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EVALUATION OF NEUTRON NUCLEAR DATA FOR ^{243}Cm

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The neutron nuclear data of ^{243}Cm were evaluated in the neutron energy region from 10^{-5} eV to 20 MeV. The evaluated quantities are resonance parameters up to 26 eV, the total, fission, capture, elastic and inelastic scattering, (n,2n), (n,3n) and (n,4n) reaction cross sections, angular distributions of emitted neutrons and the number of neutrons per fission. The measured data are very scarce. The evaluation was made mainly on the basis of the optical and statistical model calculations. The present results are compiled in the ENDF/B format, and they will be stored in the second version of Japanese Evaluated Nuclear Data Library, JENDL-2.

Keywords: Evaluation, Curium-243, Neutron Nuclear data, Cross Section, Resonance Parameter. Optical Model. Statistical Model. Energy Range 10^{-5} - 20MeV

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^{243}Cmの中性子核データの評価

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^{243}Cmの中性子核データを10^{-5}eVから20MeVの中性子エネルギーにわたって評価した。評価した量は共鳴パラメータ（26eV以下），核分裂断面積，中性子捕獲断面積，弾性散乱および非弾性散乱断面積，（n，2n），（n，3n）および（n，4n）反応断面積，二次中性子の角分布データ，そして核分裂反応当りの放出中性子数である。測定データの件数は非常に限られている。評価は，測定値と光学模型や統計模型による計算をもとにして行った。結果はENDF／Bフォーマットでファイル化されており，日本の評価ずみ核データライブラリーの第2版，JENDL－2に格納される。

本報告書は，日本原子力研究所が動力炉・核燃料開発事業団の委託によって行った研究の成果である。

Contents

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1. Introduction

The evaluations of neutron nuclear data of Am and Cm isotopes have been made by the present authors[1-7] for Japanese Evaluated Nuclear Data Library. As one of the activities, the nuclear data of ^{243}Cm were evaluated in the present work.

The ^{243}Cm is produced by the following chain:

$$^{241}\mathrm{Pu} \xrightarrow{\beta} {}^{241}\mathrm{Am} \begin{array}{l} \xrightarrow{(n,\gamma)} {}^{242m}\mathrm{Am} \\ \qquad\qquad \downarrow \mathrm{IT} \\ \xrightarrow[(n,\gamma)]{} {}^{242}\mathrm{Am} \end{array} \xrightarrow{\beta} {}^{242}\mathrm{Cm} \xrightarrow{(n,\gamma)} {}^{243}\mathrm{Cm}.$$

Then, it changes to ^{239}Pu by the decay with the half-life of 28.5 years[8]. The neutron nuclear data of ^{243}Cm are important for calculation of reactor burn-up and shielding of spent fuel transport casks. Especially the fission and capture cross sections are required with an accuracy of about 30 %[9].

The number of measurements on the data of ^{243}Cm is very small. The available data are the fission and capture cross sections at the thermal neutron energy[12,16,19,20] and the fission cross section up to 3 MeV[18]. Only one measurement[15] was made to deduce the resonance parameters below 26 eV. The number of prompt neutrons per fission has been measured in two experiments[13,17]. The present status of the experimental data is given in the next chapter.

In the present work, the neutron nuclear data of ^{243}Cm were evaluated from 10^{-5} eV to 20 MeV on the basis of the existing experimental data and theoretical calculations. In Chapter 3, the evaluation method and present results are described. In Chapter 4, the present results are compared with the other two evaluated data sets, ENDF/B-V[10] and ENDL-78[11].

The present results are compiled in the ENDF/B format, and they will be stored in the second version of Japanese Evaluated Nuclear Data Library, JENDL-2.

2. Present Status of Experimental Data

The measurements of the neutron nuclear data of ^{243}Cm have been made since 1957. The data reported until now are as follows:

(1) ν_p at the thermal neutron energy.

(2) The resonance integrals of the fission and capture cross sections.

(3) The fission and capture cross sections at the thermal neutron energy.

(4) The fission cross section in the energy range of 15 eV to 3 MeV.

(5) The resonance parameters for the levels up to 26 eV.

Table 1 gives the brief descriptions of measurements [12-20] which were compiled in this work. Further discussion is made below for the fission cross-section measurements.

There are two measurements on the fission cross section above the thermal neutron energy. One of them was performed by Silbert[18] by using the Physics-8 underground nuclear explosion. The neutron energies were covered from 15 eV to 3 MeV. The curium samples consisted of 89 % of ^{243}Cm and 11 % of ^{244}Cm, and had the weight of 210 g. The fission cross section was measured with the 240-m flight path and normalized to the resonance areas of ^{244}Cm at 22.85 and 34.99 eV of which values were 14.0 and 23.76 b.eV, respectively. According to his report, the analysis

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Another measurement, which is not given in Table 1, was carried out by Fullwood et al.[21-22] of LASL in 1968. It was done by using the Pommard underground nuclear explosion and the 214.43-m flight path. The fission cross sections were obtained from 0.1 to 2.9 MeV. In the compilation paper by Seeger[22] on the Pommard experiments, he reported that all of the usual recordings for ^{243}Cm had been lost, but those values had been recovered from single-sweep, plate-film recordings. Figs. 1.1 to 1.6 show the comparison of these two fission cross sections. Data of Fullwood et al. gave the different structure from those by Silbert. Silbert's results seem to be more reliable than those of Fullwood et al. The fission cross section measured by Silbert, therefore, was adopted in the present evaluation.

3. Evaluation of Neutron Nuclear Data

The neutron energy range of 10^{-5} eV to 20 MeV was devided into three intervals as follows:

(1) 10^{-5} eV ∿ 27 eV

In this interval, the data can be evaluated on the basis of the resonance parameters measured by Berreth et al.[15] and the measured fission and capture cross sections at the thermal neutron energy.

(2) 27 eV ∿ 1 keV

Only available is the fission cross section measured by Silbert[18]. As shown in Figs. 1.1 to 1.5, broad resonance structures are observed up to a few hundred eV. Then, the fission cross section was averaged so that the broad structures might be reproduced. Other cross sections of resonance parameters was performed below 80 eV. The parameters, however, have not been available.

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Only available is the fission cross section measured by Silbert[18]. As shown in Figs. 1.1 to 1.5, broad resonance structures are observed up to a few hundred eV. Then, the fission cross section was averaged so that the broad structures might be reproduced. Other cross sections were estimated from the fission cross section and average resonance parameters obtained in the interval of 10^{-5} eV to 27 eV.

(3) 1 keV ∿ 20 MeV

No experimental data exist except the fission cross section below 3 MeV. Many threshold reactions must be taken into account in addition to the elastic, fission and capture cross sections. The fission cross section was estimated by using a semi-empirical formula[1]. Other cross sections including the inelastic scattering, (n,2n), (n,3n) and (n,4n) reaction cross sections were evaluated by using the optical and statistical model calculations.

3.1 Resonance Parameters

The resonance parameters were taken from the measurement by Berreth et al.[15] They measured the neutron transmission by using the MTR fast chopper and 20-m flight path, and obtained the parameters of 15 resonances up to 25.84 eV with the Reich-Moore multilevel formula. The cross sections at 0.0253 eV calculated from their parameters are

$$\sigma_f = 743.9 \text{ barns},$$

$$\sigma_{cap} = 44.08 \text{ barns}.$$

comparing them with the experimental data listed in Table 1, it is obvious that the fission cross section is too large and the capture cross section is too small. It suggests that negative resonances should be needed. These differences were reduced by introducing one negative resonance as mentioned below.

Average resonance parameters given by Berreth et al. were used to determine the parameters of the negative resonance. They gave the mean reduced neutron width of 0.49 meV and the s-wave neutron strength function of $(2.2 \pm 0.2) \times 10^{-4}$. The mean level spacing can be estimated from them to be 2.2 eV. From these information, a negative resonance was assumed to be at −0.7 eV, and its neutron width to be 0.41 meV. Then, the fission and capture widths were determined to reproduce the thermal cross sections measured by Bemis et al.[19] who used a nearly pure ^{243}Cm sample (99.94 %). Their measurement is a very new one. Finally, the following parameters are obtained,

$$E_r = -0.7 \text{ eV},$$
$$\Gamma_n = 0.41 \text{ meV},$$
$$\Gamma_{f1} = 300 \text{ meV}$$
$$\Gamma_{f2} = 100 \text{ meV},$$
$$\Gamma_\gamma = 45 \text{ meV}.$$

Adding them to the parameter set of Berreth et al., the following thermal cross sections are obtained

$$\sigma_f = 612.3 \text{ barns},$$
$$\sigma_{cap} = 131.3 \text{ barns},$$
$$\sigma_{el} = 9.24 \text{ barns}.$$

They agree very well with the values of Bemis et al.

The effective scattering radius was determined with the optical model. The optical potential parameters which reproduce the strength function of 2.2×10^{-4} give the radius of 9.81 fm as mentioned in Section 3.3. This value was adopted to the present evaluation. The upper limit of the resolved resonance region was determined to be 27 eV by adding a half of the average level spacing of 2.2 eV to the highest resolved resonance energy of 25.84 eV.

The resonance parameters adopted in this work are listed in Table 2 by means of the ENDF/B format. Figs. 2.1 to 2.4 show the cross sections calculated from the resonance parameters.

The calculated fission cross section was compared with the measured data by Silbert in Fig. 3. They do not agree well with each other. The positions of resonance peaks are discrepant more or less. Furthermore, Berreth et al. did not give the resonance parameters at 13, 20 and 23 eV. In order to solve these problems, more measurements are needed. We made neither any modification of the resonance parameters nor addition of background cross sections in the present work.

3.2 Cross Sections in the Energy Range of 27 eV to 1 keV

As shown in Fig. 1, the fission cross section measured by Silbert shows the structures up to a few hundred eV. The fission cross section was evaluated on the basis of the measured cross section, because the resonance parameters have not been reported in this region.

The measured fission cross section was averaged as follows:

$$\sigma_f(E) = \frac{\Sigma w(E_i)\sigma_f(E_i)}{\Sigma w(E_i)} , \qquad (1)$$

where $w(E_i)$ is a weight factor of the measured value at E_i, and was given in this work as follows:

$$w(E_i) = \exp[-(\frac{E-E_i}{0.05E})^2] . \qquad (2)$$

Figs. 4.1 to 4.6 show the experimental data and the average fission cross section. In Fig. 4.1, the cross section calculated from the resonance parameters is also given. The small resonance structures shown in the experimental data were smoothed out with the method described here, and only large structures were observed in the average fission cross section.

The average elastic scattering and capture cross sections were estimated from the fission cross section. The average fission cross section $\bar{\sigma}_f(E)$ can be represented approximately as follows:

$$\bar{\sigma}_f(E) = \frac{2\pi\lambda^2}{k^2} \sum_J \frac{g_J}{\langle D\rangle_J} \left\langle \frac{\Gamma_n \Gamma_f}{\Gamma} \right\rangle \sim \frac{2\pi\lambda^2}{k^2} S_0 \frac{\langle\Gamma_f\rangle}{\langle\Gamma\rangle} ,$$

$$= C(E) \langle\Gamma_f\rangle , \qquad (3)$$

where S_0 stands for the s-wave strength function. The average capture and elastic scattering cross sections are written in the same way as follows:

$$\bar{\sigma}_{cap}(E) \cong \frac{2\pi\lambda^2}{k^2} S_0 \frac{\langle\Gamma_\gamma\rangle}{\langle\Gamma\rangle} = C(E) \langle\Gamma_\gamma\rangle , \qquad (4)$$

$$\bar{\sigma}_{el}(E) \cong 4\pi R^2 + \frac{2\pi\lambda^2}{k^2} S_0 \frac{\langle\Gamma_n\rangle}{\langle\Gamma\rangle} ,$$

$$= 4\pi R^2 + C(E) \langle\Gamma_n\rangle \qquad (5)$$

The interference terms between the resonance and potential scattering are neglected in Eq. (5). Resonance width fluctuation effect for each cross section is also neglected. The energy dependent coefficient C(E) can be obtained from Eq. (3),

$$C(E) = \frac{2\pi\lambda^2}{k^2} \frac{\langle\Gamma_n\rangle}{\langle D\rangle} \frac{1}{\langle\Gamma\rangle} = \frac{\bar{\sigma}_f(E)}{\langle\Gamma_f\rangle} \qquad (6)$$

Therefore the capture cross section is obtained easily by assuming $\langle\Gamma_f\rangle$ and $\langle\Gamma_\gamma\rangle$ to be constant. This assumption means that the structures of the average fission cross section come from the broad fluctuation of the average neutron width $\langle\Gamma_n\rangle$ which can be calculated by the following formula,

$$\langle\Gamma_n\rangle = \frac{C(E)\{\langle\Gamma_\gamma\rangle + \langle\Gamma_f\rangle\}}{\frac{2\pi^2}{k^2}\frac{1}{\langle D\rangle} - C(E)} . \tag{7}$$

The elastic scattering cross section is calculated by substituting Eqs. (6) and (7) into Eq. (5). In the present evaluation, average resonance widths were estimated from the values in the resolved resonance region as follows:

$\langle\Gamma_\gamma\rangle$ = 40 meV,

$\langle\Gamma_f\rangle$ = 370 meV,

$\langle D\rangle$ = 2.2 eV,

R = 9.81 fm.

The total cross section was calculated as the sum of Eqs. (3), (4) and (5). Fig. 5 shows the obtained cross sections in this energy region.

3.3 Cross Sections at the Energies above 1 keV

In this high energy region, the optical and statistical model calculations were performed to estimate the inelastic scattering, (n,2n), (n,3n) and (n,4n) reactions as well as the total, elastic scattering, fission and capture cross sections. First, the optical potential parameters were investigated by taking account of the following two conditions:

(1) the s-wave strength function in low energy should be 2.2×10^{-4} which was given by Berreth et al.[15)]

(2) the compound nucleus formation cross section in keV region should be about 1.1 times of the fission cross section, because the average capture and fission widths are 40 and 370 meV, respectively, and the compound nucleus formation cross section can be expected to be proportional to the sum of them.

In the case of ^{243}Cm, no other quantities are available to determine the optical potential parameters. We adopted the potential parameters of ^{242}Am[7], which are listed in Table 3, as an initial guess. This parameter set gives the s-wave strength function of 1.37×10^{-4} at 1 eV, which is much smaller than 2.2×10^{-4}. It was found out that the condition (1) was satisfied by decreasing the well depth of the real potential from 42.0 MeV to 40.5 MeV. The corrected parameter set gives the s-wave strength function of 2.18×10^{-4} and the scattering radius of 9.81 fm at 1 eV. This value of the radius was adopted as the effective scattering radius in the resolved resonance region as mentioned in Section 3.1. However, the set gives the compound formation cross section of 2.7 barns at 1 keV which seems to be too large comparing with the fission cross section. On the other hand, the parameters in Table 3 give the compound formation cross section of 1.78 barns which satisfies the condition (2). It was decided, therefore, that the optical potential parameters of ^{242}Am was adopted in this energy region.

The smooth fission cross section was obtained by averaging the experimental data of Silbert and it was reproduced by the following semi-empirical formula:

$$\sigma_f(E) = \sigma_c(E) \left\{ \sum_\lambda \frac{C_\lambda}{(E-E_\lambda^R)^2 + R_\lambda} + \sum_k \frac{B_k}{1 + \exp[\alpha_k(E_k^B - E)]} \right\} , \qquad (8)$$

where $\sigma_c(E)$ stands for the compound nucleus formation cross section which is obtained with the optical model. The first term in the parenthesis represents the fission probabilities through resonances and the second term those through the fission barriers. The parameters C_λ, E_λ^R, R_λ, α_k, E_k^B and B_k can be obtained by fitting Eq. (8) to the experimental data.

In order to fit Eq. (8) to the experimental data, the fission cross sections of Silbert were averaged over by using Eq. (1) with the following weight factor:

$$w(E_i) = \exp[-(\frac{E - E_i}{0.1E})^2] . \qquad (2')$$

The parameters listed in Table 4 were obtained finally. The resonance at 11.5 MeV and the two barriers at 6 and 13 MeV were assumed, and their parameters were determined by taking account of shapes of the (n,Xn) reaction cross sections which are sensitive to the values of the fission cross section. Fig. 6 shows the comparison of the evaluated fission cross section with the experimental data.

The (n,2n), (n,3n) and (n,4n) reaction cross sections were calculated with the Pearlstein's method[23),]

$$\sigma_{n,2n}(E) = \sigma_{ne}(E)\ P_M(E)\ P_{2n}(E), \qquad (9)$$

$$\sigma_{n,3n}(E) = \sigma_{ne}(E)\ P_M(E)\ P_{3n}(E), \qquad (10)$$

$$\sigma_{n,4n}(E) = \sigma_{ne}(E)\ P_M(E)\ P_{4n}(E), \qquad (11)$$

where $\sigma_{ne}(E)$ is the non-elastic cross section, $P_M(E)$ is the neutron emission probability, and $P_{2n}(E)$, $P_{3n}(E)$ and $P_{4n}(E)$ are the two, three and four neutron emission probabilities, respectively. In this evaluation, the non-elastic cross section was assumed to be equal to the compound nucleus formation cross section calculated with the optical model, because the compound elastic scattering cross section can be neglected in the high energy region. The neutron emission probability $P_M(E)$ is given as follows:

$$P_M(E) = 1 - \frac{\sigma_{compt}(E)}{\sigma_{ne}(E)} , \qquad (12)$$

where $\sigma_{compt}(E)$ stands for the sum of the cross sections which compete with the (n,2n), (n,3n) and (n,4n) reaction cross sections, and it was calculated as

$$\sigma_{compt}(E) = \sigma_f(E) + \sigma^0_{inel}(E) , \tag{13}$$

where $\sigma_f(E)$ is the fission cross section mentioned above and $\sigma^0_{inel}(E)$ is the high energy component of the inelastic scattering cross section. The parameters used in the calculation are listed in Table 5.

The capture and inelastic scattering cross sections were calculated with the program CASTHY[25)] which performs the optical and statistical model calculations. In the present calculation, the fission, (n,2n), (n,3n) and (n,4n) reactions were taken into account as the competing process. The average capture width and level spacing were assumed to be 40 meV and 2.2 eV, respectively. The level scheme of ^{243}Cm was taken from the recommendation by Ellis,[26)] and it is given in Table 6. The level density parameters used in the calculation are listed in Table 7.

All the cross sections above 1 keV are displayed in Fig. 7.

3.4 Other quantities

The angular distributions of elastically and inelastically scattered neutrons were calculated with CASTHY. The average cosine of the scattering angle in the laboratory system was also obtained. Neutrons emitted into the other channels were assumed to be distributed isotropically in the center-of-mass system.

As to the number of prompt neutrons per fission, Jaffey and Lerner,[13)] and Zhuravlev et al.[17)] made measurements at the thermal neutron energy. Since their results agree well with each other within the quoted errors, their weighted average value of 3.43 was adopted in this evaluation. The energy dependent formula was obtained from the Howerton's empirical formula[27),

$$\nu(Z,A,E) = 2.33 + 0.06\,\{2 + (-1)^{A-Z} - (-1)^{Z}\} + 0.15(Z-92) + 0.02(A-235) + [0.130 + 0.006(A-235)](E-E_{th}) \,, \tag{14}$$

where E_{th} is the threshold energy of fission,

$$E_{th} = 18.6 - 0.36\,Z^2/(A+1) + 0.2[2 - (-1)^{A+1-Z} - (-1)^{Z}] - B_n \,, \tag{15}$$

and B_n is the binding energy of the last neutron in the (A+1) nucleus. For ^{243}Cm, which has B_n = 6.7995 MeV, this formula gives

$$\nu = 3.14 + 0.178\ E(\text{MeV}) \,. \tag{16}$$

Taking the thermal value of 3.43, we finally adopted the following formula,

$$\nu = 3.43 + 0.178\ E(\text{MeV}). \tag{17}$$

4. Discussions

The quantities evaluated in this work are as follows:

(1) Resonance parameters laying up to 25.84 eV,

(2) The total, fission, capture, elastic and inelastic scattering, (n,2n), (n,3n) and (n,4n) reaction cross sections,

(3) Angular distributions of secondary neutrons,

(4) The number of neutrons per fission.

The resonance parameters are listed in Table 2, and the cross sections are given in Table 8 in the ENDF/B format. In this chapter, the present their weighted average value of 3.43 was adopted in this evaluation. The energy dependent formula was obtained from the Howerton's empirical formula[27],

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The resonance parameters are listed in Table 2, and the cross sections are given in Table 8 in the ENDF/B format. In this chapter, the present results are compared with the data of ENDF/B-V[10] and ENDL-78[11].

Fig. 8 shows the comparison of the fission cross sections. The data below 100 eV are given in Fig. 8.1. Large discrepancies are found in the resolved resonance region. The ENDF/B-V adopted the resonance parameters of Berreth et al. But no interference effects are found, because the single-level Breit-Wigner formula was applied. Since the ENDL-78 probably adopted hypothetical resonances, its resonance structures are completely different from other two. The differences of the thermal fission cross sections are caused by the facts that the ENDF/B-V and ENDL-78 adopted the value of Hulet et al.[12] while nd the present work used the data of Bemis et al.[19]

Fig. 8.2 compares the fission cross sections above 1 keV. There are large differences around hundreds keV, because our result was based on the data by Silbert while other two are close to the data by Fullwood et al.[21,22]

The capture cross sections are shown in Fig. 9. The present result agrees well with the value by Bemis et al. at the thermal neutron energy. On the contrary, other two evaluations are too different from the experimental data. Above the resolved resonance region, differences are also large.

The elastic scattering and total cross sections are shown in Figs. 10 and 11. The discrepancies are relatively small except the energy region below 30 eV. Figs. 12 to 15 illustrate the inelastic scattering, (n,2n), (n,3n) and (n,4n) reaction cross sections.

In the present results, discontinuities are found in the capture, elastic and total cross sections at 1 keV. These discontinuities are due to the differences of the evaluation method applied in the two regions below and above 1 keV. However, we left them unchanged because it is not clear that which values are more resonable, those in the lower region or in the higher region.

Table 9 lists the resonance integrals obtained from three evaluated data sets as well as the experimental data. The present result for the fission is in a good agreement with the experimental data. However, the present capture resonance integral is much larger than the value of Bemis et al. On the other hand, our absorption resonance integral agrees well with that of Berreth et al., and the present evaluation reproduces well the capture cross section of Bemis et al. at the thermal neutron energy as described in Section 3.1. Hence, the existing experimental data themselves seem to be inconsistent with one another.

The resonance integral of ENDF/B-V agrees well with the measured data, but it's thermal capture cross section is too small as shown in Fig. 9. The ENDL-78 has too small values of both the fission and capture resonance integrals. This is caused by the small cross sections in the resolved resonance region.

5. Conclusion

The neutron nuclear data of ^{243}Cm were evaluated in the neutron energy of 10^{-5} eV to 20 MeV. As described in Chapter 4, the discrepancy is very large among existing evaluated data. It is very difficult, however, to solve it at present for lack of experimental data. New experiments are required.

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Table 1 Status of Experimental Data of ^{243}Cm

	Author's Sym.	Quantities	Energy Range	Ref. No.
1.	57 Hulet	σ_f	thermal	12

Samples were prepared from transuranic elements separated from long neutron irradiation in MTR. Fission counting rate was measured in the thermal column of the MTR using double chamber fission counter. Flux monitor was a ^{239}Pu standard.

$$\sigma_f = 690 \pm 50 \text{ barns.}$$

2.	70 Jaffey	$\bar{\nu}_p$	thermal	13

Samples were mounted on a platinum plate, inserted into a gas-filled ionization chamber, and exposed to a thermal neutron beam from Argonne CP-5 reactor. Fission neutrons were detected by four ZnS(Ag) methyl methacrylate discs (Hornyak buttons). Standards were ^{233}U, ^{235}U and ^{252}Cf.

$$\bar{\nu}_p = 3.430 \pm 0.047.$$

3.	71 Thompson	I_f	thermal	14

Enriched isotopes were obtained from the magnetic separation process at ORNL. To obtain fission resonance integrals I_f, ^{235}U samples were irradiated along with the curium samples inside Cd in a reactor neutron flux. A Ge(Li) detector and a 4096-channel pulse height analyzer were used for accumulating the fission product gamma ray spectrum.

$$I_f = 1860 \pm 400 \text{ barns.}$$

4.	72 Berreth	I_a	0.01 ∿ 30 eV	15

Measurements were performed with the MTR fast chopper. The 20 m flight path and a 4096-channel TOF analyzer were used. A gold sample was used as a standard. The Reich-Moore multilevel formula was used in determining the resonance parameters, which were listed for 15 levels.

$$I_a = 2345 \pm 470 \text{ barns.}$$

5. 72 Ihle σ_f, σ_γ thermal 16

Irradiating ^{241}Am in the reactor BR2, Mol, Belgium was carried out to measure the isotopic composition of ^{238}Pu and to deduce effective reactor cross sections of actinide nuclides. Cross sections for the involved nuclides were obtained by fitting calculated yields to the experimental data. The calculations were carried out by means of program CORA. Effective reactor cross sections were listed.

$$\sigma_f = 750 \text{ barns},$$

$$\sigma_\gamma = 200 \text{ barns}.$$

6. 73 Zhuravlev $\bar{\nu}_p$ thermal 17

Energy spectrum and average number of prompt fission neutrons were measured. Gas scintillator and plastic scintillator were used to detect the fission fragments and neutrons, respectively.

$$\bar{\nu}_p = 3.39 \pm 0.14.$$

7. 76 Silbert σ_f 15 eV $\sim$ 3 MeV. 18

Fission cross sections were measured in a TOF method with 240 m flight path, using underground nuclear explosion Physics-8. Silicon semiconductor detectors were used for the emitted fission fragments. Neutron flux measurement was performed with thin samples of ^6LiF or ^{235}U.

8. 77 Bemis σ_f, σ_γ, I_f, I_γ thermal 19

Nearly isotopically pure ^{243}Cm (99.94%) sample was irradiated in cobalt-monitored reactor. The sample was irradiated in the ORR. Cadmium filter techniques were used. Cross sections in barns are as follows,

$$\sigma_\gamma(\text{th}) = 137.4 \pm 9.6,$$

$$\sigma_f(\text{th}) = 633.3 \pm 26.9,$$

$$\sigma_\gamma(2200\text{m/s}) = 130.7 \pm 9.6,$$

$$\sigma_f(2200\text{m/s}) = 609.6 \pm 25.9,$$

$$I_\gamma = 214.4 \pm 20.3,$$

$$I_f = 1575 \pm 136.$$

9. 80 Zhuravlev σ_f, I_f thermal 20

Measurements were made in a horizontal channel in the SM-2 high-flux reactor. Cd-difference method was used. The standard cross section was taken from the ^{235}U fission cross section of 582.2 ± 1.3 barns.

$$\sigma_f = 672 \pm 60 \text{ barns},$$

$$I_f = 1480 \pm 150 \text{ barns}.$$

Table 2 Resonance parameters of ^{243}Cm

```
 9.62430+ 4 2.40972+ 2          0          0          1          09643 2151
 9.62430+ 4 1.00000+ 0          0          0          1          09643 2151
 1.00000- 5 2.70000+ 1          1          3          0          09643 2151
 2.50000+ 0 1.00000+ 0          0          0          1          09643 2151
 2.40972+ 2 0.0      + 0          0          0         96         169643 2151
-7.00000- 1 2.50000+ 0 4.10000- 4 4.50000- 2 3.00000- 1 1.00000- 19643 2151
 1.49000+ 0 2.50000+ 0 2.69000- 4 4.00000- 2-1.00000- 1 3.50000- 19643 2151
 2.27000+ 0 2.50000+ 0 1.89800- 3 4.00000- 2 2.25000- 1 3.25000- 19643 2151
 3.09000+ 0 2.50000+ 0 7.38000- 4 4.00000- 2-1.30000- 1 0.0      + 09643 2151
 3.34000+ 0 2.50000+ 0 2.92000- 4 4.00000- 2 8.00000- 2 0.0      + 09643 2151
 3.74000+ 0 2.50000+ 0 7.74000- 4 4.00000- 2-1.10000- 1 0.0      + 09643 2151
 5.40000+ 0 2.50000+ 0 8.13000- 4 4.00000- 2 1.50000- 1 0.0      + 09643 2151
 5.96000+ 0 2.50000+ 0 3.83300- 3 4.00000- 2-1.50000- 1 1.00000+ 09643 2151
 8.80000+ 0 2.50000+ 0 9.20000- 4 4.00000- 2-3.00000- 1 0.0      + 09643 2151
 1.03200+ 1 2.50000+ 0 5.14000- 3 4.00000- 2 1.00000- 1 1.40000+ 09643 2151
 1.10700+ 1 2.50000+ 0 3.33000- 3 4.00000- 2-9.00000- 2 0.0      + 09643 2151
 1.45500+ 1 2.50000+ 0 9.54000- 4 4.00000- 2 2.50000- 1 0.0      + 09643 2151
 1.56000+ 1 2.50000+ 0 1.74000- 3 4.00000- 2-2.50000- 1 0.0      + 09643 2151
 2.16800+ 1 2.50000+ 0 4.28000- 3 4.00000- 2 2.50000- 1 0.0      + 09643 2151
 2.44400+ 1 2.50000+ 0 3.00000- 3 4.00000- 2-1.50000- 1 0.0      + 09643 2151
 2.58400+ 1 2.50000+ 0 2.85000- 3 4.00000- 2 1.50000- 1 0.0      + 09643 2151
                                                                  9643 2  0
```

Table 3 Optical potential parameters

(in MeV and fm)

real term	$V(E_n) = 42.0 - 0.107\ E_n$
	$r_0 = 1.282$
	$a = 0.6$
surface term*	$W_s(E_n) = 9.0 - 0.339\ E_n + 0.0531\ E_n^2$
	$r_s = 1.290$
	$b = 0.5$
spin-orbit term	$V_{so} = 7.0$
	$r_{so} = 1.282$
	$a_{so} = 0.6$

* derivative Woods-Saxon type.

Table 4 Parameters for ^{243}Cm fission cross section

1. Resonances

λ	E_{λ}^{R} (MeV)	R_{λ} (MeV^2)	C_{λ} (MeV^2)
1	0.003	0.06222	0.2051
2	0.815	0.05625	0.2577
3	1.291	0.01824	0.5159
4	3.5	9.631	14.92
5	11.5	4.0	20.0

2. Barriers

k	E_{k}^{B} (MeV)	α_{k}^{B} (MeV^{-1})	B_k
1	6.0	1.5	0.3
2	13.0	3.0	0.3

Table 5 Parameters for ^{243}Cm(n,Xn) cross sections

	^{243}Cm	^{242}Cm	^{241}Cm
S_n (MeV)	5.6958		
S_{2n} (MeV)	12.6620		
S_{3n} (MeV)	18.7497		
a (MeV^{-1})	25.5947	25.1343	24.7431
Pairing energy (MeV)	0.72	1.15	0.72
Joint energy (MeV)	3.8373	4.2698	3.8424
Temperature (MeV)	0.4194	0.4242	0.4283

Table 6 Level scheme of ^{243}Cm

Level*	Energy (keV)	Spin and Parity	
gr.	0.0	5/2	+
1	42	7/2	+
2	87	1/2	+
3	94	9/2	+
4	94	3/2	+
5	133	7/2	+
6	153	11/2	+
7	164	9/2	+
8	219	13/2	+
9	228	11/2	+
10	260	9/2	+
11	530	15/2	-
12	729	1/2	-
13	769	3/2	-
14	798	5/2	+

* Levels above 820 keV were assumed to be overlapping.

Table 7 Level density parameters of ^{243}Cm and ^{244}Cm

	^{243}Cm	^{244}Cm
a (MeV^{-1})	25.5947	25.9685
α_M ($MeV^{-1/2}$)	17.4941	17.6697
Δ (MeV)	0.72	1.22
C_0 (MeV^{-1})	5586.01	5690.92
E_x (MeV)	3.8373	4.3348

Table 8 Cross sections of ^{243}Cm

Cross sections evaluated in this work are tabulated in the ENDF/B format. Values of the total, elastic, fission and capture cross sections below 27 eV are the background data for the resonance parameters given in Table 2. The average cosines of the scattering angle in the laboratory system are also given in the table.

9.62430+ 4	2.40972+ 2	0	99	0	09643	3	1
0.0 + 0	0.0 + 0	0	0	2	2169643	3	1
141	2	216	5	0	09643	3	1
1.00000- 5	0.0 + 0	2.53000- 2	0.0 + 0	2.70000+ 1	0.0 + 09643	3	1
2.70000+ 1	8.54503+ 1	2.72480+ 1	8.02332+ 1	2.75370+ 1	7.82680+ 19643	3	1
2.79150+ 1	8.03543+ 1	2.89750+ 1	9.25243+ 1	3.02680+ 1	9.85754+ 19643	3	1
3.12170+ 1	9.92655+ 1	3.19930+ 1	9.41802+ 1	3.29050+ 1	8.18811+ 19643	3	1
3.37020+ 1	7.05225+ 1	3.41520+ 1	6.71270+ 1	3.45400+ 1	6.72190+ 19643	3	1
3.49310+ 1	7.02862+ 1	3.57190+ 1	8.20788+ 1	3.63150+ 1	8.97057+ 19643	3	1
3.68160+ 1	9.13245+ 1	3.73200+ 1	8.78068+ 1	3.81000+ 1	7.59932+ 19643	3	1
3.88540+ 1	6.45841+ 1	3.94060+ 1	5.91387+ 1	4.00330+ 1	5.58185+ 19643	3	1
4.25220+ 1	4.83591+ 1	4.31410+ 1	4.79275+ 1	4.37740+ 1	4.92539+ 19643	3	1
4.44630+ 1	5.28245+ 1	4.63210+ 1	6.75059+ 1	4.70700+ 1	7.05385+ 19643	3	1
4.77920+ 1	6.97391+ 1	4.86710+ 1	6.46255+ 1	5.01090+ 1	5.39273+ 19643	3	1
5.09020+ 1	5.00597+ 1	5.16110+ 1	4.84538+ 1	5.23360+ 1	4.86454+ 19643	3	1
5.30230+ 1	5.07266+ 1	5.36680+ 1	5.46143+ 1	5.44930+ 1	6.22588+ 19643	3	1
5.60820+ 1	7.94851+ 1	5.69030+ 1	8.46518+ 1	5.76820+ 1	8.52164+ 19643	3	1
5.86630+ 1	8.06925+ 1	6.03750+ 1	6.86933+ 1	6.11600+ 1	6.61243+ 19643	3	1
6.18270+ 1	6.69474+ 1	6.25720+ 1	7.14159+ 1	6.36810+ 1	8.31607+ 19643	3	1
6.48910+ 1	9.61201+ 1	6.58400+ 1	1.01125+ 2	6.69610+ 1	1.00125+ 29643	3	1
6.84230+ 1	9.65633+ 1	6.93710+ 1	9.93150+ 1	7.05840+ 1	1.09970+ 29643	3	1
7.20820+ 1	1.23954+ 2	7.31080+ 1	1.26551+ 2	7.42440+ 1	1.21079+ 29643	3	1
7.73430+ 1	9.20469+ 1	7.90620+ 1	8.15757+ 1	8.11420+ 1	7.39035+ 19643	3	1
8.62160+ 1	6.18691+ 1	8.75590+ 1	6.09514+ 1	8.88180+ 1	6.28724+ 19643	3	1
9.02220+ 1	6.82328+ 1	9.38820+ 1	8.77948+ 1	9.54090+ 1	9.16310+ 19643	3	1
9.68410+ 1	9.02556+ 1	9.85760+ 1	8.28636+ 1	1.01480+ 2	6.64547+ 19643	3	1
1.02760+ 2	6.16539+ 1	1.04070+ 2	5.95518+ 1	1.05400+ 2	6.01748+ 19643	3	1
1.09090+ 2	6.69581+ 1	1.10840+ 2	6.70099+ 1	1.12970+ 2	6.31855+ 19643	3	1
1.15840+ 2	5.69136+ 1	1.17760+ 2	5.49017+ 1	1.19720+ 2	5.50714+ 19643	3	1
1.22110+ 2	5.78237+ 1	1.27910+ 2	6.96049+ 1	1.30130+ 2	7.10805+ 19643	3	1
1.32420+ 2	6.89833+ 1	1.35420+ 2	6.21678+ 1	1.40110+ 2	4.96269+ 19643	3	1
1.42430+ 2	4.51485+ 1	1.44570+ 2	4.26211+ 1	1.46760+ 2	4.14856+ 19643	3	1
1.49240+ 2	4.15213+ 1	1.52310+ 2	4.29334+ 1	1.56290+ 2	4.64980+ 19643	3	1
1.60420+ 2	5.03010+ 1	1.63550+ 2	5.12144+ 1	1.70410+ 2	4.99884+ 19643	3	1
1.78690+ 2	5.21823+ 1	1.82720+ 2	5.10343+ 1	1.89750+ 2	4.70779+ 19643	3	1
1.93410+ 2	4.67090+ 1	1.97950+ 2	4.84095+ 1	2.03860+ 2	5.12861+ 19643	3	1
2.07530+ 2	5.12795+ 1	2.11300+ 2	4.92048+ 1	2.18260+ 2	4.35478+ 19643	3	1
2.21860+ 2	4.20070+ 1	2.25560+ 2	4.18704+ 1	2.43940+ 2	4.60829+ 19643	3	1
2.50390+ 2	4.93122+ 1	2.58240+ 2	5.37084+ 1	2.64070+ 2	5.48848+ 19643	3	1
2.71330+ 2	5.36244+ 1	2.95020+ 2	4.41067+ 1	3.04340+ 2	4.18739+ 19643	3	1
3.18000+ 2	4.01675+ 1	3.26800+ 2	4.00939+ 1	3.40270+ 2	4.18998+ 19643	3	1
3.50020+ 2	4.27178+ 1	3.79870+ 2	4.13808+ 1	3.98990+ 2	4.18536+ 19643	3	1
4.14870+ 2	4.24622+ 1	4.25590+ 2	4.14816+ 1	4.41820+ 2	3.90458+ 19643	3	1
4.50940+ 2	3.87029+ 1	4.64480+ 2	3.96472+ 1	4.87440+ 2	4.14424+ 19643	3	1
5.04230+ 2	4.17338+ 1	5.16990+ 2	4.07930+ 1	5.35340+ 2	3.84612+ 19643	3	1
5.45770+ 2	3.79756+ 1	5.56500+ 2	3.85629+ 1	5.80870+ 2	4.11896+ 19643	3	1
5.94660+ 2	4.15133+ 1	6.30260+ 2	3.98157+ 1	6.45860+ 2	4.03109+ 19643	3	1
6.73980+ 2	4.23562+ 1	6.93760+ 2	4.23304+ 1	7.73270+ 2	3.86489+ 19643	3	1
8.10230+ 2	3.80574+ 1	8.36350+ 2	3.85844+ 1	8.74390+ 2	4.01614+ 19643	3	1
9.03710+ 2	3.99723+ 1	9.54600+ 2	3.91315+ 1	1.00000+ 3	3.82889+ 19643	3	1
1.00000+ 3	2.90777+ 1	2.00000+ 3	2.38868+ 1	3.00000+ 3	2.15923+ 19643	3	1
4.00000+ 3	2.02258+ 1	5.00000+ 3	1.92941+ 1	6.00000+ 3	1.86058+ 19643	3	1

Table 8 (cont'd)

7.00000+ 3	1.80706+ 1	8.00000+ 3	1.76390+ 1	9.00000+ 3	1.72793+ 1	9643	3	1
1.00000+ 4	1.69753+ 1	2.00000+ 4	1.52983+ 1	3.00000+ 4	1.45095+ 1	9643	3	1
4.00000+ 4	1.40007+ 1	4.21743+ 4	1.39079+ 1	5.00000+ 4	1.36223+ 1	9643	3	1
6.00000+ 4	1.33154+ 1	7.00000+ 4	1.30534+ 1	8.00000+ 4	1.28231+ 1	9643	3	1
8.73610+ 4	1.26675+ 1	9.00000+ 4	1.26146+ 1	9.43901+ 4	1.25281+ 1	9643	3	1
1.00000+ 5	1.24225+ 1	1.33552+ 5	1.18605+ 1	1.50000+ 5	1.16228+ 1	9643	3	1
1.53635+ 5	1.15711+ 1	1.64681+ 5	1.14193+ 1	2.00000+ 5	1.09779+ 1	9643	3	1
2.19909+ 5	1.07455+ 1	2.28946+ 5	1.06451+ 1	2.61079+ 5	1.03115+ 1	9643	3	1
3.00000+ 5	9.94892+ 0	4.00000+ 5	9.15152+ 0	5.00000+ 5	8.52594+ 0	9643	3	1
5.32199+ 5	8.35621+ 0	6.00000+ 5	8.04050+ 0	7.00000+ 5	7.67037+ 0	9643	3	1
7.32025+ 5	7.57347+ 0	7.72191+ 5	7.46468+ 0	8.00000+ 5	7.39719+ 0	9643	3	1
8.01312+ 5	7.39420+ 0	8.23403+ 5	7.34568+ 0	9.00000+ 5	7.20592+ 0	9643	3	1
1.00000+ 6	7.08118+ 0	1.25000+ 6	6.97736+ 0	1.50000+ 6	7.04466+ 0	9643	3	1
1.75000+ 6	7.17829+ 0	2.00000+ 6	7.32546+ 0	2.50000+ 6	7.57975+ 0	9643	3	1
3.00000+ 6	7.74224+ 0	4.00000+ 6	7.76828+ 0	5.00000+ 6	7.48360+ 0	9643	3	1
5.71940+ 6	7.20116+ 0	6.00000+ 6	7.08625+ 0	7.00000+ 6	6.66237+ 0	9643	3	1
8.00000+ 6	6.27530+ 0	9.00000+ 6	5.99861+ 0	9.50000+ 6	5.90899+ 0	9643	3	1
1.00000+ 7	5.84908+ 0	1.05000+ 7	5.81448+ 0	1.10000+ 7	5.79927+ 0	9643	3	1
1.15000+ 7	5.79752+ 0	1.20000+ 7	5.80774+ 0	1.25000+ 7	5.82547+ 0	9643	3	1
1.27140+ 7	5.83602+ 0	1.30000+ 7	5.85088+ 0	1.35000+ 7	5.88150+ 0	9643	3	1
1.40000+ 7	5.91713+ 0	1.45000+ 7	5.95538+ 0	1.50000+ 7	5.99498+ 0	9643	3	1
1.60000+ 7	6.07387+ 0	1.70000+ 7	6.14629+ 0	1.80000+ 7	6.20743+ 0	9643	3	1
1.88270+ 7	6.24891+ 0	1.90000+ 7	6.25696+ 0	2.00000+ 7	6.29428+ 0	9643	3	1
						9643	3	0
9.62430+ 4	2.40972+ 2	0	0	0	0	9643	3	2
0.0 + 0	0.0 + 0	0	0	3	216	9643	3	2
3	2	141	2	216	5	9643	3	2
1.00000- 5	0.0 + 0	2.53000- 2	0.0 + 0	2.70000+ 1	0.0 + 0	9643	3	2
2.70000+ 1	1.22540+ 1	2.72480+ 1	1.22290+ 1	2.75370+ 1	1.22210+ 1	9643	3	2
2.79150+ 1	1.22330+ 1	2.89750+ 1	1.23070+ 1	3.02680+ 1	1.23580+ 1	9643	3	2
3.12170+ 1	1.23710+ 1	3.19930+ 1	1.23410+ 1	3.29050+ 1	1.22670+ 1	9643	3	2
3.37020+ 1	1.22080+ 1	3.41520+ 1	1.21930+ 1	3.45400+ 1	1.21950+ 1	9643	3	2
3.49310+ 1	1.22110+ 1	3.57190+ 1	1.22830+ 1	3.63150+ 1	1.23400+ 1	9643	3	2
3.68160+ 1	1.23550+ 1	3.73200+ 1	1.23320+ 1	3.81000+ 1	1.22550+ 1	9643	3	2
3.88540+ 1	1.21940+ 1	3.94060+ 1	1.21700+ 1	4.00330+ 1	1.21570+ 1	9643	3	2
4.25220+ 1	1.21330+ 1	4.31410+ 1	1.21320+ 1	4.37740+ 1	1.21370+ 1	9643	3	2
4.44630+ 1	1.21510+ 1	4.63210+ 1	1.22310+ 1	4.70700+ 1	1.22530+ 1	9643	3	2
4.77920+ 1	1.22500+ 1	4.86710+ 1	1.22190+ 1	5.01090+ 1	1.21640+ 1	9643	3	2
5.09020+ 1	1.21470+ 1	5.16110+ 1	1.21420+ 1	5.23360+ 1	1.21430+ 1	9643	3	2
5.30230+ 1	1.21530+ 1	5.36680+ 1	1.21720+ 1	5.44930+ 1	1.22180+ 1	9643	3	2
5.60820+ 1	1.23630+ 1	5.69030+ 1	1.24200+ 1	5.76820+ 1	1.24310+ 1	9643	3	2
5.86630+ 1	1.23880+ 1	6.03750+ 1	1.22820+ 1	6.11600+ 1	1.22630+ 1	9643	3	2
6.18270+ 1	1.22720+ 1	6.25720+ 1	1.23130+ 1	6.36810+ 1	1.24410+ 1	9643	3	2
6.48910+ 1	1.26180+ 1	6.58400+ 1	1.27010+ 1	6.69610+ 1	1.26950+ 1	9643	3	2
6.84230+ 1	1.26520+ 1	6.93710+ 1	1.27030+ 1	7.05840+ 1	1.28990+ 1	9643	3	2
7.20820+ 1	1.32000+ 1	7.31080+ 1	1.32740+ 1	7.42440+ 1	1.31690+ 1	9643	3	2
7.73430+ 1	1.26480+ 1	7.90620+ 1	1.25000+ 1	8.11420+ 1	1.24080+ 1	9643	3	2
8.62160+ 1	1.22860+ 1	8.75590+ 1	1.22790+ 1	8.88180+ 1	1.23020+ 1	9643	3	2
9.02220+ 1	1.23680+ 1	9.38820+ 1	1.26830+ 1	9.54090+ 1	1.27650+ 1	9643	3	2
9.68410+ 1	1.27480+ 1	9.85760+ 1	1.26210+ 1	1.01480+ 2	1.23770+ 1	9643	3	2
1.02760+ 2	1.23200+ 1	1.04070+ 2	1.22980+ 1	1.05400+ 2	1.23070+ 1	9643	3	2
1.09090+ 2	1.24050+ 1	1.10840+ 2	1.24110+ 1	1.12970+ 2	1.23620+ 1	9643	3	2
1.15840+ 2	1.22880+ 1	1.17760+ 2	1.22680+ 1	1.19720+ 2	1.22730+ 1	9643	3	2
1.22110+ 2	1.23100+ 1	1.27910+ 2	1.25030+ 1	1.30130+ 2	1.25370+ 1	9643	3	2
1.32420+ 2	1.25060+ 1	1.35420+ 2	1.23980+ 1	1.40110+ 2	1.22360+ 1	9643	3	2
1.42430+ 2	1.21920+ 1	1.44570+ 2	1.21710+ 1	1.46760+ 2	1.21630+ 1	9643	3	2
1.49240+ 2	1.21640+ 1	1.52310+ 2	1.21780+ 1	1.56290+ 2	1.22160+ 1	9643	3	2
1.60420+ 2	1.22650+ 1	1.63550+ 2	1.22800+ 1	1.70410+ 2	1.22710+ 1	9643	3	2
1.78690+ 2	1.23120+ 1	1.82720+ 2	1.22990+ 1	1.89750+ 2	1.22490+ 1	9643	3	2

Table 8 (cont'd)

1.93410+ 2	1.22470+ 1	1.97950+ 2	1.22750+ 1	2.03860+ 2	1.23260+	19643	3	2
2.07530+ 2	1.23300+ 1	2.11300+ 2	1.22990+ 1	2.18260+ 2	1.22210+	19643	3	2
2.21860+ 2	1.22040+ 1	2.25560+ 2	1.22040+ 1	2.43940+ 2	1.22750+	19643	3	2
2.50390+ 2	1.23380+ 1	2.58240+ 2	1.24400+ 1	2.64070+ 2	1.24760+	19643	3	2
2.71330+ 2	1.24550+ 1	2.95020+ 2	1.22750+ 1	3.04340+ 2	1.22420+	19643	3	2
3.18000+ 2	1.22200+ 1	3.26800+ 2	1.22220+ 1	3.40270+ 2	1.22590+	19643	3	2
3.50020+ 2	1.22790+ 1	3.79870+ 2	1.22670+ 1	3.98990+ 2	1.22860+	19643	3	2
4.14870+ 2	1.23070+ 1	4.25590+ 2	1.22900+ 1	4.41820+ 2	1.22440+	19643	3	2
4.50940+ 2	1.22400+ 1	4.64480+ 2	1.22650+ 1	4.87440+ 2	1.23160+	19643	3	2
5.04230+ 2	1.23310+ 1	5.16990+ 2	1.23120+ 1	5.35340+ 2	1.22610+	19643	3	2
5.45770+ 2	1.22530+ 1	5.56500+ 2	1.22700+ 1	5.80870+ 2	1.23490+	19643	3	2
5.94660+ 2	1.23650+ 1	6.30260+ 2	1.23280+ 1	6.45860+ 2	1.23490+	19643	3	2
6.73980+ 2	1.24290+ 1	6.93760+ 2	1.24370+ 1	7.73270+ 2	1.23380+	19643	3	2
8.10230+ 2	1.23290+ 1	8.36350+ 2	1.23550+ 1	8.74390+ 2	1.24270+	19643	3	2
9.03710+ 2	1.24300+ 1	9.54600+ 2	1.24120+ 1	1.00000+ 3	1.23905+	19643	3	2
1.00000+ 3	1.34029+ 1	2.00000+ 3	1.29003+ 1	3.00000+ 3	1.26165+	19643	3	2
4.00000+ 3	1.24052+ 1	5.00000+ 3	1.22509+ 1	6.00000+ 3	1.21247+	19643	3	2
7.00000+ 3	1.20159+ 1	8.00000+ 3	1.19186+ 1	9.00000+ 3	1.18354+	19643	3	2
1.00000+ 4	1.17594+ 1	2.00000+ 4	1.12344+ 1	3.00000+ 4	1.08879+	19643	3	2
4.00000+ 4	1.06105+ 1	4.21743+ 4	1.05525+ 1	5.00000+ 4	1.03380+	19643	3	2
6.00000+ 4	1.01093+ 1	7.00000+ 4	9.90082+ 0	8.00000+ 4	9.70732+	09643	3	2
8.73610+ 4	9.57264+ 0	9.00000+ 4	9.52589+ 0	9.43901+ 4	9.44829+	09643	3	2
1.00000+ 5	9.33803+ 0	1.33552+ 5	8.78333+ 0	1.50000+ 5	8.53182+	09643	3	2
1.53635+ 5	8.47976+ 0	1.64681+ 5	8.32617+ 0	2.00000+ 5	7.87663+	09643	3	2
2.19909+ 5	7.64793+ 0	2.28946+ 5	7.54932+ 0	2.61079+ 5	7.22100+	09643	3	2
3.00000+ 5	6.86182+ 0	4.00000+ 5	6.08812+ 0	5.00000+ 5	5.47649+	09643	3	2
5.32199+ 5	5.30574+ 0	6.00000+ 5	4.98798+ 0	7.00000+ 5	4.60190+	09643	3	2
7.32025+ 5	4.49848+ 0	7.72191+ 5	4.37967+ 0	8.00000+ 5	4.30318+	09643	3	2
8.01312+ 5	4.29985+ 0	8.23403+ 5	4.24399+ 0	9.00000+ 5	4.07595+	09643	3	2
1.00000+ 6	3.91058+ 0	1.25000+ 6	3.68681+ 0	1.50000+ 6	3.64927+	09643	3	2
1.75000+ 6	3.73278+ 0	2.00000+ 6	3.88493+ 0	2.50000+ 6	4.24338+	09643	3	2
3.00000+ 6	4.53124+ 0	4.00000+ 6	4.70917+ 0	5.00000+ 6	4.47001+	09643	3	2
5.71940+ 6	4.17235+ 0	6.00000+ 6	4.04679+ 0	7.00000+ 6	3.60921+	09643	3	2
8.00000+ 6	3.23704+ 0	9.00000+ 6	2.96481+ 0	9.50000+ 6	2.86932+	09643	3	2
1.00000+ 7	2.79966+ 0	1.05000+ 7	2.75332+ 0	1.10000+ 7	2.72708+	09643	3	2
1.15000+ 7	2.71734+ 0	1.20000+ 7	2.72060+ 0	1.25000+ 7	2.73372+	09643	3	2
1.27140+ 7	2.74169+ 0	1.30000+ 7	2.75410+ 0	1.35000+ 7	2.77961+	09643	3	2
1.40000+ 7	2.80852+ 0	1.45000+ 7	2.83940+ 0	1.50000+ 7	2.87109+	09643	3	2
1.60000+ 7	2.93320+ 0	1.70000+ 7	2.98917+ 0	1.80000+ 7	3.03583+	09643	3	2
1.88270+ 7	3.06655+ 0	1.90000+ 7	3.07208+ 0	2.00000+ 7	3.09834+	09643	3	2
						9643	3	0
9.62430+ 4	2.40972+ 2	0	99	0		09643	3	4
0.0 + 0	-4.20000+ 4	0	0	1		629643	3	4
62	3	0	0	0		09643	3	4
4.21743+ 4	0.0 + 0	5.00000+ 4	4.93450- 2	6.00000+ 4	7.01674-	29643	3	4
7.00000+ 4	8.57765- 2	8.00000+ 4	9.84447- 2	8.73610+ 4	1.06420-	19643	3	4
9.00000+ 4	1.10526- 1	9.43901+ 4	1.16190- 1	1.00000+ 5	1.44636-	19643	3	4
1.33552+ 5	2.20267- 1	1.50000+ 5	2.67334- 1	1.53635+ 5	2.74584-	19643	3	4
1.64681+ 5	2.96488- 1	2.00000+ 5	3.56967- 1	2.19909+ 5	3.82640-	19643	3	4
2.28946+ 5	3.92976- 1	2.61079+ 5	4.26327- 1	3.00000+ 5	4.62485-	19643	3	4
4.00000+ 5	5.14885- 1	5.00000+ 5	5.27748- 1	5.32199+ 5	5.23864-	19643	3	4
6.00000+ 5	5.15737- 1	7.00000+ 5	4.95921- 1	7.32025+ 5	4.92851-	19643	3	4
7.72191+ 5	4.91350- 1	8.00000+ 5	4.92827- 1	8.01312+ 5	4.93138-	19643	3	4
8.23403+ 5	5.00413- 1	9.00000+ 5	5.27925- 1	1.00000+ 6	5.94548-	19643	3	4
1.25000+ 6	8.12728- 1	1.50000+ 6	9.83966- 1	1.75000+ 6	1.07515+	09643	3	4
2.00000+ 6	1.09812+ 0	2.50000+ 6	1.03094+ 0	3.00000+ 6	9.35454-	19643	3	4
4.00000+ 6	8.74823- 1	5.00000+ 6	9.43378- 1	5.71940+ 6	9.55934-	19643	3	4
6.00000+ 6	8.47882- 1	7.00000+ 6	3.05842- 1	8.00000+ 6	1.23138-	19643	3	4
9.00000+ 6	7.33611- 2	9.50000+ 6	6.25080- 2	1.00000+ 7	5.49197-	29643	3	4

Table 8 (cont'd)

```
 1.05000+ 7 4.84647- 2 1.10000+ 7 4.40861- 2 1.15000+ 7 3.95820- 29643 3  4
 1.20000+ 7 3.69402- 2 1.25000+ 7 3.32482- 2 1.27140+ 7 3.32741- 29643 3  4
 1.30000+ 7 3.10177- 2 1.35000+ 7 2.82801- 2 1.40000+ 7 2.64713- 29643 3  4
 1.45000+ 7 2.46450- 2 1.50000+ 7 2.25839- 2 1.60000+ 7 1.88431- 29643 3  4
 1.70000+ 7 1.61750- 2 1.80000+ 7 1.37126- 2 1.88270+ 7 1.17162- 29643 3  4
 1.90000+ 7 1.18116- 2 2.00000+ 7 9.98792- 3                       9643 3  4
                                                                  9643 3  0
 9.62430+ 4 2.40972+ 2          0         99          0          09643 3 16
 0.0       + 0-5.69580+ 6          0          0          1         249643 3 16
         24          2          0          0          0          09643 3 16
 5.71940+ 6 0.0       + 0 6.00000+ 6 9.71420- 2 7.00000+ 6 6.02990- 19643 3 16
 8.00000+ 6 8.30720- 1 9.00000+ 6 9.45640- 1 9.50000+ 6 9.83360- 19643 3 16
 1.00000+ 7 1.01490+ 0 1.05000+ 7 1.04610+ 0 1.10000+ 7 1.07830+ 09643 3 16
 1.15000+ 7 1.11090+ 0 1.20000+ 7 1.12630+ 0 1.25000+ 7 1.05930+ 09643 3 16
 1.27140+ 7 9.78460- 1 1.30000+ 7 8.28210- 1 1.35000+ 7 5.81650- 19643 3 16
 1.40000+ 7 4.72520- 1 1.45000+ 7 4.16160- 1 1.50000+ 7 3.55860- 19643 3 16
 1.60000+ 7 2.23150- 1 1.70000+ 7 1.20080- 1 1.80000+ 7 5.88280- 29643 3 16
 1.88270+ 7 3.11960- 2 1.90000+ 7 2.72310- 2 2.00000+ 7 1.21900- 29643 3 16
                                                                  9643 3  0
 9.62430+ 4 2.40972+ 2          0         99          0          09643 3 17
 0.0       + 0-1.26620+ 7          0          0          1         129643 3 17
         12          2          0          0          0          09643 3 17
 1.27140+ 7 0.0       + 0 1.30000+ 7 9.56300- 4 1.35000+ 7 2.08630- 29643 3 17
 1.40000+ 7 7.36150- 2 1.45000+ 7 1.63380- 1 1.50000+ 7 2.79650- 19643 3 17
 1.60000+ 7 5.23580- 1 1.70000+ 7 7.19470- 1 1.80000+ 7 8.55160- 19643 3 17
 1.88270+ 7 9.33050- 1 1.90000+ 7 9.46440- 1 2.00000+ 7 1.00290+ 09643 3 17
                                                                  9643 3  0
 9.62430+ 4 2.40972+ 2          0         99          0          09643 3 18
 0.0       + 0 0.0       + 0          0          0          3        2029643 3 18
          3          2        141          2        202          59643 3 18
 1.00000- 5 0.0       + 0 2.53000- 2 0.0       + 0 2.70000+ 1 0.0       + 09643 3 18
 2.70000+ 1 6.09423+ 1 2.72480+ 1 5.57752+ 1 2.75370+ 1 5.38260+ 19643 3 18
 2.79150+ 1 5.58883+ 1 2.89750+ 1 6.79103+ 1 3.02680+ 1 7.38594+ 19643 3 18
 3.12170+ 1 7.45235+ 1 3.19930+ 1 6.94982+ 1 3.29050+ 1 5.73471+ 19643 3 18
 3.37020+ 1 4.61065+ 1 3.41520+ 1 4.27410+ 1 3.45400+ 1 4.28290+ 19643 3 18
 3.49310+ 1 4.58642+ 1 3.57190+ 1 5.75128+ 1 3.63150+ 1 6.50257+ 19643 3 18
 3.68160+ 1 6.66145+ 1 3.73200+ 1 6.31428+ 1 3.81000+ 1 5.14832+ 19643 3 18
 3.88540+ 1 4.01961+ 1 3.94060+ 1 3.47987+ 1 4.00330+ 1 3.15045+ 19643 3 18
 4.25220+ 1 2.40931+ 1 4.31410+ 1 2.36635+ 1 4.37740+ 1 2.49799+ 19643 3 18
 4.44630+ 1 2.85225+ 1 4.63210+ 1 4.30439+ 1 4.70700+ 1 4.60325+ 19643 3 18
 4.77920+ 1 4.52391+ 1 4.86710+ 1 4.01875+ 1 5.01090+ 1 2.95993+ 19643 3 18
 5.09020+ 1 2.57657+ 1 5.16110+ 1 2.41698+ 1 5.23360+ 1 2.43594+ 19643 3 18
 5.30230+ 1 2.64206+ 1 5.36680+ 1 3.02703+ 1 5.44930+ 1 3.78228+ 19643 3 18
 5.60820+ 1 5.47591+ 1 5.69030+ 1 5.98118+ 1 5.76820+ 1 6.03544+ 19643 3 18
 5.86630+ 1 5.59165+ 1 6.03750+ 1 4.41293+ 1 6.11600+ 1 4.15983+ 19643 3 18
 6.18270+ 1 4.24034+ 1 6.25720+ 1 4.67899+ 1 6.36810+ 1 5.82787+ 19643 3 18
 6.48910+ 1 7.08841+ 1 6.58400+ 1 7.57235+ 1 6.69610+ 1 7.47353+ 19643 3 18
 6.84230+ 1 7.12593+ 1 6.93710+ 1 7.39090+ 1 7.05840+ 1 8.41721+ 19643 3 18
 7.20820+ 1 9.75541+ 1 7.31080+ 1 1.00003+ 2 7.42440+ 1 9.47408+ 19643 3 18
 7.73430+ 1 6.67509+ 1 7.90620+ 1 5.65757+ 1 8.11420+ 1 4.90875+ 19643 3 18
 8.62160+ 1 3.72971+ 1 8.75590+ 1 3.63934+ 1 8.88180+ 1 3.82684+ 19643 3 18
 9.02220+ 1 4.34968+ 1 9.38820+ 1 6.24288+ 1 9.54090+ 1 6.61010+ 19643 3 18
 9.68410+ 1 6.47596+ 1 9.85760+ 1 5.76216+ 1 1.01480+ 2 4.17007+ 19643 3 18
 1.02760+ 2 3.70139+ 1 1.04070+ 2 3.49558+ 1 1.05400+ 2 3.55608+ 19643 3 18
 1.09090+ 2 4.21481+ 1 1.10840+ 2 4.21879+ 1 1.12970+ 2 3.84615+ 19643 3 18
 1.15840+ 2 3.23376+ 1 1.17760+ 2 3.03657+ 1 1.19720+ 2 3.05254+ 19643 3 18
 1.22110+ 2 3.32037+ 1 1.27910+ 2 4.45989+ 1 1.30130+ 2 4.60065+ 19643 3 18
 1.32420+ 2 4.39713+ 1 1.35420+ 2 3.73718+ 1 1.40110+ 2 2.51549+ 19643 3 18
 1.42430+ 2 2.07645+ 1 1.44570+ 2 1.82791+ 1 1.46760+ 2 1.71596+ 19643 3 18
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Table 8 (cont'd)

1.49240+ 2	1.71933+ 1	1.52310+ 2	1.85774+ 1	1.56290+ 2	2.20660+ 1	9643	3	18
1.60420+ 2	2.57710+ 1	1.63550+ 2	2.66544+ 1	1.70410+ 2	2.54464+ 1	9643	3	18
1.78690+ 2	2.75583+ 1	1.82720+ 2	2.64363+ 1	1.89750+ 2	2.25799+ 1	9643	3	18
1.93410+ 2	2.22150+ 1	1.97950+ 2	2.38595+ 1	2.03860+ 2	2.66341+ 1	9643	3	18
2.07530+ 2	2.66195+ 1	2.11300+ 2	2.46068+ 1	2.18260+ 2	1.91058+ 1	9643	3	18
2.21860+ 2	1.75990+ 1	2.25560+ 2	1.74624+ 1	2.43940+ 2	2.15329+ 1	9643	3	18
2.50390+ 2	2.46362+ 1	2.58240+ 2	2.88284+ 1	2.64070+ 2	2.99328+ 1	9643	3	18
2.71330+ 2	2.87144+ 1	2.95020+ 2	1.95567+ 1	3.04340+ 2	1.73899+ 1	9643	3	18
3.18000+ 2	1.57275+ 1	3.26800+ 2	1.56499+ 1	3.40270+ 2	1.73818+ 1	9643	3	18
3.50020+ 2	1.81598+ 1	3.79870+ 2	1.68468+ 1	3.98990+ 2	1.72816+ 1	9643	3	18
4.14870+ 2	1.78482+ 1	4.25590+ 2	1.69016+ 1	4.41820+ 2	1.45578+ 1	9643	3	18
4.50940+ 2	1.42229+ 1	4.64480+ 2	1.51172+ 1	4.87440+ 2	1.68104+ 1	9643	3	18
5.04230+ 2	1.70718+ 1	5.16990+ 2	1.61690+ 1	5.35340+ 2	1.39392+ 1	9643	3	18
5.45770+ 2	1.34696+ 1	5.56500+ 2	1.40229+ 1	5.80870+ 2	1.64916+ 1	9643	3	18
5.94660+ 2	1.67833+ 1	6.30260+ 2	1.51597+ 1	6.45860+ 2	1.56129+ 1	9643	3	18
6.73980+ 2	1.74982+ 1	6.93760+ 2	1.74564+ 1	7.73270+ 2	1.39729+ 1	9643	3	18
8.10230+ 2	1.33994+ 1	8.36350+ 2	1.38744+ 1	8.74390+ 2	1.53074+ 1	9643	3	18
9.03710+ 2	1.51123+ 1	9.54600+ 2	1.43075+ 1	1.00000+ 3	1.35079+ 1	9643	3	18
1.00000+ 3	1.34490+ 1	2.00000+ 3	9.59260+ 0	3.00000+ 3	7.90430+ 0	9643	3	18
4.00000+ 3	6.93170+ 0	5.00000+ 3	6.26470+ 0	6.00000+ 3	5.77900+ 0	9643	3	18
7.00000+ 3	5.41000+ 0	8.00000+ 3	5.12140+ 0	9.00000+ 3	4.87970+ 0	9643	3	18
1.00000+ 4	4.68080+ 0	2.00000+ 4	3.67570+ 0	3.00000+ 4	3.29750+ 0	9643	3	18
4.00000+ 4	3.10570+ 0	5.00000+ 4	2.99420+ 0	6.00000+ 4	2.92310+ 0	9643	3	18
7.00000+ 4	2.87480+ 0	8.00000+ 4	2.84120+ 0	9.00000+ 4	2.81510+ 0	9643	3	18
1.00000+ 5	2.79460+ 0	1.50000+ 5	2.72680+ 0	2.00000+ 5	2.67160+ 0	9643	3	18
3.00000+ 5	2.56980+ 0	4.00000+ 5	2.50060+ 0	5.00000+ 5	2.47750+ 0	9643	3	18
6.00000+ 5	2.49510+ 0	7.00000+ 5	2.53230+ 0	8.00000+ 5	2.56090+ 0	9643	3	18
9.00000+ 5	2.56100+ 0	1.00000+ 6	2.53300+ 0	1.25000+ 6	2.43110+ 0	9643	3	18
1.50000+ 6	2.36700+ 0	1.75000+ 6	2.33200+ 0	2.00000+ 6	2.31140+ 0	9643	3	18
2.50000+ 6	2.28740+ 0	3.00000+ 6	2.26570+ 0	4.00000+ 6	2.18130+ 0	9643	3	18
5.00000+ 6	2.06930+ 0	5.71940+ 6	2.07250+ 0	6.00000+ 6	2.09420+ 0	9643	3	18
7.00000+ 6	2.14430+ 0	8.00000+ 6	2.08440+ 0	9.00000+ 6	2.01480+ 0	9643	3	18
9.50000+ 6	1.99380+ 0	1.00000+ 7	1.97960+ 0	1.05000+ 7	1.96660+ 0	9643	3	18
1.10000+ 7	1.94980+ 0	1.15000+ 7	1.92970+ 0	1.20000+ 7	1.92390+ 0	9643	3	18
1.25000+ 7	1.99920+ 0	1.27140+ 7	2.08260+ 0	1.30000+ 7	2.23660+ 0	9643	3	18
1.35000+ 7	2.47110+ 0	1.40000+ 7	2.53600+ 0	1.45000+ 7	2.51180+ 0	9643	3	18
1.50000+ 7	2.46580+ 0	1.60000+ 7	2.37510+ 0	1.70000+ 7	2.30140+ 0	9643	3	18
1.80000+ 7	2.24390+ 0	1.88270+ 7	2.20640+ 0	1.90000+ 7	2.19940+ 0	9643	3	18
2.00000+ 7	2.16450+ 0					9643	3	18
						9643	3	0
9.62430+ 4	2.40972+ 2	0	99	0	0	9643	3	37
0.0 + 0	-1.87497+ 7	0	0	1	3	9643	3	37
3	2	0	0	0	0	9643	3	37
1.88270+ 7	0.0 + 0	1.90000+ 7	2.22370- 7	2.00000+ 7	6.36550- 3	9643	3	37
						9643	3	0
9.62430+ 4	2.40972+ 2	0	1	0	0	9643	3	51
0.0 + 0	-4.20000+ 4	0	0	1	62	9643	3	51
62	3	0	0	0	0	9643	3	51
4.21743+ 4	0.0 + 0	5.00000+ 4	4.93450- 2	6.00000+ 4	7.01674- 2	9643	3	51
7.00000+ 4	8.57765- 2	8.00000+ 4	9.84447- 2	8.73610+ 4	1.06420- 1	9643	3	51
9.00000+ 4	1.09113- 1	9.43901+ 4	1.13149- 1	1.00000+ 5	1.16817- 1	9643	3	51
1.33552+ 5	1.30840- 1	1.50000+ 5	1.30120- 1	1.53635+ 5	1.30196- 1	9643	3	51
1.64681+ 5	1.30724- 1	2.00000+ 5	1.29461- 1	2.19909+ 5	1.28990- 1	9643	3	51
2.28946+ 5	1.28868- 1	2.61079+ 5	1.28398- 1	3.00000+ 5	1.26511- 1	9643	3	51
4.00000+ 5	1.20495- 1	5.00000+ 5	1.12742- 1	5.32199+ 5	1.09149- 1	9643	3	51
6.00000+ 5	1.02851- 1	7.00000+ 5	9.36163- 2	7.32025+ 5	9.15960- 2	9643	3	51
7.72191+ 5	8.92803- 2	8.00000+ 5	8.74443- 2	8.01312+ 5	8.74161- 2	9643	3	51
8.23403+ 5	8.63464- 2	9.00000+ 5	8.30522- 2	1.00000+ 6	8.05835- 2	9643	3	51
1.25000+ 6	7.11426- 2	1.50000+ 6	5.43243- 2	1.75000+ 6	3.70825- 2	9643	3	51

Table 8 (cont'd)

```
2.00000+ 6 2.33229- 2 2.50000+ 6 7.97952- 3 3.00000+ 6 2.56837- 39643 3 51
4.00000+ 6 2.90438- 4 5.00000+ 6 3.67283- 5 5.71940+ 6 8.44075- 69643 3 51
6.00000+ 6 4.29936- 6 7.00000+ 6 2.39015- 7 8.00000+ 6 1.68919- 89643 3 51
9.00000+ 6 1.94888- 9 9.50000+ 6 7.53252-10 1.00000+ 7 3.06014-109643 3 51
1.05000+ 7 1.27267-10 1.10000+ 7 5.55113-11 1.15000+ 7 2.42967-119643 3 51
1.20000+ 7 1.12228-11 1.25000+ 7 5.06817-12 1.27140+ 7 3.79098-129643 3 51
1.30000+ 7 2.40336-12 1.35000+ 7 1.12735-12 1.40000+ 7 5.48609-139643 3 51
1.45000+ 7 2.68707-13 1.50000+ 7 1.30937-13 1.60000+ 7 3.18020-149643 3 51
1.70000+ 7 8.24035-15 1.80000+ 7 2.17766-15 1.88270+ 7 7.26501-169643 3 51
1.90000+ 7 6.03345-16 2.00000+ 7 1.68648-16                       9643 3 51
                                                                  9643 3  0
9.62430+ 4 2.40972+ 2          0          2          0          09643 3 52
0.0      + 0-8.70000+ 4          0          0          1        579643 3 52
        57          3          0          0          0          09643 3 52
8.73610+ 4 0.0      + 0 9.00000+ 4 1.41262- 3 9.43901+ 4 3.04141- 39643 3 52
1.00000+ 5 5.05603- 3 1.33552+ 5 1.59450- 2 1.50000+ 5 1.97167- 29643 3 52
1.53635+ 5 2.04319- 2 1.64681+ 5 2.24369- 2 2.00000+ 5 2.76570- 29643 3 52
2.19909+ 5 2.99956- 2 2.28946+ 5 3.09577- 2 2.61079+ 5 3.39984- 29643 3 52
3.00000+ 5 3.70387- 2 4.00000+ 5 4.13811- 2 5.00000+ 5 4.21492- 29643 3 52
5.32199+ 5 4.16224- 2 6.00000+ 5 4.05056- 2 7.00000+ 5 3.80898- 29643 3 52
7.32025+ 5 3.75504- 2 7.72191+ 5 3.64367- 2 8.00000+ 5 3.52715- 29643 3 52
8.01312+ 5 3.52492- 2 8.23403+ 5 3.46310- 2 9.00000+ 5 3.29601- 29643 3 52
1.00000+ 6 3.19031- 2 1.25000+ 6 2.86535- 2 1.50000+ 6 2.23152- 29643 3 52
1.75000+ 6 1.54186- 2 2.00000+ 6 9.74574- 3 2.50000+ 6 3.31386- 39643 3 52
3.00000+ 6 1.04410- 3 4.00000+ 6 1.10990- 4 5.00000+ 6 1.33315- 59643 3 52
5.71940+ 6 2.96393- 6 6.00000+ 6 1.49169- 6 7.00000+ 6 8.00414- 89643 3 52
8.00000+ 6 5.51026- 9 9.00000+ 6 6.22744-10 9.50000+ 6 2.38380-109643 3 52
1.00000+ 7 9.59802-11 1.05000+ 7 3.95960-11 1.10000+ 7 1.71443-119643 3 52
1.15000+ 7 7.45485-12 1.20000+ 7 3.42393-12 1.25000+ 7 1.53810-129643 3 52
1.27140+ 7 1.14803-12 1.30000+ 7 7.25799-13 1.35000+ 7 3.38873-139643 3 52
1.40000+ 7 1.64177-13 1.45000+ 7 8.00629-14 1.50000+ 7 3.88550-149643 3 52
1.60000+ 7 9.36429-15 1.70000+ 7 2.40933-15 1.80000+ 7 6.32638-169643 3 52
1.88270+ 7 2.10026-16 1.90000+ 7 1.74226-16 2.00000+ 7 4.84426-179643 3 52
                                                                  9643 3  0
9.62430+ 4 2.40972+ 2          0          3          0          09643 3 53
0.0      + 0-9.40000+ 4          0          0          1        559643 3 53
        55          3          0          0          0          09643 3 53
9.43901+ 4 0.0      + 0 1.00000+ 5 4.43849- 3 1.33552+ 5 2.54019- 29643 3 53
1.50000+ 5 3.28916- 2 1.53635+ 5 3.43734- 2 1.64681+ 5 3.78785- 29643 3 53
2.00000+ 5 4.51696- 2 2.19909+ 5 4.84685- 2 2.28946+ 5 4.98225- 29643 3 53
2.61079+ 5 5.34373- 2 3.00000+ 5 5.57592- 2 4.00000+ 5 5.98437- 29643 3 53
5.00000+ 5 6.08483- 2 5.32199+ 5 6.02934- 2 6.00000+ 5 5.94519- 29643 3 53
7.00000+ 5 5.73877- 2 7.32025+ 5 5.71295- 2 7.72191+ 5 5.69012- 29643 3 53
8.00000+ 5 5.67171- 2 8.01312+ 5 5.67404- 2 8.23403+ 5 5.68782- 29643 3 53
9.00000+ 5 5.70845- 2 1.00000+ 6 5.79325- 2 1.25000+ 6 5.51864- 29643 3 53
1.50000+ 6 4.41261- 2 1.75000+ 6 3.10345- 2 2.00000+ 6 1.99219- 29643 3 53
2.50000+ 6 7.01584- 3 3.00000+ 6 2.31534- 3 4.00000+ 6 2.73923- 49643 3 53
5.00000+ 6 3.60321- 5 5.71940+ 6 8.46716- 6 6.00000+ 6 4.34701- 69643 3 53
7.00000+ 6 2.47265- 7 8.00000+ 6 1.77458- 8 9.00000+ 6 2.07706- 99643 3 53
9.50000+ 6 8.07911-10 1.00000+ 7 3.30217-10 1.05000+ 7 1.38111-109643 3 53
1.10000+ 7 6.05451-11 1.15000+ 7 2.66171-11 1.20000+ 7 1.23467-119643 3 53
1.25000+ 7 5.59666-12 1.27140+ 7 4.19267-12 1.30000+ 7 2.66329-129643 3 53
1.35000+ 7 1.25345-12 1.40000+ 7 6.11939-13 1.45000+ 7 3.00625-139643 3 53
1.50000+ 7 1.46939-13 1.60000+ 7 3.58898-14 1.70000+ 7 9.34700-159643 3 53
1.80000+ 7 2.48149-15 1.88270+ 7 8.30706-16 1.90000+ 7 6.90255-169643 3 53
2.00000+ 7 1.93669-16                                             9643 3 53
                                                                  9643 3  0
9.62430+ 4 2.40972+ 2          0          4          0          09643 3 54
0.0      + 0-9.40000+ 4          0          0          1        559643 3 54
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Table 8 (cont'd)

```
         55          3          0          0          0          09643 3 54
9.43901+ 4 0.0      + 0 1.00000+ 5 1.83245- 2 1.33552+ 5 4.80802- 29643 3 54
1.50000+ 5 5.67994- 2 1.53635+ 5 5.83694- 2 1.64681+ 5 6.25947- 29643 3 54
2.00000+ 5 7.23904- 2 2.19909+ 5 7.62620- 2 2.28946+ 5 7.77859- 29643 3 54
2.61079+ 5 8.23614- 2 3.00000+ 5 8.63671- 2 4.00000+ 5 9.01388- 29643 3 54
5.00000+ 5 8.78427- 2 5.32199+ 5 8.58009- 2 6.00000+ 5 8.18902- 29643 3 54
7.00000+ 5 7.52435- 2 7.32025+ 5 7.37077- 2 7.72191+ 5 7.13880- 29643 3 54
8.00000+ 5 6.91536- 2 8.01312+ 5 6.91052- 2 8.23403+ 5 6.77627- 29643 3 54
9.00000+ 5 6.40215- 2 1.00000+ 6 6.12482- 2 1.25000+ 6 5.35320- 29643 3 54
1.50000+ 6 4.09755- 2 1.75000+ 6 2.80660- 2 2.00000+ 6 1.76744- 29643 3 54
2.50000+ 6 6.00680- 3 3.00000+ 6 1.89931- 3 4.00000+ 6 2.04199- 49643 3 54
5.00000+ 6 2.47924- 5 5.71940+ 6 5.54435- 6 6.00000+ 6 2.79627- 69643 3 54
7.00000+ 6 1.51092- 7 8.00000+ 6 1.04597- 8 9.00000+ 6 1.18746- 99643 3 54
9.50000+ 6 4.55382-10 1.00000+ 7 1.83657-10 1.05000+ 7 7.58802-119643 3 54
1.10000+ 7 3.28987-11 1.15000+ 7 1.43224-11 1.20000+ 7 6.58538-129643 3 54
1.25000+ 7 2.96119-12 1.27140+ 7 2.21109-12 1.30000+ 7 1.39860-129643 3 54
1.35000+ 7 6.53547-13 1.40000+ 7 3.16886-13 1.45000+ 7 1.54645-139643 3 54
1.50000+ 7 7.51049-14 1.60000+ 7 1.81255-14 1.70000+ 7 4.66951-159643 3 54
1.80000+ 7 1.22759-15 1.88270+ 7 4.07923-16 1.90000+ 7 3.38448-169643 3 54
2.00000+ 7 9.42008-17                                              9643 3 54
                                                                   9643 3  0
9.62430+ 4 2.40972+ 2          0          5          0          09643 3 55
0.0      + 0-1.33000+ 5          0          0          1         539643 3 55
         53          3          0          0          0          09643 3 55
1.33552+ 5 0.0      + 0 1.50000+ 5 2.78066- 2 1.53635+ 5 3.12138- 29643 3 55
1.64681+ 5 4.04371- 2 2.00000+ 5 6.10142- 2 2.19909+ 5 6.90770- 29643 3 55
2.28946+ 5 7.21761- 2 2.61079+ 5 8.10405- 2 3.00000+ 5 8.75984- 29643 3 55
4.00000+ 5 9.49493- 2 5.00000+ 5 9.40069- 2 5.32199+ 5 9.25021- 29643 3 55
6.00000+ 5 8.90982- 2 7.00000+ 5 8.28813- 2 7.32025+ 5 8.15181- 29643 3 55
7.72191+ 5 7.99167- 2 8.00000+ 5 7.85579- 2 8.01312+ 5 7.85421- 29643 3 55
8.23403+ 5 7.77741- 2 9.00000+ 5 7.53474- 2 1.00000+ 6 7.36374- 29643 3 55
1.25000+ 6 6.59401- 2 1.50000+ 6 5.10280- 2 1.75000+ 6 3.52882- 29643 3 55
2.00000+ 6 2.24418- 2 2.50000+ 6 7.79154- 3 3.00000+ 6 2.52503- 39643 3 55
4.00000+ 6 2.85928- 4 5.00000+ 6 3.63487- 5 5.71940+ 6 8.35353- 69643 3 55
6.00000+ 6 4.25501- 6 7.00000+ 6 2.36824- 7 8.00000+ 6 1.67417- 89643 3 55
9.00000+ 6 1.93566- 9 9.50000+ 6 7.48321-10 1.00000+ 7 3.04092-109643 3 55
1.05000+ 7 1.26517-10 1.10000+ 7 5.51943-11 1.15000+ 7 2.41607-119643 3 55
1.20000+ 7 1.11653-11 1.25000+ 7 5.04351-12 1.27140+ 7 3.77289-129643 3 55
1.30000+ 7 2.39219-12 1.35000+ 7 1.12233-12 1.40000+ 7 5.46335-139643 3 55
1.45000+ 7 2.67561-13 1.50000+ 7 1.30412-13 1.60000+ 7 3.16835-149643 3 55
1.70000+ 7 8.21186-15 1.80000+ 7 2.17074-15 1.88270+ 7 7.24310-169643 3 55
1.90000+ 7 6.01389-16 2.00000+ 7 1.68147-16                        9643 3 55
                                                                   9643 3  0
9.62430+ 4 2.40972+ 2          0          6          0          09643 3 56
0.0      + 0-1.53000+ 5          0          0          1         519643 3 56
         51          3          0          0          0          09643 3 56
1.53635+ 5 0.0      + 0 1.64681+ 5 2.41734- 3 2.00000+ 5 6.89782- 39643 3 56
2.19909+ 5 9.03633- 3 2.28946+ 5 9.90650- 3 2.61079+ 5 1.21706- 29643 3 56
3.00000+ 5 1.41443- 2 4.00000+ 5 1.83122- 2 5.00000+ 5 2.13453- 29643 3 56
5.32199+ 5 2.21104- 2 6.00000+ 5 2.35889- 2 7.00000+ 5 2.52332- 29643 3 56
7.32025+ 5 2.58884- 2 7.72191+ 5 2.67407- 2 8.00000+ 5 2.73206- 29643 3 56
8.01312+ 5 2.73620- 2 8.23403+ 5 2.80106- 2 9.00000+ 5 2.99409- 29643 3 56
1.00000+ 6 3.24692- 2 1.25000+ 6 3.46118- 2 1.50000+ 6 2.96624- 29643 3 56
1.75000+ 6 2.18384- 2 2.00000+ 6 1.44723- 2 2.50000+ 6 5.33202- 39643 3 56
3.00000+ 6 1.82675- 3 4.00000+ 6 2.30393- 4 5.00000+ 6 3.19290- 59643 3 56
5.71940+ 6 7.72232- 6 6.00000+ 6 4.00521- 6 7.00000+ 6 2.34735- 79643 3 56
8.00000+ 6 1.71932- 8 9.00000+ 6 2.04903- 9 9.50000+ 6 8.03227-109643 3 56
1.00000+ 7 3.30720-10 1.05000+ 7 1.39265-10 1.10000+ 7 6.14258-119643 3 56
1.15000+ 7 2.71518-11 1.20000+ 7 1.26601-11 1.25000+ 7 5.76572-129643 3 56
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Table 8 (cont'd)

```
1.27140+ 7 4.32762-12 1.30000+ 7 2.75589-12 1.35000+ 7 1.30254-129643 3 56
1.40000+ 7 6.38628-13 1.45000+ 7 3.14901-13 1.50000+ 7 1.54519-139643 3 56
1.60000+ 7 3.80147-14 1.70000+ 7 9.96552-15 1.80000+ 7 2.66138-159643 3 56
1.88270+ 7 8.94872-16 1.90000+ 7 7.44109-16 2.00000+ 7 2.09790-169643 3 56
                                                                 9643 3  0
9.62430+ 4 2.40972+ 2          0          7          0          09643 3 57
0.0      + 0-1.64000+ 5          0          0          1        509643 3 57
        50          3          0          0          0          09643 3 57
1.64681+ 5 0.0      + 0 2.00000+ 5 1.43773- 2 2.19909+ 5 2.08111- 29643 3 57
2.28946+ 5 2.34294- 2 2.61079+ 5 3.09554- 2 3.00000+ 5 3.70445- 29643 3 57
4.00000+ 5 4.69063- 2 5.00000+ 5 5.09784- 2 5.32199+ 5 5.14302- 29643 3 57
6.00000+ 5 5.18956- 2 7.00000+ 5 5.12260- 2 7.32025+ 5 5.12712- 29643 3 57
7.72191+ 5 5.13629- 2 8.00000+ 5 5.13880- 2 8.01312+ 5 5.14163- 29643 3 57
8.23403+ 5 5.16805- 2 9.00000+ 5 5.22642- 2 1.00000+ 6 5.34430- 29643 3 57
1.25000+ 6 5.16436- 2 1.50000+ 6 4.18150- 2 1.75000+ 6 2.97518- 29643 3 57
2.00000+ 6 1.92835- 2 2.50000+ 6 6.87598- 3 3.00000+ 6 2.28198- 39643 3 57
4.00000+ 6 2.70380- 4 5.00000+ 6 3.57110- 5 5.71940+ 6 8.39232- 69643 3 57
6.00000+ 6 4.30884- 6 7.00000+ 6 2.45368- 7 8.00000+ 6 1.76174- 89643 3 57
9.00000+ 6 2.06541- 9 9.50000+ 6 8.03551-10 1.00000+ 7 3.28512-109643 3 57
1.05000+ 7 1.37442-10 1.10000+ 7 6.02628-11 1.15000+ 7 2.64971-119643 3 57
1.20000+ 7 1.22954-11 1.25000+ 7 5.57462-12 1.27140+ 7 4.17649-129643 3 57
1.30000+ 7 2.65328-12 1.35000+ 7 1.24894-12 1.40000+ 7 6.09957-139643 3 57
1.45000+ 7 2.99599-13 1.50000+ 7 1.46465-13 1.60000+ 7 3.57821-149643 3 57
1.70000+ 7 9.32104-15 1.80000+ 7 2.47516-15 1.88270+ 7 8.28702-169643 3 57
1.90000+ 7 6.88479-16 2.00000+ 7 1.93214-16                      9643 3 57
                                                                 9643 3  0
9.62430+ 4 2.40972+ 2          0          8          0          09643 3 58
0.0      + 0-2.19000+ 5          0          0          1        489643 3 58
        48          3          0          0          0          09643 3 58
2.19909+ 5 0.0      + 0 2.28946+ 5 3.02513- 5 2.61079+ 5 2.58161- 49643 3 58
3.00000+ 5 6.17186- 4 4.00000+ 5 1.98867- 3 5.00000+ 5 3.82278- 39643 3 58
5.32199+ 5 4.45080- 3 6.00000+ 5 5.77428- 3 7.00000+ 5 7.65293- 39643 3 58
7.32025+ 5 8.28442- 3 7.72191+ 5 9.09208- 3 8.00000+ 5 9.65790- 39643 3 58
8.01312+ 5 9.68958- 3 8.23403+ 5 1.02296- 2 9.00000+ 5 1.19413- 29643 3 58
1.00000+ 6 1.41201- 2 1.25000+ 6 1.73577- 2 1.50000+ 6 1.63051- 29643 3 58
1.75000+ 6 1.27879- 2 2.00000+ 6 8.86931- 3 2.50000+ 6 3.48822- 39643 3 58
3.00000+ 6 1.26002- 3 4.00000+ 6 1.73487- 4 5.00000+ 6 2.57749- 59643 3 58
5.71940+ 6 6.47802- 6 6.00000+ 6 3.40504- 6 7.00000+ 6 2.07310- 79643 3 58
8.00000+ 6 1.55665- 8 9.00000+ 6 1.89462- 9 9.50000+ 6 7.49367-109643 3 58
1.00000+ 7 3.11164-10 1.05000+ 7 1.32065-10 1.10000+ 7 5.86702-119643 3 58
1.15000+ 7 2.61034-11 1.20000+ 7 1.22461-11 1.25000+ 7 5.60889-129643 3 58
1.27140+ 7 4.21960-12 1.30000+ 7 2.69535-12 1.35000+ 7 1.28051-129643 3 58
1.40000+ 7 6.31094-13 1.45000+ 7 3.12615-13 1.50000+ 7 1.54125-139643 3 58
1.60000+ 7 3.82547-14 1.70000+ 7 1.01095-14 1.80000+ 7 2.71956-159643 3 58
1.88270+ 7 9.19451-16 1.90000+ 7 7.65330-16 2.00000+ 7 2.17050-169643 3 58
                                                                 9643 3  0
9.62430+ 4 2.40972+ 2          0          9          0          09643 3 59
0.0      + 0-2.28000+ 5          0          0          1        479643 3 59
        47          3          0          0          0          09643 3 59
2.28946+ 5 0.0      + 0 2.61079+ 5 3.70788- 3 3.00000+ 5 6.77831- 39643 3 59
4.00000+ 5 1.26564- 2 5.00000+ 5 1.66657- 2 5.32199+ 5 1.76108- 29643 3 59
6.00000+ 5 1.94243- 2 7.00000+ 5 2.15690- 2 7.32025+ 5 2.23050- 29643 3 59
7.72191+ 5 2.32453- 2 8.00000+ 5 2.38759- 2 8.01312+ 5 2.39233- 29643 3 59
8.23403+ 5 2.45892- 2 9.00000+ 5 2.65920- 2 1.00000+ 6 2.91737- 29643 3 59
1.25000+ 6 3.17575- 2 1.50000+ 6 2.76998- 2 1.75000+ 6 2.07093- 29643 3 59
2.00000+ 6 1.38969- 2 2.50000+ 6 5.20097- 3 3.00000+ 6 1.79423- 39643 3 59
4.00000+ 6 2.26867- 4 5.00000+ 6 3.15798- 5 5.71940+ 6 7.63945- 69643 3 59
6.00000+ 6 3.96270- 6 7.00000+ 6 2.32590- 7 8.00000+ 6 1.70505- 89643 3 59
9.00000+ 6 2.03566- 9 9.50000+ 6 7.98203-10 1.00000+ 7 3.28747-109643 3 59
```

Table 8 (cont'd)

```
1.05000+ 7 1.38486-10 1.10000+ 7 6.10967-11 1.15000+ 7 2.70137-119643 3 59
1.20000+ 7 1.25999-11 1.25000+ 7 5.73982-12 1.27140+ 7 4.30851-129643 3 59
1.30000+ 7 2.74410-12 1.35000+ 7 1.29720-12 1.40000+ 7 6.36262-139643 3 59
1.45000+ 7 3.13691-13 1.50000+ 7 1.53951-13 1.60000+ 7 3.78851-149643 3 59
1.70000+ 7 9.93411-15 1.80000+ 7 2.65369-15 1.88270+ 7 8.92432-169643 3 59
1.90000+ 7 7.42058-16 2.00000+ 7 2.09240-16                       9643 3 59
                                                                  9643 3  0
9.62430+ 4 2.40972+ 2          0         10          0          09643 3 60
0.0      + 0-2.60000+ 5          0          0          1         469643 3 60
        46          3          0          0          0          09643 3 60
2.61079+ 5 0.0      + 0 3.00000+ 5 1.06267- 2 4.00000+ 5 2.82133- 29643 3 60
5.00000+ 5 3.73474- 2 5.32199+ 5 3.88942- 2 6.00000+ 5 4.12099- 29643 3 60
7.00000+ 5 4.28015- 2 7.32025+ 5 4.32949- 2 7.72191+ 5 4.38690- 29643 3 60
8.00000+ 5 4.42011- 2 8.01312+ 5 4.42443- 2 8.23403+ 5 4.46997- 29643 3 60
9.00000+ 5 4.58348- 2 1.00000+ 6 4.74745- 2 1.25000+ 6 4.68598- 29643 3 60
1.50000+ 6 3.86164- 2 1.75000+ 6 2.79297- 2 2.00000+ 6 1.83645- 29643 3 60
2.50000+ 6 6.67397- 3 3.00000+ 6 2.23470- 3 4.00000+ 6 2.65697- 49643 3 60
5.00000+ 6 3.52683- 5 5.71940+ 6 8.28962- 6 6.00000+ 6 4.25634- 69643 3 60
7.00000+ 6 2.42732- 7 8.00000+ 6 1.74444- 8 9.00000+ 6 2.04933- 99643 3 60
9.50000+ 6 7.97543-10 1.00000+ 7 3.26164-10 1.05000+ 7 1.36520-109643 3 60
1.10000+ 7 5.98729-11 1.15000+ 7 2.63347-11 1.20000+ 7 1.22245-119643 3 60
1.25000+ 7 5.54420-12 1.27140+ 7 4.15416-12 1.30000+ 7 2.63949-129643 3 60
1.35000+ 7 1.24273-12 1.40000+ 7 6.07217-13 1.45000+ 7 2.98208-139643 3 60
1.50000+ 7 1.45812-13 1.60000+ 7 3.56338-14 1.70000+ 7 9.28524-159643 3 60
1.80000+ 7 2.46643-15 1.88270+ 7 8.25936-16 1.90000+ 7 6.86191-169643 3 60
2.00000+ 7 1.92594-16                                             9643 3 60
                                                                  9643 3  0
9.62430+ 4 2.40972+ 2          0         11          0          09643 3 61
0.0      + 0-5.30000+ 5          0          0          1         429643 3 61
        42          3          0          0          0          09643 3 61
5.32199+ 5 0.0      + 0 6.00000+ 5 4.69997- 5 7.00000+ 5 2.19800- 49643 3 61
7.32025+ 5 3.06102- 4 7.72191+ 5 4.36145- 4 8.00000+ 5 5.39647- 49643 3 61
8.01312+ 5 5.46675- 4 8.23403+ 5 6.43721- 4 9.00000+ 5 1.01425- 39643 3 61
1.00000+ 6 1.58990- 3 1.25000+ 6 2.91812- 3 1.50000+ 6 3.40791- 39643 3 61
1.75000+ 6 3.10400- 3 2.00000+ 6 2.44451- 3 2.50000+ 6 1.20134- 39643 3 61
3.00000+ 6 5.18118- 4 4.00000+ 6 9.32415- 5 5.00000+ 6 1.74334- 59643 3 61
5.71940+ 6 4.89745- 6 6.00000+ 6 2.64589- 6 7.00000+ 6 1.68506- 79643 3 61
8.00000+ 6 1.27645- 8 9.00000+ 6 1.57788- 9 9.50000+ 6 6.31556-109643 3 61
1.00000+ 7 2.65928-10 1.05000+ 7 1.14501-10 1.10000+ 7 5.15671-119643 3 61
1.15000+ 7 2.32412-11 1.20000+ 7 1.10158-11 1.25000+ 7 5.09388-129643 3 61
1.27140+ 7 3.84632-12 1.30000+ 7 2.46812-12 1.35000+ 7 1.18126-129643 3 61
1.40000+ 7 5.86646-13 1.45000+ 7 2.92332-13 1.50000+ 7 1.44885-139643 3 61
1.60000+ 7 3.63619-14 1.70000+ 7 9.70565-15 1.80000+ 7 2.63500-159643 3 61
1.88270+ 7 8.97025-16 1.90000+ 7 7.47721-16 2.00000+ 7 2.13639-169643 3 61
                                                                  9643 3  0
9.62430+ 4 2.40972+ 2          0         12          0          09643 3 62
0.0      + 0-7.29000+ 5          0          0          1         399643 3 62
        39          3          0          0          0          09643 3 62
7.32025+ 5 0.0      + 0 7.72191+ 5 2.68179- 3 8.00000+ 5 3.92965- 39643 3 62
8.01312+ 5 3.98660- 3 8.23403+ 5 4.85903- 3 9.00000+ 5 7.23512- 39643 3 62
1.00000+ 6 9.45303- 3 1.25000+ 6 1.19387- 2 1.50000+ 6 1.08183- 29643 3 62
1.75000+ 6 8.21840- 3 2.00000+ 6 5.59925- 3 2.50000+ 6 2.13157- 39643 3 62
3.00000+ 6 7.17682- 4 4.00000+ 6 8.21072- 5 5.00000+ 6 1.08306- 59643 3 62
5.71940+ 6 2.54097- 6 6.00000+ 6 1.29828- 6 7.00000+ 6 7.18903- 89643 3 62
8.00000+ 6 5.01640- 9 9.00000+ 6 5.74096-10 9.50000+ 6 2.21208-109643 3 62
1.00000+ 7 8.96460-11 1.05000+ 7 3.72285-11 1.10000+ 7 1.62064-119643 3 62
1.15000+ 7 7.08130-12 1.20000+ 7 3.26324-12 1.25000+ 7 1.47103-129643 3 62
1.27140+ 7 1.09923-12 1.30000+ 7 6.95934-13 1.35000+ 7 3.25623-139643 3 62
1.40000+ 7 1.58297-13 1.45000+ 7 7.72647-14 1.50000+ 7 3.75266-149643 3 62
```

Table 8 (cont'd)

```
 1.60000+ 7 9.07587-15 1.70000+ 7 2.34237-15 1.80000+ 7 6.16827-169643 3 62
 1.88270+ 7 2.05155-16 1.90000+ 7 1.70216-16 2.00000+ 7 4.74146-179643 3 62
                                                                  9643 3  0
 9.62430+ 4 2.40972+ 2          0         13          0          09643 3 63
 0.0      + 0-7.69000+ 5          0          0          1         389643 3 63
         38          3          0          0          0          09643 3 63
 7.72191+ 5 0.0      + 0 8.00000+ 5 4.77014- 3 8.01312+ 5 4.91672- 39643 3 63
 8.23403+ 5 7.14837- 3 9.00000+ 5 1.30043- 2 1.00000+ 6 1.80311- 29643 3 63
 1.25000+ 6 2.27453- 2 1.50000+ 6 2.00575- 2 1.75000+ 6 1.49244- 29643 3 63
 2.00000+ 6 1.00548- 2 2.50000+ 6 3.81292- 3 3.00000+ 6 1.29134- 39643 3 63
 4.00000+ 6 1.50378- 4 5.00000+ 6 2.01295- 5 5.71940+ 6 4.76367- 69643 3 63
 6.00000+ 6 2.44066- 6 7.00000+ 6 1.36177- 7 8.00000+ 6 9.54940- 99643 3 63
 9.00000+ 6 1.09599- 9 9.50000+ 6 4.22834-10 1.00000+ 7 1.71549-109643 3 63
 1.05000+ 7 7.13266-11 1.10000+ 7 3.10858-11 1.15000+ 7 1.35981-119643 3 63
 1.20000+ 7 6.27363-12 1.25000+ 7 2.83118-12 1.27140+ 7 2.11660-129643 3 63
 1.30000+ 7 1.34083-12 1.35000+ 7 6.27985-13 1.40000+ 7 3.05593-139643 3 63
 1.45000+ 7 1.49294-13 1.50000+ 7 7.25618-14 1.60000+ 7 1.75760-149643 3 63
 1.70000+ 7 4.54250-15 1.80000+ 7 1.19772-15 1.88270+ 7 3.98736-169643 3 63
 1.90000+ 7 3.30892-16 2.00000+ 7 9.22711-17                      9643 3 63
                                                                  9643 3  0
 9.62430+ 4 2.40972+ 2          0         14          0          09643 3 64
 0.0      + 0-7.98000+ 5          0          0          1         369643 3 64
         36          3          0          0          0          09643 3 64
 8.01312+ 5 0.0      + 0 8.23403+ 5 5.16010- 3 9.00000+ 5 1.43506- 29643 3 64
 1.00000+ 6 2.28185- 2 1.25000+ 6 3.09147- 2 1.50000+ 6 2.76551- 29643 3 64
 1.75000+ 6 2.10570- 2 2.00000+ 6 1.46587- 2 2.50000+ 6 5.89426- 39643 3 64
 3.00000+ 6 2.06168- 3 4.00000+ 6 2.39924- 4 5.00000+ 6 3.03512- 59643 3 64
 5.71940+ 6 6.88004- 6 6.00000+ 6 3.48363- 6 7.00000+ 6 1.91500- 79643 3 64
 8.00000+ 6 1.35081- 8 9.00000+ 6 1.55808- 9 9.50000+ 6 6.01150-109643 3 64
 1.00000+ 7 2.43632-10 1.05000+ 7 1.01201-10 1.10000+ 7 4.40570-119643 3 64
 1.15000+ 7 1.92620-11 1.20000+ 7 8.88826-12 1.25000+ 7 4.01328-129643 3 64
 1.27140+ 7 3.00122-12 1.30000+ 7 1.90201-12 1.35000+ 7 8.91486-139643 3 64
 1.40000+ 7 4.34179-13 1.45000+ 7 2.12247-13 1.50000+ 7 1.03208-139643 3 64
 1.60000+ 7 2.50265-14 1.70000+ 7 6.47503-15 1.80000+ 7 1.70929-159643 3 64
 1.88270+ 7 5.69645-16 1.90000+ 7 4.72833-16 2.00000+ 7 1.32043-169643 3 64
                                                                  9643 3  0
 9.62430+ 4 2.40972+ 2          0         98          0          09643 3 91
 0.0      + 0-8.20000+ 5          0          0          1         359643 3 91
         35          3          0          0          0          09643 3 91
 8.23403+ 5 0.0      + 0 9.00000+ 5 1.32820- 2 1.00000+ 6 6.06709- 29643 3 91
 1.25000+ 6 2.87527- 1 1.50000+ 6 5.55160- 1 1.75000+ 6 7.67944- 19643 3 91
 2.00000+ 6 8.97366- 1 2.50000+ 6 9.58218- 1 3.00000+ 6 9.11115- 19643 3 91
 4.00000+ 6 8.71925- 1 5.00000+ 6 9.42992- 1 5.71940+ 6 9.55843- 19643 3 91
 6.00000+ 6 8.47835- 1 7.00000+ 6 3.05839- 1 8.00000+ 6 1.23138- 19643 3 91
 9.00000+ 6 7.33611- 2 9.50000+ 6 6.25080- 2 1.00000+ 7 5.49197- 29643 3 91
 1.05000+ 7 4.84647- 2 1.10000+ 7 4.40861- 2 1.15000+ 7 3.95820- 29643 3 91
 1.20000+ 7 3.69402- 2 1.25000+ 7 3.32482- 2 1.27140+ 7 3.32741- 29643 3 91
 1.30000+ 7 3.10177- 2 1.35000+ 7 2.82801- 2 1.40000+ 7 2.64713- 29643 3 91
 1.45000+ 7 2.46450- 2 1.50000+ 7 2.25839- 2 1.60000+ 7 1.88431- 29643 3 91
 1.70000+ 7 1.61750- 2 1.80000+ 7 1.37126- 2 1.88270+ 7 1.17162- 29643 3 91
 1.90000+ 7 1.18116- 2 2.00000+ 7 9.98792- 3                      9643 3 91
                                                                  9643 3  0
 9.62430+ 4 2.40972+ 2          0         99          0          09643 3102
 0.0      + 0 0.0      + 0          0          0          3        2169643 3102
          3          2        141          2        216          59643 3102
 1.00000- 5 0.0      + 0 2.53000- 2 0.0      + 0 2.70000+ 1 0.0      + 09643 3102
 2.70000+ 1 1.22540+ 1 2.72480+ 1 1.22290+ 1 2.75370+ 1 1.22210+ 19643 3102
 2.79150+ 1 1.22330+ 1 2.89750+ 1 1.23070+ 1 3.02680+ 1 1.23580+ 19643 3102
 3.12170+ 1 1.23710+ 1 3.19930+ 1 1.23410+ 1 3.29050+ 1 1.22670+ 19643 3102
```

Table 8 (cont'd)

3.37020+	1	1.22080+	1	3.41520+	1	1.21930+	1	3.45400+	1	1.21950+	19643	3102
3.49310+	1	1.22110+	1	3.57190+	1	1.22830+	1	3.63150+	1	1.23400+	19643	3102
3.68160+	1	1.23550+	1	3.73200+	1	1.23320+	1	3.81000+	1	1.22550+	19643	3102
3.88540+	1	1.21940+	1	3.94060+	1	1.21700+	1	4.00330+	1	1.21570+	19643	3102
4.25220+	1	1.21330+	1	4.31410+	1	1.21320+	1	4.37740+	1	1.21370+	19643	3102
4.44630+	1	1.21510+	1	4.63210+	1	1.22310+	1	4.70700+	1	1.22530+	19643	3102
4.77920+	1	1.22500+	1	4.86710+	1	1.22190+	1	5.01090+	1	1.21640+	19643	3102
5.09020+	1	1.21470+	1	5.16110+	1	1.21420+	1	5.23360+	1	1.21430+	19643	3102
5.30230+	1	1.21530+	1	5.36680+	1	1.21720+	1	5.44930+	1	1.22180+	19643	3102
5.60820+	1	1.23630+	1	5.69030+	1	1.24200+	1	5.76820+	1	1.24310+	19643	3102
5.86630+	1	1.23880+	1	6.03750+	1	1.22820+	1	6.11600+	1	1.22630+	19643	3102
6.18270+	1	1.22720+	1	6.25720+	1	1.23130+	1	6.36810+	1	1.24410+	19643	3102
6.48910+	1	1.26180+	1	6.58400+	1	1.27010+	1	6.69610+	1	1.26950+	19643	3102
6.84230+	1	1.26520+	1	6.93710+	1	1.27030+	1	7.05840+	1	1.28990+	19643	3102
7.20820+	1	1.32000+	1	7.31080+	1	1.32740+	1	7.42440+	1	1.31690+	19643	3102
7.73430+	1	1.26480+	1	7.90620+	1	1.25000+	1	8.11420+	1	1.24080+	19643	3102
8.62160+	1	1.22860+	1	8.75590+	1	1.22790+	1	8.88180+	1	1.23020+	19643	3102
9.02220+	1	1.23680+	1	9.38820+	1	1.26830+	1	9.54090+	1	1.27650+	19643	3102
9.68410+	1	1.27480+	1	9.85760+	1	1.26210+	1	1.01480+	2	1.23770+	19643	3102
1.02760+	2	1.23200+	1	1.04070+	2	1.22980+	1	1.05400+	2	1.23070+	19643	3102
1.09090+	2	1.24050+	1	1.10840+	2	1.24110+	1	1.12970+	2	1.23620+	19643	3102
1.15840+	2	1.22880+	1	1.17760+	2	1.22680+	1	1.19720+	2	1.22730+	19643	3102
1.22110+	2	1.23100+	1	1.27910+	2	1.25030+	1	1.30130+	2	1.25370+	19643	3102
1.32420+	2	1.25060+	1	1.35420+	2	1.23980+	1	1.40110+	2	1.22360+	19643	3102
1.42430+	2	1.21920+	1	1.44570+	2	1.21710+	1	1.46760+	2	1.21630+	19643	3102
1.49240+	2	1.21640+	1	1.52310+	2	1.21780+	1	1.56290+	2	1.22160+	19643	3102
1.60420+	2	1.22650+	1	1.63550+	2	1.22800+	1	1.70410+	2	1.22710+	19643	3102
1.78690+	2	1.23120+	1	1.82720+	2	1.22990+	1	1.89750+	2	1.22490+	19643	3102
1.93410+	2	1.22470+	1	1.97950+	2	1.22750+	1	2.03860+	2	1.23260+	19643	3102
2.07530+	2	1.23300+	1	2.11300+	2	1.22990+	1	2.18260+	2	1.22210+	19643	3102
2.21860+	2	1.22040+	1	2.25560+	2	1.22040+	1	2.43940+	2	1.22750+	19643	3102
2.50390+	2	1.23380+	1	2.58240+	2	1.24400+	1	2.64070+	2	1.24760+	19643	3102
2.71330+	2	1.24550+	1	2.95020+	2	1.22750+	1	3.04340+	2	1.22420+	19643	3102
3.18000+	2	1.22200+	1	3.26800+	2	1.22220+	1	3.40270+	2	1.22590+	19643	3102
3.50020+	2	1.22790+	1	3.79870+	2	1.22670+	1	3.98990+	2	1.22860+	19643	3102
4.14870+	2	1.23070+	1	4.25590+	2	1.22900+	1	4.41820+	2	1.22440+	19643	3102
4.50940+	2	1.22400+	1	4.64480+	2	1.22650+	1	4.87440+	2	1.23160+	19643	3102
5.04230+	2	1.23310+	1	5.16990+	2	1.23120+	1	5.35340+	2	1.22610+	19643	3102
5.45770+	2	1.22530+	1	5.56500+	2	1.22700+	1	5.80870+	2	1.23490+	19643	3102
5.94660+	2	1.23650+	1	6.30260+	2	1.23280+	1	6.45860+	2	1.23490+	19643	3102
6.73980+	2	1.24290+	1	6.93760+	2	1.24370+	1	7.73270+	2	1.23380+	19643	3102
8.10230+	2	1.23290+	1	8.36350+	2	1.23550+	1	8.74390+	2	1.24270+	19643	3102
9.03710+	2	1.24300+	1	9.54600+	2	1.24120+	1	1.00000+	3	1.23905+	19643	3102
1.00000+	3	2.22585+	0	2.00000+	3	1.39389+	0	3.00000+	3	1.07155+	09643	3102
4.00000+	3	8.88961-	1	5.00000+	3	7.78517-	1	6.00000+	3	7.02130-	19643	3102
7.00000+	3	6.44727-	1	8.00000+	3	5.98976-	1	9.00000+	3	5.64212-	19643	3102
1.00000+	4	5.35107-	1	2.00000+	4	3.88180-	1	3.00000+	4	3.24112-	19643	3102
4.00000+	4	2.84552-	1	4.21743+	4	2.76506-	1	5.00000+	4	2.40740-	19643	3102
6.00000+	4	2.12790-	1	7.00000+	4	1.92036-	1	8.00000+	4	1.76176-	19643	3102
8.73610+	4	1.66759-	1	9.00000+	4	1.63065-	1	9.43901+	4	1.57843-	19643	3102
1.00000+	5	1.45218-	1	1.33552+	5	1.10847-	1	1.50000+	5	9.67992-	29643	3102
1.53635+	5	9.46301-	2	1.64681+	5	8.79358-	2	2.00000+	5	7.26948-	29643	3102
2.19909+	5	6.75022-	2	2.28946+	5	6.56107-	2	2.61079+	5	5.99849-	29643	3102
3.00000+	5	5.48141-	2	4.00000+	5	4.79135-	2	5.00000+	5	4.41985-	29643	3102
5.32199+	5	4.30919-	2	6.00000+	5	4.16821-	2	7.00000+	5	4.02553-	29643	3102
7.32025+	5	4.02915-	2	7.72191+	5	4.03680-	2	8.00000+	5	4.02836-	29643	3102
8.01312+	5	4.03065-	2	8.23403+	5	4.03594-	2	9.00000+	5	4.10438-	29643	3102
1.00000+	6	4.30544-	2	1.25000+	6	4.67225-	2	1.50000+	6	4.44248-	29643	3102
1.75000+	6	3.83553-	2	2.00000+	6	3.10122-	2	2.50000+	6	1.80299-	29643	3102

Table 8 (cont'd)

3.00000+ 6	9.84782- 3	4.00000+ 6	2.98895- 3	5.00000+ 6	9.17023-	49643	3102
5.71940+ 6	3.77955- 4	6.00000+ 6	2.39062- 4	7.00000+ 6	2.79072-	59643	3102
8.00000+ 6	4.12750- 6	9.00000+ 6	1.01791- 6	9.50000+ 6	5.79998-	79643	3102
1.00000+ 7	3.48086- 7	1.05000+ 7	2.13652- 7	1.10000+ 7	1.37128-	79643	3102
1.15000+ 7	8.84009- 8	1.20000+ 7	6.03481- 8	1.25000+ 7	4.08374-	89643	3102
1.27140+ 7	3.65666- 8	1.30000+ 7	2.97101- 8	1.35000+ 7	2.19711-	89643	3102
1.40000+ 7	1.72315- 8	1.45000+ 7	1.38314- 8	1.50000+ 7	1.11330-	89643	3102
1.60000+ 7	7.42804- 9	1.70000+ 7	5.26155- 9	1.80000+ 7	3.79428-	99643	3102
1.88270+ 7	2.88171- 9	1.90000+ 7	2.83849- 9	2.00000+ 7	2.11729-	99643	3102
						9643	3 0
9.62430+ 4	2.40972+ 2	0	0	0		09643	3251
0.0 + 0	0.0 + 0	0	0	1		769643	3251
76	3	0	0	0		09643	3251
1.00000- 5	2.76660- 3	1.00000+ 3	3.75660- 3	2.00000+ 3	4.85167-	39643	3251
3.00000+ 3	5.99384- 3	4.00000+ 3	7.17300- 3	5.00000+ 3	8.37434-	39643	3251
6.00000+ 3	9.59583- 3	7.00000+ 3	1.08354- 2	8.00000+ 3	1.20914-	29643	3251
9.00000+ 3	1.33573- 2	1.00000+ 4	1.46349- 2	2.00000+ 4	2.77872-	29643	3251
3.00000+ 4	4.12465- 2	4.00000+ 4	5.47317- 2	4.21743+ 4	5.76683-	29643	3251
5.00000+ 4	6.83020- 2	6.00000+ 4	8.16055- 2	7.00000+ 4	9.46554-	29643	3251
8.00000+ 4	1.07415- 1	8.73610+ 4	1.16608- 1	9.00000+ 4	1.19858-	19643	3251
9.43901+ 4	1.25233- 1	1.00000+ 5	1.32197- 1	1.33552+ 5	1.71101-	19643	3251
1.50000+ 5	1.89012- 1	1.53635+ 5	1.92827- 1	1.64681+ 5	2.04163-	19643	3251
2.00000+ 5	2.37855- 1	2.19909+ 5	2.55199- 1	2.28946+ 5	2.62699-	19643	3251
2.61079+ 5	2.87643- 1	3.00000+ 5	3.14651- 1	4.00000+ 5	3.71177-	19643	3251
5.00000+ 5	4.13998- 1	5.32199+ 5	4.25695- 1	6.00000+ 5	4.47168-	19643	3251
7.00000+ 5	4.72886- 1	7.32025+ 5	4.79683- 1	7.72191+ 5	4.87521-	19643	3251
8.00000+ 5	4.92655- 1	8.01312+ 5	4.92874- 1	8.23403+ 5	4.96624-	19643	3251
9.00000+ 5	5.08205- 1	1.00000+ 6	5.20728- 1	1.25000+ 6	5.49829-	19643	3251
1.50000+ 6	5.84694- 1	1.75000+ 6	6.23987- 1	2.00000+ 6	6.62243-	19643	3251
2.50000+ 6	7.23304- 1	3.00000+ 6	7.63135- 1	4.00000+ 6	8.06048-	19643	3251
5.00000+ 6	8.24937- 1	5.71940+ 6	8.30090- 1	6.00000+ 6	8.30918-	19643	3251
7.00000+ 6	8.31291- 1	8.00000+ 6	8.30759- 1	9.00000+ 6	8.32609-	19643	3251
9.50000+ 6	8.35365- 1	1.00000+ 7	8.39644- 1	1.05000+ 7	8.45402-	19643	3251
1.10000+ 7	8.52374- 1	1.15000+ 7	8.60146- 1	1.20000+ 7	8.68283-	19643	3251
1.25000+ 7	8.76420- 1	1.27140+ 7	8.79835- 1	1.30000+ 7	8.84301-	19643	3251
1.35000+ 7	8.91771- 1	1.40000+ 7	8.98748- 1	1.45000+ 7	9.05196-	19643	3251
1.50000+ 7	9.11107- 1	1.60000+ 7	9.21348- 1	1.70000+ 7	9.29621-	19643	3251
1.80000+ 7	9.36165- 1	1.88270+ 7	9.40475- 1	1.90000+ 7	9.41267-	19643	3251
2.00000+ 7	9.45213- 1					9643	3251
						9643	3 0
						9643	0 0

Table 9 Comparison of resonance integrals*

reference	fission	capture	absorption
71 Thompson[14)]	1860 ± 400		
72 Berreth[15)]			2345 ± 470
77 Bemis[19)]	1575 ± 136	214.4 ± 20.3	
80 Zhuravlev[20)]	1480 ± 150		
ENDF/B-V**	1960	250	2210
ENDL-78**	777	121	898
Present**	1752	405	2157

* All values are given in barns.

** They were calculated above 0.5 eV.

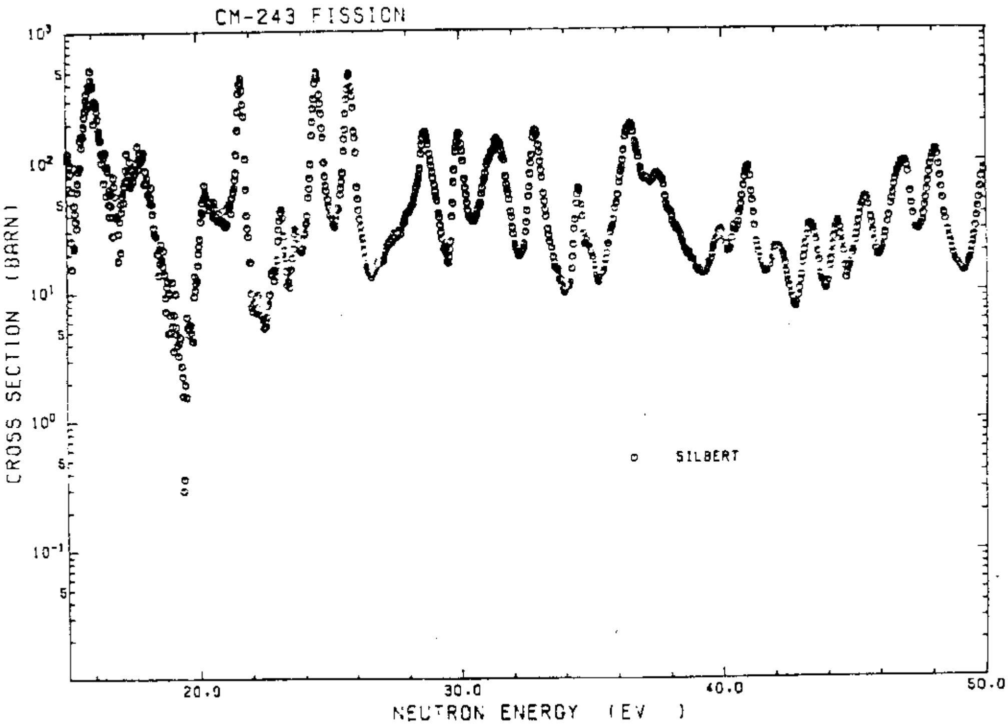

Fig. 1-1 Experimental data of the ^{243}Cm fission cross section.

Figs. 1-1 to 1-6 show the experimental data of the ^{243}Cm fission cross section.

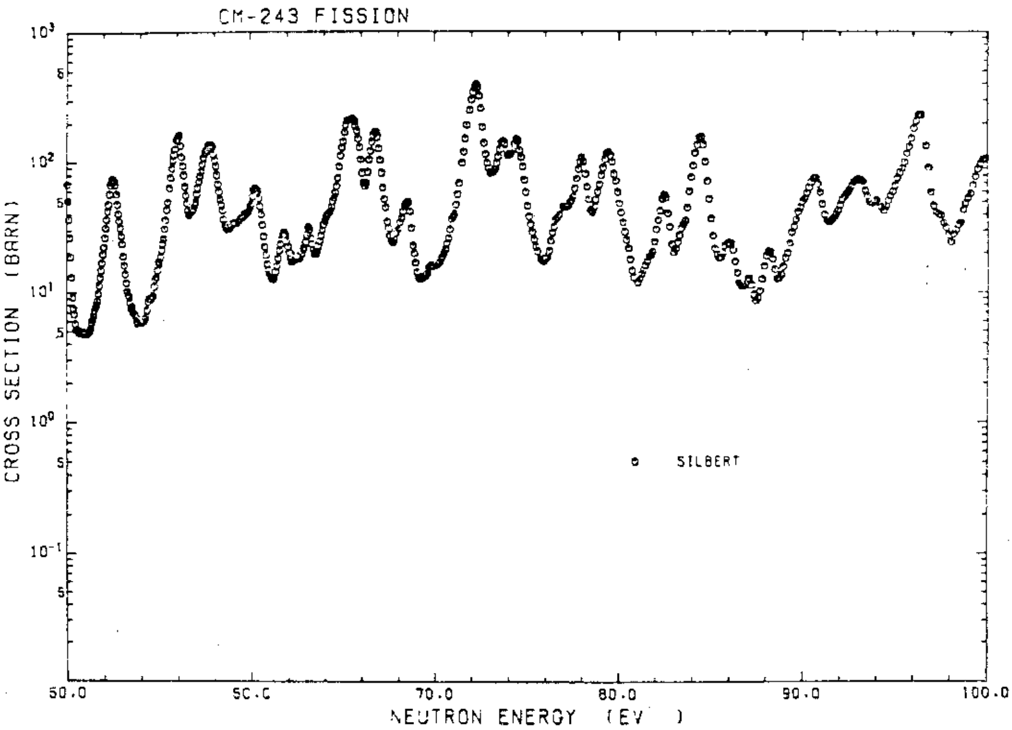

Fig. 1-2 Experimental data of the ^{243}Cm fission cross section.

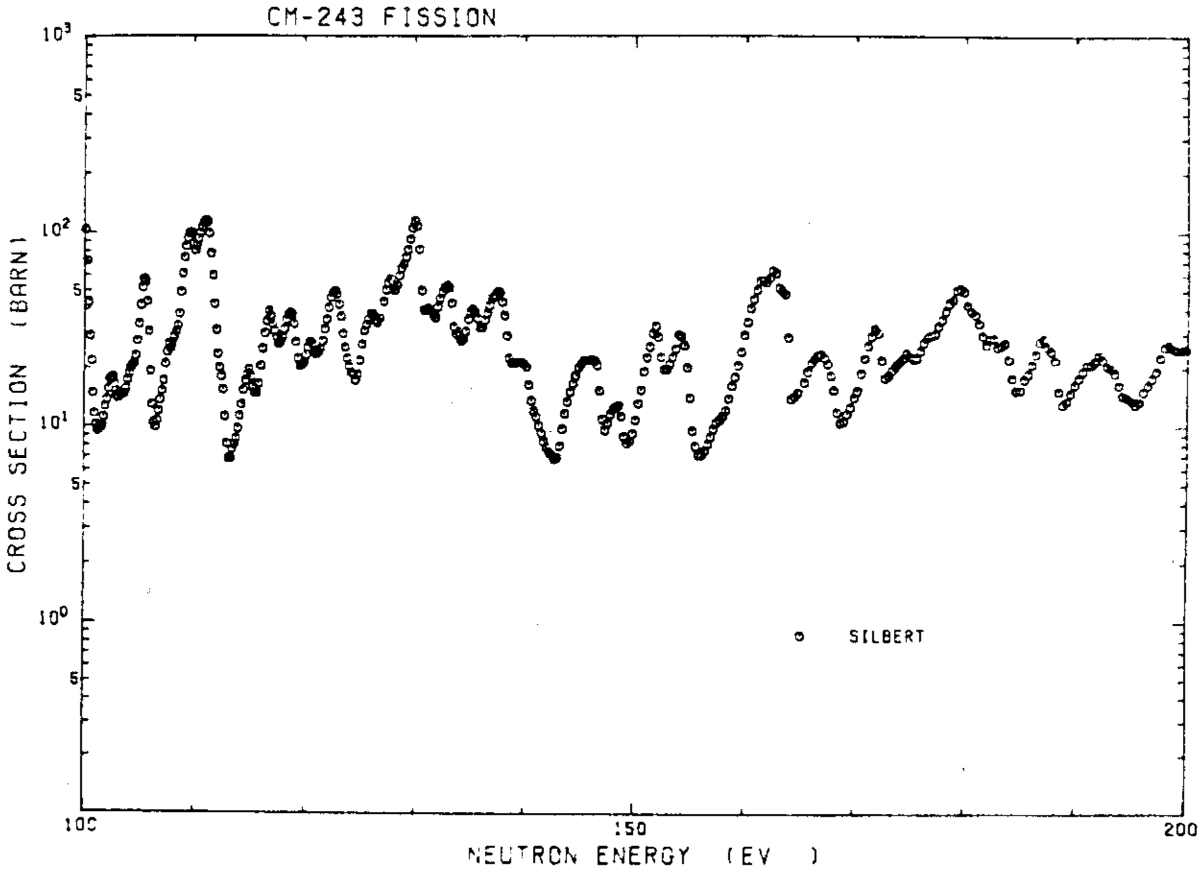

Fig. 1-3 Experimantal data of the ^{243}Cm fission cross section.

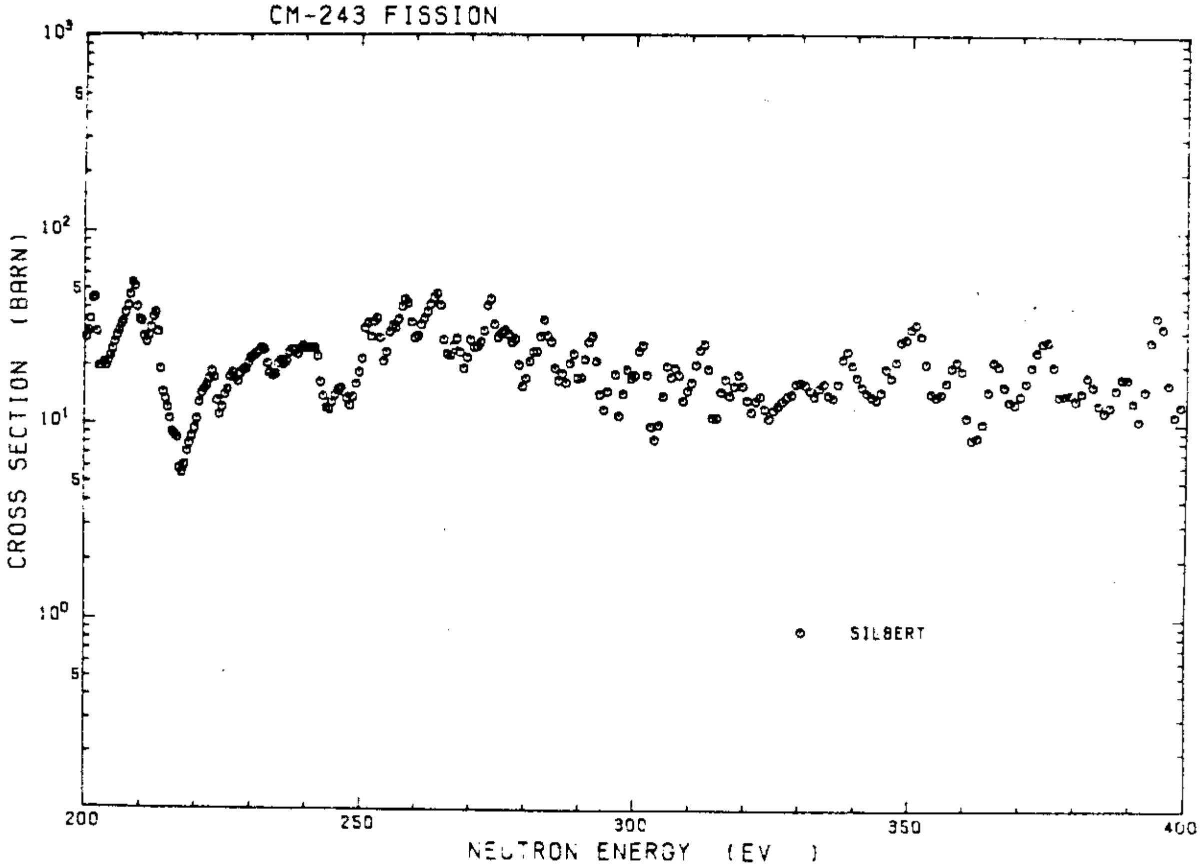

Fig. 1-4 Experimental data of the ^{243}Cm fission cross section.

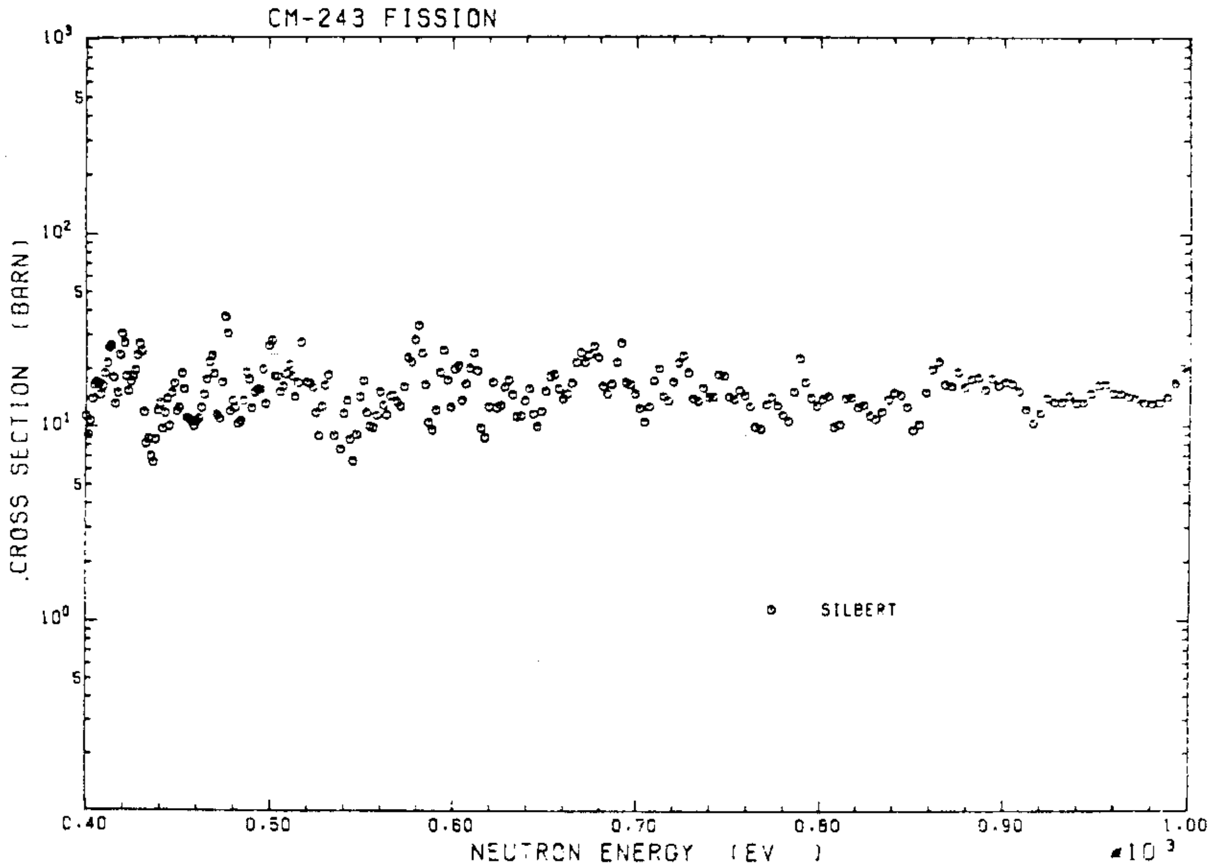

Fig. 1-5 Experimental data of the ^{243}Cm fission cross section.

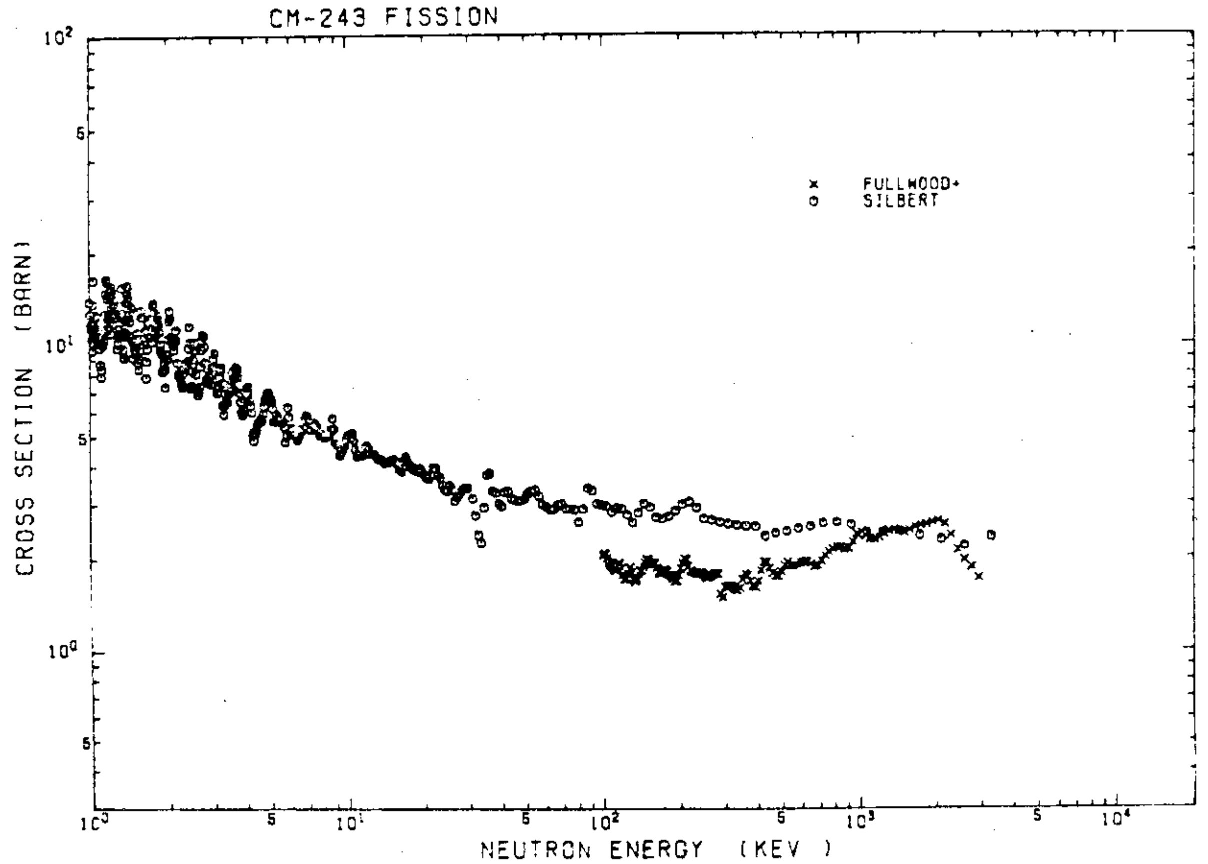

Fig. 1-6 Experimental data of the ^{243}Cm fission cross section.

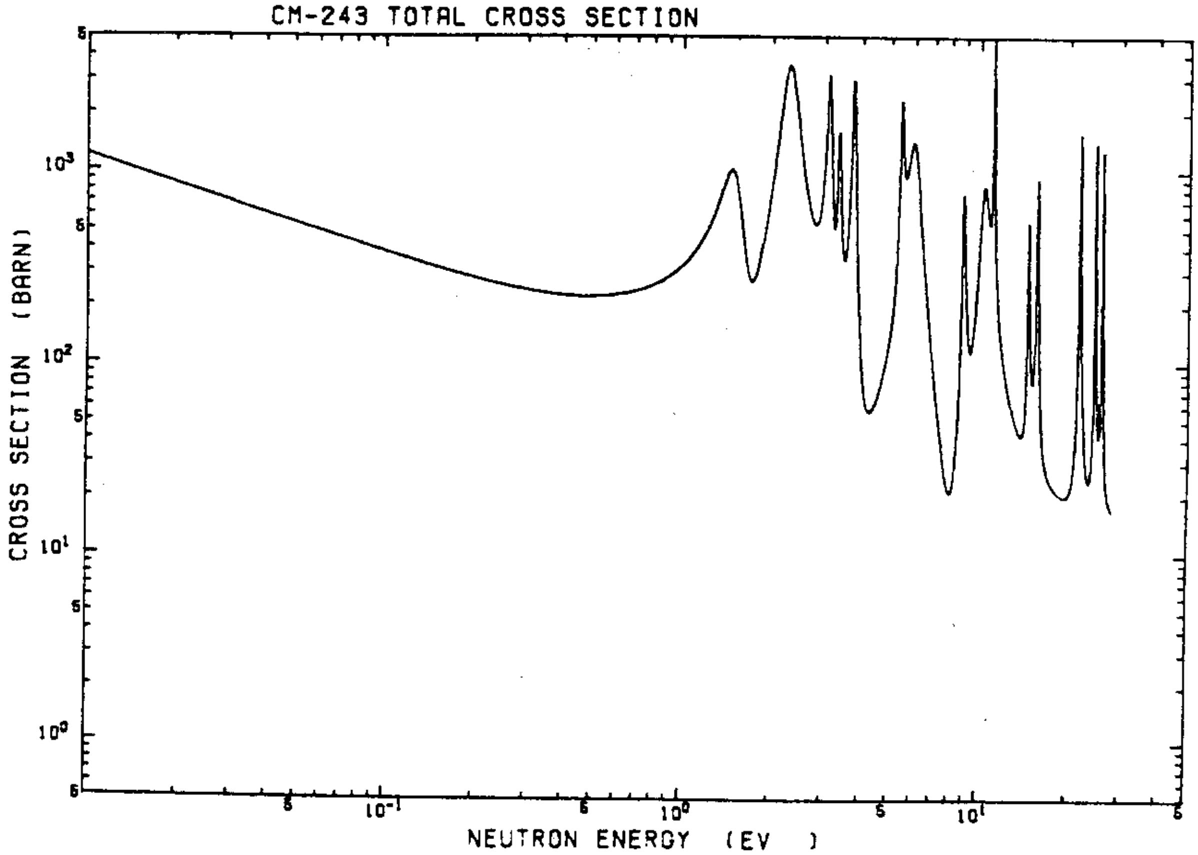

Fig. 2-1 The total cross section calculated from resonance parameters.

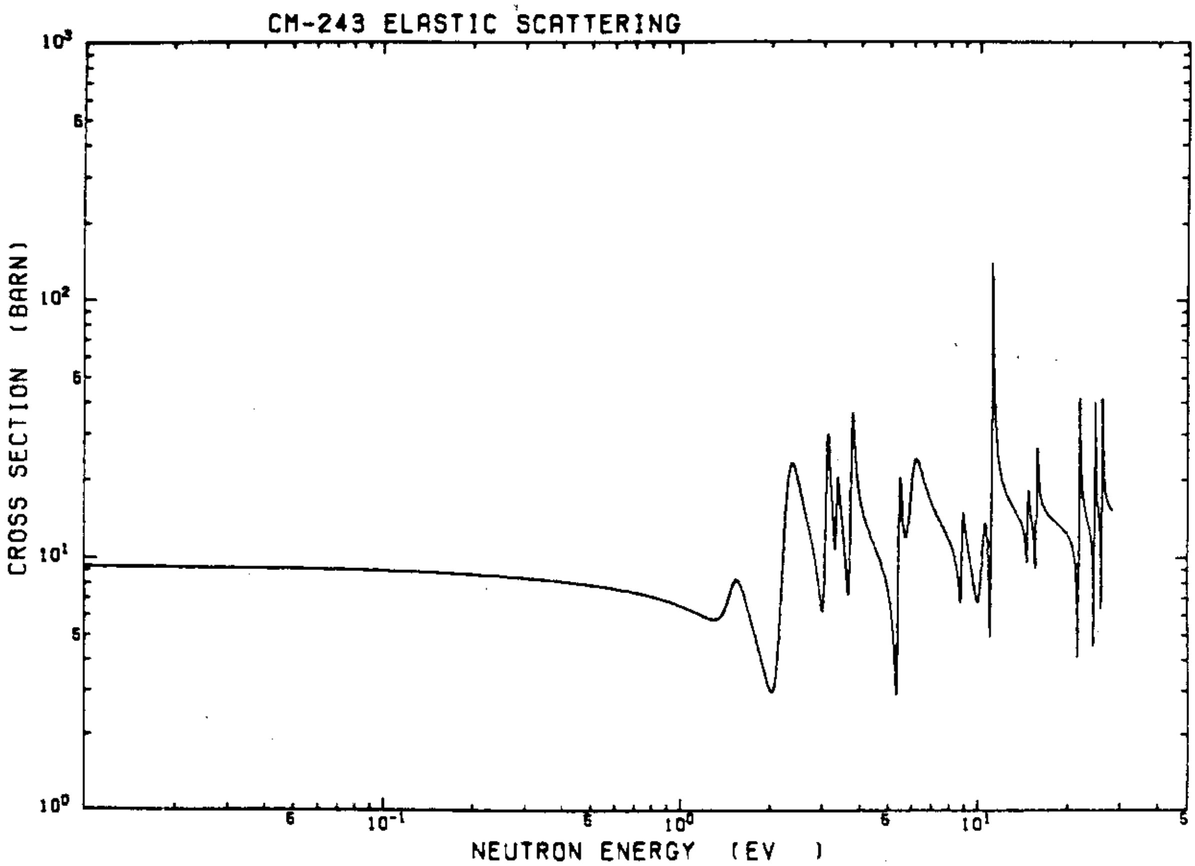

Fig. 2-2 The elastic scattering cross section calculated from resonance parameters.

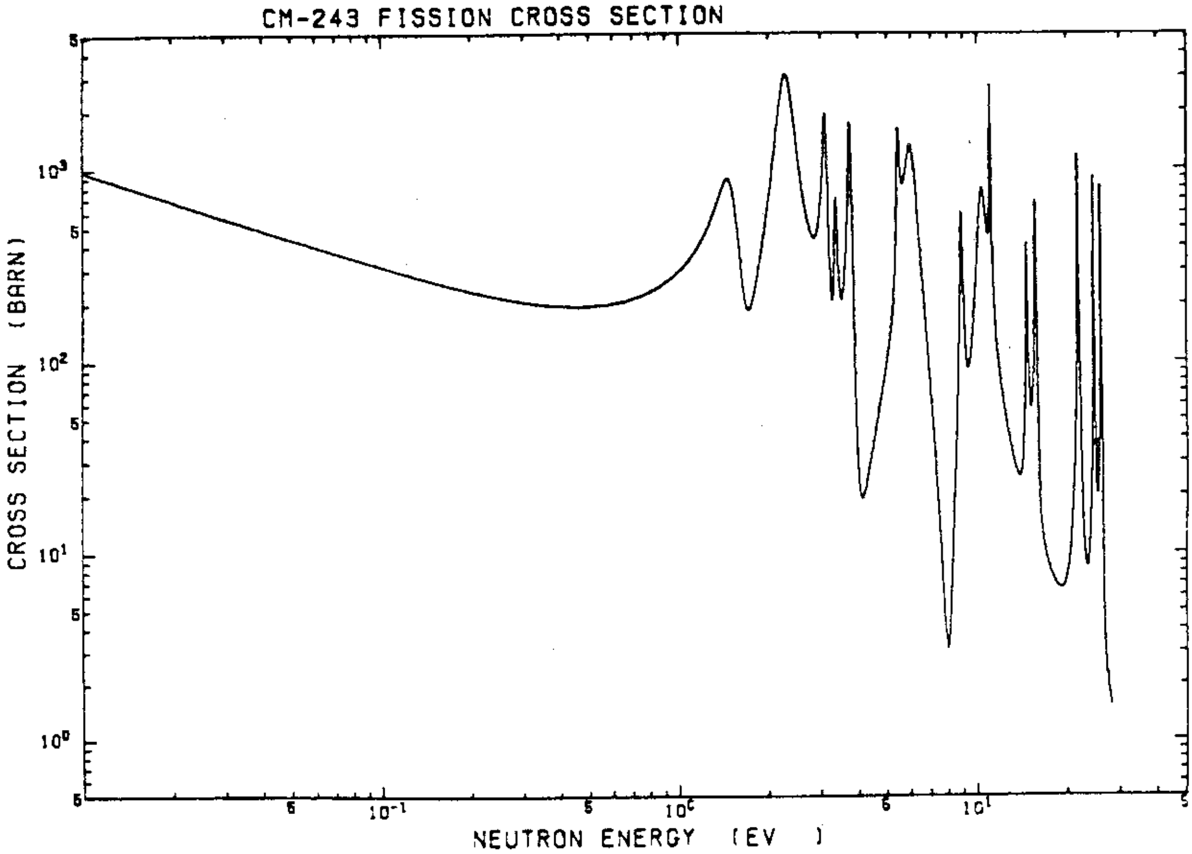

Fig. 2-3 The fission cross section calculated from resonance parameters.

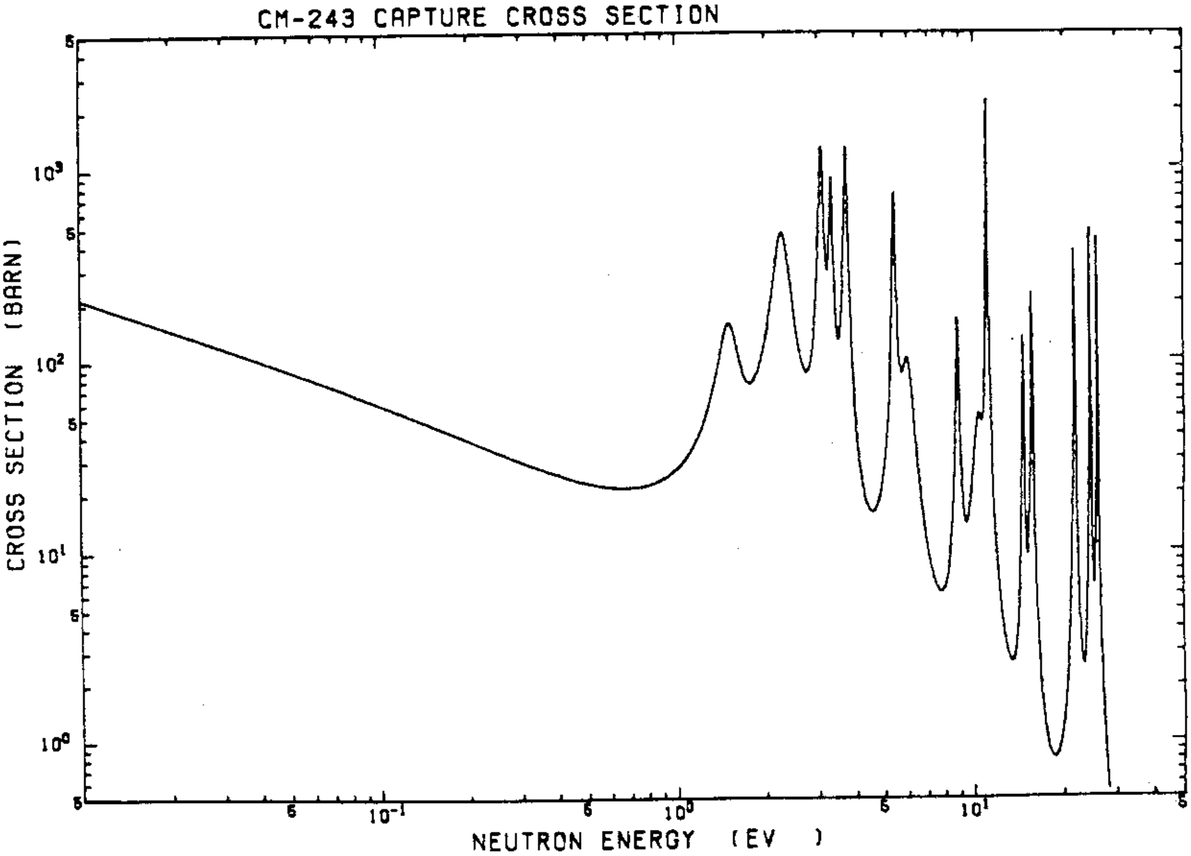

Fig. 2-4 The capture cross section calculated from resonance parameters.

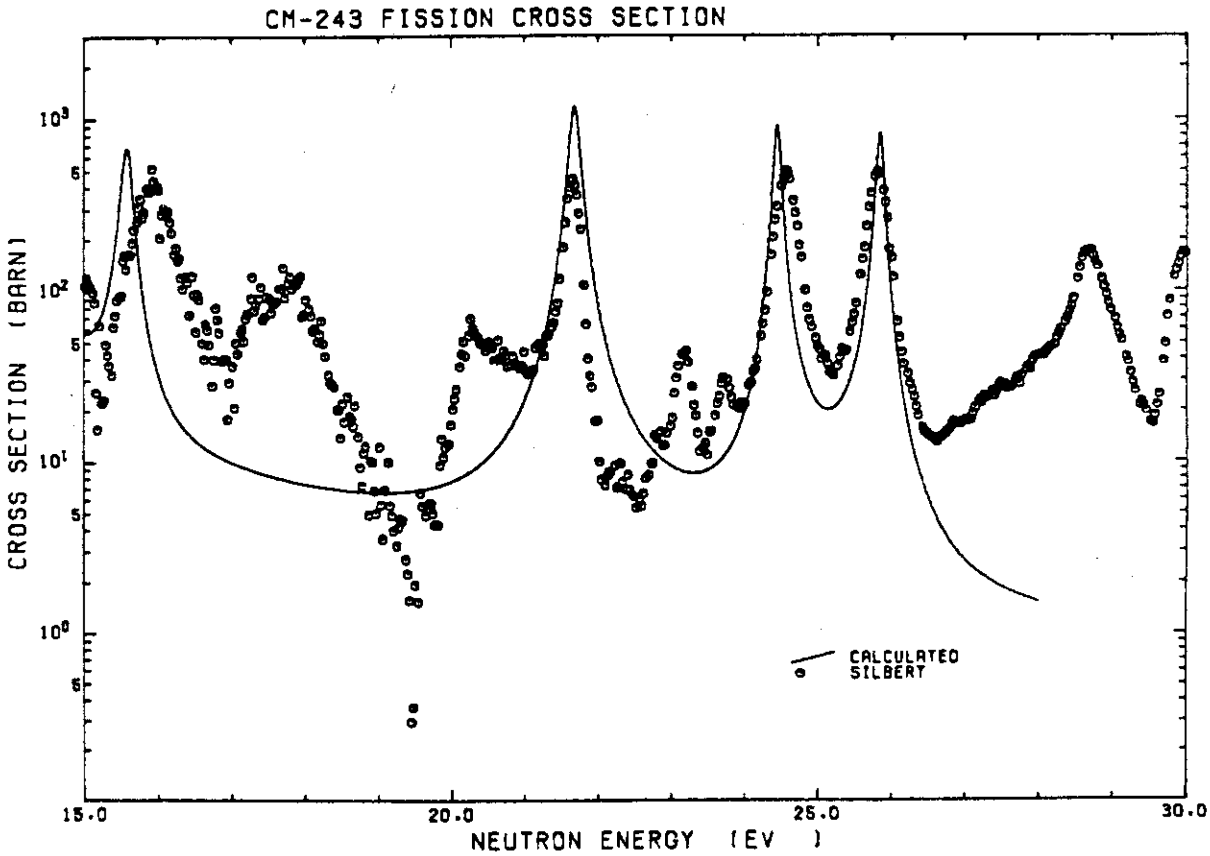

Fig. 3 Comparison of the calculated fission cross section with experimental data.

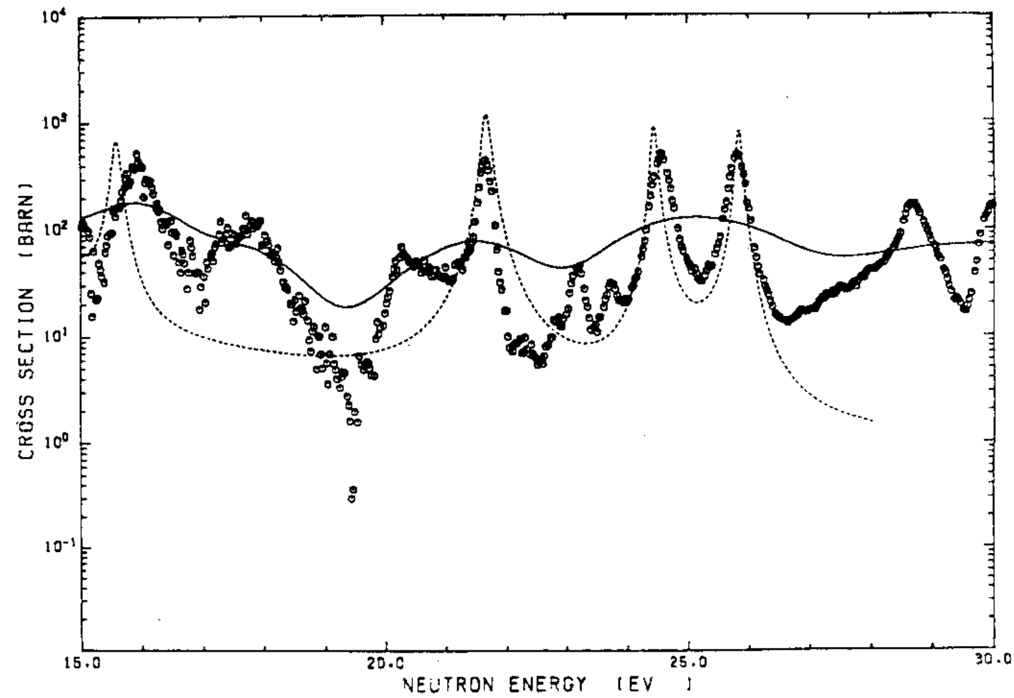

Fig. 4-1 Comparison of the smoothed fission cross section with experimental data.

A solid curve shows the smoothed cross section. Open circles are the experimental data by Silbert[18]. The cross section calculated from resonance parameters is also shown with a dotted curve.

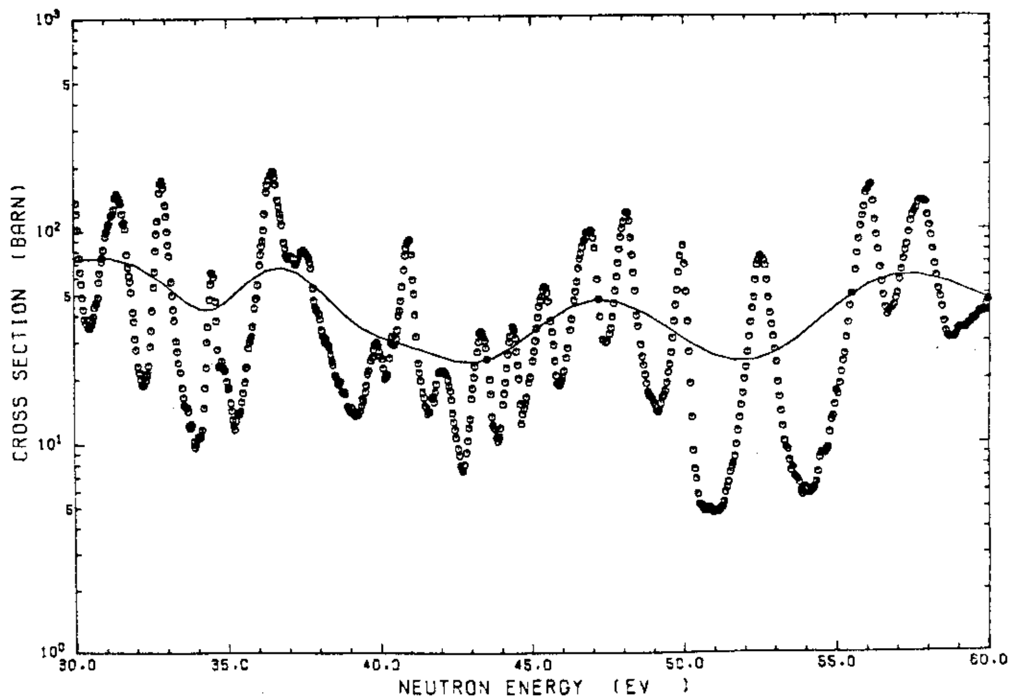

Fig. 4-2 Comparison of the smoothed fission cross section with experimental data.

A solid curve shows the smoothed cross section. Open circles are the experimental data by Silbert[18].

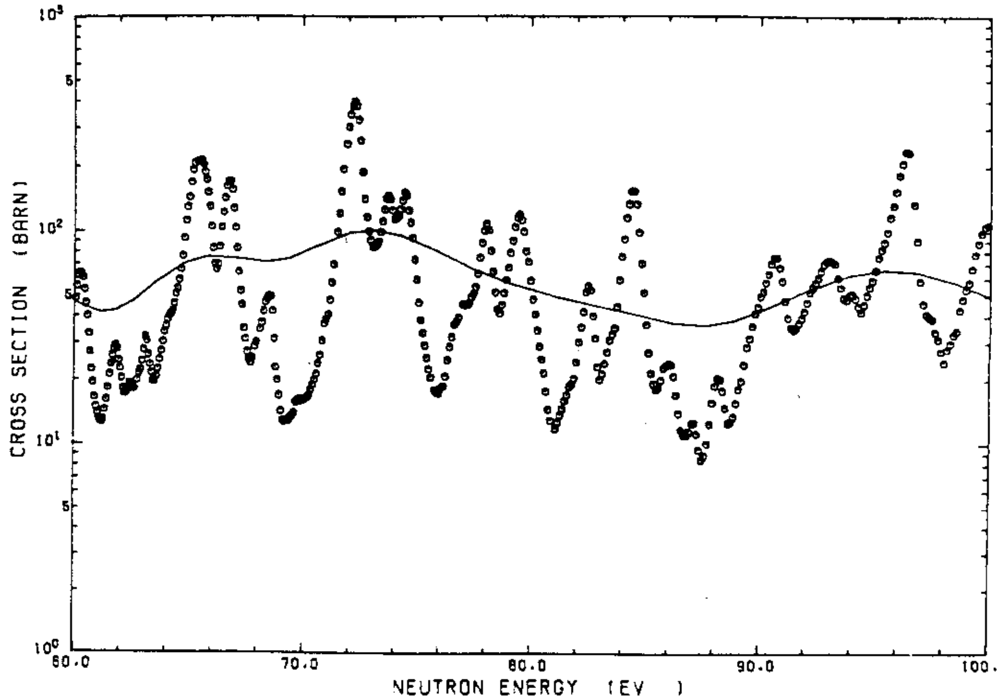

Fig. 4-3 Comparison of the smoothed fission cross section with experimental data. A solid curve shows the smoothed cross section. Open circles are the experimental data by Silbert[18].

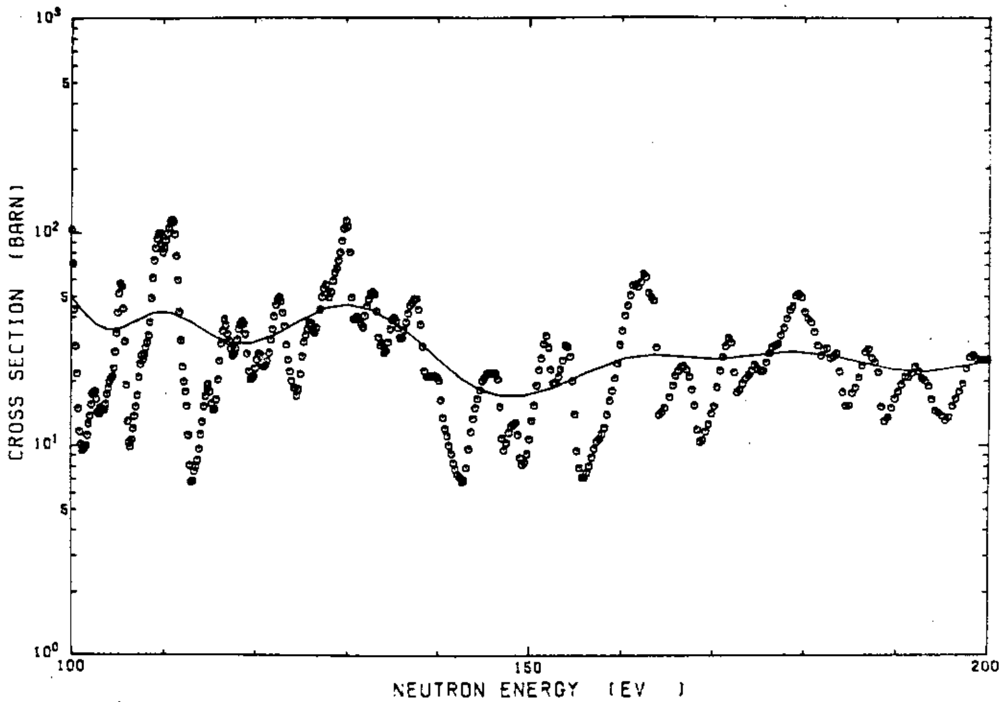

Fig. 4-4 Comparison of the smoothed fission cross section with experimental data. A solid curve shows the smoothed cross section. Open circles are the experimental data by Silbert[18].

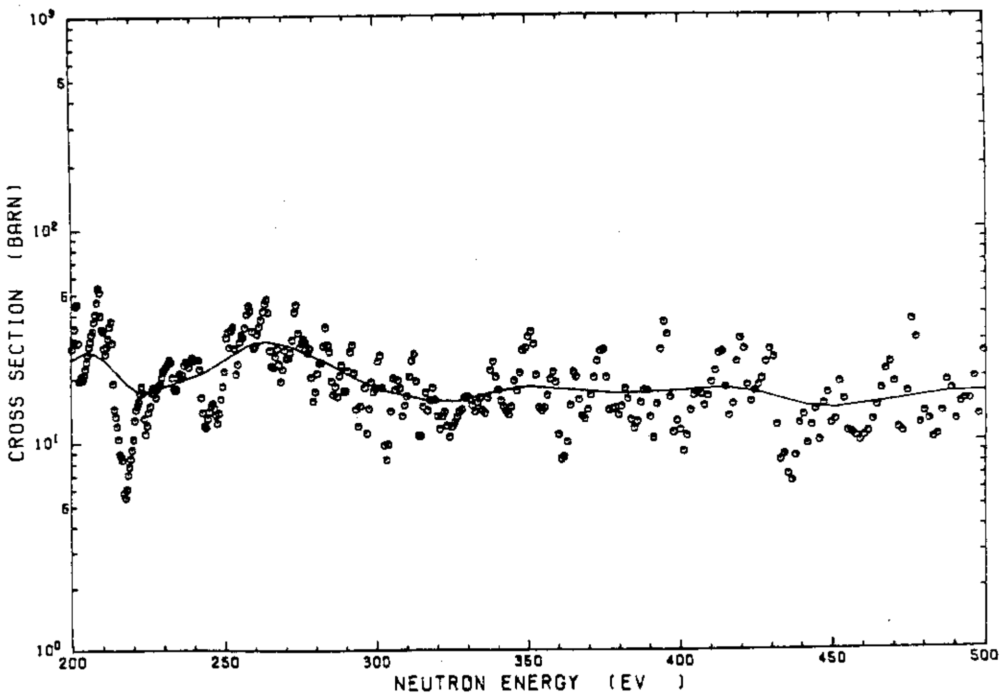

Fig. 4-5 Comparison of the smoothed fission cross section with experimental data. A solid curve shows the smoothed cross section. Open circles are the experimental data by Silbert[18].

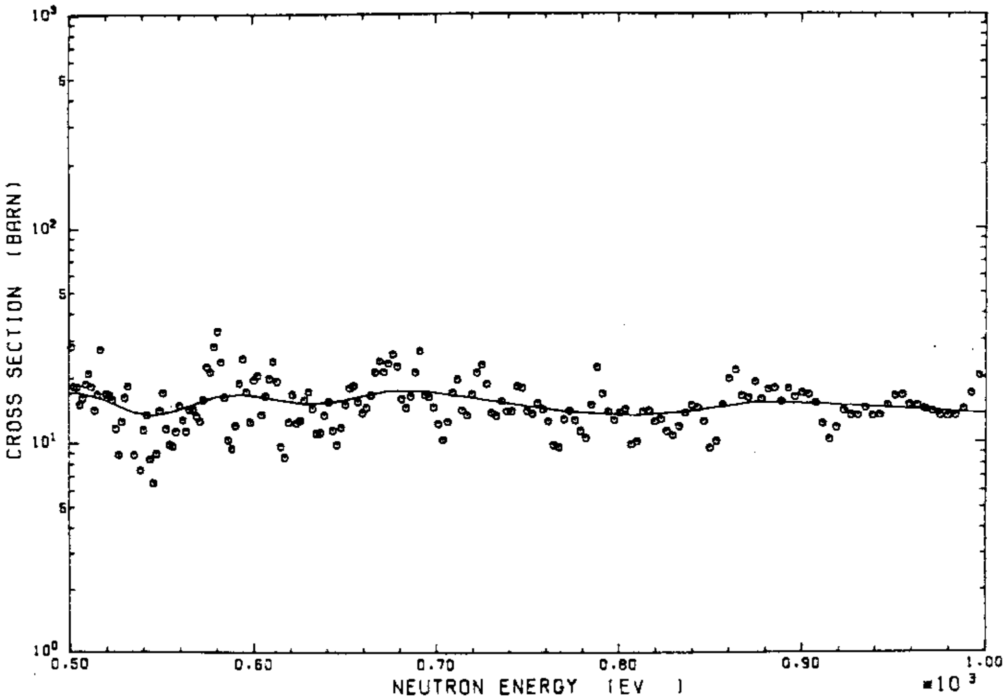

Fig. 4-6 Comparison of the smoothed fission cross section with experimental data. A solid curve shows the smoothed cross section. Open circles are the experimental data by Silbert[18].

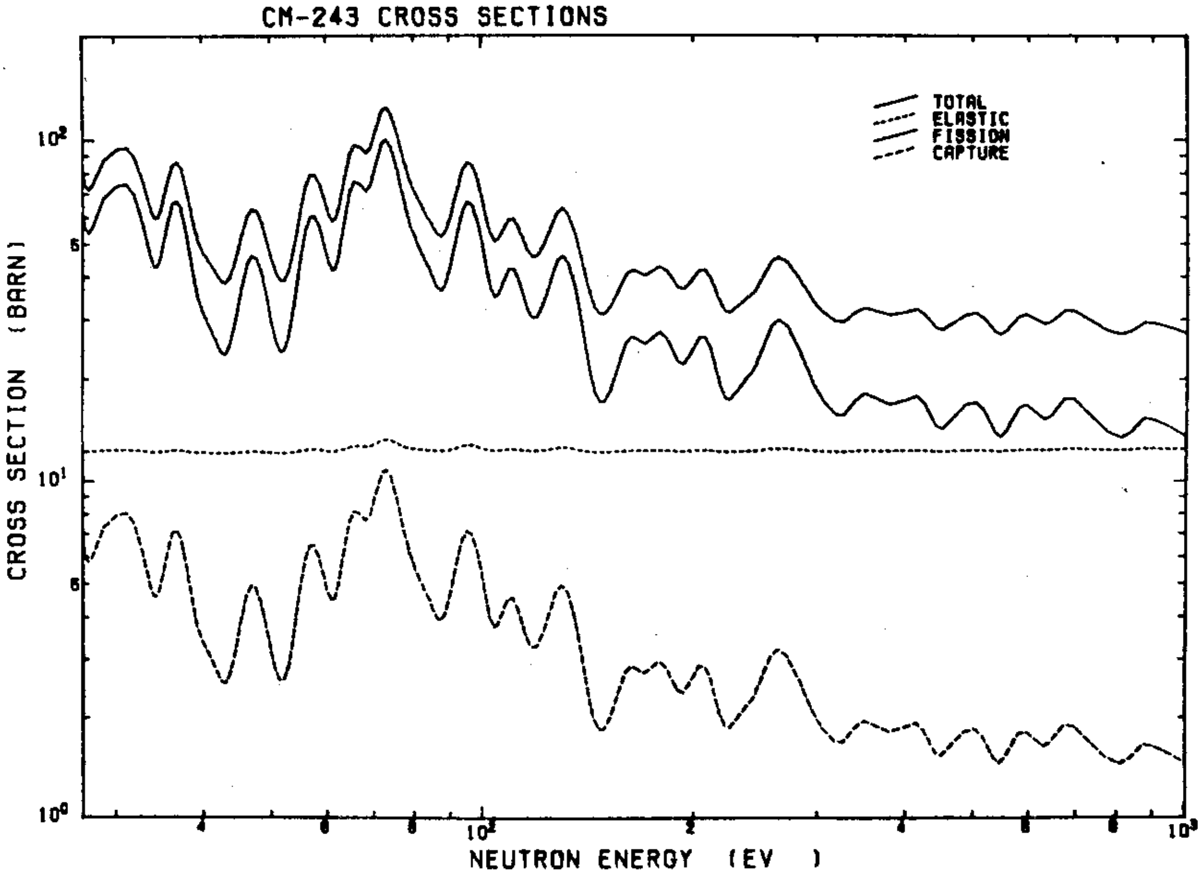

Fig. 5 Cross sections evaluated in the energy range of 27 eV to 1 keV.

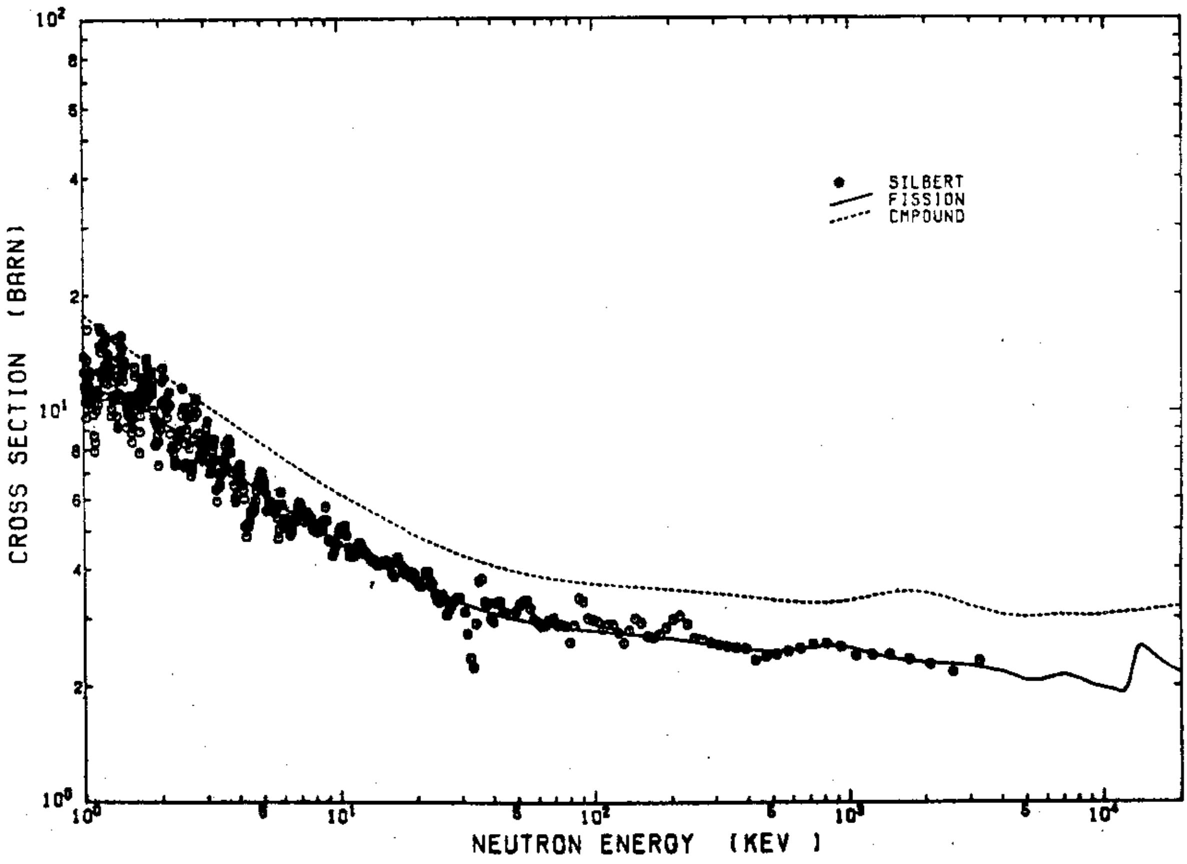

Fig. 6 The fission and compound nucleus formation cross sections above 1 keV.

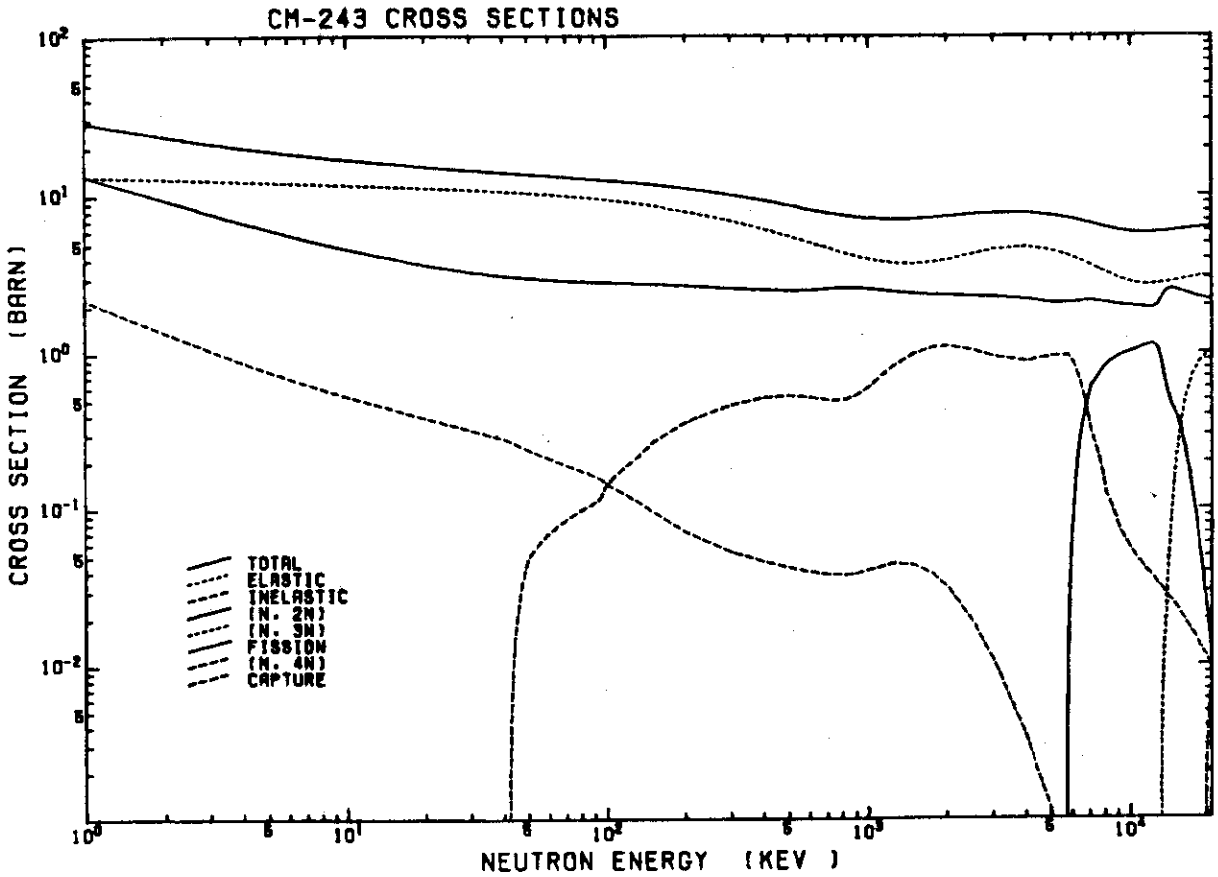

Fig. 7 Evaluated cross sections above 1 keV.

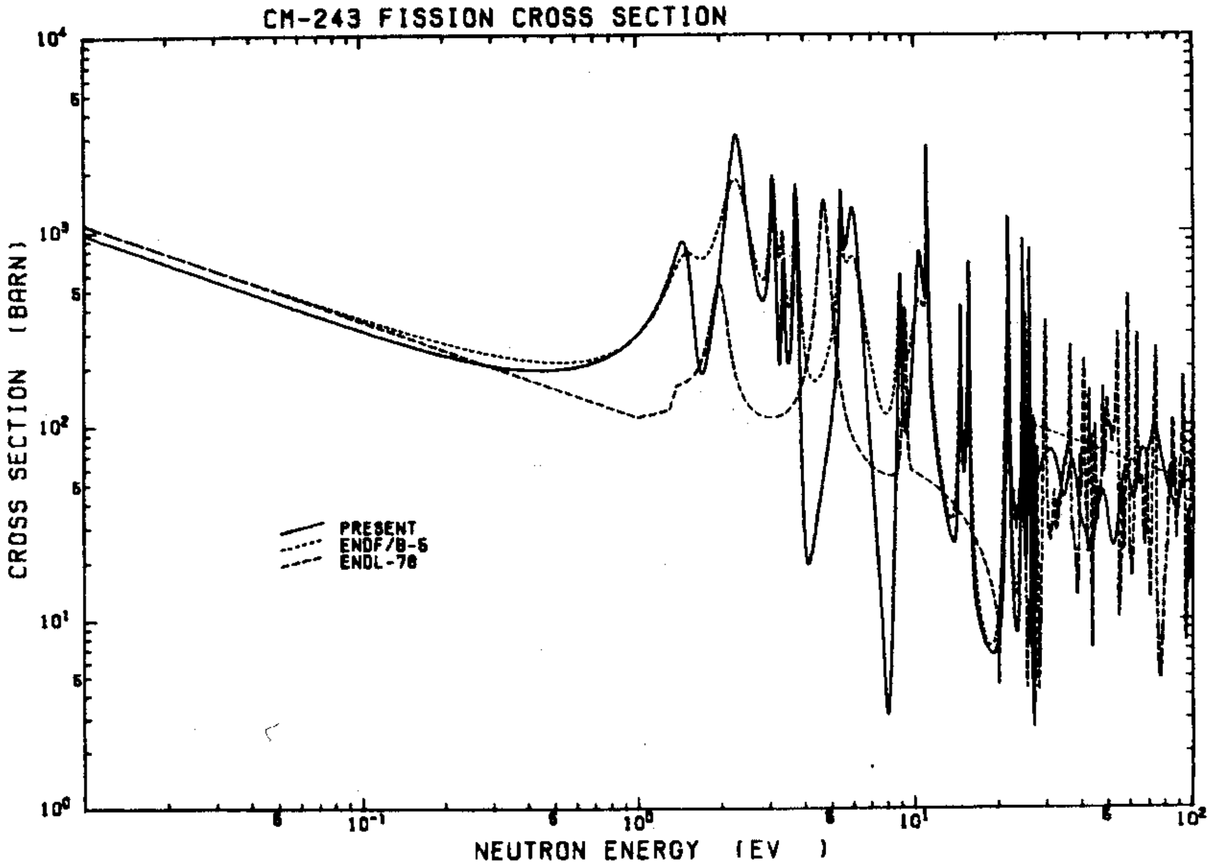

Fig. 8-1 Comparison of the evaluated fission cross sections below 100 eV.

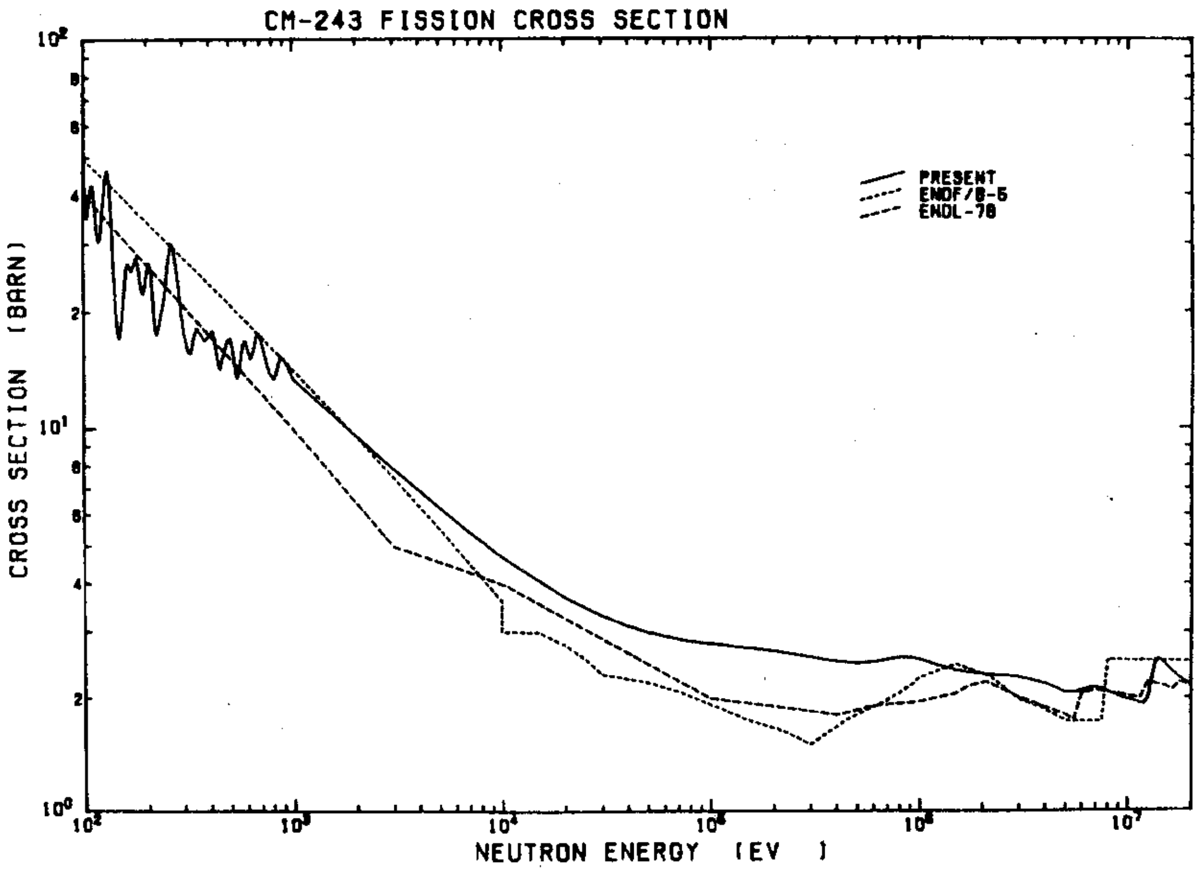

Fig. 8-2 Comparison of the evaluated fission cross sections above 100 eV.

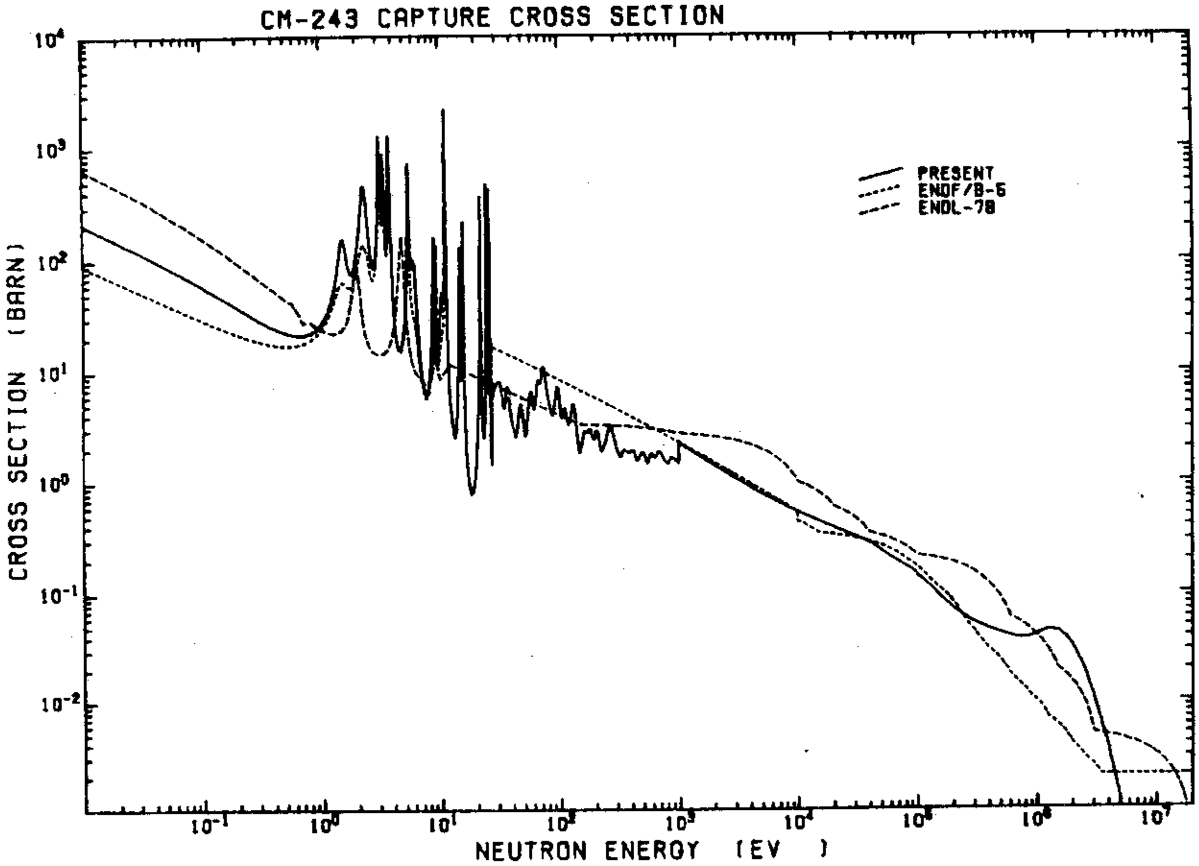

Fig. 9 Comparison of the evaluated capture cross sections.

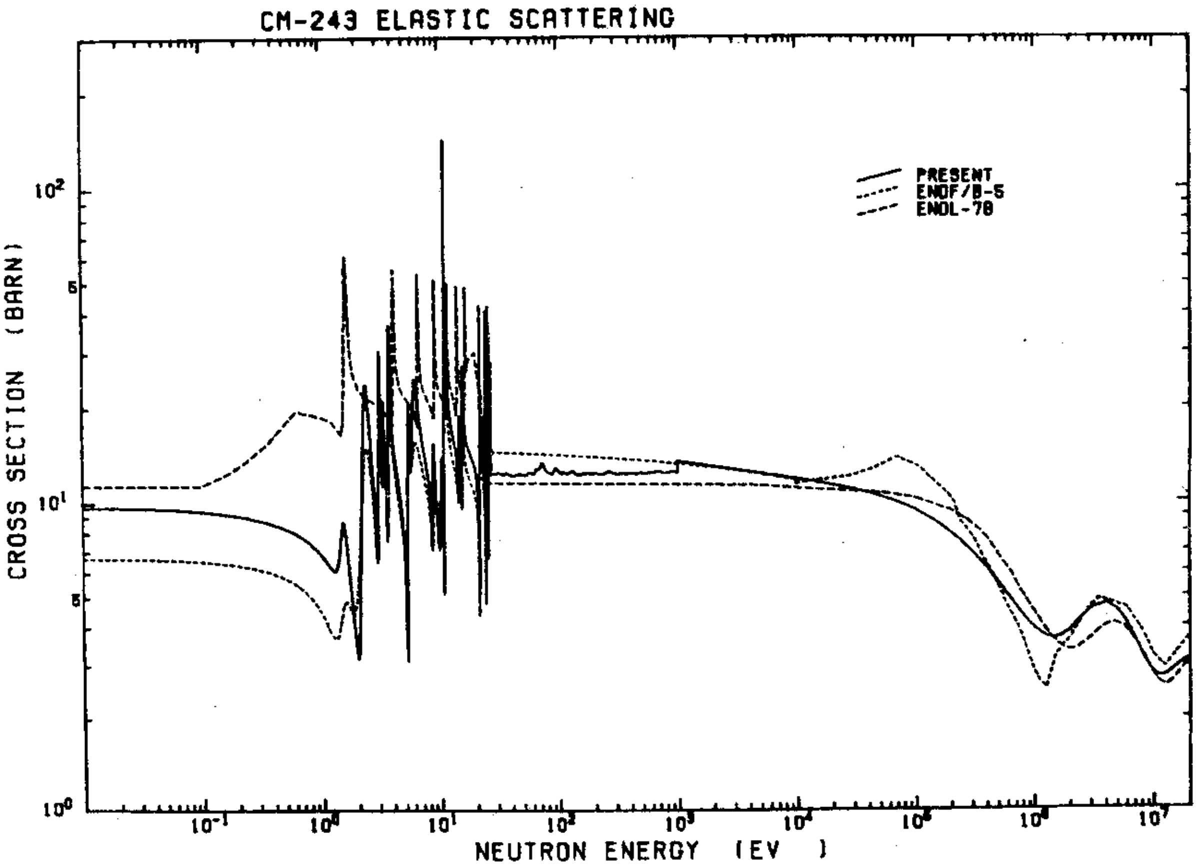

Fig. 10 Comparison of the evaluated elastic scattering cross sections.

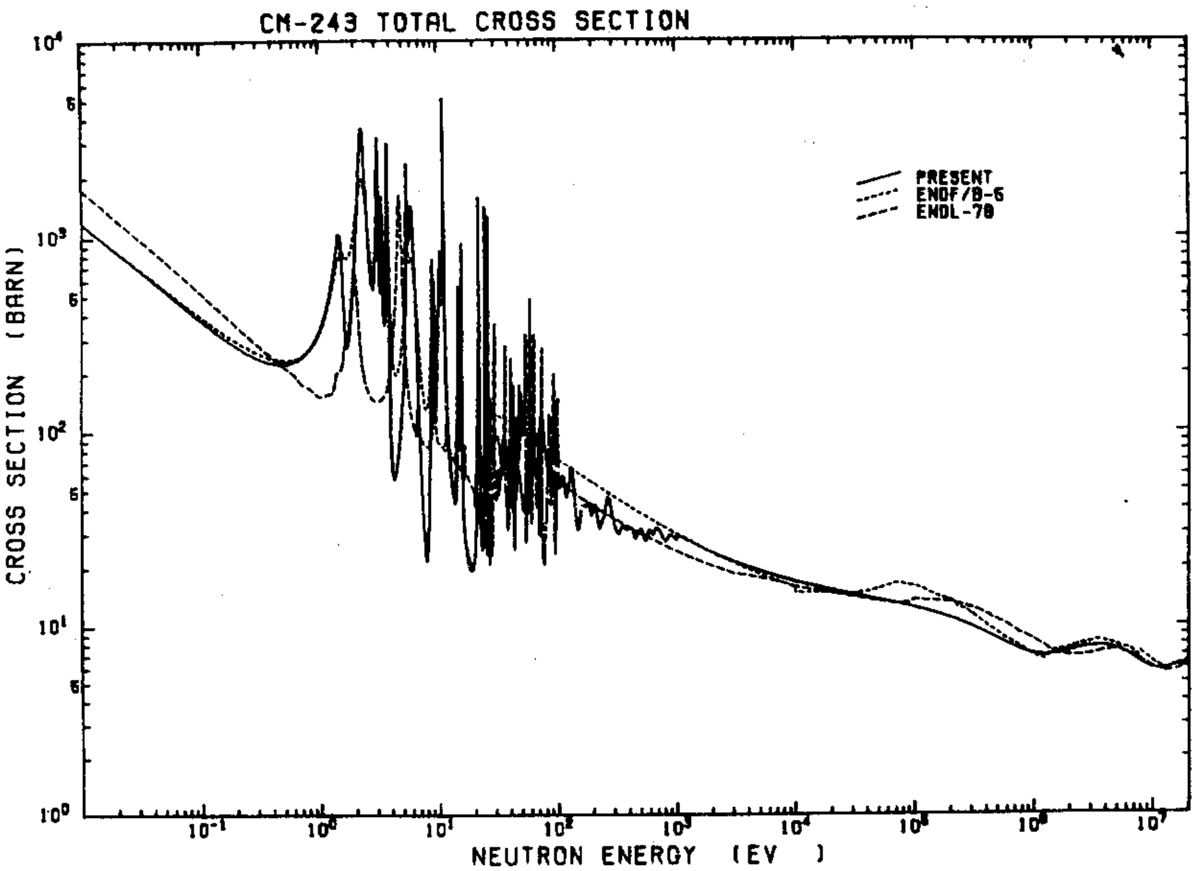

Fig. 11 Comparison of the evaluated total cross sections.

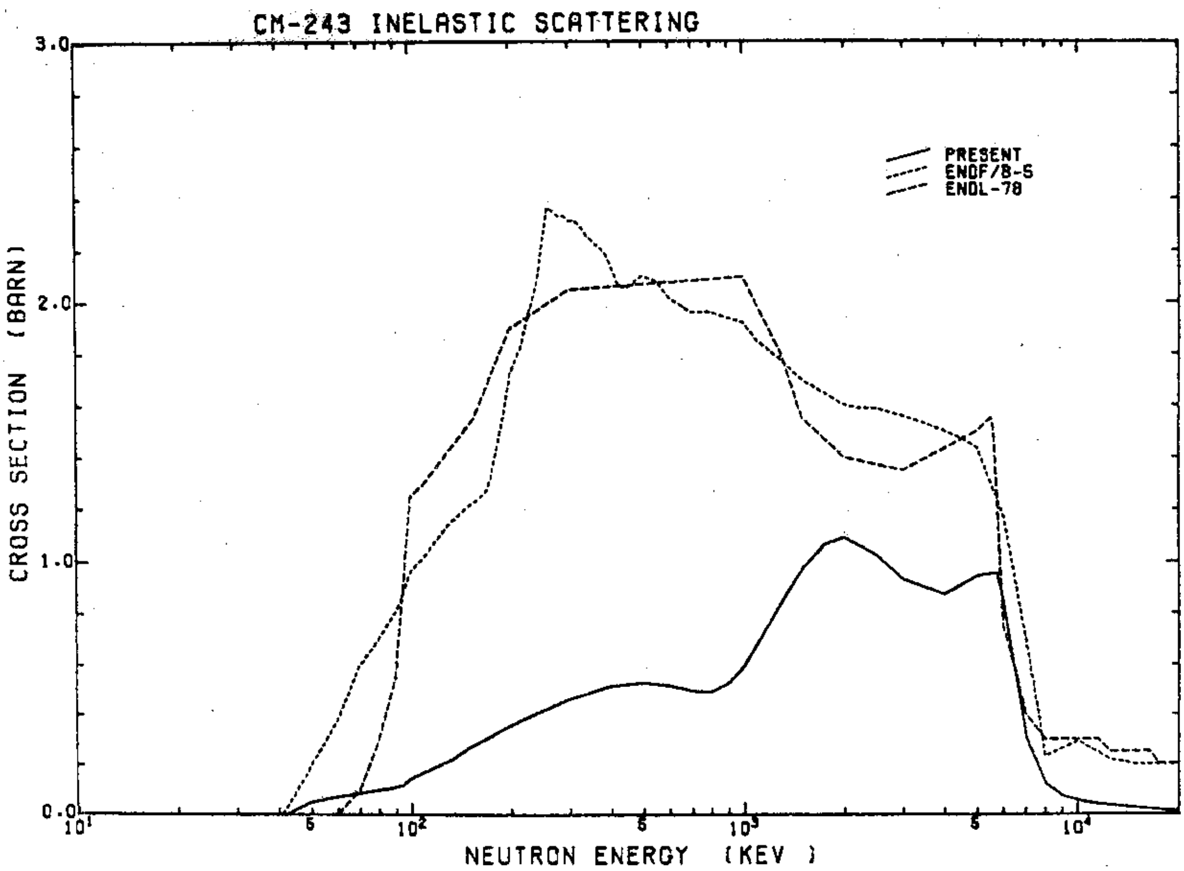

Fig. 12 Comparison of the evaluated inelastic scattering cross sections.

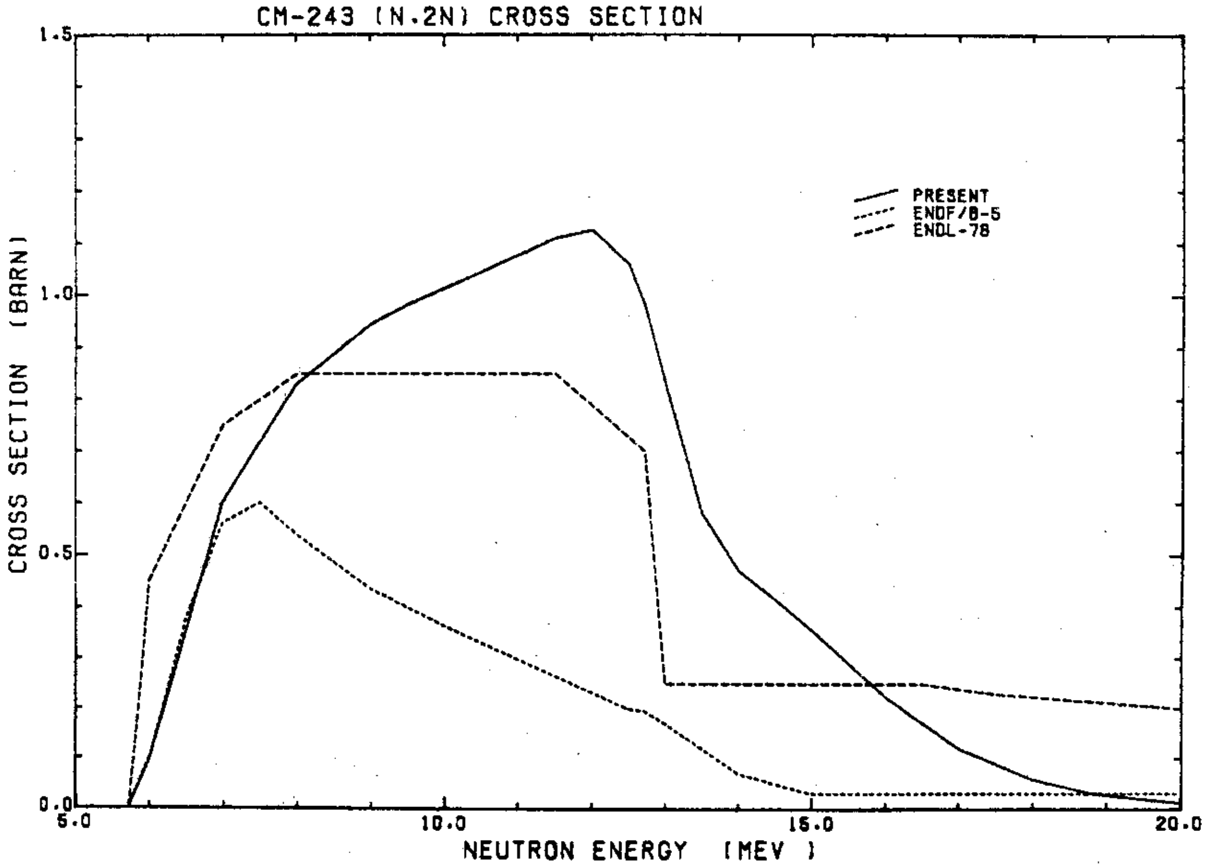

Fig. 13 Comparison of the evaluated (n,2n) cross sections.

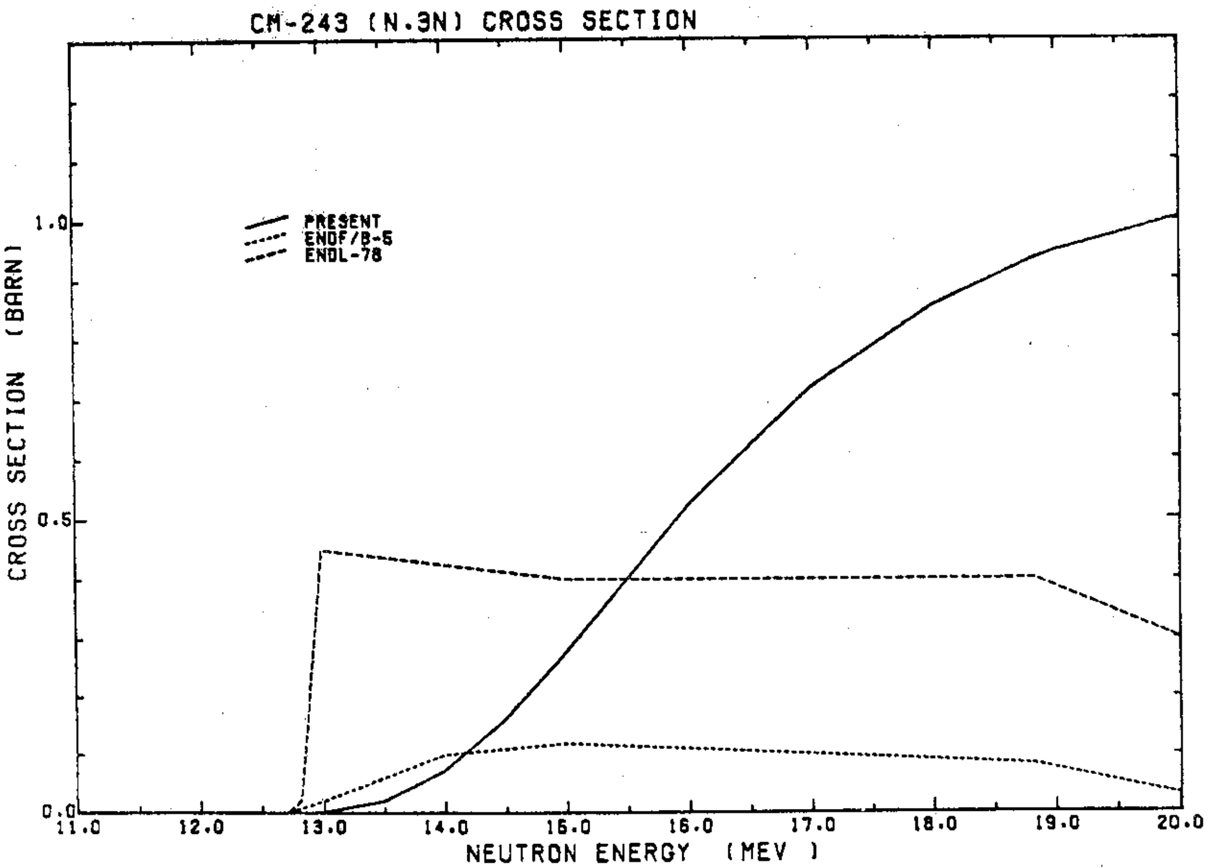

Fig. 14 Comparison of the evaluated (n,3n) cross sections.

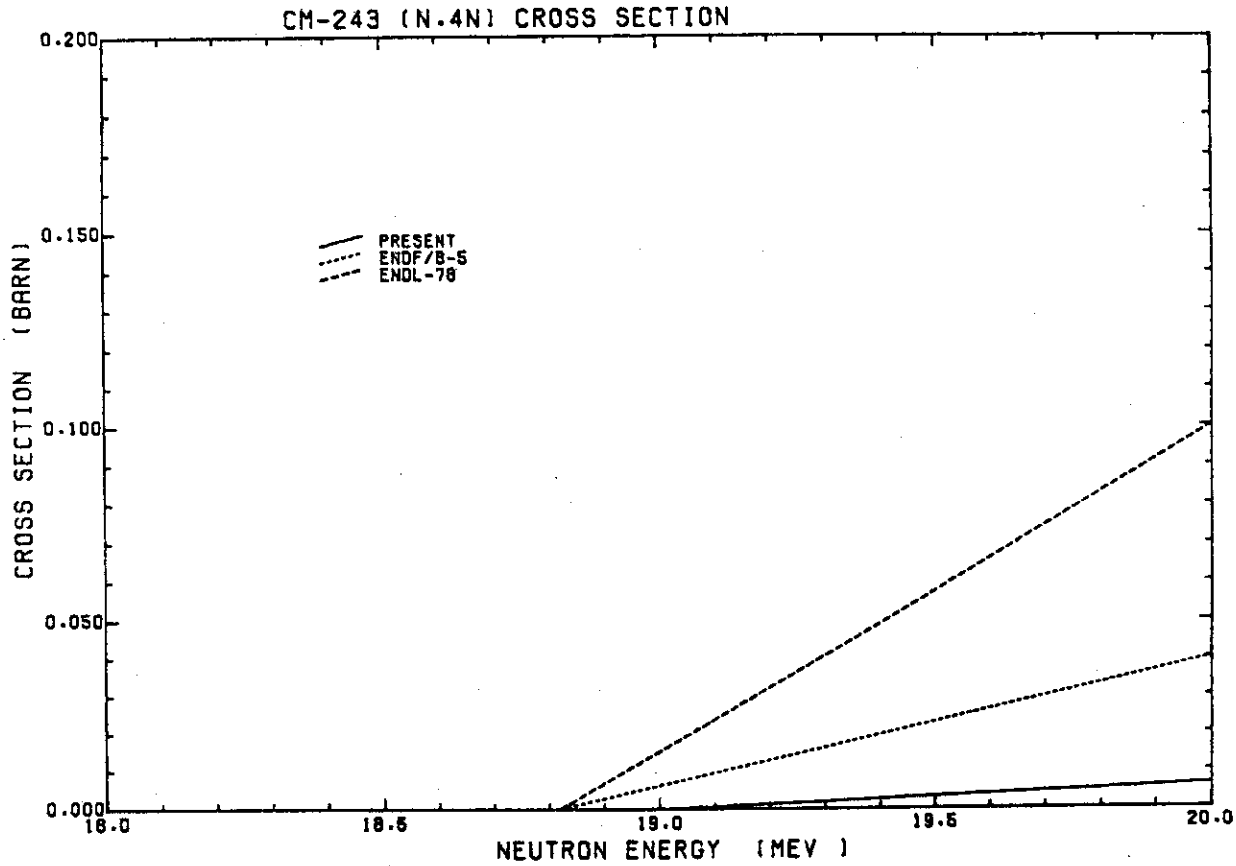

Fig. 15 Comparison of the evaluated (n,4n) cross sections.