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NEUTRON NUCLEAR DATA FOR PU-240

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This book contains four parts, on Pu-239, Pu-240, Pu-241, and Pu-242, of which the part on Pu-240 was translated and included in the present document. For the other isotopes the reader is referred to the following documents published earlier:

Pu-239: INDC(CCP)-166, August 1981
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Further revisions to these evaluations can be expected; the data user is advised to verify whether he has the most recent version.

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INTRODUCTION

In nuclear reactors ^{239}Pu is produced through neutron capture by ^{238}U nuclei followed by β^- disintegration of ^{239}U and ^{239}Np. The isotopes ^{240}Pu, ^{241}Pu and ^{242}Pu are formed in the subsequent process of the capture of neutrons by ^{239}Pu nuclei. This booklet gives evaluated nuclear data for these isotopes in the energy region 10^{-5} eV-15 MeV needed for reactor calculations and other applications.

Table I.1 shows the energies Q and thresholds T of possible reactions of neutrons with nuclei of ^{239}Pu, ^{240}Pu, ^{241}Pu and ^{242}Pu in the region being examined.

An evaluation of neutron cross-sections of plutonium isotopes in accordance with their energy dependence has been performed in the following energy regions: the resonance, the unresolved resonance and the fast neutron energy regions. In view of the requirements arising in actual practice, the thermal region of 10^{-5}-5 eV has been shown separately. The evaluation covers the following characteristics for possible reactions between neutrons and nuclei: total interaction cross-section σ_{nT}, absorption cross-section σ_{nA}, fission cross-section σ_{nf}, radiative capture cross-section $\sigma_{n\gamma}$, elastic scattering cross-section σ_{nn}, inelastic scattering cross-section $\sigma_{nn'}$, (n,2n) and (n,3n) reactions, average number of neutrons per fission event $\bar{\nu}$ and per absorption event η, angular distributions of elastically scattered neutrons $d\sigma_{nn}/d\Omega$ and inelastically scattered neutrons $d\sigma_{nn'}/d\Omega$, energy distributions of secondary neutrons, and spectra of γ-rays accompanying the nonelastic processes.

Reactions with charged particle emission were not examined in view of their low probability.

The data shown constitute complete systems of constants (files). In addition, group-averaged constants broken down into the standard 26 groups and Westcott's g-factors are given.

<u>The resonance energy region</u>. Owing to the complex energy dependence of neutron cross-sections, evaluated resonance parameters which can be used for calculating the detailed dependences of the cross-sections of all types of reaction are given. Our evaluation is based on the Breit-Wigner and Reich-Moore formalisms. In the region 10^{-5}-5 eV the cross-sections are presented in tabular form in view of the high levels of accuracy required, which are not always provided by parametrization.

The unresolved resonance region. In this region, average resonance parameters are obtained which can be used for calculating all types of cross-section. The evaluation is based on the use both of average experimental cross-sections and of data from the resolved resonance region. For calculating neutron cross-sections, use was made of energy-averaged Breit-Wigner formulae which allow for different ideas about width distribution laws.

The fast neutron energy region. The nuclear data evaluation in this region is based on analysis of available experimental data and on widely-used present-day theoretical models such as the generalized optical model, the statistical model, the pre-equilibrium decay model and others. The models and the parameters used in them were carefully tested over the whole range of experimental data available. Fission penetrability was calculated using the Hill-Wheeler model with discrete and continuous spectra of transitional states. The effective penetrability for radiative capture was calculated in accordance with the cascade theory of γ-ray emission with the spectral factor in Lorentzian form, as required by testing in terms of widths of the $(n,\gamma f)$ process. The level density of the continuous excitation spectrum was approximated by present-day models based on collective effects. The neutron transmission coefficients were determined using the coupled channel method taking into account the deformation of the nucleus. The (n,2n) and (n,3n) reaction cross-sections were obtained using a model based on information about process stages. The angular distributions of the elastic scattered neutrons and neutrons inelastically scattered at ground-state rotational band levels were calculated by means of the coupled channel method. For other levels the angular distributions were considered to be isotropic. For finding the energy distributions of secondary neutrons in a continuous spectrum, use was made of a cascade statistical model based on the pre-equilibrium mechanism by which the process takes place. The spectra of γ-rays from inelastic processes were, with the exception of fission γ-rays, calculated by means of the statistical cascade model. Experimental data were used for the fission γ-ray spectrum.

The evaluated data are presented in the tables. They have been included in the Soviet evaluated nuclear constants library and have been approved as standard for use in the USSR. More detailed information on the complete nuclear data files for plutonium isotopes, including numerical data on magnetic tape and a detailed description of the evaluation procedure, can be obtained upon request from the Nuclear Data Centre of the State Committee on the Utilization of Atomic Energy, which is located at the Fiziko-Energeticheskij Institut in Obninsk.

Table I.1. Energies Q and thresholds T of reactions between neutrons and ^{239}Pu, ^{240}Pu, ^{241}Pu and ^{242}Pu nuclei

Reaction	Isotope							
	^{239}Pu		^{240}Pu		^{241}Pu		^{242}Pu	
	Q	T	Q	T	Q	T	Q	T
	MeV							
(n, γ)	—	—6,534	—	—5,241	—	—6,301	—	—5,037
(n, 2n)	—5,655	5,679	—6,534	6,561	—5,241	5,263	—6,301	6,327
(n, 3n)	—12,653	12,706	—12.189	12,240	—11,775	11,824	—11,542	11,590
(n, 4n)	—18,513	18.591	—19.187	19,267	—17,430	17,503	—18,075	18,150
(n, p)	—	—0,059	—1,311	1.317	—0,582	0,584		
(n, d)	—3,94	3,96	—4,252	4,270	—4,332	4,350	—4,658	4,678
(n, t)	—3,17	3,18	—4,222	4,240	—3,236	3,250	—4,371	4.389
(n, np)	—9,167	9,193	—9,473	6,500	—6.552	6,580	—6,883	6,912
(n, nd)	—9,42	9.46	—10,520	10,564	—9,490	9,530	—10,629	10,673
(n, nt)	—9,79	9,83	—9,740	9,781	—9,46	9,50	—9,535	9,575
(n, ^{3}He)	—3,66	3,68	—4.053	4.070	—4.491	4,510	—4,860	4,880
(n, ^{4}He)	—	—11,79	—	—10,38	—	—11,233	—	—9,786
(n,n ^{3}He)	—8.79	8,83	—10,240	10,283	—9,29	9,33	—10.793	10,838
(n,n ^{4}He)	—	—5,24	—	—5,26	—	—5,14	—	—4,982

Chapter 2

NUCLEAR DATA FOR ^{240}Pu

The evaluation of resonance parameters of ^{240}Pu in the resolved resonance energy region (10^{-5}–1000 eV) was based on the parameters obtained in experimental work [1-9]. After renormalization to more accurate values of Γ_n, as described in Ref. [10], these parameters cease to contradict one another. The parameters of the first resonance were rendered more accurate by us, using the available measurements of capture cross-sections and total cross-sections at the thermal point, the most accurate of which are those measured by Lounsbury [11] ($\sigma_{n\gamma}$ = (289.5 ± 1.4b), and the coherent scattering lengths in Ref. [12] (σ_{nn} = 1.54 ± 0.09b). The evaluated thermal cross-sections are to a large extent determined by these two quantities. Cross-sections in the thermal energy region are shown in Table 2.1. These cross-sections can also be calculated with Breit-Wigner formulae using the evaluated resonance parameters shown in Table 2.2.

In the unresolved resonance region (1-142 keV), evaluated neutron cross-sections and average parameters are based on the available experimental data for σ_{nT} [13-16] and $\sigma_{n\gamma}$ [4, 17-19] and on evaluated average resonance parameters from the resolved resonance region, as follows: $\langle\Gamma_\gamma\rangle$ = 30.7 MeV; $\langle D\rangle$ = 13.5 ± 0.5 MeV; S_o = (1.1 ± 0.16) · 10^{-4}; (Γ_f) = 3.34 ± 1 MeV; X_{max} = $1/X_{min}$ = 30.

The method used for evaluating cross-sections in the unresolved resonance region is described in Ref. [20]. It takes into account the presence of a two-humped fission barrier and consequently, in addition to Porter-Thomas fluctuations, fission widths are subject to further fluctuations as a result of the existence of bound states in the second well of the fission barrier.

The strength function of the p-wave S_1 = (2.8 ± 0.4) · 10^{-4} was selected from the condition of agreement between experimental and theoretical data for $\sigma_{n\gamma}$ in the unresolved resonance region.

Table 2.3 shows the number of degrees of freedom for the partial reaction channel widths taken into account in the unresolved resonance region, while Tables 2.4-2.7 give the energy-dependent average parameters of ^{240}Pu in the energy region 1-142 keV. Table 2.8 gives evaluated average cross-sections in the unresolved resonance energy region calculated using evaluated average resonance parameters.

The fission cross-section in the fast energy region (142 keV-15 MeV) was evaluated from experimental data [8, 21-31], which were practically all obtained with respect to ^{235}U using the quantitites σ_{nf} (^{235}U) obtained by us [32]. Table 2.9 gives evaluated values of σ_f (^{240}Pu) together with the ratio σ_{nf} (^{240}Pu)/σ_{nf} (^{235}U).

The evalution of $\bar{\nu}_p$ was based on the experimental data described in Ref. [34] and on data from last publications [35,36]. The results of experiments have been normalised to $\bar{\nu}^{sp}(^{252}Cf) = 3,731$. The energy dependence of $\bar{\nu}_p$ (^{240}Pu) can be approximated by the following formula:

$$\bar{\nu}_p(E) = 2.8408 + 0.14601\ E\ (MeV).$$

The quantity $\bar{\nu}_d$ was taken to be equal to 0.009 in the region up to 5 MeV and 0.006 in the region above 7 MeV and undergoes a linear decrease between 5 and 7 MeV; $\bar{\nu}^{sp}$ (^{240}Pu) was taken to be equal to 2.14 $\pm$ 0.01 [34].

The total interaction cross-section in the fast energy region was evaluated on the basis of calculations using the coupled channel method. We found the optical potential from the potential for ^{238}U and adjusted it in order to take into account existing experimental data for ^{240}Pu on σ_t, S_o, S_1 and R' [33].

The parameters of potential for ^{240}Pu were selected as follows:

$$W_D = \begin{cases} 3{,}05 + 0{,}4\,E & (E \leqslant 10\ \text{MeV}) \\ 7{,}05 & (E > 10\ \text{MeV}) \end{cases}\ \text{MeV}$$

$$V_R = (46{,}04 - 0{,}3\,E)\ \text{MeV}$$

$$a_D = (0{,}555 + 0{,}0045E)\ \text{ф},$$

$$r_R^0 = 1{,}256\ \text{ф},\ a_R = 0{,}626\ \text{ф},\ r_D^0 = 1{,}26\ \text{ф},\ V_{so} = 7{,}5\ \text{MeV}$$

$$\beta_2 = 0{,}191,\ \beta_4 = 0{,}094.$$

Table 2.10 shows the evaluated total interaction cross-section.

The evaluations of other types of neutron cross-section were based on calculations using the statistical and generalized optical models. Optical penetrabilities were calculated using the coupled channel method.

For calculating level densities, the Fermi-gas model based on collective effects was used. The radiative capture penetrabilities were normalized to $\langle\Gamma_\gamma\rangle_{obs}$. In order to allow for fission competition, fission penetrabilities were determined from the description of the evaluated cross-section σ_f.

Tables 2.10–2.14 show evaluated data on σ_{nT}, σ_{nn}, $\sigma_{n\gamma}$, $\sigma_{nn'}$, σ_{n2n} and σ_{n3n}.

The fission neutron spectrum was approximated by the Maxwellian distribution $N_M(E) = 2\exp(-E/kT)/(\sqrt{\pi T^{3/2}})$, where T is the temperature of the nucleus (values of T are given in Table 2.10). The energy distributions of secondary neutrons from the (n,n') (continuous spectrum), (n,2n) and (n,3n) reactions were evaluated from the statistical model with allowance for the possibility of pre-equilibrium emission; these are shown in Table 2.16. The spectra of γ-rays from inelastic processes are given in Table 2.17. The spectrum of fission γ-rays was taken to be equal to the experimental spectrum of Ref. [37] and is assumed not to depend on neutron energy. Tables 2.15 and 2.18 show group-averaged constants for ^{240}Pu.

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Table 2.1. Evaluated values of $\sigma_{n\gamma}$, σ_{nf}, σ_{nn} and σ_{nT} for ^{240}Pu in the energy region 0.00001-5 eV

E, eV	$\sigma_{n\gamma}$	σ_{nf}	σ_{nn}	σ_{nT}
	b			
0,00001	13793,330	2,836	1,648	13797,810
0,00005	6169,028	1,269	1,648	6171,945
0,0001	4362,573	0,897	1,648	4365,118
0,0005	1952,475	0,401	1,646	1954,522
0,001	1381,912	0,284	1,644	1383,840
0,002	979,007	0,201	1,640	980,848
0,003	800,869	0,165	1,636	802,670
0,004	694,888	0,143	1,631	696,662
0,005	622,705	0,128	1,627	624,460
0,006	569,529	0,117	1,623	571,269
0,007	528,283	0,108	1,618	530,009
0,008	495,104	0,102	1,614	496,820
0,009	467,677	0,096	1,610	469,383
0,010	444,523	0,091	1,606	446,220
0,020	320,401	0,066	1,563	322,030
0,0253	287,798	0,059	1,540	289,397
0,030	266,712	0,054	1,520	268,286
0,040	235,533	0,048	1,477	237,058
0,060	200,086	0,041	1,389	201,516
0,070	189,007	0,038	1,345	190,390
0,080	180,430	0,036	1,301	181,767
0,090	173,640	0,035	1,257	174,932
0,100	168,182	0,034	1,213	169,429
0,150	152,846	0,030	0,991	153,867
0,200	148,238	0,029	0,769	149,036
0,300	155,079	0,030	0,356	155,465
0,350	164,582	0,031	0,185	164,798
0,400	178,261	0,034	0,063	178,358
0,450	196,882	0,037	0,023	196,942
0,500	221,808	0,041	0,116	221,965
0,550	255,254	0,047	0,426	255,727
0,600	300,793	0,055	1,099	301,947
0,650	364,371	0,066	2,389	366,826
0,700	456,370	0,082	4,773	461,225
0,750	596,196	0,107	9,201	605,504
0,800	823,590	0,147	17,747	841,484
0,850	1230,818	0,219	35,537	1266,574
0,875	1568,091	0,279	51,758	1620,128
0,900	2074,905	0,368	77,739	2153,012
0,925	2887,717	0,512	122,030	3010,259
0,9500	4313,127	0,764	204,399	4518,290
0,9625	5466,960	0,968	273,814	5741,742
0,9750	7159,012	1,267	378,485	7538,764
0,9875	9777,057	1,730	544,971	10323,758
1,0250	38015,810	6,722	2466,964	40489,496
1,0375	74235,750	13,126	5057,439	79306,315
1,0500	141163,600	24,959	10086,550	151275,109

Cont. 2.1.

E, eV	$\sigma_{n\gamma}$	σ_{nf}	σ_{nn}	σ_{nT}
	b			
1,0590	152791,400	27,015	11289,470	164107,885
1,0600	149320,200	26,401	11074,07	160420,671
1,0650	123481,100	21,833	9328,521	132831,454
1,0700	94580,320	16,723	7277,130	101874,173
1,0800	53271,700	9,420	4249,396	57530,516
1,0900	31895,740	5,640	2636,015	34537,395
1,1000	20672,700	3,656	1768,977	22445,333
1,1125	13161,080	2,328	1175,260	14338,668
1,1250	9030,889	1,598	840,810	9873,297
1,1375	6547,405	1,159	635,021	7183,585
1,1500	4948,172	0,876	499,527	5448,575
1,175	3092,752	0,548	337,476	3430,776
1,200	2103,889	0,373	247,432	2351,694
1,225	1517,794	0,270	191,881	1709,945
1,250	1143,148	0,203	154,970	1298,321
1,30	710,742	0,127	110,060	820,929
1,35	481,197	0,086	84,449	565,732
1,40	345,508	0,062	68,247	413,817
1,50	200,626	0,037	49,322	249,985
1,60	129,512	0,024	38,851	168,387
1,80	65,370	0,013	27,879	93,262
2,20	25,084	0,005	18,985	44,074
2,40	17,432	0,004	16,787	34,223
2,60	12,718	0,003	15,231	27,952
2,80	9,629	0,003	14,074	23,706
3,00	7,508	0,002	13,180	20,690
3,20	5,995	0,002	12,468	18,465
3,40	4,883	0,002	11,889	16,774
3,60	4,044	0,002	11,407	15,453
3,80	3,398	0,001	11,00	14,399
4,00	2,890	0,001	10,652	13,543
4,20	2,486	0,001	10,351	12,838
4,40	2,158	0,001	10,087	12,246
4,60	1,890	0,001	9,853	11,744
4,80	1,668	0,001	9,645	11,314
5,00	1,483	0,001	9,459	10,943

Table 2.2. Evaluated resonance parameters for ^{240}Pu

Group Number	E_r, eV	Γ_n	Γ_f	Γ_γ
		meV		
1	1,056	2,3543	0,0057	32,24
2	20,46	2,65	0,70	32,2
3	38,34	17,00	0,09	26,5
4	41,64	14,40	0,11	32,0
5	66,65	51,00	0,04	28,5

Cont. 2.2

Group Number	E_r, eV	Γ_n	Γ_f	Γ_γ
		meV		
6	72,80	21,50	0,22	28,6
7	90,78	13,00	0,08	30,7
8	92,52	3,20	0,20	30,7
9	105,05	44,00	0,08	35,5
10	121,67	14,50	0,18	30,7
11	130,8	0,17	0,00	30,7
12	135,3	18,50	0,16	30,7
13	151,9	14,00	0,50	29,5
14	162,8	9,00	0,07	27,5
15	170,2	17,5	0,30	27,3
16	186,0	18,4	0,12	29,5
17	192,1	0,30	0,00	30,7
18	199,6	1,00	0,00	30,7
19	239,3	13,60	0,10	27,9
20	260,5	24,40	0,26	31,0
21	287,1	135,00	0,60	30,0
22	304,9	7,40	0,30	30,7
23	318,4	6,00	0,00	30,7
24	320,8	20,00	0,00	30,7
25	338,5	7,400	0,00	30,7
26	346,1	17,70	0,04	30,7
27	363,8	31,20	0,00	34,0
28	372,1	15,20	0,04	29,0
29	405,0	106,00	0,40	30,0
30	419,0	6,20	0,00	30,7
31	446,0	1,90	0,00	30,7
32	449,8	18,90	0,00	30,7
33	466,5	2,70	0,00	30,7
34	473,3	4,50	0,0	30,7
35	493,9	6,70	0,16	30,7
36	499,3	18,50	0,0	31,0
37	514,3	21,50	0,0	30,7
38	526,1	0,91	0,1	30,7
39	530,8	0,70	0,1	30,7
40	546,8	31,00	0,0	36,0
41	553,3	17,0	0,2	30,7
42	566,4	31,50	0,0	29,5
43	584,1	1,14	0,0	30,7
44	596,9	57,50	0,0	33,5
45	608,1	22,80	0,0	31,5
46	632,5	14,50	0,03	30,7
47	637,5	15,0	0,0	30,7
48	665,1	195,00	4,0	33,0
49	678,6	26,00	0,3	30,7
50	712,1	1,30	0,0	30,7
51	743,3	1,00	0,0	30,7
52	750,0	68,00	9,5	30,7
53	758,9	6,00	2,0	30,7

Cont. 2.2

Group Number	E_r, eV	Γ_n	Γ_f	Γ_γ
		meV		
54	778,3	1,20	0,0	30,7
55	782,2	2,80	138,0	30,7
56	791,0	23,90	15,0	30,7
57	810,5	213,00	10,5	30,7
58	819,9	110,00	1,5	30,7
59	845,6	10,30	1,0	30,7
60	854,9	48,00	0,15	30,7
61	876,5	14,00	0,8	30,7
62	891,5	95,00	1,7	30,7
63	903,9	21,60	0,8	30,7
64	908,9	78,00	0,0	30,7
65	915,3	37,00	0,0	30,7
66	943,5	122,00	0,1	30,7
67	958,4	73,00	0,1	30,7
68	971,3	78,00	0,2	30,7
69	979,2	7,30	1,8	30,7
70	1001,8	95,00	1,8	30,7

Table 2.3. Number of degrees of freedom of χ^2 distribution of partial widths

l	J	π	$\bar{\nu}\langle\Gamma_n\rangle$	$\nu\langle\Gamma_{n'}\rangle$	$\nu\langle\Gamma_f\rangle$	$\nu\langle\Gamma_\gamma\rangle$
0	1/2	+	1	2	1	∞
1	1/2	—	1	1	2	∞
1	3/2	—	1	2	4	∞
2	3/2	+	1	1	4	∞
2	5/2	+	1	1	6	∞

Table 2.4. Average distances between resonances of ^{240}Pu

E, keV	$\langle D \rangle_{1/2}$	$\langle D \rangle_{3/2}$	$\langle D \rangle_{5/2}$
	eV		
1	13,4778	6,8909	4,7678
2	13,4502	6,8767	4,7580
3	13,4227	6,8626	4,7483
4	13,3952	6,8486	4,7385
6	13,3405	6,8205	4,7191
8	13,2859	6,7926	4,6997
10	13,2316	6,7648	4,6805
12	13,1775	6,7372	4,6613
14	13,1237	6,7096	4,6422
16	13,0701	6,6822	4,6232
20	12,9635	6,6276	4,5854
24	12,8579	6,5735	4,5479
28	12,7531	6,5199	4,5107
32	12,6492	6,4668	4,4739
36	12,5463	6,4141	4,4373
40	12,4441	6,3618	4,4011
45	12,3177	6,2971	4,3563
50	12,1926	6,2331	4,3119
60	11,9464	6,1071	4,2246
70	11,7053	5,9837	4,1391
80	11,4693	5,8629	4,0554
90	11,2382	5,7446	3,9734
100	11,0120	5,6289	3,8932
110	10,7905	5,5155	3,8147
120	10,5736	5,4046	3,7378
130	10,3613	5,2959	3,6625
140	10,1534	5,1895	3,5888

Table 2.5. Average neutron widths of ^{240}Pu

E, keV	$\Gamma^0_{n\ 1/2+}$	$\Gamma^1_{n\ 1/2-}$	$\Gamma^1_{n\ 3/2-}$	$\Gamma^2_{n\ 3/2+}$	$\Gamma^2_{n\ 5/2+}$
	meV				
1	46,883	0,406	0,207	0,0	0,0
2	66,166	1,142	0,584	0,0	0,0
3	80,871	2,086	1,067	0,0	0,0
4	93,191	3,194	1,633	0,001	0,001
6	113,668	5,805	2,968	0,003	0,002
8	130,716	8,842	4,521	0,005	0,004
10	145,548	12,225	6,250	0,010	0,007
12	158,788	15,900	8,129	0,015	0,010
14	170,810	19,824	10,135	0,022	0,015
16	181,857	23,966	12,253	0,030	0,021
20	201,665	32,796	16,767	0,052	0,036

Cont. 2.5.

E, keV	$\Gamma^0_{n\ 1/2+}$	$\Gamma^1_{n\ 1/2-}$	$\Gamma^1_{n\ 3/2-}$	$\Gamma^2_{n\ 3/2+}$	$\Gamma^2_{n\ 5/2+}$
	meV				
24	219,113	42,220	21,585	0,081	0,056
28	234,740	52,112	26,643	0,118	0,081
32	248,904	62,374	31,888	0,162	0,112
36	261,853	72,923	37,281	0,215	0,149
40	273,771	83,696	42,788	0,277	0,191
45	287,428	97,393	49,790	0,365	0,253
50	299,899	111,264	56,880	0,468	0,327
60	321,888	139,248	71,184	0,714	0,494
70	340,663	167,195	85,469	1,017	0,703
80	356,841	194,789	99,573	1,374	0,950
90	370,861	221,803	113,379	1,785	1,235
100	383,053	248,072	126,805	2,248	1,555
110	393,668	273,484	139,791	2,761	1,910
120	402,909	297,957	152,297	3,322	2,297
130	410,939	321,438	164,295	3,926	2,715
140	417,895	343,893	175,769	4,572	3,162

Table 2.6. Average inelastic widths of ^{240}Pu

E, keV	$\Gamma^0_{n'\ 1/2+}$	$\Gamma^1_{n'\ 1/2-}$	$\Gamma^1_{n'\ 3/2-}$	$\Gamma^2_{n'\ 3/2+}$	$\Gamma^2_{n'\ 5/2+}$
	meV				
45	0,001	1,046	1,069	30,978	21,430
50	0,014	6,664	6,813	57,372	39,689
60	0,126	23,913	24,449	87,653	60,634
70	0,387	45,433	46,450	108,352	74,950
80	0,826	69,250	70,799	124,474	86,098
90	1,450	94,289	96,396	137,736	95,269
100	2,274	119,870	122,545	148,989	103,048
110	3,298	145,530	148,774	158,729	109,780
120	4,521	170,946	174,754	167,278	115,689
130	5,939	195,890	200,248	174,863	120,930
140	7,545	220,195	225,089	181,646	125,616

Table 2.7. Average fission widths and the factor χ_{max} for ^{240}Pu

E, keV	$\Gamma_{f1/2}/\nu$	$\Gamma_{f3/2}/\nu$	$\Gamma_{f5/2}/\nu$	X_{max}
	meV			
1	3,339	1,707	1,181	29,513
2	3,353	1,714	1,186	29,201

Cont. 2.7.

E, keV	$\Gamma_{f1/2}/\nu$	$\Gamma_{f3/2}/\nu$	$\Gamma_{f5/2}/\nu$	X_{max}
	meV			
3	3,367	1,722	1,191	28,892
4	3,382	1,729	1,196	28,587
6	3,411	1,744	1,207	27,987
8	3,440	1,759	1,217	27,401
10	3,470	1,774	1,227	26,828
12	3,500	1,789	1,238	26,267
14	3,530	1,805	1,249	25,720
16	3,560	1,820	1,259	25,184
20	3,622	1,852	1,281	24,149
24	3,684	1,883	1,303	23,159
28	3,748	1,916	1,325	22,213
32	3,812	1,949	1,348	21,309
36	3,878	1,983	1,372	20,445
40	3,945	2,017	1,395	19,619
45	4,030	2,060	1,425	18,638
50	4,117	2,105	1,456	17,74
60	4,297	2,196	1,519	16,007
70	4,484	2,292	1,586	14,485
80	4,680	2,392	1,656	13,125
90	4,884	2,496	1,727	11,910
100	5,097	2,605	1,802	10,824
110	5,319	2,719	1,880	9,854
120	5,550	2,837	1,962	8,986
130	5,792	2,960	2,047	8,210
140	6,044	3,089	2,136	7,515

Table 2.8. Evaluated cross-sections of ^{240}Pu in the unresolved resonance region

E, keV	σ_{nT}	σ_{nn}	σ_{nf}	$\sigma_{n\gamma}$	$\sigma_{nn'}$
	b				
1	23,921	19,551	0,260	4,110	0
2	19,860	17,064	0,180	2,616	0
3	18,103	15,885	0,152	2,066	0
4	17,078	15,151	0,137	1,790	0
6	15,898	14,280	0,120	1,498	0
8	15,222	13,776	0,112	1,334	0
10	14,777	13,446	0,108	1,223	0
12	14,459	13,209	0,106	1,144	0
14	14,219	13,039	0,105	1,075	0
16	14,030	12,900	0,104	1,026	0
20	13,752	12,716	0,102	0,934	0
24	13,553	12,590	0,101	0,862	0
28	13,402	12,494	0,099	0,809	0
32	13,282	12,426	0,097	0,759	0

Cont. 2.8.

E, keV	σ_{nT}	σ_{nn}	σ_{nf}	$\sigma_{n\gamma}$	$\sigma_{nn'}$
	b				
36	13,181	12,365	0,096	0,720	0
40	13,096	12,316	0,094	0,686	0
45	13,003	12,251	0,092	0,636	0,024
50	12,921	12,151	0,090	0,581	0,099
60	12,778	11,946	0,085	0,489	0,258
70	12,652	11,762	0,080	0,428	0,382
80	12,535	11,589	0,077	0,382	0,487
90	12,422	11,423	0,075	0,347	0,577
100	12,313	11,258	0,074	0,321	0,660
110	12,204	11,116	0,073	0,300	0,715
120	12,096	10,968	0,073	0,283	0,772
130	11,988	10,820	0,074	0,270	0,824
140	11,878	10,684	0,074	0,259	0,861

Table 2.9. Evaluated fission cross-sections of ^{240}Pu

E, MeV	$\sigma_{nf}(^{240}Pu)$, b	$\sigma_{nf}(^{235}U)$, b	$\frac{\sigma_{nf}(^{240}Pu)}{\sigma_{nf}(^{235}U)}$	$\Delta \frac{\sigma_{nf}(^{240}Pu)}{\sigma_{nf}(^{235}U)}$, %
0,15	0,074	1,458	0,0508	5,2
0,16	0,076	1,438	0,0529	4,8
0,18	0,080	1,399	0,0572	4,0
0,20	0,084	1,336	0,0629	3,8
0,22	0,089	1,336	0,0666	3,8
0,24	0,095	1,311	0,0725	3,8
0,26	0,103	1,289	0,0799	3,8
0,28	0,110	1,270	0,0874	3,8
0,30	0,120	1,250	0,0960	3,8
0,32	0,130	1,233	0,1064	3,8
0,34	0,145	1,221	0,1188	3,8
0,36	0,161	1,215	0,1325	3,8
0,38	0,176	1,214	0,1450	3,8
0,40	0,201	1,212	0,1658	3,8
0,42	0,237	1,2052	0,1966	3,8
0,44	0,261	1,1963	0,2183	3,9
0,46	0,297	1,186	0,2504	3,9
0,48	0,338	1,1759	0,2874	3,9
0,50	0,391	1,166	0,3353	4,0
0,55	0,53	1,146	0,4625	4,1
0,60	0,66	1,128	0,5851	4,2
0,65	0,786	1,113	0,7062	4,0
0,70	0,890	1,105	0,8054	4,0
0,75	0,986	1,104	0,8931	3,9
0,80	1,10	1,117	0,9848	3,8
0,85	1,248	1,144	1,0909	3,7
0,90	1,360	1,180	1,1525	3,6
0,95	1,441	1,204	1,1968	3,5
1,0	1,497	1,215	1,2321	3,2
1,1	1,549	1,22	1,2697	3,0
1,2	1,556	1,2260	1,2692	2,7
1,4	1,568	1,2390	1,2655	2,5
1,6	1,616	1,2580	1,2846	2,4
1,8	1,666	1,2760	1,3056	2,3
2,0	1,690	1,2840	1,3162	2,2
2,2	1,688	1,2748	1,3241	2,1
2,4	1,680	1,2587	1,3347	2,1
2,6	1,671	1,2391	1,3486	2,1
2,8	1,661	1,2217	1,3596	2,1
3,0	1,652	1,2050	1,3710	2,1
3,2	1,642	1,1930	1,3764	2,1
3,4	1,632	1,1821	1,3806	2,1
3,6	1,620	1,1711	1,3833	2,1
3,8	1,607	1,1691	1,3864	2,1
4,0	1,594	1,1470	1,3897	2,1
4,5	1,558	1,1170	1,3948	2,3
5,0	1,516	1,0870	1,3947	2,4
5,5	1,507	1,052	1,4325	2,5

Cont. 2.9.

E, MeV	$\sigma_{nf}(^{240}Pu)$, b	$\sigma_{nf}(^{235}U)$, b	$\frac{\sigma_{nf}(^{240}Pu)}{\sigma_{nf}(^{235}U)}$	$\Delta \frac{\sigma_{nf}(^{240}Pu)}{\sigma_{nf}(^{235}U)}$, %
6,0	1,674	1,139	1,4697	2,5
6,5	1,893	1,386	1,3658	2,6
7,0	2,100	1,60	1,3125	2,6
7,5	2,274	1,755	1,2957	2,6
8,0	2,349	1,82	1,2907	2,8
8,5	2,337	1,824	1,2812	2,9
9,0	2,319	1,812	1,2798	2,9
9,5	2,304	1,80	1,2800	3,0
10,0	2,285	1,7860	1,2794	3,0
10,5	2,271	1,7761	1,2786	3,1
11,0	2,266	1,770	1,2802	3,2
11,5	2,242	1,7584	1,2750	3,2
12,0	2,229	1,7680	1,2607	3,3
12,5	2,216	1,8364	1,2067	3,6
13,0	2,208	1,922	1,1488	4,0
13,5	2,212	1,9981	1,1071	4,3
14,0	2,229	2,0603	1,0819	4,8
14,5	2,293	2,0969	1,0935	4,9
15,0	2,418	2,108	1,1471	5,0

Table 2.10. Evaluated data on cross-sections and temperature T of ^{240}Pu fission neutrons in the energy region 0.15–15 MeV

E, MeV	σ_{nT}	σ_{nn}	$\sigma_{n\gamma}$	$\sigma_{nn'}$	$\sigma_{n,2n}$	$\sigma_{n,3n}$	T, MeV
	b						
0,15	11,712	10,470	0,248	0,920	0,0	0,0	1,391
0,16	11,481	10,215	0,240	0,950	0,0	0,0	1,392
0,18	10,935	9,630	0,227	0,998	0,0	0,0	1,392
0,20	10,547	9,198	0,216	1,049	0,0	0,0	1,392
0,22	10,341	8,962	0,212	1,078	0,0	0,0	1,392
0,24	10,164	8,741	0,211	1,117	0,0	0,0	1,392
0,26	9,979	8,537	0,208	1,131	0,0	0,0	1,393
0,28	9,978	8,364	0,214	1,290	0,0	0,0	1,393
0,30	9,816	8,174	0,213	1,309	0,0	0,0	1,393
0,32	9,659	7,993	0,211	1,325	0,0	0,0	1,393
0,34	9,508	7,816	0,210	1,337	0,0	0,0	1,393
0,36	9,361	7,644	0,209	1,347	0,0	0,0	1,393
0,38	9,220	7,480	0,208	1,356	0,0	0,0	1,394
0,40	9,084	7,313	0,207	1,363	0,0	0,0	1,394
0,42	8,953	7,147	0,205	1,364	0,0	0,0	1,394
0,44	8,926	7,057	0,214	1,394	0,0	0,0	1,394
0,46	8,808	6,905	0,212	1,394	0,0	0,0	1,394
0,48	8,694	6,754	0,210	1,392	0,0	0,0	1,395
0,50	8,584	6,600	0,207	1,386	0,0	0,0	1,395
0,55	8,334	6,229	0,201	1,374	0,0	0,0	1,395
0,60	8,107	5,889	0,194	1,364	0,0	0,0	1,396
0,65	7,850	5,443	0,171	1,450	0,0	0,0	1,396
0,70	7,600	5,000	0,152	1,558	0,0	0,0	1,396
0,75	7,400	4,659	0,140	1,615	0,0	0,0	1,397
0,80	7,220	4,368	0,131	1,621	0,0	0,0	1,397
0,85	7,135	4,152	0,124	1,611	0,0	0,0	1,398
0,90	7,080	3,995	0,120	1,605	0,0	0,0	1,398
0,95	7,040	3,855	0,114	1,630	0,0	0,0	1,399
1,00	7,000	3,704	0,107	1,692	0,0	0,0	1,399
1,1	6,950	3,479	0,094	1,828	0,0	0,0	1,400
1,2	6,930	3,332	0,088	1,954	0,0	0,0	1,401
1,4	6,920	3,062	0,076	2,214	0,0	0,0	1,403
1,6	7,010	3,059	0,064	2,271	0,0	0,0	1,404
1,8	7,145	3,192	0,050	2,237	0,0	0,0	1,406
2,0	7,275	3,374	0,037	2,174	0,0	0,0	1,408
2,2	7,380	3,550	0,0260	2,116	0,0	0,0	1,410
2,4	7,500	3,764	0,0252	2,0308	0,0	0,0	1,411
2,6	7,604	3,950	0,0237	1,9593	0,0	0,0	1,413
2,8	7,710	4,134	0,0218	1,8932	0,0	0,0	1,415
3,0	7,800	4,321	0,0200	1,807	0,0	0,0	1,417
3,2	7,870	4,437	0,0187	1,7723	0,0	0,0	1,418
3,4	7,935	4,519	0,0174	1,7666	0,0	0,0	1,420
3,6	7,965	4,581	0,0163	1,7477	0,0	0,0	1,422
3,8	7,990	4,630	0,0154	1,7376	0,0	0,0	1,423
4,0	8,000	4,668	0,0148	1,7232	0,0	0,0	1,425
4,5	7,965	4,677	0,0133	1,7167	0,0	0,0	1,429
5,0	7,840	4,580	0,0118	1,7322	0,0	0,0	1,433

Cont. 2.10.

E, MeV	σ_{nT}	σ_{nn}	$\sigma_{n\gamma}$	$\sigma_{nn'}$	$\sigma_{n,2n}$	$\sigma_{n,3n}$	T, MeV
	b						
5,5	7,570	4,318	0,0111	1,7339	0,0	0,0	1,437
6,0	7,280	4,030	0,0098	1,5662	0,0	0,0	1,442
6,5	7,030	3,780	0,0088	1,3482	0,0	0,0	1,446
7,0	6,828	3,579	0,0080	1,1220	0,019	0,0	1,450
7,5	6,622	3,374	0,0072	0,9188	0,048	0,0	1,454
8,0	6,452	3,206	0,0065	0,7695	0,121	0,0	1,458
8,5	6,285	3,045	0,0060	0,6870	0,210	0,0	1,461
9,0	6,143	2,912	0,0055	0,5955	0,311	0,0	1,465
9,5	6,027	2,801	0,0051	0,5669	0,350	0,0	1,469
10,0	5,939	2,717	0,0047	0,5583	0,374	0,0	1,473
10,5	5,866	2,656	0,0043	0,5447	0,390	0,0	1,477
11,0	5,826	2,618	0,0040	0,5400	0,398	0,0	1,481
11,5	5,827	2,590	0,0038	0,5302	0,461	0,0	1,485
12,0	5,841	2,599	0,0036	0,5204	0,489	0,0	1,488
12,5	5,851	2,613	0,0033	0,5107	0,509	0,0	1,492
13,0	5,864	2,637	0,0031	0,5029	0,501	0,012	1,496
13,5	5,885	2,670	0,0029	0,4921	0,445	0,063	1,500
14,0	5,914	2,710	0,0028	0,4812	0,367	0,124	1,503
14,5	5,943	2,750	0,0026	0,4724	0,277	0,148	1,507
15,0	5,976	2,801	0,0025	0,4445	0,159	0,151	1,510

Table 2.11. Cross-sections of level excitation and continuous spectrum of ^{240}Pu, b

E, MeV	Level energy E_q, MeV												
	Direct		Compound nucleus mechanism										
	0,043	0,142	0,043	0,142	0,294	0,597	0,649	0,742	0,861	0,900	0,938	0,959	0,993
0,15	0,021		0,899										
0,16	0,024		0,926										
0,18	0,029		0,968	0,001									
0,20	0,038		1,009	0,002									
0,22	0,044		1,031	0,003									
0,24	0,051		1,054	0,012									
0,26	0,057	0,001	1,056	0,017									
0,28	0,076	0,001	1,190	0,023									
0,30	0,083	0,002	1,196	0,028									
0,32	0,090	0,003	1,198	0,034									
0,34	0,096	0,004	1,196	0,041									
0,36	0,103	0,004	1,192	0,048									
0,38	0,109	0,006	1,185	0,056									
0,40	0,116	0,007	1,175	0,065									
0,42	0,122	0,008	1,160	0,074									
0,44	0,128	0,010	1,170	0,086									
0,46	0,134	0,012	1,153	0,095									
0,48	0,140	0,013	1,134	0,105									
0,50	0,146	0,015	1,111	0,114									
0,55	0,159	0,021	1,054	0,139	0,001								
0,60	0,173	0,027	0,996	0,162	0,001	0,005							
0,65	0,185	0,034	0,905	0,178	0,002	0,146							
0,70	0,199	0,042	0,833	0,196	0,004	0,230	0,054						
0,75	0,211	0,050	0,769	0,209	0,006	0,270	0,100						
0,80	0,222	0,057	0,704	0,218	0,008	0,284	0,127	0,001					

0,85	0,233	0,064	0,654	0,227	0,010	0,281	0,139	0,003						
0,90	0,243	0,071	0,605	0,232	0,013	0,271	0,146	0,004	0,020					
0,95	0,252	0,077	0,548	0,231	0,016	0,255	0,145	0,005	0,048	0,047	0,006			
1,00	0,262	0,083	0,486	0,223	0,018	0,235	0,141	0,007	0,065	0,096	0,052	0,024		
1,10	0,278	0,094	0,390	0,202	0,022	0,192	0,123	0,009	0,075	0,146	0,120	0,076	0,025	
1,20	0,293	0,104	0,320	0,181	0,025	0,161	0,110	0,012	0,072	0,156	0,142	0,095	0,046	
1,40	0,316	0,118	0,232	0,148	0,028	0,114	0,089	0,017	0,054	0,132	0,127	0,087	0,058	
1,60	0,332	0,127	0,152	0,105	0,024	0,070	0,064	0,017	0,036	0,094	0,091	0,059	0,050	
1,80	0,340	0,133	0,091	0,066	0,017	0,040	0,041	0,014	0,022	0,061	0,059	0,037	0,037	
2,00	0,342	0,135	0,051	0,038	0,011	0,023	0,025	0,010	0,013	0,037	0,036	0,022	0,025	
2,20	0,341	0,136	0,028	0,022	0,007	0,013	0,015	0,006	0,007	0,022	0,021	0,013	0,015	
2,40	0,336	0,137	0,015	0,012	0,004	0,007	0,009	0,004	0,004	0,012	0,012	0,008	0,009	
2,60	0,330	0,136	0,008	0,007	0,002	0,004	0,005	0,002	0,002	0,007	0,007	0,005	0,005	
2,80	0,323	0,135	0,005	0,004	0,001	0,002	0,003	0,001	0,001	0,004	0,004	0,003	0,003	
3,00	0,315	0,134	0,002	0,002	0,001	0,001	0,002	0,001	0,001	0,002	0,002	0,002	0,002	
3,20	0,307	0,133	0,001	0,001		0,001	0,001	0,001		0,001	0,001	0,001	0,001	
3,40	0,302	0,133	0,001	0,001			0,001			0,001	0,001	0,001	0,001	
3,60	0,296	0,132												
3,80	0,289	0,129												
4,00	0,282	0,127												
4,50	0,268	0,121												
5,00	0,256	0,115												
5,50	0,248	0,109												
6,00	0,240	0,104												
6,50	0,235	0,098												
7,00	0,228	0,092												
7,50	0,221	0,086												
8,00	0,214	0,081												
8,5	0,208	0,077												
9,0	0,202	0,073												
9,5	0,197	0,069												
10,0	0,192	0,066												

Cont. 2.11.

E, MeV	Level energy E_q, MeV												
	Direct		Compound nucleus mechanism										
	0,043	0,142	0,043	0,142	0,294	0,597	0,649	0,742	0,861	0,900	0,938	0,959	0,993
10,5	0,187	0,063											
11,0	0,181	0,059											
11,5	0,174	0,056											
12,0	0,167	0,053											
12,5	0,161	0,050											
13,0	0,155	0,048											
13,5	0,147	0,045											
14,0	0,139	0,042											
14,5	0,133	0,039											
15,0	0,127	0,037											

E, MeV	Level energy E_q, MeV												$\sigma_{nn'}^{cont}$
	Direct		Compound nucleus mechanism										
	1,002	1,031	1,038	1,076	1,090	1,116	1,138	1,161	1,178	1,180	1,223	1,232	
0,15													
0,16													
0,18													
0,20													
0,22													
0,24													
0,26													
0,28													
0,30													

Cont. 2.11.

0,32													
0,34													
0,36													
0,38													
0,40													
0,42													
0,44													
0,46													
0,48													
0,50													
0,55													
0,60													
0,65													
0,70													
0,75													
0,80													
0,85													
0,90													
0,95													
1,00													
1,10	0,032	0,030	0,010	0,003	0,001								
1,20	0,053	0,071	0,021	0,026	0,026	0,001	0,029		0,004	0,005			
1,40	0,057	0,089	0,029	0,049	0,040	0,006	0,090	0,002	0,061	0,053	0,064	0,027	0,127
1,60	0,044	0,071	0,025	0,045	0,030	0,008	0,077	0,003	0,060	0,047	0,069	0,035	0,536
1,80	0,030	0,050	0,019	0,034	0,019	0,008	0,051	0,003	0,043	0,031	0,048	0,028	0,915
2,00	0,019	0,032	0,013	0,023	0,011	0,006	0,032	0,003	0,028	0,019	0,030	0,019	1,171
2,20	0,012	0,020	0,009	0,014	0,006	0,005	0,019	0,002	0,018	0,011	0,018	0,013	1,323
2,40	0,007	0,011	0,005	0,009	0,004	0,003	0,011	0,002	0,011	0,007	0,011	0,008	1,3728
2,60	0,004	0,007	0,003	0,005	0,002	0,002	0,006	0,001	0,006	0,004	0,006	0,005	1,3883
2,80	0,003	0,004	0,002	0,003	0,001	0,001	0,004	0,001	0,004	0,002	0,004	0,003	1,3722
3,00	0,002	0,002	0,001	0,002	0,001	0,001	0,002		0,002	0,001	0,002	0,002	1,3220
3,20	0,001	0,001	0,001	0,001		0,001	0,001		0,001	0,001	0,001	0,001	1,3133
3,40	0,001	0,001		0,001			0,001		0,001	0,001	0,001	0,001	1,3166

Cont. 2.11.

E, MeV	Level energy E_q, MeV												$\sigma_{nn'}^{cont}$
	Direct		Compound nucleus mechanism										
	1,002	1,031	1,038	1,076	1,090	1,116	1,138	1,161	1,178	1,180	1,223	1,232	
3,60													1,3197
3,80													1,3196
4,00													1,3142
4,50													1,3277
5,00													1,3612
5,50													1,3769
6,00													1,2222
6,50													1,0152
7,00													0,8020
7,50													0,6118
8,00													0,4745
8,5													0,4020
9,0													0,3205
9,5													0,3009
10,0													0,3003
10,5													0,2947
11,0													0,3000
11,5													0,3002
12,0													0,3004
12,5													0,2997
13,0													0,2999
13,5													0,3001
14,0													0,3002
14,5													0,3004
15,0													0.2805

Table 2.12. Expansion coefficients A_ℓ for Legendre polynomials of angular distributions of elastically scattered neutrons:

$$\frac{d\sigma_n(\theta)}{d\Omega} = \frac{\sigma_n}{4\pi}\left[1 + \sum_{l=1}^{l_{max}} (2l+1) A_l P_l(\cos\theta)\right]$$

A_l	*E*, MeV			
	0,03	0,1	0,25	0,5
A_1	$1,926329 \cdot 10^{-2}$	$7,442489 \cdot 10^{-2}$	$2,366093 \cdot 10^{-1}$	$3,275448 \cdot 10^{-1}$
A_2	$4,414097 \cdot 10^{-4}$	$6,470504 \cdot 10^{-3}$	$4,329131 \cdot 10^{-2}$	$1,085732 \cdot 10^{-1}$
A_3	$3,026323 \cdot 10^{-6}$	$2,448228 \cdot 10^{-4}$	$5,142904 \cdot 10^{-3}$	$3,007204 \cdot 10^{-2}$
A_4		$7,761329 \cdot 10^{-6}$	$3,120084 \cdot 10^{-4}$	$5,513512 \cdot 10^{-3}$
A_5			$1,942414 \cdot 10^{-7}$	$8,131873 \cdot 10^{-5}$
A_6				$3,143330 \cdot 10^{-5}$
A_7				$6,799094 \cdot 10^{-7}$
A_8				
A_9				
A_{10}				
A_{11}				
A_{12}				
A_{13}				
A_{14}				
A_{15}				
A_{16}				
A_{17}				
A_{18}				
A_{19}				

A_l	*E*, MeV			
	0,75	1	1,5	2
A_1	$4,178902 \cdot 10^{-1}$	$4,846072 \cdot 10^{-1}$	$5,888094 \cdot 10^{-1}$	$6,714022 \cdot 10^{-1}$
A_2	$1,845840 \cdot 10^{-1}$	$2,600257 \cdot 10^{-1}$	$4,063836 \cdot 10^{-1}$	$4,973681 \cdot 10^{-1}$
A_3	$9,186587 \cdot 10^{-2}$	$1,811623 \cdot 10^{-1}$	$3,349480 \cdot 10^{-1}$	$3,931097 \cdot 10^{-1}$
A_4	$2,763125 \cdot 10^{-2}$	$7,710176 \cdot 10^{-2}$	$2,280611 \cdot 10^{-1}$	$3,220916 \cdot 10^{-1}$
A_5	$1,735785 \cdot 10^{-3}$	$1,030913 \cdot 10^{-2}$	$7,518865 \cdot 10^{-2}$	$1,611099 \cdot 10^{-1}$
A_6	$5,443322 \cdot 10^{-4}$	$3,087584 \cdot 10^{-3}$	$2,413091 \cdot 10^{-2}$	$5,939962 \cdot 10^{-2}$
A_7	$3,740652 \cdot 10^{-5}$	$2,667468 \cdot 10^{-4}$	$3,681756 \cdot 10^{-3}$	$1,281358 \cdot 10^{-2}$
A_8	$1,540486 \cdot 10^{-6}$	$1,460692 \cdot 10^{-5}$	$4,466738 \cdot 10^{-4}$	$2,081674 \cdot 10^{-3}$
A_9		$3,781454 \cdot 10^{-7}$	$3,509021 \cdot 10^{-5}$	$2,255545 \cdot 10^{-4}$
A_{10}			$1,765201 \cdot 10^{-6}$	$1,479202 \cdot 10^{-5}$
A_{11}				$2,272874 \cdot 10^{-7}$
A_{12}				
A_{13}				
A_{14}				
A_{15}				
A_{16}				
A_{17}				
A_{18}				
A_{19}				

Cont. 2.12.

A_l	E, MeV			
	3	4	5	6
A_1	$7,717806\cdot 10^{-1}$	$8,264381\cdot 10^{-1}$	$8,518833\cdot 10^{-1}$	$8,645070\cdot 10^{-1}$
A_2	$5,978643\cdot 10^{-1}$	$6,726449\cdot 10^{-1}$	$7,201241\cdot 10^{-1}$	$7,481988\cdot 10^{-1}$
A_3	$4,645482\cdot 10^{-1}$	$5,399711\cdot 10^{-1}$	$5,971206\cdot 10^{-1}$	$6,377228\cdot 10^{-1}$
A_4	$3,814053\cdot 10^{-1}$	$4,280121\cdot 10^{-1}$	$4,740797\cdot 10^{-1}$	$5,181552\cdot 10^{-1}$
A_5	$2,536680\cdot 10^{-1}$	$3,073522\cdot 10^{-1}$	$3,525812\cdot 10^{-1}$	$3,958219\cdot 10^{-1}$
A_6	$1,225879\cdot 10^{-1}$	$1,747021\cdot 10^{-1}$	$2,222650\cdot 10^{-1}$	$2,711068\cdot 10^{-1}$
A_7	$4,199531\cdot 10^{-2}$	$8,116242\cdot 10^{-2}$	$1,211039\cdot 10^{-1}$	$1,633145\cdot 10^{-1}$
A_8	$1,153263\cdot 10^{-2}$	$3,447824\cdot 10^{-2}$	$6,546642\cdot 10^{-2}$	$1,012148\cdot 10^{-1}$
A_9	$2,193050\cdot 10^{-3}$	$1,099018\cdot 10^{-2}$	$2,842009\cdot 10^{-2}$	$5,629532\cdot 10^{-2}$
A_{10}	$2,661130\cdot 10^{-4}$	$2,434863\cdot 10^{-3}$	$8,982674\cdot 10^{-3}$	$2,383865\cdot 10^{-2}$
A_{11}	$9,960892\cdot 10^{-6}$	$5,632878\cdot 10^{-4}$	$2,527834\cdot 10^{-3}$	$8,378287\cdot 10^{-3}$
A_{12}		$9,097284\cdot 10^{-5}$	$5,091129\cdot 10^{-4}$	$2,069139\cdot 10^{-3}$
A_{13}		$1,175966\cdot 10^{-5}$	$8,301957\cdot 10^{-5}$	$4,117610\cdot 10^{-4}$
A_{14}		$1,842400\cdot 10^{-6}$	$1,310936\cdot 10^{-5}$	$7,350564\cdot 10^{-5}$
A_{15}			$3,182467\cdot 10^{-7}$	$2,869567\cdot 10^{-6}$
A_{16}				
A_{17}				
A_{18}				
A_{19}				

A_l	E, MeV		
	8	9	10
A_1	$8,684730\cdot 10^{-1}$	$8,670069\cdot 10^{-1}$	$8,686833\cdot 10^{-1}$
A_2	$7,568520\cdot 10^{-1}$	$7,480865\cdot 10^{-1}$	$7,429383\cdot 10^{-1}$
A_3	$6,633550\cdot 10^{-1}$	$6,560002\cdot 10^{-1}$	$6,486538\cdot 10^{-1}$
A_4	$5,685312\cdot 10^{-1}$	$5,729873\cdot 10^{-1}$	$5,717611\cdot 10^{-1}$
A_5	$4,633028\cdot 10^{-1}$	$4,806967\cdot 10^{-1}$	$4,909701\cdot 10^{-1}$
A_6	$3,559565\cdot 10^{-1}$	$3,861142\cdot 10^{-1}$	$4,100394\cdot 10^{-1}$
A_7	$2,535857\cdot 10^{-1}$	$2,945160\cdot 10^{-1}$	$3,303166\cdot 10^{-1}$
A_8	$1,795816\cdot 10^{-1}$	$2,209878\cdot 10^{-1}$	$2,618535\cdot 10^{-1}$
A_9	$1,325473\cdot 10^{-1}$	$1,734685\cdot 10^{-1}$	$2,132275\cdot 10^{-1}$
A_{10}	$8,623754\cdot 10^{-2}$	$1,273303\cdot 10^{-1}$	$1,684572\cdot 10^{-1}$
A_{11}	$4,431725\cdot 10^{-2}$	$7,506897\cdot 10^{-2}$	$1,113888\cdot 10^{-1}$
A_{12}	$1,599654\cdot 10^{-2}$	$3,251376\cdot 10^{-2}$	$5,674241\cdot 10^{-2}$
A_{13}	$4,903383\cdot 10^{-3}$	$1,190318\cdot 10^{-2}$	$2,409719\cdot 10^{-2}$
A_{14}	$1,362522\cdot 10^{-3}$	$3,760364\cdot 10^{-3}$	$8,510740\cdot 10^{-3}$
A_{15}	$2,645637\cdot 10^{-4}$	$8,730896\cdot 10^{-4}$	$2,280021\cdot 10^{-3}$
A_{16}	$4,773674\cdot 10^{-5}$	$1,748657\cdot 10^{-4}$	$5,008059\cdot 10^{-4}$
A_{17}	$4,470916\cdot 10^{-6}$	$1,846900\cdot 10^{-5}$	$5,990598\cdot 10^{-5}$
A_{18}			
A_{19}			

Cont. 2.12.

A_l	E, MeV		
	11	13	15
A_1	$8,750966\cdot10^{-1}$	$8,986336\cdot10^{-1}$	$9,217441\cdot10^{-1}$
A_2	$7,458937\cdot10^{-1}$	$7,784288\cdot10^{-1}$	$8,181693\cdot10^{-1}$
A_3	$6,470040\cdot10^{-1}$	$6,736756\cdot10^{-1}$	$7,167449\cdot10^{-1}$
A_4	$5,703125\cdot10^{-1}$	$5,908206\cdot10^{-1}$	$6,299613\cdot10^{-1}$
A_5	$4,976084\cdot10^{-1}$	$5,219835\cdot10^{-1}$	$5,568417\cdot10^{-1}$
A_6	$4,279340\cdot10^{-1}$	$4,619917\cdot10^{-1}$	$4,953072\cdot10^{-1}$
A_7	$3,590322\cdot10^{-1}$	$4,061824\cdot10^{-1}$	$4,408528\cdot10^{-1}$
A_8	$2,974721\cdot10^{-1}$	$3,548396\cdot10^{-1}$	$3,908870\cdot10^{-1}$
A_9	$2,485833\cdot10^{-1}$	$3,074834\cdot10^{-1}$	$3,435740\cdot10^{-1}$
A_{10}	$2,047669\cdot10^{-1}$	$2,631570\cdot10^{-1}$	$2,970263\cdot10^{-1}$
A_{11}	$1,478805\cdot10^{-1}$	$2,106331\cdot10^{-1}$	$2,465581\cdot10^{-1}$
A_{12}	$8,592290\cdot10^{-2}$	$1,469147\cdot10^{-1}$	$1,873400\cdot10^{-1}$
A_{13}	$4,120544\cdot10^{-2}$	$8,730133\cdot10^{-2}$	$1,256260\cdot10^{-1}$
A_{14}	$1,609812\cdot10^{-2}$	$4,387505\cdot10^{-2}$	$7,316175\cdot10^{-2}$
A_{15}	$4,850753\cdot10^{-3}$	$1,841281\cdot10^{-2}$	$3,623959\cdot10^{-2}$
A_{16}	$1,167751\cdot10^{-3}$	$6,490544\cdot10^{-3}$	$1,518316\cdot10^{-2}$
A_{17}	$1,584398\cdot10^{-4}$	$1,903396\cdot10^{-3}$	$5,338035\cdot10^{-3}$
A_{18}		$4,302381\cdot10^{-4}$	$1,465305\cdot10^{-3}$
A_{19}		$5,279252\cdot10^{-5}$	$2,210678\cdot10^{-4}$

Table 2.13. Expansion coefficients A_ℓ for Legendre polynomials of angular distributions of neutrons scattered at the 2^+ level (43 keV)

A_l	E, MeV			
	0,25	0,5	0,75	1
A_1	$-7,979602\cdot10^{-3}$	$-1,373319\cdot10^{-2}$	$-2,305120\cdot10^{-2}$	$-3,517964\cdot10^{-2}$
A_2	$-3,553559\cdot10^{-3}$	$-1,267003\cdot10^{-2}$	$-1,695195\cdot10^{-2}$	$-2,110409\cdot10^{-2}$
A_3	$1,635159\cdot10^{-3}$	$3,254349\cdot10^{-3}$	$2,833882\cdot10^{-3}$	$5,017963\cdot10^{-3}$
A_4	$5,250656\cdot10^{-6}$	$-8,845921\cdot10^{-4}$	$-3,099897\cdot10^{-3}$	$-7,329130\cdot10^{-3}$
A_5	$-6,539792\cdot10^{-6}$	$-9,133986\cdot10^{-5}$	$-1,859170\cdot10^{-4}$	$-1,315490\cdot10^{-5}$
A_6	$2,582448\cdot10^{-7}$	$1,019477\cdot10^{-5}$	$1,350429\cdot10^{-4}$	$5,139608\cdot10^{-4}$
A_7		$-2,489014\cdot10^{-7}$	$-1,443145\cdot10^{-6}$	$-1,283248\cdot10^{-5}$
A_8			$1,162270\cdot10^{-6}$	$1,054238\cdot10^{-5}$
A_9				$3,139768\cdot10^{-7}$
A_{10}				
A_{11}				
A_{12}				
A_{13}				
A_{14}				
A_{15}				
A_{16}				
A_{17}				
A_{18}				
A_{19}				

Cont. 2.13.

A_l	E, MeV			
	1,5	2	3	4
A_1	—6,151960·10⁻²	—5,508488·10⁻²	6,741991·10⁻²	1,124696·10⁻¹
A_2	—5,117977·10⁻²	—8,481282·10⁻²	—6,380345·10⁻²	—4,633498·10⁻²
A_3	2,162784·10⁻²	3,972165·10⁻²	1,883795·10⁻²	4,845986·10⁻⁴
A_4	—3,724146·10⁻³	1,707081·10⁻²	1,522226·10⁻²	2,635692·10⁻²
A_5	7,985897·10⁻³	2,366694·10⁻²	4,148273·10⁻²	3,729658·10⁻²
A_6	1,413386·10⁻³	2,605191·10⁻³	—7,245222·10⁻⁴	—1,525161·10⁻²
A_7	4,144370·10⁻⁵	1,500891·10⁻³	2,739114·10⁻³	—7,510671·10⁻³
A_8	1,903511·10⁻⁴	9,479212·10⁻⁴	4,765559·10⁻³	—4,097697·10⁻⁴
A_9	—1,836318·10⁻⁵	—6,652662·10⁻⁵	5,944017·10⁻⁴	5,912044·10⁻³
A_{10}	2,209617·10⁻⁶	5,944203·10⁻⁵	6,750844·10⁻⁴	4,466616·10⁻³
A_{11}		—4,990546·10⁻⁶	—6,667303·10⁻⁵	3,621372·10⁻⁴
A_{12}				5,280861·10⁻⁴
A_{13}				4,290647·10⁻⁵
A_{14}				—4,716094·10⁻⁵
A_{15}				
A_{16}				
A_{17}				
A_{18}				
A_{19}				

A_l	E, MeV			
	5	6	8	9
A_1	1,259607·10⁻¹	1,462804·10⁻¹	2,121454·10⁻¹	2,616214·10⁻¹
A_2	—5,940357·10⁻²	—6,373718·10⁻²	—3,730441·10⁻²	—8,334602·10⁻³
A_3	2,390336·10⁻²	—4,593710·10⁻²	—6,474696·10⁻²	—6,373102·10⁻²
A_4	2,812727·10⁻²	1,575194·10⁻²	—1,314206·10⁻²	—2,351289·10⁻²
A_5	2,535186·10⁻²	2,813722·10⁻²	2,079077·10⁻²	6,959431·10⁻³
A_6	—1,565751·10⁻²	—6,915043·10⁻³	1,767006·10⁻³	3,199331·10⁻³
A_7	—1,528092·10⁻²	—1,941723·10⁻²	—2,420720·10⁻²	—2,190724·10⁻²
A_8	—1,782401·10⁻²	—3,114824·10⁻²	—4,455992·10⁻²	—4,896338·10⁻²
A_9	6,929611·10⁻³	2,484387·10⁻³	—1,979626·10⁻²	—3,034203·10⁻²
A_{10}	6,713951·10⁻³	1,696296·10⁻³	—1,154504·10⁻²	—1,467720·10⁻²
A_{11}	1,059286·10⁻³	2,863399·10⁻³	1,177100·10⁻²	1,248228·10⁻²
A_{12}	2,188848·10⁻³	5,223380·10⁻³	1,057322·10⁻²	1,010298·10⁻²
A_{13}	1,544589·10⁻⁴	2,524936·10⁻⁴	1,489835·10⁻³	4,044521·10⁻³
A_{14}	—1,808148·10⁻⁴	—7,390944·10⁻⁵	2,900277·10⁻³	6,430362·10⁻³
A_{15}	1,510929·10⁻⁵	9,851672·10⁻⁶	1,144764·10⁻³	2,312045·10⁻³
A_{16}			—2,016576·10⁻⁴	—2,304786·10⁻⁴
A_{17}			1,998094·10⁻⁵	7,337777·10⁻⁵
A_{18}				
A_{19}				

Cont. 2.13

A_l	E, MeV			
	10	11	13	15
A_1	$3,120317\cdot10^{-1}$	$3,570498\cdot10^{-1}$	$4,329147\cdot10^{-1}$	$4,980469\cdot10^{-1}$
A_2	$2,016594\cdot10^{-2}$	$4,786557\cdot10^{-2}$	$1,115032\cdot10^{-1}$	$1,731908\cdot10^{-1}$
A_3	$-5,848957\cdot10^{-2}$	$-4,772743\cdot10^{-2}$	$-5,133621\cdot10^{-3}$	$3,538233\cdot10^{-2}$
A_4	$-2,585496\cdot10^{-2}$	$-2,351068\cdot10^{-2}$	$-4,507113\cdot10^{-3}$	$1,656621\cdot10^{-2}$
A_5	$-7,149521\cdot10^{-4}$	$-4,051883\cdot10^{-3}$	$3,666859\cdot10^{-3}$	$2,315837\cdot10^{-2}$
A_6	$5,990264\cdot10^{-3}$	$7,696505\cdot10^{-3}$	$1,079534\cdot10^{-2}$	$2,564071\cdot10^{-2}$
A_7	$-1,794090\cdot10^{-2}$	$-1,351608\cdot10^{-2}$	$-2,404193\cdot10^{-3}$	$1,514133\cdot10^{-2}$
A_8	$-4,865753\cdot10^{-2}$	$-4,435040\cdot10^{-2}$	$-2,782948\cdot10^{-2}$	$-8,934911\cdot10^{-3}$
A_9	$-3,704970\cdot10^{-2}$	$-4,010329\cdot10^{-2}$	$-3,480624\cdot10^{-2}$	$-1,972810\cdot10^{-2}$
A_{10}	$-1,764189\cdot10^{-2}$	$-2,030791\cdot10^{-2}$	$-2,179938\cdot10^{-2}$	$-1,518727\cdot10^{-2}$
A_{11}	$9,143666\cdot10^{-3}$	$4,144321\cdot10^{-3}$	$2,008369\cdot10^{-3}$	$6,965062\cdot10^{-3}$
A_{12}	$7,080543\cdot10^{-3}$	$3,313118\cdot10^{-3}$	$1,934857\cdot10^{-3}$	$8,419925\cdot10^{-3}$
A_{13}	$6,723602\cdot10^{-3}$	$8,866735\cdot10^{-3}$	$8,548033\cdot10^{-3}$	$5,645351\cdot10^{-3}$
A_{14}	$1,078756\cdot10^{-2}$	$1,528163\cdot10^{-2}$	$1,918131\cdot10^{-2}$	$1,175961\cdot10^{-2}$
A_{15}	$4,015361\cdot10^{-3}$	$6,335123\cdot10^{-3}$	$1,387844\cdot10^{-2}$	$1,483249\cdot10^{-2}$
A_{16}	$1,296789\cdot10^{-4}$	$9,980720\cdot10^{-4}$	$7,032775\cdot10^{-3}$	$1,452910\cdot10^{-2}$
A_{17}	$2,699002\cdot10^{-4}$	$7,787357\cdot10^{-4}$	$3,304524\cdot10^{-3}$	$9,422101\cdot10^{-3}$
A_{18}			$5,669686\cdot10^{-4}$	$3,343408\cdot10^{-3}$
A_{19}			$1,232409\cdot10^{-4}$	$5,626597\cdot10^{-4}$

Table 2.14. Expansion coefficients A_ℓ for Legendre polynomials of angular distributions of neutrons scattered at the 4^+ level (142 keV)

A_l	E, MeV			
	0,5	0,75	1	1,5
A_1	$3,492167\cdot10^{-2}$	$5,083438\cdot10^{-2}$	$6,169474\cdot10^{-2}$	$8,133352\cdot10^{-2}$
A_2	$-6,711030\cdot10^{-3}$	$-1,718764\cdot10^{-2}$	$-2,849444\cdot10^{-2}$	$-6,170748\cdot10^{-2}$
A_3	$-8,119067\cdot10^{-3}$	$-1,021515\cdot10^{-2}$	$-9,692628\cdot10^{-3}$	$-2,775602\cdot10^{-3}$
A_4	$-1,220109\cdot10^{-3}$	$9,447559\cdot10^{-4}$	$3,927752\cdot10^{-3}$	$9,325978\cdot10^{-3}$
A_5	$2,353266\cdot10^{-4}$	$6,637189\cdot10^{-4}$	$7,146025\cdot10^{-4}$	$-3,084806\cdot10^{-3}$
A_6	$-5,517312\cdot10^{-6}$	$-1,403963\cdot10^{-4}$	$-3,827916\cdot10^{-4}$	$-9,273331\cdot10^{-4}$
A_7	$1,348129\cdot10^{-7}$	$1,194061\cdot10^{-5}$	$5,320641\cdot10^{-5}$	$4,756210\cdot10^{-4}$
A_8		$-7,067580\cdot10^{-7}$	$-3,877524\cdot10^{-6}$	$-9,579105\cdot10^{-5}$
A_9				$4,768986\cdot10^{-6}$
A_{10}				$-3,181542\cdot10^{-7}$
A_{11}				
A_{12}				
A_{13}				
A_{14}				
A_{15}				
A_{16}				
A_{17}				
A_{18}				
A_{19}				

Cont. 2.14.

A_l	E, MeV			
	2	3	4	5
A_1	$1,194461\cdot10^{-1}$	$1,509580\cdot10^{-1}$	$1,564586\cdot10^{-1}$	$1,662858\cdot10^{-1}$
A_2	$-9,435533\cdot10^{-2}$	$-1,190427\cdot10^{-1}$	$-1,086849\cdot10^{-1}$	$-9,393755\cdot10^{-2}$
A_3	$-8,781352\cdot10^{-3}$	$-3,038972\cdot10^{-2}$	$-1,327171\cdot10^{-2}$	$-1,926288\cdot10^{-2}$
A_4	$-1,364331\cdot10^{-3}$	$-1,892189\cdot10^{-2}$	$-1,958586\cdot10^{-2}$	$-2,656406\cdot10^{-2}$
A_5	$-9,050865\cdot10^{-3}$	$-4,226131\cdot10^{-3}$	$-5,044877\cdot10^{-3}$	$-1,752214\cdot10^{-3}$
A_6	$1,272829\cdot10^{-3}$	$6,713687\cdot10^{-3}$	$5,104324\cdot10^{-4}$	$2,332126\cdot10^{-3}$
A_7	$1,036950\cdot10^{-3}$	$-1,230153\cdot10^{-3}$	$-4,326303\cdot10^{-3}$	$-1,798216\cdot10^{-4}$
A_8	$-5,656189\cdot10^{-4}$	$-1,801051\cdot10^{-3}$	$4,297417\cdot10^{-3}$	$9,720491\cdot10^{-3}$
A_9	$4,093151\cdot10^{-5}$	$2,044276\cdot10^{-4}$	$5,234896\cdot10^{-4}$	$-6,124236\cdot10^{-4}$
A_{10}	$2,490499\cdot10^{-6}$	$1,267978\cdot10^{-4}$	$-4,717444\cdot10^{-4}$	$-1,052030\cdot10^{-3}$
A_{11}	$2,688367\cdot10^{-6}$	$4,301223\cdot10^{-5}$	$1,524085\cdot10^{-4}$	$4,249761\cdot10^{-4}$
A_{12}			$-1,080832\cdot10^{-4}$	$-3,185175\cdot10^{-5}$
A_{13}			$-4,492372\cdot10^{-5}$	$-1,245333\cdot10^{-4}$
A_{14}			$3,036316\cdot10^{-5}$	$8,250148\cdot10^{-5}$
A_{15}			$-5,596802\cdot10^{-7}$	$-2,153671\cdot10^{-5}$
A_{16}				
A_{17}				
A_{18}				
A_{19}				

A_l	E, MeV			
	6	8	9	10
A_1	$1,809298\cdot10^{-1}$	$2,403260\cdot10^{-1}$	$2,674455\cdot10^{-1}$	$2,928140\cdot10^{-1}$
A_2	$-7,860278\cdot10^{-2}$	$-4,781798\cdot10^{-2}$	$-3,261912\cdot10^{-2}$	$-1,848497\cdot10^{-2}$
A_3	$-3,535168\cdot10^{-2}$	$-6,823740\cdot10^{-2}$	$-7,472062\cdot10^{-2}$	$-7,736248\cdot10^{-2}$
A_4	$-2,966771\cdot10^{-2}$	$-4,652191\cdot10^{-2}$	$-4,843831\cdot10^{-2}$	$-4,902725\cdot10^{-2}$
A_5	$1,091123\cdot10^{-2}$	$1,294119\cdot10^{-2}$	$1,050938\cdot10^{-2}$	$9,909807\cdot10^{-3}$
A_6	$7,382993\cdot10^{-3}$	$-2,454678\cdot10^{-3}$	$-5,650286\cdot10^{-3}$	$-4,857732\cdot10^{-3}$
A_7	$1,662213\cdot10^{-3}$	$1,395395\cdot10^{-3}$	$3,768477\cdot10^{-3}$	$3,169186\cdot10^{-3}$
A_8	$4,781696\cdot10^{-3}$	$5,242639\cdot10^{-3}$	$6,823515\cdot10^{-3}$	$5,950404\cdot10^{-3}$
A_9	$-4,324675\cdot10^{-3}$	$2,779027\cdot10^{-4}$	$2,931894\cdot10^{-3}$	$3,983911\cdot10^{-3}$
A_{10}	$2,827957\cdot10^{-5}$	$3,267386\cdot10^{-3}$	$5,808924\cdot10^{-3}$	$9,977556\cdot10^{-3}$
A_{11}	$7,724862\cdot10^{-4}$	$-3,661943\cdot10^{-4}$	$-5,646412\cdot10^{-4}$	$-4,094654\cdot10^{-4}$
A_{12}	$1,078390\cdot10^{-5}$	$-3,467173\cdot10^{-4}$	$-2,518404\cdot10^{-3}$	$-4,035322\cdot10^{-3}$
A_{13}	$1,747508\cdot10^{-4}$	$8,344461\cdot10^{-4}$	$-4,827648\cdot10^{-4}$	$3,374331\cdot10^{-4}$
A_{14}	$1,570806\cdot10^{-4}$	$-6,407053\cdot10^{-4}$	$-3,424923\cdot10^{-4}$	$1,586463\cdot10^{-3}$
A_{15}	$-1,524533\cdot10^{-4}$	$-7,642367\cdot10^{-4}$	$-8,833991\cdot10^{-4}$	$8,075675\cdot10^{-5}$
A_{16}		$-1,157087\cdot10^{-4}$	$-3,125860\cdot10^{-4}$	$-9,720480\cdot10^{-4}$
A_{17}		$4,023461\cdot10^{-5}$	$5,222529\cdot10^{-5}$	$-8,735885\cdot10^{-5}$
A_{18}				
A_{19}				

Cont. 2.14.

A_l	E, MeV		
	11	13	15
A_1	$3,198142\cdot10^{-1}$	$3,699510\cdot10^{-1}$	$4,223763\cdot10^{-1}$
A_2	$1,190067\cdot10^{-3}$	$4,671855\cdot10^{-2}$	$1,001463\cdot10^{-1}$
A_3	$-7,723457\cdot10^{-2}$	$-6,435750\cdot10^{-2}$	$-4,870682\cdot10^{-}$
A_4	$-4,960575\cdot10^{-2}$	$-5,199838\cdot10^{-2}$	$-5,536026\cdot10^{-2}$
A_5	$4,683466\cdot10^{-3}$	$-9,060205\cdot10^{-3}$	$-1,981086\cdot10^{-2}$
A_6	$-3,291566\cdot10^{-3}$	$-1,025260\cdot10^{-2}$	$-1,191715\cdot10^{-2}$
A_7	$1,222917\cdot10^{-3}$	$-6,911418\cdot10^{-3}$	$-9,186341\cdot10^{-2}$
A_8	$2,476153\cdot10^{-3}$	$-2,821091\cdot10^{-3}$	$-1,034689\cdot10^{-3}$
A_9	$4,861433\cdot10^{-3}$	$7,039380\cdot10^{-3}$	$4,262631\cdot10^{-2}$
A_{10}	$1,277542\cdot10^{-2}$	$1,590389\cdot10^{-2}$	$1,725199\cdot10^{-3}$
A_{11}	$9,858263\cdot10^{-5}$	$5,823513\cdot10^{-3}$	$1,421194\cdot10^{-2}$
A_{12}	$-4,924602\cdot10^{-3}$	$-2,101392\cdot10^{-3}$	$7,183207\cdot10^{-2}$
A_{13}	$5,901732\cdot10^{-5}$	$-6,941850\cdot10^{-4}$	$1,125376\cdot10^{-3}$
A_{14}	$2,486010\cdot10^{-3}$	$1,915706\cdot10^{-3}$	$-5,071390\cdot10^{-3}$
A_{15}	$-9,047863\cdot10^{-5}$	$8,264599\cdot10^{-5}$	$-2,539325\cdot10^{-3}$
A_{16}	$-2,318305\cdot10^{-3}$	$-4,410425\cdot10^{-3}$	$-3,392622\cdot10^{-3}$
A_{17}	$-6,070390\cdot10^{-4}$	$-2,906756\cdot10^{-3}$	$-3,901434\cdot10^{-3}$
A_{18}		$-1,207650\cdot10^{-3}$	$-3,893949\cdot10^{-3}$
A_{19}		$3,445681\cdot10^{-4}$	$-1,263612\cdot10^{-4}$

Table 2.15. Matrix of inelastic transitions resulting from the (n, n'), (n, 2n) and (n, 3n) processes

i	σ_{in} $(i,\ i+k)$ at equal k										
	0	1	2	3	4	5	6	7	8	9	10
0	0,204	0,035	0,021	0,067	0,258	0,377	0,318	0,104	0,026	0,007	0,001
1	0,278	0,048	0,039	0,137	0,204	0,251	0,134	0,044	0,012	0,003	
2	0,268	0,051	0,097	0,299	0,468	0,326	0,132	0,041	0,011	0,002	
3	0,393	0,120	0,189	0,441	0,384	0,203	0,073	0,018	0,004	0,001	
4	0,573	0,318	0,525	0,413	0,224	0,099	0,026	0,006	0,001		
5	0,829	0,412	0,382	0,137	0,044	0,012					
6	1,132	0,205	0,062	0,030	0,008	0,001					
7	0,892	0,333	0,003								
8	0,456	0,411									
9	0,087	0,193	0,060	0,014	0,002						
10	0,000	0,000	0,000	0,002	0,001						

Table 2.16. Neutron spectrum from the (n, n') (continuous spectrum), (n, 2n) and (n, 3n) reactions

E_n, MeV	Reaction type	Secondary neutron energy, MeV and reaction spectrum														
1,5	(n, n')	0,025	0,075	0,125	0,175	0,225	0,261									
		3,048	4,291	4,485	4,279	3,891	0,000									
2	(n, n')	0,033	0,100	0,167	0,233	0,300	0,367	0,433	0,500	0,567	0,633	0,700	0,761			
		1,518	2,069	2,093	1,932	1,700	1,452	1,213	0,995	0,804	0,642	0,506	0,000			
3	(n, n')	0,05	0,15	0,25	0,45	0,55	0,75	0,85	0,95	1,15	1,35	1,45	1,65	1,75	1,761	
		1,187	1,533	1,468	1,064	0,858	0,522	0,397	0,297	0,159	0,081	0,057	0,026	0,017	0,000	
4	(n, n')	0,067	0,200	0,600	0,867	1,000	1,267	1,400	1,667	1,800	2,067	2,200	2,467	2,600	2,733	2,761
		1,058	1,306	0,788	0,453	0,332	0,170	0,119	0,056	0,037	0,016	0,010	0,004	0,002	0,001	0,000
5	(n, n')	0,083	0,250	0,583	0,750	1,083	1,250	1,583	1,750	2,083	2,250	2,583	2,750	2,917	3,250	3,417
		0,969	1,149	0,806	0,612	0,323	0,226	0,106	0,070	0,030	0,019	0,007	0,004	0,002	0,001	0,000
6	(n, n')	0,1	0,3	0,5	0,9	1,1	1,5	1,7	2,1	2,5	3,1	3,5	3,9	4,1	4,5	4,761
		0,858	0,985	0,838	0,480	0,344	0,168	0,116	0,55	0,028	0,013	0,009	0,007	0,006	0,005	0,000
7	(n, n')	0,117	0,350	0,583	0,817	0,283	1,750	2,217	2,450	2,917	3,383	3,850	4,550	4,783	5,717	5,761
		0,779	0,868	0,717	0,541	0,274	0,131	0,063	0,045	0,026	0,017	0,013	0,009	0,008	0,005	0,000
	(n, 2n)	0,117	0,350	0,466												
	1st neutron	2,027	2,258	0,000												
	(n, 2n)	0,04	0,08	0,12	0,16	0,20	0,24	0,28	0,32	0,466						
	2nd neutron	1,092	2,900	4,16	4,712	4,5253	3,730	2,589	1,347	0,000						
9	(n, n')	0,25	0,45	0,75	1,35	1,95	2,55	3,15	3,75	4,35	5,25	5,85	6,45	7,05	7,65	7,761
		0,689	0,727	0,568	0,278	0,124	0,057	0,029	0,019	0,013	0,009	0,007	0,006	0,004	0,003	0,000
	(n, 2n)	0,15	0,45	0,75	1,05	1,35	1,65	1,95	2,25	2,466						
	1st neutron	0,578	0,612	0,484	0,364	0,299	0,344	0,390	0,261	0,000						
	(n, 2n)	0,04	0,12	0,20	0,32	0,52	0,80	0,96	1,16	1,32	1,52	1,68	1,72	1,92	2.16	2,466
	2nd neutron	0,042	0,282	0,588	0,961	1,183	0,907	0,627	0,396	0,213	0,132	0,053	0,109	0,030	0,003	0,000

11	(*n*, *n'*)	0,183	0,55	1,283	2,017	2,750	3,483	4,217	4,950	5,683	6,417	7,150	7,883	8,617	9,350	9,673
		0,583	0,615	0,324	0,141	0,662	0,031	0,019	0,014	0,000	0,008	0,006	0,005	0,004	0,003	0,000
	(*n*, 2*n*)	0,183	0,550	0,917	1,283	1,650	2,017	2,383	2,750	3,117	3,483	3,850	4,217	4,466		
	1st neutron	0,612	0,613	0,457	0,313	0,206	0,134	0,088	0,060	0,045	0,046	0,085	0,068	0,000		
	(*n*, 2*n*)	0,04	0,20	0,40	0,60	0,80	1,00	1,40	1,60	1,80	2,20	2,40	2,80	3,000	3,40	4,466
	2nd neutron	0,016	0,262	0,619	0,809	0,823	0,724	0,425	0,294	0,193	0,071	0,040	0,011	0,005	0,001	0,000
13	(*n*, *n'*)	0,217	0,650	1,517	2,383	3,250	4,117	4,983	5,850	6,717	7,583	8,450	9,317	10,183	11,050	11,761
		0,393	0,453	0,290	0,145	0,066	0,036	0,023	0,017	0,013	0,010	0,008	0,006	0,005	0,001	0,000
	(*n*, 2*n*)	0,217	0,650	1,083	1,517	1,950	2,383	2,817	3,250	3,683	4,117	4,983	5,417	5,850	6,283	6,466
	1st neutron	0,307	0,556	0,461	0,304	0,194	0,124	0,080	0,054	0,038	0,029	0,020	0,020	0,017	0,015	0,000
	(*n*, 2*n*)	0,04	0,12	0,20	0,36	0,80	1,20	1,80	2,00	2,20	2,60	3,00	3,40	3,80	4,20	6,466
	2nd neutron	0,009	0,067	0,156	0,357	0,664	0,593	0,310	0,230	0,166	0,078	0,033	0,013	0,004	0,001	0,000
	(*n*, 3*n*)	0,217	0,650	0,811												
	1st neutron	2,298	0,009	0,000												
	(*n*, 3*n*)	0,04	0,08	0,12	0,16	0,20	0,24	0,28	0,32	0,36	0,40	0,44	0,48	0,52	0,56	0,811
	2nd neutron	0,661	1,857	2,890	3,492	3,630	3,387	2,891	2,281	1,658	1,101	0,655	0,334	0,132	0,030	0,000
	(*n*, 3*n*)	0,04	0,08	0,12	0,16	0,20	0,24	0,28	0,32	0,36	0,40	0,811				
15	3rd neutron	5,857	5,650	4,586	3,372	2,151	1,560	0,944	0,495	0,186	0,009	0,000				
	(*n*, *n'*)	0,25	0,75	1,75	2,75	3,75	4,75	5,75	6,75	7,75	8,75	9,75	10,75	12,75	13,75	13,761
		0,272	0,317	0,224	0,135	0,082	0,053	0,036	0,027	0,020	0,016	0,012	0,009	0,006	0,003	0,000
	(*n*, 2*n*)	0,25	0,75	1,75	2,75	3,75	4,75	5,25	5,75	6,25	6,75	7,25	7,75	8,25	8,466	
	1st neutron	0,035	0,075	0,183	0,326	0,149	0,082	0,065	0,054	0,046	0,040	0,041	0,092	0,101	0,000	
	(*n*, 2*n*)	0,04	0,08	0,12	0,24	0,40	0,48	0,60	1,00	1,60	2,00	2,40	3,00	4,00	5,00	8,466
	2nd neutron	0,006	0,021	0,045	0,142	0,293	0,362	0,449	0,573	0,437	0,297	0,179	0,100	0,011	0,001	0,000
	(*n*, 3*n*)	0,25	0,75	1,25	1,75	2,811										
	1st neutron	1,476	0,444	0,074	0,007	0,000										
	(*n*, 3*n*)	0,04	0,08	0,12	0,40	0,60	0,80	1,00	1,20	1,40	1,60	1,80	2,00	2,20	2,811	
	2nd neutron	0,049	0,169	0,327	1,217	1,193	0,881	0,573	0,285	0,131	0,052	0,017	0,004	0,001	0,000	
	(*n*, 3*n*)	0,04	0,08	0,12	0,28	0,40	0,48	0,60	0,80	1,00	1,20	1,40	1,60	1,80	2,00	2,811
	3rd neutron	1,498	1,833	1,939	1,629	1,226	0,979	0,673	0,333	0,151	0,063	0,024	0,008	0,002	0,001	0,000

Table 2.17. Spectrum of γ-rays accompanying inelastic processes

E_n, MeV	E_γ, MeV (from inelastic scattering)															
	0,05	0,1	0,2	0,3	0,4	0,6	0,8	1,0	1,5	2,0	2,5	3,0	4,0	5,0	6,0	7,0
15	0,004	0,025	0,153	0,395	0,743	1,517	2,377	3,189	3,117	2,394	1,639	1,080	0,422	0,146	0,045	0,012
12	0,004	0,024	0,150	0,385	0,722	1,462	2,278	3,039	2,855	2,073	1,318	0,797	0,256	0,070	0,016	0,003
9	0,003	0,023	0,144	0,367	0,687	1,373	2,118	2,806	2,478	1,648	0,931	0,491	0,113	0,020	0,003	0,000
6	0,003	0,021	0,131	0,331	0,614	1,196	1,820	2,390	1,889	1,078	0,489	0,198	0,023	0,002		
3	0,002	0,017	0,102	0,260	0,443	0,839	1,548	1,549	0,991	0,402	0,158	0,000				

E_n, MeV	E_γ, MeV (from radiative capture)														
	0,05	0,1	0,2	0,4	0,6	0,8	1,0	1,5	2,0	3,0	4,0	5,0	6,0	8,0	10,0
15	0,008	0,056	0,325	1,920	3,047	3,537	3,740	3,397	2,754	1,569	0,793	0,362	0,152	0,021	0,002
12	0,008	0,055	0,322	1,903	3,012	3,478	3,655	3,245	2,551	1,342	0,618	0,254	0,094	0,009	0,000
9	0,008	0,055	0,320	1,888	2,975	3,412	3,555	3,060	2,306	1,090	0,440	0,156	0,049	0,003	0,000
6	0,008	0,054	0,316	1,864	2,917	3,310	3,405	2,800	1,975	0,800	0,266	0,074	0,017	0,000	
3	0,001	0,054	0,310	1,830	2,832	3,159	2,182	2,430	1,561	0,484	0,115	0,021	0,003		
1	0,001	0,053	0,303	1,789	2,732	2,987	2,940	2,069	1,191	0,271	0,004	0,000			

E_n, MeV	E_γ, MeV (from fission)														
	0,1	0,2	0,3	0,5	0,7	1,0	1,5	2,0	2,5	3,0	4,0	5,0	6,0	8,0	9,0
0—15	1,0	5,2	6,3	6,2	5,0	3,2	1,2	0,65	0,40	0,22	0,089	0,027	0,014	0,001	0,0

E_n, MeV	E_γ, MeV (from the (n, 2n) process)													
	0,05	0,1	0,2	0,3	0,5	0,8	1,2	1,6	2,0	2,5	3,0	4,0	5,0	6,0
8	0,003	0,020	0,116	0,293	0,717	0,846	0,513							
11	0,002	0,014	0,085	0,239	0,688	0,961	0,974	0,748	0,479	0,223	0,084	0,005		
15	0,005	0,035	0,205	0,578	1,666	2,149	2,086	1,652	1,187	0,721	0,410	0,108	0,021	0,003

E_n, MeV	E_γ, MeV (from the (n, 3n) process)												
	0,05	0,1	0,2	0,3	0,5	0,07	0,9	1,1	1,3	1,5	1,8	2,1	2,4
15	0,0005	0,0039	0,025	0,064	0,177	0,283	0,334	0,352	0,307	0,259	0,164	0,086	0,038

Table 2.18. Group-averaged constants for ^{240}Pu

№	E_i, E_{i+1}	$\sigma_{n\gamma}$	σ_{nf}	$\bar{\nu}$	σ_{nn}	$\sigma_{nn'}$	$\sigma_{n,2n}$	$\sigma_{n,3n}$	μ_l	ξ
		b			b					
0	10,5—15 МэВ	0,004	2,249	4,541	2,624	0,527	0,432	0,009	0,8829	0,0010
1	6,5—10,5	0,007	2,181	3,958	3,375	0,962	0,094		0,8691	0,0011
2	4—6,5	0,012	1,571	3,565	4,496	1,695			0,8483	0,0013
3	2,5—4,0	0,020	1,644	3,308	4,323	1,826			0,7794	0,0018
4	1,4—2,5	0,046	1,654	3,127	3,321	2,185			0,6227	0,0029
5	0,8—1,4	0,102	1,463	3,006	3,627	1,816			0,5015	0,0042
6	0,4—0,8	0,186	0,592	2,934	6,004	1,438			0,3609	0,0053
7	0,2—0,4	0,211	0,121	2,892	8,302	1,228			0,2540	0,0062
8	0,1—0,2	0,260	0,076	2,871	10,465	0,867			0,1259	0,0073
9	46,5—100 кэВ	0,449	0,082	2,860	11,778	0,356			0,0522	0,0079
10	21,5—46,5	0,765	0,097	2,854	12,437	0,003			0,0238	0,0081
11	10—21,5	1,061	0,105	2,852	13,010	0,000			0,0118	0,0082
12	4,65—10,0	1,428	0,117	2,851	14,069				0,0066	0,0083
13	2,15—4,65	2,028	0,150	2,850	15,760				0,0042	0,0083
14	1,0—2,15	3,294	0,216	2,850	18,211				0,0031	0,0083
15	465—1000 эВ	4,814	0,269	2,850	18,528				0,0028	0,0083
16	215—465	7,852	0,059	2,850	22,048				0,0028	0,0083
17	100—215	24,044	0,130	2,850	29,189				0,0028	0,0083
18	46,5—100	42,398	0,154	2,850	59,564				0,0028	0,0083
19	21,5—46,5	68,247	0,235	2,850	43,721				0,0028	0,0083
20	10,0—21,5	30,898	0,669	2,850	8,934				0,0028	0,0083
21	4,65—10,0	0,776	0,001	2,850	8,459				0,0028	0,0083
22	2,15—4,65	8,768	0,002	2,850	13,298				0,0028	0,0083
23	1,0—2,15	9363,358	1,657	2,850	724,759				0,0028	0,0083
24	0,465—1,0	1189,321	0,210	2,850	45,343				0,0028	0,0083
25	0,215—0,465	163,154	0,029	2,850	0,303				0,0028	0,0083
	0,0253	287,798	0,059	2,850	1,540				0,0028	0,0083