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## JENDL FP Decay Data File 2000

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# JENDL FP Decay Data File 2000

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## Abstract

A decay data file of fission product (FP) nuclides has been developed for the use in nuclear technology field as one of special purpose files of JENDL (Japanese Evaluated Nuclear Data Library) in the format of ENDF/B and it is called JENDL FP Decay Data File 2000. The file includes the decay data for 1229 fission product nuclides: 142 stable and 1087 unstable nuclides. The data included for a nuclide are decay modes, their Q values and branching ratios, average decay energy values of beta-rays, gamma-rays and alpha-particles and their spectral data. The primary source of the decay data is ENSDF (Evaluated Nuclear Structure Data File), which is the internationally recognized data file of nuclear structure properties. The data in ENSDF, however, cover only measured ones. The data of the short-lived nuclides needed for the application fields such as decay heat prediction are often incomplete or not measured because of their short half-lives. For such nuclides a theoretical model calculation is applied to derive the needed data such as average decay energies and spectral data. The data in JENDL FP Decay Data File 2000 have been tested by summation calculation comparing its results with measured data of decay heat values and aggregate fission product spectra of various fissioning nuclei. The comparison showed good agreement between the calculated results and the measured values.

Keywords : Fission Product, Decay Data, Japanese Evaluated Nuclear Data Library, Decay Heat, Beta- and Gamma-ray Spectra

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# JENDL FP 崩壊データファイル 2000

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## 要 旨

日本の評価済ファイル JENDL (Japanese Evaluated Nuclear Data Library) の特殊目的データファイルの一つとして、原子核工学分野での利用のため、核分裂生成物 (FP) の崩壊データファイルを ENDF/B フォーマットで作成した。このファイルが JENDL FP 崩壊データファイル 2000 である。このファイルには 1229 の核分裂生成物に関する崩壊データが収納されている。このうち、安定核は 142 で不安定核が 1087 である。含まれる崩壊データは崩壊形式、その崩壊の Q 値と分岐比、ベータ線、ガンマ線及びアルファ線の平均崩壊エネルギーとスペクトルである。崩壊データのデータソースとしては、主に ENSDF (評価済核構造データファイル) を採用した。この ENSDF ファイルは核構造に関するデータを収納してある国際的に認識されているデータファイルである。ただ、ENSDF ファイルのデータは測定データのみに基づいている。崩壊熱評価など応用分野で必要とされている短半減期核種のデータは、不完全であるか、測定されていないものもある。このような核種のデータについては、理論的な計算を適用し、平均崩壊エネルギーやスペクトルのデータを算出し、採用してある。JENDL FP 崩壊データファイル 2000 のデータは、総和計算に利用し、崩壊熱や核分裂性核種の核分裂後のスペクトルの測定値との比較を通して検証した。この結果、総和計算の結果は測定値との良い一致を示した。

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## 1 Introduction

Decay data of fission product (FP) nuclides are one of the most important basic data for nuclear technologies. Accurate calculation of FP accumulation in nuclear power reactors needs a set of reliable nuclear data including the decay data of FPs. The FP accumulation during the operation and after shutdown of the power reactors is essential to many aspects of nuclear reactor safety, operation and nuclear safeguard.

Japanese Nuclear Data Committee released a file used for the calculation of FP accumulation in nuclear reactors as JNDC Nuclear Data Library of Fission Products Second Version <sup>1)</sup> (JNDC-V2 file) in 1990. The file covers half-lives, average decay energies, branching ratios and fission yields of 1227 FP nuclides. The decay heat calculation using the file was able to reproduce the measured decay heat values of various fissioning nuclides rather well. The file, however, has a different format from the Japanese Evaluated Nuclear Data Library (JENDL) compiled in the ENDF/B <sup>2)</sup> format, and then the file has not been treated as a member of JENDL family. The effort to make JENDL FP Decay Data File has been tried, but the problem to make the file is that JNDC-V2 file does not include the radiation spectral data. The evaluated nuclear data file requires “completeness” of the data needed for application. The “completeness” means that the data required by the format are included even if their measured values are not available. That requires theoretical estimation for such data. Some average decay energy values of JNDC-V2 file are theoretically estimated ones even if the measured data are available because the measured data of such nuclides are considered to have some deficiency. The measured spectral data of such nuclides, then, are not able to reproduce the average decay energy values adopted in the file. The theoretical estimation is also required to provide the consistent spectral data with the average decay energy values by compensating the deficient measured spectra. Such theoretically compensated spectral data should be able to reproduce the adopted average decay energy values when they are integrated over whole energy range and guarantee the consistency of the data included in the file.

The adoption of the theoretically estimated gamma-ray spectra was first attempted to calculate the aggregate fission products spectra <sup>3)</sup>. The calculated aggregate spectra showed that theoretically estimated spectra are applicable to compensate the deficient spectrum data. In this calculation the theoretically estimated spectra were prepared for 32 typical FPs categorized with Q values and odd-evenness of the proton and neutron numbers of fission products. When a nuclide needs an estimated spectrum, a suitable estimated spectrum was selected from the 32 typical ones. In the ENDF/B format, the estimated spectrum of individual nuclide is needed to be incorporated into the file. The ENDF/B-VI FP Decay Data File <sup>4)</sup> is the first evaluated data file which adopts the model estimated spectra for individual nuclide with no or “incompletely” measured spectrum data. JENDL FP Decay Data File 2000 also adopts the model estimated average decay energy values of beta- and gamma-rays and those spectral data for nuclides with “incomplete” or no measured decay spectra in order to keep consistency between the average decay energy values and the spectra. The file is then applicable to nuclear technology fields using decay property of fission products.

In Chapter 2 the data contained in the file are described. The data format and the summary of the data in JENDL FP Decay Data File 2000 are presented in Chapter 3. The spectrum comparisons of fission product nuclides are given in Chapter 4. The decay heat and the aggregate fission product spectrum are compared in Chapter 5 and 6 respectively. Finally the summary is presented in Chapter 7.

## 2 Decay Data

JENDL Decay Data File 2000 contains the decay data of 1229 fission product nuclides from A=66 to 172. Two nuclides are added comparing with JNDC-V2 file where 1227 nuclides are contained. The additional nuclides are  $^{81m}\text{Ge}$  and  $^{165m}\text{Tb}$ . There are 2 states with equal half-life in  $^{81}\text{Ge}$ . They are separated in the JENDL file. As for  $^{165m}\text{Tb}$ , the state assigned as  $^{165m}\text{Tb}$  in JNDC-V2 file is actually  $^{165n}\text{Tb}$  (the second isomeric state of  $^{165}\text{Tb}$ ) and the first isomeric state between  $^{165n}\text{Tb}$  and  $^{165}\text{Tb}$  is added in the JENDL file. Of these 1229 nuclides 142 nuclides are stable and the other 1087 nuclides are unstable. In the file, such decay data as half-life, decay modes, Q values, branching ratios, average decay energy values of beta-ray, gamma-ray and alpha-ray are included. The average beta-ray energy here means emitted electron energy per decay and includes conversion electron energy. The average gamma-ray energy means emitted gamma-ray and X-ray energy. As for spectral data, each radiation including conversion electron and X-ray is separately given in the file when their measured data are available. The spectral data of delayed neutron are not given in the present file. Only the branching ratio of the delayed neutron decay is given. The number of nuclides is summarized in Table 1. As

Table 1 Number of nuclides of various types

Number of Nuclides	Data Types, Comments
1229	Total number of nuclides in the file
142	Stable nuclides
1087	Unstable nuclides or states
197	First isomeric states
8	Second isomeric states
581	With theoretically estimated average gamma decay energy value
506	With measured average gamma decay energy value
543	With theoretically estimated average beta decay energy value
506	With measured average beta decay energy value
1053	With gamma-ray spectrum data
	431 With theoretically estimated spectrum only
	496 With measured spectrum only
	126 With measured and theoretically estimated spectrum
899	With beta-ray spectrum
	432 With theoretically estimated spectrum only
	374 With measured spectrum only
	93 With measured and theoretically estimated spectrum
5	Nuclides with alpha-ray spectrum (Measured)

seen in this table the theoretically estimated average decay energy values and spectra are adopted for about a half of the nuclides contained. That means about a half of the nuclides contained in the file have no or "incomplete" experimentally measured decay data and are needed to be complemented by theoretically estimated ones. It has long been known that there are some nuclides with the so-called "Pandemonium Effect" <sup>5)</sup>, in which the measured spectrum data overestimate the average beta-ray energy value and underestimate the average gamma-ray energy value. It is because of missing levels of the daughter nuclides. It has been shown that the decay heat calculation using the estimated decay energy values instead of the measured ones for such nuclides well reproduces the measured decay heat

values of various kinds of fissioning nuclides. In the compilation of JENDL FP Decay Data File 2000, the measured data of about 100 nuclides are considered to be “incomplete” and theoretically estimated decay energy values are adopted for them. As for spectral data, the measured ones are included in the file as discrete spectra, that is, energy value and its intensity. In the case of beta-rays, the maximum energy of the beta-ray and the intensity are included as measured spectra. The theoretically estimated spectra, on the other hand, are given as continuous ones for both beta- and gamma-rays.

The half-lives and the Q values are adopted from measured ones and Audi's evaluation<sup>6)</sup>, respectively, if they are available. When the measured value of the half-life is not available, the estimated half-life values by Tachibana et al.<sup>7)</sup> are adopted. The size of JENDL FP Decay Data File 2000 amounts to about 14 MB.

## 2.1 Measured Decay Data

As a primary source of the decay data file, internationally recognized ENSDF (Evaluated Nuclear Structure Data File)<sup>8)</sup> was used. The decay data sets in ENSDF were retrieved and converted into the ENDF/B format using an analysis code of ENSDF, RADLST<sup>9)</sup>. The data sets in ENSDF include the information of energy levels and radiations accompanying the decay process. The JENDL format needs such information as decay mode, its half-life and Q value, radiation types (beta-ray, gamma-ray, X-ray, conversion electron etc.) , their energy values and intensities. The computer code RADLST retrieves the necessary data and converts them to the ENDF/B format. The data in ENSDF, however, are categorized with the level property of a daughter nuclide and are treated as different data sets when there are more than 2 decay modes in a parent nuclide. The different data sets have to be merged into one data group of the parent nuclide in the ENDF/B format. And also when a daughter nuclides has an isomeric state, it sometimes happens that the radiations from the isomeric state to the ground state are counted as those from the parent nuclide. In order to avoid such double counting, the radiations from the isomeric state have to be removed from those from the parent nuclide.

The data in ENSDF are based on measured ones and are provided through detailed examination by evaluators as most probable ones. The data, however, often suffer from the so-called “Pandemonium Effect” as mentioned above. In a case where the beta decay branches to high energy levels of a daughter nuclide happen to be not observed when the half-life of the nuclide is short and the Q value of the decay mode is high, the derived average beta decay energy value is overestimated and the gamma decay energy value underestimated. So it needs careful examination to derive the average decay energy values from the measured decay scheme. However, it is difficult to determine which decay scheme in ENSDF suffers from the “Pandemonium Effect”. There are no general procedure to find out the deficient decay scheme. The maximum level energy of a daughter nucleus, however, becomes a guide to find it out. If the maximum level energy observed is much lower than the Q value, the nuclide becomes a candidate having the deficient decay scheme. The data of such nuclide should be examined in detail. When the data are considered to be deficient for deriving the average decay energy values, the theoretically estimated values are used to compensate the deficient measured data. These kinds of modification were performed for the decay energy values and spectra in the compilation of JENDL FP Decay Data File 2000.

## 2.2 Theoretically Estimated Decay Data

For the estimation of the experimentally unknown or incompletely measured decay data, “Gross Theory of Beta Decay”<sup>10)</sup> developed by Yamada et al. was used. The theory expresses the gross properties of beta decay. The individual energy levels of a daughter nucleus are treated as continuous

ones. In this theory, the decay constant is expressed as:

$$\lambda = \frac{1}{2\pi^3} \int_{-Q}^0 \sum_{\Omega} |g_{\Omega}|^2 \cdot |M_{\Omega}(E_g)|^2 f(-E_g + 1) dE_g,$$

where  $E_g$  is the partial decay energy and is related to the excitation energy  $E_i$  as  $E_g = -(E_i - 1)$ . The function  $f(-E_g + 1)$  is the integrated Fermi function <sup>11)</sup>. The notation  $\sum_{\Omega} |g_{\Omega}|^2 \cdot |M_{\Omega}(E_g)|^2$  is used for the beta-strength function. The  $\Omega$  symbol refers to types of the beta transition, Fermi, Gamow-Teller and so on. The essence of the gross theory lies in a way to evaluate the strength function with the aid of sum rules and a relatively simple nuclear model. The matrix element  $|M_{\Omega}|^2$  is then given by the following expression.

$$|M_{\Omega}(E)|^2 = \int_{\varepsilon_{min}}^{\varepsilon_{max}} D_{\Omega}(E, \varepsilon) W(E, \varepsilon) \frac{dn_1}{d\varepsilon} d\varepsilon$$

where

$D_{\Omega}(E, \varepsilon)$  : One-particle strength function inferred from sum rules,

$\Omega$  : Type of beta-decay operator (allowed or first forbidden transition),

$E$  : Energy of final nuclear state measured from initial state,

$\varepsilon$  : One-particle energy of decaying nucleon,

$\frac{dn_1}{d\varepsilon}$  : Energy distribution of one particle,

$W(E, \varepsilon)$  : Weight function to take into account the Pauli exclusion principle.

The average beta- and gamma-ray energy values are then described as:

$$\bar{E}_{\beta} = \frac{1}{2\pi^3 \lambda} \int_{-Q}^0 \sum_{\Omega} |g_{\Omega}|^2 \cdot |M_{\Omega}(E_g)|^2 \int_1^{-E_g+1} mc^2(E-1)pE(-E_g+1-E)^2 F(E) dEdE_g,$$

$$\bar{E}_{\gamma} = \frac{1}{2\pi^3 \lambda} \int_{-Q}^0 \sum_{\Omega} |g_{\Omega}|^2 \cdot |M_{\Omega}(E_g)|^2 mc^2(Q+E_g) \int_1^{-E_g+1} pE(-E_g+1-E)^2 F(E) dEdE_g,$$

where  $F$  stands for the Fermi function, and  $p$  for the electron momentum.

The spectral data are also estimated using the strength function mentioned above. The beta-ray spectrum is then expressed <sup>12)</sup> as:

$$P(E_e) = T_{1/2} \int_{E_L}^{Q-E_e} \left[ \sum_{\Omega} S_{\Omega}(E_{exc}) F(Z, E_e) \zeta_{\Omega}(Z, E_e, Q - E_{exc})(Q - E_{exc} - E_e)^2 (E_e^2 - m^2 c^4)^{\frac{1}{2}} E_e \right] dE_{exc},$$

where

$S_{\Omega}(E_{exc}) \propto |M_{\Omega}(E_{exc} - Q)|^2$  : Strength function,

$T_{1/2}$  : Estimated beta-decay half life ( $= \ln 2 / \lambda$ ),

$F(Z, E_e)$  : Fermi function,

$\zeta_{\Omega}(Z, E_e, Q - E_{exc})$  : Shape factor,

$E_e$  : Beta ray energy,

$E_{exc}$	: Excitation energy in daughter nucleus,
$E_L$	: Maximum level energy experimentally observed in daughter nucleus,
$m$	: Electron rest mass,
$c$	: Light speed in vacuum.

The gamma-ray spectrum is also estimated using the beta strength function and cascade transition model <sup>3)</sup>. The initial population density of a daughter nuclide is given by the beta feeding function  $b(E)$  which is defined using the beta strength function  $S_\beta(E_{exc})$  as:

$$b(E) = S_\beta(E) \cdot f(Z, Q_\beta - E) \cdot T_{1/2}.$$

Once  $b(E)$  is obtained, the level population at the energy  $E'$  is written as:

$$g(E') = b(E') + \int_{E'}^{E_{max}} g(E'')(E'' - E')^3 S_\gamma(E'' - E') \rho(E') dE'',$$

where

$S_\gamma(E'' - E')$	: Gamma-ray strength function, normalized to $\int_0^{E''} (E'' - E')^3 S_\gamma(E'' - E') \rho(E') dE' = 1.0$
$\rho(E')$	: Level density.

The intensity of the cascade gamma-ray,  $I(E_\gamma)$ , is expressed as:

$$I(E_\gamma) = \int_0^{E_{max}} dE' \int_{E'}^{E_{max}} dE'' \delta(E'' - E' - E_\gamma) g(E'') (E'' - E')^3 S_\gamma(E'' - E') \rho(E').$$

The above equation is solved numerically starting from  $E_{max}(= Q_\beta)$  toward the lower energy successively. For the gamma-ray strength function, the expression by Brink and Axel <sup>13)</sup> was adopted.

$$S_\gamma(E_\gamma) = C \frac{\Gamma^2 E_\gamma}{(E_\gamma^2 - E_R^2)^2 + (E_\gamma \Gamma)^2},$$

where  $C$  is a normalization constant. The position  $E_R$  and the width  $\Gamma$  of the giant  $E1$  resonance are given by,

$$\Gamma : 5 \text{ MeV},$$

$$E_R : 80A^{-1/3} \text{ MeV (A = mass number)}.$$

The level density  $\rho(E')$  is calculated following the prescription by Gilbert and Cameron <sup>14)</sup>. In this model calculation the low energy part of the gamma-ray spectrum increases unintentionally. Then the low energy part is forced to decrease by multiplying the factor of

$$1 - \exp \left\{ -\frac{\frac{E}{E_0}}{1 - \frac{E}{E_0}} \right\},$$

where  $E_0$  values are set to be 0.5 MeV for the nuclides with the  $Q$  values lower than 1.3 MeV or 1.3 MeV for the nuclides with the  $Q$  values higher than 1.3 MeV. The estimated spectra were prepared as continuous spectra with 100 keV energy bin structure.

The estimated beta- and gamma-ray spectra were adopted to the nuclides having no measured spectrum data after the normalization to give the adopted average decay energy values when the spectrum is integrated over whole energy range. As the estimated average decay energy value is also adopted for

the nuclide with “incomplete” spectrum data, the measured spectrum data are inconsistent with the adopted average energy value for such nuclide. Therefore the estimated spectrum was used for these nuclides. In this step the measured spectrum information was kept unchanged in the file except for the normalization factor to obtain the absolute intensities, and the estimated spectrum was added to keep the consistency between the spectrum data and the average decay energy value.

### 2.3 Merging of Measured and Estimated Spectra

When a nuclide has incompletely measured spectrum, the spectrum has to be compensated with the estimated spectrum described in the previous section. The highest energy level of the daughter nucleus in such cases is rather low compared with the Q value. There seems to be some missing energy levels in the measured level scheme. The beta transitions to those levels are ignored in this case. Then the estimated beta strength is used for compensating the missing transitions to the higher energy part. And the measured transitions to the levels lower than the maximum level observed are kept unchanged so as to use the original measured data. In order to obtain the full spectrum which is consistent with the adopted average energy value, the measured spectrum and the estimated one relating to the higher levels than the maximum observed level have to be merged into one spectrum. Figure 1 shows this prescription. The measured level scheme is shown in the left hand side. The beta transitions to higher levels are not observed. The measured beta strength is denoted as bold solid line in the right hand side. The estimated strength is shown as a continuous curve at the higher energy part of the excitation energy than the observed maximum energy level. The estimated spectra in JENDL FP Decay Data File

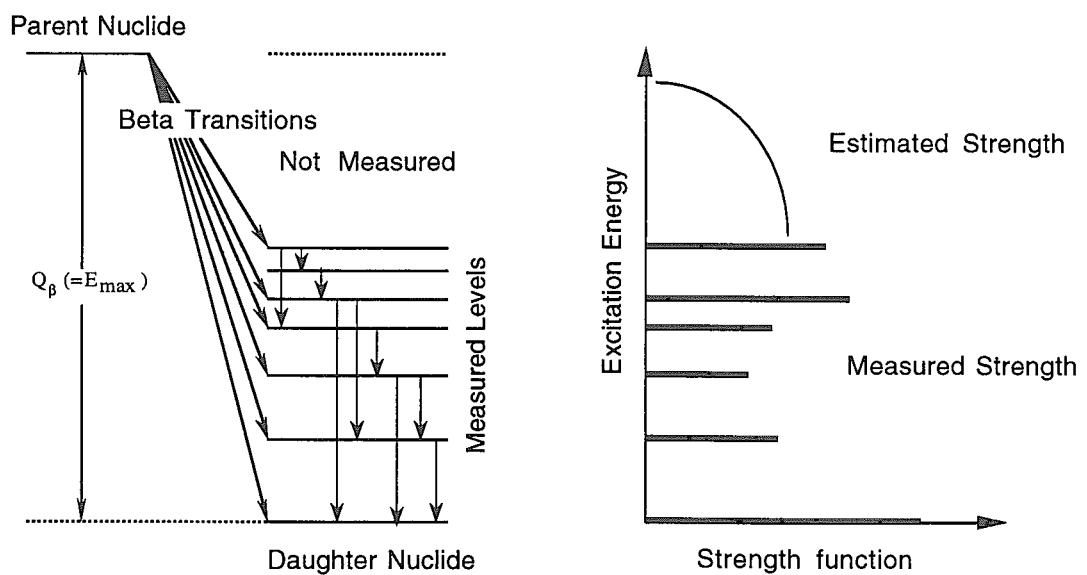


Fig. 1 Beta decay and strength function

2000 were obtained using this estimated strength.

The measured spectrum is represented as discrete data, that is, by the energy of the gamma-ray or the maximum energy of the beta transition and their intensities. The estimated spectrum, on the other hand, is represented as continuous ones because the estimated beta strength is a continuous function of

energy. The discrete and continuous spectra have the normalization factors, FD and FC, respectively, to give the absolute intensity. The FD and FC values are derived using following relations:

$$\bar{E} = \alpha \cdot \bar{E}_{dis.} + \beta \cdot \bar{E}_{cont.}$$

$$\alpha + \beta = 1.0 \quad \text{for } \bar{E}_{dis.} < \bar{E} < \bar{E}_{cont.} \quad \text{or} \quad \bar{E}_{cont.} < \bar{E} < \bar{E}_{dis.}$$

where

$\bar{E}$  : Average decay energy value adopted in JENDL FP Decay Data File 2000,

$\bar{E}_{dis.}$  : Average decay energy value derived from the discrete (measured) spectrum with the original normalization factor,

$\bar{E}_{cont.}$  : Average decay energy value derived from the continuous (estimated) spectrum.

Generally  $\bar{E}$  is lower than  $\bar{E}_{dis.}$  for beta-ray energy and higher than  $\bar{E}_{dis.}$  for gamma-ray energy. When the  $\bar{E}$  value is lower than both  $\bar{E}_{dis.}$  and  $\bar{E}_{cont.}$  values,  $\alpha$  value is taken to be  $\bar{E}/\bar{E}_{dis.}$  and  $\beta$  value 0.0. On the other hand when the  $\bar{E}$  value is greater than both  $\bar{E}_{dis.}$  and  $\bar{E}_{cont.}$  values, the  $\alpha$  value is taken to be 1.0 and  $\beta$  value becomes  $(\bar{E} - \bar{E}_{dis.})/\bar{E}_{cont.}$ . As the discrete spectrum is expressed as the intensity per 100 decays, FD value then becomes  $\alpha \times 0.01$ . On the other hand FC value equals to  $\beta$ .

An example of the merging a discrete (measured) spectrum and a continuous (estimated) one is shown in Fig. 2 for the case of beta-ray spectrum of  $^{143}\text{Cs}$  decay. The measured beta-ray spectrum is

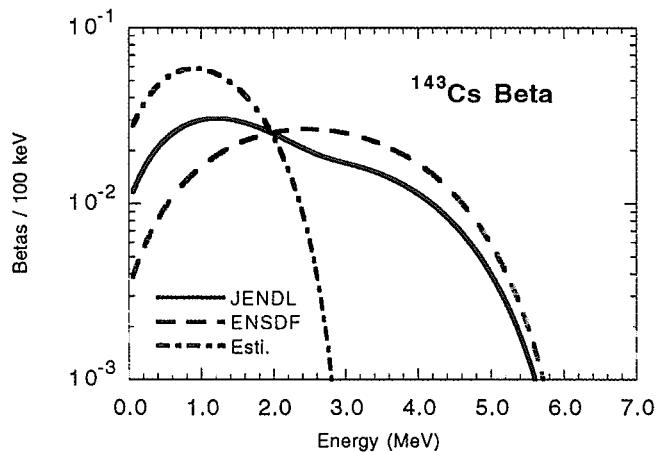


Fig. 2 Beta-ray spectrum of  $^{143}\text{Cs}$  decay

represented by "ENSDF" because the data are retrieved from ENSDF file. The estimated spectrum is given by "Esti.". The merged spectrum is shown as "JENDL". The Q value of  $^{143}\text{Cs}$  decay is 6.25 MeV and the energy of the highest level observed is 2.64 MeV. The beta transitions to the levels above 2.64 MeV are not observed experimentally. The estimated strength function was used to calculate the transitions to the unobserved region. The estimated beta strength to the states below 2.64 MeV is ignored and only the strength to the states above 2.64 MeV is used because the measured data are used for the beta transitions to the states below 2.64 MeV. The "Esti." spectrum in the figure is the continuous spectrum estimated by this way. The maximum energy of the calculated spectrum then becomes much lower than the Q value and nearly equals to the subtraction of the maximum energy

value from the Q value. The merged spectrum "JENDL" in the figure is constructed using FD and FC values mentioned above: 6.738E-03 for FD and 3.262E-01 for FC in this case.

Another example is shown in Fig. 3 for the case of gamma-ray spectrum of  $^{99}\text{Sr}$  decay. The notations

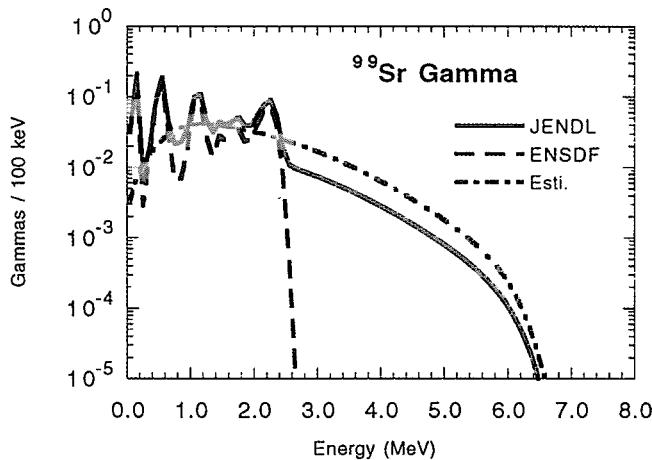


Fig. 3 Gamma-ray spectrum of  $^{99}\text{Sr}$  decay

are the same as in Fig. 2. Although the measured gamma-ray is line spectrum, it is broadened arbitrary for the sake of the comparison. As shown in this figure, the broadened line structure of the measured spectrum is seen. The Q value of the decay is 8.03 MeV and the maximum level energy observed is 2.3 MeV. The energy of gamma-rays observed is lower than 2.3 MeV. The estimated gamma-ray spectrum is extended to higher energy region. The JENDL spectrum is made by combining the measured spectrum and the estimated one. Therefore the structure of the measured spectrum is kept in the spectrum. The FD and FC values for this case are 1.000E-02 and 4.416E-01, respectively. This means that the measured spectrum is kept intact and the estimated one is simply added to the measured one in this case.

### 3 Data Format and Summary Data Table

JENDL FP Decay Data File 2000 has been compiled in the format of ENDF/B file. The format is reported in the reference<sup>15)</sup> and briefly described here. Each datum in the file is stored in a BCD card image record and each record contains three identification numbers: MAT, MF and MT. The MAT number is a material number which is uniquely assigned to each nuclide. The MF number is a file number. The File 1, MF=1, contains the comments on the data included. The radioactive decay data are included in File 8, that is, MF=8. The MT number shows a reaction type, but MT=457 is assigned to radioactive decay data. The each decay datum, therefore, has the identification numbers of MF=8 and MT=457. The structure of the decay data file in the ENDF/B format is shown in Table 2. The meaning of the variables in Table 2 is following:

- ZA : Designation of the original nuclide ( $=1000*Z + A$ ),
- AWR : Ratio of the LIS state of the original nuclide mass to that of neutron,
- LIS : State of the nuclide (LIS=0, ground state; LIS=1, first excited state etc.),

Table 2 Structure of DECAY DATA

Z A	AWR	LIS	LIS0	0	NSP	MAT	8	457
T <sub>1/2</sub>	ΔT <sub>1/2</sub>	0	0	6	0	MAT	8	457
Ē“β”	ΔĒ“β”	Ē“γ”	ΔĒ“γ”	Ē“α”	ΔĒ“α”	MAT	8	457
SPI	PAR	0	0	6*NDK	NDK	MAT	8	457
RTYP <sub>1</sub>	RFS <sub>1</sub>	Q <sub>1</sub>	ΔQ <sub>1</sub>	BR <sub>1</sub>	ΔBR <sub>1</sub>	MAT	8	457
⋮								
RTYP <sub>NDK</sub>	RFS <sub>NDK</sub>	Q <sub>NDK</sub>	ΔQ <sub>NDK</sub>	BR <sub>NDK</sub>	ΔBR <sub>NDK</sub>	MAT	8	457
					Repeat NSP times; omit if NSP=0			
0	STYP	LCON	0	6	NER	MAT	8	457
FD	ΔFD	ĒR	ΔĒR	FC	ΔFC	MAT	8	457
					Omit if LCON=1			
ER <sub>1</sub>	ΔER <sub>1</sub>	0	0	NT	0	MAT	8	457
RTYP <sub>1</sub>	TYPE <sub>1</sub>	RI <sub>1</sub>	ΔRI <sub>1</sub>	RIS <sub>1</sub>	ΔRIS <sub>1</sub>	MAT	8	457
RICC <sub>1</sub>	ΔRICC <sub>1</sub>	RICK <sub>1</sub>	ΔRICK <sub>1</sub>	RICL <sub>1</sub>	ΔRICL <sub>1</sub>	MAT	8	457
⋮								
ER <sub>NER</sub>	ΔER <sub>NER</sub>	0	0	NT	0	MAT	8	457
RTYP <sub>NER</sub>	TYPE <sub>NER</sub>	RI <sub>NER</sub>	ΔRI <sub>NER</sub>	RIS <sub>NER</sub>	ΔRIS <sub>NER</sub>	MAT	8	457
RICC <sub>NER</sub>	ΔRICC <sub>NER</sub>	RICK <sub>NER</sub>	ΔRICK <sub>NER</sub>	RICL <sub>NER</sub>	ΔRICL <sub>NER</sub>	MAT	8	457
					Omit if LCON=0			
RTYP	0.0	0	0	NR	NP	MAT	8	457
ER <sub>int</sub>	0	0	/	0	RP(E)	MAT	8	457
0				0	0	MAT	8	0

- LIS0 : Isomeric state number for the original nuclide (LIS=0, ground state; LIS=1, first isomeric state, etc.),
- T<sub>1/2</sub> : Half-life of the original nuclide (in the unit of seconds),
- Ē“x” : Average decay energy (eV) of “x” radiation for decay heat applications. The “β”, “γ”, and “α” energies are given in that order,
- SPI : Spin of the nuclide in its LIS state; when there is no available spin data, SPI=-77.777 is given,
- PAR : Parity of the nuclide in its LIS state ( $\pm 1.0$ ),
- NDK : Total number of decay modes,
- RTYP : Decay mode of the nuclide in its LIS state,
- RFS : Isomeric state flag for daughter nuclide. (RFS=0.0, ground state; RFS=1.0, first isomeric state; etc.),
- Q : Q value of the decay mode (eV),
- BR : Branching ratio of the decay mode,

NSP : Total number of radiation types (STYP) for which spectral information is given,  
 STYP : Decay radiation type,  
 ER : Discrete energy (eV) of radiation produced,  
 RI : Relative intensity of radiation produced,  
 RP(E) : Normalized spectrum of the continuum component of the radiation,  
 TYPE : Type of transition for beta and electron capture,  
 RICC : Total internal conversion coefficient,  
 RICK : K-shell internal conversion coefficient,  
 RICL : L-shell internal conversion coefficient,  
 RIS : Internal pair formation coefficient,  
 LCON : Continuum spectrum flag (=0, no continuous spectrum given; =1, only continuous spectrum given; =2, both discrete and continuous spectra),  
 NT : Number of entries given for each discrete energy (ER),  
 FC : Continuum spectrum normalization factor,  
 FD : Discrete spectrum normalization factor,  
 NER : Total number of tabulated discrete energies for a given spectrum type (STYP),  
 $\bar{ER}$  : Average decay energy of radiation produced,  
 NR : Number of interpolation ranges for the continuum spectrum,  
 NP : Number of points at which the distribution will be given,  
 ER<sub>int</sub> : Interpolation scheme for the continuum spectrum,  
 $\Delta$  : Uncertainty in any quantity.

The decay mode identification, RTYP, has the following definitions.

RTYP	Decay Mode
1. $\beta^-$	Beta decay
2. e.c., ( $\beta^+$ )	Electron capture and/or positron emission
3. IT	Isomeric transition
4. $\alpha$	Alpha decay
5. n	Neutron emission but not delayed neutron decay
6. SF	Spontaneous fission
7. p	Proton emission
10. -	Unknown

The decay radiation type, STYP, has the following definitions.

STYP	Radiation type				
0. $\gamma$	Gamma rays				
1. $\beta^-$	Beta rays				
2. e.c., $(\beta^+)$	Electron capture and/or positron emission				
4. $\alpha$	Alpha particles				
5. n	Neutrons				
6. SF	Spontaneous fission fragments				
7. p	Protons				
8. $e^-$	"Discrete electrons" such as internal conversion electrons.				
9. x	X-rays and annihilation radiation.				

### 3.1 Example of the Data in the File

An example of the data in JENDL FP Decay Data File 2000 is shown here.

```

2.80670+04 6.63566+01      -1      0      1      12852 1451   1
0.00000+00 1.00000+00      0      0      0      02852 1451   2
0.00000+00 0.00000+00      0      0      4      62852 1451   3
0.00000+00 0.00000+00      0      0      20     22852 1451   4
28-NI- 67 JAERI NDC EVAL-JUN99 J. KATAKURA      2852 1451   5
          DIST-JUN00      2852 1451   6
---- JENDL FPDDL MATERIAL 2852      2852 1451   7
---- DECRY DATA      2852 1451   8
---- ENDF-6 FORMAT      2852 1451   9
67NI B- DECAY (21 S 1)      ENSDF DATE 911210      2852 1451  10
          DISCRETE DATA ARE FROM ENSDF      2852 1451  11
          CONTINUOUS DATA ARE FROM CALCULATION WHEN ATTACHED      2852 1451  12
          AVERAGE ENERGIES WITHOUT UNCERTAINTY ARE FROM JNDC FILE V2      2852 1451  13
          CONTINUOUS SPECTRA ARE CALCULATED USING GROSS THEORY      2852 1451  14
REFERENCES      2852 1451  15
QB: G. AUDI, A.H. WAPSTRA - NUCL. PHYS. A595, 409 (1995)      2852 1451  16
EB AND/OR EG: K. TASAKA ET AL. - JAERI 1320 (1990)      2852 1451  17
GROSS THEORY: K. TAKAHASHI ET AL.      2852 1451  18
          - AT. DATA NUCL. DATA TABLES 12, 101 (1973)      2852 1451  19
          T. YOSHIDA AND R. NAKASIMA      2852 1451  20
          - J. NUCL. SCI. TECHNOL. 19, 393 (1981)      2852 1451  21
CONT. SPECTRA: T. YOSHIDA AND J. KATAKURA      2852 1451  22
          - NUCL. SCI. ENG., 93, 193 (1986)      2852 1451  23
          J. KATAKURA AND T. R. ENGLAND - LA-12125-MS (1991)      2852 1451  24
0.00000+00 0.00000+00      1      451      26      12852 1451  25
0.00000+00 0.00000+00      8      457      50      12852 1451  26
0.00000+00 0.00000+00      0      0      0      02852 1  0  27
0.00000+00 0.00000+00      0      0      0      02852 0  0  28
2.80670+04 6.63566+01      0      0      0      22852 8457  29
2.10000+01 1.00000+00      0      0      6      02852 8457  30
1.14920+06 0.00000+00 1.43410+06 0.00000+00 0.00000+00 0.00000+002852 8457  31
5.00000-01-1.00000+00      0      0      6      12852 8457  32
1.00000+00 0.00000+00 3.55770+06 2.06560+04 1.00000+00 0.00000+002852 8457  33
0.00000+00 0.00000+00      2      0      6      72852 8457  34
3.00929-04 0.00000+00 1.43410+06 8.48528+03 9.69907-01 0.00000+002852 8457  35
8.21600+05 5.00000+02      0      0      4      02852 8457  36
1.00000+00 0.00000+00 4.70000-01 7.99000-02 0.00000+00 0.00000+002852 8457  37
1.11530+06 5.00000+02      0      0      4      02852 8457  38
1.00000+00 0.00000+00 4.93500-01 8.93000-02 0.00000+00 0.00000+002852 8457  39
1.93710+06 5.00000+02      0      0      4      02852 8457  40
1.00000+00 0.00000+00 6.43900-01 1.03400-01 0.00000+00 0.00000+002852 8457  41
2.27200+06 1.00000+03      0      0      4      02852 8457  42

```

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2.62300+06	1.00000+03	0	0	4	02852	8457	44	
1.00000+00	0.00000+00	1.41000-01	8.93000-02	0.00000+00	0.00000+00	2852	8457	45
2.68000+06	1.00000+03	0	0	4	02852	8457	46	
1.00000+00	0.00000+00	2.30300-01	1.08100-01	0.00000+00	0.00000+00	2852	8457	47
2.84100+06	1.00000+03	0	0	4	02852	8457	48	
1.00000+00	0.00000+00	2.67900-01	9.40000-02	0.00000+00	0.00000+00	2852	8457	49
1.00000+00	0.00000+00	0	0	1	392852	8457	50	
39	1				2852	8457	51	
0.00000+00	4.20405-08	1.00000+05	8.72341-08	2.00000+05	1.36106-07	2852	8457	52
3.00000+05	1.88657-07	4.00000+05	2.44361-07	5.00000+05	3.02692-07	2852	8457	53
6.00000+05	3.62074-07	7.00000+05	4.19354-07	8.00000+05	4.70328-07	2852	8457	54
9.00000+05	5.06588-07	1.00000+06	5.23405-07	1.10000+06	5.24981-07	2852	8457	55
1.20000+06	5.25507-07	1.30000+06	5.07921-07	1.40000+06	4.90161-07	2852	8457	56
1.50000+06	4.75666-07	1.60000+06	4.58952-07	1.70000+06	4.43432-07	2852	8457	57
1.80000+06	4.24093-07	1.90000+06	4.04723-07	2.00000+06	3.81104-07	2852	8457	58
2.10000+06	3.56899-07	2.20000+06	3.28522-07	2.30000+06	2.99498-07	2852	8457	59
2.40000+06	2.66459-07	2.50000+06	2.33045-07	2.60000+06	1.96190-07	2852	8457	60
2.70000+06	1.59432-07	2.80000+06	1.19831-07	2.90000+06	8.08851-08	2852	8457	61
3.00000+06	3.98411-08	3.10000+06	4.45457-12	3.20000+06	3.62125-12	2852	8457	62
3.30000+06	3.51958-12	3.40000+06	2.74098-12	3.50000+06	1.98655-12	2852	8457	63
3.60000+06	1.26053-12	3.70000+06	5.64114-13	3.80000+06	3.11665-13	2852	8457	64
0.00000+00	1.00000+00	0	0	6	62852	8457	65	
6.94032-03	0.00000+00	1.14920+06	1.55563+04	3.05968-01	0.00000+00	2852	8457	66
7.20000+05	2.10000+04	0	0	4	02852	8457	67	
1.00000+00	1.00000+00	2.60000-01	0.00000+00	0.00000+00	0.00000+00	2852	8457	68
8.81000+05	2.10000+04	0	0	4	02852	8457	69	
1.00000+00	1.00000+00	2.40000-01	0.00000+00	0.00000+00	0.00000+00	2852	8457	70
9.38000+05	2.10000+04	0	0	4	02852	8457	71	
1.00000+00	1.00000+00	1.40000-01	0.00000+00	0.00000+00	0.00000+00	2852	8457	72
1.28900+06	2.10000+04	0	0	4	02852	8457	73	
1.00000+00	1.00000+00	2.20000-01	0.00000+00	0.00000+00	0.00000+00	2852	8457	74
1.62400+06	2.10000+04	0	0	4	02852	8457	75	
1.00000+00	1.00000+00	1.13000+00	0.00000+00	0.00000+00	0.00000+00	2852	8457	76
3.56100+06	2.10000+04	0	0	4	02852	8457	77	
1.00000+00	1.00000+00	9.80000+01	0.00000+00	0.00000+00	0.00000+00	2852	8457	78
1.00000+00	0.00000+00	0	0	1	392852	8457	79	
39	1				2852	8457	80	
0.00000+00	1.98972-06	1.00000+05	2.04172-06	2.00000+05	1.85987-06	2852	8457	81
3.00000+05	1.52875-06	4.00000+05	1.13984-06	5.00000+05	7.61794-07	2852	8457	82
6.00000+05	4.33828-07	7.00000+05	1.89983-07	8.00000+05	5.07011-08	2852	8457	83
9.00000+05	3.79597-09	1.00000+06	0.00000+00	1.10000+06	0.00000+00	2852	8457	84
1.20000+06	0.00000+00	1.30000+06	0.00000+00	1.40000+06	0.00000+00	2852	8457	85
1.50000+06	0.00000+00	1.60000+06	0.00000+00	1.70000+06	0.00000+00	2852	8457	86
1.80000+06	0.00000+00	1.90000+06	0.00000+00	2.00000+06	0.00000+00	2852	8457	87
2.10000+06	0.00000+00	2.20000+06	0.00000+00	2.30000+06	0.00000+00	2852	8457	88
2.40000+06	0.00000+00	2.50000+06	0.00000+00	2.60000+06	0.00000+00	2852	8457	89
2.70000+06	0.00000+00	2.80000+06	0.00000+00	2.90000+06	0.00000+00	2852	8457	90
3.00000+06	0.00000+00	3.10000+06	0.00000+00	3.20000+06	0.00000+00	2852	8457	91
3.30000+06	0.00000+00	3.40000+06	0.00000+00	3.50000+06	0.00000+00	2852	8457	92
3.60000+06	0.00000+00	3.70000+06	0.00000+00	3.80000+06	0.00000+00	2852	8457	93
0.00000+00	0.00000+00	0	0	0	02852	8 0	94	
0.00000+00	0.00000+00	0	0	0	02852	0 0	95	
0.00000+00	0.00000+00	0	0	0	0	0 0 0	96	

This is the example of  $^{67}\text{Ni}$  decay data. The number of the right most side is a sequence number which is assigned for each nuclide in JENDL FP Decay Data File 2000. After the general comments in File 1 (MF=1), the decay data are listed in File 8 (MF=8). The decay data start on line 29. On this line it is shown that there are 2 kinds of spectral data, NSP=2. Actually the spectra of gamma- and beta-rays

are included in this data set. On the 31st line,  $\bar{E}_{\beta''}$ ,  $\Delta\bar{E}_{\beta''}$ ,  $\bar{E}_{\gamma''}$ ,  $\Delta\bar{E}_{\gamma''}$ ,  $\bar{E}_{\alpha''}$  and  $\Delta\bar{E}_{\alpha''}$  are seen. Since the  $^{67}\text{Ni}$  has no alpha decay mode,  $\bar{E}_{\alpha''}$  is 0.0. And that  $\Delta\bar{E}_{\beta''}$  and  $\Delta\bar{E}_{\gamma''}$  are 0.0 means that they are not measured ones but theoretically estimated ones. The 33rd line shows that there is only one decay mode,  $\beta^-$  decay to the ground state of the daughter nuclide. The gamma-ray spectral data are shown on line 34 through 64. On the 34th line it is shown that there are both discrete and continuous gamma-ray spectra, that is, LCON=2. The number of the discrete gamma-rays is 7, NER=7. After 7 discrete gamma-rays the continuous gamma-ray spectral data start on the 50th line. The continuous spectrum is given in 39 energy bins. The beta-ray spectral data are listed on the 65th line through 93rd line. There are 6 discrete beta-ray data. The maximum energy values of the transitions and their intensities are shown until the 78th line. The continuous beta-ray spectral data are following after the discrete data. The continuous beta-ray spectral data are shown in 39 energy bins structure. Such decay data as shown here are included in JENDL FP Decay Data File 2000 except for the data of stable nuclides. The data of the stable nuclides are included in only File 1, that is, MF=1. In File 1, there is a flag, STA, which shows the target stability. When a nuclide is stable, STA=0.0 is given. When a nuclide is unstable, STA=1.0 is given. The STA flag is placed in the second parameter on the second line in File 1. In the case of  $^{67}\text{Ni}$  decay mentioned above, the STA flag is 1.0 that shows that the nuclide is unstable and the decay data should be given in MF=8, MT=457.

### 3.2 Summary Data Table

The half-lives, decay energy values, decay modes, Q values, branching ratios and other information for 1229 fission products are listed in the following Table. The table is produced using a computer code SPEC5<sup>16)</sup> developed by T. R. England. All nuclides have been grouped by increasing mass number, then charge and state per mass. The first column is a sequence number for the ordering of data. All other columns have specific meaning described in the ENDF/B formats manual and are briefly summarized below except those given in previous section (RTYPE, RFS, Q, NDK, NSP and MAT).

- Symbol : Chemical symbol preceded by Z value and followed by the atomic number.
- S : Isomeric state number (0=ground, 1=1st isomeric state, etc.).
- ZZAAAS : is a numeric identifier consisting of the quantity  $Z \times 10000 + A \times 10 + S$ , where S is the isomeric state number mentioned above.
- Halflife : Total decay half-life in seconds.
- E-beta : Average beta decay energy in a unit of eV which includes all electron related radiation such as  $\beta^-$ ,  $\beta^+$ , conversion electron etc.
- E-gamma : Average gamma decay energy in a unit of eV which includes all "electromagnetic" radiation such as gamma-rays, X-rays, and annihilation radiation.
- E-alpha : Average alpha decay energy in a unit of eV.
- Branching : Branching ratio.

Multiple particle emission is also defined by combining the RTYP indicators as decimal digits in the sequence in which particles are emitted. Thus, for beta decay followed by a delayed neutron, RTYP = 1.5, and a positron followed by alpha decay is 2.4, etc. The Q-value for such cases is the energy difference based on masses of the initial and final states.

## JENDL FP DECAY DATA FILE 2000

No	Symbol	S	ZAAAS	Halflife	E-bata	E-gamma	E-alpha	RTYP	RFS	Q	Branching	NDK	NSP	MAT
1	23-V-	66	0	230660 1.0400E-02	5.4830E+06	4.7990E+06	0.0000E+00	1.00	0.0	1.6214E+07	1.0000E+00	1	2 373	
2	24-Cr-	66	0	240660 3.2440E-02	3.8630E+06	1.6930E+06	0.0000E+00	1.00	0.0	9.8500E+06	1.0000E+00	1	2 2473	
3	25-Mn-	66	0	250660 1.0460E-01	4.7390E+06	4.6440E+06	0.0000E+00	1.00	0.0	1.3823E+07	1.0000E+00	1	2 2558	
4	26-Fe-	66	0	260660 1.3860E+00	2.2670E+06	1.0470E+06	0.0000E+00	1.00	0.0	5.7330E+06	1.0000E+00	1	2 2661	
5	27-Co-	66	0	270660 2.3000E-01	3.2000E+06	3.3730E+06	0.0000E+00	1.00	0.0	1.6975E+06	1.0000E+00	1	2 2746	
6	28-Ni-	66	0	280660 1.9660E+05	6.5000E+04	0.0000E+00	0.0000E+00	1.00	0.0	2.2560E+05	1.0000E+00	1	1 2849	
7	29-Cu-	66	0	290660 3.0530E+02	1.0760E+06	7.8000E+04	0.0000E+00	1.00	0.0	2.6420E+06	1.0000E+00	1	2 2934	
8	30-Zn-	66	0	300660 stable								0	0 3031	
9	24-Cr-	67	0	240670 2.1480E-02	4.9320E+06	3.1370E+06	0.0000E+00	1.00	0.0	1.3422E+07	1.0000E+00	1	2 476	
10	25-Mn-	67	0	250670 5.3290E-02	4.5310E+06	2.4530E+06	0.0000E+00	1.00	0.0	1.2873E+07	1.0000E+00	1	2 561	
11	26-Fe-	67	0	260670 6.7030E-01	3.7080E+06	1.8520E+06	0.0000E+00	1.00	0.0	8.7467E+06	1.0000E+00	1	2 2664	
12	27-Co-	67	0	270670 4.2000E-01	3.0100E+06	1.2490E+06	0.0000E+00	1.00	0.0	8.4210E+06	1.0000E+00	1	2 2749	
13	28-Ni-	67	0	280670 2.1000E+01	1.1492E+06	1.4341E+06	0.0000E+00	1.00	0.0	3.5577E+06	1.0000E+00	1	2 2852	
14	29-Cu-	67	0	290670 2.2260E+05	1.5560E+05	1.1540E+05	0.0000E+00	1.00	0.0	5.7700E+05	1.0000E+00	1	1 42937	
15	30-Zn-	67	0	300670 stable								0	0 3034	
16	31-Ga-	67	0	310670 2.8177E+05	3.6000E+04	1.5960E+05	0.0000E+00	2.00	0.0	1.0000E+06	1.0000E+00	1	4 3119	
17	24-Cr-	68	0	240680 1.6700E-02	4.3910E+06	2.0090E+06	0.0000E+00	1.00	0.0	1.1210E+07	1.0000E+00	1	2 2479	
18	25-Mn-	68	0	250680 4.0770E-02	5.0720E+06	5.0500E+06	0.0000E+00	1.00	0.0	1.5637E+07	1.0000E+00	1	2 2564	
19	26-Fe-	68	0	260680 1.4690E+00	2.7290E+06	1.2150E+06	0.0000E+00	1.00	0.0	7.5920E+06	1.0000E+00	1	2 2667	
20	27-Co-	68	0	270680 7.3890E-01	3.6850E+06	3.8090E+06	0.0000E+00	1.00	0.0	1.1658E+07	1.0000E+00	1	2 2752	
21	28-Ni-	68	0	280680 5.7609E+02	6.6370E+05	5.8190E+05	0.0000E+00	1.00	0.0	2.0559E+06	1.0000E+00	1	2 2855	
22	29-Cu-	68	0	290680 3.1100E+01	1.4800E+06	1.0200E+06	0.0000E+00	1.00	0.0	4.4621E+06	1.0000E+00	1	2 2940	
23	29-Cu-	68	1	290681 2.2500E+02	1.3000E+05	1.1010E+06	0.0000E+00	1.00	0.0	5.1800E+06	1.0000E-01	2	4 2941	
24	30-Zn-	68	0	300680 stable						3.00	0.0	5.2160E+05	8.4000E-01	
25	31-Ga-	68	0	310680 4.0577E+03	7.4000E+05	9.4500E+05	0.0000E+00	2.00	0.0	2.9211E+06	1.0000E+00	0	0 3037	
26	24-Cr-	69	0	240690 1.0720E-02	5.1210E+06	3.8210E+06	0.0000E+00	1.00	0.0	1.4516E+07	1.0000E+00	1	4 3122	
27	25-Mn-	69	0	250690 3.1620E-02	4.9840E+06	3.0700E+06	0.0000E+00	1.00	0.0	1.3477E+07	1.0000E+00	1	2 2482	
28	26-Fe-	69	0	260690 9.4760E-02	4.0460E+06	2.2360E+06	0.0000E+00	1.00	0.0	1.1644E+07	1.0000E+00	1	2 2567	
29	27-Co-	69	0	270690 9.0860E-01	3.5610E+06	1.6130E+06	0.0000E+00	1.00	0.0	9.3319E+06	1.0000E+00	1	2 2755	
30	28-Ni-	69	0	280690 1.1400E+01	1.4100E+06	2.7900E+06	0.0000E+00	1.00	0.0	5.3622E+06	1.0000E+00	1	2 2858	
31	29-Cu-	69	0	290690 1.7100E+02	8.9000E+05	5.3000E+05	0.0000E+00	1.00	0.0	2.6750E+06	1.0000E+00	1	2 2943	
32	30-Zn-	69	0	300690 3.3800E+03	3.2140E+05	4.0000E+00	0.0000E+00	1.00	0.0	9.6000E+05	1.0000E+00	1	2 3040	
33	30-Zn-	69	1	300691 4.9540E+04	2.2000E+04	4.1610E+05	0.0000E+00	1.00	0.0	3.3440E+06	3.3000E-04	2	4 3041	
34	31-Ga-	69	0	310690 stable						3.00	0.0	4.3864E+05	9.9967E-01	
35	32-Ge-	69	0	320690 1.4060E+05	1.2000E+05	9.5000E+05	0.0000E+00	2.00	0.0	2.2273E+06	1.0000E+00	0	0 3125	
36	24-Cr-	70	0	240700 9.1760E-03	5.0840E+06	2.5320E+06	0.0000E+00	1.00	0.0	1.3117E+07	1.0000E+00	1	4 3222	
37	25-Mn-	70	0	250700 1.8450E-02	5.4500E+06	5.5650E+06	0.0000E+00	1.00	0.0	1.6898E+07	1.0000E+00	1	2 2485	
38	26-Fe-	70	0	260700 8.5250E-02	3.3200E+06	1.4600E+06	0.0000E+00	1.00	0.0	8.5340E+06	1.0000E+00	1	2 2673	
39	27-Co-	70	0	270700 1.7970E-01	4.1540E+06	4.2080E+06	0.0000E+00	1.00	0.0	1.2734E+07	1.0000E+00	1	2 2758	
40	28-Ni-	70	0	280700 1.6510E+01	1.2400E+06	7.1290E+05	0.0000E+00	1.00	0.0	3.4751E+06	1.0000E+00	1	2 2861	
41	29-Cu-	70	0	290700 4.5000E+00	2.8000E+06	5.2000E+05	0.0000E+00	1.00	0.0	6.5991E+06	1.0000E+00	1	2 2946	
42	29-Cu-	70	1	290701 4.7000E+01	1.7400E+06	2.8300E+06	0.0000E+00	1.00	0.0	6.7200E+06	1.0000E+00	1	2 2947	
43	30-Zn-	70	0	300700 stable						0.0	0	0 3043		
44	31-Ga-	70	0	310700 1.2684E+03	6.4402E+05	7.3152E+03	0.0000E+00	1.00	0.0	1.6556E+06	9.9590E-01	2	5 3128	
45	32-Ge-	70	0	320700 stable						2.00	0.0	6.5472E+05	4.1000E-03	
46	25-Mn-	71	0	250710 1.6270E-02	5.5740E+06	3.9100E+06	0.0000E+00	1.00	0.0	1.5503E+07	1.0000E+00	0	0 3225	
47	26-Fe-	71	0	260710 3.9440E-02	4.4010E+06	2.7100E+06	0.0000E+00	1.00	0.0	1.1943E+07	1.0000E+00	1	2 2676	

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No	Symbol	S	ZAAAS	Halflife	E-beta	E-gamma	E-alpha	Rtyp	RFS	Q	Branching	NDK	NSP	MAT		
48	27-Co-	71	0	270710	3.5980E-01	4.1020E+06	2.1620E+06	0.0000E+00	1.00	0.0	1.0926E+07	1.0000E+00	1	2761		
49	28-Ni-	71	0	280710	3.2061E+00	2.8220E+06	1.2440E+06	0.0000E+00	1.00	0.0	6.8746E+06	1.0000E+00	1	2864		
50	29-Cu-	71	0	290710	1.9500E+01	1.3558E+06	7.1207E+05	0.0000E+00	1.00	0.0	4.5575E+06	8.3400E-01	2	2949		
51	30-Zn-	71	0	300710	1.4700E+02	1.0480E+06	3.1500E+05	0.0000E+00	1.00	1.0	4.3998E+06	1.6600E-01	1			
52	30-Zn-	71	1	300711	1.4260E+04	5.3700E+05	1.5600E+06	0.0000E+00	1.00	0.0	2.8152E+06	1.0000E+00	1	3046		
53	31-Ga-	71	0	310710	stable	9.8800E+05	4.7900E+03	4.2000E+03	0.0000E+00	2.00	0.0	2.3192E+05	1.0000E+00	0	3131	
54	32-Ge-	71	0	320710	1.1690E-02	6.0900E+06	6.1000E+06	0.0000E+00	1.00	0.0	1.8744E+05	1.0000E+00	1	3228		
55	25-Mn-	72	0	250720	2.9860E-02	4.0610E+06	1.8740E+06	0.0000E+00	1.00	0.0	1.0426E+07	1.0000E+00	1	2576		
56	26-Fe-	72	0	260720	7.8960E-02	4.6080E+06	4.6940E+06	0.0000E+00	1.00	0.0	1.4075E+07	1.0000E+00	1	2679		
57	27-Co-	72	0	270720	7.8820E+00	9.1310E+05	9.1310E+05	0.0000E+00	1.00	0.0	5.3840E+06	1.0000E+00	1	2764		
58	28-Ni-	72	0	280720	6.6000E+00	2.0350E+06	2.9940E+06	0.0000E+00	1.00	0.0	8.0660E+06	1.0000E+00	1	2867		
59	29-Cu-	72	0	290720	1.6740E+05	1.0260E+05	1.5250E+05	0.0000E+00	1.00	0.0	4.5808E+05	1.0000E+00	1			
60	30-Zn-	72	0	300720	5.0760E+04	5.0600E+05	2.7070E+06	0.0000E+00	1.00	0.0	3.9991E+06	1.0000E+00	1	3049		
61	31-Ga-	72	0	310720	stable	5.0600E+04	5.0600E+05	2.7070E+06	0.0000E+00	1.00	0.0	0	3231			
62	32-Ge-	72	0	320720	stable	9.3600E+04	1.0300E+06	1.7800E+06	0.0000E+00	2.00	0.0	4.3561E+06	1.0000E+00	1	3316	
63	33-As-	72	0	320720	9.4430E-03	6.0900E+06	4.8040E+06	0.0000E+00	1.00	0.0	1.7283E+07	1.0000E+00	1			
64	25-Mn-	73	0	250730	2.2660E-02	4.9030E+06	3.4070E+06	0.0000E+00	1.00	0.0	1.3638E+07	1.0000E+00	1	2682		
65	26-Fe-	73	0	260730	5.9850E-02	4.7180E+06	2.9800E+06	0.0000E+00	1.00	0.0	1.2920E+07	1.0000E+00	1	2267		
66	27-Co-	73	0	270730	1.2620E+00	3.280730	1.6190E+06	0.0000E+00	1.00	0.0	6.2510E+06	1.0000E+00	1	2870		
67	28-Ni-	73	0	280730	3.9000E+00	1.9850E+06	7.7230E+05	0.0000E+00	1.00	0.0	6.2510E+06	1.0000E+00	1	2958		
68	29-Cu-	73	0	290730	2.3500E+01	1.5436E+06	1.1709E+06	0.0000E+00	1.00	0.0	4.2939E+06	1.0000E+00	1	3052		
69	30-Zn-	73	0	300730	1.7500E+04	4.4700E+05	3.4100E+05	0.0000E+00	1.00	0.0	1.5933E+06	4.0000E-03	2	3137		
70	31-Ga-	73	0	310730	stable	1.1130E+04	5.2700E+04	5.2700E+04	0.0000E+00	3.00	0.0	6.6590E+04	9.9600E-01	0	3234	
71	32-Ge-	73	0	320730	stable	6.9900E-01	6.3700E+03	6.3700E+03	0.0000E+00	2.00	0.0	3.4086E+05	1.0000E+00	1	3235	
72	32-Ge-	73	1	320731	4.9900E-01	1.5900E+04	4.6700E+06	2.3240E+06	0.0000E+00	1.00	0.0	1.0293E+07	1.0000E+00	1	3319	
73	33-As-	73	0	330730	6.9380E+06	5.1670E+02	5.1670E+06	5.4200E+06	0.0000E+00	1.00	0.0	1.6260E+07	1.0000E+00	1	2277	
74	26-Fe-	74	0	270740	1.7480E-02	3.7350E-02	3.7350E+00	2.6830E+00	1.1990E+06	0.0000E+00	1.00	0.0	7.1820E+06	1.0000E+00	1	2873
75	27-Co-	74	0	270740	1.4370E+00	2.5110E+06	2.5110E+06	3.2060E+06	0.0000E+00	1.00	0.0	1.0066E+07	1.0000E+00	1	2958	
76	28-Ni-	74	0	280740	4.9849E+00	5.7770E+05	8.5970E+05	0.0000E+00	1.00	0.0	2.3448E+06	1.1000E-01	2	3055		
77	29-Cu-	74	0	290740	9.5000E+01	4.4700E+05	3.4100E+05	0.0000E+00	1.00	0.0	2.2850E+06	8.9000E-01	2			
78	30-Zn-	74	0	300740	stable	0.0000E+00	0.0000E+00	1.00	1.0	0.0	5.3680E+06	1.0000E+00	1	3140		
79	31-Ga-	74	0	310740	4.8700E+02	9.9000E+05	3.0300E+06	0.0000E+00	1.00	0.0	5.3700E+06	2.5000E-01	2	3141		
80	31-Ga-	74	1	310741	9.5000E+00	0.0000E+00	3.6000E+04	0.0000E+00	1.00	0.0	5.9700E+04	7.5000E-01	0			
81	32-Ge-	74	0	320740	stable	2.6500E+05	7.5800E+05	0.0000E+00	1.00	0.0	1.3530E+06	3.4000E-01	0	3237		
82	33-As-	74	0	330740	1.5353E+06	0.0000E+00	2.00	0.0	0.0	2.5624E+06	6.6000E-01	2	3322			
83	34-Se-	74	0	340740	stable	5.4750E+02	5.4750E+02	5.4750E+02	0.0000E+00	1.00	0.0	1.5870E+07	1.0000E+00	0	3425	
84	26-Fe-	75	0	260750	1.3190E-02	5.2590E-02	3.7450E+06	0.0000E+00	1.00	0.0	1.4778E+07	1.0000E+00	1	2688		
85	27-Co-	75	0	270750	3.0840E-02	3.8270E+06	2.2160E+06	0.0000E+00	1.00	0.0	1.0498E+07	1.0000E+00	1	2773		
86	28-Ni-	75	0	280750	1.6470E-01	1.3000E+00	2.6880E+06	1.0900E+06	0.0000E+00	1.00	0.0	8.1620E+06	9.6500E-01	2	2876	
87	29-Cu-	75	0	290750	1.2465E+02	1.7331E+06	1.8200E+06	3.7754E+05	0.0000E+00	1.00	0.0	3.3000E+06	3.5000E-02	2	2961	
88	30-Zn-	75	0	300750	1.0200E+01	1.2465E+02	1.2465E+02	3.7754E+05	0.0000E+00	1.00	0.0	3.958E+06	1.0000E+00	1	3058	
89	31-Ga-	75	0	310750	1.2600E+02	1.2600E+02	3.2520E+06	0.0000E+00	1.00	1.0	7.1000E-02	2.3143				

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No	Symbol	S	ZZAAAS	Half-life	E-bata	E-gamma	E-alpha	RTYP	RFS	Q	Branching	NDK	NSP	MAT	
90	32-Ge-	75	0	320750	4.9668E+03	4.2100E+05	3.5000E+04	0.0000E+00	1.00	0.0	1.1766E+06	1.0000E+00	1	2 3240	
91	32-Ge-	75	1	320751	4.7700E+01	7.6997E+04	5.6861E+04	0.0000E+00	1.00	0.0	1.3173E+06	3.0000E-04	2	4 3241	
92	33-As-	75	0	330750	stable	4.9100E+03	3.8630E+05	0.0000E+00	2.00	0.0	8.6364E+05	1.0000E+00	0	0 3325	
93	34-Se-	75	0	340750	1.0348E+07	5.1330E+06	2.7160E+06	0.0000E+00	1.00	0.0	1.3410E+07	1.0000E+00	1	4 3428	
94	26-Fe-	76	0	260760	9.5720E-03	6.8660E+06	6.3710E+06	0.0000E+00	1.00	0.0	1.8630E+07	1.0000E+00	1	2 2691	
95	27-Co-	76	0	270760	2.3920E-02	3.3790E+01	1.5270E+06	0.0000E+00	1.00	0.0	8.7000E+06	1.0000E+00	1	2 2776	
96	28-Ni-	76	0	280760	1.2570E-01	3.1130E+06	3.5040E+06	0.0000E+00	1.00	0.0	1.1733E+07	9.7000E-01	2	2 2879	
97	29-Cu-	76	0	290760	1.5740E+00	stable	1.50	0.0	4.1000E+06	3.0000E-02				2 2964	
98	30-Zn-	76	0	300760	5.7000E+00	1.3980E+06	7.5410E+05	0.0000E+00	1.00	0.0	4.1600E+06	1.0000E+00	1	2 3061	
99	31-Ga-	76	0	310760	3.2600E+01	1.8000E+06	2.8000E+06	0.0000E+00	1.00	0.0	7.0100E+06	1.0000E+00	1	2 3146	
100	32-Ge-	76	0	320760	stable	1.0700E+06	4.1700E+05	0.0000E+00	1.00	0.0	2.9620E+06	9.9980E-01	0	0 3243	
101	33-As-	76	0	330760	9.3120E+04	stable	2.00	0.0	9.2331E+05	2.0000E-04				2 3328	
102	34-Se-	76	0	340760	stable	5.6470E+06	4.5600E+06	0.0000E+00	1.00	0.0	1.6325E+07	1.0000E+00	0	0 3431	
103	27-Co-	77	0	270770	2.1870E-02	4.4810E+06	3.0880E+06	0.0000E+00	1.00	0.0	1.1998E+07	1.0000E+00	1	2 2779	
104	28-Ni-	77	0	280770	6.5030E-02	1.2600E+00	3.2670E+06	1.5060E+06	0.0000E+00	1.00	0.0	1.0120E+07	1.0000E+00	1	2 2882
105	29-Cu-	77	0	290770	1.2600E+00	2.0800E+00	2.5400E+06	1.9400E+06	0.0000E+00	1.00	0.0	2.3700E+06	1.0000E+00	1	2 2967
106	30-Zn-	77	0	300770	2.0800E+00	1.3000E+01	2.0430E+06	7.8930E+05	0.0000E+00	1.00	0.0	5.1800E+06	1.0000E+00	1	2 3064
107	31-Ga-	77	0	310770	1.3000E+01	2.0234E+06	6.4300E+05	1.0780E+06	0.0000E+00	1.00	0.0	2.7020E+06	1.0000E+00	1	2 3149
108	32-Ge-	77	0	320770	4.0680E+04	3.20771	5.2900E+01	6.6400E+04	0.0000E+00	1.00	0.0	2.8628E+06	8.1000E-01	2	4 3246
109	32-Ge-	77	1	320771	5.2900E+01	stable	3.00	0.0	1.5970E+05	1.9000E-01				4 3247	
110	33-As-	77	0	330770	1.3979E+05	2.2600E+05	8.0600E+03	0.0000E+00	1.00	0.0	6.8287E+05	9.2100E-01	2	2 3331	
111	34-Se-	77	0	340770	stable	7.0800E+01	8.7700E+04	0.0000E+00	3.00	0.0	5.2086E+05	7.9000E-02			
112	34-Se-	77	1	340771	1.7360E+01	6.0200E+05	3.1900E+05	0.0000E+00	2.00	0.0	1.6200E+05	1.0000E+00	0	0 3434	
113	35-Br-	77	0	350770	2.0533E+05	stable	2.00	1.0	1.2030E+06	1.3651E+06	9.7660E-01	2	4 3519		
114	35-Br-	77	1	350771	2.5700E+02	8.3600E+04	1.9300E+04	0.0000E+00	3.00	0.0	1.0587E+05	1.0000E+00	1	3 3520	
115	27-Co-	78	0	270780	1.8190E-02	6.4240E+06	6.8150E+06	0.0000E+00	1.00	0.0	2.0140E+07	1.0000E+00	1	2 2782	
116	28-Ni-	78	0	280780	5.0580E-02	3.9290E+06	1.8770E+06	0.0000E+00	1.00	0.0	1.3265E+07	1.0000E+00	1	2 2885	
117	29-Cu-	78	0	290780	4.6380E-01	3.8300E+07	4.0530E+06	0.0000E+00	1.00	0.0	6.4400E+06	9.9991E-01	2	2 2970	
118	30-Zn-	78	0	300780	1.4700E+00	2.3600E+06	1.5300E+06	0.0000E+00	1.00	0.0	5.6000E+06	9.0000E-05			
119	31-Ga-	78	0	310780	5.0900E+00	2.6000E+06	2.5400E+06	0.0000E+00	1.00	0.0	8.2056E+06	1.0000E+00	1	2 3152	
120	32-Ge-	78	0	320780	5.2800E+03	2.2700E+05	2.7800E+05	0.0000E+00	1.00	0.0	9.5414E+05	1.0000E+00	1	2 3249	
121	33-As-	78	0	330780	5.4420E+03	1.2600E+06	1.3100E+06	0.0000E+00	1.00	0.0	4.2095E+06	1.0000E+00	1	2 3334	
122	34-Se-	78	0	340780	stable	1.0240E+06	1.0340E+06	0.0000E+00	1.00	0.0	7.0780E+05	1.0000E-04	0	0 3437	
123	35-Br-	78	0	350780	3.8760E+02	stable	2.00	0.0	3.5738E+06	9.9990E-01				5 3522	
124	28-Ni-	79	0	280790	3.7350E-02	4.8410E+06	3.9030E+06	0.0000E+00	1.00	0.0	1.4055E+07	1.0000E+00	1	2 2888	
125	29-Cu-	79	0	290790	5.4920E-01	3.7090E+06	1.9700E+06	0.0000E+00	1.00	0.0	1.1742E+07	1.0000E+00	1	2 2973	
126	30-Zn-	79	0	300790	9.9500E-01	3.0160E+06	2.9170E+06	0.0000E+00	1.00	0.0	9.0900E+06	9.8800E-01	2	2 3070	
127	31-Ga-	79	0	310790	2.8470E+00	2.4500E+06	2.0800E+06	0.0000E+00	1.00	0.0	9.4280E+06	1.2000E-02			
128	32-Ge-	79	0	320790	1.9100E+01	1.7100E+06	4.0743E+05	0.0000E+00	1.00	0.0	6.7600E+06	1.0000E-03	2	4 3155	
129	32-Ge-	79	1	320791	3.9000E+01	1.2921E+06	1.7753E+06	0.0000E+00	1.00	0.0	4.1480E+06	1.0000E+00	1	4 3252	
											4.3300E+06	9.6000E-01	2	4 3253	
											1.8602E+05	4.0000E-02			

## JENDL FP DECAY DATA FILE 2000

No	Symbol	S	ZAAAAS	Halflife	E-beta	E-gamma	E-alpha	Rtyp	RFS	Q	Branching	NDK	NSP	MAT
130	33-As-	79	0	330790	5.4100E+02	8.3900E+05	3.3800E+04	0.0000E+00	1.00	0	2.2810E+06	2.1000E-02	2	2 3337
131	34-Se-	79	0	340790	2.0510E+13	5.5800E+04	0.0000E+00	0.0000E+00	1.00	1.0	2.1853E+06	9.7900E-01	1	1 3440
132	34-Se-	79	1	340791	2.3520E+02	8.3000E+04	1.4000E+04	0.0000E+00	3.00	0.0	1.5105E+05	1.0000E+00	1	3 3441
133	35-Br-	79	0	350790	stable	1.5980E+05	0.0000E+00	3.00	0.0	2.0720E+05	1.0000E+00	0	1 3525	
134	35-Br-	79	1	350791	4.8600E+00	4.7000E+04	2.5600E+05	0.0000E+00	2.00	0.0	1.6255E+06	1.0000E+00	1	1 3526
135	36-Kr-	79	0	360790	1.2610E+05	2.3800E+04	4.0900E+04	0.0000E+00	3.00	0.0	1.3001E+05	1.0000E+00	1	1 3628
136	36-Kr-	79	1	360791	5.0000E+01	9.0000E+04	2.9610E+06	0.0000E+00	1.00	0.0	1.4063E+07	1.0000E+00	1	1 3629
137	28-Ni-	80	0	290800	4.0670E-02	5.3050E+06	4.5870E+06	0.0000E+00	1.00	0.0	1.62778E+07	1.0000E+00	1	2 2891
138	29-Cu-	80	0	290800	4.1290E-02	4.3270E+06	1.7100E+06	0.0000E+00	1.00	0.0	7.2904E+06	9.6630E-01	2	2 2976
139	30-Zn-	80	0	300800	5.4500E-01	2.5900E+06	1.50	0.0	4.9000E+06	3.3700E-02	2	2 3073		
140	31-Ga-	80	0	310800	1.6970E+00	3.1220E+06	3.5480E+06	0.0000E+00	1.00	0.0	9.9140E-01	2	2 3158	
141	32-Ge-	80	0	320800	2.9500E+01	8.1510E+05	6.1970E+05	0.0000E+00	1.50	1.0	2.1600E+06	8.6000E-03	1	1 3255
142	33-As-	80	0	330800	1.5200E+01	2.1500E+06	5.8000E+05	0.0000E+00	1.00	0.0	2.6702E+06	1.0000E+00	1	1 3340
143	34-Se-	80	0	340800	stable	0.0000E+00	0.0000E+00	0.0000E+00	1.00	0.0	5.6414E+06	1.0000E+00	0	0 3443
144	35-Br-	80	0	350800	1.0608E+03	7.2300E+05	7.5600E+04	0.0000E+00	1.00	0.0	2.0010E+06	9.1700E-01	2	5 3528
145	35-Br-	80	1	350801	1.5914E+04	5.9600E+04	2.4100E+04	0.0000E+00	3.00	0.0	1.8711E+06	8.3000E-02	1	1 3529
146	36-Kr-	80	0	360800	stable	5.2520E+06	4.3870E+06	0.0000E+00	1.00	0.0	1.5364E+07	1.0000E+00	0	0 3631
147	28-Ni-	81	0	280810	1.2010E-02	4.8260E+06	3.4570E+06	0.0000E+00	1.00	0.0	1.3600E+07	1.0000E+00	1	2 2894
148	29-Cu-	81	0	290810	2.1980E-02	4.0320E+06	2.7130E+06	0.0000E+00	1.00	0.0	1.1855E+07	1.0000E+00	1	2 2979
149	30-Zn-	81	0	300810	2.6710E-01	1.5750E+06	2.3150E+05	0.0000E+00	1.00	0.0	8.3200E+06	8.7800E-01	2	4 3161
150	31-Ga-	81	0	310810	1.2210E+00	2.2200E+06	2.2600E+06	0.0000E+00	1.00	0.0	3.7533E+06	8.9000E-02	1	4 3343
151	32-Ge-	81	0	320810	7.6000E+00	1.6700E+06	2.9600E+06	0.0000E+00	1.50	0.0	3.3900E+06	1.2200E-01	1	4 3258
152	32-Ge-	81	1	320811	7.6000E+00	2.5000E+06	1.8300E+06	0.0000E+00	1.00	0.0	6.2300E+06	1.0000E+00	1	4 3259
153	33-As-	81	0	330810	3.3300E+01	1.5750E+06	2.3150E+05	0.0000E+00	1.00	0.0	3.8563E+06	9.1100E-01	2	4 3343
154	34-Se-	81	0	340810	1.1070E+03	6.1100E+05	8.0000E+03	0.0000E+00	1.00	1.0	1.5853E+06	8.9000E-02	1	4 3446
155	34-Se-	81	1	340811	3.4368E+03	8.4220E+04	1.7970E+04	0.0000E+00	1.00	0.0	1.6890E+06	5.1000E-04	2	4 3447
156	35-Br-	81	0	350810	stable	0.0000E+00	0.0000E+00	0.0000E+00	3.00	0.0	1.0301E+05	9.9949E-01	0	0 3531
157	36-Kr-	81	0	360810	7.2000E+12	4.8300E+03	7.2000E+03	0.0000E+00	2.00	0.0	2.0071E+05	1.0000E+00	1	4 3634
158	36-Kr-	81	1	360811	1.3100E+01	5.7500E+04	1.2980E+05	0.0000E+00	2.00	0.0	4.7120E+05	2.5000E-02	4	4 3635
159	37-Rb-	81	0	370810	1.6474E+04	1.2100E+05	5.0600E+05	0.0000E+00	2.00	0.0	2.2372E+06	2.7500E-02	2	4 3713
160	37-Rb-	81	1	370811	1.8300E+03	7.9200E+04	3.0400E+04	0.0000E+00	2.00	1.0	2.3230E+06	2.4000E-02	2	4 3714
161	28-Ni-	82	0	280820	5.9850E-03	5.9830E+06	3.5360E+06	0.0000E+00	1.00	0.0	8.6310E+04	9.7600E-01	0	0 2897
162	29-Cu-	82	0	290820	2.5050E-02	4.6890E+06	5.0620E+06	0.0000E+00	1.00	0.0	1.4930E+07	1.0000E+00	1	2 2982
163	30-Zn-	82	0	300820	3.5710E-02	4.2340E+06	2.1810E+06	0.0000E+00	1.00	0.0	1.0880E+07	1.0000E+00	1	2 3079
164	31-Ga-	82	0	310820	5.9997E-01	3.7960E+06	4.1310E+06	0.0000E+00	1.00	0.0	1.2677E+07	7.8100E-01	2	2 3164
165	32-Ge-	82	0	320820	4.6001E+00	1.4490E+06	7.6520E+05	0.0000E+00	1.00	0.0	5.3000E+06	2.1900E-01	0	0 3261
166	33-As-	82	0	330820	1.9100E+01	2.9171E+06	1.0849E+06	0.0000E+00	1.00	0.0	4.7000E+06	1.0000E+00	1	2 3346
167	33-As-	82	1	330821	1.3600E+01	1.8200E+06	2.7900E+06	0.0000E+00	1.00	0.0	7.2700E+06	1.0000E+00	1	2 3347
168	34-Se-	82	0	340820	stable	0.0000E+00	0.0000E+00	0.0000E+00	0	0	1.5190E+06	1.0000E+00	0	0 3449

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No	Symbol	S	Z	AAAS	Halflife	E-bata	E-gamma	E-alpha	RTYP	RFS	Q	Branching	NDK	NSP	MAT	
169	35-Br-	82	0	350820	1.2708E+05	1.4600E+05	2.6390E+06	0.0000E+00	1.00	0.0	3.0926E+06	1.0000E+00	1	4	3534	
170	35-Br-	82	1	350821	3.6800E+02	6.4900E+04	7.3600E+03	0.0000E+00	1.00	0.0	3.1385E+06	2.4000E-02	2	4	3535	
171	36-Kr-	82	0	360820	stable	7.6380E+01	1.4190E+06	0.0000E+00	2.00	0.0	4.3995E+06	1.0000E+00	0	0	3637	
172	37-Rb-	82	0	370820	7.6380E+01	1.0940E+06	2.9340E+06	0.0000E+00	2.00	0.0	4.4810E+06	1.0000E+00	1	4	3716	
173	37-Rb-	82	1	370821	2.3299E+04	9.6000E+04	4.3320E+06	0.0000E+00	1.00	0.0	4.3574E+07	1.0000E+00	1	2	2985	
174	29-Cu-	83	0	290830	1.2090E-02	5.2810E+06	3.9530E+06	0.0000E+00	1.00	0.0	1.2650E+07	1.0000E+00	1	2	3082	
175	30-Zn-	83	0	300830	3.2840E-02	4.1020E+06	3.7430E+06	0.0000E+00	1.00	0.0	1.1513E+07	5.6000E-01	2	2	3167	
176	31-Ga-	83	0	310830	3.0999E-01	3.8810E+06	0.0000E+00	1.00	0.0	8.1000E+06	4.4000E-01					
177	32-Ge-	83	0	320830	1.8500E+00	2.6890E+06	2.4440E+06	0.0000E+00	1.00	0.0	8.8770E+06	9.9998E-01	2	2	3264	
178	33-As-	83	0	330830	1.3300E+01	1.2556E+06	2.7514E+06	0.0000E+00	1.00	0.0	1.2000E+06	2.0000E-05				
179	34-Se-	83	0	340830	1.3400E+03	5.0000E+05	2.6100E+06	0.0000E+00	1.00	0.0	5.4600E+06	3.6600E-01	2	2	3349	
180	34-Se-	83	1	340831	7.0100E+01	1.2730E+06	9.8200E+05	0.0000E+00	1.00	0.0	3.6920E+06	1.0000E+00	1	2	3452	
181	35-Br-	83	0	350830	8.6400E+03	3.2500E+05	7.0000E+03	0.0000E+00	1.00	0.0	3.8970E+06	1.0000E+00	1	2	3453	
182	36-Kr-	83	0	360830	stable	3.9100E+04	2.7700E+03	0.0000E+00	3.00	0.0	4.1544E+04	1.0000E+00	0	0	3640	
183	36-Kr-	83	1	360831	6.5900E+03	4.9000E+03	4.9100E+05	0.0000E+00	2.00	0.0	9.0914E+05	2.3000E-01	1	3	641	
184	37-Rb-	83	0	370830	7.4480E+06	8.0000E+05	8.0000E+05	0.0000E+00	2.00	1.0	8.6800E+05	7.7000E-01	2	4	3719	
185	38-Sr-	83	0	380830	1.1668E+05	1.4000E+05	5.1820E+06	5.3400E+06	0.0000E+00	1.00	0.0	2.7577E+06	1.0000E+00	1	4	3822
186	29-Cu-	84	0	290840	2.8500E-02	4.6230E+06	3.2970E+06	0.0000E+00	1.00	0.0	1.6180E+07	1.0000E+00	1	2	2988	
187	30-Zn-	84	0	300840	1.7180E-02	4.2280E+06	4.6330E+06	0.0000E+00	1.00	0.0	1.3043E+07	1.0000E+00	1	2	3085	
188	31-Ga-	84	0	310840	2.2160E-01	2.4600E+06	2.4600E+06	0.0000E+00	1.00	0.0	1.4000E+07	6.1000E-01	2	2	3170	
189	32-Ge-	84	0	320840	1.2000E+00	2.5460E+06	1.9824E+06	0.0000E+00	1.00	0.0	8.5000E+06	3.9000E-01				
190	33-As-	84	0	330840	5.5000E+00	4.0000E+06	3.4620E+06	0.0000E+00	1.00	0.0	7.6500E+06	7.5100E-01	2	2	3267	
191	33-As-	84	1	330841	6.4999E-01	2.9180E+06	3.4620E+06	0.0000E+00	1.00	0.0	3.4000E+06	4.9000E-02				
192	34-Se-	84	0	340840	1.8600E+02	5.3600E+05	4.2000E+05	0.0000E+00	1.00	0.0	9.8700E+06	9.9915E-01	2	2	3352	
193	35-Br-	84	0	350840	1.9080E+03	1.2400E+06	1.7600E+06	0.0000E+00	1.00	0.0	4.6547E+06	1.0000E+00	1	2	3540	
194	35-Br-	84	1	350841	3.6000E+02	9.1000E+05	2.7700E+06	0.0000E+00	1.00	0.0	4.9700E+06	1.0000E+00	1	2	3541	
195	36-Kr-	84	0	360840	stable	1.5931E+06	8.9300E+05	0.0000E+00	1.00	0.0	8.9414E+05	4.0000E-02	0	0	3643	
196	37-Rb-	84	0	370840	2.8310E+06	4.9100E+05	4.9100E+05	0.0000E+00	2.00	0.0	2.6809E+06	9.6000E-01	2	5	3722	
197	37-Rb-	84	1	370841	1.2156E+03	7.9000E+04	3.8300E+05	0.0000E+00	3.00	0.0	4.6362E+05	1.0000E+00	1	3	723	
198	38-Sr-	84	0	380840	stable	3.80840	0.0000E+00	1.00	0.0	1.4065E+07	1.0000E+00	0	0	3825		
199	30-Zn-	85	0	300850	1.8020E-02	4.7860E+06	4.0100E+06	0.0000E+00	1.00	0.0	1.3824E+07	1.0000E+00	1	2	3088	
200	31-Ga-	85	0	310850	3.2830E-02	4.5090E+06	4.3050E+06	0.0000E+00	1.00	0.0	1.0135E+07	8.8000E-01	2	2	3173	
201	32-Ge-	85	0	320850	7.7580E-01	3.0290E+06	3.1830E+06	0.0000E+00	1.00	0.0	4.6000E+06	1.2000E-01	2	2	3270	
202	33-As-	85	0	330850	2.0800E+00	2.8360E+06	3.0050E+06	0.0000E+00	1.00	0.0	8.9100E+06	5.0000E-01	2	2	3355	
203	34-Se-	85	0	340850	3.1700E+01	1.7038E+06	2.0800E+06	0.0000E+00	1.00	0.0	4.4000E+06	5.0000E-01	1	2	3458	
204	35-Br-	85	0	350850	1.7400E+02	1.0410E+06	6.6000E+04	0.0000E+00	1.00	0.0	2.8700E+06	1.8000E-03	2	2	3543	
205	36-Kr-	85	0	360850	3.3940E+08	2.5071E+05	2.2300E+03	0.0000E+00	1.00	0.0	2.5700E+06	9.9820E-01	1	4	3646	

## JENDL FP DECAY DATA FILE 2000

No	Symbol	S	ZAAAS	Halflife	E-beta	E-gamma	E-alpha	RTYP	RFS	Q	Branching	NDK	NSP	MAT
206	36-Kr-	85	1	360851 1.6130E+04	2.5490E+05	1.5720E+05	0.0000E+00	1.00	0.0	9.9230E+05	7.8600E-01	2	4	3647
207	37-Rb-	85	0	370850 stable	8.5000E+03	5.0000E+05	0.0000E+00	2.00	0.0	1.0650E+06	3.0487E+05	2.1400E-01	0	3725
208	38-Sr-	85	0	380850 5.6022E+06	1.2240E+04	2.1790E+05	0.0000E+00	2.00	0.0	1.3040E+06	1.3400E-06	1	4	3828
209	38-Sr-	85	1	380851 4.0578E+03	1.2240E+04	2.1790E+05	0.0000E+00	2.00	0.0	2.3878E+05	8.6600E-01	2	4	3829
210	30-Zn-	86	0	300860 8.6000E-03	5.2610E+06	3.6850E+06	0.0000E+00	1.00	0.0	1.4720E+07	1.0000E+00	1	2	3091
211	31-Ga-	86	0	310860 3.2460E-02	4.6470E+06	5.1720E+06	0.0000E+00	1.00	0.0	1.4963E+07	1.0000E+00	1	2	3176
212	32-Ge-	86	0	320860 7.5690E-02	3.3620E+06	2.6360E+06	0.0000E+00	1.00	0.0	9.3520E+06	8.7000E-01	2	2	3273
213	33-As-	86	0	330860 9.0000E-01	3.3170E+06	3.7780E+06	0.0000E+00	1.00	0.0	5.4000E+06	1.3000E-01	0	0	3358
214	34-Se-	86	0	340860 1.5300E+01	1.4500E+06	2.2800E+06	0.0000E+00	1.50	0.0	5.0000E+06	1.2000E-01	1	4	3461
215	35-Br-	86	0	350860 5.5000E+01	1.9700E+06	3.2300E+06	0.0000E+00	1.00	0.0	5.9900E+06	1.0000E+00	1	2	3546
216	36-Kr-	86	0	360860 stable	6.6810E+05	9.3100E+04	0.0000E+00	1.00	0.0	7.6260E+06	1.0000E+00	0	0	3649
217	37-Rb-	86	0	370860 1.6097E+06	2.2010E+05	5.4600E+05	0.0000E+00	2.00	0.0	5.1863E+05	5.2000E-05	2	5	3728
218	37-Rb-	86	1	370861 6.1020E+01	9.7000E+03	3.5800E+06	0.0000E+00	2.00	0.0	5.2400E+06	1.0000E+00	1	4	3916
219	38-Sr-	86	0	380860 stable	5.3060E+04	2.3120E+04	0.0000E+00	3.00	0.0	5.4580E+06	6.9000E-03	2	4	3917
220	39-Y-	86	0	390860 2.8800E+03	2.3120E+04	2.2010E+05	0.0000E+00	2.00	0.0	5.5607E+05	1.0000E+00	0	0	3729
221	39-Y-	86	1	390861 2.8800E+03	2.3120E+04	2.2010E+05	0.0000E+00	3.00	0.0	5.5607E+05	1.0000E+00	0	0	3831
222	31-Ga-	87	0	310870 1.4380E-02	5.2640E+06	4.4360E+06	0.0000E+00	1.00	0.0	1.5460E+07	1.0000E+00	1	2	3179
223	32-Ge-	87	0	320870 7.4620E-02	3.5330E+06	3.5850E+06	0.0000E+00	1.00	0.0	1.1148E+07	7.6000E-01	2	2	3276
224	33-As-	87	0	330870 7.3000E-01	3.4400E+06	3.4730E+06	0.0000E+00	1.50	0.0	0.0000E+00	2.4000E-01	2	2	3361
225	34-Se-	87	0	340870 5.8500E+00	2.0790E+06	2.6440E+06	0.0000E+00	1.00	0.0	6.2000E+06	4.2000E-01	2	2	3464
226	35-Br-	87	0	350870 5.5690E+01	1.5203E+06	3.3400E+06	0.0000E+00	1.00	0.0	9.9000E+05	1.8000E-03	2	2	3549
227	36-Kr-	87	0	360870 4.5800E+03	1.3300E+06	7.9100E+05	0.0000E+00	1.00	0.0	6.8725E+06	9.7420E-01	2	1	3652
228	37-Rb-	87	0	370870 1.4990E+18	8.1700E+04	0.0000E+00	0.0000E+00	1.00	0.0	3.8851E+06	1.0000E+00	1	1	3731
229	38-Sr-	87	0	380870 stable	6.6500E+04	3.1950E+05	0.0000E+00	2.00	0.0	2.8331E+05	1.0000E+00	0	0	3834
230	38-Sr-	87	1	380871 1.0091E+04	6.6500E+04	3.1950E+05	0.0000E+00	3.00	0.0	3.0000E-03	2	4	3835	
231	39-Y-	87	0	390870 2.8730E+05	6.6400E+03	4.4608E+05	0.0000E+00	2.00	1.0	1.4730E+06	1.0000E+00	1	4	3919
232	39-Y-	87	1	390871 4.8130E+04	7.7000E+04	3.0492E+05	0.0000E+00	2.00	0.0	2.2418E+06	1.5700E-02	2	4	3920
233	31-Ga-	88	0	310880 1.1640E-02	5.5050E+06	5.9410E+06	0.0000E+00	1.00	0.0	3.8079E+05	9.8430E-01	1	2	3182
234	32-Ge-	88	0	320880 3.1490E-02	4.0060E+06	3.0030E+06	0.0000E+00	1.00	0.0	1.1520E+07	1.0000E+00	1	2	3279
235	33-As-	88	0	330880 1.5590E-01	3.7520E+06	4.2210E+06	0.0000E+00	1.00	0.0	1.2236E+07	7.0000E-01	2	2	3364
236	34-Se-	88	0	340880 1.5300E+00	2.2150E+06	2.0320E+06	0.0000E+00	1.00	0.0	6.8540E+06	9.9060E-01	2	4	3467
237	35-Br-	88	0	350880 1.6500E+01	2.5700E+06	3.2600E+06	0.0000E+00	1.00	0.0	1.9100E+06	9.4000E-03	2	2	3552
238	36-Kr-	88	0	360880 1.0220E+04	3.7000E+05	1.9500E+06	0.0000E+00	1.50	0.0	8.9600E+06	9.3650E-01	2	2	3552
239	37-Rb-	88	0	370880 1.0670E+03	2.0700E+06	6.3700E+05	0.0000E+00	1.00	0.0	2.9141E+06	6.3500E-02	1	4	3655
240	38-Sr-	88	0	380880 stable	3.80880	6.3700E+05	0.0000E+00	1.00	0.0	1.0000E+00	1.0000E+00	0	0	3837

## JENDL FP DECAY DATA FILE 2000

No	Symbol	S	ZAAAS	Halflife	E-beta	E-gamma	E-alpha	Rtyp	RFS	Q	Branching	NDK	NSP	MAT
241	39-Y-	88	0	390880 9.2150E+06	6.3300E+03	2.6950E+06	0.0000E+00	2.00	0.0	3.6226E+06	1.0000E+00	1	4.3922	
242	40-Zr-	88	0	400880 7.2100E+06	1.5300E+04	3.9167E+05	0.0000E+00	2.00	0.0	6.7330E+05	1.0000E+00	1	4.4019	
243	31-Ga-	89	0	310890 7.8330E-03	5.9290E+06	5.1370E+06	0.0000E+00	1.00	0.0	1.7500E+07	1.0000E+00	1	2.3185	
244	32-Ge-	89	0	320890 2.9710E-02	4.5980E+06	3.9170E+06	0.0000E+00	1.00	0.0	1.3606E+07	1.0000E+00	1	2.3282	
245	33-As-	89	0	330890 4.8220E-02	3.9770E+06	3.9430E+06	0.0000E+00	1.00	0.0	1.2305E+07	1.0000E+00	1	2.3367	
246	34-Se-	89	0	340890 4.1000E-01	3.1260E+06	1.8940E+06	0.0000E+00	1.00	0.0	8.7370E+06	9.2500E-01	2	2.3470	
247	35-Br-	89	0	350890 4.4000E+00	2.3730E+06	2.7680E+06	0.0000E+00	1.00	0.0	3.1000E+06	7.5000E+06	2	2.3555	
248	36-Kr-	89	0	360890 1.8900E+02	1.3900E+06	1.9230E+06	0.0000E+00	1.00	0.0	8.1550E+06	8.5800E-01	2	2.3658	
249	37-Rb-	89	0	370890 9.0900E+02	1.0600E+06	2.0700E+06	0.0000E+00	1.00	0.0	3.0500E+06	1.4200E-01	1	2.3737	
250	38-Sr-	89	0	380890 4.3660E+06	5.8460E+05	0.0000E+00	0.0000E+00	1.00	0.0	4.4964E+06	1.0000E+00	1	2.3840	
251	39-Y-	89	0	390890 stable	1.6060E+01	7.4300E+03	9.0140E+05	0.0000E+00	3.00	0.0	9.0912E+05	1.0000E+00	0	0.3925
252	39-Y-	89	1	390891 1.6060E+01	7.4300E+03	9.0140E+05	0.0000E+00	3.00	0.0	2.8327E+06	1.3000E-03	1	3.3926	
253	40-Zr-	89	0	400890 2.8230E+05	9.3900E+04	2.5760E+05	0.0000E+00	2.00	0.0	1.9240E+06	9.9870E-01	2	4.4022	
254	40-Zr-	89	1	400891 2.5080E+02	3.1010E+04	6.3356E+05	0.0000E+00	2.00	1.0	3.4210E+06	6.2300E-02	2	4.4023	
255	32-Ge-	90	0	320900 1.81180E-02	4.9980E+06	3.0740E+06	0.0000E+00	1.00	0.0	5.8779E+05	9.3770E-01	1	2.3285	
256	33-As-	90	0	330900 3.6720E-02	4.5970E+06	4.3800E+06	0.0000E+00	1.00	0.0	1.35773E+07	1.0000E+00	1	2.3370	
257	34-Se-	90	0	340900 1.4560E-01	2.9040E+06	2.6330E+06	0.0000E+00	1.00	0.0	8.1830E+06	9.2800E-01	2	2.3473	
258	35-Br-	90	0	350900 1.9200E+00	2.9000E+06	2.9042E+06	0.0000E+00	1.00	0.0	4.1000E+06	7.2000E-02	2	4.3558	
259	36-Kr-	90	0	360900 3.2320E+01	1.3600E+06	1.3300E+06	0.0000E+00	1.00	0.0	4.0400E+06	2.4900E-01	2	4.3661	
260	37-Rb-	90	0	370900 1.5800E+02	1.9916E+06	2.1641E+06	0.0000E+00	1.00	1.0	4.2250E+06	1.2200E-01	1	2.3740	
261	37-Rb-	90	1	370901 2.5800E+02	1.4323E+06	3.2504E+06	0.0000E+00	1.00	0.0	6.5869E+06	1.0000E+00	2	4.3741	
262	38-Sr-	90	0	380900 9.0700E+08	1.9580E+05	0.0000E+00	0.0000E+00	1.00	0.0	6.6960E+06	9.7400E-01	1	2.3843	
263	39-Y-	90	0	390900 2.3080E+05	9.3380E+05	1.2400E+00	0.0000E+00	1.00	0.0	5.4600E+05	1.0000E+00	1	2.3928	
264	39-Y-	90	1	390901 1.1480E+04	4.5300E+04	6.4090E+05	0.0000E+00	1.00	1.0	6.4500E+05	1.8800E-03	2	3.3929	
265	40-Zr-	90	0	400900 stable	1.0920E-01	7.3000E+01	2.3000E+06	0.0000E+00	3.00	0.0	6.8204E+05	9.9812E-01	0	0.4025
266	40-Zr-	90	1	400901 5.2560E+04	3.6900E+05	2.2750E+06	0.0000E+00	2.00	0.0	6.1110E+06	2.0000E-02	2	4.4116	
267	41-Nb-	90	0	410900 5.4199E-01	3.4170E+06	2.1390E+06	0.0000E+00	1.00	0.0	3.7920E+06	9.8000E-01	1	4.3664	
268	32-Ge-	91	0	320910 1.4590E-02	5.1300E+06	4.4790E+06	0.0000E+00	1.00	0.0	1.45353E+07	1.0000E+00	1	2.3288	
269	33-As-	91	0	330910 2.2540E-02	4.8610E+06	4.1060E+06	0.0000E+00	1.00	0.0	1.4332E+07	1.0000E+00	1	2.3373	
270	34-Se-	91	0	340910 2.7000E-01	3.7850E+06	3.1260E+06	0.0000E+00	1.00	0.0	1.06223E+07	7.8000E-01	2	2.3476	
271	35-Br-	91	0	350910 5.4199E-01	3.4170E+06	2.1390E+06	0.0000E+00	1.00	0.0	5.7000E+06	2.2000E-01	2	2.3561	
272	36-Kr-	91	0	360910 8.5700E+00	1.9600E+06	1.9897E+06	0.0000E+00	1.50	0.0	5.3800E+06	1.8300E-01	2	2.3743	
273	37-Rb-	91	0	370910 5.8400E+01	1.5000E+06	2.3400E+06	0.0000E+00	1.00	0.0	5.8911E+06	1.0000E+00	1	2.3846	
274	38-Sr-	91	0	380910 3.4670E+04	6.4000E+05	7.1000E+05	0.0000E+00	1.00	0.0	2.7073E+06	1.1000E-01	2	2.3931	
275	39-Y-	91	0	390910 5.0550E+06	6.0340E+05	3.6000E+03	0.0000E+00	1.00	0.0	1.5448E+06	8.9000E-01	1	2.3931	
276	39-Y-	91	1	390911 2.9826E+03	2.7000E+04	5.2770E+05	0.0000E+00	3.00	0.0	5.5560E+05	1.0000E+00	1	3.3932	

## JENDL FP DECAY DATA FILE 2000

No	Symbol	S	Z	AAAS	Halflife	E-beta	E-gamma	E-alpha	RTYP	RFS	Q	Branching	NDK	NSP	MAT
277	40-Zr-	91	0	400910	stable	5.3800E+03	1.2300E+04	0.0000E+00	2.00	0.0	1.2534E+06	1.0000E+00	0	0	4028
278	41-Nb-	91	0	410910	2.1000E+10	8.8360E+04	4.3600E+04	0.0000E+00	2.00	0.0	1.3590E+06	7.0000E-02	1	3	4119
279	41-Nb-	91	1	410911	5.2580E+06	8.8360E+04	0.0000E+00	3.00	0.0	1.4622E+05	9.3000E-01	2	4	4120	
280	33-As-	92	0	330920	1.7870E-02	5.0490E+06	5.4090E+06	0.0000E+00	1.00	0.0	1.6072E+07	1.0000E+00	1	2	3376
281	34-Se-	92	0	340920	6.8570E-02	4.1130E+06	2.2370E+06	0.0000E+00	1.00	0.0	9.3850E+06	1.0000E+00	1	2	3479
282	35-Br-	92	0	350920	3.6199E-01	4.0060E+06	3.1990E+06	0.0000E+00	1.00	0.0	1.2205E+07	6.8000E-01	2	2	3564
283	36-Kr-	92	0	360920	1.8400E+00	2.0000E+06	1.4000E+06	0.0000E+00	1.50	0.0	6.6600E+06	3.2000E-01	2	4	3667
284	37-Rb-	92	0	370920	4.4920E+00	3.4992E+06	5.2010E+05	0.0000E+00	1.00	0.0	8.8800E+05	3.2000E-04	2	2	3746
285	38-Sr-	92	0	380920	9.7600E+03	1.8000E+05	1.3400E+06	0.0000E+00	1.50	0.0	7.9200E+05	1.0000E-04	1	2	3849
286	39-Y-	92	0	390920	1.2740E+04	1.4400E+06	2.5200E+05	0.0000E+00	1.00	0.0	1.9404E+06	1.0000E+00	1	2	3934
287	40-Zr-	92	0	400920	stable	5.1500E+03	1.7000E+06	0.0000E+00	2.00	0.0	3.6391E+06	1.0000E+00	0	0	4031
288	41-Nb-	92	0	410920	1.1000E+15	5.9200E+03	9.6880E+05	0.0000E+00	2.00	0.0	2.0056E+06	1.0000E+00	1	1	4122
289	41-Nb-	92	1	410921	8.7700E+05	0.0000E+00	0.0000E+00	2.1410E+06	1.0000E+00	0	0	4123	0	0	
290	42-Mo-	92	0	420920	stable	4.8490E+06	4.1110E+06	0.0000E+00	1.00	0.0	1.4313E+07	1.0000E+00	1	2	3379
291	33-As-	93	0	330930	1.3600E-02	4.1170E+06	4.1420E+06	0.0000E+00	1.00	0.0	1.2892E+07	1.0000E+00	1	2	3482
292	34-Se-	93	0	340930	5.4650E-02	3.5540E+06	3.6720E+06	0.0000E+00	1.00	0.0	7.4024E+07	6.6000E-01	2	2	3567
293	35-Br-	93	0	350930	2.9750E-01	7.5700E+04	6.7833E+05	0.0000E+00	1.50	0.0	7.7000E+06	9.8070E-01	2	4	3670
294	36-Kr-	93	0	360930	1.2860E+00	2.5173E+06	2.2600E+06	0.0000E+00	1.50	0.0	2.6800E+06	1.9300E-02	2	4	3749
295	37-Rb-	93	0	370930	5.8400E+00	2.4700E+06	1.9440E+06	0.0000E+00	1.00	0.0	7.4616E+06	9.8640E-01	2	4	3749
296	38-Sr-	93	0	380930	4.4540E+02	7.7000E+05	2.2300E+06	0.0000E+00	1.50	0.0	2.1780E+06	1.3600E-01	2	4	3852
297	39-Y-	93	0	390930	3.6600E+04	1.1670E+06	9.6000E+04	0.0000E+00	1.00	1.0	4.1366E+06	6.5500E-01	2	4	3937
298	39-Y-	93	1	390931	8.2000E-01	7.5700E+04	6.7833E+05	0.0000E+00	3.00	0.0	2.8932E+06	1.0000E+00	1	4	3938
299	40-Zr-	93	0	400930	4.8000E+13	1.9200E+04	0.0000E+00	0.0000E+00	1.00	0.0	9.1365E+04	5.0000E-02	2	1	4034
300	41-Nb-	93	0	410930	stable	1.9600E+03	0.0000E+00	3.00	0.0	6.0545E+04	9.5000E-01	0	0	4125	
301	41-Nb-	93	1	410931	5.0900E+08	2.6800E+04	1.2500E+04	0.0000E+00	2.00	0.0	4.0500E+05	1.0000E-01	1	2	4126
302	42-Mo-	93	0	420930	1.3000E+11	2.9000E+04	0.0000E+00	2.00	1.0	3.7500E+05	9.0000E-01	2	3	4228	
303	42-Mo-	93	1	420931	2.4700E+04	9.8000E+04	2.3131E+06	0.0000E+00	2.00	0.0	2.8310E+06	1.2000E-03	2	4	4229
304	33-As-	94	0	330940	1.2120E-02	5.3720E+06	5.9020E+06	0.0000E+00	3.00	0.0	2.4248E+06	9.9880E-01	1	2	3382
305	34-Se-	94	0	340940	3.6250E-02	4.1890E+06	2.3000E+06	0.0000E+00	1.00	0.0	1.7158E+07	1.0000E+00	1	2	3485
306	35-Br-	94	0	350940	2.4350E-01	4.0190E+06	4.6610E+06	0.0000E+00	1.00	0.0	1.3337E+07	1.0000E+00	1	2	3570
307	36-Kr-	94	0	360940	2.0800E-01	2.9470E+06	1.4800E+06	0.0000E+00	1.00	0.0	3.4000E+06	6.1000E-02	2	2	3673
308	37-Rb-	94	0	370940	2.7020E+00	2.7162E+06	3.6600E+06	0.0000E+00	1.00	0.0	1.0291E+07	8.9800E-01	2	4	3752
309	38-Sr-	94	0	380940	7.5200E+01	7.3250E+05	1.5733E+06	0.0000E+00	1.00	0.0	3.5079E+06	1.0000E+00	1	2	3855
310	39-Y-	94	0	390940	1.1220E+03	1.8100E+06	7.7000E+05	0.0000E+00	1.00	0.0	4.9167E+06	1.0000E+00	1	2	3940
311	40-Zr-	94	0	400940	stable	0.0000E+00	0.0000E+00	0.0000E+00	0.00	0.0	0	0	4037	0	0
312	41-Nb-	94	0	410940	6.4000E+11	1.4300E+05	1.5580E+06	0.0000E+00	1.00	0.0	2.0455E+06	1.0000E+00	1	2	4128
313	41-Nb-	94	1	410941	3.7560E+02	3.2000E+04	1.1000E+04	0.0000E+00	1.00	0.0	5.0000E-03	9.9500E-01	2	4	4129

JENDL FP DECAY DATA FILE 2000										JENDL FP DECAY DATA FILE 2000									
No	Symbol	S	ZAAAS	Halflife	E-beta	E-gamma	E-alpha	RTYP	RFS	Q	Branching	NDK	NSP	MAT					
314	42-Mo-	94	0	420940	stable	5.1780E-03	4.4660E+06	0.0000E+00	1.00	0.0	1.5332E+07	1.0000E+00	1	0 4231					
315	33-As-	95	0	330950	9.9550E-03	4.4970E+06	0.0000E+00	1.00	0.0	1.4134E+07	1.0000E+00	1	2 3385						
316	34-Se-	95	0	340950	3.1090E-02	4.5590E+06	0.0000E+00	1.00	0.0	1.4110E+07	1.0000E+00	1	2 3488						
317	35-Br-	95	0	350950	5.4250E-02	3.5930E+06	0.0000E+00	1.00	0.0	8.8000E+06	8.8000E+00	2	2 3573						
318	36-Kr-	95	0	360950	7.8000E-01	3.0550E+06	0.0000E+00	1.00	0.0	4.4000E+06	1.2000E-01	2	2 3676						
319	37-Rb-	95	0	370950	3.7750E-01	3.1020E+06	1.8870E+06	0.0000E+00	1.00	0.0	9.2787E+06	9.1410E-01	2	4 3755					
320	38-Sr-	95	0	380950	2.3900E+01	2.2100E+06	1.5350E+06	0.0000E+00	1.00	0.0	6.0869E+06	1.0000E+00	1	4 3858					
321	39-Y-	95	0	390950	6.1800E+02	1.4400E+06	1.1100E+06	0.0000E+00	1.00	0.0	4.4534E+06	1.0000E+00	1	2 3943					
322	40-Zr-	95	0	400950	5.5310E+06	1.1840E+05	7.3200E+05	0.0000E+00	1.00	0.0	1.1248E+06	9.9100E-01	2	4 4040					
323	41-Nb-	95	0	410950	3.0218E+06	4.4560E+04	7.6450E+05	0.0000E+00	1.00	0.0	8.8912E+05	9.0000E-03	1	4 4131					
324	41-Nb-	95	1	410951	3.1200E+05	3.4400E+04	2.4120E+05	0.0000E+00	1.00	0.0	9.2562E+05	1.0000E+00	1	4 4132					
325	42-Mo-	95	0	420950	stable	6.3000E+03	7.9650E+05	0.0000E+00	2.00	0.0	1.6906E+06	1.0000E+00	0	0 4234					
326	43-Tc-	95	0	430950	7.2000E+04	6.8942E+05	0.0000E+00	2.00	0.0	1.7300E+06	9.6100E-01	1	4 4319						
327	43-Tc-	95	1	430951	5.2700E+06	1.4583E+04	6.8942E+05	0.0000E+00	3.00	0.0	3.8900E+04	3.9000E-02	2	4 4320					
328	34-Se-	96	0	340960	2.3440E-02	4.6120E+06	2.6180E+06	0.0000E+00	1.00	0.0	1.2366E+07	1.0000E+00	1	2 3491					
329	35-Br-	96	0	350960	4.9240E-02	4.4690E+06	4.8220E+06	0.0000E+00	1.00	0.0	1.4280E+07	1.0000E+00	1	2 3576					
330	36-Kr-	96	0	360960	1.3380E-01	3.0730E+06	1.5666E+06	0.0000E+00	1.00	0.0	8.1840E+06	8.9000E-01	2	2 3679					
331	37-Rb-	96	0	370960	1.9900E-01	3.6600E+06	3.0840E+06	0.0000E+00	1.00	0.0	4.7000E+06	1.1000E-01	2	4 3758					
332	38-Sr-	96	0	380960	1.0600E+00	1.9700E+06	1.3543E+06	0.0000E+00	1.50	0.0	1.1740E+07	8.5800E-01	2	4 3861					
333	39-Y-	96	0	390960	5.3400E+00	2.6565E+06	1.2056E+06	0.0000E+00	1.00	0.0	5.3865E+06	1.4200E-01	1	2 3946					
334	39-Y-	96	1	390961	9.6000E+00	1.1300E+06	4.3760E+06	0.0000E+00	1.00	0.0	7.1000E+06	1.0000E+00	1	4 3947					
335	40-Zr-	96	0	400960	stable	2.5000E+05	2.4600E+06	0.0000E+00	1.00	0.0	7.1400E+06	1.0000E+00	0	0 4043					
336	41-Nb-	96	0	410960	8.4060E+04	4.1096E+04	2.4600E+06	0.0000E+00	1.00	0.0	3.1868E+06	1.0000E+00	0	0 4134					
337	42-Mo-	96	0	420960	stable	5.3000E+03	2.5000E+06	0.0000E+00	2.00	0.0	2.9732E+06	1.0000E+00	0	0 4237					
338	43-Tc-	96	0	430960	3.7000E+05	2.5400E+04	4.8400E+04	0.0000E+00	2.00	0.0	3.0700E+06	2.0000E-02	2	4 4322					
339	43-Tc-	96	1	430961	3.0900E+03	2.5400E+04	4.8400E+04	0.0000E+00	3.00	0.0	3.4200E+04	9.8000E-01	2	4 4323					
340	35-Br-	97	0	350970	3.8400E-02	4.1950E+06	3.5080E+06	0.0000E+00	1.00	0.0	1.2405E+07	1.0000E+00	1	2 3579					
341	36-Kr-	97	0	360970	1.1640E-01	3.8340E+06	2.9930E+06	0.0000E+00	1.00	0.0	1.0449E+07	1.0000E+00	1	2 3682					
342	37-Rb-	97	0	370970	1.6990E-01	3.0248E+06	2.8767E+06	0.0000E+00	1.00	0.0	6.5200E+06	7.3100E-01	2	4 3761					
343	38-Sr-	97	0	380970	4.2600E-01	2.2850E+06	2.0100E+06	0.0000E+00	1.00	0.0	7.4685E+06	9.9994E-01	2	4 3864					
344	39-Y-	97	0	390970	3.7500E+00	2.3548E+06	1.4679E+06	0.0000E+00	1.00	0.0	6.6884E+06	9.9939E-01	2	4 3949					
345	39-Y-	97	1	390971	1.1700E+00	2.2000E+06	2.6795E+06	0.0000E+00	1.50	0.0	1.1090E+06	6.1000E-04	1	3 3950					
346	40-Zr-	97	0	400970	6.0880E+04	7.0200E+05	1.8700E+05	0.0000E+00	1.00	0.0	7.3500E+06	9.9190E-01	3	4 3950					
347	41-Nb-	97	0	410970	4.3300E+03	4.6840E+05	6.6500E+05	0.0000E+00	1.00	0.0	5.0000E+05	7.0000E-03	2	4 4046					
348	41-Nb-	97	1	410971	5.2700E+01	1.4867E+04	7.2780E+05	0.0000E+00	3.00	0.0	2.6581E+06	5.0000E-02	1	4 4137					
349	42-Mo-	97	0	420970	stable						1.9148E+06	9.5000E-01	0	1 4138					

## JENDL FP DECAY DATA FILE 2000

No	Symbol	S	ZAAAS	Halflife	E-beta	E-gamma	E-alpha	RTYP	RFS	Q	Branching	NDK	NSP	MAT
350	43-Tc-	97	0	430970 8.2000E+13	5.1700E+03	1.1770E+04	0.0000E+00	2.00	0.0	3.2026E+05	1.0000E+00	1	3 4325	
351	43-Tc-	97	1	430971 7.7800E+06	8.6000E+03	9.6000E+03	0.0000E+00	3.00	0.0	9.6500E+04	1.0000E+00	1	3 4326	
352	35-Br-	98	0	350980 2.5930E-02	4.8800E+06	5.3770E+06	0.0000E+00	1.00	0.0	1.5656E+07	1.0000E+00	1	2 3582	
353	36-Kr-	98	0	360980 7.1680E-02	3.4920E+06	1.8510E+06	0.0000E+00	1.00	0.0	9.3470E+06	1.0000E+00	1	2 3685	
354	37-Rb-	98	0	370980 1.1400E-01	3.7110E+06	2.9230E+06	0.0000E+00	1.00	0.0	1.2326E+07	8.6600E-01	2	4 3764	
355	38-Sr-	98	0	380980 6.5300E-01	2.1390E+06	1.0510E+06	0.0000E+00	1.50	0.0	6.4200E+06	1.3400E-01	2	4 3867	
356	39-Y-	98	0	390980 5.4800E-01	3.0000E+06	2.0819E+06	0.0000E+00	1.50	1.0	8.9000E+05	3.2000E-03			
357	39-Y-	98	1	390981 2.0000E+00	2.7000E+06	3.0400E+06	0.0000E+00	1.50	0.0	8.8242E+06	9.9790E-01	2	4 3952	
358	40-Zr-	98	0	400980 3.0700E+01	9.0600E+05	1.6467E+05	0.0000E+00	1.50	0.0	2.4250E+06	9.6900E-01	2	4 3953	
359	41-Nb-	98	0	410980 2.8600E+00	1.6225E+06	8.5580E+05	0.0000E+00	1.00	0.0	2.2502E+06	1.0000E+00	1	2 4049	
360	41-Nb-	98	1	410981 3.0780E+03	7.6200E+05	2.8130E+06	0.0000E+00	1.00	0.0	4.5856E+06	1.0000E+00	1	2 4140	
361	42-Mo-	98	0	420980 stable	1.3300E+14	1.1800E+05	1.4100E+06	0.0000E+00	1.00	0.0	4.6700E+06	1.0000E+00	1	2 4141
362	43-Tc-	98	0	430980 4.40980 stable	2.0520E-02	4.5720E+06	3.9200E+06	0.0000E+00	1.00	0.0	1.7965E+06	1.0000E+00	1	2 4243
363	35-Br-	99	0	350990 7.1810E-02	4.2990E+06	3.5310E+06	0.0000E+00	1.00	0.0	1.3580E+07	1.0000E+00	0	0 4431	
364	36-Kr-	99	0	360990 5.9001E-02	3.6640E+06	2.6560E+06	0.0000E+00	1.00	0.0	1.2650E+07	1.0000E+00	1	2 3585	
365	37-Rb-	99	0	370990 2.7000E-01	3.2000E+06	2.1060E+06	0.0000E+00	1.50	0.0	7.7200E+06	1.3100E-01	2	2 3767	
367	38-Sr-	99	0	380990 1.4700E+00	2.3750E+06	1.1470E+06	0.0000E+00	1.50	1.0	2.2600E+06	3.3000E-03	2	4 3870	
368	39-Y-	99	0	390990 1.4700E+00	2.3750E+06	1.1470E+06	0.0000E+00	1.00	0.0	7.5671E+06	9.9040E-01	2	4 3955	
369	40-Zr-	99	0	400990 2.1000E+00	1.7100E+06	8.4400E+05	0.0000E+00	1.50	0.0	3.0000E+06	9.6000E-03			
370	41-Nb-	99	0	410990 1.5000E+01	1.2746E+06	6.2173E+05	0.0000E+00	1.00	0.0	4.5850E+06	6.4000E-01	2	4 4052	
371	41-Nb-	99	1	410991 1.5600E+02	1.1829E+06	1.7155E+06	0.0000E+00	1.00	0.0	3.6387E+06	3.6000E-01	1	4 4143	
372	42-Mo-	99	0	420990 2.3738E+05	3.9400E+05	1.4850E+05	0.0000E+00	3.00	0.0	4.040E+06	9.6100E-01	2	4 4144	
373	43-Tc-	99	0	430990 6.6600E+12	8.4600E+04	4.3900E-03	0.0000E+00	1.00	1.0	1.2145E+06	8.7000E-01	2	4 4246	
374	43-Tc-	99	1	430991 2.1640E+04	1.5105E+04	1.2650E+05	0.0000E+00	1.00	0.0	2.9365E+05	1.0000E+00	1	2 4331	
375	44-Ru-	99	0	440990 stable	5.0310E-02	5.5850E+06	0.0000E+00	1.00	0.0	1.4268E+05	9.9996E-01	2	4 4332	
376	35-Br-100	99	0	351000 3.8550E-02	3.9700E+06	2.1890E+06	0.0000E+00	1.00	0.0	1.6167E+07	1.0000E+00	0	0 4434	
377	36-Kr-100	99	0	361000 1.7470E-01	4.2760E+06	4.6740E+06	0.0000E+00	1.00	0.0	1.0648E+07	1.0000E+00	1	2 3588	
378	37-Rb-100	99	0	371000 1.7470E-01	4.2760E+06	4.6740E+06	0.0000E+00	1.00	0.0	1.3524E+07	9.4000E-01	2	2 3691	
379	38-Sr-100	99	0	381000 2.0200E-01	2.5310E+06	1.2750E+06	0.0000E+00	1.50	0.0	7.4000E+06	6.0000E-02			
380	39-Y-100	99	0	391000 7.3500E-01	2.9420E+06	2.9890E+06	0.0000E+00	1.50	0.0	7.0750E+06	9.9270E-01	2	2 3873	
381	39-Y-100	99	1	391001 5.4999E-01	3.2900E+06	2.2530E+06	0.0000E+00	1.50	0.0	9.3100E+06	7.3000E-03	2	2 3958	
382	40-Zr-100	99	0	401000 7.1000E+00	1.1141E+06	6.9823E+05	0.0000E+00	1.50	0.0	2.4000E+06	9.9190E-01	2	2 4055	
383	41-Nb-100	99	0	411000 1.5000E+00	2.4800E+06	7.1000E+05	0.0000E+00	1.00	0.0	2.8550E+06	9.8000E-01	2	2 4146	

## JENDL FP DECAY DATA FILE 2000

No	Symbol	S	ZAAAS	Halflife	E-beta	E-gamma	E-alpha	RTYP	RFS	Q	Branching	NDK	NSP	MAT		
384	41-Nb-100	1	411001	2.9900E+00	1.9430E+06	1.9500E+06	0.0000E+00	1.00	0.0	6.7470E+06	1.0000E+00	1	2	4147		
385	42-Mo-100	0	421000	stable							0	0	4249			
386	43-Tc-100	0	431000	1.5800E+01	1.3150E+06	8.3000E+04	0.0000E+00	1.00	0.0	3.2024E+06	1.0000E+00	1	2	4334		
387	44-Ru-100	0	441000	stable							0	0	4437			
388	45-Rh-100	0	451000	7.4900E+04	5.9900E+04	2.7800E+06	0.0000E+00	2.00	0.0	3.6300E+06	1.0000E+00	0	1	44516		
389	45-Rh-100	1	451001	2.7600E+02	2.9000E+03	1.4314E+05	0.0000E+00	2.00	0.0	3.7350E+06	1.7000E-02	2	4	4517		
390	36-Kr-101	0	361010	2.3290E-02	4.4400E+06	3.9300E+06	0.0000E+00	1.00	0.0	3.00	1.0760E+05	9.8300E-01	1	2	3694	
391	37-Rb-101	0	371010	3.2000E-02	4.0380E+06	3.1230E+06	0.0000E+00	1.00	0.0	3.00	1.0760E+05	1.0000E+00	1	2	3773	
392	38-Sr-101	0	381010	1.1800E-01	3.8000E+06	2.6620E+06	0.0000E+00	1.00	0.0	9.5050E+06	9.7630E-01	2	2	3876		
393	39-Y-101	0	391010	4.5000E-01	2.6910E+06	1.5230E+06	0.0000E+00	1.00	0.0	3.8200E+06	2.3700E-02					
394	40-Zr-101	0	401010	2.3000E+00	2.2000E+06	1.0910E+06	0.0000E+00	1.00	0.0	3.6200E+06	1.9400E-02					
395	41-Nb-101	0	411010	7.1000E+00	1.6860E+06	1.1960E+05	0.0000E+00	1.00	0.0	5.4850E+06	1.0000E+00					
396	42-Mo-101	0	421010	8.7660E+02	5.2000E+05	1.5140E+06	0.0000E+00	1.00	0.0	4.5690E+06	1.0000E+00	1	4	4058		
397	43-Tc-101	0	431010	8.5200E+02	4.8000E+05	3.3600E+05	0.0000E+00	1.00	0.0	2.8244E+06	1.0000E+00	1	4	4149		
398	44-Ru-101	0	441010	stable							1.6135E+06	1.0000E+00	1	4	4252	
399	45-Rh-101	0	451010	1.0400E+08	2.6300E+04	2.9800E+05	0.0000E+00	2.00	0.0	5.4149E+05	1.0000E+00	0	0	4440		
400	45-Rh-101	1	451011	3.7500E+05	9.5000E+03	3.3100E+05	0.0000E+00	2.00	0.0	6.9500E+05	9.3600E-01	2	4	4519		
401	36-Kr-102	0	361020	1.9090E-02	4.2990E+06	2.6340E+06	0.0000E+00	1.00	0.0	1.5730E+05	6.4000E-02					
402	37-Rb-102	0	371020	7.5000E-02	4.6180E+06	4.6170E+06	0.0000E+00	1.00	0.0	1.1753E+07	1.0000E+00	1	2	3697		
403	38-Sr-102	0	381020	6.9000E-02	3.0170E+06	1.5780E+06	0.0000E+00	1.00	0.0	1.5082E+07	1.0000E+00	1	2	3776		
404	39-Y-102	0	391020	9.0000E-01	3.0960E+06	3.8230E+06	0.0000E+00	1.00	0.0	8.1510E+06	9.5200E-01	2	2	3879		
405	40-Zr-102	0	401020	2.9000E+00	1.2500E+06	7.3730E+05	0.0000E+00	1.00	0.0	3.7600E+06	4.8000E-02					
406	41-Nb-102	0	411020	1.3000E+00	2.8320E+06	1.4610E+06	0.0000E+00	1.00	0.0	9.8500E+06	9.4000E-01	2	2	3964		
407	41-Nb-102	1	411021	4.3000E+00	2.2800E+06	2.0900E+06	0.0000E+00	1.00	0.0	3.4900E+06	6.0000E-02					
408	42-Mo-102	0	421020	6.7800E+02	3.4900E+05	4.7304E+04	0.0000E+00	1.00	0.0	7.2100E+06	1.0000E+00	1	2	4153		
409	43-Tc-102	0	431020	5.2800E+00	1.4201E+06	1.1933E+06	0.0000E+00	1.00	0.0	1.0100E+06	1.0000E+00	1	2	4255		
410	43-Tc-102	1	431021	2.6100E+02	7.8000E+05	2.5200E+06	0.0000E+00	1.00	0.0	4.5303E+06	1.0000E+00	1	2	4340		
411	44-Ru-102	0	441020	stable						3.00	0.0	4.5260E+06	9.8000E-01	2	2	4341
412	45-Rh-102	0	451020	1.7900E+07	1.5700E+05	4.4100E+05	0.0000E+00	1.00	0.0	0.0000E+00	2.0000E-02					
413	45-Rh-102	1	451021	9.1520E+07	5.3500E+03	2.1600E+06	0.0000E+00	2.00	0.0	2.3225E+06	2.0000E-01	2	2	4522		
414	46-Pd-102	0	461020	stable						3.00	0.0	1.4070E+05	2.3000E-03	2	2	4523
415	37-Rb-103	0	371030	2.4390E-02	4.3620E+06	3.5020E+06	0.0000E+00	1.00	0.0	1.2740E+07	1.0000E+00	0	0	4625		
416	38-Sr-103	0	381030	6.9090E-02	3.6940E+06	2.9490E+06	0.0000E+00	1.00	0.0	1.1187E+07	1.0000E+00	1	2	3779		
417	39-Y-103	0	391030	1.0050E+00	3.0340E+06	1.9810E+06	0.0000E+00	1.00	0.0	9.6340E+06	8.1000E-01	2	2	3882		
418	40-Zr-103	0	401030	1.3000E+00	2.4570E+06	1.4670E+06	0.0000E+00	1.00	0.0	4.9000E+06	1.9000E-01					
419	41-Nb-103	0	411030	1.5000E+00	2.1110E+06	9.8200E+05	0.0000E+00	1.00	0.0	5.5300E+06	9.9990E-01	2	2	4155		
420	42-Mo-103	0	421030	6.7500E+01	1.1200E+06	1.1300E+06	0.0000E+00	1.00	0.0	1.7000E+05	1.0000E-04					
421	43-Tc-103	0	431030	5.4200E+01	7.0399E+05	5.5265E+05	0.0000E+00	1.00	0.0	3.7500E+06	1.0000E+00	1	4	4258		
												2.6595E+06	1.0000E+00	1	4	4343

## JENDL FP DECAY DATA FILE 2000

No	Symbol	S	ZZAAS	Halflife	E-beta	E-gamma	E-alpha	RTYP	RFS	Q	Branching	NDK	NSP	MAT	
4.22	44-Ru-103	0	441030	3.3921E+06	6.6600E+04	4.9600E+05	0.0000E+00	1.00	0.0	7.6336E+05	2.5000E-03	2	4 4446		
4.23	45-Rh-103	0	451030	stable	3.5000E+04	1.7200E+03	0.0000E+00	3.00	0.0	3.9756E+04	1.0000E+00	1	0 4525		
4.24	45-Rh-103	1	451031	3.3668E+03	4.9710E+03	1.4563E+04	0.0000E+00	2.00	0.0	5.4308E+05	2.0000E-04	2	3 4526		
4.25	46-Pd-103	0	461030	1.4680E+06	4.9710E+03	1.4563E+04	0.0000E+00	2.00	1.0	7.2360E+05	9.9750E-01				
4.26	37-Rb-104	0	371040	2.2010E-02	4.8140E+06	5.3890E+06	0.0000E+00	1.00	0.0	1.5552E+07	1.0000E+00	1	2 3782		
4.27	38-Sr-104	0	381040	3.9610E-02	3.4300E+06	1.8520E+06	0.0000E+00	1.00	0.0	1.0135E+07	1.0000E+00	1	2 3885		
4.28	39-Y-104	0	391040	1.5670E-01	3.4940E+06	3.7500E+06	0.0000E+00	1.00	0.0	1.0920E+07	1.0000E+00	1	2 3970		
4.29	40-Zr-104	0	401040	1.2000E+00	1.7420E+06	8.9440E+05	0.0000E+00	1.00	0.0	5.8880E+06	9.9980E-01	2	4 067		
4.30	41-Nb-104	0	411040	4.7999E+00	2.5100E+06	3.3760E+06	0.0000E+00	1.00	0.0	8.1050E+06	9.9540E-01	2	2 4158		
4.31	41-Nb-104	1	411041	8.0000E-01	3.1250E+06	2.1340E+06	0.0000E+00	1.50	0.0	5.5000E+05	4.6000E-03				
4.32	42-Mo-104	0	421040	6.0000E+01	6.2290E+05	5.8470E+05	0.0000E+00	1.00	0.0	8.8900E+06	9.9500E-01	2	2 4159		
4.33	43-Tc-104	0	431040	1.1040E+03	1.4031E+06	2.2400E+06	0.0000E+00	1.00	0.0	7.6000E+05	5.0000E-03				
4.34	44-Ru-104	0	441040	stable	4.2300E+01	9.8500E+05	1.2127E+04	0.0000E+00	1.00	0.0	2.4409E+06	2.1550E+06	1	4 2661	
4.35	45-Rh-104	0	451040	4.2300E+01	8.3180E+04	4.3900E+04	0.0000E+00	2.00	0.0	5.6027E+06	1.0000E+00	1	4 4346		
4.36	45-Rh-104	1	451041	2.6000E+02	8.3180E+04	4.3900E+04	0.0000E+00	1.00	0.0	9.9550E+01	0	0 4449			
4.37	46-Pd-104	0	461040	stable	4.6720E-02	4.0870E+06	0.0000E+00	1.00	0.0	2.5770E+06	4.5000E-03	2	5 4528		
4.38	37-Rb-105	0	371050	1.3150E-02	4.0830E+06	3.3880E+06	0.0000E+00	1.00	0.0	1.3966E+07	1.0000E+00	0	0 4631		
4.39	38-Sr-105	0	381050	4.1010E-02	4.0830E+06	2.3720E+06	0.0000E+00	1.00	0.0	1.2076E+07	1.0000E+00	1	2 3785		
4.40	39-Y-105	0	391050	6.7860E-02	3.3920E+06	1.76640E+06	0.0000E+00	1.00	0.0	8.4910E+06	9.9770E-01	1	2 3888		
4.41	40-Zr-105	0	401050	1.9310E+00	2.6620E+06	1.76640E+06	0.0000E+00	1.00	0.0	1.8000E+06	2.3000E-03	2	2 3973		
4.42	41-Nb-105	0	411050	2.8000E+00	2.4990E+06	1.4040E+06	0.0000E+00	1.00	0.0	6.4850E+06	9.5500E-01	2	2 4161		
4.43	42-Mo-105	0	421050	3.5600E+01	1.9200E+06	1.4361E+06	0.0000E+00	1.50	0.0	1.4100E+06	4.5000E-02				
4.44	43-Tc-105	0	431050	4.5800E+02	1.3100E+06	7.9000E+05	0.0000E+00	1.00	0.0	3.6400E+06	1.0000E+00	1	4 2664		
4.45	44-Ru-105	0	441050	1.5980E+04	4.1300E+05	7.3800E+05	0.0000E+00	1.00	0.0	1.9169E+06	7.1500E-01	2	4 4349		
4.46	45-Rh-105	0	451050	1.2730E+05	1.5350E+05	7.7300E+04	0.0000E+00	1.00	1.0	1.7871E+06	2.8500E-01				
4.47	45-Rh-105	1	451051	4.0000E+01	9.4000E+04	3.4590E+04	0.0000E+00	3.00	0.0	5.6672E+05	1.0000E+00	1	4 531		
4.48	46-Pd-105	0	461050	stable	5.1200E+05	0.0000E+00	2.00	0.0	1.2957E+05	1.0000E+00	1	3 4532			
4.49	47-Ag-105	0	471050	3.5670E+06	1.7800E+04	2.2817E+04	0.0000E+00	3.00	0.0	1.3453E+06	1.0000E+00	0	0 4634		
4.50	47-Ag-105	1	471051	4.3400E+02	2.2817E+04	1.1770E+03	0.0000E+00	3.00	0.0	3.4000E+06	3.4000E-03	2	4 4720		
4.51	38-Sr-106	0	381060	2.3390E-02	3.8190E+06	2.3280E+06	0.0000E+00	1.00	0.0	1.3493E+07	1.0000E+00	1	2 3891		
4.52	39-Y-106	0	391060	6.1770E-02	3.8130E+06	4.1870E+06	0.0000E+00	1.00	0.0	1.3330E+07	1.0000E+00	1	2 3976		
4.53	40-Zr-106	0	401060	2.2970E-01	2.1380E+06	1.0910E+06	0.0000E+00	1.00	0.0	9.3670E+06	9.7300E-01	2	2 4073		
4.54	41-Nb-106	0	411060	1.0000E+00	3.3130E+06	2.5490E+06	0.0000E+00	1.00	0.0	2.4000E+06	2.7000E-02	2	2 4164		
4.55	42-Mo-106	0	421060	8.4001E+00	1.2320E+06	7.4590E+05	0.0000E+00	1.00	0.0	3.5200E+06	1.0000E+00				
4.56	43-Tc-106	0	431060	3.6000E+01	1.6916E+06	2.9330E+06	0.0000E+00	1.00	0.0	4.5470E+06	1.0000E+00	1	4 4352		
4.57	44-Ru-106	0	441060	3.2278E+07	1.0030E+04	0.0000E+00	1.00	0.0	3.9400E+06	1.0000E+00	1	1 4455			
4.58	45-Rh-106	0	451060	2.9800E+01	1.4110E+06	2.0600E+05	0.0000E+00	1.00	0.0	3.5411E+06	1.0000E+00	1	4 4334		
4.59	45-Rh-106	1	451061	7.8600E+03	3.6000E+05	2.8500E+06	0.0000E+00	1.00	0.0	3.6810E+06	1.0000E+00	1	4 4335		

## JENDL FP DECAY DATA FILE 2000

No	Symbol	S	ZAAAS	Halflife	E-beta	E-gamma	E-alpha	RTYP	RFS	Q	Branching	NDK	NSP	MAT	
460	4.6-Pd-106	0	4.61060	stable	5.0000E+05	7.0600E+05	0.0000E+00	2.00	0.0	2.9653E+06	1.0000E+00	0	0	4.637	
461	4.7-Ag-106	0	4.71060	1.4376E+03	9.5800E+03	2.8100E+06	0.0000E+00	2.00	0.0	3.0550E+06	1.0000E+00	1	1	4.4722	
462	4.7-Ag-106	1	4.71061	7.1540E+05	4.5040E+06	4.0360E+06	0.0000E+00	1.00	0.0	1.3586E+07	1.0000E+00	1	1	4.4723	
463	3.8-Sr-107	0	3.81070	2.2510E-02	4.260E-02	3.6670E+06	2.8010E+06	0.0000E+00	1.00	0.0	1.0652E+07	1.0000E+00	1	1	3.894
464	3.9-Y-107	0	3.91070	3.4260E-02	1.4930E-01	2.9820E+06	2.2010E+06	0.0000E+00	1.00	0.0	9.8227E+06	1.0000E+00	1	1	3.979
465	4.0-Zr-107	0	4.01070	1.4930E-01	2.9820E+06	2.8150E+06	0.0000E+00	1.00	0.0	8.0250E+06	9.0900E-01	1	2	4.076	
466	4.1-Nb-107	0	4.11070	1.4540E+00	2.8150E+06	1.8160E+06	0.0000E+00	1.00	0.0	3.3000E+06	9.1000E-02	2	2	4.167	
467	4.2-Mo-107	0	4.21070	3.5000E+00	2.3170E+06	1.3930E+06	0.0000E+00	1.00	0.0	6.1600E+06	1.0000E+00	1	2	4.270	
468	4.3-Tc-107	0	4.31070	2.1200E+01	1.1682E+06	1.4147E+06	0.0000E+00	1.00	0.0	4.8200E+06	1.0000E+00	1	1	4.355	
469	4.4-Ru-107	0	4.41070	2.2500E+02	1.0800E+06	5.9619E+05	0.0000E+00	1.00	0.0	2.9404E+06	1.0000E+00	1	1	4.458	
470	4.5-Rh-107	0	4.51070	1.3020E+03	4.3000E+05	3.1300E+05	0.0000E+00	1.00	0.0	1.5110E+06	1.0000E+00	1	1	4.537	
471	4.6-Pd-107	0	4.61070	2.0500E+14	9.3000E+03	0.0000E+00	0.0000E+00	1.00	0.0	3.3005E+04	1.0000E+00	1	1	4.640	
472	4.6-Pd-107	1	4.61071	2.1300E+01	6.2700E+04	1.5180E+05	0.0000E+00	3.00	0.0	2.1490E+05	1.0000E+00	1	1	4.641	
473	4.7-Ag-107	0	4.71070	stable	4.31070	1.2700E+04	0.0000E+00	3.00	0.0	9.3120E+04	1.0000E+00	0	0	4.725	
474	4.7-Ag-107	1	4.71071	4.4300E+01	7.9000E+04	4.7140E+06	0.0000E+00	1.00	0.0	1.3672E+07	1.0000E+00	1	1	3.726	
475	3.9-Y-108	0	3.91080	3.2870E-02	4.2100E+06	2.5670E+06	1.3390E+06	0.0000E+00	1.00	0.0	8.6350E+06	1.0000E+00	1	2	3.982
476	4.0-Zr-108	0	4.01080	8.6850E-02	3.5870E+06	3.1080E+06	0.0000E+00	1.00	0.0	1.0648E+07	1.0000E+00	1	2	4.079	
477	4.1-Nb-108	0	4.11080	6.4050E-01	1.5938E+06	1.1523E+06	0.0000E+00	1.00	0.0	4.7500E+06	1.0000E+00	1	1	4.273	
478	4.2-Mo-108	0	4.21080	1.0900E+00	2.2600E+06	2.9930E+06	0.0000E+00	1.00	0.0	7.7200E+06	1.0000E+00	1	1	4.358	
479	4.3-Tc-108	0	4.31080	5.1700E+00	3.6000E+05	6.1000E+04	0.0000E+00	1.00	0.0	1.3613E+06	1.0000E+00	1	2	4.461	
480	4.4-Ru-108	0	4.41080	2.7300E+02	1.3904E+01	1.2493E+06	0.0000E+00	1.00	0.0	4.5050E+06	1.0000E+00	1	1	4.540	
481	4.5-Rh-108	0	4.51080	1.6800E+01	6.3450E+05	2.7200E+06	0.0000E+00	1.00	0.0	4.5050E+06	1.0000E+00	1	1	4.541	
482	4.6-Pd-108	1	4.51081	3.6000E+02	6.0825E+05	1.6500E+04	0.0000E+00	1.00	0.0	1.6490E+06	9.7150E-01	0	0	4.643	
483	4.6-Pd-108	0	4.61080	stable	4.61080	1.4220E+02	0.0000E+00	2.00	0.0	1.9182E+06	2.8500E-02	2	5	4.728	
484	4.7-Ag-108	0	4.71080	1.3200E+10	8.2600E+03	2.1400E+06	0.0000E+00	3.00	0.0	9.1300E-01	8.7000E-02	2	2	4.729	
485	4.7-Ag-108	1	4.71081	1.3200E+10	8.2600E+03	2.1400E+06	0.0000E+00	3.00	0.0	1.0925E+05	1.0925E+05	0	0	4.831	
486	4.8-Cd-108	0	4.81080	stable	3.91090	2.6160E-02	3.7810E+06	0.0000E+00	1.00	0.0	1.1347E+07	1.0000E+00	1	2	3.985
487	3.9-Y-109	0	3.91090	5.7840E-02	3.3870E+06	2.7030E+06	0.0000E+00	1.00	0.0	9.9940E+06	1.0000E+00	1	2	4.082	
488	4.0-Zr-109	0	4.01090	7.0140E-01	3.1580E+06	2.2630E+06	0.0000E+00	1.00	0.0	9.1470E+06	1.0000E+00	1	2	4.173	
489	4.1-Nb-109	0	4.11090	1.7220E+00	2.6750E+06	1.8760E+06	0.0000E+00	1.00	0.0	7.6230E+06	9.9930E-01	2	2	4.276	
490	4.2-Mo-109	0	4.21090	4.31090	1.4000E+00	2.1440E+06	1.0990E+06	0.0000E+00	1.50	0.0	6.0000E+05	7.0000E-04	2	2	4.361
491	4.3-Tc-109	0	4.31090	1.4000E+00	2.1440E+06	1.0990E+06	0.0000E+00	1.00	0.0	5.9850E+06	9.9840E-01	2	2	4.361	
492	4.4-Ru-109	0	4.41090	3.4500E+01	1.0400E+06	1.6600E+06	0.0000E+00	1.00	0.0	7.2000E+05	1.6000E-03	1	1	4.464	
493	4.4-Ru-109	1	4.41091	1.2900E+01	1.2321E+06	1.1592E+06	0.0000E+00	1.00	0.0	4.1600E+06	1.0000E+00	1	2	4.465	
494	4.5-Rh-109	0	4.51090	8.0000E+01	8.5167E+05	3.7431E+05	0.0000E+00	1.00	0.0	2.5915E+06	1.0000E+00	1	1	4.543	
495	4.6-Pd-109	0	4.61090	4.9324E+04	3.6080E+05	6.4500E+02	0.0000E+00	1.00	0.0	1.1600E+06	5.0000E-04	2	4	4.646	
496	4.6-Pd-109	1	4.61091	2.8140E+02	7.7000E+04	1.1134E+05	0.0000E+00	3.00	0.0	1.0280E+06	9.9950E-01	1	1	4.647	
497	4.7-Ag-109	0	4.71090	stable	3.9600E+01	2.6438E+04	3.4179E+04	0.0000E+00	3.00	0.0	8.8035E+04	1.0000E+00	0	0	4.731
498	4.7-Ag-109	1	4.71091	3.9990E+01	4.81090	3.9990E+07	1.5420E+04	0.0000E+00	2.00	1.0	1.2600E+05	1.0000E+00	1	3	4.834
499	4.8-Cd-109	0	4.81090	4.8880E-02	4.01100	2.8440E+06	1.5090E+06	0.0000E+00	1.00	0.0	7.7030E+06	1.0000E+00	1	2	4.085
500	4.0-Zr-110	0	4.01100	3.2330E-01	4.11100	3.9270E+06	3.7450E+06	0.0000E+00	1.00	0.0	1.2063E+07	1.0000E+00	1	2	4.176
501	4.1-Nb-110	0	4.11100	2.0180E+00	4.21100	2.1990E+06	1.1520E+06	0.0000E+00	1.00	0.0	5.9060E+06	9.0000E+00	1	2	4.279
502	4.2-Mo-110	0	4.21100	9.2000E-01	4.31100	2.1700E+06	0.0000E+00	1.00	0.0	8.7780E+06	9.9630E-01	2	2	4.364	
503	4.3-Tc-110	0	4.31100	9.2000E-01	4.31100	3.0320E+06	0.0000E+00	1.00	0.0	1.4000E+06	3.7000E-03	1.50	1.0	4.464	

## JENDL FP DECAY DATA FILE 2000

No	Symbol	S	ZAAAS	Half-life	E-beta	E-gamma	E-alpha	RTYP	RFS	Q	Branching	NDK	NSP	MAT		
504	44-Ru-110	0	441100	1.4600E+01	6.5850E+05	5.9690E+05	0.0000E+00	1.00	0.0	2.8100E+06	1.0000E+00	1	4	4467		
505	45-Rh-110	0	451100	3.2000E+00	2.1000E+06	1.0811E+06	0.0000E+00	1.00	0.0	5.4000E+06	1.0000E+00	1	2	4546		
506	45-Rh-110	1	451101	2.8500E+01	1.1400E+06	2.3800E+06	0.0000E+00	1.00	0.0	5.4000E+06	1.0000E+00	1	2	4547		
507	46-Pd-110	0	461100	stable								0	0	4649		
508	47-Ag-110	0	471100	2.4600E+01	1.1780E+06	3.0680E+04	0.0000E+00	1.00	0.0	2.8922E+06	9.9700E-01	2	5	4734		
509	47-Ag-110	1	471101	2.1582E+07	6.8470E+04	2.7200E+06	0.0000E+00	1.00	0.0	3.0103E+06	9.8640E-01	2	4	4735		
510	48-Cd-110	0	481100	stable								1.1760E+05	1.3600E-02			
511	49-In-110	0	491100	1.7600E+04	1.0510E+04	3.1000E+06	0.0000E+00	2.00	0.0	3.8780E+06	1.0000E+00	1	4	4916		
512	49-In-110	1	491101	4.1500E+03	6.3000E+05	1.5600E+06	0.0000E+00	2.00	0.0	3.9400E+06	1.0000E+00	1	4	4917		
513	40-Zr-111	0	401110	3.2380E-02	3.5750E+06	3.2090E+06	0.0000E+00	1.00	0.0	1.0893E+07	1.0000E+00	1	2	4088		
514	41-Nb-111	0	411110	1.0330E-01	3.3990E+06	2.5680E+06	0.0000E+00	1.00	0.0	9.8920E+06	1.0000E+00	1	2	4179		
515	42-Mo-111	0	421110	2.8600E-01	3.0980E+06	2.4130E+06	0.0000E+00	1.00	0.0	8.8120E+06	1.0000E+00	1	2	4282		
516	43-Tc-111	0	431110	2.8410E+00	2.4860E+06	1.5010E+06	0.0000E+00	1.00	0.0	6.9770E+06	9.6600E-01	2	2	4367		
517	44-Ru-111	0	441110	2.1200E+00	1.8670E+06	9.6240E+05	0.0000E+00	1.50	0.0	2.3000E+06	3.4000E-02					
518	45-Rh-111	0	451110	1.1000E+01	1.0774E+06	8.9819E+05	0.0000E+00	1.00	0.0	5.4960E+06	1.0000E+00	1	2	4470		
519	46-Pd-111	0	461110	1.4040E+03	8.3200E+05	4.6800E+04	0.0000E+00	1.00	0.0	3.7410E+06	1.0000E+00	1	2	4549		
520	46-Pd-111	1	461111	1.9800E+04	1.8970E+05	3.6000E+05	0.0000E+00	1.00	1.0	2.1285E+06	7.0000E-03	2	4	4652		
521	47-Ag-111	0	471110	6.4370E+05	3.5100E+05	2.6400E+04	0.0000E+00	1.00	0.0	2.3700E+06	4.5584E-02	3	4	4653		
522	47-Ag-111	1	471111	6.4800E+01	2.0000E+05	7.2000E+03	0.0000E+00	1.00	0.0	2.3100E+05	2.2442E-01					
523	48-Cd-111	0	481110	stable								1.0267E+06	7.3000E-01	1	4	4737
524	48-Cd-111	1	481111	2.9160E+03	1.0500E+05	2.8400E+05	0.0000E+00	3.00	0.0	1.0368E+06	1.0000E+00	1	4	4738		
525	49-In-111	0	491110	2.4234E+05	3.2300E+04	4.0500E+05	0.0000E+00	2.00	0.0	8.6540E+05	1.0000E+00	1	3	4841		
526	49-In-111	1	491111	4.6200E+02	6.4000E+04	4.7000E+05	0.0000E+00	3.00	0.0	5.3700E+05	1.0000E+00	1	3	4919		
527	40-Zr-112	0	401120	2.7580E-02	3.0300E+06	1.9430E+06	0.0000E+00	1.00	0.0	8.5240E+06	1.0000E+00	1	2	4091		
528	41-Nb-112	0	411120	6.3060E-02	4.1780E+06	4.1860E+06	0.0000E+00	1.00	0.0	1.3083E+07	1.0000E+00	1	2	4182		
529	42-Mo-112	0	421120	2.2970E-01	2.5520E+06	1.3540E+06	0.0000E+00	1.00	0.0	7.0790E+06	1.0000E+00	1	2	4285		
530	43-Tc-112	0	431120	9.8520E-01	3.3400E+06	2.7900E+06	0.0000E+00	1.00	0.0	9.9550E+06	1.0000E+00	1	2	4370		
531	44-Ru-112	0	441120	3.6000E+00	1.1140E+06	7.2500E+05	0.0000E+00	1.00	0.0	3.6700E+06	1.0000E+00	1	2	4473		
532	45-Rh-112	0	451120	3.8000E+00	2.4770E+06	1.1560E+06	0.0000E+00	1.00	0.0	6.8000E+06	1.0000E+00	1	2	4552		
533	46-Pd-112	0	461120	7.5710E+04	9.0000E+04	5.1500E+03	0.0000E+00	1.00	0.0	2.8800E+05	1.0000E+00	1	4	4655		
534	47-Ag-112	0	471120	1.1270E+04	1.4200E+06	6.9000E+05	0.0000E+00	1.00	0.0	3.9560E+06	1.0000E+00	1	3	4740		
535	48-Cd-112	0	481120	stable								0	0	4843		
536	49-In-112	0	491120	8.9800E+02	2.4170E+05	2.6500E+05	0.0000E+00	1.00	0.0	6.6372E+05	4.4000E-01	2	5	4922		
537	49-In-112	1	491121	1.2340E+03	1.2500E+05	3.5300E+04	0.0000E+00	2.00	0.0	2.5859E+06	5.6000E-01					
538	41-Nb-113	0	411130	5.3240E-02	3.2941E+06	3.6375E+06	0.0000E+00	1.00	0.0	1.5640E+05	1.0000E+00	1	3	4923		
539	42-Mo-113	0	421130	1.2490E-01	3.4300E+06	2.8020E+06	0.0000E+00	1.00	0.0	1.0761E+07	1.0000E+00	1	2	4185		
540	43-Tc-113	0	431130	1.5620E+00	2.7320E+06	1.8220E+06	0.0000E+00	1.00	0.0	9.9670E+06	1.0000E+00	1	2	4288		
541	44-Ru-113	0	441130	8.0000E-01	2.2490E+06	1.4160E+06	0.0000E+00	1.00	0.0	8.1880E+06	1.0000E+00	1	2	4373		
542	45-Rh-113	0	451130	2.7200E+00	1.7330E+06	8.1590E+05	0.0000E+00	1.00	0.0	4.9080E+06	1.0000E+00	1	4	4476		
543	46-Pd-113	0	461130	9.3000E+01	1.0900E+06	6.1020E+05	0.0000E+00	1.00	0.0	3.3400E+06	1.0000E+00	1	4	4555		
544	47-Ag-113	0	471130	1.9330E+04	7.1900E+05	0.0000E+00	1.00	0.0	2.0165E+06	9.8400E-01	0	2	4658			
												1.7529E+06	1.6000E-02			

## JENDL FP DECAY DATA FILE 2000

No	Symbol	S	ZZAAS	Halflife	E-beta	E-gamma	E-alpha	RTYP	RFS	Q	Branching	NDK	NSP	MAT		
545	47-Ag-113	1	471131	6.9000E+01	2.2090E+05	2.1227E+05	0.0000E+00	1.00	0.0	2.0530E+06	3.6000E-01	2	4	4744		
546	48-Cd-113	0	481130	2.9000E+23	9.3300E+04	0.0000E+00	0.0000E+00	1.00	0.0	3.1645E+05	6.4000E-01	1	1	4846		
547	48-Cd-113	1	481131	4.4500E+08	1.8540E+05	7.0700E+01	0.0000E+00	1.00	0.0	5.8000E+05	9.9860E-01	2	4	4847		
548	49-In-113	0	491130	stable	1.3300E+05	2.5769E+05	0.0000E+00	3.00	0.0	3.9169E+05	1.0000E+00	0	0	4925		
549	49-In-113	1	491131	5.9695E+03	1.3700E+05	2.8410E+05	0.0000E+00	2.00	0.0	1.0360E+06	1.9000E-04	1	3	4926		
550	50-Sn-113	0	501130	9.9440E+06							9.9981E-01	2	4	5028		
551	50-Sn-113	1	501131	1.2840E+03	5.7250E+04	1.3700E+04	0.0000E+00	2.00	0.0	1.1160E+06	8.9000E-02	2	4	5029		
552	41-Nb-114	0	411140	3.5500E-02	4.1200E+06	4.6780E+06	0.0000E+00	3.00	0.0	7.7000E+04	9.1100E-01	1	1	4188		
553	42-Mo-114	0	421140	1.0620E-01	2.9250E+06	1.5780E+06	0.0000E+00	1.00	0.0	1.0000E+00	1.0000E+00	1	2	4291		
554	43-Tc-114	0	431140	2.1500E-01	3.5780E+06	3.2570E+06	0.0000E+00	1.00	0.0	1.1067E+07	1.0000E+00	1	2	4376		
555	44-Ru-114	0	441140	5.3000E-01	1.4730E+06	8.4370E+05	0.0000E+00	1.00	0.0	4.8000E+06	1.0000E+00	1	4	4479		
556	45-Rh-114	0	451140	1.8500E+00	2.7420E+06	1.7530E+06	0.0000E+00	1.00	0.0	7.9000E+06	1.0000E+00	1	4	4558		
557	46-Pd-114	0	461140	1.4500E+02	5.3300E+05	8.4923E+04	0.0000E+00	1.00	0.0	1.4507E+06	1.0000E+00	1	4	4661		
558	47-Ag-114	0	471140	4.6000E+00	2.1500E+06	2.5900E+05	0.0000E+00	1.00	0.0	5.0764E+06	1.0000E+00	1	2	4746		
559	48-Cd-114	0	481140	stable								0	0	4849		
560	49-In-114	0	491140	7.1900E+01	7.7413E+05	2.1400E+03	0.0000E+00	1.00	0.0	1.9887E+06	9.9500E-01	2	5	4928		
561	49-In-114	1	491141	4.2777E+06	1.43329E+05	8.0200E+04	0.0000E+00	2.00	0.0	1.4519E+06	5.0000E-03	2	4	4929		
562	50-Sn-114	0	501140	stable								3.2500E-02	2	4	5031	
563	41-Nb-115	0	411150	2.7690E-02	3.7360E+06	3.2730E+06	0.0000E+00	1.00	0.0	1.1291E+07	1.0000E+00	0	1	2419		
564	42-Mo-115	0	421150	6.4780E-02	3.5980E+06	2.9980E+06	0.0000E+00	1.00	0.0	1.0731E+07	1.0000E+00	1	2	2429		
565	43-Tc-115	0	431150	1.9430E-01	2.9950E+06	2.1620E+06	0.0000E+00	1.00	0.0	9.2870E+06	1.0000E+00	1	2	2437		
566	44-Ru-115	0	441150	2.1200E+00	2.5380E+06	1.8060E+06	0.0000E+00	1.00	0.0	7.6250E+06	1.0000E+00	1	2	2482		
567	45-Rh-115	0	451150	9.9000E-01	2.0210E+06	1.0540E+06	0.0000E+00	1.00	0.0	6.0000E+06	9.9850E-01	2	4	4561		
568	46-Pd-115	0	461150	3.7401E+01	1.3453E+06	1.2512E+06	0.0000E+00	1.00	0.0	1.0000E+06	1.5000E-03	2	2	4664		
569	47-Ag-115	0	471150	1.2000E+03	1.0800E+06	4.8000E+05	0.0000E+00	1.00	0.0	4.5840E+06	7.3000E-01	2	2	4749		
570	47-Ag-115	1	471151	1.8000E+01	1.0000E+06	4.9800E+05	0.0000E+00	1.00	0.0	3.1400E+06	7.5500E-01	3	4	4750		
571	48-Cd-115	0	481150	1.9250E+05	3.1900E+05	1.9300E+05	0.0000E+00	1.00	0.0	4.1100E+06	2.1000E-01	2	4	4852		
572	48-Cd-115	1	481151	3.8500E+06	6.0510E+05	3.3000E+04	0.0000E+00	1.00	0.0	1.1097E+06	1.0000E+00	2	4	4853		
573	49-In-115	0	491150	1.3900E+22	1.5200E+05	0.0000E+00	0.0000E+00	1.00	0.0	1.2870E+06	7.0000E-05	1	1	4931		
574	49-In-115	1	491151	1.6150E+04	1.7380E+05	1.6323E+05	0.0000E+00	1.00	0.0	8.2100E+05	5.0000E-02	2	4	4932		
575	50-Sn-115	0	501150	stable								3.3620E+05	9.5000E-01	0	0	5034
576	42-Mo-116	0	421160	4.9440E-02	3.1780E+06	1.7370E+06	0.0000E+00	1.00	0.0	1.4459E+06	0.0000E+00	1	2	4297		
577	43-Tc-116	0	431160	1.1380E-01	3.6930E+06	3.4950E+06	0.0000E+00	1.00	0.0	1.6230E+06	9.9993E-01	2	2	4382		
578	44-Ru-116	0	441160	5.0650E-01	1.8430E+06	9.8600E+05	0.0000E+00	1.00	0.0	1.2870E+06	7.0000E-05	1	2	4485		
579	45-Rh-116	0	451160	6.8000E-01	2.9670E+06	2.2200E+06	0.0000E+00	1.00	0.0	1.5000E+06	2.4000E-03	2	4	4564		

## JENDL FP DECAY DATA FILE 2000

No	Symbol	S	ZAAAS	Halflife	E-bata	E-gamma	E-alpha	RTYP	RFS	Q	Branching	NDK	NSP	MAT		
580	46-Pd-116	0	4 61160	1.1800E+01	6.6230E+05	6.0400E+05	0.0000E+00	1.00	0.0	2.6070E+06	1.0000E+00	1	4 4667			
581	47-Ag-116	0	4 71160	1.6080E+02	1.5910E+06	2.4773E+06	0.0000E+00	1.00	0.0	6.1517E+06	1.0000E+00	1	2 4752			
582	47-Ag-116	1	4 71161	8.6000E+00	1.3458E+06	2.7148E+06	0.0000E+00	1.00	0.0	6.2400E+06	9.4000E-01	2	4 4753			
583	48-Cd-116	0	4 81160	stable						8.1900E+04	6.0000E-02					
584	49-In-116	0	4 91160	1.4100E+01	1.3630E+06	1.9590E+04	0.0000E+00	1.00	0.0	3.2750E+06	1.0000E+00	0	0 4855			
585	49-In-116	1	4 91161	3.2650E+03	3.1000E+05	2.4700E+06	0.0000E+00	1.00	0.0	3.4010E+06	1.0000E+00	1	3 4934			
586	49-In-116	2	4 91162	2.1800E+00	9.1406E+04	6.9000E+04	0.0000E+00	3.00	0.0	1.6239E+05	1.0000E+00	1	4 4935			
587	50-Sn-116	0	5 01160	stable						1.0						
588	51-Sb-116	0	5 11160	9.5000E+02	5.2000E+05	2.2900E+06	0.0000E+00	2.00	0.0	4.7069E+06	1.0000E+00	0	0 5037			
589	51-Sb-116	1	5 11161	3.6200E+03	2.1400E+05	3.2000E+06	0.0000E+00	2.00	0.0	5.3200E+06	1.0000E+00	1	4 5110			
590	42-Mo-117	0	4 21170	3.6980E-02	3.7800E+06	3.4420E+06	0.0000E+00	1.00	0.0	1.1558E+07	1.0000E+00	1	2 4300			
591	43-Tc-117	0	4 31170	8.6800E-02	3.1730E+06	2.3900E+06	0.0000E+00	1.00	0.0	9.2680E+06	1.0000E+00	1	2 4385			
592	44-Ru-117	0	4 41170	2.6450E-01	2.6970E+06	2.0260E+06	0.0000E+00	1.00	0.0	7.9300E+06	1.0000E+00	1	2 4488			
593	45-Rh-117	0	4 51170	1.7000E+00	2.2890E+06	1.3590E+06	0.0000E+00	1.00	0.0	6.9960E+06	9.7500E-01	2	2 4567			
594	46-Pd-117	0	4 61170	5.0000E+00	1.9150E+06	1.0870E+06	0.0000E+00	1.00	0.0	2.4000E+06	2.5000E-02					
595	47-Ag-117	0	4 71170	7.2800E+01	1.1000E+06	1.3000E+06	0.0000E+00	1.00	0.0	5.7340E+06	1.0000E+00	1	2 4670			
596	47-Ag-117	1	4 71171	5.3400E+00	1.4727E+06	8.3200E+05	0.0000E+00	1.00	0.0	4.0200E+06	1.7200E-01	2	4 4755			
597	48-Cd-117	0	4 81170	8.9600E+03	4.3000E+05	1.0800E+06	0.0000E+00	1.00	0.0	4.2000E+06	8.0276E-01	3	4 4756			
598	48-Cd-117	1	4 81171	1.2100E+04	2.0700E+05	2.0390E+06	0.0000E+00	1.00	0.0	2.5174E+06	8.5000E-02	2	4 4858			
599	49-In-117	0	4 91170	2.5900E+03	2.6400E+05	6.9000E+05	0.0000E+00	1.00	1.0	2.2021E+06	9.1500E-01	2	2 4859			
600	49-In-117	1	4 91171	6.9700E+03	2.6700E+05	9.1000E+04	0.0000E+00	1.00	0.0	1.4550E+06	9.8500E-01	2	2 4937			
601	50-Sn-117	0	5 01170	stable						3.00	0.0	4.0200E+06	1.7200E-01	2	4 4938	
602	50-Sn-117	1	5 01171	1.1750E+06	1.5600E+05	1.5750E+05	0.0000E+00	3.00	0.0	4.0600E+06	1.3724E-01	0	0 5040			
603	51-Sb-117	0	5 11170	1.0080E+04	2.8100E+04	1.8480E+05	0.0000E+00	2.00	0.0	2.8600E+04	6.0000E-02					
604	43-Tc-118	0	4 31180	5.6850E-02	3.8700E+06	3.8350E+06	0.0000E+00	1.00	0.0	2.5174E+06	8.5000E-02	2	4 5113			
605	44-Ru-118	0	4 41180	2.3260E-01	2.0940E+06	1.1180E+06	0.0000E+00	1.00	0.0	2.2130E+07	1.0000E+00	1	2 4388			
606	45-Rh-118	0	4 51180	5.3260E-01	3.0940E+06	2.4940E+06	0.0000E+00	1.00	0.0	7.0790E+06	1.0000E+00	1	2 4491			
607	46-Pd-118	0	4 61180	1.9000E+00	1.0440E+06	7.1540E+05	0.0000E+00	1.00	0.0	2.3460E+06	1.5000E-02					
608	47-Ag-118	0	4 71180	3.7600E+00	2.5790E+06	1.5700E+06	0.0000E+00	1.00	0.0	1.1404E+06	1.5000E-02					
609	47-Ag-118	1	4 71181	2.0000E+00	1.1278E+06	1.8527E+06	0.0000E+00	1.00	0.0	1.7690E+06	5.2900E-01	2	4 4759			
610	48-Cd-118	0	4 81180	3.0180E+03	2.3452E+05	2.9919E+04	0.0000E+00	1.00	0.0	3.00	0.0	4.2774E+05	4.1000E-01			
611	49-In-118	0	4 91180	5.0000E+00	1.8790E+06	7.8000E+04	0.0000E+00	1.00	0.0	5.2119E+05	1.0000E+00	1	2 4861			
612	49-In-118	1	4 91181	2.6700E+02	6.1000E+05	2.7800E+06	0.0000E+00	1.00	0.0	4.4230E+06	1.0000E+00	1	2 4940			
613	49-In-118	2	4 91182	8.5000E+00	1.0750E+05	7.5400E+04	0.0000E+00	1.00	0.0	4.5620E+06	1.4300E-02	2	4 4941			
614	50-Sn-118	0	5 01180	stable						3.00	1.0	1.4000E+05	9.8570E-01	0	0 5043	
615	51-Sb-118	0	5 11180	2.1600E+02	8.7300E+05	8.0400E+05	0.0000E+00	2.00	0.0	3.6566E+06	1.0000E+00	1	1 4 5116			
616	51-Sb-118	1	5 11181	1.8000E+04	3.5100E+04	2.6100E+06	0.0000E+00	2.00	0.0	3.9070E+06	1.0000E+00	1	1 4 5117			
617	43-Tc-119	0	4 31190	4.8570E-02	3.2640E+06	2.8470E+06	0.0000E+00	1.00	0.0	9.2000E+06	1.0000E+00	1	1 4 5391			
618	44-Ru-119	0	4 41190	1.2040E-01	2.9200E+06	2.3110E+06	0.0000E+00	1.00	0.0	8.6820E+06	1.0000E+00	1	2 4494			

JENDL FP DECAY DATA FILE 2000																			
No	Symbol	S	ZAAAAS	Halflife	E-beta	E-gamma	E-alpha	RTYP	RFS	Q	Branching	NDK	NSP	MAT					
619	45-Rh-119	0	451190	4.-5080E-01	2.-4760E+06	1.-5980E+06	0.-0000E+00	1.-00	0.-0	8.-0850E+06	1.-0000E+00	1	2	4573					
620	46-Pd-119	0	461190	5.-9569E+00	2.-1110E+06	1.-3370E+06	0.-0000E+00	1.-00	0.-0	6.-5330E+06	1.-0000E+00	1	2	4676					
621	47-Ag-119	0	471190	2.-1000E+00	1.-55613E+06	1.-6200E+06	0.-0000E+00	1.-00	1.-0	5.-2000E+06	7.-4800E-01	2	4	4761					
622	48-Cd-119	0	481190	1.-6140E+02	8.-1000E+05	1.-6400E+06	0.-0000E+00	1.-00	0.-0	3.-7970E+06	9.-5000E-02	2	4	4864					
623	48-Cd-119	1	481191	1.-3200E+02	7.-0000E+05	2.-3000E+06	0.-0000E+00	1.-00	0.-0	3.-4860E+06	9.-0500E-01	2	4	4865					
624	49-In-119	0	491190	1.-4400E+02	5.-8000E+05	7.-7000E+05	0.-0000E+00	1.-00	0.-0	2.-3633E+06	9.-9000E-01	2	4	4943					
625	49-In-119	1	491191	1.-0800E+03	9.-7100E+05	1.-2970E+05	0.-0000E+00	1.-00	0.-0	2.-2741E+06	1.-0000E-02	2	4	4944					
626	50-Sn-119	0	501190	stable	7.-4600E+07	1.-5160E+04	0.-0000E+00	3.-00	0.-0	8.-9536E+04	1.-0000E+00	0	0	5046					
627	50-Sn-119	1	501191	2.-5320E+07	2.-2700E+04	2.-3130E+04	0.-0000E+00	2.-00	0.-0	5.-9390E+05	1.-0000E+00	1	3	5047					
628	51-Sb-119	0	511190	1.-3750E+05	1.-3040E+04	7.-6800E+05	0.-0000E+00	2.-00	0.-0	2.-2930E+06	1.-0000E+00	1	4	5119					
629	52-Te-119	0	521190	5.-7710E+04	1.-6500E+05	1.-5290E+06	0.-0000E+00	2.-00	0.-0	2.-5560E+06	1.-0000E+00	1	4	5223					
630	52-Te-119	1	521191	4.-0600E+05	3.-2350E+02	3.-8240E+06	0.-0000E+00	1.-00	0.-0	1.-2592E+07	1.-0000E+00	1	2	4394					
631	43-Tc-120	0	431200	3.-231200	2.-3610E+06	1.-2660E+06	0.-0000E+00	1.-00	0.-0	6.-4990E+06	1.-0000E+00	1	2	4497					
632	44-Ru-120	0	441200	1.-0890E-01	3.-1160E-01	3.-2610E+06	0.-0000E+00	1.-00	0.-0	1.-045E+07	1.-0000E+00	1	2	4576					
633	45-Rh-120	0	451200	2.-15240E+02	8.-1370E+05	8.-1370E+05	0.-0000E+00	1.-00	0.-0	4.-8820E+06	1.-0000E+00	1	2	4677					
634	46-Pd-120	0	461200	1.-5240E+01	1.-3430E+06	2.-8811E+06	0.-0000E+00	1.-00	0.-0	8.-3250E+06	1.-0000E+00	1	2	4764					
635	47-Ag-120	0	471200	1.-23000E+00	2.-2870E+06	2.-0859E+06	0.-0000E+00	1.-00	0.-0	8.-4000E+06	6.-3000E-01	2	4	4765					
636	47-Ag-120	1	471201	3.-20000E-01	1.-3708E+06	3.-0708E+06	0.-0000E+00	3.-00	0.-0	2.-0300E+05	3.-7000E-01	2	4	4766					
637	48-Cd-120	0	481200	5.-0799E+01	6.-0720E+05	1.-2748E+05	0.-0000E+00	1.-00	0.-0	1.-7604E+06	1.-0000E+00	1	2	4867					
638	49-In-120	0	491200	3.-0800E+00	2.-2100E+06	6.-4542E+05	0.-0000E+00	1.-00	0.-0	5.-3700E+06	1.-0000E+00	1	2	4946					
639	49-In-120	1	491201	4.-7300E+01	7.-3000E+05	3.-3100E+06	0.-0000E+00	1.-00	0.-0	5.-3000E+06	1.-0000E+00	1	2	4947					
640	50-Sn-120	0	5011200	stable	9.-5340E+02	3.-0700E+05	4.-5200E+05	0.-0000E+00	2.-00	0.-0	1.-0000E+00	1.-0000E+00	0	0	5049				
641	51-Sb-120	0	5111200	4.-9770E+05	4.-22000E+04	2.-4660E+06	0.-0000E+00	2.-00	0.-0	2.-6806E+06	1.-0000E+00	1	4	5122					
642	51-Sb-120	1	5111201	4.-9770E+05	5211200	stable	2.-9510E+06	0.-0000E+00	1.-00	0.-0	9.-1740E+06	1.-0000E+00	0	0	5225				
643	52-Te-120	0	5211200	6.-9440E-02	2.-6710E+06	1.-8520E+06	0.-0000E+00	1.-00	0.-0	7.-7580E+06	1.-0000E+00	1	2	4550					
644	44-Ru-121	0	441210	1.-8570E-01	2.-3350E+06	1.-6380E+06	0.-0000E+00	1.-00	0.-0	6.-4000E+06	9.-9924E-01	2	4	4682					
645	45-Rh-121	0	451210	5.-6610E-01	2.-0715E+06	2.-0715E+06	0.-0000E+00	1.-50	0.-0	1.-2400E+06	7.-6000E-04	2	4	4767					
646	46-Pd-121	0	461210	5.-6610E-01	1.-6673E+01	1.-6673E+01	0.-0000E+00	1.-00	0.-0	4.-4700E+06	1.-0000E+00	1	4	4870					
647	47-Ag-121	0	471210	7.-8000E-01	1.-5021E+06	6.-3600E+04	0.-0000E+00	1.-00	0.-0	9.-8800E-01	2.-2400E+06	2	4	4950					
648	48-Cd-121	0	481210	1.-3500E+01	1.-2400E+06	1.-7300E+06	0.-0000E+00	1.-00	1.-0	4.-4700E+06	1.-0000E+00	1	4	4871					
649	48-Cd-121	1	481211	8.-3000E+00	1.-1800E+06	2.-2400E+06	0.-0000E+00	1.-00	0.-0	5.-1000E+06	1.-0000E+00	1	2	4949					
650	49-In-121	0	491210	2.-3100E+01	9.-8000E+05	1.-0735E+06	0.-0000E+00	1.-00	0.-0	3.-3645E+06	8.-9000E-01	2	4	5043					
651	49-In-121	1	491211	2.-3280E+02	1.-5021E+06	6.-3600E+04	0.-0000E+00	1.-00	0.-0	3.-3582E+06	1.-1000E-01	2	4	5123					
652	50-Sn-121	0	5011210	9.-7420E+04	1.-1520E+05	0.-0000E+00	1.-00	0.-0	9.-8800E-01	2.-2400E+06	1	1	5052						
653	50-Sn-121	1	5011211	1.-7400E+09	3.-3700E+04	5.-0330E+03	0.-0000E+00	1.-00	0.-0	6.-3000E+03	7.-7600E-01	2	4	5053					
654	51-Sb-121	0	5111210	stable	8.-5000E+03	5.-7700E+05	0.-0000E+00	2.-00	0.-0	1.-0356E+06	1.-0000E+00	0	0	5125					
655	52-Te-121	0	5211210	1.-4500E+06	2.-6720E+06	1.-6673E+06	0.-0000E+00	1.-00	0.-0	1.-3400E+06	1.-1400E-01	1	4	5228					
656	52-Te-121	1	5211211	1.-3300E+07	7.-5750E+04	2.-1670E+05	0.-0000E+00	2.-00	0.-0	2.-9398E+05	8.-8600E-01	2	4	5229					
657	44-Ru-122	0	441220	5.-8950E-02	2.-6800E+06	1.-4500E+06	0.-0000E+00	1.-00	0.-0	7.-33330E+06	1.-0000E+00	1	2	4503					

## JENDL FP DECAY DATA FILE 2000

No	Symbol	S	ZZAAS	Half-life	E-beta	E-gamma	E-alpha	RTYP	RFS	Q	Branching	NDK	NSP	MAT
658	45-Rh-122	0	451220	1.0520E+01	3.3700E+06	3.0700E+06	0.0000E+00	1.00	0.0	-0.0359E+07	1.0000E+00	1	2 4582	
659	46-Pd-122	0	461220	4.5550E-01	1.6500E+06	9.2090E+05	0.0000E+00	1.00	0.0	6.0360E+06	1.0000E+00	1	2 4685	
660	47-Ag-122	0	471220	4.8000E-01	3.0480E+06	2.5110E+06	0.0000E+00	1.00	0.0	9.1470E+06	9.9814E-01	2	2 4770	
661	48-Cd-122	0	481220	5.2400E+00	7.9681E+05	4.5565E+05	0.0000E+00	1.50	1.0	1.3600E+06	1.8600E-03			
662	49-In-122	0	491220	1.5000E+00	2.5300E+06	1.2420E+06	0.0000E+00	1.00	0.0	3.0020E+06	1.0000E+00	1	2 4873	
663	49-In-122	1	491221	1.0300E+01	1.3200E+06	3.0600E+06	0.0000E+00	1.00	0.0	6.3686E+06	1.0000E+00	1	2 4952	
664	50-Sn-122	0	501220	stable						6.3700E+06	1.0000E+00	1	4 4953	
665	51-Sb-122	0	511220	2.3534E+05	5.5984E+05	4.4530E+05	0.0000E+00	1.00	0.0	1.9826E+06	9.7590E-01	0	0 5055	
666	51-Sb-122	1	511221	2.5146E+02	4.0400E+04	4.2790E+04	0.0000E+00	3.00	0.0	1.6164E+06	2.4100E-02	2	5 5128	
667	52-Te-122	0	521220	stable						1.6356E+05	1.0000E+00	1	3 5129	
668	53-I-122	0	531220	2.1800E+02	2.0800E+06	9.6001E+05	0.0000E+00	2.00	0.0	4.2340E+06	1.0000E+00	1	0 5231	
669	44-Ru-123	0	441230	3.5690E-02	3.1430E+06	2.9030E+06	0.0000E+00	1.00	0.0	9.7390E+06	1.0000E+00	1	4 5310	
670	45-Rh-123	0	451230	9.3040E-02	2.9030E+06	2.1470E+06	0.0000E+00	1.00	0.0	8.4890E+06	1.0000E+00	1	2 4506	
671	46-Pd-123	0	461230	2.5560E-01	2.4950E+06	1.8590E+06	0.0000E+00	1.00	0.0	8.7190E+06	1.0000E+00	1	2 4585	
672	47-Ag-123	0	471230	3.1000E-01	2.6400E+06	1.8590E+06	0.0000E+00	1.00	0.0	7.3550E+06	9.9450E-01	2	2 4688	
673	48-Cd-123	0	481230	2.1000E+00	1.7700E+06	2.0200E+06	0.0000E+00	1.50	0.0	2.5000E+06	5.5000E-03		4 4773	
674	49-In-123	0	491230	5.9800E+00	1.4100E+06	1.0500E+06	0.0000E+00	1.00	0.0	6.1150E+06	3.1000E-01	2	4 4876	
675	49-In-123	1	491231	4.7800E+01	2.0320E+06	6.6000E+04	0.0000E+00	1.00	0.0	5.7880E+06	6.9000E-01			
676	50-Sn-123	0	501230	1.1160E+07	5.2280E+05	6.9000E+03	0.0000E+00	1.00	0.0	4.3939E+06	3.2000E-02	2	4 4955	
677	50-Sn-123	1	501231	2.4036E+03	4.7850E+05	1.4070E+05	0.0000E+00	1.00	0.0	1.0000E+06	1.0000E+00	1	4 4956	
678	51-Sb-123	0	511230	stable						1.4270E+06	1.0000E+00	1	3 5058	
679	52-Te-123	0	521230	3.1560E+20	2.0010E+03	2.6000E+02	0.0000E+00	2.00	0.0	5.3333E+04	1.0000E+00	0	0 5131	
680	52-Te-123	1	521231	1.0342E+07	1.0280E+05	1.4860E+05	0.0000E+00	3.00	0.0	2.4746E+05	1.0000E+00	1	3 5234	
681	53-I-123	0	531230	4.7800E+04	2.6600E+04	1.7270E+05	0.0000E+00	2.00	0.0	1.2342E+06	9.9996E-01	2	4 5313	
682	44-Ru-124	0	441240	3.0550E-02	3.0670E+06	1.6840E+06	0.0000E+00	1.00	0.0	1.0000E+06	4.0000E-05			
683	45-Rh-124	0	451240	5.0870E-02	3.4960E+06	3.3260E+06	0.0000E+00	1.00	0.0	8.3730E+06	1.0000E+00	1	2 4509	
684	46-Pd-124	0	461240	1.9120E-01	1.9810E+06	1.0720E+06	0.0000E+00	1.00	0.0	1.0873E+07	1.0000E+00	1	2 4588	
685	47-Ag-124	0	471240	1.7000E-01	3.0900E+06	2.6220E+06	0.0000E+00	1.00	0.0	5.5430E+06	1.0000E+00	1	2 4691	
686	48-Cd-124	0	481240	1.2400E+00	1.1413E+06	5.6755E+05	0.0000E+00	1.00	0.0	1.0136E+07	9.9020E-01	2	2 4776	
687	49-In-124	0	491240	3.1700E+00	2.1893E+06	0.0000E+00	1.00	0.0	2.7000E+06	9.8000E-03				
688	49-In-124	1	491241	3.4000E+00	1.8400E+06	3.8000E+06	0.0000E+00	1.00	0.0	4.1660E+06	1.0000E+00	1	4 4879	
689	50-Sn-124	0	501240	stable						7.3600E+06	1.0000E+00	1	4 4958	
690	51-Sb-124	0	511240	5.2010E+06	3.8900E+05	1.8470E+06	0.0000E+00	1.00	0.0	7.4000E+06	1.0000E+00	1	4 4959	
691	51-Sb-124	1	511241	9.3000E+01	1.1400E+05	4.4000E+05	0.0000E+00	1.00	0.0	2.9045E+06	1.0000E+00	0	0 5061	
692	51-Sb-124	2	511242	1.2120E+03	2.3100E+04	2.3600E+02	0.0000E+00	3.00	0.0	2.9154E+06	2.5000E-01	1	4 5134	
693	52-Te-124	0	521240	stable						1.0860E+04	7.5000E-01	2	4 5135	
694	53-I-124	0	531240	3.6120E+05	1.9600E+05	1.0850E+06	0.0000E+00	2.00	0.0	3.1596E+06	1.0000E+00	0	0 5237	
695	45-Rh-125	0	451250	4.4100E-02	3.2700E+06	2.7270E+06	0.0000E+00	1.00	0.0	9.4230E+06	1.0000E+00	1	4 5316	
696	46-Pd-125	0	461250	1.1310E-01	2.6710E+06	2.0920E+06	0.0000E+00	1.00	0.0	7.9720E+06	1.0000E+00	1	2 4591	
697	47-Ag-125	0	471250	1.7670E+00	2.5910E+06	1.8150E+06	0.0000E+00	1.00	0.0	8.6560E+06	9.5800E-01	2	2 4694	
698	48-Cd-125	0	481250	6.5000E-01	2.2200E+06	2.1800E+06	0.0000E+00	1.00	0.0	3.9000E+06	4.2000E-02	2	2 4779	
										7.1220E+06	4.9000E-01	2	2 4882	
										6.7620E+06	5.1000E-01			

## JENDL FP DECAY DATA FILE 2000

No	Symbol	S	ZZAAS	Halflife	E-beta	E-gamma	E-alpha	RTYP	RFS	Q	Branching	NDK	NSP	MAT
699	49-In-125	0	491250	2.3600E+00	1.8100E+06	1.2000E+06	0.0000E+00	1.00	0.0	5.4180E+06	1.1000E-01	2	4	4961
700	49-In-125	1	491251	1.2200E+01	2.0970E+06	6.7203E+05	0.0000E+00	1.00	1.0	5.3910E+06	8.9000E-01			
701	50-Sn-125	0	501250	8.3300E+05	8.0000E+05	3.3000E+05	0.0000E+00	1.00	0.0	5.7800E+06	1.0000E+00	1	4	4962
702	50-Sn-125	1	501251	5.7100E+02	8.0600E+05	3.4600E+05	0.0000E+00	1.00	0.0	2.3633E+06	1.0000E+00	1	4	5064
703	51-Sb-125	0	511250	8.7040E+07	9.9500E+04	4.3600E+05	0.0000E+00	1.00	0.0	2.3880E+06	1.0000E+00	1	4	5065
704	52-Te-125	0	521250	stable	1.0600E+05	3.5600E+04	0.0000E+00	3.00	0.0	1.4478E+05	1.0000E+00	0	0	5240
705	52-Te-125	1	521251	4.9590E+06	4.2200E+04	0.0000E+00	2.00	0.0	1.8577E+05	1.0000E+00	1	3	5241	
706	53-I-125	0	531250	5.1323E+06	1.6500E+04	3.5000E+04	2.7200E+05	0.00	0.0	1.6526E+06	1.0000E+00	1	4	5319
707	54-Xe-125	0	541250	6.0800E+04	3.4620E+06	3.9960E+06	0.0000E+00	1.00	0.0	1.1490E+07	1.0000E+00	1	4	5428
708	45-Rh-126	0	451260	2.6700E-02	3.4620E+06	3.3590E+06	1.2760E+06	0.00	0.0	6.5210E+06	1.0000E+00	1	2	4594
709	46-Pd-126	0	461260	7.8730E-02	2.9960E+06	3.4380E+06	0.0000E+00	1.00	0.0	1.1314E+07	1.0000E+00	1	2	4697
710	47-Ag-126	0	471260	1.0310E+00	2.4905E+06	7.2089E+05	0.0000E+00	1.00	1.0	5.3840E+06	1.0000E+00	1	2	4782
711	48-Cd-126	0	481260	5.0598E-01	2.8100E+06	2.4400E+06	0.0000E+00	1.00	0.0	8.2070E+06	1.0000E+00	1	2	4885
712	49-In-126	0	491260	1.6000E+00	4.3000E+06	4.4400E+06	0.0000E+00	1.00	0.0	8.4100E+06	1.0000E+00	1	4	4964
713	49-In-126	1	491261	1.6400E+00	2.0200E+05	1.0200E+05	0.0000E+00	1.00	1.0	3.6000E+05	1.0000E+00	1	4	4965
714	50-Sn-126	0	501260	3.1560E+12	1.6000E+05	3.6000E+05	0.0000E+00	1.00	0.0	3.6725E+06	1.0000E+00	1	4	5067
715	51-Sb-126	0	511260	1.0770E+06	2.7700E+06	1.4430E+06	0.0000E+00	1.00	0.0	3.6800E+06	8.6000E-01	2	4	5140
716	51-Sb-126	1	511261	1.1490E+03	6.5210E+05	0.0000E+00	3.00	0.0	1.7700E+04	1.4000E-01	0	0	5141	
717	52-Te-126	0	521260	stable	4.3300E+05	0.0000E+00	1.00	0.0	1.2510E+06	4.3700E-01	0	0	5243	
718	53-I-126	0	531260	1.1330E+06	1.4510E+05	2.00	0.0	2.1560E+06	5.6300E-01	2	5	5322		
719	54-Xe-126	0	541260	stable	3.4010E+06	3.0370E+06	0.0000E+00	1.00	0.0	1.0408E+07	1.0000E+00	0	0	5431
720	45-Rh-127	0	451270	2.6880E-02	2.7470E+06	2.5599E+06	0.0000E+00	1.00	0.0	8.6430E+06	1.0000E+00	1	2	4597
721	46-Pd-127	0	461270	4.7440E-02	2.0259E-01	2.8870E+06	2.1810E+06	0.00	0.0	9.7300E+06	1.0000E+00	1	2	4700
722	47-Ag-127	0	471270	9.0259E-01	4.1010E+00	2.0730E+06	2.0010E+06	0.00	0.0	8.4680E+06	1.0000E+00	1	2	4785
723	48-Cd-127	0	481270	4.1010E+00	2.4000E+06	1.4430E+06	0.0000E+00	1.00	0.0	6.5140E+06	1.6000E-01	2	4	4887
724	49-In-127	0	491270	1.0900E+00	2.4000E+06	1.0910E+04	0.0000E+00	1.00	1.0	6.5090E+06	8.4000E-01	0	0	4967
725	49-In-127	1	491271	3.6700E+00	2.1910E+06	1.7270E+06	0.0000E+00	1.00	1.0	6.9700E+06	9.9300E-01	2	4	4968
726	50-Sn-127	0	501270	7.5600E+03	5.7000E+05	1.9100E+06	0.0000E+00	1.00	0.0	9.5000E+05	7.0000E-03			
727	50-Sn-127	1	501271	2.4780E+02	8.9031E+05	8.8645E+05	0.0000E+00	1.00	0.0	3.2060E+06	1.0000E+00	1	2	5071
728	51-Sb-127	0	511270	3.3300E+05	3.1300E+05	6.9300E+05	0.0000E+00	1.00	0.0	1.5810E+06	8.6100E-01	2	4	5143
729	52-Te-127	0	521270	3.3700E+04	2.2460E+05	4.4000E+03	0.0000E+00	1.00	0.0	1.4930E+06	1.3900E-01	2	4	5246
730	52-Te-127	1	521271	9.4200E+06	7.5900E+04	1.0910E+04	0.0000E+00	1.00	0.0	7.8600E+05	2.4000E-02	2	4	5247
731	53-I-127	0	531270	stable	2.9800E+04	2.7600E+05	0.0000E+00	2.00	0.0	6.6244E+05	1.0000E+00	0	0	5325
732	54-Xe-127	0	541270	3.1450E+06	1.1600E+01	1.6700E+05	0.0000E+00	3.00	0.0	2.9710E+05	1.0000E+00	1	4	5434
733	54-Xe-127	1	541271	6.9200E+01	4.5950E+06	5.3420E+06	0.0000E+00	1.00	0.0	1.5143E+07	1.0000E+00	1	3	5435
734	45-Rh-128	0	451280	2.2200E-02	2.7610E+06	1.5060E+06	0.0000E+00	1.00	0.0	7.5700E+06	1.0000E+00	1	2	4600
735	46-Pd-128	0	461280	5.0920E-02	3.1990E+02	3.6990E+06	0.0000E+00	1.00	0.0	1.0644E+07	1.0000E+00	1	2	4703
736	47-Ag-128	0	471280	5.3580E-02	1.8310E+01	1.0030E+06	0.0000E+00	1.00	0.0	7.0700E+06	1.0000E+00	1	2	4788
737	48-Cd-128	0	481280	9.4000E-01	2.8100E+06	3.0700E+06	0.0000E+00	1.00	0.0	8.9756E+06	9.9940E-01	1	2	4889
738	49-In-128	0	491280	8.0000E-01	2.6000E+06	3.5800E+06	0.0000E+00	1.50	1.00	6.0000E+06	1.0000E+00	1	4	4970
739	49-In-128	1	491281	7.0000E-01	2.6000E+06	3.5800E+06	0.0000E+00	1.00	0.0	9.3900E+06	1.0000E+00	1	4	4971

## JENDL FP DECAY DATA FILE 2000

No	Symbol	S	ZAAAS	Halflife	E-bata	E-gamma	E-alpha	Rtyp	RFS	Q	Branching	NDK	NSP	MAT	
740	50-Sn-128	0	501280	3.5500E+03	2.5000E+05	6.0000E+05	0.0000E+00	1.00	1.00	1.2739E+06	1.0000E+00	1	4	5073	
741	51-Sb-128	0	511280	3.2440E+04	4.3000E+05	3.0900E+06	0.0000E+00	1.00	0.00	4.3836E+06	1.0000E+00	1	4	5146	
742	51-Sb-128	1	511281	6.2400E+02	9.0071E+05	1.9100E+06	0.0000E+00	1.00	0.00	4.2600E+06	9.6400E-01	2	4	5147	
743	52-Te-128	0	521280	stable					3.00	0.00	2.0000E+04	3.6000E-02			
744	53-Te-128	0	531280	1.4994E+03	7.3800E+05	9.0000E+04	0.0000E+00	1.00	0.00	2.1190E+06	9.3100E-01	0	0	5249	
745	54-Xe-128	0	541280	stable					2.00	0.00	1.2520E+06	6.9000E-02	2	5	5328
746	55-Cs-128	0	551280	2.1720E+02	8.7000E+05	8.8900E+05	0.0000E+00	2.00	0.00	3.9286E+06	1.0000E+00	0	0	5437	
747	46-Pd-129	0	461290	6.0899E-02	3.9990E+02	3.6810E+06	0.0000E+00	1.00	0.00	1.2280E+07	1.0000E+00	1	4	5510	
748	47-Ag-129	0	471290	5.7680E-02	3.1070E+06	2.7900E+06	0.0000E+00	1.00	0.00	9.5770E+06	1.0000E+00	1	2	4706	
749	48-Cd-129	0	481290	2.2580E+00	2.3040E+06	2.2280E+06	0.0000E+00	1.00	0.00	9.8760E+06	9.9980E-01	2	2	4791	
750	49-In-129	0	491290	6.3000E-01	2.4600E+06	2.1700E+06	0.0000E+00	1.50	1.00	2.9000E+06	2.0000E-04				
751	49-In-129	1	491291	1.2300E+00	2.1550E+06	2.9470E+06	0.0000E+00	1.00	1.00	7.6200E+06	1.2000E-01				
752	50-Sn-129	0	501290	1.3380E+02	1.2900E+06	1.0079E+06	0.0000E+00	1.50	0.00	7.7200E+06	9.7000E-01	2	2	4974	
753	50-Sn-129	1	501291	4.1400E+02	8.0838E+05	2.0908E+06	0.0000E+00	1.00	0.00	3.9960E+06	3.0000E-02				
754	51-Sb-129	0	511290	1.5840E+04	3.9700E+05	1.4600E+06	0.0000E+00	1.00	1.00	4.0250E+06	9.5000E-01	3	3	5077	
755	51-Sb-129	1	511291	1.0620E+03	3.7428E+05	2.1446E+06	0.0000E+00	1.00	1.00	2.1740E+06	5.0000E-02				
756	52-Te-129	0	521290	4.1760E+03	5.4000E+05	5.5142E+04	0.0000E+00	1.00	0.00	3.5200E+04	2.0000E-06				
757	52-Te-129	1	521291	2.9030E+06	2.6900E+05	3.7400E+04	0.0000E+00	1.00	0.00	2.7740E+06	9.6000E-02				
758	53-I-129	0	531290	4.9500E+14	4.0900E+04	2.8200E+03	0.0000E+00	1.00	0.00	2.3770E+06	8.5000E-01				
759	54-Xe-129	0	541290	stable											
760	55-Cs-129	0	551290	1.1542E+05	1.4800E+04	2.8100E+05	0.0000E+00	2.00	0.00	1.1960E+06	1.0000E+00	1	3	5441	
761	46-Pd-130	0	461300	1.0760E-01	3.8930E+06	2.2110E+06	0.0000E+00	1.00	0.00	1.0587E+07	1.0000E+00	1	4	5153	
762	47-Ag-130	0	471300	1.5360E-02	4.3000E+06	5.0220E+06	0.0000E+00	1.00	0.00	1.6040E+06	3.6000E-01	2	2	4709	
763	48-Cd-130	0	481300	1.4470E+00	2.2580E+06	1.2250E+06	0.0000E+00	1.00	0.00	1.0550E+05	6.4000E-01				
764	49-In-130	0	491300	3.2000E-01	3.1000E+06	2.6930E+06	0.0000E+00	1.00	0.00	1.9378E+05	1.0000E+00				
765	50-Sn-130	0	501300	2.2320E+02	3.8000E+05	5.1200E+04	0.0000E+00	3.00	0.00	2.3610E+05	1.0000E+00	0	0	5440	
766	50-Sn-130	1	501301	1.0200E+02	9.0000E+05	2.0700E+06	0.0000E+00	1.00	1.00	2.5200E+06	1.4300E-02	2	4	4976	
767	51-Sb-130	0	511300	2.3700E+03	7.0000E+05	3.2700E+06	0.0000E+00	1.00	0.00	4.1200E+06	1.0000E+00	1	4	5080	
768	51-Sb-130	1	511301	3.7800E+02	9.9000E+05	2.7100E+06	0.0000E+00	1.00	0.00	4.9590E+06	1.0000E+00	1	4	5152	
769	52-Te-130	0	521300	4.4500E+04	2.9200E+05	2.1400E+06	0.0000E+00	1.00	0.00	5.0200E+06	1.0000E+00	0	0	5255	
770	53-I-130	0	531300	5.4000E+02	1.7530E+05	1.0949E+05	0.0000E+00	1.00	0.00	3.0240E+06	1.6000E-01	2	4	5334	
771	53-I-130	1	531301	stable					3.00	0.00	3.9961E+04	8.4000E-01			
772	54-Xe-130	0	541300	stable											
773	55-Cs-130	0	551300	4.1010E+05	5.1900E+05	0.0000E+00	1.00	0.00		3.6858E+05	1.6000E-02	0	0	5443	
774	55-Cs-130	0	551300	1.7526E+03	3.9500E+06	3.6490E+06	0.0000E+00	1.00	0.00	2.9792E+06	9.8400E-01	2	5	5516	
775	46-Pd-131	0	461310	3.7700E-02							1.2148E+07	1.0000E+00	1	2	4712

## JENDL FP DECAY DATA FILE 2000

No	Symbol	S	ZAAAS	Halflife	E-bata	E-gamma	E-alpha	RTYP	RFS	Q	Branching	NDK	NSP	MAT	
776	47-Ag-131	0	471310 1.0880E+02	4.1220E+06	3.7240E+06	0.0000E+00	1.00	0.0	1.2586E+07	1.0000E+00	1	2 4797			
777	48-Cd-131	0	481310 2.7200E+02	3.5180E+06	3.2670E+06	0.0000E+00	1.00	0.0	1.0900E+07	1.0000E+00	1	2 4895			
778	49-In-131	0	491310 2.8000E+01	3.0000E+06	2.0170E+06	0.0000E+00	1.00	0.0	9.1736E+06	9.1740E+01	3	2 4979			
779	49-In-131	1	491311 3.5000E+01	3.0126E+06	2.2012E+06	0.0000E+00	1.00	0.0	8.8090E+06	1.0000E+00	1	2 4980			
780	49-In-131	2	491312 3.2000E+01	3.4000E+06	5.2233E+06	0.0000E+00	1.00	1.0	1.3210E+07	9.9000E+01	2	4 4981			
781	50-Sn-131	0	501310 3.9000E+01	1.4644E+06	1.1937E+06	0.0000E+00	1.00	0.0	8.2300E+06	1.0000E+02					
782	50-Sn-131	1	501311 5.8400E+01	1.2459E+06	1.8924E+06	0.0000E+00	1.00	0.0	4.6320E+06	1.0000E+00	1	2 5082			
783	51-Sb-131	0	511310 1.3818E+03	6.1000E+05	1.9100E+06	0.0000E+00	1.00	0.0	4.8800E+06	1.0000E+00	1	2 5083			
784	52-Te-131	0	521310 1.5000E+03	7.1200E+05	4.1980E+05	0.0000E+00	1.00	1.0	3.0000E+06	1.1600E+01					
785	52-Te-131	1	521311 1.0800E+05	1.8300E+05	1.4502E+06	0.0000E+00	1.00	0.0	2.2335E+06	1.0000E+00	1	4 5258			
786	53-I-131	0	531310 6.9299E+05	1.9260E+05	3.8300E+05	0.0000E+00	1.00	0.0	1.8225E+05	2.2200E+01	2	4 5259			
787	54-Xe-131	0	541310 stable	2.0000E+04	2.2900E+04	0.0000E+00	3.00	0.0	1.6393E+05	1.0000E+00	0	0 5446			
788	54-Xe-131	1	541311 1.0230E+06	1.4200E+05	4.9900E+03	0.0000E+00	2.00	0.0	3.5240E+05	1.0000E+00	1	3 5519			
789	55-Cs-131	0	551310 8.3710E+05	4.9400E+05	4.3400E+04	0.0000E+00	2.00	0.0	1.3698E+06	1.0000E+00	1	4 5628			
790	56-Ba-131	0	561310 9.9400E+05	4.7590E+05	5.0160E+06	0.0000E+00	1.00	0.0	1.4197E+07	1.0000E+00	1	2 4800			
791	47-Ag-132	0	471320 1.3810E+02	4.2810E+06	8.8970E+06	0.0000E+00	1.00	0.0	9.4135E+07	1.0000E+00	1	2 4897			
792	48-Cd-132	0	481320 1.8660E+02	3.4050E+06	4.8443E+06	0.0000E+00	1.00	0.0	6.5900E+06	4.3000E+02	2	4 4982			
793	49-In-132	0	491320 2.0100E+01	3.5000E+06	1.3000E+05	0.0000E+00	1.00	0.0	3.1030E+06	1.0000E+00	1	4 5085			
794	50-Sn-132	0	501320 3.9700E+01	7.0000E+05	2.6000E+06	0.0000E+00	1.00	0.0	5.4900E+06	1.0000E+00	1	4 5158			
795	51-Sb-132	0	511320 1.6700E+02	1.2500E+06	1.2800E+06	0.0000E+00	1.00	0.0	2.3400E+05	1.0000E+00	1	4 5261			
796	51-Sb-132	1	511321 2.4600E+02	1.0100E+05	2.7680E+05	0.0000E+00	1.00	0.0	3.5770E+06	1.0000E+00	1	4 5340			
797	52-Te-132	0	521320 8.2600E+03	4.9700E+05	2.2580E+06	0.0000E+00	1.00	0.0	3.7000E+06	1.4000E+01	2	4 5341			
798	53-I-132	0	531320 4.9900E+03	1.3540E+05	3.5670E+05	0.0000E+00	1.00	0.0	3.00	1.2000E+05	8.6000E+01	0	0 5449		
799	54-Xe-132	0	541320 stable	1.5000E+02	6.6000E+05	0.0000E+00	1.00	0.0	1.2795E+06	1.8700E+02	2	5 5522			
800	55-Cs-132	0	551320 5.5980E+05	1.2930E+04	7.1480E+05	0.0000E+00	2.00	0.0	2.1195E+06	9.8130E+01					
801	56-Ba-132	0	561320 stable	3.4600E+02	4.3830E+06	0.0000E+00	1.00	0.0	1.3350E+07	1.0000E+00	0	0 5631			
802	47-Ag-133	0	471330 2.4510E+02	3.5390E+06	3.2960E+06	0.0000E+00	1.00	0.0	1.0975E+07	1.0000E+00	1	2 4803			
803	48-Cd-133	0	481330 2.2400E+01	3.7666E+06	3.4140E+06	0.0000E+00	1.00	0.0	1.3531E+07	5.4000E+01	2	2 4985			
804	49-In-133	0	491330 3.3240E+03	2.4100E+06	1.8610E+06	0.0000E+00	1.00	0.0	1.1100E+07	4.6000E+01					
805	50-Sn-133	0	501330 1.4400E+00	2.7400E+06	0.0000E+00	1.00	0.0	7.9900E+06	9.9870E+01	2	2 5088				
806	51-Sb-133	0	511330 1.5000E+02	6.6000E+05	0.0000E+00	1.00	0.0	6.9000E+05	1.3000E+03						
807	52-Te-133	0	521330 7.5000E+02	7.0600E+05	1.1990E+06	0.0000E+00	1.00	0.0	4.0030E+06	8.2700E+01	2	2 5161			
808	52-Te-133	0	521331 3.3240E+03	3.7200E+05	1.8560E+06	0.0000E+00	1.00	0.0	3.6690E+06	1.7300E+01					
809	52-Te-133	1	521331 3.3240E+03	6.1200E+05	0.0000E+00	1.00	0.0	2.9180E+06	1.0000E+00	1	4 5264				
810	53-I-133	0	531330 7.4900E+04	4.0900E+05	0.0000E+00	1.00	0.0	3.2500E+06	7.2932E+01	3	4 5265				
										1.6200E+06	9.0682E+02				
										3.3427E+05	1.8000E+01	2	2 5343		
										1.7706E+06	9.7120E+01	2	2 5343		
										1.5374E+06	2.8800E+02				

## JENDL FP DECAY DATA FILE 2000

No	Symbol	S	ZAAAS	HalfLife	E-beta	E-gamma	E-alpha	RTYP	RFS	Q	Branching	NDK	NSP	MAT
811	53-I-133	1	531331	9.0000E+00	4.9100E+04	1.5814E+06	0.0000E+00	3.00	0.0	1.6320E+06	1.0000E+00	1	3	5344
812	54-Xe-133	0	541330	4.5300E+05	1.3600E+05	4.7100E+04	0.0000E+00	1.00	0.0	4.2736E+05	1.0000E+00	1	4	5452
813	54-Xe-133	1	541331	1.8920E+05	1.9100E+05	4.0800E+04	0.0000E+00	3.00	0.0	2.3322E+05	1.0000E+00	1	3	5453
814	55-Cs-133	0	551330	stable	4.9500E+08	4.0160E+04	0.0000E+00	2.00	0.0	5.1744E+05	1.0000E+00	0	0	5525
815	56-Ba-133	0	561330	3.3200E+05	2.2200E+05	6.8063E+04	0.0000E+00	2.00	0.0	8.0560E+05	9.6000E-05	2	4	5635
816	56-Ba-133	1	561331	1.4000E+05	1.4000E+05	6.8063E+04	0.0000E+00	3.00	0.0	2.8825E+05	9.9990E-01			
817	57-La-133	0	571330	1.4080E+04	4.4000E+04	1.3000E+05	0.0000E+00	2.00	0.0	2.2300E+06	9.9970E-01	2	4	5710
818	48-Cd-134	0	481340	1.8070E-02	3.6300E+06	2.2440E+06	0.0000E+00	1.00	0.0	1.9400E+06	3.0000E-04			
819	49-In-134	0	491340	2.1370E-02	3.9920E+06	4.6990E+06	0.0000E+00	1.00	0.0	1.5087E+07	1.0000E+00	1	2	4901
820	50-Sn-134	0	501340	1.1200E+00	2.5303E+06	1.2480E+06	0.0000E+00	1.00	0.0	7.3700E+06	8.3000E-01	2	2	4988
821	51-Sb-134	0	511340	7.8000E-01	2.7810E+06	2.2560E+06	0.0000E+00	1.50	0.0	4.2500E+06	1.7000E-01			
822	51-Sb-134	1	511341	1.0230E+01	2.9400E+06	2.0700E+06	0.0000E+00	1.00	0.0	8.3937E+06	1.0000E+00	1	4	5164
823	52-Te-134	0	521340	2.5100E+03	2.3700E+05	8.7100E+05	0.0000E+00	1.50	1.0	8.4200E+05	9.9838E-01	2	4	5165
824	53-I-134	0	531340	3.1500E+03	6.2300E+05	2.6000E+06	0.0000E+00	1.00	0.0	1.5500E+06	1.0000E+00	1	4	5267
825	53-I-134	1	531341	2.1600E+02	8.8600E+04	2.8600E+05	0.0000E+00	1.00	0.0	4.1750E+06	1.0000E+00	1	4	5346
826	54-Xe-134	0	541340	stable	6.9000E-01	1.8400E+06	0.0000E+00	3.00	0.0	8.4200E+05	9.4000E+05			
827	54-Xe-134	1	541341	2.9000E-01	1.0800E+05	1.5551E+06	0.0000E+00	1.00	0.0	2.0000E+06	1.0000E+00	1	3	5455
828	55-Cs-134	0	551340	6.5160E+07	1.6373E+05	1.5551E+06	0.0000E+00	1.00	0.0	1.2286E+06	3.0000E-06	2	4	5528
829	55-Cs-134	1	551341	1.0450E+04	1.0800E+05	2.6900E+04	0.0000E+00	3.00	0.0	1.3874E+05	1.0000E-06			
830	56-Ba-134	0	561340	stable	5.71340	7.1700E+05	0.0000E+00	2.00	0.0	3.7132E+06	1.0000E+00	0	0	5637
831	57-La-134	0	571340	3.8700E+02	7.5800E+05	3.6620E+06	0.0000E+00	1.00	0.0	1.2193E+07	1.0000E+00	1	4	5713
832	48-Cd-135	0	481350	1.7940E-02	3.9560E+06	3.6850E+06	0.0000E+00	1.00	0.0	1.2436E+07	1.0000E+00	1	2	4903
833	49-In-135	0	491350	1.6470E-02	4.0590E+06	2.4820E+06	0.0000E+00	1.00	0.0	8.9070E+06	9.2100E-01	2	2	4991
834	50-Sn-135	0	501350	1.8780E-01	2.5550E+06	0.0000E+00	1.00	0.0	8.9070E+06	9.2100E-01				
835	51-Sb-135	0	511350	1.7100E+00	2.4800E+06	1.7900E+06	0.0000E+00	1.50	0.0	5.1000E+06	7.9000E-02			
836	52-Te-135	0	521350	1.9000E+01	2.0842E+06	1.47779E+06	0.0000E+00	1.00	0.0	4.6200E+06	7.9200E-01	2	2	5167
837	53-I-135	0	531350	2.3650E+04	3.5800E+05	1.5920E+06	0.0000E+00	1.00	0.0	5.9620E+06	1.0000E+00	1	2	5270
838	54-Xe-135	0	541350	3.2900E+04	3.1500E+05	2.4800E+05	0.0000E+00	1.00	0.0	2.6481E+06	8.3430E-01	2	4	5349
839	54-Xe-135	1	541351	9.1700E+02	7.9000E+04	4.2804E+05	0.0000E+00	1.00	0.0	8.1216E+06	1.6570E-01			
840	55-Cs-135	0	551350	7.3000E+13	5.6300E+04	0.0000E+00	1.00	0.0	1.0000E+06	1.5150E+06				
841	55-Cs-135	1	551351	3.1800E+03	3.1000E+04	1.5987E+06	0.0000E+00	1.00	0.0	2.6935E+05	1.0000E+00	1	1	5531
842	56-Ba-135	0	561350	stable	5.61350	4.1800E+04	0.0000E+00	3.00	0.0	1.6330E+06	1.0000E+00	1	3	5532
843	56-Ba-135	1	561351	1.0330E+05	1.3800E+05	3.5700E+04	0.0000E+00	2.00	0.0	2.6822E+05	1.0000E+00	0	0	5640
844	57-La-135	0	571350	7.0200E+04	5.1200E+03	3.5700E+04	0.0000E+00	2.00	0.0	1.2216E+06	1.0000E+00	2	2	5641
845	58-Ce-135	0	581350	6.3700E+04	1.7500E+04	8.2100E+05	0.0000E+00	3.00	0.0	2.0256E+06	1.0000E+00	2	4	5716
846	48-Cd-136	0	481360	1.1150E-02	4.0980E+06	2.3510E+06	0.0000E+00	1.00	0.0	1.1170E+07	1.0000E+00	1	1	5822
847	49-In-136	0	491360	1.8650E-02	4.3820E+06	5.1570E+06	0.0000E+00	1.00	0.0	1.4565E+07	1.0000E+00	1	2	4905
848	50-Sn-136	0	501360	8.6210E-02	2.6140E+06	1.4270E+06	0.0000E+00	1.00	0.0	8.0850E+06	1.0000E+00	1	2	4994
849	51-Sb-136	0	511360	8.2000E-01	2.9530E+06	2.6050E+06	0.0000E+00	1.00	0.0	9.8340E+06	7.7000E-01	2	2	5097

## JENDL FP DECAY DATA FILE 2000

No	Symbol	S	ZAAAS	Halflife	E-bata	E-gamma	E-alpha	RTYP	RFS	Q	Branching	NDK	NSP	MAT		
850	52-Te-136	0	521360	1.7500E+01	1.3100E+06	2.0400E+06	0.0000E+00	1.00	0.0	5.0748E+06	9.8900E-01	2	4	5273		
851	53-I-136	0	531360	8.3400E+01	1.9900E+06	2.3500E+06	0.0000E+00	1.50	0.0	1.2900E+06	1.1000E-02					
852	53-I-136	1	531361	4.6900E+01	2.6800E+06	2.1360E+06	0.0000E+00	1.00	0.0	6.9262E+06	1.0000E+00	1	4	5352		
853	54-Xe-136	0	541360	stable						7.5700E+06	1.0000E+00	1	4	5353		
854	55-Cs-136	0	551360	1.1370E+06	1.4500E+05	2.1300E+06	0.0000E+00	1.00	0.0	2.5482E+06	8.4000E-01	2	4	5334		
855	55-Cs-136	1	551361	1.9000E+01	7.9380E+04	5.5000E+03	0.0000E+00	3.00	0.0	5.1768E+05	1.6000E-01					
856	56-Ba-136	0	561360	stable						1.0000E+05	1.0000E+00	1	0	5335		
857	56-Ba-136	1	561361	3.0840E-01	1.0200E+05	1.9300E+06	0.0000E+00	3.00	0.0	2.0305E+06	1.0000E+00	0	0	5461		
858	57-La-136	0	571360	5.9220E+02	3.0400E+05	4.1000E+05	0.0000E+00	2.00	0.0	2.8700E+06	1.0000E+00	1	3	5644		
859	58-Ce-136	0	581360	stable						1.50	0.0	6.1000E+06	2.0000E-01	1	4	5719
860	49-In-137	0	491370	1.2470E-02	4.4340E+06	4.0210E+06	0.0000E+00	1.00	0.0	1.3583E+07	1.0000E+00	0	0	5825		
861	50-Sn-137	0	501370	1.0140E-01	2.9700E+06	2.8310E+06	0.0000E+00	1.00	0.0	9.7620E+06	1.0000E+00	1	2	4997		
862	51-Sb-137	0	511370	1.3990E-01	2.5730E+06	2.3890E+06	0.0000E+00	1.00	0.0	9.3010E+06	8.0000E-01	2	2	5100		
863	52-Te-137	0	521370	2.4900E+00	2.1730E+06	1.6090E+06	0.0000E+00	1.00	0.0	6.9416E+06	9.7300E-01	2	2	5276		
864	53-I-137	0	531370	2.4500E+01	1.8930E+06	1.1317E+06	0.0000E+00	1.50	1.0	1.2300E+06	2.7000E-02					
865	54-Xe-137	0	541370	2.2910E+02	1.7000E+06	1.9080E+05	0.0000E+00	1.50	0.0	5.8775E+06	9.2900E-01	2	2	5355		
866	55-Cs-137	0	551370	9.4890E+08	1.8790E+05	1.6400E+00	0.0000E+00	1.00	0.0	4.1726E+06	7.1000E-02	1	4	5464		
867	56-Ba-137	0	561370	stable						1.00	1.0	5.1756E+06	5.0000E-02	2	1	5537
868	56-Ba-137	1	561371	1.5312E+02	4.9200E+02	5.9870E+05	0.0000E+00	3.00	0.0	6.6166E+05	1.0000E+00	0	0	5646		
869	57-La-137	0	571370	1.9000E+12	5.0100E+03	2.5360E+04	0.0000E+00	2.00	0.0	6.0011E+05	1.0000E+00	1	3	5722		
870	58-Ce-137	0	581370	3.2400E+04	1.2500E+04	3.8100E+04	0.0000E+00	2.00	0.0	1.2221E+06	1.0000E+00	1	4	5828		
871	58-Ce-137	1	581371	1.2380E+05	2.0300E+05	5.5400E+04	0.0000E+00	2.00	0.0	7.8000E-03	7.9220E-01	2	4	5829		
872	49-In-138	0	491380	1.3920E-02	4.6520E+06	5.4650E+06	0.0000E+00	1.00	0.0	1.5422E+07	1.0000E+00	1	2	5000		
873	50-Sn-138	0	501380	4.9620E-02	3.0110E+06	1.6610E+06	0.0000E+00	1.00	0.0	8.2810E+06	1.0000E+00	1	2	5103		
874	51-Sb-138	0	511380	1.6060E-01	3.0300E+06	3.5780E+06	0.0000E+00	1.00	0.0	1.0336E+07	1.0000E+00	1	2	5176		
875	52-Te-138	0	521380	1.4000E+00	1.9460E+06	1.0680E+06	0.0000E+00	1.00	0.0	6.3680E+06	9.3300E-01	2	2	5279		
876	53-I-138	0	531380	6.4900E+00	2.8000E+06	1.3500E+06	0.0000E+00	1.00	0.0	7.8200E+06	9.4500E-01	2	2	5358		
877	54-Xe-138	0	541380	8.4500E+02	6.4000E+05	1.1260E+06	0.0000E+00	1.50	0.0	2.0100E+06	5.5000E-02					
878	55-Cs-138	0	551380	2.0050E+03	1.2500E+06	2.3600E+06	0.0000E+00	1.00	0.0	5.3740E+06	1.0000E+00	1	4	5467		
879	55-Cs-138	1	551381	1.7400E+02	3.3000E+05	7.0660E+05	0.0000E+00	1.00	0.0	5.4570E+06	1.9000E-01	2	4	5541		
880	56-Ba-138	0	561380	stable						3.00	0.0	7.9000E+04	8.1000E-01			
881	57-La-138	0	571380	3.3100E+18	3.5920E+04	1.2310E+06	0.0000E+00	1.00	0.0	1.0444E+06	3.3600E-01	0	0	5649		
882	58-Ce-138	0	581380	stable						2.00	0.0	1.73778E+06	6.6400E-01	2	5	5725
883	59-Pr-138	0	591380	8.7000E+01	1.1600E+06	8.1500E+05	0.0000E+00	2.00	0.0	4.4370E+06	1.0000E+00	0	0	5831		
884	59-Pr-138	1	591381	7.6000E+03	2.2600E+05	2.4800E+06	0.0000E+00	2.00	0.0	4.8000E+06	1.0000E+00	1	4	5916		
885	50-Sn-139	0	501390	6.0950E-02	3.2550E+06	3.0720E+06	0.0000E+00	1.00	0.0	1.0188E+07	1.0000E+00	1	2	5106		
886	51-Sb-139	0	511390	7.4190E-02	2.9080E+06	2.6840E+06	0.0000E+00	1.00	0.0	1.0228E+07	1.0000E+00	1	2	5179		
887	52-Te-139	0	521390	3.4280E-01	2.3760E+06	2.3510E+06	0.0000E+00	1.00	0.0	8.4500E+06	9.6100E-01	2	2	5282		

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No	Symbol	S	ZAAAS	Halflife	E-beta	E-gamma	E-alpha	Rtyp	RFS	Q	Branching	NDK	NSP	MAT
888	53- I-139	0	531390	2.2900E+00	2.0590E+06	1.3240E+06	0.0000E+00	1.00	0.0	6.8060E+06	9.0100E-01	2	2	5361
889	54-Xe-139	0	541390	3.9680E+01	1.7900E+06	1.0160E+06	0.0000E+00	1.50	0.0	3.2000E+06	9.9000E-02			
890	55-Cs-139	0	551390	5.5600E+02	1.6400E+06	3.5000E+05	0.0000E+00	1.00	0.0	5.0570E+06	1.0000E+00	1	4	5470
891	56-Ba-139	0	561390	4.9840E+03	8.9800E+05	4.6000E+04	0.0000E+00	1.00	0.0	4.217E+06	1.0000E+00	1	2	5543
892	57-La-139	0	571390	stable						2.3168E+06	1.0000E+00			4 5652
893	58-Ce-139	0	581390	1.1892E+07	7.4000E+04	1.7400E+05	0.0000E+00	2.00	0.0	2.7800E+05	1.0000E+00	0	0	5728
894	58-Ce-139	1	581391	5.4800E+01	5.2100E+04	6.9931E+05	0.0000E+00	3.00	0.0	7.5424E+05	1.0000E+00	1	4	5834
895	59-Pr-139	0	591390	1.5880E+04	8.7680E+04	1.2930E+05	0.0000E+00	2.00	0.0	2.1290E+06	9.9990E-01	2	4	5919
896	50-Sn-140	0	501400	3.5440E-02	3.0770E+06	1.9940E+06	0.0000E+00	1.00	0.0	1.3750E+06	1.0000E-04			
897	51-Sb-140	0	511400	8.0310E-02	3.2630E+06	3.8770E+06	0.0000E+00	1.00	0.0	8.7490E+06	1.0000E+00	1	2	5109
898	52-Te-140	0	521400	1.7410E-01	2.3360E+06	1.2750E+06	0.0000E+00	1.00	0.0	1.1016E+07	1.0000E+00	1	2	5182
899	53- I-140	0	531400	8.6000E-01	2.7620E+06	2.3280E+06	0.0000E+00	1.00	0.0	6.9770E+06	9.3000E-01	2	2	5285
900	54-Xe-140	0	541400	1.3600E+01	1.0400E+06	1.4675E+06	0.0000E+00	1.50	0.0	3.5000E+06	9.4000E-02			
901	55-Cs-140	0	551400	6.3700E+01	1.7518E+06	2.2161E+06	0.0000E+00	1.00	0.0	4.0600E+06	1.0000E+00	1	4	5473
902	56-Ba-140	0	561400	1.1018E+06	3.1000E+05	1.8210E+05	0.0000E+00	1.00	0.0	6.2021E+06	1.0000E+00	1	4	5546
903	57-La-140	0	571400	1.4499E+05	5.1800E+05	2.3080E+06	0.0000E+00	1.00	0.0	1.0497E+06	1.0000E+00	1	4	5655
904	58-Ce-140	0	581400	stable						3.7619E+06	1.0000E+00			4 5731
905	59-Pr-140	0	591400	2.0340E+02	5.4460E+05	5.4250E+05	0.0000E+00	2.00	0.0	3.3880E+06	1.0000E+00	0	0	5837
906	51-Sb-141	0	511410	4.5720E-02	3.0500E+06	2.8110E+06	0.0000E+00	1.00	0.0	9.5150E+06	1.0000E+00	1	4	5922
907	52-Te-141	0	521410	1.7250E-01	2.6580E+06	2.5980E+06	0.0000E+00	1.00	0.0	8.9050E+06	1.0000E+00	1	2	5288
908	53- I-141	0	531410	4.2999E-01	2.4250E+06	1.7790E+06	0.0000E+00	1.00	0.0	7.6230E+06	7.8300E-01	2	2	5367
909	54-Xe-141	0	541410	1.7300E+00	2.0660E+06	1.0080E+06	0.0000E+00	1.50	0.0	4.2100E+06	2.1700E-01			
910	55-Cs-141	0	551410	2.4940E+01	1.9400E+06	9.9743E+05	0.0000E+00	1.00	0.0	6.1500E+06	9.9959E-01	2	4	5476
911	56-Ba-141	0	561410	1.0960E+03	9.4550E+05	9.2500E+05	0.0000E+00	1.00	0.0	6.6000E+05	4.1000E-04			
912	57-La-141	0	571410	1.4110E+04	9.6300E+05	2.6800E+04	0.0000E+00	1.00	0.0	5.2513E+06	9.9966E-01	2	4	5549
913	58-Ce-141	0	581410	2.8080E+06	1.7030E+05	7.6500E+04	0.0000E+00	1.00	0.0	3.4000E+06	3.4000E+05			
914	59-Pr-141	0	591410	stable						2.1313E+06	1.0000E+00	1	4	5658
915	60-Nd-141	0	601410	8.9600E+03	1.4200E+04	7.5100E+04	0.0000E+00	2.00	0.0	1.8230E+06	1.0000E+00	0	0	5734
916	51-Sb-142	0	511420	4.3780E-02	3.2830E+06	3.9160E+06	0.0000E+00	1.00	0.0	1.0960E+07	1.0000E+00	1	2	5840
917	52-Te-142	0	521420	9.2090E-02	2.5130E+06	1.3750E+06	0.0000E+00	1.00	0.0	7.7500E+06	1.0000E+00	1	2	5291
918	53- I-142	0	531420	2.0000E-01	2.6920E+06	3.2030E+06	0.0000E+00	1.00	0.0	4.5000E+06	1.3000E+00	2	2	5370
919	54-Xe-142	0	541420	1.2400E+00	1.4034E+06	1.5764E+06	0.0000E+00	1.00	0.0	5.0400E+06	9.9610E-01	2	2	5479
920	55-Cs-142	0	551420	1.7000E+00	2.4490E+06	1.7870E+06	0.0000E+00	1.50	0.0	9.3000E+05	3.9000E-03			
921	56-Ba-142	0	561420	6.3600E+02	3.8300E+05	1.0400E+06	0.0000E+00	1.50	0.0	7.3068E+06	9.9904E-01	2	4	5552
922	57-La-142	0	571420	5.4700E+03	8.6800E+05	2.3680E+06	0.0000E+00	1.00	0.0	1.1370E+06	9.6000E-04			
923	58-Ce-142	0	581420	6.8830E+04	8.0900E+05	5.8019E+04	0.0000E+00	1.00	0.0	4.5035E+06	1.0000E+00	1	4	5737
924	59-Pr-142	0	591420	6.7600E+02	3.6830E+03	0.0000E+00	0.0000E+00	3.00	0.0	2.1622E+06	9.9984E-01	0	0	5843
925	59-Pr-142	1	591421	8.7600E+02	3.6830E+03	0.0000E+00	0.0000E+00	3.00	0.0	7.4532E+05	1.6400E-04	2	5 5928	
926	60-Nd-142	0	601420	stable						3.6830E+03	1.0000E+00	1	0	5929

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No	Symbol	S	Z	AAAS	Half-life	E-beta	E-gamma	E-alpha	Rtyp	Rfs	Q	Branching	NDK	NSP	MAT	
927	51-Sb-143	0	51	1430	2.8790E-02	3.1320E+06	2.8860E+06	0.0000E+00	1.00	0.0	9.7590E+06	1.0000E+00	1	2	5191	
928	52-Te-143	0	52	1430	8.9010E-02	2.7100E+06	2.6510E+06	0.0000E+00	1.00	0.0	8.6650E+06	1.0000E+00	1	2	5294	
929	53-I-143	0	53	1430	2.1870E-01	2.3750E+06	2.2520E+06	0.0000E+00	1.00	0.0	8.5510E+06	1.0000E+00	1	2	5373	
930	54-Xe-143	0	54	1430	3.0000E-01	2.0500E+06	2.0800E+06	0.0000E+00	1.00	0.0	7.0420E+06	9.9110E-01	2	2	5482	
931	54-Xe-143	1	54	1431	9.6000E-01	2.2250E+06	1.7280E+06	0.0000E+00	1.00	0.0	1.8000E+06	8.9000E-03	1	2	5483	
932	55-Cs-143	0	55	1430	1.7700E+00	1.9350E+06	1.2170E+06	0.0000E+00	1.00	0.0	6.7550E+06	1.0000E+00	1	2	5555	
933	56-Ba-143	0	56	1430	1.4330E+01	1.1500E+06	1.1400E+06	0.0000E+00	1.00	0.0	4.2463E+06	1.0000E+00	1	4	5664	
934	57-La-143	0	57	1430	8.4800E+02	1.2000E+06	2.6300E+05	0.0000E+00	1.00	0.0	3.4256E+06	1.0000E+00	1	2	5740	
935	58-Ce-143	0	58	1430	1.1916E+05	4.2900E+05	2.7900E+05	0.0000E+00	1.00	0.0	1.4614E+06	1.0000E+00	1	4	5846	
936	59-Pr-143	0	59	1430	1.1730E+06	3.1530E+05	9.0000E-03	0.0000E+00	1.00	0.0	9.3392E+05	1.0000E+00	1	1	5931	
937	60-Nd-143	0	60	1430	stable	2.4960E+06	1.7450E+06	0.0000E+00	1.00	0.0	7.3220E+06	1.0000E+00	0	0	6028	
938	52-Te-144	0	52	1440	5.3850E-02	2.7190E+06	3.2480E+06	0.0000E+00	1.00	0.0	1.0600E+07	1.0000E+00	1	2	5297	
939	53-I-144	0	53	1440	1.8460E-01	1.6060E+06	9.2320E+05	0.0000E+00	1.00	0.0	5.7780E+06	9.8900E-01	2	2	5376	
940	54-Xe-144	0	54	1440	1.1500E+00	1.1500E+00	1.1500E+00	0.0000E+00	1.00	0.0	2.1000E+06	1.1000E-02	2	2	5485	
941	55-Cs-144	0	55	1440	1.0020E+00	2.6490E+06	2.1930E+06	0.0000E+00	1.00	0.0	8.4644E+06	9.6830E-01	2	2	5558	
942	56-Ba-144	0	56	1440	1.1500E+01	9.4630E+05	7.0500E+05	0.0000E+00	1.00	0.0	2.5600E+06	3.1700E-02	1	2	5667	
943	57-La-144	0	57	1440	4.0800E+01	1.3800E+06	2.3300E+06	0.0000E+00	1.00	0.0	3.1194E+06	1.0000E+00	1	4	5743	
944	58-Ce-144	0	58	1440	2.4615E+07	9.1600E+04	1.9400E+04	0.0000E+00	1.00	0.0	3.1866E+05	9.8490E-01	2	4	5849	
945	59-Pr-144	0	59	1440	1.0370E+03	1.2080E+06	2.8900E+04	0.0000E+00	1.00	0.0	2.5963E+05	1.5100E-02	1	3	5934	
946	59-Pr-144	1	59	1441	4.3200E+02	4.5000E+04	1.2710E+04	0.0000E+00	1.00	0.0	2.9975E+06	1.0000E+00	1	2	5935	
947	60-Nd-144	0	60	1440	7.2000E+22	0.0000E+00	1.9000E+06	4.00	0.0	3.0550E+06	7.0000E-04	2	4	5935		
948	61-Pm-144	0	61	1440	3.1400E+07	1.4620E+04	1.5550E+06	0.0000E+00	2.00	0.0	5.9030E+04	9.9930E-01	1	1	6031	
949	52-Te-145	0	52	1450	5.0120E-02	2.8520E+06	2.7740E+06	0.0000E+00	1.00	0.0	2.3317E+06	1.0000E+00	1	2	5300	
950	53-I-145	0	53	1450	1.1120E-01	2.4680E+06	2.3420E+06	0.0000E+00	1.00	0.0	9.0800E+06	1.0000E+00	1	2	5379	
951	54-Xe-145	0	54	1450	9.0000E-01	2.2910E+06	1.8270E+06	0.0000E+00	1.00	0.0	7.7846E+06	1.0000E+00	1	2	5488	
952	55-Cs-145	0	55	1450	5.9400E-01	2.0700E+06	1.3870E+06	0.0000E+00	1.00	0.0	8.6200E-01	2.45561	2	4	5561	
953	56-Ba-145	0	56	1450	4.3100E+00	1.8700E+06	1.1590E+06	0.0000E+00	1.00	0.0	3.5200E+06	1.3800E-01	1	4	5670	
954	57-La-145	0	57	1450	2.4800E+01	9.9780E+05	1.7290E+06	0.0000E+00	1.00	0.0	4.9234E+06	1.0000E+00	1	4	5746	
955	58-Ce-145	0	58	1450	1.8100E+02	5.3790E+05	1.0400E+06	0.0000E+00	1.00	0.0	2.5346E+06	1.0000E+00	1	4	5852	
956	59-Pr-145	0	59	1450	2.1540E+04	6.5700E+05	1.8600E+04	0.0000E+00	1.00	0.0	1.8053E+06	1.0000E+00	1	4	5937	
957	60-Nd-145	0	60	1450	stable	1.0300E+04	3.1300E+04	6.2700E-01	2.00	0.0	1.6304E+05	1.0000E+00	0	0	6034	
958	61-Pm-145	0	61	1450	5.5900E+08	1.0300E+04	3.1300E+04	6.2700E-01	2.00	0.0	4.9234E+06	1.0000E+00	2	4	6143	
959	53-I-146	0	53	1460	9.7120E-02	2.8190E+06	3.3810E+06	0.0000E+00	4.00	0.0	2.3220E+06	2.8000E-07	1	2	5382	
960	54-Xe-146	0	54	1460	2.0520E-01	1.9710E+06	1.0860E+06	0.0000E+00	1.00	0.0	6.6490E+06	1.0000E+00	1	2	5491	
961	55-Cs-146	0	55	1460	3.3500E-01	2.6320E+06	2.1900E+06	0.0000E+00	1.00	0.0	9.3665E+06	8.6600E-01	2	2	5564	
962	56-Ba-146	0	56	1460	2.2200E+00	1.1750E+06	8.3300E+05	0.0000E+00	1.00	0.0	4.1046E+06	1.3400E-01	1	2	5673	
963	57-La-146	0	57	1460	6.2700E+00	2.3500E+06	1.4924E+06	0.0000E+00	1.00	0.0	6.5302E+06	1.0000E+00	1	4	5749	
964	57-La-146	1	57	1461	1.0000E+01	2.1740E+06	1.3235E+06	0.0000E+00	1.00	0.0	6.6300E+06	1.0000E+00	1	2	5755	
965	58-Ce-146	0	58	1460	8.1100E+02	2.2000E+05	3.1600E+05	0.0000E+00	1.00	0.0	1.0262E+06	1.0000E+00	1	4	5854	
966	59-Pr-146	0	59	1460	1.4490E+03	1.3200E+06	1.0100E+06	0.0000E+00	1.00	0.0	1.41693E+06	1.0000E+00	1	2	5940	
967	60-Nd-146	0	60	1460	stable	1.0100E+06	1.0100E+06	1.0100E+06	0.0000E+00	1.00	0.0	0.0000E+00	0.0000E+00	0	0	6037

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No	Symbol	S	ZAAAS	Halflife	E-beta	E-gamma	E-alpha	RTYP	RFS	Q	Branching	NDK	NSP	MAT	
968	61-Pm-146	0	611460	1.7450E+08	9.09000E+04	7.5200E+05	0.00000E+00	1.00	0.0	1.5420E+06	3.4000E-01	2	5	6146	
969	62-Sm-146	0	621460	3.2500E+15	0.00000E+00	0.00000E+00	2.5200E+06	4.00	0.0	1.4718E+06	6.6000E-01				
970	53-I-147	0	531470	7.4040E-02	2.9650E+06	2.7720E+06	0.00000E+00	1.00	0.0	2.5430E+06	1.0000E+00	1	1	6231	
971	54-Xe-147	0	541470	2.1040E-01	2.2790E+06	2.3130E+06	0.00000E+00	1.00	0.0	9.3190E+06	1.0000E+00	1	2	5385	
972	55-Cs-147	0	551470	2.2500E-01	2.4000E+06	1.5810E+06	0.00000E+00	1.00	0.0	8.5190E+06	1.0000E+00	1	2	5494	
973	56-Ba-147	0	561470	8.9300E-01	1.8580E+06	1.3010E+06	0.00000E+00	1.00	0.0	5.7000E+06	5.7000E-01	2	4	5567	
974	57-La-147	0	571470	4.0150E+00	1.6320E+06	9.3630E+05	0.00000E+00	1.00	0.0	5.7500E+06	1.0000E+00	1	4	5676	
975	58-Ce-147	0	581470	5.6400E+01	8.5910E+05	1.0810E+06	0.00000E+00	1.00	0.0	4.3000E+05	3.3000E-04				
976	59-Pr-147	0	591470	8.0400E+02	8.1300E+05	4.8700E+05	0.00000E+00	1.00	0.0	3.2900E+06	1.0000E+00	1	2	5858	
977	60-Nd-147	0	601470	9.4870E+05	2.6900E+05	1.4000E+05	0.00000E+00	1.00	0.0	2.6857E+06	1.0000E+00	1	4	5943	
978	61-Pm-147	0	611470	8.2788E+07	6.1960E+04	4.3800E+04	0.00000E+00	1.00	0.0	8.9600E+05	1.0000E+00	1	4	6040	
979	62-Sm-147	0	621470	3.3500E+18	0.00000E+00	0.00000E+00	2.2900E+06	4.00	0.0	2.2414E+05	1.0000E+00	1	4	6149	
980	53-I-148	0	531480	6.2870E-02	3.1050E+06	3.7450E+06	0.00000E+00	1.00	0.0	2.3106E+06	1.0000E+00	1	1	6234	
981	54-Xe-148	0	541480	1.3730E-01	2.5530E+06	1.4020E+06	0.00000E+00	1.00	0.0	1.0577E+07	1.0000E+00	1	2	5388	
982	55-Cs-148	0	551480	1.7000E-01	2.4540E+06	2.9690E+06	0.00000E+00	1.00	0.0	7.1120E+06	1.0000E+00	1	2	5497	
983	56-Ba-148	0	561480	6.1000E-01	1.3430E+06	8.3530E+05	0.00000E+00	1.00	0.0	1.0449E+07	9.2000E-01	2	2	5570	
984	57-La-148	0	571480	1.0500E+00	2.1500E+06	1.2560E+06	0.00000E+00	1.00	0.0	5.8000E+06	8.0000E-02				
985	58-Ce-148	0	581480	5.6000E+01	6.8000E+05	3.1600E+05	0.00000E+00	1.00	0.0	5.1150E+06	1.0000E+00	1	4	5679	
986	59-Pr-148	0	591480	1.3620E+02	1.6850E+06	1.2359E+06	0.00000E+00	1.00	0.0	7.2624E+06	9.9870E-01	2	4	5755	
987	59-Pr-148	1	591481	1.2100E+02	1.2907E+06	1.7970E+06	0.00000E+00	1.00	0.0	1.3000E+06	1.0000E+00	1	4	5861	
988	60-Nd-148	0	601480	stable	6.6400E+05	7.2600E+05	5.7400E+05	0.00000E+00	1.00	0.0	4.9320E+06	1.0000E+00	1	4	5946
989	61-Pm-148	0	611480	4.6400E+05	1.6253E+05	1.9831E+05	0.00000E+00	1.00	0.0	5.0500E+06	1.0000E+00	1	2	5947	
990	61-Pm-148	1	611481	3.5670E+06	2.6370E+05	2.6190E+06	0.00000E+00	1.00	0.0	2.6100E+06	9.5400E-01	1	4	6152	
991	62-Sm-148	0	621480	2.2000E+23	0.00000E+00	2.0000E+06	4.00	0.0	1.3700E+05	4.6000E-02	2	4	6153		
992	54-Xe-149	0	541490	1.4840E-01	2.6370E+05	2.6190E+06	0.00000E+00	1.00	0.0	1.9862E+06	1.0000E+00	1	1	6237	
993	55-Cs-149	0	551490	9.8690E-02	2.5070E+06	2.4040E+06	0.00000E+00	1.00	0.0	8.5000E+06	1.0000E+00	1	2	5500	
994	56-Ba-149	0	561490	7.0000E-01	2.0160E+06	1.5200E+06	0.00000E+00	1.00	0.0	9.5570E+06	1.0000E+00	1	2	5573	
995	57-La-149	0	571490	1.2000E+00	1.7830E+06	1.0870E+06	0.00000E+00	1.00	0.0	7.5360E+06	9.9570E-01	2	2	5682	
996	58-Ce-149	0	581490	5.0000E+00	1.1752E+06	1.0450E+06	0.00000E+00	1.50	0.0	1.5000E+06	4.3000E-03				
997	59-Pr-149	0	591490	1.3600E+02	9.5260E+05	6.1610E+05	0.00000E+00	1.00	0.0	5.6640E+06	1.0000E+00	0	0	6043	
998	60-Nd-149	0	601490	6.2210E+03	5.0200E+05	3.7100E+05	0.00000E+00	1.00	0.0	9.8830E+06	1.0000E+00	1	4	6152	
999	61-Pm-149	0	611490	1.9109E+05	4.5000E+05	1.1900E+04	0.00000E+00	1.00	0.0	1.0709E+06	1.0000E+00	1	4	6155	
1000	62-Sm-149	0	621490	stable	8.0400E+06	1.9100E+04	6.5600E+04	0.00000E+00	2.00	0.0	2.4683E+06	1.0000E+00	0	0	6240
1001	63-Eu-149	0	631490	8.0400E+06	1.9100E+04	6.5600E+04	0.00000E+00	2.00	0.0	1.1700E+02	1.0000E+00	1	4	6319	
1002	54-Xe-150	0	541500	8.2020E-02	3.0920E+06	1.7220E+06	0.00000E+00	1.00	0.0	8.5460E+06	1.0000E+00	1	2	5503	
1003	55-Cs-150	0	551500	9.2050E-02	2.7510E+06	3.3310E+06	0.00000E+00	1.00	0.0	3.3970E+06	1.0000E+00	1	2	5576	
1004	56-Ba-150	0	561500	2.0520E+00	1.9850E+06	1.0960E+06	0.00000E+00	1.00	0.0	6.5670E+06	1.0000E+00	1	2	5685	
1005	57-La-150	0	571500	6.7558E+00	2.0370E+06	2.5470E+06	0.00000E+00	1.00	0.0	7.7720E+06	9.9964E-01	2	2	5761	
1006	58-Ce-150	0	581500	4.79999E+00	6.8918E+05	4.3969E+05	0.00000E+00	1.50	0.0	3.6000E+06	3.6000E-04	1	2	5867	
1007	59-Pr-150	0	591500	6.1900E+00	1.0760E+06	0.00000E+00	1.00	0.0	3.0100E+06	1.0000E+00	1	2	5952		
1008	60-Nd-150	0	601500	stable	0	0	5.6900E+06	0.00000E+00	1.00	0.0	0	6049	0	0	6049

## JENDL FP DECAY DATA FILE 2000

No	Symbol	S	ZAAAS	Halflife	E-bata	E-gamma	E-alpha	Rtyp	RFS	Q	Branching	NDK	NSP	MAT	
1009	61-Pm-150	0	611500	9.6500E+03	7.3000E+05	1.4700E+06	0.0000E+00	1.00	0.0	3.4540E+06	1.0000E+00	1	4	6158	
1010	62-Sm-150	0	621500	stable								0	0	6243	
1011	63-Eu-150	0	631500	1.1300E+09	1.8900E+04	1.5370E+06	0.0000E+00	2.00	0.0	2.2606E+06	1.0000E+00	1	4	6322	
1012	63-Eu-150	1	631501	4.6100E+04	2.9690E+05	5.0000E+04	0.0000E+00	1.00	0.0	9.7100E+05	8.9000E-01	2	5	6323	
1013	55-Cs-151	0	551510	5.2170E-02	2.9640E+06	2.7950E+06	0.0000E+00	1.00	0.0	2.3030E+06	1.1000E-01		1	2	5579
1014	56-Ba-151	0	561510	1.9980E-01	2.1830E+06	2.2510E+06	0.0000E+00	1.00	0.0	8.5140E+06	1.0000E+00	1	2	5688	
1015	57-La-151	0	571510	7.1340E-01	2.2020E+06	1.6010E+06	0.0000E+00	1.00	0.0	9.7900E-01	2	2	5764		
1016	58-Ce-151	0	581510	1.0200E+00	1.4400E+06	8.7740E+05	0.0000E+00	1.00	0.0	2.5000E+06	2.1000E-02		1	2	5870
1017	59-Pr-151	0	591510	1.8900E+01	1.2340E+06	7.0110E+05	0.0000E+00	1.00	0.0	4.1015E+06	1.0000E+00	1	2	5955	
1018	60-Nd-151	0	601510	7.4600E+02	5.3800E+05	9.4600E+05	0.0000E+00	1.00	0.0	2.4424E+06	1.0000E+00	1	4	6052	
1019	61-Pm-151	0	611510	1.0224E+05	3.0000E+05	3.2900E+05	0.0000E+00	1.00	0.0	1.1870E+06	1.0000E+00	1	4	6161	
1020	62-Sm-151	0	621510	2.8000E+09	1.9630E+04	6.8000E+00	0.0000E+00	1.00	0.0	7.6689E+04	1.0000E+00	1	2	6246	
1021	63-Eu-151	0	631510	stable								0	0	6325	
1022	64-Gd-151	0	641510	1.0710E+07	3.3400E+04	7.0500E+04	2.6000E-02	2.00	0.0	4.6412E+05	1.0000E+00	2	4	6422	
1023	55-Cs-152	0	551520	5.1420E-02	2.3760E+06	1.6980E+06	0.0000E+00	1.00	0.0	2.6710E+06	1.0000E-08		1	2	5582
1024	56-Ba-152	0	561520	1.0330E-01	2.5240E+06	1.3900E+06	0.0000E+00	1.00	0.0	1.0269E+07	1.0000E+00	1	2	5691	
1025	57-La-152	0	571520	5.3460E-01	2.3550E+06	2.8850E+06	0.0000E+00	1.00	0.0	9.0630E+06	1.0000E+00	1	2	5767	
1026	58-Ce-152	0	581520	1.8630E+01	1.1660E+06	7.7840E+05	0.0000E+00	1.00	0.0	4.4530E+06	1.0000E+00	1	2	5873	
1027	59-Pr-152	0	591520	3.2401E+00	1.5490E+06	2.1190E+06	0.0000E+00	1.00	0.0	6.4440E+06	1.0000E+00	1	2	5958	
1028	60-Nd-152	0	601520	6.8400E+02	2.9000E+05	1.6000E+05	0.0000E+00	1.00	0.0	1.1102E+06	1.0000E+00	1	4	6055	
1029	61-Pm-152	0	611520	2.4600E+02	1.4000E+06	1.5000E+05	0.0000E+00	1.00	0.0	3.5046E+06	1.0000E+00	1	4	6164	
1030	61-Pm-152	1	611521	4.5100E+02	8.2000E+05	1.5000E+06	0.0000E+00	1.00	0.0	3.6200E+06	1.0000E+00	1	4	6165	
1031	61-Pm-152	2	611522	9.0000E+02	6.6079E+05	1.7332E+06	0.0000E+00	1.00	0.0	3.6200E+06	1.0000E+00	1	2	6166	
1032	62-Sm-152	0	621520	stable								0	0	6249	
1033	63-Eu-152	0	631520	4.2740E+08	1.2630E+05	1.1593E+06	0.0000E+00	1.00	0.0	1.8188E+06	2.7920E-01	2	5	6328	
1034	63-Eu-152	1	631521	3.3390E+04	5.0990E+05	3.0500E+05	0.0000E+00	1.00	0.0	1.8743E+06	7.2080E-01	2	5	6329	
1035	63-Eu-152	2	631522	5.7600E+03	2.4700E+04	7.4800E+04	0.0000E+00	3.00	0.0	1.4781E+06	1.0000E+00	1	3	6330	
1036	64-Gd-152	0	641520	3.4000E+21	0.0000E+00	2.2000E+06	4.00	0.0	2.2022E+06	1.0000E+00	1	1	6425		
1037	56-Ba-153	0	561530	9.8910E-02	2.4980E+06	2.5250E+06	0.0000E+00	1.00	0.0	9.4640E+06	1.0000E+00	1	2	5694	
1038	57-La-153	0	571530	2.3570E-01	2.5950E+06	2.0880E+06	0.0000E+00	1.00	0.0	8.2620E+06	1.0000E+00	1	2	5770	
1039	58-Ce-153	0	581530	1.1850E+00	1.6800E+06	1.1250E+06	0.0000E+00	1.00	0.0	6.4450E+06	1.0000E+00	1	2	5876	
1040	59-Pr-153	0	591530	1.3100E+01	1.7000E+06	1.0270E+06	0.0000E+00	1.00	0.0	5.5470E+06	1.0000E+00	1	2	5961	
1041	60-Nd-153	0	601530	3.2000E+01	1.1110E+06	6.7230E+05	0.0000E+00	1.00	0.0	3.3360E+06	1.0000E+00	1	2	6058	
1042	61-Pm-153	0	611530	3.2401E+02	6.0720E+05	1.7220E+05	0.0000E+00	1.00	0.0	1.8810E+06	1.0000E+00	1	2	6167	
1043	62-Sm-153	0	621530	1.6657E+05	2.5200E+05	5.7000E+04	0.0000E+00	1.00	0.0	8.0825E+05	1.0000E+00	1	4	6252	
1044	63-Eu-153	0	631530	stable								0	0	6331	
1045	64-Gd-153	0	641530	2.0874E+07	5.1100E+03	8.6400E+04	0.0000E+00	2.00	0.0	4.8444E+05	1.0000E+00	1	4	6428	
1046	56-Ba-154	0	561540	5.8220E-02	2.9560E+06	1.6450E+06	0.0000E+00	1.00	0.0	8.2050E+06	1.0000E+00	1	2	5697	
1047	57-La-154	0	571540	1.9380E-01	2.6150E+06	3.1990E+06	0.0000E+00	1.00	0.0	1.0321E+07	1.0000E+00	1	2	5773	
1048	58-Ce-154	0	581540	4.6710E-01	1.6940E+06	9.5870E+05	0.0000E+00	1.00	0.0	5.5240E+06	1.0000E+00	1	2	5879	
1049	59-Pr-154	0	591540	2.3000E+00	1.8730E+06	2.4140E+06	0.0000E+00	1.00	0.0	7.3650E+06	1.0000E+00	1	4	5964	
1050	60-Nd-154	0	601540	2.5900E+01	6.0718E+05	6.0759E+05	0.0000E+00	1.00	0.0	2.7351E+06	1.0000E+00	1	4	6061	
1051	61-Pm-154	0	611540	1.0400E+02	8.7000E+05	1.7800E+06	0.0000E+00	1.00	0.0	4.0443E+06	1.0000E+00	1	4	6170	
1052	61-Pm-154	1	611541	1.6100E+02	8.7000E+05	1.7770E+06	0.0000E+00	1.00	0.0	4.0400E+06	1.0000E+00	1	4	6255	
1053	62-Sm-154	0	621540	stable								0	0	6255	

## JENDL FP DECAY DATA FILE 2000

No	Symbol	S	ZAAAS	Half-life	E-beta	E-gamma	E-alpha	RTYP	RFS	Q	Branching	NDK	NSP	MAT	
1054	63-Eu-154	0	631540	2.7100E+08	2.7300E+05	1.2490E+06	0.0000E+00	1.00	0.0	1.9684E+06	9.9980E-01	2	5	6334	
1055	63-Eu-154	1	631541	2.7600E+03	6.4000E+04	8.5009E+04	0.0000E+00	2.00	0.0	7.1733E+05	2.0000E-04				
1056	64-Gd-154	0	641540	stable	6.0000E+04	2.2400E+06	0.0000E+00	2.00	0.0	3.5620E+06	1.0000E+00	1	3	6335	
1057	65-Tb-154	0	651540	7.7400E+04	4.6000E+04	1.2900E+06	0.0000E+00	2.00	0.0	3.5600E+06	7.8200E-01	0	0	6431	
1058	65-Tb-154	1	651541	3.2400E+04	4.0843E+05	2.0600E+06	0.0000E+00	3.00	0.0	0.0000E+00	2.1800E-01	2	4	6511	
1059	65-Tb-154	2	651542	8.1700E+04	9.5000E+04	2.0600E+06	0.0000E+00	2.00	0.0	3.5600E+06	9.8200E-01	2	4	6512	
1060	57-La-155	0	571550	1.0050E-01	2.8170E+06	2.6980E+06	0.0000E+00	3.00	1.0	0.0000E+00	1.8000E-02				
1061	58-Ce-155	0	581550	4.2820E-01	2.0150E+06	1.5710E+06	0.0000E+00	1.00	0.0	9.3990E+06	1.0000E+00	1	2	5776	
1062	59-Pr-155	0	591550	7.7240E-01	2.0710E+06	1.4800E+06	0.0000E+00	1.00	0.0	6.8560E+06	9.9000E-01	2	2	5967	
1063	60-Nd-155	0	601550	8.9000E+00	1.3660E+06	8.3390E+05	0.0000E+00	1.50	0.0	1.7000E+06	1.0000E-02				
1064	61-Pm-155	0	611550	4.7999E+01	1.0200E+06	6.3300E+05	0.0000E+00	1.00	0.0	3.2240E+06	1.0000E+00	1	2	6064	
1065	62-Sm-155	0	621550	1.3380E+03	5.6800E+05	1.0290E+05	0.0000E+00	1.00	0.0	1.6269E+06	1.0000E+00	1	2	6173	
1066	63-Eu-155	0	631550	1.5025E+08	6.3000E+04	6.1100E+04	0.0000E+00	1.00	0.0	2.5209E+05	1.0000E+00	1	4	6258	
1067	64-Gd-155	0	641550	stable	3.8300E+05	1.7700E+05	0.0000E+00	2.00	0.0	8.2122E+05	1.0000E+00	0	0	6337	
1068	65-Tb-155	0	651550	4.6000E+05	3.0360E+02	3.7320E+06	0.0000E+00	1.00	0.0	1.0460E+07	1.0000E+00	1	4	6513	
1069	57-La-156	0	571560	9.8340E-02	2.1180E+06	1.1710E+06	0.0000E+00	1.00	0.0	6.6510E+06	1.0000E+00	1	2	5779	
1070	58-Ce-156	0	581560	2.7950E-01	2.1490E+06	2.6880E+06	0.0000E+00	1.00	0.0	8.3090E+06	1.0000E+00	1	2	5885	
1071	59-Pr-156	0	591560	9.7860E-01	2.1220E+06	7.6570E+05	0.0000E+00	1.00	0.0	3.8560E+06	1.0000E+00	1	2	5970	
1072	60-Nd-156	0	601560	2.0390E+01	1.3140E+06	1.8940E+06	0.0000E+00	1.00	0.0	5.1550E+06	1.0000E+00	1	2	6067	
1073	61-Pm-156	0	611560	6.1883E+01	2.2000E+05	1.1600E+05	0.0000E+00	1.00	0.0	7.2226E+05	1.0000E+00	1	2	6176	
1074	62-Sm-156	0	621560	3.3800E+04	4.5700E+05	1.2340E+06	0.0000E+00	1.00	0.0	2.4510E+06	1.0000E+00	1	4	6261	
1075	63-Eu-156	0	631560	1.3120E+06	4.5700E+05	1.9000E+06	0.0000E+00	2.00	0.0	2.4444E+06	1.0000E+00	0	0	6340	
1076	64-Gd-156	0	641560	stable	8.8000E+04	1.1300E+04	0.0000E+00	3.00	0.0	4.9600E+04	1.0000E+00	1	0	6437	
1077	65-Tb-156	0	651561	4.6200E+05	7.3000E+04	3.6830E+04	0.0000E+00	3.00	0.0	5.0000E-01	2.4510E+06	2	4	6517	
1078	65-Tb-156	1	651561	8.9100E+04	4.0000E+04	2.3000E+03	0.0000E+00	2.00	0.0	8.2400E+04	5.0000E-01				
1079	65-Tb-156	2	651562	1.91100E+04	4.0000E+04	2.9100E+05	0.0000E+00	1.00	0.0	1.3625E+06	1.0000E+00	1	4	6518	
1080	57-La-157	0	571570	5.2000E-02	3.2500E+06	3.0650E+06	0.0000E+00	1.00	0.0	8.2400E+04	5.0000E-01				
1081	58-Ce-157	0	581570	1.7930E-01	2.4310E+06	2.0890E+06	0.0000E+00	1.00	0.0	1.0239E+07	1.0000E+00	1	2	5782	
1082	59-Pr-157	0	591570	4.7020E-01	2.3870E+06	1.8810E+06	0.0000E+00	1.00	0.0	8.5420E+06	1.0000E+00	1	2	5888	
1083	60-Nd-157	0	601570	2.7220E+00	1.6680E+06	1.1400E+06	0.0000E+00	1.00	0.0	5.6540E+06	1.0000E+00	1	2	5973	
1084	61-Pm-157	0	611570	2.7690E+01	1.4510E+06	8.4080E+05	0.0000E+00	1.00	0.0	4.5140E+06	1.0000E+00	1	2	6070	
1085	62-Sm-157	0	621570	4.8200E+02	9.0000E+05	4.0900E+05	0.0000E+00	1.00	0.0	2.7340E+06	1.0000E+00	1	2	6179	
1086	63-Eu-157	0	631570	5.4650E+04	3.9000E+05	2.9100E+05	0.0000E+00	1.00	0.0	1.3625E+06	1.0000E+00	1	4	6264	
1087	64-Gd-157	0	641570	stable	3.1000E+09	1.5100E+04	1.1300E+05	0.0000E+00	2.00	0.0	6.0053E+04	1.0000E+00	0	0	6343
1088	65-Tb-157	0	651570	2.9300E+04	5.7000E+03	3.1100E+05	0.0000E+00	2.00	0.0	1.3414E+06	1.0000E+00	1	4	6519	
1089	66-Dy-157	0	661570	8.4890E-02	2.6080E+06	1.4450E+06	0.0000E+00	1.00	0.0	7.3040E+06	1.0000E+00	1	2	5891	
1090	58-Ce-158	0	581580	4.2370E-01	2.5520E+06	3.1550E+06	0.0000E+00	1.00	0.0	9.2310E+06	1.0000E+00	1	2	5976	
1091	59-Pr-158	0	591580	8.6230E-01	1.5890E+06	9.2390E+05	0.0000E+00	1.00	0.0	4.8250E+06	1.0000E+00	1	2	6073	
1092	60-Nd-158	0	601580	2.3270E+01	1.5690E+06	2.1640E+06	0.0000E+00	1.00	0.0	6.2430E+06	1.0000E+00	1	2	6182	
1093	61-Pm-158	0	611580	3.3060E+02	4.0843E+05	5.5492E+05	0.0000E+00	1.00	0.0	1.9990E+06	1.0000E+00	1	2	6267	
1094	62-Sm-158	0	621580	2.7540E+03	9.6000E+05	1.0840E+06	0.0000E+00	1.00	0.0	3.4851E+06	1.0000E+00	1	4	6346	
1095	63-Eu-158	0	631580	2.41580	stable	8.0430E+05	0.0000E+00	1.00	0.0	9.3673E+05	1.6600E-01	0	0	6443	
1096	64-Gd-158	0	641580	5.7000E+09	1.0040E+05	8.0430E+05	0.0000E+00	1.00	0.0	1.2200E+06	8.3400E-01	2	5	6522	

## JENDL FP DECAY DATA FILE 2000

No	Symbol	S	ZZAAS	Halflife	E-beta	E-gamma	E-alpha	RTYP	RFS	Q	Branching	NDK	NSP	MAT
1098	65-Tb-158	1	651581	1.0500E+01	8.2400E+04	2.4100E+04	0.0000E+00	3.00	0.0	1.1000E+05	1.0000E+00	1	3	6523
1099	66-Dy-158	0	661580	stable								0	0	6631
1100	58-Ce-159	0	581590	7.7250E-02	2.3700E+06	2.4490E+06	0.0000E+00	1.00	0.0	7.8100E+06	1.0000E+00	1	2	5894
1101	59-Pr-159	0	591590	2.2010E-01	2.7730E+06	2.3380E+06	0.0000E+00	1.00	0.0	8.2340E+06	1.0000E+00	1	2	5979
1102	60-Nd-159	0	601590	7.9450E-01	2.0630E+06	1.6660E+06	0.0000E+00	1.00	0.0	6.7630E+06	1.0000E+00	1	2	6076
1103	61-Pm-159	0	611590	3.0810E+00	1.7820E+06	1.1600E+06	0.0000E+00	1.00	0.0	5.5240E+06	1.0000E+00	1	2	6185
1104	62-Sm-159	0	621590	8.8120E+01	1.0022E+06	9.6497E+05	0.0000E+00	1.00	0.0	3.8340E+06	1.0000E+00	1	2	6270
1105	63-Eu-159	0	631590	4.1220E+03	8.7290E+05	4.0515E+05	0.0000E+00	1.00	0.0	2.5145E+06	1.0000E+00	1	2	6349
1106	64-Gd-159	0	641590	6.6800E+04	3.1000E+05	5.4000E+04	0.0000E+00	1.00	0.0	9.7056E+05	1.0000E+00	1	4	6446
1107	65-Tb-159	0	651590	stable								0	0	6525
1108	66-Dy-159	0	661590	1.2476E+07	3.6000E+05	4.5200E+04	0.0000E+00	2.00	0.0	3.6564E+05	1.0000E+00	1	4	6634
1109	58-Ce-160	0	581600	4.8810E-02	2.9310E+06	1.7000E+06	0.0000E+00	1.00	0.0	8.2360E+06	1.0000E+00	1	2	5897
1110	59-Pr-160	0	591600	2.0380E-01	2.6390E+06	3.2330E+06	0.0000E+00	1.00	0.0	9.1660E+06	1.0000E+00	1	2	5982
1111	60-Nd-160	0	601600	2.9420E-01	2.1000E+06	1.2060E+06	0.0000E+00	1.00	0.0	5.9620E+06	1.0000E+00	1	2	6079
1112	61-Pm-160	0	611600	2.4540E+00	1.9690E+06	2.5000E+06	0.0000E+00	1.00	0.0	3.120E+06	1.0000E+00	1	2	6188
1113	62-Sm-160	0	621600	6.3238E+01	8.4670E+05	6.8980E+05	0.0000E+00	1.00	0.0	2.9550E+06	1.0000E+00	1	2	6273
1114	63-Eu-160	0	631600	3.8000E+01	1.1690E+06	2.5400E+06	0.0000E+00	1.00	0.0	4.5800E+06	1.0000E+00	0	0	6449
1115	64-Gd-160	0	641600	stable								0	0	6452
1116	65-Tb-160	0	651600	6.2470E+06	2.5710E+05	1.1280E+06	0.0000E+00	1.00	0.0	1.8353E+06	1.0000E+00	1	4	6537
1117	66-Dy-160	0	661600	stable								0	0	6637
1118	67-Ho-160	0	671600	1.5360E+03	0.0000E+00	1.6300E+06	0.0000E+00	2.00	0.0	3.2200E+06	1.0000E+00	1	2	6710
1119	67-Ho-160	1	671601	1.8070E+04	3.6000E+04	1.6708E+06	0.0000E+00	2.00	0.0	3.3460E+06	3.5000E-01	2	4	6711
1120	59-Pr-161	0	591610	1.1590E-01	2.9760E+06	2.8370E+06	0.0000E+00	1.00	0.0	5.9980E+04	6.5000E-01	1	2	5985
1121	60-Nd-161	0	601610	2.5850E-01	2.1600E+06	1.8790E+06	0.0000E+00	1.00	0.0	9.4630E+06	1.0000E+00	1	2	6082
1122	61-Pm-161	0	611610	8.6300E-01	2.1080E+06	1.6960E+06	0.0000E+00	1.00	0.0	7.8900E+06	1.0000E+00	1	2	6191
1123	62-Sm-161	0	621610	6.7180E+00	1.5070E+06	1.1380E+06	0.0000E+00	1.00	0.0	6.5480E+06	1.0000E+00	1	2	6276
1124	63-Eu-161	0	631610	2.4800E+01	1.0059E+06	1.0062E+06	0.0000E+00	1.00	0.0	4.7970E+06	1.0000E+00	1	2	6355
1125	64-Gd-161	0	641610	2.2000E+02	5.8020E+05	3.9300E+05	0.0000E+00	1.00	0.0	1.9556E+06	1.0000E+00	1	4	6452
1126	65-Tb-161	0	651610	5.9400E+05	3.5600E+04	0.0000E+00	1.00	0.0	5.9308E+05	1.0000E+00	1	4	6531	
1127	66-Dy-161	0	661610	stable								0	0	6640
1128	67-Ho-161	0	671610	8.9300E+03	2.7300E+04	5.8000E+04	0.0000E+00	2.00	0.0	8.5890E+05	1.0000E+00	1	4	6713
1129	67-Ho-161	1	671611	6.7600E+00	1.0420E+05	1.0600E+05	0.0000E+00	3.00	0.0	2.1115E+05	1.0000E+00	1	3	6714
1130	59-Pr-162	0	591620	9.2270E-02	2.9220E+06	3.5770E+06	0.0000E+00	1.00	0.0	1.0100E+07	1.0000E+00	1	2	5988
1131	60-Nd-162	0	601620	1.6930E-01	2.4850E+06	1.4310E+06	0.0000E+00	1.00	0.0	7.0560E+06	1.0000E+00	1	2	6085
1132	61-Pm-162	0	611620	5.8290E-01	2.0790E+06	6.6200E+06	0.0000E+00	1.00	0.0	8.4490E+06	1.0000E+00	1	2	6194
1133	62-Sm-162	0	621620	2.6850E+00	1.3830E+06	8.7780E+05	0.0000E+00	1.00	0.0	3.8940E+06	1.0000E+00	1	2	6279
1134	63-Eu-162	0	631620	3.2430E+01	1.4030E+06	2.0180E+06	0.0000E+00	1.00	0.0	5.6440E+06	1.0000E+00	1	2	6358
1135	64-Gd-162	0	641620	5.0400E+02	2.8618E+05	5.3704E+05	0.0000E+00	1.00	0.0	1.3539E+06	1.0000E+00	1	4	6455
1136	65-Tb-162	0	651620	4.5600E+02	5.4000E+05	1.1060E+06	0.0000E+00	1.00	0.0	2.5058E+06	1.0000E+00	1	4	6534
1137	66-Dy-162	0	661620	stable								0	0	6643
1138	67-Ho-162	0	671620	9.0000E+02	5.6700E+04	1.2500E+05	0.0000E+00	2.00	0.0	2.1403E+06	1.0000E+00	1	4	6716
1139	67-Ho-162	1	671621	4.0200E+03	6.5200E+04	5.8370E+05	0.0000E+00	2.00	0.0	2.2450E+06	3.8000E-01	2	4	6717
1140	60-Nd-163	0	601630	1.4160E-01	2.4820E+06	2.2190E+06	0.0000E+00	1.00	0.0	1.0600E+05	6.2000E-01	1	2	6088
1141	61-Pm-163	0	611630	3.2110E-01	2.3930E+06	2.0190E+06	0.0000E+00	1.00	0.0	7.8380E+06	1.0000E+00	1	2	6197
1142	62-Sm-163	0	621630	1.9770E+00	1.6690E+06	1.3340E+06	0.0000E+00	1.00	0.0	5.7290E+06	1.0000E+00	1	2	6282
1143	63-Eu-163	0	631630	6.0180E+00	1.5410E+06	1.0720E+06	0.0000E+00	1.00	0.0	4.8620E+06	1.0000E+00	1	2	6361
1144	64-Gd-163	0	641630	6.8002E+01	8.5917E+05	9.6128E+05	0.0000E+00	1.00	0.0	3.1170E+06	1.0000E+00	1	2	6458
1145	65-Tb-163	0	651630	1.1700E+03	3.3600E+05	7.8800E+05	0.0000E+00	1.00	0.0	1.7851E+06	1.0000E+00	1	4	6537

## JENDL FP DECAY DATA FILE 2000

No	Symbol	S	ZZAAS	Halflife	E-beta	E-gamma	E-alpha	RTYP	RFS	Q	Branching	NDK	NSP	MAT	
1146	66-Dy-163	0	661630	stable			0.0000E+00	0.0000E+00	2.00	0.0	2.5650E+03	0	0	6646	
1147	67-Ho-163	0	671630	1-4420E+11	0.0000E+00	0.0000E+00	2.3180E+05	0.0000E+00	3.00	0.0	2.9000E+05	1	1	6719	
1148	67-Ho-163	1	671631	1.0900E+00	6.0000E+04	0.0000E+00	2.00	0.0	1.2100E+06	9.994E-01	2	1	6720		
1149	68-Er-163	0	681630	4.5000E+03	5.4120E+03	3.9990E+04	0.0000E+00	2.00	0.0	1.2100E+05	1.6000E-04	2	4	6828	
1150	60-Nd-164	0	601640	9.5340E-02	2.7410E+06	1.5880E+06	0.0000E+00	1.00	0.0	9.1200E+05	1.0000E+00	0	0	6646	
1151	61-Pm-164	0	611640	3.0680E-01	2.3480E+06	2.9260E+06	0.0000E+00	1.00	0.0	8.2710E+06	1.0000E+00	1	1	6091	
1152	62-Sm-164	0	621640	8.2100E-01	1.8030E+06	1.0490E+06	0.0000E+00	1.00	0.0	4.9280E+06	1.0000E+00	1	2	6200	
1153	63-Eu-164	0	631640	3.4570E+00	1.5630E+06	2.1470E+06	0.0000E+00	1.00	0.0	6.6420E+06	1.0000E+00	1	2	6285	
1154	64-Gd-164	0	641640	1.0960E+02	7.1800E+05	6.4690E+05	0.0000E+00	1.00	0.0	2.3410E+06	1.0000E+00	1	2	6364	
1155	65-Tb-164	0	651640	1.8000E+02	6.4000E+05	2.3700E+06	0.0000E+00	1.00	0.0	3.8900E+06	1.0000E+00	1	2	6461	
1156	66-Dy-164	0	661640	stable							0	0	6540		
1157	67-Ho-164	0	671640	1.7400E+03	1.5260E+05	2.9900E+04	0.0000E+00	1.00	0.0	9.6277E+05	4.2000E-01	2	0	6649	
1158	67-Ho-164	1	671641	2.2500E+03	7.8800E+04	4.6300E+04	0.0000E+00	2.00	0.0	9.8684E+05	5.8000E-01	2	5	6722	
1159	68-Er-164	0	681640	stable							1.4000E+05	1.0000E+00	1	3	6723
1160	61-Pm-165	0	611650	2.2160E-01	2.5790E+06	2.2210E+06	0.0000E+00	1.00	0.0	8.0490E+06	1.0000E+00	0	0	6831	
1161	62-Sm-165	0	621650	6.5000E-01	1.9630E+06	1.6910E+06	0.0000E+00	1.00	0.0	6.7630E+06	1.0000E+00	1	2	6203	
1162	63-Eu-165	0	631650	1.5870E+00	1.8300E+06	1.4070E+06	0.0000E+00	1.00	0.0	5.9060E+06	1.0000E+00	1	2	6288	
1163	64-Gd-165	0	641650	1.5950E+01	1.2300E+06	8.8110E+05	0.0000E+00	1.00	0.0	4.1920E+06	1.0000E+00	1	2	6367	
1164	65-Tb-165	0	651650	1.2700E+02	9.1156E+05	8.3600E+05	0.0000E+00	1.00	0.0	2.9620E+06	1.0000E+00	1	2	6464	
1165	66-Dy-165	0	661650	8.4020E+03	4.4800E+05	2.6300E+04	0.0000E+00	1.00	0.0	2.8540E+06	7.3000E-01	2	2	6543	
1166	66-Dy-165	1	661651	7.5400E+01	1.0140E+05	1.0700E+04	0.0000E+00	1.00	0.0	1.3949E+06	1.0000E+00	1	4	6652	
1167	67-Ho-165	0	671650	stable							2.2400E-02	2	4	6653	
1168	68-Er-165	0	681650	stable							9.7760E-01	1.0000E+00	0	0	6725
1169	61-Pm-166	0	611660	2.0860E-01	5.1700E+03	3.7800E+04	0.0000E+00	2.00	0.0	3.7598E+05	1.0000E+00	1	3	6834	
1170	62-Sm-166	0	621660	4.3080E-01	2.050E+06	3.3230E+06	0.0000E+00	1.00	0.0	9.3560E+06	1.0000E+00	1	2	6206	
1171	63-Eu-166	0	631660	9.9600E-01	1.8380E+06	2.3950E+06	0.0000E+00	1.00	0.0	6.0120E+06	1.0000E+00	1	2	6291	
1172	64-Gd-166	0	641660	5.5770E+00	1.1740E+06	8.0000E+05	0.0000E+00	1.00	0.0	7.7970E+06	1.0000E+00	1	2	6370	
1173	65-Tb-166	0	651660	2.2210E+02	7.4794E+05	2.0496E+06	0.0000E+00	1.00	0.0	3.3070E+06	1.0000E+00	1	2	6467	
1174	66-Dy-166	0	661660	2.9380E+05	1.6400E+05	4.2800E+04	0.0000E+00	1.00	0.0	4.8870E+06	1.0000E+00	1	2	6546	
1175	67-Ho-166	0	671660	9.6480E+04	6.9500E+05	3.0200E+04	0.0000E+00	1.00	0.0	4.8622E+05	1.0000E+00	1	4	6655	
1176	67-Ho-166	1	671661	3.8000E+01	1.4530E+05	1.6250E+06	0.0000E+00	1.00	0.0	1.8549E+06	1.0000E+00	1	4	6728	
1177	68-Er-166	0	681660	stable							1.8599E+06	1.0000E+00	1	4	6729
1178	69-Tm-166	0	691660	2.7720E+04	8.1000E+04	3.7800E+04	0.0000E+00	2.00	0.0	3.0396E+06	1.0000E+00	0	0	6837	
1179	62-Sm-167	0	621670	4.3530E-01	2.3380E+06	2.1010E+06	0.0000E+00	1.00	0.0	7.4330E+06	1.0000E+00	1	2	6294	
1180	63-Eu-167	0	631670	5.2530E-01	2.0240E+06	1.6430E+06	0.0000E+00	1.00	0.0	6.9680E+06	1.0000E+00	1	2	6373	
1181	64-Gd-167	0	641670	3.8080E+00	1.5450E+06	1.2170E+06	0.0000E+00	1.00	0.0	5.1420E+06	1.0000E+00	1	2	6470	
1182	65-Tb-167	0	651670	1.8160E+01	1.0140E+06	1.0273E+06	0.0000E+00	1.00	0.0	4.0900E+06	1.0000E+00	1	2	6549	
1183	66-Dy-167	0	661670	3.7200E+02	7.1000E+05	5.3400E+05	0.0000E+00	1.00	0.0	2.3500E+06	1.0000E+00	1	4	6658	
1184	67-Ho-167	0	671670	1.1200E+04	2.1500E+05	3.5000E+05	0.0000E+00	1.00	0.0	1.0067E+06	8.8000E-01	2	4	6731	
1185	68-Er-167	0	681670	stable							7.9890E+05	1.2000E-01	0	0	6840
1186	68-Er-167	1	681671	2.2690E+00	1.0900E+05	9.6900E+04	0.0000E+00	3.00	0.0	2.0780E+05	1.0000E+00	1	3	6841	
1187	69-Tm-167	0	691670	7.9920E+05	1.8200E+04	5.1000E+04	0.0000E+00	2.00	0.0	7.4836E+05	1.6000E-02	2	4	6919	
1188	62-Sm-168	0	621680	2.0120E-01	2.4430E+06	1.4150E+06	0.0000E+00	2.00	1.0	5.3970E+05	9.8400E-01	1	2	6297	
1189	63-Eu-168	0	631680	6.2510E-01	2.1680E+06	2.7490E+06	0.0000E+00	1.00	0.0	6.9750E+05	1.0000E+00	1	2	6376	

## JENDL FP DECAY DATA FILE 2000

No	Symbol	S	ZZAAs	Halflife	E-beta	E-gamma	E-alpha	Rtyp	RFS	Q	Branching	NDK	NSP	MAT
1190	64-Gd-168	0	641680	1.3570E+00	1.5210E+06	9.3250E+05	0.0000E+00	1.00	0.0	4.3970E+06	1.0000E+00	1	2	6473
1191	65-Tb-168	0	651680	7.2450E+00	1.1700E+06	1.8530E+06	0.0000E+00	1.00	0.0	5.9710E+06	1.0000E+00	1	2	6552
1192	66-Dy-168	0	661680	5.2200E+02	3.1869E+05	5.4288E+05	0.0000E+00	1.00	0.0	1.6150E+06	1.0000E+00	1	1	6661
1193	67-Ho-168	0	671680	1.7900E+02	8.0100E+05	8.7600E+05	0.0000E+00	1.00	0.0	2.9143E+06	1.0000E+00	1	1	6734
1194	68-Er-168	0	681680	stable								0	0	6843
1195	69-Tm-168	0	691680	8.0440E+06	7.8300E+04	1.2440E+06	0.0000E+00	1.00	0.0	2.5701E+05	1.0000E-04	2	2	5.6922
1196	70-Yb-168	0	701680	stable								0	0	7025
1197	63-Eu-169	0	631690	3.8050E-01	2.2770E+06	1.9350E+06	0.0000E+00	1.00	0.0	7.1520E+06	1.0000E+00	1	2	6379
1198	64-Gd-169	0	641690	1.0750E+00	1.9130E+06	1.6640E+06	0.0000E+00	1.00	0.0	6.1940E+06	1.0000E+00	1	2	6476
1199	65-Tb-169	0	651690	2.3470E+00	1.3550E+06	9.2740E+05	0.0000E+00	1.00	0.0	5.5110E+06	1.0000E+00	1	2	6555
1200	66-Dy-169	0	661690	3.9000E+01	8.6605E+05	6.3222E+05	0.0000E+00	1.00	0.0	3.2000E+06	1.0000E+00	1	2	6664
1201	67-Ho-169	0	671690	2.8200E+02	4.1400E+05	6.5700E+05	0.0000E+00	1.00	0.0	2.1240E+06	1.0000E+00	1	1	6737
1202	68-Er-169	0	681690	8.1220E+05	1.0300E+05	1.6300E+01	0.0000E+00	1.00	0.0	3.5114E+05	1.0000E+00	1	1	6846
1203	69-Tm-169	0	691690	stable								0	0	6925
1204	70-Yb-169	0	701690	2.7670E+06	1.1430E+05	3.1490E+05	0.0000E+00	2.00	0.0	9.0914E+05	1.0000E+00	0	0	4.7028
1205	63-Eu-170	0	631700	4.3960E-01	2.1650E+06	2.7530E+06	0.0000E+00	1.00	0.0	7.7310E+06	1.0000E+00	1	2	6382
1206	64-Gd-170	0	641700	6.5770E-01	1.9140E+06	1.1160E+06	0.0000E+00	1.00	0.0	5.5820E+06	1.0000E+00	1	2	6479
1207	65-Tb-170	0	651700	1.9680E+00	1.4940E+06	1.4940E+06	0.0000E+00	1.00	0.0	7.0610E+06	1.0000E+00	1	2	6558
1208	66-Dy-170	0	661700	1.0750E+01	6.4785E+05	6.2895E+05	0.0000E+00	1.00	0.0	2.8460E+06	1.0000E+00	1	2	6667
1209	67-Ho-170	0	671700	1.6600E+02	7.3000E+05	1.7000E+06	0.0000E+00	1.00	0.0	3.8700E+06	1.0000E+00	1	1	6740
1210	68-Er-170	1	681701	4.3000E+01	9.5746E+05	1.3172E+06	0.0000E+00	1.00	0.0	3.9900E+06	1.0000E+00	1	2	6741
1211	69-Tm-170	0	691700	stable								0	0	6849
1212	70-Yb-170	0	701700	1.1110E+07	3.2802E+05	4.1860E+03	0.0000E+00	1.00	0.0	9.6803E+05	9.9870E-01	2	2	5.6928
1213	70-Yb-170	0	701700	stable								0	0	7031
1214	64-Gd-171	0	641710	7.9610E-01	1.9880E+06	1.7600E+06	0.0000E+00	1.00	0.0	6.3760E+06	1.0000E+00	1	2	6482
1215	65-Tb-171	0	651710	8.9170E-01	1.5940E+06	1.1680E+06	0.0000E+00	1.00	0.0	6.3530E+06	1.0000E+00	1	2	6561
1216	66-Dy-171	0	661710	6.7970E+00	1.2500E+06	9.2900E+05	0.0000E+00	1.00	0.0	4.6750E+06	1.0000E+00	1	2	6670
1217	67-Ho-171	0	671710	5.3000E+01	7.1300E+05	5.8130E+05	0.0000E+00	1.00	0.0	3.2000E+06	1.0000E+00	1	2	6743
1218	68-Er-171	0	681710	2.7058E+04	4.1700E+05	3.7300E+05	0.0000E+00	1.00	0.0	1.4905E+06	1.0000E+00	1	4	6852
1219	69-Tm-171	0	691710	6.0600E+07	2.5400E+04	6.0600E+02	0.0000E+00	1.00	0.0	9.6428E+04	1.0000E+00	0	0	4.6931
1220	70-Yb-171	0	701710	stable								0	0	7034
1221	64-Gd-172	0	641720	3.0720E-01	2.1990E+06	1.2790E+06	0.0000E+00	1.00	0.0	6.3440E+06	1.0000E+00	1	2	6485
1222	65-Tb-172	0	651720	1.1210E+00	1.5110E+06	2.1250E+06	0.0000E+00	1.00	0.0	5.7370E+06	1.0000E+00	1	2	6564
1223	66-Dy-172	0	661720	2.0340E+00	1.0140E+06	7.5300E+05	0.0000E+00	1.00	0.0	3.9960E+06	1.0000E+00	1	2	6673
1224	67-Ho-172	0	671720	1.9740E+02	7.5713E+05	2.0579E+06	0.0000E+00	1.00	0.0	5.0930E+06	1.0000E+00	1	2	6746
1225	68-Er-172	0	681720	1.7750E+05	1.2600E+05	2.3000E+05	0.0000E+00	1.00	0.0	8.9054E+05	1.0000E+00	1	4	6855
1226	69-Tm-172	0	691720	2.2900E+05	5.3000E+05	4.7400E+05	0.0000E+00	1.00	0.0	1.8802E+06	1.0000E+00	1	4	6934
1227	70-Yb-172	0	701720	stable								0	0	7037
1228	71-Lu-172	0	711720	5.7900E+05	1.0620E+05	1.9500E+06	0.0000E+00	2.00	0.0	2.5193E+06	1.0000E+00	1	4	7116
1229	71-Lu-172	1	711721	2.2000E+02	3.3900E+04	1.4400E+03	0.0000E+00	3.00	0.0	4.1860E+04	1.0000E+00	1	3	7117

## 4 Comparison of Spectrum Data of Fission Products

As mentioned in Chapter 2, spectroscopically measured spectrum often suffers from missing transitions. In order to avoid such missing transitions, G. Rudstam and co-workers<sup>17)</sup> made direct measurements of the beta- and gamma-ray spectra of fission products. The measurement was aimed not to give the nuclear structure data but to provide the complete spectra, which cover the full energy range. The measurements were performed for about 100 fission product nuclides. The measured spectral data of beta- and gamma-rays were listed in 100 keV energy interval. In this Chapter, the spectra adopted to JENDL FP Decay Data File 2000 are compared with the measured data by G. Rudstam et al. The spectra in the JENDL file were prepared in 100 keV energy interval to fit the energy structure of the Rudstam's measurements. The comparisons were performed for nuclides having theoretically estimated spectra in the JENDL file because the adoption of such spectra is one of the special features of the file. The comparison between the spectroscopically measured data and Rudstam's may reveal the problems of spectroscopic measurements but that is another subject and is not discussed here.

The comparisons are shown in Figs. 4 through 6 for the beta- and gamma-ray spectra of fission products for which only theoretically estimated spectra are adopted in JENDL FP Decay Data File 2000. The nuclides shown in these figures have no spectroscopically measured spectra, no normalization factors for deriving absolute intensities or inconsistency between the data contained in ENSDF. The estimated spectra show rather good agreement with Rudstam's data for beta-ray spectra as seen in Figs. 4 and 5. For the case of gamma-ray spectra, even though the estimated spectra can not reproduce the fine structure seen in the Rudstam's data, they can give the gross property of the energy distributions except for some nuclides like <sup>82</sup>Ge and <sup>144</sup>Ba as seen in Fig. 6. Their maximum gamma-ray energy values observed seem to be too low comparing with their Q values of 4.7 MeV for <sup>82</sup>Ge and 3.1 MeV for <sup>144</sup>Ba. Further measurements are needed to confirm the measured data.

The beta- and gamma-ray spectra of the nuclides having both theoretically estimated spectra and the measured ones in JENDL FP Decay Data File 2000 are also compared with the Rudstam's data and are shown in Figs. 7 through 15. The nuclides in these figures have spectroscopically measured data. But the measured data are considered to be incomplete and are compensated with the theoretically estimated spectra. The beta-ray spectra are shown in Figs. 7 through 10. The gamma-ray spectra are shown in Figs. 11 through 15. In these comparisons the spectra calculated from ENSDF are also shown. In the comparison of gamma-ray spectra the data of JENDL and ENSDF are broadened with the energy resolution of the detector used in the Rudstam's measurements. The detector resolution is taken from the reference<sup>18)</sup>. In the reference it is said that the energy resolution was 20 % for the lowest energy and 7 % for the highest and the energy range covered from 40 keV to 6 MeV. From these statements and the energy dependence assumed, the following expression is derived for the resolution, that is the Gaussian width of the full-energy peak,  $\sigma$  and used for the comparison:

$$\sigma = 0.01E_\gamma \left( 7.455 + 2.836/\sqrt{E_\gamma} \right) / 2.35.$$

where  $E_\gamma$  is the gamma-ray energy in unit of MeV. The beta-ray spectra, on the other hand, have no line structure and don't need to be broadened for the comparison.

For the beta-ray spectra it is seen that the low energy parts of JENDL are more enhanced than those of ENSDF for most of the nuclides. This is due to adding the theoretically estimated spectra only to higher part of level scheme than the maximum energy level as described in the previous Chapter. The JENDL spectra of the nuclides like <sup>89</sup>Br, <sup>133</sup>Sn, <sup>134</sup>Sb and <sup>143</sup>Cs have become apparently consistent with the Rudstam's data. But the nuclides like <sup>92</sup>Rb, <sup>96</sup>Y and <sup>142</sup>Cs show that the ENSDF spectra are consistent with the Rudstam's data and that the addition of the theoretically estimated spectra is unsuitable for these nuclides. The adopted decay data in the JENDL file may be reconsidered in a

future version.

For gamma-ray spectra the JENDL spectra seem to raise the bases of the ENSDF spectra because the estimated spectra are continuous and simply added to the discrete measured data for the most of the cases. Some nuclides like  $^{92}\text{Rb}$ , however, seem that the JENDL spectra are more depressed than the ENSDF ones and they are in agreement with Rudstam's measurements. In the case of  $^{92}\text{Rb}$  the theoretically estimated spectrum is not added but the normalization of the measured spectrum is simply decreased. This fact may show that the normalizations of the ENSDF data are not precisely adopted for this decay. There seems to be another problem seen in the comparison. The JENDL gamma-ray spectra like  $^{96}\text{Rb}$ ,  $^{97}\text{Rb}$ ,  $^{95}\text{Sr}$ ,  $^{143}\text{Cs}$  and  $^{145}\text{Cs}$  nuclides underestimate the high energy part of the measured spectra. The measured spectra of these nuclides extend to the maximum energy allowed by the Q values with nearly constant intensity. This behavior seems to mean that there exist strongly populated high energy levels which have strong correlation with low energy levels near ground state. This is rather queer situation. In order to confirm the measured spectra, detailed spectroscopic measurement will be needed.

As seen in these comparisons, even though not all of the theoretically estimated spectra are suitably adopted in the JENDL file, the model estimated spectra can fill the deficiency of spectroscopically measured spectra.

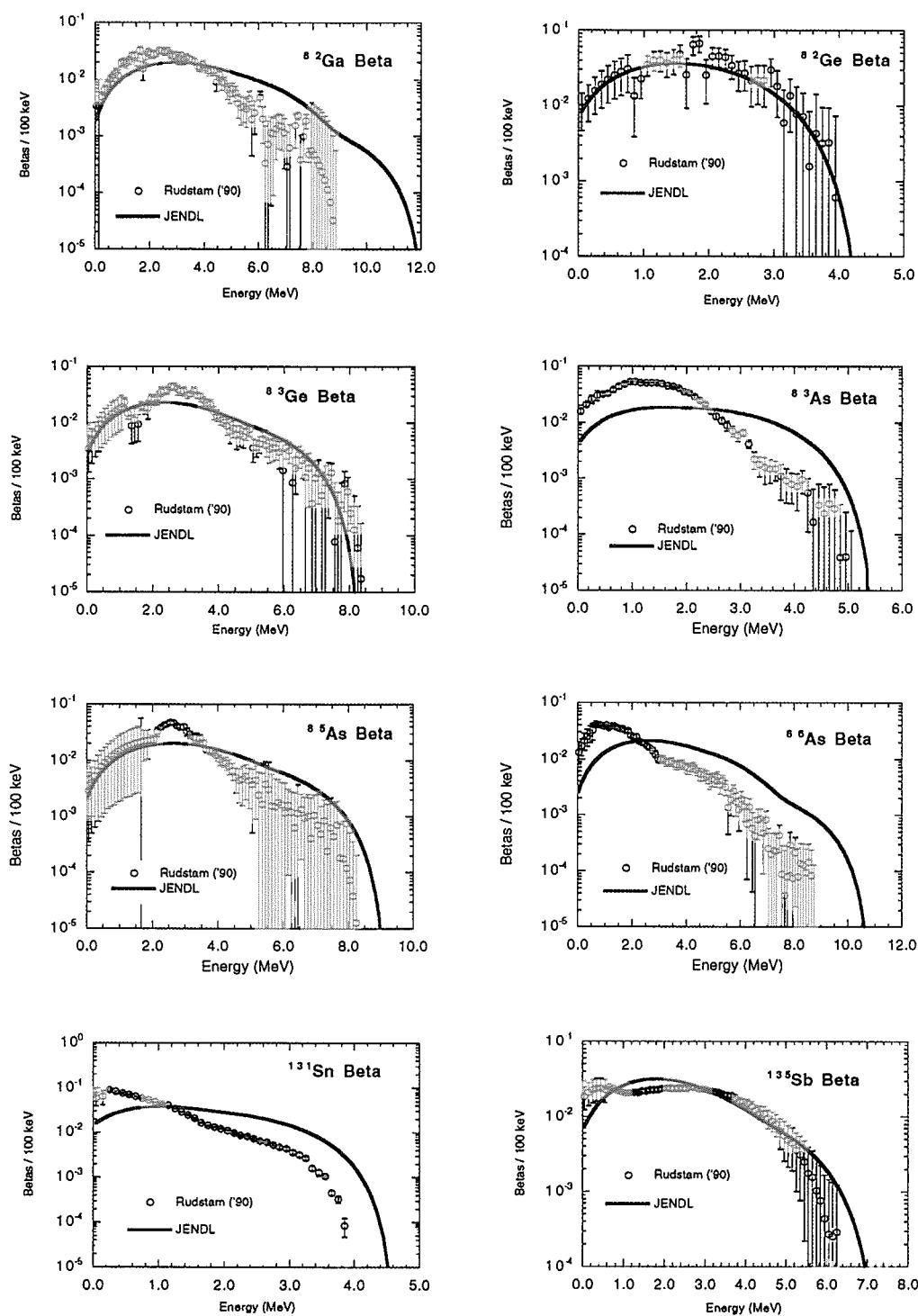


Fig. 4 Comparison of beta-ray spectra of the nuclides whose spectroscopic measured data are not included in ENSDF.

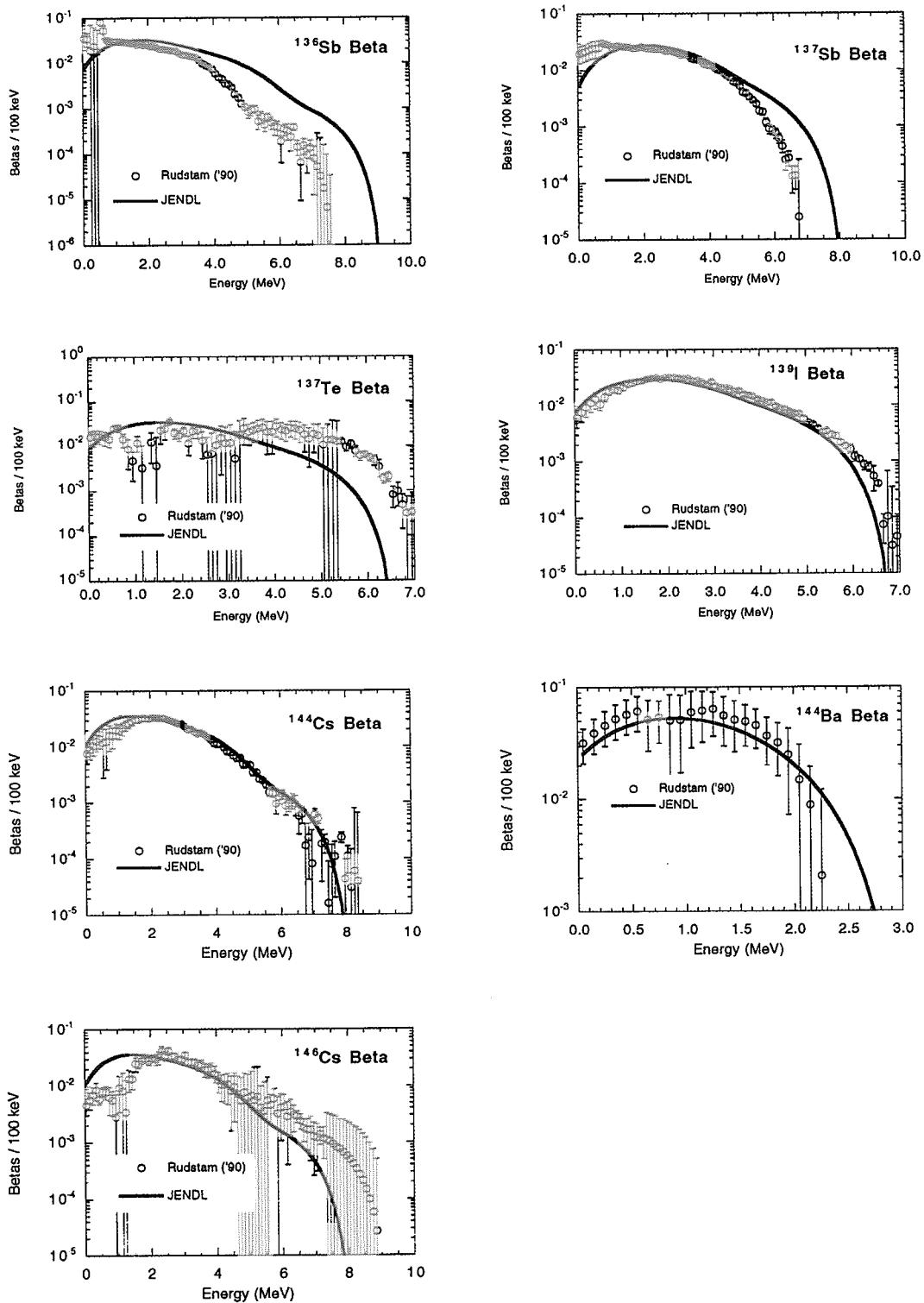


Fig. 5 Comparison of beta-ray spectra of the nuclides whose spectroscopic measured data are not included in ENSDF (II).

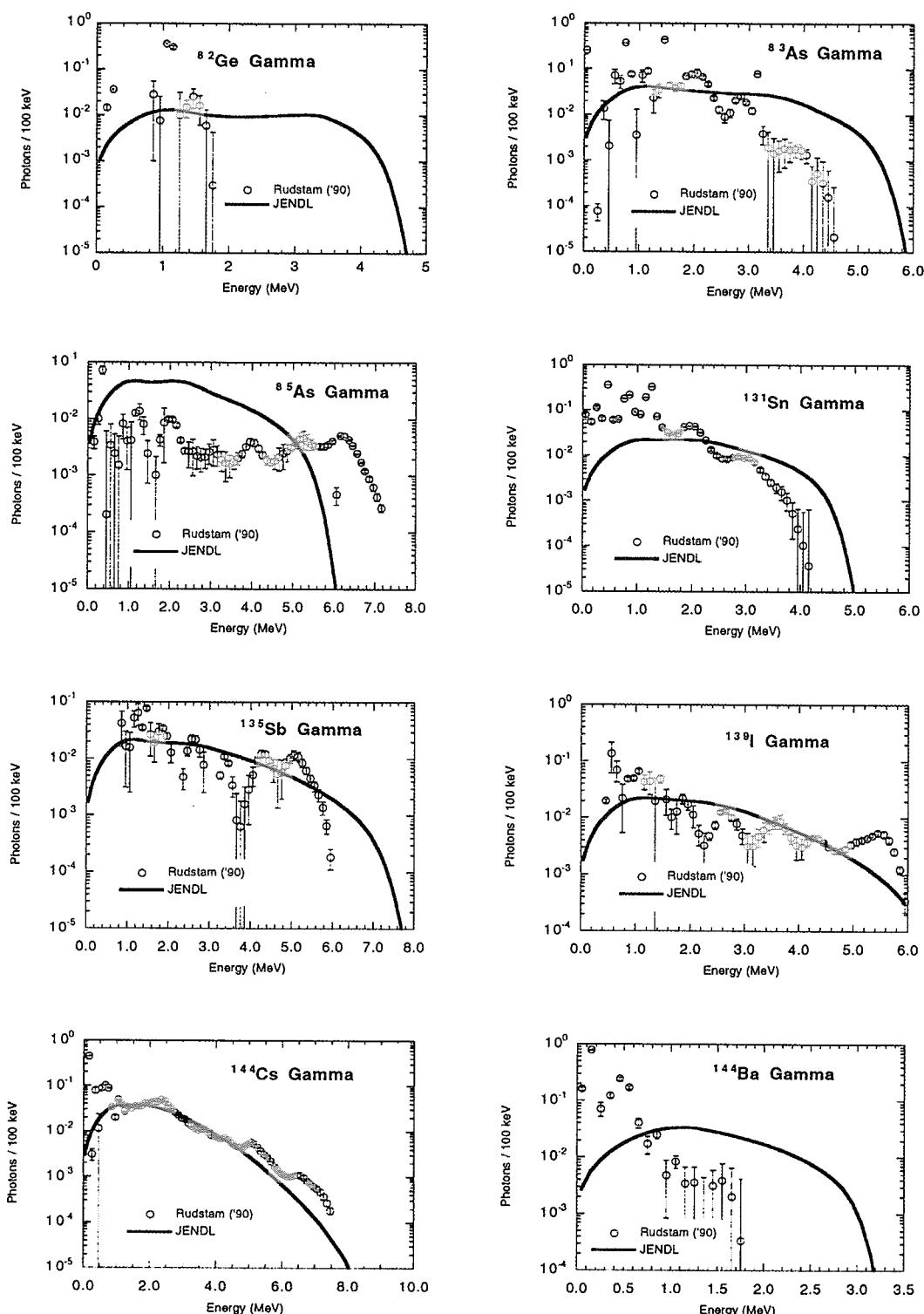


Fig. 6 Comparison of gamma-ray spectra of the nuclides whose spectroscopic measured data or normalization are not given in ENSDF.

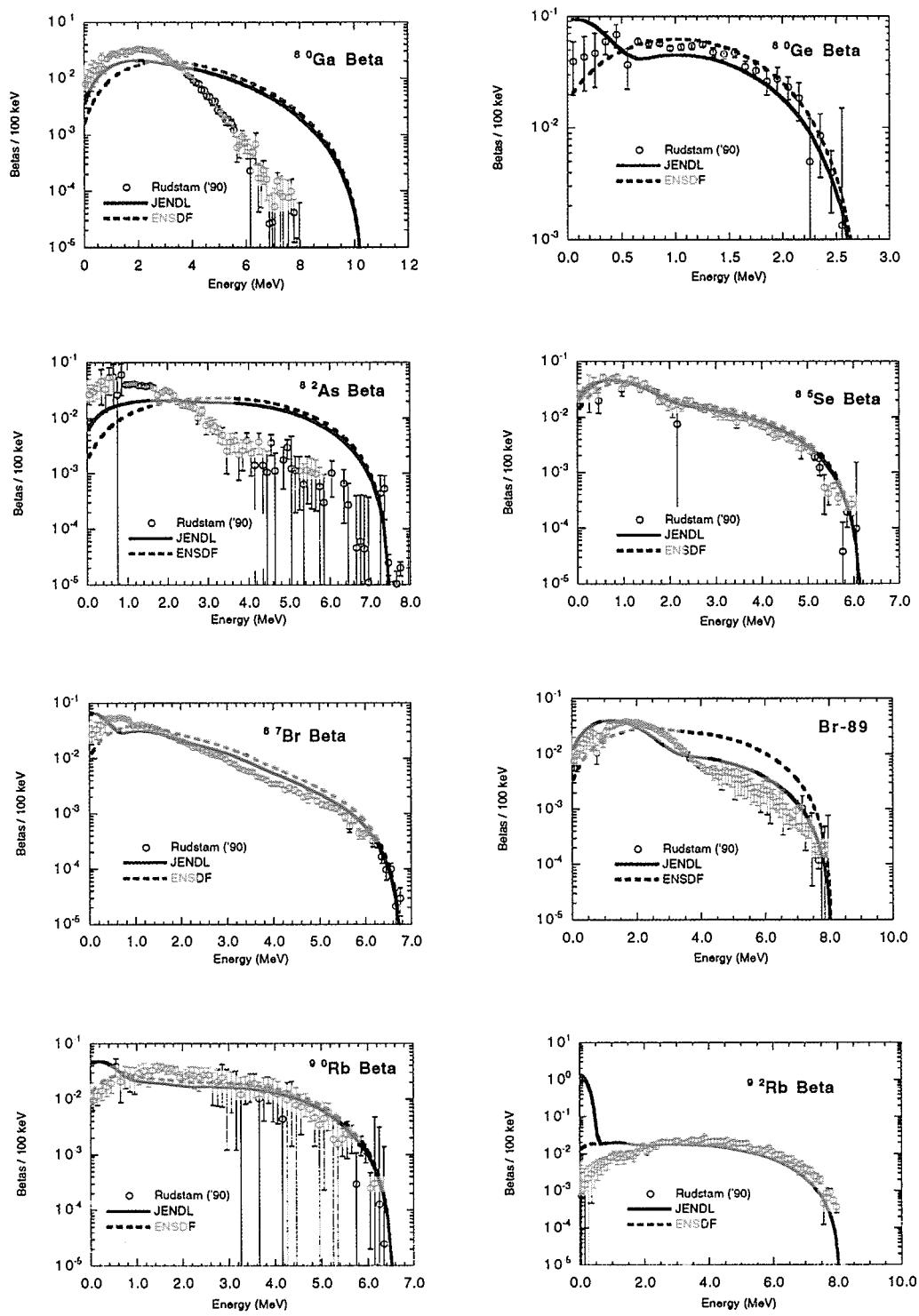


Fig. 7 Comparison of beta-ray spectra of nuclides having both spectroscopically measured and theoretically estimated ones.

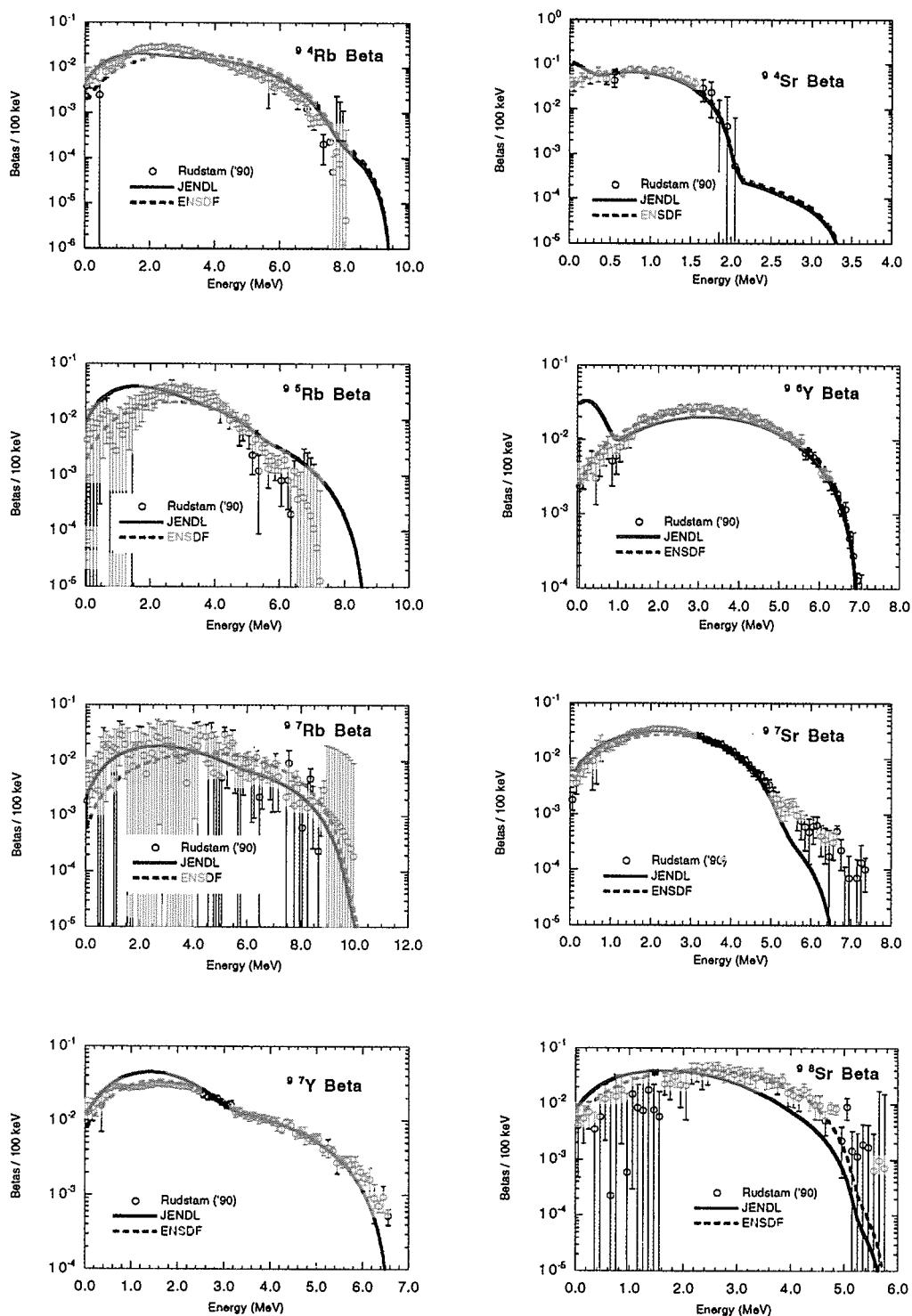


Fig. 8 Comparison of beta-ray spectra of nuclides having both spectroscopically measured and theoretically estimated ones (II)

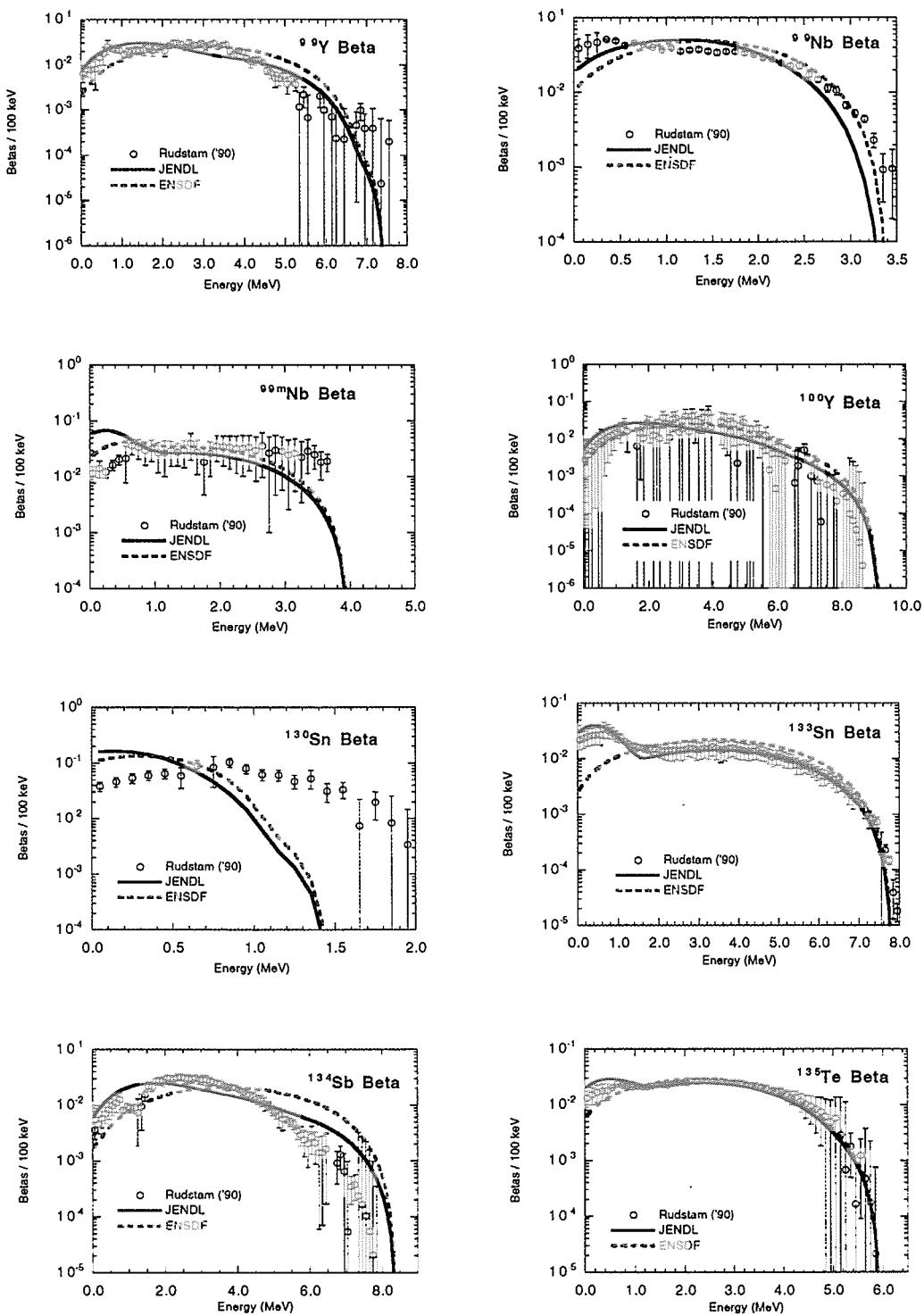


Fig. 9 Comparison of beta-ray spectra of nuclides having both spectroscopically measured and theoretically estimated ones (III).

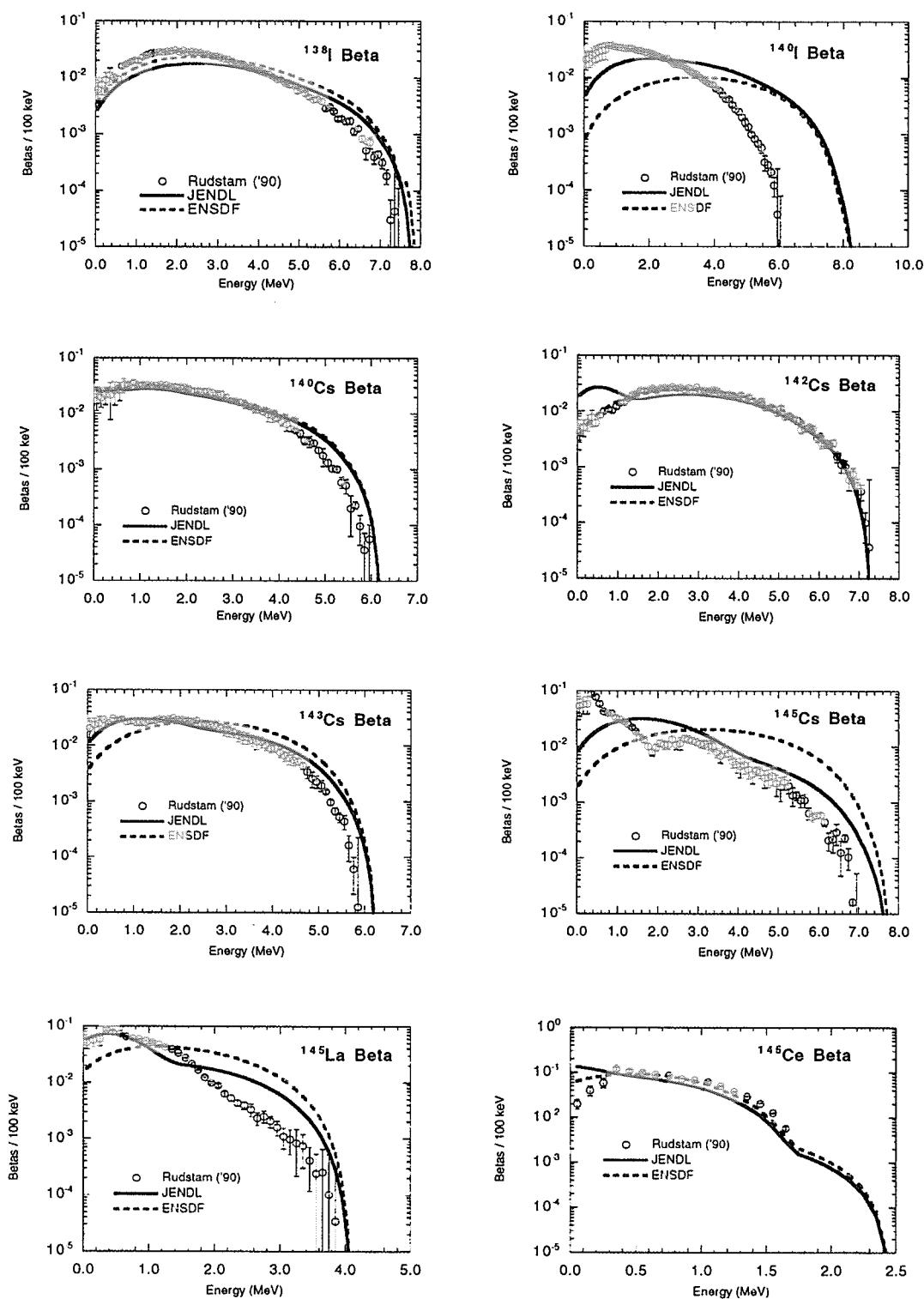


Fig. 10 Comparison of beta-ray spectra of nuclides having both spectroscopic-cally measured and theoretically estimated ones.

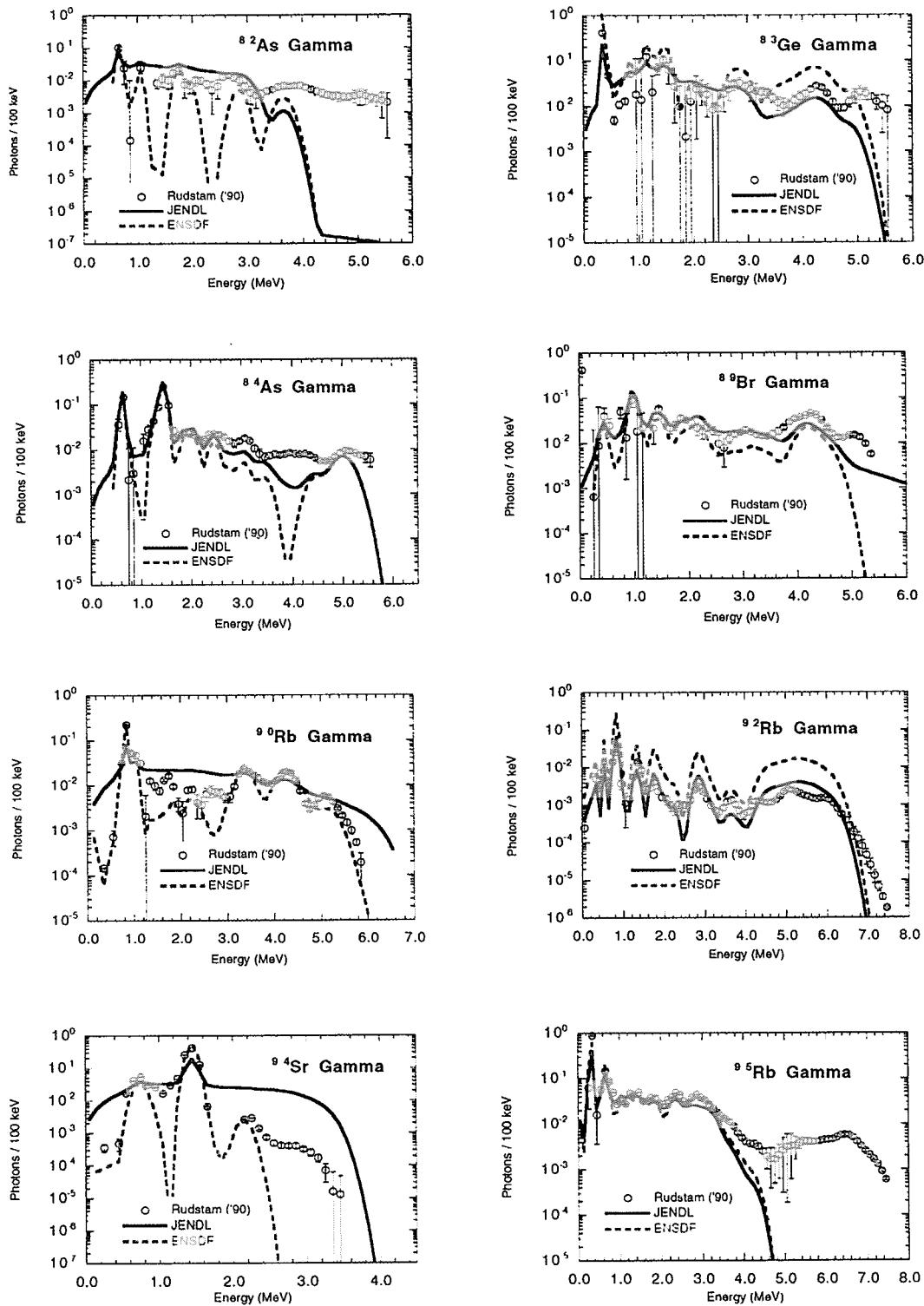


Fig. 11 Comparison of gamma-ray spectra of nuclides having both spectroscopically measured and theoretically estimated ones.

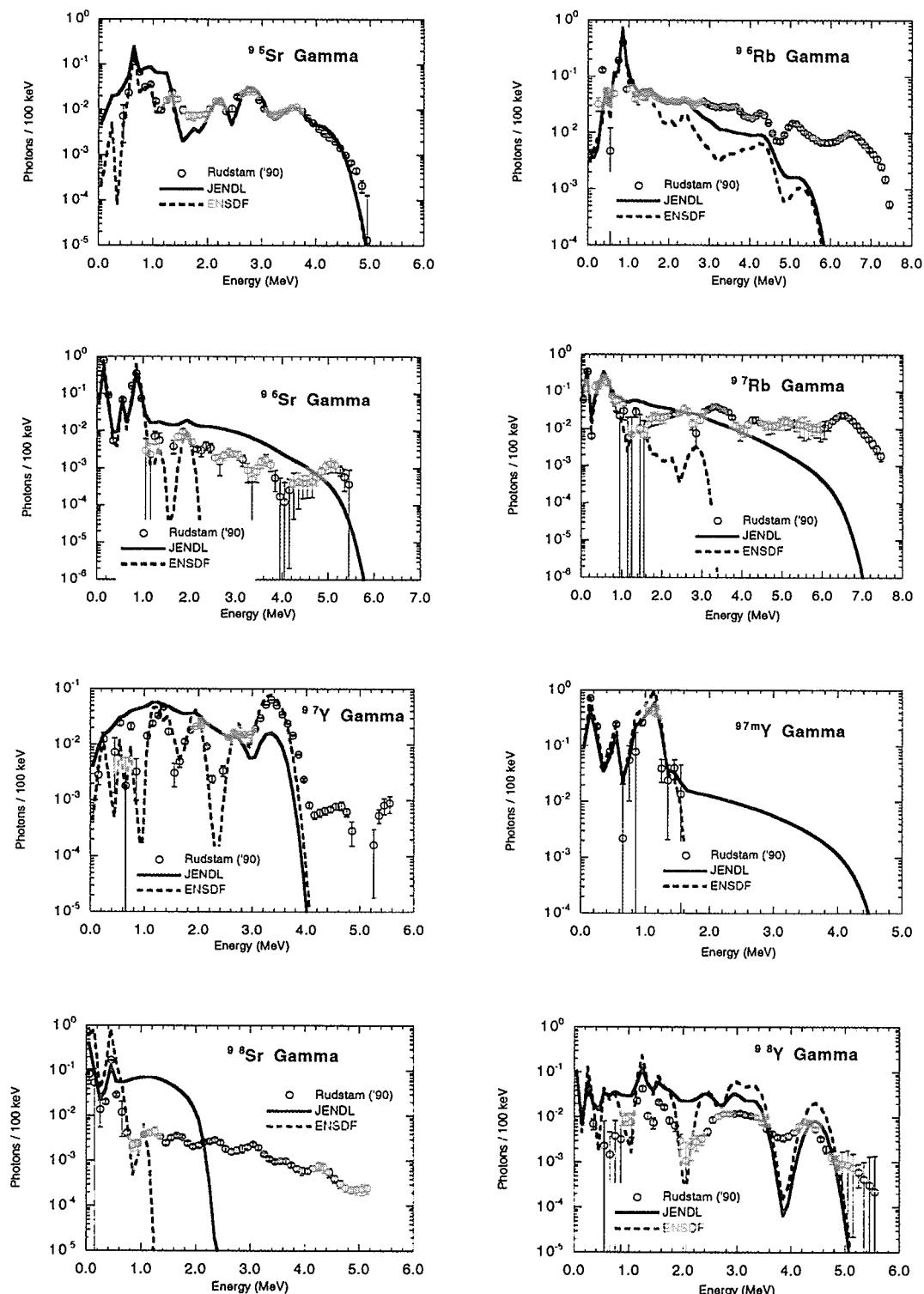


Fig. 12 Comparison of gamma-ray spectra of nuclides having both spectroscopically measured and theoretically estimated ones (II).

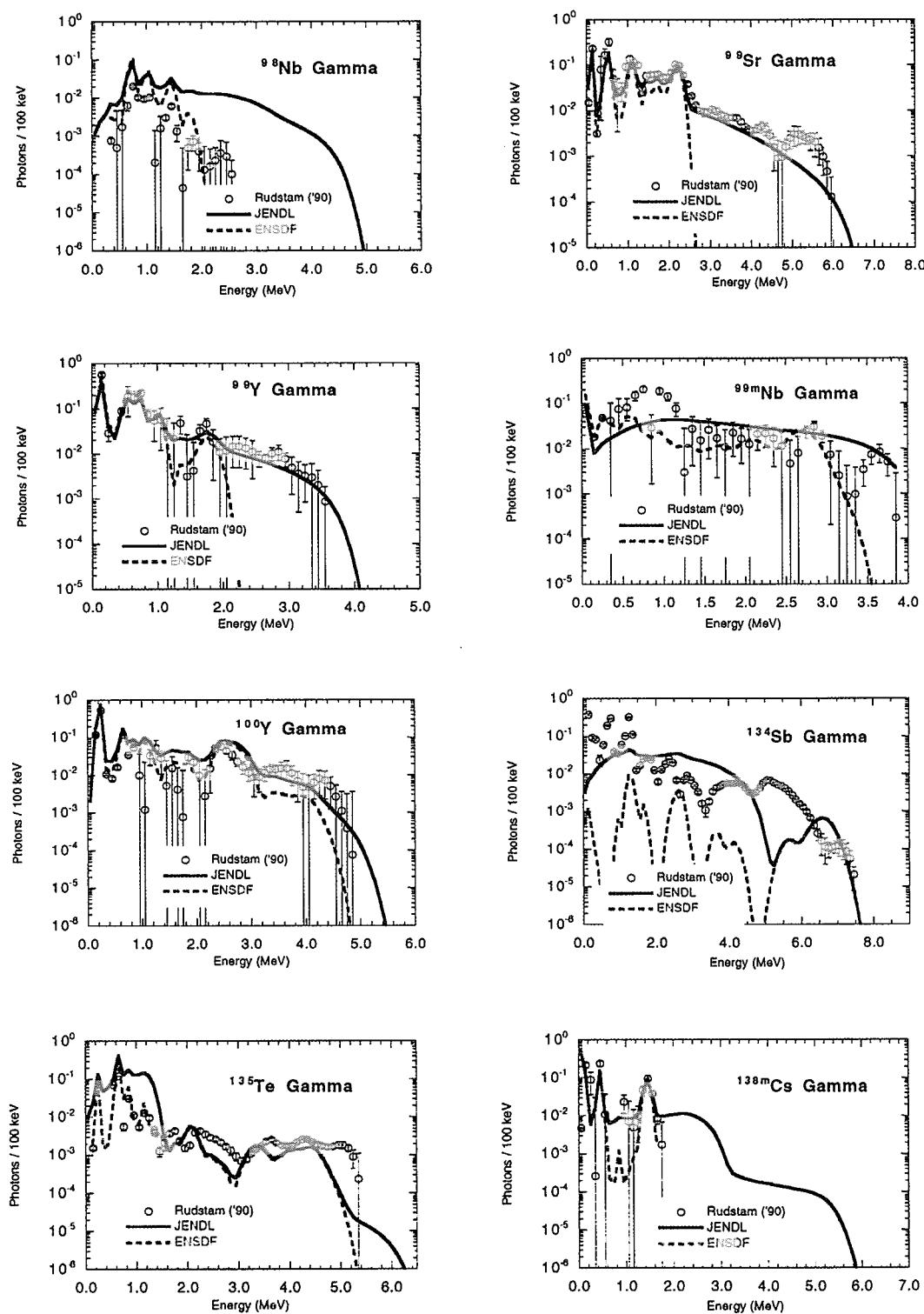


Fig. 13 Comparison of gamma-ray spectra of nuclides having both spectroscopically measured and theoretically estimated ones (III).

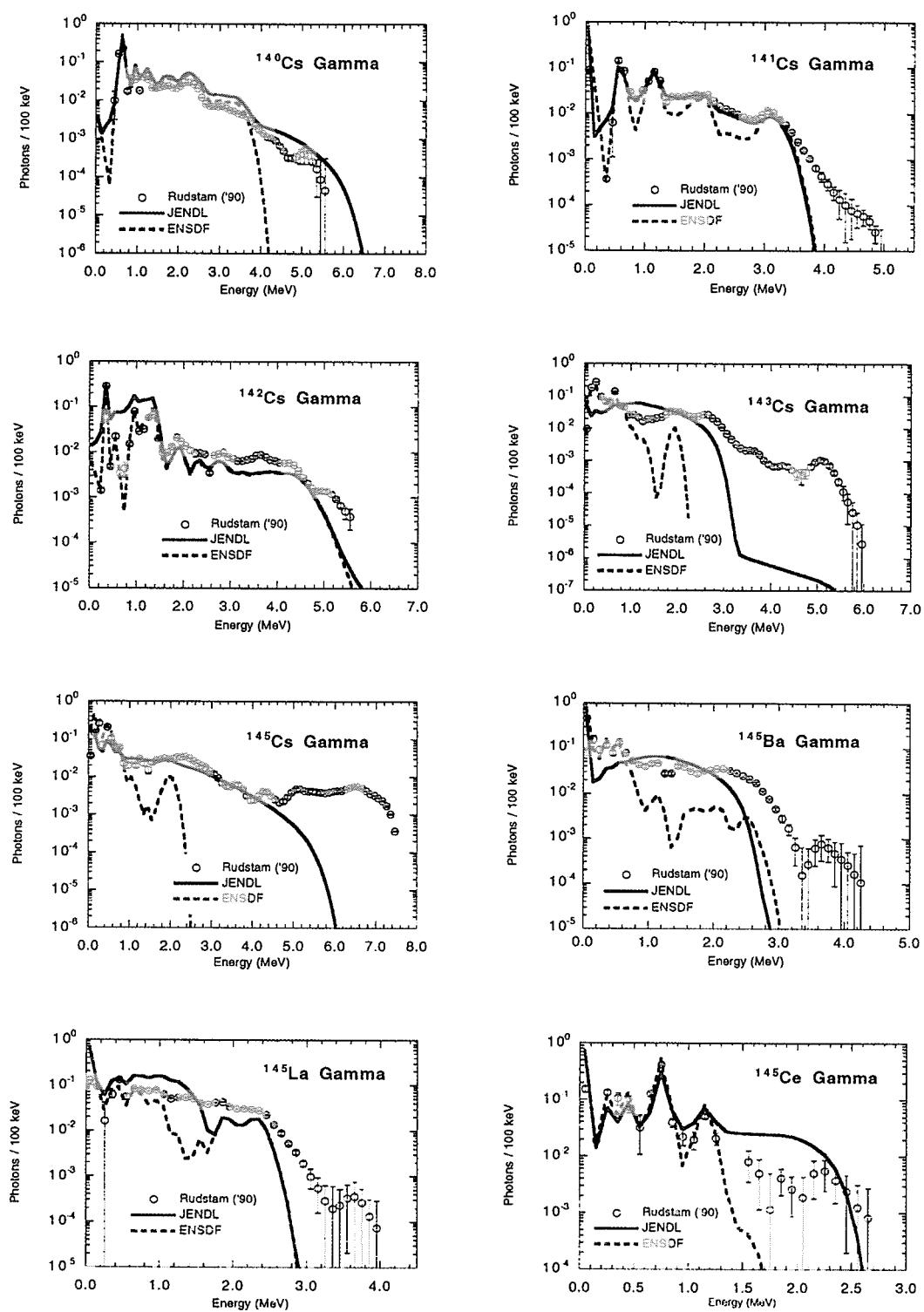


Fig. 14 Comparison of gamma-ray spectra of nuclides having both spectroscopically measured and theoretically estimated ones (IV).

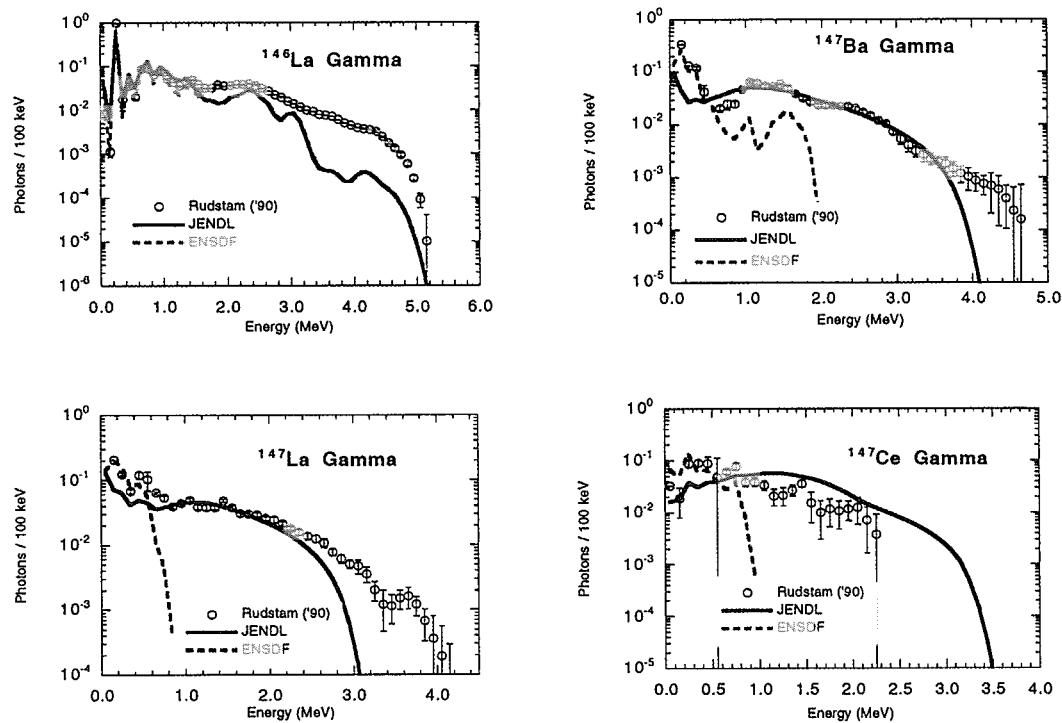


Fig. 15 Comparison of gamma-ray spectra of nuclides having both spectroscopically measured and theoretically estimated ones (V).

## 5 Comparison of Decay Heat

Reactor decay heat analysis is an important application field of JENDL FP Decay Data File 2000. The reliability of the data contained in the file should be examined by comparing the results of summation calculation using the file with the experimental data. Although heat is a form of energy, decay heat usually used as a form of power, or heat rate i.e. energy release rate of fission products produced in a reactor. The build-up and decay of fission products in a nuclear reactor can be described as:

$$\frac{dN_i}{dt} = -(\lambda_i + \sigma_i \phi) N_i + \sum_j f_{j \rightarrow i} (\lambda_j N_j) + \sum_k g_{k \rightarrow i} (\sigma_k \phi N_k) + y_i F,$$

where

$N_i$  = atom number of nuclide  $i$ ,

$\lambda_i$  = decay constant of nuclide  $i$ ,

$\sigma_i$  = neutron reaction cross section of nuclide  $i$ ,

$\phi$  = neutron flux,

$f_{j \rightarrow i}$  = production rate of nuclide  $i$  by the unit decay of nuclide  $j$ ,

$g_{k \rightarrow i}$  = production rate of nuclide  $i$  by the unit neutron reaction of nuclide  $k$ ,

$y_i$  = independent fission yield of nuclide  $i$ ,

$F$  = fission rate.

The decay power,  $P(t)$  (MeV/s), is, then, calculated as the summation of the activities of all fission product nuclides with the weight of decay energy of each nuclides,

$$P(t) = \sum_i \bar{E}_i \{\lambda_i N_i(t)\},$$

where  $\bar{E}_i$  is the average decay energy value of the nuclide  $i$ . The term of summation calculation comes from this equation.

When a fissile nuclide irradiated at a steady rate of  $F$  fissions/s for a time  $I$  s and neutron capture in the fission products is negligible, the decay heat  $P(I, t')$  per unit fission (MeV/fission) [(MeV/s)/(fission/s)] at a time  $t'$  s following the end of the irradiation is expressed using a burst function  $f(t)$  (MeV/fission/s), that is, decay power output at a time  $t$  s after a fission burst, as follows:

$$\begin{aligned} P(I, t') &= \frac{1}{F} \left[ F \int_0^I f(t + t') \cdot dt \right], \\ &= \frac{1}{F} \left[ F \int_{t'}^{I+t'} f(t) \cdot dt \right], \\ &= \int_{t'}^{I+t'} f(t) \cdot dt. \end{aligned}$$

If the irradiation time  $I$  is short compared to the decay time  $t'$  the function  $f(t)$  is approximated by  $f(t' + I/2)$ , that is,

$$P(I, t')/I = f(t' + I/2)$$

The above equation means that the decay heat  $P(I, t')$  divided by the irradiation time is equal to the burst function  $f(t)$  evaluated at  $t' + I/2$  after fission burst for  $I \ll t'$ . This equation provides a means

of evaluating approximately the burst function from decay heat measurements obtained for short irradiation times. The comparison between the decay heat measurements and the summation calculations is usually performed for the burst function.

As seen in the above equations the fission yield data are needed in the summation calculation but JENDL FP Decay Data File 2000 itself does not include the fission yield data. The yield data are taken from JNDC-V2 library whose number of nuclides is 1227 and less than the number of nuclides in the JENDL file, that is, 1229. The yield data of additional 2 nuclides in JENDL FP Decay Data File 2000 are not taken into account in the calculation because they are considered to have negligibly small contribution. Some nuclides yield data, however, are modified for the present calculation because the ground state and metastable state of some nuclides are interchanged between the JENDL file and the JNDC-V2 library. They are  $^{102,102m}\text{Rh}$ ,  $^{104,104m}\text{Nb}$ ,  $^{108,108m}\text{Rh}$ ,  $^{110,110m}\text{In}$ ,  $^{130,130m}\text{Sb}$  and  $^{170,170m}\text{Ho}$ . Using these data, the decay heat calculations were carried out with the code FPGS<sup>25)</sup>.

The comparisons were performed for the thermal neutron fission of  $^{235}\text{U}$ ,  $^{239}\text{Pu}$  and  $^{241}\text{Pu}$  and for the fast neutron fission of  $^{232}\text{Th}$ ,  $^{233}\text{U}$ ,  $^{235}\text{U}$ ,  $^{238}\text{U}$  and  $^{239}\text{Pu}$ . The measured data used for the comparison were those at the University of Tokyo (referred hereafter as YAYOI)<sup>19, 20, 21)</sup>, Oak Ridge National Laboratory (ORNL)<sup>22, 23, 24)</sup> and University of Massachusetts, LOWELL<sup>26, 27)</sup>.

### 5.1 Comparison with YAYOI Measurements

The decay heat measurements<sup>19, 20, 21)</sup> of fission products were performed for the fast neutron fissions of  $^{232}\text{Th}$ ,  $^{233}\text{U}$ ,  $^{235}\text{U}$ ,  $^{238}\text{U}$  and  $^{239}\text{Pu}$ . The samples of the fissionable nuclides were irradiated for 10 to 300 seconds in the core of fast neutron source reactor YAYOI of the University of Tokyo. The beta- and gamma-rays emitted from the irradiated samples were measured for times-after-fission of 11 to 26000 seconds. The data were obtained for the beta- and gamma-rays separately as spectral distributions. The spectra were integrated over full energy range to obtain the energy integrated values as a function of time after fission burst.

The data were converted to the energy release rate at a time  $t$  following an instantaneous fission burst. The time  $t$  in this case is taken as:

$$t = t_{\text{wait}} + \frac{1}{2} (t_{\text{irrad}} + t_{\text{count}}),$$

where

$t_{\text{wait}}$  = waiting time before counting after irradiation,

$t_{\text{irrad}}$  = irradiation time,

$t_{\text{count}}$  = counting time.

The results of the comparisons are shown in Figs. 16 through 20. The vertical axis is the burst function multiplied by the time  $t$  after fission burst. In these figures the ratios of the calculated results to the measured values, that is, C/E values are also shown in the right hand side of each figure. And the calculated results using JNDC-V2 library are shown too for the comparison. In these figures, the present results are not so different from those using JNDC-V2 library. The present results, however, show 2 to 3 % better agreement for the case of gamma energy than JNDC-V2 library does in the time region of about 1000 s and shorter after fission burst. The present improvement comes from the adoption of newly measured data from the ENSDF file reported after the compilation of JNDC-V2 library.

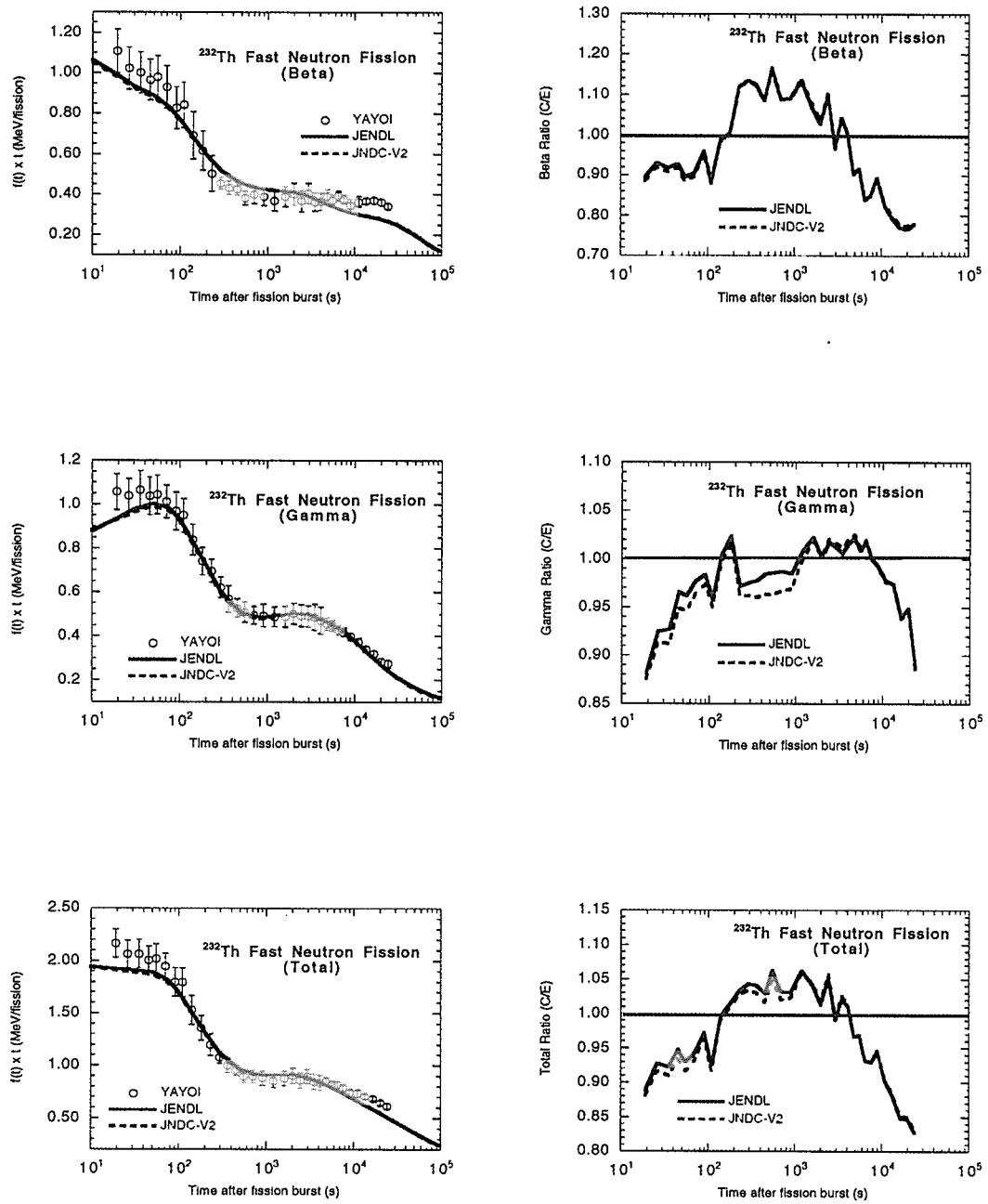


Fig. 16 Comparison of calculated and measured decay heat values after  $^{232}\text{Th}$  fast neutron fission. Left hand side shows the energy release rate multiplied by the time after fission. Right hand side shows the ratios of calculated values to measured results.

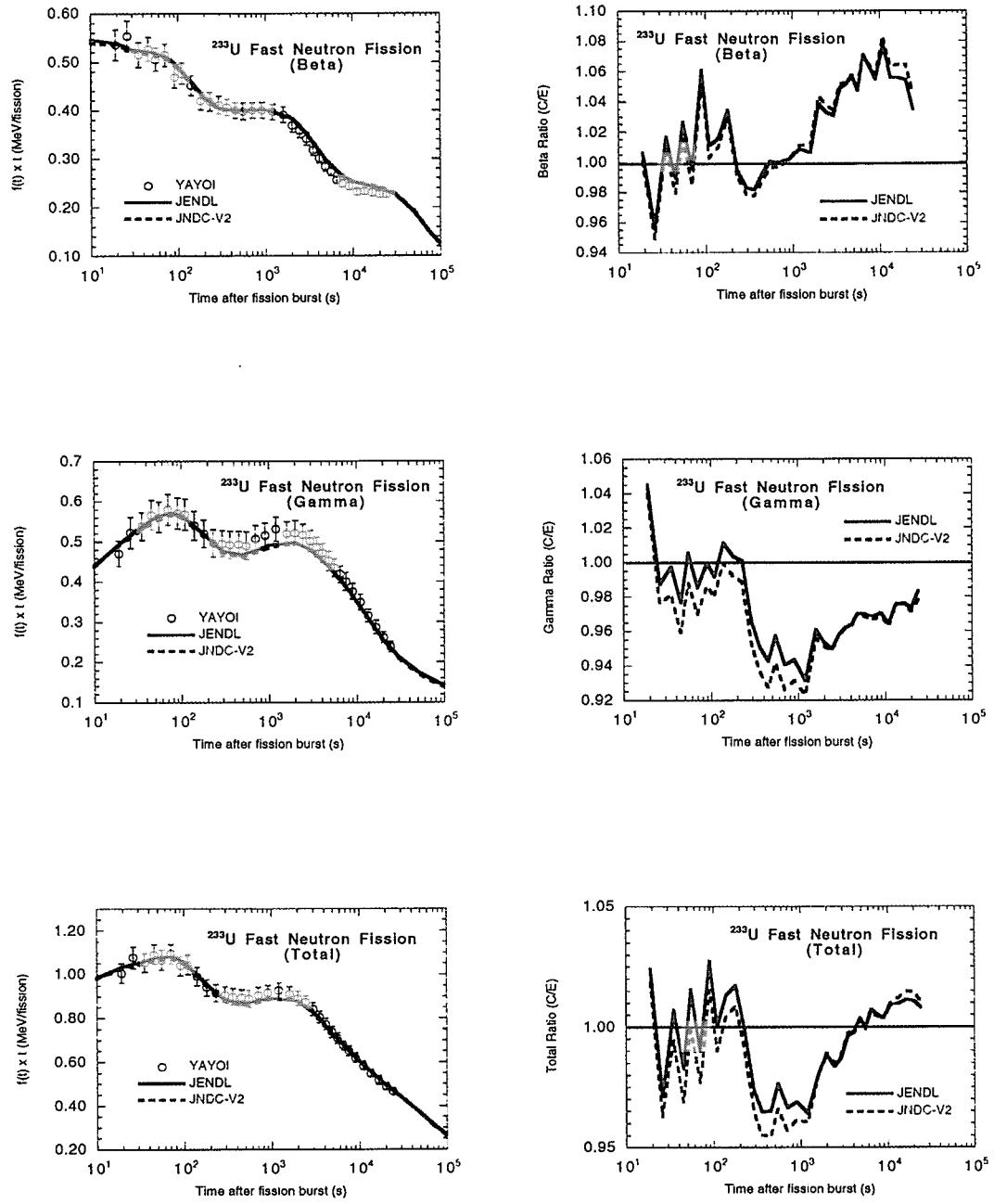


Fig. 17 Comparison of calculated and measured decay heat values after  $^{233}\text{U}$  fast neutron fission. Left hand side shows the energy release rate multiplied by the time after fission. Right hand side shows the ratios of calculated values to measured results.

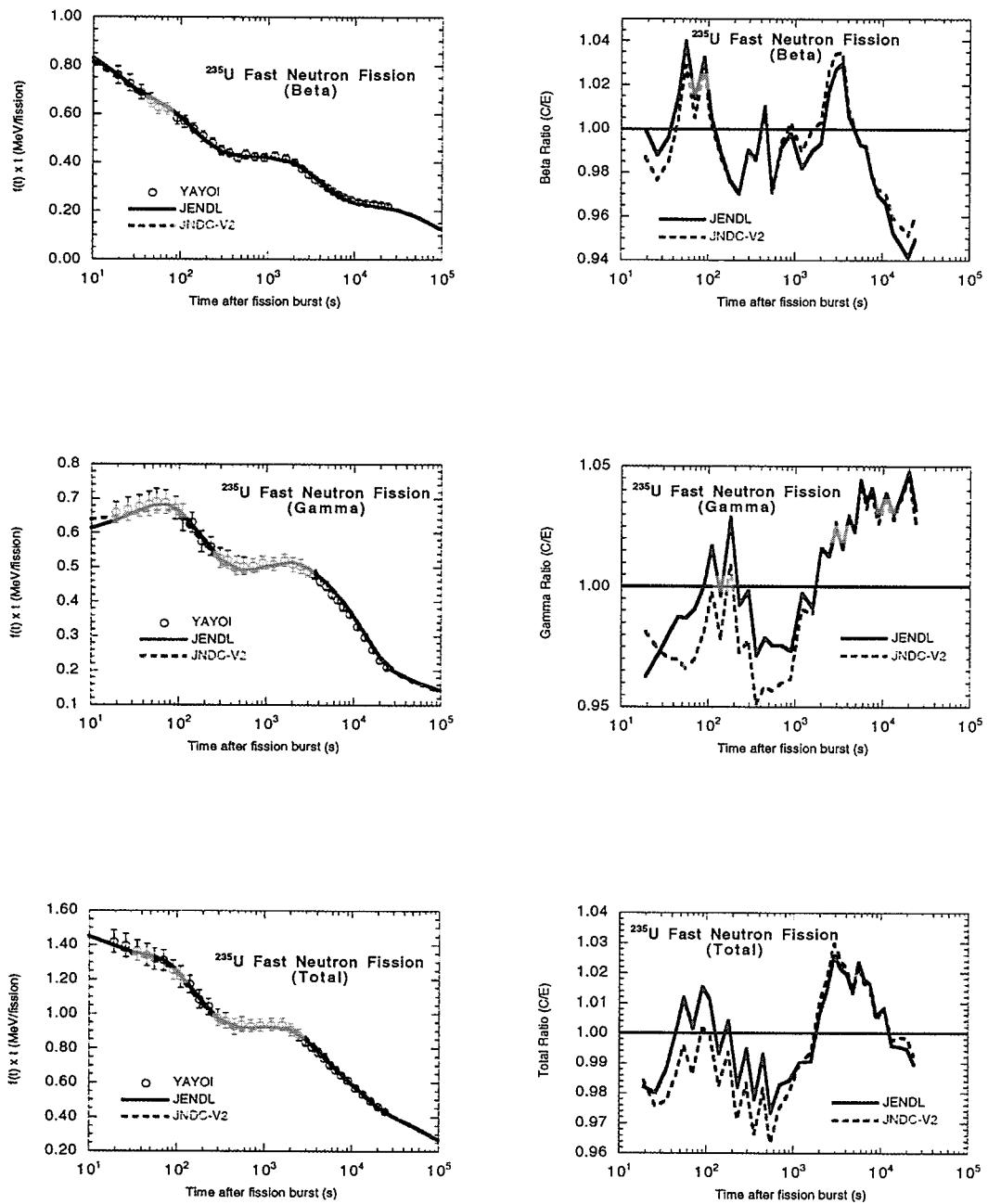


Fig. 18 Comparison of calculated and measured decay heat values after  $^{235}\text{U}$  fast neutron fission. Left hand side shows the energy release rate multiplied by the time after fission. Right hand side shows the ratios of calculated values to measured results.

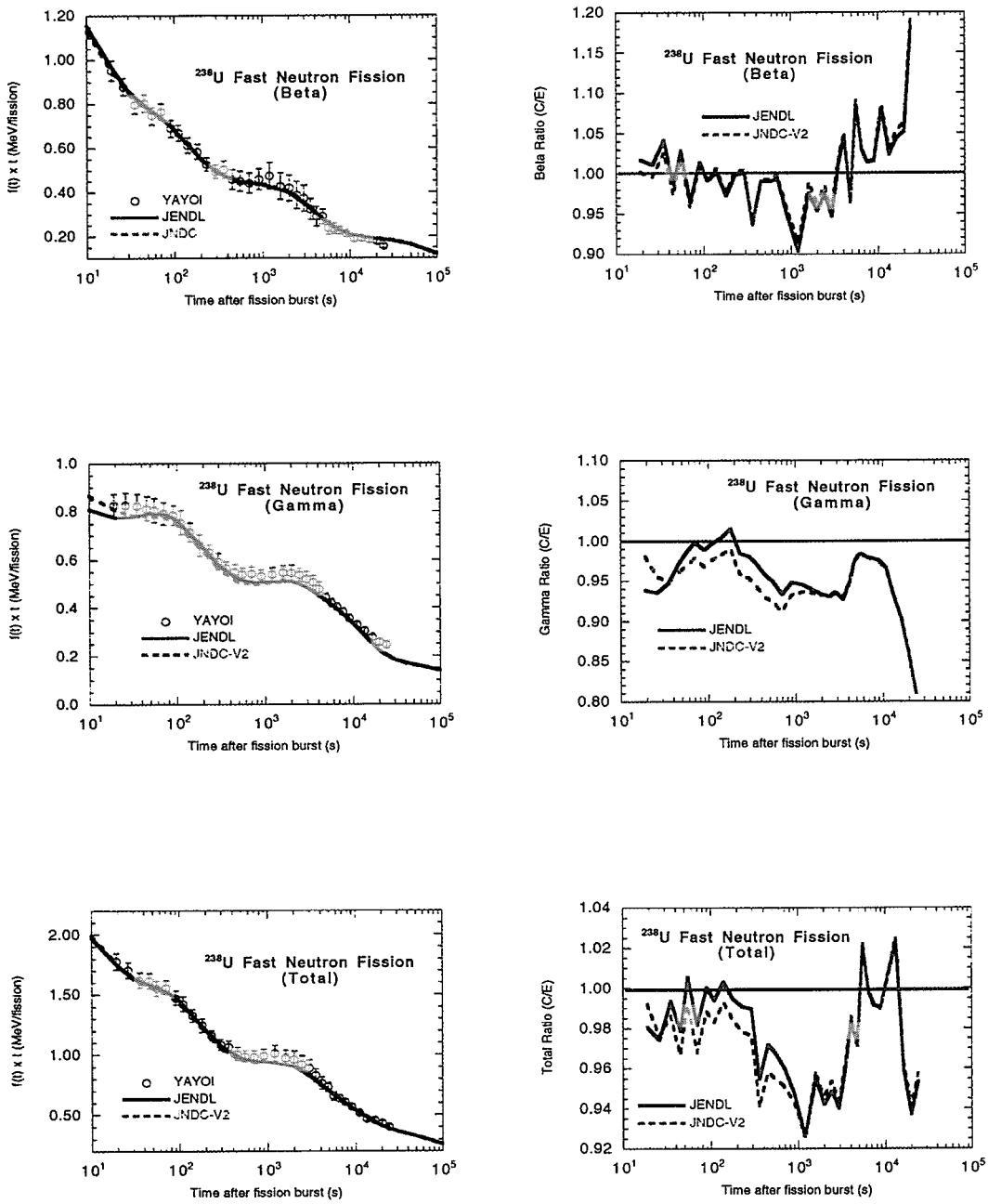


Fig. 19 Comparison of calculated and measured decay heat values after  $^{238}\text{U}$  fast neutron fission. Left hand side shows the energy release rate multiplied by the time after fission. Right hand side shows the ratios of calculated values to measured results.

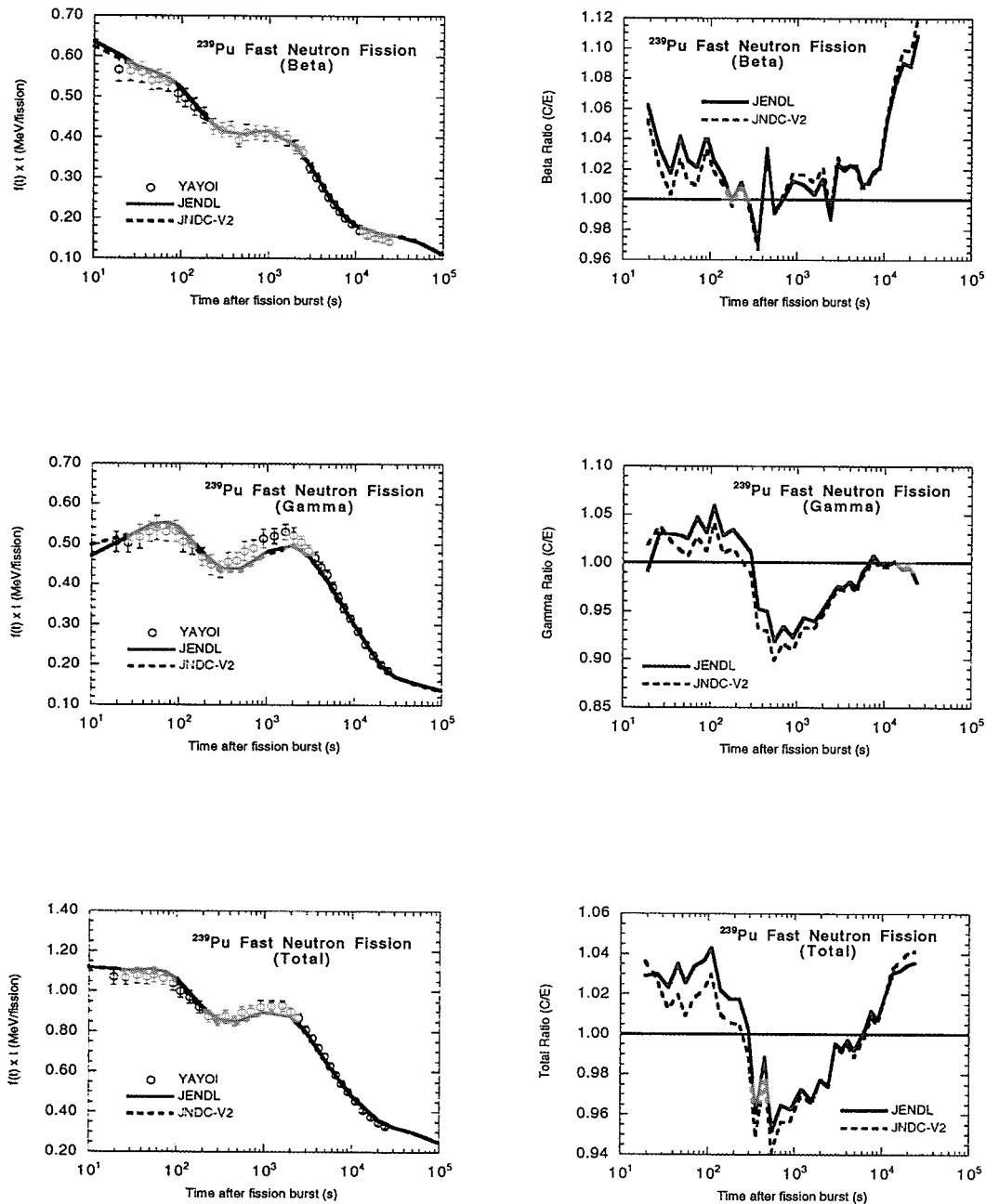


Fig. 20 Comparison of calculated and measured decay heat values after  $^{239}\text{Pu}$  fast neutron fission. Left hand side shows the energy release rate multiplied by the time after fission. Right hand side shows the ratios of calculated values to measured results.

## 5.2 Comparison with ORNL Measurements

The decay heat measurements<sup>22, 23, 24)</sup> were performed for the thermal neutron fission of  $^{235}\text{U}$ ,  $^{239}\text{Pu}$  and  $^{241}\text{Pu}$ . Samples of fissionable nuclides were irradiated for 1 to 100 seconds using the fast pneumatic tube facility at Oak Ridge Research Reactor. The beta- and gamma-rays emitted from the irradiated samples were measured for times after fission of 2 to 14000 seconds. The data were obtained as spectral distributions for beta- and gamma-rays separately. The spectral distributions were integrated to provide the energy release rate as a function of time after fission. The results of the summation calculation using JENDL FP Decay Data File 2000 were compared with the measured data.

The results of the comparisons are shown in Figs. 21 through 23. The prominent difference is seen for the gamma decay heat of  $^{241}\text{Pu}$  at the times about 10 seconds after fission burst where JNDC-V2 calculation overestimates the measured values more than 10 % but the calculation using JENDL FP Decay Data File 2000 shows no such overestimation and remain within the experimental errors. Similar behavior is also seen for the case of  $^{239}\text{Pu}$  gamma component. This improvement results from the modification of fission yield. The meta stable state and the ground state of  $^{104}\text{Nb}$  were misunderstood in JNDC-V2 library. So the present calculation used the yield data interchanged between the meta stable and the ground states of  $^{104}\text{Nb}$ . In the comparison of the gamma-ray component of  $^{235}\text{U}$  case shown in Fig. 21, the measured data at the University of Tokyo are also shown for the time region over a few 100 seconds after fission burst because the ORNL measurements seem to have some problems for this time region. The C/E values are then derived from the comparison with the measured data of the University of Tokyo for the time region after 300 seconds. The C/E values compared with the data of the University of Tokyo remain within  $\pm 5\%$  excepting the longer most part of the times.

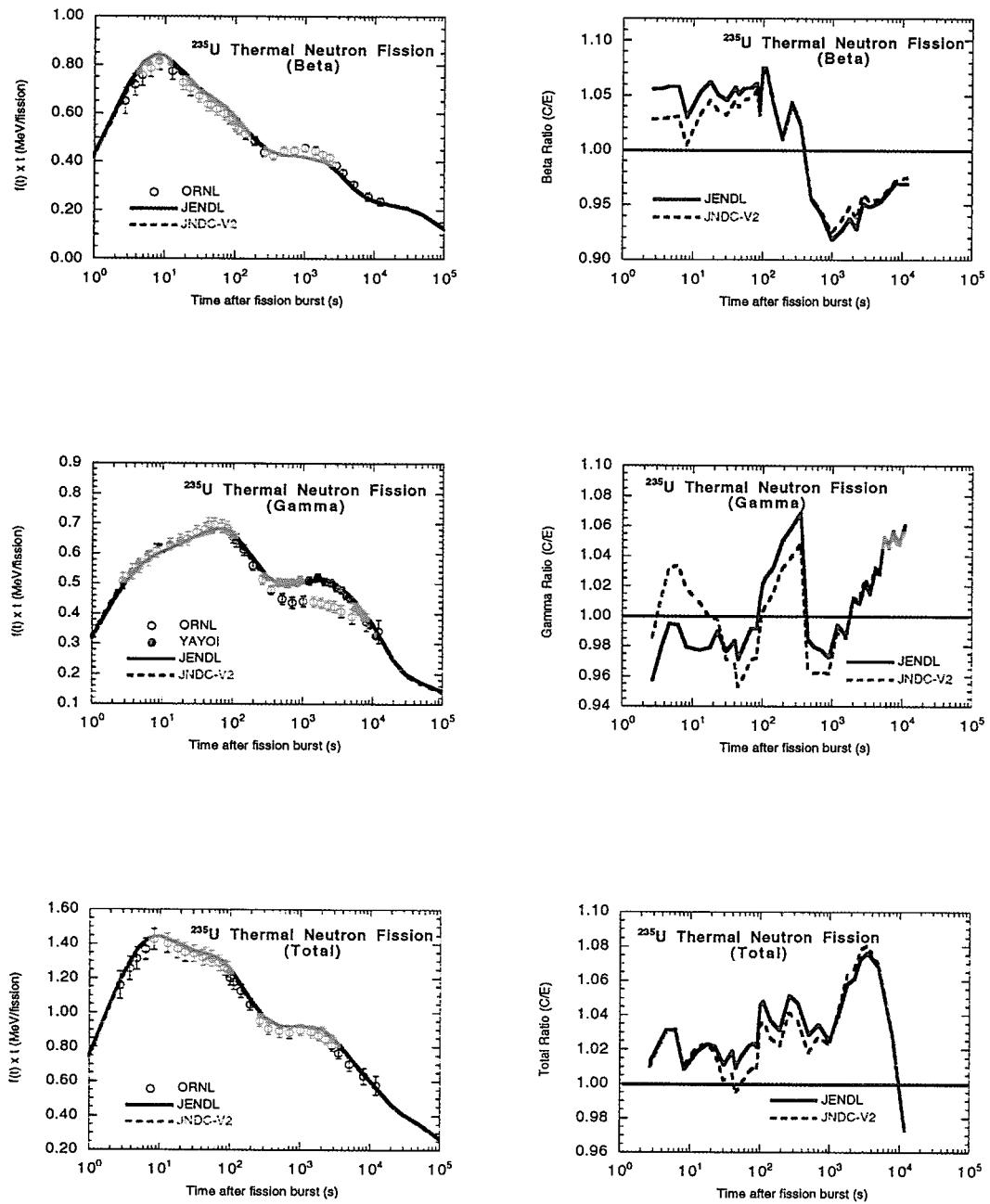


Fig. 21 Comparison of calculated and measured decay heat values after  $^{235}\text{U}$  thermal neutron fission. Left hand side shows the energy release rate multiplied by the time after fission. Right hand side shows the ratios of calculated values to measured results.

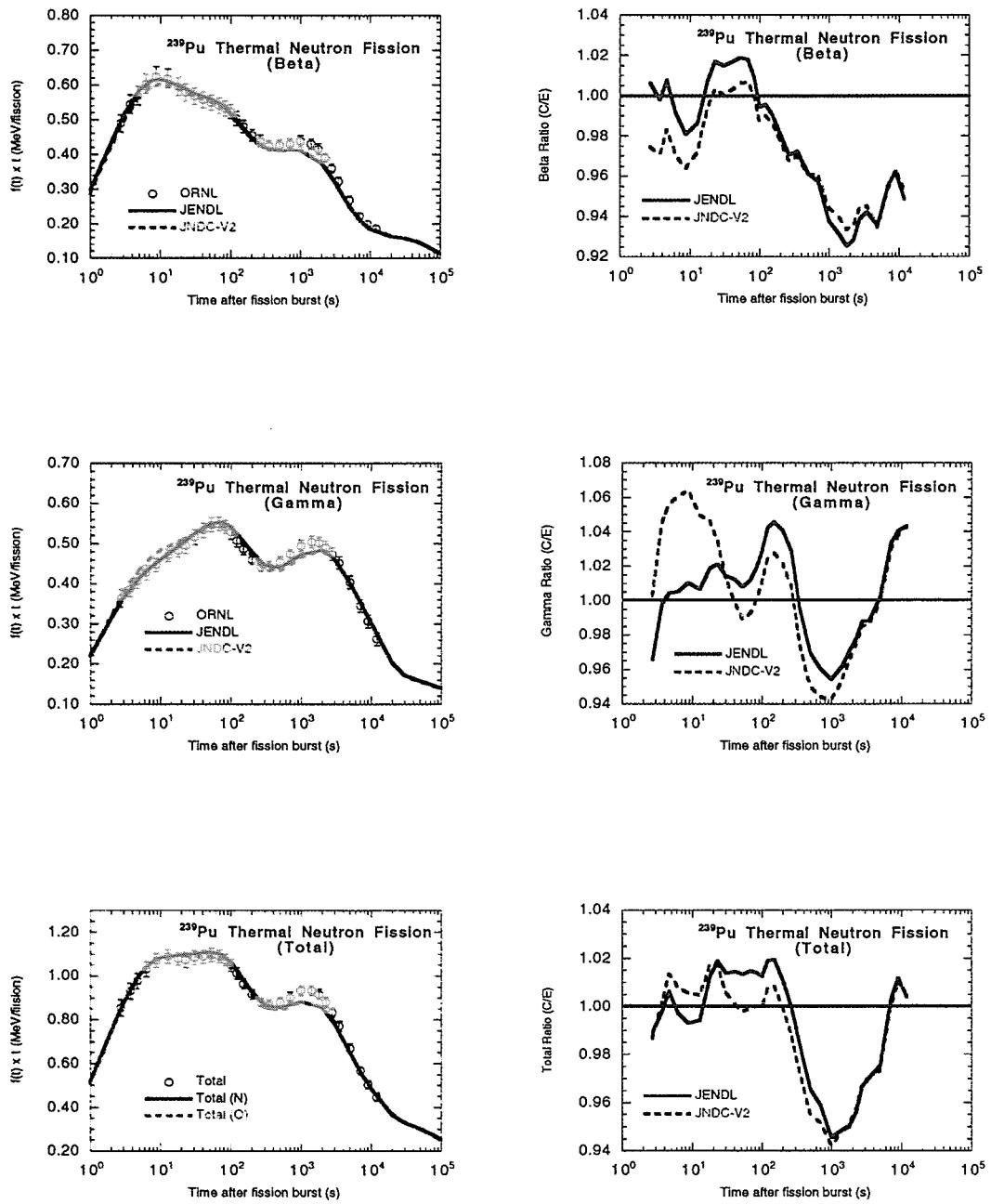


Fig. 22 Comparison of calculated and measured decay heat values after  $^{239}\text{Pu}$  thermal neutron fission. Left hand side shows the energy release rate multiplied by the time after fission. Right hand side shows the ratios of calculated values to measured results.

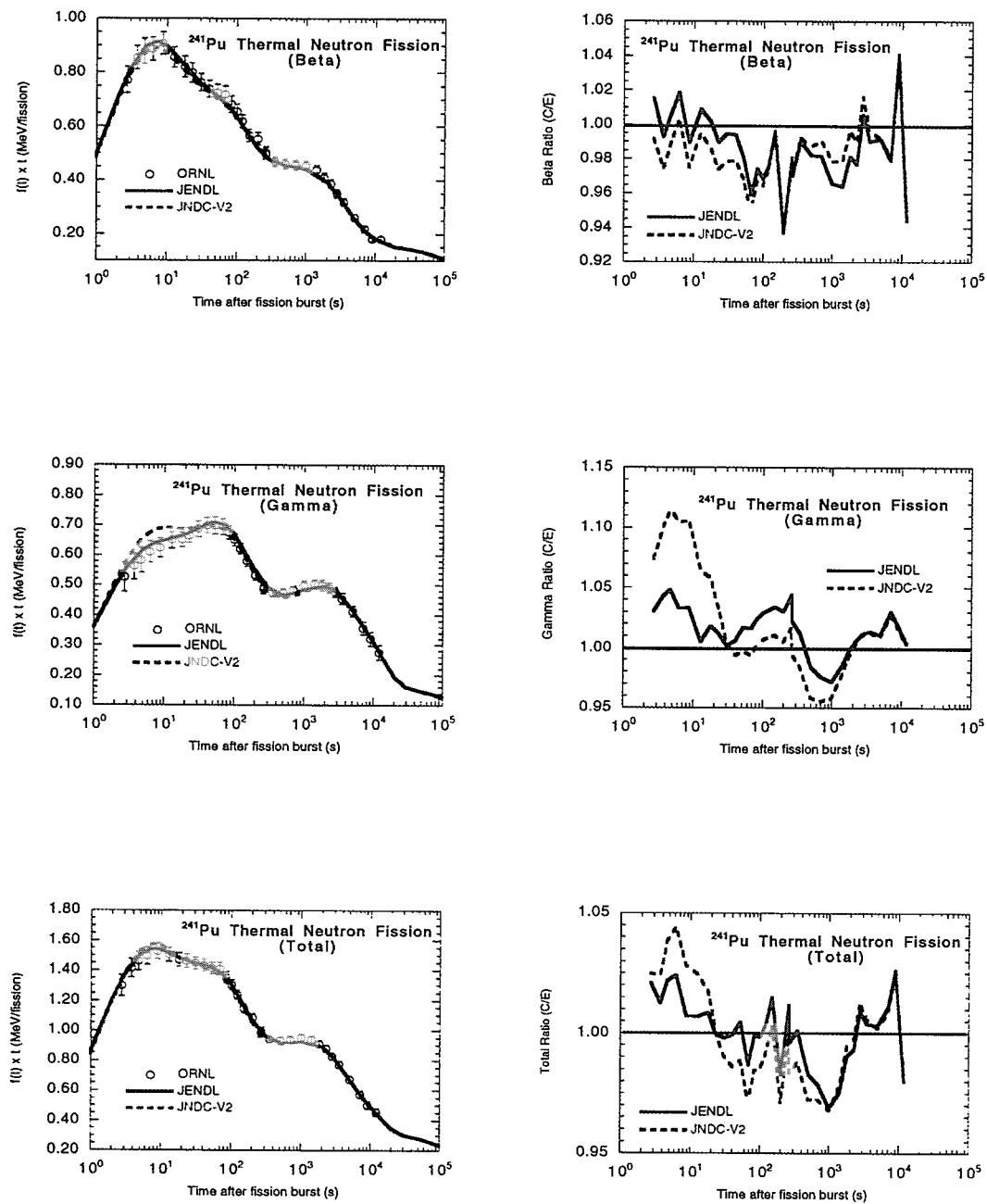


Fig. 23 Comparison of calculated and measured decay heat values after  $^{241}\text{Pu}$  thermal neutron fission. Left hand side shows the energy release rate multiplied by the time after fission. Right hand side shows the ratios of calculated values to measured results.

### 5.3 Comparison with LOWELL Measurements

A group at University of Massachusetts, LOWELL, measured <sup>26, 27)</sup> the decay heat after <sup>235</sup>U thermal neutron fission, <sup>238</sup>U fast neutron fission and <sup>239</sup>Pu thermal neutron fission. The measurements were performed also for shorter cooling times than 1 seconds. There were no available measured data for such short cooling time region before these measurements. Comparisons are shown in Figs. 24, 25 and 26.

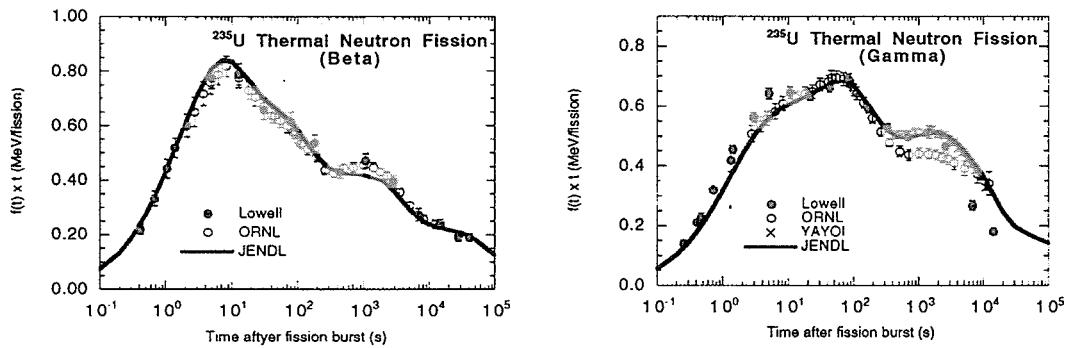


Fig. 24 Comparison of calculated and measured decay heat values after <sup>235</sup>U thermal neutron fission. Left hand side shows the beta-ray component. Right hand side shows the gamma-ray component. The measured data at ORNL and YAYOI are also shown.

In these figures, the beta-ray component is shown on the left hand side and the gamma-ray component on the right hand side. The measured data of ORNL and YAYOI are also shown in the figures.

The LOWELL measurements of the beta-ray component agree well with the previous measurements. The calculation using the JENDL file shows good agreement with the Lowell measurements at even shorter cooling times than 1.0 second.

The gamma-ray component, however, shows some discrepancies between the LOWELL and ORNL measurements of <sup>235</sup>U and <sup>239</sup>Pu at cooling times of a few seconds and over a few thousand seconds and between the LOWELL and YAYOI measurements of <sup>238</sup>U at cooling times of a few tens seconds and over a few thousand seconds. The calculation using the JENDL file also shows disagreement in the Lowell measurements in these cooling time regions. The calculated results at shorter than a few seconds cooling times, however, seem to agree reasonably well with the LOWELL data.

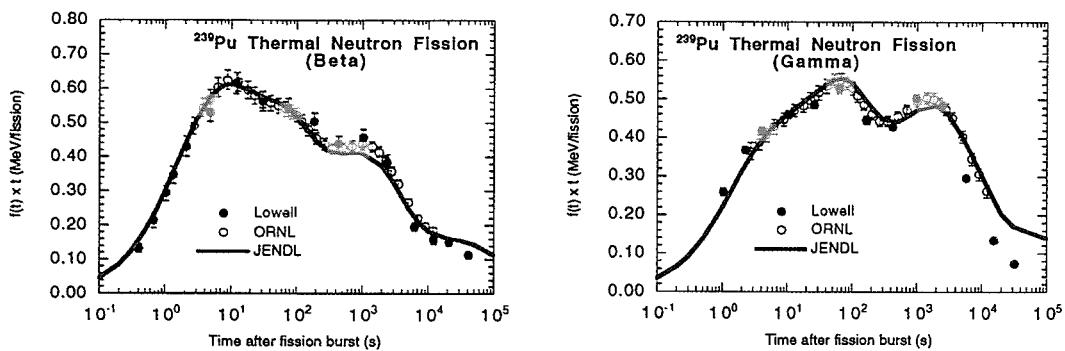


Fig. 25 Comparison of calculated and measured decay heat values after  $^{239}\text{Pu}$  thermal neutron fission. Left hand side shows the beta-ray component. Right hand side shows the gamma-ray component. The measured data at ORNL are also shown.

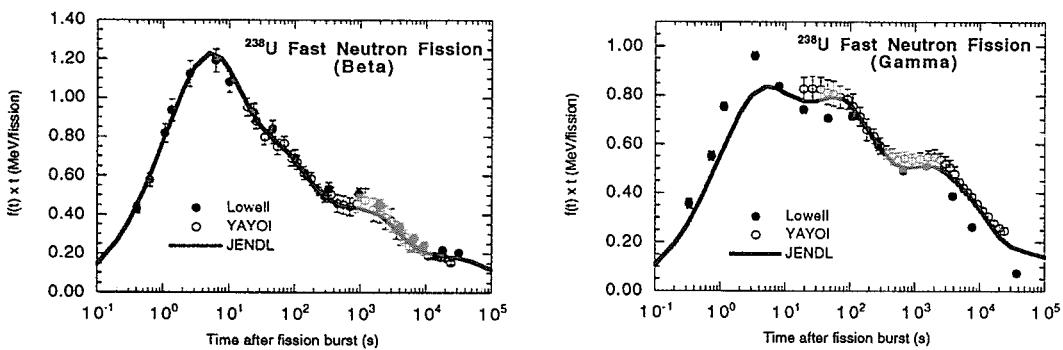


Fig. 26 Comparison of calculated and measured decay heat values after  $^{238}\text{U}$  fast neutron fission. Left hand side shows the beta-ray component. Right hand side shows the gamma-ray component. The measured data at YAYOI are also shown.

#### 5.4 Comparison with Decay Heat Calculations Using JNDC-V2 Library

It is interesting to make comparisons between the decay heat calculations using JENDL FP Decay Data File 2000 and JNDC V-2 Library for whole time range because the latter library was used to make the AESJ recommendation<sup>28)</sup> by Atomic Energy Society of Japan. The comparisons are shown in Fig. 27 as ratios between the calculated decay heat values of the JENDL file and JNDC-V2 library. Two libraries show agreement within nearly 5 % excepting the gamma component over  $10^{10}$  seconds region where the JENDL calculation shows more than 10 % lower than the JNDC-V2 calculation. As

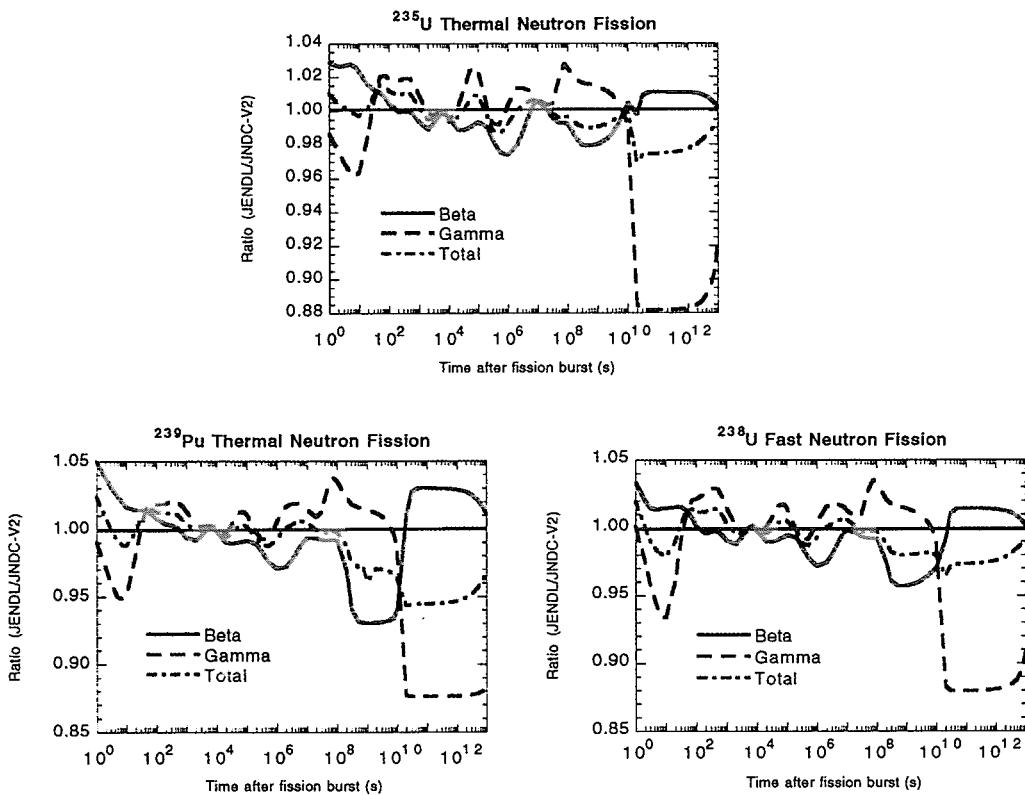


Fig. 27 Comparison between calculated decay heat values using JENDL File and JNDC-V2 library

there are a few nuclides contributing to the decay heat at such long time region after fission, we can identify the nuclide causing the difference. The nuclide is  $^{126m}\text{Sb}$  with the half-life of  $1.149 \times 10^3$  seconds. Although the half-life is rather short, the half-life of the parent nuclide  $^{126}\text{Sn}$  is  $3.156 \times 10^{12}$  seconds and the  $^{126m}\text{Sb}$  nuclide makes contribution at this time region. The average gamma decay energy values are 1.7995 MeV in the JNDC-V2 library and 1.550 MeV in the JENDL file. The data in the JENDL file are taken from the recent ENSDF file and are considered to be more reliable than old data in the JNDC-V2 library.

## 6 Comparison of Aggregate Fission Product Spectrum

The decay heat measurements mentioned in the previous Chapter were performed by measuring the beta- and gamma-ray spectra separately and the spectra were integrated for whole energy range to obtain the decay heat values. Then the spectral data of beta and gamma rays are also reported by ORNL<sup>29, 30)</sup> and YAYOI<sup>31)</sup> groups. The aggregate spectra were calculated using the JENDL file and the results were compared with the measured data. In these comparisons the measured spectra at the shortest time after fission were used because the fission product nuclides with no or “incomplete” spectral data are considered to make significant contribution to the aggregate spectra at this time region.

The comparisons with the ORNL measurements are shown in Figs. 28 through 30. The spectra

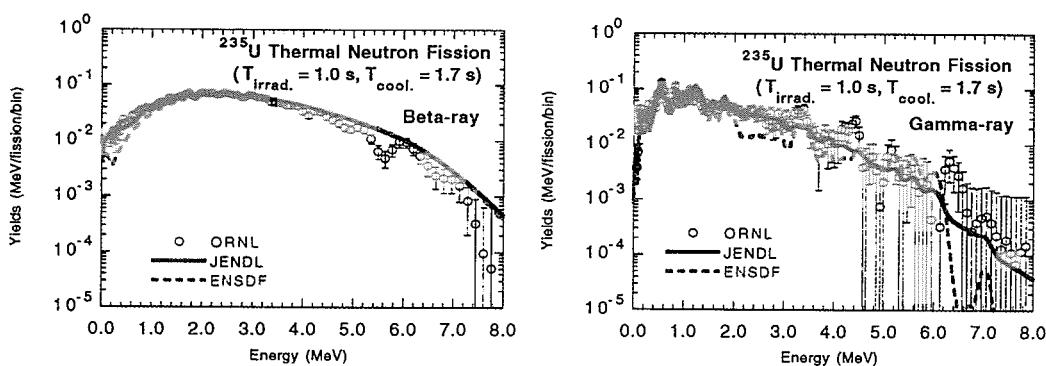


Fig. 28 Comparison of calculated and measured aggregate spectra after  $^{235}\text{U}$  thermal neutron fission at ORNL. Left hand side shows the beta-ray spectrum. Right hand side shows the gamma-ray spectrum.

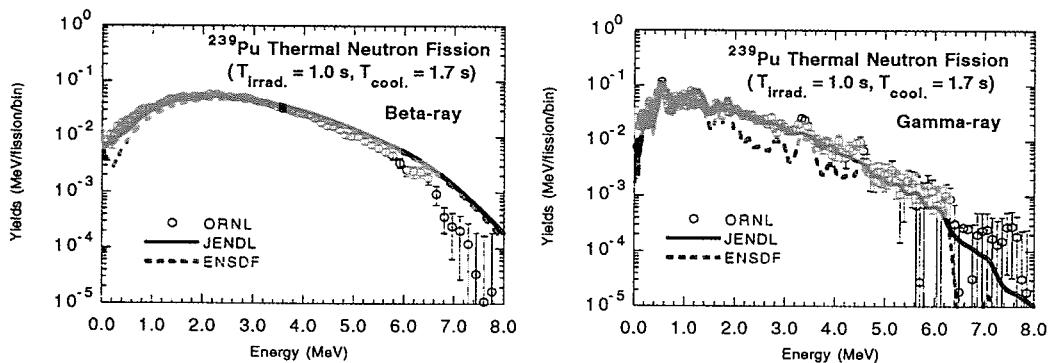


Fig. 29 Comparison of calculated and measured aggregate spectra after  $^{239}\text{Pu}$  thermal neutron fission at ORNL. Left hand side shows the beta-ray spectrum. Right hand side shows the gamma-ray spectrum.

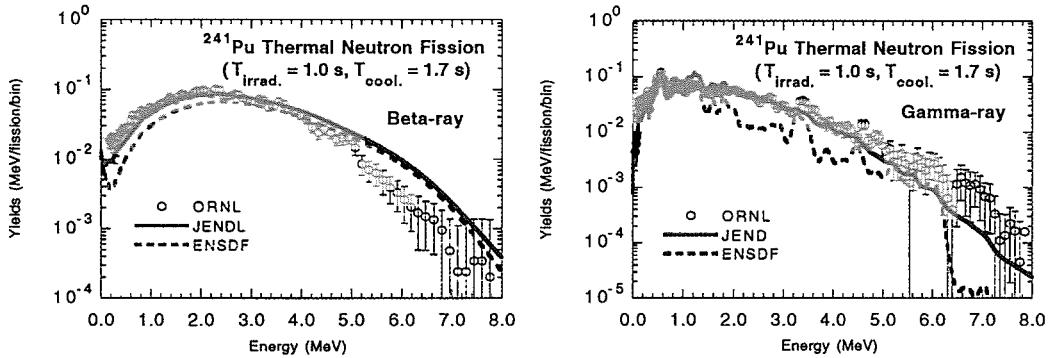


Fig. 30 Comparison of calculated and measured aggregate spectra after  $^{241}\text{Pu}$  thermal neutron fission at ORNL. Left hand side shows the beta-ray spectrum. Right hand side shows the gamma-ray spectrum.

are expressed in a unit of MeV/fission/bin, that is, the integration of the spectra gives the energy release at the time. The detector resolutions of the measurements are taken into consideration for the comparisons. As the gamma-rays taken from the spectroscopical measurements in the JENDL file have the line structure, the calculated spectra not considering the detector resolutions show some spikes which are not seen in the measured aggregate spectra. The full energy peaks of beta and gamma rays are characterized by Gaussian widths,  $\sigma$ . They are reported <sup>29, 30)</sup> as follows:

$$\sigma = 0.01E_\beta \sqrt{25.0 + 90.0/E_\beta}/2.35482$$

for beta-rays, and

$$\sigma = 0.01E_\gamma \left( 1.352 + 5.064/\sqrt{E_\gamma} \right) /2.35482$$

for gamma-rays. The  $E_\beta$  and  $E_\gamma$  values are given in unit of MeV.

The spectra indicated as "ENSDF" in the figures are the spectra using only the ENSDF data. As seen in these figures, the beta-ray spectra calculated using the JENDL file compensate well the underestimation of the ENSDF file at the low energy parts. This is due to the introduction of the spectra estimated with Gross Theory to the nuclides with "incomplete" spectral data. The higher energy part than 6 Mev still shows a little overestimation. There may be some nuclides whose measured spectra should be modified. The gamma-ray spectra using the JENDL file fill the gap between the measured spectra and the ENSDF ones and are in agreement with the measurements. The improvement is clearly seen in the energy region of 2 to 5 MeV where the ENSDF calculation shows underestimation. The JENDL spectra, however, show lower values than the ENSDF spectra at the energy region from 5 MeV to 6 MeV for  $^{235}\text{U}$  and  $^{239}\text{Pu}$ . These reduction in the JENDL spectra are caused by changing the normalization factors used in the ENSDF data like  $^{92}\text{Rb}$  seen in Fig. 11. According to the agreement of the JENDL calculations with the measured spectra, the normalization factors used in the ENSDF file for the nuclides may be not suitably adopted.

The comparisons with the measurements at the University of Tokyo are shown in Figs. 31 and 32.

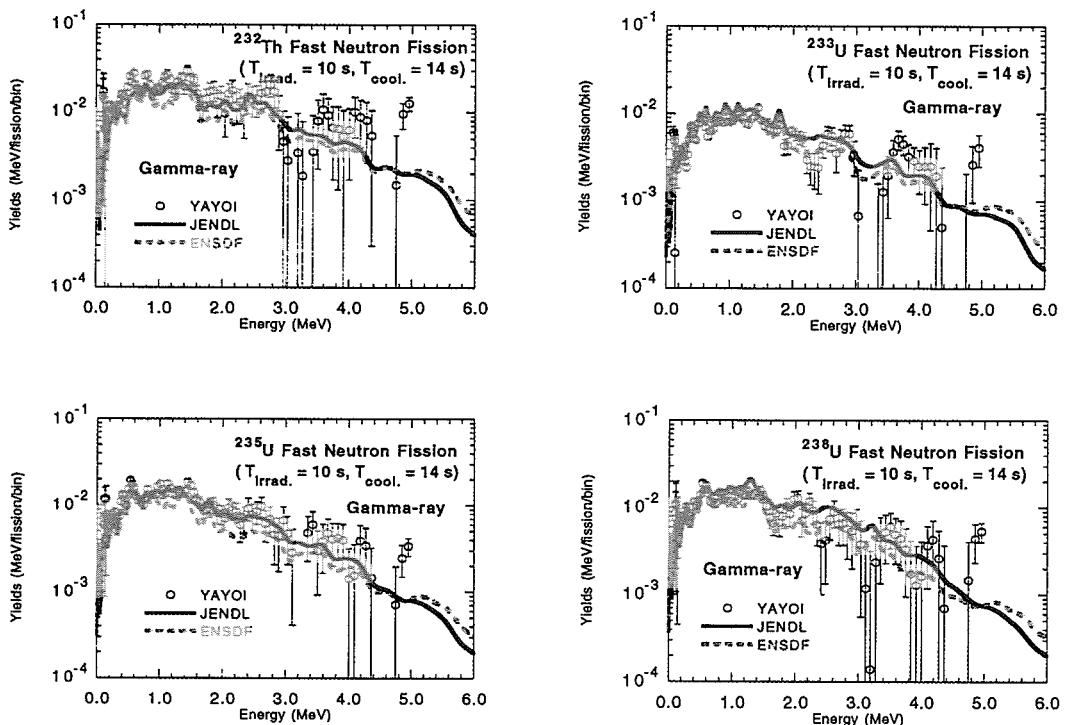


Fig. 31 Comparison of calculated and measured aggregate gamma-ray spectra after fast neutron fission at the University of Tokyo.

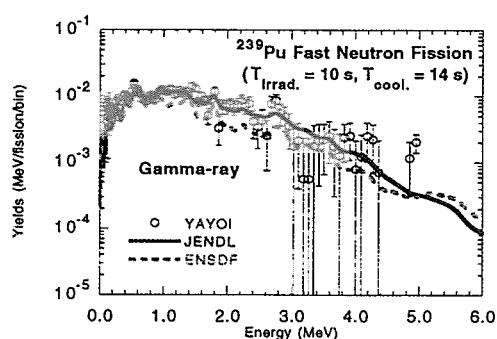


Fig. 32 Comparison of calculated and measured aggregate gamma-ray spectra after fast neutron fission at the University of Tokyo.

Estimated spectra may not be suitably performed in this energy region.

As seen in Chapter 4, the beta- and gamma-ray spectra of the individual FP nuclide are not always

The spectral data reported are only for aggregate gamma-rays in the case of the measurements at the University of Tokyo. The spectra are expressed in a unit of MeV/fission/bin. The detector resolutions are also taken into account for these comparisons. They are given in the reference<sup>31)</sup> as numerical data for each energy bin of the spectra. The JENDL spectra in the figures show the improvement of the underestimation seen in the ENSDF spectra. The effect of the estimated spectra calculated with Gross Theory is not so significant for these time regions. The nuclides with spectroscopically measured spectral data mainly contribute to the aggregate spectra. But there seems to still remain the underestimation of the JENDL spectra in the energy region above 4 MeV. The compensation of the model es-

suitably adopted. The over all agreement of aggregate spectra between the JENDL calculation and the measured data, however, seems to be good. This agreement comes from the fact that the nuclides contributing the spectra at the time considered here are too many to display the deficiency of the individual nuclide. A kind of cancellation conceals the deficiency and shows the over all agreement between the calculated spectra and the measured data.

## 7 Summary

JENDL FP Decay Data File 2000 was produced as a JENDL special purpose file. The file contains the decay data of 1229 fission product nuclides including the spectral data of beta- and gamma-rays. The primary source of the decay data contained is ENSDF, but the data not included in ENSDF are estimated with a theoretical model, that is, "Gross Theory of Beta Decay" and are included in JENDL FP Decay Data File 2000. The average decay energy values of the unstable nuclides are then consistent with their spectral data by introducing the model estimated spectra. The calculations of the decay heat and the aggregate fission product spectra using JENDL FP Decay Data File 2000 show good agreement with the measured data for various fissioning nuclides from  $^{232}\text{Th}$  to  $^{241}\text{Pu}$ . This agreement supports the applicability of JENDL FP Decay Data File 2000 to the decay heat and radiation source analysis of various kinds of nuclear fuel.

JENDL FP Decay Data File 2000, however, does not include the delayed neutron spectra. If the delayed neutron spectra were included in the file, the "completeness" of the file for use in application fields would be fulfilled. The inclusion of the delayed neutron data are then needed for future work.

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## 国際単位系(SI)と換算表

表1 SI基本単位および補助単位

量	名称	記号
長さ	メートル	m
質量	キログラム	kg
時間	秒	s
電流	アンペア	A
熱力学温度	ケルビン	K
物質量	モル	mol
光度	カンデラ	cd
平面角	ラジアン	rad
立体角	ステラジアン	sr

表3 固有の名称をもつSI組立単位

量	名称	記号	他のSI単位による表現
周波数	ヘルツ	Hz	$s^{-1}$
压力、応力	ニュートン	N	$m \cdot kg/s^2$
エネルギー、仕事、熱量	パスカル	Pa	$N/m^2$
工率、放射束	ジュール	J	$N \cdot m$
電気量、電荷	ワット	W	$J/s$
電位、電圧、起電力	クロン	C	$A \cdot s$
静電容量	ボルト	V	$W/A$
電気抵抗	ファラード	F	$C/V$
コンダクタンス	オーム	$\Omega$	$V/A$
磁束	ジーメンス	S	$A/V$
磁束密度	ウェーバ	Wb	$V \cdot s$
インダクタンス	テスラ	T	$Wb/m^2$
セルシウス温度	ヘンリイ	H	$Wb/A$
光束度	セルシウス度	$^{\circ}C$	
照度	ルーメン	lm	$cd \cdot sr$
放射能	ルクス	lx	$lm/m^2$
吸収線量	ベクレル	Bq	$s^{-1}$
吸収線量率	グレイ	Gy	$J/kg$
飛当量	シーベルト	Sv	$J/kg$

表2 SIと併用される単位

名称	記号
分、時、日	min, h, d
度、分、秒	°, ', "
リットル	L
トントン	t
電子ボルト	eV
原子質量単位	u

$$1 \text{ eV} = 1.60218 \times 10^{-19} \text{ J}$$

$$1 \text{ u} = 1.66054 \times 10^{-27} \text{ kg}$$

表5 SI接頭語

倍数	接頭語	記号
$10^{18}$	エクサ	E
$10^{15}$	ペタ	P
$10^{12}$	テラ	T
$10^9$	ギガ	G
$10^6$	メガ	M
$10^3$	キロ	k
$10^2$	ヘクト	h
$10^1$	デカ	da
$10^{-1}$	デシ	d
$10^{-2}$	センチ	c
$10^{-3}$	ミリ	m
$10^{-6}$	マイクロ	μ
$10^{-9}$	ナノ	n
$10^{-12}$	ピコ	p
$10^{-15}$	フェムト	f
$10^{-18}$	アト	a

(注)

- 表1～5は「国際単位系」第5版、国際度量衡局1985年刊行による。ただし、1eVおよび1uの値はCODATAの1986年推奨値によった。
- 表4には海里、ノット、アール、ヘクタールも含まれているが日常の単位なのでここでは省略した。
- barは、JISでは液体の圧力を表わす場合に限り表2のカテゴリーに分類されている。
- EC閣僚理事会指令ではbar、barnおよび「血圧の単位」mmHgを表2のカテゴリーに入れている。

### 換算表

力	$N (=10^5 \text{ dyn})$	kgf		lbf	
		1	0.101972	0.224809	9.80665
	4.44822	0.453592	1		

$$\text{粘度 } 1 \text{ Pa} \cdot \text{s} (\text{N} \cdot \text{s}/\text{m}^2) = 10 \text{ P(ポアズ)} (\text{g}/(\text{cm} \cdot \text{s}))$$

$$\text{動粘度 } 1 \text{ m}^2/\text{s} = 10^4 \text{ St(ストークス)} (\text{cm}^2/\text{s})$$

圧力	MPa( $=10 \text{ bar}$ )	kgf/cm <sup>2</sup>		atm	mmHg(Torr)	lbf/in <sup>2</sup> (psi)
		1	10.1972	9.86923	$7.50062 \times 10^3$	145.038
力	0.0980665	1	0.967841	735.559	14.2233	
	0.101325	1.03323	1	760	14.6959	
	$1.33322 \times 10^{-4}$	$1.35951 \times 10^{-3}$	$1.31579 \times 10^{-3}$	1	$1.93368 \times 10^{-2}$	
	$6.89476 \times 10^{-3}$	$7.03070 \times 10^{-2}$	$6.80460 \times 10^{-2}$	51.7149	1	

エネルギー・仕事・熱量	J( $=10^7 \text{ erg}$ )	kgf·m		kW·h		cal(計量法)	Btu	ft · lbf	eV	1 cal = 4.18605 J(計量法)	
		1	0.101972	$2.77778 \times 10^{-7}$	0.238889					$= 4.184 \text{ J(熱化学)}$	
	9.80665	1	2.72407 $\times 10^{-6}$	2.34270	$9.29487 \times 10^{-3}$	7.23301	$6.12082 \times 10^{19}$			$= 4.1855 \text{ J(15}^{\circ}\text{C)}$	
	$3.6 \times 10^6$	$3.67098 \times 10^5$	1	$8.59999 \times 10^5$	3412.13	$2.65522 \times 10^6$	$2.24694 \times 10^{25}$			$= 4.1868 \text{ J(国際蒸気表)}$	
	4.18605	0.426858	$1.16279 \times 10^{-6}$	1	$3.96759 \times 10^{-3}$	3.08747	$2.61272 \times 10^{19}$			仕事率 1 PS(仏馬力)	
	1055.06	107.586	$2.93072 \times 10^{-4}$	252.042	1	778.172	$6.58515 \times 10^{21}$			$= 75 \text{ kgf} \cdot \text{m/s}$	
	1.35582	0.138255	$3.76616 \times 10^{-7}$	0.323890	$1.28506 \times 10^{-3}$	1	$8.46233 \times 10^{18}$			$= 735.499 \text{ W}$	
	$1.60218 \times 10^{-19}$	$1.63377 \times 10^{-20}$	$4.45050 \times 10^{-26}$	$3.82743 \times 10^{-20}$	$1.51857 \times 10^{-22}$	$1.18171 \times 10^{-19}$	1				

放射能	Bq		Ci		吸収線量	Gy		rad	
	1	$2.70270 \times 10^{-11}$	1	100		0.01	1		
	$3.7 \times 10^{10}$	1							

照射線量	C/kg		R	
	1	3876	$2.58 \times 10^{-4}$	1

線量当量	Sv		rem	
	1	100	0.01	.1

(86年12月26日現在)

