ANCR-1068

216
7-21

2214

UC-32

MASTER

C-SURE
CROSS SECTIONS FOR UNRESOLVED
RESONANCES FROM ENDF/B

G.L. Singer and R.A. Grimesey

Aerojet Nuclear Company

NATIONAL REACTOR TESTING STATION

Idaho Falls, Idaho — 83401

DATE PUBLISHED—MAY 1972

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

PREPARED FOR THE

U. S. ATOMIC ENERGY COMMISSION

IDAHO OPERATIONS OFFICE UNDER CONTRACT AT(10-1)-1375

200

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

Printed in the United States of America
Available from
National Technical Information Service
U. S. Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22151
Price: Printed Copy \$3.00; Microfiche \$0.95

LEGAL NOTICE

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Atomic Energy Commission, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

C-SURE

CROSS SECTIONS FOR UNRESOLVED RESONANCES FROM ENDF/B

by

G. L. Singer and R. A. Grimesey

NOTICE

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Atomic Energy Commission, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

AEROJET NUCLEAR COMPANY

Date Published - May 1972

PREPARED FOR THE U. S. ATOMIC ENERGY COMMISSION
IDAHO OPERATIONS OFFICE
UNDER CONTRACT NO. AT(10-1)-1375

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

ABSTRACT

The C-SURE code calculates unresolved capture, fission, and compound elastic scattering cross sections from ENDF/B data at energies specified by input. These calculations include Doppler broadening to provide temperature dependent data, so that self-shielding can automatically be accounted for in the unresolved resonance calculation.

The program includes the following features: minimum card input, an ENDF/B update facility, and the option of a separate printout of the s-wave and p-wave unresolved resonance contributions.

CONTENTS

ABSTRACT	11
I. INTRODUCTION	1
II. UNRESOLVED RESONANCE CALCULATIONS	2
1. DISCUSSION OF EQUATIONS	2
2. DEFINITION OF TERMS	12
III. SMOOTH CROSS SECTION CALCULATIONS	16
IV. INPUT INSTRUCTIONS	17
1. TYPES OF INPUT	17
2. PROGRAM CONTROL DATA	17
3. ENDF/B DATA	24
3.1 Complete ENDF/B Data	24
3.2 ENDF/B Change Data	24
V. PROGRAM OUTPUT	25
1. PRINTED OUTPUT	25
2. PUNCHED CARD OUTPUT	25
3. ERROR MESSAGES	25
VI. REFERENCES	27
APPENDIX A -- INTEGRATIONS OVER THE CHI-SQUARED DISTRIBUTIONS. .	28
APPENDIX B -- INPUT/OUTPUT UNITS	32
APPENDIX C -- SUBROUTINE DESCRIPTIONS	33
APPENDIX D -- FLOW CHART	36
APPENDIX E -- SAMPLE PROBLEM SET	37

TABLES

I. Card Input Instructions	18
A-I. Values of p_i	31
A-II. Values of p'_i	31

I. INTRODUCTION

The C-SURE code calculates Doppler broadened capture, fission, and compound elastic scattering cross sections at an arbitrary set of energy points for the unresolved resonance range. The smooth background cross sections may be calculated outside the unresolved resonance range as well as in the unresolved range. The code will read input either from an ENDF/B tape or from cards based on the ENDF/B format.

Shielded cross sections may be calculated within the framework of the Narrow Resonance Approximation with little additional computation time required relative to infinitely dilute cross sections.

A derivation of the equations used by the code is included along with suitable references and discussion.

Options or features of the C-SURE code include:

1. Initial default values and, for stacked runs, storage of previous input values reduce to a minimum the number of values required as input.
2. The program can generate the mesh at which cross sections are evaluated or the user may input his own mesh.
3. ENDF/B input is from either tape or cards.
4. The ENDF/B data from a data tape may be punched in the format required for C-SURE card input.
5. Individual cards of the initial ENDF/B data may be replaced in subsequent runs of a series.
6. A single isotope of an ENDF/B material may be selected for processing.
7. Smooth scattering, capture, and fission cross sections may be calculated beyond the unresolved resonance range.
8. The printouts of the s-wave and p-wave unresolved resonance contributions may be separate.

II. UNRESOLVED RESONANCE CALCULATIONS

1. DISCUSSION OF EQUATIONS

C-SURE calculates unresolved capture, fission, and compound elastic scattering cross sections from ENDF/B data^[6] at energies specified by input. These calculations include Doppler broadening to provide temperature dependent data, so that self-shielding can automatically be accounted for in the unresolved resonance calculation.

In the following section, key definitions will be supplied and a complete list of definitions will be provided in the following section.

The ENDF/B data for the unresolved range contain a complete set of average or tabulated resonance parameters for each ℓ -state and J-state. Energy dependent average parameters $\langle D \rangle_{\ell,J}$, $\langle \Gamma_n \rangle_{\ell,J}$, $\langle \Gamma_\gamma \rangle_{\ell,J}$, $\langle \Gamma_f \rangle_{\ell,J}$, and $\langle \Gamma \rangle_{\ell,J}$ are specified for each orbital angular momentum state ℓ of the neutron and each total angular momentum state J of the compound nucleus. In addition, the number of degrees of freedom, $\mu_{\ell,J}^k$, for the statistical chi-squared distribution of each average partial width $\langle \Gamma_k \rangle_{\ell,J}$ in the unresolved range is specified. The average level spacing $\langle D \rangle_{\ell,J}$ is energy dependent, but is assumed constant as far as statistical fluctuations are concerned. The unresolved equations in C-SURE permit $\ell = 0, 1, 2$, for s, p, and d wave neutrons, respectively, and up to four J states for p and d wave neutrons (only two J states are possible for s wave neutrons corresponding to the two possible spin orientations of the incident neutrons).

The equations from which C-SURE calculates the pointwise unresolved resonance cross sections are based upon finite range resolved resonance integrals in the narrow resonance (NR) approximation for a mixture of isotopes.^[5]

$$\Sigma_r = \frac{\int_{E_1}^{E_2} \frac{\Sigma_r(E)}{\Sigma_T(E)} \frac{dE}{E}}{\int_{E_1}^{E_2} \frac{1}{\Sigma_T(E)} \frac{dE}{E}} \quad (1)$$

In the final form of this equation, the denominator permits the effects of first order overlap of resonances in the (ℓ,J) sequences of a given isotope. $\Sigma_r(E)$ in the numerator is the capture, fission, or

compound elastic scattering cross section of the particular sequence (ℓ, J) of the isotope being considered. The average parameters given in the ENDF/B library are subject to statistical fluctuation in the unresolved range in each sequence (ℓ, J) according to chi-squared distributions where the probability of a particular value of the variable r is given by

$$P_n(r)dr = \frac{n}{2} \frac{1}{\Gamma^*\left(\frac{n}{2}\right)} \left(\frac{nr}{2}\right)^{\frac{n}{2}-1} \exp\left(-\frac{nr}{2}\right) dr \quad (2)$$

where n is the number of degrees of freedom in the chi-squared distribution, $\Gamma^*\left(\frac{n}{2}\right)$ is the normalized gamma or factorial function (not a level width), and

$$r = \frac{\Gamma_x^{\ell, J}}{\langle \Gamma_x \rangle_{\ell, J}}.$$

The $\langle \Gamma_x \rangle_{\ell, J}$ are the average partial widths given in the ENDF/B library for the unresolved range and $\Gamma_x^{\ell, J}$ is a point value in the chi-squared statistical distribution.

At infinite dilution, an asymptotic $1/E$ flux is assumed and Equation (1) for the capture, fission, and compound elastic cross sections at an energy (E) yields,^[8]

$$\langle \sigma_c(E) \rangle = \frac{2\pi^2}{k^2} \sum_{\ell=0}^{NLS} \sum_J^{NJS_\ell} \frac{g_J}{\langle D \rangle_{\ell, J} \cos 2\phi_\ell} \left\langle \frac{\Gamma_n(E) \Gamma_\gamma(E)}{\Gamma(E)} \right\rangle_{\ell, J} \quad (3)$$

$$\langle \sigma_f(E) \rangle = \frac{2\pi^2}{k^2} \sum_{\ell=0}^{NLS} \sum_J^{NJS_\ell} \frac{g_J}{\langle D \rangle_{\ell, J} \cos 2\phi_\ell} \left\langle \frac{\Gamma_n(E) \Gamma_f(E)}{\Gamma(E)} \right\rangle_{\ell, J} \quad (4)$$

$$\begin{aligned} \langle \sigma_s(E) \rangle = & \frac{4\pi}{k^2} \sum_J g_{J^\mu \ell, J} \sin^2 \phi_\ell \\ & + \frac{2\pi^2}{k^2} \sum_{\ell=0}^{NLS} \sum_J^{NJS_\ell} \frac{g_J}{\langle D \rangle_{\ell, J} \cos 2\phi_\ell} \left\langle \frac{\Gamma_n(E) \Gamma_n(E) - 2\Gamma_n(E) \Gamma(E) \sin^2 \phi_\ell}{\Gamma(E)} \right\rangle_{\ell, J} \end{aligned} \quad (5)$$

where NLS is the number of incident neutron orbital angular momentum states ℓ and NJS_ℓ is the number of compound nucleus open decay channels, each with total angular momentum J , for a given ℓ state. For each open decay channel,

$$g_J = \frac{1}{2} \left(\frac{2J+1}{2I+1} \right) \quad (6)$$

where I is the ground state spin of the target nucleus.

The $\langle \rangle$ in Equations (3), (4), and (5) imply suitable fluctuation averages of the partial widths Γ_x for the single level resonance formulas over the chi-squared statistical distributions given by Equation (2).

Equations (3), (4), and (5) are only valid at infinite dilution for the natural line shape of the Breit Wigner single level resonance formula. To include the effects of Doppler broadening and finite self shielding where the first order effects of resonance overlap between different sequences of a material are present, a more sophisticated approximation is required. The general features of this approximation can be obtained from the so-called two sequence approximation for a single isotope.^[5] The two sequences referred to here could be considered to be the two spin states for s-wave neutrons of the isotope. Consider $\Sigma_T(E)$ in the numerator and denominator of Equation (1),

$$\begin{aligned} \Sigma_T(E) &= \Sigma_r^1 + \Sigma_r^2 + \Sigma_p \\ &= \sum_i \Sigma_{r_i}^1 + \sum_j \Sigma_{r_j}^2 + \Sigma_p, \end{aligned} \quad (7)$$

where Σ_r^1 and Σ_r^2 are the resonant cross sections for the first and the second sequences, respectively, and each includes a sum over all resonances in the sequence. The individual sequences are treated at this point as if the resonances were resolved.

The effects of other sequences and other isotopes are present in the two sequence approximation only to the extent they are present in Σ_p , the total scattering cross section in the vicinity of the resonances under consideration. In the approximations which follow, the assumptions in general are based on the validity of the NR approximation in the unresolved range and the fact that $\Sigma_p > \Sigma_r^1 + \Sigma_r^2$ which is the usual case. In the event that these conditions are not present, it implies that higher order terms in the expansions are not negligible and that the resultant single sequence equations do not adequately represent resonance overlap effects. Higher order terms have been derived and applied under these conditions in fast reactor calculations;^[5] however, these

extensions of the theory are beyond the scope of the present discussion and require a more cumbersome development.

The numerator for the resolved capture cross section of the first sequence is expanded in the following way to clarify the first order effects of resonance overlap between the two sequences.

$$\int_{E_1}^{E_2} \frac{\Sigma_c^1(E)}{\Sigma_T(E)} \frac{dE}{E} = \sum_i \int_{E_1}^{E_2} \frac{\Sigma_{c_i}^1}{\left(\Sigma_r^1 + \Sigma_p\right) \left(1 + \frac{\Sigma_r^2}{\Sigma_r^1 + \Sigma_p}\right)} \frac{dE}{E} \quad (8)$$

$$= \sum_i \int_{E_1}^{E_2} \frac{\Sigma_{c_i}^1}{\Sigma_r^1 + \Sigma_p} \left[1 - \frac{\Sigma_r^2}{\Sigma_r^1 + \Sigma_p} + \left(\frac{\Sigma_r^2}{\Sigma_r^1 + \Sigma_p} \right)^2 \right] \frac{dE}{E}$$

$$= \sum_i \int_{E_1}^{E_2} \frac{\Sigma_{c_i}^1}{\Sigma_r^1 + \Sigma_p} \left[1 - \frac{\Sigma_r^2}{\Sigma_r^1 + \Sigma_r^2 + \Sigma_p} \right] \frac{dE}{E}$$

$$= \sum_i \int_{E_1}^{E_2} \frac{\Sigma_{c_i}^1}{\Sigma_r^1 + \Sigma_p} \left[1 - \sum_j \frac{\Sigma_{r_j}^2}{\Sigma_r^2 + \Sigma_p} \right] \frac{dE}{E} \quad (9)$$

In obtaining Equation (9) from Equation (8), the narrow resonance assumption was employed in the last step to eliminate all but the i 'th resonance in the denominators of the two sequences. The resonances of each sequence are assumed to be spaced far enough apart so that as the i 'th resonance in the numerator is encountered, only the effects of that same resonance are encountered in the denominator. The term in the bracket of Equation (9) is a small correction term for the overlap of the second sequence resonances on the first sequence.

The denominator is expanded in a slightly different fashion.

$$\int_{E_1}^{E_2} \frac{1}{\Sigma_T(E)} \frac{dE}{E} = \frac{1}{\Sigma_p} \int_{E_1}^{E_2} \frac{1}{1 + \frac{\Sigma_r^1 + \Sigma_r^2}{\Sigma_p}} \frac{dE}{E} \quad (10)$$

$$\begin{aligned}
&= \frac{1}{\Sigma_p} \int_{E_1}^{E_2} \left[1 - \frac{\Sigma_r^1 + \Sigma_r^2}{\Sigma_p} + \left(\frac{\Sigma_r^1 + \Sigma_r^2}{\Sigma_p} \right)^2 \right] \frac{dE}{E} \\
&= \frac{1}{\Sigma_p} \int_{E_1}^{E_2} \left[1 - \frac{\Sigma_r^1}{\Sigma_r^1 + \Sigma_r^2 + \Sigma_p} - \frac{\Sigma_r^2}{\Sigma_r^1 + \Sigma_r^2 + \Sigma_p} \right] \frac{dE}{E} \\
&= \frac{1}{\Sigma_p} \int_{E_1}^{E_2} \left[1 - \frac{\Sigma_r^1}{\Sigma_r^1 + \Sigma_p} \left(1 - \frac{\Sigma_r^2}{\Sigma_r^1 + \Sigma_p} + \left(\frac{\Sigma_r^2}{\Sigma_r^1 + \Sigma_p} \right)^2 \right) \right. \\
&\quad \left. - \frac{\Sigma_r^2}{\Sigma_r^2 + \Sigma_p} \left(1 - \frac{\Sigma_r^1}{\Sigma_r^2 + \Sigma_p} + \left(\frac{\Sigma_r^1}{\Sigma_r^2 + \Sigma_p} \right)^2 \right) \right] \frac{dE}{E} \\
&= \frac{1}{\Sigma_p} \int_{E_1}^{E_2} \left[1 - \sum_i \frac{\Sigma_{r_i}^1}{\Sigma_{r_i}^1 + \Sigma_p} \left(1 - \sum_j \frac{\Sigma_{r_j}^2}{\Sigma_{r_j}^2 + \Sigma_p} \right) \right. \\
&\quad \left. - \sum_j \frac{\Sigma_{r_j}^2}{\Sigma_{r_j}^2 + \Sigma_p} \left(1 - \sum_i \frac{\Sigma_{r_i}^1}{\Sigma_{r_i}^1 + \Sigma_p} \right) \right] \frac{dE}{E} \tag{11}
\end{aligned}$$

where the narrow resonance assumption was again employed in the last step. The average effective cross section for the first sequence resonances is then Equation (9) divided by Equation (11).

$$\begin{aligned}
\langle \Sigma_c^1 \rangle &= \frac{\Sigma_p \sum_i \int_{E_1}^{E_2} \frac{\Sigma_{c_i}^1}{\Sigma_{r_i}^1 + \Sigma_p} \left(1 - \sum_j \frac{\Sigma_{r_j}^2}{\Sigma_{r_j}^2 + \Sigma_p} \right) \frac{dE}{E}}{\int_{E_1}^{E_2} \left[1 - \sum_i \frac{\Sigma_{r_i}^1}{\Sigma_{r_i}^1 + \Sigma_p} \left(1 - \sum_j \frac{\Sigma_{r_j}^2}{\Sigma_{r_j}^2 + \Sigma_p} \right) \right.} \\
&\quad \left. - \sum_j \frac{\Sigma_{r_j}^2}{\Sigma_{r_j}^2 + \Sigma_p} \left(1 - \sum_i \frac{\Sigma_{r_i}^1}{\Sigma_{r_i}^1 + \Sigma_p} \right) \right] \frac{dE}{E}} \tag{12}
\end{aligned}$$

The parentheses in the numerator contain the first order effects of resonance overlap of second sequence resonances on the first sequence. The parentheses in the denominator contain the first order effects of the mutual overlap of the two sequences. We will now demonstrate that the first order overlap effect of second sequence resonances on the first sequence approximately cancels between the numerator and denominator of Equation (12). If the numerator of Equation (12) is expanded we obtain,

$$\frac{\Sigma_p}{E_2-E_1} \left[\int_{E_1}^{E_2} \sum_i \frac{\Sigma_{c_i}^1}{\Sigma_{r_i}^1 + \Sigma_p} dE - \int_{E_1}^{E_2} \sum_i \frac{\Sigma_{c_i}^1}{\Sigma_{r_i}^1 + \Sigma_p} \sum_j \frac{\Sigma_{r_j}^2}{\Sigma_{r_j}^2 + \Sigma_p} dE \right]$$

The second integral is the integral of the product of the terms of the two sequences. Since the two sequences are independent, the relative positions of individual resonances in the two sequences are randomly distributed. If the narrow resonance assumption is valid at all, it can be demonstrated that this random superposition of the two sequences will result in only an occasional coincidence between individual resonances in the two sequences. When this is true, the contribution from the second sequence to the integral over one resonance in the first sequence will be approximately $1/\Sigma_p$, a constant for the integration, and the integral of the product may be replaced by the product of separate integrals over the two sequences to first order. Conversely, first sequence resonances are only occasionally in coincidence with second sequence resonances and the same is true for the integrals of the second sequence. The numerator of Equation (12) may then be written as

$$\frac{\Sigma_p}{E_2-E_1} \sum_i \int_{E_1}^{E_2} \frac{\Sigma_{c_i}^1}{\Sigma_{r_i}^1 + \Sigma_p} dE \left[1 - \sum_j \int_{E_1}^{E_2} \frac{\Sigma_{r_j}^2}{\Sigma_{r_j}^2 + \Sigma_p} dE \right]$$

where the $1/E$ dependence of the integrand has been factored outside the integrand as $1/(E_2-E_1)$, a slowly varying factor in the integrand relative to the resonances in the two sequences.

The same approximation is applied to the overlap terms in the denominator of Equation (12) and Equation (12) becomes

$$\begin{aligned}
\langle \Sigma_c^1 \rangle = & \frac{\frac{\Sigma_p}{E_2 - E_1} \sum_i \int_{E_1}^{E_2} \frac{\Sigma_{r_i}^1}{\Sigma_{r_i}^1 + \Sigma_p} dE \left[1 - \sum_j \int_{E_1}^{E_2} \frac{\Sigma_{r_j}^2}{\Sigma_{r_j}^2 + \Sigma_p} dE \right]}{\frac{1}{E_2 - E_1} \left[1 - \sum_i \int_{E_1}^{E_2} \frac{\Sigma_{r_i}^1}{\Sigma_{r_i}^1 + \Sigma_p} dE \left(1 - \sum_j \int_{E_1}^{E_2} \frac{\Sigma_{r_j}^2}{\Sigma_{r_j}^2 + \Sigma_p} dE \right) \right.} \\
& \left. - \sum_j \int_{E_1}^{E_2} \frac{\Sigma_{r_j}^2}{\Sigma_{r_j}^2 + \Sigma_p} \left(1 - \sum_i \int_{E_1}^{E_2} \frac{\Sigma_{r_i}^1}{\Sigma_{r_i}^1 + \Sigma_p} dE \right) \right]}. \quad (13)
\end{aligned}$$

The validity of this approximation depends on the validity of the narrow resonance assumption and the level density of the two sequences. If the resonances are truly narrow so that the resonances in each sequence approach a line spectra then the product integral will yield results very close to the integral of the separate sequences. In general, the higher the energy, the more valid is the narrow resonance approximation. The validity of the NR approximation depends on the probability of a neutron scattering across the resonance in a single collision. The single collision scattering interval is given by $E(1-\alpha)$ and hence varies as E . The width of the resonances varies as $\Gamma_n^0 \sqrt{E} \propto \sqrt{E}$. By this simple comparison it is seen that as energy increases, the width of the single collision interval will eventually overtake the resonance widths making the NR approximation valid even though it may not be valid in the resolved resonance range.

The bracket in the numerator contains the effects of first order overlap of second sequence resonances on the first sequence. This term is also present in the denominator as a factor of the first sequence integral. If we divide the numerator and denominator of Equation (13) by the bracket in the numerator and rearrange the terms in the denominator we obtain

$$\langle \Sigma_c^1 \rangle = \frac{\frac{\Sigma_p}{E_2 - E_1} \sum_i \int_{E_1}^{E_2} \frac{\Sigma_{c,i}^1}{\Sigma_{r,i}^1 + \Sigma_p} dE}{\left[\frac{1}{E_2 - E_1} \left(1 - \sum_i \int_{E_1}^{E_2} \frac{\Sigma_{r,i}^1}{\Sigma_{r,i}^1 + \Sigma_p} dE \right) \left(1 - \frac{\sum_j \int_{E_1}^{E_2} \frac{\Sigma_{r,j}^2}{\Sigma_{r,j}^2 + \Sigma_p} dE}{1 - \sum_j \int_{E_1}^{E_2} \frac{\Sigma_{r,j}^2}{\Sigma_{r,j}^2 + \Sigma_p} dE} \right) \right]} \quad (14)$$

If the narrow resonance assumption is valid, the second bracket in the denominator will be approximately 1.0. This second bracket in the denominator is significant when there is strong overlap between the two sequences. Experimental evidence indicates that only in the case of extreme Doppler broadening in mixtures of fissile isotopes where the level density is high does the third term become very significant. Self overlap effects in the numerator of Equation (14) as well as second order overlap effects between different sequences have not been included in the numerator of Equation (14). The inclusion of these effects require a more sophisticated development than we are describing here. [5]

Neglect of the second bracket in the denominator of Equation (14) yields an equation identical to one for a single sequence expansion using the narrow resonance assumption.

$$\langle \Sigma_c^1 \rangle = \frac{\frac{\Sigma_p}{E_2 - E_1} \sum_i \int_{E_1}^{E_2} \frac{\Sigma_{c,i}^1}{\Sigma_{r,i}^1 + \Sigma_p} dE}{1 - \frac{1}{E_2 - E_1} \sum_i \int_{E_1}^{E_2} \frac{\Sigma_{r,i}^1}{\Sigma_{r,i}^1 + \Sigma_p} dE} \quad (15)$$

This equation is called the Single Sequence Approximation. It is widely used for the calculation of unresolved resonance cross sections for fast reactors. [3] Equation (15) is the one the unresolved equations of C-SURE and PHROG are based upon. It is the equivalent of the effective

resonance integral for the single sequence approximation with a correction in the denominator for flux perturbation across the resonances. The effect of other sequences and additional materials is included only in so far as they are present in Σ_p in the Narrow Resonance Assumption.

If Equation (15) is divided through by N_a , the atom density of the absorber, and the Doppler broadened single level resonance formula substituted for the cross sections neglecting interference scatter, Equation (15) becomes

$$\langle \sigma_c(E) \rangle = \sum_{\ell, J} \frac{\sum_i \frac{\sigma_p}{E_2 - E_1} \int_{E_1}^{E_2} \frac{\Gamma_{\gamma 0}^i \sigma_0 \psi_i(\theta, x)}{\sigma_0 \psi_i(\theta, x) + \sigma_p} dx}{1 - \frac{1}{E_2 - E_1} \sum_i \int_{E_1}^{E_2} \frac{\Gamma_{\gamma 0}^i \sigma_0 \psi_i(\theta, x)}{\sigma_0 \psi_i(\theta, x) + \sigma_p}} \quad (16)$$

where the sum over (ℓ, J) includes the contribution to the capture cross section from all neutrons ℓ and all spin states J for a given ℓ . σ_p is now the scattering cross section per absorber atom. The interval $E_2 - E_1$ about E is small enough that $1/E$ can be factored out of the denominator yet large enough to include many narrow resonances. If the resonances are truly narrow the integration limits can be extended from zero to infinity since the resonance cross section is only large at the midpoint energy E between E_2 and E_1 . The interval $E_2 - E_1$ is equal to the number of resonances N_i times the average level spacing $\langle D \rangle_{\ell, J}$ for a given sequence (ℓ, J) . The sum over the resonances i then becomes, in the limit, a fluctuation integral over the statistical chi-square distributions for each species.

$$\langle \sigma_c(E) \rangle = \sum_{\ell, J} \frac{\frac{\sigma_p \langle \Gamma_{\gamma} \rangle_{\ell, J}}{\langle D \rangle_{\ell, J} \cos 2\phi_{\ell}} \int_0^{\infty} P_n(r) J(\theta, \beta) dr}{1 - \frac{1}{\langle D \rangle_{\ell, J}} \int_0^{\infty} P_n(r) \Gamma_{\ell, J} J(\theta, \beta) dr} \quad (17)$$

where $P_n(r)$ is given by Equation (2) and

$$J(\theta, \beta) = \int_0^\infty \frac{\psi(\theta, x)}{\psi(\theta, x) + \beta} dx, \quad \beta = \frac{\sigma_p}{\sigma_0 \cos 2\phi_\ell} \quad (18)$$

$J(\theta, \beta)$ is a function of the partial width fluctuation integrals through the dependence of θ and β on the partial widths. The compound elastic cross section is given by

$$\langle \sigma_s(S) \rangle = \frac{4\pi}{k^2} \sum_{\ell} (2\ell+1) \sin^2 \theta_{\ell} + \sum_{\ell, J} \frac{\frac{\sigma_p}{\langle D \rangle_{\ell, J} \cos 2\phi_{\ell}} \left[\int_0^\infty P_n(r) \Gamma_{n, \ell, J} J(\theta, \beta) dr - 2 \sin^2 \phi_{\ell} \int_0^\infty P_n(r) \Gamma_{\ell, J}(E) J(\theta, \beta) dr \right]}{1 - \frac{1}{\langle D \rangle_{\ell, J}} \int_0^\infty P_n(r) \Gamma_{\ell, J} J(\theta, \beta) dr}, \quad (19)$$

where it is required that $\sum_J g_{J\mu_{\ell, J}} = 2\ell+1$ and $\mu_{\ell, J}$ is the number of degrees of freedom for the neutron width of a particular J state corresponding to the number of open decay channels for the compound nucleus with total angular momentum J formed with neutrons of angular momentum ℓ .

For fissionable isotopes, statistical fluctuations are present for both the fission width and the neutron width and the equations become^[3]

$$\langle \sigma_c(E) \rangle = \sum_{\ell, J} \frac{\frac{\sigma_p \langle \Gamma_Y \rangle_{\ell, J}}{\langle D \rangle_{\ell, J} \cos 2\phi_{\ell}} \int_0^\infty P_n(r) \int_0^\infty P_k(s) J(\theta, \beta) ds dr}{1 - \frac{1}{\langle D \rangle_{\ell, J}} \int_0^\infty P_n(r) \int_0^\infty P_k(s) \Gamma_{\ell, J} J(\theta, \beta) ds dr} \quad (20)$$

$$\langle \sigma_f(E) \rangle = \sum_{\ell, J} \frac{\frac{\sigma_p}{\langle D \rangle_{\ell, J} \cos 2\phi_{\ell}} \int_0^\infty P_n(r) \int_0^\infty P_k(s) s \langle \Gamma_f \rangle_{\ell, J} J(\theta, \beta) ds dr}{1 - \frac{1}{\langle D \rangle_{\ell, J}} \int_0^\infty P_n(r) \int_0^\infty P_k(s) \Gamma_{\ell, J} J(\theta, \beta) ds dr} \quad (21)$$

$$\langle \sigma_s(E) \rangle = \sum_{\ell, J} \frac{\frac{\sigma_p}{\langle D \rangle_{\ell, J} \cos 2\phi_\ell \left[\int_0^\infty P_n(r) r \langle \Gamma_n \rangle_{\ell, J} \int_0^\infty P_k(s) J(\theta, \beta) ds dr \right.} - 2 \sin^2 \phi_\ell \int_0^\infty P_n(r) \int_0^\infty P_k(s) \Gamma_{\ell, J} J(\theta, \beta) ds dr \left. \right]}{1 - \frac{1}{\langle D \rangle_{\ell, J}} \int_0^\infty P_n(r) \int_0^\infty P_k(s) \Gamma_{\ell, J} J(\theta, \beta) ds dr} . \quad (22)$$

If infinitely dilute cross sections are requested, the denominator in each of the above equations is effectively set equal to 1.0 and the numerator is evaluated at $\sigma_p = 10^7$. In this case, the numerator of Equations (20), (21), and (22) yields a result identical to Equations (3), (4), and (5) for fissionable isotopes. For other values of θ and β , $J(\theta, \beta)$ is interpolated from tables and both the numerator and denominator are evaluated.

Equations (17), (19), (20), (21), and (22) will yield pointwise unresolved resonance cross sections at either infinite dilution or finite dilution with temperature dependence. The energy mesh can be input to the code and is completely arbitrary. The input parameters for the unresolved range of a given material may be either read directly off an ENDF/B tape from File 2 and File 3 or input by cards when fitting cross sections to experimental data. When File 3 data are present as well as File 2 data, background cross sections are calculated over the same energy mesh and added to the compound cross sections at each energy point.

2. DEFINITION OF TERMS

A complete listing of all the variables used in the above equations will now be given

$\sum_{\ell, J}$ is the summation over all J and ℓ -states of a given isotope

$\langle D \rangle_{\ell, J}$ is the average level spacing for each ℓ, J state of the compound nucleus

$\langle \Gamma(E) \rangle_{\ell, J}$ is the average total width at E for the spin state ℓ, J

$$\langle \Gamma(E) \rangle_{\ell,J} = \langle \Gamma_n(E) \rangle_{\ell,J} + \langle \Gamma_f(E) \rangle_{\ell,J} + \langle \Gamma_\gamma(E) \rangle_{\ell,J} + \langle \Gamma_x(E) \rangle_{\ell,J} = \Gamma$$

$\langle \Gamma_\gamma(E) \rangle_{\ell,J}$ is the average radiation width at E

$\langle \Gamma_f(E) \rangle_{\ell,J}$ is the average fission width at energy E

$\langle \Gamma_x(E) \rangle_{\ell,J}$ is a partial width permitted in the ENDF/B file for all other extraneous open decay channels, eg, discrete level inelastic excitation ($\langle \Gamma_x \rangle_{\ell,J}$ is not presently processed by C-SURE)

$$\langle \Gamma_n(E) \rangle_{\ell,J} = \langle \Gamma_n^0(E) \rangle_{\ell,J} \sqrt{E} V_\ell(E) \mu_{\ell,J}$$

$\langle \Gamma_n^0 \rangle_{\ell,J}$ is the average reduced neutron width

$\mu_{\ell,J}$ is the number of degrees of freedom in the neutron width distribution

$V_\ell(E)$ is the penetrability of the target nucleus for incident neutrons of angular momentum ℓ

$$V_0 = 1.0$$

$$V_1 = \frac{\rho^2}{1 + \rho^2}$$

$$V_2 = \frac{\rho^4}{9.0 + 3.0 \rho^2 + \rho^4}$$

where

$$\rho = ka$$

$$k = .002196771 (A_0 / (A_0 + 1)) \sqrt{E}$$

a, the opaque nucleus channel radius, equals $[0.123 A_0^{1/3} + .08]$

ϕ_ℓ is the phase shift and

$$\phi_0 = \hat{\rho}$$

$$\phi_1 = \hat{\rho} - \tan^{-1} \hat{\rho}$$

$$\phi_2 = \hat{\rho} - \tan^{-1} \left(\frac{3\hat{\rho}}{3 - \hat{\rho}^2} \right)$$

where

$$\hat{\rho} = kR_a$$

and where

R_a is the noncompound (potential) scattering length of the absorber (in units of 10^{-12} cm.) as given in File 2 of ENDF/B.

The parameters $\langle \Gamma_\gamma(E) \rangle_{\ell,J}$, $\langle \Gamma_f(E) \rangle_{\ell,J}$, $\langle \bar{\Gamma}_n^0(E) \rangle_{\ell,J}$, and $\langle \bar{D} \rangle_{\ell,J}$ are either a constant value for a given ℓ, J state or, if tabulated data values are given, are determined at each energy by interpolation.

The fluctuation integrals in Equations (20) - (22) can be represented as

$$S(f(x)) = \int_0^\infty P_n(r) \int_0^\infty P_k(s) f(x) ds dr, \quad (23)$$

where $f(x)$ represents the argument of the integrands.

Equation (23) represents integration over the chi-squared distributions used to take into account fluctuations of the fission and neutron width; respectively.

$P_n(r)$ is the chi-squared distribution for the neutron width.

$P_k(s)$ is the chi-squared distribution for the fission width.

r is the ratio of neutron width at E to mean neutron width at E .

s is the ratio of fission width at E to mean fission width at E .

$$J(\theta, \beta) = \int_0^\infty \frac{\psi(\theta, x)}{\psi(\theta, x) + \beta} dx \quad (24)$$

is the relative probability of absorption. For sufficiently large values of β , the approximation, $J(\theta, \beta) = \frac{\pi}{2 \sqrt{\beta^2 + \beta}}$, is used.

$\psi(\theta, x)$ is the symmetric Doppler line-shape function.

$$\psi(\theta, x) = \frac{1}{\sqrt{4\pi\theta}} \int_{-\infty}^\infty \frac{e^{-(x-y)^2/4\theta}}{1 + y^2} dy \quad (25)$$

where

$$\theta = \frac{4E_0 kT}{A_0 \Gamma^2} \left(\frac{A_0}{1 + A_0} \right)^2$$

$$x = \frac{2E_0}{\Gamma}$$

$$\beta = \frac{\sigma_p}{\sigma_0 \cos 2\phi_\ell}$$

σ_p is the effective scattering cross section per absorber atom in the NR approximation

$$\sigma_p = \sigma_{pa} + \frac{1}{N_a \left(\frac{\bar{\ell}_0}{1-C} \right)} + \sigma_m$$

$$\sigma_{pa} = \sum_{\ell} (2\ell+1) \frac{4\pi}{k^2} \sin^2 \phi_{\ell}$$

$\bar{\ell}_0$ is the radius or thickness of the absorber lump

C is the Dancoff pin shadowing factor

σ_m is the sum of the scattering cross sections per absorber atom for all moderators in the absorber lump

N_a is the lump absorber atom density

$$\sigma_0 = 2.6037 \times 10^6 \langle \Gamma_n(E) \rangle g_J \left(\frac{A_0 + 1.0}{A_0} \right)^2 / \langle \Gamma(E) \rangle$$

g_J is the statistical weight for J state levels

$$g_J = \frac{1}{2} \left(\frac{2J+1}{2I+1} \right)$$

J is the total angular momentum quantum number of the compound nucleus

I is the ground state spin of the target nucleus

A_0 is the atomic mass ratio

III. SMOOTH CROSS SECTION CALCULATIONS

The smooth cross sections are determined by interpolation using the values from ENDF/B, File 3. The interpolation scheme used is determined from this file.

Caution should be used at the unresolved range limits, as the smooth values are usually discontinuous at these points. When reading in the input mesh, therefore, the values for unresolved range limits should be altered slightly to make sure the values are just inside the unresolved range. When the program generates the mesh, this is done automatically.

IV. INPUT INSTRUCTIONS

1. TYPES OF INPUT

There are two types of input data, program control data and ENDF/B data. When ENDF/B data are input on cards, the cards follow the program control data for a given run. For stacked runs, this implies control data and ENDF/B data follow each other alternately.

2. PROGRAM CONTROL DATA

The program control data consist of one or more title cards, one integer data card, one floating point data card, and an optional series of mesh cards for each run of a series. If so specified on the integer card, ENDF/B data cards may follow the previous data.

The program is designed to require the user to provide a minimum of input data. A set of initial default values is supplied so that the user may, for most uses, leave most of the data blank for the initial run. For a series of runs, the variable values from the previous run are used as the default values, except for two cases specified in Table I. This simplifies the running of a series of the same type of problems; however, if the value of a variable from the previous run is not desired the user must be sure to reset this value. If a variable is not to be used at all, set the variable to "-1" for integer variables or to "-1.0" for floating point variables.

Table I gives a description of the program control data cards. Of all the variables on the integer and floating point data card, the only variable absolutely requiring an input value on the initial run is the variable "MATNO". Other normally used variables are denoted by an asterisk. The required cards are denoted by a double asterisk. Where the input description is involved, a concise statement of purpose precedes the description of the use of the variable.

TABLE I

CARD INPUT INSTRUCTIONS

****Card 1:** Format (20A4, T80,A1) (To run a series of materials, repeat this card.)

<u>Variable</u>	<u>Columns</u>	<u>Description</u>
RUNTL(1)	1-4	Title card to be printed as a heading for each page of output.
RUNTL(2)	5-8	
.	.	
.	.	
RUNTL(20)	77-80	
ASTQ	80	If ASTQ is an asterisk, the following card is expected to be a title card (or the type described below as Card 1').

Card 1' (optional series): Format (19A4,A3,A1) (Present only if column 80 of the preceding card was an asterisk.)

<u>Variable</u>	<u>Columns</u>	<u>Description</u>
REPRT(1)	1-4	Title card to be printed with the initial input listing only.
REPRT(2)	5-8	
.	.	
.	.	
REPRT(20)	77-79	
ASTQ	80	If ASTQ is an asterisk, the following card is expected to be a title card of this same type.

Note: The above implies that title cards are continued to be read in until there is not an asterisk in Column 80 of the last title card.

**Card 2: Format (12I5) (Integer Data Card)

<u>Variable</u>	<u>Columns</u>	<u>Description</u>	<u>Initial Default Value</u>
*MATNO	1-5	<p>ENDF/B material number.</p> <p>If MATNO is left blank, or set equal to zero, on runs other than the initial run of stacked runs, the ENDF/B data for the previous run (or this data modified by use of NDFBCH and ENDF/B data change cards) will be reused for this run. In this case, the following input variables must not be changed: IDTAP, ISONLY, NDFB. The use of the ENDF/B data of the previous run is superseded if IREW=1, in which case the data will be reread and any variable may be used. In stacked runs, the MATNO's must be in the same order as on the ENDF/B tape (nondecreasing order) or else IREW (rewind) must be used.</p>	(0)
*IDTAP	6-10	<p>ENDF/B tape number.</p> <p>If IDTAP is used, the tape number will be checked, and the title of the tape will be printed at the top of each page of output.</p>	(-1)
INUMSH	11-15	<p>The input unit for the mesh.</p> <p>This variable is applicable only if MESHRD $\neq$ -1, ie, only if the mesh is read in.</p>	(5)
IPTIME	16-20	<p>Purpose: time information printout.</p> <p>If IPTIME = 1, then the time elapsed from the previous time printout and the cumulative time will be printed at frequent intervals.</p>	(-1)
IPTPLG	21-25	<p>Purpose: mesh determination -- simplest type.</p> <p>If IPTPLG is used, the program will create the mesh at which the cross sections are evaluated. IPTPLG is the number of points per unit lethargy for the mesh. Thus, cross sections are evaluated at a lethargy spacing of 1/IPTPLG between the lower and upper unresolved range limits. This variable is applicable only if MESHRD = -1.</p>	(50)

<u>Variable</u>	<u>Columns</u>	<u>Description</u>	<u>Initial Default Value</u>
ISKCFP	26-30	<p>Purpose: skipping cross section types.</p> <p>If ISKCFP = -1 all types of reactions present are processed. If ISKCFP is divisible by 2, capture cross sections will be skipped. If ISKCFP is divisible by 3, fission cross sections will be skipped. If ISKCFP is divisible by 5, scattering will be skipped. Example: set ISKCFP = 15 to do capture only.</p>	(-1)
ISONLY	31-35	<p>Purpose: selecting a single isotope from a material.</p> <p>If for an ENDF/B material containing more than one isotope, it is desired to process only the N'th isotope, set ISONLY equal to N. ISONLY can be used to skip the unresolved calculations and do only the smooth by setting ISONLY = -2.</p>	(-1)
LETHM	36-40	<p>Purpose: mesh determination.</p> <p>If LETHM = -1, the mesh read in should be in units of energy in ascending order. If LETHM = +1, the mesh read in should be in units of lethargy in descending order.</p>	(-1)
MESHRD	41-45	<p>Purpose: for reading in the mesh.</p> <p>If MESHRD = -1, do not read any mesh cards, but use the IPTPLG option</p> <p>If MESHRD = +1, for problem 1 of stacked runs, read the mesh cards (see card 4); for problem N, N > 1, of stacked runs, then use the mesh of the most recent previous run read in with MESHRD ≥ 1.</p> <p>If MESHRD = 2, read the mesh for this problem (see card 4).</p> <p>Also, for 1 and 2, the mesh generated is listed if not previously listed.</p> <p>If MESHRD = 3, do as for 1 except do not list the mesh generated.</p> <p>If MESHRD = 4, do as for 2 except do not list the mesh generated.</p> <p>If the mesh read in extends beyond the unresolved range limits, the variables ELORED and EHIRED must also be used to extend the range.</p>	(-1)

<u>Variable</u>	<u>Columns</u>	<u>Description</u>	<u>Initial Default Value</u>
NDFB	46-50	Input unit for the ENDF/B data. If NDFB = 5, see card 5.	(9)
NDFBCH	51-55	Purpose: allows changes in ENDF/B card data. If NDFBCH = N, then N ENDF/B change cards are expected instead of a complete set of ENDF/B data cards. See card 5. NDFB must equal 5 if NDFBCH is used.	(-1)
NDFPUN	56-60	Purpose: punches ENDF/B card data. If NDFPUN is positive, the unresolved and smooth capture and fission data decks are punched from the ENDF/B library in the proper format for use as input to C-SURE. If this variable is used, NDFB must not equal 5, NDFBCH must equal -1, and MATNO must not equal zero and must not be equal to MATNO for the previous run, unless the tape is rewound, ie, IREW = 1. NDFPUN is not saved but must be read in each time punching is desired.	(-1)
IREW	61-65	Purpose: to rewind ENDF/B tape. If IREW = 1, the tape for this run is rewound. To avoid the user accidentally rewinding the tape on all subsequent runs, this value is not saved but must be read in each time rewinding is desired.	(-1)

**Card 3: Format (6E11.0). (Floating Point Data Card)

<u>Variable</u>	<u>Columns</u>	<u>Description</u>	<u>Initial Default Value</u>
ALTABN	1-11	Purpose: change the abundance weighting of an isotope. Set the value of the abundance for the isotope being processed to ALTABN. The use of ALTABN requires the use of ISONLY. (The main use of ALTABN is to change the abundance weight to 1.0 when only one isotope of a material is being processed.)	(-1.)

Variable	Columns	Description	Initial Default Value
*SIGP	12-22	The value of SIGP input should equal $\sigma_m + \frac{1}{N_a \left(\frac{\bar{x}_0}{1-C} \right)}$ <p>where,</p> <p>σ_m is the sum over all moderators of the scattering cross sections per absorber atom.</p> <p>N_a is the lump absorber atom density</p> <p>$\bar{x}_0$ is the radius or thickness of the absorber lump</p> <p>C is the Dancoff correction factor.</p>	(10 ⁷)
SMFAC	23-33	If SMFAC is used, then all smooth cross sections are multiplied by SMFAC before being printed. The main use of this variable is to allow weighting of the smooth cross sections when only 1 isotope of an ENDF/B material is processed.	(1.0)
		SMFAC may be used only if ISONLY is used.	
*TKELVN	34-44	The temperature in degrees Kelvin	(10 ⁻²⁰)
ELORED	45-55 }	Purpose: Energy Range Determination	(10 ⁻²⁰)
EHIRED	56-66 }		
		ELORED and EHIRED are used as the lower and upper energy range limits in eV. for determining the energies at which the cross sections are evaluated. These input values are overridden by the code when they would result in zero values for all cross sections at the beginning and end of the range they would determine. ELORED is overridden by the minimum of the lowest energy in the smooth file at which capture, fission, or scattering is given and the lower energy limit of the unresolved resonance range. EHIRED is overridden by corresponding maximum values. However, if ELORED or EHIRED is set equal to -2.0, the range limit used will be the corresponding unresolved resonance energy range limit.	(2×10 ⁷)

Card 4 (optional series): Format (6E11.0,7I2) (Energy Mesh Cards)

<u>Variable</u>	<u>Columns</u>	<u>Description</u>
EA(1)	1-11	Energy points at which cross sections are to be evaluated.
EA(2)	12-22	
.	.	
.	.	
EA(6)	55-66	
IA(1)	67-68	The number of points to be inserted, equally spaced in energy, between the above energy values. If $2 \leq I \leq 6$ and if $IA(I) = N$, then N mesh points are inserted between the energy points given above, $EA(I-1)$ and $EA(I)$. For $IA(1) = N$, N mesh points are inserted between $EA(6)$ on the previous card and $EA(1)$ on the current card.
.	.	
.	.	
IA(6)	77-78	
IA(7)	79-80	This value must be zero for all mesh cards except the last. On the last mesh card, if the last value for a mesh point is given in $EA(I)$, then $IA(7)$ must equal I , ie, $IA(7)$ indicates which field is the last field to be read on the last mesh card.

Note: To make changing the mesh easier, all zero values in energy, after the first mesh point on card 1, columns 1-11, are ignored. The mesh generated must not exceed 1000 points.

Card 5 (optional series): Format (See Chapter IV, Section 3.)

If ENDF/B data cards or change cards are used, as they must be when NDFB = 5, then insert them here. See Chapter IV, Section 3, for a description of the cards required.

3. ENDF/B DATA

3.1 Complete ENDF/B Data.

For ENDF/B data read from tape, the data format used by C-SURE must conform to the requirements described in reference [6].

For ENDF/B data read from cards, the data format used by C-SURE is slightly modified to eliminate some superfluous data as follows. The data for File 1 are replaced by a single title card (format: 20A4). The File 2 data are the same except that the subsection for the resolved resonance range is omitted. File 3 is identical in both cases, but only reaction types 2 (elastic scattering), 18 (fission), and 102 (capture) are allowed. Either File 2 or File 3 may be omitted. No other files may be present. The end of the ENDF/B card data is recognized when an ENDF/B tape end record is encountered. This card must contain a "-1" in columns 69 and 70, a blank in column 71, and a "0" in column 72.

3.2 ENDF/B Change Data

Whenever ENDF/B has been read in on cards during an earlier run of a series of runs, individual cards of these data may be replaced by use of the input variable NDFBCH (also see Table I, Card 2). The format of these ENDF/B change cards is identical to that of the cards they replace.

There are several requirements when using ENDF/B data change cards. Some previous run of the stacked runs and the present run must have the input variable NDFB = 5. Each ENDF/B data change card, placed consecutively in the position indicated as Card 5 in Table I, will replace the first ENDF/B card from the previous run which has an identical sequence number in columns 77-80. The new cards to replace old data from the earlier run of the stacked runs must be in the same relative sequence as the earlier data.

V. PROGRAM OUTPUT

1. PRINTED OUTPUT

The principle output consists of the following cross sections for scattering, capture, and fission: total (smooth plus resonance), resonance contribution, smooth contribution, s-wave resonance contribution, and p-wave resonance contribution. Less output than listed above may be produced if some of the above are not applicable. If fission data are present, s-wave and p-wave resonance contributions will be printed for a maximum of 600 energy values per run. Scattering cross sections will be printed for a maximum of 500 energy values per run.

Each page of output is headed by a title line which includes the program name, the date of the last revision, the date of the run, and the page number. The following line consists of a title to the run, which is generated a combination of data from both the ENDF/B library and card input. The third line printed may consist of the tape title and the ENDF/B material number.

The input cards are listed as they are read and again after default values have been applied. If the mesh is input, the expansion is listed. If card input is used for ENDF/B data, it is listed.

The program checks the input and prints appropriate error messages.

2. PUNCHED CARD OUTPUT

If the input variable NDFPUN is set positive, the unresolved and smooth capture and fission data decks are punched from the ENDF/B library in the proper format for later use as input to C-SURE. See Chapter IV, Section 3, for a description of these cards.

3. ERROR MESSAGES

The program checks the input and may inform the user that he has made an error. A list of error stops will be found in Appendix C, *Subroutine Descriptions*, by subroutine then by error number.

If the cause of the error is not apparent in problems involving stacked runs, the user may have forgotten to reset one of his variables for the new run. For example, the user may encounter an error message

stating that the data on his floating point data card are not meaningful and give a number 935 with the error message. Instead of becoming unduly disturbed since his input card was a perfectly valid set of zeroes, he should check the previous run for values on the corresponding card which may need to be reset using a "-1". (See Chapter IV, Section 2.) He may find in this example, that he has reset ISONLY to -1 from 2, say, but has not reset ALTABN or SMFAC, similarly.

VI. REFERENCES

1. H. C. Honeck, ENDF/B -- Specifications for an Evaluated Nuclear Data File for Reactor Applications, BNL-50066 (T-467) ENDF 102 (May 1966).
2. D. E. Kusner, R. A. Dannels, and S. Kellman, ETOG-1, A FORTRAN IV Program to Process Data from the ENDF/B File to the MUFT, GAM, and ANISN Formats, WCAP-3845-1, ENDF 144 (December 1969).
3. B. J. Toppel, A. L. Rago, and D. M. O'Shea, MC², A Code to Calculate Multigroup Cross Sections, ANL-7318 (June 1967).
4. H. M. Sumner, ERIC 2, A FORTRAN Program to Calculate Resonance Integrals and from Them Effective Capture and Fission Cross-Sections, AEEW-R-323 (April 1964).
5. R. B. Nicholson and E. A. Fischer, "The Doppler Effect in Fast Reactors," Advances in Nuclear Science and Technology, Vol. 4, New York: Academic Press, Inc. (1968) pp. kk0-192.
6. M. K. Drake, Data Formats and Procedures for the ENDF Neutron Cross Section Library, BNL 50274, ENDF 102, Vol. I (October 1970).
7. R. L. Curtis, G. L. Singer, F. J. Wheeler, and R. A. Grimesey, PHROG--A FORTRAN IV Program to Generate Fast Neutron Spectra and Average Multigroup Constants, IN-1435 (April 1971).
8. G. I. Bell and S. Glasstone, Nuclear Reactor Theory, New York: Van Nostrand Reinhold Publishing Co. (1970).

APPENDIX A

INTEGRATIONS OVER THE CHI-SQUARED DISTRIBUTIONS

The integrations over the chi-squared distributions indicated in Equations (17) through (22) are actually performed using the following approximations. For fissile isotopes,

$$S(f(x)) = \int_0^\infty P_n(r) \int_0^\infty P_k(s) f(x) ds dr \doteq \frac{1}{5 \cdot 10} \sum_{i=1}^{10} \sum_{i'=1}^5 f(p_i, p_{i'}'). \quad (A-1)$$

For nonfissile isotopes there are no fission widths involved so that Equation (A-1) becomes

$$S(f(x)) = \int_0^\infty P_n(r) f(x) dr = \frac{1}{10} \sum_{i=1}^{10} f(p_i). \quad (A-2)$$

These equations and constants give a 10-point integration with one or two degrees of freedom for the neutron width distributions and a 5-point integration with one to four degrees of freedom for the fission width distribution. A justification for the approximation of the form of Equation (A-2) is given below. The justification for the double integral approximation above is similar. The p_i and $p_{i'}'$ are constants whose values are given in Tables 1 and 2 and which were determined as follows and as described in Appendix A of MC²[3] and in the ERIC-2 code.[4]

Values of z_i are determined such that

$$\int_{z_i}^{z_{i+1}} P_n(x) dx = \frac{1}{N}, \quad (A-3)$$

where P_n is the chi-squared distribution of order n . N is set to 10 for the neutron-width distributions which may be of order 1 or 2 and set to 5 for the fission-width distributions which may be of order 1, 2, 3, or 4. $N-1$ point z_i are involved, besides the points $z_0 = 0$ and $z_N = \infty$.

Within each interval (z_i, z_{i+1}) , average values for x , represented by p_i , are determined using

$$p_{i+1} = N \int_{z_i}^{z_{i+1}} x P_n(x) dx. \quad (A-4)$$

Figure 1 shows these choices of the z_i and p_i .

Fig. 1 Choice of z_i and p_i for approximation of $S(f(x))$ by 5 point integration.

Now,

$$\begin{aligned} S(f) &= \int_0^{\infty} P_n(x) f(x) dx = \int_0^{z_1} P_n(x) f(x) dx \\ &+ \int_{z_1}^{z_2} P_n(x) f(x) dx + \dots + \int_{z_{N-1}}^{z_{\infty}} P_n(x) f(x) dx \end{aligned}$$

so that, by the trapezoidal rule, the following approximation holds.

$$\begin{aligned} S(f(x)) &\doteq f(p_1) \int_0^{z_1} P_n(x) dx + f(p_2) \int_{z_1}^{z_2} P_n(x) dx \\ &+ \dots + f(p_n) \int_{z_{N-1}}^{z_N} P_n(x) dx. \end{aligned}$$

Using Equation (A-3)

$$S(f(x)) \doteq f(p_1) \frac{1}{N} + \dots f(p_n) \frac{1}{N} = \frac{1}{N} \sum_{i=1}^n f(p_i).$$

Thus,

$$\int_0^{\infty} f(x) P_n(x) dx \doteq \frac{1}{N} \sum_{i=1}^N f(p_i). \quad (A-5)$$

The $J(\theta, \beta)$ tables used by C-SURE to approximate the values given by Equation (17) were tested using the QUICKW subroutine of MC². The table look-up and interpolation method was found to be above four times faster than the QUICKW method and only slightly less accurate. Frequently the use of the table is not necessary. For values of β sufficiently large, the formula for $J(\theta, \beta)$ for the infinite dilute case, $J(\infty, \beta) = \pi/2\sqrt{\beta(1+\beta)}$, is used.

TABLE A-I^[3]VALUES OF p_i

Used for Integration of Neutron-width
Distributions with One or Two Degrees of Freedom

Degrees of Freedom, n			Degrees of Freedom, n		
Index, i	1	2	Index, i	1	2
1	0.00525430	0.0517550	6	0.574320	0.800477
2	0.0371740	0.163089	7	0.879486	1.05263
3	0.103133	0.288398	8	1.33502	1.39297
4	0.207850	0.431720	9	2.10558	1.91582
5	0.359875	0.599144	10	4.39230	3.30400

TABLE A-II^[3]VALUES OF p_i'

Used for Integration of Fission-width
Distributions with One, Two, Three, or Four Degrees of Freedom

Index, i'	Degrees of Freedom, k			
	1	2	3	4
1	0.0212093	0.107400	0.189269	0.254966
2	0.155477	0.360070	0.476304	0.549072
3	0.467072	0.699863	0.793185	0.82565
4	1.10710	1.22312	1.23576	1.23075
5	3.24914	2.60955	2.30575	2.12265

APPENDIX B

INPUT/OUTPUT UNITS

Fortran units 5, 6, and 7 are used for card input, printed output, and punched output, respectively. The default value for the ENDF/B library is unit 9. Units 55 and 56 are scratch units which are needed only if the option to change individual cards of previously read in card data are used. In this case, these units alternate storing the original and the altered ENDF/B data. Unit 1 is used temporarily to store ENDF/B data which are to be punched and is not needed if NDFPUN = -1 for all runs.

APPENDIX C

SUBROUTINE DESCRIPTIONS

This appendix contains a brief description of the C-SURE subroutines* in the order they appear in the code. Also included is a list of calls to other subroutines and a list of numbered error stops.

MAIN	Main calling routine of C-SURE. Calls: ININ, NDFB5, PAGE, PAGI, RESU, TMAT, TMF1, TMF2, TMF3, TIM, TPOS, TRID, ZERO.
ARMESH	Generates the mesh. Calls: PAGE
BLOCK DATA	Contain $J(\theta, \beta)$ tables for Doppler broadening and shielding.
CONT	Reads ENDF/B CONT record.
CPOS	Reads ENDF/B card data to determine proper file and section.
ECHNG	Changes individual ENDF/B data cards previously stored. Calls: PAGE
EDUMP	Clears buffers and obtains dump when certain errors occur.
ERR	Error routine Calls: EDUMP
FJCJTB	Interpolates in $J(\theta, \beta)$ for Doppler broadening
HOLL	Reads ENDF/B HOLL record Calls: CONT, LIST
ININ	Card input routine Calls: ARMESH, ININTR, LSTMSH, ERR, PAGE Error stops: 920; Input not allowed: MATNO = 0 on first run or MATNO < 0. 925; Input not allowed: ISONLY < -2 or ISONLY > 10.

*Most of the tape handling subroutines were taken essentially in tact from ETOG-1(2); several other subroutines have roots in this code.

930; Input not allowed: TKELVN is negative.

935; Input not allowed: ISONLY = -1 and either ALTABN $\neq$ -1 or SMFAC $\neq$ 1.

940; Input not allowed: IPTPLG < 0 or IPTPLG > 500.

945; Input not allowed: NDFBCH > 0 and NDFB $\neq$ 5.

950; Input not allowed: NDFPUN $\neq$ -1 and either NDFB = 5 or NDFBCH $\neq$ -1.

955; Input not allowed: ALTABN > 1.0.

ININTR Transfers card input from arrays into named variables.

LIST Reads ENDF/B LIST record.

LSTMSH Lists the energy mesh generated by ARMESH.
Calls: PAGE

LRF2 Moves File 2 ENDF/B data (when formula type is LRF = 2) into arrays and variables used in RESU.
Calls: CONT, LIST

NDFB5 Reads ENDF/B card data.
Calls: ERR, PAGE
Error stops: More than 5000 ENDF/B data cards input.

NEWU1 Finds interpolated values for ENDF/B unresolved parameters.
Calls: TERPO

PAGE Writes page headings.

PAGI Initializes version number, date, and time.

PENTRA Calculates the penetrability.

RESU Calculates and prints unresolved resonance cross sections.
Calls: FJCJT, NEWU1, PAGE, PENTRA, TERPO.

RWENDF Prepares for punching and punches ENDF/B data.

SMCHK Checks to see if smooth data is all zeroes in the range considered.
Calls: TERPO

TAB1	Reads ENDF/B TAB1 record; assigns permanent storage for smooth cross sections.
TERPO	Interpolation routine.
TIM	Prints elapsed and total time.
TMAT	Positions the ENDF/B tape to the desired material. Calls: CONT, HOLL
TMF1	Reads the first part of ENDF/B File 1. Calls: CONT
TMF2	Reads ENDF/B File 2 data. Calls: CONT, LIST, LRF2
TMF3	Reads ENDF/B File 3 data. Calls: CONT, TAB1, TAB1C, TPOS, SMCHK, XTND
TPOS	Positions the ENDF/B tape to the desired file and reaction type. Calls: CONT
TRID	Reads and checks the ENDF/B tape identification number. Calls: CONT
XTND	Extends input data over a wider energy range by adding zeroes over the extensions.
ZERO	Initializes common variables.

APPENDIX D
FLOW CHART

APPENDIX E

SAMPLE PROBLEM SET

The sample problem set consists of a set of eleven stacked problems, six using ENDF/B data for U-238 and five using ENDF/B data for Pu-239. The intent of these problems is to test the major options of C-SURE and to demonstrate the use of the input procedure, particularly the use of the default values.

The reader will notice that in some of the sample problems in which the mesh was read in, such as run number 3, there are grossly different cross section values at apparently the same energy value. This sample problem was chosen to show that energy values on either side of the unresolved range energy limits may appear to be the same point due to round off before printing, while the cross section results differ because the values on the ENDF/B files are usually discontinuous at the range limits.

The sample problem set output follows.

SAMPLE RUNS FOR U-238, SET 1, NO. 1 TEST INTERNAL MESH

ENDF/B MAT. NO. 0

CONTROLLING INPUT CARDS AS READ

NUMBER OF THE RUN = 1

SAMPLE RUNS FOR U-238, SET 1, NO. 1 TEST INTERNAL MESH
1103 201 0 1 3 0 0 0 0 0 0 0
0.0 0.0 0.0 0.0 0.0 -2.0000E 00-2.0000E 00

INPUT CARDS AFTER DEFAULTS

MATNO	IDTAP	INUMSH	IPTIME	IPTPLG	ISKCFS	ISONLY	LETHM	MESHRD	NDFB	NDFBCH	NDFPUN	IREW
1103	201	5	1	3	-1	-1	-1	-1	9	-1	-1	-1
ALTABN		SIGP		SMFAC		TKELVN		ELORED		EHIREO		
-1.0000E 00		1.0000E 07		1.0000E 00		1.0000E-20		-2.0000E 00		-2.0000E 00		

THERE IS NO SMOOTH FISSION DATA PRESENT FOR THIS MATERIAL IN THE RANGE CONSIDERED.

U-238 SAMPLE RUNS FOR U-238, SET 1, NO. 1 TEST INTERNAL MESH

TIME: 14.96/ 14.96 (SEC.)

ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1103

*** UNRESOLVED RESONANCE CROSS SECTIONS ***

LOWER UNRESOLVED RANGE ENERGY LIMIT IN EV.: 3.9100E 03 UPPER UNRESOLVED RANGE ENERGY LIMIT IN EV.: 4.5000E 04

ENERGY	TOTAL CAPTURE	SMOOTH CONTRIBUTION	RESONANCE CONTRIBUTION	S-WAVE CONTRIBUTION	P-WAVE CONTRIBUTION
3.9100E 03	1.1169E 00	1.0000E-04	1.1168E 00	7.1094E-01	4.0586E-01
5.8751E 03	7.2471E 01	1.0000E-04	9.2461E-01	4.9715E-01	4.2746E-01
8.8279E 03	7.8188E-01	1.5363E-04	7.8173E-01	3.4706E-01	4.3467E-01
1.3265E 04	6.8181E-01	5.8154E-03	6.7599E-01	2.4185E-01	4.3415E-01
1.9931E 04	5.6212E-01	9.9573E-03	5.5216E-01	1.6872E-01	3.8344E-01
2.9948E 04	4.5727E-01	1.7957E-02	4.3931E-01	1.1789E-01	3.2143E-01
4.5000E 04	3.7961E-01	3.2000E-02	3.4761E-01	8.2704E-02	2.6490E-01

U-238 SAMPLE RUNS FOR U-238, SET 1, NO. 1 TEST INTERNAL MESH

TIME: 0.20/ 15.16 (SEC.)

ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1103

ENERGY	TOTAL SCATTER	SMOOTH CONTRIBUTION	RESONANCE CONTRIBUTION	S-WAVE CONTRIBUTION	P-WAVE CONTRIBUTION
3.9100E 03	1.5780E 01	1.0000E-01	1.5680E 01	1.5583E 01	9.7844E-02
5.8751E 03	1.4908E 01	1.0000E-01	1.4808E 01	1.4633E 01	1.7522E-01
8.8279E 03	1.4203E 01	1.0000E-01	1.4103E 01	1.3800E 01	3.0333E-01
1.3265E 04	1.3809E 01	2.1500E-01	1.3593E 01	1.3054E 01	5.3984E-01
1.9931E 04	1.3429E 01	3.0000E-01	1.3129E 01	1.2367E 01	7.6229E-01
2.9948E 04	1.3010E 01	3.0000E-01	1.2710E 01	1.1708E 01	1.0018E 00
4.5000E 04	1.2694E 01	2.9896E-01	1.2395E 01	1.1042E 01	1.3532E 00

SET 1 NO. 2, TEST INPUT MESH, ALSO TEST MATNO = 0

TIME: 0.03/ 15.17 (SEC.)

ENDF/B MAT. NO. 1103

NUMBER OF THE RUN = 2

CONTROLLING INPUT CARDS AS READ

SET 1 NO. 2, TEST INPUT MESH, ALSO TEST MATNO = 0
0 0 0 0 0 0 0 0 0 0 0 0 0
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

INPUT CARDS AFTER DEFAULTS

MATNO	IDTAP	INUMSH	IPTIME	IPTPLG	ISKCFS	ISONLY	LETHM	MESHRD	NDFB	NDFBCH	NDFPUN	IREW
1103	201	5	1	3	-1	-1	-1	1	9	-1	-1	-1
ALTABN		SIGP		SMFAC		TKELVN		ELORED		EHIREO		
-1.0000E 00		1.0000E 07		1.0000E 00		1.0000E-20		-2.0000E 00		-2.0000E 00		

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS
U-238 SET 1 NO. 2, TEST INPUT MESH, ALSO TEST MATNO = 0

DATE OF RUN 02/10/72 PAGE 5
TIME: 0.02/ 15.21 (SEC.)
ENDF/B MAT. NO. 1103

INPUT CARDS FOR MESH

3.9000E 03 3.9100E 03 4.1186E 03 4.3384E 03 6.2424E 03 1.0000E 04 0 0 0 0 6 0 0
2.0000E 04 4.4999E 04 4.5000E 04 4.6000E 04 0.0 0.0 0 0 2 0 0 4

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS
U-238 SET 1 NO. 2, TEST INPUT MESH, ALSO TEST MATNO = 0

DATE OF RUN 02/10/72 PAGE 6
TIME: 0.02/ 15.23 (SEC.)
ENDF/B MAT. NO. 1103

18 POINT ENERGY MESH PRODUCED

3.9000E 03 3.9100E 03 4.1186E 03 4.3384E 03 4.6104E 03 4.8824E 03 5.1544E 03 5.4264E 03 5.6984E 03 5.9704E 03
6.2424E 03 1.0000E 04 2.0000E 04 4.4999E 04 4.4999E 04 4.5000E 04 4.5000E 04 4.6000E 04

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS
U-238 SET 1 NO. 2, TEST INPUT MESH, ALSO TEST MATNO = 0
ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

DATE OF RUN 02/10/72 PAGE 7
TIME: 0.0 / 15.23 (SEC.)
ENDF/B MAT. NO. 1103

*** UNRESOLVED RESONANCE CROSS SECTIONS ***

LOWER UNRESOLVED RANGE ENERGY LIMIT IN EV.: 3.9100E 03 UPPER UNRESOLVED RANGE ENERGY LIMIT IN EV.: 4.5000E 04

ENERGY	TOTAL CAPTURE	SMOOTH CONTRIBUTION	RESONANCE CONTRIBUTION	S-WAVE CONTRIBUTION	P-WAVE CONTRIBUTION
3.9000E 03	4.1937E-01	4.1937E-01	0.0	0.0	0.0
3.9100E 03	1.1169E 00	1.0000E-04	1.1168E 00	7.1094E-01	4.0586E-01
4.1186E 03	1.0845E 00	1.0000E-04	1.0844E 00	6.7934E-01	4.0306E-01
4.3384E 03	1.0532E 00	1.0000E-04	1.0531E 00	6.4908E-01	4.0405E-01
4.6104E 03	1.0208E 00	1.0000E-04	1.0207E 00	6.1535E-01	4.0535E-01
4.8824E 03	9.9534E-01	1.0000E-04	9.9524E-01	5.8512E-01	4.1012E-01
5.1544E 03	9.7222E-01	1.0000E-04	9.7212E-01	5.5786E-01	4.1426E-01
5.4264E 03	9.5109E-01	1.0000E-04	9.5099E-01	5.3314E-01	4.1785E-01
5.6984E 03	9.3429E-01	1.0000E-04	9.3419E-01	5.1069E-01	4.2350E-01
5.9704E 03	9.1975E-01	1.0000E-04	9.1965E-01	4.9017E-01	4.2948E-01
6.2424E 03	9.0627E-01	1.0000E-04	9.0617E-01	4.7131E-01	4.3486E-01
1.0000E 04	7.4714E-01	6.3198E-04	7.4651E-01	3.1076E-01	4.3575E-01
2.0000E 04	5.6109E-01	1.0000E-02	5.5109E-01	1.6821E-01	3.8288E-01
4.4999E 04	3.7961E-01	3.1999E-02	3.4761E-01	8.2704E-02	2.6491E-01
4.4999E 04	3.7961E-01	3.1999E-02	3.4761E-01	8.2704E-02	2.6490E-01
4.5000E 04	3.7961E-01	3.2000E-02	3.4761E-01	8.2703E-02	2.6490E-01
4.5000E 04	7.2561E-01	3.7800E-01	3.4761E-01	8.2703E-02	2.6490E-01
4.6000E 04	3.7330E-01	3.7330E-01	0.0	0.0	0.0

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS
U-238 SET 1 NO. 2, TEST INPUT MESH, ALSO TEST MATNO = 0
ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

DATE OF RUN 02/10/72 PAGE 8
TIME: 0.52/ 15.74 (SEC.)
ENDF/B MAT. NO. 1103

ENERGY	TOTAL SCATTER	SMOOTH CONTRIBUTION	RESONANCE CONTRIBUTION	S-WAVE CONTRIBUTION	P-WAVE CONTRIBUTION
3.9000E 03	0.0	0.0	0.0	0.0	0.0
3.9100E 03	1.5780E 01	1.0000E-01	1.5680E 01	1.5583E 01	9.7844E-02
4.1186E 03	1.5657E 01	1.0000E-01	1.5557E 01	1.5454E 01	1.0331E-01
4.3384E 03	1.5536E 01	1.0000E-01	1.5436E 01	1.5327E 01	1.0901E-01
4.6104E 03	1.5400E 01	1.0000E-01	1.5300E 01	1.5182E 01	1.1765E-01
4.8824E 03	1.5277E 01	1.0000E-01	1.5177E 01	1.5048E 01	1.2885E-01
5.1544E 03	1.5164E 01	1.0000E-01	1.5064E 01	1.4924E 01	1.4023E-01
5.4264E 03	1.5059E 01	1.0000E-01	1.4959E 01	1.4808E 01	1.5176E-01
5.6984E 03	1.4965E 01	1.0000E-01	1.4865E 01	1.4700E 01	1.6556E-01
5.9704E 03	1.4879E 01	1.0000E-01	1.4779E 01	1.4598E 01	1.8049E-01
6.2424E 03	1.4798E 01	1.0000E-01	1.4698E 01	1.4503E 01	1.9576E-01
1.0000E 04	1.4024E 01	1.0000E-01	1.3924E 01	1.3563E 01	3.6106E-01
2.0000E 04	1.3425E 01	3.0000E-01	1.3125E 01	1.2361E 01	7.6391E-01
4.4999E 04	1.2694E 01	2.9897E-01	1.2395E 01	1.1042E 01	1.3532E 00
4.4999E 04	1.2694E 01	2.9897E-01	1.2395E 01	1.1042E 01	1.3532E 00
4.5000E 04	1.2694E 01	2.9896E-01	1.2395E 01	1.1042E 01	1.3532E 00
4.5000E 04	2.5096E 01	1.2701E 01	1.2395E 01	1.1042E 01	1.3532E 00
4.6000E 04	1.2675E 01	1.2675E 01	0.0	0.0	0.0

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS
SET 1, NO. 3, TEST LETHM

DATE OF RUN 02/10/72 PAGE 9
TIME: 0.07/ 15.81 (SEC.)
ENDF/B MAT. NO. 1103
NUMBER OF THE RUN = 3

CONTROLLING INPUT CARDS AS READ

SET 1, NO. 3, TEST LETHM
0 0 0 0 0 0 0 0 0 0
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

INPUT CARDS AFTER DEFAULTS

MATNO	IDTAP	INUMSH	IPTIME	IPTPLG	ISKCF5	ISONLY	LETHM	MESHRD	NDFB	NDFBCH	NDFPUN	IREW
1103	201	5	1	3	-1	-1	1	2	9	-1	-1	-1
ALTABN		SIGP		SMFAC		TKELVN		ELORED		EMHRED		
-1.0000E 00		1.0000E 07		1.0000E 00		1.0000E-20		-2.0000E 00		-2.0000E 00		

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS
U-238 SET 1, NO. 3, TEST LETHM

DATE OF RUN 02/10/72 PAGE 10
TIME: 0.03/ 15.04 (SEC.)
ENDF/B MAT. NO. 1103

INPUT CARDS FOR MESH

7.9000E 00 7.6000E 00 0.0 0.0 0.0 0 5 0 0 0 2

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS
U-238 SET 1, NO. 3, TEST LETHM

DATE OF RUN 02/10/72 PAGE 11
TIME: 0.02/ 15.86 (SEC.)
ENDF/B MAT. NO. 1103

7 POINT ENERGY MESH PRODUCED

3.7074E 03 3.9236E 03 4.1398E 03 4.3560E 03 4.5722E 03 4.7883E 03 5.0045E 03

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS
U-238 SET 1, NO. 3, TEST LETHM
ENDF/B-11 TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

DATE OF RUN 02/10/72 PAGE 12
TIME: 0.0 / 15.86 (SEC.)
ENDF/B MAT. NO. 1103

*** UNRESOLVED RESONANCE CROSS SECTIONS ***

LOWER UNRESOLVED RANGE ENERGY LIMIT IN EV.: 3.9100E 03 UPPER UNRESOLVED RANGE ENERGY LIMIT IN EV.: 4.5000E 04

ENERGY	TOTAL CAPTURE	SMOOTH CONTRIBUTION	RESONANCE CONTRIBUTION	S-WAVE CONTRIBUTION	P-WAVE CONTRIBUTION
3.7074E 03	4.0744E-01	4.0744E-01	0.0	0.0	0.0
3.9236E 03	1.1147E 00	1.0000E-04	1.1146E 00	7.0879E-01	4.0581E-01
4.1398E 03	1.0814E 00	1.0000E-04	1.0813E 00	6.7629E-01	4.0497E-01
4.3560E 03	1.0508E 00	1.0000E-04	1.0507E 00	6.4678E-01	4.0397E-01
4.5722E 03	1.0246E 00	1.0000E-04	1.0245E 00	6.1987E-01	4.0463E-01
4.7883E 03	1.0039E 00	1.0000E-04	1.0038E 00	5.9522E-01	4.0854E-01
5.0045E 03	9.8469E-01	1.0000E-04	9.8459E-01	5.7254E-01	4.1205E-01

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS
U-238 SET 1, NO. 3, TEST LETHM
ENDF/B-11 TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

DATE OF RUN 02/10/72 PAGE 13
TIME: 0.15/ 16.01 (SEC.)
ENDF/B MAT. NO. 1103

ENERGY	TOTAL SCATTER	SMOOTH CONTRIBUTION	RESONANCE CONTRIBUTION	S-WAVE CONTRIBUTION	P-WAVE CONTRIBUTION
3.7074E 03	0.0	0.0	0.0	0.0	0.0
3.9236E 03	1.5772E 01	1.0000E-01	1.5672E 01	1.5574E 01	9.8202E-02
4.1398E 03	1.5645E 01	1.0000E-01	1.5545E 01	1.5441E 01	1.0386E-01
4.3560E 03	1.5527E 01	1.0000E-01	1.5427E 01	1.5318E 01	1.0946E-01
4.5722E 03	1.5418E 01	1.0000E-01	1.5318E 01	1.5202E 01	1.1609E-01
4.7883E 03	1.5318E 01	1.0000E-01	1.5218E 01	1.5093E 01	1.2495E-01
5.0045E 03	1.5225E 01	1.0000E-01	1.5125E 01	1.4991E 01	1.3393E-01

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS
 SET 1, NO. 4, TEST SIGP

DATE OF RUN 02/10/72 PAGE 14

* TIME: 0.02/ 16.02 (SEC.)
 ENDF/D MAT. NO. 1103

CONTROLLING INPUT CARDS AS READ

NUMBER OF THE RUN = 4

SET 1, NO. 4, TEST SIGP
 MULTIPLE
 TITLE
 CARDS

0 0 0 0 0 0 0 -1 1 0 0 0 0
 0.0 6.0000E 01 0.0 0.0 0.0 0.0

INPUT CARDS AFTER DEFAULTS

MATNO	IDTAP	INUMSH	IPTIME	IPTPLG	ISKCF5	ISONLY	LETHM	MESHRO	NDFB	NDFBCH	NDFPUN	IREW
1103	201	5	1	3	-1	-1	-1	1	9	-1	-1	-1
ALTABN	SIGP	SMFAC	TKELVN	ELDRED	EHIREO							
-1.0000E 00	6.0000E 01	1.0000E 00	1.0000E-20	-2.0000E 00	-2.0000E 00							

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 15

U-238 SET 1, NO. 4, TEST SIGP

* TIME: 0.03/ 16.06 (SEC.)

ENDF/B-11 TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1103

*** UNRESOLVED RESONANCE CROSS SECTIONS ***

LOWER UNRESOLVED RANGE ENERGY LIMIT IN EV.: 3.9100E 03

UPPER UNRESOLVED RANGE ENERGY LIMIT IN EV.: 4.5000E 04

ENERGY	TOTAL CAPTURE	SMOOTH CONTRIBUTION	RESONANCE CONTRIBUTION	S-WAVE CONTRIBUTION	P-WAVE CONTRIBUTION
3.7074E 03	4.0744E-01	4.0744E-01	0.0	0.0	0.0
3.9236E 03	4.9563E-01	1.0000E-04	4.9553E-01	2.6692E-01	2.2861E-01
4.1398E 03	4.8889E-01	1.0000E-04	4.8879E-01	2.6014E-01	2.2865E-01
4.3560E 03	4.8256E-01	1.0000E-04	4.8246E-01	2.5384E-01	2.2862E-01
4.5722E 03	4.7731E-01	1.0000E-04	4.7721E-01	2.4794E-01	2.2926E-01
4.7883E 03	4.7379E-01	1.0000E-04	4.7369E-01	2.4244E-01	2.3125E-01
5.0045E 03	4.7043E-01	1.0000E-04	4.7033E-01	2.3727E-01	2.3306E-01

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 16

U-238 SET 1, NO. 4, TEST SIGP

* TIME: 0.27/ 16.32 (SEC.)

ENDF/B-11 TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1103

ENERGY	TOTAL SCATTER	SMOOTH CONTRIBUTION	RESONANCE CONTRIBUTION	S-WAVE CONTRIBUTION	P-WAVE CONTRIBUTION
3.7074E 03	0.0	0.0	0.0	0.0	0.0
3.9236E 03	1.2399E 01	1.0000E-01	1.2299E 01	1.2251E 01	4.8329E-02
4.1398E 03	1.2394E 01	1.0000E-01	1.2294E 01	1.2243E 01	5.1313E-02
4.3560E 03	1.2389E 01	1.0000E-01	1.2289E 01	1.2234E 01	5.4294E-02
4.5722E 03	1.2384E 01	1.0000E-01	1.2284E 01	1.2226E 01	5.7727E-02
4.7883E 03	1.2380E 01	1.0000E-01	1.2280E 01	1.2218E 01	6.2130E-02
5.0045E 03	1.2377E 01	1.0000E-01	1.2277E 01	1.2210E 01	6.6615E-02

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 17

SET 1, NO. 5, TEST TKELVN (TEMPERATURE VARIABLE)

TIME: 0.03/ 16.36 (SEC.)

ENDF/B MAT. NO. 1103

CONTROLLING INPUT CARDS AS READ

NUMBER OF THE RUN = 5

SET 1, NO. 5, TEST TKELVN (TEMPERATURE VARIABLE)
 0 0 0 0 0 0 0 0 0 0 0 0 0
 0.0 0.0 0.0 2.9300E 02 0.0 0.0

INPUT CARDS AFTER DEFAULTS

MATNO	IDTAP	INUMSH	IPTIME	IPTPLG	ISKCF5	ISONLY	LETHM	MESHRO	NDFB	NDFBCH	NDFPUN	IREW
1103	201	5	1	3	-1	-1	-1	1	9	-1	-1	-1
ALTABN	SIGP	SMFAC	TKELVN	ELDRED	EHIREO							
-1.0000E 00	6.0000E 01	1.0000E 00	2.9300E 02	-2.0000E 00	-2.0000E 00							

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS
 U-238 SET 1, NO. 5, TEST TKELVN (TEMPERATURE VARIABLE)
 ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

DATE OF RUN 02/10/72 PAGE 18
 TIME: 0.02/ 16.37 (SEC.)
 ENDF/B MAT. NO. 1103

*** UNRESOLVED RESONANCE CROSS SECTIONS ***

LOWER UNRESOLVED RANGE ENERGY LIMIT IN EV.: 3.9100E 03 UPPER UNRESOLVED RANGE ENERGY LIMIT IN EV.: 4.5000E 04

ENERGY	TOTAL CAPTURE	SMOOTH CONTRIBUTION	RESONANCE CONTRIBUTION	S-WAVE CONTRIBUTION	P-WAVE CONTRIBUTION
3.7074E 03	4.0744E-01	4.0744E-01	0.0	0.0	0.0
3.9236E 03	9.0561E-01	1.0000E-04	9.0551E-01	5.1352E-01	3.9199E-01
4.1398E 03	8.8834E-01	1.0000E-04	8.8824E-01	4.9674E-01	3.9151E-01
4.3560E 03	8.7216E-01	1.0000E-04	8.7206E-01	4.8121E-01	3.9085E-01
4.5722E 03	8.5853E-01	1.0000E-04	8.5843E-01	4.6671E-01	3.9172E-01
4.7883E 03	8.4891E-01	1.0000E-04	8.4881E-01	4.5320E-01	3.9561E-01
5.0045E 03	8.3972E-01	1.0000E-04	8.3962E-01	4.4052E-01	3.9911E-01

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS
 U-238 SET 1, NO. 5, TEST TKELVN (TEMPERATURE VARIABLE)
 ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

DATE OF RUN 02/10/72 PAGE 19
 TIME: 0.35/ 16.72 (SEC.)
 ENDF/B MAT. NO. 1103

ENERGY	TOTAL SCATTER	SMOOTH CONTRIBUTION	RESONANCE CONTRIBUTION	S-WAVE CONTRIBUTION	P-WAVE CONTRIBUTION
3.7074E 03	0.0	0.0	0.0	0.0	0.0
3.9236E 03	1.3590E 01	1.0000E-01	1.3490E 01	1.3396E 01	9.3461E-02
4.1398E 03	1.3575E 01	1.0000E-01	1.3475E 01	1.3376E 01	9.8953E-02
4.3560E 03	1.3560E 01	1.0000E-01	1.3460E 01	1.3355E 01	1.0439E-01
4.5722E 03	1.3546E 01	1.0000E-01	1.3446E 01	1.3335E 01	1.1079E-01
4.7883E 03	1.3534E 01	1.0000E-01	1.3434E 01	1.3315E 01	1.1927E-01
5.0045E 03	1.3523E 01	1.0000E-01	1.3423E 01	1.3295E 01	1.2786E-01

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS
 SET 1, NO. 6, TEST ISONLY = -2 (SMOOTH ONLY)

DATE OF RUN 02/10/72 PAGE 20
 TIME: 0.03/ 16.76 (SEC.)
 ENDF/B MAT. NO. 1103

CONTROLLING INPUT CARDS AS READ

NUMBER OF THE RUN = 6

SET 1, NO. 6, TEST ISONLY = -2 (SMOOTH ONLY)
 0 0 0 0 0 0 0 -2 0 0 0 0 0 0 0
 -1.0000E 00 1.0000E 07 1.0000E 00 1.0000E-20 0.0 0.0

INPUT CARDS AFTER DEFAULTS

MATNO	IDTAP	INUMSH	IPTIME	IPPLG	ISKCFS	ISONLY	LETHN	MESHRD	NDFB	NDFBCH	NDFPUN	IREW
1103	201	5	1	3	-1	-2	-1	1	9	-1	-1	-1
ALTABN	SIGP	SMFAC	TKELVN	ELORED	ENIRED							
-1.0000E 00	1.0000E 07	1.0000E 00	1.0000E-20	-2.0000E 00	-2.0000E 00							

THE INPUT VARIABLE ISONLY = -2, THEREFORE ONLY SMOOTH CROSS SECTIONS WILL BE CALCULATED.

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS
 U-238 SET 1, NO. 6, TEST ISONLY = -2 (SMOOTH ONLY)
 ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

DATE OF RUN 02/10/72 PAGE 21
 TIME: 0.02/ 16.77 (SEC.)
 ENDF/B MAT. NO. 1103

*** UNRESOLVED RESONANCE CROSS SECTIONS ***

LOWER UNRESOLVED RANGE ENERGY LIMIT IN EV.: 3.9100E 03 UPPER UNRESOLVED RANGE ENERGY LIMIT IN EV.: 4.5000E 04

ENERGY	TOTAL CAPTURE	SMOOTH CONTRIBUTION	RESONANCE CONTRIBUTION	S-WAVE CONTRIBUTION	P-WAVE CONTRIBUTION
3.7074E 03	4.0744E-01	4.0744E-01	0.0	0.0	0.0
3.9236E 03	1.0000E-04	1.0000E-04	0.0	0.0	0.0
4.1398E 03	1.0000E-04	1.0000E-04	0.0	0.0	0.0
4.3560E 03	1.0000E-04	1.0000E-04	0.0	0.0	0.0
4.5722E 03	1.0000E-04	1.0000E-04	0.0	0.0	0.0
4.7883E 03	1.0000E-04	1.0000E-04	0.0	0.0	0.0
5.0045E 03	1.0000E-04	1.0000E-04	0.0	0.0	0.0

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 4 22

U-238 SET 1, NO. 6, TEST ISONLY = -2 (SMOOTH ONLY)

TIME: 0.15/ 16.92 (SEC.)

ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1103

ENERGY	TOTAL SCATTER	SMOOTH CONTRIBUTION	RESONANCE CONTRIBUTION	S-WAVE CONTRIBUTION	P-WAVE CONTRIBUTION
3.7074E 03	0.0	0.0	0.0	0.0	0.0
3.9236E 03	1.0000E-01	1.0000E-01	0.0	0.0	0.0
4.1398E 03	1.0000E-01	1.0000E-01	0.0	0.0	0.0
4.3560E 03	1.0000E-01	1.0000E-01	0.0	0.0	0.0
4.5722E 03	1.0000E-01	1.0000E-01	0.0	0.0	0.0
4.7883E 03	1.0000E-01	1.0000E-01	0.0	0.0	0.0
5.0045E 03	1.0000E-01	1.0000E-01	0.0	0.0	0.0

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 23

SET 1 NO. 7, TEST RANGE LIMIT DEFAULTS

TIME: 0.02/ 16.94 (SEC.)

ENDF/B MAT. NO. 1103

CONTROLLING INPUT CARDS AS READ

NUMBER OF THE RUN = 7

SET 1 NO. 7, TEST RANGE LIMIT DEFAULTS

0 0 0 1 0 -1 0 0 -1 0 0 0 0
0.0 0.0 0.0 0.0 1.0000E-20 2.0000E 07

INPUT CARDS AFTER DEFAULTS

MATNO	IDTAP	INUMSH	IPTIME	IPTPLG	ISKCFS	ISONLY	LETHM	MESHRD	NDFB	NDFBCH	NDFPUN	IREW
1103	201	5	1	3	-1	-2	-1	-1	9	-1	-1	-1
ALTABN	SIGP	SMFAC	TKELVN	ELDRED	EHIREO							
-1.0000E 00	1.0000E 07	1.0000E 00	1.0000E-20	1.0000E-20	2.0000E 07							

THE INPUT VARIABLE ISONLY = -2, THEREFORE ONLY SMOOTH CROSS SECTIONS WILL BE CALCULATED.

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 24

U-238 SET 1 NO. 7, TEST RANGE LIMIT DEFAULTS

TIME: 0.03/ 16.97 (SEC.)

ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1103

*** UNRESOLVED RESONANCE CROSS SECTIONS ***

LOWER UNRESOLVED RANGE ENERGY LIMIT IN EV.: 3.9100E 03

UPPER UNRESOLVED RANGE ENERGY LIMIT IN EV.: 4.5000E 04

ENERGY	TOTAL CAPTURE	SMOOTH CONTRIBUTION	RESONANCE CONTRIBUTION	S-WAVE CONTRIBUTION	P-WAVE CONTRIBUTION
1.0000E-05	1.3620E 02	1.3620E 02	0.0	0.0	0.0
1.4019E-05	1.1503E 02	1.1503E 02	0.0	0.0	0.0
1.9652E-05	9.7157E 01	9.7157E 01	0.0	0.0	0.0
2.7549E-05	8.2059E 01	8.2059E 01	0.0	0.0	0.0
3.8620E-05	6.9306E 01	6.9306E 01	0.0	0.0	0.0
5.4138E-05	5.8536E 01	5.8536E 01	0.0	0.0	0.0
7.5893E-05	4.9439E 01	4.9439E 01	0.0	0.0	0.0
1.0639E-04	4.1756E 01	4.1756E 01	0.0	0.0	0.0
1.4914E-04	3.5267E 01	3.5267E 01	0.0	0.0	0.0
2.0908E-04	2.9788E 01	2.9788E 01	0.0	0.0	0.0
2.9309E-04	2.5158E 01	2.5158E 01	0.0	0.0	0.0
4.1087E-04	2.1249E 01	2.1249E 01	0.0	0.0	0.0
5.7597E-04	1.7947E 01	1.7947E 01	0.0	0.0	0.0
8.0743E-04	1.5159E 01	1.5159E 01	0.0	0.0	0.0
1.1319E-03	1.2804E 01	1.2804E 01	0.0	0.0	0.0
1.5867E-03	1.0815E 01	1.0815E 01	0.0	0.0	0.0
2.2244E-03	9.1356E 00	9.1356E 00	0.0	0.0	0.0
3.1182E-03	7.7172E 00	7.7172E 00	0.0	0.0	0.0
4.3712E-03	6.5194E 00	6.5194E 00	0.0	0.0	0.0
6.1278E-03	5.5080E 00	5.5080E 00	0.0	0.0	0.0
8.5902E-03	4.6540E 00	4.6540E 00	0.0	0.0	0.0
1.2042E-02	3.9332E 00	3.9332E 00	0.0	0.0	0.0
1.6881E-02	3.3249E 00	3.3249E 00	0.0	0.0	0.0
2.3665E-02	2.8116E 00	2.8116E 00	0.0	0.0	0.0
3.3174E-02	2.3787E 00	2.3787E 00	0.0	0.0	0.0
4.6506E-02	2.0139E 00	2.0139E 00	0.0	0.0	0.0
6.5193E-02	1.7066E 00	1.7066E 00	0.0	0.0	0.0
9.1390E-02	1.4482E 00	1.4482E 00	0.0	0.0	0.0
1.2812E-01	1.2315E 00	1.2315E 00	0.0	0.0	0.0
1.7960E-01	1.0500E 00	1.0500E 00	0.0	0.0	0.0
2.5177E-01	8.9885E-01	8.9885E-01	0.0	0.0	0.0
3.5294E-01	7.7397E-01	7.7397E-01	0.0	0.0	0.0
4.9477E-01	6.7214E-01	6.7214E-01	0.0	0.0	0.0
6.9358E-01	5.9126E-01	5.9126E-01	0.0	0.0	0.0
9.7229E-01	5.3056E-01	5.3056E-01	0.0	0.0	0.0
1.3630E 00	4.9200E-01	4.9200E-01	0.0	0.0	0.0
1.9107E 00	4.8215E-01	4.8215E-01	0.0	0.0	0.0
2.6785E 00	5.2536E-01	5.2536E-01	0.0	0.0	0.0
3.7549E 00	7.2957E-01	7.2957E-01	0.0	0.0	0.0
5.2638E 00	1.5593E-02	1.5593E-02	0.0	0.0	0.0
7.3790E 00	1.3162E-02	1.3162E-02	0.0	0.0	0.0
1.0344E 01	1.2503E-02	1.2503E-02	0.0	0.0	0.0
1.4501E 01	4.2548E-03	4.2548E-03	0.0	0.0	0.0

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 25

U-238 SET 1 NO. 7, TEST RANGE LIMIT DEFAULTS

TIME: 0.18/ 17.16 (SEC.)

ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1103

ENERGY	TOTAL CAPTURE	SMOOTH CONTRIBUTION	RESONANCE CONTRIBUTION	S-WAVE CONTRIBUTION	P-WAVE CONTRIBUTION
2.0328E 01	4.8152E-03	4.8152E-03	0.0	0.0	0.0
2.8497E 01	5.4493E-03	5.4493E-03	0.0	0.0	0.0
3.9948E 01	6.1670E-03	6.1670E-03	0.0	0.0	0.0
5.6001E 01	2.3383E-03	2.3383E-03	0.0	0.0	0.0
7.8504E 01	7.5351E-04	7.5351E-04	0.0	0.0	0.0
1.1005E 02	9.9960E-04	9.9960E-04	0.0	0.0	0.0
1.5427E 02	3.1278E-03	3.1278E-03	0.0	0.0	0.0
2.1627E 02	1.5212E-02	1.5212E-02	0.0	0.0	0.0
3.0317E 02	8.6181E-04	8.6181E-04	0.0	0.0	0.0
4.2500E 02	7.1341E-04	7.1341E-04	0.0	0.0	0.0
5.9579E 02	8.5516E-04	8.5516E-04	0.0	0.0	0.0
8.3520E 02	4.8732E-01	4.8732E-01	0.0	0.0	0.0
1.1708E 03	1.0366E-01	1.0366E-01	0.0	0.0	0.0
1.6413E 03	1.4942E-01	1.4942E-01	0.0	0.0	0.0
2.3009E 03	2.8383E-01	2.8383E-01	0.0	0.0	0.0
3.2254E 03	3.7905E-01	3.7905E-01	0.0	0.0	0.0
4.5216E 03	1.0000E-04	1.0000E-04	0.0	0.0	0.0
6.3385E 03	1.0000E-04	1.0000E-04	0.0	0.0	0.0
8.8856E 03	1.6542E-04	1.6542E-04	0.0	0.0	0.0
1.2456E 04	5.2895E-03	5.2895E-03	0.0	0.0	0.0
1.7462E 04	8.4513E-03	8.4513E-03	0.0	0.0	0.0
2.4479E 04	1.3562E-02	1.3562E-02	0.0	0.0	0.0
3.4315E 04	2.2289E-02	2.2289E-02	0.0	0.0	0.0
4.8105E 04	3.6392E-01	3.6392E-01	0.0	0.0	0.0
6.7435E 04	2.6321E-01	2.6321E-01	0.0	0.0	0.0
9.4534E 04	2.0327E-01	2.0327E-01	0.0	0.0	0.0
1.3252E 05	1.9091E-01	1.9091E-01	0.0	0.0	0.0
1.8577E 05	1.6545E-01	1.6545E-01	0.0	0.0	0.0
2.6043E 05	1.4482E-01	1.4482E-01	0.0	0.0	0.0
3.6508E 05	1.2845E-01	1.2845E-01	0.0	0.0	0.0
5.1178E 05	1.3012E-01	1.3012E-01	0.0	0.0	0.0
7.1743E 05	1.4789E-01	1.4789E-01	0.0	0.0	0.0
1.0057E 06	1.4740E-01	1.4740E-01	0.0	0.0	0.0
1.4099E 06	9.7801E-02	9.7801E-02	0.0	0.0	0.0
1.9764E 06	5.2625E-02	5.2625E-02	0.0	0.0	0.0
2.7707E 06	2.8807E-02	2.8807E-02	0.0	0.0	0.0
3.8840E 06	1.5804E-02	1.5804E-02	0.0	0.0	0.0
5.4448E 06	9.0429E-03	9.0429E-03	0.0	0.0	0.0
7.6328E 06	6.0755E-03	6.0755E-03	0.0	0.0	0.0
1.0700E 07	4.4236E-03	4.4236E-03	0.0	0.0	0.0
1.5000E 07	3.2000E-03	3.2000E-03	0.0	0.0	0.0

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 26

U-238 SET 1 NO. 7, TEST RANGE LIMIT DEFAULTS

TIME: 0.70/ 17.85 (SEC.)

ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1103

ENERGY	TOTAL SCATTER	SMOOTH CONTRIBUTION	RESONANCE CONTRIBUTION	S-WAVE CONTRIBUTION	P-WAVE CONTRIBUTION
1.0000E-05	8.9549E 00	8.9549E 00	0.0	0.0	0.0
1.4019E-05	8.9549E 00	8.9549E 00	0.0	0.0	0.0
1.9652E-05	8.9549E 00	8.9549E 00	0.0	0.0	0.0
2.7569E-05	8.9549E 00	8.9549E 00	0.0	0.0	0.0
3.8620E-05	8.9549E 00	8.9549E 00	0.0	0.0	0.0
5.4138E-05	8.9549E 00	8.9549E 00	0.0	0.0	0.0
7.5893E-05	8.9549E 00	8.9549E 00	0.0	0.0	0.0
1.0639E-04	8.9549E 00	8.9549E 00	0.0	0.0	0.0
1.4914E-04	8.9549E 00	8.9549E 00	0.0	0.0	0.0
2.0908E-04	8.9549E 00	8.9549E 00	0.0	0.0	0.0
2.9309E-04	8.9549E 00	8.9549E 00	0.0	0.0	0.0
4.1087E-04	8.9549E 00	8.9549E 00	0.0	0.0	0.0
5.7597E-04	8.9549E 00	8.9549E 00	0.0	0.0	0.0
8.0743E-04	8.9548E 00	8.9548E 00	0.0	0.0	0.0
1.1319E-03	8.9548E 00	8.9548E 00	0.0	0.0	0.0
1.5867E-03	8.9547E 00	8.9547E 00	0.0	0.0	0.0
2.2244E-03	8.9547E 00	8.9547E 00	0.0	0.0	0.0
3.1182E-03	8.9546E 00	8.9546E 00	0.0	0.0	0.0
4.3712E-03	8.9544E 00	8.9544E 00	0.0	0.0	0.0
6.1278E-03	8.9542E 00	8.9542E 00	0.0	0.0	0.0
8.5902E-03	8.9539E 00	8.9539E 00	0.0	0.0	0.0
1.2042E-02	8.9535E 00	8.9535E 00	0.0	0.0	0.0
1.6881E-02	8.9529E 00	8.9529E 00	0.0	0.0	0.0
2.3665E-02	8.9521E 00	8.9521E 00	0.0	0.0	0.0
3.3174E-02	8.9510E 00	8.9510E 00	0.0	0.0	0.0
4.6506E-02	8.9494E 00	8.9494E 00	0.0	0.0	0.0
6.5193E-02	8.9472E 00	8.9472E 00	0.0	0.0	0.0
9.1390E-02	8.9441E 00	8.9441E 00	0.0	0.0	0.0
1.2812E-01	8.9396E 00	8.9396E 00	0.0	0.0	0.0
1.7960E-01	8.9334E 00	8.9334E 00	0.0	0.0	0.0
2.5177E-01	8.9245E 00	8.9245E 00	0.0	0.0	0.0
3.5244E-01	8.9120E 00	8.9120E 00	0.0	0.0	0.0
4.9477E-01	8.8939E 00	8.8939E 00	0.0	0.0	0.0
6.9358E-01	8.8676E 00	8.8676E 00	0.0	0.0	0.0
9.7229E-01	8.8288E 00	8.8288E 00	0.0	0.0	0.0
1.3630E 00	8.7697E 00	8.7697E 00	0.0	0.0	0.0
1.9107E 00	8.6767E 00	8.6767E 00	0.0	0.0	0.0
2.6785E 00	8.5179E 00	8.5179E 00	0.0	0.0	0.0
3.7549E 00	8.1972E 00	8.1972E 00	0.0	0.0	0.0
5.2638E 00	0.0	0.0	0.0	0.0	0.0
7.3790E 00	0.0	0.0	0.0	0.0	0.0
1.0344E 01	0.0	0.0	0.0	0.0	0.0
1.4501E 01	0.0	0.0	0.0	0.0	0.0
2.0328E 01	0.0	0.0	0.0	0.0	0.0
2.8497E 01	0.0	0.0	0.0	0.0	0.0
3.9948E 01	0.0	0.0	0.0	0.0	0.0
5.6001E 01	0.0	0.0	0.0	0.0	0.0
7.8504E 01	0.0	0.0	0.0	0.0	0.0
1.1005E 02	0.0	0.0	0.0	0.0	0.0

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 27

U-238 SET 1 NO. 7, TEST RANGE LIMIT DEFAULTS

TIME: 0.12/ 17.97 (SEC.)

ENDF/B-11 TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1103

1.5427E 02	0.0	0.0	0.0	0.0	0.0
2.1627E 02	0.0	0.0	0.0	0.0	0.0
3.0317E 02	0.0	0.0	0.0	0.0	0.0
4.2500E 02	0.0	0.0	0.0	0.0	0.0
5.9579E 02	0.0	0.0	0.0	0.0	0.0
8.3520E 02	0.0	0.0	0.0	0.0	0.0
1.1708E 03	0.0	0.0	0.0	0.0	0.0
1.6413E 03	0.0	0.0	0.0	0.0	0.0
2.3009E 03	0.0	0.0	0.0	0.0	0.0
3.2254E 03	0.0	0.0	0.0	0.0	0.0
4.5216E 03	1.0000E-01	1.0000E-01	0.0	0.0	0.0
6.3385E 03	1.0000E-01	1.0000E-01	0.0	0.0	0.0
8.8856E 03	1.0000E-01	1.0000E-01	0.0	0.0	0.0
1.2456E 04	1.8133E-01	1.8133E-01	0.0	0.0	0.0
1.7462E 04	3.0011E-01	3.0011E-01	0.0	0.0	0.0
2.4479E 04	3.0002E-01	3.0002E-01	0.0	0.0	0.0
3.4315E 04	3.0002E-01	3.0002E-01	0.0	0.0	0.0
4.8105E 04	1.2619E 01	1.2619E 01	0.0	0.0	0.0
6.7435E 04	1.2134E 01	1.2134E 01	0.0	0.0	0.0
9.4534E 04	1.1467E 01	1.1467E 01	0.0	0.0	0.0
1.3252E 05	1.0580E 01	1.0580E 01	0.0	0.0	0.0
1.8577E 05	9.7160E 00	9.7160E 00	0.0	0.0	0.0
2.6043E 05	8.8007E 00	8.8007E 00	0.0	0.0	0.0
3.6508E 05	7.6918E 00	7.6918E 00	0.0	0.0	0.0
5.1178E 05	6.6407E 00	6.6407E 00	0.0	0.0	0.0
7.1743E 05	5.6513E 00	5.6513E 00	0.0	0.0	0.0
1.0057E 06	4.6167E 00	4.6167E 00	0.0	0.0	0.0
1.4099E 06	3.7345E 00	3.7345E 00	0.0	0.0	0.0
1.9764E 06	3.8179E 00	3.8179E 00	0.0	0.0	0.0
2.7707E 06	4.4676E 00	4.4676E 00	0.0	0.0	0.0
3.8840E 06	4.7212E 00	4.7212E 00	0.0	0.0	0.0
5.4448E 06	4.2490E 00	4.2490E 00	0.0	0.0	0.0
7.6328E 06	3.3829E 00	3.3829E 00	0.0	0.0	0.0
1.0700E 07	2.8685E 00	2.8685E 00	0.0	0.0	0.0
1.5000E 07	2.9700E 00	2.9700E 00	0.0	0.0	0.0

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 28

SAMPLE RUNS FOR PU-239, SET 2, NO. 1, RESET INTERNAL MESH

TIME: 0.08/ 18.05 (SEC.)

ENDF/B MAT. NO. 1103

CONTROLLING INPUT CARDS AS READ

NUMBER OF THE RUN = 8

SAMPLE RUNS FOR PU-239, SET 2, NO. 1, RESET INTERNAL MESH

1104 0 0 1 0 -1 0 0 0
0.0 1.0000E 07 0.0 1.0000E-20-2.0000E 00-2.0000E 00

INPUT CARDS AFTER DEFAULTS

MATNO	IDTAP	INUMSH	IPTIME	IPTPLG	ISKCFS	ISONLY	LETHM	MESHRD	NDFB	NDFBCH	NDFPUN	IREW
1104	201	5	1	4	-1	-1	-1	-1	9	-1	-1	-1
ALTABN	SIGP	SMFAC	TKELVN	ELORED	EMIED							
-1.0000E 00	1.0000E 07	1.0000E 00	1.0000E-20	-2.0000E 00	-2.0000E 00							

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 29

PU-239 SAMPLE RUNS FOR PU-239, SET 2, NO. 1, RESET INTERNAL MESH

TIME: 6.06/ 24.11 (SEC.)

ENDF/B-11 TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1104

*** UNRESOLVED RESONANCE CROSS SECTIONS ***

LOWER UNRESOLVED RANGE ENERGY LIMIT IN EV.: 3.0000E 02

UPPER UNRESOLVED RANGE ENERGY LIMIT IN EV.: 2.5000E 04

ENERGY	TOTAL		RESONANCE CONTRIBUTION		SMOOTH CONTRIBUTION	
	CAPTURE	FISSION	CAPTURE	FISSION	CAPTURE	FISSION
3.0000E 02	1.3744E 01	1.1238E 01	1.3744E 01	1.1238E 01	0.0	0.0
3.9553E 02	5.4630E 00	1.0925E 01	5.4630E 00	1.0925E 01	0.0	0.0
5.2147E 02	8.6751E 00	1.7011E 01	8.6751E 00	1.7011E 01	0.0	0.0
6.8751E 02	6.0206E 00	4.5252E 00	6.0206E 00	4.5252E 00	0.0	0.0
9.0642E 02	5.3521E 00	7.2835E 00	5.3521E 00	7.2835E 00	0.0	0.0
1.1950E 03	3.9677E 00	5.0256E 00	3.9677E 00	5.0256E 00	0.0	0.0
1.5755E 03	4.1462E 00	3.5734E 00	4.1462E 00	3.5734E 00	0.0	0.0
2.0772E 03	4.0649E 00	2.5027E 00	4.0649E 00	2.5027E 00	0.0	0.0
2.7386E 03	2.5129E 00	3.6440E 00	2.5129E 00	3.6440E 00	0.0	0.0
3.6106E 03	2.4018E 00	2.6778E 00	2.4018E 00	2.6778E 00	0.0	0.0
4.7603E 03	2.0310E 00	2.3522E 00	2.0310E 00	2.3522E 00	0.0	0.0
6.2760E 03	1.7231E 00	2.0821E 00	1.7231E 00	2.0821E 00	0.0	0.0
8.2743E 03	1.2332E 00	2.2971E 00	1.2332E 00	2.2971E 00	0.0	0.0
1.0909E 04	1.0208E 00	1.9037E 00	1.0208E 00	1.9037E 00	0.0	0.0
1.4382E 04	8.0977E-01	1.8571E 00	8.0977E-01	1.8571E 00	0.0	0.0
1.8962E 04	6.5627E-01	1.7958E 00	6.5627E-01	1.7958E 00	0.0	0.0
2.5000E 04	5.4719E-01	1.7265E 00	5.4719E-01	1.7265E 00	0.0	0.0

DATE OF RUN 02/10/72 PAGE 30

TIME: 0.68/ 24.79 (SEC.)

ENDF/B MAT. NO. 1104

ENERGY	S-WAVE RESONANCE CONTRIBUTION		P-WAVE RESONANCE CONTRIBUTION	
	CAPTURE	FISSION	CAPTURE	FISSION
3.0000E 02	1.3726E 01	1.1147E 01	1.7616E-02	9.1106E-02
3.9553E 02	5.4428E 00	1.0821E 01	2.0212E-02	1.0457E-01
5.2147E 02	8.6519E 00	1.6891E 01	2.3183E-02	1.2002E-01
6.8751E 02	5.9940E 00	4.3875E 00	2.6579E-02	1.3772E-01
9.0642E 02	5.3216E 00	7.1255E 00	3.0452E-02	1.5801E-01
1.1950E 03	3.9329E 00	4.8444E 00	3.4857E-02	1.8123E-01
1.5755E 03	4.1063E 00	3.3656E 00	3.9844E-02	2.0778E-01
2.0772E 03	4.0194E 00	2.2646E 00	4.5454E-02	2.3811E-01
2.7386E 03	2.4612E 00	3.3713E 00	5.1708E-02	2.7268E-01
3.6106E 03	2.3433E 00	2.3658E 00	5.8591E-02	3.1198E-01
4.7603E 03	1.9650E 00	1.9957E 00	6.6031E-02	3.5650E-01
6.2740E 03	1.6492E 00	1.6754E 00	7.3879E-02	4.0870E-01
8.2743E 03	1.1513E 00	1.8342E 00	8.1897E-02	4.6292E-01
1.0909E 04	9.3101E-01	1.3784E 00	8.9749E-02	5.2530E-01
1.4382E 04	7.1264E-01	1.2635E 00	9.7133E-02	5.9365E-01
1.8962E 04	5.5264E-01	1.1286E 00	1.0363E-01	6.6725E-01
2.5000E 04	4.3824E-01	9.8180E-01	1.0895E-01	7.4467E-01

DATE OF RUN 02/10/72 PAGE 31

TIME: 0.05/ 24.84 (SEC.)

ENDF/B MAT. NO. 1104

ENERGY	TOTAL SCATTER	SMOOTH CONTRIBUTION	RESONANCE CONTRIBUTION	S-WAVE CONTRIBUTION	P-WAVE CONTRIBUTION
3.0000E 02	1.6183E 01	0.0	1.6183E 01	1.6183E 01	2.3375E-05
3.9553E 02	1.2201E 01	0.0	1.2201E 01	1.2201E 01	4.0582E-05
5.2147E 02	1.7043E 01	0.0	1.7043E 01	1.7043E 01	7.0419E-05
6.8751E 02	1.2708E 01	0.0	1.2708E 01	1.2708E 01	1.2211E-04
9.0642E 02	1.3769E 01	0.0	1.3769E 01	1.3769E 01	2.1157E-04
1.1950E 03	1.2637E 01	0.0	1.2637E 01	1.2637E 01	3.6586E-04
1.5755E 03	1.3179E 01	0.0	1.3179E 01	1.3178E 01	6.3139E-04
2.0772E 03	1.3589E 01	0.0	1.3589E 01	1.3588E 01	1.0863E-03
2.7386E 03	1.2587E 01	0.0	1.2587E 01	1.2586E 01	1.8610E-03
3.6106E 03	1.2720E 01	0.0	1.2720E 01	1.2717E 01	3.1690E-03
4.7603E 03	1.2564E 01	0.0	1.2564E 01	1.2558E 01	5.3524E-03
6.2760E 03	1.2409E 01	0.0	1.2409E 01	1.2400E 01	8.9824E-03
8.2743E 03	1.1877E 01	0.0	1.1877E 01	1.1862E 01	1.4773E-02
1.0909E 04	1.1521E 01	0.0	1.1521E 01	1.1497E 01	2.3907E-02
1.1438E 04	1.1224E 01	0.0	1.1224E 01	1.1186E 01	3.8100E-02
1.8962E 04	1.0959E 01	0.0	1.0959E 01	1.0900E 01	5.9640E-02
2.5000E 04	1.0726E 01	0.0	1.0726E 01	1.0634E 01	9.1796E-02

DATE OF RUN 02/10/72 PAGE 32

TIME: 0.03/ 24.88 (SEC.)

ENDF/B MAT. NO. 1104

NUMBER OF THE RUN = 9

CONTROLLING INPUT CARDS AS READ

SET 2, NO. 2,	TEST REWIND AND PUNCH
0 0	0 0 0 0 0
0.0 0.0	0.0 0.0

INPUT CARDS AFTER DEFAULTS

MATNO	IDTAP	INUMSH	IPTIME	IPTPLG	ISKCFS	ISONLY	LETHM	MESHRD	NDFB	NDFBCH	NDFPUN	IREW
1104	201	5	1	4	-1	-1	-1	1	9	-1	1	1
ALTABN		SIGP		SMFAC		TKELVN		ELORED		EMHRED		
-1.0000E 00		1.0000E 07		1.0000E 00		1.0000E-20		-2.0000E 00		-2.0000E 00		

THERE IS NO SMOOTH SCATTER DATA PRESENT FOR THIS MATERIAL IN THE RANGE CONSIDERED.

THERE IS NO SMOOTH FISSION DATA PRESENT FOR THIS MATERIAL IN THE RANGE CONSIDERED.

THERE IS NO SMOOTH CAPTURE DATA PRESENT FOR THIS MATERIAL IN THE RANGE CONSIDERED.

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 33

PU-239 SET 2, NO. 2, TEST REWIND AND PUNCH

TIME: 10.93/ 35.81 (SEC.)

ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1104

THE FOLLOWING ENDF/B DATA CARDS HAVE BEEN PUNCHED IN C-SURE TYPE FORMAT:

```
PU-239
9.4239E 04 2.3700E 02 0 0 1 1104 1451 1
9.4239E 04 1.0000E 00 0 1 2 01104 2151 2
3.0000E 02 2.5900E 04 2 2 0 01104 2151 3
5.0000E-01 9.0535E-01 0 0 2 01104 2151 4
2.3700E 02 0.0 0 0 2 01104 2151 5
0.0 0.0 2 0 186 301104 2151 6
0.0 0.0 1.0000E 00 0.0 2.0000E 001104 2151 7
3.0000E 02 8.7800E 00 0.0 1.1370E-03 4.1600E-02 1.5000E 001104 2151 8
3.1000E 02 8.7800E 00 0.0 1.0960E-03 4.1600E-02 1.5000E 001104 2151 9
3.4000E 02 8.7800E 00 0.0 9.3600E-04 4.1600E-02 1.5000E 001104 2151 10
3.6500E 02 8.7800E 00 0.0 8.4500E-04 4.1600E-02 1.5000E 001104 2151 11
4.7500E 02 8.7800E 00 0.0 5.8100E-04 4.1600E-02 1.5000E 001104 2151 12
5.2500E 02 8.7800E 00 0.0 1.6520E-03 4.1600E-02 1.5000E 001104 2151 13
5.8000E 02 8.7800E 00 0.0 1.6510E-03 4.1600E-02 1.5000E 001104 2151 14
6.1000E 02 8.7800E 00 0.0 7.1600E-04 4.1600E-02 1.5000E 001104 2151 15
6.6500E 02 8.7800E 00 0.0 7.1100E-04 4.1600E-02 1.5000E 001104 2151 16
7.2500E 02 8.7800E 00 0.0 7.3000E-04 4.1600E-02 1.5000E 001104 2151 17
8.2500E 02 8.7800E 00 0.0 7.3400E-04 4.1600E-02 1.5000E 001104 2151 18
8.7000E 02 8.7800E 00 0.0 7.2600E-04 4.1600E-02 1.5000E 001104 2151 19
9.3000E 02 8.7800E 00 0.0 1.2230E-03 4.1600E-02 1.5000E 001104 2151 20
9.7500E 02 8.7800E 00 0.0 1.1720E-03 4.1600E-02 1.5000E 001104 2151 21
1.0500E 03 8.7800E 00 0.0 9.6800E-04 4.1600E-02 1.5000E 001104 2151 22
1.0750E 03 8.7800E 00 0.0 8.0200E-04 4.1600E-02 1.5000E 001104 2151 23
1.2250E 03 8.7800E 00 0.0 8.3300E-04 4.1600E-02 1.5000E 001104 2151 24
1.3250E 03 8.7800E 00 0.0 8.5100E-04 4.1600E-02 1.5000E 001104 2151 25
1.5500E 03 8.7800E 00 0.0 8.8500E-04 4.1600E-02 1.5000E 001104 2151 26
2.0000E 03 8.7800E 00 0.0 9.4300E-04 4.1600E-02 1.5000E 001104 2151 27
2.1000E 03 8.7800E 00 0.0 9.4700E-04 4.1600E-02 1.5000E 001104 2151 28
2.2000E 03 8.7800E 00 0.0 9.4900E-04 4.1600E-02 1.5000E 001104 2151 29
2.4000E 03 8.7800E 00 0.0 9.2700E-04 4.1600E-02 1.5000E 001104 2151 30
2.8000E 03 8.7800E 00 0.0 9.2900E-04 4.1600E-02 1.5000E 001104 2151 31
3.5000E 03 8.7800E 00 0.0 9.4400E-04 4.1600E-02 1.5000E 001104 2151 32
6.5000E 03 8.7800E 00 0.0 9.8000E-04 4.1600E-02 1.5000E 001104 2151 33
8.5000E 03 8.7800E 00 0.0 9.6100E-04 4.1600E-02 1.5000E 001104 2151 34
1.0000E 04 8.7800E 00 0.0 8.9000E-04 4.1600E-02 1.5000E 001104 2151 35
1.7000E 04 8.7800E 00 0.0 8.6900E-04 4.1600E-02 1.5000E 001104 2151 36
2.5000E 04 8.7800E 00 0.0 8.6600E-04 4.1600E-02 1.5000E 001104 2151 37
1.0000E 00 0.0 2 0 186 301104 2151 38
0.0 0.0 1.0000E 00 0.0 1.0000E 001104 2151 39
3.0000E 02 3.1200E 00 0.0 4.0900E-04 4.1600E-02 1.5000E 001104 2151 40
3.1000E 02 3.1200E 00 0.0 3.8900E-04 4.1600E-02 1.5000E 001104 2151 41
3.4000E 02 3.1200E 00 0.0 3.3300E-04 4.1600E-02 1.5000E 001104 2151 42
3.6500E 02 3.1200E 00 0.0 3.0000E-04 4.1600E-02 1.5000E 001104 2151 43
4.7500E 02 3.1200E 00 0.0 2.0700E-04 4.1600E-02 1.5000E 001104 2151 44
5.2500E 02 3.1200E 00 0.0 5.8700E-04 4.1600E-02 1.5000E 001104 2151 45
5.8000E 02 3.1200E 00 0.0 5.8100E-04 4.1600E-02 1.5000E 001104 2151 46
6.1000E 02 3.1200E 00 0.0 2.5500E-04 4.1600E-02 1.5000E 001104 2151 47
6.6500E 02 3.1200E 00 0.0 2.5300E-04 4.1600E-02 1.5000E 001104 2151 48
7.2500E 02 3.1200E 00 0.0 2.5900E-04 4.1600E-02 1.5000E 001104 2151 49
8.2500E 02 3.1200E 00 0.0 2.6100E-04 4.1600E-02 1.5000E 001104 2151 50
8.7000E 02 3.1200E 00 0.0 2.5800E-04 4.1600E-02 1.5000E 001104 2151 51
```

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 34

PU-239 SET 2, NO. 2, TEST REWIND AND PUNCH

TIME: 0.30/ 36.11 (SEC.)

ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1104

```
8.7000E 02 3.1200E 00 0.0 2.5800E-04 4.1600E-02 1.5000E 001104 2151 52
9.3000E 02 3.1200E 00 0.0 4.3500E-04 4.1600E-02 1.5000E 001104 2151 53
9.7500E 02 3.1200E 00 0.0 4.1170E-04 4.1600E-02 1.5000E 001104 2151 54
1.0500E 03 3.1200E 00 0.0 3.4400E-04 4.1600E-02 1.5000E 001104 2151 55
1.0750E 03 3.1200E 00 0.0 2.8500E-04 4.1600E-02 1.5000E 001104 2151 56
1.2250E 03 3.1200E 00 0.0 2.9600E-04 4.1600E-02 1.5000E 001104 2151 57
1.3250E 03 3.1200E 00 0.0 3.0200E-04 4.1600E-02 1.5000E 001104 2151 58
1.5500E 03 3.1200E 00 0.0 3.1400E-04 4.1600E-02 1.5000E 001104 2151 59
2.0000E 03 3.1200E 00 0.0 3.3500E-04 4.1600E-02 1.5000E 001104 2151 60
2.1000E 03 3.1200E 00 0.0 3.3700E-04 4.1600E-02 1.5000E 001104 2151 61
2.2000E 03 3.1200E 00 0.0 3.3700E-04 4.1600E-02 1.5000E 001104 2151 62
2.4000E 03 3.1200E 00 0.0 3.2900E-04 4.1600E-02 1.5000E 001104 2151 63
2.8000E 03 3.1200E 00 0.0 3.3000E-04 4.1600E-02 1.5000E 001104 2151 64
3.5000E 03 3.1200E 00 0.0 3.3500E-04 4.1600E-02 1.5000E 001104 2151 65
6.5000E 03 3.1200E 00 0.0 3.4800E-04 4.1600E-02 1.5000E 001104 2151 66
8.5000E 03 3.1200E 00 0.0 3.4200E-04 4.1600E-02 1.5000E 001104 2151 67
1.0000E 04 3.1200E 00 0.0 3.1600E-04 4.1600E-02 1.5000E 001104 2151 68
1.7000E 04 3.1200E 00 0.0 3.0900E-04 4.1600E-02 1.5000E 001104 2151 69
2.5000E 04 3.1200E 00 0.0 3.0800E-04 4.1600E-02 1.5000E 001104 2151 70
2.3700E 02 0.0 1 0 3 01104 2151 71
0.0 0.0 2 0 186 301104 2151 72
0.0 0.0 1.0000E 00 0.0 1.0000E 001104 2151 73
3.0000E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 74
3.1000E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 75
3.4000E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 76
3.6500E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 77
4.7500E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 78
5.2500E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 79
5.8000E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 80
6.1000E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 81
6.6500E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 82
7.2500E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 83
8.2500E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 84
8.7000E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 85
9.3000E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 86
9.7500E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 87
1.0500E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 88
1.0750E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 89
1.2250E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 90
1.3250E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 91
1.5500E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 92
2.0000E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 93
2.1000E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 94
2.2000E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 95
2.4000E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 96
2.8000E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 97
3.5000E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 98
6.5000E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 99
8.5000E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 100
1.0000E 04 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 101
1.7000E 04 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 102
```

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 35

PU-239 SET 2, NO. 2, TEST REWIND AND PUNCH

TIME: 0.27/ 36.38 (SEC.)

ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1104

2.5000E 04 8.7800E 00 0.0	1.3170E-03 4.1600E-02 0.0	1104 2151 103
1.0000E 00 0.0	2 0 186	301104 2151 104
0.0 0.0 0.0	2.0000E 00 0.0	2.0000E 001104 2151 105
3.0000E 02 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 106
3.1000E 02 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 107
3.4000E 02 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 108
3.6500E 02 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 109
4.7500E 02 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 110
5.2500E 02 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 111
5.8000E 02 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 112
6.1000E 02 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 113
6.6500E 02 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 114
7.2500E 02 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 115
8.2500E 02 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 116
8.7000E 02 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 117
9.3000E 02 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 118
9.7500E 02 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 119
1.0500E 03 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 120
1.0750E 03 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 121
1.2250E 03 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 122
1.3250E 03 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 123
1.5500E 03 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 124
1.0000E 03 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 125
2.1000E 03 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 126
2.2000E 03 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 127
2.4000E 03 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 128
2.8000E 03 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 129
3.5000E 03 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 130
6.5000E 03 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 131
8.5000E 03 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 132
1.0000E 04 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 133
1.7000E 04 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 134
2.5000E 04 3.1200E 00 0.0	4.6800E-04 4.1600E-02 1.0000E	001104 2151 135
2.0000E 00 0.0	2 0 186	301104 2151 136
0.0 0.0 0.0	1.0000E 00 0.0	3.0000E 001104 2151 137
3.0000E 02 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 138
3.1000E 02 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 139
3.4000E 02 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 140
3.6500E 02 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 141
4.7500E 02 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 142
5.2500E 02 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 143
5.8000E 02 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 144
6.1000E 02 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 145
6.6500E 02 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 146
7.2500E 02 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 147
8.2500E 02 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 148
8.7000E 02 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 149
9.3000E 02 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 150
9.7500E 02 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 151
1.0500E 03 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 152
1.0750E 03 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 153

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 36

PU-239 SET 2, NO. 2, TEST REWIND AND PUNCH

TIME: 0.17/ 36.54 (SEC.)

ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1104

1.2250E 03 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 154
1.3250E 03 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 155
1.5500E 03 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 156
2.0000E 03 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 157
2.1000E 03 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 158
2.2000E 03 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 159
2.4000E 03 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 160
2.8000E 03 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 161
3.5000E 03 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 162
6.5000E 03 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 163
8.5000E 03 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 164
1.0000E 04 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 165
1.7000E 04 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 166
2.5000E 04 2.1230E 00 0.0	3.1845E-04 4.1600E-02 1.0000E	001104 2151 167
0.0 0.0 0	0 0 0	01104 2 0 168
0.0 0.0 0	0 0 0	01104 0 0 169
9.4239E 04 2.3700E 02	0 0 0	01104 3 2 170
0.0 0.0 0	0 0 2	3061104 3 2 171
123 5 306	2	1104 3 2 172
1.0000E-05 8.7670E 00 1.0000E-04	8.7670E 00 1.0000E-03	8.7620E 001104 3 2 173
3.0000E-03 8.7520E 00 5.0000E-03	8.7410E 00 7.0000E-03	8.7300E 001104 3 2 174
1.0000E-02 8.7140E 00 1.2000E-02	8.7030E 00 1.4000E-02	8.6918E 001104 3 2 175
1.6000E-02 8.6805E 00 1.8000E-02	8.6690E 00 2.0000E-02	8.6573E 001104 3 2 176
2.2000E-02 8.6455E 00 2.4000E-02	8.6335E 00 2.5300E-02	8.6257E 001104 3 2 177
2.6000E-02 8.6214E 00 2.8000E-02	8.6091E 00 3.0000E-02	8.5966E 001104 3 2 178
3.2000E-02 8.5840E 00 3.4000E-02	8.5712E 00 3.6000E-02	8.5582E 001104 3 2 179
3.8000E-02 8.5451E 00 4.0000E-02	8.5318E 00 4.2000E-02	8.5183E 001104 3 2 180
4.4000E-02 8.5046E 00 4.6000E-02	8.4907E 00 4.8000E-02	8.4766E 001104 3 2 181
5.0000E-02 8.4624E 00 5.2000E-02	8.4479E 00 5.4000E-02	8.4333E 001104 3 2 182
5.6000E-02 8.4185E 00 5.8000E-02	8.4034E 00 6.0000E-02	8.3882E 001104 3 2 183
6.2000E-02 8.3727E 00 6.4000E-02	8.3571E 00 6.6000E-02	8.3412E 001104 3 2 184
6.8000E-02 8.3251E 00 7.0000E-02	8.3088E 00 7.2000E-02	8.2923E 001104 3 2 185
7.4000E-02 8.2755E 00 7.6000E-02	8.2585E 00 7.8000E-02	8.2413E 001104 3 2 186
8.0000E-02 8.2238E 00 8.2000E-02	8.2061E 00 8.4000E-02	8.1882E 001104 3 2 187
8.6000E-02 8.1700E 00 8.8000E-02	8.1516E 00 9.0000E-02	8.1329E 001104 3 2 188
9.2000E-02 8.1139E 00 9.4000E-02	8.0946E 00 9.6000E-02	8.0752E 001104 3 2 189
9.8000E-02 8.0555E 00 1.0000E-01	8.0355E 00 1.2000E-01	7.8195E 001104 3 2 190
1.4000E-01 7.5726E 00 1.4885E-01	7.4530E 00 1.6000E-01	7.2939E 001104 3 2 191
1.8000E-01 6.9903E 00 2.0000E-01	6.6912E 00 2.0952E-01	6.5729E 001104 3 2 192
2.2000E-01 6.4900E 00 2.2833E-01	6.4874E 00 2.4000E-01	6.6518E 001104 3 2 193
2.5300E-01 7.2410E 00 2.5699E-01	7.5514E 00 2.6000E-01	7.8369E 001104 3 2 194
2.6795E-01 8.8348E 00 2.7625E-01	1.0286E 01 2.8000E-01	1.1075E 001104 3 2 195
2.8333E-01 1.1123E 01 2.8980E-01	1.2339E 01 2.9600E-01	1.4902E 011104 3 2 196
3.0000E-01 1.5809E 01 3.0220E-01	1.6271E 01 3.0867E-01	1.7632E 011104 3 2 197
3.1575E-01 1.8311E 01 3.2000E-01	1.8641E 01 3.2404E-01	1.8833E 011104 3 2 198
3.3501E-01 1.8884E 01 3.4000E-01	1.8749E 01 3.6000E-01	1.7786E 011104 3 2 199
3.6367E-01 1.7587E 01 3.8000E-01	1.6728E 01 3.8248E-01	1.6606E 011104 3 2 200
4.0000E-01 1.5826E 01 4.0355E-01	1.5686E 01 4.2000E-01	1.5104E 011104 3 2 201
4.2850E-01 1.4843E 01 4.4000E-01	1.4529E 01 4.5904E-01	1.4088E 011104 3 2 202
4.6000E-01 1.4068E 01 4.8000E-01	1.3693E 01 4.9742E-01	1.3420E 011104 3 2 203
5.0000E-01 1.3383E 01 5.2000E-01	1.3124E 01 5.4000E-01	1.2905E 011104 3 2 204

PU-239 SET 2, NU. 2, TEST REWIND AND PUNCH

TIME: 0.27/ 36.81 (SEC.)

ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1104

5.4680E-01 1.2838E 01 5.6000E-01 1.2717E 01 5.8000E-01 1.2554E 011104 3 2 205
6.0000E-01 1.2412E 01 6.1191E-01 1.2336E 01 6.2000E-01 1.2287E 011104 3 2 206
6.4000E-01 1.2176E 01 6.6000E-01 1.2077E 01 6.8000E-01 1.1988E 011104 3 2 207
6.9999E-01 1.1907E 01 7.0000E-01 1.1907E 01 7.2000E-01 1.1834E 011104 3 2 208
7.4000E-01 1.1768E 01 7.6000E-01 1.1707E 01 7.8000E-01 1.1651E 011104 3 2 209
8.0000E-01 1.1599E 01 8.2000E-01 1.1551E 01 8.2254E-01 1.1545E 011104 3 2 210
8.4000E-01 1.1507E 01 8.6000E-01 1.1466E 01 8.8000E-01 1.1427E 011104 3 2 211
9.0000E-01 1.1391E 01 9.2000E-01 1.1358E 01 9.4000E-01 1.1326E 011104 3 2 212
9.6000E-01 1.1296E 01 9.8000E-01 1.1268E 01 1.0000E 00 1.1240E 011104 3 2 213
1.0000E 00 1.7000E 00 2.0000E 00 1.7000E 00 3.0000E 00 1.7000E 011104 3 2 214
4.0000E 00 1.7000E 00 5.0000E 00 1.7000E 00 6.0000E 00 1.7000E 011104 3 2 215
1.0000E 01 1.7000E 00 2.0000E 01 0.0 5.0000E 01 0.0 1104 3 2 216
2.0000E 02 0.0 3.0000E 02 0.0 2.5000E 04 0.0 1104 3 2 217
2.5000E 04 1.1238E 01 3.0000E 04 1.1102E 01 3.5000E 04 1.1007E 011104 3 2 218
4.0000E 04 1.0921E 01 4.5000E 04 1.0820E 01 5.0000E 04 1.0730E 011104 3 2 219
5.5000E 04 1.0614E 01 5.7300E 04 1.0568E 01 6.0000E 04 1.0517E 011104 3 2 220
6.5000E 04 1.0398E 01 7.0000E 04 1.0282E 01 7.5000E 04 1.0169E 011104 3 2 221
7.6400E 04 1.0129E 01 8.0000E 04 1.0041E 01 8.5000E 04 9.9241E 011104 3 2 222
9.0000E 04 9.8240E 00 9.5000E 04 9.7083E 00 1.0000E 05 9.5916E 011104 3 2 223
1.2000E 05 9.2041E 00 1.4000E 05 8.8641E 00 1.6000E 05 8.5639E 011104 3 2 224
1.6470E 05 8.4916E 00 1.8000E 05 8.2871E 00 1.9300E 05 8.1243E 011104 3 2 225
2.0000E 05 8.0427E 00 2.2000E 05 7.8197E 00 2.4000E 05 7.6122E 011104 3 2 226
2.6000E 05 7.4227E 00 2.8000E 05 7.2613E 00 2.8730E 05 7.1904E 011104 3 2 227
3.0000E 05 7.0680E 00 3.2000E 05 6.8693E 00 3.3140E 05 6.7712E 011104 3 2 228
3.4000E 05 6.7020E 00 3.6000E 05 6.5559E 00 3.8000E 05 6.3987E 011104 3 2 229
3.8970E 05 6.3305E 00 3.9370E 05 6.3021E 00 4.0000E 05 6.2592E 011104 3 2 230
4.2000E 05 6.1308E 00 4.3380E 05 6.0502E 00 4.3690E 05 6.0170E 011104 3 2 231
4.4000E 05 5.9923E 00 4.6000E 05 5.8594E 00 4.6300E 05 5.8392E 011104 3 2 232
4.7200E 05 5.7832E 00 4.8000E 05 5.7324E 00 4.8200E 05 5.7187E 011104 3 2 233
4.8800E 05 5.6901E 00 5.0000E 05 5.6007E 00 5.0700E 05 5.5378E 011104 3 2 234
5.1420E 05 5.4876E 00 5.2000E 05 5.4498E 00 5.4000E 05 5.3228E 011104 3 2 235
5.5840E 05 5.2130E 00 5.6000E 05 5.1980E 00 5.8000E 05 5.0832E 011104 3 2 236
6.0000E 05 4.9754E 00 6.2000E 05 4.8816E 00 6.4000E 05 4.7985E 011104 3 2 237
6.6000E 05 4.7195E 00 6.8000E 05 4.6390E 00 7.0000E 05 4.5585E 011104 3 2 238
7.2000E 05 4.4804E 00 7.3810E 05 4.4117E 00 7.4000E 05 4.3999E 011104 3 2 239
7.6300E 05 4.3111E 00 7.8000E 05 4.2237E 00 8.0400E 05 4.1254E 011104 3 2 240
8.2000E 05 4.0565E 00 8.4000E 05 3.9945E 00 8.5300E 05 3.9773E 011104 3 2 241
8.6000E 05 3.9493E 00 8.8000E 05 3.9032E 00 9.0000E 05 3.8473E 011104 3 2 242
9.2000E 05 3.7883E 00 9.4000E 05 3.7133E 00 9.6000E 05 3.6358E 011104 3 2 243
9.8000E 05 3.5588E 00 1.0000E 06 3.4900E 00 1.1000E 06 3.2490E 011104 3 2 244
1.2000E 06 3.0640E 00 1.3000E 06 2.9400E 00 1.4000E 06 2.8540E 011104 3 2 245
1.5000E 06 2.7900E 00 1.6000E 06 2.7680E 00 1.7000E 06 2.7760E 011104 3 2 246
1.8000E 06 2.6030E 00 1.9000E 06 2.6480E 00 2.0000E 06 2.6070E 011104 3 2 247
2.1000E 06 2.9740E 00 2.2000E 06 3.0510E 00 2.3000E 06 3.1380E 011104 3 2 248
2.4000E 06 3.2260E 00 2.5000E 06 3.3160E 00 2.6000E 06 3.3960E 011104 3 2 249
2.7000E 06 3.4770E 00 2.8000E 06 3.5540E 00 2.9000E 06 3.6260E 011104 3 2 250
3.0000E 06 3.6990E 00 3.1000E 06 3.7630E 00 3.2000E 06 3.8180E 011104 3 2 251
3.3000E 06 3.8610E 00 3.4000E 06 3.8990E 00 3.5000E 06 3.9240E 011104 3 2 252
3.6000E 06 3.9470E 00 3.7000E 06 3.9620E 00 3.8000E 06 3.9800E 011104 3 2 253
3.9000E 06 3.9900E 00 4.0000E 06 4.0020E 00 4.1000E 06 4.0100E 011104 3 2 254
4.2000E 06 4.0140E 00 4.3000E 06 4.0130E 00 4.4000E 06 4.0140E 011104 3 2 255

PU-239 SET 2, NU. 2, TEST REWIND AND PUNCH

TIME: 0.30/ 37.11 (SEC.)

ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1104

4.5000E 06 4.0090E 00 4.6000E 06 3.9990E 00 4.7000E 06 3.9870E 011104 3 2 256
4.8000E 06 3.9710E 00 4.9000E 06 3.9680E 00 5.0000E 06 3.9200E 011104 3 2 257
5.1000E 06 3.8890E 00 5.2000E 06 3.8500E 00 5.3000E 06 3.8170E 011104 3 2 258
5.4000E 06 3.7700E 00 5.5000E 06 3.7460E 00 5.6000E 06 3.7050E 011104 3 2 259
5.7000E 06 3.6680E 00 5.8000E 06 3.6310E 00 5.9000E 06 3.5940E 011104 3 2 260
6.0000E 06 3.5530E 00 6.1000E 06 3.5190E 00 6.2000E 06 3.4790E 011104 3 2 261
6.3000E 06 3.4380E 00 6.4000E 06 3.3950E 00 6.5000E 06 3.3580E 011104 3 2 262
6.6000E 06 3.3230E 00 6.7000E 06 3.2850E 00 6.8000E 06 3.2520E 011104 3 2 263
6.9000E 06 3.2190E 00 7.0000E 06 3.1890E 00 7.1000E 06 3.1590E 011104 3 2 264
7.2000E 06 3.1300E 00 7.3000E 06 3.1020E 00 7.4000E 06 3.0760E 011104 3 2 265
7.5000E 06 3.0530E 00 7.6000E 06 3.0270E 00 7.7000E 06 3.0070E 011104 3 2 266
7.8000E 06 2.9830E 00 7.9000E 06 2.9630E 00 8.0000E 06 2.9470E 011104 3 2 267
8.2000E 06 2.8960E 00 8.4000E 06 2.8590E 00 8.6000E 06 2.8210E 011104 3 2 268
8.8000E 06 2.7890E 00 9.0000E 06 2.7570E 00 9.2000E 06 2.7330E 011104 3 2 269
9.4000E 06 2.7120E 00 9.6000E 06 2.6910E 00 9.8000E 06 2.6710E 011104 3 2 270
1.0000E 07 2.6590E 00 1.0500E 07 2.6290E 00 1.1000E 07 2.6240E 011104 3 2 271
1.1500E 07 2.6310E 00 1.2000E 07 2.6480E 00 1.2500E 07 2.6750E 011104 3 2 272
1.2580E 07 2.6830E 00 1.3000E 07 2.7090E 00 1.3500E 07 2.7520E 011104 3 2 273
1.4000E 07 2.8040E 00 1.4500E 07 2.8640E 00 1.5000E 07 2.9350E 011104 3 2 274
0.0 0.0 0 0 0 0 01104 3 0 275
9.4239E 04 2.3700E 02 0 0 0 0 01104 3 18 276
0.0 1.9850E 08 0 0 0 2 3451104 3 18 277
159 365 2 1104 3 18 278
1.0000E-05 3.6584E 04 5.0000E-05 1.6363E 04 1.0000E-04 1.1573E 041104 3 18 279
5.0000E-04 5.1737E 03 1.0000E-03 3.6595E 03 2.0000E-03 2.5884E 031104 3 18 280
3.0000E-03 2.1141E 03 4.0000E-03 1.8315E 03 5.0000E-03 1.6389E 031104 3 18 281
6.0000E-03 1.4968E 03 7.0000E-03 1.3864E 03 8.0000E-03 1.2976E 031104 3 18 282
9.0000E-03 1.2242E 03 1.0000E-02 1.1621E 03 1.1000E-02 1.1088E 031104 3 18 283
1.2000E-02 1.0623E 03 1.3000E-02 1.0214E 03 1.4000E-02 9.8497E 021104 3 18 284
1.5000E-02 9.5230E 02 1.6000E-02 9.2822E 02 1.7000E-02 8.9603E 021104 3 18 285
1.8000E-02 8.7161E 02 1.9000E-02 8.4924E 02 2.0000E-02 8.2864E 021104 3 18 286
2.1000E-02 8.0962E 02 2.2000E-02 7.9194E 02 2.3000E-02 7.7549E 021104 3 18 287
2.4000E-02 7.6019E 02 2.5000E-02 7.4160E 02 2.7500E-02 7.1402E 021104 3 18 288
3.0000E-02 6.8644E 02 3.2500E-02 6.6090E 02 3.5000E-02 6.4149E 021104 3 18 289
3.7500E-02 6.2209E 02 4.0000E-02 6.0472E 02 4.2500E-02 5.9042E 021104 3 18 290
4.5000E-02 5.7510E 02 4.7500E-02 5.6386E 02 5.0000E-02 5.5263E 021104 3 18 291
5.2500E-02 5.4241E 02 5.5000E-02 5.3322E 02 5.7500E-02 5.2504E 021104 3 18 292
6.0000E-02 5.1789E 02 6.2500E-02 5.1036E 02 6.5000E-02 5.0564E 021104 3 18 293
6.7500E-02 4.9951E 02 7.0000E-02 4.9542E 02 7.2500E-02 4.9031E 021104 3 18 294
7.5000E-02 4.8725E 02 7.7500E-02 4.8316E 02 8.0000E-02 4.7908E 021104 3 18 295
8.2500E-02 4.7703E 02 8.5000E-02 4.7499E 02 8.7500E-02 4.7397E 021104 3 18 296
9.0000E-02 4.7193E 02 9.2500E-02 4.7193E 02 9.5000E-02 4.7091E 021104 3 18 297
9.7500E-02 4.7091E 02 1.0000E-01 4.7091E 02 1.0500E-01 4.7091E 021104 3 18 298
1.1000E-01 4.7091E 02 1.1500E-01 4.7295E 02 1.2000E-01 4.7806E 021104 3 18 299
1.2500E-01 4.8316E 02 1.3000E-01 4.9136E 02 1.3500E-01 4.9849E 021104 3 18 300
1.4000E-01 5.0768E 02 1.4500E-01 5.2300E 02 1.5000E-01 5.3730E 021104 3 18 301
1.5500E-01 5.2632E 02 1.6000E-01 5.7305E 02 1.6500E-01 5.9553E 021104 3 18 302
1.7000E-01 6.2209E 02 1.7500E-01 6.5375E 02 1.8000E-01 6.8440E 021104 3 18 303
1.8500E-01 7.2423E 02 1.9000E-01 7.6816E 02 1.9500E-01 8.1310E 021104 3 18 304
2.0000E-01 8.7337E 02 2.1000E-01 9.9084E 02 2.2000E-01 1.1481E 031104 3 18 305
2.3000E-01 1.3371E 03 2.4000E-01 1.5945E 03 2.5000E-01 1.9010E 031104 3 18 306

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 39

PU-239 SET 2, NO. 2, TEST REWIND AND PUNCH

TIME: 0.27/ 37.37 (SEC.)

ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1104

2.6000E-01 2.2779E 03 2.7000E-01 2.6222E 03 2.8000E-01 2.9337E 031104 3 18 307
2.9000E-01 3.0982E 03 3.0000E-01 3.1033E 03 3.1000E-01 2.9398E 031104 3 18 308
3.2000E-01 2.6140E 03 3.3000E-01 2.2064E 03 3.4000E-01 1.8111E 031104 3 18 309
3.5000E-01 1.4995E 03 3.6000E-01 1.2319E 03 3.7000E-01 1.0409E 031104 3 18 310
3.8000E-01 8.8154E 02 3.9000E-01 7.4466E 02 4.0000E-01 6.3434E 021104 3 18 311
4.1000E-01 5.4752E 02 4.2000E-01 4.6886E 02 4.3000E-01 4.1166E 021104 3 18 312
4.4000E-01 3.6181E 02 4.5000E-01 3.2075E 02 4.6000E-01 2.8806E 021104 3 18 313
4.7000E-01 2.6522E 02 4.8000E-01 2.4209E 02 4.9000E-01 2.2268E 021104 3 18 314
5.0000E-01 2.0532E 02 5.1000E-01 1.8327E 02 5.2000E-01 1.7263E 021104 3 18 315
5.3000E-01 1.6037E 02 5.4000E-01 1.5118E 02 5.5000E-01 1.3994E 021104 3 18 316
5.6000E-01 1.3279E 02 5.7000E-01 1.2564E 02 5.8000E-01 1.1951E 021104 3 18 317
5.9000E-01 1.1338E 02 6.0000E-01 1.0623E 02 6.1000E-01 1.0102E 021104 3 18 318
6.2000E-01 9.6531E 01 6.3000E-01 9.1730E 01 6.4000E-01 8.8359E 011104 3 18 319
6.5000E-01 8.4477E 01 6.6000E-01 8.1208E 01 6.7000E-01 7.8655E 011104 3 18 320
6.8000E-01 7.5488E 01 6.9000E-01 7.3036E 01 7.0000E-01 7.0687E 011104 3 18 321
7.1000E-01 6.8746E 01 7.2000E-01 6.6401E 01 7.3000E-01 6.4354E 011104 3 18 322
7.4000E-01 6.2617E 01 7.5000E-01 6.0983E 01 7.6000E-01 5.9348E 011104 3 18 323
7.7000E-01 5.7714E 01 7.8000E-01 5.6182E 01 7.9000E-01 5.5262E 011104 3 18 324
8.0000E-01 5.4241E 01 8.1000E-01 5.2811E 01 8.2000E-01 5.1279E 011104 3 18 325
8.3000E-01 5.0359E 01 8.4000E-01 4.9542E 01 8.5000E-01 4.8112E 011104 3 18 326
8.6000E-01 4.7295E 01 8.7000E-01 4.6478E 01 8.8000E-01 4.5456E 011104 3 18 327
8.9000E-01 4.4435E 01 9.0000E-01 4.3413E 01 9.1000E-01 4.2902E 011104 3 18 328
9.2000E-01 4.1717E 01 9.3000E-01 4.1268E 01 9.4000E-01 4.0549E 011104 3 18 329
9.5000E-01 3.9838E 01 9.6000E-01 3.8919E 01 9.7000E-01 3.8612E 011104 3 18 330
9.8000E-01 3.7897E 01 9.9000E-01 3.7182E 01 1.0000E 00 3.6467E 011104 3 18 331
1.0000E 00 1.1440E 01 2.0000E 00 9.0000E 00 3.0000E 00 7.1000E 001104 3 18 332
4.0000E 00 6.0000E 00 5.0000E 00 5.2000E 00 6.0000E 00 4.6000E 001104 3 18 333
1.0000E 01 0.0 5.0000E 01 0.0 2.0000E 02 0.0 1104 3 18 334
2.0000E 02 3.1000E 00 2.5000E 02 3.1000E 00 2.5000E 02 4.9000E 001104 3 18 335
3.0000E 02 4.9000E 00 3.0000E 02 0.0 2.5000E 04 0.0 1104 3 18 336
4.2000E 04 1.6446E 00 5.0000E 04 1.4480E 00 5.0000E 04 1.6200E 001104 3 18 337
4.0000E 04 1.5950E 00 4.5000E 04 1.5750E 00 5.0000E 04 1.5580E 001104 3 18 338
5.5000E 04 1.5500E 00 5.7300E 04 1.5430E 00 6.0000E 04 1.5350E 001104 3 18 339
6.5000E 04 1.5200E 00 7.0000E 04 1.5080E 00 7.5000E 04 1.5000E 001104 3 18 340
7.6400E 04 1.4990E 00 8.0000E 04 1.4980E 00 8.5000E 04 1.4930E 001104 3 18 341
9.0000E 04 1.4850E 00 9.5000E 04 1.4900E 00 1.0000E 05 1.4970E 001104 3 18 342
1.2000E 05 1.4790E 00 1.4000E 05 1.4980E 00 1.6000E 05 1.5010E 001104 3 18 343
1.6470E 05 1.5070E 00 1.8000E 05 1.5030E 00 1.9300E 05 1.5030E 001104 3 18 344
2.0000E 05 1.5030E 00 2.2000E 05 1.5050E 00 2.4000E 05 1.5050E 001104 3 18 345
2.6000E 05 1.5050E 00 2.8000E 05 1.5030E 00 2.8730E 05 1.5030E 001104 3 18 346
3.0000E 05 1.5030E 00 3.2000E 05 1.5090E 00 3.3140E 05 1.5120E 001104 3 18 347
3.4000E 05 1.5140E 00 3.6000E 05 1.5120E 00 3.8000E 05 1.5150E 001104 3 18 348
3.8970E 05 1.5170E 00 3.9370E 05 1.5180E 00 4.0000E 05 1.5200E 001104 3 18 349
4.2000E 05 1.5210E 00 4.3380E 05 1.5200E 00 4.3690E 05 1.5200E 001104 3 18 350
4.4000E 05 1.5210E 00 4.6300E 05 1.5220E 00 4.6300E 05 1.5220E 001104 3 18 351
4.7200E 05 1.5240E 00 4.8000E 05 1.5250E 00 4.8200E 05 1.5260E 001104 3 18 352
4.8800E 05 1.5270E 00 5.0000E 05 1.5290E 00 5.0700E 05 1.5300E 001104 3 18 353
5.1420E 05 1.5320E 00 5.2000E 05 1.5330E 00 5.4000E 05 1.5370E 001104 3 18 354
5.5840E 05 1.5410E 00 5.6000E 05 1.5420E 00 5.8000E 05 1.5510E 001104 3 18 355
6.0000E 05 1.5590E 00 6.2000E 05 1.5670E 00 6.4000E 05 1.5750E 001104 3 18 356
6.6000E 05 1.5820E 00 6.8000E 05 1.5940E 00 7.0000E 05 1.6130E 001104 3 18 357

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 40

PU-239 SET 2, NO. 2, TEST REWIND AND PUNCH

TIME: 0.23/ 37.61 (SEC.)

ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1104

7.2000E 05 1.6330E 00 7.3810E 05 1.6490E 00 7.4000E 05 1.6510E 001104 3 18 358
7.6300E 05 1.6740E 00 7.8000E 05 1.6960E 00 8.0400E 05 1.7170E 001104 3 18 359
8.2000E 05 1.7190E 00 8.4000E 05 1.7080E 00 8.5300E 05 1.6900E 001104 3 18 360
8.6000E 05 1.6800E 00 8.8000E 05 1.6560E 00 9.0000E 05 1.6440E 001104 3 18 361
9.2000E 05 1.6410E 00 9.4000E 05 1.6490E 00 9.6000E 05 1.6630E 001104 3 18 362
9.8000E 05 1.6810E 00 1.0000E 06 1.7000E 00 1.1000E 06 1.7530E 001104 3 18 363
1.2000E 06 1.7550E 00 1.3000E 06 1.7640E 00 1.4000E 06 1.8040E 001104 3 18 364
5.0000E 06 1.8650E 00 6.0000E 06 1.7000E 06 1.9750E 06 1.9750E 001104 3 18 365
1.8000E 06 2.0000E 00 1.9000E 06 2.0070E 00 2.0000E 06 2.0040E 001104 3 18 366
2.1000E 06 1.9800E 00 2.2000E 06 1.9560E 00 2.3000E 06 1.9180E 001104 3 18 367
2.4000E 06 1.8820E 00 2.5000E 06 1.8560E 00 2.6000E 06 1.8380E 001104 3 18 368
2.7000E 06 1.8270E 00 2.8000E 06 1.8250E 00 2.9000E 06 1.8270E 001104 3 18 369
3.0000E 06 1.8310E 00 3.1000E 06 1.8320E 00 3.2000E 06 1.8320E 001104 3 18 370
3.3000E 06 1.8290E 00 3.4000E 06 1.8240E 00 3.5000E 06 1.8150E 001104 3 18 371
3.6000E 06 1.8060E 00 3.7000E 06 1.7940E 00 3.8000E 06 1.7820E 001104 3 18 372
3.9000E 06 1.7710E 00 4.0000E 06 1.7570E 00 4.1000E 06 1.7450E 001104 3 18 373
4.2000E 06 1.7320E 00 4.3000E 06 1.7200E 00 4.4000E 06 1.7090E 001104 3 18 374
4.5000E 06 1.6980E 00 4.6000E 06 1.6890E 00 4.7000E 06 1.6780E 001104 3 18 375
4.8000E 06 1.6690E 00 4.9000E 06 1.6600E 00 5.0000E 06 1.6540E 001104 3 18 376
5.1000E 06 1.6540E 00 5.2000E 06 1.6540E 00 5.3000E 06 1.6520E 001104 3 18 377
5.4000E 06 1.6500E 00 5.5000E 06 1.6480E 00 5.6000E 06 1.6610E 001104 3 18 378
5.7000E 06 1.6710E 00 5.8000E 06 1.6820E 00 5.9000E 06 1.6890E 001104 3 18 379
6.0000E 06 1.6950E 00 6.1000E 06 1.7140E 00 6.2000E 06 1.7460E 001104 3 18 380
6.3000E 06 1.8140E 00 6.4000E 06 1.8600E 00 6.5000E 06 1.9020E 001104 3 18 381
6.6000E 06 1.9420E 00 6.7000E 06 1.9790E 00 6.8000E 06 2.0090E 001104 3 18 382
6.9000E 06 2.0360E 00 7.0000E 06 2.0630E 00 7.1000E 06 2.0870E 001104 3 18 383
7.2000E 06 2.1100E 00 7.3000E 06 2.1340E 00 7.4000E 06 2.1560E 001104 3 18 384
7.5000E 06 2.1650E 00 7.6000E 06 2.1730E 00 7.7000E 06 2.1830E 001104 3 18 385
7.8000E 06 2.1920E 00 7.9000E 06 2.2020E 00 8.0000E 06 2.2140E 001104 3 18 386
8.2000E 06 2.2400E 00 8.4000E 06 2.2310E 00 8.6000E 06 2.2790E 001104 3 18 387
8.8000E 06 2.2340E 00 9.0000E 06 2.2460E 00 9.2000E 06 2.2560E 001104 3 18 388
9.4000E 06 2.2720E 00 9.6000E 06 2.2690E 00 9.8000E 06 2.2480E 001104 3 18 389
1.0000E 07 2.2270E 00 1.0500E 07 2.2230E 00 1.1000E 07 2.2430E 001104 3 18 390
1.1500E 07 2.2760E 00 1.2000E 07 2.2690E 00 1.2500E 07 2.2800E 001104 3 18 391
1.2580E 07 2.2840E 00 1.3000E 07 2.3010E 00 1.3500E 07 2.2940E 001104 3 18 392
1.4000E 07 2.2710E 00 1.4500E 07 2.2780E 00 1.5000E 07 2.3210E 001104 3 18 393
0.0 0.0 0 0 0 0 01104 3 18 394
9.4239E 04 2.3700E 02 0 0 0 0 01104 3102 395
0.0 0.0 0 0 0 2 3451104 3102 396
158 5 345 2 1104 3102 397
1.0000E-05 1.1393E 04 1.0000E-04 3.6017E 03 5.0000E-04 1.6180E 031104 3102 398
1.0000E-03 1.1479E 03 2.0000E-03 8.1801E 02 3.0000E-03 6.7306E 021104 3102 399
4.0000E-03 5.8740E 02 5.0000E-03 5.2939E 02 6.0000E-03 4.8686E 021104 3102 400
7.0000E-03 4.7971E 02 6.0000E-03 4.7971E 02 9.0000E-03 4.0606E 021104 3102 401
1.0000E-02 1.8831E 02 1.0000E-02 3.7295E 02 2.0000E-02 3.5965E 021104 3102 402
1.3000E-02 3.4806E 02 1.4000E-02 3.3786E 02 1.5000E-02 3.2877E 021104 3102 403
1.6000E-02 3.2064E 02 1.7000E-02 3.1328E 02 1.9000E-02 3.0044E 021104 3102 404
2.1000E-02 2.8958E 02 2.3000E-02 2.8034E 02 2.4000E-02 2.7616E 021104 3102 405
2.5300E-02 2.7130E 02 2.7500E-02 2.6343E 02 3.0000E-02 2.5600E 021104 3102 406
3.2500E-02 2.5108E 02 3.5000E-02 2.4377E 02 3.7500E-02 2.3956E 021104 3102 407
4.0000E-02 2.3592E 02 4.2500E-02 2.3144E 02 4.5000E-02 2.2997E 021104 3102 408

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS
PU-239 SET 2, NO. 2, TEST REWIND AND PUNCH
ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

DATE OF RUN 02/10/72 PAGE 41
TIME: 0.28/ 37.89 (SEC.)
ENDF/B MAT. NO. 1104

4.7500E-02 2.2616E 02 5.0000E-02 2.2392E 02 5.2500E-02 2.2207E 021104 3102 409
5.5000E-02 2.2048E 02 6.0000E-02 2.1763E 02 6.2500E-02 2.1721E 021104 3102 410
6.5000E-02 2.1567E 02 6.7500E-02 2.1601E 02 7.0000E-02 2.1511E 021104 3102 411
7.2500E-02 2.1601E 02 7.5000E-02 2.1558E 02 7.7500E-02 2.1683E 021104 3102 412
8.0000E-02 2.1870E 02 8.2500E-02 2.1912E 02 8.5000E-02 2.2016E 021104 3102 413
8.7500E-02 2.2077E 02 9.0000E-02 2.2300E 02 9.2500E-02 2.2373E 021104 3102 414
9.5000E-02 2.2601E 02 9.7500E-02 2.2777E 02 1.0000E-01 2.3001E 021104 3102 415
1.0500E-01 2.3598E 02 1.1000E-01 2.4379E 02 1.1500E-01 2.5155E 021104 3102 416
1.2000E-01 2.5789E 02 1.2500E-01 2.6663E 02 1.3000E-01 2.7510E 021104 3102 417
1.3500E-01 2.8616E 02 1.4000E-01 2.9691E 02 1.4500E-01 3.0419E 021104 3102 418
1.5000E-01 3.1990E 02 1.5500E-01 3.3278E 02 1.6000E-01 3.5022E 021104 3102 419
1.6500E-01 3.6838E 02 1.7000E-01 3.8877E 02 1.7500E-01 4.1312E 021104 3102 420
1.8000E-01 4.3728E 02 1.8500E-01 4.6665E 02 1.9000E-01 4.9845E 021104 3102 421
1.9500E-01 5.3111E 02 2.0000E-01 5.7426E 02 2.1000E-01 6.5932E 021104 3102 422
2.2000E-01 7.1716E 02 2.3000E-01 9.0663E 02 2.4000E-01 1.0888E 031104 3102 423
2.5000E-01 1.3088E 03 2.6000E-01 1.5683E 03 2.7000E-01 1.8053E 031104 3102 424
2.8000E-01 2.0199E 03 2.9000E-01 2.1330E 03 3.0000E-01 2.1365E 031104 3102 425
3.1000E-01 2.0240E 03 3.2000E-01 1.7997E 03 3.3000E-01 1.5191E 031104 3102 426
3.4000E-01 1.2469E 03 3.5000E-01 1.0235E 03 3.6000E-01 8.3161E 021104 3102 427
3.7000E-01 6.8447E 02 3.7500E-01 6.1439E 02 3.8000E-01 5.5208E 021104 3102 428
3.8500E-01 4.9651E 02 3.9000E-01 4.4702E 02 4.0000E-01 3.6811E 021104 3102 429
4.1000E-01 3.0919E 02 4.2000E-01 2.5877E 02 4.3000E-01 2.2254E 021104 3102 430
4.4000E-01 1.9198E 02 4.5000E-01 1.6761E 02 4.6000E-01 1.4864E 021104 3102 431
4.7000E-01 1.3357E 02 4.8000E-01 1.2184E 02 4.9000E-01 1.1091E 021104 3102 432
5.0000E-01 1.0376E 01 7.2000E-01 2.6414E 01 7.3000E-01 2.5560E 011104 3102 433
5.3000E-01 7.6514E 01 5.4000E-01 7.1086E 01 5.5000E-01 6.5018E 011104 3102 434
5.6000E-01 6.0946E 01 5.7000E-01 5.7105E 01 5.8000E-01 5.3913E 011104 3102 435
5.9000E-01 5.0531E 01 6.0000E-01 4.6870E 01 6.1000E-01 4.4138E 011104 3102 436
6.2000E-01 4.1751E 01 6.3000E-01 3.9281E 01 6.4000E-01 3.7361E 011104 3102 437
6.5000E-01 3.4832E 01 6.6000E-01 3.3740E 01 6.7000E-01 3.2433E 011104 3102 438
6.8000E-01 3.0919E 01 6.9000E-01 2.9809E 01 7.0000E-01 2.8039E 011104 3102 439
7.1000E-01 2.7249E 01 7.2000E-01 2.6414E 01 7.3000E-01 2.5560E 011104 3102 440
7.4000E-01 2.4847E 01 7.5000E-01 2.4191E 01 7.6000E-01 2.3545E 011104 3102 441
7.7000E-01 2.2899E 01 7.8000E-01 2.2291E 01 7.9000E-01 2.1920E 011104 3102 442
8.0000E-01 2.1521E 01 8.1000E-01 2.0951E 01 8.2000E-01 2.0343E 011104 3102 443
8.3000E-01 1.9982E 01 8.4000E-01 1.9659E 01 8.5000E-01 1.9089E 011104 3102 444
8.6000E-01 1.8765E 01 8.7000E-01 1.8443E 01 8.8000E-01 1.8034E 011104 3102 445
8.9000E-01 1.7625E 01 8.9500E-01 1.8045E 01 9.0000E-01 1.8456E 011104 3102 446
9.0500E-01 1.7017E 01 9.1000E-01 1.7017E 01 9.2000E-01 1.6570E 011104 3102 447
9.3000E-01 1.6371E 01 9.4000E-01 1.6010E 01 9.5000E-01 1.5801E 011104 3102 448
9.6000E-01 1.5440E 01 9.7000E-01 1.5316E 01 9.8000E-01 1.5041E 011104 3102 449
9.9000E-01 1.4746E 01 1.0000E 00 1.4461E 01 1.0000E 00 5.7900E 001104 3102 450
1.0010E 00 5.7900E 00 2.0000E 00 4.0000E-01 3.0000E 00 4.0000E-011104 3102 451
4.0000E 00 5.0000E-01 5.0000E 00 4.0000E-01 6.0000E 00 3.0000E-011104 3102 452
1.0000E 01 0.0 5.0000E 01 0.0 2.0000E 02 0.0 1104 3102 453
2.0000E 02 4.0000E-01 4.5000E 02 5.0000E-01 2.5000E 04 5.0000E-011104 3102 454
3.0000E 02 5.0000E-01 3.0000E 02 0.0 2.5000E 04 0.0 1104 3102 455
2.5000E 04 5.9670E-01 3.0000E 04 5.0960E-01 3.5000E 04 4.4370E-011104 3102 456
4.0000E 04 3.9320E-01 4.5000E 04 3.5480E-01 5.0000E 04 3.2490E-011104 3102 457
5.5000E 04 3.0300E-01 5.7300E 04 2.9420E-01 6.0000E 04 2.8410E-011104 3102 458
6.5000E 04 2.6890E-01 7.0000E 04 2.5690E-01 7.5000E 04 2.4770E-011104 3102 459

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS
PU-239 SET 2, NO. 2, TEST REWIND AND PUNCH
ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

DATE OF RUN 02/10/72 PAGE 42
TIME: 0.22/ 38.11 (SEC.)
ENDF/B MAT. NO. 1104

7.6400E 04 2.4580E-01 8.0000E 04 2.4090E-01 8.5000E 04 2.3490E-011104 3102 460
9.0000E 04 2.2950E-01 9.5000E 04 2.2680E-01 1.0000E 05 2.2490E-011104 3102 461
1.2000E 05 2.1690E-01 1.4000E 05 2.1190E-01 1.6000E 05 2.0760E-011104 3102 462
1.6470E 05 2.0640E-01 1.8000E 05 2.0280E-01 1.9300E 05 1.9920E-011104 3102 463
2.0000E 05 1.9730E-01 2.2000E 05 1.9110E-01 2.4000E 05 1.8430E-011104 3102 464
2.6000E 05 1.7680E-01 2.8000E 05 1.6890E-01 2.8730E 05 1.6590E-011104 3102 465
3.0000E 05 1.6080E-01 3.2000E 05 1.5310E-01 3.3140E 05 1.4860E-011104 3102 466
3.4000E 05 1.4530E-01 3.6000E 05 1.3670E-01 3.8000E 05 1.2860E-011104 3102 467
3.8970E 05 1.2490E-01 3.9370E 05 1.2320E-01 4.0000E 05 1.2090E-011104 3102 468
4.2000E 05 1.1300E-01 4.3380E 05 1.0780E-01 4.3690E 05 1.0760E-011104 3102 469
4.4000E 05 1.0510E-01 4.6000E 05 9.7750E-02 4.6300E 05 9.6700E-021104 3102 470
4.7200E 05 9.3600E-02 4.8000E 05 9.0800E-02 4.8200E 05 9.0100E-021104 3102 471
4.8800E 05 8.8200E-02 5.0000E 05 8.4180E-02 5.0700E 05 8.1900E-021104 3102 472
5.1420E 05 7.9700E-02 5.2000E 05 7.7870E-02 5.4000E 05 7.1940E-021104 3102 473
5.5840E 05 7.0000E-02 5.6000E 05 6.6410E-02 5.8000E 05 6.1400E-021104 3102 474
6.0000E 05 5.6480E-02 6.2000E 05 5.2380E-02 6.4000E 05 4.8470E-021104 3102 475
6.6000E 05 4.4950E-02 6.8000E 05 4.1940E-02 7.0000E 05 3.9540E-021104 3102 476
7.2000E 05 3.7530E-02 7.3810E 05 3.5900E-02 7.4000E 05 3.5890E-021104 3102 477
7.6300E 05 3.4760E-02 7.8000E 05 3.4050E-02 8.0400E 05 3.3760E-021104 3102 478
8.2000E 05 3.2850E-02 8.4000E 05 3.1960E-02 8.5300E 05 3.1570E-021104 3102 479
8.6000E 05 3.1090E-02 8.8000E 05 3.0250E-02 9.0000E 05 2.9420E-021104 3102 480
9.2000E 05 2.8610E-02 9.4000E 05 2.7820E-02 9.6000E 05 2.7040E-021104 3102 481
9.8000E 05 2.6280E-02 1.0000E 06 2.5540E-02 1.1000E 06 2.2030E-021104 3102 482
1.2000E 06 1.9200E-02 1.3000E 06 1.7000E-02 1.4000E 06 1.5200E-021104 3102 483
1.5000E 06 1.3800E-02 1.6000E 06 1.2400E-02 1.7000E 06 1.1400E-021104 3102 484
1.8000E 06 1.0400E-02 1.9000E 06 9.6000E-03 2.0000E 06 8.9000E-031104 3102 485
2.1000E 06 8.2000E-03 2.2000E 06 7.7000E-03 2.3000E 06 7.1000E-031104 3102 486
2.4000E 06 6.7000E-03 2.5000E 06 6.4000E-03 2.6000E 06 6.0000E-031104 3102 487
2.7000E 06 5.6700E-03 2.8000E 06 5.3600E-03 2.9000E 06 5.0700E-031104 3102 488
3.0000E 06 4.8300E-03 3.1000E 06 4.5700E-03 3.2000E 06 4.3700E-031104 3102 489
3.3000E 06 4.1700E-03 3.4000E 06 4.0000E-03 3.5000E 06 3.8200E-031104 3102 490
3.6000E 06 3.6700E-03 3.7000E 06 3.5200E-03 3.8000E 06 3.3800E-031104 3102 491
3.9000E 06 3.2300E-03 4.0000E 06 3.1200E-03 4.1000E 06 3.0200E-031104 3102 492
4.2000E 06 2.9100E-03 4.3000E 06 2.7800E-03 4.4000E 06 2.6900E-031104 3102 493
4.5000E 06 2.6200E-03 4.6000E 06 2.5300E-03 4.7000E 06 2.4400E-031104 3102 494
4.8000E 06 2.3700E-03 4.9000E 06 2.2800E-03 5.0000E 06 2.2300E-031104 3102 495
5.1000E 06 2.1600E-03 5.2000E 06 2.1000E-03 5.3000E 06 2.0400E-031104 3102 496
5.4000E 06 1.9800E-03 5.5000E 06 1.9200E-03 5.6000E 06 1.8700E-031104 3102 497
5.7000E 06 1.8300E-03 5.8000E 06 1.7800E-03 5.9000E 06 1.7300E-031104 3102 498
6.0000E 06 1.6900E-03 6.1000E 06 1.6500E-03 6.2000E 06 1.6100E-031104 3102 499
6.3000E 06 1.5700E-03 6.4000E 06 1.5300E-03 6.5000E 06 1.5000E-031104 3102 500
6.6000E 06 1.4700E-03 6.7000E 06 1.4300E-03 6.8000E 06 1.4000E-031104 3102 501
6.9000E 06 1.3700E-03 7.0000E 06 1.3400E-03 7.1000E 06 1.3100E-031104 3102 502
7.2000E 06 1.2800E-03 7.3000E 06 1.2600E-03 7.4000E 06 1.2400E-031104 3102 503
7.5000E 06 1.2200E-03 7.6000E 06 1.1900E-03 7.7000E 06 1.1600E-031104 3102 504
7.8000E 06 1.1400E-03 7.9000E 06 1.1200E-03 8.0000E 06 1.1000E-031104 3102 505
8.2000E 06 1.0600E-03 8.4000E 06 1.0200E-03 8.6000E 06 1.0000E-031104 3102 506
8.8000E 06 9.7000E-04 9.0000E 06 9.4000E-04 9.2000E 06 9.1000E-041104 3102 507
9.4000E 06 8.8000E-04 9.6000E 06 8.5000E-04 9.8000E 06 8.2000E-041104 3102 508
1.0000E 07 8.0000E-04 1.0500E 07 7.4000E-04 1.1000E 07 6.9000E-041104 3102 509
1.1500E 07 6.4000E-04 1.2000E 07 6.0000E-04 1.2500E 07 5.7000E-041104 3102 510

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 43

PU-239 SET 2, NO. 2, TEST REWIND AND PUNCH

TIME: 0.23/ 38.34 (SEC.)

ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1104

1.2580E 07 5.6000E-04 1.3000E 07 5.4000E-04 1.3500E 07 5.2000E-04 1104 3102 511
1.4000E 07 4.8000E-04 1.4500E 07 4.6000E-04 1.5000E 07 4.4000E-04 1104 3102 512
0.0 0.0 0 0 0 0 01104 3 0 513
1104 0 0 514
0 0 515
-1 0 516

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 44

PU-239 SET 2, NO. 2, TEST REWIND AND PUNCH

TIME: 0.0 / 38.34 (SEC.)

ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1104

*** UNRESOLVED RESONANCE CROSS SECTIONS ***

LOWER UNRESOLVED RANGE ENERGY LIMIT IN EV.: 3.0000E 02

UPPER UNRESOLVED RANGE ENERGY LIMIT IN EV.: 2.5000E 04

ENERGY	TOTAL		RESONANCE CONTRIBUTION		SMOOTH CONTRIBUTION	
	CAPTURE	FISSION	CAPTURE	FISSION	CAPTURE	FISSION
3.7074E 03	2.3633E 00	2.6440E 00	2.3633E 00	2.6440E 00	0.0	0.0
3.9236E 03	2.2831E 00	2.5736E 00	2.2831E 00	2.5736E 00	0.0	0.0
4.1398E 03	2.2099E 00	2.5092E 00	2.2099E 00	2.5092E 00	0.0	0.0
4.3560E 03	2.1427E 00	2.4503E 00	2.1427E 00	2.4503E 00	0.0	0.0
4.5722E 03	2.0810E 00	2.3960E 00	2.0810E 00	2.3960E 00	0.0	0.0
4.7883E 03	2.0238E 00	2.3459E 00	2.0238E 00	2.3459E 00	0.0	0.0
5.0045E 03	1.9709E 00	2.2994E 00	1.9709E 00	2.2994E 00	0.0	0.0

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 45

PU-239 SET 2, NO. 2, TEST REWIND AND PUNCH

TIME: 0.25/ 38.59 (SEC.)

ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1104

ENERGY	S-WAVE RESONANCE CONTRIBUTION		P-WAVE RESONANCE CONTRIBUTION	
	CAPTURE	FISSION	CAPTURE	FISSION
3.7074E 03	2.3041E 00	2.3280E 00	5.9281E-02	3.1601E-01
3.9236E 03	2.2223E 00	2.2488E 00	6.0775E-02	3.2480E-01
4.1398E 03	2.1477E 00	2.1759E 00	6.2210E-02	3.3333E-01
4.3560E 03	2.0792E 00	2.1087E 00	6.3589E-02	3.4161E-01
4.5722E 03	2.0160E 00	2.0463E 00	6.4916E-02	3.4967E-01
4.7883E 03	1.9577E 00	1.9884E 00	6.6194E-02	3.5751E-01
5.0045E 03	1.9035E 00	1.9342E 00	6.7427E-02	3.6516E-01

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 46

PU-239 SET 2, NO. 2, TEST REWIND AND PUNCH

TIME: 0.03/ 38.62 (SEC.)

ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1104

ENERGY	TOTAL SCATTER	SMOOTH CONTRIBUTION	RESONANCE CONTRIBUTION	S-WAVE CONTRIBUTION	P-WAVE CONTRIBUTION
3.7074E 03	1.2705E 01	0.0	1.2705E 01	1.2702E 01	3.3334E-03
3.9236E 03	1.2673E 01	0.0	1.2673E 01	1.2669E 01	3.7138E-03
4.1398E 03	1.2643E 01	0.0	1.2643E 01	1.2638E 01	4.1120E-03
4.3560E 03	1.2614E 01	0.0	1.2614E 01	1.2609E 01	4.5280E-03
4.5722E 03	1.2586E 01	0.0	1.2586E 01	1.2581E 01	4.9614E-03
4.7883E 03	1.2560E 01	0.0	1.2560E 01	1.2555E 01	5.4116E-03
5.0045E 03	1.2536E 01	0.0	1.2536E 01	1.2530E 01	5.8785E-03

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 47

SET 2, NO. 3, TEST ALTABN AND SMFAC USING ISONLY = 1

TIME: 0.05/ 38.67 (SEC.)

ENDF/B MAT. NO. 1104

CONTROLLING INPUT CARDS AS READ

NUMBER OF THE RUN = 10

SET 2, NO. 3, TEST ALTABN AND SMFAC USING ISONLY = 1

0 0 0 0 0 0 1 0 0 0 0 0 0
5.0000E-01 0.0 2.5000E-01 0.0 0.0 0.0 0.0

INPUT CARDS AFTER DEFAULTS

MATNO	LOTAP	INUMSH	IPTIME	IPTPLG	ISKCFS	ISONLY	LETHM	MESHRO	NDFB	NDFBCH	NDFPUN	IREW
1104	201	5	1	4	-1	1	-1	1	9	-1	-1	-1
ALTABN	SIGP	SMFAC	TKELYN	ELORED	EHIED							
5.0000E-01	1.0000E 07	2.5000E-01	1.0000E-20	-2.0000E 00	-2.0000E 00							

THE INPUT VARIABLE ISONLY HAS BEEN USED. ONLY ISOTOPE NUMBER 1 WILL BE PROCESSED

THE INPUT VARIABLE ALTABN HAS BEEN USED. THUS THE ABUNDANCE WEIGHTING FOR THIS ISOTOPE WILL BE 5.0000E-01

THE INPUT VARIABLE SMFAC HAS BEEN USED. ALL SMOOTH CROSS SECTIONS PRODUCED WILL BE MULTIPLIED BY 2.5000E-01

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 48

PII-239 SET 2, NO. 3, TEST ALTABN AND SMFAC USING ISONLY = 1

TIME: 0.02/ 30.69 (SEC.)

ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1104

*** UNRESOLVED RESONANCE CROSS SECTIONS ***

LOWER UNRESOLVED RANGE ENERGY LIMIT IN EV.: 3.0000E 02

UPPER UNRESOLVED RANGE ENERGY LIMIT IN EV.: 2.5000E 04

ENERGY	TOTAL		RESONANCE CONTRIBUTION		SMOOTH CONTRIBUTION	
	CAPTURE	FISSION	CAPTURE	FISSION	CAPTURE	FISSION
3.7074E 03	1.1817E 00	1.3220E 00	1.1817E 00	1.3220E 00	0.0	0.0
3.9236E 03	1.1415E 00	1.2868E 00	1.1415E 00	1.2868E 00	0.0	0.0
4.1398E 03	1.1049E 00	1.2546E 00	1.1049E 00	1.2546E 00	0.0	0.0
4.3560E 03	1.0714E 00	1.2251E 00	1.0714E 00	1.2251E 00	0.0	0.0
4.5722E 03	1.0405E 00	1.1980E 00	1.0405E 00	1.1980E 00	0.0	0.0
4.7883E 03	1.0119E 00	1.1729E 00	1.0119E 00	1.1729E 00	0.0	0.0
5.0045E 03	9.8545E-01	1.1497E 00	9.8545E-01	1.1497E 00	0.0	0.0

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 49

PU-239 SET 2, NO. 3, TEST ALTABN AND SMFAC USING ISONLY = 1

TIME: 0.28/ 38.97 (SEC.)

ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1104

ENERGY	S-WAVE RESONANCE CONTRIBUTION		P-WAVE RESONANCE CONTRIBUTION	
	CAPTURE	FISSION	CAPTURE	FISSION
3.7074E 03	1.1520E 00	1.1640E 00	2.9641E-02	1.5800E-01
3.9236E 03	1.1112E 00	1.1244E 00	3.0388E-02	1.6240E-01
4.1398E 03	1.0738E 00	1.0880E 00	3.1105E-02	1.6666E-01
4.3560E 03	1.0396E 00	1.0543E 00	3.1794E-02	1.7080E-01
4.5722E 03	1.0080E 00	1.0232E 00	3.2458E-02	1.7483E-01
4.7883E 03	9.7883E-01	9.9418E-01	3.3097E-02	1.7876E-01
5.0045E 03	9.5174E-01	9.6712E-01	3.3713E-02	1.8258E-01

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 50

PU-239 SET 2, NO. 3, TEST ALTABN AND SMFAC USING ISONLY = 1

TIME: 0.02/ 38.99 (SEC.)

ENDF/B-II TAPE 201 REVISIONS 2,3 8-7-70, 8-25-70

ENDF/B MAT. NO. 1104

ENERGY	TOTAL	SMOOTH	RESONANCE	S-WAVE	P-WAVE
	SCATTER	CONTRIBUTION	CONTRIBUTION	CONTRIBUTION	CONTRIBUTION
3.7074E 03	6.3527E 00	0.0	6.3527E 00	6.3510E 00	1.6667E-03
3.9236E 03	6.3365E 00	0.0	6.3365E 00	6.3347E 00	1.8569E-03
4.1398E 03	6.3213E 00	0.0	6.3213E 00	6.3192E 00	2.0560E-03
4.3560E 03	6.3069E 00	0.0	6.3069E 00	6.3046E 00	2.2640E-03
4.5722E 03	6.2932E 00	0.0	6.2932E 00	6.2907E 00	2.4807E-03
4.7883E 03	6.2802E 00	0.0	6.2802E 00	6.2775E 00	2.7058E-03
5.0045E 03	6.2678E 00	0.0	6.2678E 00	6.2648E 00	2.9392E-03

DATE OF RUN 02/10/72 PAGE 51

TIME: 0.03/ 39.02 (SEC.)

CONTROLLING INPUT CARDS AS READ

NUMBER OF THE RUN = 11

MATNO	IDTAP	INUMSH	IPTIME	IPTPLG	ISCKFS	ISONLY	LETHM	MESHRD	NDFB	NDFBCH	NDFPUN	IREW
1104	201	5	1	4	-1	-1	-1	2	5	-1	-1	1
ALTABN		SIGP		SHFAC		TKCLVN		CLDRED		CHIREO		
-1.0000E 00		1.0000E 07		1.0000E 00		1.0000E-20		-2.0000E 00		-2.0000E 00		

DATE OF RUN 02/10/72 PAGE 52
TIME: 0.03/ 39.05 (SEC.)

```
2.9900E 02 3.0000E 02 1.0000E 04 2.5000E 04 0.0      0.0      0 0 0 0 0 0 4
```

DATE OF RUN 02/10/72 PAGE 53

TIME: 0.0 / 39.05 (SEC.)

2.9900E 02 3.0000E 02 1.0000E 04 2.5000E 04

DATE OF RUN 02/10/72 PAGE 54

TIME: 0.0 / 39.05 (SEC.)

811-230 1104 1451 1

[illegible]

SET 2, NU. 4, TEST NOFB = 5 (ENDF/B CARD INPUT)

TIME: 0.27/ 39.32 (SEC.)

PU-239

1104 1451 1

ENDF/B MAT. NO. 1104

```
1.0500E 03 3.1200E 00 0.0 3.4400E-04 4.1600E-02 8.0500E-021104 2151 55
1.0750E 03 3.1200E 00 0.0 2.8500E-04 4.1600E-02 4.7300E-021104 2151 56
1.2250E 03 3.1200E 00 0.0 2.9600E-04 4.1600E-02 4.4400E-021104 2151 57
1.3250E 03 3.1200E 00 0.0 3.0200E-04 4.1600E-02 2.1310E-011104 2151 58
1.5500E 03 3.1200E 00 0.0 3.1400E-04 4.1600E-02 1.6000E-021104 2151 59
2.0000E 03 3.1200E 00 0.0 3.3500E-04 4.1600E-02 1.3600E-021104 2151 60
2.1000E 03 3.1200E 00 0.0 3.3700E-04 4.1600E-02 1.0000E-041104 2151 61
2.2000E 03 3.1200E 00 0.0 3.3700E-04 4.1600E-02 1.1000E-031104 2151 62
2.4000E 03 3.1200E 00 0.0 3.2900E-04 4.1600E-02 2.3600E-021104 2151 63
2.8000E 03 3.1200E 00 0.0 3.3000E-04 4.1600E-02 5.2500E-021104 2151 64
3.5000E 03 3.1200E 00 0.0 3.3500E-04 4.1600E-02 2.2300E-021104 2151 65
6.5000E 03 3.1200E 00 0.0 3.4800E-04 4.1600E-02 1.9000E-021104 2151 66
8.5000E 03 3.1200E 00 0.0 3.4200E-04 4.1600E-02 5.8100E-021104 2151 67
1.0000E 04 3.1200E 00 0.0 3.1600E-04 4.1600E-02 3.9800E-021104 2151 68
1.7000E 04 3.1200E 00 0.0 3.0900E-04 4.1600E-02 7.6600E-021104 2151 69
2.5000E 04 3.1200E 00 0.0 3.0800E-04 4.1600E-02 9.2400E-021104 2151 70
2.3700E 02 0.0 0 0 0 01104 2151 71
0.0 0.0 0 0 186 301104 2151 72
0.0 0.0 0.0 1.0000E 00 0.0 1.0000E 001104 2151 73
3.0000E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 74
3.1000E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 75
3.4000E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 76
3.6500E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 77
4.7500E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 78
5.2500E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 79
5.8000E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 80
6.1000E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 81
6.6500E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 82
7.2500E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 83
8.2500E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 84
8.7000E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 85
9.3000E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 86
9.7500E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 87
1.0500E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 88
1.0750E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 89
1.2250E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 90
1.3250E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 91
1.5500E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 92
2.0000E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 93
2.1000E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 94
2.2000E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 95
2.4000E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 96
2.8000E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 97
3.5000E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 98
6.5000E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 99
8.5000E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 100
1.0000E 04 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 101
1.7000E 04 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 102
2.5000E 04 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 2151 103
1.0000E 00 0.0 0 0 186 301104 2151 104
0.0 0.0 0.0 2.0000E 00 0.0 2.0000E 001104 2151 105
3.0000E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 106
3.1000E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 107
3.4000E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 108
```

SET 2, NU. 4, TEST NOFB = 5 (ENDF/B CARD INPUT)

TIME: 0.22/ 39.54 (SEC.)

PU-239

1104 1451 1

ENDF/B MAT. NO. 1104

```
3.6500E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 109
4.7500E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 110
5.2500E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 111
5.8000E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 112
6.1000E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 113
6.6500E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 114
7.2500E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 115
8.2500E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 116
8.7000E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 117
9.3000E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 118
9.7500E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 119
1.0500E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 120
1.0750E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 121
1.2250E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 122
1.3250E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 123
1.5500E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 124
2.0000E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 125
2.1000E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 126
2.2000E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 127
2.4000E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 128
2.8000E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 129
3.5000E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 130
6.5000E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 131
8.5000E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 132
1.0000E 04 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 133
1.7000E 04 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 134
2.5000E 04 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 001104 2151 135
2.0000E 00 0.0 0 0 186 301104 2151 136
0.0 0.0 0.0 1.0000E 00 0.0 3.0000E 001104 2151 137
3.0000E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 138
3.1000E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 139
3.4000E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 140
3.6500E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 141
4.7500E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 142
5.2500E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 143
5.8000E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 144
6.1000E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 145
6.6500E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 146
7.2500E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 147
8.2500E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 148
8.7000E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 149
9.3000E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 150
9.7500E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 151
1.0500E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 152
1.0750E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 153
1.2250E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 154
1.3250E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 155
1.5500E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 156
2.0000E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 157
2.1000E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 158
2.2000E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 159
2.4000E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 160
2.8000E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 161
3.5000E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 162
```

SET 2, NO. 4, TEST NDFB = 5 (ENDF/B CARD INPUT)

TIME: 0.25/ 39.79 (SEC.)

PU-239

1104 1451 1

ENDF/B MAT. NO. 1104

```
6.5000E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 163
6.5000E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 164
1.0000E 04 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 165
1.7000E 04 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 166
2.5000E 04 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 001104 2151 167
0.0 0.0 0 0 0 0 01104 2 0 168
0.0 0.0 0 0 0 0 01104 0 0 169
9.4239E 04 2.3700E 02 0 0 0 01104 3 1A 170
0.0 1.9850E 08 0 0 0 2 3451104 3 1B 171
159 3 345 2 1104 3 1B 172
1.0000E-05 3.6584E 04 5.0000E-05 1.6363E 04 1.0000E-04 1.1573E 041104 3 1B 173
5.0000E-04 5.1737E 03 1.0000E-03 3.6595E 03 2.0000E-03 2.5884E 031104 3 1B 174
3.0000E-03 2.1141E 03 4.0000E-03 1.8315E 03 5.0000E-03 1.6389E 031104 3 1B 175
6.0000E-03 1.4968E 03 7.0000E-03 1.3864E 03 8.0000E-03 1.2976E 031104 3 1B 176
9.0000E-03 1.2242E 03 1.0000E-02 1.1621E 03 1.1000E-02 1.1088E 031104 3 1B 177
1.2000E-02 1.0623E 03 1.3000E-02 1.0214E 03 1.4000E-02 9.8497E 021104 3 1B 178
1.5000E-02 9.5230E 02 1.6000E-02 9.2282E 02 1.7000E-02 8.9603E 021104 3 1B 179
1.8000E-02 8.7161E 02 1.9000E-02 8.4942E 02 2.0000E-02 8.2864E 021104 3 1B 180
2.1000E-02 8.0942E 02 2.2000E-02 7.9194E 02 2.3000E-02 7.7549E 021104 3 1B 181
2.4000E-02 7.6019E 02 2.5000E-02 7.4160E 02 2.7500E-02 7.1402E 021104 3 1B 182
3.0000E-02 6.8644E 02 3.2500E-02 6.6090E 02 3.5000E-02 6.4149E 021104 3 1B 183
3.7500E-02 6.2209E 02 4.0000E-02 6.0472E 02 4.2500E-02 5.9042E 021104 3 1B 184
4.5000E-02 5.7510E 02 4.7500E-02 5.6386E 02 5.0000E-02 5.5263E 021104 3 1B 185
5.2500E-02 5.4241E 02 5.5000E-02 5.3322E 02 5.7500E-02 5.2504E 021104 3 1B 186
6.0000E-02 5.1789E 02 6.2500E-02 5.1074E 02 6.5000E-02 5.0505E 021104 3 1B 187
6.7500E-02 5.0951E 02 7.0000E-02 4.9542E 02 7.2500E-02 4.9031E 021104 3 1B 188
7.5000E-02 4.8725E 02 7.7500E-02 4.8316E 02 8.0000E-02 4.7908E 021104 3 1B 189
8.2500E-02 4.7703E 02 8.5000E-02 4.7499E 02 8.7500E-02 4.7397E 021104 3 1B 190
9.0000E-02 4.7193E 02 9.2500E-02 4.7193E 02 9.5000E-02 4.7091E 021104 3 1B 191
9.7500E-02 4.7091E 02 1.0000E-01 4.7091E 02 1.0500E-01 4.7091E 021104 3 1B 192
1.1000E-01 4.7091E 02 1.1500E-01 4.7295E 02 1.2000E-01 4.7806E 021104 3 1B 193
1.2500E-01 4.8316E 02 1.3000E-01 4.9134E 02 1.3500E-01 4.9849E 021104 3 1B 194
1.4000E-01 5.0768E 02 1.4500E-01 5.2300E 02 1.5000E-01 5.3730E 021104 3 1B 195
1.5500E-01 5.5263E 02 1.6000E-01 5.7305E 02 1.6500E-01 5.9553E 021104 3 1B 196
1.7000E-01 6.2209E 02 1.7500E-01 6.5375E 02 1.8000E-01 6.8440E 021104 3 1B 197
1.8500E-01 7.2423E 02 1.9000E-01 7.6816E 02 1.9500E-01 8.1310E 021104 3 1B 198
2.0000E-01 8.7377E 02 2.1000E-01 9.9084E 02 2.2000E-01 1.1401E 021104 3 1B 199
2.3000E-01 1.3371E 03 2.4000E-01 1.5945E 03 2.5000E-01 1.9010E 031104 3 1B 200
2.6000E-01 2.2799E 03 2.7000E-01 2.6222E 03 2.8000E-01 2.9337E 031104 3 1B 201
2.9000E-01 3.0982E 03 3.1000E-01 3.1033E 03 3.1000E-01 3.9398E 031104 3 1B 202
3.2000E-01 2.6140E 03 3.3000E-01 2.2064E 03 3.4000E-01 1.8111E 031104 3 1B 203
3.5000E-01 1.4995E 03 3.6000E-01 1.2319E 03 3.7000E-01 1.0409E 031104 3 1B 204
3.8000E-01 8.8154E 02 3.9000E-01 7.4466E 02 4.0000E-01 6.3434E 021104 3 1B 205
4.1000E-01 5.4752E 02 4.2000E-01 4.6886E 02 4.3000E-01 4.1166E 021104 3 1B 206
4.4000E-01 3.6161E 02 4.5000E-01 3.2075E 02 4.6000E-01 2.8806E 021104 3 1B 207
4.7000E-01 2.6252E 02 4.8000E-01 2.4209E 02 4.9000E-01 2.2264E 021104 3 1B 208
5.0000E-01 2.0532E 02 5.1000E-01 1.8387E 02 5.2000E-01 1.7263E 021104 3 1B 209
5.3000E-01 1.6037E 02 5.4000E-01 1.5118E 02 5.5000E-01 1.3994E 021104 3 1B 210
5.6000E-01 1.3279E 02 5.7000E-01 1.2564E 02 5.8000E-01 1.1951E 021104 3 1B 211
5.9000E-01 1.1338E 02 6.0000E-01 1.0623E 02 6.1000E-01 1.0102E 021104 3 1B 212
6.2000E-01 9.6531E 01 6.3000E-01 9.1730E 01 6.4000E-01 8.8359E 011104 3 1B 213
6.5000E-01 8.4477E 01 6.6000E-01 8.1208E 01 6.7000E-01 7.8655E 011104 3 1B 214
6.8000E-01 7.5488E 01 6.9000E-01 7.3036E 01 7.0000E-01 7.0687E 011104 3 1B 215
7.1000E-01 6.8746E 01 7.2000E-01 6.6601E 01 7.3000E-01 6.4354E 011104 3 1B 216
```

SET 2, NO. 4, TEST NDFB = 5 (ENDF/B CARD INPUT)

TIME: 0.23/ 40.02 (SEC.)

PU-239

1104 1451 1

ENDF/B MAT. NO. 1104

```
7.4000E-01 6.2617E 01 7.5000E-01 6.0983E 01 7.6000E-01 5.9348E 011104 3 1B 217
7.7000E-01 5.7714E 01 7.8000E-01 5.6182E 01 7.9000E-01 5.5262E 011104 3 1B 218
8.0000E-01 5.4241E 01 8.1000E-01 5.2811E 01 8.2000E-01 5.1279E 011104 3 1B 219
8.3000E-01 5.0359E 01 8.4000E-01 4.9542E 01 8.5000E-01 4.8112E 011104 3 1B 220
8.6000E-01 4.7295E 01 8.7000E-01 4.6478E 01 8.8000E-01 4.5456E 011104 3 1B 221
9.0000E-01 4.4435E 01 9.0000E-01 4.3413E 01 9.1000E-01 4.2902E 011104 3 1B 222
9.2000E-01 4.1779E 01 9.3000E-01 4.1268E 01 9.4000E-01 4.0349E 011104 3 1B 223
9.5000E-01 3.9389E 01 9.6000E-01 3.8790E 01 9.7000E-01 3.8612E 011104 3 1B 224
9.8000E-01 3.7877E 01 9.9000E-01 3.7182E 01 1.0000E 00 4.6467E 011104 3 1B 225
1.0000E 00 1.1440E 01 2.0000E 00 9.0000E 00 3.0000E 00 7.1000E 001104 3 1B 226
4.0000E 00 6.0000E 00 5.0000E 00 5.2000E 00 6.0000E 00 4.6000E 001104 3 1B 227
1.0000E 01 0.0 5.0000E 01 0.0 2.0000E 02 0.0 1104 3 1B 228
2.0000E 02 3.1000E 00 2.5000E 02 3.1000E 00 2.5000E 02 4.9000E 001104 3 1B 229
3.0000E 02 4.9000E 00 3.0000E 02 0.0 2.5000E 04 0.0 1104 3 1B 230
2.5000E 04 1.6840E 00 3.0000E 04 1.6480E 00 3.5000E 04 1.6200E 001104 3 1B 231
4.0000E 04 1.5950E 00 4.5000E 04 1.5753E 00 5.0000E 04 1.5580E 001104 3 1B 232
5.5000E 04 1.5500E 00 5.7300E 04 1.5430E 00 6.0000E 04 1.5350E 001104 3 1B 233
6.5000E 04 1.5200E 00 7.0000E 04 1.5080E 00 7.5000E 04 1.5000E 001104 3 1B 234
7.6400E 04 1.4990E 00 8.0000E 04 1.4980E 00 8.5000E 04 1.4930E 001104 3 1B 235
9.0000E 04 1.4850E 00 9.5000E 04 1.4900E 00 1.0000E 05 1.4970E 001104 3 1B 236
1.2000E 05 1.4970E 00 1.4000E 05 1.4980E 00 1.6000E 05 1.5010E 001104 3 1B 237
1.6470E 05 1.5200E 00 1.8000E 05 1.5030E 00 1.9300E 05 1.5030E 001104 3 1B 238
1.8000E 05 1.5030E 00 2.2000E 05 1.5050E 00 2.4000E 05 1.5050E 001104 3 1B 239
2.6000E 05 1.5050E 00 2.8000E 05 1.5030E 00 2.8730E 05 1.5030E 001104 3 1B 240
3.0000E 05 1.5030E 00 3.2000E 05 1.5090E 00 3.3140E 05 1.5120E 001104 3 1B 241
3.4000E 05 1.5140E 00 3.6000E 05 1.5120E 00 3.8000E 05 1.5150E 001104 3 1B 242
3.8970E 05 1.5170E 00 3.9370E 05 1.5180E 00 4.0000E 05 1.5200E 001104 3 1B 243
4.2000E 05 1.5210E 00 4.3380E 05 1.5200E 00 4.3690E 05 1.5200E 001104 3 1B 244
4.4000E 05 1.5200E 00 4.6000E 05 1.5220E 00 4.6300E 05 1.5220E 001104 3 1B 245
4.7200E 05 1.5240E 00 4.8000E 05 1.5250E 00 4.8200E 05 1.5260E 001104 3 1B 246
4.8800E 05 1.5270E 00 5.0000E 05 1.5290E 00 5.0700E 05 1.5300E 001104 3 1B 247
5.1420E 05 1.5320E 00 5.2000E 05 1.5330E 00 5.4000E 05 1.5370E 001104 3 1B 248
5.5840E 05 1.5410E 00 5.6000E 05 1.5420E 00 5.8000E 05 1.5510E 001104 3 1B 249
6.0000E 05 1.5590E 00 6.2000E 05 1.5670E 00 6.4000E 05 1.5750E 001104 3 1B 250
6.6000E 05 1.5820E 00 6.8000E 05 1.5940E 00 7.0000E 05 1.6130E 001104 3 1B 251
7.2000E 05 1.6330E 00 7.3810E 05 1.6490E 00 7.4000E 05 1.6510E 001104 3 1B 252
7.6300E 05 1.6710E 00 7.8000E 05 1.6770E 00 8.0400E 05 1.7170E 001104 3 1B 253
8.2000E 05 1.7190E 00 8.4000E 05 1.7080E 00 8.5300E 05 1.6900E 001104 3 1B 254
8.6000E 05 1.6800E 00 8.8000E 05 1.6560E 00 9.0000E 05 1.6440E 001104 3 1B 255
9.2000E 05 1.6410E 00 9.4000E 05 1.6490E 00 9.6000E 05 1.6630E 001104 3 1B 256
9.8000E 05 1.6810E 00 1.0000E 06 1.7000E 06 1.1000E 06 1.7530E 001104 3 1B 257
1.2000E 06 1.7550E 00 1.3000E 06 1.7640E 00 1.4000E 06 1.8040E 001104 3 1B 258
1.5000E 06 1.8650E 00 1.6000E 06 1.9290E 00 1.7000E 06 1.9750E 001104 3 1B 259
1.8000E 06 2.0000E 00 1.9000E 06 2.0070E 00 2.0000E 06 2.0040E 001104 3 1B 260
2.1000E 06 1.9800E 00 2.2000E 06 1.9560E 00 2.3000E 06 1.9180E 001104 3 1B 261
2.4000E 06 1.8820E 00 2.5000E 06 1.8560E 00 2.6000E 06 1.8380E 001104 3 1B 262
2.7000E 06 1.8270E 00 2.8000E 06 1.8250E 00 2.9000E 06 1.8270E 001104 3 1B 263
3.0000E 06 1.8310E 00 3.1000E 06 1.8320E 00 3.2000E 06 1.8320E 001104 3 1B 264
3.3000E 06 1.8290E 00 3.4000E 06 1.8240E 00 3.5000E 06 1.8150E 001104 3 1B 265
3.6000E 06 1.8060E 00 3.7000E 06 1.7940E 00 3.8000E 06 1.7820E 001104 3 1B 266
3.9000E 06 1.7710E 00 4.0000E 06 1.7570E 00 4.1000E 06 1.7450E 001104 3 1B 267
4.2000E 06 1.7320E 00 4.3000E 06 1.7200E 00 4.4000E 06 1.7090E 001104 3 1B 268
4.5000E 06 1.6980E 00 4.6000E 06 1.6890E 00 4.7000E 06 1.6780E 001104 3 1B 269
4.8000E 06 1.6690E 00 4.9000E 06 1.6600E 00 5.0000E 06 1.6540E 001104 3 1B 270
```

SET 2, NO. 4, TEST NOFB = 5 (ENDF/B CARD INPUT)

TIME: 0.22/ 40.24 (SEC.)

PU-239

1104 1451 1

ENDF/B MAT. NO. 1104

```
5.1000E 06 1.6540E 00 5.2000E 06 1.6540E 00 5.3000E 06 1.6520E 001104 3 18 271
5.4000E 06 1.6500E 00 5.5000E 06 1.6480E 00 5.6000E 06 1.6610E 001104 3 18 272
5.7000E 06 1.6710E 00 5.8000E 06 1.6820E 00 5.9000E 06 1.6890E 001104 3 18 273
6.0000E 06 1.6950E 00 6.1000E 06 1.7140E 00 6.2000E 06 1.7660E 001104 3 18 274
6.3000E 06 1.8140E 00 6.4000E 06 1.8600E 00 6.5000E 06 1.9020E 001104 3 18 275
6.6000E 06 1.9420E 00 6.7000E 06 1.9790E 00 6.8000E 06 2.0090E 001104 3 18 276
6.9000E 06 2.0360E 00 7.0000E 06 2.0630E 00 7.1000E 06 2.0870E 001104 3 18 277
7.2000E 06 2.1100E 00 7.3000E 06 2.1340E 00 7.4000E 06 2.1560E 001104 3 18 278
7.5000E 06 2.1650E 00 7.6000E 06 2.1730E 00 7.7000E 06 2.1830E 001104 3 18 279
7.8000E 06 2.1920E 00 7.9000E 06 2.2020E 00 8.0000E 06 2.2140E 001104 3 18 280
8.2000E 06 2.2400E 00 8.4000E 06 2.2310E 00 8.6000E 06 2.2290E 001104 3 18 281
8.8000E 06 2.2340E 00 9.0000E 06 2.2460E 00 9.2000E 06 2.2560E 001104 3 18 282
9.4000E 06 2.2720E 00 9.6000E 06 2.2690E 00 9.8000E 06 2.2480E 001104 3 18 283
1.0000E 07 2.2270E 00 1.0500E 07 2.2230E 00 1.1000E 07 2.2430E 001104 3 18 284
1.1500E 07 2.2760E 00 1.2000E 07 2.2690E 00 1.2500E 07 2.2800E 001104 3 18 285
1.2580E 07 2.2840E 00 1.3000E 07 2.3010E 00 1.3500E 07 2.2940E 001104 3 18 286
1.4000E 07 2.2710E 00 1.4500E 07 2.2780E 00 1.5000E 07 2.3210E 001104 3 18 287
0.0 0 0 0 0 0 01104 3 0 288
9.4239E 04 9.4239E 04 0 0 0 01104 3102 289
0.0 0.0 0 0 0 0 3451104 3102 290
158 5 345 2 1104 3102 291
1.0000E-05 1.1393E 04 1.0000E-04 3.6017E 02 5.0000E-04 1.6180E 031104 3102 292
1.0000E-03 1.1479E 03 2.0000E-03 8.1801E 02 3.0000E-03 6.7306E 021104 3102 293
4.0000E-03 5.8740E 02 5.0000E-03 5.2930E 02 6.0000E-03 4.8686E 021104 3102 294
7.0000E-03 4.5417E 02 8.0000E-03 4.7197E 02 9.0000E-03 4.0640E 021104 3102 295
1.0000E-02 3.8831E 02 1.1000E-02 3.7295E 02 1.2000E-02 3.5965E 021104 3102 296
1.3000E-02 3.4806E 02 1.4000E-02 3.3786E 02 1.5000E-02 3.2877E 021104 3102 297
1.6000E-02 3.2064E 02 1.7000E-02 3.1328E 02 1.9000E-02 3.0044E 021104 3102 298
2.1000E-02 2.8958E 02 2.3000E-02 2.8034E 02 2.4000E-02 2.7616E 021104 3102 299
2.5300E-02 2.7130E 02 2.7500E-02 2.6343E 02 3.0000E-02 2.5600E 021104 3102 300
3.2500E-02 2.5108E 02 3.5000E-02 2.4377E 02 3.7500E-02 2.3956E 021104 3102 301
4.0000E-02 2.3292E 02 4.2500E-02 2.3144E 02 4.5000E-02 2.2997E 021104 3102 302
4.7500E-02 2.2166E 02 5.0000E-02 2.2392E 02 5.2500E-02 2.2207E 021104 3102 303
5.5000E-02 2.2048E 02 6.0000E-02 2.1763E 02 6.2500E-02 2.1721E 021104 3102 304
6.5000E-02 2.1567E 02 6.7500E-02 2.1601E 02 7.0000E-02 2.1511E 021104 3102 305
7.2500E-02 2.1601E 02 7.5000E-02 2.1558E 02 7.7500E-02 2.1683E 021104 3102 306
8.0000E-02 2.1870E 02 8.2500E-02 2.1912E 02 8.5000E-02 2.2016E 021104 3102 307
8.7500E-02 2.2077E 02 9.0000E-02 2.2300E 02 9.2500E-02 2.2373E 021104 3102 308
9.5000E-02 2.2411E 02 9.7500E-02 2.2777E 02 1.0000E-01 2.3001E 021104 3102 309
1.0500E-01 2.3598E 02 1.1000E-01 2.4379E 02 1.1500E-01 2.5155E 021104 3102 310
1.2000E-01 2.5789E 02 1.2500E-01 2.6663E 02 1.3000E-01 2.7510E 021104 3102 311
1.3500E-01 2.8616E 02 1.4000E-01 2.9691E 02 1.4500E-01 3.0419E 021104 3102 312
1.5000E-01 3.1990E 02 1.5500E-01 3.3278E 02 1.6000E-01 3.5022E 021104 3102 313
1.6500E-01 3.6838E 02 1.7000E-01 3.8877E 02 1.7500E-01 4.1312E 021104 3102 314
1.8000E-01 4.3728E 02 1.8500E-01 4.6665E 02 1.9000E-01 4.9845E 021104 3102 315
1.9500E-01 5.3111E 02 2.0000E-01 5.7426E 02 2.1000E-01 6.5922E 021104 3102 316
2.2000E-01 7.7176E 02 2.3000E-01 9.0663E 02 2.4000E-01 1.0888E 031104 3102 317
2.5000E-01 1.3088E 03 2.6000E-01 1.5683E 03 2.7000E-01 1.8053E 031104 3102 318
2.8000E-01 2.0199E 03 2.9000E-01 2.1330E 03 3.0000E-01 2.1365E 031104 3102 319
3.1000E-01 2.0240E 03 3.2000E-01 1.7997E 03 3.3000E-01 1.5191E 031104 3102 320
3.4000E-01 1.2469E 03 3.5000E-01 1.0235E 03 3.6000E-01 8.3616E 021104 3102 321
3.7000E-01 6.8447E 02 3.7500E-01 6.1439E 02 3.8000E-01 5.5208E 021104 3102 322
3.8500E-01 4.9651E 02 3.9000E-01 4.4702E 02 4.0000E-01 3.6811E 021104 3102 323
4.1000E-01 3.0919E 02 4.2000E-01 2.5877E 02 4.3000E-01 2.2254E 021104 3102 324
```

SET 2, NO. 4, TEST NOFB = 5 (ENDF/B CARD INPUT)

TIME: 0.20/ 40.44 (SEC.)

PU-239

1104 1451 1

ENDF/B MAT. NO. 1104

```
4.4000E-01 1.9198E 02 4.5000E-01 1.6761E 02 4.6000E-01 1.4864E 021104 3102 325
4.7000E-01 1.3357E 02 4.8000E-01 1.2184E 02 4.9000E-01 1.1091E 021104 3102 326
5.0000E-01 1.0057E 02 5.1000E-01 8.9635E 01 5.2000E-01 8.3158E 011104 3102 327
5.3000E-01 7.6514E 01 5.4000E-01 7.1086E 01 5.5000E-01 6.5018E 011104 3102 328
5.6000E-01 6.0946E 01 5.7000E-01 5.7105E 01 5.8000E-01 5.3913E 011104 3102 329
5.9000E-01 5.0531E 01 6.0000E-01 4.6870E 01 6.1000E-01 4.4138E 011104 3102 330
6.2000E-01 4.1751E 01 6.3000E-01 3.9281E 01 6.4000E-01 3.7361E 011104 3102 331
6.5000E-01 3.4832E 01 6.6000E-01 3.3740E 01 6.7000E-01 3.2433E 011104 3102 332
6.8000E-01 3.0919E 01 6.9000E-01 2.9809E 01 7.0000E-01 2.8039E 011104 3102 333
7.1000E-01 2.7269E 01 7.2000E-01 2.6414E 01 7.3000E-01 2.5560E 011104 3102 334
7.4000E-01 2.4847E 01 7.5000E-01 2.4191E 01 7.6000E-01 2.3545E 011104 3102 335
7.7000E-01 2.2899E 01 7.8000E-01 2.2291E 01 7.9000E-01 2.1920E 011104 3102 336
8.0000E-01 2.1521E 01 8.1000E-01 2.0951E 01 8.2000E-01 2.0343E 011104 3102 337
8.3000E-01 1.9982E 01 8.4000E-01 1.9659E 01 8.5000E-01 1.9089E 011104 3102 338
8.6000E-01 1.8765E 01 8.7000E-01 1.8443E 01 8.8000E-01 1.8034E 011104 3102 339
8.9000E-01 1.7625E 01 8.9500E-01 1.8045E 01 9.0000E-01 1.8496E 011104 3102 340
9.0500E-01 1.7728E 01 9.1000E-01 1.7017E 01 9.2000E-01 1.6570E 011104 3102 341
9.3000E-01 1.6371E 01 9.4000E-01 1.6010E 01 9.5000E-01 1.5801E 011104 3102 342
9.6000E-01 1.5440E 01 9.7000E-01 1.5316E 01 9.8000E-01 1.5041E 011104 3102 343
9.9000E-01 1.4746E 01 1.0000E 00 1.4461E 01 1.0000E 00 5.7900E 001104 3102 344
1.0010E 00 5.7900E 00 2.0000E 00 4.0000E-01 3.0000E 00 4.0000E-011104 3102 345
4.0000E 00 5.0000E-01 5.0000E 01 0.0 2.0000E 02 0.0 1104 3102 346
1.0000E 01 0.0 5.0000E 01 0.0 2.0000E 02 0.0 1104 3102 347
2.0000E 02 4.0000E-01 2.5000E 02 4.0000E-01 2.5000E 02 5.0000E-011104 3102 348
3.0000E 02 5.0000E-01 3.0000E 02 0.0 2.5000E 04 0.0 1104 3102 349
2.5000E 04 5.9670E-01 3.0000E 04 5.0960E-01 3.5000E 04 4.4370E-011104 3102 350
4.0000E 04 3.9320E-01 4.5000E 04 3.5480E-01 5.0000E 04 3.2490E-011104 3102 351
5.5000E 04 3.0300E-01 5.7300E 04 2.9420E-01 6.0000E 04 2.8410E-011104 3102 352
6.5000E 04 2.6890E-01 7.0000E 04 2.5690E-01 7.5000E 04 2.4770E-011104 3102 353
7.6400E 04 2.4580E-01 8.0000E 04 2.4090E-01 8.5000E 04 2.3490E-011104 3102 354
9.0000E 04 2.2950E-01 9.5000E 04 2.2680E-01 1.0000E 05 2.2490E-011104 3102 355
1.2000E 05 2.1690E-01 1.4000E 05 2.1190E-01 1.6000E 05 2.0760E-011104 3102 356
1.6470E 05 2.0640E-01 1.8000E 05 2.0280E-01 1.9300E 05 1.9920E-011104 3102 357
2.0000E 05 1.9730E-01 2.2000E 05 1.9110E-01 2.4000E 05 1.8430E-011104 3102 358
2.6000E 05 1.7450E-01 2.8000E 05 1.6800E-01 2.8730E 05 1.6590E-011104 3102 359
3.0000E 05 1.6080E-01 3.2000E 05 1.5310E-01 3.3140E 05 1.4860E-011104 3102 360
3.4000E 05 1.4530E-01 3.6000E 05 1.3670E-01 3.8000E 05 1.2860E-011104 3102 361
3.8970E 05 1.2490E-01 3.9370E 05 1.2320E-01 4.0000E 05 1.2090E-011104 3102 362
4.2000E 05 1.1300E-01 4.3380E 05 1.0780E-01 4.3690E 05 1.0760E-011104 3102 363
4.4000E 05 1.0510E-01 4.6000E 05 9.7750E-02 4.6300E 05 9.6700E-021104 3102 364
4.7200E 05 9.3600E-02 4.8000E 05 9.0800E-02 4.8200E 05 9.0100E-021104 3102 365
4.8800E 05 8.8200E-02 8.8000E 05 8.6180E-02 5.0700E 05 8.1900E-021104 3102 366
5.1420E 05 7.9700E-02 5.2000E 05 7.7870E-02 5.4000E 05 7.1940E-021104 3102 367
5.5840E 05 6.7000E-02 5.6000E 05 6.6410E-02 5.8000E 05 6.1400E-021104 3102 368
6.0000E 05 5.6680E-02 6.2000E 05 5.2380E-02 6.4000E 05 4.8470E-021104 3102 369
6.6000E 05 4.4950E-02 6.8000E 05 4.1940E-02 7.0000E 05 3.9540E-021104 3102 370
7.2000E 05 3.7530E-02 7.3810E 05 3.5900E-02 7.4000E 05 3.5890E-021104 3102 371
7.6300E 05 3.4760E-02 7.8000E 05 3.4050E-02 8.0400E 05 3.3760E-021104 3102 372
8.2000E 05 3.2850E-02 8.4000E 05 3.1940E-02 8.5300E 05 3.1570E-021104 3102 373
8.6000E 05 3.1090E-02 8.8000E 05 3.0250E-02 9.0000E 05 2.9420E-021104 3102 374
9.2000E 05 2.8610E-02 9.4000E 05 2.7820E-02 9.6000E 05 2.7040E-021104 3102 375
9.8000E 05 2.6280E-02 1.0000E 06 2.5540E-02 1.1000E 06 2.2030E-021104 3102 376
1.2000E 06 1.9200E-02 1.3000E 06 1.7000E-02 1.4000E 06 1.5200E-021104 3102 377
1.5000E 06 1.3800E-02 1.6000E 06 1.2400E-02 1.7000E 06 1.1400E-021104 3102 378
```


I C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS
SET 2, NO. 4, TEST NDFB = 5 (ENDF/B CARD INPUT)

DATE OF RUN 02/10/72 PAGE 61
TIME: 0.20/ 40.63 (SEC.)

PU-239

1104 1451 1

ENDF/B MAT. NO. 1104

```

1.8000E 06 1.0400E-02 1.9000E 06 9.6000E-03 2.0000E 06 8.9000E-031104 3102 379
2.1000E 06 8.2000E-03 2.2000E 06 7.7000E-03 2.3000E 06 7.1000E-031104 3102 380
2.4000E 06 6.7000E-03 2.5000E 06 6.4000E-03 2.6000E 06 6.0000E-031104 3102 381
2.7000E 06 5.6700E-03 2.8000E 06 5.3600E-03 2.9000E 06 5.0700E-031104 3102 382
3.0000E 06 4.8300E-03 3.1000E 06 4.5700E-03 3.2000E 06 4.3700E-031104 3102 383
3.3000E 06 4.1700E-03 3.4000E 06 4.0000E-03 3.5000E 06 3.8200E-031104 3102 384
3.6000E 06 3.6700E-03 3.7000E 06 3.5200E-03 3.8000E 06 3.3800E-031104 3102 385
3.9000E 06 3.2300E-03 4.0000E 06 3.1200E-03 4.1000E 06 3.0200E-031104 3102 386
4.2000E 06 2.9100E-03 4.3000E 06 2.7800E-03 4.4000E 06 2.6900E-031104 3102 387
4.5000E 06 2.6200E-03 4.6000E 06 2.5300E-03 4.7000E 06 2.4400E-031104 3102 388
4.8000E 06 2.3700E-03 4.9000E 06 2.2800E-03 5.0000E 06 2.2300E-031104 3102 389
5.1000E 06 2.1600E-03 5.2000E 06 2.1000E-03 5.3000E 06 2.0400E-031104 3102 390
5.4000E 06 1.9800E-03 5.5000E 06 1.9200E-03 5.6000E 06 1.8700E-031104 3102 391
5.7000E 06 1.8300E-03 5.8000E 06 1.7800E-03 5.9000E 06 1.7300E-031104 3102 392
6.0000E 06 1.6900E-03 6.1000E 06 1.6500E-03 6.2000E 06 1.6100E-031104 3102 393
6.3000E 06 1.5700E-03 6.4000E 06 1.5300E-03 6.5000E 06 1.5000E-031104 3102 394
6.6000E 06 1.4700E-03 6.7000E 06 1.4300E-03 6.8000E 06 1.4000E-031104 3102 395
6.9000E 06 1.3700E-03 7.0000E 06 1.3400E-03 7.1000E 06 1.3100E-031104 3102 396
7.2000E 06 1.2800E-03 7.3000E 06 1.2600E-03 7.4000E 06 1.2400E-031104 3102 397
7.5000E 06 1.2200E-03 7.6000E 06 1.1900E-03 7.7000E 06 1.1600E-031104 3102 398
7.8000E 06 1.1400E-03 7.9000E 06 1.1200E-03 8.0000E 06 1.1000E-031104 3102 399
8.2000E 06 1.0600E-03 8.4000E 06 1.0200E-03 8.6000E 06 1.0000E-031104 3102 400
8.8000E 06 9.7000E-04 9.9000E 06 9.4000E-04 9.2000E 06 9.1000E-041104 3102 401
9.4000E 06 8.8000E-04 9.6000E 06 8.5000E-04 9.8000E 06 8.2000E-041104 3102 402
1.0000E 07 8.0000E-04 1.0500E 07 7.4000E-04 1.1000E 07 6.9000E-041104 3102 403
1.1500E 07 6.4000E-04 1.2000E 07 6.0000E-04 1.2500E 07 5.7000E-041104 3102 404
1.2580E 07 5.6000E-04 1.3000E 07 5.4000E-04 1.3500E 07 5.2000E-041104 3102 405
1.4000E 07 4.8000E-04 1.4500E 07 4.6000E-04 1.5000E 07 4.4000E-041104 3102 406
0.0 0.0 0 0 0 0 01104 3 0 407
0 0 0 0 0 0 01104 0 0 408
0 0 0 0 0 0 00 0 0 409
-1 0 0 0 0 0 0-1 0 0 410

```

I C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS
SET 2, NO. 4, TEST NDFB = 5 (ENDF/B CARD INPUT)

DATE OF RUN 02/10/72 PAGE 62
TIME: 1.45/ 42.08 (SEC.)

PU-239

1104 1451 1

ENDF/B MAT. NO. 1104

*** UNRESOLVED RESONANCE CROSS SECTIONS ***

LOWER UNRESOLVED RANGE ENERGY LIMIT IN EV.: 3.0000E 02 UPPER UNRESOLVED RANGE ENERGY LIMIT IN EV.: 2.5000E 04

ENERGY	TOTAL		RESONANCE CONTRIBUTION		SMOOTH CONTRIBUTION	
	CAPTURE	FISSION	CAPTURE	FISSION	CAPTURE	FISSION
2.9900E 02	5.0000E-01	4.9000E 00	0.0	0.0	5.0000E-01	4.9000E 00
3.0000E 02	1.3744E 01	1.1238E 01	1.3744E 01	1.1238E 01	0.0	0.0
1.0000E 04	1.0989E 00	1.9189E 00	1.0989E 00	1.9189E 00	0.0	0.0
2.5000E 04	5.4719E-01	1.7265E 00	5.4719E-01	1.7265E 00	0.0	0.0

I C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS
SET 2, NO. 4, TEST NDFB = 5 (ENDF/B CARD INPUT)

DATE OF RUN 02/10/72 PAGE 63
TIME: 0.13/ 42.22 (SEC.)

PU-239

1104 1451 1

ENDF/B MAT. NO. 1104

ENERGY	S-WAVE RESONANCE CONTRIBUTION		P-WAVE RESONANCE CONTRIBUTION	
	CAPTURE	FISSION	CAPTURE	FISSION
3.0000E 02	1.3726E 01	1.1147E 01	1.7616E-02	2.1106E-02
1.0000E 04	1.0116E 00	1.4139E 00	8.7329E-02	5.0500E-01
2.5000E 04	4.3823E-01	9.8180E-01	1.0895E-01	7.4467E-01

I C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS
SET 2, NO. 4, TEST NDFB = 5 (ENDF/B CARD INPUT)

DATE OF RUN 02/10/72 PAGE 64
TIME: 0.03/ 42.25 (SEC.)

PU-239

1104 1451 1

ENDF/B MAT. NO. 1104

ENERGY	TOTAL SCATTER	SMOOTH CONTRIBUTION	RESONANCE CONTRIBUTION	S-WAVE CONTRIBUTION		P-WAVE CONTRIBUTION	
				S-WAVE	P-WAVE	S-WAVE	P-WAVE
2.9900E 02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3.0000E 02	1.6183E 01	0.0	1.6183E 01	1.6183E 01	2.3375E-05	1.6183E 01	2.3375E-05
1.0000E 04	1.1616E 01	0.0	1.1616E 01	1.1595E 01	2.0570E-02	1.1595E 01	2.0570E-02
2.5000E 04	1.0726E 01	0.0	1.0726E 01	1.0634E 01	9.1797E-02	1.0634E 01	9.1797E-02

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS
SET 2, NO. 5, TEST NDFBCH (CHANGING INDIVIDUAL ENDF/B DATA CARDS)

DATE OF RUN 02/10/72 PAGE 65
TIME: 0.05/ 42.30 (SEC.)

ENDF/B MAT. NO. 1104

CONTROLLING INPUT CARDS AS READ

NUMBER OF THE RUN = 12

SET 2, NO. 5, TEST NDFBCH (CHANGING INDIVIDUAL ENDF/B DATA CARDS)
0 0 0 1 4 0 0 0 -1 5 2 0 0
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

INPUT CARDS AFTER DEFAULTS

MATNO	IDTAP	INUMSH	IPTIME	IPTPLG	ISKCFS	ISONLY	LETHM	MESHRD	NDFB	NDFBCH	NDFPUN	IREW
1104	201	5	1	4	-1	-1	-1	-1	5	2	-1	-1
ALTABN	SIGP	SMFAC	TKELVN	ELORED	EHIREO							
-1.0000E 00	1.0000E 07	1.0000E 00	1.0000E-20	-2.0000E 00	-2.0000E 00							

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS
SET 2, NO. 5, TEST NDFBCH (CHANGING INDIVIDUAL ENDF/B DATA CARDS)

DATE OF RUN 02/10/72 PAGE 66
TIME: 0.02/ 42.32 (SEC.)

PU-239

1104 1451 1

ENDF/B MAT. NO. 1104

ALTERED ENDF/B INPUT DATA

PU-239				1104 1451	1
9.4239E 04 2.3700E 02	0	0	1	01104 2151	2
9.4239E 04 1.0000E 00	0	1	2	01104 2151	3
3.0000E 02 2.5000E 04	2	2	0	01104 2151	4
5.0000E-01 9.0535E-01	0	0	2	01104 2151	5
2.3700E 02 0.0	0	0	2	01104 2151	6
0.0	2	0	186	301104 2151	7
0.0	0.0	0.0	1.0000E 00 0.0	2.0000E 001104 2151	8
3.0000E 02 8.7800E 00 0.0	1.1370E-03	4.1600E-02	1.5000E 001104 2151	9	
3.1000E 02 8.7800E 00 0.0	1.0960E-03	4.1600E-02	1.5000E 001104 2151	10	
3.4000E 02 8.7800E 00 0.0	9.3600E-04	4.1600E-02	1.5000E 001104 2151	11	
3.6500E 02 8.7800E 00 0.0	8.4500E-04	4.1600E-02	1.5000E 001104 2151	12	
4.7500E 02 8.7800E 00 0.0	5.8100E-04	4.1600E-02	1.5000E 001104 2151	13	
5.2500E 02 8.7800E 00 0.0	1.6520E-03	4.1600E-02	1.5000E 001104 2151	14	
5.8000E 02 8.7800E 00 0.0	1.6510E-03	4.1600E-02	1.5000E 001104 2151	15	
6.1000E 02 8.7800E 00 0.0	7.1600E-04	4.1600E-02	1.5000E 001104 2151	16	
6.6500E 02 8.7800E 00 0.0	7.1100E-04	4.1600E-02	1.5000E 001104 2151	17	
7.2500E 02 8.7800E 00 0.0	7.3000E-04	4.1600E-02	1.5000E 001104 2151	18	
8.2500E 02 8.7800E 00 0.0	7.3400E-04	4.1600E-02	1.5000E 001104 2151	19	
8.7000E 02 8.7800E 00 0.0	7.2800E-04	4.1600E-02	1.5000E 001104 2151	20	
9.3000E 02 8.7800E 00 0.0	1.2230E-03	4.1600E-02	1.5000E 001104 2151	21	
9.7500E 02 8.7800E 00 0.0	1.1720E-03	4.1600E-02	1.5000E 001104 2151	22	
1.0500E 03 8.7800E 00 0.0	9.6800E-04	4.1600E-02	1.5000E 001104 2151	23	
1.0750E 03 8.7800E 00 0.0	8.0200E-04	4.1600E-02	1.5000E 001104 2151	24	
1.2250E 03 8.7800E 00 0.0	8.3300E-04	4.1600E-02	1.5000E 001104 2151	25	
1.3250E 03 8.7800E 00 0.0	8.5100E-04	4.1600E-02	1.5000E 001104 2151	26	
1.5500E 03 8.7800E 00 0.0	8.8500E-04	4.1600E-02	1.5000E 001104 2151	27	
2.0000E 03 8.7800E 00 0.0	9.4300E-04	4.1600E-02	1.5000E 001104 2151	28	
2.1000E 03 8.7800E 00 0.0	9.4700E-04	4.1600E-02	1.5000E 001104 2151	29	
2.2000E 03 8.7800E 00 0.0	9.4900E-04	4.1600E-02	1.5000E 001104 2151	30	
2.4000E 03 8.7800E 00 0.0	9.2700E-04	4.1600E-02	1.5000E 001104 2151	31	
2.8000E 03 8.7800E 00 0.0	9.2900E-04	4.1600E-02	1.5000E 001104 2151	32	
3.5000E 03 8.7800E 00 0.0	9.4400E-04	4.1600E-02	1.5000E 001104 2151	33	
4.5000E 03 8.7800E 00 0.0	9.8000E-04	4.1600E-02	1.5000E 001104 2151	34	
8.5000E 03 8.7800E 00 0.0	9.6100E-04	4.1600E-02	1.5000E 001104 2151	35	
1.0000E 04 8.7800E 00 0.0	8.9000E-04	4.1600E-02	1.5000E 001104 2151	36	
1.7000E 04 8.7800E 00 0.0	8.6900E-04	4.1600E-02	1.5000E 001104 2151	37	
2.5000E 04 8.7800E 00 0.0	8.6600E-04	4.1600E-02	1.5000E 001104 2151	38	
1.0000E 00 0.0	2	0	186	301104 2151	39
0.0	1.0000E 00 0.0	1.0000E 001104 2151	40		
3.0000E 02 3.1200E 00 0.0	4.0400E-04	4.1600E-02	1.9100E-021104 2151	41	
3.1000E 02 3.1200E 00 0.0	3.8900E-04	4.1600E-02	8.1000E-031104 2151	42	
3.4000E 02 3.1200E 00 0.0	3.3300E-04	4.1600E-02	8.4000E-031104 2151	43	
3.6500E 02 3.1200E 00 0.0	3.0000E-04	4.1600E-02	6.6700E-021104 2151	44	
4.7500E 02 3.1200E 00 0.0	2.0700E-04	4.1600E-02	3.2530E-011104 2151	45	
5.2500E 02 3.1200E 00 0.0	5.8700E-04	4.1600E-02	9.3800E-021104 2151	46	
5.8000E 02 3.1200E 00 0.0	5.8700E-04	4.1600E-02	8.0500E-021104 2151	47	
6.1000E 02 3.1200E 00 0.0	6.1000E-04	4.1600E-02	6.3000E-031104 2151	48	
6.6500E 02 3.1200E 00 0.0	2.5300E-04	4.1600E-02	6.3000E-031104 2151	49	
7.2500E 02 3.1200E 00 0.0	2.5900E-04	4.1600E-02	2.9000E-021104 2151	50	

SET 2, NO. 5, TEST NDFBCH (CHANGING INDIVIDUAL ENDF/B DATA CARDS)

TIME: 0.30/ 42.62 (SEC.)

PU-239

ENDF/B MAT. NO. 1104

8.2500E 02 3.1200E 00 0.0 2.6100E-04 4.1600E-02 4.4000E-02 1104 1451 51

8.7000E 02 3.1200E 00 0.0 2.5800E-04 4.1600E-02 3.9800E-02 1104 1451 52

9.3000E 02 3.1200E 00 0.0 4.3500E-04 4.1600E-02 6.1000E-02 1104 1451 53

9.7500E 02 3.1200E 00 0.0 4.1700E-04 4.1600E-02 6.6000E-02 1104 1451 54

1.0500E 03 3.1200E 00 0.0 3.4400E-04 4.1600E-02 8.0500E-02 1104 1451 55

1.0750E 03 3.1200E 00 0.0 2.8500E-04 4.1600E-02 4.7300E-02 1104 1451 56

1.2250E 03 3.1200E 00 0.0 2.9600E-04 4.1600E-02 4.4400E-02 1104 1451 57

1.3250E 03 3.1200E 00 0.0 3.0200E-04 4.1600E-02 2.1310E-01 1104 1451 58

1.5500E 03 3.1200E 00 0.0 3.1400E-04 4.1600E-02 1.6000E-02 1104 1451 59

2.0000E 03 3.1200E 00 0.0 3.3500E-04 4.1600E-02 1.3600E-02 1104 1451 60

2.1000E 03 3.1200E 00 0.0 3.3700E-04 4.1600E-02 1.0000E-02 1104 1451 61

2.2000E 03 3.1200E 00 0.0 3.3700E-04 4.1600E-02 1.1000E-02 1104 1451 62

2.4000E 03 3.1200E 00 0.0 3.2900E-04 4.1600E-02 2.3600E-02 1104 1451 63

2800.0 3.12 0.0 0.00033 0.00416 0.05 1104 1451 64 *** NEW ***

3.5000E 03 3.1200E 00 0.0 3.3500E-04 4.1600E-02 2.2300E-02 1104 1451 65

6.5000E 03 3.1200E 00 0.0 3.4800E-04 4.1600E-02 1.9000E-02 1104 1451 66

8.5000E 03 3.1200E 00 0.0 3.4200E-04 4.1600E-02 5.8100E-02 1104 1451 67

1.0000E 04 3.1200E 00 0.0 3.1600E-04 4.1600E-02 3.9800E-02 1104 1451 68

1.7000E 04 3.1200E 00 0.0 3.0900E-04 4.1600E-02 7.6600E-02 1104 1451 69

25000.0 3.12 0.0 0.00035 0.0416 0.0924 1104 1451 70 *** NEW ***

2.3700E 02 0.0 0 1 0 3 01104 1451 71

0.0 0.0 0 2 0 186 301104 1451 72

0.0 0.0 0.0 1.0000E 00 0.0 1.0000E 00 1104 1451 73

3.0000E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 74

3.1000E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 75

3.4000E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 76

3.6500E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 77

4.7500E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 78

5.2500E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 79

5.8000E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 80

6.1000E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 81

6.6500E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 82

7.2500E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 83

8.2500E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 84

8.7000E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 85

9.3000E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 86

9.7500E 02 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 87

1.0500E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 88

1.0750E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 89

1.2250E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 90

1.3250E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 91

1.5500E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 92

2.0000E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 93

2.1000E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 94

2.2000E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 95

2.4000E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 96

2.8000E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 97

3.5000E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 98

6.5000E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 99

8.5000E 03 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 100

1.0000E 04 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 101

1.7000E 04 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 102

2.5000E 04 8.7800E 00 0.0 1.3170E-03 4.1600E-02 0.0 1104 1451 103

1.0000E 00 0.0 0 2 0 186 301104 1451 104

0.0 0.0 0.0 2.0000E 00 0.0 2.0000E 00 1104 1451 105

3.0000E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 106

3.1000E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 107

3.4000E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 108

3.6500E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 109

4.7500E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 110

5.2500E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 111

5.8000E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 112

6.1000E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 113

6.6500E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 114

7.2500E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 115

8.2500E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 116

8.7000E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 117

9.3000E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 118

9.7500E 02 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 119

1.0500E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 120

1.0750E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 121

1.2250E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 122

1.3250E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 123

1.5500E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 124

2.0000E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 125

2.1000E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 126

2.2000E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 127

2.4000E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 128

2.8000E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 129

3.5000E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 130

6.5000E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 131

8.5000E 03 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 132

1.0000E 04 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 133

1.7000E 04 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 134

2.5000E 04 3.1200E 00 0.0 4.6800E-04 4.1600E-02 1.0000E 00 1104 1451 135

2.0000E 00 0.0 0 2 0 186 301104 1451 136

0.0 0.0 0.0 1.0000E 00 0.0 3.0000E 00 1104 1451 137

3.0000E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 138

3.1000E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 139

3.4000E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 140

3.6500E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 141

4.7500E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 142

5.2500E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 143

5.8000E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 144

6.1000E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 145

6.6500E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 146

7.2500E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 147

8.2500E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 148

8.7000E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 149

9.3000E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 150

9.7500E 02 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 151

1.0500E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 152

1.0750E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 153

1.2250E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 154

1.3250E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 155

1.5500E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 156

2.0000E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 157

2.1000E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 158

2.2000E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 159

2.4000E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 160

2.8000E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 161

3.5000E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 162

6.5000E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 163

8.5000E 03 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 164

1.0000E 04 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 165

1.7000E 04 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 166

2.5000E 04 2.1230E 00 0.0 3.1845E-04 4.1600E-02 1.0000E 00 1104 1451 167

0.0 0.0 0 0 0 0 01104 2 0 168

0.0 0.0 0 0 0 0 01104 0 0 169

9.4239E 04 2.3700E 02 0 0 0 0 01104 3 18 170

0.0 1.9850E 08 0 0 0 2 3451104 3 18 171

159 345 2 1104 3 18 172

1.0000E-05 3.6584E 04 5.0000E-05 1.6363E 04 1.0000E-04 1.1573E 04 1104 3 18 173

5.0000E-04 5.1737E 03 1.0000E-03 3.6595E 03 2.0000E-03 2.5884E 03 1104 3 18 174

3.0000E-03 2.1141E 03 4.0000E-03 1.8315E 03 5.0000E-03 1.6389E 031104 3 18 175
6.0000E-03 1.4968E 03 7.0000E-03 1.3864E 03 8.0000E-03 1.2976E 031104 3 18 176
9.0000E-03 1.2242E 03 1.0000E-02 1.1621E 03 1.1000E-02 1.1088E 031104 3 18 177
1.2000E-02 1.0623E 03 1.3000E-02 1.0214E 03 1.4000E-02 9.8497E 021104 3 18 178
1.5000E-02 9.5230E 02 1.6000E-02 9.2282E 02 1.7000E-02 8.9603E 021104 3 18 179
1.8000E-02 8.7161E 02 1.9000E-02 8.4924E 02 2.0000E-02 8.2864E 021104 3 18 180
2.1000E-02 8.0962E 02 2.2000E-02 7.9176E 02 2.3000E-02 7.7549E 021104 3 18 181
2.4000E-02 7.6019E 02 2.5000E-02 7.4160E 02 2.7500E-02 7.1402E 021104 3 18 182
3.0000E-02 6.8644E 02 3.2500E-02 6.6090E 02 3.5000E-02 6.4149E 021104 3 18 183
3.7500E-02 6.2209E 02 4.0000E-02 6.0472E 02 4.2500E-02 5.9042E 021104 3 18 184
4.5000E-02 5.7510E 02 4.7500E-02 5.6386E 02 5.0000E-02 5.5263E 021104 3 18 185
5.2500E-02 5.4241E 02 5.5000E-02 5.3322E 02 5.7500E-02 5.2504E 021104 3 18 186
6.0000E-02 5.1789E 02 6.2500E-02 5.1074E 02 6.5000E-02 5.0564E 021104 3 18 187
6.7500E-02 4.9951E 02 7.0000E-02 4.9542E 02 7.2500E-02 4.9031E 021104 3 18 188
7.5000E-02 4.8725E 02 7.7500E-02 4.8316E 02 8.0000E-02 4.7908E 021104 3 18 189
8.2500E-02 4.7703E 02 8.5000E-02 4.7499E 02 8.7500E-02 4.7397E 021104 3 18 190
9.0000E-02 4.7193E 02 9.2500E-02 4.7193E 02 9.5000E-02 4.7091E 021104 3 18 191
9.7500E-02 4.7091E 02 1.0000E-01 4.7091E 02 1.0500E-01 4.7091E 021104 3 18 192
1.1000E-01 4.7091E 02 1.1500E-01 4.7295E 02 1.2000E-01 4.7806E 021104 3 18 193
1.2500E-01 4.8316E 02 1.3000E-01 4.9134E 02 1.3500E-01 4.9849E 021104 3 18 194
1.4000E-01 5.0768E 02 1.4500E-01 5.2300E 02 1.5000E-01 5.3730E 021104 3 18 195
1.5500E-01 5.5263E 02 1.6000E-01 5.7305E 02 1.6500E-01 5.9553E 021104 3 18 196
1.7000E-01 6.2209E 02 1.7500E-01 6.5375E 02 1.8000E-01 6.8440E 021104 3 18 197
1.8500E-01 7.2423E 02 1.9000E-01 7.6816E 02 1.9500E-01 8.1310E 021104 3 18 198
2.0000E-01 8.7373E 02 2.1000E-01 9.9084E 02 2.2000E-01 1.1481E 031104 3 18 199
2.3000E-01 1.3371E 03 2.4000E-01 1.5945E 03 2.5000E-01 1.9010E 031104 3 18 200
2.6000E-01 2.2775E 03 2.7000E-01 2.8222E 03 2.8000E-01 2.9337E 031104 3 18 201
2.9000E-01 3.0982E 03 3.0000E-01 3.1033E 03 3.1000E-01 2.9398E 031104 3 18 202
3.2000E-01 2.6140E 03 3.3000E-01 2.2064E 03 3.4000E-01 1.8111E 031104 3 18 203
3.5000E-01 1.4995E 03 3.6000E-01 1.2319E 03 3.7000E-01 1.0409E 031104 3 18 204
3.8000E-01 8.8154E 03 3.9000E-01 7.4444E 03 4.0000E-01 6.3634E 021104 3 18 205
4.1000E-01 5.4752E 02 4.2000E-01 4.6886E 02 4.3000E-01 4.1166E 021104 3 18 206
4.4000E-01 3.6161E 02 4.5000E-01 3.2075E 02 4.6000E-01 2.8806E 021104 3 18 207
4.7000E-01 2.6252E 02 4.8000E-01 2.4209E 02 4.9000E-01 2.2268E 021104 3 18 208
5.0000E-01 2.0532E 02 5.1000E-01 1.8387E 02 5.2000E-01 1.7263E 021104 3 18 209
5.3000E-01 1.6037E 02 5.4000E-01 1.5118E 02 5.5000E-01 1.3994E 021104 3 18 210
5.6000E-01 1.3279E 02 5.7000E-01 1.2564E 02 5.8000E-01 1.1951E 021104 3 18 211
5.9000E-01 1.1338E 02 6.0000E-01 1.0623E 02 6.1000E-01 1.0102E 021104 3 18 212
6.2000E-01 9.6531E 01 6.3000E-01 9.1730E 01 6.4000E-01 8.6400E 011104 3 18 213
6.5000E-01 8.4477E 01 6.6000E-01 8.1208E 01 6.7000E-01 7.8655E 011104 3 18 214
6.8000E-01 7.5488E 01 6.9000E-01 7.3036E 01 7.0000E-01 7.0687E 011104 3 18 215
7.1000E-01 6.8746E 01 7.2000E-01 6.6601E 01 7.3000E-01 6.4354E 011104 3 18 216
7.4000E-01 6.2617E 01 7.5000E-01 6.0983E 01 7.6000E-01 5.9348E 011104 3 18 217
7.7000E-01 5.7714E 01 7.8000E-01 5.6182E 01 7.9000E-01 5.5262E 011104 3 18 218
8.0000E-01 5.2421E 01 8.1000E-01 5.2811E 01 8.2000E-01 5.1279E 011104 3 18 219
8.3000E-01 5.0359E 01 8.4000E-01 4.9542E 01 8.5000E-01 4.8112E 011104 3 18 220
8.6000E-01 4.7295E 01 8.7000E-01 4.6478E 01 8.8000E-01 4.5456E 011104 3 18 221
8.9000E-01 4.4435E 01 9.0000E-01 4.3413E 01 9.1000E-01 4.2902E 011104 3 18 222
9.2000E-01 4.1779E 01 9.3000E-01 4.1268E 01 9.4000E-01 4.0349E 011104 3 18 223
9.5000E-01 3.9838E 01 9.6000E-01 3.8919E 01 9.7000E-01 3.8612E 011104 3 18 224
9.8000E-01 3.7897E 01 9.9000E-01 3.7182E 01 1.0000E 00 3.6667E 011104 3 18 225
1.0000E 00 1.1440E 01 2.0000E 00 9.0000E 00 3.0000E 00 7.1000E 001104 3 18 226
4.0000E 00 6.0000E 00 5.0000E 00 5.2000E 00 6.0000E 00 4.6000E 001104 3 18 227
1.0000E 01 0.0 5.0000E 01 0.0 2.0000E 02 0.0 1104 3 18 228
2.0000E 02 3.1000E 00 2.5000E 02 3.1000E 00 2.5000E 02 4.9000E 001104 3 18 229
3.0000E 02 4.9000E 00 3.0000E 02 0.0 2.5000E 04 0.0 1104 3 18 230
2.5000E 04 1.6484E 00 3.0000E 04 1.6480E 00 3.5000E 04 1.6200E 001104 3 18 231
4.0000E 04 1.5950E 00 4.5000E 04 1.5750E 00 5.0000E 04 1.5580E 001104 3 18 232
5.5000E 04 1.5500E 00 5.7300E 04 1.5430E 00 6.0000E 04 1.5350E 001104 3 18 233
6.5000E 04 1.5200E 00 7.0000E 04 1.5080E 00 7.5000E 04 1.5000E 001104 3 18 234
7.6400E 04 1.4990E 00 8.0000E 04 1.4980E 00 8.5000E 04 1.4930E 001104 3 18 235
9.0000E 04 1.4850E 00 9.5000E 04 1.4900E 00 1.0000E 05 1.4970E 001104 3 18 236
1.2000E 05 1.4970E 00 1.4000E 05 1.4980E 00 1.6000E 05 1.5010E 001104 3 18 237
1.6470E 05 1.5020E 00 1.8000E 05 1.5030E 00 1.9300E 05 1.5030E 001104 3 18 238
2.0000E 05 1.5030E 00 2.2000E 05 1.5050E 00 2.4000E 05 1.5050E 001104 3 18 239
2.6000E 05 1.5050E 00 2.8000E 05 1.5030E 00 2.8730E 05 1.5030E 001104 3 18 240
3.0000E 05 1.5030E 00 3.2000E 05 1.5090E 00 3.3140E 05 1.5120E 001104 3 18 241
3.4000E 05 1.5140E 00 3.6000E 05 1.5120E 00 3.8000E 05 1.5150E 001104 3 18 242
3.9770E 05 1.5170E 00 3.9370E 05 1.5180E 00 4.0000E 05 1.5200E 001104 3 18 243
4.2000E 05 1.5240E 00 4.3580E 05 1.5200E 00 4.3690E 05 1.5200E 001104 3 18 244
4.4000E 05 1.5200E 00 4.6000E 05 1.5220E 00 4.6300E 05 1.5220E 001104 3 18 245
4.7200E 05 1.5240E 00 4.8000E 05 1.5250E 00 4.8200E 05 1.5260E 001104 3 18 246
4.8800E 05 1.5270E 00 5.0000E 05 1.5290E 00 5.0700E 05 1.5300E 001104 3 18 247
5.1420E 05 1.5320E 00 5.2000E 05 1.5330E 00 5.4000E 05 1.5370E 001104 3 18 248
5.5840E 05 1.5410E 00 5.6000E 05 1.5420E 00 5.8000E 05 1.5510E 001104 3 18 249
6.0000E 05 1.5590E 00 6.2000E 05 1.5670E 00 6.4000E 05 1.5750E 001104 3 18 250
6.6000E 05 1.5820E 00 6.8000E 05 1.5940E 00 7.0000E 05 1.6130E 001104 3 18 251
7.2000E 05 1.6330E 00 7.3810E 05 1.6490E 00 7.4000E 05 1.6510E 001104 3 18 252
7.6300E 05 1.6740E 00 7.8000E 05 1.6960E 00 8.0400E 05 1.7170E 001104 3 18 253
8.2000E 05 1.7190E 00 8.4000E 05 1.7080E 00 8.5300E 05 1.6900E 001104 3 18 254
8.6000E 05 1.6800E 00 8.8000E 05 1.6560E 00 9.0000E 05 1.6440E 001104 3 18 255
9.2000E 05 1.6410E 00 9.4000E 05 1.6490E 00 9.6000E 05 1.6630E 001104 3 18 256
9.8000E 05 1.6810E 00 1.0000E 06 7.000E 00 1.1000E 06 1.7530E 001104 3 18 257
1.2000E 06 1.7550E 00 1.3000E 06 1.7640E 00 1.4000E 06 1.8040E 001104 3 18 258
1.5000E 06 1.8650E 00 1.6000E 06 1.9290E 00 1.7000E 06 1.9750E 001104 3 18 259
1.8000E 06 2.0000E 00 1.9000E 06 2.0070E 00 2.0000E 06 2.0040E 001104 3 18 260
2.1000E 06 1.9800E 00 2.2000E 06 1.9560E 00 2.3000E 06 1.9180E 001104 3 18 261
2.4000E 06 1.9820E 00 2.5000E 06 1.8560E 00 2.6000E 06 1.8380E 001104 3 18 262
2.7000E 06 1.9270E 00 2.8000E 06 1.8250E 00 2.9000E 06 1.8270E 001104 3 18 263
3.0000E 06 1.8310E 00 3.1000E 06 1.8320E 00 3.2000E 06 1.8320E 001104 3 18 264
3.3000E 06 1.8290E 00 3.4000E 06 1.8240E 00 3.5000E 06 1.8150E 001104 3 18 265
3.6000E 06 1.8060E 00 3.7000E 06 1.7940E 00 3.8000E 06 1.7820E 001104 3 18 266
3.9000E 06 1.7710E 00 4.0000E 06 1.7570E 00 4.1000E 06 1.7450E 001104 3 18 267
4.2000E 06 1.7320E 00 4.3000E 06 1.7200E 00 4.4000E 06 1.7090E 001104 3 18 268
4.5000E 06 1.6990E 00 4.6000E 06 1.6890E 00 4.7000E 06 1.6780E 001104 3 18 269
4.8000E 06 1.6690E 00 4.9000E 06 1.6600E 00 5.0000E 06 1.6540E 001104 3 18 270
5.1000E 06 1.6540E 00 5.2000E 06 1.6540E 00 5.3000E 06 1.6520E 001104 3 18 271
5.4000E 06 1.6500E 00 5.5000E 06 1.6480E 00 5.6000E 06 1.6410E 001104 3 18 272
5.7000E 06 1.6710E 00 5.8000E 06 1.6820E 00 5.9000E 06 1.6890E 001104 3 18 273
6.0500E 06 1.6950E 00 6.1000E 06 1.7140E 00 6.2000E 06 1.7660E 001104 3 18 274
6.3000E 06 1.8140E 00 6.4000E 06 1.8600E 00 6.5000E 06 1.9020E 001104 3 18 275
6.6000E 06 1.9420E 00 6.7000E 06 1.9790E 00 6.8000E 06 2.0090E 001104 3 18 276
6.9000E 06 2.0360E 00 7.0000E 06 2.0630E 00 7.1000E 06 2.0870E 001104 3 18 277
7.2000E 06 2.1100E 00 7.3000E 06 2.1340E 00 7.4000E 06 2.1560E 001104 3 18 278
7.5000E 06 2.1650E 00 7.6000E 06 2.1730E 00 7.7000E 06 2.1830E 001104 3 18 279
7.8000E 06 2.1920E 00 7.9000E 06 2.2020E 00 8.0000E 06 2.2140E 001104 3 18 280
8.2000E 06 2.2400E 00 8.4000E 06 2.2310E 00 8.6000E 06 2.2250E 001104 3 18 281
8.8000E 06 2.2340E 00 9.0000E 06 2.2460E 00 9.2000E 06 2.2500E 001104 3 18 282
9.4000E 06 2.2720E 00 9.6000E 06 2.2690E 00 9.8000E 06 2.2480E 001104 3 18 283
1.0000E 07 2.2270E 00 1.0500E 07 2.2230E 00 1.1000E 07 2.2430E 001104 3 18 284
1.1500E 07 2.2760E 00 1.2000E 07 2.2690E 00 1.2500E 07 2.2800E 001104 3 18 285
1.2580E 07 2.2840E 00 1.3000E 07 2.3010E 00 1.3500E 07 2.2940E 001104 3 18 286
1.4000E 07 2.2710E 00 1.4500E 07 2.2780E 00 1.5000E 07 2.3210E 001104 3 18 287
0.0 0.0 0 0 0 0 0 01104 3 18 288
9.4239E 04 9.4239E 04 0 0 0 0 0 01104 3102 289
0.0 0.0 0 0 0 2 3451104 3102 290
158 5 345 2 1104 3102 291
1.0000E-05 1.1393E 04 1.0000E-04 3.6017E 03 5.0000E-04 1.6180E 031104 3102 292
1.0500E-03 1.1479E 03 2.0000E-03 6.1801E 02 3.0000E-03 6.7306E 021104 3102 293
4.0000E-03 9.8740E 02 5.0000E-03 5.2993E 02 6.0000E-03 4.8686E 021104 3102 294
7.0000E-03 4.5417E 02 8.0000E-03 4.2797E 02 9.0000E-03 4.0640E 021104 3102 295
1.0000E-02 3.8831E 02 1.1000E-02 3.7295E 02 1.2000E-02 3.5965E 021104 3102 296
1.3000E-02 3.4806E 02 1.4000E-02 3.3786E 02 1.5000E-02 3.2877E 021104 3102 297
1.6000E-02 3.2064E 02 1.7000E-02 3.1328E 02 1.9000E-02 3.0044E 021104 3102 298
2.1000E-02 2.8958E 02 2.3000E-02 2.8034E 02 2.4000E-02 2.7616E 021104 3102 299
2.5300E-02 2.7130E 02 2.7500E-02 2.6343E 02 3.0000E-02 2.5600E 021104 3102 300
3.2500E-02 2.5108E 02 3.5000E-02 2.4377E 02 3.7500E-02 2.3956E 021104 3102 301
4.0000E-02 2.3592E 02 4.2500E-02 2.3144E 02 4.5000E-02 2.2997E 021104 3102 302
4.7500E-02 2.2616E 02 5.0000E-02 2.2392E 02 5.2500E-02 2.2207E 021104 3102 303
5.5000E-02 2.2048E 02 6.0000E-02 2.1763E 02 6.2500E-02 2.1721E 021104 3102 304
6.5000E-02 2.1567E 02 6.7500E-02 2.1601E 02 7.0000E-02 2.1511E 021104 3102 305
7.2500E-02 2.1601E 02 7.5000E-02 2.1558E 02 7.7500E-02 2.1683E 021104 3102 306

8.0000E-02 2.1870E 02 8.2500E-02 2.1912E 02 8.5000E-02 2.2016E 021104 3102 307
8.7500E-02 2.2077E 02 9.0000E-02 2.2300E 02 9.2500E-02 2.2373E 021104 3102 308
9.5000E-02 2.2601E 02 9.7500E-02 2.2777E 02 1.0000E-01 2.3001E 021104 3102 309
1.0500E-01 2.3598E 02 1.1000E-01 2.4379E 02 1.1500E-01 2.5155E 021104 3102 310
1.2000E-01 2.5789E 02 1.2500E-01 2.6663E 02 1.3000E-01 2.7510E 021104 3102 311
1.3500E-01 2.8616E 02 1.4000E-01 2.9691E 02 1.4500E-01 3.0419E 021104 3102 312
1.5000E-01 3.1990E 02 1.5500E-01 3.3278E 02 1.6000E-01 3.5022E 021104 3102 313
1.6500E-01 3.6838E 02 1.7000E-01 3.8877E 02 1.7500E-01 4.1312E 021104 3102 314
1.8000E-01 4.3728E 02 1.8500E-01 4.6665E 02 1.9000E-01 4.9845E 021104 3102 315
1.9500E-01 5.3111E 02 2.0000E-01 5.7426E 02 2.1000E-01 6.5932E 021104 3102 316
2.2000E-01 7.7176E 02 2.3000E-01 9.0663E 02 2.4000E-01 1.0888E 031104 3102 317
2.5000E-01 1.3088E 03 2.6000E-01 1.5683E 03 2.7000E-01 1.8053E 031104 3102 318
2.8000E-01 2.0199E 03 2.9000E-01 2.1330E 03 3.0000E-01 2.1365E 031104 3102 319
3.1000E-01 2.0240E 03 3.2000E-01 1.7997E 03 3.3000E-01 1.5191E 031104 3102 320
3.4000E-01 1.2449E 03 3.5000E-01 1.0235E 03 3.6000E-01 8.3161E 021104 3102 321
3.7000E-01 6.8447E 02 3.7500E-01 6.1439E 02 3.8000E-01 5.5208E 021104 3102 322
3.8500E-01 4.9651E 02 3.9000E-01 4.4702E 02 4.0000E-01 3.6811E 021104 3102 323
4.1000E-01 3.0919E 02 4.2000E-01 2.5877E 02 4.3000E-01 2.2254E 021104 3102 324
4.4000E-01 1.9198E 02 4.5000E-01 1.6761E 02 4.6000E-01 1.4864E 021104 3102 325
4.7000E-01 1.3357E 02 4.8000E-01 1.2184E 02 4.9000E-01 1.1091E 021104 3102 326
5.0000E-01 1.0057E 02 5.1000E-01 8.9635E 01 5.2000E-01 8.3158E 011104 3102 327
5.3000E-01 7.6514E 01 5.4000E-01 7.1086E 01 5.5000E-01 6.5018E 011104 3102 328
5.6000E-01 6.0946E 01 5.7000E-01 5.7105E 01 5.8000E-01 5.3913E 011104 3102 329
5.9000E-01 5.0531E 01 6.0000E-01 4.6870E 01 6.1000E-01 4.4138E 011104 3102 330
6.2000E-01 4.1751E 01 6.3000E-01 3.9281E 01 6.4000E-01 3.7361E 011104 3102 331
6.5000E-01 3.4764E 01 6.6000E-01 3.4749E 01 6.7000E-01 3.2433E 011104 3102 332
6.8000E-01 3.0919E 01 6.9000E-01 2.9809E 01 7.0000E-01 2.8039E 011104 3102 333
7.1000E-01 2.7269E 01 7.2000E-01 2.6414E 01 7.3000E-01 2.5560E 011104 3102 334
7.4000E-01 2.4847E 01 7.5000E-01 2.4191E 01 7.6000E-01 2.3545E 011104 3102 335
7.7000E-01 2.2899E 01 7.8000E-01 2.2291E 01 7.9000E-01 2.1920E 011104 3102 336
8.0000E-01 2.1521E 01 8.1000E-01 2.0951E 01 8.2000E-01 2.0343E 011104 3102 337
8.3000E-01 1.9982E 01 8.4000E-01 1.9659E 01 8.5000E-01 1.9089E 011104 3102 338
8.6000E-01 1.8745E 01 8.7000E-01 1.8443E 01 8.8000E-01 1.8034E 011104 3102 339
8.9000E-01 1.7625E 01 8.9500E-01 1.8045E 01 9.0000E-01 1.8456E 011104 3102 340
9.0500E-01 1.7728E 01 9.1000E-01 1.7017E 01 9.2000E-01 1.6570E 011104 3102 341
9.3000E-01 1.6371E 01 9.4000E-01 1.6010E 01 9.5000E-01 1.5801E 011104 3102 342
9.6000E-01 1.5440E 01 9.7000E-01 1.5316E 01 9.8000E-01 1.5041E 011104 3102 343
9.9000E-01 1.4746E 01 1.0000E 00 1.4461E 01 1.0000E 00 1.4900E 001104 3102 344
1.0010E 00 5.7900E 00 2.0000E 00 6.0000E-01 3.0000E 00 6.0000E-011104 3102 345
4.0000E 00 5.0000E-01 5.0000E 00 4.0000E-01 6.0000E 00 3.0000E-011104 3102 346
1.0000E 01 0.0 5.0000E 01 0.0 2.0000E 02 0.0 1104 3102 347
2.0000E 02 4.0000E-01 2.5000E 02 4.0000E-01 2.5000E 02 5.0000E-011104 3102 348
3.0000E 02 5.0000E-01 3.0000E 02 0.0 2.5000E 04 0.0 1104 3102 349
2.5000E 04 5.9670E-01 3.0000E 04 5.0960E-01 3.5000E 04 4.4370E-011104 3102 350
4.0000E 04 3.9320E-01 4.5000E 04 3.5680E-01 5.0000E 04 3.2490E-011104 3102 351
5.0000E 04 3.0300E-01 5.7300E 04 2.9420E-01 6.0000E 04 2.8410E-011104 3102 352
6.5000E 04 2.6890E-01 7.0000E 04 2.5690E-01 7.5000E 04 2.4770E-011104 3102 353
7.6400E 04 2.4580E-01 8.0000E 04 2.4090E-01 8.5000E 04 2.3490E-011104 3102 354
9.0000E 04 2.2950E-01 9.5000E 04 2.2600E-01 1.0000E 05 2.2470E-011104 3102 355
1.2000E 05 2.1690E-01 1.4000E 05 2.1190E-01 1.6000E 05 2.0760E-011104 3102 356
1.6470E 05 2.0640E-01 1.8000E 05 2.0280E-01 1.9300E 05 1.9920E-011104 3102 357
2.0000E 05 1.9730E-01 2.2000E 05 1.9110E-01 2.4000E 05 1.8430E-011104 3102 358
2.6000E 05 1.7680E-01 2.8000E 05 1.6890E-01 2.8730E 05 1.6590E-011104 3102 359
3.0000E 05 1.6080E-01 3.2000E 05 1.5310E-01 3.3140E 05 1.4860E-011104 3102 360
3.4000E 05 1.4530E-01 3.6000E 05 1.3670E-01 3.8000E 05 1.2860E-011104 3102 361
3.8970E 05 1.2440E-01 3.9370E 05 1.2320E-01 4.0000E 05 1.2090E-011104 3102 362
4.2000E 05 1.1300E-01 4.3380E 05 1.0780E-01 4.3690E 05 1.0760E-011104 3102 363
4.4000E 05 1.0510E-01 4.6000E 05 9.7750E-02 4.6300E 05 9.6700E-021104 3102 364
4.7200E 05 9.3600E-02 4.8000E 05 9.0800E-02 4.8200E 05 9.0100E-021104 3102 365
4.8800E 05 8.8200E-02 5.0000E 05 8.4180E-02 5.0700E 05 8.1900E-021104 3102 366
5.1420E 05 7.9700E-02 5.2000E 05 7.7870E-02 5.4000E 05 7.1940E-021104 3102 367
5.5840E 05 6.7000E-02 5.6000E 05 6.6410E-02 5.8000E 05 6.1400E-021104 3102 368
6.0000E 05 5.6680E-02 6.2000E 05 5.2380E-02 6.4000E 05 4.8470E-021104 3102 369
6.6000E 05 4.8950E-02 6.8000E 05 4.1940E-02 7.0000E 05 3.9540E-021104 3102 370
7.2000E 05 3.7530E-02 7.3810E 05 3.5900E-02 7.4000E 05 3.5890E-021104 3102 371
7.6300E 05 3.4760E-02 7.8000E 05 3.4050E-02 8.0400E 05 3.3760E-021104 3102 372
8.2000E 05 3.2850E-02 8.4000E 05 3.1960E-02 8.5300E 05 3.1570E-021104 3102 373
8.6000E 05 3.1090E-02 8.8000E 05 3.0250E-02 9.0000E 05 2.9420E-021104 3102 374
9.2000E 05 2.8610E-02 9.4000E 05 2.7820E-02 9.6000E 05 2.7040E-021104 3102 375
9.8000E 05 2.6280E-02 1.0000E 06 2.5540E-02 1.1000E 06 2.2030E-021104 3102 376
1.2000E 06 1.9200E-02 1.3000E 06 1.7000E-02 1.4000E 06 1.5200E-021104 3102 377
1.5000E 06 1.3800E-02 1.6000E 06 1.2400E-02 1.7000E 06 1.1400E-021104 3102 378
1.8000E 06 1.0400E-02 1.9000E 06 9.6000E-03 2.0000E 06 8.9000E-031104 3102 379
2.1000E 06 8.2000E-03 2.2000E 06 7.7000E-03 2.3000E 06 7.1000E-031104 3102 380
2.4000E 06 6.7000E-03 2.5000E 06 6.4000E-03 2.6000E 06 6.0000E-031104 3102 381
2.7000E 06 5.6700E-03 2.8000E 06 5.3600E-03 2.9000E 06 5.0700E-031104 3102 382
3.0000E 06 4.8300E-03 3.1000E 06 4.5700E-03 3.2000E 06 4.3700E-031104 3102 383
3.3000E 06 4.1700E-03 3.4000E 06 4.0000E-03 3.5000E 06 3.8200E-031104 3102 384
3.6000E 06 3.6700E-03 3.7000E 06 3.5200E-03 3.8000E 06 3.3800E-031104 3102 385
3.9000E 06 3.2300E-03 4.0000E 06 3.1200E-03 4.1000E 06 3.0200E-031104 3102 386
4.2000E 06 2.9100E-03 4.3000E 06 2.7800E-03 4.4000E 06 2.6900E-031104 3102 387
4.5000E 06 2.4200E-03 4.6000E 06 2.3300E-03 4.7000E 06 2.4400E-031104 3102 388
4.8000E 06 2.3700E-03 4.9000E 06 2.2800E-03 5.0000E 06 2.2300E-031104 3102 389
5.1000E 06 2.1600E-03 5.2000E 06 2.1000E-03 5.3000E 06 2.0400E-031104 3102 390
5.4000E 06 1.9800E-03 5.5000E 06 1.9200E-03 5.6000E 06 1.8700E-031104 3102 391
5.7000E 06 1.8300E-03 5.8000E 06 1.7800E-03 5.9000E 06 1.7300E-031104 3102 392
6.0000E 06 1.6900E-03 6.1000E 06 1.6500E-03 6.2000E 06 1.6100E-031104 3102 393
6.3000E 06 1.5700E-03 6.4000E 06 1.5300E-03 6.5000E 06 1.5000E-031104 3102 394
6.6000E 06 1.4700E-03 6.7000E 06 1.4300E-03 6.8000E 06 1.4000E-031104 3102 395
6.9000E 06 1.3700E-03 7.0000E 06 1.3400E-03 7.1000E 06 1.3100E-031104 3102 396
7.2000E 06 1.2800E-03 7.3000E 06 1.2600E-03 7.4000E 06 1.2400E-031104 3102 397
7.5000E 06 1.2200E-03 7.6000E 06 1.1900E-03 7.7000E 06 1.1600E-031104 3102 398
7.8000E 06 1.1400E-03 7.9000E 06 1.1200E-03 8.0000E 06 1.1000E-031104 3102 399
8.2000E 06 1.0600E-03 8.4000E 06 1.0200E-03 8.6000E 06 1.0000E-031104 3102 400
8.8000E 06 9.7000E-04 9.0000E 06 9.4000E-04 9.2000E 06 9.1000E-041104 3102 401
9.4000E 06 8.8000E-04 9.6000E 06 8.5000E-04 9.8000E 06 8.2000E-041104 3102 402
1.0000E 07 8.0000E-04 1.0500E 07 7.4000E-04 1.1000E 07 6.9000E-041104 3102 403
1.1500E 07 6.4000E-04 1.2000E 07 6.0000E-04 1.2500E 07 5.7000E-041104 3102 404
1.2580E 07 5.6000E-04 1.3000E 07 5.4000E-04 1.3500E 07 5.2000E-041104 3102 405
1.4000E 07 4.8000E-04 1.4500E 07 4.6000E-04 1.5000E 07 4.4000E-041104 3102 406
0.0 0.0 0 0 0 0 01104 3 0 407
1104 0 0 408
0 0 0 409
-1 0 0 410

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 68

SET 2, NO. 5, TEST NDFBCH (CHANGING INDIVIDUAL ENDF/B DATA CARDS)

TIME: 2.65/ 45.26 (SEC.)

PU-239

1104 1451 1

ENDF/B MAT. NO. 1104

*** UNRESOLVED RESONANCE CROSS SECTIONS ***

LOWER UNRESOLVED RANGE ENERGY LIMIT IN EV.: 3.0000E 02

UPPER UNRESOLVED RANGE ENERGY LIMIT IN EV.: 2.5000E 04

ENERGY	TOTAL		RESONANCE CONTRIBUTION		SMOOTH CONTRIBUTION	
	CAPTURE	FISSION	CAPTURE	FISSION	CAPTURE	FISSION
3.0000E 02	1.3744E 01	1.1238E 01	1.3744E 01	1.1238E 01	0.0	0.0
3.9553E 02	5.4630E 00	1.0925E 01	5.4630E 00	1.0925E 01	0.0	0.0
5.2147E 02	8.6751E 00	1.7011E 01	8.6751E 00	1.7011E 01	0.0	0.0
6.8751E 02	6.0206E 00	4.5252E 00	6.0206E 00	4.5252E 00	0.0	0.0
9.0642E 02	5.3521E 00	7.2835E 00	5.3521E 00	7.2835E 00	0.0	0.0
1.1950E 03	3.9677E 00	5.0256E 00	3.9677E 00	5.0256E 00	0.0	0.0
1.5755E 03	4.1462E 00	3.5734E 00	4.1462E 00	3.5734E 00	0.0	0.0
2.0772E 03	4.0649E 00	2.5027E 00	4.0649E 00	2.5027E 00	0.0	0.0
2.7386E 03	1.0806E 00	4.1215E 00	1.0806E 00	4.1215E 00	0.0	0.0
3.6106E 03	2.4018E 00	2.6778E 00	2.4018E 00	2.6778E 00	0.0	0.0
4.7603E 03	2.0310E 00	2.3522E 00	2.0310E 00	2.3522E 00	0.0	0.0
6.2760E 03	1.7231E 00	2.0821E 00	1.7231E 00	2.0821E 00	0.0	0.0
8.2743E 03	1.2332E 00	2.2971E 00	1.2332E 00	2.2971E 00	0.0	0.0
1.0909E 04	1.0208E 00	1.9037E 00	1.0208E 00	1.9037E 00	0.0	0.0
1.4382E 04	8.0977E-01	1.8571E 00	8.0977E-01	1.8571E 00	0.0	0.0
1.8962E 04	6.6546E-01	1.8093E 00	6.6546E-01	1.8093E 00	0.0	0.0
2.5000E 04	5.7523E-01	1.7738E 00	5.7523E-01	1.7738E 00	0.0	0.0

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 69

SET 2, NO. 5, TEST NDFBCH (CHANGING INDIVIDUAL ENDF/B DATA CARDS)

TIME: 0.63/ 45.89 (SEC.)

PU-239

1104 1451 1

ENDF/B MAT. NO. 1104

ENERGY	S-WAVE RESONANCE CONTRIBUTION		P-WAVE RESONANCE CONTRIBUTION	
	CAPTURE	FISSION	CAPTURE	FISSION
3.0000E 02	1.3726E 01	1.1147E 01	1.7616E-02	9.1106E-02
3.9553E 02	5.4428E 00	1.0821E 01	2.0212E-02	1.0457E-01
5.2147E 02	8.6519E 00	1.6891E 01	2.3183E-02	1.2002E-01
6.8751E 02	5.9940E 00	4.3875E 00	2.6579E-02	1.3772E-01
9.0642E 02	5.3216E 00	7.1255E 00	3.0452E-02	1.5801E-01
1.1950E 03	3.9329E 00	4.8444E 00	3.4857E-02	1.8123E-01
1.5755E 03	4.1063E 00	3.3656E 00	3.9844E-02	2.0778E-01
2.0772E 03	4.0194E 00	2.2646E 00	4.5454E-02	2.3811E-01
2.7386E 03	1.0289E 00	3.6488E 00	5.1709E-02	2.7268E-01
3.6106E 03	2.3433E 00	2.3658E 00	5.8591E-02	3.1198E-01
4.7603E 03	1.9650E 00	1.9957E 00	6.4031E-02	3.5650E-01
6.2760E 03	1.6492E 00	1.6754E 00	7.3879E-02	4.0670E-01
8.2743E 03	1.1513E 00	1.8342E 00	8.1897E-02	4.6292E-01
1.0909E 04	9.3101E-01	1.3784E 00	8.9769E-02	5.2530E-01
1.4382E 04	7.1264E-01	1.2635E 00	9.7133E-02	5.9365E-01
1.8962E 04	5.6191E-01	1.1421E 00	1.0363E-01	6.6725E-01
2.5000E 04	4.6627E-01	1.0292E 00	1.0895E-01	7.4467E-01

(C-SURE/ 3, 11-10-71, G. L. SINGER) PRODUCES POINTWISE UNRESOLVED CROSS SECTIONS

DATE OF RUN 02/10/72 PAGE 70

SET 2, NO. 5, TEST NDFBCH (CHANGING INDIVIDUAL ENDF/B DATA CARDS)

TIME: 0.05/ 45.94 (SEC.)

PU-239

1104 1451 1

ENDF/B MAT. NO. 1104

ENERGY	TOTAL	SMOOTH	RESONANCE	S-WAVE	P-WAVE
	SCATTER	CONTRIBUTION	CONTRIBUTION	CONTRIBUTION	CONTRIBUTION
3.0000E 02	1.6183E 01	0.0	1.6183E 01	1.6183E 01	2.3375E-05
3.9553E 02	1.2201E 01	0.0	1.2201E 01	1.2201E 01	4.0582E-05
5.2147E 02	1.7043E 01	0.0	1.7043E 01	1.7043E 01	7.0419E-05
6.8751E 02	1.2708E 01	0.0	1.2708E 01	1.2708E 01	1.2211E-04
9.0642E 02	1.3769E 01	0.0	1.3769E 01	1.3769E 01	2.1151E-04
1.1950E 03	1.2637E 01	0.0	1.2637E 01	1.2637E 01	3.6586E-04
1.5755E 03	1.3179E 01	0.0	1.3179E 01	1.3179E 01	6.3139E-04
2.0772E 03	1.3589E 01	0.0	1.3589E 01	1.3589E 01	1.0863E-03
2.7386E 03	1.3542E 01	0.0	1.3542E 01	1.3542E 01	1.8610E-03
3.6106E 03	1.2720E 01	0.0	1.2720E 01	1.2720E 01	3.1690E-03
4.7603E 03	1.2564E 01	0.0	1.2564E 01	1.2564E 01	5.3524E-03
6.2760E 03	1.2409E 01	0.0	1.2409E 01	1.2409E 01	8.9424E-03
8.2743E 03	1.1877E 01	0.0	1.1877E 01	1.1862E 01	1.4739E-02
1.0909E 04	1.1521E 01	0.0	1.1521E 01	1.1497E 01	2.3907E-02
1.4382E 04	1.1224E 01	0.0	1.1224E 01	1.1186E 01	3.8100E-02
1.8962E 04	1.1000E 01	0.0	1.1000E 01	1.0940E 01	5.9640E-02
2.5000E 04	1.0863E 01	0.0	1.0863E 01	1.0772E 01	9.1796E-02

END OF DATA, END OF PROBLEM