CROSS SECTION EVALUATION WORKING GROUP BENCHMARK SPECIFICATIONS

VOLUME II

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CROSS SECTION EVALUATION GROUP

SHIELDING BENCHMARK COMPILATION

**CSEWG SHIELDING DATA TESTING
AND APPLICATIONS SUBCOMMITTEE**

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CSEWG SHIELDING DATA TESTING AND APPLICATIONS BENCHMARKS

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I. INTRODUCTION

A. Availability of Integral Experiment Information

At the time of the release of ENDF/B-IV in 1974, the Shielding Subcommittee had identified a series of 12 shielding data testing benchmarks (the SDT series). Most were used in the ENDF/B-IV data testing effort. A new concept and series was begun in the interim, the so-called Shielding Benchmark (SB) series. An effort was made to upgrade the SDT series as far as possible and to add new "SB" benchmarks. In order to be designated in the "SB" class, both an experiment and analysis must have been performed. The current recommended benchmarks for Shielding Data Testing are listed in Table 1.

Until recently, the philosophy has been to include only citations to published references for shielding benchmarks. It is now our intention to provide adequate information in this volume for proper analysis of any new benchmarks added to the collection. These compilations appear in Section II, with the SB5 Fusion Reactor Shielding Benchmark as the first entry.

B. Relevance of the Benchmarks

The SDT1-SDT5 "broomstick" experiments provide tests of total cross sections and as such are of general importance for shielding applications. SB2 and SB3 test gamma-ray production and, hence, are of general value. SDT11 provides test of neutron transport through iron and stainless steel and are of general values because of the widespread use of steel and iron as shielding materials. SDT9, SDT13, and SB4 and all mockup experiments which are relevant to sodium-cooled fast reactor design and provide tests of transport through combinations of sodium, iron, and steel. SDT10 and SB5 provide tests of data for neutrons at 14 MeV and are of value for fusion applications.

TABLE i. Integral Experiments Recommended by CSEWG
for Shielding Data Testing

SDT1	Iron Broomstick Experiment - an experimental check of neutron total cross sections, R. E. Maerker (ORNL-3867, ENDF-166, revised)
SDT2	Oxygen Broomstick Experiment - an experimental check of neutron total cross sections, R. E. Maerker (ORNL-3868, ENDF-167, revised)
SDT3	Nitrogen Broomstick Experiment - an experimental check of neutron total cross sections, R. E. Maerker (ORNL-3869, ENDF-168, revised)
SDT4	Sodium Broomstick Experiment - an experimental check of neutron total cross sections, R. E. Maerker (ORNL-3870, ENDF-169, revised)
SDT5	Stainless Steel Broomstick Experiment - an experimental check of neutron total cross sections, R. E. Maerker (ORNL-3871, ENDF-170, revised)
SDT9	Neutron Attenuation Measurements in a Mockup of the FFTF Radial Shield, P. Rose, H. Alter, R. Paschall, A. W. Thiele (AI-AEC-13048, ENDF-181)
SDT10	Calculational Models for LLL Pulsed Spheres, E. F. Plechaty, R. J. Howerton (UCID-16372) - ${}^6\text{Li}$, ${}^7\text{Li}$, Be, C, N, O, Mg, Al, Ti, Fe, Pb, ${}^{235}\text{U}$, ${}^{238}\text{U}$, ${}^{239}\text{Pu}$
SDT11	The ORNL Benchmark Experiment for Neutron Transport Through Iron and Stainless Steel, Part 1, R. E. Maerker (ORNL/TM-4222, ENDF-188)
SDT12	The ORNL Benchmark Experiment for Neutron Transport Through Sodium, R. E. Maerker (ORNL/TM-4223, ENDF-189)

SB Series

SB2	Experiment on Secondary Gamma-Ray Production Cross Sections Arising from Thermal-Neutron Capture in Each of 14 Different Elements Plus Stainless Steel, R. E. Maerker (ORNL/TN-5203, ENDF-227)
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- SB3 Experiment on Secondary Gamma-Ray Production Cross Sections Averaged Over a Fast-Neutron Spectrum for Each of 13 Different Elements Plus Stainless Steel, R. E. Maerker (ORNL/TM-5204, ENDF-228)
- SB4 Measurement and Calculations of the ORNL CRBR Upper Axial Shield Experiment, R. E. Maerker, F. J. Muckenthaler, C. E. Clifford (ORNL-5259, ENDF-258)
- (Note this is approved as a benchmark candidate pending its removal from "Applied Technology" classification. Experimental results are currently restricted to U.S. distribution)
- SB5 Fusion Reactor Shielding Benchmark, G. T. Chapman, G. L. Morgan, J. W. McConnell, R. T. Santoro, R. G. Alsmiller, Jr., and J. M. Barnes. See also Nucl. Sci. Eng. 78, 259 (1981).

II. COMPILATION OF SHIELDING BENCHMARK SPECIFICATIONS

SB5. Fusion Reactor Shielding Benchmark

A. Benchmark Name and Type: ORNL Fusion Shielding Benchmark; a Series of Attenuation Experiments and Analyses.

B. System Description: Neutron and photon flux spectra have been measured and calculated for the case of neutrons, produced by D-T reactions, incident on various laminated slab shields composed of stainless steel and borated polyethylene.

C. Model Description: The experimental configuration is three-dimensional but may to a good approximation be reduced to a two-dimensional configuration. The three-dimensional configuration will first be described for the sake of generality and then the two-dimensional configuration used in an ORNL analysis will be discussed.

1. Three-Dimensional Configuration

In Fig. 1 a horizontal cut through the room that houses the experiment is given. In this figure and throughout this discussion the z-axis is the axis of the deuteron beam, the x-axis is parallel to the floor and roof, and the y-axis is perpendicular to the floor and the roof. The iron cavity liner around the target serves as a spectrum modifier and makes the neutron spectrum incident on the experimental shield configuration similar to the spectrum incident on the first wall of a fusion reactor. The front of the thermal shield is always located 50 cm behind the detector location. The thermal neutron shield in Fig. 1 is composed of stainless steel 304, is 5.08 cm thick, and has a square cross sectional area, 152.4 cm by 152.4 cm. This stainless steel slab is identical to the stainless steel slabs used as part of the laminated shield configurations described later. In Figs. 2 and 3 other views of the experimental configuration and the experimental room are given. The dimensions given in Figs. 1-3 are

Fig. 1 - Horizontal schematic of experimental enclosure. See Figs. 2 and 3 for additional dimensions. (Drawing not to scale)

DIMENSIONS ARE IN
CENTIMETERS

Fig. 2 - Three-dimensional view of experimental enclosure. See Figs. 1 and 3 for additional dimensions. (Drawing not to scale)

sufficient to enable the experiment to be modeled to any desired detail, but the reader who wishes to model the experiment in three dimensions should also see Ref. 1.

2. Two-Dimensional Configuration

In Fig. 4 the reduced geometry representation of the experiment that is used to obtain the calculated results presented later is shown. The geometry in Fig. 4 is two-dimensional in that there is cylindrical symmetry about the z-axis. In the two-dimensional model the lithiated-paraffin that is shown in Fig. 1 is not included. In the two-dimensional model the back concrete wall is placed directly against the stainless steel thermal neutron shield. The thermal shield is located 73 cm behind the detector¹ (as shown in Fig. 4). The two-dimensional model dimensions given in Fig. 4 correspond very approximately to the dimensions in Figs. 1-3. In the two-dimensional model the outside boundary of the configuration is to be taken as an albedo surface with a reflection coefficient of .2 for all particle types and energies. This reflection coefficient was determined by matching particle flux contours obtained with the two-dimensional model shown in Fig. 4 with particle flux contours obtained using a two-dimensional representation of the complete experimental room. More detail concerning the determination of this reflection coefficient will be found in Ref. 1. Also shown in Fig. 4 is a typical experimental laminated shield configuration as it is used in the two-dimensional representation of the experiment. In the experiment the experimental slab configuration is always located as shown in Fig. 4, i.e., the front of the experimental slab configuration is always 21.5 cm from the source.

3. Material Composition

In Table 1 the number densities of the materials that occur in Figs. 1-4 are given. Also included in this table are the compositions of the material slabs that were used in the various experiments.

Fig. 4 - Two-dimensional calculational model of the experimental configuration.

Table 1

Composition of Materials Used in the Calculation

Element	Concrete	Air	Number Density			
			Iron Can	SS-304	BP*	LP**
<hr/>						
H	7.86X10 ⁻³				7.13x10 ⁻²	5.926x10 ⁻²
B-10					4.87x10 ⁻⁴	
B-11					1.97x10 ⁻³	
C					3.41x10 ⁻²	3.338x10 ⁻²
N		3.64x10 ⁻⁵				
O	4.39x10 ⁻²	9.74x10 ⁻⁶			3.64x10 ⁻³	1.125x10 ⁻²
Na	1.05x10 ⁻³					
Mg	1.40x10 ⁻⁴					
Al	2.39x10 ⁻³					
Si	1.58x10 ⁻²					
K	6.90x10 ⁻⁴					
Ca	2.92x10 ⁻³					
Cr				1.77x10 ⁻²		
Mn				1.77x10 ⁻³		
Fe	3.10x10 ⁻⁴		8.48x10 ⁻²	6.02x10 ⁻²		
Ni				7.83x10 ⁻³		
Li-6						5.565x10 ⁻⁴
Li-7						6.944x10 ⁻³

* BP = Borated Polyethylene

** LP = Lithiated Paraffin

4. Method of Calculation

This benchmark may be calculated with S_n transport methods coupled with special first and last flight corrections. The preferred technique is described in Section E, Calculated Results.

The benchmark may also be calculated in three-dimensions using Monte Carlo technique. Sufficient information has been provided for a three-dimensional calculation, and results can be compared with data in Appendix A. Reference 11 and 12 should be consulted for further details and analysis techniques.

D. Experimental Data

The neutron source was obtained by focusing a 250 keV deuteron beam on a cylindrical titanium-tritide (TiT) target² having a radius of .64 cm, a thickness of 4 mg/cm² and a density of 4.28 g/cm³. The neutron source strength was measured by using the associated particle technique. More details concerning the experiment will be found in Ref. 3.

The neutron-gamma-ray detector consisted of 66.1 g of NE-213 liquid scintillator contained in a cylindrical aluminum can having a wall thickness of 4.32×10^{-2} cm. The active volume of the detector was 79 cm³ (4.66 cm diameter and 4.66 cm height). Neutron and gamma ray events were separated using pulse shape discrimination methods. The neutron and gamma pulse height spectra were unfolded using FERD⁴ to produce energy spectra. The neutron response matrix was obtained using the pulsed neutron beam from the Oak Ridge Linear Accelerator and the gamma ray response matrix was generated using gamma ray sources of known energy. The energy resolution of the detector varies as:

$$R_N = \sqrt{300 + \frac{800}{E_N}} \quad (1)$$

for neutrons of energy E_N in MeV, and

$$R_Y = \sqrt{170 + \frac{288}{E_Y}} \quad (2)$$

for gamma rays of energy E_Y in MeV. The quantities R_N and R_Y are full width and half maximum (in percent) of the detector response (assumed Gaussian) to neutrons and gamma rays.

Experimental data have been obtained for the seven configurations outlined in Table 2. For all of the configurations except number one, the neutron flux per unit energy for all energies > 850 keV and the gamma ray flux per unit energy for all energies > 750 keV have been measured at several detector locations. In the case of configuration number one, i.e., the configuration with no laminated slab shield, gamma ray measurements were not made and data were taken only with the detector on the axis of the deuteron beam. The experimental data for all of the configurations are shown in Appendix A.

E. Calculated Results

All of the analytical results reported in this benchmark description are based on the two-dimensional configuration shown in Fig. 4 and discussed previously. This configuration was modeled in r - z geometry using 42 radial and 82 axial mesh intervals. The radial and axial boundaries used in the calculations are given in Table 3.

The sequence of radiation transport calculations necessary to obtain the neutron and gamma ray energy spectra is complex and very detailed and is described fully in Refs. 1 and 5, so only the salient features are discussed here.

The neutron source calculation was carried out using a procedure that is described in detail in Ref. 2. Also, additional details concerning the source calculation are given in Ref. 1. The probability that a deuteron of energy E_d reacts while traveling a distance dx in a target containing N_t tritium atoms per cm^3 is²

$$P = N_t \int_0^{E_d} \sigma(E) dE / (dE/dx) \quad (3)$$

where σ is the microscopic cross section for the $T(D,n)^4\text{He}$ reaction and dE/dx is the stopping power for deuterons in the target material. If σ is expressed as the angular differential cross section for the reaction, then P is also the probability for the emission of the neutron into any solid angle. The differential cross section and stopping power used in the calculation reported here are taken from Ref. 2. Equation (3) can be used to determine the neutron emission probabilities for all deuteron energies and for all angles into which the neutron is emitted. The energies of the neutrons are then obtained as a function of E_d and emission angle using the kinematic equations for a two-body reaction.^{1,2} The probabilities for the emission of neutrons into the solid angles defined by the polar angle intervals of 0-40, 40-90, and 90-180 degrees with respect to the axis of the deuteron beam for the case of 250 keV deuterons incident on a 4 mg/cm^2 thick titanium-tritide target are given as a function of neutron energy in Table 4. The energy intervals correspond to the energy boundaries of the group structure used to describe the multigroup cross sections. The angular interval of 0-40 degrees corresponds to the angle at which neutrons are emitted directly out of the mouth of the source cavity, i.e., the polar angle defined by a ray from the D-T source to the mouth of the cavity is ~ 40 degrees. The 40-90 and 90-180 degree angular intervals correspond to the angles at which neutrons are emitted into the lateral surface and towards the rear of the source cavity, respectively. These angular intervals were selected on the basis of the source cavity geometry.¹ The data in Table 4 serve as the input to the radiation transport codes used to calculate the neutron and gamma ray energy spectra. The average energy of the emitted neutrons for the angular intervals considered may easily be obtained from the probabilities in Table 4.

TABLE 2
COMPOSITION AND THICKNESS OF STAINLESS STEEL 304
AND BORATED POLYETHYLENE SLABS

Configuration	Composition						Total Slab Thickness (cm)
	SS-304 ^a	SS-304	BP ^b	SS-304	BP	SS-304	
	Slab Thickness (cm)						
1	0						0
2	15.24						15.24
3	30.48						30.48
4	30.48	5.08	5.08				40.64
5	30.48	5.08	5.08	5.08			45.72
6	30.48	5.08	5.08	5.08	5.08		50.80
7	30.48	5.08	5.08	5.08	5.08	5.08	55.88

^aStainless steel type 304

^bBorated polyethylene

All of the S_n transport calculations used to obtain the data reported here, incorporated a 53-neutron, 21-gamma-ray energy group library obtained by collapsing the 171-neutron, 36-gamma-ray VITAMIN C data library (ENDF/B-IV).⁶ The VITAMIN C library was created as a general purpose cross section data set for the analysis of fusion neutronics problems. The fine group library was collapsed using the ANISN⁷ code by representing the experimental

TABLE 3
THE RADIAL AND AXIAL BOUNDARIES USED
IN THE TWO-DIMENSIONAL CALCULATIONS

Radial Boundaries (cm)	Axial Boundaries (cm)	
0.0000		
0.5000	150.000	264.060
1.0000	157.500	265.330
2.0000	165.000	266.600
3.0000	172.500	267.870
4.0000	180.000	269.140
5.0000	187.500	270.410
7.5000	195.000	271.680
10.000	196.500	272.950
12.500	198.000	274.220
15.000	199.500	275.490
17.500	201.000	276.760
20.000	202.500	278.030
22.500	203.500	279.300
25.625	204.500	280.570
28.750	205.500	281.840
31.875	206.500	283.110
35.000	207.500	284.380
38.125	208.500	285.650
41.250	209.500	286.920
44.375	210.500	288.190
47.500	211.500	289.460
50.625	212.500	298.068
53.750	216.500	306.676
56.875	220.500	315.284
60.000	224.500	323.892
63.125	228.500	332.500
66.250	231.040	335.000
69.375	233.580	337.500
72.500	236.120	361.000
75.000	238.660	362.000
79.800	241.200	366.000
84.600	243.740	371.080
89.400	246.280	402.790
94.200	248.820	434.500
99.000	251.360	437.000
101.00	253.900	439.500
114.00	256.440	442.000
127.00	258.980	444.500
140.00	260.250	449.750
142.50	261.250	455.000
145.00	262.790	460.250
147.50		465.500

components in the angular intervals given in Table 4 in spherical geometry and using the neutron energy distribution in that angular interval as the source spectrum. That is, a different cross section collapse calculation was used in the three regions corresponding to the polar angular intervals $0-40^\circ$, $40-90^\circ$, and $90-180^\circ$. The energy boundaries of the collapsed data library, given in Table 5, were based in part on those used in the DLC-47 library⁸, but expanded at high energies so that the D-T neutron source could be more accurately represented in the transport calculations. The angular dependence of the cross sections for all nuclei was approximated using a P_3 Legendre expansion. The composition of the materials used in the calculations are given in Table 1.

The sequence of radiation transport calculations used to obtain the neutron and gamma ray energy spectra is shown in Fig. 5. The sequence is initiated by performing three separate calculations using the GRTUNCL code⁹ to obtain the uncollided neutron and first collisions source distributions at all spatial mesh intervals in the calculational geometry. The GRTUNCL code as used here assumed isotropic neutron emission from a point source. A GRTUNCL calculation was made for each of the angular intervals shown in Table 4 using the incident source spectra shown in Table 4 in each of the angular intervals. To ensure that the contribution to the uncollided neutron flux and first collision sources were due to neutrons emitted in the angular intervals specified in Table 4, black absorbers were interposed in the calculational geometry to confine the source neutrons to these angles. The purpose of the sequence of calculations is to account approximately for the energy-angle dependence of the neutrons from the D-T source.

TABLE 4

PROBABILITY FOR THE EMISSION OF NEUTRONS INTO THE
SPECIFIED ENERGY AND SOLID ANGLE INTERVALS
FOR 250 KEV INCIDENT DEUTERONS

Energy Interval		Polar Angular Interval		
(MeV)		0°-40°	40°-90°	90°-180°
14.92	15.68	0.0130		
14.55	14.92	0.0902	0.0697	
14.19	14.55	0.0168	0.2460	
13.80	14.19		0.0750	0.2163
13.50	13.80			0.2088
12.84	13.50			0.0642
		0.1200	0.3907	0.4893

The uncollided flux and first collision source data from each GRTUNCL calculation are combined to form a single source tape which is the input data to the two-dimensional discrete ordinates code DOT.¹⁰ This code calculates the collided flux distributions using the first collision data as a spatially distributed source. These calculations were completed using an S₁₂ angular quadrature. A final scattering source tape is generated in DOT and is employed to carry out a last-flight transport calculation using the FALSTF code⁹ to obtain the neutron and gamma ray flux distributions at each detector from GRTUNCL to yield the total flux at each detector location. These distributions are processed to obtain the neutron and gamma ray energy spectra by smoothing the flux per unit energy in each multigroup energy interval with an energy-dependent Gaussian response function having a width determined by Eq. (1) for neutrons, and Eq. (2) for gamma rays.

Fig. 5 - Block diagram of S_n calculational scheme

TABLE 5

53-NEUTRON, 21-GAMMA-RAY ENERGY RADIATION
TRANSPORT CROSS SECTION GROUP STRUCTURE

Neutron Group	Upper Energy (eV)	Neutron Group	Upper Energy (eV)	Gamma Ray Group	Upper Energy (MeV)
1	0.17333E + 08	28	0.60810E + 06	54	14.0
2	0.15683E + 08	29	0.49787E + 06	55	12.0
3	0.14918E + 08	30	0.36883E + 06	56	10.0
4	0.14550E + 08	31	0.29850E + 06	57	8.0
5	0.14191E + 08	32	0.29720E + 06	58	7.5
6	0.13840E + 08	33	0.18316E + 06	59	7.0
7	0.13499E + 08	34	0.11109E + 06	60	6.5
8	0.12840E + 08	35	0.67379E + 05	61	6.0
9	0.12214E + 08	36	0.40868E + 05	62	5.5
10	0.11052E + 08	37	0.24788E + 05	63	5.0
11	0.10000E + 08	38	0.23579E + 05	64	4.5
12	0.90484E + 07	39	0.15034E + 05	65	4.0
13	0.81873E + 07	40	0.91188E + 04	66	3.5
14	0.74082E + 07	41	0.55308E + 04	67	3.0
15	0.60653E + 07	42	0.33546E + 04	68	2.5
16	0.49659E + 07	43	0.20347E + 04	69	2.0
17	0.40657E + 07	44	0.12341E + 04	70	1.50
18	0.36788E + 07	45	0.74852E + 03	71	1.0
19	0.27253E + 07	46	0.45400E + 03	72	0.60
20	0.23653E + 07	47	0.27536E + 03	73	0.20
21	0.23069E + 07	48	0.16702E + 03	74	0.10
22	0.22313E + 07	49	0.10130E + 03		0.010
23	0.16530E + 07	50	0.61442E + 02		
24	0.13534E + 07	51	0.37267E + 02		
25	0.86294E + 06	52	0.10677E + 02		
26	0.82085E + 06	53	0.41399E + 00		
27	0.74274E + 06		0.10000E - 04		

The measured and calculated differential neutron energy spectra as a function of SS-304 and BP slab composition and thickness are compared in Fig. 6 when the NE-213 detector is on the axis of symmetry. The neutron source-to-detector distance is 154.5 cm. In Fig. 6, and the comparisons of other data given below, the solid curves are measured spectra and the points are the calculated results. The two solid curves for each configuration represent the 68% confidence interval in the measured spectra obtained from the unfolding procedure that is used to obtain energy spectra from the pulse height data. The spectra are arranged in order of increasing slab thickness from top-to-bottom in the figure and both the measured and calculated data are normalized to one D-T neutron.

The spectra are compared for neutron energies above 850 keV. The calculated and measured spectra are in excellent agreement for all of the configurations except when the slab contains 15.24 cm of SS-304 (configuration 2). In general, the agreement is favorable in the neutron energy range between 850 keV and ~11 MeV. The calculated results are systematically higher than the measured data between ~11 and 12.5 MeV, in good agreement between 12.5 and ~15 MeV, and then the calculated data exhibit a more rapid roll-off at the higher neutron energies. It is not kinematically possible for the incident deuterons (250 keV) to produce neutrons with energies above 15.1 MeV in the D-T reaction. The indication of more energetic neutrons in the spectra is a manifestation of the response of the experimental instrumentation and the difference in the roll-off at neutron energies above ~15 MeV can be attributed to the Gaussian response function being convoluted with neutron energy bins (pulse height channels and multigroup energy intervals) that differ between measured and calculated data.

The measured and calculated differential neutron energy spectra as a function of SS-304 and BP slab composition and thickness when the detector is off the axis of symmetry are compared in Fig. 7. The NE-213 detector was positioned at a distance of 46.0 cm normal to the deuteron beam - tritium

Fig. 6 - Neutron flux per unit energy vs. energy for various slab configurations, (See Table 2) when the detector position is on the axis of the deuteron beam.

target axis for all of the slab configurations except for that comprised of 30.48 cm of SS-304 (configuration 3). For this measurement, the detector was located at a distance of 100 cm from the beam axis. A series of measurements of neutron spectra in the plane perpendicular to the deuteron beam axis revealed that the neutron yield was symmetric about the axis. Consequently, the incorporation of the two-dimensional representation of the experimental apparatus and the detector location in the r - z geometry of the calculational model can be correlated with the actual detector location in the cartesian coordinate system of the experiment.

The comparisons in Fig. 7 are similar to those in Fig. 6 except for configuration 3 where the detector location is 100 cm off axis. For this case, the disagreement may be due to the fact that the albedo surface at the boundary of the reduced geometry is not satisfactory when the detector is too close to the surface.

The differential gamma ray energy spectra for the cases with the detector is on and off the axis of symmetry as a function of SS-304 and BP slab thickness and composition are compared in Figs. 8 and 9. The measured and calculated spectra are compared for gamma rays having energies above 750 keV. The measured and calculated data are in good agreement for gamma rays with energies to ~ 8 MeV. The calculation reproduces the measurements in magnitude but because of the rather coarse energy group structure, the various peaks in the measured differential distributions are not reproduced. The important point to note in these comparisons is that the gamma rays that contribute to these spectra are due, in part, to the reactions of low energy neutrons (< 850 keV) with the slab materials. Thus, even though the neutron spectra are not measured below 850 keV the gamma ray comparisons in Figs. 8 and 9 are some indication that the calculated neutron spectra below 850 keV are reasonably reliable.

Fig. 7 - Neutron flux per unit energy vs. energy for various slab configurations (See Table 2) when the detector position is not on the axis of the deuteron beam.

Fig. 8 - Gamma ray flux per unit energy vs. energy for various slab configurations when the detector is on the axis of the deuteron beam.

Fig. 9 - Gamma ray flux per unit energy vs. energy for various slab configurations when the detector is not on the axis of the deuteron beam.

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APPENDIX A

Tabulation of the unfolded energy spectra

The tabulations in this appendix show the numerical values of the final unfolded data for both gamma rays and neutrons. Each table corresponds to a specific configuration and detector location. The energy is given in MeV, and the upper and lower values of the confidence interval are given in neutrons or gamma rays per cm^2 per MeV and per source neutron. The negative values occurring at the higher energies result from supplying bins to the unfolding program which contain no counts. The program "expects" data for the total light-unit range and returns data for this range. These negative data points, therefore, are not significant and are included here only to show the complete calculated data set. The data are listed in the order shown in Table 2.

Tables A.1 to A.7 give the experimental data for the seven configurations when the detector is on the axis of the deuteron beam and Table A.8 to A.13 give the experimental data for configurations 2 to 7 when the detector is not on the axis of the deuteron beam. The detector coordinates are given relative to the source position.

Table A.1

Neutron Data
Configuration 1* (see Table 2)

Detector Location: $x = 0.0$ cm, $y = 0.0$ cm, $z = 154.5$ cm

Energy (MeV)	Fluence (MeV-cm ⁻²) Confidence Interval		Energy (MeV)	Fluence (MeV-cm ⁻²) Confidence Interval	
0.91	2.25E-06	2.31E-06	5.94	7.85E-08	9.54E-08
1.01	1.78E-06	1.83E-06	6.25	6.51E-08	8.49E-08
1.11	1.39E-06	1.45E-06	6.55	5.73E-08	7.82E-08
1.21	1.20E-06	1.26E-06	6.83	5.61E-08	7.47E-08
1.31	1.18E-06	1.22E-06	7.23	5.79E-08	7.41E-08
1.41	1.17E-06	1.22E-06	7.73	5.10E-08	6.95E-08
1.51	1.10E-06	1.15E-06	8.25	2.46E-08	4.28E-08
1.61	9.49E-07	9.92E-07	8.77	1.13E-08	2.66E-08
1.71	7.60E-07	7.92E-07	9.24	1.20E-08	2.85E-08
1.81	5.96E-07	6.37E-07	9.72	1.92E-08	3.44E-08
1.94	5.12E-07	5.52E-07	10.23	3.60E-08	5.20E-08
2.11	5.35E-07	5.63E-07	10.75	5.50E-08	7.22E-08
2.31	4.91E-07	5.23E-07	11.26	5.76E-08	7.50E-08
2.50	3.82E-07	4.06E-07	11.76	5.62E-08	7.33E-08
2.69	3.30E-07	3.51E-07	12.40	1.29E-07	1.46E-07
2.90	3.50E-07	3.74E-07	13.20	4.70E-07	4.85E-07
3.10	3.25E-07	3.55E-07	14.03	9.44E-07	9.57E-07
3.30	2.42E-07	2.65E-07	14.86	1.06E-06	1.07E-06
3.51	1.61E-07	1.87E-07	15.62	7.94E-07	8.03E-07
3.71	1.34E-07	1.63E-07	16.45	4.12E-07	4.18E-07
3.90	1.46E-07	1.67E-07	17.44	1.39E-07	1.41E-07
4.15	1.48E-07	1.71E-07	18.51	3.20E-08	3.31E-08
4.46	1.28E-07	1.41E-07	19.58	5.28E-09	5.70E-09
4.75	1.09E-07	1.25E-07	20.53	-5.67E-10	-2.41E-10
5.06	9.15E-08	1.11E-07	21.43	-2.27E-09	-2.00E-09
5.36	7.82E-08	9.97E-08	22.40	-2.78E-09	-2.49E-09
5.64	8.07E-08	9.88E-08	23.43	-2.46E-09	-2.17E-09

*Gamma ray data were not measured for this configuration.

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Table A.2

Neutron Data

Configuration 2 (see Table 2)

Detector Location: x = 0.0 cm, y = 0.0 cm, z = 154.5 cm

Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval		Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval	
0.91	1.67E-06	1.68E-06	5.94	1.58E-08	1.79E-08
1.01	1.28E-06	1.29E-06	6.25	1.30E-08	1.55E-08
1.11	9.55E-07	9.64E-07	6.55	1.22E-08	1.47E-08
1.21	7.40E-07	7.49E-07	6.83	1.29E-08	1.51E-08
1.31	6.00E-07	6.06E-07	7.23	1.27E-08	1.48E-08
1.41	4.99E-07	5.06E-07	7.73	1.00E-08	1.23E-08
1.51	4.25E-07	4.33E-07	8.25	7.45E-09	9.68E-09
1.61	3.59E-07	3.65E-07	8.77	7.20E-09	9.07E-09
1.71	3.01E-07	3.06E-07	9.24	6.61E-09	8.63E-09
1.81	2.52E-07	2.58E-07	9.72	5.36E-09	7.19E-09
1.94	2.07E-07	2.13E-07	10.23	5.72E-09	7.63E-09
2.11	1.76E-07	1.80E-07	10.75	7.30E-09	9.36E-09
2.31	1.43E-07	1.48E-07	11.26	7.52E-09	9.60E-09
2.50	1.10E-07	1.13E-07	11.76	7.30E-09	9.34E-09
2.69	8.91E-08	9.20E-08	12.40	1.54E-08	1.74E-08
2.90	8.09E-08	8.41E-08	13.20	5.67E-08	5.86E-08
3.10	7.19E-08	7.60E-08	14.03	1.17E-07	1.19E-07
3.30	5.97E-08	6.27E-08	14.86	1.34E-07	1.35E-07
3.51	4.77E-08	5.13E-08	15.62	1.02E-07	1.03E-07
3.71	4.04E-08	4.43E-08	16.45	5.42E-08	5.49E-08
3.90	3.68E-08	3.95E-08	17.44	1.88E-08	1.91E-08
4.15	3.17E-08	3.48E-08	18.51	4.48E-09	4.62E-09
4.46	2.68E-08	2.86E-08	19.58	7.94E-10	8.53E-10
4.75	2.22E-08	2.44E-08	20.53	-2.07E-11	2.62E-11
5.06	1.86E-08	2.11E-08	21.43	-2.69E-10	-2.28E-10
5.36	1.69E-08	1.97E-08	22.40	-3.64E-10	-3.24E-10
5.64	1.70E-08	1.93E-08	23.43	-3.47E-10	-3.12E-10

Table A.2 (Cont'd)

Gamma-ray Data
Configuration 2 (see Table 2)

Detector Location: x = 0.0 cm, y = 0.0 cm, z = 154.5 cm

Energy (MeV)	Fluence (MeV-1cm-2) Confidence Interval		Energy (MeV)	Fluence (MeV-1cm-2) Confidence Interval	
0.72	3.88E-07	6.58E-07	3.93	4.87E-08	5.70E-08
0.76	6.14E-07	7.25E-07	4.06	3.69E-08	4.60E-08
0.80	7.28E-07	7.62E-07	4.19	2.83E-08	3.81E-08
0.84	7.28E-07	7.42E-07	4.31	2.69E-08	3.82E-08
0.88	6.56E-07	6.67E-07	4.44	3.48E-08	4.76E-08
0.92	5.58E-07	5.69E-07	4.57	4.84E-08	6.25E-08
0.96	4.64E-07	4.75E-07	4.70	5.98E-08	7.41E-08
1.00	3.94E-07	4.05E-07	4.83	5.90E-08	7.44E-08
1.04	3.56E-07	3.67E-07	4.99	4.10E-08	5.91E-08
1.08	3.46E-07	3.56E-07	5.15	1.08E-08	3.05E-08
1.13	3.50E-07	3.60E-07	5.32	-7.53E-09	1.28E-08
1.17	3.59E-07	3.70E-07	5.50	3.45E-10	2.25E-08
1.22	3.64E-07	3.76E-07	5.67	3.22E-08	5.55E-08
1.28	3.65E-07	3.77E-07	5.83	6.56E-08	8.77E-08
1.33	3.59E-07	3.69E-07	6.00	7.87E-08	9.93E-08
1.38	3.40E-07	3.49E-07	6.18	6.66E-08	8.69E-08
1.42	3.08E-07	3.18E-07	6.35	4.07E-08	6.01E-08
1.47	2.73E-07	2.82E-07	6.51	2.02E-08	3.75E-08
1.53	2.42E-07	2.50E-07	6.70	1.51E-08	3.00E-08
1.58	2.18E-07	2.26E-07	6.90	2.88E-08	4.19E-08
1.64	1.97E-07	2.06E-07	7.10	4.84E-08	6.10E-08
1.72	1.85E-07	1.93E-07	7.30	6.08E-08	7.25E-08
1.80	1.83E-07	1.91E-07	7.50	6.06E-08	7.11E-08
1.88	1.84E-07	1.93E-07	7.70	5.03E-08	6.00E-08
1.96	1.85E-07	1.93E-07	7.90	3.64E-08	4.52E-08
2.04	1.88E-07	1.95E-07	8.10	2.51E-08	3.27E-08
2.12	1.90E-07	1.97E-07	8.30	1.82E-08	2.50E-08
2.20	1.85E-07	1.93E-07	8.50	1.56E-08	2.17E-08
2.28	1.71E-07	1.78E-07	8.73	1.49E-08	2.01E-08
2.36	1.49E-07	1.56E-07	8.98	1.34E-08	1.79E-08
2.45	1.22E-07	1.29E-07	9.23	1.01E-08	1.37E-08
2.55	1.01E-07	1.07E-07	9.48	5.78E-09	8.83E-09
2.65	8.97E-08	9.63E-08	9.73	2.05E-09	4.63E-09
2.75	8.48E-08	9.14E-08	9.98	-4.38E-10	1.85E-09
2.85	7.96E-08	8.61E-08	10.30	-1.75E-09	3.25E-10
2.95	7.25E-08	7.88E-08	10.70	-1.76E-09	2.37E-10
3.05	6.63E-08	7.28E-08	11.10	-1.29E-09	4.83E-10
3.15	6.33E-08	7.01E-08	11.50	-8.71E-10	5.38E-10
3.25	6.33E-08	7.03E-08	11.90	-4.79E-10	5.85E-10
3.35	6.46E-08	7.16E-08	12.30	-1.32E-10	7.38E-10
3.45	6.60E-08	7.30E-08	12.70	1.64E-10	1.01E-09
3.55	6.63E-08	7.37E-08	13.10	3.55E-10	1.17E-09
3.66	6.45E-08	7.23E-08	13.50	3.64E-10	1.14E-09
3.79	5.88E-08	6.67E-08	13.90	2.90E-10	9.55E-10

Table A.3

Neutron Data

Configuration 3 (See Table 2)

Detector Location: $x = 0.0$ cm, $y = 0.0$ cm, $z = 154.5$ cm

Energy (MeV)	Fluence (MeV-cm ⁻²) Confidence Interval		Energy (MeV)	Fluence (MeV-cm ⁻²) Confidence Interval	
0.91	5.71E-07	5.75E-07	5.94	2.12E-09	2.62E-09
1.01	4.19E-07	4.22E-07	6.25	2.34E-09	2.92E-09
1.11	2.93E-07	2.95E-07	6.55	2.49E-09	3.11E-09
1.21	2.08E-07	2.10E-07	6.83	2.41E-09	2.94E-09
1.31	1.53E-07	1.55E-07	7.23	1.86E-09	2.33E-09
1.41	1.18E-07	1.20E-07	7.73	1.09E-09	1.63E-09
1.51	9.55E-08	9.74E-08	8.25	7.71E-10	1.30E-09
1.61	7.82E-08	7.98E-08	8.77	1.22E-09	1.65E-09
1.71	6.41E-08	6.53E-08	9.24	1.33E-09	1.80E-09
1.81	5.22E-08	5.37E-08	9.72	1.12E-09	1.55E-09
1.94	4.10E-08	4.24E-08	10.23	1.21E-09	1.65E-09
2.11	3.24E-08	3.34E-08	10.75	1.52E-09	1.98E-09
2.31	2.49E-08	2.60E-08	11.26	1.49E-09	1.97E-09
2.50	1.88E-08	1.96E-08	11.76	1.41E-09	1.87E-09
2.69	1.50E-08	1.57E-08	12.40	2.57E-09	3.02E-09
2.90	1.32E-08	1.40E-08	13.20	7.70E-09	8.11E-09
3.10	1.14E-08	1.24E-08	14.03	1.44E-08	1.47E-08
3.30	9.15E-09	9.87E-09	14.86	1.57E-08	1.60E-08
3.51	6.90E-09	7.70E-09	15.62	1.17E-08	1.19E-08
3.71	5.61E-09	6.51E-09	16.45	6.08E-09	6.22E-09
3.90	5.23E-09	5.88E-09	17.44	2.06E-09	2.13E-09
4.15	4.79E-09	5.50E-09	18.51	4.75E-10	5.03E-10
4.46	4.07E-09	4.50E-09	19.58	7.58E-11	8.59E-11
4.75	3.19E-09	3.69E-09	20.53	-1.14E-11	-3.42E-12
5.06	2.61E-09	3.18E-09	21.43	-3.59E-11	-2.91E-11
5.36	2.18E-09	2.80E-09	22.40	-4.27E-11	-3.60E-11
5.64	2.03E-09	2.56E-09	23.43	-3.77E-11	-3.09E-11

Table A.3 (Cont'd)

Gamma-ray Data
Configuration 2 (see Table 2)
Detector Location: $x = 0.0$ cm, $y = 0.0$ cm, $z = 154.5$ cm

Energy (MeV)	Fluence (MeV-cm ⁻²) Confidence Interval		Energy (MeV)	Fluence (MeV-cm ⁻²) Confidence Interval	
0.72	1.04E-07	1.95E-07	3.93	1.87E-08	2.26E-08
0.76	1.56E-07	1.94E-07	4.06	1.77E-08	2.20E-08
0.80	1.79E-07	1.90E-07	4.19	1.42E-08	1.89E-08
0.84	1.75E-07	1.81E-07	4.31	9.89E-09	1.52E-08
0.88	1.56E-07	1.61E-07	4.44	7.77E-09	1.39E-08
0.92	1.33E-07	1.38E-07	4.57	9.28E-09	1.60E-08
0.96	1.13E-07	1.17E-07	4.70	1.30E-08	1.97E-08
1.00	9.66E-08	1.01E-07	4.83	1.50E-08	2.23E-08
1.04	8.65E-08	9.08E-08	4.99	1.34E-08	2.21E-08
1.08	8.24E-08	8.68E-08	5.15	8.71E-09	1.75E-08
1.13	8.18E-08	8.61E-08	5.32	3.74E-09	1.34E-08
1.17	8.19E-08	8.62E-08	5.50	4.18E-09	1.47E-08
1.22	8.08E-08	8.55E-08	5.67	1.08E-08	2.19E-08
1.28	7.85E-08	8.34E-08	5.83	1.91E-08	2.98E-08
1.33	7.67E-08	8.09E-08	6.00	2.37E-08	3.35E-08
1.38	7.53E-08	7.93E-08	6.18	2.26E-08	3.23E-08
1.42	7.32E-08	7.74E-08	6.35	1.76E-08	2.67E-08
1.47	7.03E-08	7.44E-08	6.51	1.31E-08	2.12E-08
1.53	6.73E-08	7.11E-08	6.70	1.21E-08	1.89E-08
1.58	6.48E-08	6.86E-08	6.90	1.57E-08	2.18E-08
1.64	6.23E-08	6.60E-08	7.10	2.12E-08	2.71E-08
1.72	6.01E-08	6.38E-08	7.30	2.47E-08	3.00E-08
1.80	6.24E-08	6.61E-08	7.50	2.45E-08	2.94E-08
1.88	6.75E-08	7.13E-08	7.70	2.11E-08	2.56E-08
1.96	6.97E-08	7.35E-08	7.90	1.63E-08	2.02E-08
2.04	7.04E-08	7.40E-08	8.10	1.18E-08	1.52E-08
2.12	7.33E-08	7.69E-08	8.30	8.50E-09	1.13E-08
2.20	7.55E-08	7.90E-08	8.50	6.55E-09	9.03E-09
2.28	7.09E-08	7.42E-08	8.73	5.38E-09	7.51E-09
2.36	5.97E-08	6.30E-08	8.98	4.46E-09	6.25E-09
2.45	4.60E-08	4.92E-08	9.23	3.46E-09	4.85E-09
2.55	3.51E-08	3.81E-08	9.48	2.29E-09	3.45E-09
2.65	2.84E-08	3.14E-08	9.73	1.30E-09	2.32E-09
2.75	2.56E-08	2.86E-08	9.98	6.04E-10	1.44E-09
2.85	2.51E-08	2.81E-08	10.30	1.45E-10	8.53E-10
2.95	2.40E-08	2.70E-08	10.70	-3.06E-11	5.04E-10
3.05	2.15E-08	2.45E-08	11.10	-3.65E-11	2.67E-10
3.15	1.93E-08	2.24E-08	11.50	-3.97E-11	1.72E-10
3.25	1.90E-08	2.22E-08	11.90	-6.53E-11	1.12E-10
3.35	1.96E-08	2.29E-08	12.30	-9.60E-11	8.98E-11
3.45	1.99E-08	2.32E-08	12.70	-1.06E-10	8.08E-11
3.55	1.92E-08	2.27E-08	13.10	-9.88E-11	7.20E-11
3.66	1.81E-08	2.18E-08	13.50	-7.98E-11	6.22E-11
3.79	1.81E-08	2.18E-08	13.90	-5.80E-11	5.24E-11

Table A.4

Neutron Data

Configuration 4 (see Table 2)

Detector Location: $x = 0.0$ cm, $y = 0.0$ cm, $z = 154.5$ cm

Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval		Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval	
0.91	7.54E-08	7.63E-08	5.94	9.07E-10	1.07E-09
1.01	5.58E-08	5.64E-08	6.25	7.63E-10	9.49E-10
1.11	4.13E-08	4.20E-08	6.55	6.85E-10	8.88E-10
1.21	3.37E-08	3.44E-08	6.83	7.05E-10	8.77E-10
1.31	2.92E-08	2.97E-08	7.23	7.39E-10	8.92E-10
1.41	2.49E-08	2.54E-08	7.73	7.17E-10	8.91E-10
1.51	2.07E-08	2.13E-08	8.25	6.61E-10	8.32E-10
1.61	1.68E-08	1.72E-08	8.77	6.82E-10	8.22E-10
1.71	1.35E-08	1.39E-08	9.24	7.25E-10	8.73E-10
1.81	1.09E-08	1.14E-08	9.72	7.59E-10	8.92E-10
1.94	8.68E-09	9.11E-09	10.23	8.01E-10	9.40E-10
2.11	6.99E-09	7.28E-09	10.75	8.39E-10	9.87E-10
2.31	5.49E-09	5.82E-09	11.26	7.87E-10	9.35E-10
2.50	4.42E-09	4.67E-09	11.76	7.63E-10	9.05E-10
2.69	3.80E-09	4.02E-09	12.40	1.25E-09	1.39E-09
2.90	3.39E-09	3.63E-09	13.20	3.04E-09	3.16E-09
3.10	2.91E-09	3.21E-09	14.03	4.99E-09	5.08E-09
3.30	2.45E-09	2.68E-09	14.86	5.04E-09	5.12E-09
3.51	2.05E-09	2.31E-09	15.62	3.57E-09	3.64E-09
3.71	1.82E-09	2.12E-09	16.45	1.79E-09	1.83E-09
3.90	1.72E-09	1.93E-09	17.44	5.82E-10	6.02E-10
4.15	1.51E-09	1.74E-09	18.51	1.27E-10	1.35E-10
4.46	1.40E-09	1.54E-09	19.58	1.71E-11	2.01E-11
4.75	1.30E-09	1.47E-09	20.53	-5.83E-12	-4.10E-12
5.06	1.15E-09	1.33E-09	21.43	-1.20E-11	-1.07E-11
5.36	1.03E-09	1.23E-09	22.40	-1.35E-11	-1.22E-11
5.64	9.90E-10	1.17E-09	23.43	-1.15E-11	-1.03E-11

Table A.4 (Cont'd)

Gamma-ray Data
Configuration 4 (see Table 2)

Detector Location: x = 0.0 cm, y = 0.0 cm, z = 154.5 cm

Energy (MeV)	Fluence (MeV-cm ⁻²) Confidence Interval		Energy (MeV)	Fluence (MeV-cm ⁻²) Confidence Interval	
0.72	5.42E-08	1.13E-07	3.93	7.03E-09	1.03E-08
0.76	8.34E-08	1.08E-07	4.06	6.67E-09	1.03E-08
0.80	9.55E-08	1.04E-07	4.19	6.98E-09	1.09E-08
0.84	9.44E-08	9.96E-08	4.31	7.40E-09	1.19E-08
0.88	8.49E-08	8.96E-08	4.44	7.44E-09	1.26E-08
0.92	7.22E-08	7.69E-08	4.57	7.55E-09	1.32E-08
0.96	6.20E-08	6.65E-08	4.70	7.64E-09	1.34E-08
1.00	5.60E-08	6.04E-08	4.83	6.30E-09	1.26E-08
1.04	5.24E-08	5.68E-08	4.99	3.06E-09	1.02E-08
1.08	5.04E-08	5.48E-08	5.15	-2.37E-10	7.69E-09
1.13	4.94E-08	5.36E-08	5.32	1.47E-09	9.66E-09
1.17	4.78E-08	5.19E-08	5.50	7.62E-09	1.64E-08
1.22	4.40E-08	4.82E-08	5.67	1.42E-08	2.33E-08
1.28	4.05E-08	4.47E-08	5.83	1.58E-08	2.50E-08
1.33	3.98E-08	4.35E-08	6.00	1.17E-08	2.00E-08
1.38	3.98E-08	4.32E-08	6.18	5.16E-09	1.31E-08
1.42	3.82E-08	4.17E-08	6.35	1.19E-09	8.75E-09
1.47	3.63E-08	3.96E-08	6.51	2.99E-09	9.91E-09
1.53	3.55E-08	3.86E-08	6.70	9.60E-09	1.53E-08
1.58	3.61E-08	3.91E-08	6.90	1.61E-08	2.13E-08
1.64	3.68E-08	3.98E-08	7.10	1.83E-08	2.33E-08
1.72	3.46E-08	3.75E-08	7.30	1.67E-08	2.11E-08
1.80	3.16E-08	3.46E-08	7.50	1.37E-08	1.78E-08
1.88	3.16E-08	3.45E-08	7.70	1.13E-08	1.50E-08
1.96	3.38E-08	3.69E-08	7.90	1.01E-08	1.32E-08
2.04	3.83E-08	4.11E-08	8.10	9.13E-09	1.19E-08
2.12	4.36E-08	4.64E-08	8.30	8.05E-09	1.04E-08
2.20	4.53E-08	4.81E-08	8.50	6.61E-09	8.63E-09
2.28	4.08E-08	4.35E-08	8.73	4.84E-09	6.50E-09
2.36	3.32E-08	3.58E-08	8.98	3.04E-09	4.41E-09
2.45	2.55E-08	2.81E-08	9.23	1.63E-09	2.72E-09
2.55	1.92E-08	2.16E-08	9.48	7.00E-10	1.59E-09
2.65	1.52E-08	1.77E-08	9.73	1.87E-10	9.57E-10
2.75	1.41E-08	1.65E-08	9.98	-5.62E-11	6.52E-10
2.85	1.38E-08	1.62E-08	10.30	-9.29E-11	5.21E-10
2.95	1.28E-08	1.52E-08	10.70	-4.23E-11	4.78E-10
3.05	1.18E-08	1.42E-08	11.10	-3.80E-11	4.10E-10
3.15	1.18E-08	1.44E-08	11.50	-7.42E-11	3.06E-10
3.25	1.25E-08	1.51E-08	11.90	-1.18E-10	1.69E-10
3.35	1.23E-08	1.50E-08	12.30	-1.48E-10	1.20E-10
3.45	1.11E-08	1.38E-08	12.70	-1.41E-10	1.37E-10
3.55	9.47E-09	1.23E-08	13.10	-1.25E-10	1.30E-10
3.66	8.22E-09	1.12E-08	13.50	-1.02E-10	1.24E-10
3.79	7.60E-09	1.07E-08	13.90	-6.95E-11	1.04E-10

Table A.5

Neutron Data

Configuration 5 (see Table 2)

Detector Location: $x = 0.0$ cm, $y = 0.0$ cm, $z = 154.5$ cm

Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval		Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval	
0.91	4.89E-08	4.94E-08	5.94	4.77E-10	5.68E-10
1.01	3.67E-08	3.70E-08	6.25	3.98E-10	5.01E-10
1.11	2.64E-08	2.68E-08	6.55	3.50E-10	4.61E-10
1.21	1.95E-08	1.99E-08	6.83	3.42E-10	4.36E-10
1.31	1.52E-08	1.55E-08	7.23	3.70E-10	4.54E-10
1.41	1.24E-08	1.26E-08	7.73	4.08E-10	5.05E-10
1.51	1.05E-08	1.08E-08	8.25	3.59E-10	4.53E-10
1.61	8.89E-09	9.15E-09	8.77	3.22E-10	4.00E-10
1.71	7.48E-09	7.68E-09	9.24	3.07E-10	3.90E-10
1.81	6.19E-09	6.43E-09	9.72	3.19E-10	3.93E-10
1.94	4.93E-09	5.16E-09	10.23	3.78E-10	4.54E-10
2.11	4.00E-09	4.17E-09	10.75	4.29E-10	5.08E-10
2.31	3.25E-09	3.43E-09	11.26	3.89E-10	4.70E-10
2.50	2.62E-09	2.76E-09	11.76	3.55E-10	4.32E-10
2.69	2.23E-09	2.35E-09	12.40	6.30E-10	7.05E-10
2.90	2.00E-09	2.13E-09	13.20	1.59E-09	1.66E-09
3.10	1.69E-09	1.86E-09	14.03	2.51E-09	2.56E-09
3.30	1.34E-09	1.46E-09	14.86	2.43E-09	2.48E-09
3.51	9.98E-10	1.14E-09	15.62	1.68E-09	1.71E-09
3.71	8.38E-10	1.00E-09	16.45	8.22E-10	8.43E-10
3.90	8.60E-10	9.76E-10	17.44	2.63E-10	2.74E-10
4.15	8.61E-10	9.87E-10	18.51	5.73E-11	6.14E-11
4.46	7.35E-10	8.12E-10	19.58	7.73E-12	9.34E-12
4.75	6.01E-10	6.92E-10	20.53	-2.97E-12	-1.68E-12
5.06	5.62E-10	6.63E-10	21.43	-5.99E-12	-4.95E-12
5.36	5.60E-10	6.75E-10	22.40	-6.84E-12	-5.76E-12
5.64	5.43E-10	6.43E-10	23.43	-5.95E-12	-4.83E-12

Table A.5 (Cont'd)

Gamma-ray Data
Configuration 5 (see Table 2)
Detector Location: x = 0.0 cm, y = 0.0 cm, z = 154.5 cm

Energy (MeV)	Fluence (MeV-1cm-2) Confidence Interval		Energy (MeV)	Fluence (MeV-1cm-2) Confidence Interval	
0.72	2.75E-08	5.06E-08	3.93	4.44E-09	5.30E-09
0.76	4.18E-08	5.13E-08	4.06	3.73E-09	4.66E-09
0.80	4.72E-08	5.00E-08	4.19	3.34E-09	4.35E-09
0.84	4.56E-08	4.67E-08	4.31	3.56E-09	4.75E-09
0.88	4.06E-08	4.16E-08	4.44	4.35E-09	5.74E-09
0.92	3.53E-08	3.63E-08	4.57	5.41E-09	6.89E-09
0.96	3.11E-08	3.21E-08	4.70	6.23E-09	7.73E-09
1.00	2.85E-08	2.94E-08	4.83	5.97E-09	7.57E-09
1.04	2.71E-08	2.80E-08	4.99	3.97E-09	5.90E-09
1.08	2.63E-08	2.72E-08	5.15	1.04E-09	3.09E-09
1.13	2.59E-08	2.68E-08	5.32	-1.40E-11	2.13E-09
1.17	2.56E-08	2.65E-08	5.50	2.08E-09	4.40E-09
1.22	2.53E-08	2.62E-08	5.67	5.90E-09	8.40E-09
1.28	2.45E-08	2.55E-08	5.83	8.56E-09	1.09E-08
1.33	2.34E-08	2.43E-08	6.00	8.43E-09	1.06E-08
1.38	2.21E-08	2.29E-08	6.18	6.10E-09	8.25E-09
1.42	2.11E-08	2.19E-08	6.35	3.66E-09	5.66E-09
1.47	2.02E-08	2.10E-08	6.51	2.80E-09	4.61E-09
1.53	1.96E-08	2.03E-08	6.70	3.96E-09	5.48E-09
1.58	1.91E-08	1.99E-08	6.90	6.44E-09	7.79E-09
1.64	1.87E-08	1.95E-08	7.10	8.42E-09	9.68E-09
1.72	1.79E-08	1.87E-08	7.30	9.02E-09	1.02E-08
1.80	1.72E-08	1.79E-08	7.50	8.33E-09	9.40E-09
1.88	1.70E-08	1.78E-08	7.70	6.97E-09	7.93E-09
1.96	1.73E-08	1.81E-08	7.90	5.57E-09	6.42E-09
2.04	1.78E-08	1.86E-08	8.10	4.51E-09	5.27E-09
2.12	1.85E-08	1.92E-08	8.30	3.81E-09	4.46E-09
2.20	1.85E-08	1.93E-08	8.50	3.30E-09	3.86E-09
2.28	1.72E-08	1.79E-08	8.73	2.71E-09	3.17E-09
2.36	1.46E-08	1.53E-08	8.98	1.99E-09	2.38E-09
2.45	1.17E-08	1.24E-08	9.23	1.31E-09	1.62E-09
2.55	9.50E-09	1.01E-08	9.48	7.71E-10	1.02E-09
2.65	8.23E-09	8.87E-09	9.73	4.09E-10	6.15E-10
2.75	7.62E-09	8.27E-09	9.98	1.92E-10	3.60E-10
2.85	7.36E-09	8.01E-09	10.30	5.16E-11	1.99E-10
2.95	7.06E-09	7.69E-09	10.70	-7.49E-12	1.11E-10
3.05	6.66E-09	7.30E-09	11.10	-1.33E-11	6.76E-11
3.15	6.41E-09	7.09E-09	11.50	-1.23E-11	4.49E-11
3.25	6.43E-09	7.13E-09	11.90	-1.77E-11	2.94E-11
3.35	6.44E-09	7.15E-09	12.30	-2.52E-11	2.56E-11
3.45	6.18E-09	6.89E-09	12.70	-2.67E-11	2.32E-11
3.55	5.71E-09	6.46E-09	13.10	-2.42E-11	1.77E-11
3.66	5.27E-09	6.07E-09	13.50	-1.96E-11	1.67E-11
3.79	4.96E-09	5.77E-09	13.90	-1.39E-11	1.53E-11

Table A.6

Neutron Data

Configuration 6 (see Table 2)

Detector Location: $x = 0.0$ cm, $y = 0.0$ cm, $z = 154.5$ cm

Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval		Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval	
0.91	1.06E-08	1.09E-08	5.94	3.16E-10	4.02E-10
1.01	8.24E-09	8.49E-09	6.25	3.31E-10	4.28E-10
1.11	6.13E-09	6.44E-09	6.55	3.24E-10	4.27E-10
1.21	5.14E-09	5.43E-09	6.83	2.99E-10	3.87E-10
1.31	4.84E-09	5.05E-09	7.23	2.40E-10	3.18E-10
1.41	4.45E-09	4.70E-09	7.73	2.37E-10	3.27E-10
1.51	3.80E-09	4.07E-09	8.25	3.00E-10	3.89E-10
1.61	3.11E-09	3.31E-09	8.77	3.63E-10	4.35E-10
1.71	2.55E-09	2.70E-09	9.24	3.54E-10	4.28E-10
1.81	2.16E-09	2.34E-09	9.72	2.97E-10	3.64E-10
1.94	1.95E-09	2.13E-09	10.23	2.98E-10	3.69E-10
2.11	1.89E-09	2.02E-09	10.75	3.62E-10	4.32E-10
2.31	1.56E-09	1.70E-09	11.26	3.68E-10	4.39E-10
2.50	1.13E-09	1.30E-09	11.76	3.49E-10	4.18E-10
2.69	9.97E-10	1.10E-09	12.40	4.94E-10	5.59E-10
2.90	9.38E-10	1.06E-09	13.20	1.07E-09	1.13E-09
3.10	7.99E-10	9.45E-10	14.03	1.67E-09	1.72E-09
3.30	6.29E-10	7.33E-10	14.86	1.65E-09	1.69E-09
3.51	5.01E-10	6.29E-10	15.62	1.14E-09	1.17E-09
3.71	4.73E-10	6.16E-10	16.45	5.56E-10	5.75E-10
3.90	5.11E-10	6.17E-10	17.44	1.72E-10	1.81E-10
4.15	5.38E-10	6.50E-10	18.51	3.43E-11	3.75E-11
4.46	5.18E-10	5.90E-10	19.58	4.62E-12	5.77E-12
4.75	4.45E-10	5.27E-10	20.53	-4.70E-13	6.00E-13
5.06	3.89E-10	4.84E-10	21.43	-1.67E-12	-3.85E-13
5.36	3.28E-10	4.30E-10	22.40	-1.96E-12	-5.33E-13
5.64	3.04E-10	3.94E-10	23.43	-1.74E-12	-3.15E-13

Table A.6 (Cont'd.)

Gamma-ray Data

Configuration 6 (see Table 2)

Detector Location: $x = 0.0$ cm, $y = 0.0$ cm, $z = 154.5$ cm

Energy (MeV)	Fluence (MeV-lcm ⁻²) Confidence Interval	Energy (MeV)	Fluence (MeV-lcm ⁻²) Confidence Interval
0.72	1.59E-08 3.53E-08	3.93	3.43E-09 4.25E-09
0.76	2.90E-08 3.65E-08	4.06	3.11E-09 4.02E-09
0.80	3.44E-08 3.68E-08	4.19	2.96E-09 3.93E-09
0.84	3.39E-08 3.51E-08	4.31	3.08E-09 4.17E-09
0.88	3.09E-08 3.19E-08	4.44	3.29E-09 4.60E-09
0.92	2.73E-08 2.84E-08	4.57	3.42E-09 4.85E-09
0.96	2.42E-08 2.53E-08	4.70	3.34E-09 4.76E-09
1.00	2.20E-08 2.30E-08	4.83	2.94E-09 4.49E-09
1.04	2.04E-08 2.14E-08	4.99	2.36E-09 4.19E-09
1.08	1.93E-08 2.03E-08	5.15	1.89E-09 3.88E-09
1.13	1.82E-08 1.91E-08	5.32	1.87E-09 3.90E-09
1.17	1.73E-08 1.83E-08	5.50	2.54E-09 4.73E-09
1.22	1.69E-08 1.80E-08	5.67	3.95E-09 6.33E-09
1.28	1.65E-08 1.76E-08	5.83	5.24E-09 7.47E-09
1.33	1.60E-08 1.69E-08	6.00	5.34E-09 7.40E-09
1.38	1.56E-08 1.65E-08	6.18	4.09E-09 6.12E-09
1.42	1.53E-08 1.61E-08	6.35	2.60E-09 4.55E-09
1.47	1.49E-08 1.57E-08	6.51	2.28E-09 3.98E-09
1.53	1.47E-08 1.54E-08	6.70	3.47E-09 4.92E-09
1.58	1.46E-08 1.53E-08	6.90	5.63E-09 6.95E-09
1.64	1.44E-08 1.52E-08	7.10	7.13E-09 8.36E-09
1.72	1.36E-08 1.43E-08	7.30	7.23E-09 8.35E-09
1.80	1.25E-08 1.32E-08	7.50	6.36E-09 7.35E-09
1.88	1.20E-08 1.27E-08	7.70	5.28E-09 6.20E-09
1.96	1.22E-08 1.30E-08	7.90	4.49E-09 5.29E-09
2.04	1.28E-08 1.35E-08	8.10	3.98E-09 4.67E-09
2.12	1.31E-08 1.37E-08	8.30	3.53E-09 4.12E-09
2.20	1.26E-08 1.33E-08	8.50	3.00E-09 3.50E-09
2.28	1.15E-08 1.22E-08	8.73	2.31E-09 2.73E-09
2.36	1.00E-08 1.07E-08	8.98	1.53E-09 1.85E-09
2.45	8.29E-09 8.91E-09	9.23	8.64E-10 1.13E-09
2.55	7.12E-09 7.71E-09	9.48	4.00E-10 6.19E-10
2.65	6.61E-09 7.22E-09	9.73	1.29E-10 3.17E-10
2.75	6.13E-09 6.75E-09	9.98	3.99E-12 1.63E-10
2.85	5.55E-09 6.16E-09	10.30	-4.43E-11 8.30E-11
2.95	5.05E-09 5.65E-09	10.70	-3.01E-11 6.47E-11
3.05	4.68E-09 5.29E-09	11.10	-6.22E-12 6.12E-11
3.15	4.42E-09 5.06E-09	11.50	2.73E-12 5.41E-11
3.25	4.34E-09 5.00E-09	11.90	-2.91E-12 4.83E-11
3.35	4.35E-09 5.03E-09	12.30	-9.39E-12 4.16E-11
3.45	4.30E-09 5.00E-09	12.70	-1.08E-11 3.55E-11
3.55	4.14E-09 4.86E-09	13.10	-1.05E-11 3.02E-11
3.66	3.92E-09 4.69E-09	13.50	-8.74E-12 2.52E-11
3.79	3.71E-09 4.49E-09	13.90	-6.13E-12 2.17E-11

Table A.7

Neutron Data
Configuration 7 (see Table 2)

Detector Location: $x = 0.0$ cm, $y = 0.0$ cm, $z = 154.5$ cm

Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval		Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval	
0.91	7.22E-09	7.40E-09	5.94	1.12E-10	1.51E-10
1.01	5.76E-09	5.89E-09	6.25	1.08E-10	1.51E-10
1.11	4.35E-09	4.51E-09	6.55	1.24E-10	1.71E-10
1.21	3.39E-09	3.53E-09	6.83	1.54E-10	1.93E-10
1.31	2.83E-09	2.93E-09	7.23	1.77E-10	2.12E-10
1.41	2.47E-09	2.59E-09	7.73	1.42E-10	1.82E-10
1.51	2.21E-09	2.33E-09	8.25	9.68E-11	1.37E-10
1.61	1.94E-09	2.04E-09	8.77	1.20E-10	1.53E-10
1.71	1.66E-09	1.74E-09	9.24	1.43E-10	1.77E-10
1.81	1.39E-09	1.49E-09	9.72	1.46E-10	1.77E-10
1.94	1.16E-09	1.26E-09	10.23	1.49E-10	1.81E-10
2.11	1.01E-09	1.08E-09	10.75	1.51E-10	1.84E-10
2.31	8.46E-10	9.27E-10	11.26	1.38E-10	1.72E-10
2.50	7.29E-10	7.92E-10	11.76	1.45E-10	1.78E-10
2.69	6.22E-10	6.77E-10	12.40	2.45E-10	2.77E-10
2.90	5.36E-10	5.99E-10	13.20	5.05E-10	5.31E-10
3.10	4.76E-10	5.48E-10	14.03	7.44E-10	7.65E-10
3.30	4.24E-10	4.76E-10	14.86	7.19E-10	7.38E-10
3.51	3.46E-10	4.10E-10	15.62	5.01E-10	5.15E-10
3.71	2.73E-10	3.40E-10	16.45	2.47E-10	2.56E-10
3.90	2.38E-10	2.87E-10	17.44	7.91E-11	8.34E-11
4.15	2.23E-10	2.76E-10	18.51	1.67E-11	1.84E-11
4.46	2.46E-10	2.80E-10	19.58	1.91E-12	2.72E-12
4.75	2.43E-10	2.81E-10	20.53	-1.05E-12	-5.27E-13
5.06	2.09E-10	2.52E-10	21.43	-1.80E-12	-1.41E-12
5.36	1.60E-10	2.09E-10	22.40	-2.00E-12	-1.60E-12
5.64	1.31E-10	1.74E-10	23.43	-1.71E-12	-1.34E-12

Table A.7 (Cont'd)

Gamma-ray Data
Configuraiton 7 (see Table 2)

Detector Location: x = 0.0 cm, y = 0.0 cm, z = 154.5 cm

Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval		Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval	
0.72	5.63E-09	1.79E-08	3.93	1.58E-09	2.00E-09
0.76	1.15E-08	1.68E-08	4.06	1.26E-09	1.72E-09
0.80	1.44E-08	1.65E-08	4.19	9.42E-10	1.45E-09
0.84	1.48E-08	1.63E-08	4.31	7.47E-10	1.33E-09
0.88	1.39E-08	1.53E-08	4.44	7.23E-10	1.41E-09
0.92	1.26E-08	1.40E-08	4.57	9.40E-10	1.69E-09
0.96	1.14E-08	1.28E-08	4.70	1.38E-09	2.13E-09
1.00	1.04E-08	1.19E-08	4.83	1.82E-09	2.62E-09
1.04	9.98E-09	1.14E-08	4.99	1.94E-09	2.90E-09
1.08	1.02E-08	1.17E-08	5.15	1.22E-09	2.26E-09
1.13	1.13E-08	1.28E-08	5.32	4.11E-11	1.11E-09
1.17	1.25E-08	1.39E-08	5.50	-5.61E-10	6.05E-10
1.22	1.28E-08	1.42E-08	5.67	1.65E-10	1.41E-09
1.28	1.22E-08	1.35E-08	5.83	1.60E-09	2.78E-09
1.33	1.14E-08	1.25E-08	6.00	2.62E-09	3.70E-09
1.38	1.06E-08	1.15E-08	6.18	2.54E-09	3.63E-09
1.42	9.44E-09	1.03E-08	6.35	1.62E-09	2.66E-09
1.47	8.14E-09	8.82E-09	6.51	7.77E-10	1.69E-09
1.53	7.00E-09	7.57E-09	6.70	6.00E-10	1.38E-09
1.58	6.23E-09	6.70E-09	6.90	1.29E-09	2.00E-09
1.64	5.79E-09	6.21E-09	7.10	2.19E-09	2.88E-09
1.72	5.61E-09	6.00E-09	7.30	2.61E-09	3.24E-09
1.80	5.36E-09	5.73E-09	7.50	2.39E-09	2.97E-09
1.88	5.10E-09	5.47E-09	7.70	1.83E-09	2.36E-09
1.96	4.96E-09	5.35E-09	7.90	1.28E-09	1.75E-09
2.04	4.94E-09	5.30E-09	8.10	9.28E-10	1.35E-09
2.12	4.90E-09	5.26E-09	8.30	7.56E-10	1.12E-09
2.20	4.77E-09	5.12E-09	8.50	6.93E-10	1.00E-09
2.28	4.54E-09	4.88E-09	8.73	6.36E-10	9.02E-10
2.36	4.22E-09	4.56E-09	8.98	5.29E-10	7.60E-10
2.45	3.67E-09	4.00E-09	9.23	3.85E-10	5.67E-10
2.55	2.88E-09	3.20E-09	9.48	2.34E-10	3.87E-10
2.65	2.29E-09	2.61E-09	9.73	9.90E-11	2.39E-10
2.75	2.13E-09	2.45E-09	9.98	3.71E-12	1.33E-10
2.85	2.16E-09	2.48E-09	10.30	-5.28E-11	5.69E-11
2.95	2.07E-09	2.38E-09	10.70	-6.40E-11	2.09E-11
3.05	1.83E-09	2.15E-09	11.10	-4.30E-11	1.75E-11
3.15	1.66E-09	1.99E-09	11.50	-1.82E-11	2.52E-11
3.25	1.69E-09	2.04E-09	11.90	-4.88E-12	3.31E-11
3.35	1.87E-09	2.22E-09	12.30	-9.37E-13	3.94E-11
3.45	2.03E-09	2.39E-09	12.70	4.30E-13	3.94E-11
3.55	2.06E-09	2.42E-09	13.10	-4.20E-13	3.42E-11
3.66	1.96E-09	2.35E-09	13.50	-1.44E-12	2.76E-11
3.79	1.81E-09	2.21E-09	13.90	-1.61E-12	2.11E-11

Table A.8

Neutron Data

Configuration 2 (see Table 2)

Detector Location: $x = 46.0$ cm, $y = 0.0$ cm, $z = 154.5$ cm

Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval		Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval	
0.91	1.42E-06	1.43E-06	5.94	1.20E-08	1.37E-08
1.01	1.10E-06	1.11E-06	6.25	1.10E-08	1.30E-08
1.11	8.28E-07	8.35E-07	6.55	1.07E-08	1.28E-08
1.21	6.29E-07	6.36E-07	6.83	1.06E-08	1.24E-08
1.31	4.98E-07	5.03E-07	7.23	9.97E-09	1.16E-08
1.41	4.10E-07	4.15E-07	7.73	8.07E-09	9.98E-09
1.51	3.51E-07	3.57E-07	8.25	5.42E-09	7.22E-09
1.61	3.00E-07	3.05E-07	8.77	4.39E-09	5.91E-09
1.71	2.51E-07	2.55E-07	9.24	4.21E-09	5.83E-09
1.81	2.08E-07	2.13E-07	9.72	4.94E-09	6.45E-09
1.94	1.69E-07	1.74E-07	10.23	7.27E-09	8.87E-09
2.11	1.44E-07	1.47E-07	10.75	8.56E-09	1.03E-08
2.31	1.20E-07	1.23E-07	11.26	6.60E-09	8.33E-09
2.50	9.17E-08	9.45E-08	11.76	6.12E-09	7.80E-09
2.69	7.33E-08	7.57E-08	12.40	1.88E-08	2.04E-08
2.90	6.75E-08	7.02E-08	13.20	5.64E-08	5.78E-08
3.10	6.00E-08	6.34E-08	14.03	9.29E-08	9.39E-08
3.30	4.87E-08	5.11E-08	14.86	9.62E-08	9.71E-08
3.51	3.78E-08	4.07E-08	15.62	7.18E-08	7.25E-08
3.71	3.19E-08	3.51E-08	16.45	3.84E-08	3.89E-08
3.90	3.01E-08	3.23E-08	17.44	1.33E-08	1.35E-08
4.15	2.70E-08	2.95E-08	18.51	2.99E-09	3.09E-09
4.46	2.24E-08	2.39E-08	19.58	4.12E-10	4.44E-10
4.75	1.89E-08	2.07E-08	20.53	-8.87E-11	-7.55E-11
5.06	1.65E-08	1.85E-08	21.43	-2.05E-10	-1.97E-10
5.36	1.42E-08	1.64E-08	22.40	-2.25E-10	-2.16E-10
5.64	1.29E-08	1.48E-08	23.43	-1.88E-10	-1.80E-10

Table A.8 (Cont'd)

Gamma-ray Data

Configuration 2 (see Table 2)

Detector Location: x = 46.0 cm, y = 0.0 cm, z = 154.5 cm

Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval		Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval	
0.72	2.68E-07	4.99E-07	3.93	3.66E-08	4.41E-08
0.76	4.88E-07	5.83E-07	4.06	3.36E-08	4.17E-08
0.80	5.98E-07	6.27E-07	4.19	3.39E-08	4.28E-08
0.84	5.98E-07	6.10E-07	4.31	3.29E-08	4.32E-08
0.88	5.33E-07	5.44E-07	4.44	3.10E-08	4.27E-08
0.92	4.52E-07	4.63E-07	4.57	3.11E-08	4.37E-08
0.96	3.82E-07	3.92E-07	4.70	3.48E-08	4.76E-08
1.00	3.31E-07	3.41E-07	4.83	3.76E-08	5.15E-08
1.04	3.01E-07	3.10E-07	4.99	3.49E-08	5.10E-08
1.08	2.91E-07	3.00E-07	5.15	2.32E-08	4.08E-08
1.13	2.95E-07	3.04E-07	5.32	1.18E-08	2.99E-08
1.17	3.04E-07	3.14E-07	5.50	1.08E-08	3.05E-08
1.22	3.12E-07	3.23E-07	5.67	2.47E-08	4.54E-08
1.28	3.13E-07	3.24E-07	5.83	4.37E-08	6.33E-08
1.33	3.00E-07	3.09E-07	6.00	5.44E-08	7.28E-08
1.38	2.75E-07	2.84E-07	6.18	5.11E-08	6.90E-08
1.42	2.49E-07	2.57E-07	6.35	3.83E-08	5.54E-08
1.47	2.24E-07	2.33E-07	6.51	2.74E-08	4.25E-08
1.53	2.01E-07	2.09E-07	6.70	2.50E-08	3.78E-08
1.58	1.81E-07	1.89E-07	6.90	3.25E-08	4.40E-08
1.64	1.68E-07	1.75E-07	7.10	4.28E-08	5.36E-08
1.72	1.67E-07	1.74E-07	7.30	4.79E-08	5.80E-08
1.80	1.66E-07	1.74E-07	7.50	4.61E-08	5.52E-08
1.88	1.63E-07	1.71E-07	7.70	3.87E-08	4.69E-08
1.96	1.62E-07	1.70E-07	7.90	2.95E-08	3.69E-08
2.04	1.65E-07	1.72E-07	8.10	2.13E-08	2.78E-08
2.12	1.68E-07	1.75E-07	8.30	1.55E-08	2.11E-08
2.20	1.64E-07	1.71E-07	8.50	1.23E-08	1.71E-08
2.28	1.47E-07	1.54E-07	8.73	1.03E-08	1.45E-08
2.36	1.23E-07	1.30E-07	8.98	8.52E-09	1.21E-08
2.45	1.01E-07	1.07E-07	9.23	6.14E-09	9.01E-09
2.55	8.83E-08	9.42E-08	9.48	3.38E-09	5.80E-09
2.65	8.21E-08	8.81E-08	9.73	1.16E-09	3.23E-09
2.75	7.53E-08	8.14E-08	9.98	-2.23E-10	1.52E-09
2.85	6.76E-08	7.36E-08	10.30	-9.22E-10	6.65E-10
2.95	6.08E-08	6.67E-08	10.70	-8.37E-10	4.65E-10
3.05	5.64E-08	6.23E-08	11.10	-5.50E-10	5.37E-10
3.15	5.48E-08	6.10E-08	11.50	-2.64E-10	6.08E-10
3.25	5.62E-08	6.25E-08	11.90	-4.60E-11	7.26E-10
3.35	5.90E-08	6.54E-08	12.30	9.56E-11	8.02E-10
3.45	6.11E-08	6.75E-08	12.70	1.54E-10	7.91E-10
3.55	6.03E-08	6.71E-08	13.10	1.12E-10	6.88E-10
3.66	5.48E-08	6.19E-08	13.50	3.02E-11	5.55E-10
3.79	4.48E-08	5.20E-08	13.90	-1.50E-11	4.28E-10

Table A.9

Neutron Data
Configuration 3 (see Table 2)

Detector Location: x = 100.0 cm, y = 0.0 cm, z = 159.2 cm

Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval	Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval
0.91	1.66E-07 1.67E-07	5.94	7.07E-10 8.52E-10
1.01	1.17E-07 1.18E-07	6.25	5.59E-10 7.17E-10
1.11	8.05E-08 8.13E-08	6.55	4.83E-10 6.49E-10
1.21	5.70E-08 5.77E-08	6.83	4.99E-10 6.40E-10
1.31	4.20E-08 4.26E-08	7.23	5.00E-10 6.24E-10
1.41	3.23E-08 3.28E-08	7.73	4.40E-10 5.85E-10
1.51	2.61E-08 2.66E-08	8.25	3.81E-10 5.21E-10
1.61	2.13E-08 2.17E-08	8.77	3.16E-10 4.33E-10
1.71	1.73E-08 1.77E-08	9.24	3.34E-10 4.57E-10
1.81	1.42E-08 1.46E-08	9.72	3.97E-10 5.07E-10
1.94	1.14E-08 1.18E-08	10.23	3.79E-10 4.91E-10
2.11	9.23E-09 9.55E-09	10.75	3.65E-10 4.82E-10
2.31	7.29E-09 7.63E-09	11.26	4.38E-10 5.57E-10
2.50	5.82E-09 6.08E-09	11.76	5.28E-10 6.41E-10
2.69	4.69E-09 4.90E-09	12.40	6.62E-10 7.75E-10
2.90	3.84E-09 4.09E-09	13.20	1.22E-09 1.32E-09
3.10	3.22E-09 3.50E-09	14.03	2.24E-09 2.16E-09
3.30	2.67E-09 2.88E-09	14.86	2.24E-09 2.32E-09
3.51	2.14E-09 2.39E-09	15.62	1.65E-09 1.71E-09
3.71	1.79E-09 2.05E-09	16.45	8.47E-10 8.82E-10
3.90	1.59E-09 1.78E-09	17.44	2.79E-10 2.97E-10
4.15	1.36E-09 1.56E-09	18.51	6.31E-11 7.10E-11
4.46	1.29E-09 1.42E-09	19.58	1.08E-11 1.51E-11
4.75	1.16E-09 1.30E-09	20.53	-6.61E-13 2.84E-12
5.06	9.20E-10 1.08E-09	21.43	-4.16E-12 -1.43E-12
5.36	7.73E-10 9.47E-10	22.40	-5.71E-12 -3.04E-12
5.64	7.70E-10 9.23E-10	23.43	-5.51E-12 -2.90E-12

Table A.9 (Cont'd)

Gamma-ray Data
Configuration 3 (see Table 2)

Detector Location: x = 100.0 cm, y = 0.0 cm, z = 159.2 cm

Energy (MeV)	Fluence (MeV-1cm-2) Confidence Interval		Energy (MeV)	Fluence (MeV-1cm-2) Confidence Interval	
0.72	4.17E-08	8.61E-08	3.93	8.53E-09	1.04E-08
0.76	6.64E-08	8.48E-08	4.06	8.41E-09	1.05E-08
0.80	7.61E-08	8.15E-08	4.19	8.84E-09	1.11E-08
0.84	7.42E-08	7.68E-08	4.31	9.26E-09	1.18E-08
0.88	6.64E-08	6.87E-08	4.44	9.37E-09	1.24E-08
0.92	5.74E-08	5.97E-08	4.57	9.30E-09	1.24E-08
0.96	5.01E-08	5.24E-08	4.70	8.78E-09	1.19E-08
1.00	4.53E-08	4.75E-08	4.83	7.69E-09	1.12E-08
1.04	4.29E-08	4.50E-08	4.99	5.99E-09	1.02E-08
1.08	4.19E-08	4.40E-08	5.15	4.12E-09	8.68E-09
1.13	4.12E-08	4.34E-08	5.32	3.37E-09	7.90E-09
1.17	4.02E-08	4.23E-08	5.50	4.42E-09	9.44E-09
1.22	3.85E-08	4.09E-08	5.67	7.78E-09	1.31E-08
1.28	3.67E-08	3.92E-08	5.83	1.14E-08	1.63E-08
1.33	3.54E-08	3.76E-08	6.00	1.31E-08	1.78E-08
1.38	3.46E-08	3.65E-08	6.18	1.26E-08	1.71E-08
1.42	3.35E-08	3.56E-08	6.35	1.07E-08	1.50E-08
1.47	3.23E-08	3.43E-08	6.51	9.29E-09	1.29E-08
1.53	3.15E-08	3.35E-08	6.70	8.40E-09	1.17E-08
1.58	3.20E-08	3.39E-08	6.90	8.69E-09	1.16E-08
1.64	3.37E-08	3.56E-08	7.10	9.98E-09	1.26E-08
1.72	3.61E-08	3.81E-08	7.30	1.17E-08	1.41E-08
1.80	3.95E-08	4.14E-08	7.50	1.26E-08	1.48E-08
1.88	4.41E-08	4.60E-08	7.70	1.17E-08	1.38E-08
1.96	4.80E-08	5.00E-08	7.90	9.45E-09	1.12E-08
2.04	5.07E-08	5.26E-08	8.10	6.59E-09	8.08E-09
2.12	5.26E-08	5.45E-08	8.30	4.17E-09	5.47E-09
2.20	5.26E-08	5.44E-08	8.50	2.68E-09	3.81E-09
2.28	4.82E-08	4.99E-08	8.73	1.93E-09	2.83E-09
2.36	3.99E-08	4.15E-08	8.98	1.58E-09	2.36E-09
2.45	2.96E-08	3.12E-08	9.23	1.27E-09	1.93E-09
2.55	2.14E-08	2.29E-08	9.48	8.99E-10	1.41E-09
2.65	1.77E-08	1.92E-08	9.73	4.91E-10	9.38E-10
2.75	1.64E-08	1.79E-08	9.98	1.65E-10	5.77E-10
2.85	1.52E-08	1.67E-08	10.30	-5.02E-11	2.58E-10
2.95	1.37E-08	1.52E-08	10.70	-8.73E-11	1.33E-10
3.05	1.25E-08	1.39E-08	11.10	-5.41E-11	9.73E-11
3.15	1.18E-08	1.33E-08	11.50	-2.98E-11	7.66E-11
3.25	1.15E-08	1.31E-08	11.90	-3.26E-11	7.61E-11
3.35	1.14E-08	1.30E-08	12.30	-4.06E-11	7.25E-11
3.45	1.13E-08	1.29E-08	12.70	-4.26E-11	5.66E-11
3.55	1.10E-08	1.27E-08	13.10	-4.07E-11	4.84E-11
3.66	1.03E-08	1.21E-08	13.50	-2.87E-11	3.62E-11
3.79	9.34E-09	1.12E-08	13.90	-2.36E-11	2.56E-11

Table A.10

Neutron Data

Configuration 4 (see Table 2)

Detector Location: x = 46.0 cm, y = 0.0 cm, z = 154.5 cm

Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval		Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval	
0.91	5.10E-08	5.17E-08	5.94	4.98E-10	6.33E-10
1.01	3.77E-08	3.82E-08	6.25	5.32E-10	6.86E-10
1.11	2.78E-08	2.84E-08	6.55	5.59E-10	7.25E-10
1.21	2.28E-08	2.33E-08	6.83	5.81E-10	7.23E-10
1.31	2.02E-08	2.06E-08	7.23	5.94E-10	7.19E-10
1.41	1.74E-08	1.78E-08	7.73	5.10E-10	6.51E-10
1.51	1.43E-08	1.48E-08	8.25	4.77E-10	6.18E-10
1.61	1.14E-08	1.17E-08	8.77	5.88E-10	7.04E-10
1.71	9.04E-09	9.33E-09	9.24	5.87E-10	7.08E-10
1.81	7.31E-09	7.67E-09	9.72	4.95E-10	6.04E-10
1.94	5.87E-09	6.22E-09	10.23	4.55E-10	5.67E-10
2.11	4.88E-09	5.12E-09	10.75	4.91E-10	6.11E-10
2.31	3.91E-09	4.18E-09	11.26	5.23E-10	6.45E-10
2.50	3.05E-09	3.25E-09	11.76	5.92E-10	7.09E-10
2.69	2.57E-09	2.75E-09	12.40	9.33E-10	1.05E-09
2.90	2.40E-09	2.60E-09	13.20	1.98E-09	2.08E-09
3.10	2.12E-09	2.37E-09	14.03	3.14E-09	3.22E-09
3.30	1.68E-09	1.86E-09	14.86	3.19E-09	3.25E-09
3.51	1.26E-09	1.48E-09	15.62	2.29E-09	2.35E-09
3.71	1.05E-09	1.29E-09	16.45	1.18E-09	1.21E-09
3.90	1.00E-09	1.18E-09	17.44	3.99E-10	4.16E-10
4.15	9.44E-10	1.13E-09	18.51	9.10E-11	9.78E-11
4.46	9.52E-10	1.07E-09	19.58	1.22E-11	1.49E-11
4.75	9.78E-10	1.11E-09	20.53	-4.19E-12	-2.55E-12
5.06	9.29E-10	1.08E-09	21.43	-8.17E-12	-6.92E-12
5.36	7.34E-10	8.99E-10	22.40	-8.92E-12	-7.65E-12
5.64	5.58E-10	7.03E-10	23.43	-7.53E-12	-6.34E-12

Table A.10 (Cont'd)

Gamma-ray Data
Configuration 4 (see Table 2)

Detector Location: x = 46.0 cm, y = 0.0 cm, z = 154.5 cm

Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval		Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval	
0.72	3.56E-08	7.64E-08	3.93	7.33E-09	9.22E-09
0.76	6.13E-08	7.84E-08	4.06	5.37E-09	7.42E-09
0.80	6.95E-08	7.54E-08	4.19	3.48E-09	5.75E-09
0.84	6.55E-08	6.87E-08	4.31	2.53E-09	5.12E-09
0.88	5.84E-08	6.12E-08	4.44	3.04E-09	5.99E-09
0.92	5.18E-08	5.46E-08	4.57	5.23E-09	8.50E-09
0.96	4.62E-08	4.90E-08	4.70	8.44E-09	1.17E-08
1.00	4.12E-08	4.39E-08	4.83	1.03E-08	1.39E-08
1.04	3.75E-08	4.01E-08	4.99	8.48E-09	1.28E-08
1.08	3.60E-08	3.86E-08	5.15	2.57E-09	7.24E-09
1.13	3.62E-08	3.88E-08	5.32	-2.14E-09	2.61E-09
1.17	3.63E-08	3.88E-08	5.50	-1.13E-09	4.05E-09
1.22	3.52E-08	3.78E-08	5.67	5.74E-09	1.12E-08
1.28	3.39E-08	3.66E-08	5.83	1.32E-08	1.85E-08
1.33	3.34E-08	3.57E-08	6.00	1.60E-08	2.08E-08
1.38	3.26E-08	3.46E-08	6.18	1.29E-08	1.77E-08
1.42	3.09E-08	3.30E-08	6.35	7.49E-09	1.20E-08
1.47	2.90E-08	3.10E-08	6.51	3.98E-09	8.03E-09
1.53	2.77E-08	2.96E-08	6.70	4.48E-09	7.88E-09
1.58	2.75E-08	2.92E-08	6.90	8.45E-09	1.15E-08
1.64	2.80E-08	2.98E-08	7.10	1.27E-08	1.56E-08
1.72	2.78E-08	2.96E-08	7.30	1.48E-08	1.75E-08
1.80	2.65E-08	2.82E-08	7.50	1.44E-08	1.68E-08
1.88	2.57E-08	2.74E-08	7.70	1.23E-08	1.44E-08
1.96	2.69E-08	2.87E-08	7.90	9.48E-09	1.14E-08
2.04	3.09E-08	3.26E-08	8.10	6.98E-09	8.70E-09
2.12	3.60E-08	3.77E-08	8.30	5.16E-09	6.57E-09
2.20	3.84E-08	4.00E-08	8.50	4.10E-09	5.33E-09
2.28	3.56E-08	3.72E-08	8.73	3.45E-09	4.50E-09
2.36	2.89E-08	3.04E-08	8.98	2.93E-09	3.83E-09
2.45	2.13E-08	2.28E-08	9.23	2.34E-09	3.04E-09
2.55	1.66E-08	1.80E-08	9.48	1.54E-09	2.13E-09
2.65	1.44E-08	1.59E-08	9.73	8.15E-10	1.32E-09
2.75	1.24E-08	1.39E-08	9.98	2.78E-10	6.74E-10
2.85	1.04E-08	1.19E-08	10.30	-8.51E-11	2.67E-10
2.95	9.24E-09	1.06E-08	10.70	-1.56E-10	9.68E-11
3.05	8.98E-09	1.04E-08	11.10	-7.82E-11	6.92E-11
3.15	9.34E-09	1.08E-08	11.50	-1.08E-11	8.59E-11
3.25	9.98E-09	1.15E-08	11.90	1.02E-11	9.57E-11
3.35	1.03E-08	1.18E-08	12.30	-1.80E-12	9.48E-11
3.45	9.93E-09	1.15E-08	12.70	-1.94E-11	8.23E-11
3.55	9.18E-09	1.08E-08	13.10	-2.45E-11	6.62E-11
3.66	8.56E-09	1.03E-08	13.50	-1.87E-11	5.39E-11
3.79	8.28E-09	1.01E-08	13.90	-9.87E-12	4.39E-11

Table A.11

Neutron Data

Configuration 5 (see Table 2)

Detector Location: x = -46.0 cm, y = 0.0 cm, z = 154.5 cm

Energy (MeV)	Fluence (MeV-1cm-2) Confidence Interval		Energy (MeV)	Fluence (MeV-1cm-2) Confidence Interval	
0.91	3.92E-08	3.96E-08	5.94	3.50E-10	4.10E-10
1.01	2.87E-08	2.90E-08	6.25	3.35E-10	4.03E-10
1.11	2.05E-08	2.08E-08	6.55	3.35E-10	4.09E-10
1.21	1.53E-08	1.55E-08	6.83	3.35E-10	3.97E-10
1.31	1.19E-08	1.21E-08	7.23	3.00E-10	3.56E-10
1.41	9.55E-09	9.74E-09	7.73	2.64E-10	3.27E-10
1.51	7.92E-09	8.13E-09	8.25	2.56E-10	3.18E-10
1.61	6.60E-09	6.77E-09	8.77	2.63E-10	3.15E-10
1.71	5.49E-09	5.62E-09	9.24	2.55E-10	3.09E-10
1.81	4.56E-09	4.72E-09	9.72	2.59E-10	3.07E-10
1.94	3.77E-09	3.93E-09	10.23	2.84E-10	3.33E-10
2.11	3.18E-09	3.29E-09	10.75	3.05E-10	3.56E-10
2.31	2.56E-09	2.69E-09	11.26	3.08E-10	3.60E-10
2.50	2.04E-09	2.13E-09	11.76	3.28E-10	3.77E-10
2.69	1.68E-09	1.76E-09	12.40	4.88E-10	5.36E-10
2.90	1.44E-09	1.54E-09	13.20	1.04E-09	1.08E-09
3.10	1.22E-09	1.33E-09	14.03	1.68E-09	1.71E-09
3.30	1.02E-09	1.10E-09	14.86	1.68E-09	1.71E-09
3.51	8.54E-10	9.54E-10	15.62	1.18E-09	1.20E-09
3.71	7.79E-10	8.89E-10	16.45	5.82E-10	5.95E-10
3.90	7.53E-10	8.30E-10	17.44	1.85E-10	1.92E-10
4.15	6.45E-10	7.31E-10	18.51	3.99E-11	4.25E-11
4.46	5.27E-10	5.79E-10	19.58	5.31E-12	6.33E-12
4.75	4.60E-10	5.21E-10	20.53	-2.09E-12	-1.27E-12
5.06	4.21E-10	4.88E-10	21.43	-4.19E-12	-3.50E-12
5.36	3.85E-10	4.62E-10	22.40	-4.76E-12	-4.04E-12
5.64	3.67E-10	4.34E-10	23.43	-4.10E-12	-3.39E-12

Table A.11 (Cont'd)

Gamma-ray Data
Configuration 5 (see Table 2)

Detector Location: $x = -46.0$ cm, $y = 0.0$ cm, $z = 154.5$ cm

Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval		Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval	
0.72	1.39E-08	3.10E-08	3.93	3.57E-09	4.31E-09
0.76	2.86E-08	3.56E-08	4.06	2.62E-09	3.42E-09
0.80	3.43E-08	3.65E-08	4.19	2.59E-09	3.45E-09
0.84	3.37E-08	3.46E-08	4.31	3.13E-09	4.14E-09
0.88	3.05E-08	3.14E-08	4.44	3.61E-09	4.83E-09
0.92	2.70E-08	2.78E-08	4.57	3.90E-09	5.20E-09
0.96	2.39E-08	2.47E-08	4.70	4.13E-09	5.40E-09
1.00	2.18E-08	2.26E-08	4.83	4.05E-09	5.42E-09
1.04	2.05E-08	2.13E-08	4.99	3.33E-09	5.00E-09
1.08	1.98E-08	2.06E-08	5.15	1.92E-09	3.71E-09
1.13	1.94E-08	2.01E-08	5.32	9.76E-10	2.81E-09
1.17	1.89E-08	1.97E-08	5.50	1.65E-09	3.65E-09
1.22	1.82E-08	1.91E-08	5.67	4.02E-09	6.18E-09
1.28	1.75E-08	1.84E-08	5.83	6.39E-09	8.39E-09
1.33	1.70E-08	1.77E-08	6.00	7.06E-09	8.89E-09
1.38	1.65E-08	1.72E-08	6.18	5.77E-09	7.62E-09
1.42	1.60E-08	1.68E-08	6.35	3.75E-09	5.52E-09
1.47	1.57E-08	1.64E-08	6.51	2.60E-09	4.12E-09
1.53	1.56E-08	1.62E-08	6.70	2.90E-09	4.18E-09
1.58	1.54E-08	1.60E-08	6.90	4.57E-09	5.75E-09
1.64	1.49E-08	1.55E-08	7.10	6.43E-09	7.51E-09
1.72	1.42E-08	1.49E-08	7.30	7.37E-09	8.35E-09
1.80	1.41E-08	1.48E-08	7.50	7.13E-09	8.04E-09
1.88	1.43E-08	1.50E-08	7.70	6.04E-09	6.87E-09
1.96	1.43E-08	1.50E-08	7.90	4.71E-09	5.43E-09
2.04	1.45E-08	1.52E-08	8.10	3.62E-09	4.24E-09
2.12	1.51E-08	1.57E-08	8.30	2.87E-09	3.42E-09
2.20	1.52E-08	1.58E-08	8.50	2.41E-09	2.87E-09
2.28	1.42E-08	1.48E-08	8.73	2.00E-09	2.38E-09
2.36	1.22E-08	1.28E-08	8.98	1.50E-09	1.82E-09
2.45	9.78E-09	1.03E-08	9.23	9.67E-10	1.23E-09
2.55	7.88E-09	8.41E-09	9.48	5.03E-10	7.09E-10
2.65	6.98E-09	7.53E-09	9.73	1.92E-10	3.70E-10
2.75	6.43E-09	6.98E-09	9.98	2.76E-11	1.85E-10
2.85	5.96E-09	6.51E-09	10.30	-3.74E-11	9.66E-11
2.95	5.69E-09	6.23E-09	10.70	-1.76E-11	8.52E-11
3.05	5.50E-09	6.05E-09	11.10	2.67E-12	8.17E-11
3.15	5.11E-09	5.69E-09	11.50	6.42E-12	5.15E-11
3.25	4.57E-09	5.17E-09	11.90	-4.55E-12	3.13E-11
3.35	4.21E-09	4.81E-09	12.30	-1.92E-11	3.24E-11
3.45	4.33E-09	4.94E-09	12.70	-2.59E-11	2.23E-11
3.55	4.81E-09	5.46E-09	13.10	-2.40E-11	1.22E-11
3.66	5.23E-09	5.92E-09	13.50	-1.66E-11	1.20E-11
3.79	4.80E-09	5.49E-09	13.90	-9.40E-12	1.16E-11

Table A.12

Neutron Data

Configuration 6 (see Table 2)

Detector Location: $x = -46.0$ cm, $y = 0.0$ cm, $z = 154.5$ cm

Energy (MeV)	Fluence (MeV-cm ⁻²) Confidence Interval		Energy (MeV)	Fluence (MeV-cm ⁻²) Confidence Interval	
0.91	7.87E-09	8.13E-09	5.94	2.10E-10	2.73E-10
1.01	6.04E-09	6.23E-09	6.25	2.08E-10	2.79E-10
1.11	4.59E-09	4.83E-09	6.55	2.21E-10	2.96E-10
1.21	3.84E-09	4.05E-09	6.83	2.32E-10	2.96E-10
1.31	3.38E-09	3.55E-09	7.23	2.10E-10	2.66E-10
1.41	2.94E-09	3.12E-09	7.73	1.85E-10	2.49E-10
1.51	2.53E-09	2.72E-09	8.25	2.04E-10	2.68E-10
1.61	2.17E-09	2.33E-09	8.77	2.33E-10	2.86E-10
1.71	1.87E-09	1.99E-09	9.24	2.37E-10	2.92E-10
1.81	1.58E-09	1.73E-09	9.72	2.43E-10	2.92E-10
1.94	1.35E-09	1.48E-09	10.23	2.30E-10	2.80E-10
2.11	1.22E-09	1.32E-09	10.75	1.93E-10	2.45E-10
2.31	1.05E-09	1.16E-09	11.26	1.80E-10	2.32E-10
2.50	8.54E-10	9.41E-10	11.76	2.16E-10	2.66E-10
2.69	7.36E-10	8.13E-10	12.40	3.55E-10	4.04E-10
2.90	6.91E-10	7.82E-10	13.20	7.05E-10	7.48E-10
3.10	6.22E-10	7.32E-10	14.03	1.04E-09	1.07E-09
3.30	5.42E-10	6.22E-10	14.86	9.90E-10	1.02E-09
3.51	4.34E-10	5.32E-10	15.62	6.77E-10	7.00E-10
3.71	3.50E-10	4.59E-10	16.45	3.26E-10	3.40E-10
3.90	3.24E-10	4.04E-10	17.44	1.01E-10	1.08E-10
4.15	3.07E-10	3.88E-10	18.51	2.09E-11	2.38E-11
4.46	3.15E-10	3.68E-10	19.58	2.21E-12	3.65E-12
4.75	3.17E-10	3.77E-10	20.53	-1.69E-12	-6.86E-13
5.06	2.87E-10	3.57E-10	21.43	-2.76E-12	-1.99E-12
5.36	2.40E-10	3.18E-10	22.40	-3.05E-12	-2.25E-12
5.64	2.21E-10	2.89E-10	23.43	-2.62E-12	-1.84E-12

Table A.12 (Cont'd)

Gamma-ray Data

Configuration 6 (see Table 2)

Detector Location: $x = -46.0$ cm, $y = 0.0$ cm, $z = 154.5$ cm

Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval	Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval
0.72	1.58E-08 2.07E-08	3.93	2.51E-09 3.33E-09
0.76	2.35E-08 2.97E-08	4.06	2.26E-09 3.15E-09
0.80	2.63E-08 2.84E-08	4.19	2.10E-09 3.08E-09
0.84	2.55E-08 2.66E-08	4.31	1.94E-09 3.05E-09
0.88	2.31E-08 2.41E-08	4.44	1.78E-09 3.10E-09
0.92	2.05E-08 2.15E-08	4.57	1.90E-09 3.35E-09
0.96	1.83E-08 1.92E-08	4.70	2.47E-09 3.90E-09
1.00	1.68E-08 1.78E-08	4.83	2.96E-09 4.54E-09
1.04	1.60E-08 1.69E-08	4.99	2.87E-09 4.72E-09
1.08	1.53E-08 1.63E-08	5.15	1.71E-09 3.74E-09
1.13	1.46E-08 1.56E-08	5.32	3.87E-10 2.45E-09
1.17	1.42E-08 1.51E-08	5.50	3.59E-11 2.31E-09
1.22	1.43E-08 1.52E-08	5.67	1.34E-09 3.76E-09
1.28	1.43E-08 1.53E-08	5.83	3.36E-09 5.65E-09
1.33	1.39E-08 1.48E-08	6.00	4.71E-09 6.82E-09
1.38	1.31E-08 1.39E-08	6.18	4.51E-09 6.63E-09
1.42	1.22E-08 1.30E-08	6.35	3.17E-09 5.18E-09
1.47	1.15E-08 1.23E-08	6.51	1.91E-09 3.69E-09
1.53	1.10E-08 1.18E-08	6.70	1.54E-09 3.07E-09
1.58	1.08E-08 1.15E-08	6.90	2.54E-09 3.94E-09
1.64	1.06E-08 1.13E-08	7.10	4.31E-09 5.61E-09
1.72	1.04E-08 1.11E-08	7.30	5.72E-09 6.94E-09
1.80	9.91E-09 1.06E-08	7.50	6.00E-09 7.11E-09
1.88	9.02E-09 9.70E-09	7.70	5.14E-09 6.17E-09
1.96	8.60E-09 9.31E-09	7.90	3.76E-09 4.66E-09
2.04	9.25E-09 9.93E-09	8.10	2.56E-09 3.36E-09
2.12	1.01E-08 1.08E-08	8.30	1.88E-09 2.58E-09
2.20	1.02E-08 1.09E-08	8.50	1.62E-09 2.24E-09
2.28	9.22E-09 9.86E-09	8.73	1.57E-09 2.07E-09
2.36	7.64E-09 8.27E-09	8.98	1.41E-09 1.84E-09
2.45	6.13E-09 6.75E-09	9.23	1.07E-09 1.43E-09
2.55	5.30E-09 5.88E-09	9.48	6.56E-10 9.38E-10
2.65	4.92E-09 5.52E-09	9.73	2.97E-10 5.36E-10
2.75	4.60E-09 5.21E-09	9.98	4.55E-11 2.60E-10
2.85	4.26E-09 4.87E-09	10.30	-1.01E-10 8.29E-11
2.95	3.97E-09 4.57E-09	10.70	-1.24E-10 3.61E-11
3.05	3.77E-09 4.37E-09	11.10	-8.18E-11 5.60E-11
3.15	3.65E-09 4.28E-09	11.50	-3.82E-11 8.60E-11
3.25	3.62E-09 4.27E-09	11.90	-1.42E-11 9.20E-11
3.35	3.58E-09 4.24E-09	12.30	-6.49E-12 8.82E-11
3.45	3.47E-09 4.15E-09	12.70	-6.44E-12 7.82E-11
3.55	3.29E-09 3.99E-09	13.10	-1.20E-11 6.52E-11
3.66	3.04E-09 3.79E-09	13.50	-1.69E-11 5.26E-11
3.79	2.79E-09 3.55E-09	13.90	-1.62E-11 4.31E-11

Table A.13

Neutron Data

Configuration 7 (see Table 2)

Detector Location: $x = -46.0$ cm, $y = 0.0$ cm, $z = 154.5$ cm

Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval		Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval	
0.91	5.60E-09	5.73E-09	5.94	1.07E-10	1.34E-10
1.01	4.32E-09	4.41E-09	6.25	1.14E-10	1.43E-10
1.11	3.31E-09	3.42E-09	6.55	1.14E-10	1.46E-10
1.21	2.69E-09	2.78E-09	6.83	1.10E-10	1.37E-10
1.31	2.24E-09	2.32E-09	7.23	1.09E-10	1.33E-10
1.41	1.88E-09	1.96E-09	7.73	1.05E-10	1.33E-10
1.51	1.63E-09	1.72E-09	8.25	9.70E-11	1.24E-10
1.61	1.43E-09	1.50E-09	8.77	1.02E-10	1.24E-10
1.71	1.25E-09	1.31E-09	9.24	9.85E-11	1.22E-10
1.81	1.08E-09	1.15E-09	9.72	9.87E-11	1.19E-10
1.94	9.21E-10	9.89E-10	10.23	1.00E-10	1.22E-10
2.11	7.74E-10	8.25E-10	10.75	9.50E-11	1.17E-10
2.31	6.51E-10	7.08E-10	11.26	9.55E-11	1.18E-10
2.50	5.80E-10	6.24E-10	11.76	1.12E-10	1.33E-10
2.69	5.05E-10	5.44E-10	12.40	1.64E-10	1.85E-10
2.90	4.19E-10	4.62E-10	13.20	3.11E-10	3.28E-10
3.10	3.42E-10	3.93E-10	14.03	4.79E-10	4.94E-10
3.30	2.90E-10	3.27E-10	14.86	4.80E-10	4.93E-10
3.51	2.43E-10	2.88E-10	15.62	3.38E-10	3.48E-10
3.71	2.23E-10	2.69E-10	16.45	1.68E-10	1.74E-10
3.90	2.24E-10	2.58E-10	17.44	5.37E-11	5.67E-11
4.15	2.06E-10	2.43E-10	18.51	1.14E-11	1.27E-11
4.46	1.69E-10	1.92E-10	19.58	1.40E-12	2.07E-12
4.75	1.41E-10	1.67E-10	20.53	-6.60E-13	-6.49E-14
5.06	1.33E-10	1.62E-10	21.43	-1.29E-12	-6.55E-13
5.36	1.20E-10	1.52E-10	22.40	-1.48E-12	-7.70E-13
5.64	1.09E-10	1.37E-10	23.43	-1.31E-12	-5.99E-13

Table A.13 (Cont'd)

Gamma-ray Data

Configuration 7 (see Table 2)

Detector Location: $x = -46.0$ cm, $y = 0.0$ cm, $z = 154.5$ cm

Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval	Energy (MeV)	Fluence (MeV ⁻¹ cm ⁻²) Confidence Interval		
0.72	5.00E-09	1.38E-08	3.93	1.12E-09	1.46E-09
0.76	9.21E-09	1.30E-08	4.06	1.09E-09	1.45E-09
0.80	1.07E-08	1.22E-08	4.19	1.17E-09	1.58E-09
0.84	1.07E-08	1.17E-08	4.31	1.32E-09	1.77E-09
0.88	1.01E-08	1.10E-08	4.44	1.38E-09	1.92E-09
0.92	9.08E-09	1.01E-08	4.57	1.30E-09	1.88E-09
0.96	7.75E-09	8.75E-09	4.70	1.07E-09	1.66E-09
1.00	6.41E-09	7.41E-09	4.83	7.50E-10	1.39E-09
1.04	5.48E-09	6.49E-09	4.99	4.33E-10	1.19E-09
1.08	5.20E-09	6.22E-09	5.15	2.98E-10	1.11E-09
1.13	5.36E-09	6.37E-09	5.32	5.05E-10	1.35E-09
1.17	5.56E-09	6.52E-09	5.50	9.62E-10	1.88E-09
1.22	5.74E-09	6.69E-09	5.67	1.49E-09	2.46E-09
1.28	6.09E-09	6.97E-09	5.83	1.70E-09	2.62E-09
1.33	6.58E-09	7.35E-09	6.00	1.51E-09	2.37E-09
1.38	6.88E-09	7.53E-09	6.18	1.07E-09	1.92E-09
1.42	6.79E-09	7.38E-09	6.35	6.90E-10	1.49E-09
1.47	6.39E-09	6.88E-09	6.51	6.79E-10	1.39E-09
1.53	5.86E-09	6.29E-09	6.70	1.04E-09	1.67E-09
1.58	5.36E-09	5.72E-09	6.90	1.59E-09	2.15E-09
1.64	4.89E-09	5.22E-09	7.10	1.93E-09	2.45E-09
1.72	4.57E-09	4.87E-09	7.30	1.90E-09	2.39E-09
1.80	4.37E-09	4.67E-09	7.50	1.58E-09	2.04E-09
1.88	4.22E-09	4.52E-09	7.70	1.20E-09	1.61E-09
1.96	4.16E-09	4.47E-09	7.90	9.26E-10	1.29E-09
2.04	4.30E-09	4.59E-09	8.10	7.85E-10	1.12E-09
2.12	4.53E-09	4.82E-09	8.30	7.33E-10	1.01E-09
2.20	4.56E-09	4.84E-09	8.50	6.61E-10	9.03E-10
2.28	4.15E-09	4.42E-09	8.73	5.33E-10	7.46E-10
2.36	3.43E-09	3.70E-09	8.98	3.54E-10	5.41E-10
2.45	2.72E-09	2.98E-09	9.23	1.96E-10	3.42E-10
2.55	2.34E-09	2.58E-09	9.48	8.82E-11	2.11E-10
2.65	2.15E-09	2.40E-09	9.73	2.82E-11	1.38E-10
2.75	1.92E-09	2.18E-09	9.98	-8.11E-13	1.01E-10
2.85	1.75E-09	2.00E-09	10.30	-1.33E-11	8.18E-11
2.95	1.75E-09	2.00E-09	10.70	-1.37E-11	7.48E-11
3.05	1.84E-09	2.10E-09	11.10	-1.39E-11	6.88E-11
3.15	1.86E-09	2.13E-09	11.50	-8.01E-12	4.55E-11
3.25	1.79E-09	2.07E-09	11.90	-5.95E-12	3.36E-11
3.35	1.69E-09	1.97E-09	12.30	-8.30E-12	2.39E-11
3.45	1.61E-09	1.89E-09	12.70	-1.50E-11	1.97E-11
3.55	1.52E-09	1.81E-09	13.10	-1.80E-11	2.05E-11
3.66	1.40E-09	1.71E-09	13.50	-1.48E-11	1.95E-11
3.79	1.25E-09	1.56E-09	13.90	-1.01E-11	1.68E-11