinate is of course an approximation. Its suitability was assessed through a comparison of irradiation parameters from two separate adjustment runs. In one run, all the available dosimetry measurements, including the gradient wires from CT specimens with the effective Y coordinates, were used. In the second adjustment run the gradient wires from CT specimens were not used. The adjusted fast flux values were calculated for all the locations of the dosimeters (as used in the first run). The differences in the fast neutron flux from the two runs were very small (on the order of a few tenths of a percent) at almost all locations. Higher differences (2 to 3%, with a maximum difference of 3.2%) were found at only a few locations, and in all cases they remained smaller than the standard deviation (1σ) of the adjusted fast flux. Therefore, the previously described approximation used for the gradient wires irradiated in CT specimens appears to be adequate.

The activation cross-section library and covariance information in 640 energy groups was created from the IRDF 90 and ENDF V dosimetry files. To account for the gadolinium cover, a modified set of cross sections was generated; the 640-group cross sections were multiplied by attenuation factors defined as:

$$AF = \exp\left[-(D \times AV/AT) \times TH \times CS\right], \qquad (1)$$

where

AF = attenuation factor,
D = density of cover material (7.9004 g/cm^3 for Gd),
AV = Avogadros number,
AT = atomic weight (157.25 for Gd),
TH = thickness of the cover (0.89 mm, 35 mil),
CS = total absorption cross section of Gd (taken from the IRDF 90 file).

This formula is, of course, a crude approximation only and does not consider the geometry of the covers and the dosimeters. However, it appears to be reasonably accurate for the current application. The resulting cross sections were combined with the cross sections for bare dosimeters and were converted to 32 energy groups for use in the adjustment runs. Cross-section covariance matrixes were also converted to the 32-group structure. The computer code FLXPRO from the LSL-M2 code package was used for this purpose.[2]

Measured activities were converted to reaction rates by taking into account the reactor power vs time history of the irradiation. The computer code ACT from the LSL-M2 code package was used for this purpose.[2] The reactor power vs time history for the irradiation of the HSSI 10.05 capsule is given in Table A.2 of the Appendix.

The spectrum covariance matrix used for the adjustment runs was originally calculated for the simulated surveillance capsule position of the Oak Ridge Research Reactor Poolside Facility Metallurgical Experiment.[3,4] The original calculation of the fluence variance-covariances covered only the range from 18 to 0.1 MeV. Therefore, two energy groups from 1.0×10^{-5} to 0.1 eV and from 0.1 eV to 0.1 MeV were added, with large variances of 150% and 75%, respectively, and small correlations of 0.1 and 0.2. The spectrum covariance matrix was converted in the group structure used in the adjustment with the computer code FLXPRO. Obviously the assumed spectrum variance-covariance information is only approximate; however, it does not appear to be critical for the analysis since comprehensive dosimetry measurements are available. In such cases the adjustment results are generally not sensitive to the details in the spectrum covariance matrix.

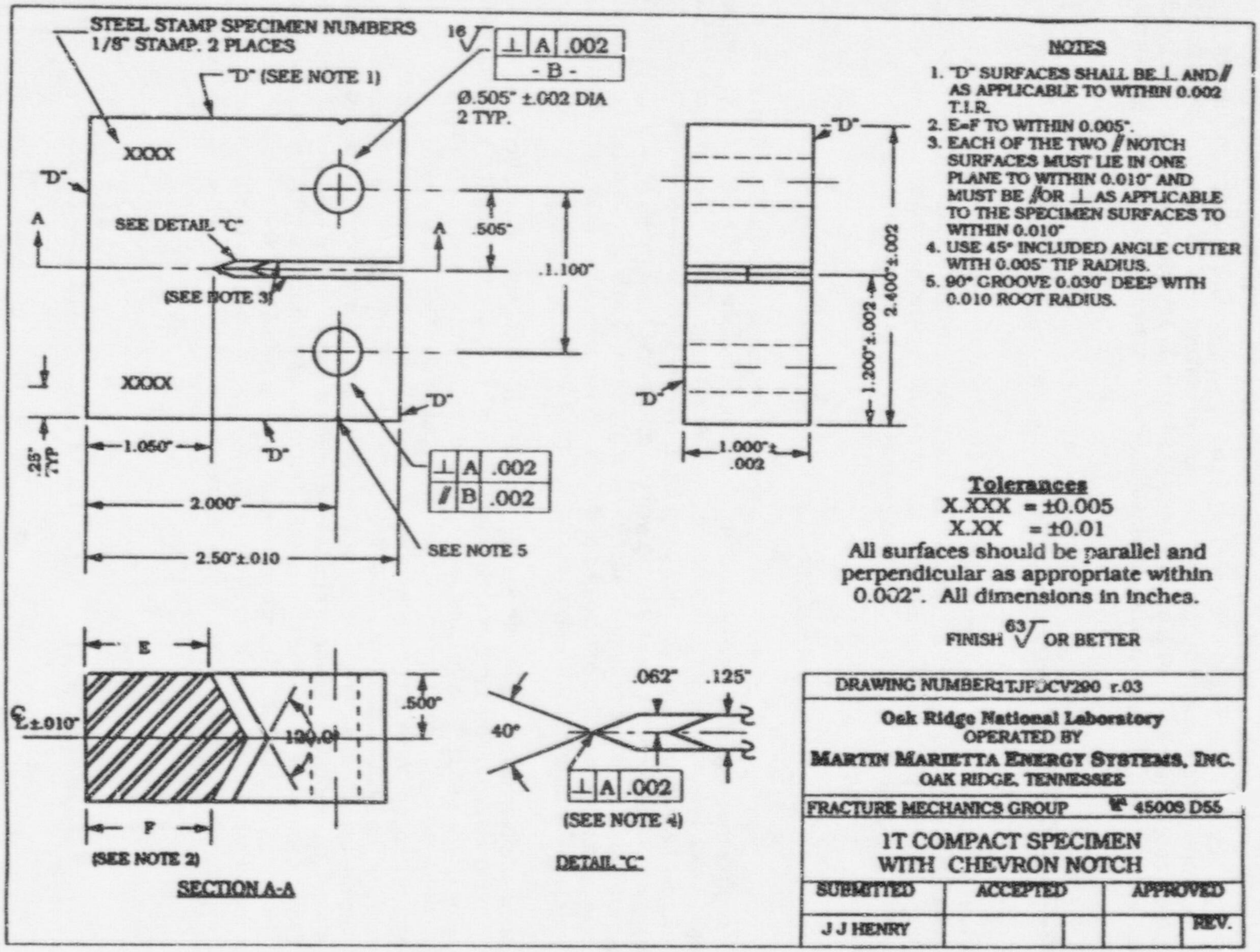

Figure 6. 1T compact tension specimen with chevron notch.

For the least-squares neutron spectrum adjustment calculations, computer code LSL-M2 was used. The adjustment runs provided the adjusted neutron spectrum at each dosimetry location. The neutron irradiation exposure rates selected to characterize the irradiation conditions were neutron fluence rate with energy greater than 1 MeV ($F_{E>1\ MeV}$), neutron fluence rate with energy greater than 0.1 MeV ($F_{E>0.1\ MeV}$), and dpa rate. Fluence rates, $F_{E>1\ MeV}$ and $F_{E>0.1\ MeV}$, were obtained as sums of group fluxes over the corresponding energy range. The dpa rate calculations required that cross sections taken from American Society for Testing and Materials (ASTM) E-693 be folded with the corresponding group fluxes and summed.[5] These exposure parameters were determined for each dosimetry location.

Results and Discussion

The exposure parameters at each dosimeter location obtained from the adjustment runs were fitted to a three-dimensional function. Describing the spacial variation of the irradiation parameters by means of a fitting function is desirable because the values of exposure parameters are often needed at locations other than the dosimetry locations. The function used for fitting the irradiation parameters was of the form

$$F(x,y,z) = A \cos [B_x (x - x_0)] \cos [B_z (z - z_0)] \exp (-\lambda y) . \quad (2)$$

The constants A, B_x, x_0, B_z, z_0, and λ were determined with least-squares fitting and are listed in Table 1 for each of the three irradiation parameters. Constants obtained for the HSSI 10.0D capsule are also listed in Table 1 for comparison. The fluence E > 1 MeV, fluence E > 0.1 MeV, and dpa for each metallurgical specimen were calculated using Eq. 2 and the capsule irradiation time of 3595.8 hours. The results are tabulated in Table 2 along with the specimen ID, specimen type, and coordinates. Exposure parameters at any other location (*x*, *y*, or *z*) can be readily calculated using Eq. 2 and the capsule irradiation time. The coordinates of the point where exposure parameters are needed must be given relative to the coordinate system shown in Figs. 3 and 4.

The normalization constants (A) obtained for the HSSI 10.05 capsule ranged from 7 to 10% less than comparable normalization constants obtained for the HSSI 10.0D capsule. The attenuation coefficients (λ) obtained for the HSSI 10.05 capsule also ranged from 9 to 19% less than comparable coefficients obtained for the HSSI 10.0D capsule. These differences in normalization constants and attenuation coefficients appear to be larger than one would expect. However, when irradiation parameters inside the capsule are calculated, the effects of the smaller normalization constants for the HSSI 10.05 capsule are countered by the lower attenuation coefficients. To evaluate the effect of the different constants, the irradiation parameters for the metallurgical specimens in the HSSI 10.05 capsule were calculated using both sets of fitting constants. The maximum difference found at any metallurgical specimen location was 5.3%. Therefore, even though the differences in individual fitting parameters from the two experiments appear to be large, the two sets of fitting parameters, when used in Eq. 2, give exposure parameters that are in good agreement.

Table 1. Constants determined for the three-dimensional fits* of exposure parameters for the HSSI 10.05 and HSSI 10.0D capsules[1]

(A) Fitting parameters for $F_{E>1\,MeV}$

	A ($cm^{-2}s^{-1}$)	B_x (cm^{-1})	x_0 (cm)	B_z (cm^{-1})	z_0 (cm)	λ (cm^{-1})
HSSI 10.05	1.865 E+12	0.05995	5.525	0.04182	1.752	0.1548
HSSI 10.0D	2.021 E+12	0.06082	5.071	0.04252	2.030	0.1707

(B) Fitting parameters for $F_{E>0.1\,MeV}$

	A ($cm^{-2}s^{-1}$)	B_x (cm^{-1})	x_0 (cm)	B_z (cm^{-1})	z_0 (cm)	λ (cm^{-1})
HSSI 10.05	4.409 E+12	0.06761	3.808	0.04265	1.737	0.1039
HSSI 10.0D	4.887 E+12	0.06920	3.303	0.04337	1.706	0.1286

(C) Fitting parameters for dpa rate

	A (s^{-1})	B_x (cm^{-1})	x_0 (cm)	B_z (cm^{-1})	z_0 (cm)	λ (cm^{-1})
HSSI 10.05	2.679E-09	0.06259	4.812	0.04213	1.751	0.1377
HSSI 10.0D	2.890E-09	0.06404	4.272	0.04262	1.998	0.1535

*The fitting function is of the form

$$F(x,y,z) = A \cos[B_x(x - x_0)] \cos[B_z(z - z_0)] \exp(-\lambda y) .$$

Table 2. Exposure parameters for the metallurgical specimens in the HSSI 10.05 capsule.

Specimen			Coordinates			Fluence		
Block	ID	Type	X (cm)	Y (cm)	Z (cm)	(E > 1 MeV) (cm^{-2})	(E > 0.1 MeV) (cm^{-2})	dpa
A1	2CD0	Charpy	-10.83	3.66	26.09	4.00E+18	1.09E+19	6.06E-03
A1	2CD1	Charpy	-10.83	3.66	25.09	4.27E+18	1.16E+19	6.48E-03
A1	2CD2	Charpy	-10.83	3.66	24.09	4.53E+18	1.24E+19	6.88E-03
A1	2CD3	Charpy	-10.83	3.66	23.09	4.78E+18	1.31E+19	7.27E-03
A1	2CD4	Charpy	-10.83	3.66	22.09	5.03E+18	1.38E+19	7.65E-03
A1	2CD5	Charpy	-10.83	3.66	21.09	5.26E+18	1.45E+19	8.02E-03
A1	2CD6	Charpy	-9.83	3.66	26.09	4.35E+18	1.20E+19	6.61E-03
A1	2CD7	Charpy	-9.83	3.66	25.09	4.65E+18	1.28E+19	7.07E-03
A1	2CD8	Charpy	-9.83	3.66	24.09	4.93E+18	1.36E+19	7.51E-03
A1	2CD9	Charpy	-9.83	3.66	23.09	5.20E+18	1.45E+19	7.93E-03
A1	2CD10	Charpy	-9.83	3.66	22.09	5.47E+18	1.52E+19	8.35E-03
A1	2CD11	Charpy	-9.83	3.66	21.09	5.72E+18	1.60E+19	8.75E-03
A1	02D01	Charpy	-8.74	3.66	26.09	4.72E+18	1.31E+19	7.18E-03
A1	02D02	Charpy	-8.74	3.66	25.09	5.03E+18	1.40E+19	7.68E-03
A1	02D03	Charpy	-8.74	3.66	24.09	5.34E+18	1.49E+19	8.16E-03
A1	02D04	Charpy	-8.74	3.66	23.09	5.64E+18	1.58E+19	8.62E-03
A1	02D06	Charpy	-8.74	3.66	22.09	5.93E+18	1.67E+19	9.07E-03
A1	02D08	Charpy	-8.74	3.66	21.09	6.20E+18	1.75E+19	9.50E-03

Table 2. (continued)

Specimen			Coordinates			Fluence		
Block	ID	Type	X (cm)	Y (cm)	Z (cm)	(E > 1 MeV) (cm^{-2})	(E > 0.1 MeV) (cm^{-2})	dpa
A1	2CE0	Charpy	-7.65	3.66	26.09	5.06E+18	1.41E+19	7.72E-03
A1	2CE1	Charpy	-7.65	3.66	25.09	5.40E+18	1.52E+19	8.25E-03
A1	2CE2	Charpy	-7.65	3.66	24.09	5.73E+18	1.61E+19	8.77E-03
A1	2CE3	Charpy	-7.65	3.66	23.09	6.05E+18	1.71E+19	9.27E-03
A1	2CE4	Charpy	-7.65	3.66	22.09	6.36E+18	1.80E+19	9.75E-03
A1	2CE5	Charpy	-7.65	3.66	21.09	6.66E+18	1.89E+19	1.02E-02
A1	2CE6	Charpy	-6.65	3.66	26.09	5.36E+18	1.50E+19	8.19E-03
A1	2CE7	Charpy	-6.65	3.66	25.09	5.72E+18	1.61E+19	8.75E-03
A1	2CE8	Charpy	-6.65	3.66	24.09	6.07E+18	1.72E+19	9.29E-03
A1	2CE9	Charpy	-6.65	3.66	23.09	6.40E+18	1.82E+19	9.82E-03
A1	2CE10	Charpy	-6.65	3.66	22.09	6.73E+18	1.92E+19	1.03E-02
A1	2CE11	Charpy	-6.65	3.66	21.09	7.05E+18	2.01E+19	1.08E-02
A1	MW9HD	1TCT	-7.44	3.45	17.53	7.96E+18	2.26E+19	1.22E-02
A1	MW9HB	1TCT	-10.03	3.45	17.53	6.66E+18	1.85E+19	1.02E-02
B1	MW15AJ1	Charpy	-5.00	3.66	26.09	5.81E+18	1.64E+19	8.88E-03
B1	MW15AI4	Charpy	-5.00	3.66	25.09	6.19E+18	1.76E+19	9.48E-03
B1	MW15AI5	Charpy	-5.00	3.66	24.09	6.57E+18	1.87E+19	1.01E-02
B1	MW15AG5	Charpy	-5.00	3.66	23.09	6.94E+18	1.98E+19	1.06E-02
B1	MW15AG1	Charpy	-5.00	3.66	22.09	7.29E+18	2.09E+19	1.12E-02
B1	MW15BF2	Charpy	-5.00	3.66	21.09	7.63E+18	2.19E+19	1.17E-02
B1	MW15BG3	Charpy	-4.00	3.66	26.09	6.05E+18	1.71E+19	9.25E-03
B1	MW15BI1	Charpy	-4.00	3.66	25.09	6.45E+18	1.83E+19	9.88E-03
B1	MW15AG3	Charpy	-4.00	3.66	24.09	6.85E+18	1.95E+19	1.05E-02
B1	MW15BI5	Charpy	-4.00	3.66	23.09	7.23E+18	2.07E+19	1.11E-02
B1	MW15AI2	Charpy	-4.00	3.66	22.09	7.60E+18	2.18E+19	1.17E-02
B1	MW15BJ2	Charpy	-4.00	3.66	21.09	7.95E+18	2.29E+19	1.22E-02
B1	02D17	Charpy	-2.91	3.66	26.09	6.29E+18	1.78E+19	9.62E-03
B1	02D18	Charpy	-2.91	3.66	25.09	6.71E+18	1.91E+19	1.03E-02
B1	02D19	Charpy	-2.91	3.66	24.09	7.12E+18	2.03E+19	1.09E-02
B1	02D20	Charpy	-2.91	3.66	23.09	7.52E+18	2.15E+19	1.15E-02
B1	02D23	Charpy	-2.91	3.66	22.09	7.90E+18	2.27E+19	1.21E-02
B1	02D25	Charpy	-2.91	3.66	21.09	8.27E+18	2.38E+19	1.27E-02
B1	MW11AJ3	Charpy	-1.82	3.66	26.09	6.50E+18	1.84E+19	9.94E-03
B1	MW15AF2	Charpy	-1.82	3.66	25.09	6.94E+18	1.97E+19	1.06E-02
B1	MW9AB4	Charpy	-1.82	3.66	24.09	7.36E+18	2.10E+19	1.13E-02
B1	MW9BA2	Charpy	-1.82	3.66	23.09	7.77E+18	2.22E+19	1.19E-02
B1	MW9BB4	Charpy	-1.82	3.66	22.09	8.17E+18	2.34E+19	1.25E-02
B1	MW9AB1	Charpy	-1.82	3.66	21.09	8.55E+18	2.46E+19	1.31E-02
B1	MW11BF5	Charpy	-0.82	3.66	26.09	6.68E+18	1.88E+19	1.02E-02
B1	MW11BG3	Charpy	-0.82	3.66	25.09	7.12E+18	2.02E+19	1.09E-02
B1	MW11BI2	Charpy	-0.82	3.66	24.09	7.56E+18	2.15E+19	1.16E-02
B1	MW11BI4	Charpy	-0.82	3.66	23.09	7.98E+18	2.28E+19	1.22E-02
B1	MW11BI5	Charpy	-0.82	3.66	22.09	8.38E+18	2.40E+19	1.29E-02
B1	MW11BJ1	Charpy	-0.82	3.66	21.09	8.78E+18	2.52E+19	1.35E-02
B1	MW11HB	1TCT	-1.62	3.45	17.53	1.02E+19	2.91E+19	1.56E-02
B1	MW11HD	1TCT	-4.21	3.45	17.53	9.33E+18	2.67E+19	1.43E-02
C1	2DD5	Charpy	0.82	3.66	25.91	6.99E+18	1.96E+19	1.07E-02
C1	2DD6	Charpy	0.82	3.66	24.91	7.45E+18	2.10E+19	1.14E-02
C1	2DD8	Charpy	0.82	3.66	23.91	7.90E+18	2.24E+19	1.21E-02

Table 2. (continued)

Specimen			Coordinates			Fluence		
Block	ID	Type	X (cm)	Y (cm)	Z (cm)	(E > 1 MeV) (cm^{-2})	(E > 0.1 MeV) (cm^{-2})	dpa
C1	2DD11	Charpy	0.82	3.66	22.91	8.33E+18	2.37E+19	1.28E-02
C1	2DD12	Charpy	0.82	3.66	21.91	8.75E+18	2.49E+19	1.34E-02
C1	2DE10	Charpy	0.82	3.66	20.91	9.15E+18	2.61E+19	1.40E-02
C1	4D310	Charpy	0.82	3.66	19.91	9.54E+18	2.73E+19	1.46E-02
C1	4D311	Charpy	0.82	3.66	18.91	9.91E+18	2.84E+19	1.52E-02
C1	4D312	Charpy	0.82	3.66	17.91	1.03E+19	2.95E+19	1.58E-02
C1	4D313	Charpy	0.82	3.66	16.91	1.06E+19	3.05E+19	1.63E-02
C1	4D314	Charpy	0.82	3.66	15.91	1.09E+19	3.14E+19	1.68E-02
C1	4D315	Charpy	0.82	3.66	14.91	1.12E+19	3.23E+19	1.73E-02
C1	2DE12	Charpy	1.82	3.66	25.91	7.10E+18	1.99E+19	1.08E-02
C1	2CE12	Charpy	1.82	3.66	24.91	7.57E+18	2.13E+19	1.15E-02
C1	2DD0	Charpy	1.82	3.66	23.91	8.02E+18	2.26E+19	1.22E-02
C1	2DD1	Charpy	1.82	3.66	22.91	8.46E+18	2.39E+19	1.29E-02
C1	2DD2	Charpy	1.82	3.66	21.91	8.89E+18	2.52E+19	1.36E-02
C1	2DD4	Charpy	1.82	3.66	20.91	9.29E+18	2.64E+19	1.42E-02
C1	4D316	Charpy	1.82	3.66	19.91	9.69E+18	2.76E+19	1.48E-02
C1	2B120	Charpy	1.82	3.66	18.91	1.01E+19	2.87E+19	1.54E-02
C1	2B121	Charpy	1.82	3.66	17.91	1.04E+19	2.98E+19	1.60E-02
C1	2B122	Charpy	1.82	3.66	16.91	1.08E+19	3.08E+19	1.65E-02
C1	2B123	Charpy	1.82	3.66	15.91	1.11E+19	3.18E+19	1.70E-02
C1	2B124	Charpy	1.82	3.66	14.91	1.14E+19	3.27E+19	1.75E-02
C1	02D35	Charpy	2.91	3.66	25.91	7.19E+18	2.00E+19	1.09E-02
C1	02D36	Charpy	2.91	3.66	24.91	7.66E+18	2.14E+19	1.17E-02
C1	02D38	Charpy	2.91	3.66	23.91	8.12E+18	2.28E+19	1.24E-02
C1	02D40	Charpy	2.91	3.66	22.91	8.57E+18	2.41E+19	1.31E-02
C1	02D41	Charpy	2.91	3.66	21.91	9.00E+18	2.54E+19	1.37E-02
C1	02D42	Charpy	2.91	3.66	20.91	9.41E+18	2.66E+19	1.44E-02
C1	MW9AE1	Charpy	2.91	3.66	19.91	9.81E+18	2.78E+19	1.50E-02
C1	MW9AE2	Charpy	2.91	3.66	18.91	1.02E+19	2.90E+19	1.56E-02
C1	MW9AE3	Charpy	2.91	3.66	17.91	1.06E+19	3.00E+19	1.62E-02
C1	MW9AE4	Charpy	2.91	3.66	16.91	1.09E+19	3.11E+19	1.67E-02
C1	MW9AE5	Charpy	2.91	3.66	15.91	1.12E+19	3.20E+19	1.72E-02
C1	MW9BD1	Charpy	2.91	3.66	14.91	1.15E+19	3.30E+19	1.77E-02
C1	WC07A	Charpy	4.00	3.66	25.91	7.25E+18	2.00E+19	1.10E-02
C1	WC07B	Charpy	4.00	3.66	24.91	7.73E+18	2.15E+19	1.17E-02
C1	WC07C	Charpy	4.00	3.66	23.91	8.19E+18	2.28E+19	1.24E-02
C1	GC44	Charpy	4.00	3.66	22.91	8.64E+18	2.42E+19	1.31E-02
C1	HC42	Charpy	4.00	3.66	21.91	9.07E+18	2.54E+19	1.38E-02
C1	NC34CF1	Charpy	4.00	3.66	20.91	9.49E+18	2.67E+19	1.45E-02
C1	NC34CF3	Charpy	4.00	3.66	19.91	9.89E+18	2.79E+19	1.51E-02
C1	NC34CF5	Charpy	4.00	3.66	18.91	1.03E+19	2.90E+19	1.57E-02
C1	NC34DF2	Charpy	4.00	3.66	17.91	1.06E+19	3.01E+19	1.63E-02
C1	NC34DF5	Charpy	4.00	3.66	16.91	1.10E+19	3.11E+19	1.68E-02
C1	NC34HI5	Charpy	4.00	3.66	15.91	1.13E+19	3.21E+19	1.73E-02
C1	NC34JI1	Charpy	4.00	3.66	14.91	1.16E+19	3.30E+19	1.78E-02
C1	WC06A	Charpy	5.00	3.66	25.91	7.28E+18	2.00E+19	1.10E-02
C1	WC07D	Charpy	5.00	3.66	24.91	7.75E+18	2.14E+19	1.17E-02
C1	WC06C	Charpy	5.00	3.66	23.91	8.22E+18	2.28E+19	1.25E-02
C1	WC06D	Charpy	5.00	3.66	22.91	8.67E+18	2.41E+19	1.32E-02
C1	NC34JI2	Charpy	5.00	3.66	21.91	9.10E+18	2.54E+19	1.38E-02
C1	NC34JI3	Charpy	5.00	3.66	20.91	9.52E+18	2.66E+19	1.45E-02
C1	NC34JI4	Charpy	5.00	3.66	19.91	9.93E+18	2.78E+19	1.51E-02
C1	NC34JI5	Charpy	5.00	3.66	18.91	1.03E+19	2.89E+19	1.57E-02
C1	NC34BH2	Charpy	5.00	3.66	17.91	1.07E+19	3.00E+19	1.63E-02

Table 2. (continued)

Specimen			Coordinates			Fluence		
Block	ID	Type	X (cm)	Y (cm)	Z (cm)	(E > 1 MeV) (cm^{-2})	(E > 0.1 MeV) (cm^{-2})	dpa
C1	NC34BB5	Charpy	5.00	3.66	16.91	1.10E+19	3.10E+19	1.68E-02
C1	NC34BE5	Charpy	5.00	3.66	15.91	1.14E+19	3.20E+19	1.73E-02
C1	NC34BE3	Charpy	5.00	3.66	14.91	1.17E+19	3.29E+19	1.78E-02
D1	HFA12	Charpy	6.65	3.66	26.09	7.17E+18	1.94E+19	1.08E-02
D1	HFA13	Charpy	6.65	3.66	25.09	7.65E+18	2.08E+19	1.15E-02
D1	HFA14	Charpy	6.65	3.66	24.09	8.12E+18	2.22E+19	1.22E-02
D1	HFA15	Charpy	6.65	3.66	23.09	8.57E+18	2.35E+19	1.29E-02
D1	HFA16	Charpy	6.65	3.66	22.09	9.01E+18	2.47E+19	1.36E-02
D1	HFA17	Charpy	6.65	3.66	21.09	9.43E+18	2.60E+19	1.43E-02
D1	HFA18	Charpy	7.65	3.66	26.09	7.13E+18	1.91E+19	1.07E-02
D1	HFA19	Charpy	7.65	3.66	25.09	7.61E+18	2.05E+19	1.14E-02
D1	HFA20	Charpy	7.65	3.66	24.09	8.07E+18	2.18E+19	1.21E-02
D1	HFA21	Charpy	7.65	3.66	23.09	8.52E+18	2.31E+19	1.28E-02
D1	HFA22	Charpy	7.65	3.66	22.09	8.96E+18	2.44E+19	1.35E-02
D1	HFA23	Charpy	7.65	3.66	21.09	9.38E+18	2.56E+19	1.41E-02
D1	NC31AE4	Charpy	8.74	3.66	26.09	7.06E+18	1.87E+19	1.05E-02
D1	NC31BE4	Charpy	8.74	3.66	25.09	7.53E+18	2.00E+19	1.13E-02
D1	NC31DF1	Charpy	8.74	3.66	24.09	7.99E+18	2.13E+19	1.20E-02
D1	NC31DF3	Charpy	8.74	3.66	23.09	8.43E+18	2.26E+19	1.26E-02
D1	NC31DF5	Charpy	8.74	3.66	22.09	8.86E+18	2.38E+19	1.33E-02
D1	NC31AA3	Charpy	8.74	3.66	21.09	9.28E+18	2.50E+19	1.39E-02
D1	FTLB10	Charpy	9.83	3.66	26.09	6.95E+18	1.82E+19	1.03E-02
D1	FTLB09	Charpy	9.83	3.66	25.09	7.42E+18	1.95E+19	1.10E-02
D1	FTLB08	Charpy	9.83	3.66	24.09	7.87E+18	2.07E+19	1.17E-02
D1	FTLB05	Charpy	9.83	3.66	23.09	8.31E+18	2.20E+19	1.24E-02
D1	FTLB03	Charpy	9.83	3.66	22.09	8.73E+18	2.32E+19	1.30E-02
D1	FTLB02	Charpy	9.83	3.66	21.09	9.14E+18	2.43E+19	1.37E-02
D1	FTLB16	Charpy	10.83	3.66	26.09	6.83E+18	1.76E+19	1.01E-02
D1	FTLB15	Charpy	10.83	3.66	25.09	7.29E+18	1.89E+19	1.08E-02
D1	FTLB14	Charpy	10.83	3.66	24.09	7.73E+18	2.01E+19	1.15E-02
D1	FTLB13	Charpy	10.83	3.66	23.09	8.16E+18	2.13E+19	1.21E-02
D1	FTLB12	Charpy	10.83	3.66	22.09	8.58E+18	2.24E+19	1.28E-02
D1	FTLB11	Charpy	10.83	3.66	21.09	8.98E+18	2.35E+19	1.34E-02
D1	MW9HC	1TCT	7.44	3.45	17.53	1.11E+19	3.02E+19	1.67E-02
D1	MW9OD	1TCT	10.03	3.45	17.53	1.08E+19	2.84E+19	1.61E-02
A2	MW9ID	1TCT	-8.27	3.45	12.50	8.62E+18	2.45E+19	1.32E-02
A2	MW11KD	1TCT	-8.27	3.45	9.96	9.02E+18	2.56E+19	1.38E-02
A2	MW9IC	1TCT	-8.27	3.45	7.42	9.31E+18	2.65E+19	1.43E-02
A2	MW11KC	1TCT	-8.27	3.45	4.88	9.49E+18	2.70E+19	1.46E-02
A2	MW9JB	1TCT	-8.27	3.45	2.34	9.57E+18	2.73E+19	1.47E-02

Table 2. (continued)

Specimen			Coordinates			Fluence		
Block	ID	Type	X (cm)	Y (cm)	Z (cm)	(E > 1 MeV) (cm^{-2})	(E > 0.1 MeV) (cm^{-2})	dpa
B2	MW9JA	1TCT	-2.16	3.45	12.50	1.14E+19	3.29E+19	1.76E-02
B2	MW11IC	1TCT	-2.16	3.45	9.96	1.19E+19	3.44E+19	1.84E-02
B2	MW9JC	1TCT	-2.16	3.45	7.42	1.23E+19	3.56E+19	1.90E-02
B2	MW11ID	1TCT	-2.16	3.45	4.88	1.26E+19	3.63E+19	1.94E-02
B2	MW9KB	1TCT	-2.16	3.45	2.34	1.27E+19	3.66E+19	1.95E-02
C2	NC31AA2	Charpy	2.04	3.66	12.57	1.20E+19	3.47E+19	1.85E-02
C2	NC31AA4	Charpy	2.04	3.66	11.57	1.23E+19	3.54E+19	1.89E-02
C2	NC31AB1	Charpy	2.04	3.66	10.57	1.25E+19	3.60E+19	1.92E-02
C2	NC31AB2	Charpy	2.04	3.66	9.57	1.27E+19	3.66E+19	1.95E-02
C2	NC31AB3	Charpy	2.04	3.66	8.57	1.29E+19	3.71E+19	1.98E-02
C2	NC31AB5	Charpy	2.04	3.66	7.57	1.30E+19	3.75E+19	2.00E-02
C2	NC31AF4	Charpy	2.04	3.66	6.57	1.31E+19	3.79E+19	2.02E-02
C2	NC31AH2	Charpy	2.04	3.66	5.57	1.32E+19	3.82E+19	2.04E-02
C2	NC31AH4	Charpy	2.04	3.66	4.57	1.33E+19	3.84E+19	2.05E-02
C2	NC31BA2	Charpy	2.04	3.66	3.57	1.34E+19	3.86E+19	2.06E-02
C2	NC31BB3	Charpy	2.04	3.66	2.57	1.34E+19	3.87E+19	2.06E-02
C2	NC31BB4	Charpy	2.04	3.66	1.57	1.34E+19	3.87E+19	2.06E-02
C2	NC31DF4	Charpy	3.04	3.66	12.57	1.22E+19	3.49E+19	1.87E-02
C2	2DE0	Charpy	3.04	3.66	11.57	1.24E+19	3.56E+19	1.91E-02
C2	NC34AA5	Charpy	3.04	3.66	10.57	1.26E+19	3.62E+19	1.94E-02
C2	2DE2	Charpy	3.04	3.66	9.57	1.28E+19	3.68E+19	1.97E-02
C2	NC34BH4	Charpy	3.04	3.66	8.57	1.30E+19	3.73E+19	2.00E-02
C2	2DE1	Charpy	3.04	3.66	7.57	1.31E+19	3.78E+19	2.02E-02
C2	NC34CF4	Charpy	3.04	3.66	6.57	1.33E+19	3.81E+19	2.04E-02
C2	2DE3	Charpy	3.04	3.66	5.57	1.34E+19	3.84E+19	2.05E-02
C2	NC34AA1	Charpy	3.04	3.66	4.57	1.34E+19	3.87E+19	2.07E-02
C2	2DE4	Charpy	3.04	3.66	3.57	1.35E+19	3.88E+19	2.07E-02
C2	MW11BF4	Charpy	3.04	3.66	2.57	1.35E+19	3.89E+19	2.08E-02
C2	NC34BB4	Charpy	3.04	3.66	1.57	1.35E+19	3.90E+19	2.08E-02
C2	MW9AC1	Charpy	4.04	3.66	12.57	1.23E+19	3.49E+19	1.88E-02
C2	MW9AC2	Charpy	4.04	3.66	11.57	1.25E+19	3.56E+19	1.91E-02
C2	MW9AC3	Charpy	4.04	3.66	10.57	1.27E+19	3.63E+19	1.95E-02
C2	MW9AC4	Charpy	4.04	3.66	9.57	1.29E+19	3.68E+19	1.98E-02
C2	MW9AC5	Charpy	4.04	3.66	8.57	1.31E+19	3.74E+19	2.01E-02
C2	MW9AI1	Charpy	4.04	3.66	7.57	1.32E+19	3.78E+19	2.03E-02
C2	MW9AI2	Charpy	4.04	3.66	6.57	1.34E+19	3.82E+19	2.05E-02
C2	MW9AI3	Charpy	4.04	3.66	5.57	1.35E+19	3.85E+19	2.06E-02
C2	MW9AI4	Charpy	4.04	3.66	4.57	1.35E+19	3.87E+19	2.08E-02
C2	MW9AI5	Charpy	4.04	3.66	3.57	1.36E+19	3.89E+19	2.09E-02
C2	MW9BF2	Charpy	4.04	3.66	2.57	1.36E+19	3.90E+19	2.09E-02
C2	MW9BF5	Charpy	4.04	3.66	1.57	1.36E+19	3.90E+19	2.09E-02
D2	72PH13	1/2T-CT	6.74	2.82	13.14	1.38E+19	3.69E+19	2.07E-02
D2	73QH04	1/2T-CT	6.74	2.82	11.87	1.42E+19	3.79E+19	2.13E-02
D2	72PH05	1/2T-CT	6.74	2.82	10.60	1.45E+19	3.88E+19	2.17E-02
D2	73QH05	1/2T-CT	6.74	2.82	9.33	1.48E+19	3.96E+19	2.22E-02
D2	MW9HEA	1/2T-CT	6.74	2.82	8.06	1.50E+19	4.02E+19	2.25E-02
D2	MW11LFB	1/2T-CT	6.74	2.82	6.79	1.52E+19	4.08E+19	2.28E-02
D2	MW9LEB	1/2T-CT	6.74	2.82	5.52	1.54E+19	4.12E+19	2.31E-02
D2	MW11JFB	1/2T-CT	6.74	2.82	4.25	1.55E+19	4.15E+19	2.32E-02
D2	MW9HFA	1/2T-CT	6.74	2.82	2.98	1.55E+19	4.17E+19	2.33E-02
D2	MW11KFAB	1/2T-CT	6.74	2.82	1.71	1.56E+19	4.18E+19	2.34E-02
D2	72PH10	1/2T-CT	6.74	5.36	13.14	9.34E+18	2.84E+19	1.46E-02
D2	73QH03	1/2T-CT	6.74	5.36	11.87	9.58E+18	2.91E+19	1.50E-02
D2	72PH04	1/2T-CT	6.74	5.36	10.60	9.79E+18	2.98E+19	1.53E-02

Table 2. (continued)

Specimen			Coordinates			Fluence		
Block	ID	Type	X (cm)	Y (cm)	Z (cm)	(E > 1 MeV) (cm^{-2})	(E > 0.1 MeV) (cm^{-2})	dpa
D2	73QH12	1/2T-CT	6.74	5.36	9.33	9.98E+18	3.04E+19	1.56E-02
D2	MW11HEB	1/2T-CT	6.74	5.36	8.06	1.01E+19	3.09E+19	1.59E-02
D2	MW9IEA	1/2T-CT	6.74	5.36	6.79	1.03E+19	3.13E+19	1.61E-02
D2	MW11MCA	1/2T-CT	6.74	5.36	5.52	1.04E+19	3.17E+19	1.63E-02
D2	MW9KFB	1/2T-CT	6.74	5.36	4.25	1.04E+19	3.19E+19	1.64E-02
D2	MW11HFB	1/2T-CT	6.74	5.36	2.98	1.05E+19	3.20E+19	1.64E-02
D2	MW9JEA	1/2T-CT	6.74	5.36	1.71	1.05E+19	3.21E+19	1.65E-02
D2	72PH09	1/2T-CT	9.80	2.82	13.14	1.34E+19	3.46E+19	1.99E-02
D2	73QH02	1/2T-CT	9.80	2.82	11.87	1.38E+19	3.55E+19	2.04E-02
D2	72PH08	1/2T-CT	9.80	2.82	10.60	1.41E+19	3.64E+19	2.09E-02
D2	73QH14	1/2T-CT	9.80	2.82	9.33	1.43E+19	3.71E+19	2.13E-02
D2	MW9CEA	1/2T-CT	9.80	2.82	8.06	1.46E+19	3.77E+19	2.16E-02
D2	MW11LEB	1/2T-CT	9.80	2.82	6.79	1.48E+19	3.82E+19	2.19E-02
D2	MW9IFA	1/2T-CT	9.80	2.82	5.52	1.49E+19	3.86E+19	2.21E-02
D2	MW11IFB	1/2T-CT	9.80	2.82	4.25	1.50E+19	3.89E+19	2.23E-02
D2	MW9LFA	1/2T-CT	9.80	2.82	2.98	1.51E+19	3.91E+19	2.24E-02
D2	MW11MDB	1/2T-CT	9.80	2.82	1.71	1.51E+19	3.91E+19	2.24E-02
D2	73QH11	1/2T-CT	9.80	5.36	13.14	9.05E+18	2.66E+19	1.40E-02
D2	72PH14	1/2T-CT	9.80	5.36	11.87	9.29E+18	2.73E+19	1.44E-02
D2	73QH10	1/2T-CT	9.80	5.36	10.6	9.50E+18	2.79E+19	1.47E-02
D2	72PH07	1/2T-CT	9.80	5.36	9.33	9.68E+18	2.85E+19	1.50E-02
D2	MW9OFA	1/2T-CT	9.80	5.36	8.06	9.84E+18	2.90E+19	1.52E-02
D2	MW11JFA	1/2T-CT	9.80	5.36	6.79	9.96E+18	2.94E+19	1.54E-02
D2	MW9JFB	1/2T-CT	9.80	5.36	5.52	1.01E+19	2.97E+19	1.56E-02
D2	MW11HEA	1/2T-CT	9.80	5.36	4.25	1.01E+19	2.99E+19	1.57E-02
D2	MW9JEB	1/2T-CT	9.80	5.36	2.98	1.02E+19	3.00E+19	1.58E-02
D2	MW9HEB	1/2T-CT	9.80	5.36	1.71	1.02E+19	3.01E+19	1.58E-02
A3	MW9LA	1TCT	-8.27	3.45	-0.89	9.52E+18	2.71E+19	1.46E-02
A3	MW9LC	1TCT	-8.27	3.45	-3.43	9.35E+18	2.66E+19	1.44E-02
A3	MW11JA	1TCT	-8.27	3.45	-5.97	9.08E+18	2.58E+19	1.39E-02
A3	MW11JD	1TCT	-8.27	3.45	-8.51	8.71E+18	2.47E+19	1.34E-02
A3	MW9LD	1TCT	-8.27	3.45	-11.05	8.24E+18	2.33E+19	1.26E-02
B3	MW9KD	1TCT	-2.16	3.45	-0.89	1.26E+19	3.64E+19	1.94E-02
B3	MW9KC	1TCT	-2.16	3.45	-3.43	1.24E+19	3.58E+19	1.91E-02
B3	MW11LC	1TCT	-2.16	3.45	-5.97	1.20E+19	3.47E+19	1.85E-02
B3	MW9LB	1TCT	-2.16	3.45	-8.51	1.15E+19	3.32E+19	1.77E-02
B3	MW11LB	1TCT	-2.16	3.45	-11.05	1.09E+19	3.13E+19	1.68E-02
C3	NC31BB5	Charpy	2.04	3.66	-0.07	1.34E+19	3.86E+19	2.06E-02
C3	NC31BF1	Charpy	2.04	3.66	-1.07	1.33E+19	3.84E+19	2.05E-02
C3	NC34BB2	Charpy	2.04	3.66	-2.07	1.32E+19	3.82E+19	2.04E-02
C3	NC34BF4	Charpy	2.04	3.66	-3.07	1.31E+19	3.79E+19	2.02E-02
C3	NC34BF5	Charpy	2.04	3.66	-4.07	1.30E+19	3.75E+19	2.00E-02
C3	NC34BH1	Charpy	2.04	3.66	-5.07	1.29E+19	3.71E+19	1.98E-02
C3	NC34AB2	Charpy	2.04	3.66	-6.07	1.27E+19	3.66E+19	1.95E-02
C3	NC34AB4	Charpy	2.04	3.66	-7.07	1.25E+19	3.60E+19	1.92E-02
C3	NC34AE4	Charpy	2.04	3.66	-8.07	1.23E+19	3.54E+19	1.89E-02
C3	NC34AE5	Charpy	2.04	3.66	-9.07	1.20E+19	3.47E+19	1.85E-02
C3	NC34AF1	Charpy	2.04	3.66	-10.07	1.18E+19	3.39E+19	1.81E-02
C3	NC34AF2	Charpy	2.04	3.66	-11.07	1.15E+19	3.31E+19	1.77E-02
C3	NC31BA4	Charpy	3.04	3.66	-0.07	1.35E+19	3.88E+19	2.07E-02
C3	2DE5	Charpy	3.04	3.66	-1.07	1.34E+19	3.87E+19	2.07E-02
C3	NC31BB1	Charpy	3.04	3.66	-2.07	1.34E+19	3.84E+19	2.05E-02

Table 2. (continued)

Specimen			Coordinates			Fluence		
Block	ID	Type	X (cm)	Y (cm)	Z (cm)	(E > 1 MeV) (cm^{-2})	(E > 0.1 MeV) (cm^{-2})	dpa
C3	2DE6	Charpy	3.04	3.66	-3.07	1.33E+19	3.81E+19	2.04E-02
C3	NC31BH3	Charpy	3.04	3.66	-4.07	1.31E+19	3.78E+19	2.02E-02
C3	2DE7	Charpy	3.04	3.66	-5.07	1.30E+19	3.73E+19	2.00E-02
C3	NC34BE1	Charpy	3.04	3.66	-6.07	1.28E+19	3.68E+19	1.97E-02
C3	2DE8	Charpy	3.04	3.66	-7.07	1.26E+19	3.62E+19	1.94E-02
C3	NC31BH5	Charpy	3.04	3.66	-8.07	1.24E+19	3.56E+19	1.91E-02
C3	2DE9	Charpy	3.04	3.66	-9.07	1.22E+19	3.49E+19	1.87E-02
C3	MW11BF1	Charpy	3.04	3.66	-10.07	1.19E+19	3.41E+19	1.83E-02
C3	NC31BF3	Charpy	3.04	3.66	-11.07	1.16E+19	3.33E+19	1.78E-02
C3	MW9BJ1	Charpy	4.04	3.66	-0.07	1.36E+19	3.89E+19	2.09E-02
C3	MW11AA2	Charpy	4.04	3.66	-1.07	1.35E+19	3.87E+19	2.08E-02
C3	MW11AA3	Charpy	4.04	3.66	-2.07	1.35E+19	3.85E+19	2.06E-02
C3	MW11AB2	Charpy	4.04	3.66	-3.07	1.34E+19	3.82E+19	2.05E-02
C3	MW11AB4	Charpy	4.04	3.66	-4.07	1.32E+19	3.78E+19	2.03E-02
C3	MW11AF5	Charpy	4.04	3.66	-5.07	1.31E+19	3.74E+19	2.01E-02
C3	MW11AG4	Charpy	4.04	3.66	-6.07	1.29E+19	3.69E+19	1.98E-02
C3	MW11AG5	Charpy	4.04	3.66	-7.07	1.27E+19	3.63E+19	1.95E-02
C3	MW11AJ2	Charpy	4.04	3.66	-8.07	1.25E+19	3.56E+19	1.91E-02
C3	MW11BB1	Charpy	4.04	3.66	-9.07	1.23E+19	3.49E+19	1.88E-02
C3	MW11BB4	Charpy	4.04	3.66	-10.07	1.20E+19	3.42E+19	1.84E-02
C3	MW11BB5	Charpy	4.04	3.66	-11.07	1.17E+19	3.33E+19	1.79E-02
D3	MW11LD	1TCT	8.27	3.45	-0.89	1.39E+19	3.78E+19	2.09E-02
D3	MW9NC	1TCT	8.27	3.45	-3.43	1.36E+19	3.71E+19	2.06E-02
D3	MW9NA	1TCT	8.27	3.45	-5.97	1.32E+19	3.60E+19	1.99E-02
D3	MW11JC	1TCT	8.27	3.45	-8.51	1.27E+19	3.45E+19	1.91E-02
D3	MW9NB	1TCT	8.27	3.45	-11.05	1.20E+19	3.25E+19	1.81E-02
A4	72WP214	Charpy	-10.83	3.66	-19.59	4.78E+18	1.32E+19	7.27E-03
A4	72WP215	Charpy	-10.83	3.66	-20.59	4.53E+18	1.24E+19	6.88E-03
A4	72WP216	Charpy	-10.83	3.66	-21.59	4.27E+18	1.17E+19	6.48E-03
A4	72WP217	Charpy	-10.83	3.66	-22.59	4.00E+18	1.09E+19	6.06E-03
A4	72WP218	Charpy	-10.83	3.66	-23.59	3.73E+18	1.01E+19	5.64E-03
A4	72WP219	Charpy	-10.83	3.66	-24.59	3.45E+18	9.28E+18	5.20E-03
A4	72WP220	Charpy	-9.83	3.66	-19.59	5.20E+18	1.45E+19	7.94E-03
A4	72WP221	Charpy	-9.83	3.66	-20.59	4.93E+18	1.37E+19	7.51E-03
A4	72WP222	Charpy	-9.83	3.66	-21.59	4.65E+18	1.28E+19	7.07E-03
A4	72WP223	Charpy	-9.83	3.66	-22.59	4.35E+18	1.20E+19	6.61E-03
A4	72WP224	Charpy	-9.83	3.66	-23.59	4.06E+18	1.11E+19	6.15E-03
A4	72WP225	Charpy	-9.83	3.66	-24.59	3.75E+18	1.02E+19	5.67E-03
A4	02D09	Charpy	-8.74	3.66	-19.59	5.64E+18	1.58E+19	8.62E-03
A4	02D10	Charpy	-8.74	3.66	-20.59	5.34E+18	1.50E+19	8.16E-03
A4	02D11	Charpy	-8.74	3.66	-21.59	5.03E+18	1.40E+19	7.68E-03
A4	02D12	Charpy	-8.74	3.66	-22.59	4.72E+18	1.31E+19	7.18E-03
A4	02D14	Charpy	-8.74	3.66	-23.59	4.39E+18	1.22E+19	6.68E-03
A4	02D16	Charpy	-8.74	3.66	-24.59	4.06E+18	1.12E+19	6.16E-03
A4	72WP226	Charpy	-7.65	3.66	-19.59	6.05E+18	1.71E+19	9.27E-03
A4	72WP227	Charpy	-7.65	3.66	-20.59	5.73E+18	1.62E+19	8.77E-03
A4	72WP228	Charpy	-7.65	3.66	-21.59	5.40E+18	1.52E+19	8.25E-03
A4	72WP229	Charpy	-7.65	3.66	-22.59	5.06E+18	1.42E+19	7.72E-03
A4	72WP230	Charpy	-7.65	3.66	-23.59	4.71E+18	1.31E+19	7.18E-03
A4	73WP5	Charpy	-7.65	3.66	-24.59	4.36E+18	1.21E+19	6.62E-03
A4	73WP6	Charpy	-6.65	3.66	-19.59	6.40E+18	1.82E+19	9.82E-03
A4	73WN16	Charpy	-6.65	3.66	-20.59	6.07E+18	1.72E+19	9.29E-03

Table 2. (continued)

Specimen			Coordinates			Fluence		
Block	ID	Type	X (cm)	Y (cm)	Z (cm)	(E > 1 MeV) (cm^{-2})	(E > 0.1 MeV) (cm^{-2})	dpa
A4	73WF311	Charpy	-6.65	3.66	-21.59	5.72E+18	1.62E+19	8.75E-03
A4	73WF312	Charpy	-6.65	3.66	-22.59	5.36E+18	1.51E+19	8.19E-03
A4	73WF313	Charpy	-6.65	3.66	-23.59	4.99E+18	1.40E+19	7.61E-03
A4	73WF314	Charpy	-6.65	3.66	-24.59	4.61E+18	1.28E+19	7.02E-03
A4	MW11HA	1TCT	-7.44	3.45	-16.03	7.42E+18	2.10E+19	1.14E-02
A4	MW9OC	1TCT	-10.03	3.45	-16.03	6.20E+18	1.72E+19	9.45E-03
B4	02D05	Charpy	-5.00	3.66	-19.59	6.94E+18	1.98E+19	1.07E-02
B4	02D07	Charpy	-5.00	3.66	-20.59	6.57E+18	1.87E+19	1.01E-02
B4	02D13	Charpy	-5.00	3.66	-21.59	6.19E+18	1.76E+19	9.49E-03
B4	02D15	Charpy	-5.00	3.66	-22.59	5.81E+18	1.64E+19	8.88E-03
B4	02D21	Charpy	-5.00	3.66	-23.59	5.41E+18	1.52E+19	8.25E-03
B4	02D22	Charpy	-5.00	3.66	-24.59	5.00E+18	1.40E+19	7.61E-03
B4	02D24	Charpy	-4.00	3.66	-19.59	7.23E+18	2.07E+19	1.11E-02
B4	02D29	Charpy	-4.00	3.66	-20.59	6.85E+18	1.95E+19	1.05E-02
B4	02D31	Charpy	-4.00	3.66	-21.59	6.45E+18	1.84E+19	9.89E-03
B4	02D32	Charpy	-4.00	3.66	-22.59	6.05E+18	1.71E+19	9.25E-03
B4	02D37	Charpy	-4.00	3.66	-23.59	5.63E+18	1.59E+19	8.60E-03
B4	02D39	Charpy	-4.00	3.66	-24.59	5.21E+18	1.46E+19	7.94E-03
B4	02D26	Charpy	-2.91	3.66	-19.59	7.52E+18	2.15E+19	1.15E-02
B4	02D27	Charpy	-2.91	3.66	-20.59	7.12E+18	2.03E+19	1.09E-02
B4	02D28	Charpy	-2.91	3.66	-21.59	6.71E+18	1.91E+19	1.03E-02
B4	02D30	Charpy	-2.91	3.66	-22.59	6.29E+18	1.78E+19	9.62E-03
B4	02D33	Charpy	-2.91	3.66	-23.59	5.86E+18	1.65E+19	8.94E-03
B4	02D34	Charpy	-2.91	3.66	-24.59	5.42E+18	1.52E+19	8.25E-03
B4	02D45	Charpy	-1.82	3.66	-19.59	7.77E+18	2.22E+19	1.19E-02
B4	02D47	Charpy	-1.82	3.66	-20.59	7.36E+18	2.10E+19	1.13E-02
B4	02D48	Charpy	-1.82	3.66	-21.59	6.94E+18	1.97E+19	1.06E-02
B4	WC12C	Charpy	-1.82	3.66	-22.59	6.50E+18	1.84E+19	9.94E-03
B4	WC14A	Charpy	-1.82	3.66	-23.59	6.06E+18	1.71E+19	9.24E-03
B4	WC14B	Charpy	-1.82	3.66	-24.59	5.60E+18	1.57E+19	8.53E-03
B4	WC12D	Charpy	-0.82	3.66	-19.59	7.98E+18	2.28E+19	1.22E-02
B4	WC14D	Charpy	-0.82	3.66	-20.59	7.56E+18	2.15E+19	1.16E-02
B4	WC14E	Charpy	-0.82	3.66	-21.59	7.12E+18	2.02E+19	1.09E-02
B4	99A-5559	Charpy	-0.82	3.66	-22.59	6.68E+18	1.89E+19	1.02E-02
B4	99A-5560	Charpy	-0.82	3.66	-23.59	6.22E+18	1.75E+19	9.48E-03
B4	99A-5561	Charpy	-0.82	3.66	-24.59	5.75E+18	1.61E+19	8.74E-03
B4	MW9OB	1TCT	-1.62	3.45	-16.03	9.47E+18	2.70E+19	1.45E-02
B4	MW9CA	1TCT	-4.21	3.45	-16.03	8.69E+18	2.48E+19	1.33E-02
C4	73WF316	Charpy	0.82	3.66	-13.47	1.06E+19	3.05E+19	1.63E-02
C4	73WF319	Charpy	0.82	3.66	-14.47	1.02E+19	2.94E+19	1.57E-02
C4	73WF320	Charpy	0.82	3.66	-15.47	9.89E+18	2.84E+19	1.52E-02
C4	73WF321	Charpy	0.82	3.66	-16.47	9.52E+18	2.73E+19	1.46E-02
C4	73WF322	Charpy	0.82	3.66	-17.47	9.13E+18	2.61E+19	1.40E-02
C4	73WF323	Charpy	0.82	3.66	-18.47	8.72E+18	2.49E+19	1.34E-02
C4	73WF334	Charpy	0.82	3.66	-19.47	8.30E+18	2.36E+19	1.27E-02
C4	73WF337	Charpy	0.82	3.66	-20.47	7.87E+18	2.23E+19	1.20E-02
C4	73WF338	Charpy	0.82	3.66	-21.47	7.42E+18	2.10E+19	1.13E-02
C4	73WF339	Charpy	0.82	3.66	-22.47	6.96E+18	1.96E+19	1.06E-02
C4	73WF340	Charpy	0.82	3.66	-23.47	6.49E+18	1.82E+19	9.88E-03
C4	73WF353	Charpy	0.82	3.66	-24.47	6.01E+18	1.67E+19	9.12E-03

Table 2. (continued)

Specimen			Coordinates			Fluence		
Block	ID	Type	X (cm)	Y (cm)	Z (cm)	(E > 1 MeV) (cm^{-2})	(E > 0.1 MeV) (cm^{-2})	dpa
C4	73WF355	Charpy	1.82	3.66	-13.47	1.07E+19	3.08E+19	1.65E-02
C4	73WF356	Charpy	1.82	3.66	-14.47	1.04E+19	2.98E+19	1.60E-02
C4	73WF357	Charpy	1.82	3.66	-15.47	1.00E+19	2.87E+19	1.54E-02
C4	73WF358	Charpy	1.82	3.66	-16.47	9.66E+18	2.76E+19	1.48E-02
C4	73WF370	Charpy	1.82	3.66	-17.47	9.27E+18	2.64E+19	1.42E-02
C4	73W311	Charpy	1.82	3.66	-18.47	8.86E+18	2.52E+19	1.36E-02
C4	73W363	Charpy	1.82	3.66	-19.47	8.43E+18	2.39E+19	1.29E-02
C4	73W433	Charpy	1.82	3.66	-20.47	7.99E+18	2.26E+19	1.22E-02
C4	73W463	Charpy	1.82	3.66	-21.47	7.54E+18	2.12E+19	1.15E-02
C4	73W536	Charpy	1.82	3.66	-22.47	7.07E+18	1.98E+19	1.08E-02
C4	73W538	Charpy	1.82	3.66	-23.47	6.59E+18	1.84E+19	1.00E-02
C4	73W539	Charpy	1.82	3.66	-24.47	6.10E+18	1.69E+19	9.25E-03
C4	MW9BD2	Charpy	2.91	3.66	-13.47	1.09E+19	3.10E+19	1.67E-02
C4	MW9BD3	Charpy	2.91	3.66	-14.47	1.05E+19	3.00E+19	1.61E-02
C4	MW9BD4	Charpy	2.91	3.66	-15.47	1.02E+19	2.89E+19	1.56E-02
C4	MW9BD5	Charpy	2.91	3.66	-16.47	9.78E+18	2.78E+19	1.50E-02
C4	MW9CE1	Charpy	2.91	3.66	-17.47	9.39E+18	2.66E+19	1.43E-02
C4	MW9CE2	Charpy	2.91	3.66	-18.47	8.97E+18	2.54E+19	1.37E-02
C4	MW9CE3	Charpy	2.91	3.66	-19.47	8.54E+18	2.41E+19	1.30E-02
C4	MW9CE4	Charpy	2.91	3.66	-20.47	8.09E+18	2.27E+19	1.23E-02
C4	MW9CE5	Charpy	2.91	3.66	-21.47	7.63E+18	2.14E+19	1.16E-02
C4	NC31AF1	Charpy	2.91	3.66	-22.47	7.16E+18	2.00E+19	1.09E-02
C4	NC31AF3	Charpy	2.91	3.66	-23.47	6.67E+18	1.85E+19	1.01E-02
C4	NC31AE2	Charpy	2.91	3.66	-24.47	6.18E+18	1.70E+19	9.35E-03
C4	73W701	Charpy	4.00	3.66	-13.47	1.10E+19	3.11E+19	1.68E-02
C4	73W702	Charpy	4.00	3.66	-14.47	1.06E+19	3.01E+19	1.62E-02
C4	73W704	Charpy	4.00	3.66	-15.47	1.02E+19	2.90E+19	1.56E-02
C4	73W705	Charpy	4.00	3.66	-16.47	9.86E+18	2.78E+19	1.50E-02
C4	73W707	Charpy	4.00	3.66	-17.47	9.46E+18	2.66E+19	1.44E-02
C4	73W709	Charpy	4.00	3.66	-18.47	9.04E+18	2.54E+19	1.38E-02
C4	73W710	Charpy	4.00	3.66	-19.47	8.61E+18	2.41E+19	1.31E-02
C4	73W712	Charpy	4.00	3.66	-20.47	8.16E+18	2.28E+19	1.24E-02
C4	73W714	Charpy	4.00	3.66	-21.47	7.70E+18	2.14E+19	1.17E-02
C4	73W715	Charpy	4.00	3.66	-22.47	7.22E+18	2.00E+19	1.09E-02
C4	73W716	Charpy	4.00	3.66	-23.47	6.73E+18	1.86E+19	1.02E-02
C4	73W718	Charpy	4.00	3.66	-24.47	6.23E+18	1.71E+19	9.40E-03
C4	73W541	Charpy	5.00	3.66	-13.47	1.10E+19	3.10E+19	1.68E-02
C4	99-5528	Charpy	5.00	3.66	-14.47	1.07E+19	3.00E+19	1.62E-02
C4	99-5529	Charpy	5.00	3.66	-15.47	1.03E+19	2.89E+19	1.57E-02
C4	99-5530	Charpy	5.00	3.66	-16.47	9.90E+18	2.77E+19	1.51E-02
C4	99-5531	Charpy	5.00	3.66	-17.47	9.50E+18	2.65E+19	1.44E-02
C4	99-5532	Charpy	5.00	3.66	-18.47	9.08E+18	2.53E+19	1.38E-02
C4	99-5533	Charpy	5.00	3.66	-19.47	8.64E+18	2.40E+19	1.31E-02
C4	99-5534	Charpy	5.00	3.66	-20.47	8.19E+18	2.27E+19	1.24E-02
C4	99-5535	Charpy	5.00	3.66	-21.47	7.72E+18	2.13E+19	1.17E-02
C4	99-5536	Charpy	5.00	3.66	-22.47	7.25E+18	1.99E+19	1.10E-02
C4	99-5537	Charpy	5.00	3.66	-23.47	6.75E+18	1.85E+19	1.02E-02
C4	99-5638	Charpy	5.00	3.66	-24.47	6.25E+18	1.70E+19	9.41E-03
D4	WC08D	Charpy	6.65	3.66	-19.59	8.57E+18	2.35E+19	1.29E-02
D4	WC08C	Charpy	6.65	3.66	-20.59	8.12E+18	2.22E+19	1.22E-02
D4	WC08B	Charpy	6.65	3.66	-21.59	7.65E+18	2.09E+19	1.15E-02
D4	WC08A	Charpy	6.65	3.66	-22.59	7.17E+18	1.95E+19	1.08E-02
D4	WC12A	Charpy	6.65	3.66	-23.59	6.68E+18	1.80E+19	1.00E-02

Table 2. (continued)

Specimen			Coordinates			Fluence		
Block	ID	Type	X (cm)	Y (cm)	Z (cm)	(E > 1 MeV) (cm^{-2})	(E > 0.1 MeV) (cm^{-2})	dpa
D4	WC13D	Charpy	6.65	3.66	-24.59	6.18E+18	1.66E+19	9.26E-03
D4	WC06B	Charpy	7.65	3.66	-19.59	8.52E+18	2.32E+19	1.28E-02
D4	WC14C	Charpy	7.65	3.66	-20.59	8.07E+18	2.19E+19	1.21E-02
D4	WC12B	Charpy	7.65	3.66	-21.59	7.61E+18	2.05E+19	1.14E-02
D4	WC07E	Charpy	7.65	3.66	-22.59	7.13E+18	1.92E+19	1.07E-02
D4	WC08E	Charpy	7.65	3.66	-23.59	6.64E+18	1.78E+19	9.94E-03
D4	72WP201	Charpy	7.65	3.66	-24.59	6.14E+18	1.63E+19	9.17E-03
D4	NC34AH2	Charpy	8.74	3.66	-19.59	8.43E+18	2.26E+19	1.26E-02
D4	NC34AH4	Charpy	8.74	3.66	-20.59	7.99E+18	2.14E+19	1.20E-02
D4	NC34AH5	Charpy	8.74	3.66	-21.59	7.53E+18	2.01E+19	1.13E-02
D4	NC34BA5	Charpy	8.74	3.66	-22.59	7.06E+18	1.87E+19	1.05E-02
D4	NC34BF4	Charpy	8.74	3.66	-23.59	6.57E+18	1.74E+19	9.80E-03
D4	NC34DF3	Charpy	8.74	3.66	-24.59	6.08E+18	1.60E+19	9.04E-03
D4	72WP202	Charpy	9.83	3.66	-19.59	8.31E+18	2.20E+19	1.24E-02
D4	72WP203	Charpy	9.83	3.66	-20.59	7.87E+18	2.08E+19	1.17E-02
D4	72WP204	Charpy	9.83	3.66	-21.59	7.42E+18	1.95E+19	1.10E-02
D4	72WP205	Charpy	9.83	3.66	-22.59	6.95E+18	1.82E+19	1.03E-02
D4	72WP206	Charpy	9.83	3.66	-23.59	6.48E+18	1.69E+19	9.61E-03
D4	72WP207	Charpy	9.83	3.66	-24.59	5.99E+18	1.55E+19	8.86E-03
D4	72WP208	Charpy	10.83	3.66	-19.59	8.16E+18	2.13E+19	1.21E-02
D4	72WP209	Charpy	10.83	3.66	-20.59	7.73E+18	2.01E+19	1.15E-02
D4	72WP210	Charpy	10.83	3.66	-21.59	7.29E+18	1.89E+19	1.08E-02
D4	72WP211	Charpy	10.83	3.66	-22.59	6.83E+18	1.76E+19	1.01E-02
D4	72WP212	Charpy	10.83	3.66	-23.59	6.36E+18	1.64E+19	9.39E-03
D4	72WP213	Charpy	10.83	3.66	-24.59	5.88E+18	1.50E+19	8.67E-03
D4	MW11HC	1TCT	7.44	3.45	-16.03	1.03E+19	2.81E+19	1.56E-02
D4	MW9HA	1TCT	10.03	3.45	-16.03	1.00E+19	2.64E+19	1.50E-02

The most likely reason for the different fitting parameters obtained for the HSSI 10.0D and HSSI 10.05 capsules is the arrangement of dosimeters in the two capsules. The difference that appears to be most important is the inclusion of dosimeters near the face of the capsule next to the core. In the HSSI 10.05 capsule, some dosimeters were located within 1.0 cm of the capsule face. In the HSSI 10.0D capsule, the closest dosimeter was located 2.25 cm from the capsule face. To test this hypothesis, a separate adjustment run was made for the HSSI 10.05 capsule omitting all dosimeters that were located within 2.25 cm of the face of the capsule. Three-dimensional fitting constants derived from the test run were closer to the values obtained for the HSSI 10.0D experiment. For example, for the fast flux (E > 1 MeV), the normalization constant A and the attenuation constant λ were only 3.1% and 1.7% smaller than the respective values for the HSSI 10.0D experiment. The good agreement between the attenuation coefficients supports the hypothesis. The flux magnitude and hence the normalization constant A are also in good agreement but may be affected by other differences in the irradiations such as reactor core loadings.

Uncertainties are not accurately propagated through all the computational sequences, and there may be biases that are not recognized. However, uncertainties obtained from the least-squares adjustment procedure take into account estimated uncertainties of neutronics calculations and measured activities. Uncertainties for the exposure parameter rates obtained from the adjustment calculations at the locations of the dosimeters are approximately 4% (1 σ). When irradiation exposure rates are calculated from Eq. 2, uncertainties arising from the three-dimensional fitting should also be considered. Differences between the exposure parameter rates at the dosimetry locations, as obtained from the adjustment and as calculated from the fitting function, are on the order of 1% (averaged over all dosimetry locations) and at some points reach approximately 4%. Therefore, for the irradiation exposure parameters obtained from Eq. 2, an uncertainty of 6% (1 σ) is considered to be a good estimate.

Conclusion

The irradiation exposure parameter distributions in the HSSI 10.05 capsule were determined. Exposure parameters were reported for all the metallurgical specimens at the important notch-tip locations and in the form of three-dimensional fitting functions. It is recommended that an uncertainty of 6% (1 σ) be associated with the exposure parameters obtained from the three-dimensional fits.

References

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5. American Society for Testing and Materials (ASTM), E-693, *Standard Practice for Characterizing Neutron Exposures in Ferritic Steels in Terms of Displacements Per Atom (DPA)*, Annual Book of ASTM Standards.

Appendix

The data included in this Appendix should be sufficient for another organization to recalculate the exposure parameters if fluence rate spectra are available or if neutronics calculations are performed. In particular, the data included herein are (1) specific activities of each dosimeter at the end of irradiation (Table A.1), (2) coordinates of each dosimeter relative to the coordinate system shown in Figs. 3 and 4 (Table A.1), and (3) the irradiation history of the capsule (Table A.2). Specific activities of the removable dosimeter tube (RDT) dosimeters are also given (Table A.3). Only the north RDT was installed during the second part of irradiation because of damage to the south RDT holder.

Table A.1. Activities of the dosimeters in the HSSI 10.05 capsule

Dosimeter ID	Reaction	Coordinates X (cm)	Y† (cm)	Z (cm)	Activity* at EOI** (Bq/mg)
A1-111-1	Fe-54 (n,p) Mn-54	-10.33	3.66	25.59	3.96E+03
A1-111-2	Fe-54 (n,p) Mn-54	-10.33	3.66	23.59	4.25E+03
A1-111-3	Fe-54 (n,p) Mn-54	-10.33	3.66	21.59	4.65E+03
A1-11-01	Fe-54 (n,p) Mn-54	-7.44	4.41	17.53	6.25E+03
A1-11-02	Fe-54 (n,p) Mn-54	-10.03	4.41	17.53	5.45E+03
B1-121-1	Fe-54 (n,p) Mn-54	-4.50	3.66	25.59	5.18E+03
B1-121-2	Fe-54 (n,p) Mn-54	-4.50	3.66	23.59	5.71E+03
B1-121-3	Fe-54 (n,p) Mn-54	-4.50	3.66	21.59	6.26E+03
B1-122-1	Fe-54 (n,p) Mn-54	-1.32	3.66	25.59	5.88E+03
B1-122-2	Fe-54 (n,p) Mn-54	-1.32	3.66	23.59	6.52E+03
B1-122-3	Fe-54 (n,p) Mn-54	-1.32	3.66	21.59	7.09E+03
B1-12-01	Fe-54 (n,p) Mn-54	-1.62	4.41	17.53	7.85E+03
B1-12-02	Fe-54 (n,p) Mn-54	-4.21	4.41	17.53	7.17E+03
C1-11-01	Fe-54 (n,p) Mn-54	1.32	3.66	25.27	6.12E+03
C1-11-02	Fe-54 (n,p) Mn-54	1.32	3.66	22.87	6.82E+03
C1-11-03	Fe-54 (n,p) Mn-54	1.32	3.66	20.47	7.80E+03
C1-11-04	Fe-54 (n,p) Mn-54	1.32	3.66	18.07	8.45E+03
C1-11-05	Fe-54 (n,p) Mn-54	1.32	3.66	15.67	8.90E+03
C1-12-01	Fe-54 (n,p) Mn-54	4.50	3.66	25.27	6.45E+03
C1-12-02	Fe-54 (n,p) Mn-54	4.50	3.66	22.87	7.23E+03
C1-12-03	Fe-54 (n,p) Mn-54	4.50	3.66	20.47	8.07E+03
C1-12-04	Fe-54 (n,p) Mn-54	4.50	3.66	18.07	8.82E+03
C1-12-05	Fe-54 (n,p) Mn-54	4.50	3.66	15.67	9.29E+03
D1-131-1	Fe-54 (n,p) Mn-54	7.15	3.66	25.59	6.37E+03
D1-131-2	Fe-54 (n,p) Mn-54	7.15	3.66	23.59	7.18E+03
D1-131-3	Fe-54 (n,p) Mn-54	7.15	3.66	21.59	7.98E+03
D1-132-1	Fe-54 (n,p) Mn-54	10.33	3.66	25.59	6.45E+03
D1-132-2	Fe-54 (n,p) Mn-54	10.33	3.66	23.59	7.16E+03
D1-132-3	Fe-54 (n,p) Mn-54	10.33	3.66	21.59	7.70E+03
D1-13-01	Fe-54 (n,p) Mn-54	10.03	4.41	17.53	9.01E+03
D1-13-02	Fe-54 (n,p) Mn-54	7.44	4.41	17.53	9.04E+03
A2-211-1	Fe-54 (n,p) Mn-54	-8.27	4.41	12.32	6.71E+03
A2-211-2	Fe-54 (n,p) Mn-54	-8.27	4.41	9.82	6.85E+03
A2-211-3	Fe-54 (n,p) Mn-54	-8.27	4.41	7.32	6.95E+03
A2-211-4	Fe-54 (n,p) Mn-54	-8.27	4.41	4.82	7.15E+03
A2-211-5	Fe-54 (n,p) Mn-54	-8.27	4.41	2.32	6.96E+03
B2-221-1	Fe-54 (n,p) Mn-54	-2.16	4.41	12.32	8.53E+03
B2-221-2	Fe-54 (n,p) Mn-54	-2.16	4.41	9.82	8.71E+03
B2-221-3	Fe-54 (n,p) Mn-54	-2.16	4.41	7.32	8.96E+03
B2-221-4	Fe-54 (n,p) Mn-54	-2.16	4.41	4.82	9.12E+03
B2-221-5	Fe-54 (n,p) Mn-54	-2.16	4.41	2.32	9.02E+03

Table A.1 (continued)

Dosimeter ID	Reaction	Coordinates X (cm)	Y[†] (cm)	Z (cm)	Activity* at EOI** (Bq/mg)
C2-21-01	Fe-54 (n,p) Mn-54	2.53	3.66	11.87	9.90E+03
C2-21-02	Fe-54 (n,p) Mn-54	2.54	3.66	9.47	1.03E+04
C2-21-03	Fe-54 (n,p) Mn-54	2.53	3.66	7.07	1.05E+04
C2-21-04	Fe-54 (n,p) Mn-54	2.54	3.66	4.67	1.05E+04
C2-21-05	Fe-54 (n,p) Mn-54	2.54	3.66	2.27	1.05E+04
D2-231-1	Fe-54 (n,p) Mn-54	6.74	2.18	12.32	1.35E+04
D2-231-2	Fe-54 (n,p) Mn-54	6.74	2.18	9.82	1.44E+04
D2-231-3	Fe-54 (n,p) Mn-54	6.74	2.18	7.32	1.42E+04
D2-231-4	Fe-54 (n,p) Mn-54	6.74	2.18	4.82	1.40E+04
D2-231-5	Fe-54 (n,p) Mn-54	6.74	2.18	2.32	1.43E+04
D2-233-1	Fe-54 (n,p) Mn-54	9.80	2.18	12.32	1.31E+04
D2-233-2	Fe-54 (n,p) Mn-54	9.80	2.18	9.82	1.38E+04
D2-233-3	Fe-54 (n,p) Mn-54	9.80	2.18	7.32	1.41E+04
D2-233-4	Fe-54 (n,p) Mn-54	9.80	2.18	4.82	1.41E+04
D2-233-5	Fe-54 (n,p) Mn-54	9.80	2.18	2.32	1.40E+04
D2-234-1	Fe-54 (n,p) Mn-54	9.80	5.99	12.32	6.95E+03
D2-234-2	Fe-54 (n,p) Mn-54	9.80	5.99	9.82	7.16E+03
D2-234-3	Fe-54 (n,p) Mn-54	9.80	5.99	7.32	7.50E+03
D2-234-4	Fe-54 (n,p) Mn-54	9.80	5.99	4.82	7.57E+03
D2-234-5	Fe-54 (n,p) Mn-54	9.80	5.99	2.32	7.45E+03
A3-311-1	Fe-54 (n,p) Mn-54	-8.27	4.41	-0.82	6.89E+03
A3-311-2	Fe-54 (n,p) Mn-54	-8.27	4.41	-3.32	6.74E+03
A3-311-3	Fe-54 (n,p) Mn-54	-8.27	4.41	-5.82	6.69E+03
A3-311-4	Fe-54 (n,p) Mn-54	-8.27	4.41	-8.32	6.48E+03
A3-311-5	Fe-54 (n,p) Mn-54	-8.27	4.41	-10.82	6.10E+03
B3-321-1	Fe-54 (n,p) Mn-54	-2.16	4.41	-0.82	9.03E+03
B3-321-2	Fe-54 (n,p) Mn-54	-2.16	4.41	-3.32	8.97E+03
B3-321-3	Fe-54 (n,p) Mn-54	-2.16	4.41	-5.82	8.81E+03
B3-321-4	Fe-54 (n,p) Mn-54	-2.16	4.41	-8.32	8.35E+03
B3-321-5	Fe-54 (n,p) Mn-54	-2.16	4.41	-10.82	7.66E+03
C3-31-01	Fe-54 (n,p) Mn-54	2.54	3.66	-0.77	1.03E+04
C3-31-02	Fe-54 (n,p) Mn-54	2.54	3.66	-3.17	1.04E+04
C3-31-03	Fe-54 (n,p) Mn-54	2.54	3.66	-5.57	1.02E+04
C3-31-04	Fe-54 (n,p) Mn-54	2.54	3.66	-7.97	9.79E+03
C3-31-05	Fe-54 (n,p) Mn-54	2.54	3.66	-10.37	9.30E+03
D3-331-1	Fe-54 (n,p) Mn-54	8.27	4.41	-0.82	1.07E+04
D3-331-2	Fe-54 (n,p) Mn-54	8.27	4.41	-3.32	1.06E+04
D3-331-3	Fe-54 (n,p) Mn-54	8.27	4.41	-5.82	1.03E+04
D3-331-4	Fe-54 (n,p) Mn-54	8.27	4.41	-8.32	9.94E+03
D3-331-5	Fe-54 (n,p) Mn-54	8.27	4.41	-10.82	9.33E+03
A4-211-1	Fe-54 (n,p) Mn-54	-10.33	3.66	-20.09	3.98E+03
A4-211-2	Fe-54 (n,p) Mn-54	-10.33	3.66	-22.09	3.57E+03
A4-211-3	Fe-54 (n,p) Mn-54	-10.33	3.66	-24.09	3.10E+03

Table A.1 (continued)

Dosimeter ID	Reaction	Coordinates X (cm)	Y† (cm)	Z (cm)	Activity* at EOI** (Bq/mg)
A4-212-1	Fe-54 (n,p) Mn-54	-7.15	3.66	-20.09	4.73E+03
A4-212-2	Fe-54 (n,p) Mn-54	-7.15	3.66	-22.09	4.23E+03
A4-212-3	Fe-54 (n,p) Mn-54	-7.15	3.66	-24.09	3.75E+03
A4-21-01	Fe-54 (n,p) Mn-54	-7.44	4.41	-16.03	5.67E+03
A4-21-02	Fe-54 (n,p) Mn-54	-10.03	4.41	-16.03	4.89E+03
B4-221-1	Fe-54 (n,p) Mn-54	-4.50	3.66	-20.09	5.43E+03
B4-221-2	Fe-54 (n,p) Mn-54	-4.50	3.66	-22.09	4.89E+03
B4-221-3	Fe-54 (n,p) Mn-54	-4.50	3.66	-24.09	4.16E+03
B4-222-1	Fe-54 (n,p) Mn-54	-1.32	3.66	-20.09	6.03E+03
B4-222-2	Fe-54 (n,p) Mn-54	-1.32	3.66	-22.09	5.25E+03
B4-222-3	Fe-54 (n,p) Mn-54	-1.32	3.66	-24.09	4.46E+03
B4-22-01	Fe-54 (n,p) Mn-54	-1.62	4.41	-16.03	6.99E+03
B4-22-02	Fe-54 (n,p) Mn-54	-4.21	4.41	-16.03	6.41E+03
C4-41-01	Fe-54 (n,p) Mn-54	1.32	3.66	-14.17	8.11E+03
C4-41-02	Fe-54 (n,p) Mn-54	1.32	3.66	-16.57	7.54E+03
C4-41-03	Fe-54 (n,p) Mn-54	1.32	3.66	-18.97	6.65E+03
C4-41-04	Fe-54 (n,p) Mn-54	1.32	3.66	-21.37	5.73E+03
C4-41-05	Fe-54 (n,p) Mn-54	1.32	3.66	-23.77	4.96E+03
C4-42-01	Fe-54 (n,p) Mn-54	4.50	3.66	-14.17	8.57E+03
C4-42-02	Fe-54 (n,p) Mn-54	4.50	3.66	-16.57	7.81E+03
C4-42-03	Fe-54 (n,p) Mn-54	4.50	3.66	-18.97	7.02E+03
C4-42-04	Fe-54 (n,p) Mn-54	4.50	3.66	-21.37	6.07E+03
C4-42-05	Fe-54 (n,p) Mn-54	4.50	3.66	-23.77	5.25E+03
D4-231-1	Fe-54 (n,p) Mn-54	7.15	3.66	-20.09	6.77E+03
D4-231-2	Fe-54 (n,p) Mn-54	7.15	3.66	-22.09	6.00E+03
D4-231-3	Fe-54 (n,p) Mn-54	7.15	3.66	-24.09	5.14E+03
D4-232-1	Fe-54 (n,p) Mn-54	10.33	3.66	-20.09	6.75E+03
D4-232-2	Fe-54 (n,p) Mn-54	10.33	3.66	-22.09	5.97E+03
D4-232-3	Fe-54 (n,p) Mn-54	10.33	3.66	-24.09	5.17E+03
D4-23-01	Fe-54 (n,p) Mn-54	10.03	4.41	-16.03	8.05E+03
D4-23-02	Fe-54 (n,p) Mn-54	7.44	4.41	-16.03	8.04E+03
Y-1-1	Fe-54 (n,p) Mn-54	0.24	1.54	23.97	1.01E+04
Y-1-2	Fe-54 (n,p) Mn-54	0.24	2.79	23.97	7.93E+03
Y-1-3	Fe-54 (n,p) Mn-54	0.24	4.04	23.97	5.81E+03
Y-1-4	Fe-54 (n,p) Mn-54	0.24	5.29	23.97	4.51E+03
Y-1-5	Fe-54 (n,p) Mn-54	0.24	6.54	23.97	3.60E+03
Y-1-6	Fe-54 (n,p) Mn-54	0.24	7.79	23.97	3.22E+03
Y-2-1	Fe-54 (n,p) Mn-54	1.46	1.54	1.99	1.63E+04
Y-2-2	Fe-54 (n,p) Mn-54	1.46	2.79	1.99	1.23E+04
Y-2-3	Fe-54 (n,p) Mn-54	1.46	4.04	1.99	9.46E+03
Y-2-4	Fe-54 (n,p) Mn-54	1.46	5.29	1.99	7.19E+03
Y-2-5	Fe-54 (n,p) Mn-54	1.46	6.54	1.99	5.83E+03
Y-2-6	Fe-54 (n,p) Mn-54	1.46	7.79	1.99	4.91E+03
Y-3-1	Fe-54 (n,p) Mn-54	-0.24	1.54	-22.46	8.37E+03
Y-3-2	Fe-54 (n,p) Mn-54	-0.24	2.79	-22.46	6.34E+03
Y-3-3	Fe-54 (n,p) Mn-54	-0.24	4.04	-22.46	4.90E+03
Y-3-4	Fe-54 (n,p) Mn-54	-0.24	5.29	-22.46	3.79E+03

Table A.1 (continued)

Dosimeter ID	Reaction	Coordinates X (cm)	Y† (cm)	Z (cm)	Activity* at EOI** (Bq/mg)
Y-3-5	Fe-54 (n,p) Mn-54	-0.24	6.54	-22.46	2.98E+03
Y-3-6	Fe-54 (n,p) Mn-54	-0.24	7.79	-22.46	2.59E+03
X-1-01	Fe-54 (n,p) Mn-54	11.53	1.00	14.15	1.71E+04
X-1-02	Fe-54 (n,p) Mn-54	9.50	1.00	14.15	1.70E+04
X-1-03	Fe-54 (n,p) Mn-54	6.96	1.00	14.15	1.72E+04
X-1-04	Fe-54 (n,p) Mn-54	4.42	1.00	14.15	1.71E+04
X-1-05	Fe-54 (n,p) Mn-54	1.88	1.00	14.15	1.62E+04
X-1-06	Fe-54 (n,p) Mn-54	-0.66	1.00	14.15	1.55E+04
X-1-07	Fe-54 (n,p) Mn-54	-3.20	1.00	14.15	1.42E+04
X-1-08	Fe-54 (n,p) Mn-54	-5.74	1.00	14.15	1.26E+04
X-1-09	Fe-54 (n,p) Mn-54	-8.28	1.00	14.15	1.16E+04
X-1-10	Fe-54 (n,p) Mn-54	-10.82	1.00	14.15	9.63E+03
X-3-01	Fe-54 (n,p) Mn-54	11.53	1.00	-12.65	1.55E+04
X-3-02	Fe-54 (n,p) Mn-54	9.50	1.00	-12.65	1.61E+04
X-3-03	Fe-54 (n,p) Mn-54	6.96	1.00	-12.65	1.61E+04
X-3-04	Fe-54 (n,p) Mn-54	4.42	1.00	-12.65	1.57E+04
X-3-05	Fe-54 (n,p) Mn-54	1.88	1.00	-12.65	1.52E+04
X-3-06	Fe-54 (n,p) Mn-54	-0.66	1.00	-12.65	1.43E+04
X-3-07	Fe-54 (n,p) Mn-54	-3.20	1.00	-12.65	1.30E+04
X-3-08	Fe-54 (n,p) Mn-54	-5.74	1.00	-12.65	1.18E+04
X-3-09	Fe-54 (n,p) Mn-54	-8.28	1.00	-12.65	1.04E+04
X-3-10	Fe-54 (n,p) Mn-54	-10.32	1.00	-12.65	8.79E+03
FRDS21	Co-59 (n,g) Co-60	0.00	3.02	20.85	4.70E+03
FRDS21	Ag-109 (n,g) Ag-110m	0.00	3.02	20.85	9.31E+03
FRDS21	Np-237 (n,f) Zr-95	0.00	3.02	20.85	1.29E+05
FRDS21	Np-237 (n,f) Ru-106	0.00	3.02	20.85	2.25E+04
FRDS21	Np-237 (n,f) Cs-137	0.00	3.02	20.85	3.04E+03
FRDS21	Np-237 (n,f) Ce-144	0.00	3.02	20.85	4.87E+04
FRDS21	U-238 (n,f) Zr-95	0.00	3.02	20.85	1.67E+04
FRDS21	U-238 (n,f) Ru-106	0.00	3.02	20.85	4.28E+03
FRDS21	U-238 (n,f) Cs-137	0.00	3.02	20.85	4.32E+02
FRDS21	U-238 (n,f) Ce-144	0.00	3.02	20.85	8.56E+03
FRDS21	Ni-58 (n,p) Co-58	0.00	3.02	20.85	2.77E+05
FRDS21	Fe-54 (n,p) Mn-54	0.00	3.02	20.85	8.61E+03
FRDS21	Cu-63 (n,a) Co-60	0.00	3.02	20.85	1.23E+02
FRDS22	Co-59 (n,g) Co-60	-2.16	3.45	0.75	5.50E+03
FRDS22	Ag-109 (n,g) Ag-110m	-2.16	3.45	0.75	1.10E+04
FRDS22	Np-237 (n,f) Zr-95	-2.16	3.45	0.75	1.43E+05
FRDS22	Np-237 (n,f) Ru-106	-2.16	3.45	0.75	2.57E+04
FRDS22	Np-237 (n,f) Cs-137	-2.16	3.45	0.75	3.45E+03
FRDS22	Np-237 (n,f) Ce-144	-2.16	3.45	0.75	5.59E+04
FRDS22	U-238 (n,f) Zr-95	-2.16	3.45	0.75	1.95E+04
FRDS22	U-238 (n,f) Ru-106	-2.16	3.45	0.75	5.05E+03
FRDS22	U-238 (n,f) Cs-137	-2.16	3.45	0.75	5.03E+02
FRDS22	U-238 (n,f) Ce-144	-2.16	3.45	0.75	1.01E+04
FRDS22	Ni-58 (n,p) Co-58	-2.16	3.45	0.75	3.12E+05

Table A.1 (continued)

Dosimeter ID	Reaction	Coordinates X (cm)	Y† (cm)	Z (cm)	Activity* at EOI** (Bq/mg)
FRDS22	Fe-54 (n,p) Mn-54	-2.16	3.45	0.75	9.86E+03
FRDS22	Cu-63 (n,a) Co-60	-2.16	3.45	0.75	1.39E+02
FRDS24	Co-59 (n,g) Co-60	-2.16	1.38	0.75	7.97E+03
FRDS24	Ag-109 (n,g) Ag-110m	-2.16	1.38	0.75	1.66E+04
FRDS24	Np-237 (n,f) Zr-95	-2.16	1.38	0.75	2.06E+05
FRDS24	Np-237 (n,f) Ru-106	-2.16	1.38	0.75	3.65E+04
FRDS24	Np-237 (n,f) Cs-137	-2.16	1.38	0.75	4.82E+03
FRDS24	Np-237 (n,f) Ce-144	-2.16	1.38	0.75	7.91E+04
FRDS24	U-238 (n,f) Zr-95	-2.16	1.38	0.75	3.02E+04
FRDS24	U-238 (n,f) Ru-106	-2.16	1.38	0.75	7.43E+03
FRDS24	U-238 (n,f) Cs-137	-2.16	1.38	0.75	7.31E+02
FRDS24	U-238 (n,f) Ce-144	-2.16	1.38	0.75	1.47E+04
FRDS24	Ni-58 (n,p) Co-58	-2.16	1.38	0.75	4.68E+05
FRDS24	Fe-54 (n,p) Mn-54	-2.16	1.38	0.75	1.54E+04
FRDS24	Cu-63 (n,a) Co-60	-2.16	1.38	0.75	2.28E+02

*For the Co and Ag monitors, diluted Al alloys were used. Co/Al was 0.1 wt % Co, and Ag/Al was 0.173 wt % Ag. Activities listed are per milligram of alloy. The fission product activities for the ^{237}NP and ^{238}U monitors are given per milligram of ^{237}Np and ^{238}U, respectively. Activities of all other monitors are given per milligram of chemically pure target material.

†The 1T C(T) and 0.5T C(T) specimens had chevron notches. Because of the chevron, the thickness of the steel that shields the gradient wire inserted in the notch is changing along the notch. To take this into account in the neutronics analysis, the listed Y coordinates of the gradient wires in the C(T) specimens were replaced with "effective" coordinates as follows: 5.99 cm was changed to 5.67 cm, 4.41 cm was changed to 3.89 cm, and 2.18 cm was changed to 2.14 cm. The effective Y coordinates give the average thickness of the steel between the gradient wires and the front of the capsule.

**End of irradiation (EOI) for the HSSI 10.05 capsule is 03/05/93 at 23:54.

Table A.2. Irradiation history for the HSSI 10.05 capsule

Cycle	Beginning Date	Beginning Time	End Date	End Time	Fraction of full power*
340B	04/15/92	14:34	04/15/92	18:04	1
341A	05/05/92	09:02	05/05/92	16:28	1
	05/06/92	09:40	05/06/92	14:10	1
	05/06/92	14:55	05/06/92	16:58	1
	05/07/92	08:53	05/07/92	23:45	1
341B	05/12/92	15:29	05/12/92	17:04	1
	05/13/92	10:38	05/21/92	23:45	1
342A	05/27/92	09:09	06/02/92	08:15	1
	06/02/92	13:51	06/04/92	23:43	1
342B	06/09/92	17:39	06/09/92	18:35	1
	06/10/92	14:45	06/14/92	12:18	1
343B	07/08/92	17:06	07/17/92	23:45	1
344A	07/22/92	18:26	07/23/92	10:45	1
	07/23/92	12:43	07/30/92	10:53	1
	07/30/92	16:49	07/31/92	12:31	1
	07/31/92	15:38	07/31/92	23:45	1
344B	08/06/92	07:49	08/12/92	14:32	1
	08/12/92	15:42	08/14/92	23:47	1
345A	08/20/92	13:02	08/28/92	23:45	1
345B	09/02/92	09:31	09/04/92	23:45	1
	09/08/92	15:00	09/10/92	15:18	1
	09/10/92	15:24	09/11/92	23:45	1
346A	09/16/92	14:06	09/16/92	15:12	1
	09/16/92	15:29	09/25/92	23:45	1
346B	09/30/92	09:49	09/30/92	21:06	1
	10/01/92	13:00	10/04/92	10:52	1
	10/04/92	11:16	10/04/92	11:30	1
RDT 7 & 8 withdrawn	10/04/92	11:45	10/08/92	22:51	1
347A	10/19/92	14:13	10/19/92	14:23	1
	10/19/92	14:41	10/22/92	09:40	1
	10/22/92	10:20	10/22/92	13:38	1
	10/22/92	14:05	10/23/92	10:00	1
347B	10/28/92	09:22	10/29/92	13:36	1
	10/29/92	14:32	10/30/92	15:08	1
	10/30/92	15:39	11/01/92	12:33	1
	11/01/92	13:03	11/04/92	10:27	1
	11/04/92	10:38	11/05/92	08:15	1
348A	11/11/92	18:13	11/12/92	10:45	1
	11/12/92	11:39	11/16/92	10:10	1
	11/16/92	10:25	11/17/92	14:15	1
	11/18/92	09:35	11/20/92	23:45	1
348B	11/25/92	13:37	11/25/92	23:45	1
	11/30/92	08:15	12/02/92	10:19	1
	12/02/92	10:27	12/04/92	13:15	1
349A	12/11/92	12:44	12/12/92	00:13	1
	12/12/92	11:30	12/13/92	19:07	1
	12/13/92	19:45	12/16/92	08:01	1
	12/16/92	17:07	12/18/92	10:20	1
349C	01/05/93	09:14	01/08/93	23:45	1

Table A.2 (continued)

	Beginning		End		Fraction of full power*
Cycle	Date	Time	Date	Time	
350A	01/14/93	10:45	01/14/93	16:06	1
	01/14/93	16:09	01/15/93	08:52	1
	01/15/93	09:50	01/22/93	23:45	1
350B	01/27/93	10:06	02/05/93	08:45	1
351A	02/10/93	13:03	02/18/93	09:44	1
	02/18/93	09:59	02/18/93	11:59	1
	02/18/93	14:35	02/19/93	08:28	1
	02/19/93	09:20	02/19/93	12:34	1
351B	02/25/93	04:28	02/26/93	09:01	1
	02/26/93	10:18	02/27/93	10:50	1
	02/27/93	10:55	03/01/93	16:53	1
	03/01/93	17:14	03/04/93	11:37	1
	03/04/93	11:45	03/05/93	23:45	1

*Core full power is 2 MW.

Table A.3. Activities of the removable dosimeter tube (RDT) dosimeters

Reaction	Coordinates			Specific activity at EOI†		
	X (cm)	Y (cm)	Z* (cm)	RDT 7 (Bq/mg)	RDT 8 (Bq/mg)	RDT 9 (Bq/mg)
Fe-54 (n,p) Mn-54	-17.14	-0.96	24.13	3.09E+3		
Fe-54 (n,p) Mn-54	-17.14	-0.96	13.97	4.55E+3		
Fe-54 (n,p) Mn-54	-17.14	-0.96	3.81	5.12E+3		
Fe-54 (n,p) Mn-54	-17.14	-0.96	-3.81	5.11E+3		
Fe-54 (n,p) Mn-54	-17.14	-0.96	-13.97	4.28E+3		
Fe-54 (n,p) Mn-54	-17.14	-0.96	-24.13	2.71E+3		
Co-59 (n,g) Co-60	-17.14	-0.96	24.13	1.69E+4		
Co-59 (n,g) Co-60	-17.14	-0.96	13.97	2.93E+4		
Co-59 (n,g) Co-60	-17.14	-0.96	3.81	3.26E+4		
Co-59 (n,g) Co-60	-17.14	-0.96	-3.81	3.23E+4		
Co-59 (n,g) Co-60	-17.14	-0.96	-13.97	2.75E+4		
Co-59 (n,g) Co-60	-17.14	-0.96	-24.13	1.81E+4		
Fe-54 (n,p) Mn-54	17.14	-0.96	24.13		7.19E+3	7.86E+3
Fe-54 (n,p) Mn-54	17.14	-0.96	13.97		1.05E+4	1.04E+3
Fe-54 (n,p) Mn-54	17.14	-0.96	3.81		1.20E+4	1.13E+4
Fe-54 (n,p) Mn-54	17.14	-0.96	-3.81		1.18E+4	1.11E+4
Fe-54 (n,p) Mn-54	17.14	-0.96	-13.97		9.92E+3	8.94E+3
Fe-54 (n,p) Mn-54	17.14	-0.96	-24.13		6.28E+3	4.97E+3
Co-59 (n,g) Co-60	17.14	-0.96	24.13		2.46E+4	2.55E+4
Co-59 (n,g) Co-60	17.14	-0.96	13.97		4.42E+4	4.29E+4
Co-59 (n,g) Co-60	17.14	-0.96	3.81		5.10E+4	4.74E+4
Co-59 (n,g) Co-60	17.14	-0.96	-3.81		5.11E+4	4.61E+4
Co-59 (n,g) Co-60	17.14	-0.96	-13.97		4.26E+4	3.61E+4
Co-59 (n,g) Co-60	17.14	-0.96	-24.13		2.65E+4	2.12E+4

*The uncertainty in the axial position of the RDT is ±2.54 cm (1 in.).

†The end of irradiation (EOI) for RDTs 7 and 8 is 10/8/92 at 22:51; for RDT 9 the end of irradiation is 03/05/93 at 23:54.

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11. ABSTRACT *(200 words or less)*

This report describes the computational methodology for the least-squares adjustment of dosimetry data from the HSSI 10.05 capsule with neutronics calculations. It presents exposure parameters for the metallurgical specimens irradiated in the capsule. The exposure parameters reported are the neutron fluence greater than 1.0 MeV, fluence greater than 0.1 MeV, and displacements per atom. Exposure parameter distributions are also described in terms of three-dimensional fitting functions. When fitting functions are used, it is recommended that an uncertainty of 6% (1σ) be associated with the exposure parameters.

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