

Computational Physics and Engineering Division

ORIGEN-S DECAY DATA LIBRARY AND HALF-LIFE UNCERTAINTIES

O. W. Hermann, P. R. Daniel,* and J. C. Ryman

*Participated while a graduate student at the University of Florida on assignment to Oak Ridge National Laboratory as a DOE Fellow. Research funded by the Office of Civilian Radioactive Waste Management, U.S. Department of Energy.

Date Published: September 1998

Prepared by the
OAK RIDGE NATIONAL LABORATORY
P. O. Box 2008
Oak Ridge, Tennessee 37831-6370
managed by
LOCKHEED MARTIN ENERGY RESEARCH CORP.
for the
U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-96OR22464

CONTENTS

LIST OF TABLES	v
ACKNOWLEDGMENTS	vii
ABSTRACT	ix
1. INTRODUCTION	1
2. DESCRIPTION OF TYPES OF DATA IN THE DECAY LIBRARY	3
3. SOURCES OF DECAY DATA	7
4. HALF-LIFE UNCERTAINTIES	11
5. SUMMARY	13
6. REFERENCES	15
APPENDIX A: ORIGEN-S LIBRARY DECAY DATA AND HALF-LIFE UNCERTAINTIES	17
APPENDIX B: COMPARISONS BETWEEN PREVIOUS AND UPDATED LIBRARIES	71

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Units of half-life indicated by the variable IU	3
2. Definitions of branching fraction variables	4
3. Summary of decay data sources	8
4. Unique nuclides updated with decay data from ENSDF	9
5. Nuclides not updated with decay data or changed to stable	10
A.1 ORIGEN-S library half-lives, uncertainties, and other nuclear decay data (light elements, materials of construction, and activation products)	18
A.2 ORIGEN-S library half-lives, uncertainties, and other nuclear decay data (actinides and their daughters)	39
A.3 ORIGEN-S library half-lives, uncertainties, and other nuclear decay data (fission products)	45
B.1 Percentage change in decay data from old library to new	72

ACKNOWLEDGMENTS

The authors express their appreciation to A. G. Croff and S. B. Ludwig of the Chemical Technology Division of Oak Ridge National Laboratory (ORNL) for including both the ORIGEN2 and ORIGEN-S libraries in the decay data update project.

We acknowledge the contribution of several individuals within the Computational Physics and Engineering Division of ORNL: C. V. Parks and S. M. Bowman, for valuable technical guidance; R. Q. Wright and R. W. Roussin, for providing ENDF/B-VI information and making the data files available; B. D. Murphy and M. D. DeHart, for their technical reviews of the report; and W. C. Carter and J. B. Anderson, for their skillful preparation of the text, the complex formatting, and the release of this report.

The authors are greatly indebted to those individuals, including the experimentalists and the evaluators at numerous locations, and data file preparers at the National Nuclear Data Center at Brookhaven National Laboratory (BNL), from which the ENDF/B-VI files and ENSDF files were obtained. The authors also acknowledge BNL for providing the RADLST Program to treat ENSDF data.

Finally, the authors appreciate the interest and incentives of A. H. Wells, consultant.

The major portion of the work in this project was supported by the Office of Civilian Radioactive Waste Management, U.S. Department of Energy.

ABSTRACT

The results of an extensive update of the decay data of the ORIGEN-S library are presented in this report. The updated decay data were provided for both the ORIGEN-S and ORIGEN2 libraries in the same project. A complete edit of the decay data plus the available half-life uncertainties are included in Appendix A. A detailed description of the types of data contained in the library, the format of the library, and the data sources are also presented. Approximately 24% of the library nuclides are stable, 66% were updated from ENDF/B-VI, about 8% were updated from ENSDF, and the remaining 2% were not updated. Appendix B presents a listing of percentage changes in decay heat from the old to the updated library for all nuclides containing a difference exceeding 1% in any parameter.

1. INTRODUCTION

An extensive decay data library update project¹ was conducted prior to the release of the SCALE 4.2 version of ORIGEN-S.² The improved decay data were placed in both the ORIGEN2^{3,4} and ORIGEN-S libraries during the same project. The ORIGEN-S and ORIGEN2 codes are enhanced versions of the original ORIGEN code.⁵ The main functions of the ORIGEN-type codes are to compute fuel depletion, actinide transmutation and decay, fission product buildup and decay, and radiation source terms. Although there are major differences in the input descriptions and cross-section data of the two codes, the basic matrix exponential expansion model and the alternative Bateman equation solutions within the codes are essentially identical, and the radiation decay data are the same. In addition to the use of identical decay data, the size of the ORIGEN-S library was increased to the 1697-nuclide size of the ORIGEN2 library.

The ORIGEN-S data are divided into three library segments:

- (1) a light-element segment of 689 nuclides, composed of light elements, materials of construction and their activation and decay products;
- (2) an actinide segment of 129 nuclides, containing the fuel nuclides and their activation and decay products; and
- (3) a fission product segment of 879 nuclides containing fission products and their decay products.

The primary objective of this report is to provide a complete list of the updated ORIGEN-S decay data and the available half-life uncertainties. Other objectives are to present a detailed description of the ORIGEN-S decay library and to show the available references for the sources of the data. The types of data in the decay data library are described in Sect. 2. The sources of the decay data for the nuclides are provided in Sect. 3. Half-life uncertainties are discussed in Sect. 4. The library description and data sources, which are essentially repeated from Sect. M6, "ORIGEN-S Data Libraries," in the SCALE document,⁶ are included to produce a more complete description of the decay data library. Appendix A contains the complete list of decay data with half-life uncertainties. Appendix B contains a comparison between previous and updated decay libraries.

2. DESCRIPTION OF TYPES OF DATA IN THE DECAY LIBRARY

The decay data library contains decay data, atom-percent (at. %) natural abundances, and radioactivity concentration guides for both air and water. These data are in a single data file broken into three segments: light elements, actinides, and fission products. The decay data are read with a list-directed read statement as follows

```
READ(LIBDEC,*) LIB, NUC1, IU, HALFL, FB1, FP, FP1, FA, FT, LI2,  
*FSF, FN, Q(I), ABUND(I), AMPC(I), WMPC(I), LI3, FG(I), FB
```

During the processing, the nuclide data are stored in several arrays at locations indicated by the index I. The value of the ID number in both NUC1 and NUCL(I) is given by

$$\text{NUCL(I)} = Z * 10000 + W * 10 + \text{IS} , \quad (2.1)$$

where Z is the atomic number, W is the atomic mass number, and IS is 0 for a ground state or 1 for the first metastable state. In principle, IS could be greater than 1 for a nuclide in a higher metastable state, but none of the libraries currently contain data for any such nuclides.

The variable HALFL is the physical half-life in units designated by the variable IU, as shown in Table 1. The definitions of eight variables for branching fractions are given in Table 2.

Table 1. Units of half-life indicated
by the variable IU

IU	Units of half-life
1	seconds
2	minutes
3	hours
4	days
5	years
6	stable
7	10^3 years
8	10^6 years
9	10^9 years

Table 2. Definitions of branching fraction variables

Variable name	Definition
FB	Fraction of decay transitions that take place by beta (negatron) emission and lead to a product nuclide in the ground state
FB1	Fraction of decay transitions that take place by beta emission and lead to a product nuclide in an excited (metastable) nuclear state
FP	Fraction of decay transitions that take place by positron emission or orbital electron capture and lead to a product nuclide in the ground state
FP1	Fraction of decay transitions that take place by positron emission or orbital electron capture and lead to a product nuclide in an excited (metastable) nuclear state
FA	Fraction of decay transitions that take place by alpha particle emission
FT	Fraction of decay transitions that take place by isomeric transition
FSF	Fraction of decay transitions that take place by spontaneous fission
FN	Fraction of decay transitions that take place by the emission of both a beta particle and a neutron

The variable Q(I) is the total amount of recoverable energy (MeV) per disintegration released by radioactive decay. It does not include the energy of neutrinos emitted during beta decay transitions.

The variable FG(I) is the fraction of recoverable energy per disintegration that comes from gamma and X rays. In the ORIGEN-S libraries, this fraction includes the energy from all decay gamma and X rays and from all gamma rays associated with spontaneous fission. Using an approximation⁷ for the combined spectra of prompt and equilibrium fission-product gamma rays from spontaneous fission, a value of 12.56 MeV per spontaneous fission transition was calculated for use in determining FG for any nuclide having a spontaneous fission fraction exceeding 10^{-7} . Note that the definition of FG is not the same as that for the original ORIGEN libraries.⁵ FG included only those photons with energies greater than 200 keV. In addition, it included the bremsstrahlung radiation from beta particles slowing down in a UO₂ fuel matrix. Bremsstrahlung radiation is not included in the values of FG in the ORIGEN-S libraries, since the bremsstrahlung spectrum depends on the medium that contains the decaying nuclide. Neither is the energy from gamma rays accompanying (α ,n) reactions included, because it too depends on the medium.

The variable ABUND(I) is the atom percent abundance of naturally occurring isotopes. It is read by ORIGEN-S for light-element nuclides but is ignored for actinide and fission-product nuclides.

The variables WMPC(I) and AMPC(I) are the radioactivity concentration guides for continuous ingestion (from water) and inhalation (from air) in unrestricted areas, in units of curies per cubic meter (Ci m⁻³). The RCG values, as defined in the pre-1991 version of Part 10, Title 20, of the *Code of Federal Regulations*⁸ (10 CFR 20), specify the maximum permissible concentrations of an isotope in soluble and insoluble forms, for both ingestion and inhalation, and for occupational and unrestricted exposure. When the activity (in curies) of a given isotope is divided by WMPC (or AMPC) for that isotope, the result is the volume of water (or air) required to dilute that quantity of the isotope to its maximum permissible concentration. The dilution volume is a measure of the radioactive toxicity of the nuclide for cases of direct ingestion or inhalation. The values of WMPC and AMPC are defined to be the smaller (i.e., more toxic) of the values for soluble and insoluble forms of the isotope.

The variables LIB, LI2, and LI3 contain the library ID numbers read first from each card image. These variables are for accounting purposes and may be ignored.

3. SOURCES OF DECAY DATA

The primary source of the radioactive decay data was the Evaluated Nuclear Data Files (ENDF/B-VI).⁹ Approximately 24% of the library nuclides are stable. About 66% of the nuclides were completely updated with decay half-lives, branching fractions, recoverable energy per decay, and gamma energy per decay from ENDF/B-VI. The decay data for most of the remaining nuclides were taken from the Evaluated Nuclear Structure Data File (ENSDF).^{10,11} Only 21 nuclides were not fully updated. Here the number of nuclides represents the number of nuclide positions or locations in the library. The number of unique nuclides would be smaller because some isotopes or isomers are included in more than one of the three library segments.

Table 3 summarizes nuclides according to their change status (updated or unchanged), their decay data source, and their decay nature (stable or radioactive). The nature of ²⁰⁴Pb was changed¹ to stable because it was reevaluated⁹ since the previous update.⁷ Most nuclides were updated from ENDF/B-VI data files. Nuclides that were updated from ENSDF data are listed in Table 4.

All remaining nuclides for which all data items were not updated, or which were given special treatment, are listed in Table 5. Although these items are taken from the last 26 nuclides in the listing in Table 3, note that only 22 are shown in Table 5. The reason for the difference in numbers is because four of the different nuclides in Table 5 are in two library segments, and the values in Table 3 represent the number of nuclide positions in the entire library. The pseudonuclides ^{155m}Gd and ²⁵⁰S are not real nuclides but are locations for neutron counters used by ORIGEN2. The special purpose of ⁴H is explained in Sect. M6.3 of the SCALE document.⁶ The decay data for nuclides in Table 5 which are not specifically footnoted were taken from either the library for the original version of ORIGEN⁵ or the first expansion of the light-element and fission-product libraries.^{12,13} The sources of most of the decay data in those libraries were either the Table of Isotopes¹⁴ or the Chart of the Nuclides,¹⁵ although the sources of some of the data remain unknown.

A part of the recoverable energy per decay not included in the ENDF/B-VI and ENSDF data was that from spontaneous fission. This quantity was calculated as the product of the spontaneous fission branching fraction and the recoverable energy per fission and added to the ENDF or ENSDF recoverable energy. A value (consistent with that used in unchanged data) of 200 MeV per fission⁷ was assumed. A value of 12.56 MeV gamma energy per fission⁷ was used in computing the fraction of recoverable energy from photons.

In addition to radioactive decay data, the decay database contains two other kinds of data. Atom percent natural isotopic abundances were taken from Holden,¹⁶ and maximum permissible radioactivity concentration guides (RCGs) for air and water were taken from the *Code of Federal Regulations*, 10 CFR 20.⁸

Subsequent to the extensive decay data update project,¹ it was discovered that the conversion of measured disintegrations per second to the half-life upper limit reported¹⁷ for ⁷⁹Se data was low by a factor of 10. The ORIGEN-S library contains the required half-life revision. Also, the half-life of ^{86m}Br was changed back to the initial value because it was inadvertently given the ⁸⁶Br value. These two changes were performed prior to the release of SCALE 4.3.

Table 3. Summary of decay data sources

Number of nuclides	Stability, change status, and data source
404	Stable, unchanged
1126	Radioactive, updated (ENDF/B-VI ⁹)
2	Required half-life revisions, after ENDF/B-VI update
139	Radioactive, updated (ENSDF ^{10,19,20})
1	Stable, updated (<i>Table of Radioactive Isotopes</i> ^a)
21	Radioactive, partial ^b or no change (prior ORIGEN2 ^c)
4	Special purpose (pseudonuclide), unchanged
1697	Total library size

^aTaken from ref. 18.

^bNot all data items were changed.

^cTaken from ref. 7.

Table 4. Unique nuclides updated with decay data from ENSDF

4Be11	25Mn57	59Ce139m	72Hf178m	78Pt195m
5B12	25Mn58	59Pr139	27Hf179m	78Pt197m
7N13	27Co58m	59Pr140	72Hf180m	78Pt197
6C15	27Co61	60Nd141	73Ta180	80Hg197m
11Na24m	27Co62	63Eu149	72Hf181	89Hg197
11Na25	28Ni65	66Dy157	73Ta182m	78Pt199m
13Al29	28Ni66	66Dy159	73Ta183	78Pt199
13Al30	29Cu67	67Ho163	74W183m	79Au199
14Si32	30Zn69m	68Er163	74W185m	79Au200
15P33	30Zn69	68Er165	76Os185	80Hg205
15P34	31Ga70	68Er169	74W188	84Po211m
16S35	30Zn71	70Yb169	75Re188m	88Ra222
16S37	30Zn71m	69Tm170	75Re188	90Th226
17Cl38m	32Ge71	68Er171	74W189	92U230
17Cl38	32Ge71m	69Tm171	75Re189	92U231
19K43	45Rh102	68Er172	76Os190m	91Pa235
19K44	47Ag106	69Tm172	76Os191m	93Np235
21Sc46m	55Cs131	69Tm173	76Os191	95Am239
20Ca49	56Ba131	70Yb175	78Pt191	93Np241
21Sc49	56Ba131m	72Hf175	77Ir192	94Pu246
21Sc50	55Cs132	71Lu176m	77Ir192m	95Am246
23V53	56Ba133m	70Yb177	76Os193	96Cm251
23V54	58Ce137	71Lu177m	78Pt193m	99Es254
24Cr55	58Ce139	71Lu177	77Ir194m	

Table 5. Nuclides not updated with decay data or changed to stable

$1\text{H}4^a$	$58\text{Ce}142$	$70\text{Yb}175\text{m}$	$99\text{Es}254\text{m}^b$
$4\text{Be}8^c$	$62\text{Sm}149$	$92\text{U}241$	$98\text{Cf}255$
$23\text{V}50^d$	$65\text{Tb}162\text{m}$	$82\text{Pb}204^e$	$99\text{Es}255$
$34\text{Se}85\text{m}$	$64\text{Gd}155\text{m}^a$	$96\text{Cm}250$	$\text{S}250^a$
$35\text{Br}86\text{m}$	$65\text{Tb}163\text{m}$	$79\text{Bk}251$	
$58\text{Ce}137\text{m}^d$	$69\text{Tm}170\text{m}$	$98\text{Cf}254$	

^aSpecial-purpose pseudonuclides with no physical decay data.

^bGamma energies from ref. 18.

^cHalf-life increased from 6.7×10^{-17} s to 2×10^{-6} s to require fewer changes in PC version.

^dHalf-lives and recoverable energies from ENSDF.

^eThe “radioactivity/stability status” was specified as “stable” in ref. 18.

4. HALF-LIFE UNCERTAINTIES

All decay-related data contained in the ORIGEN-S decay data library are presented in Tables A.1–A.3 of Appendix A. The data in the table include the nuclide name, the half-life, the decay branching fractions for both the decay mode and the state of the product nuclide, the Q-value (or recoverable energy per disintegration), and the fraction of the Q-value from gamma emission. The states of the product nuclide are either the ground state or a metastable state (sometimes referred to as an excited or isomeric state). No more than one metastable state of an isotope is present in the library.

Additionally, half-life uncertainties that were available from the two main decay data sources, ENDF/B-VI and ENSDF, are listed in the tables. These data are given in the same units as the corresponding half-lives.

Although it is not strictly rigorous, it is often an acceptable practice to treat the ENDF or ENSDF uncertainties²¹ as standard deviations in performing further statistical analyses. An example of such an analysis would be the propagation of the standard deviation in half-life through the decay equations to estimate the uncertainty in the time-dependent residual quantity of a radionuclide.

5. SUMMARY

A detailed description of the ORIGEN-S decay data library was presented in this report. The definitions of the types of data, the library format, and a complete listing of all decay data were included. The data were taken from the Evaluated Nuclear Data File (ENDF/B-VI) and the Evaluated Nuclear Structure Data File (ENSDF) libraries in the extensive decay data update prior to the release of the SCALE 4.2 version of ORIGEN-S. Two nuclides were further updated prior to SCALE 4.3. Approximately 2% of the nuclides were not updated, because they were not included in the above sources.

A notable feature of this report is the inclusion of half-life uncertainties in the decay data listing of Appendix A. These half-life uncertainties may be useful in determining the uncertainties in spent fuel characteristics at various decay times. The uncertainty data were taken from the ENDF/B-VI and ENSDF libraries.

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APPENDIX A

**ORIGEN-S LIBRARY DECAY DATA AND
HALF-LIFE UNCERTAINTIES**

Table A.1 ORIGEN-S library half-lives, uncertainties, and other nuclear decay data
(light elements, materials of construction, and activation products)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclide							Q-value, MeV per disintegration	Fraction of Q-value that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron		
				Ground	Metastable	Ground	Metastable					
H 1	stable											
H 2	stable											
H 3	seconds	3.891E+08	1.893E+06	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.006	.000
H 4 ^b	seconds	1.000E-03	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.000	.000
HE 3	stable											
HE 4	stable											
HE 6	seconds	8.067E-01	1.500E-03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.570	.000
LI 6	stable											
LI 7	stable											
LI 8	seconds	8.380E-01	6.000E-03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	10.270	.000
BE 8	seconds	2.000E-06	NA	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.095	.000
BE 9	stable											
BE 10	seconds	5.049E+13	6.311E+12	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.203	.000
BE 11	seconds	1.381E+01	8.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	6.095	.236
B 10	stable											
B 11	stable											
B 12	seconds	2.020E-02	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	6.413	.009
C 12	stable											
C 13	stable											
C 14	seconds	1.808E+11	1.262E+09	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.049	.000
C 15	seconds	2.449E+00	4.000E-03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	6.483	.557
N 13	seconds	5.979E+02	2.400E-01	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	1.511	.675
N 14	stable											
N 15	stable											
N 16	seconds	7.130E+00	2.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	7.254	.619
O 16	stable											
O 17	stable											
O 18	stable											
O 19	seconds	2.691E+01	8.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.681	.351
F 19	stable											
F 20	seconds	1.100E+01	2.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.115	.397
NE 20	stable											
NE 21	stable											

Table A.1 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclide							Q-value, MeV per disintegration	Fraction of Q-value that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron		
				Ground	Metastable	Ground	Metastable					
								Ground	Ground			
NE 22	stable	3.724E+01	1.200E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.067	.080
NE 23	seconds	8.211E+07	6.311E+04	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	2.387	.919
NA 22	stable											
NA 23	seconds	5.277E+04	1.440E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.677	.882
NA 24	seconds	2.018E-02	NA	.0003	.0000	.0000	.0000	.9997	.0000	.0000	.473	.998
NA 24M	seconds	5.960E+01	7.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.946	.224
NA 25	stable											
MG 24	stable											
MG 25	stable											
MG 26	stable											
MG 27	seconds	5.677E+02	6.600E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.593	.559
MG 28	seconds	7.528E+04	1.080E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.525	.899
AL 27	stable											
AL 28	seconds	1.344E+02	4.800E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.020	.589
AL 29	seconds	3.940E+02	4.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.377	.777
AL 30	seconds	3.600E+00	6.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	5.680	.593
SI 28	stable											
SI 29	stable											
SI 30	stable										.596	.001
SI 31	seconds	9.439E+03	1.800E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.069	.000
SI 32	seconds	5.430E+09	1.300E+08	1.0000	.0000	.0000	.0000	.0000	.0000	.0000		
P 31	stable											
P 32	seconds	1.232E+06	3.456E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.695	.000
P 33	seconds	2.189E+06	1.100E+04	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.076	.000
P 34	seconds	1.243E+01	8.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.640	.125
S 32	stable											
S 33	stable											
S 34	stable											
S 35	seconds	7.561E+06	1.100E+04	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.049	.000
S 36	stable											
S 37	seconds	3.030E+02	1.200E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.731	.785
CL 35	stable											
CL 36	seconds	9.499E+12	6.311E+10	.9810	.0000	.0190	.0000	.0000	.0000	.0000	.247	.000

Table A.1 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclide							Q-value, MeV per disintegration	Fraction of Q-value that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron		
				Ground	Metastable	Ground	Metastable					
CL 37	stable	2.234E+03	3.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.970	.478
CL 38	seconds	7.150E-01	3.000E-03	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.671	1.000
CL 38M	stable											
AR 36	stable											
AR 37	seconds	3.028E+06	3.456E+03	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.002	.153
AR 38	stable											
AR 39	seconds	8.489E+09	9.467E+07	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.219	.000
AR 40	stable											
AR 41	seconds	6.577E+03	2.520E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.747	.735
AR 42	seconds	1.038E+09	3.471E+07	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.233	.000
K 39	stable											
K 40	seconds	4.030E+16	2.525E+14	.8933	.0000	.1067	.0000	.0000	.0000	.0000	.634	.246
K 41	stable											
K 42	seconds	4.450E+04	1.080E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.715	.169
K 43	seconds	8.030E+04	4.000E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.269	.753
K 44	seconds	1.328E+03	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.840	.620
CA 40	stable											
CA 41	seconds	3.250E+12	1.262E+11	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.003	.143
CA 42	stable											
CA 43	stable											
CA 44	stable											
CA 45	seconds	1.415E+07	1.555E+05	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.077	.000
CA 46	stable											
CA 47	seconds	3.919E+05	1.728E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.401	.749
CA 48	stable											
CA 49	seconds	5.229E+02	1.400E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.040	.785
SC 45	stable											
SC 46	seconds	7.241E+06	8.640E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.122	.947
SC 46M	seconds	1.875E+01	4.000E-02	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.143	.624
SC 47	seconds	2.890E+05	2.592E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.271	.399
SC 48	seconds	1.573E+05	3.600E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.576	.937
SC 49	seconds	3.432E+03	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.819	.001
SC 50	seconds	1.025E+02	5.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.838	.661

Table A.1 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclide							Q-value, MeV per disintegration	Fraction of Q-value that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron		
				Ground	Metastable	Ground	Metastable					
TI 46	stable											
TI 47	stable											
TI 48	stable											
TI 49	stable											
TI 50	stable											
TI 51	seconds	3.456E+02	6.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.238	.298
V 49	seconds	2.920E+07	4.320E+05	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.004	.213
V 50	seconds	4.400E+24	1.300E+24	.3000	.0000	.7000	.0000	.0000	.0000	.0000	1.293	.998
V 51	stable											
V 52	seconds	2.250E+02	6.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.514	.575
V 53	seconds	9.660E+01	2.400E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.047	.507
V 54	seconds	4.980E+01	5.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	6.380	.759
CR 50	stable											
CR 51	seconds	2.394E+06	3.456E+02	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.037	.899
CR 52	stable											
CR 53	stable											
CR 54	stable											
CR 55	seconds	2.098E+02	1.800E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.102	.001
MN 54	seconds	2.697E+07	8.640E+03	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.840	.995
MN 55	stable											
MN 56	seconds	9.283E+03	2.160E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.523	.671
MN 57	seconds	8.720E+01	8.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.203	.086
MN 58	seconds	6.530E+01	7.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.100	.578
FE 54	stable											
FE 55	seconds	8.615E+07	6.311E+05	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.006	.291
FE 56	stable											
FE 57	stable											
FE 58	stable											
FE 59	seconds	3.845E+06	6.048E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.306	.910
CO 58M	seconds	3.290E+04	4.000E+02	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.023	.082
CO 58	seconds	6.127E+06	1.296E+03	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	1.010	.966
CO 59	stable											
CO 60	seconds	1.663E+08	1.578E+04	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.601	.963

Table A.1 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclide							Q-value, MeV per disintegration	Fraction of Q-value that comes from gammas	
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable						Ground
CO 60M	seconds	6.282E+02	2.400E+00	.0024	.0000	.0000	.0000	.9976	.0000	.0000	.065	.102	
CO 61	seconds	5.940E+03	1.800E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.564	.172	
CO 62	seconds	9.000E+01	2.400E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.240	.494	
NI 58	stable												
NI 59	seconds	2.367E+12	4.102E+11	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.007	.401	
NI 60	stable												
NI 61	stable												
NI 62	stable												
NI 63	seconds	3.159E+09	6.311E+07	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.017	.000	
NI 64	stable												
NI 65	seconds	9.072E+03	4.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.184	.464	
NI 66	seconds	1.966E+05	1.100E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.065	.000	
CU 62	seconds	5.844E+02	1.200E+00	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	2.283	.439	
CU 63	stable												
CU 64	seconds	4.572E+04	7.200E+00	.3710	.0000	.6290	.0000	.0000	.0000	.0000	.313	.609	
CU 65	stable												
CU 66	seconds	3.060E+02	1.200E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.154	.068	
CU 67	seconds	2.226E+05	5.000E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.271	.426	
ZN 63	seconds	2.286E+03	1.800E+01	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	2.021	.545	
ZN 64	stable												
ZN 65	seconds	2.107E+07	8.640E+03	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.590	.989	
ZN 66	stable												
ZN 67	stable												
ZN 68	stable												
ZN 69	seconds	3.380E+03	6.000E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.321	.000	
ZN 69M	seconds	4.954E+04	8.000E+01	.0003	.0000	.0000	.0000	.9997	.0000	.0000	.438	.950	
ZN 70	stable												
ZN 71	seconds	1.470E+02	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.363	.231	
ZN 71M	seconds	1.426E+04	1.800E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.097	.744	
GA 69	stable												
GA 70	seconds	1.268E+03	1.800E+00	.9959	.0000	.0041	.0000	.0000	.0000	.0000	.651	.011	
GA 71	stable												
GA 72	seconds	5.076E+04	3.600E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.206	.844	

Table A.1 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclide							Q-value, MeV per disintegration	Fraction of Q-value that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron		
				Ground	Metastable	Ground	Metastable					
								Ground	Metastable	Ground	Ground	
GA 72M	seconds	3.700E-02	NA	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.119	1.000
GE 70	stable											
GE 71	seconds	9.880E+05	3.000E+03	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.009	.467
GE 71M	seconds	2.040E-02	NA	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.181	.828
GE 72	stable											
GE 73	stable											
GE 74	stable											
GE 75	seconds	4.967E+03	2.400E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.456	.077
GE 75M	seconds	4.770E+01	7.000E-01	.0003	.0000	.0000	.0000	.9997	.0000	.0000	.136	.419
GE 76	stable											
GE 77	seconds	4.068E+04	3.600E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.684	.607
GE 77M	seconds	5.290E+01	6.000E-01	.7900	.0000	.0000	.0000	.2100	.0000	.0000	1.013	.064
AS 75	stable											
AS 76	seconds	9.475E+04	2.520E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.483	.281
AS 77	seconds	1.398E+05	1.800E+02	.9968	.0032	.0000	.0000	.0000	.0000	.0000	.234	.032
SE 74	stable											
SE 75	seconds	1.035E+07	8.640E+02	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.407	.964
SE 76	stable											
SE 77	stable											
SE 77M	seconds	1.745E+01	1.000E-01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.159	.549
SE 78	stable											
SE 79	seconds	1.041E+13	1.010E+13	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.053	.000
SE 79M	seconds	2.346E+02	3.000E+00	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.094	.146
SE 80	stable											
SE 81	seconds	1.107E+03	7.200E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.618	.010
SE 81M	seconds	3.435E+03	5.400E+00	.0005	.0000	.0000	.0000	.9995	.0000	.0000	.100	.149
SE 82	stable											
SE 83	seconds	1.338E+03	6.600E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.050	.850
SE 83M	seconds	7.010E+01	4.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.227	.428
BR 79	stable											
BR 80	seconds	1.061E+03	1.200E+00	.9170	.0000	.0830	.0000	.0000	.0000	.0000	.801	.095
BR 80M	seconds	1.591E+04	3.600E+01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.085	.285
BR 81	stable											

Table A.1 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclide								Q-value, MeV per disintegration	Fraction of Q-value that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable			Ground	Ground		
BR 82	seconds	1.271E+05	7.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.783	.948	
BR 82M	seconds	3.678E+02	3.000E+00	.0240	.0000	.0000	.0000	.9760	.0000	.0000	.078	.104	
BR 83	seconds	8.640E+03	7.200E+01	.0002	.9998	.0000	.0000	.0000	.0000	.0000	.333	.021	
BR 78	stable												
KR 79	seconds	1.261E+05	3.600E+02	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.281	.914	
KR 79M	seconds	5.000E+01	3.000E+00	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.126	.317	
KR 80	stable												
KR 81	seconds	6.722E+12	6.627E+11	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.022	.775	
KR 81M	seconds	1.300E+01	1.000E+00	.0000	.0000	.0001	.0000	.9999	.0000	.0000	.187	.696	
KR 82	stable												
KR 83	stable												
KR 83M	seconds	6.588E+03	7.200E+01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.038	.063	
KR 84	stable												
KR 85	seconds	3.383E+08	6.311E+05	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.253	.009	
KR 85M	seconds	1.613E+04	2.880E+01	.7900	.0000	.0000	.0000	.2100	.0000	.0000	.412	.381	
KR 86	stable												
KR 87	seconds	4.579E+03	3.720E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.123	.373	
KR 88	seconds	1.022E+04	1.080E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.322	.841	
RB 85	stable												
RB 86	seconds	1.610E+06	1.555E+03	.9999	.0000	.0001	.0000	.0000	.0000	.0000	.761	.122	
RB 86M	seconds	6.102E+01	1.800E-01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.556	.982	
RB 87	seconds	1.515E+18	4.102E+16	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.082	.000	
RB 88	seconds	1.067E+03	6.600E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.709	.235	
RB 89	seconds	9.120E+02	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.088	.670	
SR 84	stable												
SR 85	seconds	5.602E+06	1.728E+03	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.527	.984	
SR 85M	seconds	4.060E+03	4.200E+00	.0000	.0000	.1270	.0000	.8730	.0000	.0000	.229	.944	
SR 86	stable												
SR 87	stable												
SR 87M	seconds	1.012E+04	3.600E+01	.0000	.0000	.0030	.0000	.9970	.0000	.0000	.386	.832	
SR 88	stable												
SR 89	seconds	4.368E+06	7.776E+03	.9999	.0001	.0000	.0000	.0000	.0000	.0000	.583	.000	
SR 90	seconds	8.883E+08	3.156E+06	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.196	.000	

Table A.1 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclide							Q-value, MeV per disintegration	Fraction of Q-value that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron		
				Ground	Metastable	Ground	Metastable					
SR 91	seconds	3.427E+04	2.160E+02	.4200	.5800	.0000	.0000	.0000	.0000	.0000	1.347	.523
SR 93	seconds	4.454E+02	1.440E+00	.6540	.3460	.0000	.0000	.0000	.0000	.0000	3.090	.736
Y 89	stable											
Y 89M	seconds	1.606E+01	4.000E-02	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.909	.992
Y 90	seconds	2.308E+05	3.600E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.934	.000
Y 90M	seconds	1.148E+04	3.600E+01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.680	.933
Y 91	seconds	5.055E+06	5.184E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.607	.006
Y 92	seconds	1.274E+04	3.600E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.689	.150
Y 93	seconds	3.636E+04	5.760E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.260	.070
Y 94	seconds	1.122E+03	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.587	.298
Y 96	seconds	5.900E+00	2.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.435	.272
ZR 89	seconds	2.824E+05	2.592E+02	.0000	.0000	.0013	.9987	.0000	.0000	.0000	.350	.733
ZR 90	stable											
ZR 91	stable											
ZR 92	stable											
ZR 93	seconds	4.828E+13	3.156E+12	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.019	.000
ZR 94	stable											
ZR 95	seconds	5.531E+06	3.456E+03	.9889	.0111	.0000	.0000	.0000	.0000	.0000	.850	.861
ZR 96	stable											
ZR 97	seconds	6.084E+04	1.800E+02	.0520	.9480	.0000	.0000	.0000	.0000	.0000	.886	.217
NB 91	seconds	2.146E+10	4.102E+09	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.017	.697
NB 92	seconds	1.104E+15	9.467E+13	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	1.513	.995
NB 93	stable											
NB 93M	seconds	5.090E+08	4.734E+06	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.029	.065
NB 94	seconds	6.406E+11	5.049E+10	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.717	.915
NB 95	seconds	3.021E+06	2.592E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.809	.945
NB 95M	seconds	3.119E+05	2.592E+03	.0560	.0000	.0000	.0000	.9440	.0000	.0000	.239	.287
NB 96	seconds	8.406E+04	1.800E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.716	.906
NB 97	seconds	4.326E+03	4.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.134	.587
NB 97M	seconds	6.000E+01	8.000E+00	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.743	.980
NB 98	seconds	2.860E+00	6.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.656	.448
NB100	seconds	1.500E+00	2.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.197	.221
MO 92	stable											

Table A.1 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclide								Q-value, MeV per disintegration	Fraction of Q-value that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable			Ground	Ground		
MO 93M	seconds	2.500E+04	NA	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	2.426	.952	
MO 93	seconds	1.104E+11	2.209E+10	.0000	.0000	.1800	.8200	.0000	.0000	.0000	.016	.688	
MO 94	stable												
MO 95	stable												
MO 96	stable												
MO 97	stable												
MO 98	stable												
MO 99	seconds	2.374E+05	3.600E+01	.1200	.8800	.0000	.0000	.0000	.0000	.0000	.676	.402	
MO100	stable												
MO101	seconds	8.760E+02	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.032	.745	
TC 97	seconds	8.205E+13	1.262E+13	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.017	.703	
TC 97M	seconds	7.819E+06	8.640E+04	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.092	.101	
TC 98	seconds	1.325E+14	9.467E+12	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.517	.919	
TC 99	seconds	6.662E+12	3.787E+10	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.085	.000	
TC100	seconds	1.580E+01	1.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.398	.059	
TC101	seconds	8.520E+02	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.813	.413	
RU 96	stable												
RU 97	seconds	2.506E+05	8.640E+03	.0000	.0000	.9996	.0004	.0000	.0000	.0000	.253	.951	
RU 98	stable												
RU 99	stable												
RU 100	stable												
RU 101	stable												
RU 102	stable												
RU 103	seconds	3.392E+06	1.728E+03	.0027	.9973	.0000	.0000	.0000	.0000	.0000	.562	.881	
RU 104	stable												
RU 105	seconds	1.598E+04	7.200E+01	.7160	.2840	.0000	.0000	.0000	.0000	.0000	1.150	.642	
RU 106	seconds	3.211E+07	1.296E+04	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.010	.000	
RU 107	seconds	2.250E+02	3.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.652	.361	
RH 102	seconds	9.152E+07	NA	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	2.165	.998	
RH 103	stable												
RH 104	seconds	4.230E+01	4.000E-01	.9955	.0000	.0045	.0000	.0000	.0000	.0000	.999	.012	
RH 104M	seconds	2.604E+02	3.000E+00	.0013	.0000	.0000	.0000	.9987	.0000	.0000	.127	.359	
RH 105	seconds	1.273E+05	2.160E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.230	.335	

Table A.1 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclide								Q-value, MeV per disintegration	Fraction of Q-value that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable			Ground	Ground		
								Ground	Ground				
RH 105M	seconds	4.500E+01	NA	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.125	.274	
RH 106	seconds	2.980E+01	8.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.617	.127	
RH 106M	seconds	7.800E+03	1.200E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.173	.899	
RH 107	seconds	1.302E+03	2.400E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.750	.417	
PD 102	stable												
PD 103	seconds	1.468E+06	1.642E+03	.0000	.0000	.0003	.9998	.0000	.0000	.0000	.020	.744	
PD 104	stable												
PD 105	stable												
PD 106	stable												
PD 107	seconds	2.051E+14	9.467E+12	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.009	.000	
PD 107M	seconds	2.130E+01	5.000E-01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.213	.713	
PD 108	stable												
PD 109	seconds	4.932E+04	3.600E+02	.0005	.9995	.0000	.0000	.0000	.0000	.0000	.361	.002	
PD 109M	seconds	2.814E+02	6.000E-01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.184	.598	
PD 110	stable												
PD 111	seconds	1.404E+03	1.200E+01	.0074	.9926	.0000	.0000	.0000	.0000	.0000	.878	.051	
PD 111M	seconds	1.980E+04	3.600E+02	.0740	.1960	.0000	.0000	.7300	.0000	.0000	.545	.659	
AG 106	seconds	1.440E+03	6.000E+00	.0100	.0000	.9900	.0000	.0000	.0000	.0000	.595	.168	
AG 107	stable												
AG 108	seconds	1.422E+02	6.000E-01	.9715	.0000	.0285	.0000	.0000	.0000	.0000	.628	.029	
AG 108M	seconds	4.008E+09	6.627E+08	.0000	.0000	.9130	.0000	.0870	.0000	.0000	1.636	.991	
AG 109	stable												
AG 109M	seconds	3.960E+01	2.000E-01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.085	.129	
AG 110	seconds	2.460E+01	2.000E-01	.9970	.0000	.0030	.0000	.0000	.0000	.0000	1.212	.025	
AG 110M	seconds	2.158E+07	3.456E+03	.9864	.0000	.0000	.0000	.0136	.0000	.0000	2.813	.974	
AG 111	seconds	6.437E+05	8.640E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.381	.069	
AG 111M	seconds	6.480E+01	8.000E-01	.0070	.0000	.0000	.0000	.9930	.0000	.0000	.062	.125	
AG 112	seconds	1.130E+04	7.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.086	.331	
CD 106	stable												
CD 107	seconds	2.340E+04	7.200E+01	.0000	.0000	.0006	.9994	.0000	.0000	.0000	.026	.798	
CD 108	stable												
CD 109	seconds	3.997E+07	3.456E+04	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.020	.758	
CD 110	stable												

Table A.1 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclide							Q-value, MeV per disintegration	Fraction of Q-value that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron		
				Ground	Metastable	Ground	Metastable					
								Ground	Ground	Ground		
CD 111	stable	2.916E+03	1.800E+01	.0000	.0000	.0000	1.0000	.0000	.0000	.387	.734	
CD 111M	seconds											
CD 112	stable	2.935E+23	5.996E+22	1.0000	.0000	.0000	.0000	.0000	.0000	.091	.000	
CD 113	seconds	4.450E+08	1.578E+07	.9986	.0000	.0000	.0014	.0000	.0000	.184	.000	
CD 113M	seconds											
CD 114	stable											
CD 115	seconds	1.925E+05	3.600E+02	.0000	1.0000	.0000	.0000	.0000	.0000	.510	.378	
CD 115M	seconds	3.853E+06	2.592E+04	.9999	.0001	.0000	.0000	.0000	.0000	.636	.052	
CD 116	stable											
CD 117	seconds	8.964E+03	1.440E+02	.0900	.9100	.0000	.0000	.0000	.0000	1.510	.715	
CD 117M	seconds	1.210E+04	1.800E+02	.9850	.0150	.0000	.0000	.0000	.0000	2.235	.910	
CD 119	seconds	1.614E+02	1.200E+00	.1000	.9000	.0000	.0000	.0000	.0000	2.472	.683	
CD 121	seconds	1.350E+01	3.000E-01	.0000	1.0000	.0000	.0000	.0000	.0000	3.179	.592	
IN 113	stable											
IN 113M	seconds	5.969E+03	3.600E+00	.0000	.0000	.0000	1.0000	.0000	.0000	.387	.664	
IN 114	seconds	7.190E+01	1.000E-01	.9950	.0000	.0050	.0000	.0000	.0000	.775	.003	
IN 114M	seconds	4.278E+06	8.640E+02	.0000	.0000	.0430	.9570	.0000	.0000	.236	.398	
IN 115	seconds	1.392E+22	7.889E+20	1.0000	.0000	.0000	.0000	.0000	.0000	.153	.000	
IN 116	seconds	1.410E+01	3.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	1.384	.014	
IN 116M	seconds	3.249E+03	3.600E+00	1.0000	.0000	.0000	.0000	.0000	.0000	2.784	.888	
IN 117	seconds	2.628E+03	4.200E+01	.9968	.0032	.0000	.0000	.0000	.0000	.954	.721	
IN 117M	seconds	6.990E+03	4.200E+01	.5290	.0000	.0000	.4710	.0000	.0000	.522	.174	
IN 118	seconds	5.000E+00	3.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	1.848	.042	
IN 119	seconds	1.440E+02	6.000E+00	.9907	.0093	.0000	.0000	.0000	.0000	1.370	.561	
IN 119M	seconds	1.080E+03	1.800E+01	.9750	.0000	.0000	.0250	.0000	.0000	1.107	.117	
IN 120	seconds	3.080E+00	8.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	2.759	.234	
IN 120M	seconds	4.620E+01	8.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	3.922	.724	
IN 121	seconds	2.310E+01	6.000E-01	.8870	.1130	.0000	.0000	.0000	.0000	1.912	.485	
SN 112	stable											
SN 113	seconds	9.944E+06	3.456E+03	.0000	.0000	1.0000	.0000	.0000	.0000	.028	.814	
SN 113M	seconds	1.284E+03	2.400E+01	.0000	.0000	.0890	.9110	.0000	.0000	.065	.210	
SN 114	stable											
SN 115	stable											

Table A.1 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclide							Q-value, MeV per disintegration	Fraction of Q-value that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron		
				Ground	Metastable	Ground	Metastable					
								Ground	Metastable	Ground		
SN 116	stable	1.175E+06	3.456E+03	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.313	.502
SN 117	stable											
SN 117M	seconds											
SN 118	stable											
SN 119	stable											
SN 119M	seconds	2.532E+07	1.123E+05	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.087	.131
SN 120	stable											
SN 121	seconds	9.742E+04	1.440E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.115	.000
SN 121M	seconds	1.736E+09	1.578E+08	.2240	.0000	.0000	.0000	.7760	.0000	.0000	.039	.128
SN 122	stable											
SN 123	seconds	1.116E+07	3.456E+04	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.527	.013
SN 123M	seconds	2.405E+03	4.200E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.619	.228
SN 124	stable											
SN 125	seconds	8.329E+05	2.592E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.123	.278
SN 125M	seconds	5.712E+02	3.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.162	.306
SB 121	stable											
SB 122	seconds	2.333E+05	8.640E+02	.9760	.0000	.0240	.0000	.0000	.0000	.0000	1.002	.436
SB 122M	seconds	2.526E+02	1.200E+00	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.160	.438
SB 123	stable											
SB 124	seconds	5.201E+06	2.592E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.236	.826
SB 124M	seconds	9.300E+01	3.000E+00	.2500	.0000	.0000	.0000	.7500	.0000	.0000	.557	.795
SB 125	seconds	8.615E+07	9.467E+05	.7700	.2300	.0000	.0000	.0000	.0000	.0000	.533	.814
SB 126	seconds	1.071E+06	8.640E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.119	.883
SB 126M	seconds	1.140E+03	1.800E+01	.8600	.0000	.0000	.0000	.1400	.0000	.0000	2.186	.711
TE 120	stable											
TE 121	seconds	1.450E+06	3.024E+04	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.586	.985
TE 121M	seconds	1.331E+07	6.048E+05	.0000	.0000	.1140	.0000	.8860	.0000	.0000	.291	.745
TE 122	stable											
TE 123	seconds	3.913E+20	3.156E+19	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.017	.765
TE 123M	seconds	1.034E+07	8.640E+03	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.246	.602
TE 124	stable											
TE 125	stable											
TE 125M	seconds	5.011E+06	8.640E+04	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.142	.251

Table A.1 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclide							Q-value, MeV per disintegration	Fraction of Q-value that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron		
				Ground	Metastable	Ground	Metastable					
TE 126	stable	3.366E+04	2.520E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.229	.021
TE 127	seconds	9.418E+06	1.728E+05	.0240	.0000	.0000	.0000	.9760	.0000	.0000	.090	.123
TE 127M	stable											
TE 128	stable											
TE 129	seconds	4.176E+03	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.600	.103
TE 129M	seconds	2.903E+06	8.640E+03	.3600	.0000	.0000	.0000	.6400	.0000	.0000	.307	.120
TE 130	stable											
TE 131	seconds	1.500E+03	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.142	.369
TE 131M	seconds	1.080E+05	7.200E+03	.7780	.0000	.0000	.0000	.2220	.0000	.0000	1.612	.882
I 125	seconds	5.196E+06	9.504E+03	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.059	.716
I 126	seconds	1.125E+06	6.048E+03	.4370	.0000	.5630	.0000	.0000	.0000	.0000	.610	.744
I 127	stable											
I 128	seconds	1.499E+03	1.200E+00	.9310	.0000	.0690	.0000	.0000	.0000	.0000	.829	.109
I 129	seconds	4.954E+14	1.262E+13	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.079	.312
I 130	seconds	4.450E+04	3.600E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.428	.881
I 130M	seconds	5.400E+02	6.000E+00	.1600	.0000	.0000	.0000	.8400	.0000	.0000	.288	.382
I 131	seconds	6.947E+05	8.640E+02	.9891	.0109	.0000	.0000	.0000	.0000	.0000	.573	.666
I 132	seconds	8.222E+03	3.600E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.778	.820
XE 124	stable											
XE 125	seconds	6.084E+04	7.200E+02	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.300	.892
XE 125M	seconds	5.700E+01	1.000E+00	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.247	.469
XE 126	stable											
XE 127	seconds	3.145E+06	8.640E+03	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.311	.901
XE 127M	seconds	6.920E+01	9.000E-01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.293	.573
XE 128	stable											
XE 129	stable											
XE 129M	seconds	7.681E+05	1.728E+04	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.227	.224
XE 130	stable											
XE 131	stable											
XE 131M	seconds	1.028E+06	8.640E+03	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.162	.124
XE 132	stable											
XE 133	seconds	4.530E+05	8.640E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.184	.257
XE 133M	seconds	1.892E+05	8.640E+02	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.225	.179

Table A.1 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclide								Q-value, MeV per disintegration	Fraction of Q-value that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable			Ground	Ground		
XE 134	stable	3.290E+04	7.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.567	.439
XE 135	seconds	9.174E+02	3.000E+00	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.523	.818
XE 135M	stable												
XE 136	stable												
XE 137	seconds	2.291E+02	7.800E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.888	.101
CS 131	seconds	8.372E+05	9.000E+02	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.028	.821
CS 132	seconds	5.598E+05	6.000E+02	.0187	.0000	.9813	.0000	.0000	.0000	.0000	.0000	.728	.982
CS 133	stable												
CS 134	seconds	6.507E+07	1.578E+05	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.720	.904
CS 134M	seconds	1.048E+04	3.600E+01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.131	.203
CS 135	seconds	7.258E+13	9.467E+12	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.056	.000
CS 136	seconds	1.137E+06	2.592E+03	.8880	.1120	.0000	.0000	.0000	.0000	.0000	.0000	2.051	.935
CS 137	seconds	9.467E+08	6.311E+06	.0557	.9443	.0000	.0000	.0000	.0000	.0000	.0000	.188	.000
CS 138	seconds	1.932E+03	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.604	.655
BA 130	stable												
BA 131	seconds	1.020E+06	1.800E+04	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.502	.914
BA 131M	seconds	8.760E+02	1.200E+01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.187	.412
BA 132	stable												
BA 133	seconds	3.320E+08	4.102E+06	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.455	.885
BA 133M	seconds	1.400E+05	4.000E+02	.0000	.0000	.0001	.0000	.9999	.0000	.0000	.0000	.285	.235
BA 134	stable												
BA 135	stable												
BA 135M	seconds	1.033E+05	7.200E+02	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.259	.229
BA 136	stable												
BA 136M	seconds	3.084E-01	1.900E-03	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	2.030	.949
BA 137	stable												
BA 137M	seconds	1.531E+02	6.000E-02	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.663	.904
BA 138	stable												
BA 139	seconds	5.078E+03	2.040E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.942	.046
BA 140	seconds	1.102E+06	2.592E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.493	.369
BA 141	seconds	1.096E+03	4.200E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.730	.472
LA 137	seconds	1.893E+12	6.311E+11	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.030	.835
LA 138	seconds	3.314E+18	6.311E+16	.3360	.0000	.6640	.0000	.0000	.0000	.0000	.0000	1.262	.977

Table A.1 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclide							Q-value, MeV per disintegration	Fraction of Q-value that comes from gammas	
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable						Ground
LA 139	stable	1.450E+05	6.048E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.832	.812	
LA 140	seconds	1.411E+04	1.080E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.994	.043	
LA 141	stable												
CE 136	stable												
CE 137	seconds	3.240E+04	1.100E+03	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.050	.756	
CE 137M	seconds	1.238E+05	1.100E+03	.0000	.0000	.0100	.0000	.9900	.0000	.0000	.258	.214	
CE 138	stable												
CE 139	seconds	1.189E+07	2.000E+03	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.248	.702	
CE 139M	seconds	5.480E+01	1.000E+00	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.751	.931	
CE 140	stable												
CE 141	seconds	2.808E+06	4.320E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.247	.310	
CE 142	seconds	3.311E+18	NA	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.000	.000	
CE 143	seconds	1.188E+05	7.200E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.709	.394	
CE 144	seconds	2.462E+07	1.728E+04	.9860	.0140	.0000	.0000	.0000	.0000	.0000	.110	.172	
CE 145	seconds	1.806E+02	3.600E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.536	.560	
PR 141	stable												
PR 142	seconds	6.883E+04	1.440E+02	.9998	.0000	.0002	.0000	.0000	.0000	.0000	.868	.067	
PR 142M	seconds	8.760E+02	3.000E+01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.002	.000	
PR 143	seconds	1.172E+06	1.728E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.315	.000	
PR 144	seconds	1.037E+03	3.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.238	.023	
PR 145	seconds	2.154E+04	3.600E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.696	.027	
ND 142	stable												
ND 143	stable												
ND 144	seconds	6.600E+22	NA	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	1.910	.000	
ND 145	stable												
ND 146	stable												
ND 147	seconds	9.487E+05	8.640E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.408	.343	
ND 148	stable												
ND 149	seconds	6.210E+03	2.520E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.871	.426	
ND 150	stable												
ND 151	seconds	7.464E+02	4.200E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.481	.639	
PM 145	seconds	5.586E+08	1.262E+07	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.044	.734	
PM 147	seconds	8.279E+07	6.311E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.062	.000	

Table A.1 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclide								Q-value, MeV per disintegration	Fraction of Q-value that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable				Ground		
								Ground	Metastable	Ground			
PM 148	seconds	4.640E+05	7.776E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.303	.440	
PM 148M	seconds	3.568E+06	9.504E+03	.9540	.0000	.0000	.0000	.0460	.0000	.0000	2.156	.920	
PM 149	seconds	1.911E+05	1.800E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.377	.032	
PM 150	seconds	9.648E+03	7.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.249	.654	
PM 151	seconds	1.022E+05	1.440E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.616	.534	
PM 152	seconds	2.460E+02	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.545	.097	
SM 144	stable												
SM 145	seconds	2.938E+07	2.592E+05	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.093	.702	
SM 146	seconds	3.250E+15	1.578E+14	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	2.543	.000	
SM 147	seconds	3.345E+18	6.311E+16	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	2.311	.000	
SM 148	seconds	2.500E+23	NA	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	1.986	.000	
SM 149	seconds	3.154E+23	NA	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.000	.000	
SM 150	stable												
SM 151	seconds	2.840E+09	1.893E+08	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.020	.001	
SM 152	stable												
SM 153	seconds	1.666E+05	3.600E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.335	.194	
SM 154	stable												
SM 155	seconds	1.338E+03	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.667	.154	
EU 151	stable												
EU 152	seconds	4.206E+08	1.262E+06	.2792	.0000	.7208	.0000	.0000	.0000	.0000	1.288	.902	
EU 152M	seconds	3.355E+04	3.600E+01	.7200	.0000	.2800	.0000	.0000	.0000	.0000	.805	.376	
EU 153	stable												
EU 154	seconds	2.711E+08	1.578E+05	.9998	.0000	.0002	.0000	.0000	.0000	.0000	1.532	.818	
EU 155	seconds	1.477E+08	1.578E+06	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.131	.493	
EU 156	seconds	1.312E+06	6.912E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.695	.726	
GD 152	seconds	3.408E+21	NA	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	2.206	.000	
GD 153	seconds	2.087E+07	1.728E+04	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.148	.726	
GD 154	stable												
GD 155M ^b	seconds	3.100E-02	NA	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.122	.000	
GD 155	stable												
GD 156	stable												
GD 157	stable												
GD 158	stable												

Table A.1 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclide								Q-value, MeV per disintegration	Fraction of Q-value that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable				Ground		
GD 159	seconds	6.682E+04	2.880E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.362	.144		
GD 160	stable												
GD 161	seconds	2.196E+02	3.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.971	.400		
GD 162	seconds	5.040E+02	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.823	.652		
TB 157	seconds	4.734E+09	9.467E+08	.0000	.0000	1.0000	.0000	.0000	.0000	.013	.737		
TB 159	stable												
TB 160	seconds	6.247E+06	1.728E+04	1.0000	.0000	.0000	.0000	.0000	.0000	1.480	.826		
TB 161	seconds	5.962E+05	1.728E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.233	.154		
TB 162	seconds	4.656E+02	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	1.646	.673		
DY 156	stable												
DY 157	seconds	2.930E+04	1.500E+02	.0000	.0000	1.0000	.0000	.0000	.0000	.317	.982		
DY 158	stable												
DY 159	seconds	1.248E+07	1.800E+04	.0000	.0000	1.0000	.0000	.0000	.0000	.055	.821		
DY 160	stable												
DY 161	stable												
DY 162	stable												
DY 163	stable												
DY 164	stable												
DY 165	seconds	8.402E+03	2.160E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.474	.055		
DY 165M	seconds	7.548E+01	3.600E-01	.0224	.0000	.0000	.0000	.9776	.0000	.118	.169		
DY 166	seconds	2.938E+05	3.600E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.206	.209		
HO 163	seconds	1.442E+11	8.000E+08	.0000	.0000	1.0000	.0000	.0000	.0000	.000	.000		
HO 165	stable												
HO 166	seconds	9.648E+04	7.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.725	.041		
HO 166M	seconds	3.787E+10	5.680E+09	1.0000	.0000	.0000	.0000	.0000	.0000	1.774	.918		
ER 162	stable												
ER 163	seconds	4.500E+03	2.400E+01	.0000	.0000	1.0000	.0000	.0000	.0000	.045	.884		
ER 164	stable												
ER 165	seconds	3.730E+04	1.500E+02	.0000	.0000	1.0000	.0000	.0000	.0000	.043	.880		
ER 166	stable												
ER 167	stable												
ER 167M	seconds	2.280E+00	3.000E-02	.0000	.0000	.0000	.0000	1.0000	.0000	.203	.478		
ER 168	stable												

Table A.1 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclide							Q-value, MeV per disintegration	Fraction of Q-value that comes from gammas	
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable						Ground
ER 169	seconds	8.122E+05	1.8000E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.103	.000		
ER 170	stable												
ER 171	seconds	2.706E+04	8.0000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.790	.472		
ER 172	seconds	1.775E+05	1.8000E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.633	.796		
TM 169	stable												
TM 170	seconds	1.111E+07	3.0000E+04	.9985	.0000	.0015	.0000	.0000	.0000	.335	.016		
TM 170M	seconds	4.100E-06	NA	.0000	.0000	.0000	.0000	1.0000	.0000	.000	.000		
TM 171	seconds	6.060E+07	4.0000E+05	1.0000	.0000	.0000	.0000	.0000	.0000	.026	.023		
TM 172	seconds	2.290E+05	1.1000E+03	1.0000	.0000	.0000	.0000	.0000	.0000	1.005	.483		
TM 173	seconds	2.970E+04	3.0000E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.696	.558		
YB 168	stable												
YB 169	seconds	2.767E+06	5.0000E+02	.0000	.0000	1.0000	.0000	.0000	.0000	.429	.734		
YB 170	stable												
YB 171	stable												
YB 172	stable												
YB 173	stable												
YB 174	stable												
YB 175	seconds	3.620E+05	9.0000E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.170	.235		
YB 175M	seconds	6.700E-02	NA	.0000	.0000	.0000	.0000	1.0000	.0000	.513	.000		
YB 176	stable												
YB 177	seconds	6.800E+03	4.0000E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.606	.307		
LU 175	stable												
LU 176	seconds	1.136E+18	5.049E+16	1.0000	.0000	.0000	.0000	.0000	.0000	.784	.626		
LU 176M	seconds	1.309E+04	1.100E+01	1.0000	.0000	.0010	.0000	.0000	.0000	.448	.018		
LU 177	seconds	5.797E+05	9.0000E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.182	.193		
LU 177M	seconds	1.390E+07	3.0000E+04	.7900	.0000	.0000	.0000	.2100	.0000	1.249	.801		
HF 174	stable												
HF 175	seconds	6.050E+06	1.8000E+05	.0000	.0000	1.0000	.0000	.0000	.0000	.411	.899		
HF 176	stable												
HF 177	stable												
HF 178	stable												
HF 178M	seconds	4.000E+00	2.0000E-01	.0000	.0000	.0000	.0000	1.0000	.0000	1.134	.882		
HF 179	stable												

Table A.1 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclide							Q-value, MeV per disintegration	Fraction of Q-value that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron		
				Ground	Metastable	Ground	Metastable					
								Ground	Metastable	Ground		
HF 179M	seconds	1.867E+01	3.000E-02	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.358	.662
HF 180	stable											
HF 180M	seconds	1.980E+04	4.000E+02	.0002	.0000	.0000	.0000	1.0000	.0000	.0000	1.121	.890
HF 181	seconds	3.662E+06	6.000E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.732	.727
HF 182	seconds	2.840E+14	6.311E+13	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.303	.792
TA 180	seconds	2.935E+04	2.200E+01	.1400	.0000	.8600	.0000	.0000	.0000	.0000	.100	.478
TA 181	stable											
TA 182	seconds	9.936E+06	1.728E+04	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.508	.863
TA 182M	seconds	9.500E+02	6.000E+00	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.523	.514
TA 183	seconds	4.410E+05	9.000E+03	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.638	.462
W 180	stable											
W 181	seconds	1.047E+07	1.728E+04	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.048	.859
W 182	stable											
W 183M	seconds	5.200E+00	6.000E-02	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.297	.437
W 183	stable											
W 184	stable											
W 185	seconds	6.489E+06	2.592E+04	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.127	.000
W 185M	seconds	1.002E+02	1.800E+00	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.183	.123
W 186	stable											
W 187	seconds	8.604E+04	3.600E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.722	.590
W 188	seconds	6.000E+06	5.000E+04	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.101	.019
W 189	seconds	6.900E+02	1.800E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.230	1.000
RE 185	stable											
RE 186	seconds	3.263E+05	3.240E+02	.9400	.0000	.0600	.0000	.0000	.0000	.0000	.361	.052
RE 187	seconds	1.578E+18	6.311E+17	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.001	.000
RE 188	seconds	6.113E+04	8.000E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.836	.068
RE 188M	seconds	1.116E+03	6.000E+00	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.161	.466
RE 189	seconds	8.750E+04	1.500E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.386	.145
OS 184	stable											
OS 185	seconds	8.090E+06	5.000E+04	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.727	.980
OS 186	stable											
OS 187	stable											
OS 188	stable											

Table A.1 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclide							Q-value, MeV per disintegration	Fraction of Q-value that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron		
				Ground	Metastable	Ground	Metastable					
								Ground	Metastable	Ground		
OS 189	stable											
OS 190	stable											
OS 190M	seconds	5.940E+02	6.000E+00	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	1.696	.937
OS 191	seconds	1.331E+06	9.000E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.125	.320
OS 191M	seconds	4.716E+04	1.800E+02	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.070	.107
OS 192	stable											
OS 193	seconds	1.098E+05	1.500E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.445	.151
OS 194	seconds	1.893E+08	6.311E+06	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.034	.056
IR 191	stable											
IR 192	seconds	6.379E+06	7.000E+02	.9524	.0000	.0476	.0000	.0000	.0000	.0000	1.035	.790
IR 192M	seconds	7.600E+09	3.000E+08	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.151	.019
IR 193	stable											
IR 194	seconds	6.894E+04	1.080E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.901	.100
IR 194M	seconds	1.480E+07	1.000E+06	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.413	.966
PT 190	seconds	1.893E+19	3.156E+18	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	3.243	.000
PT 191	seconds	2.510E+05	9.000E+03	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.335	.811
PT 192	stable											
PT 193	seconds	1.578E+09	2.840E+08	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.005	.433
PT 193M	seconds	3.740E+05	3.000E+03	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.141	.092
PT 194	stable											
PT 195	stable											
PT 195M	seconds	3.473E+05	9.000E+02	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.245	.310
PT 196	stable											
PT 197	seconds	6.590E+04	1.100E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.276	.091
PT 197M	seconds	5.725E+03	1.100E+01	.0330	.0000	.0000	.0000	.9670	.0000	.0000	.399	.209
PT 198	stable											
PT 199	seconds	1.848E+03	2.400E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.741	.271
PT 199M	seconds	1.360E+01	4.000E-01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.417	.817
AU 197	stable											
AU 198	seconds	2.329E+05	1.728E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.730	.552
AU 199	seconds	2.712E+05	6.000E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.233	.385
AU 200	seconds	2.904E+03	1.800E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.013	.269
HG 196	stable											

Table A.1 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclide								Q-value, MeV per disintegration	Fraction of Q-value that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
Ground	Metastable	Ground	Metastable	Ground	Ground	Ground	Ground						
HG 197	seconds	2.309E+05	1.8000E+02	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.552		
HG 197M	seconds	8.570E+04	4.0000E+02	.0000	.0000	.0700	.0000	.9300	.0000	.0000	.311		
HG 198	stable												
HG 199	stable												
HG 199M	seconds	2.556E+03	3.0000E+01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.350		
HG 200	stable												
HG 201	stable												
HG 202	stable												
HG 203	seconds	4.027E+06	1.5555E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.707		
HG 204	stable												
HG 205	seconds	3.120E+02	6.0000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.010		
TL 203	stable												
TL 204	seconds	1.193E+08	6.311E+05	.9743	.0000	.0257	.0000	.0000	.0000	.0000	.006		
TL 205	stable												
TL 206	seconds	2.520E+02	1.200E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.000		
PB 204	stable												
PB 205	seconds	4.797E+14	2.209E+13	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.506		
PB 206	stable												
PB 207	stable												
PB 208	stable												
PB 209	seconds	1.171E+04	5.040E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.000		
BI 208	seconds	1.161E+13	1.262E+11	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.998		
BI 209	stable												
BI 210	seconds	4.331E+05	4.320E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.000		
BI 210M	seconds	9.467E+13	3.156E+12	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.049		
BI 211	seconds	1.284E+02	1.200E+00	.0027	.0000	.0000	.0000	.0000	.9973	.0000	.007		
PO 210	seconds	1.196E+07	1.728E+02	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.000		
PO 211	seconds	5.160E-01	3.000E-03	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.001		
PO 211M	seconds	2.520E+01	6.000E-01	.0000	.0000	.0000	.0000	.0000	.9998	.0000	.002		

^a“NA” denotes not available in ENDF/B-VI or ENSDF libraries.^bPseudonuclide.

Table A.2 ORIGEN-S library half-lives, uncertainties, and other nuclear decay data
(actinides and their daughters)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclides								Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Spontaneous fission			
				Ground	Metastable	Ground	Metastable						
											Ground		
HE 4 ^b	stable	2.520E+02	1.200E+00	.0000	.0000	.0000	.0000	.0000	0.00E+00	.537	.000		
TL 206	seconds	2.862E+02	1.200E+00	.0000	.0000	.0000	.0000	.0000	0.00E+00	.497	.004		
TL 207	seconds	1.832E+02	2.400E-01	.0000	.0000	.0000	.0000	.0000	0.00E+00	3.946	.852		
TL 208	seconds	1.320E+02	4.200E+00	.0000	.0000	.0000	.0000	.0000	0.00E+00	2.811	.754		
PB 206	stable												
PB 207	stable												
PB 208	seconds	1.171E+04	5.040E+01	.0000	.0000	.0000	.0000	.0000	0.00E+00	.198	.000		
PB 209	seconds	7.037E+08	6.311E+06	.0000	.0000	.0000	.0000	.0000	0.00E+00	.040	.127		
PB 210	seconds	2.166E+03	1.200E+01	.0000	.0000	.0000	.0000	.0000	0.00E+00	.521	.130		
PB 211	seconds	3.830E+04	3.600E+01	.0000	.0000	.0000	.0000	.0000	0.00E+00	.319	.455		
PB 212	seconds	1.608E+03	NA	.0000	.0000	.0000	.0000	.0000	0.00E+00	.544	.460		
PB 214	seconds	1.161E+13	1.262E+11	.0000	1.0000	.0000	.0000	.0000	0.00E+00	2.652	.998		
BI 208	stable												
BI 209	seconds	9.467E+13	3.156E+12	.0000	.0000	.0000	.0000	.0000	0.00E+00	5.309	.049		
BI 210M	seconds	4.331E+05	4.320E+02	.0000	.0000	.0000	.0000	.0000	0.00E+00	.389	.000		
BI 210	seconds	1.284E+02	1.200E+00	.0027	.0000	.0000	.0000	.0000	0.00E+00	6.733	.007		
BI 211	seconds	3.633E+03	3.600E+00	.6406	.0000	.0000	.0000	.0000	0.00E+00	2.825	.037		
BI 212	seconds	2.735E+03	3.600E+00	.9790	.0000	.0000	.0000	.0000	0.00E+00	.714	.177		
BI 213	seconds	1.194E+03	2.400E+01	.9998	.0000	.0000	.0000	.0000	0.00E+00	2.163	.697		
BI 214	seconds	1.196E+07	1.728E+02	.0000	.0000	.0000	.0000	.0000	0.00E+00	5.407	.000		
PO 210	seconds	2.520E+01	6.000E-01	.0000	.0000	.0000	.0000	.0000	0.00E+00	7.515	.002		
PO 211M	seconds	5.160E-01	3.000E-03	.0000	.0000	.0000	.0000	.0000	0.00E+00	7.595	.001		
PO 211	seconds	2.980E-07	3.000E-09	.0000	.0000	.0000	.0000	.0000	0.00E+00	8.953	.000		
PO 212	seconds	4.200E-06	8.000E-07	.0000	.0000	.0000	.0000	.0000	0.00E+00	8.536	.000		
PO 213	seconds	1.643E-04	1.800E-06	.0000	.0000	.0000	.0000	.0000	0.00E+00	7.833	.000		
PO 214	seconds	1.780E-03	4.000E-06	.0000	.0000	.0000	.0000	.0000	0.00E+00	7.526	.000		
PO 215	seconds	1.450E-01	2.000E-03	.0000	.0000	.0000	.0000	.0000	0.00E+00	6.906	.000		
PO 216	seconds	1.860E+02	6.000E-01	.0002	.0000	.0000	.0000	.0000	0.00E+00	6.113	.000		
PO 217	seconds	3.230E-02	4.000E-04	.0001	.0000	.0000	.0000	.0000	0.00E+00	7.199	.000		
AT 217	seconds	3.500E-02	5.000E-03	.0000	.0000	.0000	.0000	.0000	0.00E+00	7.266	.000		
RN 218	seconds	3.960E+00	1.000E-02	.0000	.0000	.0000	.0000	.0000	0.00E+00	7.000	.008		
RN 219	seconds												

Table A.2 (continued)

Nuclide name	Time units or stable	Half-life	Half-life ^a uncertainty	Branching fractions, by decay mode and by state of product nuclides								Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Spontaneous fission			
				Ground	Metastable	Ground	Metastable						
											Ground		
RN 220	seconds	5.560E+01	1.000E-01	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	6.405	.000	
RN 222	seconds	3.304E+05	2.592E+01	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	5.590	.000	
FR 221	seconds	2.940E+02	1.200E+01	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	6.512	.005	
FR 223	seconds	1.308E+03	2.400E+01	.9999	.0000	.0000	.0000	.0000	6.00E-05	0.00E+00	.413	.139	
RA 222	seconds	3.800E+01	5.000E-01	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	6.670	.001	
RA 223	seconds	9.879E+05	1.728E+02	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	5.799	.022	
RA 224	seconds	3.162E+05	3.456E+03	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	5.790	.002	
RA 225	seconds	1.279E+06	1.728E+04	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	.122	.118	
RA 226	seconds	5.049E+10	2.209E+08	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	4.872	.001	
RA 228	seconds	1.814E+08	9.467E+05	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	.009	.047	
AC 225	seconds	8.640E+05	8.640E+03	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	5.891	.003	
AC 227	seconds	6.870E+08	9.467E+05	.9862	.0000	.0000	.0000	.0000	1.38E-02	0.00E+00	.082	.002	
AC 228	seconds	2.214E+04	7.200E+01	1.0000	.0000	.0000	.0000	.0000	5.50E-08	0.00E+00	1.316	.669	
TH 226	seconds	1.854E+03	NA	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	6.448	.001	
TH 227	seconds	1.617E+06	4.320E+02	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	6.164	.018	
TH 228	seconds	6.037E+07	6.311E+04	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	5.525	.001	
TH 229	seconds	2.487E+11	1.262E+09	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	5.186	.018	
TH 230	seconds	2.379E+12	9.467E+09	.0000	.0000	.0000	.0000	.0000	1.00E+00	2.50E-13	4.763	.000	
TH 231	seconds	9.187E+04	3.600E+01	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	.184	.169	
TH 232	seconds	4.434E+17	1.893E+15	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	4.086	.000	
TH 233	seconds	1.338E+03	6.000E+00	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	.456	.080	
TH 234	seconds	2.082E+06	2.592E+03	.0000	1.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	.070	.139	
PA 231	seconds	1.034E+12	3.471E+09	.0000	.0000	.0000	.0000	.0000	1.00E+00	1.50E-12	5.133	.008	
PA 232	seconds	1.132E+05	1.728E+03	.9998	.0000	.0020	.0000	.0000	0.00E+00	0.00E+00	1.105	.850	
PA 233	seconds	2.333E+06	8.640E+03	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	.428	.522	
PA 234M	seconds	7.020E+01	1.800E+00	.9987	.0000	.0000	.0000	.0013	0.00E+00	0.00E+00	.827	.013	
PA 234	seconds	2.412E+04	1.800E+02	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	2.468	.794	
PA 235	seconds	1.446E+03	1.200E+01	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	.470	.000	
U 230	seconds	1.797E+06	NA	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	5.992	.000	
U 231	seconds	3.630E+05	9.000E+03	.0000	.0000	1.0000	.0000	.0000	5.50E-05	0.00E+00	.089	.862	
U 232	seconds	2.203E+09	1.578E+07	.0000	.0000	.0000	.0000	.0000	1.00E+00	9.00E-13	5.412	.000	
U 233	seconds	5.024E+12	6.311E+09	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	4.915	.000	
U 234	seconds	7.754E+12	9.467E+09	.0000	.0000	.0000	.0000	.0000	1.00E+00	1.73E-11	4.856	.000	

Table A.2 (continued)

Nuclide name	Time units or stable	Half-life	Half-life ^a uncertainty	Branching fractions, by decay mode and by state of product nuclides								Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Spontaneous fission			
				Ground	Metastable	Ground	Metastable						
											Ground		
U 235	seconds	2.221E+16	2.209E+13	.0000	.0000	.0000	.0000	.0000	1.00E+00	7.20E-11	4.674	.036	
U 236	seconds	7.391E+14	9.467E+11	.0000	.0000	.0000	.0000	.0000	1.00E+00	9.64E-10	4.568	.000	
U 237	seconds	5.832E+05	8.640E+02	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	.327	.437	
U 238	seconds	1.410E+17	1.578E+14	.0000	.0000	.0000	.0000	.0000	1.00E+00	5.45E-07	4.270	.000	
U 239	seconds	1.408E+03	3.000E+00	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	.458	.112	
U 240	seconds	5.076E+04	3.600E+02	.0000	1.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	.151	.065	
U 241	seconds	1.000E+00	NA	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	.404	.000	
NP 235	seconds	3.423E+07	1.100E+05	.0000	.0000	1.0000	.0000	.0000	1.40E-05	0.00E+00	.010	.702	
NP 236M	seconds	8.100E+04	1.440E+03	.4800	.0000	.5200	.0000	.0000	0.00E+00	0.00E+00	.134	.380	
NP 236	seconds	3.629E+12	3.787E+11	.0890	.0000	.9100	.0000	.0000	0.00E+00	0.00E+00	.345	.426	
NP 237	seconds	6.753E+13	3.156E+11	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	4.813	.007	
NP 238	seconds	1.829E+05	1.728E+02	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	.841	.769	
NP 239	seconds	2.035E+05	3.456E+02	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	.427	.430	
NP 240M	seconds	4.332E+02	1.200E+00	.9988	.0000	.0000	.0000	.0012	0.00E+00	0.00E+00	.945	.341	
NP 240	seconds	3.714E+03	1.200E+01	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	1.621	.718	
NP 241	seconds	8.340E+02	1.200E+01	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	.475	.073	
PU 236	seconds	9.152E+07	3.156E+06	.0000	.0000	.0000	.0000	.0000	1.00E+00	8.50E-10	5.865	.000	
PU 237	seconds	3.903E+06	5.184E+03	.0000	.0000	1.0000	.0000	.0000	4.20E-05	0.00E+00	.065	.865	
PU 238	seconds	2.768E+09	9.467E+06	.0000	.0000	.0000	.0000	.0000	1.00E+00	1.90E-09	5.591	.000	
PU 239	seconds	7.608E+11	9.467E+08	.0000	.0000	.0000	.0000	.0000	1.00E+00	4.40E-12	5.243	.000	
PU 240	seconds	2.071E+11	2.209E+08	.0000	.0000	.0000	.0000	.0000	1.00E+00	5.70E-08	5.253	.000	
PU 241	seconds	4.528E+08	3.156E+06	1.0000	.0000	.0000	.0000	.0000	2.39E-05	0.00E+00	.005	.000	
PU 242	seconds	1.179E+13	3.471E+10	.0000	.0000	.0000	.0000	.0000	1.00E+00	5.49E-06	4.982	.000	
PU 243	seconds	1.784E+04	1.080E+01	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	.194	.129	
PU 244	seconds	2.525E+15	2.840E+13	.0000	.0000	.0000	.0000	.0000	9.99E-01	1.20E-03	4.891	.003	
PU 245	seconds	3.780E+04	3.600E+02	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	.734	.541	
PU 246	seconds	9.366E+05	1.800E+03	.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	.256	.559	
AM 239	seconds	4.280E+04	4.000E+02	.0000	.0000	.9999	.0000	.0000	1.00E-04	0.00E+00	.374	.629	
AM 240	seconds	1.832E+05	7.200E+02	.0000	.0000	1.0000	.0000	.0000	1.90E-06	0.00E+00	1.098	.943	
AM 241	seconds	1.365E+10	1.578E+07	.0000	.0000	.0000	.0000	.0000	1.00E+00	3.77E-12	5.629	.005	
AM 242M	seconds	4.450E+09	6.311E+07	.0000	.0000	.0000	.0000	.9955	4.50E-03	1.60E-10	.068	.089	
AM 242	seconds	5.767E+04	7.200E+01	.8270	.0000	.1730	.0000	.0000	0.00E+00	0.00E+00	.194	.100	
AM 243	seconds	2.326E+11	4.734E+08	.0000	.0000	.0000	.0000	.0000	1.00E+00	3.70E-11	5.431	.011	

Table A.2 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclides								Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha		Spontaneous fission		
				Ground	Metastable	Ground	Metastable		Ground	Ground			
AM 244M	seconds	1.560E+03	NA	.9996	.0000	.0004	.0000	.0000	0.00E+00	0.00E+00	.520	.033	
AM 244	seconds	3.636E+04	3.600E+02	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	1.128	.718	
AM 245	seconds	7.380E+03	3.600E+01	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	.320	.102	
AM 246	seconds	2.340E+03	1.800E+01	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	1.376	.505	
CM 241	seconds	2.834E+06	1.728E+04	.0000	.0000	.9900	.0000	.0000	1.00E-02	0.00E+00	.683	.738	
CM 242	seconds	1.408E+07	5.184E+03	.0000	.0000	.0000	.0000	.0000	1.00E+00	6.33E-08	6.155	.000	
CM 243	seconds	8.994E+08	6.311E+06	.0000	.0000	.0024	.0000	.0000	9.98E-01	0.00E+00	6.175	.022	
CM 244	seconds	5.712E+08	6.311E+05	.0000	.0000	.0000	.0000	.0000	1.00E+00	1.35E-06	5.900	.000	
CM 245	seconds	2.682E+11	6.311E+09	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	5.615	.017	
CM 246	seconds	1.493E+11	3.156E+09	.0000	.0000	.0000	.0000	.0000	1.00E+00	2.61E-04	5.525	.001	
CM 247	seconds	5.049E+14	1.578E+13	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	5.354	.059	
CM 248	seconds	1.073E+13	9.467E+10	.0000	.0000	.0000	.0000	.0000	9.17E-01	8.26E-02	21.260	.049	
CM 249	seconds	3.849E+03	1.800E+00	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	.296	.064	
CM 250	10 ³ yrs	1.740E+01	NA	.1400	.0000	.0000	.0000	.0000	2.50E-01	6.10E-01	123.300	.062	
CM 251	seconds	1.008E+03	1.200E+01	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	.560	.196	
BK 249	seconds	2.765E+07	5.184E+05	1.0000	.0000	.0000	.0000	.0000	1.45E-05	4.70E-10	.033	.000	
BK 250	seconds	1.158E+04	1.800E+01	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	1.188	.757	
BK 251	minutes	5.700E+01	NA	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	1.100	.000	
CF 249	seconds	1.106E+10	6.627E+07	.0000	.0000	.0000	.0000	.0000	1.00E+00	5.20E-09	6.291	.052	
CF 250	seconds	4.128E+08	2.840E+06	.0000	.0000	.0000	.0000	.0000	9.99E-01	7.70E-04	6.277	.002	
CF 251	seconds	2.834E+10	1.389E+09	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	6.041	.021	
CF 252	seconds	8.347E+07	2.525E+05	.0000	.0000	.0000	.0000	.0000	9.69E-01	3.09E-02	12.220	.032	
CF 253	seconds	1.539E+06	6.912E+03	.9969	.0000	.0000	.0000	.0000	3.10E-03	0.00E+00	.096	.000	
CF 254	days	6.050E+01	NA	.0000	.0000	.0000	.0000	.0000	3.10E-03	9.97E-01	199.400	.063	
CF 255	hours	1.500E+00	NA	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	.100	.000	
ES 253	seconds	1.769E+06	2.592E+03	.0000	.0000	.0000	.0000	.0000	1.00E+00	8.70E-08	6.737	.000	
ES 254M	hours	3.930E+01	NA	.0000	.0000	.0008	.0155	.0000	9.83E-01	1.03E-03	8.173	.060	
ES 254	seconds	2.382E+07	5.000E+04	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	6.499	.012	
ES 255	days	3.900E+01	NA	.0000	.0000	.0000	.0000	.0000	1.00E+00	4.17E-05	7.370	.000	
S 250 ^c	stable												

^a“NA” denotes not available in ENDF/B-VI or ENSDF libraries.^bPresent to account for conservation of mass from alpha decays.^cPseudonuclide.

Table A.3 ORIGEN-S half-lives, uncertainties, and other nuclear decay data
(fission products)

Nuclide name	Time units or stable	Half-life	Half-life ^a uncertainty	Branching fractions, by decay mode and by state of product nuclides								Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable			Ground	Ground		
				Ground	Metastable	Ground	Metastable	Ground	Ground				
H 3	seconds	3.891E+08	1.893E+06	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.006	.000	
LI 6	stable												
LI 7	stable												
BE 9	stable												
BE 10	seconds	5.049E+13	6.311E+12	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.203	.000	
C 14	seconds	1.808E+11	1.262E+09	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.049	.000	
NI 66	seconds	1.966E+05	1.100E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.065	.000	
CU 66	seconds	3.060E+02	1.200E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.154	.068	
ZN 66	stable												
CU 67	seconds	2.226E+05	5.000E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.271	.426	
ZN 67	stable												
ZN 68	stable												
ZN 69	seconds	3.380E+03	6.000E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.321	.000	
ZN 69M	seconds	4.954E+04	8.000E+01	.0003	.0000	.0000	.0000	.9997	.0000	.0000	.438	.950	
GA 69	stable												
ZN 70	stable												
GA 70	seconds	1.268E+03	1.800E+00	.9959	.0000	.0041	.0000	.0000	.0000	.0000	.651	.011	
GE 70	stable												
ZN 71	seconds	1.470E+02	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.363	.231	
ZN 71M	seconds	1.426E+04	1.800E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.097	.744	
GA 71	stable												
GE 71	seconds	9.880E+05	3.000E+03	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.009	.467	
GE 71M	seconds	2.040E-02	NA	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.181	.828	
CO 72	seconds	1.235E-01	NA	.8847	.0000	.0000	.0000	.0000	.0000	.1153	9.394	.500	
NI 72	seconds	3.831E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.795	.327	
CU 72	seconds	6.489E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	5.029	.595	
ZN 72	seconds	1.674E+05	3.600E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.255	.598	
GA 72	seconds	5.076E+04	3.600E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.206	.844	
GE 72	stable												
CO 73	seconds	1.290E-01	NA	.7488	.0000	.0000	.0000	.0000	.0000	.2512	7.914	.377	
NI 73	seconds	4.906E-01	NA	.9999	.0000	.0000	.0000	.0000	.0000	.0000	4.900	.330	
CU 73	seconds	5.114E+00	NA	.9944	.0000	.0000	.0000	.0000	.0000	.0056	2.759	.280	
ZN 73	seconds	2.350E+01	1.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.715	.431	

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclides							Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron		
				Ground	Metastable	Ground	Metastable					
								Ground	Ground			
GA 73	seconds	1.750E+04	1.080E+02	.0130	.9870	.0000	.0000	.0000	.0000	.0000	.787	.433
GE 73	stable											
GE 73M	seconds	4.990E-01	1.100E-02	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.066	.170
CO 74	seconds	9.196E-02	NA	.8257	.0000	.0000	.0000	.0000	.0000	.1743	10.740	.505
NI 74	seconds	9.002E-01	NA	.9964	.0000	.0000	.0000	.0000	.0000	.0036	3.883	.309
CU 74	seconds	6.482E-01	NA	.9970	.0000	.0000	.0000	.0000	.0000	.0029	5.718	.561
ZN 74	seconds	9.600E+01	1.000E+00	.2500	.7500	.0000	.0000	.0000	.0000	.0000	1.437	.598
GA 74	seconds	4.872E+02	7.200E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.028	.749
GE 74	stable											
CO 75	seconds	8.166E-02	NA	.6869	.0000	.0000	.0000	.0000	.0000	.3131	9.302	.403
NI 75	seconds	2.312E-01	NA	.9900	.0000	.0000	.0000	.0000	.0000	.0100	6.047	.366
CU 75	seconds	9.274E-01	NA	.9653	.0000	.0000	.0000	.0000	.0000	.0347	3.795	.287
ZN 75	seconds	1.020E+01	2.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.748	.507
GA 75	seconds	1.260E+02	1.800E+00	.9520	.0480	.0000	.0000	.0000	.0000	.0000	1.656	.214
GE 75	seconds	4.967E+03	2.400E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.456	.077
GE 75M	seconds	4.770E+01	7.000E-01	.0003	.0000	.0000	.0000	.9997	.0000	.0000	.136	.419
AS 75	stable											
NI 76	seconds	3.046E-01	NA	.9649	.0000	.0000	.0000	.0000	.0000	.0351	4.924	.310
CU 76	seconds	2.602E-01	NA	.9716	.0000	.0000	.0000	.0000	.0000	.0284	6.633	.528
ZN 76	seconds	5.600E+00	1.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.152	.350
GA 76	seconds	3.260E+01	6.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.704	.595
GE 76	stable											
AS 76	seconds	9.475E+04	2.520E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.483	.281
SE 76	stable											
NI 77	seconds	1.033E-01	NA	.9529	.0000	.0000	.0000	.0000	.0000	.0471	7.597	.406
CU 77	seconds	3.052E-01	NA	.8769	.0000	.0000	.0000	.0000	.0000	.1231	4.855	.310
ZN 77	seconds	2.080E+00	5.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.220	.426
GA 77	seconds	1.320E+01	2.000E-01	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	2.832	.279
GE 77	seconds	4.068E+04	3.600E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.684	.607
GE 77M	seconds	5.290E+01	6.000E-01	.7900	.0000	.0000	.0000	.2100	.0000	.0000	1.013	.064
AS 77	seconds	1.398E+05	1.800E+02	.9968	.0032	.0000	.0000	.0000	.0000	.0000	.234	.032
SE 77	stable											
SE 77M	seconds	1.745E+01	1.000E-01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.159	.549

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclides								Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable			Ground			
											Ground		
NI 78	seconds	1.318E-01	NA	.9070	.0000	.0000	.0000	.0000	.0000	.0930	5.866	.320	
CU 78	seconds	1.179E-01	NA	.9009	.0000	.0000	.0000	.0000	.0000	.0991	7.953	.510	
ZN 78	seconds	1.470E+00	1.500E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.754	.407	
GA 78	seconds	5.090E+00	5.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	5.081	.500	
GE 78	seconds	5.280E+03	6.000E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.505	.550	
AS 78	seconds	5.442E+03	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.579	.520	
SE 78	stable												
CU 79	seconds	1.351E-01	NA	.7579	.0000	.0000	.0000	.0000	.0000	.2421	5.860	.336	
ZN 79	seconds	1.000E+00	1.000E-01	.9885	.0000	.0000	.0000	.0000	.0000	.0115	5.938	.491	
GA 79	seconds	3.000E+00	9.000E-02	.9470	.0520	.0000	.0000	.0000	.0000	.0005	4.216	.494	
GE 79	seconds	1.910E+01	3.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.052	.199	
AS 79	seconds	5.406E+02	9.000E+00	.0106	.9894	.0000	.0000	.0000	.0000	.0000	.876	.032	
SE 79	seconds	1.041E+13	1.010E+13	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.053	.000	
SE 79M	seconds	2.346E+02	3.000E+00	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.094	.146	
BR 79	stable												
BR 79M	seconds	4.860E+00	4.000E-02	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.206	.770	
KR 79	seconds	1.261E+05	3.600E+02	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.281	.914	
CU 80	seconds	8.988E-02	NA	.8496	.0000	.0000	.0000	.0000	.0000	.1504	9.041	.507	
ZN 80	seconds	5.400E-01	2.000E-02	.9890	.0000	.0000	.0000	.0000	.0000	.0110	4.005	.310	
GA 80	seconds	1.660E+00	9.000E-02	.9918	.0000	.0000	.0000	.0000	.0000	.0082	6.673	.532	
GE 80	seconds	2.950E+01	4.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.510	.397	
AS 80	seconds	1.520E+01	2.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.026	.273	
SE 80	stable												
BR 80	seconds	1.061E+03	1.200E+00	.9170	.0000	.0830	.0000	.0000	.0000	.0000	.801	.095	
BR 80M	seconds	1.591E+04	3.600E+01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.085	.285	
KR 80	stable												
CU 81	seconds	7.421E-02	NA	.4705	.0000	.0000	.0000	.0000	.0000	.5295	8.810	.392	
ZN 81	seconds	1.227E-01	NA	.9426	.0000	.0000	.0000	.0000	.0000	.0574	6.782	.400	
GA 81	seconds	1.230E+00	1.000E-02	.4700	.4100	.0000	.0000	.0000	.0000	.1190	4.810	.468	
GE 81	seconds	7.600E+00	6.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.283	.256	
AS 81	seconds	3.330E+01	8.000E-01	.9700	.0300	.0000	.0000	.0000	.0000	.0000	1.808	.127	
SE 81	seconds	1.107E+03	7.200E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.618	.010	
SE 81M	seconds	3.435E+03	5.400E+00	.0005	.0000	.0000	.0000	.9995	.0000	.0000	.100	.149	

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^d	Branching fractions, by decay mode and by state of product nuclides								Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable			Ground	Ground		
BR 81	stable	6.722E+12	6.627E+11	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.022	.775	
KR 81	seconds	1.300E+01	1.000E+00	.0000	.0000	.0001	.0000	.9999	.0000	.0000	.187	.696	
KR 81M	seconds	1.268E-01	NA	.7877	.0000	.0000	.0000	.0000	.0000	.2123	6.577	.332	
ZN 82	seconds	6.000E-01	NA	.7900	.0000	.0000	.0000	.0000	.0000	.2100	8.064	.512	
GA 82	seconds	4.600E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.214	.346	
GE 82	seconds	1.910E+01	5.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.002	.271	
AS 82	seconds	1.360E+01	4.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.617	.607	
SE 82	stable	1.271E+05	7.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.783	.948	
BR 82	seconds	3.678E+02	3.000E+00	.0240	.0000	.0000	.0000	.9760	.0000	.0000	.078	.104	
BR 82M	stable	8.364E-02	NA	.7713	.0000	.0000	.0000	.0000	.0000	.2287	8.245	.479	
ZN 83	seconds	3.100E-01	NA	.4400	.0000	.0000	.0000	.0000	.0000	.5600	8.072	.464	
GA 83	seconds	1.900E+00	NA	.9983	.0000	.0000	.0000	.0000	.0000	.0017	5.133	.476	
GE 83	seconds	1.340E+01	3.000E-01	.3000	.0000	.0000	.0000	.0000	.0000	.687	4.007	.687	
AS 83	seconds	1.338E+03	6.600E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.050	.850	
SE 83	seconds	7.010E+01	4.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.227	.428	
SE 83M	seconds	8.640E+03	7.200E+01	.0002	.9998	.0000	.0000	.0000	.0000	.0000	.333	.021	
BR 83	stable	6.588E+03	7.200E+01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.038	.063	
KR 83M	seconds	9.838E-02	NA	.7198	.0000	.0000	.0000	.0000	.0000	.2802	9.100	.509	
GA 84	seconds	1.200E+00	NA	.9000	.0000	.0000	.0000	.0000	.0000	.1000	5.063	.486	
SE 84	seconds	5.500E+00	3.000E-01	.9991	.0000	.0000	.0000	.0000	.0000	.0009	5.440	.294	
AS 84	seconds	1.920E+02	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.960	.438	
BR 84	seconds	1.908E+03	4.800E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.986	.582	
BR 84M	seconds	3.600E+02	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.669	.755	
KR 84	stable	8.697E-02	NA	.5504	.0000	.0000	.0000	.0000	.0000	.4496	9.217	.467	
GA 85	seconds	2.500E-01	NA	.8000	.0000	.0000	.0000	.0000	.0000	.2000	6.351	.501	
GE 85	seconds	2.028E+00	1.200E-02	.2900	.0000	.0000	.0000	.0000	.0000	.7100	6.344	.474	
AS 85	seconds	3.170E+01	9.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.970	.558	
SE 85	seconds	1.900E+01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.494	.386	

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclides								Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable						
											Ground		
BR 85	seconds	1.722E+02	1.800E+00	.9982	.0000	.0000	.0000	.0000	.0000	.0000	1.107	.060	
KR 85	seconds	3.383E+08	6.311E+05	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.253	.009	
KR 85M	seconds	1.613E+04	2.880E+01	.7900	.0000	.0000	.0000	.2100	.0000	.0000	.412	.381	
RB 85	stable												
GE 86	seconds	2.468E-01	NA	.7800	.0000	.0000	.0000	.0000	.0000	.2200	6.147	.429	
AS 86	seconds	9.000E-01	2.000E-01	.8800	.0000	.0000	.0000	.0000	.0000	.1200	7.180	.526	
SE 86	seconds	1.530E+01	9.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.550	.648	
BR 86	seconds	5.510E+01	4.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	5.340	.641	
BR 86M	seconds	4.500E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.752	.351	
KR 86	stable												
RB 86	seconds	1.610E+06	1.555E+03	.9999	.0000	.0001	.0000	.0000	.0000	.0000	.761	.122	
RB 86M	seconds	6.102E+01	1.800E-01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.556	.982	
SR 86	stable												
GE 87	seconds	1.339E-01	NA	.8487	.0000	.0000	.0000	.0000	.0000	.1513	7.229	.496	
AS 87	seconds	3.000E-01	NA	.5600	.0000	.0000	.0000	.0000	.0000	.4400	7.250	.479	
SE 87	seconds	5.600E+00	NA	.9981	.0000	.0000	.0000	.0000	.0000	.0019	4.723	.560	
BR 87	seconds	5.569E+01	1.300E-01	.9749	.0000	.0000	.0000	.0000	.0000	.0251	4.951	.674	
KR 87	seconds	4.579E+03	3.720E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.123	.373	
RB 87	seconds	1.515E+18	4.102E+16	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.082	.000	
SR 87	stable												
SR 87M	seconds	1.012E+04	3.600E+01	.0000	.0000	.0030	.0000	.9970	.0000	.0000	.386	.832	
GE 88	seconds	1.290E-01	NA	.7835	.0000	.0000	.0000	.0000	.0000	.2165	7.172	.419	
AS 88	seconds	1.348E-01	NA	.8009	.0000	.0000	.0000	.0000	.0000	.1991	8.122	.520	
SE 88	seconds	1.500E+00	NA	.9950	.0000	.0000	.0000	.0000	.0000	.0050	4.250	.478	
BR 88	seconds	1.650E+01	1.000E-01	.9363	.0000	.0000	.0000	.0000	.0000	.0637	5.881	.561	
KR 88	seconds	1.022E+04	1.080E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.322	.841	
RB 88	seconds	1.067E+03	6.600E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.709	.235	
SR 88	stable												
AS 89	seconds	1.212E-01	NA	.6673	.0000	.0000	.0000	.0000	.0000	.3327	8.181	.482	
SE 89	seconds	4.100E-01	NA	.9500	.0000	.0000	.0000	.0000	.0000	.0500	5.051	.375	
BR 89	seconds	4.370E+00	3.000E-02	.8620	.0000	.0000	.0000	.0000	.0000	.1380	5.481	.587	
KR 89	seconds	1.902E+02	1.200E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.186	.571	
RB 89	seconds	9.120E+02	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.088	.670	

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclides							Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron		
				Ground	Metastable	Ground	Metastable					
								Ground	Ground	Ground		
SR 89	seconds	4.368E+06	7.776E+03	.9999	.0001	.0000	.0000	.0000	.0000	.0000	.583	.000
Y 89	stable											
Y 89M	seconds	1.606E+01	4.000E-02	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.909	.992
AS 90	seconds	9.112E-02	NA	.7565	.0000	.0000	.0000	.0000	.0000	.2435	9.174	.477
SE 90	seconds	4.272E-01	NA	.8900	.0000	.0000	.0000	.0000	.0000	.1100	5.607	.470
BR 90	seconds	1.920E+00	6.000E-02	.7680	.0000	.0000	.0000	.0000	.0000	.2320	5.871	.548
KR 90	seconds	3.232E+01	9.000E-02	.8800	.1200	.0000	.0000	.0000	.0000	.0000	2.578	.480
RB 90	seconds	1.530E+02	3.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.156	.521
RB 90M	seconds	2.580E+02	5.000E+00	.9770	.0000	.0000	.0000	.0230	.0000	.0000	4.751	.700
SR 90	seconds	8.883E+08	3.156E+06	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.196	.000
Y 90	seconds	2.308E+05	3.600E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.934	.000
Y 90M	seconds	1.148E+04	3.600E+01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.680	.933
ZR 90	stable											
ZR 90M	seconds	8.092E-01	2.000E-03	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	2.319	.993
SE 91	seconds	2.700E-01	NA	.7900	.0000	.0000	.0000	.0000	.0000	.2100	7.062	.443
BR 91	seconds	6.000E-01	NA	.8910	.0000	.0000	.0000	.0000	.0000	.1090	5.628	.380
KR 91	seconds	8.570E+00	4.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.812	.458
RB 91	seconds	5.840E+01	4.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.901	.600
SR 91	seconds	3.427E+04	2.160E+02	.4200	.5800	.0000	.0000	.0000	.0000	.0000	1.347	.523
Y 91	seconds	5.055E+06	5.184E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.607	.006
Y 91M	seconds	2.983E+03	4.200E+00	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.555	.951
ZR 91	stable											
NB 91	seconds	2.146E+10	4.102E+09	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.017	.697
SE 92	seconds	1.682E-01	NA	.8677	.0000	.0000	.0000	.0000	.0000	.1323	6.435	.348
BR 92	seconds	3.650E-01	7.000E-03	.7000	.0000	.0000	.0000	.0000	.0000	.3000	7.681	.417
KR 92	seconds	1.850E+00	1.000E-02	.9997	.0000	.0000	.0000	.0000	.0000	.0003	3.559	.408
RB 92	seconds	4.500E+00	2.000E-02	.9999	.0000	.0000	.0000	.0000	.0000	.0001	4.044	.129
SR 92	seconds	9.756E+03	3.600E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.516	.884
Y 92	seconds	1.274E+04	3.600E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.689	.150
ZR 92	stable											
NB 92	seconds	1.104E+15	9.467E+13	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	1.513	.995
SE 93	seconds	9.677E-02	NA	.8797	.0000	.0000	.0000	.0000	.0000	.1203	8.341	.497
BR 93	seconds	1.763E-01	NA	.5900	.0000	.0000	.0000	.0000	.0000	.4100	7.533	.488

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclides								Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable			Ground			
											Ground		
KR 93	seconds	1.290E+00	1.000E-02	.9805	.0000	.0000	.0000	.0000	.0000	.0195	.440		
RB 93	seconds	5.700E+00	1.000E-01	.9866	.0000	.0000	.0000	.0000	.0000	.0134	.334		
SR 93	seconds	4.454E+02	1.440E+00	.6540	.3460	.0000	.0000	.0000	.0000	.0000	.736		
Y 93	seconds	3.636E+04	5.760E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.070		
ZR 93	seconds	4.828E+13	3.156E+12	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.000		
NB 93	stable										.019		
NB 93M	seconds	5.090E+08	4.734E+06	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.029		
BR 94	seconds	1.108E-01	NA	.7020	.0000	.0000	.0000	.0000	.0000	.2980	8.908		
KR 94	seconds	2.100E-01	NA	.9430	.0000	.0000	.0000	.0000	.0000	.0570	4.456		
RB 94	seconds	2.702E+00	5.000E-03	.8995	.0000	.0000	.0000	.0000	.0000	.1015	6.925		
SR 94	seconds	7.520E+01	8.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.267		
Y 94	seconds	1.122E+03	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.587		
ZR 94	stable												
NB 94	seconds	6.406E+11	5.049E+10	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.717		
NB 94M	seconds	3.756E+02	6.000E-01	.0050	.0000	.0000	.0000	.9950	.0000	.0000	.047		
BR 95	seconds	1.069E-01	NA	.7292	.0000	.0000	.0000	.0000	.0000	.2708	7.507		
KR 95	seconds	7.800E-01	NA	.9050	.0000	.0000	.0000	.0000	.0000	.0950	6.463		
RB 95	seconds	3.840E-01	6.000E-03	.9148	.0000	.0000	.0000	.0000	.0000	.0852	6.273		
SR 95	seconds	2.510E+01	2.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.825		
Y 95	seconds	6.300E+02	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.637		
ZR 95	seconds	5.531E+06	3.456E+03	.9889	.0111	.0000	.0000	.0000	.0000	.0000	.850		
NB 95	seconds	3.021E+06	2.592E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.809		
NB 95M	seconds	3.119E+05	2.592E+03	.0560	.0000	.0000	.0000	.9440	.0000	.0000	.239		
MO 95	stable												
BR 96	seconds	8.881E-02	NA	.7808	.0000	.0000	.0000	.0000	.0000	.2192	9.460		
KR 96	seconds	2.931E-01	NA	.9225	.0000	.0000	.0000	.0000	.0000	.0775	4.681		
RB 96	seconds	1.990E-01	3.000E-03	.8660	.0000	.0000	.0000	.0000	.0000	.1340	7.849		
SR 96	seconds	1.060E+00	3.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.148		
Y 96	seconds	5.900E+00	2.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.435		
ZR 96	stable												
NB 96	seconds	8.406E+04	1.800E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.716		
MO 96	stable												
KR 97	seconds	1.000E-01	NA	.9161	.0000	.0000	.0000	.0000	.0000	.0839	6.875		
											.435		

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclides								Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable						
											Ground		
RB 97	seconds	1.718E-01	1.600E-03	.7360	.0000	.0000	.0000	.0000	.0000	.2640	8.446	.568	
SR 97	seconds	4.200E-01	3.000E-02	.8500	.1500	.0000	.0000	.0000	.0000	.0001	4.660	.474	
Y 97	seconds	3.500E+00	2.000E-01	.9994	.0000	.0000	.0000	.0000	.0000	.0006	3.952	.455	
ZR 97	seconds	6.084E+04	1.800E+02	.0520	.9480	.0000	.0000	.0000	.0000	.0000	.886	.217	
NB 97	seconds	4.326E+03	4.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.134	.587	
NB 97M	seconds	6.000E+01	8.000E+00	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.743	.980	
MO 97	stable												
KR 98	seconds	1.602E-01	NA	.9170	.0000	.0000	.0000	.0000	.0000	.0830	5.391	.343	
RB 98	seconds	1.140E-01	5.000E-03	.8400	.0000	.0000	.0000	.0000	.0000	.1600	6.733	.434	
SR 98	seconds	6.500E-01	3.000E-02	.9970	.0000	.0000	.0000	.0000	.0000	.0030	3.191	.329	
Y 98	seconds	6.400E-01	3.000E-02	.9976	.0000	.0000	.0000	.0000	.0000	.0024	5.151	.507	
ZR 98	seconds	3.070E+01	4.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.001	.164	
NB 98	seconds	2.860E+00	6.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.656	.448	
NB 98M	seconds	3.078E+03	2.400E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.462	.783	
MO 98	stable												
TC 98	seconds	1.325E+14	9.467E+12	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.517	.919	
RB 99	seconds	5.900E-02	1.000E-03	.8500	.0000	.0000	.0000	.0000	.0000	.1500	6.422	.414	
SR 99	seconds	2.710E-01	4.000E-03	.9990	.0000	.0000	.0000	.0000	.0000	.0010	5.413	.499	
Y 99	seconds	1.470E+00	2.000E-02	.9847	.0000	.0000	.0000	.0000	.0000	.0153	3.845	.349	
ZR 99	seconds	2.100E+00	1.000E-01	.6400	.3600	.0000	.0000	.0000	.0000	.0000	2.593	.457	
NB 99	seconds	1.500E+01	2.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.020	.356	
NB 99M	seconds	1.560E+02	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.630	.605	
MO 99	seconds	2.374E+05	3.600E+01	.1200	.8800	.0000	.0000	.0000	.0000	.0000	.676	.402	
TC 99	seconds	6.662E+12	3.787E+10	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.085	.000	
TC 99M	seconds	2.164E+04	3.600E+01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.158	.802	
RU 99	stable												
RB 100	seconds	9.844E-02	NA	.9505	.0000	.0000	.0000	.0000	.0000	.0495	8.984	.520	
SR 100	seconds	2.020E-01	3.000E-03	.9925	.0000	.0000	.0000	.0000	.0000	.0075	3.809	.335	
Y 100	seconds	7.350E-01	7.000E-03	.9915	.0000	.0000	.0000	.0000	.0000	.0085	5.804	.431	
ZR 100	seconds	7.100E+00	4.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.812	.385	
NB 100	seconds	1.500E+00	2.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.197	.221	
NB 100M	seconds	2.980E+00	1.100E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.896	.501	
MO 100	stable												

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclides								Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable						
											Ground		
TC 100	seconds	1.580E+01	1.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.398	.059	
RU 100	stable												
RB 101	seconds	9.385E-02	NA	.7168	.0000	.0000	.0000	.0000	.0000	.2832	7.370	.424	
SR 101	seconds	1.941E-01	NA	.9753	.0000	.0000	.0000	.0000	.0000	.0247	6.139	.434	
Y 101	seconds	5.000E-01	5.000E-02	.9793	.0000	.0000	.0000	.0000	.0000	.0207	4.224	.361	
ZR 101	seconds	2.000E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.251	.336	
NB 101	seconds	7.100E+00	3.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.406	.299	
MO 101	seconds	8.760E+02	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.032	.745	
TC 101	seconds	8.520E+02	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.813	.413	
RU 101	stable												
SR 102	seconds	2.871E-01	NA	.9524	.0000	.0000	.0000	.0000	.0000	.0476	4.618	.342	
Y 102	seconds	9.000E-01	NA	.9406	.0000	.0000	.0000	.0000	.0000	.0594	6.947	.550	
ZR 102	seconds	2.900E+00	2.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.987	.371	
NB 102	seconds	1.300E+00	2.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.293	.340	
MO 102	seconds	6.780E+02	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.398	.119	
TC 102	seconds	5.280E+00	1.500E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.613	.457	
TC 102M	seconds	2.610E+02	4.200E+00	.9800	.0000	.0000	.0000	.0200	.0000	.0000	3.317	.761	
RU 102	stable												
RH 102	seconds	9.152E+07	NA	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	2.165	.998	
PD 102	stable												
SR 103	seconds	1.196E-01	NA	.9112	.0000	.0000	.0000	.0000	.0000	.0888	6.696	.440	
Y 103	seconds	2.604E-01	NA	.8763	.0000	.0000	.0000	.0000	.0000	.1237	5.081	.390	
ZR 103	seconds	1.300E+00	1.000E-01	.9998	.0000	.0000	.0000	.0000	.0000	.0002	3.924	.374	
NB 103	seconds	1.500E+00	2.000E-01	.9999	.0000	.0000	.0000	.0000	.0000	.0001	3.093	.317	
MO 103	seconds	6.750E+01	1.500E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.278	.498	
TC 103	seconds	5.420E+01	8.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.257	.440	
RU 103	seconds	3.392E+06	1.728E+03	.0027	.0000	.0000	.0000	.0000	.0000	.0000	.562	.881	
RH 103	stable												
SR 103M	seconds	3.367E+03	6.000E-01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.038	.044	
RB 104	seconds	1.629E-01	NA	.8653	.0000	.0000	.0000	.0000	.0000	.1347	5.366	.345	
Y 104	seconds	1.283E-01	NA	.9122	.0000	.0000	.0000	.0000	.0000	.0878	7.293	.514	
ZR 104	seconds	2.573E+00	NA	.9989	.0000	.0000	.0000	.0000	.0000	.0011	2.637	.339	
NB 104	seconds	4.800E+00	NA	.9929	.0000	.0000	.0000	.0000	.0000	.0071	5.887	.573	

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life ^a uncertainty	Branching fractions, by decay mode and by state of product nuclides								Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable			Ground	Ground		
MO 104	seconds	6.000E+01	2.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.208	.484	
TC 104	seconds	1.098E+03	1.800E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.695	.608	
RU 104	stable												
RH 104	seconds	4.230E+01	4.000E-01	.9955	.0000	.0045	.0000	.0000	.0000	.0000	.999	.012	
RH 104M	seconds	2.604E+02	3.000E+00	.0013	.0000	.0000	.0000	.9987	.0000	.0000	.127	.359	
PD 104	stable												
Y 105	seconds	1.469E-01	NA	.8025	.0000	.0000	.0000	.0000	.0000	.1975	5.821	.407	
ZR 105	seconds	4.926E-01	NA	.9860	.0000	.0000	.0000	.0000	.0000	.0140	4.431	.398	
NB 105	seconds	2.950E+00	6.000E-02	.9777	.0000	.0000	.0000	.0000	.0000	.0223	3.911	.359	
MO 105	seconds	3.560E+01	1.600E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.177	.452	
TC 105	seconds	4.560E+02	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.993	.392	
RU 105	seconds	1.598E+04	7.200E+01	.7160	.2840	.0000	.0000	.0000	.0000	.0000	1.150	.642	
RH 105	seconds	1.273E+05	2.160E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.230	.335	
RH 105M	seconds	4.500E+01	NA	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.125	.274	
PD 105	stable												
Y 106	seconds	8.943E-02	NA	.8434	.0000	.0000	.0000	.0000	.0000	.1566	8.101	.517	
ZR 106	seconds	9.071E-01	NA	.9848	.0000	.0000	.0000	.0000	.0000	.0152	3.235	.337	
NB 106	seconds	1.000E+00	NA	.9450	.0000	.0000	.0000	.0000	.0000	.0550	5.882	.433	
MO 106	seconds	8.400E+00	5.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.978	.377	
TC 106	seconds	3.600E+01	1.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.630	.633	
RU 106	seconds	3.211E+07	1.296E+04	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.010	.000	
RH 106	seconds	2.980E+01	8.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.617	.127	
RH 106M	seconds	7.800E+03	1.200E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.173	.899	
PD 106	stable												
AG 106	seconds	1.440E+03	6.000E+00	.0100	.0000	.9900	.0000	.0000	.0000	.0000	.595	.168	
Y 107	seconds	9.226E-02	NA	.7406	.0000	.0000	.0000	.0000	.0000	.2594	6.646	.421	
ZR 107	seconds	2.430E-01	NA	.9629	.0000	.0000	.0000	.0000	.0000	.0371	5.200	.423	
NB 107	seconds	7.660E-01	NA	.9122	.0000	.0000	.0000	.0000	.0000	.0878	4.673	.389	
MO 107	seconds	3.500E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.710	.375	
TC 107	seconds	2.120E+01	2.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.583	.548	
RU 107	seconds	2.250E+02	3.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.652	.361	
RH 107	seconds	1.302E+03	2.400E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.750	.417	
PD 107	seconds	2.051E+14	9.467E+12	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.009	.000	

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclides								Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable						
								Ground	Ground				
PD 107M	seconds	2.130E+01	5.000E-01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.213	.713	
AG 107	stable												
ZR 108	seconds	3.781E-01	NA	.9297	.0000	.0000	.0000	.0000	.0000	.0703	3.942	.340	
NB 108	seconds	2.423E-01	NA	.9353	.0000	.0000	.0000	.0000	.0000	.0647	6.727	.462	
MO 108	seconds	1.500E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.746	.420	
TC 108	seconds	5.170E+00	7.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	5.242	.571	
RU 108	seconds	2.730E+02	3.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.561	.109	
RH 108	seconds	1.680E+01	5.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.640	.473	
RH 108M	seconds	3.600E+02	1.800E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.489	.818	
PD 108	stable												
AG 108	seconds	1.422E+02	6.000E-01	.9715	.0000	.0285	.0000	.0000	.0000	.0000	.628	.029	
AG 108M	seconds	4.008E+09	6.627E+08	.0000	.0000	.9130	.0000	.0870	.0000	.0000	1.636	.991	
CD 108	stable												
ZR 109	seconds	1.300E-01	NA	.9261	.0000	.0000	.0000	.0000	.0000	.0739	6.130	.441	
NB 109	seconds	3.154E-01	NA	.8735	.0000	.0000	.0000	.0000	.0000	.1265	5.489	.412	
MO 109	seconds	1.408E+00	NA	.9947	.0000	.0000	.0000	.0000	.0000	.0053	4.552	.412	
TC 109	seconds	1.400E+00	NA	.9830	.0000	.0000	.0000	.0000	.0000	.0170	3.246	.338	
RU 109	seconds	3.500E+01	NA	.5000	.0000	.0000	.0000	.0000	.0000	.0000	2.300	.422	
RH 109	seconds	8.000E+01	2.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.237	.251	
RH 109M	seconds	5.000E+01	NA	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.050	1.000	
PD 109	seconds	4.932E+04	3.600E+02	.0005	.9995	.0000	.0000	.0000	.0000	.0000	.361	.002	
PD 109M	seconds	2.814E+02	6.000E-01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.184	.598	
AG 109	stable												
AG 109M	seconds	3.960E+01	2.000E-01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.085	.129	
CD 109	seconds	3.997E+07	3.456E+04	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.020	.758	
NB 110	seconds	1.298E-01	NA	.8995	.0000	.0000	.0000	.0000	.0000	.1005	7.728	.485	
MO 110	seconds	2.772E+00	NA	.9870	.0000	.0000	.0000	.0000	.0000	.0130	3.355	.343	
TC 110	seconds	8.300E-01	NA	.9690	.0000	.0000	.0000	.0000	.0000	.0310	5.212	.416	
RU 110	seconds	1.500E+01	NA	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	1.255	.475	
RH 110	seconds	3.160E+00	1.700E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.991	.361	
RH 110M	seconds	2.850E+01	1.500E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.737	.692	
PD 110	stable												
AG 110	seconds	2.460E+01	2.000E-01	.9970	.0000	.0030	.0000	.0000	.0000	.0000	1.212	.025	

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclides								Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable						
											Ground		
AG 110M	seconds	2.158E+07	3.456E+03	.9864	.0000	.0000	.0000	.0136	.0000	.0000	2.813	.974	
CD 110	stable												
NB 111	seconds	1.718E-01	NA	.8160	.0000	.0000	.0000	.0000	.0000	.1840	6.080	.422	
MO 111	seconds	4.664E-01	NA	.9897	.0000	.0000	.0000	.0000	.0000	.0103	5.515	.438	
TC 111	seconds	1.982E+00	NA	.9431	.0000	.0000	.0000	.0000	.0000	.0569	4.012	.374	
RU 111	seconds	1.600E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.829	.340	
RH 111	seconds	1.100E+01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.976	.455	
PD 111	seconds	1.404E+03	1.200E+01	.0074	.9926	.0000	.0000	.0000	.0000	.0000	.878	.051	
PD 111M	seconds	1.980E+04	3.600E+02	.0740	.1960	.0000	.0000	.7300	.0000	.0000	.545	.659	
AG 111	seconds	6.437E+05	8.640E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.381	.069	
AG 111M	seconds	6.480E+01	8.000E-01	.0070	.0000	.0000	.0000	.9930	.0000	.0000	.062	.125	
CD 111	stable												
CD 111M	seconds	2.916E+03	1.800E+01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.387	.734	
NB 112	seconds	8.672E-02	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	8.364	.501	
MO 112	seconds	9.754E-01	NA	.9792	.0000	.0000	.0000	.0000	.0000	.0208	3.914	.346	
TC 112	seconds	4.314E-01	NA	.9480	.0000	.0000	.0000	.0000	.0000	.0520	6.154	.453	
RU 112	seconds	3.600E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.839	.394	
RH 112	seconds	1.500E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.633	.318	
PD 112	seconds	7.576E+04	1.800E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.096	.051	
AG 112	seconds	1.130E+04	7.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.086	.331	
CD 112	stable												
MO 113	seconds	2.287E-01	NA	.9620	.0000	.0000	.0000	.0000	.0000	.0380	6.250	.448	
TC 113	seconds	6.524E-01	NA	.9281	.0000	.0000	.0000	.0000	.0000	.0719	4.587	.397	
RU 113	seconds	3.000E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.665	.386	
RH 113	seconds	9.000E-01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.549	.320	
PD 113	seconds	9.300E+01	5.000E+00	.8150	.1850	.0000	.0000	.0000	.0000	.0000	1.700	.359	
AG 113	seconds	1.933E+04	1.800E+02	.9830	.0170	.0000	.0000	.0000	.0000	.0000	.834	.086	
AG 113M	seconds	6.870E+01	1.600E+00	.2000	.0000	.0000	.0000	.8000	.0000	.0000	.254	.457	
CD 113	seconds	2.935E+23	5.996E+22	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.091	.000	
CD 113M	seconds	4.450E+08	1.578E+07	.9986	.0000	.0000	.0000	.0014	.0000	.0000	.184	.000	
IN 113	stable												
IN 113M	seconds	5.969E+03	3.600E+00	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.387	.664	
MO 114	seconds	3.766E-01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.503	.350	

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life ^a uncertainty	Branching fractions, by decay mode and by state of product nuclides								Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable				Ground		
								Ground	Metastable	Ground			
TC 114	seconds	2.023E-01	NA	.9346	.0000	.0000	.0000	.0000	.0000	.0654	6.868	.474	
RU 114	seconds	8.137E+00	NA	.9990	.0000	.0000	.0000	.0000	.0000	.0010	2.317	.364	
RH 114	seconds	1.700E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.495	.390	
PD 114	seconds	1.470E+02	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.567	.150	
AG 114	seconds	4.600E+00	2.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.254	.093	
CD 114	stable												
IN 114	seconds	7.190E+01	1.000E-01	.9950	.0000	.0050	.0000	.0000	.0000	.0000	.775	.003	
IN 114M	seconds	4.278E+06	8.640E+02	.0000	.0000	.0430	.0000	.9570	.0000	.0000	.236	.398	
SN 114	stable												
MO 115	seconds	1.259E-01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	6.596	.454	
TC 115	seconds	2.704E-01	NA	.8566	.0000	.0000	.0000	.0000	.0000	.1434	5.237	.413	
RU 115	seconds	8.784E-01	NA	.9977	.0000	.0000	.0000	.0000	.0000	.0023	4.345	.416	
RH 115	seconds	8.315E+00	NA	.9923	.0000	.0000	.0000	.0000	.0000	.0077	3.077	.343	
PD 115	seconds	3.800E+01	NA	.7300	.2700	.0000	.0000	.0000	.0000	.0000	2.597	.482	
AG 115	seconds	1.200E+03	3.000E+01	.9430	.0570	.0000	.0000	.0000	.0000	.0000	1.583	.305	
AG 115M	seconds	1.800E+01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.814	.486	
CD 115	seconds	1.925E+05	3.600E+02	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.510	.378	
CD 115M	seconds	3.853E+06	2.592E+04	.9999	.0001	.0000	.0000	.0000	.0000	.0000	.636	.052	
IN 115	seconds	1.392E+22	7.889E+20	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.153	.000	
IN 115M	seconds	1.615E+04	1.440E+01	.0500	.0000	.0000	.0000	.9500	.0000	.0000	.331	.490	
SN 115	stable												
TC 116	seconds	1.155E-01	NA	.8778	.0000	.0000	.0000	.0000	.0000	.1222	7.260	.481	
RU 116	seconds	1.700E+00	NA	.9892	.0000	.0000	.0000	.0000	.0000	.0108	2.833	.348	
RH 116	seconds	9.492E-01	NA	.9946	.0000	.0000	.0000	.0000	.0000	.0054	5.189	.428	
PD 116	seconds	1.272E+01	4.400E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.266	.477	
AG 116	seconds	1.608E+02	6.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.789	.557	
AG 116M	seconds	1.040E+01	8.000E-01	.9800	.0000	.0000	.0000	.0200	.0000	.0000	4.061	.669	
CD 116	stable												
IN 116	seconds	1.410E+01	3.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.384	.014	
IN 116M	seconds	3.249E+03	3.600E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.784	.888	
SN 116	stable												
TC 117	seconds	1.518E-01	NA	.7875	.0000	.0000	.0000	.0000	.0000	.2125	5.695	.420	
RU 117	seconds	3.428E-01	NA	.9795	.0000	.0000	.0000	.0000	.0000	.0205	4.731	.428	

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life ^a uncertainty	Branching fractions, by decay mode and by state of product nuclides								Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable			Ground			
											Ground		
RH 117	seconds	1.217E+00	NA	.9518	.0000	.0000	.0000	.0000	.0000	.0482	3.667	.371	
PD 117	seconds	5.000E+00	NA	.5000	.0000	.0000	.0000	.0000	.0000	.0000	3.002	.362	
AG 117	seconds	7.280E+01	2.000E+00	.8600	.1400	.0000	.0000	.0000	.0000	.0000	2.521	.516	
AG 117M	seconds	5.340E+00	5.000E-02	.8550	.1450	.0000	.0000	.0000	.0000	.0000	2.298	.362	
CD 117	seconds	8.964E+03	1.440E+02	.0900	.9100	.0000	.0000	.0000	.0000	.0000	1.510	.715	
CD 117M	seconds	1.210E+04	1.800E+02	.9850	.0150	.0000	.0000	.0000	.0000	.0000	2.235	.910	
IN 117	seconds	2.628E+03	4.200E+01	.9968	.0032	.0000	.0000	.0000	.0000	.0000	.954	.721	
IN 117M	seconds	6.990E+03	4.200E+01	.5290	.0000	.0000	.0000	.4710	.0000	.0000	.522	.174	
SN 117	stable												
SN 117M	seconds	1.175E+06	3.456E+03	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.313	.502	
TC 118	seconds	8.155E-02	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	7.712	.497	
RU 118	seconds	6.623E-01	NA	.9589	.0000	.0000	.0000	.0000	.0000	.0411	3.230	.346	
RH 118	seconds	3.156E-01	NA	.9708	.0000	.0000	.0000	.0000	.0000	.0292	5.600	.445	
PD 118	seconds	3.100E+00	NA	.5000	.5000	.0000	.0000	.0000	.0000	.0000	1.759	.407	
AG 118	seconds	3.760E+00	1.500E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.088	.391	
AG 118M	seconds	2.000E+00	2.000E-01	.5900	.0000	.0000	.0000	.4100	.0000	.0000	2.751	.545	
CD 118	seconds	3.018E+03	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.264	.113	
IN 118	seconds	5.000E+00	3.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.848	.042	
IN 118M	seconds	2.670E+02	3.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.282	.829	
SN 118	stable												
RU 119	seconds	1.949E-01	NA	.9564	.0000	.0000	.0000	.0000	.0000	.0436	5.252	.440	
RH 119	seconds	4.654E-01	NA	.9170	.0000	.0000	.0000	.0000	.0000	.0830	4.113	.389	
PD 119	seconds	1.759E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.448	.388	
AG 119	seconds	2.100E+00	1.000E-01	.7800	.2200	.0000	.0000	.0000	.0000	.0000	3.296	.526	
CD 119	seconds	1.614E+02	1.200E+00	1.000	.9000	.0000	.0000	.0000	.0000	.0000	2.472	.683	
CD 119M	seconds	1.320E+02	1.200E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.054	.784	
IN 119	seconds	1.440E+02	6.000E+00	.9907	.0093	.0000	.0000	.0000	.0000	.0000	1.370	.561	
IN 119M	seconds	1.080E+03	1.800E+01	.9750	.0000	.0000	.0000	.0250	.0000	.0000	1.107	.117	
SN 119	stable												
SN 119M	seconds	2.532E+07	1.123E+05	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.087	.131	
RU 120	seconds	3.503E-01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.346	.422	
RH 120	seconds	1.725E-01	NA	.9407	.0000	.0000	.0000	.0000	.0000	.0593	6.127	.463	
PD 120	seconds	3.906E+00	NA	.9999	.0000	.0000	.0000	.0000	.0000	.0001	2.157	.377	

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclides								Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable						
											Ground		
AG 120	seconds	1.170E+00	5.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	5.168	.558	
CD 120	seconds	5.080E+01	2.100E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.735	.174	
IN 120	seconds	3.080E+00	8.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.759	.234	
IN 120M	seconds	4.620E+01	8.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.922	.724	
SN 120	stable												
RH 121	seconds	2.496E-01	NA	.8643	.0000	.0000	.0000	.0000	.0000	.1357	4.597	.403	
PD 121	seconds	6.437E-01	NA	.9973	.0000	.0000	.0000	.0000	.0000	.0027	3.974	.412	
AG 121	seconds	8.000E-01	1.000E-01	.9992	.0000	.0000	.0000	.0000	.0000	.0008	3.739	.554	
CD 121	seconds	1.350E+01	3.000E-01	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	3.179	.592	
IN 121	seconds	2.310E+01	6.000E-01	.8870	.1130	.0000	.0000	.0000	.0000	.0000	1.912	.485	
IN 121M	seconds	2.328E+02	6.000E+00	.9880	.0000	.0000	.0000	.0120	.0000	.0000	1.598	.040	
SN 121	seconds	9.742E+04	1.440E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.115	.000	
SN 121M	seconds	1.736E+09	1.578E+08	.2240	.0000	.0000	.0000	.7760	.0000	.0000	.039	.128	
SB 121	stable												
RH 122	seconds	1.072E-01	NA	.9170	.0000	.0000	.0000	.0000	.0000	.0830	6.486	.473	
PD 122	seconds	1.411E+00	NA	.9956	.0000	.0000	.0000	.0000	.0000	.0044	2.572	.358	
AG 122	seconds	4.800E-01	8.000E-02	.9981	.0000	.0000	.0000	.0000	.0000	.0019	5.559	.452	
CD 122	seconds	5.240E+00	3.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.252	.364	
IN 122	seconds	1.500E+00	3.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.605	.345	
IN 122M	seconds	1.030E+01	6.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.065	.620	
SN 122	stable												
SB 122	seconds	2.333E+05	8.640E+02	.9760	.0000	.0000	.0000	.0000	.0000	.0000	1.002	.436	
SB 122M	seconds	2.526E+02	1.200E+00	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.160	.438	
TE 122	stable												
RH 123	seconds	1.343E-01	NA	.8289	.0000	.0000	.0000	.0000	.0000	.1711	5.150	.417	
PD 123	seconds	3.004E-01	NA	.9931	.0000	.0000	.0000	.0000	.0000	.0069	4.356	.427	
AG 123	seconds	3.900E-01	NA	.9540	.0000	.0000	.0000	.0000	.0000	.0460	4.514	.412	
CD 123	seconds	8.905E+00	NA	.7700	.2300	.0000	.0000	.0000	.0000	.0000	2.965	.371	
IN 123	seconds	5.980E+00	6.000E-02	.0320	.9680	.0000	.0000	.0000	.0000	.0000	2.465	.447	
IN 123M	seconds	4.780E+01	5.000E-01	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	2.076	.032	
SN 123	seconds	1.116E+07	3.456E+04	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.527	.013	
SN 123M	seconds	2.405E+03	4.200E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.619	.228	
SB 123	stable												

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life ^a uncertainty	Branching fractions, by decay mode and by state of product nuclides								Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable						
								Ground	Ground				
TE 123	seconds	3.913E+20	3.156E+19	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.017	.765	
TE 123M	seconds	1.034E+07	8.640E+03	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.246	.602	
PD 124	seconds	5.140E-01	NA	.9730	.0000	.0000	.0000	.0000	.0000	.0270	3.064	.350	
AG 124	seconds	2.495E-01	NA	.9771	.0000	.0000	.0000	.0000	.0000	.0229	5.721	.458	
CD 124	seconds	9.000E-01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.709	.332	
IN 124	seconds	3.170E+00	5.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.664	.578	
SN 124	stable												
SB 124	seconds	5.201E+06	2.592E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.236	.826	
SB 124M	seconds	9.300E+01	3.000E+00	.2500	.0000	.0000	.0000	.7500	.0000	.0000	.557	.795	
TE 124	stable												
PD 125	seconds	1.660E-01	NA	.9773	.0000	.0000	.0000	.0000	.0000	.0227	4.773	.438	
AG 125	seconds	3.335E-01	NA	.9368	.0000	.0000	.0000	.0000	.0000	.0632	4.434	.409	
CD 125	seconds	1.548E+00	NA	.7000	.3000	.0000	.0000	.0000	.0000	.0000	3.409	.395	
IN 125	seconds	2.330E+00	4.000E-02	.1120	.8880	.0000	.0000	.0000	.0000	.0000	3.090	.418	
IN 125M	seconds	1.220E+01	1.000E-01	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	2.769	.243	
SN 125	seconds	8.329E+05	2.592E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.123	.278	
SN 125M	seconds	5.712E+02	3.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.162	.306	
SB 125	seconds	8.615E+07	9.467E+05	.7700	.2300	.0000	.0000	.0000	.0000	.0000	.533	.814	
TE 125	stable												
TE 125M	seconds	5.011E+06	8.640E+04	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.142	.251	
PD 126	seconds	2.520E-01	NA	.9497	.0000	.0000	.0000	.0000	.0000	.0503	3.658	.349	
AG 126	seconds	1.398E-01	NA	.9536	.0000	.0000	.0000	.0000	.0000	.0464	6.455	.533	
CD 126	seconds	5.060E-01	1.500E-02	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	2.211	.326	
IN 126	seconds	1.450E+00	2.200E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	6.203	.695	
SN 126	seconds	3.156E+12	NA	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.263	.496	
SB 126	seconds	1.071E+06	8.640E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.119	.883	
SB 126M	seconds	1.140E+03	1.800E+01	.8600	.0000	.0000	.0000	.1400	.0000	.0000	2.186	.711	
TE 126	stable												
XE 126	stable												
AG 127	seconds	1.753E-01	NA	.9014	.0000	.0000	.0000	.0000	.0000	.0986	5.117	.426	
CD 127	seconds	5.719E-01	NA	.4999	.4999	.0000	.0000	.0000	.0000	.0001	4.074	.491	
IN 127	seconds	1.150E+00	5.000E-02	.1530	.8404	.0000	.0000	.0000	.0000	.0066	3.919	.451	
IN 127M	seconds	3.760E+00	2.000E-02	.0000	.9935	.0000	.0000	.0000	.0000	.0065	3.919	.441	

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life ^a uncertainty	Branching fractions, by decay mode and by state of product nuclides						Q-value, MeV per disintegration	Fraction of Q that comes from gammas	
				Beta		Positron		Isomeric Transition	Alpha			Beta-neutron
				Ground	Metastable	Ground	Metastable					
SN 127	seconds	7.560E+03	1.440E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.787	
SN 127M	seconds	2.478E+02	1.800E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.499	
SB 127	seconds	3.326E+05	4.320E+03	.8250	.1750	.0000	.0000	.0000	.0000	.0000	.679	
TE 127	seconds	3.366E+04	2.520E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.021	
TE 127M	seconds	9.418E+06	1.728E+05	.0240	.0000	.0000	.0000	.9760	.0000	.0000	.123	
I 127	stable											
XE 127	seconds	3.145E+06	8.640E+03	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.901	
AG 128	seconds	9.428E-02	NA	.9311	.0000	.0000	.0000	.0000	.0000	.0689	.534	
CD 128	seconds	1.053E+00	NA	.9989	.0000	.0000	.0000	.0000	.0000	.0011	.354	
IN 128	seconds	9.000E-01	1.000E-01	.9996	.0000	.0000	.0000	.0000	.0000	.0004	.541	
SN 128	seconds	3.546E+03	3.000E+01	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.707	
SB 128	seconds	3.244E+04	1.080E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.864	
SB 128M	seconds	6.240E+02	1.200E+01	.9640	.0000	.0000	.0000	.0360	.0000	.0000	.665	
TE 128	stable											
I 128	seconds	1.499E+03	1.200E+00	.9310	.0000	.0690	.0000	.0000	.0000	.0000	.109	
XE 128	stable											
CD 129	seconds	2.987E-01	NA	.9985	.0000	.0000	.0000	.0000	.0000	.0015	.492	
IN 129	seconds	5.900E-01	2.000E-02	.8940	.1060	.0000	.0000	.0000	.0000	.0016	.465	
SN 129	seconds	1.296E+02	2.400E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.533	
SN 129M	seconds	4.020E+02	2.400E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.721	
SB 129	seconds	1.584E+04	3.600E+01	.8200	.1800	.0000	.0000	.0000	.0000	.0000	.776	
TE 129	seconds	4.176E+03	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.103	
TE 129M	seconds	2.903E+06	8.640E+03	.3600	.0000	.0000	.0000	.6400	.0000	.0000	.120	
I 129	seconds	4.954E+14	1.262E+13	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.312	
XE 129	stable											
XE 129M	seconds	7.681E+05	1.728E+04	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.224	
CD 130	seconds	4.768E-01	NA	.9903	.0000	.0000	.0000	.0000	.0000	.0097	.351	
IN 130	seconds	3.200E-01	2.000E-02	.7000	.2900	.0000	.0000	.0000	.0000	.0091	.525	
SN 130	seconds	2.232E+02	2.400E+00	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.671	
SB 130	seconds	2.370E+03	4.800E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.824	
SB 130M	seconds	3.780E+02	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.734	
TE 130	stable											
I 130	seconds	4.450E+04	3.600E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.881	

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclides							Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron		
				Ground	Metastable	Ground	Metastable			Ground	Ground	
								Ground				
I 130M	seconds stable	5.400E+02	6.000E+00	.1600	.0000	.0000	.8400	.0000	.0000	.288	.382	
XE 130	seconds	1.062E-01	NA	.9513	.0000	.0000	.0000	.0000	.0487	6.809	.480	
CD 131	seconds	2.700E-01	2.000E-02	.9325	.0491	.0000	.0000	.0000	.0184	4.731	.426	
IN 131	seconds	3.900E+01	2.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	3.240	.728	
SN 131	seconds	1.380E+03	1.200E+02	.9320	.0680	.0000	.0000	.0000	.0000	2.332	.750	
SB 131	seconds	1.500E+03	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	1.142	.369	
TE 131	seconds	1.080E+05	7.200E+03	.7780	.0000	.0000	.2220	.0000	.0000	1.612	.882	
TE 131M	seconds	6.947E+05	8.640E+02	.9891	.0109	.0000	.0000	.0000	.0000	.573	.666	
I 131	seconds											
XE 131	stable											
XE 131M	seconds	1.028E+06	8.640E+03	.0000	.0000	.0000	1.0000	.0000	.0000	.162	.124	
CD 132	seconds	1.357E-01	NA	.7944	.0000	.0000	.0000	.0000	.2056	5.433	.349	
IN 132	seconds	1.860E-01	2.200E-02	.9500	.0000	.0000	.0000	.0000	.0500	9.146	.634	
SN 132	seconds	4.000E+01	1.000E+00	.0000	1.0000	.0000	.0000	.0000	.0000	2.022	.640	
SB 132	seconds	2.520E+02	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	3.873	.666	
SB 132M	seconds	1.680E+02	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	3.860	.674	
TE 132	seconds	2.815E+05	2.880E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.334	.699	
I 132	seconds	8.222E+03	3.600E+00	1.0000	.0000	.0000	.0000	.0000	.0000	2.778	.820	
XE 132	stable											
CS 132	seconds	5.598E+05	6.000E+02	.0187	.0000	.9813	.0000	.0000	.0000	.728	.982	
BA 132	stable											
IN 133	seconds	1.116E-01	NA	.6834	.0000	.0000	.0000	.0000	.3166	7.391	.462	
SN 133	seconds	1.440E+00	4.000E-02	.9974	.0000	.0000	.0000	.0000	.0025	4.654	.443	
SB 133	seconds	1.500E+02	6.000E+00	.8300	.1700	.0000	.0000	.0000	.0000	2.696	.757	
TE 133	seconds	7.500E+02	1.800E+01	1.0000	.0000	.0000	.0000	.0000	.0000	1.875	.640	
TE 133M	seconds	3.324E+03	2.400E+01	.7230	.1020	.0000	.0000	.1750	.0000	2.050	.821	
I 133	seconds	7.488E+04	3.600E+02	.9712	.0288	.0000	.0000	.0000	.0000	1.021	.599	
I 133M	seconds	9.000E+00	2.000E+00	.0000	.0000	.0000	1.0000	.0000	.0000	1.633	.967	
XE 133	seconds	4.530E+05	8.640E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.184	.257	
XE 133M	seconds	1.892E+05	8.640E+02	.0000	.0000	.0000	1.0000	.0000	.0000	.225	.179	
CS 133	stable											
BA 133	seconds	3.320E+08	4.102E+06	.0000	.0000	1.0000	.0000	.0000	.0000	.455	.885	
IN 134	seconds	8.056E-02	NA	.6624	.0000	.0000	.0000	.0000	.3376	8.927	.526	

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclides								Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable			Ground	Ground		
								Ground	Ground				
SN 134	seconds	1.040E+00	NA	.8300	.0000	.0000	.0000	.0000	.0000	.1700	3.634	.343	
SB 134	seconds	8.500E-01	1.000E-01	.9990	.0000	.0000	.0000	.0000	.0000	.0010	5.037	.448	
SB 134M	seconds	1.043E+01	1.400E-01	.9988	.0000	.0000	.0000	.0000	.0000	.0012	5.142	.463	
TE 134	seconds	2.508E+03	4.800E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.095	.784	
I 134	seconds	3.156E+03	2.400E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.227	.809	
I 134M	seconds	2.214E+02	4.200E+00	.0000	.0230	.0000	.0000	.9770	.0000	.0000	.325	.742	
XE 134	stable												
XE 134M	seconds	2.900E-01	1.700E-02	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	1.965	.966	
CS 134	seconds	6.507E+07	1.578E+05	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.720	.904	
CS 134M	seconds	1.048E+04	3.600E+01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.131	.203	
BA 134	stable												
SN 135	seconds	4.178E-01	NA	.9140	.0000	.0000	.0000	.0000	.0000	.0860	5.078	.489	
SB 135	seconds	1.710E+00	2.000E-02	.7980	.0000	.0000	.0000	.0000	.0000	.2020	4.055	.395	
TE 135	seconds	1.900E+01	2.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.562	.415	
I 135	seconds	2.365E+04	7.200E+01	.8430	.1570	.0000	.0000	.0000	.0000	.0000	1.951	.816	
XE 135	seconds	3.290E+04	7.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.567	.439	
XE 135M	seconds	9.174E+02	3.000E+00	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.523	.818	
CS 135	seconds	7.258E+13	9.467E+12	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.056	.000	
CS 135M	seconds	3.180E+03	1.200E+02	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	1.630	.979	
BA 135	stable												
BA 135M	seconds	1.033E+05	7.200E+02	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.259	.229	
SN 136	seconds	7.172E-01	NA	.8361	.0000	.0000	.0000	.0000	.0000	.1639	4.124	.346	
SB 136	seconds	8.200E-01	NA	.7700	.0000	.0000	.0000	.0000	.0000	.2300	5.666	.460	
TE 136	seconds	1.750E+01	2.000E-01	.9910	.0000	.0000	.0000	.0000	.0000	.0090	3.294	.607	
I 136	seconds	8.340E+01	1.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.344	.543	
I 136M	seconds	4.690E+01	1.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.823	.537	
XE 136	stable												
CS 136	seconds	1.137E+06	2.592E+03	.8880	.1120	.0000	.0000	.0000	.0000	.0000	2.051	.935	
BA 136	stable												
BA 136M	seconds	3.084E-01	1.900E-03	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	2.030	.949	
SB 137	seconds	4.779E-01	NA	.8000	.0000	.0000	.0000	.0000	.0000	.2000	5.062	.472	
TE 137	seconds	3.500E+00	NA	.9780	.0000	.0000	.0000	.0000	.0000	.0220	3.788	.425	
I 137	seconds	2.450E+01	2.000E-01	.9330	.0000	.0000	.0000	.0000	.0000	.0670	3.302	.373	

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life ^a uncertainty	Branching fractions, by decay mode and by state of product nuclides								Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable						
											Ground		
XE 137	seconds	2.291E+02	7.800E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.888	.101	
CS 137	seconds	9.467E+08	6.311E+06	.0557	.9443	.0000	.0000	.0000	.0000	.0000	.188	.000	
BA 137	stable												
BA 137M	seconds	1.531E+02	6.000E-02	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.663	.904	
SB 138	seconds	1.734E-01	NA	.7799	.0000	.0000	.0000	.0000	.0000	.2201	6.731	.531	
TE 138	seconds	1.400E+00	4.000E-01	.9370	.0000	.0000	.0000	.0000	.0000	.0630	3.035	.352	
I 138	seconds	6.490E+00	7.000E-02	.9464	.0000	.0000	.0000	.0000	.0000	.0536	4.727	.546	
XE 138	seconds	8.448E+02	4.800E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.773	.635	
CS 138	seconds	1.932E+03	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.604	.655	
CS 138M	seconds	1.746E+02	4.800E+00	.1900	.0000	.0000	.0000	.8100	.0000	.0000	.990	.714	
BA 138	stable												
LA 138	seconds	3.314E+18	6.311E+16	.3360	.0000	.6640	.0000	.0000	.0000	.0000	1.262	.977	
SB 139	seconds	2.178E-01	NA	.5831	.0000	.0000	.0000	.0000	.0000	.4169	5.836	.460	
TE 139	seconds	5.800E-01	NA	.9370	.0000	.0000	.0000	.0000	.0000	.0630	4.755	.494	
I 139	seconds	2.300E+00	5.000E-02	.9040	.0000	.0000	.0000	.0000	.0000	.0960	3.870	.362	
XE 139	seconds	3.968E+01	1.400E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.662	.334	
CS 139	seconds	5.562E+02	3.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.980	.167	
BA 139	seconds	5.078E+03	2.040E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.942	.046	
LA 139	stable												
CE 139	seconds	1.189E+07	2.000E+03	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.248	.702	
PR 139	seconds	1.588E+04	1.500E+02	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.217	.596	
TE 140	seconds	8.938E-01	NA	.8450	.0000	.0000	.0000	.0000	.0000	.1550	3.684	.346	
I 140	seconds	8.600E-01	4.000E-02	.9070	.0000	.0000	.0000	.0000	.0000	.0930	5.130	.454	
XE 140	seconds	1.360E+01	1.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.526	.581	
CS 140	seconds	6.370E+01	3.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.968	.558	
BA 140	seconds	1.102E+06	2.592E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.493	.369	
LA 140	seconds	1.450E+05	6.048E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.832	.812	
CE 140	stable												
PR 140	seconds	2.034E+02	6.000E-01	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	1.087	.499	
TE 141	seconds	2.726E-01	NA	.8953	.0000	.0000	.0000	.0000	.0000	.1047	5.307	.489	
I 141	seconds	4.600E-01	NA	.6100	.0000	.0000	.0000	.0000	.0000	.3900	4.339	.410	
XE 141	seconds	1.730E+00	1.000E-02	.9996	.0000	.0000	.0000	.0000	.0000	.0004	3.601	.436	
CS 141	seconds	2.494E+01	6.000E-02	.9996	.0000	.0000	.0000	.0000	.0000	.0004	2.744	.415	

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life ^a uncertainty ^a	Branching fractions, by decay mode and by state of product nuclides								Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable			Ground	Ground		
BA 141	seconds	1.096E+03	4.200E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.730	.472	
LA 141	seconds	1.411E+04	1.080E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.994	.043	
CE 141	seconds	2.808E+06	4.320E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.247	.310	
PR 141	stable												
ND 141	seconds	8.960E+03	1.100E+02	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.089	.841	
TE 142	seconds	5.901E-01	NA	.8492	.0000	.0000	.0000	.0000	.0000	.1508	3.962	.347	
I 142	seconds	2.000E-01	NA	.8400	.0000	.0000	.0000	.0000	.0000	.1600	5.978	.536	
XE 142	seconds	1.220E+00	2.000E-02	.9959	.0000	.0000	.0000	.0000	.0000	.0041	2.981	.529	
CS 142	seconds	1.700E+00	2.000E-02	.9990	.0000	.0000	.0000	.0000	.0000	.0010	4.236	.422	
BA 142	seconds	6.360E+02	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.449	.743	
LA 142	seconds	5.466E+03	3.000E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.230	.732	
CE 142	seconds	3.311E+18	NA	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.000	.000	
PR 142	seconds	6.883E+04	1.440E+02	.9998	.0000	.0002	.0000	.0000	.0000	.0000	.868	.067	
PR 142M	seconds	8.760E+02	3.000E+01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.002	.000	
ND 142	stable												
I 143	seconds	4.011E-01	NA	.8200	.0000	.0000	.0000	.0000	.0000	.1800	4.725	.477	
XE 143	seconds	9.600E-01	NA	.9880	.0000	.0000	.0000	.0000	.0000	.0120	4.142	.504	
CS 143	seconds	1.780E+00	1.000E-02	.9839	.0000	.0000	.0000	.0000	.0000	.0161	3.194	.388	
BA 143	seconds	1.450E+01	5.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.376	.412	
LA 143	seconds	8.484E+02	9.600E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.380	.094	
CE 143	seconds	1.188E+05	7.200E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.709	.394	
PR 143	seconds	1.172E+06	1.728E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.315	.000	
ND 143	stable												
I 144	seconds	1.460E-01	NA	.8476	.0000	.0000	.0000	.0000	.0000	.1524	6.045	.537	
XE 144	seconds	1.100E+00	NA	.9927	.0000	.0000	.0000	.0000	.0000	.0073	2.532	.365	
CS 144	seconds	1.020E+00	3.000E-02	.9687	.0000	.0000	.0000	.0000	.0000	.0313	5.060	.526	
BA 144	seconds	1.140E+01	5.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.651	.427	
LA 144	seconds	4.090E+01	4.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.668	.611	
CE 144	seconds	2.462E+07	1.728E+04	.9860	.0140	.0000	.0000	.0000	.0000	.0000	.110	.172	
PR 144	seconds	1.037E+03	3.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.238	.023	
PR 144M	seconds	4.320E+02	1.800E+01	.0004	.0000	.0000	.0000	.9996	.0000	.0000	.058	.216	
ND 144	seconds	6.600E+22	NA	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	1.910	.000	
I 145	seconds	1.934E-01	NA	.7591	.0000	.0000	.0000	.0000	.0000	.2409	4.940	.474	

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclides						Q-value, MeV per disintegration	Fraction of Q that comes from gammas	
				Beta		Positron		Isomeric Transition	Alpha			Beta-neutron
				Metastable		Ground						
				Ground	Metastable	Ground	Metastable					
XE 145	seconds	9.000E-01	NA	.9389	.0000	.0000	.0000	.0000	.0000	.0611	4.144	.441
CS 145	seconds	5.940E-01	1.300E-02	.8540	.0000	.0000	.0000	.0000	.0000	.1460	3.808	.622
BA 145	seconds	4.310E+00	1.600E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.134	.298
LA 145	seconds	2.480E+01	2.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.374	.631
CE 145	seconds	1.806E+02	3.600E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.536	.560
PR 145	seconds	2.154E+04	3.600E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.696	.027
ND 145	stable											
PM 145	seconds	5.586E+08	1.262E+07	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.044	.734
SM 145	seconds	2.938E+07	2.592E+05	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.093	.702
XE 146	seconds	5.627E-01	NA	.9349	.0000	.0000	.0000	.0000	.0000	.0650	3.085	.352
CS 146	seconds	3.430E-01	7.000E-03	.8680	.0000	.0000	.0000	.0000	.0000	.1320	5.184	.417
BA 146	seconds	2.200E+00	3.000E-02	.9999	.0000	.0000	.0000	.0000	.0000	.0001	2.250	.391
LA 146	seconds	6.270E+00	1.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.212	.541
CE 146	seconds	8.112E+02	7.800E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.573	.557
PR 146	seconds	1.449E+03	1.080E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.328	.438
ND 146	stable											
PM 146	seconds	1.745E+08	1.578E+06	.3390	.0000	.0000	.0000	.0000	.0000	.0000	.842	.892
SM 146	seconds	3.250E+15	1.578E+14	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	2.543	.000
XE 147	seconds	1.991E-01	NA	.9129	.0000	.0000	.0000	.0000	.0000	.0871	4.633	.499
CS 147	seconds	5.455E-01	NA	.7500	.0000	.0000	.0000	.0000	.0000	.2500	3.946	.401
BA 147	seconds	7.000E-01	3.000E-02	.9997	.0000	.0000	.0000	.0000	.0000	.0003	3.159	.412
LA 147	seconds	4.400E+00	5.000E-01	.9995	.0000	.0000	.0000	.0000	.0000	.0005	2.568	.364
CE 147	seconds	5.640E+01	1.200E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.940	.557
PR 147	seconds	8.160E+02	3.000E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.621	.514
ND 147	seconds	9.487E+05	8.640E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.408	.343
PM 147	seconds	8.279E+07	6.311E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.062	.000
SM 147	seconds	3.345E+18	6.311E+16	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.311	.000
CS 148	seconds	2.056E-01	NA	.7490	.0000	.0000	.0000	.0000	1.0000	.0000	5.547	.535
BA 148	seconds	6.070E-01	2.500E-02	.9994	.0000	.0000	.0000	.0000	.0000	.2510	2.178	.383
LA 148	seconds	1.050E+00	1.000E-02	.9987	.0000	.0000	.0000	.0000	.0000	.0013	3.325	.376
CE 148	seconds	5.600E+01	1.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.988	.320
PR 148	seconds	1.362E+02	2.400E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.793	.442
ND 148	stable											

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life ^a uncertainty	Branching fractions, by decay mode and by state of product nuclides								Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable						
								Ground	Ground	Ground	Ground		
PM 148	seconds	4.640E+05	7.776E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.303	.440	
PM 148M	seconds	3.568E+06	9.504E+03	.9540	.0000	.0000	.0000	.0460	.0000	.0000	2.156	.920	
SM 148	seconds	2.500E+23	NA	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	1.986	.000	
CS 149	seconds	2.442E-01	NA	.6724	.0000	.0000	.0000	.0000	.0000	.3276	5.088	.472	
BA 149	seconds	6.952E-01	NA	.9997	.0000	.0000	.0000	.0000	.0000	.0003	3.536	.430	
LA 149	seconds	2.408E+00	NA	.9919	.0000	.0000	.0000	.0000	.0000	.0081	2.872	.379	
CE 149	seconds	5.200E+00	3.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.220	.471	
PR 149	seconds	1.356E+02	4.200E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.569	.393	
ND 149	seconds	6.210E+03	2.520E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.871	.426	
PM 149	seconds	1.911E+05	1.800E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.377	.032	
SM 149	seconds	3.154E+23	NA	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.000	.000	
EU 149	seconds	8.040E+06	4.000E+04	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.086	.768	
CS 150	seconds	1.238E-01	NA	.8491	.0000	.0000	.0000	.0000	.0000	.1509	6.159	.541	
BA 150	seconds	9.622E-01	NA	.9976	.0000	.0000	.0000	.0000	.0000	.0024	3.082	.356	
LA 150	seconds	6.081E-01	NA	.9906	.0000	.0000	.0000	.0000	.0000	.0094	4.586	.555	
CE 150	seconds	4.000E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.129	.389	
PR 150	seconds	6.190E+00	1.600E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.093	.348	
ND 150	stable												
PM 150	seconds	9.648E+03	7.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.249	.654	
SM 150	stable												
EU 150	seconds	1.130E+09	3.156E+07	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	1.560	.984	
BA 151	seconds	3.327E-01	NA	.9624	.0000	.0000	.0000	.0000	.0000	.0376	4.448	.506	
LA 151	seconds	7.194E-01	NA	.9345	.0000	.0000	.0000	.0000	.0000	.0655	3.828	.418	
CE 151	seconds	1.020E+00	6.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.317	.379	
PR 151	seconds	1.890E+01	7.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.935	.362	
ND 151	seconds	7.464E+02	4.200E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.481	.639	
PM 151	seconds	1.022E+05	1.440E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.616	.534	
SM 151	seconds	2.840E+09	1.893E+08	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.020	.001	
EU 151	stable												
BA 152	seconds	4.205E-01	NA	.9428	.0000	.0000	.0000	.0000	.0000	.0572	3.937	.353	
LA 152	seconds	2.850E-01	NA	.9396	.0000	.0000	.0000	.0000	.0000	.0604	5.264	.548	
CE 152	seconds	7.663E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.944	.400	
PR 152	seconds	6.776E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.668	.578	

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclides								Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Metastable		Ground							
				Ground	Metastable	Ground	Metastable						
ND 152	seconds	6.840E+02	1.200E+01	.0000	.0000	.0000	.0000	.0000	.0000	.494	.326		
PM 152	seconds	2.460E+02	6.000E+00	.0000	.0000	.0000	.0000	.0000	.0000	1.545	.097		
PM 152M	seconds	4.512E+02	4.800E+00	.0000	.0000	.0000	.0000	.0000	.0000	2.381	.630		
SM 152	stable												
EU 152	seconds	4.206E+08	1.262E+06	.2792	.7208	.0000	.0000	.0000	.0000	1.288	.902		
EU 152M	seconds	3.355E+04	3.600E+01	.7200	.2800	.0000	.0000	.0000	.0000	.805	.376		
GD 152	seconds	3.408E+21	NA	.0000	.0000	.0000	.0000	1.0000	.0000	2.206	.000		
LA 153	seconds	3.258E-01	NA	.8931	.0000	.0000	.0000	.0000	.1069	4.729	.442		
CE 153	seconds	1.469E+00	NA	.9938	.0000	.0000	.0000	.0000	.0062	2.807	.401		
PR 153	seconds	4.491E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	2.727	.377		
ND 153	seconds	6.750E+01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	1.783	.377		
PM 153	seconds	3.240E+02	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.779	.221		
SM 153	seconds	1.666E+05	3.600E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.335	.194		
EU 153	stable												
GD 153	seconds	2.087E+07	1.728E+04	.0000	1.0000	.0000	.0000	.0000	.0000	.148	.726		
LA 154	seconds	1.493E-01	NA	.8973	.0000	.0000	.0000	.0000	.1027	5.861	.546		
CE 154	seconds	2.016E+00	NA	.9936	.0000	.0000	.0000	.0000	.0064	2.654	.361		
PR 154	seconds	1.061E+00	NA	.9989	.0000	.0000	.0000	.0000	.0011	4.287	.563		
ND 154	seconds	4.000E+01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	1.215	.500		
PM 154	seconds	1.032E+02	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	2.791	.681		
PM 154M	seconds	1.608E+02	4.200E+00	1.0000	.0000	.0000	.0000	.0000	.0000	2.898	.690		
SM 154	stable												
EU 154	seconds	2.711E+08	1.578E+05	.9998	.0002	.0000	.0000	.0000	.0000	1.532	.818		
GD 154	stable												
LA 155	seconds	1.540E-01	NA	.8324	.0000	.0000	.0000	.0000	.1676	5.596	.482		
CE 155	seconds	5.278E-01	NA	.9840	.0000	.0000	.0000	.0000	.0160	3.591	.438		
PR 155	seconds	1.122E+00	NA	.9846	.0000	.0000	.0000	.0000	.0154	3.555	.416		
ND 155	seconds	1.822E+01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	2.200	.379		
PM 155	seconds	4.800E+01	4.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	1.653	.383		
SM 155	seconds	1.338E+03	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.667	.154		
EU 155	seconds	1.477E+08	1.578E+06	1.0000	.0000	.0000	.0000	.0000	.0000	.131	.493		
GD 155M ^b	seconds	3.100E-02	NA	.0000	.0000	.0000	1.0000	.0000	.0000	.122	.000		
GD 155	stable												

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclides							Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron		
				Ground	Metastable	Ground	Metastable					
CE 156	seconds	5.963E-01	NA	.9701	.0000	.0000	.0000	.0000	.0000	.0299	3.299	.355
PR 156	seconds	3.793E-01	NA	.9728	.0000	.0000	.0000	.0000	.0000	.0272	4.846	.555
ND 156	seconds	1.962E+01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.888	.406
PM 156	seconds	1.310E+01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.208	.590
SM 156	seconds	3.384E+04	7.200E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.329	.343
EU 156	seconds	1.312E+06	6.912E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.695	.726
GD 156	stable											
CE 157	seconds	2.144E-01	NA	.9555	.0000	.0000	.0000	.0000	.0000	.0445	4.537	.460
PR 157	seconds	3.800E-01	NA	.9361	.0000	.0000	.0000	.0000	.0000	.0639	4.292	.438
ND 157	seconds	2.483E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.808	.406
PM 157	seconds	6.118E+01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.292	.367
SM 157	seconds	4.842E+02	7.200E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.264	.318
EU 157	seconds	5.465E+04	1.080E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.660	.403
GD 157	stable											
PR 158	seconds	1.686E-01	NA	.9358	.0000	.0000	.0000	.0000	.0000	.0642	5.733	.550
ND 158	seconds	2.695E+00	NA	.9999	.0000	.0000	.0000	.0000	.0000	.0001	2.513	.368
PM 158	seconds	3.800E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.733	.580
SM 158	seconds	3.306E+02	5.400E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.963	.576
EU 158	seconds	2.754E+03	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.046	.528
GD 158	stable											
PR 159	seconds	1.805E-01	NA	.8764	.0000	.0000	.0000	.0000	.0000	.1236	5.165	.453
ND 159	seconds	6.416E-01	NA	.9976	.0000	.0000	.0000	.0000	.0000	.0024	3.729	.447
PM 159	seconds	3.000E+00	NA	.9998	.0000	.0000	.0000	.0000	.0000	.0002	2.942	.394
SM 159	seconds	1.620E+02	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.965	.491
EU 159	seconds	1.086E+03	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.278	.317
GD 159	seconds	6.682E+04	2.880E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.362	.144
TB 159	stable											
ND 160	seconds	7.886E-01	NA	.9905	.0000	.0000	.0000	.0000	.0000	.0095	3.309	.364
PM 160	seconds	7.289E-01	NA	.9973	.0000	.0000	.0000	.0000	.0000	.0027	4.470	.559
SM 160	seconds	7.258E+01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.536	.449
EU 160	seconds	4.400E+01	3.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.064	.522
GD 160	stable											
TB 160	seconds	6.247E+06	1.728E+04	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.480	.826

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclides							Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron		
				Ground	Metastable	Ground	Metastable					
DY 160	stable	3.113E-01	NA	.9830	.0000	.0000	.0000	.0000	.0000	.0170	4.044	.465
ND 161	seconds	7.899E-01	NA	.9825	.0000	.0000	.0000	.0000	.0000	.0175	3.809	.445
PM 161	seconds	4.780E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.645	.430
SM 161	seconds	4.780E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.645	.430
EU 161	seconds	4.205E+01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.012	.500
GD 161	seconds	2.196E+02	3.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.971	.400
TB 161	seconds	5.962E+05	1.728E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.233	.154
DY 161	stable	3.243E-01	NA	.9786	.0000	.0000	.0000	.0000	.0000	.0214	4.705	.557
PM 162	seconds	5.260E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.261	.388
SM 162	seconds	1.624E+02	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.421	.590
EU 162	seconds	5.040E+02	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.823	.652
GD 162	seconds	4.656E+02	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.646	.673
TB 162	seconds	8.028E+03	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.832	.626
TB 162M	stable	1.268E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.003	.444
DY 162	seconds	7.604E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.613	.410
SM 163	seconds	9.277E+01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.820	.528
EU 163	seconds	1.170E+03	1.800E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.110	.711
GD 163	seconds	7.000E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.749	.240
TB 163M	minutes	1.385E+00	NA	.9999	.0000	.0000	.0000	.0000	.0000	.0001	2.852	.000
DY 163	stable	1.533E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.710	.368
SM 164	seconds	1.301E+03	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.365	.579
EU 164	seconds	1.800E+02	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.050	.474
GD 164	seconds	4.536E-01	NA	.9975	.0000	.0000	.0000	.0000	.0000	.0000	.000	.765
TB 164	seconds	1.355E+00	NA	.9981	.0000	.0000	.0000	.0000	.0000	.0000	3.655	.000
DY 164	stable	4.229E+01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0025	3.237	.463
SM 165	seconds	1.266E+02	6.000E+00	.1400	.8600	.0000	.0000	.0000	.0000	.0000	2.111	.435
EU 165	seconds	8.402E+03	2.160E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.710	.417
GD 165	seconds	7.548E+01	3.600E-01	.0224	.0000	.0000	.0000	.9776	.0000	.0000	.474	.489
TB 165	seconds									.0000	.055	
DY 165	seconds									.0000	.118	
DY 165M	seconds									.0000		
HO 165	stable											.169

Table A.3 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^a	Branching fractions, by decay mode and by state of product nuclides								Q-value, MeV per disintegration	Fraction of Q that comes from gammas
				Beta		Positron		Isomeric Transition	Alpha	Beta-neutron			
				Ground	Metastable	Ground	Metastable			Ground	Ground		
DY 166	seconds	2.938E+05	3.600E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.206	.209	
HO 166	seconds	9.648E+04	7.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.725	.041	
HO 166M	seconds	3.787E+10	5.680E+09	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.774	.918	
ER 166	seconds	0.000E+00	NA										
ER 167	stable												
ER 167M	seconds	2.280E+00	3.000E-02	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.203	.478	
ER 168	stable												
YB 168	stable												
ER 169	seconds	8.122E+05	1.800E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.103	.000	
TM 169	stable												
YB 169	seconds	2.767E+06	5.000E+02	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.429	.734	
ER 170	stable												
TM 170	seconds	1.111E+07	3.000E+04	.9985	.0000	.0015	.0000	.0000	.0000	.0000	.335	.016	
TM 170M	seconds	4.100E-06	NA	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.000	.000	
YB 170	stable												
ER 171	seconds	2.706E+04	8.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.790	.472	
TM 171	seconds	6.060E+07	4.000E+05	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.026	.023	
YB 171	stable												
ER 172	seconds	1.775E+05	1.800E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.633	.796	
TM 172	seconds	2.290E+05	1.100E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.005	.483	
YB 172	stable												

^a“NA” denotes not available in ENDF/B-VI or ENSDF libraries.^bPseudonuclide.

APPENDIX B

COMPARISONS BETWEEN PREVIOUS AND UPDATED LIBRARIES

Table B.1 presents a listing of percentage changes in decay data from the old library to the updated library for all nuclides containing a difference exceeding 1% in any of the parameters. Note,

$$\% \text{ change} = 100 \frac{(\text{new value} - \text{old value})}{\text{old value}} .$$

Nuclides not listed either had data within 1% or were not available in ENDF/B-VI or ENSDF.

Although the listing is specifically a comparison with the prior ORIGEN2 data, the differences in a significant part of the data should be similar for ORIGEN-S data.

Table B.1 Percentage change in decay data
from old library to new

LIB	ISO	HL	FB1	FP	FP1	FAL	FIT	FSN	FBN	EN
1	3LI	8	+-	+-	+-	+-	+-	+-	+-	63.
1	4BE	11	2.	+-	+-	+-	+-	+-	+-	-47.
1	5 B	12	+-	+-	+-	+-	+-	+-	+-	-52.
1	6 C	15	+-	+-	+-	+-	+-	+-	+-	126.
1	7 N	16	+-	+-	+-	NEW	+-	+-	+-	+-
1	8 O	19	-7.	+-	+-	+-	+-	+-	+-	-44.
1	9 F	20	-4.	+-	+-	+-	+-	+-	+-	-41.
1	11NA	24	-2.	+-	+-	+-	+-	+-	+-	+-
1	11NA	24M	1.	+-	+-	+-	+-	+-	+-	+-
1	13AL	29	+-	+-	+-	+-	+-	+-	+-	86.
1	13AL	30	-2.	+-	+-	+-	+-	+-	+-	+-
1	14SI	32	-74.	+-	+-	+-	+-	+-	+-	-67.
1	15 P	32	+-	+-	+-	+-	+-	+-	+-	-59.
1	15 P	33	1.	+-	+-	+-	+-	+-	+-	-69.
1	15 P	34	+-	+-	+-	+-	+-	+-	+-	-48.
1	16 S	35	+-	+-	+-	+-	+-	+-	+-	-71.
1	16 S	37	+-	+-	+-	+-	+-	+-	+-	-22.
1	17CL	38	+-	+-	+-	+-	+-	+-	+-	-2.
1	18AR	37	+-	+-	+-	+-	+-	+-	+-	12.
1	18AR	39	+-	+-	+-	+-	+-	+-	+-	-61.
1	18AR	42	+-	+-	+-	+-	+-	+-	+-	-61.
1	19 K	40	+-	+-	+-	+-	+-	+-	+-	4.
1	19 K	43	-1.	+-	+-	+-	+-	+-	+-	+-
1	19 K	44	+-	+-	+-	+-	+-	+-	+-	-26.
1	20CA	41	27.	+-	+-	+-	+-	+-	+-	11.
1	20CA	49	+-	+-	+-	+-	+-	+-	+-	-23.
1	21SC	46M	+-	+-	+-	+-	+-	+-	+-	4.
1	21SC	49	+-	+-	+-	+-	+-	+-	+-	-59.
1	23 V	49	2.	+-	+-	+-	+-	+-	+-	3.
1	23 V	54	-9.	+-	+-	+-	+-	+-	+-	-13.
1	24CR	51	+-	+-	+-	+-	+-	+-	+-	3.
1	24CR	55	-2.	+-	+-	+-	+-	+-	+-	+-
1	25MN	57	-10.	+-	+-	+-	+-	+-	+-	3.
1	25MN	58	+-	+-	+-	+-	+-	+-	+-	3.
1	26FE	55	5.	+-	+-	+-	+-	+-	+-	+-
1	26FE	59	-1.	+-	+-	+-	+-	+-	+-	+-
1	27CO	58M	+-	+-	+-	+-	+-	+-	+-	-7.
1	27CO	60M	+-	+-	+-	+-	+-	+-	+-	2.
1	27CO	61	+-	+-	+-	+-	+-	+-	+-	3.
1	27CO	62	+-	+-	+-	+-	+-	+-	+-	1.
1	28NI	59	-6.	+-	+-	+-	+-	+-	+-	10.
1	28NI	63	9.	+-	+-	+-	+-	+-	+-	+-
1	28NI	66	+-	+-	+-	+-	+-	+-	+-	-3.
1	30ZN	63	-1.	+-	+-	+-	+-	+-	+-	+-
1	30ZN	69	-1.	+-	+-	+-	+-	+-	+-	+-
1	30ZN	71	2.	+-	+-	+-	+-	+-	+-	-51.
1	30ZN	71M	1.	+-	+-	+-	-100.	+-	+-	-29.
1	31GA	70	+-	+-	NEW	+-	+-	+-	+-	+-
1	31GA	72M	-7.	+-	+-	+-	+-	+-	+-	+-
1	32GE	71	-3.	+-	+-	+-	+-	+-	+-	+-
1	32GE	71M	-7.	+-	+-	+-	+-	+-	+-	-8.
1	32GE	75	+-	+-	+-	+-	+-	+-	+-	-2.
1	32GE	75M	-2.	+-	+-	+-	+-	+-	+-	-2.
1	32GE	77	+-	+-	+-	+-	+-	+-	+-	-3.
1	32GE	77M	-3.	+-	+-	+-	+-	+-	+-	-2.
1	33AS	77	+-	29.	+-	+-	+-	+-	+-	-2.

Table B.1 (continued)

LIB	ISO	HL	FB1	FP	FP1	FAL	FIT	FSN	FBN	EN
1	34SE	77M	+-	+-	+-	+-	+-	+-	+-	-36.
1	34SE	79	-49.	+-	+-	+-	+-	+-	+-	26.
1	34SE	79M	+-	+-	+-	+-	+-	+-	+-	-1.
1	34SE	81M	+-	+-	+-	+-	+-	+-	+-	-3.
1	34SE	83	+-	+-	+-	+-	+-	+-	+-	2.
1	35BR	80	2.	+-	+-	+-	+-	+-	+-	+-
1	35BR	83	+-	+-	+-	+-	+-	+-	+-	1.
1	36KR	79M	-9.	+-	+-	+-	+-	+-	+-	+-
1	36KR	81	1.	+-	+-	+-	+-	+-	+-	5.
1	36KR	81M	-2.	+-	NEW	+-	+-	+-	+-	-2.
1	36KR	83M	+-	+-	+-	+-	+-	+-	+-	-6.
1	37RB	86	+-	+-	NEW	+-	+-	+-	+-	+-
1	37RB	87	2.	+-	+-	+-	+-	+-	+-	-42.
1	38SR	85M	-3.	+-	-9.	+-	2.	+-	+-	+-
1	38SR	89	+-	NEW	+-	+-	+-	+-	+-	+-
1	38SR	90	-3.	+-	+-	+-	+-	+-	+-	+-
1	38SR	93	-1.	NEW	+-	+-	+-	+-	+-	21.
1	39	Y 90M	3.	+-	+-	+-	+-	+-	+-	+-
1	39	Y 94	-2.	+-	+-	+-	+-	+-	+-	-8.
1	39	Y 96	-96.	+-	+-	+-	+-	+-	+-	15.
1	40ZR	89	+-	+-	-19.	+-	+-	+-	+-	-72.
1	40ZR	93	+-	5.	+-	+-	+-	+-	+-	-3.
1	40ZR	95	+-	59.	+-	+-	+-	+-	+-	+-
1	41NB	91	-93.	+-	+-	+-	+-	+-	+-	+-
1	41NB	92	*****	+-	+-	+-	+-	+-	+-	+-
1	41NB	93M	19.	+-	+-	+-	+-	+-	+-	-3.
1	41NB	95M	+-	+-	+-	+-	-6.	+-	+-	2.
1	41NB	96	+-	+-	+-	+-	+-	+-	+-	-3.
1	41NB	98	2.	+-	+-	+-	+-	+-	+-	28.
1	41NB100	-37.	+-	+-	+-	+-	+-	+-	+-	-20.
1	42MO	93M	1.	+-	+-	+-	+-	+-	+-	3.
1	42MO	93	+-	+-	-82.	NEW	+-	+-	+-	1.
1	42MO	99	+-	+-	+-	+-	+-	+-	+-	25.
1	42MO101	+-	+-	+-	+-	+-	+-	+-	+-	5.
1	43TC	97	+-	+-	+-	+-	+-	+-	+-	-1.
1	43TC	97M	+-	+-	+-	+-	+-	+-	+-	-4.
1	43TC100	+-	+-	+-	+-	+-	+-	+-	+-	-6.
1	44RU	97	+-	+-	+-	-50.	+-	+-	+-	+-
1	44RU103	+-	11.	+-	+-	+-	+-	+-	+-	+-
1	44RU105	+-	1.	+-	+-	+-	+-	+-	+-	-3.
1	44RU107	-11.	+-	+-	+-	+-	+-	+-	+-	14.
1	45RH104M	+-	+-	+-	+-	+-	+-	+-	+-	-9.
1	45RH105M	+-	+-	+-	+-	+-	+-	+-	+-	-3.
1	45RH106M	-2.	+-	+-	+-	+-	+-	+-	+-	-1.
1	45RH107	+-	+-	+-	+-	+-	+-	+-	+-	-7.
1	46PD103	+-	+-	-100.	NEW	+-	+-	+-	+-	-70.
1	46PD107	+-	+-	+-	+-	+-	+-	+-	+-	-7.
1	46PD107M	+-	+-	+-	+-	+-	+-	+-	+-	1.
1	46PD109	2.	+-	+-	+-	+-	+-	+-	+-	-19.
1	46PD109M	+-	+-	+-	+-	+-	+-	+-	+-	-2.
1	46PD111	6.	+-	+-	+-	+-	+-	+-	+-	-2.
1	46PD111M	+-	-39.	+-	+-	+-	7.	+-	+-	-7.
1	47AG106	-100.	+-	+-	+-	+-	+-	+-	+-	-51.
1	47AG108	+-	+-	21.	+-	+-	+-	+-	+-	+-
1	47AG108M	+-	+-	+-	+-	+-	-2.	+-	+-	+-
1	47AG109M	+-	+-	+-	+-	+-	+-	+-	+-	-3.
1	47AG110M	+-	+-	+-	+-	+-	2.	+-	+-	+-
1	47AG111M	+-	+-	+-	+-	+-	+-	+-	+-	-5.
1	48CD107	+-	+-	-100.	NEW	+-	+-	+-	+-	-78.
1	48CD111M	+-	+-	+-	+-	+-	+-	+-	+-	-2.

Table B.1 (continued)

	LIB	ISO	HL	FB1	FP	FP1	FAL	FIT	FSN	FBN	EN
1	48CD113	NEW	++	++	++	++	++	++	++	++	NEW
3	48CD113M	++	++	++	++	++	40.	++	++	++	-35.
1	48CD115	++	++	++	++	++	++	++	++	++	-5.
1	48CD115M	++	57.	++	++	++	++	++	++	++	1.
1	48CD117	-4.	-2.	++	++	++	++	++	++	++	24.
1	48CD117M	-1.	-97.	++	++	++	++	++	++	++	63.
1	48CD119	-71.	-10.	++	++	++	++	++	++	++	34.
1	48CD121	5.	456.	++	++	++	++	++	++	++	14.
1	49IN113M	++	++	++	++	++	++	++	++	++	-2.
1	49IN114	++	++	-85.	++	++	++	++	++	++	-4.
1	49IN114M	++	++	++	++	++	++	++	++	++	-1.
1	49IN115	-12.	++	++	++	++	++	++	++	++	-37.
1	49IN117	++	NEW	++	++	++	++	++	++	++	26.
1	49IN117M	++	++	++	++	++	++	++	++	++	-18.
1	49IN118	++	++	++	++	++	++	++	++	++	-9.
1	49IN119	-4.	-81.	++	++	++	++	++	++	++	2.
1	49IN119M	++	++	++	++	++	-50.	++	++	++	-22.
1	49IN120	-93.	++	++	++	++	++	++	++	++	-29.
1	49IN120M1400.	++	++	++	++	++	++	++	++	++	45.
1	49IN121	-17.	NEW	++	++	++	++	++	++	++	-6.
1	50SN113	++	++	NEW	++	++	++	++	++	++	++
1	50SN113M	7.	++	-91.	++	++	NEW	++	++	++	-18.
1	50SN117M	-3.	++	++	++	++	++	++	++	++	++
1	50SN119M	20.	++	++	++	++	++	++	++	++	++
1	50SN121	++	++	++	++	++	++	++	++	++	-44.
1	50SN121M	10.	++	++	++	++	NEW	++	++	++	-88.
1	50SN125M	++	++	++	++	++	++	++	++	++	2.
1	51SB122M	++	++	++	++	++	++	++	++	++	-1.
1	51SB124M	++	++	++	++	++	-6.	++	++	++	28.
1	51SB125	-1.	++	++	++	++	++	++	++	++	1.
1	51SB126M	++	++	++	++	++	++	++	++	++	2.
1	52TE121	-1.	++	++	++	++	++	++	++	++	++
1	52TE121M	++	++	++	++	++	++	++	++	++	-1.
1	52TE123	24.	++	++	++	++	++	++	++	++	-1.
1	52TE129M	++	++	++	++	++	-2.	++	++	++	4.
1	53 I126	++	++	++	++	++	++	++	++	++	2.
1	53 I128	++	++	15.	++	++	++	++	++	++	++
1	53 I129	++	++	++	++	++	++	++	++	++	1.
1	53 I130M	++	++	++	++	++	1.	++	++	++	-6.
1	53 I131	++	-2.	++	++	++	++	++	++	++	++
1	54XE125M	++	++	++	++	++	++	++	++	++	-1.
1	54XE127M	-1.	++	++	++	++	++	++	++	++	29.
1	54XE129M	11.	++	++	++	++	++	++	++	++	-4.
1	54XE133	++	++	++	++	++	++	++	++	++	2.
1	54XE133M	++	++	++	++	++	++	++	++	++	-3.
1	54XE137	++	++	++	++	++	++	++	++	++	-4.
1	55CS134	++	++	NEW	++	++	++	++	++	++	++
1	55CS134M	++	++	++	++	++	++	++	++	++	-3.
1	55CS136	++	-32.	++	++	++	++	++	++	++	-11.
1	55CS138	++	++	++	++	++	++	++	++	++	1.
1	56BA131	++	++	++	++	++	++	++	++	++	-3.
1	56BA131M	-3.	++	++	++	++	++	++	++	++	4.
1	56BA133	-2.	++	++	++	++	++	++	++	++	3.
1	56BA133M	++	++	-13.	++	++	++	++	++	++	++
1	56BA135M	++	++	++	++	++	++	++	++	++	-3.
1	56BA139	2.	++	++	++	++	++	++	++	++	++
1	56BA140	++	++	++	++	++	++	++	++	++	5.
1	57LA137	++	++	++	++	++	++	++	++	++	-2.
1	57LA138	-22.	++	-1.	++	++	++	++	++	++	2.
1	58CE137	++	++	++	++	++	++	++	++	++	-4.

Table B.1 (continued)

LIB	ISO	HL	FB1	FP	FP1	FAL	FIT	FSN	FBN	EN
1	58CE139	++	++	++	++	++	++	++	++	29.
1	58CE139M	-2.	++	++	++	++	++	++	++	++
1	58CE144	++	17.	++	++	++	++	++	++	-1.
1	58CE145	++	++	++	++	++	++	++	++	3.
1	59PR142	++	++	NEW	++	++	++	++	++	++
1	59PR142M	++	++	++	++	++	++	++	++	-99.
1	60ND144	++	++	++	++	++	++	++	++	NEW
1	60ND149	++	++	++	++	++	++	++	++	-2.
1	61PM145	++	++	++	++	NEW	++	++	++	++
1	61PM147	++	++	++	++	++	++	++	++	2.
1	61PM148M	++	++	++	++	++	-6.	++	++	++
1	61PM150	++	++	++	++	++	++	++	++	-1.
1	61PM152	++	++	++	++	++	++	++	++	-11.
1	62SM145	++	++	++	++	++	++	++	++	-5.
1	62SM146	47.	++	++	++	++	++	++	++	++
1	62SM148	++	++	++	++	++	++	++	++	-1.
1	62SM153	++	++	++	++	++	++	++	++	1.
1	62SM155	++	++	++	++	++	++	++	++	-32.
1	63EU152	-2.	++	++	++	++	++	++	++	++
1	63EU154	++	++	NEW	++	++	++	++	++	2.
1	63EU155	-6.	++	++	++	++	++	++	++	7.
1	63EU156	++	++	++	++	++	++	++	++	-3.
1	64GD153	++	++	++	++	++	++	++	++	-3.
1	64GD159	++	++	++	++	++	++	++	++	-34.
1	64GD161	-1.	++	++	++	++	++	++	++	-21.
1	64GD162	-16.	-100.	++	++	++	++	++	++	34.
1	65TB157	++	++	++	++	++	++	++	++	62.
1	65TB160	++	++	++	++	++	++	++	++	8.
1	65TB161	++	++	++	++	++	++	++	++	-31.
1	65TB162	4.	++	++	++	++	++	++	++	-2.
1	66DY157	++	++	++	++	++	++	++	++	-13.
1	66DY159	++	++	++	++	++	++	++	++	-5.
1	66DY165	++	++	++	++	++	++	++	++	-39.
1	66DY165M	++	++	++	++	++	++	++	++	-6.
1	66DY166	++	++	++	++	++	++	++	++	4.
1	67HO163	*****	++	++	++	++	++	++	++	-100.
1	67HO166M	++	++	++	++	++	++	++	++	-5.
1	68ER163	++	++	++	++	++	++	++	++	355.
1	68ER165	++	++	++	++	++	++	++	++	-6.
1	68ER167M	++	++	++	++	++	++	++	++	-2.
1	68ER169	++	++	++	++	++	++	++	++	-70.
1	68ER171	++	++	++	++	++	++	++	++	-2.
1	68ER172	++	++	++	++	++	++	++	++	-30.
1	69TM172	++	++	++	++	++	++	++	++	-47.
1	69TM173	++	++	++	++	++	++	++	++	-47.
1	70YB169	++	++	++	++	++	++	++	++	1.
1	70YB177	++	++	++	++	++	++	++	++	-57.
1	71LU176	20.	++	++	++	++	++	++	++	-23.
1	71LU176M	-1.	++	NEW	++	++	++	++	++	-66.
1	71LU177M	4.	++	++	++	++	-5.	++	++	-8.
1	72HF178M	++	++	++	++	++	++	++	++	-1.
1	72HF179M	++	++	++	++	++	++	++	++	-5.
1	72HF180M	++	++	++	++	++	++	++	++	-2.
1	72HF181	++	++	++	++	++	++	++	++	-3.
1	72HF182	++	++	++	++	++	++	++	++	-39.
1	73TA180	-100.	++	NEW	++	++	++	++	++	-67.
1	73TA182M	-4.	++	++	++	++	++	++	++	4.
1	73TA183	++	NEW	++	++	++	++	++	++	-40.
1	74 W181	++	++	++	++	++	++	++	++	-1.
1	74 W183M	++	++	++	++	++	++	++	++	14.

Table B.1 (continued)

LIB	ISO	HL	FB1	FP	FP1	FAL	FIT	FSN	FBN	EN
1	74	W185M	+-	+-	+-	+-	+-	+-	+-	-7.
1	74	W187	+-	+-	+-	+-	+-	+-	+-	-6.
1	74	W189	+-	+-	+-	+-	+-	+-	+-	-39.
1	75RE186	+-	+-	-8.	+-	+-	+-	+-	+-	+-
1	75RE187	+-	+-	+-	+-	+-	+-	+-	+-	-100.
1	75RE188M	+-	+-	+-	+-	+-	+-	+-	+-	-6.
1	75RE189	+-	+-	+-	+-	+-	+-	+-	+-	-62.
1	76OS185	+-	+-	+-	+-	+-	+-	+-	+-	1.
1	76OS191	+-	+-	+-	+-	+-	+-	+-	+-	-49.
1	76OS191M	+-	+-	+-	+-	+-	+-	+-	+-	-6.
1	76OS193	-2.	+-	+-	+-	+-	+-	+-	+-	-61.
1	76OS194	+-	+-	+-	+-	+-	+-	+-	+-	-65.
1	77IR192M	+-	+-	+-	+-	+-	+-	+-	+-	-6.
1	77IR194M*****	+-	+-	+-	+-	+-	+-	+-	+-	2313.
1	78PT191	-3.	+-	+-	+-	+-	+-	+-	+-	-5.
1	78PT193	-90.	+-	+-	+-	+-	+-	+-	+-	1.
1	78PT193M	+-	+-	+-	+-	+-	+-	+-	+-	-5.
1	78PT195M	28.	+-	+-	+-	+-	+-	+-	+-	+-
1	78PT197	2.	+-	+-	+-	+-	+-	+-	+-	-63.
1	78PT197M	19.	+-	+-	+-	+-	+-	+-	+-	-5.
1	78PT199	3.	+-	+-	+-	+-	+-	+-	+-	-56.
1	78PT199M	-4.	+-	+-	+-	+-	+-	+-	+-	-2.
1	79AU198	+-	+-	+-	+-	+-	+-	+-	+-	-47.
1	79AU200	+-	+-	+-	+-	+-	+-	+-	+-	-54.
1	80HG197	-1.	+-	+-	+-	+-	+-	+-	+-	+-
1	80HG197M	+-	+-	17.	+-	+-	-1.	+-	+-	+-
1	80HG205	-5.	+-	+-	+-	+-	+-	+-	+-	-66.
1	81TL204	+-	+-	22.	+-	+-	+-	+-	+-	+-
1	81TL206	+-	+-	+-	+-	+-	+-	+-	+-	-65.
1	82PB205	-49.	+-	+-	+-	+-	+-	+-	+-	19.
1	82PB209	-1.	+-	+-	+-	+-	+-	+-	+-	2.
1	83BI210	+-	+-	+-	+-	NEW	+-	+-	+-	+-
1	84PO211	-8.	+-	+-	+-	+-	+-	+-	+-	+-
1	84PO211M	+-	+-	+-	+-	+-	+-	+-	+-	-1.
2	81TL206	+-	+-	+-	+-	+-	+-	+-	+-	-65.
2	82PB209	-1.	+-	+-	+-	+-	+-	+-	+-	2.
2	82PB210	+-	+-	+-	+-	NEW	+-	+-	+-	1.
2	82PB211	+-	+-	+-	+-	+-	+-	+-	+-	3.
2	82PB214	+-	+-	+-	+-	+-	+-	+-	+-	1.
2	83BI210	+-	+-	+-	+-	NEW	+-	+-	+-	+-
2	83BI212	+-	+-	+-	+-	+-	+-	+-	+-	-2.
2	83BI213	+-	+-	+-	+-	-3.	+-	+-	+-	+-
2	83BI214	+-	+-	+-	+-	14.	+-	+-	+-	+-
2	84PO211M	+-	+-	+-	+-	+-	+-	+-	+-	-1.
2	84PO211	-8.	+-	+-	+-	+-	+-	+-	+-	+-
2	84PO216	-3.	+-	+-	+-	+-	+-	+-	+-	+-
2	84PO218	2.	+-	+-	+-	+-	+-	+-	+-	+-
2	87FR221	2.	+-	+-	+-	+-	+-	+-	+-	+-
2	87FR223	+-	+-	+-	+-	+-	+-	+-	+-	-6.
2	88RA225	+-	+-	+-	+-	+-	+-	+-	+-	3.
2	88RA228	-14.	+-	+-	+-	+-	+-	+-	+-	-28.
2	89AC228	+-	+-	+-	+-	NEW	+-	+-	+-	-10.
2	90TH229	7.	+-	+-	+-	+-	+-	+-	+-	+-
2	90TH230	-2.	+-	+-	+-	+-	+-	-50.	+-	+-
2	90TH231	+-	+-	+-	+-	+-	+-	+-	+-	94.
2	90TH233	+-	+-	+-	+-	+-	+-	+-	+-	7.
2	90TH234	+-	+-	+-	+-	+-	+-	+-	+-	2.
2	91PA231	+-	+-	+-	+-	+-	+-	-50.	+-	+-
2	91PA232	+-	+-	NEW	+-	+-	+-	+-	+-	+-
2	91PA233	+-	+-	+-	+-	+-	+-	+-	+-	12.

Table B.1 (continued)

LIB	ISO	HL	FB1	FP	FP1	FAL	FIT	FSN	FBN	EN
2	91PA234	+-	+-	+-	+-	+-	+-	+-	+-	2.
2	92 U231	+-	+-	+-	+-	+-	+-	+-	+-	-36.
2	92 U232	-3.	+-	+-	+-	+-	+-	-10.	+-	+-
2	92 U233	+-	+-	+-	+-	+-	+-	-100.	+-	+-
2	92 U234	+-	+-	+-	+-	+-	+-	73.	+-	+-
2	92 U235	+-	+-	+-	+-	+-	+-	-97.	+-	6.
2	92 U236	+-	+-	+-	+-	+-	+-	-20.	+-	+-
2	92 U237	+-	+-	+-	+-	+-	+-	+	+-	2.
2	92 U238	+-	+-	+-	+-	+-	+-	7.	+-	+-
2	92 U240	+-	+-	+-	+-	+-	+-	+-	+-	9.
2	93NP235	+-	+-	+-	+-	+-	+-	+-	+-	2.
2	93NP236	+-	+-	+-	+-	+-	+-	+-	+-	1.
2	93NP237	+-	+-	+-	+-	+-	+-	+-	+-	-7.
2	93NP238	+-	+-	+-	+-	+-	+-	+-	+-	4.
2	93NP239	+-	+-	+-	+-	+-	+-	+-	+-	5.
2	93NP240M	-2.	+-	+-	+-	+-	NEW	+-	+-	-3.
2	93NP240	-5.	+-	+-	+-	+-	+-	+-	+-	-9.
2	93NP241	-13.	+-	+-	+-	+-	+-	+-	+-	+-
2	94PU236	2.	+-	+-	+-	+-	+-	6.	+-	+-
2	94PU237	+-	+-	+-	+-	27.	+-	+-	+-	5.
2	94PU238	+-	+-	+-	+-	+-	+-	3.	+-	+-
2	94PU240	+-	+-	+-	+-	+-	+-	14.	+-	+-
2	94PU241	+-	+-	+-	+-	-2.	+-	+-	+-	3.
2	94PU242	-3.	+-	+-	+-	+-	+-	-1.	+-	+-
2	94PU244	-3.	+-	+-	+-	+-	+-	+-	+-	-5.
2	94PU245	+-	+-	+-	+-	+-	+-	+-	+-	83.
2	94PU246	+-	+-	+-	+-	+-	+-	+-	+-	80.
2	95AM239	+-	+-	+-	+-	+-	+-	+-	+-	-8.
2	95AM241	+-	+-	+-	+-	+-	+-	-8.	+-	+-
2	95AM242M	-7.	+-	+-	+-	-10.	+-	+-	+-	2.
2	95AM242	+-	+-	+-	+-	+-	+-	+-	+-	2.
2	95AM243	+-	+-	+-	+-	+-	+-	-79.	+-	+-
2	95AM244M	+-	+-	-12.	+-	+-	+-	+-	+-	2.
2	95AM244	+-	+-	+-	+-	+-	+-	+-	+-	28.
2	95AM245	+-	+-	+-	+-	+-	+-	+-	+-	2.
2	95AM246	56.	+-	+-	+-	+-	+-	+-	+-	1.
2	96CM241	-9.	+-	+-	+-	+-	+-	+-	+-	-1.
2	96CM242	+-	+-	+-	+-	+-	+-	-7.	+-	+-
2	96CM243	+-	+-	NEW	+-	+-	+-	+-	+-	+-
2	96CM247	3.	+-	+-	+-	+-	+-	+-	+-	+-
2	96CM248	+-	+-	+-	+-	+-	+-	+-	+-	-77.
2	96CM251	*****	+-	+-	+-	+-	+-	+-	+-	87.
2	97BK249	+-	+-	+-	+-	+-	+-	2.	+-	-74.
2	97BK250	+-	+-	+-	+-	+-	+-	+-	+-	1.
2	98CF249	+-	+-	+-	+-	+-	+-	4.	+-	-19.
2	98CF250	+-	+-	+-	+-	+-	+-	+-	+-	-2.
2	98CF252	+-	+-	+-	+-	+-	+-	+-	+-	-50.
2	98CF253	+-	+-	+-	+-	+-	+-	+-	+-	-2.
2	99ES253	+-	+-	+-	+-	+-	+-	+-	+-	6787.
2	99ES254	+-	+-	+-	+-	+-	+-	-100.	+-	-2.
3	28NI 66	+-	+-	+-	+-	+-	+-	+-	+-	-3.
3	30ZN 69	-1.	+-	+-	+-	+-	+-	+-	+-	+-
3	31GA 70	+-	+-	NEW	+-	+-	+-	+-	+-	+-
3	30ZN 71	2.	+-	+-	+-	+-	+-	+-	+-	-51.
3	30ZN 71M	1.	+-	+-	+-	+-	-100.	+-	+-	-29.
3	32GE 71	-3.	+-	+-	+-	+-	+-	+-	+-	+-
3	32GE 71M	-7.	+-	+-	+-	+-	+-	+-	+-	-8.
3	27CO 72	+-	+-	+-	+-	+-	+-	+-	NEW	9.
3	28NI 72	58.	+-	+-	+-	+-	+-	+-	+-	-13.
3	29CU 72	8.	+-	+-	+-	+-	+-	+-	NEW	7.

Table B.1 (continued)

LIB	ISO	HL	FB1	FP	FP1	FAL	FIT	FSN	FBN	EN
3	27CO	73	12.	++	++	++	++	++	NEW	4.
3	28NI	73	25.	++	++	++	++	++	NEW	-9.
3	29CU	73	30.	++	++	++	++	++	NEW	-20.
3	30ZN	73	++	++	++	++	++	++	++	11.
3	31GA	73	++	-1.	++	++	++	++	++	3.
3	32GE	73M	-6.	++	++	++	++	++	++	-2.
3	27CO	74	-14.	++	++	++	++	++	NEW	13.
3	28NI	74	39.	++	++	++	++	++	NEW	-9.
3	29CU	74	13.	++	++	++	++	++	NEW	2.
3	30ZN	74	1.	NEW	++	++	++	++	++	33.
3	31GA	74	++	++	++	++	++	++	++	-7.
3	27CO	75	2.	++	++	++	++	++	NEW	9.
3	28NI	75	29.	++	++	++	++	++	NEW	-6.
3	29CU	75	21.	++	++	++	++	++	NEW	-16.
3	30ZN	75	13.	++	++	++	++	++	++	14.
3	31GA	75	11.	20.	++	++	++	++	++	20.
3	32GE	75	++	++	++	++	++	++	++	-2.
3	32GE	75M	-2.	++	++	++	++	++	++	-2.
3	28NI	76	13.	++	++	++	++	++	NEW	-7.
3	29CU	76	18.	++	++	++	++	++	NEW	++
3	30ZN	76	4.	++	++	++	++	++	++	-2.
3	31GA	76	20.	++	++	++	++	++	++	-3.
3	28NI	77	++	++	++	++	++	++	NEW	3.
3	29CU	77	4.	++	++	++	++	++	NEW	-12.
3	30ZN	77	49.	++	++	++	++	++	++	++
3	31GA	77	2.	14.	++	++	++	++	++	11.
3	32GE	77	++	++	++	++	++	++	++	-3.
3	32GE	77M	-3.	++	++	++	++	++	++	-2.
3	33AS	77	++	29.	++	++	++	++	++	-2.
3	34SE	77M	++	++	++	++	++	++	++	-36.
3	28NI	78	-4.	++	++	++	++	++	NEW	-7.
3	29CU	78	-2.	++	++	++	++	++	NEW	5.
3	30ZN	78	-39.	++	++	++	++	++	NEW	21.
3	31GA	78	4.	++	++	++	++	++	++	11.
3	32GE	78	1.	++	++	++	++	++	++	-2.
3	33AS	78	++	++	++	++	++	++	++	-2.
3	29CU	79	-8.	++	++	++	++	++	NEW	-10.
3	30ZN	79	162.	++	++	++	++	++	NEW	13.
3	31GA	79	5.	NEW	++	++	++	++	-61.	20.
3	32GE	79	-56.	++	++	++	++	++	++	-4.
3	33AS	79	++	-1.	++	++	++	++	++	++
3	34SE	79	-49.	++	++	++	++	++	++	26.
3	34SE	79M	++	++	++	++	++	++	++	-1.
3	35BR	79M	++	++	++	++	++	++	++	-2.
3	29CU	80	-1.	++	++	++	++	++	NEW	-5.
3	30ZN	80	-24.	++	++	++	++	++	NEW	-1.
3	31GA	80	-2.	++	++	++	++	++	-5.	19.
3	32GE	80	23.	++	++	++	++	++	++	47.
3	33AS	80	-8.	++	++	++	++	++	++	-3.
3	35BR	80	2.	++	++	++	++	++	++	++
3	29CU	81	++	++	++	++	++	++	NEW	-3.
3	30ZN	81	-5.	++	++	++	++	++	NEW	-7.
3	31GA	81	74.	NEW	++	++	++	++	NEW	7.
3	32GE	81	-25.	++	++	++	++	++	++	1.
3	33AS	81	4.	NEW	++	++	++	++	++	8.
3	34SE	81M	++	++	++	++	++	++	++	-3.
3	36KR	81	1.	++	++	++	++	++	++	5.
3	36KR	81M	-2.	++	NEW	++	++	++	++	-2.
3	30ZN	82	-6.	++	++	++	++	++	NEW	-2.
3	31GA	82	290.	++	++	++	++	++	NEW	6.

Table B.1 (continued)

LIB	ISO	HL	FB1	FP	FP1	FAL	FIT	FSN	FBN	EN
3	32GE	82	+-	+-	+-	+-	+-	+-	+-	7.
3	33AS	82	-9.	+-	+-	+-	+-	+-	+-	15.
3	33AS	82M	5.	+-	+-	+-	+-	+-	+-	-19.
3	30ZN	83	+-	+-	+-	+-	+-	+-	NEW	+-
3	31GA	83	110.	+-	+-	+-	+-	+-	NEW	13.
3	32GE	83	+-	+-	+-	+-	+-	+-	6.	2.
3	33AS	83	+-	9.	+-	+-	+-	+-	+-	51.
3	34SE	83	+-	+-	+-	+-	+-	+-	+-	2.
3	35BR	83	+-	+-	+-	+-	+-	+-	+-	1.
3	36KR	83M	+-	+-	+-	+-	+-	+-	+-	-6.
3	31GA	84	+-	+-	+-	+-	+-	+-	NEW	6.
3	32GE	84	+-	+-	+-	+-	+-	+-	4.	17.
3	33AS	84	-5.	+-	+-	+-	+-	+-	-31.	-7.
3	34SE	84	-3.	+-	+-	+-	+-	+-	+-	2.
3	35BR	84	+-	+-	+-	+-	+-	+-	+-	-2.
3	31GA	85	-5.	+-	+-	+-	+-	+-	NEW	14.
3	32GE	85	7.	+-	+-	+-	+-	+-	NEW	5.
3	33AS	85	+-	+-	+-	+-	+-	+-	255.	26.
3	34SE	85	-19.	+-	+-	+-	+-	+-	+-	18.
3	35BR	85	+-	+-	+-	+-	+-	+-	+-	6.
3	32GE	86	-5.	+-	+-	+-	+-	+-	NEW	11.
3	33AS	86	+-	+-	+-	+-	+-	+-	216.	5.
3	34SE	86	-8.	-100.	+-	+-	+-	+-	+-	46.
3	35BR	86	+-	+-	+-	+-	+-	+-	+-	5.
3	35BR	86M1122.	+-	+-	+-	+-	+-	+-	+-	9.
3	37RB	86	+-	+-	NEW	+-	+-	+-	+-	+-
3	32GE	87	7.	+-	+-	+-	+-	+-	NEW	1.
3	33AS	87	+-	+-	+-	+-	+-	+-	42.	23.
3	34SE	87	+-	+-	+-	+-	+-	+-	6.	11.
3	35BR	87	+-	+-	+-	+-	+-	+-	9.	28.
3	37RB	87	2.	+-	+-	+-	+-	+-	+-	-42.
3	32GE	88	-10.	+-	+-	+-	+-	+-	NEW	10.
3	33AS	88	4.	+-	+-	+-	+-	+-	NEW	3.
3	34SE	88	+-	+-	+-	+-	+-	+-	+-	14.
3	35BR	88	1.	+-	+-	+-	+-	+-	38.	133.
3	33AS	89	-6.	+-	+-	+-	+-	+-	NEW	12.
3	35BR	89	-3.	+-	+-	+-	+-	+-	60.	14.
3	38SR	89	+-	NEW	+-	+-	+-	+-	+-	+-
3	33AS	90	1.	+-	+-	+-	+-	+-	NEW	2.
3	34SE	90	-23.	+-	+-	+-	+-	+-	NEW	22.
3	35BR	90	20.	+-	+-	+-	+-	+-	93.	3.
3	36KR	90	+-	-2.	+-	+-	+-	+-	+-	+-
3	37RB	90	+-	+-	+-	+-	+-	+-	+-	3.
3	37RB	90M	+-	+-	+-	+-	-47.	+-	+-	6.
3	38SR	90	-3.	+-	+-	+-	+-	+-	+-	+-
3	39 Y	90M	3.	+-	+-	+-	+-	+-	+-	+-
3	40ZR	90M	-3.	+-	+-	+-	+-	+-	+-	+-
3	34SE	91	46.	+-	+-	+-	+-	+-	NEW	8.
3	35BR	91	+-	+-	+-	+-	+-	+-	56.	4.
3	36KR	91	-1.	+-	+-	+-	+-	+-	+-	15.
3	37RB	91	+-	+-	+-	+-	+-	+-	NEW	-4.
3	41NB	91	-93.	+-	+-	+-	+-	+-	+-	+-
3	34SE	92	-32.	+-	+-	+-	+-	+-	NEW	16.
3	35BR	92	22.	+-	+-	+-	+-	+-	15.	15.
3	36KR	92	+-	+-	+-	+-	+-	+-	-18.	12.
3	37RB	92	+-	+-	+-	+-	+-	+-	-12.	8.
3	38SR	92	+-	+-	+-	+-	+-	+-	+-	-1.
3	41NB	92	*****	+-	+-	+-	+-	+-	+-	+-
3	34SE	93	-9.	+-	+-	+-	+-	+-	NEW	11.
3	35BR	93	-12.	+-	+-	+-	+-	+-	NEW	15.

Table B.1 (continued)

LIB	ISO	HL	FB1	FP	FP1	FAL	FIT	FSN	FBN	EN
3	36KR	93	2.	++	++	++	++	++	-39.	8.
3	37RB	93	-2.	++	++	++	++	++	-17.	18.
3	38SR	93	-1.	NEW	++	++	++	++	++	21.
3	40ZR	93	++	5.	++	++	++	++	++	-3.
3	41NB	93M	19.	++	++	++	++	++	++	-3.
3	35BR	94	++	++	++	++	++	++	NEW	5.
3	36KR	94	++	++	++	++	++	++	30.	15.
3	37RB	94	++	++	++	++	++	++	-9.	46.
3	38SR	94	++	++	++	++	++	++	++	7.
3	39 Y	94	-2.	++	++	++	++	++	++	-8.
3	35BR	95	-8.	++	++	++	++	++	NEW	++
3	36KR	95	56.	++	++	++	++	++	NEW	10.
3	37RB	95	7.	++	++	++	++	++	20.	39.
3	38SR	95	-3.	++	++	++	++	++	++	16.
3	39 Y	95	++	++	++	++	++	++	++	18.
3	40ZR	95	++	59.	++	++	++	++	++	++
3	41NB	95M	++	++	++	++	-6.	++	++	2.
3	35BR	96	6.	++	++	++	++	++	NEW	++
3	36KR	96	-33.	++	++	++	++	++	NEW	-4.
3	37RB	96	-4.	++	++	++	++	++	6.	27.
3	38SR	96	-73.	++	++	++	++	++	NEW	27.
3	39 Y	96	-96.	++	++	++	++	++	++	15.
3	41NB	96	++	++	++	++	++	++	++	-3.
3	36KR	97	-33.	++	++	++	++	++	NEW	-2.
3	37RB	97	1.	++	++	++	++	++	26.	61.
3	38SR	97	110.	NEW	++	++	++	++	-94.	11.
3	39 Y	97	215.	++	++	++	++	++	-96.	28.
3	36KR	98	-29.	++	++	++	++	++	NEW	-6.
3	37RB	98	-19.	++	++	++	++	++	-38.	-1.
3	38SR	98	-24.	++	++	++	++	++	-40.	++
3	39 Y	98	113.	++	++	++	++	++	-50.	8.
3	40ZR	98	++	++	++	++	++	++	++	11.
3	41NB	98	2.	++	++	++	++	++	++	28.
3	41NB	98M	++	++	++	++	++	++	++	7.
3	37RB	99	-22.	++	++	++	++	++	-59.	7.
3	38SR	99	-52.	++	++	++	++	++	NEW	4.
3	39 Y	99	84.	++	++	++	++	++	-60.	3.
3	40ZR	99	-12.	NEW	++	++	++	++	++	7.
3	41NB	99	5.	++	++	++	++	++	++	30.
3	41NB	99M	++	++	++	++	++	++	++	21.
3	42MO	99	++	++	++	++	++	++	++	25.
3	43TC	99M	++	++	++	++	++	++	++	11.
3	37RB100		-2.	++	++	++	++	++	NEW	6.
3	38SR100		-81.	++	++	++	++	++	NEW	-4.
3	39 Y100		-3.	++	++	++	++	++	NEW	++
3	40ZR100		++	-100.	++	++	++	++	++	32.
3	41NB100		-37.	++	++	++	++	++	++	-20.
3	41NB100M		24.	++	++	++	++	++	++	12.
3	43TC100		++	++	++	++	++	++	++	-6.
3	37RB101		-17.	++	++	++	++	++	NEW	++
3	38SR101		-23.	++	++	++	++	++	NEW	++
3	39 Y101		-49.	++	++	++	++	++	NEW	-8.
3	40ZR101		-39.	++	++	++	++	++	++	4.
3	41NB101		1.	++	++	++	++	++	++	8.
3	42MO101		++	++	++	++	++	++	++	5.
3	38SR102		-31.	++	++	++	++	++	NEW	-5.
3	39 Y102		230.	++	++	++	++	++	NEW	3.
3	40ZR102		-90.	++	++	++	++	++	++	-8.
3	41NB102		-57.	++	++	++	++	++	++	3.
3	42MO102		2.	++	++	++	++	++	++	28.

Table B.1 (continued)

LIB	ISO	HL	FB1	FP	FP1	FAL	FIT	FSN	FBN	EN
3	43TC102	+-	+-	+-	+-	+-	+-	+-	+-	50.
3	43TC102M	+-	+-	+-	+-	+-	-60.	+-	+-	4.
3	38SR103	-14.	+-	+-	+-	+-	+-	+-	NEW	-5.
3	39 Y103	-29.	+-	+-	+-	+-	+-	+-	NEW	-8.
3	40ZR103	-27.	+-	+-	+-	+-	+-	+-	NEW	-5.
3	41NB103	-90.	+-	+-	+-	+-	+-	+-	NEW	+-
3	42MO103	13.	+-	+-	+-	+-	+-	+-	+-	+-
3	43TC103	8.	+-	+-	+-	+-	+-	+-	+-	2.
3	44RU103	+-	11.	+-	+-	+-	+-	+-	+-	+-
3	45RH103M	+-	+-	+-	+-	+-	+-	+-	+-	-2.
3	38SR104	-15.	+-	+-	+-	+-	+-	+-	NEW	-10.
3	39 Y104	-11.	+-	+-	+-	+-	+-	+-	NEW	-4.
3	40ZR104	-32.	+-	+-	+-	+-	+-	+-	NEW	-11.
3	41NB104	380.	+-	+-	+-	+-	+-	+-	NEW	16.
3	42MO104	-38.	+-	+-	+-	+-	+-	+-	+-	17.
3	45RH104M	+-	+-	+-	+-	+-	+-	+-	+-	-9.
3	39 Y105	-15.	+-	+-	+-	+-	+-	+-	NEW	-12.
3	40ZR105	-12.	+-	+-	+-	+-	+-	+-	NEW	-12.
3	41NB105	64.	+-	+-	+-	+-	+-	+-	NEW	-1.
3	42MO105	-34.	+-	+-	+-	+-	+-	+-	+-	2.
3	43TC105	-5.	+-	+-	+-	+-	+-	+-	+-	7.
3	44RU105	+-	1.	+-	+-	+-	+-	+-	+-	-3.
3	45RH105M	+-	+-	+-	+-	+-	+-	+-	+-	-3.
3	39 Y106	-4.	+-	+-	+-	+-	+-	+-	NEW	-4.
3	40ZR106	-7.	+-	+-	+-	+-	+-	+-	NEW	-18.
3	41NB106	87.	+-	+-	+-	+-	+-	+-	NEW	-2.
3	42MO106	-7.	+-	+-	+-	+-	+-	+-	+-	10.
3	43TC106	-3.	+-	+-	+-	+-	+-	+-	+-	19.
3	45RH106M	-2.	+-	+-	+-	+-	+-	+-	+-	-1.
3	47AG106	-100.	+-	+-	+-	+-	+-	+-	+-	-51.
3	39 Y107	-12.	+-	+-	+-	+-	+-	+-	NEW	-11.
3	40ZR107	-2.	+-	+-	+-	+-	+-	+-	NEW	-13.
3	41NB107	14.	+-	+-	+-	+-	+-	+-	NEW	-6.
3	42MO107	-45.	+-	+-	+-	+-	+-	+-	+-	+-
3	43TC107	-27.	+-	+-	+-	+-	+-	+-	+-	-8.
3	44RU107	-11.	+-	+-	+-	+-	+-	+-	+-	14.
3	45RH107	+-	+-	+-	+-	+-	+-	+-	+-	-7.
3	46PD107	+-	+-	+-	+-	+-	+-	+-	+-	-7.
3	46PD107M	+-	+-	+-	+-	+-	+-	+-	+-	1.
3	40ZR108	-7.	+-	+-	+-	+-	+-	+-	NEW	-19.
3	41NB108	9.	+-	+-	+-	+-	+-	+-	NEW	-4.
3	42MO108	+-	+-	+-	+-	+-	+-	+-	NEW	2.
3	43TC108	+-	+-	+-	+-	+-	+-	+-	+-	13.
3	44RU108	1.	+-	+-	+-	+-	+-	+-	+-	9.
3	45RH108	+-	+-	+-	+-	+-	+-	+-	+-	13.
3	45RH108M	2.	+-	+-	+-	+-	+-	+-	+-	10.
3	47AG108	+-	+-	21.	+-	+-	+-	+-	+-	+-
3	47AG108M	+-	+-	+-	+-	+-	-2.	+-	+-	+-
3	40ZR109	-6.	+-	+-	+-	+-	+-	+-	NEW	-11.
3	41NB109	10.	+-	+-	+-	+-	+-	+-	NEW	-7.
3	42MO109	36.	+-	+-	+-	+-	+-	+-	NEW	+-
3	43TC109	-97.	+-	+-	+-	+-	+-	+-	NEW	-13.
3	44RU109	+-	+-	+-	+-	+-	+-	+-	+-	-3.
3	45RH109	-11.	-100.	+-	+-	+-	+-	+-	+-	-3.
3	45RH109M	+-	+-	+-	+-	+-	+-	+-	+-	-80.
3	46PD109	2.	+-	+-	+-	+-	+-	+-	+-	-19.
3	46PD109M	+-	+-	+-	+-	+-	+-	+-	+-	-2.
3	47AG109M	+-	+-	+-	+-	+-	+-	+-	+-	-3.
3	41NB110	3.	+-	+-	+-	+-	+-	+-	NEW	-1.
3	42MO110	47.	+-	+-	+-	+-	+-	+-	NEW	-4.

Table B.1 (continued)

LIB	ISO	HL	FB1	FP	FP1	FAL	FIT	FSN	FBN	EN
3	43TC110	+-	+-	+-	+-	+-	+-	+-	NEW	-8.
3	44RU110	-6.	NEW	+-	+-	+-	+-	+-	+-	-18.
3	45RH110	-89.	+-	+-	+-	+-	+-	+-	+-	-17.
3	45RH110M	850.	+-	+-	+-	+-	+-	+-	+-	47.
3	47AG110M	+-	+-	+-	+-	+-	2.	+-	+-	+-
3	41NB111	10.	+-	+-	+-	+-	+-	+-	NEW	-10.
3	42MO111	19.	+-	+-	+-	+-	+-	+-	NEW	+-
3	43TC111	48.	+-	+-	+-	+-	+-	+-	NEW	-12.
3	44RU111	-90.	+-	+-	+-	+-	+-	+-	+-	-13.
3	45RH111	-83.	-100.	+-	+-	+-	+-	+-	+-	-13.
3	46PD111	6.	+-	+-	+-	+-	+-	+-	+-	-2.
3	46PD111M	+-	-39.	+-	+-	+-	7.	+-	+-	-7.
3	47AG111M	+-	+-	+-	+-	+-	+-	+-	+-	-5.
3	48CD111M	+-	+-	+-	+-	+-	+-	+-	+-	-2.
3	41NB112	2.	+-	+-	+-	+-	+-	+-	+-	-3.
3	42MO112	42.	+-	+-	+-	+-	+-	+-	NEW	-10.
3	43TC112	21.	+-	+-	+-	+-	+-	+-	NEW	-6.
3	44RU112	414.	+-	+-	+-	+-	+-	+-	+-	-17.
3	45RH112	-68.	+-	+-	+-	+-	+-	+-	+-	-11.
3	46PD112	5.	+-	+-	+-	+-	+-	+-	+-	-38.
3	42MO113	16.	+-	+-	+-	+-	+-	+-	NEW	-3.
3	43TC113	42.	+-	+-	+-	+-	+-	+-	NEW	-15.
3	44RU113	8.	+-	+-	+-	+-	+-	+-	NEW	-9.
3	45RH113	+-	+-	+-	+-	+-	+-	+-	+-	-15.
3	46PD113	3.	85.	+-	+-	+-	+-	+-	+-	-14.
3	47AG113	1.	31.	+-	+-	+-	+-	+-	+-	-21.
3	47AG113M	4.	-100.	+-	+-	+-	NEW	+-	+-	-78.
3	48CD113	NEW	+-	+-	+-	+-	+-	+-	+-	NEW
3	48CD113M	+-	+-	+-	+-	+-	40.	+-	+-	-35.
3	49IN113M	+-	+-	+-	+-	+-	+-	+-	+-	-2.
3	42MO114	17.	+-	+-	+-	+-	+-	+-	+-	-13.
3	43TC114	17.	+-	+-	+-	+-	+-	+-	NEW	-8.
3	44RU114	61.	+-	+-	+-	+-	+-	+-	NEW	-21.
3	45RH114	+-	+-	+-	+-	+-	+-	+-	NEW	-7.
3	46PD114	2.	+-	+-	+-	+-	+-	+-	+-	-52.
3	47AG114	2.	+-	+-	+-	+-	+-	+-	+-	10.
3	49IN114	+-	+-	-85.	+-	+-	+-	+-	+-	-4.
3	49IN114M	+-	+-	+-	+-	+-	+-	+-	+-	-1.
3	42MO115	9.	+-	+-	+-	+-	+-	+-	+-	-9.
3	43TC115	22.	+-	+-	+-	+-	+-	+-	NEW	-17.
3	44RU115	20.	+-	+-	+-	+-	+-	+-	NEW	-11.
3	45RH115	38.	+-	+-	+-	+-	+-	+-	NEW	-19.
3	47AG115	+-	179.	+-	+-	+-	+-	+-	+-	-8.
3	47AG115M	6.	-100.	+-	+-	+-	+-	+-	+-	-5.
3	48CD115	+-	+-	+-	+-	+-	+-	+-	+-	-5.
3	48CD115M	+-	57.	+-	+-	+-	+-	+-	+-	1.
3	49IN115	-12.	+-	+-	+-	+-	+-	+-	+-	-37.
3	49IN115M	4.	+-	+-	+-	+-	-1.	+-	+-	-1.
3	43TC116	9.	+-	+-	+-	+-	+-	+-	NEW	-12.
3	44RU116	21.	+-	+-	+-	+-	+-	+-	NEW	-24.
3	45RH116	14.	+-	+-	+-	+-	+-	+-	NEW	-10.
3	46PD116	-9.	-100.	+-	+-	+-	+-	+-	+-	-19.
3	47AG116	+-	+-	+-	+-	+-	+-	+-	+-	11.
3	47AG116M	+-	+-	+-	+-	+-	NEW	+-	+-	1.
3	43TC117	12.	+-	+-	+-	+-	+-	+-	NEW	-19.
3	44RU117	11.	+-	+-	+-	+-	+-	+-	NEW	-19.
3	45RH117	13.	+-	+-	+-	+-	+-	+-	NEW	-20.
3	46PD117	+-	+-	+-	+-	+-	+-	+-	+-	-11.
3	47AG117	+-	-30.	+-	+-	+-	+-	+-	+-	2.
3	47AG117M	+-	-71.	+-	+-	+-	+-	+-	+-	-12.

Table B.1 (continued)

LIB	ISO	HL	FBI	FP	FP1	FAL	FIT	FSN	FBN	EN
3	48CD117	-4.	-2.	+-	+-	+-	+-	+-	+-	24.
3	48CD117M	-1.	-97.	+-	+-	+-	+-	+-	+-	63.
3	49IN117	+-	NEW	+-	+-	+-	+-	+-	+-	26.
3	49IN117M	+-	+-	+-	+-	+-	+-	+-	+-	-18.
3	50SN117M	-3.	+-	+-	+-	+-	+-	+-	+-	+-
3	43TC118	6.	+-	+-	+-	+-	+-	+-	+-	-14.
3	44RU118	7.	+-	+-	+-	+-	+-	+-	NEW	-27.
3	45RH118	7.	+-	+-	+-	+-	+-	+-	NEW	-16.
3	46PD118	+-	+-	+-	+-	+-	+-	+-	+-	-22.
3	47AG118	2.	+-	+-	+-	+-	+-	+-	+-	28.
3	47AG118M	-29.	+-	+-	+-	+-	+-	+-	+-	30.
3	48CD118	+-	+-	+-	+-	+-	+-	+-	+-	-40.
3	49IN118	+-	+-	+-	+-	+-	+-	+-	+-	-9.
3	44RU119	10.	+-	+-	+-	+-	+-	+-	NEW	-20.
3	45RH119	4.	+-	+-	+-	+-	+-	+-	NEW	-23.
3	46PD119	3.	+-	+-	+-	+-	+-	+-	NEW	-19.
3	47AG119	-65.	-56.	+-	+-	+-	+-	+-	NEW	4.
3	48CD119	-71.	-10.	+-	+-	+-	+-	+-	+-	34.
3	48CD119M	-31.	-100.	+-	+-	+-	+-	+-	+-	48.
3	49IN119	-4.	-81.	+-	+-	+-	+-	+-	+-	2.
3	49IN119M	+-	+-	+-	+-	+-	-50.	+-	+-	-22.
3	50SN119M	20.	+-	+-	+-	+-	+-	+-	+-	+-
3	44RU120	19.	+-	+-	+-	+-	+-	+-	+-	-18.
3	45RH120	6.	+-	+-	+-	+-	+-	+-	NEW	-17.
3	46PD120	-9.	+-	+-	+-	+-	+-	+-	NEW	-27.
3	47AG120	+-	+-	+-	+-	+-	+-	+-	NEW	101.
3	48CD120	+-	-100.	+-	+-	+-	+-	+-	+-	-22.
3	49IN120	-93.	+-	+-	+-	+-	+-	+-	+-	-29.
3	49IN120M	400.	+-	+-	+-	+-	+-	+-	+-	45.
3	45RH121	13.	+-	+-	+-	+-	+-	+-	NEW	-26.
3	46PD121	3.	+-	+-	+-	+-	+-	+-	NEW	-20.
3	47AG121	-73.	+-	+-	+-	+-	+-	+-	NEW	-3.
3	48CD121	5.	456.	+-	+-	+-	+-	+-	+-	14.
3	49IN121	-17.	NEW	+-	+-	+-	+-	+-	+-	-6.
3	49IN121M	18.	+-	+-	+-	+-	NEW	+-	+-	-26.
3	50SN121	+-	+-	+-	+-	+-	+-	+-	+-	-44.
3	50SN121M	10.	+-	+-	+-	+-	NEW	+-	+-	-88.
3	45RH122	2.	+-	+-	+-	+-	+-	+-	NEW	-19.
3	46PD122	11.	+-	+-	+-	+-	+-	+-	NEW	-32.
3	47AG122	380.	+-	+-	+-	+-	+-	+-	NEW	-5.
3	48CD122	-5.	+-	+-	+-	+-	+-	+-	+-	-14.
3	49IN122	-85.	+-	+-	+-	+-	+-	+-	+-	-22.
3	49IN122M	587.	+-	+-	+-	+-	+-	+-	+-	1128.
3	51SB122M	+-	+-	+-	+-	+-	+-	+-	+-	-1.
3	45RH123	+-	+-	+-	+-	+-	+-	+-	NEW	-26.
3	46PD123	-3.	+-	+-	+-	+-	+-	+-	NEW	-23.
3	47AG123	-55.	+-	+-	+-	+-	+-	+-	NEW	-4.
3	48CD123	6.	+-	+-	+-	+-	+-	+-	+-	-12.
3	49IN123	+-	2.	+-	+-	+-	+-	+-	+-	5.
3	49IN123M	+-	100.	+-	+-	+-	+-	+-	+-	-24.
3	52TE123	24.	+-	+-	+-	+-	+-	+-	+-	-1.
3	46PD124	-8.	+-	+-	+-	+-	+-	+-	NEW	-32.
3	47AG124	-7.	+-	+-	+-	+-	+-	+-	NEW	-14.
3	48CD124	-95.	+-	+-	+-	+-	+-	+-	+-	-25.
3	49IN124	+-	+-	+-	+-	+-	+-	+-	+-	5.
3	51SB124M	+-	+-	+-	+-	+-	-6.	+-	+-	28.
3	46PD125	-9.	+-	+-	+-	+-	+-	+-	NEW	-25.
3	47AG125	-13.	+-	+-	+-	+-	+-	+-	NEW	-19.
3	48CD125	-5.	+-	+-	+-	+-	+-	+-	+-	-16.
3	49IN125	+-	27.	+-	+-	+-	+-	+-	+-	-4.

Table B.1 (continued)

LIB	ISO	HL	FB1	FP	FP1	FAL	FIT	FSN	FBN	EN
3	49IN125M	2.	9.	++	++	++	++	++	++	-17.
3	50SN125M	++	++	++	++	++	++	++	++	2.
3	51SB125	-1.	++	++	++	++	++	++	++	1.
3	46PD126	-12.	++	++	++	++	++	++	NEW	-31.
3	47AG126	-10.	++	++	++	++	++	++	NEW	-11.
3	48CD126	-87.	NEW	++	++	++	++	++	++	-25.
3	49IN126	-5.	++	++	++	++	++	++	++	21.
3	50SN126	++	++	++	++	++	++	++	++	25.
3	51SB126M	++	++	++	++	++	++	++	++	2.
3	47AG127	-15.	++	++	++	++	++	++	NEW	-19.
3	48CD127	-13.	++	++	++	++	++	++	NEW	-13.
3	49IN127	-43.	NEW	++	++	++	++	++	-1.	-4.
3	49IN127M	3.	NEW	++	++	++	++	++	NEW	-8.
3	50SN127	++	++	++	++	++	++	++	++	-1.
3	50SN127M	++	++	++	++	++	++	++	++	9.
3	51SB127	++	26.	++	++	++	++	++	++	-2.
3	47AG128	-8.	++	++	++	++	++	++	NEW	-12.
3	48CD128	-18.	++	++	++	++	++	++	NEW	-23.
3	49IN128	-76.	++	++	++	++	++	++	-96.	-2.
3	50SN128	++	++	++	++	++	++	++	++	5.
3	51SB128	++	++	++	++	++	++	++	++	3.
3	51SB128M	++	++	++	++	++	NEW	++	++	-4.
3	53 I128	++	++	15.	++	++	++	++	++	++
3	48CD129	-12.	++	++	++	++	++	++	NEW	-16.
3	49IN129	-26.	-80.	++	++	++	++	++	-95.	1.
3	50SN129	-71.	++	++	++	++	++	++	++	7.
3	50SN129M	168.	++	++	++	++	NEW	++	++	8.
3	51SB129	2.	38.	++	++	++	++	++	++	-7.
3	52TE129M	++	++	++	++	++	-2.	++	++	4.
3	53 I129	++	++	++	++	++	++	++	++	1.
3	54XE129M	11.	++	++	++	++	++	++	++	-4.
3	48CD130	-9.	++	++	++	++	++	++	NEW	-24.
3	49IN130	-40.	NEW	++	++	++	++	++	-80.	13.
3	50SN130	++	++	++	++	++	++	++	++	8.
3	51SB130	-1.	++	++	++	++	++	++	++	++
3	53 I130M	++	++	++	++	++	1.	++	++	-6.
3	48CD131	-11.	++	++	++	++	++	++	NEW	-8.
3	49IN131	-10.	NEW	++	++	++	++	++	-81.	-13.
3	50SN131	-38.	++	++	++	++	++	++	++	8.
3	51SB131	++	++	++	++	++	++	++	++	-5.
3	53 I131	++	-2.	++	++	++	++	++	++	++
3	48CD132	-6.	++	++	++	++	++	++	NEW	-19.
3	49IN132	55.	++	++	++	++	++	++	NEW	8.
3	50SN132	++	NEW	++	++	++	++	++	++	-2.
3	51SB132	50.	++	++	++	++	++	++	++	-2.
3	51SB132M	-33.	++	++	++	++	++	++	++	-2.
3	49IN133	-2.	++	++	++	++	++	++	NEW	-5.
3	50SN133	-2.	++	++	++	++	++	++	1114.	-5.
3	51SB133	4.	673.	++	++	++	++	++	++	-27.
3	52TE133	++	++	++	++	++	++	++	++	7.
3	52TE133M	++	NEW	++	++	++	35.	++	++	-31.
3	54XE133	++	++	++	++	++	++	++	++	2.
3	54XE133M	++	++	++	++	++	++	++	++	-3.
3	56BA133	-2.	++	++	++	++	++	++	++	3.
3	49IN134	4.	++	++	++	++	++	++	NEW	-2.
3	50SN134	23.	++	++	++	++	++	++	NEW	-12.
3	51SB134	-92.	++	++	++	++	++	++	NEW	2.
3	51SB134M	-3.	++	++	++	++	++	++	47.	2.
3	52TE134	++	++	++	++	++	++	++	++	-7.
3	53 I134M	++	NEW	++	++	++	++	++	++	-6.

Table B.1 (continued)

LIB	ISO	HL	FB1	FP	FP1	FAL	FIT	FSN	FBN	EN
3	54XE134M	+-	+-	+-	+-	+-	+-	+-	+-	3.
3	55CS134	+-	+-	NEW	+-	+-	+-	+-	+-	+-
3	55CS134M	+-	+-	+-	+-	+-	+-	+-	+-	-3.
3	50SN135	44.	+-	+-	+-	+-	+-	+-	NEW	-10.
3	51SB135	+-	+-	+-	+-	+-	+-	+-	153.	-17.
3	52TE135	-1.	+-	+-	+-	+-	+-	+-	+-	15.
3	53 I135	+-	2.	+-	+-	+-	+-	+-	+-	+-
3	56BA135M	+-	+-	+-	+-	+-	+-	+-	+-	-3.
3	50SN136	74.	+-	+-	+-	+-	+-	+-	NEW	-16.
3	51SB136	255.	+-	+-	+-	+-	+-	+-	NEW	-14.
3	52TE136	-17.	+-	+-	+-	+-	+-	+-	80.	16.
3	53 I136	+-	+-	+-	+-	+-	+-	+-	+-	2.
3	53 I136M	2.	+-	+-	+-	+-	+-	+-	+-	26.
3	55CS136	+-	-32.	+-	+-	+-	+-	+-	+-	-11.
3	51SB137	68.	+-	+-	+-	+-	+-	+-	NEW	-13.
3	52TE137	+-	+-	+-	+-	+-	+-	+-	340.	-12.
3	53 I137	+-	+-	+-	+-	+-	+-	+-	24.	-7.
3	54XE137	+-	+-	+-	+-	+-	+-	+-	+-	-4.
3	51SB138	33.	+-	+-	+-	+-	+-	+-	NEW	-10.
3	52TE138	-15.	+-	+-	+-	+-	+-	+-	NEW	-15.
3	53 I138	1.	+-	+-	+-	+-	+-	+-	114.	18.
3	54XE138	+-	+-	+-	+-	+-	+-	+-	+-	-2.
3	55CS138	+-	+-	+-	+-	+-	+-	+-	+-	1.
3	55CS138M	+-	+-	+-	+-	+-	8.	+-	+-	6.
3	57LA138	-22.	+-	-1.	+-	+-	+-	+-	+-	2.
3	51SB139	27.	+-	+-	+-	+-	+-	+-	NEW	-10.
3	52TE139	37.	+-	+-	+-	+-	+-	+-	NEW	-9.
3	53 I139	-4.	+-	+-	+-	+-	+-	+-	-4.	-8.
3	55CS139	-1.	+-	+-	+-	+-	+-	+-	+-	+-
3	56BA139	2.	+-	+-	+-	+-	+-	+-	+-	+-
3	58CE139	+-	+-	+-	+-	+-	+-	+-	+-	29.
3	59PR139	+-	+-	+-	+-	+-	+-	+-	+-	29.
3	52TE140	19.	+-	+-	+-	+-	+-	+-	NEW	-13.
3	53 I140	+-	+-	+-	+-	+-	+-	+-	-71.	2.
3	54XE140	+-	+-	+-	+-	+-	+-	+-	+-	13.
3	55CS140	+-	+-	+-	+-	+-	+-	+-	+-	-2.
3	56BA140	+-	+-	+-	+-	+-	+-	+-	+-	5.
3	59PR140	+-	+-	+-	+-	+-	+-	+-	+-	55.
3	52TE141	16.	+-	+-	+-	+-	+-	+-	NEW	-12.
3	53 I141	15.	+-	+-	+-	+-	+-	+-	225.	-10.
3	54XE141	+-	+-	+-	+-	+-	+-	+-	-20.	-6.
3	55CS141	+-	+-	+-	+-	+-	+-	+-	-51.	-14.
3	60ND141	+-	+-	+-	+-	+-	+-	+-	+-	-3.
3	52TE142	20.	+-	+-	+-	+-	+-	+-	NEW	-14.
3	53 I142	2.	+-	+-	+-	+-	+-	+-	NEW	-13.
3	54XE142	+-	+-	+-	+-	+-	+-	+-	-20.	4.
3	55CS142	+-	+-	+-	+-	+-	+-	+-	-54.	-8.
3	56BA142	+-	+-	+-	+-	+-	+-	+-	+-	-1.
3	57LA142	-2.	+-	+-	+-	+-	+-	+-	+-	-10.
3	59PR142	+-	+-	NEW	+-	+-	+-	+-	+-	+-
3	59PR142M	+-	+-	+-	+-	+-	+-	+-	+-	-99.
3	53 I143	22.	+-	+-	+-	+-	+-	+-	NEW	-14.
3	54XE143	220.	+-	+-	+-	+-	+-	+-	9.	-8.
3	55CS143	5.	+-	+-	+-	+-	+-	+-	42.	-14.
3	56BA143	7.	+-	+-	+-	+-	+-	+-	+-	-11.
3	57LA143	+-	+-	+-	+-	+-	+-	+-	+-	-30.
3	53 I144	10.	+-	+-	+-	+-	+-	+-	NEW	-16.
3	54XE144	10.	+-	+-	+-	+-	+-	+-	NEW	-21.
3	55CS144	+-	+-	+-	+-	+-	+-	+-	185.	-6.
3	56BA144	4.	+-	+-	+-	+-	+-	+-	+-	-3.

Table B.1 (continued)

LIB	ISO	HL	FB1	FP	FP1	FAL	FIT	FSN	FBN	EN
3	57LA144	2.	++	++	++	++	++	++	++	6.
3	58CE144	+-	17.	++	++	++	++	++	++	-1.
3	60ND144	+-	++	++	++	++	++	++	++	NEW
3	53 I145	4.	++	++	++	++	++	++	NEW	-21.
3	54XE145	+-	++	++	++	++	++	++	NEW	-18.
3	55CS145	6.	++	++	++	++	++	++	232.	-5.
3	56BA145	-30.	++	++	++	++	++	++	++	-2.
3	57LA145	-14.	++	++	++	++	++	++	++	-8.
3	58CE145	+-	++	++	++	++	++	++	++	3.
3	61PM145	+-	++	++	++	NEW	++	++	++	+-
3	62SM145	+-	++	++	++	++	++	++	++	-5.
3	54XE146	-40.	++	++	++	++	++	++	NEW	-22.
3	55CS146	81.	++	++	++	++	++	++	238.	-11.
3	56BA146	+-	++	++	++	++	++	++	NEW	16.
3	57LA146	-24.	++	++	++	++	++	++	NEW	2.
3	58CE146	-5.	++	++	++	++	++	++	++	30.
3	59PR146	+-	++	++	++	++	++	++	++	-9.
3	61PM146	+-	++	5.	++	++	++	++	++	-1.
3	62SM146	47.	++	++	++	++	++	++	++	+-
3	54XE147	-25.	++	++	++	++	++	++	NEW	-19.
3	55CS147	-2.	++	++	++	++	++	++	NEW	-20.
3	56BA147	-69.	++	++	++	++	++	++	NEW	-14.
3	57LA147	-56.	++	++	++	++	++	++	NEW	-11.
3	58CE147	-19.	++	++	++	++	++	++	++	-9.
3	59PR147	13.	++	++	++	++	++	++	++	3.
3	61PM147	+-	++	++	++	++	++	++	++	2.
3	55CS148	2.	++	++	++	++	++	++	NEW	-16.
3	56BA148	-90.	++	++	++	++	++	++	NEW	-17.
3	57LA148	-19.	++	++	++	++	++	++	NEW	-28.
3	58CE148	30.	++	++	++	++	++	++	++	+-
3	59PR148	-1.	++	++	++	++	++	++	++	+-
3	61PM148M	+-	++	++	++	++	-6.	++	++	+-
3	62SM148	+-	++	++	++	++	++	++	++	-1.
3	55CS149	-12.	++	++	++	++	++	++	NEW	-11.
3	56BA149	-24.	++	++	++	++	++	++	NEW	-18.
3	57LA149	-16.	++	++	++	++	++	++	NEW	-20.
3	58CE149	420.	++	++	++	++	++	++	++	-12.
3	59PR149	-2.	++	++	++	++	++	++	++	11.
3	60ND149	+-	++	++	++	++	++	++	++	-2.
3	63EU149	+-	++	++	++	++	++	++	++	15.
3	55CS150	+-	++	++	++	++	++	++	NEW	-15.
3	56BA150	-46.	++	++	++	++	++	++	NEW	-10.
3	57LA150	-6.	++	++	++	++	++	++	NEW	-13.
3	58CE150	300.	++	++	++	++	++	++	++	-26.
3	59PR150	-50.	++	++	++	++	++	++	++	-4.
3	61PM150	+-	++	++	++	++	++	++	++	-1.
3	63EU150	+-	++	++	++	++	++	++	++	1.
3	56BA151	-24.	++	++	++	++	++	++	NEW	-12.
3	57LA151	-25.	++	++	++	++	++	++	NEW	-13.
3	58CE151	2.	++	++	++	++	++	++	++	-25.
3	59PR151	372.	++	++	++	++	++	++	++	-19.
3	56BA152	-44.	++	++	++	++	++	++	NEW	-6.
3	57LA152	-8.	++	++	++	++	++	++	NEW	-13.
3	58CE152	-45.	++	++	++	++	++	++	++	-13.
3	59PR152	-19.	++	++	++	++	++	++	++	-8.
3	60ND152	+-	++	++	++	++	++	++	++	-12.
3	61PM152	+-	++	++	++	++	++	++	++	-11.
3	61PM152M	+-	++	++	++	++	++	++	++	39.
3	63EU152	-2.	++	++	++	++	++	++	++	+-
3	57LA153	-25.	++	++	++	++	++	++	NEW	-9.

Table B.1 (continued)

LIB	ISO	HL	FB1	FP	FP1	FAL	FIT	FSN	FBN	EN
3	58CE153	-15.	++	++	++	++	++	++	NEW	-26.
3	59PR153	-42.	++	++	++	++	++	++	++	-13.
3	60ND153	++	++	++	++	++	++	++	++	-15.
3	61PM153	++	++	++	++	++	++	++	++	4.
3	62SM153	++	++	++	++	++	++	++	++	1.
3	64GD153	++	++	++	++	++	++	++	++	-3.
3	57LA154	-15.	++	++	++	++	++	++	NEW	-14.
3	58CE154	-44.	++	++	++	++	++	++	NEW	-10.
3	59PR154	-19.	++	++	++	++	++	++	NEW	-9.
3	60ND154	++	++	++	++	++	++	++	++	13.
3	61PM154	-39.	++	++	++	++	++	++	++	6.
3	61PM154M	49.	++	++	++	++	-100.	++	++	13.
3	63EU154	++	++	NEW	++	++	++	++	++	2.
3	57LA155	-30.	++	++	++	++	++	++	NEW	-9.
3	58CE155	-26.	++	++	++	++	++	++	NEW	-21.
3	59PR155	-41.	++	++	++	++	++	++	NEW	-8.
3	60ND155	-30.	++	++	++	++	++	++	++	-14.
3	61PM155	31.	++	++	++	++	++	++	++	-16.
3	62SM155	++	++	++	++	++	++	++	++	-32.
3	63EU155	-6.	++	++	++	++	++	++	++	7.
3	58CE156	-49.	++	++	++	++	++	++	NEW	-14.
3	59PR156	-26.	++	++	++	++	++	++	NEW	-12.
3	60ND156	-66.	++	++	++	++	++	++	++	9.
3	62SM156	++	++	++	++	++	++	++	++	-23.
3	63EU156	++	++	++	++	++	++	++	++	-3.
3	58CE157	-41.	++	++	++	++	++	++	NEW	-15.
3	59PR157	-44.	++	++	++	++	++	++	NEW	-10.
3	60ND157	-40.	++	++	++	++	++	++	++	-13.
3	61PM157	-10.	++	++	++	++	++	++	++	-13.
3	62SM157	++	++	++	++	++	++	++	++	-17.
3	63EU157	++	++	++	++	++	++	++	++	-12.
3	59PR158	-36.	++	++	++	++	++	++	NEW	-9.
3	60ND158	-66.	++	++	++	++	++	++	NEW	++
3	61PM158	++	++	++	++	++	++	++	++	-10.
3	62SM158	-87.	++	++	++	++	++	++	++	36.
3	63EU158	++	++	++	++	++	++	++	++	-4.
3	59PR159	-43.	++	++	++	++	++	++	NEW	-10.
3	60ND159	-54.	++	++	++	++	++	++	NEW	-6.
3	61PM159	-29.	++	++	++	++	++	++	NEW	-15.
3	63EU159	++	++	++	++	++	++	++	++	-19.
3	64GD159	++	++	++	++	++	++	++	++	-34.
3	60ND160	-63.	++	++	++	++	++	++	NEW	-2.
3	61PM160	-27.	++	++	++	++	++	++	NEW	-9.
3	62SM160	-79.	++	++	++	++	++	++	++	-14.
3	63EU160	-14.	++	++	++	++	++	++	++	35.
3	65TB160	++	++	++	++	++	++	++	++	8.
3	60ND161	-44.	++	++	++	++	++	++	NEW	-17.
3	61PM161	-34.	++	++	++	++	++	++	NEW	-12.
3	62SM161	-63.	++	++	++	++	++	++	++	-4.
3	63EU161	++	++	++	++	++	++	++	++	-3.
3	64GD161	-1.	++	++	++	++	++	++	++	-21.
3	65TB161	++	++	++	++	++	++	++	++	-31.
3	61PM162	-19.	++	++	++	++	++	++	NEW	-19.
3	62SM162	-73.	++	++	++	++	++	++	++	4.
3	63EU162	-40.	++	++	++	++	++	++	++	2.
3	64GD162	-16.	-100.	++	++	++	++	++	++	34.
3	65TB162	4.	++	++	++	++	++	++	++	-2.
3	62SM163	-51.	++	++	++	++	++	++	++	-16.
3	63EU163	-49.	++	++	++	++	++	++	++	-13.
3	64GD163	++	++	++	++	++	++	++	++	9.

Table B.1 (continued)

LIB	ISO	HL	FB1	FP	FP1	FAL	FIT	FSN	FBN	EN
3	65TB163	++	++	++	++	++	++	++	++	9.
3	62SM164	-67.	++	++	++	++	++	++	NEW	-3.
3	63EU164	-29.	++	++	++	++	++	++	NEW	-16.
3	64GD164	++	++	++	++	++	++	++	++	27.
3	65TB164	++	++	++	++	++	++	++	++	29.
3	62SM165	-51.	++	++	++	++	++	++	NEW	-17.
3	63EU165	-47.	++	++	++	++	++	++	NEW	-14.
3	64GD165	-58.	++	++	++	++	++	++	++	-9.
3	65TB165	287.	72.	++	++	++	++	++	++	++
3	66DY165	++	++	++	++	++	++	++	++	-39.
3	66DY165M	++	++	++	++	++	++	++	++	-6.
3	66DY166	++	++	++	++	++	++	++	++	4.
3	67HO166M	++	++	++	++	++	++	++	++	-5.
3	68ER167M	++	++	++	++	++	++	++	++	-2.
3	68ER169	++	++	++	++	++	++	++	++	-70.
3	70YB169	++	++	++	++	++	++	++	++	1.
3	68ER171	++	++	++	++	++	++	++	++	-2.
3	68ER172	++	++	++	++	++	++	++	++	-30.
3	69TM172	++	++	++	++	++	++	++	++	-47.

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