International Atomic Energy Agency

INDC(NDS)-127/NE

INDC INTERNATIONAL NUCLEAR DATA COMMITTEE

Proposed Recommended List of Heavy Element Radionuclide Decay Data

Part I. Half-lives (December 1981 Edition)

Part II. Provisional List of Alpha Spectra (December 1981 Edition)

This compilation supersedes the December 1980 Edition

A. Lorenz, editor

Compiled by Members of the IAEA
Coordinated Research Programme on the
Measurement and Evaluation of Transactinium
Isotope Decay Data

December 1981

IAEA NUCLEAR DATA SECTION, WAGRAMERSTRASSE 5, A-1400 VIENNA

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Introduction

The objective of the IAEA Coordinated Research Programme (CRP) on the Measurement and Evaluation of Transactinium Isotope Nuclear Decay Data, is to arrive at a consistent set of transactinium isotope decay data and their uncertainties (including half-lives, branching fractions and gamma-ray and alpha emission spectra) which would satisfy the requirements identified by the community of data users.

Since the beginning of this activity in 1978, the scope of radionuclides covered has widened to include most radionuclides which occur in or result from the nuclear fuel cycle. The sets of heavy radionuclide decay data, compiled and reviewed by members of the CRP, constitutes the "Proposed Recommended List" presented in this report.

In its present form, the enclosed list of half-lives should be regarded as containing tentatively proposed values. The group recognizes that considerable expertise in the area of half-life measurement and evaluation exists within research groups not directly involved in the preparation of this list. Consequently, this group wishes to elicit as wide a range of comments and criticism as possible on this list of proposed values.

Further reference to the activities of this CRP can be found in the Summary Report of their October 1981 meeting, INDC(NDS)-126/NE.

List of Half-Lives - December 1981 Edition

The decay data listed in this tabulation are the result of a critical appraisal of the current statu s of heavy element radionuclide half-lives and branching fractions by members of the IAEA Coordinated Research Programme on Measurement and Evaluation of Transactinium Isotope Decay Data. Members of this Coordinated Research Programme and those who participated in the critical review of the data (referred to below as the "Group") are listed in Appendix 1.

The data compiled in this list have been drawn from the following existing decay data files:

- ENSDF, the Evaluated Nuclear Structure and Decay Data File compiled by the Nuclear Data Project at Oak Ridge,
- the actinide data file of the Idaho National Engineering Laboratory (INEL) which serves as the source file for the decay data part of the ENDF/B compilation, and
- the UK Chemical Nuclear Data Committee Heavy Element Decay Data File, compiled at the AEE Winfrith laboratory.

Whenever warranted, the data have been supplemented or superseded by the latest known measured and/or evaluated values.

At their meeting in October 1981, the Group reviewed the "Proposed Recommended List of Transactinium Isotope Decay Data. Part I. Half-lives (December 1980 Edition)" published in INDC(NDS)-121/NE, in the light of new measurements which have been completed since the June 1980 meeting.

In reviewing the measurements which have been completed since June 1980, the group made the following changes in the recommended list of half-lives:

1. A new evaluation of the total half-lives of the uranium isotopes by N.E. Holden (1) was accepted by the group; this resulted in the adoption of the following new values:

^{232}U $T_{1/2}$ = (69.8 ± 1.0) years

^{233}U $T_{1/2}$ = $(1.592 \pm 0.002).10^5$ years

^{234}U $T_{1/2}$ = $(2.454 \pm 0.006).10^5$ years

^{235}U $T_{1/2}$ = $(7.037 \pm 0.011).10^8$ years

^{236}U $T_{1/2}$ = $(2.342 \pm 0.003).10^7$ years

^{238}U $T_{1/2}$ = $(4.468 \pm 0.005).10^9$ years

2. A new measurement of the ^{237}Pu half-life by H. Baba et al (2) at JAERI, has yielded a new value of (45.12 ± 0.03) days. The group recommended that this half-life be evaluated in the light of this new measurement before introducing a new value into the recommended list. CBNM was asked to perform this evaluation.

3. New measurements of the half-life of ^{241}Pu have been reported in the open literature during 1980/1981 (3,4). These new data, coupled with earlier work indicate reasonable agreement between mass-spectrometric (unweighted mean value of (14.34 ± 0.04)y) and ^{241}Am in-growth (unweighted mean value of (14.5 ± 0.1)y) measurements. In view of these developments, the group's earlier recommended value of (14.7 ± 0.4)y requires adjustment. Although a number of problems are still unresolved, this group recommends a provisional change to (14.4 ± 0.2)y.

   Among the remaining problems, one particular measurement with a Pu-240, 241, 242 enriched sample continues to show a marked discrepancy from the above value, i.e. (14.8 ± 0.1)y (5,6), and the possible effects of chemical bonding on the half-life (7) still requires investigation.

4. A new measurement of the ^{242}Cm half-life by Usuda et al, (8) at JAERI has yielded a value of (161.35 ± 0.30) days. The group recommended that this half-life be evaluated in the light of this new measurement before introducing it in the recommended list. CBNM was asked to perform this evaluation.

5. New measurements of the spontaneous fission half-lives for ^{233}U, ^{234}U, ^{235}U and ^{236}U have been reported by H.R. von Gunten et al, (9) at EIR/Wuerenlingen . The group accepted these new measurements subject to an assessment by Knitter (CBNM). The new values are:

$$^{233}U \quad (T_{1/2})_{SF} = 2.7 \cdot 10^{17} \text{ years}$$

$$^{234}U \quad (T_{1/2})_{SF} = (1.42 \pm 0.08) \cdot 10^{16} \text{ years}$$

$$^{235}U \quad (T_{1/2})_{SF} = (9.8 \pm 2.8) \cdot 10^{18} \text{ years}$$

$$^{236}U \quad (T_{1/2})_{SF} = (2.43 \pm 0.13) \cdot 10^{16} \text{ years}$$

6. Special consideration was given to the spontaneous fission data evaluated and calculated for the UK heavy element decay data library (UKHEDD-1) (10). The tabulated data comprises the prompt energy release (Qsf), the branching fraction, and the average number of prompt neutron ($\bar{\nu}_p$) for 26 heavy element nuclides. Of the branching fractions given in this tabulation, most are identical with the proposed recommended values listed in INDC(NDS)-121/NE, or fall within the quoted uncertainties. The only branching fraction (BF) value which is significantly different is that for ^{240}Pu which was recently reevaluated for the UKHEDD-1 library. The following new value was adopted

$$^{240}Pu \quad (BF)_{SF} = (5.7 \pm 0.2).10^{-8}$$

yielding the revised spontaneous fission half-life of

$$^{240}Pu \quad (T_{1/2})_{SF} = (1.15 \pm 0.04).10^{11}y$$

Provisional List of Alpha Spectra - December 1981 Edition

The provisional list of alpha spectra of heavy radionuclides given in this report consists of values published in the Nuclear Data Sheets, supplemented where warranted by values from the Table of Isotopes (7th Edition) and represents the current status of the published data. A proposed recommended list of alpha spectra will replace the provisional list after an evaluation of new and ongoing measurements will have been performed by the group.

References

(1) N.E. Holden, BNL-NCS-51320 (1981)
(2) H. Baba, T. Suzuki, K. Hata, J. Inorg. Nucl. Chem 43 1062 (1981)
(3) S.F. Marsh, R.M. Abernathey, R.J. Beckman, J.E. Rein, Int. J. Appl. Rad. Isotopes 31 629 (1980).
(4) S.K. Aggarwal, S.N. Acharya, A.R. Parab, H.C. Jain, Phys. Rev. 23 C 1748 (1981)
(5) E.A.C. Crouch, I.C. McKean, UKNDC(78) P38, p. 97(1978)
(6) A.L. Nichols, IAEA-TECDOC-232, p. 67 (1980)
(7) V.N. Tikhonov, F.E. Chukreev, INDC(CCP)-151/NF (1980)
(8) H. Umezawa, INDC(NDS)-126/NE, Appendix 9 (1981)
(9) H.R. von Gunten, et al., Phys. Rev. 23 C 1110 (1981)
(10) A.L. Nichols, INDC(NDS)-126/NE, Appendix 6 (1981)

Description of Table Entries

Decay mode:	A	Alpha decay	IT	Isomeric transition
	B-	Beta decay	SF	Spontaneous fission
	EC	Electron capture	T	total half-life (derived from partial half-lives)
Units :	MS	millisecond	H	hour
	S	second	D	day
	M	minute	Y	year (= 365.2422 days)

Half-life data: expressed in commonly accepted units

Half-life uncertainties:

In ascribing uncertainties to the recommended half-life values, the group adopted the following criteria:

- the total uncertainty be defined as "1 sigma random error plus 1/3 the linear sum of the systematic errors based on a statistical confidence level of 68.3 %", and that
- the total uncertainty be in no case lower than 0.1 %.

It must be noted that not all assigned uncertainties have an experimental basis.

Percent uncertainty: calculated quantity; number of significant figures provides visual check of data consistency

Branching Fractions: defined such that the total decay probability for all modes of decay does not exceed unity.

Reference: identification of data origin, given at end of each table

Comments: A. Half-life derived from branching fraction

B. Branching fraction derived from half-life

C. Total half-life as defined here equals partial half-life multipled by branching fraction.

References to the List of Proposed Recommended Heavy Element Radionuclide Half-lives and Branching Ratios

EL7601 — Y.A. Ellis
Mass Chain Evaluation A = 243
Nuclear Data Sheets 19, (1) (1976) 103

GU8101 — H.R. von Gunten, et al.
Ground-state spontaneous fission half-lives of uranium isotopes
Phys. Rev. C 23 1110 (1981)

HO8101 — N.E. Holden
The uranium half-lives. A critical review.
Brookhaven National Laboratory Report
BNL-NCS-51320, January 1981

KU8001 — V. Kulakov
Priv. Comm.(June 1980)
(see INDC(NDS)-118/NE, Appendix 9)

LE7801 — C.M. Lederer, V.S. Shirley (Edts.)
Table of Isotopes (7th Edition)
John Wiley and Sons (1978)

LO7901 — A. Lorenz
INDC(NDS)-108/N, Proposed Recommended List of Transactinium Isotope Decay Data.
Part I. Half-lives (September 1979 Edition)

LO8101 — A. Lorenz
INDC(NDS)-127/NE. Proposed recommended list of heavy element isotope decay data.
Part I. Half-lives. (December 1981 Edition)

ME7901 — J.W. Meadows, et al.
Phys. Rev. C 22 (2) (1980) 750

NI7801 — A.L. Nichols, M.F. James
INDC(NDS)-105/N, Appendix 5 (1979)
Subset of the UK Chemical Nuclear Data Committee Heavy Element Decay Data File Compiled at the AEE Winfrith Laboratory (Incorporated into original IAEA File in September 1979)

NI7802 Same as NI7801, incorporated into IAEA File in September 1980.

RE7801 C.W. Reich
INEL Actinide Decay Data File for ENDF/B-V
Subset incorporated into original IAEA File in September 1979

RE8001 C.W. Reich, Private Communication (November 1980)

ZE7901 A.G. Zelenkov, et al.
Atomnaya Energiya 47 (1979) 404-406

References to the List of Proposed Recommended Heavy Element Radionuclide Isotope Alpha Spectra

BA7801 S.A. Baranov
Conf. Proc. Nuclear Spectroscopy and the Structure of the Atomic Nucleus, Alma Ata (1978) 123.

EL7601 Y.A. Ellis
Mass Chain Evaluation A = 243
Nuclear Data Sheets 19, (1) (1976) 103

EL7701 Y.A. Ellis
Mass Chain Evaluation A = 234
Nuclear Data Sheets 21, (4) (1977) 493

EL7702 Y.A. Ellis, R.L. Haese
Mass Chain Evaluation A = 242
Nuclear Data Sheets 21, (4) 1977) 615

EL7703 Y.A. Ellis
Mass Chain Evaluation A = 230
Nuclear Data Sheets 20 (2) (1977) 139

EL7801 Y.A. Ellis
Mass Chain Evaluation A = 241
Nucler Data Sheets 23, (1) (1978) 123

HO7601 D.J. Horen
Mass Chain Evaluation A = 228
Nuclear Data Sheets 17 (3) (1976) 367

LE7801 C.M. Lederer, V.S. Shirley (Edts.)
Table of Isotopes (7th Edition)
John Wiley and Sons (1978)

SC7601 M.R. Schmorak
Mass Chain Evaluation A = 244-262 (even A), Nuclear Data Sheets 17, (3) (1976) 391

SC7701 M.R. Schmorak
Mass Chain Evaluation A = 239
Nuclear Data Sheets 21, (1) (1977) 153

SC7702 M.R. Schmorak
Mass Chain Evaluation A = 240
Nuclear Data Sheets 20, (2) (1977) 218

SC8101 M.R. Schmorak
Mass Chain Evaluation A = 246-262 (even A)
Nuclear Data Sheets 32, (1) (1981) 87

TO7801 K.S. Toth
Mass Chain Evaluation A = 229
Nuclear Data Sheets 24 (2) (1978) 263

Appendix 1

PARTICIPANTS IN THE REVIEW OF THE DATA

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NUCLIDE	DECAY MODE	*	HALF-LIFE UNITS	DATA	UNCERTAINTY		PER-CENT	REFERENCE	*	BRANCHING FRACTION DATA	UNCERTAINTY		PER-CENT	REFERENCE	*	COMMENT
80-HG-206	B-	*	M	(8.15	+- 0.10	)	1.227	NI7801	*						*	
81-TL-206	B-	*	M	(4.20	+- 0.02	)	0.476	NI7802	*						*	
81-TL-206M1	IT	*	M	(3.8	+- 0.2	)	5.263	NI7802	*						*	
81-TL-207	B-	*	M	(4.77	+- 0.03	)	0.629	NI7801	*						*	
81-TL-207M1	IT	*	S	(1.33	+- 0.11	)	8.271	NI7801	*						*	
81-TL-208	B-	*	M	(3.053	+- 0.004	)	0.131	NI7802	*						*	
81-TL-209	B-	*	M	(2.20	+- 0.07	)	3.182	NI7801	*						*	
81-TL-210	B-	*	M	(1.30	+- 0.03	)	2.308	NI7802	*						*	
82-PB-205	EC	*	Y	(1.4	+- 0.1	)E+7	7.143	NI7802	*						*	
82-PB-209	B-	*	H	(3.253	+- 0.014	)	0.430	NI7801	*						*	
82-PB-210	A	*	Y	(1.01	+- 0.32	)E+9	31.683	NI7802	*	(2.2	+- 0.7	)E-8	31.818	NI7802	*	A
82-PB-210	B-	*	Y	(22.2	+- 0.2	)	0.901	NI7802	*	1.0				NI7802	*	
82-PB-211	B-	*	M	(36.1	+- 0.2	)	0.554	NI7801	*						*	
82-PB-212	B-	*	H	(10.64	+- 0.01	)	0.094	NI7802	*						*	
82-PB-214	B-	*	M	(26.8	+- 0.9	)	3.358	NI7801	*						*	
83-BI-210	A	*	Y	(1.056	+- 0.081	)E+4	7.670	NI7802	*	(1.3	+- 0.1	)E-6	7.692	NI7802	*	A
83-BI-210	B-	*	D	(5.013	+- 0.005	)	0.100	NI7802	*	1.0				NI7802	*	
83-BI-210M1	A	*	Y	(3.0	+- 0.2	)E+6	6.667	NI7802	*						*	
83-BI-211	A	*	M	(2.17	+- 0.04	)	1.843	NI7801	*	(0.99727	+- 0.00004	)	0.004	NI7801	*	
83-BI-211	B-	*	M	(13.25	+- 0.28	)	2.113	NI7801	*	(2.73	+- 0.03	)E-3	1.099	NI7801	*	A
83-BI-212	T	*	M	(60.60	+- 0.05	)	0.083	NI7802	*						*	C
83-BI-212	A	*	M	(168.8	+- 0.5	)	0.296	NI7802	*	(0.359	+- 0.001	)	0.279	NI7802	*	A
83-BI-212	B-	*	M	(94.54	+- 0.17	)	0.180	NI7802	*	(0.641	+- 0.001	)	0.156	NI7802	*	A
83-BI-212M1	T	*	M	(25.	+- 1.0	)	4.000	NI7802	*						*	C
83-BI-212M1	A	*	M	(26.9	+- 1.6	)	5.948	NI7802	*	(0.93	+- 0.04	)	4.301	NI7802	*	A
83-BI-212M1	B-	*	M	(357.	+- 204.	)	57.143	NI7802	*	(0.07	+- 0.04	)	57.143	NI7802	*	A
83-BI-212M2	B-	*	M	(9,	+- 1.	)	11.111	NI7802	*						*	
83-BI-213	T	*	M	(45.59	+- 0.06	)	0.132	NI7802	*						*	C
83-BI-213	A	*	M	(35.18	+- 2.12	)	6.026	NI7802	*	(0.0216	+- 0.0013	)	6.019	NI7802	*	A
83-BI-213	B-	*	M	(46.60	+- 0.09	)	0.193	NI7802	*	(0.9784	+- 0.0013	)	0.133	NI7802	*	A
83-BI-214	A	*	D	(65.8	+- 3.4	)	5.167	NI7802	*	(2.1	+- 0.1	)E-4	4.762	NI7802	*	A
83-BI-214	B-	*	M	(19.9	+- 0.4	)	2.010	NI7802	*	(0.99979	+- 0.00001	)	0.001	NI7802	*	

NUCLIDE	DECAY MODE	HALF-LIFE UNITS	HALF-LIFE DATA	HALF-LIFE UNCERTAINTY	HALF-LIFE PER-CENT	HALF-LIFE REFERENCE	BRANCHING FRACTION DATA	BRANCHING FRACTION UNCERTAINTY	BRANCHING FRACTION PER-CENT	BRANCHING FRACTION REFERENCE	COMMENT
83-BI-215	B-	M	(7.4	+- 0.6)	8.108	NI7801					
84-PO-209	A	Y	(102.0	+- 5.0)	4.902	NI7802	(0.9974	+- 0.0001)	0.010	NI7802	
84-PO-209	EC	Y	(392.3	+- 24.4)	6.220	NI7802	(2.6	+- 0.1)E-3	3.846	NI7802	A
84-PO-210	A	D	(138.4	+- 0.2)	0.145	NI7802					
84-PO-211	A	S	(0.516	+- 0.003)	0.581	NI7801					
84-PO-211M1	A	S	(25.5	+- 0.3)	1.176	NI7801	(0.998	+- 0.002)	0.200	NI7801	
84-PO-212	A	S	(3.00	+- 0.05)E-7	1.667	NI7802					
84-PO-212M1	A	S	(45.1	+- 0.6)	1.330	NI7802	(1.000	+- 0.015)	1.500	NI7802	
84-PO-213	A	S	(4.2	+- 0.8)E-6	19.048	NI7802					
84-PO-214	A	MS	(0.165	+- 0.003)	1.818	NI7801					
84-PO-215	A	MS	(1.78	+- 0.01)	0.562	NI7801	1.0			NI7801	
84-PO-215	B	S	(445.	+- 445.)	100.000	NI7801	(4.	+- 2.)E-6	50.000	NI7801	A
84-PO-216	A	S	(0.15	+- 0.01)	6.667	NI7801					
84-PO-218	A	M	(3.05	+- 0.09)	2.951	NI7801	(0.9998	+- 0.0001)	0.010	NI7801	
84-PO-218	B-	D	(10.6	+- 5.3)	50.000	NI7801	(2.	+- 1.)E-4	50.000	NI7801	A
85-AT-215	A	MS	(0.1	+- 0.02)	20.000	NI7801					
85-AT-217	A	S	(0.0323	+- 0.0004)	1.238	NI7802	(0.99988	+- 0.00004)	0.004	NI7802	
85-AT-217	B-	S	(270.	+- 90.)	33.333	NI7802	(1.2	+- 0.4)E-4	33.333	NI7802	A
85-AT-218	A	S	(1.6	+- 0.4)	25.000	NI7801	(0.999	+- 0.001)	0.100	NI7801	
85-AT-218	B-	M	(26.7	+- 26.7)	100.000	NI7801	(1.	+- 1.)E-3	100.000	NI7801	A
85-AT-219	T	M	(0.9	+- 0.1)	11.111	NI7801					
85-AT-219	A	M	(0.928	+- 0.104)	11.207	NI7801	(0.97	+- 0.01)	1.031	NI7801	A
85-AT-219	B-	M	(30.	+- 10.)	33.333	NI7801	(0.03	+- 0.01)	33.333	NI7801	A
86-RN-217	A	S	(5.4	+- 0.5)E-4	9.259	NI7802					
86-RN-218	A	MS	(35.0	+- 6.0)	17.143	NI7801					
86-RN-219	A	S	(3.96	+- 0.05)	1.263	NI7801					
86-RN-220	A	S	(55.6	+- 0.1)	0.180	NI7801					
86-RN-222	A	D	(3.825	+- 0.004)	0.105	NI7801					
87-FR-221	A	M	(4.9	+- 0.2)	4.082	NI7802					
87-FR-223	A	D	(252.	+- 42.)	16.667	NI7802	(6.	+- 1.)E-5	16.667	NI7802	A
87-FR-223	B-	M	(21.8	+- 0.4)	1.835	NI7802	(0.99994	+- 0.00001)	0.001	NI7802	

NUCLIDE	DECAY MODE	UNITS	HALF-LIFE DATA	HALF-LIFE UNCERTAINTY	PER-CENT	REFERENCE	BRANCHING FRACTION DATA	BRANCHING FRACTION UNCERTAINTY	PER-CENT	REFERENCE	COMMENT
88-RA-223	A	D	(11.43	+- 0.02)	0.175	NI7801					
88-RA-224	A	D	(3.66	+- 0.04)	1.093	NI7801					
88-RA-225	B-	D	(14.8	+- 0.2)	1.351	NI7802					
88-RA-226	A	Y	(1.600	+- 0.007)E+3	0.438	NI7801					
88-RA-228	B-	Y	(5.75	+- 0.03)	0.522	NI7801					
89-AC-225	A	D	(10.0	+- 0.1)	1.000	NI7802					
89-AC-227	T	Y	(21.77	+- 0.03)	0.138	NI7802					C
89-AC-227	A	Y	(1578.	+- 11.)	0.697	NI7802	(0.0138	+- 0.0001)	0.725	NI7802	A
89-AC-227	B-	Y	(22.07	+- 0.03)	0.136	NI7802	(0.9862	+- 0.0001)	0.010	NI7802	A
89-AC-228	B-	H	(6.13	+- 0.09)	1.468	NI7801					
90-TH-227	A	D	(18.718	+- 0.020)	0.107	NI7802					
90-TH-228	A	Y	(1.913	+- 0.002)	0.105	L07901					
90-TH-229	A	Y	(7.34	+- 0.16)E+3	2.180	NI7802					
90-TH-230	A	Y	(7.54	+- 0.03)E+4	0.398	ME7901	1.0			ME7901	
90-TH-230	SF	Y	(1.5	+- 1.5)E+17	100.000	LE7801	(5.0	+- 5.0)E-13	100.000		B
90-TH-231	B-	H	(25.52	+- 0.03)	0.118	NI7801					
90-TH-232	A	Y	(1.405	+- 0.006)E+10	0.427	L07901	1.0			L07901	
90-TH-232	SF	Y	1.E+21			LE7801	1.405E-11				B
90-TH-233	B-	M	(22.3	+- 0.2)	0.897	NI7802					
90-TH-234	B-	D	(24.10	+- 0.03)	0.124	NI7801					
90-TH-235	B-	M	(6.9	+- 0.2)	2.899	NI7801					
91-PA-231	A	Y	(3.276	+- 0.011)E+4	0.336	L07901	1.0			L07901	
91-PA-231	SF	Y	1.1E+16			LE7801	3.0E-12				B
91-PA-232	B-	D	(1.31	+- 0.02)	1.527	L07901	1.0			L07901	
91-PA-232	EC	Y	(120.0	+- 40.0)	33.333	NI7802	(3.	+- 1.)E-5	33.333	NI7802	
91-PA-233	B-	D	(27.0	+- 0.1)	0.370	L07901					
91-PA-234	B-	H	(6.70	+- 0.05)	0.746	NI7802					
91-PA-234M1	B-	M	(1.17	+- 0.01)	0.855	NI7802	(0.9987	+- 0.0002)	0.020	NI7802	
91-PA-234M1	IT	H	(15.	+- 2.3)	15.333	NI7802	(0.0013	+- 0.0002)	15.385	NI7802	A
91-PA-235	B-	M	(24.2	+- 0.3)	1.240	NI7801					

NUCLIDE	DECAY MODE	HALF-LIFE UNITS	HALF-LIFE DATA	HALF-LIFE UNCERTAINTY	HALF-LIFE PER-CENT	HALF-LIFE REFERENCE	BRANCHING FRACTION DATA	BRANCHING FRACTION UNCERTAINTY	BRANCHING FRACTION PER-CENT	BRANCHING FRACTION REFERENCE	COMMENT
92-U -232	A	Y	(69.8	+- 1.0)	1.433	H08101	1.0			H08101	
92-U -232	SF	Y	(78.	+- 60.)E+12	76.923	RE7801	(0.9	+- 0.7)E-12	77.778	RE7801	A
92-U -233	A	Y	(1.592	+- 0.002)E+5	0.126	L07901	1.0			L07901	
92-U -233	SF	Y	(1.2	+- 0.3)E+17	25.000	RE7801	(1.3	+- 0.3)E-12	23.077	RE7801	A
92-U -234	A	Y	(2.454	+- 0.006)E+5	0.244	H08101	1.0			H08101	
92-U -234	SF	Y	(1.42	+- 0.08)E+16	5.634	GU8101	(1.73	+- 0.10)E-11	5.780		B
92-U -235	A	Y	(7.037	+- 0.011)E+8	0.156	H08101	1.0			H08101	
92-U -235	SF	Y	(9.8	+- 2.8)E+18	28.571	GU8101	(7.18	+- 2.05)E-11	28.552		B
92-U -235M1	IT	M	(26.	+- 2.)	7.692	NI7801					
92-U -236	A	Y	(2.342	+- 0.003)E+7	0.128	H08101	1.0			H08101	
92-U -236	SF	Y	(2.43	+- 0.13)E+16	5.350	GU8101	(9.64	+- 0.52)E-10	5.394		B
92-U -237	B-	D	(6.75	+- 0.01)	0.148	L07901					
92-U -238	A	Y	(4.468	+- 0.005)E+9	0.112	H08101	1.0			H08101	
92-U -238	SF	Y	(8.19	+- 0.09)E+15	1.099	RE7901	(5.45	+- 0.06)E-7	1.101		B
92-U -239	B-	M	(23.50	+- 0.05)	0.213	L07901					
92-U -240	B-	H	(14.1	+- 0.2)	1.418	NI7801					
93-NP-236	T	Y	(1.15	+- 0.12)E+5	10.435	L07901					C
93-NP-236	B-	Y	(1.29	+- 0.32)E+6	24.806	L07901	(0.089	+- 0.020)	22.472	L07901	A
93-NP-236	EC	Y	(1.262	+- 0.135)E+5	10.697	L07901	(0.911	+- 0.020)	2.195	L07901	A
93-NP-236M1	T	H	(22.5	+- 0.4)	1.778	L07901					C
93-NP-236M1	B-	H	(46.88	+- 1.28)	2.730	L07901	(0.48	+- 0.01)	2.083	L07901	A
93-NP-236M1	EC	H	(43.27	+- 1.13)	2.612	L07901	(0.52	+- 0.01)	1.923	L07901	A
93-NP-237	A	Y	(2.14	+- 0.01)E+6	0.467	L07901	1.0			L07901	
93-NP-237	SF	Y	1.E+18			LE7801	2.14E-12				B
93-NP-238	B-	D	(2.117	+- 0.002)	0.094	L07901					
93-NP-239	B-	D	(2.354	+- 0.006)	0.255	L07901					
93-NP-240	B-	M	(65.	+- 3.)	4.615	NI7801					
93-NP-240M1	B-	M	(7.4	+- 0.2)	2.703	NI7801	(0.9989	+- 0.0003)	0.030	NI7801	
93-NP-240M1	IT	D	(4.68	+- 1.34)	28.632	NI7801	(0.0011	+- 0.0003)	27.273	NI7801	A
93-NP-241	B-	M	(16.	+- 0.2)	1.250	NI7801					
94-PU-236	A	Y	(2.851	+- 0.008)	0.281	L07901	1.0			L07901	
94-PU-236	SF	Y	(3.52	+- 1.)E+9	28.409	LE7801	(8.1	+- 2.3)E-10	28.395		B
94-PU-237	A	Y	(3.77	+- 0.34)E+3	9.019	LE7801	(0.000033	+- 0.000003)	9.091	LE7801	A
94-PU-237	EC	D	(45.4	+- 0.2)	0.441	LE7801	0.9999			LE7801	

NUCLIDE	DECAY MODE	*	HALF-LIFE UNITS	DATA	UNCERTAINTY		PER-CENT	REFERENCE	*	BRANCHING FRACTION DATA	UNCERTAINTY		PER-CENT	REFERENCE	*	COMMENT
94-PU-238	A	*	Y	(87.74	+- 0.09	)	0.103	L07901	*	1.0				L07901	*	
94-PU-238	SF	*	Y	(4.77	+- 0.13	)E+10	2.725	RE7801	*	(1.84	+- 0.05	)E-9	2.717	RE7801	*	A
		*							*						*	
94-PU-239	A	*	Y	(2.411	+- 0.003	)E+4	0.124	L07901	*	1.0				L07901	*	
94-PU-239	SF	*	Y	5.5E+15				RE7801	*	4.4E-12				RE7801	*	A
		*							*						*	
94-PU-240	A	*	Y	(6.55	+- 0.02	)E+3	0.305	L07901	*	1.0				L07901	*	
94-PU-240	SF	*	Y	(1.15	+- 0.04	)E+11	3.478	L08101	*	(5.7	+- 0.2	)E-8	3.509		*	B
		*							*						*	
94-PU-241	A	*	Y	(6.00	+- 0.25	)E+5	4.167	LE7801	*	(2.45	+- 0.08	)E-5	3.265	LE7801	*	A
94-PU-241	B-	*	Y	(14.4	+- 0.2	)	1.389	L08101	*	0.999				L08101	*	
		*							*						*	
94-PU-242	A	*	Y	(3.76	+- 0.02	)E+5	0.532	L07901	*	1.0				L07901	*	
94-PU-242	SF	*	Y	(6.84	+- 0.08	)E+10	1.170	RE7801	*	(5.5	+- 0.06	)E-6	1.091	RE7801	*	A
		*							*						*	
94-PU-243	B-	*	H	(4.956	+- 0.005	)	0.101	NI7801	*						*	
		*							*						*	
94-PU-244	A	*	Y	(8.2	+- 0.1	)E+7	1.220	L07901	*	1.0				L07901	*	
94-PU-244	SF	*	Y	(6.56	+- 0.32	)E+10	4.878	RE7801	*	(1.25	+- 0.06	)E-3	4.800	RE7801	*	A
		*							*						*	
94-PU-245	B-	*	H	(10.5	+- 0.1	)	0.952	NI7801	*						*	
		*							*						*	
94-PU-246	B-	*	D	(10.85	+- 0.02	)	0.184	NI7801	*						*	
		*							*						*	
95-AM-240	A	*	Y	(3.05	+- 1.12	)E+3	36.721	NI7801	*	(1.9	+- 0.7	)E-6	36.842	NI7801	*	A
95-AM-240	EC	*	H	(50.8	+- 0.3	)	0.591	NI7801	*	1.0				NI7801	*	
		*							*						*	
95-AM-241	A	*	Y	(432.6	+- 0.6	)	0.139	L07901	*	1.0				L07901	*	
95-AM-241	SF	*	Y	(1.06	+- 0.03	)E+14	2.830	RE7801	*	(4.1	+- 0.1	)E-12	2.439	RE7801	*	A
		*							*						*	
95-AM-242	T	*	H	(16.01	+- 0.02	)	0.125	LE7801	*						*	C
95-AM-242	B-	*	H	(19.36	+- 0.07	)	0.362	LE7801	*	(0.827	+- 0.003	)	0.363	LE7801	*	A
95-AM-242	EC	*	H	(92.5	+- 1.6	)	1.730	LE7801	*	(0.173	+- 0.003	)	1.734	LE7801	*	A
		*							*						*	
95-AM-242M1	A	*	Y	(3.13	+- 0.15	)E+4	4.792	ZE7901	*	(4.5	+- 0.2	)E-3	4.444	ZE7901	*	A
95-AM-242M1	SF	*	Y	(8.8	+- 3.3	)E+11	37.500	RE7801	*	(1.6	+- 0.6	)E-10	37.500	RE7801	*	A
95-AM-242M1	IT	*	Y	(141.	+- 2.	)	1.418	ZE7901	*	0.9955				ZE7901	*	
		*							*						*	
95-AM-243	A	*	Y	(7.38	+- 0.04	)E+3	0.542	L07901	*	1.0				L07901	*	
95-AM-243	SF	*	Y	(3.35	+- 0.31	)E+13	9.254	RE7801	*	(2.2	+- 0.2	)E-10	9.091	RE7801	*	A
		*							*						*	
95-AM-244	B-	*	H	(10.1	+- 0.1	)	0.990	NI7801	*						*	
		*							*						*	
95-AM-244M1	B-	*	M	26.				NI7801	*	(0.99959	+- 0.00003	)	0.003	NI7801	*	
95-AM-244M1	EC	*	D	44.				NI7801	*	(4.1	+- 0.3	)E-4	7.317	NI7801	*	A
		*							*						*	
95-AM-245	B-	*	H	(2.05	+- 0.01	)	0.488	NI7801	*						*	
		*							*						*	
95-AM-246	B-	*	M	(39.	+- 3.	)	7.692	NI7801	*						*	
		*							*						*	
95-AM-246M1	B-	*	M	(25.	+- 0.2	)	0.800	NI7801	*						*	
		*							*						*	
96-CM-241	T	*	D	(32.8	+- 0.2	)	0.610	NI7801	*						*	C

NUCLIDE	DECAY MODE	UNITS	HALF-LIFE DATA	HALF-LIFE UNCERTAINTY	HALF-LIFE PER-CENT	HALF-LIFE REFERENCE	BRANCHING FRACTION DATA	BRANCHING FRACTION UNCERTAINTY	BRANCHING FRACTION PER-CENT	BRANCHING FRACTION REFERENCE	COMMENT
96-CM-241	A	Y	(8.98	+- 0.90)	10.022	NI7801	(0.010	+- 0.001)	10.000	NI7801	A
96-CM-241	EC	D	(33.1	+- 0.2)	0.604	NI7801	(0.990	+- 0.001)	0.101	NI7801	A
96-CM-242	A	D	(162.8	+- 0.4)	0.246	LO7901	1.0			LO7901	
96-CM-242	SF	Y	(6.5	+- 0.6)E+6	9.231	RE7801	(6.8	+- 0.6)E-8	8.824	RE7801	A
96-CM-243	T	Y	(28.5	+- 0.2)	0.702	EL7601					C
96-CM-243	A	Y	(28.6	+- 0.2)	0.699	NI7801	(0.9976	+- 0.0004)	0.040	NI7801	A
96-CM-243	EC	Y	(1.19	+- 0.20)E+4	16.807	NI7801	(0.0024	+- 0.0004)	16.667	NI7801	A
96-CM-244	A	Y	(18.11	+- 0.02)	0.110	LO7901	1.0			LO7901	
96-CM-244	SF	Y	(1.344	+- 0.002)E+7	0.149	RE7801	(1.347	+- 0.002)E-6	0.148	RE7801	A
96-CM-245	A	Y	(8500.	+- 100.)	1.176	EL7601					
96-CM-246	A	Y	(4.73	+- 0.1)E+3	2.114	LO7901	1.0			LO7901	
96-CM-246	SF	Y	(1.81	+- 0.04)E+7	2.210	RE7801	(2.614	+- 0.005)E-4	0.191	RE7801	A
96-CM-247	A	Y	(1.56	+- 0.05)E+7	3.205	NI7801					
96-CM-248	T	Y	(3.397	+- 0.032)E+5	0.942	RE7801					C
96-CM-248	A	Y	(3.703	+- 0.035)E+5	0.945	RE7801	(0.9174	+- 0.0003)	0.033	RE7801	A
96-CM-248	SF	Y	(4.113	+- 0.041)E+6	0.997	RE7801	(0.0826	+- 0.0003)	0.363	RE7801	A
96-CM-249	B-	M	(64.15	+- 0.07)	0.109	NI7801					
96-CM-250	SF	Y	(1.13	+- 0.05)E+4	4.425	LE7801					
97-BK-249	T	D	(320.	+- 6.)	1.875	LE7801					C
97-BK-249	A	Y	(6.04	+- 0.35)E+4	5.795	LE7801	(1.45	+- 0.08)E-5	5.517	LE7801	A
97-BK-249	SF	Y	(1.864	+- 0.087)E+9	4.667	RE7801	(4.6	+- 0.2)E-10	4.348	RE7801	A
97-BK-250	B-	H	(3.217	+- 0.004)	0.124	RE8001					
98-CF-249	A	Y	(350.6	+- 2.1)	0.599	LO7901	1.0			LO7901	
98-CF-249	SF	Y	(6.98	+- 0.15)E+10	2.149	RE7801	(5.2	+- 0.1)E-9	1.923	RE7801	A
98-CF-250	A	Y	(13.08	+- 0.09)	0.688	LO7901	1.0			LO7901	
98-CF-250	SF	Y	(1.70	+- 0.07)E+4	4.118	RE7801	(7.7	+- 0.3)E-4	3.896	RE7801	A
98-CF-251	A	Y	(898.	+- 44.)	4.900	NI7801					
98-CF-252	T	Y	(2.64	+- 0.01)	0.379	LO7901					C
98-CF-252	A	Y	(2.72	+- 0.01)	0.368	RE7801	(0.96908	+- 0.00008)	0.008	RE7801	A
98-CF-252	SF	Y	(85.38	+- 0.39)	0.457	RE7801	(0.03092	+- 0.00008)	0.259	RE7801	A
98-CF-253	T	D	(17.81	+- 0.08)	0.449	NI7801					C
98-CF-253	A	Y	(15.73	+- 2.03)	12.905	NI7801	(0.0031	+- 0.0004)	12.903	NI7801	A
98-CF-253	B-	D	(17.86	+- 0.08)	0.448	NI7801	(0.9969	+- 0.0004)	0.040	NI7801	A
99-ES-253	A	D	(20.4	+- 0.1)	0.490	KU8001	1.0			KU8001	
99-ES-253	SF	Y	(6.42	+- 0.22)E+5	3.427	RE7801	(8.7	+- 0.3)E-8	3.448	RE7801	A

NUCLIDE	DECAY MODE	LEVEL	ENERGY (KEV) DATA	UNCERTAINTY	PER-CENT	REFERENCE	EMISSION PROBABILITY DATA	UNCERTAINTY	PER-CENT	REFERENCE	COMMENT
90-TH-228	A	84	(5340.54	+- 0.15)	0.003	H07601	(0.267	+- 0.002)	0.749	H07601	
90-TH-228	A	0	(5423.33	+- 0.22)	0.004	H07601	(0.727	+- 0.010)	1.376	H07601	
90-TH-229	A	285	(4797.8	+- 1.2)	0.025	T07801	0.0127			T07801	
90-TH-229	A	268	(4814.6	+- 1.2)	0.025	T07801	(0.0930	+- 0.0008)	0.860	T07801	
90-TH-229	A	244	4837.			T07801	0.048			T07801	
90-TH-229	A	236	(4845.3	+- 1.2)	0.025	T07801	(0.562	+- 0.002)	0.356	T07801	
90-TH-229	A	180	(4901.0	+- 1.2)	0.024	T07801	(0.1020	+- 0.0008)	0.784	T07801	
90-TH-229	A	112	(4967.5	+- 1.2)	0.024	T07801	(0.0597	+- 0.0006)	1.005	T07801	
90-TH-229	A	101	(4978.5	+- 1.2)	0.024	T07801	(0.0317	+- 0.0004)	1.262	T07801	
90-TH-229	A	30	5050.			T07801	0.052			T07801	
90-TH-229	A	25	5052.			T07801	0.016			T07801	
90-TH-230	A	68	(4621.0	+- 1.5)	0.032	EL7703	(0.234	+- 0.001)	0.427	EL7701	
90-TH-230	A	0	(4687.5	+- 1.5)	0.032	EL7703	(0.763	+- 0.003)	0.393	EL7701	
91-PA-231	A	387	(4680.	+- 3.)	0.064	LE7801	(0.021	+- 0.002)	9.524	LE7801	
91-PA-231	A	354	(4709.	+- 3.)	0.064	LE7801	(0.014	+- 0.002)	14.286	LE7801	
91-PA-231	A	330	(4735.	+- 3.)	0.063	LE7801	(0.11	+- 0.03)	27.273	LE7801	
91-PA-231	A	211	(4852.	+- 3.)	0.062	LE7801	(0.014	+- 0.002)	14.286	LE7801	
91-PA-231	A	127	(4934.	+- 3.)	0.061	LE7801	(0.028	+- 0.005)	17.857	LE7801	
91-PA-231	A	110	(4951.	+- 2.)	0.040	LE7801	(0.22	+- 0.04)	18.182	LE7801	
91-PA-231	A	85	(4984.	+- 3.)	0.060	LE7801	(0.023	+- 0.008)	34.783	LE7801	
91-PA-231	A	46	(5014.	+- 2.)	0.040	LE7801	(0.24	+- 0.03)	12.500	LE7801	
91-PA-231	A	30	(5030.	+- 2.)	0.040	LE7801	(0.23	+- 0.04)	17.391	LE7801	
91-PA-231	A	0	(5059.	+- 2.)	0.040	LE7801	(0.10	+- 0.01)	10.000	LE7801	
92-U -232	A	378	(4945.5	+- 2.0)	0.040	LE7801	(0.0000017	+- 0.0000003)	17.647	LE7801	
92-U -232	A	328	(4997.3	+- 2.0)	0.040	LE7801	(0.000029	+- 0.000005)	17.241	LE7801	
92-U -232	A	187	(5137.3	+- 2.0)	0.039	LE7801	(0.0028	+- 0.0002)	7.143	LE7801	
92-U -232	A	58	(5263.8	+- 1.0)	0.019	LE7801	(0.312	+- 0.004)	1.282	LE7801	
92-U -232	A	0	(5320.7	+- 1.0)	0.019	LE7801	(0.686	+- 0.006)	0.875	LE7801	
92-U -233	A	140	(4687.	+- 3.)	0.064	LE7801	(0.000028	+- 0.000003)	10.714	LE7801	
92-U -233	A	125	(4701.	+- 2.)	0.043	LE7801	(0.0006	+- 0.00006)	10.000	LE7801	
92-U -233	A	97	(4729.	+- 2.)	0.042	LE7801	(0.0161	+- 0.0042)	26.087	LE7801	
92-U -233	A	75	(4751.	+- 2.)	0.042	LE7801	(0.0001	+- 0.0001)	100.000	LE7801	
92-U -233	A	72	(4754.	+- 2.)	0.042	LE7801	(0.00163	+- 0.00080)	49.080	LE7801	
92-U -233	A	68	(4758.	+- 2.)	0.042	LE7801	(0.00016	+- 0.00002)	12.500	LE7801	
92-U -233	A	42	(4783.	+- 2.)	0.042	LE7801	(0.1323	+- 0.0020)	1.512	LE7801	
92-U -233	A	29	(4796.	+- 2.)	0.042	LE7801	(0.0028	+- 0.0003)	10.714	LE7801	
92-U -233	A	20	(4804.	+- 3.)	0.062	LE7801	(0.00051	+- 0.00005)	9.804	LE7801	
92-U -233	A	0	(4824.4	+- 2.0)	0.041	LE7801	(0.844	+- 0.005)	0.592	LE7801	
92-U -234	A	635	(4152.	+- 2.)	0.048	EL7701	(0.0000003	+- 0.0000001)	33.333	EL7701	
92-U -234	A	174	(4604.7	+- 2.)	0.043	EL7701	(0.0024	+- 0.0003)	12.500	EL7701	
92-U -234	A	53	(4723.7	+- 2.)	0.042	EL7701	(0.275	+- 0.015)	5.455	EL7701	
92-U -234	A	0	(4775.8	+- 2.)	0.042	EL7701	(0.725	+- 0.02)	2.759	EL7701	
92-U -235	A	452	(4145.	+- 6.)	0.145	LE7801	(0.009	+- 0.002)	22.222	LE7801	
92-U -235	A	388	(4209.	+- 4.)	0.095	LE7801	(0.057	+- 0.006)	10.526	LE7801	
92-U -235	A	275	(4322.	+- 4.)	0.093	LE7801	(0.047	+- 0.005)	10.638	LE7801	
92-U -235	A	237	(4358.	+- 4.)	0.092	LE7801	(0.17	+- 0.02)	11.765	LE7801	

NUCLIDE	DECAY MODE	LEVEL	ENERGY (KEV) DATA	UNCERTAINTY	PER-CENT	REFERENCE	EMISSION PROBABILITY DATA	UNCERTAINTY	PER-CENT	REFERENCE	COMMENT
92-U -235	A	205	(4392.	+- 3.)	0.068	LE7801	(0.54	+- 0.03)	5.556	LE7801	
92-U -235	A	186	(4414.	+- 5.)	0.113	LE7801	(0.021	+- 0.002)	9.524	LE7801	
92-U -235	A	162	(4435.	+- 5.)	0.113	LE7801	(0.007	+- 0.002)	28.571	LE7801	
92-U -235	A	96	(4501.	+- 4.)	0.089	LE7801	(0.017	+- 0.002)	11.765	LE7801	
92-U -235	A	42	(4555.	+- 3.)	0.066	LE7801	(0.045	+- 0.005)	11.111	LE7801	
92-U -235	A	0	(4597.	+- 3.)	0.065	LE7801	(0.054	+- 0.005)	9.259	LE7801	
92-U -236	A	162	(4335.	+- 5.)	0.115	BA7801	(0.0015	+- 0.0001)	6.667	BA7801	
92-U -236	A	49	(4445.3	+- 1.0)	0.022	BA7801	(0.224	+- 0.005)	2.232	BA7801	
92-U -236	A	0	(4495.5	+- 1.0)	0.022	BA7801	(0.775	+- 0.009)	1.161	BA7801	
92-U -238	A	160	(4039.	+- 5.)	0.124	LE7801	(0.0023	+- 0.0007)	30.435	LE7801	
92-U -238	A	50	(4149.	+- 5.)	0.121	LE7801	(0.23	+- 0.04)	17.391	LE7801	
92-U -238	A	0	(4196.	+- 4.)	0.095	LE7801	(0.77	+- 0.04)	5.195	LE7801	
93-NP-237	A	300	(4581.	+- 2.)	0.044	EL7801	(0.0040	+- 0.0004)	10.000	EL7801	
93-NP-237	A	280	(4599.	+- 2.)	0.043	EL7801	(0.0034	+- 0.0004)	11.765	EL7801	
93-NP-237	A	238	(4640.	+- 2.)	0.043	EL7801	(0.0618	+- 0.0012)	1.942	EL7801	
93-NP-237	A	212	(4664.	+- 2.)	0.043	EL7801	(0.0332	+- 0.0010)	3.012	EL7801	
93-NP-237	A	109	(4766.1	+- 1.5)	0.031	EL7801	(0.08	+- 0.03)	37.500	EL7801	
93-NP-237	A	104	(4771.1	+- 1.5)	0.031	EL7801	(0.25	+- 0.06)	24.000	EL7801	
93-NP-237	A	86	(4788.1	+- 1.5)	0.031	EL7801	(0.47	+- 0.09)	19.149	EL7801	
93-NP-237	A	71	(4803.	+- 2.)	0.042	EL7801	(0.016	+- 0.010)	62.500	EL7801	
93-NP-237	A	57	(4817.	+- 2.)	0.042	EL7801	(0.025	+- 0.004)	16.000	EL7801	
93-NP-237	A	0	(4873.	+- 2.)	0.041	EL7801	(0.026	+- 0.002)	7.692	EL7801	
94-PU-236	A	157	(5615.	+- 2.)	0.036	LE7801	(0.0018	+- 0.0005)	27.778	LE7801	
94-PU-236	A	48	(5721.	+- 1.)	0.017	LE7801	(0.309	+- 0.005)	1.618	LE7801	
94-PU-236	A	0	(5768.	+- 1.)	0.017	NI8001	(0.691	+- 0.008)	1.158	NI8001	
94-PU-238	A	296	(5205.6	+- 0.3)	0.006	EL7701	(0.00003	+- 0.00002)	66.667	EL7701	
94-PU-238	A	143	(5357.7	+- 0.1)	0.002	EL7701	(0.0010	+- 0.0003)	30.000	EL7701	
94-PU-238	A	43	(5456.5	+- 0.4)	0.007	EL7701	(0.283	+- 0.006)	2.120	EL7701	
94-PU-238	A	0	(5499.21	+- 0.20)	0.004	EL7701	(0.716	+- 0.006)	0.838	EL7701	
94-PU-239	A	333	(4828.	+- 3.)	0.062	SC7701	(0.000025	+- 0.000006)	24.000	SC7701	
94-PU-239	A	295	(4866.	+- 5.)	0.103	SC7701	(0.00001	+- 0.000002)	20.000	SC7701	
94-PU-239	A	291	(4871.	+- 5.)	0.103	SC7701	(0.000019	+- 0.000004)	21.053	SC7701	
94-PU-239	A	249	(4912.	+- 5.)	0.102	SC7701	(0.000005	+- 0.000003)	60.000	SC7701	
94-PU-239	A	225	(4934.	+- 3.)	0.061	SC7701	(0.00004	+- 0.00001)	25.000	SC7701	
94-PU-239	A	197	(4960.	+- 5.)	0.101	SC7701	(0.00006	+- 0.00003)	50.000	SC7701	
94-PU-239	A	171	(4987.	+- 3.)	0.060	SC7701	(0.00007	+- 0.00002)	28.571	SC7701	
94-PU-239	A	150	(5006.	+- 5.)	0.100	SC7701	(0.00013	+- 0.00005)	38.462	SC7701	
94-PU-239	A	129	(5028.	+- 3.)	0.060	SC7701	(0.00005	+- 0.00001)	20.000	SC7701	
94-PU-239	A	103	(5054.	+- 5.)	0.099	SC7701	(0.00025	+- 0.00005)	20.000	SC7701	
94-PU-239	A	82	(5076.	+- 5.)	0.099	SC7701	(0.00036	+- 0.00003)	8.333	SC7701	
94-PU-239	A	52	(5104.6	+- 1.0)	0.020	SC7701	(0.115	+- 0.002)	1.739	SC7701	
94-PU-239	A	13	(5142.9	+- 0.8)	0.016	SC7701	(0.151	+- 0.002)	1.325	SC7701	
94-PU-239	A	0	(5155.4	+- 0.7)	0.014	SC7701	(0.733	+- 0.007)	0.955	SC7701	
94-PU-240	A	310	(4864.	+- 1.)	0.021	BA7701	(0.00001	+- 0.00001)	100.000	BA7701	
94-PU-240	A	149	(5021.5	+- 0.5)	0.010	BA7701	(0.00071	+- 0.00001)	1.408	BA7701	
94-PU-240	A	45	(5123.62	+- 0.25)	0.005	BA7701	(0.264	+- 0.002)	0.758	BA7701	

NUCLIDE	DECAY MODE	LEVEL	ENERGY (KEV) DATA	UNCERTAINTY	PER-CENT	REFERENCE	EMISSION PROBABILITY DATA	UNCERTAINTY	PER-CENT	REFERENCE	COMMENT
94-PU-240	A	0	(5168.30	+- 0.15)	0.003	BA7701	(0.735	+- 0.004)	0.544	BA7701	
94-PU-241	A	274	(4784.	+- 5.)	0.105	EL7801	(0.002	+- 0.001)	50.000	EL7801	
94-PU-241	A	261	(4799.	+- 3.)	0.063	EL7801	(0.012	+- 0.001)	8.333	EL7801	
94-PU-241	A	204	(4853.5	+- 1.2)	0.025	EL7801	(0.121	+- 0.002)	1.653	EL7801	
94-PU-241	A	160	(4896.5	+- 1.2)	0.025	EL7801	(0.832	+- 0.005)	0.601	EL7801	
94-PU-241	A	83	(4972.	+- 3.)	0.060	EL7801	(0.013	+- 0.001)	7.692	EL7801	
94-PU-241	A	56	(4998.	+- 2.)	0.040	EL7801	(0.0041	+- 0.0005)	12.195	EL7801	
94-PU-241	A	11	(5042.	+- 2.)	0.040	EL7801	0.0102			EL7801	
94-PU-241	A	0	(5054.	+- 2.)	0.040	EL7801	0.0035			EL7801	
94-PU-242	A	307	(4598.5	+- 1.6)	0.035	SC7703	(0.000013	+- 0.000005)	38.462	SC7703	
94-PU-242	A	148	(4754.6	+- 1.3)	0.027	SC7703	(0.00098	+- 0.00017)	17.347	SC7703	
94-PU-242	A	45	(4856.3	+- 1.2)	0.025	SC7703	(0.224	+- 0.020)	8.929	SC7703	
94-PU-242	A	0	(4900.6	+- 1.2)	0.024	SC7703	(0.775	+- 0.030)	3.871	SC7703	
95-AM-241	A	460	(5092.	+- 5.)	0.098	EL7801	(0.000004	+- 0.000002)	50.000	EL7801	
95-AM-241	A	452	(5099.	+- 4.)	0.078	EL7801	(0.000004	+- 0.000002)	50.000	EL7801	
95-AM-241	A	434	(5114.	+- 4.)	0.078	EL7801	(0.000004	+- 0.000002)	50.000	EL7801	
95-AM-241	A	396	(5156.	+- 2.)	0.039	EL7801	(0.000005	+- 0.000003)	60.000	EL7801	
95-AM-241	A	371	(5178.	+- 2.)	0.039	EL7801	(0.000003	+- 0.000001)	33.333	EL7801	
95-AM-241	A	369	(5182.	+- 2.)	0.039	EL7801	(0.000009	+- 0.000002)	22.222	EL7801	
95-AM-241	A	324	(5223.	+- 2.)	0.038	EL7801	(0.000013	+- 0.000003)	23.077	EL7801	
95-AM-241	A	305	(5244.	+- 2.)	0.038	EL7801	(0.000024	+- 0.000008)	33.333	EL7801	
95-AM-241	A	268	(5280.	+- 3.)	0.057	EL7801	(0.000005	+- 0.000001)	20.000	EL7801	
95-AM-241	A	226	(5322.	+- 2.)	0.038	EL7801	(0.00015	+- 0.00005)	33.333	EL7801	
95-AM-241	A	159	(5388.	+- 1.)	0.019	EL7801	(0.014	+- 0.002)	14.286	EL7801	
95-AM-241	A	103	(5442.98	+- 0.13)	0.002	EL7801	(0.128	+- 0.002)	1.562	EL7801	
95-AM-241	A	76	(5469.	+- 1.)	0.018	EL7801	(0.0004	+- 0.0002)	50.000	EL7801	
95-AM-241	A	60	(5485.74	+- 0.12)	0.002	EL7801	(0.852	+- 0.008)	0.939	EL7801	
95-AM-241	A	33	(5512.	+- 2.)	0.036	EL7801	(0.0020	+- 0.0005)	25.000	EL7801	
95-AM-241	A	0	(5544.3	+- 0.3)	0.005	EL7801	(0.0034	+- 0.0005)	14.706	EL7801	
95-AM-243	A	359	(4997.	+- 3.)	0.060	LE7801	(0.000016	+- 0.000004)	25.000	LE7801	
95-AM-243	A	348	(5008.	+- 3.)	0.060	LE7801	(0.000016	+- 0.000004)	25.000	LE7801	
95-AM-243	A	326	(5029.	+- 3.)	0.060	LE7801	(0.000022	+- 0.000005)	22.727	LE7801	
95-AM-243	A	320	(5035.	+- 3.)	0.060	LE7801	(0.000022	+- 0.000005)	22.727	LE7801	
95-AM-243	A	267	(5088.	+- 3.)	0.059	LE7801	(0.00004	+- 0.00001)	25.000	LE7801	
95-AM-243	A	241	(5113.	+- 1.)	0.020	LE7801	(0.000054	+- 0.00001)	18.519	LE7801	
95-AM-243	A	173	(5181.	+- 1.)	0.019	LE7801	(0.011	+- 0.003)	27.273	LE7801	
95-AM-243	A	118	(5234.	+- 1.)	0.019	LE7801	(0.106	+- 0.005)	4.717	LE7801	
95-AM-243	A	75	(5276.	+- 1.)	0.019	LE7801	(0.879	+- 0.005)	0.569	LE7801	
95-AM-243	A	31	(5321.	+- 1.)	0.019	LE7801	(0.0012	+- 0.0012)	100.000	LE7801	
95-AM-243	A	0	(5350.	+- 1.)	0.019	LE7801	(0.0016	+- 0.0009)	56.250	LE7801	
95-AM-244	A	43	(5762.84	+- 0.03)	0.001	SC7601	(0.236	+- 0.002)	0.847	SC7601	
95-AM-244	A	0	(5804.96	+- 0.05)	0.001	SC7601	(0.764	+- 0.002)	0.262	SC7601	
96-CM-243	A	451	(5622.	+- 3.)	0.053	EL7601	(0.0006	+- 0.0001)	16.667	EL7601	
96-CM-243	A	434	(5639.	+- 3.)	0.053	EL7601	(0.0014	+- 0.0001)	7.143	EL7601	
96-CM-243	A	425	(5646.	+- 3.)	0.053	EL7601	(0.0003	+- 0.0001)	33.333	EL7601	
96-CM-243	A	392	(5682.	+- 3.)	0.053	EL7601	(0.002	+- 0.002)	100.000	EL7601	
96-CM-243	A	387	(5686.	+- 3.)	0.053	EL7601	(0.016	+- 0.004)	25.000	EL7601	

NUCLIDE	DECAY MODE	LEVEL	ENERGY (KEV) DATA	UNCERTAINTY	PER-CENT	REFERENCE	EMISSION PROBABILITY DATA	UNCERTAINTY	PER-CENT	REFERENCE	COMMENT
96-CM-243	A	330	(5741.6	+- 1.0)	0.017	EL7601	(0.115	+- 0.003)	2.609	EL7601	
96-CM-243	A	285	(5784.5	+- 1.0)	0.017	EL7601	(0.735	+- 0.010)	1.361	EL7601	
96-CM-243	A	193	(5876.	+- 3.)	0.051	EL7601	(0.006	+- 0.001)	16.667	EL7601	
96-CM-243	A	164	(5907.	+- 3.)	0.051	EL7601	(0.001	+- 0.001)	100.000	EL7601	
96-CM-243	A	76	(5993.	+- 3.)	0.050	EL7601	(0.056	+- 0.010)	17.857	EL7601	
96-CM-243	A	57	(6010.	+- 3.)	0.050	EL7601	(0.010	+- 0.001)	10.000	EL7601	
96-CM-243	A	8	(6057.	+- 3.)	0.050	EL7601	(0.047	+- 0.005)	10.638	EL7601	
96-CM-243	A	0	(6067.	+- 3.)	0.049	EL7601	(0.015	+- 0.002)	13.333	EL7601	
96-CM-245	A	299	(5240.	+- 3.)	0.057	LE7801	(0.005	+- 0.002)	40.000	LE7801	
96-CM-245	A	229	(5307.	+- 2.)	0.038	LE7801	(0.062	+- 0.010)	16.129	LE7801	
96-CM-245	A	172	(5360.	+- 2.)	0.037	LE7801	(0.910	+- 0.020)	2.198	LE7801	
96-CM-245	A	94	(5448.	+- 5.)	0.092	LE7801	(0.002	+- 0.002)	100.000	LE7801	
96-CM-245	A	42	(5498.	+- 5.)	0.091	LE7801	(0.009	+- 0.001)	11.111	LE7801	
96-CM-245	A	0	(5531.	+- 3.)	0.054	LE7801	(0.011	+- 0.005)	45.455	LE7801	
96-CM-246	A	45	(5343.	+- 2.)	0.037	LE7801	(0.21	+- 0.01)	4.762	LE7801	
96-CM-246	A	0	(5386.	+- 3.)	0.056	LE7801	(0.79	+- 0.01)	1.266	LE7801	
98-CF-252	A	144	5976.6			SC8101	(0.0023	+- 0.0004)	17.391	SC8101	
98-CF-252	A	43	(6075.7	+- 0.5)	0.008	SC8101	(0.152	+- 0.003)	1.974	SC8101	
98-CF-252	A	0	(6118.3	+- 0.5)	0.008	SC8101	(0.816	+- 0.003)	0.368	SC8101	