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Calculated Neutron Spectrum from 800-MeV Protons Incident on a Copper Beam Stop

by

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CALCULATED NEUTRON SPECTRUM FROM 800-MeV
PROTONS INCIDENT ON A COPPER BEAM STOP

by

Dennis G. Perry

ABSTRACT

A Monte Carlo calculation has been performed to obtain the neutron spectrum generated by 800-MeV protons incident on the LAMPF main copper beam stop. The total flux is calculated to be of the order of 10^{13} n/cm²-sec-mA at full-beam intensity of 1 mA, with flux spectra calculated for angles of 20°, 30°, 60°, 90°, 120°, and 150°.

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I. INTRODUCTION

The Clinton P. Anderson Meson Physics Facility (LAMPF) is designed to be a high-intensity proton accelerator of medium energy (800 MeV). The primary purpose is to generate mesons of an intensity not obtainable elsewhere.¹ Thus, it is primarily a tool for the atomic, nuclear, and elementary particle physicist and nuclear chemist, but it also has important applications in medicine, isotope production, defense science, and in the study of the structure of materials. Some of these applications use the primary proton beam, while others use the proton beam as a means of generating the secondary particle beam of interest.

One of these secondary reactions of interest to the radio and nuclear chemist as well as the materials scientist is the neutron flux generated at the main LAMPF proton beam stop. Because the proton beam is expected to reach an intensity of 1 mA, the neutron flux generated should be one of the most intense available on a continuing, long-term basis anywhere in the world. Because of this intensity, the source of neutrons has attracted interest from the nuclear chemists and materials scientists in various programs. Because of the intense neutron flux expected in a Controlled Thermonuclear Reactor (CTR), this source of neutrons can be expected to play

a large role in developing materials damage information related to a CTR. But, what intensity can one expect from this source, and what is the spectrum shape? These questions can be preliminarily answered by theoretical calculations.

II. CALCULATION

A Monte Carlo calculation has been performed to estimate the neutron spectrum emerging from the LAMPF Area A beam stop. This calculation gives a predicted spectral shape as well as an expected total intensity. These estimates are useful to those planning experiments at LAMPF, as well as initial estimates for unfolding the differential neutron spectrum from measured integral foil activities.

The incident proton beam is assumed to have a Gaussian intensity distribution with 95% of the protons contained within a radius of 5.7 cm.² The proton energy incident on the beam stop is assumed to be 750 MeV, allowing 50 MeV of energy loss in the various upstream production targets.

A cross-sectional view of the beam stop configuration for these calculations is shown schematically in Fig. 1. Also shown in Fig. 1 is a pneumatic transfer line (rabbit). The neutrons generated in the copper beam stop have been transported to the interior of the rabbit and analyzed as a

TABLE I
DIMENSIONS AND COMPOSITION OF BEAM STOP AREA

Area	Composition	Boundary	Radius (cm)	Length (cm)
1	Cu	1	8.81	43.18
2	Cu + H ₂ O	2	10.08	43.18
3	H ₂ O	3	10.33	43.18
4	Cu	4	10.41	43.18
5	void	5	11.68	205.00
6	Fe	6	90.00	205.00
10	void	10	3.81	137.16
11	Fe	11	3.66	137.16
12	H ₂ O	12	3.98	137.16
13	Fe	13	4.13	137.16

function of angle with respect to the center of the beam stop. The detailed composition and dimensions of the beam stop and adjacent rabbit are given in Table I, with the numbering system corresponding to that of Fig. 1. The numbers within an area refer to the composition, and the numbers on the lines refer to boundary dimensions. The beam stop may be moved parallel to the rabbit for a total of 66.04 cm (see Fig. 2). In the extreme downstream position, the beam stop extends beyond the straight water cooled portion of the rabbit by 3.81 cm. In the extreme upstream position, the straight water cooled portion of the rabbit extends beyond the face of the beam stop by 31.75 cm.

The Monte Carlo calculations were performed on the Los Alamos Scientific Laboratory (LASL) CDC-6600 and CDC-7600 computers using the computer codes NMTC³ and MCN.⁴ For a previous comparison of experimental measurements and the output from these codes, see, for example, Ref. 5. The two codes are complimentary to each other in their calculation of the neutron spectrum. The code NMTC is used first to generate neutrons of all energies from the proton interaction with the copper beam stop. NMTC

then transports to the required boundary those neutrons above some minimum energy, e.g., 20 MeV in these calculations. The code MCN is then used to transport those neutrons below 20 MeV to the same boundary.

The calculations reported here were performed in several steps. In the first step the neutron spectrum was calculated for the surface of the copper beam stop. The second step was to transport the neutrons from the surface of the beam stop to the outer boundary of steel located 90 cm from the center of the beam stop. Those neutrons which entered the rabbit line were lost to this transport calculation.

The neutrons which entered the rabbit line were then analyzed to obtain the flux as a function of energy and angle with respect to the center of the beam stop. The differential flux, the integral flux, and the flux per unit lethargy are illustrated in Figs. 3-8 for different angles. The angles plotted are defined as the angle between the center of the beam stop and the chosen location in the rabbit line. The flux data of Figs. 3-8 are presented in tabular form in Tables II-VIII.

REFERENCES

1. L. Rosen and D. Nagle, "Introduction to the Proposed Los Alamos Meson Project," Los Alamos Scientific Laboratory report LA-3025-MS.
2. H. Howard, Los Alamos Scientific Laboratory, private communication, 1973.
3. W. A. Coleman and T. W. Armstrong, "The Nucleon-Meson Transport Code, NMTC," Oak Ridge National Laboratory report ORNL-46-6 (October 1970).
4. E. D. Cashwell, J. R. Neergaard, W. M. Taylor, and G. D. Turner, "MCN: A Neutron Monte Carlo Code," Los Alamos Scientific Laboratory report LA-4751 (January 1972).
5. R. R. Fullwood, J. D. Cramer, R. A. Haarman, R. P. Forrest, Jr., and R. G. Schrandt, "Neutron Production by Medium-Energy Protons on Heavy Metal Targets," Los Alamos Scientific Laboratory report LA-4789 (January 1972).

TABLE II
RABBIT NEUTRON FLUX AT 20°

DIFFERENTIAL FLUX, UNITS= NEUTRONS/CM*2-MEV-P

E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)
1.00000E-08	0.	1.3352E-08	1.25000E-01	2.37137E-08	1.25000E-01	4.21697E-08	1.25000E-01	4.21697E-08	1.25000E-01
7.49894E-08	1.25000E-01	1.3352E-07	1.25000E-01	2.37137E-07	1.25000E-01	4.21697E-07	1.25000E-01	4.21697E-07	1.25000E-01
7.49894E-07	1.24312E-01	1.3352E-06	1.24312E-01	2.37137E-06	1.24312E-01	4.21697E-06	1.24312E-01	4.21697E-06	1.24312E-01
7.49894E-06	7.26274E-02	1.3352E-05	5.48265E-02	2.37137E-05	3.38748E-02	4.21697E-05	3.38748E-02	4.21697E-05	3.38748E-02
7.49894E-05	6.52879E-03	1.3352E-04	4.27950E-03	2.37137E-04	2.32672E-03	4.21697E-04	2.32672E-03	4.21697E-04	2.32672E-03
7.49894E-04	2.52400E-03	1.3352E-03	1.04145E-03	2.37137E-03	5.82498E-04	4.21697E-03	5.82498E-04	4.21697E-03	5.82498E-04
7.49894E-03	5.07435E-04	1.3352E-02	8.83748E-04	2.37137E-02	6.07839E-04	4.21697E-02	6.07839E-04	4.21697E-02	6.07839E-04
7.49894E-02	1.24750E-04	1.3352E-01	1.85239E-04	2.37137E-01	1.40531E-04	4.21697E-01	1.40531E-04	4.21697E-01	1.40531E-04
7.49894E-01	1.79372E-05	1.3352E+00	4.16761E-06	2.37137E+00	1.68421E-06	4.21697E+00	1.68421E-06	4.21697E+00	1.68421E-06
7.49894E+00	5.70397E-07	1.3352E+01	1.47419E-07	2.37137E+01	1.30257E-07	4.21697E+01	1.30257E-07	4.21697E+01	1.30257E-07
7.49894E+01	6.17356E-08	1.3352E+02	7.14533E-08	2.37137E+02	2.94519E-08	4.21697E+02	2.94519E-08	4.21697E+02	2.94519E-08
5.92453E+02	1.17131E-08								

FLUX PER UNIT LETHARGY, UNITS= NEUTRONS/CM*2-P

E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)
1.00000E-08	0.	1.3352E-08	3.89139E-09	2.37137E-08	6.91998E-09	4.21697E-08	6.91998E-09	4.21697E-08	6.91998E-09
7.49894E-08	2.18829E-08	1.3352E-07	3.89139E-08	2.37137E-07	6.91998E-08	4.21697E-07	6.91998E-08	4.21697E-07	6.91998E-08
7.49894E-07	2.17625E-07	1.3352E-06	3.86998E-07	2.37137E-06	6.88189E-07	4.21697E-06	6.88189E-07	4.21697E-06	6.88189E-07
7.49894E-06	1.26033E-06	1.3352E-05	1.70681E-06	2.37137E-05	1.87530E-06	4.21697E-05	1.87530E-06	4.21697E-05	1.87530E-06
7.49894E-05	1.49348E-06	1.3352E-04	1.33226E-06	2.37137E-04	1.79184E-06	4.21697E-04	1.79184E-06	4.21697E-04	1.79184E-06
7.49894E-04	4.42015E-06	1.3352E-03	3.24216E-06	2.37137E-03	3.22469E-06	4.21697E-03	3.22469E-06	4.21697E-03	3.22469E-06
7.49894E-03	8.63311E-06	1.3352E-02	7.51211E-05	2.37137E-02	3.36498E-05	4.21697E-02	3.36498E-05	4.21697E-02	3.36498E-05
7.49894E-02	2.18398E-05	1.3352E-01	5.76672E-05	2.37137E-01	8.00119E-05	4.21697E-01	8.00119E-05	4.21697E-01	8.00119E-05
7.49894E-01	3.14014E-05	1.3352E+00	1.29743E-05	2.37137E+00	9.32373E-06	4.21697E+00	9.32373E-06	4.21697E+00	9.32373E-06
7.49894E+00	9.98553E-06	1.3352E+01	4.58934E-06	2.37137E+01	7.21098E-06	4.21697E+01	7.21098E-06	4.21697E+01	7.21098E-06
7.49894E+01	1.04076E-05	1.3352E+02	2.22443E-05	2.37137E+02	1.63045E-05	4.21697E+02	1.63045E-05	4.21697E+02	1.63045E-05
5.92453E+02	1.59859E-05	6.24177E+02	0.						

INTEGRAL FLUX, UNITS= NEUTRONS/CM*2-P

E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)
1.00000E-08	0.	1.3352E-08	1.26772E-04	2.37137E-08	1.26772E-04	4.21697E-08	1.26772E-04	4.21697E-08	1.26772E-04
7.49894E-08	1.26766E-04	1.3352E-07	1.26761E-04	2.37137E-07	1.26751E-04	4.21697E-07	1.26751E-04	4.21697E-07	1.26751E-04
7.49894E-07	1.26703E-04	1.3352E-06	1.26640E-04	2.37137E-06	1.26552E-04	4.21697E-06	1.26552E-04	4.21697E-06	1.26552E-04
7.49894E-06	1.26147E-04	1.3352E-05	1.25832E-04	2.37137E-05	1.25405E-04	4.21697E-05	1.25405E-04	4.21697E-05	1.25405E-04
7.49894E-05	1.24518E-04	1.3352E-04	1.24145E-04	2.37137E-04	1.23812E-04	4.21697E-04	1.23812E-04	4.21697E-04	1.23812E-04
7.49894E-04	1.22456E-04	1.3352E-03	1.21351E-04	2.37137E-03	1.20541E-04	4.21697E-03	1.20541E-04	4.21697E-03	1.20541E-04
7.49894E-03	1.18648E-04	1.3352E-02	1.16427E-04	2.37137E-02	1.09550E-04	4.21697E-02	1.09550E-04	4.21697E-02	1.09550E-04
7.49894E-02	9.45976E-05	1.3352E-01	8.89374E-05	2.37137E-01	7.45214E-05	4.21697E-01	7.45214E-05	4.21697E-01	7.45214E-05
7.49894E-01	4.18460E-05	1.3352E+00	3.39953E-05	2.37137E+00	3.07519E-05	4.21697E+00	3.07519E-05	4.21697E+00	3.07519E-05
7.49894E+00	2.50896E-05	1.3352E+01	2.25932E-05	2.37137E+01	2.14459E-05	4.21697E+01	2.14459E-05	4.21697E+01	2.14459E-05
7.49894E+01	1.67858E-05	1.3352E+02	1.40838E-05	2.37137E+02	6.52288E-06	4.21697E+02	6.52288E-06	4.21697E+02	6.52288E-06
5.92453E+02	7.24287E-07	6.24177E+02	0.						

TABLE III
RABBIT NEUTRON FLUX AT 30°

DIFFERENTIAL FLUX, UNITS= NEUTRONS/CM**2-MEV-P

E(MEV)	V(UNITS)	E(MEV)	V(UNITS)	E(MEV)	V(UNITS)	E(MEV)	V(UNITS)
1.00000E-08	0.	1.33352E-08	5.00000E-01	2.37137E-08	5.00000E-01	4.21697E-08	5.00000E-01
7.49894E-08	5.00000E-01	1.33352E-07	5.00000E-01	2.37137E-07	4.50000E-01	4.21697E-07	4.00000E-01
7.49894E-07	3.50000E-01	1.33352E-06	3.00000E-01	2.37137E-06	2.22960E-01	4.21697E-06	1.06964E-01
7.49894E-06	7.05175E-02	1.33352E-05	8.80952E-02	2.37137E-05	6.79434E-02	4.21697E-05	3.60544E-02
7.49894E-05	1.91324E-02	1.33352E-04	1.01526E-02	2.37137E-04	5.22556E-03	4.21697E-04	2.60894E-03
7.49894E-04	2.38145E-03	1.33352E-03	3.96839E-03	2.37137E-03	4.45304E-03	4.21697E-03	3.36820E-03
7.49894E-03	2.35099E-03	1.33352E-02	1.51462E-03	2.37137E-02	1.24437E-03	4.21697E-02	7.10590E-04
7.49894E-02	3.26649E-04	1.33352E-01	3.85380E-04	2.37137E-01	3.62062E-04	4.21697E-01	2.39511E-04
7.49894E-01	9.69442E-05	1.33352E+00	5.95457E-05	2.37137E+00	9.81996E-06	4.21697E+00	1.25573E-05
7.49894E+00	3.56627E-06	1.33352E+01	5.46442E-07	2.37137E+01	3.95537E-07	4.21697E+01	3.64686E-07
7.49894E+01	1.73385E-07	1.33352E+02	6.78233E-08	2.37137E+02	3.05707E-08	4.21697E+02	4.20376E-08
5.92453E+02	1.29403E-08						

FLUX PER UNIT LETHARGY, UNITS= NEUTRONS/CM**2-P

E(MEV)	V(UNITS)	E(MEV)	V(UNITS)	E(MEV)	V(UNITS)	E(MEV)	V(UNITS)
1.00000E-08	0.	1.33352E-08	1.55656E-08	2.37137E-08	2.76799E-08	4.21697E-08	4.92228E-08
7.49894E-08	8.75317E-08	1.33352E-07	1.55656E-07	2.37137E-07	2.49119E-07	4.21697E-07	3.93782E-07
7.49894E-07	6.12722E-07	1.33352E-06	9.33935E-07	2.37137E-06	1.23430E-06	4.21697E-06	1.05301E-06
7.49894E-06	1.37455E-06	1.33352E-05	2.74251E-06	2.37137E-05	3.76133E-06	4.21697E-05	3.54940E-06
7.49894E-05	3.34938E-06	1.33352E-04	3.16062E-06	2.37137E-04	2.89286E-06	4.21697E-04	2.56839E-06
7.49894E-04	4.16904E-06	1.33352E-03	1.23541E-05	2.37137E-03	2.46519E-05	4.21697E-03	3.31505E-05
7.49894E-03	4.11571E-05	1.33352E-02	4.71520E-05	2.37137E-02	6.88880E-05	4.21697E-02	6.90546E-05
7.49894E-02	5.71841E-05	1.33352E-01	1.19973E-04	2.37137E-01	2.00436E-04	4.21697E-01	2.35789E-04
7.49894E-01	1.69713E-04	1.33352E+00	1.85373E-04	2.37137E+00	5.43630E-05	4.21697E+00	1.23621E-04
7.49894E+00	6.24321E-05	1.33352E+01	1.70114E-05	2.37137E+01	2.19189E-05	4.21697E+01	3.59018E-05
7.49894E+01	3.03533E-05	1.33352E+02	2.11142E-05	2.37137E+02	1.69238E-05	4.21697E+02	4.13843E-05
5.92453E+02	1.76608E-05	6.24177E+02	0.				

INTEGRAL FLUX, UNITS= NEUTRONS/CM**2-P

E(MEV)	V(UNITS)	E(MEV)	V(UNITS)	E(MEV)	V(UNITS)	E(MEV)	V(UNITS)
1.00000E-08	0.	1.33352E-08	4.31596E-04	2.37137E-08	4.31592E-04	4.21697E-08	4.31585E-04
7.49894E-08	4.31573E-04	1.33352E-07	4.31551E-04	2.37137E-07	4.31512E-04	4.21697E-07	4.31450E-04
7.49894E-07	4.31351E-04	1.33352E-06	4.31198E-04	2.37137E-06	4.30965E-04	4.21697E-06	4.30656E-04
7.49894E-06	4.30393E-04	1.33352E-05	4.30049E-04	2.37137E-05	4.29364E-04	4.21697E-05	4.28423E-04
7.49894E-05	4.27536E-04	1.33352E-04	4.26699E-04	2.37137E-04	4.25909E-04	4.21697E-04	4.25185E-04
7.49894E-04	4.24543E-04	1.33352E-03	4.23501E-04	2.37137E-03	4.20413E-04	4.21697E-03	4.14249E-04
7.49894E-03	4.05960E-04	1.33352E-02	3.95670E-04	2.37137E-02	3.83803E-04	4.21697E-02	3.66660E-04
7.49894E-02	3.49172E-04	1.33352E-01	3.34875E-04	2.37137E-01	3.04884E-04	4.21697E-01	2.54772E-04
7.49894E-01	1.95827E-04	1.33352E+00	1.53347E-04	2.37137E+00	1.07056E-04	4.21697E+00	9.34648E-05
7.49894E+00	6.25605E-05	1.33352E+01	4.69520E-05	2.37137E+01	4.26993E-05	4.21697E+01	3.72194E-05
7.49894E+01	2.82441E-05	1.33352E+02	2.06557E-05	2.37137E+02	1.53772E-05	4.21697E+02	1.11462E-05
5.92453E+02	8.00171E-07	6.24177E+02	0.				

TABLE IV

RABBIT NEUTRON FLUX AT 60°

DIFFERENTIAL FLUX, UNITS= NEUTRONS/CM**2-MEV-P

E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)
1.0000E-08	0.	1.3352E-08	1.1302E+01	2.37137E-08	1.3300E+01	4.21697E-08	1.1300E+01
7.49890E-08	1.1202E+01	1.3352E-07	7.63667E+00	2.37137E-07	6.06935E+00	4.21697E-07	7.59304E+00
7.49890E-07	5.3273E+00	1.3352E-06	2.3750E+00	2.37137E-06	2.07152E+00	4.21697E-06	3.53914E+00
7.49890E-06	2.3050E+00	1.3352E-05	7.0640E-01	2.37137E-05	2.00875E-01	4.21697E-05	1.83431E-01
7.49890E-05	1.1719E-01	1.3352E-04	7.0640E-02	2.37137E-04	4.03025E-02	4.21697E-04	2.90362E-02
7.49890E-04	2.1300E-02	1.3352E-03	1.8835E-02	2.37137E-03	1.32572E-02	4.21697E-03	7.61792E-03
7.49890E-03	4.5619E-03	1.3352E-02	2.8460E-03	2.37137E-02	2.03970E-03	4.21697E-02	3.18046E-03
7.49890E-02	2.6256E-03	1.3352E-01	1.1978E-03	2.37137E-01	1.12633E-03	4.21697E-01	9.13430E-04
7.49890E-01	3.8237E-04	1.3352E+00	1.2124E-04	2.37137E+00	6.35556E-05	4.21697E+00	1.3856E-05
7.49890E+00	5.7740E-06	1.3352E+01	1.6434E-06	2.37137E+01	1.56610E-06	4.21697E+01	1.19217E-06
7.49890E+01	8.88636E-07	1.3352E+02	2.6394E-07	2.37137E+02	7.53343E-08	5.09117E+02	2.53531E-08

FLUX PER UNIT LEFTWING, UNITS= NEUTRONS/CM**2-P

E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)
1.0000E-08	0.	1.3352E-08	3.5178E-07	2.37137E-08	6.25566E-07	4.21697E-08	1.11243E-06
7.49890E-08	1.9747E-06	1.3352E-07	2.4396E-06	2.37137E-07	3.00286E-06	4.21697E-07	7.47501E-06
7.49890E-07	9.3202E-06	1.3352E-06	7.3936E-06	2.37137E-06	1.14790E-05	4.21697E-06	3.40413E-05
7.49890E-06	4.17689E-05	1.3352E-05	1.98240E-05	2.37137E-05	1.09956E-05	4.21697E-05	1.88580E-05
7.49890E-05	2.05157E-05	1.3352E-04	2.19920E-05	2.37137E-04	2.45700E-05	4.21697E-04	2.86866E-05
7.49890E-04	3.6230E-05	1.3352E-03	5.86381E-05	2.37137E-03	7.33915E-05	4.21697E-03	7.49952E-05
7.49890E-03	7.9862E-05	1.3352E-02	8.6620E-05	2.37137E-02	1.62741E-04	4.21697E-02	3.05621E-04
7.49890E-02	4.59654E-04	1.3352E-01	3.7290E-04	2.37137E-01	7.30252E-04	4.21697E-01	8.99234E-04
7.49890E-01	5.6060E-05	1.3352E+00	3.7743E-04	2.37137E+00	3.51842E-04	4.21697E+00	1.36415E-04
7.49890E+00	1.81083E-04	1.3352E+01	5.1163E-05	2.37137E+01	8.78104E-05	4.21697E+01	1.17364E-04
7.49890E+01	1.55667E-04	1.3352E+02	6.00048E-05	2.37137E+02	4.17040E-05	5.09117E+02	3.00575E-05

INTEGRAL FLUX, UNITS= NEUTRONS/CM**2-P

F (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)
1.0000E-08	0.	1.3352E-08	1.46050E-03	2.37137E-08	1.46049E-03	4.21697E-08	1.46033E-03
7.49890E-08	1.48005E-03	1.3352E-07	1.45950E-03	2.37137E-07	1.45895E-03	4.21697E-07	1.45880E-03
7.49890E-07	1.45013E-03	1.3352E-06	1.45380E-03	2.37137E-06	1.45195E-03	4.21697E-06	1.44900E-03
7.49890E-06	1.44037E-03	1.3352E-05	1.42993E-03	2.37137E-05	1.42497E-03	4.21697E-05	1.42122E-03
7.49890E-05	1.41671E-03	1.3352E-04	1.41158E-03	2.37137E-04	1.40608E-03	4.21697E-04	1.39904E-03
7.49890E-04	1.39279E-03	1.3352E-03	1.38328E-03	2.37137E-03	1.36857E-03	4.21697E-03	1.35822E-03
7.49890E-03	1.35108E-03	1.3352E-02	1.31151E-03	2.37137E-02	1.26935E-03	4.21697E-02	1.24867E-03
7.49890E-02	1.17227E-03	1.3352E-01	1.05735E-03	2.37137E-01	9.64126E-04	4.21697E-01	7.88554E-04
7.49890E-01	5.55754E-04	1.3352E+00	3.84401E-04	2.37137E+00	2.94046E-04	4.21697E+00	2.86802E-04
7.49890E+00	1.71980E-04	1.3352E+01	1.46700E-04	2.37137E+01	1.33918E-04	4.21697E+01	1.11965E-04
7.49890E+01	8.26540E-05	1.3352E+02	4.3731E-05	2.37137E+02	2.31080E-05	5.09117E+02	1.27437E-05

TABLE V
RABBIT NEUTRON FLUX AT 90°
(BEAM STOP IN UPSTREAM POSITION)

DIFFERENTIAL FLUX, UNITS= NEUTRONS/CM**2-MEV-P					
E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)
1.0000E-00	1.3335E-00	2.37137E-00	2.7000E+01	4.21697E-00	2.5000E+01
7.4000E-00	1.3335E-00	2.37137E-07	1.5223E+01	4.21697E-07	1.3301E+01
7.4000E-00	1.3335E-00	2.37137E-06	3.4432E+00	4.21697E-06	2.4050E+00
7.4000E-00	1.3335E-00	2.37137E-05	7.6635E+01	4.21697E-05	3.9555E+01
7.4000E-00	1.3335E-00	2.37137E-04	1.4119E+01	4.21697E-04	7.4640E-02
7.4000E-00	1.3335E-00	2.37137E-03	1.6932E+02	4.21697E-03	1.0531E-02
7.4000E-00	1.3335E-00	2.37137E-02	6.3035E+03	4.21697E-02	4.4021E-03
7.4000E-00	1.3335E-00	2.37137E-01	1.8359E+03	4.21697E-01	1.4640E-03
7.4000E-00	1.3335E-00	2.37137E+00	9.5850E+05	4.21697E+00	5.7031E-05
7.4000E-00	1.3335E-00	2.37137E+01	4.3760E+06	4.21697E+01	1.6527E-06
7.4000E+01	1.3335E-07	2.37137E+02	6.5960E-00	3.8080E+02	5.9941E-00
FLUX PER UNIT LETRANGY, UNITS= NEUTRONS/CM**2-P					
E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)
1.0000E-00	1.3335E-00	2.37137E-00	1.4947E-06	4.21697E-00	2.4611E-06
7.4000E-00	1.3335E-00	2.37137E-07	8.4276E-06	4.21697E-07	1.3173E-05
7.4000E-00	1.3335E-00	2.37137E-06	1.9061E-05	4.21697E-06	2.4879E-05
7.4000E-00	1.3335E-00	2.37137E-05	4.2425E-05	4.21697E-05	3.8940E-05
7.4000E-00	1.3335E-00	2.37137E-04	7.8165E-05	4.21697E-04	7.3504E-05
7.4000E-00	1.3335E-00	2.37137E-03	9.3737E-05	4.21697E-03	1.0367E-04
7.4000E-00	1.3335E-00	2.37137E-02	3.5339E-04	4.21697E-02	4.3790E-04
7.4000E-00	1.3335E-00	2.37137E-01	1.0113E-03	4.21697E-01	1.4419E-03
7.4000E-00	1.3335E-00	2.37137E+00	5.3062E-04	4.21697E+00	5.6145E-04
7.4000E+01	1.3335E-01	2.37137E+01	2.4225E-04	4.21697E+01	1.6271E-04
7.4000E+02	1.3335E-02	2.37137E+02	3.6515E-05	3.8080E+02	5.4051E-05
INTEGRAL FLUX, UNITS= NEUTRONS/CM**2-P					
E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)
1.0000E-00	1.3335E-00	2.37137E-00	2.3755E+03	4.21697E-00	2.3754E-03
7.4000E-00	1.3335E-00	2.37137E-07	2.3723E+03	4.21697E-07	2.3702E-03
7.4000E-00	1.3335E-00	2.37137E-06	2.3758E+03	4.21697E-06	2.3583E-03
7.4000E-00	1.3335E-00	2.37137E-05	2.3703E+03	4.21697E-05	2.3197E-03
7.4000E-00	1.3335E-00	2.37137E-04	2.2820E+03	4.21697E-04	2.2625E-03
7.4000E-00	1.3335E-00	2.37137E-03	2.2042E+03	4.21697E-03	2.1802E-03
7.4000E-00	1.3335E-00	2.37137E-02	2.0656E+03	4.21697E-02	1.9773E-03
7.4000E-00	1.3335E-00	2.37137E-01	1.6185E+03	4.21697E-01	1.3644E-03
7.4000E-00	1.3335E-00	2.37137E+00	5.0064E+04	4.21697E+00	3.7508E-04
7.4000E+01	1.3335E-01	2.37137E+01	1.8701E+04	4.21697E+01	1.2645E-04
7.4000E+02	1.3335E-02	2.37137E+02	1.4834E+05	3.8080E+02	9.7809E-06

TABLE VI

RABBIT NEUTRON FLUX AT 90°
(BEAM STOP IN DOWNSTREAM POSITION)

DIFFERENTIAL FLUX, UNITS= NEUTRONS/CM**2-MEV-P

E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)
1.0000E-08	0.	1.3352E-07	1.1600E+01	2.3713E-08	1.1600E+01	4.2169E-08	1.1600E+01	1.1600E+01	1.1600E+01
7.49894E-08	1.1600E+01	1.3352E-07	1.1600E+01	2.3713E-07	1.1600E+01	4.2169E-07	1.1600E+01	1.1600E+01	1.1600E+01
7.49894E-07	1.15851E+01	1.3352E-06	9.80316E+00	2.3713E-06	6.52412E+00	4.2169E-06	4.37879E+00	4.37879E+00	4.37879E+00
7.49894E-06	2.94625E+00	1.3352E-05	1.90731E+00	2.3713E-05	1.01807E+00	4.2169E-05	3.97877E-01	3.97877E-01	3.97877E-01
7.49894E-05	2.13896E-01	1.3352E-04	1.50098E-01	2.3713E-04	9.20803E-02	4.2169E-04	4.14906E-02	4.14906E-02	4.14906E-02
7.49894E-04	2.79009E-02	1.3352E-03	2.01023E-02	2.3713E-03	2.36803E-02	4.2169E-03	1.67383E-02	1.67383E-02	1.67383E-02
7.49894E-03	1.13586E-02	1.3352E-02	7.40206E-03	2.3713E-02	5.09139E-03	4.2169E-02	3.92625E-03	3.92625E-03	3.92625E-03
7.49894E-02	2.27474E-03	1.3352E-01	1.95267E-03	2.3713E-01	1.88529E-03	4.2169E-01	1.17410E-03	1.17410E-03	1.17410E-03
7.49894E-01	7.26437E-04	1.3352E+00	2.60620E-04	2.3713E+00	6.74130E-05	4.2169E+00	2.64468E-05	2.64468E-05	2.64468E-05
7.49894E+00	1.01960E-05	1.3352E+01	3.78100E-06	2.3713E+01	3.37502E-06	4.2169E+01	1.32651E-06	1.32651E-06	1.32651E-06
7.49894E+01	5.55196E-07	1.3352E+02	3.71901E-07	2.3713E+02	9.40004E-08	3.88044E+02	5.99416E-08	5.99416E-08	5.99416E-08

FLUX PER UNIT LEHARGY, UNITS= NEUTRONS/CM**2-P

E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)
1.0000E-08	0.	1.3352E-08	3.61121E-07	2.3713E-08	6.42174E-07	4.2169E-08	1.14197E-06	1.14197E-06	1.14197E-06
7.49894E-08	2.03073E-06	1.3352E-07	3.61121E-06	2.3713E-07	9.42174E-06	4.2169E-07	1.14197E-05	1.14197E-05	1.14197E-05
7.49894E-07	2.01412E-05	1.3352E-06	2.80279E-05	2.3713E-06	3.61174E-05	4.2169E-06	4.31873E-05	4.31873E-05	4.31873E-05
7.49894E-06	5.15780E-05	1.3352E-05	6.18673E-05	2.3713E-05	5.63934E-05	4.2169E-05	3.90985E-05	3.90985E-05	3.90985E-05
7.49894E-05	3.74453E-05	1.3352E-04	4.95291E-05	2.3713E-04	5.09777E-05	4.2169E-04	4.88536E-05	4.88536E-05	4.88536E-05
7.49894E-04	4.89282E-05	1.3352E-03	8.74850E-05	2.3713E-03	1.31116E-04	4.2169E-03	1.64781E-04	1.64781E-04	1.64781E-04
7.49894E-03	1.98047E-04	1.3352E-02	2.30435E-04	2.3713E-02	3.26146E-04	4.2169E-02	3.06720E-04	3.06720E-04	3.06720E-04
7.49894E-02	3.98223E-04	1.3352E-01	6.07952E-04	2.3713E-01	1.04339E-03	4.2169E-01	1.15585E-03	1.15585E-03	1.15585E-03
7.49894E-01	1.27522E-03	1.3352E+00	8.36247E-04	2.3713E+00	3.73281E-04	4.2169E+00	2.68358E-04	2.68358E-04	2.68358E-04
7.49894E+00	1.70444E-04	1.3352E+01	1.13242E-04	2.3713E+01	1.06008E-04	4.2169E+01	1.38380E-04	1.38380E-04	1.38380E-04
7.49894E+01	9.71942E-05	1.3352E+02	1.15777E-04	2.3713E+02	5.28649E-05	3.88044E+02	5.04951E-05	5.04951E-05	5.04951E-05

INTEGRAL FLUX, UNITS= NEUTRONS/CM**2-P

E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)
1.0000E-08	0.	1.3352E-08	2.24526E-03	2.3713E-08	2.24517E-03	4.2169E-08	2.24501E-03	2.24501E-03	2.24501E-03
7.49894E-08	2.24472E-03	1.3352E-07	2.24422E-03	2.3713E-07	2.24331E-03	4.2169E-07	2.24171E-03	2.24171E-03	2.24171E-03
7.49894E-07	2.23805E-03	1.3352E-06	2.23362E-03	2.3713E-06	2.22681E-03	4.2169E-06	2.21770E-03	2.21770E-03	2.21770E-03
7.49894E-06	2.20701E-03	1.3352E-05	2.19411E-03	2.3713E-05	2.17004E-03	4.2169E-05	2.16450E-03	2.16450E-03	2.16450E-03
7.49894E-05	2.15477E-03	1.3352E-04	2.14541E-03	2.3713E-04	2.13393E-03	4.2169E-04	2.12820E-03	2.12820E-03	2.12820E-03
7.49894E-04	2.11007E-03	1.3352E-03	2.09784E-03	2.3713E-03	2.07597E-03	4.2169E-03	2.04331E-03	2.04331E-03	2.04331E-03
7.49694E-03	2.00200E-03	1.3352E-02	1.95228E-03	2.3713E-02	1.89408E-03	4.2169E-02	1.81313E-03	1.81313E-03	1.81313E-03
7.49694E-02	1.71646E-03	1.3352E-01	1.61698E-03	2.3713E-01	1.46402E-03	4.2169E-01	1.28398E-03	1.28398E-03	1.28398E-03
7.49894E-01	9.15031E-04	1.3352E+00	5.96214E-04	2.3713E+00	3.07160E-04	4.2169E+00	2.93856E-04	2.93856E-04	2.93856E-04
7.49894E+00	2.26769E-04	1.3352E+01	1.86144E-04	2.3713E+01	1.55335E-04	4.2169E+01	1.08611E-04	1.08611E-04	1.08611E-04
7.49894E+01	7.59641E-05	1.3352E+02	5.16653E-05	2.3713E+02	2.27213E-05	3.88044E+02	9.78049E-06	9.78049E-06	9.78049E-06

TABLE VII
RABBIT NEUTRON FLUX AT 120°

DIFFERENTIAL FLUX, UNITS= NEUTRONS/CM**2-MEV-P									
E(MEV)	V(UNITS)	E(MEV)	V(UNITS)	E(MEV)	V(UNITS)	E(MEV)	V(UNITS)	E(MEV)	V(UNITS)
1.0000E-08	0.	1.3335E-08	4.0000E+00	2.3713E-08	3.6500E+00	4.2169E-08	3.1000E+00	4.2169E-08	3.1000E+00
7.4989E-08	3.0000E+00	1.3335E-07	2.7000E+00	2.3713E-07	2.4000E+00	4.2169E-07	2.2500E+00	4.2169E-07	2.2500E+00
7.4989E-07	2.1212E+00	1.3335E-06	1.2000E+00	2.3713E-06	6.0939E+01	4.2169E-06	3.9200E+01	4.2169E-06	3.9200E+01
7.4989E-06	2.1010E+01	1.3335E-05	1.2000E+00	2.3713E-05	5.0619E+02	4.2169E-05	3.5932E+02	4.2169E-05	3.5932E+02
7.4989E-05	2.5554E+02	1.3335E-04	2.1050E+02	2.3713E-04	1.6001E+02	4.2169E-04	1.2978E+02	4.2169E-04	1.2978E+02
7.4989E-04	1.0556E+02	1.3335E-03	8.5369E+03	2.3713E-03	6.3200E+03	4.2169E-03	4.2200E+03	4.2169E-03	4.2200E+03
7.4989E-03	2.9000E+03	1.3335E-02	2.0720E+04	2.3713E-02	2.0155E+04	4.2169E-02	1.5100E+04	4.2169E-02	1.5100E+04
7.4989E-02	8.6700E+04	1.3335E-01	6.5740E+05	2.3713E-01	6.1127E+05	4.2169E-01	5.4900E+05	4.2169E-01	5.4900E+05
7.4989E-01	2.0041E+04	1.3335E+00	1.0400E+04	2.3713E+00	3.0729E+05	4.2169E+00	5.6269E+06	4.2169E+00	5.6269E+06
7.4989E+00	2.1224E+06	1.3335E+01	7.4650E+07	2.3713E+01	1.5793E+07	4.2169E+01	2.6700E+07	4.2169E+01	2.6700E+07
7.4989E+01	1.5997E+07	1.1532E+02	7.9419E+08	2.3713E+02					
FLUX PER UNIT LE*HARGY, UNITS= NEUTRONS/CM**2-P									
E(MEV)	V(UNITS)	E(MEV)	V(UNITS)	E(MEV)	V(UNITS)	E(MEV)	V(UNITS)	E(MEV)	V(UNITS)
1.0000E-08	0.	1.3335E-08	1.2455E+07	2.3713E-08	2.0206E+07	4.2169E-08	3.2407E+07	4.2169E-08	3.2407E+07
7.4989E-08	5.2519E-07	1.3335E-07	8.4054E+06	2.3713E-07	1.5286E+06	4.2169E-07	2.2150E+06	4.2169E-07	2.2150E+06
7.4989E-07	3.7168E-06	1.3335E-06	3.7663E+06	2.3713E-06	3.0164E+06	4.2169E-06	3.0673E+06	4.2169E-06	3.0673E+06
7.4989E-06	3.6794E-06	1.3335E-05	3.2875E+06	2.3713E-05	3.2451E+06	4.2169E-05	3.5305E+06	4.2169E-05	3.5305E+06
7.4989E-05	4.4736E-06	1.3335E-04	6.5557E+06	2.3713E-04	9.3009E+06	4.2169E-04	1.2777E+05	4.2169E-04	1.2777E+05
7.4989E-04	1.8130E-05	1.3335E-03	2.6574E+05	2.3713E-03	3.5031E+05	4.2169E-03	4.1543E+05	4.2169E-03	4.1543E+05
7.4989E-03	5.0927E-05	1.3335E-02	6.4529E+05	2.3713E-02	1.1150E+04	4.2169E-02	1.4060E+04	4.2169E-02	1.4060E+04
7.4989E-02	1.5170E-04	1.3335E-01	2.0460E+04	2.3713E-01	3.3039E+04	4.2169E-01	5.4134E+04	4.2169E-01	5.4134E+04
7.4989E-01	3.5085E-04	1.3335E+00	3.2370E+04	2.3713E+00	2.1440E+04	4.2169E+00	5.5302E+05	4.2169E+00	5.5302E+05
7.4989E+00	3.7152E-05	1.3335E+01	2.3241E+05	2.3713E+01	0.7432E+06	4.2169E+01	2.6304E+05	4.2169E+01	2.6304E+05
7.4989E+01	2.8005E-05	1.1532E+02	2.1161E+05	2.3713E+02	0.				
INTEGRAL FLUX, UNITS= NEUTRONS/CM**2-P									
E(MEV)	V(UNITS)	E(MEV)	V(UNITS)	E(MEV)	V(UNITS)	E(MEV)	V(UNITS)	E(MEV)	V(UNITS)
1.0000E-08	0.	1.3335E-08	7.1982E+04	2.3713E-08	7.1979E+04	4.2169E-08	7.1979E+04	4.2169E-08	7.1979E+04
7.4989E-08	7.1966E+04	1.3335E-07	7.1953E+04	2.3713E-07	7.1932E+04	4.2169E-07	7.1092E+04	4.2169E-07	7.1092E+04
7.4989E-07	7.1043E+04	1.3335E-06	7.1750E+04	2.3713E-06	7.1290E+04	4.2169E-06	7.1513E+04	4.2169E-06	7.1513E+04
7.4989E-06	7.1464E+04	1.3335E-05	7.1372E+04	2.3713E-05	7.1290E+04	4.2169E-05	7.1290E+04	4.2169E-05	7.1290E+04
7.4989E-05	7.1120E+04	1.3335E-04	7.1000E+04	2.3713E-04	7.0845E+04	4.2169E-04	7.0845E+04	4.2169E-04	7.0845E+04
7.4989E-04	7.0932E+04	1.3335E-03	6.9839E+04	2.3713E-03	6.9175E+04	4.2169E-03	6.8297E+04	4.2169E-03	6.8297E+04
7.4989E-03	6.7261E+04	1.3335E-02	6.5987E+04	2.3713E-02	6.3374E+04	4.2169E-02	6.1501E+04	4.2169E-02	6.1501E+04
7.4989E-02	5.7867E+04	1.3335E-01	5.5097E+04	2.3713E-01	4.8956E+04	4.2169E-01	4.8406E+04	4.2169E-01	4.8406E+04
7.4989E-01	2.6960E+04	1.3335E+00	1.8109E+04	2.3713E+00	1.0094E+04	4.2169E+00	4.7310E+05	4.2169E+00	4.7310E+05
7.4989E+00	3.3097E+05	1.3335E+01	2.4209E+05	2.3713E+01	1.0399E+05	4.2169E+01	1.6213E+05	4.2169E+01	1.6213E+05
7.4989E+01	9.6222E+06	1.1532E+02	2.6209E+06	2.3713E+02	0.				

RABBIT NEUTRON FLUX AT 150°

DIFFERENTIAL FLUX, UNITS= NEUTRONS/CM²*2-MEV*P

E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)
1.30000E+00	3.	1.3352E+00	1.66000E+01	2.37137E+00	1.66000E+01	4.21697E+00	1.66000E+01
7.49894E+00	1.66000E+01	1.3352E+00	1.66000E+01	2.37137E+07	1.66000E+01	4.21697E+07	1.66000E+01
7.49894E+00	1.66000E+01	1.3352E+06	1.66000E+01	2.37137E+06	1.66000E+01	4.21697E+06	1.543200E+01
7.49894E+06	1.43494E+01	1.3352E+05	1.33400E+01	2.37137E+05	1.20041E+01	4.21697E+05	1.15331E+01
7.49894E+05	7.68307E+02	1.3352E+04	3.67024E+02	2.37137E+04	1.74041E+02	4.21697E+04	0.30591E+03
7.49894E+04	4.99576E+03	1.3352E+03	3.00217E+03	2.37137E+03	3.2323E+03	4.21697E+03	3.06053E+03
7.49894E+03	2.97104E+03	1.3352E+02	2.93497E+03	2.37137E+02	2.39797E+03	4.21697E+02	1.42676E+03
7.49894E+02	7.53208E+04	1.3352E+01	6.90087E+04	2.37137E+01	6.03150E+04	4.21697E+01	6.25151E+04
7.49894E+01	2.15112E+04	1.3352E+00	1.022675E+04	2.37137E+00	2.59530E+05	4.21697E+00	5.93472E+00
7.49894E+00	2.79232E+06	1.3352E+00	1.10170E+06	2.37137E+00	5.10010E+07	4.21697E+00	2.30953E+07
8.66025E+01	8.73114E+00						

FLUX PER UNIT LETHARGY, UNITS= NEUTRONS/CM²-P

E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)
1.00000E+05	0.	1.3352E+01	5.1677E+09	2.3713E+08	9.18973E+09	4.21697E+06	1.63020E+08
7.49899E+04	2.90655E+07	1.3352E+07	5.1677E+07	2.3713E+07	9.18973E+08	4.21697E+07	1.63020E+07
7.49899E+07	2.90655E+07	1.3352E+06	5.1677E+07	2.3713E+06	9.18973E+06	4.21697E+06	1.63020E+06
7.49899E+06	2.51160E+06	1.3352E+05	4.1531E+06	2.3713E+05	8.6680E+06	4.21697E+05	1.13536E+05
7.49899E+05	1.34532E+05	1.3352E+04	1.14259E+05	2.3713E+04	9.47916E+06	4.21697E+04	8.17681E+05
7.49899E+04	8.74575E+04	1.3352E+03	1.18366E+05	2.3713E+03	1.76940E+05	4.21697E+03	2.30884E+05
7.49899E+03	5.20279E+05	1.3352E+02	9.13692E+05	2.3713E+02	1.32751E+04	4.21697E+02	1.40830E+04
7.49899E+02	1.27374E+04	1.3352E+01	2.14833E+04	2.3713E+01	3.3906E+04	4.21697E+01	6.15435E+04
7.49899E+01	3.76551E+04	1.3352E+00	3.19640E+04	2.3713E+00	1.43675E+04	4.21697E+00	5.04209E+05
7.49899E+00	4.8861E+05	1.3352E+00	3.42973E+05	2.3713E+00	2.00773E+05	4.21697E+00	2.26797E+05
8.66025E+01	1.7371E+02	0.	0.	2.3713E+01	2.00773E+05	4.21697E+01	2.26797E+05

INTEGRAL FLUX, UNITS= NEUTRONS/CM**2=PS

E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)	E (MEV)	V (UNITS)
1.00000E+08	0.	1.33352E+08	7.26859E+04	2.37137E+08	7.26850E+04	4.21697E+08	7.26856E+04
7.49899E+08	7.26853E+04	1.33352E+07	7.26844E+04	2.37137E+07	7.26832E+04	4.21697E+07	7.26809E+04
7.49899E+08	7.26748E+04	1.33352E+06	7.26694E+04	2.37137E+06	7.26586E+04	4.21697E+06	7.26336E+04
7.49899E+08	7.25956E+04	1.33352E+05	7.25320E+04	2.37137E+05	7.24900E+04	4.21697E+05	7.22573E+04
7.49899E+08	7.19735E+04	1.33352E+04	7.16372E+04	2.37137E+04	7.13516E+04	4.21697E+04	7.11966E+04
7.49899E+05	7.19735E+04	1.33352E+03	7.06865E+04	2.37137E+03	7.03906E+04	4.21697E+03	6.99033E+04
7.49899E+04	7.09522E+04	1.33352E+02	7.78075E+04	2.37137E+02	6.56833E+04	4.21697E+02	6.22245E+04
7.49899E+03	6.91881E+04	1.33352E+01	5.55641E+04	2.37137E+01	5.01935E+04	4.21697E+01	4.18455E+04
7.49899E+02	5.87732E+04	1.33352E+00	1.70453E+04	2.37137E+00	9.05063E+05	4.21697E+00	5.46283E+05
7.49899E+01	2.64602E+05	1.33352E+01	2.77994E+05	2.37137E+01	1.92253E+05	4.21697E+01	1.20958E+05
7.49899E+00	4.00205E+05	1.33352E+02	0.				
8.66025E+08	6.33312E+02

Fig. 1. Cross-sectional view of the beam stop and rabbit configuration. The areas and boundary numbers correspond to those of Table I.

Fig. 2. Plan view of the beam stop and rabbit configuration.

Fig. 3. Calculated neutron flux in the rabbit line for an angle of 20° from the center of the copper beam stop.

Fig. 4. Calculated neutron flux in the rabbit line for an angle of 30° from the center of the copper beam stop.

Fig. 5. Calculated neutron flux in the rabbit line for an angle of 60° from the center of the copper beam stop.

Fig. 6. Calculated neutron flux in the rabbit line for an angle of 90° from the center of the copper beam stop. $\circ$ indicate beam stop in its extreme downstream position. Δ indicate extreme upstream position of the beam

Fig. 7. Calculated neutron flux in the rabbit line for an angle of 120° from the center of the copper beam stop.

Fig. 8 Calculated neutron flux in the rabbit line for an angle of 150° from the center of the copper beam stop.