

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.

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OAK RIDGE NATIONAL LABORATORY
P. O. Box 2008
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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

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

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				Ground				
H 1	stable														
H 2	stable														
H 3	seconds	3.891E+08	1.893E+06	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.006	.000	.000
H 4 ^b	seconds	1.000E-03	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.000	.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	.0000	.0000	1.570	.000	.000
LI 6	stable														
LI 7	stable														
LI 8	seconds	8.380E-01	6.000E-03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	10.270	.000	.000
BE 8	seconds	2.000E-06	NA	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.095	.000	.000
BE 9	stable														
BE 10	seconds	5.049E+13	6.311E+12	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.203	.000	.000
BE 11	seconds	1.381E+01	8.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	6.095	.236	.000
B 10	stable														
B 11	stable														
B 12	seconds	2.020E-02	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	6.413	.009	.000
C 12	stable														
C 13	stable														
C 14	seconds	1.808E+11	1.262E+09	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.049	.000	.000
C 15	seconds	2.449E+00	4.000E-03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	6.483	.557	.000
N 13	seconds	5.979E+02	2.400E-01	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.511	.675	.000
N 14	stable														
N 15	stable														
N 16	seconds	7.130E+00	2.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	7.254	.619	.000
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	.0000	.0000	2.681	.351	.000
F 19	stable														
F 20	seconds	1.100E+01	2.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.115	.397	.000
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	Ground				
NE 22	stable	3.724E+01	1.200E-01	.0000	.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	.0000	2.387	.919
NA 22	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		
NA 23	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		
NA 24	seconds	5.277E+04	1.440E+01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.677	.882
NA 24M	seconds	2.018E-02	NA	.0003	.0000	.0000	.0000	.9997	.0000	.0000	.0000	.473	.998
NA 25	seconds	5.960E+01	7.000E-01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.946	.224
MG 24	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		
MG 25	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		
MG 26	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		
MG 27	seconds	5.677E+02	6.600E-01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.593	.559
MG 28	seconds	7.528E+04	1.080E+02	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.525	.899
AL 27	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		
AL 28	seconds	1.344E+02	4.800E-02	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.020	.589
AL 29	seconds	3.940E+02	4.000E+00	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.377	.777
AL 30	seconds	3.600E+00	6.000E-02	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	5.680	.593
SI 28	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		
SI 29	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		
SI 30	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		
SI 31	seconds	9.439E+03	1.800E+01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.596	.001
SI 32	seconds	5.430E+09	1.300E+08	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.069	.000
P 31	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		
P 32	seconds	1.232E+06	3.456E+03	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.695	.000
P 33	seconds	2.189E+06	1.100E+04	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.076	.000
P 34	seconds	1.243E+01	8.000E-02	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.640	.125
S 32	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		
S 33	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		
S 34	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		
S 35	seconds	7.561E+06	1.100E+04	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.049	.000
S 36	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		
S 37	seconds	3.030E+02	1.200E+00	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.731	.785
CL 35	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		
CL 36	seconds	9.499E+12	6.311E+10	.9810	.0000	.0190	.0000	.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				Ground					
								Ground	Ground							
CL 37	stable			1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.970	.478
CL 38	seconds	2.234E+03	3.000E+00	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.671	1.000
CL 38M	seconds	7.150E-01	3.000E-03	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		
AR 36	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		.153
AR 37	seconds	3.028E+06	3.456E+03	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		.000
AR 38	stable			1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		.000
AR 39	seconds	8.489E+09	9.467E+07	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		.000
AR 40	stable			1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		.735
AR 41	seconds	6.577E+03	2.520E+01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.747	.000
AR 42	seconds	1.038E+09	3.471E+07	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.233	.000
K 39	stable			.8933	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.634	.246
K 40	seconds	4.030E+16	2.525E+14	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		.169
K 41	stable			1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.715	.753
K 42	seconds	4.450E+04	1.080E+01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.269	.620
K 43	seconds	8.030E+04	4.000E+02	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.840	.000
K 44	seconds	1.328E+03	1.200E+01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		.143
CA 40	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.000	.000
CA 41	seconds	3.250E+12	1.262E+11	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.000	.000
CA 42	stable															
CA 43	stable															
CA 44	stable			1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.000	.000
CA 45	seconds	1.415E+07	1.555E+05	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.077	.000
CA 46	stable			1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.401	.749
CA 47	seconds	3.919E+05	1.728E+02	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.040	.785
CA 48	stable			1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		.000
CA 49	seconds	5.229E+02	1.400E+00	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.122	.947
SC 45	stable			1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.143	.624
SC 46	seconds	7.241E+06	8.640E+02	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.271	.399
SC 46M	seconds	1.875E+01	4.000E-02	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.576	.937
SC 47	seconds	2.890E+05	2.592E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.819	.001
SC 48	seconds	1.573E+05	3.600E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.838	.661
SC 49	seconds	3.432E+03	1.200E+01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		
SC 50	seconds	1.025E+02	5.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		

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	
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	.0000	1.238	.298	
V 49	seconds	2.920E+07	4.320E+05	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.004	.213	
V 50	seconds	4.400E+24	1.300E+24	.3000	.0000	.7000	.0000	.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	.0000	2.514	.575	
V 53	seconds	9.660E+01	2.400E+00	1.0000	.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	.0000	6.380	.759	
CR 50	stable													
CR 51	seconds	2.394E+06	3.456E+02	.0000	.0000	1.0000	.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	.0000	1.102	.001	
MN 54	seconds	2.697E+07	8.640E+03	.0000	.0000	1.0000	.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	.0000	2.523	.671	
MN 57	seconds	8.720E+01	8.000E-01	1.0000	.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	.0000	4.100	.578	
FE 54	stable													
FE 55	seconds	8.615E+07	6.311E+05	.0000	.0000	1.0000	.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	.0000	1.306	.910	
CO 58M	seconds	3.290E+04	4.000E+02	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.023	.082	
CO 58	seconds	6.127E+06	1.296E+03	.0000	.0000	1.0000	.0000	.0000	.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	.0000	2.601	.000	
														.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	.0000	.065	.102
CO 61	seconds	5.940E+03	1.800E+01	1.0000	.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	.0000	3.240	.494
NI 58	stable												
NI 59	seconds	2.367E+12	4.102E+11	.0000	.0000	1.0000	.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	.0000	.017	.000
NI 64	stable												
NI 65	seconds	9.072E+03	4.000E+00	1.0000	.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	.0000	.065	.000
CU 62	seconds	5.844E+02	1.200E+00	.0000	.0000	1.0000	.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	.0000	.313	.609
CU 65	stable												
CU 66	seconds	3.060E+02	1.200E+00	1.0000	.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	.0000	.271	.426
ZN 63	seconds	2.286E+03	1.800E+01	.0000	.0000	1.0000	.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	.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	.0000	.321	.000
ZN 69M	seconds	4.954E+04	8.000E+01	.0003	.0000	.0000	.0000	.9997	.0000	.0000	.0000	.438	.950
ZN 70	stable												
ZN 71	seconds	1.470E+02	6.000E+00	1.0000	.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	.0000	2.097	.744
GA 69	stable												
GA 70	seconds	1.268E+03	1.800E+00	.9959	.0000	.0041	.0000	.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	.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		
GA 72M	seconds	3.700E-02	NA	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.1119	1.000
GE 70	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.467
GE 71	seconds	9.880E+05	3.000E+03	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.009	.828
GE 71M	seconds	2.040E-02	NA	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.181	
GE 72	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
GE 73	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
GE 74	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
GE 75	seconds	4.967E+03	2.400E+00	1.0000	.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	.0000	.136	.419
GE 76	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
GE 77	seconds	4.068E+04	3.600E+01	1.0000	.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	.0000	1.013	.064
AS 75	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
AS 76	seconds	9.475E+04	2.520E+02	1.0000	.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	.0000	.234	.032
SE 74	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
SE 75	seconds	1.035E+07	8.640E+02	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.407	.964
SE 76	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
SE 77	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
SE 77M	seconds	1.745E+01	1.000E-01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.159	.549
SE 78	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
SE 79	seconds	1.041E+13	1.010E+13	1.0000	.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	.0000	.094	.146
SE 80	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
SE 81	seconds	1.107E+03	7.200E+00	1.0000	.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	.0000	.100	.149
SE 82	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
SE 83	seconds	1.338E+03	6.600E+01	1.0000	.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	.0000	2.227	.428
BR 79	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
BR 80	seconds	1.061E+03	1.200E+00	.9170	.0830	.0000	.0000	.0000	.0000	.0000	.0000	.801	.095
BR 80M	seconds	1.591E+04	3.600E+01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.085	.285
BR 81	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	

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		
BR 82	seconds	1.271E+05	7.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.783	.948
BR 82M	seconds	3.678E+02	3.000E+00	.0240	.0000	.0000	.0000	.0000	.0000	.9760	.0000	.078	.104
BR 83	seconds	8.640E+03	7.200E+01	.0002	.9998	.0000	.0000	.0000	.0000	.0000	.0000	.333	.021
KR 78	stable												
KR 79	seconds	1.261E+05	3.600E+02	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.281	.914
KR 79M	seconds	5.000E+01	3.000E+00	.0000	.0000	.0000	.0000	1.0000	.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	.0000	.022	.775
KR 81M	seconds	1.300E+01	1.000E+00	.0000	.0000	.0001	.0000	.9999	.0000	.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	.0000	.038	.063
KR 84	stable												
KR 85	seconds	3.383E+08	6.311E+05	1.0000	.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	.0000	.412	.381
KR 86	stable												
KR 87	seconds	4.579E+03	3.720E+01	1.0000	.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	.0000	2.322	.841
RB 85	stable												
RB 86	seconds	1.610E+06	1.555E+03	.9999	.0000	.0001	.0000	.0000	.0000	.0000	.0000	.761	.122
RB 86M	seconds	6.102E+01	1.800E-01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.556	.982
RB 87	seconds	1.515E+18	4.102E+16	1.0000	.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	.0000	2.709	.235
RB 89	seconds	9.120E+02	6.000E+00	1.0000	.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	.0000	.527	.984
SR 85M	seconds	4.060E+03	4.200E+00	.0000	.0000	.1270	.0000	.8730	.0000	.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	.0000	.386	.832
SR 88	stable												
SR 89	seconds	4.368E+06	7.776E+03	.9999	.0001	.0000	.0000	.0000	.0000	.0000	.0000	.583	.000
SR 90	seconds	8.883E+08	3.156E+06	1.0000	.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				Ground			
SR 91	seconds	3.427E+04	2.160E+02	.4200	.5800	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.347	.523
SR 93	seconds	4.454E+02	1.440E+00	.6540	.3460	.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.090	.736
Y 89	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.909	.992
Y 89M	seconds	1.606E+01	4.000E-02	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.934	.000
Y 90	seconds	2.308E+05	3.600E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.933	.000
Y 90M	seconds	1.148E+04	3.600E+01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.607	.006
Y 91	seconds	5.055E+06	5.184E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.689	.150
Y 92	seconds	1.274E+04	3.600E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.260	.070
Y 93	seconds	3.636E+04	5.760E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.587	.298
Y 94	seconds	1.122E+03	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.435	.272
Y 96	seconds	5.900E+00	2.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.350	.733
ZR 89	seconds	2.824E+05	2.592E+02	.0000	.0000	.0013	.9987	.0000	.0000	.0000	.0000	.0000		
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	.0000	.0000	.019	.000
ZR 94	stable													
ZR 95	seconds	5.531E+06	3.456E+03	.9889	.0111	.0000	.0000	.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	.0000	.0000	.886	.217
NB 91	seconds	2.146E+10	4.102E+09	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.017	.697
NB 92	seconds	1.104E+15	9.467E+13	.0000	.0000	1.0000	.0000	.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	.0000	.0000	.029	.065
NB 94	seconds	6.406E+11	5.049E+10	1.0000	.0000	.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	.0000	.0000	.809	.945
NB 95M	seconds	3.119E+05	2.592E+03	.0560	.0000	.0000	.0000	.9440	.0000	.0000	.0000	.0000	.239	.287
NB 96	seconds	8.406E+04	1.800E+02	1.0000	.0000	.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	.0000	.0000	1.134	.587
NB 97M	seconds	6.000E+01	8.000E+00	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.743	.980
NB 98	seconds	2.860E+00	6.000E-02	1.0000	.0000	.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	.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	
								Ground	Metastable	Ground					Ground
MO 93M	seconds	2.500E+04	NA	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.426	.952	
MO 93	seconds	1.104E+11	2.209E+10	.0000	.0000	.1800	.8200	.0000	.0000	.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	.0000	.0000	.676	.402	
MO100	stable														
MO101	seconds	8.760E+02	6.000E+00	1.0000	.0000	.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	.0000	.0000	.017	.703	
TC 97M	seconds	7.819E+06	8.640E+04	.0000	.0000	.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	.0000	.0000	1.517	.919	
TC 99	seconds	6.662E+12	3.787E+10	1.0000	.0000	.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	.0000	.0000	1.398	.059	
TC101	seconds	8.520E+02	6.000E+00	1.0000	.0000	.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	.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	.0000	.0000	.562	.881	
RU 104	stable														
RU 105	seconds	1.598E+04	7.200E+01	.7160	.2840	.0000	.0000	.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	.0000	.0000	.010	.000	
RU 107	seconds	2.250E+02	3.000E+00	1.0000	.0000	.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	.0000	.0000	2.165	.998	
RH 103	stable														
RH 104	seconds	4.230E+01	4.000E-01	.9955	.0000	.0045	.0000	.0000	.0000	.0000	.0000	.0000	.999	.012	
RH 104M	seconds	2.604E+02	3.000E+00	.0013	.0000	.0000	.0000	.9987	.0000	.0000	.0000	.0000	1.127	.359	
RH 105	seconds	1.273E+05	2.160E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.230	.335	

Table A.1 (continued)

Nuclide name	Time units or stable	Half-life	Half-life uncertainty ^d	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			
RH 105M	seconds	4.500E+01	NA	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.125	.274
RH 106	seconds	2.980E+01	8.000E-02	1.0000	.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	.0000	3.173	.899
RH 107	seconds	1.302E+03	2.400E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.750	.417
PD 102	stable												
PD 103	seconds	1.468E+06	1.642E+03	.0000	.0000	.0000	.9998	.0000	.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	.0000	.009	.000
PD 107M	seconds	2.130E+01	5.000E-01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.213	.713
PD 108	stable												
PD 109	seconds	4.932E+04	3.600E+02	.0005	.9995	.0000	.0000	.0000	.0000	.0000	.0000	.361	.002
PD 109M	seconds	2.814E+02	6.000E-01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.184	.598
PD 110	stable												
PD 111	seconds	1.404E+03	1.200E+01	.0074	.9926	.0000	.0000	.0000	.0000	.0000	.0000	.878	.051
PD 111M	seconds	1.980E+04	3.600E+02	.0740	.1960	.0000	.0000	.7300	.0000	.0000	.0000	.545	.659
AG 106	seconds	1.440E+03	6.000E+00	.0100	.0000	.9900	.0000	.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	.0000	.628	.029
AG 108M	seconds	4.008E+09	6.627E+08	.0000	.0000	.9130	.0000	.0870	.0000	.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	.0000	.085	.129
AG 110	seconds	2.460E+01	2.000E-01	.9970	.0000	.0030	.0000	.0000	.0000	.0000	.0000	1.212	.025
AG 110M	seconds	2.158E+07	3.456E+03	.9864	.0000	.0000	.0000	.0136	.0000	.0000	.0000	2.813	.974
AG 111	seconds	6.437E+05	8.640E+02	1.0000	.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	.0000	.062	.125
AG 112	seconds	1.130E+04	7.200E+01	1.0000	.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	.0000	.026	.798
CD 108	stable												
CD 109	seconds	3.997E+07	3.456E+04	.0000	.0000	.0000	1.0000	.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	Metastable	Ground			
CD 111	stable	2.916E+03	1.800E+01	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.387	.734	
CD 111M	seconds			1.0000									
CD 112	stable	2.935E+23	5.996E+22	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.091	.000	
CD 113	seconds	4.450E+08	1.578E+07	.9986	.0000	.0000	.0014	.0000	.0000	.0000	.184	.000	
CD 114	stable												
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	
CD 116	stable												
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	
CD 119	seconds	1.614E+02	1.200E+00	.1000	.9000	.0000	.0000	.0000	.0000	.0000	2.472	.683	
CD 121	seconds	1.350E+01	3.000E-01	.0000	1.0000	.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	.0000	.387	.664	
IN 114	seconds	7.190E+01	1.000E-01	.9950	.0000	.0000	.0000	.0000	.0000	.0000	.775	.003	
IN 114M	seconds	4.278E+06	8.640E+02	.0000	.0000	.0430	.9570	.0000	.0000	.0000	.236	.398	
IN 115	seconds	1.392E+22	7.889E+20	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.153	.000	
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	
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	1.0000	.0000	.0000	.4710	.0000	.0000	.0000	.522	.174	
IN 118	seconds	5.000E+00	3.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.848	.042	
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	.0250	.0000	.0000	.0000	1.107	.117	
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	
IN 121	seconds	2.310E+01	6.000E-01	.8870	.1130	.0000	.0000	.0000	.0000	.0000	1.912	.485	
SN 112	stable												
SN 113	seconds	9.944E+06	3.456E+03	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.028	.814	
SN 113M	seconds	1.284E+03	2.400E+01	.0000	.0000	.0890	.9110	.0000	.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					
								Ground	Metastable	Ground						
SN 116	stable															
SN 117	stable															
SN 117M	seconds	1.175E+06	3.456E+03	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.313	.502
SN 118	stable															
SN 119	stable															
SN 119M	seconds	2.532E+07	1.123E+05	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.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	.0000	.0000	.0000	.0000	.115	.000
SN 121M	seconds	1.736E+09	1.578E+08	.2240	.0000	.0000	.0000	.7760	.0000	.0000	.0000	.0000	.0000	.0000	.039	.128
SN 122	stable															
SN 123	seconds	1.116E+07	3.456E+04	1.0000	.0000	.0000	.0000	.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	.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	.0000	.0000	.0000	.0000	1.123	.278
SN 125M	seconds	5.712E+02	3.000E+00	1.0000	.0000	.0000	.0000	.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	.0000	.0000	.0000	.0000	1.002	.436
SB 122M	seconds	2.526E+02	1.200E+00	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.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	.0000	.0000	.0000	.0000	2.236	.826
SB 124M	seconds	9.300E+01	3.000E+00	.2500	.0000	.0000	.0000	.7500	.0000	.0000	.0000	.0000	.0000	.0000	.557	.795
SB 125	seconds	8.615E+07	9.467E+05	.7700	.2300	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.533	.814
SB 126	seconds	1.071E+06	8.640E+03	1.0000	.0000	.0000	.0000	.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	.0000	.0000	.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	.0000	.0000	.0000	.0000	.586	.985
TE 121M	seconds	1.331E+07	6.048E+05	.0000	.0000	.1140	.0000	.8860	.0000	.0000	.0000	.0000	.0000	.0000	.291	.745
TE 122	stable															
TE 123	seconds	3.913E+20	3.156E+19	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.017	.765
TE 123M	seconds	1.034E+07	8.640E+03	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.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	.0000	.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				Ground						
								Ground	Ground								
TE 126	stable	3.366E+04	2.520E+02	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.229	.021	
TE 127	seconds	9.418E+06	1.728E+05	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.090	.123	
TE 127M	stable																
TE 128	stable																
TE 129	seconds	4.176E+03	1.200E+01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.600	.103	
TE 129M	seconds	2.903E+06	8.640E+03	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.307	.120	
TE 130	stable																
TE 131	seconds	1.500E+03	6.000E+00	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.142	.369	
TE 131M	seconds	1.080E+05	7.200E+03	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.612	.882	
I 125	seconds	5.196E+06	9.504E+03	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.059	.716	
I 126	seconds	1.125E+06	6.048E+03	.0000	.0000	.0000	.0000	.5630	.0000	.0000	.0000	.0000	.0000	.0000	.610	.744	
I 127	stable																
I 128	seconds	1.499E+03	1.200E+00	.0000	.0000	.0000	.0000	.0690	.0000	.0000	.0000	.0000	.0000	.0000	.829	.109	
I 129	seconds	4.954E+14	1.262E+13	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.079	.312	
I 130	seconds	4.450E+04	3.600E+01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.428	.881	
I 130M	seconds	5.400E+02	6.000E+00	.0000	.0000	.0000	.0000	.1600	.0000	.0000	.0000	.0000	.0000	.0000	.288	.382	
I 131	seconds	6.947E+05	8.640E+02	.0109	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.573	.666	
I 132	seconds	8.222E+03	3.600E+00	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.778	.820	
XE 124	stable																
XE 125	seconds	6.084E+04	7.200E+02	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.300	.892	
XE 125M	seconds	5.700E+01	1.000E+00	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.247	.469	
XE 126	stable																
XE 127	seconds	3.145E+06	8.640E+03	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.311	.901	
XE 127M	seconds	6.920E+01	9.000E-01	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.293	.573	
XE 128	stable																
XE 129	stable																
XE 129M	seconds	7.681E+05	1.728E+04	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.227	.224	
XE 130	stable																
XE 131	stable																
XE 131M	seconds	1.028E+06	8.640E+03	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.162	.124	
XE 132	stable																
XE 133	seconds	4.530E+05	8.640E+01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.184	.257	
XE 133M	seconds	1.892E+05	8.640E+02	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.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	Ground								
XE 134	stable	3.290E+04	7.200E+01	.0000	.0000	.0000	.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	.0000	.0000	.0000	.523	.818	
XE 135M	stable																
XE 136	stable																
XE 137	seconds	2.291E+02	7.800E-01	.0000	.0000	.0000	.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	.0000	.0000	.0000	.028	.821	
CS 132	seconds	5.598E+05	6.000E+02	.0000	.0000	.9813	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.728	.982	
CS 133	stable																
CS 134	seconds	6.507E+07	1.578E+05	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.720	.904	
CS 134M	seconds	1.048E+04	3.600E+01	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.131	.203	
CS 135	seconds	7.258E+13	9.467E+12	.0000	.0000	.0000	.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	.0000	.0000	.0000	2.051	.935	
CS 137	seconds	9.467E+08	6.311E+06	.0557	.9443	.0000	.0000	.0000	.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	.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	.0000	.0000	.0000	.502	.914	
BA 131M	seconds	8.760E+02	1.200E+01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.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	.0000	.0000	.0000	.455	.885	
BA 133M	seconds	1.400E+05	4.000E+02	.0000	.0000	.0001	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.285	.235	
BA 134	stable																
BA 135	stable																
BA 135M	seconds	1.033E+05	7.200E+02	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.259	.229	
BA 136	stable																
BA 136M	seconds	3.084E-01	1.900E-03	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	2.030	.949	
BA 137	stable																
BA 137M	seconds	1.531E+02	6.000E-02	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.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	.0000	.0000	.0000	.942	.046	
BA 140	seconds	1.102E+06	2.592E+02	1.0000	.0000	.0000	.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	.0000	.0000	.0000	1.730	.472	
LA 137	seconds	1.893E+12	6.311E+11	.0000	.0000	1.0000	.0000	.0000	.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	.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		
								Ground	Metastable	Ground			
LA 139	stable	1.450E+05	6.048E+01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.832	.812
LA 140	seconds	1.411E+04	1.080E+02	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.994	.043
LA 141	stable	3.240E+04	1.100E+03	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.050	.756
CE 137	seconds	1.238E+05	1.100E+03	.0000	.0000	.0100	.0000	.0000	.0000	.0000	.0000	.258	.214
CE 137M	stable	1.189E+07	2.000E+03	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.248	.702
CE 139	seconds	5.480E+01	1.000E+00	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.751	.931
CE 139M	stable	2.808E+06	4.320E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.247	.310
CE 141	seconds	3.311E+18	NA	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.000	.000
CE 142	seconds	1.188E+05	7.200E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.709	.394
CE 143	seconds	2.462E+07	1.728E+04	.9860	.0140	.0000	.0000	.0000	.0000	.0000	.0000	.110	.172
CE 144	seconds	1.806E+02	3.600E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.536	.560
CE 145	stable	6.883E+04	1.440E+02	.9998	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.868	.067
PR 142	seconds	8.760E+02	3.000E+01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.002	.000
PR 142M	seconds	1.172E+06	1.728E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.315	.000
PR 143	seconds	1.037E+03	3.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.238	.023
PR 144	seconds	2.154E+04	3.600E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.696	.027
PR 145	stable	6.600E+22	NA	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	1.910	.000
ND 142	stable	9.487E+05	8.640E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.408	.343
ND 143	seconds	6.210E+03	2.520E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.871	.426
ND 144	stable	7.464E+02	4.200E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.481	.639
ND 145	stable	5.586E+08	1.262E+07	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.044	.734
ND 146	stable	8.279E+07	6.311E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.062	.000
ND 147	stable												
ND 148	stable												
ND 149	stable												
ND 150	stable												
ND 151	seconds												
PM 145	seconds												
PM 147	seconds												

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		
PM 148	seconds	4.640E+05	7.776E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.303	.440
PM 148M	seconds	3.568E+06	9.504E+03	.9540	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.156	.920
PM 149	seconds	1.911E+05	1.800E+02	1.0000	.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	.0000	2.249	.654
PM 151	seconds	1.022E+05	1.440E+02	1.0000	.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	.0000	1.545	.097
SM 144	stable												
SM 145	seconds	2.938E+07	2.592E+05	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.093	.702
SM 146	seconds	3.250E+15	1.578E+14	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	2.543	.000
SM 147	seconds	3.345E+18	6.311E+16	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	2.311	.000
SM 148	seconds	2.500E+23	NA	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	1.986	.000
SM 149	seconds	3.154E+23	NA	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.000	.000
SM 150	stable												
SM 151	seconds	2.840E+09	1.893E+08	1.0000	.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	.0000	.335	.194
SM 154	stable												
SM 155	seconds	1.338E+03	1.200E+01	1.0000	.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	.0000	1.288	.902
EU 152M	seconds	3.355E+04	3.600E+01	.7200	.0000	.2800	.0000	.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	.0000	1.532	.818
EU 155	seconds	1.477E+08	1.578E+06	1.0000	.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	.0000	1.695	.726
GD 152	seconds	3.408E+21	NA	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	2.206	.000
GD 153	seconds	2.087E+07	1.728E+04	.0000	.0000	1.0000	.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	.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					
								Ground	Metastable	Ground						
GD 159	seconds	6.682E+04	2.880E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.362	.144
GD 160	stable			1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.400
GD 161	seconds	2.196E+02	3.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.823
GD 162	seconds	5.940E+02	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.652
TB 157	seconds	4.734E+09	9.467E+08	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.737
TB 159	stable			1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.826
TB 160	seconds	6.247E+06	1.728E+04	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.154
TB 161	seconds	5.962E+05	1.728E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.673
TB 162	seconds	4.656E+02	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.982
DY 156	stable			1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.821
DY 157	seconds	2.930E+04	1.500E+02	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
DY 158	stable			1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
DY 159	seconds	1.248E+07	1.800E+04	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
DY 160	stable			1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
DY 161	stable			1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
DY 162	stable			1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
DY 163	stable			1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
DY 164	stable			1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
DY 165	seconds	8.402E+03	2.160E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.055
DY 165M	seconds	7.548E+01	3.600E-01	.0224	.0000	.0000	.0000	.9776	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.169
DY 166	seconds	2.938E+05	3.600E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.209
HO 163	seconds	1.442E+11	8.000E+08	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.000
HO 165	stable			1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.041
HO 166	seconds	9.648E+04	7.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.918
HO 166M	seconds	3.787E+10	5.680E+09	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.884
ER 162	stable			1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.880
ER 164	stable			1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.478
ER 165	seconds	3.730E+04	1.500E+02	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
ER 166	stable			1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
ER 167	stable			1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
ER 167M	seconds	2.280E+00	3.000E-02	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	
ER 168	stable			1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	

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					
ER 169	seconds	8.122E+05	1.800E+03	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.103	.000	
ER 170	stable													
ER 171	seconds	2.706E+04	8.000E+00	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.790	.472	
ER 172	seconds	1.775E+05	1.800E+03	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.633	.796	
TM 169	stable													
TM 170	seconds	1.111E+07	3.000E+04	.0000	.0015	.0000	.0000	.0000	.0000	.0000	.0000	.335	.016	
TM 170M	seconds	4.100E-06	NA	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.000	.000	
TM 171	seconds	6.060E+07	4.000E+05	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.026	.023	
TM 172	seconds	2.290E+05	1.100E+03	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.005	.483	
TM 173	seconds	2.970E+04	3.000E+02	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.696	.558	
YB 168	stable													
YB 169	seconds	2.767E+06	5.000E+02	.0000	1.0000	.0000	.0000	.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	9.000E+02	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.170	.235	
YB 175M	seconds	6.700E-02	NA	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.513	.000	
YB 176	stable													
YB 177	seconds	6.800E+03	4.000E+02	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.606	.307	
LU 175	stable													
LU 176	seconds	1.136E+18	5.049E+16	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.784	.626	
LU 176M	seconds	1.309E+04	1.100E+01	.0000	.0010	.0000	.0000	.0000	.0000	.0000	.0000	.448	.018	
LU 177	seconds	5.797E+05	9.000E+02	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.182	.193	
LU 177M	seconds	1.390E+07	3.000E+04	.0000	.0000	.0000	.0000	.2100	.0000	.0000	.0000	1.249	.801	
HF 174	stable													
HF 175	seconds	6.050E+06	1.800E+05	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.411	.899	
HF 176	stable													
HF 177	stable													
HF 178	stable													
HF 178M	seconds	4.000E+00	2.000E-01	.0000	.0000	.0000	.0000	1.0000	.0000	.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	Ground				
HF 179M	seconds	1.867E+01	3.000E-02	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.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	.0000	.0000	.0000	1.121	.890
HF 181	seconds	3.662E+06	6.000E+03	1.0000	.0000	.0000	.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	.0000	.0000	.0000	.303	.792
TA 180	seconds	2.935E+04	2.200E+01	.1400	.0000	.0000	.8600	.0000	.0000	.0000	.0000	.0000	.0000	1.00	.478
TA 181	stable														
TA 182	seconds	9.936E+06	1.728E+04	1.0000	.0000	.0000	.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	.0000	.0000	.0000	.523	.514
TA 183	seconds	4.410E+05	9.000E+03	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.638	.462
W 180	stable														
W 181	seconds	1.047E+07	1.728E+04	.0000	.0000	.0000	1.0000	.0000	.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	.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	.0000	.0000	.0000	.127	.000
W 185M	seconds	1.002E+02	1.800E+00	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.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	.0000	.0000	.0000	.722	.590
W 188	seconds	6.000E+06	5.000E+04	1.0000	.0000	.0000	.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	.0000	.0000	.0000	1.230	1.000
RE 185	stable														
RE 186	seconds	3.263E+05	3.240E+02	.9400	.0000	.0000	.0600	.0000	.0000	.0000	.0000	.0000	.0000	.361	.052
RE 187	seconds	1.578E+18	6.311E+17	1.0000	.0000	.0000	.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	.0000	.0000	.0000	.836	.068
RE 188M	seconds	1.116E+03	6.000E+00	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.161	.466
RE 189	seconds	8.750E+04	1.500E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.386	.145
OS 184	stable														
OS 185	seconds	8.090E+06	5.000E+04	.0000	.0000	.0000	1.0000	.0000	.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				
								Ground	Ground						
OS 189	stable														
OS 190	stable														
OS 190M	seconds	5.940E+02	6.000E+00	.0000	.0000	.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	.0000	.0000	.125	.320	
OS 191M	seconds	4.716E+04	1.800E+02	.0000	.0000	.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	.0000	.0000	.445	.151	
OS 194	seconds	1.893E+08	6.311E+06	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.034	.056	
IR 191	stable														
IR 192	seconds	6.379E+06	7.000E+02	.9524	.0000	.0000	.0476	.0000	.0000	.0000	.0000	.0000	1.035	.790	
IR 192M	seconds	7.600E+09	3.000E+08	.0000	.0000	.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	.0000	.0000	.901	.100	
IR 194M	seconds	1.480E+07	1.000E+06	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.413	.966	
PT 190	seconds	1.893E+19	3.156E+18	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	3.243	.000	
PT 191	seconds	2.510E+05	9.000E+03	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.335	.811	
PT 192	stable														
PT 193	seconds	1.578E+09	2.840E+08	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.005	.433	
PT 193M	seconds	3.740E+05	3.000E+03	.0000	.0000	.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	.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	.0000	.0000	.276	.091	
PT 197M	seconds	5.725E+03	1.100E+01	.0330	.0000	.0000	.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	.0000	.0000	.741	.271	
PT 199M	seconds	1.360E+01	4.000E-01	.0000	.0000	.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	.0000	.0000	.730	.552	
AU 199	seconds	2.712E+05	6.000E+02	1.0000	.0000	.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	.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
HG 197	seconds	2.309E+05	1.800E+02	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.132	.552
HG 197M	seconds	8.570E+04	4.000E+02	.0000	.0000	.0700	.0000	.0000	.0000	.0000	.0000	.0000	.302	.311
HG 198	stable													
HG 199	stable													
HG 199M	seconds	2.556E+03	3.000E+01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.534	.350
HG 200	stable													
HG 201	stable													
HG 202	stable													
HG 203	seconds	4.027E+06	1.555E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.336	.707
HG 204	stable													
HG 205	seconds	3.120E+02	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.546	.010
TL 203	stable													
TL 204	seconds	1.193E+08	6.311E+05	.9743	.0000	.0257	.0000	.0000	.0000	.0000	.0000	.0000	.239	.006
TL 205	stable													
TL 206	seconds	2.520E+02	1.200E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.537	.000
PB 204	stable													
PB 205	seconds	4.797E+14	2.209E+13	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.006	.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	.0000	.0000	.198	.000
BI 208	seconds	1.161E+13	1.262E+11	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.652	.998
BI 209	stable													
BI 210	seconds	4.331E+05	4.320E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.389	.000
BI 210M	seconds	9.467E+13	3.156E+12	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	5.309	.049
BI 211	seconds	1.284E+02	1.200E+00	.0027	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	6.733	.007
PO 210	seconds	1.196E+07	1.728E+02	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	5.407	.000
PO 211	seconds	5.160E-01	3.000E-03	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	7.595	.001
PO 211M	seconds	2.520E+01	6.000E-01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	7.515	.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														
TL 206	seconds	2.520E+02	1.200E+00	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.537	.000
TL 207	seconds	2.862E+02	1.200E+00	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.497	.004
TL 208	seconds	1.832E+02	2.400E-01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.946	.852
TL 209	seconds	1.320E+02	4.200E+00	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.811	.754
PB 206	stable														
PB 207	stable														
PB 208	seconds	1.171E+04	5.040E+01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.198	.000
PB 209	seconds	7.037E+08	6.311E+06	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.040	.127
PB 210	seconds	2.166E+03	1.200E+01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.521	.130
PB 211	seconds	3.830E+04	3.600E+01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.319	.455
PB 212	seconds	1.608E+03	NA	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.544	.460
PB 214	seconds	1.161E+13	1.262E+11	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.652	.998
BI 208	stable														
BI 209	stable														
BI 210M	seconds	9.467E+13	3.156E+12	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	5.309	.049
BI 210	seconds	4.331E+05	4.320E+02	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.389	.000
BI 211	seconds	1.284E+02	1.200E+00	.0027	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	6.733	.007
BI 212	seconds	3.633E+03	3.600E+00	.6406	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.825	.037
BI 213	seconds	2.735E+03	3.600E+00	.9790	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.714	.177
BI 214	seconds	1.194E+03	2.400E+01	.9998	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.163	.697
PO 210	seconds	1.196E+07	1.728E+02	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	5.407	.000
PO 211M	seconds	2.520E+01	6.000E-01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	7.515	.002
PO 211	seconds	5.160E-01	3.000E-03	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	7.595	.001
PO 212	seconds	2.980E-07	3.000E-09	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	8.953	.000
PO 213	seconds	4.200E-06	8.000E-07	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	8.536	.000
PO 214	seconds	1.643E-04	1.800E-06	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	7.833	.000
PO 215	seconds	1.780E-03	4.000E-06	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	7.526	.000
PO 216	seconds	1.450E-01	2.000E-03	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	6.906	.000
PO 217	seconds	1.860E+02	6.000E-01	.0002	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	6.113	.000
AT 218	seconds	3.230E-02	4.000E-04	.0001	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	7.199	.000
RN 218	seconds	3.500E-02	5.000E-03	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	7.266	.000
RN 219	seconds	3.960E+00	1.000E-02	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	7.000	.008

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					
RN 220	seconds	5.560E+01	1.000E-01	.0000	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	0.00E+00	6.405	.000
RN 222	seconds	3.304E+05	2.592E+01	.0000	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	0.00E+00	5.590	.000
FR 221	seconds	2.940E+02	1.200E+01	.0000	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	0.00E+00	6.512	.005
FR 223	seconds	1.308E+03	2.400E+01	.9999	.0000	.0000	.0000	.0000	.0000	6.00E-05	0.00E+00	0.00E+00	.413	.139
RA 222	seconds	3.800E+01	5.000E-01	.0000	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	0.00E+00	6.670	.001
RA 223	seconds	9.879E+05	1.728E+02	.0000	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	0.00E+00	5.999	.022
RA 224	seconds	3.162E+05	3.456E+03	.0000	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	0.00E+00	5.790	.002
RA 225	seconds	1.279E+06	1.728E+04	1.0000	.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	0.00E+00	.122	.118
RA 226	seconds	5.049E+10	2.209E+08	.0000	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	0.00E+00	4.872	.001
RA 228	seconds	1.814E+08	9.467E+05	1.0000	.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	0.00E+00	.009	.047
AC 225	seconds	8.640E+05	8.640E+03	.0000	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	0.00E+00	5.891	.003
AC 227	seconds	6.870E+08	9.467E+05	.9862	.0000	.0000	.0000	.0000	.0000	1.38E-02	0.00E+00	0.00E+00	.082	.002
AC 228	seconds	2.214E+04	7.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	5.50E-08	0.00E+00	0.00E+00	1.316	.669
TH 226	seconds	1.854E+03	NA	.0000	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	0.00E+00	6.448	.001
TH 227	seconds	1.617E+06	4.320E+02	.0000	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	0.00E+00	6.164	.018
TH 228	seconds	6.037E+07	6.311E+04	.0000	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	0.00E+00	5.525	.001
TH 229	seconds	2.487E+11	1.262E+09	.0000	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	0.00E+00	5.186	.018
TH 230	seconds	2.379E+12	9.467E+09	.0000	.0000	.0000	.0000	.0000	.0000	1.00E+00	2.50E-13	0.00E+00	4.763	.000
TH 231	seconds	9.187E+04	3.600E+01	1.0000	.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	0.00E+00	.184	.169
TH 232	seconds	4.434E+17	1.893E+15	.0000	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	0.00E+00	4.086	.000
TH 233	seconds	1.338E+03	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	0.00E+00	.456	.080
TH 234	seconds	2.082E+06	2.592E+03	.0000	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	0.00E+00	.070	.139
PA 231	seconds	1.034E+12	3.471E+09	.0000	.0000	.0000	.0000	.0000	.0000	1.00E+00	1.50E-12	0.00E+00	5.133	.008
PA 232	seconds	1.132E+05	1.728E+03	.9998	.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	0.00E+00	1.105	.850
PA 233	seconds	2.333E+06	8.640E+03	1.0000	.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	0.00E+00	.428	.522
PA 234M	seconds	7.020E+01	1.800E+00	.9987	.0000	.0000	.0000	.0000	.0013	0.00E+00	0.00E+00	0.00E+00	.827	.013
PA 234	seconds	2.412E+04	1.800E+02	1.0000	.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	0.00E+00	2.468	.794
PA 235	seconds	1.446E+03	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	0.00E+00	.470	.000
U 230	seconds	1.797E+06	NA	.0000	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	0.00E+00	5.992	.000
U 231	seconds	3.630E+05	9.000E+03	.0000	.0000	.0000	.0000	.0000	.0000	5.50E-05	0.00E+00	0.00E+00	.089	.862
U 232	seconds	2.203E+09	1.578E+07	.0000	.0000	1.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	0.00E+00	5.412	.000
U 233	seconds	5.024E+12	6.311E+09	.0000	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	0.00E+00	4.915	.000
U 234	seconds	7.754E+12	9.467E+09	.0000	.0000	.0000	.0000	.0000	.0000	1.00E+00	1.73E-11	0.00E+00	4.856	.000

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				
U 235	seconds	2.221E+16	2.209E+13	.0000	.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	.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	.0000	0.00E+00	0.00E+00	.327	.437
U 238	seconds	1.410E+17	1.578E+14	.0000	.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	.0000	0.00E+00	0.00E+00	.458	.112
U 240	seconds	5.076E+04	3.600E+02	.0000	1.0000	.0000	.0000	.0000	.0000	0.00E+00	0.00E+00	.151	.065
U 241	seconds	1.000E+00	NA	.0000	.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	.0000	1.40E-05	0.00E+00	.010	.702
NP 236M	seconds	8.100E+04	1.440E+03	.4800	.0000	.5200	.0000	.0000	.0000	0.00E+00	0.00E+00	.134	.380
NP 236	seconds	3.629E+12	3.787E+11	.0890	.0000	.9100	.0000	.0000	.0000	0.00E+00	0.00E+00	.345	.426
NP 237	seconds	6.753E+13	3.156E+11	.0000	.0000	.0000	.0000	.0000	.0000	1.00E+00	0.00E+00	.813	.007
NP 238	seconds	1.829E+05	1.728E+02	1.0000	.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	.0000	0.00E+00	0.00E+00	.427	.430
NP 240M	seconds	4.332E+02	1.200E+00	.9988	.0000	.0000	.0000	.0012	.0000	0.00E+00	0.00E+00	.945	.341
NP 241	seconds	3.714E+03	1.200E+01	1.0000	.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	.0000	0.00E+00	0.00E+00	.475	.073
PU 236	seconds	9.152E+07	3.156E+06	.0000	.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	.0000	4.20E-05	0.00E+00	.065	.865
PU 238	seconds	2.768E+09	9.467E+06	.0000	.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	.0000	1.00E+00	4.40E-12	5.243	.000
PU 240	seconds	2.071E+11	2.209E+08	.0000	.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	.0000	2.39E-05	0.00E+00	.005	.000
PU 242	seconds	1.179E+13	3.471E+10	.0000	.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	.0000	0.00E+00	0.00E+00	.194	.129
PU 244	seconds	2.525E+15	2.840E+13	.0000	.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	.0000	0.00E+00	0.00E+00	.734	.541
PU 246	seconds	9.366E+05	1.800E+03	1.0000	.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	.0000	1.00E-04	0.00E+00	.374	.629
AM 240	seconds	1.832E+05	7.200E+02	.0000	.0000	1.0000	.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	.0000	1.00E+00	3.77E-12	5.629	.005
AM 242M	seconds	4.450E+09	6.311E+07	.0000	.0000	.0000	.0000	.0000	.0000	4.50E-03	1.60E-10	.068	.089
AM 242	seconds	5.767E+04	7.200E+01	.8270	.0000	.1730	.0000	.0000	.0000	0.00E+00	0.00E+00	.194	.100
AM 243	seconds	2.326E+11	4.734E+08	.0000	.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	Metastable			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	1.00E-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	.0000	.0155	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	Metastable	Ground					
H 3	seconds	3.891E+08	1.893E+06	1.0000	.0000	.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	.0000	.0000	.203	.000	
C 14	seconds	1.808E+11	1.262E+09	1.0000	.0000	.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	.0000	.0000	.065	.000	
CU 66	seconds	3.060E+02	1.200E+00	1.0000	.0000	.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	.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	.0000	.0000	.321	.000	
ZN 69M	seconds	4.954E+04	8.000E+01	.0003	.0000	.0000	.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	.0000	.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	.0000	.0000	1.363	.231	
ZN 71M	seconds	1.426E+04	1.800E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.097	.744	
GA 71	stable														
GE 71	seconds	9.880E+05	3.000E+03	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.009	.467	
GE 71M	seconds	2.040E-02	NA	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.181	.828	
CO 72	seconds	1.235E-01	NA	.8847	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	9.394	.500	
NI 72	seconds	3.831E+00	NA	1.0000	.0000	.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	.0000	.0000	5.029	.595	
ZN 72	seconds	1.674E+05	3.600E+02	1.0000	.0000	.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	.0000	.0000	3.206	.844	
GE 72	stable														
CO 73	seconds	1.290E-01	NA	.7488	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	7.914	.377	
NI 73	seconds	4.906E-01	NA	.9999	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.900	.330	
CU 73	seconds	5.114E+00	NA	.9944	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.759	.280	
ZN 73	seconds	2.350E+01	1.000E+00	1.0000	.0000	.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		
GA 73	seconds	1.750E+04	1.080E+02	.0130	.9870	.0000	.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	.0000	.066	.170
CO 74	seconds	9.196E-02	NA	.8257	.0000	.0000	.0000	.0000	.0000	.0000	.1743	10.740	.505
NI 74	seconds	9.002E-01	NA	.9964	.0000	.0000	.0000	.0000	.0000	.0000	.0036	3.883	.309
CU 74	seconds	6.482E-01	NA	.9970	.0000	.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	.0000	1.437	.598
GA 74	seconds	4.872E+02	7.200E+00	1.0000	.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	.0000	.3131	9.302	.403
NI 75	seconds	2.312E-01	NA	.9900	.0000	.0000	.0000	.0000	.0000	.0000	.0100	6.047	.366
CU 75	seconds	9.274E-01	NA	.9653	.0000	.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	.0000	3.748	.507
GA 75	seconds	1.260E+02	1.800E+00	.9520	.0480	.0000	.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	.077
GE 75M	seconds	4.770E+01	7.000E-01	.0003	.0000	.0000	.0000	.9997	.0000	.0000	.0000	.136	.419
AS 75	stable												
NI 76	seconds	3.046E-01	NA	.9649	.0000	.0000	.0000	.0000	.0000	.0000	.0351	4.924	.310
CU 76	seconds	2.602E-01	NA	.9716	.0000	.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	.0000	2.152	.350
GA 76	seconds	3.260E+01	6.000E-01	1.0000	.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	.0000	1.483	.281
SE 76	stable												
NI 77	seconds	1.033E-01	NA	.9529	.0000	.0000	.0000	.0000	.0000	.0000	.0471	7.597	.406
CU 77	seconds	3.052E-01	NA	.8769	.0000	.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	.0000	4.220	.426
GA 77	seconds	1.320E+01	2.000E-01	.0000	1.0000	.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	.0000	1.684	.607
GE 77M	seconds	5.290E+01	6.000E-01	.7900	.0000	.0000	.0000	.2100	.0000	.0000	.0000	1.013	.064
AS 77	seconds	1.398E+05	1.800E+02	.9968	.0032	.0000	.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	.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				
				Ground	Metastable	Ground	Metastable	Ground	Ground						
NI 78	seconds	1.318E-01	NA	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0930	5.866	.320		
CU 78	seconds	1.179E-01	NA	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0991	7.953	.510		
ZN 78	seconds	1.470E+00	1.500E-01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.754	.407		
GA 78	seconds	5.090E+00	5.000E-02	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	5.081	.500		
GE 78	seconds	5.280E+03	6.000E+01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.505	.550		
AS 78	seconds	5.442E+03	1.200E+01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.579	.520		
SE 78	stable														
CU 79	seconds	1.351E-01	NA	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.2421	5.860	.336		
ZN 79	seconds	1.000E+00	1.000E-01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0115	5.938	.491		
GA 79	seconds	3.000E+00	9.000E-02	.0520	.0000	.0000	.0000	.0000	.0000	.0000	.0005	4.216	.494		
GE 79	seconds	1.910E+01	3.000E-01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.052	.199		
AS 79	seconds	5.406E+02	9.000E+00	.9894	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.876	.032		
SE 79	seconds	1.041E+13	1.010E+13	.0000	.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	.0000	.094	.146		
BR 79	stable														
BR 79M	seconds	4.860E+00	4.000E-02	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.206	.770		
KR 79	seconds	1.261E+05	3.600E+02	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.281	.914		
CU 80	seconds	8.988E-02	NA	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.1504	9.041	.507		
ZN 80	seconds	5.400E-01	2.000E-02	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0110	4.005	.310		
GA 80	seconds	1.660E+00	9.000E-02	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0082	6.673	.532		
GE 80	seconds	2.950E+01	4.000E-01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.510	.397		
AS 80	seconds	1.520E+01	2.000E-01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.026	.273		
SE 80	stable														
BR 80	seconds	1.061E+03	1.200E+00	.0000	.0000	.0830	.0000	.0000	.0000	.0000	.0000	.801	.095		
BR 80M	seconds	1.591E+04	3.600E+01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.085	.285		
KR 80	stable														
CU 81	seconds	7.421E-02	NA	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.5295	8.810	.392		
ZN 81	seconds	1.227E-01	NA	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0574	6.782	.400		
GA 81	seconds	1.230E+00	1.000E-02	.4100	.0000	.0000	.0000	.0000	.0000	.0000	.1190	4.810	.468		
GE 81	seconds	7.600E+00	6.000E-01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.283	.256		
AS 81	seconds	3.330E+01	8.000E-01	.0300	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.808	.127		
SE 81	seconds	1.107E+03	7.200E+00	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.618	.010		
SE 81M	seconds	3.435E+03	5.400E+00	.0000	.0000	.0000	.0000	.9995	.0000	.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														
KR 81	seconds	6.722E+12	6.627E+11	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.022	.775	
KR 81M	seconds	1.300E+01	1.000E+00	.0000	.0000	.0001	.0000	.0000	.9999	.0000	.0000	.0000	.187	.696	
ZN 82	seconds	1.268E-01	NA	.7877	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.2123	6.577	.332	
GA 82	seconds	6.000E-01	NA	.7900	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.2100	8.064	.512	
GE 82	seconds	4.600E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.214	.346	
AS 82	seconds	1.910E+01	5.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.002	.271	
AS 82M	seconds	1.360E+01	4.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.617	.607	
SE 82	stable														
BR 82	seconds	1.271E+05	7.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.783	.948	
BR 82M	seconds	3.678E+02	3.000E+00	.0240	.0000	.0000	.0000	.0000	.9760	.0000	.0000	.0000	.078	.104	
KR 82	stable														
ZN 83	seconds	8.364E-02	NA	.7713	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.2287	8.245	.479	
GA 83	seconds	3.100E-01	NA	.4400	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.5600	8.072	.464	
GE 83	seconds	1.900E+00	NA	.9983	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0017	5.133	.476	
AS 83	seconds	1.340E+01	3.000E-01	.3000	.7000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.007	.687	
SE 83	seconds	1.338E+03	6.600E+01	1.0000	.0000	.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	.0000	.0000	2.227	.428	
BR 83	seconds	8.640E+03	7.200E+01	.0002	.9998	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.333	.021	
KR 83	stable														
KR 83M	seconds	6.588E+03	7.200E+01	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.038	.063	
GA 84	seconds	9.838E-02	NA	.7198	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.2802	9.100	.509	
GE 84	seconds	1.200E+00	NA	.9000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.1000	5.063	.486	
AS 84	seconds	5.500E+00	3.000E-01	.9991	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0009	5.440	.294	
SE 84	seconds	1.920E+02	1.200E+01	1.0000	.0000	.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	.0000	.0000	2.986	.582	
BR 84M	seconds	3.600E+02	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.669	.755	
KR 84	stable														
GA 85	seconds	8.697E-02	NA	.5504	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.4496	9.217	.467	
GE 85	seconds	2.500E-01	NA	.8000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.2000	6.351	.501	
AS 85	seconds	2.028E+00	1.200E-02	.2900	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.7100	6.344	.474	
SE 85	seconds	3.170E+01	9.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.970	.558	
SE 85M	seconds	1.900E+01	NA	1.0000	.0000	.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		
								Ground	Metastable	Ground			
BR 85	seconds	1.722E+02	1.800E+00	.9982	.0018	.0000	.0000	.0000	.0000	.0000	.0000	1.107	.060
KR 85	seconds	3.383E+08	6.311E+05	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.253	.009
KR 85M	seconds	1.613E+04	2.880E+01	.0000	.7900	.0000	.0000	.2100	.0000	.0000	.0000	.412	.381
RB 85	stable		NA	.0000	.7800	.0000	.0000	.0000	.0000	.0000	.2200	6.147	.429
GE 86	seconds	2.468E-01	2.000E-01	.0000	.8800	.0000	.0000	.0000	.0000	.0000	.1200	7.180	.526
AS 86	seconds	9.000E-01	9.000E-01	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.550	.648
SE 86	seconds	1.530E+01	4.000E-01	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	5.340	.641
BR 86	seconds	5.510E+01	4.000E-01	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.752	.351
BR 86M	seconds	4.500E+00	NA	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.761	.122
KR 86	stable	1.610E+06	1.555E+03	.0000	.9999	.0000	.0000	.0000	.0000	.0000	.0000	.556	.982
RB 86	seconds	6.102E+01	1.800E-01	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000		
SR 86	stable		NA	.0000	.8487	.0000	.0000	.0000	.0000	.0000	.1513	7.229	.496
GE 87	seconds	1.339E-01	NA	.0000	.5600	.0000	.0000	.0000	.0000	.0000	.4400	7.250	.479
AS 87	seconds	3.000E-01	NA	.0000	.9981	.0000	.0000	.0000	.0000	.0000	.0019	4.723	.560
SE 87	seconds	5.600E+00	NA	.0000	.9749	.0000	.0000	.0000	.0000	.0000	.0251	4.951	.674
BR 87	seconds	5.569E+01	1.300E-01	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.123	.373
KR 87	seconds	4.579E+03	3.720E+01	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.082	.000
RB 87	seconds	1.515E+18	4.102E+16	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000		
SR 87	stable		NA	.0000	.0000	.0030	.0000	.9970	.0000	.0000	.0000	.386	.832
SR 87M	seconds	1.012E+04	3.600E+01	.0000	.7835	.0000	.0000	.0000	.0000	.0000	.2165	7.172	.419
GE 88	seconds	1.290E-01	NA	.0000	.8009	.0000	.0000	.0000	.0000	.0000	.1991	8.122	.520
AS 88	seconds	1.348E-01	NA	.0000	.9950	.0000	.0000	.0000	.0000	.0000	.0050	4.250	.478
SE 88	seconds	1.500E+00	NA	.0000	.9363	.0000	.0000	.0000	.0000	.0000	.0637	5.881	.561
BR 88	seconds	1.650E+01	1.000E-01	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.322	.841
KR 88	seconds	1.022E+04	1.080E+02	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.709	.235
RB 88	seconds	1.067E+03	6.600E+00	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000		
SR 88	stable		NA	.0000	.6673	.0000	.0000	.0000	.0000	.0000	.3327	8.181	.482
AS 89	seconds	1.212E-01	NA	.0000	.9500	.0000	.0000	.0000	.0000	.0000	.0500	5.051	.375
SE 89	seconds	4.100E-01	NA	.0000	.8620	.0000	.0000	.0000	.0000	.0000	.1380	5.481	.587
BR 89	seconds	4.370E+00	3.000E-02	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.186	.571
KR 89	seconds	1.902E+02	1.200E+00	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.088	.670
RB 89	seconds	9.120E+02	6.000E+00	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000		

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		
SR 89	seconds	4.368E+06	7.776E+03	.9999	.0001	.0000	.0000	.0000	.0000	.0000	.0000	.583	.000
Y 89	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.909	.992
Y 89M	seconds	1.606E+01	4.000E-02	.7565	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	9.174	.477
AS 90	seconds	9.112E-02	NA	.8900	.0000	.0000	.0000	.0000	.0000	.0000	.1100	5.607	.470
SE 90	seconds	4.272E-01	NA	.7680	.0000	.0000	.0000	.0000	.0000	.0000	.2320	5.871	.548
BR 90	seconds	1.920E+00	6.000E-02	.8800	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.578	.480
KR 90	seconds	3.232E+01	9.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.156	.521
RB 90	seconds	1.530E+02	3.000E+00	.9770	.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.751	.700
RB 90M	seconds	2.580E+02	5.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.196	.000
SR 90	seconds	8.883E+08	3.156E+06	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.934	.000
Y 90	seconds	2.308E+05	3.600E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.680	.933
Y 90M	seconds	1.148E+04	3.600E+01	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000		
ZR 90	stable			.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.319	.993
ZR 90M	seconds	8.092E-01	2.000E-03	.7900	.0000	.0000	.0000	.0000	.0000	.0000	.2100	7.062	.443
SE 91	seconds	2.700E-01	NA	.8910	.0000	.0000	.0000	.0000	.0000	.0000	.1090	5.628	.380
BR 91	seconds	6.000E-01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.812	.458
KR 91	seconds	8.570E+00	4.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.901	.600
RB 91	seconds	5.840E+01	4.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.347	.523
SR 91	seconds	3.427E+04	2.160E+02	.4200	.5800	.0000	.0000	.0000	.0000	.0000	.0000	.607	.006
Y 91	seconds	5.055E+06	5.184E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.555	.951
Y 91M	seconds	2.983E+03	4.200E+00	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000		
ZR 91	stable			.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.017	.697
NB 91	seconds	2.146E+10	4.102E+09	.8677	.0000	.0000	.0000	.0000	.0000	.0000	.1323	6.435	.348
SE 92	seconds	1.682E-01	NA	.7000	.0000	.0000	.0000	.0000	.0000	.0000	.3000	7.681	.417
BR 92	seconds	3.650E-01	7.000E-03	.9997	.0000	.0000	.0000	.0000	.0000	.0000	.0003	3.559	.408
KR 92	seconds	1.850E+00	1.000E-02	.9999	.0000	.0000	.0000	.0000	.0000	.0000	.0001	4.044	.129
RB 92	seconds	4.500E+00	2.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.516	.884
SR 92	seconds	9.756E+03	3.600E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.689	.150
Y 92	seconds	1.274E+04	3.600E+01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000		
ZR 92	stable			.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	1.513	.995
NB 92	seconds	1.104E+15	9.467E+13	.8797	.0000	.0000	.0000	.0000	.0000	.0000	.1203	8.341	.497
SE 93	seconds	9.677E-02	NA	.5900	.0000	.0000	.0000	.0000	.0000	.0000	.0000	7.533	.488
BR 93	seconds	1.763E-01	NA										

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	.0000	.0195	5.200	.440	
RB 93	seconds	5.700E+00	1.000E-01	.9866	.0000	.0000	.0000	.0000	.0000	.0000	.0134	4.071	.334	
SR 93	seconds	4.454E+02	1.440E+00	.6540	.3460	.0000	.0000	.0000	.0000	.0000	.0000	3.090	.736	
Y 93	seconds	3.636E+04	5.760E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.260	.070	
ZR 93	seconds	4.828E+13	3.156E+12	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.019	.000	
NB 93	stable													
NB 93M	seconds	5.090E+08	4.734E+06	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.029	.065	
BR 94	seconds	1.108E-01	NA	.7020	.0000	.0000	.0000	.0000	.0000	.0000	.2980	8.908	.523	
KR 94	seconds	2.100E-01	NA	.9430	.0000	.0000	.0000	.0000	.0000	.0000	.0570	4.456	.332	
RB 94	seconds	2.702E+00	5.000E-03	.8995	.0000	.0000	.0000	.0000	.0000	.0000	.1015	6.925	.595	
SR 94	seconds	7.520E+01	8.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.267	.629	
Y 94	seconds	1.122E+03	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.587	.298	
ZR 94	stable													
NB 94	seconds	6.406E+11	5.049E+10	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.717	.915	
NB 94M	seconds	3.756E+02	6.000E-01	.0050	.0000	.0000	.0000	.9950	.0000	.0000	.0000	.047	.250	
BR 95	seconds	1.069E-01	NA	.7292	.0000	.0000	.0000	.0000	.0000	.0000	.2708	7.507	.495	
KR 95	seconds	7.800E-01	NA	.9050	.0000	.0000	.0000	.0000	.0000	.0000	.0950	6.463	.519	
RB 95	seconds	3.840E-01	6.000E-03	.9148	.0000	.0000	.0000	.0000	.0000	.0000	.0852	6.273	.537	
SR 95	seconds	2.510E+01	2.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.825	.523	
Y 95	seconds	6.300E+02	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.637	.489	
ZR 95	seconds	5.531E+06	3.456E+03	.9889	.0111	.0000	.0000	.0000	.0000	.0000	.0000	.850	.861	
NB 95	seconds	3.021E+06	2.592E+03	1.0000	.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	.0000	.239	.287	
MO 95	stable													
BR 96	seconds	8.881E-02	NA	.7808	.0000	.0000	.0000	.0000	.0000	.0000	.2192	9.460	.510	
KR 96	seconds	2.931E-01	NA	.9225	.0000	.0000	.0000	.0000	.0000	.0000	.0775	4.681	.335	
RB 96	seconds	1.990E-01	3.000E-03	.8660	.0000	.0000	.0000	.0000	.0000	.0000	.1340	7.849	.622	
SR 96	seconds	1.060E+00	3.000E-02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.148	.430	
Y 96	seconds	5.900E+00	2.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.435	.272	
ZR 96	stable													
NB 96	seconds	8.406E+04	1.800E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.716	.906	
MO 96	stable													
KR 97	seconds	1.000E-01	NA	.9161	.0000	.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					
RB 97	seconds	1.718E-01	1.600E-03	.7360	.0000	.0000	.0000	.0000	.0000	.0000	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	.886	.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	1.0000	.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	.676	.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	1.0000	.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					
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	.0200	.0000	.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	.9973	.0000	.0000	.0000	.0000	.0000	.562	.881
RH 103	stable											
RH 103M	seconds	3.367E+03	6.000E-01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.038	.044
SR 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 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		
MO 104	seconds	6.00E+01	2.00E+00	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.208	.484
TC 104	seconds	1.098E+03	1.800E+01	.0000	.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	.0000	.999	.012
RH 104M	seconds	2.604E+02	3.000E+00	.0013	.0000	.0000	.0000	.9987	.0000	.0000	.0000	.127	.359
PD 104	stable												
Y 105	seconds	1.469E-01	NA	.8025	.0000	.0000	.0000	.0000	.0000	.0000	.1975	5.821	.407
ZR 105	seconds	4.926E-01	NA	.9860	.0000	.0000	.0000	.0000	.0000	.0000	.0140	4.431	.398
NB 105	seconds	2.950E+00	6.000E-02	.9777	.0000	.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	.0000	3.177	.452
TC 105	seconds	4.560E+02	6.000E+00	1.0000	.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	.0000	1.150	.642
RH 105	seconds	1.273E+05	2.160E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.230	.335
RH 105M	seconds	4.500E+01	NA	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.125	.274
PD 105	stable												
Y 106	seconds	8.943E-02	NA	.8434	.0000	.0000	.0000	.0000	.0000	.0000	.1566	8.101	.517
ZR 106	seconds	9.071E-01	NA	.9848	.0000	.0000	.0000	.0000	.0000	.0000	.0152	3.235	.337
NB 106	seconds	1.000E+00	NA	.9450	.0000	.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	.0000	1.978	.377
TC 106	seconds	3.600E+01	1.000E+00	1.0000	.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	.0000	.010	.000
RH 106	seconds	2.980E+01	8.000E-02	1.0000	.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	.0000	3.173	.899
PD 106	stable												
AG 106	seconds	1.440E+03	6.000E+00	.0100	.0000	.9900	.0000	.0000	.0000	.0000	.0000	.595	.168
Y 107	seconds	9.226E-02	NA	.7406	.0000	.0000	.0000	.0000	.0000	.0000	.2594	6.646	.421
ZR 107	seconds	2.430E-01	NA	.9629	.0000	.0000	.0000	.0000	.0000	.0000	.0371	5.200	.423
NB 107	seconds	7.660E-01	NA	.9122	.0000	.0000	.0000	.0000	.0000	.0000	.0878	4.673	.389
MO 107	seconds	3.500E+00	NA	1.0000	.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	.0000	2.583	.548
RU 107	seconds	2.250E+02	3.000E+00	1.0000	.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	.0000	.750	.417
PD 107	seconds	2.051E+14	9.467E+12	1.0000	.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					
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	.0000	.0000	.0000	.0000	.0000	.628	.029
AG 108M	seconds	4.008E+09	6.627E+08	.0000	.0000	.0000	.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	.9000	.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	1.0000	.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	.0000	.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			.8160	.0000	.0000	.0000	.0000	.0000	.1840	6.080	.422	
NB 111	seconds	1.718E-01	NA	.9897	.0000	.0000	.0000	.0000	.0000	.0103	5.515	.438	
MO 111	seconds	4.664E-01	NA	.9431	.0000	.0000	.0000	.0000	.0000	.0569	4.012	.374	
TC 111	seconds	1.982E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.829	.340	
RU 111	seconds	1.600E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.976	.455	
RH 111	seconds	1.100E+01	NA	.0074	.9926	.0000	.0000	.0000	.0000	.0000	.878	.051	
PD 111	seconds	1.404E+03	1.200E+01	.0740	.1960	.0000	.0000	.7300	.0000	.0000	.545	.659	
PD 111M	seconds	1.980E+04	3.600E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.381	.069	
AG 111	seconds	6.437E+05	8.640E+02	.0070	.0000	.0000	.0000	.9930	.0000	.0000	.062	.125	
AG 111M	seconds	6.480E+01	8.000E-01	.0000	.0000	.0000	.0000	.0000	.0000	.0000			
CD 111	stable			.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.387	.734	
CD 111M	seconds	2.916E+03	1.800E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	8.364	.501	
NB 112	seconds	8.672E-02	NA	.9792	.0000	.0000	.0000	.0000	.0000	.0208	3.914	.346	
MO 112	seconds	9.754E-01	NA	.9480	.0000	.0000	.0000	.0000	.0000	.0520	6.154	.453	
TC 112	seconds	4.314E-01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.839	.394	
RU 112	seconds	3.600E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.633	.318	
RH 112	seconds	1.500E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.096	.051	
PD 112	seconds	7.576E+04	1.800E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.086	.331	
AG 112	seconds	1.130E+04	7.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000			
CD 112	stable			.9620	.0000	.0000	.0000	.0000	.0000	.0380	6.250	.448	
MO 113	seconds	2.287E-01	NA	.9281	.0000	.0000	.0000	.0000	.0000	.0719	4.587	.397	
TC 113	seconds	6.524E-01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.665	.386	
RU 113	seconds	3.000E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.549	.320	
RH 113	seconds	9.000E-01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.700	.359	
PD 113	seconds	9.300E+01	5.000E+00	.8150	.1850	.0000	.0000	.0000	.0000	.0000	.834	.086	
AG 113	seconds	1.933E+04	1.800E+02	.9830	.0170	.0000	.0000	.0000	.0000	.0000	.254	.457	
AG 113M	seconds	6.870E+01	1.600E+00	.2000	.0000	.0000	.0000	.8000	.0000	.0000	.091	.000	
CD 113	seconds	2.935E+23	5.996E+22	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.184	.000	
CD 113M	seconds	4.450E+08	1.578E+07	.9986	.0000	.0000	.0000	.0014	.0000	.0000			
IN 113	stable			.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.387	.664	
IN 113M	seconds	5.969E+03	3.600E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.503	.350	
MO 114	seconds	3.766E-01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000			

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					
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	.0000	.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 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			
RH 117	seconds	1.217E+00	NA	.9518	.0000	.0000	.0000	.0000	.0000	.0000	.0482	3.667	.371	
PD 117	seconds	5.000E+00	NA	.5000	.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	.0000	2.521	.516	
AG 117M	seconds	5.340E+00	5.000E-02	.8550	.1450	.0000	.0000	.0000	.0000	.0000	.0000	2.298	.362	
CD 117	seconds	8.964E+03	1.440E+02	.0900	.9100	.0000	.0000	.0000	.0000	.0000	.0000	1.510	.715	
CD 117M	seconds	1.210E+04	1.800E+02	.9850	.0150	.0000	.0000	.0000	.0000	.0000	.0000	2.235	.910	
IN 117	seconds	2.628E+03	4.200E+01	.9968	.0032	.0000	.0000	.0000	.0000	.0000	.0000	.954	.721	
IN 117M	seconds	6.990E+03	4.200E+01	.5290	.0000	.0000	.0000	.4710	.0000	.0000	.0000	.522	.174	
SN 117	stable													
SN 117M	seconds	1.175E+06	3.456E+03	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.313	.502	
TC 118	seconds	8.155E-02	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	7.712	.497	
RU 118	seconds	6.623E-01	NA	.9589	.0000	.0000	.0000	.0000	.0000	.0000	.0411	3.230	.346	
RH 118	seconds	3.156E-01	NA	.9708	.0000	.0000	.0000	.0000	.0000	.0000	.0292	5.600	.445	
PD 118	seconds	3.100E+00	NA	.5000	.5000	.0000	.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	.0000	4.088	.391	
AG 118M	seconds	2.000E+00	2.000E-01	.5900	.0000	.0000	.0000	.4100	.0000	.0000	.0000	2.751	.545	
CD 118	seconds	3.018E+03	1.200E+01	1.0000	.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	.0000	1.848	.042	
IN 118M	seconds	2.670E+02	3.000E+00	1.0000	.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	.0000	.0436	5.252	.440	
RH 119	seconds	4.654E-01	NA	.9170	.0000	.0000	.0000	.0000	.0000	.0000	.0830	4.113	.389	
PD 119	seconds	1.759E+00	NA	1.0000	.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	.0000	3.296	.526	
CD 119	seconds	1.614E+02	1.200E+00	1.0000	.9000	.0000	.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	.0000	3.054	.784	
IN 119	seconds	1.440E+02	6.000E+00	.9907	.0093	.0000	.0000	.0000	.0000	.0000	.0000	1.370	.561	
IN 119M	seconds	1.080E+03	1.800E+01	.9750	.0000	.0000	.0000	.0250	.0000	.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	.0000	.087	.131	
RU 120	seconds	3.503E-01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.346	.422	
RH 120	seconds	1.725E-01	NA	.9407	.0000	.0000	.0000	.0000	.0000	.0000	.0593	6.127	.463	
PD 120	seconds	3.906E+00	NA	.9999	.0000	.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	.0000	.0000	5.168	.558
CD 120	seconds	5.080E+01	2.100E-01	1.0000	.0000	.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	.0000	.0000	2.759	.234
IN 120M	seconds	4.620E+01	8.000E-01	1.0000	.0000	.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	.0000	.0000	.1357	4.597	.403
PD 121	seconds	6.437E-01	NA	.9973	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0027	3.974	.412
AG 121	seconds	8.000E-01	1.000E-01	.9992	.0000	.0000	.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	.0000	.0000	3.179	.592
IN 121	seconds	2.310E+01	6.000E-01	.8870	.1130	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.912	.485
IN 121M	seconds	2.328E+02	6.000E+00	.9880	.0000	.0000	.0000	.0120	.0000	.0000	.0000	.0000	1.598	.040
SN 121	seconds	9.742E+04	1.440E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.115	.000
SN 121M	seconds	1.736E+09	1.578E+08	.2240	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.039	.128
SB 121	stable													
RH 122	seconds	1.072E-01	NA	.9170	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0830	6.486	.473
PD 122	seconds	1.411E+00	NA	.9956	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0044	2.572	.358
AG 122	seconds	4.800E-01	8.000E-02	.9981	.0000	.0000	.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	.0000	.0000	1.252	.364
IN 122	seconds	1.500E+00	3.000E-01	1.0000	.0000	.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	.0000	.0000	4.065	.620
SN 122	stable													
SB 122	seconds	2.333E+05	8.640E+02	.9760	.0000	.0000	.0000	.0240	.0000	.0000	.0000	.0000	1.002	.436
SB 122M	seconds	2.526E+02	1.200E+00	.0000	.0000	.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	.0000	.0000	.1711	5.150	.417
PD 123	seconds	3.004E-01	NA	.9931	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0069	4.356	.427
AG 123	seconds	3.900E-01	NA	.9540	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0460	4.514	.412
CD 123	seconds	8.905E+00	NA	.7700	.2300	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.965	.371
IN 123	seconds	5.980E+00	6.000E-02	.0320	.9680	.0000	.0000	.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	.0000	.0000	2.076	.032
SN 123	seconds	1.116E+07	3.456E+04	1.0000	.0000	.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	.0000	.0000	.619	.228
SB 123	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	Ground		
								Ground	Metastable				
TE 123	seconds	3.913E+20	3.156E+19	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.017	.765
TE 123M	seconds	1.034E+07	8.640E+03	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.246	.602
PD 124	seconds	5.140E-01	NA	.9730	.0000	.0000	.0000	.0000	.0000	.0000	.0270	3.064	.350
AG 124	seconds	2.495E-01	NA	.9771	.0000	.0000	.0000	.0000	.0000	.0000	.0229	5.721	.458
CD 124	seconds	9.000E-01	NA	1.0000	.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	.0000	4.664	.578
SN 124	stable												
SB 124	seconds	5.201E+06	2.592E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.236	.826
SB 124M	seconds	9.300E+01	3.000E+00	.2500	.0000	.0000	.0000	.0000	.0000	.7500	.0000	.557	.795
TE 124	stable												
PD 125	seconds	1.660E-01	NA	.9773	.0000	.0000	.0000	.0000	.0000	.0000	.0227	4.773	.438
AG 125	seconds	3.335E-01	NA	.9368	.0000	.0000	.0000	.0000	.0000	.0000	.0632	4.434	.409
CD 125	seconds	1.548E+00	NA	.7000	.3000	.0000	.0000	.0000	.0000	.0000	.0000	3.409	.395
IN 125	seconds	2.330E+00	4.000E-02	.1120	.8880	.0000	.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	.0000	2.769	.243
SN 125	seconds	8.329E+05	2.592E+03	1.0000	.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	.0000	1.162	.306
SB 125	seconds	8.615E+07	9.467E+05	.7700	.2300	.0000	.0000	.0000	.0000	.0000	.0000	.533	.814
TE 125	stable												
TE 125M	seconds	5.011E+06	8.640E+04	.0000	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	.142	.251
PD 126	seconds	2.520E-01	NA	.9497	.0000	.0000	.0000	.0000	.0000	.0000	.0503	3.658	.349
AG 126	seconds	1.398E-01	NA	.9536	.0000	.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	.0000	2.211	.326
IN 126	seconds	1.450E+00	2.200E-01	1.0000	.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	.0000	.263	.496
SB 126	seconds	1.071E+06	8.640E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.119	.883
SB 126M	seconds	1.140E+03	1.800E+01	.8600	.0000	.0000	.0000	.0000	.0000	.1400	.0000	2.186	.711
TE 126	stable												
XE 126	stable												
AG 127	seconds	1.753E-01	NA	.9014	.0000	.0000	.0000	.0000	.0000	.0000	.0986	5.117	.426
CD 127	seconds	5.719E-01	NA	.4999	.4999	.0000	.0000	.0000	.0000	.0000	.0001	4.074	.491
IN 127	seconds	1.150E+00	5.000E-02	.1530	.8404	.0000	.0000	.0000	.0000	.0000	.0066	3.919	.451
IN 127M	seconds	3.760E+00	2.000E-02	.0000	.9935	.0000	.0000	.0000	.0000	.0000	.0065	3.919	.441

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					
SN 127	seconds	7.560E+03	1.440E+02	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.413	.787
SN 127M	seconds	2.478E+02	1.800E+00	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.777	.499
SB 127	seconds	3.326E+05	4.320E+03	.8250	.1750	.0000	.0000	.0000	.0000	.0000	.978	.679
TE 127	seconds	3.366E+04	2.520E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.229	.021
TE 127M	seconds	9.418E+06	1.728E+05	.0240	.0000	.0000	.0000	.9760	.0000	.0000	.090	.123
I 127	stable											
XE 127	seconds	3.145E+06	8.640E+03	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.311	.901
AG 128	seconds	9.428E-02	NA	.9311	.0000	.0000	.0000	.0000	.0000	.0689	6.932	.534
CD 128	seconds	1.053E+00	NA	.9989	.0000	.0000	.0000	.0000	.0000	.0011	2.834	.354
IN 128	seconds	9.000E-01	1.000E-01	.9996	.0000	.0000	.0000	.0000	.0000	.0004	5.730	.541
SN 128	seconds	3.546E+03	3.000E+01	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.853	.707
SB 128	seconds	3.244E+04	1.080E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.578	.864
SB 128M	seconds	6.240E+02	1.200E+01	.9640	.0000	.0000	.0000	.0360	.0000	.0000	2.854	.665
TE 128	stable											
I 128	seconds	1.499E+03	1.200E+00	.9310	.0000	.0000	.0000	.0000	.0000	.0000	.829	.109
XE 128	stable											
CD 129	seconds	2.987E-01	NA	.9985	.0000	.0000	.0000	.0000	.0000	.0015	4.532	.492
IN 129	seconds	5.900E-01	2.000E-02	.8940	.1060	.0000	.0000	.0000	.0000	.0016	4.672	.465
SN 129	seconds	1.296E+02	2.400E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.713	.533
SN 129M	seconds	4.020E+02	2.400E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.899	.721
SB 129	seconds	1.584E+04	3.600E+01	.8200	.1800	.0000	.0000	.0000	.0000	.0000	1.747	.776
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
I 129	seconds	4.954E+14	1.262E+13	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.079	.312
XE 129	stable											
XE 129M	seconds	7.681E+05	1.728E+04	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.227	.224
CD 130	seconds	4.768E-01	NA	.9903	.0000	.0000	.0000	.0000	.0000	.0097	3.486	.351
IN 130	seconds	3.200E-01	2.000E-02	.7000	.2900	.0000	.0000	.0000	.0000	.0091	6.095	.525
SN 130	seconds	2.232E+02	2.400E+00	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	1.424	.671
SB 130	seconds	2.370E+03	4.800E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.969	.824
SB 130M	seconds	3.780E+02	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.688	.734
TE 130	stable											
I 130	seconds	4.450E+04	3.600E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.428	.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	Metastable					Ground
I 130M	seconds	5.400E+02	6.000E+00	.1600	.0000	.0000	.0000	.8400	.0000	.0000	.0000	.0000	.288	.382
XE 130	stable													
CD 131	seconds	1.062E-01	NA	.9513	.0000	.0000	.0000	.0000	.0000	.0000	.0487	.0000	6.809	.480
IN 131	seconds	2.700E-01	2.000E-02	.9325	.0491	.0000	.0000	.0000	.0000	.0000	.0184	.0000	4.731	.426
SN 131	seconds	3.900E+01	2.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.240	.728
SB 131	seconds	1.380E+03	1.200E+02	.9320	.0680	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.332	.750
TE 131	seconds	1.500E+03	6.000E+00	1.0000	.0000	.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	.0000	.0000	1.612	.882
I 131	seconds	6.947E+05	8.640E+02	.9891	.0109	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.573	.666
XE 131	stable													
XE 131M	seconds	1.028E+06	8.640E+03	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.162	.124
CD 132	seconds	1.357E-01	NA	.7944	.0000	.0000	.0000	.0000	.0000	.0000	.2056	.0000	5.433	.349
IN 132	seconds	1.860E-01	2.200E-02	.9500	.0000	.0000	.0000	.0000	.0000	.0000	.0500	.0000	9.146	.634
SN 132	seconds	4.000E+01	1.000E+00	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.022	.640
SB 132	seconds	2.520E+02	6.000E+00	1.0000	.0000	.0000	.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	.0000	.0000	.0000	3.860	.674
TE 132	seconds	2.815E+05	2.880E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.334	.699
I 132	seconds	8.222E+03	3.600E+00	1.0000	.0000	.0000	.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	.0000	.0000	.0000	.728	.982
BA 132	stable													
IN 133	seconds	1.116E-01	NA	.6834	.0000	.0000	.0000	.0000	.0000	.0000	.3166	.0000	7.391	.462
SN 133	seconds	1.440E+00	4.000E-02	.9974	.0000	.0000	.0000	.0000	.0000	.0000	.0025	.0000	4.654	.443
SB 133	seconds	1.500E+02	6.000E+00	.8300	.1700	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.696	.757
TE 133	seconds	7.500E+02	1.800E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.875	.640
TE 133M	seconds	3.324E+03	2.400E+01	.7230	.1020	.0000	.0000	.1750	.0000	.0000	.0000	.0000	2.050	.821
I 133	seconds	7.488E+04	3.600E+02	.9712	.0288	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.021	.599
I 133M	seconds	9.000E+00	2.000E+00	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	1.633	.967
XE 133	seconds	4.530E+05	8.640E+01	1.0000	.0000	.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	.0000	.0000	.225	.179
CS 133	stable													
BA 133	seconds	3.320E+08	4.102E+06	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.455	.885
IN 134	seconds	8.056E-02	NA	.6624	.0000	.0000	.0000	.0000	.0000	.0000	.3376	.0000	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	Metastable	Ground				
SN 134	seconds	1.040E+00	NA	.8300	.0000	.0000	.0000	.0000	.0000	.0000	.1700	3.634	.343	
SB 134	seconds	8.500E-01	1.000E-01	.9990	.0000	.0000	.0000	.0000	.0000	.0000	.0010	5.037	.448	
SB 134M	seconds	1.043E+01	1.400E-01	.9988	.0000	.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	.0000	1.095	.784	
I 134	seconds	3.156E+03	2.400E+01	1.0000	.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	.0000	.325	.742	
XE 134	stable													
XE 134M	seconds	2.900E-01	1.700E-02	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	1.965	.966	
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	
BA 134	stable													
SN 135	seconds	4.178E-01	NA	.9140	.0000	.0000	.0000	.0000	.0000	.0000	.0860	5.078	.489	
SB 135	seconds	1.710E+00	2.000E-02	.7980	.0000	.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	.0000	3.562	.415	
I 135	seconds	2.365E+04	7.200E+01	.8430	.1570	.0000	.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	.0000	.567	.439	
XE 135M	seconds	9.174E+02	3.000E+00	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.523	.818	
CS 135	seconds	7.258E+13	9.467E+12	1.0000	.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	.0000	1.630	.979	
BA 135	stable													
BA 135M	seconds	1.033E+05	7.200E+02	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.259	.229	
SN 136	seconds	7.172E-01	NA	.8361	.0000	.0000	.0000	.0000	.0000	.0000	.1639	4.124	.346	
SB 136	seconds	8.200E-01	NA	.7700	.0000	.0000	.0000	.0000	.0000	.0000	.2300	5.666	.460	
TE 136	seconds	1.750E+01	2.000E-01	.9910	.0000	.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	.0000	4.344	.543	
I 136M	seconds	4.690E+01	1.000E+00	1.0000	.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	.0000	2.051	.935	
BA 136	stable													
BA 136M	seconds	3.084E-01	1.900E-03	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	2.030	.949	
SB 137	seconds	4.779E-01	NA	.8000	.0000	.0000	.0000	.0000	.0000	.0000	.2000	5.062	.472	
TE 137	seconds	3.500E+00	NA	.9780	.0000	.0000	.0000	.0000	.0000	.0000	.0220	3.788	.425	
I 137	seconds	2.450E+01	2.000E-01	.9330	.0000	.0000	.0000	.0000	.0000	.0000	.0670	3.302	.373	

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		
XE 137	seconds	2.291E+02	7.800E-01	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.888	.101
CS 137	seconds	9.467E+08	6.311E+06	.0557	.0000	.0000	.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	.0000	.663	.904
SB 138	seconds	1.734E-01	NA	.7799	.0000	.0000	.0000	.0000	.0000	.0000	.2201	6.731	.531
TE 138	seconds	1.400E+00	4.000E-01	.9370	.0000	.0000	.0000	.0000	.0000	.0000	.0630	3.035	.352
I 138	seconds	6.490E+00	7.000E-02	.9464	.0000	.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	.0000	1.773	.635
CS 138	seconds	1.932E+03	6.000E+00	1.0000	.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	.0000	.990	.714
BA 138	stable												
LA 138	seconds	3.314E+18	6.311E+16	.3360	.0000	.6640	.0000	.0000	.0000	.0000	.0000	1.262	.977
SB 139	seconds	2.178E-01	NA	.5831	.0000	.0000	.0000	.0000	.0000	.0000	.4169	5.836	.460
TE 139	seconds	5.800E-01	NA	.9370	.0000	.0000	.0000	.0000	.0000	.0000	.0630	4.755	.494
I 139	seconds	2.300E+00	5.000E-02	.9040	.0000	.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	.0000	2.662	.334
CS 139	seconds	5.562E+02	3.000E+00	1.0000	.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	.0000	.942	.046
LA 139	stable												
CE 139	seconds	1.189E+07	2.000E+03	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.248	.702
PR 139	seconds	1.588E+04	1.500E+02	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.217	.596
TE 140	seconds	8.938E-01	NA	.8450	.0000	.0000	.0000	.0000	.0000	.0000	.1550	3.684	.346
I 140	seconds	8.600E-01	4.000E-02	.9070	.0000	.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	.0000	2.526	.581
CS 140	seconds	6.370E+01	3.000E-01	1.0000	.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	.0000	.493	.369
LA 140	seconds	1.450E+05	6.048E+01	1.0000	.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	.0000	1.087	.499
TE 141	seconds	2.726E-01	NA	.8953	.0000	.0000	.0000	.0000	.0000	.0000	.1047	5.307	.489
I 141	seconds	4.600E-01	NA	.6100	.0000	.0000	.0000	.0000	.0000	.0000	.3900	4.339	.410
XE 141	seconds	1.730E+00	1.000E-02	.9996	.0000	.0000	.0000	.0000	.0000	.0000	.0004	3.601	.436
CS 141	seconds	2.494E+01	6.000E-02	.9996	.0000	.0000	.0000	.0000	.0000	.0000	.0004	2.744	.415

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					
BA 141	seconds	1.096E+03	4.200E+00	.0000	.0000	.0000	.0000	.0000	.0000	1.730	.472	
LA 141	seconds	1.411E+04	1.080E+02	.0000	.0000	.0000	.0000	.0000	.0000	.994	.043	
CE 141	seconds	2.808E+06	4.320E+02	.0000	.0000	.0000	.0000	.0000	.0000	.247	.310	
PR 141	stable											
ND 141	seconds	8.960E+03	1.100E+02	.0000	1.0000	.0000	.0000	.0000	.0000	.089	.841	
TE 142	seconds	5.901E-01	NA	.8492	.0000	.0000	.0000	.0000	.1508	3.962	.347	
I 142	seconds	2.000E-01	NA	.8400	.0000	.0000	.0000	.0000	.1600	5.978	.536	
XE 142	seconds	1.220E+00	2.000E-02	.9959	.0000	.0000	.0000	.0000	.0041	2.981	.529	
CS 142	seconds	1.700E+00	2.000E-02	.9990	.0000	.0000	.0000	.0000	.0010	4.236	.422	
BA 142	seconds	6.360E+02	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	1.449	.743	
LA 142	seconds	5.466E+03	3.000E+01	1.0000	.0000	.0000	.0000	.0000	.0000	3.230	.732	
CE 142	seconds	3.311E+18	NA	.0000	.0000	.0000	.0000	1.0000	.0000	.000	.000	
PR 142	seconds	6.883E+04	1.440E+02	.9998	.0000	.0002	.0000	.0000	.0000	.868	.067	
PR 142M	seconds	8.760E+02	3.000E+01	.0000	.0000	.0000	.0000	1.0000	.0000	.002	.000	
ND 142	stable											
I 143	seconds	4.011E-01	NA	.8200	.0000	.0000	.0000	.0000	.1800	4.725	.477	
XE 143	seconds	9.600E-01	NA	.9880	.0000	.0000	.0000	.0000	.0120	4.142	.504	
CS 143	seconds	1.780E+00	1.000E-02	.9839	.0000	.0000	.0000	.0000	.0161	3.194	.388	
BA 143	seconds	1.450E+01	5.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	2.376	.412	
LA 143	seconds	8.484E+02	9.600E+00	1.0000	.0000	.0000	.0000	.0000	.0000	1.380	.094	
CE 143	seconds	1.188E+05	7.200E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.709	.394	
PR 143	seconds	1.172E+06	1.728E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.315	.000	
ND 143	stable											
I 144	seconds	1.460E-01	NA	.8476	.0000	.0000	.0000	.0000	.1524	6.045	.537	
XE 144	seconds	1.100E+00	NA	.9927	.0000	.0000	.0000	.0000	.0073	2.532	.365	
CS 144	seconds	1.020E+00	3.000E-02	.9687	.0000	.0000	.0000	.0000	.0313	5.060	.526	
BA 144	seconds	1.140E+01	5.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	1.651	.427	
LA 144	seconds	4.090E+01	4.000E-01	1.0000	.0000	.0000	.0000	.0000	.0000	3.668	.611	
CE 144	seconds	2.462E+07	1.728E+04	.9860	.0140	.0000	.0000	.0000	.0000	.110	.172	
PR 144	seconds	1.037E+03	3.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	1.238	.023	
PR 144M	seconds	4.320E+02	1.800E+01	.0004	.0000	.0000	.0000	.9996	.0000	.058	.216	
ND 144	seconds	6.600E+22	NA	.0000	.0000	.0000	.0000	.0000	.0000	1.910	.000	
I 145	seconds	1.934E-01	NA	.7591	.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					
				Ground	Metastable	Ground	Metastable				Ground				
XE 145	seconds	9.00E-01	NA	.9389	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0611	4.144	.441	
CS 145	seconds	5.940E-01	1.300E-02	.8540	.0000	.0000	.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	.0000	.0000	3.134	.298	
LA 145	seconds	2.480E+01	2.000E+00	1.0000	.0000	.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	.0000	.0000	1.536	.560	
PR 145	seconds	2.154E+04	3.600E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.696	.027	
ND 145	stable														
PM 145	seconds	5.586E+08	1.262E+07	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.044	.734	
SM 145	seconds	2.938E+07	2.592E+05	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.093	.702	
XE 146	seconds	5.627E-01	NA	.9349	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.085	.352	
CS 146	seconds	3.430E-01	7.000E-03	.8680	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.1320	5.184	.417	
BA 146	seconds	2.200E+00	3.000E-02	.9999	.0000	.0000	.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	.0000	.0000	4.212	.541	
CE 146	seconds	8.112E+02	7.800E+00	1.0000	.0000	.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	.0000	.0000	2.328	.438	
ND 146	stable														
PM 146	seconds	1.745E+08	1.578E+06	.3390	.0000	.6610	.0000	.0000	.0000	.0000	.0000	.0000	.842	.892	
SM 146	seconds	3.250E+15	1.578E+14	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.543	.000	
XE 147	seconds	1.991E-01	NA	.9129	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0871	4.633	.499	
CS 147	seconds	5.455E-01	NA	.7500	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.2500	3.946	.401	
BA 147	seconds	7.000E-01	3.000E-02	.9997	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0003	3.159	.412	
LA 147	seconds	4.400E+00	5.000E-01	.9995	.0000	.0000	.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	.0000	.0000	1.940	.557	
PR 147	seconds	8.160E+02	3.000E+01	1.0000	.0000	.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	.0000	.0000	.408	.343	
PM 147	seconds	8.279E+07	6.311E+03	1.0000	.0000	.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	.0000	.0000	2.311	.000	
CS 148	seconds	2.056E-01	NA	.7490	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.2510	5.547	.535	
BA 148	seconds	6.070E-01	2.500E-02	.9994	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.178	.383	
LA 148	seconds	1.050E+00	1.000E-02	.9987	.0000	.0000	.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	.0000	.0000	.988	.320	
PR 148	seconds	1.362E+02	2.400E+00	1.0000	.0000	.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 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					
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	.0000	.0000	.000	.000
EU 149	seconds	8.040E+06	4.000E+04	.0000	.0000	.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	.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
				Ground	Metastable	Ground	Metastable					
ND 152	seconds	6.840E+02	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.494	.326
PM 152	seconds	2.460E+02	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.545	.097
PM 152M	seconds	4.512E+02	4.800E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.381	.630
SM 152	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
GD 152	seconds	3.408E+21	NA	.0000	.0000	.0000	.0000	.0000	1.0000	.0000	2.206	.000
LA 153	seconds	3.258E-01	NA	.8931	.0000	.0000	.0000	.0000	.0000	.1069	4.729	.442
CE 153	seconds	1.469E+00	NA	.9938	.0000	.0000	.0000	.0000	.0000	.0062	2.807	.401
PR 153	seconds	4.491E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.727	.377
ND 153	seconds	6.750E+01	NA	1.0000	.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	.0000	.779	.221
SM 153	seconds	1.666E+05	3.600E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.335	.194
EU 153	stable											
GD 153	seconds	2.087E+07	1.728E+04	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.148	.726
LA 154	seconds	1.493E-01	NA	.8973	.0000	.0000	.0000	.0000	.0000	.1027	5.861	.546
CE 154	seconds	2.016E+00	NA	.9936	.0000	.0000	.0000	.0000	.0000	.0064	2.654	.361
PR 154	seconds	1.061E+00	NA	.9989	.0000	.0000	.0000	.0000	.0000	.0011	4.287	.563
ND 154	seconds	4.000E+01	NA	1.0000	.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	.0000	2.791	.681
PM 154M	seconds	1.608E+02	4.200E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.898	.690
SM 154	stable											
EU 154	seconds	2.711E+08	1.578E+05	.9998	.0000	.0002	.0000	.0000	.0000	.0000	1.532	.818
GD 154	stable											
LA 155	seconds	1.540E-01	NA	.8324	.0000	.0000	.0000	.0000	.0000	.1676	5.596	.482
CE 155	seconds	5.278E-01	NA	.9840	.0000	.0000	.0000	.0000	.0000	.0160	3.591	.438
PR 155	seconds	1.122E+00	NA	.9846	.0000	.0000	.0000	.0000	.0000	.0154	3.555	.416
ND 155	seconds	1.822E+01	NA	1.0000	.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	.0000	1.653	.383
SM 155	seconds	1.338E+03	1.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.667	.154
EU 155	seconds	1.477E+08	1.578E+06	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.131	.493
GD 155M ^p	seconds	3.100E-02	NA	.0000	.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				Ground		
								Ground	Metastable	Ground			
DY 160	stable	3.113E-01	NA	.9830	.0000	.0000	.0000	.0000	.0000	.0000	.0000	4.044	.465
ND 161	seconds	7.899E-01	NA	.9825	.0000	.0000	.0000	.0000	.0000	.0000	.0170	3.809	.445
PM 161	seconds	4.780E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.645	.430
SM 161	seconds	4.205E+01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.012	.500
EU 161	seconds	2.196E+02	3.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.971	.400
GD 161	seconds	5.962E+05	1.728E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.233	.154
TB 161	stable	3.243E-01	NA	.9786	.0000	.0000	.0000	.0000	.0000	.0000	.0214	4.705	.557
DY 161	seconds	5.260E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.261	.388
PM 162	seconds	1.624E+02	NA	1.0000	.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	.0000	.823	.652
GD 162	seconds	4.656E+02	6.000E+00	1.0000	.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	.0000	1.832	.626
TB 162M	seconds	1.268E+00	NA	1.0000	.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	.0000	2.613	.410
SM 163	seconds	9.277E+01	NA	1.0000	.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	.0000	1.110	.711
GD 163	seconds	7.000E+00	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.749	.240
TB 163M	minutes	1.385E+00	NA	.9999	.0000	.0000	.0000	.0000	.0000	.0000	.0001	2.852	.000
DY 163	stable	1.533E+00	NA	1.0000	.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	.0000	1.365	.579
EU 164	seconds	1.800E+02	6.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	3.050	.765
GD 164	seconds	4.536E-01	NA	.9975	.0000	.0000	.0000	.0000	.0000	.0000	.0025	3.655	.000
TB 164	stable	1.355E+00	NA	.9981	.0000	.0000	.0000	.0000	.0000	.0000	.0019	3.237	.463
DY 164	seconds	4.229E+01	NA	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	2.111	.417
SM 165	seconds	1.266E+02	6.000E+00	.1400	.8600	.0000	.0000	.0000	.0000	.0000	.0000	1.710	.489
EU 165	seconds	8.402E+03	2.160E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.474	.055
GD 165	seconds	7.548E+01	3.600E-01	.0224	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.118	.169
TB 165	seconds												
DY 165M	seconds												
HO 165	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					
DY 166	seconds	2.938E+05	3.600E+02	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.209	
HO 166	seconds	9.648E+04	7.200E+01	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.041	
HO 166M	seconds	3.787E+10	5.680E+09	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.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	.478	
ER 168	stable											
YB 168	stable											
ER 169	seconds	8.122E+05	1.800E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.000	
TM 169	stable											
YB 169	seconds	2.767E+06	5.000E+02	.0000	.0000	1.0000	.0000	.0000	.0000	.0000	.734	
ER 170	stable											
TM 170	seconds	1.111E+07	3.000E+04	.9985	.0000	.0015	.0000	.0000	.0000	.0000	.016	
TM 170M	seconds	4.100E-06	NA	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.000	
YB 170	stable											
ER 171	seconds	2.706E+04	8.000E+00	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.472	
TM 171	seconds	6.060E+07	4.000E+05	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.023	
YB 171	stable											
ER 172	seconds	1.775E+05	1.800E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.796	
TM 172	seconds	2.290E+05	1.100E+03	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.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	FBI	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	FBI	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	41NB	100	-37.	--	--	--	--	--	--	-20.
1	42MO	93M	1.	--	--	--	--	--	--	3.
1	42MO	93	--	--	-82.	NEW	--	--	--	1.
1	42MO	99	--	--	--	--	--	--	--	25.
1	42MO	101	--	--	--	--	--	--	--	5.
1	43TC	97	--	--	--	--	--	--	--	-1.
1	43TC	97M	--	--	--	--	--	--	--	-4.
1	43TC	100	--	--	--	--	--	--	--	-6.
1	44RU	97	--	--	--	-50.	--	--	--	--
1	44RU	103	--	11.	--	--	--	--	--	--
1	44RU	105	--	1.	--	--	--	--	--	-3.
1	44RU	107	-11.	--	--	--	--	--	--	14.
1	45RH	104M	--	--	--	--	--	--	--	-9.
1	45RH	105M	--	--	--	--	--	--	--	-3.
1	45RH	106M	-2.	--	--	--	--	--	--	-1.
1	45RH	107	--	--	--	--	--	--	--	-7.
1	46PD	103	--	--	-100.	NEW	--	--	--	-70.
1	46PD	107	--	--	--	--	--	--	--	-7.
1	46PD	107M	--	--	--	--	--	--	--	1.
1	46PD	109	2.	--	--	--	--	--	--	-19.
1	46PD	109M	--	--	--	--	--	--	--	-2.
1	46PD	111	6.	--	--	--	--	--	--	-2.
1	46PD	111M	--	-39.	--	--	7.	--	--	-7.
1	47AG	106	-100.	--	--	--	--	--	--	-51.
1	47AG	108	--	--	21.	--	--	--	--	--
1	47AG	108M	--	--	--	--	-2.	--	--	--
1	47AG	109M	--	--	--	--	--	--	--	-3.
1	47AG	110M	--	--	--	--	2.	--	--	--
1	47AG	111M	--	--	--	--	--	--	--	-5.
1	48CD	107	--	--	-100.	NEW	--	--	--	-78.
1	48CD	111M	--	--	--	--	--	--	--	-2.

Table B.1 (continued)

LIB	ISO	HL	FBI	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	49IN120M	1400.	++	++	++	++	++	++	++	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	FBI	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	FBI	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	FBI	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	FBI	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	FBI	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.
3	55CS141	--	--	--	--	--	--	--	-51.	-14.
3	60ND141	--	--	--	--	--	--	--	--	-3.
3	52TE142	20.	--	--	--	--	--	--	NEW	-14.
3	53 I142	2.	--	--	--	--	--	--	NEW	-13.
3	54XE142	--	--	--	--	--	--	--	--	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	FBI	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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