

**RADIOACTIVITY ANALYSIS
IN
NIOBIUM ACTIVATION FOILS**

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INTRODUCTION

The motivation for this study was to measure and analyze the activity of six (6) niobium (Nb) foils (the x-rays from an internal transition in Nb-93m) and apply this information with previously obtained activation foil data. The niobium data was used to determine the epi-thermal to MeV range for the neutron spectrum and fluence. The foil activation data was re-evaluated in a spectrum analysis code (STAY'SL) to provide new estimates of the exposure at the Los Alamos Spallation Radiation Effect Facility (LASREF).

The activity of the niobium foils was measured and analyzed at the University of Missouri-Columbia (UMC) under the direction of Professor William Miller. The spectrum analysis was performed at the University of Missouri-Rolla (UMR) by Professor Gary Mueller.

This study was supported by the Los Alamos National Laboratory (LANL) and the University of California through subcontract number 4425M0014-3G for \$25,448 under the supervision of Dr. Walter Sommer.

NIOBIUM ACTIVITY MEASUREMENTS

Six niobium foils were irradiated in a neutron flux during the period, August 1 to October 13, 1992 at LASREF at the Los Alamos Meson Physics Facility (LAMPF). Gamma-ray spectrum measurements were determined in July, 1993 at LAMPF. However, fast neutron activation of niobium produces radioactive ^{93m}Nb from the activation reaction $^{93}\text{Nb} (n,n') ^{93m}\text{Nb}$. The half-life of ^{93m}Nb is 16.13 years and has K x-ray emission energies at 16.6 and 18.6 keV. As a result, the gamma-ray measurements at LAMPF did not provide any data about the niobium activation reaction.

In the fall of 1994, the six niobium foils were shipped from LANL to UMC to be measured and analyzed using the niobium activation reaction $^{93}\text{Nb} (n,n') ^{93m}\text{Nb}$. The complete results from the UMC measurements and analysis are given in Appendix I.

Table I and II summarize the UMC results that are used in the spectral analysis. Table II shows that there are three foils for each sample except for foil 2A. Based on the weights of the foils and their activities the following six foils are used in the spectral analysis: 1A, 2A, 3C, 4C, 5A, and 6A.

SPECTRAL ANALYSIS

Five foils (Ni, Co, Fe, Cu, Nb) were irradiated in a neutron flux during the period, August 1 to October 13, 1992 at LAMPF. The neutron irradiation was done at the six positions of 1-1 to 1-5, 2-1 to 2-5, 3-1 to 3-5, 4-1 to 4-5, 5-1 to 5-5, and 6-1 to 6-5. The recorded beam current history is shown in Appendix II. The average integrated beam current for this irradiation is 307.17 microAmps. The beam current history is used to correct the activity for decay during irradiation using the BCF [1] computer code. The corrected activities along with an initial spectrum, activation cross sections, and variance covariance information are used as input to the STAY'SL [2] computer program. The STAY'SL code calculates the most probable neutron energy spectrum using a least-square technique. Figures for the differential neutron flux and the neutron energy flux obtained from the STAY'SL calculations for the six positions are given in Appendix II. The reactions analyzed and their corrected saturated activities for the six positions are listed in Appendix III. Also shown is the difference between the measured activity, the adjusted activity calculated by STAY'SL, and the 90% energy limits. In addition, Appendix III lists the integrated group energy fluxes, fluences for the different neutron energy groups and percentage of neutrons above 20 MeV. The complete results of STAY'SL calculations for each of the six positions of 1-1 to 1-5 through 6-1 to 6-5 are given in Appendix IV.

Table I. Foil Identification

MURR ID	LANL ID
1A	shot 1
2A	shot 2
3A	shot 4
4A	shot 3
5A	shot 5
6A	shot 6

Table II. Niobium Activities

Sample	Mass (mg)	E.O.I. Activity ($\mu\text{Ci}/\text{mg}$)	Estimated % Error
1A	16.80	0.252	20%
1B	17.04	0.246	20%
1C	17.08	0.236	20%
2A	16.88	0.734	20%
3A	17.42	0.376	20%
3B	14.28	0.460	20%
3C	16.85	0.398	20%
4A	17.30	0.187	20%
4B	17.33	0.199	20%
4C	16.73	0.199	20%
5A	16.97	0.491	20%
5B	16.79	0.492	20%
5C	16.94	0.488	20%
6A	16.93	0.342	20%
6B	16.91	0.343	20%
6C	16.75	0.335	20%

DISCUSSION OF RESULTS

The niobium activation reaction $^{93}\text{Nb} (n,n') ^{93m}\text{Nb}$ provides useful neutron measurements in an energy range that has not been previously presented. As shown in the 90% energy limits in Appendix III, the activation reaction for the niobium provides values from 0.5 MeV to approximately 6 MeV. This new measurement is significant in that both the number of neutrons and their energy are substantial in this region. As a result, these neutrons will have a significant effect on the total number of neutrons and the number neutrons above 20 MeV. The measured niobium activation data provide the needed resolution in this energy region to more accurately describe the overall neutron spectra.

Establishing the neutron activity in this new energy region provides new estimates of the number of neutrons above 20 MeV. As shown in Appendix III these values vary from 3.89 to 1.72 percent of the total. There seems to be a correlation between the total number of neutrons and the number of neutrons above 20 MeV. That is, as the total number of neutrons decreases the percentage of neutrons above 20 MeV also decreases. This trend is shown below in Table III.

Table III. Summary of Total Neutrons

TOTAL NUMBER OF NEUTRONS n/cm ² -s-mA	PERCENT NEUTRON ABOVE 20 MeV percent
2.884E+13	3.89
1.508E+13	2.48
1.312E+13	2.33
1.230E+13	2.24
8.598E+12	1.82
7.730E+12	1.72

The bold data indicates foil package 5-1 to 5-5 which should be used with caution since the peak identification is ambiguous.

REFERENCES

- [1] Davidson, D.R. Neutron and proton dosimetry at the LAMPF 800-MeV proton accelerator, Ph.D. Dissertation, Iowa State University, Ames, IA (1990).
- [2] Perey, F.G., Least-squares dosimetry unfolding: The program STAY'SL, ORNL/TM-6062. ORNL (1977).

APPENDIX I

UMC Nb-93m Activity Determination

TO: Dr. William H. Miller
 FROM: Norman A. Kahler
 SUBJECT: Niobium foil Sample identification

March 8, 1995

Attached are three tables that show various information from the LANL data and the MURR data for the Y-88 peak. As shown at the bottom of the MURR data table, approximately 510 days have passed since the data from LANL was taken. Because only an approximate decay correction is going to be applied; the shot 1 EOI time of 262 days was added to the 510 days to find the EOI time for the MURR readings. The activity of the MURR data is simply

$$\text{activity} = \frac{\text{CPS} \cdot e^{-\lambda t}}{\varepsilon \cdot \text{yield}}$$

where:

ε : The efficiency at 0.898 MeV
 t: The EOI time (772 days)
 CPS: The counts per second
 yield: The yield fraction. (0.93)

Sample 2A or shot 2 are known to be the same because only one foil was contained in this particular vial. It is also obvious from the data because this particular sample is the most radioactive of all the samples. The comparison that was performed basically compares the magnitude of the activity in Becquerel (Bq) to sample 2 or shot 2 for the respective data. It is concluded from the attached tables that the following MURR ID samples have the following LANL ID.

MURR ID	Percent difference from Sample 2A	LANL ID	Percent difference from Shot 2
1A	85.2%	shot 1	84.8%
2A	0.0%	shot 2	0.0%
3A	63.4%	shot 4	62.7%
4A	87.2%	shot 3	86.8%
5A	55.9%	shot 5	56.4%
6A	71.3%	shot 6	70.8%

To further justify the results, the activity of the MURR data was ratio to the LANL data for the above determined identifications. As the attached ratio table indicates, the ratio of the MURR ID samples to the appropriate LANL ID samples were all approximately 1.5. This justifies the selection of the matching MURR ID to the LANL ID because the value of there ratios were all about the same. Although why the activities were different by 1.5 has not been determined. The purpose of this analysis was to determine which MURR ID went with the appropriate LANL ID. Therefore, no further analysis was done to determine why this difference of 1.5 exists.

LANL DATA

Name-ID	DPM	Bq	Percent difference from shot 2
shot 1	1.559E+07	2.598E+05	0.848050682
shot 2	1.026E+08	1.710E+06	0
shot 3	1.351E+07	2.252E+05	0.868323587
shot 4	3.824E+07	6.373E+05	0.627290448
shot 5	4.470E+07	7.450E+05	0.564327485
shot 6	2.994E+07	4.990E+05	0.708187135

MURR DATA

Name-ID	CPS	Bq	Percent difference from 2A
1A	3.160E+01	3.833E+05	0.852336449
2A	2.140E+02	2.596E+06	0
3A	7.840E+01	9.509E+05	0.63364486
4A	2.740E+01	3.323E+05	0.871962617
5A	9.430E+01	1.144E+06	0.559345794
6A	6.140E+01	7.447E+05	0.713084112

22-Nov-94 30-Jun-93 510 days
 EOI of the LANL data 262 days
 Y-88 half life 106.61 days
 yield fraction of Y-88 0.93
 efficiency @ 0.898 MeV 0.134

RATIOS

1A / shot 1	1.475E+00
2A / shot 2	1.518E+00
3A / shot 4	1.492E+00
4A / shot 3	1.476E+00
5A / shot 5	1.535E+00
6A / shot 6	1.492E+00

Nb-93m ACTIVITY
DETERMINATION
IN
NIOBIUM FOILS

by

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INTRODUCTION

The purpose of this experiment is to measure the activity of Nb-93m in the niobium foils. To accomplish this task, the University of Missouri Research Reactor was enlisted to do this experiment because of the availability of high resolution low energy germanium detectors. The following is a description of how the results contained in Appendix A were attained.

EQUIPMENT

The basic equipment used in this experiment is contained in the following table.

Name of Equipment	Model Number	Serial Number
Digital VAX station 3100 M38 (w/ Digital Storage Expansion)	WS42A-DA*	AB023065II*
ORTEC Bias Supply	ORTEC 459	-
ORTEC Amplifier	ORTEC 572	-
Nuclear Data ADC	ND 570	-
Nuclear Data AIM	ND 556	-
ORTEC Nim Bin	ORTEC 4001A BIN	-
EG&G ORTEC Gamma-X HPGe coaxial detector	GMX-30200-P 30.2% Rel. Photopeak Eff.	31-TN10688A
Analytics, calibrated Am-241 Point Source	-	49076-156 (HP-199)
Analytics, calibrated Mixed Gamma Point Source	-	35353A-156 (HP-5)
Reactor Experiments, Inc. Niobium Foil	Cat. No.: 875A	Lot No.: 1030
Mettler digital scale	Mettler AT 261 Delta Range	K84252
Micrometer	-	-

Note: A blank was left if the model or serial number was unavailable or unknown.

Table 1: Equipment

PROCEDURE

Calibration of the Detector:

To begin the experiment certain materials were needed to calibrate the Gamma-X HPGe coaxial detector. The source purchased for low energy calibration was an Am-241 point source. This source was sealed in mylar tape and centered in the window of an aluminum plate. The MURR designation for this source is HP-199. Using this source and a mixed gamma source (HP-5) an efficiency curve from 10 keV to 4000 keV was derived in the POS 1 geometry (one inch from the face of the detector) as seen in Figure 1. Table 2 lists values used to define the efficiency curve.

Gamma Energy (keV)	Efficiency
10.00	0.0100
13.90	0.0199
26.35	0.0779
33.21	0.0922
59.54	0.0883
59.90	0.0865
88.00	0.0835
122.00	0.0718
300.00	0.0340
662.00	0.0168
1173.00	0.0095
1332.00	0.0085
4000.00	0.0030
<i>Note: By interpolation the efficiency at</i>	
16.6 keV =	0.02288
18.6 keV =	0.02574

*These efficiencies were interpolated or extrapolated

**Table 2: Detector Efficiency in POS 1 Geometry
for Gamma-X Detector**

Counting the Foils:

Before the foil samples were counted, each sample was weighed on a digital scale (Mettler AT 261 Delta Range, calibrated 5-4-94). Extreme caution was taken not to touch the foils and to keep the handling time to a minimum. The foils were mounted at the center of sample cards, similar to the HP-199 source, with tape used to fix the sample in position. To verify that the tape did not attenuate the foil, measurements were made with tape on one side of the foil and then with tape on both sides of the foil. The results showed no statistical difference. Thus, all the foils were taped to the sample cards with tape on both sides. The foils were identified by a number and a letter. The number designated the vial they arrived in and the letter designated the individual foil from that vial. Each sample was then counted in the same position that the calibration source had been counted in (i.e. the POS 1 geometry). The foils were each counted for 15 minutes at this geometry.

Attenuation Calculation:

Attenuation factors were determined by counting sample 2A with and without a 0.03cm attenuation foil. The amount of radiation attenuated through the 0.03 cm foil is correlated to a coefficient called an attenuation coefficient. This coefficient can be used to determine how much radiation is attenuated at any thickness through the source foil. The measurements with and without

the attenuation foil were taken for 15 minutes. The following table shows the results from these measurements and the corresponding results from the attenuation coefficient calculations.

	Energy (keV)	Peak Area	Corrected Live Time (sec)
<i>Data</i>	16.6	187638	750
	18.6	45336	
	16.6	5503	763
	18.6	2616	

Energy (keV)	I/I ₀	μ (1/cm) $\ln(I/I_0)/(-x)$
16.6	0.0288	118.21
18.6	0.0567	95.65

* x= attenuation foil thickness

Table 3: Attenuation Coefficient Calculation using Foil 2A

The numerical calculation used the following formula to calculate μ , the attenuation coefficient.

$$\frac{I}{I_0} = e^{-\mu x}$$

I_0 = unattenuated counts per second (peak area / corrected live time)

I = attenuated counts per second (peak area / corrected live time)

μ = attenuation coefficient

x = attenuation foil thickness (0.03cm)

See reference 1.

Data Handling:

There was a possibility of Ta-182 induced fluorescence x-rays causing interference and an error in the results. This possible interference needed to be considered. If the Ta-182 activity is less than 2% of the Nb-93m activity in a 0.1 mm thick niobium foil, the correction of Ta-182 induced fluorescence will be less than about 5%. The correction is less for lighter foils and greater for heavier foils.² Through measurement, it was determined the amount of Ta-182 activity in the samples, at the time of measurement, was less than 2% of the Nb-93m activity in the ~0.3 mm thick foils. Thus, no correction was required for Ta-182 activity. A problem could also occur if Niobium metal has a Tantalum content greater than 5 ppm before irradiation.² From the chemical analysis information, of the Niobium foil, that was received with the attenuation foil, the Tantalum content was less than 5 ppm. Note, the attenuation foil was assumed to be from the same batch of Niobium foils that were irradiated.

Another problem that had to be addressed was with how the computer software performed its automatic peak search on low-energy peaks. The computer program did not always automatically find the correct peaks. The use of a manual interactive peak search was required to correct the problem.

Table 4 lists some of the information needed to calculate the Nb-93m activity. One piece of information of interest from Table 4 is the assumed end of irradiation (E.O.I.). None of the information received to do this experiment explicitly gave an E.O.I. time. However, the time listed was assumed by using the *delta time* listed on the MicroVAX-RAYGUN output we received.

Assumed End of Irradiation	11-Oct-92
Date of Measurement at MURR	28-Nov-94
Decay Time (days)	778
Half-life of Nb-93m ²	16.13 years
Decay Correction [*]	1.096
K x-ray emission probability ²	0.115 per decay
K-alpha energy of Nb-93m ²	16.6 keV
K-beta energy of Nb-93m ²	18.6 keV
Thickness of attenuation foil ^{**}	0.3 mm

^{*} Decay Correction = $\exp(\lambda t)$

^{**} Foil thickness was measured with a micrometer.

Table 4: Miscellaneous Information Used in this Project

Assuming the Nb-93m activity was homogeneously distributed throughout the foil. The overall attenuation was determined by integrating $\exp(-\mu x)$ across the thickness of the foil as the following derivation illustrates.

$$\frac{I(x)}{I_0} = e^{-\mu x}$$

$$I(x) = I_0 \cdot e^{-\mu x}$$

$$I(x) \cdot \int_0^x dx = I_0 \cdot \int_0^x e^{-\mu x} dx$$

$$I(x) \cdot x = I_0 \cdot \frac{1}{\mu} \cdot (1 - e^{-\mu x})$$

$$I_0 = \frac{I(x) \cdot x \cdot \mu}{(1 - e^{-\mu x})}$$

I_0 = unattenuated counts per second (peak area / corrected live time)

I = attenuated counts per second (peak area / corrected live time)

μ = attenuation coefficient

x = attenuation foil thickness (0.03cm)

This approach considers all possible attenuations at any thickness of the foil. Also, the equations in Appendix A show that the independent areas and efficiencies for each energy were taken into consideration when performing the activity at E.O.I. calculation.

Repeatability of Measurements:

The attenuated and unattenuated results must show repeatability. To demonstrate repeatability, 5 measurements, using sample 2A, were taken consecutively on the same day. Two of the measurements were unattenuated and 3 of the measurements were attenuated. After each completed measurement, the sample was removed and then placed back on the detector like a new sample. This was done to keep all variables consistent with how the original measurements were performed. Table 5 shows the corresponding standard deviation and percent error of the attenuated and unattenuated peak area and corrected live time.

Niobium Foil Source	Energy (keV)	Peak Area	Standard Deviation	Percent Error	Corrected Live Time (sec)	Standard Deviation	Percent Error
<i>Unattenuated Source Measurement 1</i>	16.6	188657	427	0.226%	776	0.707	0.0911%
	18.6	45419	294	0.648%		0.707	0.0911%
<i>Unattenuated Source Measurement 2</i>	16.6	188053	427	0.227%	777	0.707	0.0910%
	18.6	45835	294	0.642%		0.707	0.0910%
<i>Attenuated Source Measurement 1</i>	16.6	5281	288	5.45%	788	0.577	0.0733%
	18.6	2578	97	3.75%		0.577	0.0733%
<i>Attenuated Source Measurement 2</i>	16.6	4756	288	6.06%	788	0.577	0.0733%
	18.6	2704	97	3.58%		0.577	0.0733%
<i>Attenuated Source Measurement 3</i>	16.6	5224	288	5.51%	788	0.577	0.0733%
	18.6	2514	97	3.85%		0.577	0.0733%

Table 5: Standard Deviation and Percent Error of counts per second for Repeated Measurements

The percent error for the attenuated peak area was approximately 6% for the K-alpha x-ray and 4% for the K-beta x-ray. The unattenuated counts per second had an error of less than 1%. These results demonstrate the repeatability of the measurements for the unattenuated source. They also show that the attenuated source measurements were repeatable to within approximately 6% error. The corrected live time had less than 1% error for both the attenuated and unattenuated source.

Error Analysis:

The possibility of error was apparent in all areas of this experiment. The error most apparent in the efficiency curve calculation was due to uncertainties in the calibration source. The

most important of these uncertainties was the Am-241 (HP-199) source. This source had an error of 4% in its activity according to the certificate of calibration. The maximum uncertainty for the mixed gamma source (HP-5) was 5% according to its certificate of calibration. From this information, it was concluded that the efficiency curve had an approximate 5% error.

The measurement of peak areas had an approximate error of 1% for an unattenuated source. This error was observed when determining if the tape used to tape the foil to the sample cards had any affect to the results returned. It was also observed when doing the repeatability measurements. This shows the reproducibility of the results were within 1%. Although when the source was attenuated by a piece of niobium foil, the peak area had an approximate reproduction error of 6%. This error was seen when trying to show the reproducibility of the measurements.

The corrected live time had an estimated error of 1% as seen when demonstrating reproducibility. The error due to mass was approximately 0.1%. This was because the mass was measured to within a tenth of a milligram on the 5-place balance. The K x-ray emission probability (0.115 ± 0.003 per decay) had an error of 3%.² The half-life of Nb-93m (16.13 ± 0.15 years) had an error of 0.9%.²

The largest source of error was probably the attenuation coefficient. The attenuated and unattenuated counts per second have an approximate 6% and 1% error from the peak. This means the error for the attenuation coefficient was approximately 7%. The following table lists these errors.

Name of Error	ERROR
Efficiency	5%
Peak Area (unattenuated attenuated)	1% 6%
Corrected Live Time	1%
Mass	0.1%
K x-ray Emission	3%
Half-Life of Nb-93m	0.9%
Attenuation Coefficient	7%

Table 6: Estimates of Error

Errors are additive when the factors in the equation are being multiplied or divided. The greater error is taken when adding terms. This means that the activity shown in Appendix A should have a total uncertainty of about 20%.

SUMMARY AND CONCLUSION

The activity of Nb-93m in the niobium foils found in Appendix A, was determined by the use of a Gamma-X coaxial detector. The detector was calibrated by a calibrated Am-241 point source (HP-199) and a calibrated mixed gamma source (HP-5). The calibration information, found in table 2, produced the calibration curve (see figure 1). The niobium foils were then weighed and mounted at the center of sample cards with tape; similar to how the calibration sources were mounted. The tape used to mount the samples, was verified not to attenuate the foil. Each sample was then counted for 15 minutes, 1 inch from the face of the detector. The same position the calibration sources used.

Then an attenuation coefficient was determined by counting sample 2A with and without an attenuation foil (0.03cm thick). The coefficient was used to determine the amount of attenuated radiation through the source foil to correct the activity. After completing these measurements, two more possible data corrections were addressed. The possibility of Ta-182 induced fluorescence x-rays causing interference and the content of Tantalum in the Niobium foil before irradiation. Through measurement, the amount of Ta-182 activity was determined to be less than 2%; therefore, no correction for Ta-182 induced fluorescence x-rays was needed. The chemical analysis information provided showed that the Tantalum content was less than 5 ppm; therefore, no correction was needed.

The computer software automatic determination of peak areas for the low-energy peaks had a problem. The use of a manual interactive peak search was required. The corrected peak areas are contained in Appendix A.

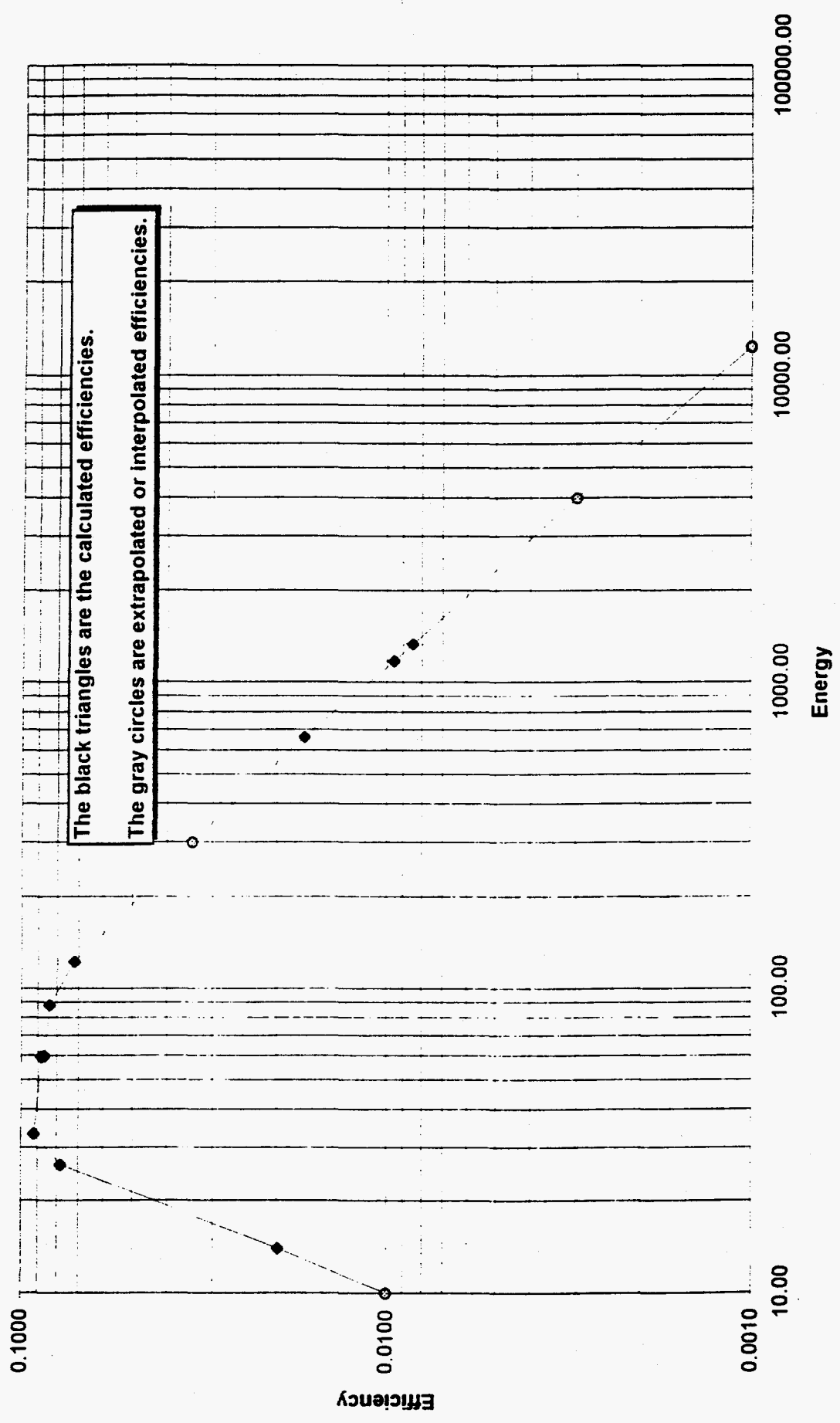
The problem of repeatability was also addressed. To demonstrate the repeatability of the results, 5 measurements of foil sample 2A were performed consecutively on the same day. Each measurement was treated like a measurement of a new sample. This was done to keep the results consistent with how the original measurements were performed. Two of the measurements were unattenuated and three of the measurements were attenuated. As seen in table 5, the peak area of the unattenuated measurements had an error of less than 1%, while the attenuated measurements had an error of approximately 6% for the K-alpha x-ray. The corrected live time for both the attenuated and

unattenuated measurements had an error of less than 1%. This indicates that the results were repeatable. Although, the larger attenuated measurement error might be reduced by counting the foil for more than 15 minutes or until the peak area was around 100,000.

The estimate of total uncertainty was performed to show the accuracy of the activity at E.O.I. Table 6 shows the error for the various measured and given values. A conservative approach was taken when estimating the error of the various values. This makes the total uncertainty an overly conservative estimate.

The information contained in Appendix A is considered to be as accurate as reasonable. The equations contained in Appendix A show that the independent areas and efficiencies for each x-ray energy are taken into consideration when performing the calculation of activity at the E.O.I. It is felt that these results are best results that can be found by the detection system used.

Figure 1: Efficiency Curve



Appendix A

Activities measured

in

Niobium Foils

Sample	Energy (keV)	Efficiency	Peak Area	Corrected Live Time (sec)	Mass (mg)	E.O.I. Activity ($\mu\text{Ci/mg}$)	Estimated % Error
1A	16.6	0.0229	74452	854	16.80	0.252	20%
	18.6	0.0257	18194				
1B	16.6	0.0229	73202	852	17.04	0.246	20%
	18.6	0.0257	18487				
1C	16.6	0.0229	69560	854	17.08	0.236	20%
	18.6	0.0257	18971				
2A	16.6	0.0229	185966	728	16.88	0.734	20%
	18.6	0.0257	45104				
3A	16.6	0.0229	110704	819	17.42	0.376	20%
	18.6	0.0257	26848				
3B	16.6	0.0229	110802	819	14.28	0.460	20%
	18.6	0.0257	27144				
3C	16.6	0.0229	112841	818	16.85	0.398	20%
	18.6	0.0257	27603				
4A	16.6	0.0229	54910	840	17.30	0.187	20%
	18.6	0.0257	14901				
4B	16.6	0.0229	58587	829	17.33	0.199	20%
	18.6	0.0257	14864				
4C	16.6	0.0229	57501	843	16.73	0.199	20%
	18.6	0.0257	14687				
5A	16.6	0.0229	138254	806	16.97	0.491	20%
	18.6	0.0257	33798				
5B	16.6	0.0229	137468	808	16.79	0.492	20%
	18.6	0.0257	33656				
5C	16.6	0.0229	137152	807	16.94	0.488	20%
	18.6	0.0257	33702				
6A	16.6	0.0229	99268	832	16.93	0.342	20%
	18.6	0.0257	24208				
6B	16.6	0.0229	99418	832	16.91	0.343	20%
	18.6	0.0257	24110				
6C	16.6	0.0229	96401	835	16.75	0.335	20%
	18.6	0.0257	23597				

* Efficiencies are from table 1

$$\text{Activity at E.O.I.} = e^{\lambda t} \cdot \frac{\text{decays}}{\text{sec}} \cdot \frac{1}{0.115} \cdot \frac{1}{\text{mass}} \cdot \frac{1}{37000}$$

where:

$$\frac{\text{decays}}{\text{sec}} = \left[\left(\frac{\text{peak area}_{K_{\alpha}}}{\epsilon_{K_{\alpha}}} \cdot \frac{\mu_{K_{\alpha}} \cdot x}{(1 - e^{-\mu_{K_{\alpha}} \cdot x})} \right) + \left(\frac{\text{peak area}_{K_{\beta}}}{\epsilon_{K_{\beta}}} \cdot \frac{\mu_{K_{\beta}} \cdot x}{(1 - e^{-\mu_{K_{\beta}} \cdot x})} \right) \right] \cdot \frac{1}{\text{corrected live time}}$$

and

- $\lambda = \ln(2)/\text{half life}$ (half life = 16.13 years)
- $t = \text{decay time since end of irradiation (E.O.I.)}$ {778 days}
- $\epsilon = \text{efficiency}$ (K_{α} is the 16.6 keV and K_{β} is the 18.6 keV x-ray)
- $x = \text{thickness of attenuation foil}$ (0.3mm)

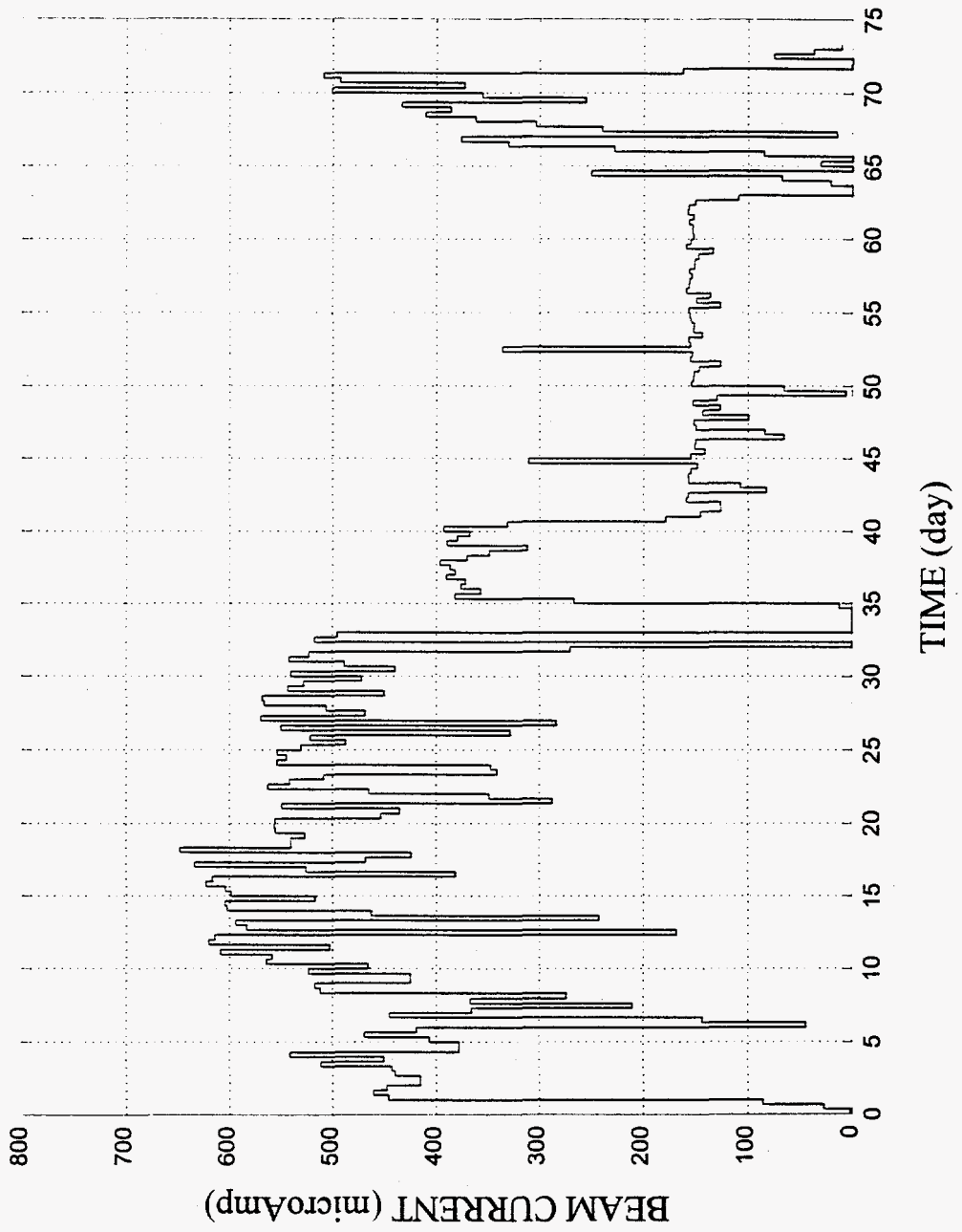
REFERENCES:

1. Knoll, Glenn F., *Radiation Detection and Measurement*, John Wiley and Sons, Inc., New York, 1989.
2. ASTM - E 1297 - 89, *Measuring Fast-Neutron Reaction Rates by Radioactivation of Niobium*, 1990 ASTM Annual Book of Standards.

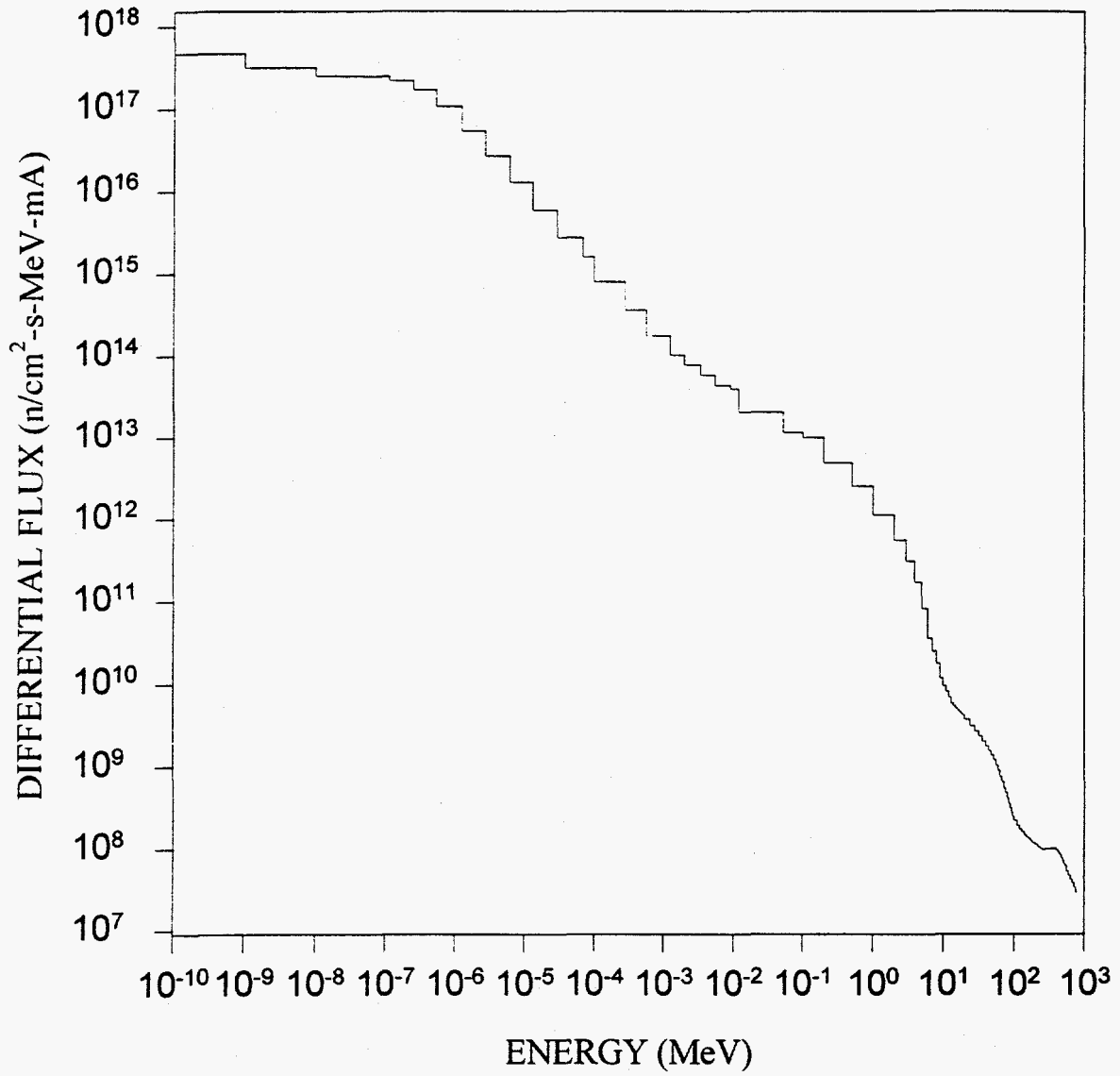
APPENDIX II

**Figures for Beam History, Differential Neutron Flux,
and Neutron Energy Flux**

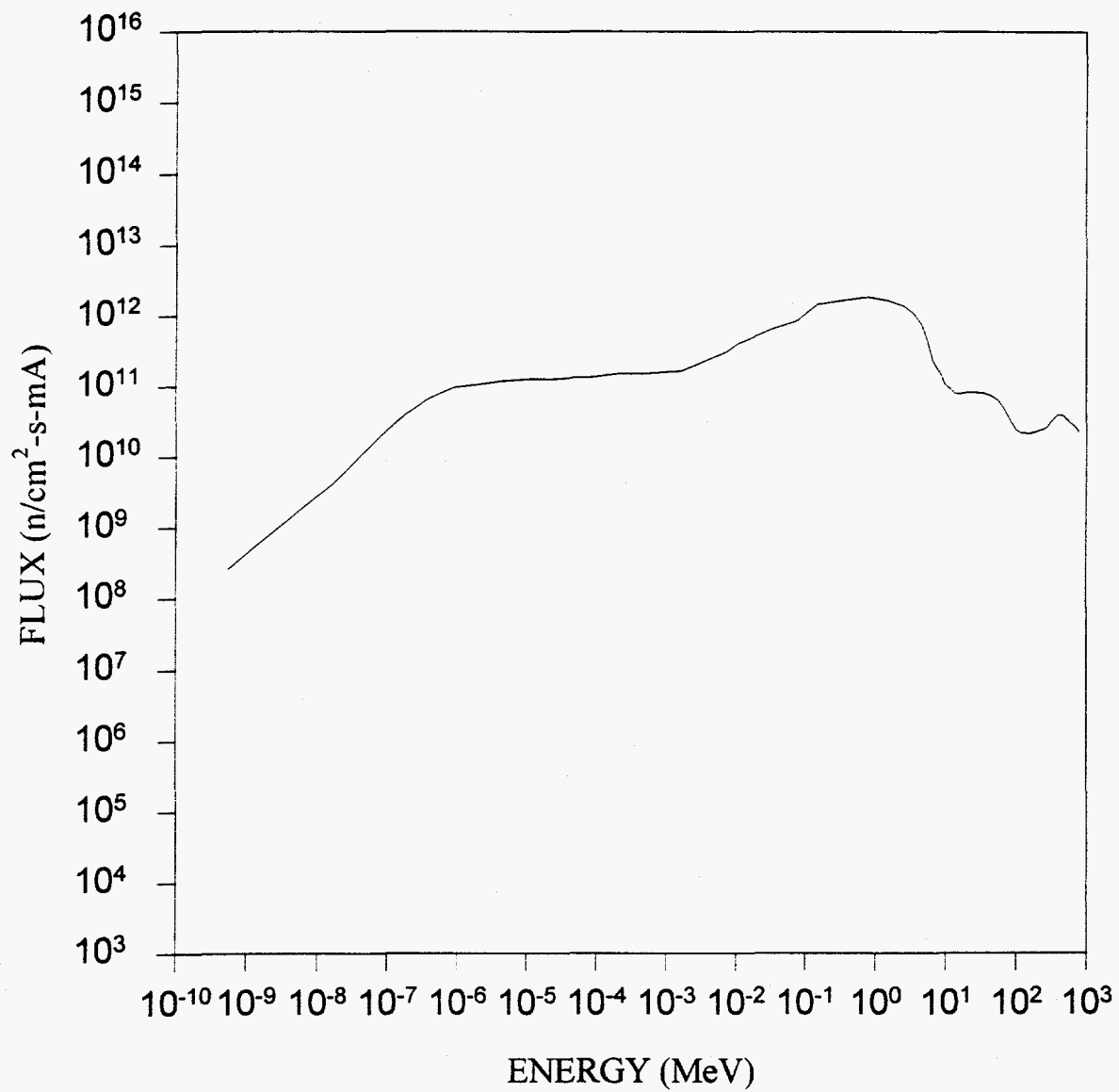
BEAM CURRENT HISTORY



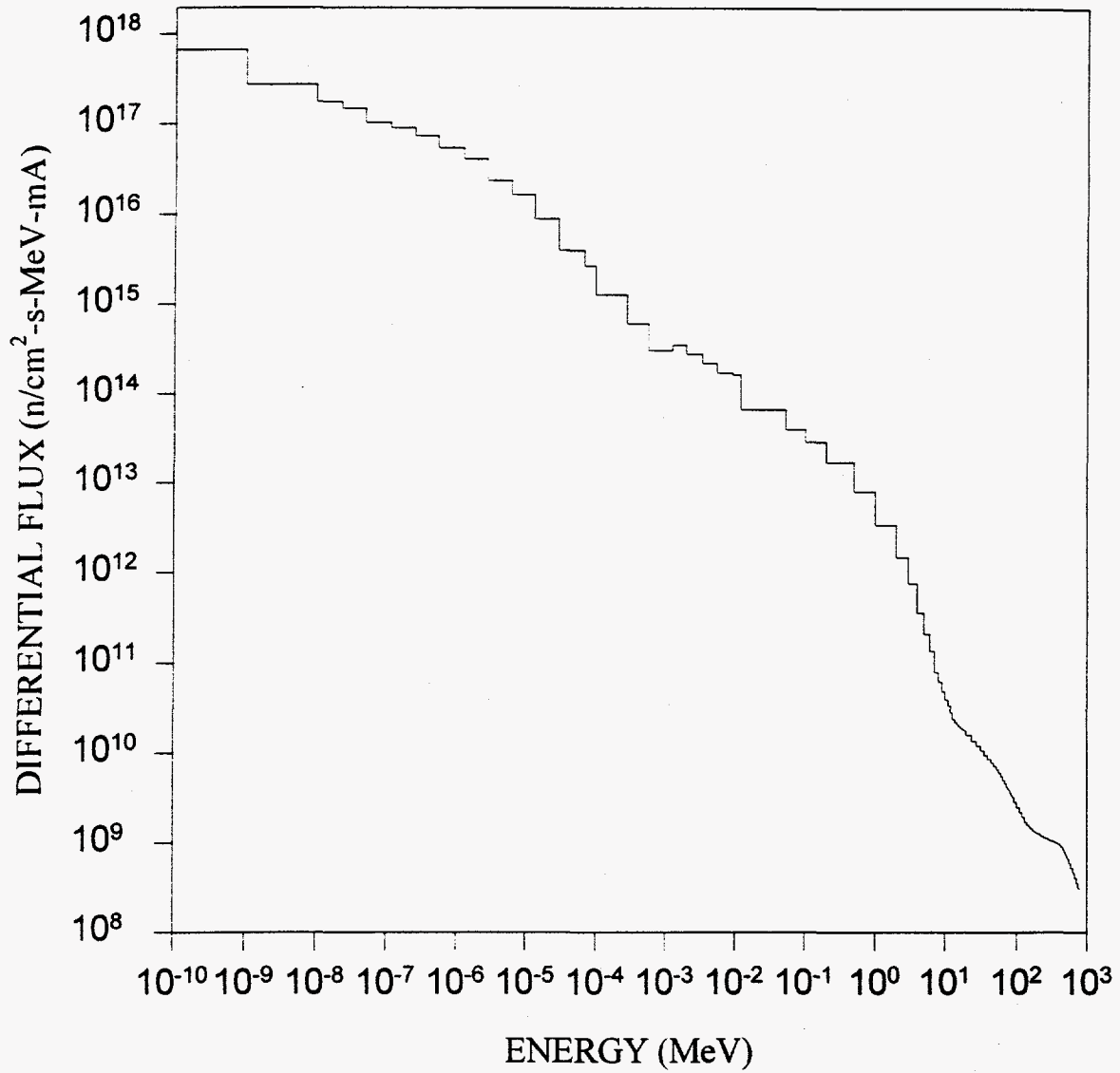
1-1 TO 1-5 DIFFERENTIAL NEUTRON FLUX



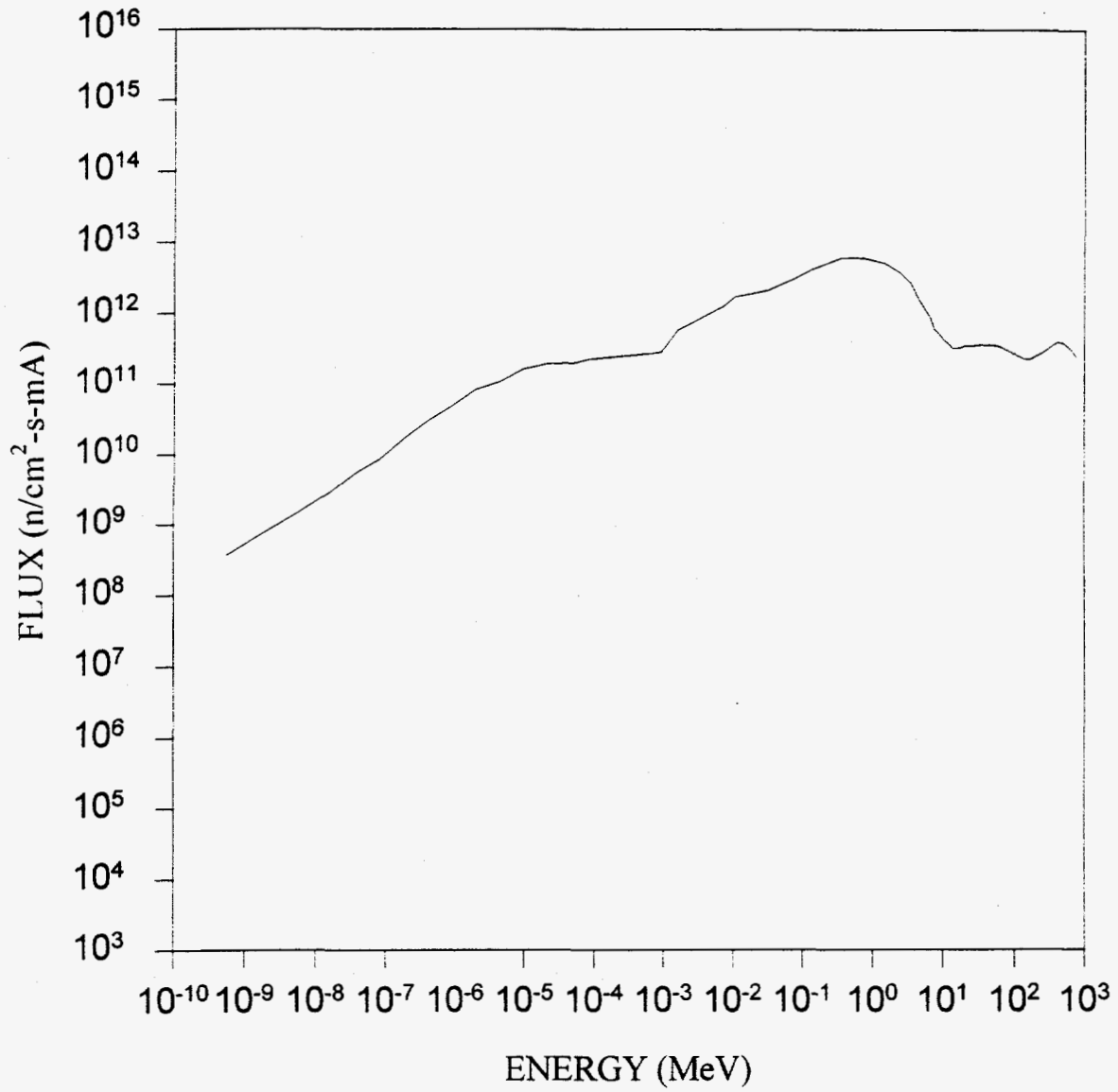
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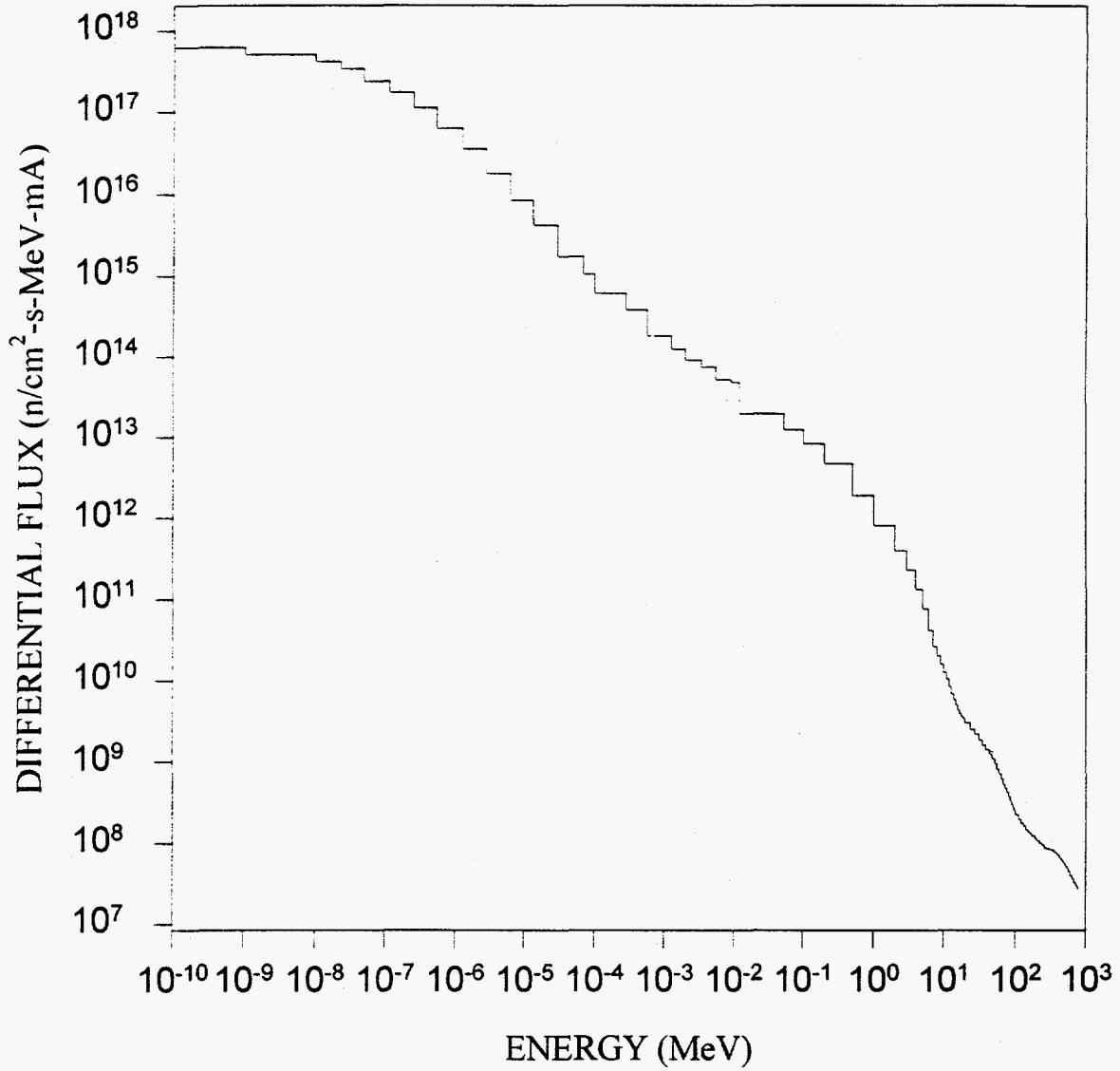
2-1 TO 2-5 DIFFERENTIAL NEUTRON FLUX



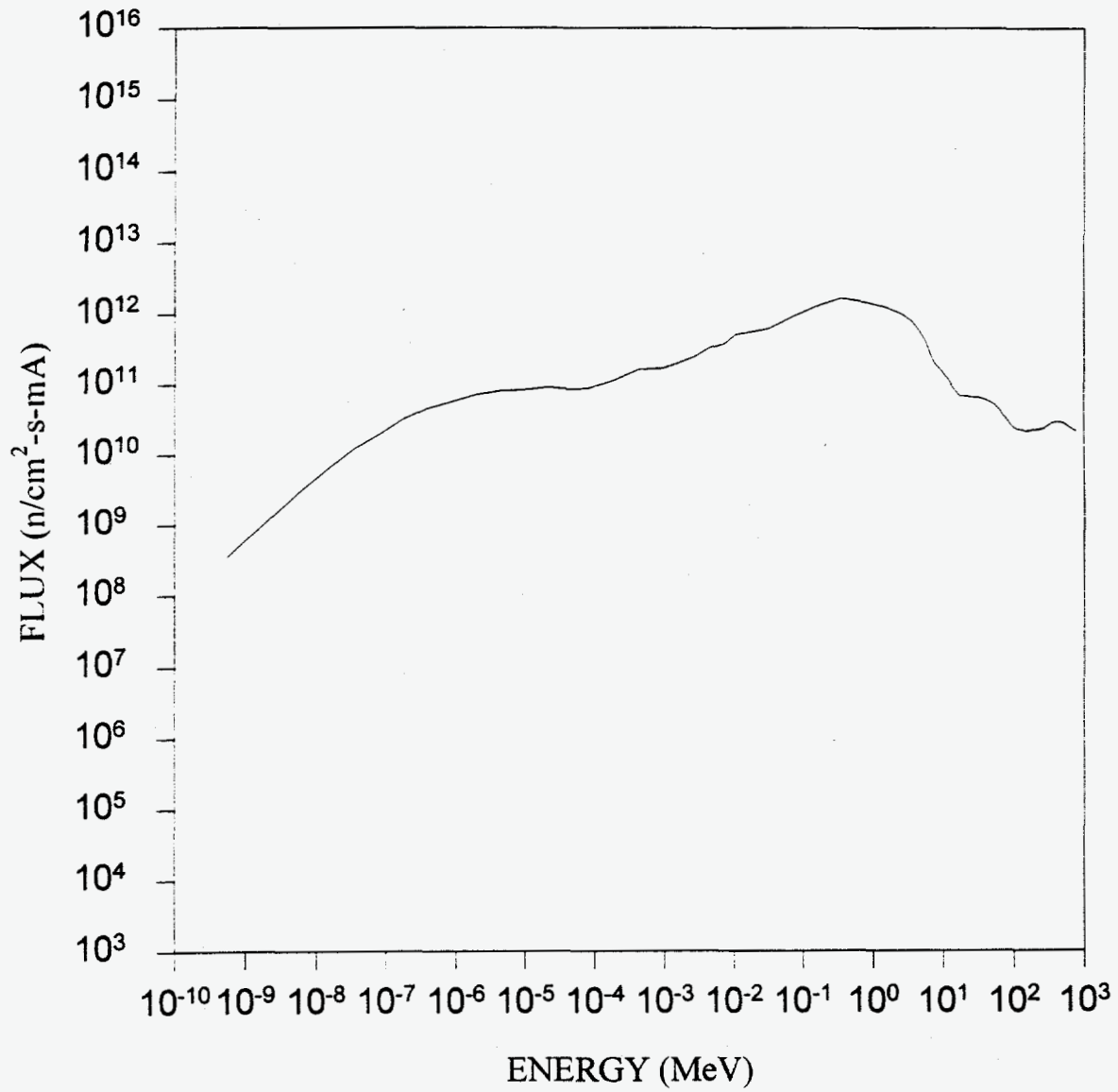
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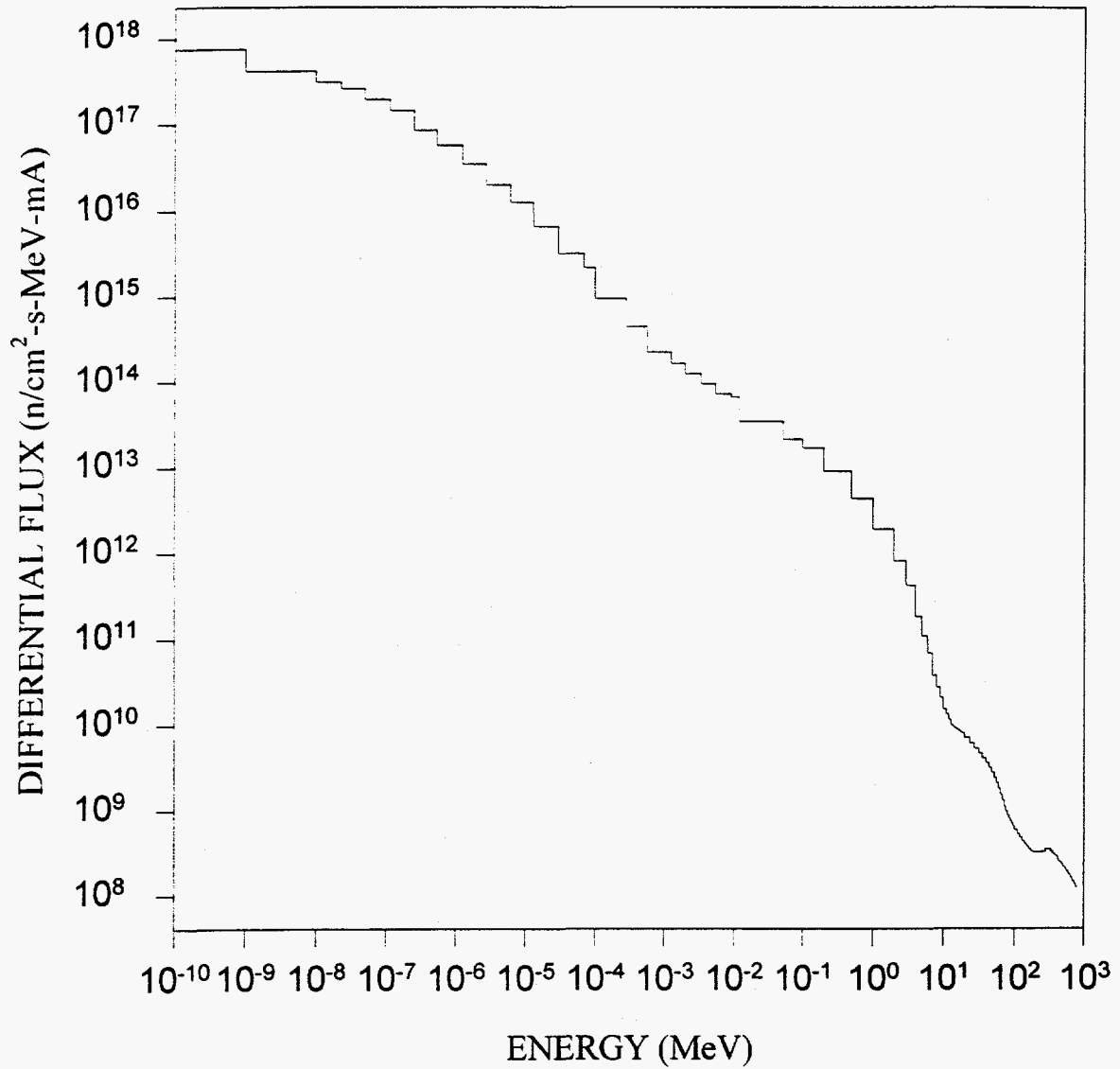
3-1 TO 3-5 DIFFERENTIAL NEUTRON FLUX



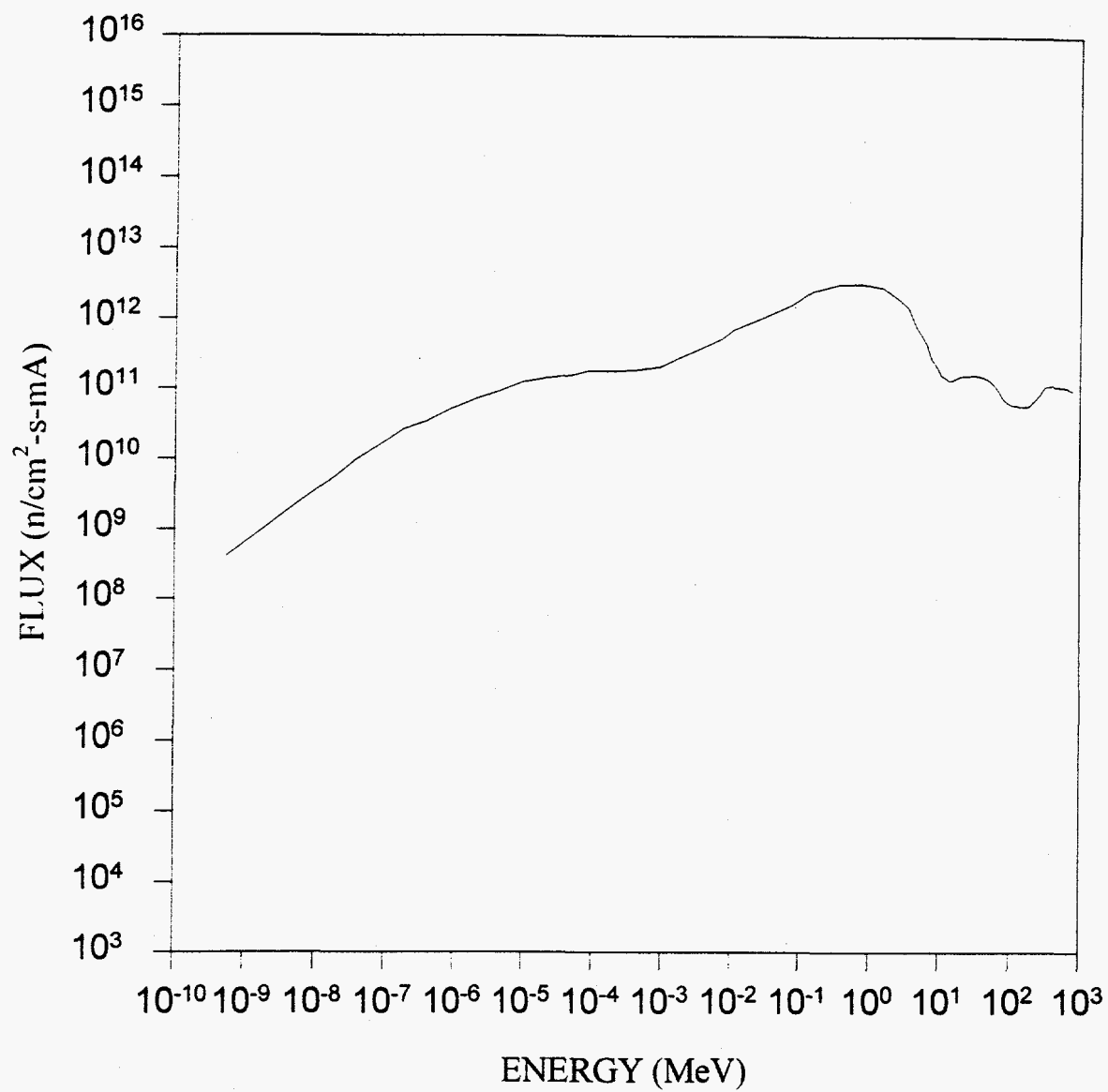
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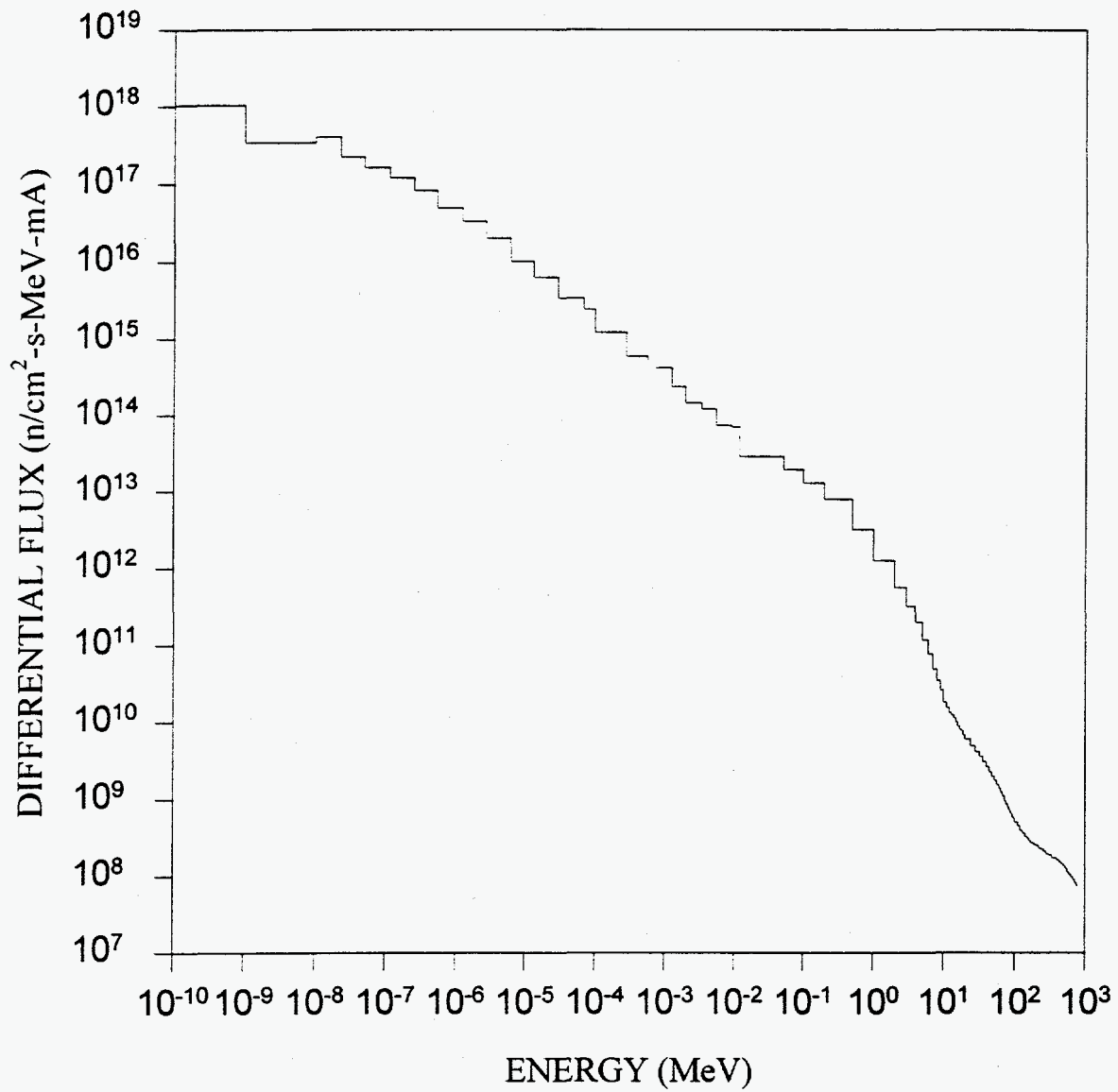
4-1 TO 4-5 DIFFERENTIAL NEUTRON FLUX



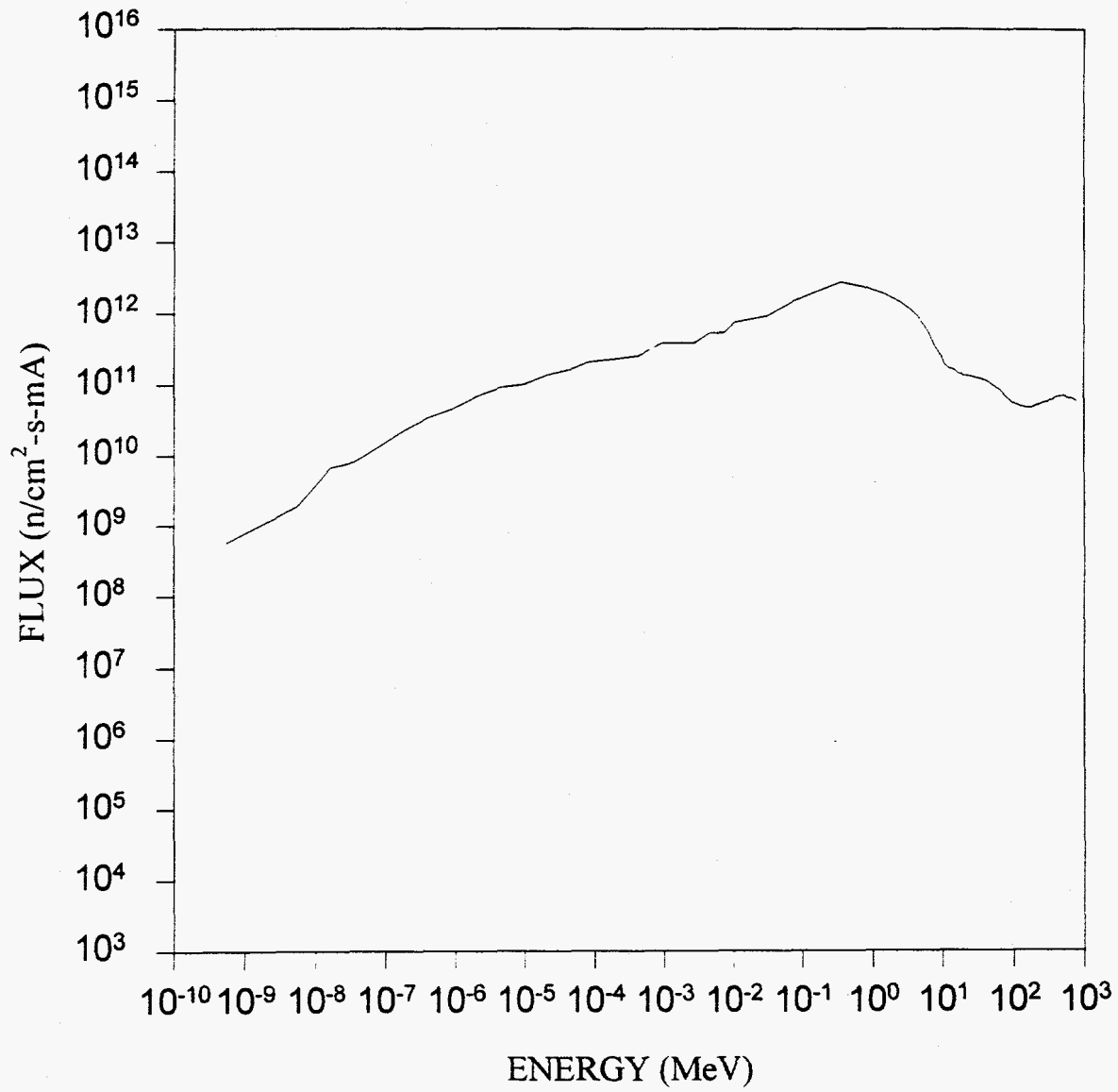
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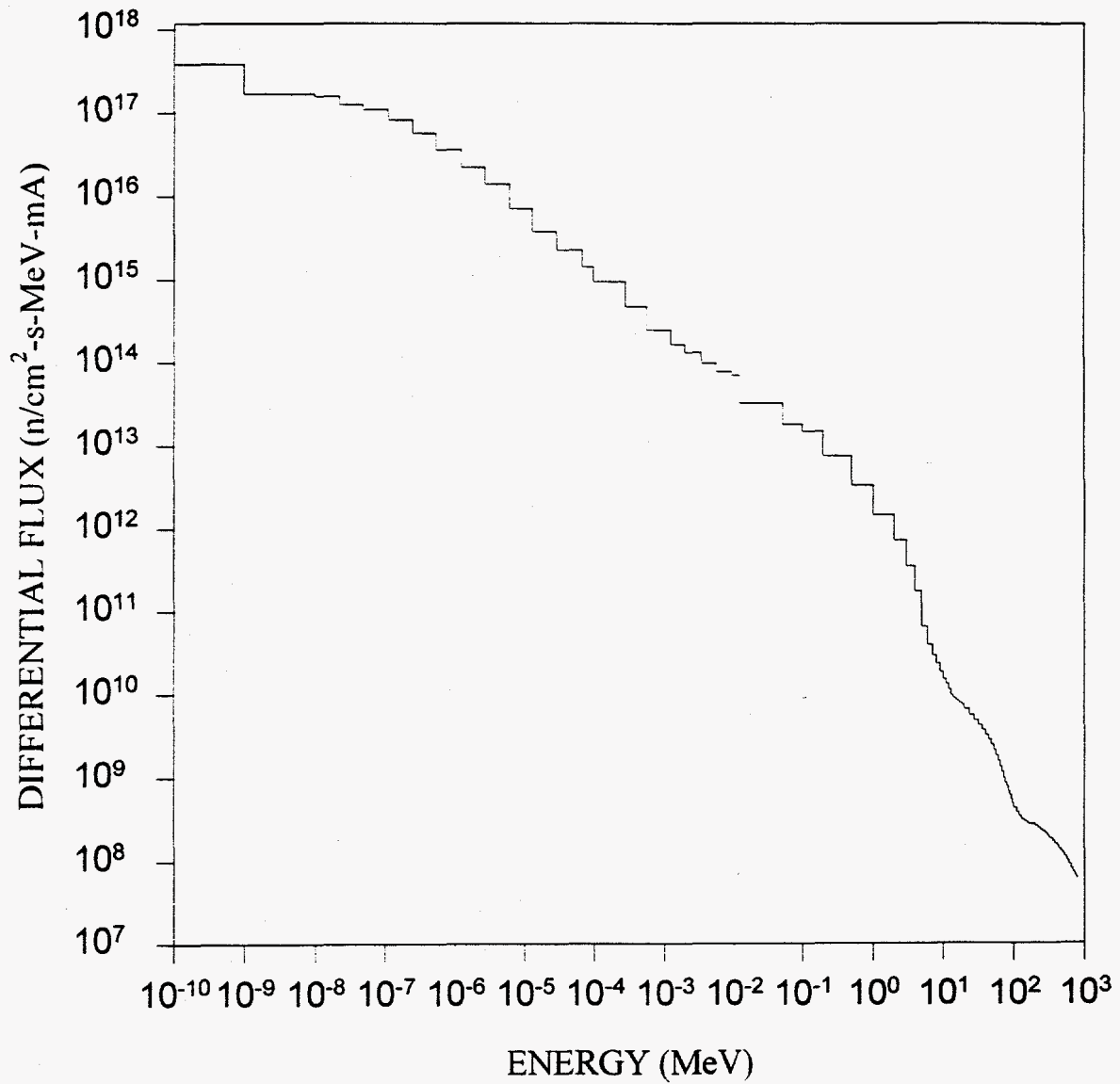
5-1 TO 5-5 DIFFERENTIAL NEUTRON FLUX



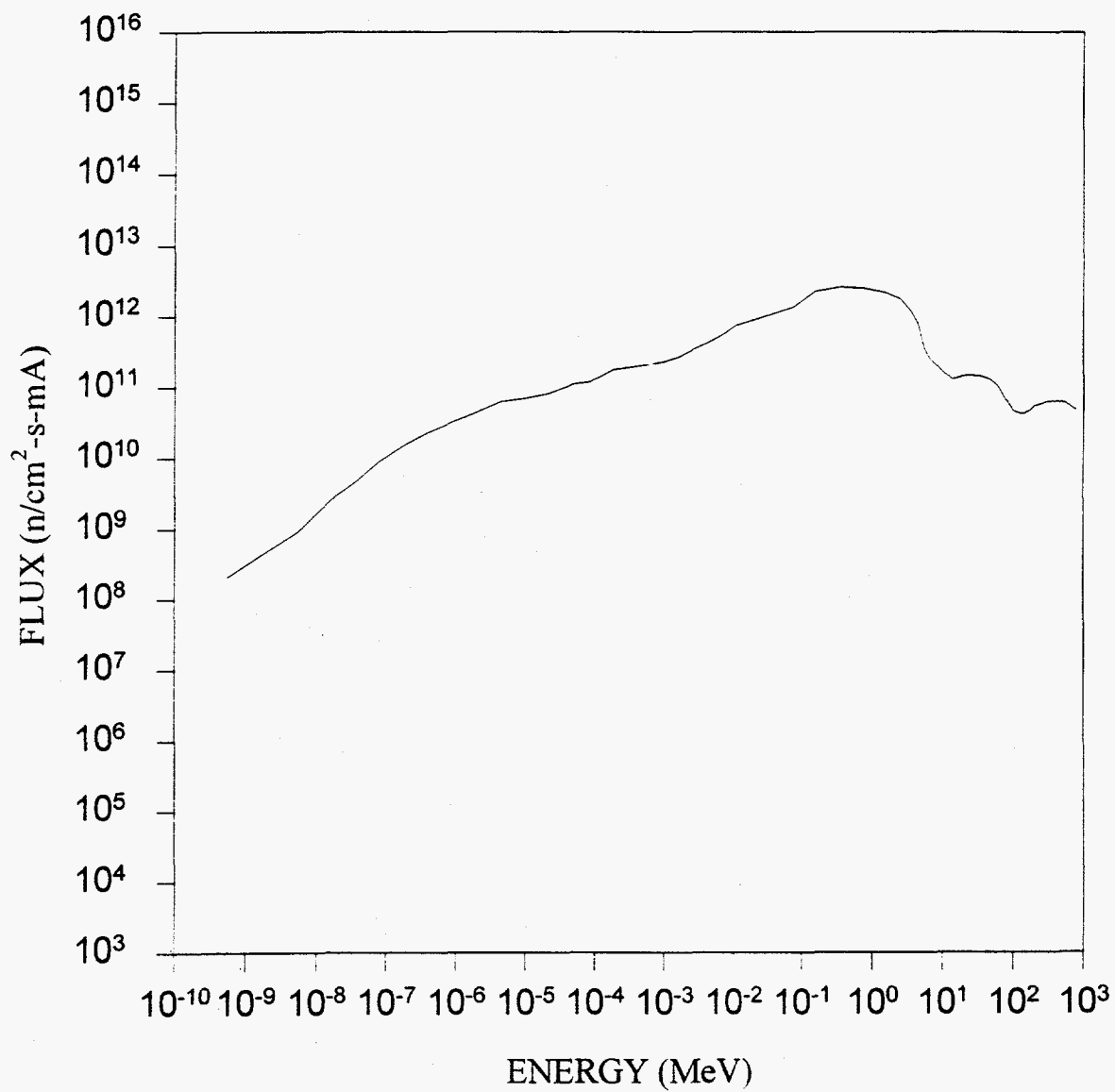
5-1 TO 5-5 NEUTRON FLUX



6-1 TO 6-5 DIFFERENTIAL NEUTRON FLUX



6-1 TO 6-5 NEUTRON FLUX



APPENDIX III

Reactions, Corrected Saturated Activities,
and Integrated Group Energy Fluxes and Fluences

SUMMARY CALCULATIONS

FOR 1-1 TO 1-5

DOSIMETRY ACTIVITIES

	MEASURED	+/-%	BEFORE	DIF%	AFTER	DIF%	CHI	REACTION	90 % LIMITS	
1	4.27E+11	10.0	4.89E+11	-14.6	4.71E+11	-10.5	.7	FE54(N,*)MN54	2.00E+00	3.80E+02
2	2.58E+11	10.0	2.44E+11	5.6	2.45E+11	5.2	.2	FE58(N,G)FE59	1.00E-08	5.25E-02
3	5.72E+10	10.0	5.35E+10	6.5	5.33E+10	6.8	.2	CO59(N,2N)CO58	1.20E+01	3.60E+01
4	1.85E+10	10.0	1.42E+10	23.3	1.45E+10	21.7	.6	CO59(N,3N)CO57	2.00E+01	5.20E+01
5	7.15E+12	15.0	8.12E+12	-13.5	8.21E+12	-14.8	.2	CO59(N,G)CO60	1.00E-08	1.00E-04
6	1.55E+10	15.0	1.77E+10	-14.5	1.67E+10	-7.6	.3	NI60(N,P)CO60	5.00E+00	2.80E+01
7	1.36E+09	10.0	1.08E+09	20.6	1.14E+09	16.4	1.0	CU(N,*)54MN	6.80E+01	6.80E+02
8	4.67E+08	25.0	8.82E+07	81.1	9.19E+07	80.3	10.2	CU(N,*)59FE	5.60E+01	6.80E+02
9	7.04E+08	10.0	8.03E+08	-14.0	8.22E+08	-16.7	.6	CU(N,*)56CO	6.00E+01	6.40E+02
10	3.83E+09	10.0	4.16E+09	-8.7	4.23E+09	-10.5	.4	CU(N,*)57CO	4.00E+01	5.60E+02
11	6.99E+09	10.0	6.61E+09	5.5	6.73E+09	3.8	.1	CU(N,*)58CO	2.80E+01	5.20E+02
12	5.25E+09	25.0	1.22E+09	76.7	1.25E+09	76.2	9.3	CU(N,*)60CO	3.20E+01	6.00E+02
13	5.45E+11	20.0	5.41E+11	.6	5.07E+11	7.0	.0	NB93(N,N')NB93M	5.00E-01	5.00E+00

STD. DEV. = 34.66 34.05

CHISQ = 37.28 34.22

SUMMARY OF INTEGRATED GROUP ENERGY FLUXES AND FLUENCES

ENERGY	FLUX	FLUX	FLUENCE	STANDARD	%
MeV	n/cm2-s-mA	n/cm2-s	n/cm2	DEVIATION	
<1.0	2.836E+12	8.712E+11	5.520E+18	+/- 8.22	32.98
0.1-1.0	3.451E+12	1.060E+12	6.718E+18	+/- 5.46	40.14
1.0-10.0	2.096E+12	6.438E+11	4.079E+18	+/- 8.90	24.37
10.0-20.0	5.514E+10	1.694E+10	1.073E+17	+/-11.21	.64
20.0-40.0	5.548E+10	1.704E+10	1.080E+17	+/-12.12	.65
40.0-100.0	4.596E+10	1.412E+10	8.947E+16	+/-15.94	.53
100.0-200.0	1.396E+10	4.289E+09	2.717E+16	+/-23.59	.16
>200.0	4.107E+10	1.262E+10	7.994E+16	+/-22.22	.48
TOTAL	8.598E+12	2.641E+12	1.674E+19	+/- 6.51	

THE PERCENTAGE OF NEUTRONS ABOVE 20 MeV IS - 1.82

SUMMARY CALCULATIONS FOR 2-1 TO 2-5

DOSIMETRY ACTIVITIES									
MEASURED	+/-%	BEFORE	DIF%	AFTER	DIF%	CHI	REACTION	90 % LIMITS	
1	1.29E+12	15.0	9.92E+11	23.1	9.78E+11	24.2	1.7 FE54(N,*)CR51	2.80E+01	6.40E+02
2	2.01E+12	10.0	2.26E+12	-12.4	2.23E+12	-11.2	.6 FE54(N,*)MN54	2.00E+00	5.20E+02
3	4.98E+11	10.0	4.27E+11	14.4	4.66E+11	6.5	.6 FE58(N,G)FE59	5.00E-08	2.00E-01
4	2.42E+11	10.0	2.37E+11	2.3	2.31E+11	4.6	.0 CO59(N,2N)CO58	1.20E+01	4.00E+01
5	9.00E+10	10.0	6.88E+10	23.6	6.77E+10	24.8	.7 CO59(N,3N)CO57	2.00E+01	6.00E+01
6	1.56E+10	10.0	1.48E+10	5.2	1.45E+10	7.0	.0 CO59(N,4N)CO56	3.20E+01	1.50E+02
7	1.29E+13	15.0	1.08E+13	16.3	1.22E+13	5.1	.1 CO59(N,G)CO60	2.30E-08	1.00E-04
8	6.49E+10	15.0	7.21E+10	-11.1	7.03E+10	-8.3	.2 NI60(N,P)CO60	5.00E+00	1.20E+02
9	1.34E+10	10.0	1.15E+10	13.8	1.17E+10	12.7	.4 CU(N,*)54MN	8.80E+01	6.80E+02
10	2.88E+09	25.0	9.09E+08	68.5	9.15E+08	68.3	7.1 CU(N,*)59FE	6.40E+01	6.80E+02
11	6.90E+09	10.0	8.26E+09	-19.8	8.23E+09	-19.3	.8 CU(N,*)56CO	6.40E+01	6.40E+02
12	3.00E+10	10.0	3.51E+10	-17.0	3.48E+10	-15.9	.9 CU(N,*)57CO	4.00E+01	6.00E+02
13	4.50E+10	10.0	4.82E+10	-7.2	4.77E+10	-6.0	.2 CU(N,*)58CO	2.80E+01	6.00E+02
14	2.56E+10	25.0	9.94E+09	61.2	9.87E+09	61.5	5.8 CU(N,*)60CO	3.60E+01	6.40E+02
15	1.58E+12	20.0	1.58E+12	.1	1.59E+12	-.1	.0 NB93(N,N')NB93M	5.00E-01	6.00E+00

STD. DEV. = 28.33 27.77
CHISQ = 36.35 33.27

SUMMARY OF INTEGRATED GROUP ENERGY FLUXES AND FLUENCES

ENERGY	FLUX	FLUX	FLUENCE	STANDARD	%
MeV	n/cm2-s-mA	n/cm2-s	n/cm2	DEVIATION	
<1.0	8.636E+12	2.653E+12	1.681E+19	+/- 8.29	29.95
0.1-1.0	1.223E+13	3.757E+12	2.381E+19	+/- 5.55	42.41
1.0-10.0	6.571E+12	2.019E+12	1.279E+19	+/- 9.18	22.78
10.0-20.0	2.376E+11	7.300E+10	4.625E+17	+/-11.93	.82
20.0-40.0	2.436E+11	7.485E+10	4.742E+17	+/-12.21	.84
40.0-100.0	2.935E+11	9.016E+10	5.712E+17	+/-16.66	1.02
100.0-200.0	1.584E+11	4.866E+10	3.083E+17	+/-21.95	.55
>200.0	4.252E+11	1.306E+11	8.277E+17	+/-20.34	1.47
TOTAL	2.884E+13	8.860E+12	5.614E+19	+/- 6.63	

THE PERCENTAGE OF NEUTRONS ABOVE 20 MeV IS - 3.89

SUMMARY CALCULATIONS FOR 3-1 TO 3-5

DOSIMETRY ACTIVITIES

	MEASURED	+/-%	BEFORE	DIF%	AFTER	DIF%	CHI	REACTION	90 % LIMITS	
1	3.61E+11	10.0	4.24E+11	-17.7	4.08E+11	-13.2	1.1	FE54(N,*)MN54	2.00E+00	3.60E+02
2	2.45E+11	10.0	2.41E+11	1.9	2.42E+11	1.2	.0	FE58(N,G)FE59	1.00E-09	5.25E-02
3	5.13E+10	10.0	4.99E+10	2.7	4.98E+10	3.0	.0	CO59(N,2N)CO58	1.20E+01	3.60E+01
4	1.61E+10	10.0	1.16E+10	28.1	1.19E+10	25.9	.9	CO59(N,3N)CO57	2.00E+01	5.20E+01
5	7.13E+12	15.0	6.70E+12	6.0	6.82E+12	4.3	.0	CO59(N,G)CO60	1.00E-09	1.00E-04
6	1.16E+09	10.0	9.55E+08	17.6	9.75E+08	15.9	.8	CU(N,*)54MN	7.20E+01	6.80E+02
7	4.01E+08	25.0	7.82E+07	80.5	7.93E+07	80.2	10.2	CU(N,*)59FE	5.60E+01	6.80E+02
8	6.05E+08	10.0	7.25E+08	-19.7	7.24E+08	-19.6	1.0	CU(N,*)56CO	6.00E+01	6.40E+02
9	3.33E+09	10.0	3.61E+09	-8.7	3.64E+09	-9.3	.3	CU(N,*)57CO	4.00E+01	6.00E+02
10	6.07E+09	10.0	5.64E+09	7.2	5.71E+09	6.0	.2	CU(N,*)58CO	2.80E+01	5.40E+02
11	4.52E+09	25.0	1.05E+09	76.7	1.07E+09	76.4	9.3	CU(N,*)60CO	3.20E+01	6.00E+02
12	4.31E+11	20.0	4.28E+11	.7	4.00E+11	7.1	.0	NB93(N,N')NB93M	5.00E-01	6.00E+00

STD. DEV. = 36.10 35.63

CHISQ = 39.32 36.01

SUMMARY OF INTEGRATED GROUP ENERGY FLUXES AND FLUENCES

ENERGY MeV	FLUX n/cm2-s-mA	FLUX n/cm2-s	FLUENCE n/cm2	STANDARD DEVIATION	%
<1.0	2.809E+12	8.630E+11	5.468E+18	+/- 8.58	36.34
0.1-1.0	3.088E+12	9.488E+11	6.012E+18	+/- 5.88	39.95
1.0-10.0	1.634E+12	5.021E+11	3.132E+18	+/-10.14	21.14
10.0-20.0	6.158E+10	1.892E+10	1.199E+17	+/-12.98	.80
20.0-40.0	4.596E+10	1.412E+10	8.947E+16	+/-12.54	.59
40.0-100.0	3.890E+10	1.195E+10	7.573E+16	+/-16.43	.50
100.0-200.0	1.424E+10	4.376E+09	2.773E+16	+/-22.09	.18
>200.0	3.355E+10	1.031E+10	6.531E+16	+/-22.42	.43
TOTAL	7.730E+12	2.375E+12	1.505E+19	+/- 7.08	

THE PERCENTAGE OF NEUTRONS ABOVE 20 MeV IS - 1.72

SUMMARY CALCULATIONS

FOR 4-1 TO 4-5

DOSIMETRY ACTIVITIES											
MEASURED	+/-%	BEFORE	DIF%	AFTER	DIF%	CHI	REACTION	90 % LIMITS			
1	8.15E+11	10.0	9.12E+11	-11.9	9.01E+11	-10.5	.6 FE54(N,*)MN54	2.00E+00	5.00E+02		
2	3.20E+11	10.0	2.91E+11	8.9	3.08E+11	3.8	.2 FE58(N,G)FE59	1.00E-09	2.00E-01		
3	1.10E+11	10.0	1.04E+11	5.7	1.04E+11	5.5	.1 CO59(N,2N)CO58	1.20E+01	3.60E+01		
4	3.64E+10	10.0	2.93E+10	19.6	2.93E+10	19.6	.4 CO59(N,3N)CO57	2.00E+01	5.60E+01		
5	9.50E+12	15.0	8.82E+12	7.1	9.47E+12	.3	.0 CO59(N,G)CO60	1.00E-09	1.00E-04		
6	2.96E+10	15.0	3.12E+10	-5.3	3.07E+10	-3.8	.1 NI60(N,P)CO60	5.00E+00	4.80E+01		
7	3.91E+09	10.0	3.44E+09	12.0	3.47E+09	11.3	.3 CU(N,*)54MN	8.80E+01	7.20E+02		
8	1.06E+09	25.0	2.71E+08	74.4	2.71E+08	74.4	8.5 CU(N,*)59FE	6.00E+01	7.20E+02		
9	2.03E+09	10.0	2.37E+09	-17.1	2.34E+09	-15.4	.6 CU(N,*)56CO	6.40E+01	6.80E+02		
10	9.75E+09	10.0	1.09E+10	-11.4	1.07E+10	-9.4	.4 CU(N,*)57CO	4.00E+01	6.40E+02		
11	1.60E+10	10.0	1.61E+10	-.6	1.59E+10	.7	.0 CU(N,*)58CO	2.80E+01	6.00E+02		
12	1.04E+10	25.0	3.16E+09	69.5	3.13E+09	69.8	7.6 CU(N,*)60CO	3.20E+01	6.40E+02		
13	8.57E+11	20.0	8.55E+11	.3	8.45E+11	1.5	.0 NB93(N,N')NB93M	5.00E-01	5.00E+00		
STD. DEV.	=	31.15	30.85								
CHISQ	=	28.99	26.64								

SUMMARY OF INTEGRATED GROUP ENERGY FLUXES AND FLUENCES

ENERGY	FLUX	FLUX	FLUENCE	STANDARD	%
MeV	n/cm2-s-mA	n/cm2-s	n/cm2	DEVIATION	
<1.0	4.537E+12	1.394E+12	8.832E+18	+/- 8.28	30.08
0.1-1.0	6.524E+12	2.004E+12	1.270E+19	+/- 5.65	43.25
1.0-10.0	3.530E+12	1.084E+12	6.871E+18	+/- 9.19	23.40
10.0-20.0	1.022E+11	3.141E+10	1.990E+17	+/-11.75	.68
20.0-40.0	1.118E+11	3.434E+10	2.176E+17	+/-12.60	.74
40.0-100.0	9.480E+10	2.912E+10	1.845E+17	+/-17.81	.63
100.0-200.0	3.787E+10	1.164E+10	7.372E+16	+/-24.70	.25
>200.0	1.292E+11	3.969E+10	2.515E+17	+/-20.54	.86
TOTAL	1.508E+13	4.634E+12	2.936E+19	+/- 6.69	

THE PERCENTAGE OF NEUTRONS ABOVE 20 MeV IS - 2.48

SUMMARY CALCULATIONS FOR 5-1 TO 5-5

DOSIMETRY ACTIVITIES

	MEASURED	+/-%	BEFORE	DIF%	AFTER	DIF%	CHI	REACTION	90 % LIMITS	
1	5.95E+11	10.0	7.57E+11	-27.3	7.36E+11	-23.8	2.8	FE54(N,*)MN54	2.00E+00	4.40E+02
2	5.37E+10	10.0	2.25E+10	58.2	2.31E+10	57.0	10.0	CO59(N,3N)CO57	2.00E+01	5.20E+01
3	1.04E+13	15.0	1.02E+13	2.3	9.81E+12	5.7	.0	CO59(N,G)CO60	1.00E-08	1.00E-04
4	3.79E+10	15.0	3.47E+10	8.4	3.35E+10	11.5	.3	NI60(N,P)CO60	5.00E+00	2.80E+01
5	2.85E+09	10.0	2.23E+09	21.6	2.27E+09	20.5	1.3	CU(N,*)54MN	8.00E+01	7.20E+02
6	6.64E+09	10.0	7.73E+09	-16.5	7.61E+09	-14.7	.9	CU(N,*)57CO	4.00E+01	6.40E+02
7	1.31E+10	25.0	2.25E+09	82.8	2.23E+09	82.9	10.9	CU(N,*)60CO	3.20E+01	6.40E+02
8	1.06E+12	20.0	6.53E+11	38.7	6.17E+11	42.0	.4	NB93(N,N')NB93M	5.00E-01	6.00E+00
STD. DEV.	=		43.58		43.52					
CHISQ	=		63.71		60.64					

SUMMARY OF INTEGRATED GROUP ENERGY FLUXES AND FLUENCES

ENERGY MeV	FLUX n/cm2-s-mA	FLUX n/cm2-s	FLUENCE n/cm2	STANDARD DEVIATION	%
<1.0	4.292E+12	1.318E+12	8.354E+18	+/-11.01	34.88
0.1-1.0	5.105E+12	1.568E+12	9.937E+18	+/- 6.20	41.49
1.0-10.0	2.509E+12	7.709E+11	4.884E+18	+/-10.01	20.39
10.0-20.0	1.119E+11	3.437E+10	2.177E+17	+/-14.66	.91
20.0-40.0	9.094E+10	2.794E+10	1.770E+17	+/-18.08	.74
40.0-100.0	7.411E+10	2.277E+10	1.443E+17	+/-20.43	.50
100.0-200.0	3.022E+10	9.285E+09	5.883E+16	+/-26.14	.25
>200.0	8.014E+10	2.462E+10	1.560E+17	+/-24.56	.65
TOTAL	1.230E+13	3.780E+12	2.395E+19	+/- 8.07	

THE PERCENTAGE OF NEUTRONS ABOVE 20 MeV IS - 2.24

NOTE: The measured gamma-ray data from RAYGUN and SPECANL indicate that the identification of the peaks may be ambiguous. Thus, the results of this foil package should be used with caution.

SUMMARY CALCULATIONS FOR 6-1 TO 6-5

DOSIMETRY ACTIVITIES									
MEASURED	+/-%	BEFORE	DIF%	AFTER	DIF%	CHI	REACTION	90 % LIMITS	
1	7.16E+11	10.0	7.80E+11	-8.9	7.50E+11	-4.6	.2 FE54(N,*)MN54	2.00E+00	4.20E+02
2	2.72E+11	10.0	2.70E+11	.7	2.69E+11	.9	.0 FE58(N,G)FE59	2.30E-08	2.00E-01
3	9.49E+10	10.0	1.01E+11	-7.0	9.52E+10	-.3	.0 CO59(N,2N)CO58	1.20E+01	3.60E+01
4	3.54E+10	10.0	2.77E+10	22.0	2.59E+10	27.0	.7 CO59(N,3N)CO57	2.00E+01	5.20E+01
5	8.00E+12	15.0	7.80E+12	2.5	7.84E+12	2.1	.0 CO59(N,G)CO60	2.30E-08	1.00E-04
6	2.54E+10	15.0	2.78E+10	-9.8	2.62E+10	-3.2	.1 NI60(N,P)CO60	5.00E+00	4.00E+01
7	2.93E+09	10.0	2.26E+09	22.8	2.49E+09	15.1	1.1 CU(N,*)54MN	7.60E+01	6.80E+02
8	8.53E+08	25.0	1.84E+08	78.5	1.98E+08	76.8	9.4 CU(N,*)59FE	5.60E+01	6.80E+02
9	1.56E+09	10.0	1.69E+09	-8.1	1.78E+09	-14.1	.3 CU(N,*)56CO	6.40E+01	6.40E+02
10	7.72E+09	10.0	8.50E+09	-10.1	8.54E+09	-10.6	.4 CU(N,*)57CO	4.00E+01	6.00E+02
11	1.32E+10	10.0	1.33E+10	-.9	1.31E+10	.9	.0 CU(N,*)58CO	2.80E+01	5.40E+02
12	8.97E+09	25.0	2.49E+09	72.3	2.50E+09	72.2	8.2 CU(N,*)60CO	3.20E+01	6.00E+02
13	7.40E+11	20.0	7.33E+11	.9	7.08E+11	4.3	.0 NB93(N,N')NB93M	5.00E-01	5.00E+00

STD. DEV. = 32.63 32.19

CHISQ = 31.62 30.77

SUMMARY OF INTEGRATED GROUP ENERGY FLUXES AND FLUENCES

ENERGY	FLUX	FLUX	FLUENCE	STANDARD	%
MeV	n/cm2-s-mA	n/cm2-s	n/cm2	DEVIATION	
<1.0	4.197E+12	1.289E+12	8.170E+18	+/- 7.91	31.99
0.1-1.0	5.591E+12	1.718E+12	1.088E+19	+/- 5.47	42.61
1.0-10.0	2.921E+12	8.974E+11	5.686E+18	+/- 9.00	22.26
10.0-20.0	9.752E+10	2.996E+10	1.898E+17	+/-11.42	.74
20.0-40.0	9.934E+10	3.052E+10	1.934E+17	+/-11.68	.76
40.0-100.0	8.390E+10	2.578E+10	1.633E+17	+/-15.88	.64
100.0-200.0	3.318E+10	1.019E+10	6.459E+16	+/-22.33	.25
>200.0	8.996E+10	2.764E+10	1.751E+17	+/-21.87	.69
TOTAL	1.312E+13	4.031E+12	2.554E+19	+/- 6.52	

THE PERCENTAGE OF NEUTRONS ABOVE 20 MeV IS - 2.33

APPENDIX IV

STAY'SL Output Calculations

1-1 TO 1-5

100 13 2 0 0
.0050 20.0000 .0300 20.0000 .0300 .0300 3.2550
.0000 0 0 6.3360E+06

FE54PX	1.311E-13	.10	.00	.00
FE58G	7.932E-14	.10	.00SFSH	IFX 4.76FENG
CO592	1.757E-14	.10	.00	.00
CO593	5.672E-15	.10	.00	.00
CO59G	2.197E-12	.15	.00SFSH	IFX 1.96CONG
NI60P	4.758E-15	.15	.00	.00
CUX54MN	4.175E-16	.10	.00	.00
CUX59FE	1.436E-16	.25	.00	.00
CUX56CO	2.163E-16	.10	.00	.00
CUX57CO	1.176E-15	.10	.00	.00
CUX58CO	2.148E-15	.10	.00	.00
CUX60CO	1.613E-15	.25	.00	.00
NB93N	1.673E-13	.20	.00	.00

0 FRACTIONAL ERRORS IN INPUT SPECTRUM

16 1.000E+00
1.000E-11 1.000E-07 1.000E-05 1.000E-03 1.000E-02 1.000E-01 4.000E-01 1.000E+00
4.000E+00 1.000E+01 2.000E+01 4.400E+01 1.000E+02 4.000E+02 8.000E+02 0.000E+00
5.000E-01 4.000E-01 2.800E-01 2.000E-01 1.500E-01 1.000E-01 8.000E-02 8.000E-02
2.500E-01 3.000E-01 3.500E-01 4.000E-01 5.000E-01 6.000E-01 0.000E+00 0.000E+00

1 INPUT SPECTRUM

100 1.000E+00
4.678E+17 3.151E+17 2.489E+17 2.471E+17 2.446E+17 2.174E+17 1.673E+17 1.060E+17
5.290E+16 2.640E+16 1.284E+16 5.877E+15 2.735E+15 1.607E+15 7.962E+14 3.566E+14
1.748E+14 1.026E+14 7.664E+13 5.731E+13 4.285E+13 3.884E+13 2.025E+13 1.131E+13
9.898E+12 4.824E+12 2.507E+12 1.109E+12 5.560E+11 3.065E+11 1.700E+11 8.141E+10
3.594E+10 2.498E+10 1.757E+10 1.186E+10 9.622E+09 8.212E+09 6.925E+09 5.856E+09
5.399E+09 5.099E+09 4.831E+09 4.589E+09 4.394E+09 4.228E+09 3.734E+09 3.163E+09
2.717E+09 2.368E+09 2.052E+09 1.789E+09 1.577E+09 1.378E+09 1.201E+09 1.039E+09
9.009E+08 7.643E+08 6.569E+08 5.532E+08 4.840E+08 4.129E+08 3.569E+08 3.165E+08
2.788E+08 2.473E+08 2.218E+08 1.905E+08 1.742E+08 1.611E+08 1.477E+08 1.390E+08
1.341E+08 1.279E+08 1.206E+08 1.182E+08 1.135E+08 1.056E+08 1.006E+08 9.800E+07
9.952E+07 9.951E+07 9.973E+07 1.018E+08 1.006E+08 1.010E+08 9.693E+07 9.337E+07
8.824E+07 8.323E+07 7.704E+07 7.122E+07 6.464E+07 6.174E+07 5.344E+07 4.745E+07
4.228E+07 3.782E+07 3.343E+07 2.919E+07

TITLE: 1-1 TO 1-5

NGROUP= 100 NFOIL= 13 ACTIVITY NORM= 3.255E+00
REACTIIONS COVER ACTIVITIES SELF-SHIELDING
FE54(N,*)MN54 .00 4.267E-13 .00
FE58(N,G)FE59 .00 2.582E-13 IFX FENG 4.76
CO59(N,2N)CO58 .00 5.719E-14 .00
CO59(N,3N)CO57 .00 1.846E-14 .00
CO59(N,G)CO60 .00 7.151E-12 IFX CONG 1.96
NI60(N,P)CO60 .00 1.549E-14 .00
CU(N,*)54MN .00 1.359E-15 .00
CU(N,*)59FE .00 4.674E-16 .00
CU(N,*)56CO .00 7.041E-16 .00
CU(N,*)57CO .00 3.828E-15 .00
CU(N,*)58CO .00 6.992E-15 .00
CU(N,*)60CO .00 5.250E-15 .00
NB93(N,N')NB93M .00 5.446E-13 .00

COVARIANCE PARAMETERS

FLUXES: WIDTH = 2.0000E+01 FCOV = 3.0000E-02
SIGMAS: WIDTH = 2.0000E+01 XCOV = 3.0000E-02
ACTIVITIES = 5.0000E-03 CROSS SECTIONS = 3.0000E-02

DETERM = 3.787*10** -20.00 ERROR = -3.196E-14

INPUT NORMALIZATION DATA

AK1= .0000 VAK= .00090 NORM= 0 RENORM= .9568 CHI 2 = 23.7512

DOSIMETRY ACTIVITIES

MEASURED +/-%	BEFORE	DIF% AFTER	DIF% CHI	REACTION	90 % LIMITS
1 4.27E+11 10.0	4.89E+11	-14.6	4.71E+11 -10.5	.7 FE54(N,*)MN54	2.00E+00 3.80E+02
2 2.58E+11 10.0	2.44E+11	5.6	2.45E+11 5.2	.2 FE58(N,G)FE59	1.00E-08 5.25E-02
3 5.72E+10 10.0	5.35E+10	6.5	5.33E+10 6.8	.2 CO59(N,2N)CO58	1.20E+01 3.60E+01

4	1.85E+10	10.0	1.42E+10	23.3	1.45E+10	21.7	.6	CO59(N,3N)CO57	2.00E+01	5.20E+01
5	7.15E+12	15.0	8.12E+12	-13.5	8.21E+12	-14.8	.2	CO59(N,G)CO60	1.00E-08	1.00E-04
6	1.55E+10	15.0	1.77E+10	-14.5	1.67E+10	-7.6	.3	NI60(N,P)CO60	5.00E+00	2.80E+01
7	1.36E+09	10.0	1.08E+09	20.6	1.14E+09	16.4	1.0	CU(N,*)54MN	6.80E+01	6.80E+02
8	4.67E+08	25.0	8.82E+07	31.1	9.19E+07	30.3	10.2	CU(N,*)59FE	5.60E+01	6.80E+02
9	7.04E+08	10.0	8.03E+08	-14.0	8.22E+08	-16.7	.6	CU(N,*)56CO	6.00E+01	6.40E+02
10	3.83E+09	10.0	4.16E+09	-3.7	4.23E+09	-10.5	.4	CU(N,*)57CO	4.00E+01	5.60E+02
11	6.99E+09	10.0	6.61E+09	5.5	6.73E+09	3.8	.1	CU(N,*)58CO	2.80E+01	5.20E+02
12	5.25E+09	25.0	1.22E+09	76.7	1.25E+09	76.2	9.3	CU(N,*)60CO	3.20E+01	6.00E+02
13	5.45E+11	20.0	5.41E+11	.6	5.07E+11	7.0	.0	NB93(N,N')NB93M	5.00E-01	5.00E+00

STD. DEV. = 34.66 34.05

CHISQ = 37.28 34.22

DOSIMETRY DATA INPUT CORRELATION MATRIX

```

11000
2 21000
3 2 21000
4 2 2 21000
5 2 2 2 21000
6 2 2 2 2 11000
7 2 2 2 2 2 21000
8 1 1 1 1 1 1 11000
9 2 2 2 2 2 2 11000
10 2 2 2 2 2 2 1 21000
11 2 2 2 2 2 2 1 2 21000
12 1 1 1 1 1 1 0 1 1 11000
13 1 1 1 1 1 1 0 1 1 1 11000

```

RELATIVE COV. MATRIX OF ACTIVITIES

* CORRELATION MATRIX

```

1 25.22 1000
2 25.19 2441000
3 35.69 813 1121000
4 52.46 590 44 6451000
5 36.08 168 715 69 261000
6 30.88 779 246 777 475 1651000
7 44.69 322 18 134 158 12 981000
8 41.60 394 21 209 230 13 143 8061000
9 41.95 437 20 248 276 13 160 806 8381000
10 36.66 643 32 524 505 19 344 682 754 8141000
11 35.31 738 43 681 610 25 471 555 641 706 8881000
12 35.52 671 36 569 530 22 384 660 733 790 905 8951000
13 99.60 116 83 94 46 60 135 7 10 10 26 40 311000

```

CONTRIBUTION DUE TO INPUT FLUX COV. MATRIX

* CORRELATION MATRIX

```

1 23.35 1000
2 24.05 2601000
3 33.71 918 1131000
4 37.83 873 54 9401000
5 26.66 231 999 89 391000
6 28.21 907 268 892 713 2331000
7 39.97 379 12 152 239 9 1121000
8 37.64 459 14 233 347 11 165 9911000
9 38.99 498 13 275 406 10 180 964 9901000
10 34.89 719 25 573 729 17 387 795 869 9131000
11 33.76 822 36 746 877 26 530 643 734 788 9681000
12 33.60 754 29 628 770 21 435 773 849 891 997 9811000
13 16.65 726 498 578 364 462 865 32 52 53 149 235 1791000

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CONTRIBUTION DUE TO INPUT X-SEC. COV. MATRIX

* CORRELATION MATRIX

```

1 9.52 1000
2 7.48 1261000
3 11.71 81 1031000
4 36.34 26 33 211000
5 24.31 39 49 32 101000
6 12.57 75 96 61 20 291000

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7 20.01 47 50 38 12 19 361000
 8 17.71 53 58 43 14 21 40 251000
 9 15.46 61 78 50 16 24 46 29 331000
 10 11.26 84 107 58 22 33 64 40 45 521000
 11 10.35 91 116 74 24 36 59 43 49 56 771000
 12 11.51 82 105 57 22 32 62 39 44 51 69 751000
 13 98.20 10 12 3 3 4 7 5 5 6 8 9 81000

DIFFERENTIAL FLUXES INPUT NORMALIZED BY .9668									
G	ENERGY	NEW	OLD	RATIO	STD DEV %	NEW	OLD	RATIO	INT FLUX >+--*
1	1.000E-10	4.943E+17	4.523E+17	1.093	30.88	46.08	.670	8.598E+12	6.51
2	1.000E-09	3.310E+17	3.046E+17	1.087	27.78	43.59	.637	8.597E+12	6.51
3	1.000E-08	2.601E+17	2.406E+17	1.081	25.38	41.96	.605	8.594E+12	6.52
4	2.300E-08	2.571E+17	2.389E+17	1.076	23.58	41.15	.573	8.591E+12	6.52
5	5.000E-08	2.531E+17	2.365E+17	1.070	21.83	40.22	.543	8.584E+12	6.53
6	1.150E-07	2.233E+17	2.102E+17	1.062	19.83	38.49	.515	8.567E+12	6.54
7	2.550E-07	1.703E+17	1.617E+17	1.053	17.80	36.24	.491	8.536E+12	6.56
8	5.500E-07	1.069E+17	1.025E+17	1.043	16.06	34.06	.471	8.486E+12	6.59
9	1.275E-06	5.287E+16	5.114E+16	1.034	14.63	32.00	.457	8.408E+12	6.63
10	2.800E-06	2.615E+16	2.552E+16	1.025	13.51	30.10	.449	8.328E+12	6.66
11	6.300E-06	1.261E+16	1.241E+16	1.016	12.66	28.35	.446	8.236E+12	6.68
12	1.350E-05	5.722E+15	5.682E+15	1.007	12.04	26.77	.450	8.146E+12	6.70
13	3.000E-05	2.641E+15	2.644E+15	.999	11.57	25.25	.458	8.051E+12	6.71
14	6.900E-05	1.540E+15	1.554E+15	.991	11.37	24.17	.470	7.948E+12	6.72
15	1.000E-04	7.573E+14	7.698E+14	.984	11.16	22.99	.485	7.900E+12	6.72
16	2.800E-04	3.370E+14	3.448E+14	.977	10.84	21.59	.502	7.764E+12	6.70
17	5.750E-04	1.642E+14	1.690E+14	.972	10.55	20.33	.519	7.665E+12	6.69
18	1.275E-03	9.590E+13	9.919E+13	.967	10.23	19.10	.536	7.550E+12	6.66
19	2.000E-03	7.133E+13	7.410E+13	.963	9.92	18.00	.551	7.480E+12	6.65
20	3.400E-03	5.316E+13	5.541E+13	.959	9.55	16.92	.564	7.380E+12	6.62
21	5.500E-03	3.965E+13	4.143E+13	.957	9.17	15.94	.576	7.269E+12	6.60
22	9.200E-03	3.586E+13	3.755E+13	.955	8.84	15.14	.584	7.122E+12	6.56
23	1.200E-02	1.875E+13	1.958E+13	.958	7.80	13.20	.591	7.022E+12	6.54
24	5.250E-02	1.053E+13	1.093E+13	.963	6.58	11.01	.598	6.262E+12	6.43
25	1.000E-01	9.235E+12	9.569E+12	.965	5.97	9.93	.601	5.762E+12	6.43
26	2.000E-01	4.512E+12	4.664E+12	.967	5.42	8.98	.604	4.839E+12	6.55
27	5.000E-01	2.348E+12	2.424E+12	.969	5.14	8.54	.602	3.485E+12	7.06
28	1.000E+00	1.025E+12	1.072E+12	.956	6.61	11.47	.576	2.311E+12	8.16
29	2.000E+00	5.014E+11	5.375E+11	.933	9.57	17.19	.557	1.286E+12	9.58
30	3.000E+00	2.704E+11	2.963E+11	.912	12.23	22.56	.542	7.848E+11	9.77
31	4.000E+00	1.483E+11	1.644E+11	.903	13.55	25.73	.526	5.144E+11	8.83
32	5.000E+00	7.104E+10	7.871E+10	.903	13.64	26.77	.509	3.661E+11	7.61
33	6.000E+00	3.143E+10	3.475E+10	.905	13.60	27.67	.492	2.951E+11	7.01
34	7.000E+00	2.194E+10	2.415E+10	.908	13.47	28.47	.473	2.636E+11	6.87
35	8.000E+00	1.552E+10	1.699E+10	.914	13.27	29.18	.455	2.417E+11	6.87
36	9.000E+00	1.056E+10	1.147E+10	.921	13.02	29.83	.437	2.262E+11	6.95
37	1.000E+01	8.640E+09	9.303E+09	.929	12.76	30.46	.419	2.156E+11	7.03
38	1.100E+01	7.444E+09	7.939E+09	.938	12.51	31.07	.402	2.070E+11	7.12
39	1.200E+01	6.342E+09	6.695E+09	.947	12.25	31.65	.387	1.995E+11	7.21
40	1.300E+01	5.420E+09	5.662E+09	.957	12.01	32.19	.373	1.932E+11	7.29
41	1.400E+01	5.050E+09	5.220E+09	.967	11.80	32.70	.361	1.878E+11	7.36
42	1.500E+01	4.819E+09	4.930E+09	.977	11.62	33.19	.350	1.827E+11	7.41
43	1.600E+01	4.611E+09	4.671E+09	.987	11.49	33.65	.341	1.779E+11	7.46
44	1.700E+01	4.419E+09	4.437E+09	.996	11.41	34.09	.335	1.733E+11	7.51
45	1.800E+01	4.266E+09	4.248E+09	1.004	11.39	34.51	.330	1.689E+11	7.54
46	1.900E+01	4.133E+09	4.088E+09	1.011	11.42	34.91	.327	1.646E+11	7.56
47	2.000E+01	3.671E+09	3.610E+09	1.017	11.64	35.66	.326	1.605E+11	7.58
48	2.400E+01	3.124E+09	3.058E+09	1.022	12.02	36.68	.328	1.458E+11	7.65
49	2.800E+01	2.691E+09	2.627E+09	1.025	12.43	37.58	.331	1.333E+11	7.76
50	3.200E+01	2.349E+09	2.289E+09	1.026	12.88	38.38	.336	1.225E+11	7.93
51	3.600E+01	2.035E+09	1.984E+09	1.026	13.39	39.11	.342	1.131E+11	8.18
52	4.000E+01	1.771E+09	1.730E+09	1.024	13.94	39.78	.351	1.050E+11	8.49
53	4.400E+01	1.552E+09	1.521E+09	1.021	14.62	40.57	.360	9.790E+10	8.89
54	4.800E+01	1.353E+09	1.332E+09	1.016	15.40	41.50	.371	9.169E+10	9.36
55	5.200E+01	1.172E+09	1.161E+09	1.009	16.22	42.37	.383	8.627E+10	9.90
56	5.600E+01	1.007E+09	1.005E+09	1.002	17.08	43.20	.395	8.159E+10	10.48
57	6.000E+01	8.654E+08	8.710E+08	.994	17.95	43.99	.408	7.756E+10	11.10
58	6.400E+01	7.275E+08	7.389E+08	.985	18.83	44.74	.421	7.410E+10	11.73
59	6.800E+01	6.193E+08	6.351E+08	.975	19.70	45.46	.433	7.119E+10	12.34
60	7.200E+01	5.165E+08	5.348E+08	.966	20.56	46.14	.445	6.871E+10	12.93
61	7.600E+01	4.476E+08	4.679E+08	.957	21.37	46.81	.457	6.665E+10	13.46
62	8.000E+01	3.784E+08	3.992E+08	.948	22.14	47.45	.467	6.485E+10	13.97
63	8.400E+01	3.244E+08	3.451E+08	.940	22.84	48.06	.475	6.334E+10	14.42

64	8.800E+01	2.857E+08	3.060E+08	.934	23.46	48.66	.482	6.204E+10	14.82
65	9.200E+01	2.502E+08	2.695E+08	.928	24.00	49.23	.487	6.090E+10	15.19
66	9.600E+01	2.211E+08	2.391E+08	.925	24.43	49.79	.491	5.990E+10	15.51
67	1.000E+02	1.979E+08	2.144E+08	.923	24.79	50.38	.492	5.901E+10	15.80
68	1.100E+02	1.699E+08	1.842E+08	.922	25.05	50.99	.491	5.704E+10	16.46
69	1.200E+02	1.557E+08	1.684E+08	.924	25.19	51.55	.489	5.534E+10	17.05
70	1.300E+02	1.445E+08	1.558E+08	.928	25.22	52.07	.484	5.378E+10	17.62
71	1.400E+02	1.333E+08	1.428E+08	.934	25.14	52.56	.478	5.234E+10	18.15
72	1.500E+02	1.265E+08	1.344E+08	.941	24.98	53.02	.471	5.100E+10	18.65
73	1.600E+02	1.232E+08	1.296E+08	.950	24.74	53.46	.463	4.974E+10	19.12
74	1.700E+02	1.188E+08	1.237E+08	.961	24.47	53.88	.454	4.851E+10	19.56
75	1.800E+02	1.135E+08	1.166E+08	.973	24.18	54.27	.446	4.732E+10	19.97
76	1.900E+02	1.127E+08	1.143E+08	.987	23.92	54.65	.438	4.618E+10	20.34
77	2.000E+02	1.098E+08	1.097E+08	1.001	23.80	55.17	.431	4.506E+10	20.68
78	2.200E+02	1.037E+08	1.021E+08	1.016	23.85	55.84	.427	4.286E+10	21.31
79	2.400E+02	1.004E+08	9.726E+07	1.032	24.03	56.45	.426	4.078E+10	21.89
80	2.600E+02	9.928E+07	9.475E+07	1.048	24.38	57.03	.428	3.878E+10	22.41
81	2.800E+02	1.024E+08	9.622E+07	1.064	24.94	57.56	.433	3.679E+10	22.88
82	3.000E+02	1.039E+08	9.621E+07	1.080	25.71	58.07	.443	3.474E+10	23.30
83	3.200E+02	1.056E+08	9.642E+07	1.095	26.72	58.55	.456	3.267E+10	23.64
84	3.400E+02	1.093E+08	9.842E+07	1.110	27.94	59.00	.474	3.055E+10	23.88
85	3.600E+02	1.093E+08	9.726E+07	1.124	29.36	59.43	.494	2.837E+10	24.00
86	3.800E+02	1.110E+08	9.765E+07	1.137	30.96	59.85	.517	2.618E+10	23.94
87	4.000E+02	1.072E+08	9.371E+07	1.144	31.79	58.55	.543	2.396E+10	23.65
88	4.200E+02	1.034E+08	9.027E+07	1.146	31.67	55.56	.570	2.182E+10	23.17
89	4.400E+02	9.764E+07	8.531E+07	1.145	31.45	52.56	.598	1.975E+10	22.55
90	4.600E+02	9.185E+07	8.047E+07	1.141	31.09	49.57	.627	1.780E+10	21.80
91	4.800E+02	8.466E+07	7.448E+07	1.137	30.57	46.58	.656	1.596E+10	20.92
92	5.000E+02	7.782E+07	6.886E+07	1.130	29.86	43.58	.685	1.427E+10	19.92
93	5.200E+02	7.014E+07	6.249E+07	1.122	28.95	40.59	.713	1.271E+10	18.81
94	5.400E+02	6.647E+07	5.969E+07	1.114	27.85	37.60	.741	1.131E+10	17.63
95	5.600E+02	5.680E+07	5.167E+07	1.099	25.39	33.12	.767	9.977E+09	16.33
96	6.000E+02	4.956E+07	4.588E+07	1.080	21.49	27.15	.791	7.705E+09	13.74
97	6.400E+02	4.338E+07	4.088E+07	1.061	17.28	21.20	.815	5.723E+09	11.13
98	6.800E+02	3.812E+07	3.656E+07	1.043	12.81	15.29	.838	3.988E+09	8.54
99	7.200E+02	3.312E+07	3.232E+07	1.025	8.18	9.48	.863	2.463E+09	6.05
100	7.600E+02	2.844E+07	2.822E+07	1.008	3.90	4.24	.920	1.138E+09	3.90

INTEGRALS OF SPECTRA

OLD SPECTRUM 8.921E+12 +OR- 12.698 %
 NEW SPECTRUM 8.598E+12 +OR- 6.514 %

ENERGY	FLUX	SDEV	ENERGY	FLUX	SDEV
1.000E-10	4.943E+17	30.88	3.600E+01	2.035E+09	13.39
1.000E-09	3.310E+17	27.78	4.000E+01	1.771E+09	13.94
1.000E-08	2.601E+17	25.38	4.400E+01	1.552E+09	14.62
2.300E-08	2.571E+17	23.58	4.800E+01	1.353E+09	15.40
5.000E-08	2.531E+17	21.83	5.200E+01	1.172E+09	16.22
1.150E-07	2.233E+17	19.83	5.600E+01	1.007E+09	17.08
2.550E-07	1.703E+17	17.80	6.000E+01	8.654E+08	17.95
5.500E-07	1.069E+17	16.06	6.400E+01	7.275E+08	18.83
1.275E-06	5.287E+16	14.63	6.800E+01	6.193E+08	19.70
2.800E-06	2.615E+16	13.51	7.200E+01	5.165E+08	20.56
6.300E-06	1.261E+16	12.66	7.600E+01	4.476E+08	21.37
1.350E-05	5.722E+15	12.04	8.000E+01	3.784E+08	22.14
3.000E-05	2.641E+15	11.57	8.400E+01	3.244E+08	22.84
6.900E-05	1.540E+15	11.37	8.800E+01	2.857E+08	23.46
1.000E-04	7.573E+14	11.16	9.200E+01	2.502E+08	24.00
2.800E-04	3.370E+14	10.84	9.600E+01	2.211E+08	24.43
5.750E-04	1.642E+14	10.55	1.000E+02	1.979E+08	24.79
1.275E-03	9.590E+13	10.23	1.100E+02	1.699E+08	25.05
2.000E-03	7.133E+13	9.92	1.200E+02	1.557E+08	25.19
3.400E-03	5.316E+13	9.55	1.300E+02	1.445E+08	25.22
5.500E-03	3.965E+13	9.17	1.400E+02	1.333E+08	25.14
9.200E-03	3.586E+13	8.84	1.500E+02	1.265E+08	24.98
1.200E-02	1.875E+13	7.80	1.600E+02	1.232E+08	24.74
5.250E-02	1.053E+13	6.58	1.700E+02	1.188E+08	24.47
1.000E-01	9.235E+12	5.97	1.800E+02	1.135E+08	24.18
2.000E-01	4.512E+12	5.42	1.900E+02	1.127E+08	23.92
5.000E-01	2.348E+12	5.14	2.000E+02	1.098E+08	23.80
1.000E+00	1.025E+12	6.61	2.200E+02	1.037E+08	23.85
2.000E+00	5.014E+11	9.57	2.400E+02	1.004E+08	24.03
3.000E+00	2.704E+11	12.23	2.600E+02	9.928E+07	24.38

4.000E+00	1.483E+11	13.55	2.800E+02	1.024E+08	24.94
5.000E+00	7.104E+10	13.64	3.000E+02	1.039E+08	25.71
6.000E+00	3.143E+10	13.60	3.200E+02	1.056E+08	26.72
7.000E+00	2.194E+10	13.47	3.400E+02	1.093E+08	27.94
8.000E+00	1.552E+10	13.27	3.600E+02	1.093E+08	29.36
9.000E+00	1.056E+10	13.02	3.800E+02	1.110E+08	30.96
1.000E+01	8.640E+09	12.76	4.000E+02	1.072E+08	31.79
1.100E+01	7.444E+09	12.51	4.200E+02	1.034E+08	31.67
1.200E+01	6.342E+09	12.25	4.400E+02	9.764E+07	31.45
1.300E+01	5.420E+09	12.01	4.600E+02	9.185E+07	31.09
1.400E+01	5.050E+09	11.80	4.800E+02	8.466E+07	30.57
1.500E+01	4.819E+09	11.62	5.000E+02	7.782E+07	29.86
1.600E+01	4.611E+09	11.49	5.200E+02	7.014E+07	28.95
1.700E+01	4.419E+09	11.41	5.400E+02	6.647E+07	27.85
1.800E+01	4.266E+09	11.39	5.600E+02	5.680E+07	25.39
1.900E+01	4.133E+09	11.42	5.000E+02	4.956E+07	21.49
2.000E+01	3.671E+09	11.64	5.400E+02	4.338E+07	17.28
2.400E+01	3.124E+09	12.02	5.800E+02	3.812E+07	12.81
2.800E+01	2.691E+09	12.43	7.200E+02	3.312E+07	8.18
3.200E+01	2.349E+09	12.88	7.600E+02	2.844E+07	3.90

SUMMARY OF BROAD-GROUP FLUXES, FLUENCES, AND UNCERTAINTIES

IRRAD TIME(S)= 6.336E+06 ACT NORM = 3.255E+00

ENERGY	FLUX	FLUENCE	SDEV
TOTAL	8.598E+12	1.674E+19 +/-	6.51
1.000E-10	3.020E+10	5.878E+16 +/-	23.21
1.150E-07	4.219E+11	8.213E+17 +/-	14.63
1.350E-05	2.384E+12	4.640E+18 +/-	8.22
1.000E-01	3.451E+12	6.718E+18 +/-	5.46
1.000E+00	2.096E+12	4.079E+18 +/-	8.90
1.000E+01	5.514E+10	1.073E+17 +/-	11.21
2.000E+01	5.548E+10	1.080E+17 +/-	12.12
4.000E+01	4.596E+10	8.947E+16 +/-	15.94
1.000E+02	1.396E+10	2.717E+16 +/-	23.59
2.000E+02	4.107E+10	7.994E+16 +/-	22.22

SUMMARY OF INTEGRATED GROUP ENERGY FLUXES AND FLUENCES

ENERGY MeV	FLUX n/cm2-s-mA	FLUX n/cm2-s	FLUENCE n/cm2	STANDARD DEVIATION	%
<1.0	2.836E+12	8.712E+11	5.520E+18	-/- 8.22	32.98
0.1-1.0	3.451E+12	1.060E+12	6.718E+18	-/- 5.46	40.14
1.0-10.0	2.096E+12	6.438E+11	4.079E+18	-/- 8.90	24.37
10.0-20.0	5.514E+10	1.694E+10	1.073E+17	-/-11.21	.64
20.0-40.0	5.548E+10	1.704E+10	1.080E+17	-/-12.12	.65
40.0-100.0	4.596E+10	1.412E+10	8.947E+16	-/-15.94	.53
100.0-200.0	1.396E+10	4.289E+09	2.717E+16	-/-23.59	.16
>200.0	4.107E+10	1.262E+10	7.994E+16	-/-22.22	.48
TOTAL	8.598E+12	2.641E+12	1.674E+19	-/- 6.51	

THE PERCENTAGE OF NEUTRONS ABOVE 20 MeV IS - 1.82

RELATIVE COVARIANCES(10X10)

1000	843	-21	-208	-208	7	108	63	7	12
1000	405	80	13	4	73	62	21	19	
1000	879	784	156	-151	-68	65	46		
1000	941	313	-189	-147	72	70			
1000	501	-165	-209	75	96				
1000	531	-65	-136	97					
1000	608	-221	-217						
1000	298	-554							
1000	-161								
1000									

2-1 TO 2-5

100 15 2 0 0
.0050 20.0000 .0300 20.0000 .0300 .0300 3.2550
.0000 0 0 5.3360E+06

FE54AX	3.963E-13	.15	.00	.00
FE54PX	5.173E-13	.10	.00	.00
FE58G	1.531E-13	.10	.00SFSH	IFX 4.76FENG
CO592	7.447E-14	.10	.00	.00
CO593	2.766E-14	.10	.00	.00
CO594	4.783E-15	.10	.00	.00
CO59G	3.954E-12	.15	.00SFSH	IFX 1.96CONG
NI60P	1.995E-14	.15	.00	.00
CUX54MN	4.102E-15	.10	.00	.00
CUX59FE	8.857E-16	.25	.00	.00
CUX56CO	2.119E-15	.10	.00	.00
CUX57CO	9.223E-15	.10	.00	.00
CUX58CO	1.382E-14	.10	.00	.00
CUX60CO	7.870E-15	.25	.00	.00
NB93N	4.867E-13	.20	.00	.00

0 FRACTIONAL ERRORS IN INPUT SPECTRUM

16 1.000E+00
1.000E-11 1.000E-07 1.000E-05 1.000E-03 1.000E-02 1.000E-01 4.000E-01 1.000E+00
4.000E+00 1.000E+01 2.000E+01 4.400E+01 1.000E+02 4.000E+02 8.000E+02 0.000E+00
5.000E-01 4.000E-01 2.800E-01 2.000E-01 1.500E-01 1.000E-01 8.000E-02 8.000E-02
2.500E-01 3.000E-01 3.500E-01 4.000E-01 5.000E-01 6.000E-01 0.000E+00 0.000E+00

1 INPUT SPECTRUM

100 1.000E+00
6.711E+17 2.699E+17 1.759E+17 1.476E+17 1.038E+17 9.051E+16 7.335E+16 5.417E+16
4.063E+16 2.354E+16 1.650E+16 8.976E+15 4.037E+15 2.687E+15 1.291E+15 6.190E+14
3.096E+14 3.571E+14 2.803E+14 2.203E+14 1.728E+14 1.634E+14 6.687E+13 4.054E+13
2.922E+13 1.724E+13 8.080E+12 3.411E+12 1.502E+12 7.612E+11 3.658E+11 2.122E+11
1.388E+11 8.049E+10 6.288E+10 4.892E+10 3.977E+10 3.397E+10 2.866E+10 2.425E+10
2.238E+10 2.117E+10 2.012E+10 1.921E+10 1.853E+10 1.802E+10 1.607E+10 1.376E+10
1.202E+10 1.072E+10 9.557E+09 8.634E+09 7.895E+09 7.237E+09 6.626E+09 6.065E+09
5.593E+09 5.066E+09 4.665E+09 4.220E+09 3.971E+09 3.645E+09 3.387E+09 3.221E+09
2.849E+09 2.863E+09 2.496E+09 2.197E+09 1.946E+09 1.704E+09 1.591E+09 1.491E+09
1.427E+09 1.367E+09 1.323E+09 1.292E+09 1.250E+09 1.193E+09 1.152E+09 1.123E+09
1.093E+09 1.069E+09 1.051E+09 1.035E+09 1.012E+09 9.905E+08 9.715E+08 9.269E+08
8.947E+08 8.445E+08 8.004E+08 7.490E+08 6.980E+08 6.540E+08 5.891E+08 5.205E+08
4.601E+08 4.005E+08 3.524E+08 3.113E+08

TITLE: 2-1 TO 2-5

NGROUP= 100 NFOIL= 15 ACTIVITY NORM= 3.255E+00
REACTIIONS COVER ACTIVITIES SELF-SHIELDING
FE54(N,*)CR51 .00 1.290E-12 .00
FE54(N,*)MN54 .00 2.009E-12 .00
FE58(N,G)FE59 .00 4.983E-13 IFX FENG 4.76
CO59(N,2N)CO58 .00 2.424E-13 .00
CO59(N,3N)CO57 .00 9.003E-14 .00
CO59(N,4N)CO56 .00 1.557E-14 .00
CO59(N,G)CO60 .00 1.287E-11 IFX CONG 1.96
NI60(N,P)CO60 .00 6.494E-14 .00
CU(N,*)54MN .00 1.335E-14 .00
CU(N,*)59FE .00 2.883E-15 .00
CU(N,*)56CO .00 6.897E-15 .00
CU(N,*)57CO .00 3.002E-14 .00
CU(N,*)58CO .00 4.498E-14 .00
CU(N,*)60CO .00 2.562E-14 .00
NB93(N,N')NB93M .00 1.584E-12 .00

COVARIANCE PARAMETERS

FLUXES: WIDTH = 2.0000E+01 FCOV = 3.0000E-02
SIGMAS: WIDTH = 2.0000E+01 XCOV = 3.0000E-02
ACTIVITIES = 5.0000E-03 CROSS SECTIONS = 3.0000E-02

DETERM = 3.030*10** -21.00 ERROR = 1.363E-15

INPUT NORMALIZATION DATA

AK1= .0000 VAK= .00090 NORM= 0 RENORM= .9958 CHI 2 = 19.3325

DOSIMETRY ACTIVITIES

MEASURED +/-%	BEFORE	DIF% AFTER	DIF% CHI	REACTION	90 % LIMITS
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14 34.61 996 866 42 482 628 748 20 391 882 924 956 999 9851000
 15 16.19 119 506 667 573 358 253 537 842 28 40 44 108 175 1261000

CONTRIBUTION DUE TO INPUT X-SEC. COV. MATRIX
 * CORRELATION MATRIX

1 13.21 1000
 2 10.59 641000
 3 8.24 83 1031000
 4 11.76 58 72 931000
 5 35.17 19 24 31 221000
 6 29.18 23 29 37 26 91000
 7 24.94 27 34 44 31 10 121000
 8 12.43 55 68 88 62 21 25 291000
 9 20.30 34 42 54 38 13 15 18 361000
 10 18.50 37 46 59 41 14 17 20 39 241000
 11 16.16 42 53 68 47 16 19 22 45 27 301000
 12 12.85 53 66 85 60 20 24 28 56 35 38 431000
 13 11.48 59 74 95 67 22 27 31 63 39 42 49 611000
 14 13.07 52 65 84 59 20 24 28 55 34 37 43 54 601000
 15 97.70 7 9 11 8 3 3 4 7 5 5 6 7 8 71000

DIFFERENTIAL FLUXES INPUT NORMALIZED BY .9958										
G	ENERGY	NEW	OLD	RATIO	STD DEV	%	NEW	OLD	RATIO	INT FLUX >+--*
1	1.000E-10	8.227E+17	6.683E+17	1.231	37.64	46.08	.817	2.884E+13	6.63	
2	1.000E-09	3.301E+17	2.688E+17	1.228	34.62	43.59	.794	2.884E+13	6.63	
3	1.000E-08	2.151E+17	1.752E+17	1.228	32.34	41.96	.771	2.883E+13	6.63	
4	2.300E-08	1.809E+17	1.470E+17	1.231	30.72	41.15	.746	2.883E+13	6.63	
5	5.000E-08	1.273E+17	1.034E+17	1.231	29.03	40.22	.722	2.883E+13	6.63	
6	1.150E-07	1.105E+17	9.013E+16	1.226	26.83	38.49	.697	2.882E+13	6.63	
7	2.550E-07	8.881E+16	7.305E+16	1.216	24.38	36.24	.673	2.880E+13	6.63	
8	5.500E-07	6.498E+16	5.395E+16	1.205	22.12	34.06	.649	2.878E+13	6.64	
9	1.275E-06	4.825E+16	4.046E+16	1.193	20.68	32.00	.628	2.873E+13	6.64	
10	2.800E-06	2.767E+16	2.344E+16	1.180	18.30	30.10	.608	2.866E+13	6.65	
11	6.300E-06	1.919E+16	1.643E+16	1.168	16.75	28.35	.591	2.856E+13	6.65	
12	1.350E-05	1.033E+16	8.939E+15	1.156	15.45	26.77	.577	2.842E+13	6.66	
13	3.000E-05	4.596E+15	4.020E+15	1.143	14.30	25.25	.567	2.825E+13	6.66	
14	6.900E-05	3.030E+15	2.676E+15	1.132	13.52	24.17	.560	2.807E+13	6.66	
15	1.000E-04	1.441E+15	1.286E+15	1.121	12.79	22.99	.556	2.798E+13	6.66	
16	2.800E-04	6.828E+14	6.164E+14	1.108	12.00	21.59	.556	2.772E+13	6.65	
17	5.750E-04	3.377E+14	3.083E+14	1.095	11.34	20.33	.558	2.752E+13	6.64	
18	1.275E-03	3.852E+14	3.556E+14	1.083	10.75	19.10	.563	2.728E+13	6.63	
19	2.000E-03	2.993E+14	2.791E+14	1.072	10.23	18.00	.569	2.700E+13	6.61	
20	3.400E-03	2.329E+14	2.194E+14	1.062	9.74	16.92	.576	2.658E+13	6.58	
21	5.500E-03	1.810E+14	1.721E+14	1.052	9.29	15.94	.583	2.609E+13	6.54	
22	9.200E-03	1.698E+14	1.627E+14	1.043	8.92	15.14	.589	2.542E+13	6.49	
23	1.200E-02	6.876E+13	6.659E+13	1.032	7.87	13.20	.596	2.495E+13	6.46	
24	5.250E-02	4.129E+13	4.037E+13	1.023	6.65	11.01	.604	2.216E+13	6.33	
25	1.000E-01	2.959E+13	2.910E+13	1.017	6.05	9.93	.610	2.020E+13	6.33	
26	2.000E-01	1.738E+13	1.717E+13	1.012	5.52	8.98	.615	1.724E+13	6.40	
27	5.000E-01	8.115E+12	8.046E+12	1.009	5.26	8.54	.616	1.203E+13	6.86	
28	1.000E+00	3.421E+12	3.397E+12	1.007	6.84	11.47	.597	7.972E+12	7.81	
29	2.000E+00	1.502E+12	1.496E+12	1.004	10.03	17.19	.583	4.551E+12	8.76	
30	3.000E+00	7.568E+11	7.580E+11	.998	12.93	22.56	.573	3.049E+12	8.45	
31	4.000E+00	3.611E+11	3.643E+11	.991	14.44	25.73	.561	2.292E+12	7.49	
32	5.000E+00	2.082E+11	2.113E+11	.985	14.64	26.77	.547	1.931E+12	6.82	
33	6.000E+00	1.354E+11	1.382E+11	.980	14.68	27.67	.530	1.723E+12	6.52	
34	7.000E+00	7.815E+10	8.016E+10	.975	14.59	28.47	.513	1.588E+12	6.42	
35	8.000E+00	6.081E+10	6.262E+10	.971	14.41	29.18	.494	1.509E+12	6.44	
36	9.000E+00	4.718E+10	4.872E+10	.968	14.14	29.83	.474	1.449E+12	6.48	
37	1.000E+01	3.828E+10	3.960E+10	.967	13.84	30.46	.454	1.401E+12	6.55	
38	1.100E+01	3.267E+10	3.383E+10	.966	13.51	31.07	.435	1.363E+12	6.62	
39	1.200E+01	2.756E+10	2.854E+10	.966	13.16	31.65	.416	1.330E+12	6.68	
40	1.300E+01	2.334E+10	2.415E+10	.966	12.80	32.19	.398	1.303E+12	6.75	
41	1.400E+01	2.157E+10	2.229E+10	.968	12.46	32.70	.381	1.280E+12	6.80	
42	1.500E+01	2.044E+10	2.108E+10	.970	12.16	33.19	.366	1.258E+12	6.86	
43	1.600E+01	1.948E+10	2.004E+10	.972	11.90	33.65	.354	1.238E+12	6.91	
44	1.700E+01	1.865E+10	1.913E+10	.975	11.71	34.09	.344	1.218E+12	6.96	
45	1.800E+01	1.803E+10	1.845E+10	.977	11.60	34.51	.336	1.199E+12	7.01	
46	1.900E+01	1.758E+10	1.795E+10	.980	11.56	34.91	.331	1.181E+12	7.05	
47	2.000E+01	1.572E+10	1.600E+10	.982	11.74	35.66	.329	1.164E+12	7.10	
48	2.400E+01	1.348E+10	1.370E+10	.984	12.09	36.68	.330	1.101E+12	7.29	
49	2.800E+01	1.179E+10	1.197E+10	.985	12.50	37.58	.333	1.047E+12	7.49	

50	3.200E+01	1.053E+10	1.068E+10	.986	12.97	38.38	.338	9.999E+11	7.72
51	3.600E+01	9.387E+09	9.517E+09	.986	13.50	39.11	.345	9.578E+11	7.98
52	4.000E+01	8.478E+09	8.598E+09	.986	14.09	39.78	.354	9.202E+11	8.25
53	4.400E+01	7.744E+09	7.862E+09	.985	14.78	40.57	.364	8.863E+11	8.55
54	4.800E+01	7.086E+09	7.207E+09	.983	15.59	41.50	.376	8.553E+11	8.87
55	5.200E+01	6.472E+09	6.598E+09	.981	16.42	42.37	.387	8.270E+11	9.21
56	5.600E+01	5.906E+09	6.040E+09	.978	17.27	43.20	.400	8.011E+11	9.56
57	6.000E+01	5.426E+09	5.570E+09	.974	18.12	43.99	.412	7.775E+11	9.93
58	6.400E+01	4.895E+09	5.045E+09	.970	18.96	44.74	.424	7.558E+11	10.31
59	6.800E+01	4.488E+09	4.646E+09	.966	19.77	45.46	.435	7.362E+11	10.68
60	7.200E+01	4.041E+09	4.202E+09	.962	20.55	46.14	.445	7.182E+11	11.06
61	7.600E+01	3.785E+09	3.955E+09	.957	21.28	46.81	.455	7.021E+11	11.43
62	8.000E+01	3.459E+09	3.630E+09	.953	21.93	47.45	.462	6.869E+11	11.80
63	8.400E+01	3.201E+09	3.373E+09	.949	22.51	48.06	.468	6.731E+11	12.16
64	8.800E+01	3.032E+09	3.208E+09	.945	22.99	48.66	.473	6.603E+11	12.51
65	9.200E+01	2.673E+09	2.837E+09	.942	23.38	49.23	.475	6.482E+11	12.85
66	9.600E+01	2.680E+09	2.851E+09	.940	23.66	49.79	.475	6.375E+11	13.16
67	1.000E+02	2.332E+09	2.486E+09	.938	23.84	50.38	.473	6.268E+11	13.47
68	1.100E+02	2.051E+09	2.188E+09	.938	23.93	50.99	.469	6.034E+11	14.19
69	1.200E+02	1.817E+09	1.938E+09	.938	23.89	51.55	.463	5.829E+11	14.87
70	1.300E+02	1.593E+09	1.697E+09	.939	23.74	52.07	.456	5.647E+11	15.51
71	1.400E+02	1.491E+09	1.584E+09	.941	23.48	52.56	.447	5.488E+11	16.09
72	1.500E+02	1.402E+09	1.485E+09	.944	23.13	53.02	.436	5.339E+11	16.64
73	1.600E+02	1.348E+09	1.421E+09	.949	22.73	53.46	.425	5.199E+11	17.16
74	1.700E+02	1.298E+09	1.361E+09	.954	22.30	53.88	.414	5.064E+11	17.65
75	1.800E+02	1.264E+09	1.318E+09	.960	21.88	54.27	.403	4.934E+11	18.10
76	1.900E+02	1.244E+09	1.287E+09	.967	21.51	54.65	.394	4.808E+11	18.53
77	2.000E+02	1.212E+09	1.245E+09	.974	21.21	55.17	.386	4.683E+11	18.92
78	2.200E+02	1.167E+09	1.188E+09	.982	21.30	55.84	.381	4.441E+11	19.65
79	2.400E+02	1.136E+09	1.147E+09	.990	21.48	56.45	.380	4.208E+11	20.34
80	2.600E+02	1.118E+09	1.118E+09	.999	21.87	57.03	.384	3.980E+11	20.98
81	2.800E+02	1.098E+09	1.088E+09	1.009	22.51	57.56	.391	3.757E+11	21.57
82	3.000E+02	1.084E+09	1.065E+09	1.018	23.42	58.07	.403	3.537E+11	22.09
83	3.200E+02	1.075E+09	1.047E+09	1.027	24.58	58.55	.420	3.320E+11	22.52
84	3.400E+02	1.069E+09	1.031E+09	1.037	25.98	59.00	.440	3.105E+11	22.84
85	3.600E+02	1.054E+09	1.008E+09	1.046	27.59	59.43	.464	2.892E+11	23.02
86	3.800E+02	1.040E+09	9.864E+08	1.055	29.38	59.85	.491	2.681E+11	23.04
87	4.000E+02	1.027E+09	9.675E+08	1.061	30.42	58.55	.520	2.473E+11	22.84
88	4.200E+02	9.828E+08	9.231E+08	1.065	30.53	55.56	.550	2.268E+11	22.46
89	4.400E+02	9.507E+08	8.910E+08	1.067	30.51	52.56	.580	2.071E+11	21.94
90	4.600E+02	8.982E+08	8.410E+08	1.068	30.32	49.57	.612	1.881E+11	21.29
91	4.800E+02	8.512E+08	7.971E+08	1.068	29.94	46.58	.643	1.701E+11	20.51
92	5.000E+02	7.956E+08	7.459E+08	1.067	29.35	43.58	.673	1.531E+11	19.60
93	5.200E+02	7.398E+08	6.951E+08	1.064	28.54	40.59	.703	1.372E+11	18.57
94	5.400E+02	6.912E+08	6.513E+08	1.061	27.52	37.60	.732	1.224E+11	17.45
95	5.600E+02	6.190E+08	5.867E+08	1.055	25.14	33.12	.759	1.086E+11	16.22
96	6.000E+02	5.421E+08	5.183E+08	1.046	21.32	27.15	.785	8.381E+10	13.66
97	6.400E+02	4.748E+08	4.582E+08	1.036	17.17	21.20	.810	6.212E+10	11.06
98	6.800E+02	4.094E+08	3.988E+08	1.026	12.74	15.29	.833	4.313E+10	8.47
99	7.200E+02	3.568E+08	3.509E+08	1.017	8.14	9.48	.859	2.676E+10	6.00
100	7.600E+02	3.122E+08	3.100E+08	1.007	3.89	4.24	.918	1.249E+10	3.89

INTEGRALS OF SPECTRA

OLD SPECTRUM 2.824E+13 +OR- 11.905 %
NEW SPECTRUM 2.884E+13 +OR- 6.626 %

ENERGY	FLUX	SDEV	ENERGY	FLUX	SDEV
1.000E-10	8.227E+17	37.64	3.600E+01	9.387E+09	13.50
1.000E-09	3.301E+17	34.62	4.000E+01	8.478E+09	14.09
1.000E-08	2.151E+17	32.34	4.400E+01	7.744E+09	14.78
2.300E-08	1.809E+17	30.72	4.800E+01	7.086E+09	15.59
5.000E-08	1.273E+17	29.03	5.200E+01	6.472E+09	16.42
1.150E-07	1.105E+17	26.83	5.600E+01	5.906E+09	17.27
2.550E-07	8.881E+16	24.38	6.000E+01	5.426E+09	18.12
5.500E-07	6.498E+16	22.12	6.400E+01	4.895E+09	18.96
1.275E-06	4.825E+16	20.08	6.800E+01	4.488E+09	19.77
2.800E-06	2.767E+16	18.30	7.200E+01	4.041E+09	20.55
6.300E-06	1.919E+16	16.75	7.600E+01	3.785E+09	21.28
1.350E-05	1.033E+16	15.45	8.000E+01	3.459E+09	21.93
3.000E-05	4.596E+15	14.30	8.400E+01	3.201E+09	22.51
6.900E-05	3.030E+15	13.52	8.800E+01	3.032E+09	22.99
1.000E-04	1.441E+15	12.79	9.200E+01	2.673E+09	23.38
2.800E-04	6.828E+14	12.00	9.600E+01	2.680E+09	23.66

5.750E-04	3.377E+14	11.34	1.000E+02	2.332E+09	23.84
1.275E-03	3.852E+14	10.75	1.100E+02	2.051E+09	23.93
2.000E-03	2.993E+14	10.23	1.200E+02	1.817E+09	23.89
3.400E-03	2.329E+14	9.74	1.300E+02	1.593E+09	23.74
5.500E-03	1.810E+14	9.29	1.400E+02	1.491E+09	23.48
9.200E-03	1.698E+14	8.92	1.500E+02	1.402E+09	23.13
1.200E-02	6.876E+13	7.87	1.600E+02	1.348E+09	22.73
5.250E-02	4.129E+13	6.65	1.700E+02	1.298E+09	22.30
1.000E-01	2.959E+13	6.05	1.800E+02	1.264E+09	21.88
2.000E-01	1.738E+13	5.52	1.900E+02	1.244E+09	21.51
5.000E-01	8.115E+12	5.26	2.000E+02	1.212E+09	21.31
1.000E+00	3.421E+12	5.84	2.200E+02	1.167E+09	21.30
2.000E+00	1.502E+12	10.03	2.400E+02	1.136E+09	21.48
3.000E+00	7.568E+11	12.93	2.600E+02	1.118E+09	21.87
4.000E+00	3.611E+11	14.44	2.800E+02	1.098E+09	22.51
5.000E+00	2.082E+11	14.64	3.000E+02	1.084E+09	23.42
6.000E+00	1.354E+11	14.68	3.200E+02	1.075E+09	24.58
7.000E+00	7.815E+10	14.59	3.400E+02	1.069E+09	25.98
8.000E+00	6.081E+10	14.41	3.600E+02	1.054E+09	27.59
9.000E+00	4.718E+10	14.14	3.800E+02	1.040E+09	29.38
1.000E+01	3.828E+10	13.84	4.000E+02	1.027E+09	30.42
1.100E+01	3.267E+10	13.51	4.200E+02	9.828E+08	30.53
1.200E+01	2.756E+10	13.16	4.400E+02	9.507E+08	30.51
1.300E+01	2.334E+10	12.80	4.600E+02	8.982E+08	30.32
1.400E+01	2.157E+10	12.46	4.800E+02	8.512E+08	29.94
1.500E+01	2.044E+10	12.16	5.000E+02	7.956E+08	29.35
1.600E+01	1.948E+10	11.90	5.200E+02	7.398E+08	28.54
1.700E+01	1.865E+10	11.71	5.400E+02	6.912E+08	27.52
1.800E+01	1.803E+10	11.60	5.600E+02	6.190E+08	25.14
1.900E+01	1.758E+10	11.56	6.000E+02	5.421E+08	21.32
2.000E+01	1.572E+10	11.74	6.400E+02	4.748E+08	17.17
2.400E+01	1.348E+10	12.09	6.800E+02	4.094E+08	12.74
2.800E+01	1.179E+10	12.50	7.200E+02	3.568E+08	8.14
3.200E+01	1.053E+10	12.97	7.600E+02	3.122E+08	3.89

SUMMARY OF BROAD-GROUP FLUXES, FLUENCES, AND UNCERTAINTIES

IRRAD TIME(S) = 6.336E+06 ACT NORM = 3.255E+00

ENERGY	FLUX	FLUENCE	SDEV
TOTAL	2.884E+13	5.614E+19	6.63
1.000E-10	1.967E+10	3.828E+16	30.94
1.150E-07	3.974E+11	7.735E+17	19.06
1.350E-05	8.219E+12	1.600E+19	8.29
1.000E-01	1.223E+13	2.381E+19	5.55
1.000E+00	6.571E+12	1.279E+19	9.18
1.000E+01	2.376E+11	4.625E+17	11.93
2.000E+01	2.436E+11	4.742E+17	12.21
4.000E+01	2.935E+11	5.712E+17	16.66
1.000E+02	1.584E+11	3.083E+17	21.95
2.000E+02	4.252E+11	8.277E+17	20.34

SUMMARY OF INTEGRATED GROUP ENERGY FLUXES AND FLUENCES

ENERGY MeV	FLUX n/cm2-s-mA	FLUX n/cm2-s	FLUENCE n/cm2	STANDARD DEVIATION	%
<1.0	8.636E+12	2.653E+12	1.681E+19	8.29	29.95
0.1-1.0	1.223E+13	3.757E+12	2.381E+19	5.55	42.41
1.0-10.0	6.571E+12	2.019E+12	1.279E+19	9.18	22.78
10.0-20.0	2.376E+11	7.300E+10	4.625E+17	11.93	.82
20.0-40.0	2.436E+11	7.485E+10	4.742E+17	12.21	.84
40.0-100.0	2.935E+11	9.016E+10	5.712E+17	16.66	1.02
100.0-200.0	1.584E+11	4.866E+10	3.083E+17	21.95	.55
>200.0	4.252E+11	1.306E+11	8.277E+17	20.34	1.47
TOTAL	2.884E+13	8.860E+12	5.614E+19	6.63	

THE PERCENTAGE OF NEUTRONS ABOVE 20 MeV IS - 3.89

RELATIVE COVARIANCES (10X10)

1000	881	121	-113	-153	-40	72	46	6	12
1000	459	124	28	-28	53	50	16	15	
1000	890	793	237	-108	-51	57	33		
1000	943	402	-132	-119	58	51			
1000	582	-105	-173	56	71				
1000	517	-103	-128	92					
1000	544	-189	-197						
1000	407	-595							
1000	-298								
1000									

3-1 TO 3-5

100	12	2	0	0					
.0050	20.0000	.0300	20.0000	.0300	.0300	3.2550			
.0000	0	0	6.3360E+06						
FE54PX	1.108E-13	.10		.00		.00			
FE58G	7.540E-14	.10		.00SFSH	IFX	4.76FENG			
CO592	1.577E-14	.10		.00		.00			
CO593	4.936E-15	.10		.00		.00			
CO59G	2.190E-12	.15		.00SFSH	IFX	1.96CONG			
CUX54MN	3.562E-16	.10		.00		.00			
CUX59FE	1.232E-16	.25		.00		.00			
CUX56CO	1.859E-16	.10		.00		.00			
CUX57CO	1.022E-15	.10		.00		.00			
CUX58CO	1.866E-15	.10		.00		.00			
CUX60CO	1.390E-15	.25		.00		.00			
NB93N	1.323E-13	.20		.00		.00			

0 FRACTIONAL ERRORS IN INPUT SPECTRUM

16	1.000E+00								
1.000E-11	1.000E-07	1.000E-05	1.000E-03	1.000E-02	1.000E-01	4.000E-01	1.000E+00		
4.000E+00	1.000E+01	2.000E+01	4.400E+01	1.000E+02	4.000E+02	8.000E+02	0.000E+00		
5.000E-01	4.000E-01	2.800E-01	2.000E-01	1.500E-01	1.000E-01	8.000E-02	8.000E-02		
2.500E-01	3.000E-01	3.500E-01	4.000E-01	5.000E-01	6.000E-01	0.000E+00	0.000E+00		

1 INPUT SPECTRUM

100	1.000E+00								
6.262E+17	5.117E+17	4.183E+17	3.387E+17	2.361E+17	1.733E+17	1.118E+17	6.228E+16		
3.523E+16	1.784E+16	8.458E+15	4.182E+15	1.705E+15	1.046E+15	6.043E+14	3.812E+14		
1.818E+14	1.240E+14	9.096E+13	7.415E+13	5.177E+13	4.839E+13	1.945E+13	1.243E+13		
8.329E+12	4.720E+12	1.942E+12	8.184E+11	3.996E+11	2.295E+11	1.320E+11	7.717E+10		
4.143E+10	2.639E+10	2.009E+10	1.598E+10	1.256E+10	1.051E+10	8.433E+09	6.818E+09		
5.840E+09	5.026E+09	4.340E+09	3.911E+09	3.679E+09	3.477E+09	3.065E+09	2.511E+09		
2.187E+09	1.871E+09	1.616E+09	1.408E+09	1.233E+09	1.084E+09	9.565E+08	8.180E+08		
7.125E+08	6.221E+08	5.258E+08	4.692E+08	4.197E+08	3.702E+08	3.334E+08	3.014E+08		
2.737E+08	2.541E+08	2.265E+08	1.984E+08	1.788E+08	1.659E+08	1.476E+08	1.396E+08		
1.332E+08	1.238E+08	1.240E+08	1.147E+08	1.076E+08	9.950E+07	9.442E+07	8.723E+07		
8.675E+07	8.381E+07	8.262E+07	8.164E+07	7.807E+07	7.473E+07	7.243E+07	6.853E+07		
6.470E+07	6.203E+07	5.836E+07	5.576E+07	5.231E+07	4.988E+07	4.559E+07	4.007E+07		
3.656E+07	3.290E+07	3.022E+07	2.786E+07						

TITLE: 3-1 TO 3-5

NGROUP=	100	NFOIL=	12	ACTIVITY NORM=	3.255E+00				
		REACTIONS	COVER	ACTIVITIES	SELF-SHIELDING				
		FE54(N,*)MN54	.00	3.607E-13	.00				
		FE58(N,G)FE59	.00	2.454E-13	IFX FENG 4.76				
		CO59(N,2N)CO58	.00	5.133E-14	.00				
		CO59(N,3N)CO57	.00	1.607E-14	.00				
		CO59(N,G)CO60	.00	7.128E-12	IFX CONG 1.96				
		CU(N,*)54MN	.00	1.159E-15	.00				
		CU(N,*)59FE	.00	4.010E-16	.00				
		CU(N,*)56CO	.00	6.051E-16	.00				
		CU(N,*)57CO	.00	3.327E-15	.00				
		CU(N,*)58CO	.00	6.074E-15	.00				
		CU(N,*)60CO	.00	4.524E-15	.00				
		NB93(N,N')NB93M	.00	4.306E-13	.00				

COVARIANCE PARAMETERS

FLUXES: WIDTH = 2.0000E+01 FCOV = 3.0000E-02
 SIGMAS: WIDTH = 2.0000E+01 XCOV = 3.0000E-02
 ACTIVITIES = 5.0000E-03 CROSS SECTIONS = 3.0000E-02

DETERM = 7.409*10** -18.00 ERROR = 1.034E-15

INPUT NORMALIZATION DATA

AK1= .0000 VAK= .00090 NORM= 0 RENORM= .9918 CHI 2 = 23.9212

DOSIMETRY ACTIVITIES

MEASURED	+/-%	BEFORE	DIF%	AFTER	DIF%	CHI	REACTION	90 % LIMITS
1	3.61E+11	10.0	4.24E+11	-17.7	4.08E+11	-13.2	1.1 FE54(N,*)MN54	2.00E+00 3.60E+02
2	2.45E+11	10.0	2.41E+11	1.9	2.42E+11	1.2	.0 FE58(N,G)FE59	1.00E-09 5.25E-02
3	5.13E+10	10.0	4.99E+10	2.7	4.98E+10	3.0	.0 CO59(N,2N)CO58	1.20E+01 3.60E+01
4	1.61E+10	10.0	1.16E+10	28.1	1.19E+10	25.9	.9 CO59(N,3N)CO57	2.00E+01 5.20E+01
5	7.13E+12	15.0	6.70E+12	6.0	6.82E+12	4.3	.0 CO59(N,G)CO60	1.00E-09 1.00E-04
6	1.16E+09	10.0	9.55E+08	17.6	9.75E+08	15.9	.8 CU(N,*)54MN	7.20E+01 6.80E+02
7	4.01E+08	25.0	7.82E+07	80.5	7.93E+07	80.2	10.2 CU(N,*)59FE	5.60E+01 6.80E+02
8	6.05E+08	10.0	7.25E+08	-19.7	7.24E+08	-19.6	1.0 CU(N,*)56CO	6.00E+01 6.40E+02
9	3.33E+09	10.0	3.61E+09	-8.7	3.64E+09	-9.3	.3 CU(N,*)57CO	4.00E+01 6.00E+02

10 6.07E+09 10.0 5.64E+09 7.2 5.71E+09 6.0 1.2 CU(N,*)58CO 2.80E+01 5.40E+02
 11 4.52E+09 25.0 1.05E+09 76.7 1.07E+09 76.4 9.3 CU(N,*)60CO 3.20E+01 6.00E+02
 12 4.31E+11 20.0 4.28E+11 1.7 4.00E+11 7.1 1.0 NB93(N,N')NB93M 5.00E-01 6.00E+00

STD. DEV. = 36.10 35.63

CHISQ = 39.32 36.01

DOSIMETRY DATA INPUT CORRELATION MATRIX

```

11000
2 21000
3 2 21000
4 2 2 21000
5 2 2 2 21000
6 2 2 2 2 21000
7 1 1 1 1 1 11000
8 2 2 2 2 2 2 11000
9 2 2 2 2 2 2 1 21000
10 2 2 2 2 2 2 1 2 21000
11 1 1 1 1 1 1 0 1 1 11000
12 1 1 1 1 1 1 0 1 1 1 01000
  
```

RELATIVE COV. MATRIX OF ACTIVITIES
 % CORRELATION MATRIX

```

1 25.31 1000
2 24.82 2481000
3 35.40 817 1221000
4 52.47 587 46 6351000
5 35.64 165 739 72 251000
6 44.23 332 18 135 168 121000
7 41.45 399 21 205 237 13 8181000
8 42.12 440 21 240 281 13 818 8491000
9 37.06 628 32 490 492 19 709 776 8331000
10 35.46 724 43 647 598 25 590 671 733 8911000
11 35.82 656 36 535 518 21 688 756 810 908 8971000
12 98.85 122 85 101 48 59 7 10 11 26 40 311000
  
```

CONTRIBUTION DUE TO INPUT FLUX COV. MATRIX
 % CORRELATION MATRIX

```

1 23.54 1000
2 23.66 2631000
3 33.37 920 1251000
4 37.80 865 56 9281000
5 27.34 217 997 90 371000
6 39.81 387 12 152 253 91000
7 37.76 461 14 232 355 10 9911000
8 39.39 496 13 265 412 10 966 9901000
9 35.33 697 24 538 709 16 820 887 9271000
10 33.91 803 36 710 860 24 678 763 813 9691000
11 33.95 733 29 591 752 19 800 869 907 997 9821000
12 16.92 742 495 611 373 430 33 52 53 145 231 1751000
  
```

CONTRIBUTION DUE TO INPUT X-SEC. COV. MATRIX
 % CORRELATION MATRIX

```

1 9.29 1000
2 7.50 1291000
3 11.80 82 1021000
4 36.40 27 33 211000
5 22.87 42 52 33 111000
6 19.26 50 62 40 13 201000
7 17.10 57 70 45 14 23 271000
8 14.91 65 81 51 17 26 31 351000
9 11.20 86 107 68 22 35 42 47 541000
10 10.36 94 116 74 24 38 45 51 58 781000
11 11.43 85 105 67 22 34 41 46 53 70 761000
12 97.39 10 12 8 3 4 5 5 6 8 9 31000
  
```

DIFFERENTIAL FLUXES INPUT NORMALIZED BY .9918									
G	ENERGY	NEW	OLD	RATIO	STD DEV %	NEW	OLD	RATIO	INT FLUX >+-%
1	1.000E-10	6.802E+17	6.210E+17	1.095	30.15	46.08	.654	7.730E+12	7.08
2	1.000E-09	5.527E+17	5.075E+17	1.089	27.11	43.59	.622	7.730E+12	7.08
3	1.000E-08	4.496E+17	4.149E+17	1.084	24.77	41.96	.590	7.725E+12	7.09
4	2.300E-08	3.625E+17	3.359E+17	1.079	23.03	41.15	.560	7.719E+12	7.09

5	5.000E-08	2.513E+17	2.342E+17	1.073	21.35	40.22	.531	7.709E+12	7.11
6	1.150E-07	1.831E+17	1.719E+17	1.065	19.44	38.49	.505	7.693E+12	7.12
7	2.550E-07	1.170E+17	1.109E+17	1.056	17.51	36.24	.483	7.667E+12	7.15
8	5.500E-07	6.461E+16	6.177E+16	1.046	15.87	34.06	.466	7.632E+12	7.18
9	1.275E-06	3.621E+16	3.494E+16	1.036	14.54	32.00	.454	7.586E+12	7.21
10	2.800E-06	1.817E+16	1.769E+16	1.027	13.50	30.10	.449	7.530E+12	7.24
11	6.300E-06	3.538E+15	3.388E+15	1.018	12.73	28.35	.449	7.467E+12	7.27
12	1.350E-05	4.185E+15	4.148E+15	1.009	12.17	26.77	.455	7.405E+12	7.29
13	3.000E-05	1.692E+15	1.691E+15	1.001	11.75	25.25	.465	7.336E+12	7.30
14	6.900E-05	1.030E+15	1.037E+15	.993	11.59	24.17	.480	7.270E+12	7.31
15	1.000E-04	5.906E+14	5.993E+14	.985	11.43	22.99	.497	7.238E+12	7.31
16	2.800E-04	3.701E+14	3.781E+14	.979	11.13	21.59	.516	7.132E+12	7.31
17	5.750E-04	1.754E+14	1.803E+14	.973	10.87	20.33	.535	7.023E+12	7.29
18	1.275E-03	1.190E+14	1.230E+14	.968	10.58	19.10	.554	6.900E+12	7.27
19	2.000E-03	3.694E+13	3.021E+13	.964	10.29	18.00	.572	6.814E+12	7.25
20	3.400E-03	7.062E+13	7.354E+13	.960	9.96	16.92	.589	6.692E+12	7.22
21	5.500E-03	4.917E+13	5.134E+13	.958	9.61	15.94	.603	6.544E+12	7.18
22	9.200E-03	4.586E+13	4.799E+13	.956	9.31	15.14	.615	6.362E+12	7.14
23	1.200E-02	1.848E+13	1.929E+13	.958	8.26	13.20	.626	6.233E+12	7.10
24	5.250E-02	1.187E+13	1.233E+13	.963	7.00	11.01	.636	5.485E+12	7.00
25	1.000E-01	7.972E+12	8.260E+12	.965	6.39	9.93	.643	4.921E+12	7.02
26	2.000E-01	4.529E+12	4.681E+12	.968	5.83	8.98	.649	4.124E+12	7.18
27	5.000E-01	1.865E+12	1.926E+12	.969	5.56	8.54	.650	2.765E+12	7.94
28	1.000E+00	7.760E+11	8.117E+11	.956	7.26	11.47	.633	1.832E+12	9.29
29	2.000E+00	3.697E+11	3.963E+11	.933	10.68	17.19	.621	1.056E+12	10.96
30	3.000E+00	2.077E+11	2.276E+11	.913	13.78	22.56	.611	6.867E+11	11.30
31	4.000E+00	1.182E+11	1.309E+11	.903	15.42	25.73	.599	4.789E+11	10.51
32	5.000E+00	6.908E+10	7.653E+10	.903	15.66	26.77	.585	3.608E+11	9.33
33	6.000E+00	3.717E+10	4.109E+10	.905	15.73	27.67	.568	2.917E+11	8.39
34	7.000E+00	2.378E+10	2.617E+10	.908	15.67	28.47	.551	2.545E+11	7.86
35	8.000E+00	1.821E+10	1.992E+10	.914	15.50	29.18	.531	2.307E+11	7.55
36	9.000E+00	1.460E+10	1.585E+10	.921	15.24	29.83	.511	2.125E+11	7.38
37	1.000E+01	1.157E+10	1.246E+10	.929	14.93	30.46	.490	1.979E+11	7.30
38	1.100E+01	9.780E+09	1.042E+10	.938	14.57	31.07	.469	1.864E+11	7.29
39	1.200E+01	7.930E+09	8.364E+09	.948	14.17	31.65	.448	1.766E+11	7.31
40	1.300E+01	6.482E+09	6.762E+09	.959	13.75	32.19	.427	1.687E+11	7.36
41	1.400E+01	5.614E+09	5.792E+09	.969	13.34	32.70	.408	1.622E+11	7.42
42	1.500E+01	4.884E+09	4.985E+09	.980	12.94	33.19	.390	1.566E+11	7.47
43	1.600E+01	4.262E+09	4.304E+09	.990	12.59	33.65	.374	1.517E+11	7.52
44	1.700E+01	3.878E+09	3.879E+09	1.000	12.31	34.09	.361	1.474E+11	7.56
45	1.800E+01	3.680E+09	3.649E+09	1.009	12.11	34.51	.351	1.435E+11	7.59
46	1.900E+01	3.505E+09	3.448E+09	1.016	12.00	34.91	.344	1.399E+11	7.61
47	2.000E+01	3.110E+09	3.040E+09	1.023	12.13	35.66	.340	1.363E+11	7.62
48	2.400E+01	2.561E+09	2.490E+09	1.029	12.46	36.68	.340	1.239E+11	7.66
49	2.800E+01	2.240E+09	2.169E+09	1.033	12.86	37.58	.342	1.137E+11	7.75
50	3.200E+01	1.920E+09	1.856E+09	1.035	13.34	38.38	.347	1.047E+11	7.88
51	3.600E+01	1.660E+09	1.603E+09	1.036	13.88	39.11	.355	9.702E+10	8.08
52	4.000E+01	1.444E+09	1.396E+09	1.034	14.49	39.78	.364	9.038E+10	8.34
53	4.400E+01	1.261E+09	1.223E+09	1.032	15.20	40.57	.375	8.461E+10	8.66
54	4.800E+01	1.104E+09	1.075E+09	1.027	16.01	41.50	.386	7.956E+10	9.05
55	5.200E+01	9.690E+08	9.486E+08	1.021	16.84	42.37	.398	7.514E+10	9.50
56	5.600E+01	8.228E+08	8.113E+08	1.014	17.67	43.20	.409	7.127E+10	10.01
57	6.000E+01	7.107E+08	7.066E+08	1.006	18.49	43.99	.420	6.798E+10	10.53
58	6.400E+01	6.147E+08	6.170E+08	.996	19.29	44.74	.431	6.513E+10	11.07
59	6.800E+01	5.143E+08	5.215E+08	.986	20.04	45.46	.441	6.268E+10	11.61
60	7.200E+01	4.542E+08	4.653E+08	.976	20.75	46.14	.450	6.062E+10	12.12
61	7.600E+01	4.019E+08	4.162E+08	.966	21.40	46.81	.457	5.880E+10	12.62
62	8.000E+01	3.508E+08	3.671E+08	.956	21.99	47.45	.463	5.719E+10	13.09
63	8.400E+01	3.128E+08	3.307E+08	.946	22.49	48.06	.468	5.579E+10	13.53
64	8.800E+01	2.802E+08	2.989E+08	.937	22.92	48.66	.471	5.454E+10	13.94
65	9.200E+01	2.524E+08	2.714E+08	.930	23.26	49.23	.472	5.342E+10	14.32
66	9.600E+01	2.328E+08	2.520E+08	.924	23.51	49.79	.472	5.241E+10	14.67
67	1.000E+02	2.065E+08	2.246E+08	.919	23.69	50.38	.470	5.148E+10	15.00
68	1.100E+02	1.802E+08	1.968E+08	.916	23.80	50.99	.467	4.941E+10	15.75
69	1.200E+02	1.622E+08	1.773E+08	.915	23.81	51.55	.462	4.761E+10	16.45
70	1.300E+02	1.506E+08	1.645E+08	.915	23.74	52.07	.456	4.599E+10	17.11
71	1.400E+02	1.344E+08	1.464E+08	.918	23.59	52.56	.449	4.448E+10	17.75
72	1.500E+02	1.277E+08	1.384E+08	.922	23.39	53.02	.441	4.314E+10	18.32
73	1.600E+02	1.227E+08	1.321E+08	.928	23.17	53.46	.433	4.186E+10	18.87
74	1.700E+02	1.150E+08	1.228E+08	.936	22.96	53.88	.426	4.063E+10	19.39
75	1.800E+02	1.163E+08	1.230E+08	.946	22.78	54.27	.420	3.949E+10	19.85
76	1.900E+02	1.088E+08	1.138E+08	.956	22.67	54.65	.415	3.832E+10	20.30
77	2.000E+02	1.033E+08	1.067E+08	.968	22.75	55.17	.412	3.723E+10	20.69
78	2.200E+02	9.676E+07	9.868E+07	.981	23.03	55.84	.413	3.517E+10	21.40
79	2.400E+02	9.308E+07	9.364E+07	.994	23.49	56.45	.416	3.323E+10	22.04
80	2.600E+02	8.721E+07	8.651E+07	1.008	24.13	57.03	.423	3.137E+10	22.62
81	2.800E+02	8.796E+07	8.604E+07	1.022	24.98	57.56	.434	2.963E+10	23.11
82	3.000E+02	8.618E+07	8.312E+07	1.037	26.04	58.07	.448	2.787E+10	23.53

83	3.200E+02	8.612E+07	8.194E+07	1.051	27.30	58.55	.466	2.614E+10	23.86
84	3.400E+02	8.622E+07	8.097E+07	1.065	28.75	59.00	.487	2.442E+10	24.06
85	3.600E+02	8.348E+07	7.743E+07	1.078	30.35	59.43	.511	2.270E+10	24.12
86	3.800E+02	8.083E+07	7.411E+07	1.091	32.10	59.85	.536	2.103E+10	23.99
87	4.000E+02	7.896E+07	7.183E+07	1.099	32.99	58.55	.563	1.941E+10	23.65
88	4.200E+02	7.498E+07	6.797E+07	1.103	32.86	55.56	.591	1.783E+10	23.13
89	4.400E+02	7.090E+07	6.417E+07	1.105	32.60	52.56	.620	1.633E+10	22.48
90	4.600E+02	6.797E+07	6.152E+07	1.105	32.17	49.57	.649	1.492E+10	21.73
91	4.800E+02	6.384E+07	5.788E+07	1.103	31.56	46.58	.678	1.356E+10	20.85
92	5.000E+02	6.081E+07	5.530E+07	1.100	30.75	43.58	.706	1.228E+10	19.87
93	5.200E+02	5.680E+07	5.188E+07	1.095	29.74	40.59	.733	1.106E+10	18.78
94	5.400E+02	5.387E+07	4.947E+07	1.089	28.53	37.60	.759	9.926E+09	17.60
95	5.600E+02	4.877E+07	4.521E+07	1.079	25.95	33.12	.784	8.849E+09	16.33
96	6.000E+02	4.229E+07	3.974E+07	1.064	21.91	27.15	.807	6.898E+09	13.69
97	6.400E+02	3.804E+07	3.526E+07	1.049	17.58	21.20	.829	5.207E+09	11.09
98	6.800E+02	3.375E+07	3.263E+07	1.034	13.00	15.29	.850	3.685E+09	8.50
99	7.200E+02	3.057E+07	2.997E+07	1.020	8.28	9.48	.873	2.335E+09	6.05
100	7.600E+02	2.780E+07	2.763E+07	1.006	3.93	4.24	.926	1.112E+09	3.93

INTEGRALS OF SPECTRA

OLD SPECTRUM 8.023E+12 +OR- 12.641 %
 NEW SPECTRUM 7.730E+12 +OR- 7.076 %

ENERGY	FLUX	SDEV	ENERGY	FLUX	SDEV
1.000E-10	6.802E+17	30.15	3.600E+01	1.660E+09	13.88
1.000E-09	5.527E+17	27.11	4.000E+01	1.444E+09	14.49
1.000E-08	4.496E+17	24.77	4.400E+01	1.261E+09	15.20
2.300E-08	3.625E+17	23.03	4.800E+01	1.104E+09	16.01
5.000E-08	2.513E+17	21.35	5.200E+01	9.690E+08	16.84
1.150E-07	1.831E+17	19.44	5.600E+01	8.228E+08	17.67
2.550E-07	1.170E+17	17.51	6.000E+01	7.107E+08	18.49
5.500E-07	6.461E+16	15.87	6.400E+01	6.147E+08	19.29
1.275E-06	3.621E+16	14.54	6.800E+01	5.143E+08	20.04
2.800E-06	1.817E+16	13.50	7.200E+01	4.542E+08	20.75
6.300E-06	8.538E+15	12.73	7.600E+01	4.019E+08	21.40
1.350E-05	4.185E+15	12.17	8.000E+01	3.508E+08	21.99
3.000E-05	1.692E+15	11.75	8.400E+01	3.128E+08	22.49
6.900E-05	1.030E+15	11.59	8.800E+01	2.802E+08	22.92
1.000E-04	5.906E+14	11.43	9.200E+01	2.524E+08	23.26
2.800E-04	3.701E+14	11.13	9.600E+01	2.328E+08	23.51
5.750E-04	1.754E+14	10.87	1.000E+02	2.065E+08	23.69
1.275E-03	1.190E+14	10.58	1.100E+02	1.802E+08	23.80
2.000E-03	8.694E+13	10.29	1.200E+02	1.622E+08	23.81
3.400E-03	7.062E+13	9.96	1.300E+02	1.506E+08	23.74
5.500E-03	4.917E+13	9.61	1.400E+02	1.344E+08	23.59
9.200E-03	4.586E+13	9.31	1.500E+02	1.277E+08	23.39
1.200E-02	1.848E+13	8.26	1.600E+02	1.227E+08	23.17
5.250E-02	1.187E+13	7.00	1.700E+02	1.150E+08	22.96
1.000E-01	7.972E+12	6.39	1.800E+02	1.163E+08	22.78
2.000E-01	4.529E+12	5.83	1.900E+02	1.088E+08	22.67
5.000E-01	1.865E+12	5.56	2.000E+02	1.033E+08	22.75
1.000E+00	7.760E+11	7.26	2.200E+02	9.676E+07	23.03
2.000E+00	3.697E+11	10.68	2.400E+02	9.308E+07	23.49
3.000E+00	2.077E+11	13.78	2.600E+02	8.721E+07	24.13
4.000E+00	1.182E+11	15.42	2.800E+02	8.796E+07	24.98
5.000E+00	6.908E+10	15.66	3.000E+02	8.618E+07	26.04
6.000E+00	3.717E+10	15.73	3.200E+02	8.612E+07	27.30
7.000E+00	2.378E+10	15.67	3.400E+02	8.622E+07	28.75
8.000E+00	1.821E+10	15.50	3.600E+02	8.348E+07	30.35
9.000E+00	1.460E+10	15.24	3.800E+02	8.083E+07	32.10
1.000E+01	1.157E+10	14.93	4.000E+02	7.896E+07	32.99
1.100E+01	9.780E+09	14.57	4.200E+02	7.498E+07	32.86
1.200E+01	7.930E+09	14.17	4.400E+02	7.090E+07	32.60
1.300E+01	6.482E+09	13.75	4.600E+02	6.797E+07	32.17
1.400E+01	5.614E+09	13.34	4.800E+02	6.384E+07	31.56
1.500E+01	4.884E+09	12.94	5.000E+02	6.081E+07	30.75
1.600E+01	4.262E+09	12.59	5.200E+02	5.680E+07	29.74
1.700E+01	3.878E+09	12.31	5.400E+02	5.387E+07	28.53
1.800E+01	3.680E+09	12.11	5.600E+02	4.877E+07	25.95
1.900E+01	3.505E+09	12.00	6.000E+02	4.229E+07	21.91
2.000E+01	3.110E+09	12.13	6.400E+02	3.804E+07	17.58
2.400E+01	2.561E+09	12.46	6.800E+02	3.375E+07	13.00
2.800E+01	2.240E+09	12.86	7.200E+02	3.057E+07	8.28
3.200E+01	1.920E+09	13.34	7.600E+02	2.780E+07	3.93

SUMMARY OF BROAD-GROUP FLUXES, FLUENCES, AND UNCERTAINTIES

IRRAD TIME(S)= 6.336E+06 ACT NORM = 3.255E+00

ENERGY	FLUX	FLUENCE	SDEV
TOTAL	7.730E+12	1.505E+19 +/-	7.08
1.000E-10	3.755E+10	7.310E+16 +/-	23.06
1.150E-07	2.873E+11	5.592E+17 +/-	14.54
1.350E-05	2.484E+12	4.835E+18 +/-	8.58
1.000E-01	3.088E+12	6.012E+18 +/-	5.88
1.000E+00	1.634E+12	3.182E+18 +/-	10.14
1.000E+01	6.158E+10	1.199E+17 +/-	12.98
2.000E+01	4.596E+10	8.947E+16 +/-	12.54
4.000E+01	3.890E+10	7.573E+16 +/-	16.43
1.000E+02	1.424E+10	2.773E+16 +/-	22.09
2.000E+02	3.355E+10	6.531E+16 +/-	22.42

SUMMARY OF INTEGRATED GROUP ENERGY FLUXES AND FLUENCES

ENERGY MeV	FLUX n/cm2-s-mA	FLUX n/cm2-s	FLUENCE n/cm2	STANDARD DEVIATION	%
<1.0	2.809E+12	8.630E+11	5.468E+18	+/- 8.58	36.34
0.1-1.0	3.088E+12	9.488E+11	6.012E+18	+/- 5.88	39.95
1.0-10.0	1.634E+12	5.021E+11	3.182E+18	+/-10.14	21.14
10.0-20.0	6.158E+10	1.892E+10	1.199E+17	+/-12.98	.80
20.0-40.0	4.596E+10	1.412E+10	8.947E+16	+/-12.54	.59
40.0-100.0	3.890E+10	1.195E+10	7.573E+16	+/-16.43	.50
100.0-200.0	1.424E+10	4.376E+09	2.773E+16	+/-22.09	.18
>200.0	3.355E+10	1.031E+10	6.531E+16	+/-22.42	.43
TOTAL	7.730E+12	2.375E+12	1.505E+19	+/- 7.08	

THE PERCENTAGE OF NEUTRONS ABOVE 20 MeV IS - 1.72

RELATIVE COVARIANCES(10X10)

1000	820	-95	-240	-236	-47	104	80	12	5
1000	354	63	-9	-26	69	71	25	15	
1000	898	798	277	-134	-111	55	61		
1000	941	452	-152	-194	55	89			
1000	645	-112	-260	51	117				
1000	463	-145	-121	124					
1000	598	-224	-207						
1000	288	-563							
1000	-184								
1000									

4-1 TO 4-5

100 13 2 0 0
.0050 20.0000 .0300 20.0000 .0300 .0300 3.2550
.0000 0 0 6.3360E+06
FE54PX 2.504E-13 .10 .00 .00
FE58G 9.829E-14 .10 .00SFSH IFX 4.76FENG
CO592 3.375E-14 .10 .00 .00
CO593 1.119E-14 .10 .00 .00
CO59G 2.919E-12 .15 .00SFSH IFX 1.96CONG
NI60P 9.090E-15 .15 .00 .00
CUX54MN 1.202E-15 .10 .00 .00
CUX59FE 3.248E-16 .25 .00 .00
CUX56CO 6.226E-16 .10 .00 .00
CUX57CO 2.995E-15 .10 .00 .00
CUX58CO 4.917E-15 .10 .00 .00
CUX60CO 3.185E-15 .25 .00 .00
NB93N 2.634E-13 .20 .00 .00

0 FRACTIONAL ERRORS IN INPUT SPECTRUM
16 1.000E+00

1.000E-11 1.000E-07 1.000E-05 1.000E-03 1.000E-02 1.000E-01 4.000E-01 1.000E+00
4.000E+00 1.000E+01 2.000E+01 4.400E+01 1.000E+02 4.000E+02 8.000E+02 0.000E+00
5.000E-01 4.000E-01 2.800E-01 2.000E-01 1.500E-01 1.000E-01 8.000E-02 8.000E-02
2.500E-01 3.000E-01 3.500E-01 4.000E-01 5.000E-01 6.000E-01 0.000E+00 0.000E+00

1 INPUT SPECTRUM

100 1.000E+00
7.504E+17 4.184E+17 3.101E+17 2.602E+17 1.928E+17 1.439E+17 8.561E+16 5.704E+16
3.481E+16 2.008E+16 1.256E+16 6.608E+15 3.191E+15 2.159E+15 9.518E+14 4.433E+14
2.262E+14 1.651E+14 1.251E+14 9.515E+13 7.253E+13 6.685E+13 3.442E+13 2.139E+13
1.697E+13 8.998E+12 4.318E+12 1.900E+12 8.060E+11 4.254E+11 1.831E+11 1.100E+11
6.854E+10 3.759E+10 2.770E+10 2.111E+10 1.544E+10 1.345E+10 1.159E+10 1.001E+10
9.445E+09 9.124E+09 8.827E+09 8.552E+09 8.339E+09 8.155E+09 7.293E+09 6.237E+09
5.403E+09 4.742E+09 4.129E+09 3.614E+09 3.182E+09 2.790E+09 2.426E+09 2.099E+09
1.817E+09 1.540E+09 1.326E+09 1.116E+09 9.795E+08 8.798E+08 8.106E+08 7.484E+08
6.983E+08 6.527E+08 5.937E+08 5.329E+08 4.860E+08 4.386E+08 4.083E+08 3.820E+08
3.588E+08 3.383E+08 3.284E+08 3.225E+08 3.235E+08 3.196E+08 3.257E+08 3.286E+08
3.508E+08 3.544E+08 3.477E+08 3.278E+08 3.101E+08 2.993E+08 2.896E+08 2.668E+08
2.506E+08 2.441E+08 2.342E+08 2.174E+08 2.128E+08 2.016E+08 1.911E+08 1.758E+08
1.623E+08 1.479E+08 1.375E+08 1.260E+08

TITLE: 4-1 TO 4-5

NGROUP= 100 NFOIL= 13 ACTIVITY NORM= 3.255E+00
REACTIIONS COVER ACTIVITIES SELF-SHIELDING
FE54 (N,*)MN54 .00 8.151E-13 .00
FE58 (N,G)FE59 .00 3.199E-13 IFX FENG 4.76
CO59 (N,2N)CO58 .00 1.099E-13 .00
CO59 (N,3N)CO57 .00 3.642E-14 .00
CO59 (N,G)CO60 .00 9.501E-12 IFX CONG 1.96
NI60 (N,P)CO60 .00 2.959E-14 .00
CU (N,*)54MN .00 3.913E-15 .00
CU (N,*)59FE .00 1.057E-15 .00
CU (N,*)56CO .00 2.027E-15 .00
CU (N,*)57CO .00 9.749E-15 .00
CU (N,*)58CO .00 1.600E-14 .00
CU (N,*)60CO .00 1.037E-14 .00
NB93 (N,N')NB93M .00 8.574E-13 .00

COVARIANCE PARAMETERS

FLUXES: WIDTH = 2.0000E+01 FCOV = 3.0000E-02
SIGMAS: WIDTH = 2.0000E+01 XCOV = 3.0000E-02
ACTIVITIES = 5.0000E-03 CROSS SECTIONS = 3.0000E-02

DETERM = 5.213*10** -19.00 ERROR = 6.687E-15

INPUT NORMALIZATION DATA

AK1= .0000 VAK= .00090 NORM= 0 RENORM= .9982 CHI 2 = 18.7763

DOSIMETRY ACTIVITIES

MEASURED +/-%	BEFORE	DIF%	AFTER	DIF%	CHI	REACTION	90 % LIMITS
1 8.15E+11	10.0	9.12E+11	-11.9	9.01E+11	-10.5	.6 FE54 (N,*)MN54	2.00E+00 5.00E+02
2 3.20E+11	10.0	2.91E+11	8.9	3.08E+11	3.8	.2 FE58 (N,G)FE59	1.00E-09 2.00E-01
3 1.10E+11	10.0	1.04E+11	5.7	1.04E+11	5.5	.1 CO59 (N,2N)CO58	1.20E+01 3.60E+01

4	3.64E+10	10.0	2.93E+10	19.6	2.93E+10	19.6	.4	CO59(N,3N)CO57	2.00E+01	5.60E+01
5	9.50E+12	15.0	8.82E+12	7.1	9.47E+12	.3	.0	CO59(N,G)CO60	1.00E-09	1.00E-04
6	2.96E+10	15.0	3.12E+10	-5.3	3.07E+10	-3.8	.1	NI60(N,P)CO60	5.00E+00	4.80E+01
7	3.91E+09	10.0	3.44E+09	12.0	3.47E+09	11.3	.3	CU(N,*)54MN	3.80E+01	7.20E+02
8	1.06E+09	25.0	2.71E+08	74.4	2.71E+08	74.4	8.5	CU(N,*)59FE	6.00E+01	7.20E+02
9	2.03E+09	10.0	2.37E+09	-17.1	2.34E+09	-15.4	.6	CU(N,*)56CO	6.40E+01	6.80E+02
10	9.75E+09	10.0	1.09E+10	-11.4	1.07E+10	-9.4	.4	CU(N,*)57CO	4.00E+01	6.40E+02
11	1.60E+10	10.0	1.61E+10	-.6	1.59E+10	.7	.0	CU(N,*)58CO	2.80E+01	6.00E+02
12	1.04E+10	25.0	3.16E+09	69.5	3.13E+09	69.8	7.6	CU(N,*)60CO	3.20E+01	6.40E+02
13	8.57E+11	20.0	8.55E+11	.3	8.45E+11	1.5	.0	NB93(N,N')NB93M	5.00E-01	5.00E+00

STD. DEV. = 31.15 30.85

CHISQ = 28.99 26.64

DOSIMETRY DATA INPUT CORRELATION MATRIX

```

11000
2 21000
3 2 21000
4 2 2 21000
5 2 2 2 21000
6 2 2 2 2 11000
7 2 2 2 2 2 21000
8 1 1 1 1 1 1 11000
9 2 2 2 2 2 2 2 11000
10 2 2 2 2 2 2 2 1 21000
11 2 2 2 2 2 2 2 1 2 21000
12 1 1 1 1 1 1 1 0 1 1 11000
13 1 1 1 1 1 1 1 0 1 1 1 11000

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RELATIVE COV. MATRIX OF ACTIVITIES
% CORRELATION MATRIX

```

1 25.93 1000
2 22.82 2241000
3 35.81 788 1341000
4 52.24 601 55 6491000
5 35.00 140 693 73 281000
6 30.58 726 278 783 489 1701000
7 44.82 405 21 114 137 12 1081000
8 42.28 460 23 169 190 13 142 7881000
9 42.57 508 23 206 234 13 161 794 8151000
10 36.77 688 36 448 437 19 322 712 758 8121000
11 34.63 782 51 618 559 26 452 604 662 723 8671000
12 35.54 707 41 486 459 21 355 698 744 795 879 8701000
13 99.39 95 90 89 44 61 128 6 8 9 21 35 251000

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CONTRIBUTION DUE TO INPUT FLUX COV. MATRIX
% CORRELATION MATRIX

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1 23.96 1000
2 21.48 2411000
3 33.83 892 1391000
4 37.75 890 70 9441000
5 25.46 194 996 95 431000
6 27.91 848 309 899 733 2431000
7 39.59 486 14 130 209 10 1261000
8 37.67 549 17 193 289 11 166 9951000
9 39.04 590 16 231 347 10 184 974 9911000
10 34.48 783 29 498 639 18 367 853 901 9381000
11 32.78 883 44 683 810 27 513 715 778 826 9681000
12 33.11 810 34 544 675 21 408 841 889 924 998 9781000
13 16.04 611 568 566 361 495 848 28 42 44 125 209 1511000

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CONTRIBUTION DUE TO INPUT X-SEC. COV. MATRIX
% CORRELATION MATRIX

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1 9.93 1000
2 7.72 1171000
3 11.74 77 991000
4 36.12 25 32 211000
5 24.01 38 49 32 101000
6 12.50 73 93 61 20 301000

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7 21.00 43 56 37 12 18 341000
8 19.20 47 61 40 13 20 38 221000
9 15.99 53 69 45 15 22 42 25 281000
10 12.77 71 91 60 20 29 56 34 37 411000
11 11.16 81 104 69 22 34 65 38 42 47 631000
12 12.90 70 90 59 19 29 56 33 36 41 55 621000
13 98.09 9 12 8 3 4 7 4 5 5 7 8 71000

DIFFERENTIAL FLUXES INPUT NORMALIZED BY .9982									
G	ENERGY	NEW	OLD	RATIO	STD DEV %	NEW	OLD	RATIO	INT FLUX >+-%
1	1.000E-10	8.631E+17	7.490E+17	1.152	33.49	46.08	.727	1.508E+13	6.69
2	1.000E-09	4.793E+17	4.176E+17	1.148	30.45	43.59	.698	1.508E+13	6.70
3	1.000E-08	3.543E+17	3.095E+17	1.145	28.10	41.96	.670	1.508E+13	6.70
4	2.300E-08	2.970E+17	2.597E+17	1.143	26.39	41.15	.641	1.507E+13	6.70
5	5.000E-08	2.195E+17	1.925E+17	1.141	24.68	40.22	.614	1.507E+13	6.71
6	1.150E-07	1.629E+17	1.436E+17	1.134	22.60	38.49	.587	1.505E+13	6.71
7	2.550E-07	9.616E+16	8.546E+16	1.125	20.40	36.24	.563	1.503E+13	6.72
8	5.500E-07	6.353E+16	5.694E+16	1.116	18.45	34.06	.542	1.500E+13	6.73
9	1.275E-06	3.843E+16	3.475E+16	1.106	16.77	32.00	.524	1.495E+13	6.75
10	2.800E-06	2.197E+16	2.004E+16	1.096	15.36	30.10	.511	1.490E+13	6.76
11	5.300E-06	1.362E+16	1.254E+16	1.087	14.22	28.35	.502	1.482E+13	6.78
12	1.350E-05	7.107E+15	6.596E+15	1.077	13.32	26.77	.498	1.472E+13	6.79
13	3.000E-05	3.403E+15	3.185E+15	1.068	12.58	25.25	.498	1.460E+13	6.80
14	6.900E-05	2.285E+15	2.155E+15	1.060	12.16	24.17	.503	1.447E+13	6.81
15	1.000E-04	9.997E+14	9.501E+14	1.052	11.76	22.99	.511	1.440E+13	6.81
16	2.800E-04	4.619E+14	4.425E+14	1.044	11.28	21.59	.522	1.422E+13	6.80
17	5.750E-04	2.339E+14	2.258E+14	1.036	10.87	20.33	.535	1.408E+13	6.79
18	1.275E-03	1.696E+14	1.648E+14	1.029	10.48	19.10	.549	1.392E+13	6.77
19	2.000E-03	1.277E+14	1.249E+14	1.022	10.12	18.00	.562	1.380E+13	6.75
20	3.400E-03	9.655E+13	9.498E+13	1.017	9.73	16.92	.575	1.362E+13	6.73
21	5.500E-03	7.323E+13	7.240E+13	1.011	9.35	15.94	.587	1.342E+13	6.70
22	9.200E-03	6.720E+13	6.673E+13	1.007	9.03	15.14	.596	1.314E+13	6.67
23	1.200E-02	3.446E+13	3.436E+13	1.003	7.99	13.20	.605	1.296E+13	6.64
24	5.250E-02	2.136E+13	2.135E+13	1.000	6.76	11.01	.614	1.156E+13	6.52
25	1.000E-01	1.691E+13	1.694E+13	.998	6.16	9.93	.620	1.055E+13	6.52
26	2.000E-01	8.955E+12	8.982E+12	.997	5.61	8.98	.625	8.855E+12	6.62
27	5.000E-01	4.293E+12	4.310E+12	.996	5.34	8.54	.625	6.169E+12	7.12
28	1.000E+00	1.883E+12	1.897E+12	.993	6.93	11.47	.605	4.022E+12	8.20
29	2.000E+00	7.938E+11	8.045E+11	.987	10.14	17.19	.590	2.139E+12	9.51
30	3.000E+00	4.164E+11	4.246E+11	.981	13.04	22.56	.578	1.346E+12	9.39
31	4.000E+00	1.785E+11	1.828E+11	.977	14.53	25.73	.564	9.292E+11	8.25
32	5.000E+00	1.071E+11	1.098E+11	.976	14.69	26.77	.549	7.507E+11	7.37
33	6.000E+00	6.673E+10	6.842E+10	.975	14.70	27.67	.531	6.436E+11	6.90
34	7.000E+00	3.662E+10	3.752E+10	.976	14.59	28.47	.513	5.769E+11	6.75
35	8.000E+00	2.702E+10	2.765E+10	.977	14.38	29.18	.493	5.402E+11	6.76
36	9.000E+00	2.064E+10	2.107E+10	.979	14.10	29.83	.473	5.132E+11	6.83
37	1.000E+01	1.514E+10	1.541E+10	.982	13.77	30.46	.452	4.926E+11	6.92
38	1.100E+01	1.323E+10	1.343E+10	.985	13.43	31.07	.432	4.774E+11	7.00
39	1.200E+01	1.144E+10	1.157E+10	.989	13.07	31.65	.413	4.642E+11	7.08
40	1.300E+01	9.916E+09	9.992E+09	.992	12.71	32.19	.395	4.528E+11	7.16
41	1.400E+01	9.391E+09	9.428E+09	.996	12.37	32.70	.378	4.429E+11	7.22
42	1.500E+01	9.104E+09	9.108E+09	1.000	12.07	33.19	.364	4.335E+11	7.29
43	1.600E+01	8.835E+09	8.811E+09	1.003	11.84	33.65	.352	4.244E+11	7.34
44	1.700E+01	8.583E+09	8.537E+09	1.005	11.68	34.09	.343	4.155E+11	7.40
45	1.800E+01	8.386E+09	8.324E+09	1.007	11.61	34.51	.337	4.069E+11	7.44
46	1.900E+01	8.211E+09	8.140E+09	1.009	11.65	34.91	.334	3.986E+11	7.49
47	2.000E+01	7.347E+09	7.280E+09	1.009	11.92	35.66	.334	3.903E+11	7.53
48	2.400E+01	6.281E+09	6.226E+09	1.009	12.39	36.68	.338	3.610E+11	7.69
49	2.800E+01	5.433E+09	5.393E+09	1.007	12.94	37.58	.344	3.358E+11	7.89
50	3.200E+01	4.757E+09	4.733E+09	1.005	13.57	38.38	.353	3.141E+11	8.14
51	3.600E+01	4.127E+09	4.122E+09	1.001	14.26	39.11	.365	2.951E+11	8.44
52	4.000E+01	3.595E+09	3.607E+09	.997	15.03	39.78	.378	2.786E+11	8.79
53	4.400E+01	3.147E+09	3.176E+09	.991	15.91	40.57	.392	2.642E+11	9.19
54	4.800E+01	2.741E+09	2.785E+09	.984	16.90	41.50	.407	2.516E+11	9.63
55	5.200E+01	2.365E+09	2.422E+09	.977	17.92	42.37	.423	2.406E+11	10.09
56	5.600E+01	2.029E+09	2.095E+09	.969	18.94	43.20	.439	2.312E+11	10.58
57	6.000E+01	1.741E+09	1.814E+09	.960	19.96	43.99	.454	2.231E+11	11.06
58	6.400E+01	1.462E+09	1.537E+09	.951	20.96	44.74	.468	2.161E+11	11.53
59	6.800E+01	1.247E+09	1.324E+09	.942	21.91	45.46	.482	2.102E+11	11.98
60	7.200E+01	1.040E+09	1.114E+09	.933	22.82	46.14	.494	2.053E+11	12.39
61	7.600E+01	9.043E+08	9.777E+08	.925	23.65	46.81	.505	2.011E+11	12.76
62	8.000E+01	8.055E+08	8.782E+08	.917	24.41	47.45	.514	1.975E+11	13.10
63	8.400E+01	7.365E+08	8.091E+08	.910	25.07	48.06	.522	1.943E+11	13.41

64	8.800E+01	6.755E+08	7.470E+08	.904	25.62	48.66	.527	1.913E+11	13.71
65	9.200E+01	6.270E+08	6.970E+08	.899	26.06	49.23	.529	1.886E+11	13.99
66	9.600E+01	5.837E+08	6.515E+08	.896	26.39	49.79	.530	1.861E+11	14.25
67	1.000E+02	5.297E+08	5.926E+08	.894	26.61	50.38	.528	1.838E+11	14.49
68	1.100E+02	4.750E+08	5.319E+08	.893	26.72	50.99	.524	1.785E+11	15.06
69	1.200E+02	4.336E+08	4.851E+08	.894	26.69	51.55	.518	1.737E+11	15.60
70	1.300E+02	3.923E+08	4.378E+08	.896	26.53	52.07	.510	1.694E+11	16.11
71	1.400E+02	3.668E+08	4.076E+08	.900	26.25	52.56	.499	1.655E+11	16.57
72	1.500E+02	3.452E+08	3.813E+08	.905	25.87	53.02	.488	1.618E+11	17.01
73	1.600E+02	3.267E+08	3.582E+08	.912	25.41	53.46	.475	1.583E+11	17.42
74	1.700E+02	3.108E+08	3.377E+08	.920	24.90	53.88	.462	1.551E+11	17.79
75	1.800E+02	3.047E+08	3.278E+08	.929	24.36	54.27	.449	1.520E+11	18.13
76	1.900E+02	3.025E+08	3.219E+08	.940	23.85	54.65	.436	1.489E+11	18.44
77	2.000E+02	3.069E+08	3.229E+08	.950	23.48	55.17	.425	1.459E+11	18.72
78	2.200E+02	3.069E+08	3.190E+08	.962	23.27	55.84	.417	1.398E+11	19.26
79	2.400E+02	3.166E+08	3.251E+08	.974	23.21	56.45	.411	1.336E+11	19.77
80	2.600E+02	3.235E+08	3.280E+08	.986	23.35	57.03	.409	1.273E+11	20.27
81	2.800E+02	3.498E+08	3.502E+08	.999	23.72	57.56	.412	1.208E+11	20.73
82	3.000E+02	3.579E+08	3.538E+08	1.012	24.34	58.07	.419	1.138E+11	21.17
83	3.200E+02	3.555E+08	3.471E+08	1.024	25.24	58.55	.431	1.067E+11	21.53
84	3.400E+02	3.391E+08	3.272E+08	1.036	26.40	59.00	.447	9.955E+10	21.80
85	3.600E+02	3.244E+08	3.095E+08	1.048	27.79	59.43	.468	9.277E+10	21.93
86	3.800E+02	3.164E+08	2.988E+08	1.059	29.39	59.85	.491	8.628E+10	21.89
87	4.000E+02	3.085E+08	2.891E+08	1.067	30.28	58.55	.517	7.996E+10	21.66
88	4.200E+02	2.855E+08	2.663E+08	1.072	30.29	55.56	.545	7.379E+10	21.26
89	4.400E+02	2.689E+08	2.501E+08	1.075	30.21	52.56	.575	6.808E+10	20.76
90	4.600E+02	2.622E+08	2.437E+08	1.076	29.98	49.57	.605	6.270E+10	20.16
91	4.800E+02	2.516E+08	2.338E+08	1.076	29.59	46.58	.635	5.745E+10	19.43
92	5.000E+02	2.332E+08	2.170E+08	1.074	29.00	43.58	.665	5.242E+10	18.59
93	5.200E+02	2.276E+08	2.124E+08	1.072	28.22	40.59	.695	4.776E+10	17.67
94	5.400E+02	2.149E+08	2.012E+08	1.068	27.22	37.60	.724	4.321E+10	16.64
95	5.600E+02	2.023E+08	1.908E+08	1.061	24.88	33.12	.751	3.891E+10	15.52
96	6.000E+02	1.843E+08	1.755E+08	1.050	21.11	27.15	.777	3.082E+10	13.14
97	6.400E+02	1.683E+08	1.620E+08	1.039	17.01	21.20	.802	2.345E+10	10.71
98	6.800E+02	1.517E+08	1.476E+08	1.028	12.63	15.29	.826	1.671E+10	8.27
99	7.200E+02	1.395E+08	1.373E+08	1.017	8.08	9.48	.853	1.064E+10	5.92
100	7.600E+02	1.265E+08	1.258E+08	1.006	3.88	4.24	.914	5.061E+09	3.88

INTEGRALS OF SPECTRA

OLD SPECTRUM 1.505E+13 +OR- 12.039 %
 NEW SPECTRUM 1.508E+13 +OR- 6.695 %

ENERGY	FLUX	SDEV	ENERGY	FLUX	SDEV
1.000E-10	8.631E+17	33.49	3.600E+01	4.127E+09	14.26
1.000E-09	4.793E+17	30.45	4.000E+01	3.595E+09	15.03
1.000E-08	3.543E+17	28.10	4.400E+01	3.147E+09	15.91
2.300E-08	2.970E+17	26.39	4.800E+01	2.741E+09	16.90
5.000E-08	2.195E+17	24.68	5.200E+01	2.365E+09	17.92
1.150E-07	1.629E+17	22.60	5.600E+01	2.029E+09	18.94
2.550E-07	9.616E+16	20.40	6.000E+01	1.741E+09	19.96
5.500E-07	6.353E+16	18.45	6.400E+01	1.462E+09	20.96
1.275E-06	3.843E+16	16.77	6.800E+01	1.247E+09	21.91
2.800E-06	2.197E+16	15.36	7.200E+01	1.040E+09	22.82
6.300E-06	1.362E+16	14.22	7.600E+01	9.043E+08	23.65
1.350E-05	7.107E+15	13.32	8.000E+01	8.055E+08	24.41
3.000E-05	3.403E+15	12.58	8.400E+01	7.365E+08	25.07
6.900E-05	2.285E+15	12.16	8.800E+01	6.755E+08	25.62
1.000E-04	9.997E+14	11.76	9.200E+01	6.270E+08	26.06
2.800E-04	4.619E+14	11.28	9.600E+01	5.837E+08	26.39
5.750E-04	2.339E+14	10.87	1.000E+02	5.297E+08	26.61
1.275E-03	1.696E+14	10.48	1.100E+02	4.750E+08	26.72
2.000E-03	1.277E+14	10.12	1.200E+02	4.336E+08	26.69
3.400E-03	9.655E+13	9.73	1.300E+02	3.923E+08	26.53
5.500E-03	7.323E+13	9.35	1.400E+02	3.668E+08	26.25
9.200E-03	6.720E+13	9.03	1.500E+02	3.452E+08	25.87
1.200E-02	3.446E+13	7.99	1.600E+02	3.267E+08	25.41
5.250E-02	2.136E+13	6.76	1.700E+02	3.108E+08	24.90
1.000E-01	1.691E+13	6.16	1.800E+02	3.047E+08	24.36
2.000E-01	8.955E+12	5.61	1.900E+02	3.025E+08	23.85
5.000E-01	4.293E+12	5.34	2.000E+02	3.069E+08	23.48
1.000E+00	1.883E+12	6.93	2.200E+02	3.069E+08	23.27
2.000E+00	7.938E+11	10.14	2.400E+02	3.166E+08	23.21
3.000E+00	4.164E+11	13.04	2.600E+02	3.235E+08	23.35

4.000E+00	1.785E+11	14.53	2.800E+02	3.498E+08	23.72
5.000E+00	1.071E+11	14.69	3.000E+02	3.579E+08	24.34
6.000E+00	6.673E+10	14.70	3.200E+02	3.555E+08	25.24
7.000E+00	3.662E+10	14.59	3.400E+02	3.391E+08	26.40
8.000E+00	2.702E+10	14.38	3.600E+02	3.244E+08	27.79
9.000E+00	2.064E+10	14.10	3.800E+02	3.164E+08	29.39
1.000E+01	1.514E+10	13.77	4.000E+02	3.085E+08	30.28
1.100E+01	1.323E+10	13.43	4.200E+02	2.855E+08	30.29
1.200E+01	1.144E+10	13.07	4.400E+02	2.689E+08	30.21
1.300E+01	9.916E+09	12.71	4.600E+02	2.622E+08	29.98
1.400E+01	9.391E+09	12.37	4.800E+02	2.516E+08	29.59
1.500E+01	9.104E+09	12.07	5.000E+02	2.332E+08	29.00
1.600E+01	8.835E+09	11.84	5.200E+02	2.276E+08	28.22
1.700E+01	8.583E+09	11.68	5.400E+02	2.149E+08	27.22
1.800E+01	8.386E+09	11.61	5.600E+02	2.023E+08	24.88
1.900E+01	8.211E+09	11.65	6.000E+02	1.843E+08	21.11
2.000E+01	7.347E+09	11.92	6.400E+02	1.683E+08	17.01
2.400E+01	6.281E+09	12.39	6.800E+02	1.517E+08	12.63
2.800E+01	5.433E+09	12.94	7.200E+02	1.395E+08	8.08
3.200E+01	4.757E+09	13.57	7.600E+02	1.265E+08	3.88

SUMMARY OF BROAD-GROUP FLUXES, FLUENCES, AND UNCERTAINTIES

IRRAD TIME(S) = 6.336E+06 ACT NORM = 3.255E+00

ENERGY	FLUX	FLUENCE	SDEV
TOTAL	1.508E+13	2.936E+19	-/- 6.69
1.000E-10	3.198E+10	6.226E+16	-/- 26.44
1.150E-07	3.308E+11	6.439E+17	-/- 16.31
1.350E-05	4.175E+12	8.126E+18	-/- 8.28
1.000E-01	6.524E+12	1.270E+19	-/- 5.65
1.000E+00	3.530E+12	6.871E+18	-/- 9.19
1.000E+01	1.022E+11	1.990E+17	-/- 11.75
2.000E+01	1.118E+11	2.176E+17	-/- 12.60
4.000E+01	9.480E+10	1.845E+17	-/- 17.81
1.000E+02	3.787E+10	7.372E+16	-/- 24.70
2.000E+02	1.292E+11	2.515E+17	-/- 20.54

SUMMARY OF INTEGRATED GROUP ENERGY FLUXES AND FLUENCES

ENERGY MeV	FLUX n/cm2-s-mA	FLUX n/cm2-s	FLUENCE n/cm2	STANDARD DEVIATION	%
<1.0	4.537E+12	1.394E+12	8.832E+18	-/- 8.28	30.08
0.1-1.0	6.524E+12	2.004E+12	1.270E+19	-/- 5.65	43.25
1.0-10.0	3.530E+12	1.084E+12	6.871E+18	-/- 9.19	23.40
10.0-20.0	1.022E+11	3.141E+10	1.990E+17	-/-11.75	.68
20.0-40.0	1.118E+11	3.434E+10	2.176E+17	-/-12.60	.74
40.0-100.0	9.480E+10	2.912E+10	1.845E+17	-/-17.81	.63
100.0-200.0	3.787E+10	1.164E+10	7.372E+16	-/-24.70	.25
>200.0	1.292E+11	3.969E+10	2.515E+17	-/-20.54	.86
TOTAL	1.508E+13	4.634E+12	2.936E+19	-/- 6.69	

THE PERCENTAGE OF NEUTRONS ABOVE 20 MeV IS - 2.48

RELATIVE COVARIANCES (10X10)

1000	849	3	-194	-209	-25	97	63	9	10
1000	406	83	6	-16	67	60	23	17	
1000	891	801	213	-140	-87	48	52		
1000	947	370	-175	-166	43	75			
1000	544	-156	-230	37	100				
1000	502	-87	-152	82					
1000	627	-145	-258						
1000	394	-564							
1000	-223								
1000									

5-1 TO 5-5

100 8 2 0 0
 .0050 20.0000 .0300 20.0000 .0300 .0300 3.2550
 .0000 0 0 6.3360E+06
 FE54PX 1.828E-13 .10 .00 .00
 CO593 1.649E-14 .10 .00 .00
 CO59G 3.199E-12 .15 .00SFSH IFX 1.96CONG
 NI60P 1.165E-14 .15 .00 .00
 CUX54MN 8.762E-16 .10 .00 .00
 CUX57CO 2.039E-15 .10 .00 .00
 CUX60CO 4.016E-15 .25 .00 .00
 NB93N 3.271E-13 .20 .00 .00

0 FRACTIONAL ERRORS IN INPUT SPECTRUM

16 1.000E+00
 1.000E-11 1.000E-07 1.000E-05 1.000E-03 1.000E-02 1.000E-01 4.000E-01 1.000E+00
 4.000E+00 1.000E+01 2.000E+01 4.400E+01 1.000E+02 4.000E+02 8.000E+02 0.000E+00
 5.000E-01 4.000E-01 2.800E-01 2.000E-01 1.500E-01 1.000E-01 8.000E-02 8.000E-02
 2.500E-01 3.000E-01 3.500E-01 4.000E-01 5.000E-01 6.000E-01 0.000E+00 0.000E+00

1 INPUT SPECTRUM

100 1.000E+00
 1.039E+18 3.399E+17 4.029E+17 2.213E+17 1.621E+17 1.200E+17 8.277E+16 4.945E+16
 3.329E+16 2.022E+16 1.027E+16 6.343E+15 3.420E+15 2.453E+15 1.208E+15 5.970E+14
 4.179E+14 2.371E+14 1.446E+14 1.204E+14 7.341E+13 6.990E+13 2.876E+13 1.967E+13
 1.316E+13 7.900E+12 3.179E+12 1.254E+12 5.731E+11 3.230E+11 1.990E+11 1.179E+11
 7.748E+10 4.889E+10 3.494E+10 2.624E+10 1.823E+10 1.551E+10 1.329E+10 1.235E+10
 1.123E+10 9.963E+09 8.848E+09 8.064E+09 7.733E+09 6.851E+09 6.063E+09 4.979E+09
 4.164E+09 3.585E+09 3.113E+09 2.672E+09 2.305E+09 1.996E+09 1.761E+09 1.555E+09
 1.400E+09 1.239E+09 1.117E+09 9.591E+08 8.696E+08 7.775E+08 7.100E+08 6.515E+08
 5.911E+08 5.590E+08 4.991E+08 4.467E+08 3.914E+08 3.597E+08 3.235E+08 3.098E+08
 2.848E+08 2.688E+08 2.648E+08 2.538E+08 2.472E+08 2.291E+08 2.219E+08 2.093E+08
 1.953E+08 1.894E+08 1.876E+08 1.738E+08 1.727E+08 1.717E+08 1.646E+08 1.597E+08
 1.517E+08 1.464E+08 1.434E+08 1.378E+08 1.299E+08 1.244E+08 1.124E+08 1.048E+08
 9.788E+07 9.018E+07 8.189E+07 7.589E+07

TITLE: 5-1 TO 5-5

NGROUP= 100 NFOIL= 8 ACTIVITY NORM= 3.255E+00
 REACTIONS COVER ACTIVITIES SELF-SHIELDING
 FE54(N,*)MN54 .00 5.950E-13 .00
 CO59(N,3N)CO57 .00 5.367E-14 .00
 CO59(N,G)CO60 .00 1.041E-11 IFX CONG 1.96
 NI60(N,P)CO60 .00 3.792E-14 .00
 CU(N,*)54MN .00 2.852E-15 .00
 CU(N,*)57CO .00 6.637E-15 .00
 CU(N,*)60CO .00 1.307E-14 .00
 NB93(N,N')NB93M .00 1.065E-12 .00

COVARIANCE PARAMETERS

FLUXES: WIDTH = 2.0000E+01 FCOV = 3.0000E-02
 SIGMAS: WIDTH = 2.0000E+01 XCOV = 3.0000E-02
 ACTIVITIES = 5.0000E-03 CROSS SECTIONS = 3.0000E-02

DETERM = 4.145*10** -9.00 ERROR = -1.324E-14

INPUT NORMALIZATION DATA

AK1= .0000 VAK= .00090 NORM= 0 RENORM= 1.0006 CHI 2 = 26.6769

DOSIMETRY ACTIVITIES

MEASURED	+/-%	BEFORE	DIF%	AFTER	DIF%	CHI	REACTION	90 % LIMITS
1	5.95E+11	10.0	7.57E+11	-27.3	7.36E+11	-23.8	2.8 FE54(N,*)MN54	2.00E+00 4.40E+02
2	5.37E+10	10.0	2.25E+10	58.2	2.31E+10	57.0	10.0 CO59(N,3N)CO57	2.00E+01 5.20E+01
3	1.04E+13	15.0	1.02E+13	2.3	9.81E+12	5.7	.0 CO59(N,G)CO60	1.00E-08 1.00E-04
4	3.79E+10	15.0	3.47E+10	8.4	3.35E+10	11.5	.3 NI60(N,P)CO60	5.00E+00 2.80E+01
5	2.85E+09	10.0	2.23E+09	21.6	2.27E+09	20.5	1.3 CU(N,*)54MN	8.00E+01 7.20E+02
6	6.64E+09	10.0	7.73E+09	-16.5	7.61E+09	-14.7	.9 CU(N,*)57CO	4.00E+01 6.40E+02
7	1.31E+10	25.0	2.25E+09	82.8	2.23E+09	82.9	10.9 CU(N,*)60CO	3.20E+01 6.40E+02
8	1.06E+12	20.0	6.53E+11	38.7	6.17E+11	42.0	.4 NB93(N,N')NB93M	5.00E-01 6.00E+00

STD. DEV. = 43.58 43.52

CHISQ = 63.71 60.64

CHECK INPUT IT IS RATHER UNLIKELY !!!
 ***** BEWARE OF OUTPUT !!!!!!!!!!!!! *****

DOSIMETRY DATA INPUT CORRELATION MATRIX

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11000
2 21000
3 2 21000
4 2 2 11000
5 2 2 2 21000
6 2 2 2 2 21000
7 1 1 1 1 1 11000
8 1 1 1 1 1 1 01000
    
```

RELATIVE COV. MATRIX OF ACTIVITIES
% CORRELATION MATRIX

```

1 25.76 1000
2 52.48 6001000
3 34.80 161 291000
4 31.09 752 468 1801000
5 43.87 373 158 12 941000
6 36.98 660 463 19 303 7191000
7 35.67 685 488 22 340 701 8991000
8 98.60 113 48 64 140 7 24 291000
    
```

CONTRIBUTION DUE TO INPUT FLUX COV. MATRIX
% CORRELATION MATRIX

```

1 23.99 1000
2 37.73 8861000
3 24.94 227 461000
4 28.32 873 706 2631000
5 39.21 439 240 10 1081000
6 35.06 737 672 18 341 8421000
7 33.62 770 713 22 386 825 9981000
8 16.86 685 377 501 877 32 135 1641000
    
```

CONTRIBUTION DUE TO INPUT X-SEC. COV. MATRIX
% CORRELATION MATRIX

```

1 9.38 1000
2 36.48 261000
3 24.28 39 101000
4 12.83 75 19 291000
5 19.68 49 13 19 361000
6 11.74 82 21 32 60 391000
7 11.92 80 21 31 59 38 641000
8 97.15 10 3 4 7 5 8 81000
    
```

DIFFERENTIAL FLUXES INPUT NORMALIZED BY				1.0006					
G	ENERGY	NEW	OLD	RATIO	STD DEV %	NEW	OLD	RATIO	INT FLUX >+-%
1	1.000E-10	1.062E+18	1.040E+18	1.022	39.89	46.08	.866	1.230E+13	8.07
2	1.000E-09	3.461E+17	3.401E+17	1.018	37.13	43.59	.852	1.230E+13	8.07
3	1.000E-08	4.085E+17	4.031E+17	1.013	35.15	41.96	.838	1.230E+13	8.07
4	2.300E-08	2.234E+17	2.214E+17	1.009	33.91	41.15	.824	1.229E+13	8.07
5	5.000E-08	1.628E+17	1.622E+17	1.004	32.60	40.22	.811	1.229E+13	8.07
6	1.150E-07	1.199E+17	1.201E+17	.998	30.71	38.49	.798	1.228E+13	8.06
7	2.550E-07	8.220E+16	8.282E+16	.993	28.48	36.24	.786	1.226E+13	8.06
8	5.500E-07	4.883E+16	4.948E+16	.987	26.41	34.06	.775	1.224E+13	8.05
9	1.275E-06	3.269E+16	3.331E+16	.981	24.51	32.00	.766	1.220E+13	8.04
10	2.800E-06	1.975E+16	2.023E+16	.976	22.81	30.10	.758	1.215E+13	8.02
11	6.300E-06	9.978E+15	1.028E+16	.971	21.30	28.35	.751	1.208E+13	7.99
12	1.350E-05	6.132E+15	6.347E+15	.966	19.98	26.77	.746	1.201E+13	7.96
13	3.000E-05	3.291E+15	3.422E+15	.962	18.74	25.25	.742	1.191E+13	7.92
14	6.900E-05	2.350E+15	2.454E+15	.957	17.87	24.17	.739	1.178E+13	7.87
15	1.000E-04	1.152E+15	1.209E+15	.953	16.95	22.99	.737	1.171E+13	7.84
16	2.800E-04	5.679E+14	5.973E+14	.951	15.88	21.59	.736	1.150E+13	7.75
17	5.750E-04	3.966E+14	4.181E+14	.949	14.92	20.33	.734	1.133E+13	7.68
18	1.275E-03	2.247E+14	2.372E+14	.947	13.98	19.10	.732	1.105E+13	7.57
19	2.000E-03	1.369E+14	1.447E+14	.946	13.13	18.00	.730	1.089E+13	7.51
20	3.400E-03	1.140E+14	1.205E+14	.946	12.29	16.92	.726	1.070E+13	7.44
21	5.500E-03	6.951E+13	7.345E+13	.946	11.50	15.94	.721	1.046E+13	7.36
22	9.200E-03	6.622E+13	6.994E+13	.947	10.82	15.14	.715	1.020E+13	7.28
23	1.200E-02	2.740E+13	2.878E+13	.952	9.35	13.20	.708	1.002E+13	7.23
24	5.250E-02	1.889E+13	1.968E+13	.960	7.72	11.01	.701	8.909E+12	7.02
25	1.000E-01	1.269E+13	1.317E+13	.964	6.88	9.93	.693	8.011E+12	6.98
26	2.000E-01	7.646E+12	7.904E+12	.967	6.15	8.98	.684	6.743E+12	7.04
27	5.000E-01	3.084E+12	3.181E+12	.969	5.75	8.54	.673	4.449E+12	7.63
28	1.000E+00	1.203E+12	1.255E+12	.959	7.38	11.47	.643	2.907E+12	8.81

29	2.000E+00	5.391E+11	5.734E+11	.940	10.64	17.19	.619	1.704E+12	10.14
30	3.000E+00	2.990E+11	3.232E+11	.925	13.51	22.56	.599	1.165E+12	10.29
31	4.000E+00	1.832E+11	1.991E+11	.920	14.92	25.73	.580	8.655E+11	9.75
32	5.000E+00	1.090E+11	1.180E+11	.924	15.01	26.77	.561	6.823E+11	9.19
33	6.000E+00	7.204E+10	7.752E+10	.929	15.01	27.67	.543	5.733E+11	8.97
34	7.000E+00	4.580E+10	4.892E+10	.936	14.96	28.47	.526	5.013E+11	8.99
35	8.000E+00	3.302E+10	3.496E+10	.944	14.90	29.18	.511	4.555E+11	9.13
36	9.000E+00	2.504E+10	2.625E+10	.954	14.85	29.83	.498	4.225E+11	9.31
37	1.000E+01	1.757E+10	1.824E+10	.963	14.84	30.46	.487	3.974E+11	9.48
38	1.100E+01	1.511E+10	1.552E+10	.974	14.91	31.07	.480	3.798E+11	9.62
39	1.200E+01	1.308E+10	1.330E+10	.984	15.02	31.65	.475	3.647E+11	9.74
40	1.300E+01	1.229E+10	1.236E+10	.994	15.19	32.19	.472	3.517E+11	9.83
41	1.400E+01	1.128E+10	1.124E+10	1.004	15.40	32.70	.471	3.394E+11	9.91
42	1.500E+01	1.010E+10	9.969E+09	1.013	15.66	33.19	.472	3.281E+11	9.98
43	1.600E+01	9.040E+09	8.853E+09	1.021	15.95	33.65	.474	3.180E+11	10.03
44	1.700E+01	8.293E+09	8.068E+09	1.028	16.26	34.09	.477	3.090E+11	10.06
45	1.800E+01	7.994E+09	7.737E+09	1.033	16.57	34.51	.480	3.007E+11	10.08
46	1.900E+01	7.107E+09	6.855E+09	1.037	16.88	34.91	.484	2.927E+11	10.08
47	2.000E+01	6.304E+09	6.066E+09	1.039	17.36	35.66	.487	2.856E+11	10.08
48	2.400E+01	5.181E+09	4.982E+09	1.040	17.97	36.68	.490	2.603E+11	10.10
49	2.800E+01	4.328E+09	4.166E+09	1.039	18.51	37.58	.493	2.396E+11	10.22
50	3.200E+01	3.714E+09	3.587E+09	1.035	18.99	38.38	.495	2.223E+11	10.44
51	3.600E+01	3.209E+09	3.115E+09	1.030	19.43	39.11	.497	2.074E+11	10.75
52	4.000E+01	2.735E+09	2.673E+09	1.023	19.84	39.78	.499	1.946E+11	11.16
53	4.400E+01	2.339E+09	2.306E+09	1.014	20.32	40.57	.501	1.837E+11	11.64
54	4.800E+01	2.005E+09	1.997E+09	1.004	20.87	41.50	.503	1.743E+11	12.17
55	5.200E+01	1.749E+09	1.762E+09	.992	21.41	42.37	.505	1.663E+11	12.73
56	5.600E+01	1.524E+09	1.556E+09	.980	21.94	43.20	.508	1.593E+11	13.30
57	6.000E+01	1.353E+09	1.401E+09	.966	22.48	43.99	.511	1.532E+11	13.87
58	6.400E+01	1.181E+09	1.240E+09	.952	23.02	44.74	.514	1.478E+11	14.43
59	6.800E+01	1.049E+09	1.118E+09	.938	23.56	45.46	.518	1.431E+11	14.98
60	7.200E+01	8.877E+08	9.596E+08	.925	24.09	46.14	.522	1.389E+11	15.50
61	7.600E+01	7.938E+08	8.701E+08	.912	24.62	46.81	.526	1.353E+11	15.97
62	8.000E+01	7.006E+08	7.779E+08	.901	25.13	47.45	.530	1.321E+11	16.40
63	8.400E+01	6.325E+08	7.104E+08	.890	25.61	48.06	.533	1.293E+11	16.80
64	8.800E+01	5.748E+08	6.519E+08	.882	26.05	48.66	.535	1.268E+11	17.16
65	9.200E+01	5.175E+08	5.914E+08	.875	26.45	49.23	.537	1.245E+11	17.49
66	9.600E+01	4.868E+08	5.593E+08	.870	26.79	49.79	.538	1.224E+11	17.78
67	1.000E+02	4.333E+08	4.994E+08	.868	27.10	50.38	.538	1.205E+11	18.05
68	1.100E+02	3.877E+08	4.469E+08	.867	27.36	50.99	.537	1.162E+11	18.66
69	1.200E+02	3.405E+08	3.916E+08	.869	27.54	51.55	.534	1.123E+11	19.23
70	1.300E+02	3.144E+08	3.599E+08	.874	27.64	52.07	.531	1.089E+11	19.75
71	1.400E+02	2.849E+08	3.237E+08	.880	27.67	52.56	.526	1.057E+11	20.23
72	1.500E+02	2.756E+08	3.100E+08	.889	27.64	53.02	.521	1.029E+11	20.67
73	1.600E+02	2.563E+08	2.850E+08	.900	27.57	53.46	.516	1.001E+11	21.08
74	1.700E+02	2.453E+08	2.689E+08	.912	27.48	53.88	.510	9.757E+10	21.45
75	1.800E+02	2.453E+08	2.649E+08	.926	27.40	54.27	.505	9.512E+10	21.78
76	1.900E+02	2.389E+08	2.539E+08	.941	27.34	54.65	.500	9.266E+10	22.08
77	2.000E+02	2.366E+08	2.473E+08	.956	27.42	55.17	.497	9.028E+10	22.35
78	2.200E+02	2.230E+08	2.292E+08	.973	27.66	55.84	.495	8.554E+10	22.85
79	2.400E+02	2.198E+08	2.220E+08	.990	28.00	56.45	.496	8.108E+10	23.29
80	2.600E+02	2.109E+08	2.094E+08	1.007	28.46	57.03	.499	7.669E+10	23.69
81	2.800E+02	2.002E+08	1.954E+08	1.024	29.07	57.56	.505	7.247E+10	24.02
82	3.000E+02	1.973E+08	1.895E+08	1.041	29.83	58.07	.514	6.847E+10	24.27
83	3.200E+02	1.985E+08	1.877E+08	1.058	30.77	58.55	.526	6.452E+10	24.43
84	3.400E+02	1.866E+08	1.739E+08	1.073	31.87	59.00	.540	6.055E+10	24.48
85	3.600E+02	1.880E+08	1.728E+08	1.088	33.12	59.43	.557	5.682E+10	24.39
86	3.800E+02	1.892E+08	1.718E+08	1.101	34.52	59.85	.577	5.306E+10	24.15
87	4.000E+02	1.828E+08	1.647E+08	1.110	35.02	58.55	.598	4.927E+10	23.70
88	4.200E+02	1.779E+08	1.598E+08	1.114	34.49	55.56	.621	4.562E+10	23.10
89	4.400E+02	1.692E+08	1.518E+08	1.115	33.89	52.56	.645	4.206E+10	22.40
90	4.600E+02	1.631E+08	1.465E+08	1.114	33.17	49.57	.669	3.868E+10	21.60
91	4.800E+02	1.594E+08	1.435E+08	1.111	32.32	46.58	.694	3.541E+10	20.71
92	5.000E+02	1.525E+08	1.379E+08	1.106	31.32	43.58	.719	3.222E+10	19.71
93	5.200E+02	1.430E+08	1.300E+08	1.101	30.16	40.59	.743	2.917E+10	18.60
94	5.400E+02	1.361E+08	1.245E+08	1.094	28.83	37.60	.767	2.631E+10	17.42
95	5.600E+02	1.217E+08	1.125E+08	1.082	26.15	33.12	.790	2.359E+10	16.16
96	6.000E+02	1.118E+08	1.049E+08	1.066	22.03	27.15	.811	1.872E+10	13.65
97	6.400E+02	1.029E+08	9.793E+07	1.051	17.64	21.20	.832	1.425E+10	11.09
98	6.800E+02	9.339E+07	9.023E+07	1.035	13.03	15.29	.852	1.013E+10	8.53
99	7.200E+02	8.358E+07	8.194E+07	1.020	8.29	9.48	.874	6.398E+09	6.05
100	7.600E+02	7.638E+07	7.593E+07	1.006	3.93	4.24	.927	3.055E+09	3.93

INTEGRALS OF SPECTRA

OLD SPECTRUM 1.283E+13 +OR- 12.495 %
NEW SPECTRUM 1.230E+13 +OR- 8.069 %

ENERGY FLUX SDEV ENERGY FLUX SDEV

1.000E-10	1.062E+18	39.89	3.600E+01	3.209E+09	19.43
1.000E-09	3.461E+17	37.13	4.000E+01	2.735E+09	19.84
1.000E-08	4.085E+17	35.15	4.400E+01	2.339E+09	20.32
2.300E-08	2.234E+17	33.91	4.800E+01	2.005E+09	20.87
5.000E-08	1.628E+17	32.60	5.200E+01	1.749E+09	21.41
1.150E-07	1.199E+17	30.71	5.600E+01	1.524E+09	21.94
2.550E-07	8.220E+16	28.48	6.000E+01	1.353E+09	22.48
5.500E-07	4.883E+16	26.41	6.400E+01	1.181E+09	23.02
1.275E-06	3.269E+16	24.51	6.800E+01	1.049E+09	23.56
2.800E-06	1.975E+16	22.81	7.200E+01	8.877E+08	24.09
5.300E-06	9.978E+15	21.30	7.600E+01	7.938E+08	24.62
1.350E-05	6.132E+15	19.98	8.000E+01	7.006E+08	25.13
3.000E-05	3.291E+15	18.74	8.400E+01	6.325E+08	25.61
6.900E-05	2.350E+15	17.87	8.800E+01	5.748E+08	26.05
1.000E-04	1.152E+15	16.95	9.200E+01	5.175E+08	26.45
2.800E-04	5.679E+14	15.88	9.600E+01	4.868E+08	26.79
5.750E-04	3.966E+14	14.92	1.000E+02	4.333E+08	27.10
1.275E-03	2.247E+14	13.98	1.100E+02	3.877E+08	27.36
2.000E-03	1.369E+14	13.13	1.200E+02	3.405E+08	27.54
3.400E-03	1.140E+14	12.29	1.300E+02	3.144E+08	27.64
5.500E-03	6.951E+13	11.50	1.400E+02	2.849E+08	27.67
9.200E-03	6.622E+13	10.82	1.500E+02	2.756E+08	27.64
1.200E-02	2.740E+13	9.35	1.600E+02	2.563E+08	27.57
5.250E-02	1.889E+13	7.72	1.700E+02	2.453E+08	27.48
1.000E-01	1.269E+13	6.88	1.800E+02	2.453E+08	27.40
2.000E-01	7.646E+12	6.15	1.900E+02	2.389E+08	27.34
5.000E-01	3.084E+12	5.75	2.000E+02	2.366E+08	27.42
1.000E+00	1.203E+12	7.38	2.200E+02	2.230E+08	27.66
2.000E+00	5.391E+11	10.64	2.400E+02	2.198E+08	28.00
3.000E+00	2.990E+11	13.51	2.600E+02	2.109E+08	28.46
4.000E+00	1.832E+11	14.92	2.800E+02	2.002E+08	29.07
5.000E+00	1.090E+11	15.01	3.000E+02	1.973E+08	29.83
6.000E+00	7.204E+10	15.01	3.200E+02	1.985E+08	30.77
7.000E+00	4.580E+10	14.96	3.400E+02	1.866E+08	31.87
8.000E+00	3.302E+10	14.90	3.600E+02	1.880E+08	33.12
9.000E+00	2.504E+10	14.85	3.800E+02	1.892E+08	34.52
1.000E+01	1.757E+10	14.84	4.000E+02	1.828E+08	35.02
1.100E+01	1.511E+10	14.91	4.200E+02	1.779E+08	34.49
1.200E+01	1.308E+10	15.02	4.400E+02	1.692E+08	33.89
1.300E+01	1.229E+10	15.19	4.600E+02	1.631E+08	33.17
1.400E+01	1.128E+10	15.40	4.800E+02	1.594E+08	32.32
1.500E+01	1.010E+10	15.66	5.000E+02	1.525E+08	31.32
1.600E+01	9.040E+09	15.95	5.200E+02	1.430E+08	30.16
1.700E+01	8.293E+09	16.26	5.400E+02	1.361E+08	28.83
1.800E+01	7.994E+09	16.57	5.600E+02	1.217E+08	26.15
1.900E+01	7.107E+09	16.88	6.000E+02	1.118E+08	22.03
2.000E+01	6.304E+09	17.36	6.400E+02	1.029E+08	17.64
2.400E+01	5.181E+09	17.97	6.800E+02	9.339E+07	13.03
2.800E+01	4.328E+09	18.51	7.200E+02	8.358E+07	8.29
3.200E+01	3.714E+09	18.99	7.600E+02	7.638E+07	3.93

SUMMARY OF BROAD-GROUP FLUXES, FLUENCES, AND UNCERTAINTIES

IRRAD TIME(S) = 6.336E+06 ACT NORM = 3.255E+00

ENERGY	FLUX	FLUENCE	SDEV
TOTAL	1.230E+13	2.395E+19 +/-	8.07
1.000E-10	2.599E+10	5.060E+16 +/-	34.08
1.150E-07	2.673E+11	5.202E+17 +/-	23.99
1.350E-05	3.998E+12	7.783E+18 +/-	11.01
1.000E-01	5.105E+12	9.937E+18 +/-	6.20
1.000E+00	2.509E+12	4.884E+18 +/-	10.01
1.000E+01	1.119E+11	2.177E+17 +/-	14.66
2.000E+01	9.094E+10	1.770E+17 +/-	18.08
4.000E+01	7.411E+10	1.443E+17 +/-	20.43
1.000E+02	3.022E+10	5.883E+16 +/-	26.14
2.000E+02	8.014E+10	1.560E+17 +/-	24.56

SUMMARY OF INTEGRATED GROUP ENERGY FLUXES AND FLUENCES

ENERGY MeV	FLUX n/cm2-s-mA	FLUX n/cm2-s	FLUENCE n/cm2	STANDARD DEVIATION	%
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<1.0	4.292E+12	1.318E+12	3.354E+18	-/-11.01	34.88
0.1-1.0	5.105E+12	1.568E+12	9.937E+18	+/- 6.20	41.49
1.0-10.0	2.509E+12	7.709E+11	4.884E+18	+/-10.01	20.39
10.0-20.0	1.119E+11	3.437E+10	2.177E+17	+/-14.66	.91
20.0-40.0	9.094E+10	2.794E+10	1.770E+17	+/-18.08	.74
40.0-100.0	7.411E+10	2.277E+10	1.443E+17	+/-20.43	.60
100.0-200.0	3.022E+10	9.285E+09	5.883E+16	+/-26.14	.25
>200.0	8.014E+10	2.462E+10	1.560E+17	+/-24.56	.65
TOTAL	1.230E+13	3.780E+12	2.395E+19	-/- 8.07	

THE PERCENTAGE OF NEUTRONS ABOVE 20 MeV IS - 2.24

RELATIVE COVARIANCES(10X10)

1000	906	410	130	52	-15	4	10	6	5
1000	696	367	238	-38	-59	-25	14	16	
1000	880	753	38	-229	-167	32	54		
1000	933	207	-237	-237	20	76			
1000	433	-154	-271	-12	83				
1000	673	128	-250	-61					
1000	692	-226	-303						
1000	283	-488							
1000	27								
1000									

6-1 TO 6-5

100 13 2 0 0
 .0050 20.0000 .0300 20.0000 .0300 .0300 3.2550
 .0000 0 0 6.3360E+06
 FE54PX 2.201E-13 .10 .00 .00
 FE58G 8.346E-14 .10 .00SFSH IFX 4.76FENG
 CO592 2.915E-14 .10 .00 .00
 CO593 1.089E-14 .10 .00 .00
 CO59G 2.459E-12 .15 .00SFSH IFX 1.96CONG
 NI60P 7.789E-15 .15 .00 .00
 CUX54MN 8.992E-16 .10 .00 .00
 CUX59FE 2.621E-16 .25 .00 .00
 CUX56CO 4.796E-16 .10 .00 .00
 CUX57CO 2.371E-15 .10 .00 .00
 CUX58CO 4.061E-15 .10 .00 .00
 CUX60CO 2.757E-15 .25 .00 .00
 NB93N 2.273E-13 .20 .00 .00

0 FRACTIONAL ERRORS IN INPUT SPECTRUM
 16 1.000E+00

1.000E-11 1.000E-07 1.000E-05 1.000E-03 1.000E-02 1.000E-01 4.000E-01 1.000E+00
 4.000E+00 1.000E+01 2.000E+01 4.400E+01 1.000E+02 4.000E+02 8.000E+02 0.000E+00
 5.000E-01 4.000E-01 2.800E-01 2.000E-01 1.500E-01 1.000E-01 8.000E-02 8.000E-02
 2.500E-01 3.000E-01 3.500E-01 4.000E-01 5.000E-01 6.000E-01 0.000E+00 0.000E+00

1 INPUT SPECTRUM

100 1.000E+00
 3.807E+17 1.697E+17 1.586E+17 1.264E+17 1.093E+17 8.165E+16 5.668E+16 3.587E+16
 2.189E+16 1.373E+16 7.049E+15 3.772E+15 2.262E+15 1.413E+15 9.417E+14 4.708E+14
 2.446E+14 1.634E+14 1.299E+14 9.805E+13 7.778E+13 7.036E+13 3.239E+13 1.827E+13
 1.506E+13 7.484E+12 3.313E+12 1.455E+12 7.209E+11 3.507E+11 1.741E+11 6.522E+10
 3.996E+10 2.991E+10 2.362E+10 1.861E+10 1.533E+10 1.329E+10 1.137E+10 9.749E+09
 9.116E+09 8.719E+09 8.355E+09 8.020E+09 7.749E+09 7.518E+09 6.677E+09 5.677E+09
 4.888E+09 4.269E+09 3.701E+09 3.227E+09 2.834E+09 2.479E+09 2.153E+09 1.856E+09
 1.605E+09 1.358E+09 1.166E+09 9.801E+08 8.572E+08 7.813E+08 6.823E+08 6.208E+08
 5.492E+08 4.895E+08 4.343E+08 3.859E+08 3.477E+08 3.174E+08 3.036E+08 2.933E+08
 2.814E+08 2.770E+08 2.747E+08 2.790E+08 2.642E+08 2.507E+08 2.348E+08 2.250E+08
 2.131E+08 1.994E+08 1.873E+08 1.828E+08 1.729E+08 1.612E+08 1.587E+08 1.513E+08
 1.397E+08 1.315E+08 1.261E+08 1.212E+08 1.146E+08 1.105E+08 1.012E+08 9.148E+07
 8.162E+07 7.436E+07 6.796E+07 6.250E+07

TITLE: 6-1 TO 6-5

NGROUP= 100 NFOIL= 13 ACTIVITY NORM= 3.255E+00
 REACTIONS COVER ACTIVITIES SELF-SHIELDING
 FE54(N,*)MN54 .00 7.164E-13 .00
 FE58(N,G)FE59 .00 2.717E-13 IFX FENG 4.76
 CO59(N,2N)CO58 .00 9.488E-14 .00
 CO59(N,3N)CO57 .00 3.545E-14 .00
 CO59(N,G)CO60 .00 3.004E-12 IFX CONG 1.96
 NI60(N,P)CO60 .00 2.535E-14 .00
 CU(N,*)54MN .00 2.927E-15 .00
 CU(N,*)59FE .00 8.531E-16 .00
 CU(N,*)56CO .00 1.561E-15 .00
 CU(N,*)57CO .00 7.718E-15 .00
 CU(N,*)58CO .00 1.322E-14 .00
 CU(N,*)60CO .00 8.974E-15 .00
 NB93(N,N')NB93M .00 7.399E-13 .00

COVARIANCE PARAMETERS

FLUXES: WIDTH = 2.0000E+01 FCOV = 3.0000E-02
 SIGMAS: WIDTH = 2.0000E+01 XCOV = 3.0000E-02
 ACTIVITIES = 5.0000E-03 CROSS SECTIONS = 3.0000E-02

DETERM = 2.244*10** -19.00 ERROR = -3.558E-15

INPUT NORMALIZATION DATA

AK1= .0000 VAK= .00090 NORM= 0 RENORM= 1.0499 CHI 2 = 20.4479

DOSIMETRY ACTIVITIES

MEASURED +/-%	BEFORE	DIF%	AFTER	DIF%	CHI	REACTION	90 % LIMITS
1 7.16E+11 10.0	7.80E+11	-8.9	7.50E+11	-4.6	.2	FE54(N,*)MN54	2.00E+00 4.20E+02
2 2.72E+11 10.0	2.70E+11	.7	2.69E+11	.9	.0	FE58(N,G)FE59	2.30E-08 2.00E-01
3 9.49E+10 10.0	1.01E+11	-7.0	9.52E+10	-.3	.0	CO59(N,2N)CO58	1.20E+01 3.60E+01

7 19.40 47 58 40 13 19 361000
8 17.29 52 65 44 14 21 41 271000
9 15.20 60 74 51 16 24 46 31 341000
10 11.28 80 100 68 22 32 62 41 46 531000
11 10.37 88 109 74 24 35 68 45 50 57 771000
12 11.50 79 98 67 22 31 61 40 45 52 69 761000
13 97.98 9 12 8 3 4 7 5 5 6 8 9 81000

DIFFERENTIAL FLUXES INPUT NORMALIZED BY 1.0499									
G	ENERGY	NEW	OLD	RATIO	STD DEV %	NEW	OLD	RATIO	INT FLUX >+-%
1	1.000E-10	4.152E+17	3.997E+17	1.039	36.14	46.08	.784	1.312E+13	6.52
2	1.000E-09	1.848E+17	1.782E+17	1.037	33.04	43.59	.758	1.312E+13	6.52
3	1.000E-08	1.725E+17	1.665E+17	1.036	30.66	41.96	.731	1.312E+13	6.52
4	2.300E-08	1.373E+17	1.327E+17	1.035	28.92	41.15	.703	1.312E+13	6.52
5	5.000E-08	1.186E+17	1.148E+17	1.033	27.12	40.22	.674	1.311E+13	6.52
6	1.150E-07	8.834E+16	8.573E+16	1.030	24.87	38.49	.646	1.311E+13	6.53
7	2.550E-07	6.113E+16	5.951E+16	1.027	22.42	36.24	.619	1.309E+13	6.53
8	5.500E-07	3.855E+16	3.766E+16	1.024	20.18	34.06	.592	1.308E+13	6.54
9	1.275E-06	2.344E+16	2.298E+16	1.020	18.19	32.00	.568	1.305E+13	6.55
10	2.800E-06	1.465E+16	1.442E+16	1.016	16.47	30.10	.547	1.301E+13	6.56
11	6.300E-06	7.496E+15	7.401E+15	1.013	15.01	28.35	.530	1.296E+13	6.57
12	1.350E-05	3.997E+15	3.960E+15	1.009	13.82	26.77	.516	1.291E+13	6.58
13	3.000E-05	2.389E+15	2.375E+15	1.006	12.80	25.25	.507	1.284E+13	6.59
14	6.900E-05	1.487E+15	1.484E+15	1.002	12.14	24.17	.502	1.275E+13	6.60
15	1.000E-04	9.877E+14	9.887E+14	.999	11.55	22.99	.502	1.270E+13	6.60
16	2.800E-04	4.922E+14	4.943E+14	.996	10.92	21.59	.506	1.252E+13	6.59
17	5.750E-04	2.550E+14	2.568E+14	.993	10.42	20.33	.513	1.238E+13	6.58
18	1.275E-03	1.699E+14	1.716E+14	.990	9.97	19.10	.522	1.220E+13	6.57
19	2.000E-03	1.347E+14	1.364E+14	.988	9.59	18.00	.533	1.208E+13	6.55
20	3.400E-03	1.015E+14	1.029E+14	.986	9.21	16.92	.544	1.189E+13	6.53
21	5.500E-03	8.035E+13	8.166E+13	.984	8.85	15.94	.555	1.167E+13	6.50
22	9.200E-03	7.256E+13	7.387E+13	.982	8.56	15.14	.566	1.138E+13	6.46
23	1.200E-02	3.341E+13	3.401E+13	.983	7.60	13.20	.576	1.117E+13	6.44
24	5.250E-02	1.888E+13	1.918E+13	.984	6.46	11.01	.587	9.821E+12	6.32
25	1.000E-01	1.556E+13	1.581E+13	.984	5.91	9.93	.595	8.924E+12	6.33
26	2.000E-01	7.739E+12	7.858E+12	.985	5.41	8.98	.602	7.368E+12	6.45
27	5.000E-01	3.426E+12	3.478E+12	.985	5.17	8.54	.605	5.046E+12	7.00
28	1.000E+00	1.494E+12	1.528E+12	.978	6.72	11.47	.586	3.333E+12	8.06
29	2.000E+00	7.299E+11	7.569E+11	.964	9.86	17.19	.573	1.840E+12	9.33
30	3.000E+00	3.503E+11	3.682E+11	.951	12.72	22.56	.564	1.110E+12	9.24
31	4.000E+00	1.724E+11	1.828E+11	.943	14.20	25.73	.552	7.596E+11	8.12
32	5.000E+00	6.434E+10	6.848E+10	.940	14.39	26.77	.538	5.872E+11	7.14
33	6.000E+00	3.932E+10	4.195E+10	.937	14.42	27.67	.521	5.229E+11	6.82
34	7.000E+00	2.937E+10	3.140E+10	.935	14.32	28.47	.503	4.836E+11	6.70
35	8.000E+00	2.317E+10	2.480E+10	.934	14.11	29.18	.484	4.542E+11	6.67
36	9.000E+00	1.824E+10	1.954E+10	.934	13.82	29.83	.463	4.310E+11	6.69
37	1.000E+01	1.502E+10	1.610E+10	.933	13.49	30.46	.443	4.128E+11	6.74
38	1.100E+01	1.303E+10	1.395E+10	.934	13.12	31.07	.422	3.978E+11	6.80
39	1.200E+01	1.115E+10	1.194E+10	.934	12.74	31.65	.402	3.847E+11	6.87
40	1.300E+01	9.570E+09	1.024E+10	.935	12.35	32.19	.384	3.736E+11	6.94
41	1.400E+01	8.959E+09	9.571E+09	.936	11.98	32.70	.366	3.640E+11	7.00
42	1.500E+01	8.579E+09	9.154E+09	.937	11.64	33.19	.351	3.551E+11	7.05
43	1.600E+01	8.231E+09	8.772E+09	.938	11.36	33.65	.338	3.465E+11	7.11
44	1.700E+01	7.909E+09	8.420E+09	.939	11.16	34.09	.327	3.383E+11	7.16
45	1.800E+01	7.649E+09	8.136E+09	.940	11.04	34.51	.320	3.303E+11	7.20
46	1.900E+01	7.426E+09	7.893E+09	.941	11.01	34.91	.315	3.227E+11	7.24
47	2.000E+01	6.593E+09	7.010E+09	.940	11.19	35.66	.314	3.153E+11	7.28
48	2.400E+01	5.598E+09	5.960E+09	.939	11.56	36.68	.315	2.889E+11	7.44
49	2.800E+01	4.814E+09	5.132E+09	.938	11.99	37.58	.319	2.665E+11	7.66
50	3.200E+01	4.197E+09	4.482E+09	.936	12.49	38.38	.325	2.473E+11	7.93
51	3.600E+01	3.632E+09	3.886E+09	.935	13.06	39.11	.334	2.305E+11	8.27
52	4.000E+01	3.159E+09	3.388E+09	.933	13.68	39.78	.344	2.159E+11	8.67
53	4.400E+01	2.767E+09	2.975E+09	.930	14.41	40.57	.355	2.033E+11	9.12
54	4.800E+01	2.413E+09	2.603E+09	.927	15.26	41.50	.368	1.922E+11	9.63
55	5.200E+01	2.089E+09	2.260E+09	.924	16.12	42.37	.381	1.826E+11	10.17
56	5.600E+01	1.795E+09	1.949E+09	.921	17.01	43.20	.394	1.742E+11	10.74
57	6.000E+01	1.548E+09	1.685E+09	.918	17.90	43.99	.407	1.670E+11	11.31
58	6.400E+01	1.306E+09	1.426E+09	.916	18.78	44.74	.420	1.609E+11	11.87
59	6.800E+01	1.119E+09	1.224E+09	.914	19.63	45.46	.432	1.556E+11	12.40
60	7.200E+01	9.399E+08	1.029E+09	.913	20.44	46.14	.443	1.512E+11	12.90
61	7.600E+01	8.220E+08	9.000E+08	.913	21.20	46.81	.453	1.474E+11	13.36
62	8.000E+01	7.499E+08	8.203E+08	.914	21.90	47.45	.462	1.441E+11	13.78
63	8.400E+01	6.564E+08	7.164E+08	.916	22.51	48.06	.468	1.411E+11	14.18

64	8.800E+01	5.994E+08	6.518E+08	.920	23.04	48.66	.474	1.385E+11	14.54
65	9.200E+01	5.330E+08	5.766E+08	.924	23.47	49.23	.477	1.361E+11	14.88
66	9.600E+01	4.783E+08	5.139E+08	.931	23.80	49.79	.478	1.340E+11	15.18
67	1.000E+02	4.278E+08	4.560E+08	.938	24.03	50.38	.477	1.320E+11	15.45
68	1.100E+02	3.838E+08	4.052E+08	.947	24.18	50.99	.474	1.278E+11	16.06
69	1.200E+02	3.497E+08	3.651E+08	.958	24.21	51.55	.470	1.239E+11	16.64
70	1.300E+02	3.232E+08	3.332E+08	.970	24.12	52.07	.463	1.204E+11	17.18
71	1.400E+02	3.135E+08	3.188E+08	.983	23.95	52.56	.456	1.172E+11	17.68
72	1.500E+02	3.073E+08	3.079E+08	.998	23.70	53.02	.447	1.141E+11	18.17
73	1.600E+02	2.995E+08	2.954E+08	1.014	23.41	53.46	.438	1.110E+11	18.64
74	1.700E+02	2.996E+08	2.908E+08	1.030	23.11	53.88	.429	1.080E+11	19.09
75	1.800E+02	3.021E+08	2.884E+08	1.047	22.83	54.27	.421	1.050E+11	19.52
76	1.900E+02	3.119E+08	2.929E+08	1.065	22.63	54.65	.414	1.020E+11	19.93
77	2.000E+02	3.004E+08	2.774E+08	1.083	22.60	55.17	.410	9.886E+10	20.32
78	2.200E+02	2.899E+08	2.632E+08	1.102	22.78	55.84	.408	9.285E+10	21.05
79	2.400E+02	2.761E+08	2.465E+08	1.120	23.14	56.45	.410	8.705E+10	21.74
80	2.600E+02	2.688E+08	2.362E+08	1.138	23.71	57.03	.416	8.153E+10	22.38
81	2.800E+02	2.585E+08	2.237E+08	1.155	24.51	57.56	.426	7.615E+10	22.95
82	3.000E+02	2.454E+08	2.094E+08	1.172	25.54	58.07	.440	7.098E+10	23.44
83	3.200E+02	2.336E+08	1.967E+08	1.188	26.80	58.55	.458	6.607E+10	23.82
84	3.400E+02	2.307E+08	1.919E+08	1.202	28.26	59.00	.479	6.140E+10	24.06
85	3.600E+02	2.206E+08	1.815E+08	1.215	29.90	59.43	.503	5.679E+10	24.14
86	3.800E+02	2.076E+08	1.692E+08	1.227	31.69	59.85	.529	5.238E+10	24.04
87	4.000E+02	2.049E+08	1.666E+08	1.230	32.63	58.55	.557	4.823E+10	23.72
88	4.200E+02	1.945E+08	1.589E+08	1.224	32.58	55.56	.586	4.413E+10	23.19
89	4.400E+02	1.784E+08	1.467E+08	1.216	32.37	52.56	.616	4.024E+10	22.54
90	4.600E+02	1.666E+08	1.381E+08	1.207	32.00	49.57	.646	3.667E+10	21.80
91	4.800E+02	1.583E+08	1.324E+08	1.195	31.44	46.58	.675	3.334E+10	20.94
92	5.000E+02	1.505E+08	1.273E+08	1.183	30.67	43.58	.704	3.017E+10	19.98
93	5.200E+02	1.407E+08	1.203E+08	1.169	29.69	40.59	.731	2.716E+10	18.89
94	5.400E+02	1.339E+08	1.160E+08	1.155	28.51	37.60	.758	2.435E+10	17.72
95	5.600E+02	1.204E+08	1.063E+08	1.134	25.95	33.12	.783	2.167E+10	16.44
96	6.000E+02	1.063E+08	9.605E+07	1.107	21.92	27.15	.807	1.685E+10	13.80
97	6.400E+02	9.260E+07	8.569E+07	1.081	17.59	21.20	.830	1.260E+10	11.14
98	6.800E+02	8.242E+07	7.807E+07	1.056	13.01	15.29	.851	8.895E+09	8.55
99	7.200E+02	7.365E+07	7.135E+07	1.032	8.29	9.48	.874	5.598E+09	6.06
100	7.600E+02	6.631E+07	6.562E+07	1.010	3.93	4.24	.926	2.652E+09	3.93

INTEGRALS OF SPECTRA

OLD SPECTRUM 1.337E+13 +OR- 12.150 %
 NEW SPECTRUM 1.312E+13 +OR- 6.515 %

ENERGY	FLUX	SDEV	ENERGY	FLUX	SDEV
1.000E-10	4.152E+17	36.14	3.600E+01	3.632E+09	13.06
1.000E-09	1.848E+17	33.04	4.000E+01	3.159E+09	13.68
1.000E-08	1.725E+17	30.66	4.400E+01	2.767E+09	14.41
2.300E-08	1.373E+17	28.92	4.800E+01	2.413E+09	15.26
5.000E-08	1.186E+17	27.12	5.200E+01	2.089E+09	16.12
1.150E-07	8.834E+16	24.87	5.600E+01	1.795E+09	17.01
2.550E-07	6.113E+16	22.42	6.000E+01	1.548E+09	17.90
5.500E-07	3.855E+16	20.18	6.400E+01	1.306E+09	18.78
1.275E-06	2.344E+16	18.19	6.800E+01	1.119E+09	19.63
2.800E-06	1.465E+16	16.47	7.200E+01	9.399E+08	20.44
6.300E-06	7.496E+15	15.01	7.600E+01	8.220E+08	21.20
1.350E-05	3.997E+15	13.82	8.000E+01	7.499E+08	21.90
3.000E-05	2.389E+15	12.80	8.400E+01	6.564E+08	22.51
6.900E-05	1.487E+15	12.14	8.800E+01	5.994E+08	23.04
1.000E-04	9.877E+14	11.55	9.200E+01	5.330E+08	23.47
2.800E-04	4.922E+14	10.92	9.600E+01	4.783E+08	23.80
5.750E-04	2.550E+14	10.42	1.000E+02	4.278E+08	24.03
1.275E-03	1.699E+14	9.97	1.100E+02	3.838E+08	24.18
2.000E-03	1.347E+14	9.59	1.200E+02	3.497E+08	24.21
3.400E-03	1.015E+14	9.21	1.300E+02	3.232E+08	24.12
5.500E-03	8.035E+13	8.85	1.400E+02	3.135E+08	23.95
9.200E-03	7.256E+13	8.56	1.500E+02	3.073E+08	23.70
1.200E-02	3.341E+13	7.60	1.600E+02	2.995E+08	23.41
5.250E-02	1.888E+13	6.46	1.700E+02	2.996E+08	23.11
1.000E-01	1.556E+13	5.91	1.800E+02	3.021E+08	22.83
2.000E-01	7.739E+12	5.41	1.900E+02	3.119E+08	22.63
5.000E-01	3.426E+12	5.17	2.000E+02	3.004E+08	22.60
1.000E+00	1.494E+12	6.72	2.200E+02	2.899E+08	22.78
2.000E+00	7.299E+11	9.86	2.400E+02	2.761E+08	23.14
3.000E+00	3.503E+11	12.72	2.600E+02	2.688E+08	23.71

4.000E+00	1.724E+11	14.20	2.800E+02	2.585E+08	24.51
5.000E+00	5.434E+10	14.39	3.000E+02	2.454E+08	25.54
6.000E+00	3.932E+10	14.42	3.200E+02	2.336E+08	26.80
7.000E+00	2.937E+10	14.32	3.400E+02	2.307E+08	28.26
8.000E+00	2.317E+10	14.11	3.600E+02	2.206E+08	29.90
9.000E+00	1.824E+10	13.82	3.800E+02	2.076E+08	31.69
1.000E+01	1.502E+10	13.49	4.000E+02	2.049E+08	32.63
1.100E+01	1.303E+10	13.12	4.200E+02	1.945E+08	32.58
1.200E+01	1.115E+10	12.74	4.400E+02	1.784E+08	32.37
1.300E+01	9.570E+09	12.35	4.600E+02	1.666E+08	32.00
1.400E+01	8.959E+09	11.98	4.800E+02	1.583E+08	31.44
1.500E+01	8.579E+09	11.64	5.000E+02	1.505E+08	30.67
1.600E+01	8.231E+09	11.36	5.200E+02	1.407E+08	29.69
1.700E+01	7.909E+09	11.16	5.400E+02	1.339E+08	28.51
1.800E+01	7.649E+09	11.04	5.600E+02	1.204E+08	25.95
1.900E+01	7.426E+09	11.01	6.000E+02	1.063E+08	21.92
2.000E+01	6.593E+09	11.19	6.400E+02	9.260E+07	17.59
2.400E+01	5.598E+09	11.56	6.800E+02	8.242E+07	13.01
2.800E+01	4.814E+09	11.99	7.200E+02	7.365E+07	8.29
3.200E+01	4.197E+09	12.49	7.600E+02	6.631E+07	3.93

SUMMARY OF BROAD-GROUP FLUXES, FLUENCES, AND UNCERTAINTIES

IRRAD TIME(S) = 6.336E+06 ACT NORM = 3.255E+00

ENERGY	FLUX	FLUENCE	SDEV
TOTAL	1.312E+13	2.554E+19 +/-	6.52
1.000E-10	1.570E+10	3.055E+16 +/-	28.77
1.150E-07	1.993E+11	3.880E+17 +/-	17.70
1.350E-05	3.982E+12	7.751E+18 +/-	7.91
1.000E-01	5.591E+12	1.088E+19 +/-	5.47
1.000E+00	2.921E+12	5.686E+18 +/-	9.00
1.000E+01	9.752E+10	1.898E+17 +/-	11.42
2.000E+01	9.934E+10	1.934E+17 +/-	11.68
4.000E+01	8.390E+10	1.633E+17 +/-	15.88
1.000E+02	3.318E+10	6.459E+16 +/-	22.33
2.000E+02	8.996E+10	1.751E+17 +/-	21.87

SUMMARY OF INTEGRATED GROUP ENERGY FLUXES AND FLUENCES

ENERGY MeV	FLUX n/cm2-s-mA	FLUX n/cm2-s	FLUENCE n/cm2	STANDARD DEVIATION	%
<1.0	4.197E+12	1.289E+12	8.170E+18	-/- 7.91	31.99
0.1-1.0	5.591E+12	1.718E+12	1.088E+19	+/- 5.47	42.61
1.0-10.0	2.921E+12	8.974E+11	5.686E+18	-/- 9.00	22.26
10.0-20.0	9.752E+10	2.996E+10	1.898E+17	-/-11.42	.74
20.0-40.0	9.934E+10	3.052E+10	1.934E+17	-/-11.68	.76
40.0-100.0	8.390E+10	2.578E+10	1.633E+17	-/-15.88	.64
100.0-200.0	3.318E+10	1.019E+10	6.459E+16	-/-22.33	.25
>200.0	8.996E+10	2.764E+10	1.751E+17	-/-21.87	.69
TOTAL	1.312E+13	4.031E+12	2.554E+19	-/- 6.52	

THE PERCENTAGE OF NEUTRONS ABOVE 20 MeV IS - 2.33

RELATIVE COVARIANCES(10X10)

1000	889	42	-179	-204	-34	95	61	2	6
1000	373	40	-38	-26	79	65	14	13	
1000	886	794	233	-125	-71	70	55		
1000	945	393	-163	-151	77	79			
1000	567	-146	-214	82	104				
1000	489	-110	-115	109					
1000	593	-226	-223						
1000	290	-563							
1000	-127								
1000									