MASTER

ENDF/B PROCESSING CODES FOR THE RESONANCE REGION

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Availability of Computer Programs

The computer programs described in this report have been sent to the Argonne Code Center for distribution. For further information write or call

Argonne Code Center, Building 203 Room C-230
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439

Phone: Area 312 739-7711 Extension 4366

Introduction

In this report we describe some six programs written for calculating point-wise cross-sections in the resolved and unresolved resonance region. These programs have been written specifically to read in the resonance parameters in the ENDF/B files. However, the smooth cross-sections from File 3 have to be added to the output of these programs to obtain the final cross-section.

Out of the six codes described in this report, the first four calculate the cross-sections in the resolved resonance region and the last two in the unresolved resonance region. The first program SIGPLOT calculates cross-sections for scattering, capture and fission using the single level Breit-Wigner parameters of ENDF/B Version I data. It also calculates multilevel scattering cross-sections. The cross-sections may be Doppler broadened if necessary. The second program SIGMA2 is essentially a modified version of SIGPLOT written for ENDF/B Version II data. The third program RAMP1 calculates scattering, capture and fission cross-sections using the Reich-Moore approximation, with or without Doppler broadening. The next program ADLER calculates cross-sections from the Adler-Adler parameters. Doppler broadening is done using the ψ and χ functions. AVERAGE3 and AVERAGE4 calculate cross-sections in the unresolved region using energy independent parameters and energy dependent parameters of ENDF/B Version II respectively. Width-fluctuation corrections are applied by numerical integration. Also, there is no provision made for allowing any inelastic effects in AVERAGE3 whereas they are taken into account in the latter program. After describing the programs, we have given the program listings with sample input data and

results of the test problems.

The main purpose of writing these codes has been to have a set of codes which (i) would serve as a standard reference set against which the results of other codes could be compared and (ii) could be used in neutron cross-sections evaluation and (iii) from which automated plots of cross-sections could be obtained for author proofs. As such, every effort has been made to obtain accurate results from the codes avoiding the usual computer time-saving approximations such as taking only a small number of resonances in a particular energy region. Also, these codes have been checked against existing codes to trace down any errors of programming. However, the author would appreciate it if the users could communicate any errors they might find in using these codes.

My grateful thanks are due to D. E. Cullen for writing the subroutines used in calculating the Doppler broadened cross sections by the trapezoidal rule. I have also benefited from useful discussions with M. S. Moore.

Copies of these programs have been sent to the Argonne Code Center. (See Availability of Computer Codes)

Any further details regarding these programs may be obtained from the author at the National Neutron Cross Section Center.

Description of the Program

PROGRAM SIGPLOT

This is a program to calculate scattering, capture, fission, and total cross sections from resonance parameters of Version I data from File 2 of ENDF/B. Provision is also made to allow for level-level interference effects in the scattering cross section. The formulae used are essentially the same as given in the report of Gregson, et al.,⁽¹⁾ but are modified to include fission. Modified versions of the three subroutines, ORDER, FACTS, and SIGMA, described in this report are used in the current program. Further details of these formulae are given in the Data Formats and Procedures Manual⁽²⁾.

Formulae:

1. Elastic Scattering

$$\begin{aligned}
 \sigma_{el}^A(m) = & (2l+1) \frac{4\pi}{k^2} \sin^2 \phi_2 \\
 & + \frac{\pi}{k^2} \sum_J g_J \sum_{r=1}^{N_{res}(l,J)} \frac{\Gamma_r^2 \cos 2\phi - 2\Gamma_r (\Gamma_r + \Gamma_f) \sin^2 \phi_2}{(E - E_r')^2 + \left(\frac{\Gamma_r}{2}\right)^2} \\
 & + \frac{2(E - E_r') \Gamma_r \sin 2\phi_2}{(E - E_r')^2 + \left(\frac{\Gamma_r}{2}\right)^2}
 \end{aligned} \tag{1}$$

2. Capture

$$\sigma_{\text{cap}}^{\text{el}}(m) = \frac{\pi}{k_n^2} \sum_J g_J \sum_{r=1}^{N_{\text{res}}(J,J)} \frac{\Gamma_{ar} \Gamma_{fr}}{(E-E_r')^2 + \left(\frac{\Gamma_r}{2}\right)^2} \quad (2)$$

3. Fission

$$\sigma_{\text{f}}^{\text{el}}(m) = \frac{\pi}{k_n^2} \sum_J g_J \sum_{r=1}^{N_{\text{res}}(J,J)} \frac{\Gamma_{ar} \Gamma_{fr}}{(E-E_r')^2 + \left(\frac{\Gamma_r}{2}\right)^2} \quad (3)$$

4. Elastic Scattering with Level-Level Interference

In addition to the expression given in Eq. (1), we have the following level-level interference term:

$$\frac{\pi}{k_n^2} \sum_J g_J \sum_{r=2}^{N_{\text{res}}(J,J)} \sum_{s=1}^{r-1} \frac{2\Gamma_{ar} \Gamma_{as} \left[(E-E_r') (E-E_s') + \frac{\Gamma_r \Gamma_s}{4} \right]}{\left[(E-E_r')^2 + \left(\frac{\Gamma_r}{2}\right)^2 \right] \left[(E-E_s')^2 + \left(\frac{\Gamma_s}{2}\right)^2 \right]} \quad (4)$$

where m is the m^{th} isotope,

$N_{res}(l, J)$ are the number of resonances for a given l and J ,

$$\Gamma_{nr}(E) = \frac{P_l(E) \Gamma_{nr}(|E_r|)}{P_l(|E_r|)},$$

$$\Gamma_r = \Gamma_{nr}(E) + \Gamma_{vr} + \Gamma_{fr},$$

$$E_r' = E_r + \left[\frac{S_l(|E_r|) - S_l(E)}{2P_l(|E_r|)} \right] \Gamma_{nr}(|E_r|) \quad (E \text{ in eV}),$$

$$k_n = 2.196771 \times 10^{-24} \left(\frac{AWR}{AWR + 1.0} \right) \sqrt{E(\text{eV})}^{-1/2} \quad (\text{barns}),$$

AWR = mass of the element in units of the neutron mass,

E = neutron energy in eV in the Laboratory System,

S_l = shift factor,

P_l = penetration factor,

ϕ_l = phase shift,

ρ = ka ,

a = channel radius.

Storage Capacity of the Program

1. Maximum number of isotopes: 10.
2. Maximum number of l values per isotope per energy range: 5.
3. Maximum number of resonances over all isotope energy ranges and l values: 500.
4. Total memory for the program: 37K octal.

5. Time: approximately 14 secs C.P. time/ 25 res/ isotope on the CDC-6600.
6. This program assumes that the resolved resonance parameters are given for one energy range which is the same for all isotopes.

Procedure:

1. After all the data for one element are read in, the resonance energies over all isotopes are arranged in increasing order.
2. For each pair of levels which lie within the limits of the energy range in the input data, a variable number ($8 = 4 \text{ MM}$ as it stands now) of energy points which lie between these two levels are generated, and the scattering, capture, fission, and total cross section are calculated and printed out for all the resonances of a given isotope as well as for all the isotopes of a given element. A finer mesh may be obtained by setting MM (card SIGP246) to a higher value.
3. To avoid having huge core storage, the cross sections are not stored in memory but are printed out as they are generated.
4. The resonances in each isotope are arranged in increasing order of l and for a given increasing order of J before the cross sections are calculated.
5. For a given isotope, the measured resonance spins are, for example, 3 and 4. In File 2 the spins of some low energy resonances where they have been experimentally measured will have one of these two values. For the rest of the resonances where this data is lacking, the

spins would be given as 3.5. In such a case, in calculating the cross section with level-level interference, we let spin-3 resonances interfere with one another. Similarly, spin-4 resonances that interfere with each other are treated as a group. The rest of the resonances (spin 3.5) do not interfere among themselves unless this is indicated on the title card in Col. 65 (see p. 8).

6. To Doppler-broaden cross sections, we write the Doppler-broadened cross section as

$$\sigma_{\Delta}(E') = \frac{1}{\Delta\sqrt{\pi}} \int_0^{\infty} \sigma(E'') e^{-[(E'-E'')/\Delta]^2} dE'' \quad (5)$$

where

$$\Delta \text{ (eV)} = 0.3177 \left(\frac{T_{eff}}{293.0} \right)^{1/2} \left(\frac{E' \text{ (eV)}}{AMR} \right)^{1/2}$$

T_{eff} = effective temperature in degrees Kelvin.

AMR = nuclear mass

The above expression is obtained as a good approximation for the more accurate expression for Doppler-broadened cross section (see Solbrig⁽³⁾) when $E/\Delta \gg 1$. It is known that this approximation is good except at very low energies where the more accurate expression has to be used. Therefore, in this program Doppler-broadening of the cross section is by-passed for neutron energies less than 0.025 eV. The above expression

can be written as

$$\sigma_{\Delta}(E') = \frac{1}{\sqrt{\pi}} \int_{-E'/\Delta}^{\infty} \sigma(E' + x \cdot \Delta) e^{-x^2} dx, \quad (6)$$

where since E'/Δ is large, the integral is written as

$$\sigma_{\Delta}(E') = \frac{1}{\sqrt{\pi}} \int_{-\infty}^{+\infty} \sigma(E' + x \cdot \Delta) e^{-x^2} dx. \quad (7)$$

A. Gauss-Hermite Quadrature

This integral can be evaluated using a 9-point Gauss-Hermite quadrature formula, provided the structure in the cross section is not small compared with the Doppler width Δ . Comparison of a test case which is Doppler broadened using ϕ and χ functions, the trapezoidal rule, and Gauss-Hermite quadrature formula gives accurate results, provided the width of the resonances $\Gamma \geq 5\Delta$. If this condition is not satisfied, we have recourse to using the trapezoidal rule for evaluating the integral as described below. In most of the cases we use the quadrature formula for calculating the integral, as it has been found that the trapezoidal rule method requires a large amount of computer time. However, the trapezoidal method should be used if the resonances are very narrow and/or are very closely spaced. This may be done by setting all $FLAG(I) = 1$ in the subroutine `SIEVE`.

B. Trapezoidal Method

The above integrals can also be evaluated numerically by using the

trapezoidal rule. To start with, a certain number of pivot points (NTAB which is an odd integer) equal to, say, 11 are specified at each energy E' where we wish to evaluate the Doppler-broadened cross section. Pivot points are then specified at eleven energy values given by $E'' = E'$ and $E'' = E' \pm \Delta \dots E' \pm 5\Delta$. The cross section to be Doppler-broadened is explicitly evaluated at each pivot point at every iteration. The integral will give negligible contribution beyond this energy interval due to the $e^{-(E'-E'')^2/\Delta^2}$ factor. If, however, E' is very small so that the energy at one of the above pivot points is less than or equal to zero, we set $E'' = 10^{-3}$ eV as the lowest energy and set the energy of the pivot points at $E'' = 10^{-3} + \Delta \dots, 10^{-3} + 10\Delta$. In addition, we have to specify an ERRERR (say of the order of 10^{-4}). The above integral is then evaluated at these points, and if the relative value in each subinterval is less than $\text{ERRERR}/(\text{NTAB}-1)$, the program assumes that the integral has converged in that interval; if not, at every iteration the number of steps is doubled until the integral converges. This method has been checked against results obtained by using ϕ and χ functions in test cases and found to converge rapidly.

Use of these two numerical methods to evaluate the Doppler-broadened cross sections enables us to treat resonances due to higher l -values where expressions for the Doppler-broadened cross sections in terms of the ϕ and χ functions become very involved.

Input Data

The first card of the input is a TITLE card with the format (7A4, 2X, I5, F5.1, 2I5, E10.4, I5). One can punch an appropriate title in Cols. 1-28. If Doppler-broadened cross sections are desired, punch 1 in Col. 35, or else punch 0. In Cols. 36-40 give the effective temperature T_{eff} in degrees Kelvin, and in Cols. 41-45 punch NTAB, which is equal to the odd number of pivot points for the integration for Doppler-broadening; NTAB > 13 seems highly unlikely. In Cols. 46-50 punch an integer between 1 and 6 which specifies the particular cross section to be Doppler-broadened. The following list indicates these:

- 1 - scattering cross section with no level-level interference
- 2 - capture cross section with no level-level interference
- 3 - fission cross section with no level-level interference
- 4 - sum of the above three
- 5 - scattering cross section with level-level interference
- 6 - sum of 5, 2, and 3.

In Cols. 51-60 punch ERROR, which has been described above. If level-level interference in the scattering cross sections among those resonances which are assigned an average spin is desired, punch 1 in Col. 65, or else punch 0. The rest of the data cards are from BMDP/B File 2 beginning with the HEAD Card and these give the resonance parameters. These are described in the Data Formats and Procedures Manual⁽²⁾

REACTOR CODE ABSTRACT

1. Name of Code: SIGPLST.
2. Computer for which Code is designed: CDC-6600.
3. Nature of problem solved: This code calculates the scattering, capture, fission, and total cross sections from resolved resonance parameter data. Scattering cross sections may be calculated with or without level-level interference. Provision is also made to numerically Doppler-broaden any of the cross sections.
4. Method of solution: Multi-level Breit-Wigner formula. Details of formulae to be found in Oregon, et al.⁽¹⁾
5. Restrictions on the complexity of the problem: This program can handle resonance data up to a maximum of 10 different isotopes with a total number of 500 resonances and an l value not exceeding 5. It further assumes that the resolved resonance parameters are given for one energy range which is the same for all the isotopes of an element. The mesh points at which the cross sections are calculated can be varied. Since the calculated data are not stored, an increase in the number of mesh points does not conflict with any storage requirements.
6. Typical running time: Calculations of the cross sections of mono-isotopic manganese from its resonance data with 27 resonances, with 20 mesh points between the positive energy resonance, takes 14 secs of central processor time on the CDC-6600.
7. Unusual features of the program:
 - a) In calculating scattering cross sections with level-level interference, resonances are grouped according to their spins for the same l value. Thus for s-wave resonances, for example, the spins are 3 and 4. It is possible that there are a number of resonances whose spins have not been measured, and these are

given an average spin of 3.5. The program normally calculates scattering cross sections with level-level interference among the spin-3 group and the spin-4 group. Contributions of the spin-3.5 resonances are calculated as a sum of single-level Breit-Wigner terms. If, however, it is desired to include the level-level interference terms among these resonances, this may be indicated on the control card.

b) The method of numerical integration used to Doppler-broaden cross sections is very general and is designed to take care of situations where the fine structure of the cross section is rapidly varying.

8. Related auxiliary programs: This program has been patterned after the MLBW program ⁽¹⁾ with certain corrections and changes in the sub-routines ORDER, FACTS, and SIGMA.
9. References: K. Oregson, M. F. James, and D. S. Norton, "MLBW - A Multi-level Breit-Wigner Computer Program," U.K. Atomic Energy Establishment Report AEW-MS17 (1965).
10. Machine requirements: This needs a 37k octal memory.
11. Programming language: FORTRAN IV.
12. Operating system or monitor: Brookhaven National Laboratory version of CDC Scope 2.0 operating system.
13. Other programming or operating information: None.
14. Name and establishment: M. R. Bhat and D. Cullen, National Neutron Cross Section Center, Brookhaven National Laboratory, Upton, N.Y.
15. Material available: Fortran deck with sample output.
16. Category:

PROGRAM SIGMA2

This program is a modified version of SIGPLOT described in the preceding pages. The modifications enable it to handle ENDF/B Version II data. These modifications are described in the Data Formats and Procedures Manual⁽²⁾ in great detail and are briefly the following:

(1) provision is made to give the individual isotopic masses AWRI

(2) channel radius "a" (in units of 10^{-12} cm) and defined by

$$a = \left[1.23(AWRI * 1.008665)^{1/3} + 0.8 \right] \times 10^{-1}$$

is used to calculate the penetrabilities $P_l(ka)$ and the shift factors $S_l(ka)$ whereas the effective scattering radius $\hat{a}$ is used to calculate $\phi_l(k\hat{a})$, the phase shift.

For details regarding the input data, Doppler broadening and other details of the program please see the write-up on SIGPLOT (p. 12) as they are common to the two programs.

PROGRAM RAMPl

Program RAMPl (Reich And Moore Program Version 1) calculates scattering, capture, fission and total cross sections in the resolved resonance region using the Reich-Moore formalism⁽⁴⁾. The resonance parameters are assumed to be in the ENDF/B Version-II data format⁽²⁾. The cross sections may also be Doppler broadened if so desired.

Formulae:

The cross section for a neutron reaction with the exit channel c is:

$$\sigma_{nc} = \pi \lambda_n^2 \sum_J g_J \left| \delta_{nc} - U_{nc}^J \right|^2 \quad (1)$$

where λ_n is the reduced neutron wave length; g_J is the statistical weight factor for resonances of spin J and U_{nc}^J is the collision matrix.

In the Reich-Moore approximation, the collision matrix is expressed in terms of a matrix $(I-K)$, with dimensions $(m+1) \times (m+1)$ where m is the number of fission channels used in the cross section analysis; ($m=2$ in the ENDF/B format) and it is assumed that there is only one neutron spin (though there may be two channel spins for p-wave neutrons). Thus we define,

$$(I-K)_{cc'} = \delta_{cc'} - \frac{1}{2} \sum_{\lambda} \frac{\Gamma_{\lambda c}^{1/2} \Gamma_{\lambda c'}^{1/2}}{E_{\lambda} - E - \frac{i}{2} \Gamma_{\lambda \gamma}} \quad (2)$$

where E_{λ} is the resonance energy and $\Gamma_{\lambda \gamma}$ the corresponding capture width of the λ -th resonance, and $\Gamma_{\lambda c}$ and $\Gamma_{\lambda c'}$ are the partial widths corresponding to the channels c and c' . Here it is also further assumed that the shift factor Δ_{λ} is zero. The collision matrix U_{nc}^J can be expressed in terms

of the matrix defined in equation (2) as

$$U_{nc}^J = e^{-i(\phi_n + \phi_c)} [2(I-K)_{nc}^{-1} - \delta_{nc}] \quad (3)$$

where ϕ_n and ϕ_c are the hard-sphere phase-shifts. The different cross sections can now be written as

$$\begin{aligned} \sigma_{\text{Total}} &= \sum_J \sigma_{nT}^J = 2\pi \chi_n^2 \sum_J g_J \text{Re}(1 - U_{nn}^J) \\ &= 2\pi \chi_n^2 \sum_J g_J \left[(1 - \cos 2\phi_n^J) + 2\text{Re}(e^{-2i\phi_n^J} \rho_{nn}^J) \right] \end{aligned} \quad (4)$$

$$\begin{aligned} \sigma_{\text{Fission}} &= \sum_J \sigma_{nf}^J = \pi \chi_n^2 \sum_J g_J \left(|U_{nf_1}^J|^2 + |U_{nf_2}^J|^2 \right) \\ &= 4\pi \chi_n^2 \sum_J g_J \left(|\rho_{nf_1}^J|^2 + |\rho_{nf_2}^J|^2 \right) \end{aligned} \quad (5)$$

$$\begin{aligned} \sigma_{\text{Scattering}} &= \sum_J \sigma_{nn}^J = \pi \chi_n^2 \sum_J g_J |1 - U_{nn}^J|^2 \\ &= \pi \chi_n^2 \sum_J g_J \left[2(1 - \cos 2\phi_n^J) + 4\text{Re}(e^{-2i\phi_n^J} \rho_{nn}^J) \right. \\ &\quad \left. - 4\text{Re}(\rho_{nn}^J) + 4|\rho_{nn}^J|^2 \right] \end{aligned} \quad (6)$$

$$\sigma_{\text{capture}} = 4\pi \chi_n^2 \sum_J g_J \sum_{a,b} (I-K)_{na}^{-1} (I-K)_{nb}^{-1*} \text{Re}[(I-K)_{ab} - \delta_{ab}] \quad (7)$$

where $a, b = 1, 2, 3$, and 1 = neutron channel and 2, 3 are fission channels.

The total, fission and capture cross-sections are obtained by direct calculation and the scattering cross-section is obtained by subtraction from these.

In the above expressions the matrix ρ_{nc} is defined as

$$\rho_{nc} = \delta_{nc} - (I - K)_{nc}^{-1}.$$

In addition we define the following:

$$\Gamma_{\lambda n}(E) = \frac{P_l(E) \Gamma_{\lambda n}(|E|)}{P_l(|E|)}$$

$$k_n = \frac{1}{\lambda_n} = 2.196771 \times 10^{-3} \left(\frac{AMRI}{AMRI+1.0} \right) \sqrt{E(\text{eV})}$$

where AMRI is the isotopic mass of the I-th isotope in units of the neutron mass.

E = the neutron energy in eV in the laboratory system.

P_l = penetration factor for angular momentum l .

ϕ_l = phase shift factor " " " " " "

where,

$$\phi_0 = k\hat{a}$$

$$\phi_1 = k\hat{a} - \tan^{-1}(k\hat{a})$$

$$\phi_2 = k\hat{a} - \tan^{-1} \left(\frac{3k\hat{a}}{3 - k^2 \hat{a}^2} \right) \quad \text{etc.}$$

$\hat{a}$ = effective scattering radius.

We use a channel radius $a = (1.23(AMRI + 1.008665)^{1/3} + 0.8) \times 10^{-12}$ in units of 10^{-12} cm to calculate the penetration factor and the effective scattering radius " $\hat{a}$ " as determined from a fit of experimental data to calculate the scattering cross section.

Storage Capacity of the Program

1. Maximum number of isotopes: 10.
2. Maximum number of l values per isotope per energy range: 5.
3. Maximum number of resonances over all isotope energy ranges and l values: 500.
4. Total memory for the program: 40 K octal.
5. Time: approximately 11 secs/100 energy points for a nucleus with 4 isotopes and 294 s- and p-wave resonances.
6. This program assumes that the resolved resonance parameters are given for one energy range which is the same for all isotopes.

Procedure:

1. After all the data for one element are read in, the resonance energies over all isotopes are arranged in increasing order.
2. For each pair of levels which lie within the limits of the energy range in the input data, a variable number of energy points ($4 \text{ MM} = 8$ as it stands now) which lie between these two levels are generated, and the scattering, capture, fission, and total cross section are calculated and printed out for all the resonances of a given isotope as well as for all the isotopes of a given element. One can get a finer mesh by setting MM (card B2P1228) to a higher value.
3. To avoid having huge core storage, the cross sections are not stored in memory but are printed out as they are generated.
4. The resonances in each isotope are arranged in increasing order of l and for a given increasing order of J before the cross sections are calculated.
5. To Doppler-broaden cross sections, the same procedure using Gauss-Hermite Quadrature or the Trapezoidal Method as described in SIGPLOT (p.10) is used.

Input Data

The first card of the input is a TITLE card with the format (7A4, 2X, I5, F.1, 2I5, E10.4, I5). One can punch an appropriate title in Cols. 1-28. If Doppler-broadened cross sections are desired, punch 1 in Col. 35, or else punch 0. In Cols. 36-40 give the effective temperature T_{eff} in degrees Kelvin, and in Cols. 41-45 punch NTAB, which is equal to the odd number of pivot points for the integration for Doppler-broadening; NTAB > 13 seems highly unlikely. In Cols. 46-50 punch an integer between 1 and 4 which specifies the particular cross section to be Doppler-broadened. The following list indicates these:

- 1 - scattering cross section
- 2 - capture cross section
- 3 - fission cross section
- 4 - total cross section.

In Cols. 51-60 punch ERROR, which has been described above. The rest of the data cards are from ENDF/B File 2 beginning with the HEAD Card and these give the resonance parameters⁽²⁾.

REACTOR CODE ABSTRACT

1. Name of Code: RAMP1
2. Computer for which code is designed: CDC-6600
3. Nature of problem solved: This code calculates scattering, capture, fission and total cross sections from Reich-Moore resolved resonance parameters. Cross sections may be Doppler broadened if so desired.
4. Method of solution: Reich-Moore approximation. Details may be found in the reference given.
5. Restrictions on the complexity of the problem: This program can handle resonance data up to a maximum of 10 different isotopes with a total number of 500 resonances and an l value not exceeding 5. The mesh points at which the cross sections are calculated can be varied. Further, since the calculated data are not stored, an increase in the number of mesh points does not conflict with any storage requirements.
6. Typical running time: Calculations of 4 isotopes involving a total of 294 s and p-wave resonances took 11 sec. of central processor time per 100 energy points on the CDC-6600.
7. Unusual features of the program: The Doppler broadening is done using numerical methods and can handle p-wave and resonances corresponding to higher partial waves.
8. Related auxiliary programs: None
9. References: C. W. Reich and M. S. Moore, Phys. Rev. 111, 929, 1958.
10. Machine Requirements: This program needs 40K octal memory.
11. Programming language: FORTRAN IV

13. Operating System or monitor: Brookhaven National Laboratory
version of CDC Scope 3.0 operating system.
14. Name and establishment: M. R. Bhat, National Neutron Cross Section
Center, Brookhaven National Laboratory, Upton, N. Y. 11973.
15. Material available: PORTMAN deck with sample output.
16. Category:

PROGRAM ADLER

This is a program to calculate total, capture or fission cross-sections according to the Adler-Adler formalism using the corresponding parameters from File 2 of ENDF/B Version II data.

Formulae

The Adler-Adler formulae have been discussed in the reports given in the references^(5,6). The formulae are:

$$\begin{aligned} \sigma^{(x)}(E) = & \frac{2C}{E} (1 - \cos \omega) \\ & + \frac{C}{\sqrt{E}} \sum_k \frac{\mu_k (G_k^{(x)} \cos \omega + H_k^{(x)} \sin \omega) + (\mu_k - E)(H_k^{(x)} \cos \omega - G_k^{(x)} \sin \omega)}{(\mu_k - E)^2 + \nu_k^2} \\ & + \frac{C}{\sqrt{E}} (A_1^{(x)} + \frac{A_2^{(x)}}{E} + \frac{A_3^{(x)}}{E^2} + \frac{A_4^{(x)}}{E^3} + B_1^{(x)} E + B_2^{(x)} E^2) \end{aligned} \quad (1)$$

$$\text{and } B, C = \frac{C}{\sqrt{E}} (A_1^{(x)} + \frac{A_2^{(x)}}{E} + \frac{A_3^{(x)}}{E^2} + \frac{A_4^{(x)}}{E^3} + B_1^{(x)} E + B_2^{(x)} E^2);$$

$$\text{where } \frac{C}{E} = \pi \chi^2; \text{ where } \frac{1}{\chi} = k = 2.196771 \times 10^{-3} \times \left(\frac{AMRI}{AMRI + 1.6} \right) \sqrt{E(\text{eV})}$$

where k is the wave number of the incident neutron in the center-of-mass system and $AMRI$ is the isotopic mass in units of the neutron mass.

$\frac{2C}{E} (1 - \cos \omega)$ = potential scattering cross section; this term is non-zero only for scattering and total cross sections.

Procedure (con't)

(3) Cross-sections are not stored in memory so that an increase in mesh points does not conflict with any memory requirements.

(4) Only s-wave resonances are handled by the program.

(5) The Doppler broadened cross-section is written as:

$$\sigma_{\Delta}(E) = \frac{1}{\Delta\sqrt{\pi}} \int_0^{\infty} \sigma(E') e^{-\frac{(E-E')^2}{\Delta^2}} dE' \quad (2)$$

$$\text{where } \Delta(\text{eV}) = 0.3177 \left(\frac{T_{\text{eff}}}{293.0} \right)^{1/2} \left(\frac{E(\text{eV})}{AWRI} \right)^{1/2}$$

where T_{eff} = effective temperature in degrees Kelvin

$AWRI$ = mass of the isotope. This expression is quite good

except for resonances of very small energies.⁽⁷⁾ We use the real and imaginary parts of the complex probability integral which are proportional to the Ψ and Φ functions to obtain expressions for Doppler broadened cross-sections.

We define

$$U = \text{Im} \left(\frac{1}{\pi} \int_0^{\infty} \frac{e^{-t^2}}{z-t} dt \right) ; \quad V = \text{Re} \left(\frac{1}{\pi} \int_0^{\infty} \frac{e^{-t^2}}{z-t} dt \right) \quad (3)$$

where $z = \xi + i\eta$, ξ and η real. Further,

$$\Psi(s, \theta) = \sqrt{\frac{\pi}{\theta}} U(\xi, \eta) = \frac{1}{(4\pi\theta)^{1/2}} \int_{-\infty}^{\infty} \frac{e^{-(s-r)^2/4\theta}}{1+r^2} dr$$

$$\text{and } \Phi(s, \theta) = \sqrt{\frac{\pi}{\theta}} V(\xi, \eta) = \frac{1}{(4\pi\theta)^{1/2}} \int_{-\infty}^{\infty} \frac{e^{-(s-r)^2/4\theta}}{1+r^2} r dr$$

where $\eta = \frac{1}{2\theta}$ and $\xi = s\eta$. If we further set $\xi = \frac{E-E}{\Delta}$ and $\eta = \frac{1}{\Delta^2}$,

$$\omega = 2k\hat{a}$$

Where $\hat{a}$ corresponds to the effective scattering radius in units of 10^{-13} cm;

$$= 2WN \sqrt{E(\text{eV})}$$

$$\text{and } WN = 2.196771 \left(\frac{AWRI}{AWRI + 1.0} \right) \times 10^{-3} \times \hat{a},$$

$$A_1(x), A_2(x), A_3(x), A_4(x)$$

$$\text{and } B_1(x), B_2(x)$$

are background parameters which give contributions due to "tails" of resonances lying outside of the energy range under consideration. They are associated with the type of reaction "x".

$$G_k^{(x)}, H_k^{(x)}$$

Are Adler-Adler parameters, characteristic of the k-th resonance and the type of reaction indicated by "x".

Procedure

(1) After all the data for one element are read in, the resonance energies of all the isotopes are arranged in increasing order.

(2) For each pair of resonances which lie within the limits of the energy range in the input data, a variable number of energy points ($20 = 4 \text{ MM}$ as it stands now) which lie between these two resonances are generated, and the total, capture and fission cross sections are calculated and printed out. This is done for all the resonances in an element. A finer mesh may be obtained by setting MM (card ADLR278) to a higher value.

we obtain the Doppler broadened cross section as

$$\sigma_{\Delta}^{(x)}(\omega) = \frac{2C}{\Delta} (1 - \cos \omega) + \frac{C\sqrt{\pi}}{\Delta} \sum_k \frac{U_k^{(x)}}{H_k^{(x)}} (G_k^{(x)} \cos \omega + H_k^{(x)} \sin \omega) + \frac{C\sqrt{\pi}}{\Delta} \sum_k \frac{V_k^{(x)}}{H_k^{(x)}} (H_k^{(x)} \cos \omega - G_k^{(x)} \sin \omega) \quad (4)$$

The potential scattering term (non-zero only for scattering and total cross-sections) and the background terms are not Doppler broadened, as they are slowly varying and not affected by Doppler broadening. The functions $U_k^{(x)}$ and $V_k^{(x)}$ are characteristic of the k-th resonance of the type of cross-section "x", and its parameters are evaluated using a subroutine-PFCN⁽⁸⁾.

Input Data

First Data Card: Format (7A4, 2X, I5, F5.1)

Reads in TITLE(1),, TITLE(7), IDPL, TEFF

TITLE(1),, TITLE(7), = any suitable title for the program.

IDPL = 1 if Doppler broadened cross-sections are desired or else = 0

TEFF = Effective temperature of the sample in degrees kelvin.

Rest of the Data Cards: Follow the KNDP/B File 2 format for Adler-

Adler parameters. This is described in detail in Reference 2.

REACTOR CODE ABSTRACT

1. Name of Code: ADLER
2. Computer for which code is designed: CDC-6600
3. Nature of problem solved: This code calculates total, capture and fission cross-sections from the corresponding Adler-Adler parameters in the ENDF/B File 2 and also Doppler broadens cross-sections.
4. Method of solution: Adler-Adler formalism. Details of formulae are to be found in the report given in references.
5. Restrictions on the complexity of the problem: This program can handle resonance data up to a maximum of 10 isotopes with a total number of 500 resonances. It further assumes that the resolved resonance parameters are given for one energy range which is the same for all the isotopes of an element. The mesh points at which the cross-sections are calculated can be varied. Since the calculated data are not stored, an increase in the number of mesh points does not conflict with any storage requirement.
6. Typical running time: Calculations of cross-sections of one isotope with 37 resonances and 20 mesh points between resonances takes:
 - (a) without Doppler broadening, 21 secs
 - (b) with Doppler broadening, 209 secs.
7. Unusual features of the program: None
8. Related auxiliary program: None
9. References: D. B. Adler and E. T. Adler, Analysis of Neutron Resonances in Fissile Elements: Programs CODILLI, CURVEPLOT and SIGMA, Report COO-1546-3 (Sept. 1966), Dept. of Physics, University of Illinois, Urbana, Illinois.
10. Machine requirements: This needs a 37K octal memory.
11. Programming language: FORTRAN IV
12. Operating system or monitor: Brookhaven National Laboratory version of CDC Scope 3 operating system.

13. Other programming or operating information: None
14. Name and establishment: Max. Neutron Cross-Section Center, Brookhaven National Laboratory, U.S.A.
15. Material available: None
16. Category:

PROGRAM AVIACK3

This is a program to calculate scattering, capture, and fission cross sections in the unresolved resonance region from the energy independent parameters given in ENDF/B, File 2.

Method

The method follows the paper of Lane and Lynn⁽⁹⁾ and we write the average scattering, fission, and capture cross section respectively as

$$\langle \sigma_{n,n} \rangle = \frac{K}{E} \sum_J \frac{G_J}{\langle D_J \rangle} \left[\left\langle \frac{\Gamma_n \Gamma_n}{\Gamma_n + \Gamma_f + \Gamma_\gamma} \right\rangle - 2\Gamma_n \sin^2 \phi_c \right] + \sigma_p \quad (1)$$

$$\langle \sigma_{n,f} \rangle = \frac{K}{E} \sum_J \frac{G_J}{\langle D_J \rangle} \left\langle \frac{\Gamma_n \Gamma_f}{\Gamma_n + \Gamma_f + \Gamma_\gamma} \right\rangle \quad (2)$$

and

$$\langle \sigma_{n,\gamma} \rangle = \frac{K}{E} \sum_J \frac{G_J}{\langle D_J \rangle} \left\langle \frac{\Gamma_n \Gamma_\gamma}{\Gamma_n + \Gamma_f + \Gamma_\gamma} \right\rangle \quad (3)$$

where $K = (2\pi^2/k^2)E(\text{ev})$, where $k = \frac{1}{R} = 2.19677 \times 10^{-8} \left(\frac{AWRI}{AWRI+1.0} \right) \sqrt{E}$ and

$AWRI$ is the isotopic mass,

E = neutron energy in eV,

$G_J = \frac{(2J+1)}{2(2I+1)}$, where I is the target nucleus spin and J is the compound nucleus spin,

$\langle D_J \rangle$ = mean level spacing in eV for spin J resonances,

$\sigma_p = \sum_l \sigma_{pl}$ = potential scattering cross section,

$\sigma_{pl} = 4\pi(2l+1) \frac{\sin^2 \phi_l}{k^2}$ where l is the angular momentum and

$\phi_0 = k\hat{a}$ where $\hat{a}$ is the scattering radius (A)

$\phi_l = k\hat{a} - \tan^{-1}(k\hat{a})$ and etc.

and the rest of the quantities are different partial widths in eV. The quantities in equation (1) refer to one particular l -value. The brackets indicate averaging over the neutron and fission width fluctuations assumed to follow a χ^2 distribution of different degrees of freedom as given in the ENDF/B data. We would like to point here that the fluctuation correction factors $R_{n,l,j}$, $R_{\gamma,l,j}$, or $R_{f,l,j}$ are not calculated separately as the fluctuation corrections are applied by direct averaging as indicated in equations 1-3. The summation is over the different spin states. The averaging is done by the method of Grebler and Hutchins⁽¹⁰⁾ and corresponds to evaluating the double integrals on a 10x10 grid, and ν can vary from 1 to 4. The gamma width Γ_γ is assumed to follow a δ -function type of distribution corresponding to a large number degrees of freedom in the χ^2 distribution.

Incidentally, we note here that this program (1) takes into account only s- and p-wave contributions to the cross sections and (2) does not take into account inelastic scattering. This program uses the channel radius $a = (1.23 \times (AMRI \pm 1.008668))^{1/3} + 0.8) \times 10^{-13}$ in units of 10^{-13} cm to calculate nuclear penetrabilities.

This program needs 21K octal memory for execution.

The data input is explained in great detail in the FORTRAN listing of the program and follows the ENDF/B format except for the first data card which is the title card.

Title Card Format (I10,7A4,2I,2E10.4)

This reads in IRUN, RUN(1),, RUN(?), EO, EN, ESETP.

IRUN = Any run number. If this is zero the program exists, otherwise this card indicates the beginning of a new calculation and one can stack any number of these one behind another.

RUN(1),, RUN(7) = Any alphanumeric information. v

E0 = Beginning energy for calculations in eV.

EN = Ending energy for calculations in eV.

ESTEP = Step interval in eV for calculations in eV.

This information is needed only for non-fissile nuclei.

REACTOR CODE ABSTRACT

1. Name of Code: AVRA3
2. Computer for which Code is designed: CDC-6600
3. Nature of problem solved: This Code calculates average scattering, capture, and fission cross sections from s- and p-wave data of the unresolved parameters of File 2 of KND7/B.
4. Method of calculation: Theory of average cross section due to Lane and Lynn.⁽⁹⁾
5. Restrictions on the complexity of the problem: This program calculates average cross sections up to 100 energy values in the unresolved region. It does not allow for inelastic scattering and calculates only s- and p-wave contributions. Maximum $\gamma = 4$.
6. Typical running time: Test run calculating s- and p-wave contributions to average scattering, capture, and fission cross sections of Pu-239 at 16 energy points and s- and p-wave contributions to average scattering at capture cross section of U-238 at 100 energy points took 5 secs of central processor time on the CDC-6600.
7. Unusual feature of the program: This program can allow for different degrees of freedom for fission width distribution of resonances of different spins.
8. Related auxiliary programs: None.
9. References: A. M. Lane and J. R. Lynn, Proc. Phys. Soc. A70, 557 (1957).
10. Machine requirements: Needs 21K total memory.
11. Programming language: FORTRAN IV.
12. Operating system or monitor: Brookhaven National Laboratory version of CDC Scope 3.0 operating system.
13. Other programming or operating information: None.

14. Name and establishment: H. R. Shae, National Neutron Cross Section Center, Brookhaven National Laboratory, Upton, New York.
15. Material available: Fortran deck with sample output.
16. Category:

PROGRAM AVTAGE4

This is a program to calculate scattering capture, and fission cross sections in the unresolved resonance region, with the ENDF/B Version II data for the unresolved parameters of File 2 which gives the average neutron, gamma and fission widths and widths for any competing inelastic processes as a function of energy.

Method

The method follows the paper of Lane and Lynn⁽⁹⁾ and we write the average scattering, fission, and capture cross section respectively as

$$\langle \sigma_n \rangle = \frac{K}{E} \sum_J \frac{s_J}{\langle D_J \rangle} \left[\left\langle \frac{\Gamma_n \Gamma_n}{\Gamma_n + \Gamma_f + \Gamma_\gamma + \Gamma_{in}} \right\rangle - 2 \Gamma_n \sin^2 \phi_l \right] + \sigma_p \quad (1)$$

$$\langle \sigma_f \rangle = \frac{K}{E} \sum_J \frac{s_J}{\langle D_J \rangle} \left\langle \frac{\Gamma_n \Gamma_f}{\Gamma_n + \Gamma_f + \Gamma_\gamma + \Gamma_{in}} \right\rangle \quad (2)$$

and

$$\langle \sigma_\gamma \rangle = \frac{K}{E} \sum_J \frac{s_J}{\langle D_J \rangle} \left\langle \frac{\Gamma_n \Gamma_\gamma}{\Gamma_n + \Gamma_f + \Gamma_\gamma + \Gamma_{in}} \right\rangle \quad (3)$$

where $K = (2\pi^2 / h^2) E (\text{eV})$ where h is defined below,

E = neutron energy in eV,

$s_J = \frac{(2J+1)}{2(2I+1)}$ where I is the target nucleus spin and J is the compound nucleus spin,

$\langle D_J \rangle$ = mean level spacing in eV spin J resonances,

$\sigma_p = \sum \sigma_{pi}$ = potential scattering cross section.

$$\sigma_{pl} = 4\pi(2l+1) \frac{\sin^2 \phi_l}{k^2}$$

Where l is the angular momentum and

$\phi_0 = ka$ where a is the scattering radius (A)

$\phi_1 = ka - \tan^{-1}(ka)$

$\phi_l = ka - \tan^{-1} \left(\frac{3k}{1-k^2} \right)$ where

$$k = 2.196771 \times 10^{-3} \left(\frac{AMNI}{AMNI+1.0} \right) \sqrt{E(\text{eV})}$$

and $AMNI$ is the isotopic mass in units of neutron mass.

Γ_x = is a width in eV to allow for any competing inelastic processes,

and the rest of the quantities are different partial widths in eV.

$\Gamma_n = \Gamma_n^0 \sqrt{E} V_{\mu_{f,j}}$ where Γ_n^0 is the reduced neutron width

(ENDF(I)), $\mu_{f,j}$ is the number of degrees of freedom in the neutron

width distribution (ENDF), E the neutron energy and V_ℓ is the penetration factor defined as:

$$V_\ell = 1 \quad \text{for } \ell = 0$$

$$= \rho^2 / (1 + \rho^2) \quad \text{for } \ell = 1$$

$$= \rho^6 / (9 + 3\rho^2 + \rho^4) \quad \text{for } \ell = 2$$

where $\rho = ka$ where k is the wave-number of the neutron in the center-of-mass system (see above) and $a = (1.23(AMNI \times 1.008665))^{1/3} + 0.8) \times 0.1$ is the channel radius in units of 10^{-10} cm. The brackets indicate averaging over the neutron, fission, and any inelastic width fluctuations assumed to follow a χ^2 distribution of different degrees of freedom as given in the ENDF/B data. The summation is over the different spin states J . Also, allowance is made for possible different degrees of freedom of the fission width distribution corresponding to different spin states. The averaging is done by a method similar to that of Greebler and Hutchins,⁽¹⁰⁾ and corresponds to evaluating the double integrals on a 10×10 grid, and ν can vary from 1 to 4. The gamma width Γ_γ is assumed to follow a δ -function type of distribution corresponding to a large number of degrees of freedom in the γ^2 distribution.

Incidentally, we note here that this program (1) takes into account only s-, p-, and d-wave contributions to the cross sections and (2) does take into account inelastic scattering. The scattering radius A in the

unresolved resonance region of ENDF/B File 2 is used to calculate potential scattering while the nuclear radius a defined above is used to calculate nuclear penetrabilities as suggested in the new procedural modifications at the April 1970 CSERG Meeting.

This program needs 58K (octal) memory for execution.

The data input is explained in great detail in the FORTRAN listing of the program and follows the ENDF/B format except for the first data card which is the title card.

Title Card Format (IIG, VII)

Read in IRUN, RUN(1),, RUN(7)

IRUN = Any run number. If it is zero the program exits if non-zero it indicates the beginning of a new calculation. One can stack any number of these cases one behind the other.

RUN(1),, RUN(7) = Any alphanumeric in Fortran.

1. Name of Code: AVRAGE
2. Computer for which Code is designed: CDC-6600
3. Nature of problem solved: This Code calculates average scattering, capture, and fission cross sections from s-, p-, and d-wave data of the unresolved parameters of File 2 of ENDF/B. The parameter corresponds to ENDF/B Version II data with energy dependent neutron, gamma, fission, and inelastic widths.

Method of calculation: Theory of average cross section due to Lane and Lynn. (9)
4. Restrictions on the complexity of the problem: This program calculates average cross sections up to 100 energy values in the unresolved region. It allows for inelastic scattering and its width fluctuation and calculates only s-, p-, and d-wave contributions. Maximum $\nu = 4$.
5. Typical running time: Test run calculating s- and p-wave contributions to average scattering, capture, and fission cross sections of Pu-239 at 16 energy points and s- and p-wave contributions to average scattering and capture cross section of U-238 at 19 energy points took 3.5 sec of central processor time on the CDC-6600.
6. Unusual features of the program: This program can allow for different degrees of freedom for fission width distribution of resonances of different spins.
7. Related auxiliary programs: None.
8. References: A. W. Lane and J. P. Lynn, *Phys. Rev.* **170**, 557 (1957).
9. Machine requirements: Needs 50K total memory.
10. Programming language: FORTRAN IV.
11. Operating system or monitor: Brookhaven National Laboratory version of CDC Scope 3.0 operating system.
12. Other programming or operating information: None.

14. Name and establishment: M. B. Ehat, National Neutron Cross Section Center, Brookhaven National Laboratory, Upton, New York 11973.
15. Material available: FORTRAN deck with sample output.
16. Category: \

References

1. K. Gregson, M. F. James, and D. S. Norton, "MLBW - A Multi-level Breit-Wigner Computer Program," U. K. Atomic Energy Establishment Report AEW-517 (1965).
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7. G. W. Hinman, G. F. Knecht, J. D. Sampson and G. B. Woot, Nucl. Sci. Eng. 16, 202 (1963).
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9. A. M. Lane and J. E. Lynn, Proc. Phys. Soc. A 70, 557 (1957).
10. P. Groebler and E. A. Hutchins, Proc. of the Seminar on Physics of Fast and Intermediate Reactors, YAEA, Vienna 1962, Vol. 3, p. 121.

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CLASSICAL JOURNAL


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      PARATE(1)=PARATE(9),C9952017
      ARAY(2,1)=ARAY(9,1),C9952017
      ARAY(6,1)=ARAY(9,1),C9952017
0030 CONTINUE
      NCOUNT=1
      DO 1330 I=1,N
      APX=AP(I)
      WRES=WRRES(I)
      WNT=NCOUNT+WRES
      DO 1331 J=NCOUNT+1,WNT
      CALL FACTERR(ARAY(I),C9952017,CONPAR(J),CONIPAR(J),PB,CUNSY,ALO,
      &APX,1.0)
0032 CONTINUE
      NCOUNT=NCOUNT+1
0033 CONTINUE
      DO 100 I=1,N
      INAN(1,1)=ARAY(I,1)
      INAN(2,1)=ARAY(I,1)
0035 CONTINUE
      CALL SIXS(1,N,CVYL,HOV,1.0)
000000 HERE RESONANCE IN A COUNTRY HAS INCREASED IN INCREASING ORDER IN
000000 ENERGY ALONG WITH WHICH YOUVE GAINED NO CALCULATED THE ENERGY BECH
000000 AT WHICH THE CALCULATED IN AND CALCULATED.
      PRINT27
      PRINT25
      PRINT7
      U=ETHERM
      CALL SIGMA(ETHERM,1.0)
      PRINT25
      CLO=EL(12,1),C9952017
      JFLAG(1)=1
      IRANGE=1
000000 WE HAVE ARBITRARILY SET THE RESONANCE NOW MORE TO BE ALSO NO COPPER
000000 BROADEN THERMAL CALCULATED IN DATA IN TO THE PROBLEM YOU TO READ
000000 IN FROM THE DATA AND ONLY ONLY WHEN SLOPED TO SLOPED IN.
      PRINT8,ETHERM,IRANGE,1.0
      IF(I=1).EQ.1 THEN GO TO 140
      GO TO 140
0040 YEF=YEFF/293.15
      DELTA=0.3177*3.14*(YEF-CVYL)/HOV
      CONTINUE
      CALL GRID(ETHERM,DELTA,YAL,PRO,SVAS)
      CALL GREAT2(COPPER,IRANGE,YAL,CVYL,CUNSY,1.0)
      PRINT26,ETHERM,IRANGE,JFLAG(1)
      IF(I=1).EQ.1 THEN GO TO 140
0050 PRINT25
      PRINT7
      PRINT25
      DO 124 J=1,NIN
      HERJJ=HER(J)
      DO 125 KK=1,IRANGE
      IRANGE=KK
      LRJJK=LR(J,IRANGE)
      IF(LRJJK=0) THEN GO TO 130
0051 PRINT10
      GO TO 130
0052 IF(JJ.EQ.1) THEN GO TO 130
      GO TO 132
0053 ELOREF=EL(JJ,IRANGE,CALC)
      EHIREF=EH(JJ,IRANGE,CALC)
      CLO=ELOREF

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SIGP103
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 SIGP105
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      END=END
      GO TO 1240
2202 ELO=ELC(J,K)*CALC
      END=END
      IF(ELC,EO,ELORF,AND,END,ELC,ELC) GO TO 2204
      GO TO 1240
2204 HH=HARTO/COHARTO
      HH=HH
      IF(LA=0)
      HLRH=ELC(J,K)
      J4=J
      ISTARY=0
      ENO=0
2207 IF(LEND,CO,CO) GO TO 2210
      J4=J4+1
      E1=ERAN(J,J4)
      G1=ERAN(J,J4)
      E2=ERAN(J,J4)
      G2=ERAN(J,J4)
      IF(E1,LY,ELC,AND,CO,LY,ELC) GO TO 2209
      GO TO 2205
2209 IF(E1,LE,ELC,AND,CO,LY,ELC) GO TO 2209
      GO TO 2202
2210 G1=ELC
      G2=CO
      ISTARY=0
      GO TO 2204
2212 IF(E1,LY,ELC,AND,CO,LY,ELC) GO TO 2209
      GO TO 2205
2214 IF(J4,CO,1,AND,TOVARY,CO,1) GO TO 2210
      GO TO 2204
2216 G2=ELC
      G2=CO
      G1=ELC
      J4=J4+1
      ISTARY=0
      GO TO 2204
2218 G2=ELC/CO/CO/CO
      G2=ELC
      IF(LA=0)
      GO TO 2204
2220 IF(E1,LY,END,AND,CO,CO) GO TO 2205
      GO TO 2204
2222 K2=ELC
      G2=ELC
      ENO=0
      GO TO 2204
2224 IF(E1,CO,END,AND,CO,CO) GO TO 2205
      GO TO 2204
2226 IF(PLAS,ELC,ELC,ELC)
2228 IF(E1,CO,ELC) GO TO 2205
      GO TO 2204
2230 CONTINUE
      CALL STEVE(CO,CO,CO,CO,CO,CO,CO,CO)
      CALL GENS(CO,CO,CO,CO,CO)
      GO TO 220
2232 IF(LEND,CO,CO) GO TO 220
      J4=J4+1
      GO TO 220
2234 DO 200 I=1,10
      C=CH(I)

```

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[illegible]

[illegible]

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```

      SHMK3=SHMK3*2.0*SHML2/CONST2
      SHMK3=SHMK3+SHMK3
256 CONTINUE
257 CONTINUE
      SHMK23=SHMK23+SHMK2*SHMK3*2
258 CONTINUE
      SHML2=SHML2+SHMK23*2
      IF(L2-N2)109,109,109
259 BETA=0.1*ADM(1)/(CONSTE*CONST2)
      AREF(1)=AREF(1)+SHML4*BETA
      AREF(2)=AREF(2)+SHML6*BETA
      AREF(3)=AREF(3)+SHMLF*BETA
      AREF(4)=AREF(4)+BETA*(SHML6*SHMLC*CONSLF)
      AREF(5)=AREF(5)+SHML2*BETA
      AREF(6)=AREF(6)+BETA*(SHMLC*CONSLF*CONSLF)
      IF(L2-N2)109,110,110
260 STOP=0.0
      LRUJK=LMU(1,KK)
      IF(LRUJK-1)1250,1250,1250
2610 MLSKH=MLE(1,KK)
      DO 124 LL=1,MLSKH
      LURE=LANG(1,KK,LL)
      SS=FLOAT(LURE)
      CALL FACTS(0,LURE,PF,CP,PC,CONVPA,IMP,APL,0,0)
      TRM=(2.0*SS+1.0)*4.0*PI
      TRM=TRM*SIN(P3)*SIN(P3)/(CONVPA*CONVPA)
      SIG=SIG+TRM
262 CONTINUE
263 AREF(1)=AREF(1)+SIG*ADM(1)
      AREF(4)=AREF(4)+SIG*ADM(4)
      AREF(5)=AREF(5)+SIG*ADM(5)
      AREF(6)=AREF(6)+SIG*ADM(6)
264 CONTINUE
      RETURN
      END
      SUBROUTINE FACTS(0,L,PF,CP,PC,CONVPA,IMP,APL,0,0)

```

SUBROUTINE TO CALCULATE PENETRATION AND
 SHIFT FACTORS

0 IS THE ENERGY L IS THE AVERAGE NUMBER OF PENETRATION FACTOR
 OF THE SHIFT FACTOR AND CP IS THE PHASE SHIFT AN IS A CONSTE IS AN
 FOR DETAILS OF FORMULAS SEE SECTION 6.5 OF REFERENCE [1]

```

      DATA NMLU(1),000000
      EAD=ABS(0)
      CONML0=2.106771E-03*nm
      CONSTE=CONML0/IDUR+1.0
2650--SINCE ADM IS GIVEN WITH A-0.1, L IS IN CM AND ADM IS IN CM
2651--TO CONVERT TO THE CENTER OF MASS SYSTEM
      ROE=OP*CONSTE
      S=FLOAT(L)
      IF(L,LE-0100)GO TO 100
      GO TO(110,120,130,140,150)
2660 PF=ROE
      SF=0.0
      IF(PL00-0.000000)GO TO 100
      PS=ROE
      GO TO 170
2670 ROE2=ROE*ROE
      DENOM=1.0+ROE1
      PF=ROE2+ROE/DENOM

```

```

      SF=-1,0/DEMON
      IF(PL00-LT,2,0) GO TO 800
      PS=RGK-ATAN (RGK)
      IF(PS/RGK=0,0000018800,850,810
120  RGK2=RGK*RGK
      RGK4=RGK2*RGK2
      DEMON=1,0-RGK2*RGK4*0,6
      PF=RGK4*RGK/DEMON
      SF=- (18,0-3,0-RGK2)/DEMON
      IF(PL00-LT,2,0) GO TO 140
      PS=RGK-ATAN (13,0-RGK/13,0-1,00001
      IF(PS/RGK=0,0000018100,800,110
130  RGK2=RGK*RGK
      RGK4=RGK2*RGK2
      RGK6=RGK4*RGK2
      DEMON=825,0-45,0-RGK2*0,6-1,00001
      PF=RGK6*RGK/DEMON
      SF=- (675,0-90,0-RGK2*0,6-1,00001
      IF(PL00-LT,2,0) GO TO 160
      PS=RGK-ATAN ((15,0-RGK*RGK2)/
      IF(PS/RGK=0,0000018100,800,110
140  RGK2=RGK*RGK
      RGK4=RGK2*RGK2
      RGK6=RGK4*RGK2
      RGK8=RGK6*RGK2
      DEMON=11025,0-1375,0-RGK2*0,6-1,00001
      PF=RGK8*RGK/DEMON
      IF(PL00-LT,2,0) GO TO 180
      SF=- (44100,0-4725,0-RGK2*
      PS=RGK-ATAN ((105,0-RGK*RGK2)/
      1-RGK2*RGK4))
      IF(PS/RGK=0,0000018100,800,110
150  RGK2=RGK*RGK
      RGK4=RGK2*RGK2
      RGK6=RGK4*RGK2
      RGK8=RGK6*RGK2
      RGK10=RGK8*RGK2
      DEMON=993025,0-37125,0-RGK2*0,6-1,00001
      1-15,0-RGK8*RGK10
      PF=RGK10*RGK/DEMON
      SF=4400125,0-39000,0-RGK2*
      1-435,0-RGK6*15,0-RGK2
      SF=-SF/DEMON
      IF(PL00-LT,2,0) GO TO 180
      PS=RGK-ATAN ((945,0-RGK*RGK2)/
      115,0-RGK4))
      IF(PS/RGK=0,0000018100,800,110
160  PS=0,0
170  RETURN
      END
      SUBROUTINE TORC0001
      COMMON/UTRAN(200,100)
      I1=1
      J1=J
      IF(I1.EQ,0) I1=901
      IF(J1.EQ,0) J1=901
      ERAN(1,J1)=ERAN(1,I1)
      ERAN(2,J1)=ERAN(2,I1)
      RETURN
      END
      SUBNO=30000 TORC0001

```

```

FACT027
FACT028
FACT029
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COMMON/0/00000000000000000000

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NSAVELEVEL=M	QIKS2230
M=J	QIKS2240
GO TO 30	QIKS2250
34 NSAVELEVEL=M	QIKS2260
NSAVELEVEL=M	QIKS2270
M=J	QIKS2280
GO TO 35	QIKS2290
35 IF (COMPAR(0,1))3,2,100	QIKS2300
SWAP IF ONLY TWO STEPS ARE OUT OF ORDER	QIKS2310
131 CALL MOVE(0,0)	QIKS2320
CALL MOVE(0,M)	QIKS2330
CALL MOVE(0,N)	QIKS2340
35 IF (LEVEL) 151, 150, 101	QIKS2350
152 RETURN	QIKS2360
POP UP	QIKS2370
251 M = NSAVELEVEL	QIKS2380
NSAVELEVEL	QIKS2390
LEVEL=LEVEL+1	QIKS2400
GO TO 30	QIKS2410
END MAIN	QIKS2420
C PARTITION	QIKS2430
32 I=M	QIKS2440
J=N	QIKS2450
KEY=KEYLOC(M,N)	QIKS2460
CALL MOVE(KEY, 0)	QIKS2470
54 IF (N = KEY) 17, 1, 17	QIKS2480
17 CALL MOVE(N,KEY)	QIKS2490
1 CONTINUE	QIKS2500
C HOLE AT BOTTOM	QIKS2510
IF (COMPAR(0,1))3,2,2	QIKS2520
2 I=I+1	QIKS2530
IF (I = J) 1, 4, 1	QIKS2540
3 CALL MOVE(I,J)	QIKS2550
GO TO 5	QIKS2560
6 CONTINUE	QIKS2570
C HOLE AT TOP	QIKS2580
IF (COMPAR(0,J))5,5,7	QIKS2590
5 J=J+1	QIKS2600
IF (I = J) 6, 4, 6	QIKS2610
7 CALL MOVE(J,I)	QIKS2620
GO TO 2	QIKS2630
C 4 CONTINUE	QIKS2640
C SPREADER GOES HERE	QIKS2650
C END PARTITION	QIKS2660
C SPREADER	QIKS2670
4 CALL MOVE(0,1)	QIKS2680
12 IF (I = N) 110, 10, 110	QIKS2690
110 I = I + 1	QIKS2700
IF (COMPAR(0,1))10,12,10	QIKS2710
10 IF (J = M) 108, 8, 108	QIKS2720
108 J = J + 1	QIKS2730
IF (COMPAR(0,J))8,10,0	QIKS2740
C 8 CONTINUE	QIKS2750
C RETURN TO MAIN PROGRAM	QIKS2760
END	QIKS2770
SUBROUTINE SPINOR(S,L,XJ)	SPNR001
TERM=0.0	SPNR002
DENOM=0.0	SPNR003
IF (S.EQ.0.,AND.L.EQ.0) GO TO 100	SPNR004
GO TO 101	SPNR0041
C-----FOR S=0 AND S-WAVE RESONANCES SPINS ARE ALL KNOWN HENCE ONE NEEDS	SPNR005

C-----LEVEL-LEVEL INTERFERENCE.

```

101 IF(S.EQ.0.)GO TO 102
   GO TO 103
102 XJ=FLOAT (L)
   GO TO 110
103 XJ1=5*0.5
   XJ2=5*0.5
111 XL=FLOAT (L)
   IF(XJ1.GT.XL)GO TO 104
   GO TO 105
104 TERM=TERM+XJ1*(2.0*XL+1.0)
   DENOM=DENOM+(2.0*XL+1.0)
   GO TO 106
105 TERM=TERM+XL*(2.0*XJ1+1.0)
   DENOM=DENOM+(2.0*XJ1+1.0)
106 IF(XJ2.GT.XL)GO TO 107
   GO TO 108
107 TERM=TERM+XJ2*(2.0*XL+1.0)
   DENOM=DENOM+(2.0*XL+1.0)
   GO TO 109
108 TERM=TERM+XL*(2.0*XJ2+1.0)
   DENOM=DENOM+(2.0*XJ2+1.0)
109 XJ=TERM/DENOM
   GO TO 110
100 XJ=0.0
110 RETURN
END

```

SUBROUTINE GAUSS(0,BELTA,DOPE)

```

COMMON ARAY,IRAY,ERAY,NOT,ZAI,ABN,NER,LFW,EL,EH,LRU,LRF,LANG,NLS,
1NRES,LN,JN,PENFAR,SHIFAR,SPI,AP,LIS,C,AM,DREF,AREF,IRANGE,NIS,
3INCROSS,IVSPIN,ELO,TEFF,DELTA,E,AWR
DIMENSION ARAY(6,500),IRAY(3,500),ERAY(2,500),NOT(20),ZAI(10),
1ABN(10),NER(10),LFW(10),EL(10,10),EH(10,10),LRU(10,10),LRF(10,10),
2LANG(10,5,5),NLS(10,10),NRES(10),LN(50),JN(150),PENFAR(500),
3SHIFAR(500),SPI(10),AP(10),LIS(10),C(10),AM(10),DREF(6),AREF(6)
DIMENSION ABC(9),WET(9)
DATA ABC/-3,19099320178153,-2.26658058453184,-1.46855328921667,-2,GAUS010
172355101875284,0,0,0,72355101875284,1.46855328921667,2.26658058453184,GAUS011
2184,3,19099320178153/
DATA WET/0,3960697726326E-04,0,4943624275537E-02,0,8847452739438E-04,GAUS013
101,0,4326515570026E+00,0,7202352136061E+00,0,4326515570026E+00,0,8GAUS014
2847452739438E-04,0,4943624275537E-02,0,3960697726326E-04/
DATA PHIRT/1.772454/
TERM=0.0
X=BELTA*ABC(9)
IF(E-X)100,100,101
101 DO 102 I=1,9
   ABCI=ABC(I)
   WETI=WET(I)
   Z=E+ABCI*BELTA
   CALL SIGMA(Z,AWR,IRANGE)
   TERM=TERM+AREF(INCROSS)*WETI
102 CONTINUE
DOPE=TERM/PHIRT
GO TO 110
100 DOPE=0.0
110 RETURN
END
SUBROUTINE GREAT1(F,FINT,NYAB,JMAX,XYAB,PARTS,GOOF,INTER,ERROR,
1 IERR)

```

C-----CARRY OUT CONVERGENCE INTEGRATION SCHEME USING TRAPAZOIDAL RULE

SPNR006
 SPNR007
 SPNR0071
 SPNR008
 SPNR009
 SPNR010
 SPNR011
 SPNR012
 SPNR013
 SPNR0131
 SPNR014
 SPNR015
 SPNR016
 SPNR017
 SPNR018
 SPNR019
 SPNR0191
 SPNR020
 SPNR021
 SPNR022
 SPNR023
 SPNR024
 SPNR025
 SPNR026
 SPNR027
 SPNR028
 SPNR029
 GAUS001
 GAUS002
 GAUS003
 GAUS004
 GAUS005
 GAUS006
 GAUS007
 GAUS008
 GAUS009
 GAUS010
 GAUS011
 GAUS012
 GAUS013
 GAUS014
 GAUS015
 GAUS016
 GAUS017
 GAUS018
 GAUS019
 GAUS020
 GAUS021
 GAUS022
 GAUS023
 GAUS024
 GAUS025
 GAUS026
 GAUS027
 GAUS028
 GAUS029
 GAUS030
 GAUS031
 GRT1001
 GRT1002
 GRT1003

C-----AND DOUBLING THE NUMBER OF REGIONS PER SUBINTERVAL FOR EACH	GRT1804
C-----ITERATION, ONLY DOUBLE UP IN THOSE INTERVALS THAT HAVE NOT ALREADY	GRT1805
C-----CONVERGED.	GRT1806
C-----F = SINGLE PRECISION FUNCTION TO BE INTEGRATED	GRT1807
C-----FINT = THE RESULTING INTEGRAL	GRT1808
C-----NTAB = NUMBER OF ORDINATES SUPPLIED (THERE ARE N-1 INTERVALS)	GRT1809
C-----JMAX = MAXIMUM ALLOWABLE NUMBER OF ITERATIONS	GRT1810
C-----XTAB = TABLE OF THE ORDINATE VALUES, RANGE OF INTEGRATION IS	GRT1811
C-----FROM XTAB(1) TO XTAB(NTAB)	GRT1812
C-----PARTS = ARRAY OF DIMENSION NTAB, EQUAL TO THE PARTIAL INTEGRALS	GRT1813
C-----OVER EACH OF THE NTAB-1 INTERVALS	GRT1814
C-----GOOF = ARRAY OF DIMENSION NTAB, EQUAL TO THE NORMAL ERROR IN EACH	GRT1815
C-----OF THE NTAB-1 INTERVAL.	GRT1816
C-----INTER = ARRAY OF DIMENSION NTAB, SPECIFYING THE NUMBER OF	GRT1817
C-----SUBINTERVALS IN EACH INTERVAL	GRT1818
C-----ERROR = ACCEPTABLE NORMAL ERROR	GRT1819
C-----IERR = ERROR INDICATOR, SET TO ZERO IF METHOD CONVERGED, SET TO	GRT1820
C-----ONE IF METHOD DOES NOT CONVERGE	GRT1821
C-----DIMENSION XTAB(NTAB), PARTS(NTAB), INTER(NTAB), GOOF(NTAB)	GRT1822
C-----INITIALIZE VALUE OF THE INTEGRAL	GRT1823
C-----FINT=0.0	GRT1824
C-----CALCULATE THE NUMBER OF INTERVALS	GRT1825
C-----NM1=NTAB-1	GRT1826
C-----CALCULATE ALLOWABLE ERROR PER INTERVAL	GRT1827
C-----ERRN=ERROR/FLOAT(NM1)	GRT1828
C-----INITIALIZE APPROXIMATION TO INTEGRAL	GRT1829
C-----TOTAL=0.0	GRT1830
C-----CALCULATE INITIAL APPROXIMATION	GRT1831
C-----DO 10 I=1,NM1	GRT1832
C-----INTER(I)=1	GRT1833
C-----PARTS(I)=0.5*(XTAB(I+1)+XTAB(I))*F(XTAB(I+1))+F(XTAB(I))	GRT1834
C-----10 TOTAL=TOTAL+PARTS(I)	GRT1835
C-----CALCULATE INITIAL ERRORS	GRT1836
C-----DO 15 I=1,NM1	GRT1837
C-----15 GOOF(I)=PARTS(I)	GRT1838
C-----SET UP LOOP OVER ITERATIONS	GRT1839
C-----DO 100 J=1,JMAX	GRT1840
C-----SAVE LAST APPROXIMATION	GRT1841
C-----TOTAL1=TOTAL	GRT1842
C-----SET UP LOOP OVER INTERVALS	GRT1843
C-----DO 20 I=1,NM1	GRT1844
C-----CHECK FOR CONVERGENCE IN THIS INTERVAL	GRT1845
C-----IF(ABS(GOOF(I)/TOTAL).LT,ERRN) GO TO 20	GRT1846
C-----CALCULATE DOUBLE INTERVAL	GRT1847
C-----DX=(XTAB(I+1)-XTAB(I))/FLOAT(INTER(I))	GRT1848
C-----DOUBLE NUMBER OF STEPS	GRT1849
C-----INTER(I)=2*INTER(I)	GRT1850
C-----INITIALIZE CONTRIBUTION TO INTEGRAL	GRT1851
C-----REST=0.0	GRT1852
C-----II=INTER(I)	GRT1853
C-----INITIALIZE ORDINATE	GRT1854
C-----XNOW=XTAB(I)+0.5*DX	GRT1855
C-----SET UP LOOP OVER ORDINATES	GRT1856
C-----DO 30 K=1,II,2	GRT1857
C-----REST=REST+F(XNOW)	GRT1858
C-----30 XNOW=XNOW+DX	GRT1859
C-----CALCULATE NEXT PARTIAL INTEGRAL	GRT1860
C-----REST=0.5*(PARTS(I)+DX*REST)	GRT1861
C-----ADD NEW PARTIAL INTEGRAL AND SUBTRACT OLD PARTIAL INTEGRAL	GRT1862
C-----TOTAL=TOTAL+REST-PARTS(I)	GRT1863
C-----CALCULATE NEW ERROR AND SET PARTIAL INTEGRAL TO NEW VALUE	GRT1864


```

      GOOF(1)=REST-PARTS(1)
      PARTS(1)=REST
      22 CONTINUE
C-----CHECK FOR CONVERGENCE
      102 IF(ABS(1.-TOTAL1/TOTAL).LE.ETORCH) GO TO 222
C-----THE METHOD HAS NOT CONVERGED
      FINT=TOTAL
      IERR=1
      RETURN
C-----THE METHOD HAS CONVERGED
      222 FINT=TOTAL
      IERR=2
      RETURN
      END
      SUBROUTINE OPTIMIZE(FINT,NTAB,NTABX,NTABY,NTABZ)
C-----CARRY OUT CONVERGENCE OPTIMIZATION SCHEME USING UP TO 222 INTERVALS
C-----WHICH ARE THEN FURTHER SUBDIVIDED INTO CONVERGENCE SUB-INTS OF THE
C-----MAXIMUM ALLOWABLE NUMBER OF ITERATIONS AND SUBSTEPS. THE SUBROUTINE
C-----ARGUMENTS ARE DEFINED AS FOLLOWS:
C-----F      FUNCTION TO BE INTEGRATED
C-----FINT    THE RESULTING INTEGRAL
C-----XTAB    TABLE OF COORDINATE CORRELATION INTERVALS AND XTABX,XTABY,XTABZ
C-----XTABINT    XTABINT(1)
C-----NTAB    THE LENGTH OF TAB AND TABX TABY TABZ OF COORDINATES
C-----ERROR    ALLOWABLE NORMALIZATION
C-----IERR    ERROR INDICATOR SET TO 222 IF METHOD CONVERGES, 555 IF
C-----        ONE IF METHOD DOES NOT CONVERGE, 444 IF
C-----        ONE IF METHOD DOES NOT CONVERGE ON TABX (XTABX) IS TOO LONG
C-----        DIMENSION XTAB(33),PARTS(33),DOPPLER(100)
C-----DEFINE THE MAXIMUM ALLOWABLE NUMBER OF SUBSTEPS AND THE NUMBER
C-----TABLE LENGTH,
      DATA JMAX,NTABX,NTABY,NTABZ
C-----DETERMINE IF TABLE IS TOO LONG
      IF(NTAB.GT.NTABX) GO TO 222
C-----CALL GENERAL INTEGRATION SUBROUTINE
      222 F(15.0)
      CALL GREAT10(FINT,NTAB,JMAX,NTABX,PARTS,GOOF,INTEGRAL,1,1)
      RETURN
C-----TABLE IS TOO LONG.
      102 IERR=1
      FINT=0.0
      RETURN
      END
      FUNCTION DOPPLER(X)
      COMMON ARAY,IRAY,ERAY,NOT,PAT,ABN,NER,LFW,EL,EH,LRU,LRF,LANG,NLS,
      1NRES,LN,UN,PENFAR,SHIFAR,SPI,AP,LIS,C,AM,DREF,AREF,IRANGE,NIS,
      3INCROSS,IVSPIN,ELO,TEFF,DELTA,E,AWR
      DIMENSION ARAY(10,500),IRAY(10,500),ERAY(10,500),NOT(20),ZAI(10),
      1ABN(10),NER(10),LFW(10),EL(10,10),EH(10,10),LRU(10,10),LRF(10,10),
      2LANG(10,5,5),NLS(10,10),NRES(10),LN(50),UN(150),PENFAR(500),SHIFAR
      3(500),SPI(10),AP(10),LIS(10),C(10),AM(10),DREF(6),AREF(6)
      Z=(E-X)/DELTA
      Z2=Z*Z
      CALL SIGMA(X,AWR,IRANGE)
      DOPPLER=AREF(INCROSS)*EXP(-Z2)/(DELTA*1.772454)
      RETURN
      END
      SUBROUTINE GHIN(O,BELTA,NTAB,XTAB)
      COMMON ARAY,IRAY,ERAY,NOT,ZAI,ABN,NER,LFW,EL,EH,LRU,LRF,LANG,NLS,
      1NRES,LN,UN,PENFAR,SHIFAR,SPI,AP,LIS,C,AM,DREF,AREF,IRANGE,NIS,
      3INCROSS,IVSPIN,ELO,TEFF,DELTA,E,AWR

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      CRT1006
      CRT1007
      CRT1008
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      CRT2099
      CRT2100

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    DIMENSION ARAY(6,500),IRAY(3,500),ERAY(2,500),NOT(20),ZAI(10),
    1ABN(10),NER(10),LFW(10),EL(10,10),EW(10,10),LRU(10,10),LRF(10,10),
    2LANG(10,5,5),NLS(10,10),NRES(10),LN(50),JN(150),PENFAR(500),
    3SHIFAR(500),SPT(10),AP(10),LIS(10),C(10),AM(10),DREF(6),AREF(6)
    DIMENSION XTAB(33)
    IGNORE=1
    N2=NTAB/2
    N21=N2+1
    N22=N2+2
    N3=NTAB-1
    XTAB(N21)=0
    DO 1410 I=N22,NTAB
    XTAB(I)=XTAB(I-1)+SELYA
    I=NTAB+1-I
    XTAB(I)=XTAB(I+1)+SELYA
1410 CONTINUE
    DO 1411 I=1,NTAB
    XTAB(I)=XTAB(I)
    IF(XTAB(I))1412,1412,1411
1412 IGNORE=0
1411 CONTINUE
    IF(IGNORE.EQ.0)GO TO 1413
    GO TO 1414
1413 XTAB(1)=1.0E+03
    DO 1415 I=1,N3
    I=I+1
    XTAB(I)=XTAB(I)+FLOAT(I)*SELYA
1415 CONTINUE
1414 RETURN
    END
    SUBROUTINE SIEVE(E1,E2,EG,CG,0,0,NX,BEFF,DWR)
    COMMON/C/EX(101),JFLAG(101)
    IF(E2.LT.E1)GO TO 101
    GO TO 300
300 N2=2*N
    DO 1000 I=1,100
    JFLAG(I)=2
1000 CONTINUE
    TEF=BEFF/293.0
    DP=(1.585E+00)*SQRT (TEF/DWR)
    WHEN MULTIPLIED BY SQRT(TEF) DP GIVES D TIMES CORRESPONDING SELYA
    DP1=DP*SQRT(E1)
    DP2=DP*SQRT(E2)
    DG1=G1/FLOAT (N)
    DG2=G2/FLOAT (N)
    EX(1)=E1
    IF(G1.LT.DP1)GO TO 1001
    GO TO 1002
1001 JFLAG(1)=1
1002 ENDF=ABS (E2-E1)
    NX=1
    DO 100 I=1,N
    XX=E1+DG1*FLOAT (I)
    IF(XX.LT.E2)GO TO 107
    GO TO 100
107 NX=NX+1
    EX(NX)=XX
    IF(G1.LT.DP1)GO TO 1003
    GO TO 100
1003 JFLAG(NX)=1
100 CONTINUE

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CR1000
 CR1001
 CR1002
 CR1003
 CR1004
 CR1005
 CR1006
 CR1007
 CR1008
 CR1009
 CR1010
 CR1011
 CR1012
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 CR1014
 CR1015
 CR1016
 CR1017
 CR1018
 CR1019
 CR1020
 CR1021
 CR1022
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 CR1025
 CR1026
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 CR1028
 CR1029
 CR1030
 CR1031
 CR1032
 CR1033
 SIEVE01
 SIEVE02
 SIEVE03
 SIEVE04
 SIEVE05
 SIEVE06
 SIEVE07
 SIEVE08
 SIEVE09
 SIEVE10
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 SIEVE19
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 SIEVE21
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 SIEVE25
 SIEVE26
 SIEVE27

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DO 200 I=1,N
  XX=E2-OG2*FLOAT (I)
  IF(XX.GT.E1)GO TO 100
  GO TO 200
100 NX=NX+1
  EX(NX)=XX
  IF(G2.LT.OP2)GO TO 1005
  GO TO 200
1005 JFLAG(NX)=1
200 CONTINUE
110 DIFF=(E2-E1)/FLOAT (N2)
  IF(DIFF)101,102,103
101 PRINT123
  PRINT2000,E1,E2,DIFF
  GO TO 104
103 FORMAT(32H CALLING SEQUENCE OF SIEVE WRONG)
2000 FORMAT(4H E1=E13,6,4H E2=E13,6,6H DIFF=E13,6)
102 N21=NX+1
  NN=NX
  N22=N21*N2-2
  NX=N22
  E21=(E1+E2)/2.0
  DP12=DP*SQRT (E21)
  E43=E2-E1-((G1+G2)/2.0)
  IF(E43.LT.DP12)GO TO 1000
  GO TO 1007
1006 DO 111 I=N21,N22
  I2=I-NN
  EX(I)=E1+DIFF*FLOAT (I2)
  JFLAG(I)=1
111 CONTINUE
  GO TO 1040
1007 DO 112 I=N21,N22
  I2=I-NN
  EX(I)=E1+DIFF*FLOAT (I2)
  DPTEST=DP*SQRT (EX(I))
  IF(EX(I).LE.E21)GO TO 1008
  GO TO 1009
1008 IF(G1.LT.DPTEST)GO TO 1010
  GO TO 112
1010 JFLAG(I)=1
  GO TO 112
1009 IF(G2.LT.DPTEST)GO TO 1011
  GO TO 112
1011 JFLAG(I)=1
112 CONTINUE
1040 DO 113 I=1,NX
  OPF=DP*SQRT (EX(I))
  IF(OPF.EQ.0,0)GO TO 113
  TERM=EX(I)/OPF
  IF(TERM.LT.25.1)GO TO 114
  GO TO 113
114 JFLAG(I)=1
113 CONTINUE
104 RETURN
END

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SIEV020
SIEV021
SIEV022
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SIEV031
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SIEV033
SIEV034
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SIEV060
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SIEV062
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SIEV064
SIEV065
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SIEV068
SIEV069
SIEV070
SIEV071
SIEV072
SIEV073
SIEV074
SIEV075

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SIGPLOT TEST. IRON DATA.

26856.E+055.36724E+0

26854.0 0.0584

4750. 100.E+3

.001175 0.0

-15800. .5E+0

7.83E+3 .5E+0

52.1 E+3 .5E+0

71.9 E+3 .5E+0

98.5 E+3 .5E+0

102.6 E+3 .5E+0

132. E+3 .5E+0

147. E+3 .5E+0

173. E+3 .5E+0

188.5 E+3 .5E+0

245. E+3 .5E+0

330. E+3 .5E+0

370. E+3 .5E+0

1.175E+3 0.0

9480. .5

14480. .5

26856.E+0 .9168E+0

4750. 100.E+3

0.E+0 .60E+0

.001187 0.0

-4800. .5

27780. .5

74. E+3 .5E+0

83.4 E+3 .5E+0

123.5 E+3 .5E+0

130. E+3 .5E+0

141.3 E+3 .5E+0

169. E+3 .5E+0

180. E+3 .5E+0

220. E+3 .5E+0

243.5 E+3 .5E+0

273. E+3 .5E+0

315. E+3 .5E+0

360. E+3 .5E+0

382. E+3 .5E+0

1.187E+3 0.0

1150. .5

2350. .5

11280. 1.0

22780. 1.0

34180. 1.0

36680. .5

38380. 1.0

45880. .5

51980. .5

53380. 1.5

55280. .5

59280. .5

26857.E+0 .021730E+0

4750. 100.E+3

.5 .6

.001193 0.0

3980. 0.0

6580. 1.0

28020. 1.0

5001.000

1202.18

2100.E+0

1600.E+0

400.E+0

1375.E+0

1600.E+0

1950.E+0

4800.E+0

38000.E+0

13000.E+0

2750.E+0

3800.E+0

2.84

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576.01

1401.44

425.E+0

1000.E+0

150.E+0

500.E+0

2300.E+0

690.E+0

3160.E+0

1300.E+0

300.E+0

3500.E+0

5500.E+0

9300.E+0

10200.E+0

.616

1.0204

1.022

1.1055

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1.1625

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40520.	3.	2516.83	2516.	.83
45580.	1.	269.03	269.	.83
.001193	0.0			48
1630.	0.	1.08	.25	.83
4750.	0.	1.086	1256	.83
7220.	1.	1.753	.923	.83
7900.	1.	1.146	.316	.83
12800.	2.	1.336	.586	.83
13900.	2.	2.426	.776	1.85
18000.	1.	2.71	1.66	1.85
21300.	1.	6.92	1.92	3.
26250.F+0	.0031E+0			1.
4750.	100.E+3			1.
8.E+0	.60E+0			2.
1.200E+3	2.3			6
-692.	.5	3.59	2.54	1.00
1.200E+3	0.0			1.0
230.	.5	.02054	.02054	1.
359.	.5	3.3178	.2173	1.

DATA FOR ISOTOPE NUMBER 1

(2,A) DESIGNATION OF THE ISOTOPE 2.6834E+04 FRACTIONAL ABUNDANCE 9.448E-02 NO OF ENERGY RANGES 1
LOWER LIMIT OF THE ENERGY RANGE(EV) 4.750E+03 UPPER LIMIT(EV) 1.288E+05 LRU= 2
NUCLEAR SPIN 0.000E+00 SCATTERING LENGTH 6.000E-01 NO OF L-VALUES 2 LIS= 3
CONSTANT USED TO CALCULATE PENETRABILITY 1.175E-03 SCATTERING LENGTH(A-) 0.000E+00 ANGULAR MOMENTUM 0 NO OF RESONANCES 13

ERES	SPIN	GTOT	CN	CGAMMA	CF
1.500E+04	5.000E-01	5.001E+03	5.000E+03	1.000E+00	0.000E+00
7.800E+03	5.000E-01	1.222E+03	1.200E+03	3.100E+00	0.000E+00
5.210E+04	5.000E-01	2.100E+03	2.100E+03	3.000E+01	0.000E+00
7.100E+04	5.000E-01	1.000E+03	1.000E+03	3.000E+01	0.000E+00
9.850E+04	5.000E-01	4.000E+02	4.000E+02	3.000E+01	0.000E+00
1.024E+05	5.000E-01	1.375E+03	1.375E+03	3.000E+01	0.000E+00
1.320E+05	5.000E-01	1.000E+03	1.000E+03	3.000E+01	0.000E+00
1.470E+05	5.000E-01	1.950E+03	1.950E+03	3.000E+01	0.000E+00
1.730E+05	5.000E-01	4.000E+03	4.000E+03	3.000E+01	0.000E+00
1.800E+05	5.000E-01	3.000E+03	3.000E+03	3.000E+01	0.000E+00
2.450E+05	5.000E-01	1.300E+04	1.300E+04	3.000E+01	0.000E+00
3.300E+05	5.000E-01	2.750E+03	2.750E+03	3.000E+01	0.000E+00
3.700E+05	5.000E-01	3.000E+03	3.000E+03	3.000E+01	0.000E+00

CONSTANT USED TO CALCULATE PENETRABILITY 1.175E-03 SCATTERING LENGTH(A-) 0.000E+00 ANGULAR MOMENTUM 0 NO OF RESONANCES 2

ERES	SPIN	GTOT	CN	CGAMMA	CF
9.480E+03	5.000E-01	2.040E+00	1.000E+03	1.222E+00	0.000E+00
1.400E+04	5.000E+03	2.130E+00	1.100E+03	1.222E+00	0.000E+00

DATA FOR ISOTOPE NUMBER 2

(2,A) DESIGNATION OF THE ISOTOPE 2.6834E+04 FRACTIONAL ABUNDANCE 9.448E-01 NO OF ENERGY RANGES 1
LOWER LIMIT OF THE ENERGY RANGE(EV) 4.750E+03 UPPER LIMIT(EV) 1.288E+05 LRU= 2
NUCLEAR SPIN 0.000E+00 SCATTERING LENGTH 6.000E-01 NO OF L-VALUES 2 LIS= 3
CONSTANT USED TO CALCULATE PENETRABILITY 1.175E-03 SCATTERING LENGTH(A-) 0.000E+00 ANGULAR MOMENTUM 0 NO OF RESONANCES 15

ERES	SPIN	GTOT	GN	GGAMMA	GP
-4.000E+03	5.000E+01	5.700E+02	5.750E+02	1.010E+22	0.000E+00
2.770E+04	5.000E+01	1.4014E+03	1.400E+03	1.442E+00	0.000E+00
7.400E+04	5.000E+01	4.250E+02	4.250E+02	1.000E+00	0.000E+00
8.300E+04	5.000E+01	1.000E+03	1.000E+03	1.000E+00	0.000E+00
1.235E+05	5.000E+01	1.500E+02	1.500E+02	1.000E+00	0.000E+00
1.300E+05	5.000E+01	5.000E+02	5.000E+02	1.000E+00	0.000E+00
1.413E+05	5.000E+01	2.300E+03	2.300E+03	1.000E+00	0.000E+00
1.600E+05	5.000E+01	6.900E+02	6.900E+02	1.000E+00	0.000E+00
1.800E+05	5.000E+01	3.100E+03	3.100E+03	1.000E+00	0.000E+00
2.200E+05	5.000E+01	1.300E+03	1.300E+03	1.000E+00	0.000E+00
2.435E+05	5.000E+01	3.000E+02	3.000E+02	1.000E+00	0.000E+00
2.730E+05	5.000E+01	3.500E+03	3.500E+03	1.000E+00	0.000E+00
3.150E+05	5.000E+01	5.500E+03	5.500E+03	1.000E+00	0.000E+00
3.600E+05	5.000E+01	9.300E+03	9.300E+03	1.000E+00	0.000E+00
3.820E+05	5.000E+01	1.000E+04	1.000E+04	1.000E+00	0.000E+00

CONSTANT USED TO CALCULATE PENETRABILITY 3.1070E+03 SCATTERING LENGTH(A) 2.032E+22 ANGULAR MOMENTUM 3 NO OF RESONANCES 12

ERES	SPIN	GTOT	GN	GGAMMA	GP
1.150E+03	5.000E+01	6.100E+01	5.200E+02	5.640E+01	0.000E+00
2.350E+03	5.000E+01	1.000E+00	4.000E+04	1.000E+00	0.000E+00
1.120E+04	1.500E+00	1.022E+00	2.200E+02	1.000E+00	0.000E+00
2.270E+04	1.500E+00	1.105E+00	3.050E+01	1.000E+00	0.000E+00
3.410E+04	1.500E+00	2.340E+00	3.400E+01	1.000E+00	0.000E+00
3.660E+04	5.000E+01	1.430E+00	4.300E+01	1.000E+00	0.000E+00
3.830E+04	1.500E+00	1.200E+00	2.900E+01	1.000E+00	0.000E+00
4.500E+04	5.000E+01	2.301E+00	3.010E+01	1.000E+00	0.000E+00
5.190E+04	5.000E+01	2.605E+00	6.050E+00	1.000E+00	0.000E+00
5.330E+04	1.500E+00	1.370E+00	3.700E+01	1.000E+00	0.000E+00
5.500E+04	5.000E+01	1.123E+00	1.623E+01	1.000E+00	0.000E+00
5.900E+04	5.000E+01	2.740E+00	7.400E+01	2.000E+00	0.000E+00

DATA FOR ISOTOPE NUMBER 3

(2.1) DESIGNATION OF THE ISOTOPE 2.0057E+04 FRACTIONAL ABUNDANCE 2.178E+02 NO OF ENERGY RANGES 3
 LOWER LIMIT OF THE ENERGY RANGE(EV) 4.750E+23 UPPER LIMIT(EV) 1.788E+25 LRU= 1 LRT= 2
 NUCLEAR SPIN 5.000E+01 SCATTERING LENGTH 6.000E+01 NO OF L-VALUES 2 LIS= 3
 CONSTANT USED TO CALCULATE PENETRABILITY 1.1930E+03 SCATTERING LENGTH(A) 2.000E+00 ANGULAR MOMENTUM 0 NO OF RESONANCES 5

ERES	SPIN	GTOT	GN	GGAMMA	GP
3.900E+03	2.000E+00	2.450E+02	2.400E+02	1.500E+00	0.000E+00
6.300E+03	1.000E+00	4.673E+02	4.600E+02	3.732E+02	0.000E+00
2.600E+04	1.000E+00	3.805E+02	3.800E+03	5.000E+00	0.000E+00
4.050E+04	0.000E+00	2.516E+03	2.510E+03	4.300E+01	0.000E+00
4.550E+04	1.000E+00	2.690E+02	2.600E+02	0.300E+01	0.000E+00

CONSTANT USED TO CALCULATE PENETRABILITY 1.1950E+03 SCATTERING LENGTH(A=) 0.0000E+00 ANGULAR MOMENTUM 1 NO OF RESONANCES 0

ERES	SPIN	GTOT	GN	GGAMMA	GP
1.6300E+03	0.0000E+00	1.0880E+00	2.5000E+01	0.3000E+01	0.0000E+00
4.7500E+03	0.0000E+00	1.0860E+00	2.5600E+01	0.3000E+01	0.0000E+00
7.2200E+03	1.0000E+00	1.7530E+00	9.2300E+01	0.3000E+01	0.0000E+00
7.9000E+03	1.0000E+00	1.1460E+00	3.1600E+01	0.3000E+01	0.0000E+00
1.2600E+04	2.0000E+00	1.3360E+00	5.0600E+01	0.3000E+01	0.0000E+00
1.3900E+04	2.0000E+00	2.4260E+00	7.7600E+01	1.6500E+00	0.0000E+00
1.8000E+04	1.0000E+00	2.7100E+00	1.0600E+00	1.6500E+00	0.0000E+00
2.1300E+04	1.0000E+00	0.9200E+00	1.9200E+00	5.0000E+00	0.0000E+00

DATA FOR ISOTOPE NUMBER 4

(E,A) DESIGNATION OF THE ISOTOPE 2.6000E+04 FRACTIONAL ABUNDANCE 0.1000E+03 NO OF ENERGY RANGES 1
 LOWER LIMIT OF THE ENERGY RANGE(EV) 4.7500E+03 UPPER LIMIT(EV) 1.0000E+05 LGU= 1 LUP= 2
 NUCLEAR SPIN 0.0000E+00 SCATTERING LENGTH 0.0000E+01 NO OF L-VALUES 2 LIS= 0
 CONSTANT USED TO CALCULATE PENETRABILITY 1.2000E+03 SCATTERING LENGTH(A=) 0.0000E+00 ANGULAR MOMENTUM 0 NO OF RESONANCES 1

ERES	SPIN	GTOT	GN	GGAMMA	GP
0.0222E+02	0.0000E+01	0.0700E+00	2.9700E+00	1.0000E+00	0.0000E+00

CONSTANT USED TO CALCULATE PENETRABILITY 1.2000E+03 SCATTERING LENGTH(A=) 0.0000E+00 ANGULAR MOMENTUM 1 NO OF RESONANCES 2

ERES	SPIN	GTOT	GN	GGAMMA	GP
2.3200E+02	0.0000E+01	1.0200E+00	0.9400E+03	1.0000E+00	0.0000E+00
0.5922E+02	0.0000E+01	1.0173E+00	1.7300E+02	1.0000E+00	0.0000E+00

CROSS-SECTIONS AT THERMAL ENERGY

NEUTRON ENERGY(EV)	SIGNN	SIGCAP	SIGF	SIGT	SIGNNMULT	SIGTMULT
2.512000E-02	1.336513E+01	2.523005E+00	0.000000E+00	1.500022E+01	1.137373E+01	1.309602E+01

NEUTRON ENERGY(EV)	SIGNN	SIGCAP	SIGF	SIGT	SIGNNMULT	SIGTMULT
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4.750000E+03	6.785771E+00	5.682725E-01	0.000000E+00	7.346844E+00	5.693696E+00	6.253968E+00
4.981043E+03	6.582255E+00	5.412982E-03	0.000000E+00	6.587667E+00	5.432315E+00	5.437728E+00
5.137500E+03	6.465403E+00	5.973383E-03	0.000000E+00	6.471377E+00	5.410551E+00	5.416524E+00
5.217370E+03	6.468483E+00	6.343325E-03	0.000000E+00	6.466826E+00	5.413359E+00	5.419782E+00
5.529000E+03	6.508239E+00	8.971672E-03	0.000000E+00	6.589218E+00	5.578369E+00	5.579341E+00
5.836270E+03	7.275194E+00	1.643329E-02	0.000000E+00	7.291627E+00	6.323456E+00	6.339890E+00
5.912500E+03	7.693594E+00	2.838699E-02	0.000000E+00	7.713981E+00	6.768468E+00	6.788775E+00
6.048135E+03	9.358738E+00	3.432255E-02	0.000000E+00	9.385853E+00	8.444938E+00	8.479252E+00
6.338803E+03	1.367898E+01	6.217415E-02	0.000000E+00	1.374188E+01	1.255846E+01	1.259264E+01
6.388800E+03	1.153816E+01	3.519889E-02	0.000000E+00	1.157335E+01	1.013255E+01	1.016774E+01
6.531865E+03	1.151748E+01	3.498538E-02	0.000000E+00	1.155247E+01	1.011165E+01	1.014663E+01
6.768800E+03	1.839641E+01	2.128743E-02	0.000000E+00	1.841778E+01	9.813374E+00	9.834663E+00
6.783730E+03	1.839735E+01	2.119639E-02	0.000000E+00	1.841855E+01	9.814939E+00	9.836139E+00
6.998800E+03	1.128888E+01	1.963277E-02	0.000000E+00	1.138843E+01	9.945888E+00	9.965448E+00
7.218247E+03	1.414936E+01	3.261779E-01	0.000000E+00	1.447554E+01	1.287594E+01	1.328212E+01
7.219123E+03	1.466885E+01	7.818764E-01	0.000000E+00	1.544913E+01	1.339585E+01	1.417612E+01
7.228800E+03	1.552657E+01	1.539844E+00	0.000000E+00	1.786642E+01	1.425398E+01	1.579382E+01
7.228976E+03	1.469754E+01	7.818644E-01	0.000000E+00	1.547868E+01	1.342539E+01	1.428642E+01
7.221753E+03	1.428473E+01	3.263858E-01	0.000000E+00	1.453184E+01	1.293296E+01	1.325927E+01
7.228928E+03	1.399226E+01	3.789944E-02	0.000000E+00	1.483816E+01	1.272393E+01	1.276183E+01
7.372500E+03	1.656123E+01	2.761971E-02	0.000000E+00	1.658885E+01	1.538898E+01	1.541652E+01
7.525800E+03	1.956881E+01	3.279241E-02	0.000000E+00	2.088168E+01	1.897588E+01	1.988867E+01
7.677500E+03	2.328673E+01	3.787367E-02	0.000000E+00	2.332386E+01	2.256586E+01	2.268295E+01
7.838800E+03	2.511229E+01	3.868538E-02	0.000000E+00	2.515835E+01	2.478823E+01	2.474638E+01
7.847500E+03	2.517165E+01	3.794438E-02	0.000000E+00	2.528968E+01	2.488225E+01	2.484819E+01
7.865800E+03	2.519768E+01	3.787235E-02	0.000000E+00	2.523555E+01	2.486198E+01	2.489988E+01
7.882500E+03	2.519888E+01	3.846959E-02	0.000000E+00	2.522935E+01	2.488779E+01	2.492628E+01
7.88854E+03	2.523834E+01	2.589722E-01	0.000000E+00	2.549731E+01	2.496461E+01	2.522358E+01
7.899427E+03	2.536322E+01	5.928254E-01	0.000000E+00	2.595524E+01	2.589858E+01	2.588257E+01
7.908800E+03	2.557363E+01	1.147331E+00	0.000000E+00	2.672897E+01	2.538192E+01	2.644925E+01
7.988573E+03	2.536117E+01	5.928871E-01	0.000000E+00	2.595318E+01	2.589846E+01	2.588247E+01
7.981146E+03	2.523234E+01	2.589441E-01	0.000000E+00	2.549129E+01	2.496248E+01	2.522158E+01
8.295800E+03	1.919762E+01	2.253841E-02	0.000000E+00	1.922815E+01	1.923586E+01	1.925839E+01
8.698800E+03	1.335488E+01	1.199169E-02	0.000000E+00	1.536687E+01	1.338878E+01	1.331278E+01
9.085800E+03	1.828244E+01	7.876996E-03	0.000000E+00	1.828951E+01	1.884792E+01	1.884499E+01
9.477968E+03	9.323188E+00	8.358898E-01	0.000000E+00	1.015812E+01	9.883493E+00	9.918413E+00
9.478980E+03	1.861444E+01	2.881131E+00	0.000000E+00	1.269557E+01	1.837469E+01	1.245582E+01
9.488880E+03	1.277854E+01	4.159574E+00	0.000000E+00	1.693811E+01	1.253818E+01	1.669768E+01
9.481820E+03	1.861935E+01	2.881881E+00	0.000000E+00	1.278835E+01	1.837823E+01	1.245924E+01
9.482940E+03	9.318955E+00	8.358569E-01	0.000000E+00	1.815481E+01	9.877798E+00	9.912847E+00
9.918880E+03	7.313152E+00	3.242787E-03	0.000000E+00	7.316394E+00	7.821118E+00	7.824352E+00
1.034800E+04	6.564929E+00	2.419987E-03	0.000000E+00	6.567349E+00	6.244188E+00	6.244188E+00
1.077880E+04	6.831694E+00	1.925418E-03	0.000000E+00	6.833619E+00	5.698138E+00	5.692864E+00
1.119898E+04	5.668848E+00	1.862921E+00	0.000000E+00	7.523741E+00	5.389128E+00	7.172849E+00
1.119949E+04	5.728218E+00	4.654958E+00	0.000000E+00	1.837518E+01	5.388586E+00	1.888246E+01
1.128880E+04	5.838226E+00	9.388277E+00	0.000000E+00	1.513858E+01	5.478464E+00	1.478674E+01
1.128851E+04	5.735588E+00	4.655149E+00	0.000000E+00	1.839866E+01	5.383695E+00	1.888884E+01
1.128182E+04	5.872845E+00	1.863879E+00	0.000000E+00	7.535124E+00	5.328232E+00	7.183311E+00
1.168880E+04	5.328346E+00	1.381587E-03	0.000000E+00	5.321728E+00	4.964887E+00	4.965388E+00
1.288880E+04	5.862646E+00	1.213998E-03	0.000000E+00	5.863888E+00	4.785838E+00	4.786244E+00
1.288880E+04	4.838786E+00	1.898311E-03	0.000000E+00	4.839884E+00	4.482188E+00	4.482188E+00
1.279866E+04	4.882337E+00	2.788987E-01	0.000000E+00	5.872428E+00	4.449188E+00	4.719278E+00
1.279933E+04	5.847677E+00	6.737919E-01	0.000000E+00	5.721469E+00	4.694669E+00	5.368461E+00
1.288880E+04	5.459894E+00	1.346754E+00	0.000000E+00	6.886448E+00	5.186418E+00	6.452972E+00
1.288867E+04	5.851586E+00	6.737859E-01	0.000000E+00	5.725372E+00	4.897238E+00	5.371824E+00
1.288134E+04	4.884717E+00	2.781845E-01	0.000000E+00	5.874822E+00	4.458518E+00	4.728614E+00
1.387588E+04	4.513546E+00	9.679328E-04	0.000000E+00	4.514514E+00	4.162595E+00	4.162595E+00
1.335888E+04	4.394794E+00	9.259876E-04	0.000000E+00	4.395728E+00	4.047885E+00	4.048811E+00

[illegible]

[illegible]

IRAY(3,J)=1	SIG2121
ERAY(1,J)=SPI(1)	SIG2122
ERAY(2,J)=AP(I)	SIG2123
102 CONTINUE	SIG2124
J1=J1+NRS	SIG2125
JL=JL+1	SIG2126
IF(NMOD-NLS(1,J2))104,104,103	SIG2127
103 NRRANGE=NRANGE+1	SIG2128
J2=J2+1	SIG2129
IF(NRRANGE-NERI)106,106,1010	SIG2130
1010 NRES(I)=J1-JFID	SIG2131
JFID=J1	SIG2132
101 CONTINUE	SIG2133
NTOTAL=J1-1	SIG2134
SCALE=1.0E+00	SIG2135
PHI=3.14159265	SIG2136
3 FORMAT(2E11,4,4I11)	SIG2137
4 FORMAT(4E11,4)	SIG2138
5 FORMAT(8E11,4,3I10)	SIG2139
6 FORMAT(2X,2E11,4)	SIG2140
7 FORMAT(107H NEUTRON ENERGY(EV) SIGNN SIGCAP	SIG2141
1IGF SIGT SIGNNMULT SIGTMULT)	SIG2142
8 FORMAT(2X,7E15,6)	SIG2143
9 FORMAT(10X,2E20,6)	SIG2144
10 FORMAT(20H ERROR IN INPUT DATA)	SIG2145
11 FORMAT(10X,2I10)	SIG2146
12 FORMAT(10X,6I10)	SIG2147
14 FORMAT(53H CROSS-SECTIONS CALCULATED WITHOUT DOPPLER BROADENING)	SIG2148
15 FORMAT(49H CROSS-SECTIONS CALCULATED WITH DOPPLER BROADENING)	SIG2149
16 FORMAT(15H NEUTRON ENERGYE15,6)	SIG2150
17 FORMAT(33H (Z,A) DESIGNATION OF THE ELEMENTE11,4,22H AT.WT/MASS OF	SIG2151
1 NEUTRONE11,4,15H NO OF ISOTOPEI5)	SIG2152
18 FORMAT(24H DATA FOR ISOTOPE NUMBERI5)	SIG2153
19 FORMAT(33H (Z,A) DESIGNATION OF THE ISOTOPEE11,4,21H FRACTIONAL ABS	SIG2154
1UNDANCEE11,4,20H NO OF ENERGY RANGEI5)	SIG2155
20 FORMAT(36H LOWER LIMIT OF THE ENERGY RANGE(EV)E11,4,16H UPPER LI	SIG2156
MIT(EV)E11,4,6H LRU=I5,6H LRF=I5)	SIG2157
21 FORMAT(13H NUCLEAR SPINE11,4,18H SCATTERING LENGTHE11,4,15H NO OF	SIG2158
1L-VALUEI5)	SIG2159
22 FORMAT(45H MASS OF THE ISOTOPE IN UNITS OF NEUTRON MASSE11,4,22H S	SIG2160
1CATTERING LENGTH(A-)E11,4,17H ANGULAR MOMENTUMI5,17H NO OF RESONANS	SIG2161
2CESI5)	SIG2162
23 FORMAT(05H ERES SPIN GTOT GN	SIG2163
1 GGAMMA GF)	SIG2164
24 FORMAT(11H TITLE 7A4)	SIG2165
25 FORMAT(//)	SIG2166
26 FORMAT(6(2X,E11,4,2X))	SIG2167
27 FORMAT(33H CROSS-SECTIONS AT THERMAL ENERGY)	SIG2168
28 FORMAT(2X,2E20,6,110)	SIG2169
29 FORMAT(2X,4E11,4)	SIG2170
30 FORMAT(22H EFFECTIVE TEMPERATUREF7,1,41H IN DEGREES KELVIN. NO	SIG2171
1OF PIVOT POINTSI5,10H CONVERGENCE ERRORE10,4,13H AND INCROSS=I5)	SIG2172
31 FORMAT(53H THE INTEGRAL FOR DOPPLER BROADENING DID NOT CONVERGE)	SIG2173
33 FORMAT(116H1 PROGRAM SIGMA2, PROGRAM TO CALCULATE SINGLE OR MULTIS	SIG2174
1LEVEL BREIT-WIGNER CROSS-SECTIONS. USES ENDF/B VERSION I1 DATA)	SIG2175
C-----THIS IS WHERE RESONANCES OF EACH ISOTOPE ARE ARRANGED IN INCREASING	SIG2176
C-----G ORDER IN L AND FOR EACH L IN INCREASING ORDER, IN J.	SIG2177
DO 133 I=1,NIS	SIG2178
NRESI=NRES(I)	SIG2179
CALL ORDER(I,NRESI)	SIG2180
133 CONTINUE	SIG2181

13	FORMAT(10(1X,[10])	SIG2182
	DO 135 I=1,NTOTAL	SIG2183
	ARRAY(1,I)=ARRAY(1,I)*SCALE	SIG2184
	ARRAY(3,I)=ARRAY(3,I)*SCALE	SIG2185
	ARRAY(4,I)=ARRAY(4,I)*SCALE	SIG2186
	ARRAY(5,I)=ARRAY(5,I)*SCALE	SIG2187
	ARRAY(6,I)=ARRAY(6,I)*SCALE	SIG2188
135	CONTINUE	SIG2189
	NCOUNT=1	SIG2190
	DO 133B I=1,NIS	SIG2191
	XWR=AWR(I)	SIG2192
	YWR=XWR*1.288645	SIG2193
	YWR=YWR*(1.0/3.0)	SIG2194
	APX=0.123*YWR+0.88	SIG2195
	NRES=NRES(I)	SIG2196
	NLMT=NCOUNT*NRES-1	SIG2197
	DO 1331 J=NCOUNT,NLMT	SIG2198
	CALL FACTS(ARRAY(1,J),IRAY(1,J),PENFAR(J),SHIFAR(J),PS,CONST,XWR,	SIG2199
	1APX,1.0)	SIG2200
1331	CONTINUE	SIG2201
	NCOUNT=NCOUNT*NRES	SIG2202
133B	CONTINUE	SIG2203
	DO 138 I=1,NTOTAL	SIG2204
	ERAN(1,I)=ARRAY(1,I)	SIG2205
	ERAN(2,I)=ARRAY(3,I)	SIG2206
138	CONTINUE	SIG2207
	CALL GIKS(1,NTOTAL,MOV,KOH)	SIG2208
C----	HERE RESONANCE IN AN ELEMENT ARE ARRANGED IN INCREASING ORDER IN	SIG2209
C----	ENERGY ALONG WITH THEIR TOTAL GAMMAS TO CALCULATE THE ENERGY MESH	SIG2210
C----	AT WHICH THE CROSS-SECTIONS ARE CALCULATED.	SIG2211
146	PRINT27	SIG2212
	PRINT25	SIG2213
	PRINT7	SIG2214
	E=ETHERM	SIG2215
	CALL SIGMA(ETHERM,2)	SIG2216
	PRINT25	SIG2217
	ELO=EL(1,1)*SCALE	SIG2218
	JFLAG(1)=1	SIG2219
	IRANGE=1	SIG2220
C----	WE HAVE ARBITRARILY SET ELO=1.0E-11 MEV HERE TO BE ABLE TO DOPPLERS	SIG2221
C----	BROADEN THERMAL CROSS-SECTIONS, LATER ON IN THE PROGRAM ELO IS READ	SIG2222
C----	IN FROM THE DATA AND COULD VARY FROM 1.0E-11 TO 1.0E+09 MEV.	SIG2223
	PRINT8,ETHERM,(AREF(LL),LL=1,6)	SIG2224
	IF(DOPL.EQ.1)GO TO 147	SIG2225
	GO TO 148	SIG2226
147	TEF=TEFF/293.8	SIG2227
	DELTA=0.3177*SQRT ((TEF*ETHERM)/AWR)	SIG2228
C	CONTINUE	SIG2229
	CALL GRID(ETHERM,DELTA,NTAB,XTAB)	SIG2230
	CALL GREAT2(DOPPLER,FINT,XTAB,NTAB,ERROR,IERR)	SIG2231
	PRINT28,ETHERM,FINT,JFLAG(1)	SIG2232
	IF(IERR.EQ.1)PRINT31	SIG2233
148	PRINT25	SIG2234
	PRINT7	SIG2235
	PRINT25	SIG2236
	DO 124 JJ=1,NIS	SIG2237
	NERJJ=NER(JJ)	SIG2238
	DO 125 KK=1,NERJJ	SIG2239
	IRANGE=KK	SIG2240
	LROJK=LRO(JJ,KK)	SIG2241
	IF(LROJK-1)131,132,125	

131 PRINT10	SIG2242
GO TO 130	SIG2243
1321 IF(JJ.EQ.1)GO TO 1320	SIG2244
GO TO 132	SIG2244.1
1320 ELOREF=EL(JJ,KK)*SCALE	SIG2245
EHIREF=EH(JJ,KK)*SCALE	SIG2246
ELO=ELOREF	SIG2247
EH1=EHIREF	SIG2248
GO TO 1240	SIG2249
132 ELO=EL(JJ,KK)*SCALE	SIG2250
EH1=EH(JJ,KK)*SCALE	SIG2251
IF(ELO.EQ.ELOREF,AND,EH1.EQ.EHIREF)GO TO 124	SIG2252
GO TO 1240	SIG2252.1
1240 MM=MAXPTS/(8*MAXRES)	SIG2253
NN=MM	SIG2254
IFLAG=1	SIG2255
NLSKK=NLS(JJ,KK)	SIG2256
J4=1	SIG2257
ISTART=1	SIG2258
IEND=1	SIG2259
117 IF(IEND.EQ.0)GO TO 125	SIG2260
J5=J4+1	SIG2261
E1=ERAN(1,J4)	SIG2262
G1=ERAN(2,J4)	SIG2263
E2=ERAN(1,J5)	SIG2264
G2=ERAN(2,J5)	SIG2265
IF(E1.LT.ELO,AND,E2.LT.ELO)GO TO 1120	SIG2266
GO TO 1105	SIG2266.1
1105 IF(E1.LE.ELO,AND,E2.GT.ELO)GO TO 1110	SIG2267
GO TO 1111	SIG2267.1
1110 E1=ELO	SIG2268
G1=G2	SIG2269
ISTART=0	SIG2270
GO TO 1114	SIG2271
1111 IF(E1.GT.ELO,AND,E2.LE.EH1)GO TO 1112	SIG2272
GO TO 1113	SIG2272.1
1112 IF(J4.EQ.1,AND,ISTART.EQ.1)GO TO 1100	SIG2273
GO TO 1114	SIG2273.1
1106 E2=E1	SIG2274
G2=G1	SIG2275
E1=ELO	SIG2276
J4=J4+1	SIG2277
ISTART=0	SIG2278
GO TO 1114	SIG2279
1116 E2=EH1+G1/FLOAT(MM)	SIG2280
G2=G1	SIG2281
IFLAG=0	SIG2282
GO TO 1114	SIG2283
1113 IF(E1.LT.EH1,AND,E2.GE.EH1)GO TO 1123	SIG2284
GO TO 1124	SIG2284.1
1123 E2=EH1	SIG2285
G2=G1	SIG2286
IEND=0	SIG2287
GO TO 1114	SIG2288
1124 IF(E1.GE.EH1,AND,E2.GT.EH1)GO TO 125	SIG2289
GO TO 1125	SIG2289.1
1125 IF(IFLAG)1120,125,1120	SIG2290
1114 IF(E1.EQ.E2)GO TO 1120	SIG2291
GO TO 1110	SIG2291.1
1110 CONTINUE	SIG2292
CALL SIEVE(E1,G1,E2,G2,MM,NN,NH,TEFF,AHR)	SIG2293

CALL QIKS(1,NX,MOVE,KOME)	SIG2294
GO TO 116	SIG2295
1120 IF(IEND.EQ.0)GO TO 125	SIG2296
J4=J4+1	SIG2297
GO TO 117	SIG2298
116 DO 109 I=1,NX	SIG2299
E=EX(I)	SIG2300
JFLAGI=JFLAG(I)	SIG2301
CALL SIGMA(E,KK)	SIG2302
PRINT8,E,(AREF(LL),LL=1,6)	SIG2303
IF(IDPL.EQ.1)GO TO 141	SIG2304
GO TO 109	SIG23041
141 IF(E,LT,ETHERM)GO TO 109	SIG2305
GO TO 1410	SIG23051
C-----IF THE NEUTRON ENERGY IS LESS THAN 0.0255 EV DOPPLER BROADENING IS	SIG2306
G-----PASSED AS A DIFFERENT KERNEL SHOULD BE USED TO CALCULATE DOPPLER	SIG2307
C-----BROADENED CROSS-SECTIONS.	SIG2308
1410 TEF=TEFF/293.0	SIG2309
DELTA=B.3177*SQRT ((TEF*E)/AWR)	SIG2310
C CONTINUE	SIG2311
GO TO (1121,1122),JFLAGI	SIG2312
1121 CALL GRID(E,DELTA,NTAB,XTAB)	SIG2313
32 FORMAT(2X,11E11,4)	SIG2314
CALL GREAT2(DOPPLER,FINT,NTAB,NTAB,ERROR,IERR)	SIG2315
PRINT20,E,FINT,JFLAG(I)	SIG2316
IF(IERR.EQ.1)PRINT31	SIG2317
GO TO 109	SIG2318
1122 CALL GAUSS(E,DELTA,DOPE)	SIG2319
PRINT20,E,DOPE,JFLAG(I)	SIG2320
109 CONTINUE	SIG2321
IF(IFLAG)1117,125,1117	SIG2322
1117 J4=J4+1	SIG2323
IF(NTOTAL=J4)125,1250,117	SIG2324
1250 E1=ERAN(1,J4)	SIG2325
G1=ERAN(2,J4)	SIG2326
GO TO 1116	SIG2327
125 CONTINUE	SIG2328
124 CONTINUE	SIG2329
120 CONTINUE	SIG2330
130 CALL EXIT	SIG2331
END	SIG2332
SUBROUTINE QIKS (MM,NN,MOVE,COMPAR)	QIKS0010
COIKS ALL-IN-MEMORY SORT PROGRAM	QIKS0020
C MM = FIRST SUBSCRIPT	QIKS0030
C NN = LAST SUBSCRIPT (ARRAY IS IN COMMON)	QIKS0040
C MOVE AND COMPARE ARE USER SUPPLIED PROGRAMS	QIKS0050
DIMENSION MSAVE(20),NSAVE(20)	QIKS0060
KEYLOC(M,N)=(N+M)/2	QIKS0070
I=0	QIKS0080
J=0	QIKS0090
LEVEL = 0	QIKS0100
M=MM	QIKS0110
N=NN	QIKS0120
35 CONTINUE	QIKS0130
C TEST FOR ONE OF TWO ITEMS	QIKS0140
IF(N-M-1) 31,51,32	QIKS0150
C 32 CONTINUE	QIKS0160
C PARTITION AND SPREADER GO HERE. SEE BELOW. RETURN IS TO 8	QIKS0170
C PUSH DOWN	QIKS0180
8 LEVEL=LEVEL+1	QIKS0190
C WORK ON SMALLEST PORTION	QIKS0200

```

      IF ((J-M) = (N-I)) 134, 134, 34
134  NSAVE(LEVEL) = I
      NSAVE(LEVEL)=N
      N=J
      GO TO 35
34  NSAVE(LEVEL)=M
      NSAVE(LEVEL)=J
      M=I
      GO TO 35
51  IF (COMPAR(M,N))31,31,131
C   SNAP IF ONLY TWO ITEMS ARE OUT OF ORDER
131  CALL MOVE(M,0)
      CALL MOVE(N,M)
      CALL MOVE(0,N)
31  IF (LEVEL) 151, 150, 151
150  RETURN
C   POP UP
151  M = NSAVE(LEVEL)
      N=NSAVE(LEVEL)
      LEVEL=LEVEL-1
      GO TO 35
C   END MAIN
C   PARTITION
32  I=M
      J=N
      KEY=KEYLOC(M,N)
      CALL MOVE(KEY,0)
54  IF (N = KEY) 17, 1, 27
17  CALL MOVE(N,KEY)
1  CONTINUE
C   HOLE AT BOTTOM
      IF (COMPAR(0,I))3,2,2
2  I=I+1
      IF (I = J) 1, 4, 1
3  CALL MOVE(I,J)
      GO TO 5
6  CONTINUE
C   HOLE AT TOP
      IF (COMPAR(0,J))5,5,7
5  J=J-1
      IF (I = J) 6, 4, 6
7  CALL MOVE(J,I)
      GO TO 2
4  CONTINUE
C   SPREADER GOES HERE
C   END PARTITION
C   SPREADER
4  CALL MOVE(0,I)
12  IF (I = N) 110, 10, 110
110  I = I + 1
      IF (COMPAR(0,I))10,12,10
10  IF (J = N) 100, 8, 100
100  J = J + 1
      IF (COMPAR(0,J))8,10,0
C   8 CONTINUE
C   RETURN TO MAIN PROGRAM
      END
      SUBROUTINE MOV(I,J)
      COMMON/D/ERAN(2,501)
      I1=I
      J1=J

```

```

OIKS0210
OIKS0220
OIKS0230
OIKS0240
OIKS0250
OIKS0260
OIKS0270
OIKS0280
OIKS0290
OIKS0300
OIKS0310
OIKS0320
OIKS0330
OIKS0340
OIKS0350
OIKS0360
OIKS0370
OIKS0380
OIKS0390
OIKS0400
OIKS0410
OIKS0420
OIKS0430
OIKS0440
OIKS0450
OIKS0460
OIKS0470
OIKS0480
OIKS0490
OIKS0500
OIKS0510
OIKS0520
OIKS0530
OIKS0540
OIKS0550
OIKS0560
OIKS0570
OIKS0580
OIKS0590
OIKS0600
OIKS0610
OIKS0620
OIKS0630
OIKS0640
OIKS0650
OIKS0660
OIKS0670
OIKS0680
OIKS0690
OIKS0700
OIKS0710
OIKS0720
OIKS0730
OIKS0740
OIKS0750
OIKS0760
OIKS0770
MOV 001
MOV 002
MOV 003
MOV 004

```



```

      IF(I1.EQ,0)I1=701
      IF(J1.EQ,0)J1=701
      ERAN(1,J1)=ERAN(1,I1)
      ERAN(2,J1)=ERAN(2,I1)
      RETURN
      END
      SUBROUTINE MOVE(I,J)
      COMMON/C/EX(101),JFLAG(101)
      I1=I
      J1=J
      IF(I1.EQ,0)I1=101
      IF(J1.EQ,0)J1=101
      EX(J1)=EX(I1)
      JFLAG(J1)=JFLAG(I1)
      RETURN
      END
      FUNCTION KOM(I,J)
      COMMON/D/ERAN(2,501)
      I1=I
      J1=J
      IF(I1.EQ,0)I1=501
      IF(J1.EQ,0)J1=501
      EOM=ERAN(1,I1)-ERAN(2,J1)
      IF(EOM)100,101,102
100  KOM=-1
      GO TO 103
101  KOM=0
      GO TO 103
102  KOM=1
103  RETURN
      END
      FUNCTION KOME(I,J)
      COMMON/C/EX(101),JFLAG(101)
      I1=I
      J1=J
      IF(I1.EQ,0)I1=101
      IF(J1.EQ,0)J1=101
      EOX=EX(I1)-EX(J1)
      IF(EOX)100,101,102
100  KOME=-1
      GO TO 103
101  KOME=0
      GO TO 103
102  KOME=1
103  RETURN
      END
      SUBROUTINE SPINOR(S,L,XJ)
      TERM=0.0
      DENOM=0.0
      IF(S.EQ,0..AND.L.EQ,0)GO TO 100
      GO TO 101
C-----FOR S=0 AND S-WAVE RESONANCES SPINS ARE ALL KNOWN HENCE ONE NEEDS
C-----LEVEL-LEVEL INTERFERENCE.
101  IF(S.EQ,0,)GO TO 102
      GO TO 103
102  XJ=FLOAT (L)
      GO TO 110
103  XJ1=S*0.5
      XJ2=S*0.5
111  XL=FLOAT (L)
      IF(XJ1.GT,XL)GO TO 104

```

```

MOV 005
MOV 006
MOV 007
MOV 008
MOV 009
MOV 010
MOVE001
MOVE002
MOVE003
MOVE004
MOVE005
MOVE006
MOVE007
MOVE008
MOVE009
MOVE010
KOM 001
KOM 002
KOM 003
KOM 004
KOM 005
KOM 006
KOM 007
KOM 008
KOM 009
KOM 010
KOM 011
KOM 012
KOM 013
KOM 014
KOM 015
KOME001
KOME002
KOME003
KOME004
KOME005
KOME006
KOME007
KOME008
KOME009
KOME010
KOME011
KOME012
KOME013
KOME014
KOME015
SPNR001
SPNR002
SPNR003
SPNR004
SPNR005
SPNR006
SPNR007
SPNR008
SPNR009
SPNR010
SPNR011
SPNR012
SPNR013

```

GO TO 105	SPNR0131
104 TERM=TERM+XJ1*(2.0*XL+1.0)	SPNR014
DENOM=DENOM+(2.0*XL+1.0)	SPNR015
GO TO 106	SPNR016
105 TERM=TERM+XL*(2.0*XJ1+1.0)	SPNR017
DENOM=DENOM+(2.0*XJ1+1.0)	SPNR018
106 IF(XJ2.GT.XL)GO TO 107	SPNR019
GO TO 108	SPNR0191
107 TERM=TERM+XJ2*(2.0*XL+1.0)	SPNR020
DENOM=DENOM+(2.0*XL+1.0)	SPNR021
GO TO 109	SPNR022
108 TERM=TERM+XL*(2.0*XJ2+1.0)	SPNR023
DENOM=DENOM+(2.0*XJ2+1.0)	SPNR024
109 XJ=TERM/DENOM	SPNR025
GO TO 110	SPNR026
100 XJ=0.0	SPNR027
110 RETURN	SPNR028
END	SPNR029
SUBROUTINE GREAT2(F,FINT,XTAB,NTAB,ERROR,IERR)	GRT2001
C-----CARRY OUT CONVERGENCE INTEGRATION SCHEME USING UP TO 200 INTERVALS	GRT2002
C-----WHICH ARE THEN FURTHER SUBDIVIDED UNTIL CONVERGENCE OCCURS OR THE	GRT2003
C-----MAXIMUM ALLOWABLE NUMBER OF ITERATIONS IS EXCEEDED, THE SUBROUTINE	GRT2004
C-----ARGUMENTS ARE DEFINED AS FOLLOWS.....	GRT2005
C-----F =FUNCTION TO BE INTEGRATED.	GRT2006
C-----FINT =THE RESULTING INTEGRAL	GRT2007
C-----XTAB =TABLE OF ORDINATES (INTEGRATION INTERVAL IS FROM XTAB(1) TO	GRT2008
C-----XTAB(NTAB))	GRT2009
C-----NTAB =THE LENGTH OF THE XTAB TABLE (NUMBER OF ORDINATES).	GRT2010
C-----ERROR =ALLOWABLE NORMAL ERROR.	GRT2011
C-----IERR =ERROR INDICATOR SET TO ZERO IF METHOD CONVERGES. SET TO	GRT2012
C-----ONE IF METHOD DOES NOT CONVERGE.	GRT2013
C-----ONE IF METHOD DOES NOT CONVERGE OR TABLE (XTAB) IS TOO LONG	GRT2014
DIMENSION XTAB(33),PARTS(33),GOOF(33),INTER(33)	GRT2015
C-----DEFINE THE MAXIMUM ALLOWABLE NUMBER OF ITERATIONS AND THE MAXIMUM	GRT2016
C-----TABLE LENGTH.	GRT2017
DATA JMAX,NTABMX/20,1000/	GRT2018
C-----DETERMINE IF TABLE IS TOO LONG	GRT2019
IF(NTAB.GT.NTABMX) GO TO 100	GRT2020
C-----CALL GENERAL INTEGRATION SUBROUTINE.	GRT2021
ZZZ=F(5.0)	GRT20211
CALL GREAT1(F,FINT,NTAB,JMAX,XTAB,PARTS,GOOF,INTER,ERROR,IERR)	GRT2022
RETURN	GRT2023
C-----TABLE IS TOO LONG.	GRT2024
100 IERR=1	GRT2025
FINT=0.0	GRT2026
RETURN	GRT2027
END	GRT2028
SUBROUTINE GREAT1(F,FINT,NTAB,JMAX,XTAB,PARTS,GOOF,INTER,ERROR,	GRT1001
1 IERR)	GRT1002
C-----CARRY OUT CONVERGENCE INTEGRATION SCHEME USING TRAPEZOIDAL RULE	GRT1003
C-----AND DOUBLING THE NUMBER OF REGIONS PER SUBINTERVAL FOR EACH	GRT1004
C-----ITERATION, ONLY DOUBLE UP IN THOSE INTERVALS THAT HAVE NOT ALREADY	GRT1005
C-----CONVERGED.	GRT1006
C-----F =SINGLE PRECISION FUNCTION TO BE INTEGRATED	GRT1007
C-----FINT =THE RESULTING INTEGRAL	GRT1008
C-----NTAB =NUMBER OF ORDINATES SUPPLIED (THERE ARE N-1 INTERVALS)	GRT1009
C-----JMAX =MAXIMUM ALLOWABLE NUMBER OF ITERATIONS	GRT1010
C-----XTAB =TABLE OF THE ORDINATE VALUES. RANGE OF INTEGRATION IS	GRT1011
C-----FROM XTAB(1) TO XTAB(NTAB)	GRT1012
C-----PARTS =ARRAY OF DIMENSION NTAB, EQUAL TO THE PARTIAL INTEGRALS	GRT1013
C-----OVER EACH OF THE NTAB-1 INTERVALS	GRT1014

C-----GOOF	=ARRAY OF DIMENSION NTAB, EQUAL TO THE NORMAL ERROR IN EACH	GRT1815
C-----	OF THE NTAB-1 INTERVAL.	GRT1816
C-----INTER	=ARRAY OF DIMENSION NTAB, SPECIFYING THE NUMBER OF	GRT1817
C-----	SUBINTERVALS IN EACH INTERVAL	GRT1818
C-----ERROR	=ACCEPTABLE NORMAL ERROR	GRT1819
C-----CIERR	=ERROR INDICATOR, SET TO ZERO IF METHOD CONVERGES, SET TO	GRT1820
C-----	ONE IF METHOD DOES NOT CONVERGE	GRT1821
C-----	DIMENSION XTAB(NTAB),PARTS(NTAB),INTER(NTAB),GOOF(NTAB)	GRT1822
C-----	INITIALIZE VALUE OF THE INTEGRAL	GRT1823
C-----	FINT=0.0	GRT1824
C-----	CALCULATE THE NUMBER OF INTERVALS	GRT1825
C-----	NM1=NTAB-1	GRT1826
C-----	CALCULATE ALLOWABLE ERROR PER INTERVAL	GRT1827
C-----	ERRN=ERROR/FLOAT(NM1)	GRT1828
C-----	INITIALIZE APPROXIMATION TO INTEGRAL	GRT1829
C-----	TOTAL=0.0	GRT1830
C-----	CALCULATE INITIAL APPROXIMATION	GRT1831
C-----	DO 10 I=1,NM1	GRT1832
C-----	INTER(I)=1	GRT1833
C-----	PARTS(I)=0.5*(XTAB(I+1)-XTAB(I))*((CIERR*XTAB(I+1))+CIERR*XTAB(I))	GRT1834
C-----	10 TOTAL=TOTAL+PARTS(I)	GRT1835
C-----	CALCULATE INITIAL ERRORS	GRT1836
C-----	DO 15 I=1,NM1	GRT1837
C-----	15 GOOF(I)=PARTS(I)	GRT1838
C-----	SET UP LOOP OVER ITERATIONS	GRT1839
C-----	DO 100 J=1,JMAX	GRT1840
C-----	SAVE LAST APPROXIMATION	GRT1841
C-----	TOTAL1=TOTAL	GRT1842
C-----	SET UP LOOP OVER INTERVALS	GRT1843
C-----	DO 20 I=1,NM1	GRT1844
C-----	CHECK FOR CONVERGENCE IN THIS INTERVAL	GRT1845
C-----	IF(ABS(GOOF(I)/TOTAL),LT,ERRN) GO TO 20	GRT1846
C-----	CALCULATE DOUBLE INTERVAL	GRT1847
C-----	DX=(XTAB(I+1)-XTAB(I))/FLOAT(INTER(I))	GRT1848
C-----	DOUBLE NUMBER OF STEPS	GRT1849
C-----	INTER(I)=2*INTER(I)	GRT1850
C-----	INITIALIZE CONTRIBUTION TO INTEGRAL	GRT1851
C-----	REST=0.0	GRT1852
C-----	II=INTER(I)	GRT1853
C-----	INITIALIZE ORDINATE	GRT1854
C-----	XNOW=XTAB(I)+0.5*DX	GRT1855
C-----	SET UP LOOP OVER ORDINATES	GRT1856
C-----	DO 30 K=1,II,2	GRT1857
C-----	REST=REST+F(XNOW)	GRT1858
C-----	30 XNOW=XNOW+DX	GRT1859
C-----	CALCULATE NEXT PARTIAL INTEGRAL	GRT1860
C-----	REST=0.5*(PARTS(I)+DX*REST)	GRT1861
C-----	ADD NEW PARTIAL INTEGRAL AND SUBTRACT OLD PARTIAL INTEGRAL	GRT1862
C-----	TOTAL=TOTAL+REST-PARTS(I)	GRT1863
C-----	CALCULATE NEW ERROR AND SET PARTIAL INTEGRAL TO NEW VALUE	GRT1864
C-----	GOOF(I)=REST-PARTS(I)	GRT1865
C-----	PARTS(I)=REST	GRT1866
C-----	20 CONTINUE	GRT1867
C-----	CHECK FOR CONVERGENCE	GRT1868
C-----	100 IF(ABS(1.-TOTAL1/TOTAL),LT,ERRN) GO TO 200	GRT1869
C-----	THE METHOD HAS NOT CONVERGED	GRT1870
C-----	FINT=TOTAL	GRT1871
C-----	CIERR=1	GRT1872
C-----	RETURN	GRT1873
C-----	THE METHOD HAS CONVERGED	GRT1874
C-----	200 FINT=TOTAL	GRT1875

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      IERR=0
      RETURN
      END
      SUBROUTINE GRID(Q,BELTA,NTAB,XTAB)
      COMMON ARRAY,IRAY,ERAY,NOT,ZAI,ABN,NER,LFW,EL,EH,LRU,LPF,LANG,NLS,
      1NRES,LN,JN,PENFAR,SHIFAR,SP1,AP,AHRI,AM,DREF,AREF,BREF,IRANGE,NIS,
      3INCROSS,IVSPIN,ELO,TEFF,DELTA,E,AWR
      DIMENSION ARAY(6,500),IRAY(3,500),ERAY(2,500),NOT(20),ZAI(10),
      1ABN(10),NER(10),LFW(10),EL(10,10),EH(10,10),LRU(10,10),LPF(10,10),
      2LANG(10,5,5),NLS(10,10),NRES(10),LN(50),JN(150),PENFAR(500),
      3SHIFAR(500),SP1(10),AP(10),AHRI(10),AM(10),DREF(6),AREF(6),BREF(6,
      410)
      DIMENSION XTAB(33)
      IGNORE=1
      N2=NTAB/2
      N21=N2+1
      N22=N2+2
      N3=NTAB-1
      XTAB(N21)=0
      DO 1410 I=N22,NTAB
      XTAB(I)=XTAB(I-1)*BELTA
      II=NTAB+1-I
      XTAB(II)=XTAB(II+1)*BELTA
1410 CONTINUE
      DO 1411 I=1,NTAB
      XTAB(I)=XTAB(I)
      IF(XTAB(I))1412,1412,1411
1412 IGNORE=0
1411 CONTINUE
      IF(IGNORE,EQ,0)GO TO 1413
      GO TO 1414
1413 XTAB(1)=1.0E-03
      DO 1415 I=1,N3
      II=I+1
      XTAB(II)=XTAB(I)*FLOAT(II)*DELTA
1415 CONTINUE
1414 RETURN
      END
      SUBROUTINE GAUSS(Q,BELTA,DOPE)
      COMMON ARRAY,IRAY,ERAY,NOT,ZAI,ABN,NER,LFW,EL,EH,LRU,LPF,LANG,NLS,
      1NRES,LN,JN,PENFAR,SHIFAR,SP1,AP,AHRI,AM,DREF,AREF,BREF,IRANGE,NIS,
      3INCROSS,IVSPIN,ELO,TEFF,DELTA,E,AWR
      DIMENSION ARAY(6,500),IRAY(3,500),ERAY(2,500),NOT(20),ZAI(10),
      1ABN(10),NER(10),LFW(10),EL(10,10),EH(10,10),LRU(10,10),LPF(10,10),
      2LANG(10,5,5),NLS(10,10),NRES(10),LN(50),JN(150),PENFAR(500),
      3SHIFAR(500),SP1(10),AP(10),AHRI(10),AM(10),DREF(6),AREF(6),BREF(6,
      410)
      DIMENSION ABC(9),WET(9)
      DATA ABC/=.3,1.9899320178153,=.2,2.6658058453184,-1.46855328921667,=.0,
      172355101875284,.0,0,0,7.2355101875284,1.46855328921667,2.24658058453,
      2184,.3,1.9899320178153/
      DATA WET/0,3.968697726326E-04,0,4.943624275537E-02,0,8.847452739438E-
      101,0,4.326515570026E+00,0,7.282352156061E+00,0,4.326515570026E+00,0,0,
      2047452739438E-01,0,4.943624275537E-02,0,3.968697726326E-04/
      DATA PHRT/1,772454/
      TEF=TEFF/293,0
      TERM=0,0
      DO 200 K=1,NIS
      T1=0,0
      XWR=AWR(K)
      BELTA=(0,3177E+00)*SQRT((0*TEF)/XWR)

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      CRT1076
      CRT1077
      CRT1078
      CR10801
      CR10802
      CR10803
      CR10804
      CR10805
      CR10806
      CR10807
      CR10808
      CR10809
      CR10810
      CR10811
      CR10812
      CR10813
      CR10814
      CR10815
      CR10816
      CR10817
      CR10818
      CR10819
      CR10820
      CR10821
      CR10822
      CR10823
      CR10824
      CR10825
      CR10826
      CR10827
      CR108271
      CR10828
      CR10829
      CR10830
      CR10831
      CR10832
      CR10833
      CR10834
      CAUS001
      CAUS002
      CAUS003
      CAUS004
      CAUS005
      CAUS006
      CAUS007
      CAUS008
      CAUS009
      CAUS010
      CAUS011
      CAUS012
      CAUS013
      CAUS014
      CAUS015
      CAUS016
      CAUS017
      CAUS018
      CAUS019
      CAUS020
      CAUS021
      CAUS022
      CAUS023

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	X=BELTA*ABC(9)	GAUS024
	IF(E-X)100,100,101	GAUS025
101	DO 102 I=1,9	GAUS026
	ABC1=ABC(I)	GAUS027
	WET1=WET(I)	GAUS028
	Z=E+ABC1*BELTA	GAUS029
	CALL SIGMA(2,IRANGE)	GAUS030
	T1=T1+BREF(INCROSS,K)*WET1	GAUS031
102	CONTINUE	GAUS032
	GO TO 110	GAUS033
100	T1=0,0	GAUS034
110	TERM=TERM+T1	GAUS035
200	CONTINUE	GAUS036
	DOPE=TERM/PHIRY	GAUS037
	RETURN	GAUS038
	END	GAUS039
	SUBROUTINE FACTS(Q,L,PF,SF,PS,CONSTE,BWR,BP,PLOD)	FACT001
C		FACT002
C	SUBROUTINE TO CALCULATE PENETRATION AND	FACT003
C	SHIFT FACTORS	FACT004
C	Q IS THE ENERGY L IS THE ANGULAR MOMENTUM PF PENETRATION FACTOR	FACT005
C	SF THE SHIFT FACTOR AND PS THE PHASE SHIFT AP IS R CONSTE IS KM	FACT006
C	FOR DETAILS OF FORMULAE SEE GREGSON ET AL AEEW-H517(MLBW)1965	FACT007
C		FACT008
	DATA WNEUT/1.008665/	FACT009
	EAB=ABS(Q)	FACT010
	CONHLD=2.196771E+03*BWR*SQRT(EAB)	FACT011
	CONSTE=CONHLD/(BWR+1.0)	FACT012
C----	SINCE AWR IS GIVEN WITH THE NEUTRON MASS AS UNITY WE ADD ONE ABOVE	FACT013
C----	TO CONVERT TO THE CENTER-OF-MASS SYSTEM	FACT014
	ROE=BP*CONSTE	FACT015
	S=FLOAT(L)	FACT016
	IF(L,LE,0)GO TO 100	FACT017
	GO TO(110,120,130,140,150),L	FACT018
100	PF=ROE	FACT019
	SF=0,0	FACT020
	IF(PLOD-LT,2,0) GO TO 160	FACT021
	PS=ROE	FACT022
	GO TO 170	FACT023
110	ROE2=ROE*ROE	FACT024
	DENOM=1.0+ROE2	FACT025
	PF=ROE2*ROE/DENOM	FACT026
	SF=-1.0/DENOM	FACT027
	IF(PLOD-LT,2,0) GO TO 160	FACT028
	PS=ROE-ATAN(ROE)	FACT029
	IF(PS/ROE-0.000001)160,170,170	FACT030
120	ROE2=ROE*ROE	FACT031
	ROE4=ROE2*ROE2	FACT032
	DENOM=3.0+ROE2+ROE4*0.0	FACT033
	PF=ROE4*ROE/DENOM	FACT034
	SF=-(1.0+3.0*ROE2)/DENOM	FACT035
	IF(PLOD-LT,2,0) GO TO 160	FACT036
	PS=ROE-ATAN(3.0*ROE/(3.0+ROE2))	FACT037
	IF(PS/ROE-0.000001)160,170,170	FACT038
130	ROE2=ROE*ROE	FACT039
	ROE4=ROE2*ROE2	FACT040
	ROE6=ROE4*ROE2	FACT041
	DENOM=225.0+45.0*ROE2+0.0*ROE4+ROE6	FACT042
	PF=ROE6*ROE/DENOM	FACT043
	SF=-(675.0+90.0*ROE2+0.0*ROE4)/DENOM	FACT044
	IF(PLOD-LT,2,0) GO TO 160	FACT045

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PS=ROE-ATAN ((15.0*ROE-ROE2*ROE)/(15.0-6.0*ROE2))
IF (PS/ROE-0.000001) 160,170,170
140 ROE2=ROE*ROE
   ROE4=ROE2*ROE2
   ROE6=ROE4*ROE2
   ROE8=ROE4*ROE4
   DENOM=11025.0+1575.0*ROE2+135.0*ROE4+10.0*ROE6+ROE8
   PF=ROE8*ROE/DENOM
   IF (PLOD.LT.2.0) GO TO 160
   SF=-(44100.0+4725.0*ROE2+270.0*ROE4+10.0*ROE6)/DENOM
   PS=ROE-ATAN ((105.0*ROE-10.0*ROE2*ROE)/(105.0-45.0
1*ROE2*ROE4))
   IF (PS/ROE-0.000001) 160,170,170
150 ROE2=ROE*ROE
   ROE4=ROE2*ROE2
   ROE6=ROE4*ROE2
   ROE8=ROE4*ROE4
   ROE10=ROE6*ROE4
   DENOM=893025.0+99225.0*ROE2+6300.0*ROE4+315.0*ROE6
1+15.0*ROE8+ROE10
   PF=ROE10*ROE/DENOM
   SF=4465125.0+396900.0*ROE2+18900.0*ROE4
1+630.0*ROE6+15.0*ROE8
   SF=-SF/DENOM
   IF (PLOD.LT.2.0) GO TO 160
   PS=ROE-ATAN ((945.0*ROE-ROE*(105.0*ROE2-ROE4))/(945.0-420.0*ROE2+
115.0*ROE4))
   IF (PS/ROE-0.000001) GO TO 170
160 PS=0.0
170 RETURN
END
SUBROUTINE ORDER(K,N1)
COMMON ARAY,IRAY,ERAY,NOT,ZAI,ABN,NER,LFH,EL,EH,LRU,LRF,LANG,NLS,
1NRES,LN,JN,PENFAR,SHIFAR,SP1,AP,AWR1,AM,DREF,AREF,BREF,IRANGE,NIS,
3INCROSS,1VSPIN,ELO,TEFF,DELTA,E,AWR
DIMENSION ARAY(6,500),IRAY(3,500),ERAY(2,500),NOT(20),ZAI(10),
1ABN(10),NER(10),LFH(10),EL(10,10),EH(10,10),LRU(10,10),LRF(10,10),
2LANG(10,5,5),NLS(10,10),NRES(10),LN(50),JN(150),PENFAR(500),
3SHIFAR(500),SP1(10),AP(10),AWR1(10),AM(10),DREF(6),AREF(6),BREF(6,
410)
IF (K-1) 2,2,3
2 NTR=0
  NUHL=0
  NUMJ=0
  NN=0
  MN=0
  JJ=0
  NC=0
  MC=0
3 NT=NTR+1
  NTR=NTR+N1
  OL=-0.9
6 OL=OL+1.0
  DO 101 N=NT,NTR
    TERM=FLOAT (IRAY(1,N))
    IF (OL-TERM) 101,101,0
9 NN=NN+1
  DO 100 J=1,6
    A=ARAY(J,N)
    ARAY(J,N)=ARAY(J,NN)
    ARAY(J,NN)=A

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FACT040
FACT047
FACT048
FACT049
FACT050
FACT051
FACT052
FACT053
FACT054
FACT055
FACT056
FACT057
FACT058
FACT059
FACT060
FACT061
FACT062
FACT063
FACT064
FACT065
FACT066
FACT067
FACT068
FACT069
FACT070
FACT071
FACT072
FACT073
FACT074
FACT075
FACT076
ORDR001
ORDR002
ORDR003
ORDR004
ORDR005
ORDR006
ORDR007
ORDR008
ORDR009
ORDR010
ORDR011
ORDR012
ORDR013
ORDR014
ORDR015
ORDR016
ORDR017
ORDR018
ORDR019
ORDR020
ORDR021
ORDR022
ORDR023
ORDR024
ORDR025
ORDR026
ORDR027
ORDR028
ORDR029
ORDR030

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100 CONTINUE	ORDR031
DO 1001 J=1,3	ORDR032
IA=IRAY(J,N)	ORDR033
IRAY(J,N)=IRAY(J,NN)	ORDR034
IRAY(J,NN)=IA	ORDR035
1001 CONTINUE	ORDR036
DO 1002 J=1,2	ORDR037
EA=ERAY(J,N)	ORDR038
ERAY(J,N)=ERAY(J,NN)	ORDR039
ERAY(J,NN)=EA	ORDR040
1002 CONTINUE	ORDR041
101 CONTINUE	ORDR042
IF(NN-NC)8,8,11	ORDR043
11 NUHL=NUHL+1	ORDR044
LN(NUHL)=NN-NC	ORDR045
NC=NN	ORDR046
NU=NT+LN(NUHL)-1	ORDR047
OM=8.25	ORDR048
14 OM=OM+8.5	ORDR049
DO 205 M=NT,NU	ORDR050
TERMJ=ARAY(2,M)	ORDR051
IF(OM-TERMJ)205,205,15	ORDR052
15 MM=MM+1	ORDR053
DO 204 J=1,6	ORDR054
A=ARAY(J,M)	ORDR055
ARAY(J,M)=ARAY(J,MM)	ORDR056
ARAY(J,MM)=A	ORDR057
204 CONTINUE	ORDR058
DO 2041 J=1,3	ORDR059
IA=IRAY(J,M)	ORDR060
IRAY(J,M)=IRAY(J,MM)	ORDR061
IRAY(J,MM)=IA	ORDR062
2041 CONTINUE	ORDR063
DO 2042 J=1,2	ORDR064
EA=ERAY(J,M)	ORDR065
ERAY(J,M)=ERAY(J,MM)	ORDR066
ERAY(J,MM)=EA	ORDR067
2042 CONTINUE	ORDR068
205 CONTINUE	ORDR069
IF(MM-MC)14,14,16	ORDR070
16 NUHJ=NUHJ+1	ORDR071
JN(NUHJ)=MM-MC	ORDR072
MC=MM	ORDR073
NT=NT+JN(NUHJ)	ORDR074
IF(NN-MM)17,17,14	ORDR075
17 IF(NT-NN)16,16,8	ORDR076
18 RETURN	ORDR077
END	ORDR078
FUNCTION DOPPLER(X)	DOPL001
COMMON ARAY,IRAY,ERAY,NOT,2A1,ABN,NER,LFW,EL,EH,LRU,LRF,LANG,NLS,	DOPL002
INRES,LN,JN,PENFAR,SHIFAR,SPI,AP,AHRI,AM,DREF,AREF,BREF,IRANGE,NIS,	DOPL003
INCROSS,IVSPIN,ELO,TEFF,DELTA,E,AWR	DOPL004
DIMENSION ARAY(6,500),IRAY(3,500),ERAY(2,500),NOT(20),2A1(10),	DOPL005
1ABN(10),NER(10),LFW(10),EL(10,10),EH(10,10),LRU(10,10),LRF(10,10),	DOPL006
2LANG(10,5,5),NLS(10,10),NRES(10),LN(50),JN(150),PENFAR(500),	DOPL007
3SHIFAR(500),SPI(10),AP(10),AHRI(10),AM(10),DREF(6),AREF(6),BREF(6,	DOPL008
410)	DOPL009
TEF=TEFF/293.8	DOPL010
TERM=0.0	DOPL011
CALL SIGMA(X,IRANGE)	DOPL012
DO 100 I=1,NIS	DOPL013

XWR=AHRI(1)	DOPL014
CELTA=(0.3177E+00)*SORT((TEF+E)/XWR)	DOPL015
Z=(E-X)/CELTA	DOPL016
Z2=Z*Z	DOPL017
T1=BREF(1NCROSS,1)*EXP(-Z2)/(CELTA*1.772454)	DOPL018
TERM=TERM+T1	DOPL019
100 CONTINUE	DOPL020
DOPPLER=TERM	DOPL021
RETURN	DOPL022
END	DOPL023
SUBROUTINE SIGMA(0,KK)	SIGM001
COMMON/E/XMIN(8),XMAX(6),XREF(6)	SIGM002
COMMON ARAY,IRAY,ERAY,NOT,ZAI,ABN,NER,LFW,EL,EH,LRU,LRF,LANG,NLS,	SIGM003
1NRES,LN,JN,PENFAR,SHIFAR,SPI,AP,AHRI,AH,DREF,AREF,BREF,IRANGE,NIS,	SIGM004
3INCROSS,IYSPIN,ELD,TEFF,DELTA,E,AWR	SIGM005
DIMENSION ARAY(6,500),IRAY(3,500),ERAY(2,500),NOT(20),ZAI(10),	SIGM006
1ABN(10),NER(10),LFW(10),EL(10,10),EH(10,10),LRU(10,10),LRF(10,10),	SIGM007
2LANG(10,5,5),NLS(10,10),NRES(10),LN(50),JN(150),PENFAR(500),	SIGM008
3SHIFAR(500),SPI(10),AP(10),AHRI(10),AH(10),DREF(6),AREF(6),BREF(6),	SIGM009
410)	SIGM010
PI=3.14159265359	SIGM011
DO 4 J=1,6	SIGM012
AREF(J)=0.0	SIGM013
DO 5 K=1,10	SIGM014
BREF(J,K)=0.0	SIGM015
5 CONTINUE	SIGM016
4 CONTINUE	SIGM017
TERROR=1.0E+03	SIGM018
L2=0	SIGM019
N2=0	SIGM020
LA=0	SIGM021
JA=0	SIGM022
NTR=0	SIGM023
DO 112 I=1,NIS	SIGM024
NRESI=NRES(I)	SIGM025
API=AP(I)	SIGM026
XWR=AHRI(I)	SIGM027
YWR=XWR*1.008665	SIGM028
YWR=YWR*(1.0/3.0)	SIGM029
APX=0.123*YWR+0.00	SIGM030
3 NTR=NTR+NRESI	SIGM031
IF(NRESI)110,110,100	SIGM032
100 LA=LA+1	SIGM033
102 L2=L2+LN(LA)	SIGM034
CALL FACTS(0,IRAY(1,L2),PF,SF,PX,CONSTE,XWR,APX,3.0)	SIGM035
CALL FACTS(0,IRAY(1,L2),PX,SK,PS,CONSTE,XWR,API,3.0)	SIGM036
SNGLN=0.0	SIGM037
SNGLC=0.0	SIGM038
SNGLF=0.0	SIGM039
SNNL2=0.0	SIGM040
103 JA=JA+1	SIGM041
104 N1=N2+1	SIGM042
N2=N2+JN(JA)	SIGM043
GJ=2.0*(2.0*SPI(I)+1.0)	SIGM044
GJ=(2.0*ARAY(2,N1)+1.0)/GJ	SIGM045
X=1.0	SIGM046
SPIN=ARAY(2,N1)	SIGM047
SPII=SPI(I)	SIGM048
CALL SPINOR(SPII,IRAY(1,L2),XSPIN)	SIGM049
ADDIF=ABS(XSPIN-SPIN)	SIGM050
IF(1YSPIN,EO,3)GO TO 120	SIGM051


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GO TO 116
116 IF(ABDIF,LT,TERROR)GO TO 117
GO TO 115
117 X=0.0
118 SNNK23=0.0
DO 100 K=N1,N2
GNK=PF*ARRAY(4,K)/PENFAR(K)
GK=GNK*ARRAY(5,K)*ARRAY(6,K)
ERDK=ARRAY(1,K)+((SHIFAR(K)-SF)*ARRAY(4,K))/(2.0*PENFAR(K))
ED=0-ERDK
OK=ED*ED*0.25*GK*GK
SNNK2=GNK*GNK*COS(2.0*PS)
SNNK2=SNNK2-2.0*GNK*(ARRAY(5,K)*ARRAY(6,K))*SIN(PS)*SIN(PS)
SNNK2=SNNK2+2.0*GNK*ED*SIN(2.0*PS)
SNNK2=SNNK2/OK
SNCK=GNK*ARRAY(9,K)/OK
SNFK=GNK*ARRAY(4,K)/OK
SNGLN=SNGLN+SNNK2*GJ
SNGLC=SNGLC+SNCK*GJ
SNGLF=SNGLF+SNFK*GJ
SNNK3=0.0
IF(K=N1)107,107,105
105 M1=K-1
DO 100 M=N1,M1
GNM=PF*ARRAY(4,M)/PENFAR(M)
GM=GNM*ARRAY(5,M)*ARRAY(6,M)
ERDM=ARRAY(1,M)+((SHIFAR(M)-SF)*ARRAY(4,M))/(2.0*PENFAR(M))
EDD=0-ERDM
OM=EOD*EOD*0.25*GM*GM
SNNM3=ED*EDD*0.25*GK*GM
SNNM3=SNNM3+2.0*GNK*GNM/(DM*OK)
SNNK3=SNNK3+SNNM3
106 CONTINUE
107 CONTINUE
SNNK23=SNNK23+SNNK2+SNNK3*0.1
108 CONTINUE
SNNL2=SNNL2+SNNK23*GJ
IF(L2=N2)109,109,103
109 BETA=PI*ABN(1)/(CONSTE*CONSTG)
AREF(1)=AREF(1)+SNGLN*BETA
AREF(2)=AREF(2)+SNGLC*BETA
AREF(3)=AREF(3)+SNGLF*BETA
AREF(4)=AREF(4)+BETA*(SNGLN+SNGLC+SNGLF)
AREF(5)=AREF(5)+SNNL2*BETA
AREF(6)=AREF(6)+BETA*(SNGLC+SNGLF+SNNL2)
BREF(1,1)=SNGLN*BETA+BREF(1,1)
BREF(2,1)=SNGLC*BETA+BREF(2,1)
BREF(3,1)=SNGLF*BETA+BREF(3,1)
BREF(4,1)=BETA*(SNGLN+SNGLC+SNGLF)+BREF(4,1)
BREF(5,1)=SNNL2*BETA+BREF(5,1)
BREF(6,1)=BETA*(SNGLC+SNGLF+SNNL2)+BREF(6,1)
IF(L2=NTR)100,110,110
110 SIGP=0.0
LRUJK=LRU(1,KK)
IF(LRUJK,1)1250,1250,125
1250 NLSKK=NLS(1,KK)
DO 126 LL=1,NLQKK
LURE=LANG(1,KK,LL)
SS=FLOAT(LURE)
CALL FACTS(0,LURE,PF,SF,PS,CONSTA,XMR,API,3.0)
TRM=(2.0*SS+1.0)*4.0*PI

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SIGM011
SIGM012
SIGM021
SIGM033
SIGM034
SIGM035
SIGM036
SIGM037
SIGM038
SIGM039
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SIGM105
SIGM106
SIGM107
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SIGM110
SIGM111
SIGM112
SIGM113
SIGM114
SIGM115
SIGM116
SIGM117
SIGM118
SIGM119
SIGM120

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TRM=TRM*SIN(PS)*SIN(PS)/(CONSTA*CONSTA)	SIGM121
SIGP=SIGP+TRM	SIGM122
126 CONTINUE	SIGM123
125 AREF(1)=AREF(1)+SIGP*ABN(1)	SIGM124
AREF(4)=AREF(4)+SIGP*ABN(1)	SIGM125
AREF(5)=AREF(5)+SIGP*ABN(1)	SIGM126
AREF(6)=AREF(6)+SIGP*ABN(1)	SIGM127
BREF(1,1)=BREF(1,1)+SIGP*ABN(1)	SIGM128
BREF(4,1)=BREF(4,1)+SIGP*ABN(1)	SIGM129
BREF(5,1)=BREF(5,1)+SIGP*ABN(1)	SIGM130
BREF(6,1)=BREF(6,1)+SIGP*ABN(1)	SIGM131
112 CONTINUE	SIGM132
RETURN	SIGM133
END	SIGM134
SUBROUTINE SIEVE(E1,G1,E2,G2,M,N,NX,BEFF,BWR)	SIEV001
COMMON/C/EX(101),JFLAG(101)	SIEV002
IF(E2.LT,E1)GO TO 101	SIEV003
GO TO 300	SIEV004
300 N2=2*N	SIEV005
DO 1000 I=1,100	SIEV006
JFLAG(I)=2	SIEV007
1000 CONTINUE	SIEV008
TEF=BEFF/203.0	SIEV009
DP=(1.3403E+00)*SORT (TEF/BWR)	SIEV010
WHEN MULTIPLIED BY SORT(E) OF GIVES 9 TIMES CORRESPONDING DELTA	SIEV011
DP1=DP*SORT(E1)	SIEV012
DP2=DP*SORT (E2)	SIEV013
DG1=G1/FLOAT (M)	SIEV014
DG2=G2/FLOAT (M)	SIEV015
EX(1)=E1	SIEV016
IF(G1.LT,DP1)GO TO 1001	SIEV017
GO TO 1002	SIEV018
1001 JFLAG(1)=1	SIEV019
1002 ENDF=ABS (E2-E1)	SIEV020
NX=1	SIEV021
DO 100 I=1,N	SIEV022
XX=E1-DG1*FLOAT (I)	SIEV023
IF(XX.LT,E2)GO TO 107	SIEV024
GO TO 100	SIEV025
107 NX=NX+1	SIEV026
EX(NX)=XX	SIEV027
IF(G1.LT,DP1)GO TO 1003	SIEV028
GO TO 100	SIEV029
1003 JFLAG(NX)=1	SIEV030
100 CONTINUE	SIEV031
DO 200 I=1,N	SIEV032
XX=E2-DG2*FLOAT (I)	SIEV033
IF(XX.GT,E1)GO TO 100	SIEV034
GO TO 200	SIEV035
100 NX=NX+1	SIEV036
EX(NX)=XX	SIEV037
IF(G2.LT,DP2)GO TO 1005	SIEV038
GO TO 200	SIEV039
1005 JFLAG(NX)=1	SIEV040
200 CONTINUE	SIEV041
110 DIFF=(E2-E1)/FLOAT (N2)	
IF(DIFF)101,102,102	
101 PRINT103	
PRINT2000,E1,E2,DIFF	
GO TO 104	
103 FORMAT(32H CALLING SEQUENCE OF SIEVE WRONG)	

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2000 FORMAT(4H E1=E13,6,4H E2=E13,6,6H DIFF=E13,0)
102 N21=NX+1
   NN=NX
   N22=N21+N2-2
   NX=N22
   E21=(E1+E2)/2.0
   DP12=DP+SQRT (E21)
   E43=E2-E1-((G1+G2)/2.0)
   IF(E43.LT,DP12)GO TO 1006
   GO TO 1007
1006 DO 111 I=N21,N22
   I2=I-NN
   EX(I)=E1-DIFF*FLOAT (I2)
   JFLAG(I)=1
111 CONTINUE
   GO TO 1040
1007 DO 112 I=N21,N22
   I2=I-NN
   EX(I)=E1-DIFF*FLOAT (I2)
   OPTEST=DP+SQRT (EX(I))
   IF(EX(I).LE,E21)GO TO 1000
   GO TO 1009
1008 IF(G1.LT,OPTEST)GO TO 1010
   GO TO 112
1010 JFLAG(I)=1
   GO TO 112
1009 IF(G2.LT,OPTEST)GO TO 1010
   GO TO 112
1011 JFLAG(I)=1
112 CONTINUE
1040 DO 113 I=1,NX
   DPF=DP+SQRT (EX(I))
   IF(DPF.EQ,0.0)GO TO 113
   TERM=EX(I)/DPF
   IF(TERM.LT,25.)GO TO 114
   GO TO 113
114 JFLAG(I)=1
113 CONTINUE
104 RETURN
END

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SIEVB42
SIEVB43
SIEVB44
SIEVB45
SIEVB46
SIEVB47
SIEVB48
SIEVB49
SIEVB50
SIEVB51
SIEVB52
SIEVB53
SIEVB54
SIEVB55
SIEVB56
SIEVB57
SIEVB58
SIEVB59
SIEVB60
SIEVB61
SIEVB62
SIEVB63
SIEVB64
SIEVB65
SIEVB66
SIEVB67
SIEVB68
SIEVB69
SIEVB70
SIEVB71
SIEVB72
SIEVB73
SIEVB74
SIEVB75

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SIGMA2 TEST, IRON DATA.

26856.E+8	55.36724E+8	0	358.	11	2	1.0E-4
26854.E+8	.0584E+8	0		8		4
4750.	100.E+3	1		2		1
	.6	0		0		8
53.4762	0.8	0		0		2
-15808.	.5E+8	5001.000	5000.		1.00	78
7.03E+3	.9E+8	1202.14	1200.E+8	2.14		
52.1 E+3	.5E+8	2100.E+8	2100.E+8		.3E+8	
71.9 E+3	.5E+8	1600.E+8	1600.E+8		.3E+8	
98.5 E+3	.5E+8	400.E+8	400.E+8		.3E+8	
102.6 E+3	.9E+8	1375.E+8	1375.E+8		.3E+8	
132. E+3	.5E+8	1600.E+8	1600.E+8		.3E+8	
147. E+3	.5E+8	1950.E+8	1950.E+8		.3E+8	
173. E+3	.5E+8	4000.E+8	4000.E+8		.3E+8	
186.5 E+3	.9E+8	30000.E+8	30000.E+8		.3E+8	
245. E+3	.9E+8	13000.E+8	13000.E+8		.3E+8	
330. E+3	.9E+8	2750.E+8	2750.E+8		.3E+8	
378. E+3	.5E+8	3000.E+8	3000.E+8		.3E+8	
53.4762	.5	1	0		12	
9488.	.5	2.04	1.04		1.0	
14400.	.5	2.83	1.13		1.0	
26856.E+8	.9160E+8	0	0		1	
4750.	100.E+3	1	2		0	
	.60E+8	0	0		2	
55.4544	0.8	0	0		98	
-4020.	.5	576.01	575.		1.01	
27708.	.5	1401.44	1420.		1.44	
74. E+3	.5E+8	425.E+8	425.E+8		1.E+8	
83.4 E+3	.5E+8	1000.E+8	1000.E+8		1.E+8	
123.5 E+3	.5E+8	150.E+8	150.E+8		1.E+8	
130. E+3	.5E+8	500.E+8	500.E+8		1.E+8	
141.3 E+3	.5E+8	2300.E+8	2300.E+8		1.E+8	
169. E+3	.5E+8	400.E+8	400.E+8		1.E+8	
188. E+3	.5E+8	3100.E+8	3100.E+8		1.E+8	
220. E+3	.5E+8	1300.E+8	1300.E+8		1.E+8	
243.5 E+3	.5E+8	300.E+8	300.E+8		1.E+8	
273. E+3	.5E+8	3500.E+8	3500.E+8		1.E+8	
315. E+3	.5E+8	5500.E+8	5500.E+8		1.E+8	
360. E+3	.5E+8	9300.E+8	9300.E+8		1.E+8	
382. E+3	.5E+8	10000.E+8	10000.E+8		1.E+8	
55.4544	0.8	1	0			
1150.	.5	816	832			
2350.	.5	1.0004	1.000			
11200.	1.5	1.012	1.012			
22700.	1.5	1.1055	1.1055			
34100.	1.5	2.148	2.148			
36600.	.5	1.43	1.43			
38300.	1.5	1.290	1.290			
45000.	.5	2.101	2.101			
51900.	.5	2.005	2.005			
53300.	1.5	2.33	2.33			
55000.	.5	8.0127	8.0127			
59000.	.5	0.76	0.76			
26857.E+8	.021700E+8	0	0			
4750.	100.E+3	1	2			
	.6	0	0			
56.4463	.5	0.8	0.8			
3900.	0.8	2.013	2.013			
6300.	1.0	4.0300	4.0300			
20600.	0.7	3.005	3.005			

0
0
0
0
10

2

0
0
0
15

40500.	0.	2516.03	2516.	.03	
45500.	1.	269.83	269.	.03	
56.4463	0.0		1	.48	0
1630.	0.	1.08	.25	.03	
4750.	0.	1.080	.256	.03	
7220.	1.	1.753	.923	.03	
7980.	1.	1.140	.316	.03	
12800.	2.	1.336	.576	.03	
13980.	2.	2.426	.776	1.65	
18880.	1.	2.71	1.06	1.65	
21300.	1.	0.92	1.92	5.	
26050.E+0	.0031E+0		0	1	0
4750.	120.E+3		1	2	0
0.E+0	.60E+0		0	0	0
57.4356	0.0		0	0	1
-600.	.5	3.57	2.57	1.00	
57.4356	0.0	1	0	12	2
230.	.5	1.00654	.00654	1.	
359.	.5	1.0173	.0173	1.	

TITLE SIGMA2 TEST, IRON DATA,

(2,A) DESIGNATION OF THE ELEMENT 2.6056E+04 AT.WT/MASS OF NEUTRON 5.5367E+01 NO OF ISOTOPES 4

DATA FOR ISOTOPE NUMBER 1

(2,A) DESIGNATION OF THE ISOTOPE 2.6054E+04 FRACTIONAL ABUNDANCE 5.6400E-02 NO OF ENERGY RANGES 1
 LOWER LIMIT OF THE ENERGY RANGE(KEV) 4.7500E+03 UPPER LIMIT(KEV) 1.0000E+05 LRU= 1 LRF= 2
 NUCLEAR SPIN 0.0000E+00 SCATTERING LENGTH 6.0000E-01 NO OF L-VALUES 2
 MASS OF THE ISOTOPE IN UNITS OF NEUTRON MASS 5.3476E+01 SCATTERING LENGTH(A=) 0.0000E+00 ANGULAR MOMENTUM 0 NO OF RESONANCES 10

ERES	SPIN	GTOY	GN	GGAMMA	GP
1.5000E+04	5.0000E-01	0.0010E+03	5.0000E+03	1.0000E+00	0.0000E+00
7.8300E+03	5.0000E-01	1.2022E+03	1.2000E+03	0.1400E+00	0.0000E+00
5.2100E+04	5.0000E-01	2.1000E+03	2.1000E+03	3.0000E-01	0.0000E+00
7.1900E+04	5.0000E-01	1.4000E+03	1.4000E+03	3.0000E-01	0.0000E+00
9.8500E+04	5.0000E-01	4.0000E+02	4.0000E+02	3.0000E-01	0.0000E+00
1.0260E+05	5.0000E-01	1.3750E+03	1.3750E+03	3.0000E-01	0.0000E+00
1.3200E+05	5.0000E-01	1.0000E+03	1.0000E+03	3.0000E-01	0.0000E+00
1.4700E+05	5.0000E-01	1.9500E+03	1.9500E+03	3.0000E-01	0.0000E+00
1.7300E+05	5.0000E-01	4.0000E+03	4.0000E+03	3.0000E-01	0.0000E+00
1.8850E+05	5.0000E-01	3.0000E+04	3.0000E+04	3.0000E-01	0.0000E+00
2.4500E+05	5.0000E-01	1.3000E+04	1.3000E+04	3.0000E-01	0.0000E+00
3.3000E+05	5.0000E-01	2.7500E+03	2.7500E+03	3.0000E-01	0.0000E+00
3.7000E+05	5.0000E-01	3.0000E+03	3.0000E+03	3.0000E-01	0.0000E+00

MASS OF THE ISOTOPE IN UNITS OF NEUTRON MASS 5.3470E+01 SCATTERING LENGTH(A=) 0.0000E+00 ANGULAR MOMENTUM 1 NO OF RESONANCES 2

ERES	SPIN	GTOY	GN	GGAMMA	GP
9.4000E+03	5.0000E-01	2.0400E+00	1.0400E+00	1.0000E+00	0.0000E+00
1.4400E+04	5.0000E-01	2.1300E+00	1.1300E+00	1.0000E+00	0.0000E+00

DATA FOR ISOTOPE NUMBER 2

(2,A) DESIGNATION OF THE ISOTOPE 2.6056E+04 FRACTIONAL ABUNDANCE 9.1600E-01 NO OF ENERGY RANGES 1

LOWER LIMIT OF THE ENERGY RANGE(EV) 2.6057E+04 FRACTIONAL ABUNDANCE 2.3700E+02 NO OF ENERGY RANGES 3
 NUCLEAR SPIN 5.0000E+01 SCATTERING LENGTH(1/EV) 4.7500E+03 UPPER LIMIT(EV) 1.0000E+05 LRP 2
 MASS OF THE ISOTOPE IN UNITS OF NEUTRON MASS 5.6446E+01 SCATTERING LENGTH(A) 0.0000E+00 ANGULAR MOMENTUM 0 NO OF RESONANCES 10

ERES	SPIN	GTOT	GN	GGAMMA	GF
1.1500E+03	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
2.7700E+04	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
7.4000E+04	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
8.3600E+04	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
1.2350E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
1.3000E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
1.4130E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
1.4600E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
1.8000E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
2.2000E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
2.4350E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
2.7300E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
3.1500E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
3.6000E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
3.6200E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00

MASS OF THE ISOTOPE IN UNITS OF NEUTRON MASS 5.6446E+01 SCATTERING LENGTH(A) 0.0000E+00 ANGULAR MOMENTUM 0 NO OF RESONANCES 10

ERES	SPIN	GTOT	GN	GGAMMA	GF
1.1500E+03	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
2.7700E+04	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
7.4000E+04	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
8.3600E+04	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
1.2350E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
1.3000E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
1.4130E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
1.4600E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
1.8000E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
2.2000E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
2.4350E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
2.7300E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
3.1500E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
3.6000E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
3.6200E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00

DATA FOR ISOTOPE NUMBER 3

(2.1A) DESIGNATION OF THE ISOTOPE 2.6057E+04 FRACTIONAL ABUNDANCE 2.3700E+02 NO OF ENERGY RANGES 3
 LOWER LIMIT OF THE ENERGY RANGE(EV) 4.7500E+03 UPPER LIMIT(EV) 1.0000E+05 LRP 2
 NUCLEAR SPIN 5.0000E+01 SCATTERING LENGTH(1/EV) 4.7500E+03
 MASS OF THE ISOTOPE IN UNITS OF NEUTRON MASS 5.6446E+01 SCATTERING LENGTH(A) 0.0000E+00 ANGULAR MOMENTUM 0 NO OF RESONANCES 5

ERES	SPIN	GTOT	GN	GGAMMA	GF
1.1500E+03	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
2.7700E+04	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
7.4000E+04	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
8.3600E+04	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
1.2350E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
1.3000E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
1.4130E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
1.4600E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
1.8000E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
2.2000E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
2.4350E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
2.7300E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
3.1500E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
3.6000E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00
3.6200E+05	5.0000E+01	5.0000E+01	5.0000E+01	1.0000E+00	0.0000E+00

6.3000E+03 1.0000E+00 4.6373E+02 4.0000E+02 8.7300E+00 0.0000E+00
 2.0000E+04 1.0000E+00 3.0000E+03 3.0000E+03 5.0000E+00 0.0000E+00
 4.0000E+04 0.0000E+00 2.0160E+03 2.0160E+03 0.3000E+01 0.0000E+00
 4.5500E+04 1.0000E+00 2.6985E+02 2.6985E+02 0.3000E+01 0.0000E+00

MASS OF THE ISOTOPE IN UNITS OF NEUTRON MASS 5.0446E+01 SCATTERING LENGTH(A=) 0.0000E+00 ANGULAR MOMENTUM 0

ERES SPIN GYOT GN GGAMMA GP
 1.6300E+03 0.0000E+00 1.0000E+00 2.5000E+01 0.3000E+01 0.0000E+00
 4.7500E+03 0.0000E+00 1.0000E+00 2.5000E+01 0.3000E+01 0.0000E+00
 7.2200E+03 1.0000E+00 1.7535E+00 9.2300E+01 0.3000E+01 0.0000E+00
 7.0000E+03 1.0000E+00 1.1400E+00 8.3000E+01 0.3000E+01 0.0000E+00
 1.2000E+04 2.0000E+00 1.3300E+00 5.0000E+01 0.3000E+01 0.0000E+00
 1.3900E+04 2.0000E+00 2.4200E+00 7.7600E+01 0.3000E+01 0.0000E+00
 2.0000E+04 3.0000E+00 2.7100E+00 1.0000E+02 0.3000E+01 0.0000E+00
 2.1300E+04 3.0000E+00 0.0000E+00 1.0000E+02 0.3000E+01 0.0000E+00

DATA FOR ISOTOPE NUMBER 4

(2,1) DESIGNATION OF THE ISOTOPE 2.0000E+04 FRACTIONAL ABUNDANCE 3.1000E+03 NO OF ENERGY RANGES 1
 LOWER LIMIT OF THE ENERGY RANGE(EV) 4.7500E+03 UPPER LIMIT(EV) 1.0000E+05 LRU= 1 LRU= 2
 NUCLEAR SPIN 0.0000E+00 SCATTERING LENGTH 6.0000E-01 NO OF L-VALUES 2
 MASS OF THE ISOTOPE IN UNITS OF NEUTRON MASS 5.7436E+01 SCATTERING LENGTH(A=) 0.0000E+00 ANGULAR MOMENTUM 0 NO OF RESONANCES 3

ERES SPIN GYOT GN GGAMMA GP
 0.0000E+02 5.0000E+01 3.0700E+00 2.0700E+00 1.0000E+00 0.0000E+00

MASS OF THE ISOTOPE IN UNITS OF NEUTRON MASS 5.7436E+01 SCATTERING LENGTH(A=) 0.0000E+00 ANGULAR MOMENTUM 2

ERES SPIN GYOT GN GGAMMA GP
 2.3000E+02 5.0000E+01 1.0000E+00 0.3400E+03 1.0000E+00 0.0000E+00
 3.3000E+02 5.0000E+01 1.0175E+00 2.7300E+02 1.0000E+00 0.0000E+00

CROSS-SECTIONS AT THERMAL ENERGY

NEUTRON ENERGY(EV) SIGNN SIGCAP SIGP SIGY SIGNNNULY SIGNHULY
 2.5000E+02 1.30035E+01 2.50312E+00 0.000000E+00 1.000047E+01 1.15735E+01 1.30066E+01

NEUTRON ENERGY (EV)	SIGNN	SIGCAP	SIGF	SIGT	SIGNNMULT	SIGTMULT
4.750000E+03	6.700210E+00	5.590099E-01	0.000000E+00	7.346115E+00	5.693567E+00	6.233464E+00
4.900000E+03	6.502024E+00	5.413977E-03	0.000000E+00	6.580330E+00	5.423033E+00	5.437797E+00
5.133000E+03	6.466435E+00	5.974322E-03	0.000000E+00	6.72119E+00	5.438674E+00	5.450649E+00
5.213300E+03	6.461200E+00	6.344211E-03	0.000000E+00	6.672608E+00	5.433503E+00	5.450040E+00
5.225000E+03	6.501146E+00	6.971742E-03	0.000000E+00	6.590110E+00	5.578991E+00	5.579563E+00
5.632700E+03	7.276019E+00	1.642974E-02	0.000000E+00	7.292449E+00	6.323510E+00	6.339940E+00
5.912500E+03	7.694269E+00	2.830127E-02	0.000000E+00	7.714575E+00	6.708333E+00	6.708459E+00
6.066135E+03	9.350335E+00	5.438011E-02	0.000000E+00	9.384944E+00	8.44000E+00	8.478300E+00
6.308000E+03	1.367604E+01	0.211322E-02	0.000000E+00	1.373978E+01	1.222778E+01	1.250993E+01
6.530000E+03	1.357094E+01	3.518022E-02	0.000000E+00	1.157447E+01	1.813309E+01	1.810627E+01
6.533045E+03	1.151664E+01	3.497635E-02	0.000000E+00	1.155362E+01	1.811221E+01	1.814719E+01
6.765000E+03	1.840049E+01	2.129222E-02	0.000000E+00	1.842218E+01	9.816790E+00	9.830891E+00
6.763730E+03	3.8049140E+01	2.120134E-02	0.000000E+00	3.842268E+01	9.816790E+00	9.830891E+00
6.990000E+03	3.129585E+01	3.964597E-02	0.000000E+00	3.131545E+01	9.952143E+00	9.971709E+00
7.21247E+03	3.416031E+01	5.259774E-01	0.000000E+00	3.440628E+01	1.200419E+01	1.331217E+01
7.219123E+03	3.467804E+01	7.659346E-01	0.000000E+00	3.54917E+01	1.308493E+01	1.485347E+01
7.220000E+03	3.55366E+01	1.53083E+00	0.000000E+00	3.707590E+01	1.426337E+01	1.508221E+01
7.22276E+03	3.478016E+01	7.685190E-01	0.000000E+00	3.45917E+01	1.343520E+01	1.421500E+01
7.221733E+03	3.421574E+01	3.260000E-01	0.000000E+00	3.454163E+01	1.294327E+01	1.346936E+01
7.22520E+03	3.480368E+01	5.791072E-02	0.000000E+00	3.484159E+01	1.27365E+01	1.272561E+01
7.325000E+03	1.657625E+01	3.260824E-01	0.000000E+00	1.668398E+01	1.548332E+01	1.543897E+01
7.325000E+03	1.990824E+01	5.202935E-02	0.000000E+00	2.322187E+01	1.548332E+01	1.543897E+01
7.677500E+03	2.331314E+01	5.711650E-02	0.000000E+00	2.327425E+01	1.89498E+01	1.922773E+01
7.800000E+03	2.513752E+01	3.810035E-02	0.000000E+00	2.522187E+01	2.32919E+01	2.262631E+01
7.847500E+03	2.519089E+01	3.79083E-02	0.000000E+00	2.523488E+01	2.473374E+01	2.477183E+01
7.865000E+03	2.52220E+01	5.79163E-02	0.000000E+00	2.526061E+01	2.480755E+01	2.48579E+01
7.882500E+03	2.52220E+01	3.85124E-02	0.000000E+00	2.525453E+01	2.491332E+01	2.495183E+01
7.98034E+03	2.52633E+01	2.58665E-01	0.000000E+00	2.522718E+01	2.49001E+01	2.54807E+01
7.99927E+03	2.53018E+01	5.916925E-01	0.000000E+00	2.597799E+01	2.511500E+01	2.578750E+01
7.99800E+03	2.53937E+01	1.146631E+00	0.000000E+00	2.574499E+01	2.532708E+01	2.617378E+01
7.98805E+03	2.53865E+01	5.91674E-01	0.000000E+00	2.597772E+01	2.51576E+01	2.570744E+01
7.98146E+03	2.52379E+01	2.580100E-01	0.000000E+00	2.591611E+01	2.49881E+01	2.524603E+01
8.295000E+03	1.921420E+01	2.255651E-02	0.000000E+00	1.923683E+01	1.935329E+01	1.975504E+01
8.698000E+03	1.336321E+01	3.20851E-02	0.000000E+00	1.337551E+01	3.31003E+01	1.332203E+01
9.085000E+03	3.82025E+01	7.804440E-03	0.000000E+00	3.821533E+01	3.804417E+01	1.805125E+01
9.477600E+03	1.86211E+01	0.359735E-01	0.000000E+00	1.816405E+01	9.808470E+00	9.924655E+00
9.400000E+03	3.278991E+01	4.164793E+00	0.000000E+00	3.798485E+01	3.838167E+01	3.240541E+01
9.40200E+03	1.862400E+01	2.603611E+00	0.000000E+00	1.870927E+01	1.254779E+01	1.671250E+01
9.48240E+03	9.32309E+00	3.36825E-01	0.000000E+00	1.278962E+01	1.808520E+01	1.240001E+01
9.910000E+03	7.315977E+00	3.245635E-01	0.000000E+00	7.15992E+00	9.83084E+00	9.919071E+00
1.033400E+04	6.833459E+00	2.42199E-03	0.000000E+00	6.59587E+00	6.24869E+00	6.248491E+00
1.11900E+04	5.662268E+00	1.86280E+00	0.000000E+00	7.32506E+00	5.671969E+00	5.673090E+00
1.119949E+04	5.721642E+00	4.654780E+00	0.000000E+00	6.37634E+01	5.390990E+00	1.82470E+01
1.12000E+04	5.831645E+00	9.308775E+00	0.000000E+00	1.137348E+01	5.390990E+00	1.82470E+01
1.120951E+04	5.736932E+00	4.654801E+00	0.000000E+00	1.13948E+01	5.479932E+00	1.478771E+01
1.12102E+04	5.673472E+00	1.862977E+00	0.000000E+00	1.839182E+01	5.35189E+00	1.804800E+01
1.16000E+04	5.32137E+00	1.382435E-03	0.000000E+00	7.36444E+00	5.32178E+00	7.184709E+00
1.20000E+04	5.0603725E+00	1.214665E-03	0.000000E+00	5.322959E+00	4.965201E+00	4.966664E+00
1.24500E+04	4.839637E+00	1.69804E-03	0.000000E+00	4.846765E+00	4.704132E+00	4.707347E+00
1.27066E+04	4.803667E+00	2.698693E-03	0.000000E+00	4.846765E+00	4.493155E+00	4.484254E+00
1.279933E+04	5.048263E+00	6.73336E-01	0.000000E+00	5.721299E+00	4.49918E+00	4.739770E+00
1.28000E+04	5.46820E+00	1.345802E+00	0.000000E+00	6.56640E+00	4.65249E+00	5.38504E+00
					5.166520E+00	6.432362E+00

[illegible]

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101 CONTINUE
    NTOTAL=J1-1
    PHI=3.14159265359
    3 FORMAT(2E11,4,4I11)
    4 FORMAT(6E11,4)
    5 FORMAT(8E11,4,3I10)
    6 FORMAT(2X,2E11,4)
    7 FORMAT(76H NEUTRON ENERGY(EV)      SIGN      SECOND      316
    1F      S(TOTAL)
    8 FORMAT(2X,7E13,6)
    9 FORMAT(18X,2E20,6)
    10 FORMAT(20H ERROR IN INPUT DATA)
    11 FORMAT(18X,2I10)
    12 FORMAT(18X,6I10)
    16 FORMAT(15H NEUTRON ENERGY(E13,6)
    14 FORMAT(53H CROSS-SECTIONS CALCULATED WITHOUT DOPPLER BROADENING)
    15 FORMAT(58H CROSS-SECTIONS CALCULATED WITH DOPPLER BROADENING)
    17 FORMAT(33H (2,A) DESIGNATION OF THE ELEMENTE11,4,22H AT. WT/MASS OF
    1 NEUTRONE11,4,15H NO OF ISOTOPEE15)
    18 FORMAT(24H DATA FOR ISOTOPE NUMBERI5)
    19 FORMAT(33H (2,A) DESIGNATION OF THE ISOTOPEE11,4,21H FRACTIONAL AB
    1UNDANCEE11,4,20H NO OF ENERGY RANGEI5)
    20 FORMAT(36H LOWER LIMIT OF THE ENERGY RANGE(EV)E11,4,16H UPPER L
    1MIT(EV)E11,4,6H LRU=15,6H LRF=15)
    21 FORMAT(13H NUCLEAR SPINE11,4,18H SCATTERING LENGTHE11,4,15H NO OF
    1L-VALUEI5)
    22 FORMAT(49H MASS OF THE ISOTOPE IN UNITS OF NEUTRON MASSE11,4,22H S
    1CATTERING LENGTH(A=)E11,4,17H ANGULAR MOMENTUMI5,17H NL IF RESONAN
    2CESI5)
    23 FORMAT(84H      ERES      SPIN      GN      CGANNA
    1      GFA      GFD)
    24 FORMAT(11H TITLE      7A4)
    25 FORMAT(//)
    26 FORMAT(6(2X,E11,4,2X))
    27 FORMAT(33H CROSS-SECTIONS AT THERMAL ENERGY)
    28 FORMAT(2X,2E20,6,110)
    29 FORMAT(2X,4E11,4)
    30 FORMAT(22H EFFECTIVE TEMPERATUREE15,1,41H IN DEGREES KELVIN, NO
    1OF PIVOT POINTSI5,18H CONVERGENCE ERRORE15,4,13H AND (NCROSS=15)
    31 FORMAT(54H THE INTEGRAL FOR DOPPLER BROADENING DOES NOT CONVERGE)
    33 FORMAT(126H1 PROGRAM      RAMP2.      PROGRAM TO CALCULATE CROSS-SECTI
    1ONS ACCORDING TO THE REICH-MOORE FORMALISM. USES ENDF60 VERSION 11
    2 DATA)
C-----THIS IS WHERE RESONANCES OF EACH ISOTOPE ARE ARRANGED IN INCREASING
C-----G ORDER IN L AND FOR EACH L IN INCREASING ORDER IN J.
    DO 133 I=1,NIS
    NRES1=NRES(I)
    CALL ORDER(I,NRES1)
133 CONTINUE
    13 FORMAT(10I10)
    NCOUNT=1
    DO 1330 I=1,NIS
    XWR=ANR1(I)
    YWR=XWR*1.588665
    YWR=YWR*(1.0/3.0)
    APX=0.123*YWR*0.80
    NRES1=NRES(I)
    NLMT=NCOUNT+NRES1-1
    DO 1331 J=NCOUNT,NLMT
    CALL FACTS(ARAY(1,0),BRAVE(1,0),CORNZAR(0),CHIFAR(0),F0,COROT,XWR,
    1APX,2.0)

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1331	CONTINUE	RHP1183
	NCOUNT=NCOUNT+NCRESI	RHP1184
1332	CONTINUE	RHP1185
	DO 100 I=1,NTOTAL	RHP1186
	ERAN(1,I)=ARAY(1,I)	RHP1187
	ABCFB=ABS(ARAY(5,I))	RHP1188
	ABCFB=ABS(ARAY(6,I))	RHP1189
	ERAN(2,I)=ARAY(3,I)+ARAY(4,I)+ABCFB+ABCFB	RHP1190
100	CONTINUE	RHP1191
	CALL QIKS(1,NTOTAL,MOV,KOH)	RHP1192
C----	HERE RESONANCE IN AN ELEMENT ARE ARRANGED IN INCREASING ORDER IN	RHP1193
C----	ENERGY ALONG WITH THEIR TOTAL GAMMAS TO CALCULATE THE ENERGY MESH	RHP1194
C----	AT WHICH THE CROSS-SECTIONS ARE CALCULATED.	RHP1195
140	PRINT27	RHP1196
	PRINT25	RHP1197
	PRINT7	RHP1198
	E=ETHERN	RHP1199
	CALL RMSIGN(ETHERN,2)	RHP1200
	PRINT25	RHP1201
	ELO=EL(1,2)	RHP1202
	JFLAG(1)=1	RHP1203
	IRANGE=1	RHP1204
	PRINT8,ETHERN,(ARCFILL),LL=1,4)	RHP1205
140	PRINT25	RHP1206
	PRINT7	RHP1207
	PRINT25	RHP1208
	DO 124 JJ=1,NIS	RHP1209
	NERJJ=NER(JJ)	RHP1210
	DO 125 KK=1,NERJJ	RHP1211
	IRANGE=KK	RHP1212
	LROJK=LRO(JJ,KK)	RHP1213
	IF(LROJK=1)131,132,132,132	RHP1214
131	PRINT10	RHP1215
	GO TO 130	RHP1216
1321	IF(JJ.EQ.1)GO TO 1320	RHP1217
	GO TO 132	RHP1218
1320	ELOREF=EL(JJ,KK)	RHP1219
	EHINEF=EH(JJ,KK)	RHP1220
	ELO=ELOREF	RHP1221
	EH=EHINEF	RHP1222
	GO TO 1240	RHP1223
132	ELO=EL(JJ,KK)	RHP1224
	EH=EH(JJ,KK)	RHP1225
	IF(ELO.EQ.ELOREF.AND.EH.EQ.EHINEF)GO TO 130	RHP1226
	GO TO 1240	RHP1227
1240	KH=MAXPTS/(8*IRANGE)	RHP1228
	KH=KH	RHP1229
	JFLAG=1	RHP1230
	NLSKK=NLS(JJ,KK)	RHP1231
	J4=1	RHP1232
	ISTARY=0	RHP1233
	IEND=1	RHP1234
117	IF(IEND.EQ.0)GO TO 120	RHP1235
	J5=J4+1	RHP1236
	E1=ERAN(1,J4)	RHP1237
	G1=ERAN(2,J4)	RHP1238
	E2=ERAN(1,J5)	RHP1239
	G2=ERAN(2,J5)	RHP1240
	IF(E1.LT.ELO.AND.E2.GT.ELO)GO TO 1120	RHP1241
1120	IF(E1.LE.ELO.AND.E2.GT.ELO)GO TO 1110	RHP1242
	GO TO 1111	RHP1243

1110 E1=ELO	RMP1244
C1=C2	RMP1245
ISTART=0	RMP1246
GO TO 1114	RMP1247
1111 IF(E1.GT.ELO.AND.E2.LE.EMI)GO TO 1112	RMP1248
GO TO 1113	RMP1249
1112 IF(J4.EQ.1.AND.ISTART.EQ.1)GO TO 1100	RMP1250
GO TO 1114	RMP1251
1113 E2=E1	RMP1252
C2=C1	RMP1253
E1=ELO	RMP1254
J4=J4+1	RMP1255
ISTART=0	RMP1256
GO TO 1114	RMP1257
1114 E2=EMI+C1/FLCAT (END)	RMP1258
C2=C1	RMP1259
IFLAG=0	RMP1260
GO TO 1114	RMP1261
1113 IF(E1.LT.EMI.AND.E2.GT.EMI)GO TO 1120	RMP1262
GO TO 1124	RMP1263
1123 E2=EMI	RMP1264
C2=C1	RMP1265
IEND=0	RMP1266
GO TO 1114	RMP1267
1124 IF(E1.GE.EMI.AND.E2.GT.EMI)GO TO 120	RMP1268
GO TO 1125	RMP1269
1125 IF(JFLAG)1126,125,1220	RMP1270
1114 IF(E1.EQ.E2)GO TO 1200	RMP1271
GO TO 1116	RMP1272
1116 CONTINUE	RMP1273
CALL SIEVE(E1,C1,E2,C2,K1,K2,K3,TEFF,ANR)	RMP1274
CALL QIKS(1,NX,MOVE,MCHES)	RMP1275
GO TO 116	RMP1276
1120 IF(IEND.EQ.0)GO TO 120	RMP1277
J4=J4+1	RMP1278
GO TO 117	RMP1279
116 DO 109 I=1,NX	RMP1280
E=EX(I)	RMP1281
JFLAG=JFLAG(I)	RMP1282
CALL RMSIGN(E,KK)	RMP1283
PRINT8,E,(ANR(LL),LL=1,4)	RMP1284
IF(IDPL.EQ.1)GO TO 143	RMP1285
GO TO 109	RMP1286
141 IF(E.LT.ETHERN)GO TO 109	RMP1287
GO TO 1410	RMP1288
C-----IF THE NEUTRON ENERGY IS LESS THAN 0.0250 EV DOPPLER BROADENING IS	RMP1289
C---PASSED AS A DIFFERENT KERNEL SHOULD BE USED TO CALCULATE DOPPLER	RMP1290
C---BROADENED CROSS-SECTIONS.	RMP1291
1410 TEFF=TEFF/293.8	RMP1292
DELTA=8.3177*80RT ((TEFF+E)/ANR)	RMP1293
GO TO (1121,1122),JFLAG	RMP1294
1121 CALL GRID(E,DELTA,NTAB,XTAB)	RMP1295
32 FORMAT(2X,11E11.4)	RMP1296
CALL GREAT2(DOPPLER,FINT,NTAB,XTAB,ERROR,IERR)	RMP1297
PRINT8,E,FINT,JFLAG(I)	RMP1298
IF(IERR.EQ.1)PRINT32	RMP1299
GO TO 109	RMP1300
1122 CALL GAUSS(E,DELTA,DOPE)	RMP1301
PRINT8,E,DOPE,JFLAG(I)	RMP1302
109 CONTINUE	RMP1303
IF(IFLAG)1117,125,1117	RMP1304

```

1117 J4=J4+1
      IF (N7OTAL(J4))1123,1125,1127
1123 C1=ERAN(1,J4)
      S1=ERAN(2,J4)
      EQ TO 1116
1125 CONTINUE
1124 CONTINUE
1126 CONTINUE
1130 CALL EXIT
      END
      SUBROUTINE QIKS (MM,NN,MOVE,COMPARE)
      ALL-IN-MEMORY SORT PROGRAM
C     MM = FIRST SUBSCRIPT
C     NN = LAST SUBSCRIPT (ARRAY IS IN COMMON)
C     MOVE AND COMPARE ARE USER SUPPLIED PROGRAMS
      DIMENSION MSAVE(20),NSAVE(20)
      KEYLOC(M,N)=(M+NN)/2
      I=0
      J=0
      LEVEL = 0
      M=MM
      N=NN
35 CONTINUE
      TEST FOR ONE OR TWO ITEMS
      IF (N-M-1) 31,31,33
C 32 CONTINUE
      PARTITION AND REORDER CO HERE. SEE BELOW. RETURN IS TO 0
      PUSH DOWN
      @ LEVEL=LEVEL+1
      WORK ON SMALLER PORTION
      IF ((J-M) - (N-1)) 134, 134, 34
C 134 MSAVE(LEVEL) = I
      NSAVE(LEVEL)=N
      N=J
      GO TO 35
C 34 MSAVE(LEVEL)=M
      NSAVE(LEVEL)=J
      M=I
      GO TO 35
C 31 IF (COMPARE(M,NSAVE(LEVEL)))
      SWAP IF ONLY TWO ITEMS ARE OUT OF ORDER
C 131 CALL MOVE(M,J)
      CALL MOVE(M,N)
      CALL MOVE(I,N)
C 31 IF (LEVEL) 158, 158, 158
158 RETURN
C POP UP
C 151 M = NSAVE(LEVEL)
      N=MSAVE(LEVEL)
      LEVEL=LEVEL-1
      GO TO 35
C END MAIN
C PARTITION
C 32 I=M
      J=N
      KEY=KEYLOC(M,N)
      CALL MOVE(KEY, 0)
C 34 IF (N - KEY) 17, 17, 17
C 17 CALL MOVE(N,KEY)
      1 CONTINUE
C HOLE AT HOYICH

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RMP1305
RMP1306
RMP1307
RMP1308
RMP1309
RMP1310
RMP1311
RMP1312
RMP1313
RMP1314
QIKS0015
QIKS0020
QIKS0030
QIKS0040
QIKS0050
QIKS0060
QIKS0070
QIKS0080
QIKS0090
QIKS0100
QIKS0110
QIKS0120
QIKS0130
QIKS0140
QIKS0150
QIKS0160
QIKS0170
QIKS0180
QIKS0190
QIKS0200
QIKS0210
QIKS0220
QIKS0230
QIKS0240
QIKS0250
QIKS0260
QIKS0270
QIKS0280
QIKS0290
QIKS0300
QIKS0310
QIKS0320
QIKS0330
QIKS0340
QIKS0350
QIKS0360
QIKS0370
QIKS0380
QIKS0390
QIKS0400
QIKS0410
QIKS0420
QIKS0430
QIKS0440
QIKS0450
QIKS0460
QIKS0470
QIKS0480
QIKS0490
QIKS0500
QIKS0510

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```

1 IF (COMPAR(0,100,0,0)
2 I=I+1
3 IF (I - N) 3, 4, 5
4 CALL MOVE(1,0)
5 GO TO 3
6 CONTINUE
7 HOLE AT TOP
8 IF (COMPAR(0,0)15,0
9 J=J+1
10 IF (I - N) 6, 7, 8
11 CALL MOVE(1,0)
12 GO TO 2
13 CONTINUE
14 SPREADS GOES HERE
15 END PARTITION
16 OVERLEADER
17 CALL MOVE(0,1)
18 IF (I - N) 110, 10, 110
110 I = I + 1
19 IF (COMPAR(0,1)10,12,00
10 IF (I - N) 100, 0, 100
100 J = J + 1
21 IF (COMPAR(0,0)10,20,0
22 CONTINUE
23 RETURN TO MAIN PROGRAM
24 END
25 SUBROUTINE MOVE(1,J)
26 COMMON/O/ERAN(2,501)
27 I1=I
28 J1=J
29 IF (I1.EQ.0) I1=501
30 IF (J1.EQ.0) J1=501
31 ERAN(1,J1)=ERAN(1,I1)
32 ERAN(2,J1)=ERAN(2,I1)
33 RETURN
34 END
35 SUBROUTINE MOVE(1,J)
36 COMMON/O/EX(101),JFLAG(101)
37 I1=I
38 J1=J
39 IF (I1.EQ.0) I1=101
40 IF (J1.EQ.0) J1=101
41 EX(J1)=EX(I1)
42 JFLAG(J1)=JFLAG(I1)
43 RETURN
44 END
45 FUNCTION KOM(1,J)
46 COMMON/O/ERAN(2,501)
47 I1=I
48 J1=J
49 IF (I1.EQ.0) I1=501
50 IF (J1.EQ.0) J1=501
51 EOM=ERAN(1,I1)-ERAN(1,J1)
52 IF (EOM)100,101,102
100 KOM=-1
53 GO TO 103
101 KOM=0
54 GO TO 103
102 KOM=1
103 RETURN
55 END

```

QIK8072H
QIK8073H
QIK8074H
QIK8075H
QIK8076H
QIK8077H
QIK8078H
QIK8079H
QIK8080H
QIK8081H
QIK8082H
QIK8083H
QIK8084H
QIK8085H
QIK8086H
QIK8087H
QIK8088H
QIK8089H
QIK8090H
QIK8091H
QIK8092H
QIK8093H
QIK8094H
QIK8095H
QIK8096H
QIK8097H
QIK8098H
QIK8099H
MOV 001
MOV 002
MOV 003
MOV 004
MOV 005
MOV 006
MOV 007
MOV 008
MOV 009
MOV 010
MOVE001
MOVE002
MOVE003
MOVE004
MOVE005
MOVE006
MOVE007
MOVE008
MOVE009
MOVE010
KOM 001
KOM 002
KOM 003
KOM 004
KOM 005
KOM 006
KOM 007
KOM 008
KOM 009
KOM 010
KOM 011
KOM 012
KOM 013
KOM 014
KOM 015

FUNCTION KONE(I,J)	KONE001
COMMON/C/EX(101),JFLAG(102)	KONE002
J1=1	KONE003
J1=J	KONE004
IF(I1.EQ.0)I1=102	KONE005
IF(J1.EQ.0)J1=102	KONE006
EOX=EX(I1)-EX(J1)	KONE007
IF(EOX)100,101,102	KONE008
100 KONE=1	KONE009
GO TO 103	KONE010
101 KONE=0	KONE011
GO TO 103	KONE012
102 KONE=1	KONE013
103 RETURN	KONE014
END	KONE015
SUBROUTINE GREAT2(F,FINT,NTAB,NTAB,ERROR,IERR)	GRT2001
C-----CARRY OUT CONVERGENCE INTEGRATION SCHEME USING UP TO 200 INTERVALS	GRT2002
C-----WHICH ARE THEN FURTHER SUBDIVIDED UNTIL CONVERGENCE OCCURS OR THE	GRT2003
C-----MAXIMUM ALLOWABLE NUMBER OF ITERATIONS IS EXCEEDED. THE SUBROUTINE	GRT2004
C-----ARGUMENTS ARE DEFINED AS FOLLOWS.....	GRT2005
C-----F FUNCTION TO BE INTEGRATED.	GRT2006
C-----FINT THE RESULTING INTEGRAL	GRT2007
C-----XTAB TABLE OF ORDINATES (INTEGRATION INTERVAL IS FROM XTAB(1) TO	GRT2008
C-----XTAB(NTAB))	GRT2009
C-----NTAB THE LENGTH OF THE XTAB TABLE (NUMBER OF ORDINATES).	GRT2010
C-----ERROR ALLOWABLE NORMAL ERROR.	GRT2011
C-----IERR ERROR INDICATOR SET TO ZERO IF METHOD CONVERGES. SET TO	GRT2012
C-----ONE IF METHOD DOES NOT CONVERGE.	GRT2013
C-----ONE IF METHOD DOES NOT CONVERGE ON TABLE (XTAB) IS TOO LONG	GRT2014
C-----DIMENSION XTAB(33),PARTS(33),GOOF(33),INTER(33)	GRT2015
C-----DEFINE THE MAXIMUM ALLOWABLE NUMBER OF ITERATIONS AND THE MAXIMUM	GRT2016
C-----TABLE LENGTH,	GRT2017
C-----DATA JMAX,NTAB*4/20,1000/	GRT2018
C-----DETERMINE IF TABLE IS TOO LONG	GRT2019
C-----IF(NTAB.GT.NTAB*4) GO TO 100	GRT2020
C-----CALL GENERAL INTEGRATION SUBROUTINE.	GRT2021
C-----ZEE=F(5.0)	GRT2022
C-----CALL GREAT1(F,FINT,NTAB,JMAX,NTAB,PARTS,GOOF,INTER,ERROR,IERR)	GRT2023
C-----RETURN	GRT2024
C-----TABLE IS TOO LONG.	GRT2025
100 IERR=1	GRT2026
FINT=0.0	GRT2027
RETURN	GRT2028
END	GRT1001
SUBROUTINE GREAT1(F,FINT,NTAB,JMAX,NTAB,PARTS,GOOF,INTER,ERROR,	GRT1002
1 IERR)	GRT1003
C-----CARRY OUT CONVERGENCE INTEGRATION SCHEME USING TRAPEZOIDAL RULE	GRT1004
C-----AND DOUBLING THE NUMBER OF REGIONS PER SUBINTERVAL FOR EACH	GRT1005
C-----ITERATION. ONLY DOUBLE UP IN THOSE INTERVALS THAT HAVE NOT ALREADY	GRT1006
C-----CONVERGED.	GRT1007
C-----F SINGLE PRECISION FUNCTION TO BE INTEGRATED	GRT1008
C-----FINT THE RESULTING INTEGRAL	GRT1009
C-----NTAB NUMBER OF ORDINATES SUPPLIED (THERE ARE N-1 INTERVALS)	GRT1010
C-----JMAX MAXIMUM ALLOWABLE NUMBER OF ITERATIONS	GRT1011
C-----XTAB TABLE OF THE ORDINATE VALUES. RANGE OF INTEGRATION IS	GRT1012
C-----FROM XTAB(1) TO XTAB(NTAB)	GRT1013
C-----PARTS ARRAY OF DIMENSION NTAB, EQUAL TO THE PARTIAL INTEGRALS	GRT1014
C-----OVER EACH OF THE NTAB-1 INTERVALS	GRT1015
C-----GOOF ARRAY OF DIMENSION NTAB, EQUAL TO THE NORMAL ERROR IN EACH	GRT1016
C-----OF THE NTAB-1 INTERVAL.	GRT1017
C-----INTER ARRAY OF DIMENSION NTAB, SPECIFYING THE NUMBER OF	

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C----- SUBINTERVALS IN EACH INTERVAL
C-----ERROR =ACCEPTABLE NORMAL ERROR
C-----IERR =ERROR INDICATOR. SET TO ZERO IF METHOD CONVERGES, SET TO
C----- ONE IF METHOD DOES NOT CONVERGE
      DIMENSION XTAB(NTAB),PARTS(NTAB),INTER(NTAB),GOOF(NTAB)
C-----INITIALIZE VALUE OF THE INTEGRAL
      FINT=0.0
C-----CALCULATE THE NUMBER OF INTERVALS
      NM1=NTAB-1
C-----CALCULATE ALLOWABLE ERROR PER INTERVAL
      ERRN=ERROR/LOAT(NM1)
C-----INITIALIZE APPROXIMATION TO INTEGRAL
      TOTAL=0.0
C-----CALCULATE INITIAL APPROXIMATION
      DO 10 I=1,NM1
        INTER(I)=1
        PARTS(I)=0.5*(XTAB(I+1)-XTAB(I))*F(XTAB(I+1))+F(XTAB(I))
      10 TOTAL=TOTAL+PARTS(I)
C-----CALCULATE INITIAL ERRORS
      DO 15 I=1,NM1
      15 GOOF(I)=PARTS(I)
C-----SET UP LOOP OVER ITERATIONS
      DO 100 J=1,JMAX
C-----SAVE LAST APPROXIMATION
        TOTAL1=TOTAL
C-----SET UP LOOP OVER INTERVALS
        DO 20 I=1,NM1
C-----CHECK FOR CONVERGENCE IN THIS INTERVAL
          IF(ABS(GOOF(I)/TOTAL).LT.ERRN) GO TO 20
C-----CALCULATE DOUBLE INTERVAL
          DX=(XTAB(I+1)-XTAB(I))/LOAT(INTER(I))
C-----DOUBLE NUMBER OF STEPS
          INTER(I)=2*INTER(I)
C-----INITIALIZE CONTRIBUTION TO INTEGRAL
          REST=0.0
          II=INTER(I)
C-----INITIALIZE ORDINATE
          XNOW=XTAB(I)+0.5*DX
C-----SET UP LOOP OVER ORDINATES
          DO 30 H=1,II,2
            REST=REST+F(XNOW)
            30 XNOW=XNOW+DX
C-----CALCULATE NEXT PARTIAL INTEGRAL
            REST=0.5*(PARTS(I)+DX*REST)
C-----ADD NEW PARTIAL INTEGRAL AND SUBTRACT OLD PARTIAL INTEGRAL
            TOTAL=TOTAL+REST-PARTS(I)
C-----CALCULATE NEW ERROR AND SET PARTIAL INTEGRAL TO NEW VALUE
            GOOF(I)=REST-PARTS(I)
            PARTS(I)=REST
          20 CONTINUE
C-----CHECK FOR CONVERGENCE
          100 IF(ABS(1.-TOTAL1/TOTAL).LE.ERRN) GO TO 200
C-----THE METHOD HAS NOT CONVERGED
          FINT=TOTAL
          IERR=1
          RETURN
C-----THE METHOD HAS CONVERGED
      200 FINT=TOTAL
          IERR=0
          RETURN
      END

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GRT1018
 GRT1019
 GRT1020
 GRT1021
 GRT1022
 GRT1023
 GRT1024
 GRT1025
 GRT1026
 GRT1027
 GRT1028
 GRT1029
 GRT1030
 GRT1031
 GRT1032
 GRT1033
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 GRT1036
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 GRT1038
 GRT1039
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 GRT1074
 GRT1075
 GRT1076
 GRT1077
 GRT1078

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SUBROUTINE CRIN(0,BELTA,NTAD,NTAD)
COMMON ARAY,IRAY,ERAY,NOY,BAL,ABN,NER,LFW,EL,EM,LRU,LRF,LANG,NLS,
1NRES,LN,JN,PENFAR,SHIFAR,SPI,AP,AHRI,AN,DREF,AREF,DREF,IRANGE,NIS,
3INCROSS,IVSPIN,ELO,TEFF,BELTA,E,AWR
DIMENSION ARAY(6,500),IRAY(3,500),ERAY(2,500),NOY(20),BAL(10),
1ABN(10),NER(10),LFW(10),EL(10,10),EM(10,10),LRU(10,10),LRF(10,10),
2LANG(10,3,5),NLS(10,10),NRES(10),LN(50),JN(150),PENFAR(500),
3SHIFAR(500),SPI(10),AP(10),AHRI(10),AN(10),DREF(6),AREF(6),DREF(6,
410)
DIMENSION NTAD(33)
IGNORE=1
N2=NTAB/2
N21=N2-1
N22=N2-2
N3=NTAB-1
XTAB(N21)=0
DO 1410 I=N22,NTAB
XTAB(I)=XTAB(I-1)*DELTA
I1=NTAB-1-I
XTAB(I1)=NTAD(I1-1)*DELTA
2410 CONTINUE
DO 1411 I=1,NTAB
XTAB1=XTAB(I)
IF(XTAB1)1412,1412,1411
2412 IGNORE=0
2411 CONTINUE
IF(IGNORE,CO,DO)GO TO 1413
GO TO 1414
2413 XTAB1=1.0E+00
DO 1415 I=1,N3
I2=I-1
XTAB(I1)=NTAD(I1)*WLOCAT(I1)*DELTA
2415 CONTINUE
2414 RETURN
END
SUBROUTINE CAUSIO,DELTA,CCPE)
COMMON ARAY,IRAY,ERAY,NOY,BAL,ABN,NER,LFW,EL,EM,LRU,LRF,LANG,NLS,
1NRES,LN,JN,PENFAR,SHIFAR,SPI,AP,AHRI,AN,DREF,AREF,DREF,IRANGE,NIS,
3INCROSS,IVSPIN,ELO,TEFF,BELTA,E,AWR
DIMENSION ARAY(6,500),IRAY(3,500),ERAY(2,500),NOY(20),BAL(10),
1ABN(10),NER(10),LFW(10),EL(10,10),EM(10,10),LRU(10,10),LRF(10,10),
2LANG(10,3,5),NLS(10,10),NRES(10),LN(50),JN(150),PENFAR(500),
3SHIFAR(500),SPI(10),AP(10),AHRI(10),AN(10),DREF(6),AREF(6),DREF(6,
410)
DIMENSION ABC(9),WET(9)
DATA ABC/-3.19999322170155,-2.2650050455104,-2.46055320021607,-0.
172355181875284,0,0,0.72099303070204,1.46055320021607,2.2650050455104,
2104.3,19299328178150/
DATA WET/2.3960697726326E-04,0.4943624275537E-02,0.0047492739438E-
101,0.4326515570826E+00,0.7202392190061E+00,0.4326515570826E+00,0.8
2847452739438E-04,0.4943624275537E-02,0.3960697726326E-04/
DATA PH/RT/1.772454/
TEF=TEFF/200,0
TERM=0.0
DO 280 K=1,NIS
T1=0,0
XNR=AHRI(K)
BELTA=0.3177E+00)*SORT((0+TEF)/XNR)
X=BELTA*ABC(K)
IF(E-X)100,100,101
101 DO 102 I=1,9
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CAUS002
CAUS003
CAUS004
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CAUS025
CAUS026

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ABC1=ABC(1)
WET1=WET(1)
Z=E+ABC1*BELTA
CALL RMSIGN(Z,IRANGE)
T1=T1+BREF(INCROSS,1)*WET1
102 CONTINUE
GO TO 110
108 T1=B,0
110 TERM=TERM+T1
200 CONTINUE
DOPE=TERM/PWIRT
RETURN
END
SUBROUTINE FACTS(Q,L,PF,SF,PS,CONSTE,BWR,CP,PLCD)

C
C SUBROUTINE TO CALCULATE PENETRATION AND
C SHIFT FACTORS
C Q IS THE ENERGY L IS THE ANGULAR MOMENTUM OF PENETRATION FACTOR
C SF THE SHIFT FACTOR AND PS THE PHASE SHIFT KP IS R CONSTE IS KM
C FOR DETAILS OF FORMULAE SEE GREGSON ET AL AEEH-M517(MLB)1965
C
DOUBLE PRECISION PS,CONSTE,ROE,ROE2,ROE4
EAB=ABS(Q)
CONHLD=2.196771E-03*CHRGSCRT(EAB)
CONSTE=CONHLD/(BWR+1.0)
C-----SINCE AWR IS GIVEN WITH THE NEUTRON MASS AS UNITY WE ADD ONE ABOVE
C-----TO CONVERT TO THE CENTER-OF-MASS SYSTEM
ROE=B*CONSTE
S=FLOAT(L)
IF(L.LE.0)GO TO 100
GO TO(110,120,130,140,150),L
100 PF=ROE
SF=B,0
IF(PLCD.LT.2,0) GO TO 100
PS=ROE
GO TO 170
110 ROE2=ROE*ROE
DENOM=1.0+ROE2
PF=ROE2*ROE/DENOM
SF=-1.0/DENOM
IF(PLCD.LT.2,0) GO TO 100
PS=ROE-DATAN(ROE)
IF(PS/ROE=0.000001)160,170,170
120 ROE2=ROE*ROE
ROE4=ROE2*ROE2
DENOM=3.0+ROE2+ROE4*0.0
PF=ROE4*ROE/DENOM
SF=-(18.0+3.0*ROE2)/DENOM
IF(PLCD.LT.2,0) GO TO 100
PS=ROE-DATAN(3.0*ROE/(3.0+ROE2))
IF(PS/ROE=0.000001)160,170,170
130 ROE2=ROE*ROE
ROE4=ROE2*ROE2
ROE6=ROE4*ROE2
DENOM=225.0+45.0*ROE2+0.0*ROE4+ROE6
PF=ROE6*ROE/DENOM
SF=-(675.0+90.0*ROE2+0.0*ROE4)/DENOM
IF(PLCD.LT.2,0) GO TO 100
PS=ROE-DATAN((15.0*ROE-ROE2*ROE)/(15.0+0.0*ROE2))
IF(PS/ROE=0.000001)160,170,170
140 ROE2=ROE*ROE

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ROE4=ROE2*ROE2
ROE6=ROE4*ROE2
ROE8=ROE4*ROE4
DENOM=11025.0+1575.0*ROE2+135.0*ROE4+10.0*ROE6+ROE8
PF=ROE8*ROE/DENOM
IF(PLD LT,2,2) GO TO 160
SF=- (44100.0+4725.0*ROE2+270.0*ROE4+10.0*ROE6)/DENOM
PS=ROE-DATAN((105.0*ROE-10.0*ROE2+ROE)/(105.0-45.0
1*ROE2+ROE4))
IF(PS/ROE-0.000001)1260,170,170
150 ROE2=ROE*ROE
ROE4=ROE2*ROE2
ROE6=ROE4*ROE2
ROE8=ROE4*ROE4
ROE10=ROE6*ROE4
DENOM=893025.0+99225.0*ROE2+6350.0*ROE4+410.0*ROE6
1+15.0*ROE8+ROE10
PF=ROE10*ROE/DENOM
SF=4465125.0+396900.0*ROE2+10920.0*ROE4
1*630.0*ROE6+15.0*ROE8
SF=-SF/DENOM
IF(PLD LT,2,0) GO TO 160
PS=ROE-DATAN((045.0*ROE-ROE/(105.0*ROE2+ROE4))/(045.0-420.0*ROE2+
115.0*ROE4))
IF(PS/ROE GE,0.000001) GO TO 170
160 PS=0
170 RETURN
END
SUBROUTINE ORDRF(K,N1)
COMMON ARAY,IRAY,ERAY,NOT,ZA1,ABN,NER,LFW,EL,EN,LRU,LRF,LANG,NLS,
1NRES,LN,JN,PENFAR,SHIFAR,SPI,AP,AMR1,AM,OREF,AREF,BREF,IRANGE,NIS,
3INCROSS,IVSPIN,ELO,TEFF,DELTA,E,AMR
DIMENSION ARAY(6,500),IRAY(3,500),ERAY(2,500),NOT(20),ZA1(10),
1ABN(10),NER(10),LFW(10),EL(10,10),EN(10,10),LRU(10,10),LRF(10,10),
2LANG(10,5,5),NLS(10,10),NRES(10),LN(50),JN(150),PENFAR(500),
3SHIFAR(500),SPI(10),AP(10),AMR1(10),AM(10),OREF(10),AREF(6),BREF(6,
410)
IF(K-1)2,2,3
2 NTR=0
NUML=0
NUMJ=0
NN=0
MM=0
JJ=0
NC=0
MC=0
3 NT=NTR+1
NTR=NTR+N1
OL=-0.9
0 OL=OL+1.0
DO 101 N=NT,NTR
TERM=FLOAT (IRAY(1,N))
IF(OL-TERM)101,101,0
9 NN=NN+1
DO 100 J=1,0
A=ARAY(J,N)
ARAY(J,N)=ARAY(J,NN)
ARAY(J,NN)=A
100 CONTINUE
DO 1001 J=1,3
IA=IRAY(J,4)

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ORDR033

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      IRAY(J,N)=IRAY(J,NN)
      IRAY(J,NN)=IA
1001 CONTINUE
      DO 1002 J=1,2
      EA=ERAY(J,N)
      ERAY(J,N)=ERAY(J,NN)
      ERAY(J,NN)=EA
1002 CONTINUE
101 CONTINUE
      IF(NN-NC)8,8,21
11 NUML=NUML+1
      LN(NUML)=NN-NC
      NC=NN
      NU=NT+LN(NUML)-1
      OH=8.25
14 OH=OH+0.5
      DO 205 M=NT,NU
      TERMJ=ARAY(2,M)
      IF(OH-TERMJ)205,205,19
15 MM=MM+1
      DO 204 J=1,3
      A=ARAY(J,M)
      ARAY(J,M)=ARAY(J,MM)
      ARAY(J,MM)=A
204 CONTINUE
      DO 2041 J=1,3
      IA=IRAY(J,M)
      IRAY(J,M)=IRAY(J,MM)
      IRAY(J,MM)=IA
2041 CONTINUE
      DO 2042 J=1,2
      EA=ERAY(J,M)
      ERAY(J,M)=ERAY(J,MM)
      ERAY(J,MM)=EA
2042 CONTINUE
205 CONTINUE
      IF(MM-MC)14,14,16
16 NUMJ=NUMJ+1
      JN(NUMJ)=MM-MC
      MC=MM
      NT=NT+JN(NUMJ)
      IF(NN-MM)17,17,14
17 IF(NTR-MM)18,18,0
18 RETURN

```

END
FUNCTION DOPPLER(X)

```

COMMON ARAY,IRAY,ERAY,NOT,BAI,ADN,NER,LFU,EL,EH,LRU,LRF,LANG,NLS,
1NRES,LN,JN,PENFAR,SHIFAR,SPI,AP,AWR,AM,DREF,AREF,OREF,IRANGE,NIS,
3INCROSS,IVSPIN,ELO,TEFF,DELTA,C,AWR
DIMENSION ARAY(4,500),IRAY(3,500),ERAY(2,500),NOT(20),BAI(10),
1ABN(10),NER(10),LFU(10),EL(10,10),EH(10,10),LRU(10,10),LRF(10,10),
2LANG(10,3,3),NLS(10,10),NRES(10),LN(50),JN(150),PENFAR(500),
3SHIFAR(500),SPI(10),AP(10),AMR(10),AM(10),DREF(10),AREF(10),OREF(10),
410)
TEF=TEFF/293.0
TERM=0.0
CALL R4SIGM(X,IRANGE)
DO 100 I=1,NIS
XNR=AWR(1)
CELT=(0.3177E+00)*CORT((TEF+C)/XNR)
Z=(E-X)/CELT

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22=2*2
T1=BREF(INCROSS,1)*CNP(=32)/16CLV(A*1,772454)
TERM=TERM+T1
100 CONTINUE
DOPPLER=TERM
RETURN
END
SUBROUTINE ABCMAT(A,B,C)
DOUBLE PRECISION A,B,C
DIMENSION A(3,3),B(3,3),C(3,3)
DO 100 I=1,3
DO 101 J=1,3
C(I,J)=B,I,B
DO 102 K=1,3
C(I,J)=C(I,J)+A(I,K)*B(K,J)
102 CONTINUE
101 CONTINUE
100 CONTINUE
RETURN
END
SUBROUTINE FROMNS(A,B,C,D)
DOUBLE PRECISION A,B,C,D
DIMENSION A(3,3),B(3,3),C(3,3),D(3,3),E(3,3)
C-----THIS SUBROUTINE INVERTS A COMPLEX MATRIX WITH REAL AND IMAGINARY
C-----PARTS A AND B AND GIVES C AND D THE REAL AND IMAGINARY PARTS OF THE
C-----E INVERSE. FROENIUS-COMUT KITHOD OF INVERSION.
DO 200 I=1,3
DO 201 J=1,3
C(I,J)=A(I,J)
201 CONTINUE
200 CONTINUE
CALL THRINV(A,3,IND)
IF(IND.EQ.1) GO TO 300
CALL ABCMAT(A,B,C)
CALL ABCMAT(B,C,D)
DO 202 I=1,3
DO 203 J=1,3
C(I,J)=C(I,J)+D(I,J)
203 CONTINUE
202 CONTINUE
CALL THRINV(C,3,IND)
IF(IND.EQ.1) GO TO 300
CALL ABCMAT(C,D,D)
DO 204 I=1,3
DO 205 J=1,3
D(I,J)=-D(I,J)
205 CONTINUE
204 CONTINUE
GO TO 302
300 PRINT*1
GO TO 302
301 FORMAT(52H TROUBLE IN INVERTING THE COMPLEX MATRIX, JCO ADOPT.)
302 RETURN
END
SUBROUTINE THRINV(D,N,KINERR)
C INVERTS SYMMETRIC MATRIX (D(I,J),J=1,N,I=1,N)
DOUBLE PRECISION D,N,FOOTV
DIMENSION D(3,3),SIGU
KINERR=0
55 CONTINUE
56 GO TO 1,1

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29 D021=1,J
   D(I,J)=-D(I,J)
  2 D(J,I)=D(I,J)
  1 D(J,J)=2,+D(J,J)
38 D07LR=1,N
   FOOEY=1,-D(LR,LR)
   IF(FOOEY,EO,0,0) GO TO 333
   D(LR,LR)=1./FOOEY
31 CONTINUE
   GO TO 27
333 KINHERR=1
   GOTO1001
27 D041J=1,N
   S(J)=D(LR,J)
32 IF(J-LR)28,41,20
28 D(J,LR)=D(J,LR)+D(LR,LR)
   D(LR,J)=D(J,LR)
41 CONTINUE
33 DO 7J=1,N
34 IF(J-LR) 6,7,0
  6 DO 503 I=1,J
35 IF(I-LR) 8,503,0
  8 D(I,J)=D(I,J)+D(I,LR)*S(J)
  8 D(J,I)=D(I,J)
503 CONTINUE
  7 CONTINUE
1001 RETURN
END
SUBROUTINE SIEVE(E1,G1,E2,G2,N,NH,CEFF,CUR)
COMMON/C/EX(101),JFLAG(101)
IF(E2.LT.E1)GO TO 101
GO TO 300
300 N2=2*N
   DO 1000 I=1,100
   JFLAG(I)=2
1000 CONTINUE
   YEF=CEFF/293,0
   DP=(1.5885E+00)*SQRT(YEF/CUR)
   WHEN MULTIPLIED BY SQRT(E) DP GIVES 5 TIMES CORRESPONDING DELTA
   DP1=DP*SQRT(E1)
   DP2=DP*SQRT(E2)
   DG1=G1/FLOAT(N)
   DG2=G2/FLOAT(N)
   EX(1)=E1
   IF(G1.LT.DP1)GO TO 1001
   GO TO 1002
1001 JFLAG(1)=1
1002 ENDIF=ABS(E2-E1)
   NX=1
   DO 100 I=1,N
   XX=E1+DG1*FLOAT(I)
   IF(XX.LT.E2)GO TO 107
   GO TO 100
107 NX=NX+1
   EX(NX)=XX
   IF(G1.LT.DP1)GO TO 1003
   GO TO 100
1003 JFLAG(NX)=1
100 CONTINUE
   DO 200 I=1,N
   XX=E2+DG2*FLOAT(I)

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THR1009
THR1010
THR1011
THR1012
THR1013
THR1014
THR1015
THR1016
THR1017
THR1018
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THR1020
THR1021
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SIEV008
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SIEV010
SIEV011
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SIEV025
SIEV026
SIEV027
SIEV028
SIEV029

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      IF(XX.GT,E1)GO TO 100
      GO TO 202
100  NX=NX+1
      EX(NX)=XX
      IF(G2.LT,OP2)GO TO 1003
      GO TO 202
1003 JFLAG(NX)=1
      202 CONTINUE
118  DIFF=(E2-E1)/FLOAT (N2)
      IF(DIFF)101,102,102
101  PRINT103
      PRINT2000,E1,OP,DIFF
      GO TO 104
103  FORMAT(32H CALLING SEQUENCE OF SIEVE WRONG)
2000  FORMAT(4H E1=E13.0,4H G2=G23.0,6H DIFF=D13.0)
102  N21=NX+1
      NN=NX
      N22=N21+N2-2
      NX=N22
      E21=(E1+E2)/2.0
      OP12=OP+SORT (E21)
      E43=E2-E1-((G1+G2)/2.0)
      IF(E43.LT,OP12)GO TO 1003
      GO TO 1007
1000  DO 111 I=N21,N22
      I2=I-NN
      EX(I)=E1+DIFF*FLOAT (I2)
      JFLAG(I)=1
101  CONTINUE
      GO TO 1040
1007  DO 112 I=N21,N22
      I2=I-NN
      EX(I)=E1+DIFF*FLOAT (I2)
      OPTEST=OP+SORT (EX(I))
      IF(EX(I).LE,E21)GO TO 1000
      GO TO 1009
1008  IF(G1.LT,OPTEST)GO TO 1010
      GO TO 112
1010  JFLAG(I)=1
      GO TO 112
1009  IF(G2.LT,OPTEST)GO TO 1011
      GO TO 112
1011  JFLAG(I)=1
112  CONTINUE
1040  DO 113 I=1,NN
      OPF=OP+SORT (EX(I))
      IF(OPF.EQ,2.0)GO TO 113
      TERM=EX(I)/OPF
      IF(TERM.LT,25.0)GO TO 114
      GO TO 113
114  JFLAG(I)=1
113  CONTINUE
104  RETURN
      END
      SUBROUTINE RMSIGH(Q,KK)
      COMMON/E/XMIN(6),XMAX(6),XREF(6)
      COMMON ARAY,ERAY,NOT,2A1,ABN,NER,LPU,EL,EN,LNU,LNF,LANG,NLS,
      1NRES,LN,JN,PENFAR,SHIFAR,SPI,AP,AURI,AN,BREF,ARCV,CREF,IRANGE,NIS,
      3INCROSS,IVSPIN,ELO,TEFF,DELTA,E,AWR
      DIMENSION ARAY(6,500),IRAY(3,500),ERAY(2,500),NOT(20),2A1(10),
      1ABN(10),NER(10),LPU(10),EL(10,10),EN(10,10),LNU(10,10),LNF(10,10),RMSG001
      RMSG002
      RMSG003
      RMSG004
      RMSG005
      RMSG006
      RMSG007

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2LANG(10,5,5),NLS(10,10),NRES(10),LN(50),JN(150),PENFAN(500),      RMSC000
3SH;FAR(500),SPI(10),AP(10),AURI(10),AN(10),DREF(6),AREF(6),DREF(6),      RMSC001
410)      RMSC002
DOUBLEPRECISIONM,S,RI,S1,B,DEN,DIFF,P1,M2,RM01,RM02,CJ,T1,T2,Y3,T4RMSC003
1,TERM,TERMN,TERM,TERMA,TERMG,SIGN1,SIGN2,SIGN3,SIGN4,SIGN5,SIGN6,SIGN7,      RMSC004
2BETA,TRM,SIG,CONST,CONSTA,P1,P2      RMSC005
DIMENSION R(3,3),S(3,3),R1(3,3),S1(3,3),S1(3,3)      RMSC006
C-----THIS SUBROUTINE USES THE FROBENIUS-SCHUR METHOD FOR INVERTING THE      RMSC007
C-----COMPLEX MATRIX.      RMSC008
P1=3,141592653590+00      RMSC009
02=807(0)      RMSC010
DO 4 J=1,6      RMSC011
AREF(J)=0.0      RMSC012
DO 5 K=1,10      RMSC013
0REF(J,K)=0.0      RMSC014
5 CONTINUE      RMSC015
4 CONTINUE      RMSC016
L2=0      RMSC017
N2=0      RMSC018
LA=0      RMSC019
JA=0      RMSC020
NTR=0      RMSC021
DO 112 I=1,NIS      RMSC022
NREI=NRES(I)      RMSC023
API=AP(I)      RMSC024
XNR=AURI(I)      RMSC025
YNR=XNR+1,000000      RMSC026
YNR=YNR+(1,0/3,0)      RMSC027
APX=0,123+YNR+P,00      RMSC028
3 NTR=NTR+NRESI      RMSC029
IF(NRESI)110,110,100      RMSC030
100 LA=LA+1      RMSC031
102 L2=L2+LNILA      RMSC032
CALL FACTS(Q,IRAY(1,L2),PF,07,PB,CONST,XNR,APX,3,0)      RMSC033
CALL FACTS(Q,IRAY(1,L2),PB,08,PS,CONST,XNR,API,3,0)      RMSC034
SIGN1=0.0      RMSC035
SIGN2=0.0      RMSC036
SIGN3=0.0      RMSC037
SIGN4=0.0      RMSC038
SIGN5=0.0      RMSC039
SIGN6=0.0      RMSC040
SIGN7=0.0      RMSC041
103 JA=JA+1      RMSC042
104 N1=N2+1      RMSC043
N2=N2+JN(JA)      RMSC044
CJ=2,0+(2,2+SPI(I)+2,0)      RMSC045
CJ=(2,0+ARAY(2,N1)+2,0)/00      RMSC046
3001 DO 7 J=1,3      RMSC047
DO 8 K=1,3      RMSC048
S(J,K)=0.0      RMSC049
IF(J,10-K)GO TO 0      RMSC050
GO TO 10      RMSC051
9 R(J,K)=1.0      RMSC052
GO TO 0      RMSC053
10 R(J,K)=0.0      RMSC054
8 CONTINUE      RMSC055
7 CONTINUE      RMSC056
DO 100 K=N1,N2      RMSC057
DIFF=ARAY(1,K)-0      RMSC058
A1=ARAY(3,K)      RMSC059
A1=(A1+PF)/PENFAN(0)      RMSC060
A1=007(A1)      RMSC061
A2=ARAY(5,K)      RMSC062

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      IF(A2)200,201,202
200 A2=-SQRT(-A2)
    GO TO 300
201 A2=0.0
    GO TO 300
202 A2=SQRT(A2)
300 A3=ARRAY(4,K)
    IF(A3)301,302,303
301 A3=-SQRT(-A3)
    GO TO 400
302 A3=0.0
    GO TO 400
303 A3=SQRT(A3)
400 DEN=DIFF**2+0.25*ARRAY(4,K)*ARRAY(4,K)
    R(1,1)=R(1,1)+((0.25*ARRAY(4,K)*A1*A1)/DEN)
    S(1,1)=S(1,1)-((0.5*DIFF*A1*A1)/DEN)
    R(1,2)=R(1,2)+((0.25*ARRAY(4,K)*A1*A2)/DEN)
    S(1,2)=S(1,2)-((0.5*DIFF*A1*A2)/DEN)
    R(1,3)=R(1,3)+((0.25*ARRAY(4,K)*A1*A3)/DEN)
    S(1,3)=S(1,3)-((0.5*DIFF*A1*A3)/DEN)
    R(2,2)=R(2,2)+((0.25*ARRAY(4,K)*A2*A2)/DEN)
    S(2,2)=S(2,2)-((0.5*DIFF*A2*A2)/DEN)
    R(3,3)=R(3,3)+((0.25*ARRAY(4,K)*A3*A3)/DEN)
    S(3,3)=S(3,3)-((0.5*DIFF*A3*A3)/DEN)
    R(2,3)=R(2,3)+((0.25*ARRAY(4,K)*A2*A3)/DEN)
    S(2,3)=S(2,3)-((0.5*DIFF*A2*A3)/DEN)
100 CONTINUE
    R(2,1)=R(1,2)
    S(2,1)=S(1,2)
    R(3,1)=R(1,3)
    S(3,1)=S(1,3)
    R(3,2)=R(2,3)
    S(3,2)=S(2,3)
    DO 11 JJJ=1,3
    DO 12 KKK=1,3
      S(JJJ,KKK)=R(JJJ,KKK)
12 CONTINUE
11 CONTINUE
    CALL FROMNS(R,0,01,01)
    RH01=R(1,1)
    RH02=S(1,1)
    P1=DCOS(2.0*PS)
    P2=-DSIN(2.0*PS)
    TERM1=(1.0-P1*(2.0*RH01+1.0)*2.0*P2*RH02)*2.0
    TERM2=GJ*TERM1-4.0*GJ*DSIN(P2)*DSIN(P2)
    T1=R(1,2)
    T2=S(1,2)
    T3=R(1,3)
    T4=S(1,3)
    TERM3=GJ*(T1**2+T2**2+T3**2+T4**2)*4.0
    TERM4=(RH01**2+RH02**2)*(0(1,1)-1.0)*(T1**2+T2**2)*(0(2,2)-1.0)*
1 (T3**2+T4**2)*(0(3,3)-1.0)
    TERM5=TERM4*2.0*(RH01*T1+RH02*T2)*0(1,2)*2.0*(RH01*T3+RH02*T4)*
10 (1,3)*2.0*(T1*T3+T2*T4)*0(2,3)
    TERM6=4.0*GJ*TERM3
    TERM7=TERM1-TERM3-TERM6
    SIGN1=SIGN1+TERM7
    SIGN2=SIGN2+TERM4
    SIGN3=SIGN3+TERM5
    SIGN4=SIGN4+TERM6
    IF(L2-N2)109,109,109

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109	BETA=PI*ABN(1)/(CONSTE*CONSTC)	RHSG130
	AREF(1)=AREF(1)+SIGNNI*BETA	RHSG131
	AREF(2)=AREF(2)+SIGNCI*BETA	RHSG132
	AREF(3)=AREF(3)+SIGNPI*BETA	RHSG133
	AREF(4)=AREF(4)+SIGNTI*BETA	RHSG134
	BREF(1,1)=BREF(1,1)+SIGNNI*BETA	RHSG135
	BREF(2,1)=BREF(2,1)+SIGNCI*BETA	RHSG136
	BREF(3,1)=BREF(3,1)+SIGNPI*BETA	RHSG137
	BREF(4,1)=BREF(4,1)+SIGNTI*BETA	RHSG138
	IF(L3-NTR)100,110,120	RHSG139
110	SIGP=0.0	RHSG140
	LNUJK=LNU(1,KK)	RHSG141
	IF(LNUJK=1)1250,1250,1250	RHSG142
1250	NLKK=NLS(1,KK)	RHSG143
	DO 124 LL=1,NLKK	RHSG144
	LURE=LANG(1,KK,LL)	RHSG145
	SS=FLOAT(LURE)	RHSG146
	CALL FACTS(0,LURE,P2,02,P3,CONSTA,HUM,API,3,0)	RHSG147
	TRM=(2.0-SS+1.0)*4.0*PI	RHSG148
	TRM=TRM*DSIN(P3)*DSIN(PC)/(CONSTA*CONSTA)	RHSG149
	SIGP=SIGP+TRM	RHSG150
124	CONTINUE	RHSG151
125	AREF(1)=AREF(1)+SIGP*ABN(1)	RHSG152
	AREF(4)=AREF(4)+SIGP*ABN(1)	RHSG153
	BREF(1,1)=BREF(1,1)+SIGP*ABN(1)	RHSG154
	BREF(4,1)=BREF(4,1)+SIGP*ABN(1)	RHSG155
112	CONTINUE	RHSG156
	RETURN	RHSG157
	END	RHSG158

NOCK PU-241	RAMP1	VEST	DATA.	C950.0	11	0	1.0E-04	
940241.0	238.9850		0	0	0	0	0	0
940241.0	1.0		0	1	1	0	0	0
1.0	20.0		1	3	0	0	0	0
2.5	0.9772		0	0	1	0	0	0
238.9859	0.0		0	0	98	15		
-0.160	2.0	0.029E-03	4.0E-02	0.000E-02	2.000E-02			
0.260	3.0	0.051E-03	4.0E-02	0.000E-02	2.500E-02			
4.300	2.0	0.660E-03	4.0E-02	0.000E-02	1.400E-02			
4.580	3.0	0.430E-03	4.0E-02	0.000E-02	0.000E-02			
5.920	2.0	2.430E-03	4.0E-02	0.000E-02	3.000E-02			
6.930	3.0	0.710E-03	4.0E-02	0.500E-02	0.000E-02			
8.600	2.0	1.000E-03	4.0E-02	0.000E-02	0.000E-02			
9.500	3.0	0.180E-03	4.0E-02	0.000E-02	0.000E-02			
10.100	2.0	1.500E-03	4.0E-02	0.000E-02	90.000E-02			
12.780	3.0	0.790E-03	4.0E-02	20.000E-02	3.500E-02			
13.400	2.0	2.200E-03	4.0E-02	1.400E-02	2.500E-02			
14.750	3.0	0.200E-03	4.0E-02	1.400E-02	1.400E-02			
15.980	2.0	1.520E-03	4.0E-02	40.000E-02	6.500E-02			
16.690	3.0	1.230E-03	4.0E-02	10.000E-02	0.000E-02			
17.630	2.0	3.200E-03	4.0E-02	0.000E-02	2.000E-02			

PROGRAM TO CALCULATE CROSS-SECTIONS ACCORDING TO THE NEUTRON-NUCLEON FORMATION, USED ENERGY VERSION 11 DATA CAMPA.

3717L HQEN PU-249 NAMPS YCST DAYD.

(U) DESIGNATION OF THE ELEMENT 9-4024-05 AT 88W/1N 2-3006-02 NO OF 100702Z

QAYZ FOR 130800Z MARCH 1

3399NVA ADVENES 40 ON 00-300000'8 30NVA0000V 9VNO130VUJ 50-3730'0 3008008 2M5 20. NO11VNC10320 (V'2)

[illegible]

MASS OF THE 100702 IN UNITS OF NEUTRON MASS 2.5000000 SEATING LENGTH(10) 0.0000000 ANGULAR MOMENTUM 0 NO OF RECORDS 68

GRCS	SPIN	GN	GEARNA	67A	67D
1.6000E+01	3.0000E+00	3.0000E+00	4.0000E+02	4.0000E+02	3.0000E+00
2.6000E+01	3.0000E+00	3.0000E+00	4.0000E+02	3.0000E+02	3.0000E+02
4.3000E+00	3.0000E+00	0.0000E+04	4.0000E+02	3.0000E+02	3.0000E+02
4.5000E+00	3.0000E+00	4.3000E+04	4.0000E+02	0.0000E+02	3.0000E+02
5.0200E+00	3.0000E+00	2.4300E+04	4.0000E+02	3.0000E+00	3.0000E+02
6.9300E+00	3.0000E+00	7.1000E+04	4.0000E+02	3.0000E+02	3.0000E+02
8.0000E+00	3.0000E+00	3.0000E+00	4.0000E+02	0.0000E+02	3.0000E+02
9.5000E+00	3.0000E+00	3.0000E+00	4.0000E+02	0.0000E+02	3.0000E+02
3.0100E+01	3.0000E+00	3.0000E+04	4.0000E+02	0.0000E+02	3.0000E+02
3.2700E+01	3.0000E+00	3.0000E+04	4.0000E+02	0.0000E+02	3.0000E+02
3.3300E+01	3.0000E+00	7.0900E+04	4.0000E+02	3.0000E+01	3.0000E+02
3.4750E+01	3.0000E+00	2.2000E+04	4.0000E+02	3.4000E+02	3.0000E+02
3.5900E+01	3.0000E+00	0.2000E+00	4.0000E+02	3.4000E+02	3.0000E+02
3.6600E+01	3.0000E+00	3.0000E+00	4.0000E+02	3.0000E+01	3.0000E+02
3.7030E+01	3.0000E+00	3.0000E+00	4.0000E+02	3.0000E+01	3.0000E+02
		3.2000E+04	4.0000E+02	3.0000E+02	3.0000E+02

AGENCY FORMS & GUIDELINES-330000

NEUTRON ENERGY (eV)	σ_{CAP}	σ_{TOT}
0.025	683	790
0.05	683	790
0.1	683	790
0.2	683	790
0.5	683	790
1.0	683	790
2.0	683	790
5.0	683	790
10.0	683	790
20.0	683	790
50.0	683	790
100.0	683	790
200.0	683	790
500.0	683	790
1000.0	683	790
2000.0	683	790
5000.0	683	790
10000.0	683	790
20000.0	683	790
50000.0	683	790
100000.0	683	790
200000.0	683	790
500000.0	683	790
1000000.0	683	790
2000000.0	683	790
5000000.0	683	790
10000000.0	683	790
20000000.0	683	790
50000000.0	683	790
100000000.0	683	790
200000000.0	683	790
500000000.0	683	790
1000000000.0	683	790
2000000000.0	683	790
5000000000.0	683	790
10000000000.0	683	790
20000000000.0	683	790
50000000000.0	683	790
100000000000.0	683	790
200000000000.0	683	790
500000000000.0	683	790
1000000000000.0	683	790
2000000000000.0	683	790
5000000000000.0	683	790
10000000000000.0	683	790
20000000000000.0	683	790
50000000000000.0	683	790
100000000000000.0	683	790
200000000000000.0	683	790
500000000000000.0	683	790
1000000000000000.0	683	790
2000000000000000.0	683	790
5000000000000000.0	683	790
10000000000000000.0	683	790
20000000000000000.0	683	790
50000000000000000.0	683	790
100000000000000000.0	683	790
200000000000000000.0	683	790
500000000000000000.0	683	790
1000000000000000000.0	683	790
2000000000000000000.0	683	790
5000000000000000000.0	683	790
10000000000000000000.0	683	790
20000000000000000000.0	683	790
50000000000000000000.0	683	790
100000000000000000000.0	683	790
200000000000000000000.0	683	790
500000000000000000000.0	683	790
1000000000000000000000.0	683	790
2000000000000000000000.0	683	790
5000000000000000000000.0	683	790
10000000000000000000000.0	683	790
20000000000000000000000.0	683	790
50000000000000000000000.0	683	790
100000000000000000000000.0	683	790
200000000000000000000000.0	683	790
500000000000000000000000.0	683	790
1000000000000000000000000.0	683	790
2000000000000000000000000.0	683	790
5000000000000000000000000.0	683	790
10000000000000000000000000.0	683	790
20000000000000000000000000.0	683	790
50000000000000000000000000.0	683	790
100000000000000000000000000.0	683	790
200000000000000000000000000.0	683	790
500000000000000000000000000.0	683	790
1000000000000000000000000000.0	683	

2,533,000 0,000,000 3,062,500 5,099,500 9,099,500

	SIGCAP	SIGP	SIGTOTAL
NEUTRON ENERGY(EV)			
SIGNN			

1.000000E+00	1.058544E+01	4.980487E+00	0.772773E+00	2.225064E+01
1.036730E+00	1.055050E+01	4.552330E+00	0.920150E+00	2.282386E+01
1.072660E+00	1.051761E+01	4.253114E+00	7.005793E+00	2.105652E+01
1.025000E+00	1.001607E+01	2.271752E+00	1.108875E+01	2.347657E+01
2.650000E+00	9.478000E+00	2.614639E+00	1.066293E+01	2.073557E+01
3.475000E+00	8.536163E+00	5.725111E+00	2.600162E+01	4.106269E+01
4.227340E+00	5.104500E+00	2.650225E+02	1.355504E+02	4.056774E+02
4.263670E+00	0.031456E+00	6.438140E+02	3.402202E+02	9.940745E+02
4.308000E+00	3.043022E+01	1.504601E+03	1.069601E+03	2.604640E+03
4.336330E+00	3.104469E+01	9.187889E+02	9.132591E+02	1.055025E+03
4.370300E+00	2.100056E+01	3.779431E+02	9.675073E+02	9.665309E+02
4.372660E+00	2.053207E+01	3.567800E+02	9.526902E+02	9.299915E+02
4.379570E+00	1.921911E+01	3.099162E+02	9.199569E+02	8.490922E+02
4.448000E+00	1.322645E+01	1.463447E+02	4.368031E+02	5.963742E+02
4.479705E+00	1.177551E+01	1.314030E+02	4.005665E+02	6.310250E+02
4.510700E+00	1.159440E+01	1.408460E+02	5.050123E+02	7.165627E+02
4.500000E+00	1.384179E+01	1.699230E+02	7.029183E+02	8.066631E+02
4.608215E+00	1.510298E+01	6.095554E+01	3.722261E+02	4.762046E+02
4.708430E+00	1.332331E+01	4.045471E+01	2.030701E+02	2.560956E+02
4.715700E+00	1.103322E+01	2.079539E+01	1.519174E+02	1.045459E+02
5.223705E+00	1.036064E+01	1.163614E+01	1.708226E+02	1.920274E+02
5.250000E+00	1.030179E+01	1.147389E+01	1.754491E+02	1.972240E+02
5.505000E+00	9.990475E+00	1.203536E+01	2.565913E+02	2.706171E+02
5.920000E+00	1.065095E+01	1.366810E+01	3.219910E+02	3.463109E+02
6.172500E+00	1.115386E+01	1.340941E+01	3.000274E+02	3.246699E+02
6.425000E+00	1.091760E+01	1.446039E+01	2.430126E+02	2.691905E+02
6.616215E+00	1.004552E+01	2.210922E+01	2.202129E+02	2.524307E+02
6.677500E+00	9.570393E+00	2.959330E+01	2.264704E+02	2.656421E+02
6.794290E+00	8.371790E+00	7.467760E+01	3.153549E+02	3.908044E+02
6.862145E+00	8.079052E+00	1.775740E+02	9.515465E+02	7.379996E+02
6.930000E+00	1.009265E+01	0.452944E+02	9.409550E+02	1.384343E+03
6.997055E+00	2.107452E+01	1.720051E+02	9.203538E+02	7.142335E+02
7.065710E+00	1.792169E+01	7.144360E+01	9.726230E+02	3.619883E+02
7.347500E+00	1.344609E+01	1.236440E+01	1.130863E+02	1.596976E+02
7.765000E+00	1.166345E+01	6.508113E+00	9.027773E+01	1.004493E+02
8.102500E+00	1.025646E+01	1.000070E+01	1.142373E+02	1.353025E+02
8.479000E+00	9.194361E+00	7.555025E+01	3.162147E+02	4.069593E+02
8.539500E+00	1.204644E+01	1.051301E+02	9.432464E+02	7.404229E+02
8.600000E+00	2.572665E+01	3.031015E+02	7.058903E+02	1.113924E+03
8.660500E+00	2.454734E+01	1.091000E+02	2.036174E+02	3.973535E+02
8.721000E+00	1.064061E+01	7.491804E+01	2.064011E+01	1.221997E+02
8.825000E+00	1.460965E+01	2.650259E+01	3.616975E+00	4.000222E+01
9.030000E+00	1.213703E+01	1.003372E+01	2.632057E+01	4.049932E+01
9.275000E+00	1.090433E+01	1.096461E+01	6.047112E+01	6.234005E+01
9.339020E+00	1.054623E+01	1.473751E+01	7.964874E+01	1.049245E+02
9.419910E+00	1.010021E+01	2.020259E+01	1.305000E+02	1.609696E+02
9.500000E+00	1.119660E+01	5.097000E+01	2.142990E+02	2.764744E+02
9.500000E+00	1.216397E+01	2.055911E+01	1.639949E+02	2.047108E+02
9.629250E+00	1.190605E+01	1.077122E+01	1.430153E+02	1.737734E+02
9.650000E+00	1.190027E+01	1.639470E+01	2.395057E+02	1.670000E+02
9.660100E+00	1.106079E+01	1.547043E+01	1.305660E+02	1.659000E+02
9.800000E+00	1.160041E+01	1.061033E+01	1.504070E+02	1.726264E+02
9.950000E+00	1.106901E+01	1.025375E+01	1.720509E+02	1.949016E+02
1.010000E+01	1.242240E+01	1.001515E+01	1.730137E+02	1.954513E+02
1.0537075E+01	1.253795E+01	9.306169E+00	6.741065E+01	0.533470E+01
1.077000E+01	1.200537E+01	4.153931E+00	4.115512E+01	5.739442E+01
1.104190E+01	1.147766E+01	3.310095E+00	2.293927E+01	3.773303E+01
1.144700E+01	1.065231E+01	3.060003E+00	1.302704E+01	2.674104E+01
1.211000E+01	9.055921E+00	5.067992E+00	1.926266E+01	3.330657E+01
1.250421E+01	7.469301E+00	1.430950E+01	7.330651E+01	9.536547E+01
1.264210E+01	7.000704E+00	7.017004E+01	1.055657E+02	2.027934E+02

[illegible]

[illegible]

[illegible]

26	FORMAT(12(1X,F8.5,2X))			ADLN193
27	FORMAT(33H CROSS-SECTIONS AT THERMAL ENERGY)			ADLN194
28	FORMAT(4(E13.6,1X,11))			ADLN195
29	FORMAT(35H THE BACKGROUND PARAMETERS ARE)			ADLN196
30	FORMAT(74H	NUY	NUY	GT ADLN197
1	RT)			ADLN198
31	FORMAT(74H	MUF	MUF	CF ADLN199
1	WF)			ADLN200
32	FORMAT(74H	MUG	MUG	CC ADLN201
1	HC)			ADLN202
33	FORMAT(58H BACKGROUND PARAMETERS FOR THE TOTAL CROSS-SECTION)			ADLN203
34	FORMAT(92H BACKGROUND PARAMETERS FOR THE FISSION CROSS-SECTION)			ADLN204
35	FORMAT(52H BACKGROUND PARAMETERS FOR THE CAPTURE CROSS-SECTION)			ADLN205
36	FORMAT(4H A1=E18.6,4H A2=E18.6,4H A3=E18.6,4H A4=E18.6,4H B1=E18.6,4H B2=E18.6)			ADLN206
37	FORMAT(48H MASS OF THIS ISOTOPE IN UNITS OF NEUTRON MASS E11.4)			ADLN207
38	FORMAT(4H NX=15,18H IF NX=2 TOTAL AND CAPTURE BACKGROUND PARAMETERS GIVEN, IF NX=3 TOTAL, CAPTURE AND FISSION PARAMETERS GIVEN)			ADLN208
39	FORMAT(35H ANGULAR MOMENTUM OF THE RESONANCES I18.19H NUMBER OF J-BAYES I18)			ADLN209
40	FORMAT(29H J-VALUE FOR THESE RESONANCES F2.57H NUMBER OF RESONANCES I18 FOR THE ABOVE L-VALUE AND THIS J IS I18)			ADLN210
41	FORMAT(4H LI=15,18H IF LI=5 TOTAL AND CAPTURE, LI=6 FISSION AND CAPTURE, AND LI=7 TOTAL CAPTURE AND FISSION CROSS-SECTIONS GIVEN)			ADLN211
42	FORMAT(186H1 PROGRAM ADLER, CALCULATES CROSS-SECTIONS FROM ADLER-ADLER PARAMETERS WITH OPTION FOR DOPPLER BROADENING.)			ADLN212
43	FORMAT(24H ENDF/B VERSION II DATA.)			ADLN213
	DO 100 I=1,NTOTAL			ADLN214
	TERM1=ARRAY1(1,I)			ADLN215
	TERM2=ARRAY1(2,I)			ADLN216
	IF (TERM1.EQ.0.0.0R,TERM2.EQ.0.0)GO TO 1000			ADLN217
	GO TO 1001			ADLN218
1000	TERM1=ARRAY1(5,I)			ADLN219
	TERM2=ARRAY1(6,I)			ADLN220
	IF (TERM1.EQ.0.0.0R,TERM2.EQ.0.0)GO TO 1002			ADLN221
	GO TO 1003			ADLN222
1001	ERAN(1,I)=TERM1			ADLN223
	ERAN(2,I)=TERM2			ADLN224
	GO TO 100			ADLN225
1002	TERM1=ARRAY2(3,I)			ADLN226
	TERM2=ARRAY2(4,I)			ADLN227
	IF (TERM1.EQ.0.0.0R,TERM2.EQ.0.0)GO TO 1004			ADLN228
	GO TO 1005			ADLN229
1003	ERAN(1,I)=TERM1			ADLN230
	ERAN(2,I)=TERM2			ADLN231
	GO TO 100			ADLN232
1004	PRINT10			ADLN233
	GO TO 100			ADLN234
1005	ERAN(1,I)=TERM1			ADLN235
	ERAN(2,I)=TERM2			ADLN236
100	CONTINUE			ADLN237
	CALL OIKS(1,NTOTAL,NOV,NOH)			ADLN238
	PRINT11			ADLN239
	PRINT25			ADLN240
	PRINT27			ADLN241
	PRINT29			ADLN242
	PRINT14			ADLN243
	PRINT29			ADLN244
	E=ETWERN			ADLN245
	CALL ADSIGMA(E,NIS,1.0)			ADLN246
	PRINT0,E,(ANEF(11),LL01.0)			ADLN247
				ADLN248

```

PRINT3
IF (IOP1-EO,0)GO TO 1500
PRINT12
PRINT23
GO TO 1501
1500 PRINT13
PRINT25
1501 PRINT14
PRINT25
120 CONTINUE
DO 124 JJ=1,N13
MERJJ=MER(JJ)
DO 125 KK=1,MERJJ
IRANGE=KK
LRUJK=LRU(JJ,KK)
IF (LRUJK-1)131,132,125
131 PRINT15
GO TO 130
1321 IF (JJ,EO,1)GO TO 1320
GO TO 132
1320 ELOREF=EL(JJ,KK)
EHIREF=EH(JJ,KK)
ELO=ELOREF
EH=EHIREF
GO TO 1240
132 ELO=EL(JJ,KK)
EH=EH(JJ,KK)
IF (ELO,EO,ELOREF,AND,EH,EO,EHIREF)GO TO 124
GO TO 1240
1240 MH=MAXPTS/(4*MAXRES)
MH=MH
IFLAG=1
NLSKK=NLS(JJ,KK)
J4=1
ISTART=1
IEND=1
117 IF (IEND-EO,0)GO TO 125
J5=J4+1
E1=ERAN(1,J4)
G1=ERAN(2,J4)
E2=ERAN(1,J5)
G2=ERAN(2,J5)
IF (E1.LT.ELO,AND,E2.LT.ELO)GO TO 1120A
GO TO 1105
1105 IF (E1.LE.ELO,AND,E2.GT.ELO)GO TO 1110
GO TO 1111
1110 E1=ELO
G1=G2
ISTART=0
GO TO 1114
1111 IF (E1.GT.ELO,AND,E2.LE,EH)GO TO 1112
GO TO 1113
1112 IF (J4,EO,1,AND,ISTART,EO,1)GO TO 1100
GO TO 1114
1106 E2=E1
G2=G1
E1=ELO
J4=J4-1
ISTART=0
GO TO 1114
1110 E2=EH+G1/POATY (MH)

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ADLR251
ADLR252
ADLR253
ADLR254
ADLR255
ADLR256
ADLR257
ADLR258
ADLR259
ADLR260
ADLR261
ADLR262
ADLR263
ADLR264
ADLR265
ADLR266
ADLR267
ADLR268
ADLR269
ADLR270
ADLR271
ADLR272
ADLR273
ADLR274
ADLR275
ADLR276
ADLR277
ADLR277.1
ADLR278
ADLR279
ADLR280
ADLR281
ADLR282
ADLR283
ADLR284
ADLR285
ADLR286
ADLR287
ADLR288
ADLR289
ADLR290
ADLR291
ADLR291.1
ADLR292
ADLR292.1
ADLR293
ADLR294
ADLR295
ADLR296
ADLR297
ADLR297.1
ADLR298
ADLR298.1
ADLR299
ADLR300
ADLR301
ADLR302
ADLR303
ADLR304
ADLR305

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      G2=G1
      IFLAG=0
      GO TO 1114
1113 IF(E1.LT,EMI,AND,E2.GE,EMI)GO TO 1123
      GO TO 1124
1123 E2=EMI
      G2=G1
      IEND=0
      GO TO 1114
1124 IF(E1.GE,EMI,AND,E2.GT,EMI)GO TO 125
      GO TO 1125
1125 IF(IFLAG)1120,125,1120
1114 IF(E1.EQ,E2)GO TO 1120
      GO TO 1110
1110 CONTINUE
      CALL SIEVE(E1,G1,E2,G2,MM,NN,NX,TEFF,AHR)
      CALL OIKS(1,NX,MOVE,KOME)
      GO TO 115
1120 IF(IEND.EQ,0)GO TO 125
      J4=J4+1
      GO TO 117
1116 DO 109 I=1,NX
      E=EX(I)
      JFLAG=JFLAG(I)
      CALL ADSIGMA(E,NIS,NK,IOPL)
      PRINT8,E,(AREF(LL),LL=1,5)
109 CONTINUE
      IF(IFLAG)1117,125,1117
1117 J4=J4+1
      IF(NTOTAL-J4)125,1250,117
1250 E1=ERAN(1,J4)
      G1=ERAN(2,J4)
      GO TO 1116
125 CONTINUE
124 CONTINUE
130 CALL EXIT
      END
      SUBROUTINE ADSIGMA(G,NET,NK,IOPL)
      COMMON/D/ERAN(2,501)
      COMMON/C/EX(101),JFLAG(101)
      COMMON ARAY1(6,500),ARAY2(6,500),NOT(20),ZAI(20),AGN(10),
1NER(10),LFN(10),EL(10,10),EH(10,10),LRU(10,10),LRF(10,10),
      ZLANG(10,5,5),NLS(10,10),NRES(10),SPI(10),AP(10),LIS(10),AM(10),
      JAWRJ(10),LI(10),NXX(10),ABG(10,6,3),NJS(10,0,0),AJ(10,5,5),
      4AREF(6),TEFF,DELTA,C
      TEF=TEFF/293.0
      E12=SQRT(G)
      T1=1.0/E12
      N2=0
      NTR=0
      DO 4 J=1,6
      AREF(J)=0.0
      4 CONTINUE
      DO 112 I=1,NCV
      LT=1
      LC=1
      LF=1
      LI=LI(I)
      IF(LI-5)505,521,502
505 PRINT85
1055 FORMAT(23H ERROR INPUT DATA LI(I))

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ADLR300
ADLR307
ADLR308
ADLR309
ADLR3091
ADLR310
ADLR311
ADLR312
ADLR313
ADLR314
ADLR3141
ADLR315
ADLR316
ADLR3161
ADLR317
ADLR318
ADLR319
ADLR320
ADLR321
ADLR322
ADLR323
ADLR324
ADLR325
ADLR326
ADLR327
ADLR328
ADLR329
ADLR330
ADLR331
ADLR332
ADLR333
ADLR334
ADLR335
ADLR336
ADLR337
ADLR338
ADLR339
ADSG001
ADSG002
ADSG003
ADSG004
ADSG005
ADSG006
ADSG007
ADSG008
ADSG009
ADSG010
ADSG011
ADSG012
ADSG013
ADSG014
ADSG015
ADSG016
ADSG017
ADSG018
ADSG019
ADSG020
ADSG021
ADSG022
ADSG023
ADSG024

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GO TO 112
501 LF=5
GO TO 603
502 IF(LI1-6)508,503,504
503 LT=0
GO TO 603
504 IF(LI1-7)506,505,508
505 CONTINUE
600 NRES=NRES(I)
API=AP(I)
AMRJ=AMRJ(I)
NN=2.196771E-03*(AMRJ/(AMRJ+1.0))+API
NAVE=2.196771E-03*(AMRJ/(AMRJ+1.0))
CC=1.5/(NAVE+2)
CC=CC-3.1415927
DELTA=0.3177*SQRT((TEF*Q)/AMRJ)
IF(IDPL.EQ.0)GO TO 700
DETA=(CC+1.7724538)/DELTA
700 XOMEGA=2.0*NN*PI2
SIGT=0.0
SIGC=0.0
SIGF=0.0
NXXI=NXX(I)
IF(NXXI.EQ.2)GO TO 1000
GO TO 1001
1000 TAILT=ABC(I,1,1)*(ABC(I,2,1)/Q)+(ABC(I,3,1)/(Q+2))*
1(ABC(I,4,1)/(Q+3))+ABC(I,5,1)*Q*ABC(I,6,1)*Q*Q
TAILT=TAILT*CC/E12
TAILC=ABC(I,1,2)*(ABC(I,2,2)/Q)+(ABC(I,3,2)/(Q+2))*
1(ABC(I,4,2)/(Q+3))+ABC(I,5,2)*Q*ABC(I,6,2)*Q*Q
TAILC=TAILC*CC/E12
TAILF=0.0
GO TO 1010
1001 IF(NXXI.EQ.3)GO TO 1002
GO TO 1003
1002 TAILT=ABC(I,1,1)*(ABC(I,2,2)/Q)+(ABC(I,3,1)/(Q+2))*
1(ABC(I,4,1)/(Q+3))+ABC(I,5,1)*Q*ABC(I,6,1)*Q*Q
TAILT=TAILT*CC/E12
TAILF=ABC(I,1,2)*(ABC(I,2,2)/Q)+(ABC(I,3,2)/(Q+2))*
1(ABC(I,4,2)/(Q+3))+ABC(I,5,2)*Q*ABC(I,6,2)*Q*Q
TAILF=TAILF*CC/E12
TAILC=ABC(I,1,3)*(ABC(I,2,3)/Q)+(ABC(I,3,3)/(Q+2))*
1(ABC(I,4,3)/(Q+3))+ABC(I,5,3)*Q*ABC(I,6,3)*Q*Q
TAILF=TAILF*CC/E12
GO TO 1010
1003 PRINT1004
1004 FORMAT(24H ERROR INPUT DATA EXHIBIT)
1010 N1=N2+1
N2=N2+NRES
DO 100 K=N1,N2
IF(LT.EQ.0)GO TO 320
XMUT=ARRAY1(1,K)
XMUT=ARRAY1(2,K)
XGT=ARRAY1(3,K)
XMT=ARRAY1(4,K)
S1=XGT*COS(XOMEGA)-XMT*SIN(XOMEGA)
S2=XMT*COS(XOMEGA)+XGT*SIN(XOMEGA)
IF(IDPL.EQ.0)GO TO 201
GO TO 202
201 DEN=(XMUT+Q)**2*(XMUT+2)
TERM=(XMUT*S1+(XMUT-Q)*S2)/DEN

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      SIGT=SIGT+(TERM=CC=T1)
      GO TO 300
202 SXI=(XNUT-Q)/DELTA
      ETA=XNUT/DELTA
      CALL PFCN(SXI,ETA,U,V)
      TERM=T1*(S1+U+S2*V)
      SIGT=SIGT+TERM*BETA
300 IF(LF.EQ,0)GO TO 400
      XNUT=ARRAY1(5,K)
      XNUT=ARRAY1(6,K)
      XGF=ARRAY2(1,K)
      XHF=ARRAY2(2,K)
      IF(IDPL.EQ,0)GO TO 302
      GO TO 302
301 DEN=(XNUT-Q)**2*(XNUT**2)
      TERM=(XNUT*XGF+(XNUT-Q)*XHF)/DEN
      SIGF=SIGF+TERM*CC*T1
      GO TO 400
302 SXI=(XNUT-Q)/DELTA
      ETA=XNUT/DELTA
      CALL PFCN(SXI,ETA,U,V)
      TERM=T1*(U*XGF+V*XHF)
      SIGF=SIGF+TERM*BETA
400 IF(LC.EQ,0)GO TO 100
      XMUC=ARRAY2(3,K)
      XMUC=ARRAY2(3,K)
      XMUC=ARRAY2(4,K)
      XGC=ARRAY2(5,K)
      XHC=ARRAY2(6,K)
      IF(IDPL.EQ,0)GO TO 402
      GO TO 402
401 DEN=(XMUC-Q)**2*(XMUC**2)
      TERM=(XMUC*XGC+(XMUC-Q)*XHC)/DEN
      SIGC=SIGC+TERM*CC*T1
      GO TO 100
402 SXI=(XMUC-Q)/DELTA
      ETA=XMUC/DELTA
      CALL PFCN(SXI,ETA,U,V)
      TERM=T1*(U*XGC+V*XHC)
      SIGC=SIGC+TERM*BETA
100 CONTINUE
      SIGP=(2-Q/Q)*((1-C=CCS(HQ=SCA)))*CG
      SIGT=SIGT+SIGP
      SIGT=SIGT+TAILP
      SIGF=SIGF+TAILF
      SIGC=SIGC+TAILC
      IF(LT.EQ,0)SIGT=0.0
      AREF(1)=AREF(1)+ABN(1)*SIGT
      AREF(2)=AREF(2)+ABN(1)*SIGF
      AREF(3)=AREF(3)+ABN(1)*SIGC
112 CONTINUE
      RETURN
      END
      SUBROUTINE SIEVE(E1,G1,G2,G2,N,N,NH,SEFF,OMR)
      COMMON/C/EX(101),JFLAG(101)
      IF(E2.LT,E1)GO TO 101
      GO TO 300
300 N2=2*N
      DO 100 I=1,100
      JFLAG(I)=2
100 CONTINUE

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      TEF=SEFF/293.8
      DP=(1.5005E+00)*SORT (TEF/5000)
      WHEN MULTIPLIED BY SORTED DP GIVES 9 TIMES CORRESPONDING DELTA
      DP1=DP*SORT(E1)
      DP2=DP*SORT (E2)
      DG1=D1/FLOAT (4)
      DG2=D2/FLOAT (4)
      EX(1)=E1
      IF(G1.LT,DP1)GO TO 1004
      GO TO 1002
1001 JFLAG(1)=1
1002 ENOIF=ABS (E2-E1)
      NX=1
      DO 100 I=1,N
      XX=E1-DG1*FLOAT (I)
      IF(XX.LT,E2)GO TO 107
      GO TO 100
107 NX=NX+1
      EX(NX)=XX
      IF(G1.LT,DP1)GO TO 1003
      GO TO 100
1003 JFLAG(NX)=1
104 CONTINUE
      DO 200 I=1,N
      XX=E2-DG2*FLOAT (I)
      IF(XX.GT,E1)GO TO 100
      GO TO 200
100 NX=NX+1
      EX(NX)=XX
      IF(G2.LT,DP2)GO TO 1000
      GO TO 200
1000 JFLAG(NX)=1
200 CONTINUE
110 DIFF=(E2-E1)/FLOAT (N2)
      IF(DIFF)101,101,102
101 PRINT01
      GO TO 104
102 FORMAT(12H CALLING SEQUENCE OF SIEVE WRONG)
102 N21=NX+1
      NN=NX
      N22=N21+N2-2
      NX=N22
      E21=(E1-E2)/2.0
      DP12=DP*SORT (E21)
      E43=E2-E1-((G1+G2)/2.0)
      IF(E43.LT,DP12)GO TO 1000
      GO TO 1007
1006 DO 111 I=N21,N22
      I2=I-NN
      EX(I)=E1-DIFF*FLOAT (I2)
      JFLAG(I)=1
111 CONTINUE
      GO TO 1040
1007 DO 112 I=N21,N22
      I2=I-NN
      EX(I)=E1-DIFF*FLOAT (I2)
      DPTEST=DP*SORT (EX(I))
      IF(EX(I).LE,E21)GO TO 1000
      GO TO 1009
1008 IF(G1.LT,DPTEST)GO TO 1010
      GO TO 112

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 SIEVE00


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1010 JFLAG(1)=1
    GO TO 112
1009 IF (C2.LT.DPTEST) GO TO 1028
    GO TO 112
1011 JFLAG(1)=1
112 CONTINUE
1040 GO 113 I=1,NX
    DPF=DP*SQRT (EX(1))
    IF (DPF.EQ.0.0) GO TO 113
    TERM=EX(1)/DPF
    IF (TERM.LT.5.0) GO TO 110
    GO TO 113
114 JFLAG(1)=1
113 CONTINUE
104 RETURN
END
SUBROUTINE PFCN(X1,ETA,U,V)
CPFC2 SUBROUTINE TO EVALUATE THE COMPLEX PROBABILITY INTEGRAL
C
    AS A CONTOUR INTEGRAL
    UREF(2)=(H/PHI)*(Y1*EXP(-(Z**2))/(X1-Z**2+Y1**2))
    VINF(2)=(H/PHI)*((X1-Z)*EXP(-(Z**2))/(X1-Z**2+Y1**2))
    TANF(2)=SIN(2)/COS(2)
    VALF(2)=(5.54419139392619*Z*(29.337337812464*Z*(563.226517880
114*Z*(5926.5043121835*Z*(21563.282428660*Z*(41178.756829233*
22*(27662.791034654*Z*(2818.861494885)))))))/(1.8*Z*(52.5
3*Z*(1.023.75*Z*(9384.375*Z*(42229.6675*Z*(88682.34375
4*Z*(73981.923125*Z*(15836.1328125)))))))
    TERROR=1.0E-07
    PHI=3.1415926536
    X1=ABS(X1)
    Y1=ABS(ETA)
    IF (X1) 11,22,11
11 IF (Y1) 77,99,77
99 IF (X1-2.8) 991,991,992
992 IF (X1-5.0) 9921,9921,9922
9922 I=0
    DUSH=0.0
    DU=1.0
993 I=I+1
    GIG=1
    DU=DU*((2.2*GIG-1.0)/(2.0*CH2**2))
    IF (DU-TERROR) 994,994,995
995 DUSH=DUSH+DU
    GO TO 993
994 DUSH=DUSH+1.0
    DUSH=(DUSH)/(2.0*X1)
    IF (X1) 9941,9941,9942
9941 U=EXP(-(X1**2))
    V=((2.0)/SQRT (PHI))*DUSH
    V=-V
    GO TO 86
9942 U=EXP(-(X1**2))
    V=((2.0)/SQRT (PHI))*DUSH
    GO TO 86
9921 I=0
    DUSH=0.0
    AXE=(5.1)/(X1**2)
9923 I=I+1
    GIG=1
    GIG=2.0*GIG-1.0
    GIG=GIG*GIG

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PFCN0046

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TERM=(EXP(-(CIG*AXE*(X1**2))))/(CIG*ANG*1.0)
ABSTRM=ABS (TERM)
IF (ABSTRM-TERROR) 9925,9925,9924
9924 DWSN=DWSN+TERM
GO TO 9923
9925 DWSN=(2.0)*SORT (AXE/PHI)*DWSN
DWSN1=(0.5)*SORT (PHI)*EXP(-(X1**2))*TAN7(PHI/(2.0)*SORT (AXE))
DWSN=DWSN
DWSN=DWSN+DWSN1
IF (SX1) 9926,9926,9927
9926 U=EXP(-(X1**2))
V=((2.0)/SORT (PHI))*DWSN
V=-V
GO TO 88
9927 U=EXP(-(X1**2))
V=((2.0)/SORT (PHI))*DWSN
GO TO 88
991 I=0
DWSN=0.0
DN=-1.0)
996 I=I+1
CIG=1
DN=DN*((2.0*(X1**2))/(2.0*CIG-1.0))
DN=-DN
ABSDN=ABS (DN)
IF (ABSDN-TERROR) 997,997,999
998 DWSN=DWSN+DN
GO TO 996
997 DWSN=DWSN/(2.0*X1)
IF (SX1) 9971,9971,9972
9971 U=EXP(-(X1**2))
V=((2.0)/SORT (PHI))*DWSN
V=-V
GO TO 88
9972 U=EXP(-(X1**2))
V=((2.0)/SORT (PHI))*DWSN
GO TO 88
22 IF (ETA) 44,55,88
44 IF(Y1-1.5)444,445,443
444 U=EXP(Y1**2)*(1.0*ERRCON7(V1))
V=0.0
GO TO 88
445 X2=1.0/(Y1*V1)
U=2.0*EXP(Y1**2)*(VALF(X2)/V2)
V=0.0
GO TO 88
55 U=1.0
V=0.0
GO TO 88
46 IF(Y1-1.5)664,665,663
664 U=EXP(Y1**2)*(1.0*ERRCON7(V1))
V=0.0
GO TO 88
665 X2=1.0/(Y1*V1)
U=VALF(X2)/V2
V=0.0
GO TO 88
77 IF(X1-0.44)778,779,771
778 IF(Y1-0.44)772,772,771
772 H=0.5
GO TO 773

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771 RHO=SQRT (X1**2+Y1**2)
    TERL=ALOG(TERROR)
    RHO1=PHI/PHI*Y1*Y1
    IF (RHO1-E.1)1011,1012,1012
1011 RHO1=0.1
1012 RHO1=ABS (RHO1)
    RHO2=ALOG((1.13+RHO)/RHO1)
    H1=PHI/SQRT (RHO2-TERL)
    RHO3=(PHI/H1)**2-Y1*Y1
    IF (RHO3-E.1)1021,1022,1022
1021 RHO3=0.1
1022 RHO3=ABS (RHO3)
    RHO4=ALOG((1.13+RHO)/RHO3)
    H=PHI/SQRT (RHO4-TERL)
773 AL=-(2.0)*PHI*Y1/H
    BM=(2.0)*X1*Y1
    CN=(2.0)*PHI*X1/H
    T=0.0
    AU=UREF(0.0)
    UPOS=0.0
123 T=T+H
    UT=UREF(T)
    IF (UT-TERROR) 122,122,123
1231 UPOS=UPOS+UT
    GO TO 123
122 UNEG=0.0
    S=0.0
125 S=S+H
    US=UREF(S)
    IF (US-TERROR) 124,124,124
1241 UNEG=UNEG+US
    GO TO 125
124 AU=AU+UPOS+UNEG
    GO TO 126
126 VPOS=0.0
    AV=VIMF(0.0)
    T=0.0
128 T=T+H
    VT=VIMF(T)
    ABSPT=ABS (VT)
    IF (ABSPT-TERROR) 127,127,127
1271 VPOS=VPOS+VT
    GO TO 128
127 S=0.0
    VNEG=0.0
130 S=S+H
    VS=VIMF(S)
    ABSPS=ABS (VS)
    IF (ABSPS-TERROR) 129,129,129
1291 VNEG=VNEG+VS
    GO TO 130
129 AV=AV+VPOS+VNEG
    U1=AU
    V1=AV
    POLR=(2.0*EXP (Y1**2-H1**2))*(EXP (2.0*AL)*COS (CM)-EXP (AL)*
    1COS (CN-BM))/(1.0-2.0*EXP (AL)*COS (CN)*EXP (2.0*AL))
    POLI=-(2.0*EXP (Y1**2-H1**2))*(EXP (2.0*AL)*SIN (BM)*EXP (AL)*
    1SIN (CN-BM))/(1.0-2.0*EXP (AL)*COS (CN)*EXP (2.0*AL))
    PHIH=PHI/H
    IF (Y1=PHIH) 300,400,500
300 A=1.0

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PFCN0163
PFCN0164
PFCN0165
PFCN0166
PFCN0167
PFCN0168

```

```

      B=1.0
      GO TO 600
400  A=0.5
      B=0.5
      GO TO 600
500  A=0.0
      B=0.0
600  U1=U1+A*POLR
      V1=V1+B*POLI
      GO TO 33
33  IF (SX1) 331,88,333
331  IF (ZYA) 441,88,443
333  IF (ZTA) 661,88,663
441  V=2.0*EXP (Y1**2-X1**2)*COS (2.0*X1*Y1)=U1
      V=-2.0*EXP (Y1**2-X1**2)*SIN (2.0*X1*Y1)=V1
      GO TO 88
661  U=U1
      V=-V1
      GO TO 88
663  U=2.0*EXP (V1**2-X1**2)*COS (2.0*X1*Y1)=U1
      V=2.0*EXP (V1**2-X1**2)*SIN (2.0*X1*Y1)=V1
      GO TO 88
663  U=U1
      V=V1
88  RETURN
END
FUNCTION ERRORF(X)
  DATA P,A1,A2,A3,A4,A5/0.3275911,0.25482092,0.0,0.204496730,
1  1.421413741,-1.453152027,1.061405429/
  T=1.0/(1.0+P*X)
  ERRORF=1.0*(P*(A5*T+A4)*T*A3)*T*A2)*T*A1)*T*EXP(-X**2)
  RETURN
END
SUBROUTINE MOV(I,J)
  COMMON/D/ERAN(2,501)
  I1=I
  J1=J
  IF(I1.EQ.0) I1=501
  IF(J1.EQ.0) J1=501
  ERAN(1,J1)=ERAN(1,I1)
  ERAN(2,J1)=ERAN(2,I1)
  RETURN
END
SUBROUTINE MOVE(I,J)
  COMMON/C/EX(101),JFLAG(101)
  I1=I
  J1=J
  IF(I1.EQ.0) I1=101
  IF(J1.EQ.0) J1=101
  EX(J1)=EX(I1)
  JFLAG(J1)=JFLAG(I1)
  RETURN
END
FUNCTION KOM(I,J)
  COMMON/D/ERAN(2,501)
  I1=I
  J1=J
  IF(I1.EQ.0) I1=501
  IF(J1.EQ.0) J1=501
  EOM=ERAN(1,I1)-ERAN(1,J1)
  IF(EOM)100,101,102

```

```

PFCN0169
PFCN0170
PFCN0171
PFCN0172
PFCN0173
PFCN0174
PFCN0175
PFCN0176
PFCN0177
PFCN0178
PFCN0179
PFCN0180
PFCN0181
PFCN0182
PFCN0183
PFCN0184
PFCN0185
PFCN0186
PFCN0187
PFCN0188
PFCN0189
PFCN0190
PFCN0191
PFCN0192
PFCN0193
PFCN0194
ERRF001
ERRF002
ERRF003
ERRF004
ERRF005
ERRF006
ERRF007
MOV001
MOV002
MOV003
MOV004
MOV005
MOV006
MOV007
MOV008
MOV009
MOV010
MOVE001
MOVE002
MOVE003
MOVE004
MOVE005
MOVE006
MOVE007
MOVE008
MOVE009
MOVE010
KOM001
KOM002
KOM003
KOM004
KOM005
KOM006
KOM007
KOM008

```

```

100 KOM=-1
   GO TO 103
101 KOM=0
   GO TO 103
102 KOM=1
103 RETURN
END
FUNCTION KOME(I,J)
COMMON/C/EX(103),JFLAG(103)
I1=I
J1=J
IF(I1.EQ.0)I1=101
IF(J1.EQ.0)J1=101
EOX=EX(I1)-EX(J1)
IF(EOX)100,101,102
100 KOME=-1
   GO TO 103
101 KOME=0
   GO TO 103
102 KOME=1
103 RETURN
END
SUBROUTINE QIKS (MM,NN,MOVE,COMPAR)
CQIKS  ALL-IN-MEMORY SORT PROGRAM
C      MM = FIRST SUBSCRIPT
C      NN = LAST SUBSCRIPT (ARRAY IS IN COMMON)
C      MOVE AND COMPAR ARE USER SUPPLIED PROGRAMS
DIMENSION MSAVE(20),NSAVE(20)
KEYLOC(M,N)=(N-M)/2
I=0
J=0
LEVEL = 0.
M=MM
N=NN
35 CONTINUE
C      TEST FOR ONE OR TWO ITEMS
IF(N-M-1) 31,31,32
C 32 CONTINUE
C      PARTITION AND SPREADER GO HERE; SEE BELOW. RETURN IS TO 0.
C      PUSH DOWN
C      LEVEL=LEVEL+1
C      WORK ON SMALLEST PORTION
IF ((J-M) - (N-I)) 134, 134, 34
134 NSAVE(LEVEL) = I
   NSAVE(LEVEL) = N
   N=J
   GO TO 35
34 NSAVE(LEVEL) = I
   NSAVE(LEVEL) = J
   M=I
   GO TO 35
51 IF (COMPAR(M,N)) 31,31,131
C      SWAP IF ONLY TWO ITEMS ARE OUT OF ORDER
131 CALL MOVE(M,0)
   CALL MOVE(N,M)
   CALL MOVE(2,N)
31 IF (LEVEL) 151, 150, 151
150 RETURN
C      POP UP
151 M = NSAVE(LEVEL)
   N = NSAVE(LEVEL)

```

```

KOM009
KOM010
KOM011
KOM012
KOM013
KOM014
KOM015
KOM001
KOM002
KOM003
KOM004
KOM005
KOM006
KOM007
KOM008
KOM009
KOM010
KOM011
KOM012
KOM013
KOM014
KOM015
QIKS0010
QIKS0020
QIKS0030
QIKS0040
QIKS0050
QIKS0060
QIKS0070
QIKS0080
QIKS0090
QIKS0100
QIKS0110
QIKS0120
QIKS0130
QIKS0140
QIKS0150
QIKS0160
QIKS0170
QIKS0180
QIKS0190
QIKS0200
QIKS0210
QIKS0220
QIKS0230
QIKS0240
QIKS0250
QIKS0260
QIKS0270
QIKS0280
QIKS0290
QIKS0300
QIKS0310
QIKS0320
QIKS0330
QIKS0340
QIKS0350
QIKS0360
QIKS0370
QIKS0380
QIKS0390

```

```

LEVEL=LEVEL-1
GO TO 35
C   END MAIN
C   PARTITION
32 I=M
   J=N
   KEY=KEYLOC(M,N)
   CALL MOVE(KEY, 0)
94 IF (N - KEY) 17, 17, 17
17 CALL MOVE(N,KEY)
   1 CONTINUE
C   HOLE AT BOTTOM
   IF (COMPAR(0,I)) 3,2,2
   2 I=I+1
   IF (I = J) 1, 4, 2
   3 CALL MOVE(I,J)
   GO TO 5
   6 CONTINUE
C   HOLE AT TOP
   IF (COMPAR(0,J)) 5,5,7
   5 J=J-1
   IF (I = J) 6, 4, 6
   7 CALL MOVE(J,I)
   GO TO 2
C   4 CONTINUE
C   SPREADER GOES HERE
C   END PARTITION
C   SPREADER
   4 CALL MOVE(0,I)
12 IF (I = N) 110, 10, 120
110 I = I + 1
   IF (COMPAR(0,I)) 10,12,10
10 IF (J = M) 100, 8, 100
100 J = J - 1
   IF (COMPAR(0,J)) 8,20,0
C   8 CONTINUE
C   RETURN TO MAIN PROGRAM
END

```

```

QIKS0400
QIKS0410
QIKS0420
QIKS0430
QIKS0440
QIKS0450
QIKS0460
QIKS0470
QIKS0480
QIKS0490
QIKS0500
QIKS0510
QIKS0520
QIKS0530
QIKS0540
QIKS0550
QIKS0560
QIKS0570
QIKS0580
QIKS0590
QIKS0600
QIKS0610
QIKS0620
QIKS0630
QIKS0640
QIKS0650
QIKS0660
QIKS0670
QIKS0680
QIKS0690
QIKS0700
QIKS0710
QIKS0720
QIKS0730
QIKS0740
QIKS0750
QIKS0760
QIKS0770

```

ADLER TEST. U-233 DATA

92233. 231.0375

92233. 1.0

0.790 40.0

2.5 1.00925

231.0375 0.0

0.0 0.0

0.0 0.0

0.0 0.0

0.0 0.0

2.5 0.0

0293.0

0 0

0 1

1 4

0 0

6 0

0.0 0.0

0.0 0.0

0.0 0.0

0 0

0 0

1

1

0

1

10

0.0

0.0

0.0

1

074

0

0

0

0

3

0.0

0.0

0.0

0

73

0. 0. 0. 0. -2.7900E+00 3.7000E-01
 -2.5726E-03-8 2334E-04-2.7900E+00 3.7000E-01 1.6119E-04-6.6074E-06
 0. 0. 0. 0. 1.8000E-01 7.0000E-02
 -3.1903E-07-1 2945E-06 1.0000E-01 7.0000E-02 4.2644E-07-6.0920E-08
 0. 0. 0. 0. 1.4200E+00 3.5000E-01
 9.0401E-05-5 1063E-05 1.4200E+00 3.5000E-01 3.3406E-04-1.1103E-05
 0. 0. 0. 0. 1.7800E+00 1.2000E-01
 1.6990E-04-4 4167E-07 1.7800E+00 1.2000E-01 3.9807E-05 0.0334E-06
 0. 0. 0. 0. 2.2900E+00 5.0000E-02
 6.5802E-05 2.0881E-05 2.2900E+00 5.0000E-02 5.6747E-05 2.0320E-06
 0. 0. 0. 0. 3.3000E+00 5.0000E-01
 3.6869E-05-6 4686E-05 3.3000E+00 5.0000E-01 2.5220E-06 1.0661E-06
 0. 0. 0. 0. 3.6300E+00 0.0000E-02
 3.1404E-05 1.0707E-05 3.6300E+00 0.0000E-02 1.4057E-05 1.3250E-06
 0. 0. 0. 0. 4.5200E+00 3.9000E-01
 6.6570E-05-0 2684E-05 4.5200E+00 3.9000E-01 5.7074E-06-4.1730E-06
 0. 0. 0. 0. 5.7300E+00 1.0000E-01
 1.5626E-05-3 0745E-05 5.7300E+00 1.0000E-01 5.1020E-06-3.2744E-06
 0. 0. 0. 0. 6.0000E+00 9.0000E-02
 2.5643E-04 5.2802E-05 0.0000E+00 9.0000E-02 8.7314E-05 4.0359E-06
 0. 0. 0. 0. 7.4900E+00 9.0000E-02
 7.9501E-06 2.1170E-06 7.4900E+00 9.0000E-02 2.6805E-06 1.5074E-06
 0. 0. 0. 0. 8.6300E+00 2.0000E-01
 2.3332E-05-1 1.110E-06 0.6300E+00 2.0000E-01 3.5029E-06-2.0320E-06
 0. 0. 0. 0. 9.1500E+00 1.4000E-01
 2.2373E-05-2 3.180E-05 0.1500E+00 1.4000E-01 4.0431E-06-9.4426E-07
 0. 0. 0. 0. 1.0300E+01 1.0000E-01
 4.1572E-04 5.1034E-06 1.0300E+01 1.0000E-01 6.2866E-05 3.6893E-06
 0. 0. 0. 0. 1.1200E+01 2.0000E-01
 5.2970E-05 1.4057E-05 1.1200E+01 2.0000E-01 5.4523E-06-5.0107E-06
 0. 0. 0. 0. 1.1750E+01 1.0000E-01
 9.7624E-06-6 0.204E-00 1.1750E+01 1.0000E-01-1.0493E-05-3.5029E-07
 0. 0. 0. 0. 1.2760E+01 1.7000E-01
 3.5300E-04 6.7225E-05 1.2760E+01 1.7000E-01 4.8873E-05 3.5334E-06
 0. 0. 0. 0. 1.3470E+01 2.0000E-01
 5.1934E-05 2.5495E-05 1.3470E+01 2.0000E-01 1.4910E-05-5.3610E-06
 0. 0. 0. 0. 1.3660E+01 1.4000E-01
 7.4794E-05-3 2.013E-05 1.3660E+01 1.4000E-01 3.1670E-06 2.3759E-06
 0. 0. 0. 0. 1.5200E+01 1.2000E-01
 1.0151E-04-5 5.050E-05 1.5200E+01 1.2000E-01 7.0574E-05-4.4167E-06
 0. 0. 0. 0. 1.6130E+01 2.2000E-01
 1.5429E-04-7 5.603E-00 1.6130E+01 2.2000E-01 0.2890E-06-4.5842E-06
 0. 0. 0. 0. 1.6520E+01 1.3000E-01
 1.4357E-04 4.0527E-05 1.6520E+01 1.3000E-01 5.8475E-05 0.6250E-06
 0. 0. 0. 0. 1.7930E+01 1.2000E-01
 6.4430E-05 6.3397E-06 1.7930E+01 1.2000E-01 1.4651E-05 2.1627E-06
 0. 0. 0. 0. 1.8420E+01 2.1000E-01
 9.0755E-05 7.4027E-07 1.8420E+01 2.1000E-01 1.0004E-05-1.9190E-06
 0. 0. 0. 0. 1.8860E+01 1.5000E-01
 3.2556E-04-6 0.144E-05 1.8860E+01 1.5000E-01 5.0670E-05 4.6900E-06

0.	0.	0.	0.	2.0530E+01	2.0000E-01
1.6076E-04	1.4130E-05	2.0530E+01	2.0000E-01	2.0617E-05	1.2104E-06
0.	0.	0.	0.	2.1050E+01	1.3000E-01
1.9910E-04	1.3316E-04	2.1050E+01	1.3000E-01	3.2391E-05	1.7816E-05
0.	0.	0.	0.	2.2230E+01	2.4000E-01
0.1222E-04	1.2172E-04	2.2230E+01	2.4000E-01	9.8431E-05	1.2047E-05
0.	0.	0.	0.	2.2940E+01	3.0000E-01
1.4414E-04	2.2236E-06	2.2940E+01	3.0000E-01	1.4170E-05	1.1093E-05
0.	0.	0.	0.	2.3940E+01	3.3000E-01
9.0112E-05	1.4114E-04	2.3940E+01	3.3000E-01	6.1872E-06	4.6147E-06
0.	0.	0.	0.	2.5130E+01	1.9000E-01
1.2617E-04	4.088E-05	2.5130E+01	1.9000E-01	2.1109E-05	4.0736E-07
0.	0.	0.	0.	2.6190E+01	1.7000E-01
4.0504E-06	1.5946E-05	2.6190E+01	1.7000E-01	0.6963E-06	2.1322E-06
0.	0.	0.	0.	2.6570E+01	2.4000E-01
9.4563E-05	1.7773E-05	2.6570E+01	2.4000E-01	1.9431E-05	1.3781E-05
0.	0.	0.	0.	2.7390E+01	4.3000E-01
2.0302E-05	1.6707E-05	2.7390E+01	4.3000E-01	1.1636E-05	5.3457E-06
0.	0.	0.	0.	2.8330E+01	1.6000E-01
3.4603E-05	3.6933E-05	2.8330E+01	1.6000E-01	2.0330E+01	1.6000E-01
0.	0.	0.	0.	2.8990E+01	3.0000E-01
3.1153E-04	0.7572E-04	2.8990E+01	3.0000E-01	2.6035E-05	1.1664E-05
0.	0.	0.	0.	2.9660E+01	7.0000E-02
6.6060E-06	1.7469E-05	2.9660E+01	7.0000E-02	4.0504E-06	1.0052E-06
0.	0.	0.	0.	3.0150E+01	1.0000E-01
4.0055E-06	2.0705E-06	3.0150E+01	1.0000E-01	3.0150E+01	1.0000E-01
0.	0.	0.	0.	3.0760E+01	1.4000E-01
7.9394E-05	7.2203E-05	3.0760E+01	1.4000E-01	1.7910E-05	1.2943E-06
0.	0.	0.	0.	3.1200E+01	4.7000E-01
2.1057E-04	1.1311E-04	3.1200E+01	4.7000E-01	1.8889E-05	0.7420E-06
0.	0.	0.	0.	3.1900E+01	1.4000E-01
1.6314E-04	1.9007E-05	3.1900E+01	1.4000E-01	3.5227E-05	1.0263E-05
0.	0.	0.	0.	3.2740E+01	4.3000E-01
6.1103E-05	1.4001E-04	3.2740E+01	4.3000E-01	3.2740E+01	4.3000E-01
0.	0.	0.	0.	3.4030E+01	6.6000E-01
1.4634E-04	4.8660E-05	3.4030E+01	6.6000E-01	3.4640E-05	3.6994E-05
0.	0.	0.	0.	3.4530E+01	4.2000E-01
2.6161E-04	4.9748E-05	3.4530E+01	4.2000E-01	6.2740E-06	2.2201E-05
0.	0.	0.	0.	3.5190E+01	1.2000E-01
4.0420E-05	0.2440E-06	3.5190E+01	1.2000E-01	9.5509E-06	1.0883E-06
0.	0.	0.	0.	3.5460E+01	1.7000E-01
1.7773E-05	3.5950E-05	3.5460E+01	1.7000E-01	1.7362E-06	9.4570E-06
0.	0.	0.	0.	3.6540E+01	9.0000E-02
0.5593E-05	2.0130E-05	3.6540E+01	9.0000E-02	2.9908E-05	0.3613E-06
0.	0.	0.	0.	3.7500E+01	2.4000E-01
1.1392E-04	4.5760E-05	3.7500E+01	2.4000E-01	7.9957E-06	4.7061E-06
0.	0.	0.	0.	3.9460E+01	2.0000E-01
1.7370E-04	1.7530E-04	3.9460E+01	2.0000E-01	2.2063E-06	1.0733E-05
0.	0.	0.	0.	3.9570E+01	1.6000E-01
2.9546E-06	0.8538E-05	3.9570E+01	1.6000E-01	6.4271E-06	1.3067E-05
0.	0.	0.	0.	4.0060E+01	4.9000E-01
1.4452E-04	1.4173E-04	4.0060E+01	4.9000E-01	1.3052E-05	1.6677E-05
0.	0.	0.	0.	4.1060E+01	9.0000E-02
3.1755E-05	2.0195E-05	4.1060E+01	9.0000E-02	1.6372E-05	4.9002E-06
0.	0.	0.	0.	4.2620E+01	1.2000E-01
9.3923E-05	2.5434E-05	4.2620E+01	1.2000E-01	2.6424E-05	5.4371E-06
0.	0.	0.	0.	4.3470E+01	1.4000E-01
5.0685E-05	0.5136E-06	4.3470E+01	1.4000E-01	1.0539E-05	1.4753E-07
0.	0.	0.	0.	4.4640E+01	5.6000E-01
1.1797E-04	3.0719E-05	4.4640E+01	5.6000E-01	5.3305E-06	9.1220E-06
0.	0.	0.	0.	4.5310E+01	5.2000E-01

1.6966E-05-8 8191E-05 4.5310E+01 5.2000E-01 6.8303E-06-6.9601E-06
 0. 0. 0. 0. 4.6810E+01 8.0000E-02
 3.8760E-05-2 4612E-05 4.8810E+01 8.0000E-02 2.1977E-05-6.2291E-06
 0. 0. 0. 0. 4.7170E+01 2.3000E-01
 1.1489E-04-9 8881E-06 4.7170E+01 2.3000E-01 5.5894E-06-5.6656E-06
 0. 0. 0. 0. 4.8640E+01 1.3000E-01
 2.5373E-04-3 2836E-05 4.8640E+01 1.3000E-01 1.2224E-04 5.0107E-06
 0. 0. 0. 0. 4.9120E+01 9.0000E-02
 1.3753E-05-9 7320E-06 4.9120E+01 9.0000E-02-3.3049E-06-7.0819E-06
 0. 0. 0. 0. 5.0210E+01 4.5000E-01
 7.7673E-05-4 5785E-05 5.0210E+01 4.5000E-01-2.5891E-07-6.1329E-06
 0. 0. 0. 0. 5.0990E+01 3.0000E-01
 2.7277E-05-6 8535E-07 5.0990E+01 3.0000E-01-2.2845E-06-1.2489E-05
 0. 0. 0. 0. 5.1950E+01 6.2000E-01
 2.3652E-05-6 6174E-05 5.1950E+01 6.2000E-01-2.4866E-05 1.0813E-06
 0. 0. 0. 0. 5.2910E+01 2.2000E-01
 7.2675E-05-9 7788E-05 5.2910E+01 2.2000E-01 1.2397E-05 3.6704E-06
 0. 0. 0. 0. 5.3970E+01 1.4000E-01
 9.1637E-05-3 4435E-05 5.3970E+01 1.4000E-01 1.7179E-05 3.4724E-06
 0. 0. 0. 0. 5.4770E+01 9.0000E-02
 9.1920E-05 1 1362E-05 5.4770E+01 9.0000E-02 3.8780E-05 3.9141E-06
 0. 0. 0. 0. 5.6090E+01 2.7000E-01
 9.3314E-05 1 9525E-04 5.6090E+01 2.7000E-01 8.8334E-06 3.8079E-07
 0. 0. 0. 0. 5.6350E+01 3.0000E-01
 3.3395E-04-8 1937E-05 5.6350E+01 3.0000E-01 3.4344E-05 8.8414E-06
 0. 0. 0. 0. 5.7480E+01 4.9000E-01
 4.3587E-04 3 5943E-05 5.7480E+01 4.9000E-01 2.4082E-05 4.8886E-06
 0. 0. 0. 0. 5.8510E+01 2.3000E-01
 1.4106E-04 0 9598E-05 5.8510E+01 2.3000E-01 1.5763E-05-3.9769E-06
 0. 0. 0. 0. 6.1300E+01 4.0000E-01
 2.8253E-04 7 2312E-05 6.1300E+01 4.0000E-01 2.2717E-05-1.7971E-06
 0. 0. 0. 0. 6.2500E+01 2.0000E-01
 1.6427E-04-2 2704E-05 6.2500E+01 2.0000E-01 0.2500E-01 2.0000E-01
 0. 0. 0. 0. 6.4300E+01 4.0000E-01
 3.4727E-04-3 5502E-05 6.4300E+01 4.0000E-01 0.4300E-01 4.8000E-01
 0.4082E-05-2.4642E-05

PROGRAM ADLER, CALCULATES CROSS-SECTIONS FROM ADLER-ADLER PARAMETERS WITH OPTION FOR DOPPLER BROADENING.

ENDF/6 VERSION 11 DATA.

TITLE ADLER TEST, U-233 DATA.

OPTION TO DOPPLER BROADEN 0 EFFECTIVE TEMPERATURE(OK) 2997000

(2,1) DESIGNATION OF THE ELEMENT 9.2233E+04 AT.WT/MASS OF NEUTRON 2.3104E+02 NO OF ISOTOPEs 1

DATA FOR ISOTOPE NUMBER 1

(2,1) DESIGNATION OF THE ISOTOPE 9.2233E+04 FRACTIONAL ABUNDANCE 1.0000E+00 NO OF ENERGY RANGES 1
LOWER LIMIT OF THE ENERGY RANGE(KEV) 7.9000E-01 UPPER LIMIT(KEV) 6.0000E+01 LRU0 3 LRU1 4
NUCLEAR SPIN 2.5000E+00 SCATTERING LENGTH 1.0092E+00 NO OF L-VALUES 1
MASS OF THIS ISOTOPE IN UNITS OF NEUTRON MASS 2.3104E+02
LI= 6 IF LI=5 TOTAL AND CAPTURE, LI=6 FISSION AND CAPTURE, AND LI=7 TOTAL CAPTURE AND FISSION CROSS-SECTIONS GIVEN
NX= 3 IF NX=2 TOTAL AND CAPTURE BACKGROUND PARAMETERS GIVEN, IF NX=3 TOTAL, CAPTURE AND FISSION PARAMETERS GIVEN

BACKGROUND PARAMETERS FOR THE TOTAL CROSS-SECTION
A1= 0.000000E+00 A2= 0.000000E+00 A3= 0.000000E+00 A4= 0.000000E+00 B1= 0.000000E+00 B2= 0.000000E+00

BACKGROUND PARAMETERS FOR THE FISSION CROSS-SECTION
A1= 0.000000E+00 A2= 0.000000E+00 A3= 0.000000E+00 A4= 0.000000E+00 B1= 0.000000E+00 B2= 0.000000E+00

BACKGROUND PARAMETERS FOR THE CAPTURE CROSS-SECTION
A1= 0.000000E+00 A2= 0.000000E+00 A3= 0.000000E+00 A4= 0.000000E+00 B1= 0.000000E+00 B2= 0.000000E+00

ANGULAR MOMENTUM OF THE RESONANCES 3 NUMBER OF J-STATES 1

J-VALUE FOR THESE RESONANCES 2, 3, 4 NUMBER OF RESONANCES FOR THE ABOVE L-VALUE AND THIS J IS 73

ADLER-ADLER PARAMETERS FOR THIS ISOTOPE

[illegible]

00-300000000-5
14

[illegible]

00-300000000-0

[illegible]

00-320000-0

[illegible]

00+3000000'0
104

也。

0

22

2

2

3.483000E+01
 3.493000E+01
 3.519000E+01
 3.546000E+01
 3.654000E+01
 3.750000E+01
 3.946000E+01
 3.997000E+01
 4.706000E+01
 4.106000E+01
 4.262000E+01
 4.347000E+01
 4.464000E+01
 4.531200E+01
 4.681700E+01
 4.717000E+01
 4.864000E+01
 4.912000E+01
 5.021000E+01
 5.099000E+01
 5.195000E+01
 5.291000E+01
 5.397000E+01
 5.477000E+01
 5.609000E+01
 5.635000E+01
 5.748000E+01
 5.851000E+01
 6.130000E+01
 6.250000E+01
 6.430000E+01

6.620000E+01
 4.280000E+01
 1.280000E+01
 1.720000E+01
 9.000000E+02
 2.402000E+01
 2.802000E+01
 1.600000E+01
 4.900000E+01
 9.000000E+02
 1.200000E+01
 1.420000E+01
 5.600000E+01
 5.200000E+01
 8.000000E+02
 2.300000E+01
 1.300000E+01
 9.000000E+02
 9.000000E+02
 4.500000E+01
 3.000000E+01
 6.200000E+01
 2.200000E+01
 1.400000E+01
 9.000000E+02
 2.700000E+01
 3.000000E+01
 4.900000E+01
 2.300000E+01
 4.000000E+01
 2.000000E+01
 4.000000E+01

1.463400E+04
 2.616100E+04
 4.842000E+05
 1.777300E+05
 0.559300E+05
 1.139200E+04
 1.737000E+04
 2.954600E+06
 1.445200E+04
 3.175500E+05
 9.392300E+05
 9.868500E+05
 1.179700E+04
 0.696600E+05
 3.076000E+05
 1.140900E+04
 2.937300E+04
 1.375300E+05
 7.767300E+05
 2.727700E+05
 2.365200E+05
 7.287500E+05
 9.183700E+05
 9.192000E+05
 9.331400E+05
 3.339500E+04
 4.358700E+04
 1.410600E+04
 2.825300E+04
 1.642700E+04
 3.472700E+04

4.866000E+05
 4.974100E+05
 -0.244600E+06
 -3.595800E+05
 2.813000E+05
 4.576600E+05
 1.753600E+04
 -0.853800E+05
 -1.417300E+04
 2.019500E+05
 2.543400E+05
 0.513600E+06
 3.871500E+05
 -0.069100E+05
 -2.461200E+05
 -9.808100E+06
 -3.283600E+05
 -0.732000E+06
 -4.570500E+05
 -0.853500E+07
 -0.617400E+05
 -0.770000E+05
 -3.443500E+05
 1.136200E+05
 1.952500E+04
 -0.193700E+05
 3.594300E+05
 3.959800E+05
 7.231200E+05
 -2.278400E+05
 -3.950200E+05

MUC
 -2.790000E+00
 1.000000E+01
 1.420000E+00
 1.700000E+00
 2.290000E+00
 3.300000E+00
 3.630000E+00
 4.520000E+00
 5.730000E+00
 6.800000E+00
 7.490000E+00
 8.630000E+00
 9.150000E+00
 1.035000E+01
 1.128000E+01
 1.175000E+01
 1.276000E+01
 1.347000E+01
 1.366000E+01
 1.528000E+01
 1.613000E+01
 1.652000E+01
 1.793000E+01
 1.842000E+01
 1.866000E+01
 2.053000E+01

MUC
 3.700000E+01
 7.000000E+02
 3.500000E+01
 1.200000E+01
 5.000000E+02
 5.000000E+01
 0.000000E+02
 3.900000E+01
 1.000000E+01
 9.000000E+02
 9.000000E+02
 2.600000E+01
 1.400000E+01
 1.600000E+01
 2.000000E+01
 1.600000E+01
 1.700000E+01
 2.000000E+01
 1.400000E+01
 1.200000E+01
 2.200000E+01
 1.300000E+01
 1.200000E+01
 2.100000E+01
 1.500000E+01
 2.000000E+01

GC
 1.611900E+04
 4.264400E+07
 3.548600E+06
 3.980700E+05
 5.674700E+05
 2.452000E+06
 1.405700E+05
 5.707400E+06
 3.102000E+06
 0.731400E+05
 2.480500E+06
 3.502900E+06
 4.843100E+06
 0.286600E+05
 5.452300E+06
 -1.049300E+05
 4.807300E+05
 1.491000E+05
 3.167800E+06
 7.057600E+05
 0.209000E+06
 3.047500E+05
 1.465100E+05
 1.000600E+05
 9.367000E+05
 2.061700E+02

HC
 -0.807000E+06
 -0.092000E+08
 -1.110300E+05
 0.033400E+06
 2.832000E+06
 1.066100E+06
 1.325000E+06
 -4.173000E+06
 -3.274400E+06
 -4.035900E+06
 1.507000E+06
 -2.032000E+06
 -0.442600E+07
 3.409500E+06
 -5.010700E+06
 -3.902900E+07
 3.533400E+06
 -9.361000E+06
 2.375900E+06
 -4.416700E+06
 -4.584200E+06
 0.625000E+06
 2.162700E+06
 -1.919000E+06
 4.090000E+06
 1.210400E+06

2.185000E+01	1.300000E-01	5.239100E-05	1.731600E-05
2.223000E+01	2.400000E-01	9.843100E-05	01.204700E-05
2.294000E+01	3.800000E-01	-1.417900E-05	01.189500E-05
2.354000E+01	3.300000E-01	6.107200E-06	4.614700E-06
2.513000E+01	1.900000E-01	2.110900E-05	04.873600E-07
2.619000E+01	1.700000E-01	-8.696300E-06	-2.132200E-06
2.697000E+01	2.400000E-01	1.563100E-05	1.378300E-05
2.739000E+01	4.300000E-01	1.163600E-05	5.345700E-06
2.833000E+01	1.600000E-01	1.775000E-05	06.396600E-07
2.899000E+01	3.800000E-01	2.683500E-05	-1.166600E-05
2.966000E+01	7.000000E-02	4.858400E-06	-1.805200E-06
3.015000E+01	1.800000E-01	-9.594900E-07	01.949400E-06
3.076000E+01	1.400000E-01	1.791000E-05	1.294500E-06
3.120000E+01	4.700000E-01	1.880900E-05	-8.742000E-06
3.198000E+01	1.400000E-01	3.522700E-05	-1.026500E-05
3.274000E+01	4.300000E-01	-1.309800E-06	-1.646400E-05
3.403000E+01	6.600000E-01	-3.464800E-05	-3.699400E-05
3.453000E+01	4.200000E-01	6.274600E-06	2.228100E-05
3.519000E+01	1.200000E-01	-5.558900E-06	1.888500E-06
3.546000E+01	1.700000E-01	1.736200E-06	9.454800E-06
3.654000E+01	9.800000E-02	2.998800E-05	8.361300E-06
3.750000E+01	2.400000E-01	7.995700E-06	4.786100E-06
3.946000E+01	2.800000E-01	-2.208300E-06	01.873300E-05
3.957000E+01	1.600000E-01	6.427100E-06	1.386700E-05
4.006000E+01	4.900000E-01	1.385200E-05	1.667700E-05
4.106000E+01	9.000000E-02	1.637200E-05	4.980200E-06
4.262000E+01	1.200000E-01	2.642400E-05	5.437100E-06
4.347000E+01	1.400000E-01	1.853900E-05	01.675300E-07
4.464000E+01	5.600000E-01	5.338500E-06	9.122000E-06
4.531000E+01	5.200000E-01	6.838300E-06	06.960100E-06
4.601000E+01	8.000000E-02	2.197700E-05	06.229100E-06
4.717000E+01	2.300000E-01	5.589400E-06	05.665600E-06
4.864000E+01	1.300000E-01	1.222400E-04	5.810700E-06
4.912000E+01	9.000000E-02	-3.304900E-06	07.801900E-06
5.021000E+01	4.500000E-01	-2.589100E-07	06.152900E-06
5.099000E+01	3.800000E-01	-2.284500E-06	01.248900E-05
5.195000E+01	6.200000E-01	-2.486600E-05	1.881300E-06
5.241000E+01	2.200000E-01	1.239700E-05	3.670400E-06
5.397000E+01	1.400000E-01	1.717900E-05	3.472400E-06
5.477000E+01	9.000000E-02	3.878000E-05	3.914100E-06
5.609000E+01	2.700000E-01	8.833400E-06	3.807500E-07
5.635000E+01	3.000000E-01	3.434400E-05	8.841400E-06
5.748000E+01	4.900000E-01	2.480200E-05	4.868800E-06
5.851000E+01	2.365000E-01	1.576300E-05	03.876500E-06
6.130000E+01	1.800000E-01	1.271700E-05	01.797100E-06
6.250000E+01	2.800000E-01	8.541000E-05	03.990300E-06
6.430000E+01	4.800000E-01	5.480200E-05	02.464200E-05

ADLER-ADLER CROSS-SECTIONS FOR THIS ELEMENT

CROSS-SECTIONS AT THERMAL ENERGY

NEUTRON ENERGY(EV)

TOTAL N-SECTION

FISSION N-SECTION

CAPTURE X-SECTION

4.774971E-01

[illegible]

[illegible]

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RHO2=RHO**2
RHOPN2=RHOPEN**2
WAVE=2.196771E-03*E2*(AWRI/(AWRI+1.0))
PSS=RHO
PSP=RHO-ATAN (RHO)
SIGPTS=(SIN (PSS)/WAVE)**2
SIGPTS=SIGPTS*PHIFCR
SIGPTP=(SIN(PSP)/WAVE)**2
SIGPTP=SIGPTP*PHIFCR
SIGPTP=3.0*SIGPTP
DO 201 J=1,JA
CJ=(2.0*XXJA(J)+1.0)/(2.0*SPIN+1.0)
GJ=GJ/2.0
XXJAJ=XXJA(J)
GN=GNO(J)*E2*XYJAJ
MU=INT (XXJAJ)
GAMMA=GG(J)
GALPHA=GN
GBETA=B.0
GF=B.0
TERM=(CONST*GJ*GN*GG(J))/(E*DA(J))
TERS=(CONST*GJ*GN*GN)/(E*DA(J))
CALL GCAP(GALPHA,GBETA,GAMMA,GF,MU,GG)
CALL GSCAT(GALPHA,GBETA,GAMMA,GF,MU,GS)
GC=GC*TERM
GS=GS*TERS
CORR=(CONST*GJ*2.0*GN*SIN(PSS)*SIN(PSP))/(E*DA(J))
GS=GS-CORR
GIG=GIG+GC
GIS=GIS+GS
201 CONTINUE
GIGG(I)=GIG
GISS(I)=GIS+SIRPYS
IF(NR=2)205,204,00
206 GIG=3.0
GIS=B.0
DO 207 J=1,JB
CJ=(2.0*XXJB(J)+1.0)/(2.0*SPIN+1.0)
GJ=GJ/2.0
VL=RHOPN2/(RHO*PN2+1.0)
XXJB=XXJB(J)
MU=INT (XXJB)
GN=GNOB(J)*E2*VL*XXJB
GAMMA=GB(J)
GF=B.0
GALPHA=GN
GBETA=B.0
TERM=(CONST*GJ*GN*GG(J))/(E*DA(J))
TERS=(CONST*GJ*GN*GN)/(E*DA(J))
CALL GCAP(GALPHA,GBETA,GAMMA,GF,MU,GG)
CALL GSCAT(GALPHA,GBETA,GAMMA,GF,MU,GS)
GC=GC*TERM
GS=GS*TERS
CORR=(CONST*GJ*2.0*GN*SIN(PSP)*SIN(PSP))/(E*DA(J))
GS=GS-CORR
GIG=GIG+GC
GIS=GIS+GS
207 CONTINUE
GIGG(I)=GIG
GISP(I)=GIS+SIRPYD
205 E=E+ESTEP

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AVG3182
AVG3183
AVG3184
AVG3185
AVG3186
AVG3187
AVG3188
AVG3189
AVG3190
AVG3191
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AVG3193
AVG3194
AVG3195
AVG3196
AVG3197
AVG3198
AVG3199
AVG3200
AVG3201
AVG3202
AVG3203
AVG3204
AVG3205
AVG3206
AVG3207
AVG3207.1
AVG3207.2
AVG3208
AVG3209
AVG3210
AVG3211
AVG3212
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AVG3221
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AVG3225
AVG3226
AVG3227
AVG3228
AVG3229
AVG3230
AVG3231
AVG3232
AVG3232.1
AVG3232.2
AVG3233
AVG3234
AVG3235
AVG3236
AVG3237
AVG3238

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IF(E,GT,EN)GO TO 202
GO TO 203
203 I=I+1
GO TO 204
202 NC=1
GO TO 400
302 DO 210 I=1,NE
E=ES(I)
E2=SQRT(E)
RHO=C+E2
RHOPEN=CPEN+E2
WAVE=2.196771E-03*E2*(AHR/(AHR+1.0))
PSS=RHO
PSP=RHO-ATAN (RHO)
SIGPTS=(SIN(PSS)/WAVE)**2
SIGPTS=SIGPTS*PHIFOR
SIGPTP=(SIN(PSP)/WAVE)**2
SIGPTP=SIGPTP*HIFOR
SIGPTP=1.0*SIGPTP
RHO2=RHO**2
RHOPN2=RHOPEN**2
VL=RHOPN2/(RHO*PN2+1.0)
GIG=0.0
GIF=0.0
GIS=0.0
DO 211 J=1,JA
GJ=(2.0*XXJA(J)+1.0)/(2.0*SPIN+1.0)
GJ=GJ/2.0
XXJAJ=XXJA(J)
MU=INT (XXJAJ)
NU=MUF(A(J))
GN=GN(J)*E2*XXJAJ
GAMMA=GG(J)
GALPHA=GN
GBETA=GFE(I,J)
TERM=(CONST*GJ*GN*GFE(I,J))/(E*DA(J))
TERG=(CONST*GJ*GG(J)*GN)/(E*DA(J))
TERS=(CONST*GJ*GN*GN)/(E*DA(J))
CALL GFIS(GALPHA,GBETA,GAMMA,MU,NU,GS)
CALL GSPE(GALPHA,GBETA,GAMMA,MU,NU,GC)
CALL SCAF(GALPHA,GBETA,GAMMA,MU,NU,SF)
GS=GS*TERM
GC=GC*TERG
SF=SF*TERS
CORR=(CONST*GJ*2.0*GN*GSIN(PSS)+GIN(PSS))/(E*DA(J))
SF=SF-CORR
GIG=GIG+GC
GIF=GIF+GS
GIS=GIS+SF
211 CONTINUE
GIGS(I)=GIG
GIGS(I)=GIF
GIS(I)=GIS+SIGPTS
IF(NR-2)215,212,00
212 GIG=0.0
GIF=0.0
GIS=0.0
DO 213 J=1,JB
GJ=(2.0*XXJB(J)+1.0)/(2.0*SPIN+1.0)
GJ=GJ/2.0
XXJB=XXJB(J)

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AVG3239
AVG32391
AVG3240
AVG3241
AVG3242
AVG3243
AVG3244
AVG3245
AVG3246
AVG3247
AVG3248
AVG3249
AVG3250
AVG3251
AVG3252
AVG3253
AVG3254
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AVG3258
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AVG3260
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AVG3277
AVG3278
AVG3279
AVG3280
AVG3281
AVG32811
AVG32812
AVG3282
AVG3283
AVG3284
AVG3285
AVG3286
AVG3287
AVG3288
AVG3289
AVG3290
AVG3291
AVG3292
AVG3293
AVG3294
AVG3295
AVG3296

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MU=INT (XXJBJ)
NU=MUFBJ
GN=GNOB(J)*E2*XXJBJ*VL
GAMMA=GGBJ(J)
GALPHA=GN
GBETA=GFEB(I,J)
TERM=(CONST*GJ*GFEB(I,J)*GN)/(E*DAB(J))
TERG=(CONST*GJ*GN*GGBJ(J))/(E*DAB(J))
TERS=(CONST*GJ*GN*GN)/(E*DAB(J))
CALL GFIS(GALPHA,GBETA,GAMMA,MU,NU,GS)
CALL GSPE(GALPHA,GBETA,GAMMA,MU,NU,GC)
CALL SCAF(GALPHA,GBETA,GAMMA,MU,NU,SF)
GS=GS*TERM
GC=GC*TERG
SF=SF*TERS
CORR=(CONST*GJ*2.0*GN*OSIN(PSP)*OSIN(PSP))/(E*DAB(J))
SF=SF*CORR
GIG=GIG+GC
GIF=GIF+GS
GIS=GIS+SF
213 CONTINUE
GIGGP(I)=GIG
GIGFP(I)=GIF
GISP(I)=GIS*SIGPTP
210 CONTINUE
GO TO 410
400 PRINT10
10 FORMAT(72H AVERAGE SCATTERING AND CAPTURE CROSS-SECTIONS FOR A NON
1-FISSILE NUCLEUS)
PRINT11,(RUN(J),J=1,7)
11 FORMAT(9H TITLE 7A4)
PRINT12,E0,EN
12 FORMAT(24H ENERGY LIMITS LOWER E10.4,10H UPPER E10.4)
GO TO (401,402),NR
401 PRINT21
PRINT36
PRINT14,(ES(I),GISG(I),I=1,NG)
PRINT35
PRINT13
13 FORMAT(53H NEUTRON ENERGY(EV) S-WAVE CAPTURE CROSS-SECTION)
36 FORMAT(53H NEUTRON ENERGY(EV) S-WAVE SCATNG CROSS-SECTION)
14 FORMAT(2E22.6)
PRINT14,(ES(I),GISG(I),I=1,NG)
GO TO 800
402 PRINT21
PRINT37
DO 7001 I=1,NG
TOTAL=GISG(I)+GISP(I)
PRINT16,ES(I),GISG(I),GISP(I),TOTAL
7001 CONTINUE
PRINT35
PRINT15
15 FORMAT(110H NEUTRON ENERGY(EV) S-WAVE CAPTURE CROSS-SECTION
1 P-WAVE CAPTURE CROSS-SECTION TOTAL)
37 FORMAT(110H NEUTRON ENERGY(EV) S-WAVE SCATNG CROSS-SECTION
1 P-WAVE SCATNG CROSS-SECTION TOTAL)
16 FORMAT(4X,E13.6,17X,E13.6,21X,E13.6,21X,E13.6)
DO 7000 I=1,NG
TOTAL=GIGGS(I)+GIGGP(I)
PRINT16,ES(I),GIGGS(I),GIGGP(I),TOTAL
7000 CONTINUE

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AVG3297
 AVG3298
 AVG3299
 AVG3300
 AVG3301
 AVG3302
 AVG3303
 AVG3304
 AVG3305
 AVG3306
 AVG3307
 AVG3308
 AVG3309
 AVG3310
 AVG3311
 AVG3311
 AVG3311
 AVG3312
 AVG3313
 AVG3314
 AVG3315
 AVG3316
 AVG3317
 AVG3318
 AVG3319
 AVG3320
 AVG3321
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 AVG3323
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 AVG3329
 AVG3330
 AVG3331
 AVG3332
 AVG3333
 AVG3334
 AVG3335
 AVG3336
 AVG3337
 AVG3338
 AVG3339
 AVG3340
 AVG3341
 AVG3342
 AVG3343
 AVG3344
 AVG3345
 AVG3346
 AVG3347
 AVG3348
 AVG3349
 AVG3350
 AVG3351
 AVG3352
 AVG3353
 AVG3354
 AVG3355

GO TO 880	AV63356
418 PRINT17	AV63357
17 FORMAT(76H AVERAGE SCATTERING CAPTURE AND FISSION CROSS-SECTIONS FOR A FISSION NUCLEUS)	AV63358
PRINT11,(RUN(J),J=1,7)	AV63359
GO TO (411,412),NR	AV63360
411 PRINT21	AV63361
PRINT36	AV63362
PRINT14,(ES(I),G1SS(I),I=1,NE)	AV63363
PRINT35	AV63364
PRINT13	AV63365
PRINT14,(ES(I),G1GGS(I),I=1,NE)	AV63366
PRINT18	AV63367
18 FORMAT(53H NEUTRON ENERGY(EV) S-WAVE FISSION CROSS-SECTION)	AV63368
PRINT14,(ES(I),G1GFS(I),I=1,NE)	AV63369
GO TO 880	AV63370
412 PRINT21	AV63371
PRINT37	AV63372
DO 7002 I=1,NE	AV63373
TOTAL=G1SS(I)+G1SP(I)	AV63374
PRINT16,ES(I),G1SS(I),G1SP(I),TOTAL	AV63375
7002 CONTINUE	AV63376
PRINT35	AV63377
PRINT15	AV63378
DO 7003 I=1,NE	AV63379
TOTAL=G1GGS(I)+G1GCP(I)	AV63380
PRINT16,ES(I),G1GGS(I),G1GCP(I),TOTAL	AV63381
7003 CONTINUE	AV63382
PRINT19	AV63383
19 FORMAT(110H NEUTRON ENERGY(EV) S-WAVE FISSION CROSS-SECTION TOTAL)	AV63384
1 P-WAVE NEUTRON CROSS-SECTION	AV63385
DO 7004 I=1,NE	AV63386
TOTAL=G1GFS(I)+G1GCP(I)	AV63387
PRINT16,ES(I),G1GFS(I),G1GCP(I),TOTAL	AV63388
7004 CONTINUE	AV63389
GO TO 880	AV63390
88 PRINT20	AV63391
20 FORMAT(47H INPUT ERROR NUMBER OF L-VALUES LARGER THAN TWO)	AV63392
21 FORMAT(62H AVERAGE CROSS-SECTIONS CALCULATED USING GREEDLER APPROXIMATION)	AV63393
22 FORMAT(31H DATA FOR A NON-FISSION NUCLEUS)	AV63394
23 FORMAT(27H DATA FOR A FISSION NUCLEUS)	AV63395
24 FORMAT(12H S-WAVE DATA)	AV63396
CONTINUE	AV63397
25 FORMAT(12H P-WAVE DATA)	AV63398
26 FORMAT(26H ENERGY LIMITS LOWERE20.6,7H UPPERE20.6,7H LRU=15,7H	AV63399
1 LRF=15,7H LFI=15)	AV63400
27 FORMAT(7H RUN NO15,0H TITLE 7A4,4H EOE13.6,4H ENR10.6,7H ESTE	AV63401
1PE13,6)	AV63402
28 FORMAT(12H TARGET SPINE11.4,18H SCATTERING LENGTH11.4,24H NO OF	AV63403
ENERGY VALUES AT WHICH FISSION WIDTHS ARE GIVEN15)	AV63404
29 FORMAT(51H FISSION WIDTHS ARE GIVEN AT THE FOLLOWING ENERGIES)	AV63405
30 FORMAT(19H MEAN LEVEL SPACING11.4,11H LEVEL SPINE11.4,22H REDUCED	AV63406
1 NEUTRON WIDTH11.4,12H GAMMA GAMMAE11.4)	AV63407
31 FORMAT(56H NO OF DEGREES OF FREEDOM FOR NEUTRON WIDTH DISTRIBUTION	AV63408
117)	AV63409
32 FORMAT(56H NO OF DEGREES OF FREEDOM FOR FISSION WIDTH DISTRIBUTION	AV63410
117)	AV63411
33 FORMAT(23H THE FISSION WIDTHS ARE)	AV63412
34 FORMAT(14H ISOTOPIE MASSE12.4,17H ANGULAR MOMENTUM15,10H NO OF SP	AV63413
IN STATES15)	AV63414
	AV63415

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35 FORMAT(//)
36 FORMAT(46H NUCLEAR RADIUS A=(1.23*MASS**1/3*0.0)*0.1 ,PE11.4)
39 FORMAT(80H1 PROGRAM AVRAGE3, CALCULATES CROSS-SECTIONS IN THE UNRE
150LVED RESONANCE REGION.)
48 FORMAT(59H ENDF/B VERSION II DATA WITH ENERGY INDEPENDENT PARAMETE
1RS,.)
888 GO TO 881
8888 RETURN
END
SUBROUTINE GCAP(GALPHA,GDETA,GAMMA,GGF,MU,SC)
COMMON/XBAR/XX(4,10)
SC=0.0
DO 100 J=1,10
XJ=XX(MU,J)
VALUE=XJ/(GALPHA*0.0J+GDETA*GGF+GAMMA)
SC=SC+VALUE
100 CONTINUE
SC=SC/10.0
RETURN
END
SUBROUTINE GFIS(GALPHA,GDETA,GAMMA,MU,MU,S)
COMMON/XBAR/XX(4,10)
S=0.0
DO 100 J=1,10
YJ=XX(MU,J)
CALL GCAP(GALPHA,GDETA,GAMMA,YJ,MU,SC)
S=S+YJ*SC
100 CONTINUE
S=S/10.0
RETURN
END
SUBROUTINE GSPE(GALPHA,GDETA,GAMMA,MU,MU,S)
COMMON/XBAR/XX(4,10)
S=0.0
DO 100 J=1,10
YJ=XX(MU,J)
CALL GCAP(GALPHA,GDETA,GAMMA,YJ,MU,SC)
S=S+SC
100 CONTINUE
S=S/10.0
RETURN
END
SUBROUTINE GSCT(GALPHA,GDETA,GAMMA,GGF,MU,SC)
COMMON/XBAR/XX(4,10)
SC=0.0
DO 100 J=1,10
XJ=XX(MU,J)
VALUE=(XJ*XJ)/(GALPHA*0.0J+GDETA*GGF+GAMMA)
SC=SC+VALUE
100 CONTINUE
SC=SC/10.0
RETURN
END
SUBROUTINE SCAF(GALPHA,GDETA,GAMMA,MU,MU,S)
COMMON/XBAR/XX(4,10)
S=0.0
DO 100 J=1,10
YJ=XX(MU,J)
CALL GSCT(GALPHA,GDETA,GAMMA,YJ,MU,SC)
S=S+SC
100 CONTINUE

```

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AVG3416
AVG3417
AVG3418
AVG3419
AVG3420
AVG3421
AVG3422
AVG3423
AVG3424
GCAP001
GCAP002
GCAP003
GCAP004
GCAP005
GCAP006
GCAP007
GCAP008
GCAP009
GCAP010
GCAP011
GFIS001
GFIS002
GFIS003
GFIS004
GFIS005
GFIS006
GFIS007
GFIS008
GFIS009
GFIS010
GFIS011
GSPE001
GSPE002
GSPE003
GSPE004
GSPE005
GSPE006
GSPE007
GSPE008
GSPE009
GSPE010
GSPE011
GSCT001
GSCT002
GSCT003
GSCT004
GSCT005
GSCT006
GSCT007
GSCT008
GSCT009
GSCT010
GSCT011
SCAF001
SCAF002
SCAF003
SCAF004
SCAF005
SCAF006
SCAF007
SCAF008

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S-S/10.0
RETURN
END

SCAF009
SCAF010
SCAF011

1 AVERAGES TEST. PU=230 DATA											
3.00000+	2	1.00000+	5								
5.00000-	1	9.05000-	1								
3.00000+	2	6.00000-	2	1.00000+	3	1.00000+	3	2.50000+	3	3.00000+	01051 2151 203
5.00000+	3	8.00000+	3	1.30000+	4	2.00000+	4	3.00000+	4	4.00000+	21051 2151 204
5.00000+	4	6.00000+	4	8.00000+	4	1.00000+	5				31051 2151 205
236.9985	0.	0.	0								41051 2151 206
0.	0.	0.	0								1051 2151 207
0.70000+	0	0.	0	1.00000+	0	0.40000+	4	0.07000+	2	0.	01051 2151 208
2.00000+	0	2.00000+	0	2.00000+	0	2.00000+	0	2.00000+	0	2.00000+	01051 2151 209
2.00000+	0	2.00000+	0	2.00000+	0	2.00000+	0	2.00000+	0	2.00000+	01051 2151 210
2.00000+	0	2.00000+	0	2.00000+	0	2.00000+	0	2.00000+	0	2.00000+	01051 2151 211
0.	0.	0.	0								01051 2151 212
3.12000+	0	1.00000+	0	1.00000+	0	3.34000+	4	0.07000+	2	0.	01051 2151 214
5.52000-	2	5.59000-	2	5.60000-	2	5.70000-	2	5.93200-	2	0.23200-	01051 2151 215
0.57000-	2	7.33000-	2	8.72000-	2	1.12200-	1	1.50200-	1	1.07500-	11051 2151 216
2.48000-	1	3.00000-	1	3.06000-	1	4.05000-	1				1051 2151 217
236.9985	0.	0.00000+	0								01051 2151 218
0.	0.	0.	0								01051 2151 219
0.70000+	0	0.	0	1.00000+	0	2.19000+	0	0.07000+	0	0.	01051 2151 220
0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	
0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	
0.00000+	0	0.00000+	0								
3.12000+	0	1.00000+	0	2.00000+	0	7.00000+	0	3.07000+	0	0.03000+	
0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	
0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	
0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	
0.00000+	0	0.00000+	0								
2.12000+	0	2.00000+	0	1.00000+	0	3.00000+	0	3.07000+	0	0.03000+	
0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	
0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	
0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	0.40000	
2 AVERAGES TEST. U=230 DATA											
3.92000+	0	3.00000+	0								
2.0	0.9104										
236.0058	0.0										
18.0	0.0	1.0	1.700+	04.0+3							
236.0058	0.0	1		0							
18.0	0.0	1.0	3.000+	04.0+3							
9.25	1.0	-1.0	2.000+	04.0+3							
3 AVERAGES TEST. U=230 DATA											
0.4504E+01	5.0E+04										
3.5	0.3608E+01										
0.4504E+01	8.2E+02	1.25E+02	1.75E+02	3.25E+02	2.75E+02	3.25E+02	3.25E+02	3.25E+02	3.25E+02	3.25E+02	
3.50E+02	4.50E+02	6.00E+02	0.00E+02	1.25E+03	1.75E+03	3.25E+03	3.25E+03	3.25E+03	3.25E+03	3.25E+03	
2.50E+03	3.50E+03	4.50E+03	5.00E+03	7.00E+03	7.00E+03	7.00E+03	7.00E+03	7.00E+03	7.00E+03	7.00E+03	
1.25E+04	1.75E+04	2.25E+04	2.75E+04	3.25E+04	3.25E+04	3.25E+04	3.25E+04	3.25E+04	3.25E+04	3.25E+04	
3.00E+04											
233.0247	0.0	0	0	0	0	0	0	0	0	0	
0.0	0.0	0	0	0	0	0	0	0	0	0	
1.00	3.0	1.0	1.0E+04	0.035	0.035	0.035	0.035	0.035	0.035	0.035	
2.9474E-01	2.9204E-01	2.4623E-01	2.4250E-01	2.0443E-01	4.9725E-01	0.11044	2151	196			
2.7310E-01	4.9109E-01	4.4004E-01	2.3327E-01	3.0220E-01	3.5300E-01	0.11044	2151	197			
4.2449E-01	3.2358E-01	3.2196E-01	3.2204E-01	3.3009E-01	3.3291E-01	0.11044	2151	198			
4.3037E-01	4.3070E-01	4.3035E-01	4.7000E-01	3.2070E-01	3.0902E-01	0.11044	2151	199			
3.7033E-01						0.11044	2151	200			
0.0	0.0	0	1	31	0.035	0.035	0.035	0.035	0.035	0.035	
1.00	4.0	1.0	1.0E+04	0.035	0.035	0.035	0.035	0.035	0.035	0.035	
1.4737E-01	1.4032E-01	1.2311E-01	1.2220E-01	1.3207E-01	2.4092E-01	0.11044	2151	203			
1.3655E-01	2.2554E-01	2.2002E-01	1.1003E-01	1.9110E-01	1.7090E-01	0.11044	2151	204			

2.1225E-01	1.6179E-01	1.6898E-01	1.0142E-01	1.6505E-01	1.6646E-01	11844	2151	205
2.1918E-01	2.1935E-01	2.2517E-01	2.3640E-01	2.6039E-01	2.9996E-01	11844	2151	206
2.8517E-01						1044	2151	207
233.0247	2.0	1	0	4		01044	2151	208
1.0	0.2	1	2	31		01044	2151	209
1.16	2.0	1.0	2.32E-04	0.035	0.01044	2151	210	
3.32E-01	3.32E-01	3.32E-01	3.32E-01	3.32E-01	3.32E-01	11844	2151	211
3.32E-01	3.32E-01	3.32E-01	3.32E-01	3.32E-01	3.32E-01	11844	2151	212
3.32E-01	3.32E-01	3.32E-01	3.32E-01	3.32E-01	3.32E-01	11844	2151	213
3.32E-01	3.32E-01	3.32E-01	3.32E-01	3.32E-01	3.32E-01	11844	2151	214
3.32E-01						1044	2151	215
0.0	0.0	1	1	31		01044	2151	216
1.0	0.0	2.0	2.00E-04	0.035	0.01044	2151	217	
1.27E-01	1.27E-01	1.27E-01	1.27E-01	1.27E-01	1.27E-01	11844	2151	218
1.27E-01	1.27E-01	1.27E-01	1.27E-01	1.27E-01	1.27E-01	11844	2151	219
1.27E-01	1.27E-01	1.27E-01	1.27E-01	1.27E-01	1.27E-01	11844	2151	220
1.27E-01	1.27E-01	1.27E-01	1.27E-01	1.27E-01	1.27E-01	11844	2151	221
1.27E-01						1044	2151	222
0.0	0.0	1	2	31		01044	2151	223
1.0	0.0	2.0	2.00E-04	0.035	0.01044	2151	224	
2.86E-01	2.86E-01	2.86E-01	2.86E-01	2.86E-01	2.86E-01	11844	2151	225
2.86E-01	2.86E-01	2.86E-01	2.86E-01	2.86E-01	2.86E-01	11844	2151	226
2.86E-01	2.86E-01	2.86E-01	2.86E-01	2.86E-01	2.86E-01	11844	2151	227
2.86E-01	2.86E-01	2.86E-01	2.86E-01	2.86E-01	2.86E-01	11844	2151	228
2.86E-01						1044	2151	229
0.0	0.0	1	1	31		01044	2151	230
1.12	0.0	1.0	2.24E-04	0.035	0.01044	2151	231	
1.43E-01	1.43E-01	1.43E-01	1.43E-01	1.43E-01	1.43E-01	11844	2151	232
1.43E-01	1.43E-01	1.43E-01	1.43E-01	1.43E-01	1.43E-01	11844	2151	233
1.43E-01	1.43E-01	1.43E-01	1.43E-01	1.43E-01	1.43E-01	11844	2151	234
1.43E-01	1.43E-01	1.43E-01	1.43E-01	1.43E-01	1.43E-01	11844	2151	235
1.43E-01						1044	2151	236

PROGRAM AVERAGES. CALCULATES CROSS-SECTIONS IN THE UNRESOLVED RESONANCE REGION.

ENDF/B VERSION II DATA WITH ENERGY INDEPENDENT PARAMETERS.

RUN NO 1 TITLE AVERAGES TEST, PU-239 DATA E0 0.00000E+00 EN 0.00000E+00 ESTEP 0.00000E+00
ENERGY LIMITS LOWER 3.00000E+02 UPPER 1.00000E+05 LRU= 2 LRF= 1 LFI= 0
TARGET SPIN 5.000E+01 SCATTERING LENGTH 9.0500E-01 NO OF ENERGY VALUES AT WHICH FISSION WIDTHS ARE GIVEN 16
DATA FOR A FISSION NUCLEUS

S=WAVE DATA

FISSION WIDTHS ARE GIVEN AT THE FOLLOWING ENERGIES

3.0000E+02 4.0000E+02 1.0000E+03 1.5000E+03 2.5000E+03 3.5000E+03
5.0000E+03 8.0000E+03 1.3000E+04 2.0000E+04 3.0000E+04 4.0000E+04
5.0000E+04 6.0000E+04 8.0000E+04 1.0000E+05
ISOTOPIC MASS 2.3700E+02 ANGULAR MOMENTUM 0 NO OF SPIN STATES 2

MEAN LEVEL SPACING 0.7800E+00 LEVEL SPIN 0.0000E+00 REDUCED NEUTRON WIDTH 9.4000E-04 GAMMA GAMMA 3.0700E+02
NO OF DEGREES OF FREEDOM FOR NEUTRON WIDTH DISTRIBUTION 1
NO OF DEGREES OF FREEDOM FOR FISSION WIDTH DISTRIBUTION 2
THE FISSION WIDTHS ARE
2.0000E+00 2.0000E+00 2.0000E+00 2.0000E+00 2.0000E+00 2.0000E+00
2.0000E+00 2.0000E+00 2.0000E+00 2.0000E+00 2.0000E+00 2.0000E+00
2.0000E+00 2.0000E+00 2.0000E+00 2.0000E+00

MEAN LEVEL SPACING 3.1200E+00 LEVEL SPIN 1.0000E+00 REDUCED NEUTRON WIDTH 3.8400E-04 GAMMA GAMMA 3.0700E+02
NO OF DEGREES OF FREEDOM FOR NEUTRON WIDTH DISTRIBUTION 1
NO OF DEGREES OF FREEDOM FOR FISSION WIDTH DISTRIBUTION 1
THE FISSION WIDTHS ARE
5.5200E-02 5.5900E-02 5.6000E-02 5.7000E-02 5.9320E-02 6.2300E-02
6.5700E-02 7.3300E-02 8.7200E-02 1.1020E-01 1.2020E-01 1.9750E-01
2.4800E-01 3.0200E-01 3.0600E-01 4.0500E-01

P=WAVE DATA

ISOTOPIC MASS 2.3700E+02 ANGULAR MOMENTUM 1 NO OF SPIN STATES 3

MEAN LEVEL SPACING 0.7800E+00 LEVEL SPIN 0.0000E+00 REDUCED NEUTRON WIDTH 2.1950E-03 GAMMA GAMMA 3.0700E+02
NO OF DEGREES OF FREEDOM FOR NEUTRON WIDTH DISTRIBUTION 1
NO OF DEGREES OF FREEDOM FOR FISSION WIDTH DISTRIBUTION 2
THE FISSION WIDTHS ARE
4.0000E-02 4.0000E-02 4.0000E-02 4.0000E-02 4.0000E-02 4.0000E-02
4.0000E-02 4.0000E-02 4.0000E-02 4.0000E-02 4.0000E-02 4.0000E-02

4.0000E-02 4.0000E-02 4.0000E-02 4.0000E-02

MEAN LEVEL SPACING 3.1200E+00 LEVEL SPIN 1.0000E+00 REDUCED NEUTRON WIDTH 7.0000E-04 GAMMA GAMMA 3.0700E-02
 NO OF DEGREES OF FREEDOM FOR NEUTRON WIDTH DISTRIBUTION 2
 NO OF DEGREES OF FREEDOM FOR FISSION WIDTH DISTRIBUTION 2
 THE FISSION WIDTHS ARE
 4.0000E-02 4.0000E-02 4.2000E-02 4.0000E-02 4.0000E-02 4.3000E-02
 4.0000E-02 4.0000E-02 4.2000E-02 4.0000E-02 4.0000E-02 4.0000E-02
 4.0000E-02 4.0000E-02 4.0000E-02 4.0000E-02

MEAN LEVEL SPACING 2.1200E+00 LEVEL SPIN 2.0000E+00 REDUCED NEUTRON WIDTH 9.3000E-04 GAMMA GAMMA 3.0700E-02
 NO OF DEGREES OF FREEDOM FOR NEUTRON WIDTH DISTRIBUTION 1
 NO OF DEGREES OF FREEDOM FOR FISSION WIDTH DISTRIBUTION 2
 THE FISSION WIDTHS ARE
 4.0000E-02 4.0000E-02 4.0000E-02 4.0000E-02 4.0000E-02 4.0000E-02
 4.0000E-02 4.0000E-02 4.0000E-02 4.0000E-02 4.0000E-02 4.0000E-02
 4.0000E-02 4.0000E-02 4.0000E-02 4.0000E-02

NUCLEAR RADIUS $A = (1.23 + 0.82 \cdot 1/3 \cdot 0.0) \cdot 0.1 = 0.4337E-01$
 AVERAGE SCATTERING CAPTURE AND FISSION CROSS-SECTIONS FOR A FISSIONABLE NUCLEUS

TITLE AVERAGE TEST, PU-239 DATA

AVERAGE CROSS-SECTIONS CALCULATED USING GREENGLER APPROXIMATION

NEUTRON ENERGY (EV)	S-WAVE SCATTERING CROSS-SECTION	P-WAVE SCATTERING CROSS-SECTION	TOTAL
3.000000E+02	2.383416E+01	1.296935E+04	2.383429E+01
4.000000E+02	2.347809E+01	9.165503E+04	2.347809E+01
5.000000E+02	2.316030E+01	1.425274E+03	2.317073E+01
6.000000E+02	2.291372E+01	3.176370E+03	2.291690E+01
7.000000E+02	2.267470E+01	8.631692E+03	2.250333E+01
8.000000E+02	2.232009E+01	1.650611E+02	2.234616E+01
9.000000E+02	2.204450E+01	3.235447E+02	2.204694E+01
1.000000E+03	2.169100E+01	7.591461E+02	2.176700E+01
1.100000E+03	2.127333E+01	1.724855E+01	2.144503E+01
1.200000E+03	2.080939E+01	3.332512E+01	2.119264E+01
1.300000E+03	2.041040E+01	5.767430E+01	2.099523E+01
1.400000E+03	2.006609E+01	8.139886E+01	2.080000E+01
1.500000E+03	1.976917E+00	1.036500E+00	1.000567E+01
1.600000E+03	1.950014E+00	1.242964E+00	1.074970E+01
1.700000E+03	1.925618E+00	1.611306E+00	1.066062E+01
1.800000E+03	1.903133E+00	1.928741E+00	1.050007E+01

NEUTRON ENERGY (EV)	SCATTERING CROSS-SECTION	P-WAVE CAPTURE CROSS-SECTION	TOTAL
3.000000E+02	1.709310E+00	1.070727E+01	9.402392E+00
4.000000E+02	6.000000E+00	1.510540E+01	6.247640E+00
5.000000E+02	4.152304E+00	1.942591E+01	4.009493E+00
6.000000E+02	3.701670E+00	2.368040E+01	3.620299E+00
7.000000E+02	2.710170E+00	3.014797E+01	2.711659E+00
8.000000E+02	1.700000E+00	3.514000E+01	2.292962E+00
9.000000E+02	1.070162E+00	4.000000E+01	1.000000E+00
1.000000E+03	7.000000E+00	4.011123E+01	1.326120E+00
1.100000E+03	7.000000E+01	5.000000E+01	1.273021E+00
1.200000E+03	4.007000E+01	6.162074E+01	1.109070E+00
1.300000E+03	2.370000E+01	6.302000E+01	9.679432E+01
1.400000E+03	2.500110E+01	6.101040E+01	8.720000E+01
1.500000E+03	2.000000E+01	5.963000E+01	7.996197E+01
1.600000E+03	1.000000E+01	5.712791E+01	7.390140E+01
1.700000E+03	1.267204E+01	5.210092E+01	6.477276E+01

1.000000E+05
NEUTRON ENERGY(EV)
3.000000E+02
6.000000E+02
1.000000E+03
1.500000E+03
2.500000E+03
3.500000E+03
5.000000E+03
8.000000E+03
1.300000E+04
2.000000E+04
3.000000E+04
4.000000E+04
5.000000E+04
6.000000E+04
0.000000E+04
1.000000E+05

1.003023E-01
S-WAVE FISSION CROSS-SECTION
1.250000E-01
8.656434E+00
6.549967E+00
5.232006E+00
3.939989E+00
3.272720E+00
2.688799E+00
2.087673E+00
1.624810E+00
1.322883E+00
1.118400E+00
9.945280E-01
9.143779E-01
8.537790E-01
7.561141E-01
0.026107E+01

4.757880E-01
P-WAVE NEUTRON CROSS-SECTION
7.497054E-02
1.058106E-01
1.361744E-01
1.668404E-01
2.121837E-01
2.481061E-01
2.919436E-01
3.329202E-01
4.168780E-01
4.639770E-01
4.884094E-01
4.989240E-01
4.821877E-01
4.698790E-01
4.381376E-01
4.071883E-01

9.761712E-01
TOTAL
1.266309E+01
8.762249E+00
6.682141E+00
5.398047E+00
4.143160E+00
3.520900E+00
2.979630E+00
2.440601E+00
2.041690E+00
1.786382E+00
1.600334E+00
1.485092E+00
1.396560E+00
1.322859E+00
1.194252E+00
1.009287E+00

PROGRAM AVERAGES. CALCULATES CROSS-SECTIONS IN THE UNRESOLVED RESONANCE REGION.

ENDOF/8 VERSION 11 DATA WITH ENERGY INDEPENDENT PARAMETERS.

RUN NO 2 TITLE AVERAGES TEST-U-2380DATA
 ENERGY UNITS LOWER 3.02000E+03 UPPER 5.00000E+04 LRU 2 LRF 3 LFI 8
 TARGET SPIN 0.0000E+00 SCATTERING LENGTH 9.1840E-01 NO OF ENERGY VALUES AT WHICH FISSION WIDTHS ARE GIVEN 2
 DATA FOR A NON-FISSILE NUCLEUS

S-HAVE DATA

ISOTOPIC MASS 2.3811+02 ANGULAR MOMENTUM 0 NO OF SPIN STATES 3
 MEAN LEVEL SPACING 1.0500E+01 LEVEL SPIN 5.0000E-01 REDUCED NEUTRON WIDTH 1.7000E+03 GAMMA GAMMA 2.0000E+03
 NO OF DEGREES OF FREEDOM FOR NEUTRON WIDTH DISTRIBUTION 1
 P-HAVE DATA
 ISOTOPIC MASS 2.3811+02 ANGULAR MOMENTUM 1 NO OF SPIN STATES 2
 MEAN LEVEL SPACING 1.0500E+01 LEVEL SPIN 5.0000E-01 REDUCED NEUTRON WIDTH 2.0200E+03 GAMMA GAMMA 2.0000E+02
 NO OF DEGREES OF FREEDOM FOR NEUTRON WIDTH DISTRIBUTION 1
 MEAN LEVEL SPACING 9.2500E+00 LEVEL SPIN 1.5000E+00 REDUCED NEUTRON WIDTH 1.0000E+03 GAMMA GAMMA 2.0000E+02
 NO OF DEGREES OF FREEDOM FOR NEUTRON WIDTH DISTRIBUTION 1
 NUCLEAR RADIUS A=(1.73+MASS**1/3)*0.01 = 0.4230E-01
 AVERAGE SCATTERING AND CAPTURE CROSS-SECTIONS FOR A NON-FISSILE NUCLEUS

TITLE	AVERAGES TEST-U-2380DATA	UPPER 1.0000E+05	UPPER 1.0000E+05
ENERGY LIMITS	LOWER 1.0000E+03	UPPER 1.0000E+05	UPPER 1.0000E+05
AVERAGE CROSS-SECTIONS CALCULATED USING GREINER APPROXIMATION	S-HAVE SCATTERING CROSS-SECTION	S-HAVE SCATTERING CROSS-SECTION	S-HAVE SCATTERING CROSS-SECTION
NEUTRON ENERGY(EV)	2.01420E+01	2.01420E+01	2.01420E+01
1.00000E+03	1.74400E+01	1.74400E+01	1.74400E+01
2.00000E+03	1.64400E+01	1.64400E+01	1.64400E+01
3.00000E+03	1.54700E+01	1.54700E+01	1.54700E+01
4.00000E+03	1.51357E+01	1.51357E+01	1.51357E+01
5.00000E+03	1.47200E+01	1.47200E+01	1.47200E+01
6.00000E+03	1.43070E+01	1.43070E+01	1.43070E+01
7.00000E+03	1.41100E+01	1.41100E+01	1.41100E+01
8.00000E+03	1.38750E+01	1.38750E+01	1.38750E+01
9.00000E+03	1.36713E+01	1.36713E+01	1.36713E+01
1.00000E+04	1.34911E+01	1.34911E+01	1.34911E+01
1.10000E+04	1.33307E+01	1.33307E+01	1.33307E+01
1.20000E+04	1.31847E+01	1.31847E+01	1.31847E+01
1.30000E+04	1.30520E+01	1.30520E+01	1.30520E+01
1.40000E+04	1.29310E+01	1.29310E+01	1.29310E+01
1.50000E+04	1.28100E+01	1.28100E+01	1.28100E+01
1.60000E+04	1.27141E+01	1.27141E+01	1.27141E+01
1.70000E+04	1.26143E+01	1.26143E+01	1.26143E+01
1.80000E+04	1.25347E+01	1.25347E+01	1.25347E+01
1.90000E+04	1.24303E+01	1.24303E+01	1.24303E+01
2.00000E+04	1.23504E+01	1.23504E+01	1.23504E+01
2.10000E+04	1.22703E+01	1.22703E+01	1.22703E+01
2.20000E+04	1.22047E+01	1.22047E+01	1.22047E+01
2.30000E+04	1.21341E+01	1.21341E+01	1.21341E+01
2.40000E+04	1.20640E+01	1.20640E+01	1.20640E+01
2.50000E+04	1.20010E+01	1.20010E+01	1.20010E+01
2.60000E+04	1.19302E+01	1.19302E+01	1.19302E+01
2.70000E+04	1.18617E+01	1.18617E+01	1.18617E+01
2.80000E+04	1.17938E+01	1.17938E+01	1.17938E+01
2.90000E+04	1.17260E+01	1.17260E+01	1.17260E+01
3.00000E+04	1.16583E+01	1.16583E+01	1.16583E+01
3.10000E+04	1.15907E+01	1.15907E+01	1.15907E+01
3.20000E+04	1.15232E+01	1.15232E+01	1.15232E+01
3.30000E+04	1.14557E+01	1.14557E+01	1.14557E+01
3.40000E+04	1.13882E+01	1.13882E+01	1.13882E+01
3.50000E+04	1.13207E+01	1.13207E+01	1.13207E+01
3.60000E+04	1.12532E+01	1.12532E+01	1.12532E+01
3.70000E+04	1.11857E+01	1.11857E+01	1.11857E+01
3.80000E+04	1.11182E+01	1.11182E+01	1.11182E+01
3.90000E+04	1.10507E+01	1.10507E+01	1.10507E+01
4.00000E+04	1.09832E+01	1.09832E+01	1.09832E+01
4.10000E+04	1.09157E+01	1.09157E+01	1.09157E+01
4.20000E+04	1.08482E+01	1.08482E+01	1.08482E+01
4.30000E+04	1.07807E+01	1.07807E+01	1.07807E+01
4.40000E+04	1.07132E+01	1.07132E+01	1.07132E+01
4.50000E+04	1.06457E+01	1.06457E+01	1.06457E+01
4.60000E+04	1.05782E+01	1.05782E+01	1.05782E+01
4.70000E+04	1.05107E+01	1.05107E+01	1.05107E+01
4.80000E+04	1.04432E+01	1.04432E+01	1.04432E+01
4.90000E+04	1.03757E+01	1.03757E+01	1.03757E+01
5.00000E+04	1.03082E+01	1.03082E+01	1.03082E+01
5.10000E+04	1.02407E+01	1.02407E+01	1.02407E+01
5.20000E+04	1.01732E+01	1.01732E+01	1.01732E+01
5.30000E+04	1.01057E+01	1.01057E+01	1.01057E+01
5.40000E+04	1.00382E+01	1.00382E+01	1.00382E+01
5.50000E+04	9.9707E+00	9.9707E+00	9.9707E+00
5.60000E+04	9.9032E+00	9.9032E+00	9.9032E+00
5.70000E+04	9.8357E+00	9.8357E+00	9.8357E+00
5.80000E+04	9.7682E+00	9.7682E+00	9.7682E+00
5.90000E+04	9.7007E+00	9.7007E+00	9.7007E+00
6.00000E+04	9.6332E+00	9.6332E+00	9.6332E+00
6.10000E+04	9.5657E+00	9.5657E+00	9.5657E+00
6.20000E+04	9.4982E+00	9.4982E+00	9.4982E+00
6.30000E+04	9.4307E+00	9.4307E+00	9.4307E+00
6.40000E+04	9.3632E+00	9.3632E+00	9.3632E+00
6.50000E+04	9.2957E+00	9.2957E+00	9.2957E+00
6.60000E+04	9.2282E+00	9.2282E+00	9.2282E+00
6.70000E+04	9.1607E+00	9.1607E+00	9.1607E+00
6.80000E+04	9.0932E+00	9.0932E+00	9.0932E+00
6.90000E+04	9.0257E+00	9.0257E+00	9.0257E+00
7.00000E+04	8.9582E+00	8.9582E+00	8.9582E+00
7.10000E+04	8.8907E+00	8.8907E+00	8.8907E+00
7.20000E+04	8.8232E+00	8.8232E+00	8.8232E+00
7.30000E+04	8.7557E+00	8.7557E+00	8.7557E+00
7.40000E+04	8.6882E+00	8.6882E+00	8.6882E+00
7.50000E+04	8.6207E+00	8.6207E+00	8.6207E+00
7.60000E+04	8.5532E+00	8.5532E+00	8.5532E+00
7.70000E+04	8.4857E+00	8.4857E+00	8.4857E+00
7.80000E+04	8.4182E+00	8.4182E+00	8.4182E+00
7.90000E+04	8.3507E+00	8.3507E+00	8.3507E+00
8.00000E+04	8.2832E+00	8.2832E+00	8.2832E+00
8.10000E+04	8.2157E+00	8.2157E+00	8.2157E+00
8.20000E+04	8.1482E+00	8.1482E+00	8.1482E+00
8.30000E+04	8.0807E+00	8.0807E+00	8.0807E+00
8.40000E+04	8.0132E+00	8.0132E+00	8.0132E+00
8.50000E+04	7.9457E+00	7.9457E+00	7.9457E+00
8.60000E+04	7.8782E+00	7.8782E+00	7.8782E+00
8.70000E+04	7.8107E+00	7.8107E+00	7.8107E+00
8.80000E+04	7.7432E+00	7.7432E+00	7.7432E+00
8.90000E+04	7.6757E+00	7.6757E+00	7.6757E+00
9.00000E+04	7.6082E+00	7.6082E+00	7.6082E+00
9.10000E+04	7.5407E+00	7.5407E+00	7.5407E+00
9.20000E+04	7.4732E+00	7.4732E+00	7.4732E+00
9.30000E+04	7.4057E+00	7.4057E+00	7.4057E+00
9.40000E+04	7.3382E+00	7.3382E+00	7.3382E+00
9.50000E+04	7.2707E+00	7.2707E+00	7.2707E+00
9.60000E+04	7.2032E+00	7.2032E+00	7.2032E+00
9.70000E+04	7.1357E+00	7.1357E+00	7.1357E+00
9.80000E+04	7.0682E+00	7.0682E+00	7.0682E+00
9.90000E+04	7.0007E+00	7.0007E+00	7.0007E+00
10.0000E+04	6.9332E+00	6.9332E+00	6.9332E+00

8.988888E-04
9.000000E-04
9.100000E-04
9.200000E-04
9.300000E-04
9.400000E-04
9.500000E-04
9.600000E-04
9.700000E-04
9.800000E-04
9.900000E-04
1.000000E-03

NEUTRON ENERGY(KEV)

1.888888E-03
2.888888E-03
3.888888E-03
4.888888E-03
5.888888E-03
6.888888E-03
7.888888E-03
8.888888E-03
9.888888E-03
1.088888E-02
1.188888E-02
1.288888E-02
1.388888E-02
1.488888E-02
1.588888E-02
1.688888E-02
1.788888E-02
1.888888E-02
1.988888E-02
2.088888E-02
2.188888E-02
2.288888E-02
2.388888E-02
2.488888E-02
2.588888E-02
2.688888E-02
2.788888E-02
2.888888E-02
2.988888E-02
3.088888E-02
3.188888E-02
3.288888E-02
3.388888E-02
3.488888E-02
3.588888E-02
3.688888E-02
3.788888E-02
3.888888E-02
3.988888E-02
4.088888E-02
4.188888E-02
4.288888E-02
4.388888E-02
4.488888E-02
4.588888E-02

9.313900E-08
9.798017E-08
9.767800E-08
9.744950E-08
9.728371E-08
9.697800E-08
9.677387E-08
9.659000E-08
9.632934E-08
9.618957E-08
9.599115E-08
9.567487E-08

S-WAVE CAPTURE CROSS-SECTION

2.682770E-08
1.458600E-08
1.622994E-08
7.064915E-01
6.549640E-01
5.576891E-01
4.864937E-01
4.388128E-01
3.899181E-01
3.399194E-01
3.249900E-01
2.884900E-01
2.795524E-01
2.614641E-01
2.486820E-01
2.317874E-01
2.193130E-01
2.082287E-01
1.982336E-01
1.891916E-01
1.800635E-01
1.724476E-01
1.663499E-01
1.601967E-01
1.543261E-01
1.488041E-01
1.436249E-01
1.391800E-01
1.347855E-01
1.305743E-01
1.266099E-01
1.228550E-01
1.196219E-01
1.163900E-01
1.133145E-01
1.104117E-01
1.076800E-01
1.050420E-01
1.025347E-01
1.001855E-01
9.792659E-02
9.577834E-02
9.370950E-02
9.173870E-02
8.989600E-02

P-WAVE CAPTURE CROSS-SECTION

2.849600E-01
3.277550E-01
3.236470E-01
3.550280E-01
3.762550E-01
3.999120E-01
3.999170E-01
4.897230E-01
4.887830E-01
4.898224E-01
4.893487E-01
4.877870E-01
4.852824E-01
4.828344E-01
3.983790E-01
3.980550E-01
3.855620E-01
3.889480E-01
3.762420E-01
3.714927E-01
3.667275E-01
3.619657E-01
3.572384E-01
3.525480E-01
3.478800E-01
3.433270E-01
3.388240E-01
3.343880E-01
3.298280E-01
3.257457E-01
3.215430E-01
3.174290E-01
3.133920E-01
3.094390E-01
3.055620E-01
3.017750E-01
2.980570E-01
2.944230E-01
2.908670E-01
2.873890E-01
2.839790E-01
2.806440E-01
2.773830E-01
2.741810E-01

1.149440E-01
1.142880E-01
1.143130E-01
1.141940E-01
1.140010E-01
1.139681E-01
1.139510E-01
1.137420E-01
1.134310E-01
1.132110E-01
1.134110E-01
1.130220E-01

TOTAL

2.887270E-08
1.727404E-08
1.340041E-08
1.181910E-08
1.031320E-08
9.400000E-01
8.864050E-01
8.377640E-01
7.976240E-01
7.637700E-01
7.343000E-01
7.081050E-01
6.847540E-01
6.633840E-01
6.443160E-01
6.269940E-01
6.093820E-01
5.928720E-01
5.791790E-01
5.683300E-01
5.593700E-01
5.481740E-01
5.381020E-01
5.281330E-01
5.174330E-01
5.067410E-01
4.967930E-01
4.873760E-01
4.793230E-01
4.698880E-01
4.608110E-01
4.524570E-01
4.446810E-01
4.370480E-01
4.297780E-01
4.227960E-01
4.159740E-01
4.092880E-01
4.030040E-01
3.967860E-01
3.905260E-01
3.853120E-01
3.791920E-01
3.743420E-01
3.691190E-01
3.648370E-01

4.600000E+04
 4.700000E+04
 4.800000E+04
 4.900000E+04
 5.000000E+04
 5.100000E+04
 5.200000E+04
 5.300000E+04
 5.400000E+04
 5.500000E+04
 5.600000E+04
 5.700000E+04
 5.800000E+04
 5.900000E+04
 6.000000E+04
 6.100000E+04
 6.200000E+04
 6.300000E+04
 6.400000E+04
 6.500000E+04
 6.600000E+04
 6.700000E+04
 6.800000E+04
 6.900000E+04
 7.000000E+04
 7.100000E+04
 7.200000E+04
 7.300000E+04
 7.400000E+04
 7.500000E+04
 7.600000E+04
 7.700000E+04
 7.800000E+04
 7.900000E+04
 8.000000E+04
 8.100000E+04
 8.200000E+04
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 8.500000E+04
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 8.700000E+04
 8.800000E+04
 8.900000E+04
 9.000000E+04
 9.100000E+04
 9.200000E+04
 9.300000E+04
 9.400000E+04
 9.500000E+04
 9.600000E+04
 9.700000E+04
 9.800000E+04
 9.900000E+04
 1.000000E+05

8.004120E-02
 8.630840E-02
 8.463876E-02
 8.303701E-02
 8.149640E-02
 8.001369E-02
 7.850540E-02
 7.720064E-02
 7.580064E-02
 7.459001E-02
 7.330070E-02
 7.216430E-02
 7.104729E-02
 6.980702E-02
 6.800407E-02
 6.775433E-02
 6.673721E-02
 6.575061E-02
 6.479374E-02
 6.384507E-02
 6.296335E-02
 6.208743E-02
 6.123619E-02
 6.040060E-02
 5.960367E-02
 5.882049E-02
 5.805015E-02
 5.731505E-02
 5.659270E-02
 5.588021E-02
 5.520143E-02
 5.453176E-02
 5.387056E-02
 5.324123E-02
 5.261919E-02
 5.201190E-02
 5.141002E-02
 5.083946E-02
 5.027335E-02
 4.972002E-02
 4.917006E-02
 4.865003E-02
 4.813256E-02
 4.762626E-02
 4.713076E-02
 4.664573E-02
 4.617003E-02
 4.570579E-02
 4.525010E-02
 4.480302E-02
 4.436640E-02
 4.393766E-02
 4.351732E-02
 4.310516E-02
 4.270091E-02

2.710607E-01
 2.680001E-01
 2.650039E-01
 2.620703E-01
 2.591977E-01
 2.563846E-01
 2.536293E-01
 2.509303E-01
 2.482861E-01
 2.456952E-01
 2.431563E-01
 2.406670E-01
 2.382205E-01
 2.358370E-01
 2.334921E-01
 2.311924E-01
 2.289369E-01
 2.267242E-01
 2.245533E-01
 2.224231E-01
 2.203325E-01
 2.182809E-01
 2.162660E-01
 2.142800E-01
 2.123457E-01
 2.104301E-01
 2.085644E-01
 2.067236E-01
 2.049149E-01
 2.031376E-01
 2.013900E-01
 1.996730E-01
 1.979850E-01
 1.963262E-01
 1.946942E-01
 1.930892E-01
 1.915106E-01
 1.899576E-01
 1.884297E-01
 1.869264E-01
 1.854469E-01
 1.839900E-01
 1.825576E-01
 1.811466E-01
 1.797574E-01
 1.783896E-01
 1.770425E-01
 1.757150E-01
 1.744090E-01
 1.731217E-01
 1.718534E-01
 1.706037E-01
 1.693722E-01
 1.681505E-01
 1.669623E-01

3.591020E-01
 3.543056E-01
 3.496427E-01
 3.451073E-01
 3.406948E-01
 3.363903E-01
 3.322147E-01
 3.281309E-01
 3.241667E-01
 3.202940E-01
 3.165170E-01
 3.128321E-01
 3.092350E-01
 3.057240E-01
 3.022961E-01
 2.989467E-01
 2.956739E-01
 2.924740E-01
 2.893471E-01
 2.862802E-01
 2.832959E-01
 2.803679E-01
 2.775021E-01
 2.746966E-01
 2.719494E-01
 2.692506E-01
 2.666220E-01
 2.640394E-01
 2.615077E-01
 2.590250E-01
 2.565922E-01
 2.542039E-01
 2.518644E-01
 2.495674E-01
 2.473134E-01
 2.451011E-01
 2.429294E-01
 2.407971E-01
 2.387031E-01
 2.366464E-01
 2.346260E-01
 2.326409E-01
 2.306901E-01
 2.287720E-01
 2.268862E-01
 2.250333E-01
 2.232134E-01
 2.214216E-01
 2.196592E-01
 2.179255E-01
 2.162190E-01
 2.145413E-01
 2.128899E-01
 2.112637E-01
 2.096633E-01

PROGRAM AVRA3, CALCULATES CROSS-SECTIONS IN THE UNRESOLVED RESONANCE REGION.

ENDF/B VERSION II DATA WITH ENERGY INDEPENDENT PARAMETERS.

RUN NO 3 TITLE AVERAGES TEST, U-235 DATA E0 0.000000E+00 EN 0.000000E+20 ESTEP 0.000000E+00
ENERGY LIMITS LOWER 6.450400E+01 UPPER 3.000000E+04 LRU 2 LRF 1 LFI 0
TARGET-SPIN 3.5000E+00 SCATTERING LENGTH 0.3660E-01 NO OF ENERGY VALUES AT WHICH FISSION WIDTHS ARE GIVEN 25
DATA FOR A FISSION NUCLEUS

S-WAVE DATA

FISSION WIDTHS ARE GIVEN AT THE FOLLOWING ENERGIES

6.4504E+01 8.2000E+01 1.2500E+02 1.7500E+02 2.2500E+02 2.7500E+02
3.5000E+02 4.5000E+02 6.0000E+02 8.5000E+02 1.2500E+03 1.7500E+03
2.5000E+03 3.5000E+03 4.5000E+03 5.5000E+03 7.0000E+03 9.0000E+03
1.2500E+04 1.7500E+04 2.2500E+04 2.7500E+04 3.5000E+04 4.5000E+04
5.0000E+04

ISOTOPIC MASS 2.3302E+02 ANGULAR MOMENTUM 0 NO OF SPIN STATES 2

MEAN LEVEL SPACING 1.0000E+00 LEVEL SPIN 3.0000E+00 REDUCED NEUTRON WIDTH 1.0000E+04 GAMMA GAMMA 3.5000E+02

NO OF DEGREES OF FREEDOM FOR NEUTRON WIDTH DISTRIBUTION 1

NO OF DEGREES OF FREEDOM FOR FISSION WIDTH DISTRIBUTION 2

THE FISSION WIDTHS ARE

2.9474E-01 2.9264E-01 2.4623E-01 2.4258E-01 2.6413E-01 4.9705E-01
2.7310E-01 4.5109E-01 4.4004E-01 2.3327E-01 3.0220E-01 3.3300E-01
4.2449E-01 3.2358E-01 3.2196E-01 3.2204E-01 3.3009E-01 3.3291E-01
4.3037E-01 4.3070E-01 4.5035E-01 4.7200E-01 5.2070E-01 5.9992E-01
5.7033E-01

MEAN LEVEL SPACING 1.0000E+00 LEVEL SPIN 4.0000E+00 REDUCED NEUTRON WIDTH 1.0000E+04 GAMMA GAMMA 3.5000E+02

NO OF DEGREES OF FREEDOM FOR NEUTRON WIDTH DISTRIBUTION 1

NO OF DEGREES OF FREEDOM FOR FISSION WIDTH DISTRIBUTION 1

THE FISSION WIDTHS ARE

1.4737E-01 1.4632E-01 1.2311E-01 1.2129E-01 1.3207E-01 2.4052E-01
1.3655E-01 2.2554E-01 2.2002E-01 1.1603E-01 1.5115E-01 1.7650E-01
2.1225E-01 1.6179E-01 1.6090E-01 1.6142E-01 1.6505E-01 1.6646E-01
2.1910E-01 2.1935E-01 2.2517E-01 2.3640E-01 2.6039E-01 2.9996E-01
2.8517E-01

P-WAVE DATA

ISOTOPIC MASS 2.3302E+02 ANGULAR MOMENTUM 1 NO OF SPIN STATES 4

MEAN LEVEL SPACING 1.169E+00 LEVEL SPIN 2.200E+00 REDUCED NEUTRON WIDTH 2.320E+04 GAMMA GAMMA 3.500E+02
 NO OF DEGREES OF FREEDOM FOR NEUTRON WIDTH DISTRIBUTION 1
 NO OF DEGREES OF FREEDOM FOR FISSION WIDTH DISTRIBUTION 2
 THE FISSION WIDTHS ARE
 3.320E-01 3.320E-01 3.320E-01 3.320E-01 3.320E-01 3.320E-01
 3.320E-01 3.320E-01 3.320E-01 3.320E-01 3.320E-01 3.320E-01
 3.320E-01 3.320E-01 3.320E-01 3.320E-01 3.320E-01 3.320E-01
 3.320E-01 3.320E-01 3.320E-01 3.320E-01 3.320E-01 3.320E-01
 3.320E-01 3.320E-01 3.320E-01 3.320E-01 3.320E-01 3.320E-01

MEAN LEVEL SPACING 1.200E+00 LEVEL SPIN 3.000E+00 REDUCED NEUTRON WIDTH 2.000E+04 GAMMA GAMMA 3.500E+02
 NO OF DEGREES OF FREEDOM FOR NEUTRON WIDTH DISTRIBUTION 2
 NO OF DEGREES OF FREEDOM FOR FISSION WIDTH DISTRIBUTION 3
 THE FISSION WIDTHS ARE
 1.270E-01 1.270E-01 1.270E-01 1.270E-01 1.270E-01 1.270E-01
 1.270E-01 1.270E-01 1.270E-01 1.270E-01 1.270E-01 1.270E-01
 1.270E-01 1.270E-01 1.270E-01 1.270E-01 1.270E-01 1.270E-01
 1.270E-01 1.270E-01 1.270E-01 1.270E-01 1.270E-01 1.270E-01
 1.270E-01 1.270E-01 1.270E-01 1.270E-01 1.270E-01 1.270E-01

MEAN LEVEL SPACING 1.000E+00 LEVEL SPIN 4.000E+00 REDUCED NEUTRON WIDTH 2.000E+04 GAMMA GAMMA 3.500E+02
 NO OF DEGREES OF FREEDOM FOR NEUTRON WIDTH DISTRIBUTION 2
 NO OF DEGREES OF FREEDOM FOR FISSION WIDTH DISTRIBUTION 2
 THE FISSION WIDTHS ARE
 2.060E-01 2.060E-01 2.060E-01 2.060E-01 2.060E-01 2.060E-01
 2.060E-01 2.060E-01 2.060E-01 2.060E-01 2.060E-01 2.060E-01
 2.060E-01 2.060E-01 2.060E-01 2.060E-01 2.060E-01 2.060E-01
 2.060E-01 2.060E-01 2.060E-01 2.060E-01 2.060E-01 2.060E-01
 2.060E-01 2.060E-01 2.060E-01 2.060E-01 2.060E-01 2.060E-01

MEAN LEVEL SPACING 1.120E+00 LEVEL SPIN 3.000E+00 REDUCED NEUTRON WIDTH 2.240E+04 GAMMA GAMMA 3.500E+02
 NO OF DEGREES OF FREEDOM FOR NEUTRON WIDTH DISTRIBUTION 3
 NO OF DEGREES OF FREEDOM FOR FISSION WIDTH DISTRIBUTION 3
 THE FISSION WIDTHS ARE
 1.430E-01 1.430E-01 1.430E-01 1.430E-01 1.430E-01 1.430E-01
 1.430E-01 1.430E-01 1.430E-01 1.430E-01 1.430E-01 1.430E-01
 1.430E-01 1.430E-01 1.430E-01 1.430E-01 1.430E-01 1.430E-01
 1.430E-01 1.430E-01 1.430E-01 1.430E-01 1.430E-01 1.430E-01
 1.430E-01 1.430E-01 1.430E-01 1.430E-01 1.430E-01 1.430E-01

NUCLEAR RADIIUS A01 23.000E+01/300.0100 1 0.0300E+01
 AVERAGE SCATTERING CAPTURE AND FISSION CROSS-SECTIONS FOR A FISSION NUCLEUS

TITLE AVERAGES FOR U-235 DATA

AVERAGE CROSS-SECTION CALCULATED USING GREENLEAF APPROXIMATION

NEUTRON ENERGY(EV) S-AVE SCATRG CROSS-SECTION P-AVE SCATRG CROSS-SECTION

6.450400E+01 9.780764E+00
 8.200000E+01 9.783050E+00
 1.250000E+02 9.037030E+00
 1.750000E+02 9.086114E+00
 2.250000E+02 9.775332E+00
 2.750000E+02 9.523042E+00
 3.500000E+02 9.731142E+00
 4.500000E+02 9.525672E+00
 6.000000E+02 9.511716E+00
 8.500000E+02 9.780389E+00
 1.250000E+03 9.565566E+00

TOTAL
 9.780764E+00
 9.783050E+00
 9.037030E+00
 9.086114E+00
 9.775332E+00
 9.523042E+00
 9.731142E+00
 9.525672E+00
 9.511716E+00
 9.780389E+00
 9.565566E+00

1.750000E+03
2.500000E+03
3.500000E+03
4.500000E+03
5.500000E+03
7.000000E+03
9.000000E+03
1.200000E+04
1.750000E+04
2.250000E+04
2.750000E+04
3.500000E+04
4.500000E+04
5.000000E+04

9.467848E+00
9.354848E+00
9.376033E+00
9.325037E+00
9.276947E+00
9.207787E+00
9.131486E+00
9.953983E+00
9.021273E+00
9.698854E+00
9.582843E+00
9.419337E+00
9.219320E+00
9.144976E+00

6.697286E+04
1.357264E+03
2.634245E+03
4.318002E+03
6.376853E+03
1.014866E+02
1.639495E+02
3.932915E+02
9.588845E+02
0.676379E+02
1.217698E+01
1.799386E+01
2.644437E+01
3.865493E+01

9.467710E+00
9.354197E+00
9.376167E+00
9.329347E+00
9.283317E+00
9.213856E+00
9.147881E+00
9.983312E+00
8.877153E+00
8.78617E+00
8.704612E+00
8.592762E+00
8.483764E+00
8.453526E+00

NEUTRON ENERGY (EV)

S-WAVE CAPTURE CROSS-SECTION

P-WAVE CAPTURE CROSS-SECTION

TOTAL

6.452400E+03
0.400000E+03
1.250000E+02
1.750000E+02
2.250000E+02
2.750000E+02
3.500000E+02
4.500000E+02
5.000000E+02
6.000000E+02
8.000000E+02
1.750000E+03
3.500000E+03
4.500000E+03
5.000000E+03
7.000000E+03
9.000000E+03
1.200000E+04
1.750000E+04
2.250000E+04
2.750000E+04
3.500000E+04
4.500000E+04
5.000000E+04
5.000000E+04
6.450000E+03
1.250000E+02
1.750000E+02
2.250000E+02
2.750000E+02
3.500000E+02
4.500000E+02
5.000000E+02
6.000000E+02
8.000000E+02
1.250000E+03
1.750000E+03
2.250000E+03
2.750000E+03
3.500000E+03
4.500000E+03
5.000000E+03
7.000000E+03

1.070961E+03
1.400249E+03
1.275553E+03
1.075604E+03
9.122775E+00
6.249314E+00
7.099210E+00
9.017959E+00
4.344129E+00
4.678069E+00
3.401984E+00
2.642982E+00
1.997828E+00
1.841602E+00
3.992338E+00
1.413895E+00
1.212624E+00
1.038101E+00
7.606101E+01
0.166118E+03
5.208346E+03
4.494779E+01
3.701678E+02
2.907789E+03
2.828880E+03
3.363187E+03
2.973384E+03
2.386274E+03
1.935322E+01
1.737230E+01
1.784734E+01
1.395819E+01
1.363367E+01
1.178661E+01
0.478841E+00
7.385532E+00
6.413942E+00
5.531843E+00
4.593878E+00
3.798989E+00
3.418838E+00
3.088465E+00

1.673280E+03
1.487880E+03
1.278678E+03
1.079381E+01
0.144832E+00
0.295635E+00
7.831450E+00
9.877167E+00
4.412481E+00
4.751285E+00
3.582672E+00
2.758929E+00
2.135816E+00
2.888282E+00
1.613625E+00
1.287730E+00
1.045662E+00
9.395932E+01
0.711220E+03
0.193356E+03
7.598143E+03
7.018288E+03
0.918168E+03
3.367555E+03
2.978488E+01
2.312466E+01
1.942857E+01
1.745534E+01
1.789913E+01
1.486172E+01
1.375182E+01
1.18143E+01
8.637866E+00
7.58987E+00
6.64134E+00
5.88282E+00
4.67888E+00
4.163479E+00
3.81863E+00
3.457617E+00

0.00000E+03
1.20000E+04
1.70000E+04
2.20000E+04
2.70000E+04
3.00000E+04
4.00000E+04
5.00000E+04

0.62332E+00
2.34241E+00
1.94820E+00
1.72001E+00
1.54251E+00
1.37692E+00
1.28457E+00
1.10153E+00

5.04210E+01
5.03360E+01
0.71661E+01
7.42502E+01
7.05097E+01
0.00469E+01
0.22271E+01
0.45591E+01

0.13303E+00
0.02000E+00
0.01000E+00
0.01000E+00
0.01000E+00
0.01000E+00
0.01000E+00
0.01000E+00

[illegible]

[illegible]

	P-WAVE SIGMAFIS9	D-WAVE SIGMAFIS9	TOTAL SIGMA
1	2FISS)		AVG4123
37	FORMAT(3SH AVERAGE SCATTERING CROSS-SECTION)		AVG4124
38	FORMAT(3SH AVERAGE CAPTURE CROSS-SECTION)		AVG4125
39	FORMAT(3SH AVERAGE FISSION CROSS-SECTION)		AVG4126
40	FORMAT(2X,7E15,6)		AVG4127
41	FORMAT(45H INPUT PARAMETERS WITH CALCULATED TOTAL WIDTH)		AVG4128
42	FORMAT(10H L-VALUE=15,10H J-STATE=FS,2)		AVG4129
43	FORMAT(79H1 PROGRAM AVRAGE4. CALCULATES CROSS-SECTIONS IN THE UNRESOLVED RESONANCE REGION)		AVG4130
44	FORMAT(56H ENDF/B VERSION 11 DATA WITH ENERGY DEPENDENT PARAMETERS)		AVG4131
1)			AVG4132
320	T=2.196771E-03*(AMRI/(AMRI+1.0))		AVG4133
	CONST=19.7392840/(T*Y)		AVG4134
	PHIFOUR=12.566371		AVG4135
	CPEN=2.196771E-03*(AMRI/(AMRI+1.0))*OPEN		AVG4136
	C=2.196771E-03*(AMRI/(AMRI+1.0))*A		AVG4137
	DO 403 J=1,3		AVG4138
	DO 405 K=1, 75		AVG4139
	DO 404 J=1,6		AVG4140
	SIGC(I,J,K)=0.0		AVG4141
	SIGS(I,J,K)=0.0		AVG4142
	SIGF(I,J,K)=0.0		AVG4143
	GTC(I,J,K)=0.0		AVG4144
404	CONTINUE		AVG4145
	SIGCT(I,K)=0.0		AVG4146
	SIGST(I,K)=0.0		AVG4147
	SIGFT(I,K)=0.0		AVG4148
	SIGFT(I,K)=0.0		AVG4149
405	CONTINUE		AVG4150
403	CONTINUE		AVG4151
	DO 408 I=1,NLS		AVG4152
	NJSI=NJS(I)		AVG4153
	LI=L(I)		AVG4154
	FL=FLOAT(LI)		AVG4155
	LI=L(I)+1		AVG4156
	DO 401 J=1,NJSI		AVG4157
	AJIJ=AJ(I,J)		AVG4158
	NEIJ=NE(I,J)		AVG4159
	CJ=(2.0*AJIJ+1.0)/(4.0*CPEN+2.0)		AVG4160
	AMUNIJ=AMUN(I,J)		AVG4161
	AMUFIJ=AMUF(I,J)		AVG4162
	AMUXIJ=AMUX(I,J)		AVG4163
	MU=INT(AMUNIJ)		AVG4164
	MU=INT(AMUFIJ)		AVG4165
	LAMBDA=INT(AMUXIJ)		AVG4166
	DO 402 K=1,NEIJ		AVG4167
	E1JK=E(I,J,K)		AVG4168
	E2=SORT(E1JK)		AVG4169
	WAVE=2.196771E-03*(AMRI/(AMRI+1.0))*E2		AVG4170
	RHO=C*E2		AVG4171
	RHOPEN=CPEN+E2		AVG4172
	GO TO(500,501,402),LI		AVG4173
500	VL=E2*AMUN(I,J)		AVG4174
	PS=RHO		AVG4175
	GO TO 503		AVG4176
501	VL=E2*(RHOPEN+2/(1.0+RHOPEN+0.2))*AMUN(I,J)		AVG4177
	PS=RHO-ATAN(RHO)		AVG4178
	GO TO 503		AVG4179
502	VL=E2*(RHOPEN+4/(RHOPEN+0.0+0.0+0.0+0.0+0.0+0.0+0.0+0.0+0.0))*AMUN(I,J)		AVG4180
	PS=RHO-ATAN(3.0+RHO/(3.0+RHO+0.2))		AVG4181


```

503 SIGP1=(SIGP1)/A+10**2
SIGP1=SIGP1+P*P*10**2,0.071L+1.00
GN=GN*(1,J,K)=NL
GAMMA=GC(1,J,K)
ALPHA=GN
GBETA=CF(1,J,K)
DIFF=GX(1,J,K)
GTC(1,J,K)=GN+GAMMA+GBETA+DIFF
752 TERC=(CONST*GJ+GN+GAMMA)/(EIJ*DI(1,J,K))
TERS=(CONST*GJ+GN+GN)/(EIJ*DI(1,J,K))
TERF=(CONST*GJ+GN+GBETA)/(EIJ*DI(1,J,K))
CALL CNRLGALPHA,GBETA,GAMMA,MU,MU,LAMBDA,GS,DIFF,1
CALL CNRLGALPHA,GBETA,GAMMA,MU,MU,LAMBDA,GC,DIFF,2
CALL CNRLGALPHA,GBETA,GAMMA,MU,MU,LAMBDA,CFF,DIFF,3
GS=GS+TERS
GC=GC+TERC
GFF=GFF+TERF
CORR=(CONST*GJ+2.0*GJ+2.0*GJ+2.0*GJ)/(EIJ*DI(1,J,K))
GS=GS+CORR
SIGC(1,J,K)=GC
SIGS(1,J,K)=GS
SIGF(1,J,K)=CFF
SIGPT(1,K)=SIGCGY
482 CONTINUE
481 CONTINUE
480 CONTINUE
PRINT25
PRINT41
PRINT25
DO 8000 I=1,NL9
LI=LI(1)
NJS1=NJS(1)
DO 8001 J=1,NJ9
AJIJ=AJ(1,J)
NEIJ=NE(1,J)
PRINT42,LI,AJIJ
PRINT25
PRINT22
PRINT40,(E(1,J,K),DI(1,J,K),GX(1,J,K),GYC(1,J,K),GNO(1,J,K),
1GG(1,J,K),GF(1,J,K),KK=1,NZ1J)
8801 CONTINUE
8800 CONTINUE
DO 800 K=1,75
DO 801 I=1,3
DO 802 J=1,6
SIGCY(1,K)=SIGCY(1,K)+SIGC(1,J,K)
SIGSY(1,K)=SIGCY(1,K)+SIGS(1,J,K)
SIGFT(1,K)=SIGCY(1,K)+SIGF(1,J,K)
882 CONTINUE
SIGST(1,K)=SIGCY(1,K)+SIGPT(1,K)
881 CONTINUE
880 CONTINUE
NN=NE(1,1)
PRINT25
PRINT37
PRINT25
PRINT34
DO 900 K=1,NK
TERM=0.0
DO 901 I=1,3
TERM=TERM+SIGST(1,K)

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981 CONTINUE
PRINT 24,E(1,1,K),SIGGY(1,K),SIGGY(2,K),SIGGY(3,K),TERM
982 CONTINUE
PRINT25
PRINT30
PRINT25
PRINT35
DO 982 K=1,NN
TERM=0.0
DO 983 I=1,J
TERM=TERM+SIGGY(I,K)
983 CONTINUE
PRINT 24,E(1,1,K),SIGGY(1,K),SIGGY(2,K),SIGGY(3,K),TERM
982 CONTINUE
PRINT25
PRINT30
PRINT25
PRINT35
DO 984 K=1,NN
TERM=0.0
DO 985 I=1,J
TERM=TERM+SIGGY(I,K)
985 CONTINUE
PRINT 24,E(1,1,K),SIGGY(1,K),SIGGY(2,K),SIGGY(3,K),TERM
984 CONTINUE
GO TO 981
8822 CALL GMBY
END
SUBROUTINE GNRL(GALPHA,BETA,GAMMA,PV,MU,LAMBDA,S,DF,IO)
COMMON/XBAR/XX(4,10)
S=0.0
IF(GALPHA)1000,1002,1001
1001 IF(GAMMA)1000,1003,1002
1002 IF(BETA)1002,1003,1004
1003 IF(DF)1000,1005,1006
1005 DO 101 J=1,10
XJ=XX(MU,J)
GO TO(200,201,202),IO
200 S=S+((XJ-XJ)/(GALPHA+HJ+GAMMA))
GO TO 100
201 S=S+(XJ/(GALPHA+HJ+GAMMA))
202 CONTINUE
100 CONTINUE
S=S/10.0
GO TO 1000
1006 DO 101 J=1,10
XJ=XX(MU,J)
DO 102 K=1,10
XK=XX(LAMBDA,K)
GO TO(300,301,302),IO
300 S=S+((XJ-XJ)/(GALPHA+HJ+GAMMA+DF+K))
GO TO 102
301 S=S+(XJ/(GALPHA+HJ+GAMMA+DF+K))
302 CONTINUE
102 CONTINUE
101 CONTINUE
S=S/100.0
GO TO 1000
1004 IF(DF)1000,1007,1000
1007 DO 103 J=1,10
XJ=XX(MU,J)

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AVG4241
AVG4242
AVG4243
AVG4244
AVG4245
AVG4246
AVG4247
AVG4248
AVG4249
AVG4250
AVG4251
AVG4252
AVG4253
AVG4254
AVG4255
AVG4256
AVG4257
AVG4258
AVG4259
AVG4260
AVG4261
AVG4262
AVG4263
AVG4264
AVG4265
AVG4266
AVG4267
AVG4268
GNRL001
GNRL002
GNRL003
GNRL004
GNRL005
GNRL006
GNRL007
GNRL008
GNRL009
GNRL010
GNRL011
GNRL012
GNRL013
GNRL014
GNRL015
GNRL016
GNRL017
GNRL018
GNRL019
GNRL020
GNRL021
GNRL022
GNRL023
GNRL024
GNRL025
GNRL026
GNRL027
GNRL028
GNRL029
GNRL030
GNRL031
GNRL032
GNRL033

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```

DO 104 K=1,10
  XK=XX(MU,K)
  GO TO(400,401,402),I0
400 S=S+((XJ-XJ)/(GALPHA+HJ+CBETA+H+GAMMA))
  GO TO 104
401 S=S+(XJ/(GALPHA+HJ+CBETA+H+GAMMA))
  GO TO 104
402 S=S+((XJ-XK)/(GALPHA+HJ+CBETA+H+GAMMA))
104 CONTINUE
103 CONTINUE
  S=S/100.0
  GO TO 1002
1000 DO 105 J=1,10
  XJ=XX(MU,J)
  DO 106 K=1,10
  XK=XX(MU,K)
  DO 107 L=1,10
  XL=XX(LAMBDA,L)
  GO TO(500,501,502),I0
500 S=S+((XJ-XJ)/(GALPHA+HJ+CBETA+H+GAMMA+DFORHL))
  GO TO 107
501 S=S+(XJ/(GALPHA+HJ+CBETA+H+GAMMA+DFORHL))
  GO TO 107
502 S=S+((XJ-XK)/(GALPHA+HJ+CBETA+H+GAMMA+DFORHL))
107 CONTINUE
106 CONTINUE
105 CONTINUE
  S=S/1000.0
1002 RETURN
END

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GNRL034
 GNRL035
 GNRL036
 GNRL037
 GNRL038
 GNRL039
 GNRL040
 GNRL041
 GNRL042
 GNRL043
 GNRL044
 GNRL045
 GNRL046
 GNRL047
 GNRL048
 GNRL049
 GNRL050
 GNRL051
 GNRL052
 GNRL053
 GNRL054
 GNRL055
 GNRL056
 GNRL057
 GNRL058
 GNRL059
 GNRL060
 GNRL061
 GNRL062
 GNRL063

100 AVERAGE4 TEST. U-235 DATA				
64.524	24788.0	2	0	01102 2151
3.5	0.926	0	2	01102 2151
233.025	0.0	0	2	01102 2151
3.0000E+00	0.	0	156	251102 2151
0.	0.	0	0	01102 2151
6.4504E+01	1.0000E+00	0.	2.0000E+00	01102 2151
8.2902E+01	1.0000E+00	0.	2.9347E-01	01102 2151
1.1569E+02	1.0000E+00	0.	2.9133E-01	01102 2151
1.4035E+02	1.0000E+00	0.	2.4640E-01	01102 2151
1.9074E+02	1.0000E+00	0.	2.1766E-01	01102 2151
2.4491E+02	1.0000E+00	0.	2.6993E-01	01102 2151
3.1447E+02	1.0000E+00	0.	3.0000E-02	01102 2151
4.0379E+02	1.0000E+00	0.	3.9141E-01	01102 2151
5.1040E+02	1.0000E+00	0.	3.7344E-01	01102 2151
6.6574E+02	1.0000E+00	0.	5.1390E-01	01102 2151
8.5402E+02	1.0000E+00	0.	3.4713E-01	01102 2151
1.0976E+03	1.0000E+00	0.	2.5096E-01	01102 2151
1.4093E+03	1.0000E+00	0.	2.9373E-01	01102 2151
1.8096E+03	1.0000E+00	0.	3.4813E-01	01102 2151
2.3236E+03	1.0000E+00	0.	3.7003E-01	01102 2151
2.9036E+03	1.0000E+00	0.	4.3610E-01	01102 2151
3.0310E+03	1.0000E+00	0.	4.3340E-01	01102 2151
4.9191E+03	1.0000E+00	0.	4.2475E-01	01102 2151
6.3163E+03	1.0000E+00	0.	4.3006E-01	01102 2151
8.1103E+03	1.0000E+00	0.	4.4334E-01	01102 2151
1.0414E+04	1.0000E+00	0.	4.4329E-01	01102 2151
1.3372E+04	1.0000E+00	0.	4.4530E-01	01102 2151
1.7169E+04	1.0000E+00	0.	4.5646E-01	01102 2151
2.2046E+04	1.0000E+00	0.	4.7366E-01	01102 2151
2.4700E+04	1.0000E+00	0.	4.6210E-01	01102 2151
4.0000E+00	0.	0	156	251102 2151
0.	0.	0	0	01102 2151
6.4504E+01	1.0000E+00	0.	1.0000E+00	01102 2151
8.2902E+01	1.0000E+00	0.	1.4673E-01	01102 2151
1.1569E+02	1.0000E+00	0.	1.4567E-01	01102 2151
1.4035E+02	1.0000E+00	0.	1.2333E-01	01102 2151
1.9074E+02	1.0000E+00	0.	1.0000E-01	01102 2151
2.4491E+02	1.0000E+00	0.	1.3297E-01	01102 2151
3.1447E+02	1.0000E+00	0.	1.9019E-01	01102 2151
4.0379E+02	1.0000E+00	0.	1.7571E-01	01102 2151
5.1040E+02	1.0000E+00	0.	1.8672E-01	01102 2151
6.6574E+02	1.0000E+00	0.	2.5695E-01	01102 2151
8.5402E+02	1.0000E+00	0.	1.7357E-01	01102 2151
1.0976E+03	1.0000E+00	0.	1.2540E-01	01102 2151
1.4093E+03	1.0000E+00	0.	1.2607E-01	01102 2151
1.8096E+03	1.0000E+00	0.	1.7406E-01	01102 2151
2.3236E+03	1.0000E+00	0.	1.8542E-01	01102 2151
2.9036E+03	1.0000E+00	0.	2.1009E-01	01102 2151
3.0310E+03	1.0000E+00	0.	2.1674E-01	01102 2151
4.9191E+03	1.0000E+00	0.	2.1230E-01	01102 2151
6.3163E+03	1.0000E+00	0.	2.1820E-01	01102 2151
8.1103E+03	1.0000E+00	0.	2.1753E-01	01102 2151
1.0414E+04	1.0000E+00	0.	2.2167E-01	01102 2151
1.3372E+04	1.0000E+00	0.	2.2163E-01	01102 2151
1.7169E+04	1.0000E+00	0.	2.2265E-01	01102 2151
2.2046E+04	1.0000E+00	0.	2.2883E-01	01102 2151
2.4700E+04	1.0000E+00	0.	2.3603E-01	01102 2151
2.3302E+02	0.	0	2.3110E-01	01102 2151
2.0000E+00	0.	0	156	251102 2151
0.	0.	0	0	01102 2151
0.0000E+00	0.	0	156	251102 2151
0.	0.	0	0	01102 2151

PROGRAM AVERAGE4. CALCULATES CROSS-SECTIONS IN THE UNRESOLVED RESONANCE REGION

END/8 VERSION 11 DATA WITH ENERGY DEPENDENT PARAMETERS

RUN NO 300 TITLE AVERAGE4 TEST. U-235 DATA

ENERGY LIMITS LOWER 0.050400E+03 UPPER 2.470000E+04 LRUO 2 LRPO 2

TARGET SPIN 8.5000E+00 DEPARTING LENGTH 0.2000E+01 NUMBER OF L-STATES 2

NUCLEAR RADIUS 'A' AS CALCULATED FROM $A^{1/3} \times 1.45 \times 10^{-13} \text{ cm}$ 0.0000E+00

NUCLEAR MASS/NEUTRON MASS 2.3502E+02 ANGULAR MOMENTUM 0 NUMBER OF J-STATES FOR THIS L-VALUE 2

SPIN 3.000E+00 INTERPOLATION CODE 5 NUMBER OF ENERGY POINTS 25				NU NEUTRON 1.000E+00		NU GAMMA		NU FISSON 2.000E+00	
DEGREES OF FREEDOM.				GAMMA INFLAS		GAMMA N NOT		GAMMA GAMMA	
ENERGY (eV)				SPACING		GAMMA INFLAS		GAMMA GAMMA	
0.45000E+01	0.45000E+01	0.45000E+01	0.45000E+01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.29000E+01	0.29000E+01	0.29000E+01	0.29000E+01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2.15000E+01	2.15000E+01	2.15000E+01	2.15000E+01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
3.40000E+01	3.40000E+01	3.40000E+01	3.40000E+01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
8.90740E+01	8.90740E+01	8.90740E+01	8.90740E+01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2.44910E+02	2.44910E+02	2.44910E+02	2.44910E+02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
3.14700E+02	3.14700E+02	3.14700E+02	3.14700E+02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
4.03700E+02	4.03700E+02	4.03700E+02	4.03700E+02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
5.10000E+02	5.10000E+02	5.10000E+02	5.10000E+02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
6.05740E+02	6.05740E+02	6.05740E+02	6.05740E+02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
8.54200E+02	8.54200E+02	8.54200E+02	8.54200E+02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
1.09700E+03	1.09700E+03	1.09700E+03	1.09700E+03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
1.40930E+03	1.40930E+03	1.40930E+03	1.40930E+03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
1.80900E+03	1.80900E+03	1.80900E+03	1.80900E+03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2.32000E+03	2.32000E+03	2.32000E+03	2.32000E+03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2.98000E+03	2.98000E+03	2.98000E+03	2.98000E+03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
3.83000E+03	3.83000E+03	3.83000E+03	3.83000E+03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
4.91000E+03	4.91000E+03	4.91000E+03	4.91000E+03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
6.31000E+03	6.31000E+03	6.31000E+03	6.31000E+03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
8.11000E+03	8.11000E+03	8.11000E+03	8.11000E+03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
1.04200E+04	1.04200E+04	1.04200E+04	1.04200E+04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
1.33200E+04	1.33200E+04	1.33200E+04	1.33200E+04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
1.71000E+04	1.71000E+04	1.71000E+04	1.71000E+04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

ENERGY(EV)	SPACING	GAMMA INCLAS	GAMMA TOTAL	GAMMA N NOT	GAMMA GAMMA	GAMMA FISS
6.450400E+01	1.000000E+00	0.000000E+00	3.200477E+01	7.100700E-05	3.500000E-02	2.920700E-01
6.470200E+01	1.000000E+00	0.000000E+00	3.270744E+01	8.125300E-05	3.500000E-02	2.912300E-01
1.150500E+02	1.000000E+00	0.000000E+00	2.826231E+01	9.047200E-05	3.500000E-02	2.400500E-01
1.405500E+02	1.000000E+00	0.000000E+00	2.530300E+01	1.040000E-04	3.500000E-02	2.174000E-01
1.707400E+02	1.000000E+00	0.000000E+00	2.023600E+01	1.030000E-04	3.500000E-02	2.052000E-01
2.140100E+02	1.000000E+00	0.000000E+00	4.173910E+01	1.317500E-04	3.500000E-02	3.082700E-01
3.44700E+02	1.000000E+00	0.000000E+00	3.001130E+01	8.060000E-05	3.500000E-02	3.914100E-01
4.037000E+02	1.000000E+00	0.000000E+00	5.510000E+01	1.149000E-04	3.500000E-02	3.159000E-01
5.104000E+02	1.000000E+00	0.000000E+00	2.000200E+01	1.047000E-04	3.500000E-02	3.471300E-01
6.057400E+02	1.000000E+00	0.000000E+00	2.000200E+01	1.047000E-04	3.500000E-02	2.500600E-01
8.540200E+02	1.000000E+00	0.000000E+00	2.000200E+01	1.047000E-04	3.500000E-02	2.500600E-01
1.077000E+03	1.000000E+00	0.000000E+00	2.000200E+01	1.047000E-04	3.500000E-02	2.500600E-01
1.405300E+03	1.000000E+00	0.000000E+00	2.000200E+01	1.047000E-04	3.500000E-02	2.500600E-01
1.000600E+03	1.000000E+00	0.000000E+00	4.101300E+01	1.010000E-04	3.500000E-02	3.402200E-01
2.323000E+03	1.000000E+00	0.000000E+00	4.790300E+01	9.0402700E-05	3.500000E-02	3.705300E-01
3.031000E+03	1.000000E+00	0.000000E+00	4.603070E+01	9.702000E-05	3.500000E-02	4.320000E-01
4.219100E+03	1.000000E+00	0.000000E+00	4.720401E+01	1.072000E-04	3.500000E-02	4.247500E-01
6.310300E+03	1.000000E+00	0.000000E+00	4.777200E+01	9.641900E-05	3.500000E-02	4.308000E-01
8.110300E+03	1.000000E+00	0.000000E+00	4.004400E+01	9.441700E-05	3.500000E-02	4.350000E-01
1.041400E+04	1.000000E+00	0.000000E+00	4.004400E+01	9.763000E-05	3.500000E-02	4.433400E-01
1.337200E+04	1.000000E+00	0.000000E+00	4.910310E+01	9.071900E-05	3.500000E-02	4.450000E-01
1.710000E+04	1.000000E+00	0.000000E+00	5.043930E+01	9.040200E-05	3.500000E-02	4.546000E-01
2.040000E+04	1.000000E+00	0.000000E+00	5.220030E+01	9.320000E-05	3.500000E-02	4.730000E-01
2.470000E+04	1.000000E+00	0.000000E+00	5.130030E+01	8.007900E-04	3.500000E-02	4.623000E-01

LOWALUES 8 JUSTATE 4.00

ENERGY(EV)	SPACING	GAMMA INCLAS	GAMMA TOTAL	GAMMA N NOT	GAMMA GAMMA	GAMMA FISS
6.450400E+01	1.000000E+00	0.000000E+00	1.023070E+01	7.100700E-05	3.500000E-02	1.407300E-01
6.470200E+01	1.000000E+00	0.000000E+00	1.014144E+01	8.125300E-05	3.500000E-02	1.450700E-01
1.150500E+02	1.000000E+00	0.000000E+00	1.593011E+01	9.047200E-05	3.500000E-02	1.233300E-01
1.405500E+02	1.000000E+00	0.000000E+00	1.451000E+01	1.040000E-04	3.500000E-02	1.000200E-01
1.707400E+02	1.000000E+00	0.000000E+00	1.004000E+01	1.030000E-04	3.500000E-02	1.302700E-01
2.140100E+02	1.000000E+00	0.000000E+00	2.272100E+01	1.317500E-04	3.500000E-02	1.091500E-01
3.447000E+02	1.000000E+00	0.000000E+00	2.124130E+01	8.060000E-05	3.500000E-02	1.751000E-01
4.037000E+02	1.000000E+00	0.000000E+00	2.235010E+01	9.0402700E-05	3.500000E-02	1.807200E-01
5.104000E+02	1.000000E+00	0.000000E+00	2.945930E+01	1.149000E-04	3.500000E-02	2.050900E-01
6.057400E+02	1.000000E+00	0.000000E+00	2.114407E+01	1.112400E-04	3.500000E-02	1.730700E-01
8.540200E+02	1.000000E+00	0.000000E+00	1.639400E+01	1.047000E-04	3.500000E-02	1.250000E-01
1.077000E+03	1.000000E+00	0.000000E+00	1.650020E+01	1.047000E-04	3.500000E-02	1.250000E-01
1.405300E+03	1.000000E+00	0.000000E+00	2.120000E+01	9.900000E-05	3.500000E-02	1.740000E-01
1.000600E+03	1.000000E+00	0.000000E+00	2.247400E+01	1.010000E-04	3.500000E-02	1.852000E-01
2.323000E+03	1.000000E+00	0.000000E+00	2.570000E+01	9.0402700E-05	3.500000E-02	2.000000E-01
3.031000E+03	1.000000E+00	0.000000E+00	2.921400E+01	9.040200E-05	3.500000E-02	2.107400E-01
4.219100E+03	1.000000E+00	0.000000E+00	2.572700E+01	9.040200E-05	3.500000E-02	2.120000E-01
6.310300E+03	1.000000E+00	0.000000E+00	2.601700E+01	9.641900E-05	3.500000E-02	2.173000E-01
8.110300E+03	1.000000E+00	0.000000E+00	2.603000E+01	9.441700E-05	3.500000E-02	2.216700E-01
1.041400E+04	1.000000E+00	0.000000E+00	2.691000E+01	9.071900E-05	3.500000E-02	2.220000E-01
1.337200E+04	1.000000E+00	0.000000E+00	2.701000E+01	9.040200E-05	3.500000E-02	2.203000E-01
1.710000E+04	1.000000E+00	0.000000E+00	2.090730E+01	9.320000E-05	3.500000E-02	2.303000E-01
2.040000E+04	1.000000E+00	0.000000E+00	2.010030E+01	1.007900E-04	3.500000E-02	2.310000E-01

LOWALUES 1 JUSTATE 2.00

ENERGY(IEV) 8 0.500000E+00 2 0.500000E+00
 SPACING 1.100000E+00 1.100000E+00
 GAMMA IMELAS 0.000000E+00 0.000000E+00
 GAMMA TOTAL 3.070000E-01 3.070000E-01
 GAMMA N NOT 2.320000E-04 2.320000E-04
 GAMMA GAMMA 3.500000E-02 3.500000E-02
 GAMMA FISS 3.320000E-01 3.320000E-01

ENERGY(IEV) 8 0.500000E+00 2 0.500000E+00
 SPACING 1.100000E+00 1.100000E+00
 GAMMA IMELAS 0.000000E+00 0.000000E+00
 GAMMA TOTAL 3.070000E-01 3.070000E-01
 GAMMA N NOT 2.320000E-04 2.320000E-04
 GAMMA GAMMA 3.500000E-02 3.500000E-02
 GAMMA FISS 3.320000E-01 3.320000E-01

ENERGY(IEV) 8 0.500000E+00 2 0.500000E+00
 SPACING 1.100000E+00 1.100000E+00
 GAMMA IMELAS 0.000000E+00 0.000000E+00
 GAMMA TOTAL 3.070000E-01 3.070000E-01
 GAMMA N NOT 2.320000E-04 2.320000E-04
 GAMMA GAMMA 3.500000E-02 3.500000E-02
 GAMMA FISS 3.320000E-01 3.320000E-01

ENERGY(IEV) 8 0.500000E+00 2 0.500000E+00
 SPACING 1.100000E+00 1.100000E+00
 GAMMA IMELAS 0.000000E+00 0.000000E+00
 GAMMA TOTAL 3.070000E-01 3.070000E-01
 GAMMA N NOT 2.320000E-04 2.320000E-04
 GAMMA GAMMA 3.500000E-02 3.500000E-02
 GAMMA FISS 3.320000E-01 3.320000E-01

LoValue 8 0.500000E+00

ENERGY (EV)	SPACING	GAMMA INELAS	GAMMA TOTAL	GAMMA N NOT	GAMMA GAMMA	GAMMA FISS
0.430400E+01	1.000000E+00	0.000000E+00	3.210007E+01	2.000000E-04	3.900000E-02	2.000000E-01
0.290200E+01	1.000000E+00	0.000000E+00	3.210010E+01	2.000000E-04	3.900000E-02	2.000000E-01
1.150900E+02	1.000000E+00	0.000000E+00	3.210017E+01	2.000000E-04	3.900000E-02	2.000000E-01
1.409300E+02	1.000000E+00	0.000000E+00	3.210024E+01	2.000000E-04	3.900000E-02	2.000000E-01
1.907400E+02	1.000000E+00	0.000000E+00	3.210039E+01	2.000000E-04	3.900000E-02	2.000000E-01
2.449100E+02	1.000000E+00	0.000000E+00	3.210052E+01	2.000000E-04	3.900000E-02	2.000000E-01
3.144700E+02	1.000000E+00	0.000000E+00	3.210079E+01	2.000000E-04	3.900000E-02	2.000000E-01
4.037900E+02	1.000000E+00	0.000000E+00	3.210109E+01	2.000000E-04	3.900000E-02	2.000000E-01
5.104000E+02	1.000000E+00	0.000000E+00	3.210159E+01	2.000000E-04	3.900000E-02	2.000000E-01
6.057400E+02	1.000000E+00	0.000000E+00	3.210231E+01	2.000000E-04	3.900000E-02	2.000000E-01
8.540200E+02	1.000000E+00	0.000000E+00	3.210336E+01	2.000000E-04	3.900000E-02	2.000000E-01
1.097600E+03	1.000000E+00	0.000000E+00	3.210400E+01	2.000000E-04	3.900000E-02	2.000000E-01
1.400300E+03	1.000000E+00	0.000000E+00	3.210710E+01	2.000000E-04	3.900000E-02	2.000000E-01
1.009600E+03	1.000000E+00	0.000000E+00	3.211031E+01	2.000000E-04	3.900000E-02	2.000000E-01
2.323600E+03	1.000000E+00	0.000000E+00	3.211498E+01	2.000000E-04	3.900000E-02	2.000000E-01
2.903600E+03	1.000000E+00	0.000000E+00	3.212174E+01	2.000000E-04	3.900000E-02	2.000000E-01
3.031000E+03	1.000000E+00	0.000000E+00	3.213154E+01	2.000000E-04	3.900000E-02	2.000000E-01
4.919100E+03	1.000000E+00	0.000000E+00	3.214573E+01	2.000000E-04	3.900000E-02	2.000000E-01
0.316300E+03	1.000000E+00	0.000000E+00	3.216623E+01	2.000000E-04	3.900000E-02	2.000000E-01
0.110300E+03	1.000000E+00	0.000000E+00	3.219980E+01	2.000000E-04	3.900000E-02	2.000000E-01
2.041400E+04	1.000000E+00	0.000000E+00	3.223035E+01	2.000000E-04	3.900000E-02	2.000000E-01
2.337200E+04	1.000000E+00	0.000000E+00	3.229938E+01	2.000000E-04	3.900000E-02	2.000000E-01
2.716900E+04	1.000000E+00	0.000000E+00	3.230656E+01	2.000000E-04	3.900000E-02	2.000000E-01
2.234600E+04	1.000000E+00	0.000000E+00	3.251358E+01	2.000000E-04	3.900000E-02	2.000000E-01
2.470000E+04	1.000000E+00	0.000000E+00	3.250553E+01	2.000000E-04	3.900000E-02	2.000000E-01

L=VALUE 1 J=STATE 5.0E

ENERGY (EV)	SPACING	GAMMA INELAS	GAMMA TOTAL	GAMMA N NOT	GAMMA GAMMA	GAMMA FISS
0.430400E+01	1.120000E+00	0.000000E+00	1.700004E-01	2.240000E-04	3.900000E-02	1.430000E-01
0.290200E+01	1.120000E+00	0.000000E+00	1.700106E-01	2.240000E-04	3.900000E-02	1.430000E-01
1.150900E+02	1.120000E+00	0.000000E+00	1.700009E-01	2.240000E-04	3.900000E-02	1.430000E-01
1.409300E+02	1.120000E+00	0.000000E+00	1.700014E-01	2.240000E-04	3.900000E-02	1.430000E-01
1.907400E+02	1.120000E+00	0.000000E+00	1.700029E-01	2.240000E-04	3.900000E-02	1.430000E-01
2.449100E+02	1.120000E+00	0.000000E+00	1.700029E-01	2.240000E-04	3.900000E-02	1.430000E-01
3.144700E+02	1.120000E+00	0.000000E+00	1.700042E-01	2.240000E-04	3.900000E-02	1.430000E-01
4.037900E+02	1.120000E+00	0.000000E+00	1.700061E-01	2.240000E-04	3.900000E-02	1.430000E-01
5.104000E+02	1.120000E+00	0.000000E+00	1.700080E-01	2.240000E-04	3.900000E-02	1.430000E-01
6.057400E+02	1.120000E+00	0.000000E+00	1.700129E-01	2.240000E-04	3.900000E-02	1.430000E-01
8.540200E+02	1.120000E+00	0.000000E+00	1.700106E-01	2.240000E-04	3.900000E-02	1.430000E-01
1.097600E+03	1.120000E+00	0.000000E+00	1.700273E-01	2.240000E-04	3.900000E-02	1.430000E-01
1.400300E+03	1.120000E+00	0.000000E+00	1.700397E-01	2.240000E-04	3.900000E-02	1.430000E-01
1.009600E+03	1.120000E+00	0.000000E+00	1.700577E-01	2.240000E-04	3.900000E-02	1.430000E-01
2.323600E+03	1.120000E+00	0.000000E+00	1.700639E-01	2.240000E-04	3.900000E-02	1.430000E-01
2.903600E+03	1.120000E+00	0.000000E+00	1.701210E-01	2.240000E-04	3.900000E-02	1.430000E-01
3.031000E+03	1.120000E+00	0.000000E+00	1.701766E-01	2.240000E-04	3.900000E-02	1.430000E-01
4.919100E+03	1.120000E+00	0.000000E+00	1.702961E-01	2.240000E-04	3.900000E-02	1.430000E-01
0.316300E+03	1.120000E+00	0.000000E+00	1.703709E-01	2.240000E-04	3.900000E-02	1.430000E-01
0.110300E+03	1.120000E+00	0.000000E+00	1.703345E-01	2.240000E-04	3.900000E-02	1.430000E-01
1.041400E+04	1.120000E+00	0.000000E+00	1.707747E-01	2.240000E-04	3.900000E-02	1.430000E-01
1.337200E+04	1.120000E+00	0.000000E+00	1.791165E-01	2.240000E-04	3.900000E-02	1.430000E-01
1.716900E+04	1.120000E+00	0.000000E+00	1.796047E-01	2.240000E-04	3.900000E-02	1.430000E-01
2.204600E+04	1.120000E+00	0.000000E+00	1.000299E-01	2.240000E-04	3.900000E-02	1.430000E-01

2.478888E+04 1.238888E+00 0.000000E+00 1.007193E-01 2.240000E+04 3.000000E+03 1.000000E+01

AVERAGE SCATTERING CROSS-SECTION

NEUTRON ENERGY (eV)	S-WAVE SIGMANN	P-WAVE SIGMANN	D-WAVE SIGMANN	TOTAL SIGMANN
6.58400E+01	1.128373E+01	1.037337E+00	0.000000E+00	1.128373E+01
6.29920E+01	1.143204E+01	1.713097E+00	0.000000E+00	1.143204E+01
1.15090E+02	1.162599E+01	3.333000E+00	0.000000E+00	1.162599E+01
1.03550E+02	1.105701E+01	5.407945E+00	0.000000E+00	1.105701E+01
1.00740E+02	1.102793E+01	9.061713E+00	0.000000E+00	1.102793E+01
2.44910E+02	1.210540E+01	1.493374E+00	0.000000E+00	1.210540E+01
3.14470E+02	1.134207E+01	2.462094E+00	0.000000E+00	1.134207E+01
4.23790E+02	1.139494E+01	4.054033E+00	0.000000E+00	1.139494E+01
5.18480E+02	1.163324E+01	6.672611E+00	0.000000E+00	1.163324E+01
6.05740E+02	1.172399E+01	8.009350E+00	0.000000E+00	1.172399E+01
6.54620E+02	1.171037E+01	1.010774E+00	0.000000E+00	1.171037E+01
1.05760E+03	2.101736E+01	2.979232E+00	0.000000E+00	2.101736E+01
1.009330E+03	1.144099E+01	4.009263E+00	0.000000E+00	1.144099E+01
1.009060E+03	1.141825E+01	0.840017E+00	0.000000E+00	1.141825E+01
2.12360E+03	1.120022E+01	3.321133E+00	0.000000E+00	1.120022E+01
3.092360E+03	1.123070E+01	2.165010E+00	0.000000E+00	1.123070E+01
3.03100E+03	1.127600E+01	3.540397E+00	0.000000E+00	1.127600E+01
4.21910E+03	1.130070E+01	5.773555E+00	0.000000E+00	1.130070E+01
6.11030E+03	1.102099E+01	9.304220E+00	0.000000E+00	1.102099E+01
6.10330E+03	1.093131E+01	1.517711E+00	0.000000E+00	1.093131E+01
1.14140E+04	1.000333E+01	2.459221E+00	0.000000E+00	1.000333E+01
1.13720E+04	1.074009E+01	3.000194E+00	0.000000E+00	1.074009E+01
1.11090E+04	1.063184E+01	6.130242E+00	0.000000E+00	1.063184E+01
2.25460E+04	1.066647E+01	9.0540030E+00	0.000000E+00	1.066647E+01
2.07000E+04	1.041324E+01	1.160041E+00	0.000000E+00	1.041324E+01

AVERAGE CAPTURE CROSS-SECTION

NEUTRON ENERGY (eV)	S-WAVE SIGMANN	P-WAVE SIGMANN	D-WAVE SIGMANN	TOTAL SIGMANN
6.58400E+01	1.128373E+01	1.037337E+00	0.000000E+00	1.128373E+01
6.29920E+01	1.143204E+01	1.713097E+00	0.000000E+00	1.143204E+01
1.15090E+02	1.162599E+01	3.333000E+00	0.000000E+00	1.162599E+01
1.03550E+02	1.105701E+01	5.407945E+00	0.000000E+00	1.105701E+01
1.00740E+02	1.102793E+01	9.061713E+00	0.000000E+00	1.102793E+01
2.44910E+02	1.210540E+01	1.493374E+00	0.000000E+00	1.210540E+01
3.14470E+02	1.134207E+01	2.462094E+00	0.000000E+00	1.134207E+01
4.23790E+02	1.139494E+01	4.054033E+00	0.000000E+00	1.139494E+01
5.18480E+02	1.163324E+01	6.672611E+00	0.000000E+00	1.163324E+01
6.05740E+02	1.172399E+01	8.009350E+00	0.000000E+00	1.172399E+01
6.54620E+02	1.171037E+01	1.010774E+00	0.000000E+00	1.171037E+01
1.05760E+03	2.101736E+01	2.979232E+00	0.000000E+00	2.101736E+01
1.009330E+03	1.144099E+01	4.009263E+00	0.000000E+00	1.144099E+01
1.009060E+03	1.141825E+01	0.840017E+00	0.000000E+00	1.141825E+01
2.12360E+03	1.120022E+01	3.321133E+00	0.000000E+00	1.120022E+01
3.092360E+03	1.123070E+01	2.165010E+00	0.000000E+00	1.123070E+01
3.03100E+03	1.127600E+01	3.540397E+00	0.000000E+00	1.127600E+01
4.21910E+03	1.130070E+01	5.773555E+00	0.000000E+00	1.130070E+01
6.11030E+03	1.102099E+01	9.304220E+00	0.000000E+00	1.102099E+01
6.10330E+03	1.093131E+01	1.517711E+00	0.000000E+00	1.093131E+01
1.14140E+04	1.000333E+01	2.459221E+00	0.000000E+00	1.000333E+01
1.13720E+04	1.074009E+01	3.000194E+00	0.000000E+00	1.074009E+01
1.11090E+04	1.063184E+01	6.130242E+00	0.000000E+00	1.063184E+01
2.25460E+04	1.066647E+01	9.0540030E+00	0.000000E+00	1.066647E+01
2.07000E+04	1.041324E+01	1.160041E+00	0.000000E+00	1.041324E+01

2.903400E+03
3.831000E+03
4.191100E+03
4.314300E+03
8.110300E+03
1.841400E+04
1.337200E+04
1.716900E+04
2.284600E+04
2.479800E+04

2.774552E+00
2.356176E+00
1.220019E+00
1.116496E+00
9.481374E-01
8.203611E-01
7.328348E-01
6.879729E-01
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4.873876E-01

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1.693456E-01
1.984431E-01
2.138096E-01
2.386737E-01
2.654864E-01
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9.293311E-01
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AVERAGE PISBCH 600000000000

2.903400E+03
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1.520425E+00
1.332190E+00
1.178811E+00
1.000768E+00
1.010640E+00
9.293311E-01
8.466746E-01
8.473107E-01