

STATUS OF PSEUDO FISSION-PRODUCT CROSS SECTIONS FOR FAST REACTORS

Results of the SWG17

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Abstract

Within the framework of the SWG17 benchmark organized by a Working Party of the Nuclear Science Committee of the Nuclear Energy Agency, a comparison of lumped or pseudo fission product cross sections for fast reactors has been made. Four institutions participated with data libraries based on the JEF2.2, EAF-4.2, BROND-2, FOND-2.1, ADL-3 and JENDL-3.2 evaluated nuclear data files.

Several parameters have been compared with each other: the one-group cross sections and reactivity worths of the lumped nuclide for several partial absorption and scattering cross sections, and the one-group cross sections of the individual fission products. Also graphs of the multi-group cross sections of the lumped nuclide have been compared.

From two contributions based on JEF2.2, it can be concluded that the data processing influences the capture cross section by about 1% and the inelastic scattering cross section by 2%. The differences between the lumped cross sections of the different data libraries are surprisingly small: maximum 6% for capture and 9% for the inelastic scattering. Similar results are obtained for the reactivity effects. Since the reactivity worth of the lumped nuclide is dominated by the capture reaction, the maximum spread in the total reactivity worth is still only 5.5%.

The one-group capture and inelastic scattering cross sections of most of the important individual fission products differ by less than 10% (root mean square values). For the (n,2n) group cross sections, which are rather sensitive to the weighting spectrum in the fast energy range, these differences are several tens of percents.

The final conclusion is that the present status of lumped nuclide cross sections for fast reactors is satisfactory, although some improvements are possible as indicated in this report.

Keywords

Cross sections
Data Libraries
Fast Reactors
Fission products
Pseudo Nuclides

15050002

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1. INTRODUCTION

This report summarizes the results of the Subworking Group 17 (SWG17) of the Working Party on Evaluation Coordination (WPEC) of the Nuclear Energy Agency (NEA) of the Organisation for Economic Development (OECD) at Paris. The objective of SWG17 was to investigate the status of fission-product cross section evaluations for fast reactor applications by means of comparison of the lumped fission product effects in fast power reactors. The definition of the activities of the subgroup was established at the May 1995 meeting of the WPEC at Paris. The background was that for future development of fast power reactors with extended burnup the reactivity effect of fission products need to be known preferably with an uncertainty of about 5% (1σ).

An uncertainty of 5% in the reactivity effect is a rather small uncertainty compared to the actual uncertainty in the cross sections (averaged over a fast-reactor flux spectrum) of the individual fission products. However, since the reactivity effect is composed of a very large number of contributions of individual fission products, cancellation of errors may occur, leading to a reduced uncertainty in the lumped effect. This could be true for statistical errors, but not for errors of systematic nature. Since for the bulk of the fission products there are only few experimental data available in the fast energy range, most evaluated data rely heavily on calculations, with adjustments to available differential or in some cases integral data. For the radiative capture cross sections the Hauser-Feshbach theory with width-fluctuation correction is used in all evaluations; a small systematic error could result from different formalisms used for the width fluctuation correction and global (optical-model) parametrizations. However, in general local systematics were used for the parametrization, reducing the effects of systematic errors. Also from experimental data adjustment a small systematic error could result. A rather small contribution results for (n,p) and (n, α) reactions. It is believed that altogether the systematic uncertainty in the lumped capture effect is below 5%.

Another component of the reactivity effect of fast power reactors is due to elastic and particularly inelastic scattering. In this case the important contributions (10 to 15%) to the total reactivity effect result from the lowest levels excited by inelastic scattering. Here only few measurements exist and the evaluations are in general based upon Hauser-Feshbach theory with width fluctuation correction. There has been some concern that in most evaluations a spherical optical model was used and that direct excitation was neglected. Since it is known that for many nuclides in the fission-product mass range direct excitation cannot be neglected at high energies, it was expected that also at lower energies some effect could be seen. Early γ -ray measurements of (n,n') reactions and integral reactivity measurements also indicated that the current evaluations were in general too low at low energies. Another subgroup (SWG 10) deals with these questions and new measurements were made, eg. for Pd and Mo isotopes. Meanwhile, it is clear that in the early evaluations of some fission products the cross sections for the excitation of low-lying states were too low. However the neglect of direct-collective effects was not the reason for the too low values at low energies; this was merely due to the optical-model parametrization. A coupled channels optical model generally showed the best results. At higher energies these effects however are important. The expectation was that altogether the uncertainty in the lumped inelastic scattering reactivity effect could be larger than the corresponding capture effect. A figure of 30% would not be surprising.

A comparison of lumped fission-product capture cross sections based upon different nuclear data libraries should reveal a spread in the data from which perhaps some conclusions could be drawn about the uncertainty and about the possible need to enhance evaluation efforts. An important condition is that the different libraries are independent. This is not completely true, since the same basic methodology and often the same experimental data were used. Also in some cases data for one library were adopted in another library. However there are some notable differences between the evaluations. First of all, different evaluators have used different parametrizations and in some evaluations more recent data have been used than in others. As an example, the JEF-2.2 fission product file has been adjusted to integral data, the JENDL-3 data file has undergone extensive re-evaluation with recent data. The BROND-2 file is another source of independent data. Furthermore, new activation files like EAF-4.2 and ADL-3 have been issued recently with emphasis on radiative capture and other charged-particle emission reaction cross sections. These new activation files are very complete, since they contain virtually all fission-product cross sections. Altogether it is believed that the outcome of an comparison could yield valuable indications with regard to the status of and uncertainty of the lumped fission-product effect in fast reactors.

Therefore, a computational benchmark was defined where participants were asked to calculate pseudo fission-product cross sections, using their own multigroup structure and given concentrations for the fissile nuclide ^{239}Pu . A micro flux weighting spectrum, typical for a fast power reactor has been supplied pointwise, but it was not strictly necessary to use it for the generation of multigroup constants, to avoid large amounts of work. The participant could also use its own library with a probably different weighting spectrum. However, the weighting spectrum was obligatory for the condensation to one-group cross sections. In a later phase also a pointwise adjoint flux spectrum was specified to allow for reactivity worth calculations. The results requested were: multi-group pseudo cross sections, one-group pseudo cross sections and reactivity worths, mainly for capture and inelastic scattering. For further interpretation also the one-group cross sections of the individual fission products were requested. All data necessary to perform the benchmark are included in this report. Almost all results are reproduced.

2. BENCHMARK DESCRIPTION

The lumped or pseudo fission-product nuclide accounts for the neutron absorption and scattering of all the individual fission products present in the spent fuel due to the fissioning of one actinide atom. The effective yields of the individual fission products are given in Appendix A for five different actinide atoms. In the benchmark, the yields of ^{239}Pu were used to calculate the cross sections of the lumped nuclide according to:

$$\sigma^x = \sum_{n=1}^N \gamma_n \sigma_n^x \quad (2.1)$$

where γ_n is the effective yield or concentration of fission product n and σ_n^x is the one-group microscopic cross section of that fission product for reaction type x . The yields of all the fission products specified in Appendix A sum to 2. If the contributions of some fission products are omitted from the sum in equation 2.1, e.g. due to lack of cross sections, the participant should specify the resulting sum of yields in his calculations. The cross section of the individual fission product n in equation 2.1 is weighted over the total energy range by:

$$\sigma_n^x = \frac{\sum_{g=1}^G \Phi_g \sigma_{n,g}^x}{\sum_{g=1}^G \Phi_g} \quad (2.2)$$

with Φ_g the fine-group neutron spectrum. This function had to be derived by linear interpolation (lin-lin) from the pointwise neutron spectrum provided in the benchmark description (see figure 2.1 and Appendix B). For scattering cross sections, equation 2.2 reads:

$$\sigma_n^x = \frac{\sum_{g=1}^G \Phi_g \sum_{g'=1}^G \sigma_{n,g \rightarrow g'}^x}{\sum_{g=1}^G \Phi_g} \quad (2.3)$$

To be able to solve discrepancies, the participant also had to specify the energy group structure and weighting spectra used to calculate the fine-group microscopic cross sections of the individual fission products ($\sigma_{n,g}^x$ in equation 2.2 and $\sigma_{n,g \rightarrow g'}^x$ in equation 2.3). The preferred micro-flux weighting spectrum is the one specified in Appendix B.

The participants had to calculate the contribution of the lumped nuclide to the reactivity effect according to:

$$\rho^x = - \frac{\sum_{g=1}^G \sigma_g^x \Phi_g^* \Phi_g}{\sum_{g=1}^G \Phi_g^* \Phi_g} \quad (2.4)$$

where Φ_g^* is the adjoint function. For a scattering cross section, the reactivity

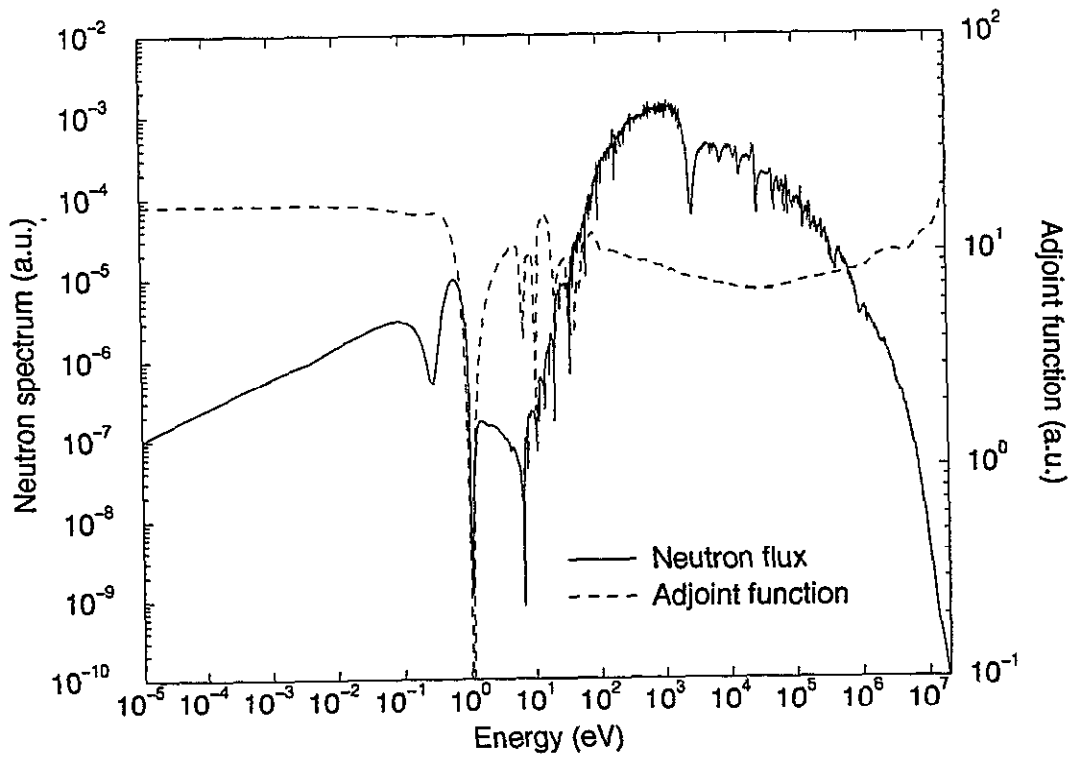


Figure 2.1 The pointwise neutron spectrum and adjoint function used in the benchmark.

effect is given by:

$$\rho^x = - \frac{\sum_{g=1}^G \sigma_{g \rightarrow g'}^x (\Phi_g^* - \Phi_{g'}^*) \Phi_g}{\sum_{g=1}^G \Phi_g^* \Phi_g} \quad (2.5)$$

Also the denominator in equations 2.4 and 2.5 had to be specified by the participants. The adjoint function was given pointwise with a linear interpolation scheme (lin-lin), cf. 2.1 and Appendix B.

3. PARTICIPANTS

Contributions to the benchmark were received from CEA (France), ECN (Netherlands), IPPE (Russia) and JNDC (Japan).

3.1 CEA

The contribution of the Commissariat à l'Energie Atomique (CEA) is based on a fine-group version of the JEF2.2 evaluated nuclear data file. The one-group cross sections and the corresponding reactivity worths of 80 individual fission products have been calculated as well as the one-group cross sections and reactivity worths of the lumped nuclide. The sum of yields of all the 80 fission products equals 1.90933.

3.2 ECN

The Netherlands Energy Research Foundation (ECN) contributed results based on the JEF-2.2 evaluated nuclear data file and the EAF-4.2 activation file. The first-mentioned file contains data for elastic and inelastic scattering and partial activation cross sections, the second one contains only partial activation and transmutation cross sections. The radiative capture cross sections in EAF-4.2 for the important fission product nuclides have been adopted from the JEF-2.2 file.

A fine-group library in XMAS structure (172 groups) is used, weighted with a thermal reactor spectrum and based on the JEF-2.2 evaluated nuclear data file. It contains the cross sections of 155 individual fission products with a sum of yields of 1.99936. From this library, one-group cross sections of all individual fission products were calculated as well as the fine-group cross sections and scattering matrices of the lumped nuclide. These were subsequently used to calculate the one-group cross sections and the reactivity worths of the lumped nuclide.

The extensive EAF-4.2 file was used for comparison and to calculate the influence of the weighting spectrum used in the preparation of the fine-group data library. Therefore, two fine-group libraries were made with different weighting spectra: one based on a thermal reactor spectrum (Maxwellian, 1/E and fission spectrum) and one based on the fast reactor spectrum specified in the benchmark. The fine-group cross sections of all individual fission products were used to calculate the fine-group cross sections of the lumped nuclide, which were subsequently condensed to one group.

3.3 IPPE

Three different contributions of the Institute of Physics Power Engineering (IPPE) were received based on libraries from the BROND-2, the FOND-2.1, and the ADL-3 evaluated nuclear data files. The BROND-2 file contains original evaluations made in Russia. The general purpose FOND-2.1 file contains BROND-2, but has been extended with other evaluations. The ADL-3 file is an extended activation/transmutation library. The BROND-2 library contains only 49 of the 162 requested fission products with a total cumulative yield of 1.3689; the extensive FOND-2.1 and ADL-3 libraries contain all 162 nuclides. For this reason, not all the BROND-2 results are reported here.

Two versions of the BROND-2 and FOND-2.1 libraries were used. First, existing fine-group versions with 299 energy groups were used to calculate the one-group (n,γ) cross sections of the individual fission products and the fine-group and one-group (n,γ) cross section and the corresponding reactivity worth of the lumped nuclide. Secondly, broad-group libraries with 28 energy groups condensed with a standard weighting spectrum (not the one specified in this benchmark) were used to calculate the (n,γ) cross section and the corresponding reactivity worth of the lumped nuclide, and the reactivity worth due to inelastic scattering (the inelastic scattering matrix in this FOND-2.1 library contains the contributions of 125 individual fission products with a sum of yields of 1.9340). The broad-group FOND-2.1 library was also used to calculate the one-group radiative capture cross section of the lumped nuclide. This cross section differs about 1% from the one-group cross section calculated by the fine-group version of the FOND-2.1 library and is omitted from the comparison in this report.

A fine-group version of the ADL-3 activation library with 299 energy groups was used to calculate for various reactions the one-group cross sections of the individual fission products and the one-group cross sections and the reactivity worths of the lumped nuclide.

3.4 JNDC

JNDC is a joint contribution of Kawasaki Heavy Industries, Hitachi, Toshiba Corporation and the Japan Atomic Energy Research Institute. Two contributions were received: one based on a 70-group library processed from the JENDL-3.2 evaluated nuclear data file and one based on a 73-group library. In both cases, a typical FBR spectrum was used for the micro flux weighting by the TIMS code. The JENDL-3.2 file contains 140 fission products of the 162 requested ones (see Appendix A) with a sum of yields of 1.99714.

First, a 70-group data library was made containing elastic and inelastic scattering matrices, and absorption cross sections in the energy range up to 10 MeV. This library contains the total absorption cross sections, but no partial capture cross sections. From this library, one-group cross sections for absorption, elastic and inelastic scattering and the $(n,2n)$ reaction of the individual fission products were calculated as well as the one-group cross sections and the corresponding reactivity worths of the lumped nuclide. The results of this library have preference from the view point of reactor calculations.

Secondly, a 73-group data library was made based on the 70 group data library with three energy groups added in the range between 10 and 19.64 MeV. From this library, one-group cross sections were made for all reactions except the partial inelastic scattering ones. Also the fine-group cross sections, the one-group cross sections and the corresponding reactivity worths of the lumped nuclide were calculated. From the view point of nuclear data evaluation, this library has preference.

4. RESULTS LUMPED NUCLIDE

4.1 One-group cross sections

The one-group cross sections of the pseudo fission products are given in Table 4.1 for the elastic scattering (MT=2), inelastic scattering (MT=4), (n,2n) reaction (MT=16), radiative capture (MT=102), (n,p) reaction (MT=103) and (n, α) reaction (MT=107). The last column of the table contains the maximum spread. First we discuss the important capture and inelastic scattering cross sections. The maximum spread is about 6% for capture and about 9% for inelastic scattering. The highest values are for JEF-2.2 and rather low values for JENDL-3.2. Also the total and elastic scattering cross sections are relatively low in JENDL-3.2. Possibly the optical model parametrizations were quite different. For (n,2n), (n, α) and (n,p) there are large discrepancies. This has probably to do with the fact that these threshold cross sections show a steep rise where the fission spectrum declines steeply. Since the shape of the cross section is rather uncertain, this is reflected in the one-group cross section. It is noted that weighting spectrum differences as well as group structure differences may play a role, cf section 4.4. The contributions of the (n,p) and (n, α) reactions to the total absorption cross section can be neglected. The conclusion is that the 6% maximum spread in the capture cross seems reasonable whereas the 9% spread in the inelastic cross section is smaller than expected.

4.2 Reactivity worths

The corresponding table for the reactivity effects is given in table 4.2. It is noted that the reactivity effects are given here with a normalization that is different from common practice. Thus absolute values have no meaning. On average the total reactivity effect consists mainly of the radiative capture effect with a 10% contribution of inelastic scattering and very small contributions from the other components (less than 1%). Due to the fact that inelastic scattering cannot be calculated from the activation files a full comparison is only available for JEF-2.2 and JENDL-3.2. The maximum differences in the total reactivity is 5.5% and in the capture and inelastic scattering components 5.8% and 4.8%, respectively.

Table 4.1 *One group cross sections of the pseudo nuclide.*

Lab	File	Flux ^a	2 (b)	4 (b)	16 (mb)	102 (b)	103 (μb)	107 (μb)	Total (b)
CEA	JEF-2.2 ^b		15.2	0.590		0.571			16.4
ECN	JEF-2.2	T	15.2	0.577	1.23	0.577	12.0	4.4	16.4
ECN	EAF-4.2 ^c	T			1.44	0.570	11.8	11.3	16.4
ECN	EAF-4.2 ^d	F			1.57	0.565	12.1	11.5	
JNDC	JENDL-3.2	F	14.4	0.531	1.12	0.546	5.4	21.4	15.5
IPPE	BROND-2 ^e			0.425	0.64	0.499			
IPPE	FOND-2.1			0.527	0.78	0.578	12.8	5.32	
IPPE	ADL-3				0.92	0.544	7.5	6.73	
Average ^f			14.8	0.545	1.12	0.561	10.0	9.9	15.9
Maxdiff (%)			5.4	9.0	70	5.9	74	172	5.7

^a Micro flux weighting spectrum (T is thermal, F is fast reactor weighting).^b Not used for average to avoid double counting of JEF-2.2 values.^c Not used for average; used to inspect the effect of the micro flux weighting.^d (n,γ) cross section not used for average because of relation with JEF-2.2.^e Not used for average because of missing nuclides.^f Numbers in italics not included in the average.Table 4.2 *Reactivity effects of the pseudo nuclide (arbitrary units).*

Lab	File	Flux ^a	2 (au) ^j	4 (au)	16 (au) ^j	102 (au)	Total (au)	Total Corr ^h
CEA	JEF-2.2 ^b		-4.25	-0.0708		-0.580	-0.655	-0.656
ECN	JEF-2.2	T	-3.92	-0.0684	-0.694	-0.583	-0.656	-0.656
ECN	EAF-4.2 ^c	T				-0.576		
ECN	EAF-4.2 ^d	F				-0.571		-0.642
JNDC	JENDL-3.2	F	-4.67	-0.0652	-0.644	-0.546	-0.622	-0.622
IPPE	BROND-2 ^e			-0.0477		-0.504		
IPPE	FOND-2.1 ^f			-0.0632		-0.584		
IPPE	FOND-2.1 ^g			-0.0654		-0.584	-0.649	-0.654
IPPE	ADL-3			-0.0654		-0.550		-0.621
Average ⁱ			-4.30	-0.0663	-0.669	-0.567	-0.644	-0.639
Maxdiff(%)			17	4.8	7.5	5.8	5.3	5.5

^a Micro flux weighting spectrum (T is thermal, F is fast reactor weighting).^b Not used for average to avoid double counting of JEF-2.2 values.^c Not used for average; used to inspect the effect of the micro flux weighting (see also table 4.3).^d (n,γ) cross section not used for average because of relation with JEF-2.2.^e Not used for average because of missing nuclides.^f Not used for average because of missing nuclides^g Corrected for missing nuclides (factor 2/1.934 for MT=4).^h Missing data supplemented with average value of missing components.ⁱ Numbers in italics not included in the average.^j Numbers have been multiplied by 1·10³.

4.3 Cross section plots

In Appendix C all data have been plotted for capture, inelastic scattering and (n,2n) cross sections. In this chapter, a detailed analysis is made mainly based on JEF-2.2, FOND-2.1 and JENDL-3.2.

First the plots of group cross sections for the radiative capture cross section are compared (see figures 4.1 and 4.2). Because the cross sections of the lumped nuclide show a $1/v$ behaviour above 100 keV, the same curves multiplied with the square root of the energy are shown in figures 4.3 and 4.4, respectively. In the energy range above 100 keV, the various evaluations only differ by a small factor. At lower energies, the resonance structure is visible and some differences between the evaluations is seen from the graphs. At the thermal groups the differences merely reflect the differences in the group structures. This also holds to a certain extent at the highest energies; above 10 MeV there are some differences in the direct-collective capture contributions. Altogether, since in the important energy range above 100 eV, most of the resonance structure has averaged out, there is good reason to believe that the hypothesis of cancellation of errors is correct for fast reactors and that in fact only systematic errors determine the uncertainty in fast capture effect. From the curves 4.3 and 4.4, it is seen that JENDL-3.2 is generally lower than JEF-2.2 and FOND-2.1 above 100 eV. In particular there are differences in the "unresolved range" from 1 to 100 keV.

Secondly, the plots of inelastic scattering cross sections are inspected (see figure 4.5). Here there is remarkable agreement between 200 keV and 10 MeV, but there are some differences below 200 keV. Apparently, cancellation of errors works well above 100 keV, but since there are many less nuclides with levels below 200 keV and since these have different threshold energies, the cross section below 200 keV shows a large spread. As the region up to 200 keV is quite important in fast reactors it could be worthwhile to concentrate on these nuclides. Further analysis shows that the cross section at 10 keV is mainly due to ^{151}Sm and to a lesser extent due to ^{103}Ru . Other important nuclides with thresholds below 200 keV are ^{101}Ru , ^{133}Cs , ^{103}Rh , ^{145}Nd , ^{107}Pd and ^{149}Sm .

The plots for the (n,2n) cross section show a large spread (see figure 4.6), which is partly due to the different group structures and flux weighting spectra used. Still it is curious that at 14 MeV, for which many (n,2n) measurement data are available, the FOND-2.1 library is too low. This needs further investigation. The EAF-4.2 evaluation was adjusted to 14 MeV data or systematics.

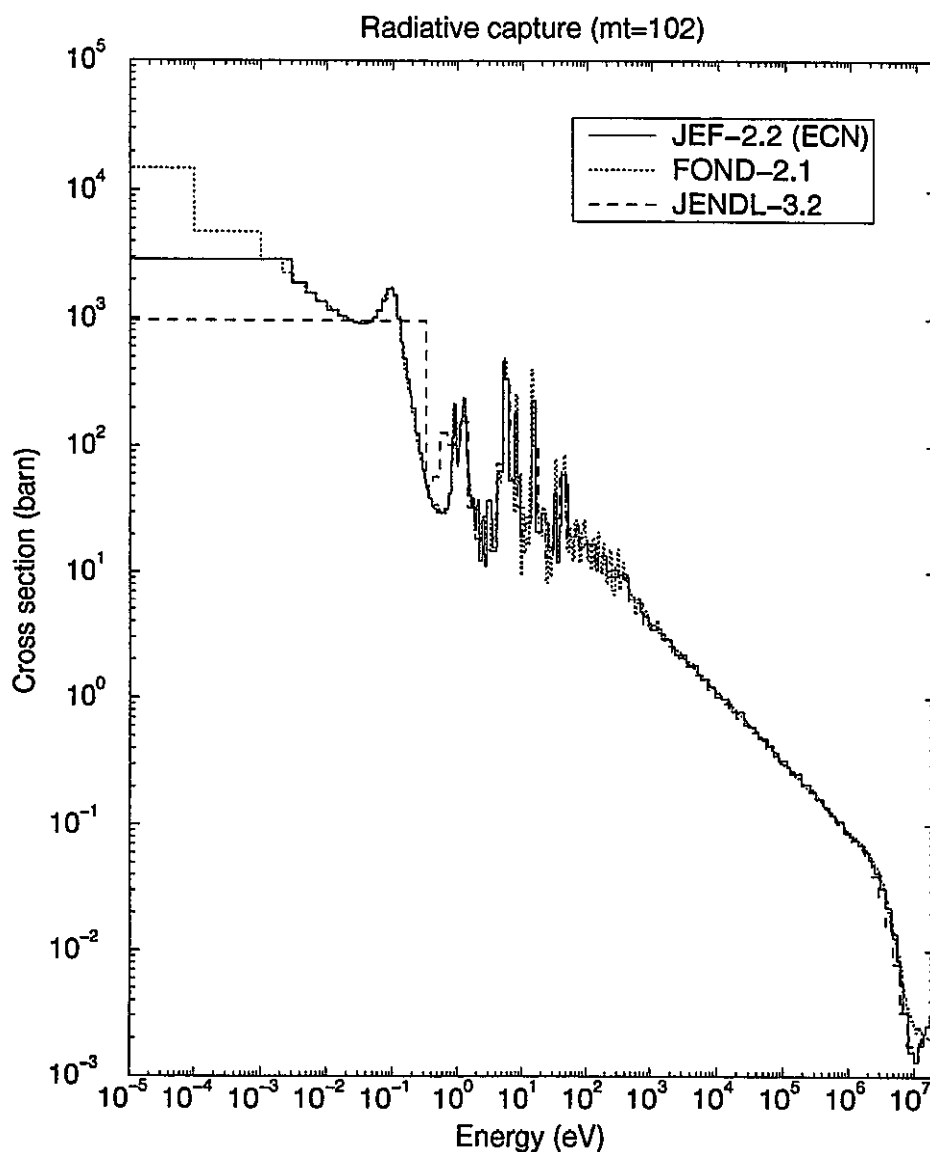


Figure 4.1 *The radiative capture cross section of the lumped nuclide as a function of the energy. Above 1 keV, the pseudo fission product behaves as a $1/v$ nuclide. The EAF-4.2 results are not shown because they are very close to JEF-2.2. The BROND-2 results are shown in Appendix C where a full comparison is given. The ADL-3 results are not available.*

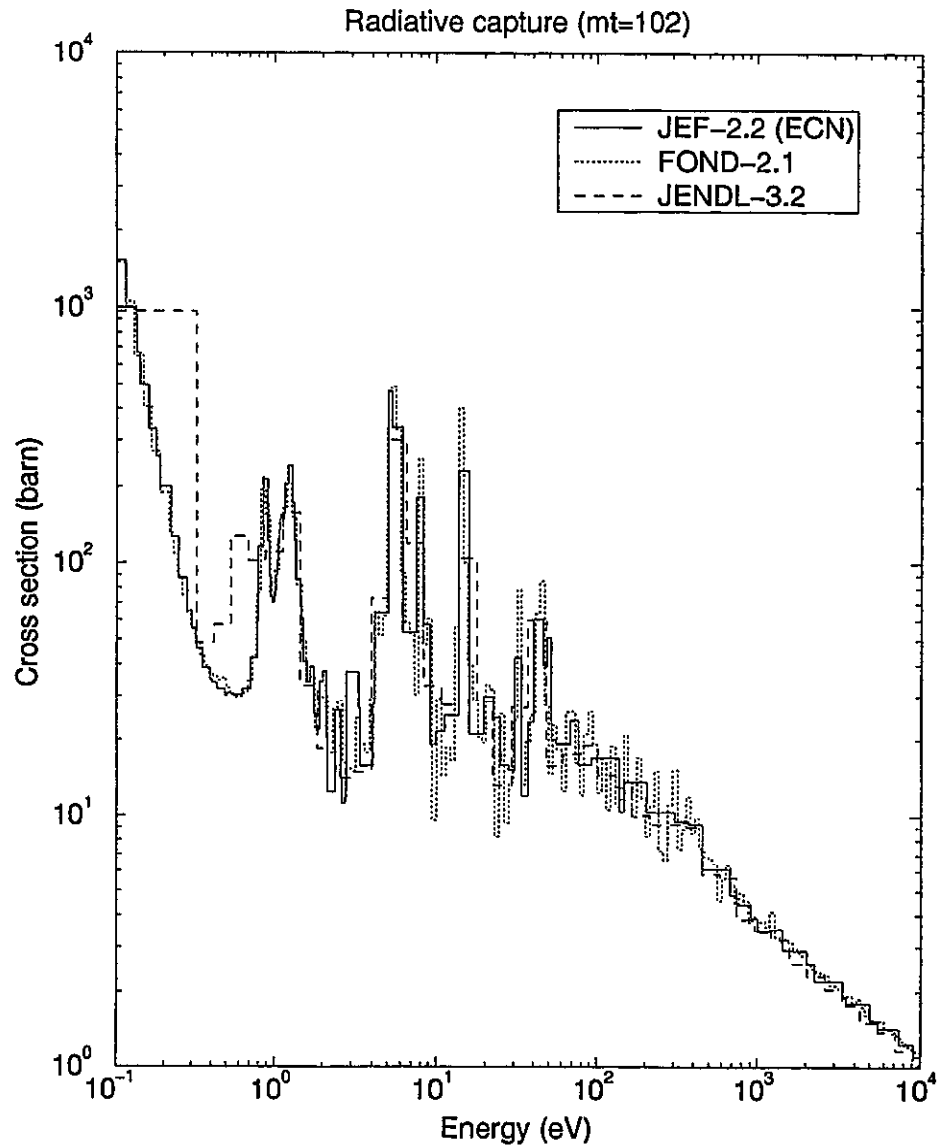


Figure 4.2 The radiative capture cross section of the lumped nuclide as a function of the energy in the range between 0.1 eV and 10 keV. The main differences are due to the different energy group structures used by the participants. The EAF-4.2 results are very close to JEF-2.2, the BROND-2 results are shown in Appendix C and the ADL-3 results are not available.

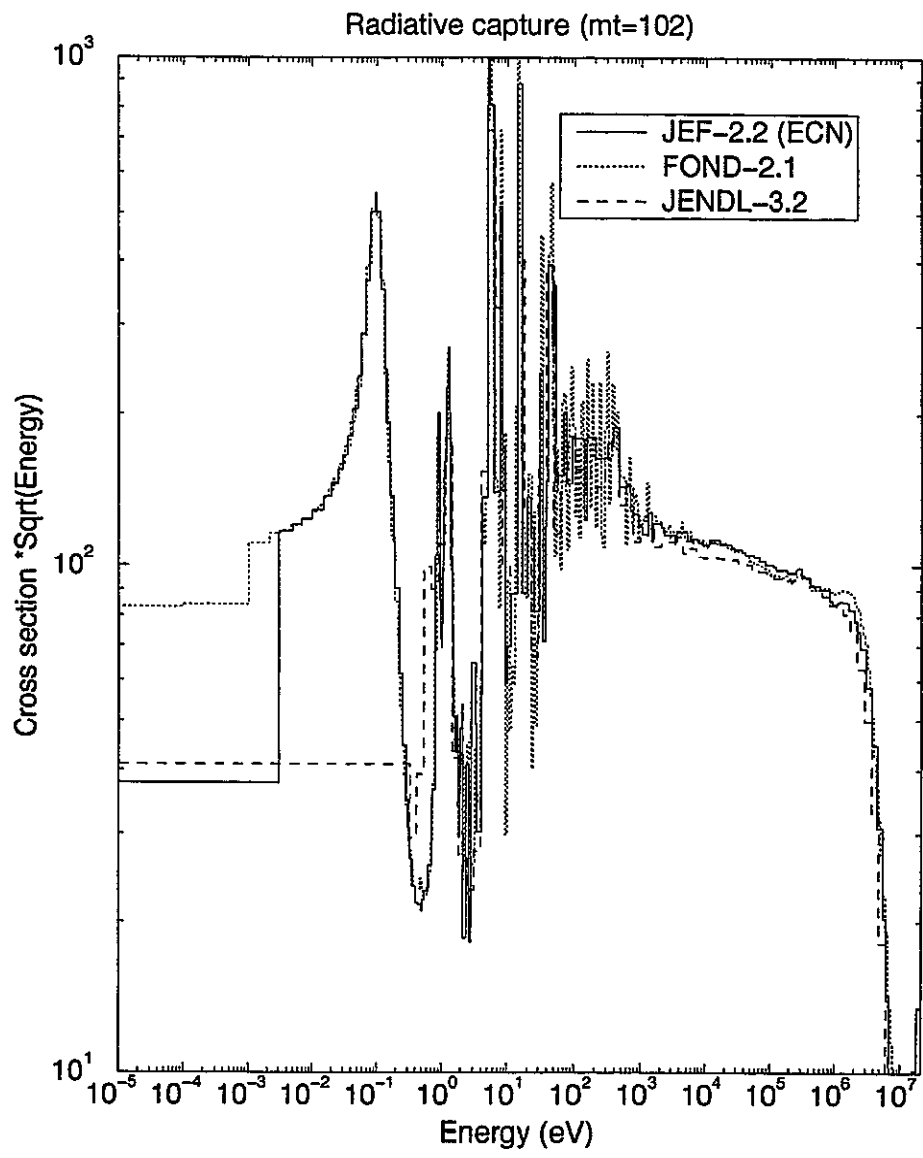


Figure 4.3 *The radiative capture cross section of the lumped nuclide multiplied with the square root of the energy as a function of the energy. The differences in the unresolved resonance range are evident from this figure. Again, the EAF-4.2 results are very close to JEF-2.2, the BROND-2 results are shown in Appendix C and the ADL-3 results are not available.*

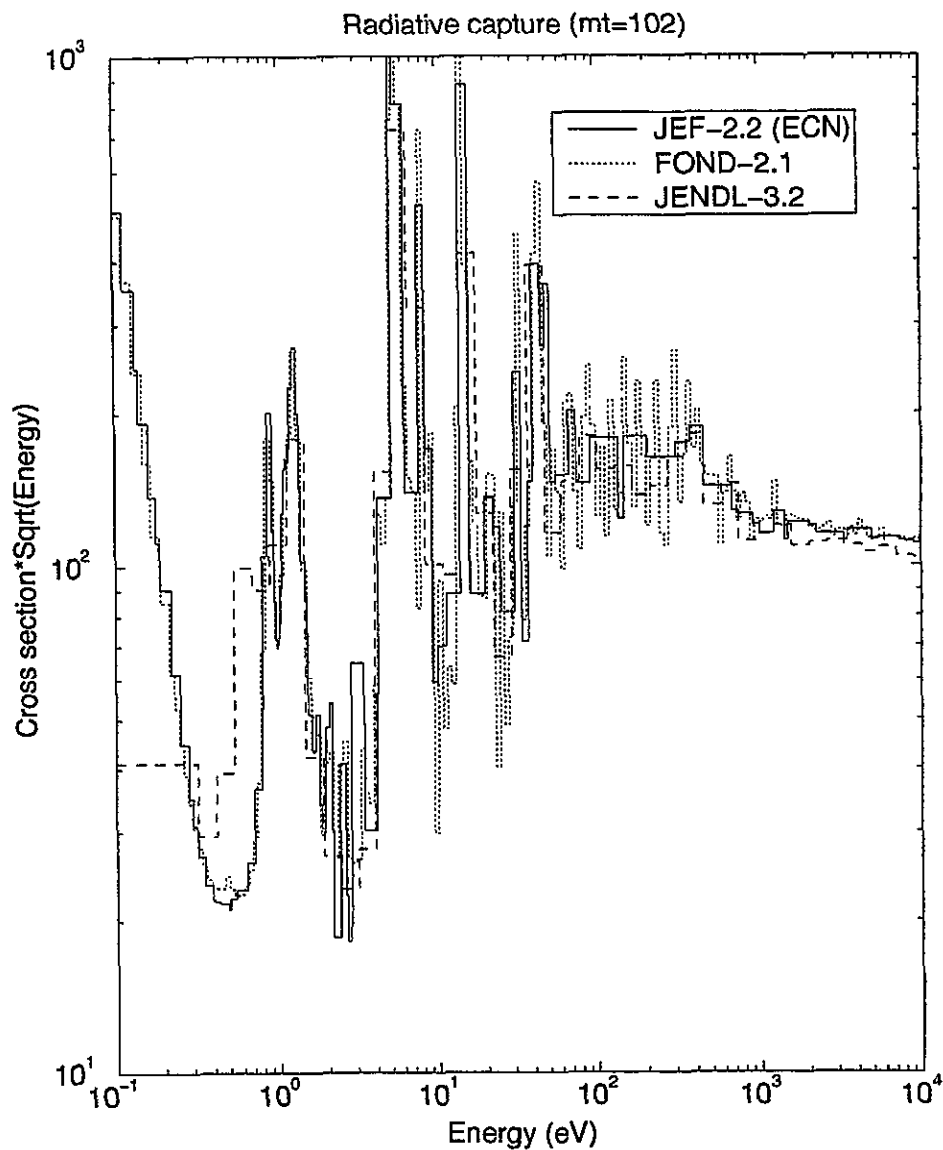


Figure 4.4 The radiative capture cross section of the lumped nuclide multiplied with the square root of the energy as a function of the energy in the range between 0.1 eV and 10 keV. Again, the EAF-4.2 results are very close to JEF-2.2, the BROND-2 results are shown in Appendix C and the ADL-3 results are not available.

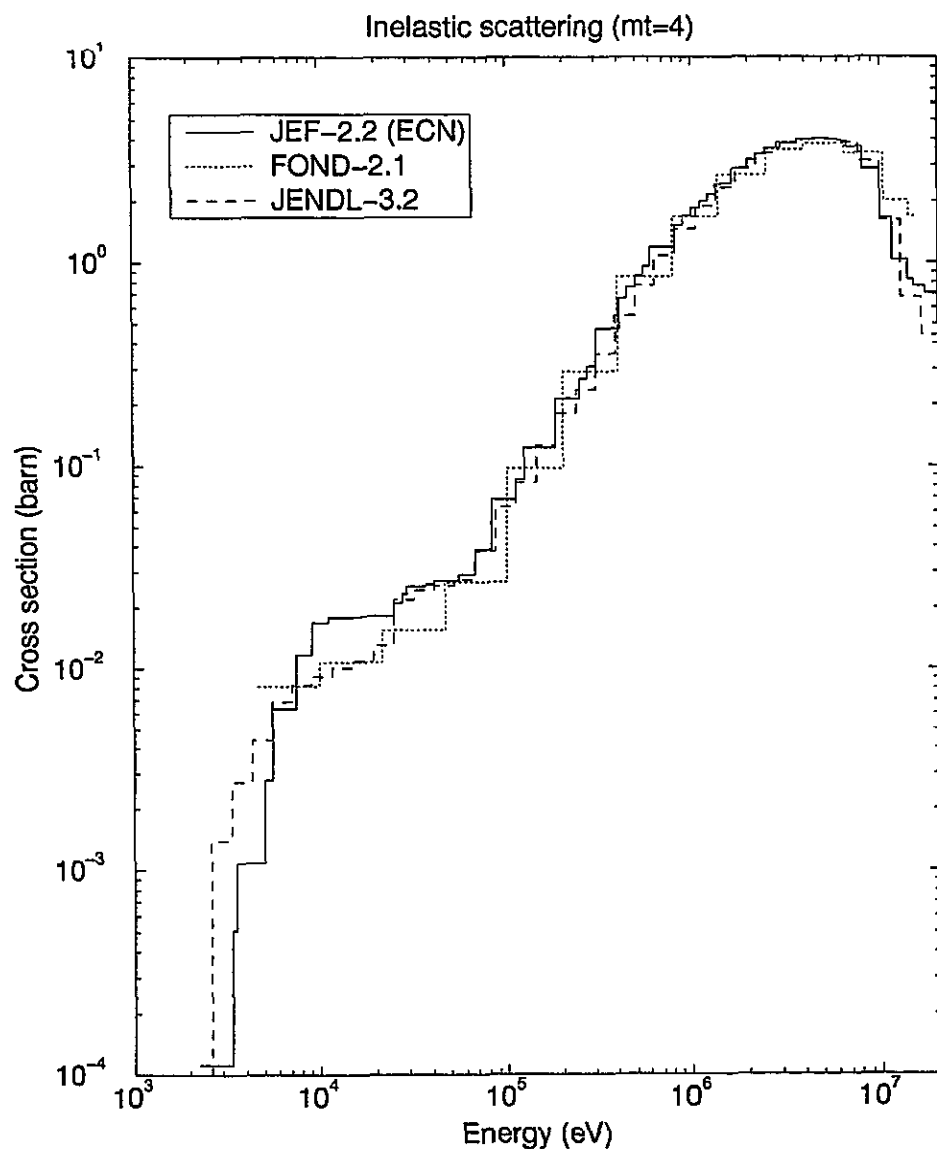


Figure 4.5 The inelastic scattering cross section of the lumped nuclide as a function of the energy. In the MeV range, the deviations are smallest. At the lower energies (10 keV), the nuclides ^{151}Sm and ^{103}Ru dominate the cross section. Other important nuclides with thresholds below 200 keV are ^{101}Ru , ^{133}Cs , ^{103}Rh , ^{145}Nd , ^{107}Pd and ^{149}Sm .

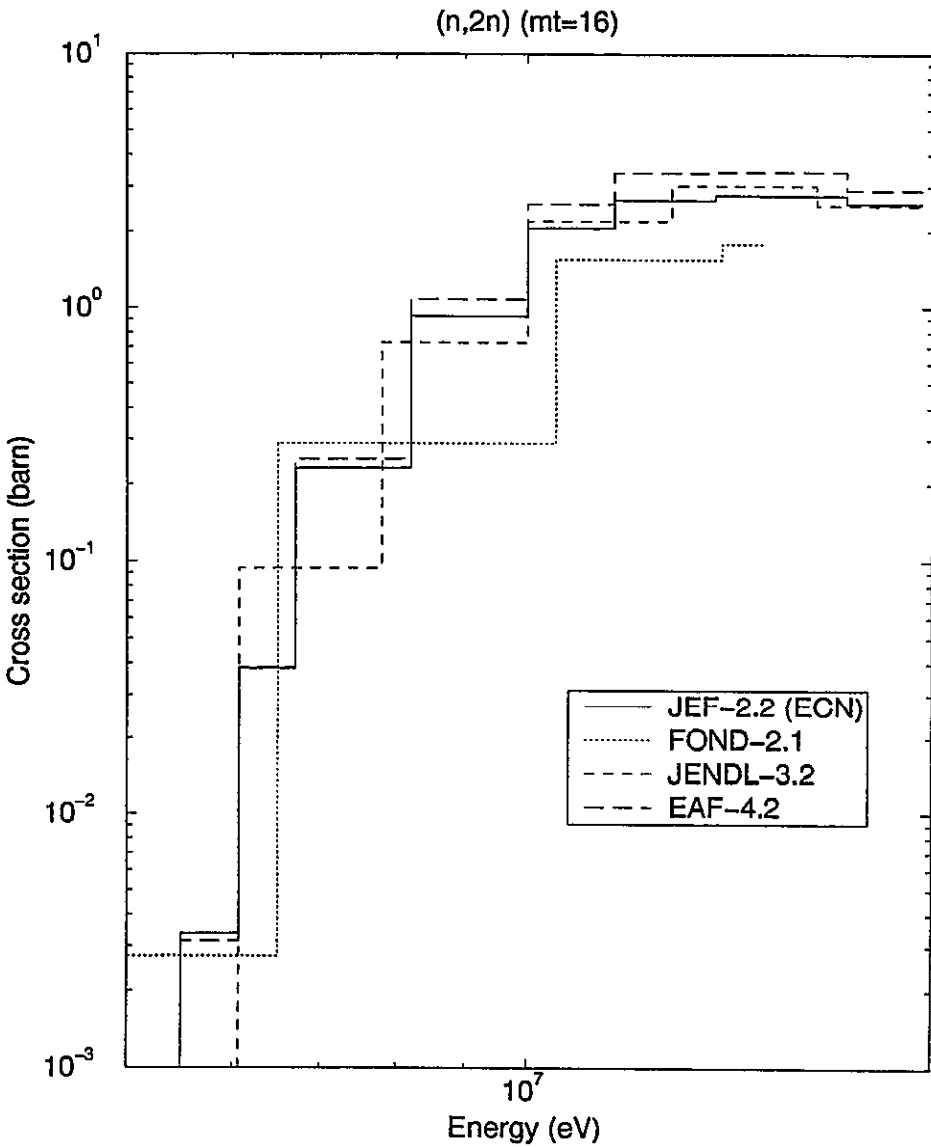


Figure 4.6 The (n,2n) cross section of the lumped nuclide as a function of the energy.

4.4 Influence of the weighting spectrum

As mentioned in section 3.2, the basic EAF-4.2 file has been collapsed to a fine-group cross section data library in the XMAS group structure by use of two different weighting spectra: a light-water reactor spectrum (Maxwellian, $1/E$ and fission spectrum) and the fast reactor spectrum shown in figure 2.1. Subsequently the two fine-group libraries were collapsed to one group by the neutron spectrum provided in the benchmark.

Table 4.3 shows the two results. When the thermal weighting spectrum is used, the threshold reactions have up to 8% smaller cross sections and less negative reactivity worths than in case the fast weighting spectrum is used. This effect is quite large. Apparently, the threshold reactions are very sensitive to the weighting spectrum used. The difference for the radiative capture cross section is, however, less than 1%. For the inelastic cross sections as far as available on EAF-4.2 (for production of metastable states only) the differences are below 2% (not shown in table 4.3). Therefore, the use of a pseudo fission product based on individual nuclide cross sections weighted with a thermal reactor spectrum is justified, provided the number of fine energy groups is sufficiently large.

The results of table 4.3 should also be compared with those of tables 4.1 and 4.2. For the $(n,2n)$ reaction, the EAF-4.2 file gives higher cross sections than JEF-2.2, which is probably due to the missing data in JEF-2.2 (see chapter 5). There is a good agreement for the (n,γ) and (n,p) cross sections. For the (n,α) reaction the EAF-4.2 data seem quite high.

Table 4.3 *One-group cross sections and reactivity worths calculated with the EAF-4.2 activation file processed by two a thermal and fast weighting spectrums.*

MT	Thermal	Fast	Ratio
One-group cross sections			
16	1.443e-03	1.572e-03	0.918
17	3.220e-05	3.478e-05	0.926
102	5.703e-01	5.653e-01	1.009
103	1.179e-05	1.212e-05	0.973
104	8.235e-07	8.613e-07	0.956
105	7.417e-08	7.950e-08	0.933
106	2.298e-09	2.430e-09	0.946
107	1.129e-05	1.147e-05	0.984
111	1.348e-08	1.430e-08	0.942
Reactivity worths			
102	-5.760e-01	-5.709e-01	1.009
103	-1.746e-05	-1.792e-05	0.974
104	-1.764e-06	-1.851e-06	0.953
105	-1.694e-07	-1.817e-07	0.932
106	-5.168e-09	-5.476e-09	0.944
107	-1.482e-05	-1.506e-05	0.984
111	-3.073e-08	-3.268e-08	0.940

5. FISSION-PRODUCT CROSS SECTIONS

Table 5.1 gives the one-group radiative capture cross sections for 130 nuclides in order of descending importance (according to the product of concentration and cross section). In the French data set some nuclides are lacking in the lumped fission product (values set to zero). The differences between the CEA and ECN results reflect the processing differences.

Intercomparison of the data for the various nuclides reveals that there are still rather large differences between the values of the cross sections of different nuclides. The strong resonance absorbers ^{149}Sm , ^{151}Sm , ^{153}Eu , ^{155}Eu have high cross sections also in fast power reactors. The last columns of table 5.1 contain the averages and root mean square values. Note that in this table, JEF-2.2 is counted twice, which may give too optimistic results. From the top-20 nuclides the RMS values are less than 10%, except for the nuclides ^{151}Sm , ^{103}Ru , ^{135}Cs . These are unstable nuclides, for which there are almost no measurements. Integral data are available for these nuclides and have been used in the JEF-2.2 evaluation. From the next 20 nuclides the one with RMS larger than 20% are ^{155}Eu , ^{96}Zr , and ^{95}Zr . It is recommended to have a closer look at these nuclides. More generally, the largest uncertainties come from unstable nuclides. Still, the average RMS value for the top 40 nuclides is below 10%.

Table 5.2 gives the one-group inelastic scattering cross sections for JEF-2.2 and JENDL-3.2 for the most important nuclides in order of descending importance. The activation libraries EAF-4.2 and ADL-3 do not contain total inelastic scattering cross sections. The differences between the values of the cross sections for different nuclides are smaller than in the case of radiative capture. The largest values are obtained for ^{151}Sm and ^{103}Ru , which are nuclides with rather low excitation levels (below 100 keV). The RMS values for the top 40 nuclides are less than 15%, except for the nuclides ^{104}Ru , ^{131}Xe , ^{139}La , ^{151}Sm , ^{144}Ce (but only two different evaluations were considered). These nuclides should be inspected in more detail. The average RMS value for the top 40 nuclides is less than 8%, which is surprisingly small.

From table 5.3 where the (n,2n) one-group cross sections are compared, it becomes evident that the JEF-2.2 data file does not contain data for all nuclides. The RMS values are in general below 35%, however the cross section difference is rather systematic, with relatively low values for ADL-3. This needs further investigation.

Table 5.1 *One group cross sections for radiative capture (MT=102) of the nuclides in order of descending importance determined by the product of the cross section (FOND-2.1) and yield of the nuclide.*

Institute Library	CEA JEF-2.2	ECN JEF-2.2	IPPE FOND-2.1	IPPE ADL-3	JNDC JENDL-3.2	Average	RMS (%)
¹⁰¹ Ru	0.7143	0.7243	0.7616	0.7141	0.7523	0.7333	2.71
¹⁰⁵ Pd	0.9369	0.9490	0.9161	0.8568	0.9594	0.9236	3.94
¹⁴⁹ Sm	2.5398	2.5437	2.8700	2.6540	2.2990	2.5813	7.17
⁹⁹ Tc	0.6301	0.6479	0.6561	0.6152	0.5923	0.6283	3.65
¹³³ Cs	0.5072	0.5167	0.5184	0.4715	0.4874	0.5003	3.62
¹⁰⁷ Pd	1.0569	1.0700	1.0399	0.9840	1.0520	1.0406	2.87
¹⁰³ Rh	0.6751	0.6832	0.6526	0.6124	0.6774	0.6601	3.94
¹⁴⁷ Pm	1.5064	1.5167	1.4309	1.3335	1.2753	1.4126	6.72
¹⁵¹ Sm	3.3618	3.3998	2.9413	2.6922	2.1080	2.9006	16.43
¹⁰³ Ru	1.1828	1.1992	1.2140	1.1416	0.5047	1.0485	26.03
⁹⁷ Mo	0.3351	0.3406	0.3568	0.3159	0.3484	0.3394	4.08
¹⁴⁵ Nd	0.5657	0.5700	0.5124	0.4755	0.5648	0.5377	6.99
¹³¹ Xe	0.2917	0.2937	0.3323	0.3018	0.3461	0.3131	7.03
¹⁵³ Eu	2.7363	2.7655	2.9288	2.4251	2.5958	2.6903	6.31
¹⁴³ Nd	0.3592	0.3550	0.3370	0.3080	0.3589	0.3437	5.70
¹⁰² Ru	0.1558	0.1581	0.1796	0.1732	0.1642	0.1662	5.41
¹⁰⁹ Ag	0.7846	0.7927	0.7203	0.6705	0.6916	0.7319	6.69
¹⁰⁴ Ru	0.1517	0.1546	0.1658	0.1572	0.1685	0.1596	4.06
¹³⁵ Cs	0.2379	0.2445	0.1361	0.2269	0.2284	0.2148	18.56
¹⁴¹ Pr	0.1553	0.1582	0.1540	0.1360	0.1564	0.1520	5.34
⁹⁵ Mo	0.3180	0.3204	0.3351	0.3096	0.3360	0.3238	3.16
⁹⁸ Mo	0.1233	0.1280	0.1179	0.1067	0.1194	0.1191	5.97
¹⁰⁰ Mo	0.0933	0.0938	0.1011	0.0862	0.1000	0.0949	5.64
¹⁵⁵ Eu	2.8163	2.8428	2.9559	2.6783	1.3368	2.5260	23.80
¹⁰⁸ Pd	0.1778	0.1770	0.2507	0.2352	0.2358	0.2153	14.60
¹³² Xe	0.0689	0.0708	0.0755	0.0804	0.0980	0.0787	13.27
⁹³ Zr	0.1349	0.1335	0.1042	0.0924	0.1057	0.1141	14.94
¹⁵² Sm	0.4951	0.4956	0.5077	0.4768	0.4799	0.4910	2.31
¹⁴¹ Ce	0.2970	0.2963	0.2960	0.2754	0.2977	0.2925	2.93
¹²⁹ I	0.3644	0.3700	0.3804	0.3566	0.3840	0.3711	2.72
¹⁰⁶ Ru	0.0922	0.0871	0.0946	0.0887	0.0916	0.0909	2.91
⁹⁶ Zr	0.0343	0.0358	0.0590	0.0550	0.0391	0.0447	22.98
¹⁰⁶ Pd	0.1994	0.2027	0.2553	0.1959	0.2772	0.2261	14.85
¹²⁷ I	0.6168	0.6199	0.6307	0.5806	0.6028	0.6102	2.83
¹⁴⁶ Nd	0.0947	0.0956	0.1100	0.0911	0.1076	0.0998	7.57
¹⁴⁸ Nd	0.1703	0.1681	0.1636	0.1609	0.1469	0.1620	5.08
¹³⁴ Xe	0.0361	0.0360	0.0374	0.0292	0.0272	0.0332	12.53
¹³⁹ La	0.0339	0.0333	0.0390	0.0320	0.0343	0.0345	6.86
⁹⁵ Nb	0.3469	0.3496	0.2705	0.3311	0.3669	0.3330	9.99
⁹⁵ Zr	0.0651	0.0643	0.1229	0.0586	0.1489	0.0919	40.13

Table 5.1 *Continued.*

Institute Library	CEA JEF-2.2	ECN JEF-2.2	IPPE FOND-2.1	IPPE ADL-3	JNDC JENDL-3.2	Average	RMS (%)
¹¹⁰ Pd	0.0970	0.0985	0.2189	0.0920	0.1291	0.1271	37.53
¹¹¹ Cd	0.4605	0.4665	0.4683	0.4350	0.7475	0.5155	22.62
¹⁴⁷ Sm	1.4571	1.4660	1.4183	1.3243	1.2719	1.3875	5.52
¹⁵⁰ Nd	0.1728	0.1748	0.1729	0.1668	0.1626	0.1700	2.68
¹⁵⁴ Eu	3.0951	3.1233	3.1720	2.9430	3.4503	3.1567	5.24
¹⁴³ Pr	0.4094	0.4095	0.4206	0.3847	0.1263	0.3501	32.13
¹⁵⁷ Gd	1.8214	1.8389	1.6372	1.4989	1.3578	1.6308	11.36
⁹² Zr	0.0365	0.0368	0.0433	0.0425	0.0418	0.0402	7.26
⁹¹ Zr	0.0796	0.0789	0.0790	0.0720	0.0913	0.0801	7.77
¹⁵⁶ Gd	0.6203	0.6156	0.7077	0.6631	0.7059	0.6625	6.00
⁹⁴ Zr	0.0229	0.0237	0.0271	0.0262	0.0258	0.0251	6.22
¹⁴⁷ Nd	1.0075	1.0173	0.7995	0.9482	1.2315	1.0008	13.90
¹³⁷ Cs	0.0274	0.0280	0.0160	0.0264	0.0160	0.0228	24.34
¹⁴² Ce	0.0436	0.0442	0.0186	0.0196	0.0252	0.0302	37.57
¹⁴⁴ Ce	0.0493	0.0490	0.0337	0.0470	0.0241	0.0406	24.85
¹⁵⁹ Tb	0.0000	1.7482	2.0672	1.6488	1.8546	1.8297	8.48
¹⁵⁴ Sm	0.2479	0.2507	0.2729	0.2514	0.2471	0.2540	3.77
⁸³ Kr	0.0000	0.2465	0.2422	0.2232	0.2806	0.2481	8.34
¹⁴⁴ Nd	0.0800	0.0807	0.0936	0.0758	0.0829	0.0826	7.23
¹²⁸ Te	0.0418	0.0416	0.1029	0.0387	0.0408	0.0531	46.81
¹⁴⁸ Pm	4.1510	4.1781	4.2530	5.8795	3.2167	4.3357	19.84
¹⁴⁹ Pm	3.5314	3.5548	3.6200	3.3688	1.2367	3.0623	29.93
¹⁴⁰ Ce	0.0138	0.0135	0.0123	0.0142	0.0061	0.0120	24.95
¹¹⁶ Cd	0.0000	0.1182	0.8856	0.1139	0.0823	0.3000	112.80
⁸¹ Br	0.0000	0.4293	0.3892	0.4048	0.2777	0.3752	15.48
¹²⁵ Sb	0.3184	0.3217	0.3216	0.0000	0.4493	0.3527	15.82
¹⁶¹ Dy	0.0000	2.5911	2.5856	2.4223	0.0000	2.5330	3.09
⁹⁹ Mo	0.5052	0.5132	0.5176	0.4907	0.3780	0.4810	10.87
¹¹⁵ In	0.4711	0.4772	0.4755	0.4540	0.6084	0.4972	11.30
¹⁰⁴ Pd	0.0000	0.2016	0.3311	0.1921	0.2993	0.2560	23.57
⁹¹ Y	0.0461	0.0467	0.0472	0.0445	0.0891	0.0547	31.47
¹³¹ I	0.1686	0.1706	0.1743	0.1613	0.2808	0.1911	23.56
¹¹³ Cd	0.4092	0.4134	0.4128	0.3865	0.5273	0.4299	11.57
⁸⁴ Kr	0.0000	0.0699	0.0664	0.0629	0.0519	0.0628	10.77
¹¹² Cd	0.2421	0.2443	0.2535	0.2399	0.2084	0.2377	6.45
¹²⁹ Te	0.0000	0.1387	0.1387	2.7649	0.7658	0.9520	113.18
¹⁵⁰ Sm	0.4543	0.4583	0.3408	0.3237	0.4341	0.4022	14.41
¹²¹ Sb	0.4657	0.4707	0.4663	0.4467	0.4414	0.4582	2.57
¹⁰⁰ Ru	0.0000	0.1996	0.1991	0.1886	0.2067	0.1985	3.26
¹⁵⁸ Gd	0.0000	0.3337	0.3356	0.3126	0.3417	0.3309	3.32
¹³⁰ Te	0.0143	0.0147	0.0149	0.0137	0.0129	0.0141	5.11
¹⁰⁵ Rh	0.5905	0.5988	0.6036	0.0000	0.6544	0.6119	4.09
¹⁴⁰ Ba	0.0000	0.0188	0.0691	0.0185	0.0024	0.0272	92.16
⁸⁷ Rb	0.0247	0.0248	0.0248	0.0213	0.0292	0.0249	10.11
¹³³ Xe	0.1351	0.1287	0.1275	0.1184	0.1380	0.1295	5.26

Table 5.1 *Continued.*

Institute Library	CEA JEF-2.2	ECN JEF-2.2	IPPE FOND-2.1	IPPE ADL-3	JNDC JENDL-3.2	Average	RMS (%)
¹¹⁴ Cd	0.0000	0.2785	0.2818	0.2611	0.1882	0.2524	15.00
¹⁵⁵ Gd	0.0000	2.9068	2.9057	2.6694	2.6347	2.7792	4.59
¹⁴⁸ Sm	0.0000	0.3686	0.3110	0.2907	0.2885	0.3147	10.27
⁹⁰ Sr	0.0131	0.0134	0.0134	0.0126	0.0100	0.0125	10.25
¹⁴⁰ La	0.3773	0.3788	0.3919	0.3507	0.0000	0.3747	3.99
¹³⁶ Xe	0.0031	0.0031	0.0031	0.0029	0.0011	0.0026	28.79
⁸⁹ Y	0.0000	0.0174	0.0145	0.0225	0.0178	0.0180	16.00
¹²⁷ Te	0.0000	0.4100	0.4100	3.1977	0.8786	1.2241	94.39
¹³⁸ Ba	0.0033	0.0034	0.0036	0.0034	0.0052	0.0038	18.71
¹¹¹ Ag	0.0000	0.7936	0.8141	0.7389	0.0000	0.7822	4.06
¹⁴⁸ Pm	0.0000	3.9372	4.2530	3.9542	1.9922	3.5342	25.44
¹¹⁷ Sn	0.0000	0.2228	0.2243	0.2129	0.2377	0.2244	3.93
¹⁴³ Ce	0.0000	0.3364	0.3512	0.3144	0.0000	0.3340	4.53
⁸⁹ Sr	0.0000	0.0225	0.0226	0.0214	0.0126	0.0198	21.01
¹¹⁰ Cd	0.0000	0.2714	0.2658	0.2640	0.2200	0.2553	8.06
¹¹⁸ Sn	0.0000	0.1255	0.1264	0.1204	0.0890	0.1153	13.34
¹²³ Sb	0.0000	0.2560	0.2558	0.2471	0.2849	0.2610	5.46
¹⁶⁰ Gd	0.0000	0.2236	0.1696	0.1726	0.2248	0.1977	13.44
⁷⁷ Se	0.0000	0.4126	0.3864	0.3936	0.3970	0.3974	2.41
¹²³ Sn	0.0000	0.1232	0.1239	0.1179	0.3672	0.1831	58.09
¹²⁵ Te	0.0000	0.4001	0.4019	0.3696	0.3783	0.3875	3.59
⁸⁰ Se	0.0000	0.0582	0.0493	0.0545	0.0422	0.0510	11.75
⁸⁵ Kr	0.0000	0.0436	0.0066	0.0413	0.0597	0.0378	51.29
¹²⁵ Sn	0.0000	0.3681	0.3791	0.3539	0.0000	0.3670	2.81
¹¹⁹ Sn	0.0000	0.0643	0.0630	0.0587	0.1847	0.0927	57.35
¹³⁶ Ba	0.0000	0.0531	0.0505	0.0453	0.0700	0.0547	16.90
¹³⁷ Ba	0.0000	0.0649	0.0680	0.0642	0.0822	0.0698	10.42
¹²⁴ Sn	0.0000	0.0265	0.0281	0.0288	0.0150	0.0246	22.89
¹²⁰ Sn	0.0000	0.0454	0.0454	0.0585	0.0456	0.0487	11.63
⁸⁶ Kr	0.0000	0.0039	0.0034	0.0040	0.0028	0.0036	13.46
¹³⁶ Cs	0.0000	0.3023	0.3187	0.2888	0.2535	0.2908	8.26
⁸⁵ Rb	0.2193	0.2245	0.1979	0.2063	0.2767	0.2250	12.24
⁷⁸ Se	0.0000	0.0806	0.0682	0.0706	0.0917	0.0778	11.95
¹³⁰ Xe	0.0000	0.1265	0.1267	0.1461	0.2729	0.1680	36.33
¹²⁸ Xe	0.0000	0.1905	0.1886	0.2026	0.2600	0.2104	13.82
⁹⁶ Mo	0.0000	0.0859	0.0901	0.0873	0.0893	0.0882	1.88
¹⁶⁰ Dy	0.0000	2.2301	2.2255	2.1165	0.0000	2.1907	2.40
⁸² Se	0.0000	0.0093	0.0094	0.0092	0.0288	0.0142	59.66
¹²⁶ Sn	0.0000	0.0070	0.0070	0.0071	0.0085	0.0074	8.26
¹⁶² Dy	0.0000	0.9439	0.9456	0.8971	0.0000	0.9289	2.42
¹²² Sn	0.0000	0.0234	0.0238	0.0231	0.0276	0.0245	7.56
⁸⁸ Sr	0.0000	0.0010	0.0010	0.0011	0.0041	0.0018	73.81
¹⁵⁶ Eu	0.0000	0.0696	0.0713	0.0650	0.7202	0.2315	121.87
¹⁵⁴ Gd	0.0000	1.1355	1.3159	1.2452	0.9733	1.1675	11.07
¹³⁴ Ba	0.0000	0.1164	0.1120	0.1038	0.2081	0.1351	31.40

Table 5.2 *One group cross sections for inelastic scattering (MT=4), of the nuclides in order of descending importance determined by the product of the cross section (JENDL-3.2) and yield of the nuclide.*

Institute Library	CEA JEF-2.2	ECN JEF-2.2	JNDC JENDL-3.2	Average	RMS (%)
¹⁰¹ Ru	0.6176	0.6012	0.4748	0.5646	11.30
¹³³ Cs	0.4675	0.4576	0.4411	0.4554	2.39
⁹⁹ Tc	0.4633	0.4487	0.3599	0.4239	10.78
¹⁰³ Rh	0.4129	0.4028	0.4041	0.4066	1.11
¹³⁵ Cs	0.3057	0.2998	0.2615	0.2890	6.78
¹⁰⁴ Ru	0.2127	0.2072	0.2919	0.2373	16.30
¹⁰⁵ Pd	0.5106	0.4970	0.3870	0.4649	11.90
¹⁰⁰ Mo	0.2716	0.2641	0.2852	0.2736	3.19
¹⁰² Ru	0.1940	0.1884	0.2426	0.2083	11.68
¹⁴¹ Pr	0.3522	0.3448	0.3577	0.3516	1.50
¹⁴⁵ Nd	0.5086	0.4985	0.5236	0.5103	2.02
¹⁰³ Ru	1.0791	1.0630	0.9858	1.0426	3.91
⁹⁷ Mo	0.2611	0.2549	0.2947	0.2703	6.47
¹³¹ Xe	0.5059	0.4955	0.3559	0.4524	15.12
¹⁰⁷ Pd	0.5094	0.4961	0.4284	0.4780	7.42
¹⁴⁹ Sm	0.9357	0.9174	0.9073	0.9202	1.28
¹³⁹ La	0.2745	0.2693	0.1850	0.2429	16.90
⁹⁸ Mo	0.1898	0.1880	0.1956	0.1911	1.68
¹⁰⁶ Ru	0.2860	0.2792	0.3048	0.2900	3.74
¹³⁷ Cs	0.1718	0.1685	0.1565	0.1656	3.96
¹³⁴ Xe	0.1670	0.1656	0.1268	0.1532	12.17
¹⁵¹ Sm	1.9461	1.9303	1.1939	1.6901	20.76
¹⁴² Ce	0.2104	0.2064	0.1706	0.1958	9.13
¹³² Xe	0.2088	0.2054	0.1559	0.1900	12.71
¹⁴⁷ Pm	0.5153	0.5027	0.4834	0.5005	2.62
⁹³ Zr	0.2349	0.2301	0.2062	0.2237	5.61
¹⁴⁶ Nd	0.3134	0.3060	0.3054	0.3082	1.18
⁹⁵ Mo	0.3383	0.3319	0.3328	0.3343	0.85
¹⁴⁸ Nd	0.3780	0.3695	0.3943	0.3806	2.71
¹⁰⁹ Ag	0.4323	0.4218	0.4105	0.4215	2.11
⁹⁴ Zr	0.1380	0.1368	0.1543	0.1431	5.57
¹³⁶ Xe	0.1156	0.1144	0.0924	0.1075	9.91
¹⁰⁸ Pd	0.2604	0.2547	0.2531	0.2561	1.23
¹⁵⁰ Nd	0.6038	0.5902	0.5478	0.5806	4.11
¹⁴⁴ Ce	0.4548	0.4433	0.2091	0.3691	30.67
¹⁴³ Nd	0.1570	0.1554	0.1380	0.1501	5.74
¹⁵² Sm	0.7550	0.7364	0.6112	0.7009	9.11
⁹² Zr	0.1322	0.1310	0.1510	0.1381	6.63
¹³⁸ Ba	0.1087	0.1076	0.0849	0.1004	10.91
⁹⁶ Zr	0.0883	0.0874	0.0838	0.0865	2.26

Table 5.2 *Continued.*

Institute Library	CEA JEF-2.2	ECN JEF-2.2	JNDC JENDL-3.2	Average	RMS (%)
⁹⁶ Zr	0.0883	0.0874	0.0838	0.0865	2.26
¹²⁹ I	0.4695	0.4605	0.4174	0.4491	5.06
¹⁴⁰ Ce	0.0684	0.0676	0.0780	0.0713	6.61
¹⁵³ Eu	1.0290	1.0051	0.7759	0.9367	12.18
¹¹⁰ Pd	0.2897	0.2838	0.2884	0.2873	0.88
¹³⁰ Te	0.1155	0.1145	0.1292	0.1198	5.60
⁹⁰ Sr	0.1056	0.1047	0.1303	0.1135	10.47
¹⁰⁶ Pd	0.2263	0.2208	0.2036	0.2169	4.46
¹⁵⁴ Sm	0.5118	0.4997	0.6552	0.5556	12.71
¹²⁷ I	0.5195	0.5089	0.4693	0.4992	4.33
⁸⁷ Rb	0.1884	0.1840	0.1813	0.1846	1.58
¹⁴⁴ Nd	0.2105	0.2071	0.2132	0.2103	1.18
⁸³ Kr	0.0000	0.6619	0.5107	0.5863	12.90
¹⁴³ Pr	0.3973	0.3895	0.4662	0.4177	8.26
⁹⁵ Zr	0.1093	0.1083	0.0956	0.1044	5.97
⁹¹ Y	0.1741	0.1713	0.1875	0.1776	3.99
⁹¹ Zr	0.0851	0.0845	0.0913	0.0870	3.51
¹⁵⁵ Eu	0.7267	0.7078	0.6595	0.6980	4.05
¹¹¹ Cd	0.4115	0.4014	0.3348	0.3826	8.90
¹³⁴ Cs	0.7659	0.7546	0.8764	0.7990	6.87
¹⁴¹ Ce	0.1437	0.1421	0.1078	0.1312	12.62
¹⁴⁷ Nd	0.6425	0.6295	0.8092	0.6938	11.79
¹²⁸ Te	0.1524	0.1506	0.1433	0.1488	2.65
⁹⁵ Nb	0.1814	0.1794	0.1316	0.1641	14.03
⁸⁹ Y	0.0000	0.1013	0.0827	0.0920	10.13
¹⁵⁶ Gd	0.5917	0.5773	0.5054	0.5581	6.76
¹⁵⁷ Gd	0.8340	0.8158	0.8253	0.8251	0.90
⁸⁸ Sr	0.0000	0.0404	0.0505	0.0455	11.16
¹⁴⁷ Sm	0.5573	0.5452	0.5243	0.5423	2.51
⁹⁹ Mo	0.5006	0.4874	0.6881	0.5587	16.41
⁸⁴ Kr	0.0000	0.1638	0.1147	0.1392	17.62
¹⁴⁰ Ba	0.0000	0.1311	0.1522	0.1416	7.44
¹³¹ I	0.2701	0.2646	0.2820	0.2722	2.66
⁸⁶ Kr	0.0000	0.1114	0.0655	0.0885	25.98
¹³³ Xe	0.1951	0.1925	0.2571	0.2149	13.88
¹⁵⁸ Gd	0.0000	0.5067	0.5507	0.5287	4.16
⁸¹ Br	0.0000	0.2173	0.3164	0.2669	18.56
⁸⁹ Sr	0.0000	0.0366	0.0790	0.0578	36.74
¹²⁹ Te	0.0000	0.1390	0.1850	0.1620	14.20
¹¹⁹ Sn	0.0000	0.5773	0.6247	0.6010	3.94
⁸⁵ Kr	0.0000	0.0537	0.0620	0.0579	7.16
¹⁵⁰ Sm	0.3317	0.3243	0.3734	0.3431	6.30
⁸² Se	0.0000	0.1211	0.1439	0.1325	8.59
¹²¹ Sb	0.4425	0.4348	0.4908	0.4560	5.44
¹⁰⁰ Ru	0.0000	0.1609	0.2071	0.1840	12.55

Table 5.2 *Continued.*

Institute Library	CEA JEF-2.2	ECN JEF-2.2	JNDC JENDL-3.2	Average	RMS (%)
¹²⁶ Sn	0.0000	0.0667	0.1018	0.0842	20.81
¹¹³ Cd	0.3898	0.3776	0.3305	0.3659	6.99
¹²⁵ Sb	0.1746	0.1714	0.1819	0.1759	2.50
¹⁵⁹ Tb	0.0000	0.9638	0.6133	0.7885	22.23
¹¹² Cd	0.1488	0.1457	0.1849	0.1598	11.15
¹⁰⁴ Pd	0.0000	0.2035	0.1922	0.1979	2.86
¹⁵⁴ Eu	0.9158	0.8918	0.4550	0.7542	28.08
¹⁵⁶ Eu	0.0000	1.3320	1.1121	1.2221	9.00
¹¹⁷ Sn	0.0000	0.3214	0.3463	0.3339	3.73
¹⁴⁸ Sm	0.0000	0.1982	0.2462	0.2222	10.81
¹⁰⁵ Rh	0.2872	0.2806	0.4240	0.3306	20.00
¹¹⁴ Cd	0.0000	0.1390	0.2030	0.1710	18.72
¹⁶⁰ Gd	0.0000	0.5105	0.5664	0.5385	5.19
⁸⁰ Se	0.0000	0.1235	0.1525	0.1380	10.51
¹¹⁶ Cd	0.0000	0.1597	0.2119	0.1858	14.04
¹⁴⁹ Pm	0.5045	0.4923	0.6892	0.5620	16.03
¹²⁴ Sn	0.0000	0.0645	0.1035	0.0840	23.23
¹¹⁵ In	0.1190	0.1177	0.1393	0.1253	7.89
¹³⁶ Ba	0.0000	0.1298	0.1353	0.1326	2.07
¹²⁷ Te	0.0000	0.1215	0.2295	0.1755	30.78
¹⁵³ Sm	0.0000	1.4055	1.3639	1.3847	1.50
¹⁴⁸ Pm	0.6098	0.5942	0.4980	0.5673	8.71
¹³⁷ Ba	0.0000	0.1851	0.1415	0.1633	13.37
¹²³ Sb	0.0000	0.2208	0.2576	0.2392	7.70
¹¹⁰ Cd	0.0000	0.1255	0.1674	0.1464	14.30
¹⁵⁵ Gd	0.0000	0.7726	0.7637	0.7681	0.57
¹²² Sn	0.0000	0.0727	0.0983	0.0855	14.99
¹²⁰ Sn	0.0000	0.0670	0.1002	0.0836	19.87
¹²⁵ Te	0.0000	0.5385	0.5546	0.5466	1.46
¹¹⁸ Sn	0.0000	0.0608	0.0959	0.0784	22.36
¹²³ Sn	0.0000	0.0907	0.1487	0.1197	24.24
⁷⁸ Se	0.0000	0.1294	0.1652	0.1473	12.15
⁷⁷ Se	0.0000	0.3267	0.4345	0.3806	14.16
⁹⁶ Mo	0.0000	0.1160	0.1833	0.1496	22.48
⁸⁵ Rb	0.2460	0.2403	0.3057	0.2640	11.20
¹³⁰ Xe	0.0000	0.2370	0.1742	0.2056	15.27
¹⁴⁸ Pm	0.0000	0.5942	0.7662	0.6802	12.64
¹³⁶ Cs	0.0000	0.1827	0.3319	0.2573	29.00
¹⁴² Nd	0.0000	0.0744	0.0974	0.0859	13.37
¹²⁸ Xe	0.0000	0.2641	0.2022	0.2331	13.27
¹³⁴ Ba	0.0000	0.1694	0.1688	0.1691	0.18
¹²⁶ Te	0.0000	0.1412	0.1532	0.1472	4.09
⁹⁰ Zr	0.0000	0.0501	0.0590	0.0545	8.14
⁸² Kr	0.0000	0.1753	0.1342	0.1548	13.29
¹¹⁵ Sn	0.0000	0.1916	0.2001	0.1958	2.16

Table 5.3 *One group cross sections for (n,2n) reactions (MT=16). of the nuclides in order of descending importance determined by the product of the cross section (ADL-3) and yield of the nuclide.*

Institute Library	CEA JEF-2.2	ECN JEF-2.2	IPPE ADL-3	JNDC JENDL-3.2	Average	RMS (%)
¹⁴² Ce	1.1818	1.0179	1.0874	0.9124	1.0499	9.37
¹⁴⁵ Nd	3.9818	3.8276	1.5629	3.2449	3.1543	30.40
¹⁴³ Nd	2.6339	2.5023	1.0868	1.8441	2.0168	30.48
¹⁰¹ Ru	1.0978	0.9987	0.6108	1.0233	0.9326	20.31
¹³¹ Xe	2.0694	1.9330	0.9326	1.1105	1.5114	32.83
¹⁴⁴ Ce	1.6126	1.4160	1.2582	1.2309	1.3794	11.02
⁹⁷ Mo	0.0000	0.0000	0.5574	0.5398	0.5486	1.61
¹³⁷ Cs	0.4922	0.3927	0.4355	0.3799	0.4251	10.32
¹³⁶ Xe	0.7068	0.5802	0.3998	0.5135	0.5501	20.20
⁹³ Zr	0.8254	0.7369	0.6553	1.0138	0.8078	16.50
¹⁰⁷ Pd	2.2136	2.0801	0.8043	1.2667	1.5912	36.52
¹⁴¹ Ce	2.0727	1.9468	2.0871	3.2376	2.3361	22.40
⁹⁶ Zr	0.6988	0.6158	0.4580	0.5241	0.5742	15.88
¹⁰⁵ Pd	1.1214	1.0192	0.4507	0.7754	0.8417	30.70
¹³⁴ Xe	0.6174	0.4972	0.2839	0.2728	0.4178	34.91
¹³⁵ Cs	0.3927	0.2867	0.2716	0.2671	0.3045	16.89
¹⁰⁰ Mo	0.5894	0.5017	0.3109	0.3065	0.4271	28.67
¹⁴⁹ Sm	4.1049	3.9494	1.5415	2.6303	3.0565	34.21
¹⁵¹ Sm	2.9146	2.7685	2.4655	2.4093	2.6395	7.94
¹⁴⁶ Nd	1.1233	1.0230	0.6855	0.6612	0.8733	23.27
¹⁰³ Ru	2.2548	2.1410	1.0694	1.6210	1.7716	26.56
¹³⁹ La	0.5170	0.4278	0.2676	0.2497	0.3655	30.54
¹⁰⁴ Ru	0.0000	0.0000	0.2434	0.2903	0.2669	8.78
¹⁴⁸ Nd	1.4448	1.3391	0.8781	0.8036	1.1164	25.02
¹³³ Cs	0.4921	0.4005	0.2254	0.2128	0.3327	35.53
⁹⁸ Mo	0.4841	0.3964	0.2514	0.2423	0.3435	29.58
⁹⁴ Zr	0.0000	0.0000	0.3308	0.3609	0.3458	4.35
¹³⁸ Ba	0.4936	0.3937	0.2701	0.2665	0.3560	26.55
⁹⁵ Zr	1.0420	0.9499	0.7379	1.2580	0.9969	18.73
¹³² Xe	0.4985	0.3889	0.2375	0.2064	0.3328	35.45
¹⁴⁷ Pm	1.0495	0.9402	0.7492	0.5796	0.8296	21.69
¹⁰² Ru	0.0000	0.0000	0.1723	0.2058	0.1890	8.86
⁹⁹ Tc	0.4543	0.3697	0.1973	0.2010	0.3056	36.18
¹⁰⁶ Ru	0.0000	0.0000	0.2971	0.3716	0.3344	11.15
¹⁴⁰ Ce	0.0000	0.0000	0.2043	0.1914	0.1978	3.27
¹⁵⁰ Nd	1.3084	1.1096	0.8256	0.6928	0.9841	24.41
⁹⁰ Sr	0.0000	0.0000	0.4331	0.4335	0.4333	0.04
¹⁰³ Rh	0.3539	0.2761	0.1669	0.1389	0.2340	36.82
¹⁴¹ Pr	0.3735	0.2902	0.1736	0.1826	0.2550	32.30
⁹⁵ Mo	0.0000	0.0000	0.3382	0.3408	0.3395	0.38

Table 5.3 *One group cross sections for (n,2n) reactions (MT=16).*

Institute Library	CEA JEF-2.2	ECN JEF-2.2	IPPE ADL-3	JNDC JENDL-3.2	Average	RMS (%)
¹⁴⁰ Ba	0.0000	2.4793	1.7190	1.5348	1.9110	21.39
⁹² Zr	0.0000	0.0000	0.2253	0.2366	0.2309	2.44
¹³⁰ Te	0.0000	0.0000	0.3499	0.3008	0.3254	7.54
⁹¹ Zr	0.4528	0.4000	0.3370	0.3101	0.3750	14.81
¹⁴⁴ Nd	0.9323	0.8359	0.5527	0.4850	0.7015	26.70
¹⁴⁷ Nd	0.0000	0.0000	3.1135	4.9516	4.0325	22.79
¹⁰⁸ Pd	0.4641	0.3716	0.1749	0.2133	0.3060	38.36
⁸⁹ Sr	0.0000	0.0000	0.7110	1.2691	0.9901	28.18
¹⁵² Sm	0.8242	0.7408	0.4670	0.3803	0.6031	30.57
⁹¹ Y	0.0000	0.0000	0.4003	0.3647	0.3825	4.66
¹⁴³ Pr	0.0000	0.0000	0.8734	0.7758	0.8246	5.92
¹⁰⁹ Ag	0.3879	0.3136	0.1785	0.1790	0.2648	33.96
⁹⁵ Nb	0.4757	0.3922	0.2893	0.2776	0.3587	22.56
¹¹¹ Cd	0.8347	0.7483	0.5800	0.7638	0.7317	12.77
¹²⁸ Te	0.0000	0.0000	0.2773	0.2267	0.2520	10.02
¹⁴⁰ La	0.0000	0.0000	3.9566	0.0000	3.9566	0.00
¹¹⁰ Pd	0.5779	0.4859	0.2284	0.3032	0.3988	34.98
¹³³ Xe	0.0000	0.0000	0.9399	1.2794	1.1096	15.30
¹²⁹ I	0.3965	0.3107	0.2297	0.2434	0.2950	22.41
¹²⁹ Te	0.0000	0.0000	0.8330	1.5979	1.2155	31.46
⁸⁵ Kr	0.0000	0.0000	0.2869	0.6447	0.4658	38.40
¹⁵⁴ Sm	0.0000	0.0000	0.5825	0.4901	0.5363	8.61
¹⁵³ Eu	0.7206	0.6040	0.3774	0.2563	0.4896	37.31
⁹⁹ Mo	0.0000	0.0000	1.5544	2.1806	1.8675	16.77
¹⁰⁶ Pd	0.3844	0.2929	0.1378	0.1692	0.2461	40.11
¹⁵⁷ Gd	0.0000	0.0000	1.5178	1.2578	1.3878	9.37
¹⁴³ Ce	0.0000	0.0000	3.4956	0.0000	3.4956	0.00
¹³⁴ Cs	0.0000	0.0000	0.8867	0.9711	0.9289	4.54
¹⁴⁷ Sm	2.6939	2.5681	0.9539	0.8208	1.7592	49.70
¹²⁶ Sn	0.0000	0.0000	0.3984	0.4161	0.4073	2.17
⁸⁷ Rb	0.0000	0.0000	0.0959	0.1044	0.1002	4.25
¹⁵⁵ Eu	0.6982	0.5957	0.5030	0.3643	0.5403	22.74
⁸⁶ Kr	0.0000	0.1518	0.1141	0.0885	0.1181	22.03
¹²⁷ I	0.3880	0.3255	0.2162	0.2331	0.2907	24.05
¹⁵⁴ Eu	1.0676	0.9558	1.6655	1.2818	1.2427	21.79
¹¹³ Cd	0.6090	0.5296	0.9032	1.1662	0.8020	31.44
⁸⁸ Sr	0.0000	0.0000	0.0553	0.0483	0.0518	6.80
⁸³ Kr	0.0000	0.6797	0.2187	0.3625	0.4203	45.82
⁸⁹ Y	0.0000	0.0720	0.0490	0.0433	0.0548	22.62
¹⁵⁶ Gd	0.6199	0.5188	0.3587	0.3074	0.4512	27.65
¹⁵⁰ Sm	0.0000	0.0000	0.5997	0.3996	0.4997	20.02
¹¹⁹ Sn	0.0000	0.0000	0.8365	1.3121	1.0743	22.14
¹⁵⁸ Gd	0.0000	0.0000	0.5982	0.5008	0.5495	8.87
¹³¹ I	0.0000	0.0000	0.2435	0.3070	0.2752	11.54
¹²⁵ Sb	0.0000	0.0000	0.2931	0.2520	0.2726	7.52

Table 5.3 One group cross sections for (n,2n) reactions (MT=16).

Institute Library	CEA JEF-2.2	ECN JEF-2.2	IPPE ADL-3	JNDC JENDL-3.2	Average	RMS (%)
¹³² Te	0.0000	0.0000	0.3962	0.0000	0.3962	0.00
¹²⁴ Sn	0.0000	0.0000	0.3355	0.3282	0.3318	1.11
⁸⁴ Kr	0.0000	0.1263	0.0705	0.0628	0.0865	32.69
¹⁵⁶ Eu	0.0000	0.0000	1.9911	1.3876	1.6894	17.86
¹⁴⁸ Pm	0.0000	0.0000	2.0836	2.1593	2.1214	1.78
¹⁴⁸ Sm	0.0000	0.0000	0.4725	0.4138	0.4431	6.62
¹³⁷ Ba	0.0000	0.0000	0.6610	0.8709	0.7660	13.70
¹¹⁷ Sn	0.0000	0.0000	0.5407	0.8909	0.7158	24.46
¹²⁷ Te	0.0000	0.0000	0.7215	1.1535	0.9375	23.04
¹⁶¹ Dy	0.0000	0.0000	1.4646	0.0000	1.4646	0.00
⁸² Se	0.0000	0.0000	0.1208	0.1422	0.1315	8.16
¹²³ Sn	0.0000	0.0000	0.7066	2.2047	1.4556	51.46
¹⁶⁰ Gd	0.0000	0.0000	0.7977	0.7502	0.7740	3.07
¹⁵⁹ Tb	0.0000	0.6496	0.4991	0.4648	0.5378	14.92
¹¹² Cd	0.0000	0.0000	0.1476	0.1672	0.1574	6.22
¹¹⁴ Cd	0.0000	0.0000	0.1915	0.2356	0.2135	10.32
¹²² Sn	0.0000	0.0000	0.2762	0.2667	0.2714	1.75
¹³⁶ Ba	0.0000	0.0000	0.2321	0.1867	0.2094	10.85
¹⁰⁰ Ru	0.0000	0.0000	0.1242	0.1511	0.1376	9.75
¹⁵³ Sm	0.0000	0.0000	2.5744	1.7546	2.1645	18.94
¹¹⁶ Cd	0.0000	0.0000	0.2617	0.2859	0.2738	4.42
¹¹⁵ In	0.0000	0.0000	0.1825	0.1617	0.1721	6.05
¹⁴⁹ Pm	0.0000	0.0000	0.7706	0.7371	0.7539	2.22
¹²⁰ Sn	0.0000	0.0000	0.2113	0.2052	0.2082	1.46
¹²¹ Sb	0.0000	0.0000	0.2142	0.1598	0.1870	14.55
¹⁰⁴ Pd	0.0000	0.2287	0.1014	0.1155	0.1485	38.36
¹⁵⁵ Gd	0.0000	0.0000	1.3381	0.9688	1.1534	16.01
¹⁴⁸ Pm	0.0000	0.0000	2.8793	2.1593	2.5193	14.29
¹³⁶ Cs	0.0000	0.0000	1.2428	1.1047	1.1737	5.88
¹²⁵ Te	0.0000	0.0000	0.9264	1.0398	0.9831	5.77
¹¹⁸ Sn	0.0000	0.0000	0.1708	0.1529	0.1618	5.54
⁸¹ Br	0.0000	0.0000	0.0754	0.0808	0.0781	3.44
¹²⁵ Sn	0.0000	0.0000	0.9031	0.0000	0.9031	0.00
⁸⁰ Se	0.0000	0.0000	0.0954	0.1055	0.1004	5.00
¹⁰⁵ Rh	0.0000	0.0000	0.1620	0.2340	0.1979	18.19
¹²³ Sb	0.0000	0.0000	0.2339	0.2306	0.2322	0.70
¹¹⁵ Cd	0.0000	0.0000	0.8746	0.0000	0.8746	0.00
¹¹¹ Ag	0.0000	0.0000	0.2272	0.0000	0.2272	0.00
¹¹⁰ Cd	0.0000	0.0000	0.1120	0.0957	0.1038	7.88
⁹⁶ Mo	0.0000	0.0000	0.1709	0.1648	0.1678	1.81
⁷⁷ Se	0.0000	0.0000	0.2817	0.5030	0.3923	28.20
¹⁶⁰ Tb	0.0000	0.0000	1.7044	0.0000	1.7044	0.00
¹³⁰ Xe	0.0000	0.2918	0.1753	0.1914	0.2195	23.49
¹⁴² Nd	0.0000	0.0000	0.1202	0.1387	0.1295	7.14
⁷⁸ Se	0.0000	0.0000	0.0655	0.0669	0.0662	1.05

6. CONCLUSIONS

From the previous sections we may conclude that the considered data evaluations give a maximum spread in lumped one-group cross sections averaged over the spectrum of a large fast power reactor of about 6% for capture and 9% for inelastic scattering. The total reactivity effect has a maximum spread of 5.5%. These values indicate that the uncertainty on the reactivity effect is of the same order. Inspection of the differences did not reveal large problems in the libraries for capture and inelastic scattering cross sections. Slight improvements could be obtained by having closer inspection of the capture cross sections of the unstable nuclides ^{151}Sm , ^{103}Ru and ^{135}Cs . From the inelastic scattering cross sections some improvements could be obtained by investigating the data for nuclides with low-lying levels, below 200 keV (e.g. ^{101}Ru , ^{133}Cs , ^{103}Rh , ^{145}Nd , ^{103}Ru , ^{107}Pd and ^{149}Sm).

However, improvements for individual fission products will not easily solve the remaining discrepancies, since there are also systematic differences. These are probably caused by the evaluation method. For capture the unresolved resonance treatment with the difficulties in parametrization of strength functions, level spacing and radiation widths due to missed resonances, and the treatment of width fluctuations could be important. Also the background correction in the resolved energy range can play a role.

For the inelastic cross sections, the optical model choice and parametrization as well as width-fluctuation factor treatment could be different in various evaluations. It is not easy to assess such differences in the evaluation methods.

A possible point to be further investigated is the systematic difference of 5 to 6% in the total, elastic and capture cross sections between JENDL-3.2 and JEF-2.2. A common reason could be the optical-model parametrization or the systematics used for the (p-wave) strength functions. More generally, it is suggested to compare the yield-averaged values of S_0 , S_1 , Γ_γ and D_0 of the various evaluations, to assess possible reasons for systematic differences. These parameters determine the unresolved resonance range and are difficult to extract from resolved resonance parameters if there is a significant fraction of missed (p-wave) resonances. The optical model should match the s- and p-wave strength functions. In the high-energy part of the resolved-resonance range, a correction for missed resonances should be made. All these points are well known to the evaluators, but in order to make progress it is necessary to re-investigate such possible sources of differences.

Finally, in spite of the above mentioned problems, the status of lumped fission-product cross sections is satisfactory, although some improvements are possible as indicated in this report.

APPENDIX A. NUCLIDE CONCENTRATIONS

Table A.1 *Nuclides and concentrations in the lumped fission product. For the benchmark, the yields of ^{239}Pu were used.*

Nuclide	Identification	^{235}U	^{238}U	^{239}Pu	^{240}Pu	^{241}Pu
^{76}Ge	320760	.00015	.00001	.00011	.00001	.00000
^{75}As	330750	.00007	.00000	.00000	.00000	.00000
^{77}Se	340770	.00029	.00004	.00013	.00014	.00010
^{78}Se	340780	.00056	.00014	.00035	.00029	.00019
^{79}Se	340790	.00091	.00040	.00053	.00053	.00037
^{80}Se	340800	.00151	.00087	.00090	.00091	.00068
^{82}Se	340820	.00390	.00250	.00235	.00209	.00171
^{81}Br	350810	.00246	.00157	.00137	.00148	.00109
^{82}Br	350820	.00000	.00000	.00000	.00000	.00000
^{82}Kr	360820	.00006	.00003	.00006	.00003	.00002
^{83}Kr	360830	.00601	.00390	.00348	.00312	.00245
^{84}Kr	360840	.01084	.00559	.00565	.00458	.00377
^{85}Kr	360850	.01380	.00715	.00655	.00589	.00501
^{86}Kr	360860	.01928	.01382	.00878	.00793	.00674
^{85}Rb	370850	.00029	.00015	.00014	.00012	.00010
^{86}Rb	370860	.00001	.00000	.00000	.00000	.00000
^{87}Rb	370870	.02548	.01700	.01150	.01019	.00884
^{86}Sr	380860	.00004	.00000	.00001	.00000	.00000
^{88}Sr	380880	.03641	.02102	.01421	.01281	.01135
^{89}Sr	380890	.01278	.00956	.00543	.00499	.00424
^{90}Sr	380900	.05075	.03115	.01875	.01964	.01752
^{89}Y	390890	.03156	.02202	.01285	.01110	.00960
^{90}Y	390900	.00001	.00001	.00001	.00001	.00000
^{91}Y	390910	.01763	.01332	.00864	.00847	.00746
^{90}Zr	400900	.00043	.00026	.00016	.00016	.00014
^{91}Zr	400910	.03532	.02499	.01660	.01537	.01376
^{92}Zr	400920	.05639	.04312	.03061	.02930	.02579
^{93}Zr	400930	.05964	.04700	.03791	.03531	.03153
^{94}Zr	400940	.06449	.05107	.04274	.04232	.03773
^{95}Zr	400950	.02315	.02063	.01757	.01773	.01701
^{96}Zr	400960	.06553	.05744	.04939	.05027	.04737
^{95}Nb	410950	.01146	.00991	.00854	.00839	.00811
^{95}Mo	420950	.02925	.02417	.02118	.01998	.01955
^{96}Mo	420960	.00060	.00025	.00025	.00023	.00020
^{97}Mo	420970	.05848	.05804	.05200	.05280	.05080
^{98}Mo	420980	.06136	.06127	.05650	.05568	.05495
^{99}Mo	420990	.00091	.00112	.00099	.00108	.00101
^{100}Mo	421000	.06355	.06151	.06439	.06041	.05951
^{99}Tc	430990	.05349	.06007	.05500	.05552	.05294
^{100}Ru	441000	.00152	.00165	.00153	.00149	.00144
^{101}Ru	441010	.05327	.05944	.06387	.05848	.05876

Table A.1 *Table continued.*

Nuclide	Identification	²³⁵ U	²³⁸ U	²³⁹ Pu	²⁴⁰ Pu	²⁴¹ Pu
¹⁰² Ru	441020	.04816	.06361	.06834	.06165	.06099
¹⁰³ Ru	441030	.00796	.01479	.01592	.01549	.01526
¹⁰⁴ Ru	441040	.02366	.05702	.06499	.05791	.05900
¹⁰⁶ Ru	441060	.00365	.02337	.03378	.04131	.04267
¹⁰³ Rh	451030	.02509	.04346	.04810	.04391	.04404
¹⁰⁵ Rh	451050	.00013	.00034	.00048	.00055	.00056
¹⁰⁴ Pd	461040	.00067	.00112	.00126	.00112	.00113
¹⁰⁵ Pd	461050	.01426	.03348	.04837	.05230	.05430
¹⁰⁶ Pd	461060	.00149	.00679	.01105	.01148	.01200
¹⁰⁷ Pd	461070	.00172	.01234	.03083	.04078	.04110
¹⁰⁸ Pd	461080	.00078	.00684	.02415	.03321	.03912
¹¹⁰ Pd	461100	.00045	.00139	.00923	.01200	.01691
¹⁰⁹ Ag	471090	.00054	.00201	.01632	.02139	.02758
¹¹¹ Ag	471110	.00001	.00004	.00021	.00030	.00045
¹¹⁰ Cd	481100	.00001	.00005	.00042	.00052	.00067
¹¹¹ Cd	481110	.00027	.00073	.00410	.00558	.00854
¹¹² Cd	481120	.00039	.00071	.00135	.00288	.00433
¹¹³ Cd	481130	.00034	.00055	.00091	.00150	.00222
¹¹⁴ Cd	481140	.00034	.00046	.00100	.00102	.00103
¹¹⁵ Cd	481150	.00000	.00001	.00001	.00001	.00001
^{115m} Cd	481151	.00001	.00001	.00008	.00008	.00007
¹¹⁶ Cd	481160	.00036	.00035	.00064	.00085	.00100
¹¹⁵ In	491150	.00020	.00037	.00089	.00086	.00097
¹¹⁵ Sn	501150	.00001	.00002	.00004	.00004	.00005
¹¹⁶ Sn	501160	.00000	.00001	.00002	.00002	.00002
¹¹⁷ Sn	501170	.00037	.00034	.00064	.00085	.00090
¹¹⁸ Sn	501180	.00039	.00034	.00065	.00080	.00087
¹¹⁹ Sn	501190	.00042	.00034	.00066	.00080	.00086
¹²⁰ Sn	501200	.00044	.00034	.00067	.00085	.00085
¹²² Sn	501220	.00048	.00037	.00069	.00095	.00093
¹²³ Sn	501230	.00030	.00022	.00039	.00063	.00057
¹²⁴ Sn	501240	.00060	.00042	.00120	.00120	.00111
¹²⁵ Sn	501250	.00004	.00005	.00011	.00010	.00007
¹²⁶ Sn	501260	.00104	.00100	.00303	.00316	.00240
¹²¹ Sb	511210	.00045	.00035	.00066	.00083	.00088
¹²² Sb	511220	.00000	.00000	.00000	.00000	.00000
¹²³ Sb	511230	.00024	.00017	.00030	.00046	.00043
¹²⁴ Sb	511240	.00000	.00000	.00000	.00000	.00000
¹²⁵ Sb	511250	.00063	.00066	.00163	.00138	.00095
¹²⁶ Sb	511260	.00001	.00000	.00001	.00001	.00000
¹²⁷ Sb	511270	.00005	.00004	.00012	.00010	.00008

Table A.1 *Table continued.*

Nuclide	Identification	²³⁵ U	²³⁸ U	²³⁹ Pu	²⁴⁰ Pu	²⁴¹ Pu
¹²² Te	521220	.00001	.00001	.00002	.00002	.00002
¹²³ Te	521230	.00000	.00000	.00000	.00000	.00000
¹²⁴ Te	521240	.00000	.00000	.00000	.00000	.00000
¹²⁵ Te	521250	.00005	.00005	.00012	.00009	.00007
^{125m} Te	521251	.00001	.00001	.00001	.00001	.00001
¹²⁶ Te	521260	.00006	.00001	.00008	.00005	.00002
^{127m} Te	521271	.00017	.00013	.00045	.00033	.00028
¹²⁸ Te	521280	.00321	.00506	.00790	.00618	.00520
^{129m} Te	521291	.00108	.00189	.00230	.00215	.00179
¹³⁰ Te	521300	.01439	.01959	.01956	.01889	.01534
¹³² Te	521320	.00089	.00095	.00104	.00104	.00094
¹²⁷ I	531270	.00174	.00132	.00446	.00318	.00277
¹²⁹ I	531290	.00442	.00713	.00897	.00783	.00664
¹³¹ I	531310	.00153	.00185	.00218	.00184	.00150
¹²⁸ Xe	541280	.00005	.00003	.00012	.00008	.00007
¹²⁹ Xe	541290	.00000	.00000	.00000	.00000	.00000
¹³⁰ Xe	541300	.00008	.00012	.00018	.00013	.00011
¹³¹ Xe	541310	.03063	.03391	.04139	.03224	.02683
¹³² Xe	541320	.04761	.04546	.05273	.04823	.04405
¹³³ Xe	541330	.00206	.00184	.00223	.00199	.00191
¹³⁴ Xe	541340	.07155	.06172	.07229	.06270	.06102
¹³⁶ Xe	541360	.05993	.06292	.06776	.07121	.07112
¹³³ Cs	551330	.06293	.05152	.06441	.05353	.05231
¹³⁴ Cs	551340	.00169	.00120	.00153	.00123	.00121
¹³⁵ Cs	551350	.06393	.05627	.07424	.06772	.06705
¹³⁶ Cs	551360	.00004	.00003	.00009	.00007	.00005
¹³⁷ Cs	551370	.06228	.06949	.06342	.06948	.07181
¹³⁴ Ba	561340	.00014	.00008	.00011	.00008	.00008
¹³⁵ Ba	561350	.00000	.00000	.00000	.00000	.00000
¹³⁶ Ba	561360	.00024	.00016	.00082	.00056	.00031
¹³⁷ Ba	561370	.00047	.00051	.00057	.00050	.00052
¹³⁸ Ba	561380	.06692	.06477	.04936	.06465	.06738
¹⁴⁰ Ba	561400	.00433	.00493	.00414	.00456	.00461
¹³⁹ La	571390	.07087	.06083	.06053	.05802	.06093
¹⁴⁰ La	571400	.00057	.00065	.00054	.00060	.00061
¹⁴⁰ Ce	581400	.05322	.05506	.04787	.04868	.05031
¹⁴¹ Ce	581410	.01178	.01124	.01176	.01027	.01074
¹⁴² Ce	581420	.05878	.05054	.04924	.05302	.04990
¹⁴³ Ce	581430	.00048	.00042	.00039	.00047	.00050
¹⁴⁴ Ce	581440	.03849	.03424	.02642	.03057	.03336
¹⁴¹ Pr	591410	.04854	.04277	.04611	.03757	.04006

Table A.1 *Table continued.*

Nuclide	Identification	²³⁵ U	²³⁸ U	²³⁹ Pu	²⁴⁰ Pu	²⁴¹ Pu
¹⁴³ Pr	591430	.00467	.00403	.00372	.00452	.00481
¹⁴² Nd	601420	.00028	.00024	.00026	.00021	.00022
¹⁴³ Nd	601430	.05270	.04163	.03970	.04464	.04854
¹⁴⁴ Nd	601440	.01301	.01104	.00876	.00975	.01075
¹⁴⁵ Nd	601450	.03778	.04086	.03010	.03268	.03477
¹⁴⁶ Nd	601460	.03016	.03897	.02557	.02847	.03051
¹⁴⁷ Nd	601470	.00133	.00186	.00141	.00161	.00176
¹⁴⁸ Nd	601480	.01691	.02359	.01715	.01814	.01929
¹⁵⁰ Nd	601500	.00715	.01464	.01039	.01157	.01290
¹⁴⁷ Pm	611470	.01651	.02131	.01664	.01768	.01979
¹⁴⁸ Pm	611480	.00004	.00005	.00004	.00004	.00005
^{148m} Pm	611481	.00020	.00025	.00019	.00020	.00023
¹⁴⁹ Pm	611490	.00015	.00025	.00019	.00023	.00024
¹⁴⁷ Sm	621470	.00135	.00168	.00133	.00137	.00155
¹⁴⁸ Sm	621480	.00086	.00104	.00083	.00084	.00096
¹⁴⁹ Sm	621490	.01017	.01620	.01265	.01404	.01520
¹⁵⁰ Sm	621500	.00076	.00117	.00093	.00099	.00109
¹⁵¹ Sm	621510	.00400	.00928	.00761	.00851	.00911
¹⁵² Sm	621520	.00350	.00751	.00759	.00850	.00930
¹⁵³ Sm	621530	.00002	.00006	.00007	.00008	.00009
¹⁵⁴ Sm	621540	.00097	.00213	.00321	.00405	.00447
¹⁵³ Eu	631530	.00182	.00390	.00463	.00508	.00574
¹⁵⁴ Eu	631540	.00020	.00042	.00051	.00054	.00061
¹⁵⁵ Eu	631550	.00034	.00105	.00214	.00267	.00295
¹⁵⁶ Eu	631560	.00002	.00009	.00020	.00027	.00030
¹⁵⁴ Gd	641540	.00000	.00001	.00001	.00001	.00001
¹⁵⁵ Gd	641550	.00001	.00004	.00009	.00011	.00012
¹⁵⁶ Gd	641560	.00017	.00071	.00166	.00215	.00246
¹⁵⁷ Gd	641570	.00007	.00027	.00093	.00122	.00139
¹⁵⁸ Gd	641580	.00006	.00021	.00089	.00111	.00135
¹⁶⁰ Gd	641600	.00001	.00003	.00033	.00033	.00039
¹⁵⁹ Tb	651590	.00003	.00008	.00043	.00053	.00062
¹⁶⁰ Tb	651600	.00000	.00000	.00002	.00002	.00002
¹⁶¹ Tb	651610	.00000	.00000	.00001	.00002	.00001
¹⁶⁰ Dy	661600	.00000	.00000	.00001	.00002	.00002
¹⁶¹ Dy	661610	.00000	.00001	.00020	.00029	.00020
¹⁶² Dy	661620	.00000	.00000	.00002	.00003	.00002
¹⁶³ Dy	661630	.00000	.00000	.00000	.00000	.00000
¹⁶⁴ Dy	661640	.00000	.00000	.00000	.00000	.00000
Total		2.00002	2.00002	2.00004	2.00002	2.00003

APPENDIX B. FLUX WEIGHTING SPECTRA

The next pages give the energy, adjoint function and neutron spectrum (two times three columns) used in the benchmark. A plot of these functions is shown in figure 2.1.

1.0000e-05	1.6514e+01	1.0000e-07	5.3579e-01	1.2854e+01	9.0820e-06
1.5050e-03	1.6551e+01	6.9514e-07	5.5348e-01	1.2452e+01	9.5000e-06
4.0000e-03	1.6596e+01	9.4092e-07	5.8112e-01	1.1803e+01	9.8217e-06
5.9500e-03	1.6594e+01	1.1309e-06	6.1014e-01	1.1079e+01	9.8890e-06
8.4500e-03	1.6565e+01	1.3589e-06	6.3908e-01	1.0333e+01	9.7074e-06
1.2500e-02	1.6514e+01	1.6199e-06	6.6785e-01	9.5567e+00	9.3455e-06
1.7500e-02	1.6452e+01	1.8611e-06	6.9378e-01	8.8102e+00	8.8032e-06
2.2500e-02	1.6389e+01	2.0656e-06	7.2328e-01	7.9345e+00	7.9788e-06
2.7500e-02	1.6324e+01	2.2432e-06	7.6077e-01	6.7906e+00	7.1261e-06
3.2500e-02	1.6259e+01	2.4110e-06	7.8500e-01	6.0270e+00	6.4566e-06
3.8500e-02	1.6180e+01	2.5839e-06	8.0472e-01	5.3699e+00	5.6599e-06
4.6000e-02	1.6084e+01	2.7486e-06	8.3472e-01	4.3828e+00	4.8409e-06
5.4000e-02	1.5982e+01	2.8882e-06	8.5500e-01	3.7321e+00	4.2874e-06
6.2500e-02	1.5876e+01	3.0004e-06	8.6821e-01	3.3180e+00	3.6697e-06
7.2000e-02	1.5761e+01	3.0750e-06	8.9321e-01	2.5786e+00	2.8576e-06
7.8500e-02	1.5684e+01	3.1074e-06	9.2000e-01	1.8303e+00	2.1522e-06
8.7500e-02	1.5588e+01	3.1115e-06	9.4000e-01	1.3347e+00	1.5781e-06
9.7500e-02	1.5484e+01	3.0934e-06	9.6100e-01	8.9101e-01	1.0782e-06
1.0750e-01	1.5396e+01	3.0129e-06	9.7900e-01	5.6678e-01	7.3174e-07
1.2450e-01	1.5263e+01	2.8713e-06	9.9100e-01	3.9286e-01	3.3494e-07
1.3700e-01	1.5175e+01	2.7523e-06	1.0080e+00	2.2987e-01	3.4927e-08
1.4319e-01	1.5142e+01	2.6593e-06	1.0275e+00	9.7176e-02	2.3584e-09
1.4970e-01	1.5113e+01	2.5525e-06	1.0400e+00	5.7082e-02	1.2664e-09
1.5652e-01	1.5089e+01	2.4231e-06	1.0580e+00	5.2392e-02	1.2091e-09
1.6486e-01	1.5063e+01	2.2548e-06	1.0755e+00	6.0544e-02	1.9075e-09
1.7485e-01	1.5041e+01	2.0661e-06	1.0885e+00	9.2845e-02	3.6846e-09
1.8450e-01	1.5033e+01	1.8784e-06	1.1035e+00	1.5213e-01	6.6656e-09
1.9390e-01	1.5035e+01	1.6835e-06	1.1165e+00	2.2861e-01	1.2104e-08
2.0397e-01	1.5045e+01	1.4781e-06	1.1365e+00	3.9172e-01	2.1390e-08
2.1457e-01	1.5061e+01	1.2613e-06	1.1600e+00	6.0618e-01	3.4296e-08
2.2679e-01	1.5082e+01	1.0341e-06	1.1861e+00	8.5567e-01	5.1846e-08
2.4079e-01	1.5108e+01	8.1646e-07	1.2186e+00	1.1638e+00	7.2413e-08
2.5576e-01	1.5140e+01	6.4440e-07	1.2510e+00	1.4690e+00	9.2571e-08
2.7176e-01	1.5177e+01	5.3851e-07	1.2835e+00	1.7713e+00	1.1165e-07
2.9000e-01	1.5221e+01	5.2560e-07	1.3188e+00	2.0987e+00	1.2861e-07
3.0725e-01	1.5262e+01	5.8324e-07	1.3538e+00	2.4208e+00	1.4211e-07
3.1725e-01	1.5283e+01	6.7412e-07	1.3873e+00	2.7136e+00	1.5268e-07
3.2733e-01	1.5294e+01	8.5925e-07	1.4223e+00	3.0044e+00	1.6055e-07
3.4233e-01	1.5284e+01	1.2297e-06	1.4575e+00	3.2994e+00	1.6547e-07
3.5996e-01	1.5245e+01	1.8211e-06	1.4875e+00	3.5555e+00	1.6841e-07
3.8046e-01	1.5162e+01	2.4875e-06	1.5221e+00	3.8287e+00	1.6968e-07
3.9550e-01	1.5065e+01	3.0619e-06	1.5672e+00	4.1464e+00	1.6960e-07
4.0699e-01	1.4963e+01	3.7117e-06	1.6098e+00	4.4254e+00	1.6835e-07
4.2350e-01	1.4777e+01	4.5382e-06	1.6498e+00	4.6736e+00	1.6611e-07
4.4134e-01	1.4552e+01	5.3877e-06	1.6910e+00	4.9160e+00	1.6402e-07
4.5835e-01	1.4321e+01	6.2143e-06	1.7335e+00	5.1514e+00	1.6158e-07
4.7601e-01	1.4051e+01	6.9883e-06	1.7760e+00	5.3729e+00	1.5896e-07
4.9250e-01	1.3768e+01	7.6897e-06	1.8185e+00	5.5821e+00	1.5800e-07
5.0981e-01	1.3426e+01	8.3004e-06	1.8477e+00	5.7177e+00	1.5557e-07
5.2560e-01	1.3086e+01	8.7289e-06	1.8700e+00	5.8209e+00	1.5227e-07

1.9072e+00	5.9810e+00	1.5031e-07	5.8842e+00	9.4689e+00	4.0528e-08
1.9523e+00	6.1641e+00	1.4932e-07	5.9334e+00	9.1751e+00	3.9016e-08
1.9972e+00	6.3366e+00	1.4943e-07	5.9831e+00	8.8789e+00	3.7290e-08
2.0398e+00	6.4900e+00	1.5018e-07	6.0332e+00	8.5803e+00	3.5212e-08
2.0798e+00	6.6408e+00	1.5112e-07	6.0837e+00	8.2791e+00	3.2934e-08
2.1150e+00	6.7756e+00	1.5136e-07	6.1345e+00	7.9754e+00	3.0540e-08
2.1577e+00	6.9253e+00	1.5141e-07	6.1859e+00	7.6691e+00	2.8253e-08
2.2137e+00	7.1166e+00	1.5096e-07	6.2377e+00	7.3604e+00	2.5967e-08
2.2712e+00	7.2834e+00	1.5024e-07	6.2898e+00	7.0490e+00	2.3519e-08
2.3301e+00	7.4235e+00	1.4971e-07	6.3425e+00	6.7349e+00	2.1035e-08
2.3712e+00	7.5198e+00	1.4918e-07	6.3956e+00	6.4185e+00	1.8395e-08
2.4021e+00	7.5922e+00	1.4819e-07	6.4491e+00	6.0990e+00	1.4832e-08
2.4533e+00	7.7063e+00	1.4659e-07	6.5030e+00	5.7772e+00	9.3627e-09
2.5175e+00	7.8368e+00	1.4503e-07	6.5575e+00	5.4527e+00	3.6889e-09
2.5750e+00	7.9481e+00	1.4338e-07	6.6124e+00	5.1252e+00	9.2182e-10
2.6296e+00	8.0553e+00	1.4142e-07	6.6677e+00	4.7950e+00	8.7657e-10
2.6896e+00	8.1795e+00	1.3963e-07	6.7235e+00	4.4621e+00	4.3045e-09
2.7439e+00	8.2953e+00	1.3761e-07	6.7797e+00	4.1266e+00	1.5391e-08
2.8030e+00	8.4155e+00	1.3514e-07	6.8365e+00	3.9154e+00	3.1664e-08
2.8739e+00	8.5576e+00	1.3230e-07	6.8937e+00	4.0199e+00	4.7359e-08
2.9466e+00	8.7034e+00	1.2926e-07	6.9513e+00	4.3156e+00	6.1788e-08
3.0212e+00	8.8380e+00	1.2618e-07	7.0095e+00	4.6139e+00	7.4658e-08
3.0981e+00	8.9309e+00	1.2349e-07	7.0682e+00	4.9148e+00	8.4983e-08
3.1775e+00	8.9959e+00	1.2135e-07	7.1273e+00	5.2182e+00	9.2292e-08
3.2588e+00	9.0625e+00	1.1873e-07	7.1869e+00	5.5242e+00	9.6419e-08
3.3404e+00	9.1401e+00	1.1571e-07	7.2471e+00	5.8328e+00	9.8035e-08
3.4236e+00	9.2415e+00	1.1244e-07	7.3078e+00	6.1439e+00	9.8901e-08
3.5102e+00	9.3582e+00	1.0830e-07	7.3689e+00	6.4576e+00	1.0068e-07
3.5991e+00	9.4779e+00	1.0350e-07	7.4306e+00	6.7738e+00	1.0309e-07
3.6902e+00	9.5849e+00	1.0179e-07	7.4928e+00	7.0929e+00	1.0421e-07
3.7836e+00	9.6623e+00	1.0214e-07	7.5555e+00	7.4146e+00	1.0079e-07
3.8794e+00	9.7253e+00	1.0014e-07	7.6187e+00	7.7388e+00	8.8309e-08
3.9640e+00	9.7810e+00	9.3918e-08	7.6825e+00	8.0660e+00	6.4581e-08
4.0647e+00	9.8805e+00	8.4453e-08	7.7468e+00	8.3959e+00	4.3556e-08
4.1815e+00	1.0045e+01	7.3368e-08	7.8116e+00	8.7283e+00	4.8161e-08
4.2874e+00	1.0223e+01	7.3422e-08	7.8769e+00	9.0635e+00	8.7718e-08
4.3959e+00	1.0406e+01	7.9826e-08	7.9428e+00	9.2657e+00	1.3917e-07
4.5072e+00	1.0594e+01	7.8787e-08	8.0093e+00	9.3096e+00	1.7303e-07
4.6213e+00	1.0702e+01	7.7633e-08	8.0763e+00	9.3296e+00	1.8948e-07
4.7383e+00	1.0707e+01	7.4761e-08	8.1439e+00	9.3499e+00	1.9783e-07
4.8582e+00	1.0690e+01	6.9518e-08	8.2120e+00	9.3702e+00	2.0265e-07
4.9812e+00	1.0674e+01	6.5579e-08	8.2808e+00	9.3908e+00	2.0548e-07
5.0646e+00	1.0662e+01	6.3262e-08	8.3501e+00	9.4116e+00	2.0617e-07
5.1070e+00	1.0656e+01	6.1636e-08	8.4200e+00	9.4325e+00	2.0356e-07
5.1497e+00	1.0650e+01	6.0102e-08	8.4904e+00	9.4535e+00	1.9584e-07
5.1928e+00	1.0639e+01	5.8606e-08	8.5615e+00	9.4748e+00	1.8816e-07
5.2363e+00	1.0615e+01	5.7080e-08	8.6331e+00	9.4962e+00	1.9054e-07
5.2801e+00	1.0584e+01	5.5791e-08	8.7053e+00	9.5179e+00	1.9842e-07
5.3242e+00	1.0553e+01	5.4481e-08	8.7782e+00	9.5506e+00	2.0670e-07
5.3688e+00	1.0521e+01	5.3260e-08	8.8516e+00	9.5964e+00	2.1598e-07
5.4138e+00	1.0490e+01	5.2199e-08	8.9257e+00	9.6446e+00	2.2189e-07
5.4590e+00	1.0458e+01	5.1183e-08	9.0004e+00	9.6931e+00	2.2418e-07
5.5047e+00	1.0425e+01	5.0119e-08	9.0757e+00	9.7421e+00	2.2478e-07
5.5508e+00	1.0393e+01	4.9076e-08	9.1517e+00	9.7915e+00	2.2363e-07
5.5972e+00	1.0360e+01	4.8003e-08	9.2282e+00	9.8413e+00	2.2161e-07
5.6441e+00	1.0327e+01	4.6841e-08	9.3055e+00	9.8915e+00	2.2141e-07
5.6913e+00	1.0294e+01	4.5672e-08	9.3834e+00	9.9422e+00	2.2227e-07
5.7389e+00	1.0235e+01	4.4394e-08	9.4619e+00	9.9932e+00	2.2220e-07
5.7870e+00	1.0049e+01	4.3167e-08	9.5411e+00	9.8944e+00	2.2205e-07
5.8354e+00	9.7600e+00	4.1942e-08	9.6209e+00	9.4322e+00	2.2320e-07

9.7014e+00	8.7540e+00	2.2357e-07	1.5995e+01	1.4580e+01	1.2502e-06
9.7826e+00	8.0699e+00	2.2212e-07	1.6129e+01	1.4511e+01	1.2908e-06
9.8645e+00	7.3800e+00	2.1949e-07	1.6264e+01	1.4441e+01	1.2992e-06
9.9470e+00	6.6849e+00	2.1456e-07	1.6400e+01	1.4372e+01	1.2661e-06
1.0030e+01	5.9840e+00	2.0764e-07	1.6537e+01	1.4301e+01	1.2369e-06
1.0114e+01	5.2780e+00	1.9458e-07	1.6675e+01	1.4230e+01	1.2797e-06
1.0199e+01	4.5662e+00	1.8601e-07	1.6815e+01	1.4158e+01	1.3693e-06
1.0284e+01	3.8459e+00	1.8880e-07	1.6956e+01	1.4086e+01	1.4335e-06
1.0370e+01	3.1214e+00	1.8844e-07	1.7098e+01	1.4013e+01	1.4480e-06
1.0457e+01	2.3884e+00	1.8402e-07	1.7241e+01	1.3939e+01	1.3918e-06
1.0544e+01	1.8197e+00	1.7400e-07	1.7385e+01	1.3865e+01	1.0864e-06
1.0633e+01	1.8985e+00	1.5203e-07	1.7530e+01	1.3791e+01	6.6340e-07
1.0721e+01	2.4523e+00	1.1655e-07	1.7677e+01	1.3663e+01	8.1886e-07
1.0811e+01	3.0092e+00	8.0801e-08	1.7825e+01	1.3408e+01	1.4523e-06
1.0902e+01	3.5723e+00	7.2241e-08	1.7974e+01	1.3073e+01	1.9006e-06
1.0993e+01	4.1417e+00	1.0387e-07	1.8124e+01	1.2735e+01	2.0757e-06
1.1085e+01	4.7141e+00	1.6102e-07	1.8276e+01	1.2394e+01	2.1279e-06
1.1178e+01	5.2897e+00	2.1781e-07	1.8429e+01	1.2050e+01	2.1517e-06
1.1271e+01	5.8715e+00	2.6401e-07	1.8584e+01	1.1703e+01	2.1581e-06
1.1366e+01	6.4595e+00	2.9961e-07	1.8739e+01	1.1354e+01	2.1468e-06
1.1461e+01	7.0538e+00	3.2157e-07	1.8895e+01	1.1002e+01	2.1007e-06
1.1557e+01	7.6511e+00	3.2101e-07	1.9053e+01	1.0647e+01	1.9823e-06
1.1654e+01	8.2516e+00	2.8792e-07	1.9213e+01	1.0288e+01	1.8516e-06
1.1751e+01	8.8583e+00	2.0385e-07	1.9374e+01	9.9264e+00	1.7955e-06
1.1850e+01	9.4712e+00	1.6548e-07	1.9537e+01	9.5612e+00	1.7570e-06
1.1948e+01	1.0087e+01	3.1094e-07	1.9700e+01	9.1938e+00	1.7482e-06
1.2049e+01	1.0709e+01	4.9879e-07	1.9864e+01	8.8241e+00	1.7753e-06
1.2149e+01	1.1338e+01	5.7007e-07	2.0030e+01	8.4510e+00	1.7684e-06
1.2251e+01	1.1969e+01	5.7046e-07	2.0198e+01	8.0735e+00	1.4557e-06
1.2354e+01	1.2607e+01	5.6690e-07	2.0367e+01	7.6937e+00	1.0691e-06
1.2457e+01	1.3137e+01	5.8629e-07	2.0538e+01	7.3116e+00	6.4305e-07
1.2561e+01	1.3388e+01	5.9828e-07	2.0709e+01	6.9251e+00	1.6794e-07
1.2666e+01	1.3472e+01	5.9680e-07	2.0883e+01	6.5352e+00	2.2232e-07
1.2772e+01	1.3556e+01	5.9747e-07	2.1058e+01	6.3042e+00	1.0720e-06
1.2879e+01	1.3641e+01	6.0412e-07	2.1234e+01	6.3151e+00	2.2675e-06
1.2987e+01	1.3727e+01	6.1079e-07	2.1412e+01	6.4089e+00	3.1625e-06
1.3095e+01	1.3814e+01	6.0338e-07	2.1591e+01	6.5037e+00	3.6864e-06
1.3205e+01	1.3901e+01	5.7158e-07	2.1771e+01	6.5990e+00	3.7866e-06
1.3316e+01	1.3989e+01	5.0821e-07	2.1953e+01	6.6952e+00	3.0957e-06
1.3427e+01	1.4077e+01	5.0631e-07	2.2137e+01	6.7924e+00	2.2269e-06
1.3540e+01	1.4167e+01	5.5624e-07	2.2323e+01	6.8903e+00	3.2851e-06
1.3653e+01	1.4257e+01	5.6205e-07	2.2510e+01	6.9889e+00	5.2178e-06
1.3767e+01	1.4348e+01	5.4761e-07	2.2698e+01	7.0882e+00	6.0024e-06
1.3882e+01	1.4439e+01	5.3804e-07	2.2888e+01	7.1885e+00	6.2557e-06
1.3998e+01	1.4532e+01	5.2148e-07	2.3079e+01	7.2899e+00	6.4671e-06
1.4115e+01	1.4625e+01	4.4287e-07	2.3273e+01	7.3919e+00	6.5531e-06
1.4233e+01	1.4719e+01	3.6021e-07	2.3467e+01	7.4946e+00	6.5790e-06
1.4353e+01	1.4813e+01	4.2313e-07	2.3663e+01	7.5984e+00	6.5044e-06
1.4473e+01	1.4909e+01	3.9102e-07	2.3861e+01	7.6930e+00	6.4641e-06
1.4594e+01	1.5005e+01	2.3880e-07	2.4061e+01	7.7769e+00	6.7286e-06
1.4716e+01	1.5103e+01	3.4321e-07	2.4263e+01	7.8596e+00	6.9128e-06
1.4839e+01	1.5147e+01	6.4532e-07	2.4466e+01	7.9430e+00	6.8930e-06
1.4963e+01	1.5110e+01	8.6620e-07	2.4671e+01	8.0270e+00	6.8769e-06
1.5088e+01	1.5046e+01	9.4219e-07	2.4877e+01	8.1117e+00	6.9358e-06
1.5214e+01	1.4981e+01	9.5924e-07	2.5086e+01	8.1973e+00	7.0188e-06
1.5342e+01	1.4915e+01	9.7369e-07	2.5295e+01	8.2834e+00	7.0147e-06
1.5471e+01	1.4849e+01	1.0128e-06	2.5507e+01	8.3702e+00	6.9200e-06
1.5600e+01	1.4783e+01	1.0781e-06	2.5720e+01	8.4579e+00	6.6769e-06
1.5730e+01	1.4716e+01	1.1497e-06	2.5935e+01	8.5461e+00	5.4097e-06
1.5862e+01	1.4648e+01	1.2040e-06	2.6152e+01	8.6352e+00	4.3311e-06

2.6371e+01	8.6953e+00	5.8508e-06	4.3479e+01	4.4896e+00	2.3316e-05
2.6592e+01	8.7206e+00	7.7371e-06	4.3843e+01	4.7126e+00	2.1494e-05
2.6815e+01	8.7408e+00	8.1427e-06	4.4210e+01	4.9378e+00	1.4486e-05
2.7038e+01	8.7611e+00	7.8086e-06	4.4580e+01	5.1647e+00	1.6632e-05
2.7265e+01	8.7817e+00	7.8442e-06	4.4953e+01	5.3935e+00	2.5166e-05
2.7494e+01	8.8024e+00	8.3201e-06	4.5328e+01	5.6242e+00	2.6443e-05
2.7724e+01	8.8233e+00	8.4111e-06	4.5707e+01	5.8567e+00	2.6582e-05
2.7956e+01	8.8444e+00	8.4259e-06	4.6090e+01	6.0913e+00	2.6168e-05
2.8190e+01	8.8656e+00	8.3776e-06	4.6476e+01	6.3281e+00	2.5350e-05
2.8425e+01	8.8870e+00	8.2324e-06	4.6865e+01	6.5379e+00	2.4392e-05
2.8663e+01	8.9085e+00	8.0792e-06	4.7257e+01	6.6849e+00	2.1987e-05
2.8902e+01	8.9303e+00	8.0746e-06	4.7652e+01	6.7977e+00	2.2431e-05
2.9145e+01	8.9545e+00	8.1703e-06	4.8051e+01	6.9115e+00	2.6099e-05
2.9389e+01	8.9815e+00	8.2649e-06	4.8453e+01	7.0261e+00	2.7424e-05
2.9634e+01	9.0092e+00	8.3745e-06	4.8859e+01	7.1417e+00	2.6699e-05
2.9883e+01	9.0371e+00	8.4368e-06	4.9268e+01	7.2583e+00	2.5320e-05
3.0133e+01	9.0652e+00	8.4312e-06	4.9680e+01	7.3758e+00	2.0136e-05
3.0384e+01	9.0935e+00	8.3916e-06	5.0096e+01	7.4003e+00	2.1959e-05
3.0639e+01	9.1221e+00	8.2921e-06	5.0516e+01	7.3243e+00	3.0108e-05
3.0895e+01	9.1510e+00	8.2680e-06	5.0938e+01	7.2410e+00	3.1799e-05
3.1154e+01	9.1800e+00	8.4515e-06	5.1364e+01	7.1570e+00	3.1722e-05
3.1414e+01	9.2093e+00	8.6013e-06	5.1794e+01	7.0722e+00	3.0314e-05
3.1677e+01	9.2389e+00	8.4787e-06	5.2227e+01	6.9867e+00	1.9986e-05
3.1943e+01	9.2687e+00	8.0557e-06	5.2665e+01	6.9005e+00	2.1346e-05
3.2210e+01	9.1326e+00	7.8038e-06	5.3105e+01	6.8137e+00	3.3446e-05
3.2480e+01	8.7994e+00	8.1690e-06	5.3550e+01	6.7905e+00	3.5474e-05
3.2752e+01	8.4340e+00	8.5363e-06	5.3998e+01	6.9222e+00	3.5566e-05
3.3026e+01	8.0658e+00	8.5790e-06	5.4449e+01	7.1457e+00	3.5046e-05
3.3302e+01	7.6950e+00	8.5402e-06	5.4905e+01	7.3715e+00	3.3539e-05
3.3580e+01	7.3208e+00	8.5576e-06	5.5364e+01	7.5991e+00	3.0233e-05
3.3861e+01	6.9433e+00	8.3616e-06	5.5828e+01	7.8283e+00	3.1727e-05
3.4144e+01	6.5624e+00	7.7993e-06	5.6294e+01	8.0596e+00	3.4597e-05
3.4430e+01	6.1781e+00	7.3979e-06	5.6766e+01	8.2931e+00	3.1070e-05
3.4718e+01	5.7912e+00	7.2101e-06	5.7242e+01	8.5285e+00	2.7144e-05
3.5009e+01	5.4009e+00	7.1351e-06	5.7721e+01	8.7657e+00	2.8181e-05
3.5302e+01	5.0072e+00	7.5665e-06	5.8204e+01	9.0049e+00	3.2334e-05
3.5597e+01	4.7542e+00	8.7243e-06	5.8691e+01	9.2460e+00	2.9566e-05
3.5895e+01	4.6684e+00	8.6589e-06	5.9181e+01	9.4892e+00	3.1165e-05
3.6195e+01	4.6074e+00	4.4255e-06	5.9677e+01	9.7343e+00	4.1069e-05
3.6498e+01	4.5458e+00	6.7859e-07	6.0176e+01	9.9816e+00	4.5514e-05
3.6804e+01	4.4838e+00	2.0487e-06	6.0680e+01	1.0231e+01	4.7047e-05
3.7112e+01	4.4212e+00	5.8555e-06	6.1187e+01	1.0482e+01	4.6965e-05
3.7422e+01	4.3580e+00	9.4199e-06	6.1699e+01	1.0691e+01	4.5239e-05
3.7736e+01	4.2944e+00	1.0927e-05	6.2216e+01	1.0791e+01	4.4411e-05
3.8052e+01	4.2302e+00	7.9129e-06	6.2736e+01	1.0825e+01	4.3541e-05
3.8370e+01	4.1655e+00	9.3512e-06	6.3261e+01	1.0859e+01	4.6029e-05
3.8691e+01	4.1140e+00	1.4858e-05	6.3790e+01	1.0894e+01	5.0711e-05
3.9014e+01	4.0951e+00	1.6050e-05	6.4324e+01	1.0928e+01	5.8540e-05
3.9341e+01	4.0955e+00	1.6782e-05	6.4862e+01	1.0963e+01	5.9556e-05
3.9671e+01	4.0959e+00	1.7643e-05	6.5405e+01	1.0999e+01	2.9327e-05
4.0003e+01	4.0963e+00	1.8308e-05	6.5953e+01	1.1034e+01	1.0351e-05
4.0337e+01	4.0967e+00	1.8508e-05	6.6505e+01	1.1070e+01	2.9691e-05
4.0674e+01	4.0971e+00	1.8323e-05	6.7061e+01	1.1106e+01	5.5724e-05
4.1015e+01	4.0975e+00	1.3816e-05	6.7623e+01	1.1143e+01	7.0324e-05
4.1358e+01	4.0979e+00	7.5972e-06	6.8188e+01	1.1180e+01	7.4105e-05
4.1704e+01	4.0983e+00	1.2594e-05	6.8758e+01	1.1217e+01	7.5936e-05
4.2053e+01	4.0987e+00	2.1010e-05	6.9334e+01	1.1254e+01	7.6447e-05
4.2406e+01	4.0991e+00	2.3015e-05	6.9915e+01	1.1292e+01	7.6591e-05
4.2760e+01	4.1285e+00	2.3490e-05	7.0499e+01	1.1330e+01	7.7748e-05
4.3118e+01	4.2682e+00	2.3533e-05	7.1089e+01	1.1368e+01	8.1615e-05

7.1684e+01	1.1407e+01	8.3465e-05	1.1819e+02	1.0064e+01	1.9943e-04
7.2284e+01	1.1446e+01	6.2603e-05	1.1917e+02	1.0060e+01	2.2923e-04
7.2889e+01	1.1486e+01	6.1912e-05	1.2017e+02	1.0057e+01	2.6479e-04
7.3499e+01	1.1526e+01	7.2652e-05	1.2118e+02	1.0053e+01	2.5300e-04
7.4114e+01	1.1566e+01	5.8412e-05	1.2219e+02	1.0050e+01	2.8137e-04
7.4734e+01	1.1607e+01	5.2856e-05	1.2322e+02	1.0046e+01	3.0102e-04
7.5360e+01	1.1648e+01	7.3626e-05	1.2425e+02	1.0043e+01	3.0086e-04
7.5990e+01	1.1689e+01	9.8363e-05	1.2528e+02	1.0039e+01	2.8992e-04
7.6626e+01	1.1731e+01	1.0248e-04	1.2633e+02	1.0035e+01	2.9108e-04
7.7267e+01	1.1773e+01	1.0404e-04	1.2739e+02	1.0032e+01	3.0087e-04
7.7914e+01	1.1815e+01	1.0597e-04	1.2846e+02	1.0028e+01	3.0217e-04
7.8566e+01	1.1858e+01	1.0473e-04	1.2953e+02	1.0024e+01	2.9817e-04
7.9223e+01	1.1901e+01	1.0188e-04	1.3062e+02	1.0020e+01	2.9388e-04
7.9886e+01	1.1945e+01	7.7095e-05	1.3171e+02	1.0016e+01	2.9711e-04
8.0554e+01	1.1988e+01	6.7619e-05	1.3281e+02	1.0012e+01	2.8358e-04
8.1228e+01	1.2033e+01	9.1642e-05	1.3393e+02	1.0009e+01	2.6731e-04
8.1909e+01	1.2077e+01	1.0203e-04	1.3505e+02	1.0005e+01	2.9563e-04
8.2594e+01	1.2122e+01	1.0349e-04	1.3618e+02	1.0001e+01	3.1429e-04
8.3285e+01	1.2168e+01	1.0378e-04	1.3731e+02	9.9966e+00	3.2633e-04
8.3982e+01	1.2168e+01	1.0108e-04	1.3846e+02	9.9926e+00	3.4799e-04
8.4685e+01	1.2122e+01	8.4108e-05	1.3962e+02	9.9885e+00	3.4629e-04
8.5393e+01	1.2073e+01	8.3347e-05	1.4079e+02	9.9844e+00	3.4217e-04
8.6108e+01	1.2024e+01	1.1125e-04	1.4197e+02	9.9802e+00	3.1384e-04
8.6829e+01	1.1974e+01	1.3234e-04	1.4316e+02	9.9780e+00	3.1184e-04
8.7555e+01	1.1923e+01	1.4329e-04	1.4436e+02	9.9780e+00	3.0992e-04
8.8288e+01	1.1873e+01	1.4264e-04	1.4556e+02	9.9782e+00	2.9213e-04
8.9027e+01	1.1821e+01	1.4979e-04	1.4678e+02	9.9785e+00	3.3227e-04
8.9772e+01	1.1770e+01	1.2684e-04	1.4801e+02	9.9787e+00	3.6137e-04
9.0523e+01	1.1718e+01	1.0362e-04	1.4925e+02	9.9789e+00	3.6993e-04
9.1281e+01	1.1665e+01	1.3701e-04	1.5050e+02	9.9792e+00	3.5070e-04
9.2044e+01	1.1612e+01	1.5332e-04	1.5175e+02	9.9794e+00	3.4766e-04
9.2815e+01	1.1559e+01	1.5856e-04	1.5302e+02	9.9796e+00	3.7135e-04
9.3591e+01	1.1505e+01	1.7295e-04	1.5431e+02	9.9799e+00	3.6499e-04
9.4374e+01	1.1451e+01	1.6837e-04	1.5560e+02	9.9801e+00	3.3805e-04
9.5165e+01	1.1396e+01	1.5643e-04	1.5690e+02	9.9803e+00	3.3663e-04
9.5960e+01	1.1341e+01	1.5349e-04	1.5821e+02	9.9806e+00	3.7222e-04
9.6763e+01	1.1286e+01	1.5857e-04	1.5953e+02	9.9808e+00	3.9044e-04
9.7573e+01	1.1230e+01	1.6172e-04	1.6087e+02	9.9811e+00	3.8467e-04
9.8390e+01	1.1173e+01	1.6485e-04	1.6222e+02	9.9813e+00	3.8897e-04
9.9213e+01	1.1116e+01	1.7574e-04	1.6357e+02	9.9816e+00	2.9570e-04
1.0004e+02	1.1058e+01	2.3579e-04	1.6494e+02	9.9818e+00	2.8749e-04
1.0088e+02	1.1001e+01	2.6395e-04	1.6632e+02	9.9821e+00	3.8500e-04
1.0172e+02	1.0942e+01	1.2501e-04	1.6772e+02	9.9824e+00	4.0670e-04
1.0258e+02	1.0883e+01	5.2683e-05	1.6912e+02	9.9826e+00	3.9912e-04
1.0344e+02	1.0824e+01	1.3336e-04	1.7053e+02	9.9829e+00	4.0161e-04
1.0430e+02	1.0764e+01	1.3737e-04	1.7197e+02	9.9831e+00	4.3691e-04
1.0517e+02	1.0703e+01	1.5101e-04	1.7340e+02	9.9834e+00	4.4283e-04
1.0605e+02	1.0643e+01	1.7797e-04	1.7485e+02	9.9837e+00	4.3906e-04
1.0694e+02	1.0581e+01	1.9958e-04	1.7631e+02	9.9817e+00	4.1469e-04
1.0784e+02	1.0519e+01	2.4273e-04	1.7779e+02	9.9754e+00	4.0619e-04
1.0873e+02	1.0457e+01	2.4081e-04	1.7928e+02	9.9667e+00	4.1848e-04
1.0965e+02	1.0394e+01	2.3448e-04	1.8078e+02	9.9581e+00	4.1914e-04
1.1056e+02	1.0330e+01	2.3479e-04	1.8229e+02	9.9493e+00	4.0984e-04
1.1149e+02	1.0266e+01	2.3943e-04	1.8381e+02	9.9405e+00	4.0280e-04
1.1242e+02	1.0201e+01	2.3866e-04	1.8535e+02	9.9315e+00	6.1204e-04
1.1336e+02	1.0136e+01	2.3720e-04	1.8690e+02	9.9226e+00	6.6463e-04
1.1431e+02	1.0089e+01	2.7029e-04	1.8847e+02	9.9135e+00	2.7871e-04
1.1527e+02	1.0074e+01	2.6271e-04	1.9005e+02	9.9043e+00	1.6080e-04
1.1623e+02	1.0071e+01	1.4590e-04	1.9164e+02	9.8951e+00	3.2330e-04
1.1721e+02	1.0067e+01	1.4960e-04	1.9325e+02	9.8858e+00	3.7165e-04

1.9486e+02	9.8765e+00	3.6521e-04	3.2127e+02	9.2104e+00	7.7533e-04
1.9649e+02	9.8670e+00	4.0580e-04	3.2395e+02	9.1975e+00	7.7211e-04
1.9813e+02	9.8575e+00	4.2376e-04	3.2666e+02	9.1845e+00	8.1586e-04
1.9979e+02	9.8479e+00	4.3565e-04	3.2940e+02	9.1713e+00	8.4110e-04
2.0146e+02	9.8382e+00	4.4630e-04	3.3215e+02	9.1581e+00	8.1470e-04
2.0315e+02	9.8284e+00	4.4030e-04	3.3494e+02	9.1447e+00	7.7179e-04
2.0485e+02	9.8186e+00	5.8070e-04	3.3774e+02	9.1327e+00	8.0157e-04
2.0656e+02	9.8087e+00	4.7188e-04	3.4056e+02	9.1241e+00	9.3980e-04
2.0829e+02	9.7987e+00	3.3216e-04	3.4341e+02	9.1176e+00	9.7223e-04
2.1003e+02	9.7885e+00	4.6655e-04	3.4629e+02	9.1110e+00	6.9630e-04
2.1179e+02	9.7784e+00	5.1783e-04	3.4918e+02	9.1044e+00	6.2106e-04
2.1356e+02	9.7681e+00	5.2637e-04	3.5211e+02	9.0978e+00	8.2066e-04
2.1535e+02	9.7577e+00	5.0962e-04	3.5505e+02	9.0911e+00	8.8634e-04
2.1716e+02	9.7473e+00	5.1121e-04	3.5802e+02	9.0843e+00	8.9285e-04
2.1897e+02	9.7368e+00	5.1312e-04	3.6102e+02	9.0774e+00	8.6155e-04
2.2080e+02	9.7262e+00	5.1548e-04	3.6405e+02	9.0705e+00	8.6149e-04
2.2265e+02	9.7155e+00	5.3426e-04	3.6709e+02	9.0636e+00	8.7985e-04
2.2451e+02	9.7046e+00	5.4149e-04	3.7016e+02	9.0566e+00	8.5846e-04
2.2640e+02	9.6938e+00	5.4495e-04	3.7325e+02	9.0495e+00	8.3870e-04
2.2829e+02	9.6828e+00	5.5164e-04	3.7638e+02	9.0424e+00	8.5831e-04
2.3020e+02	9.6717e+00	5.2665e-04	3.7953e+02	9.0352e+00	8.8682e-04
2.3213e+02	9.6606e+00	5.3489e-04	3.8271e+02	9.0280e+00	8.7461e-04
2.3406e+02	9.6493e+00	6.1883e-04	3.8591e+02	9.0207e+00	8.7795e-04
2.3603e+02	9.6380e+00	4.7591e-04	3.8914e+02	9.0133e+00	8.9983e-04
2.3800e+02	9.6265e+00	4.0750e-04	3.9239e+02	9.0059e+00	8.8621e-04
2.3999e+02	9.6150e+00	5.5347e-04	3.9568e+02	8.9984e+00	8.3359e-04
2.4200e+02	9.6033e+00	5.8415e-04	3.9899e+02	8.9908e+00	8.4499e-04
2.4403e+02	9.5916e+00	6.0794e-04	4.0233e+02	8.9832e+00	8.2694e-04
2.4606e+02	9.5798e+00	6.1576e-04	4.0570e+02	8.9755e+00	7.7319e-04
2.4813e+02	9.5678e+00	5.9222e-04	4.0910e+02	8.9678e+00	8.1819e-04
2.5020e+02	9.5558e+00	5.5794e-04	4.1251e+02	8.9620e+00	8.9788e-04
2.5230e+02	9.5437e+00	5.7422e-04	4.1597e+02	8.9611e+00	9.2605e-04
2.5441e+02	9.5321e+00	6.0504e-04	4.1944e+02	8.9633e+00	9.3441e-04
2.5654e+02	9.5214e+00	6.0717e-04	4.2296e+02	8.9654e+00	9.4991e-04
2.5869e+02	9.5111e+00	5.8981e-04	4.2650e+02	8.9676e+00	9.4670e-04
2.6085e+02	9.5008e+00	5.7066e-04	4.3007e+02	8.9698e+00	8.6651e-04
2.6303e+02	9.4903e+00	6.1254e-04	4.3366e+02	8.9720e+00	8.6668e-04
2.6524e+02	9.4797e+00	6.5321e-04	4.3729e+02	8.9743e+00	9.4693e-04
2.6745e+02	9.4690e+00	6.8586e-04	4.4095e+02	8.9765e+00	9.5365e-04
2.6969e+02	9.4583e+00	6.9852e-04	4.4464e+02	8.9788e+00	9.5844e-04
2.7194e+02	9.4474e+00	5.0662e-04	4.4837e+02	8.9811e+00	9.3506e-04
2.7422e+02	9.4365e+00	4.4408e-04	4.5212e+02	8.9834e+00	8.8872e-04
2.7651e+02	9.4255e+00	6.3363e-04	4.5590e+02	8.9857e+00	9.0956e-04
2.7883e+02	9.4143e+00	7.1933e-04	4.5972e+02	8.9881e+00	9.0608e-04
2.8116e+02	9.4031e+00	7.0961e-04	4.6356e+02	8.9904e+00	9.1682e-04
2.8352e+02	9.3918e+00	7.0726e-04	4.6744e+02	8.9928e+00	9.8045e-04
2.8589e+02	9.3804e+00	7.1109e-04	4.7136e+02	8.9952e+00	9.7891e-04
2.8828e+02	9.3689e+00	6.0675e-04	4.7530e+02	8.9976e+00	9.3298e-04
2.9069e+02	9.3573e+00	6.2968e-04	4.7927e+02	9.0001e+00	9.4060e-04
2.9313e+02	9.3456e+00	7.5899e-04	4.8328e+02	9.0026e+00	9.6931e-04
2.9558e+02	9.3338e+00	7.6219e-04	4.8733e+02	9.0051e+00	9.5541e-04
2.9805e+02	9.3220e+00	7.6764e-04	4.9140e+02	9.0076e+00	9.6578e-04
3.0055e+02	9.3100e+00	7.5909e-04	4.9551e+02	9.0101e+00	9.6191e-04
3.0306e+02	9.2979e+00	7.5966e-04	4.9966e+02	9.0126e+00	9.6546e-04
3.0560e+02	9.2857e+00	7.7891e-04	5.0385e+02	9.0152e+00	9.7016e-04
3.0815e+02	9.2734e+00	7.5105e-04	5.0807e+02	9.0178e+00	9.8042e-04
3.1074e+02	9.2610e+00	7.4879e-04	5.1232e+02	9.0204e+00	9.6473e-04
3.1333e+02	9.2485e+00	7.8726e-04	5.1660e+02	9.0231e+00	8.7685e-04
3.1595e+02	9.2359e+00	8.1872e-04	5.2092e+02	9.0257e+00	8.6263e-04
3.1860e+02	9.2232e+00	8.0997e-04	5.2528e+02	9.0284e+00	9.6276e-04

5.2968e+02	9.0311e+00	9.5105e-04	8.7329e+02	8.5448e+00	1.2194e-03
5.3412e+02	9.0338e+00	9.3753e-04	8.8060e+02	8.5458e+00	1.2281e-03
5.3858e+02	9.0366e+00	1.0052e-03	8.8797e+02	8.5468e+00	1.2023e-03
5.4309e+02	9.0394e+00	1.0222e-03	8.9540e+02	8.5478e+00	1.1401e-03
5.4763e+02	9.0421e+00	1.0144e-03	9.0289e+02	8.5488e+00	1.0984e-03
5.5222e+02	9.0450e+00	1.0060e-03	9.1045e+02	8.5499e+00	1.1543e-03
5.5684e+02	9.0478e+00	1.0038e-03	9.1807e+02	8.5509e+00	1.2200e-03
5.6150e+02	9.0507e+00	1.0179e-03	9.2575e+02	8.5520e+00	1.2929e-03
5.6620e+02	9.0493e+00	1.1167e-03	9.3350e+02	8.5530e+00	1.1207e-03
5.7093e+02	9.0411e+00	1.1187e-03	9.4131e+02	8.5541e+00	1.1718e-03
5.7571e+02	9.0301e+00	9.4292e-04	9.4918e+02	8.5552e+00	1.2293e-03
5.8053e+02	9.0190e+00	1.0253e-03	9.5713e+02	8.5563e+00	1.0627e-03
5.8538e+02	9.0078e+00	1.2757e-03	9.6514e+02	8.5439e+00	1.1277e-03
5.9028e+02	8.9966e+00	1.0628e-03	9.7321e+02	8.5155e+00	1.3384e-03
5.9522e+02	8.9852e+00	9.3368e-04	9.8136e+02	8.4846e+00	1.3352e-03
6.0021e+02	8.9738e+00	1.0914e-03	9.8957e+02	8.4533e+00	1.0347e-03
6.0523e+02	8.9622e+00	1.1146e-03	9.9785e+02	8.4219e+00	1.0325e-03
6.1029e+02	8.9506e+00	1.1888e-03	1.0062e+03	8.3901e+00	1.1730e-03
6.1539e+02	8.9388e+00	1.0771e-03	1.0146e+03	8.3581e+00	1.1752e-03
6.2054e+02	8.9270e+00	9.9656e-04	1.0231e+03	8.3258e+00	1.1447e-03
6.2574e+02	8.9151e+00	1.0692e-03	1.0317e+03	8.2931e+00	1.2335e-03
6.3098e+02	8.9030e+00	1.0944e-03	1.0403e+03	8.2604e+00	1.3260e-03
6.3626e+02	8.8909e+00	1.1483e-03	1.0490e+03	8.2273e+00	1.1243e-03
6.4159e+02	8.8786e+00	1.1595e-03	1.0578e+03	8.1939e+00	1.0432e-03
6.4695e+02	8.8663e+00	1.2865e-03	1.0666e+03	8.1602e+00	1.1570e-03
6.5237e+02	8.8538e+00	1.3991e-03	1.0755e+03	8.1264e+00	1.1959e-03
6.5783e+02	8.8413e+00	1.0208e-03	1.0845e+03	8.0921e+00	1.2582e-03
6.6333e+02	8.8286e+00	8.8728e-04	1.0936e+03	8.0575e+00	1.1900e-03
6.6888e+02	8.8159e+00	1.1216e-03	1.1028e+03	8.0227e+00	1.0897e-03
6.7448e+02	8.8030e+00	1.1280e-03	1.1120e+03	7.9876e+00	1.1970e-03
6.8013e+02	8.7900e+00	1.1785e-03	1.1213e+03	7.9614e+00	1.3340e-03
6.8582e+02	8.7769e+00	1.1280e-03	1.1307e+03	7.9581e+00	1.1553e-03
6.9155e+02	8.7637e+00	1.0984e-03	1.1401e+03	7.9685e+00	9.1725e-04
6.9734e+02	8.7504e+00	1.2004e-03	1.1497e+03	7.9791e+00	1.1280e-03
7.0317e+02	8.7370e+00	1.1026e-03	1.1593e+03	7.9897e+00	1.2831e-03
7.0906e+02	8.7235e+00	1.0616e-03	1.1691e+03	8.0004e+00	1.1899e-03
7.1499e+02	8.7119e+00	1.1533e-03	1.1788e+03	8.0112e+00	1.2603e-03
7.2097e+02	8.7027e+00	1.1754e-03	1.1887e+03	8.0221e+00	1.1692e-03
7.2701e+02	8.6937e+00	1.1631e-03	1.1986e+03	8.0331e+00	1.0891e-03
7.3310e+02	8.6847e+00	1.1601e-03	1.2087e+03	8.0441e+00	1.2135e-03
7.3923e+02	8.6756e+00	1.1817e-03	1.2188e+03	8.0554e+00	1.3727e-03
7.4541e+02	8.6665e+00	1.1412e-03	1.2290e+03	8.0666e+00	1.4937e-03
7.5165e+02	8.6572e+00	1.1417e-03	1.2393e+03	8.0779e+00	1.1996e-03
7.5794e+02	8.6479e+00	1.1445e-03	1.2496e+03	8.0893e+00	1.0860e-03
7.6429e+02	8.6385e+00	1.1563e-03	1.2600e+03	8.1009e+00	1.1774e-03
7.7068e+02	8.6290e+00	1.1732e-03	1.2706e+03	8.1125e+00	1.1679e-03
7.7713e+02	8.6195e+00	1.1612e-03	1.2813e+03	8.1243e+00	1.2798e-03
7.8363e+02	8.6098e+00	1.1321e-03	1.2920e+03	8.1361e+00	1.2577e-03
7.9019e+02	8.6001e+00	1.1464e-03	1.3028e+03	8.1481e+00	1.2459e-03
7.9680e+02	8.5903e+00	1.2217e-03	1.3137e+03	8.1601e+00	1.2504e-03
8.0347e+02	8.5804e+00	1.2175e-03	1.3247e+03	8.1722e+00	1.2347e-03
8.1019e+02	8.5704e+00	1.2627e-03	1.3358e+03	8.1797e+00	1.2513e-03
8.1698e+02	8.5604e+00	1.0995e-03	1.3470e+03	8.1799e+00	1.2585e-03
8.2381e+02	8.5503e+00	1.0172e-03	1.3583e+03	8.1777e+00	1.2671e-03
8.3070e+02	8.5423e+00	1.2123e-03	1.3696e+03	8.1754e+00	1.3431e-03
8.3765e+02	8.5399e+00	1.3298e-03	1.3811e+03	8.1732e+00	1.2836e-03
8.4466e+02	8.5409e+00	1.2483e-03	1.3926e+03	8.1709e+00	1.1354e-03
8.5173e+02	8.5418e+00	9.6983e-04	1.4043e+03	8.1686e+00	1.1568e-03
8.5886e+02	8.5428e+00	9.9375e-04	1.4160e+03	8.1663e+00	1.1743e-03
8.6605e+02	8.5438e+00	1.1630e-03	1.4278e+03	8.1640e+00	1.1720e-03

1.4398e+03	8.1616e+00	1.2098e-03	2.3738e+03	7.5666e+00	3.8602e-04
1.4518e+03	8.1592e+00	1.2730e-03	2.3937e+03	7.5614e+00	3.7432e-04
1.4640e+03	8.1568e+00	1.1807e-03	2.4138e+03	7.5561e+00	3.4698e-04
1.4763e+03	8.1465e+00	1.1203e-03	2.4339e+03	7.5509e+00	2.9974e-04
1.4886e+03	8.1279e+00	1.2512e-03	2.4543e+03	7.5455e+00	2.8169e-04
1.5010e+03	8.1088e+00	1.3348e-03	2.4748e+03	7.5401e+00	2.6511e-04
1.5136e+03	8.0896e+00	1.1398e-03	2.4956e+03	7.5347e+00	2.5112e-04
1.5263e+03	8.0701e+00	1.0358e-03	2.5164e+03	7.5292e+00	2.4695e-04
1.5391e+03	8.0505e+00	1.1395e-03	2.5375e+03	7.5237e+00	2.0943e-04
1.5519e+03	8.0308e+00	1.1146e-03	2.5588e+03	7.5182e+00	1.8033e-04
1.5649e+03	8.0109e+00	1.2108e-03	2.5802e+03	7.5125e+00	1.6141e-04
1.5781e+03	7.9908e+00	1.3068e-03	2.6018e+03	7.5069e+00	1.4221e-04
1.5913e+03	7.9706e+00	1.0867e-03	2.6235e+03	7.5012e+00	1.3565e-04
1.6045e+03	7.9502e+00	9.6775e-04	2.6454e+03	7.4954e+00	1.2109e-04
1.6179e+03	7.9297e+00	1.0164e-03	2.6676e+03	7.4896e+00	1.0753e-04
1.6315e+03	7.9089e+00	1.0788e-03	2.6899e+03	7.4838e+00	9.6432e-05
1.6452e+03	7.8880e+00	1.1313e-03	2.7124e+03	7.4779e+00	8.6299e-05
1.6590e+03	7.8669e+00	1.1000e-03	2.7351e+03	7.4719e+00	7.8119e-05
1.6728e+03	7.8456e+00	1.0920e-03	2.7580e+03	7.4659e+00	7.1258e-05
1.6868e+03	7.8241e+00	1.1099e-03	2.7811e+03	7.4599e+00	6.6330e-05
1.7009e+03	7.8025e+00	1.0583e-03	2.8044e+03	7.4553e+00	6.3130e-05
1.7152e+03	7.7808e+00	1.0075e-03	2.8279e+03	7.4530e+00	6.2344e-05
1.7295e+03	7.7588e+00	1.1071e-03	2.8515e+03	7.4517e+00	6.0075e-05
1.7440e+03	7.7365e+00	1.1284e-03	2.8754e+03	7.4504e+00	5.9528e-05
1.7586e+03	7.7142e+00	1.1943e-03	2.8994e+03	7.4490e+00	6.2924e-05
1.7733e+03	7.6982e+00	9.7512e-04	2.9237e+03	7.4477e+00	6.6842e-05
1.7882e+03	7.6920e+00	8.1158e-04	2.9482e+03	7.4463e+00	7.2241e-05
1.8031e+03	7.6893e+00	9.8680e-04	2.9728e+03	7.4450e+00	7.8137e-05
1.8182e+03	7.6865e+00	1.0159e-03	2.9977e+03	7.4436e+00	8.4490e-05
1.8335e+03	7.6838e+00	9.7996e-04	3.0228e+03	7.4422e+00	9.2374e-05
1.8488e+03	7.6809e+00	9.5865e-04	3.0481e+03	7.4407e+00	1.0227e-04
1.8643e+03	7.6781e+00	9.7595e-04	3.0736e+03	7.4393e+00	1.1201e-04
1.8798e+03	7.6753e+00	9.6063e-04	3.0993e+03	7.4379e+00	1.2190e-04
1.8956e+03	7.6724e+00	8.9992e-04	3.1253e+03	7.4364e+00	1.3363e-04
1.9114e+03	7.6695e+00	8.8162e-04	3.1514e+03	7.4350e+00	1.4353e-04
1.9274e+03	7.6666e+00	1.0102e-03	3.1778e+03	7.4335e+00	1.5271e-04
1.9435e+03	7.6636e+00	1.1391e-03	3.2043e+03	7.4320e+00	1.6665e-04
1.9598e+03	7.6607e+00	8.2348e-04	3.2311e+03	7.4305e+00	1.8303e-04
1.9762e+03	7.6577e+00	6.4775e-04	3.2582e+03	7.4290e+00	1.9274e-04
1.9928e+03	7.6546e+00	8.5982e-04	3.2855e+03	7.4275e+00	2.0050e-04
2.0095e+03	7.6516e+00	7.9876e-04	3.3130e+03	7.4260e+00	2.1224e-04
2.0263e+03	7.6485e+00	7.3842e-04	3.3407e+03	7.4244e+00	2.2251e-04
2.0432e+03	7.6454e+00	7.7590e-04	3.3687e+03	7.4228e+00	2.3985e-04
2.0603e+03	7.6423e+00	7.6245e-04	3.3969e+03	7.4213e+00	2.5934e-04
2.0775e+03	7.6391e+00	7.2856e-04	3.4253e+03	7.4197e+00	2.5899e-04
2.0949e+03	7.6360e+00	7.1228e-04	3.4539e+03	7.4174e+00	2.5765e-04
2.1125e+03	7.6328e+00	7.5350e-04	3.4829e+03	7.4144e+00	2.7757e-04
2.1302e+03	7.6295e+00	7.0408e-04	3.5120e+03	7.4113e+00	3.0527e-04
2.1479e+03	7.6257e+00	6.7714e-04	3.5413e+03	7.4082e+00	2.9945e-04
2.1659e+03	7.6211e+00	6.6612e-04	3.5710e+03	7.4051e+00	3.0098e-04
2.1841e+03	7.6163e+00	5.7917e-04	3.6009e+03	7.4019e+00	3.1072e-04
2.2024e+03	7.6115e+00	5.6661e-04	3.6311e+03	7.3987e+00	3.1673e-04
2.2208e+03	7.6067e+00	5.9401e-04	3.6615e+03	7.3955e+00	3.3083e-04
2.2394e+03	7.6018e+00	5.7997e-04	3.6921e+03	7.3923e+00	3.2880e-04
2.2581e+03	7.5969e+00	5.0828e-04	3.7229e+03	7.3890e+00	3.3981e-04
2.2770e+03	7.5920e+00	4.7368e-04	3.7541e+03	7.3857e+00	3.3478e-04
2.2961e+03	7.5870e+00	4.7469e-04	3.7855e+03	7.3824e+00	3.4350e-04
2.3153e+03	7.5820e+00	4.6384e-04	3.8172e+03	7.3790e+00	3.6507e-04
2.3346e+03	7.5769e+00	4.2831e-04	3.8492e+03	7.3757e+00	3.5919e-04
2.3542e+03	7.5718e+00	3.9660e-04	3.8814e+03	7.3723e+00	3.4538e-04

3.9138e+03	7.3688e+00	3.3724e-04	6.4528e+03	7.0575e+00	4.1539e-04
3.9466e+03	7.3654e+00	3.4938e-04	6.5068e+03	7.0515e+00	4.0090e-04
3.9796e+03	7.3619e+00	3.6394e-04	6.5613e+03	7.0491e+00	3.9777e-04
4.0129e+03	7.3584e+00	3.6566e-04	6.6161e+03	7.0480e+00	4.2921e-04
4.0464e+03	7.3548e+00	3.6119e-04	6.6715e+03	7.0468e+00	4.2127e-04
4.0803e+03	7.3512e+00	3.6555e-04	6.7274e+03	7.0457e+00	4.0396e-04
4.1145e+03	7.3476e+00	3.7655e-04	6.7836e+03	7.0445e+00	4.1728e-04
4.1489e+03	7.3440e+00	3.6650e-04	6.8404e+03	7.0434e+00	4.0984e-04
4.1836e+03	7.3403e+00	3.6201e-04	6.8976e+03	7.0422e+00	3.9440e-04
4.2186e+03	7.3366e+00	3.8155e-04	6.9554e+03	7.0410e+00	4.0339e-04
4.2539e+03	7.3329e+00	3.8859e-04	7.0136e+03	7.0398e+00	4.0382e-04
4.2896e+03	7.3295e+00	3.7477e-04	7.0723e+03	7.0386e+00	4.0355e-04
4.3255e+03	7.3263e+00	3.7133e-04	7.1315e+03	7.0374e+00	3.9720e-04
4.3616e+03	7.3230e+00	3.8533e-04	7.1912e+03	7.0362e+00	3.8477e-04
4.3981e+03	7.3197e+00	3.9199e-04	7.2513e+03	7.0349e+00	3.6591e-04
4.4349e+03	7.3164e+00	4.0519e-04	7.3120e+03	7.0337e+00	3.5190e-04
4.4720e+03	7.3130e+00	4.0265e-04	7.3732e+03	7.0324e+00	3.4259e-04
4.5095e+03	7.3096e+00	3.9037e-04	7.4349e+03	7.0312e+00	3.2794e-04
4.5473e+03	7.3062e+00	3.9631e-04	7.4971e+03	7.0299e+00	3.1401e-04
4.5853e+03	7.3028e+00	4.0514e-04	7.5598e+03	7.0286e+00	2.9124e-04
4.6236e+03	7.2993e+00	4.1462e-04	7.6231e+03	7.0273e+00	2.8096e-04
4.6624e+03	7.2958e+00	4.1143e-04	7.6869e+03	7.0260e+00	2.7867e-04
4.7014e+03	7.2923e+00	4.1135e-04	7.7512e+03	7.0247e+00	2.6865e-04
4.7406e+03	7.2888e+00	4.2313e-04	7.8161e+03	7.0233e+00	2.6366e-04
4.7804e+03	7.2852e+00	4.2112e-04	7.8815e+03	7.0220e+00	2.7092e-04
4.8204e+03	7.2816e+00	4.2167e-04	7.9474e+03	7.0206e+00	2.7840e-04
4.8607e+03	7.2779e+00	4.2990e-04	8.0139e+03	7.0193e+00	2.7532e-04
4.9014e+03	7.2742e+00	4.2525e-04	8.0810e+03	7.0179e+00	2.8093e-04
4.9424e+03	7.2705e+00	4.2930e-04	8.1487e+03	7.0165e+00	2.8737e-04
4.9838e+03	7.2668e+00	4.3637e-04	8.2168e+03	7.0151e+00	2.8277e-04
5.0255e+03	7.2630e+00	4.3691e-04	8.2855e+03	7.0133e+00	2.8765e-04
5.0675e+03	7.2592e+00	4.3599e-04	8.3549e+03	7.0105e+00	3.0072e-04
5.1099e+03	7.2554e+00	4.3637e-04	8.4248e+03	7.0072e+00	3.1389e-04
5.1526e+03	7.2515e+00	4.4593e-04	8.4953e+03	7.0038e+00	3.1871e-04
5.1958e+03	7.2476e+00	4.4862e-04	8.5664e+03	7.0004e+00	3.2743e-04
5.2393e+03	7.2437e+00	4.4333e-04	8.6381e+03	6.9969e+00	3.3575e-04
5.2831e+03	7.2385e+00	4.4088e-04	8.7104e+03	6.9934e+00	3.4351e-04
5.3273e+03	7.2319e+00	4.3301e-04	8.7833e+03	6.9899e+00	3.5127e-04
5.3719e+03	7.2250e+00	4.3170e-04	8.8568e+03	6.9864e+00	3.5564e-04
5.4169e+03	7.2180e+00	4.3737e-04	8.9309e+03	6.9828e+00	3.6358e-04
5.4621e+03	7.2110e+00	4.0730e-04	9.0056e+03	6.9792e+00	3.6831e-04
5.5079e+03	7.2039e+00	3.8072e-04	9.0810e+03	6.9756e+00	3.6762e-04
5.5539e+03	7.1968e+00	3.8287e-04	9.1570e+03	6.9720e+00	3.7238e-04
5.6004e+03	7.1896e+00	3.5870e-04	9.2336e+03	6.9683e+00	3.8708e-04
5.6474e+03	7.1823e+00	3.3938e-04	9.3109e+03	6.9646e+00	3.9467e-04
5.6946e+03	7.1750e+00	3.6263e-04	9.3888e+03	6.9608e+00	3.8601e-04
5.7423e+03	7.1676e+00	3.9932e-04	9.4673e+03	6.9570e+00	3.8824e-04
5.7903e+03	7.1601e+00	4.1416e-04	9.5466e+03	6.9532e+00	3.9308e-04
5.8388e+03	7.1526e+00	4.2423e-04	9.6265e+03	6.9494e+00	3.9160e-04
5.8876e+03	7.1451e+00	4.2662e-04	9.7070e+03	6.9455e+00	4.0263e-04
5.9369e+03	7.1374e+00	4.3028e-04	9.7883e+03	6.9416e+00	4.0474e-04
5.9866e+03	7.1297e+00	4.2629e-04	9.8701e+03	6.9377e+00	4.1015e-04
6.0366e+03	7.1220e+00	4.0870e-04	9.9528e+03	6.9337e+00	4.1345e-04
6.0871e+03	7.1141e+00	4.2440e-04	1.0036e+04	6.9297e+00	3.9881e-04
6.1381e+03	7.1062e+00	3.8184e-04	1.0120e+04	6.9256e+00	3.8933e-04
6.1895e+03	7.0983e+00	3.4636e-04	1.0205e+04	6.9212e+00	4.0534e-04
6.2413e+03	7.0902e+00	3.7630e-04	1.0290e+04	6.9167e+00	4.1048e-04
6.2935e+03	7.0821e+00	3.8205e-04	1.0376e+04	6.9122e+00	3.8687e-04
6.3461e+03	7.0740e+00	4.0117e-04	1.0463e+04	6.9076e+00	3.8861e-04
6.3993e+03	7.0658e+00	4.1510e-04	1.0551e+04	6.9030e+00	4.0644e-04

1.0639e+04	6.8984e+00	4.0624e-04	1.7541e+04	6.7218e+00	2.8465e-04
1.0728e+04	6.8937e+00	4.0199e-04	1.7688e+04	6.7189e+00	2.8427e-04
1.0818e+04	6.8890e+00	4.1630e-04	1.7836e+04	6.7160e+00	2.7934e-04
1.0909e+04	6.8842e+00	4.0749e-04	1.7985e+04	6.7130e+00	2.8844e-04
1.1000e+04	6.8794e+00	3.9413e-04	1.8136e+04	6.7100e+00	2.8663e-04
1.1092e+04	6.8746e+00	3.9175e-04	1.8287e+04	6.7070e+00	2.8690e-04
1.1185e+04	6.8697e+00	3.9438e-04	1.8440e+04	6.7040e+00	2.9686e-04
1.1278e+04	6.8648e+00	4.0918e-04	1.8595e+04	6.7009e+00	2.9326e-04
1.1373e+04	6.8598e+00	4.0082e-04	1.8750e+04	6.6978e+00	2.9996e-04
1.1468e+04	6.8548e+00	3.8386e-04	1.8907e+04	6.6947e+00	2.9433e-04
1.1564e+04	6.8498e+00	3.8308e-04	1.9065e+04	6.6916e+00	2.8667e-04
1.1661e+04	6.8447e+00	3.7431e-04	1.9225e+04	6.6884e+00	2.9862e-04
1.1758e+04	6.8396e+00	3.5197e-04	1.9386e+04	6.6852e+00	3.0496e-04
1.1857e+04	6.8344e+00	3.4794e-04	1.9548e+04	6.6820e+00	2.9100e-04
1.1956e+04	6.8292e+00	3.4204e-04	1.9711e+04	6.6788e+00	2.8866e-04
1.2056e+04	6.8239e+00	3.3053e-04	1.9876e+04	6.6755e+00	2.9749e-04
1.2157e+04	6.8186e+00	3.2622e-04	2.0043e+04	6.6722e+00	2.9405e-04
1.2258e+04	6.8133e+00	3.1257e-04	2.0210e+04	6.6689e+00	3.0066e-04
1.2361e+04	6.8079e+00	3.0774e-04	2.0379e+04	6.6655e+00	3.1065e-04
1.2464e+04	6.8024e+00	3.0689e-04	2.0550e+04	6.6622e+00	3.0706e-04
1.2569e+04	6.7969e+00	2.9256e-04	2.0722e+04	6.6595e+00	2.9900e-04
1.2674e+04	6.7914e+00	2.9396e-04	2.0895e+04	6.6581e+00	3.0204e-04
1.2780e+04	6.7858e+00	3.0323e-04	2.1070e+04	6.6572e+00	3.0665e-04
1.2887e+04	6.7802e+00	2.9964e-04	2.1247e+04	6.6562e+00	3.0010e-04
1.2995e+04	6.7745e+00	3.0419e-04	2.1424e+04	6.6553e+00	2.9394e-04
1.3104e+04	6.7705e+00	3.1197e-04	2.1603e+04	6.6543e+00	2.9011e-04
1.3213e+04	6.7691e+00	3.0366e-04	2.1784e+04	6.6534e+00	2.9274e-04
1.3324e+04	6.7685e+00	3.1438e-04	2.1967e+04	6.6524e+00	2.9902e-04
1.3435e+04	6.7679e+00	3.3872e-04	2.2151e+04	6.6514e+00	2.9139e-04
1.3548e+04	6.7674e+00	3.3584e-04	2.2336e+04	6.6504e+00	2.8253e-04
1.3661e+04	6.7668e+00	3.4058e-04	2.2523e+04	6.6494e+00	2.7565e-04
1.3775e+04	6.7662e+00	3.5947e-04	2.2711e+04	6.6484e+00	2.6223e-04
1.3890e+04	6.7656e+00	3.6464e-04	2.2901e+04	6.6474e+00	2.6219e-04
1.4007e+04	6.7650e+00	3.7864e-04	2.3093e+04	6.6464e+00	2.7810e-04
1.4124e+04	6.7644e+00	3.8645e-04	2.3286e+04	6.6453e+00	2.8048e-04
1.4242e+04	6.7638e+00	3.7044e-04	2.3481e+04	6.6443e+00	2.8663e-04
1.4361e+04	6.7632e+00	3.6023e-04	2.3678e+04	6.6432e+00	2.8778e-04
1.4482e+04	6.7626e+00	3.4905e-04	2.3876e+04	6.6422e+00	2.9564e-04
1.4603e+04	6.7620e+00	3.2088e-04	2.4076e+04	6.6411e+00	3.1399e-04
1.4725e+04	6.7614e+00	2.8700e-04	2.4277e+04	6.6400e+00	3.2600e-04
1.4848e+04	6.7608e+00	2.5739e-04	2.4480e+04	6.6389e+00	3.4322e-04
1.4972e+04	6.7601e+00	2.3155e-04	2.4685e+04	6.6378e+00	3.7360e-04
1.5097e+04	6.7595e+00	2.0871e-04	2.4892e+04	6.6367e+00	3.9796e-04
1.5224e+04	6.7589e+00	1.9354e-04	2.5100e+04	6.6356e+00	4.0175e-04
1.5351e+04	6.7582e+00	1.8677e-04	2.5310e+04	6.6345e+00	4.1379e-04
1.5480e+04	6.7576e+00	1.8651e-04	2.5522e+04	6.6334e+00	4.2059e-04
1.5609e+04	6.7569e+00	1.9308e-04	2.5735e+04	6.6322e+00	4.0226e-04
1.5740e+04	6.7562e+00	2.0183e-04	2.5950e+04	6.6311e+00	3.8796e-04
1.5871e+04	6.7547e+00	2.1336e-04	2.6167e+04	6.6305e+00	3.6681e-04
1.6004e+04	6.7523e+00	2.2127e-04	2.6386e+04	6.6305e+00	3.1557e-04
1.6138e+04	6.7496e+00	2.2417e-04	2.6607e+04	6.6307e+00	2.5845e-04
1.6273e+04	6.7469e+00	2.3348e-04	2.6830e+04	6.6309e+00	2.1010e-04
1.6410e+04	6.7442e+00	2.4644e-04	2.6971e+04	6.6310e+00	1.7563e-04
1.6547e+04	6.7415e+00	2.4987e-04	2.7084e+04	6.6311e+00	1.3928e-04
1.6686e+04	6.7387e+00	2.5368e-04	2.7281e+04	6.6312e+00	1.0087e-04
1.6825e+04	6.7360e+00	2.6003e-04	2.7509e+04	6.6314e+00	7.5385e-05
1.6966e+04	6.7332e+00	2.6616e-04	2.7740e+04	6.6315e+00	6.3506e-05
1.7108e+04	6.7304e+00	2.7158e-04	2.7972e+04	6.6317e+00	6.3007e-05
1.7251e+04	6.7275e+00	2.7076e-04	2.8206e+04	6.6319e+00	6.8578e-05
1.7395e+04	6.7247e+00	2.7566e-04	2.8412e+04	6.6321e+00	7.3787e-05

2.8530e+04	6.6322e+00	7.7671e-05	4.6892e+04	6.7199e+00	2.0486e-04
2.8680e+04	6.6324e+00	8.5728e-05	4.7285e+04	6.7233e+00	2.0137e-04
2.8920e+04	6.6327e+00	9.7973e-05	4.7681e+04	6.7266e+00	1.9672e-04
2.9162e+04	6.6330e+00	1.0926e-04	4.8080e+04	6.7297e+00	1.8768e-04
2.9406e+04	6.6334e+00	1.1955e-04	4.8482e+04	6.7323e+00	1.7905e-04
2.9652e+04	6.6337e+00	1.2805e-04	4.8888e+04	6.7348e+00	1.6326e-04
2.9900e+04	6.6340e+00	1.3670e-04	4.9297e+04	6.7372e+00	1.3929e-04
3.0150e+04	6.6343e+00	1.4676e-04	4.9709e+04	6.7397e+00	1.1562e-04
3.0403e+04	6.6346e+00	1.5238e-04	5.0125e+04	6.7422e+00	9.8404e-05
3.0657e+04	6.6350e+00	1.5734e-04	5.0545e+04	6.7448e+00	9.5342e-05
3.0913e+04	6.6353e+00	1.6296e-04	5.0968e+04	6.7473e+00	1.0073e-04
3.1172e+04	6.6356e+00	1.6680e-04	5.1394e+04	6.7499e+00	1.0018e-04
3.1433e+04	6.6360e+00	1.6751e-04	5.1824e+04	6.7525e+00	8.7055e-05
3.1696e+04	6.6363e+00	1.7024e-04	5.2258e+04	6.7551e+00	7.2639e-05
3.1961e+04	6.6366e+00	1.7520e-04	5.2695e+04	6.7577e+00	6.6087e-05
3.2229e+04	6.6370e+00	1.7584e-04	5.3136e+04	6.7604e+00	7.3833e-05
3.2499e+04	6.6373e+00	1.7781e-04	5.3581e+04	6.7630e+00	9.6167e-05
3.2771e+04	6.6377e+00	1.8190e-04	5.4029e+04	6.7657e+00	1.1578e-04
3.3045e+04	6.6381e+00	1.8513e-04	5.4481e+04	6.7685e+00	1.2687e-04
3.3321e+04	6.6386e+00	1.8626e-04	5.4937e+04	6.7712e+00	1.3402e-04
3.3600e+04	6.6392e+00	1.8977e-04	5.5397e+04	6.7740e+00	1.4106e-04
3.3881e+04	6.6399e+00	1.9105e-04	5.5860e+04	6.7768e+00	1.4721e-04
3.4165e+04	6.6406e+00	1.8998e-04	5.6328e+04	6.7796e+00	1.4978e-04
3.4451e+04	6.6412e+00	1.9089e-04	5.6799e+04	6.7824e+00	1.5133e-04
3.4739e+04	6.6419e+00	1.9357e-04	5.7274e+04	6.7853e+00	1.4659e-04
3.5029e+04	6.6426e+00	1.9868e-04	5.7754e+04	6.7882e+00	1.4952e-04
3.5323e+04	6.6433e+00	1.9576e-04	5.8237e+04	6.7911e+00	1.6057e-04
3.5618e+04	6.6439e+00	1.9190e-04	5.8724e+04	6.7940e+00	1.6105e-04
3.5916e+04	6.6446e+00	1.8844e-04	5.9216e+04	6.7970e+00	1.5756e-04
3.6217e+04	6.6453e+00	1.8524e-04	5.9711e+04	6.8000e+00	1.6029e-04
3.6520e+04	6.6460e+00	1.8578e-04	6.0211e+04	6.8030e+00	1.6642e-04
3.6826e+04	6.6468e+00	1.8442e-04	6.0715e+04	6.8060e+00	1.6545e-04
3.7134e+04	6.6475e+00	1.8468e-04	6.1223e+04	6.8092e+00	1.5816e-04
3.7444e+04	6.6482e+00	1.8503e-04	6.1735e+04	6.8126e+00	1.4928e-04
3.7758e+04	6.6489e+00	1.8599e-04	6.2252e+04	6.8162e+00	1.3922e-04
3.8074e+04	6.6497e+00	1.8671e-04	6.2773e+04	6.8198e+00	1.2843e-04
3.8392e+04	6.6504e+00	1.8492e-04	6.3298e+04	6.8235e+00	1.2121e-04
3.8714e+04	6.6512e+00	1.8454e-04	6.3827e+04	6.8271e+00	1.1826e-04
3.9038e+04	6.6528e+00	1.8674e-04	6.4362e+04	6.8308e+00	1.1651e-04
3.9364e+04	6.6554e+00	1.8620e-04	6.4901e+04	6.8346e+00	1.1342e-04
3.9694e+04	6.6583e+00	1.8328e-04	6.5444e+04	6.8384e+00	1.1427e-04
4.0026e+04	6.6611e+00	1.8369e-04	6.5991e+04	6.8422e+00	1.1916e-04
4.0361e+04	6.6640e+00	1.8622e-04	6.6543e+04	6.8460e+00	1.2334e-04
4.0699e+04	6.6669e+00	1.8585e-04	6.7100e+04	6.8499e+00	1.2751e-04
4.1039e+04	6.6698e+00	1.8306e-04	6.7661e+04	6.8538e+00	1.3132e-04
4.1383e+04	6.6727e+00	1.8312e-04	6.8228e+04	6.8577e+00	1.3629e-04
4.1729e+04	6.6757e+00	1.8394e-04	6.8799e+04	6.8617e+00	1.4396e-04
4.2078e+04	6.6787e+00	1.8284e-04	6.9374e+04	6.8657e+00	1.5083e-04
4.2430e+04	6.6817e+00	1.8252e-04	6.9955e+04	6.8697e+00	1.5416e-04
4.2785e+04	6.6847e+00	1.7739e-04	7.0540e+04	6.8738e+00	1.5361e-04
4.3143e+04	6.6878e+00	1.7914e-04	7.1131e+04	6.8779e+00	1.4859e-04
4.3504e+04	6.6909e+00	1.8506e-04	7.1726e+04	6.8820e+00	1.4385e-04
4.3868e+04	6.6940e+00	1.8627e-04	7.2326e+04	6.8862e+00	1.3958e-04
4.4235e+04	6.6971e+00	1.9265e-04	7.2931e+04	6.8904e+00	1.2300e-04
4.4605e+04	6.7003e+00	1.9796e-04	7.3542e+04	6.8946e+00	8.1069e-05
4.4979e+04	6.7035e+00	1.9932e-04	7.4157e+04	6.8989e+00	6.4797e-05
4.5355e+04	6.7067e+00	2.0551e-04	7.4778e+04	6.9031e+00	8.6976e-05
4.5735e+04	6.7100e+00	2.0037e-04	7.5403e+04	6.9070e+00	1.0150e-04
4.6117e+04	6.7133e+00	1.9724e-04	7.6034e+04	6.9108e+00	1.0819e-04
4.6503e+04	6.7166e+00	2.0682e-04	7.6671e+04	6.9147e+00	1.1288e-04

7.7312e+04	6.9185e+00	1.2109e-04	1.2536e+05	7.1444e+00	9.0901e-05
7.7959e+04	6.9224e+00	1.3318e-04	1.2640e+05	7.1499e+00	9.4032e-05
7.8612e+04	6.9264e+00	1.4415e-04	1.2747e+05	7.1556e+00	9.4159e-05
7.9220e+04	6.9300e+00	1.5004e-04	1.2854e+05	7.1613e+00	8.1826e-05
7.9550e+04	6.9320e+00	1.5486e-04	1.2961e+05	7.1670e+00	6.7388e-05
7.9933e+04	6.9343e+00	1.5821e-04	1.3070e+05	7.1727e+00	8.0955e-05
8.0602e+04	6.9383e+00	1.6523e-04	1.3179e+05	7.1786e+00	1.0461e-04
8.1276e+04	6.9424e+00	1.7022e-04	1.3289e+05	7.1844e+00	1.1643e-04
8.1956e+04	6.9465e+00	1.5967e-04	1.3400e+05	7.1903e+00	1.2178e-04
8.2399e+04	6.9492e+00	1.4009e-04	1.3513e+05	7.1963e+00	1.2253e-04
8.2743e+04	6.9512e+00	1.0361e-04	1.3626e+05	7.2023e+00	1.1310e-04
8.3334e+04	6.9548e+00	6.6024e-05	1.3740e+05	7.2083e+00	9.8113e-05
8.4031e+04	6.9590e+00	6.2304e-05	1.3855e+05	7.2144e+00	7.6040e-05
8.4734e+04	6.9632e+00	7.8197e-05	1.3970e+05	7.2206e+00	4.9975e-05
8.5443e+04	6.9675e+00	8.9972e-05	1.4087e+05	7.2268e+00	3.9706e-05
8.6158e+04	6.9718e+00	9.5611e-05	1.4205e+05	7.2331e+00	4.0753e-05
8.6879e+04	6.9762e+00	9.9978e-05	1.4324e+05	7.2394e+00	4.6185e-05
8.7606e+04	6.9805e+00	1.0563e-04	1.4444e+05	7.2458e+00	5.2403e-05
8.8339e+04	6.9850e+00	1.0933e-04	1.4565e+05	7.2522e+00	5.5283e-05
8.9078e+04	6.9894e+00	1.1129e-04	1.4687e+05	7.2586e+00	5.7656e-05
8.9824e+04	6.9939e+00	1.0941e-04	1.4810e+05	7.2652e+00	5.9747e-05
9.0576e+04	6.9984e+00	1.1075e-04	1.4934e+05	7.2718e+00	6.3535e-05
9.1334e+04	7.0030e+00	1.1417e-04	1.5059e+05	7.2784e+00	6.7155e-05
9.2098e+04	7.0076e+00	1.1164e-04	1.5185e+05	7.2851e+00	6.9177e-05
9.2868e+04	7.0122e+00	1.0680e-04	1.5312e+05	7.2907e+00	7.0316e-05
9.3646e+04	7.0169e+00	1.0057e-04	1.5440e+05	7.2946e+00	7.0281e-05
9.4430e+04	7.0216e+00	9.2268e-05	1.5569e+05	7.2978e+00	6.7578e-05
9.5220e+04	7.0264e+00	8.6436e-05	1.5699e+05	7.3010e+00	6.4240e-05
9.6016e+04	7.0312e+00	8.3856e-05	1.5830e+05	7.3042e+00	6.2836e-05
9.6820e+04	7.0353e+00	8.0362e-05	1.5963e+05	7.3075e+00	6.2735e-05
9.7630e+04	7.0383e+00	7.6113e-05	1.6096e+05	7.3108e+00	6.3302e-05
9.8447e+04	7.0409e+00	7.4707e-05	1.6231e+05	7.3142e+00	6.5638e-05
9.9271e+04	7.0435e+00	7.7349e-05	1.6367e+05	7.3175e+00	6.8902e-05
1.0010e+05	7.0461e+00	8.0779e-05	1.6504e+05	7.3209e+00	7.1108e-05
1.0094e+05	7.0488e+00	8.3830e-05	1.6642e+05	7.3243e+00	7.3226e-05
1.0179e+05	7.0515e+00	8.4673e-05	1.6781e+05	7.3278e+00	6.1531e-05
1.0264e+05	7.0542e+00	8.7664e-05	1.6922e+05	7.3312e+00	4.9438e-05
1.0350e+05	7.0569e+00	9.2869e-05	1.7063e+05	7.3347e+00	5.3608e-05
1.0437e+05	7.0597e+00	9.5719e-05	1.7206e+05	7.3383e+00	5.7426e-05
1.0524e+05	7.0624e+00	9.5926e-05	1.7350e+05	7.3418e+00	6.0354e-05
1.0612e+05	7.0652e+00	9.5766e-05	1.7495e+05	7.3454e+00	6.6781e-05
1.0701e+05	7.0681e+00	9.1154e-05	1.7642e+05	7.3491e+00	7.2549e-05
1.0790e+05	7.0709e+00	8.2214e-05	1.7789e+05	7.3527e+00	7.5598e-05
1.0880e+05	7.0738e+00	8.0431e-05	1.7938e+05	7.3564e+00	7.7273e-05
1.0971e+05	7.0767e+00	8.3614e-05	1.8089e+05	7.3601e+00	8.1326e-05
1.1063e+05	7.0796e+00	8.4004e-05	1.8240e+05	7.3639e+00	8.2548e-05
1.1156e+05	7.0825e+00	8.4025e-05	1.8393e+05	7.3676e+00	7.5800e-05
1.1249e+05	7.0855e+00	8.7817e-05	1.8546e+05	7.3714e+00	6.1536e-05
1.1343e+05	7.0885e+00	9.0914e-05	1.8701e+05	7.3753e+00	4.4980e-05
1.1438e+05	7.0915e+00	9.2167e-05	1.8858e+05	7.3791e+00	3.8264e-05
1.1534e+05	7.0946e+00	9.3711e-05	1.9016e+05	7.3830e+00	4.0128e-05
1.1631e+05	7.0976e+00	9.5396e-05	1.9175e+05	7.3870e+00	4.1775e-05
1.1728e+05	7.1016e+00	9.5738e-05	1.9336e+05	7.3910e+00	4.3348e-05
1.1826e+05	7.1067e+00	9.5369e-05	1.9497e+05	7.3950e+00	4.4974e-05
1.1925e+05	7.1119e+00	9.4560e-05	1.9660e+05	7.3990e+00	4.4271e-05
1.2024e+05	7.1172e+00	9.2579e-05	1.9825e+05	7.4031e+00	4.3208e-05
1.2125e+05	7.1225e+00	8.3033e-05	1.9991e+05	7.4072e+00	4.3486e-05
1.2226e+05	7.1279e+00	7.6512e-05	2.0158e+05	7.4113e+00	4.5968e-05
1.2329e+05	7.1334e+00	7.9533e-05	2.0327e+05	7.4155e+00	4.7615e-05
1.2432e+05	7.1389e+00	8.3997e-05	2.0497e+05	7.4197e+00	4.5866e-05

2.0668e+05	7.4239e+00	4.5727e-05	3.3513e+05	7.6549e+00	2.8010e-05
2.0841e+05	7.4282e+00	4.7454e-05	3.3794e+05	7.6607e+00	2.8561e-05
2.1016e+05	7.4325e+00	4.8457e-05	3.4076e+05	7.6666e+00	2.8711e-05
2.1192e+05	7.4369e+00	4.9694e-05	3.4361e+05	7.6725e+00	2.9399e-05
2.1369e+05	7.4413e+00	5.1426e-05	3.4649e+05	7.6785e+00	2.8034e-05
2.1548e+05	7.4451e+00	5.2854e-05	3.4939e+05	7.6845e+00	2.7319e-05
2.1728e+05	7.4481e+00	5.4660e-05	3.5231e+05	7.6906e+00	2.7339e-05
2.1910e+05	7.4508e+00	4.7183e-05	3.5526e+05	7.6956e+00	2.4944e-05
2.2093e+05	7.4536e+00	3.9809e-05	3.5824e+05	7.6989e+00	2.1722e-05
2.2278e+05	7.4564e+00	4.2836e-05	3.6124e+05	7.7016e+00	1.8706e-05
2.2465e+05	7.4592e+00	4.5256e-05	3.6426e+05	7.7044e+00	1.7535e-05
2.2653e+05	7.4620e+00	4.7170e-05	3.6730e+05	7.7071e+00	1.8951e-05
2.2842e+05	7.4648e+00	4.7818e-05	3.7038e+05	7.7099e+00	2.1401e-05
2.3033e+05	7.4677e+00	4.5206e-05	3.7348e+05	7.7127e+00	2.3004e-05
2.3226e+05	7.4706e+00	4.0646e-05	3.7660e+05	7.7156e+00	2.1458e-05
2.3421e+05	7.4735e+00	3.6369e-05	3.7975e+05	7.7184e+00	1.8587e-05
2.3617e+05	7.4764e+00	3.4404e-05	3.8293e+05	7.7213e+00	1.6574e-05
2.3814e+05	7.4794e+00	3.6827e-05	3.8613e+05	7.7242e+00	1.5856e-05
2.4013e+05	7.4824e+00	4.0251e-05	3.8937e+05	7.7271e+00	1.6115e-05
2.4214e+05	7.4854e+00	4.1694e-05	3.9263e+05	7.7301e+00	1.6082e-05
2.4417e+05	7.4884e+00	3.8702e-05	3.9591e+05	7.7331e+00	1.6079e-05
2.4621e+05	7.4915e+00	3.6505e-05	3.9922e+05	7.7361e+00	1.5643e-05
2.4827e+05	7.4946e+00	3.8242e-05	4.0256e+05	7.7391e+00	1.5478e-05
2.5035e+05	7.4977e+00	3.9111e-05	4.0593e+05	7.7422e+00	1.5253e-05
2.5244e+05	7.5008e+00	4.0064e-05	4.0933e+05	7.7452e+00	1.4714e-05
2.5456e+05	7.5040e+00	4.2042e-05	4.1275e+05	7.7483e+00	1.4355e-05
2.5669e+05	7.5072e+00	4.2192e-05	4.1621e+05	7.7515e+00	1.3281e-05
2.5883e+05	7.5104e+00	4.3195e-05	4.1969e+05	7.7546e+00	1.3067e-05
2.6100e+05	7.5138e+00	4.5637e-05	4.2321e+05	7.7578e+00	1.3108e-05
2.6319e+05	7.5172e+00	4.6868e-05	4.2675e+05	7.7610e+00	1.2590e-05
2.6539e+05	7.5207e+00	4.7524e-05	4.3032e+05	7.7649e+00	1.2484e-05
2.6761e+05	7.5243e+00	4.8050e-05	4.3392e+05	7.7696e+00	1.2675e-05
2.6985e+05	7.5278e+00	4.9242e-05	4.3755e+05	7.7745e+00	1.2643e-05
2.7211e+05	7.5314e+00	4.6874e-05	4.4121e+05	7.7794e+00	1.2902e-05
2.7438e+05	7.5350e+00	3.7567e-05	4.4490e+05	7.7843e+00	1.3357e-05
2.7668e+05	7.5387e+00	2.9389e-05	4.4862e+05	7.7893e+00	1.4330e-05
2.7899e+05	7.5424e+00	2.9732e-05	4.5238e+05	7.7943e+00	1.6065e-05
2.8133e+05	7.5461e+00	3.1299e-05	4.5616e+05	7.7994e+00	1.7245e-05
2.8368e+05	7.5498e+00	3.2484e-05	4.5998e+05	7.8045e+00	1.8266e-05
2.8606e+05	7.5536e+00	3.4539e-05	4.6383e+05	7.8097e+00	1.9792e-05
2.8845e+05	7.5579e+00	3.5358e-05	4.6771e+05	7.8148e+00	1.9393e-05
2.9086e+05	7.5628e+00	3.5314e-05	4.7163e+05	7.8201e+00	1.8687e-05
2.9330e+05	7.5679e+00	3.6833e-05	4.7557e+05	7.8254e+00	1.9781e-05
2.9575e+05	7.5730e+00	3.9075e-05	4.7955e+05	7.8309e+00	2.0880e-05
2.9709e+05	7.5758e+00	3.9051e-05	4.8357e+05	7.8364e+00	2.1489e-05
2.9785e+05	7.5774e+00	3.5362e-05	4.8761e+05	7.8419e+00	2.0480e-05
2.9899e+05	7.5797e+00	3.3444e-05	4.9169e+05	7.8475e+00	2.1212e-05
3.0072e+05	7.5833e+00	3.7044e-05	4.9581e+05	7.8532e+00	2.2253e-05
3.0324e+05	7.5886e+00	3.8705e-05	4.9996e+05	7.8589e+00	2.0631e-05
3.0578e+05	7.5938e+00	3.8774e-05	5.0414e+05	7.8646e+00	2.0506e-05
3.0834e+05	7.5992e+00	3.9484e-05	5.0836e+05	7.8704e+00	1.9999e-05
3.1092e+05	7.6045e+00	3.9860e-05	5.1261e+05	7.8762e+00	2.0055e-05
3.1352e+05	7.6099e+00	3.7748e-05	5.1690e+05	7.8821e+00	2.1865e-05
3.1614e+05	7.6154e+00	3.1080e-05	5.2123e+05	7.8881e+00	2.1917e-05
3.1879e+05	7.6209e+00	2.5931e-05	5.2559e+05	7.8937e+00	2.1456e-05
3.2145e+05	7.6264e+00	2.5843e-05	5.2999e+05	7.8988e+00	2.0738e-05
3.2414e+05	7.6320e+00	2.6115e-05	5.3442e+05	7.9040e+00	1.9161e-05
3.2686e+05	7.6377e+00	2.6008e-05	5.3890e+05	7.9092e+00	1.8359e-05
3.2959e+05	7.6434e+00	2.5992e-05	5.4341e+05	7.9145e+00	1.8276e-05
3.3235e+05	7.6491e+00	2.6245e-05	5.4795e+05	7.9198e+00	1.8348e-05

5.5254e+05	7.9251e+00	1.8431e-05	9.1098e+05	8.2366e+00	4.7025e-06
5.5716e+05	7.9305e+00	1.7142e-05	9.1860e+05	8.2397e+00	4.5624e-06
5.6182e+05	7.9359e+00	1.6462e-05	9.2629e+05	8.2428e+00	4.5945e-06
5.6652e+05	7.9414e+00	1.6831e-05	9.3404e+05	8.2460e+00	4.5443e-06
5.7126e+05	7.9469e+00	1.5928e-05	9.4186e+05	8.2491e+00	4.5419e-06
5.7604e+05	7.9525e+00	1.4855e-05	9.4974e+05	8.2523e+00	4.4231e-06
5.8086e+05	7.9587e+00	1.5733e-05	9.5768e+05	8.2555e+00	4.3218e-06
5.8572e+05	7.9658e+00	1.6626e-05	9.6570e+05	8.2585e+00	4.1163e-06
5.9063e+05	7.9730e+00	1.6583e-05	9.7378e+05	8.2615e+00	3.7274e-06
5.9557e+05	7.9803e+00	1.6839e-05	9.8193e+05	8.2646e+00	3.5824e-06
6.0055e+05	7.9877e+00	1.6778e-05	9.9015e+05	8.2677e+00	3.5309e-06
6.0558e+05	7.9951e+00	1.6441e-05	9.9844e+05	8.2708e+00	3.5134e-06
6.1065e+05	8.0026e+00	1.5085e-05	1.0068e+06	8.2740e+00	3.6434e-06
6.1576e+05	8.0102e+00	1.4448e-05	1.0152e+06	8.2771e+00	3.6671e-06
6.2091e+05	8.0178e+00	1.5133e-05	1.0237e+06	8.2803e+00	3.6478e-06
6.2610e+05	8.0255e+00	1.5193e-05	1.0323e+06	8.2836e+00	3.6757e-06
6.3134e+05	8.0332e+00	1.5300e-05	1.0409e+06	8.2868e+00	3.6972e-06
6.3663e+05	8.0410e+00	1.5499e-05	1.0496e+06	8.2901e+00	3.7731e-06
6.4196e+05	8.0489e+00	1.4669e-05	1.0584e+06	8.2935e+00	3.6904e-06
6.4733e+05	8.0568e+00	1.4227e-05	1.0673e+06	8.2972e+00	3.7010e-06
6.5274e+05	8.0648e+00	1.3878e-05	1.0762e+06	8.3010e+00	3.8651e-06
6.5821e+05	8.0729e+00	1.3063e-05	1.0852e+06	8.3048e+00	3.9323e-06
6.6372e+05	8.0811e+00	1.2436e-05	1.0943e+06	8.3086e+00	3.9832e-06
6.6927e+05	8.0893e+00	1.1231e-05	1.1034e+06	8.3124e+00	4.0310e-06
6.7487e+05	8.0975e+00	1.0685e-05	1.1127e+06	8.3163e+00	4.1513e-06
6.8052e+05	8.1059e+00	1.0796e-05	1.1220e+06	8.3202e+00	4.3126e-06
6.8621e+05	8.1143e+00	1.0858e-05	1.1314e+06	8.3242e+00	4.2886e-06
6.9195e+05	8.1228e+00	1.0421e-05	1.1409e+06	8.3282e+00	4.2240e-06
6.9774e+05	8.1313e+00	1.0643e-05	1.1504e+06	8.3322e+00	4.2382e-06
7.0358e+05	8.1400e+00	1.1112e-05	1.1600e+06	8.3362e+00	4.1861e-06
7.0947e+05	8.1487e+00	1.0257e-05	1.1697e+06	8.3417e+00	4.2181e-06
7.1541e+05	8.1554e+00	9.3480e-06	1.1795e+06	8.3490e+00	4.3118e-06
7.2140e+05	8.1589e+00	9.0141e-06	1.1894e+06	8.3566e+00	4.4229e-06
7.2743e+05	8.1614e+00	9.7268e-06	1.1993e+06	8.3643e+00	4.2645e-06
7.3352e+05	8.1639e+00	1.0697e-05	1.2094e+06	8.3720e+00	4.0427e-06
7.3966e+05	8.1664e+00	1.0563e-05	1.2195e+06	8.3798e+00	3.9827e-06
7.4585e+05	8.1690e+00	1.0197e-05	1.2297e+06	8.3877e+00	3.9950e-06
7.5209e+05	8.1715e+00	9.5377e-06	1.2400e+06	8.3956e+00	4.1310e-06
7.5838e+05	8.1741e+00	9.5309e-06	1.2504e+06	8.4036e+00	4.1413e-06
7.6473e+05	8.1767e+00	9.6056e-06	1.2609e+06	8.4116e+00	4.0692e-06
7.7113e+05	8.1794e+00	8.6829e-06	1.2714e+06	8.4198e+00	3.9141e-06
7.7758e+05	8.1820e+00	8.3115e-06	1.2820e+06	8.4279e+00	3.5296e-06
7.8409e+05	8.1847e+00	7.8909e-06	1.2927e+06	8.4427e+00	3.0804e-06
7.9065e+05	8.1874e+00	7.9509e-06	1.3035e+06	8.4654e+00	2.7824e-06
7.9726e+05	8.1901e+00	8.3079e-06	1.3145e+06	8.4894e+00	2.7264e-06
8.0393e+05	8.1929e+00	8.4144e-06	1.3255e+06	8.5137e+00	2.9047e-06
8.1066e+05	8.1956e+00	8.4135e-06	1.3366e+06	8.5381e+00	3.1715e-06
8.1745e+05	8.1984e+00	8.2411e-06	1.3478e+06	8.5628e+00	3.3620e-06
8.2429e+05	8.2012e+00	7.9711e-06	1.3590e+06	8.5877e+00	3.4222e-06
8.3119e+05	8.2041e+00	7.5033e-06	1.3704e+06	8.6127e+00	3.4065e-06
8.3814e+05	8.2069e+00	7.1046e-06	1.3819e+06	8.6379e+00	3.3371e-06
8.4515e+05	8.2098e+00	7.0808e-06	1.3934e+06	8.6633e+00	3.2655e-06
8.5222e+05	8.2127e+00	7.0348e-06	1.4051e+06	8.6890e+00	3.1802e-06
8.5936e+05	8.2157e+00	6.5611e-06	1.4168e+06	8.7149e+00	3.1712e-06
8.6655e+05	8.2186e+00	6.1141e-06	1.4287e+06	8.7410e+00	3.2765e-06
8.7380e+05	8.2215e+00	5.9991e-06	1.4407e+06	8.7674e+00	3.2838e-06
8.8111e+05	8.2245e+00	6.0526e-06	1.4528e+06	8.7941e+00	3.1087e-06
8.8849e+05	8.2275e+00	5.8783e-06	1.4649e+06	8.8208e+00	3.0300e-06
8.9592e+05	8.2305e+00	5.5864e-06	1.4772e+06	8.8478e+00	3.0388e-06
9.0342e+05	8.2335e+00	5.1316e-06	1.4895e+06	8.8750e+00	3.0085e-06

1.5020e+06	8.9007e+00	2.9062e-06	2.4763e+06	9.8219e+00	1.3773e-06
1.5145e+06	8.9222e+00	2.8402e-06	2.4970e+06	9.8307e+00	1.3361e-06
1.5272e+06	8.9413e+00	2.8111e-06	2.5179e+06	9.8395e+00	1.3063e-06
1.5400e+06	8.9606e+00	2.7924e-06	2.5390e+06	9.8485e+00	1.2735e-06
1.5529e+06	8.9800e+00	2.7113e-06	2.5603e+06	9.8575e+00	1.2886e-06
1.5659e+06	8.9996e+00	2.5725e-06	2.5817e+06	9.8666e+00	1.2994e-06
1.5790e+06	9.0193e+00	2.5420e-06	2.6033e+06	9.8758e+00	1.2656e-06
1.5922e+06	9.0392e+00	2.4255e-06	2.6251e+06	9.8850e+00	1.2596e-06
1.6055e+06	9.0594e+00	2.3730e-06	2.6470e+06	9.8944e+00	1.2364e-06
1.6190e+06	9.0796e+00	2.4315e-06	2.6692e+06	9.9038e+00	1.2187e-06
1.6325e+06	9.1001e+00	2.2817e-06	2.6915e+06	9.9133e+00	1.1966e-06
1.6462e+06	9.1207e+00	2.2403e-06	2.7140e+06	9.9228e+00	1.1179e-06
1.6599e+06	9.1414e+00	2.4719e-06	2.7367e+06	9.9312e+00	1.0821e-06
1.6738e+06	9.1623e+00	2.5444e-06	2.7596e+06	9.9367e+00	1.0808e-06
1.6878e+06	9.1834e+00	2.4427e-06	2.7827e+06	9.9403e+00	1.0430e-06
1.7019e+06	9.2047e+00	2.3663e-06	2.8060e+06	9.9440e+00	1.0069e-06
1.7162e+06	9.2262e+00	2.3661e-06	2.8295e+06	9.9477e+00	9.8204e-07
1.7305e+06	9.2478e+00	2.2887e-06	2.8532e+06	9.9515e+00	9.7825e-07
1.7450e+06	9.2697e+00	2.2064e-06	2.8770e+06	9.9552e+00	9.6450e-07
1.7596e+06	9.2917e+00	2.2401e-06	2.9011e+06	9.9590e+00	9.5311e-07
1.7743e+06	9.3138e+00	2.2557e-06	2.9254e+06	9.9629e+00	9.4800e-07
1.7892e+06	9.3362e+00	2.2023e-06	2.9499e+06	9.9667e+00	9.4320e-07
1.8042e+06	9.3588e+00	2.1623e-06	2.9746e+06	9.9706e+00	9.2443e-07
1.8193e+06	9.3816e+00	1.9877e-06	2.9994e+06	9.9746e+00	9.1403e-07
1.8345e+06	9.4022e+00	1.9089e-06	3.0245e+06	9.9785e+00	9.2424e-07
1.8498e+06	9.4170e+00	2.0192e-06	3.0499e+06	9.9825e+00	9.1494e-07
1.8653e+06	9.4284e+00	2.0173e-06	3.0754e+06	9.9866e+00	9.0418e-07
1.8810e+06	9.4400e+00	1.9035e-06	3.1011e+06	9.9906e+00	8.8000e-07
1.8967e+06	9.4516e+00	1.7629e-06	3.1271e+06	9.9947e+00	8.2840e-07
1.9126e+06	9.4632e+00	1.7354e-06	3.1533e+06	9.9989e+00	7.7721e-07
1.9286e+06	9.4750e+00	1.7379e-06	3.1797e+06	1.0003e+01	7.4048e-07
1.9447e+06	9.4869e+00	1.7151e-06	3.2063e+06	1.0007e+01	7.1656e-07
1.9610e+06	9.4989e+00	1.6924e-06	3.2331e+06	1.0011e+01	6.8526e-07
1.9774e+06	9.5110e+00	1.7130e-06	3.2601e+06	1.0016e+01	6.4748e-07
1.9939e+06	9.5232e+00	1.6801e-06	3.2874e+06	1.0020e+01	6.2849e-07
2.0106e+06	9.5355e+00	1.6519e-06	3.3149e+06	1.0024e+01	6.1433e-07
2.0275e+06	9.5479e+00	1.6725e-06	3.3427e+06	1.0027e+01	5.9114e-07
2.0444e+06	9.5604e+00	1.6597e-06	3.3707e+06	1.0025e+01	5.6531e-07
2.0615e+06	9.5730e+00	1.6277e-06	3.3989e+06	1.0020e+01	5.5451e-07
2.0788e+06	9.5857e+00	1.6076e-06	3.4273e+06	1.0016e+01	5.4405e-07
2.0962e+06	9.5985e+00	1.6334e-06	3.4559e+06	1.0011e+01	5.2065e-07
2.1137e+06	9.6114e+00	1.6505e-06	3.4849e+06	1.0006e+01	5.0805e-07
2.1314e+06	9.6239e+00	1.6310e-06	3.5141e+06	1.0001e+01	4.9996e-07
2.1492e+06	9.6358e+00	1.6302e-06	3.5435e+06	9.9966e+00	4.9029e-07
2.1672e+06	9.6477e+00	1.6419e-06	3.5731e+06	9.9917e+00	4.7868e-07
2.1853e+06	9.6596e+00	1.5883e-06	3.6030e+06	9.9868e+00	4.6613e-07
2.2036e+06	9.6717e+00	1.5643e-06	3.6332e+06	9.9818e+00	4.5480e-07
2.2221e+06	9.6839e+00	1.5729e-06	3.6636e+06	9.9768e+00	4.4631e-07
2.2407e+06	9.6962e+00	1.5685e-06	3.6942e+06	9.9718e+00	4.3457e-07
2.2594e+06	9.7086e+00	1.5960e-06	3.7251e+06	9.9667e+00	4.0634e-07
2.2783e+06	9.7211e+00	1.6264e-06	3.7563e+06	9.9615e+00	3.9396e-07
2.2974e+06	9.7337e+00	1.6642e-06	3.7877e+06	9.9564e+00	4.1267e-07
2.3166e+06	9.7464e+00	1.7394e-06	3.8194e+06	9.9511e+00	4.2421e-07
2.3360e+06	9.7593e+00	1.7312e-06	3.8514e+06	9.9459e+00	4.1962e-07
2.3555e+06	9.7702e+00	1.6782e-06	3.8836e+06	9.9406e+00	4.1431e-07
2.3752e+06	9.7789e+00	1.6174e-06	3.9161e+06	9.9352e+00	4.0233e-07
2.3951e+06	9.7874e+00	1.5009e-06	3.9489e+06	9.9298e+00	3.9270e-07
2.4152e+06	9.7959e+00	1.4154e-06	3.9819e+06	9.9244e+00	3.9190e-07
2.4354e+06	9.8045e+00	1.3529e-06	4.0153e+06	9.9189e+00	3.9801e-07
2.4558e+06	9.8131e+00	1.3565e-06	4.0489e+06	9.9134e+00	4.0493e-07

4.0827e+06	9.9084e+00	3.9822e-07	6.7313e+06	1.0606e+01	5.6272e-08
4.1169e+06	9.9050e+00	3.7688e-07	6.7876e+06	1.0653e+01	5.3808e-08
4.1513e+06	9.9025e+00	3.5232e-07	6.8444e+06	1.0700e+01	5.3275e-08
4.1861e+06	9.8999e+00	3.4110e-07	6.9017e+06	1.0748e+01	5.2340e-08
4.2211e+06	9.8973e+00	3.4451e-07	6.9594e+06	1.0797e+01	4.9722e-08
4.2564e+06	9.8948e+00	3.3321e-07	7.0177e+06	1.0845e+01	4.7159e-08
4.2920e+06	9.8921e+00	2.9674e-07	7.0764e+06	1.0895e+01	4.4856e-08
4.3280e+06	9.8895e+00	2.7596e-07	7.1356e+06	1.0944e+01	4.1455e-08
4.3642e+06	9.8869e+00	2.8053e-07	7.1953e+06	1.0994e+01	3.9001e-08
4.4007e+06	9.8842e+00	2.8480e-07	7.2555e+06	1.1045e+01	3.7840e-08
4.4375e+06	9.8815e+00	2.8560e-07	7.3162e+06	1.1096e+01	3.6551e-08
4.4747e+06	9.8788e+00	2.7956e-07	7.3775e+06	1.1147e+01	3.5353e-08
4.5121e+06	9.8760e+00	2.6941e-07	7.4392e+06	1.1194e+01	3.4133e-08
4.5499e+06	9.8732e+00	2.6416e-07	7.5015e+06	1.1232e+01	3.2959e-08
4.5879e+06	9.8705e+00	2.5951e-07	7.5642e+06	1.1264e+01	3.1372e-08
4.6263e+06	9.8676e+00	2.5803e-07	7.6275e+06	1.1295e+01	2.9765e-08
4.6651e+06	9.8648e+00	2.5933e-07	7.6914e+06	1.1328e+01	2.8271e-08
4.7041e+06	9.8619e+00	2.5715e-07	7.7557e+06	1.1360e+01	2.6604e-08
4.7435e+06	9.8591e+00	2.5014e-07	7.8206e+06	1.1393e+01	2.5345e-08
4.7832e+06	9.8562e+00	2.3232e-07	7.8861e+06	1.1426e+01	2.4918e-08
4.8232e+06	9.8532e+00	2.1602e-07	7.9521e+06	1.1459e+01	2.4568e-08
4.8635e+06	9.8503e+00	2.1481e-07	8.0186e+06	1.1493e+01	2.3520e-08
4.9042e+06	9.8473e+00	2.1697e-07	8.0857e+06	1.1526e+01	2.1920e-08
4.9453e+06	9.8443e+00	2.1390e-07	8.1534e+06	1.1560e+01	2.0313e-08
4.9867e+06	9.8438e+00	2.0722e-07	8.2216e+06	1.1595e+01	1.9114e-08
5.0284e+06	9.8498e+00	1.9444e-07	8.2904e+06	1.1630e+01	1.8276e-08
5.0705e+06	9.8597e+00	1.7479e-07	8.3598e+06	1.1665e+01	1.7525e-08
5.1129e+06	9.8697e+00	1.6673e-07	8.4297e+06	1.1700e+01	1.6861e-08
5.1557e+06	9.8798e+00	1.7103e-07	8.5003e+06	1.1735e+01	1.6224e-08
5.1988e+06	9.8900e+00	1.7013e-07	8.5714e+06	1.1771e+01	1.5325e-08
5.2423e+06	9.9002e+00	1.6768e-07	8.6431e+06	1.1807e+01	1.4291e-08
5.2862e+06	9.9105e+00	1.6126e-07	8.7154e+06	1.1844e+01	1.3509e-08
5.3304e+06	9.9210e+00	1.5383e-07	8.7884e+06	1.1881e+01	1.3076e-08
5.3750e+06	9.9315e+00	1.5143e-07	8.8619e+06	1.1918e+01	1.2647e-08
5.4200e+06	9.9421e+00	1.4737e-07	8.9361e+06	1.1955e+01	1.1970e-08
5.4653e+06	9.9528e+00	1.4202e-07	9.0109e+06	1.1993e+01	1.1269e-08
5.5111e+06	9.9635e+00	1.3598e-07	9.0863e+06	1.2026e+01	1.0780e-08
5.5572e+06	9.9744e+00	1.2623e-07	9.1623e+06	1.2049e+01	1.0337e-08
5.6037e+06	9.9853e+00	1.1856e-07	9.2389e+06	1.2066e+01	9.7662e-09
5.6506e+06	9.9964e+00	1.1609e-07	9.3163e+06	1.2083e+01	9.1566e-09
5.6979e+06	1.0008e+01	1.1498e-07	9.3943e+06	1.2100e+01	8.6165e-09
5.7456e+06	1.0019e+01	1.1357e-07	9.4729e+06	1.2117e+01	8.1480e-09
5.7937e+06	1.0035e+01	1.1108e-07	9.5521e+06	1.2135e+01	7.6656e-09
5.8422e+06	1.0057e+01	1.0607e-07	9.6321e+06	1.2152e+01	7.1967e-09
5.8911e+06	1.0080e+01	1.0023e-07	9.7127e+06	1.2170e+01	6.7605e-09
5.9404e+06	1.0104e+01	9.9216e-08	9.7939e+06	1.2188e+01	6.3710e-09
5.9901e+06	1.0128e+01	9.8474e-08	9.8759e+06	1.2206e+01	6.0222e-09
6.0402e+06	1.0151e+01	9.3812e-08	9.9585e+06	1.2224e+01	5.6123e-09
6.0907e+06	1.0175e+01	9.0513e-08	1.0042e+07	1.2242e+01	5.3057e-09
6.1417e+06	1.0200e+01	8.8335e-08	1.0126e+07	1.2260e+01	5.0495e-09
6.1931e+06	1.0224e+01	8.5725e-08	1.0211e+07	1.2279e+01	4.7319e-09
6.2449e+06	1.0249e+01	8.2781e-08	1.0296e+07	1.2298e+01	4.5192e-09
6.2972e+06	1.0273e+01	7.8882e-08	1.0382e+07	1.2316e+01	4.2477e-09
6.3499e+06	1.0299e+01	7.3778e-08	1.0469e+07	1.2335e+01	4.0114e-09
6.4030e+06	1.0332e+01	7.2361e-08	1.0557e+07	1.2355e+01	3.8164e-09
6.4565e+06	1.0375e+01	7.2585e-08	1.0645e+07	1.2374e+01	3.5993e-09
6.5106e+06	1.0421e+01	6.9391e-08	1.0734e+07	1.2393e+01	3.3922e-09
6.5651e+06	1.0466e+01	6.5220e-08	1.0824e+07	1.2419e+01	3.1776e-09
6.6200e+06	1.0512e+01	6.2140e-08	1.0915e+07	1.2452e+01	2.9677e-09
6.6754e+06	1.0559e+01	5.9631e-08	1.1006e+07	1.2489e+01	2.7390e-09

1.1098e+07	1.2527e+01	2.5515e-09	1.8298e+07	1.7856e+01	0.0000e+00
1.1191e+07	1.2564e+01	2.3740e-09	1.8451e+07	1.7962e+01	0.0000e+00
1.1284e+07	1.2602e+01	2.2317e-09	1.8605e+07	1.8068e+01	0.0000e+00
1.1379e+07	1.2640e+01	2.0933e-09	1.8761e+07	1.8176e+01	0.0000e+00
1.1474e+07	1.2678e+01	1.9763e-09	1.8918e+07	1.8285e+01	0.0000e+00
1.1570e+07	1.2717e+01	1.8550e-09	1.9076e+07	1.8394e+01	0.0000e+00
1.1667e+07	1.2756e+01	1.7345e-09	1.9236e+07	1.8505e+01	0.0000e+00
1.1765e+07	1.2796e+01	1.6380e-09	1.9397e+07	1.8616e+01	0.0000e+00
1.1863e+07	1.2836e+01	1.5382e-09	1.9559e+07	1.8728e+01	0.0000e+00
1.1962e+07	1.2876e+01	1.4470e-09	1.9640e+07	1.8784e+01	0.0000e+00
1.2063e+07	1.2916e+01	1.3790e-09	0.0000e+00	0.0000e+00	0.0000e+00
1.2164e+07	1.2957e+01	1.3104e-09	0.0000e+00	0.0000e+00	0.0000e+00
1.2265e+07	1.2998e+01	1.2260e-09	0.0000e+00	0.0000e+00	0.0000e+00
1.2368e+07	1.3040e+01	1.1500e-09	0.0000e+00	0.0000e+00	0.0000e+00
1.2471e+07	1.3081e+01	1.0786e-09	0.0000e+00	0.0000e+00	0.0000e+00
1.2576e+07	1.3124e+01	1.0170e-09	0.0000e+00	0.0000e+00	0.0000e+00
1.2681e+07	1.3168e+01	9.5827e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.2787e+07	1.3241e+01	8.9744e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.2894e+07	1.3342e+01	8.4153e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.3002e+07	1.3445e+01	8.0219e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.3111e+07	1.3548e+01	7.5697e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.3220e+07	1.3652e+01	7.1302e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.3331e+07	1.3757e+01	6.7025e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.3443e+07	1.3863e+01	6.3372e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.3556e+07	1.3970e+01	6.0168e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.3669e+07	1.4077e+01	5.6797e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.3783e+07	1.4186e+01	5.3828e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.3898e+07	1.4295e+01	5.1200e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.4015e+07	1.4406e+01	4.9002e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.4132e+07	1.4517e+01	4.6896e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.4250e+07	1.4629e+01	4.4804e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.4369e+07	1.4742e+01	4.2791e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.4490e+07	1.4853e+01	4.0907e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.4611e+07	1.4965e+01	3.9478e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.4733e+07	1.5077e+01	3.7807e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.4856e+07	1.5190e+01	3.6093e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.4981e+07	1.5304e+01	3.4856e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.5106e+07	1.5419e+01	3.3885e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.5233e+07	1.5535e+01	3.3188e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.5360e+07	1.5652e+01	3.2362e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.5489e+07	1.5770e+01	3.1460e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.5618e+07	1.5889e+01	1.0000e-10	0.0000e+00	0.0000e+00	0.0000e+00
1.5749e+07	1.6009e+01	0.0000e+00	0.0000e+00	0.0000e+00	0.0000e+00
1.5881e+07	1.6130e+01	0.0000e+00	0.0000e+00	0.0000e+00	0.0000e+00
1.6014e+07	1.6252e+01	0.0000e+00	0.0000e+00	0.0000e+00	0.0000e+00
1.6148e+07	1.6365e+01	0.0000e+00	0.0000e+00	0.0000e+00	0.0000e+00
1.6283e+07	1.6463e+01	0.0000e+00	0.0000e+00	0.0000e+00	0.0000e+00
1.6419e+07	1.6557e+01	0.0000e+00	0.0000e+00	0.0000e+00	0.0000e+00
1.6556e+07	1.6652e+01	0.0000e+00	0.0000e+00	0.0000e+00	0.0000e+00
1.6695e+07	1.6748e+01	0.0000e+00	0.0000e+00	0.0000e+00	0.0000e+00
1.6835e+07	1.6845e+01	0.0000e+00	0.0000e+00	0.0000e+00	0.0000e+00
1.6976e+07	1.6942e+01	0.0000e+00	0.0000e+00	0.0000e+00	0.0000e+00
1.7118e+07	1.7040e+01	0.0000e+00	0.0000e+00	0.0000e+00	0.0000e+00
1.7261e+07	1.7140e+01	0.0000e+00	0.0000e+00	0.0000e+00	0.0000e+00
1.7406e+07	1.7239e+01	0.0000e+00	0.0000e+00	0.0000e+00	0.0000e+00
1.7551e+07	1.7340e+01	0.0000e+00	0.0000e+00	0.0000e+00	0.0000e+00
1.7698e+07	1.7441e+01	0.0000e+00	0.0000e+00	0.0000e+00	0.0000e+00
1.7846e+07	1.7544e+01	0.0000e+00	0.0000e+00	0.0000e+00	0.0000e+00
1.7995e+07	1.7647e+01	0.0000e+00	0.0000e+00	0.0000e+00	0.0000e+00
1.8146e+07	1.7751e+01	0.0000e+00	0.0000e+00	0.0000e+00	0.0000e+00

APPENDIX C. DETAILED RESULTS FOR THE
LUMPED NUCLIDE

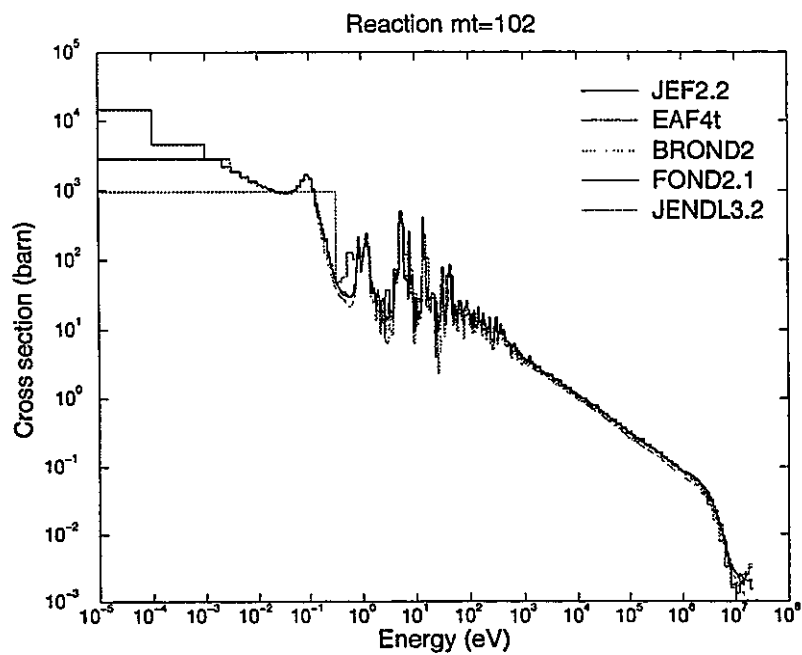


Figure C.1 *The radiative capture cross section of the lumped nuclide as a function of the energy.*

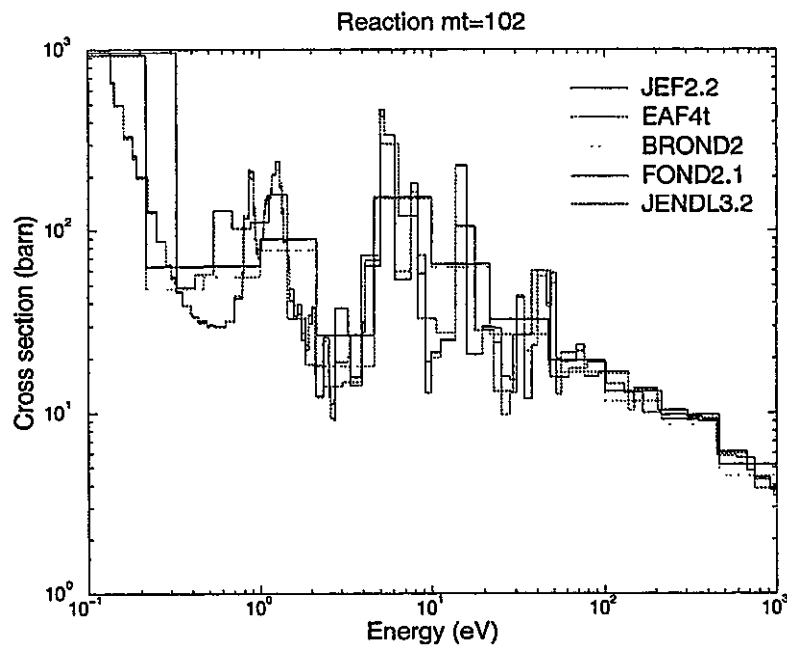


Figure C.2 *The radiative capture cross section of the lumped nuclide as a function of the energy.*

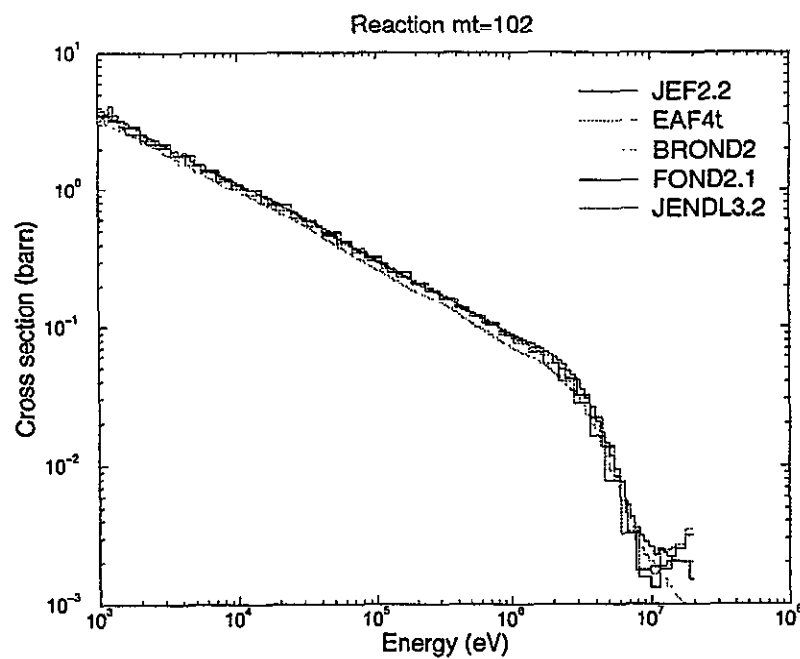


Figure C.3 *The radiative capture cross section of the lumped nuclide as a function of the energy.*

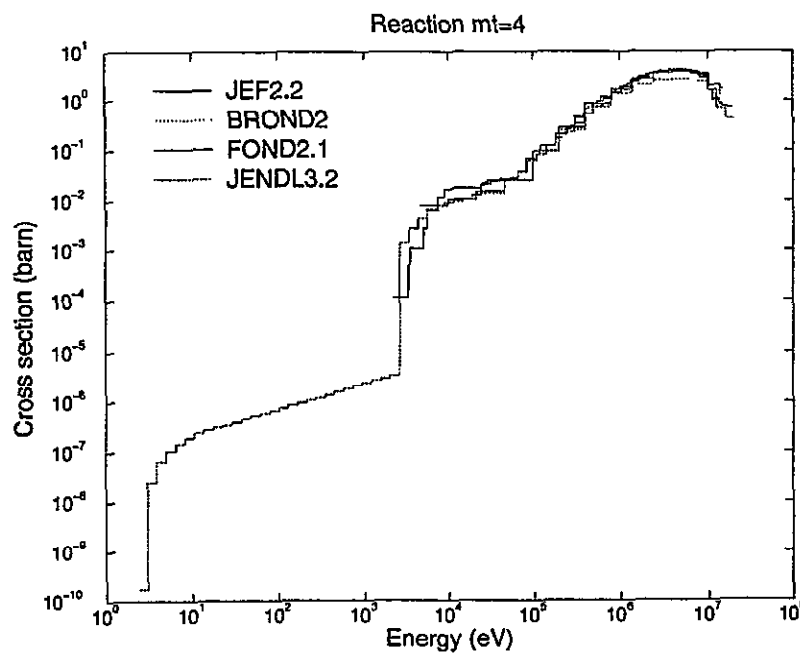


Figure C.4 *The inelastic scattering cross section of the lumped nuclide as a function of the energy.*

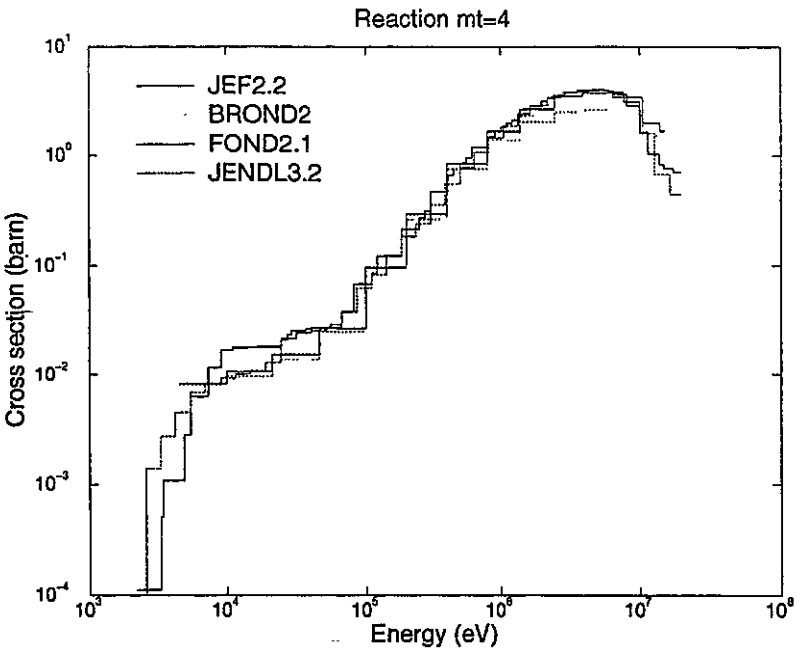


Figure C.5 The inelastic scattering cross section of the lumped nuclide as a function of the energy.

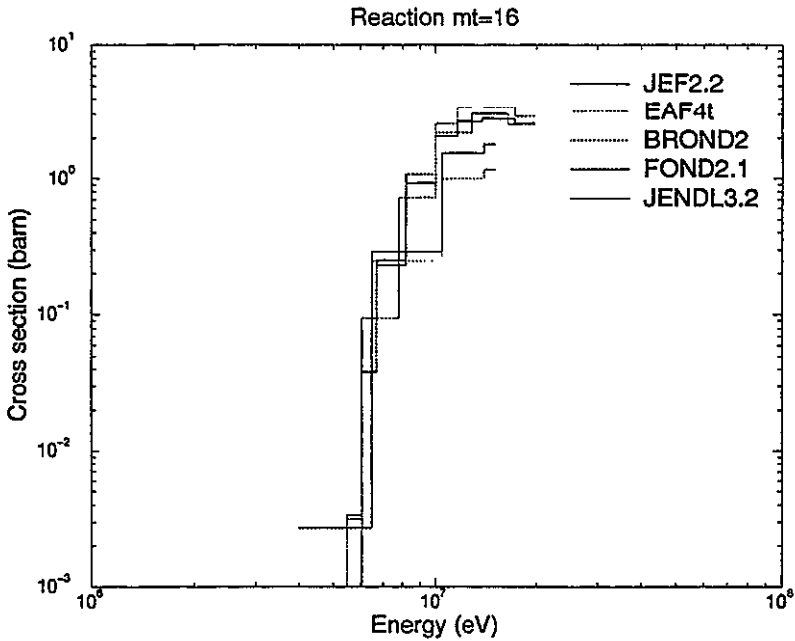


Figure C.6 The (n,2n) cross section of the lumped nuclide as a function of the energy.