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ABSTRACT

The present work incorporates the results of the new nuclear data evaluation for ^{239}Pu. The complete file compiled by the authors in 1974 was practically completely re-examined. The most substantial changes were made above 0.5 keV. In the region of unresolved resonances (0.3-100 keV), the channel contribution to the process widths for a given state and some other aspects were taken into account. The fission cross section and the α-value were evaluated with regard for the correlation of experimental errors. The non-spherical potential with optimized parameters was used to make calculations by the optical and statistical models. The contribution of pre-equilibrium emission was taken into account in calculations of secondary neutron spectra. The new standard $\bar{\nu}_{sp}(^{252}C_f)$ was used to calculate $\bar{\nu}_p$. The 26-group constants and g-Westcott factors were obtained from the evaluated data. The complete file of the evaluated data for ^{239}Pu is presented in the ENDF/B format and conveyed to the Nuclear Data Section of the IAEA.

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1. POSSIBLE NEUTRON REACTIONS WITH ^{239}Pu NUCLEUS IN THE ENERGY REGION UP TO 15 MeV

In nuclear reactors, ^{239}Pu is produced by the ^{238}U neutron capture with subsequent β^--decay of ^{239}U and ^{239}Np isotopes:

$$^{238}U(n,\gamma)^{239}U \xrightarrow[23.5\ min]{\beta^-} {}^{239}Np \xrightarrow[2.35\ day]{\beta^-} {}^{239}Pu\ .$$

The ^{239} Pu nucleus decays into ^{235}U with α-particle emission. In this case their half-decay period is 24290 ± 70 years. The half-decay period of spontaneous fission is $5.5.10^{15}$ years.

Table 1 comprises the energies Q and thresholds T of different neutron reactions with a ^{239}Pu nucleus [1,2] related by:

$$T= \frac{M_n + M_{239}}{M_{239}}(Q) = \frac{1.0086652+239.05218}{239.05218}(-Q)=1.00422(-Q) \quad (1)$$

The ground ^{239}Pu state has a spin and parity $1/2^+$. The first excited state is at 7.86 keV. The ^{239}Pu energy level diagram is detailed up to 0.57 MeV [3].

2. NUCLEAR DATA FOR THE THERMAL ENERGY REGION 10^{-5}-5 eV

2.1. Evaluated Data at 0.0253 eV

Lemmel [4] evaluated the nuclear data for ^{239}Pu and some other isotopes at 0.0253 eV by the simultaneous treatment of all available data not only for this isotope but also for the other correlated by relative measurements. Since he thoroughly analyzed all data, we used them as the evaluated ones. These data are presented in Table 2 which also includes the evaluation of the data [4] averaged over the Maxwell spectrum for T=20^{o}C and ENDF/B-IV [5]. Note that the main error in the σ_{nf} fission cross section is attributed to the uncertainty in the ^{239}Pu half--decay period. There exists a difference in the $\sigma_{nf}(^{239}Pu)/\sigma_{nf}(^{235}U)$ ratios obtained from direct and Maxwell spectrum-averaged measurements. The value of this difference exceeds one standard deviation. Thus, the error in this value must be some what increased (up to 0.007). The errors in Table 2 represent one standard deviation.

2.2. Experimental and Evaluated Data for σ_{nA} Absorption Cross Section

Direct measurements of σ_{nA} were made only by Gwin et al.[6], [7] and cover the energy region above 0.02 eV. In this case the data of both works agree well. The values of σ_{nA} may be obtained from total cross section, σ_{nT}, by subtracting scattering cross section, σ_{nn}, however, there are no direct σ_{nn} measurements in the thermal region. The σ_{nn} values can be obtained from the resonance analysis of total cross section but in this case account should be taken of the sample state (metal, liquid, oxide). In the present work, use was made of the effective values of the cross sections, $\sigma_{nn'}$, [8] to obtain σ_{nA} from σ_{nT}.

Many measurements of σ_{nT} in the thermal region [9-19] are available for ^{239}Pu. The σ_{nA} experiments and evaluation are detailed in [20]. Here, the space will be given only to the main aspects of this work. Havens'data [9] in the energy region between 0.0045 and 0.0295 eV were not taken into account in the evaluation since these were assumed to be replaced by the new ones obtained by Havens at his laboratory [19]. Due to not sufficient experimental resolution, Nikitin's data [12] were not used in the region above 0.14 eV. Auclair's data [11] were not considered because of the scanty information on experimental conditions and large dispersion of the experimental values. For the same reason, Egelstaff's data [15] were not taken into consideration. Pattenden's data [16] were not also employed since the form of the energy dependence of these data is not consistent with other measurements and, moreover, the detailed information on experiment is absent. More old Leonard's data [10] were replaced by his new results [14].

When σ_{nA} is determined in terms of σ_{nT}, a certain error may appear due to the neglect of resonance scattering and its interference with the potential one. However, the value of this error is small as compared to some other sources of uncertainties in σ_{nA}.

Chosen after a careful analysis experimental data for σ_{nA} were re-normalized and treated using the program of the polynomial representation of the experimental points with regard for their "weight" [21].

In the region between 0.001-0.05 eV, the evaluated curve is governed by the data [6,14,19] which agree, on the average, within 1%. The data [12] show large dispersion while those from [13] have smaller one and agree better with the evaluated curve. The accuracy of the cross section, σ_{nA}, in this energy region is about 1.5%.

Within 0.05-0.1 eV, the evaluated curve is determined from the self-consistent data [6,14] as well as from [19] that systematically lie 1-2% lower than this curve. The accuracy of the evaluated data in this region is 1.5-2%. The same situation is also observed in the 0.1-0.24 eV region; however, the data [13] systematically lie above (about 6%) the evaluated curve.

In the region 0.2-0.4 eV, the evaluated curve is mainly governed by Gwin's data [6] and its accuracy is about 2%.

A good agreement of the data [6,9,13,17] is observed in the region 0.4-0.6 eV. The accuracy of σ_{nA} is 2.0-2.5%.

Within 0.6-0.8 eV, the evaluated curve follows Gwin's data [6]; above 0.8 eV, the data [6] obtained from the Brookhaven National Center display a sharp rise near 1 eV, which is probably attributed to the tungsten resonance contribution. Gwin et al. corrected the averaged cross section values in the 0.8-0.9 and 0.9-1.0 eV intervals with regard for this effect. These corrected values were used in our evaluation.

The accuracy of the evaluated data for σ_{nA} from 0.6 to 0.8 eV is 3-4% and from 0.8 to 1.0 eV, about 10-15%.

After the evaluation [20] was carried out, new Gwin's data became available in the region 0.02-0.7 eV but these were only in the form of the values averaged over the energy regions,which cannot be used in the polynomial treatment. Moreover, above 0.7 eV, the data [7] available to us were not corrected for the tungsten resonance contribution and admixture of ^{240}Pu in the target; however, these data re-normalized to the value [4] at 0.0253 eV agree well with our evaluated curve. A mean deviation is about 0.3%, which points to the reliability of the evaluated data for σ_{nA} (Table 3).

2.3. Experimental and Evaluated Data for σ_{nf}

There are many measurements of $\sigma_{nf}(^{239}Pu)$ in the thermal region [6,7,10,11,18, 22-32]. Our evaluation [20] was mainly based on the data of Leonard et al. [23],Deruytter et al. [31] and Gwin et al. [6]. The above data were uniquely normalized and treated using the program [21].

In the region 0.002-0.05 eV, the evaluated curve follows the data [6,23,31] which agree within 1.7%. The data [18] have an about 2% dispersion while those from [25], a 2.5-4% one. The error of the evaluated curve in this region is about 2%.

In the region 0.05-0.21 eV, the data [6,18,23,31] agree within 1.5-2.0%. The data [25] have a 3-5% dispersion relative to the smooth curve. Here, the error of the evaluated curve is 1.7-2.0%.

In the region of the first resonance 0.2-0.4 eV, the data [6] and [31] agree well from the side of the low-energy resonance wing; from the side of the high-energy resonance wing the data [31] lie systematically 4-5% higher while the data [25], approximately 10% lower. The uncertainty of the evaluated curve for σ_{nf} from 0.2 to 0.4 eV is 3-4%. The data evaluated in the region 0.4-1 eV have the same accuracy. The data of Table 3 agree well with the new results of Deruytter and Becker [32] (Fig.1). A mean deviation from the new data of Gwin et al.[7] available for us in the form of the energy region-averaged cross sections is about 0.4%, thus supporting the reliability of the evaluated data.

2.4. Experimental and Evaluated α-Values

The data for $\alpha(^{239}Pu)$ may be obtained from the values of σ_{nf} and σ_{nA} measured by Gwin et al. [6,7]. Moreover, the α-value was measured by Brooks [33] and Ryabov [34]. However, the data [33] were not reported. The data were received from Saclay and normalized to the data [6] at 0.051 eV. These data strongly differ, by their form, from the data [6] in the region 0.13-0.35 eV where this difference is about 5% but within the experiment accuracy.

The evaluated curve follows the data of Gwin et al. and Ryabov (Fig. 2). Its accuracy is about 6% in the region 0.01-0.5 eV and about 30% from 0.7 to 1 eV. It should be noted that a mean deviation from the $\bar{\alpha}$ data [34], which were obtained later, is only about 0.3%.

The evaluated α values are summarized in Table 3.

2.5. Experimental and Evaluated η Values

A number of measurements were made of $\eta(^{239}Pu)$ up to 1 eV [14,18, 35-40]. We evaluated η using the data [14,37,40]. The data [18] below 0.02 eV and above 0.5 eV display a systematic deviation and were not employed. The data [35] differ by about 6% from those obtained from σ_{nf}/σ_{nA} ratio, which is beyond the experimental errors (1.3 and 0.6%), and display a definite deviation of the curve shape, thus pointing to a possible systematic error. Using the same facilities, these authors measured the energy dependence of $\bar{\nu}$ (^{239}Pu) in the thermal region [41]. These data suggest a ~ 12% dependence in the thermal region. At the same time, the measurements [42-45] show that in the region 0.025-0.5 eV, the $\bar{\nu}$ value remains constant within $\pm 0.5\%$ [20]. This allowed elimination of these data from the consideration. The data [39] were not also used since in this work the curve course is not detailed.

Comparison of the η curve obtained from direct measurements and the one derived from α gives good agreement (~ 1%) in the region 0.02-0.24 eV. In the region 0.24-0.5 eV, the η values derived from α lie systematically 3-4% higher; however, this difference is within the experimental errors. The accuracy of η obtained from direct measurements does not exceed 3% while the one for α, about 6%, i.e. in the region 0.02-0.5 eV direct measurements of η value and those obtained in terms of α agree well within the experimental errors. The curve determined from α in the region 0.01-0.5 eV is well satisfied with $\eta=\bar{\nu}\sigma_{nf}/\sigma_{nA}$.

The accuracy of η in the region 0.02-0.24 eV is 2% and in the region 0.24-0.5 eV, 3%.

2.6. Evaluated Data for the Thermal Energy Region

The evaluated data for ^{239}Pu in the region 10^{-5}-5 eV are given in Table 3. Note that the data in the region 1-5 eV were obtained from the evaluated resonance parameters presented below. These cross-sections were smoothly joined at 1 eV with the evaluated ones in the region 10^{-3}-1 eV. The data for σ_{nn} in the energy region considered were obtained from the resonance parameter

Negative resonances (cf.[32,46] must be obviously introduced to parametrize cross sections in the thermal region using the Breit-Wigner formalism. Table 4 summarizes the parameters of the negative and fisrt positive resonances. The parameters of other resonances are given in the next paragraph. The potential scattering cross section is evaluated below to be 10.35 barn. Evaluations using the resonance parameters give the following values of the cross sections at 0.0253 eV: σ_{nf}=744.0 barn, $\sigma_{n\gamma}$ =267.5 barn, σ_{nn}= 7.4 barn, σ_{nA}=1011.5 barn that agree well with Lemmel's evaluation [4]. The calculated values of the cross sections follow, on the average, from the ones evaluated from the experiments up to

1 eV within their accuracy and the experimental data of Gwin et al. [7] for σ_{nf} up to 5 eV (Fig. 3) (the experimental data for σ_{nA} [7] available to us were not corrected for tungsten resonances and admixture of ^{240}Pu in the target). The agreement between the calculated from the resonance parameters and experimental values is worse for σ_{nf} and σ_{nA} in the region 0.7-1 eV (a difference is 6-9%) and σ_{nf} and $\sigma_{n\gamma}$ in the region 0.08-0.2 eV (a difference is 2-4%).

Sometimes it is important to know the Westcott g-factors:

$$g(T)= \frac{1}{\sigma^{2200}\sqrt{0.025298}} \int_0^\infty \sigma(E)\sqrt{E}\, n(E)dE \qquad (2)$$

$$n(E) = \frac{2\pi\sqrt{E}}{(\pi kT)^{3/2}} \; e^{-\frac{E}{kT}} \qquad (3)$$

being a measure of deviation for the cross section energy dependence from the "1/v" law. The values of g_f, g_γ, g_a, g_η at T= 293.6°K calculated using the data of Table are equal to: g_f= 1.0546, g_γ=1.143, g_a=1.0781, g_η=0.9782 and consistent with the results of other authors [4,5,7,8,32,47,48].

Table 5 contains the data on the temperature dependence of the Westcott g-factors. It should be noted that the dependence $g_f(T)$ is somewhat weaker than the one given by Wagemans and Deruytter [47] but stronger than the one of Westcott [49] (about 4% at 1000°C) and agrees better with the former. The $g_a(T)$ and $g_\gamma(T)$ values lie above those of Westcott [49] (about 3% for g_a and about 5% for g_γ at 1000°C).

3. NEUTRON CROSS SECTION PARAMETRIZATION IN THE RESOLVED RESONANCE ENERGY REGION.

In the present work an attempt is made to parametrize the experimental thoroughly chosen data within the framework of unique formalism. This approach through being tedious is more consistent than this or that averaging of available resonance parameters. The last approach leads to a number of resonance parameters not representing a concrete experiment and, moreover, loses the information on possible correlations of experiments. The resonance parameters given below are based on the Breit-Wigner self-consistent analysis made by us in [50]. This approach is convenient for its simplicity and is a good approximation to analyze neutron cross sections in the case of inconsiderable interference effects although not always justified for ^{239}Pu 0^+ resonances.

When choosing the experimental data, the following criteria were taken into account:

a) those experimental works were chosen, which contain the detailed information on the experimental resolution function since the resonance analysis is impossible without this information;

b) use was not made of the experimental data, whose energy resolution did not allow confident level identification;

c) use was made of those experimental data, whose energy course of cross sections was approximately the same;

d) the data obtained in the narrow energy regions were treated with care.

Based on these criteria, the data [51-56] were not included into our analysis.

As a result the following experimental data were used in the resonance analysis:

1) σ_{nT}-Bollinger et al. [57] (1.4-70 eV), Ignatiev et al. [58] (30-70 eV), Derrien et al. [59] (70-500 eV);

2) σ_{nf}-Deruytter et al.[60] (1-20 eV), Derrien et al. [59] (3.7-40.0 eV), Blons et al. [61] (40-500 eV), Gwin et al. [6] (6-100 eV);

3) $\sigma_{n\gamma}$ - Gwin et al. [6] (6-100 eV) (the numerical data of Gwin et al. [7] were not available).

To our mind, the energy scale is most reliably established by the experiments made in Saclay [62]. It practically coincides with the one in Gwin's experiment [6]. We shifted the energy scales in [59] and [61] using the following law: $E'=E+\alpha E+\beta$ where $\alpha=4.4.10^{-4}$, $\beta=5.6.10^{-3}$ for [59] and $\alpha=-4.4.10^{-3}$, $\beta=4.2.10^{-2}$ for [61]. The energy scales of the remainder experiments were shifted to coincide with the chosen scale.

The data for σ_{nf} were re-normalized to the fission integrals measured by Deruytter et al. [60].

The values for total Γ_t obtained in our analysis agree well with the ones obtained by Ribon et al. [62] and,therefore, our evaluation of Γ_t is mainly based on their analysis.

The self-consistent evaluation of all types of cross sections was simultaneously made by us using the least square method within the framework of the Breit-Wigner formalism. A mathematical procedure for self-consistency led to non-physical values of Γ_γ for several levels (usually wide ones), which is, first of all, attributed to insufficiently good experimental energy resolution and to a possible existence of level doublets being not resolved experimentally. In these cases the value of a radiative width, Γ_γ, was taken close to the average one.

The resonance parameters thus obtained are presented in Table 6. Figures 4 and 5 show comparison of the calculated and experimental data for different types of cross sections. It should be noted that in a number of cases the agreement with the experimental data for $\sigma_{n\gamma}$ was not achieved in the energy region above 100 eV which is probably due to an insufficient energy resolution in experiment [6]. For example, the experimental data [6] for $\sigma_{n\gamma}$ are very large in the region 435-444 eV and sometimes exceed a total σ_{nT} cross section. The calculation in terms of the resonance parameters has allowed an agreement of $\sigma_{n\gamma}$ with the other cross sections.

The experimental data for ^{239}Pu are somewhat non-self-consistent. So, as is noted by Ribon et al. [62], in the BNL-325 [63] comprising the resonance parameters from [223] and [59] for a 415.66 eV resonance the total width Γ is equal to Γ=152$\pm$30 meV, Γ_n=10 or 3 meV (depending on J), Γ_f=18$\pm$10 meV. Subtraction gives Γ_γ=124 or 131 meV with an error of $\pm$31 meV, which is not consistent with an average value $\langle\Gamma_\gamma\rangle$=43.3 meV. The evaluation must give a total set of the self-consistent resonance parameters.

Moreover, the parameters of not all levels are determined. So, the BNL-325 has no total widths for the resonances 11.50, 34.60, 65.36, 139.28, 160.80, 174.76 eV etc. (for 36 resonances up to 508 eV). There are also no data on fission widths, Γ_f, for these resonances (for 31 resonances up to 508 eV).

The self-consistent analysis of the experimental data on σ_{nT}, σ_{nf} and $\sigma_{n\gamma}$ has allowed determination of the lacking values of Γ,Γ_f and Γ_γ. So, for two resonances the total width appeared to be approximately twice as small and the fission width, Γ_f, 2.5-3.0 times as small as in the BNL-325 (at 78.95 and 415.66 eV), for several resonances, for example, at 370.31 eV, 391.52 eV, 408.71 eV, 509.74 eV the total width,Γ, is 15% less than in the

BNL-325 and the fission width, Γ_f, at 10.93 eV is 15% less, 40% less at 82.68 eV, 25% larger at 58.84 eV than in the BNL-325. The most difference between the evaluated parameters $g\Gamma_n$ and the available ones (1.5-3.0 times) is observed for 11.48, 15.84, 78.95, 211.09, 264.23, 378.04 eV.

The averaged neutron cross sections were calculated using the resonance parameters. The results of the calculation are presented in Table 7 and compared with the experimental values.

The experimental information on the resonance spins up to 660 ev [62] was used in our analysis. However, the difficulties involving the identification of 0^+ resonances in the neutron scattering experiments especially for weak ones as well as a difference between the experimental and calculated areas under the resonance curves, resonance overlapping and the absence of the precise information on a resolution function suggest that the assignment of a spin 0^+ to resonances [64] may be doubtful, at least, for the half of the resonances.

The above method yielded the resonance parameters up to 500 eV. However, at higher energies, there exist resonances with large fission widths, and sometimes it is necessary, for practical purposes, to preserve the information on a detailed course of σ_{nf} in this region. Therefore, at energies above 500 eV, we used the resonance parameters from [62].

Using the method developed in [20], the assessment of the levels omitted due to their grouping at the distances less than the experimental energy resolution shows that in the region 300-500 eV approximately 5 levels are omitted. This fact is also supported by the energy dependence of the increasing level sum (Fig. 6).

The resonance parameters allowing for the levels omitted give the following average values: $\langle D \rangle = 2.38 \pm 0.06$ eV, $S_0 = (1.19 \pm 0.17) \cdot 10^{-4}$, $\langle \Gamma_f \rangle_{1^+} = 0.0356 \pm 0.0020$ eV, $\langle \Gamma_\gamma \rangle = 0.0433$ eV, $\langle \Gamma_f \rangle_{0^+} = 2.049 \pm 0.200$ eV.

Comparison of these values with the average parameters of Ribon et al. [62] and Trochon et al. [64] shows satisfactory agreement.

The level distances are satisfied with Wigner's distribution (Fig. 7). Figure 8 displays reduced neutron width distribution.

It is known that the $^{239}Pu\ 0^+$ state has two fission channels. In this case, it is therefore of interest to use the generalized Porter-Thomas distribution [66], which for the two-channel case is of the form:

$$P(x,\alpha_1,\alpha_2)dx = \frac{1}{2(\alpha_1,\alpha_2)^{1/2}} \exp\left(- \frac{x}{4\alpha_1,\alpha_2}\right) I_0\left[\frac{x}{4}\left(\frac{1}{\alpha_2} - \frac{1}{\alpha_1}\right)\right]dx \tag{4}$$

where I_0 is the Bessel function of an imaginary argument.

The channel contributions $\alpha_1 = 0.77$ and $\alpha_2 = 0.23$ are determined from the dispersion

$$\frac{\langle \Gamma^2 \rangle - \langle \Gamma \rangle^2}{\langle \Gamma \rangle^2} = 2 \sum_{i=1}^{2} \alpha_i^2 \tag{5}$$

according to the data for fifty one $^{239}Pu\ 0^+$ resonances.

Figure 9 shows that the use of the generalized Porter-Thomas distribution improves the agreement, as compared to the traditional Porter-Thomas distribution, when the number of freedom degrees equal to the channel number.

4. NUCLEAR DATA EVALUATION FOR THE UNRESOLVED RESONANCE ENERGY REGION (0.3-100 keV)

The present section contains the evaluated data on the average cross sections and the average resonance parameters for ^{239}Pu. The latter were obtained using the data from the resolved resonance region as well as from the information for the average cross sections in the keV-region. The fission cross section $\langle\sigma_{nf}\rangle$ and the $\langle\alpha\rangle$ value for ^{239}Pu averaged over the standard energy intervals display, up to 20 keV, considerable fluctuations caused,on one side, by the finite number of the resonances in the interval chosen and, on the other, by a possible intermediate structure in σ_{nf} due to the double-humped fission barrier [67]. For instance, in [68], different statistical tests point to the existence of the intermediate structure in the energy region from 550 to 660 eV caused by a 1^+ channel. The above fluctuations were taken into account in our evaluation as in [69], i.e. by varying over the energy intervals the strength function, S_0, and the fission width, $\langle\Gamma_f\rangle_{1^+}$.

4.1. Experimental Data for Average Cross Sections and the α Value

For ^{239}Pu in the unresolved resonance region the experimental data on the total cross section, $\langle\sigma_{nT}\rangle$, fission cross section, $\langle\sigma_{nf}\rangle$, and the α value are available (the existing data for σ_{nA} are used in the $\langle\alpha\rangle$ evaluation.

The analysis of the available data for σ_{nT} up to 100 keV [9,70-76] shows that Uttley's results [70] obtained with a ±2% accuracy are most reliable and comprehensive. Egelstaff's data [75] display considerable fluctuations and, on the average, exceed those from [70] by 10-20%. Hibdon's results [74] up to 3 keV lie below by 10-15% and in the region 3-10 keV coincide within 5% with the data [70].Havens' data [9] lie, by 5-10%, lower than Uttley's ones although agree with them within the experimental errors. Considering the aforesaid, we used the data [70] but the experimental errors were increased up to 5% because of possible systematic errors.

As the evaluated data for $\langle\sigma_{nf}\rangle$ and $\langle\alpha\rangle$ use was made of our evaluation [77] performed with regard for correlations between different experimental partial errors [78] since in this energy region considered none new measurements were done.

The energy intervals adopted here differ from the ones from [70,77]. Therefore, the evaluated data [79] for σ_{nT} normalized to the data [70] and Gwin's data [7] for σ_{nf} and σ_{nA} normalized to the data [77] were used to determine the average cross sections in the more narrow energy intervals.

4.2. Calculation of Average Cross Sections

Average cross sections, $\langle\sigma_{nx}\rangle$, were calculated using the statistical model [80,81]:

$$\langle\sigma_{nx}\rangle = \frac{2\pi^2}{K^2} \cdot \sum_r \frac{g_r}{\langle D\rangle_r} \; \frac{\langle\Gamma_n\rangle_r \langle\Gamma_x\rangle_r}{\langle\Gamma\rangle_r} \; S_{nxr} \qquad (6)$$

where S_{nxr} is the factor taking account of the effect of partial width fluctuations.

The $(n,\gamma f)$-process cross section is determined as:

$$\langle\sigma_{n\gamma f}\rangle = \sum_r \langle\sigma_{n\gamma}\rangle_r \; \frac{\langle\Gamma_{\gamma f}\rangle_r}{\langle\Gamma_\gamma^{\,c}\rangle_r} \qquad (7)$$

The ^{240}Pu compound nucleus may undergo fission from the state r via 1-3 fission channels making different contributions to the average width, $\langle\Gamma_f\rangle_r$. In the energy region considered, three nucleus-target levels may be excited: E_1=8 keV, $I^\pi=3/2^+$, E_2=57 keV, $I^\pi=5/2^+$, E_3=76 keV, $I^\pi=7/2^+$. In virtue of this, the widths Γ_{fr} and $\Gamma_{n'r}$ must, strictly speaking, obey the generalized Porter-Thomas distribution [66]. The neutron widths, Γ_{nr}, follow the Porter-Thomas distribution with the number of freedom degrees, ν_{nr}, presented in Table 8. The radiative width may be considered not to fluctuate.

The expression for the S-factor, with regard for the specific features of the width distributions, is of the form:

$$S_{nxr} = \langle\Gamma\rangle_r \left(1+2\frac{\delta_{nx}}{\nu_{nr}}\right) \int_0^\infty \frac{\exp(-\langle\Gamma_\gamma\rangle_r\, t)\,.dt}{\left(2\,\frac{\langle\Gamma_n\rangle_r}{\nu_{nr}}\cdot t+1\right)^{1+\frac{\nu_{nr}}{2}+\delta_{nx}}} \times$$

$$\times \prod_{c=f,n'} \frac{\left[\sum\limits_{K_c=1}^{\nu_c}\left(2\,\frac{\langle\Gamma_c\rangle_r}{\nu_{kcr}}\,t+\frac{1}{\beta_{kcr}}\right)^{-1}\prod\limits_{K_c=1}^{\nu_c}\left(2\,\frac{\langle\Gamma_c\rangle_r}{\nu_{kcr}}t+\frac{1}{\beta_{kcr}}\right)\right]^{\delta_{cx}}}{\prod\limits_{K_c=1}^{\nu_c}\beta_{kcr}^{1/2\nu_{kcr}}\left(2\,\frac{\langle\Gamma_c\rangle_r}{\nu_{kcr}}\,t+\frac{1}{\beta_{kcr}}\right)^{\frac{\nu_{kcr}}{2}+\delta_{cx}}} \qquad (8)$$

where ν_{cr} is the number of fission channels or the number of the excited levels, $\beta_{kcr} = \langle\Gamma_c\rangle_{kr}/\langle\Gamma_c\rangle_r$, $\nu_{kcr}=1$, $\nu_{kn'r}$ is the number of the decay ways for the state r due to the kth-level excitation (table 9).

It should be noted that the use of the generalized distribution [66] to calculate the S-factor is equivalent to the individual consideration of each fission and inelastic channels with subsequent summation over the channel number. In a number of cases, the calculation results based on formula (8) may greatly differ from those obtained assuming that the widths obey the Porter-Thomas distribution, with the freedom degree number being specified as the channel number or effective channel number [82].

4.3. Average Widths, Strength Functions and Potential Scattering Cross Section

Average neutron and inelastic widths were determined as usual:

$$\langle\Gamma_n\rangle_r = S_\ell \langle D\rangle_r P_\ell \sqrt{E}\, \nu_r \qquad (9)$$

$$\langle\Gamma_{n'}\rangle_r = \langle D\rangle_r \sum_{qb'} S_{\ell'} (E-E_q)^{1/2}\, P_{\ell'}(E-E_q)\, \nu_{J\ell' q} \qquad (10)$$

where $K=2.196771.10^{-3}\sqrt{E}\frac{A}{A+1}$, $P_0=1$, $P_1=\frac{(Ka)^2}{1+(Ka)^2}$, ν_r and $\nu_{J\ell' q}$ are the number of exit channels, A=236.9986.

Radiative capture widths $\langle\Gamma_\gamma\rangle_r$ were calculated from the cross section for a photonuclear reaction, $\sigma_\gamma(\varepsilon_\gamma)$, in the dipole approximation:

$$\langle\Gamma_\gamma\rangle_r = \frac{C_\gamma}{3}\,\frac{10^6}{(\pi\hbar c)^2} \int_0^u \varepsilon_\gamma^2\, \sigma_\gamma(\varepsilon_\gamma) \sum_{I=(J-1)}^{J+1} \frac{\rho(u-\varepsilon_\gamma, I)}{\rho(u,J)}\, d\varepsilon_\gamma \qquad (11)$$

For an axially deformed nucleus the $\sigma_\gamma(\varepsilon_\gamma)$ cross section is governed by the superposition of two Lorentzian curves:

$$\sigma_\gamma(\varepsilon_\gamma) = \sum_{i=1}^{2} \sigma_i \frac{\varepsilon_\gamma^2 \Gamma_i^2}{(\varepsilon_\gamma^2 - E_i^2)^2 + \varepsilon_\gamma^2 \Gamma_i^2} \tag{12}$$

The parameters E_i, Γ_i, σ_i are obtained in [83] from the experimental data on the cross section for photoabsorption by heavy nuclei at low energies (ε_γ < 6 MeV); σ_1=250 mbarn, σ_2=300 mbarn, E_1= =10.5 MeV, E_2=14 MeV, Γ_1=2.5 MeV, Γ_2=4.5 MeV.

The necessity to allow for the fission competition during γ - de-excitation for the nuclei with the negative fission thresholds is well known. The radiative capture widths, $<\Gamma_\gamma^c>$, should be calculated as:

$$<\Gamma_\gamma^c>_r = \frac{C_\gamma . 10^6}{3(\pi hc)^2} \int_0^U \varepsilon_\gamma^2 \sigma_\gamma(\varepsilon_\gamma) \sum_{I=|J-1|}^{J+1} \frac{\rho(U-\varepsilon_{\gamma,I}) <\Gamma_\gamma>_I (U-\varepsilon_\gamma) d\varepsilon_\gamma}{\rho(U,J)[<\Gamma_\gamma>_I(U-\varepsilon_\gamma) + <\Gamma_f>_I(U-\varepsilon_\gamma)]} \tag{13}$$

The constant, C_γ, in (11) and (13) was determined by normalizing $<\Gamma_\gamma^c>_r$ to $<\Gamma_\gamma>_{obs}$=0.043 eV at ènergy excitation U equal to binding energy 6.534 Mev and appeared to be 1.446.

The level density model used here is detailed in [84-86]. The ^{240}Pu shell correction is rather small, thus allowing the neglect of the energy dependence of the level density parameter, a, determined from the neutron resonance density $1/<D>_{obs}$ ($<D_{obs}>$ = 2.38 $\pm$ 0.06 eV, a=21.007 MeV^{-1}). The quardrupole deformation parameter, ε, is 0.24.

The strength functions, S_0 and S_1, potential scattering cross section, σ_p, in the low energy region and the scattering channel radius, a, necessary to calculate the smooth cross section course, were obtained by the least square method from the experimental data on $<\sigma_{nT}>$: $S_0=(1.03\pm0.05).10^{-4}$, $S_1=(2.3\pm0.3)10^{-4}$, $\sigma_p=10.35\pm0.45$ barn, a=0.84337.10^{-12}cm. The above uncertainties correspond to a $\pm5\%$ change in $<\sigma_{nT}>$. The value of σ_p is consistent with the data [70] (10.3 ± 0.15 barn) and [87] (10.5 ± 0.3 barn) and allows us to get an agreement between the scattering cross section at the thermal point (7.4 barn) and the evaluated data [4] (7.2 ± 1.4 barn) when making parametrization of the cross sections in the thermal region.

The strength function, S_0, obtained from the $<\sigma_{nT}>$ data is considerably less than the one calculated from the resonance parameters in the region up to 500 eV: $\sum_i \Gamma^0_{ni}/\Delta E=(1.19 \pm 0.17)10^{-4}$. The increasing sum of the reduced widths approximated by a straight line gives $S_0=1.28.10^{-4}$ (Fig. 10). The authors of [62, 63,64] present almost the same S_0. The substantially smaller $S_0=1.0\ .10^{-4}$ is obtained from the fission and capture cross sections up to 100 keV [88]. The difference in S_0 determined from the resonance parameters and from the average cross sections becomes clear if the energy dependence of S_0 is taken into account. The coupled channel calculations made by us using the optimized non-spherical potential parameters show that $S_0(^{239}Pu)$ substantially decreases with increasing energy from $1.18.10^{-4}$ at 0.5 keV to $0.97.10^{-4}$ at 100 keV.

The value of S_1 obtained from the $<\sigma_{nT}>$ data is consistent with [70] - $(2.5 \pm 0.5).10^{-4}$, [63] - $(2.3 \pm 0.4).10^{-4}$, [89] -

$(1.99 \pm 0.48).10^{-4}$. However, that the strength function, S_0, should remain near its average value when using the above method for describing a structure in average cross sections in the region 50-100 keV, S_1 must be decreased to $2.0.10^{-4}$.

The fission widths, $<\Gamma_f>_r$ were calculated by the Hill-Wheller formula [90,91]:

$$<\Gamma_f>_r = \frac{<D>_r}{2\pi} \sum_{S=1}^{\nu} \{1+\exp[-\frac{2\pi}{\hbar\omega_{rs}}(E-E_{frs}]\}^{-1} , \qquad (14)$$

$$E_{frs}=E_f+ \varepsilon_{frs}$$

where ε_{frs} denote a spectrum of the transition states of a fissile nucleus above the barrier E_f=-1.6 MeV. Table 10 includes the values of ε_{frs} found from the experimental data for $<\sigma_{nf}>$ with allowance for the proposed transition state Lynn scheme [92].

The barrier curvature, $\hbar\omega_{rs}$, was assumed to be the same for different transition states and equal to 0.5 MeV.

The fission widths, $<\Gamma_f>_{0^+}$ and $<\Gamma_f>_{1^+}$, using ε_{frs} taken from Table 10 are equal to 1.81 eV and 11.4 meV, respectively. The value of $<\Gamma_f>_{1^+}$ is substantially less than 35.6 meV obtained by averaging the resolved resonance widths up to 500 eV but the latter does not allow us to get a satisfactory agreement between experimental and calculated values for $<\sigma_{nf}>$ and $<\alpha>$ in the whole energy region considered.

The required (n,γf)-process widths are determined as:

$$<\Gamma_{\gamma f}>_r = <\Gamma_\gamma>_r - <\Gamma_\gamma^c>_r . \qquad (15)$$

For the excitation energy equal to the neutron binding one, we obtained that $\langle\Gamma_{\gamma f}\rangle_{0^+} = 11.0$ meV, $\langle\Gamma_{\gamma f}\rangle_{1^+} = 5.2$ meV consistent with the experimental results [93] - ($|\langle\Gamma_{\gamma f}\rangle_{0^+} - \langle\Gamma_{\gamma f}\rangle_{1^+}| < 4$ meV), [220] - ($\langle\Gamma_{\gamma f}\rangle_{1^+} = 4.1 \pm 0.9$ meV), [221] - ($\langle\Gamma_{\gamma f}\rangle_{1^+} = 6.1 \pm 2.9$ meV) and with the theoretical predictions [94].

4.4. Evaluated Average Neutron Cross Sections and Resonance Parameters for ^{239}Pu

The average parameters obtained allow satisfactory calculation of the average cross sections (Figs. 11-13). Note that the (n,γf)-process contribution to a fission cross section is 20% at 0.3 keV and falls to 5% at 100 keV.

The structure in $\langle\sigma_{nf}\rangle$, $\langle\sigma_{nT}\rangle$ and in $\langle\alpha\rangle$ is governed by varying two parameters: S_0 and $\langle\Gamma_f\rangle_{1^+}$. The methods used allow calculation of $\langle\sigma_{nf}\rangle$ and $\langle\alpha\rangle$ within experimental errors and of $\langle\sigma_{nt}\rangle$ [70] within a 5% error practically in the whole energy region considered (Table 11). The direct level excitation contribution to the inelastic cross sections, $\sigma_{nn'}$ (Table 11) is taken into account.

As the evaluated average cross sections we recommend to use the calculated values because the latter are consistent with the average parameters and the experimental data.

The Porter-Thomas distribution with the integer number of freedom degrees is usually used to calculate resonance self-shielding factors and other functionals. The widely used American format ENDF/B also stipulates only integer values of ν_{xr} and,moreover, excitation of one level alone. Therefore, we also give the alternative set of the parameters $\tilde{S}_0$ and $<\tilde{\Gamma}_f>_1+$ (Table 11) obeying the ENDF/B format. The appropriate numbers of freedom degrees are given in Table 8. Note that a difference in S_0, $<\Gamma_f>_1+$ and $\tilde{S}_0$, $<\tilde{\Gamma}_f>_1+$ increases with energy. The evaluated average parameters are presented in Tables 12 through 17.

5. FISSION CROSS SECTION, σ_{nf}, IN THE ENERGY REGION 0.1 keV-15 MeV

The σ_{nf} data were evaluated by us using the method that was developed in [78] and allowed for the existing correlations between partial errors in different measurements. According to [78], the error of evaluated value, σ_{eval}, may be expressed in terms of a mean-square-root deviation of partial errors $\sqrt{(\overline{|\Delta\sigma_{ik}|^2})}$, correlation coefficients for partial errors K_{ikjm} and adopted "weights", a_i^2, of the experimental data:

$$\overline{|\sigma_{eval}-\sigma_o|^2} = \sum_{i=1}^{N} \sum_{k=1}^{M} \sum_{j=1}^{N} \sum_{m=1}^{M} a_i^2 a_j^2 K_{ikjm} \sqrt{(\overline{|\Delta\sigma_{ik}|^2})} \sqrt{(\overline{|\Delta\sigma_{jm}|^2})} \tag{16}$$

Here N is the number of measurements of the value σ, M is the number of really measured parameters specifying σ. The "weights", a_i^2, are determined to minimize $\overline{|\sigma_{eval} - \sigma_o|^2}$:

$$\frac{\partial \overline{|\sigma_{eval} - \sigma_o|^2}}{\partial a_i^2} = 0, \quad i \neq 1 ,$$

$$\sum_{i=1}^{N} a_i^2 = 1 \tag{17}$$

When evaluating, the total experimental error is expanded into the partial ones so that the errors of two any different parameters necessary to find σ do not correlate, i.e. $K_{ikjm}=0$ for $k \neq m$.

All available experimental data, except those from [95-97], were used to evaluate $\sigma_{nf}(^{239}Pu)$. The data [95] were available only in the figure, the data [96,97] are preliminary, in [96] fissile isotope masses were not finally measured, and only interval-averaged cross sections are given in [97]. The evaluation results are presented in [77].

While evaluating, the σ_{nf} data were subdivided into five groups. The first group covers the data obtained by the time-of-flight method with good resolution [6,7,18,61,98-104]. The data obtained with energy sources from 10 keV to 15 MeV were divided into four groups: absolute (in measuring $\sigma_{nf}(^{239}Pu)$ only well-known standard cross sections, $H(n,n)$, $^{10}B(n,\alpha)$, σ_{nf} at 2200 m/s were used [105-109]; relative (in normalizing $\sigma_{nf}(^{239}Pu)$ the authors used $\sigma_{nf}(^{235}U)$ or $\sigma_{nf}(^{238}U)$ only at one energy point different from the thermal one [110,111]; "derived" (from simultaneous measurement of both the $\sigma_{nf}(^{239}Pu)/\sigma_{nf}(^{235}U)$-ratio and $\sigma_{nf}(^{235}U)$-cross section under the same energies, it is possible to obtain $\sigma_{nf}(^{239}Pu)$ [112-116]; direct data for the $\sigma_{nf}(^{239}Pu)/\sigma_{nf}(^{235}U)$-ratio (the data were obtained without any assumptions on the form of the energy dependence of cross sections) [117-121].

Our evaluation was carried out in the following way:

a) to determine the partial errors of all measurements;

b) to define the correlation between the partial errors of different experiments (Table 18);

c) to determine weights, evaluated values and their errors using the methods stated;

d) to treat the results using the programme [21] in the region above 30 keV for separate energy points, separately for the absolute data on $\sigma_{nf}(^{239}Pu)$ and $\sigma_{nf}(^{239}Pu)/\sigma_{nf}(^{235}U)$-ratios in order to obtain $\sigma_{nf}(^{235}U)$ which is compared to the evaluated ^{235}U fission cross section [77] to attain self-consistency among $\sigma_{nf}(^{239}Pu)$, $\sigma_{nf}(^{239}Pu)/\sigma_{nf}(^{235}U)$ and $\sigma_{nf}(^{235}U)$.

The analysis of the experimental data enabled to expand the total error into twelve partial ones and led to some correlations between them.

Certainly, the information given below on possible correlations may not be comprehensive.

For k=1 (determination of the number of ^{239}Pu nuclei), the errors from [105-107] correlate completely since these are the series of the experiments performed by the same authors but in different periods of time. In [105-107], the same ^{239}Pu layer was used. In [113], the same fission chamber was used as in [106], nevertheless, these works do not correlate completely. This is due to the fact that, unlike the absolute measurements of $\sigma_{nf}(^{239}Pu)$ [106], measurements [113] were made of the $\sigma_{nf}(^{239}Pu)/\sigma_{nf}(^{235}U)$-ratio and in [112] $\sigma_{nf}(^{235}U)$ was measured absolutely using the same layer. Thus, the errors from [106] and [112,113] correlate partly.

For k=2 (extrapolation of a fragment spectrum to the zero discrimination level), the errors from [105-107] correlate completely while [106] correlates partly with [113] and [112] according to the above reasons.

For k=3 (fragment absorption in the layer), the same correlations as observed as at k=2.

For k=4 (scattering in the chamber walls, target backing, target elements), the errors from [106] and [113] correlate completely since the same fission chamber was used. There also exists a correlation between [105] and [107]. However, since these do not include measurements in the common energy region, they may be considered non-correlating.

For k=5 (neutron attenuation in the air), the errors from [105] and [106] correlate completely (the experiments were made on the same device) as [106] and [107], in the common region 800-972 keV.

For k=6 (neutron flux determination), the errors from [6,7, 18,61,99,100,102,104] correlate completely since these used the $^{10}B(n,\alpha)$-process cross section while [105] and [106], only in the region 800-972 keV (two energy points).

For k=7 (experimental background), the errors from [101] and [103] may be considered to be partly correlating in relation to the experimental background since in both works the underground nuclear explosion was used to measure cross sections; the errors from [105], [106] and from [106], [107] correlate completely in the common energy region.

For k=8 (fission detection efficiency), the errors from [101] and [103] correlate completely because the same fragment detection method was used.

For k=9 (uncertainty in the geometrical factor), no correlations were observed.

For k=10 (standard cross section (hydrogen)), the errors from [105] and [106] correlate completely since these used the same fission chamber, with a difference at k=4; there is a complete correlation between the errors from [106,113] and [115] since the latter correlates with [106] due to the standard-hydrogen cross section- and with [113] due to the $\sigma_{nf}(^{235}U)$ standard from 0.5 to 1 MeV.

For k=11 (statistical errors), correlations are absent.

For k=12 (the normalization error), the errors from [6,7,18, 99,100,102,104] correlate completely. This is attributed to the fact that the results [6] and [7] are normalized at the thermal point; the results [100], to the data [6] and [18]; the results [102], to [18], i.e. also at the thermal point; the results [99], at the thermal point,too. Work [104] is normalized to Sowerby's evaluation in the region 10-30 keV, i.e. to the data [6,18,101, 103] giving an absolute value in the region 0.1-1.0 keV and to the data [61,100,102] which were used by Sowerby, additionally to four first works, to determine the σ_{nf} curve shape below 30 keV. The errors from [111,115-121] correlate completely since the values of $\sigma_{nf}(^{235}U)$ from [77] were used as the standard.

The weights of experiments obtained with allowance for the experimental data error correlations are presented in Table 10. It is seen that in the region 0.1-1.0 keV the weights of the experimental data almost do not vary, in the region 1-10 keV the weight of the data [61,7] is increased by a factor of 1.5-2 and the weight of the data [99,102,104] is decreased by a factor of about 2, in the region 10-30 keV the weights of the data [7,100, 105,118,119] are somewhat increased (by 10-15%). Note that the latter determine the evaluated data in this energy region. The weight of the data [61,101,102] is decreased by about 20%.

Above 30 keV, the weights of the data change slightly and the determining weights have the absolute measurements [7,105-107], the measurements of the $\sigma_f(^{239}Pu)/\sigma_f(^{235}U)$-ratio [121] and then [114,118,119,124].

The error in $\sigma_{nf}(^{239}Pu)$ is 2.2-2.8% in the region 0.1-30 keV, with the corrections being taken into account, (1.5-2.4% without allowance for the correlations) and 3.5-4.0% up to 10 MeV. The evaluated data on $\sigma_{nf}(^{239}Pu)$, the $\sigma_{nf}(^{239}Pu)/\sigma_{nf}(^{235}U)$-ratio and $\sigma_{nf}(^{235}U)$ evaluated in [77] form a consistent data set that agrees within 1-3%. The evaluated data for $\sigma_{nf}(^{239}Pu)$ and $\sigma_{nf}(^{239}Pu)/\sigma_{nf}(^{235}U)$ are presented in Table 20.

The fission theory has not been yet developed to make a quantitative prediction of a fission cross section. At present, one may speak only of parametrizing the experimental data for σ_{nf} to determine fission penetrability from them and then to calculate other types of cross sections with allowance for the fission process competition. The fission penetrabilities can be written as:

$$T_{fJ\pi}(E) = \sum_k T_{fJ\pi k}(E) + \int_{E_{f\,min}}^{\infty} P_f(E,E_{fJ\pi})\rho(E_{fJ\pi},J,\pi)dE_{fJ\pi} \qquad (18)$$

Here the first term determines the fission through the discrete spectrum of transition states and the second, through the continuous spectrum contribution. To describe a fission cross section in the wide energy region, it is of importance, first, to know discrete and continuous spectra of transition states of a fissile nucleus, fission barrier penetrabilities, P_f, and fission width distribution. Within the framework of the traditional approach to the one-humped fission barrier, the penetrability, P_f, is found by the Hill-Wheller formula [91]:

$$P_f(E,E_{fJ\pi}) = \{1+\exp[-\frac{2\pi(E-E_{fJ\pi})}{\hbar\omega_{J\pi}}]\}^{-1} \quad . \qquad (19)$$

A number of works [125-128] are devoted to the study of the double-humped barrier penetration, however, the use of expression (19) is quite justified to describe a ^{239}Pu fission cross section and incorporates the most important features of the energy dependence for the fission barrier penetration.

The fission width distribution within the framework of a double-humped barrier model is studied in [126,129]. However, the definite excess of the neutron binding energy above the ^{239}Pu fission threshold, which results in a considerable number of the open fission channels even at low neutron energies, allows use of the traditional Porter-Thomas distribution [65].

The main difficulty in predicting fission cross sections is connected with determination of discrete and continuous spectra of transition states. Our knowledge of desired spectra is mainly theoretical as the experimental data for the fission cross section in the unresolved resonance energy region permits only very approximate determination of a discrete spectrum since the integral effect is observed. More promising are, for this purpose, the data for nuclear fission induced by charged particles and angular fragment distributions [130-132].

The density, $\rho_f(E,J,\pi)$, of transition states is usually determined by the constant-temperature model [133,134]:

$$\rho_f(E,J,\pi)=C_f(2J+1)\exp[-\frac{(J+\frac{1}{2})^2}{2\sigma^2}]\exp(\frac{E}{\theta_f}) \qquad (20)$$

or by the Fermi-gas model [135] assuming the same nature of the excited states for equilibrium deformation and for the saddle point.

The parameters of the appropriate expressions are determined by fitting the calculated σ_{nf} cross section to the experimental data. In some cases the above model permits us to describe a σ_{nf} cross section up to the (n,n'f)-reaction threshold [135] with the unique set of parameters but sometimes not [136].

^{239}Pu fission cross section is measured rather well. Therefore, a correct representation of fission penetrations is of importance, first of all, for a correct account of the (n,f)-process competition in calculations of other reactions. To improve the accuracy of $\sigma_{nn'}$ and $\sigma_{n\gamma}$ calculations, the second term in (18) was taken as:

$$T_{f\ cont\ J\pi}(E) \doteq T_f(E)(2J+1)\exp\left[-\frac{(J+\frac{1}{2})^2}{2\sigma^2}\right] \qquad (21)$$

Here $T_f(E)$ was determined by fitting a calculated σ_{nf} cross section to the one evaluated from experimental data. The parameter σ was equal to 5.7, $h\omega$=0.5 MeV^{-1}. The discrete spectrum parameters obtained by us are presented in Section 4.

6. EVALUATION OF TOTAL CROSS SECTION, σ_{nT}, AND ELASTIC SCATTERING CROSS SECTION, σ_{nn}, IN THE REGION FROM 0.1 TO 15 MeV

In the region 0.1-15 MeV, there are the following experimental data on σ_{nT}: Uttley [70], 0.1-130 keV region; Glasgow and

Foster [137], 2.5-15 MeV region; Cabe et al. [138], 0.1-6 MeV region; Bratenahl et al. [139], 7-29 MeV region; Allen and Henkel [71], 0.1-7 MeV region; Meads [140], Havens et al. [9], Hibdon and Langsdorf [141], Egelstaff [75], data obtained at Los Alamos [142], Schwartz et al. [143], 0.5-15 MeV. The analysis of the experimental data obtained up to 1971 is detailed in [20]. The data [143] with a 1% accuracy agree with those from [71] (assigned error is ± 3%) and with [137] (the experimental error is ±2%). Cabe's data [138] (the error is ± 3%) lie systematically above all data, except those below 2 Mev, and above the data [143] in the whole energy region and agree with them only at 0.5 MeV within the errors given by the authors.

The data of Schwartz et al. [143] for a 0.5-15 MeV region govern the evaluated curve. Below this energy region, the evaluated curve lies among the available data following below 0.1 MeV Uttley's data [70] which are most reliable. The accuracy of the evaluated data for σ_{nT} is about 5% at energies 0.1-0.5 MeV and 1.5% above 1.0 MeV.

The experimental data on the integral elastic scattering cross section, σ_{nn}, are available only for the region 0.1-2.0 MeV [144-147]. However, it is difficult to use them because these data include a certain part of inelastic scattering with small losses. Therefore, our σ_{nn} evaluation was based on the theoretical calculations using the generalized optical (the coupled channel method) and statistical models. Non-spherical optical potential was taken to have a form:

$$V(r,\theta,\phi)=-V_R[1+\exp(\frac{r-R_r}{a_R})]^{-1} - 4iW_D \exp(\frac{r-R_D}{a_D}) \quad \times$$

$$\times [1+\exp(\frac{r-R_D}{a_D})]^{-2} - (\frac{\hbar}{m_\pi C})^2 \frac{1}{a_R r} V_{SO} \exp(\frac{r-R_a}{a_R}) \times$$

$$\times [1+\exp(\frac{r-R_R}{a_R})]^{-2} (\vec{\ell}.\vec{\sigma}) \quad , \qquad (22)$$

$$R=R_o[1+\sum_\lambda \beta_\lambda Y_{\lambda o}(\theta')] . \qquad (23)$$

The potential parameters for ^{239}Pu were carefully optimized by us using the SPRT-method. The parameters obtained permitted us to calculate, within experimental errors, the strength functions ($S_o=1.03.10^{-4}$, $S_1=2.3.10^{-4}$), potential scattering cross section ($\sigma_p=10.35$ barn), energy dependence of $\sigma_{nT}(E)$ and angular distributions of elastically and inelastically scattered neutrons. These parameters for ^{239}Pu have proved to be: $V_R=46.095-0.3$ E, MeV; $W_D=\begin{cases} 3.085 + 0.4 \text{ E, MeV (E<10 MeV)} \\ 6.95 \text{ Mev, (E>10 Mev)} \end{cases}$; $V_{SO}=7.5$ MeV; $a_R=0.626$ f; $a_D=0.555+0.0045$ E, f; $R_{OR}=$ 7.795 f; $R_{OD}=7.819$ f; $\beta_2=$ 0.217; $\beta_4=0.082$ or in a more general form for actinides : $V_R=49.72 - 17\frac{N-Z}{A} - 0.3$ E; $W_D=5.22 - 10\frac{N-Z}{A} +0.4$ E (for ^{238}U: $\beta_2=0.216$, $\beta_4=0.080$; for ^{235}U: $\beta_2=0.201$, $\beta_4=0.072$; for ^{240}Pu: $\beta_2=0.191$, $\beta_4=0.094$).

In the present evaluation, the S-matrix elements for neutron interaction with a nucleus were calculated by the coupled--channel method (rotational model) and used in a statistical model. The coupled-channel method is much more physically grounded than the spherical one since it takes account of the mechanism of the lower rotational level excitation. As a consequence, the coupled-channel method used gives the direct excitation cross sections for the ground state rotational band levels and changes both the neutron transmission coefficients and the compound-nucleus section, σ_c. The use of the generalized optical model with the above potential parameters makes it possible to calculate the total cross section σ_{nT} (Fig. 14) (a difference in the calculated and evaluated from the experimental data cross sections is no more than 2% from 1 keV to 15 MeV, the calculated strength functions are $S_0=1.15.10^{-4}$ at 0.5 keV, $S_0=1.05.10^{-4}$ at 20 keV, $S_1=2.37.10^{-4}$), angular distributions of elastically and inelastically scattered neutrons and strength functions within experimental errors while spherical optical potential calculations [134] yield a difference between the experimental and calculated σ_{nT}, amounting to about 8% for some energy regions. Moreover, the experimental values of the strength functions and angular elastic scattering distributions, especially for backscattering, are substantially worse reproduced.

The differences in neutron transmission coefficients obtained using the spherical and non-spherical models become extremely substantial with increasing orbital momentum, ℓ, when the values of transmission coefficients are decreased. This fact is especially essential for radiative capture cross section calculations since this cross section is mainly specified by the contributions of the channels with small neutron transmission coefficients that weakly compete with a radiative capture process. As shown in [136], the use of the neutron transmission coefficients determined by the generalized optical model gives much better agreement between the experimental and calculated radiative capture cross sections for actinides.

The elastic scattering through the compound mechanism yields a considerable contribution to σ_{nn} up to 2 MeV. This process was calculated by the statistical model. A comparison with the experimental data up to 2 MeV is shown in Fig. 15. Note that the experimental data include some part of inelastic scattering. The account of this fact improves the agreement between theory and experiment.

Comparison of the calculated and experimental non-elastic interaction cross sections, $\sigma_{nx} = \sigma_{nT} - \sigma_{nn}$, [148-154] (Fig. 16) gives certain information on the quality of the evaluation of the cross section, σ_{nn}, as well as of the compound-nucleus cross section calculated using the optical model. The observed difference can be caused by the underevalaution of the experimental inelastic scattering with small energy losses (first of all, direct mechanism).

The evaluated data for σ_{nT} and σ_{nn} are presented in Table 21.

7. EVALUATION of the α VALUE AND RADIATIVE CAPTURE CROSS SECTION, $\sigma_{n\gamma}$, IN THE ENERGY REGION FROM 0.1 keV TO 15 MeV

Recently a number of measurements have been made of $\alpha(^{239}Pu)$ in the energy region 0.1-10 MeV [155-169]. These are various by the methods and normalization used. In works [100, 101, 156, 169] as normalized values use was made of α for several well resolved resonances and in [6,7], of absorption and fission cross sections in the region 0.05-0.4 eV. The values of α at the thermal point were used for the normalization in [163,166,168] and at 30 keV, in [160,167]. In several works [157,159,161,165], some apparatus constants were determined experimentally.

Owing to this fact, the evaluation of α up to 1 MeV may be made from the experimental data. The abundance of measurements points to the necessity to use the method that takes account of experimental error correlations [18] (Cf.(16),(17)).

The total experimental error of α was expanded in our evaluation into 13 independent partial ones. The analysis of the methods and experimental errors made it possible to find correlations between the partial errors of different measurement [77], Table 22.

For k=1 (energy-dependent background) the experiments of Gwin et al. [7] and of Weston and Todd [162] probably may correlate partly because these were performed on the same accelerator being a source of the energy-dependent background. For the same reason, the works of Belyaev et al. [163] and Bolotsky et al. [164,169], those of Ryabov et al. [99] and Kurov et al. [156] may be also partly correlated.

For k=2 (statistical errors) correlations are absent.

For k=3 (the normalization error) the experiment of Gwin et al. [6] correlates with the data [7,162] (thermal region normalization), [100] (normalization to [6]), [155] (normalization using α at the thermal point), [164] (normalization to α at resonances below 50 eV [6,34,99,100,156, 163]), [156] (normalization to α at resonances from [6,99,162]), [99] (normalization to the same α as in [156]), [34] (normalization to α at resonances from [6,99, 100, 163, 164]). Partial correlation exists in [6] and [163] (normalization to the thermal α value obtained from η and $\bar{\nu}$ at the thermal point [163]) and in [6] and [101] (normalization to eight wide 0^+ resonances with no reference to the works dealing with these resonances). The relative data of Bandl et al. [160] correlate with the results [157-159] since we re-normalized them to the average α value at 30 ± 10 keV (0.318 ± 0.033) determined from these works. However, since there is no partial error for k=3 in [157-159], it is more correct to relate this correlation to k=9 (determination of the efficiency of a detector system). The aforesaid for [160] is also valid for [167]. Therefore, total correlation between [160] and [167] is also taken into account at k=9.

For k=4 (delayed fission γ-ray background) we consider that the error due to the delayed fission γ-ray background correlates completely in all experiments.

For k=5 (uncertainty in the relative neutron flux) the experiments [6,7,162] using the $^{10}B(n,\alpha)$-reaction cross sections correlate completely. The experiments [100,101,160] using the $^{6}Li(n,\alpha)$-reaction cross section correlate completely.

For k=6 (neutron scattering in the sample and detector walls) the errors from [6] and [7] may correlate completely since the same large liquid scintillator was used. The errors from [162,164, 169] may correlate because the same methods and, probably, the same equipment were employed.

For k=7 (uncertainty in the detector efficiency due to possible γ-ray spectrum variations) we consider that in all experiments this error correlates completely.

For k=8 (error in $\bar{\nu}$ causing the uncertainty in α), the errors from [99,100,155, 162-164, 167, 169] correlate completely.

For k=9 (uncertainty in the detector sytem efficiency), the errors from [6] and [7] employing the same liquid scintillator correlate completely. The works [157-159] are characterized by the same component of the error due to the uncertainty in the pulse distribution extrapolation to a zero threshold. Therefore, the errors may correlate partly.

For k=10 (detector system efficiency time variation), the errors from [6] and [7] using the same scintillator tank may correlate completely.

For k=11 (the uncertainty caused by the contamination correction for a sample), for k=12 (probability that a fission event is not accompanied by detecting fission neutrons) and for k=13 (energy resolution) correlations are not observed.

When evaluating α,"optimum"weights were found for experimental $\alpha(^{239}Pu)$ values with no regard for correlations (K=0), with the above correlations (K) and with regard for total correlation (K=1) (Table 23). The main changes in the "weights" of different measurements are as follows.

The weight of the data [7] and [162] is increased by a factor of 2 from 0.1 to 6 keV, which may correspond to the real situation in this energy region. These determine the evaluated values of α in this energy region (their weight sum is 0.9). In a rather narrow region 6-10 keV, the weight of the data [7] is somewhat decreased due to increasing partial background error, correlating with the coefficient of 0.5 with the error from [163], and the results [162] and [155] determine the evaluated data in this energy region. From 0.1 to 5 keV, the weight of the data [6,34, 99, 100, 156, 163, 164, 169] is decreased while above 5 keV it does not change although it remains small by its absolute value (approximately by the order less than for the most accurate data). Note that in some regions the weight of the data [166] is increased by a factor of about 2 because this experiment is weakly correlated with the other data.

From 10 to 100 keV, the evaluated α values are determined: by the data of Gwin et al. [7], whose weight up to 70 keV is increased, by the results of Weston et al. [162], whose weight is substantial only up to 20 keV and then decreases, by the data of Poletaev et al. [159], whose weight is increased from 30 keV and is governing in the second half of this region.

Above 100 keV, the evaluated α values are specified by the results of Poletaev et al. [159], Lottin et al. [157] and Hopkins et al. [158].

Table 24 summarizes the data on the α value and its errors obtained without allowance for correlations (K=0), with allowance for the above correlations (K) and total (K=1) correlations. Note that the evaluated α values practically do not depend on correlation assumptions (no more than 2% changes) but the errors themselves change noticeably. Table 24 illustrates that the accuracy of $\alpha(^{239}Pu)$ achieved is 6% from 0.1 to 20 keV; 8-10%, from 20 to 100 keV; 13-17%, from 100 to 800 keV and 25%, from 800 to 1000 keV.

Since the required accuracy of $\alpha(^{239})$ for reactor purposes is 3.6% below 100 keV and 5% up to 800 keV, there is a clear necessity to make further measurements desirably by the methods not correlating with the existing ones.

Comparison of the present evaluated data for α with the evaluated ones [170] shows that despite different approaches these agree within about 5%. It should be noted that like [170], the present work adops the results of the same experiments as the most reliable ones.

Above 100 keV, the errors of α evaluated from the experimental data are considerable, that is why evaluating $\sigma_{n\gamma}$, use was also made of our cascade theory calculations of the γ-ray emission with regard for the competition of the $(n,\gamma n')$ and $(n,\gamma f)$-processes as done in [94]. The expression for the radiative capture penetrability is written as:

$$T_{\gamma J\pi} = 2\pi \int_{\frac{A}{A+1}E}^{E+S_n} \sum_{J_k=|J-1|}^{J+1} \rho(E+S_n-\varepsilon_\gamma J_k,\pi_k) f(E,\varepsilon_\gamma) d\varepsilon_\gamma \, . \quad (24)$$

The theoretical prediction of the radiative capture cross sections for fissile nuclei incorporates an account of several factors: the use of the adequate level density model, a physically grounded form for a spectral factor, neutron transmission coefficients obtained from the generalized optical model; moreover, a necessity arises to take a correct account of the competition of fission and radiative capture $(n,\gamma f)$ and $(n,\gamma n')$--processes.

The widely adopted traditional Fermi-gas model for the level density is not consistent with the conclusions of the microscopic theory and some experimental data. The statistical treatment of the averaged characteristics of excited nuclei developed by Ignatyuk [171,173] includes the basic results of the microscopic theory and allows account of the collective effects and pair correlations in the level density.

As the calculated fission cross sections are usually fitted to the experimental data, the radiative capture cross section calculated by the statistical theory appears to be more sensitive to the choice of this or another level density model. Our calculations [136] for ^{238}U show that the use of the traditional Fermi-gas model gives a considerable deviation from the experimental data of the calculated $\sigma_{n\gamma}$ for both forms of the spectral factor, which cannot be attributed to the uncertainty of the parameters adopted. The best agreement with the experimental data in the entire energy region is attained when the Fermi-gas model involving collective modes is used. The use of the spectral Weisskopf factor does not give better agreement with the experimental data for $\sigma_{n\gamma}$ than the spectral Lorentzian factor and the Fermi-gas model involving collective modes. Therefore, taking into account that the Lorentzian factor is physically more grounded, which is emphasized by the radiative strength functions and the experimental data for the (n,γf)-process widths, it is expedient to use this form of the spectral factor in the statistical theory calculations. Thus, the Fermi-gas model involving collective modes and the spectral Lorentzian factor with the parameters shown in Section 4 were used in calculations.

Section 6 discussed the necessity to use, in statistical model calculations of $\sigma_{n\gamma}$, the neutron transmission coefficients for the inlet channel calculated by the coupled-channel method. Therefore, we have taken this approach. The values of $\langle D\rangle_{obs}$ and $\langle\Gamma_{\gamma}\rangle_{obs}$ evaluated in Section 3 were employed for normalization.

At high energies, the direct and semi-direct mechanisms of reactions making contribution to the cross section, $\sigma_{n\gamma}$, seems have to be taken into account. It was calculated by the formula proposed by Lane and Lynn [174]:

$$\sigma_{n\gamma}^{np} = 10^{-3} \cdot \frac{Z^2}{A} \left(\frac{E+4}{E^{1/2}}\right)^3 \qquad (25)$$

which governs the available experimental data for ^{238}U [175-177].

More definite conclusions on the necessity taking into account the direct and semi-direct mechanism for $\sigma_{n\gamma}$ calculations for actinides will be made after our detailed theoretical investigations with the two-and three-cascade Hauser--Feshbach model.

The data for $\sigma_{n\gamma}$ ^{239}(Pu) evaluated from 0.1 to 15 MeV are summarized in Table 21. Comparison of the calculated cross section, $\sigma_{n\gamma}$, with the data from the experimental α value is shown in Fig. 17.

8. EVALUATION OF THE $\bar{\nu}$-VALUE

Detailed reviews of the available experimental data on $\bar{\nu}_p(^{239}Pu)$ are described in [20,78]. After this there have appeared measurements of Nurpeisov et al. [179] up to 5 MeV and of Walsh and Boldeman [180] below 2 MeV. The present evaluation takes account of these data. The data [181] were not taken into consideration in this evaluation since these data strongly differ from the results of other data in the 0.4-1.3 MeV region. These data were replaced by the results of the same authors.

[182] obtained using two methods within 0.5-1% accuracy under more favourable experimental conditions. The data [144, 179, 180, 182-193] were used in our evaluation. Account was not taken of the data [151, 194-196] (standard is not known) and of [197-202] (measurements of $\bar{\nu}_p$ for the effective neutron energy of a fission spectrum). It should be noted that the accuracy of the data [151], [194-196] is low and the latter cannot affect the evaluation results. The data of Soleihak et al. [189,190], based on the analysis [203] for $\bar{\nu}_p$ (^{235}U) and the $\bar{\nu}_p$ (^{235}U)/$\bar{\nu}_p$ (^{239}Pu) ratio, were corrected for delayed γ-rays. The following standards: $\bar{\nu}_{p\ thermal}$(^{235}U) [4], $\bar{\nu}_{p\ thermal}$ (^{239}Pu) [4], $\bar{\nu}_{sp}$ (^{252}Cf)=2.731 [204] were used to re-normalize the experimental data. The reverse squares of the experimental errors not involving the uncertainty in the values of standards were taken as the weights of the experimental data for the statistical treatment [21].

The results of the evaluation of $\bar{\nu}_p(E)$ for ^{239}Pu were presented by the following polynomial:

$$\bar{\nu}_p(E) = 2.852042 + 0.118561E + 8.249.10^{-3}E^2 - 8.088225.10^{-4}E^3 + 3.026314\ .10^{-5}E^4 - 0.4148402.10^{-6}E^5 \qquad (26)$$

The evaluated data for $\bar{\nu}_t$ (^{239}Pu) are summarized in Table 21. The value of ν_d at the thermal energy equal to 0.0063 [4] and the results of ν_d evaluation [20] based on the experimental data [205-213] and fissile nuclei systematics were used to determine $\bar{\nu}_t$. Note that the results of the present evaluation lie substantially lower (3.7% at 0.1 MeV and 1.3% at 15 MeV) than the results of the previous evaluations, which is first of all attributed to a lower value of the standard ν_{sp} $^{252}C_f$.

9. INELASTIC NEUTRON SCATTERING CROSS SECTION, $\sigma_{nn'}$

The experimental information for $\sigma_{nn'}$ (^{239}Pu) is rather scanty [145, 148, 214, 215] , and the accuracy of the data is low. The large background due to fission neutrons is the main difficulty in measurements. Moreover, heavy nuclei have a high level density, which hampers separation of elastically and inelastically scattered neutrons. This also hinders to obtain the data for separate levels. Therefore, the evaluation of $\sigma_{nn'}$(^{239}Pu) was based on theoretical calculation results. The Hauser-Feshbach-Moldauer formalism was adopted to calculate $\sigma_{nn'}$ up to the boundary of discrete and continuous spectra of nucleus-target levels.

The non-modified Hauser-Feshbach formalism is usually used in the energy region larger than the boundary of discrete and continuous level spectra. However, the discrete level spectrum for ^{239}Pu is not resolved experimentally so high that the effects of width fluctuation and correlation could be neglected at its boundary. In [219] it is shown that when the number of channels is large and their contributions are comparable, the modified Hauser-Feshbach formalism taking account of the effect of inlet and outlet elastic channel correlation is a good approximation. Our calculations have shown that at small energies, when the effect of width fluctuation is large, the cross sections,$\sigma_{n\gamma}$,

σ_{nf} and $\sigma_{nn'}$ (^{239}Pu) calculated by the Hauser-Feshbach-Moldauer formalism and approach [216] strongly differ but already at 0.6 MeV are in a satisfactory agreement. Therefore, at the energies above 0.6 MeV, the formalism described in [216] was used. The ^{239}Pu level scheme was taken from [3].

Neutron transmission coefficients for inlet channels were calculated by the generalized optical model (Section 6). The spherical optical potential with the same parameters as for the inlet channels (β_2=0) was adopted to calculate outlet neutron transmission coefficients since even for the main rotational band it is not obvious to preserve the channel coupling when a neutron interacts with an excited nucleus.

The fission and radiative capture competition was taken into account using expressions (21) and (24). The Fermi-gas model involving collective effects [171-173] was used to specify a level density of a residual nucleus. The parameter, a, of ^{239}Pu nucleus level density equal to 17.288 MeV^{-1} was obtained by fitting to $\langle D\rangle_{obs}$=9.5 eV at separation energy S_n=5.655 MeV and pairing energy δ=0.42 MeV.

The cross sections for the direct excitation of the first four levels were calculated by the coupled-channel method. Comparison of the calculated and experimental data is shown in Fig. 18.

Above the (n,nf)-reaction threshold, the inelastic cross section, $\sigma_{nn'}$, was determined as a difference σ_{nx}-$-\sigma_{n\gamma}$ $-\sigma_{nf}$ - $\sigma_{n,2n}$ - $\sigma_{n,3n}$. The evaluated data are given in Tables 21 and 25.

10. THE (n,2n) AND (n,3n)-REACTION CROSS SECTIONS

The cross sections, $\sigma_{n,2n}$ and $\sigma_{n,3n}$, were calculated using the model based on the information for the nuclei that appear at the series-decay stages. The pre-equilibrium process was taken into account in this model. The method is detailed in [217]. The calculation results do not contradict the available experimental data and are adopted as the evaluated data (Table 21).

11. EVALUATION OF THE CHARACTERISTICS OF SECONDARY NEUTRONS AND γ-RAYS

11.1. Fission Neutron Spectrum

The authors of the experimental works on neutron fission spectrum measurements report as a rule only the parameters for the Maxwell distribution

$$N_M(E)=\frac{2}{\sqrt{\pi}}\cdot\frac{1}{T^{3/2}}\cdot e^{-\frac{E}{T}} \qquad (27)$$

where T is the temperature. Therefore, the evaluation using the numerical data could not be made.

In our evaluation use was made of the results [20]:

$$T=0.353+0.510\cdot[1+\bar{\nu}_f(E)]^{1/2} \qquad (28)$$

where the $\bar{\nu}_f$ refers to the fission process only:

$$\bar{\nu}_f(E)=\frac{\bar{\nu}_t(E)\sigma_{nf}(E)-\sigma_{nn'f}(E)-2\sigma_{n,2nf}(E)}{\sigma_{nf}(E)} \qquad (29)$$

$\sigma_{nn'f}$ and σ_{n2nf} were calculated using the same model as for σ_{n2n} and $\sigma_{n\ 3n}$ calculation.

11.2. Angular Distribution of Secondary Neutrons

The experimental data on angular distributions of elastically scattered neutrons usually include a certain contribution of inelastically scattered neutrons. Therefore, the angular distributions of elastically scattered neutrons as well as of inelastically scattered ones at 8 keV, 57 keV and 76 keV were calculated by the coupled-channel method (Section 6) with regard for an isotropic compound-nucleus scattering contribution and tested against the most reliable experimental data. The evaluated data are given in Tables 26 through 29. Neutron scattering at the remainder energy levels was assumed isotropic in the center mass system.

As has been mentioned above, the optical potential (22) with the parameters specified in Section 6 makes it possible to describe experimental data on angular distributions of elastically and inelastically scattered neutrons within experimental errors. Some comparisons of illustrative nature are given in Figs. 19 and 20.

11.3. Energy Neutron Distributions from Non-Elastic Processes

The non.elastic neutron spectra were calculated by the model that takes into account the pre-equilibrium mechanism of a compound nucleus decay [217]. The contribution of this mechanism increases with energy and is sufficiently large (0.07, 0.12, 0.16, 0.20 at 7, 9, 12, 15 MeV, respectively). Neutron spectra from different reactions are shown in Table 30.

11.4. γ-Ray Spectra Accompanying Non-Elastic Processes

The γ-ray spectra accompanying (n,n'), (n,2n), (n,3n) and (n,γ)-reactions were calculated by the statistical model [218] in the dipole approximation. Excitation functions of nuclei were taken such as in the appropriate cross section calculations. The spectrum of the γ-rays accompanying fission was not calculated because it is difficult to specify the fragment excitation function. Therefore, the γ-ray fission spectrum was assumed to be independent of the neutron energy and taken from the experiment [219]. The total γ-ray spectrum from non-elastic interaction of neutrons with a nucleus ^{239}Pu is given in Table 31.

12. Group Representation of Evaluated Nuclear Data for ^{239}Pu

The evaluated nuclear data were grouped in the standard 26-group representation. Averaging was performed by the Fermi spectrum up to 2.5 MeV and above, by the fission one. The group constants are given in Table 32 . The inelastic transition matrix due to (n,n'), (n,2n) and (n,3n)-processes is presented in Table 33. Tables 34 and 35 incorporate the error correlation matrices for the group values σ_{nf} and α [222].

Because the algorithm to obtain group constants is well known the main differences between the group constants obtained and the ones of the other libraries are attributed to our evaluated data on cross sections, energy and angular distributions of secondary neutrons.

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FIGURE CAPTIONS

Fig. 1. Comparison of the evaluated and experimental data on σ_{nf} between 0.01 and 0.1 eV

Fig. 2. Comparison of the evaluated and experimental data on α in the thermal region

Fig. 3. Comparison of the calculated and experimental data on σ_{nf} from 0.5 to 5 eV

Fig. 4. Comparison of the calculated and experimental data on cross sections in the region from 125 to 135 eV: a, σ_{nT}; b, σ_{nf}; c, $\sigma_{n\gamma}$

Fig. 5. Comparison of the calculated and experimental data on ^{239}Pu cross sections in the region 271-281 eV: a, σ_{nT}; b, σ_{nf} ; c, $\sigma_{n\gamma}$

Fig. 6. Energy dependence of the increasing resonance level sum

Fig. 7. Comparison of the Wigner resonance distance distribution with the experimental one

Fig. 8. Comparison of the experimental distribution of the reduced neutron widths with the Porter-Thomas one for $\nu=1.2$

Fig. 9. Comparison of the generalized Porter-Thomas distribution (_____) and the Porter-Thomas distribution for $\nu=2$ (---) with the experimental one for the fission 0^+ state widths

Fig.10. Energy dependence of the increasing sum of the reduced neutron widths. The straight line stands for $S_0 = 1.28 \cdot 10^{-4}$

Fig. 11. Comparison of the calculated and experimental data on $\langle\sigma_{nT}\rangle$ within 0.1-100 keV

Fig. 12. Comparison of the calculations and the data on $\langle\sigma_{nf}\rangle$ evaluated from experiment within 0.3-100 keV

Fig. 13. Comparison of the calculations and the data on $\langle\alpha\rangle$ evaluated from experiment within 0.3-100 keV

Fig. 14. Comparison of the calculated and experimental σ_{nT} cross sections within 0.1-15 MeV

Fig. 15. Comparison of the evaluated and experimental total σ_{nn} cross sections

Fig. 16. Comparison of the evaluated and experimental data on nonelastic interaction cross section, σ_{nx}

Fig. 17. Comparison of the calculated cross section, $\sigma_{n\gamma}$, with the data obtained from the experimental α value

Fig. 18. Comparison of the evaluated and experimental data on level excitation cross sections : a, 57 + 76 keV; b, 285 keV; c, 330 keV; d, 387 + 392 keV; e, total $\sigma_{nn'}$ cross section

Fig. 19. Comparison of the angular distributions of the elastically and inelastically scattered neutrons calculated by the generalized optical model with the experimental ones at 3.4 MeV

Fig. 20. Comparison of the calculated and experimental angular distributions for the neutrons scattered by the ground state band at 4 MeV

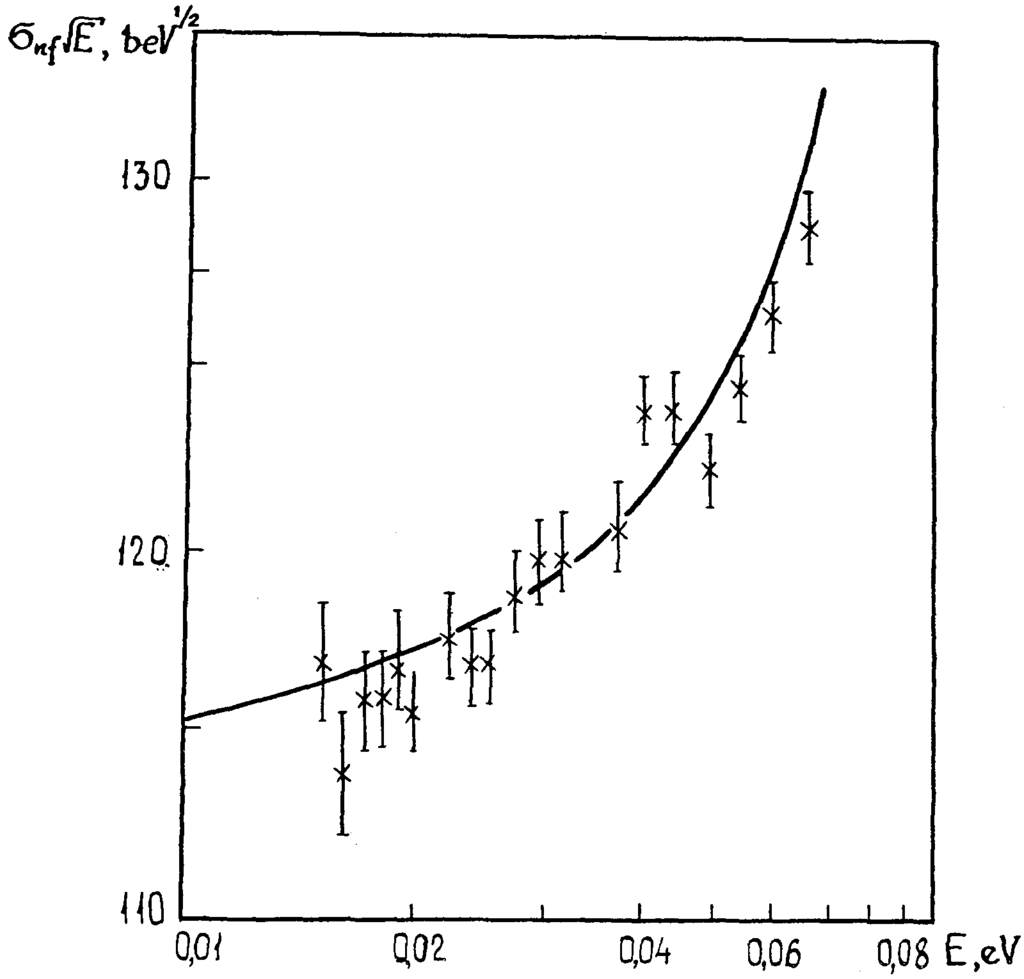

Fig. 1. Comparison of the evaluated and experimental data [32] on σ_{nf} between 0.01 and 0.1 eV

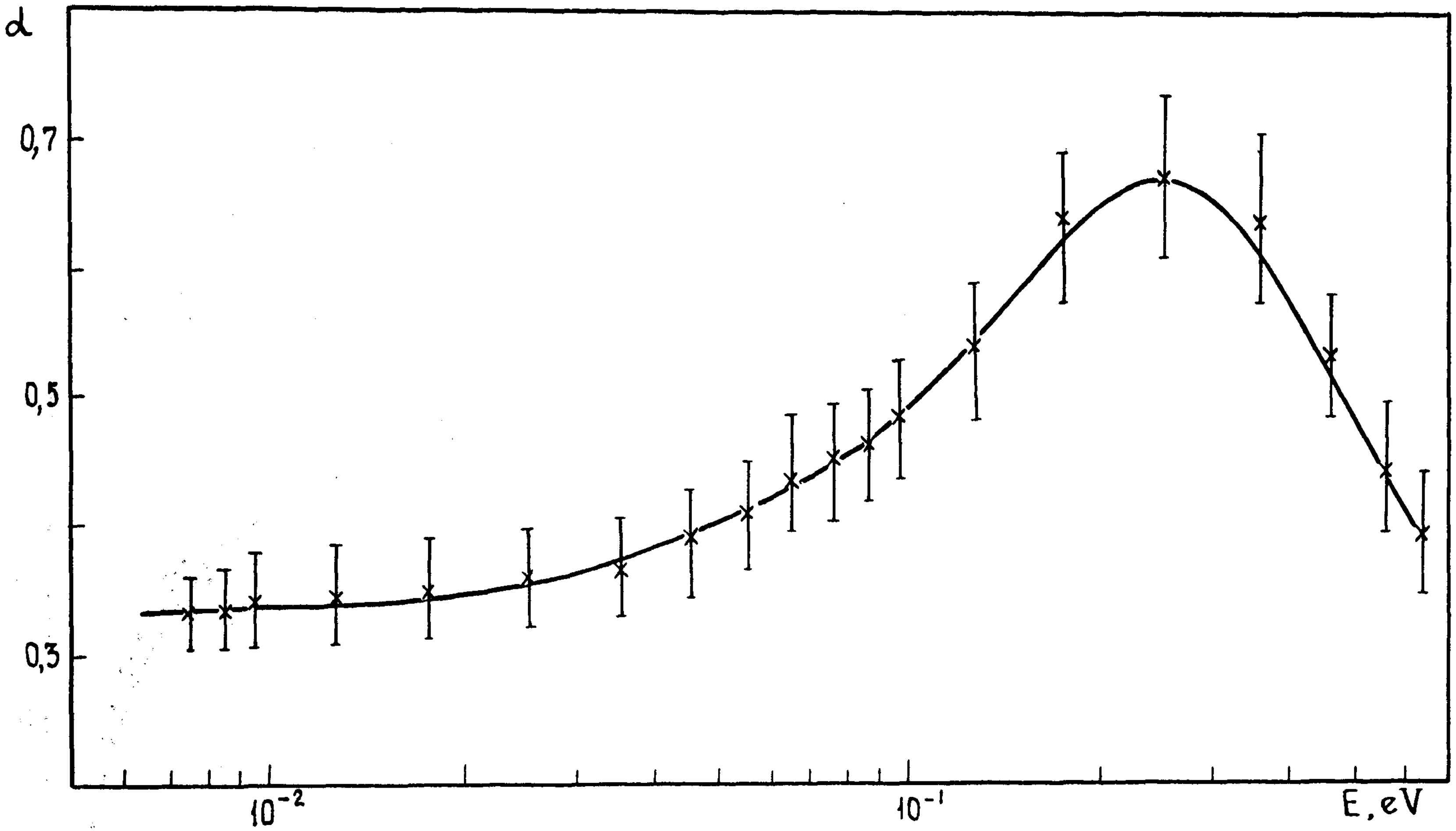

Fig. 2. Comparison of the evaluated and experimental data [34] on α in the thermal region

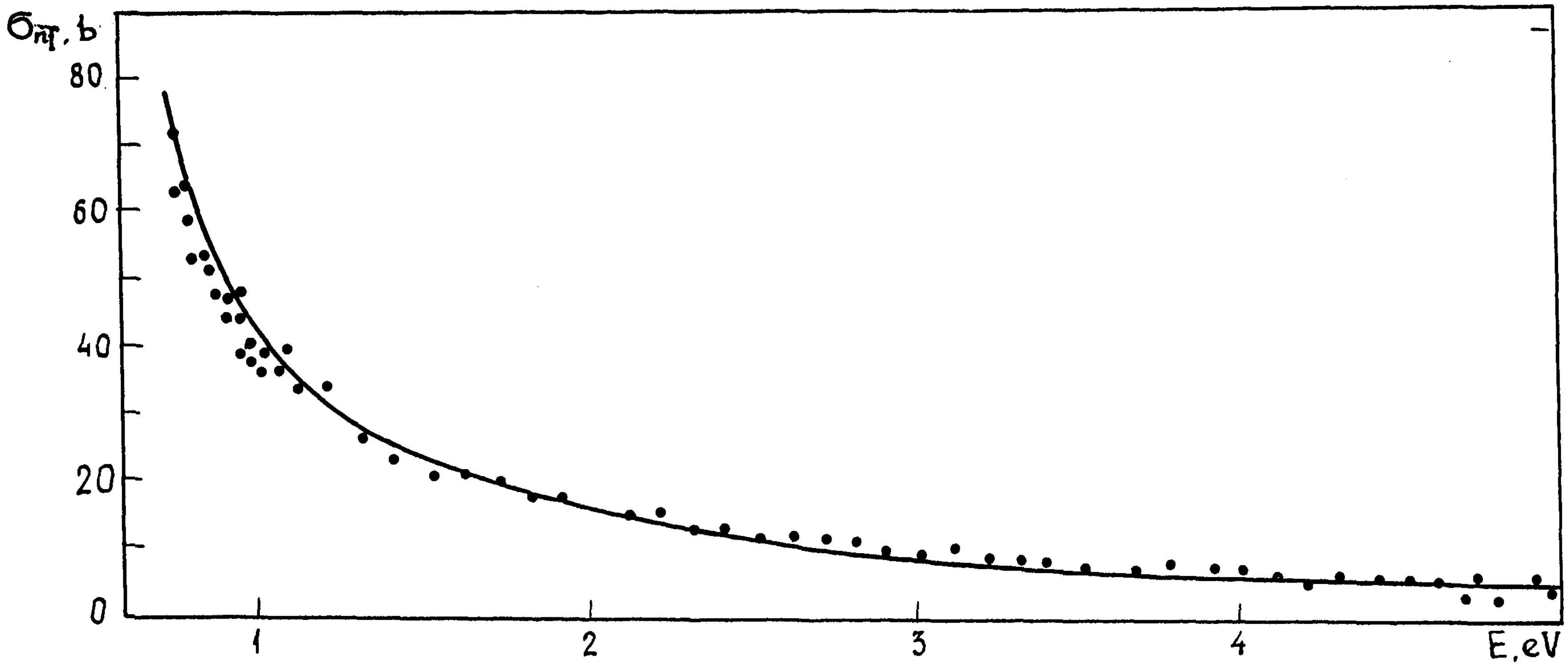

Fig. 3. Comparison of the calculated and experimental data [7] on σ_{nf} from 0.5 to 5 eV

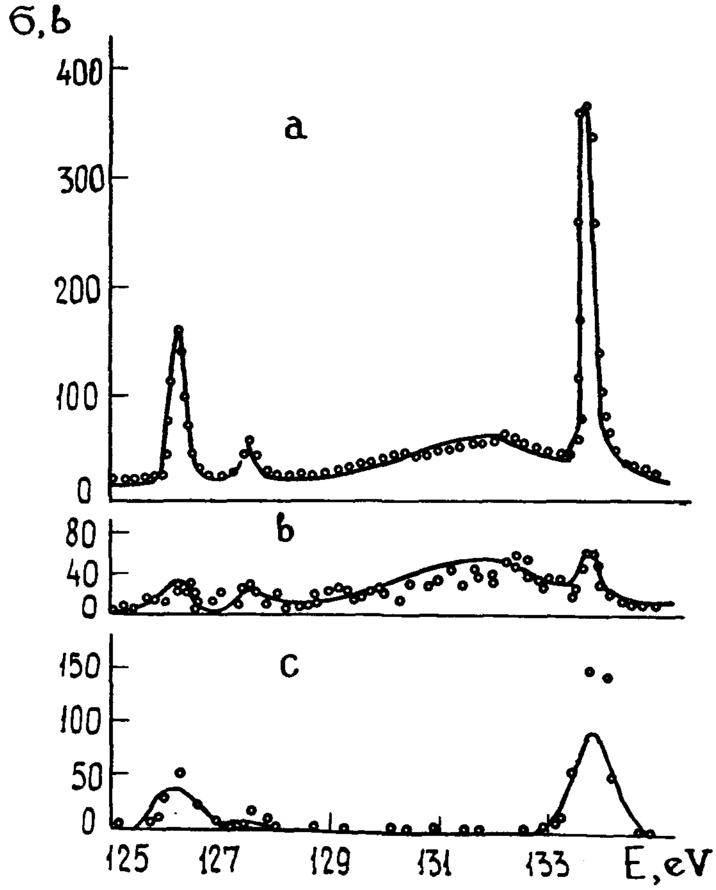

Fig. 4. Comparison of the calculated and experimental data on cross sections in the region from 125 to 135 eV : a, σ_{nT} [59] ; b, σ_{nf} [61] ; c, $\sigma_{n\gamma}$ [6]

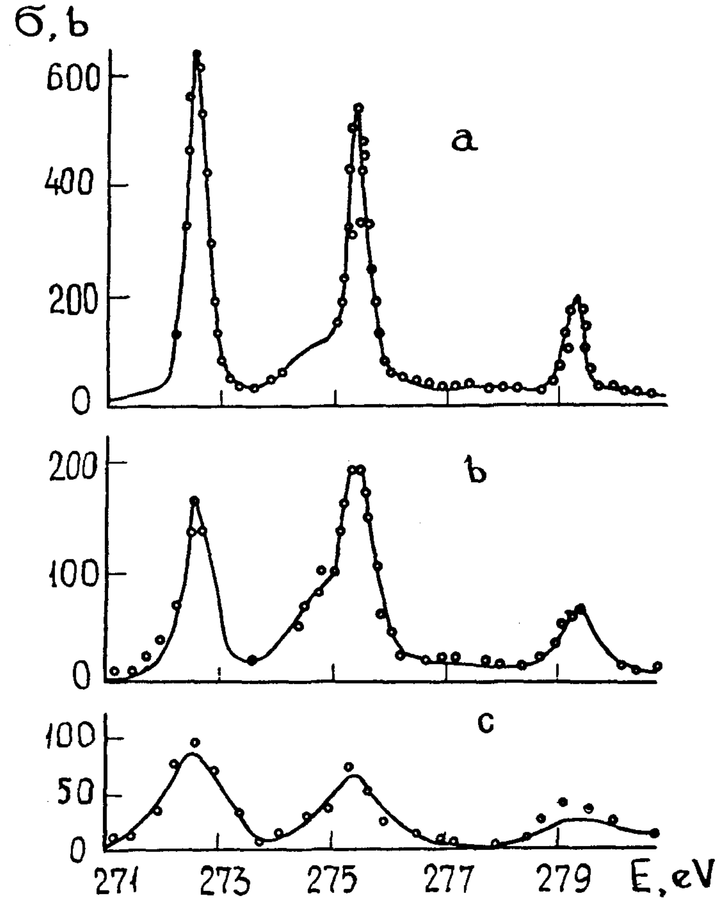

Fig. 5. Comparison of the calculated and experimental data on ^{239}Pu cross sections in the region 271-281 eV: a, σ_{nT} [59]; b, σ_{nf} [61]; c, $\sigma_{n\gamma}$ [6]

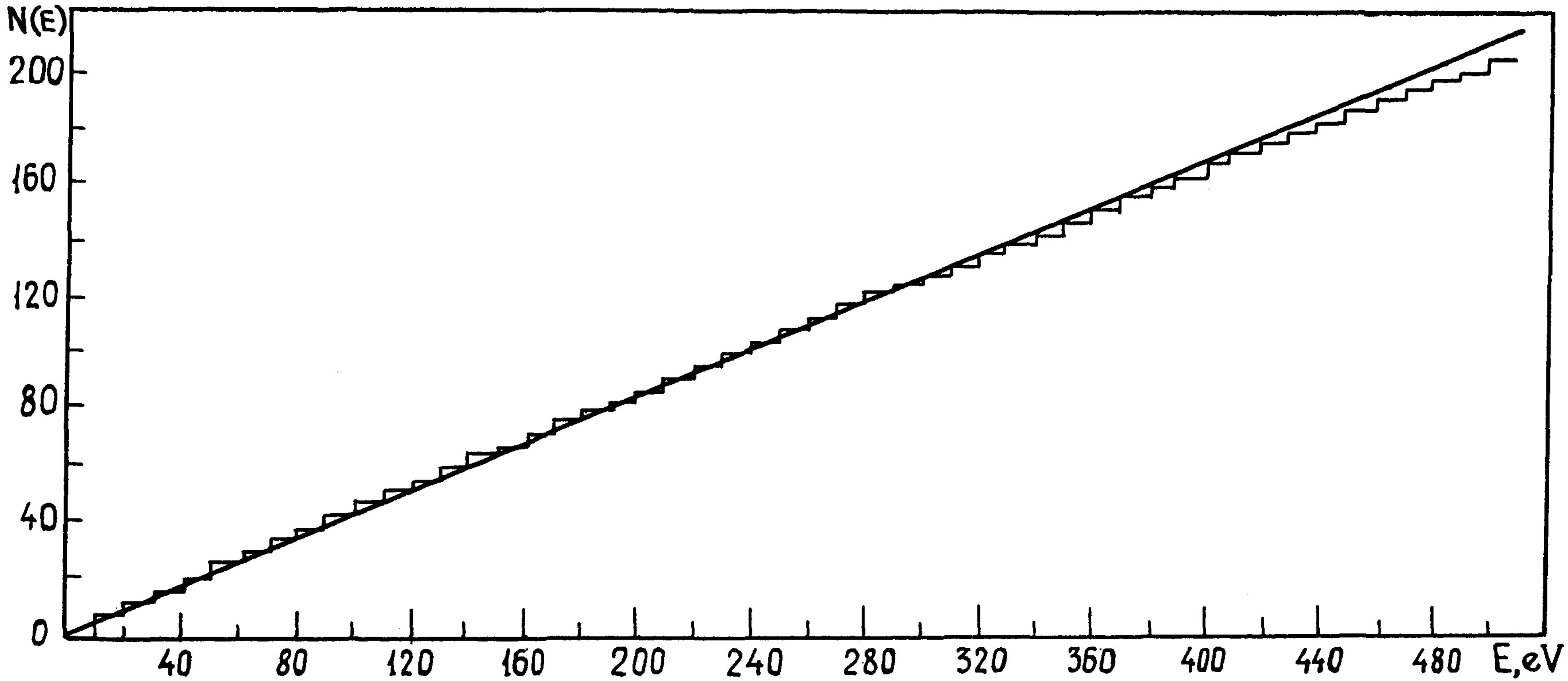

Fig. 6. Energy dependence of the increasing resonance level sum

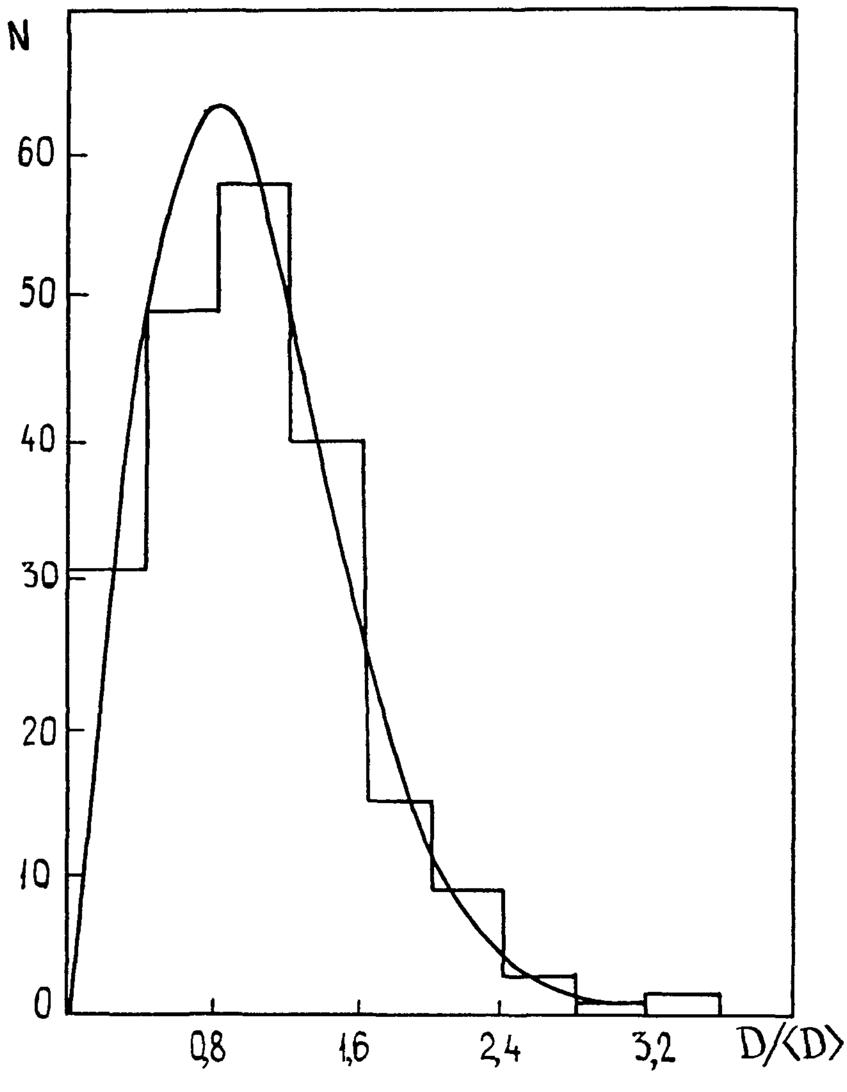

Fig. 7. Comparison of the Wigner resonance distance distribution with the experimental one

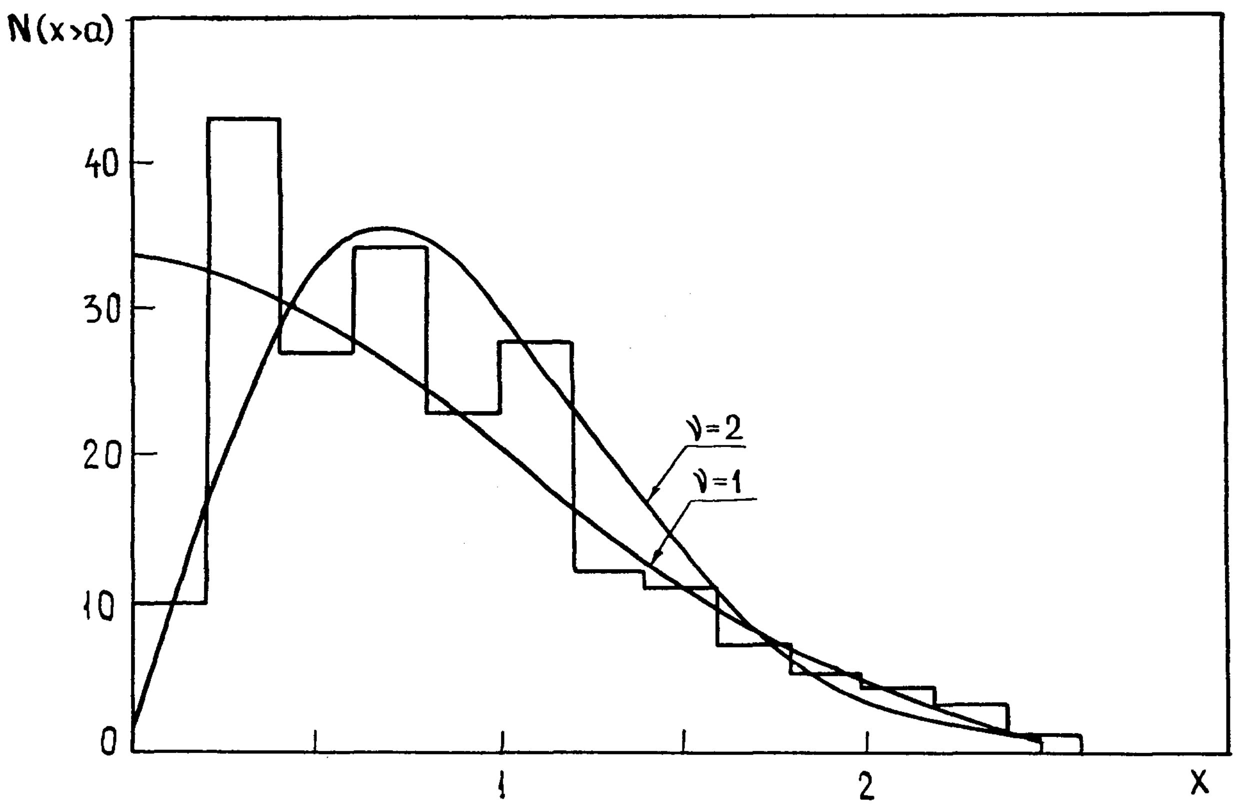

Fig. 8. Comparison of the experimental distribution of the reduced neutron widths with the Thomas--Porter one for ν=1,2

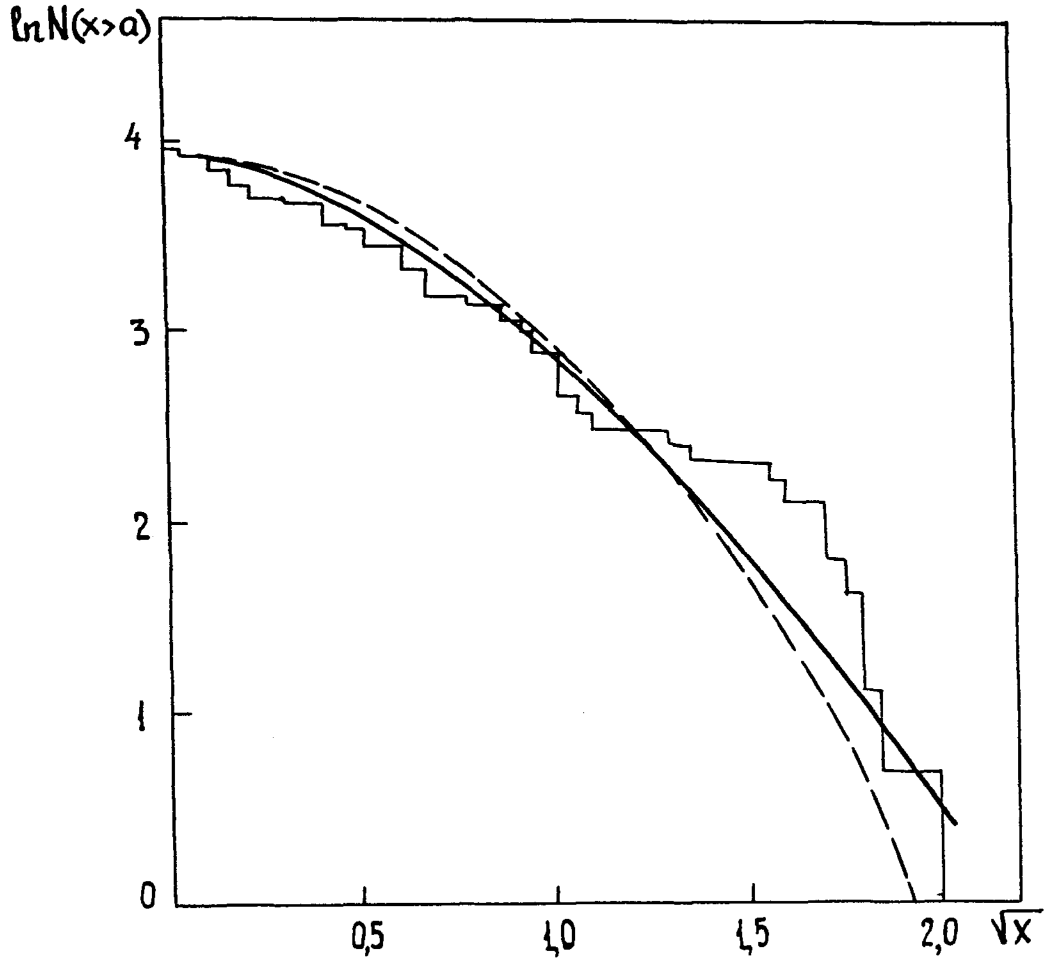

Fig. 9. Comparison of the generalized Porter--Thomas distribution (____) and the Porter-Thomas distribution for ν=2(---) with the experimental one for the fission 0^+ state widths

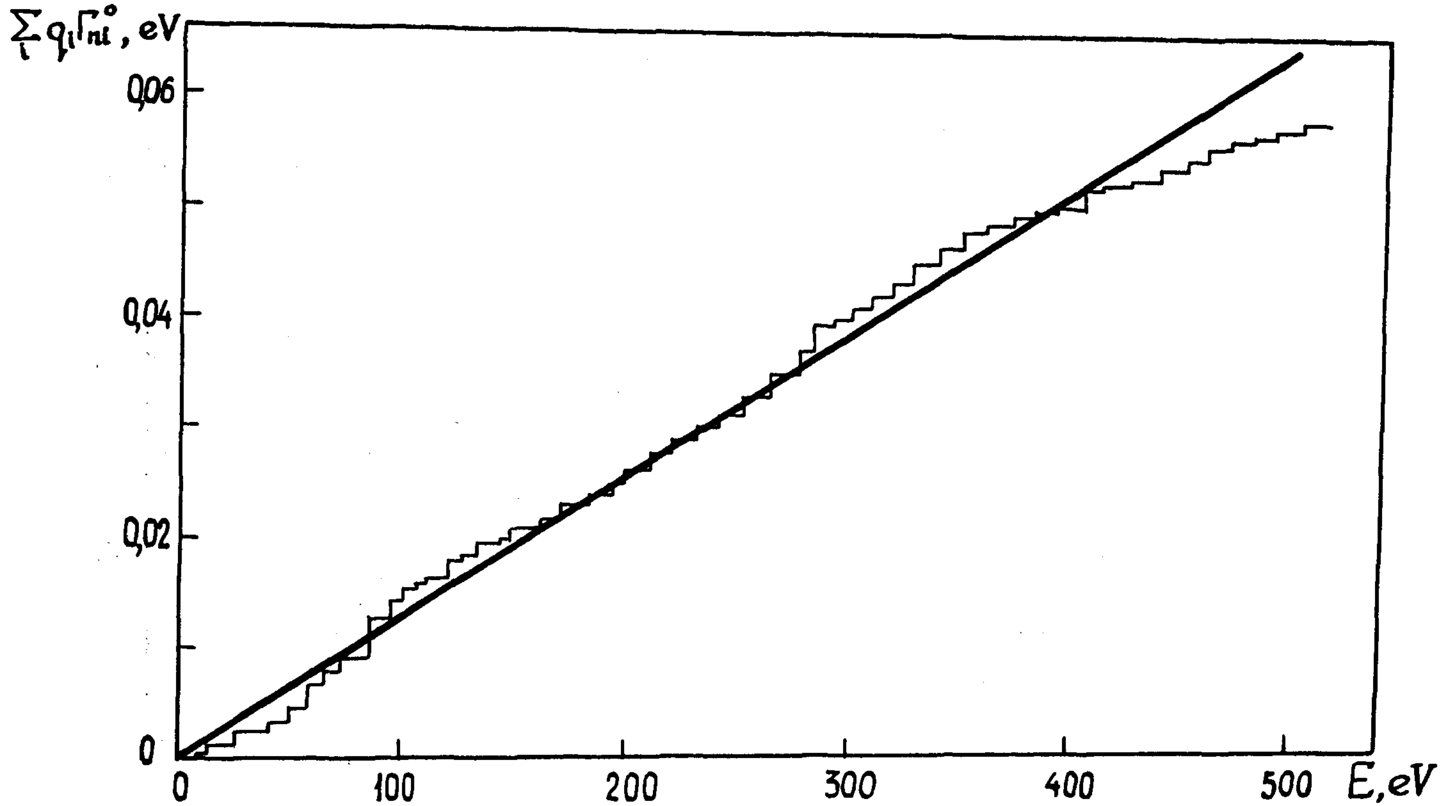

Fig. 10. Energy dependence of the increasing sum of the reduced neutron widths. The straight line stands for $S_0 = 1.28 \cdot 10^{-4}$

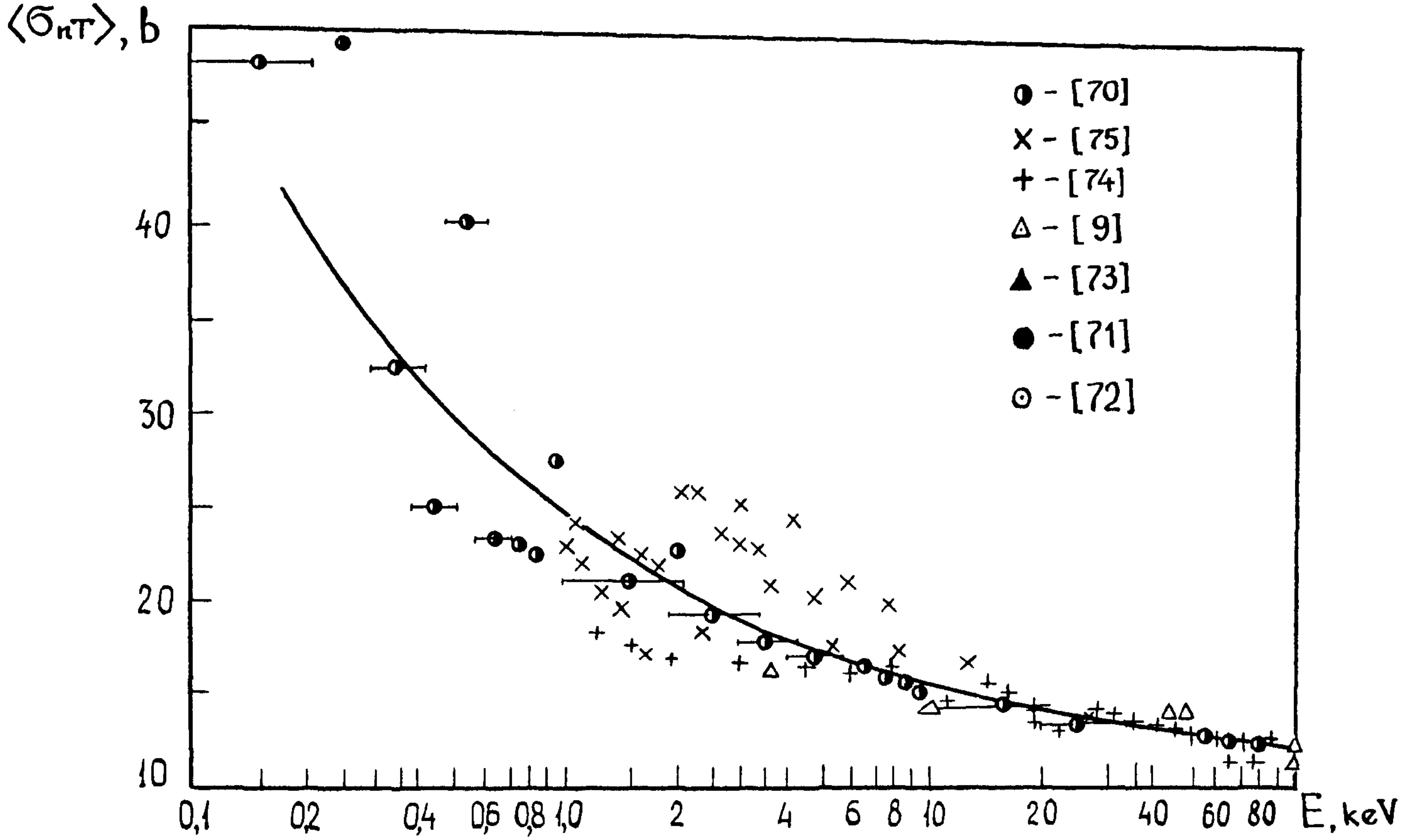

Fig. 11. Comparison of the calculated and experimental data on $\langle\sigma_{nT}\rangle$ within 0.1 - 100 keV

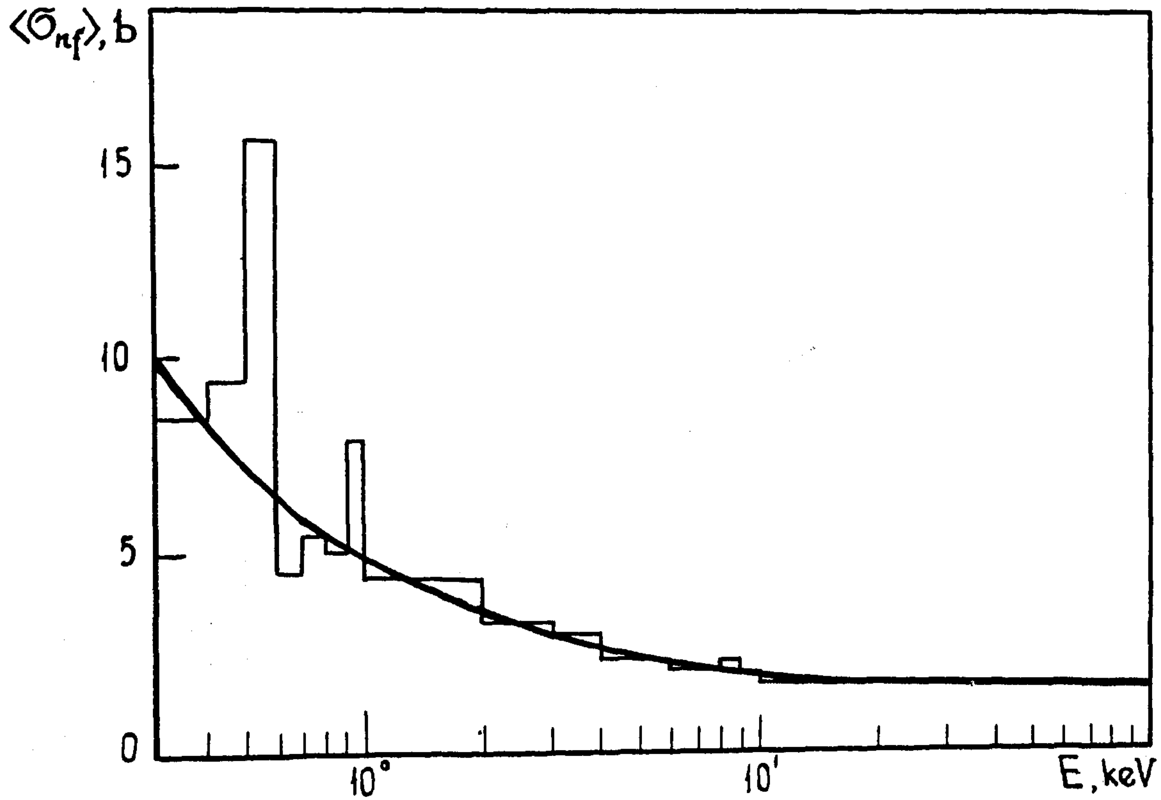

Fig. 12. Comparison of the calculations and the data on $\langle\sigma_{nf}\rangle$ evaluated from experiment within 0.3-100 keV

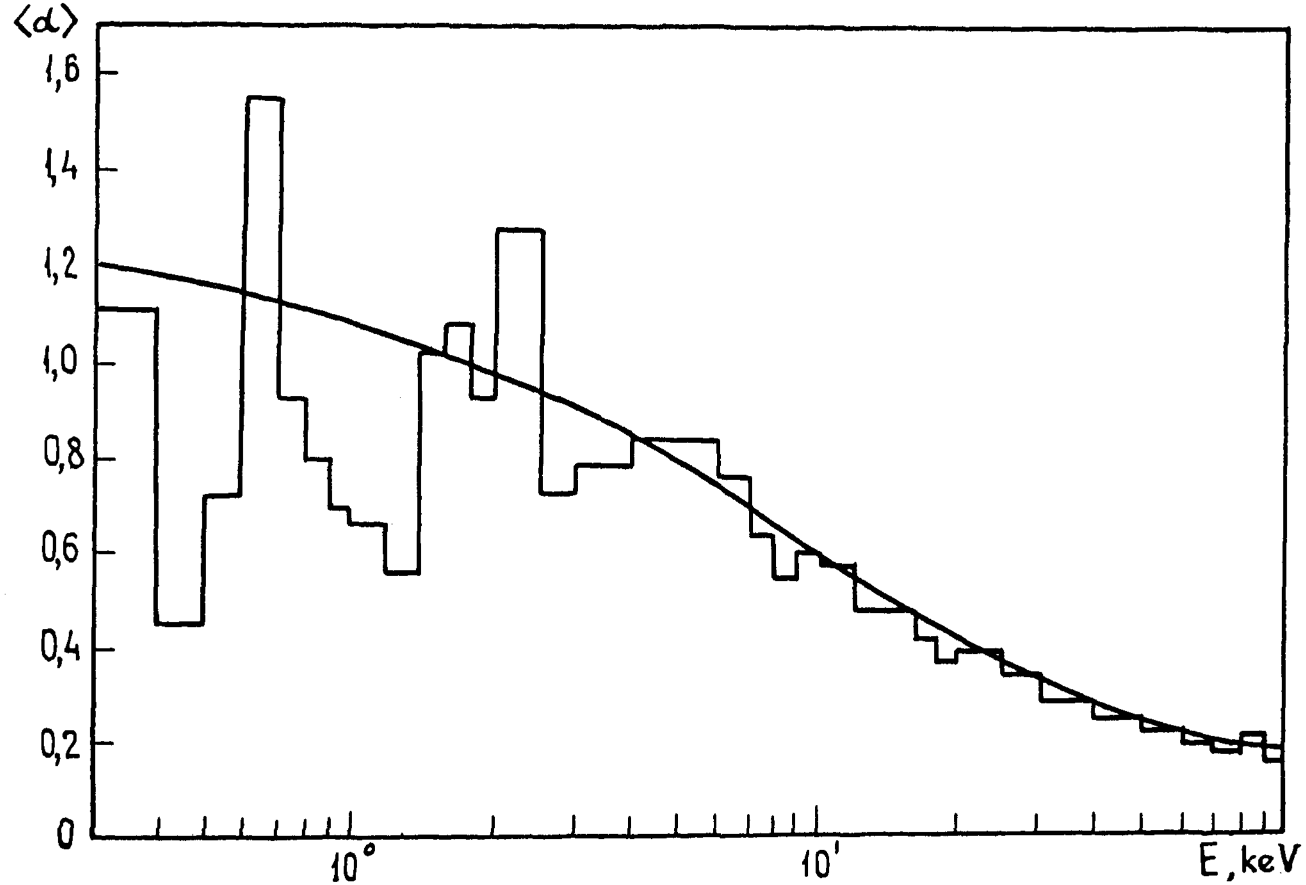

Fig. 13. Comparison of the calculations and the data on α evaluated from experiment within 0.3-100 keV

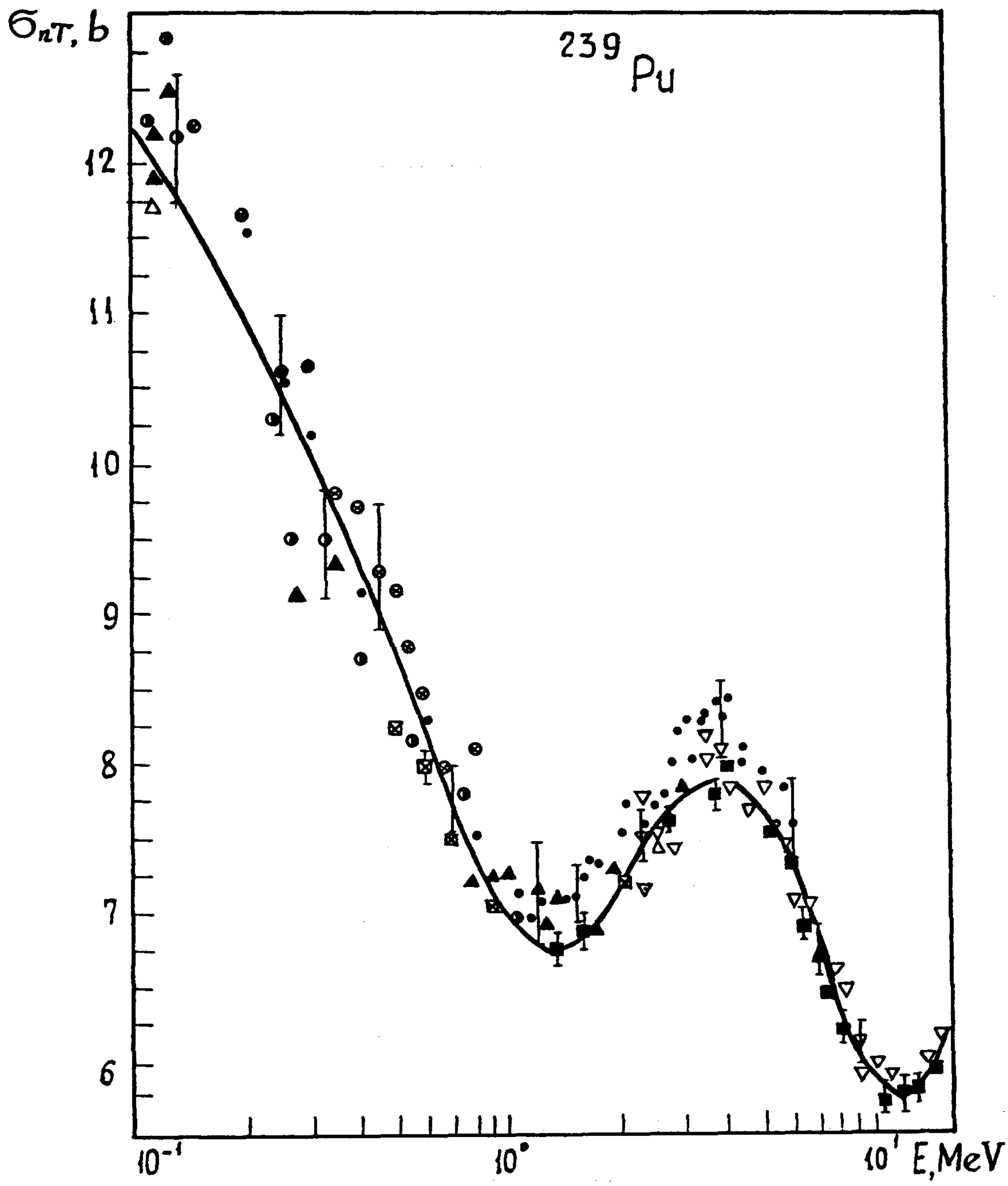

Fig. 14. Comparison of the calculated and experimental σ_{nT} cross sections within 0.1-15 MeV

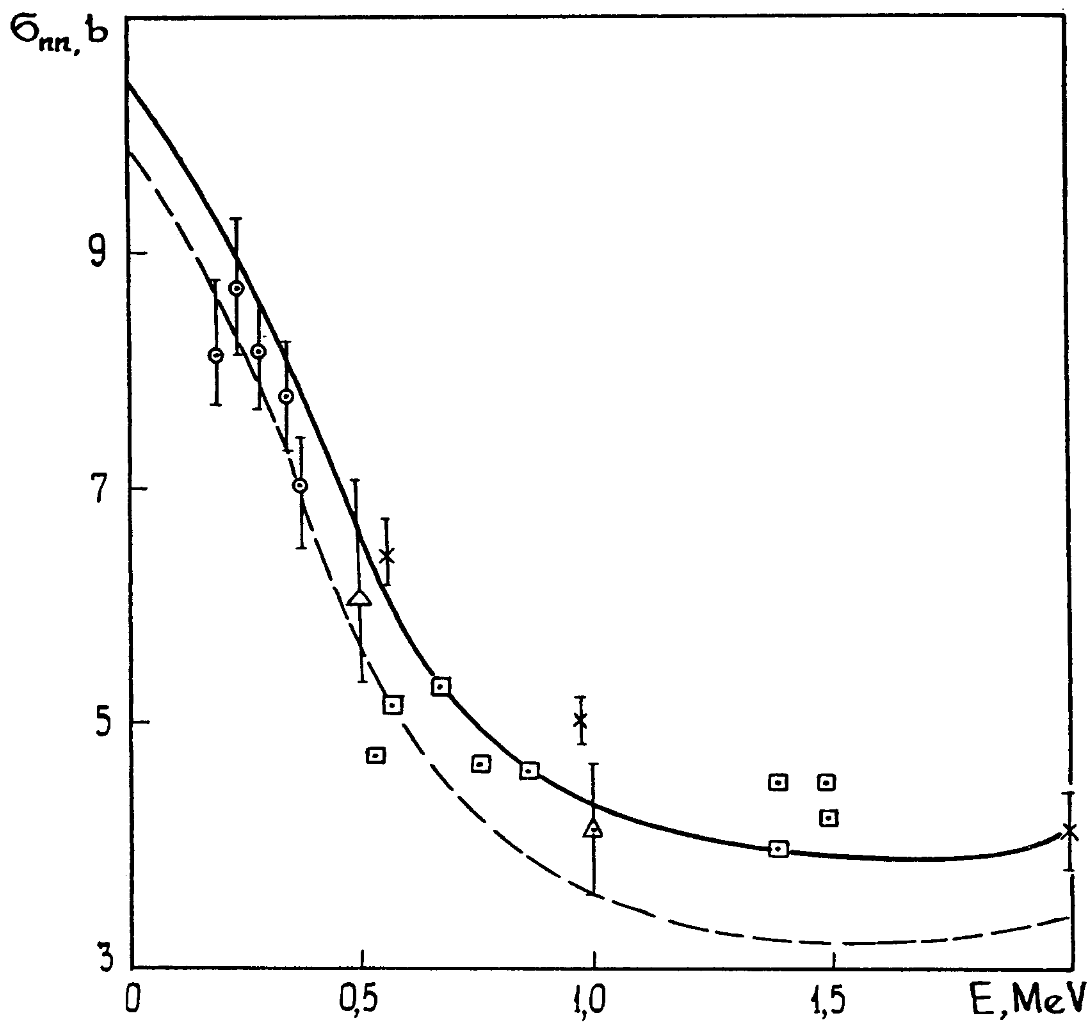

Fig. 15. Comparison of the evaluated and experimental total σ_{nn} cross sections

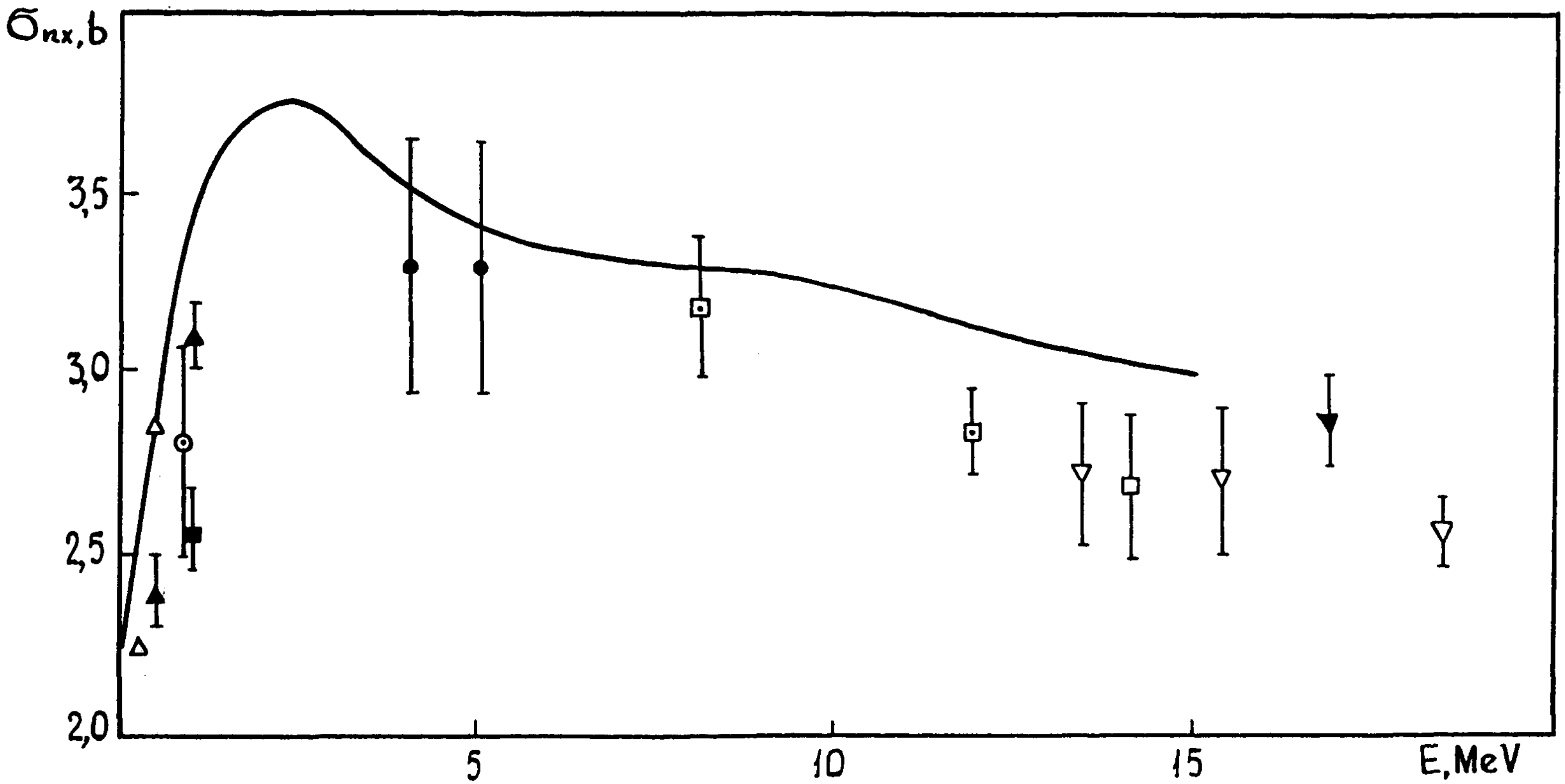

Fig. 16. Comparison of the evaluated and experimental data on nonelastic interaction cross section, σ_{nx}

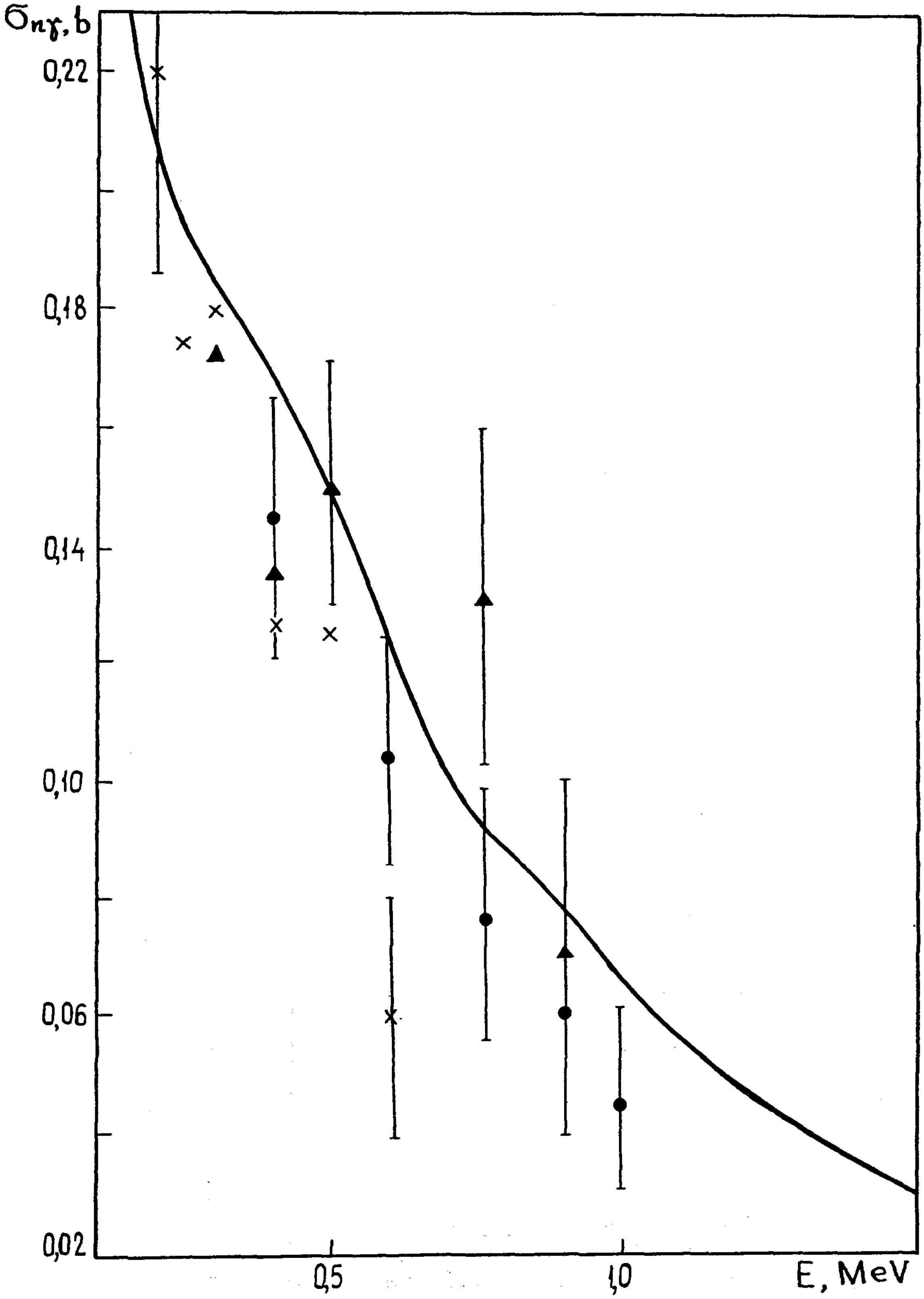

Fig. 17. Comparison of the calculated cross section, $\sigma_{n\gamma}$, with the data obtained from the experimental α value

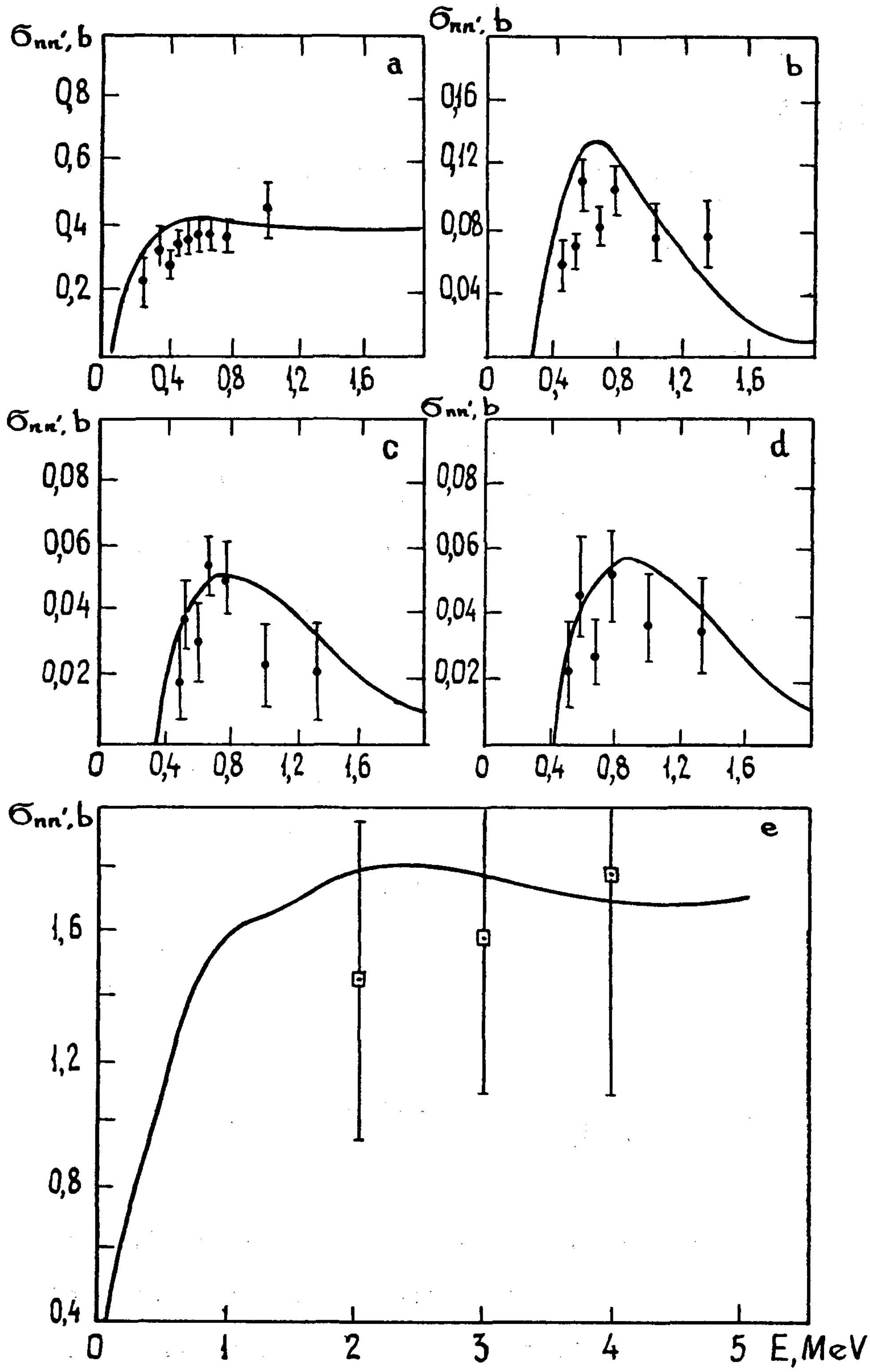

Fig. 18. Comparison of the evaluated and experimental data on level excitation cross sections : a, 57 + 76 keV; b, 285 keV; c, 330 keV; d, 387 + 392 keV; e, total $\sigma_{nn'}$ cross section

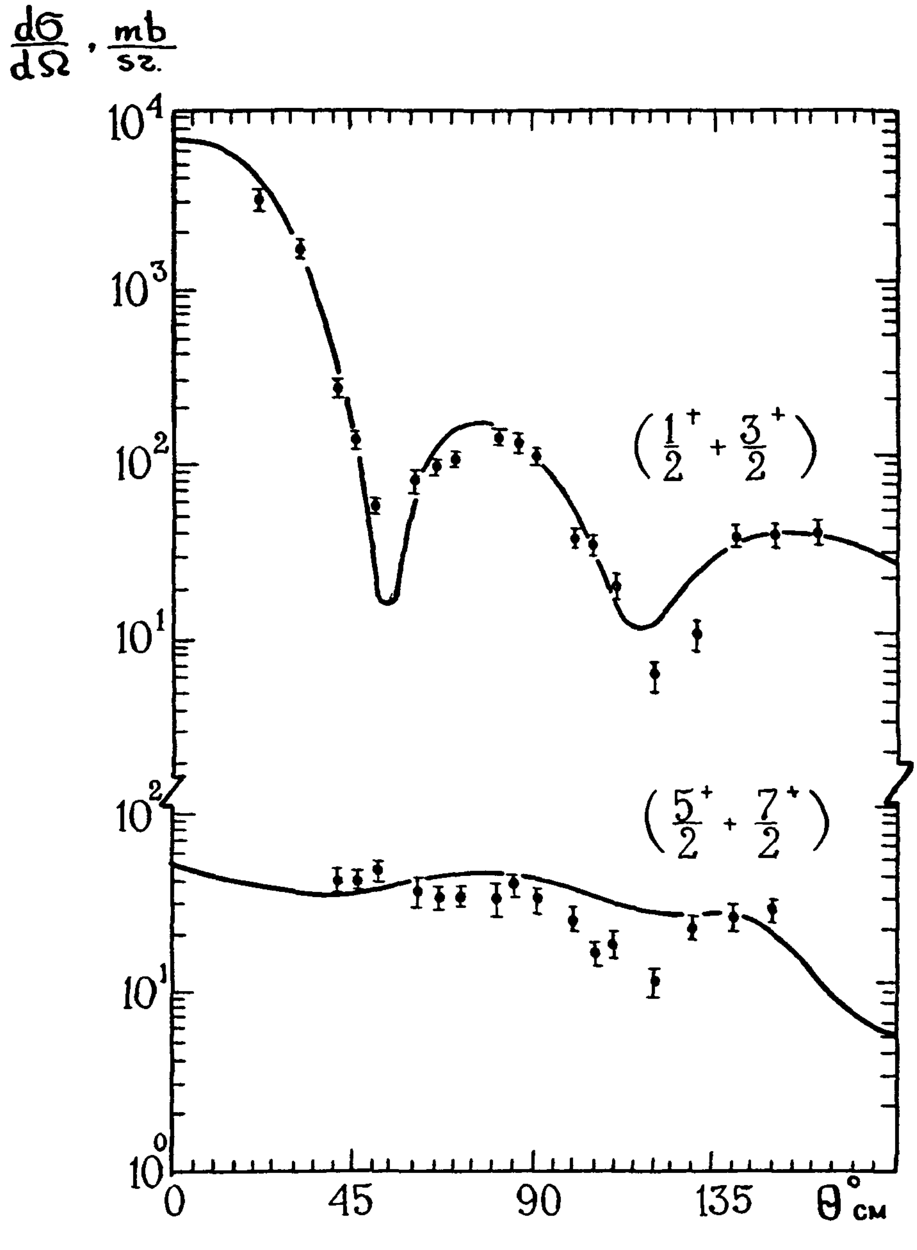

Fig. 19 Comparison of the angular distributions of the elastically and inelastically scattered neutrons calculated by the generalized optical model with the experimental ones at 3.4 MeV

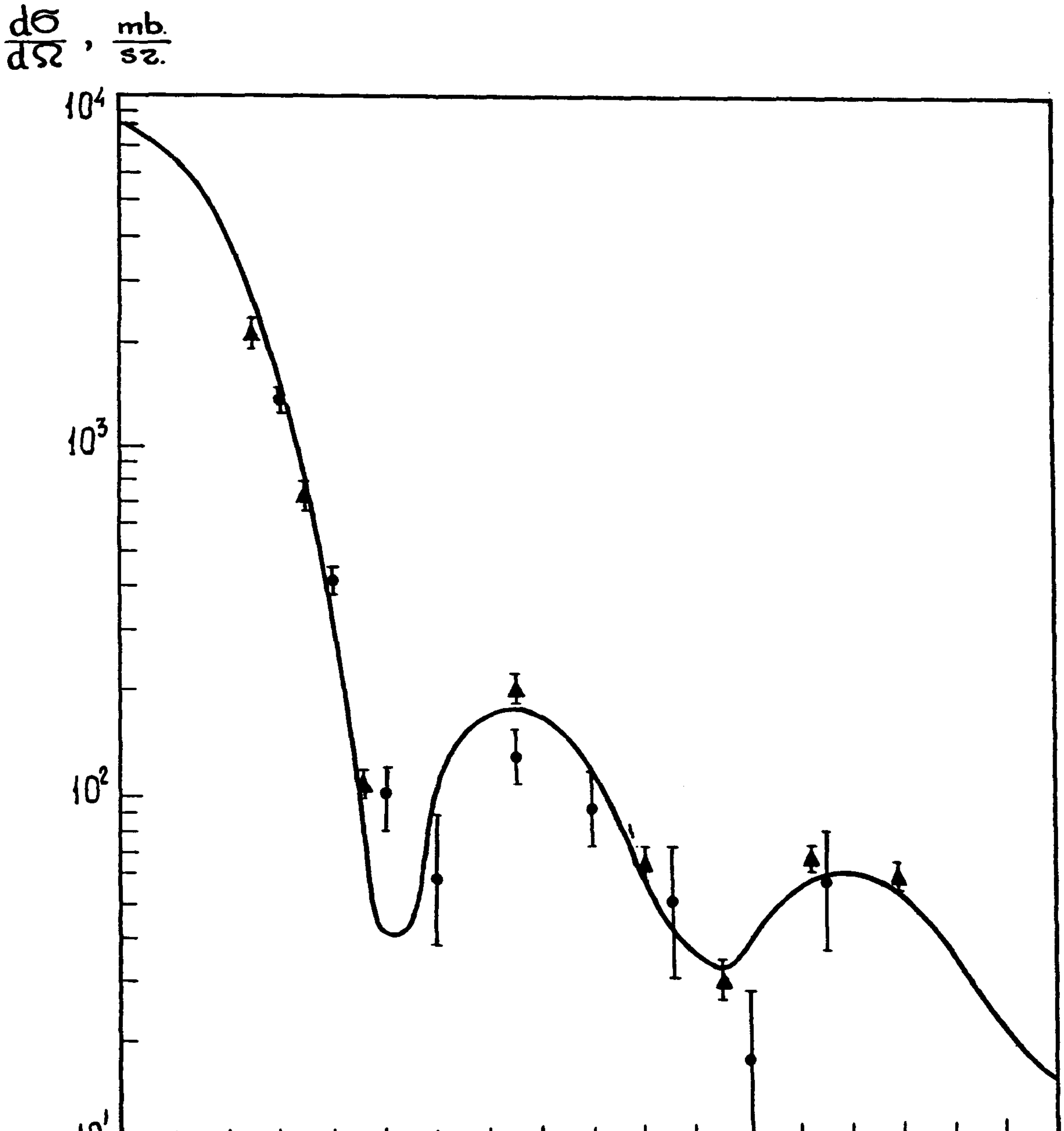

Fig. 20. Comparison of the calculated and experimental angular distributions for the neutrons scattered by the ground state band at 4 MeV

TABLE CAPTIONS

Table 1

Energies Q and thresholds T for neutron reactions with the ^{239}Pu nucleus

Reaction	Q, MeV	T, MeV
(n,γ)	-	- 6,534
(n,2n)	- 5,655	5,679
(n,3n)	-I2,653	I2,706
(n,4n)	-I8,5I3	I8,59I
(n,p)	-	- 0,059
(n,np)	- 6,I67	6,I93
(n,d)	- 3,940	3,960
(n,t)	- 3,I70	3,I80
(n,nd)	- 9,420	9,460
(n,nt)	- 9,790	9,830
(n,^{3}He)	- 3,660	3,680
(n,^{4}He)	-	-II,790
(n,n^{3}He)	- 8,790	8,830
(n,n^{4}He)	-	- 5,240

Table 2

Recommended data on the neutron cross sections and neutron yields at 0.0253 eV, Maxwell spectrum-averaged values and ENDF/B-IV library data (cross sections measured in barns)

	[4]		ENDF/B-IV [5]
	2200 m/s	$20^{o}C$	2200 m/s
1	2	3	4
σ_{nT} metal target	IOI8,5±4,I		IOI9,8±7,2
σ_{nT} liquid target	IOI9,2±4,I		
σ_{nn} metal target	7,2±I,4		8,0±2,0
σ_{nn} liquid target	8,0±I,0		
σ_{nA}	IOII,2±4,I	I092,9±2,9	IOII,8±7,I
σ_{nf}	744,0±2,5	785,3±2,2	742,0±4,2
$\sigma_{nf}(^{239}Pu)/\sigma_{nf}(^{235}U)$	I,275±0,004 (0,007)	I,379±0,004 (0,007)	
$\sigma_{n\gamma}$	267,2 ±3,3	307,6 ±I,5	269,7±6,0
α	0,359±0,005	0,392±0,002	0,3635±0,0084
η	2,I06±0,007	2,057±0,006	2,I073±0,0I35
$\eta\sigma_{nA}=\bar{\nu}_t\sigma_{nf}$	2I29±8	2248±8	
$(\eta-1)\sigma_{nA}$	III8±6	II55±7	
$\bar{\nu}_t$	2,862±0,008		2,8733±0,0I57
$\bar{\nu}_p$	2,856±0,008		
$\bar{\nu}_d$	0,0063±0,0004		0,0064±0,0004
$\bar{\nu}_t(^{239}Pu)/\bar{\nu}_t(^{252}Cf)$	0,764±0,002		
$\bar{\nu}_p(^{239}Pu)/\bar{\nu}_p(^{252}Cf)$	0,764±0,002		

Table 3

Evaluated data in the energy region from 10^{-5} to 5 eV

E, eV	σ_{nf}	$\sigma_{n\gamma}$	σ_{nn}	σ_{nA}	σ_{nT}	α	η
	barn						
I	2	3	4	5	6	7	8
$I\cdot IO^{-5}$	36I78,5	II557,I	7,58	47735,6	47743,I8	0,3I94	2,I692
$5\cdot IO^{-5}$	I6I59,0	5I62,50	7,58	2I32I,5	2I329,08	0,3I95	2,I690
$I\cdot IO^{-4}$	II44I,2	3655,80	7,58	I5097,0	I5I04,58	0,3I95	2,I690
$5\cdot IO^{-4}$	5II7,86	I638,I6	7,58	6756,02	6763,60	0,320I	2,I680
0,00I0	3620,I5	II6I,50	7,58	478I,65	4789,23	0,3208	2,I669
0,0020	2560,72	825,83	7,57	3386,55	3394,I2	0,3225	2,I64I
0,0030	2092,86	677,I7	7,56	2770,03	2777,59	0,3236	2,I623
0,0040	I8I4,35	588,92	7,56	2403,27	24I0,83	0,3246	2,I607
0,0050	I624,50	529,26	7,55	2I53,76	2I6I,3I	0,3258	2,I587
0,0060	I484,57	485,68	7,54	I970,25	I977,79	0,3272	2,I564
0,0070	I376,00	452,02	7,54	I828,02	I835,56	0,3285	2,I543
0,0080	I288,6I	425,I8	7,53	I7I3,79	I72I,32	0,3300	2,I5I9
0,0090	I2I6,40	403,I9	7,52	I6I9,59	I627,II	0,33I5	2,I495
0,0I00	II55,40	384,69	7,52	I540,09	I547,6I	0,3329	2,I472
0,0200	829,II	290,I6	7,45	III9,27	II26,72	0,3500	2,I200
0,0253	744,00	267,20	7,4I	I0II,20	I0I8,6I	0,359I	2,I058
0,0300	689,I3	253,00	7,37	942,I3	949,50	0,367I	2,0935
0,0400	607,93	233,22	7,30	84I,I5	848,45	0,3836	2,0685
0,0500	554,99	222,43	7,22	777,42	784,64	0,4008	2,043I
0,0600	522,I3	2I8,89	7,I4	74I,02	748,I6	0,4I92	2,0I66
0,0700	50I,I3	2I9,45	7,06	720,58	727,64	0,4379	I,9904
0,0800	486,02	22I,55	6,97	707,57	7I4,54	0,4558	I,9659
0,0900	475,88	226,69	6,87	702,57	709,44	0,4764	I,9385

Table 3 (continued)

I	2	3	4	5	6	7	8
0,I000	475,22	235,78	6,77	7II,00	7I7,77	0,496I	I,9I30
0,I250	492,82	266,94	6,49	759,76	766,25	0,54I7	I,8564
0,I500	545,II	3I7,33	6,I6	862,44	868,60	0,582I	I,8090
0,I750	655,55	406,88	5,77	I062,43	I068,20	0,6207	I,7659
0,2000	845,6I	549,I2	5,36	I394,73	I400,09	0,6494	I,7352
0,2200	II23,20	746,07	5,I0	I869,27	I874,37	0,6642	I,7I97
0,2400	I575,42	I06I,I3	5,I5	2636,55	264I,70	0,6736	I,7I0I
0,2600	2242,3I	I5I9,20	6,I2	376I,5I	3767,63	0,6775	I,706I
0,2800	3033,32	2047,5I	9,II	5080,83	5089,94	0,6750	I,7087
0,2900	3234,82	2I68,92	II,47	5403,74	54I5,2I	0,6705	I,7I33
0,2960	3265,64	2I74,95	I2,99	5440,59	5453,58	0,6660	I,7I79
0,3000	3248,9I	2I53,46	I3,98	5402,37	54I6,35	0,6628	I,72I2
0,3I25	2970,52	I940,66	I6,55	49II,I8	4927,73	0,6533	I,73II
0,3250	2475,58	I590,46	I7,87	4066,04	4083,9I	0,6425	I,7425
0,3500	I560,2I	957,50	I7,6I	25I7,7I	2535,32	0,6I37	I,7736
0,4000	643,68	368,25	I4,86	I0II,93	I026,79	0,572I	I,8205
0,4500	334,72	I76,92	I3,I6	5II,64	524,80	0,5286	I,8723
0,5000	2I2,43	I03,45	I2,I9	3I5,88	328,07	0,4870	I,9247
0,5500	I47,80	66,52	II,58	2I4,32	225,90	0,450I	I,9737
0,6000	I08,75	45,28	II,I6	I54,03	I65,I9	0,4I64	2,0206
0,7000	72,85	26,62	I0,64	99,47	II0,II	0,3654	2,096I
0,8000	54,24	I7,82	I0,32	72,06	82,38	0,3285	2,I543
0,9000	43,70	I2,97	I0,I0	56,67	66,77	0,2968	2,2070
I,0000	37,5I	9,99	9,94	47,50	57,44	0,2663	2,260I
I,2000	30,06	6,64	9,72	36,70	46,42	0,2209	2,3442
I,4000	25,22	4,95	9,57	30,I7	39,74	0,I963	2,3924

Table 3 (continued)

I	2	3	4	5	6	7	8
I,6000	2I,72	3,93	9,46	25,65	35,II	0,I809	2,4236
I,8000	I9,0I	3,24	9,36	22,25	3I,6I	0,I704	2,4453
2,0000	I6,86	2,75	9,29	I9,6I	28,90	0,I63I	2,4607
2,2000	I5,06	2,38	9,22	I7,44	26,66	0,I580	2,47I5
2,4000	I3,63	2,I0	9,I6	I5,73	24,89	0,I54I	2,4799
2,6000	I2,48	I,88	9,I0	I4,36	23,46	0,I506	2,4874
2,8000	II,56	I,7I	9,05	I3,27	22,32	0,I479	2,4932
3,0000	I0,82	I,57	9,00	I2,39	2I,39	0,I45I	2,4993
3,2000	I0,25	I,45	8,95	II,70	20,65	0,I4I5	2,5072
3,4000	9,80	I,36	8,90	II,I6	20,06	0,I388	2,5I32
3,6000	9,48	I,29	8,85	I0,77	I9,62	0,I36I	2,5I9I
3,8000	9,27	I,23	8,80	I0,50	I9,30	0,I327	2,5267
4,0000	9,I6	I,I8	8,75	I0,34	I9,09	0,I288	2,5354
4,2000	9,I5	I,I5	8,69	I0,30	I8,99	0,I257	2,5424
4,4000	9,23	I,I3	8,64	I0,36	I9,00	0,I224	2,5499
4,6000	9,38	I,I2	8,59	I0,50	I9,09	0,II94	2,5567
4,8000	9,60	I,I2	8,53	I0,72	I9,25	0,II67	2,5629
5,0000	9,87	I,I4	8,47	II,0I	I9,48	0,II55	2,5657

Table 4

Parameters of the negative and first positive resonances used for cross section description in the thermal region

E_r, eV	Γ_n, meV	Γ_γ, meV	Γ_f, meV	J
- I,8	0,8586	378,940	29I9,I0	0
- 0,07	$0,91356 \cdot 10^{-3}$	3,9239	66,0	I
0,3	$0,81482 \cdot 10^{-1}$	37,0	57,I5	I

Table 5

Temperature dependence of the Westcott g-factors

T, ^oK	g_f	g_a	g_γ	g_η
1	2	3	4	5
293,6	I,0546	I,078I	I,I435	0,9782
300	I,0588	I,0840	I,I54I	0,9768
3I0	I,0658	I,0937	I,I7I5	0,9745
320	I,0732	I,I040	I,I898	0,972I
330	I,08I2	I,II50	I,2090	0,9697
340	I,0897	I,I265	I,2292	0,9673
350	I,0987	I,I388	I,2505	0,9648
360	I,I083	I,I5I8	I,2729	0,9622
370	I,II85	I,I655	I,2964	0,9597
380	I,I293	I,I800	I,32II	0,9570
390	I,I408	I,I953	I,3469	0,9544
400	I,I529	I,2II3	I,3739	0,95I8
4I0	I,I656	I,228I	I,402I	0,949I
420	I,I790	I,2458	I,43I6	0,9464
430	I,I93I	I,2642	I,4622	0,9438
440	I,2078	I,2835	I,494I	0,94I0
450	I,2232	I,3035	I,5272	0,9384
460	I,2392	I,3244	I,56I5	0,9357
470	I,2558	I,3460	I,5970	0,9330
480	I,273I	I,3684	I,6336	0,9304
490	I,29II	I,39I6	I,67I4	0,9278
500	I,3096	I,4I55	I,7I03	0,9252

Table 5

(continued)

1	2	3	4	5
510	1,3287	1,4401	1,7502	0,9226
520	1,3484	1,4655	1,7913	0,9201
530	1,3687	1,4915	1,8333	0,9177
540	1,3895	1,5182	1,8763	0,9152
550	1,4109	1,5455	1,9202	0,9129
560	1,4327	1,5734	1,9651	0,9106
570	1,4550	1,6019	2,0107	0,9083
580	1,4778	1,6309	2,0572	0,9061
590	1,5009	1,6604	2,1044	0,9039
600	1,5245	1,6904	2,1523	0,9019
610	1,5485	1,7209	2,2009	0,8998
620	1,5728	1,7518	2,2501	0,8978
630	1,5975	1,7831	2,2999	0,8959
640	1,6225	1,8148	2,3502	0,8940
650	1,6477	1,8467	2,4009	0,8922
660	1,6732	1,8790	2,4521	0,8905
670	1,6989	1,9115	2,5036	0,8888
680	1,7249	1,9444	2,5555	0,8871
690	1,7510	1,9773	2,6077	0,8856
700	1,7773	2,0105	2,6601	0,8840
710	1,8038	2,0439	2,7127	0,8825
720	1,8303	2,0774	2,7655	0,8811
730	1,8570	2,1110	2,8184	0,8797
740	1,8837	2,1446	2,8713	0,8783
750	1,9105	2,1783	2,9243	0,8771

Table 5

(continued)

1	2	3	4	5
760	I,9373	2,2I2I	2,9774	0,8758
770	I,964I	2,2458	3,0303	0,8746
780	I,9909	2,2795	3,0833	0,8734
790	2,0I77	2,3I32	3,I36I	0,8723
800	2,0445	2,3468	3,I888	0,87I2
8I0	2,07I2	2,3804	3,24I4	0,870I
820	2,0978	2,4I38	3,2937	0,869I
830	2,I244	2,447I	3,3457	0,868I
840	2,I508	2,4803	3,3978	0,8672
850	2,I772	2,5I34	3,4494	0,8662
860	2,2034	2,5462	3,5008	0,8654
870	2,2295	2,5789	3,55I8	0,8645
880	2,2555	2,6II4	3,6025	0,8637
890	2,28I2	2,6437	3,6529	0,8629
900	2,3068	2,6757	3,7028	0,862I
9I0	2,3323	2,7075	3,7524	0,86I4
920	2,3575	2,739I	3,80I6	0,8607
930	2,3825	2,7704	3,8504	0,8600
940	2,4074	2,80I4	3,8986	0,8594
950	2,4320	2,8322	3,9465	0,8587
960	2,4564	2,8626	3,9939	0,858I
970	2,4805	2,8928	4,0408	0,8575
980	2,5044	2,9227	4,087I	0,8569
990	2,528I	2,9522	4,I332	0,8563
I000	2,55I5	2,98I4	4,I778	0,8558

Table 5

(continued)

1	2	3	4	5
1010	2,5747	3,0104	4,2227	0,8553
1020	2,5976	3,0389	4,2677	0,8548
1030	2,6202	3,0672	4,3117	0,8543
1040	2,6426	3,0951	4,3550	0,8538
1050	2,6647	3,1227	4,3977	0,8533
1060	2,6866	3,1499	4,4400	0,8529
1070	2,7081	3,1768	4,4815	0,8525
1080	2,7294	3,2033	4,5225	0,8521
1090	2,7504	3,2294	4,5633	0,8517
1100	2,7711	3,2552	4,6032	0,8513
1110	2,7915	3,2806	4,6426	0,8509
1120	2,8116	3,3057	4,6812	0,8505
1130	2,8315	3,3304	4,7195	0,8502
1140	2,8510	3,3548	4,7573	0,8498
1150	2,8703	3,3788	4,7945	0,8495
1160	2,8893	3,4024	4,8308	0,8492
1170	2,9080	3,4254	4,8668	0,8490
1180	2,9264	3,4485	4,9024	0,8486
1190	2,9445	3,4710	4,9359	0,8483
1200	2,9623	3,4932	4,9715	0,8480
1210	2,9796	3,5148	5,0049	0,8477
1220	2,9971	3,5364	5,0383	0,8475
1230	3,0140	3,5575	5,0709	0,8472
1240	3,0307	3,5782	5,1028	0,8470
1250	3,0471	3,5984	5,1341	0,8468

Table 5

(continued)

1	2	3	4	5
I260	3,0632	3,6I86	5,I650	0,8465
I270	3,0790	3,6382	5,I955	0,8463
I280	3,0945	3,6576	5,2250	0,8460
I290	3,I08I	3,6747	5,2545	0,8458
I300	3,I247	3,695I	5,28I6	0,8456

Evaluated data from [4] and ENDF/B-IV [5]

for T=293.6°K

g_f /4/ = I,0555 ± 0,0024 g_f /5/ = I,0549

g_γ /4/ = I,I5I ± 0,0I5

g_a /4/ = I,0808 ± 0,0039 g_a /5/ = I,0752

g_η /4/ = 0,9766 ± 0,0034 g_η /5/ = 0,98II

Table 6

Resonance parameters for ^{239}Pu

E_r	$g\Gamma_n$, eV	Γ_f, eV	Γ_γ, eV	Γ_t, eV	J
I	2	3	4	5	6
-I,8000-00	2,I465-04	2,9I9I-00	3,7894-0I	3,2989-00	0
-7,0000-02	6,85I7-07	6,6000-02	3,9239-03	6,9925-02	I
3,0000-0I	6,III2-05	5,7I50-02	3,7000-02	9,4232-02	I
5,9000-00	4,7000-05	3,2590-00	4,3300-02	3,3025-00	
7,8200-00	5,735I-04	4,8200-02	3,8800-02	8,7765-02	I
I,0930 0I	I,3239-03	I,5660-0I	4,2200-02	2,0057-0I	I
I,I500 0I	4,2527-05	I,0400-02	4,I200-02	5,I657-02	
I,I890 0I	6,6947-04	2,9000-02	4,7000-02	7,6893-02	I
I,43I0 0I	4,322I-04	6,7000-02	3,4000-02	I,0I58-0I	I
I,4680 0I	I,4I98-03	2,9200-02	3,8800-02	6,9893-02	I
I,5460 0I	4,6707-04	6,4890-0I	5,0000-02	7,0077-0I	0
I,7660 0I	I,2249-03	3,2400-02	4,0600-02	7,4633-02	I
2,2290 0I	I,8573-03	6,I800-02	4,4200-02	I,0848-0I	I
2,3940 0I	6,3860-05	4,0000-02	3,0000-02	7,0085-02	I
2,6240 0I	8,9929-04	4,5600-02	3,6400-02	8,3I99-02	I
2,7240 0I	I,0735-04	6,0000-03	3,6000-02	4,2I43-02	
3,23I0 0I	I,8747-04	I,II60-0I	3,9400-02	I,5I75-0I	0
3,4600 0I	9,I600-06	4,9000-02	4,2000-02	9,I0I2-02	
3,5500 0I	2,044I-04	4,0000-03	4,3000-02	4,7273-02	I
4,I420 0I	3,I786-03	5,0000-03	4,3000-02	5,2238-02	I
4,I660 0I	I,II50-03	4,7000-02	5,7000-02	I,0549-0I	
4,4480 0I	4,7088-03	5,4000-03	4,6600-02	5,8278-02	I
4,7600 0I	I,4I0I-03	2,4500-0I	6,I000-02	3,II64-0I	0
4,97I0 0I	I,0I43-03	7,4900-0I	4,9000-02	8,0206-0I	0

Table 6 (continued)

I	2	3	4	5	6
5,0080 0I	2,42I7-03	I,3000-02	4,I000-02	5,7229-02	I
5,2600 0I	7,2030-03	8,4000-03	4,9600-02	6,7604-02	I
5,5630 0I	I,3473-03	2,I500-02	3,5500-02	5,8796-02	I
5,7440 0I	4,04I8-03	4,4380-0I	4,9000-02	5,0897-0I	0
5,8840 0I	3,0097-03	I,0470-00	4,2000-02	I,I0I0-00	
5,9220 0I	4,0449-03	I,2I00-0I	5,4000-02	I,8039-0I	I
6,0940 0I	5,0379-03	6,7350-02	4,3000-02	6,7982-00	0
6,3080 0I	6,0472-04	I,I000-0I	4,2000-02	I,528I-0I	I
6,5360 0I	2,5760-04	4,9500-02	4,2000-02	9,I844-02	
6,57I0 0I	8,3370-03	7,3000-02	5,2000-02	I,36I2-0I	I
7,4050 0I	2,4529-03	3,I500-02	3,6500-02	7,I27I-02	I
7,4950 0I	I,57I5-02	8,5000-02	4,0000-02	I,4595-0I	I
7,8950 0I	I,0229-04	4,8500-02	4,3000-02	9,I636-02	
8,I760 0I	2,I6I9-03	I,9950-00	4,3000-02	2,0466-00	0
8,2680 0I	3,7550-04	2,9500-02	4,0500-02	7,050I-02	
8,3520 0I	6,I250-04	I,7050-00	4,3000-02	I,7504-00	
8,5320 0I	I,2850-02	2,0030-00	4,3000-02	2,0974-00	0
8,5480 0I	5,70I5-03	I,7000-02	5,0000-02	7,4602-02	I
9,0750 0I	8,4946-03	9,0000-03	3,9500-02	5,9826-02	I
9,2970 0I	6,6285-04	8,6000-03	4,7500-02	5,875I-02	
9,536I 0I	I,59I2-03	2,9000-02	6,7000-02	9,8I22-02	I
9,649I 0I	3,4I9I-03	I,6440-00	4,3000-02	I,7007-00	0
I,0025 02	3,0303-03	5,9460-00	4,3000-02	6,007I-00	0
I,0299 02	I,2957-03	9,0000-03	3,6I00-02	4,6828-02	I
I,0530 02	3,I967-03	6,0000-03	3,7700-02	4,7962-02	I
I,0667 02	7,2033-03	2,6000-02	4,0I00-02	7,5704-02	I
I,I038 02	3,5760-04	I,3000-02	3,0000-02	4,3477-02	

I	2	3	4	5	6
I,I444 02	4,I975-04	I,4535-00	4,3000-02	I,4982-00	0
I,I5I0 02	I,7220-04	I,6400-0I	4,I000-02	2,0569-0I	
I,I603 02	2,9377-03	2,I799-0I	3,9000-02	2,6874-0I	0
I,I883 02	I,4050-02	4,I000-02	4,25000-02	I,0223-0I	I
I,2099 02	2,0364-03	3,8000-02	3,I300-02	7,7446-02	0
I,2344 02	3,5099-04	3,8000-02	2,5000-02	6,3468-02	
I,2620 02	I,54I9-03	I,9000-02	7,0000-02	9,I056-02	
I,275I 02	3,7570-04	2,5000-02	3,9000-02	6,450I-02	
I,3I75 02	9,5II3-03	3,7I90-00	4,3000-02	3,8000-00	0
I,3378 02	3,7528-03	6,5000-03	4,4000-02	5,5504-02	I
I,3675 02	2,4623-03	8,3000-02	3,3000-02	I,2585-0I	0
I,3928 02	8,0400-05	2,7950-0I	4,2000-02	3,2I82-0I	
I,4292 02	2,5350-03	8,0000-02	5,4000-02	I,3738-0I	I
I,4347 02	3,II20-03	3,0000-02	4,9000-02	8,3I49-02	I
I,4625 02	5,3948-03	I,2000-02	5,I000-02	7,0I93-02	I
I,4744 02	6,6756-04	9,5600-0I	4,3000-02	I,00I7-00	0
I,482I 02	3,I3I6-04	I;0400-0I	4,5000-02	I,4942-0I	
I,4942 02	I,I952-03	5,3000-02	6,4000-02	I,I859-0I	
I,5708 02	8,669I-03	5,4I00-0I	4,7000-02	I,2268-0I	0
I,6080 02	I,5350-04	I,0I00-0I	4,0000-02	I,4I20-0I	
I,6I96 02	I,5550-04	I,0800-0I	4,2000-02	I,502I-0I	
I,6454 02	I,8686-02	9,0000-03	4,4000-02	7,79I5-02	I
I,67I0 02	4,2993-03	6,9500-02	3,7000-02	I,I223-0I	I
I,7049 02	5,I560-04	I,I500-0I	4,3000-02	I,5869-0I	
I,7I08 02	4,5550-04	9,5500-0I	4,3000-02	9,9982-0I	0
I,7456 02	3,3I85-05	I,9930-0I	4,2000-02	2,4I43-0I	

Table 6 (Continued)

I	2	3	4	5	6
I,7598 02	I,663I-03	2,9000-02	4,I000-02	7,22I8-02	
I,7722 02	2,8609-03	6,0000-03	4,2000-02	5,I8I5-02	I
I,7890 02	9,57I0-04	I,4000-02	4,3000-02	5,8276-02	
I,8364 02	I,I672-03	2,8000-02	4,2000-02	7,2356-02	
I,8487 02	4,620I-03	2,0380-00	4,3000-02	2,0995-00	0
I,8827 02	4,9060-04	8,8000-03	4,3000-02	5,2454-02	
I,9064 02	I,3246-03	I,2500-02	5,0000-02	6,4266-02	
I,9536 02	I,6I69-02	3,3400-0I	4,0000-02	4,3868-0I	0
I,9669 02	3,6960-03	5,4000-02	5,3000-02	I,II93-0I	I
I,9939 02	6,6273-03	8,I500-02	4,2000-02	I,3834-0I	I
2,0346 02	I,0II0-03	2,7500-02	4,2000-02	7,0848-02	
2,0393 02	I,6023-02	3,3500-0I	4,2000-02	4,4I09-0I	0
2,0737 02	4,8258-03	6,5000-03	4,4000-02	5,6934-02	I
2,II09 02	3,3550-04	7,4650-0I	4,3000-02	7,9084-0I	0
I,I202 02	4,8000-04	I,4560-00	4,3000-02	I,5009-00	0
2,I328 02	3,3960-04	I,5650-0I	4,3000-02	2,0086-0I	
2,I653 02	4,8832-03	I,I500-02	5,0000-02	6,80II-02	I
2,I949 02	2,6783-03	2,6000-02	4,I000-02	7,057I-02	I
2,2022 02	5,2522-03	I,I500-02	3,4000-02	5,2503-02	I
2,23I6 02	2,4203-03	9,3000-03	4,7000-02	5,9527-02	I
2,2489 02	I,2492-03	2,6000-02	5,7000-02	8,4666-02	
2,2777-02	7,6I99-03	8,0240-00	4,2000-02	8,0965-00	0
2,2789 02	I,2606-03	3,I000-02	3,4000-02	6,668I-02	
2,3I40 02	8,4I90-03	5,5000-03	3,7000-02	7,6I76-02	0
2,3263 02	2,79I0-04	7,8000-02	4,2000-02	I,2037-0I	
2,3432 02	8,05I0-03	I,4000-02	5,0000-02	7,4735-02	I

Table 6 (continued)

I	2	3	4	5	6
2,3904 02	3,9890-03	I,7000-02	5,0000-02	7,23I9-02	I
2,4060 02	2,6560-05	I,9940-0I	4,2000-02	2,4I5I-0I	
2,4288 02	4,5064-03	5,8000-02	3,2000-02	9,6009-02	I
2,4750 02	5,8I30-04	2,3600-0I	4,3000-02	2,8I33-0I	
2,4886 02	9,9730-03	5,5000-03	4,2500-02	6,I297-02	I
2,5I23 02	I,8405-02	I,3500-02	4,4000-02	8,2040-02	I
2,5450 02	I,9573-03	2,5000-02	2,7000-02	5,46I0-02	
2,56II 02	4,809I-03	3,3000-02	5,2000-02	9,I4I2-02	I
2,5900 02	2,5I3I-04	I,9900-0I	4,2000-02	2,420I-0I	
2,6237 02	2,5388-02	6,I560-00	4,2000-02	6,2996-00	0
2,6274 02	I,8I0I-03	I,0000-02	4,6000-02	5,84I3-02	
2,6423 02	I,9I05-04	2,9900-0I	4,2000-02	3;4I76-0I	
2,69II 02	9,5378-04	8,6500-02	4,2000-02	I,2977-0I	
2,6954 02	3,0I86-03	2,7500-02	4,0000-02	7,I525-02	I
2,7262 02	I,9956-02	3,2500-02	3,3000-02	9,2I08-02	I
2,7480 02	7,4730-03	7,3500-0I	4,2000-02	8,0689-0I	0
2,7557 02	I,6738-02	7,4000-02	5,4000-02	I,5032-0I	I
2,7723 02	5,2373-03	5,2370-00	4,2000-02	5,2999-00	0
2,7959 02	5,6347-03	5,6000-02	3,4000-02	I,I254-0I	0
2,8292 02	I,8045-02	I,2000-02	4,9000-02	8,5060-02	I
2,8573 02	8,6000-05	2,9900-0I	4,2000-02	3,4I34-0I	
2,8800 02	6,7520-03	6,4300-00	4,2000-02	6,4990-00	0
2,8830 02	5,I300-05	2,9900-0I	4,2000-02	3,4I2I-0I	
2,9233 02	2,9849-03	7,I500-02	3,I000-02	I,I444-0I	0
2,9646 02	2,63I2-03	3,0000-02	4,7500-02	8,I008-02	
2,9859 02	8,I932-03	2,0000-02	4,2500-02	7,3424-02	I

Table 6 (continued)

I	2	3	4	5	6
3,0I8I 02	I,3300-02	4,7000-02	4,2900-02	I,0763-0I	I
3,0820 02	2,I730-03	9,8000-02	4,8000-02	I,4890-0I	
3,090I 02	I,0223-02	2,4000-02	4,7000-02	8,463I-0I	I
3,III2 02	3,7350-04	4,0000-02	4,I500-02	8,I998-02	
3,I362 02	I,0357-02	9,5000-03	3,8000-02	6,I309-02	I
3,I666 02	3,4250-03	2,5500-02	4,3000-02	7,3067-02	I
3,2000 02	I,0000-02	4,9990-00	4,3000-02	5,0820-00	
3,2I75 02	I,0I57-04	3,0000-0I	4,I500-02	3,4I9I-0I	
3,2336 02	I,5070-02	4,6500-02	5,3000-02	I,5978-0I	0
3,2530 02	6,I325-03	4,6500-02	5,0000-02	I,0468-0I	I
3,2965 02	3,2I02-03	I,9430-00	4,2000-02	I,9978-00	0
3,339I 02	4,20I3-03	9,5000-03	5,2000-02	6,7I02-02	I
3,3593 02	I,293I-02	I,8000-02	4,6500-02	8,I74I-02	I
3,3795 02	6,I300-03	I,0500-02	5,5000-02	7,3673-02	I
3,3924 02	2,4578-03	3,4000-02	3,7000-02	8,083I-02	0
3,43I8 02	I,I232-02	I,8500-02	4,I000-02	7,4476-02	I
3,4656 02	2,93I3-03	I,I460-00	4.2000-02	I,I997-00	0
3,5030 02	I,6326-02	3,5000-02	4,0500-02	9,7268-02	I
3,5282 02	2,8873-03	I,7000-02	4,8000-02	6,8850-02	
3,5489 02	3,20I5-04	3,7000-02	4,0000-02	7,7427-02	
3,5787 02	2,235I-03	5,9490-00	4,2000-02	5,9940-00	0
3,5999 02	8,0000-04	8,I000-02	3,I000-02	I,I600-0I	0
3,6I23 02	I,9360-04	2,9550-0I	4,2000-02	3,3827-0I	
3,6400 02	5,2I37-03	2,9990-00	4,I500-02	3,06I4-00	
3,6600 02	3,2767-03	4,9450-00	4,2000-02	5,000I-00	
3,6833 02	2,7750-04	I,2000-0I	4,I500-02	I,6I87-0I	

Table 6 (continued)

I	2	3	4	5	6
3,703I 02	I,8753-03	3,0000-02	5,6000-02	8,8500-02	
3,7I72 02	5,7050-03	3,3350-00	4,2000-02	3,3998-00	0
3,7502 02	I,9228-03	6,0000-03	2,9000-02	4,269I-02	0
3,77I0 02	I,463I-03	4,0000-02	5,7000-02	9,895I-02	
3,7804 02	4,52I3-04	I,8200-0I	4,I500-02	2,253I-0I	
3,8243 02	4,II25-04	8,6000-02	4,3000-02	I,3064-0I	
3,8426 02	4,I37I-03	7,4000-02	2,9000-02	I,0852-0I	I
3,8590 02	7,03I5-04	9,5500-0I	4,I500-02	9,9935-0I	0
3,895I 02	I,I00I-03	2,I000-02	5,0000-02	7,2467-02	
3,9I52 02	8,3002-04	6,9000-02	5,4000-02	I,24II-0I	
3,9443 02	4,95I3-03	5,I000-02	4,8000-02	I,0560-0I	I
3,969I 02	I,580I-03	6,2000-02	4,3000-02	I,07II-0I	
4,0I56 02	I,382I-02	I,5500-0I	4,6000-02	2,I943-0I	I
4,0424 02	I,75I3-02	7,6000-02	5,6500-02	I,5585-0I	I
4,0603 02	I,2922-03	2,7700-0I	4,I500-02	3,2367-0I	
4,0695 02	6,I0I3-04	2,9900-0I	3,I000-02	3,3244-0I	
4,087I 02	9,5703-04	5,9000-02	5,4000-02	I,I428-0I	
4,I23I 02	6,4473-03	7,0000-02	6,6000-02	I,4460-0I	I
4,I566 02	2,5I38-03	7,0000-03	4,9000-02	5,9352-02	
4,I760 02	I,0892-03	I,7800-0I	4,9000-02	2,3I36-0I	
4,I985 02	4,63I2-03	7,4000-02	5,9000-02	I,39I7-0I	I
4,2567 02	I,9000-04	3,0000-0I	4,I500-02	I,4226-0I	
4,2637 02	6,939I-03	6,9280-00	4,I500-02	6,9973-00	0
4,2964 02	2,8530-03	7,3200-0I	4,2000-02	7,854I-0I	0
4,3I29 02	3,5I07-03	3,4430-00	4,I500-02	3,4985-00	0
4,3273 02	7,9I32-04	2,9800-0I	4,I500-02	3,4267-0I	

Table 6 (continued)

I	2	3	4	5	6
4,3776 02	2,05I3-03	I,I000-02	4,8000-02	6,I735-02	
4,3872 02	2,I232-03	4,0000-03	5,4000-02	6,083I-02	I
4,4007 02	2,73I0-04	2,9800-0I	4,3300-02	3,4239-0I	
4,424I 02	5,I407-03	3,4500-0I	4,3300-02	4,0886-0I	0
4,4975 02	I,00I5-03	8,9000-02	4,2300-02	I,3264-0I	
4,5I32 02	I,0375-02	4,0000-03	4,I500-02	5,9333-02	I
4,5445 02	4,I200-04	3,5800-0I	4,3300-02	4,0295-0I	
4,5573 02	I,9643-02	4,9300-0I	4,3300-02	6,I487-0I	0
4,5733 02	6,000I-03	I,I600-0I	4,3300-02	I,6730-0I	
4,5880 02	3,62I0-03	3,I000-02	4,3300-02	7,9I28-02	I
4,6I26 02	I,6049-03	5,2600-02	4,2000-02	9,6740-02	
4,6264 02	3,9660-04	8,4000-02	4,3300-02	I,2783-0I	
4,6820 02	3,4I02-03	2,0420-00	4,3300-02	2,0989-00	0
4,7000 02	7,03I2-03	5,0298-00	4,5000-02	5,I029-00	0
4,73I0 02	3,083I-03	9,0000-03	4,2300-02	5,54II-02	I
4,753I 02	2,774I-03	5,3300-0I	4,3300-02	5,8740-02	0
4,7690 02	I,5I3I-03	I,9470-00	4,3300-02	I,9964-00	0
4,7924 02	8,9000-05	I,5800-0I	4,3300-02	2,0I66-0I	
4,84I5 02	I,95I3-03	I,4000-02	4,2000-02	5,8602-02	
4,8729 02	I,732I-03	I,7800-0I	4,3300-02	2,2823-0I	
4,878I 02	2,4754-03	I,8000-0I	4,2500-02	2,3240-0I	
4,9065 02	9,93I3-03	2,2I60-00	4,5500-02	2,30I2-00	0
4,94I0 02	3,22I7-03	7,0000-02	4,2000-02	I,I630-0I	I
4,9563 02	6,2I25-04	I,5800-0I	4,3300-02	2,0378-0I	
5,0050 02	2,6I80-03	3,0000-02	4,3300-02	7,679I-02	
5,0286 02	8,8234-03	3,0000-02	4,3300-02	8,5065-02	I

Table 6 (continued)

I	2	3	4	5	6
5,0578 02	4,46I0-04	3,9800-0I	4,3300-02	4,4308-0I	
5,0822 02	3,4700-04	6,4800-0I	4,3300-02	6,9269-0I	
5,0974 02	3,8763-02	I,6500-0I	4,3300-02	2,5998-0I	I
5,II52 02	6,3945-03	3,2980-00	4,3300-02	3,3669-00	0
5,I5I6 02	4,9570-04	4,4000-0I	4,I500-02	4,8240-0I	
5,I657 02	I,4870-04	2,8000-0I	4,I500-02	3,2I70-0I	
5,I798 02	3,4700-04	3,2000-0I	4,I500-02	3,62I0-0I	
5,2022 02	I,II03-02	4,3000-02	4,I500-02	9,9300-02	(I)
5,242I 02	2,2752-02	2,0000-02	4,I500-02	9,I800-02	I
5,2540 02	5,9979-02	I,0500+0I	4,I500-02	I,0650+0I	
5,2600 02	7,4350-04	5,I000-02	4,I500-02	9,4000-02	
5,2738 02	7,4350-04	I,6000-02	4,I500-02	5,9000-02	
5,3052 02	3,I625-02	7,5000-02	4,I500-02	2,4300-0I	0
5,39I7 02	8,4764-03	2,4000-03	4,I500-02	5,5200-02	I
5,407I 02	I,9828-03	4,0000-02	4,I500-02	8,5500-02	
5,4I65 02	3,9655-03	4,0000-02	4,I500-02	8,9400-02	
5,4308 02	8,7243-03	5,0000-03	4,I500-02	5,8I00-02	I
5,4585 02	8,6747-03	I,I200-00	4,I500-02	I,I780-00	
5,47I4 02	8,9230-04	8,0000-0I	4,I500-02	8,4320-0I	
5,4967 02	8,7738-03	7,0000-03	4,I500-02	6,0200-02	I
5,5350 02	8,4269-03	3,0000-03	4,I500-02	6,I300-02	
5,54I3 02	2,5875-02	I,I400-00	4,I500-02	I,2320-00	
5,5572 02	2,4289-03	4,0000-0I	4,I500-02	4,4630-0I	
5,59I6 02	2,0224-02	2,I000-02	4,I500-02	8,9500-02	I
5,6284 02	2,6569-02	I,8000-0I	4,I500-02	2,7460-0I	
5,6403 02	4,8578-03	2,0000-03	4,I500-02	5,3200-02	
5,658I 02	7,0389-03	5,0000-03	4,I500-02	6,0600-02	

Table 6 (continued)

I	2	3	4	5	6
5,7III 02	6,3945-03	3,3000-02	4,I500-02	8,3000-02	(I)
5,7400 02	3,9408-02	2,2000-0I	4,I500-02	4,I9I0-0I	(0)
5,7577 02	2,9593-02	8,0000-03	4,I500-02	8,8900-02	I
5,7800 02	I,2392-03	3,6000-02	4,I500-02	8,0000-02	
5,7904 02	5,I057-03	7,0000-03	4,I500-02	5,5300-02	I
5,848I 02	3,4700-04	2,8000-0I	4,I500-02	3,22I0-0I	
5,8809 02	8,3773-03	I,0000-02	4,I500-02	6,2700-02	(I)
5,8994 02	2,4780-04	4,0000-0I	4,I500-02	4,4I90-0I	
5,9352 02	I,5862-03	4,0000-03	4,I500-02	4,8700-02	
5,9735 02	6,3945-03	5,0000-03	4,I500-02	5,5000-02	I
5,9804 02	I,0409-02	5,9I50-00	4,I500-02	5,9760-00	
6,040I 02	I,8638-02	3,5000-00	4,I500-02	6,9800-02	I
6,0764 02	7,2372-03	7,7000-03	4,I500-02	5,8800-02	I
6,0929 02	I,I698-02	6,6000-03	4,I500-02	6,3700-02	I
6,I282 02	4,362I-03	I,4000-02	4,I500-02	6,4200-02	
6,2084 02	8,8234-03	5,4000-03	4,I500-02	5,8700-02	I
6,2259 02	7,2867-03	9,8000-03	4,I500-02	6,I000-02	I
6,25I7 02	5,8492-03	7,5000-03	4,I500-02	5,6800-02	(I)
6,282I 02	I,0905-03	9,0000-03	4,I500-02	5,2700-02	
6,3297 02	I,6853-02	3,8000-00	4,I500-02	3,8740-00	
6,3647 02	3,9655-03	I,6000-02	4,I500-02	6,5400-02	
6,3928 02	6,8902-03	6,0000-03	4,I500-02	5,6700-02	I
6,4I42 02	3,4700-04	4,8000-0I	4,I500-02	5,22I0-0I	
6,4494 02	4,362I-03	3,0000-03	4,I500-02	5,0300-02	I
6,4665 02	7,4350-04	2,0000-0I	4,I500-02	2,4290-0I	
6,5829 02	6,0475-02	I,9000-02	4,I500-02	I,4II0-0I	I

Table 7

Comparison of the mean $\bar{\sigma}_{nf}$ and $\bar{\sigma}_{n\Lambda}$ cross sections (^{239}Pu) calculated from the resonance parameters with the experimental data

E, eV	$\bar{\sigma}_{nf}$, barn						$\bar{\sigma}_{nA}$, barn		
	[31]	[18]	[61]	[7]	[7]	Present work	[7]	[7]	Present work
6 - 9	60,0*	58,8*			60,9*	6I,4		III,8*	I06,I
9 -I2,6	I40,0*	I46,4*			I37,9*	I35,9		2I2,4*	202,9
I2,6 - 20	73,6*	74,2*			73,6*	66,7		I34,9*	I24,8
20 -24,7	47,6*	48,0*			47,8*	43,9		85,0*	74,7
50 - I00			60,23	58,76		60,75	96,I9		96,00
I00 - 200			I9,I8	I8,4I		I9,22	34,45		34,24
200 - 300			I8,03	I7,77		I7,69	34,24		32,I7
300 - 400			9,04	8,43		9,43	I8,I2		I7,97
400 - 500			9,85	9,47		9,29	I3,50		I3,I8

* These values are re-normalized to the adopted values of σ^{2200}.

Table 8

Numbers of freedom degrees for the Porter-Thomas distributions of neutron, fission and inelastic widths

ℓ	J	π	ν_{nr}	ν_{fr}	$\nu_{n'r}$
0	0	+	I	2	0
0	I	+	I	I	I
I	0	-	I	0	I
I	I	-	2	2	2
I	2	-	I	2	2

Table 9

Numbers of freedom degrees for the

$\langle\Gamma_{n'}\rangle_{rq}$ widths in expression (8)

ℓ'	J	π	$\nu_{J\ell'1}$	$\nu_{J\ell'2}$	$\nu_{J\ell'3}$
0	0	+	0	0	0
0	I	+	I	0	0
I	0	-	I	0	0
I	I	-	2	I	0
I	2	-	2	2	I

Table 10

Values of ε_{frs} for the transition states of ^{240}Pu

r: π	r: J	ε_{frs}, MeV
+	0, 2	0,I
+	0, 2	I,7
+	I, 2, 3	I,9
+	2, 3	0,9
-	I	0,8
-	I, 2	I,2
-	I, 2	2,0
-	2	I,4

Evaluated from experiment (e) and calculated (c) data on mean cross sections and α-value in the energy region 0.3-100 keV (barn)

E, keV	$\langle\alpha\rangle^e$	$\langle\alpha\rangle^c$	$\langle\sigma_{nf}\rangle^e$	$\langle\sigma_{nf}\rangle^c$	$\langle\sigma_{nT}\rangle^c$	$\langle\sigma_{n\gamma}\rangle^c$	$\langle\sigma_{nn'}\rangle^c$	$\langle\sigma_{nn}\rangle^c$	$\langle\sigma_{n\gamma f}\rangle^c$
I	2	3	4	5	6	7	8	9	I0
0,3 - 0,4	I,I27 ± 0,062	I,I420	8,56 ± 0,2I	8,590	32,I99	9,8I0	0	I3,799	I,I76
0,4 - 0,5	0,446 ± 0,025	0,4424	9,46 ± 0,24	9,427	25,3I0	4,I7I	0	II,7I2	0,5I8
0,5 - 0,6	0,7I7 ± 0,040	0,7084	I5,70 ± 0,40	I5,64I	46,730	II,080	0	20,009	I,344
0,6 - 0,7	I,553 ± 0,086	I,5032	4,58 ± 0,I2	4,536	24,504	6,8I9	0	I3,I49	0,8I6
0,7 - 0,8	0,932 ± 0,052	0,9295	5,45 ± 0,I4	5,449	23,04I	5,065	0	I2,527	0,6I3
0,8 - 0,9	0,796 ± 0,045	0,8090	5,I0 ± 0,I4	5,I38	2I,407	4,I57	0	I2,II2	0,507
0,9 - I,0	0,693 ± 0,039	0,6904	7,99 ± 0,22	7,98I	27,82I	5,5I0	0	I4,330	0,673
I,0 - I,2	0,659 ± 0,040	0,6688	6,53 ± 0,I5	6,575	24,243	4,397	0	I3,27I	0,539
I,2 - I,4	0,546 ± 0,033	0,5652	5,94 ± 0,I3	6,02I	22,005	3,403	0	I2,58I	0,422
I,4 - I,6	I,022 ± 0,062	0,9883	3,57 ± 0,08	3,556	I9,379	3,5I4	0	I2,309	0,429
I,6 - I,8	I,094 ± 0,066	I,0573	3,86 ± 0,09	3,834	2I,228	4,054	0	I3,340	0,495
I,8 - 2,0	0,925 ± 0,056	0,9267	3,67 ± 0,08	3,67I	I9,892	3,402	0	I2,8I9	0,4I8
2,0 - 2,5	I,293 ± 0,078	I,2455	3,0I ± 0,07	3,0I9	20,252	3,760	0	I3,473	0,456
2,5 - 3,0	0,723 ± 0,044	0,73I2	3,96 ± 0,09	3,978	20,077	2,909	0	I3,I90	0,363
3 - 4	0,794 ± 0,047	0,7897	3,05 ± 0,07	3,050	I8,057	2,409	0	I2,598	0,303
4 - 5	0,843 ± 0,050	0,8437	2,37 ± 0,05	2,377	I6,670	2,005	0	I2,288	0,256
5 - 6	0,843 ± 0,052	0,8600	2,35 ± 0,05	2,360	I7,073	2,030	0	I2,683	0,26I
6 - 7	0,773 ± 0,047	0,7980	2,05 ± 0,05	2,063	I5,749	I,646	0	I2,040	0,2I6
7 - 8	0,640 ± 0,040	0,649I	2,II ± 0,05	2,II9	I5,26I	I,375	0	II,767	0,I86
8 - 9	0,552 ± 0,034	0,5498	2,20 ± 0,04	2,203	I5,362	I,2II	0,I50	II,798	0,I68
9 - I0	0,603 ± 0,037	0,6030	I,92 ± 0,05	I,923	I5,039	I,I60	0,230	II,726	0,I63
I0 - I2	0,578 ± 0,035	0,5804	I,746 ± 0,035	I,750	I4,487	I,0I6	0,250	II,47I	0,I47
I2 - I4	0,495 ± 0,030	0,4960	I,748 ± 0,035	I,755	I4,I77	0,870	0,26I	II,29I	0,I32

Table 11 (continued)

I	2	3	4	5	6	7	8	9	I0
I4 -- I6	0,487 ± 0,030	0,4850	I,605 ± 0,032	I,606	I3,7I9	0,779	0,245	II,089	0,I22
I6 -- I8	0,425 ± 0,026	0,4240	I,642 ± 0,035	I,643	I3,543	0,697	0,240	I0,963	0,II4
I8 -- 20	0,380 ± 0,023	0,38I6	I,553 ± 0,033	I,559	I3,069	0,595	0,I9I	I0,724	0,I03
20 -- 25	0,395 ± 0,028	0,3946	I,585 ± 0,032	I,589	I3,402	0,627	0,289	I0,897	0,I09
25 -- 30	0,353 ± 0,025	0,3358	I,5I4 ± 0,039	I,523	I2,997	0,542	0,260	I0,672	0,I0I
30 -- 40	0,286 ± 0,025	0,2939	I,570 ± 0,055	I,590	I2,852	0,467	0,272	I0,523	0,096
40 -- 50	0,257 ± 0,022	0,2655	I,582 ± 0,055	I,597	I2,7I3	0,424	0,3I0	I0,382	0,094
50 -- 60	0,225 ± 0,0I9	0,2337	I,568 ± 0,055	I,579	I2,405	0,369	0,296	I0,I6I	0,089
60 -- 70	0,I97 ± 0,0I7	0,I982	I,553 ± 0,054	I,56I	I2,087	0,309	0,I80	I0,037	0,083
70 -- 80	0,I77 ± 0,0I6	0,I779	I,528 ± 0,053	I,534	II,890	0,273	0,I66	9,9I7	0,080
80 -- 90	0,2I4 ± 0,029	0,2I46	I,507 ± 0,053	I,5I0	I2,052	0,324	0,345	9,873	0,089
90 -- I00	0,I49 ± 0,0I9	0,I494	I,500 ± 0,053	I,503	II,666	0,225	0,23I	9,707	0,074

Table 12

Mean resonance distances, $\langle D \rangle_r$ for ^{239}Pu

E, keV	$\langle D \rangle_0 \pm$ (eV)	$\langle D \rangle_1 \pm$ (eV)	$\langle D \rangle_2 \pm$ (eV)
I	2	3	4
0,35	9,36I0	3,I7I9	I,9667
0,45	9,3592	3,I7I3	I,9663
0,55	9,3574	3,I707	I,9659
0,65	9,3556	3,I70I	I,9655
0,75	9,3538	3,I695	I,9652
0,85	9,3520	3,I689	I,9648
0,95	9,3502	3,I683	I,9644
I,I0	9,3476	3,I674	I,9639
I,30	9,3440	3,I662	I,963I
I,50	9,3404	3,I650	I,9623
I,70	9,3369	3,I638	I,96I6
I,90	9,3333	3,I626	I,9608
2,25	9,327I	3,I605	I,9595
2,75	9,3I82	3,I574	I,9577
3,5	9,3049	3,I529	I,9549
4,5	9,287I	3,I469	I,95II
5,5	9,2694	3,I409	I,9474
6,5	9,25I8	3,I349	I,9437
7,5	9,234I	3,I289	I,9400
8,5	9,2I65	3,I230	I,9362
9,5	9,I990	3,II70	I,9326
II,0	9,I727	3,I08I	I,9270
I3,0	9,I378	3,0963	I,9I97

Table 12 (continued)

I	2	3	4
I5,0	9,I03I	3,0845	I,9I23
I7,0	9,0684	3,0727	I,9050
I9,0	9,0339	3,06I0	I,8978
22,5	8,9739	3,0407	I,885I
27,5	8,8889	3,0II8	I,8672
35	8,7629	2,969I	I,8407
45	8,5979	2,9I3I	I,8059
55	8,4360	2,8583	I,77I8
65	8,2774	2,8045	I,7384
75	8,I2I9	2,75I7	I,7057
85	7,9694	2,7000	I,6736
95	7,8200	2,6494	I,642I

Table 13

Mean neutron widths, $<\Gamma_n>_r$

E,keV	$<\Gamma_n>_{0^+}$ meV	$<\Gamma_n>_{1^+}$ meV	$<\Gamma_n>_{0^-}$ meV	$<\Gamma_n>_{1^-}$ meV	$<\Gamma_n>_{2^-}$ meV
I	2	3	4	5	6
0,35	I7,28	5,86	0,04	0,03	0,0I
0,45	I5,I5	5,I3	0,06	0,06	0,0I
0,55	45,36	I5,37	0,08	0,06	0,02
0,65	20,67	7,00	0,II	0,07	0,02
0,75	2I,34	7,23	0,I3	0,09	0,03
0,85	2I,00	7,I2	0,I6	0,II	0,03
0,95	37,37	I2,66	0,I9	0,I3	0,04
I,I0	34,27	II,6I	0,23	0,I6	0,05
I,30	33,83	II,46	0,30	0,20	0,06
I,50	29,99	I0,I6	0,37	0,25	0,08
I,70	4I,I7	I3,95	0,44	0,30	0,09
I,90	40,I6	I3,6I	0,52	0,35	0,II
2,25	49,39	I6,74	0,67	0,46	0,I4
2,75	59,22	20,07	0,9I	0,6I	0,I9
3,5	58,95	I9,97	I,30	0,88	0,27
4,5	6I,I6	20,73	I,88	I,27	0,39
5,5	79,85	27,06	2,53	I,7I	0,53
6,5	74,03	25,09	3,23	2,I9	0,68
7,5	76,65	25,97	3,98	2,70	0,84
8,5	88,86	30,II	4,78	3,24	I,00
9,5	9I,90	3I,I4	5,62	3,8I	I,I8
II,0	9I,70	3I,07	6,94	4,7I	I,46
I3,0	98,45	33,36	8,83	5,98	I,85

Table 13 (continued)

I	2	3	4	5	6
I5,0	96,55	32,7I	I0,83	7,34	2,28
I7,0	I0I,90	34,54	I2,93	8,77	2,72
I9,0	90,94	30,8I	I5,I3	I0,25	3,I8
22,5	I27,50	43,2I	I9,I5	I2,98	4,02
27,5	I27,60	43,23	25,23	I7,I0	5,30
35	I5I,90	5I,48	34,90	23,65	7,33
45	I86,40	63,I7	48,45	32,83	I0,I8
55	I87,00	63,37	62,39	42,28	I3,I0
65	I63,90	55,54	76,46	5I,8I	I6,06
75	I49,80	50,74	90,74	6I,30	I9,00
85	262,80	89,05	I04,30	70,66	2I,90
95	I44,20	48,86	II7,80	79,8I	24,73

Table 14

Mean radiative capture widths, $\langle\Gamma_\gamma\rangle_r$

E, kev	$\langle\Gamma_\gamma\rangle_0^+$ meV	$\langle\Gamma_\gamma\rangle_1^+$ meV	$\langle\Gamma_\gamma\rangle_0^-$ meV	$\langle\Gamma_\gamma\rangle_1^-$ meV	$\langle\Gamma_\gamma\rangle_2^-$ meV
I	2	3	4	5	6
0,35	40,009	46,049	5I,035	30,342	36,298
0,45	40,009	46,050	5I,037	30,342	36,299
0,55	40,009	46,050	5I,039	30,342	36,299
0,65	40,009	46,05I	5I,042	30,342	36,300
0,75	40,0I0	46,052	5I,044	30,343	36,300
0,85	40,0I0	46,053	5I,046	30,343	36,300
0,95	40,0I0	46,054	5I,049	30,343	36,30I
I,I0	40,0I0	46,055	5I,052	30,343	36,30I
I,30	40,0I0	46,057	5I,057	30,343	36,302
I,50	40,0II	46,058	5I,062	30,343	36,303
I,70	40,0II	46,06I	5I,066	30,343	36,303
I,90	40,0II	46,062	5I,07I	30,344	36,304
2,25	40,0I2	46,063	5I,079	30,344	36,305
2,75	40,0I3	46,070	5I,09I	30,344	36,307
3,5	40,0I4	46,076	5I,I09	30,345	36,3I0
4,5	40,0I5	46,085	5I,I32	30,346	36,3I4
5,5	40,0I7	46,094	5I,I56	30,347	36,3I7
6,5	40,0I8	46,I02	5I,I79	30,347	36,32I
7,5	40,020	46,III	5I,203	30,348	36,325
8,5	40,02I	46,II9	5I,226	30,349	36,328
9,5	40,022	46,I25	5I,250	30,350	36,332
II,0	40,025	46,I4I	5I,285	30,35I	36,338
I3,0	40,027	46,I58	5I,332	30,353	36,345

Table 14 (continued)

I	2	3	4	5	6
I5,0	40,030	46,I74	5I,379	30,354	36,352
I7,0	40,032	46,I9I	5I,427	30,356	36,359
I9,0	40,035	46,208	5I,474	30,358	36,366
22,5	40,039	46,237	5I,557	30,360	36,379
27,5	40,044	46,275	5I,676	30,364	36,396
35	40,05I	46,337	5I,854	30,370	36,422
45	40,058	46,4I4	52,093	30,378	36,456
55	40,063	46,488	52,333	30;386	36,489
65	40,064	46,559	52,575	30,394	36,52I
75	39,62I	46,3I3	52,825	30,3I5	36,638
85	39,56I	46,367	53,068	30,349	36,594
95	39,499	46,422	53,3I2	30,384	36,680

Mean widths of a (n,γf)-process

E, keV	$\langle\Gamma_{\gamma f}\rangle_{0^+}$ meV	$\langle\Gamma_{\gamma f}\rangle_{1^+}$ meV	$\langle\Gamma_{\gamma f}\rangle_{0^-}$ meV	$\langle\Gamma_{\gamma f}\rangle_{1^-}$ meV	$\langle\Gamma_{\gamma f}\rangle_{2^-}$ meV
I	2	3	4	5	6
0,35	II,042	5,238	0,0I6	20,945	I3,749
0,45	II,044	5,240	0,0I6	20,947	I3,75I
0,55	II,046	5,24I	0,0I6	20,949	I3,753
0,65	II,049	5,243	0,0I6	20,952	I3,754
0,75	II,05I	5,244	0,0I6	20,954	I3,756
0,85	II,053	5,246	0,0I6	20,956	I3,758
0,95	II,055	5,247	0,0I6	20,956	I3,760
I,I0	II,059	5,249	0,0I6	20,962	I3,763
I,30	II,063	5,252	0,0I6	20,966	I3,767
I,50	II,067	5,255	0,0I6	20,968	I3,77I
I,70	II,072	5,258	0,0I6	20,975	I3,775
I,90	II,076	5,26I	0,0I6	20,979	I3,779
2,25	II,084	5,266	0,0I6	20,985	I3,786
2,75	II,095	5,273	0,0I7	20,998	I3,796
3,5	II,II2	5,284	0,0I7	2I,0I5	I3,8II
4,5	II,I34	5,298	0,0I7	2I,037	I3,83I
5,5	II,I56	5,3I2	0,0I7	2I,059	I3,850
6,5	II,I78	5,327	0,0I7	2I,082	I3,870
7,5	II,200	5,34I	0,0I7	2I,I04	I3,890
8,5	II,223	5,356	0,0I8	2I,I26	I3,9I0
9,5	II,245	5,37I	0,0I8	2I,I46	I3,930
II,0	II,278	5,393	0,0I8	2I,I82	I3,960
I3,0	II,323	5,422	0,0I8	2I,227	I4,000
I5,0	II,368	5,452	0,0I9	2I,272	I4,040

Table 15 (continued)

I	2	3	4	5	6
I7,0	II,4I3	5,482	0,0I9	2I,3I7	I4,080
I9,0	II,459	5,5I2	0,0I9	2I,362	I4,I20
22,5	II,538	5,564	0,020	2I,44I	I4,I9I
27,5	II,562	5,64I	0,02I	2I,55I	I4,293
35,0	II,826	5,757	0,023	2I,724	I4,446
45	I2,060	5,9I7	0,025	2I,952	I4,652
55	I2,298	6,080	0,028	22,I82	I4,860
65	I2,54I	6,248	0,030	22,4I2	I5,07I
75	I3,236	6,69I	0,032	22,690	I5,248
85	I3,54I	6,876	0,035	22,894	I5,449
95	I3,850	7,064	0,038	23,I0I	I5,652

Mean fission widths, $\langle \Gamma_f \rangle_r$, and channel contributions α_i Table 16

E, KeV	0^+			I^+	0^-	I^-				2^-			
	$\langle \Gamma_f \rangle_{0^+}$, eV	α_1	α_2	$\langle \Gamma_f \rangle_{1^+}$, eV	$\langle \Gamma_f \rangle_{0^-}$, eV	$\langle \Gamma_f \rangle_{1^-}$, eV	α_1	α_2	α_3	$\langle \Gamma_f \rangle_{2^-}$, eV	α_1	α_2	α_3
I	2	3	4	5	6	7	8	9	I0	II	I2	I3	I4
0,45	I,82I0	0,8I80	0,I820	0,I786	0	I,0095	0,5000	0,4968	0,0032	0,6026	0,5I60	0,4806	0,0034
0,55	I,82I0	0,8I78	0,I822	0,0498	0	I,0093	0,5000	0,4968	0,0032	0,6025	0,5I59	0,4807	0,0034
0,65	I,82I0	0,8I77	0,I823	0,0049	0	I,009I	0,5000	0,4968	0,0032	0,6024	0,5I59	0,4807	0,0034
0,75	I,82I0	0,8I75	0,I825	0,0293	0	I,0089	0,5000	0,4968	0,0032	0,6023	0,5I59	0,4807	0,0034
0,85	I,8209	0,8I74	0,I826	0,04I8	0	I,0087	0,5000	0,4968	0,0032	0,6023	0,5I59	0,4807	0,0034
0,95	I,8209	0,8I72	0,I826	0,0546	0	I,0086	0,5000	0,4968	0,0032	0,6022	0,5I59	0,4807	0,0034
I,I0	I,8209	0,8I70	0,I830	0,0596	0	I,0083	0,4999	0,4968	0,0033	0,6020	0,5I58	0,4808	0,0034
I,30	I,8208	0,8I67	0,I833	0,0873	0	I,0079	0,4999	0,4968	0,0033	0,60I9	0,5I58	0,4808	0,0034
I,50	I,8208	0,8I64	0,I836	0,020I	0	I,0075	0,4999	0,4968	0,0033	0,60I7	0,5I57	0,4808	0,0035
I,70	I,8207	0,8I62	0,I838	0,0I42	0	I,0072	0,4999	0,4968	0,0033	0,60I5	0,5I57	0,4808	0,0035
I,90	I,8207	0,8I59	0,I84I	0,022I	0	I,0068	0,4999	0,4967	0,0034	0,60I4	0,5I56	0,4809	0,0035
2,25	I,8206	0,8I53	0,I847	0,0054	0	I,0062	0,4999	0,4967	0,0034	0,60II	0,5I56	0,4809	0,0035
2,75	I,8205	0,8I46	0,I854	0,0390	0	I,0052	0,4999	0,4967	0,0034	0,6007	0,5I54	0,48II	0,0035
3,5	I,8204	0,8I35	0,I865	0,0292	0	I,0039	0,4998	0,4967	0,0035	0,6000	0,5I53	0,48I2	0,0035
4,5	I,8202	0,8I20	0,I880	0,0I90	0	I,0020	0,4998	0,4967	0,0035	0,5992	0,5I50	0,48I4	0,0036
5,5	I,820I	0,8I06	0,I894	0,0I53	0	I,0002	0,4998	0,4967	0,0035	0,5984	0,5I48	0,48I6	0,0036
6,5	I,8200	0,809I	0,I909	0,0I79	0	0,9984	0,4997	0,4967	0,0036	0,5975	0,5I46	0,48I7	0,0037
7,5	I,8I98	0,8076	0,I924	0,0329	0	0,9966	0,4997	0,4967	0,0036	0,5967	0,5I44	0,48I9	0,0037
8,5	I,8I97	0,806I	0,I939	0,0432	0	0,9947	0,4996	0,4967	0,0037	0,5958	0,5I42	0,482I	0,0037
9,5	I,8I96	0,8046	0,I954	0,0263	0	0,9929	0,4996	0,4967	0,0037	0,5950	0,5I39	0,4823	0,0038
II,0	I,8I95	0,8024	0,I976	0,0238	0	0,9902	0,4995	0,4967	0,0038	0,5937	0,5I36	0,4825	0,0039
I3,0	I,8I94	0,7994	0,2006	0,0340	0	0,9866	0,4995	0,4967	0,0038	0,5920	0,5I32	0,4828	0,0040
I5,0	I,8I94	0,7963	0,2037	0,0288	0	0,9830	0,4994	0,4967	0,0039	0,5903	0,5I28	0,4832	0,0040

Table 16 (continued)

I	2	3	4	5	6	7	8	9	I0	II	I2	I3	I4
I7,0	I,8I94	0,7933	0,2067	0,0399	0	0,9794	0,4993	0,4967	0,0040	0,5886	0,5I24	0,4835	0,004I
I9,0	I,8I94	0,7902	0,2098	0,0497	0	0,9759	0,4992	0,4967	0,004I	0,5869	0,5I20	0,4838	0,0042
22,5	I,8I97	0,7849	0,2I5I	0,03I0	0	0,9697	0,499I	0,4966	0,0043	0,5839	0,5II3	0,4843	0,0044
27,5	I,8204	0,777I	0,2229	0,03I8	0	0,9609	0,4989	0,4966	0,0045	0,5796	0,5I04	0,4849	0,0047
35,0	I,8220	0,7654	0,2346	0,0505	0	0,9479	0,4985	0,4964	0,005I	0,573I	0,5090	0,4858	0,0052
45,0	I,825I	0,7498	0,2502	0,049I	0	0,9308	0,498I	0,4962	0,0057	0,5644	0,5073	0,4868	0,0059
55,0	I,8290	0,734I	0,2659	0,06I9	0	0,9I42	0,4976	0,4960	0,0064	0,5557	0,5058	0,4877	0,0065
65,0	I,8335	0,7I85	0,28I5	0,I032	0	0,8979	0,497I	0,4956	0,0073	0,5470	0,5043	0,4883	0,0074
75,0	I,8383	0,7032	0,2968	0,I305	0	0,8820	0,4965	0,4953	0,0082	0,5384	0,5029	0,4888	0,0083
85,0	I,8430	0,6882	0,3II8	0,032I	0	0,8665	0,4959	0,4948	0,0093	0,5299	0,50I5	0,4890	0,0095
95,0	I,8473	0,6737	0,3263	0,25I3	0	0,85I4	0,4952	0,4943	0,0I05	0,52I5	0,5002	0,4892	0,0I06

Table 17

Mean inelastic widths, $\langle \Gamma_{n'} \rangle_r$, and channel contributions, α_i

E, keV	0⁺	I⁺	0⁻	I⁻			2⁻			
	$\langle \Gamma_{n'} \rangle_{0^+}$, meV	$\langle \Gamma_{n'} \rangle_{1^+}$, meV	$\langle \Gamma_{n'} \rangle_{0^-}$, meV	$\langle \Gamma_{n'} \rangle_{1^-}$, meV	α_1	α_2	$\langle \Gamma_{n'} \rangle_{2^-}$, meV	α_1	α_2	α_3
8,5	0	7,30	0,07	0,05	I	0	0,03	I	0	0
9,5	0	I2,37	0,36	0,25	I	0	0,I5	I	0	0
II,0	0	I6,23	I,02	0,69	I	0	0,43	I	0	0
I3,0	0	20,69	2,I6	I,47	I	0	0,9I	I	0	0
I5,0	0	22,35	3,54	2,40	I	0	I,49	I	0	0
I7,0	0	25,I3	5,II	3,47	I	0	2,I5	I	0	0
I9,0	0	23,45	6,84	4,63	I	0	2,87	I	0	0
22,5	0	34,69	I0,I6	6,89	I	0	4,27	I	0	0
27,5	0	36,4I	I5,45	I0,47	I	0	6,49	I	0	0
35	0	45,22	24,24	I6,42	I	0	I0,I8	I	0	0
45	0	57,28	37,00	25,07	I	0	I5,54	I	0	0
55	0	58,58	50,44	34,I8	I	0	2I,I9	I	0	0
65	0	52,0I	64,22	44,85	0,9703	0,0297	28,62	0,9424	0,0576	0
75	0	47,96	78,08	5I,I7	0,9254	0,0746	38,08	0,86I2	0,I388	0
85	0	84,75	9I,84	70,I0	0,8878	0,II22	49,27	0,7830	0,I978	0,0I92
95	0	46,76	I05,4	83,24	0,8579	0,I42I	6I,68	0,7I77	0,2378	0,0445

Table 18

Correlation coefficients, $K_{k,i,j}$, for the partial experimental errors used for ^{239}Pu fission cross section determination

$K_{I,I05,I06}$ = I,0	$K_{3,I06,II2}$ = 0,5	$K_{6,I8,I02}$ = I,0
$K_{I,I05,I07}$ = I,0	$K_{3,I06,II3}$ = 0,5	$K_{6,I8,I04}$ = I,0
$K_{I,I05,II2}$ = 0,5	$K_{3,I07,II2}$ = 0,5	$K_{6,6I,99}$ = I,0
$K_{I,I05,II3}$ = 0,5	$K_{3,I07,II3}$ = 0,5	$K_{6,6I,I00}$ = I,0
$K_{I,I06,I07}$ = I,0	$K_{3,II2,II3}$ = 0,5	$K_{6,6I,I02}$ = I,0
$K_{I,I06,II2}$ = 0,5	$K_{4,I06,II3}$ = I,0	$K_{6,6I,I04}$ = I,0
$K_{I,I06,II3}$ = 0,5	$K_{5,I05,I06}$ = I,0	$K_{6,99,I00}$ = I,0
$K_{I,I07,II2}$ = 0,5	$K_{5,I05,I07}$ = I,0	$K_{6,99,I02}$ = I,0
$K_{I,I07,II3}$ = 0,5	$K_{5,I06,I07}$ = I,0	$K_{6,99,I04}$ = I,0
$K_{I,II2,II3}$ = 0,5	$K_{6,6,7}$ = I,0	$K_{6,I00,I02}$ = I,0
$K_{2,I05,I06}$ = I,0	$K_{6,6,I8}$ = I,0	$K_{6,I00,I04}$ = I,0
$K_{2,I05,I07}$ = I,0	$K_{6,6,6I}$ = I,0	$K_{6,I02,I04}$ = I,0
$K_{2,I05,II2}$ = 0,5	$K_{6,6,99}$ = I,0	$K_{6,I05,I06}$ = I,0
$K_{2,I05,II3}$ = 0,5	$K_{6,6,I00}$ = I,0	$K_{7,I0I,I03}$ = I,0
$K_{2,I06,I07}$ = I,0	$K_{6,6,I02}$ = I,0	$K_{7,I05,I06}$ = I,0
$K_{2,I06,II2}$ = 0,5	$K_{6,6,I04}$ = I,0	$K_{7,I05,I07}$ = I,0
$K_{2,I06,II3}$ = 0,5	$K_{6,7,I8}$ = I,0	$K_{7,I06,I07}$ = I,0
$K_{2,I07,II2}$ = 0,5	$K_{6,7,6I}$ = I,0	$K_{8,I0I,I03}$ = I,0
$K_{2,I07,II3}$ = 0,5	$K_{6,7,99}$ = I,0	$K_{I0,I05,I06}$ = I,0
$K_{2,II2,II3}$ = 0,5	$K_{6,7,I00}$ = I,0	$K_{I0,I05,II3}$ = I,0
$K_{3,I05,I06}$ = I,0	$K_{6,7,I02}$ = I,0	$K_{I0,I05,II5}$ = I,0
$K_{3,I05,I07}$ = I,0	$K_{6,7,I04}$ = I,0	$K_{I0,I06,II3}$ = I,0
$K_{3,I05,II2}$ = 0,5	$K_{6,I8,6I}$ = I,0	$K_{I0,I06,II5}$ = I,0
$K_{3,I05,II3}$ = 0,5	$K_{6,I8,99}$ = I,0	$K_{I0,II3,II5}$ = I,0
$K_{3,I06,I07}$ = I,0	$K_{6,I8,I00}$ = I,0	$K_{I2,6,7}$ = I,0

Table 18

(continued)

$K_{I2,\ 6,\ I8} = I,0$	$K_{I2,\ 6I,I00} = I,0$	$K_{I2,III,II9} = I,0$
$K_{I2,\ 6,\ 6I} = I,0$	$K_{I2,\ 6I,I0I} = I,0$	$K_{I2,III,I20} = I,0$
$K_{I2,\ 6,\ 99} = I,0$	$K_{I2,\ 6I,I02} = I,0$	$K_{I2,III,I2I} = I,0$
$K_{I2,\ 6,\ I00} = I,0$	$K_{I2,\ 6I,I03} = I,0$	$K_{I2,II5,II6} = I,0$
$K_{I2,\ 6,\ I0I} = I,0$	$K_{I2,\ 6I,I04} = I,0$	$K_{I2,II5,II7} = I,0$
$K_{I2,\ 6,\ I02} = I,0$	$K_{I2,\ 99,I00} = I,0$	$K_{I2,II5,II8} = I,0$
$K_{I2,\ 6,\ I03} = I,0$	$K_{I2,\ 99,I0I} = I,0$	$K_{I2,II5,II9} = I,0$
$K_{I2,\ 6,\ I04} = I,0$	$K_{I2,\ 99,I02} = I,0$	$K_{I2,II5,I20} = I,0$
$K_{I2,\ 7,\ I8} = I,0$	$K_{I2,\ 99,I03} = I,0$	$K_{I2,II5,I2I} = I,0$
$K_{I2,\ 7,\ 6I} = I,0$	$K_{I2,\ 99,I04} = I,0$	$K_{I2,II6,II7} = I,0$
$K_{I2,\ 7,\ 99} = I,0$	$K_{I2,I00,I0I} = I,0$	$K_{I2,II6,II8} = I,0$
$K_{I2,\ 7,\ I00} = I,0$	$K_{I2,I00,I02} = I,0$	$K_{I2,II6,II9} = I,0$
$K_{I2,\ 7,\ I0I} = I,0$	$K_{I2,I00,I03} = I,0$	$K_{I2,II6,I20} = I,0$
$K_{I2,\ 7,\ I02} = I,0$	$K_{I2,I00,I04} = I,0$	$K_{I2,II6,I2I} = I,0$
$K_{I2,\ 7,\ I03} = I,0$	$K_{I2,I0I,I02} = I,0$	$K_{I2,II7,II8} = I,0$
$K_{I2,\ 7,\ I04} = I,0$	$K_{I2,I0I,I03} = I,0$	$K_{I2,II7,II9} = I,0$
$K_{I2,\ I8,\ 6I} = I,0$	$K_{I2,I0I,I04} = I,0$	$K_{I2,II7,I20} = I,0$
$K_{I2,\ I8,\ 99} = I,0$	$K_{I2,I02,I03} = I,0$	$K_{I2,II7,I2I} = I,0$
$K_{I2,\ I8,I00} = I,0$	$K_{I2,I02,I04} = I,0$	$K_{I2,II8,II9} = I,0$
$K_{I2,\ I8,I0I} = I,0$	$K_{I2,I03,I04} = I,0$	$K_{I2,II8,I20} = I,0$
$K_{I2,\ I8,I02} = I,0$	$K_{I2,III,II5} = I,0$	$K_{I2,II8,I2I} = I,0$
$K_{I2,\ I8,I03} = I,0$	$K_{I2,III,II6} = I,0$	$K_{I2,II9,I20} = I,0$
$K_{I2,\ I8,I04} = I,0$	$K_{I2,III,II7} = I,0$	$K_{I2,II9,I2I} = I,0$
$K_{I2,\ 6I,\ 99} = I,0$	$K_{I2,III,II8} = I,0$	$K_{I2,I20,I2I} = I,0$

Note: 1. For any i=j $K_{k,i,j} = 1.0$

2. $K_{k,i,j} = K_{k,j,i}$.

3. Not mentioned in Table $K_{k,i,j} = 0$

Table 19

Optimized weights without (K=0), assigned (K) and complete (K=1) correlations, and experimental values of $\sigma_{nf}(^{239}Pu)$ for the considered energy regions

Ref.	Weight of experiment			σ_{exp} (b)	
	K=0	K	K=1	0.1-0.2	0.2-0.3
/ 6 /	0,276	0,277		I8,2	I7,4
/7 /	0,344	0,346	I,00	I7,96	I7,9
/ 6I/	0,09I	0,09I		I8,90	I7,76
/I00/	0,207	0,208		I8,55	I8,43
/I03/	0,042	0,078		I7,82	I8,25
/ I8/	0,040			I9,82	I7,62

Region 0.1-0.3 keV

Table 19 (continued)

Region 0.3-0.5 keV

Ref.	Weight of experiments			σ_{exp} (b)	
	K=0	K	K=I	0,3-0,4	0,4-0,5
/ 7 /	0,786	0,826	I,0	8,48	9,40
/ 6I/	0,2I4	0,I74		8,9I	9,72

Region 0.5-0.8 keV

Ref.	Weight of experiments			σ_{exp} (b)		
	K=0	K	K=I	0,5-0,6	0,6-0,7	0,7-0,8
/ 7 /	0,783	0,823	I,0	I5,75	4,55	5,34
/ 6I/	0,2I7	0,I77		I5,5I	4,7	5,98

Region 0.8-1.0 keV

Ref.	Weight of experiments			σ_{exp} (b)	
	K=0	K	K=I	0,8-0,9	0,9-I,0
/ 7 /	0,753	0,797	I,0	5,I0	7,83
/ 6I/	0,247	0,203		5,09	8,6I

Table 19 (continued)

Region 1-5 keV

Ref.	Weight of experiment			σ_{exp} (b)			
	K=0	K	K=I	I,0-2,0	2,0-3,0	3,0-4,0	4,0-5,0
/ 6 /	0,236	0,205		4,282	3,256	3,040	2,274
/ 7 /	0,289	0,434	I,0	4,52	3,32	3,04	2,37
/ 6I/	0,078	0,I26		4,46	3,3I	3,05	2,35
/I00/	0,I77	0,I05		4,7I	3,43	3,II	2,43
/I02/	0,043	0,025		4,40	3,46	2,86	2,54
/I0I/	0,023	0,0I4		4,02	3,34	3,II	2,76
/ 99/	0,0I0	0,006		4,8I2	3,I29	3,02I	2,527
/I03/	0,036	0,022		3,82	2,64	2,75	2,3I
/ I8/	0,034	0,020		3,9I	3,35	3,45	2,62
/I04/	0,074	0,043		4,54*	3,3I*	3,097	2,39I

* Our averaging

Table 19 (continued)

Region 5-6 keV

Ref.	Weight of experiment			σ_{exp} (b)
	K=0	K	K=I	5 - 6
/ 6 /	0,09I	0,022		2,027
/ 7 /	0,304	0,369	I,0	2,32
/ 6I/	0,078	0,095		2,22
/I02/	0,05I	0,06I		2,4I
/I0I/	0,025	0,030		2,63
/ 99/	0,0I3	0,0I6		I,745
/I03/	0,03I	0,038		2,7I
/ I8/	0,039	0,047		2,74
/I04/	0,087	0,02I		2,278

Regions 6-8 KeV, 9-10 keV

Ref.	Weight of experiment			σ_{exp} (b)		
	K=0	K	K=I	6-7	7-8	9-I0
/ 6 /	0,I00	0,0I7		I,984	2,058	I,8II
/ 7 /	0,338	0,6I6	I,0	2,05	2,II	I,92
/ 6I/	0,087	0,I22		I,98	I,99	I,94
/I00/	0,202	0,I04		2,03	2,I6	I,90
/I02/	0,056	0,029		I,97	2,27	I,85
/I0I/	0,027	0,0I4		2,29	2,45	2,I0
/ 99/	0,0I5	0,008		I,839	2,029	I,734
/I03/	0,035	0,0I8		2,20	2,24	2,I4
/ I8/	0,043	0,022		2,64	I,86	2,28
/I04/	0,097	0,050		2,047	2,I3	I,82

Table 13 (continued)

Region 8-9 keV

Ref.	Weight of experiment			σ_{exp} (b)
	K=0	K	K=I	8 - 9
/ 6 /	0,077	0,020		2,I42
/ 7 /	0,257	0,34I	0,649	2,28
/ 6I/	0,066	0,087		2,47
/I00/	0,I54	0,204		2,20
/I02/	0,043			2,25
/I0I/	0,02I	0,028		2,52
/ 99/	0,0I0	0,003		I,929
/I03/	0,026	0,035		2,46
/ I8/	0,033			2,02
/I04/	0,074	0,004		2,222
/II9/	0,239	0,278	0,35I	0,663*

Region 10-20 keV

Ref.	Weight of experiment			σ_{exp} (b)
	K=0	K	K=I	I0 - 20
/ 6 /	0,057	0,003		I,74
/ 7 /	0,I84	0,207	0,802	I,78
/ 6I/	0,037	0,042		I,89
/I00/	0,II4	0,I28		I,66
/I02/	0,037	0,002		I,76
/I0I/	0,0I6	0,0I8		I,9I
/ 99/	0,008	0,009		I,487**
/I03/	0,028	0,03I		2,2I
/I04/	0,056	0,063		I,74I**
/I05/	0,I48	0,I66		I,75
/II9/	0,3I5	0,33I	0,I98	0,684*

* $\sigma_{nf}(^{239}Pu)/\sigma_{nf}(^{235}U)$ ratio

** Our averaging

Table 19 (continued)

Region 20-30 keV

Ref.	Weight of experiment			σ_{exp} (b)
	K=0	K	K=I	20 - 30
/ 7 /	0,262	0,304		I,64
/ 6I/	0,052	0,044		I,90
/I00/	0,I62	0,I35		I,59
/I02/	0,053	0,044		I,62
/I0I/	0,022	0,0I8		I,76
/II8/	0,220	0,I82		0,796*
/I99/	0,229	0,273		0,722*

* $\sigma_{nf}(^{239}Pu)/\sigma_{nf}(^{235}U)$ ratio

Region 30-110 keV

Ref.	Weight of experiment K=0	K	K=I	σ_{exp} (b)
/ 7 /	0,054	0,05I		I,6I(30-40); I,54(40-50); I,66(50-60); I,62(60-70); I,64(70-80); I,52(80-90); I,54(90-I00)
/I0I/	0,0I4	0,0I3		I,73(30-40); I,6I(40-50); I,65(50-60); I,63(60-70); I,63(70-80); I,57(80-90); I,39(90-I00); I,6(I05)
/I04/	0,043	0,040		I,632(30-40); I,552(40-50); I,57(50-60); I,596(60-70); I,572(70-80); I,593(80-90); I,545(90-I00)
/I06/	0,I49	0,I39		I,53(35); I,495(49); I,505(57); I,54(73); I,53(77,5); I,565(I02); I,5(I09)
/I05/	0,I49	0,I39		I,59(33); I,59(46); I,55(58); I,55(78); I,53(77,5); I,565(I02); I,5(I09)
/II2/	0,II8	0,II0		I,45(40); I,46(67)
/II9/	0,2I8	0,205		0,79*(32,6); 0,8(34,9); 0,789(38,2); 0,8I3(42); 0,8I3(46,4); 0,836(5I,5); 0,853(56,2); 0,87(6I,7); 0,86(67,9); 0,909(75,I); 0,924(8I,3); 0,92(88,3); 0,963(99,I)
/224/				I,035*(II0)

* $\sigma_{nf}(^{239}Pu)/\sigma_{nf}(^{235}U)$ ratio

Note; 1. Energies and energy regions are given in brackets, for which σ_{nf} or $\sigma_{nf}(^{239}Pu)/\sigma_{nf}(^{235}U)$ are given. 2. When evaluating in the region 30-110 keV and above, more short energy regions were used. Above 100 keV, the evaluation was supplemented by [222-227]. This table contains the weights for 30-110 keV since for shorter subregions these differ a little.

Table 20

$\sigma_{nf}(^{239}Pu)$ cross section and $\sigma_{nf}(^{239}Pu)/\sigma_{nf}(^{239}U)$ ratio evaluated from experiment in the energy region 0.1 keV-15 MeV

E, keV	$\sigma_{nf}(^{239}Pu)$, (b)	$\Delta\sigma_{nf}(^{239}Pu)$, (b)	$\frac{\sigma_{nf}(^{239}Pu)}{\sigma_{nf}(^{235}U)}$
I	2	3	4
0,I-0,2	I8,22	0,40	
0,2-0,3	I7,50	0,99	
0,3-0,4	8,56	0,I9	
0,4-0,5	9,46	0,2I	
0,5-0,6	I5,70	0,35	
0,6-0,7	4,58	0,I0	
0,7-0,8	5,45	0,I2	
0,8-0,9	5,I0	0,II	
0,9-I,0	7,99	0,I7	
I - 2	4,45	0,I0	
2 - 3	3,3I	0,07	
3 - 4	3,05	0,08	
4 - 5	2,37	0,05	
5 - 6	2,35	0,05	
6 - 7	2,05	0,05	
7 - 8	2,II	0,05	
8 - 9	2,20	0,05	
9 - I0	I,92	0,05	
I0 - 20	I,659	0,040	0,680
20 - 30	I,550	0,040	0,738
30 - 40	I,570	0,044	0,785
40 - 50	I,582	0,044	0,826

Table 20

(continued)

I	2	3	4
50 - 60	I,568	0,044	0,860
60 - 70	I,553	0,044	0,888
70 - 80	I,528	0,043	0,9II
80 - 90	I,507	0,042	0,932
90 - I00	I,500	0,042	0,953
0,I0	I,508	0,042	0,9697
0,I2	I,509	0,042	0,99I5
0,I4	I,508	0,042	I,0203
0,I6	I,506	0,042	I,0473
0,I8	I,504	0,042	I,075I
0,20	I,503	0,042	I,I000
0,22	I,502	0,042	I,I243
0,24	I,502	0,042	I,I457
0,26	I,503	0,042	I,I660
0,28	I,506	0,043	I,I858
0,30	I,5I0	0,043	I,2080
0,32	I,5I8	0,043	I,23II
0,34	I,526	0,043	I,2498
0,36	I,535	0,044	I,2634
0,38	I,544	0,044	I,27I8
0,40	I,554	0,044	I,2822
0,42	I,562	0,044	I,2960
0,44	I,570	0,045	I,3I24
0,46	I,576	0,045	I,3288
0,48	I,582	0,045	I,3454
0,50	I,588	0,045	I,36I9
0,55	I,595	0,046	I,39I8

Table 20

(continued)

I	2	3	4
0,60	I,600	0,046	I,4I84
0,65	I,609	0,046	I,4456
0,70	I,62I	0,047	I,4670
0,75	I,636	0,047	I,48I9
0,80	I,660	0,048	I,486I
0,85	I,683	0,049	I,47I2
0,90	I,706	0,050	I,4458
0,95	I,7I8	0,050	I,4269
I,0	I,729	0,050	I,4230
I,I	I,777	0,052	I,4566
I,2	I,832	0,054	I,4943
I,4	I,9I6	0,057	I,5464
I,6	I,947	0,058	I,5476
I,8	I,962	0,059	I,5376
2,0	I,964	0,060	I,5296
2,2	I,946	0,060	I,5265
2,4	I,92I	0,059	I,5262
2,6	I,895	0,059	I,5293
2,8	I,873	0,059	I,533I
3,0	I,854	0,059	I,5386
3,2	I,840	0,059	I,5423
3,4	I,827	0,059	I,5456
3,6	I,8I4	0,059	I,5490
3,8	I,799	0,059	I,552I
4,0	I,784	0,058	I,5554
4,5	I,752	0,058	I,5685

Table 20

(continued)

I	2	3	4
5,0	I,720	0,058	I,5823
5,5	I,698	0,059	I,6I4I
6,0	I,770	0,062	I,5540
6,5	2,0I9	0,072	I,4567
7,0	2,I60	0,079	I,3500
7,5	2,220	0,082	I,2650
8,0	2,244	0,084	I,2396
8,5	2,280	0,087	I,2500
9,0	2,293	0,089	I,2655
9,5	2,302	0,09I	I,2789
I0,0	2,306	0,092	I,29I2
I0,5	2,299	0,093	I,2944
II,0	2,282	0,094	I,2893
II,5	2,246	0,094	I,2773
I2,0	2,220	0,094	I,2557
I2,5	2,237	0,096	I,2I8I
I3,0	2,270	0,099	I,I8II
I3,5	2,302	0,I03	I,I52I
I4,0	2,330	0,I04	I,I294
I4,5	2,343	0,I06	I,II74
I5,0	2,344	0,I08	I,II20

Table 21

Evaluated data on cross sections, ν_t-value and temperature of neutrons for ^{239}Pu fission spectrum in the energy region 0.1-15 MeV

E, MeV	σ_{nT}, b	σ_{nn}, b	$\sigma_{n\gamma}$, b	$\sigma_{nn'}$, b	$\sigma_{n,2n}$, b	$\sigma_{n,3n}$, b	ν_t	T, MeV
1	2	3	4	5	6	7	8	9
0,10	12,200	10,012	0,253	0,427	0	0	2,8703	1,356
0,12	11,970	9,703	0,246	0,512	0	0	2,8727	1,357
0,14	11,745	9,419	0,238	0,580	0	0	2,8751	1,357
0,16	11,525	9,154	0,229	0,636	0	0	2,8776	1,357
0,18	11,297	8,932	0,212	0,649	0	0	2,8799	1,358
0,20	11,090	8,683	0,207	0,697	0	0	2,8824	1,358
0,22	10,862	8,417	0,204	0,739	0	0	2,8848	1,358
0,24	10,650	8,181	0,200	0,767	0	0	2,8873	1,359
0,26	10,440	7,956	0,193	0,788	0	0	2,8897	1,359
0,28	10,225	7,725	0,187	0,807	0	0	2,8922	1,359
0,30	10,016	7,489	0,183	0,834	0	0	2,8946	1,359
0,32	9,817	7,214	0,182	0,903	0	0	2,8971	1,360
0,34	9,622	6,991	0,181	0,924	0	0	2,8996	1,360
0,36	9,436	6,779	0,177	0,945	0	0	2,9021	1,360

I	2	3	4	5	6	7	8	9
0,38	9,263	6,584	0,I72	0,963	0	0	2,9045	I,36I
0,40	9,084	6,384	0,I68	0,978	0	0	2,9070	I,36I
0,42	8,930	6,2I4	0,I63	0,99I	0	0	2,9095	I,36I
0,44	8,777	6,043	0,I59	I,005	0	0	2,9I20	I,362
0,46	8,638	5,885	0,I56	I,02I	0	0	2,9I45	I,362
0,48	8,506	5,732	0,I53	I,039	0	0	2,9I7I	I,362
0,50	8,384	5,585	0,I47	I,064	0	0	2,9I96	I,363
0,55	8,II2	5,235	0,I33	I,I49	0	0	2,9259	I,364
0,60	7,893	4,938	0,I20	I,235	0	0	2,9323	I,364
0,65	7,758	4,7I4	0,I05	I,330	0	0	2,9387	I,365
0,70	7,558	4,427	0,098	I,4I2	0	0	2,945I	I,366
0,75	7,422	4,235	0,092	I,459	0	0	2,95I6	I,367
0,80	7,30I	4,049	0,087	I,505	0	0	2,958I	I,368
0,85	7,I90	3,899	0,080	I,528	0	0	2,9646	I,368
0,90	7,088	3,762	0,075	I,545	0	0	2,97I2	I,369
0,95	6,950	3,596	0,070	I,566	0	0	2,9778	I,370
I,0	6,900	3,520	0,065	I,586	0	0	2,9844	I,37I
I,I	6,8I5	3,36I	0,056	I,62I	0	0	2,9977	I,373

Table 21 (continued)

I	2	3	4	5	6	7	8	9
I,2	6,788	3,269	0,048	I,639	0	0	3,0II2	I,374
I,4	6,798	3,I7I	0,035	I,676	0	0	3,0384	I,378
I,6	6,9I9	3,249	0,026	I,697	0	0	3,0660	I,38I
I,8	7,064	3,3II	0,0I9	I,772	0	0	3,094I	I,385
2,0	7,209	3,439	0,0I4	I,792	0	0	3,I225	I,389
2,2	7,353	3,599	0,0I0	I,798	0	0	3,I5I2	I,392
2,4	7,494	3,773	0,007	I,793	0	0	3,I802	I,396
2,6	7,632	3,942	0,005	I,790	0	0	3,2095	I,399
2,8	7,743	4,078	0,004	I,788	0	0	3,2390	I,403
3,0	7,828	4,I86	0,003	I,785	0	0	3,2688	I,407
3,2	7,874	4,266	0,003	I,765	0	0	3,2987	I,4I0
3,4	7,893	4,322	0,003	I,74I	0	0	3,3289	I,4I4
3,6	7,898	4,357	0,002	I,725	0	0	3,3592	I,4I8
3,8	7,890	4,375	0,002	I,7I4	0	0	3,3896	I,422
4,0	7,877	4,388	0,002	I,703	0	0	3,420I	I,425
4,5	7,800	4,344	0,002	I,702	0	0	3,4968	I,434
5,0	7,6I4	4,I92	0,002	I,700	0	0	3,5739	I,444

Table 21 (continued)

I	2	3	4	5	6	7	8	9
5,5	7,378	3,986	0,002	I,692	0,	0	3,65I0	I,453
6,0	7,090	3,738	0,003	I,579	0	0	3,7278	I,456
6,5	6,840	3,5I3	0,003	I,240	0,065	0	3,804I	I,456
7,0	6,626	3,3I5	0,003	0,976	0,I72	0	3,8797	I,457
7,5	6,450	3,I47	0,003	0,79I	0,289	0	3,9549	I,458
8,0	6,293	2,992	0,003	0,65I	0,403	0	4,0293	I,465
8,5	6,I62	2,873	0,003	0,586	0,420	0	4,I03I	I,472
9,0	6,044	2,766	0,003	0,557	0,425	0	4,I76I	I,479
9,5	5,950	2,688	0,003	0,542	0,4I5	0	4,2480	I,487
I0,0	5,868	2,623	0,003	0,529	0,407	0	4,3I9I	I,492
I0,5	5,8I3	2,588	0,003	0,526	0,397	0	4,389I	I,502
II,0	5,768	2,569	0,003	0,526	0,388	0	4,4582	I,5I0
II,5	5,743	2,572	0,004	0,522	0,339	0	4,5263	I,5I8
I2,0	5,733	2,590	0,004	0,5I8	0,40I	0	4,5935	I,526
I2,5	5,738	2,620	0,004	0,5I4	0,363	0,0 0	4,6596	I,532

Table 21 (continued)

I	2	3	4	5	6	7	8	9
I3,0	5,752	2,660	0,004	5,II	0,302	0,005	4,7249	I,536
I3,5	5,782	2,7I4	0,004	0,507	0,225	0,030	4,7893	I,539
I4,0	5,823	2,779	0,004	0,475	0,I30	0,I05	4,8529	I,542
I4,5	5,884	2,86I	0,004	0,462	0,075	0,I39	4,9I58	I,547
I5,0	5,955	2,95I	0,004	0,456	0,050	0,I50	4,9779	I,553

Table 22

Correlation coefficients, $K_{k,i,j}$, for the partial experimental errors used for $\alpha(^{239}Pu)$ determination

$K_{I, 7, I62} = 0,5$

$K_{I,I56, 99} = 0,5$

$K_{I,I63,I64} = 0,5$

$K_{I,I63,I69} = 0,5$

$K_{3, 6, 7} = I,0$

$K_{3, 6, I62} = I,0$

$K_{3, 6, I00} = I,0$

$K_{3, 6, I55} = I,0$

$K_{3, 6, I63} = I,0$

$K_{3, 6, I64} = I,0$

$K_{3, 6, IOI} = 0,5$

$K_{3, 6, I56} = I,0$

$K_{3, 6, 99} = I,0$

$K_{3, 6, 34} = I,0$

$K_{3, 6, I69} = I,0$

$K_{3, 7, I62} = I,0$

$K_{3, 7, I00} = I,0$

$K_{3, 7, I55} = I,0$

$K_{3, 7, I63} = I,0$

$K_{3, 7, I64} = I,0$

$K_{3, 7, IOI} = 0,5$

$K_{3, 7, I56} = I,0$

$K_{3, 7, 99} = I,0$

$K_{3, 7, 34} = I,0$

$K_{3, 7, I69} = I,0$

$K_{3,I62,I00} = I,0$

$K_{3,I62,I55} = I,0$

$K_{3,I62,I63} = I,0$

$K_{3,I62,I64} = I,0$

$K_{3,I62,IOI} = 0,5$

$K_{3,I62,I56} = I,0$

$K_{3,I62, 99} = I,0$

$K_{3,I62, 34} = I,0$

$K_{3,I62,I69} = I,0$

$K_{3,I00,I55} = I,0$

$K_{3,I00,I63} = I,0$

$K_{3,I00,I64} = I,0$

$K_{3,I00,IOI} = 0,5$

$K_{3,I00,I56} = I,0$

$K_{3,I00, 99} = I,0$

$K_{3,I00, 34} = I,0$

$K_{3,I00,I69} = I,0$

$K_{3,I55,I63} = I,0$

$K_{3,I55,I64} = I,0$

$K_{3,I55,IOI} = 0,5$

$K_{3,I55,I56} = I,0$

$K_{3,I55, 99} = I,0$

$K_{3,I55, 34} = I,0$

$K_{3,I55,I69} = I,0$

$K_{3,I63,I64} = I,0$

$K_{3,I63,IOI} = 0,5$

$K_{3,I63,I56} = I,0$

$K_{3,I63, 99} = I,0$

$K_{3,I63, 34} = I,0$

$K_{3,I63,I69} = I,0$

$K_{3,I64,IOI} = 0,5$

$K_{3,I64,I56} = I,0$

$K_{3,I64, 99} = I,0$

$K_{3,I64, 34} = I,0$

$K_{3,I64,I69} = I,0$

$K_{3,IOI,I56} = 0,5$

$K_{3,IOI, 99} = 0,5$

$K_{3,IOI, 34} = 0,5$

$K_{3,IOI,I69} = 0,5$

$K_{3,I56, 99} = I,0$

$K_{3,I56, 34} = I,0$

$K_{3,I56,I69} = I,0$

$K_{3, 99, 34} = I,0$

$K_{3, 99,I69} = I,0$

$K_{3, 34,I69} = I,0$

$K_{3,I59,I57} = I,0$

$K_{3,I59,I58} = I,0$

$K_{3,I59,I60} = I,0$

$K_{3,I59,I67} = I,0$

$K_{3,I57,I58} = I,0$

$K_{3,I57,I60}$ = I,0	$K_{8,I00,I55}$ = I,0	$K_{8,I64,I60}$ = I,0
$K_{3,I57,I67}$ = I,0	$K_{8,I00,I63}$ = I,0	$K_{8,I64,I67}$ = I,0
$K_{3,I58,I60}$ = I,0	$K_{8,I00,I64}$ = I,0	$K_{8,I64,I69}$ = I,0
$K_{3,I58,I67}$ = I,0	$K_{8,I00,99}$ = I,0	$K_{8,99,34}$ = I,0
$K_{5,6,7}$ = I,0	$K_{8,I00,34}$ = I,0	$K_{8,99,I60}$ = I,0
$K_{5,6,I62}$ = I,0	$K_{8,I00,I60}$ = I,0	$K_{8,99,I67}$ = I,0
$K_{5,7,I62}$ = I,0	$K_{8,I00,I67}$ = I,0	$K_{8,99,I69}$ = I,0
$K_{5,I00,I0I}$ = I,0	$K_{8,I00,I69}$ = I,0	$K_{8,34,I60}$ = I,0
$K_{5,I00,I60}$ = I,0	$K_{8,I55,I63}$ = I,0	$K_{8,34,I67}$ = I,0
$K_{5,I63,34}$ = I,0	$K_{8,I55,I64}$ = I,0	$K_{8,34,I69}$ = I,0
$K_{5,I0I,I60}$ = I,0	$K_{8,I55,99}$ = I,0	$K_{8,I60,I67}$ = I,0
$K_{6,6,7}$ = I,0	$K_{8,I55,34}$ = I,0	$K_{8,I60,I69}$ = I,0
$K_{6,I63,I64}$ = I,0	$K_{8,I55,I60}$ = I,0	$K_{8,I67,I69}$ = I,0
$K_{6,I63,I69}$ = I,0	$K_{8,I55,I67}$ = I,0	$K_{9,I59,I57}$ = I,0
$K_{8,I62,I00}$ = I,0	$K_{8,I55,I69}$ = I,0	$K_{9,I59,I58}$ = I,0
$K_{8,I62,I55}$ = I,0	$K_{8,I63,I64}$ = I,0	$K_{9,I59,I60}$ = I,0
$K_{8,I62,I63}$ = I,0	$K_{8,I63,99}$ = I,0	$K_{9,I59,I67}$ = I,0
$K_{8,I62,I64}$ = I,0	$K_{8,I63,34}$ = I,0	$K_{9,I57,I58}$ = I,0
$K_{8,I62,99}$ = I,0	$K_{8,I63,I60}$ = I,0	$K_{9,I57,I60}$ = I,0
$K_{8,I62,34}$ = I,0	$K_{8,I63,I67}$ = I,0	$K_{9,I57,I67}$ = I,0
$K_{8,I62,I60}$ = I,0	$K_{8,I63,I69}$ = I,0	$K_{9,I58,I60}$ = I,0
$K_{8,I62,I67}$ = I,0	$K_{8,I64,99}$ = I,0	$K_{9,I58,I67}$ = I,0
$K_{8,I62,I69}$ = I,0	$K_{8,I64,34}$ = I,0	$K_{9,I60,I67}$ = I,0
$K_{4,i,j}$ = I,0	$K_{7,i,j}$ = I,0	$K_{I0,i,j}$ = I,0

Note : 1. For any i=j $K_{k,i,j}$= 1.0.

2. $K_{k,i,j}$= $K_{k,j,i}$. 3. $K_{k,i,j}$ not mentioned in Table are equal to zero.

Table 23

Optimized weights without (K=0), assigned (K) and complete (K=1) correlations, and experimental values of $\alpha(^{239}Pu)$ for the considered energy regions

Region 0.1-0.2 Kev

Ref.	K=0	K	K=1	α_{exp}
/ 6 /	0,040	0,025		0,98 ±0,I2
/ 7 /	0,2I4	0,4II	0,294	0,87 ±0,0I5(0,058)
/I62/	0,229	0,430	0,706	0,87I±0,052(0,056)
/I00/	0,054			0,96 ±0,I2
/I55/	0,084	0,059		0,78 ±0,07(0,083)
/I63/	0,I02	0,002		0,88 ±0,07(0,084)
/I64/	0,042			0,93 ±0,I4
/I0I/	0,052	0,072		0,67 ±0,09
/I56/	0,050			0,7I ±0,07(0,095)
/ 99/	0,032			0,85 ±0,I4(0,I46)
/ 34/	0,064	0,00I		0,85 ± (0,I0)
/I69/	0,037			0,93 ±0,I3

Region 0.2-0.3 keV

Ref.	K=0	K	K=1	α_{exp}
/ 6 /	0,045	0,002		I,06 ±0,I2
/ 7 /	0,209	0,389	0,I47	0,94 ±0,0I(0,062)
/I62/	0,243	0,557	0,853	0,927±0,056(0,060)
/I00/	0,034	0,004		0,79 ±0,I3
/I55/	0,08I	0,008		0,86 ±0,08(0,09I)
/I63/	0,098	0,0I0		I,07 ±0,08(0,I03)
/I64/	0,043	0,004		0,96 ±0,I4
/I0I/	0,05I	0,005		0,67 ±0,09
/I56/	0,030	0,003		I,3I ±0,23
/ 99/	0,046	0,005		I,00 ±0,I4
/ 34/	0,068	0,007		0,78 ±0,09
/I66/	0,0I7	0,002		0,74 ± (0,I8)
/I69/	0,035	0,004		0,92 ±0,08

Table 23

(continued)

Region 0.3-0.4 keV

Ref.	K=0	K	K=1	α_{exp}
/ 6 /	0,052	0,002		I,30 ±0,I8
/ 7 /	0,I69	0,272		I,I6 ±0,0I4(0,089)
/ I62/	0,24I	0,5I9	I,00	I,I5 ±0,069(0,074)
/I00/	0,050	0,005		I,I3 ±0,I6
/I55/	0,088	0,069		I,II ±0,08(0,II8)
/I63/	0,I05	0,0I0		I,23 ±0,09(0,I2)
/I64/	0,052			I,I5 ±0,I6
/I0I/	0,064	0,070		0,94 ±0,II(0,II7)
/I56/	0,037			I,7I ±0,28
/ 99/	0,02I			I,00 ±0,22
/ 34/	0,06I	0,00I		I,I0 ±0,I4
/I66/	0,022	0,048		0,95 ± (0,20)
/I69/	0,038	0,004		I,I7 ±0,08

Region 0.4-0.5 keV

Ref.	K=0	K	K=1	α_{exp}
/ 6 /	0,035	0,020		0,50 ±0,I0
/ 7 /	0,230	0,286		0,44 ±0,0I3(0,034)
/I62/	0,343	0,596	I,00	0,426±0,026(0,027)
/I00/	0,022			0,44 ±0,II
/I55/	0,III	0,022		0,45 ±0,05
/I63/	0,034	0,007		0,45 ±0,09
/I64/	0,03I	0,006		0,62 ±0,I3
/I0I/	0,038	0,042		0,57 ±0,I0
/I56/	0,0I2			0,48 ±0,I6
/ 99/	0,034			0,89 ±0,I8
/ 34/	0,047	0,00I		0,70 ±0,I2
/I66/	0,008	0,0I8		0,76 ±0,30
/I69/	0,055	0,002		0,59 ±0,04

Table 23

(continued)

Region 0.5-0.6 keV

Ref.	K=0	K	K=1	α_{exp}
/ 6 /	0,039	0,032		0,78 ±0,I3
/ 7 /	0,I86	0,223		0,72 ±0,04(0,055)
/I62/	0,266	0,546	I,00	0,7I8±0,034(0,046)
/I00/	0,068	0,002		0,63 ±0,08
/I55/	0,097	0,II5		0,65 ±0,05(0,069)
/I63/	0,076	0,0II		0,75 ±0,09
/I64/	0,039			0,78 ±0,I3
/I0I/	0,036	0,035		0,64 ±0,II
/I56/	0,050			0,68 ±0,I0
/ 99/	0,053			0,84 ±0,I2
/ 34/	0,03I			0,96 ±0,I8
/I66/	0,0I7	0,035		0,95 ±0,22
/I69/	0,042			0,75 ±0,II

Region 0.6-0.7 keV

Ref.	K=0	K	K=1	α_{exp}
/ 6 /	0,06I	0,060		I,90 ±0,2I
/ 7 /	0,I6I	0,2I3		I,54 ±0,04(0,I2)
/I62/	0,235	0,474	I,00	I,488±0,089(0,096)
/I00/	0,090	0,0I9		I,44 ±0,I5
/I55/	0,087	0,089		I,60 ±0,I3(0,I7)
/I63/	0,I00	0,0I3		I,72 ±0,I7
/I64/	0,06I			I,58 ±0,20
/I0I/	0,062	0,090		I,68 ±0,I8(0,2I)
/I56/	0,032			0,75 ±0,I3
/ 99/	0,0I0			I,44± 0,45
/ 34/	0,050	0,0I3		I,2I ±0,I7
/I66/	0,0I3	0,034		I,I5 ±0,30
/I69/	0,038	0,005		I,46 ±0,I8

Table 23

(continued)

Region 0.7-0.8 keV

Ref.	K=0	K	K=1	α_{exp}
/ 6 /	0,040	0,005		I,08 ±0,I7
/ 7 /	0,I7I	0,245		0,97 ±0,0I7(0,074)
/I62/	0,242	0,528	I,00	0,89 ±0,053(0,057)
/I00/	0,052	0,02I		0,94 ±0,I3
/I55/	0,089	0,036		0,90 ±0,08(0,095)
/I63/	0,052	0,02I		0,94 ±0,I3
/I64/	0,046	0,0I9		I,02 ±0,I5
/I0I/	0,060	0,024		0,85 ±0,II
/I56/	0,098	0,040		I,03 ±0,07(0,026)
/ 99/	0,032	0,0I3		I,3I ±0,I8(0,23)
/ 34/	0,056	0,023		I,05 ±0,I4
/I66/	0,023	0,009		0,98 ±0,I8
/I69/	0,038	0,0I6		I,00 ±0,I0

Region 0.8-0.9 keV

Ref.	K=0	K	K=1	α_{exp}
/ 6 /	0,053	0,008		I,065±0,I6
/ 7 /	0,205	0,248		0,82 ±0,025(0,063)
/I62/	0,286	0,526	I,00	0,79 ±0,047(0,05I)
/I00/	0,0I3	0,006		0,53 ±0,I6
/I55/	0,I06	0,05I		0,64 ±0,05(0,068)
/I63/	0,043	0,020		0,78 ±0,I3
/I64/	0,05I	0,024		0,85 ±0,I3
/I0I/	0,06I	0,029		0,79 ±0,II
/I56/	0,028	0,0I3		0,68 ±0,I4
/ 99/	0,039	0,0I9		I,I5 ±0,20
/ 34/	0,044	0,022		0,72 ±0,I2
/I66/	0,024	0,0I2		0,88 ±0,I8
/I69/	0,047	0,022		0,78 ±0,II

Table 23

(continued)

Region 0.9-1.0 keV

Ref.	K=0	K	K=1	α_{exp}
/ 6 /	0,042	0,00I		0,83 ±0,I4
/ 7 /	0,I82	0,234		0,70 ±0,26(0,057)
/I62/	0,297	0,579	I,00	0,675±0,048(0,043)
/I00/	0,045	0,004		0,55 ±0,09
/I55/	0,I08	0,076		0,70 ±0,06(0,074)
/I63/	0,042			0,7I ±0,I2
/I64/	0,053			0,93 ±0,I4
/I0I/	0,059	0,059		0,70 ±0,I0(0,I47)
/I56/	0,024	0,002		0,48 ±0,II
/ 99/	0,028			I,2I ±0,25
/ 34/	0,054			0,66 ±0,I0
/I66/	0,020	0,04I		0,90 ±0,20
/I69/	0,046	0,004		0,76 ±0,I2

Region 1-2 keV

Ref.	K=0	K	K=1	α_{exp}
/ 6 /	0,044	0,008		0,99 ±0,I6
/ 7 /	0,I20	0,I69		0,84 ±0,0I3(0,082)
/I62/	0,227	0,485	I,00	0,802±0,048(0,057)
/I00/	0,054	0,030		0,69 ±0,I0
/I55/	0,I02	0,057		0,85 ±0,07(0,09)
/I63/	0,II9	0,066		I,02 ±0,I0
/I64/	0,053	0,029		0,95 ±0,I4
/I0I/	0,073	0,040		I,I7 ±0,I2(0,I47)
/I56/	0,025	0,0I4		0,65 ±0,I4
/ 99/	0,043	0,024		I,04 ±0,I7
/ 34/	0,057	0,032		0,76 ±0,II
/I66/	0,024	0,0I3		I,02 ±0,20
/I69/	0,059	0,033		0,85 ±0,07

Table 23

(continued)

Region 2-3 keV

Ref.	K=0	K	K=1	α_{exp}
/ 6 /	0,037	0,006		I,38 ± (0,25)
/ 7 /	0,I26	0,I73		I,00 ± (0,0I8)
/I62/	0,236	0,493	I,00	0,972±0,058(0,0695)
/I00/	0,060	0,033		0,92 ±0,I3
/I55/	0,I07	0,058		I,0I+±0,08(0,I07)
/I63/	0,085	0,046		I,23 ±0,I2(0,I48)
/I64/	0,059	0,032		I,08 ±0,I5
/I0I/	0,072	0,039		I,3I ±0,I3
/I56/	0,043	0,023		0,89 ±0,I4(0,I5)
/ 99/	0,030	0,0I6		I,09 ±0,2I
/ 34/	0,06I	0,034		0,96 ±0,I3
/I66/	0,023	0,0I2		0,98 ±0,20
/I69/	0,06I	0,035		0,97 ±0,II

Region 3-4 keV

Ref.	K=0	K	K=1	α_{exp}
/ 6 /	0,034	0,006		I,26 ± (0,25)
/ 7 /	0,I43	0,I34		0,72 ±0,066(0,070)
/I62/	0,26I	0,48I	I,00	0,738±0,043(0,053)
/I00/	0,050	0,008		0,73 ±0,I2
/I55/	0,I2I	0,I59		0,88 ±0,07(0,093)
/I63/	0,055	0,009		0,96 ±0,I5
/I64/	0,0I5	0,002		0,77 ±0,23
/I0I/	0,080	0,I06		0,95 ±0,II(0,I24)
/I56/	0,050			0,67 ±0,08(0,II)
/ 99/	0,043			0,96 ±0,I7
/ 34/	0,034	0,00I		0,85 ±0,I8
/I66/	0,024	0,048		0,84 ±0,I8
/I67/	0,020	0,0I0		I,264±0,33
/I69/	0,070	0,036		0,68 ±0,I2

Table 23

(continued)

Region 4-5 keV

Ref.	K=0	K	K=1	α_{exp}
/ 6 /	0,067	0,0II		0,98 ±0,I3(0,I35)
/ 7/	0,I66	0,222		0,87 ±0,04(0,076)
/I62/	0,244	0,492	I,00	0,83I±0,05(0,06)
/I00/	0,054	0,028		0,72 ±0,II
/I55/	0,II2	0,059		0,80 ±0,07(0,085)
/I63/	0,045	0,024		0,83 ±0,I4
/I64/	0,0I4	0,008		0,84 ± (0,25)
/I0I/	0,073	0,038		0,90 ±0,II(0,II3)
/I56/	0,045	0,023		0,95 ±0,08 (0,I6)
/ 99/	0,032	0,0I7		0,78 ±0,09(0,I56)
/ 34/	0,036	0,0I9		0,79 ±0,I5
/I66/	0,02I	0,0II		0,80 ±0,I8
/I67/	0,025	0,0I3		I,0II±0,228
/I69/	0,066	0,035		0,87 ±0,7

Region 5-6 keV

Ref.	K=0	K	K=1	α_{exp}
/ 6 /	0,08I	0,086		0,9I ±0,I2
/ 7 /	0,I45	0,I53		0,82 ±0,046(0,08)
/I62/	0,266	0,282	I,00	0,807±0,048(0,058)
/I00/	0,073	0,077		0,80 ±0,II
/I55/	0,I23	0,I30		0,87 ±0,08(0,092)
/I64/	0,0I5	0,0I5		0,8I ± (0,24)
/I0I/	0,082	0,087		0,93 ±0,II(0,I2)
/I56/	0,050	0,052		0,90 ±0,05(0,I5)
/ 99/	0,028	0,030		0,82 ±0,I8
/ 34/	0,02I	0,022		0,78 ±0,20
/I66/	0,0I4	0,0I6		0,78 ±0,I8
/I67/	0,03I	0,049		0,853±0,I8
/I69/	0,07I			0,84 ±0,09

Table 23

(continued)

Region 6-7 keV

Ref.	K=0	K	K=1	α_{exp}
/ 6 /	0,076	0,0I8		0,88 ±0,I2
/ 7 /	0,I50	0,036		0,79 ±0,04(0,077)
/I62/	0,28I	0,575	I,00	0,745±0,045(0,053)
/I00/	0,047	0,035		0,69 ±0,I2
/I55/	0,I26	0,095		0,87 ±0,08(0,092)
/I64/	0,0I5	0,0I2		0,69 ± (0,2I)
/I0I/	0,086	0,065		0,86 ±0,II
/I56/	0,053	0,039		0,97 ±0,08(0,I6)
/ 99/	0,0I8	0,0I3		0,75 ±0,2I
/ 34/	0,020	0,0I5		0,60 ±0,I6
/I66/	0,020	0,0I6		0,86 ±0,20
/I67/	0,035	0,026		0,727±0,I45
/I69/	0,073	0,055		0,73 ±0,I3

Region 7-8 keV

Ref.	K=0	K	K=1	α_{exp}
/ 6 /	0,06I	0,0I4		0,7I ±0,II
/ 7 /	0,I55	0,037		0,64 ±0,022(0,062)
/I62/	0,285	0,579	I,00	0,642±0,038(0,046)
/I00/	0,05I	0,038		0,59 ±0,I0
/I55/	0,II4	0,085		0,62 ±0,07
/I63/	0,050	0,037		0,67 ±0,II(0,II5)
/I64/	0,0I2	0,009		0,73 ± (0,25)
/I0I/	0,056	0,04I		0,68 ±0,II
/I56/	0,052	0,039		0,46 ±0,07(0,0769)
/ 99/	0,0I5	0,0II		0,60 ±0,I9
/ 34/	0,0I5	0,0I0		0,57 ±0,I8
/I66/	0,020	0,0I5		0,8I ±0,20
/I67/	0,039	0,029		0,569±0,II
/I69/	0,075	0,056		0,74 ±0,07

Table 23

(continued)

Region 8-9 keV

Ref.	K=0	K	K=1	α_{exp}
/ 6 /	0,048	0,0II		0,58 ±0,I0
/ 7 /	0,I4I	0,033		0,54 ±0,022(0,054)
/I62/	0,282	0,568	I,00	0,537±0,032(0,038)
/I00/	0,055	0,040		0,56 ±0,09
/I55/	0,II9	0,087		0,55 ±0,06
/I64/	0,0I4	0,0I0		0,63 ± (0,20)
/I0I/	0,077	0,057		0,58 ± 0,I0
/I56/	0,035	0,026		0,49 ±0,06(0,098)
/ 99/	0,035	0,026		0,50 ±0,I0
/ 34/	0,0I4	0,0I0		0,57 ±0,I8
/I66/	0,0I8	0,0I3		0,76 ±0,20
/I60/	0,043	0,032		0,72 ±0,I3
/I67/	0,045	0,033		0,569±0,I0
/I69/	0,074	0,054		0,56 ±0,09

Region 9-10 keV

Ref.	K=0	K	K=1	α_{exp}
/ 6 /	0,050	0,0I4		0,64 ±0,II
/ 7 /	0,I50	0,042		0,55 ±0,022(0,055)
/I62/	0,295	0,530	I,00	0,606±0,036(0,043)
/I00/	0,062	0,024		0,64 ±0,I0
/I55/	0,II9	0,I04		0,62 ±0,07
/I64/	0,009	0,008		0,65 ± (0,26)
/I0I/	0,083	0,073		0,74 ±0,I0
/I56/	0,037	0,033		0,43 ±0,06(0,086)
/ 99/	0,026	0,023		0,43 ±0,I0
/ 34/	0,0I9	0,0I7		0,53 ±0,I5
/I66/	0,024	0,02I		0,74 ±0,I7
/I60/	0,049	0,043		0,72 ±0,I3
/I67/	0,048	0,042		0,453±0,08
/I69/	0,029	0,026		0,47 ±0,I0

Table 23

(continued)

Region 10-15 keV

Ref.	K=0	K	K=1	α_{exp}
/ 6 /	0,I44	0,I39		0,58 $\pm$0,I0
/ I00/	0,I58	0,I53		0,52 $\pm$0,08(0,085)
/I55/	0,228	0,2I9	0,84I	0,42 $\pm$0,05(0,057)
/I0I/	0,I53	0,I48	0,024	0,60 $\pm$0,I0
/ 99/	0,II9	0,II5		0,37 $\pm$0,07
/I66/	0,058	0,056		0,6I $\pm$0,I6
/I60/	0,I40	0,I70	0,I35	0,59 $\pm$0,I0

Region 15-20 keV

Ref.	K=0	K	K=1	α_{exp}
/ 6 /	0,I32	0,I29		0,45 $\pm$0,09
/I00/	0,229	0,223	0,I69	0,46 $\pm$0,07
/I55/	0,283	0,277	0,8I0	0,4I $\pm$0,05(0,056)
/I56/	0,I22	0,II9		0,48 $\pm$0,I0
/I66/	0,063	0,06I		0,55 $\pm$0,I5
/I60/	0,I7I	0,I9I	0,02I	0,422$\pm$0,074
/I69/	0			0,35 $\pm$0,I0

Table 23

(continued)

Region 10-20 keV

Ref.	K=0	K	K=1	α_{exp}
/ 6 /	0,048	0,053		0,52 ±0,I0
/ 7 /	0,I99	0,2I8		0,48 ±0,022(0,045)
/I62/	0,343	0,378	I,00	0,486±0,029(0,035)
/I00/	0,067	0,074		0,49 ±0,08
/I55/	0,095	0,I05		0,4I ±0,05(0,056)
/I66/	0,023	0,025		0,58 ±0,I5
/I59/	0,036	0,035		0,432±0,096
/I60/	0,056	0,039		0,506±0,09
/I69/	0,048	0,006		0,4I3±0,07I

Region 20-30 keV

Ref.	K=0	K	K=1	α_{exp}
/ 6 /	0,026	0,038		0,4I ±0,I2
/ 7 /	0,222	0,352	I,00	0,35 ±0,0I8(0,035)
/I62/	0,055	0,044		0,332±0,066
/I00/	0,092	0,075		0,39 ±0,06
/I55/	0,076	0,062		0,37 ±0,04(0,053)
/I66/	0,0I5	0,0I2		0,48 ±0,I8
/I59/	0,I44	0,II7		0,332±0,04I
/I57/	0,I25	0,I0I		0,38 ±0,054
/I60/	0,082	0,067		0,329±0,054
/I67/	0,I05	0,085		0,340±0,049
/I69/	0,058	0,047		0,35 ±0,062

Table 23

(continued)

Region 30-40 keV

Ref.	K=0	K	K=1	α_{exp}
/ 7 /	0,I69	0,296	0,235	0,30 ±0,04I
/IOI/	0,079	0,099		0,247±0,049
/I59/	0,24I	0,30I	0,679	0,272±0,03I
/I57/	0,243	0,304	0,086	0,299±0,036
/I60/	0,II7			0,304±0,050
/I67/	0,I5I			0,293±0,042

Region 40-50 keV

Ref.	K=0	K	K=1	α_{exp}
/ 7 /	0,222	0,389	0,4I8	0,26 ±0,02(0,03I)
/I62/	0,079	0,062		0,254±0,05I
/I59/	0,246	0,I93	0,582	0;23I±0,027
/I57/	0,I86	0,I46		0,286±0,044
/I60/	0,II4	0,090		0,262±0,044
/I67/	0,I53	0,I20		0,25I±0,036

Region 50-60 keV

Ref.	K=0	K	K=1	α_{exp}
/ 7 /	0,252	0,348	0,252	0,23 ±0,02(0,03)
/I62/	0,I08	0,094	0,I08	0,246±0,049
/I59/	0,272	0,237	0,272	0,I9I±0,024
/I57/	0,2I6	0,I88	0,2I6	0,24I±0,034
/I60/	0,I52	0,I33	0,I52	0,237±0,040

Region 60-70 keV

Ref.	K=0	K	K=1	α_{exp}
/ 7 /	0,289	0,298	0,405	0,23 ±0,025(0,032)
/I62/	0,I3I	0,I35		0,22 ±0,044
/I59/	0,343	0,354	0,595	0,I68±0,02I
/I57/	0,237	0,2I4		0,I83±0,028

Table 23

(continued)

Region 70-80 keV

Ref.	K=0	K	K=1	α_{exp}
/ 7 /	0,3I4	0,3I7	0,548	0,I9 ±0,025(0,027)
/I62/	0,I60	0,I62		0,2I5±0,043
/I59/	0,293	0,297	0,452	0,I49±0,022
/I57/	0,233	0,224		0,I7I±0,028

Region 80-90 keV

Ref.	K=0	K	K=1	α_{exp}
/ 7 /	0,648	0,704	I,00	0,22 ±0,03(0,032)
/I62/	0,352	0,296		0,20 ±0,04

Region 90-100 keV

Ref.	K=0	K	K=1	α_{exp}
/ 7 /	0,209	0,I88		0,I7 ±0,045
/I62/	0,358	0,322	0,I88	0,I38±0,028
/I67/	0,433	0,490	0,8I2	0,I47±0,027

Region 100-200 keV

Ref.	K=0	K	K=1	α_{exp}
/ 7 /	0,308	0,304	0,556	0,I5 ±0,0I(0,023)
/I62/	0,I74	0,I72		0,I48±0,030
/I59/	0,280	0,277	0,444	0,I25±0,020
/I58/	0,238	0,247		0,I42±0,025

Energy 250 keV

Ref.	K=0	K	K=1	α_{exp}
/I58/	I,00	I,00	I,00	0,I06±0,0I8

Energy 300 keV

Ref.	K=0	K	K=1	α_{exp}
/I59/	0,409	0,396		0,II2±0,02I
/I57/	0,59I	0,604	I,00	0,II9±0,0I8

Table 23

(continued)

Energy 400 keV

Ref.	K=0	K	K=1	α_{exp}
/I59/	0,2I8	0,I94		0,084±0,0I8
/I57/	0,3I6	0,282		0,0803±0,0I3
/I58/	0,466	0,524	I,00	0,089±0,0I2

Energy 500 keV

Ref.	K=0	K	K=1	α_{exp}
/I59/	0,426	0,4I4		0,09I±0,0I8
/I57/	0,574	0,586	I,00	0,069±0,0I2

Energy 600 keV

Ref.	K=0	K	K=1	α_{exp}
/I57/	0,3I7	0,306		0,036±0,0I0
/I58/	0,683	0,694	I,00	0,065±0,0I2

Energy 750 keV

Ref.	K=0	K	K=1	α_{exp}
/I59/	0,6I8	0,630	I,00	0,080±0,0I7
/I58/	0,382	0,370		0,046±0,0I2

Energy 900 keV

Ref.	K=0	K	K=1	α_{exp}
/I59/	0,467	0,467	0,366	0,04I±0,0I6
/I58/	0,533	0,533	0,634	0,035±0,0I2

Energy 1000 keV

Ref.	K=0	K	K=1	α_{exp}
/I58/	I,00	I,00	I,00	0,027±0,007

Evaluated α(^{239}Pu) and evaluation errors with regard for the optimized weights without (K=0), assigned (K) and complete (K=1) correlations

Nos.	E, keV	α			Evaluation error,%		
		K = 0	K	K = I	K = 0	K	K = I
I	2	3	4	5	6	7	8
I	0,I-0,2	0,857	0,853	0,87I	3,07	5,43	6,36
2	0,2-0,3	0,929	0,932	0,929	3,03	5,37	6,II
3	0,3-0,4	I,I6I	I,I27	I,I50	3,I6	5,5I	6,43
4	0,4-0,5	0,488	0,446	0,426	3,7I	5,64	6,33
5	0,5-0,6	0,728	0,7I7	0,7I8	3,30	5,56	6,40
6	0,6-0,7	I,524	I,553	I,488	3,I3	5,54	6,44
7	0,7-0,8	0,962	0,932	0,890	3,I5	5,53	6,40
8	0,8-0,9	0,804	0,796	0,790	3,45	5,66	6,46
9	0,9-I,0	0,7I7	0,693	0,675	3,47	5,56	6,36
I0	I - 2	0,886	0,849	0,802	3,38	6,05	7,I0
II	2 - 3	I,044	I,008	0,972	3,47	6,03	7,I5
I2	3 - 4	0,8I8	0,794	0,738	3,67	5,90	7,I8
I3	4 - 5	0,852	0,843	0,83I	3,56	5,92	7,22
I4	5 - 6	0,842	0,843	0,807	3,7I	6,I3	7,I9
I5	6 - 7	0,794	0,773	0,745	3,76	6,07	7,II
I6	7- 8	0,642	0,640	0,642	3,82	6,26	II,90
I7	8 - 9	0,559	0,552	0,537	3,76	6,I6	II,57
I8	9 - I0	0,600	0,603	0,606	3,98	6,I2	II,85
I9	I0 - I5	0,5I5	0,5I8	0,447	6,53	8,33	I4,85
20	I5 - 20	0,446	0,445	0,4I9	7,27	8,84	I5,75

Table 24

(continued)

I	2	3	4	5	6	7	8
2I	I0 - 20	0,473	0,476	0,486	4,22	6,08	II,03
22	20 - 30	0,356	0,356	0,350	4,68	7,I6	I3,07
23	30 - 40	0,288	0,286	0,282	5,63	8,59	I2,38
24	40 - 50	0,256	0,257	0,243	5,66	8,42	I2,36
25	50 - 60	0,225	0,225	0,225	6,55	8,6I	I3,2I
26	60 - 70	0,I96	0,I97	0,I93	7,48	8,83	I3,00
27	70 - 80	0,I78	0,I77	0,I72	8,00	9,3I	I4,26
28	80 - 90	0,2I3	0,2I4	0,220	II,98	I3,67	I6,52
29	90 -I00	0,I49	0,I49	0,I45	I2,I2	I3,04	I9,56
30	I00 -200	0,I4I	0,I4I	0,I39	8,45	9,82	I4,77
3I	250	0,I06	0,I06	0,I06	I6,74	I6,74	I6,74
32	300	0,II6	0,II6	0,II9	II,77	I3,08	I6,25
33	400	0,0852	0,0856	0,0890	9,45	II,I7	I5,80
34	500	0,0784	0,078I	0,0690	I3,24	I4,54	I8,39
35	600	0,0558	0,056I	0,0650	I5,09	I5,83	20,66
36	750	0,0670	0,0674	0,0800	I6,70	I7,44	23,I2
37	900	0,0378	0,0378	0,0372	25,03	25,55	33,34
38	I000	0,0270	0,0270	0,0270	25,95	25,95	25,95

Table 25

Discrete level excitation and continuous spectrum cross sections

E,MeV	level energy E_q, MeV														
	direct excitation				compound nucleus mechanism										
	0,008	0,057	0,076	0,I64	0,008	0,057	0,076	0,I64	0,I94	0,285	0,3I7	0,330	0,360	0,387	0,392
0,I0	0,0I3	0,003			0,338	0,063	0,0I0								
0,I2	0,0I7	0,005			0,372	0,097	0,02I								
0,I4	0,022	0,007	0,00I		0,392	0,I26	0,032								
0,I6	0,026	0,0I0	0,00I		0,408	0,I50	0,04I								
0,I8	0,0I4	0,0I4	0,00I		0,4II	0,I60	0,049								
0,20	0,0I6	0,028	0,002		0,4I5	0,I77	0,059								
0,22	0,020	0,033	0,002		0,42I	0,I96	0,067								
0,24	0,022	0,038	0,003		0,425	0,207	0,072								
0,26	0,024	0,042	0,003		0,428	0,2I5	0,075	0,00I							
0,28	0,026	0,047	0,003		0,430	0,22I	0,079	0,00I							
0,30	0,028	0,049	0,003	0,00I	0,432	0,227	0,083	0,002	0,00I	0,008					
0,32	0,038	0,05I	0,003	0,00I	0,436	0,253	0,092	0,003	0,00I	0,025					
0,34	0,040	0,052	0,003	0,002	0,43I	0,254	0,094	0,004	0,00I	0,04I		0,002			
0,36	0,043	0,055	0,003	0,002	0,424	0,253	0,096	0,005	0,00I	0,056		0,007			
0,38	0,045	0,059	0,004	0,003	0,4I4	0,252	0,096	0,005	0,00I	0,07I		0,0I3			
0,40	0,047	0,062	0,004	0,003	0,403	0,250	0,097	0,006	0,002	0,084		0,0I9			0,00I

Table 25 (continued)

E, MeV	Level energy E_q, MeV: direct excitation 0,008	0,057	0,076	0,164	compound nucleus mechanism 0,008	0,057	0,076	0,164	0,194	0,285	0,317	0,330	0,360	0,387	0,392	0,435	0,462	0,470	0,488	0,492	0,506	0,512	0,555	0,565	0,583	$\sigma_{nn'}$ cont
0,42	0,050	0,066	0,005	0,004	0,392	0,246	0,096	0,007	0,002	0,095		0,024			0,004											
0,44	0,052	0,068	0,006	0,005	0,382	0,243	0,096	0,008	0,002	0,I05		0,028		0,00I	0,009											
0,46	0,054	0,07I	0,007	0,005	0,375	0,239	0,096	0,009	0,003	0,II4		0,033		0,00I	0,0I3	0,00I										
0,48	0,056	0,074	0,008	0,006	0,363	0,236	0,096	0,0I0	0,003	0,I2I		0,036		0,002	0,0I8	0,003		0,007								
0,50	0,059	0,078	0,009	0,007	0,35I	0,230	0,096	0,0II	0,003	0,I25		0,040		0,002	0,024	0,004		0,0I9		0,006						
0,55	0,064	0,085	0,0I2	0,0I0	0,3I8	0,2I5	0,092	0,0I4	0,004	0,I32		0,045		0,004	0,032	0,008	0,00I	0,047		0,04I	0,0I9	0,006				
0,60	0,069	0,I0I	0,0I5	0,0I0	0,29I	0,203	0,09I	0,0I7	0,005	0,I35		0,049		0,006	0,039	0,0I0	0,00I	0,065		0,067	0,040	0,0I4	0,005	0,00I	0,00I	
0,65	0,075	0,III	0,0I8	0,0I2	0,285	0,200	0,090	0,02I	0,006	0,I38		0,053		0,008	0,042	0,0II	0,002	0,075		0,086	0,052	0,022	0,0I2	0,002	0,002	0,007
0,70	0,080	0,I20	0,022	0,0I5	0,273	0,I98	0,089	0,022	0,007	0,I38		0,054		0,0I0	0,044	0,0I2	0,002	0,080	0,00I	0,096	0,063	0,028	0,0I9	0,003	0,004	0,032
0,75	0,084	0,I29	0,026	0,0I8	0,246	0,I83	0,088	0,026	0,008	0,I36		0,054		0,0I2	0,045	0,0I3	0,003	0,080	0,00I	0,I0I	0,068	0,032	0,024	0,005	0,006	0,07I
0,80	0,089	0,I39	0,029	0,02I	0,220	0,I69	0,087	0,028	0,009	0,I28	0,00I	0,055		0,0I4	0,044	0,0I3	0,003	0,078	0,00I	0,I0I	0,069	0,034	0,027	0,007	0,007	0,I32
0,85	0,093	0,I48	0,033	0,023	0,I96	0,I54	0,083	0,030	0,009	0,II8	0,00I	0,053		0,0I5	0,043	0,0I3	0,004	0,074	0,00I	0,097	0,068	0,035	0,028	0,009	0,008	0,I9I
0,90	0,098	0,I57	0,037	0,026	0,I72	0,I39	0,080	0,03I	0,0I0	0,I08	0,00I	0,05I		0,0I6	0,042	0,0I3	0,004	0,068	0,002	0,090	0,066	0,036	0,029	0,0I0	0,009	0,250
0,95	0,I02	0,I65	0,040	0,028	0,I53	0,I27	0,076	0,03I	0,0II	0,098	0,002	0,050		0,0I8	0,040	0,0I4	0,005	0,062	0,002	0,083	0,062	0,036	0,029	0,0II	0,009	0,3I2
I,00	0,I06	0,I73	0,044	0,03I	0,I35	0,II6	0,072	0,032	0,0I2	0,089	0,002	0,048		0,0I9	0,038	0,0I4	0,005	0,055	0,003	0,075	0,057	0,035	0,028	0,0I2	0,0I0	0,375
I,I0	0,II4	0,I9I	0,05I	0,036	0,I03	0,094	0,064	0,03I	0,0I2	0,074	0,002	0,044	0,00I	0,020	0,033	0,0I4	0,006	0,044	0,003	0,060	0,048	0,033	0,025	0,0I3	0,0I0	0,495
I,20	0,I2I	0,208	0,057	0,039	0,079	0,075	0,055	0,029	0,0I2	0,06I	0,003	0,039	0,00I	0,0I9	0,029	0,0I3	0,007	0,033	0,004	0,047	0,039	0,029	0,022	0,0I3	0,009	0,596
I,40	0,I33	0,238	0,066	0,044	0,046	0,046	0,037	0,023	0,0II	0,039	0,003	0,030	0,00I	0,0I7	0,02I	0,0II	0,007	0,0I9	0,004	0,028	0,026	0,024	0,0I7	0,0I3	0,008	0,764
I,60	0,I44	0,262	0,073	0,047	0,028	0,030	0,025	0,0I6	0,008	0,026	0,003	0,02I	0,00I	0,0I3	0,0I5	0,008	0,006	0,0II	0,004	0,0I7	0,0I7	0,0I8	0,0I2	0,0II	0,007	0,874
I,80	0,I5I	0,279	0,077	0,047	0,0I6	0,020	0,0I5	0,0II	0,006	0,0I6	0,002	0,0I3	0,00I	0,009	0,009	0,006	0,005	0,007	0,003	0,0I0	0,0II	0,0II	0,008	0,008	0,006	I,025
2,00	0,I57	0,289	0,080	0,045	0,0I0	0,0II	0,009	0,007	0,004	0,0I0	0,002	0,009	0,00I	0,006	0,006	0,004	0,003	0,004	0,002	0,006	0,007	0,008	0,005	0,005	0,004	I,098
2,20	0,I58	0,289	0,08I	0,044	0,006	0,007	0,006	0,004	0,003	0,007	0,00I	0,006	0,000	0,004	0,004	0,003	0,002	0,002	0,00I	0,004	0,004	0,005	0,003	0,003	0,003	I,I49
2,40	0,I60	0,29I	0,082	0,042	0,003	0,004	0,003	0,002	0,00I	0,004	0,00I	0,003		0,002	0,002	0,002	0,00I	0,00I	0,00I	0,002	0,002	0,003	0,002	0,002	0,002	I,I75
2,60	0,I60	0,290	0,082	0,040	0,002	0,002	0,002	0,00I	0,00I	0,002	0,000	0,002		0,00I	0,00I	0,00I	0,00I	0,00I	0,00I	0,00I	0,00I	0,002	0,00I	0,00I	0,00I	I,I93
2,80	0,I60	0,288	0,08I	0,040	0,00I	0,00I	0,00I	0,00I	0,00I	0,002		0,00I		0,00I	0,00I	0,00I	0,00I			0,00I	0,00I	0,00I	0,00I	0,00I	0,00I	I,202
3,00	0,I58	0,285	0,080	0,038	0,00I	0,00I	0,00I			0,00I		0,00I										0,00I				I,2I8

E,MeV	Level energy E_q, MeV direct excitation 0,008	0,057	0,076	0,I64	$\sigma_{nn'}^{cont}$ (b)
3,20	0,I56	0,282	0,079	0,037	I,2II
3,40	0,I53	0,278	0,078	0,036	I,I96
3,60	0,I50	0,274	0,077	0,035	I,I89
3,80	0,I47	0,27I	0,076	0,033	I,I87
4,00	0,I44	0,267	0,074	0,03I	I,I87
4,50	0,I38	0,259	0,070	0,028	I,207
5,00	0,I32	0,25I	0,065	0,025	I,227
5,50	0,I27	0,242	0,06I	0,022	I,240
6,00	0,I22	0,233	0,057	0,020	I,I47
6,50	0,II8	0,225	0,053	0,0I8	0,826
7,00	0,II4	0,2I7	0,049	0,0I6	0,580
7,50	0,II0	0,209	0,045	0,0I4	0,4I3
8,00	0,I05	0,20I	0,042	0,0I3	0,290
8,50	0,I0I	0,I92	0,039	0,0II	0,243
9,00	0,097	0,I84	0,036	0,0I0	0,230
9,50	0,094	0,I78	0,033	0,009	0,228
I0,0	0,09I	0,I69	0,03I	0,008	0,230
I0,5	0,09I	0,I68	0,030	0,007	0,230
II,0	0,09I	0,I67	0,030	0,007	0,23I
II,5	0,09I	0,I65	0,029	0,007	0,230
I2,0	0,090	0,I63	0,028	0,006	0,23I
I2,5	0,090	0,I6I	0,027	0,006	0,230
I3,0	0,090	0,I59	0,026	0,006	0,230
I3,5	0,089	0,I57	0,026	0,006	0,229
I4,0	0,088	0,I54	0,025	0,005	0,203
I4,5	0,087	0,I52	0,025	0,005	0,I93
I5,0	0,087	0,I49	0,024	0,005	0,I9I

Table 26

Legendre polynomial expansion coefficients, A_ℓ , for angular distributions of elastically scattered neutrons

A_ℓ	E, MeV									
	0,0I	0,05	0,I0	0,24	0,50	0,75	I,0	I,4	2	3
A_1	8,264583-03	5,039454-02	I,I99I85-0I	2,5II995-0I	3,678506-0I	4,68I222-0I	5,323388-0I	6,029765-0I	6,96I664-0I	8,00044I-0I
A_2	7,7I2090-05	2,334496-03	I,03353I-02	4,95I830-02	I,290550-0I	2,I53542-0I	2,9I2792-0I	3,978766-0I	5,I84243-0I	6,3295II-0I
A_3	2,5862I7-07	5,I22305-05	4,756686-04	6,073484-03	3,908096-02	I,096983-0I	2,004775-0I	3,250990-0I	4,I2902I-0I	4,9I9377-0I
A_4		8,497055-07	I,254722-05	4,050388-04	6,82I274-03	3,0I2663-02	7,54I484-02	I,770767-0I	2,997996-0I	3,836787-0I
A_5			-2,802399-08	2,902234-06	1,355724-04	1,940162-03	9,I21595-03	4,346659-02	I,323895-0I	2,40I439-0I
A_6				I,002774-07	2,0784I4-05	3,II7095-04	I,75I8I0-03	I,042646-02	4,327427-02	I,I2I839-0I
A_7					7,338350-07	2,55I483-05	I,756I05-04	I,497303-03	I,008745-02	4,I2I3I4-02
A_8					I,7II425-08	I,457980-06	I,345579-05	I,598023-04	I,798757-03	I,I69956-02
A_9						4,752I40-08	5,866745-07	I,024439-05	2,343267-04	2,550947-03
A_{10}							I,685875-08	4,3I7483-07	2,202376-05	3,6II835-04
A_{11}									I,22I44I-06	3,326287-05
A_{12}									5,I87983-08	2,48324I-06

Table 26 (continued)

A_ℓ	E, MeV									
	4	5	6	7	8	9	I0	II	I3	I5
A_1	8,47I246-0I	8,67I757-0I	8,745749-0I	8,754800-0I	8,73485I-0I	8,72IIII-0I	8,748I08-0I	8,776352-0I	8,946698-0I	9,I408I7-0I
A_2	6,99304I-0I	7,373II0-0I	7,566592-0I	7,6I7044-0I	7,566820-0I	7,484I45-0I	7,46II29-0I	7,454246-0I	7,678763-0I	8,0I635I-0I
A_3	5,605464-0I	6,I33I30-0I	6,469569-0I	6,6I992I-0I	6,6087I0-0I	6,5I8494-0I	6,466000-0I	6,4I735I-0I	6,580790-0I	6,943269-0I
A_4	4,372202-0I	4,852337-0I	5,25497I-0I	5,533523-0I	5,664236-0I	5,682395-0I	5,677655-0I	5,633344-0I	5,729673-0I	6,049447-0I
A_5	3,025900-0I	3,546I49-0I	4,005673-0I	4,382243-0I	4,65I330-0I	4,80II03-0I	4,895454-0I	4,92I670-0I	5,049433-0I	5,325822-0I
A_6	I,699II9-0I	2,22004I-0I	2,7355I0-0I	3,2I3696-0I	3,6I2277-0I	3,906775-0I	4,I36007-0I	4,27237I-0I	4,484324-0I	4,73I345-0I
A_7	8,259482-02	I,2658II-0I	I,7I7468-0I	2,I85440-0I	2,65II68-0I	3,057523-0I	3,400I65-0I	3,639985-0I	3,968976-0I	4,2I7795-0I
A_8	3,535805-02	7,033035-02	I,I06935-0I	I,5278I3-0I	I,96I504-0I	2,379384-0I	2,770278-0I	3,079964-0I	3,499I66-0I	3,75058I-0I
A_9	I,I76560-02	3,I49540-02	6,260778-02	I,025388-0I	I,47I378-0I	I,899374-0I	2,28898I-0I	2,6I0258-0I	3,054572-0I	3,30I545-0I
A_{10}	2,645009-03	I,0I7786-02	2,698925-02	5,56II80-02	9,526373-02	I,3846I2-0I	I,795086-0I	2,I4I48I-0I	2,606328-0I	2,843I97-0I
A_{11}	5,605I74-04	2,88I950-03	9,569605-03	2,393467-02	4,87I329-02	8,II6698-02	I,I75I96-0I	I,524464-0I	2,048523-0I	2,322545-0I
A_{12}	8,875933-05	6,I089I0-04	2,4686I8-03	7,428554-03	I,82383I-02	3,58I266-02	6,0I0554-02	8,7703I2-02	I,387949-0I	I,7II680-0I
A_{13}	6,779320-06	8,558478-05	4,56230I-04	I,734989-03	5,438520-03	I,282973-02	2,5I8667-02	4,I68I00-02	7,95I20I-02	I,099I80-0I
A_{14}	4,55698I-07	I,349I59-05	8,83056I-05	3,9366I2-04	I,553697-03	4,I43700-03	9,I06846-03	I,676039-02	3,825564-02	6,038386-02
A_{15}		I,I627I8-06	9,37I46I-06	5,I04I24-05	3,230050-04	I,0II0I5-03	2,563934-03	5,326232-03	I,492322-02	2,760889-02
A_{16}		6,8I4426-08	6,707545-07	4,272648-06	5,77II49-05	2,086639-04	6,0I9420-04	I,407393-03	4,850425-03	I,063505-02
A_{17}					7,I73505-06	3,002883-05	I,000398-04	2,672884-04	I,I73003-03	3,I4I74I-03
A_{18}					5,779634-07	2,798785-06	I,07247I-05	3,2674II-05	I,8I2240-04	5,896642-04

Table 27

Legendre polynomial expansion coefficients for angular distributions of neutrons inelastically scattered by the 8 keV $3/2^+$ level

A_ℓ	E, MeV								
	0,05	0,I0	0,24	0,50	0,75	I,0	I,4	2,0	3,0
A_1	-3,8025I4-04	-I,94623I-03	-4,992I76-03	-I,53I854-02	-2,947833-02	-4,84I3I8-02	-6,4II6I6-02	-3,339I89-02	7,307054-02
A_2	-9,665220-04	-I,875249-03	-2,4I0028-03	-I,557229-02	-2,I02268-02	-2,938099-02	-5,I39304-02	-8,II4229-02	-6,332520-02
A_3	4,4I2354-05	3,676436-04	I,342464-03	4,754958-03	6,82206I-02	I,079I76-02	2,382657-02	3,26208I-02	9,495306-03
A_4	-4,I08585-07	-8,302707-07	-7,I89I22-05	-I,378I28-03	-4,893780-03	-I,093044-02	-I,722870-02	-I,5I7538-03	I,535500-02
A_5	-5,I72I06-09	-I,87525I-07	-7,3I0230-06	-I,38245I-04	-2,I48890-04	-I,38I085-05	4,2I050I-03	2,379838-02	4,758I89-02
A_6		I,269839-09	2,277843-07	2,743550-05	I,6463I2-04	7,046268-04	2,085044-03	2,395054-03	-3,228707-03
A_7				-I,09I559-06	-I,444229-05	-7,277746-05	-3,998088-04	3,I65270-04	3,29279I-03
A_8				4,800I37-08	I,803037-06	I,68II82-05	2,0I2969-04	I,64I797-03	5,234283-03
A_9					-3,7I2549-08	-5,527867-07	-9,I206I3-06	-6,74I47I-05	9,I26085-04
A_{10}					3,324039-09	5,I57834-08	I,599344-06	6,7507I0-05	I,242424-03
A_{11}								-3,04I764-07	6,2980I0-06
A_{12}								2,034090-07	I,3I09I0-05

Table 27 (continued)

A_ℓ	E, MeV									
	4	5	6	7	8	9	I0	II	I3	I5
A_1	I,28I052-0I	I,429794-0I	I,6I9452-0I	I,937570-0I	2,322824-0I	2,79I92I-0I	3,295573-0I	3,665442-0I	4,2594I8-0I	4,703343-0I
A_2	-4,453340-02	-4,590358-02	-5,3I3975-02	-4,62I023-02	-2,70I909-02	2,070077-03	3,529945-02	6,245592-02	I,I39258-0I	I,63I63I-02
A_3	-8,7I8526-03	-2,89I679-02	-5,45I0I8-02	-6,924566-02	-7,2352I3-02	-6,869250-02	-5,804869-02	-4,5I4934-02	-I,I395II-02	2,075253-02
A_4	2,593879-02	2,687934-02	I,088023-02	-3,063763-03	-I,589085-02	-2,5079I4-02	-2,578982-02	-2,0227I7-02	-5,I55684-03	I,095532-02
A_5	3,5938II-02	I,964267-02	2,422782-02	3,063560-02	2,32II85-02	I,I4205I-02	4,244826-03	3,2074I2-03	9,977I29-03	2,402347-02
A_6	-I,743245-02	-2,35559I-02	-I,632I36-02	-7,348II3-03	-I,88475I-03	3,437347-03	8,740773-03	I,30532I-02	I,877449-02	2,95I034-02
A_7	-I,082064-02	-2,797704-02	-3,397366-02	-3,362792-02	-3,060260-02	-2,5I6I74-02	-I,884933-02	-I,II72II-02	4,I47590-03	I,923I43-02
A_8	3,767754-04	-I,567308-02	-3,233I33-02	-4,I97402-02	-4,853275-02	-5,I320I0-02	-4,878873-02	-4,044627-02	-2,I73889-02	-4,I96798-03
A_9	6,529506-03	9,6980I8-03	4,036697-03	-7,498743-03	-I,928469-02	-2,7026I5-02	-3,I40624-02	-3,088350-02	-2,47224I-02	-I,073883-02
A_{10}	5,227852-03	8,888284-03	5,447566-03	-3,807674-03	-I,III742-02	-I,306699-02	-I,337852-02	-I,306034-02	-I,2727I2-02	-7,I96202-03
A_{11}	4,573526-04	I,907463-03	4,3I6448-03	8,289393-03	I,2I9964-02	I,423435-02	I,24I309-02	9,429622-03	6,6049I8-03	I,2II026-02
A_{12}	3,847423-04	2,038070-03	5,557324-03	9,9354I0-03	I,33I4II-02	I,352558-02	I,05504I-02	5,472324-03	8,602I3I-04	7,42I6I4-03
A_{13}	2,I29704-05	I,5I9I72-04	4,II6053-04	8,I73368-04	2,2732I5-03	3,9I9688-03	5,84549I-03	5,8996I4-03	5,9478I5-03	6,4I9372-03
A_{14}	2,833886-06	5,437897-05	2,830430-04	9,579752-04	2,65I6I6-03	5,520I63-03	9,54554I-03	I,326962-02	I,753273-02	I,297422-02
A_{15}		6,462I79-06	4,I7I0I2-05	I,766339-04	9,202I08-04	2,2590I4-03	4,487750-03	6,9I6964-03	I,060733-02	9,I78605-03
A_{16}		4,37298I-07	3,865956-06	2,05I887-05	I,68268I-04	4,8947II-04	I,I79486-03	2,I35695-03	5,225976-03	9,3460II-03
A_{17}					4,0306I2-05	I,3672I3-04	3,82764I-04	8,562557-04	3,024440-03	6,797056-03
A_{18}					2,887406-06	I,I67930-05	4,04592I-05	I,054640-04	4,75I788-04	I,230627-03

Table 28

Legendre polynomial expansion coefficients for angular distributions of neutrons inelastically scattered by the 57 keV $5/2^+$ level

A_ℓ	E, MeV								
	0,I	0,24	0,5	0,75	I	I,4	2	3	4
A_1	-5,28I690-03	-I,7I0292-02	-2,95I582-02	-6,624255-02	-9,582789-02	-I,286925-0I	-I,234340-0I	-7,86I494-03	6,444459-02
A_2	-5,268277-03	-I,588I94-02	-2,525635-03	-I,494I29-02	-I,069004-02	-2,I006I5-02	-5,785II6-02	-5,776223-02	-4,I08I78-02
A_3	3,972497-04	4,0585I6-03	I,020569-02	I,54828I-02	I,8II580-02	2,5797I2-02	4,I74374-02	3,349987-02	I,76I059-02
A_4	-5,8I646I-06	-I,4I6332-04	-2,593589-03	-6,963II5-03	-I,240305-02	-9,875308-03	I,228I43-02	I,804846-02	2,378626-02
A_5	-3,I82039-08	-3,804668-06	-I,324329-04	6,967I65-04	2,728837-03	I,I33924-02	2,945450-02	5,023879-02	4,7I7050-02
A_6		I,I54I63-07	2,39I3I4-05	2,762I93-04	7,432II7-04	2,3503I3-03	2,I03046-03	-2,427582-03	-2,I46872-02
A_7			-I,095249-06	-I,0I89I6-05	-5,475I79-05	-I,7I4355-04	-5,826533-04	-4,053662-03	-I,485030-02
A_8			3,505052-08	I,88I633-06	I,I9I433-05	7,690I35-05	4,220295-04	3,233243-03	2,773690-03
A_9				2,458I05-08	2,266528-07	I,II5975-05	-2,2000I0-05	8,6I4057-04	4,322698-03
A_{10}				5,467697-09	5,733364-08	I,I5I783-05	I,955345-04	I,955345-04	3,28I7I7-03
A_{11}							-6,234635-07	7,8II553-06	5,438583-04
A_{12}							5,604742-08	4,404I20-06	2,I69966-04
A_{13}									8,I96928-06
A_{14}									I,048775-06

Table 28 (continued)

A_ℓ	E, MeV								
	5	6	7	8	9	I0	II	I3	I5
A_1	9,877332-02	I,290388-0I	I,633536-0I	2,063987-0I	2,576I07-0I	3,I06687-0I	3,495490-0I	4,I0990I-0I	4,578I77-0I
A_2	-4,853496-02	-5,3I0924-02	-4,928I76-02	-3,344294-02	-7,036I46-03	2,462555-02	5,I52528-02	I,022585-0I	I,53467I-0I
A_3	-I,3I7383-03	-3,938646-02	-5,409574-02	-6,I55657-02	-6,I34I95-02	-5,37I938-02	-4,337608-02	-I,49II02-02	I,586I99-02
A_4	2,493746-02	9,8I9574-03	-2,I6I632-03	-I,400695-02	-2,I34I97-02	-2,I6268I-02	-I,684009-02	-4,886633-03	9,350I5I-03
A_5	2,9246I8-02	2,5399I0-02	2,83722I-02	2,09088I-02	I,070279-02	4,653I82-03	3,680393-03	8,869802-03	2,I52636-02
A_6	-2,606600-02	-I,726672-02	-7,72530I-03	-3896838-02	I,803552-04	5,822950-03	I,084746-02	I,657-733-02	2,607537-02
A_7	-2,458I65-02	-2,948299-02	-3,23326I-02	-3,233634-02	-2,674793-02	-I,9I0744-02	-I,I0675I-02	2,604232-03	I,64II06-02
A_8	-I,II0976-02	-2,626734-02	-3,459028-02	-4,234208-02	-4,658722-02	-4,57I468-02	-3,902953-02	-2,232239-02	-5,706889-03
A_9	6,I09223-03	I,586646-03	-8,676475-03	-I,855756-02	-2,526882-02	-2,944533-02	-2,930095-02	-2,4I9077-02	-I,I67432-02
A_{10}	6,I3I8I8-03	2,507926-03	-4,82643I-03	-8,4I0966-03	-9,09I823-03	-9,984I36-03	-I,009782-02	-9,833866-03	-5,248822-03
A_{11}	I,834756-03	4,280505-03	8,855938-03	I,36659I-02	I,472II6-02	I,I55970-02	7,5358I0-03	4,83037I-03	I,I33988-02
A_{12}	I,293I96-03	3,8I9960-03	6,883838-03	9,728246-03	I,062948-02	8,842668-03	4,35I258-03	-4,984282-04	6,020848-03
A_{13}	I,558806-04	5,I98079-04	I,I79904-03	2,553879-03	4,700776-03	6,876368-03	6,969463-03	6,262428-03	6,699656-03
A_{14}	2,947540-05	I,590044-04	5,279I48-04	I,942937-03	4,342333-03	7,95II96-03	I,I47848-02	I,63I35I-02	I,305I07-02
A_{15}	5,I4II29-06	3,630698-05	I,609334-04	6,I06362-04	I,66368I-03	3,58I880-03	5,889600-03	9,424I2I-03	7,892247-03
A_{16}	2,206682-07	I,748995-06	8,483457-06	I,I40077-04	3,5I2674-04	8,66I308-04	I,574799-03	3,697I73-03	7,048626-03
A_{17}				2,I08983-05	8,263744-05	2,608363-04	6,432I4I-04	2,575II3-03	6,43096I-03
A_{18}				I,8I3384-06	8,033420-06	2,8I2235-05	7,26I9I7-05	3,05II33-04	8,699480-04

Table 29

Legendre polynomial expansion coefficients for angular distributions of neutrons inelastically scattered by the 76 keV $7/2^+$ level

A_ℓ	E, MeV								
	0,24	0,5	0,75	I	I,4	2	3	4	5
A_1	2,829185 10^{-3}	2,634946 10^{-2}	6,256521 10^{-2}	8,817952 10^{-2}	1,051316 10^{-1}	1,077687 10^{-1}	1,176725 10^{-1}	1,299178 10^{-1}	1,331021 10^{-1}
A_2	2,606366 10^{-3}	-4,671844 10^{-3}	-1,850951 10^{-2}	-4,068427 10^{-2}	-9,046600 10^{-2}	-1,368158 10^{-1}	-1,458263 10^{-1}	-1,188047 10^{-1}	-9,426169 10^{-2}
A_3	-5,728789 10^{-4}	-5,466814 10^{-3}	-1,087791 10^{-2}	-1,174374 10^{-2}	-2,862736 10^{-3}	-9,389097 10^{-4}	-2,169411 10^{-2}	-6,182494 10^{-3}	-1,537688 10^{-3}
A_4	-6,502475 10^{-5}	-6,011958 10^{-4}	1,265853 10^{-3}	6,445406 10^{-3}	1,782344 10^{-2}	8,743205 10^{-3}	-1,567800 10^{-2}	-1,972588 10^{-2}	-3,032700 10^{-2}
A_5	7,688699 10^{-6}	2,294935 10^{-4}	7,531214 10^{-4}	9,407878 10^{-4}	-1,999574 10^{-3}	-9,095910 10^{-3}	-1,902197 10^{-3}	-7,749295 10^{-3}	-9,296300 10^{-3}
A_6	-3,036888 10^{-8}	-1,571063 10^{-5}	-1,686175 10^{-4}	-5,537167 10^{-4}	-1,491632 10^{-3}	-1,252449 10^{-3}	6,771795 10^{-3}	-1,139069 10^{-3}	3,775756 10^{-3}
A_7		5,428562 10^{-7}	1,607476 10^{-5}	8,552269 10^{-5}	4,863844 10^{-4}	6,890047 10^{-4}	-3,838637 10^{-3}	-5,336404 10^{-3}	1,590917 10^{-3}
A_8		-1,469753 10^{-8}	-1,093407 10^{-6}	-7,573721 10^{-6}	-8,134691 10^{-5}	-6,559757 10^{-4}	-7,439268 10^{-4}	6,027678 10^{-3}	1,207790 10^{-2}
A_9			2,759915 10^{-8}	2,338607 10^{-7}	4,741853 10^{-6}	8,903294 10^{-5}	6,197814 10^{-4}	8,752373 10^{-4}	-1,029749 10^{-3}
A_{10}				-1,735967 10^{-9}	-1,270727 10^{-7}	-1,332501 10^{-5}	-2,471489 10^{-4}	-1,005414 10^{-3}	-1,275465 10^{-3}
A_{11}						4,360736 10^{-7}	1,181743 10^{-5}	1,146819 10^{-4}	5,497335 10^{-4}
A_{12}						1,479869 10^{-8}	8,325050 10^{-7}	-1,141405 10^{-5}	-1,367950 10^{-4}
A_{13}								3,567783 10^{-6}	3,433368 10^{-5}
A_{14}								5,567192 10^{-7}	4,514591 10^{-6}
A_{15}									1,303819 10^{-6}
A_{16}									8,864345 10^{-8}

Table 29 (continued)

A_ℓ	E, MeV							
	6	7	8	9	IO	II	I3	I5
A_1	I,423084 IO^{-I}	I,666I26 IO^{-I}	2,030436 IO^{-I}	2,39654I IO^{-I}	2,720I88 IO^{-I}	2,94809I IO^{-I}	3,438078 IO^{-I}	3,94II37 IO^{-I}
A_2	-7,6I6663 IO^{-2}	-6,II8759 IO^{-2}	-4,5I57I2 IO^{-2}	-3,060844 IO^{-2}	-I,776830 IO^{-2}	-3,4055I7 IO^{-3}	3,929I20 IO^{-2}	8,842I42 IO^{-2}
A_3	-I,570057 IO^{-2}	-3,46I266 IO^{-2}	-5,I50622 IO^{-2}	-6,2I4895 IO^{-2}	-6,680936 IO^{-2}	-6,685390 IO^{-2}	-5,985889 IO^{-2}	-4,576403 IO^{-2}
A_4	-3,299467 IO^{-2}	-3,625343 IO^{-2}	-4,67I40I IO^{-2}	-5,345756 IO^{-2}	-5,570582 IO^{-2}	-5,77I385 IO^{-2}	-6,643740 IO^{-2}	-6,799594 IO^{-2}
A_5	8,557I07 IO^{-3}	I,97I737 IO^{-2}	I,882446 IO^{-2}	I,6I5238 IO^{-2}	I,296474 IO^{-2}	7,626880 IO^{-3}	-9,I7494I IO^{-3}	-2,3I4680 IO^{-2}
A_6	I,250548 IO^{-2}	8,055736 IO^{-3}	2,568700 IO^{-3}	I,708967 IO^{-3}	3,290343 IO^{-3}	3,9I50I4 IO^{-3}	6,028787 IO^{-4}	-7,866730 IO^{-3}
A_7	2,680966 IO^{-3}	-I,756492 IO^{-3}	-7,I99674 IO^{-4}	2,738932 IO^{-3}	4,5542I0 IO^{-3}	5,69I932 IO^{-3}	8,993I79 IO^{-3}	8,702266 IO^{-3}
A_8	6,I697I0 IO^{-3}	I,497I60 IO^{-3}	4,590677 IO^{-3}	5,02I950 IO^{-3}	I,497329 IO^{-3}	-I,327963 IO^{-3}	-5,48I359 IO^{-4}	4,3236I3 IO^{-4}
A_9	-4,2I4394 IO^{-3}	-2,7I0952 IO^{-3}	I,906257 IO^{-3}	3,852962 IO^{-3}	3,5928II IO^{-3}	2,625897 IO^{-3}	I,439022 IO^{-3}	-6,7I9360 IO^{-4}
A_{10}	8,660998 IO^{-4}	4,0959I7 IO^{-3}	6,5I2600 IO^{-3}	9,42I590 IO^{-3}	I,287755 IO^{-2}	I,492II8 IO^{-2}	I,473903 IO^{-2}	I,343027 IO^{-2}
A_{11}	I,I45424 IO^{-3}	I,003943 IO^{-3}	I,2I2753 IO^{-3}	2,57II0I IO^{-3}	4,586553 IO^{-3}	5,483206 IO^{-3}	4,864455 IO^{-3}	6,642476 IO^{-3}
A_{12}	-4,72I903 IO^{-4}	-8,I34750 IO^{-4}	-8,043892 IO^{-4}	-I,262825 IO^{-3}	-2,203680 IO^{-3}	-3,303692 IO^{-3}	-I,646834 IO^{-3}	4,9277I9 IO^{-3}
A_{13}	I,338747 IO^{-4}	2,432208 IO^{-4}	-2,I743I0 IO^{-4}	-I,257I90 IO^{-3}	-2,3964I5 IO^{-3}	-2,608I88 IO^{-3}	I,23237I IO^{-3}	5,562974 IO^{-3}
A_{14}	9,4I3878 IO^{-6}	-I,I6264I IO^{-5}	-6,494838 IO^{-5}	-I,0302I0 IO^{-4}	-I,662668 IO^{-6}	3,724977 IO^{-4}	I,320099 IO^{-4}	-3,429070 IO^{-3}
A_{15}	8,655754 IO^{-6}	3,9II930 IO^{-5}	I,638794 IO^{-4}	3,099070 IO^{-4}	3,73266I IO^{-4}	7,680925 IO^{-5}	-2,540305 IO^{-3}	-6,479288 IO^{-3}
A_{16}	7,I42845 IO^{-7}	3,I979I3 IO^{-6}	6,944750 IO^{-6}	I,08792I IO^{-6}	-2,9II663 IO^{-5}	-I,36I258 IO^{-4}	-4,I9II07 IO^{-4}	-5,0I9709 IO^{-4}
A_{17}			I,344235 IO^{-5}	4,437888 IO^{-5}	I,I96088 IO^{-4}	2,65969I IO^{-4}	9,027I58 IO^{-4}	I,680727 IO^{-3}
A_{18}			6,37I494 IO^{-7}	2,I26089 IO^{-6}	7,I73357 IO^{-6}	I,739045 IO^{-5}	8,828927 IO^{-6}	2,3II822 IO^{-4}

Table 30

Neutron spectra from (n,n'-continuous spectrum), (n,2n)- and (n,3n)-reactions

E, MeV	Reaction	Secondary neutron energy, MeV, and reaction spectrum													
I	2	3	4	5	6	7	8	9	I0	II	I2	I3	I4	I5	I6
I,5	(nn')	0,025	0,075	0,I25	0,I75	0,275	0,375	0,475	0,575	0,675	0,825	0,900			
		I,573	2,2I3	2,3I3	2,207	I,777	I,308	0,909	0,603	0,382	0,I78	0			
2	(nn')	0,033	0,I00	0,I67	0,233	0,300	0,433	0,567	0,700	0,833	0,967	I,I00	I,233	I,367	I,400
		I,387	I,89I	I,9I3	I,765	I,554	I,I08	0,735	0,462	0,276	0,I58	0,085	0,044	0,02I	0,000
3	(nn')	0,050	0,I50	0,250	0,350	0,450	0,650	0,850	I,050	I,250	I,450	I,650	I,850	2,050	2,400
		I,I84	I,529	I,464	I,278	I,062	0,674	0,396	0,2I9	0,II4	0,057	0,026	0,0II	0,005	0,000
4	(nn')	0,067	0,200	0,333	0,467	0,600	0,733	0,867	I,I33	I,400	I,667	I,933	2,200	2,467	3,000
		I,059	I,306	I,I94	0,994	0,788	0,605	0,453	0,240	0,II9	0,056	0,024	0,0I0	0,004	0,000
5	(nn')	0,083	0,250	0,4I7	0,583	0,750	0,9I7	I,083	I,250	I,4I7	I,750	2,083	2,4I7	2,750	3,4I7
		0,969	I,I49	I,009	0,806	0,6I2	0,450	0,323	0,226	0,I56	0,070	0,030	0,0I2	0,004	0,000
6	(nn')	0,I00	0,300	0,500	0,700	0,900	I,I00	I,300	I,500	I,700	2,I00	2,500	2,900	3,300	5,300
		0,864	0,99I	0,842	0,652	0,48I	0,344	0,24I	0,I67	0,II4	0,054	0,027	0,0I5	0,0I0	0,000
	(n,2n)	0,I00	0,300	0,345											
	1st neutron	2,329	2,67I	0											

Table 30 (continued)

I	2	3	4	5	6	7	8	9	I0	I1	I2	I3	I4	I5	I6
	(n,2n)	0,040	0,080	0,I20	0,I60	0,200	0,240	0,280							
	1-st neutron	I,986	4,783	6,357	6,079	4,293	I,503	0,000							
7	(n,n')	0,II7	0,350	0,583	0,8I7	I,050	I,283	I,5I7	I,750	2,2I7	2,683	3,I50	3,850	4,550	6,40
		0,353	0,392	0,324	0,92I	0,66I	0,462	0,3I8	0,2I7	0,I03	0,054	0,032	0,020	0,0I4	0,
	(n,2n)	0,II7	0,350	0,583	0,8I7	I,050	I,283	I,345							
	2-nd neutron	0,940	I,046	0,862	0,648	0,465	0,325	0,000							
	(n,2n)	0,040	0,080	0,I20	0,I60	0,200	0,240	0,280	0,320	0,360	0,440	0,520	0,600	0,760	I,24
	1st neutron	0,I39	0,45I	0,8I9	I,I73	I,470	I,69I	I,83I	I,893	I,890	I,728	I,44I	I,I2I	0,548	0,
9	(n n')	0,I50	0,450	0,750	I,050	I,350	I,650	I,950	2,250	2,550	2,850	3,I50	3,750	4,650	8,40
		0,59I	0,626	0,490	0,350	0,238	0,I59	0,I05	0,069	0,047	0,I23	0,089	0,064	0,034	0
	(n,2n)	0,I50	0,450	0,750	I,050	I,350	I,650	I,950	2,250	2,550	2,850	3,I50	3,345		
	2-nd neutron	0,73I	0,767	0,597	0,424	0,289	0,I92	0,I26	0,084	0,056	0,039	0,028	0,000		
	(n,2n)	0,040	0,080	0,I20	0,200	0,360	0,520	0,600	0,760	I,000	I,320	I,560	I,800	2,040	2,84
	1-st neutron	0,026	0,092	0,I83	0,398	0,785	0,98I	I,005	0,942	0,703	0,370	0,I96	0,092	0,038	0.

Table 30 (continued)

I	2	3	4	5	6	7	8	9	I0	II	I2	I3	I4	I5	I6
11	(n,2n)	0,I83	0,550	0,9I7	I,283	I,650	2,383	2,750	3,483	4,2I7	4,583	4,950	5,683	7,I50	I0,4
		0,520	0,546	0,422	0,296	0,I98	0,085	0,057	0,028	0,0I7	0,0I5	0,047	0,037	0,024	0,00
	(n,2n)	0,I83	0,550	0,9I7	I,283	I,650	2,0I7	2,383	2,750	3,II7	3,483	3,850	4,2I7	4,583	5,34
	1st neutron	0,642	0,642	0,477	0,324	0,2I2	0,I37	0,088	0,058	0,040	0,029	0,022	0,0I8	0,0I5	0,00
	(n,2n)	0,040	0,080	0,I20	0,200	0,360	0,600	0,760	I,000	I,240	I,640	I,888	2,I20	2,440	3,96
	2nd neutron	0,0I2	0,043	0,088	0,202	0,447	0,692	0,746	0,700	0,574	0,335	0,22I	0,I38	0,067	0,00
13	(nn')	0,I08	0,325	0,542	0,975	I,408	I,842	2,275	2,925	3,575	4,225	4,875	6,I75	6,825	I2,
		0,2I8	0,3I8	0,346	0,332	0,289	0,235	0,I59	0,089	0,053	0,035	0,026	0,0I7	0,055	0,0
	(n,2n)	0,I08	0,325	0,758	0,975	I,408	I,842	2,492	3,I42	3,575	4,008	4,658	5,308	6,392	7,3
	1st neutron	0,397	0,626	0,534	0,450	0,300	0,I92	0,096	0,05I	0,035	0,026	0,0I8	0,0I4	0,0I0	0,0
	(n,2n)	0,040	0,I20	0,200	0,360	0,760	0,920	I,240	I,640	I,960	2,280	2,680	3,000	3,320	4,
	2nd neutron	0,007	0,055	0,I3I	0,307	0,596	0,623	0,567	0,407	0,278	0,I75	0,090	0,049	0,026	0,
	(n,3n)	0,I08	0,325	0,347											
	1st neutron	4,6I4	0,00I	0,000											
	(n,3n)	0,040	0,080	0,I20	0,I60	0,200	0,240								
	2nd neutron	3,8I2	7,58I	7,445	4,626	I,536	0,000								

Table 30 (continued)

I	2	3	4	5	6	7	8	9	I0	II	I2	I3	I4	I5	I6
	(n,3n)	0,040	0,080	0,I20											
	3rd neutron	I6,47	8,530	0,000											
14	(nn')	0,II7	0,350	0,583	I,5I7	2,2I7	3,I50	3,850	4,550	5,950	7,8I7	8,283	9,450	II,55	I4,40
		0,I76	0,252	0,27I	0,2I6	0,I64	0,I02	0,065	0,045	0,028	0,066	0,059	0,044	0,022	0,000
	(n,2n)	0,II7	0,350	0,8I7	I,283	I,750	2,2I7	2,683	3,383	4,3I7	5,7I7	8,050	8,5I7		
	1st neutron	0,I37	0,249	0,409	0,483	0,320	0,20I	0,I27	0,068	0,036	0,020	0,0II	0,000		
	(n,2n)	0,040	0,I20	0,200	0,360	0,680	I,080	I,640	2,200	2,680	3,I60	3,560	3,960	4,360	5,240
	2nd neutron	0,006	0,046	0,II0	0,263	0,505	0,576	0,42I	0,228	0,II6	0,052	0,025	0,0II	0,005	0,000
	(n,3n)	0,II7	0,350	0,583	0,8I7	I,050	I,283								
	1st neutron	2,755	I,I86	0,297	0,045	0,003	0,000								
	(n,3n)	0,040	0,080	0,I20	0,I60	0,200	0,240	0,320	0,400	0,440	0,520	0,600	0,680	0,760	I,I20
	2nd neutron	0,I99	0,628	I,I08	I,537	I,864	2,07I	2,I5I	I,9I0	I,72I	I,299	0,897	0,568	0,330	0,000
	(n,3n)	0,040	0,I20	0,200	0,280	0,360	0,440	0,520	0,600	0,680	0,760	0,840	0,880	0,960	I,000
	3rd neutron	2,928	3,I63	2,494	I,763	I,I66	0,727	0,427	0,244	0,I29	0,062	0,028	0,0I8	0,007	0,000

Table 31 (continued)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
(n,2n)	8	0,004	0,02	0,I3	0,32	0,60	0,87	0,92	0,82	0,0	–	–	–	–	–	–
	11	0,003	0,0I	0,I0	0,26	0,52	0,92	I,06	I,08	0,87	0,52	0,24	0,09	0,005	0,0	–
	15	0,006	0,04	0,22	0,64	I,25	2,II	2,33	2,32	I,88	I,24	0,76	0,42	0,I0	0,004	0,0
(n,3n)	15	0,00I	0,004	0,03	0,06	0,II	0,26	0,3I	0,34	0,26	0,II	0,03	0,0	-	-	-

Table 32

Group ^{239}Pu constants

Nos.	E_i, E_{i+1}	$\sigma_{n\gamma}$, b	σ_{nf}, b	$\bar{\nu}$	σ_{nn}, b	$\sigma_{nn'}$, b	$\sigma_{n,2n}$, b	$\sigma_{n,3n}$, b	μ_{ℓ}	ξ
I	2	3	4	5	6	7	8	9	I0	II
0	I0,5-I5 МэВ	0,004	2,269	4,539	2,602	0,5I9	0,367	0,007	0,884I	0,00I0
I	6,5 -I0,5	0,003	2,I87	3,970	3,I53	0,85I	0,26I		0,875I	0,00I0
2	4,0 - 6,5	0,002	I,756	3,559	4,I68	I,668			0,8628	0,00II
3	2,5 - 4,0	0,003	I,848	3,290	4,I88	I,762			0,80I0	0,00I7
4	I,4 - 2,5	0,0I8	I,945	3,I08	3,4I8	I,755			0,6768	0,0027
5	0,8 - I,4	0,060	I,772	2,994	3,493	I,599			0,5387	0,0039
6	0,4 - 0,8	0,I28	I,599	2,929	5,I74	I,203			0,3999	0,0050
7	0,2 - 0,4	0,I89	I,5I5	2,893	7,620	0,834			0,2729	0,006I
8	0,I - 0,2	0,234	I,507	2,876	9,387	0,573			0,I642	0,0070
9	46,5-I00 кэВ	0,322	I,548	2,869	I0,0I3	0,254			0,0809	0,0077
I0	2I,5-46,5	0,5II	I,572	2,864	I0,608	0,278			0,0347	0,008I
II	I0,0-2I,5	0,806	I,674	2,862	II,I36	0,24I			0,0I63	0,0082
I2	4,65-I0,0	I,588	2,I73	2,862	I2,084	0,055			0,0095	0,0083
I3	2,I5-4,65	2,73I	3,I83	2,862	I2,872				0,0028	0,0083

Table 34

Correlation error matrix for the group σ_{nf} cross section

	Errors of evaluations,%	Correlation error matrix of the values											
1	2	3											
2	I,88	I,0											
3	I,6I	0,79	I,0										
4	I,34	0,76	0,80	I,0									
5	I,28	0,7I	0,72	0,88	I,0								
6	I,45	0,73	0,58	0,74	0,93	I,0							
7	I,45	0,70	0,54	0,72	0,90	0,94	I,0						
8	I,48	0,67	0,49	0,69	0,87	0,94	0,97	I,0					
9	I,56	0,70	0,52	0,64	0,84	0,90	0,94	0,96	I,0				
I0	I,68	0,70	0,52	0,64	0,84	0,90	0,94	0,96	0,99	I,0			
II	I,80	0,49	0,5I	0,48	0,68	0,68	0,70	0,72	0,73	0,73	I,0		
I2	I,97	0,II	0,I3	0,I0	0,36	0,37	0,40	0,44	0,44	0,44	0,80	I,0	
I3	2,27	0,00	0,00	0,00	0,I8	0,2I	0,25	0,28	0,26	0,26	0,68	0,86	I,0

Table 34

(continued)

1	2	3
I4	2,27	0,00 0,00 0,00 0,I8 0,2I 0,25 0,28 0,26 0,26 0,68 0,86 0,99 I,0
I5	2,65	0,00 0,00 0,00 0,I2 0,I5 0,20 0,26 0,24 0,24 0,59 0,80 0,9I 0,9I I,0
I6	2,55	0,00 0,00 0,00 0,I2 0,I5 0,20 0,26 0,24 0,24 0,50 0,80 0,90 0,90 0,99 I,0
I7	2,I6	0,00 0,00 0,00 0,I6 0,20 0,23 0,26 0,24 0,24 0,66 0,85 0,96 0,96 0,87 0,8I I,0

Table 35

Correlation error matrix for the group α values

	Error of evaluations, %	Correlation error matrix of the values												
5	20,63	I,0												
6	I2,72	0,84	I,0											
7	II,23	0,83	0,96	I,0										
8	9,8I	0,67	0,67	0,68	I,0									
9	9,25	0,25	0,46	0,45	0,8I	I,0								
I0	7,53	0,32	0,59	0,59	0,76	0,94	I,0							
II	6,35	0,25	0,44	0,46	0,73	0,87	0,92	I,0						
I2	5,92	0,I5	0,26	0,29	0,60	0,7I	0,7I	0,88	I,0					
I3	5,90	0,I2	0,2I	0,23	0,60	0,70	0,66	0,83	0,98	I,0				
I4	6,00	0,II	0,20	0,22	0,57	0,65	0,62	0,82	0,97	0,98	I,0			
I5	5,57	0,I0	0,I9	0,2I	0,59	0,68	0,63	0,8I	0,95	0,99	0,98	I,0		
I6	5,67	0,I2	0,I9	0,2I	0,60	0,68	0,63	0,8I	0,94	0,98	0,96	I,0	I,0	
I7	5,65	0,I0	0,I9	0,2I	0,59	0,68	0,64	0,8I	0,92	0,96	0,94	0,99	I,0	I,0