1968

WANL-TME-574
Revision 1
November 17, 1966

"Nuclear Data Library For The Fission Product
Program", By M.R. Trammell and W.A. Henninger
Westinghouse Electric Corp., Astronuclear Lab.

RECEIVED

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

Astronuclear
Laboratory

WANL-TME-574

Revision 1

November 17, 1966

NUCLEAR DATA LIBRARY FOR THE FISSION PRODUCT PROGRAM

PREPARED BY:

M. R. Trammell

M. R. Trammell, Advisory Scientist
Physical Sciences
Nuclear Systems Applications

W. A. Henninger

W. A. Henninger, Engineer
Physical Sciences Laboratory

LEGAL NOTICE

This report was prepared as an account of Government sponsored work. Neither the United States, nor the Commission, nor any person acting on behalf of the Commission

A. Makes any warranty or representation, expressed or implied, with respect to the accuracy, completeness, or usefulness of the information contained in this report, or that the use of any information, apparatus, method or process disclosed in this report may not infringe privately owned rights, or

B. Assumes any liabilities with respect to the use of, or for damages resulting from the use of any information, apparatus, method, or process disclosed in this report.

As used in the above, "person acting on behalf of the Commission" includes any employee or contractor of the Commission, or employee of such contractor, to the extent that such employee or contractor of the Commission, or employee of such contractor prepares, disseminates, or provides access to, any information pursuant to his employment or contract with the Commission, or his employment with such contractor.

APPROVED BY:

G. R. Thomas

G. R. Thomas, Manager
Nuclear Systems Engineering

INFORMATION CATEGORY

UNCLASSIFIED

Philip Bridges 11/17/66
Authorized Classifier Date

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

phil

Astronuclear
Laboratory

WANL-TME-574

Revision 1

INTRODUCTION TO THE REVISED EDITION

This document represents a revised edition of WANL-TME-574. It is being issued since new values of the half-lives, fission yield, and energy spectra of some of the species arising from the fission of U-235 atoms have become available, and since, inevitably, some omissions and typographic errors occur in every publication of this kind.

The authors wish to acknowledge the invaluable assistance of Mr. V. Fesmire in assisting in the accumulation of the updated values of the data given. Otherwise, conventions of presentation and manner of presentation remain as described in the original descriptions of the "Tables of Nuclear Data".

NUCLEAR DATA LIBRARY FOR THE FISSION PRODUCT PROGRAM

I. Table of Nuclear Data

The Table of Nuclear Data includes the atomic number and chemical symbol, mass number, half-life, decay constant, fission yield, β -spectrum, and γ -spectrum of each nuclide.

1. Half-lives and the decay constants computed from them are compatible with those used by P. Zigman's group at the USNRDL⁽⁹⁾. Abbreviations used in the list of half-lives are:

S - Seconds

M - Minutes

H - Hours

D - Days

Y - Years

Decay constants are given in reciprocal seconds and, e.g., $.72963 \times 10^{-2} = .72963 \times 10^{-2}$.

2. Fission yields given are yields from thermal neutron fission of U^{235} and have been taken from Weaver, Strom, and Killeen⁽⁸⁾. In those cases where no energy spectra are available for a particular nuclide, and the nuclide does not contribute significantly to the total activity ($<0.1\%$ based on the FPIP), the fission yield for that nuclide has been assigned

to the next succeeding chain member. This re-assignment has been carried out only for early chain members and in no case has an entire chain been deleted.

3. β - and γ -spectral data have been obtained from the sources indicated in the Table.

Abbreviations refer to:

NDS reference (4)

NUS reference (5)

SHS reference (7)

Stehn reference (6)

Those references which appear with an asterisk (NDS* and NUS*) indicate that the details of the energy spectrum are not known but that the Q-value for the disintegration of that nuclide is available in the source given. In these cases, it has been assumed that half the total disintegration energy arises from β -decay and the remaining half from subsequent γ 's. The total decay has been divided accordingly in order to arrive at a more realistic estimate of the total fission energy spectrum than would be possible otherwise.

All decay energies are given in Mev.

II. Table of Decay Chains

The Table of Decay Chains is based on the table compiled by W. Henninger⁽²⁾ after consultation with the Applied Research Branch, U. S. Naval Radiological Defense Laboratory. The fission yield for the initial member of each chain has been obtained as described above and a few modifications of the original compilation have been made on

the basis of the decay schemes given in Nuclear Data Sheets. Where two or more isomers of the same nuclide appear, the fission yield given will be split equally between them. In those cases where isomers became initial chain members, the branching ratio for the decay of the parent nuclide has been taken into account.

The total chain yield is given at the end of each chain.

BIBLIOGRAPHY

1. Bolles, R.C., and Ballou, N. E., "Calculated Activities and Abundances of U²³⁵ Fission Products," U.S. Naval Radiological Defense Laboratory No. 456 (1956).
2. Henninger, W. A., Private communications.
3. Katcoff, S. K., "Fission Product Yields from Neutron Induced Fission," Nucleonics, 18, 201 (1960).
4. "Nuclear Data Sheets," National Academy of Sciences - National Research Council, Washington, D.C.
5. Nuclear Utility Services, Inc., "Environmental Safety Aspects of Nuclear Rocket Flight Operations," NUS-144 (July, 1963).
6. Stehn, John F., "Table of Radioactive Nuclides." Nucleonics, 18, 186 (1960).
7. Strominger, D., Hollander, J.M., and Seaborg, G.T., "Table of Isotopes," Rev. Mod. Physics, 30, 2 Part II, (1958).
8. Weaver, L. E., Strom, P.O., and Killeen, P.A., "Estimated Total Chain and Independent Fission Yields for Several Neutron-Induced Fission Processes," USNRDL-TR-633, (March, 1963).
9. Zigman, P., Private communication.

FISSION PRODUCT DECAY CHAIN
(Fractional Fission Yields)

Sheet No. 1

						Chain Yield
72	46.5-H Zn ⁷² 1.30 x 10 ⁻⁷	→	14.1-H Ga ⁷² 1.00 x 10 ⁻⁸	→	Stable Ge ⁷² 0	1.4 x 10 ⁻⁷
73	2.0-M Zn ⁷³ 1.05 x 10 ⁻⁶	→	4.8-H Ga ⁷³ 4 x 10 ⁻⁸	↗ ↓	0.53-S Ge ^{73m} Stable Ge ⁷³ 0	1.09 x 10 ⁻⁶
74	7.8-M Ga ⁷⁴ 3.44 x 10 ⁻⁶	→	Stable Ge ⁷⁴ 0			3.44 x 10 ⁻⁶
75	49-S Ge ^{75m} 1.146 x 10 ⁻⁵	→	82-M Ge ⁷⁵ 5.00 x 10 ⁻⁸	→	Stable As ⁷⁵	1.151 x 10 ⁻⁵
76	30-S Ga ⁷⁶ 3.322 x 10 ⁻⁵	→	Stable Ge ⁷⁶ 1.81 x 10 ⁻⁶			3.503 x 10 ⁻⁵

Nuclide	Mass No.	Half-life		Decay Constant (sec ⁻¹)		Fission Yields (Fractional)		Energy of Radiation				Reference
								E _β (max.)	%	E _γ	%	
39 Y	93	8.0	M	.14441	-2	.6332533	-1	2.0	100	2.0	100	NDS*
	94	1.3	M	.88865	-2	.5940576	-1	1.7	100	1.7	100	NDS*
	95	40	S	.17329	-1	.5294117	-1	2.25	100	2.25	100	NDS*
	97	1.5	S	.46210	0	.613245	-2	3.5	100	3.5	100	NDS*
	89m	16	S	.43322	-1	0		0	0	0.91	100	Stehn
	90	64.2	H	.29991	-5	0		2.27	100	0	0	NUS
	91m	50	M	.23105	-3	0	0	0	0	0.551	100	NUS
	91	58	D	.13832	-6	0		0.33 1.54	0.3 100	1.208	0.3	NUS
	92	3.6	H	.53483	-4	.6052	-4	1.26 1.75 3.6	9 3 88	1.84 2.4	3 9	NUS
	93	10.0	H	.19316	-4	.103041	-2	0.45 0.71 1.47 1.95 2.62 2.89	0.15 1.8 0.9 3.0 3.9 90	0.267 0.49 0.665 0.935 1.15 1.42 1.90 2.41 2.18	6.6 0.03 0.7 2.3 0.2 0.7 1.6 0.05 0.3	NUS
	94	20	M	.57762	-3	.445178	-2	5.0	40	0.56 0.92 1.13	6 43 5	Stehn
	95	10	M	.11552	-2	.944378	-2	2.35	100	2.35	100	NDS*

Chain Yield: 8.033213×10^{-2}

Chain Yield: 6.524180×10^{-2}

Stable Ce ¹⁴⁰
0

6.425670×10^{-2}

Chain Yield: 6.018407×10^{-2}

Stable Nd ¹⁴³
0

6.02741×10^{-2}

 5.575730×10^{-2}

157	15.0-H Eu ¹⁵⁷ 7.719 x 10 ⁻⁵	→	Stable Gd ¹⁵⁷ 9 x 10 ⁻⁸	Decay Chain:	7.729 x 10 ⁻⁵
158	60-M Eu ¹⁵⁸ 1.975 x 10 ⁻⁵	→	Stable Gd ¹⁵⁸ 3.9 x 10 ⁻⁷		2.015 x 10 ⁻⁵
159	18.0-H Gd ¹⁵⁹ 1.047 x 10 ⁻⁵	→	Stable Tb ¹⁵⁹ 0		1.047 x 10 ⁻⁵
160	70-S Eu ¹⁶⁰ 2.80 x 10 ⁻⁶	→	Stable Gd ¹⁶⁰ 4.9 x 10 ⁻⁷	73-D Tb ¹⁶⁰ 2 x 10 ⁻⁸	→ Stable Dy ¹⁶⁰ 0 3.31 x 10 ⁻⁶
161	3.7-M Gd ¹⁶¹ 7.3 x 10 ⁻⁷	→	6.8-D Tb ¹⁶¹ 3 x 10 ⁻⁸	→	Stable Dy ¹⁶¹ 0 7.6 x 10 ⁻⁷

Nuclide	Mass No.	Half-life		Decay Constant		Fission Yield		E_{β} (max)	Energy of Radiation			Reference
				(sec ⁻¹)		(Fractional)			%	E_{γ}	%	
30 Zn	72	46.5	H	.41407	-5	.1300	-6	0.3 1.6	95 5			NDS
	73	2.0	M	.57762	-2	.1050	-5	2.5	100	2.5	100	NDS*
31 Ga	72	14.1	H	.13655	-4	.1000	-7	0.66	17	0.601	7.2	NDS
								0.68	24	0.630	4.5	
								0.959	35	0.786	3	
								1.508	7	0.812	2.6	
								1.94	7	0.835	69	
								2.529	5	0.894	8	
								3.166	5	1.050	5.3	
										1.231	1.2	
										1.268	1.4	
										1.465	23.5	
										1.598	10.3	
										1.68	1.5	
										1.860	5.3	
										2.201	29	
										2.490	9	
										2.508	17	
	73	4.8	H	.40113	-4	.4000	-7	~ 0.40	7	0.295	97	NDS
								1.19	91	0.745	6	
								1.48	42	1.04	1	
	74	7.8	M	.14811	-2	.3440	-5	1.1	11	0.49	7.5	NDS
								1.84	4	0.596	76	
								2.05	3	0.60	3.7	
								2.27	10	0.87	9.5	
								2.65	69	1.00	7.4	
								4.3	3	1.10	6	
										1.20	11	
										1.31	2.2	

Nuclide	Mass No.	Half-life		Decay Constant (sec ⁻¹)		Fission Yield (Fractional)		E _β (max)	Energy of Radiation			Reference
									%	E γ	%	
										1.45	8	
										1.60	0.4	
										1.72	6.4	
										1.84	2.8	
										1.96	5.5	
										2.20	0.9	
										2.35	58.8	
										2.55	2.5	
										2.72	4	
										2.95	3.1	
										3.17	1.8	
										3.33	1.8	
										3.6	1.3	
	76	30	S	.23105	-4	.3322	-4					
32 Ge	73 m	.53	S	.13078	+1	0		0	0	0.0135	100	NDS
										0.0539	100	
	75 m	49	S	.14146	-1	.1146	-4	0	0	0.139	100	NDS
	75	82	M	.14088	-3	.5000	-7	0.55	0.41	0.066	0.3	NDS
								~0.72	0.29	0.199	1.4	
								0.92	11.4	0.265	11	
								0.98	1.4	0.427	0.3	
								1.19	86.5	0.477	0.3	
32 Ge	77 m	54	S	.12836	-1	.4842	-4	2.7	18	0.159	36	NUS
								2.9	46	0.215	18	

Nuclide	Mass		Half-Life	Decay Constant		F in Yield		Energy of Radiation				Reference
	No.			(sec ⁻¹)		(Fractional)		E _β (max.)	%	E _γ	%	
33 As	77	11.3	H	.17039	-4	.3395	-4	0.38	3	0.153	1.1	NUS
								0.76	15	0.21	62.5	
								1.20	11	0.265	56.3	
								1.30	4	0.368	17.0	
								1.56	24	0.416	27.2	
								2.12	29	0.563	15.2	
								2.27	14	0.632	11.3	
										.709	10.1	
										0.80	1.4	
										0.92	6.4	
										1.08	7.8	
										1.19	1.4	
										1.37	7.1	
										1.50	2.1	
										1.74	0.5	
										1.96	0.2	
										2.02	4.5	
										2.32	0.7	
	78	2.1	H	.91687	-4	.19633	-3	0.9	100	0	0	NDS
33 As	77	38.7	H	.49752	-5	.1100	-6	0.16	2.8	0.246	2.8	NDS
								0.438	2.8	0.524	2.7	
								0.684	94.4			
	78m	6.0	M	.19254	-2	.2325	-5	0	0	0.50	100	NDS
33 As	78	91	M	.12695	-3	.2325	-5	1.42	2.2	0.080	1.2	NUS
								1.49	2.1	0.270	2	
								1.60	14	0.345	1.2	
								1.86	6.2	0.615	42	
								2.96	9.7	0.695	15.5	
								3.65	19	0.83	7.9	
								4.27	47	0.99	2.5	
										1.10	2.9	
										1.21	4.2	
										1.31	10.8	

Nuclide	Mass No.	Half-Life	Decay Constant (sec ⁻¹)	Fission Yield (Fractional)	E _β (max.)	Energy of Radiation		E _γ	%	Reference		
						%						
As								1.49	2.1			
								1.70	1.7			
								1.82	1.4			
								1.94	1.5			
								2.05	1.0			
								2.24	1.0			
								2.65	1.4			
34 Se	79	9.0	M	.12836	-2	.55623	-3	1.1	100	1.1	100	NDS*
	80	36	S	.19254	-1	.93827	-3	3.25	100	3.25	100	NDS*
	81	50	S	.13863	-1	.135785	-2	1.9	100	1.9	100	NDS*
	82	18	S	.38508	-1	.228093	-2	3.7	100	3.7	100	NDS*
	85	.43	S	.161197	+1	.440076	-2	4	100	4	100	NDS*
	79m	3.89	M	.29698	-2	0		0	0	0.096	100	NUS
	79	6 x 10 ⁴	Y	.36608	-12	0		0.16	100	0	0	Stehn
	81m	57	M	.20268	-3	.2626	-4	0	0	0.103	100	NUS
	81	18.0	M	.641805	-3	.2626	-4	1.38	100	0	0	NUS
	83m	69	S	.10046	-1	.242529	-2	1.5	10	0.35	<10	NUS
							3.4	90	0.65	<10		
									1.01	5		
									2.02	5		
	83	25	M	.46210	-3	.299488	-2	1.5	100	0.35		NUS
										0.65	50	
										1.01	50	
	84	3.0	M	.38508	-2	.980192	-2	0.95	100	0.95	100	NUS*

Nuclide	Mass No.	Half-life		Decay Constant (sec ⁻¹)		Fission Yield (Fractional)		Energy of Radiation				Reference
								E _β (max)	%	E _γ	%	
Se	85	39	S	.17773	-1	.609244	-2	2.5	100	2.5	100	NUS*
	86	16	S	.43322	-1	.1250019	-1	2	100	2	100	NDS*
	87	16	S	.43322	-1	.1087435	-1	4	100	4	100	NUS*
35 Br	83	2.4	H	.80226	-4	.7130	-5	0.91	20	0.046	20	NUS
	84	32	M	.36102	-3	2481	-3	.96	80			NDS
								0.50	3	0.27	0.5	
										0.35	1.0	
								0.77	19	0.43	2.1	
								0.98	2	0.47	0.9	
								1.39	14	0.52	2.4	
								1.81	1.5	0.61	2.3	
								2.80	15	0.74	2.9	
								3.83	14	0.81	6.3	
								4.68	32	0.880	41.7	
										1.01	8.8	
										1.21	3.2	
										1.47	1.7	
										1.51	1.0	
										1.74	2.0	
										1.90	15.0	
										2.05	1.6	
										2.17	1.6	
										3.03	3.0	
										3.28	2.4	
										3.93	10.4	
	85	3.0	M	.38508	-2	.2501	-2	2.5	100	0	0	NUS
	86	60	S	.11552	-1	.64926	-2	4	100	4	100	NDS*
	87	54.5	S	.12718	-1	.1070428	-1	2.6	70	~ 3	14	NUS
								8.0	30	5.4	56	
	88	16.3	S	.42524	-1	.2605943	-1	4.85	100	4.85	100	NDS*

Nuclide	Mass No.	Half-life		Decay Constant (sec ⁻¹)		Fission Yield (Fractional)		Energy of Radiation				Reference
								$E_{\beta}(\text{max.})$	%	E_{γ}	%	
Br	89	4.4	S	.15753	0	.2580241	-1	4.5	100	4.5	100	NDS*
36 Kr	83m	114	M	.10134	-3	0	0	0	0	0.0096	100	NUS
	85m	4.4	H	.43759	-4	.5552	-4	0.824	81	0.15	81	NUS
										0.305	19	
	85	10.6	Y	.20721	-8	.5552	-4	0.15	1	0.514	1	NUS
								0.672	99			
	87	78	M	.14811	-3	.328131	-2	1.25	25	0.403	87	NUS
								3.3	10	0.847	13	
								3.8	65	2.05	<3	
										2.57	22	
	88	2.80	H	.68765	-4	.869348	-2	0.52	70	0.028	7	NUS
								0.9	10	0.166	7	
								2.7	20	0.191	35	
										0.36	5	
										0.845	23	
										1.19	<4	
										1.55	14	
										1.85	<15	
										2.19	<18	
										2.40	35	
	89	3.2	M	.36101	-2	.17507	-1	2.0	35	0	0	NUS
								3.9	65			
	90	33	S	.21005	-1	.4418467	-1	3.2	100	0	0	NUS
	91	10	S	.69315	-1	.3846738	-1	1.8	100	1.8	100	NDS*
	92	3	S	.23105	0	.285014	-1	3.0	100	3.0	100	NDS*
37 Rb	87	4.3 x 10 ¹⁰	Y	.51080	-18	.4282	-4	0.273	100	0	0	NDS

Nuclide	Mass No.	Half-life		Decay Constant (sec ⁻¹)		Fission Yield (Fractional)		Energy of Radiation				Reference
								E _{β} (max.)	%	E _{γ}	%	
	88	18.	M	.64181	-3	.93337	-3	2.5	14	0.899	14.5	NUS
								3.4	4	1.39	1.4	
								5.2	76	2.11	1.0	
										2.68	2.5	
										2.76	14.5	
	89	15.4	M	.75016	-3	.386154	-2	0.40	2	0.663	15	
								0.67	28	1.05	75	
								1.17	3	1.26	53	
								1.33	2	1.55	4	
								1.61	53	2.20	14	
								2.87	5	2.59	13	
								3.92	7	2.75	3	
37 Rb	90	2.7	M.	.42787	-2	.986395	-2	3.29	100	3.29	100	NDS*
	91	72	S	.96271	-2	.1720688	-1	4.6	100			
	92	5.3	S	.13078	0	.2460984	-1	3.25	100	3.25	100	
	89	50.5	D	.15886	-6	0		1.463	100	0	0	
	90	28	Y	.78445	-9	0		0.544	100	0	0	
38 Sr	91	9.7	H	.19850	-4	.258103	-2	0.61	7	0.645	14	NUS
								1.09	33	0.748	29	
								1.36	29	0.93	3	
								2.03	4	1.025	30	
								2.67	27	1.413	7	
	92	2.7	H	.71312	-4	.659264	-2	0.545	90	0.23	3.5	NUS
								1.5	10	0.44	4.1	
										1.37	90	

Nuclide	Mass No.	Half-life		Decay Constant		Fission Yields		Energy of Radiation				Reference
				(sec ⁻¹)		(Fractional)		E _β (max.)	%	E _γ	%	
	93	8.0	M	.14441	-2	.6332533	-1	2.0	100	2.0	100	NDS*
	94	1.3	M	.88865	-2	.5940576	-1	1.7	100	1.7	100	NDS*
	95	40	S	.17329	-1	.5294117	-1	2.25	100	2.25	100	NDS*
	97	1.5	S	.46210	0	.613245	-2	3.5	100	3.5	100	NDS*
39 Y	89m	16	S	.43322	-1	0		0	0	0.91	100	Stehn
	90	64.2	H	.29991	-5	0		2.27	100	0	0	NUS
	91m	50	M	.23105	-3	0	0	0	0	0.551	100	NUS
	91	58	D	.13832	-6	0		0.33 1.54	0.3 100	1.208	0.3	NUS
	92	3.6	H	.53483	-4	.6052	-4	1.26 1.75 3.6	9 3 88	1.84 2.4	3 9	NUS
	93	10.0	H	.19316	-4	.103041	-2	0.45 0.71 1.47 1.95 2.62 2.89	0.15 1.8 0.9 3.0 3.9 90	0.267 0.49 0.665 0.935 1.15 1.42 1.90 2.41 2.18	6.6 0.03 0.7 2.3 0.2 0.7 1.6 0.05 0.3	NUS
	94	20	M	.57762	-3	.445178	-2	5.0	40	0.56 0.92 1.13	6 43 5	Stehn
	95	10	M	.11552	-2	.944378	-2	2.35	100	2.35	100	NDS*

Nuclide	Mass No.	Half-life		Decay Constant (sec ⁻¹)		Fission Yield (Fractional)		E _β (max.)	%	E _γ	%	Reference
39 Y	96	2.3	M	.50228	-2	.602821	-1					
	97	5.0	S	.13863	0	.2460984	-1	2.75	100	2.75	100	NDS*
40 Zr	93	9.5 x 10 ⁵	Y	.23120	-13	0		0.034 0.063	25 75	0.029	25	NDS
	95	65	D	.12342	-6	.18908	-3	0.360 0.396 0.885 1.13	43 55 2 0.4	0.235 0.720 0.760	2 55 43	NUS, NDS
	97	17.0	H	.11326	-4	.2410964	-1	0.45 1.91	10 90	1.02 1.15	1 2	NUS
	98	60	S	.11552	-1	.5614245	-1	2.25	100	2.25	100	NDS*
	99	33	S	.21005	-1	.537715	-1	1.8	100	1.8	100	NDS*
	93m	3.7	Y	.59364	-8	0		0	0	0.029	100	NDS
41 Nb	95m	90	H	.21394	-5	0		0	0	0.235	100	NUS
	95	35	D	.22922	-6	0		0.160 0.93	99 1	0.762	99	NUS
	97m	60	S	.11552	-1	.297619	-2	0	0	0.75	100	NUS
	97	73	M	.15825	-3	.297619	-2	0.93 1.267	1 99	0.665 1.02	99 1	NUS
	98m	51	M	.22652	-3	.860345	-3	3.1	41	0.72 0.78 1.16 1.68 1.88	75 100 30 10 4	NUS

Nuclide	Mass No.	Half-life		Decay Constant (sec ⁻¹)		Fission Yield (Fractional)		E _β (max.)	%	E _γ	%	Reference
Nb	98	4.5	M	.25672	-2	.860345	-3	2.1	100	2.1	100	NDS *
	99	2.3	M	.50227	-2	.681273	-2	1.6	100	1.6	100	NRDL*
	100	3.0	M	.38508	-2	.6021908	-1	3.45	100	3.45	100	NDS*
	101	1.0	M	.11552	-1	.42507	-1	1.25	100	1.25	100	NDS*
42 Mo	99	66.5	H	.28954	-5	.8053	-4	0.45 0.87 1.23	14 1 85	0.372 0.740 0.780	1 10 4	NUS
	101	14.6	M	.79127	-3	.760304	-2	0.6 0.7 0.8 1.2 1.6 2.23	3 38 13 11 25 10	0.08 0.191 0.300 0.40 0.51 0.59 0.70 0.84 0.89 0.95 1.024 1.14 1.18 1.28 1.38 1.46 1.56 1.66 2.08	3 27 7 2 16 21 12 1 15 2 25 1 11 3 9 1 3 3 16	NUS
	102	11.5	M	.10046	-2	.3977691	-1	1.2	100			NUS
	104	2.5	M	.46210	-2	.1446278	-1					
	105	2.0	M	.57762	-1	.698470	-2	2.75	100	2.75	100	NDS*

Nuclide	Mass No.	Half-life	Decay Constant (sec ⁻¹)	Fis	Yield (Fractional)	E _{β} (max.)	%	E _{γ}	%	Reference
43 Tc	99m	6.0 H	.32090	-4	0	0	0	0.002	98.6	NUS
								0.140	98.6	
								0.142	1.4	
	99	2.1 x 10 ⁵ Y	.10459	-12	0	0.292	100	0	0	
	101	14.0 M	.82518	-3	.15706	1.07	8	0.307	90	
						1.32	90	0.543	8	
	102 m	4.5 M	.25672	-2	.70528	2	100	2.1	100	NDS*
	102	5 S	.13863	0	.70528	2.05	100	2.05	100	NDS*
	103	72 S	.96271	-2	.297891	1.25	100	1.25	100	NDS*
	104	18 M	.64181	-3	.340136	2.4	100	2.6	100	NDS*
44Ru	105	9.0 M	.12836	-2	.198079	1.7	100	1.7	100	NDS*
	107	60 S	.11552	-1	.182703	3	100	3	100	NDS*
	103	39.7 D	.20208	-6	0	0.10	7	0.323	3	NUS
						0.212	89	0.498	89	
						0.39	1	0.610	7	
						0.71	3			
	105	4.45 H	.43268	-4	.7763	0.526	4	0.263	5	NUS
						0.915	8	0.318	10.6	
						1.080	30	0.400	5.6	
						1.145	48	0.475	16	
						1.87	10	0.485	5	
								0.670	15	
								0.726	48	
								0.874	4.3	
								0.966	3	
	106	1.00 Y	.21965	-7	.392246	0.039	100	0	0	NUS

Nuclide	Mass No.	Half-life		Decay Constant (sec ⁻¹)		Fission Yield (Fractional)		E _β (max.)		%	E _γ	%	Reference
	107	4.6	M	.25114	-2	.8063	-4	3.0 3.8 4	12 9 79		0.195 0.86 1.03	17 8 4	NUS
	108	4.3	M	.26866	-2	.70038	-3	1.15 1.32	28 72		0.165	28	NDS
45 Rh	103m	57	M	.20268	-3	0		0	0		0.040	100	NUS
	105m	38	S	.18241	-1	0		0	0		0.129	100	NUS
	105	36	H	.53484	-5	0		0.25 0.565	10 90		0.319	10	NUS
	106	30	S	.23105	-1	0		2.0 2.4 3.0 3.54	2 11 8 78		0.513 0.612 0.624 1.045	20.5 1 9.9 1.5	NUS
	107	22	M	.52511	-3	0		0.9 1.1 1.2	3 13 84		0.305 0.39 0.68	84 13 3	NUS
	108	18	S	.38508	-1	0		3.5 4.1 4.5	22 17 51		0.433 0.617	43 22	NDS
	109m	50	S	.13863	-1	.150385	-3	0	0		0.11	100	NDS
	109	30	S	.23105	-1	.150385	-3	1.4	100		1.4	100	NDS*
	110	3.6	S	.19254	0	.17776	-3						
46 Pd	107	7 x 10 ⁶	Y	.31378	-14	0		0.035	100		0	0	NDS
	109m	4.7	M	.24580	-2	0		0	0		0.18	100	NDS

Nuclide	Mass No.	Half-life		Decay Constant (sec ⁻¹)	Fission Yield (Fractional)		E _{β} (max.)	%	E _{γ}	%	Reference
Pd	109 ₀₀₁	14 ¹¹	H	.13753	-4	0	1.025	100	0	0	NUS
	111m	5.5	H	.35008	-4	.2080	0.61	32	0.17	68	NDS
	111	23	M	.50228	-3	.17884	2.13	100	0	0	NUS
	112	21	H	.91687	-5	.10008	0.28	100	0.018	100	NUS
	113	84	S	.82518	-2	.16048	1.65	100	1.65	100	NDS*
	114	2.4	M	.48135	-2	.1355	1.4	100	0	0	NDS
	115	45	S	.15403	-1	.10285	2.25	100	2.25	100	NDS*
47 Ag	109m	39	S	.17773	-1	0	0	0	0.088	100	NUS
	111m	74	S	.93669	-2	0	0	0	0.065	100	NDS
	111	7.6	D	.10556	-5	0	0.69	6.2	0.095	0.1	NUS
							0.79	1.1	0.247	1.2	
							1.05	92.7	0.342	6.1	
	112	3.2	H	.60169	-4	0	1.22	2.6	0.615	6.5	NUS
							1.34	3.6	0.69	4.5	
							1.50	1.8	0.855	1.6	
							1.61	2.0	0.98	1.2	
							1.78	4.4	1.09	1.2	
							2.01	5.3	1.31	1.4	
							2.20	0.6	1.40	5.3	
							2.57	1.6	1.49	1.2	
							2.63	0.9	1.62	3.2	
							2.73	2.8	2.11	3.2	
							3.42	18	2.54	1.0	
							4.04	56			
							2.0	100			
	113	5.3	H	.36329	-4	0	1.7	?	0.3		NDS
	113m	72	S	.96271	-2	0	<2	10	0.3	90	NDS
							1.7				

Nuclide	Mass No.	Half-life		Decay Constant (sec ⁻¹)		Fission Yield (Fractional)		E _β (max.)	%	E _γ	%	Reference
48 Cd	114	5.0	S	.13863	0	.1860	-5	2.3	100	2.3	100	NDS*
	115m	20	S	.34657	-1	.3530	-5	2.9	28	1.2	72	NDS
	115	21	M	.55012	-3	.3530	-5	2.7 2.9	9 91	0.138 0.227	Weak Weak	NDS
	116	2.5	M	.46210	-2	.18525	-3	5.0	100	0.52 0.70	100 100	NDS
	117	66	S	.10502	-1	.10614	-3	1.9	100	1.9	100	NDS*
	115m	43	D	.18567	-6	0		0.335 0.687 1.63	1 2 97	0.48 0.935 1.3	0.3 2.3 1	NDS
	115	53	H	.36329	-5	0		0.59 0.63 0.85 1.11	24.4 12.6 0.9 62.1	0.26 0.49 0.523	1.7 12.2 24	NUS
	117m	3.0	H	.64181	-4	.1940	-5	1.0	<100	0.28 1.27	100 100	NDS
	117	50	M	.23105	-3	.1940	-5	2.3	<100	0.425	100	NUS
	118	50	M	.23105	-3	.14236	-3	0.8	100	0	0	NUS
	119	9.5	M	.12160	-2	.7013	-4	1.8 3.5	20 80	1.8	20	NDS
	119m	2.7	M	.42787	-2	.7013	-4	1.85	100	1.85	100	NDS*
121	25	S	.27726	-1	.12005	-3	2.4	100	2.4	100	NDS*	
49 In	115m	4.51	H	.42692	-4	0		0.84	5.5	0.335	94.5	NUS

Nuclide	Mass No.	Half-life	Decay Constant (sec ⁻¹)	Fission Yield (Fractional)	E _β (max.)	%	E _γ	%	Release		
115	6 x 10 ⁴	Y	.36608	-22	0	0.50	100	0	0	NDS	
117m	2.0	H	.96271	-4	0	0.95 1.62 1.77	4 23 53	0.161 0.31 0.822	23 20 4	NDS	
117	45	M	.25672	-3	0	0.740	100	0.161 0.565	100 100	NDS	
118	5.0	S	.13863	0	0	3.3 4.5	20 80	1.22	20	NDS	
119m	18	M	.64181	-3	.7500	-6	1.8 2.7	6 90	0.30 0.907	4 6	NDS
119	2.3	M	.50228	-2	.7500	-6	1.6	100	0.024 0.82	<90 <90	NDS
120	50	S	.13863	-1	.14091	-3	2.2	100	0.089 0.199 1.04 1.18	100 100 100 100	NDS
121m	3.1	M	.37266	-2	.10105	-4	1.85	100	1.85	100	NDS*
121	30	S	.23105	-1	.10105	-4	2.9	100	0.94	100	NDS
122	45	S	.15403	-1	.14366	-3	3	100	3	100	NDS*
123m	36	S	.19254	-1	.73135	-4	2.3	100	2.3	100	NDS*
123	10	S	.69315	-1	.73135	-4	3.3	100	1.10	100	NDS
124	20	S	.34657	-1	.14175	-3					

Nuclide	Mass No.	Half-life		Decay Constant (sec ⁻¹)		Isomeric Yield (Fractional)		E _{β} (max.)	%	E _{γ}	%	Reference
50 Sn	117m	14	D	.57304	-6	0		0	0	0.159 0.161	100 100	NDS
	119m	245.0	D	.32738	-7	0		0	0	0.0242 0.0653	100 100	NUS-179
	121m	5.0	Y	.43929	-8	.1700	-6	0.42	100	0.01	100	NDS
	121	27.0	H	.71312	-5	.1700	-6	0.383	100	0	0	NUS
	123m	125	D	.64181	-7	.7605	-5	0.34 1.42	2 98	1.08	2	NUS
	123	41	M.	.28177	-3	.7605	-5	1.26	100	0.16	100	NUS
	125m	9.7	M	.11910	-2	.10169	-3	0.65 2.04	2.2 97.8	0.326 0.64 1.068 1.39	99.7 0.3 0.3 1.9	NUS
	125	9.4	D	.85346	-6	.10169	-3	0.37 0.47 1.3 2.33	2.1 1.5 1.3 95	0.468 8.811 0.904 1.068 1.97	0.5 1.0 0.9 3.9 1.2	NUS
	126	2 x 10 ⁵	Y	.10982	-12	.27472	-3	0.4	100			NDS
	127	2.6	H	.74054	-4	.106743	-2	1.6	100	1.6	100	NDS*
	128	57	M	.20268	-3	.238096	-2	1.3	100	0	0	NUS
	129	1.8	H	.10697	-3	.449309	-2	2.0	100	2.0	100	NDS*
	130	2.6	M	.44433	-2	.953381	-2	1.0	100	1.0	100	NDS*
	131	3.4	M	.33978	-2	.1151461	-1	2.5	100	2.5	100	NDS*
	132	2.2	M	.52511	-2	.931972	-2	1.5	100	1.5	100	NDS*

Nuclide	Mass No.	Half-life		Decay Constant (sec ⁻¹)		Fission Yield (Fractional)		E _{β} (max.)	%	E _{γ}	%	Reference
51 Sb	124m	21.1	M	.55012	-3	.566667	-6	2.5	<100			NDS
	124m	1.3	M	.88865	-2	.566667	-6	3.2	100	0.012	Small	NDS, Stehn
	124	60	D	.13371	-6	.566667	-6	0.051	2	0.603	98	NDS
								0.225	11	0.645	7.2	
								0.621	51	0.722	10.5	
								0.954	5	0.970	2	
								1.016	1.5	1.05	2	
								1.59	5	1.298	1.2	
								2.313	23	1.32	2	
										1.361	1	
										1.37	2.5	
										1.45	2.0	
										1.50	.85	
										1.54	.85	
										1.69	48	
										1.900	0.4	
										2.09	6.3	
										2.26	1.5	
	125	2.0	Y	.10982	-7	.1281	-4	0.09	1.9	0.109	0.4	NUS
								0.105	< 0.7	0.171	0.3	
								0.118	6.0	0.176	6.8	
								0.124	30.7	0.203	0.2	
								0.233	1	0.206	0.3	
								0.295	40.4	0.319	0.8	
								0.437	5.8	0.379	1.2	
								0.612	13.4	0.427	31	
										0.462	10	
										0.598	19	
										0.604	5.2	NDS
										0.633	11	
										0.652	<0.7	
										0.668	1.6	
	126m	19	M	.60803	-3	.2196	-4	3.7	1	0.1	99	NDS

Nuclide	Mass No.	Half-life		Decay Constant (sec ⁻¹)		Fission Yield (Fractional)		E _p (max.)	%	-18- E _γ		Reference
Sb	126	12.5	D	.64181	-6	.2196	-4	1.9	100	0.415 0.665 0.695	100 100 100	NDS
	127	91	H.	.21158	-5	.20708	-3	0.8 0.86 1.11 1.50	35 10 35 20	0.06 0.25 0.31 0.46 0.77	4 14 6 54 24	NUS
	128m	11	M	.10500	-2	.585235	-3	1.0	100	0	0	NUS
	128	8.6	H	.22384	-4	.585235	-3	1.45	100	1.45	100	NDS*
	129	4.6	H	.41857	-4	.291116	-2	1.0 1.87	80 20	0.534 0.165 0.308 0.788	20 26.7 26.7 26.7	NUS
	130	7.1	M	.16271	-2	.812325	-2	2.5	100	2.5	100	NDS*
	131	23	M	.50228	-3	.1310524	-1	1.6	100	1.6	100	NDS*
	132	2.1	M	.55012	-2	.2060824	-1	3	100	3	100	NDS*
	133	4.1	M	.28177	-2	.332533	-1	2	100	2	100	NDS*
	134	48	S	.14441	-1	.1805722	-1	4.3	100	4.3	100	NUS*
	135	6.0	S	.11552	0	.437175	-2	3.5	100	3.5	100	NDS*
52 Te	125m	58	D	.13832	-6	0		0	0	0.0353 0.110	100 100	NDS
	127m	105	D	.76405	-7	.13005	-4	0.054 0.73	0.013 1.5	0.059 0.0887 0.665	1.5 98.5 0.013	NDS

Nuclide	Mass No.	Half-life		Decay Constant (sec ⁻¹)		Fission Yield (Fractional)		E _β (max.)	%	E _γ	%	Reference	
Te	127	9.3	H	.20703	-4	.13005	-4	0.27	1	0.059	0.12		
								0.695	99	0.360	0.12		
										0.418	0.83		
	129m	37	D	.21683	-6	.309625	-3	0	0	0.1063	100		NUS
	129	72	M	.16045	-3	.309625	-3	0.3	1	0.0268	80		NDS, NUS
								0.7	3	0.475	16		
								0.99	16	0.72	1.5		
								1.453	80	0.211	1.5		
										1.12	1		
	131m	30	H	.64181	-5	.23009	-2	0.215	3.0	0.08	4		NUS
								0.420	43	0.100	8		
								0.570	31	0.200	8		
								2.457	3.8	0.240	3		
										0.335	16		
										0.780	80		
										0.840	40		
										0.920	5		
										1.08	5		
										1.14	25		
										1.22	17		
										1.620	3		
										1.92	2		
										2.0	4		
										2.24	15		
	131	24	M	.48135	-3	.23009	-2	1.15	10	0.145	80	NUS	
								1.36	5	0.454	20		
								1.68	25	0.600	5		
								2.14	60	0.920	5		
									0.985	1			
									1.13	10			
132	78	H	.24685	-5	.1220488	-1	0.22	100	0.052	100	NDS		
								0.233	100				

Nuclide	Mass No.	Half-life		Decay Constant (sec ⁻¹)		Fission Yield (Fractional)		E _β (max.)	%	E _γ	%	Reference
53 I	133m	52 ^s	M	.22216	-3	.1305522	-1	1.3	70	0.334	13	NDS
								2.4	17	0.432	70	
										0.754	100	
										0.91	70	
	133	2	M	.57762	-2	.1305522	-1	2.4	100	0	0	NUS
	134	42	M	.27506	-3	.3781513	-1	1.4	100			NUS
	135	1.4	M	.82518	-2	.2250900	-1	3	100	3	100	NDS*
	129	1.6 x 10 ⁷ Y		.13727	-14	.0		0.15	100	0.040	100	NDS
	130	12.5	H	.15403	-4	.5622	-4	0.60	47	0.410	24	NDS
								1.02	53	0.53	100	
										0.66	100	
										0.74	70	
										1.15	30	
	131	8.05	D	.99659	-6	.9454	-4	0.250	2.8	0.284	5.5	NUS
								0.33	9.1	0.364	81	
								0.606	87.5	0.638	9.1	
								0.81	0.7	0.724	2.8	
	132	2.30	H	.83714	-4	.167067	-2	0.80	21	0.24	1.3	NUS
								1.04	15	0.32		
								1.22	12	0.46	2.2	
							1.49	12	0.48			
							1.61	21	0.52	19		
							2.14	18	0.62	5.2		
							2.92	0.03	0.647	9		
									0.65	26		
									0.673	99		
									0.72	6.5		
									0.775	82+		
									0.95	19		
									1.14	4.5		

Nuclide	Mass No.	Half-life		Decay Constant (sec ⁻¹)		Emission Yield (Fractional)		E _{β} (max.)	%	E _{γ}	%	Reference
53 I	132									1.30		
										1.40	8.3	
										1.45	1.4	
										1.50	1.8	
	133	20.8	H	.92568	-5	.655258	-2	0.65	9	0.53	100	NUS
										0.87	9	
										1.3	4	
	134	53	M	.21797	-3	.2170868	-1	0.5	6.5	0.14	3	NUS
										0.39	7	
								1.05	1.0	0.41	0.5	
								1.25	23	0.43	3	
								1.49	15	0.51	1	
								1.68	7.5	0.54	8	
								1.81	9.5	0.61	18	
								2.21	12	0.69	7	
								2.41	25	0.75	1	
										0.77	6	
										0.848	95	
										0.86	4.5	
										0.89	70.5	
										0.96	2	
										1.00	4.5	
										1.07	18	
										1.15	9.5	
										1.46	3.5	
										1.49	1	
										1.62	5	
										1.79	5	
	135	6.7	H	.28737	-4	.285114	-1	0.47	35	0.42	26	NUS
								1.0	40	1.28	100	
								1.4	25	1.69	46	
	136	83	S	.83512	-2	.3924269	-1	2.73	6	0.20	12	NUS
								4.16	5	0.39	19+	
								4.37	24	0.46	1.	

Nuclide	Mass No.	Half-life	Decay Constant (sec ⁻¹)	Fission Yield (Fractional)	E _β (max.)	%	E _γ	%	Reference			
53 I	136				5.60	15	0.53					
					7.0	6	0.71	3				
					3.5	44	1.00	6				
							1.32	95				
							1.55	4				
							1.72	2				
							1.91	5				
							2.25	7				
							2.40	13				
							2.63	11				
					2.84	8						
					3.2	5						
	137	24.4	S	.28408	-1	.2661064	-1	2.75	100	2.75	100	NDS
	138	6.3	S	.11002	0	.1457583	-1	3.9	100	3.9	100	NDS*
	139	2.0	S	.34657	0	.784884	-2	3.5	100	3.5	100	NDS*
54 Xe	131m	12	D	.66855	-6	0	0	0	0	0.164	100	NUS
	133m	2.3	D	.34881	-5	0	0	0	0	0.233	100	NUS
	133	5.27	D	.15223	-5	0	0	0.268	1	0.079	0.8	NDS
								0.347	99	0.081	100	
	135m	15.3	M	.75505	-3	.465186	-2	0	0	0.53	100	NRDL
	135	9.2	H	.20928	-4	.465186	-2	0.55	3	0.250	97	NUS
								0.91	97	0.36	<1	
										0.604	3	
	137	3.9	M	.29622	-2	.2661064	-1	3.5	100	0	0	NUS
	138	17	M	.67956	-3	.2751100	-1	2.4	100	0.42	100	NUS
139	41	S	.16906	-1	.2751100	-1	4.6	100			NUS	

Nuclide	Mass No.	Half-life		Decay Constant (sec ⁻¹)		Fission Yield (Fractional)		E _β (max.)	%	E _γ	%	Reference
55 Cs	140	16	S	.43322	-1	.2306922	-1	2	100	2	100	NUS*
	135	2.0 x 10 ⁶ Y		.10982	-13	0		0.21	100	0	0	NDS
	136	13	D	.61712	-6	.377151	-2	0.341	92.6	0.152	19	NUS
								0.657	7.4	0.27	22	
										0.337	59	
										0.830	100	
										1.065	84	
										1.255	21	
	137	29.2	Y	.75273	-9	.815326	-2	0.514	95	0	0	NUS
								1.18	5			
56 Ba	138	32	M	.36102	-3	.140056	-1	1.49	<0.5	0.1389	2	NUS
								2.20	10	0.1931	0.8	NUS
								2.39	36	0.2289	1.6	
								2.53	5	0.4106	3	
								2.62	16	0.4626	23	
								2.94	12	0.55	8	
								3.4	21	0.87	4	
										1.010	25	
										1.426	73	
										2.21	18	
										2.63	9	
										3.34	0.5	
	139	9.5	M	.12161	-2	.2440976	-1	2.7	16	0.63	4	NUS
							3.4	4	1.28	16		
							4.0	80				
140	66	S	.10502	-1	.2961184	-1	3	100	3	100	NDS*	
142	8	S	.86644	-1	.2857142	-1	4.3	100	4.3	100	NDS*	
56 Ba	137m	2.6	M	.44433	-2	.58525	-4	0	0	0.662	100	NUS

Nuclide	Mass No.	Half-life		Decay Constant (sec ⁻¹)		Fission Yield (Fractional)		E _{β} (max.)	%	E _{γ}	%	Reference
56 Ba	139	85	M	.13591	-3	.547219	-2	2.17	28	0.166	28	NUS, NDS
								2.34	72	1.09	0.01	
										1.26	0.04	
										1.34	0.01	
										1.43	0.3	
	140	12.8	D	.62676	-6	.1120448	-1	0.5	25	0.03	100	NUS
								0.6	10	0.16	10	
								0.9	5	0.30	10	
								1.0	60	0.54	30	
	141	18	M	.64181	-3	.6096938	-1	1.4	100	1.4	100	NDS*
	142	10	M	.11552	-2	.2490996	-1	1.15	100	1.15	100	NDS*
	143	13	S	.53319	-1	.4471788	-1	1.75	100	1.75	100	NDS*
57 La	140	40.2	H	.47896	-5	.37115	-3	0.83	12	0.334	35	NDS STEHN
								1.10	26	0.438	6	
								1.38	45	0.487	44	
								1.71	10	0.815	40	
								2.20	7	1.596	100	
	141	3.8	H	.50669	-4	.341136	-2			2.52	6.5	NDS, NUS
								1.06	2	1.37	2	
								2.43	98			
57 La	142	84	M	.13753	-3	.670268	-2	4.5	100	0.64	.55	NUS, Stehn
										0.90	12	
										2.40	11	
	143	18	M	.64181	-3	.1430572	-1	1.65	100	1.65	100	NDS*
	144	15	S	.4620	-1	.5190576	-1	2.85	100	2.85	100	NDS*
58 Ce	141	33	D	.24311	-6	0		0.435	70	0.145	70	NUS
								0.580	30			

Nuclide	Mass No.	Half-life	Decay Constant (sec ⁻¹)	Fission Yield (Fractional)	E _β (max.)	%	E _γ	%	Reference			
58 Ce	143	33	H	.58346	-5	.125050	-2	0.22 0.52 0.72 1.09 1.38	6 12 5 40 37	0.0574	105	NUS
								0.294	43			
								0.351	8			
								0.565	11			
								0.668	10			
								0.722	9			
								0.861	1			
								1.10	9			
	144	285	D	.28149	-7	.385154	-2	0.186 0.24 0.32	20 8 72	0.0337 0.054 0.0807	10 10 10	NUS
								0.100	10			
								0.134	10			
145	3.0	M	.38508	-2	.3942576	-1	1.0	100	1.0	100	NDS*	
146	13.9	M	.83112	-3	.2970188	-1	0.7	<100	0.110 0.142 0.22 0.27 0.32	57 7 36 24 12	NUS	
59 Pr	147	1.2	M	.96271	-2	.215086	-1					
	143	13.8	D	.58135	-6	0		0.933	100	0	0	NUS
	144	17.3	M	.66777	-3	0		0.8 2.29 2.98	1 1.3 97.7	0.69 1.49 2.18	1.3 0.3 0.8	NUS, Stehn
	145	5.98	H	.32198	-4	.11104	-3	1.8	100			NUS
	146	24.4	M	.47346	-3	.112045	-2	2.3 3.7	44 56	0.46 0.75	100 22	NUS

Nuclide	Mass No.	Half-life		Decay Constant (sec ⁻¹)		Fission Yield (Fractional)		E _β (max.)	%	E _γ	%	Reference
59 Pr	146									1.49	33	
	147	12.0	M	.96271	-3	.221088	-2					
	148	1.95	M	.59244	-2	.1695078	-1	2.5	100	2.5	100	NDS*
	150	15	S	.46210	-1	.445528	-2					
60 Nd	147	11.1	D	.72275	-6	0	0.212	3	0.091	77	NUS	
							0.368	20	0.532	20		
							0.810	77	0.668	3		
	149	2.0	H	.96271	-4	.1129741	-1	0.95	15	0.0965	4	NUS
								1.1	43	0.1123	11	
								1.5	31	0.1141	43	
										0.1241	6	
										0.1878	3	
										0.1979	2.5	
										0.2105	41	
										0.2261	3	
										0.2664	10	
										0.2400	31	
										0.4235	5	
										0.538	5	
	151	13	M	.88865	-3	.419327	-2	0.24	< 1			NUS
								0.54	3			
								1.19	30			
								1.65	7			
								1.82	15			
								2.06	45			
	152	3.0	M	.38508	-2	.23696	-2					
61 Pm	147	2.6	Y	.84479	-8	0		0.225	100	0	0	NUS
	149	53.1	H	.36260	-5	0		1.071	97	0.286	3	NDS

Nuclide	Mass No.	Half-life		Decay Constant (sec ⁻¹)		Fission Yield (Fractional)		E _β (max.)	%	E _γ	%	Reference
61 Pm	149							0.784	3			
	150	2.7	H	.71312	-4	.21208	-3	2.0 3.0	80 20	0.34 0.40 0.82 1.17	20 20 80 80	NDS
	151	28.4	H	.67796	-5	.23209	-3	1.1	100	0.715	100	NUS
	152	6.0	M	.19254	-2	.38315	-3	2.2	100	2.8	100	NDS*
	153	5.5	M	.21005	-2	.165206	-2					
	154	2.5	M	.46210	-2	.69167	-3	1.25	100	1.25	100	NDS*
62 Sm	151	80	Y	.27456	-9	0		0.053 0.075	1 99	0.0216	1	NUS
	153	47	H	.40966	-5	.6032	-4	0.64 0.698 0.803	38 40 22	0.0697 0.1032 0.538	38 78 10	NUS
	155	24	M	.48135	-3	.32353	-3	1.50 1.65	7 93	0.105 0.246	93 7	NUS
	156	10	H	.19254	-4	.13358	-3	0.9	100	0	0	NUS
63 Eu	155	1.7	Y	.12920	-7	.2490	-5	0.15 0.16 0.19 0.25	30 40 <10 20	0.060 0.019 <0.45 0.105 0.27 0.87	<10 15 15 20 20	NUS
	156	15.4	D	.52095	-6	.7380	-5	0.5 2.4	60 40	2.0	60	NDS

Nuclide	Mass No.	Half-life		Decay Constant (sec ⁻¹)		Fission Yield (Fractional)		E _β (max.)	%	E _γ	%	Reference
64 Gd	157	15.0	H	.12836	-4	.7719	-4	1.0 1.7	75 25	0.2 0.6	100 100	NUS
	158	60	M	.19254	-3	.1975	-4	1.3	100	1.3	100	NDS*
	160	70	S	.99021	-2	.2800	-5					
	159	18.0	H	.10697	-4	.1047	-4	0.59 0.89 0.948	20 6 74	0.058 0.079 0.225 0.362	6.6 0.6 0.6 19	NUS
	161	3.7	M	.31223	-2	.7300	-6	1.44 1.54 1.60	4 5 91	0.0566 0.0776 0.102 0.106 0.134 0.165 0.181 0.259 0.273 0.284 0.315 0.361 0.482 0.531	71.9 8.5 23.6 1.2 1.3 0.43 2.5 1.8 1.2 7.3 21 60 0.2 1.6	NDS
65 Tb	160	73	D	.10990	-6	.2000	-7	0.3 0.46 0.56 0.76 0.86 1.71	12 19 38 11 20 0.4	0.087 0.092 0.1967 0.216 0.298 0.40 0.74 0.77 0.876	10 ? 4 4 30 3 ? ? 33	NDS, SHS