

PURSE:
A PLUTONIUM RADIATION
SOURCE CODE

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動力炉・核燃料開発事業団

東海事業所技術部研究管理課 ☎東海(02928)2-1111 内線 238

Power Reactor and Nuclear Fuel Development Corporation

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Corporation,

Tokai, Ibaraki, Post No 319-11, Japan.

プルトニウム燃料の放射線源計算コード「PURSE」の 使用マニュアル

実施責任者 湯 本 録 三*

報告者 笹 島 秀 吉*

福 田 章 二**

要 旨

PURSEは主としてプルトニウム燃料の各放射線強度およびガンマ線エネルギー分布を計算するためにプログラムされた。このコードは同時にウラン燃料についても計算できる。対象とした崩壊系列はプルトニウムの娘核種が存在するウラン系列、アタチニウム系列、トリウム系列およびネプツニウム系列の全崩壊系列それに超プルトニウム元素の崩壊系列を包含している。また再処理後のプルトニウムに含まれていると考えられる十数種のFP元素の崩壊系列も考慮できるようになっている。

これら崩壊系列内の核種からのアルファ、ベータ、ガンマ線のキュリー数、放出エネルギーを時間の関数として計算する。ガンマ線に関してはエネルギーを最大18群まで取ることができ、各群ごとの全エネルギーおよび平均エネルギーが計算される。またガンマ線スペクトルをプロッターを使用することにより作図することができる。中性子発生に関しては、自発核分裂および酸素との (α, n) 反応からの中性子発生の和として計算される。

PURSEはCDC 6600用にFORTRAN IVで書かれ、計算時間は1ケース約1分弱である。プロッター機種はCal Comp 915-1136である。

* 動力炉核燃料開発事業団

** CRC (センチュリーリサーチセンター)

PURSE:
A PLUTONIUM RADIATION SOURCE CODE

R. YUMOTO*
H. SASAJIMA*
S. FUKUDA**

ABSTRACT

PURSE has been developed to calculate alpha, beta, gamma ray and neutron intensity from fresh plutonium mixed-oxide fuels which contain daughter nuclides of plutonium and uranium.

PURSE also has an ability to calculate gamma ray spectrum from mixed-oxide fuels.

Four main decay chains of uranium, actinium, thorium and neptunium are considered. In addition, decay chains of transplutonium elements and some kinds of Fission Product elements which will be slightly remained in plutonium after reprocessing are also considered.

Number of curies and emission energy of alpha, beta and gamma ray from nuclides in these decay chains are calculated as a function of time. The number of energy groups of gamma ray can be taken up to 18, the total and average energy of each groups can be calculated, and the gamma ray spectrum is plotted by the use of a plotter. As for neutron generation, spontaneous fission and (α , n) reaction with oxygen are considered.

PURSE is written in FORTRAN IV for the CDC 6600 and a running time is about one minute. A plotter is the CalComp 915-1136.

* Power Reactor and Nuclear Fuel Development Corporation.

** Century Research Center Corporation.

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1. INTRODUCTION

Plutonium is one of the transuranic elements and is produced artificially except what is produced slightly by spontaneous fission neutrons. Plutonium utilizable in reactor is derived all from uranium fuels, the isotopes of plutonium exist in the order ^{239}Pu , ^{240}Pu , ^{241}Pu , ^{242}Pu , ^{238}Pu , ^{236}Pu and ^{242}Pu in weight. ^{243}Pu is produced during reactor operation but it exists little in plutonium isotopes after reprocessing of spent fuels because the ^{243}Pu having short half life (about 5 hours) decays all to ^{243}Am in several days after reactor shutdown.

Plutonium involves more isotopes than uranium, so that radiation and its quality are much more complicated. Plutonium isotopes cover the all decay chains of uranium, actinium, neptunium and thorium, and the daughter nuclides in the decay chains are produced as a function of time. The specific activity of plutonium is higher than that of uranium because of plutonium having relatively short half lives than uranium. The gamma rays from plutonium are included particularly very soft energy gamma rays from ^{241}Am and ^{237}U produced by decay of ^{241}Pu and in addition high energy gamma rays from daughter nuclides (mainly ^{228}Th , ^{212}Bi and ^{208}Tl) due to decay of ^{236}Pu . Some problems of external exposure from these gamma rays occur, so that the handling of plutonium is very difficult.

The plutonium isotopes at first recycle involve relatively low order isotopes (much ^{239}Pu and less ^{240}Pu), and according as isotopes become high order (relatively much ^{240}Pu and less ^{239}Pu) radioactivity tends to increase. The radioactivity increases as the time after reprocessing proceeds. Some actinide elements and fission products will also be contained slightly in plutonium after reprocessing, thereby the radioactivity increases.

Spontaneous fission neutron and (α , n) reaction neutron with oxygen (^{16}O) are considered as neutron source. The neutron intensity from plutonium-uranium mixed-oxide fuels is much stronger than that from UO_2 fuels.

PURSE has been developed to evaluate radiation source from plutonium explicitly within an accuracy of nuclear data present, from the viewpoint above mentioned. Four decay chains (including transplutonium elements) and some fission product decay chains were considered in the PURSE. The code PURSE can be used to calculate the radioactivity of plutonium fuels which are handled in processes from reprocessing to loading into reactors, that is conversion to PuO_2 powder, transportation of PuO_2 , mixed-oxide fuel pelletizing and assembling, transportation of assembly and handling of reactor site. The radioactivity from thorium fuels as well as plutonium fuels can also be calculated.

2. FUNDAMENTAL EQUATIONS AND ANALYTICAL METHOD

Concentrations of nuclides in decay chain dependent on time are represented by the following first order linear differential equation;

$$\frac{dx_i(t)}{dt} = \lambda_{ii}x_i(t) + \sum_{j=1}^n Y_{ij}x_j(t) \dots\dots\dots (2.1)$$

(i = 1, 2, 3, , n)

where

- $x_i(t)$: concentrations of i-th nuclide at time t
- λ_{ii} : decay constant of i-th nuclide (sec⁻¹)
- Y_{ij} : branching ratio from j-th nuclide to i-th nuclide
- n : number of nuclides in decay chain

The equation (2.1) is also represented by the following simultaneous first order linear differential equations.

$$\left. \begin{aligned} \frac{dx_1(t)}{dt} &= \lambda_{11}x_1(t) + Y_{12}x_2(t) + Y_{13}x_3(t) + \dots\dots\dots + Y_{1n}x_n(t) \\ \frac{dx_2(t)}{dt} &= \lambda_{22}x_2(t) + Y_{21}x_1(t) + Y_{22}x_2(t) + \dots\dots\dots + Y_{2n}x_n(t) \\ &\vdots \\ &\vdots \\ &\vdots \\ &\vdots \\ &\vdots \\ \frac{dx_n(t)}{dt} &= \lambda_{nn}x_n(t) + Y_{n1}x_1(t) + Y_{n2}x_2(t) + \dots\dots\dots + Y_{nn}x_n(t) \end{aligned} \right\} \dots (2.2)$$

Using matrix notation the equations (2.2) may be represented as

$$\frac{dX}{dt} = AX \dots\dots\dots (2.3)$$

where A is an n×n matrix with elements λ_{ii} and Y_{ij}
 X is a vector $(x_1, x_2, x_3, \dots, x_n)$

and $\frac{dX}{dt}$ is the derivative vector $(\frac{dx_1}{dt}, \frac{dx_2}{dt}, \frac{dx_3}{dt}, \dots, \frac{dx_n}{dt})$.

Then, A is the following lower triangular matrix.

$$A = \begin{pmatrix} \lambda_{11} & 0 & \dots\dots\dots & 0 \\ Y_{21} & \lambda_{22} & \dots\dots\dots & 0 \\ Y_{31} & Y_{32} & \dots\dots\dots & 0 \\ \vdots & \vdots & & \vdots \\ \vdots & \vdots & & \vdots \\ \vdots & \vdots & & \vdots \\ Y_{n1} & Y_{n2} & \dots\dots\dots & \lambda_{nn} \end{pmatrix}$$

where λ_{ii} and Y_{ij} elements are constants independent on time to be determined by decay constants and branching ratios.

The equation (2.3) of a homogeneous system is solved by giving an initial condition. The eigen values of A matrix are the same as diagonal elements λ_{ij} ($i=1 \sim n$), and they are difference one another. Eigen vectors for these eigen values may be represented by B_i , the solution of the equation (2.3) is obtained as follows.

$$X(t) = \sum_{i=1}^n \alpha_i \cdot B_i \cdot e^{\lambda_{ii} \cdot t} \dots\dots\dots (2.4)$$

where initial value X_0 is obtained at $t=0$, consequently $\alpha_i \cdot B_i$ must satisfy the following relation.

$$X_0 = \sum_{i=1}^n \alpha_i \cdot B_i \dots\dots\dots (2.5)$$

3. CALCULATIONAL METHOD OF RADIOACTIVITY

Concentrations of nuclides at time t are calculated by equation (2.4). The calculation of radioactivity, energy of alpha, beta and gamma ray and neutron generation are described in the following each sections where X_i is the concentration of i-th nuclide at time t and λ_i is a decay constant.

3.1 Alpha and Beta Ray

The activity and energy of alpha and beta ray are calculated by the following equations;

$$\alpha_{di} = X_i \times \lambda_i \times A_{\alpha i} \dots\dots\dots (3.1)$$

$$\beta_{di} = X_i \times \lambda_i \times A_{\beta i} \dots\dots\dots (3.2)$$

$$\alpha_{ei} = \alpha_{di} \times E_{\alpha i} \dots\dots\dots (3.3)$$

$$\beta_{ei} = \beta_{di} \times E_{\beta i} \dots\dots\dots (3.4)$$

where

- α_{di} : number of disintegrations of alpha (dps)
- β_{di} : number of disintegrations of beta (dps)
- $A_{\alpha i}, A_{\beta i}$: abundance of alpha and beta ray per decay, respectively
- α_{ei} : energy of alpha ray (MeV/sec)
- β_{ei} : energy of beta ray (MeV/sec)
- $E_{\alpha i}, E_{\beta i}$: average energy per decay of alpha and beta, respectively (MeV).

The average alpha energy (\bar{E}_α) is calculated by the following equation

$$\bar{E}_\alpha = \frac{\sum_{i=1}^n X_i \cdot \lambda_i \cdot A_{\alpha i} \cdot E_{\alpha i}}{\sum_{i=1}^n X_i \cdot \lambda_i \cdot A_{\alpha i}} \dots\dots\dots (3.5)$$

and the average beta energy (\bar{E}_β) also is calculated by the same manner as the equation (3.5).

3.2 Gamma Ray

The number of energy groups of gamma ray can be taken up to 18. For example, the cumulative abundance and energy of gamma ray of K-th group are calculated by the following equations;

$$GX_{i,k} = \sum_{j=l}^m AB_{i,j} \dots\dots\dots (3.6)$$

$$GE_{i,k} = \sum_{j=l}^m AB_{i,j} \cdot E_{i,j} \dots\dots\dots (3.7)$$

where

- $GX_{i,k}$; abundance of gamma ray per decay of i-th nuclide of k-th group
- $AB_{i,j}$; abundance of gamma ray per decay of i-th nuclide
- $GE_{i,k}$; energy of gamma ray per decay of i-th nuclide of k-th group (MeV)
- $E_{i,k}$; energy of gamma ray per decay of i-th nuclide (MeV)
- l ; lower energy limit index of k-th group
- m ; upper energy limit index of k-th group.

The activity (γ_{di}) and energy (γ_{ei}) of gamma ray of k-th group of i-th nuclide are calculated by the following equations.

$$\gamma_{di} \text{ (dps)} = X_i \times \lambda_i \times GX_{i,k} \dots\dots\dots (3.8)$$

$$\gamma_{ei} \text{ (MeV/sec)} = X_i \times \lambda_i \times GE_{i,k} \dots\dots\dots (3.9)$$

The average gamma energy of k-th group is calculated by the following equation.

$$\bar{E}_r = \frac{\sum_{i=1}^n X_i \cdot \lambda_i \cdot GE_{i,k}}{\sum_{i=1}^n X_i \cdot \lambda_i \cdot GX_{i,k}} \dots\dots\dots (3.10)$$

3.3 Neutron

The both of neutrons from spontaneous fission and (α,n) reaction with oxygen in oxide fuels are calculated. When NG_i is neutron generation per second at an atom of i-th nuclide, the number of neutrons from i-th nuclide at time t, NGN_i, is calculated by

$$NGN_i = X_i \times NG_i \dots\dots\dots (3.11)$$

and that from all nuclides is as follows.

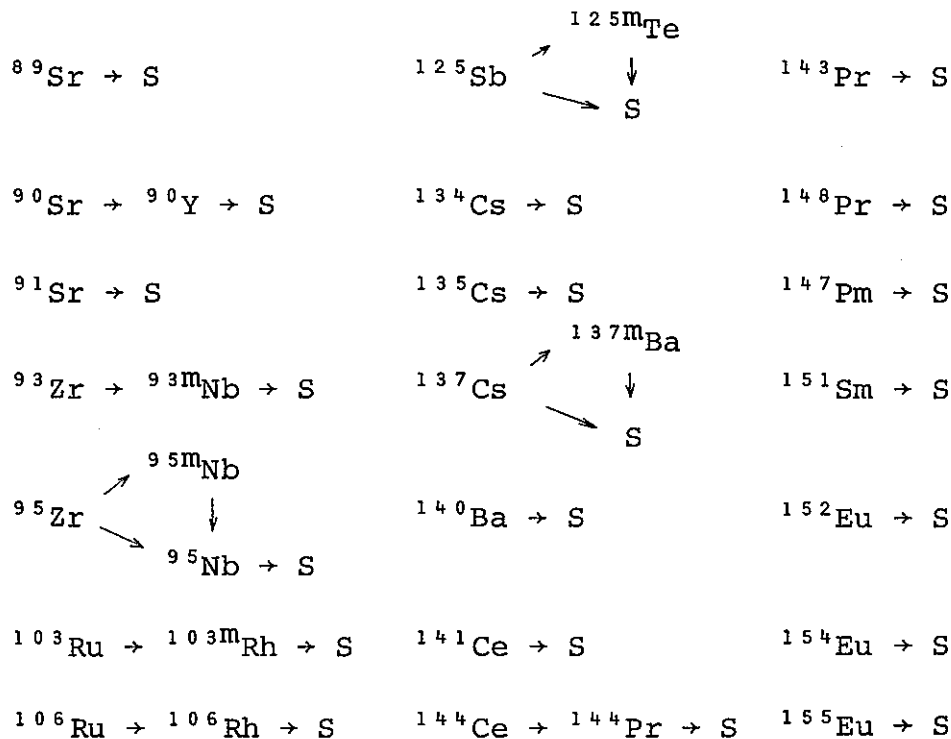
$$NGN = \sum_{i=1}^n NGN_i \dots\dots\dots (3.12)$$

4. DECAY CHAINS AND NUCLEAR CONSTANTS

4.1 Decay Chains

Plutonium isotopes in plutonium fuel handling are mainly ^{236}Pu , ^{238}Pu , ^{239}Pu , ^{240}Pu , ^{241}Pu and ^{242}Pu . These nuclides decay to thorium chain (^{236}Pu and ^{240}Pu), neptunium chain (^{241}Pu), uranium chain (^{238}Pu and ^{242}Pu), and actinium chain (^{239}Pu). These decay chains are shown in Fig. 4.1 through 4.4.

The following decay chains of fission product nuclides which have relatively long half lives were considered as impurity included in plutonium.



4.2 Half Life

Half lives have been taken from the 1974 4-th edition of the "CHART OF THE NUCLIDES"¹⁾ (refer to appendix B).

4.3 Gamma Ray Energy and Abundance

The energy and abundance of gamma ray from actinide nuclides and fission product nuclides have been taken from

the 1974 volume 13 of the "ATOMIC DATA AND NUCLEAR DATA TABLES".²⁾ They are shown in appendix B.

4.4 Neutron Yield

Neutron yield from spontaneous fission has been taken from the paper by S. Raman³⁾ and the 1963 second edition of the "REACTOR PHYSICS CONSTANTS"⁴⁾, and that from (α, n) reaction with oxygen has been calculated by semiempirical equation which was used in ORIGEN⁵⁾ code. These yields are shown in appendix B.

4.5 Other Nuclear Data

The energy of alpha and beta ray has been taken from the 1967 sixth edition of the "TABLE OF ISOTOPES".⁶⁾ They are shown in appendix B.

Atomic number

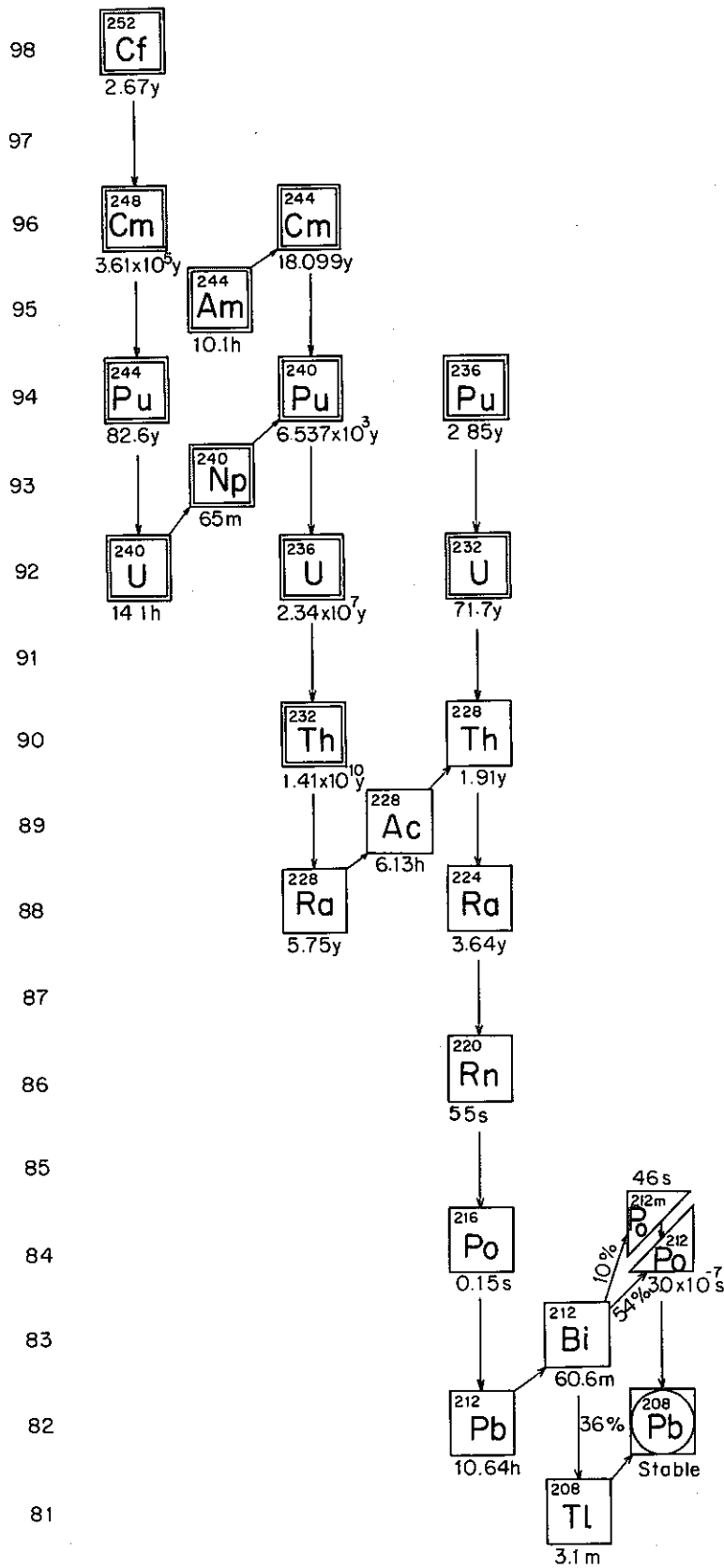


Fig. 4.1 Advanced thorium decay chain

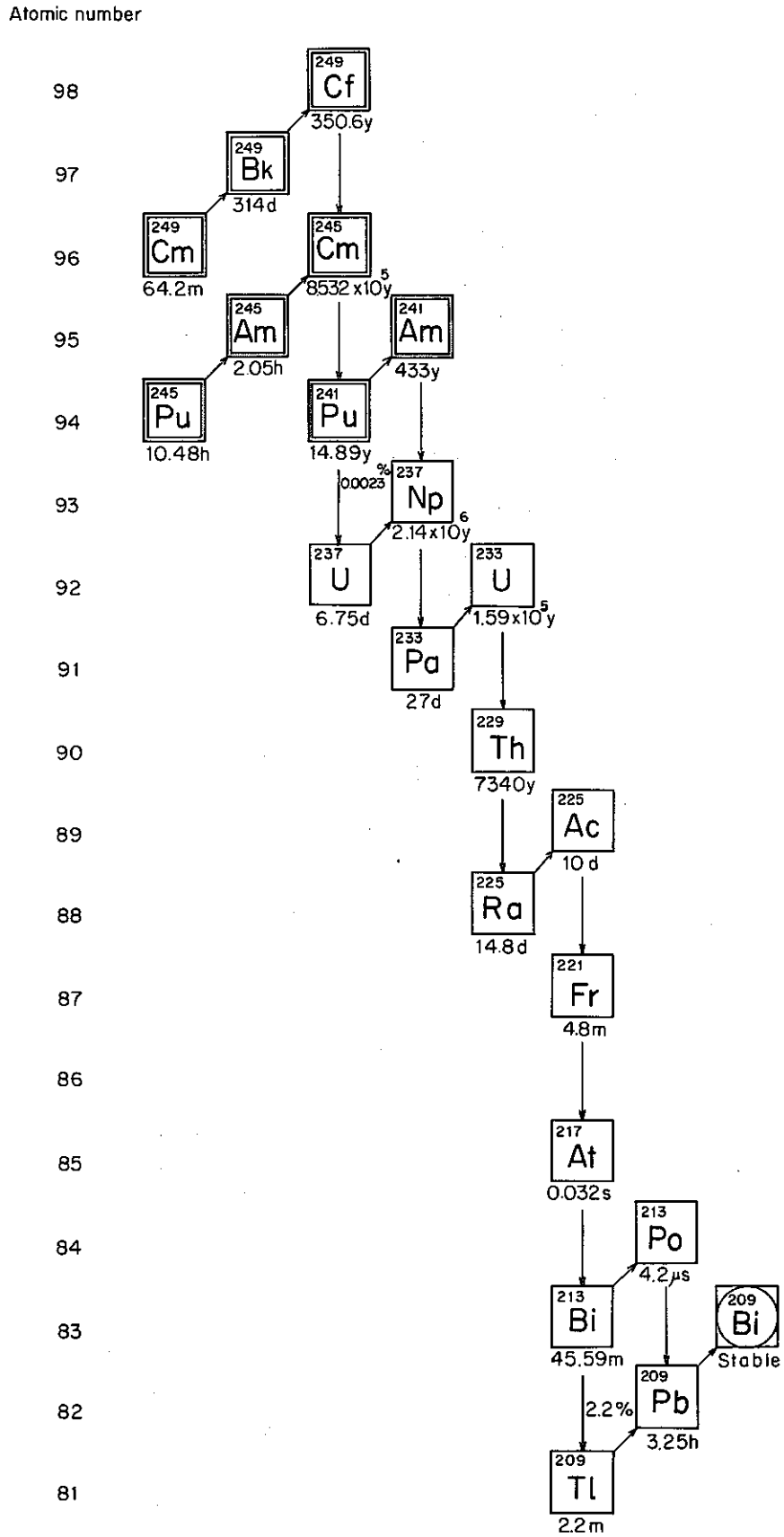


Fig. 4.2 Advanced neptunium decay chain

Atomic number

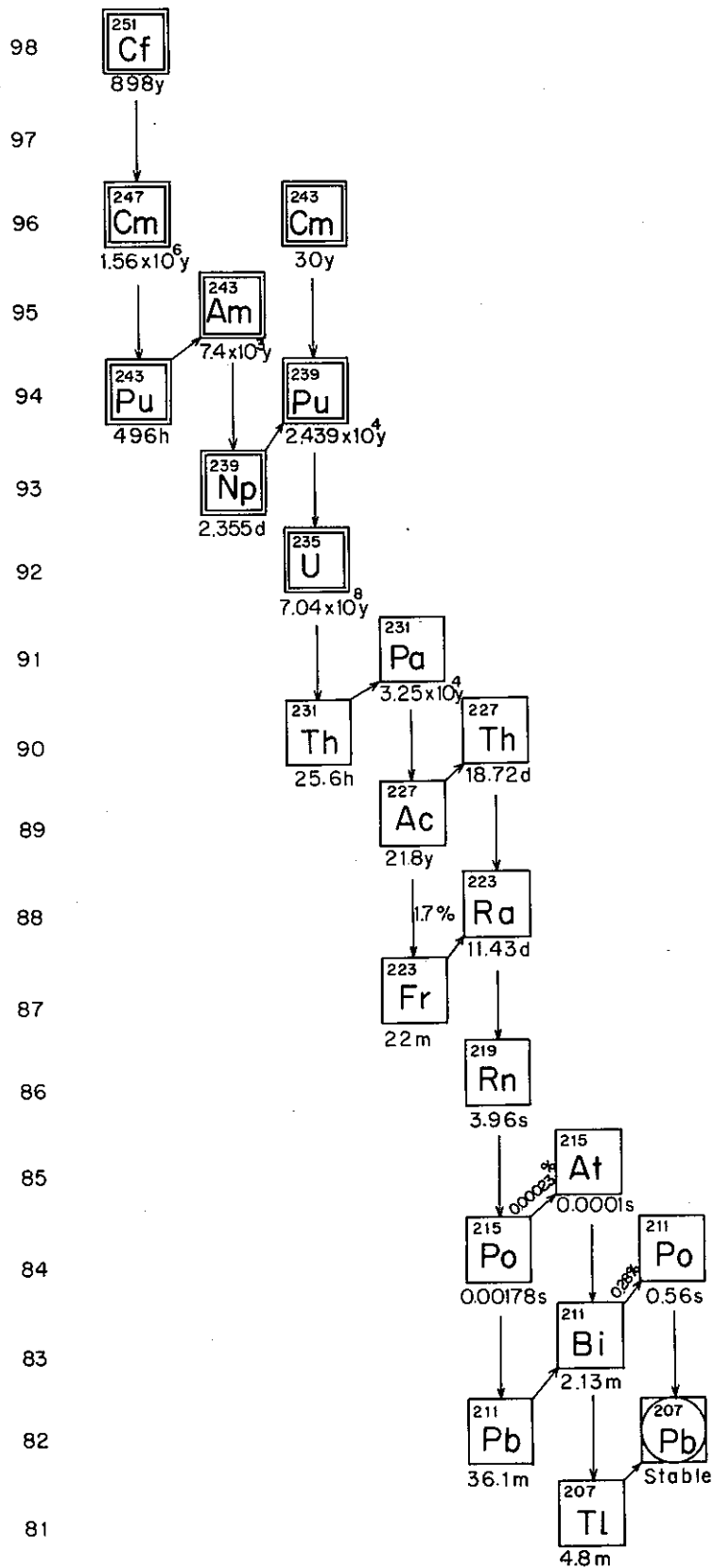


Fig. 4.3 Advanced actinium decay chain

Atomic number

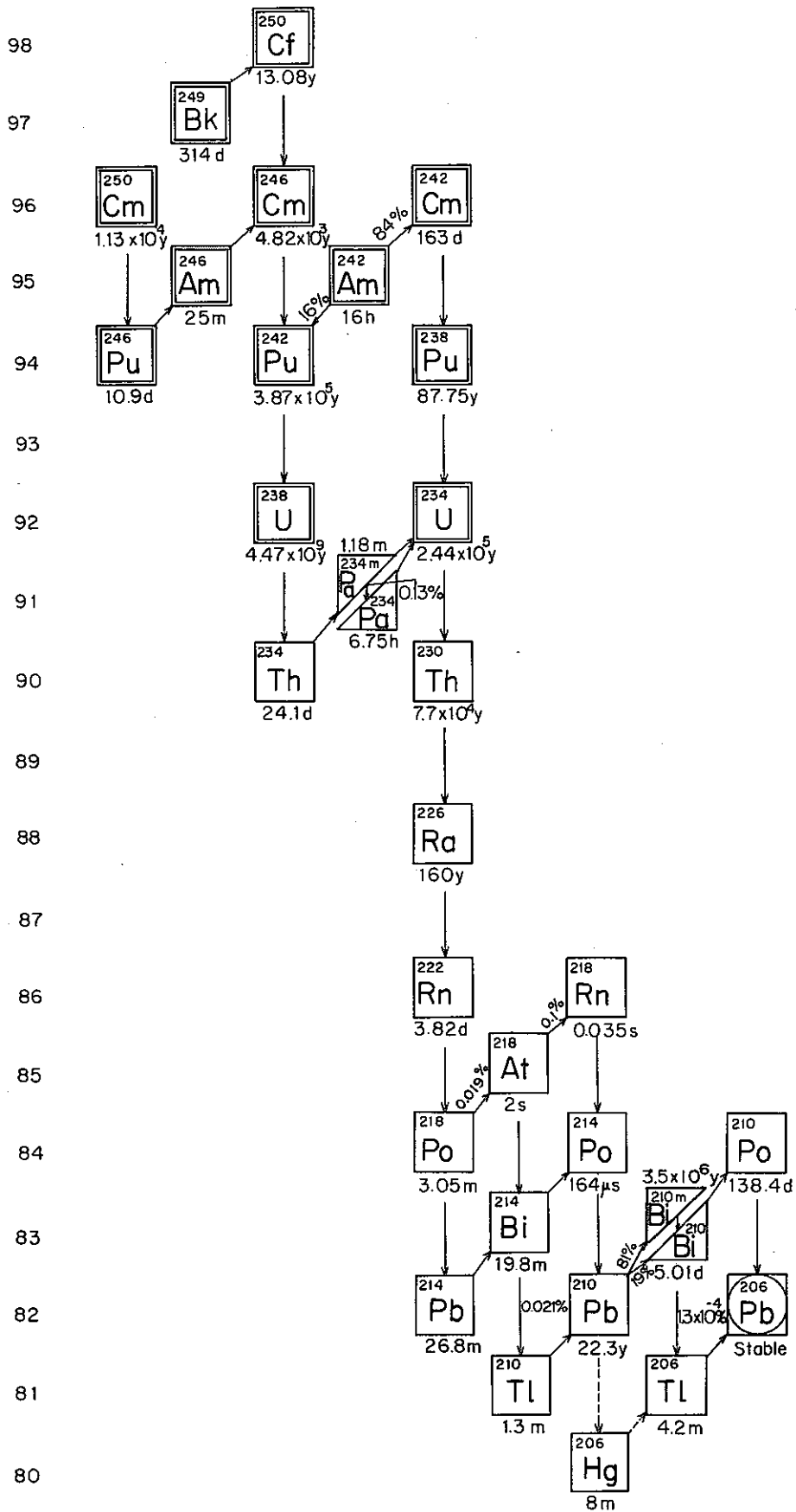


Fig. 4.4 Advanced uranium decay chain

5. CONSTITUTION OF PURSE PROGRAM

PURSE consists of three main sub-program, TSEARCH, NUDE and PUGAM.

1) TSEARCH

-calculates lapse time from date when plutonium was purified to date of chemical analysis and plutonium isotopic composition just after purification.

2) NUDE

-calculates number density of nuclides in fuel as input of plutonium isotopic composition obtained from TSEARCH and other calculation conditions.

3) PUGAM

-calculates intensity of alpha, beta and gamma ray and number of neutron release as input of number density of nuclides obtained from NUDE and other calculation conditions. Further the PUGAM consists of the following three parts.

- Ⓐ Setting of data necessary to calculate.
- Ⓑ Solution of differential equations and calculation of concentrations of nuclides by time step.
- Ⓒ Calculation of radiation intensity from concentrations of nuclides.

Sub-program functions to constitute PUGAM are described below.

- ① PUGAM : control calculation flow.
- ② INPUT : read input data.
- ③ DATST : set constants.
- ④ GAMMA : read the gamma ray data from library.
- ⑤ GEMAD : make decay-matrix.
- ⑥ EIVEC : calculate eigen-vector.

- ⑦ CALDN : calculate concentration-vector.
- ⑧ APRINT : print two dimensional matrix.
- ⑨ CPRINT : print curie (including calculation of curie).
- ⑩ DPRINT : print decay constants.
- ⑪ EPRINT : print energy (including calculation of energy).
- ⑫ GPRINT : print gamma ray library.
- ⑬ IPRINT : print input data.
- ⑭ NPRINT : print number density of nuclides.
- ⑮ SPRINT : print summary of energy and curie.
- ⑯ HEADWR : print title.
- ⑰ GRAPH : plot gamma ray spectrum.
- ⑱ DOSERAT : calculate spatial dose rate of gamma ray
- ⑲ FPRODUCT : calculate FP activity.

Calculational flow diagram of PURSE is shown in Fig. 5.1.

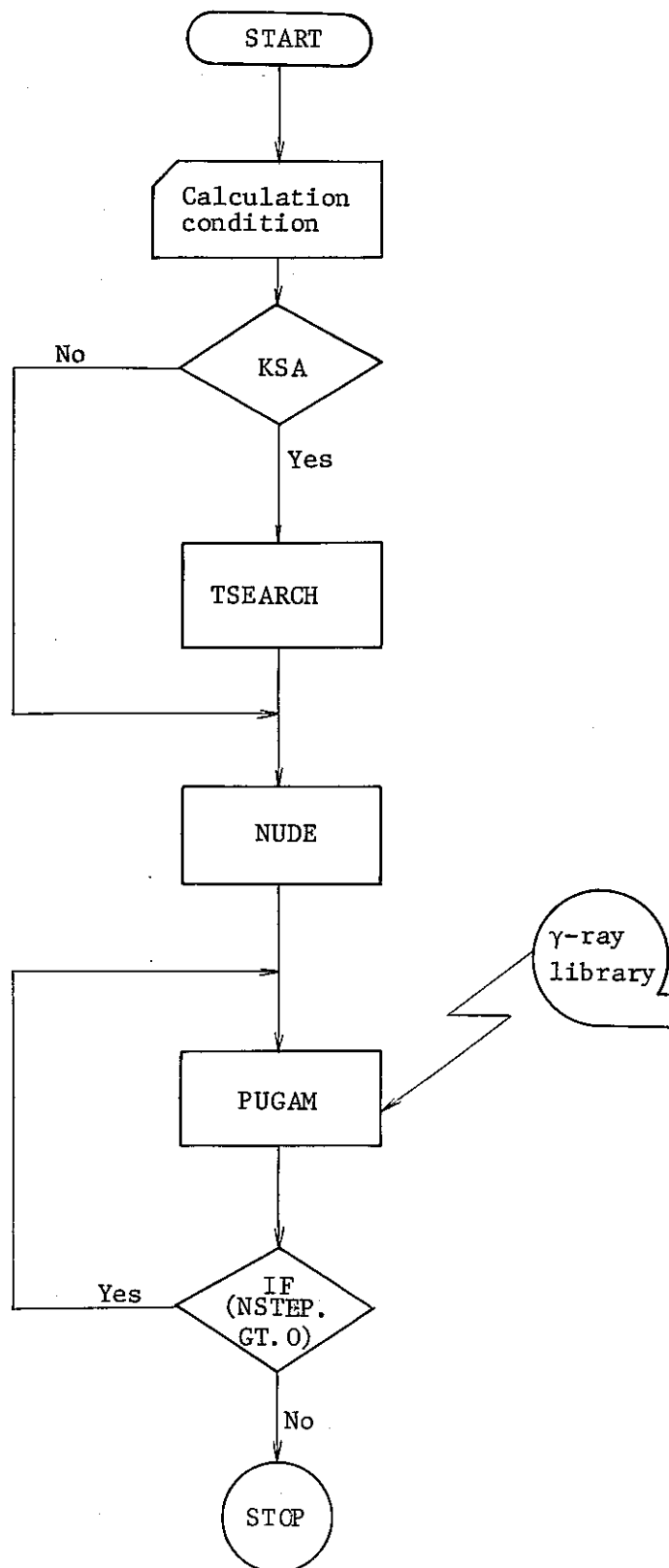


Fig. 5.1 Flow Diagram of PURSE Program

6. INPUT FORMAT AND OUTPUT CONTENTS

6.1 Input Format

<u>Card No.</u>	<u>Format</u>	<u>Symbol</u>	<u>Description</u>
1	8A10	TIT	Title
2	I5	KSA	1 - calculate TSEARCH. -1 - do not calculate TSEARCH.
	3F10.3	DELDAY	Time interval from date when plutonium isotopic composition was analysed to date of calculation (day).
		DELDAU	Time interval from date when uranium was purified to date of calculation (day).
		VOLUME	Volume of fuel (cm ³).

If KSA=-1, cards 3, 4 and 5 described below are not needed.

TSEARCH input section

3	2F10.3	HALF41	Half life of Pu-241 (year).
		DELT	Time difference between two dates of plutonium and americium analysis (day). If plutonium was analysed later than americium, add a minus sign to DELT.
	2(2X,A8)	TITLEA	Date when plutonium was analysed in the order year(A.D.), month, day. For example, Aug. 22, 1978 is input as 78. 8.22.
		TITLEB	Date when americium was analysed in the order year (A.D.), month, day.
4	4I5	IYEAR	Date when plutonium was analysed, year (A.D.).
		IMON	Date when plutonium was analysed, month.
		IDAY	Date when plutonium was analysed, day.
		JWEEK	Date when plutonium was analysed, a day of the week. 1 - Sunday 2 - Monday 3 - Tuesday

<u>Card No.</u>	<u>Format</u>	<u>Symbol</u>	<u>Description</u>
			4 - Wednesday
			5 - Thursday
			6 - Friday
			7 - Saturday
5	6F10.3	PU(I)	Plutonium isotopic composition (w/o) in the order Pu-238, Pu-239, Pu-240, Pu-241, Pu-242.
		AM	Am-241 concentration (ppm), Am-241 to Pu weight ratio.

NUDE input section

6	3I5	IWA	Unit of input for plutonium and uranium isotopic composition. 1 - w/o -1 - a/o
		IDA	Calculation of theoretical density. 1 - calculate -1 - use built-in values in this code. ($\rho_{Pu}=11.46$, $\rho_U=10.96$ g/cm ³).
		NUO	1 - do not use natural uranium. -1 - use natural uranium.
7	3F10.3	PUI	Pu enrichment (w/o)
		DID	Fuel density. If fuel density is theoretical density such as 95% T.D., enter as 0.95. If fuel density is effective density such as 10.95 g/cm ³ , enter as -10.95.
		OM	Oxygen to metal atomic ratio of mixed-oxide fuel.

If NUO=-1, card 8 described below is not needed.

8	4F10.3	U(I)	Uranium isotopic composition (unit: see IWA) in the order U-234, U-235, U-236, U-238.
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If KSA=1, card 9 described below is not needed.

9	5F10.3	PU(I)	Plutonium isotopic composition (unit: see IWA) in the order Pu-238, Pu-239, Pu-240, Pu-241, Pu-242.
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<u>Card No.</u>	<u>Format</u>	<u>Symbol</u>	<u>Description</u>
<u>PUGAM input section</u>			
10	7I5	NP(1)	Print γ -ray library (1/0; yes/no).
		NP(2)	Print decay constant and abundance (1/0; yes/no).
		NP(3)	Print energy of α , β and γ -ray (1/0; yes/no).
		NP(4)	Print matrix of decay (1/0; yes/no).
		NP(5)	Print curie by time step calculations (1/0; yes/no).
		NP(6)	Print energy by time step calculations (1/0; yes/no).
		NFP	Calculate FP activity (1/0; yes/no).
11	10I5	IYR	Date of activity calculation, year (A.D.). For example, 1978 is input as 78.
		IMT	Date of activity calculation, month.
		IDY	Date of activity calculation, day.
		NSTEP	Number of time steps (for time step calculations).
		NOPT	1-take a constant time interval. Then, enter a constant time interval in symbol IDELT. 0-take arbitrary time intervals. Then, enter time intervals in symbol TXI(I) on card 12.
		IDELT	Time interval (year). If NOPT=0, IDELT is zero.
		NPLT	1 - plot γ -ray spectrum. 0 - do not plot γ -ray spectrum.
		NTYP	Type of plot. 1 - photon. 2 - energy. 3 - photon and energy.
		NSP	1 - plot γ -ray spectrum by time steps. 0 - do not plot γ -ray spectrum by time steps.
		NDC	1 - calculate spatial dose rate of γ -ray.

<u>Card No.</u>	<u>Format</u>	<u>Symbol</u>	<u>Description</u>
			0 - do not calculate spatial dose rate of γ -ray.
If NOPT=1, card 12 described below is not needed.			
12	8E10.0	TXI(I) I=1, NSTEP	Time interval from standard date*1 to each time steps (day).
13	E10.4	PU236	Initial concentration of Pu-236 (atoms).
14	3E10.4	TD3	Time interval from date when Th-232 and U-232 were purified to date of calculation (day).
		TH(1)	Initial concentration of Th-232 (atoms).
		TH(2)	Initial concentration of U-232 (atoms).
15	I5	NGRP	Number of γ -ray energy groups, maximum 18.
16	8E10.4	GRM(1)	Lower limit energy of first γ -ray energy group (MeV).
		GRM(2)	Lower limit energy of second γ -ray energy group (MeV).
		GRM (NGRP)	Lower limit energy of NGRP-th γ -ray energy group (MeV).
		GRM (NGRP+1)	Upper limit energy of NGRP-th γ -ray energy group (MeV).
17	4E10.4	CF(I) I=1,4	Initial concentrations (atoms) in the order Cf-252, Cf-251, Cf-250, Cf-249.
18	2E10.4	BK(I) I=1,2	Initial concentrations (atoms) in the order B _k -250, B _k -249.
19	8E10.4	CM(I) I=1,8	Initial concentrations (atoms) in the order Cm-250, Cm-249, Cm-248, Cm-247, Cm-246, Cm-245, Cm-244, Cm-243.
20	E10.4	CM(9)	Initial concentration (atoms) of Cm-242.
21	6E10.4	AM(I) I=1,6	Initial concentrations (atoms) in the order Am-246, Am-245, Am-244, Am-243, Am-242, Am-241.
22	4E10.4	OP(I) I=1,4	Initial concentrations (atoms) in the order Pu-246, Pu-245, Pu-244, Pu-243.

*1 Correspond to IYR, IMT and IDY in card No.11.

<u>Card No.</u>	<u>Format</u>	<u>Symbol</u>	<u>Description</u>
23	3E10.4	XNP(I) I=1,3	Initial concentrations (atoms) in the order Np-240, Np-239, U-240.
If NFP=0, cards 24, 25, 26 and 27 described below are not needed.			
24	8E10.4	FID(I) I=1,8	Initial concentrations (atoms) in the order Sr-89, Sr-90, Sr-91, Y-90, Zr-93, Zr-95, Nb-93m, Nb-95m.
25	8E10.4	FID(I) I=9,16	Initial concentrations (atoms) in the order Nb-95, Ru-103, Rh-103m, Ru-106, Rh-106, Sb-125, Te-125m, Cs-134.
26	8E10.4	FID(I) I=17,24	Initial concentrations (atoms) in the order Cs-135, Cs-137, Ba-137m, Ba-140, Ce-141, Ce-144, Pr-143, Pr-144.
27	E10.4	FID(30) I=25,30	Initial concentrations (atoms) in the order Pr-148, Pm-147, Sm-151, Eu-152, Eu-154, Eu-155.
If NDC=0, cards 28 and 29 described below are not needed.			
28	I10	IDS	Number of detector points for calculation of γ -ray dose rate ≤ 10 .
29	10F8.2	DIS(I) I=1,IDS	Distance from source.
If NSP=0, card 30 described below is not needed.			
30	10I5	NP(I) I=1, NSTEP	Option to plot γ -ray spectrum by time steps (1/0; yes/no).

6.2 Output Contents

Output from PURSE is described below.

- 1) Plutonium composition just after purification and time interval from date when plutonium was purified to date of analysis.
- 2) Atomic number density of fuel just after purification.
- 3) Input condition for calculation of radiation intensity. For example, initial concentrations of each nuclides, date of calculation and gamma ray energy structure etc..

- 4) Initial concentrations of transplutonium and FP nuclides.
- 5) Concentrations of each nuclides.
- 6) Disintegration number per second and curie number of alpha, beta and gamma ray and number of neutron release.
- 7) Radiation intensity (MeV/sec) from each nuclides and gamma ray spectrum.
- 8) As for time step calculations, radiation intensity and concentrations of each nuclides by each time steps.
- 9) Weight and weight ratio (ppm: based on U+Pu weight) of each nuclides.
- 10) Gamma ray spectrum diagram (output only when a plotter is used).

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- 1) W. Seelman-Eggebert et al., "CHART OF THE NUCLIDES 4-th Edition 1974", Gesellschaft für Kernforschung m.b.H. Karlsruhe (8.1974).
- 2) W.W. Bowman and K.W. Macmurdo, "Radioactive-decay Gammas Ordered by Energy and Nuclide", ATOMIC DATA AND NUCLEAR DATA TABLES 13, 89-292 (2.1974).
- 3) S. Raman, "General Survey of Applications Which Require Actinide Nuclear Data", Oak Ridge National Laboratory, Oak Ridge, Tennessee 37830.
- 4) Reactor Physics Constants, ANL-5800 Second Edition, (7.1963).
- 5) M.J. Bell, "ORIGEN-THE ORNL ISOTOPE GENERATION AND DEPLETION CODE", ORNL-4628 (5.1973).
- 6) C.M. Ledere et al., "Table of Isotopes, Sixth Edition", John Wiley and Sons, INC., (1.1967).

APPENDIX A

Sample Input and Output

I) Calculation condition	23
II) Input	23
III) Job control cards	24
IV) Output	25~35

Calculation Condition

Uranium composition	Natural uranium
Plutonium enrichment	2.14 w/o
Plutonium composition	
Date of assay	April 27, 1974
Pu-238	0.11 w/o
Pu-239	76.04
Pu-240	19.78
Pu-241	3.48
Pu-242	0.59

Americium content	
Date of assay	March 15, 1974
Am-241	850 ppm
O/M	2.0
Density	95% T.D.

Date of calculation	August 24, 1978
(standard date)	
Number of time steps	1

Input

*** SAMPLE CALCULATION ***

1	1580.0	730.0	1.0					
1974	14.89	-43.0	74. 4.27	74. 3.15				
	4 27 7							
	0.11	76.04	19.78	3.48	0.59	850.0		
1	1	-1						
	2.14	0.95	2.0					
0	0	0	1	1	0			
78	8	24	1	1	1	0	0	0
	0.0							
	0.0	0.0	0.0					
15								
	2.18E-2	2.88E-2	3.80E-2	5.02E-2	6.63E-2	8.75E-2	1.156E-1	1.67E-1
	2.40E-1	3.46E-1	4.99E-1	7.19E-1	1.036E+0	1.493E+0	2.151E+0	3.10E+0
	0.0	0.0	0.0	0.0				
	0.0	0.0						
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0							
	0.0	0.0	0.0	0.0	0.0	0.0		
	0.0	0.0	0.0	0.0				
	0.0	0.0	0.0	0.0				

INPUT DATA FORM

JOB NUMBER	MAIN PROGRAM LABEL	KEYPUNCH RECORD	DATE	NO. OF CARDS
PROBLEM	MODIFICATION	KEYPUNCHED BY		
CODED BY	DATE	VERIFIED BY		

	1	2	3	4	5	6	7	8
01	P	U	R	S	E	,	T	6
02	\$	I	D	A	,	.	.	.
03	M	A	P	(	O	F	F)
04	L	A	B	E	L	(	A	,
05	R	E	W	I	N	D	(	A
06	C	O	P	Y	B	F	(	A
07	C	O	P	Y	B	F	(	A
08	U	N	L	O	A	D	(	A
09	R	E	W	I	N	D	(	T
10	L	G	O	(	P	L	=	1
11	L	A	B	E	L	(	A	,
12	R	E	W	I	N	D	(	A
13	C	O	P	Y	B	F	(	T
14	U	N	L	O	A	D	(	A
15	/	8	/	9				
16	}							
17	D	A	T	A	S	E	T	
18	}							
19	/	8	/	9				
20	/	7	/	8	/	9		

If a plotter is not used,
do not need these cards.

*** SAMPLE CALCULATION *** DATE 09/22/78 PAGE 1

* INPUT DATA *

PRINT OPTION

NP1 = 1 (1/0 : PRINT CONTENTS OF GAMMA-RAY LIBRARY / NO PRINT)
 NP2 = 1 (1/0 : PRINT DECAY CONSTANT AND ABUNDANCE DATA / NO PRINT)
 NP3 = 1 (1/0 : PRINT ENERGY DATA OF RAYS / NO PRINT)
 NP4 = 1 (1/0 : PRINT D(I,J) MATRIX / NO PRINT)
 NP5 = 1 (1/0 : PRINT D/S AND CURIE OUTPUT / NO PRINT)
 NP6 = 1 (1/0 : PRINT RAY INTENSITY OUTPUT / NO PRINT)

INITIAL NUCLIDE DENSITY (NUMBER DENSITY : ATOMS/CM**3)

PU-SERIES	T1 = 1811.(DAYS)	PU-242 = 2.8843E+18 PU-239 = 3.7641E+20	PU-241 = 1.7595E+19 PU-238 = 5.4956E+17	PU-240 = 9.7505E+19 PU-236 = 0.
U-SERIES	T2 = 730.(DAYS)	U-238 = 2.2578F+22 U-234 = 1.2963F+18	U-236 = 0.	U-235 = 1.6375E+20
TH-SERIES	T3 = 0.(DAYS)	TH-232 = 0.	U-232 = 0.	

DATE OF CALCULATION

SDATE = 78/ 8/24 (STANDARD DATE)
 TYEAR = 79/ 8/74
 TDAYS = 365.

STRUCTURE OF GAMMA RAY GROUP

NGRP = 15		(NUMBER OF GAMMA RAY GROUP)								
(NEV)		GAMMA 1	GAMMA 2	GAMMA 3	GAMMA 4	GAMMA 5	GAMMA 6	GAMMA 7	GAMMA 8	GAMMA 9
LOWER BOUNDARY		.02180	.02880	.03800	.05020	.06630	.08750	.11560	.16700	.24000
UPPER BOUNDARY		.02880	.03800	.05020	.06630	.08750	.11560	.16700	.24000	.34600
(NEV)		GAMMA10	GAMMA11	GAMMA12	GAMMA13	GAMMA14	GAMMA15			
LOWER BOUNDARY		.34600	.49900	.71900	1.03600	1.49300	2.15100			
UPPER BOUNDARY		.49900	.71900	1.03600	1.49300	2.15100	3.10000			

*** SAMPLE CALCULATION ***

DATE 09/22/78 PAGE 2

TRANS-PLOTONIUM INITIAL VALUE

CF-252 = 0.	CF-251 = 0.	CF-250 = 0.	CF-249 = 0.	
BK-250 = 0.	BK-249 = 0.			
CM-250 = 0.	CM-249 = 0.	CM-248 = 0.	CM-247 = 0.	CM-246 = 0.
CM-245 = 0.	CM-244 = 0.	CM-243 = 0.	CM-242 = 0.	
AM-246 = 0.	AM-245 = 0.	AM-244 = 0.	AM-243 = 0.	AM-242 = 0.
AM-241 = 0.				
PU-246 = 0.	PU-245 = 0.	PU-244 = 0.	PU-243 = 0.	
NP-240 = 0.	NP-239 = 0.	U-240 = 0.		

*** SAMPLE CALCULATION ***

DATE 09/22/78 PAGE 33

NUCLIDE NUMBER DENSITY DATE 78/ 8/24

NUCLIDE	PU-SERIES	U-SERIES	TH-SERIES	TOTAL	NUCLIDE	PU-SERIES	U-SERIES	TH-SERIES	TOTAL
CF-252	0.	0.	0.	0.	TH-229	.4155E+03	0.	0.	.4155E+03
CF-251	0.	0.	0.	0.	TH-228	.2955E-01	0.	0.	.2955E-01
CF-250	0.	0.	0.	0.	TH-227	.9717E+01	.1441E+03	0.	.1442E+03
CF-249	0.	0.	0.	0.	AC-228	.3242E-04	0.	0.	.3242E-04
AK-250	0.	0.	0.	0.	AC-227	.4390E+04	.6706E+07	0.	.6710E+07
BK-249	0.	0.	0.	0.	AC-225	.1433E+00	0.	0.	.1433E+00
CM-250	0.	0.	0.	0.	HA-228	.2665E+00	0.	0.	.2665E+00
CM-249	0.	0.	0.	0.	HA-226	.2238E+07	.6628E+08	0.	.6832E+08
CM-248	0.	0.	0.	0.	RA-223	.2190E+00	0.	0.	.2190E+00
CM-247	0.	0.	0.	0.	HA-224	.1525E-03	0.	0.	.1525E-03
CM-246	0.	0.	0.	0.	HA-223	.5878E+01	.8556E+04	0.	.8562E+04
CM-245	0.	0.	0.	0.	FR-223	.1420E-03	.2169E+00	0.	.2170E+00
CM-244	0.	0.	0.	0.	FR-221	.4777E-04	0.	0.	.4777E-04
CM-243	0.	0.	0.	0.	RN-222	.1452E+02	.4275E+03	0.	.4420E+03
CM-242	0.	0.	0.	0.	RN-220	.2696E-07	0.	0.	.2696E-07
AM-246	0.	0.	0.	0.	RN-219	.2357E-04	.3431E-01	0.	.3433E-01
AM-245	0.	0.	0.	0.	RN-218	.2923E-12	.8604E-11	0.	.8897E-11
AM-244	0.	0.	0.	0.	AT-218	.1670E-07	.4917E-06	0.	.5084E-06
AM-243	0.	0.	0.	0.	AT-217	.5357E-08	0.	0.	.5357E-08
AM-242	0.	0.	0.	0.	AT-215	.1389E-14	.1993E-11	0.	.1994E-11
AM-241	.5615E+19	0.	0.	.5615E+19	PO-218	.8045E-02	.2368E+00	0.	.2448E+00
PU-246	0.	0.	0.	0.	PO-216	.7272E-10	0.	0.	.7272E-10
PU-245	0.	0.	0.	0.	PO-215	.1059E-07	.1542E-04	0.	.1543E-04
PU-244	0.	0.	0.	0.	PO-214	.7207E-08	.2121E-06	0.	.2193E-06
PU-243	0.	0.	0.	0.	PO-213	.6812E-12	0.	0.	.6812E-12
PU-242	.2884E+19	0.	0.	.2884E+19	PO-212M	.7227E-08	0.	0.	.7227E-08
PU-241	.1397E+20	0.	0.	.1397E+20	PO-212	.9295E-16	0.	0.	.9295E-16
PU-240	.9745E+20	0.	0.	.9745E+20	PO-211	.9332E-08	.1558E-04	0.	.1559E-04
PU-239	.5764E+21	0.	0.	.5764E+21	PO-210	.2486E+01	.2920E+02	0.	.3168E+02
PU-238	.5284E+18	0.	0.	.5284E+18	BI-214	.5222E-01	.1537E+01	0.	.1589E+01
PU-236	0.	0.	0.	0.	BI-213	.4536E-03	0.	0.	.4536E-03
NP-240	0.	0.	0.	0.	BI-212	.1759E-05	0.	0.	.1759E-05
NP-239	0.	0.	0.	0.	BI-211	.7609E-03	.1108E+01	0.	.1108E+01
NP-237	.1502E+17	0.	0.	.1502E+17	BI-210M	.2899E+02	.2311E+03	0.	.2601E+03
U-240	0.	0.	0.	0.	BI-210	.1330E+00	.2093E+01	0.	.2226E+01
U-238	.2564E+14	.2759E+23	0.	.2759E+23	BI-209S	.3534E+01	0.	0.	.3534E+01
U-237	.3994E+12	0.	0.	.3994E+12	PR-214	.7067E-01	.2080E+01	0.	.2151E+01
U-236	.5130E+17	0.	0.	.5130E+17	PR-212	.1855E-04	0.	0.	.1855E-04
U-235	.5309E+17	.1637E+21	0.	.1637E+21	PR-211	.1289E-01	.1876E+02	0.	.1878E+02
U-234	.2113E+17	.1796E+19	0.	.1796E+19	PR-210	.1155E+04	.1843E+05	0.	.1958E+05
U-233	.7729E+10	0.	0.	.7729E+10	PR-209	.1940E-02	0.	0.	.1940E-02
U-232	0.	0.	0.	0.	PR-208S	.1128E-01	0.	0.	.1128E-01
PA-234M	.1263E-01	.1134E+08	0.	.1134E+08	PR-207S	.1588E+03	.1196E+06	0.	.1196E+06
PA-234	.5654E-02	.5060E+07	0.	.5060E+07	PH-206S	.4181E+01	.2291E+02	0.	.2291E+02
PA-253	.4980E+09	0.	0.	.4980E+09	TL-210	.7200E-06	.2119E-04	0.	.2191E-04
PA-251	.1295E+09	.3219E+12	0.	.3219E+12	TL-209	.4816E-06	0.	0.	.4816E-06
TH-234	.3714E+03	.3355E+12	0.	.3355E+12	IL-208	.3194E-07	0.	0.	.3194E-07
TH-232	.5768E+10	0.	0.	.5768E+10	IL-207	.1709E-02	.2488E+01	0.	.2490E+01
TH-231	.2202E+06	.6797E+09	0.	.6797E+09	TL-206	.1007E-09	.1584E-08	0.	.1685E-08
TH-230	.1499E+12	.7365E+13	0.	.7365E+13					
					TOTAL	4.9494E+20	2.2745E+22	0.	2.3238E+22

*** SAMPLE CALCULATION ***

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DECAY HALF AND CURIE NUMBER DATE 78/ 8/24

NUCLIDE	ALPHA-DECAY		BETA-DECAY		GAMMA-DECAY		NEUTRON			
	D/S	CI	D/S	CI	D/S	CI	S.F (N/SEC)	A-H (N/SEC)	TOT (N/SEC)	
CF-252	0.	0.	0.	0.	0.	0.	0.	0.	0.	
CF-251	0.	0.	0.	0.	0.	0.	0.	0.	0.	
CF-250	0.	0.	0.	0.	0.	0.	0.	0.	0.	
CF-249	0.	0.	0.	0.	0.	0.	0.	0.	0.	
AK-250	0.	0.	0.	0.	0.	0.	0.	0.	0.	
BK-249	0.	0.	0.	0.	0.	0.	0.	0.	0.	
CM-250	0.	0.	0.	0.	0.	0.	0.	0.	0.	
CM-249	0.	0.	0.	0.	0.	0.	0.	0.	0.	
CM-248	0.	0.	0.	0.	0.	0.	0.	0.	0.	
CM-247	0.	0.	0.	0.	0.	0.	0.	0.	0.	
CM-246	0.	0.	0.	0.	0.	0.	0.	0.	0.	
CM-245	0.	0.	0.	0.	0.	0.	0.	0.	0.	
CM-244	0.	0.	0.	0.	0.	0.	0.	0.	0.	
CM-243	0.	0.	0.	0.	0.	0.	0.	0.	0.	
CM-242	0.	0.	0.	0.	0.	0.	0.	0.	0.	
AM-246	0.	0.	0.	0.	0.	0.	0.	0.	0.	
AM-245	0.	0.	0.	0.	0.	0.	0.	0.	0.	
AM-244	0.	0.	0.	0.	0.	0.	0.	0.	0.	
AM-243	0.	0.	0.	0.	0.	0.	0.	0.	0.	
AM-242	0.	0.	0.	0.	0.	0.	0.	0.	0.	
AM-241	1.8348E+08	4.9590E-03	0.	0.	6.6137E+07	1.7875E-03	8.2516E-04	9.0649E+00	9.0657E+00	
PU-246	0.	0.	0.	0.	0.	0.	0.	0.	0.	
PU-245	0.	0.	0.	0.	0.	0.	0.	0.	0.	
PU-244	0.	0.	0.	0.	0.	0.	0.	0.	0.	
PU-243	0.	0.	0.	0.	0.	0.	0.	0.	0.	
PU-242	1.6581E+05	4.4274E-06	0.	0.	6.6541E+01	1.7994E-09	1.8419E+00	5.3880E-03	1.8473E+00	
PU-241	4.7413E+05	1.2814E-05	2.0614E+10	5.5713E-01	2.7509E+05	7.4349E-06	2.7626E-04	1.5048E-02	1.5324E-02	
PU-240	3.2767E+08	8.8559E-03	0.	0.	1.7251E+05	4.6625E-06	3.4787E+01	1.5232E+01	4.8019E+01	
PU-239	3.3916E+08	9.1665E-03	0.	0.	2.0778E+05	5.6157E-06	3.3690E-03	1.5425E+01	1.3429E+01	
PU-238	1.5236E+08	3.5773E-03	0.	0.	6.3673E+04	1.7155E-06	5.2964E-01	6.6330E+00	7.1627E+00	
PU-236	0.	0.	0.	0.	0.	0.	0.	0.	0.	
NP-240	0.	0.	0.	0.	0.	0.	0.	0.	0.	
NP-239	0.	0.	0.	0.	0.	0.	0.	0.	0.	
NP-237	1.5422E+02	4.1682E-09	0.	0.	4.8253E+01	1.3041E-09	6.1716E-10	4.2734E-06	4.2741E-06	
U-240	0.	0.	0.	0.	0.	0.	0.	0.	0.	
U-238	1.1102E+05	3.0005E-06	0.	0.	0.	0.	0.	9.8268E-02	2.0679E-03	1.0034E-01
U-237	0.	0.	4.7472E+05	1.2830E-05	4.5166E+05	1.2207E-05	2.6087E-16	0.	2.6087E-16	
U-236	4.8143E+01	1.3012E-09	0.	0.	4.6217E-02	1.2491E-12	9.3020E-08	1.1455E-06	1.2385E-06	
U-235	5.1124E+03	1.3817E-07	0.	0.	4.9513E+03	1.3382E-07	1.7435E-05	1.1508E-04	1.3251E-04	
U-234	1.1868E+05	3.2075E-06	0.	0.	1.0847E+03	2.9317E-08	2.9501E-06	3.5254E-03	3.5264E-03	
U-233	1.0685E-03	7.8878E-14	0.	0.	5.7005E-06	1.5407E-16	1.4214E-15	3.2557E-11	3.2558E-11	
U-232	0.	0.	0.	0.	0.	0.	0.	0.	0.	
PA-234M	0.	0.	1.1010E+05	2.9757E-06	1.2325E+03	3.3310E-08	0.	0.	0.	
PA-234	0.	0.	1.4433E+02	3.9007E-09	2.6513E+02	7.1657E-09	0.	0.	0.	
PA-233	0.	0.	1.4798E+02	3.9993E-09	1.1529E+02	3.1158E-09	0.	0.	0.	
PA-231	2.1769E-01	5.8836E-12	0.	0.	1.6656E-02	4.5016E-13	0.	7.4877E-09	7.4877E-09	
TH-234	0.	0.	1.1102E+05	3.0006E-06	1.6639E+04	6.4431E-02	0.	0.	0.	
TH-232	5.8944E-09	1.5931E-19	0.	0.	0.	0.	2.1532E-19	9.2579E-17	9.2794E-17	
TH-231	0.	0.	5.1140E+03	1.3822E-07	1.1436E+03	3.0908E-08	0.	0.	0.	
TH-230	2.1452E+00	5.7978E-11	0.	0.	1.4842E-02	4.0115E-13	1.3655E-12	5.9536E-08	5.9538E-08	

*** SAMPLE CALCULATION ***

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NUCLIDE	ALPHA-DECAY		BETA-DECAY		GAMMA-DECAY		NEUTRON		
	D/S	CI	D/S	CI	D/S	CI	S.F (N/SEC)	A-N(N/SEC)	TOT(N/SEC)
TH-229	1.2443E-07	3.3629E-18	0.	0.	1.3351E-07	3.6083E-18	0.	3.9973E-15	3.9973E-15
TH-228	3.3954E-10	9.1768E-21	0.	0.	4.8475E-10	1.3101E-20	0.	1.3809E-17	1.3809E-17
TH-227	6.1799E-03	1.6702E-13	0.	0.	2.9319E-03	7.9240E-14	0.	3.5456E-10	3.5456E-10
AC-228	0.	0.	1.0182E-09	2.7519E-20	1.0740E-09	2.9081E-20	0.	0.	0.
AC-227	1.1500E-04	3.1082E-15	6.4499E-03	1.7973E-13	6.1223E-04	1.6547E-14	0.	4.0105E-12	4.0105E-12
AC-225	1.1497E-07	3.1072E-18	0.	0.	8.5189E-09	2.3024E-19	0.	7.0072E-15	7.0072E-15
RA-228	0.	0.	1.0188E-09	2.7534E-20	0.	0.	0.	0.	0.
RA-226	9.4127E-04	2.5440E-14	0.	0.	1.9588E-03	5.2942E-14	0.	2.8318E-11	2.8318E-11
RA-225	0.	0.	1.1873E-07	3.2088E-18	3.9179E-08	1.0589E-18	0.	0.	0.
RA-224	5.3604E-10	9.0821E-21	0.	0.	1.2497E-11	3.3776E-22	0.	1.8600E-17	1.8600E-17
RA-223	6.0093E-03	1.6241E-13	0.	0.	2.0496E-03	5.5594E-14	0.	3.7095E-10	3.7095E-10
FR-225	0.	0.	1.1500E-04	3.1081E-15	7.2119E-05	1.9692E-15	0.	0.	0.
FR-221	1.1497E-07	3.1073E-18	0.	0.	1.4463E-08	3.9090E-19	0.	9.3817E-15	9.3817E-15
RN-222	9.2734E-04	2.5063E-14	0.	0.	6.4914E-07	1.7544E-17	0.	4.6417E-11	4.6417E-11
RN-220	3.3606E-10	9.0827E-21	0.	0.	1.0082E-13	2.7248E-24	0.	2.7589E-17	2.7589E-17
RN-219	6.0093E-03	1.6242E-13	0.	0.	1.0814E-03	2.9226E-14	0.	6.4635E-10	6.4635E-10
AT-218	1.7619E-10	4.7619E-21	0.	0.	3.5238E-13	9.5239E-24	0.	2.2969E-17	2.2969E-17
AT-217	1.1495E-07	3.1068E-18	0.	0.	0.	0.	0.	1.8172E-14	1.8172E-14
AT-215	1.3821E-08	3.7355E-19	0.	0.	0.	0.	0.	1.4465E-14	1.4465E-14
PD-218	9.2716E-04	2.5058E-14	1.7619E-10	4.7620E-21	0.	0.	0.	2.7467E-15	2.7467E-15
PD-216	3.3605E-10	9.0824E-21	0.	0.	0.	0.	0.	6.4238E-11	6.4238E-11
PD-215	6.0093E-03	1.6241E-13	1.3821E-08	3.7355E-19	0.	0.	0.	3.6282E-17	3.6282E-17
PD-214	9.2705E-04	2.5055E-14	0.	0.	1.2979E-07	3.5077E-18	0.	8.8734E-10	8.8734E-10
PD-213	1.1243E-07	3.0386E-18	0.	0.	0.	0.	0.	1.5853E-10	1.5853E-10
PD-212M	0.	0.	0.	0.	0.	0.	0.	2.6312E-14	2.6312E-14
PD-212	1.1477E-10	3.8045E-21	0.	0.	1.5436E-12	4.1720E-23	0.	5.9790E-17	5.9790E-17
PD-211	1.6825E-05	4.5474E-16	0.	0.	1.6825E-07	4.5474E-18	0.	0.	0.
PD-210	1.8369E-06	4.9645E-17	0.	0.	2.2042E-11	5.9574E-22	0.	8.1130E-14	8.1130E-14
BI-214	1.9472E-07	5.2626E-18	9.2705E-04	2.5055E-14	1.4006E-05	3.7853E-14	0.	9.5325E-15	9.5325E-15
BI-213	2.5289E-09	6.8350E-20	1.1242E-07	3.0385E-18	3.2876E-08	8.8855E-19	0.	1.6161E-16	1.6161E-16
BI-212	1.2081E-10	3.2651E-21	2.1477E-10	5.8047E-21	2.9950E-10	8.0962E-21	0.	7.7980E-18	7.7980E-18
BI-211	5.9944E-03	1.6201E-13	1.6831E-05	4.5490E-16	4.1557E-04	2.7745E-14	0.	5.7711E-10	5.7711E-10
BI-210M	0.	0.	0.	0.	2.6695E-12	7.2122E-23	0.	0.	0.
BI-210	4.6338E-12	1.2524E-22	5.5644E-06	1.5363E-17	0.	0.	0.	3.5601E-19	3.5601E-19
BI-209S	0.	0.	0.	0.	0.	0.	0.	0.	0.
PU-214	0.	0.	9.2709E-04	2.5056E-14	6.5401E-04	1.7676E-14	0.	0.	0.
PU-212	0.	0.	3.3587E-10	9.0707E-21	1.4683E-10	3.9685E-21	0.	0.	0.
PU-211	0.	0.	6.0093E-03	1.6240E-13	1.7151E-03	4.6354E-14	0.	0.	0.
PU-210	0.	0.	1.9307E-05	5.2168E-16	7.7208E-07	2.0867E-17	0.	0.	0.
PU-209	0.	0.	1.1490E-07	3.1055E-18	0.	0.	0.	0.	0.
PU-208S	0.	0.	0.	0.	0.	0.	0.	0.	0.
PU-207S	0.	0.	0.	0.	0.	0.	0.	0.	0.
PU-206S	0.	0.	0.	0.	0.	0.	0.	0.	0.
TL-210	0.	0.	1.9472E-07	5.2626E-18	5.9778E-07	1.6156E-17	0.	0.	0.
TL-209	0.	0.	2.5289E-09	6.8350E-20	1.1380E-09	3.0757E-20	0.	0.	0.
TL-208	0.	0.	1.2081E-10	3.2650E-21	2.8096E-10	7.5936E-21	0.	0.	0.
TL-207	0.	0.	5.9920E-03	1.6195E-13	1.6178E-05	4.2725E-16	0.	0.	0.
TL-206	0.	0.	4.6338E-12	1.2523E-22	2.5485E-16	6.8879E-27	0.	0.	0.
TOTAL	9.8555E+08	2.6582E-02	2.0415E+10	5.5715E-01	6.7355E+07	1.8198E-03	5.7261E+01	4.2362E+01	7.9645E+01

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RAY INTENSITY (MFV/SEC)
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NUCLIDE	ALPHA	BETA	GAMMA 1	GAMMA 2	GAMMA 3	GAMMA 4	GAMMA 5	GAMMA 6	GAMMA 7	GAMMA 8
CF-252	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CF-251	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CF-250	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CF-249	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NK-250	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
BK-249	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-250	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-249	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-248	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-247	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-246	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-245	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-244	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-243	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-242	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
AH-246	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
AH-245	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
AH-244	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
AH-243	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
AH-242	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
AH-241	1.00F+09	0.	0.	0.	7.25E+03	3.92F+06	2.50F+02	4.05E+03	1.56E+03	3.76F+02
PU-246	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PU-245	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PU-244	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PU-243	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PU-242	8.02E+03	0.	0.	0.	2.45F+00	0.	0.	1.22F+00	1.09E-01	0.
PU-241	2.30E+06	4.79F+08	0.	0.	5.11F+01	4.28F+01	4.72F+02	2.29F+04	6.05F+03	0.
PU-240	1.70E+09	0.	0.	0.	6.67E+03	0.	0.	2.46E+03	2.21E+02	0.
PU-239	1.75E+09	0.	0.	2.76E+02	8.57E+02	1.46E+03	5.19F+02	4.98F+03	1.51F+03	6.50E+02
PU-238	7.77F+08	0.	0.	0.	2.76E+03	0.	0.	1.02F+03	2.04F+02	1.14F+00
PU-236	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NP-240	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NP-239	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NP-237	7.20E+02	0.	0.	5.89F-01	1.01F-02	1.94F-02	1.92F+00	1.64E-01	2.90E-01	3.01F-01
U-240	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
U-238	4.65F+03	0.	0.	0.	0.	0.	0.	0.	0.	0.
U-237	0.	1.18E+03	3.00E+02	1.84E+01	0.	1.07F+04	0.	1.31E+04	1.56F+03	2.31F+04
U-236	2.16E+02	0.	0.	0.	1.83E-03	0.	0.	1.03F-03	0.	0.
U-235	2.23E+04	0.	1.65E+01	0.	2.19F-01	3.00F-01	2.75F+01	3.09E+01	1.13F+02	5.96E+02
U-234	5.65E+03	0.	0.	0.	0.	4.31F+01	0.	0.	3.34E+01	0.
U-233	5.12E-03	0.	0.	1.12E-08	8.56E-08	2.57E-08	1.25E-08	7.10F-08	1.20E-07	5.14E-08
U-232	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PA-234	0.	2.52F+05	0.	0.	0.	2.50F-01	0.	0.	5.10F+00	4.66F+00
PA-233	0.	7.90E+01	0.	0.	0.	8.97E-04	0.	3.97F-01	9.47F-02	0.
PA-231	1.08E+00	0.	0.	0.	0.	0.	0.	1.75F-03	1.26E-06	4.33F-07
TH-234	0.	1.77E+04	0.	0.	0.	6.88E+03	0.	1.26F+03	2.49F+02	4.46E+01
TH-232	2.36E-08	0.	0.	0.	0.	0.	0.	0.	0.	0.
TH-231	0.	1.21F+03	1.23E+01	0.	0.	1.97E+00	4.28E+01	1.11E+01	0.	0.
TH-230	1.00F+01	0.	0.	0.	0.	0.	8.61F-04	2.36E-07	2.13E-04	5.53E-05

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NUCLIDE	ALPHA	BETA	GAMMA 1	GAMMA 2	GAMMA 3	GAMMA 4	GAMMA 5	GAMMA 6	GAMMA 7	GAMMA 8
TH-229	6.05E-07	0.	0.	0.	0.	0.	0.	0.	1.44E-08	6.13E-09
TH-228	1.83E-09	0.	0.	0.	5.07E-14	0.	0.	1.28E-13	1.15E-13	3.79E-11
TH-227	3.52E-02	0.	0.	0.	2.87E-05	9.66E-07	8.87E-06	2.10E-13	2.00E-06	2.03E-04
AC-228	0.	1.23E-09	0.	0.	0.	0.	0.	1.22E-12	4.82E-12	8.22E-12
AC-227	5.72E-04	3.06E-04	0.	0.	0.	0.	2.11E-05	1.42E-05	2.62E-05	5.30E-06
AC-225	6.66E-07	0.	0.	1.26E-12	0.	3.03E-11	5.72E-11	3.37E-10	2.97E-10	2.91E-10
RA-228	0.	3.59E-11	0.	0.	0.	0.	0.	0.	0.	0.
RA-226	4.49E-03	0.	0.	0.	0.	0.	0.	0.	0.	7.01E-06
RA-225	0.	3.97E-08	0.	0.	1.57E-09	0.	0.	0.	0.	0.
RA-224	1.90E-09	0.	0.	0.	0.	0.	0.	0.	0.	0.
RA-223	3.49E-02	0.	0.	2.02E-07	0.	2.09E-07	0.	6.07E-07	9.17E-05	2.08E-06
FR-223	0.	1.32E-04	0.	0.	2.30E-06	0.	1.20E-06	1.15E-07	6.18E-08	1.32E-06
FR-221	7.22E-07	0.	0.	0.	0.	0.	0.	1.37E-11	1.92E-11	3.02E-09
RN-222	5.09E-03	0.	0.	0.	0.	0.	0.	0.	0.	0.
RN-220	2.11E-09	0.	0.	0.	0.	0.	0.	0.	0.	0.
RN-219	4.07E-02	0.	0.	0.	0.	0.	0.	2.29E-08	1.02E-06	0.
RN-218	1.26E-09	0.	0.	0.	0.	0.	0.	0.	0.	0.
AT-218	1.18E-06	4.99E-10	0.	0.	0.	0.	0.	0.	0.	0.
AT-217	8.12E-07	0.	0.	0.	0.	0.	0.	0.	0.	0.
AT-215	1.11E-07	0.	0.	0.	0.	0.	0.	0.	0.	0.
PO-218	5.56E-03	5.81E-08	0.	0.	0.	0.	0.	0.	0.	0.
PO-216	2.28E-09	0.	0.	0.	0.	0.	0.	0.	0.	0.
PO-215	4.44E-02	1.02E-08	0.	0.	0.	0.	0.	0.	0.	0.
PO-214	7.13E-03	0.	0.	0.	0.	0.	0.	0.	0.	0.
PO-213	9.42E-07	0.	0.	0.	0.	0.	0.	0.	0.	0.
PO-212M	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PU-212	1.89E-09	0.	0.	0.	0.	0.	0.	0.	0.	0.
PU-211	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PU-210	9.74E-06	0.	0.	0.	0.	0.	0.	0.	0.	0.
RI-214	1.06E-06	1.54E-03	0.	0.	0.	0.	0.	0.	0.	0.
RI-213	1.48E-08	1.56E-07	0.	0.	0.	0.	0.	0.	0.	0.
RI-212	7.11E-10	4.85E-10	0.	0.	1.47E-15	0.	0.	0.	7.45E-15	0.
RI-211	3.94E-02	9.95E-06	0.	0.	0.	0.	0.	0.	0.	0.
RI-210M	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
RI-210	2.82E-11	4.15E-06	0.	0.	0.	0.	0.	0.	0.	0.
RI-209S	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PB-214	0.	5.21E-04	0.	0.	0.	1.03E-06	0.	0.	1.29E-07	9.10E-08
PH-212	0.	1.96E-10	0.	0.	0.	0.	0.	2.24E-13	0.	3.45E-11
PH-211	0.	7.80E-03	0.	0.	0.	4.79E-08	0.	1.17E-08	0.	0.
PH-210	0.	4.58E-07	0.	0.	3.59E-08	0.	0.	0.	0.	0.
PH-209	0.	7.30E-08	0.	0.	0.	0.	0.	0.	0.	0.
PH-208S	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PH-207S	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PH-206S	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TL-210	0.	3.56E-07	0.	0.	0.	0.	0.	7.56E-10	0.	0.
TL-209	0.	5.03E-09	0.	0.	0.	0.	0.	0.	4.14E-11	0.
TL-208	0.	1.92E-10	0.	0.	0.	0.	0.	0.	0.	1.36E-13
TL-207	0.	8.65E-05	0.	0.	0.	0.	0.	0.	0.	0.
TL-206	0.	2.00E-12	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL	5.18E+09	4.29E+08	3.29E+02	2.45E+02	1.77E+04	3.94E+06	1.09E+05	5.38E+04	1.31E+04	2.47E+04
AVE-FMG	5.26E+00	7.04E-02	2.63E-02	3.32E-02	4.39E-02	5.95E-02	7.40E-02	1.01E-01	1.43E-01	2.07E-01

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NUCLIDE	GAMMA 9	GAMMA10	GAMMA11	GAMMA12	GAMMA13	GAMMA14	GAMMA15	GAM-TOTAL
CF-252	0.	0.	0.	0.	0.	0.	0.	0.
CF-251	0.	0.	0.	0.	0.	0.	0.	0.
CF-250	0.	0.	0.	0.	0.	0.	0.	0.
CF-249	0.	0.	0.	0.	0.	0.	0.	0.
CK-250	0.	0.	0.	0.	0.	0.	0.	0.
CK-249	0.	0.	0.	0.	0.	0.	0.	0.
CM-250	0.	0.	0.	0.	0.	0.	0.	0.
CM-249	0.	0.	0.	0.	0.	0.	0.	0.
CM-248	0.	0.	0.	0.	0.	0.	0.	0.
CM-247	0.	0.	0.	0.	0.	0.	0.	0.
CM-246	0.	0.	0.	0.	0.	0.	0.	0.
CM-245	0.	0.	0.	0.	0.	0.	0.	0.
CM-244	0.	0.	0.	0.	0.	0.	0.	0.
CM-243	0.	0.	0.	0.	0.	0.	0.	0.
CM-242	0.	0.	0.	0.	0.	0.	0.	0.
AM-246	0.	0.	0.	0.	0.	0.	0.	0.
AM-245	0.	0.	0.	0.	0.	0.	0.	0.
AM-244	0.	0.	0.	0.	0.	0.	0.	0.
AM-243	0.	0.	0.	0.	0.	0.	0.	0.
AM-242	0.	0.	0.	0.	0.	0.	0.	0.
AM-241	5.66E+02	3.54E+02	6.09E+02	7.88E+02	0.	0.	0.	3.94E+06
PU-246	0.	0.	0.	0.	0.	0.	0.	0.
PU-245	0.	0.	0.	0.	0.	0.	0.	0.
PU-244	0.	0.	0.	0.	0.	0.	0.	0.
PU-243	0.	0.	0.	0.	0.	0.	0.	0.
PU-242	0.	0.	0.	0.	0.	0.	0.	3.76E+00
PU-241	0.	0.	0.	0.	0.	0.	0.	2.94E+04
PU-240	0.	0.	3.89E+01	0.	0.	0.	0.	9.39E+03
PU-239	1.80E+03	6.40E+03	1.41E+02	4.11E+01	1.61E-01	0.	0.	7.26E+04
PU-238	2.31E-02	0.	5.46E-01	4.02E+01	6.45E-01	0.	0.	3.52E+03
PU-236	0.	0.	0.	0.	0.	0.	0.	0.
NP-240	0.	0.	0.	0.	0.	0.	0.	0.
NP-239	0.	0.	0.	0.	0.	0.	0.	0.
NP-237	1.04E-02	0.	0.	0.	0.	0.	0.	0.
U-240	0.	0.	0.	0.	0.	0.	0.	3.31E+00
U-238	0.	0.	0.	0.	0.	0.	0.	0.
U-237	3.72E+03	2.99E+02	0.	0.	0.	0.	0.	5.22E+04
U-236	0.	0.	0.	0.	0.	0.	0.	7.86E-03
U-235	1.72E+00	0.	0.	0.	0.	0.	0.	7.59E+02
U-234	0.	0.	0.	0.	0.	0.	0.	7.65E+01
U-233	2.34E-07	9.77E-09	0.	0.	0.	0.	0.	6.21E-07
U-232	0.	0.	0.	0.	0.	0.	0.	0.
PA-234M	1.45E+01	4.65E+00	9.22E+00	9.61E+02	3.95E+01	1.28E+02	0.	1.16E+03
PA-234	3.51E+00	2.99E+00	2.13E+01	1.20E+02	1.19E+03	7.53E+00	0.	1.77E+02
PA-233	2.06E+01	2.08E+00	0.	0.	0.	0.	0.	2.70E+01
PA-231	4.61E-03	3.50E-04	0.	0.	0.	0.	0.	4.94E-03
TH-234	0.	0.	0.	0.	0.	0.	0.	1.63E+03
TH-232	0.	0.	0.	0.	0.	0.	0.	0.
TH-231	0.	0.	0.	0.	0.	0.	0.	6.81E+01
TH-230	9.66E-03	0.	0.	0.	0.	0.	0.	1.25E+03

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NUCLIDE	GAMMA 9	GAMMA10	GAMMA11	GAMMA12	GAMMA13	GAMMA14	GAMMA15	GAM-TOTAL
TH-229	0.	0.	0.	0.	0.	0.	0.	2.06E-08
TH-228	7.65E-12	5.58E-13	7.05E-11	3.42E-11	2.42E-12	9.19E-12	3.06E-10	4.69E-10
TH-227	3.48E-04	2.06E-06	0.	0.	0.	0.	0.	6.08E-04
AC-228	8.37E-11	2.78E-11	7.05E-12	3.04E-10	3.62E-11	1.18E-10	0.	7.91E-10
AC-227	0.	0.	0.	0.	0.	0.	0.	4.68E-05
AC-225	6.80E-11	7.39E-11	1.20E-11	0.	0.	0.	0.	1.17E-09
RA-228	0.	0.	0.	0.	0.	0.	0.	0.
RA-226	7.65E-05	1.38E-04	2.93E-04	9.82E-05	4.07E-04	4.58E-04	1.55E-04	1.63E-03
RA-225	0.	0.	0.	0.	0.	0.	0.	1.57E-09
RA-224	3.01E-12	5.51E-15	1.51E-14	0.	0.	0.	0.	3.02E-12
RA-223	3.69E-04	4.94E-05	6.93E-06	0.	0.	0.	0.	5.20E-04
FR-223	6.54E-07	4.24E-08	0.	1.18E-06	0.	0.	0.	6.86E-06
FR-221	1.07E-11	1.05E-10	0.	0.	0.	0.	0.	3.17E-09
RN-222	0.	0.	3.31E-07	0.	0.	0.	0.	3.31E-07
RN-220	0.	0.	5.46E-14	0.	0.	0.	0.	5.46E-14
RN-219	1.81E-04	1.62E-04	2.43E-06	0.	0.	0.	0.	3.46E-04
Rn-218	0.	0.	2.15E-13	0.	0.	0.	0.	2.15E-13
At-218	0.	0.	0.	0.	0.	0.	0.	0.
At-217	0.	0.	0.	0.	0.	0.	0.	0.
At-215	0.	0.	0.	0.	0.	0.	0.	0.
PO-218	0.	0.	0.	0.	0.	0.	0.	0.
PO-216	0.	0.	0.	0.	0.	0.	0.	0.
PO-215	0.	0.	0.	0.	0.	0.	0.	0.
PO-214	0.	0.	0.	9.76E-08	0.	0.	0.	9.76E-08
PO-213	0.	0.	0.	0.	0.	0.	0.	0.
PO-212M	0.	0.	3.85E-13	0.	0.	0.	7.78E-12	2.66E-12
PO-212	0.	0.	0.	0.	0.	0.	0.	0.
PO-211	0.	0.	4.71E-08	7.40E-08	0.	0.	0.	1.21E-07
PO-210	0.	0.	0.	1.77E-11	0.	0.	0.	1.77E-11
Bi-214	1.34E-05	8.57E-06	2.91E-04	1.00E-04	4.18E-04	5.41E-04	1.85E-04	1.56E-05
Bi-213	2.06E-10	1.37E-08	7.59E-11	3.71E-10	4.35E-10	0.	0.	1.49E-08
Bi-212	5.07E-15	6.41E-13	7.70E-11	2.09E-11	2.02E-12	1.11E-11	3.15E-10	4.27E-10
Bi-211	0.	2.95E-04	0.	0.	0.	0.	0.	2.95E-04
Bi-210M	7.16E-13	7.85E-13	5.94E-14	0.	0.	0.	0.	7.94E-13
Bi-210	0.	0.	0.	0.	0.	0.	0.	0.
Bi-209S	0.	0.	0.	0.	0.	0.	0.	0.
Pb-214	7.40E-05	1.21E-04	3.11E-06	1.18E-05	0.	0.	0.	2.15E-04
Pb-212	0.	7.79E-14	0.	0.	0.	0.	0.	7.79E-14
Pb-211	7.86E-07	5.06E-06	2.70E-05	2.46E-04	8.85E-06	0.	0.	7.86E-06
Pb-210	0.	0.	0.	0.	0.	0.	0.	5.59E-06
Pb-209	0.	0.	0.	0.	0.	0.	0.	0.
Pb-208S	0.	0.	0.	0.	0.	0.	0.	0.
Pb-207S	0.	0.	0.	0.	0.	0.	0.	0.
Pb-206S	0.	0.	0.	0.	0.	0.	0.	0.
Tl-210	4.61E-08	6.89E-09	2.41E-09	1.72E-07	1.55E-07	6.64E-08	9.27E-08	5.40E-07
Tl-209	0.	1.65E-10	0.	0.	0.	6.73E-10	0.	8.79E-10
Tl-208	2.56E-12	3.52E-14	7.48E-11	1.52E-11	6.92E-13	1.96E-14	3.16E-10	4.09E-10
Tl-207	0.	0.	0.	1.45E-05	0.	0.	0.	1.45E-05
Tl-206	0.	0.	0.	2.05E-16	0.	0.	0.	2.05E-16
TOTAL	5.62E+03	7.06E+03	8.20E+02	1.45E+03	5.22E+01	1.55E+02	3.59E+04	4.06E+06
AVE-ENG	3.17E+01	3.95E+01	6.55E+01	8.62E+01	1.26E+00	1.74E+00	2.27E+00	4.05E+02

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NEUTRON SPECTRUM

DATE : 1/1/74

GROUP	ENERGY(MEV)	SPONTANEOUS(N/SEC)	ALPHA-NI(N/SEC)	TOTAL(N/SEC)	
1	1.492E+01	3.400E+01	7.210E-02	0.	7.210E-02
2	1.000E+01	6.705E+00	6.399E-01	0.	6.399E-01
3	6.703E+00	4.966E+00	1.571E+00	0.	1.571E+00
4	4.966E+00	4.066E+00	5.745E+00	7.420E+00	1.318E+01
5	4.066E+00	3.012E+00	3.212E+00	7.817E+00	1.103E+01
6	3.012E+00	2.466E+00	3.173E+00	1.050E+01	1.575E+01
7	2.466E+00	1.827E+00	4.979E+00	7.509E+00	1.220E+01
8	1.827E+00	1.553E+00	5.560E+00	5.582E+00	1.096E+01
9	1.553E+00	9.072E-01	4.076E+00	2.412E+00	6.439E+00
10	9.072E-01	6.081E-01	2.663E+00	7.890E-01	3.637E+00
11	6.081E-01	4.070E-01	3.520E+00	4.771E-01	3.797E+00
12	4.070E-01	1.111E-01	6.076E-01	0.	4.076E-01
13	1.111E-01	1.505E-02	2.446E-02	0.	2.746E-02
14	1.505E-02	3.555E-03	0.	0.	0.
TOTAL			3.726E+01	4.256E+01	7.984E+01

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DECAY RATE AND CURIE NUMBER		DATE : 79/ 8/24							
**** **		**** **							
NUCLIDE	ALPHA-DECAY		BETA-DECAY		GAMMA-DECAY		NEUTRON		
	D/S	CI	D/S	CI	D/S	CI	S,F(N/SEC)	A=N(N/SEC)	TOT(N/SEC)
CF-252	0.	0.	0.	0.	0.	0.	0.	0.	0.
CF-251	0.	0.	0.	0.	0.	0.	0.	0.	0.
CF-250	0.	0.	0.	0.	0.	0.	0.	0.	0.
CF-249	0.	0.	0.	0.	0.	0.	0.	0.	0.
BK-250	0.	0.	0.	0.	0.	0.	0.	0.	0.
BK-249	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-250	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-249	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-248	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-247	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-246	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-245	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-244	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-243	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-242	0.	0.	0.	0.	0.	0.	0.	0.	0.
AM-246	0.	0.	0.	0.	0.	0.	0.	0.	0.
AM-245	0.	0.	0.	0.	0.	0.	0.	0.	0.
AM-244	0.	0.	0.	0.	0.	0.	0.	0.	0.
AM-243	0.	0.	0.	0.	0.	0.	0.	0.	0.
AM-242	0.	0.	0.	0.	0.	0.	0.	0.	0.
AM-241	2.1541E+08	5.8218E-03	0.	0.	7.2644E+07	7.0985E-03	7.6638E+04	1.0642E+01	1.0443E+01
PU-246	0.	0.	0.	0.	0.	0.	0.	0.	0.
PU-245	0.	0.	0.	0.	0.	0.	0.	0.	0.
PU-244	0.	0.	0.	0.	0.	0.	0.	0.	0.
PU-243	0.	0.	0.	0.	0.	0.	0.	0.	0.
PU-242	1.6381E+05	4.4274E-06	0.	0.	6.6541E+01	1.7984E-09	1.8419E+00	5.3880E-03	1.8473E+00
PU-241	4.5256E+05	1.2231E-05	1.9676E+10	5.3179E-01	2.6258E+05	7.0967E-06	2.6370E+04	1.4363E+02	1.4627E+02
PU-240	3.2763E+08	8.8550E-03	0.	0.	1.7249E+05	4.6620E-06	3.4783E+01	1.3231E+01	4.8014E+01
PU-239	3.3915E+08	9.1662E-03	0.	0.	2.0778E+05	5.6156E-06	3.3689E+01	1.3425E+01	1.3428E+01
PU-238	1.3132E+08	3.5492E-03	0.	0.	6.2973E+04	1.7020E-06	5.2548E-01	6.5809E+00	7.1063E+00
PU-236	0.	0.	0.	0.	0.	0.	0.	0.	0.
NP-240	0.	0.	0.	0.	0.	0.	0.	0.	0.
NP-239	0.	0.	0.	0.	0.	0.	0.	0.	0.
NP-237	2.1902E+02	5.9194E-09	0.	0.	6.8526E+01	1.8521E-09	8.7645E-10	6.0689E-06	6.0697E-06
U-240	0.	0.	0.	0.	0.	0.	0.	0.	0.
U-238	1.1102E+05	3.0005E-06	0.	0.	0.	0.	9.8268E-02	2.0679E-03	1.0034E-01
U-237	0.	0.	4.3311E+05	1.2247E-05	0.	0.	2.4901E-16	0.	2.4901E-16
U-236	5.7841E+01	1.5633E-09	0.	0.	5.5527E-02	1.5007E-12	1.1174E-07	1.3762E-06	1.4880E-06
U-235	5.1128E+05	1.3818E-07	0.	0.	4.9516E+03	1.3383E-07	1.7434E-05	1.1509E-04	1.3252E-04
U-234	1.1905E+05	3.2176E-06	0.	0.	1.0881E+03	2.9409E-08	2.9594E-06	3.5365E-03	3.5395E-03
U-233	1.8487E-05	6.9964E-14	0.	0.	9.8627E-06	2.6656E-16	2.4593E-15	5.6328E-11	5.6310E-11
U-232	0.	0.	0.	0.	0.	0.	0.	0.	0.
PA-236M	0.	0.	1.1010E+05	2.9757E-06	1.2325E+03	3.3310E-08	0.	0.	0.
PA-234	0.	0.	1.4433E+02	3.9007E-09	2.6513E+02	7.1657E-09	0.	0.	0.
PA-233	0.	0.	2.1167E+02	5.1207E-09	1.6490E+02	4.4568E-09	0.	0.	0.
PA-231	3.2676E-01	8.3144E-12	0.	0.	2.5001E-02	4.7569E-13	0.	1.1239E-08	1.1239E-08
TH-234	0.	0.	1.1102E+05	3.0006E-06	1.6439E+04	4.4431E-07	0.	0.	0.
TH-232	8.5087E-09	2.2997E-19	0.	0.	0.	0.	5.1082E-19	1.3364E-16	1.3395E-16
TH-231	0.	0.	5.1144E+03	1.3823E-07	1.1437E+03	3.0910E-08	0.	0.	0.
TH-230	3.2152E+00	8.6896E-11	0.	0.	2.2246E-02	6.0124E-13	2.0466E-12	8.9232E-08	8.9235E-08

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NUCLIDE	ALPHA-DECAY		BETA-DECAY		GAMMA-DECAY		NEUTRON		
	D/S	CI	D/S	CI	D/S	CI	S,F(N/SEC)	A=N(N/SEC)	TOT(N/SEC)
TH-229	2.5997E-07	7.0261E-18	0.	0.	2.7894E-07	7.5390E-18	0.	8.3517E-15	8.3517E-15
TH-228	6.5281E-10	1.7644E-20	0.	0.	9.3194E-10	2.5188E-20	0.	3.0395E-17	3.0395E-17
TH-227	1.4122E-02	3.8167E-13	0.	0.	6.6927E-03	1.8107E-13	0.	8.1022E-10	8.1022E-10
AC-228	0.	0.	1.7184E-09	4.6447E-20	1.8161E-09	4.9083E-20	0.	0.	0.
AC-227	2.5639E-04	6.9294E-15	1.4825E-02	4.0068E-13	1.3649E-03	3.6889E-14	0.	8.9408E-12	8.9408E-12
AC-225	2.4347E-07	6.5803E-18	0.	0.	1.8041E-08	4.8760E-19	0.	1.4840E-14	1.4840E-14
RA-228	0.	0.	1.7193E-09	4.6468E-20	0.	0.	0.	0.	0.
RA-226	2.1016E-03	5.6800E-14	0.	0.	4.3736E-03	1.1820E-13	0.	6.3225E-11	6.3225E-11
RA-223	0.	0.	2.5004E-07	6.7579E-18	8.2314E-08	2.2301E-18	0.	0.	0.
RA-224	6.4730E-10	1.7495E-20	0.	0.	2.4073E-11	6.5063E-22	0.	3.5820E-17	3.5820E-17
RA-223	1.3947E-02	3.7695E-13	0.	0.	4.7570E-03	1.2857E-13	0.	6.6097E-10	6.6097E-10
FR-223	0.	0.	2.5639E-04	6.9294E-15	1.6078E-04	4.3455E-15	0.	0.	0.
FR-221	2.4348E-07	6.5805E-18	0.	0.	3.0630E-08	8.2783E-19	0.	1.9868E-14	1.9868E-14
RN-222	2.0807E-03	5.6235E-14	0.	0.	1.4565E-06	3.9364E-17	0.	1.0415E+00	1.0415E+00
RN-220	6.4735E-10	1.7496E-20	0.	0.	1.9420E-13	5.2488E-24	0.	5.3144E-17	5.3144E-17
RN-219	1.3948E-02	3.7697E-13	0.	0.	2.5098E-03	6.7833E-14	0.	1.5002E-09	1.5002E-09
RN-218	3.9532E-10	1.0684E-20	0.	0.	7.9064E-13	2.1369E-23	0.	5.1535E-17	5.1535E-17
AT-218	3.9493E-07	1.0674E-17	3.9532E-10	1.0684E-20	0.	0.	0.	4.0772E-14	4.0772E-14
AT-217	2.4344E-07	6.5795E-18	0.	0.	0.	0.	0.	3.0834E-14	3.0834E-14
AT-215	3.2079E-08	8.6701E-19	0.	0.	0.	0.	0.	6.3750E-15	6.3750E-15
PO-218	2.0805E-03	5.6224E-14	2.9533E-07	1.0684E-17	0.	0.	0.	1.4413E-10	1.4413E-10
PO-216	6.4733E-10	1.7495E-20	0.	0.	0.	0.	0.	6.9889E-17	6.9889E-17
PO-215	1.3947E-02	3.7696E-13	3.2079E-08	8.6700E-19	0.	0.	0.	2.0595E-09	2.0595E-09
PO-214	2.0801E-03	5.6219E-14	0.	0.	2.9122E-07	7.8707E-16	0.	3.5571E-10	3.5571E-10
PO-213	2.3810E-07	6.4352E-18	0.	0.	0.	0.	0.	5.5723E-14	5.5723E-14
PO-212M	0.	0.	0.	0.	2.9742E-12	8.0384E-23	0.	0.	0.
PO-212	4.1381E-10	1.1184E-20	0.	0.	0.	0.	0.	1.1520E-16	1.1520E-16
PO-211	3.9052E-05	1.0555E-15	0.	0.	3.9052E-07	1.0555E-17	0.	0.	0.
PO-210	7.3400E-06	1.9838E-16	0.	0.	8.8080E-11	2.3805E-21	0.	3.2419E-13	3.2419E-13
BI-214	4.3691E-07	1.1808E-17	2.0801E-03	5.6218E-14	3.1426E-03	8.4935E-14	0.	2.1389E-14	2.1389E-14
BI-213	5.3558E-09	1.4475E-19	2.3809E-07	6.4349E-18	6.9626E-08	1.8810E-18	0.	3.4226E-16	3.4226E-16
BI-212	2.3277E-10	6.2912E-21	4.1382E-10	1.1184E-20	5.7718E-10	1.5599E-20	0.	1.5025E-17	1.5025E-17
BI-211	1.3913E-02	3.7603E-13	3.2067E-05	1.0359E-15	1.2533E-03	3.2783E-14	0.	1.3395E-09	1.3395E-09
BI-210M	0.	0.	0.	0.	1.2790E-11	3.4568E-22	0.	0.	0.
BI-210	1.5423E-11	4.1685E-22	1.1864E-05	3.2065E-16	0.	0.	0.	1.1184E-18	1.1184E-18
BI-209S	0.	0.	0.	0.	0.	0.	0.	0.	0.
PB-214	0.	0.	2.0802E-03	5.6221E-14	1.4673E-03	3.9661E-14	0.	0.	0.
PB-212	0.	0.	6.4664E-10	1.7477E-20	2.8291E-10	7.6461E-21	0.	0.	0.
PB-211	0.	0.	1.3948E-02	3.7693E-13	3.9808E-03	1.0759E-13	0.	0.	0.
PB-210	0.	0.	6.3648E-05	1.7202E-15	2.5439E-06	6.8808E-17	0.	0.	0.
PB-209	0.	0.	2.4336E-07	6.5773E-18	0.	0.	0.	0.	0.
PB-208S	0.	0.	0.	0.	0.	0.	0.	0.	0.
PB-207S	0.	0.	0.	0.	0.	0.	0.	0.	0.
PB-206S	0.	0.	0.	0.	0.	0.	0.	0.	0.
TL-210	0.	0.	4.3691E-07	1.1808E-17	1.3413E-06	3.6251E-17	0.	0.	0.
TL-209	0.	0.	5.3558E-09	1.4475E-19	2.4101E-09	6.5138E-20	0.	0.	0.
TL-208	0.	0.	2.3277E-10	6.2910E-21	5.4135E-10	1.4631E-20	0.	0.	0.
TL-207	0.	0.	1.3908E-02	3.7589E-13	3.7551E-05	1.0149E-15	0.	0.	0.
TL-206	0.	0.	1.5423E-11	4.1684E-22	8.4827E-16	2.2926E-26	0.	0.	0.
TOTAL	1.0144E+09	2.7415E+02	1.9672E+10	5.3181E-01	7.8807E+07	2.1299E-03	3.7254E+01	4.3904E+01	8.1158E+01

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RAY INTENSITY (MEV/SEC) DATE : 79/ 8/24
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NUCLIDE	ALPHA	BETA	GAMMA 1	GAMMA 2	GAMMA 3	GAMMA 4	GAMMA 5	GAMMA 6	GAMMA 7	GAMMA 8
CF-252	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CF-251	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CF-250	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CF-249	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
BK-250	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
BK-249	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-250	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-249	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-248	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-247	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-246	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-245	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-244	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-243	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
CM-242	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
AM-246	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
AM-245	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
AM-244	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
AM-243	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
AM-242	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
AM-241	1.18E+09	0.	0.	0.	8.51E+03	4.60E+06	3.03E+02	9.46E+03	1.59E+03	4.42E+02
PU-246	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PU-245	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PU-244	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PU-243	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PU-242	8.02E+05	0.	0.	0.	2.43E+00	0.	0.	1.22E+00	1.09E-01	0.
PU-241	2.19E+06	4.09E+08	0.	0.	4.87E+01	4.09E+01	4.03E+02	2.18E+04	5.78E+03	0.
PU-240	1.70E+09	0.	0.	0.	6.67E+03	0.	0.	2.46E+03	2.21E+02	0.
PU-239	1.75E+09	0.	0.	2.26E+02	8.57E+02	3.86E+03	3.39E+02	4.98E+03	3.31E+03	6.50E+02
PU-238	7.21E+08	0.	0.	0.	2.74E+03	0.	0.	1.01E+03	2.03E+02	1.13E+00
PU-236	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NP-240	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NP-239	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
NP-237	1.02E+03	0.	0.	8.37E-01	1.45E-02	2.76E-02	2.73E+00	2.33E-01	4.12E-01	4.27E-01
U-240	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
U-238	4.65E+05	0.	0.	0.	0.	0.	0.	0.	0.	0.
U-237	0.	1.12E+05	2.87E+02	1.76E+01	0.	1.02E+04	0.	1.25E+04	1.49E+03	2.20E+04
U-236	2.59E+02	0.	0.	0.	2.20E-05	0.	0.	1.24E-03	0.	0.
U-235	2.25E+04	0.	1.63E+01	0.	2.19E-01	3.00E-01	2.75E+01	1.09E+01	1.13E+02	5.88E+02
U-234	5.67E+05	0.	0.	0.	0.	4.32E+01	0.	0.	3.35E+01	0.
U-233	8.86E-03	0.	0.	1.94E-08	1.48E-07	2.44E-08	2.16E-08	1.23E-07	2.08E-07	8.90E-08
U-232	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PA-236M	0.	2.52E+05	0.	0.	0.	0.	0.	0.	0.	0.
PA-234	0.	7.90E+01	0.	0.	0.	2.56E-01	0.	0.	5.10E+00	4.66E+00
PA-233	0.	4.93E+01	0.	0.	1.28E-05	0.	4.39E-01	5.68E+00	1.33E-01	0.
PA-231	1.62E+00	0.	0.	0.	0.	0.	0.	1.87E-05	1.89E-06	6.49E-07
TH-234	0.	1.77E+04	0.	0.	0.	4.88E+01	0.	1.26E+03	2.49E+02	4.66E+01
TH-232	3.40E+08	0.	0.	0.	0.	0.	0.	0.	0.	0.
TH-231	0.	1.21E+03	1.23E+01	0.	0.	1.97E+00	4.28E+01	1.11E+01	0.	0.
TH-230	1.50E+01	0.	0.	0.	0.	0.	1.29E-03	1.54E-07	3.20E-04	8.26E-05

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NUCLIDE	ALPHA	BETA	GAMMA 1	GAMMA 2	GAMMA 3	GAMMA 4	GAMMA 5	GAMMA 6	GAMMA 7	GAMMA 8
TH-229	1.26E+06	0.	0.	0.	0.	0.	0.	0.	3.02E-08	1.28E-08
TH-228	3.51E+09	0.	0.	0.	1.17E-15	0.	2.47E-13	4.05E-13	2.21E-13	7.22E-11
TH-227	8.05E-02	0.	0.	0.	6.57E-05	2.21E-06	2.03E-05	2.83E-05	4.57E-06	4.65E-04
AC-228	0.	2.07E-09	0.	0.	0.	0.	0.	2.05E-12	7.80E-12	1.51E-11
AC-227	1.27E-03	6.82E-04	0.	0.	0.	0.	4.71E-05	3.16E-05	5.84E-05	1.18E-05
AC-225	1.41E-06	0.	0.	2.66E-12	0.	6.42E-11	1.21E-10	7.14E-10	6.28E-10	6.16E-10
RA-228	0.	6.03E-11	0.	0.	0.	0.	0.	0.	0.	0.
RA-226	1.00E-02	0.	0.	0.	0.	0.	0.	0.	0.	1.56E-05
RA-225	0.	8.37E-08	0.	0.	0.	3.30E-09	0.	0.	0.	0.
RA-224	3.65E-09	0.	0.	0.	0.	0.	0.	0.	0.	0.
RA-223	8.11E-02	0.	0.	4.69E-07	0.	4.85E-07	0.	1.41E-06	2.13E-04	4.84E-06
FR-223	0.	2.95E-04	0.	0.	5.13E-06	0.	2.67E-06	2.56E-07	1.38E-07	2.94E-06
FR-221	1.53E-06	0.	0.	0.	0.	0.	0.	2.91E-11	4.07E-11	6.40E-09
RN-222	1.14E-02	0.	0.	0.	0.	0.	0.	0.	0.	0.
RN-220	4.07E-09	0.	0.	0.	0.	0.	0.	0.	0.	0.
RN-219	9.44E-02	0.	0.	0.	0.	0.	0.	5.11E-08	2.37E-06	0.
RN-218	2.82E-09	0.	0.	0.	0.	0.	0.	0.	0.	0.
AT-218	2.64E-06	1.12E-09	0.	0.	0.	0.	0.	0.	0.	0.
AT-217	1.72E-06	0.	0.	0.	0.	0.	0.	0.	0.	0.
AT-215	2.57E-07	0.	0.	0.	0.	0.	0.	0.	0.	0.
PO-218	1.25E-02	1.30E-07	0.	0.	0.	0.	0.	0.	0.	0.
PO-216	1.39E-09	0.	0.	0.	0.	0.	0.	0.	0.	0.
PO-215	1.03E-01	2.37E-08	0.	0.	0.	0.	0.	0.	0.	0.
PO-214	1.60E-02	0.	0.	0.	0.	0.	0.	0.	0.	0.
PO-213	1.99E-06	0.	0.	0.	0.	0.	0.	0.	0.	0.
PO-212M	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PO-212	3.64E-09	0.	0.	0.	0.	0.	0.	0.	0.	0.
PO-211	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PO-210	3.89E-05	0.	0.	0.	0.	0.	0.	0.	0.	0.
BI-214	2.38E-06	3.45E-03	0.	0.	0.	0.	0.	0.	0.	0.
BI-213	3.14E-08	1.31E-07	0.	0.	0.	0.	0.	0.	0.	0.
BI-212	1.37E-09	9.31E-10	0.	0.	2.84E-13	0.	0.	0.	1.44E-14	0.
BI-211	9.14E-02	2.30E-05	0.	0.	0.	0.	0.	0.	0.	0.
BI-210M	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
BI-210	9.37E-11	1.38E-05	0.	0.	0.	0.	0.	0.	0.	0.
BI-209S	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PB-214	0.	1.28E-03	0.	0.	0.	2.30E-06	0.	0.	2.89E-07	2.04E-07
PB-212	0.	3.81E-10	0.	0.	0.	0.	0.	4.32E-13	0.	6.66E-11
PB-211	0.	1.81E-02	0.	0.	0.	1.11E-07	0.	2.72E-08	0.	0.
PB-210	0.	1.51E-06	0.	0.	1.18E-07	0.	0.	0.	0.	0.
PB-209	0.	1.55E-07	0.	0.	0.	0.	0.	0.	0.	0.
PB-208S	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PB-207S	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
PB-206S	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TL-210	0.	7.98E-07	0.	0.	0.	0.	0.	1.70E-09	0.	0.
TL-209	0.	1.07E-08	0.	0.	0.	0.	0.	0.	8.77E-11	0.
TL-208	0.	3.70E-10	0.	0.	0.	0.	0.	0.	0.	2.62E-13
TL-207	0.	2.00E-02	0.	0.	0.	0.	0.	0.	0.	0.
TL-206	0.	2.33E-11	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL	5.35E+09	4.10E+08	3.15E+02	2.44E+02	1.83E+04	4.62E+06	1.12E+03	5.35E+04	1.30E+04	2.37E+04
AVE-ENG	5.27E+00	2.08E-02	2.83E-02	3.32E-02	4.38E-02	5.95E-02	7.38E-02	1.01E-01	1.42E-01	2.07E-01

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NUCLIDE	GAMMA 9	GAMMA10	GAMMA11	GAMMA12	GAMMA13	GAMMA14	GAMMA15	GAM-TOTAL
CF-252	0.	0.	0.	0.	0.	0.	0.	0.
CF-251	0.	0.	0.	0.	0.	0.	0.	0.
CF-250	0.	0.	0.	0.	0.	0.	0.	0.
CF-249	0.	0.	0.	0.	0.	0.	0.	0.
BK-230	0.	0.	0.	0.	0.	0.	0.	0.
BK-249	0.	0.	0.	0.	0.	0.	0.	0.
CM-250	0.	0.	0.	0.	0.	0.	0.	0.
CM-249	0.	0.	0.	0.	0.	0.	0.	0.
CM-248	0.	0.	0.	0.	0.	0.	0.	0.
CM-247	0.	0.	0.	0.	0.	0.	0.	0.
CM-246	0.	0.	0.	0.	0.	0.	0.	0.
CM-245	0.	0.	0.	0.	0.	0.	0.	0.
CM-244	0.	0.	0.	0.	0.	0.	0.	0.
CM-243	0.	0.	0.	0.	0.	0.	0.	0.
CM-242	0.	0.	0.	0.	0.	0.	0.	0.
AM-246	0.	0.	0.	0.	0.	0.	0.	0.
AM-245	0.	0.	0.	0.	0.	0.	0.	0.
AM-244	0.	0.	0.	0.	0.	0.	0.	0.
AM-243	0.	0.	0.	0.	0.	0.	0.	0.
AM-242	0.	0.	0.	0.	0.	0.	0.	0.
AM-241	6.64E+02	4.16E+02	7.15E+02	3.38E+02	0.	0.	0.	4.65E+06
PU-246	0.	0.	0.	0.	0.	0.	0.	0.
PU-245	0.	0.	0.	0.	0.	0.	0.	0.
PU-244	0.	0.	0.	0.	0.	0.	0.	0.
PU-243	0.	0.	0.	0.	0.	0.	0.	0.
PU-242	0.	0.	0.	0.	0.	0.	0.	3.76E+00
PU-241	0.	0.	0.	0.	0.	0.	0.	2.81E+04
PU-240	0.	0.	3.88E+01	0.	0.	0.	0.	9.39E+03
PU-239	1.80E+03	6.40E+03	1.41E+02	4.11E+01	1.81E-01	0.	0.	2.26E+04
PU-238	2.30E-02	0.	5.41E-01	3.99E+01	6.40E-01	0.	0.	3.49E+03
PU-236	0.	0.	0.	0.	0.	0.	0.	0.
NP-240	0.	0.	0.	0.	0.	0.	0.	0.
NP-239	0.	0.	0.	0.	0.	0.	0.	0.
NP-237	1.48E-02	0.	0.	0.	0.	0.	0.	4.69E+00
U-240	0.	0.	0.	0.	0.	0.	0.	0.
U-238	0.	0.	0.	0.	0.	0.	0.	0.
U-237	3.07E+03	2.85E+02	0.	0.	0.	0.	0.	4.98E+04
U-236	0.	0.	0.	0.	0.	0.	0.	3.44E+03
U-235	1.72E+00	0.	0.	0.	0.	0.	0.	7.59E+02
U-234	0.	0.	0.	0.	0.	0.	0.	2.67E+01
U-233	4.05E-07	1.09F-08	0.	0.	0.	0.	0.	1.08E-06
U-232	0.	0.	0.	0.	0.	0.	0.	0.
PA-234M	1.45E+01	4.45E+00	9.22E+00	9.61E+02	3.95E+01	1.28E+02	0.	1.16E+03
PA-234	3.51E+00	2.99E+00	2.14E+01	1.20E+02	1.19E+01	7.53E+00	0.	1.77E+02
PA-233	2.94E+01	2.98F+00	0.	0.	0.	0.	0.	3.87E+01
PA-231	6.92E-03	5.26E-04	0.	0.	0.	0.	0.	7.46E-03
TH-234	0.	0.	0.	0.	0.	0.	0.	1.65E+03
TH-232	0.	0.	0.	0.	0.	0.	0.	0.
TH-231	0.	0.	0.	0.	0.	0.	0.	6.81E+01
TH-230	1.45E-04	0.	0.	0.	0.	0.	0.	1.84E-03

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NUCLIDE	GAMMA 9	GAMMA10	GAMMA11	GAMMA12	GAMMA13	GAMMA14	GAMMA15	GAM-TOTAL
TH-229	0.	0.	0.	0.	0.	0.	0.	4.30E-08
TH-228	1.47E-11	1.07E-12	1.35E-10	6.58F-11	4.65E-12	1.77E-11	5.89E-10	9.01E-10
TH-227	7.94E-04	4.70F-06	0.	0.	0.	0.	0.	1.38F-03
AC-228	1.41E-10	4.69E-11	1.19E-11	8.51E-10	6.12E-11	1.99E-10	0.	1.34E-09
AC-227	0.	0.	0.	0.	0.	0.	0.	1.49E-04
AC-225	1.44E-10	1.56E-10	2.54E-11	0.	0.	0.	0.	2.47E-09
RA-228	0.	0.	0.	0.	0.	0.	0.	0.
RA-226	1.70E-04	1.07F-04	4.55E-04	2.19E-04	9.09E-04	1.02E-03	3.47E-04	3.65E-05
RA-225	0.	0.	0.	0.	0.	0.	0.	3.30E-09
RA-224	3.79E-12	1.06E-14	2.52E-14	0.	0.	0.	0.	5.82E-12
RA-223	4.56E-04	1.15E-04	1.61E-05	0.	0.	0.	0.	1.21E-03
FR-223	1.46E-06	9.66E-08	0.	2.63F-06	0.	0.	0.	1.53E-05
FR-221	2.27E-11	2.22E-10	0.	0.	0.	0.	0.	6.72E-09
RN-222	0.	0.	7.43E-07	0.	0.	0.	0.	7.43E-07
RN-220	0.	0.	1.05E-13	0.	0.	0.	0.	1.05E-13
RN-219	4.19E-04	3.76E-04	5.63E-06	0.	0.	0.	0.	8.04E-04
RN-218	0.	0.	4.82E-13	0.	0.	0.	0.	4.82E-13
AT-218	0.	0.	0.	0.	0.	0.	0.	0.
AT-217	0.	0.	0.	0.	0.	0.	0.	0.
AT-215	0.	0.	0.	0.	0.	0.	0.	0.
PO-218	0.	0.	0.	0.	0.	0.	0.	0.
PO-216	0.	0.	0.	0.	0.	0.	0.	0.
PO-215	0.	0.	0.	0.	0.	0.	0.	0.
PO-214	0.	0.	0.	2.19E-07	0.	0.	0.	2.19E-07
PO-213	0.	0.	0.	0.	0.	0.	0.	0.
PO-212M	0.	0.	7.37E-13	0.	0.	0.	4.39E-12	5.12E-12
PO-212	0.	0.	0.	0.	0.	0.	0.	0.
PO-211	0.	0.	1.09E-07	1.72E-07	0.	0.	0.	2.81E-07
PO-210	0.	0.	0.	0.	0.	0.	0.	0.
RI-214	3.01E-05	1.92E-05	6.53E-04	2.25E-04	9.38E-04	1.71E-03	4.12E-04	7.07E-11
RI-213	4.36E-10	2.89E-08	1.61E-10	7.86E-10	1.36F-09	0.	0.	3.16E-08
RI-212	9.76E-15	1.23E-12	1.48E-10	4.02E-11	3.90E-12	2.14E-11	6.07E-10	8.23E-10
RI-211	0.	0.	6.85E-04	0.	0.	0.	0.	6.85E-04
BI-210M	3.43E-12	3.76E-14	2.85E-13	0.	0.	0.	0.	3.76E-12
BI-210	0.	0.	0.	0.	0.	0.	0.	0.
RI-209S	0.	0.	0.	0.	0.	0.	0.	0.
PB-214	1.70E-04	2.72E-04	6.97E-06	2.64E-05	0.	0.	0.	4.79E-04
PB-212	0.	5.37E-14	0.	0.	0.	0.	0.	6.70E-11
PB-211	1.82E-06	1.17E-03	6.26E-05	5.72E-04	2.05E-05	0.	0.	1.83E-03
PB-210	0.	0.	0.	0.	0.	0.	0.	1.18E-07
PB-209	0.	0.	0.	0.	0.	0.	0.	0.
PB-208S	0.	0.	0.	0.	0.	0.	0.	0.
PB-207S	0.	0.	0.	0.	0.	0.	0.	0.
PB-206S	0.	0.	0.	0.	0.	0.	0.	0.
TL-210	1.03E-07	1.55E-08	5.85E-09	3.86E-07	3.43E-07	1.49E-07	2.08E-07	1.21E-06
TL-209	0.	3.49E-10	0.	0.	0.	1.43E-09	0.	1.86E-09
TL-208	4.92E-12	6.79E-14	1.44E-10	2.92E-11	1.33E-12	3.82E-14	6.09E-10	7.88E-10
TL-207	0.	0.	0.	3.37E-05	0.	0.	0.	3.37E-05
TL-206	0.	0.	0.	6.81E-16	0.	0.	0.	6.81E-16
TOTAL	5.58E+03	7.11E+03	9.26E+02	1.50E+03	9.22E+01	1.35E+02	7.59E-04	4.76E+06
AVG-ENG	3.17E-01	3.93E-01	6.55E-01	8.57E-01	1.26E+00	1.74E+00	2.27E+00	8.02E-02

*** SAMPLE CALCULATION ***

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NEUTRON SPECTRUM

DATE : 79/ 8/24

GROUP	ENERGY (MEV)	SPONTANEOUS (N/SEC)	ALPHA-N (N/SEC)	TOTAL (N/SEC)
1	1.492E+01 TO 1.000E+01	7.206E-02	0.	7.206E-02
2	1.000E+01	6.703E+00	6.397E-01	6.397E-01
3	6.703E+00	4.966E+00	1.570E+00	1.570E+00
4	4.966E+00	4.066E+00	5.764E+00	1.345E+01
5	4.066E+00	3.012E+00	3.212E+00	1.131E+01
6	3.012E+00	2.446E+00	3.172E+00	1.635E+01
7	2.446E+00	1.827E+00	4.976E+00	1.255E+01
8	1.827E+00	1.353E+00	5.559E+00	1.115E+01
9	1.353E+00	9.072E-01	4.026E+00	6.524E+00
10	9.072E-01	6.081E-01	2.662E+00	3.667E+00
11	6.081E-01	4.076E-01	3.319E+00	3.815E+00
12	4.076E-01	1.111E-01	6.075E-01	6.075E-01
13	1.111E-01	1.305E-02	2.245E-02	2.245E-02
14	1.305E-02	3.555E-03	0.	0.
TOTAL		3.725E+01	4.390E+01	8.116E+01

*** SAMPLE CALCULATION ***

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SUMMARY OUTPUT OF CURIE NUMBER AND PAY ENERGY

DATE	CURIE NUMBER			ENERGY (MEV/SEC)			SF NEUTRON	AN NEUTRON	TOTAL
	ALPHA	BETA	GAMMA	ALPHA	BETA	GAMMA			
78/ 8/24	2.66E-02	5.57E-01	1.87E-03	5.18E+09	4.29E+08	4.06E+06	3.7261E+01	4.2382E+01	7.9643E+01
79/ 8/24	2.76E-02	5.57E-01	2.13E-03	5.35E+09	4.10E+08	4.74E+06	3.7254E+01	4.3904E+01	8.1158E+01

*** SAMPLE CALCULATION ***

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*** SAMPLE CALCULATION ***

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NUCLIDE DENSITY VS TIME

(CONTINUED)

NUCLIDE	78/ 8/24	79/ 8/24	NUCLIDE	78/ 8/24	79/ 8/24
CF-252	0.	0.	TH-229	4.1551E+04	4.0616E+04
CF-251	0.	0.	TH-228	2.9554E-02	5.6820E-02
CF-250	0.	0.	TH-227	1.4420E+04	3.2953E+04
CF-249	0.	0.	AC-228	3.2416E-05	5.4714E-05
BK-250	0.	0.	AC-227	6.7099E+06	1.4959E+07
BK-249	0.	0.	AC-225	1.4330E-01	3.0348E-01
CM-250	0.	0.	RA-228	2.6652E-01	4.4979E-01
CM-249	0.	0.	RA-226	6.8521E+07	1.5299E+08
CM-248	0.	0.	RA-225	2.1903E-01	4.6128E-01
CM-247	0.	0.	RA-224	1.5247E+04	2.9370E+04
CM-246	0.	0.	RA-223	8.5617E+03	1.9871E+04
CM-245	0.	0.	FR-225	2.1701E-01	4.8381E-01
CM-244	0.	0.	FR-221	4.7769E-05	1.0116E-04
CM-243	0.	0.	Rh-222	4.4203E+02	9.9179E+02
CM-242	0.	0.	Rh-220	2.6956E-08	5.1925E-08
AM-246	0.	0.	RH-219	3.4332E-02	7.9684E-02
AM-245	0.	0.	RH-218	8.8908E-12	1.9962E-11
AM-244	0.	0.	AT-218	5.0839E-07	1.1607E-06
AM-243	0.	0.	AT-217	5.3573E-09	1.1346E-08
AM-242	0.	0.	AT-215	1.9940E-12	4.4628E-12
AM-241	3.6146E+18	4.2435E+18	PO-216	2.4483E-01	5.4932E-01
PU-246	0.	0.	PO-216	7.2722E-11	1.4008E-10
PU-245	0.	0.	PO-215	1.5432E-05	3.5817E-05
PU-244	0.	0.	PO-214	2.1936E-07	4.9216E-07
PU-243	0.	0.	PO-213	6.8122E-15	1.4427E-12
PU-242	2.8843E+18	2.8843E+18	PO-212M	2.2270E-09	4.2910E-09
PU-241	1.3965E+19	1.3330E+19	PO-212	9.2953E-17	1.7910E-16
PU-240	9.7454E+19	9.7444E+19	PO-211	1.3593E-05	3.1550E-05
PU-239	3.7636E+20	3.7635E+20	PO-210	3.1684E+01	1.7661E+02
PU-238	5.2843E+17	5.2427E+17	RI-214	1.5892E+00	3.5658E+00
NP-236	0.	0.	RI-213	4.5384E-04	9.6072E-04
NP-240	0.	0.	RI-212	1.7589E-06	3.3890E-06
NP-239	0.	0.	RI-211	1.083E+00	2.5725E+00
NP-237	1.5015E+16	2.1524E+16	RI-210M	2.8005E+02	1.2464E+03
U-240	0.	0.	RI-210	7.2260E+00	7.4091E+00
U-238	2.2578E+22	2.2578E+22	RI-209S	3.5356E+00	8.9826E+00
U-237	3.9943E+11	3.8126E+11	PH-214	2.1507E+00	4.8257E+00
U-236	5.1299E+16	4.1632E+16	PH-212	1.8547E-05	3.5734E-05
U-235	1.6580E+20	1.4581E+20	PH-211	1.8776E+01	4.3581E+01
U-234	1.3175E+16	1.3216E+16	PU-210	1.9584E+04	4.4376E+04
U-233	7.7295E+09	1.3373E+10	PH-209	1.9395E-03	4.1078E-03
U-232	0.	0.	PU-206S	1.1282E-02	2.6396E-02
PA-234M	1.1540E+07	1.1540E+07	PH-207S	1.1976E+05	4.2596E+05
PA-234	5.0597E+06	5.0597E+06	PD-206S	2.7094E+01	1.5836E+02
PA-233	4.9804E+08	7.1237E+08	TL-210	2.1912E-03	4.9165E-03
PA-231	3.2189E+11	4.8317E+11	TL-209	4.8160E-07	1.0199E-06
TH-234	3.3351E+11	3.3351E+11	TL-208	3.1936E-08	6.1534E-08
TH-232	3.7678E+09	5.4390E+09	TL-207	2.4866E+00	5.7785E+00
TH-231	6.7996E+08	6.8000E+08	TL-206	1.6846E-09	5.6072E-09
TH-230	7.5151E+12	1.1264E+13			

*** SAMPLE CALCULATION ***

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MASS AND PPM			DATE : 78/ 8/24		
**** **			**** **		
NUCLIDE	MASS(G)	PPH/(U+PU)	NUCLIDE	MASS(G)	PPH/(U+PU)
CF-252	0.	0.	TH-229	1.500E-17	1.721E-12
CF-251	0.	0.	TH-228	1.119E-23	1.218E-18
CF-250	0.	0.	TH-227	5.436E-18	5.919E-13
CF-249	0.	0.	AC-228	1.227E-26	1.336E-21
BK-250	0.	0.	AC-227	2.529E-15	2.754E-10
BK-249	0.	0.	AC-225	5.354E-23	5.810E-18
CM-250	0.	0.	RA-228	1.009E-22	1.099E-17
CM-249	0.	0.	RA-226	2.572E-14	2.800E-09
CM-248	0.	0.	RA-225	8.184E-23	8.911E-18
CM-247	0.	0.	RA-224	5.071E-26	6.175E-21
CM-246	0.	0.	RA-223	3.170E-18	3.452E-13
CM-245	0.	0.	FR-223	8.103E-23	8.750E-18
CM-244	0.	0.	FR-221	1.753E-26	1.909E-21
CM-243	0.	0.	RN-222	1.630E-19	1.774E-14
CM-242	0.	0.	RN-220	9.847E-30	1.072E-24
AM-246	0.	0.	RN-219	1.248E-23	1.359E-18
AM-245	0.	0.	RN-218	3.220E-33	3.507E-28
AM-244	0.	0.	AT-218	1.840E-28	2.004E-23
AM-243	0.	0.	AT-217	1.930E-30	2.102E-25
AM-242	0.	0.	AT-215	7.118E-34	7.751E-29
AM-241	1.447E+03	1.575E+02	PO-218	8.863E-23	9.650E-18
PU-246	0.	0.	PO-216	2.608E-32	2.880E-27
PU-245	0.	0.	PO-215	5.509E-27	5.999E-22
PU-244	0.	0.	PO-214	7.794E-29	8.486E-24
PU-243	0.	0.	PO-213	2.409E-34	2.623E-29
PU-242	1.159E+03	1.262E+02	PO-212M	7.839E-31	8.536E-26
PU-241	5.590E+03	6.086E+02	PO-212	3.272E-38	3.563E-33
PU-240	3.884E-02	4.230E+03	PO-211	4.762E-27	5.185E-22
PU-239	1.494E-01	1.627E+04	PO-210	1.105E-20	1.203E-15
PU-238	2.089E-04	2.274E+01	BI-214	2.667E-22	6.149E-17
PU-236	0.	0.	BI-213	1.604E-25	1.747E-20
NP-240	0.	0.	BI-212	6.191E-28	6.751E-23
NP-239	0.	0.	BI-211	3.883E-22	4.228E-17
NP-237	5.910E-06	6.435E-01	BI-210H	9.067E-20	9.873E-15
U-240	0.	0.	BI-210	7.761E-22	8.451E-17
U-238	8.924E+00	9.717E+05	BI-209S	1.226E-21	1.335E-16
U-237	1.572E-10	1.712E-05	PB-214	7.642E-22	8.321E-17
U-236	2.011E-05	2.189E+00	PB-212	6.528E-27	7.108E-22
U-235	6.393E-02	6.961E+03	PB-211	6.578E-21	7.163E-16
U-234	3.120E-04	5.575E+01	PB-210	6.828E-18	7.635E-13
U-233	2.991E-12	3.257E-07	PB-209	6.730E-25	7.328E-20
U-232	0.	0.	PA-208S	3.896E-24	4.242E-19
PA-234H	4.407E-15	4.798E-10	PB-207S	4.116E-17	4.481E-12
PA-234	1.966E-15	2.141E-10	PB-206S	9.264E-21	1.009E-15
PA-233	1.927E-13	2.098E-08	TL-210	7.640E-27	8.319E-22
PA-231	1.235E-10	1.445E-05	TL-209	1.071E-28	1.880E-23
TH-234	1.296E-10	1.411E-05	TL-208	1.103E-29	1.201E-24
TH-232	1.452E-12	1.581E-07	TL-207	8.554E-22	9.516E-17
TH-231	2.608E-13	2.840E-08	TL-206	5.761E-31	6.273E-26
TH-230	2.870E-09	3.125E-04			
			TOTAL	9.185E+00	

*** SAMPLE CALCULATION ***

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MASS AND PPM			DATE : 79/ 8/24		
**** **			**** **		
NUCLIDE	MASS(G)	PPH/(U+PU)	NUCLIDE	MASS(G)	PPH/(U+PU)
CF-252	0.	0.	TH-229	3.301E-17	3.595E-12
CF-251	0.	0.	TH-228	2.151E-23	2.343E-18
CF-250	0.	0.	TH-227	1.242E-17	1.353E-12
CF-249	0.	0.	AC-228	2.072E-26	2.256E-21
BK-250	0.	0.	AC-227	5.639E-15	6.140E-10
BK-249	0.	0.	AC-225	1.134E-22	1.235E-17
CM-250	0.	0.	RA-228	1.703E-22	1.854E-17
CM-249	0.	0.	RA-226	5.742E-14	6.252E-09
CM-248	0.	0.	RA-225	1.724E-22	1.877E-17
CM-247	0.	0.	RA-224	1.092E-25	1.190E-20
CM-246	0.	0.	RA-223	7.353E-18	8.013E-13
CM-245	0.	0.	FR-223	1.792E-22	1.951E-17
CM-244	0.	0.	FR-221	3.712E-26	4.042E-21
CM-243	0.	0.	RN-222	3.656E-19	3.981E-14
CM-242	0.	0.	RN-220	1.897E-29	2.065E-24
AM-246	0.	0.	RN-219	2.898E-23	3.155E-18
AM-245	0.	0.	RN-218	7.226E-33	7.868E-28
AM-244	0.	0.	AT-218	4.129E-28	4.496E-23
AM-243	0.	0.	AT-217	4.088E-30	4.451E-25
AM-242	0.	0.	AT-215	1.652E-34	1.799E-29
AM-241	1.699E+03	1.849E+02	PO-218	1.988E-22	2.165E-17
PU-246	0.	0.	PO-216	2.024E-32	2.241E-27
PU-245	0.	0.	PO-215	1.279E-26	1.392E-21
PU-244	0.	0.	PO-214	1.249E-28	1.364E-23
PU-243	0.	0.	PO-213	5.102E-34	5.556E-29
PU-242	1.159E+03	1.262E+02	PO-212M	1.310E-30	1.645E-25
PU-241	5.336E+03	5.810E+02	PO-212	6.304E-38	6.865E-33
PU-240	3.884E-02	4.229E+03	PO-211	1.105E-26	1.204E-21
PU-239	1.494E-01	1.627E+04	PO-210	4.414E-20	4.807E-15
PU-238	2.072E-04	2.256E+01	BI-214	1.267E-21	1.380E-16
PU-236	0.	0.	BI-213	3.398E-25	3.700E-20
NP-240	0.	0.	BI-212	1.193E-27	1.299E-22
NP-239	0.	0.	BI-211	9.012E-22	9.813E-17
NP-237	6.393E-06	6.939E-01	BI-210H	6.346E-19	6.732E-14
U-240	0.	0.	BI-210	2.383E-21	2.583E-16
U-238	8.924E+00	9.718E+05	BI-209S	3.117E-21	3.394E-16
U-237	1.501E-10	1.634E-05	PB-214	1.715E-21	1.867E-16
U-236	2.410E-05	2.630E+00	PB-212	1.258E-26	1.370E-21
U-235	6.393E-02	6.961E+03	PB-211	1.527E-20	1.663E-15
U-234	3.136E-04	5.593E+01	PB-210	2.252E-17	2.452E-12
U-233	5.175E-12	5.635E-07	PB-209	1.425E-24	1.552E-19
U-232	0.	0.	PB-208S	2.115E-24	2.286E-19
PA-234H	4.407E-15	4.798E-10	PB-207S	1.464E-16	1.594E-11
PA-234	1.966E-15	2.141E-10	PB-206S	3.418E-20	3.898E-15
PA-233	1.927E-13	2.098E-08	TL-210	1.071E-28	1.887E-23
PA-231	1.235E-10	1.445E-05	TL-209	3.538E-28	3.854E-23
TH-234	1.296E-10	1.411E-05	TL-208	2.125E-29	2.314E-24
TH-232	2.096E-12	2.282E-07	TL-207	1.986E-21	2.162E-16
TH-231	2.609E-13	2.840E-08	TL-206	1.918E-30	2.088E-25
TH-230	4.302E-09	4.685E-04			
			TOTAL	9.185E+00	

APPENDIX B

Nuclear Data Library

- I) Photon Energy and Abundance of Each Nuclides .. 37~45
(The value in parenthesis is abundance)
- II) Decay Constant, Abundance, Neutron Yield, α
and β Energy of Actinide Nuclides 45~46
- III) Decay Constant, Abundance and β Energy of FP
Nuclides 47

*** SAMPLE CALCULATION *** DATE 09/22/78 PAGE 3

 GAMMA RAY LIBRARY

TITLE : GAMMA RAYS LIBRARY

NUMBER OF NUCLIDE 129

1	CF=252	3	0.					
***	*****	***						
	.04330(1.40E-04)	.10020(1.00E-04)	.16000(2.00E-05)					
2	CF=251	3	0.					
***	*****	***						
	.10930(0.)	.17700(1.90E-01)	.22500(7.40E-02)					
3	CF=250	1	0.					
***	*****	***						
	.04285(0.)							
4	CF=249	25	0.					
***	*****	***						
	.03750(1.70E-04)	.04281(3.90E-04)	.05473(2.20E-03)	.06587(1.10E-04)	.06671(2.60E-04)			
	.09230(3.00E-03)	.10450(2.18E-02)	.10960(3.51E-02)	.12100(1.50E-04)	.12150(4.60E-04)			
	.12280(1.30E-02)	.12730(4.80E-03)	.22920(4.80E-04)	.24120(2.20E-03)	.25288(2.73E-02)			
	.25570(4.30E-04)	.26873(7.50E-03)	.29584(1.40E-03)	.32143(7.10E-04)	.35344(1.53E-01)			
	.38795(6.60E-01)	.39050(1.70E-04)	.40590(9.20E-05)	.58880(2.00E-03)	.64350(4.60E-05)			
5	BK=250	7	0.					
***	*****	***						
	.04280(0.)	.09905(0.)	.88998(1.66E-02)	.92928(1.39E-02)	.98896(4.56E-01)			
	1.02858(6.44E-02)	1.03176(3.55E-01)						
6	BK=249	2	0.					
***	*****	***						
	.30700(0.)	.32720(0.)						
7	CH=250	0	0.					
***	*****	***						
8	CH=249	0	0.					
***	*****	***						
9	CH=248	0	0.					
***	*****	***						

*** SAMPLE CALCULATION *** DATE 09/22/78 PAGE 4

10	CH=247	6	0.					
***	*****	***						
	.08400(2.30E-01)	.10380(2.10E-02)	.27800(3.40E-02)	.28750(2.00E-02)	.34600(1.30E-02)			
	.40240(7.20E-01)							
11	CH=246	1	0.					
***	*****	***						
	.04455(0.)							
12	CH=245	3	0.					
***	*****	***						
	.10380(0.)	.13300(1.37E-01)	.17400(1.40E-01)					
13	CH=244	9	0.					
***	*****	***						
	.04282(2.00E-04)	.09886(1.30E-05)	.15263(1.50E-05)	.26340(7.00E-07)	.30290(2.00E-07)			
	.35450(9.00E-07)	.59740(5.00E-07)	.75880(1.00E-07)	.81780(7.00E-07)				
14	CH=243	5	0.					
***	*****	***						
	.04620(0.)	.10380(0.)	.20980(5.60E-02)	.22820(7.30E-02)	.27760(1.12E-01)			
15	CH=242	8	0.					
***	*****	***						
	.04610(3.90E-04)	.10180(3.50E-05)	.15760(2.30E-05)	.21000(2.00E-07)	.56200(1.80E-06)			
	.60500(1.40E-06)	.90000(2.00E-07)	.94100(3.00E-07)					
16	AM=246	12	0.					
***	*****	***						
	.04287(0.)	.09913(9.00E-02)	.12740(8.00E-02)	.15350(6.80E-01)	.20500(6.80E-01)			
	.62900(5.00E-02)	.67900(1.00E+00)	.68600(4.00E-02)	.75600(2.50E-01)	.78100(7.50E-02)			
	.83400(1.00E-01)	.83900(4.00E-02)						
17	AM=245	6	0.					
***	*****	***						
	.04300(0.)	.05500(0.)	.10930(0.)	.24100(3.40E-03)	.25270(6.10E-02)			
	.29580(2.20E-03)							
18	AM=244	7	0.					
***	*****	***						
	.04290(0.)	.09930(5.60E-02)	.10930(0.)	.15370(1.90E-01)	.20540(3.50E-03)			
	.74610(7.00E-01)	.89820(2.90E-01)						
19	AM=243	12	0.					
***	*****	***						
	.03110(3.00E-04)	.04353(5.50E-02)	.05060(2.70E-05)	.05540(9.40E-05)	.07467(6.60E-01)			
	.08670(3.70E-03)	.11780(5.00E-03)	.14200(1.30E-03)	.16920(1.20E-05)	.19200(8.50E-06)			
	.62000(1.00E-05)	.65400(3.00E-06)						

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20	AM-242	3	0.		
*** *****					
		.04220(0.)	.04460(0.)	.10380(0.)	
21	AM-241	90	0.		
*** *****					
		.04340(9.10E-04)	.05954(3.59E-01)	.06990(2.01E-05)	.09710(1.13E-05)
		.10109(1.88E-05)	.10300(1.95E-04)	.11527(2.40E-04)	.11420(4.78E-06)
		.12301(1.02E-05)	.12530(3.95E-05)	.14655(4.58E-04)	.15012(7.20E-07)
		.16160(2.30E-08)	.16460(6.20E-07)	.16585(2.43E-07)	.16957(1.68E-06)
		.19190(2.20E-07)	.19470(1.70E-08)	.20400(3.20E-08)	.20798(7.60E-06)
		.23307(4.80E-08)	.23440(6.00E-09)	.24672(2.00E-08)	.26098(8.60E-09)
		.26750(2.45E-07)	.27572(6.22E-08)	.29115(3.15E-08)	.29272(1.31E-07)
		.30416(8.00E-07)	.31194(3.90E-07)	.32248(1.44E-06)	.33253(1.45E-06)
		.35769(3.05E-08)	.34040(2.50E-08)	.35040(1.40E-08)	.35820(1.51E-08)
		.37091(4.91E-07)	.37657(1.33E-06)	.38374(2.90E-07)	.39055(6.10E-08)
		.40648(1.20E-08)	.41590(1.61E-08)	.41919(2.76E-07)	.42638(2.50E-07)
		.44275(3.40E-08)	.45223(1.70E-08)	.45438(9.30E-08)	.45940(3.20E-08)
		.48630(1.20E-08)	.51410(2.70E-08)	.52190(7.00E-09)	.57400(1.45E-08)
		.59030(1.52E-08)	.59739(4.50E-08)	.61886(5.55E-07)	.62690(3.60E-09)
		.64137(6.45E-08)	.65288(3.54E-07)	.66237(3.46E-06)	.67570(6.80E-09)
		.68870(2.92E-07)	.69341(3.16E-08)	.69454(4.90E-08)	.70950(5.80E-08)
		.72946(1.30E-08)	.73722(7.51E-08)	.75587(7.10E-08)	.75937(1.65E-08)
		.77093(6.47E-08)	.78042(2.70E-09)	.81180(5.20E-09)	.85190(2.80E-09)
					.86290(5.10E-09)

22	PU-246	13	0.		
*** *****					
		.02759(1.41E-01)	.06660(1.02E-02)	.07564(7.20E-03)	.09381(1.00E+00)
		.17994(3.86E-07)	.18901(1.90E-03)	.19941(2.30E-03)	.21655(4.50E-03)
		.25275(3.20E-03)	.25554(9.20E-03)	.29954(1.20E-03)	.22375(9.60E-01)

23	PU-245	50	0.		
*** *****					
		.02800(1.00E-02)	.28020(1.50E-02)	.30800(6.00E-02)	.32720(2.38E-01)
		.34900(1.20E-02)	.37450(5.00E-02)	.38800(2.00E-03)	.41200(7.50E-03)
		.44520(4.00E-03)	.49200(4.00E-02)	.51500(3.00E-03)	.52500(3.00E-03)
		.59180(3.00E-03)	.62400(3.00E-03)	.62990(4.00E-02)	.66020(1.00E-02)
		.68700(1.40E-03)	.69700(1.70E-03)	.70800(4.30E-03)	.73000(2.40E-03)
		.74700(2.10E-03)	.76300(7.00E-03)	.78700(5.00E-03)	.77600(3.00E-03)
		.79600(5.00E-03)	.80000(2.50E-03)	.81700(1.00E-02)	.82400(1.70E-03)
		.84100(1.50E-02)	.86000(8.00E-03)	.87000(1.80E-03)	.87400(1.80E-03)
		.91100(1.70E-02)	.95800(1.70E-02)	.95800(1.70E-02)	.97700(7.50E-03)
		.99600(2.00E-03)	1.00510(3.00E-03)	1.00750(6.00E-03)	1.01830(1.20E-02)
					1.02330(5.00E-03)

24	PU-244	0	0.		
*** *****					

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25	PU-243	13	0.		
*** *****					
		.04180(4.60E-03)	.08400(2.00E-01)	.09640(1.20E-04)	.10930(1.70E-04)
		.34320(1.20E-03)	.35640(1.10E-03)	.38170(5.00E-03)	.38890(4.00E-05)
		.44320(1.00E-04)	.44870(2.00E-06)	.46570(2.00E-06)	.40700(1.00E-05)

26	PU-242	3	0.		
*** *****					
		.04492(3.30E-04)	.10350(7.20E-05)	.15880(4.20E-06)	

27	PU-241	17	0.		
*** *****					
		.01155(0.)	.04419(4.48E-08)	.04483(1.11E-08)	.05630(3.49E-08)
		.07096(2.41E-07)	.09467(2.98E-06)	.09844(1.70E-06)	.10367(1.04E-06)
		.11130(1.08E-06)	.11196(4.74E-08)	.11456(4.48E-07)	.11541(1.33E-07)
		.14850(1.90E-06)	.16000(6.45E-08)		.12120(8.86E-09)

28	PU-240	9	0.		
*** *****					
		.04524(4.50E-04)	.09467(6.15E-07)	.09844(1.00E-06)	.10423(7.00E-05)
		.11450(1.23E-07)	.16035(6.20E-06)	.64240(1.42E-07)	.68763(3.20E-08)

29	PU-239	144	0.		
*** *****					
		.03009(1.05E-06)	.03224(1.37E-05)	.03659(4.25E-06)	.03728(1.05E-06)
		.04057(2.56E-07)	.04623(5.11E-06)	.04758(2.87E-07)	.05163(2.08E-04)
		.05683(9.30E-06)	.06569(3.35E-07)	.06769(1.42E-06)	.06873(5.99E-06)
		.07760(4.27E-06)	.07838(1.69E-06)	.08959(1.34E-07)	.09467(3.67E-05)
		.09881(1.30E-05)	.10303(1.79E-06)	.11041(7.76E-06)	.11129(1.47E-05)
		.11535(6.70E-06)	.11624(5.96E-06)	.11972(3.03E-07)	.12367(1.68E-07)
		.12517(5.79E-07)	.12928(6.20E-05)	.14164(3.11E-07)	.14340(5.70E-08)
		.14605(1.13E-06)	.15830(8.00E-08)	.16145(1.30E-06)	.16810(3.80E-08)
		.17360(4.90E-08)	.17917(6.39E-07)	.18450(1.65E-08)	.18827(9.60E-08)
		.19565(1.07E-08)	.19798(5.00E-08)	.20552(5.60E-08)	.22543(1.65E-07)
		.24209(8.32E-08)	.24332(2.32E-07)	.24480(5.23E-08)	.24895(7.50E-08)
		.26593(2.55E-07)	.26554(2.85E-08)	.28120(2.14E-08)	.28530(1.50E-08)
		.30287(5.70E-08)	.30781(6.20E-08)	.31169(2.74E-07)	.31350(2.00E-08)
		.32081(5.69E-07)	.32376(5.39E-07)	.33280(5.05E-06)	.33606(1.13E-06)
		.34496(5.61E-06)	.35410(8.00E-09)	.36190(1.17E-07)	.36702(8.72E-07)
		.37502(1.50E-05)	.38016(3.07E-06)	.38270(2.60E-06)	.39245(1.16E-06)
		.39944(6.15E-08)	.41077(8.00E-08)	.41369(1.51E-05)	.42257(1.19E-06)
		.43000(4.91E-08)	.44578(9.10E-08)	.45145(1.92E-06)	.45757(1.54E-08)
		.46380(1.57E-09)	.47440(9.42E-10)	.48155(4.77E-08)	.48700(2.50E-09)
		.53890(3.00E-09)	.55060(4.00E-09)	.55770(6.00E-10)	.58640(1.42E-09)
		.60780(1.45E-09)	.61290(8.10E-09)	.61740(2.04E-08)	.61890(2.44E-08)
		.65319(2.32E-08)	.65797(2.50E-08)	.66015(7.95E-08)	.66402(4.45E-07)
		.65219(6.40E-08)	.65486(2.15E-08)	.65899(9.50E-08)	.66467(1.54E-08)
		.68616(8.90E-09)	.69085(5.50E-09)	.70100(5.40E-09)	.70379(3.88E-08)
		.72781(1.09E-09)	.73640(3.37E-08)	.76938(1.10E-07)	.77950(1.33E-09)
		.79300(2.50E-10)	.79650(3.20E-10)	.80340(4.40E-10)	.80820(1.47E-09)
		.82110(5.12E-10)	.82880(1.38E-09)	.83210(2.54E-10)	.83900(4.00E-10)
		.87900(5.00E-10)	.89110(7.70E-10)	.94010(4.20E-10)	.95640(5.30E-10)
		.98670(1.20E-10)	.99250(2.30E-10)	1.00550(1.20E-10)	1.05730(4.50E-10)

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30	PU-238	26	0.					
***	*****	***	***					
	.04349(3.92E-04)	.09467(9.00E-07)	.09844(1.48E-06)	.09987(7.40E-05)	.11041(1.99E-07)			
	.11129(3.07E-07)	.11541(1.16E-07)	.13277(1.01E-05)	.20098(4.28E-08)	.25823(6.77E-10)			
	.70560(5.40E-10)	.70840(5.28E-09)	.74282(5.55E-08)	.76641(2.40E-07)	.78630(3.53E-08)			
	.80542(1.39E-02)	.80823(8.58E-09)	.85173(1.39E-08)	.88321(6.53E-09)	.90434(6.21E-10)			
	.92673(6.15E-09)	.94202(5.26E-09)	.94612(1.03E-09)	1.00110(1.30E-08)	1.04190(2.29E-09)			
	1.08560(2.29E-09)							
31	PU-236	6	0.					
***	*****	***	***					
	.04700(3.10E-04)	.11000(1.20E-04)	.16500(6.60E-06)	.52000(1.70E-06)	.57000(1.00E-06)			
	.64000(2.40E-06)							

32	NP-240	30	0.					
***	*****	***	***					
	.13460(4.00E-03)	.14720(1.50E-02)	.15200(9.00E-02)	.17500(6.50E-02)	.18260(1.00E-02)			
	.19310(7.30E-02)	.27150(9.00E-02)	.29500(7.00E-03)	.30700(1.50E-02)	.44820(1.80E-01)			
	.46220(1.50E-02)	.40740(2.20E-02)	.50720(2.00E-02)	.56720(2.90E-01)	.60110(2.20E-01)			
	.60700(1.70E-02)	.84700(5.00E-02)	.86720(9.00E-02)	.88490(4.00E-02)	.89040(1.20E-02)			
	.89450(1.40E-01)	.91520(1.50E-02)	.95870(2.50E-02)	.97390(2.30E-01)	.98800(5.00E-02)			
	1.07440(1.00E-02)	1.13180(7.00E-03)	1.16300(7.00E-03)	1.16760(5.00E-02)	1.17900(7.00E-03)			
33	NP-239	31	0.					
***	*****	***	***					
	.04465(0.)	.04941(0.)	.05726(0.)	.06148(0.)	.06788(0.)			
	.08806(0.)	.10614(2.78E-01)	.10647(0.)	.16639(0.)	.18171(7.50E-04)			
	.20976(3.42E-02)	.22642(0.)	.22820(1.14E-01)	.25441(1.10E-03)	.27287(8.00E-04)			
	.27762(1.45E-01)	.28547(7.60E-03)	.31588(1.52E-02)	.33433(1.95E-02)	.36740(1.60E-03)			
	.42950(3.70E-03)	.43470(1.20E-04)	.44760(2.60E-06)	.45420(8.00E-06)	.46190(1.60E-05)			
	.46980(1.10E-03)	.48430(1.00E-05)	.49230(6.00E-05)	.49780(3.10E-05)	.49870(0.)			
	.50420(7.70E-06)							

34	NP-237	40	0.					
***	*****	***	***					
	.02938(1.50E-01)	.04660(1.40E-03)	.05711(0.)	.06290(2.00E-03)	.07100(5.00E-03)			
	.08649(1.40E-01)	.08810(1.60E-03)	.09470(8.40E-03)	.10630(1.20E-03)	.10800(0.)			
	.11720(2.00E-03)	.13111(1.00E-03)	.13428(8.00E-04)	.14325(5.00E-03)	.15141(3.00E-03)			
	.15525(1.10E-03)	.16252(4.00E-04)	.16916(8.00E-04)	.17064(7.20E-04)	.17608(2.10E-04)			
	.18078(2.50E-04)	.18440(1.00E-04)	.18700(9.00E-05)	.19142(5.50E-04)	.19322(4.60E-04)			
	.19497(2.50E-03)	.19660(3.00E-04)	.19990(9.00E-03)	.20167(5.00E-04)	.20440(3.00E-05)			
	.20918(2.00E-04)	.21231(1.90E-03)	.21396(6.00E-04)	.22240(8.00E-05)	.22980(1.40E-04)			
	.23791(8.00E-04)	.24880(6.00E-05)	.25715(8.00E-05)	.26442(9.00E-05)	.28040(3.00E-05)			

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36	U-238	1	0.					
***	*****	***	***					
	.04800(0.)							
37	U-237	21	0.					
***	*****	***	***					
	.01381(0.)	.02635(2.40E-02)	.03320(1.17E-03)	.03854(0.)	.04347(0.)			
	.05101(2.20E-05)	.05954(3.81E-01)	.06494(1.30E-02)	.10104(7.73E-01)	.11409(0.)			
	.16459(2.00E-04)	.20800(2.33E-01)	.22771(2.20E-04)	.25423(2.10E-04)	.26753(7.70E-03)			
	.29270(3.00E-05)	.35234(1.30E-02)	.35540(1.10E-03)	.33773(8.00E-05)	.36863(5.00E-04)			
	.37098(1.20E-03)							

38	U-236	4	0.					
***	*****	***	***					
	.04937(7.70E-04)	.11275(1.90E-04)	.17160(0.)	.22320(0.)				

39	U-235	34	0.					
***	*****	***	***					
	.02664(1.20E-01)	.04280(1.00E-05)	.05860(1.00E-03)	.07261(4.00E-03)	.07492(1.00E-05)			
	.08120(6.50E-03)	.08210(3.10E-03)	.08424(5.10E-02)	.09340(0.)	.10231(3.10E-03)			
	.10912(1.51E-02)	.11520(1.30E-03)	.11683(2.70E-04)	.12491(4.90E-04)	.13194(7.70E-04)			
	.13567(6.50E-04)	.14075(1.73E-03)	.14378(9.72E-02)	.14600(2.70E-04)	.15096(1.08E-03)			
	.16356(4.59E-02)	.17430(1.20E-04)	.18272(4.05E-03)	.18572(3.40E-01)	.19446(6.50E-05)			
	.19891(3.00E-04)	.20713(1.00E-02)	.20531(5.00E-02)	.21793(1.60E-04)	.22138(1.70E-05)			
	.23533(4.00E-04)	.24093(7.00E-04)	.24683(6.00E-04)	.26644(7.50E-05)				

40	U-234	5	0.					
***	*****	***	***					
	.05350(6.81E-03)	.12090(2.33E-03)	.46000(0.)	.51000(0.)	.56000(0.)			

41	U-233	57	0.					
***	*****	***	***					
	.02900(3.62E-04)	.04240(1.89E-03)	.05469(4.14E-04)	.06614(7.10E-05)	.07837(1.60E-05)			
	.07188(8.40E-03)	.07496(4.40E-03)	.07841(1.60E-05)	.09326(5.90E-05)	.09721(6.01E-04)			
	.10952(1.00E-03)	.11201(1.30E-05)	.11722(8.60E-05)	.11901(1.08E-04)	.12083(8.90E-05)			
	.12392(2.10E-05)	.13555(6.40E-05)	.14555(5.20E-05)	.14638(1.84E-04)	.14826(1.00E-05)			
	.16440(1.77E-04)	.16543(1.40E-05)	.18797(5.60E-05)	.20818(6.80E-05)	.21650(2.60E-05)			
	.21713(8.20E-05)	.24334(1.07E-04)	.24873(4.30E-05)	.27471(1.40E-05)	.27810(3.70E-05)			
	.28803(2.70E-05)	.29134(1.60E-04)	.31715(7.31E-04)	.32054(8.70E-05)	.32336(2.50E-05)			
	.35660(1.70E-05)	.36579(2.50E-05)						

42	U-232	5	0.					
***	*****	***	***					
	.05760(2.10E-03)	.12900(8.20E-04)	.27050(3.80E-05)	.32780(3.40E-05)	.50000(2.00E-07)			

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44	PA-234M	49	0.
***	*****	***	***
	.26090(1.40E-05)	.25790(4.80E-04)	.35790(1.30E-05)
	.45360(1.30E-05)	.46810(2.40E-05)	.47550(2.10E-05)
	.70100(4.70E-05)	.70630(1.50E-05)	.76010(7.60E-05)
	.70030(1.20E-05)	.76636(2.06E-04)	.78230(6.10E-05)
	.80860(3.10E-05)	.85190(4.70E-05)	.85051(9.50E-05)
	.93600(1.00E-05)	.94200(1.20E-05)	1.00103(4.00E-05)
	1.12570(2.90E-05)	1.19377(9.20E-05)	1.23740(4.20E-05)
	1.43430(4.90E-05)	1.51050(8.10E-05)	1.52720(1.40E-05)
	1.73820(1.20E-04)	1.76410(6.90E-05)	1.80900(1.90E-05)
	1.87850(5.80E-05)	1.89400(1.00E-05)	1.91180(3.30E-05)
			.38760(1.00E-05)
			.54100(1.80E-05)
			.74281(5.70E-04)
			.76627(3.45E-04)
			.88750(5.40E-05)
			1.06190(1.20E-05)
			1.39270(1.50E-05)
			1.55410(5.40E-05)
			1.85130(1.10E-04)
			1.95770(1.50E-05)

44	PA-234	50	0.
***	*****	***	***
	.06340(2.90E-02)	.15100(2.00E-01)	.15250(6.00E-02)
	.22610(1.70E-01)	.26500(1.90E-02)	.24880(2.50E-02)
	.36930(4.00E-02)	.45480(1.30E-02)	.50930(1.30E-01)
	.69900(4.30E-02)	.70680(3.50E-02)	.75790(9.00E-02)
	.82400(1.00E-02)	.87640(5.00E-02)	.88020(6.00E-02)
	.90520(1.10E-02)	.92600(1.10E-01)	.92710(1.10E-01)
	.98080(6.00E-02)	1.12660(1.70E-02)	1.35400(2.10E-02)
	1.69500(1.60E-02)		
			.18590(1.70E-02)
			.29350(4.20E-02)
			.65370(1.00E-02)
			.75730(2.00E-02)
			.88300(1.30E-01)
			.94630(1.70E-01)
			1.39400(2.50E-02)

45	PA-235	19	0.
***	*****	***	***
	.01730(0.)	.02850(0.)	.04040(1.50E-04)
	.07530(8.00E-03)	.08660(1.70E-02)	.09470(8.00E-02)
	.11100(4.40E-02)	.14540(4.40E-03)	.27150(8.50E-03)
	.34047(3.90E-02)	.37540(6.00E-03)	.39847(3.30E-02)
			.04160(0.)
			.09840(1.35E-01)
			.30017(5.80E-02)
			.61587(1.40E-02)

46	PA-231	28	0.
***	*****	***	***
	.10050(1.20E-04)	.10290(4.40E-04)	.14450(4.00E-05)
	.24540(7.00E-05)	.25574(1.50E-03)	.26014(1.80E-03)
	.26154(1.60E-02)	.29994(7.30E-02)	.30752(2.30E-02)
	.32909(1.30E-03)	.34061(1.60E-03)	.35438(1.00E-03)
	.36774(4.00E-04)	.37909(4.00E-04)	.39150(3.00E-05)
	.46470(1.00E-03)		
			.19870(1.00E-05)
			.27308(7.00E-04)
			.31288(1.10E-03)
			.35696(1.50E-03)
			.39910(2.00E-05)

47	TH-234	10	1.14E-01
***	*****	***	***
	.02950(0.)	.06280(1.00E-03)	.06350(8.49E-02)
	.11500(6.30E-02)	.15400(5.00E-02)	.15500(4.00E-02)
			.09230(4.70E-01)
			.09280(5.30E-01)
			.18400(2.00E-02)

48	TH-232	1	0.
***	*****	***	***
	.05900(0.)		

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49	TH-231	13	0.
***	*****	***	***
	.02560(9.40E-02)	.05850(6.40E-03)	.07270(3.50E-03)
	.08420(7.90E-02)	.08990(1.10E-02)	.09530(4.90E-03)
	.10680(2.40E-03)		
			.08120(8.10E-04)
			.09930(8.10E-04)
			.08210(1.70E-02)
			.10220(3.60E-03)

50	TH-230	8	0.
***	*****	***	***
	.06800(5.90E-03)	.11000(1.00E-06)	.14200(7.00E-04)
	.25500(0.)	.25900(8.00E-06)	.25300(1.70E-04)
			.18400(1.40E-04)
			.20600(0.)

51	TH-229	22	0.
***	*****	***	***
	.01730(0.)	.02530(0.)	.03200(0.)
	.06080(0.)	.07510(0.)	.08650(0.)
	.12440(2.30E-01)	.13190(9.80E-02)	.13700(1.50E-01)
	.15650(1.10E-01)	.17900(1.80E-02)	.19340(1.40E-01)
	.24220(0.)	.26900(0.)	.27000(9.00E-02)
			.04770(0.)
			.08850(0.)
			.14300(7.50E-02)
			.21000(9.00E-02)

52	TH-228	31	0.
***	*****	***	***
	.05909(4.48E-03)	.08437(4.48E-03)	.11518(5.38E-03)
	.17884(3.40E-04)	.21143(9.00E-04)	.27199(3.14E-03)
	.24092(2.24E-02)	.25261(3.14E-03)	.27737(2.24E-02)
	.32794(1.21E-03)	.45281(3.65E-03)	.51069(4.66E-02)
	.72728(6.36E-02)	.76334(5.78E-03)	.78546(1.02E-02)
	.95198(2.24E-03)	1.07871(3.20E-03)	1.09410(1.39E-03)
	.26146(3.45E-01)		
			.13167(1.43E-03)
			.23356(1.78E-02)
			.26815(3.58E-03)
			.46955(1.12E-03)
			.86053(4.31E-02)
			1.51780(2.28E-03)

53	TH-227	50	0.
***	*****	***	***
	.04220(8.00E-04)	.04350(2.40E-03)	.04380(5.00E-04)
	.05020(8.70E-02)	.06250(2.50E-03)	.07970(1.80E-02)
	.10040(8.00E-04)	.11310(3.40E-03)	.11700(1.40E-03)
	.20420(2.30E-03)	.20520(1.70E-03)	.20610(2.40E-03)
	.21800(5.50E-04)	.21900(4.50E-04)	.23400(5.80E-05)
	.25040(7.00E-04)	.25250(1.30E-03)	.25470(9.10E-03)
	.27070(3.20E-04)	.27300(4.90E-05)	.27970(9.00E-04)
	.28560(5.30E-04)	.28620(1.45E-02)	.29230(5.50E-04)
	.30030(2.80E-03)	.30400(1.35E-02)	.31260(5.20E-03)
	.35440(1.15E-02)	.34250(1.90E-03)	.35050(8.00E-06)
			.04850(4.50E-04)
			.09400(1.35E-02)
			.14050(3.20E-04)
			.21060(1.28E-02)
			.23680(1.15E-01)
			.25420(4.10E-02)
			.28140(1.50E-03)
			.29460(3.90E-03)
			.31480(5.40E-03)
			.39240(9.00E-05)

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54	AG-228	41	0.		
***	*****	***	***		
	.09950(1.20E-02)	.12910(2.50E-02)	.15420(8.50E-03)	.19950(3.00E-03)	.20940(3.90E-02)
	.27030(5.20E-02)	.27900(2.00E-03)	.32170(8.00E-02)	.32900(7.90E-02)	.35240(4.10E-03)
	.33840(1.04E-01)	.34090(3.60E-03)	.40940(1.90E-02)	.46300(4.00E-02)	.47820(2.10E-03)
	.50940(4.20E-03)	.52230(8.20E-02)	.72700(8.90E-03)	.75200(9.50E-03)	.77210(1.40E-02)
	.78200(4.70E-03)	.79400(4.20E-02)	.84200(8.30E-03)	.90420(7.50E-03)	.91110(2.50E-01)
	.95850(2.70E-03)	.96400(4.70E-02)	.96890(1.50E-01)	1.11060(3.00E-03)	1.24710(4.80E-03)
	1.45920(9.00E-03)	1.45980(9.00E-03)	1.50150(5.00E-03)	1.55690(1.80E-03)	1.58020(6.10E-03)
	1.58790(3.20E-02)	1.62470(2.80E-03)	1.63040(1.70E-02)	1.63800(4.70E-03)	1.66640(1.80E-03)
	1.88740(9.50E-04)				

55	AG-227	14	0.		
***	*****	***	***		
	.00930(0.)	.01270(0.)	.01520(0.)	.02450(0.)	.07040(1.20E-02)
	.08450(7.70E-02)	.09950(2.00E-02)	.10850(1.00E-03)	.12150(4.00E-03)	.15350(2.00E-03)
	.16700(6.00E-03)	.16000(1.40E-02)	.17200(4.00E-03)	.19000(5.00E-04)	

56	AG-225	55	0.		
***	*****	***	***		
	.03640(3.00E-04)	.06780(4.20E-03)	.07370(4.00E-03)	.07840(1.00E-03)	.08290(1.50E-03)
	.08780(5.00E-04)	.09680(3.00E-04)	.09960(2.20E-02)	.10380(1.00E-04)	.10820(2.80E-03)
	.11140(3.20E-03)	.11900(7.00E-04)	.12400(2.10E-03)	.13450(4.00E-04)	.15820(7.00E-04)
	.14480(1.50E-03)	.14990(7.30E-03)	.15370(1.70E-03)	.15720(3.70E-03)	.17040(4.00E-04)
	.17860(2.00E-04)	.18790(5.90E-03)	.19600(1.40E-03)	.19820(3.00E-04)	.21820(3.40E-03)
	.22450(1.10E-03)	.24070(2.00E-04)	.24870(2.00E-04)	.25590(1.50E-03)	.27940(5.00E-04)
	.28550(1.00E-04)	.45300(1.10E-03)	.48050(3.00E-04)	.51500(1.00E-04)	.52660(1.00E-04)

57	RA-228	2	0.	
***	*****	***	***	
	.01050(0.)	.02430(0.)		

58	RA-226	49	0.		
***	*****	***	***		
	.18610(4.00E-02)	.24200(7.80E-02)	.25900(5.80E-03)	.26277(4.50E-03)	.27470(5.00E-03)
	.29520(2.01E-01)	.35196(3.93E-03)	.40590(1.70E-03)	.41460(2.80E-06)	.44937(1.80E-06)
	.43480(3.10E-03)	.46180(7.20E-03)	.46900(1.50E-03)	.47450(7.60E-04)	.48060(3.50E-03)
	.48710(4.50E-03)	.58020(3.00E-03)	.60066(4.50E-06)	.60919(4.84E-01)	.66540(1.65E-02)
	.70510(5.5E-03)	.71980(4.20E-03)	.76840(5.32E-02)	.78560(1.21E-02)	.80620(1.33E-02)
	.85900(4.00E-03)	.93410(3.34E-02)	.96470(4.27E-03)	1.05200(3.24E-03)	1.12050(1.60E-01)
	1.15520(1.82E-02)	1.20750(4.80E-03)	1.23810(6.20E-02)	1.27100(1.56E-02)	1.37760(4.18E-02)
	1.38530(8.60E-03)	1.40160(1.44E-02)	1.40800(7.60E-02)	1.50920(7.30E-02)	1.58110(7.60E-03)
	1.66120(1.21E-02)	1.72960(3.07E-02)	1.76450(1.66E-01)	1.85830(4.10E-03)	1.94740(2.20E-02)
	2.11840(1.23E-02)	2.20410(5.30E-02)	2.29320(3.40E-03)	2.44760(1.65E-02)	

59	RA-225	1	0.	
***	*****	***	***	
	.04000(3.30E-01)			

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60	RA-224	4	0.	
***	*****	***	***	
	.24100(3.70E-02)	.29000(9.00E-03)	.41000(4.00E-03)	.65000(6.00E-03)

61	RA-223	53	0.		
***	*****	***	***		
	.03360(1.00E-03)	.06320(5.50E-04)	.10370(1.40E-04)	.10660(2.30E-04)	.11000(5.40E-04)
	.12250(1.10E-02)	.14420(3.10E-02)	.15450(5.40E-02)	.15870(7.00E-03)	.17900(1.50E-03)
	.22150(3.50E-04)	.24930(3.60E-04)	.25190(6.80E-04)	.25520(6.00E-04)	.26940(1.40E-01)
	.28780(1.60E-03)	.32390(3.70E-02)	.32830(2.00E-03)	.33390(9.60E-04)	.33830(7.20E-03)
	.34280(2.00E-03)	.36160(4.00E-04)	.36950(2.00E-04)	.37170(5.50E-03)	.37300(1.00E-03)
	.38300(6.00E-03)	.43160(3.40E-04)	.44500(1.20E-02)	.46520(4.00E-03)	.46700(1.00E-04)
	.52740(7.00E-04)	.59850(8.00E-04)	.60910(5.00E-04)		

62	FR-223	44	0.		
***	*****	***	***		
	.05000(4.00E-01)	.08000(1.30E-01)	.10000(1.00E-02)	.13440(4.00E-03)	.17350(7.40E-03)
	.18480(0.)	.20500(8.00E-03)	.23480(6.00E-02)	.24600(6.00E-04)	.25000(6.00E-04)
	.25620(6.00E-04)	.28410(2.00E-04)	.28900(6.00E-03)	.30000(6.00E-04)	.30450(2.00E-04)
	.30750(3.00E-04)	.31270(2.00E-04)	.31800(8.00E-03)	.32060(4.00E-04)	.33310(1.00E-04)
	.33970(8.00E-04)	.34250(2.00E-04)	.34900(1.00E-03)	.37200(6.00E-04)	.37600(2.00E-04)
	.37600(1.00E-04)	.37650(2.00E-04)	.37670(8.00E-03)	.38400(2.00E-04)	.39350(1.00E-04)
	.39700(1.00E-04)	.40400(7.00E-04)	.41300(2.00E-04)	.42100(1.00E-04)	.42600(6.00E-04)
	.43500(1.00E-04)	.44000(1.00E-04)	.44700(2.00E-04)	.46000(5.00E-03)	.46400(5.00E-03)
	.47650(5.60E-04)	.49200(5.00E-03)	.49750(2.00E-04)	.50800(2.00E-04)	

63	FR-221	11	0.		
***	*****	***	***		
	.08150(0.)	.09950(1.20E-03)	.11800(4.00E-04)	.15000(8.00E-04)	.17150(8.00E-04)
	.21800(1.20E-01)	.28280(1.00E-04)	.32470(2.00E-04)	.35910(6.00E-04)	.38180(4.00E-04)
	.40910(1.50E-03)				

64	RN-222	1	0.	
***	*****	***	***	
	.51000(7.00E-04)			

65	RN-220	1	0.	
***	*****	***	***	
	.54200(3.00E-04)			

66	RN-219	10	0.		
***	*****	***	***		
	.07950(0.)	.11540(3.30E-03)	.15050(1.30E-03)	.27100(1.10E-01)	.29340(7.00E-04)
	.37700(7.00E-03)	.38800(6.00E-03)	.40170(6.70E-02)	.51740(6.80E-04)	.67660(2.50E-04)

67	RN-218	1	0.	
***	*****	***	***	
	.60940(2.00E-03)			

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68	AT-218	0	0.				
69	AT-217	7	0.				
				.14000(0.)	.17000(0.)	.26000(0.)	.34000(0.)
				.45000(0.)	.59000(0.)		.37000(0.)
70	AT-215	0	0.				
71	PD-218	0	0.				
72	PD-216	0	0.				
73	PD-215	0	0.				
74	PD-214	1	0.				
				.75200(1.40E-04)			
75	PD-215	0	0.				
76	PU-212M	2	0.				
				.57000(2.00E-02)	2.61000(2.60E-02)		
77	PU-212	0	0.				
78	PU-211	2	0.				
				.56000(5.00E-03)	.88000(5.00E-03)		

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79	PU-210	1	0.				
				.80300(1.20E-05)			
80	HI-214	50	0.				
				.27320(5.30E-02)	.39500(1.20E-02)	.45000(1.00E-02)	.50000(1.20E-02)
				.62400(4.00E-03)	.66600(2.00E-02)	.70320(8.00E-03)	.72100(7.00E-03)
				.78710(1.20E-02)	.80650(1.50E-02)	.83700(8.00E-03)	.87400(4.00E-03)
				.96000(5.00E-03)	1.05000(5.00E-03)	1.12040(1.70E-01)	1.15540(1.80E-02)
				1.23830(6.00E-02)	1.28130(1.70E-02)	1.37900(5.00E-02)	1.40200(1.70E-02)
				1.43800(2.00E-03)	1.50900(2.00E-02)	1.54100(8.00E-03)	1.58300(9.00E-03)
				1.66100(1.20E-02)	1.68100(2.00E-03)	1.72800(3.00E-02)	1.76400(1.70E-01)
				1.79000(8.00E-03)	1.83600(3.00E-03)	1.84800(2.00E-02)	1.87700(2.00E-03)
				2.01700(7.00E-04)	2.11700(1.00E-02)	2.20400(5.00E-02)	2.25400(8.00E-03)
				2.34000(2.00E-03)	2.40500(2.00E-03)	2.43500(2.00E-02)	2.99000(4.00E-04)
81	BI-213	6	0.				
				.29300(4.00E-03)	.30900(2.00E-03)	.44000(2.70E-01)	.66000(1.00E-03)
				1.10100(5.00E-03)			.80700(4.00E-03)
82	RI-212	22	0.				
				.03986(1.10E-02)	.14490(1.00E-04)	.16400(4.70E-05)	.28808(3.40E-03)
				.32796(1.40E-03)	.43350(1.40E-04)	.45283(3.56E-03)	.47350(5.00E-04)
				.58314(3.10E-01)	.72717(6.65E-02)	.78542(1.12E-02)	.89339(3.70E-03)
				1.07400(1.60E-04)	1.07862(5.43E-03)	1.51275(3.20E-03)	1.62056(1.54E-02)
				1.80600(1.19E-03)	2.61460(3.59E-01)		1.67980(7.20E-04)
83	RI-211	1	0.				
				.35070(1.40E-01)			
84	BI-210M	6	0.				
				.26370(1.00E+00)	.30480(5.40E-01)	.32910(1.10E-02)	.34400(1.40E-02)
				.64980(5.60E-02)			.36960(1.30E-02)
85	BI-210	0	0.				
86	BI-209S	0	0.				

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87	PB-216	23	0.					
***	*****	***						
	.05032(2.20E-02)	.13740(6.00E-04)	.14130(4.00E-04)	.19630(5.00E-04)	.24190(7.60E-02)			
	.25880(8.00E-03)	.27480(7.00E-03)	.29520(1.90E-01)	.30540(3.00E-03)	.31420(8.00E-03)			
	.32430(2.00E-04)	.35200(3.60E-01)	.46210(1.70E-03)	.47060(1.00E-04)	.48050(3.40E-03)			
	.48720(3.30E-03)	.53380(1.70E-03)	.53870(5.00E-05)	.54400(6.00E-04)	.58830(3.60E-03)			
	.76860(8.00E-04)	.78590(8.60E-03)	.90410(5.90E-03)					
88	PB-212	4	0.					
***	*****	***						
	.11518(5.80E-03)	.17666(5.00E-04)	.23863(4.31E-01)	.41520(2.00E-04)				
89	PB-211	21	1.58E-01					
***	*****	***						
	.06550(7.70E-04)	.09500(1.30E-04)	.31360(1.00E-03)	.34270(1.50E-03)	.35110(1.00E+00)			
	.40460(3.00E-01)	.42690(1.40E-01)	.43870(4.80E-04)	.60930(2.50E-03)	.67520(1.00E-03)			
	.67660(2.30E-04)	.70430(3.70E-02)	.76640(4.90E-02)	.83180(2.40E-01)	.86550(7.00E-05)			
	.89730(2.30E-02)	1.01410(1.50E-03)	1.08000(1.10E-04)	1.10910(8.10E-03)	1.19610(1.00E-04)			
	1.27030(6.00E-05)							
90	PB-210	1	0.					
***	*****	***						
	.04650(4.00E-02)							
91	PB-209	0	0.					
***	*****	***						
92	PB-208S	0	0.					
***	*****	***						
93	PB-207S	0	0.					
***	*****	***						
94	PB-206S	0	0.					
***	*****	***						
95	TL-210	24	0.					
***	*****	***						
	.08000(0.)	.09700(4.00E-02)	.29400(8.00E-01)	.36000(4.00E-02)	.38000(3.00E-02)			
	.48000(2.00E-02)	.62000(2.00E-02)	.79500(1.00E+00)	.86000(7.00E-02)	.91000(3.00E-02)			
	1.06000(1.20E-01)	1.11000(7.00E-02)	1.21000(1.70E-01)	1.31000(7.10E-01)	1.41000(5.00E-02)			
	1.49000(2.00E-02)	1.54000(2.00E-02)	1.59000(2.00E-02)	1.65000(7.00E-02)	2.01000(7.00E-02)			
	2.09000(5.00E-02)	2.28000(3.00E-02)	2.36000(3.00E-02)	2.45000(9.00E-02)				

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96	TL-209	3	0.					
***	*****	***						
	.11700(1.40E-01)	.46500(1.40E-01)	1.56600(1.70E-01)					
97	TL-208	19	0.					
***	*****	***						
	.21150(1.90E-03)	.25350(3.10E-03)	.25260(8.00E-03)	.27235(6.90E-02)	.48620(6.00E-04)			
	.51080(2.30E-01)	.58314(8.60E-01)	.72230(2.70E-03)	.76313(1.80E-02)	.82110(9.40E-04)			
	.86037(1.23E-01)	.92770(1.30E-03)	.98280(2.00E-03)	1.09310(4.00E-04)	1.09510(4.00E-03)			
	1.28270(5.00E-04)	1.38400(7.00E-04)	1.44300(1.00E-04)	2.41460(1.00E+00)				
98	TL-207	1	0.					
***	*****	***						
	.89760(2.70E-03)							
99	TL-206	1	0.					
***	*****	***						
	.80350(5.50E-05)							
101	SR- 89	0	0.					
***	*****	***						
102	SR- 90	1	0.					
***	*****	***						
	1.73400(0.)							
103	SR- 91	35	0.					
***	*****	***						
	.11850(1.40E-03)	.26120(4.40E-03)	.27270(1.70E-03)	.27470(1.14E-02)	.35900(5.00E-04)			
	.38000(2.00E-03)	.48630(7.70E-04)	.55537(6.15E-01)	.59310(1.10E-03)	.62010(1.75E-02)			
	.63130(5.30E-03)	.65230(2.90E-02)	.65290(7.70E-02)	.65300(4.70E-03)	.74980(2.30E-03)			
	.76130(5.30E-03)	.79380(5.70E-04)	.87980(1.70E-03)	.89260(7.00E-04)	.90160(1.00E-02)			
	.92580(3.97E-02)	.97380(3.00E-04)	.99200(5.00E-04)	1.02430(3.54E-01)	1.05460(2.30E-03)			
	1.14080(1.10E-03)	1.28090(9.30E-03)	1.37270(4.00E-04)	1.35320(2.00E-04)	1.41340(9.20E-03)			
	1.47370(1.50E-03)	1.54600(6.00E-04)	1.65140(3.70E-03)	1.72400(1.90E-03)	2.01600(5.00E-05)			
104	Y- 90	1	0.					
***	*****	***						
	1.73400(0.)							
105	ZR- 93	0	0.					
***	*****	***						
106	ZR- 95	2	0.					
***	*****	***						
	.72418(4.30E-01)	.75672(5.46E-01)						

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107	NR-91M	2	0.					
***	*****	***	***					
				.01650(0.)		.03040(0.)		
108	NR-95M	2	0.					
***	*****	***	***					
				.01650(0.)		.23570(1.00E+00)		
109	NR-95	1	0.					
***	*****	***	***					
				.76579(9.90E-01)				
110	RU-103	11	0.					
***	*****	***	***					
				.03975(1.00E+00)	.11465(1.30E-04)	.24182(1.50E-04)	.29488(2.60E-03)	.35727(1.00E-04)
				.44382(3.60E-05)	.49708(9.00E-01)	.53270(1.10E-02)	.55709(8.00E-05)	.61029(5.60E-02)
				.61153(4.00E-05)				
111	RU-103M	1	0.					
***	*****	***	***					
				.04000(4.00E-03)				
112	RU-106	0	0.					
***	*****	***	***					
113	RU-106	41	0.					
***	*****	***	***					
				.42970(9.20E-04)	.45500(4.70E-04)	.51180(2.05E-01)	.57800(8.00E-05)	.61620(8.10E-03)
				.62180(9.76E-02)	.66120(1.50E-04)	.68810(7.00E-05)	.71620(1.60E-04)	.71710(1.50E-04)
				.77400(6.00E-05)	.87310(4.14E-03)	1.05010(1.45E-02)	1.06210(2.40E-04)	1.10890(5.10E-05)
				1.11460(8.00E-05)	1.12400(3.85E-03)	1.12910(1.40E-04)	1.18060(1.40E-04)	1.19430(5.30E-04)
				1.49640(2.60E-04)	1.56200(1.46E-05)	1.59270(8.00E-05)	1.60070(8.50E-05)	1.76620(2.30E-04)
				1.78900(9.00E-05)	1.79670(7.50E-04)	1.85480(8.00E-05)	1.90940(6.00E-05)	1.92680(1.30E-04)
				1.92320(1.30E-04)	1.98850(2.20E-04)	2.09410(6.00E-05)	2.14320(5.00E-05)	2.19400(5.00E-05)
				2.30970(6.00E-05)	2.30940(8.00E-05)	2.31760(6.00E-05)	2.36640(2.10E-04)	2.39080(7.00E-05)
				2.60600(1.20E-04)				
114	SU-125	17	0.					
***	*****	***	***					
				.10940(1.20E-03)	.11700(2.80E-03)	.12250(2.50E-03)	.17640(7.10E-02)	.20420(3.20E-05)
				.70810(2.40E-03)	.22770(1.30E-03)	.32100(4.40E-03)	.38050(1.55E-02)	.40790(2.00E-03)
				.42790(5.04E-01)	.44330(3.10E-03)	.46340(1.07E-01)	.60080(1.81E-01)	.60670(5.10E-02)
				.65590(1.15E-01)	.67140(1.80E-02)			
115	TE-125M	2	0.					
***	*****	***	***					
				.05550(7.00E-02)	.10950(3.00E-02)			

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*** SAMPLE CALCULATION ***

116	CS-136	9	0.					
***	*****	***	***					
				.47530(1.50E-02)	.56310(8.00E-02)	.56920(1.40E-01)	.60460(9.80E-01)	.79560(8.80E-01)
				.80180(9.00E-02)	1.05840(1.10E-02)	1.16770(1.90E-02)	1.36500(3.40E-02)	
117	CS-135	0	0.					
***	*****	***	***					
118	CS-137	3	0.					
***	*****	***	***					
				.03210(5.70E-02)	.03650(1.30E-02)	.66164(8.51E-01)		
119	RA-137M	3	0.					
***	*****	***	***					
				.03210(5.70E-02)	.03650(1.30E-02)	.66164(8.51E-01)		
120	RA-140	10	0.					
***	*****	***	***					
				.01385(1.50E-02)	.02997(1.90E-01)	.11355(2.50E-04)	.11885(9.20E-04)	.13269(2.80E-05)
				.16706(8.50E-02)	.30485(5.90E-02)	.42369(4.40E-02)	.43794(7.70E-02)	.53725(3.40E-01)
121	CE-141	2	0.					
***	*****	***	***					
				.03600(0.)	.14540(4.80E-01)			
122	CE-144	15	0.					
***	*****	***	***					
				.03357(1.50E-03)	.04093(5.00E-03)	.05391(9.00E-04)	.08012(1.54E-02)	.09995(3.80E-04)
				.13353(1.08E-01)	.62500(5.00E-06)	.67500(1.70E-05)	.69640(1.50E-02)	.81380(2.30E-05)
				.86390(1.80E-05)	1.38800(6.20E-05)	1.48920(2.90E-03)	2.18650(7.30E-02)	2.65300(4.00E-02)
123	PR-143	0	0.					
***	*****	***	***					
124	PR-144	9	0.					
***	*****	***	***					
				.62500(5.00E-06)	.67500(1.70E-05)	.69643(1.47E-02)	.81380(2.30E-05)	.86390(1.80E-05)
				1.38800(6.20E-05)	1.48920(2.90E-03)	2.18560(7.30E-05)	2.65500(4.00E-07)	
125	PR-148	1	0.					
***	*****	***	***					
				.30000(0.)				

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126	PM-147	1	0.					
*** ***** ***								
.12120(4.00E-06)								
127	SM-151	1	0.					
*** ***** ***								
.02170(0.)								
128	EU-152	48	0.					
*** ***** ***								
.12178(2.54E-01)	.24466(6.80E-02)	.25162(7.00E-04)	.27105(7.00E-04)	.29597(4.00E-05)				
.32487(7.00E-04)	.32941(1.00E-03)	.34431(2.45E-01)	.36780(8.00E-03)	.41113(2.00E-02)				
.41600(1.00E-03)	.44398(2.90E-02)	.48877(4.00E-03)	.50350(1.00E-03)	.52030(5.00E-04)				
.56408(5.00E-03)	.56664(1.00E-02)	.58634(4.00E-03)	.58652(1.00E-03)	.67468(1.00E-05)				
.67861(4.00E-03)	.68868(8.00E-05)	.71281(9.00E-04)	.71934(3.00E-03)	.76486(2.00E-03)				
.76890(8.00E-04)	.77867(1.20E-01)	.81042(3.00E-03)	.84153(1.00E-03)	.86733(3.80E-02)				
.90120(7.00E-04)	.91931(4.00E-03)	.92623(2.00E-03)	.93058(6.00E-04)	.96336(1.00E-03)				
.96401(1.32E-01)	1.00515(6.00E-05)	1.08583(9.70E-02)	1.08973(1.70E-02)	1.10890(2.00E-03)				
1.11204(1.24E-01)	1.21294(1.30E-02)	1.24991(2.00E-03)	1.24975(9.00E-04)	1.29920(1.40E-02)				
1.40802(1.98E-01)	1.45764(5.00E-03)	1.52812(2.00E-03)						
129 EU-154 50 0.								
*** ***** ***								
.12307(3.90E-01)	.14650(3.00E-04)	.18820(2.00E-03)	.23210(3.00E-04)	.24790(6.80E-02)				
.32180(5.00E-04)	.32998(1.00E-04)	.39720(4.00E-04)	.40120(2.00E-03)	.40420(2.00E-04)				
.44450(6.00E-03)	.46799(7.00E-04)	.47850(2.00E-03)	.51120(6.00E-04)	.51820(5.00E-04)				
.52760(2.00E-03)	.58203(8.00E-03)	.59179(5.00E-02)	.61330(7.00E-04)	.62520(5.00E-03)				
.64980(9.00E-04)	.67450(1.00E-03)	.69243(1.70E-02)	.71570(1.00E-03)	.72326(2.02E-01)				
.75681(4.30E-02)	.81550(5.00E-03)	.84540(5.00E-03)	.85076(2.00E-03)	.87316(1.17E-01)				
.88040(7.00E-04)	.89280(4.00E-03)	.90410(8.00E-03)	.92476(4.00E-04)	.93620(9.00E-02)				
1.00475(1.70E-01)	1.1182(1.00E-03)	1.12850(3.00E-03)	1.14070(2.00E-03)	1.16030(1.00E-04)				
1.18430(8.00E-04)	1.24140(1.00E-03)	1.24620(8.00E-03)	1.27440(1.36E-01)	1.29040(2.00E-04)				
1.31640(2.00E-04)	1.41820(9.00E-03)	1.49420(6.00E-03)	1.53800(5.00E-04)	1.59670(1.70E-02)				
130 EU-155 6 0.								
*** ***** ***								
.01890(3.20E-04)	.02650(1.28E-02)	.04530(7.40E-03)	.06001(1.28E-02)	.08654(5.20E-01)				
.10330(2.00E-01)								

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DECAY CONSTANTS AND ABUNDANCE DATA

NUCLID	DECAY CONSTANI		ABUNDANCE			SF NEUTRON		AN NEUTRON	
	1/DAY	1/SEC	ALPHA	BETA	GAHMA	1/SEC,AM	1/SEC,AM		
CF-252	7.2482E-04	8.3891E-09	9.69E-01	0.	2.69E-04	1.2786E-09	5.8415E-10		
CF-251	2.1147E-04	2.4476E-11	1.00E+00	0.	2.64E-01	0.	1.4478E-18		
CF-250	1.4519E-04	1.6804E-09	1.00E+00	0.	0.	3.1286E-22	1.1915E-10		
CF-249	5.4165E-06	6.2691E-11	1.00E+00	0.	9.37E-01	5.1286E-17	1.9447E-18		
RK-250	5.1663E+00	5.9795E-05	0.	1.00E+00	8.04E-01	0.	0.		
HK-249	2.7075E-03	2.5549E-08	0.	1.00E+00	0.	1.3627E-16	0.		
CM-250	1.6806E-07	1.9451E-12	0.	0.	0.	7.8758E-12	0.		
CM-249	1.5547E+01	1.7994E-04	0.	1.00E+00	0.	0.	0.		
CM-248	5.2605E-09	6.0885E-14	8.90E-01	0.	0.	1.1579E-14	7.0516E-11		
CM-247	1.2173E-10	1.4089E-15	1.00E+00	0.	1.04E+00	0.	6.2014E-15		
CM-246	3.9399E-07	4.5601E-12	1.00E+00	0.	0.	3.6612E-15	7.1166E-19		
CM-245	2.2236E-07	2.5771E-12	1.00E+00	0.	2.77E-01	1.5781E-10	1.1963E-19		
CM-244	1.0492E-04	1.2143E-09	1.00E+00	0.	2.31E-04	4.6664E-15	7.5270E-17		
CM-243	6.3501E-05	7.2625E-10	1.00E+00	0.	2.41E-01	4.9216E-19	4.5031E-17		
CM-242	4.2524E-03	4.9218E-08	1.00E+00	0.	4.57E-04	7.9045E-15	1.8922E-15		
AM-246	2.5593E+01	7.9622E-04	0.	1.00E+00	2.67E+00	0.	0.		
AM-245	8.1149E+00	9.3922E-05	0.	1.00E+00	6.64E-02	0.	0.		
AM-244	1.6471E+00	1.9063E-05	0.	1.00E+00	1.24E+00	0.	0.		
AM-243	2.5663E-07	2.9702E-12	1.00E+00	0.	7.25E-01	0.	1.7740E-19		
AM-242	1.0397E+00	1.2034E-05	0.	1.00E+00	0.	0.	0.		
AM-241	4.3858E-06	5.0741E-11	1.00E+00	0.	3.60E-01	2.2773E-12	2.5078E-18		
PU-246	6.3591E-02	7.3601E-07	0.	1.00E+00	2.51E+00	0.	0.		
PU-245	1.5874E+00	1.8372E-05	0.	1.00E+00	8.02E-01	0.	0.		
PU-244	2.2991E-11	2.6610E-16	1.00E+00	0.	0.	2.0221E-18	7.3224E-14		
PU-243	3.3539E+00	3.8819E-05	0.	1.00E+00	0.	2.4705E-13	0.		
PU-242	4.9071E-09	5.6795E-14	1.00E+00	0.	2.13E-01	2.4705E-13	0.		
PU-241	1.2754E-04	1.4741E-09	2.30E-05	1.00E+00	4.06E-04	6.5660E-19	1.8681E-11		
PU-240	2.9051E-07	3.3623E-12	1.00E+00	0.	5.26E-04	3.5696E-19	1.3578E-19		
PU-239	7.7861E-08	9.0117E-15	1.00E+00	0.	6.13E-04	4.9517E-14	1.5672E-20		
PU-238	2.1641E-05	2.5048E-10	1.00E+00	0.	4.80E-04	1.0023E-18	1.2552E-17		
PU-236	6.6633E-04	7.7121E-09	1.00E+00	0.	4.42E-04	1.3941E-17	4.4258E-16		
NP-240	1.5356E+01	1.7775E-04	0.	1.00E+00	1.87E+00	0.	0.		
NP-239	2.9433E-01	3.4066E-06	0.	1.00E+00	6.16E-01	0.	0.		
NP-237	8.8740E-10	1.0271E-14	1.00E+00	0.	3.13E-01	4.1102E-26	2.8640E-22		
U-240	1.1798E+00	1.3655E-05	0.	1.00E+00	0.	0.	0.		
U-238	4.2484E-15	4.9171E-18	1.00E+00	0.	0.	4.3524E-24	9.1589E-20		
U-237	1.0249E-01	1.1885E-06	0.	1.00E+00	9.51E-01	6.5311E-18	0.		
U-236	8.1086E-11	9.3884E-16	1.00E+00	0.	9.00E-04	1.8113E-24	7.0233E-25		
U-235	2.6975E-12	3.1211E-17	1.00E+00	0.	9.68E-01	1.0644E-23	7.6759E-21		
U-234	7.7829E-09	9.0080E-14	1.00E+00	0.	4.14E-03	2.2922E-14	7.6759E-21		
U-233	1.1944E-08	1.3824E-15	1.00E+00	0.	5.34E-03	1.8390E-25	4.2121E-11		
U-232	2.6486E-05	3.0653E-10	1.00E+00	0.	2.99E-03	5.4949E-22	1.5940E-17		
PA-234M	8.4587E+02	7.9092E+03	0.	1.00E+00	1.12E-02	0.	0.		
PA-234	2.4645E+00	2.8525E-05	0.	1.00E+00	1.66E+00	0.	0.		
PA-233	2.5672E-02	2.9713E-07	0.	1.00E+00	7.79E-01	0.	0.		
PA-231	5.8432E-08	6.7629E-15	1.00E+00	0.	7.05E-02	0.	2.3261E-20		
TH-234	2.8761E-02	3.3289E-07	0.	1.00E+00	1.48E-01	0.	0.		
TH-232	1.3516E-13	1.5644E-18	1.00E+00	0.	0.	5.7147E-29	2.4571E-20		
TH-231	6.4983E-01	7.5211E-06	0.	1.00E+00	2.24E-01	0.	0.		
TH-230	2.4663E-08	2.8545E-15	1.00E+00	0.	6.92E-03	1.8170E-23	7.9223E-11		

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(CONTINUED)

NUCLIDE	DECAY CONSTANT		ABUNDANCE			SF NEUTRON	AN NEUTRON
	1/DAY	1/SEC	ALPHA	BETA	GAMMA	N/SEC, AM	N/SEC, AM
TH-229	2.5872E-07	2.9945E-12	1.00E+00	0.	1.07E+00	0.	9.6202E-20
TH-228	9.9270E-04	1.1489E-08	1.00E+00	0.	1.43E+00	0.	5.3493E-16
TH-227	3.7027E-02	4.2855E-07	1.00E+00	0.	4.74E-01	0.	2.4588E-14
AC-228	2.7138E+00	3.1410E-05	0.	1.00E+00	1.06E+00	0.	0.
AC-227	8.7112E-05	1.0082E-09	1.70E-02	9.83E-01	9.05E-02	0.	5.9769E-19
AC-225	6.9315E-02	8.0225E-07	1.00E+00	0.	7.41E-02	0.	4.8897E-14
RA-228	3.3027E-04	3.8225E-09	0.	1.00E+00	0.	0.	0.
RA-226	1.1869E-06	1.3737E-11	1.00E+00	0.	2.08E+00	0.	4.1327E-19
RA-225	4.6834E-02	5.4206E-07	0.	1.00E+00	5.39E-01	0.	0.
RA-224	1.9043E-01	2.2040E-06	1.00E+00	0.	3.72E-02	0.	1.2199E-13
RA-223	6.0643E-02	7.0188E-07	1.00E+00	0.	3.41E-01	0.	4.3527E-14
FR-223	4.5786E+01	5.2993E-04	0.	1.00E+00	6.27E-01	0.	0.
FR-221	2.0794E+02	2.4068E-03	1.00E+00	0.	1.26E-01	0.	1.9640E-10
RN-222	1.8126E-01	2.0979E-06	1.00E+00	0.	7.00E-04	0.	1.0501E-13
RN-220	1.0771E+03	1.2467E-02	1.00E+00	0.	5.00E-04	0.	1.0235E-09
RN-219	1.5123E+04	1.7504E-01	1.00E+00	0.	1.80E-01	0.	1.8826E-08
RN-218	1.7111E+06	1.9804E+01	1.00E+00	0.	2.00E-03	0.	2.5817E-06
AT-218	2.9944E+04	3.4657E-01	9.99E-01	1.00E-03	0.	0.	3.5745E-08
AT-217	1.8541E+06	2.1457E+01	1.00E+00	0.	0.	0.	2.7001E-06
AT-215	5.9888E+08	6.9315E+03	1.00E+00	0.	0.	0.	1.3775E-03
PO-218	3.2726E+02	3.7877E-03	1.00E+00	1.90E-04	0.	0.	2.6238E-10
PO-216	3.9925E+05	4.6210E+00	1.00E+00	0.	0.	0.	4.9891E-07
PO-215	3.3645E+07	3.8941E+02	1.00E+00	2.50E-04	0.	0.	5.7501E-03
PO-214	3.6517E+08	4.2265E+03	1.00E+00	0.	1.40E-04	0.	7.2276E-04
PO-213	1.4259E+10	1.6504E+05	1.00E+00	0.	0.	0.	3.8624E-02
PO-212M	1.3019E+03	1.5068E-02	0.	0.	4.60E-02	0.	0.
PO-212	1.9963E+11	7.3103E+06	1.00E+00	0.	0.	0.	6.4523E-01
PO-211	1.0694E+05	1.2578E+00	1.00E+00	0.	1.00E-02	0.	0.
PU-210	5.0090E-03	5.7975E-08	1.00E+00	0.	1.20E-05	0.	2.5606E-13
BI-214	5.0411E+01	5.8346E-04	2.10E-04	1.00E+00	1.51E+00	0.	5.9944E-15
BI-213	2.1894E+01	2.5340E-04	2.20E-02	9.78E-01	2.86E-01	0.	1.5625E-13
BI-212	1.6484E+01	1.9079E-04	3.60E-01	6.40E-01	9.93E-01	0.	4.4534E-12
BI-211	4.6841E+02	5.4237E-03	9.97E-01	2.80E-03	1.40E-01	0.	5.2071E-10
BI-210M	5.4258E-10	6.2799E-15	0.	0.	1.63E+00	0.	0.
BI-210	1.3835E-01	1.6013E-06	1.30E-06	1.00E+00	0.	0.	1.5095E-19
BI-209S	0.	0.	0.	0.	0.	0.	0.
PB-214	3.7244E+01	4.3106E-04	0.	1.00E+00	7.05E-01	0.	0.
PB-212	1.5635E+00	1.8096E-05	0.	1.00E+00	4.38E-01	0.	0.
PB-211	2.7649E+01	3.2001E-04	0.	1.00E+00	2.85E-01	0.	0.
PB-210	8.5185E-05	9.8563E-10	0.	1.00E+00	4.00E-02	0.	0.
PB-209	5.1186E+00	5.9243E-05	0.	1.00E+00	0.	0.	0.
PB-208S	0.	0.	0.	0.	0.	0.	0.
PB-207S	0.	0.	0.	0.	0.	0.	0.
PO-206S	0.	0.	0.	0.	0.	0.	0.
TL-210	7.6779E+02	8.8865E-03	0.	1.00E+00	3.07E+00	0.	0.
TL-209	4.5570E+02	5.2511E-03	0.	1.00E+00	4.50E-01	0.	0.
TL-208	3.2683E+02	3.7827E-03	0.	1.00E+00	2.33E+00	0.	0.
TL-207	2.0794E+02	2.4068E-03	0.	1.00E+00	2.70E-03	0.	0.
TL-206	2.3765E+02	2.7506E-03	0.	1.00E+00	5.50E-05	0.	0.

*** SAMPLE CALCULATION ***

DFCAY CONSTANT AND ENERGY OF EACH RAY

UNIT OF DECAY IS (DECAY/SEC)
UNIT OF ENERGY IS (MEV/DECAY)

NUCLIDE	DECAY	ALPHA	BETA	NUCLIDE	DECAY	ALPHA	BETA
CF-252	8.3891E-09	6.06176	0.00000	TH-229	2.9945E-12	4.86195	0.00000
CF-251	2.4476E-11	5.74700	0.00000	TH-228	1.1489E-08	5.38225	0.00000
CF-250	1.6804E-09	6.04236	0.00000	TH-227	4.2855E-07	5.69918	0.00000
CF-249	6.2697E-13	5.88517	0.00000	AC-228	3.1410E-05	0.00000	1.20694
BK-250	5.9795E-05	0.00000	84330	AC-227	1.0082E-09	4.97245	0.66000
HR-249	2.3549E-08	0.00000	12500	AC-225	8.0225E-07	5.79438	0.00000
CM-250	1.9451E-12	5.30000	0.00000	RA-228	3.8225E-09	0.00000	0.05520
CM-249	1.7994E-04	0.00000	90000	RA-226	1.3737E-11	4.77528	0.00000
CM-248	6.0885E-14	5.07208	0.00000	RA-225	5.4206E-07	0.00000	1.33480
CM-247	1.4089E-15	5.30000	0.00000	RA-224	2.2040E-06	5.64341	0.00000
CM-246	4.5601E-12	5.37764	0.00000	RA-223	7.0188E-07	5.81460	0.00000
CM-245	2.5701E-12	5.37837	0.00000	FR-223	5.2993E-04	0.00000	1.15000
CM-244	1.2143E-09	5.82120	0.00000	FR-221	2.4068E-03	6.27662	0.00000
CM-243	7.3265E-10	5.80769	0.00000	RN-222	2.0979E-06	5.49000	0.00000
CM-242	4.9218E-08	6.13379	0.00000	RN-220	1.2467E-02	6.28700	0.00000
AM-246	2.9622E-04	0.00000	1.40590	RN-219	1.7504E-01	6.76992	0.00000
AM-245	9.3922E-05	0.00000	91000	RN-218	1.9804E+01	7.15618	0.00000
AM-244	1.9063E-05	0.00000	38700	AT-218	3.4657E-01	6.69436	2.83000
AM-243	2.9702E-12	5.26260	0.00000	AT-217	2.1457E+01	7.06743	0.00000
AM-242	1.2034E-05	0.00000	46700	AT-215	6.9315E+03	8.01000	0.00000
AM-241	5.0761E-11	5.47059	0.00000	PO-218	3.7877E-03	6.00146	3.30000
PU-246	7.3601E-07	0.00000	19860	PO-216	4.6210E+00	6.77700	0.00000
PU-245	1.8372E-05	0.00000	120000	PO-215	3.8941E+02	7.38400	74.000
PU-244	2.6610E-16	4.66000	0.00000	PO-214	4.2265E+03	7.68700	0.00000
PU-243	3.8819E-05	0.00000	54518	PO-213	1.6504E+05	8.37700	0.00000
PU-242	5.6795E-14	4.89340	0.00000	PO-212M	1.5068E-02	0.00000	0.00000
PU-241	1.4761E-09	4.84379	0.00000	PO-212	2.3105E+06	8.78500	0.00000
PU-240	3.3623E-12	5.17658	0.00000	PO-211	1.2578E+00	0.00000	0.00000
PU-239	9.0117E-13	5.14812	0.00000	PU-210	5.7975E-08	5.30500	0.00000
PU-238	2.5048E-10	5.49178	0.00000	BI-214	5.8346E-04	5.45672	1.65860
PU-236	7.7121E-09	5.76899	0.00000	BI-213	2.5340E-04	5.87000	1.39000
NP-240	1.7773E-04	0.00000	89000	BI-212	1.9079E-04	5.88613	2.25000
NP-239	3.4066E-06	0.00000	42988	BI-211	5.4237E-03	6.56752	59000
NP-237	1.0271E-14	4.66889	0.00000	BI-210M	6.2799E-15	0.00000	0.00000
U-240	1.3655E-05	0.00000	36000	BI-210	1.6013E-06	6.07484	1.16000
U-238	4.3717E-18	4.78750	0.00000	BI-209S	0.	0.00000	0.00000
U-237	1.1885E-06	0.00000	24800	PB-214	4.3106E-04	0.00000	0.61640
U-236	9.3839E-16	4.77800	0.00000	PB-212	1.8096E-05	0.00000	0.56900
U-235	3.1211E-17	4.41047	0.00000	PB-211	3.2001E-04	0.00000	1.29805
U-234	9.0080E-14	4.75872	0.00000	PB-210	9.8563E-10	0.00000	0.02374
U-233	1.3824E-13	4.79193	0.00000	PB-209	5.9243E-05	0.00000	0.65500
U-232	3.0855E-10	5.35238	0.00000	PB-208S	0.	0.00000	0.00000
PA-234M	9.7092E-03	0.00000	229000	PB-207S	0.	0.00000	0.00000
PA-234	2.8525E-05	0.00000	54750	PB-206S	0.	0.00000	0.00000
PA-233	2.9713E-07	0.00000	23296	TL-210	8.8865E-03	0.00000	1.82600
PA-231	6.7629E-13	4.95372	0.00000	TL-209	5.2511E-03	0.00000	1.99000
TH-234	3.3289E-07	0.00000	15915	TL-208	3.7827E-03	0.00000	1.58975
TH-232	1.5644E-18	3.99636	0.00000	TL-207	2.4068E-03	0.00000	1.44000
TH-231	7.5211E-06	0.00000	23640	TL-206	2.7506E-03	0.00000	1.51000
TH-230	2.8545E-13	4.67092	0.00000				

*** SAMPLE CALCULATION ***

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NUCLIDE	DECAY CONSTANT		ABUNDANCE	
	1/DAY	1/SEC	BETA	GAMMA
SR-89	1.3726E-02	1.5886E-07	1.00E+00	0.
SR-90	6.6633E-05	7.7121E-10	1.00E+00	0.
SR-91	1.7511E+00	2.0267E-05	1.00E+00	1.42E+00
Y-90	2.5952E-01	3.0038E-06	1.00E+00	0.
ZR-93	1.2660E-09	1.4653E-14	1.00E+00	0.
ZR-95	1.0830E-02	1.2535E-07	1.00E+00	9.76E-01
NB-93M	1.3963E-04	1.611E-09	0.	0.
NB-95M	1.9210E-01	2.2233E-06	0.	1.00E+00
NB-95	1.9702E-02	2.2824E-07	1.00E+00	9.90E-01
RU-103	1.7675E-02	2.0388E-07	1.00E+00	1.98E+00
RH-103M	1.7792E+01	2.0593E-04	0.	4.00E-03
RU-106	1.8836E-03	2.1800E-08	1.00E+00	0.
RH-106	1.9963E+03	2.3105E-02	1.00E+00	3.40E-01
SB-125	6.8557E-04	7.9349E-09	1.00E+00	8.85E-01
TE-125M	1.1951E-02	1.3832E-07	0.	1.00E-01
CS-134	9.2186E-04	1.0670E-08	1.00E+00	2.25E+00
CS-135	9.4952E-10	1.0990E-14	1.00E+00	0.
CS-137	6.3091E-05	7.3022E-10	1.00E+00	9.21E-01
BA-137M	3.9142E-02	4.5304E-05	0.	9.21E-01
BA-140	5.4194E-02	6.2725E-07	1.00E+00	7.49E-01
CE-141	2.1521E-02	2.4677E-07	1.00E+00	4.80E-01
CE-144	2.4330E-03	2.8169E-08	1.00E+00	1.57E-01
PR-143	5.1079E-02	5.9120E-07	1.00E+00	0.
PR-144	5.7696E+01	6.6777E-04	1.00E+00	2.30E-02
PR-148	5.0411E+02	5.8346E-05	1.00E+00	0.
PM-147	7.2482E-04	8.3891E-09	1.00E+00	4.00E-06
SM-151	2.0420E-05	2.3634E-10	1.00E+00	0.
EU-152	1.5515E-04	1.7725E-09	2.90E-01	1.45E+00
EU-154	2.2342E-04	2.5858E-09	1.00E+00	1.59E+00
EU-155	3.8287E-04	4.4314E-09	1.00E+00	5.53E-01

*** SAMPLE CALCULATION *** DECAY CONSTANT AND ENERGY

NUCLIDE	DECAY	BETA
SR-89	1.5886E-07	1.46100
SR-90	7.7121E-10	.54600
SR-91	2.0267E-05	2.67000
Y-90	3.0038E-06	2.27000
ZR-93	1.4653E-14	.09000
ZR-95	1.2535E-07	1.12100
NB-93M	1.611E-09	0.00000
NB-95M	2.2233E-06	0.00000
NB-95	2.2824E-07	.92500
RU-103	2.0388E-07	.74000
RH-103M	2.0593E-04	0.00000
RU-106	2.1800E-08	.03940
RH-106	2.3105E-02	3.54000
SB-125	7.9349E-09	2.27200
TE-125M	1.3832E-07	0.00000
CS-134	1.0670E-08	2.06200
CS-135	1.0990E-14	.21000
CS-137	7.3022E-10	.55700
BA-137M	4.5304E-05	0.00000
BA-140	6.2725E-07	1.05000
CE-141	2.4677E-07	.58100
CE-144	2.8169E-08	.32000
PR-143	5.9120E-07	.93300
PR-144	6.6777E-04	7.98900
PR-148	5.8346E-05	4.50000
PM-147	8.3891E-09	.22500
SM-151	2.3634E-10	.07600
EU-152	1.7725E-09	1.82000
EU-154	2.5858E-09	1.97000
EU-155	4.4314E-09	.26000