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SENSITIVITY ANALYSIS FOR ACTINIDE PRODUCTION AND DEPLETION IN FAST REACTORS

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In sensitivity analysis of the actinide production and depletion in fast reactors, a methematical method of calculating sensitivity coefficients is improved and simplified by combining the time-dependent generalized perturbation technique with the eigenvalue method. Numerical calculations show that the eigenvalue method is well applicable in solving the nuclide chain equation and its adjoint equation and the cyclic chains in the decay scheme of the actinides can be interpreted by means of complex eigenvalues.

The sensitivity coefficients of actinide production and depletion in a 1000 MWe fast reactor are strongly dependent on the type of Pu fuel used, i.e. Pu fuel from BWR or Pu fuel from the blanket of FBR. The sensitivity coefficients due to variations of capture cross sections, $\sigma_{n,2n}$ of ^{238}U, λ_β of ^{241}Pu and λ_α of ^{242}Cm are especially large. Sensitivity analyses for the 1000 MWe fast reactors show that higher priorily should be given to decay constants of ^{241}Pu and ^{242}Cm, capture cross sections of ^{237}Np, ^{241}Am, ^{243}Am and ^{242}Pu, and fission cross sections of ^{237}Np, ^{242}Pu, ^{241}Am and ^{242m}Am.

Keywords: Sensitivity Analysis, Actinide Production, Time-Dependent Perturbation Method, Eigenvalue-Method, Actinide Nuclear Data, Fast Reactor, Fission, Caputure, Decay

高速炉におけるアクチノイド核種の生成と消滅に関する感度解析

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高速炉におけるアクチノイド核種の生成と消滅に関する感度解析を行うために，時間依存の一般化摂動法と固有値法を結合して，感度係数を計算する数学的方法を改良し簡単化した。アクチノイド核種の生成崩壊の基本方程式および随伴方程式の解法に固有値法を適用し，その有効性を数値的に確認した。この方法では循環形式の崩壊系列を複素固有値によって解釈することができる。

1,000 MWe高速炉について感度解析を行い，感度係数が用いるPu 燃料の種類に強く依存し，また，捕獲断面積，^{238}Uの（n，2n）断面積，^{241}Puのβ崩壊および^{242}Cmのα崩壊定数の感度係数が特に大きいことを明らかにした。これらの感度解析から，^{241}Pu，^{242}Cmの崩壊定数，^{237}Np，^{241}Am，^{243}Am，^{242}Puの捕獲断面積，^{237}Np，^{241}Am，^{242m}Am，^{242}Puの核分裂断面積の優先順位が高いことを示した。

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1. Introduction

In the evaluation of the long term hazard potential associated with high-level radioactive waste, it is important to estimate the actinide production and depletion in power reactors with high accuracy. However, the present status of transactinium nuclear data is not satisfactory especially in fast energy region[1]. It is, therefore, needed to examine the effect of cross section uncertainty on the evaluation of the actinide production and depletion in fast reactors. For the purpose, the sensitivity analysis is the most powerful technique, which has been extensively used for reactor physics calculations. Furthermore, the sensitivity analysis makes it possible to determine the order of priorities among nuclear data to be measured or evaluated.

The generalized perturbation method developed by L. N. Usachev[2] and A. Gandini[3] has been successfully used for sensitivity analyses in reactor calculations. That is, sensitivity coefficients of physics parameters expressed in terms of linear and bi-linear functionals of neutron flux and adjoint flux have been calculated using the generalized perturbation technique.

While, to make sensitivity analyses of the actinide production and depletion, it is necessary to deal with the time-dependent physical processes in the nuclide field. Recently, a time-dependent generalized perturbation technique has been developed by A. Gandini[4], which is applicable to the problems not only in the neutron field but also in the nuclide field. This means that the time-dependent perturbation technique is effectively applicable to the sensitivity analysis of the actinide production and depletion in power reactors.

Many authors have made sensitivity analyses for the production of the actinide in thermal and fast reactors[5,6,7]. In early stage of these analyses, a direct-calculation technique has been used by some authors, which requires many times of calculations and is not convenient for carrying out systematic analyses. The application of the time-dependent perturbation technique to sensitivity analyses has been first made by A. Gandini for burn-up calculations and the actinide production and depletion. In the sensitivity analysis, it is further needed to solve accurately a nuclide chain equation and its importance equation. Two methods have been widely used, that is, the method of Bateman[8] and the matrix exponential method[9].

In the present report, an eigenvalue-method[9] is employed, in which basic and adjoint equations are treated as an eigenvalue problem. The simple analytical solutions for both nuclide chain equation and its importance equation can be obtained by using the eigenvalue-method. Thus, a mathematical method for calculating sensitivity coefficients is refined and simplified by combining the time-dependent generalized purturbation technique with the eigenvalue-method.

Applicability of the eigenvalue method to the present analysis is examined by numerical calculations and its usefulness is confirmed by comparing the actinide concentrations obtained by the present code with those obtained by the ORIGEN code[11]. The complete sets of sensitivity coefficients for the twenty actinides are calculated in the two 1000 MWe fast reactors loading with Pu fuel discharged from BWR and that from the blanket of FBR. From these sensitivity analyses, the order of priorities among nuclear data of the actinides is also discussed qualitatively.

2. A Mathematical Method for Sensitivity Analysis

A comprehensive code "EIGENS" has been developed for sensitivity analyses of actinide production and depletion in various power reactors[12]. In this code, sensitivity coefficients for the production of actinide are calculated by solving nuclide chain equations and their adjoint equations by means of the eigenvalue method and then by combining these solutions with the time-dependent generalized perturbation technique.

The sensitivity coefficient of the i'th nuclide detected at the final time t_f due to the variation of the k-type nuclear parameter of the j'th nuclide can be expressed by

$$S_{i,j,k} = \frac{X_{j,k}}{N_i(t_f)} \left(\frac{\partial N_i}{\partial X_{j,k}}\right)_{t=t_f}$$

$$= \frac{X_{j,k}}{N_i(t_f)} \sum_{n=0}^{N} \sum_{\ell \varepsilon k} \frac{\partial A_{\ell,j,n}}{\partial X_{j,k}} \int_{t_n}^{t_{n+1}} N^*_{\ell,i,n}(t) N_{j,n}(t) dt, \qquad (1)$$

where $t_0 = 0$ is an initial time and $t_{N+1} = t_f$, the final time

and, $A_{\ell,j,n}$; transmutation matrix element,

$N_i(t_f)$; real density of the i'th nuclide at time t_f,

$N_{j,n}(t)$; real density of the j'th nuclide at time t in the n'th time interval, In the present report, an eigenvalue-method[9] is employed, in which basic and adjoint equations are treated as an eigenvalue problem. The simple analytical solutions for both nuclide chain equation and its importance equation can be obtained by using the eigenvalue-method. Thus, a mathematical method for calculating sensitivity coefficients is refined and simplified by combining the time-dependent generalized purturbation technique with the eigenvalue-method.

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$N^*_{\ell,i,n}(t)$; importance of the ℓ'th nuclide at time t contributing to the detection of the i'th nuclide at time t_f,

$X_{j,k}$; cross section or decay constant of the j'th nuclide.

The real density of the nuclide is described by

$$\frac{dN_n(t)}{dt} = A_n N_n(t) \ , \tag{2}$$

where A_n is a nuclear transmutation matrix in the n'th time interval. Then, eigenvalues and eigenvectors can be obtained from

$$A_n C_n^{(i)} = \lambda_{i,n} C_n^{(i)} \ . \tag{3}$$

Using these eigenvalues $\lambda_{i,n}$ and eigenvectors $C_n^{(i)}$, the real density of the nuclide can be expressed in terms of

$$\begin{aligned} N_n(t) = & \sum_i A_{i,n} C_n^{(i)} e^{\lambda_{i,n}(t-t_n)} \\ & + \sum_j [A_{j,n}(a_n^{(j)} \cos\beta_{j,n}(t-t_n) - b_n^{(j)} \sin\beta_{j,n}(t-t_n)) \\ & + A_{j+k,n}(b_n^{(j)} \cos\beta_{j,n}(t-t_n) + a_n^{(j)} \sin\beta_{j,n}(t-t_n))] e^{\alpha_{j,n}(t-t_n)} \ , \\ & (t_{n+1} \geq t \geq t_n) \end{aligned} \tag{4}$$

where complex eigenvalues and eigenvectors are denoted by $\alpha_{j,n} \pm i\beta_{j,n}$ and $a_n^{(j)} \pm ib_n^{(j)}$, respectively. The coefficients $A_{i,n}$, $A_{j,n}$ and $A_{j+k,n}$ are determined by the condition

$$N_n(t_n) = N_{n-1}(t_n) \ , \tag{5}$$

where $N_0(t_0)$ is the initial condition for the real density.

The adjoint function of the nuclide is also described by

$$-\frac{dN_n^*(t)}{dt} = A_n^T N_n^*(t) \ , \tag{6}$$

where A_n^T is the transposed matrix of A_n. This equation can be, of course, derived from the importance conservation. The adjoint vectors are calculated from

$$A_n^T C_n^{(i)*} = \lambda_{i,n} C_n^{(i)*}. \tag{7}$$

Then, the adjoint function of the nuclide can be expressed in terms of

$$\begin{aligned} N_{h,n}^*(t) = & \sum_i A_{i,h,n}^* C_n^{(i)*} e^{\lambda_{i,n}(t_{n+1}-t)} \\ & + \sum_j [A_{j,h,n}^* (a_n^{(j)*} \cos\beta_{j,n}(t_{n+1}-t) - b_n^{(j)*} \sin\beta_{j,n}(t_{n+1}-t)) \\ & + A_{j+k,h,n}^* (b_n^{(j)*} \cos\beta_{j,n}(t_{n+1}-t) + a_n^{(j)*} \sin\beta_{j,n}(t_{n+1}-t))] \\ & \cdot e^{\alpha_{j,n}(t_{n+1}-t)}, \quad (t_{n+1} \geq t \geq t_n) \end{aligned} \tag{8}$$

where complex eigenvalues and eigenvectors are denoted by $\alpha_{j,n} \pm i\beta_{j,n}$ and $a_n^{(j)*} \pm ib_n^{(j)*}$, respectively. The coefficients $A_{i,h,n}^*$, $A_{j,h,n}^*$ and $A_{j+k,h,n}^*$ are also determined by the condition

$$N_{h,n}^*(t_{n+1}) = N_{h,n+1}^*(t_{n+1}), \tag{9}$$

where $N_{h,N}^*(t_{N+1}) = h(t_f)$ is the final condition for the adjoint function.

From Eqs. (2) and (5) or Eqs. (4) and (8), the importance conservation condition can be obtained

$$N_{h,n}^{*T}(t) N_n(t) = N_{h,N}^{*T}(t_f) N_N(t_f) = \text{const.} \tag{10}$$

This relation can be utilized to check the validity of numerical calculations and also to understand the physical meaning of the importance function.

3. Applicability of Eigenvalue Method to Solving Nuclide Chain Equations

The decay scheme of the actinides is shown in Fig. 1. The nuclear transmutations of the nuclides due to neutron absorption and radioactive decay are both included, so that there are some complex and cyclic chains. The formation and disappearance of the nuclides can be described by a simultaneous system of linear, homogeneous, first-order differential equations with constant coefficients, which is expressed in the matrix form as given by Eq. (2).

There are three methods for solving the above nuclide chain equations, that is, Bateman's methods, matrix exponential method and eigenvalue

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There are three methods for solving the above nuclide chain equations, that is, Bateman's methods, matrix exponential method and eigenvalue method. The method of Bateman has been widely used to solve the system of equations whose matrix of the nuclear transmutation coefficient is triangular. It is, therefore, very difficult to deal with the cyclic chain accurately, which consists of four (n,γ) reactions, two β decay and one α decay chains as seen in Fig. 1. Recently, the method of Bateman has been slightly modified by K. Tasaka[13] so that the cyclic chain can be dealt with approximately. The matrix exponential method is employed in the ORIGEN code but it is limited by storage that is required to generate the matrix exponential series. While, the analytical treatment by the eigenvalue method becomes very simple for both real and adjoint equations. It is, however, very difficult to obtain accurately eigenvalues and eigenvectors of the nuclear transmutation matrix when eigenvalues of the system of nuclide chain equations are widely separated.

The present calculations are made for the two 1000 MWe fast reactors loading with Pu fuel discharged from BWR and from blanket of FBR. The physics parameters of two fast reactors are given in Table 1. The decay constants and one-group microscopic cross sections of the actinides are taken from those for LMFBR storaged in the ORIGEN code. These values are given in Table 2.

Figure 1 shows that the half-life of the actinides ranges from 23.5 min. of ^{239}U to 4.15×10^9 y. of ^{238}U, each of which corresponds to the decay constant of 4.92×10^{-4} and 4.87×10^{-18}, respectively. The matrix elements of transmutation coefficients are shown in Fig. 2 where these elements are distributed in the neighbourhood of the diagonal element except for the α-decay terms. This fact indicates that eigenvalues are approximately determined by the values of the diagonal elements. The value of the diagonal element consists of both decay constant and neutron absorption. In general, the neutron absorption term covers over the small decay constant or long half-life, so that only the nuclide with short half-life makes it difficult to obtain accurate eigenvalues. Three nuclides ^{239}U, ^{243}Pu and ^{244}Am are omitted and the 22 nuclides from ^{235}U to ^{245}Cm are taken into consideration in the present calculations.

The eigenvalues of the matrix of nuclide chain equations for the core and blanket of the 1000 MWe fast reactors (Pu fuel from BWR) are given in Table 3. These eigenvalues are distributed from -1.201×10^{-5} to -1.885×10^{-9} in the core and slightly wider range in the blanket. The largest eigenvalue is nearly equal to the value of the diagonal element corresponding to ^{242}Am whose half life is the shortest in the 22 actinides. The smallest one, of course, corresponds to that of ^{238}U. There are two sets of complex eigenvalues which arise from two kinds of cyclic chains as shown in Fig. 3. These feedback terms cannot be treated exactly by the method of Bateman and the appearance of such terms results from a transition matrix that is not triangular.

Three tests were made to examine the accuracy of eigenvalues obtained in the present calculations. The first is to compare directly eigenvalues obtained by the present code with those obtained by the EISTACJ code[14]. The second is to calculate the maximum value of the relative residual of eigenvalue equations[14]. The satisfactory results are obtained from both investigations. The third is to compare the concentrations of actinides during irradiation and cooling calculated by the present code with those by the ORIGEN code. These results calculated for the core of 1000 MWe fast reactors with Pu fuel from BWR and from blanekt of FBR are shown in Tables 4 and 5, respectively. It is seen from these tables that the difference between both results is very small and within about 0.5 %. Thus, the eigenvalue method is well applicable in solving the nuclide chain equation and its adjoint equation.

The concentrations of actinides during irradiation for 2 years in the core of the 1000 MWe fast reactor (Pu fuel from BWR) and cooling for 180 days are shown in Fig. 4. Furthermore, importance functions of the actinides are shown in Figs. 5.1 ∿ 5.7. For example, Fig. 5.1 shows the importance functions of ^{235}U, ^{236}Np and ^{236}U contributing to the detection of the nuclide ^{236}U at the final time t_f. In the figure, the nuclide ^{235}U contributes to the production of the nuclide ^{236}U through only neutron capture process, so that its contribution becomes zero in the cooling period. While, the nuclide ^{236}Np contributes to the production of the nuclide ^{236}U through the β-decay and (n,2n) processes. The fraction of 0.43 of the β-decay yields the nuclide ^{236}U directly. From Fig. 1, it is apparent that most of the nuclides contribute to the production of the nuclides ^{236}U through various processes but their contribution are very small and not shown in Fig. 5.1.

4. Sensitivity Coefficients and Priority of Nuclear Data

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The physical processes relating to the formation and disappearance of the actinides can be understood qualitatively from their decay scheme.

However, the sensitivity analysis is needed to know quantitatively the cross sections and decay constants which are important for estimating the actinide production and depletion in the power reactor. The complete sets of sensitivity coefficients for the 22 actinides were tabulated for the two 1000 MWe fast reactors (Pu fuel from BWR and that from the blanket of FBR). In these calculations, one-group constants built in the ORIGEN code were used and a constant neutron flux approximation was also assumed.

Under the constant power operation, it is needed to increase neutron flux as decreasing the concentration of fissionable materials. This variation of neutron flux is, of course, taken into consideration in the present code. However, the constant neutron flux is a good approximation for sensitivity analysis[7].

From Eq. (1), the sensitivity coefficient is proportional to the value of the product of nuclide density and importance integrated over the whole time interval and the reaction rate or decay constant and inversely proportional to the nuclide density at the final time t_f. Furthermore, the sensitivity coefficient due to the variation of fission cross section is always negative value since the nuclide disappeares by fission process. While, the processes other than fission induce only the transmutation of the nuclide, so that the sensitivity coefficient becomes positive or negative value according to the decay chain of the nuclide.

The sensitivity coefficients of the 22 actinides are calculated under the condition that the density of the nuclide is detected at the time t_f after irradiation for 2 years in the core of 1000 MWe fast reactors and cooling for 180 days. In the present calculation, it is assumed that half of the fuel rods in the core are exchanged yearly by fresh fuel rods, so that one fuel rod is irradiated for 2 years in the core of the reactor. Furthermore, the cooling for 180 days of the discharged fuel is considered as the minimum time before reprocessing of fuel.

As one of the example, the complete sets of sensitivity coefficients for ^{238}Pu are given in Tables 6 and 7. From the Table 6, it is apparent that ^{238}Pu is produced from two sources, that is, the β-decay of ^{241}Pu and (n,2n) reaction of ^{238}U. Furthermore, λ_β of ^{241}Pu, σ_c of ^{241}Am, λ_α of ^{242}Cm, $\alpha_{n,2n}$ of ^{238}U and σ_c of ^{237}Np play an important role in the production of ^{238}Pu. The complete sets of sensitivity coefficients for 20 actinides calculated for the core of the two 1000 MWe fast reactors (Pu fuel from BWR and that from the blanket from FBR) are given in Tables of Appendix.

The sensitivity coefficients for the 12 nuclides, ^{236}U, ^{237}Np, ^{238}Pu, ^{241}Pu, ^{242}Pu, ^{241}Am, ^{242m}Am, ^{243}Am, ^{242}Cm, ^{243}Cm, ^{244}Cm and ^{245}Cm are shown in Figs. 6.1 ∿ 6.12. From these figures, the effect of nuclear data on the actinide production and depletion in fast reactors can be understood more easily. These results show that the importance of each of the nuclear data depends strongly on the characteristics of the reactor. Furthermore, the sensitivity coefficients due to the variation of capture cross sections are very large as compared with those due to the variation of fission cross sections. The effects of $\alpha_{n,2n}$ of ^{238}U, λ_β of ^{241}Pu and λ_α of ^{242}Cm are also very large.

To obtain more useful information, a matrix is constructed by arranging in column the actinides other than charged fuel in decreasing order of production and arranging in row the nuclear data in decreasing order of sensitivity coefficient. The matrices constructed for the two 1000 MWe fast reactors are shown in Tables 8 and 9. Then, it is possible that the smaller the number of columns and rows in the matrix, the higher becomes the priority of cross section or decay constant.

Reliabilities of the ^{235}U, ^{236}U, ^{238}U, ^{239}Pu, ^{240}Pu and ^{241}Pu cross sections are now sufficiently high[1)], so that higher priorities should be given to decay constants of ^{241}Pu and ^{242}Cm, capture cross sections of ^{237}Np, ^{241}Am, ^{243}Am and ^{242}Pu, and fission cross sections of ^{237}Np, ^{241}Am, ^{242m}Am and ^{242}Pu. To obtain more quantitative information, it is necessary to solve a non-linear optimization problem which leads to the required accuracy of each of the nuclear data.

5. Conclusion

Sensitivity analyses have been made for the actinide production and depletion in the two 1000 MWe fast reactors loading with Pu fuel discharged from BWR and that from the blanket of FBR. The conclusions drawn from the present study can be summarized as follows:

(1) The eigenvalue-method is well applicable to solving the nuclide chain equation and its adjoint equation, and cyclic chains in the decay scheme of the actinides can be interpreted by means of complex eigenvalues.

(2) The mathematical method for calculating sensitivity coefficients in the nuclide field is refined and simplified by combining the time-

of Appendix.

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(2) The mathematical method for calculating sensitivity coefficients in the nuclide field is refined and simplified by combining the time-

dependent generalized perturbation technique with the eigenvalue-method.

(3) Sensitivity coefficients for the actinide production and depletion in the 1000 MWe fast reactors are strongly dependent on the type of Pu fuel used, that is, Pu fuel from BWR or Pu fuel from the blanket of FBR. Furthermore, sensitivity coefficients due to the variation of capture cross sections of most of the actinides, $\alpha_{n,2n}$ of ^{238}U, λ_β of ^{241}Pu and λ_α of ^{242}Cm are very large.

(4) Sensitivity analyses of the two 1000 MWe fast reactors show that decay constants of ^{241}Pu and ^{242}Cm, capture cross sections of ^{237}Np, ^{241}Am, ^{243}Am and ^{242}Pu, and fission cross sections of ^{237}Np, ^{242}Pu, ^{241}Am and ^{242m}Am should be accorded higher priority.

From the present study, it seems to be needed to reexamine the nuclear data of all of the actinides including major actinides from the viewpoint of the actinide production and depletion since sensitivity coefficients relevant to capture cross sections of ^{239}Pu, ^{240}Pu and ^{241}Pu, and fission cross section of ^{241}Pu are unexpectedly large.

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From the present study, it seems to be needed to reexamine the nuclear data of all of the actinides including major actinides from the viewpoint of the actinide production and depletion since sensitivity coefficients relevant to capture cross sections of ^{239}Pu, ^{240}Pu and ^{241}Pu, and fission cross section of ^{241}Pu are unexpectedly large.

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Table 1 Physics Parameters of 1000 MWe Fast Reactors (from K. Tasaka)

Items	LMFBR CORE		Blanket
	(Pu from BWR)	(Pu from BL.)	
Thermal power (MW)	2,118	2,118	297
Electricity power (MWe)	877	877	123
Volume (ℓ)	3,663	3,663	7,160
Power density (W/cm^3)	578	578	41.5
Specific power (W/g)	138	138	8.3
Neutron flux($n/cm^2 \cdot sec$)	5.54×10^{15}	5.54×10^{15}	1.66×10^{15}
Burnup time (yr)	2.0	2.0	3.0
Burnup (MWD/t)	10,000	10,000	7,000
Start-up fuel inventory			
U-235 (kg)	32.6	33.8	93.5
U-238 (kg)	10,954	11,374	31,466
Total U (kg)	10,987	11,408	31,560
Pu-239 (kg)	1,520 *	2,052 **	0.0
Pu-240 (kg)	666	108	0.0
Pu-241 (kg)	318	0	0.0
Pu-242 (kg)	83.6	0	0.0
Total Pu (kg)	2,588	2,160	0.0

* Pu-239/Pu-240/Pu-241/Pu-242 = 58.7/25.7/12.3/3.2 (w/o)

** Pu-239/Pu-240/Pu-241/Pu-242 = 95.0/5.0/0.0/0.0 (w/o)

Table 2 Decay constant and one-group microscopic cross section of actinides for LMFBR storaged in ORIGEN code

No.	Nuclide	Decay constant (sec^{-1})	One-group cross section (barns)		
			Fission	Capture	(n, 2n)
1	U-235	3.09 (-17)*	2.03	0.566	1.12 (-3)
2	U-236	9.19 (-16)	0.166	0.663	4.88 (-4)
3	U-237	1.19 (- 6)	1.82	0.410	
4	U-238	4.87 (-18)	0.0428	0.296	1.53 (-3)
5	Np-236	8.75 (- 6)	3.15	0.359	
6	Np-237	1.03 (-14)	0.360	0.765	9.75 (-5)
7	Np-238	3.82 (- 6)	3.10	0.360	
8	Np-239	3.41 (- 6)	0.360	0.828	
9	Pu-236	7.71 (- 9)	1.40	0.220	
10	Pu-238	2.47 (-10)	1.38	0.224	1.95 (-4)
11	Pu-239	9.00 (-13)	1.85	0.503	2.00 (-4)
12	Pu-240	3.25 (-12)	0.354	0.415	5.10 (-4)
13	Pu-241	1.50 (- 9)	2.49	0.432	2.10 (-3)
14	Pu-242	5.80 (-14)	0.278	0.342	5.60 (-4)
15	Am-241	5.07 (-11)	0.463	0.990	3.75 (-5)
16	Am-242m	1.45 (-10)	1.83	0.403	1.39 (-3)
17	Am-242	1.20 (- 5)	1.83	0.403	1.39 (-3)
18	Am-243	2.87 (-12)	0.273	0.555	
19	Cm-242	4.92 (- 8)	0.420	0.380	
20	Cm-243	6.86 (-10)	0.320	0.400	3.75 (-4)
21	Cm-244	1.21 (- 9)	0.412	0.373	
22	Cm-245	2.66 (-12)	2.45	0.400	

* 3.09(-17) = 3.09×10^{-17}

Table 3 Eigenvalues of the coefficient matrix of basic equations for core and blanket of 1000 MWe LMFBR (Pu fuel from BWR)

No. of eigen-values	Core (5.54×10^{15} n/cm^{2}sec)		Blanket (1.66×10^{15} n/cm^{2}sec)	
	Real part (sec^{-1})	Imaginary part (sec^{-1})	Real part (sec^{-1})	Imaginary part (sec^{-1})
1	-1.2012 (-5)*		-1.2004 (-5)	
2	-8.7694 (-6)		-8.7558 (-6)	
3	-3.8392 (-6)		-3.8257 (-6)	
4	-3.4166 (-6)		-3.4120 (-6)	
5	-1.2024 (-6)		-1.1937 (-6)	
6	-5.3632 (-8)		-5.0528 (-8)	
7	-1.7689 (-8)		-1.0399 (-8)	
8	-1.6685 (-8)		-6.3518 (-9)	
9	-1.5792 (-8)		-4.7337 (-9)	
10	-1.4389 (-8)		-4.3114 (-9)	
11	-1.3104 (-8)		-3.9303 (-9)	
12	-1.2527 (-8)		-3.8660 (-9)	
13	-8.6025 (-9)	1.2790 (-10)	-2.7317 (-9)	1.3576 (-10)
14	-8.6025 (-9)	-1.2790 (-10)	-2.7317 (-9)	-1.3576 (-10)
15	-6.2352 (-9)		-2.4390 (-9)	
16	-6.0538 (-9)		-1.8921 (-9)	
17	-4.6780 (-9)		-1.8694 (-9)	
18	-4.4179 (-9)	1.1365 (-9)	-1.3952 (-9)	3.6310 (-10)
19	-4.4179 (-9)	-1.1365 (-9)	-1.3952 (-9)	-3.6310 (-10)
20	-4.3168 (-9)		-1.2933 (-9)	
21	-2.9310 (-9)		-8.3638 (-10)	
22	-1.8854 (-9)		-5.6494 (-10)	

* -1.2012 (-5) = -1.2012×10^{-5}

Table 4 Comparision of actinide concentrations in 1000 MWe LMFBR's core calculated by the present code and ORIGEN code (Pu fuel from BWR)

Nuclides	Irradiation for two years			Cooling for one year		
	ORIGEN (kg)	EIGENS (kg)	E/O	ORIGEN (kg)	EIGENS (kg)	E/O
U-235*	6.60	6.604	1.000	6.62	6.624	1.001
U-236	1.91	1.890	0.992	1.94	1.939	0.999
U-237	4.01 (-2)**	3.995 (-2)	0.998			
U-238*	4.86 (3)	4.863 (3)	0.996	4.86 (3)	4.863 (3)	1.001
Np-236	1.51 (-7)	1.505 (-7)	0.997			
Np-237	2.46	2.457	0.999	2.51	2.513	1.001
Np-238	2.73 (-3)	2.715 (-3)	0.995			
Np-239	2.34	2.345	1.002			
Pu-236	1.81 (-5)	1.778 (-5)	0.982			
Pu-238	8.87 (-1)	8.799 (-1)	0.992	1.24	1.235	0.996
Pu-239*	6.94 (2)	6.951 (2)	1.002	6.98 (2)	6.974 (2)	0.999
Pu-240*	3.68 (2)	3.668 (2)	0.997	3.68 (2)	3.668 (2)	0.997
Pu-241*	8.33 (1)	8.318 (1)	0.999	7.93 (1)	7.934 (1)	1.001
Pu-242*	4.93 (1)	4.922 (1)	0.998	4.93 (1)	4.922 (1)	0.998
Am-241	8.23	8.199	0.996	1.21 (1)	1.203 (1)	0.994
Am-242m	2.15 (-1)	2.153 (-1)	1.001	2.15 (-1)	2.143 (-1)	0.997
Am-242	3.15 (-3)	3.151 (-3)	1.000			
Am-243	4.90	4.878	0.996	4.90	4.878	0.996
Cm-242	4.63 (-1)	4.627 (-1)	0.999	9.90 (-2)	9.902 (-2)	1.000
Cm-243	2.66 (-2)	2.647 (-2)	0.995	2.61 (-2)	2.591 (-2)	0.993
Cm-244	4.34 (-1)	4.323 (-1)	0.996	4.17 (-1)	4.161 (-1)	0.998
Cm-245	1.55 (-2)	1.542 (-2)	0.995	1.55 (-2)	1.542 (-2)	0.995

* initial charged fuels

** $4.01\ (-2) = 4.01 \times 10^{-2}$

Table 5 Comparision of actinide concentrations in 1000 MWe LMFBR's core calculated by the present code and ORIGEN code (Pu fuel from Bl. of LMFBR)

Nuclides	Irradiation for two years			Cooling for one year		
	ORIGEN (kg)	EIGENS (kg)	E/O	ORIGEN (kg)	EIGENS (kg)	E/O
U-235*	6.86	6.853	0.999	6.87	6.876	1.001
U-236	1.94	1.918	0.989	1.95	1.937	0.993
U-237	4.15 (-2)	4.135 (-2)	0.996			
U-238*	5.05 (3)	5.049 (3)	1.000	5.05 (3)	5.049 (3)	1.000
Np-236	1.55 (-7)	1.551 (-7)	1.001			
Np-237	2.54	2.533	0.997	2.57	2.575	1.002
Np-238	2.81 (-3)	2.798 (-3)	0.996			
Np-239	2.43	2.435	1.002			
Pu-236	1.86 (-5)	1.836 (-5)	0.987			
Pu-238	3.55 (-1)	3.528 (-1)	0.994	3.70 (-1)	3.669 (-1)	0.992
Pu-239*	8.25 (2)	8.257 (2)	1.001	8.27 (2)	8.282 (2)	1.001
Pu-240*	1.84 (2)	1.824 (2)	0.991	1.84 (2)	1.824 (2)	0.991
Pu-241	1.19 (1)	1.189 (1)	0.999	1.14 (1)	1.134 (1)	0.995
Pu-242	7.91 (-1)	7.896 (-1)	0.998	7.91 (-1)	7.897 (-1)	0.998
Am-241	4.50 (-1)	4.473 (-1)	0.994	1.00	9.953 (-1)	0.995
Am-242m	6.93 (-3)	6.884 (-3)	0.993	6.90 (-3)	6.853 (-3)	0.993
Am-242	1.72 (-4)	1.715 (-4)	0.997			
Am-243	2.88 (-2)	2.865 (-2)	0.995	2.88 (-2)	2.865 (-2)	0.995
Cm-242	1.82 (-2)	1.805 (-2)	0.992	3.89 (-3)	3.868 (-3)	0.994
Cm-243	6.31 (-4)	6.251 (-4)	0.991			
Cm-244	1.30 (-3)	1.299 (-3)	0.999			
Cm-245	2.91 (-5)	2.872 (-5)	0.987			

* initial charged fuel

Table 6 Complete set of sensitivity coefficients for ^{238}Pu in the core of 1000 MWe LMFBR [Pu fuel from BWR] (t_f = irradiation for 2 years + cooling for 180 days)

Precursor	λ_α	λ_β	σ_f	σ_c	$\sigma_{n,2n}$
U-235*			-0.0027	0.0160	
U-236			-0.0002	0.0162	
U-237		0.0082	-0.0021	-0.0005	
U-238*			-0.0013	0.0027	0.2342
Np-236					
Np-237			-0.0102	0.2309	
Np-238		0.0055	-0.0011	-0.0001	
Np-239		0.0001			
Pu-236					
Pu-238	-0.0001		-0.1109	-0.0180	
Pu-239*			-0.0102	0.0045	0.0340
Pu-240*	0.0004		-0.0023	0.0726	
Pu-241*		0.6958	-0.1725	-0.0299	-0.0001
Pu-242*					
Am-241			-0.0369	0.6346	
Am-242m		0.0005			
Am-242		0.0037	-0.0006	-0.0001	
Am-243					
Cm-242	0.3873		-0.0189	-0.0171	
Cm-243					
Cm-244					
Cm-245					

* initial charged fuel

Table 7 Complete set of sensitivity coefficients for ^{238}Pu in the core of 1000 MWe LMFBR [Pu fuel from Bl.] (t_f = irradiation for 2 years + cooling for 180 days)

Precursor	λ_α	λ_β	σ_f	σ_c	$\sigma_{n,2n}$
U-235			-0.0087	0.0513	
U-236			-0.0006	0.0509	
U-237		0.0263	-0.0066	-0.0015	
U-238			-0.0041	0.0087	0.7510
Np-236					
Np-237			-0.0325	0.7362	
Np-238		0.0174	-0.0036	-0.0004	
Np-239		0.0004			
Pu-236					
Pu-238	-0.0011		-0.1511	-0.0245	
Pu-239			-0.0404	0.0184	0.1314
Pu-240	0.0004		-0.0018	0.0612	
Pu-241		0.0622	-0.0109	-0.0189	
Pu-242					
Am-241			-0.0023	0.0584	
Am-242m					
Am-242		0.0005			
Am-243					
Cm-242	0.0444		-0.0013	-0.0012	
Cm-243					
Cm-244					
Cm-245					

Table 8 Priority of decay constants and cross sections to be measured, which is derived from sensitivity analyses for build-up and decay of actinides in the core of 1000 MWe LMFBR*

	Nuclides	Actinides reprocessed yearly(gr)**	Priority of decay constants and cross sections				
			1	2	3	4	5
1	Am-241	1.011 (+4)	λ_β (Pu-241)	σ_f (Pu-241)	σ_c (Pu-240)	σ_c (Am-241)	σ_c (Pu-241)
2	Am-243	4.878 (+3)	σ_c (Pu-242)	σ_c (Pu-241)	σ_c (Am-243)	σ_f (Pu-241)	σ_f (Pu-242)
3	Np-237	2.504 (+3)	$\sigma_{n,2n}$ (U-238)	σ_c (Np-237)	σ_c (U-236)	σ_c (U-235)	σ_f (Np-237)
4	U-236	1.908 (+3)	σ_c (U-235)	σ_f (U-235)	σ_c (U-236)	λ_α (Pu-240)	σ_f (U-236)
5	Pu-238	1.124 (+3)	λ_β (Pu-241)	σ_c (Am-241)	λ_α (Cm-242)	$\sigma_{n,2n}$ (U-238)	σ_c (Np-237)
6	Cm-244	4.243 (+2)	σ_c (Pu-242)	σ_c (Am-243)	σ_c (Pu-241)	σ_f (Cm-244)	σ_c (Cm-244)
7	Cm-242	2.168 (+2)	λ_β (Pu-241)	σ_c (Am-241)	σ_f (Pu-241)	σ_c (Pu-240)	λ_α (Cm-242)
8	Am-242m	2.148 (+2)	λ_β (Pu-241)	σ_c (Am-241)	σ_f (Pu-241)	σ_f (Am-242m)	σ_c (pu-240)
9	Cm-243	2.619 (+1)	σ_c (Cm-242)	λ_β (Pu-241)	σ_c (Am-241)	λ_α (Cm-242)	σ_f (Pu-241)
10	Cm-245	1.542 (+1)	σ_c (Cm-244)	σ_c (Pu-242)	σ_c (Am-243)	σ_f (Cm-245)	σ_c (Pu-241)

* Pu fuel from BWR.

** irradiation for two years and cooling for 180 days.

Table 9 Priority of decay constants and cross sections to be measured, which is derived from sensitivity analyses for build-up and decay of actinides in the core of 1000 MWe LMFBR*

	Nuclides	Actinides production yearly(gr)**	Priority of decay constants and cross sections				
			1	2	3	4	5
1	Np-237	2.575 (+3)	$\sigma_{n,2n}$ (U-238)	σ_c (Np-237)	σ_c (U-235)	σ_c (U-236)	σ_f (Np-237)
2	U-236	1.927 (+3)	σ_c (U-235)	σ_f (U-235)	σ_c (U-236)	σ_f (U-236)	λ_α (Pu-240)
3	Am-241	7.209 (+2)	λ_β (Pu-241)	σ_c (Pu-240)	σ_c (Pu-239)	σ_f (Pu-241)	σ_f (Pu-239)
4	Pu-238	3.638 (+2)	$\sigma_{n,2n}$ (U-238)	σ_c (Np-237)	σ_f (Pu-238)	λ_β (Pu-241)	σ_c (Pu-240)
5	Am-243	2.865 (+1)	σ_c (Pu-240)	σ_c (Pu-242)	σ_c (Pu-241)	σ_c (Pu-239)	σ_f (Pu-241)
6	Cm-242	8.471 (+0)	λ_α (Cm-242)	λ_β (Pu-241)	σ_c (Pu-240)	σ_c (Am-241)	σ_c (Pu-239)
7	Am-242m	6.868 (+0)	λ_β (Pu-241)	σ_c (Pu-240)	σ_c (Am-241)	σ_c (Pu-239)	σ_f (Pu-241)
8	Cm-244	1.275 (+0)	σ_c (Pu-240)	σ_c (Pu-242)	σ_c (Am-243)	σ_c (Pu-241)	σ_c (Pu-239)
9	Cm-243	6.184 (-1)	λ_β (Pu-241)	σ_c (Cm-242)	σ_c (Pu-240)	σ_c (Am-241)	σ_c (Pu-239)
10	Cm-245	2.894 (-2)	σ_c (Cm-244)	σ_c (Pu-240)	σ_c (Pu-242)	σ_c (Am-243)	σ_c (Pu-241)

* Pu fuel from blanket of FBR.

** irradiation for 2 years and cooling for 180 days.

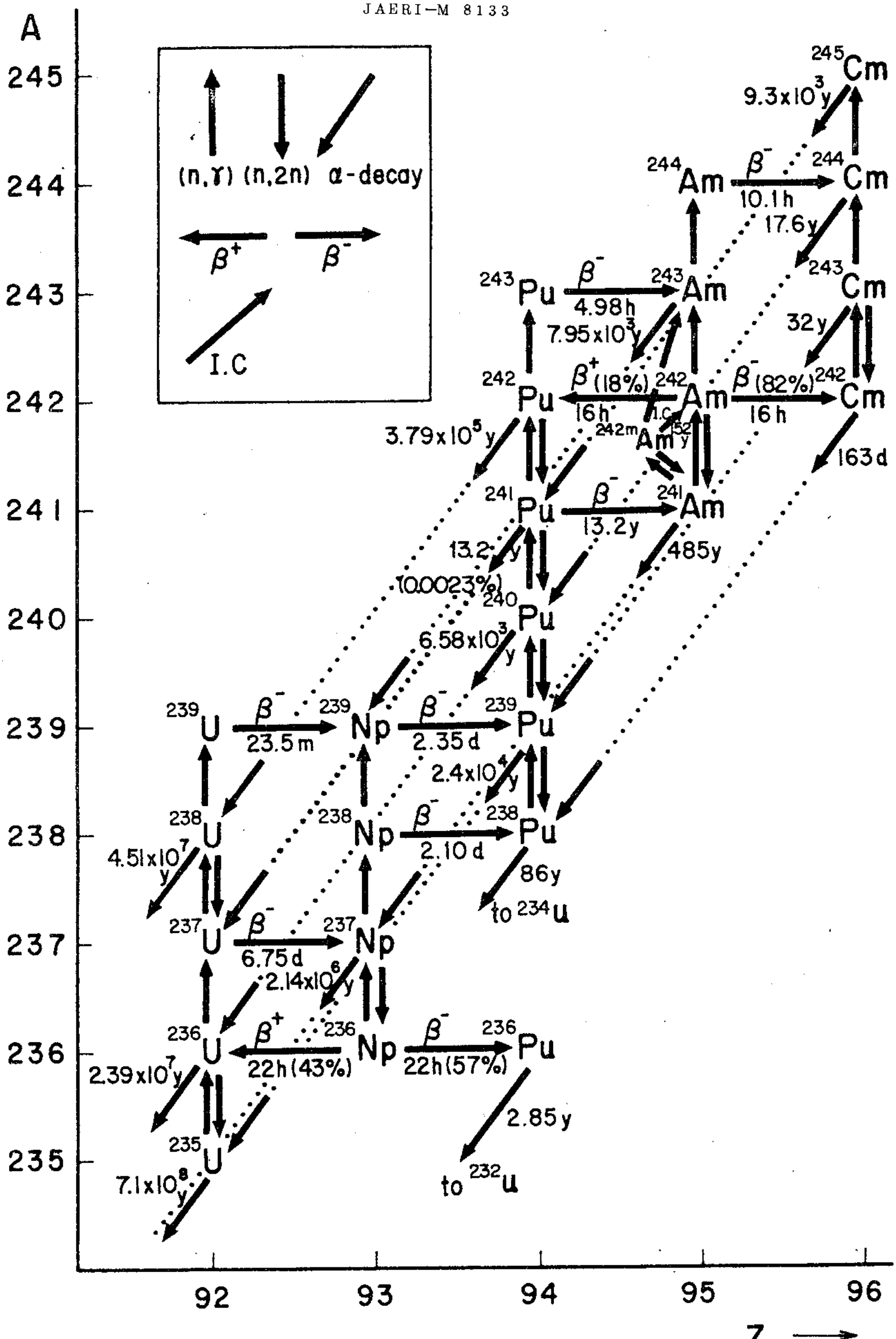

Fig. 1 Decay scheme of actinides

Nuclide \ Nuclide		1 U-235	2 U-236	3 U-237	4 U-238	5 Np-236	6 Np-237	7 Np-238	8 Np-239	9 Pu-236	10 Pu-238	11 Pu-239	12 Pu-240	13 Pu-241	14 Pu-242	15 Am-241	16 Am-242m	17 Am-242	18 Am-243	19 Cm-242	20 Cm-243	21 Cm-244	22 Cm-245
U-235	1	◑	△									●											
U-236	2	○	◑			■							●										
U-237	3		○	◑	△									●									
U-238	4			○	◑										●								
Np-236	5					◑	△																
Np-237	6			■		○	◑									●							
Np-238	7						○	◑															
Np-239	8				○			○	◑										●				
Pu-236	9					■			○	◑													
Pu-238	10							■			◑	△								●			
Pu-239	11								■		○	◑	△								●		
Pu-240	12											○	◑	△								●	
Pu-241	13												○	◑	△								●
Pu-242	14													○	◑			■					
Am-241	15													■		◑	△	△					
Am-242m	16															○	◑						
Am-242	17															○	■	◑					
Am-243	18														○		○	○	◑				
Cm-242	19																	■		◑	△		
Cm-243	20																			○	◑		
Cm-244	21																		○		○	◑	
Cm-245	22																					○	◑

◑ $-(\lambda+\sigma_a\bar{\phi})$

● λ_α ○ $\sigma_{(n,\gamma)}\bar{\phi}$

■ $\lambda_{\beta^\pm}$ or $\lambda_{I.C}$ △ $\sigma_{(n,2n)}\bar{\phi}$

Fig. 2 Matrix elements for the case of the 22 actinides

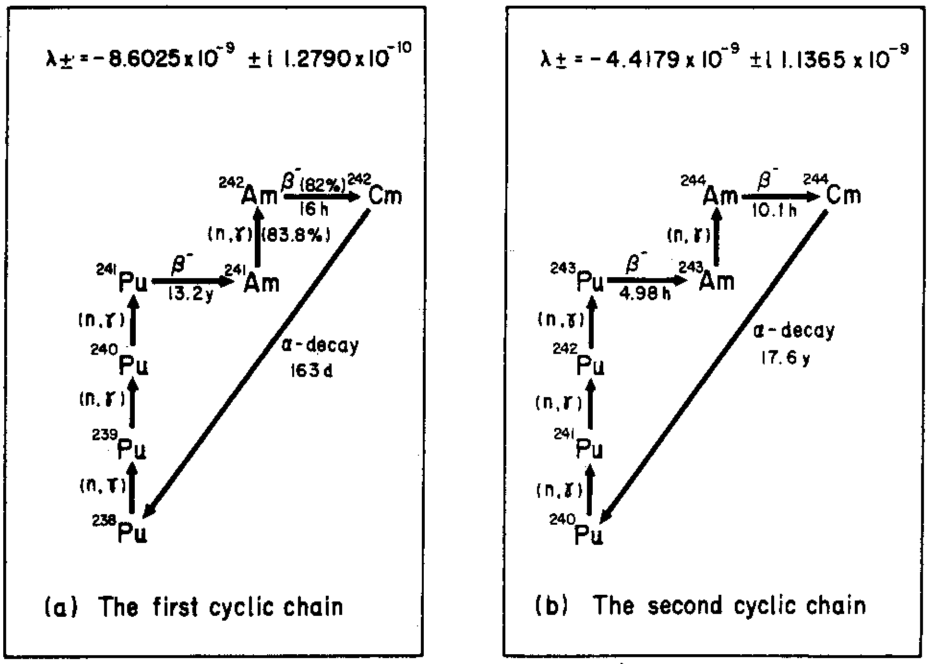

Fig. 3 The two kinds of complex eigenvalues which arise from the two cyclic chains

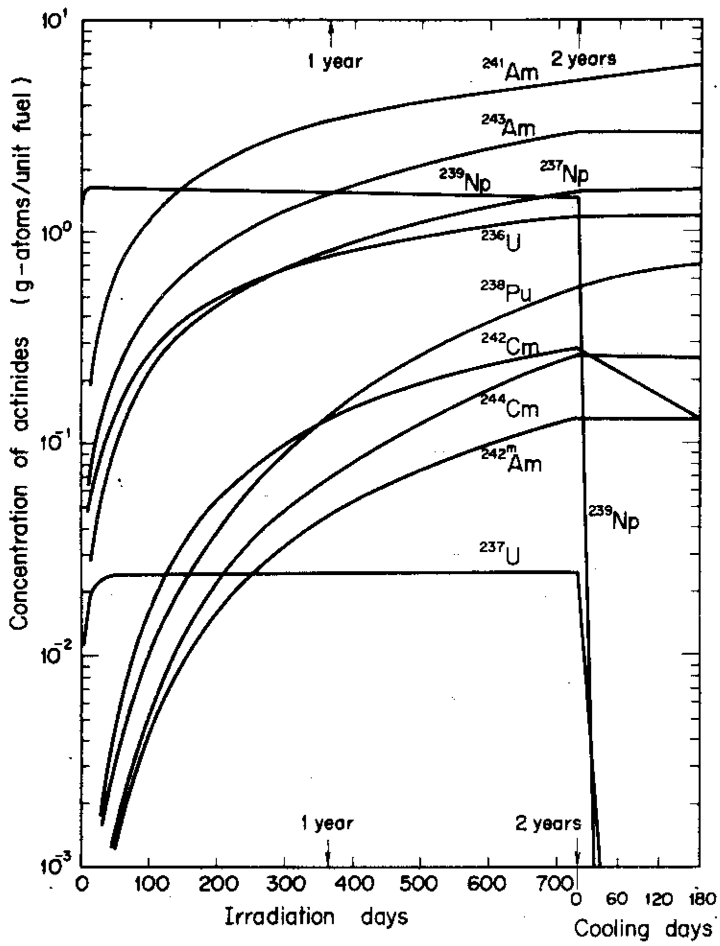

Fig. 4 The concentration of the actinides during irradiation for two years in the 1000 MWe fast reactor (Pu fuel from BWR) and cooling for 180 days.

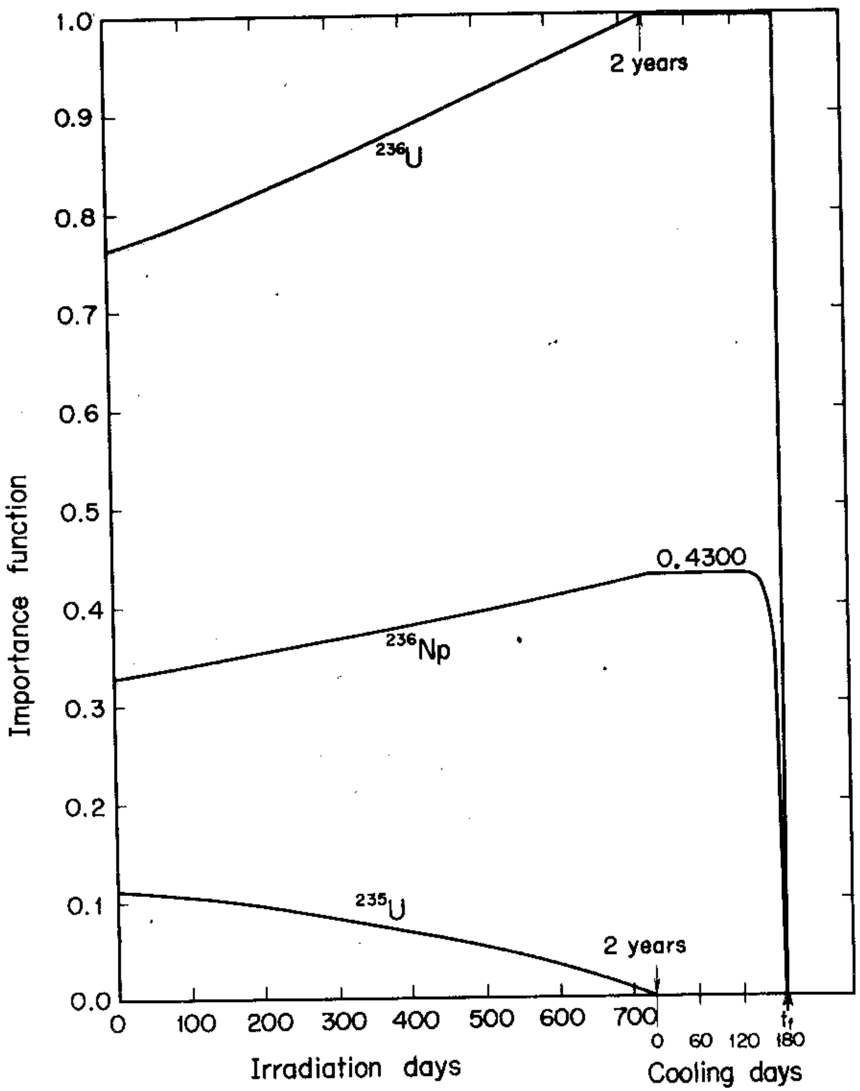

Fig. 5.1 Importance function of each nuclide contributing to the detection of ^{236}U at the time t_f

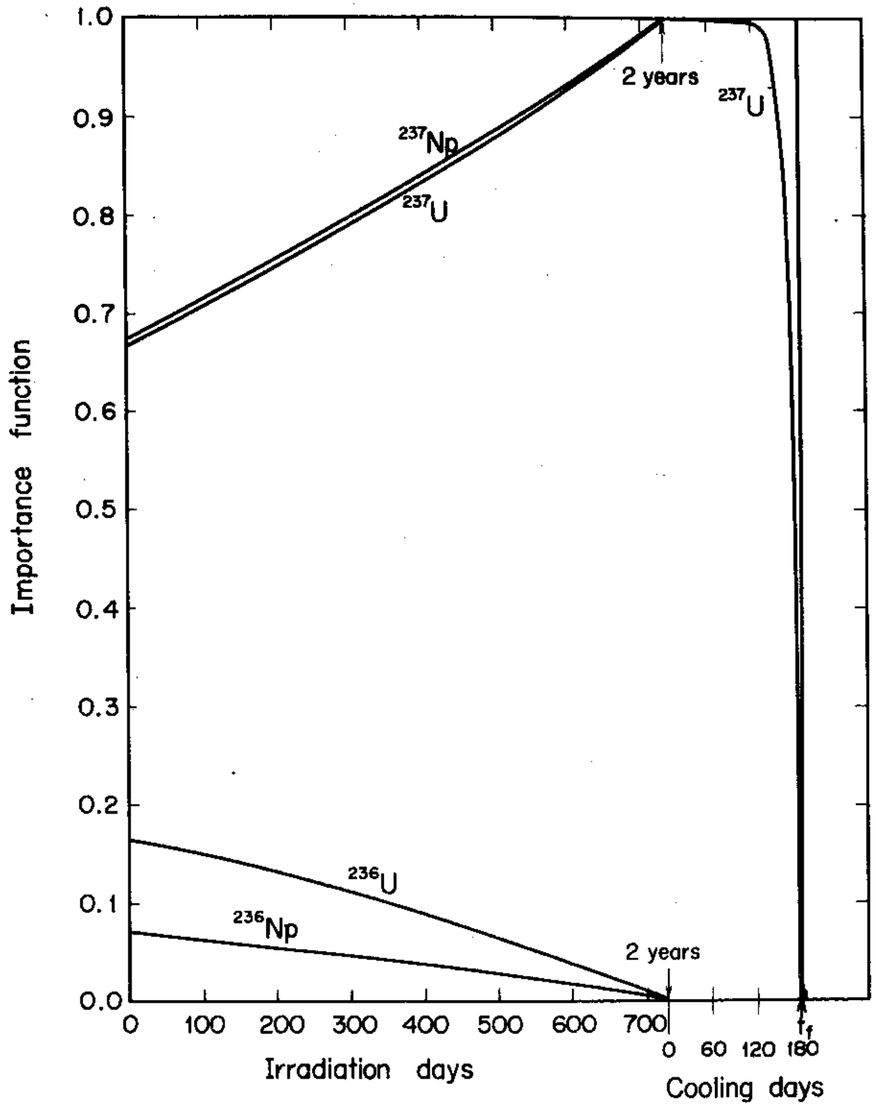

Fig. 5.2 Importance function of each nuclide contributing to the detection of ^{237}Np at the time t_f

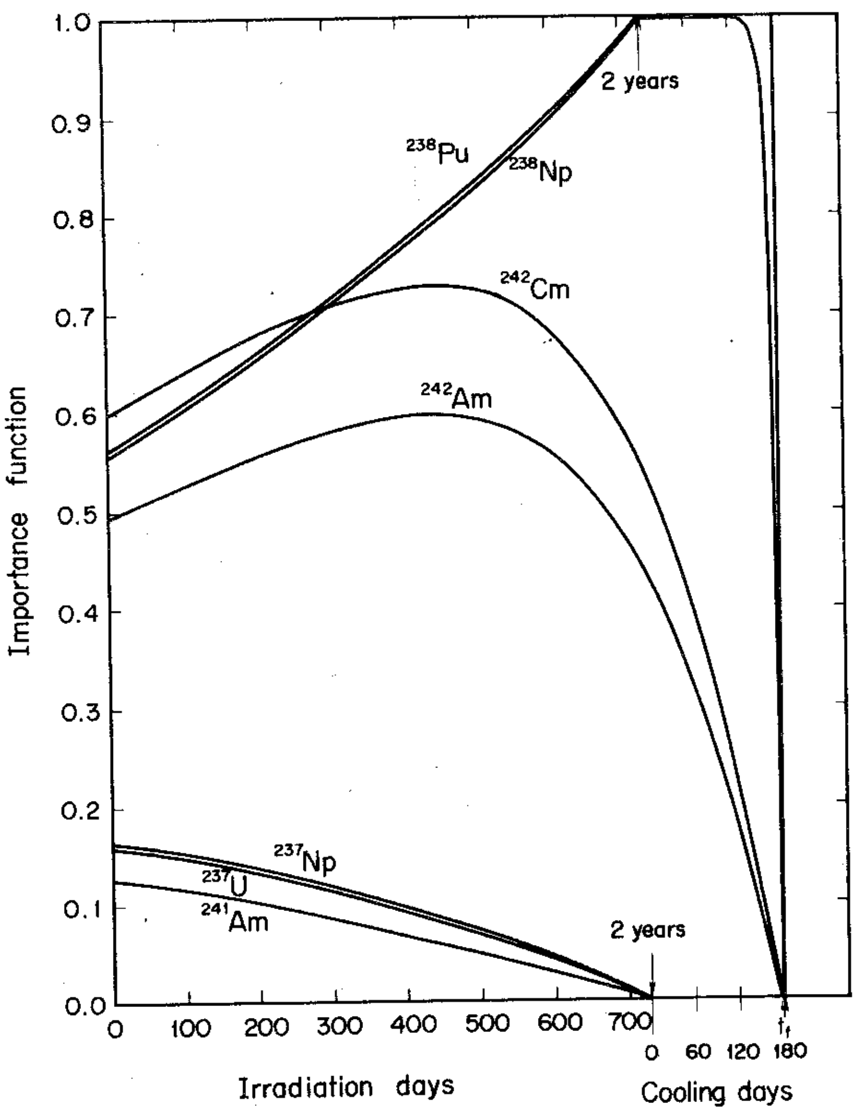

Fig. 5.3 Importance function of each nuclide contributing to the detection of ^{238}Pu at the time t_f

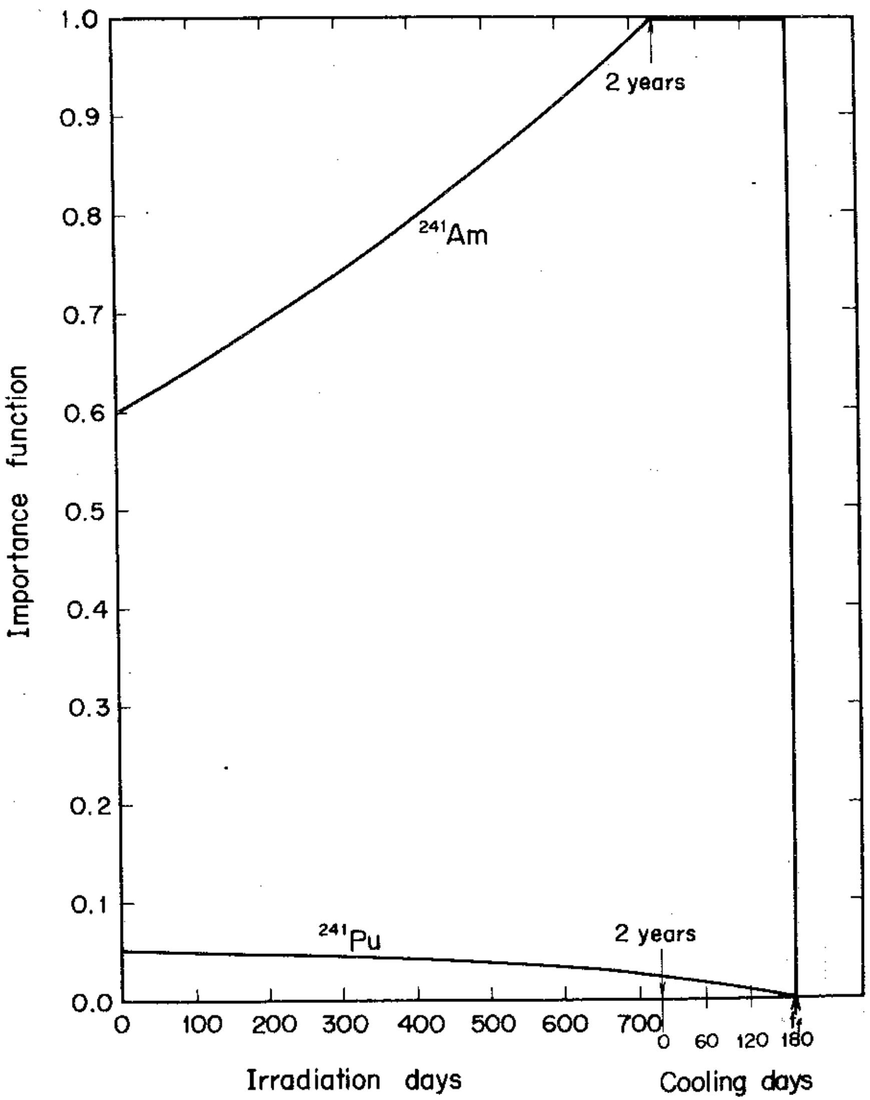

Fig. 5.4 Importance function of each nuclide contributing to the detection of ^{241}Am at the time t_f

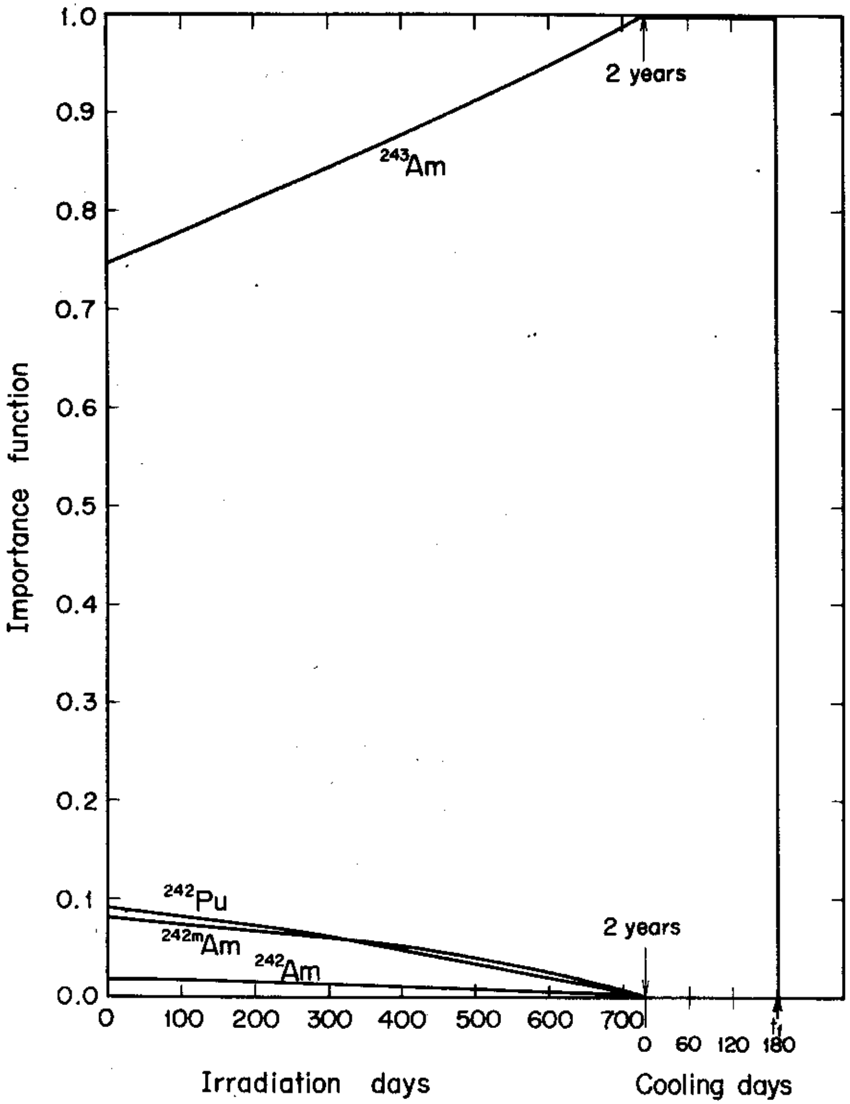

Fig. 5.5 Importance function of each nuclide contributing to the detection of ^{243}Am at the time t_f

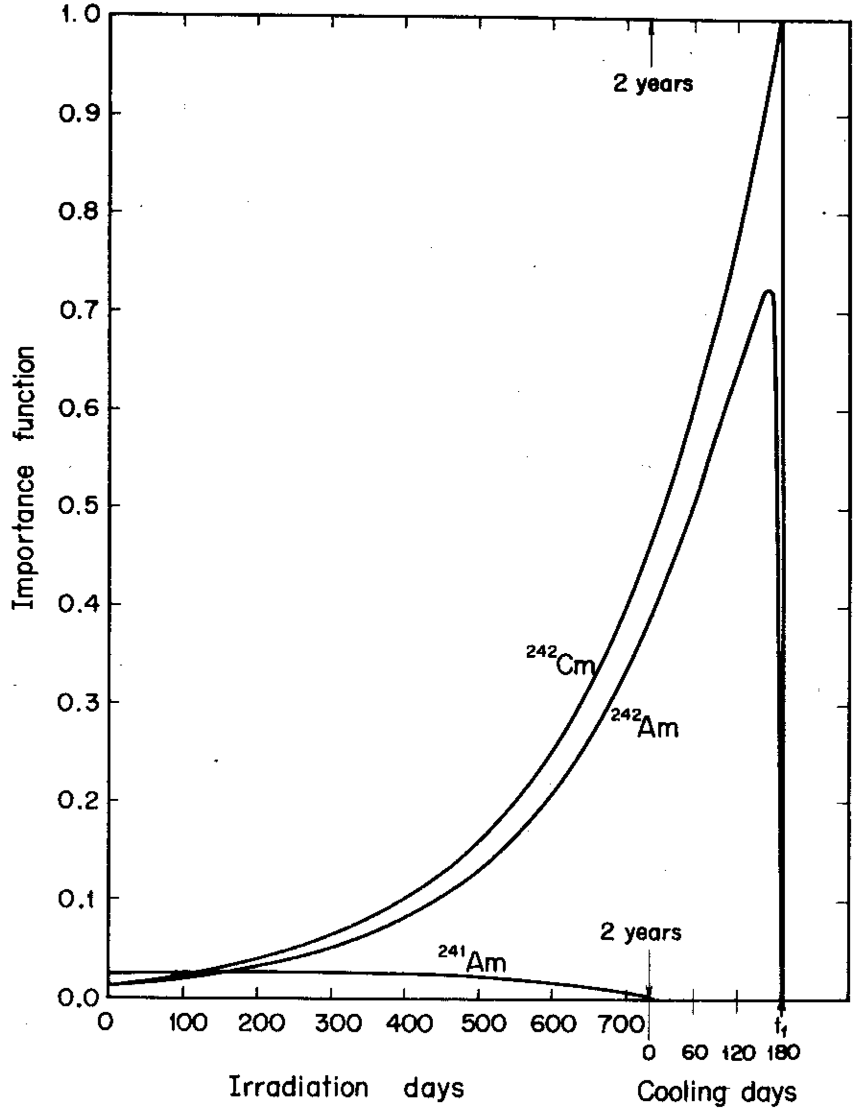

Fig. 5.6 Importance function of each nuclide contributing to the detection of ^{242}Cm at the time t_f

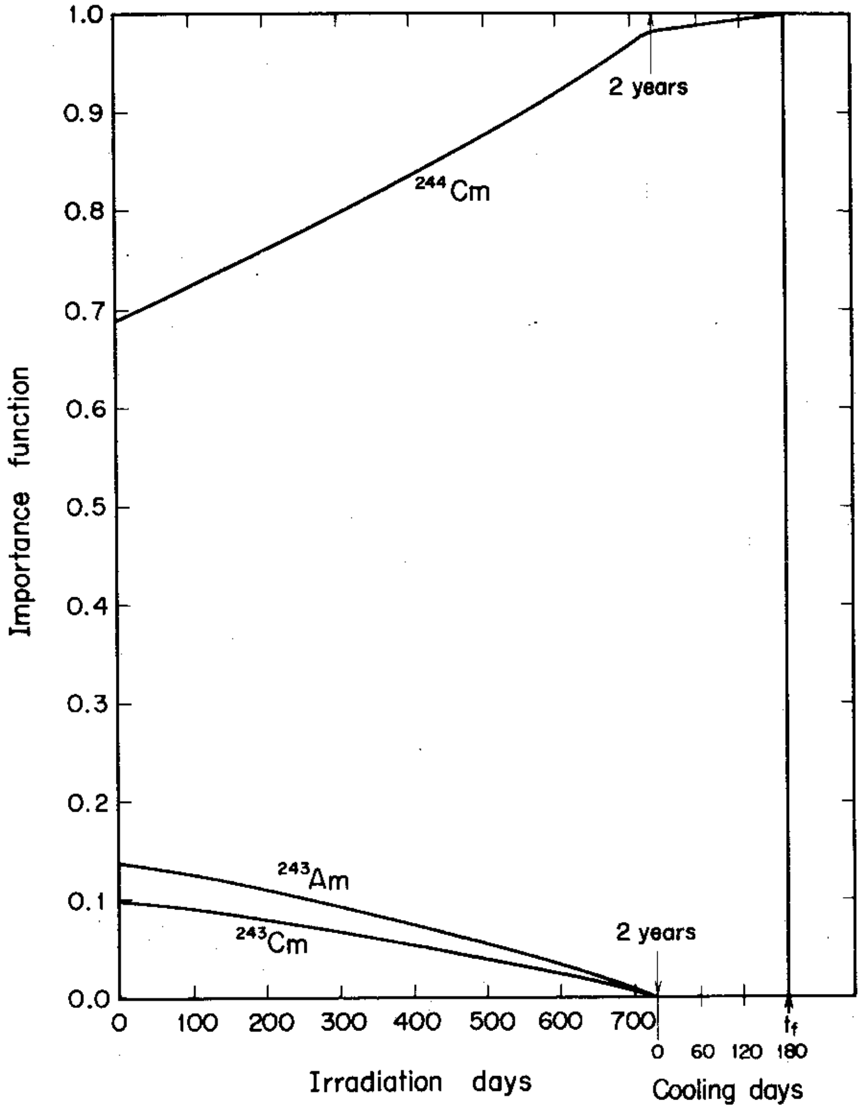

Fig. 5.7 Importance function of each nuclide contributing to the detection of ^{244}Cm at the time t_f

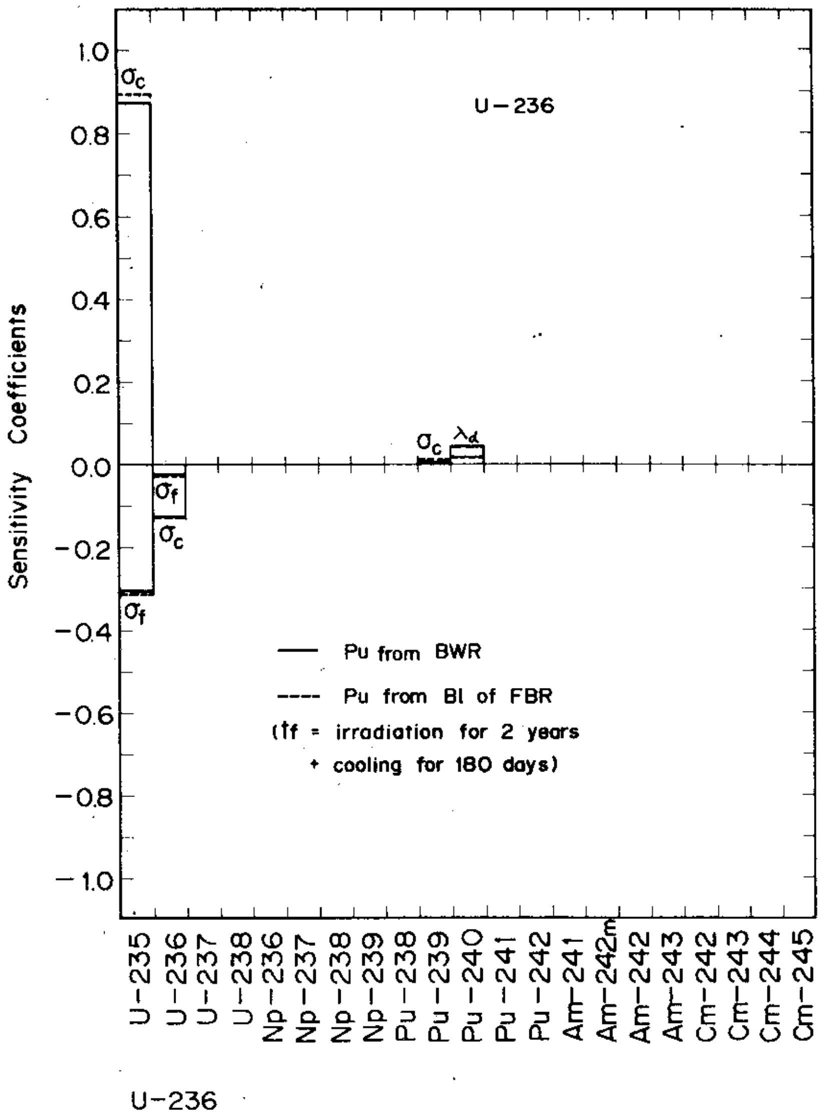

Fig. 6.1 Sensitivity coefficients for the production of ^{236}U in the two 1000 MWe fast reactors

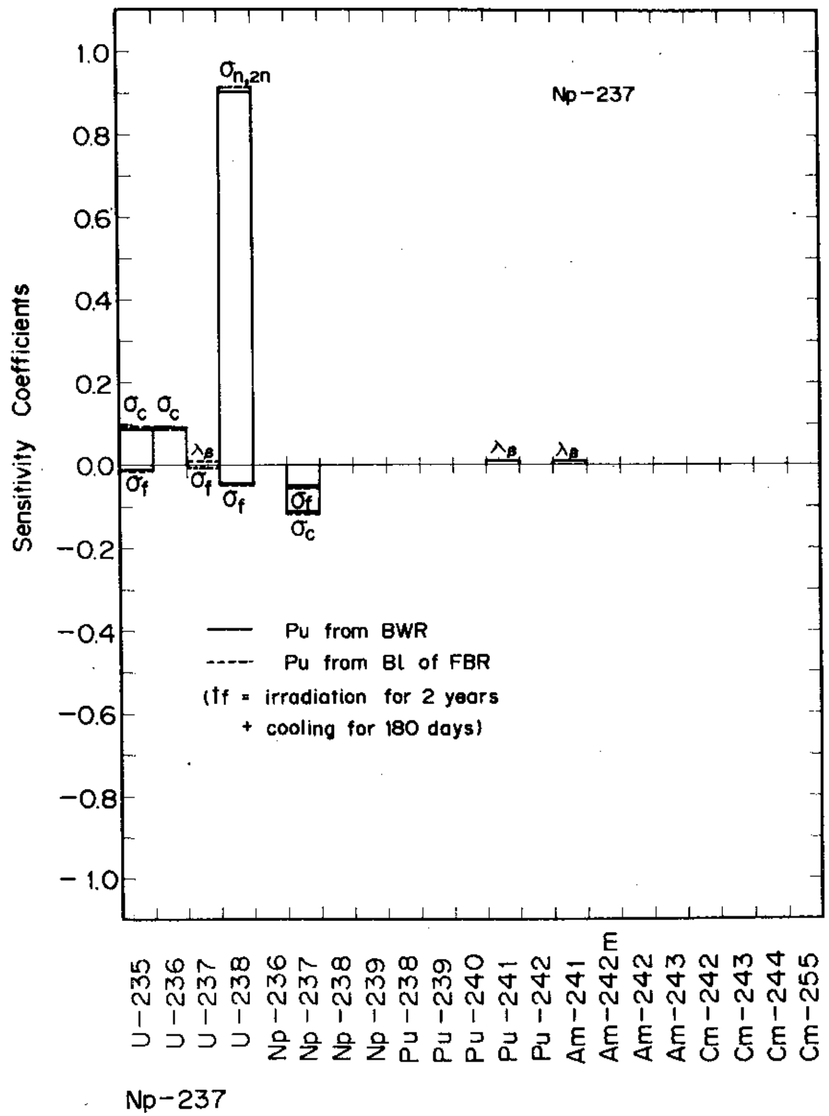

Fig. 6.2 Sensitivity coefficients for the production of ^{237}Np in the two 1000 MWe fast reactors

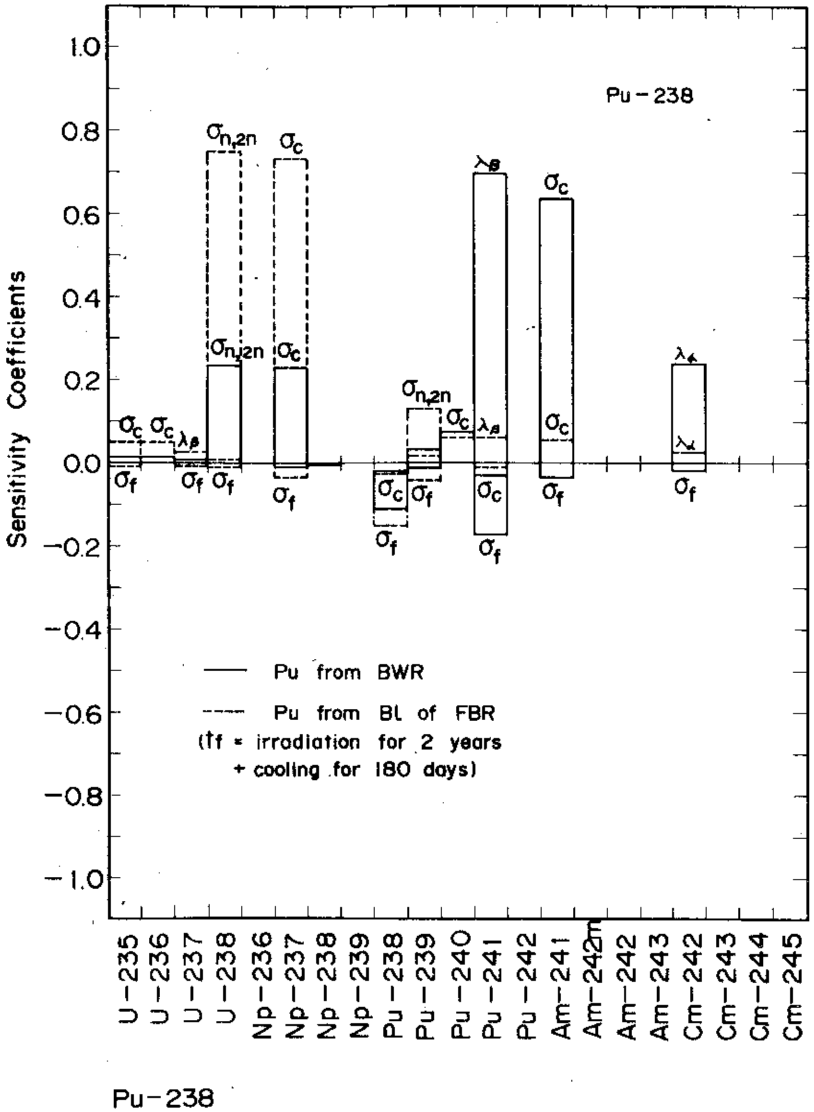

Fig. 6.3 Sensitivity coefficients for the production of ^{238}Pu in the two 1000 MWe fast reactors

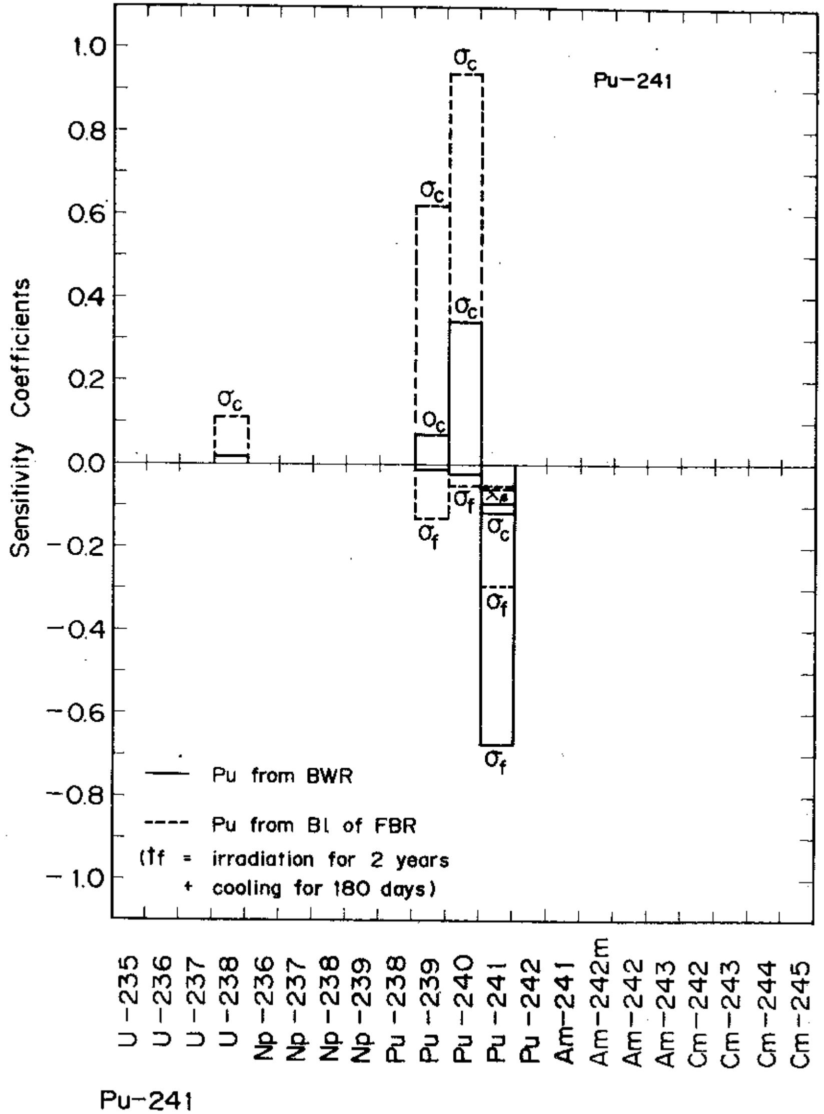

Fig. 6.4 Sensitivity coefficients for the production of ^{241}Pu in the two 1000 MWe fast reactors

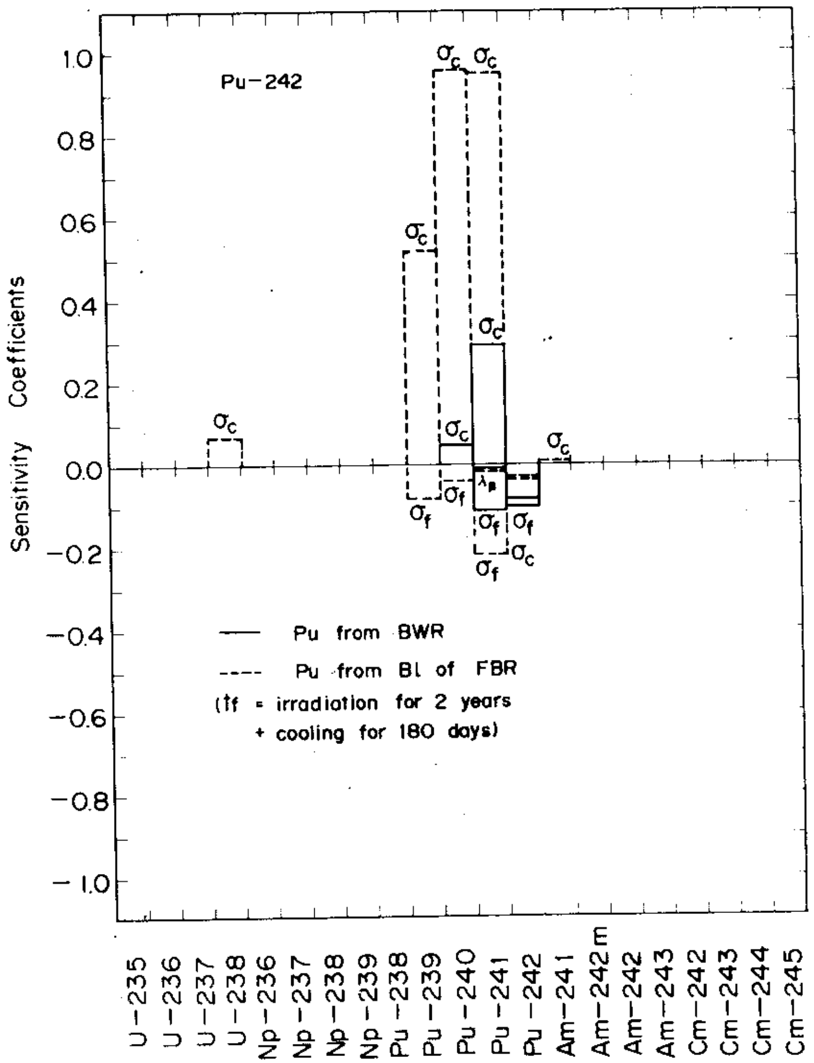

Fig. 6.5 Sensitivity coefficients for the production of ^{242}Pu in the two 1000 MWe fast reactors

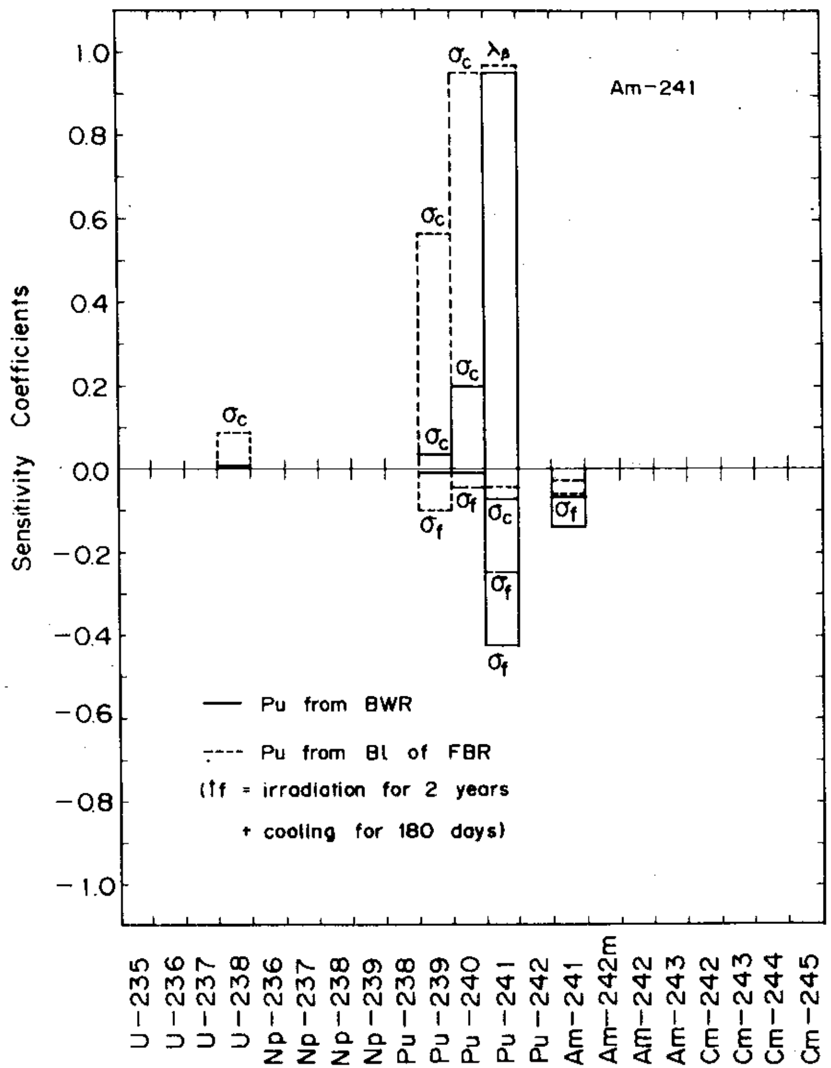

Fig. 6.6 Sensitivity coefficients for the production of ^{241}Am in the two 1000 MWe fast reactors

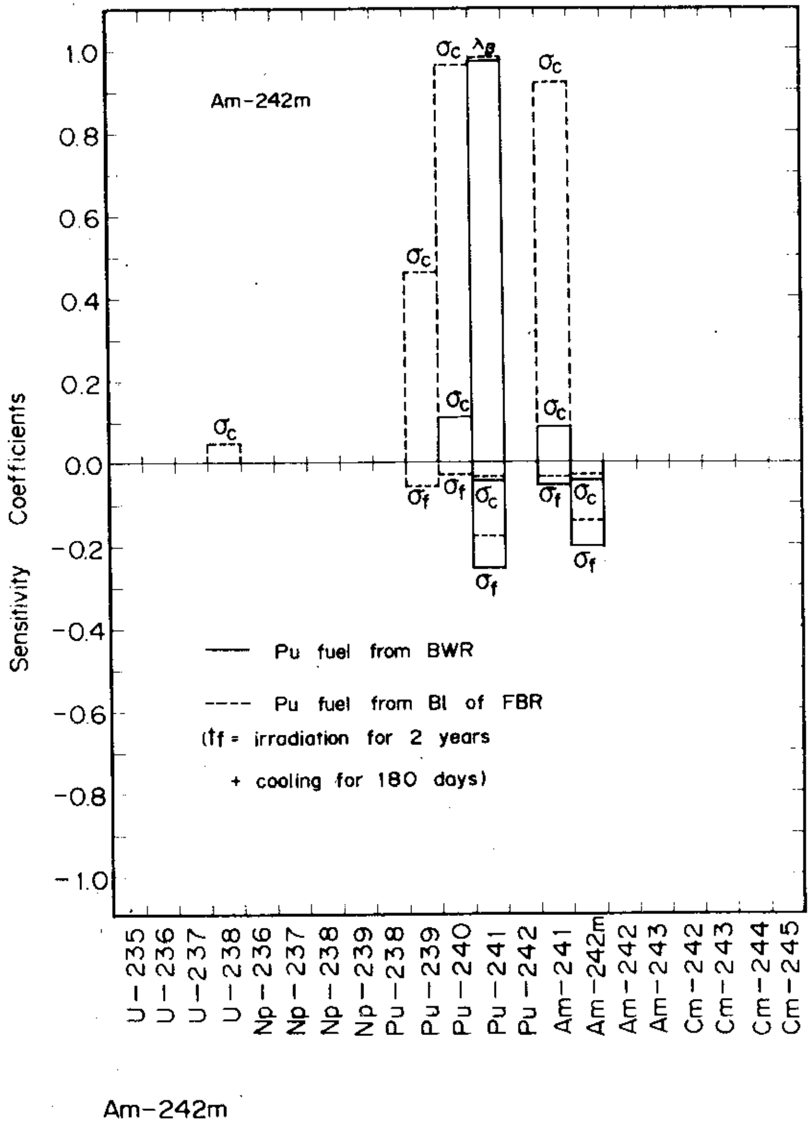

Fig. 6.7 Sensitivity coefficients for the production of ^{242m}Am in the two 1000 MWe fast reactors

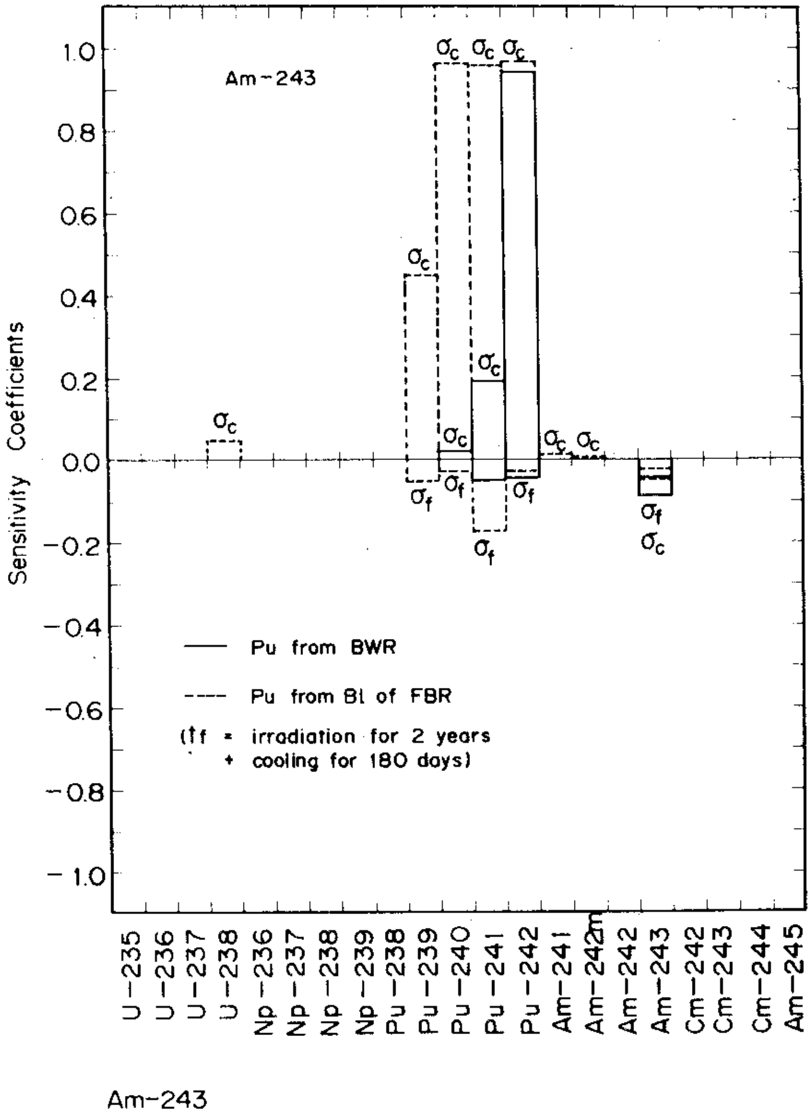

Fig. 6.8 Sensitivity coefficients for the production of ^{243}Am in the two 1000 MWe fast reactors

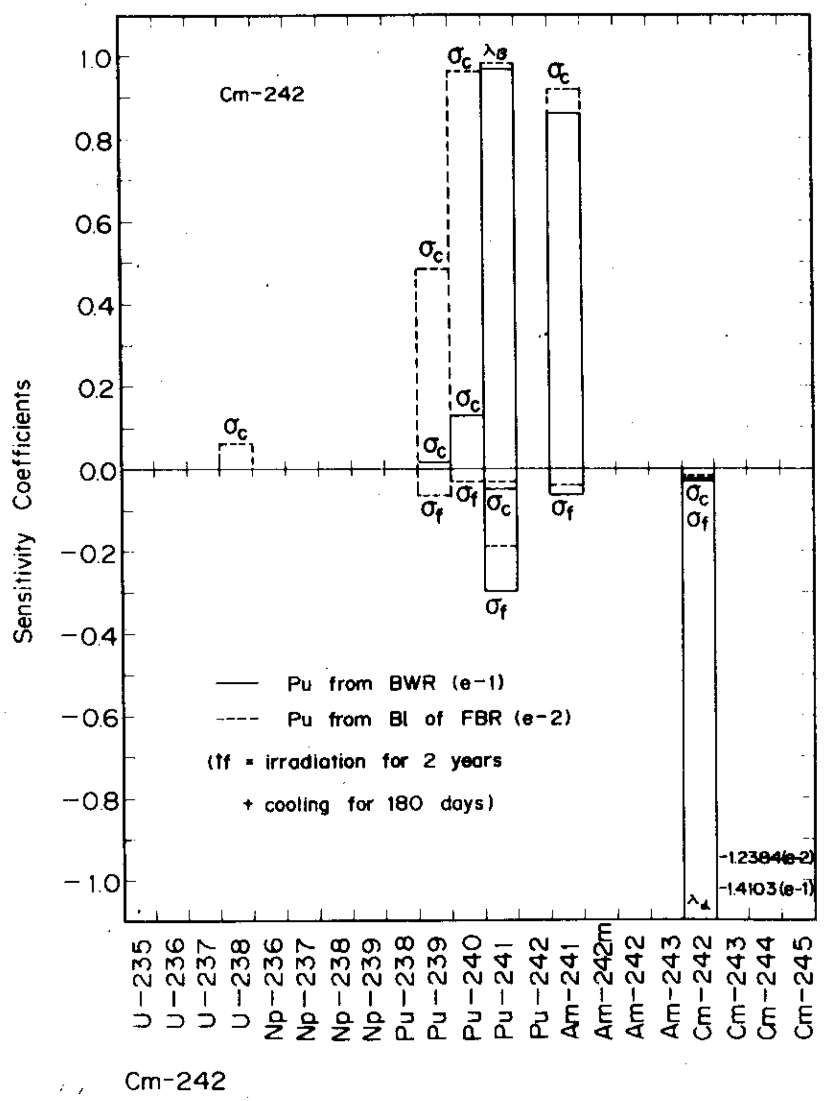

Fig. 6.9 Sensitivity coefficients for the production of ^{242}Cm in the two 1000 MWe fast reactors

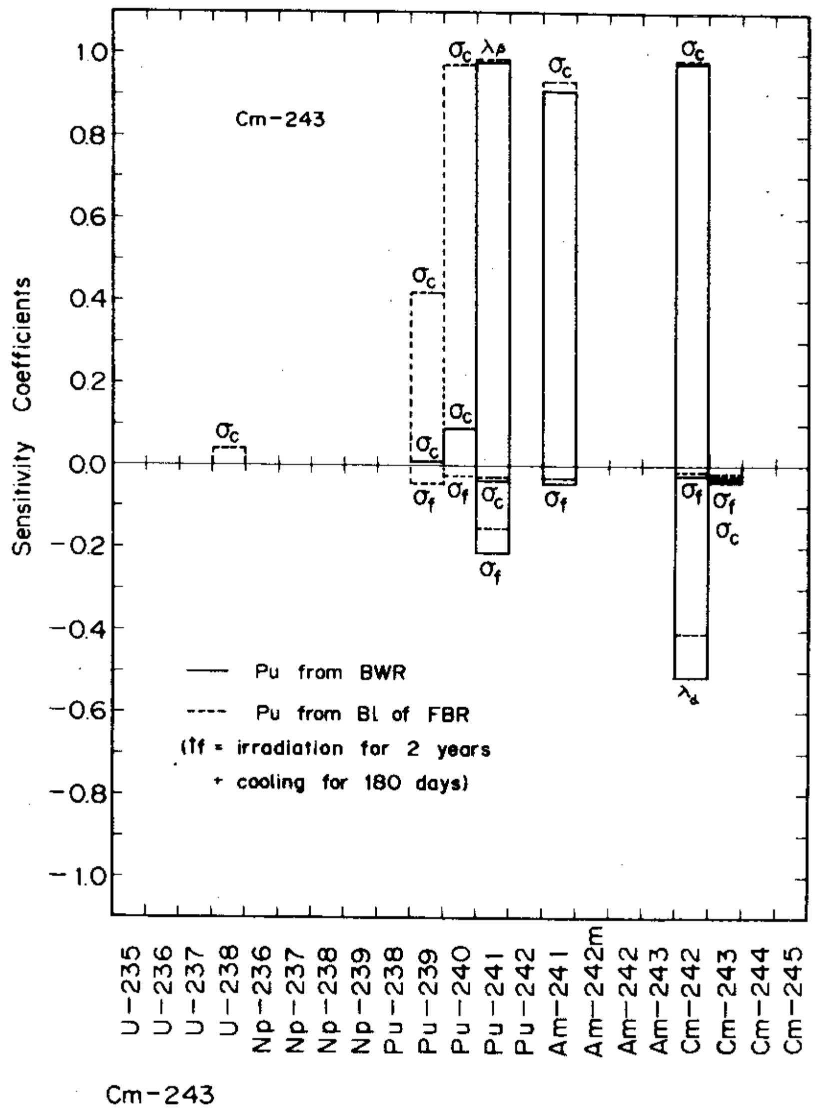

Fig. 6.10 Sensitivity coefficients for the production of ^{243}Cm in the two 1000 MWe fast reactors

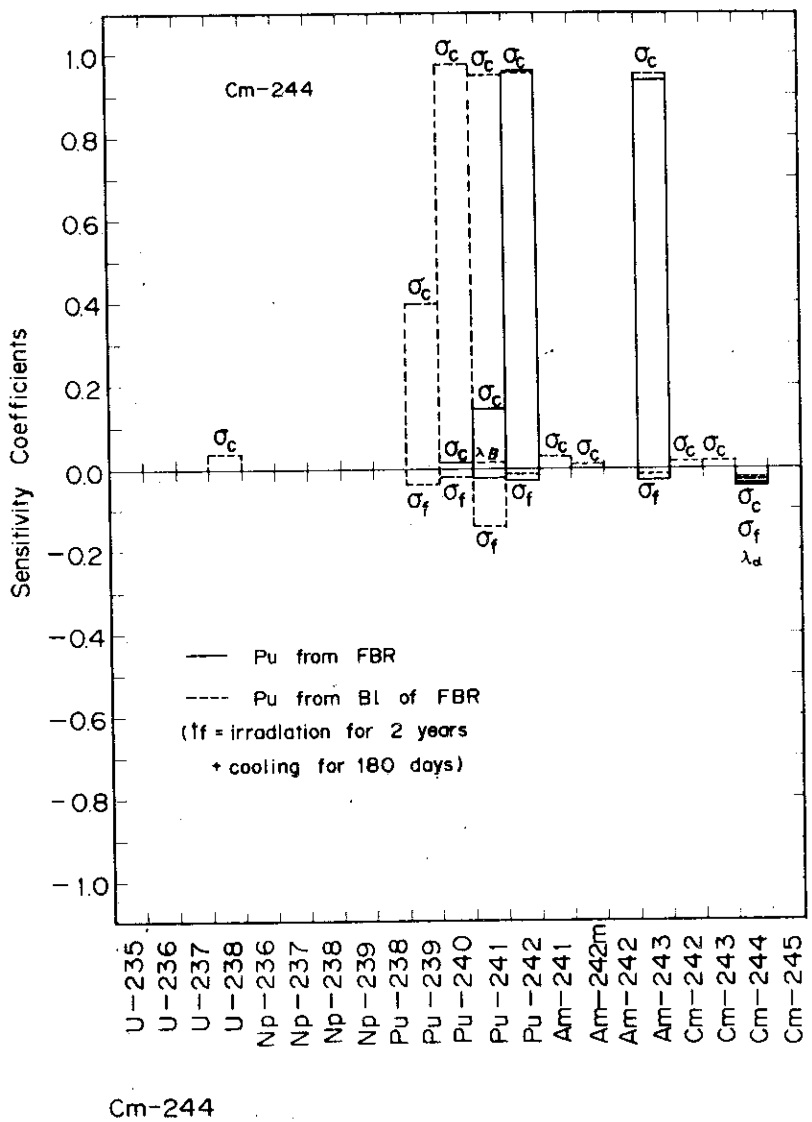

Fig. 6.11 Sensitivity coefficients for the production of ^{244}Cm in the two 1000 MWe fast reactors

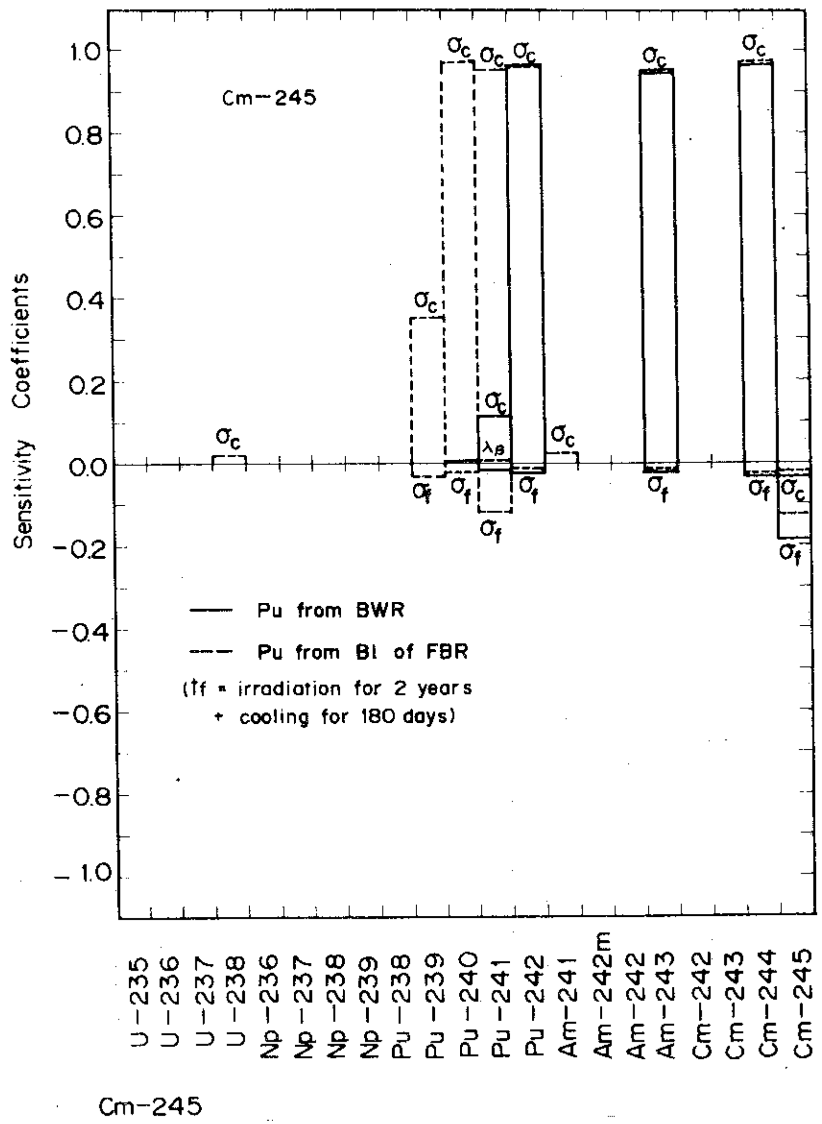

Fig. 6.12 Sensitivity coefficients for the production of ^{245}Cm in the two 1000 MWe fast reactors

Appendix

The complete set of sensitivity coefficients for the 20 actinides calculated for the core of the two 1000 MWe fast reactors (Pu fuel from BWR and that from the blanket of FBR) are given in 40 Tables. The 20 actinides are ^{235}U, ^{236}U, ^{237}U, ^{238}U, ^{237}Np, ^{239}Np, ^{236}Pu, ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{241}Pu, ^{242}Pu, ^{241}Am, ^{242m}Am, ^{242}Am, ^{243}Am, ^{242}Cm, ^{243}Cm, ^{244}Cm and ^{245}Cm. While, the sensitivity coefficients for the two nuclides ^{236}Np and ^{238}Np set equal to zero since the concentrations of these nuclides become zero during the cooling of 180 days.
In the tables, irradiation 910 days means practically irradiation of 730 days and cooling of 180 days.

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR U-235

REACTOR TYPE FAST REACTOR (PU FROM BWR) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-2.4219D-09	0.0	-7.0667D-01	-1.9701D-01	-3.8989D-04
U-236	-4.6202D-13	0.0	-3.2309D-07	-1.8452D-06	2.1600D-05
U-237	0.0	3.6421D-10	-2.1782D-10	9.0395D-10	0.0
U-238	-2.7992D-13	0.0	-1.3629D-05	1.9677D-03	-4.6155D-07
NP-236	0.0	8.5513D-13	-2.4005D-13	-2.7312D-14	0.0
NP-237	-3.8429D-15	0.0	-7.4410D-10	2.4454D-08	1.2101D-10
NP-238	0.0	-1.6123D-10	-1.1501D-10	6.0229D-10	0.0
NP-239	0.0	9.9051D-06	-1.1975D-06	-2.7541D-06	0.0
PU-236	-1.0193D-25	0.0	-1.0254D-25	-1.6113D-26	0.0
PU-238	-2.4966D-10	0.0	-7.7277D-09	7.4297D-08	0.0
PU-239	5.4586D-03	0.0	-1.8132D-03	-4.9289D-04	-1.9012D-07
PU-240	6.1633D-07	0.0	-3.7989D-08	-4.1528D-08	2.3853D-07
PU-241	2.5640D-12	4.4907D-08	-7.3523D-09	-1.0237D-09	7.8690D-11
PU-242	2.8056D-11	0.0	-5.4625D-11	1.6760D-09	4.1000D-13
AM-241	5.4794D-11	0.0	-1.4946D-09	4.2425D-08	0.0
AM-242M	0.0	1.5541D-11	-1.8950D-12	1.8041D-12	3.9120D-14
AM-242	0.0	2.5177D-10	-3.8329D-11	-8.3758D-12	-2.7406D-14
AM-243	1.7416D-09	0.0	-5.1961D-11	-1.0180D-10	0.0
CM-242	2.5253D-08	0.0	-8.9709D-10	5.8385D-10	0.0
CM-243	1.3809D-09	0.0	-3.4998D-11	-4.3743D-11	-2.1554D-14
CM-244	3.7910D-12	0.0	-9.5588D-14	-8.6536D-14	0.0
CM-245	3.9468D-18	0.0	-3.5796D-19	-5.8443D-20	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR U-236

REACTOR TYPE FAST REACTOR (PU FROM BWR) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-8.3481D-10	0.0	-3.0383D-01	8.7315D-01	-1.6763D-04
U-236	-4.5772D-08	0.0	-2.2961D-02	-1.2609D-01	-8.7321D-05
U-237	0.0	3.0152D-07	-7.2956D-08	-1.5706D-08	0.0
U-238	-2.2028D-13	0.0	-1.0725D-05	2.3355D-03	7.9301D-06
NP-236	0.0	1.5295D-08	-1.7719D-08	-2.0194D-09	0.0
NP-237	-1.8215D-12	0.0	-3.5269D-07	-7.3380D-07	8.9335D-06
NP-238	0.0	-1.3247D-10	-6.8909D-11	4.6808D-10	0.0
NP-239	0.0	2.9760D-05	-1.3920D-06	-3.2015D-06	0.0
PU-236	1.1612D-25	0.0	1.1681D-25	1.8357D-26	0.0
PU-238	-1.1797D-10	0.0	-3.6513D-09	4.3361D-08	0.0
PU-239	1.4675D-03	0.0	-2.1248D-03	8.0928D-03	-2.2489D-07
PU-240	4.2131D-02	0.0	-2.8891D-03	-3.3862D-03	-3.8902D-06
PU-241	7.9009D-10	-1.1752D-07	-1.6686D-06	-2.1670D-07	5.9018D-06
PU-242	2.0980D-11	0.0	-1.5071D-08	6.2790D-07	1.0156D-10
AM-241	3.7273D-08	0.0	-2.2010D-09	2.1885D-08	0.0
AM-242M	0.0	6.4754D-12	-5.5236D-11	5.1826D-10	2.2054D-14
AM-242	0.0	1.6483D-10	-2.1862D-11	1.4485D-11	-1.4090D-14
AM-243	1.1543D-09	0.0	-1.4595D-08	6.1614D-07	0.0
CM-242	1.4778D-08	0.0	-4.3303D-10	1.2572D-09	0.0
CM-243	5.8042D-10	0.0	-3.2395D-11	1.0156D-09	-3.0225D-14
CM-244	6.3469D-07	0.0	-2.1755D-08	-1.9696D-08	0.0
CM-245	3.6607D-15	0.0	-4.5584D-16	-7.4424D-17	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR U-237

REACTOR TYPE FAST REACTOR (PU FROM BWR) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-1.8985D-14	0.0	-6.9097D-06	2.0115D-05	-3.8123D-09
U-236	-7.1543D-13	0.0	-5.0029D-07	1.9928D-05	-1.9817D-09
U-237	0.0	-1.0042D+00	-1.3262D-06	-2.9410D-07	0.0
U-238	-1.4134D-12	0.0	-6.8814D-05	1.5943D-02	1.3283D-04
NP-236	0.0	1.1189D-12	-3.9880D-13	-4.5335D-14	0.0
NP-237	-9.8972D-15	0.0	-1.9164D-09	3.6580D-08	2.0056D-10
NP-238	0.0	-8.3951D-10	-3.9799D-10	2.9198D-09	0.0
NP-239	0.0	2.1796D-04	-9.4755D-06	-2.1794D-05	0.0
PU-236	-5.0278D-26	0.0	-5.0578D-26	-7.9479D-27	0.0
PU-238	-6.2763D-10	0.0	-1.9426D-08	2.4837D-07	0.0
PU-239	-1.2382D-06	0.0	-1.4479D-02	6.9607D-02	-1.5349D-06
PU-240	-3.9600D-05	0.0	-2.4346D-02	3.4540D-01	-3.3229D-05
PU-241	9.9984D-01	-9.5480D-02	-6.7520D-01	-1.1713D-01	-5.1850D-04
PU-242	5.9430D-12	0.0	-3.5003D-06	-4.6154D-07	6.6556D-05
AM-241	2.7882D-11	0.0	-1.0264D-[illegible]	2.8625D-07	0.0
AM-242M	0.0	1.0296D-10	-2.2482D-10	2.3463D-09	1.2326D-13
AM-242	0.0	1.6790D-09	-2.5685D-10	4.4552D-11	-1.8337D-13
AM-243	7.2296D-09	0.0	-7.3997D-08	3.6893D-06	0.0
CM-242	8.5544D-08	0.0	-2.2632D-09	6.2216D-09	0.0
CM-243	3.2383D-09	0.0	-1.4230D-10	4.7979D-09	-1.2948D-13
CM-244	3.7723D-06	0.0	-1.1043D-07	-8.6188D-08	0.0
CM-245	1.3792D-08	0.0	-2.3924D-09	-3.9060D-10	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR U-238

REACTOR TYPE FAST REACTOR (PU FROM BWR) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-5.3946D-17	0.0	-1.9634D-08	8.9236D-08	-1.0833D-11
U-236	-1.9188D-15	0.0	-1.3418D-09	8.9757D-08	-5.3961D-12
U-237	0.0	-1.0707D-06	-9.0718D-09	1.0936D-06	0.0
U-238	-3.8290D-10	0.0	-1.4955D-02	-1.0343D-01	-5.3361D-04
NP-236	0.0	3.7000D-15	-9.8331D-16	-1.1207D-16	0.0
NP-237	-7.5255D-20	0.0	-1.4572D-14	-3.0685D-14	4.9673D-13
NP-238	0.0	-3.2952D-18	-1.2211D-18	1.1124D-17	0.0
NP-239	0.0	1.6557D-12	-4.9192D-14	-1.1314D-13	0.0
PU-236	7.0540D-30	0.0	7.0961D-30	1.1151D-30	0.0
PU-238	-1.5846D-18	0.0	-4.9046D-17	7.5138D-16	0.0
PU-239	8.7823D-11	0.0	-7.5898D-11	4.3292D-10	-8.0846D-15
PU-240	2.7156D-09	0.0	-1.4680D-10	9.7566D-10	-2.0195D-13
PU-241	8.8189D-11	-1.6710D-10	-2.5455D-09	8.6448D-09	-1.8106D-12
PU-242	4.1490D-08	0.0	-2.2043D-09	-2.7117D-09	-4.2393D-12
AM-241	-9.5910D-14	0.0	-4.9354D-12	9.9138D-11	0.0
AM-242M	0.0	5.8501D-14	-8.5467D-15	-1.8770D-15	1.6834D-16
AM-242	0.0	3.2746D-13	-9.2302D-14	-2.0326D-14	-6.4461D-17
AM-243	2.7942D-17	0.0	-1.8456D-16	1.1635D-14	0.0
CM-242	2.5522D-16	0.0	-5.4471D-18	1.5269D-17	0.0
CM-243	8.9680D-18	0.0	-2.8996D-19	1.0755D-17	-2.6387D-22
CM-244	1.1869D-14	0.0	-2.7573D-16	-2.4412D-16	0.0
CM-245	5.5118D-18	0.0	-6.8507D-19	-1.1185D-19	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR NP-237

REACTOR TYPE FAST REACTOR (PU FROM BWR) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-5.2764D-11	0.0	-1.9204D-02	8.4119D-02	-1.0595D-05
U-236	-1.6850D-09	0.0	-1.3181D-03	8.4536D-02	-5.2947D-06
U-237	0.0	4.9128D-03	-8.2255D-03	-1.8525D-03	0.0
U-238	-1.4447D-10	0.0	-7.0340D-03	-4.8555D-02	8.9927D-01
NP-236	0.0	1.2017D-10	-9.7966D-10	3.3519D-09	0.0
NP-237	-4.5197D-07	0.0	-5.6570D-02	-1.2021D-01	-1.4826D-05
NP-238	0.0	-3.6396D-12	-1.3994D-12	1.2334D-11	0.0
NP-239	0.0	1.6877D-06	-5.2343D-08	-1.2039D-07	0.0
PU-236	7.7885D-27	0.0	7.8350D-27	1.2312D-27	0.0
PU-238	-1.8772D-12	0.0	-5.8103D-11	8.6284D-10	0.0
PU-239	8.6377D-05	0.0	-3.0654D-05	4.4505D-04	-8.5864D-09
PU-240	2.5953D-03	0.0	-1.5149D-04	1.0033D-03	-2.0810D-07
PU-241	9.4678D-05	8.0382D-03	-2.5509D-03	-4.4253D-04	-1.8076D-06
PU-242	1.4633D-08	0.0	-7.1824D-09	4.6996D-09	2.0724D-07
AM-241	8.3069D-03	0.0	-5.0687D-04	-1.0838D-03	0.0
AM-242M	0.0	-4.5196D-11	-3.1926D-09	-6.9692D-10	2.3011D-08
AM-242	0.0	-5.7340D-10	-1.0899D-12	6.3047D-14	5.8091D-10
AM-243	3.0921D-11	0.0	-2.1554D-10	1.3072D-08	0.0
CM-242	2.9403D-10	0.0	-6.5090D-12	1.7954D-11	0.0
CM-243	1.0458D-11	0.0	-3.5432D-13	1.2806D-11	-3.2149D-16
CM-244	1.3345D-08	0.0	-3.2195D-10	-2.8313D-10	0.0
CM-245	8.3353D-12	0.0	-1.1627D-12	-1.8983D-13	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR NP-239

REACTOR TYPE FAST REACTOR (PU FROM BWR) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-4.5616D-21	0.0	-1.6602D-12	2.1461D-11	-9.1598D-16
U-236	-1.4782D-19	0.0	-1.0337D-13	2.1843D-11	-4.2659D-16
U-237	0.0	1.9926D-11	-5.7776D-12	4.6484D-11	0.0
U-238	-1.5108D-14	0.0	-7.3556D-07	2.7770D-04	-2.5568D-08
NP-236	0.0	2.8926D-17	-4.7716D-21	6.6498D-19	0.0
NP-237	-5.6733D-17	0.0	-1.0985D-11	6.7987D-10	-2.9724D-15
NP-238	0.0	-9.3627D-12	-3.0614D-12	3.1290D-11	0.0
NP-239	0.0	-9.9999D-01	-1.6162D-07	-3.7173D-07	0.0
PU-236	3.3218D-25	0.0	3.3416D-25	5.2511D-26	0.0
PU-238	-3.5773D-12	0.0	-1.1073D-10	1.8768D-09	0.0
PU-239	-2.2031D-08	0.0	-2.5089D-04	2.0223D-03	-2.6776D-08
PU-240	-1.1131D-06	0.0	-6.7169D-04	2.0664D-02	-9.3632D-07
PU-241	-1.2250D-07	-9.1117D-04	-4.8981D-02	1.8867D-01	-3.9725D-05
PU-242	-1.7312D-06	0.0	-4.5971D-02	9.4111D-01	-8.8859D-05
AM-241	-3.5333D-06	0.0	-1.7876D-04	4.0326D-03	0.0
AM-242M	0.	-4.1264D-06	-3.5013D-04	2.2103D-03	-2.6018D-07
AM-242	0.0	-4.0979D-05	-1.7894D-06	4.9945D-05	-1.1547D-09
AM-243	9.9987D-01	0.0	-4.4160D-02	-8.9775D-02	0.0
CM-242	6.2279D-10	0.0	-1.1984D-11	4.2287D-11	0.0
CM-243	2.1139D-11	0.0	-6.8987D-13	3.0861D-11	-6.5658D-16
CM-244	4.0502D-08	0.0	-8.3841D-10	-6.8587D-10	0.0
CM-245	7.3179D-11	0.0	-8.3232D-12	-1.3589D-12	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR PU-236

REACTOR TYPE FAST REACTOR (PU FROM BWR) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-3.1208D-11	0.0	-1.1358D-02	6.5201D-02	-6.2666D-06
U-236	-1.0799D-09	0.0	-7.5516D-04	6.5887D-02	-3.0596D-06
U-237	0.0	3.0963D-02	-8.1736D-03	-1.8410D-03	0.0
U-238	-1.0282D-10	0.0	-5.0061D-03	-3.4587D-02	9.2517D-01
NP-236	0.0	3.0329D-04	-1.9842D-03	-2.2613D-04	0.0
NP-237	-2.1530D-07	0.0	-4.1689D-02	-8.8588D-02	9.9999D-01
NP-238	0.0	-1.1145D-12	-3.5834D-13	3.7199D-12	0.0
NP-239	0.0	7.9657D-07	-1.9589D-08	-4.5055D-08	0.0
PU-236	-2.5694D-01	0.0	-1.3786D-01	-2.1664D-02	0.0
PU-238	-4.1242D-13	0.0	-1.2765D-11	2.1959D-10	0.0
PU-239	4.9059D-05	0.0	-3.0431D-05	2.0073D-04	-3.2485D-09
PU-240	1.8352D-03	0.0	-6.7078D-05	2.9788D-04	-9.2836D-08
PU-241	8.7380D-05	4.2666D-03	-8.9051D-04	-1.5449D-04	-5.9212D-07
PU-242	1.0163D-08	0.0	-1.6526D-09	1.8627D-09	6.5422D-08
AM-241	4.3599D-03	0.0	-1.8171D-04	-3.8853D-04	0.0
AM-242M	0.0	-8.8094D-12	-6.2318D-10	-1.3592D-10	5.9555D-09
AM-242	0.0	-2.0493D-10	-3.0230D-13	8.4918D-15	2.0787D-10
AM-243	9.4363D-12	0.0	-5.2098D-11	3.7816D-09	0.0
CM-242	7.2845D-11	0.0	-1.3648D-12	4.1610D-12	0.0
CM-243	2.4568D-12	0.0	-6.8883D-14	2.8262D-12	-6.3691D-17
CM-244	3.8483D-09	0.0	-7.7894D-11	-6.9698D-11	0.0
CM-245	8.2175D-13	0.0	-8.4097D-14	-1.3730D-14	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR PU-238

REACTOR TYPE FAST REACTOR (PU FROM BWR) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-7.5050D-12	0.0	-2.7315D-03	1.6027D-02	-1.5070D-06
U-236	-2.5921D-10	0.0	-1.8126D-04	1.6201D-02	-7.3477D-07
U-237	0.0	8.2235D-03	-2.0612D-03	-4.6425D-04	0.0
U-238	-2.6364D-11	0.0	-1.2836D-03	2.6992D-03	2.3419D-01
NP-236	0.0	-4.0122D-11	-1.2750D-10	6.0834D-10	0.0
NP-237	-5.2629D-08	0.0	-1.0191D-02	2.3091D-01	-2.6955D-06
NP-238	0.0	6.4889D-04	-1.1217D-03	-1.3026D-04	0.0
NP-239	0.0	1.1776D-04	-6.7018D-06	-1.5414D-05	0.0
PU-236	-7.3312D-24	0.0	-7.3749D-24	-1.1589D-24	0.0
PU-238	-7.0594D-03	0.0	-1.1091D-01	-1.8003D-02	0.0
PU-239	1.0874D-05	0.0	-1.0204D-02	4.5091D-03	3.3969D-02
PU-240	4.4440D-04	0.0	-2.3388D-03	7.2563D-02	-2.0498D-06
PU-241	2.1640D-05	6.9579D-01	-1.7245D-01	-2.9917D-02	-1.3991D-04
PU-242	2.5892D-09	0.0	-3.2226D-07	-2.5094D-07	1.3138D-05
AM-241	3.4435D-04	0.0	-3.6883D-02	6.3460D-01	0.0
AM-242M	0.0	4.7922D-04	-7.7462D-05	-1.7059D-05	1.3633D-06
AM-242	0.0	1.0526D-03	-6.0078D-04	-1.3230D-04	-4.1410D-07
AM-243	6.7051D-09	0.0	-2.0314D-09	1.3473D-07	0.0
CM-242	2.4186D-01	0.0	-1.8865D-02	-1.7067D-02	0.0
CM-243	-1.8905D-09	0.0	-1.5066D-08	-1.8726D-08	6.2472D-07
CM-244	1.3723D-07	0.0	-2.8074D-09	-2.2949D-09	0.0
CM-245	2.4676D-10	0.0	-2.7756D-11	-4.5317D-12	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR PU-239

REACTOR TYPE FAST REACTOR (PU FROM BWR) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-1.9313D-16	0.0	-7.0289D-08	5.0333D-07	-3.8780D-11
U-236	-6.5415D-15	0.0	-4.5743D-09	5.1013D-07	-1.8643D-11
U-237	0.0	1.1111D-07	-7.8279D-08	2.9070D-07	0.0
U-238	-8.9327D-11	0.0	-4.3492D-03	4.9097D-01	-1.4635D-04
NP-236	0.0	-1.2159D-15	-3.1005D-15	1.7533D-14	0.0
NP-237	-1.5138D-12	0.0	-2.9311D-07	8.7596D-06	-7.7813D-11
NP-238	0.0	-5.0160D-08	-4.1520D-08	1.9256D-07	0.0
NP-239	0.0	-9.7557D-04	-3.0335D-04	-6.9770D-04	0.0
PU-236	4.4424D-26	0.0	4.4689D-26	7.0225D-27	0.0
PU-238	-9.9646D-08	0.0	-3.0843D-06	2.7161D-05	0.0
PU-239	-5.4113D-05	0.0	-4.5684D-01	-1.2420D-01	-4.7552D-05
PU-240	6.9167D-09	0.0	-3.8803D-06	-3.2853D-06	6.1381D-05
PU-241	8.9804D-10	1.7158D-05	-3.0580D-06	-3.9588D-07	5.5980D-09
PU-242	9.0772D-09	0.0	-3.0271D-08	7.5394D-07	1.5793D-10
AM-241	2.0269D-08	0.0	-6.2487D-07	1.6122D-05	0.0
AM-242M	0.0	6.4753D-09	-9.1043D-10	1.1677D-09	1.7389D-11
AM-242	0.0	8.5639D-08	-1.4676D-08	-3.1974D-09	-1.0433D-11
AM-243	7.9193D-07	0.0	-2.8866D-08	-5.8096D-08	0.0
CM-242	8.9116D-06	0.0	-3.6551D-07	4.8434D-07	0.0
CM-243	8.0386D-07	0.0	-2.3421D-08	-2.9276D-08	-1.8888D-11
CM-244	5.7944D-10	0.0	-1.6741D-11	-1.5154D-11	0.0
CM-245	1.9482D-15	0.0	-1.8285D-16	-2.9854D-17	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR PU-240

REACTOR TYPE FAST REACTOR (PU FROM BWR) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-1.1356D-17	0.0	-4.1329D-09	3.5765D-08	-2.2802D-12
U-236	-3.7841D-16	0.0	-2.6462D-10	3.6314D-08	-1.0834D-12
U-237	0.0	1.3129D-08	-6.6569D-09	3.1986D-08	0.0
U-238	-9.9869D-12	0.0	-4.8625D-04	8.8208D-02	-1.6588D-05
NP-236	0.0	-1.1881D-16	-1.7319D-16	1.1930D-15	0.0
NP-237	-1.0283D-13	0.0	-1.9910D-08	7.5881D-07	-5.3045D-12
NP-238	0.0	-5.9127D-09	-3.5301D-09	2.1424D-08	0.0
NP-239	0.0	8.6549D-04	-5.3050D-05	-1.2202D-04	0.0
PU-236	-2.3029D-26	0.0	-2.3167D-26	-3.6405D-27	0.0
PU-238	-6.6310D-09	0.0	-2.0525D-07	2.2435D-06	0.0
PU-239	-7.0843D-06	0.0	-8.0675D-02	2.8424D-01	-8.5052D-06
PU-240	-2.2317D-04	0.0	-1.0417D-01	-1.2208D-01	-1.3963D-04
PU-241	-9.4528D-11	-6.1333D-06	-7.0360D-05	-5.7470D-06	1.9578D-04
PU-242	9.3486D-10	0.0	-1.3704D-06	4.8362D-05	3.0724D-09
AM-241	1.4542D-09	0.0	-4.3842D-08	1.4213D-06	0.0
AM-242M	0.0	3.5663D-10	-6.0008D-09	5.1376D-08	-3.4836D-12
AM-242	0.0	7.6005D-09	-1.2276D-09	1.4309D-09	-8.8238D-13
AM-243	5.1567D-08	0.0	-1.3250D-06	4.7354D-05	0.0
CM-242	7.4236D-07	0.0	-2.5476D-08	1.1052D-07	0.0
CM-243	3.0723D-08	0.0	-2.9359D-09	9.8038D-08	-2.9503D-12
CM-244	4.8900D-05	0.0	-1.9740D-06	-1.7872D-06	0.0
CM-245	2.2643D-13	0.0	-2.9865D-14	-4.8759D-15	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR PU-241

REACTOR •TYPE FAST REACTOR (PU FROM BWR) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-9.7443D-19	0.0	-3.5465D-10	3.5382D-09	-1.9567D-13
U-236	-3.2117D-17	0.0	-2.2459D-11	3.5963D-09	-9.2236D-14
U-237	0.0	1.8117D-09	-7.5091D-10	4.3430D-09	0.0
U-238	-1.3726D-12	0.0	-6.6830D-05	1.5959D-02	-2.2978D-06
NP-236	0.0	-1.3700D-17	-1.4310D-17	1.1445D-16	0.0
NP-237	-9.8584D-15	0.0	-1.9089D-09	8.6610D-08	-5.0972D-13
NP-238	0.0	-8.3964D-10	-3.9806D-10	2.9202D-09	0.0
NP-239	0.0	2.1799D-04	-9.4770D-06	-2.1797D-05	0.0
PU-236	-5.0118D-26	0.0	-5.0417D-26	-7.9227D-27	0.0
PU-238	-6.2773D-10	0.0	-1.9430D-08	2.4841D-07	0.0
PU-239	-1.2717D-06	0.0	-1.4482D-02	6.9617D-02	-1.5351D-06
PU-240	-4.0351D-05	0.0	-2.4349D-02	3.4545D-01	-3.3234D-05
PU-241	-2.2255D-06	-9.6757D-02	-6.7530D-01	-1.1715D-01	-5.1858D-04
PU-242	1.6121D-12	0.0	-3.5009D-06	-4.6122D-07	6.6567D-05
AM-241	2.7055D-11	0.0	-1.0266D-08	2.8630D-07	0.0
AM-242M	0.0	1.0298D-10	-2.2489D-10	2.3471D-09	1.2325D-13
AM-242	0.0	1.6793D-09	-2.5689D-10	4.4572D-11	-1.8340D-13
AM-243	7.2307D-09	0.0	-7.4019D-08	3.6902D-06	0.0
CM-242	8.5558D-08	0.0	-2.2635D-09	6.2233D-09	0.0
CM-243	3.2388D-09	0.0	-1.4234D-10	4.7994D-09	-1.2951D-13
CM-244	3.7729D-06	0.0	-1.1047D-07	-8.5798D-08	0.0
CM-245	1.4211D-08	0.0	-2.4714D-09	-4.0349D-10	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR PU-242

REACTOR TYPE FAST REACTOR (PU FROM BWR) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-3.2813D-20	0.0	-1.1942D-11	1.3691D-10	-6.5889D-15
U-236	-1.0712D-18	0.0	-7.4910D-13	1.3927D-10	-3.0848D-15
U-237	0.0	9.6952D-11	-3.3046D-11	2.2894D-10	0.0
U-238	-7.3400D-14	0.0	-3.5737D-06	1.1041D-03	-1.2366D-07
NP-236	0.0	-9.4939D-19	-4.6556D-19	4.3027D-18	0.0
NP-237	-3.7063D-16	0.0	-7.1766D-11	3.8536D-09	-1.9199D-14
NP-238	0.0	-4.5503D-11	-1.7513D-11	1.5416D-10	0.0
NP-239	0.0	2.0480D-05	-6.4821D-07	-1.4909D-06	0.0
PU-236	1.6676D-26	0.0	1.6776D-26	2.6362D-27	0.0
PU-238	-2.3417D-11	0.0	-7.2482D-10	1.0792D-08	0.0
PU-239	-8.7650D-08	0.0	-9.9814D-04	6.4498D-03	-1.0625D-07
PU-240	-3.6178D-06	0.0	-2.1831D-03	4.9324D-02	-3.0194D-06
PU-241	-2.7523D-07	-7.0214D-03	-1.1005D-01	2.9225D-01	-8.7885D-05
PU-242	-4.0204D-06	0.0	-8.2805D-02	-1.0187D-01	-1.5768D-04
AM-241	-5.[illegible]086D-06	0.0	-2.6352D-04	4.3815D-03	0.0
AM-242M	0.0	4.4399D-06	-7.7510D-07	-1.7060D-07	9.8450D-09
AM-242	0.0	3.6723D-06	-4.1634D-06	-9.1686D-07	-2.8606D-09
AM-243	3.8525D-10	0.0	-3.2178D-09	1.9486D-07	0.0
CM-242	3.6729D-09	0.0	-8.1639D-11	2.5640D-10	0.0
CM-243	1.3061D-10	0.0	-4.8810D-12	1.9166D-10	-4.5522D-15
CM-244	1.9870D-07	0.0	-4.8083D-09	-3.9994D-09	0.0
CM-245	3.5381D-10	0.0	-4.6622D-11	-7.6118D-12	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR AM-241

REACTOR TYPE FAST REACTOR (PU FROM BWR) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-2.8081D-19	0.0	-1.0220D-10	1.0698D-09	-5.6387D-14
U-236	-9.2262D-18	0.0	-6.4517D-12	1.0876D-09	-2.6520D-14
U-237	0.0	6.2232D-10	-2.3819D-10	1.4823D-09	0.0
U-238	-4.7132D-13	0.0	-2.2948D-05	6.1625D-03	-7.9118D-07
NP-236	0.0	-5.8390D-18	-4.0785D-18	3.4248D-17	0.0
NP-237	-2.9501D-15	0.0	-5.7122D-10	2.7590D-08	-1.5263D-13
NP-238	0.0	-2.9005D-10	-1.2625D-10	9.9730D-10	0.0
NP-239	0.0	9.8543D-05	-3.6394D-06	-8.3706D-06	0.0
PU-236	1.4005D-25	0.0	1.4088D-25	2.2139D-26	0.0
PU-238	-1.8732D-10	0.0	-5.7979D-09	7.8396D-08	0.0
PU-239	-4.9013D-07	0.0	-5.5815D-03	3.1224D-02	-5.9286D-07
PU-240	-1.7777D-05	0.0	-1.0727D-02	1.9953D-01	-1.4747D-05
PU-241	-1.1136D-06	9.5158D-01	-4.2499D-01	-7.3727D-02	-3.3502D-04
PU-242	-1.1772D-11	0.0	-1.5226D-06	-5.6431D-07	3.7476D-05
AM-241	-2.0398D-03	0.0	-6.7073D-02	-1.4341D-01	0.0
AM-242M	0.0	-7.8079D-09	-5.5136D-07	-1.2070D-07	3.5611D-06
AM-242	0.0	-7.6078D-08	-1.5470D-10	-1.8006D-12	7.6939D-08
AM-243	2.4790D-09	0.0	-2.3348D-08	1.2595D-06	0.0
CM-242	2.6887D-08	0.0	-6.6763D-10	1.9240D-09	0.0
CM-243	9.9409D-10	0.0	-4.1240D-11	1.4665D-09	-3.7833D-14
CM-244	1.2870D-06	0.0	-3.4862D-08	-2.8579D-08	0.0
CM-245	2.9829D-09	0.0	-4.6644D-10	-7.6153D-11	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR AM-242M

REACTOR TYPE FAST REACTOR (PU FROM BWR) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-2.7725D-20	0.0	-1.0091D-11	1.2914D-10	-5.5673D-15
U-236	-8.9859D-19	0.0	-6.2837D-13	1.3144D-10	-2.5928D-15
U-237	0.0	1.1692D-10	-3.4436D-11	2.7307D-10	0.0
U-238	-8.8609D-14	0.0	-4.3142D-06	1.5934D-03	-1.4990D-07
NP-236	0.0	-1.8978D-17	-4.1825D-19	3.9657D-18	0.0
NP-237	-3.4207D-16	0.0	-6.6235D-11	4.0488D-09	-1.7725D-14
NP-238	0.0	-5.4964D-11	-1.8246D-11	1.8384D-10	0.0
NP-239	0.0	3.5965D-05	-9.2836D-07	-2.1352D-06	0.0
PU-236	-1.1724D-23	0.0	-1.1793D-23	-1.8533D-24	0.0
PU-238	-2.1564D-11	0.0	-6.6746D-10	1.1185D-08	0.0
PU-239	-1.2640D-07	0.0	-1.4394D-03	1.1280D-02	-1.5358D-07
PU-240	-6.2222D-06	0.0	-3.7547D-03	1.1042D-01	-5.2292D-06
PU-241	-6.4932D-07	9.7177D-01	-2.5963D-01	-4.5041D-02	-2.1015D-04
PU-242	-1.1196D-11	0.0	-5.2114D-07	-4.0012D-07	2.0062D-05
AM-241	-1.1066D-03	0.0	-5.5983D-02	8.8030D-01	0.0
AM-242M	0.0	-5.2060D-03	-2.0633D-01	-4.5437D-02	-1.5444D-04
AM-242	0.0	-6.3697D-08	-7.2506D-11	-1.1175D-11	6.4130D-08
AM-243	4.6385D-10	0.0	-3.3409D-09	2.3383D-07	0.0
CM-242	3.7246D-09	0.0	-7.2531D-11	2.5344D-10	0.0
CM-243	1.2689D-10	0.0	-4.1868D-12	1.8532D-10	-3.9788D-15
CM-244	2.3773D-07	0.0	-4.9966D-09	-4.0947D-09	0.0
CM-245	4.2896D-10	0.0	-4.9506D-11	-8.0827D-12	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR AM-242

REACTOR TYPE FAST REACTOR (PU FROM BWR) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-2.7725D-20	0.0	-1.0091D-11	1.2914D-10	-5.5673D-15
U-236	-8.9859D-19	0.0	-6.2837D-13	1.3144D-10	-2.5928D-15
U-237	0.0	1.1692D-10	-3.4436D-11	2.7307D-10	0.0
U-238	-8.8609D-14	0.0	-4.3142D-06	1.5934D-03	-1.4990D-07
NP-236	0.0	-1.8978D-17	-4.1825D-19	3.9657D-18	0.0
NP-237	-3.4207D-16	0.0	-6.6235D-11	4.0488D-09	-1.7725D-14
NP-238	0.0	-5.4964D-11	-1.8246D-11	1.8384D-10	0.0
NP-239	0.0	3.5965D-05	-9.2836D-07	-2.1352D-06	0.0
PU-236	-1.1724D-23	0.0	-1.1793D-23	-1.8533D-24	0.0
PU-238	-2.1564D-11	0.0	-6.6746D-10	1.1185D-08	0.0
PU-239	-1.2640D-07	0.0	-1.4394D-03	1.1280D-02	-1.5358D-07
PU-240	-6.2222D-06	0.0	-3.7547D-03	1.1042D-01	-5.2292D-06
PU-241	-6.4932D-07	9.7177D-01	-2.5963D-01	-4.5041D-02	-2.1015D-04
PU-242	-1.1196D-11	0.0	-5.2114D-07	-4.0012D-07	2.0062D-05
AM-241	-1.1066D-03	0.0	-5.5983D-02	8.8030D-01	0.0
AM-242M	0.0	9.9481D-01	-2.0633D-01	-4.5437D-02	-1.5444D-04
AM-242	0.0	-1.0000D+00	-7.2506D-11	-1.1175D-11	6.4130D-08
AM-243	4.6385D-10	0.0	-3.3409D-09	2.3383D-07	0.0
CM-242	3.7246D-09	0.0	-7.2531D-11	2.5344D-10	0.0
CM-243	1.2689D-10	0.0	-4.1868D-12	1.8532D-10	-3.9788D-15
CM-244	2.3773D-07	0.0	-4.9966D-09	-4.0947D-09	0.0
CM-245	4.2896D-10	0.0	-4.9506D-11	-8.0827D-12	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR AM-243

REACTOR TYPE / FAST REACTOR (PU FROM BWR) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-4.5616D-21	0.0	-1.6602D-12	2.1461D-11	-9.1598D-16
U-236	-1.4782D-19	0.0	-1.0337D-13	2.1843D-11	-4.2659D-16
U-237	0.0	1.9928D-11	-5.7776D-12	4.6484D-11	0.0
U-238	-1.5108D-14	0.0	-7.3556D-07	2.7770D-04	-2.5568D-08
NP-236	0.0	2.8926D-17	-4.7715D-21	6.6498D-19	0.0
NP-237	-5.6733D-17	0.0	-1.0985D-11	6.7987D-10	-2.9724D-15
NP-238	0.0	-9.3627D-12	-3.0614D-12	3.1290D-11	0.0
NP-239	0.0	6.4477D-06	-1.6162D-07	-3.7173D-07	0.0
PU-236	3.3218D-25	0.0	3.3416D-25	5.2511D-26	0.0
PU-238	-3.5773D-12	0.0	-1.1073D-10	1.8768D-09	0.0
PU-239	-2.2031D-08	0.0	-2.5089D-04	2.0223D-03	-2.6776D-08
PU-240	-1.1131D-06	0.0	-6.7169D-04	2.0664D-02	-9.3632D-07
PU-241	-1.2250D-07	-9.1117D-04	-4.8981D-02	1.8867D-01	-3.9725D-05
PU-242	-1.7312D-06	0.0	-4.5971D-02	9.4111D-01	-8.8859D-05
AM-241	-3.5333D-06	0.0	-1.7876D-04	4.0326D-03	0.0
AM-242M	0.0	-4.1264D-06	-3.5013D-04	2.2103D-03	-2.6018D-07
AM-242	0.0	-4.0979D-05	-1.7894D-06	4.9945D-05	-1.1547D-09
AM-243	-1.2843D-04	0.0	-4.4160D-02	-8.9775D-02	0.0
CM-242	6.2279D-10	0.0	-1.1984D-11	4.2287D-11	0.0
CM-243	2.1139D-11	0.0	-6.8987D-13	3.0861D-11	-6.5658D-16
CM-244	4.0502D-08	0.0	-8.3841D-10	-6.8587D-10	0.0
CM-245	7.3179D-11	0.0	-8.3232D-12	-1.3589D-12	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR CM-242

REACTOR TYPE FAST REACTOR (PU FROM BWR) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-4.3288D-20	0.0	-1.5755D-11	1.9710D-10	-8.6924D-15
U-236	-1.4053D-18	0.0	-9.8270D-13	2.0058D-10	-4.0534D-15
U-237	0.0	1.6822D-10	-5.1381D-11	3.9403D-10	0.0
U-238	-1.2741D-13	0.0	-6.2036D-06	2.1803D-03	-2.1533D-07
NP-236	0.0	-1.0030D-17	-6.1759D-19	6.0854D-18	0.0
NP-237	-5.2446D-16	0.0	-1.0155D-10	6.0294D-09	-2.7189D-14
NP-238	0.0	-7.9157D-11	-2.7226D-11	2.6534D-10	0.0
NP-239	0.0	4.6226D-05	-1.2732D-06	-2.9284D-06	0.0
PU-236	3.6205D-24	0.0	3.6421D-24	5.7233D-25	0.0
PU-238	-3.3053D-11	0.0	-1.0231D-09	1.6694D-08	0.0
PU-239	-1.7293D-07	0.0	-1.9693D-03	1.4504D-02	-2.0999D-07
PU-240	-8.0407D-06	0.0	-4.8520D-03	1.2943D-01	-6.7434D-06
PU-241	-7.4708D-07	9.6752D-01	-2.9872D-01	-5.1822D-02	-2.4068D-04
PU-242	-1.3298D-11	0.0	-6.7567D-07	-4.8389D-07	2.3670D-05
AM-241	-1.2918D-03	0.0	-6.5353D-02	8.6026D-01	0.0
AM-242M	0.0	1.9307D-03	-3.7775D-04	-8.3187D-05	2.6269D-06
AM-242	0.0	-3.4481D-03	-8.4196D-04	-1.8542D-04	-5.6462D-07
AM-243	6.6743D-10	0.0	-4.9859D-09	3.3665D-07	0.0
CM-242	-1.4103D+00	0.0	-3.0540D-02	-2.7630D-02	0.0
CM-243	-1.2737D-08	0.0	-3.3421D-08	-4.1486D-08	1.2286D-06
CM-244	3.4251D-07	0.0	-7.4554D-09	-6.1336D-09	0.0
CM-245	6.1606D-10	0.0	-7.3523D-11	-1.2004D-11	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR CM-243

REACTOR TYPE FAST REACTOR (PU FROM BWR) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-1.0510D-20	0.0	-3.8251D-12	5.3532D-11	-2.1104D-15
U-236	-3.3864D-19	0.0	-2.3681D-13	5.4502D-11	-9.7853D-16
U-237	0.0	5.8864D-11	-1.5463D-11	1.3640D-10	0.0
U-238	-4.4727D-14	0.0	-2.1777D-06	9.2084D-04	-7.5879D-08
NP-236	0.0	-6.4390D-17	-2.6915D-19	1.6019D-18	0.0
NP-237	-1.3935D-16	0.0	-2.6983D-11	1.8300D-09	-7.1713D-15
NP-238	0.0	-2.7607D-11	-8.1924D-12	9.1750D-11	0.0
NP-239	0.0	2.4004D-05	-5.3334D-07	-1.2267D-06	0.0
PU-236	6.1530D-22	0.0	6.1897D-22	9.7267D-23	0.0
PU-238	-8.7963D-12	0.0	-2.7226D-10	5.0191D-09	0.0
PU-239	-7.3074D-08	0.0	-8.3215D-04	7.5244D-03	-8.8926D-08
PU-240	-4.1073D-06	0.0	-2.4785D-03	8.7739D-02	-3.4670D-06
PU-241	-5.3178D-07	9.7688D-01	-2.1263D-01	-3.6888D-02	-1.7337D-04
PU-242	-8.6360D-12	0.0	-3.4163D-07	-2.9942D-07	1.5768D-05
AM-241	-8.8527D-04	0.0	-4.4788D-02	9.0424D-01	0.0
AM-242M	.0	4.6056D-04	-6.1114D-05	-1.3458D-05	1.4942D-06
AM-242	0.0	3.7120D-03	-8.4171D-04	-1.8536D-04	-5.8808D-07
AM-243	2.3368D-10	0.0	-1.4995D-09	1.1761D-07	0.0
CM-242	-5.1424D-01	0.0	-2.4320D-02	9.7800D-01	0.0
CM-243	-2.3223D-02	0.0	-3.2445D-02	-4.0556D-02	-3.7320D-05
CM-244	1.1933D-07	0.0	-2.2440D-09	-1.8143D-09	0.0
CM-245	2.1733D-10	0.0	-2.2584D-11	-3.6872D-12	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR CM-244

REACTOR TYPE FAST REACTOR (PU FROM BWR) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-1.0279D-21	0.0	-3.7412D-13	5.3784D-12	-2.0641D-16
U-236	-3.3114D-20	0.0	-2.3156D-14	5.4764D-12	-9.5724D-17
U-237	0.0	6.3104D-12	-1.5926D-12	1.4571D-11	0.0
U-238	-4.7985D-15	0.0	-2.3363D-07	1.0408D-04	-8.1483D-09
NP-236	0.0	5.2980D-16	1.0428D-18	2.8197D-19	0.0
NP-237	-1.3931D-17	0.0	-2.6974D-12	1.8890D-10	-1.2563D-15
NP-238	0.0	-2.9491D-12	-8.4381D-13	9.7952D-12	0.0
NP-239	0.0	2.8904D-06	-6.0128D-08	-1.3829D-07	0.0
PU-236	5.9156D-24	0.0	5.9509D-24	9.3514D-25	0.0
PU-238	-8.8082D-13	0.0	-2.7263D-11	5.1770D-10	0.0
PU-239	-8.2645D-09	0.0	-9.4115D-05	9.0689D-04	-1.0063D-08
PU-240	-4.9298D-07	0.0	-2.9748D-04	1.1558D-02	-4.1687D-07
PU-241	-7.1020D-08	1.8831D-03	-2.8397D-02	1.4089D-01	-2.3227D-05
PU-242	-1.1923D-06	0.0	-3.1660D-02	9.5724D-01	-6.1709D-05
AM-241	-3.2780D-06	0.0	-1.6584D-04	4.6163D-03	0.0
AM-242M	0.0	-1.0180D-06	-1.6099D-04	1.2777D-03	-1.1770D-07
AM-242	0.0	-1.8607D-05	-3.0737D-06	3.7457D-05	-2.1452D-09
AM-243	-5.8005D-05	0.0	-3.0567D-02	9.3539D-01	0.0
CM-242	-1.0634D-03	0.0	-5.0292D-05	2.4175D-03	0.0
CM-243	-2.3601D-05	0.0	-6.0991D-05	2.3868D-03	-7.0331D-08
CM-244	-4.2954D-02	0.0	-4.5529D-02	-4.1219D-02	0.0
CM-245	2.3351D-11	0.0	-2.3391D-12	-3.8189D-13	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR CM-245

REACTOR TYPE FAST REACTOR (PU FROM BWR) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-1.1430D-21	0.0	-4.1600D-13	1.6437D-12	-2.2952D-16
U-236	-7.0199D-21	0.0	-4.9089D-15	1.9381D-12	-1.4178D-17
U-237	0.0	2.6711D-12	-6.0534D-13	6.1566D-12	0.0
U-238	-2.0518D-15	0.0	-9.9899D-08	5.0778D-05	-3.4927D-09
NP-236	0.0	2.4841D-15	4.9513D-18	6.2040D-19	0.0
NP-237	-4.8003D-18	0.0	-9.2949D-13	7.2257D-11	-2.7482D-15
NP-238	0.0	-1.2427D-12	-3.2060D-13	4.1308D-12	0.0
NP-239	0.0	1.6199D-06	-2.9155D-08	-6.7057D-08	0.0
PU-236	2.2814D-21	0.0	2.2950D-21	3.6064D-22	0.0
PU-238	-3.0570D-13	0.0	-9.4622D-12	1.9770D-10	0.0
PU-239	-4.0386D-09	0.0	-4.5991D-05	5.0941D-04	-4.9238D-09
PU-240	-2.7463D-07	0.0	-1.6572D-04	7.6572D-03	-2.3305D-07
PU-241	-4.8103D-08	1.3796D-03	-1.9234D-02	1.1562D-01	-1.5811D-05
PU-242	-9.3300D-07	0.0	-2.4775D-02	9.6682D-01	-4.8548D-05
AM-241	-1.9167D-06	0.0	-9.6969D-05	3.2636D-03	0.0
AM-242M	0.0	-5.6581D-07	-9.2792D-05	8.7278D-04	-6.8167D-08
AM-242	0.0	-1.4595D-05	-2.1635D-06	3.1030D-05	-1.5327D-09
AM-243	-4.5524D-05	0.0	-2.3990D-02	9.4945D-01	0.0
CM-242	-6.7200D-04	0.0	-3.1781D-05	1.7456D-03	0.0
CM-243	-1.4026D-05	0.0	-3.6248D-05	1.7291D-03	-4.1871D-08
CM-244	-1.8984D-02	0.0	-3.5811D-02	9.6758D-01	0.0
CM-245	-7.8261D-05	0.0	-1.8825D-01	-3.0734D-02	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR U-235

REACTOR TYPE FAST REACTOR (PU FROM BL) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-2.4206D-09	0.0	-7.0623D-01	-1.9689D-01	-3.8964D-04
U-236	-4.5275D-13	0.0	-3.1660D-07	-1.8082D-06	2.1150D-05
U-237	0.0	3.6387D-10	-2.1767D-10	9.0313D-10	0.0
U-238	-2.8004D-13	0.0	-1.3635D-05	1.9686D-03	-4.6175D-07
NP-236	0.0	8.5084D-13	-2.3906D-13	-2.7200D-14	0.0
NP-237	-3.8305D-15	0.0	-7.4171D-10	2.4359D-08	1.2051D-10
NP-238	0.0	-1.6042D-10	-1.1456D-10	5.9945D-10	0.0
NP-239	0.0	9.9094D-06	-1.1980D-06	-2.7553D-06	0.0
PU-236	-1.0157D-25	0.0	-1.0218D-25	-1.6056D-26	0.0
PU-238	-1.2018D-10	0.0	-3.7198D-09	3.2720D-08	0.0
PU-239	6.4807D-03	0.0	-2.2148D-03	-6.0204D-04	-2.3210D-07
PU-240	1.8330D-07	0.0	-1.0207D-08	-1.1271D-08	7.7460D-08
PU-241	4.6240D-14	6.7873D-10	-8.8781D-11	-1.0534D-11	1.7526D-12
PU-242	6.5409D-14	0.0	-9.3137D-14	4.7177D-12	2.4892D-16
AM-241	8.1840D-13	0.0	-1.7692D-11	6.4939D-10	0.0
AM-242M	0.0	1.8557D-13	-1.9288D-14	2.9627D-14	3.8131D-16
AM-242	0.0	5.0434D-12	-5.7631D-13	-1.2564D-13	-4.1757D-16
AM-243	4.8639D-12	0.0	-8.9808D-14	-1.7920D-13	0.0
CM-242	4.2388D-10	0.0	-1.1364D-11	1.2701D-11	0.0
CM-243	2.2786D-11	0.0	-4.4847D-13	-5.6055D-13	-3.2796D-16
CM-244	3.3772D-15	0.0	-6.2243D-17	-5.6349D-17	0.0
CM-245	1.4797D-21	0.0	-1.0944D-22	-1.7868D-23	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR U-236

REACTOR TYPE FAST REACTOR (PU FROM BL) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-8.5722D-10	0.0	-3.1199D-01	8.9669D-01	-1.7213D-04
U-236	-4.6008D-08	0.0	-2.2202D-02	-1.2689D-01	-8.7875D-05
U-237	0.0	3.0940D-07	-7.4897D-08	-1.6123D-08	0.0
U-238	-2.2647D-13	0.0	-1.1027D-05	2.4012D-03	8.1528D-06
NP-236	0.0	1.5638D-08	-1.8116D-08	-2.0646D-09	0.0
NP-237	-1.8642D-12	0.0	-3.6097D-07	-7.5101D-07	9.1335D-06
NP-238	0.0	-1.3561D-10	-7.0592D-11	4.7924D-10	0.0
NP-239	0.0	3.0596D-05	-1.4311D-06	-3.2914D-06	0.0
PU-236	1.1891D-25	0.0	1.1962D-25	1.8797D-26	0.0
PU-238	-6.4008D-11	0.0	-1.9812D-09	2.1751D-08	0.0
PU-239	1.8617D-03	0.0	-2.7179D-03	1.0207D-02	-2.8761D-07
PU-240	1.6316D-02	0.0	-9.2133D-04	-1.0799D-03	-1.2503D-06
PU-241	2.2906D-11	-3.4719D-09	-4.1777D-08	-6.1735D-09	2.1323D-07
PU-242	2.9806D-14	0.0	-1.7223D-11	1.0586D-09	2.7988D-13
AM-241	7.5570D-10	0.0	-2.9584D-11	2.5124D-10	0.0
AM-242M	0.0	6.3275D-14	-5.6364D-13	6.3466D-12	2.8585D-16
AM-242	0.0	2.4160D-12	-2.5795D-13	2.3087D-13	-1.6218D-16
AM-243	1.6665D-12	0.0	-1.6826D-11	1.0506D-09	0.0
CM-242	1.8800D-10	0.0	-4.4342D-12	1.6480D-11	0.0
CM-243	6.7959D-12	0.0	-3.3101D-13	1.3154D-11	-3.2160D-16
CM-244	1.0830D-09	0.0	-2.5426D-11	-2.3019D-11	0.0
CM-245	2.8028D-18	0.0	-2.6640D-19	-4.3493D-20	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR U-237

REACTOR TYPE FAST REACTOR (PU FROM BL) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-1.3766D-13	0.0	-5.0101D-05	1.4587D-04	-2.7642D-08
U-236	-5.0842D-12	0.0	-3.5553D-06	1.4138D-04	-1.4082D-08
U-237	0.0	-1.0224D+00	-9.5960D-06	-2.1280D-06	0.0
U-238	-1.0260D-11	0.0	-4.9956D-04	1.1574D-01	9.6425D-04
NP-236	0.0	8.0674D-12	-2.8793D-12	-3.2730D-13	0.0
NP-237	-7.1635D-14	0.0	-1.3871D-08	6.2640D-07	1.4480D-09
NP-238	0.0	-6.0703D-09	-2.8795D-09	2.1114D-08	0.0
NP-239	0.0	1.5823D-03	-6.8788D-05	-1.5821D-04	0.0
PU-236	-3.6355D-25	0.0	-3.6572D-25	-5.7470D-26	0.0
PU-238	-2.4899D-09	0.0	-7.7067D-08	9.0995D-07	0.0
PU-239	-1.1223D-05	0.0	-1.3120D-01	6.2267D-01	-1.3906D-05
PU-240	-8.5647D-05	0.0	-5.2807D-02	9.3696D-01	-7.2501D-05
PU-241	9.9886D-01	-5.3827D-02	-2.9234D-01	-5.0715D-02	-2.3513D-04
PU-242	-1.6107D-12	0.0	-7.7027D-08	-6.2512D-08	3.2341D-06
AM-241	-[illegible]3790D-12	0.0	-9.5777D-10	3.2991D-08	0.0
AM-242M	0.0	9.8131D-12	-1.3712D-11	1.6648D-10	1.2627D-14
AM-242	0.0	2.3929D-10	-2.9250D-11	2.2015D-12	-2.1125D-14
AM-243	6.2295D-11	0.0	-4.3402D-10	3.1481D-08	0.0
CM-242	6.9021D-09	0.0	-1.4786D-10	4.7943D-10	0.0
CM-243	2.4242D-10	0.0	-8.7778D-12	3.5642D-10	-8.2307D-15
CM-244	3.2230D-08	0.0	-6.5555D-10	-4.4050D-10	0.0
CM-245	1.5299D-10	0.0	-1.8467D-11	-3.0151D-12	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR U-238

REACTOR TYPE FAST REACTOR (PU FROM BL) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-5.3877D-17	0.0	-1.9609D-08	8.9126D-08	-1.0819D-11
U-236	-1.8797D-15	0.0	-1.3144D-09	8.7863D-08	-5.2859D-12
U-237	0.0	-1.0686D-06	-9.0543D-09	1.0915D-06	0.0
U-238	-3.8290D-10	0.0	-1.4955D-02	-1.0343D-01	-5.3361D-04
NP-236	0.0	3.6808D-15	-9.7900D-16	-1.1157D-16	0.0
NP-237	-7.4975D-20	0.0	-1.4517D-14	-3.0571D-14	4.9455D-13
NP-238	0.0	-3.2844D-18	-1.2176D-18	1.1088D-17	0.0
NP-239	0.0	1.6557D-12	-4.9192D-14	-1.1314D-13	0.0
PU-236	7.0266D-30	0.0	7.0685D-30	1.1108D-30	0.0
PU-238	-9.4479D-19	0.0	-2.9243D-17	4.1866D-16	0.0
PU-239	1.0986D-10	0.0	-9.5680D-11	5.4225D-10	-1.0191D-14
PU-240	7.8221D-10	0.0	-3.7731D-11	2.7427D-10	-5.2062D-14
PU-241	4.1590D-12	-4.1475D-12	-6.1511D-11	3.0112D-10	-4.5709D-14
PU-242	3.1434D-10	0.0	-8.1039D-12	-9.9695D-12	-1.5863D-14
AM-241	-1.6399D-15	0.0	-8.4149D-14	2.3610D-12	0.0
AM-242M	0.0	1.1175D-15	-1.2775D-16	-2.8092D-17	2.2495D-18
AM-242	0.0	8.9127D-15	-2.1344D-15	-4.7004D-16	-1.5251D-18
AM-243	2.1198D-20	0.0	-1.0236D-19	8.7339D-18	0.0
CM-242	2.2179D-18	0.0	-4.0036D-20	1.2905D-19	0.0
CM-243	7.3960D-20	0.0	-2.0401D-21	8.7971D-20	-1.9059D-24
CM-244	8.9465D-18	0.0	-1.5453D-19	-1.3582D-19	0.0
CM-245	4.0896D-21	0.0	-3.8828D-22	-6.3393D-23	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR NP-237

REACTOR TYPE FAST REACTOR (PU FROM BL) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-5.3230D-11	0.0	-1.9373D-02	8.4867D-02	-1.0689D-05
U-236	-1.8651D-09	0.0	-1.3042D-03	8.3581D-02	-5.2388D-06
U-237	0.0	4.9518D-03	-8.2920D-03	-1.8675D-03	0.0
U-238	-1.4593D-10	0.0	-7.1052D-03	-4.9046D-02	9.0837D-01
NP-236	0.0	1.2164D-10	-9.8514D-10	3.3668D-09	0.0
NP-237	-4.5349D-07	0.0	-5.6823D-02	-1.2075D-01	-1.4892D-05
NP-238	0.0	-3.6641D-12	-1.4093D-12	1.2418D-11	0.0
NP-239	0.0	1.7048D-06	-5.2873D-08	-1.2161D-07	0.0
PU-236	7.8389D-27	0.0	7.8857D-27	1.2392D-27	0.0
PU-238	-1.1132D-12	0.0	-3.4457D-11	4.7798D-10	0.0
PU-239	1.0903D-04	0.0	-1.0259D-04	5.6215D-04	-1.0920D-08
PU-240	7.6616D-04	0.0	-3.9999D-05	2.9894D-04	-5.5126D-08
PU-241	6.3272D-06	3.3126D-04	-7.2537D-05	-1.2584D-05	-5.4394D-08
PU-242	4.1331D-11	0.0	-1.2421D-11	-4.3204D-12	5.9845D-10
AM-241	3.3919D-04	0.0	-1.2349D-05	-2.6404D-05	0.0
AM-242M	0.0	-6.2945D-13	-4.4485D-11	-9.7450D-12	4.1222D-10
AM-242	0.0	-1.3980D-11	-1.8485D-14	-1.1216D-15	1.4126D-11
AM-243	2.5475D-14	0.0	-1.3004D-13	1.0724D-11	0.0
CM-242	2.6948D-12	0.0	-5.0292D-14	1.6017D-13	0.0
CM-243	9.0744D-14	0.0	-2.6212D-15	1.1064D-13	-2.4441D-18
CM-244	1.0990D-11	0.0	-1.9633D-13	-1.6954D-13	0.0
CM-245	8.2015D-15	0.0	-8.6964D-16	-1.4198D-16	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR NP-239

REACTOR TYPE FAST REACTOR (PU FROM BL) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-8.0532D-19	0.0	-2.9310D-10	3.7889D-09	-1.6171D-13
U-236	-2.5629D-17	0.0	-1.7922D-11	3.7867D-09	-7.3960D-14
U-237	0.0	3.5204D-09	-1.0207D-09	8.2118D-09	0.0
U-238	-2.6709D-12	0.0	-1.3004D-04	4.9095D-02	-4.5201D-06
NP-236	0.0	5.0854D-15	-8.7572D-19	1.1727D-16	0.0
NP-237	-1.0006D-14	0.0	-1.9374D-09	1.1987D-07	-5.2420D-13
NP-238	0.0	-1.6503D-09	-5.3978D-10	5.5155D-09	0.0
NP-239	0.0	-9.9886D-01	-2.8573D-05	-6.5719D-05	0.0
PU-236	5.8495D-23	0.0	5.8844D-23	9.2469D-24	0.0
PU-238	-3.9644D-10	0.0	-1.2271D-08	1.9548D-07	0.0
PU-239	-4.9298D-06	0.0	-5.6140D-02	4.5024D-01	-5.9913D-06
PU-240	-4.7817D-05	0.0	-2.8855D-02	9.6618D-01	-4.0295D-05
PU-241	-4.3575D-07	-3.3484D-03	-1.7423D-01	9.5418D-01	-1.4280D-04
PU-242	-8.5579D-07	0.0	-2.2724D-02	9.6360D-01	-4.4609D-05
AM-241	-9.3159D-06	0.0	-4.7131D-04	1.4589D-02	0.0
AM-242M	0.0	-1.1118D-05	-9.4040D-04	7.9777D-03	-7.0219D-07
AM-242	0.0	-2.1302D-04	-6.2232D-06	2.5758D-04	-4.1888D-09
AM-243	9.9991D-01	0.0	-2.2166D-02	-4.5063D-02	0.0
CM-242	8.3767D-10	0.0	-1.3890D-11	5.5487D-11	0.0
CM-243	2.7229D-11	0.0	-7.7127D-13	3.9563D-11	-7.4877D-16
CM-244	4.2737D-09	0.0	-6.7633D-11	-5.3349D-11	0.0
CM-245	7.8819D-12	0.0	-6.9505D-13	-1.1348D-13	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR PU-236

REACTOR TYPE FAST REACTOR (PU FROM BL) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-3.1348D-11	0.0	-1.1409D-02	6.5498D-02	-6.2948D-06
U-236	-1.0644D-09	0.0	-7.4431D-04	6.4911D-02	-3.0156D-06
U-237	0.0	3.1080D-02	-8.2088D-03	-1.8489D-03	0.0
U-238	-1.0342D-10	0.0	-5.0353D-03	-3.4789D-02	9.3056D-01
NP-236	0.0	3.0331D-04	-1.9842D-03	-2.2614D-04	0.0
NP-237	-2.1556D-07	0.0	-4.1738D-02	-8.8694D-02	9.9999D-01
NP-238	0.0	-1.1177D-12	-3.5949D-13	3.7308D-12	0.0
NP-239	0.0	8.0121D-07	-1.9703D-08	-4.5317D-08	0.0
PU-236	-2.5709D-01	0.0	-1.3801D-01	-2.1687D-02	0.0
PU-238	-2.6198D-13	0.0	-8.1089D-12	1.3114D-10	0.0
PU-239	6.2124D-05	0.0	-3.8759D-05	2.5446D-04	-4.1373D-09
PU-240	4.8601D-04	0.0	-1.6249D-05	7.4501D-05	-2.2535D-08
PU-241	2.6859D-06	8.9325D-05	-1.4125D-05	-2.4506D-06	-9.6286D-09
PU-242	1.7548D-11	0.0	-1.4522D-12	4.2135D-13	8.1876D-11
AM-241	9.0806D-05	0.0	-2.7861D-06	-5.9572D-06	0.0
AM-242M	0.0	-8.7690D-14	-6.2075D-12	-1.3579D-12	7.2216D-11
AM-242	0.0	-3.1327D-12	-3.6911D-15	-2.1656D-16	3.1810D-12
AM-243	5.4559D-15	0.0	-2.2774D-14	2.1657D-12	0.0
CM-242	5.4622D-13	0.0	-8.8343D-15	3.0526D-14	0.0
CM-243	1.7661D-14	0.0	-4.2986D-16	2.0153D-14	-4.0650D-19
CM-244	2.2141D-12	0.0	-3.4376D-14	-3.0721D-14	0.0
CM-245	4.0088D-16	0.0	-3.2530D-17	-5.3110D-18	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR PU-238

REACTOR TYPE FAST REACTOR (PU FROM BL) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-2.4034D-11	0.0	-8.7474D-03	5.1326D-02	-4.8261D-06
U-236	-8.1451D-10	0.0	-5.6957D-04	5.0885D-02	-2.3089D-06
U-237	0.0	2.6318D-02	-6.5998D-03	-1.4865D-03	0.0
U-238	-8.4538D-11	0.0	-4.1160D-03	8.6555D-03	7.5096D-01
NP-236	0.0	-1.2774D-10	-4.0731D-10	1.9419D-09	0.0
NP-237	-1.6800D-07	0.0	-3.2529D-02	7.3619D-01	-8.6040D-06
NP-238	0.0	2.0691D-03	-3.5768D-03	-4.1536D-04	0.0
NP-239	0.0	3.7760D-04	-2.1490D-05	-4.9428D-05	0.0
PU-236	-2.3415D-23	0.0	-2.3555D-23	-3.7015D-24	0.0
PU-238	-8.6767D-03	0.0	-1.5105D-01	-2.4517D-02	0.0
PU-239	4.3988D-05	0.0	-4.0428D-02	1.8437D-02	1.3141D-01
PU-240	3.7254D-04	0.0	-1.8137D-03	6.1214D-02	-1.3698D-06
PU-241	2.0544D-06	6.2152D-02	-1.0908D-02	-1.8925D-03	-8.9423D-06
PU-242	1.3802D-11	0.0	-1.1370D-09	-1.1062D-09	7.2049D-08
AM-241	2.4672D-05	0.0	-2.2551D-03	5.8446D-02	0.0
AM-242M	0.0	3.3592D-05	-4.0717D-06	-8.9665D-07	6.3056D-08
AM-242	0.0	1.2079D-04	-5.3172D-05	-1.1709D-05	-3.7810D-08
AM-243	3.7272D-11	0.0	-3.2316D-12	2.5010D-10	0.0
CM-242	2.6796D-02	0.0	-1.3098D-03	-1.1850D-03	0.0
CM-243	-6.4836D-11	0.0	-5.7799D-10	-7.2007D-10	3.1009D-08
CM-244	2.5648D-10	0.0	-4.0217D-12	-3.1704D-12	0.0
CM-245	4.7058D-13	0.0	-4.1138D-14	-6.7163D-15	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR PU-239

REACTOR TYPE FAST REACTOR (PU FROM BL) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-1.6864D-16	0.0	-6.1377D-08	4.3952D-07	-3.3863D-11
U-236	-5.6063D-15	0.0	-3.9204D-09	4.3707D-07	-1.5978D-11
U-237	0.0	9.7007D-08	-6.8363D-08	2.5380D-07	0.0
U-238	-7.8105D-11	0.0	-3.8028D-03	4.2929D-01	-1.2797D-04
NP-236	0.0	-1.0577D-15	-2.7020D-15	1.5271D-14	0.0
NP-237	-1.3185D-12	0.0	-2.5530D-07	7.6234D-06	-6.7774D-11
NP-238	0.0	-4.3586D-08	-3.6137D-08	1.6740D-07	0.0
NP-239	0.0	-8.5301D-04	-2.6524D-04	-6.1005D-04	0.0
PU-236	3.8689D-26	0.0	3.8920D-26	6.1160D-27	0.0
PU-238	-4.0455D-08	0.0	-1.2522D-06	1.0014D-05	0.0
PU-239	-5.6206D-05	0.0	-4.8068D-01	-1.3068D-01	-4.9986D-05
PU-240	1.1812D-09	0.0	-1.0032D-06	-9.1516D-07	1.9363D-05
PU-241	1.6126D-11	2.5404D-07	-3.5226D-08	-3.3374D-09	1.8373D-10
PU-242	2.3344D-11	0.0	-5.8766D-11	2.6969D-09	6.3877D-14
AM-241	2.9464D-10	0.0	-7.0288D-09	2.4241D-07	0.0
AM-242M	0.0	7.3569D-11	-8.8971D-12	1.9267D-11	1.5794D-13
AM-242	0.0	1.7588D-09	-2.1599D-10	-4.6838D-11	-1.5604D-13
AM-243	2.7904D-09	0.0	-5.6918D-11	-1.1513D-10	0.0
CM-242	1.4946D-07	0.0	-4.4465D-09	9.8936D-09	0.0
CM-243	1.3760D-08	0.0	-2.9657D-10	-3.7070D-10	-2.6607D-13
CM-244	5.8663D-13	0.0	-1.1816D-14	-1.0697D-14	0.0
CM-245	6.8540D-19	0.0	-5.1861D-20	-8.4671D-21	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR PU-240

REACTOR TYPE FAST REACTOR (PU FROM BL) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-2.3680D-17	0.0	-8.6184D-09	7.4583D-08	-4.7550D-12
U-236	-7.7466D-16	0.0	-5.4171D-10	7.4325D-08	-2.2178D-12
U-237	0.0	2.7383D-08	-1.3887D-08	6.6713D-08	0.0
U-238	-2.0854D-11	0.0	-1.0154D-03	1.8419D-01	-3.4638D-05
NP-236	0.0	-2.4713D-16	-3.6058D-16	2.4828D-15	0.0
NP-237	-2.1400D-13	0.0	-4.1437D-08	1.5784D-06	-1.1040D-11
NP-238	0.0	-1.2288D-08	-7.3431D-09	4.4533D-08	0.0
NP-239	0.0	1.8073D-03	-1.1078D-04	-2.5479D-04	0.0
PU-236	-4.7898D-26	0.0	-4.8183D-26	-7.5717D-27	0.0
PU-238	-7.0408D-09	0.0	-2.1793D-07	2.1842D-06	0.0
PU-239	-1.8260D-05	0.0	-2.0794D-01	7.1727D-01	-2.1915D-05
PU-240	-1.7549D-04	0.0	-7.5397D-02	-8.8369D-02	-1.0216D-04
PU-241	-8.6783D-12	-4.4724D-07	-4.4864D-06	-5.5158D-07	2.0347D-05
PU-242	3.3540D-12	0.0	-3.9662D-09	2.2313D-07	2.9397D-11
AM-241	3.8701D-11	0.0	-9.4654D-10	3.8518D-08	0.0
AM-242M	0.0	7.6396D-12	-1.3707D-10	1.4470D-09	-8.4634D-14
AM-242	0.0	2.5868D-10	-3.2734D-11	5.3300D-11	-2.3785D-14
AM-243	1.8867D-10	0.0	-3.8740D-09	2.2147D-07	0.0
CM-242	2.1606D-08	0.0	-5.7987D-10	3.3507D-09	0.0
CM-243	8.0786D-10	0.0	-6.7858D-11	2.9564D-09	-7.0367D-14
CM-244	2.2806D-07	0.0	-5.8576D-09	-5.3031D-09	0.0
CM-245	3.9597D-16	0.0	-3.8994D-17	-6.3664D-18	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR PU-241

REACTOR TYPE FAST REACTOR (PU FROM BL) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-7.0712D-18	0.0	-2.5736D-09	2.5677D-08	-1.4199D-12
U-236	-2.2883D-16	0.0	-1.6002D-10	2.5620D-08	-6.5717D-13
U-237	0.0	1.3152D-08	-5.4519D-09	3.1528D-08	0.0
U-238	-9.9743D-12	0.0	-4.8563D-04	1.1597D-01	-1.6697D-05
NP-236	0.0	-9.9224D-17	-1.0371D-16	8.2918D-16	0.0
NP-237	-7.1425D-14	0.0	-1.3830D-08	6.2723D-07	-3.6929D-12
NP-238	0.0	-6.0772D-09	-2.8828D-09	2.1138D-08	0.0
NP-239	0.0	1.5841D-03	-6.8866D-05	-1.5839D-04	0.0
PU-236	-3.6275D-25	0.0	-3.6491D-25	-5.7344D-26	0.0
PU-238	-2.4927D-09	0.0	-7.7155D-08	9.1099D-07	0.0
PU-239	-1.1534D-05	0.0	-1.3135D-01	6.2339D-01	-1.3922D-05
PU-240	-8.7611D-05	0.0	-5.2868D-02	9.3803D-01	-7.2584D-05
PU-241	-1.2685D-06	-5.5151D-02	-2.9267D-01	-5.0773D-02	-2.3540D-04
PU-242	-1.7780D-12	0.0	-7.7115D-08	-6.2578D-08	3.2378D-06
AM-241	-2.4984D-12	0.0	-9.5886D-10	3.3029D-08	0.0
AM-242M	0.0	9.8243D-12	-1.3731D-11	1.6671D-10	1.2639D-14
AM-242	0.0	2.3957D-10	-2.9284D-11	2.2055D-12	-2.1149D-14
AM-243	6.2366D-11	0.0	-4.3460D-10	3.1522D-08	0.0
CM-242	6.9099D-09	0.0	-1.4803D-10	4.8004D-10	0.0
CM-243	2.4269D-10	0.0	-8.7889D-12	3.5689D-10	-8.2414D-15
CM-244	3.2267D-08	0.0	-6.5643D-10	-4.3564D-10	0.0
CM-245	1.5864D-10	0.0	-1.9181D-11	-3.1316D-12	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR PU-242

REACTOR TYPE FAST REACTOR (PU FROM BL) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-2.1206D-18	0.0	-7.7181D-10	8.8485D-09	-4.2582D-13
U-236	-6.7982D-17	0.0	-4.7539D-11	8.8374D-09	-1.9577D-13
U-237	0.0	6.2690D-09	-2.1370D-09	1.4804D-08	0.0
U-238	-4.7502D-12	0.0	-2.3128D-04	7.1451D-02	-8.0031D-06
NP-236	0.0	-6.1204D-17	-3.0057D-17	2.7772D-16	0.0
NP-237	-2.3922D-14	0.0	-4.6321D-09	2.4865D-07	-1.2392D-12
NP-238	0.0	-2.9349D-09	-1.1300D-09	9.9434D-09	0.0
NP-239	0.0	1.3254D-03	-4.1950D-05	-9.6485D-05	0.0
PU-236	1.0749D-24	0.0	1.0813D-24	1.6993D-25	0.0
PU-238	-8.9114D-10	0.0	-2.7583D-08	3.8292D-07	0.0
PU-239	-7.1405D-06	0.0	-8.1314D-02	5.2149D-01	-8.6547D-06
PU-240	-6.1751D-05	0.0	-3.7263D-02	9.5632D-01	-5.1694D-05
PU-241	-5.4425D-07	-1.4410D-02	-2.1761D-01	9.5299D-01	-1.7711D-04
PU-242	-2.0176D-06	0.0	-2.9622D-02	-3.6441D-02	-5.7858D-05
AM-241	-6.6726D-06	0.0	-3.3758D-04	8.5302D-03	0.0
AM-242M	0.0	7.0028D-06	-8.9551D-07	-1.9716D-07	9.4262D-09
AM-242	0.0	6.8460D-06	-7.7748D-06	-1.7122D-06	-5.5196D-09
AM-243	2.0313D-11	0.0	-1.2306D-10	1.0222D-08	0.0
CM-242	2.1456D-09	0.0	-4.0062D-11	1.4492D-10	0.0
CM-243	7.2165D-11	0.0	-2.2901D-12	1.0525D-10	-2.1879D-15
CM-244	1.0462D-08	0.0	-1.8586D-10	-1.4913D-10	0.0
CM-245	1.9137D-11	0.0	-1.8833D-12	-3.0748D-13	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR AM-241

REACTOR TYPE FAST REACTOR (PU FROM BL) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-4.0831D-18	0.0	-1.4860D-09	1.5555D-08	-8.1989D-13
U-236	-1.3172D-16	0.0	-9.2110D-11	1.5526D-08	-3.7862D-13
U-237	0.0	9.0526D-09	-3.4653D-09	2.1562D-08	0.0
U-238	-6.8626D-12	0.0	-3.3413D-04	8.9727D-02	-1.1520D-05
NP-236	0.0	-8.4695D-17	-5.9231D-17	4.9723D-16	0.0
NP-237	-4.2831D-14	0.0	-8.2934D-09	4.0042D-07	-2.2160D-12
NP-238	0.0	-4.2075D-09	-1.8323D-09	1.4468D-08	0.0
NP-239	0.0	1.4348D-03	-5.2991D-05	-1.2188D-04	0.0
PU-236	2.0311D-24	0.0	2.0432D-24	3.2107D-25	0.0
PU-238	-1.5302D-09	0.0	-4.7362D-08	5.9508D-07	0.0
PU-239	-8.9443D-06	0.0	-1.0186D-01	5.6449D-01	-1.0818D-05
PU-240	-7.2422D-05	0.0	-4.3702D-02	9.4878D-01	-6.0323D-05
PU-241	-7.2370D-07	9.6854D-01	-2.4876D-01	-4.3156D-02	-2.0133D-04
PU-242	-1.2804D-12	0.0	-5.1729D-08	-4.4533D-08	2.3929D-06
AM-241	-1.2163D-03	0.0	-2.9193D-02	-6.2421D-02	0.0
AM-242M	0.0	-1.7432D-09	-1.2320D-07	-2.7035D-08	1.0655D-06
AM-242	0.0	-3.3089D-08	-4.6933D-11	-5.2073D-12	3.3416D-08
AM-243	3.7034D-11	0.0	-2.4599D-10	1.8669D-08	0.0
CM-242	4.0369D-09	0.0	-8.2706D-11	2.7755D-10	0.0
CM-243	1.3974D-10	0.0	-4.8497D-12	2.0470D-10	-4.5728D-15
CM-244	1.9130D-08	0.0	-3.7154D-10	-2.8271D-10	0.0
CM-245	5.3654D-11	0.0	-6.1044D-12	-9.9664D-13	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR AM-242M

REACTOR TYPE FAST REACTOR (PU FROM BL) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-8.9907D-19	0.0	-3.2722D-10	4.1879D-09	-1.8054D-13
U-236	-2.8616D-17	0.0	-2.0011D-11	4.1854D-09	-8.2568D-14
U-237	0.0	3.7937D-09	-1.1175D-09	8.8607D-09	0.0
U-238	-2.8774D-12	0.0	-1.4010D-04	5.1743D-02	-4.8676D-06
NP-236	0.0	-6.1287D-16	-1.3548D-17	1.2847D-16	0.0
NP-237	-1.1081D-14	0.0	-2.1456D-09	1.3112D-07	-5.7420D-13
NP-238	0.0	-1.7795D-09	-5.9093D-10	5.9521D-09	0.0
NP-239	0.0	1.1679D-03	-3.0147D-05	-6.9337D-05	0.0
PU-236	-3.7919D-22	0.0	-3.8145D-22	-5.9943D-23	0.0
PU-238	-4.3655D-10	0.0	-1.3512D-08	2.1253D-07	0.0
PU-239	-5.1923D-06	0.0	-5.9129D-02	4.6087D-01	-6.3085D-06
PU-240	-4.9582D-05	0.0	-2.9920D-02	9.6493D-01	-4.1751D-05
PU-241	-4.5012D-07	9.8043D-01	-1.7998D-01	-3.1224D-02	-1.4739D-04
PU-242	-5.9368D-13	0.0	-2.0158D-08	-2.0066D-08	1.2380D-06
AM-241	-7.3840D-04	0.0	-3.7357D-02	9.2012D-01	0.0
AM-242M	0.0	-4.2603D-03	-1.4021D-01	-3.0876D-02	-1.0536D-04
AM-242	0.0	-4.2380D-08	-4.2367D-11	-8.0526D-12	4.2708D-08
AM-243	9.2276D-12	0.0	-5.0129D-11	4.6425D-09	0.0
CM-242	9.3307D-10	0.0	-1.5609D-11	6.1891D-11	0.0
CM-243	3.0404D-11	0.0	-8.6843D-13	4.4188D-11	-8.4221D-16
CM-244	4.7408D-09	0.0	-7.5709D-11	-5.9804D-11	0.0
CM-245	8.7380D-12	0.0	-7.7730D-13	-1.2691D-13	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR AM-242

REACTOR TYPE FAST REACTOR (PU FROM BL) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-8.9907D-19	0.0	-3.2722D-10	4.1879D-09	-1.8054D-13
U-236	-2.8616D-17	0.0	-2.0011D-11	4.1854D-09	-8.2568D-14
U-237	0.0	3.7937D-09	-1.1175D-09	8.8607D-09	0.0
U-238	-2.8774D-12	0.0	-1.4010D-04	5.1743D-02	-4.8676D-06
NP-236	0.0	-6.1287D-16	-1.3548D-17	1.2847D-16	0.0
NP-237	-1.1081D-14	0.0	-2.1456D-09	1.3112D-07	-5.7420D-13
NP-238	0.0	-1.7795D-09	-5.9093D-10	5.9521D-09	0.0
NP-239	0.0	1.1679D-03	-3.0147D-05	-6.9337D-05	0.0
PU-236	-3.7919D-22	0.0	-3.8145D-22	-5.9943D-23	0.0
PU-238	-4.3655D-10	0.0	-1.3512D-08	2.1253D-07	0.0
PU-239	-5.1923D-06	0.0	-5.9129D-02	4.6087D-01	-6.3085D-06
PU-240	-4.9582D-05	0.0	-2.9920D-02	9.6493D-01	-4.1751D-05
PU-241	-4.5012D-07	9.8043D-01	-1.7998D-01	-3.1224D-02	-1.4739D-04
PU-242	-5.9368D-13	0.0	-2.0158D-08	-2.0066D-08	1.2380D-06
AM-241	-7.3840D-04	0.0	-3.7357D-02	9.2012D-01	0.0
AM-242M	0.0	9.9575D-01	-1.4021D-01	-3.0876D-02	-1.0536D-04
AM-242	0.0	-1.0000D+00	-4.2367D-11	-8.0526D-12	4.2708D-08
AM-243	9.2276D-12	0.0	-5.0129D-11	4.6425D-09	0.0
CM-242	9.3307D-10	0.0	-1.5609D-11	6.1891D-11	0.0
CM-243	3.0404D-11	0.0	-8.6843D-13	4.4188D-11	-8.4221D-16
CM-244	4.7408D-09	0.0	-7.5709D-11	-5.9804D-11	0.0
CM-245	8.7380D-12	0.0	-7.7730D-13	-1.2691D-13	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR AM-243

REACTOR TYPE FAST REACTOR (PU FROM BL) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-8.0532D-19	0.0	-2.9310D-10	3.7889D-09	-1.6171D-13
U-236	-2.5629D-17	0.0	-1.7922D-11	3.7867D-09	-7.3960D-14
U-237	0.0	3.5204D-09	-1.0207D-09	8.2118D-09	0.0
U-238	-2.6709D-12	0.0	-1.3004D-04	4.9095D-02	-4.5201D-06
NP-236	0.0	5.0854D-15	-8.7571D-19	1.1727D-16	0.0
NP-237	-1.0006D-14	0.0	-1.9374D-09	1.1987D-07	-5.2420D-13
NP-238	0.0	-1.6503D-09	-5.3978D-10	5.5155D-09	0.0
NP-239	0.0	1.1399D-03	-2.8573D-05	-6.5719D-05	0.0
PU-236	5.8495D-23	0.0	5.8844D-23	9.2469D-24	0.0
PU-238	-3.9644D-10	0.0	-1.2271D-08	1.9548D-07	0.0
PU-239	-4.9298D-06	0.0	-5.6140D-02	4.5024D-01	-5.9913D-06
PU-240	-4.7817D-05	0.0	-2.8855D-02	9.6618D-01	-4.0295D-05
PU-241	-4.3575D-07	-3.3484D-03	-1.7423D-01	9.5418D-01	-1.4280D-04
PU-242	-8.5579D-07	0.0	-2.2724D-02	9.6360D-01	-4.4609D-05
AM-241	-9.3159D-06	0.0	-4.7131D-04	1.4589D-02	0.0
AM-242M	0.0	-1.1118D-05	-9.4040D-04	7.9777D-03	-7.0219D-07
AM-242	0.0	-2.1302D-04	-6.2232D-06	2.5758D-04	-4.1888D-09
AM-243	-8.6697D-05	0.0	-2.2166D-02	-4.5063D-02	0.0
CM-242	8.3767D-10	0.0	-1.3890D-11	5.5487D-11	0.0
CM-243	2.7229D-11	0.0	-7.7128D-13	3.9563D-11	-7.4878D-16
CM-244	4.2737D-09	0.0	-6.7633D-11	-5.3349D-11	0.0
CM-245	7.8819D-12	0.0	-6.9505D-13	-1.1348D-13	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR CM-242

REACTOR TYPE FAST REACTOR (PU FROM BL) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-1.1486D-18	0.0	-4.1802D-10	5.2295D-09	-2.3063D-13
U-236	-3.6616D-17	0.0	-2.5605D-11	5.2257D-09	-1.0561D-13
U-237	0.0	4.4659D-09	-1.3642D-09	1.0461D-08	0.0
U-238	-3.3853D-12	0.0	-1.6483D-04	5.7929D-02	-5.7213D-06
NP-236	0.0	-2.6495D-16	-1.6370D-17	1.6128D-16	0.0
NP-237	-1.3900D-14	0.0	-2.6915D-09	1.5976D-07	-7.2059D-13
NP-238	0.0	-2.0967D-09	-7.2140D-10	7.0285D-09	0.0
NP-239	0.0	1.2282D-03	-3.3829D-05	-7.7807D-05	0.0
PU-236	9.5795D-23	0.0	9.6367D-23	1.5143D-23	0.0
PU-238	-5.4045D-10	0.0	-1.6728D-08	2.5543D-07	0.0
PU-239	-5.8047D-06	0.0	-6.6102D-02	4.8383D-01	-7.0480D-06
PU-240	-5.3602D-05	0.0	-3.2345D-02	9.6209D-01	-4.5059D-05
PU-241	-4.8241D-07	9.7903D-01	-1.9289D-01	-3.3464D-02	-1.5768D-04
PU-242	-6.9290D-13	0.0	-2.3934D-03	-2.3483D-08	1.4075D-06
AM-241	-7.9618D-04	0.0	-4.0281D-02	9.1387D-01	0.0
AM-242M	0.0	1.4572D-03	-1.9783D-04	-4.3566D-05	1.1414D-06
AM-242	0.0	-3.4526D-03	-8.4031D-04	-1.8505D-04	-5.9220D-07
AM-243	1.1619D-11	0.0	-6.4526D-11	5.8447D-09	0.0
CM-242	-1.2384D+00	0.0	-2.2403D-02	-2.0269D-02	0.0
CM-243	-4.5559D-09	0.0	-1.1875D-08	-1.4786D-08	5.9067D-07
CM-244	5.9712D-09	0.0	-9.7453D-11	-7.7238D-11	0.0
CM-245	1.0989D-11	0.0	-9.9815D-13	-1.6296D-13	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR CM-243

REACTOR TYPE FAST REACTOR (PU FROM BL) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-4.6151D-19	0.0	-1.6797D-10	2.3507D-09	-9.2673D-14
U-236	-1.4605D-17	0.0	-1.0213D-11	2.3503D-09	-4.2201D-14
U-237	0.0	2.5867D-09	-6.7953D-10	5.9940D-09	0.0
U-238	-1.9668D-12	0.0	-9.5761D-05	4.0493D-02	-3.3367D-06
NP-236	0.0	-2.8161D-15	-1.1792D-17	7.0283D-17	0.0
NP-237	-6.1140D-15	0.0	-1.1839D-09	8.0271D-08	-3.1464D-13
NP-238	0.0	-1.2107D-09	-3.5936D-10	4.0237D-09	0.0
NP-239	0.0	1.0556D-03	-2.3453D-05	-5.3942D-05	0.0
PU-236	2.6952D-20	0.0	2.7112D-20	4.2605D-21	0.0
PU-238	-2.5290D-10	0.0	-7.8278D-09	1.3610D-07	0.0
PU-239	-4.0781D-06	0.0	-4.6441D-02	4.1814D-01	-4.9626D-06
PU-240	-4.2218D-05	0.0	-2.5476D-02	9.7014D-01	-3.5687D-05
PU-241	-3.9073D-07	9.8301D-01	-1.5623D-01	-2.7104D-02	-1.2844D-04
PU-242	-4.1516D-13	0.0	-1.3409D-08	-1.3924D-08	9.3152D-07
AM-241	-6.3243D-04	0.0	-3.1996D-02	9.3159D-01	0.0
AM-242M	0.0	3.3361D-04	-3.4246D-05	-7.5415D-06	8.2975D-07
AM-242	0.0	5.7023D-03	-8.4003D-04	-1.8499D-04	-6.0152D-07
AM-243	5.0198D-12	0.0	-2.4942D-11	2.5268D-09	0.0
CM-242	-4.0917D-01	0.0	-1.9351D-02	9.8249D-01	0.0
CM-243	-1.9541D-02	0.0	-2.2928D-02	-2.8660D-02	-2.6456D-05
CM-244	2.5757D-09	0.0	-3.7669D-11	-2.9329D-11	0.0
CM-245	4.7746D-12	0.0	-3.9064D-13	-6.3777D-14	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR CM-244

REACTOR TYPE FAST REACTOR (PU FROM BL) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-3.5465D-19	0.0	-1.2908D-10	1.8556D-09	-7.1215D-14
U-236	-1.1221D-17	0.0	-7.8464D-12	1.8555D-09	-3.2436D-14
U-237	0.0	2.1787D-09	-5.4991D-10	5.0309D-09	0.0
U-238	-1.6579D-12	0.0	-8.0718D-05	3.5959D-02	-2.8151D-06
NP-236	0.0	1.8203D-13	3.5829D-16	9.7065D-17	0.0
NP-237	-4.8023D-15	0.0	-9.2987D-10	6.5104D-08	-4.3245D-13
NP-238	0.0	-1.0162D-09	-2.9082D-10	3.3752D-09	0.0
NP-239	0.0	9.9859D-04	-2.0774D-05	-4.7780D-05	0.0
PU-236	2.0360D-21	0.0	2.0482D-21	3.2186D-22	0.0
PU-238	-2.0184D-10	0.0	-6.2474D-09	1.1227D-07	0.0
PU-239	-3.6280D-06	0.0	-4.1315D-02	3.9666D-01	-4.4174D-06
PU-240	-3.9018D-05	0.0	-2.3545D-02	9.7240D-01	-3.3032D-05
PU-241	-3.6386D-07	1.0728D-02	-1.4549D-01	9.4821D-01	-1.1980D-04
PU-242	-6.8931D-07	0.0	-1.8304D-02	9.5674D-01	-3.6055D-05
AM-241	-1.3701D-05	0.0	-6.9315D-04	2.5066D-02	0.0
AM-242M	0.0	-3.9736D-06	-6.6000D-04	6.6208D-03	-4.8559D-07
AM-242	0.0	-1.1729D-04	-1.6593D-05	2.5528D-04	-1.1813D-08
AM-243	-3.3921D-05	0.0	-1.7876D-02	9.4995D-01	0.0
CM-242	-4.9249D-03	0.0	-2.3291D-04	1.3503D-02	0.0
CM-243	-1.0077D-04	0.0	-2.6041D-04	1.3389D-02	-3.0099D-07
CM-244	-3.3157D-02	0.0	-2.7048D-02	-2.4487D-02	0.0
CM-245	3.7423D-12	0.0	-2.9911D-13	-4.8835D-14	0.0

COMPLETE SET OF SENSITIVITY COEFFICIENTS FOR CM-245

REACTOR TYPE FAST REACTOR (PU FROM BL) IRRADIATION 910DAYS

NUCLIDES	DECAY(ALPHA)	DECAY(BETA)	FISSION	CAPTURE	SIG-N2N
U-235	-6.3140D-19	0.0	-2.2980D-10	9.0796D-10	-1.2679D-13
U-236	-3.8140D-18	0.0	-2.6670D-12	1.0515D-09	-7.7099D-15
U-237	0.0	1.4766D-09	-3.3467D-10	3.4036D-09	0.0
U-238	-1.1350D-12	0.0	-5.5262D-05	2.8089D-02	-1.9321D-06
NP-236	0.0	1.3666D-12	2.7239D-15	3.4141D-16	0.0
NP-237	-2.6499D-15	0.0	-5.1309D-10	3.9882D-08	-1.5123D-12
NP-238	0.0	-6.8580D-10	-1.7695D-10	2.2796D-09	0.0
NP-239	0.0	8.9612D-04	-1.6128D-05	-3.7095D-05	0.0
PU-236	1.2570D-18	0.0	1.2645D-18	1.9871D-19	0.0
PU-238	-1.1761D-10	0.0	-3.6404D-09	7.2364D-08	0.0
PU-239	-2.8464D-06	0.0	-3.2414D-02	3.5801D-01	-3.4702D-06
PU-240	-3.3384D-05	0.0	-2.0145D-02	9.7639D-01	-2.8354D-05
PU-241	-3.1630D-07	9.8158D-03	-1.2647D-01	9.5449D-01	-1.0446D-04
PU-242	-5.9020D-07	0.0	-1.5672D-02	9.6215D-01	-3.0953D-05
AM-241	-1.0589D-05	0.0	-5.3569D-04	2.2422D-02	0.0
AM-242M	0.0	-2.9522D-06	-5.0457D-04	5.7866D-03	-3.7246D-07
AM-242	0.0	-1.1402D-04	-1.4804D-05	2.5824D-04	-1.0634D-08
AM-243	-2.9067D-05	0.0	-1.5318D-02	9.5645D-01	0.0
CM-242	-4.0094D-03	0.0	-1.8962D-04	1.2237D-02	0.0
CM-243	-7.8712D-05	0.0	-2.0341D-04	1.2154D-02	-2.3540D-07
CM-244	-1.2289D-02	0.0	-2.3181D-02	9.7901D-01	0.0
CM-245	-6.6138D-05	0.0	-1.2639D-01	-2.0635D-02	0.0