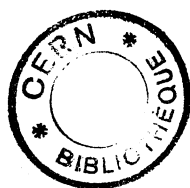


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HARWELL

**High resolution γ spectra
of 40 - 44 MeV γ photon
activation products:
Part 3 - A summary of γ rays,
radionuclides and nuclear
interferences observed.**

D. R. Williams

J. S. Hislop

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September, 1980

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HIGH RESOLUTION γ SPECTRA OF 40 - 44 MeV PHOTON ACTIVATION PRODUCTS
PART 3 A SUMMARY OF γ RAYS, RADIONUCLIDES
AND
NUCLEAR INTERFERENCES OBSERVED

D. R. Williams

J. S. Hislop

ABSTRACT

A table of γ rays observed in the high resolution γ ray spectra of 40-44 MeV γ photon activation products is presented. This table is arranged in order of increasing γ ray energy and the parent isotopes, their half-lives and their inactive precursors are identified.

Nuclear interferences caused by production of an active isotope from different parent elements have been identified and evaluated quantitatively. These are also tabulated

Environmental and Medical Sciences Division,
A. E. R. E. HARWELL.

September, 1980

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1. Introduction

Gamma photon activation analysis is finding increasing application as a complementary technique to thermal neutron activation for the destructive and non-destructive multielement analysis of a wide range of materials^(1,2). It has been applied to the analysis of biological samples⁽³⁻⁸⁾, atmospheric particulate matter^(5,6,9,10), rocks and ores^(3,11-15), soils^(6,16-18), ocean sediments⁽¹⁹⁾, sewage sludges⁽²⁰⁾, and various standard reference materials^(21,22).

However, unlike thermal neutron activation, for which an extensive literature on the nature and yield of activation products exists, there is only a restricted amount of published practical information on gamma photon activation. Several authors^(23,24) have approached the problem from a theoretical point of view, considering only specific types of photon induced reactions, but for practical purposes it is found that data obtained in this way is of limited value.

A more satisfactory approach is to irradiate individual elements and to identify the products obtained, and their yields, under practical conditions. This has been carried out by a number of authors⁽²⁵⁻²⁹⁾ for various numbers of elements at a variety of irradiation energies.

The approach used at Harwell has been to prepare a catalogue of high resolution γ spectra obtained by irradiating individual elements for 45 minutes with bremsstrahlung of maximum energy 40-44 MeV and recording their spectra at a series of decay times. These spectra, together with induced specific activities for the main activation products observed, have been published as Parts 1 and 2 of this series^(30,31). This volume (Part 3) presents (i) a tabulation of all the gamma rays quoted in Parts 1 and 2 arranged in order of increasing energy, and (ii) a tabulation of nuclear interferences derived from the data used to prepare Parts 1 and 2.

An irradiation energy of 40-44 MeV was used as this was the most common operating condition of the Harwell 45 MeV linear accelerator. By making use of an available beam multiplexing facility, irradiations at this energy could therefore be carried out at minimum cost.

2. Materials Irradiated

All stable elements from carbon to uranium, with the exception of phosphorus, sulphur and the inert gases, have been irradiated and their spectra recorded. Further details of the actual materials used may be found in Parts 1 and 2⁽³⁰⁻³¹⁾.

3. Irradiation and Measurement of activities

These procedures have been fully described in Reference 30. Briefly, groups of up to 6 elements, of comparable atomic number, together with an iron wire flux monitor, were irradiated for 45 minutes using an electron beam current of 4-10 μ A. as measured on the 3mm thick tungsten converter. The energy and intensity of the γ flux were derived from the activities of the flux monitors and all irradiations were normalised to an arbitrary flux using the activity of the 320 keV full energy peak of ⁵¹Cr produced in the iron monitor.

All activity measurements, with the exception of those for uranium and thorium, were made using the same 40cc Ge(Li) detector and multi-channel analyser system. Sample activities were generally measured after decay times of (a) one to two hours, (b) six to twelve hours, (c) twenty to thirty hours, (d) ten to twelve days and finally after approximately forty days.

4. The gamma ray energies tabulation

All the gamma ray energies were determined as described in Reference 30 and for consistency the precise energies quoted by Erdtmann and Soyka⁽³²⁾ have been used.

The tabulation of gamma ray energies (Table 1) given here was prepared as follows: Each target element was considered in turn and two or more punched data cards were prepared for each isotope observed in the spectra of that element. The first card recorded the atomic symbol of the target element, the mass number, symbol and half-life of the first isotope listed on the data sheet for that element and lastly the number of observed gamma rays attributed to that isotope. The energies of these gamma rays were recorded on the subsequent cards. This sequence was repeated for every isotope observed from each of the target elements irradiated.

A computer program was written to read the data and sort the gamma ray energies into ascending order. The sorting routine used (Harwell Subroutine Library routine KB03A) "flagged" each gamma ray thus enabling it's associated isotope and target element information to be identified.

The data presented in Table 1 are the observed gamma ray energies together with the isotopes to which they have been attributed. The half-life of the isotope, and the target element from which it was formed, are also given.

Where it has not been possible to definitely attribute a gamma ray to any particular isotope it has been marked "Not Identified" (N.I.) and no half-life has been quoted; however, an estimate of the half-life of an unidentified gamma ray can often be made by inspection of the spectra in which it appears.

5. The nuclear interferences tabulation

From Table 1 it can be seen that the **same** isotope is often produced from two or more **different** target elements. Nuclear interferences of this type are due to the fact that although the main reactions induced by 40-44 MeV gamma photons are (γ, γ') and (γ, xn) , where $x=1-4$ and the product isotope has the same atomic number as the target, other reactions such as (γ, p) , (γ, np) , (γ, α) , (γ, na) also occur. These produce isotopes of **different** atomic number to the target and give rise to the nuclear interferences described above. It is therefore important to measure the yields of these interfering reactions, relative to that of the reaction used for analysis so that the magnitude of potential inter-element interferences can be assessed.

Table 2 gives a quantitative estimation of the interferences observed in this work, based on their specific activities calculated as in Reference 30, i.e. interferences are expressed as the "apparent concentration" of the element determined in the pure interfering element. Interferences due to γ fission of thorium and uranium are not included.

The quoted mode of production of the nuclide measured is often only one of several possible reactions which could have produced that nuclide under the irradiation conditions used for this study. The **same** nuclide is often produced from **different** stable isotopes of the target element; for example, ⁴⁶Sc can be produced from vanadium by the reactions ⁵¹V(γ, na) and ⁵⁰V(γ, α). However, in this study it was not possible to determine which reaction produced the highest yield of ⁴⁶Sc. Many such alternative modes of production are listed in Parts 1 and 2 but the order in which they are listed is not necessarily that of decreasing contribution to the total measured specific activity.

Purely for comparison purposes, interferences calculated in a similar manner to that used in this work from data presented in a paper by Segebade et.al⁽³³⁾ for elements irradiated with bremsstrahlung of maximum energy 30 MeV are also shown in Table 2. In general the agreement between the results obtained at the two irradiation energies is surprisingly good but three main differences have been observed : (i) Interferences from thermal neutron induced reactions, e.g. ⁵⁵Mn(n, γ) ⁵⁶Mn, are much lower in the Harwell work probably due to the fact that efforts were made in the design of the Harwell irradiation facility to reduce the thermal neutron flux by using air rather than water cooling, (ii) As a result of the higher irradiation energy used at Harwell, the yields of $(\gamma, 2n)$ and (γ, p) reactions are significantly higher, and (iii) Similarly, an increased number of interference reactions, particularly amongst elements of high atomic number, were observed at the higher irradiation energy.

It must be stressed that this work was instigated to assess the extent of interferences induced by the particular irradiation conditions used at Harwell. Although this data may be used in general terms to assess the situation at other irradiation energies and for irradiation facilities of different design, as shown in Table 2, accurate assessment

of nuclear interferences can only be made by irradiation of individual elements under the exact conditions to be used for analysis.

The extent of two other types of nuclear interference (i) The decay of activation products from **different** elements to the **same** active isotope, and (ii) The emission of identical γ rays from different product isotopes, can also be assessed from Tables 1 and 2.

6. General comments

The two tables presented here complete the study of the high energy γ photon activation products of the stable elements and should be used in conjunction with Parts 1 and 2 of this work and an appropriate Chart of the Nuclides⁽³⁴⁾.

It must be emphasised that the prime purpose of this work was to provide **practical** information for use in non-destructive multielement γ photon activation analysis. At Harwell, a procedure involving a **single** long irradiation of samples and standards, followed by activity measurements after the decay times indicated in Section 3, has most commonly been used for this type of work. Hence, very short lived isotopes formed by photon induced reactions have not been studied in detail since, it has been found in practice, that the high yields of short lived ubiquitous nuclides such as ^{11}C and ^{15}O severely reduce the usefulness of nuclides with half-lives shorter than 20 minutes.

This work was summarised in a paper presented at the 5th. Symposium on Recent Developments in Activation Analysis held at St. Catherines College, Oxford on 17-21 July 1978.

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TABLE 1
GAMMA RAYS OBSERVED IN ORDER OF INCREASING ENERGY

Half-life units are abbreviated as follows:

S = seconds

M = minutes

H = hours

D = days

Y = years

Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad	Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad
62.3	49 Cr	41.90 M	Cr	103.2	153 Sm	46.80 H	Sm
67.0	73 Se	7.20 H	Se	103.2	153 Gd	242.00 D	Gd
67.4	61 Co	1.61 H	Ni	103.4	180m Ta	8.15 H	Ta
74.6	161 Tb	6.90 D	Dy	104.0	N.I.		Y
75.0	206 Bi	6.24 D	Bi	104.0	N.I.		Ho
75.7	194 Au	39.50 H	Au	105.3	155 Tb	5.30 D	Dy
75.7	196 Au	6.18 D	Au	105.5	129m Te	33.60 D	Te
78.6	172 Lu	6.70 H	Lu	106.2	167 Yb	17.70 M	Yb
78.6	173 Lu	1.37 Y	Lu	107.7	185 Ta	49.00 M	W
79.8	168 Tm	85.00 D	Tm	107.9	183 Ta	5.00 D	W
80.0	158 Eu	46.00 M	Gd	109.4	140 La	40.27 H	La
80.2	202 Tl	12.00 D	Tl	110.0	169 Yb	31.80 D	Yb
80.6	166 Tm	7.70 H	Tm	111.1	184 Re	38.00 D	Re
80.7	162m Ho	68.00 M	Ho	111.2	184 Ta	8.70 H	W
82.5	203 Hg	46.59 D	Hg	112.0	156 Tb	5.30 D	Tb
82.5	203 Pb	52.10 H	Pb	112.7	172 Lu	6.70 H	Lu
84.2	231 Th	25.52 H	Th	113.0	177 Lu	6.74 D	Hf
84.8	206 Bi	6.24 D	Bi	113.3	167 Yb	17.70 M	Yb
84.9	203 Pb	52.10 H	Pb	113.5	175 Yb	4.21 D	Yb
86.5	155 Tb	5.30 D	Dy	113.7	182 Ta	115.00 D	Ta
86.8	160 Tb	72.10 D	Dy	113.8	175 Hf	70.00 D	Hf
87.8	77 Br	56.00 H	Br	113.9	237 U	6.75 D	U
88.1	109 Pd	13.47 H	Pd	114.3	149 Nd	1.80 H	Nd
89.2	156 Tb	5.30 D	Tb	115.7	107 Rh	21.70 M	Pd
89.6	175 Hf	70.00 D	Hf	116.0	48 Cr	23.00 H	Cr
89.8	152n Eu	96.00 M	Eu	116.0	N.I.		Y
90.0	105 Ag	40.00 D	Cd	117.6	237 U	6.75 D	U
90.6	49 Cr	41.90 M	Cr	118.6	169 Yb	31.80 D	Yb
90.6	49 Cr	41.90 M	Fe	120.5	147 Nd	11.06 D	Nd
90.6	172 Lu	6.70 H	Lu	121.1	75 Se	120.00 D	Se
91.1	147 Nd	11.06 D	Nd	121.8	152m Eu	9.30 H	Eu
91.5	164 Ho	29.00 M	Ho	121.8	152 Eu	12.70 Y	Eu
93.1	180m Ta	8.15 H	Ta	122.1	57 Co	270.00 D	Co
93.3	67 Cu	58.50 H	Zn	122.1	57 Co	270.00 D	Ni
93.3	67 Ga	78.10 H	Ga	122.1	57 Co	270.00 D	Cu
93.6	169 Yb	31.80 D	Yb	122.4	90 Mo	5.67 H	Mo
94.2	83 Sr	33.00 H	Sr	122.6	186 Re	90.00 H	Re
95.0	N.I.		Dy	123.6	173 Hf	23.60 H	Hf
95.5	79 As	9.00 M	Se	123.7	131 Ba	11.50 D	Ba
95.7	159 Eu	18.10 M	Gd	125.4	185 W	74.00 D	W
96.0	N.I.		Hf	126.1	100 Pd	4.00 D	Pd
96.7	75 Se	120.00 D	Se	127.2	101m Rh	4.30 D	Rh
97.0	149 Nd	1.80 H	Nd	127.2	101m Rh	4.30 D	Pd
97.0	190 Ir	11.00 D	Pt	127.3	57 Ni	36.00 H	Ni
97.1	237 U	6.75 D	U	127.4	101 Rh	3.00 Y	Rh
97.5	153 Gd	242.00 D	Gd	127.4	101 Rh	3.00 D	Pd
98.4	148m Pm	43.00 D	Sm	127.4	134m Cs	2.90 H	La
98.9	195m Pt	4.10 D	Pt	129.1	129m Ba	2.13 H	Ba
98.9	195 Ir	2.50 H	Pt	129.4	191 Pt	3.00 D	Pt
98.9	195 Au	183.00 D	Au	129.5	191 Os	15.00 D	Os
99.0	158 Tb	150.00 Y	Tb	129.7	195m Pt	4.10 D	Pt
99.0	183 Ta	5.00 D	W	129.7	195 Ir	2.50 H	Pt
99.3	168 Tm	85.00 D	Tm	129.7	195 Au	183.00 D	Au
100.0	190 Ir	11.00 D	Pt	130.7	169 Yb	31.80 D	Yb
100.1	182 Ta	115.00 D	Ta	131.1	140 La	40.27 H	La
100.1	182 Ta	115.00 D	W	132.0	N.I.		Ca
100.1	182m Re	12.70 H	Re	132.0	167 Yb	17.70 M	Yb
100.6	173 Lu	1.37 Y	Lu	132.6	90 Nb	14.60 H	Nb
101.1	237 U	6.75 D	U	133.5	131 Ba	11.50 D	Ba
103.0	81m Se	57.00 M	Se	133.9	197m Hg	23.80 H	Hg

Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad	Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad
134.2	187 W	24.00 H	W	159.4	47 Sc	3.40 D	V
134.9	173 Hf	23.60 H	Hf	159.7	123m Sn	39.50 M	Sn
135.3	201 Tl	73.50 H	Tl	160.5	155 Tb	5.30 D	Dy
135.9	75 Se	120.00 D	Se	161.2	184 Ta	8.70 H	W
136.4	57 Co	270.00 D	Co	161.2	185 Ta	49.00 M	W
136.4	57 Co	270.00 D	Ni	161.3	183 Ta	5.00 D	W
137.0	N. I.		W	161.6	77m Se	18.10 S	Br
137.2	186 Re	90.00 H	Re	161.8	173 Hf	23.60 H	Hf
137.4	175 Yb	4.21 D	Yb	161.9	77 Br	56.00 H	Br
137.8	190 Ir	11.00 D	Pt	162.1	77 As	38.80 H	Se
138.4	116m In	54.00 M	In	162.1	77 As	38.80 H	Br
139.6	173 Hf	23.60 H	Hf	162.3	183 Re	70.00 D	Re
140.5	99m Tc	6.02 H	Mo	162.3	183 Re	70.00 D	Os
140.5	99m Tc	6.02 H	Ru	162.7	185 Os	94.00 D	Os
140.5	99m Tc	6.02 H	Rh	162.8	155 Tb	5.30 D	Dy
140.5	99m Tc	6.02 H	Th	162.9	90 Mo	5.67 H	Mo
140.5	99m Tc	6.02 H	U	164.5	237 U	6.75 D	U
141.2	90 Nb	14.60 H	Nb	165.8	139 Ba	82.90 M	Th
141.2	90 Nb	14.60 H	Mo	165.8	139 Ba	82.90 M	U
144.1	183 Ta	5.00 D	W	165.9	139 Ce	140.00 D	Ce
144.8	175 Yb	4.21 D	Yb	165.9	139 Ce	140.00 D	Pr
145.0	141 Nd	2.60 H	Nd	165.9	139 Ce	140.00 D	Nd
145.5	141 Ce	32.38 D	Ce	166.0	N. I.		Tb
145.7	34m Cl	32.00 M	Cl	166.7	136 Cs	13.70 D	Ba
145.7	34m Cl	32.00 M	K	167.4	201 Tl	73.50 H	Tl
146.4	159 Eu	18.10 M	Gd	167.7	151 Pm	27.80 H	Sm
147.0	N. I.		Hf	168.0	183 Os	14.00 H	Os
147.1	189 Re	24.00 H	Os	168.8	52 Fe	8.30 H	Fe
148.0	N. I.		Mg	171.3	111 In	2.83 D	In
148.7	155 Tb	5.30 D	Dy	171.3	111 In	2.83 D	Sn
149.0	N. I.		Zr	171.4	173 Lu	1.37 Y	Lu
149.8	131 Te	24.80 M	Th	172.2	191 Pt	3.00 D	Pt
149.8	131 Te	24.80 M	U	172.9	153 Sm	46.80 H	Sm
149.9	189 Re	24.00 H	Os	173.0	153 Gd	242.00 D	Gd
150.6	111m Cd	48.60 M	Cd	173.5	140 La	40.27 H	La
151.3	85m Sr	70.00 M	Sr	173.9	185 Ta	49.00 M	W
152.4	182 Ta	115.00 D	Ta	174.9	151 Gd	120.00 D	Gd
152.4	182 Ta	115.00 D	W	175.3	48 Sc	1.82 D	Ti
152.4	182m Re	12.70 H	Re	176.2	167 Yb	17.70 M	Yb
152.6	49 Cr	41.90 M	Cr	176.8	136 Cs	13.70 D	Ba
152.6	49 Cr	41.90 M	Fe	176.9	129m Ba	2.13 H	Ba
153.0	119m Te	4.68 D	Te	177.0	N. I.		Ca
153.4	136 Cs	13.70 D	Ba	177.6	185 Ta	49.00 M	W
153.7	151 Gd	120.00 D	Gd	177.7	169 Yb	31.80 D	Yb
155.0	188 Re	16.80 H	Os	179.0	191 Pt	3.00 D	Pt
155.0	188 Ir	41.00 H	Ir	179.3	173 Lu	1.37 Y	Lu
155.1	156 Tb	5.30 D	Tb	179.4	182 Ta	115.00 D	Ta
155.4	112m In	20.70 M	In	180.0	101m Rh	4.30 D	Rh
155.5	105 Ag	40.00 D	Cd	180.0	101m Rh	4.30 D	Pd
155.9	149 Nd	1.80 H	Nd	180.1	155 Tb	5.30 D	Dy
156.0	N. I.		Pt	180.6	77 Br	56.00 H	Br
156.4	182 Ta	115.00 D	Ta	180.6	129 Sb	4.32 H	Te
156.8	117m In	1.93 H	Sn	181.1	99 Mo	66.20 H	Mo
158.3	56 Ni	6.10 D	Ni	181.1	134 Te	41.80 M	Th
158.4	117m Sn	14.00 D	Sn	181.1	134 Te	41.80 M	U
158.4	199m Hg	42.60 M	Hg	181.5	73m Se	39.00 M	Se
158.6	117 In	40.00 M	Sn	181.5	172 Lu	6.70 H	Lu
159.0	123m Te	120.00 D	Te	181.9	158 Tb	150.00 Y	Tb
159.4	47 Sc	3.40 D	Ca	182.3	129m Ba	2.13 H	Ba
159.4	47 Sc	3.40 D	Ti	183.7	99m Tc	6.02 H	Mo

Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad	Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad
184.0	206 Bi	6.24 D	Bi	209.0	N. I.		Ta
184.3	168 Tm	85.00 D	Tm	209.9	183 Ta	5.00 D	W
184.4	166 Tm	7.70 H	Tm	210.8	134 Te	41.80 M	Th
184.6	67 Cu	58.50 H	Zn	210.8	134 Te	41.80 M	U
184.6	67 Ga	78.10 H	Ga	211.1	161 Er	3.24 H	Er
185.0	162m Ho	68.00 M	Ho	211.1	161m Ho	6.10 S	Er
185.9	189 Re	24.00 H	Os	211.3	149 Nd	1.80 H	Nd
186.7	190m Os	9.90 M	Os	211.3	195m Ir	3.80 H	Pt
186.7	190 Ir	11.00 D	Ir	211.3	195 Ir	2.50 H	Pt
186.7	190m Os	9.90 M	Ir	212.1	121m Te	154.00 D	Te
186.7	190 Ir	11.00 D	Pt	213.6	178a Ta	2.10 H	Ta
187.7	191 Pt	3.00 D	Pt	214.0	178m Hf	4.30 S	Hf
188.5	185 Ta	49.00 M	W	214.0	178n Lu	23.00 M	Hf
188.8	149 Nd	1.80 H	Nd	214.3	129m Ba	2.13 H	Ba
189.9	114m In	50.00 D	In	215.2	97 Ru	2.88 D	Ru
191.3	197 Pt	18.00 H	Pt	215.3	178m Hf	4.30 S	Hf
191.5	197 Hg	64.10 H	Hg	215.3	178n Lu	23.00 M	Hf
192.6	183 Ta	5.00 D	W	215.3	180m Hf	5.50 H	Ta
196.7	147 Nd	11.06 D	Nd	215.4	84m Rb	20.00 M	Rb
196.9	190 Ir	11.00 D	Ir	215.6	160 Tb	72.10 D	Tb
196.9	190 Ir	11.00 D	Pt	215.6	160 Tb	72.10 D	Dy
197.0	160 Tb	72.10 D	Tb	215.8	166 Tm	7.70 H	Tm
197.0	160 Tb	72.10 D	Dy	216.0	131 Ba	11.50 D	Ba
197.2	120m Sb	5.80 D	Sb	216.0	184 Ta	8.70 H	W
197.8	169 Yb	31.80 D	Yb	216.8	189 Re	24.00 H	Os
197.9	101 Rh	3.00 Y	Rh	219.0	96 Nb	23.35 H	Mo
197.9	101 Rh	3.00 D	Pd	219.4	189 Re	24.00 H	Os
198.0	N. I.		Ca	219.7	191 Pt	3.00 D	Pt
198.0	190 Ir	11.00 D	Ir	220.4	43 K	22.00 H	Ca
198.0	190 Ir	11.00 D	Pt	220.8	129m Ba	2.13 H	Ba
198.3	168 Tm	85.00 D	Tm	221.0	106m Ag	8.50 D	Ag
198.3	182 Ta	115.00 D	Ta	221.5	179m W	6.70 M	W
198.4	75 Se	120.00 D	Se	222.1	182 Ta	115.00 D	Ta
198.9	149 Nd	1.80 H	Nd	222.1	182 Ta	115.00 D	W
199.2	75 Ge	82.20 M	Ge	223.8	190 Ir	11.00 D	Ir
199.2	156 Eu	15.19 D	Gd	226.0	159 Gd	18.00 H	Gd
199.2	156 Tb	5.30 D	Tb	226.5	184 Ta	8.70 H	W
200.4	77 Br	56.00 H	Br	227.0	155 Dy	9.60 H	Dy
201.5	134 Te	41.80 M	Th	228.1	106m Ag	8.50 D	Ag
201.5	134 Te	41.80 M	U	228.2	132 Te	78.00 H	Th
202.3	129m Ba	2.13 H	Ba	228.2	132 Te	78.00 H	U
202.5	90m Y	3.19 H	Zr	229.0	172 Lu	6.70 H	Lu
203.0	N. I.		Te	229.3	182 Ta	115.00 D	Ta
203.1	90 Mo	5.67 H	Mo	229.3	182 Ta	115.00 D	W
203.4	172 Lu	6.70 H	Lu	229.3	182m Re	12.70 H	Re
203.9	95m Tc	61.00 D	Ru	229.5	175 Hf	70.00 D	Hf
205.1	183 Ta	5.00 D	W	230.1	149 Nd	1.80 H	Nd
205.8	192 Ir	74.20 D	Ir	231.4	115 Cd	53.50 H	Cd
206.4	135 Ce	17.00 H	Ce	231.7	85m Sr	70.00 M	Sr
207.0	N. I.		Pt	233.5	172 Lu	6.70 H	Lu
207.8	167 Ho	3.10 H	Er	233.5	173 Lu	1.37 Y	Lu
207.8	167 Tm	9.25 D	Tm	234.0	101m Rh	4.30 D	Rh
207.8	167 Tm	9.25 D	Yb	234.8	69 Ge	39.00 H	Ge
208.0	237 U	6.75 D	U	235.3	190 Ir	11.00 D	Ir
208.2	149 Nd	1.80 H	Nd	235.4	95m Nb	90.00 H	Mo
208.2	199 Au	3.15 D	Hg	236.2	183 Os	14.00 H	Os
208.3	177 Lu	6.74 D	Hf	237.9	167 Ho	3.10 H	Er
208.8	183 Re	70.00 D	Re	238.0	101m Rh	4.30 D	Rh
209.0	67 Cu	58.50 H	Zn	238.6	212 Pb	BGND	
209.0	67 Ga	78.10 H	Ga	238.9	77 Br	56.00 H	Br

Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad	Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad
239.0	77 As	38.80 H	Se	265.3	135 Ce	17.00 H	Ce
239.0	77 As	38.80 H	Br	266.6	140 La	40.27 H	La
239.6	131 Ba	11.50 D	Ba	267.1	93 Y	10.30 H	Zr
240.0	151 Pm	27.80 H	Sm	267.1	93 Y	10.30 H	Th
240.0	N. I.		Hg	267.1	93 Y	10.30 H	U
240.3	149 Nd	1.80 H	Nd	267.7	149 Nd	1.80 H	Nd
241.3	96 Nb	23.35 H	Mo	267.9	191 Pt	3.00 D	Pt
242.0	184 Ta	8.70 H	W	268.1	135m Ba	28.70 H	Ba
242.9	165 Tm	30.10 H	Tm	268.7	191 Pt	3.00 D	Pt
243.0	N. I.		La	269.6	56 Ni	6.10 D	Ni
243.4	62 Zn	9.30 H	Zn	269.7	101 Pd	8.50 H	Pd
243.6	151 Gd	120.00 D	Gd	270.0	172 Lu	6.70 H	Lu
243.7	185 Ta	49.00 M	W	270.3	149 Nd	1.80 H	Nd
244.7	152 Eu	12.70 Y	Eu	270.6	77 Br	56.00 H	Br
244.8	189 Re	24.00 H	Os	270.6	119m Te	4.68 D	Te
244.8	189 Ir	13.30 D	Ir	271.1	155 Dy	9.60 H	Dy
244.8	189 Ir	13.30 D	Pt	271.4	44m Sc	2.44 D	Sc
245.4	111m Cd	48.60 M	Cd	272.1	173 Lu	1.37 Y	Lu
245.4	111 In	2.83 D	In	273.8	136 Cs	13.70 D	Ba
245.4	111 In	2.83 D	Sn	275.2	151 Pm	27.80 H	Sm
245.9	149 Nd	1.80 H	Nd	275.4	147 Nd	11.06 D	Nd
246.1	183 Ta	5.00 D	W	275.9	81 Se	18.60 M	Se
246.1	183 Re	70.00 D	Re	275.9	133m Ba	38.90 H	Ba
247.0	62 Zn	9.30 H	Zn	277.1	149 Eu	93.10 D	Eu
247.1	172 Lu	6.70 H	Lu	277.6	107 Rh	21.70 M	Pd
247.9	84m Rb	20.00 M	Rb	278.1	134 Te	41.80 M	Th
249.4	131 Ba	11.50 D	Ba	278.1	134 Te	41.80 M	U
249.7	77 Br	56.00 H	Br	278.4	129 Te	69.60 M	Te
249.7	77 As	38.80 H	Br	278.9	197m Pt	86.00 M	Pt
249.7	135 Xe	9.14 H	Th	278.9	197m Hg	23.80 H	Hg
249.7	135 Xe	9.14 H	U	278.9	197m Au	7.80 S	Hg
249.8	77 As	38.80 H	Se	279.2	203 Hg	46.59 D	Hg
250.3	39 Cl	56.20 M	K	279.2	203 Pb	52.10 H	Pb
250.7	129 Te	69.60 M	Te	279.3	182m Re	12.70 H	Re
250.9	163 Tb	19.50 M	Dy	279.5	75 Se	120.00 D	Se
251.3	175 Yb	4.21 D	Yb	279.7	172 Lu	6.70 H	Lu
252.5	127 Sb	3.85 D	Te	280.0	N. I.		Dy
252.7	184 Re	38.00 D	Re	280.3	105 Ag	40.00 D	Ag
252.8	184 Ta	8.70 H	W	280.3	105 Ag	40.00 D	Cd
253.9	118m Sb	5.10 H	Sb	281.6	77 Br	56.00 H	Br
254.0	N. I.		Ru	282.0	N. I.		Ca
254.3	73m Se	39.00 M	Se	282.6	175 Yb	4.21 D	Yb
254.6	149 Eu	93.10 D	Eu	282.9	61 Cu	3.41 H	Cu
254.7	139 Pr	4.50 H	Pr	282.9	162m Ho	68.00 M	Ho
255.0	113 Sn	115.00 D	Sn	283.0	110 Sn	4.00 H	Sn
255.0	137m Ce	34.40 H	Ce	285.4	173 Lu	1.37 Y	Lu
257.3	90 Mo	5.67 H	Mo	285.6	163 Tb	19.50 M	Dy
260.0	162 Tb	7.60 M	Dy	285.9	149 Pm	53.10 H	Nd
260.4	62 Zn	9.30 H	Zn	287.1	120m Sb	5.80 D	Sb
260.9	115 Cd	53.50 H	Cd	288.0	148m Pm	43.00 D	Sm
261.1	169 Yb	31.80 D	Yb	289.0	N. I.		Ir
261.8	195m Hg	41.00 H	Hg	290.1	81 Se	18.60 M	Se
262.5	155 Tb	5.30 D	Dy	290.2	83 Sr	33.00 H	Sr
262.6	156 Tb	5.30 D	Tb	290.2	159 Gd	18.00 H	Gd
262.8	206 Bi	6.24 D	Bi	290.3	95 Ru	1.65 H	Ru
264.1	182 Ta	115.00 D	Ta	290.5	127 Sb	3.85 D	Te
264.1	182 Ta	115.00 D	W	291.7	183 Ta	5.00 D	W
264.5	75 Se	120.00 D	Se	291.7	183 Re	70.00 D	Re
264.8	75 Ge	82.20 M	Ge	293.3	143 Ce	33.70 H	Th
264.8	172 Lu	6.70 H	Lu	293.3	143 Ce	33.70 H	U

Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad	Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad
293.6	194 Ir	19.15 H	Pt	317.0	N. I.		Hg
293.6	194 Au	39.50 H	Au	318.0	184 Ta	8.70 H	W
294.6	190 Ir	11.00 D	Ir	318.7	69 Ge	39.00 H	Ge
294.9	103 Ru	39.60 D	Ru	319.0	105 Ag	40.00 D	Ag
295.0	101 Rh	3.00 D	Pd	319.0	105 Cd	56.00 M	Cd
295.9	192 Ir	74.20 D	Ir	319.0	105 Ag	40.00 D	Cd
295.9	192 Ir	74.20 D	Pt	319.0	N. I.		Ba
296.3	101 Pd	8.50 H	Pd	319.2	105 Rh	35.88 H	Pd
296.6	156 Tb	5.30 D	Tb	319.2	105 Rh	35.88 H	U
297.0	173 Hf	23.60 H	Hf	319.4	147 Nd	11.06 D	Nd
297.2	77 Br	56.00 H	Br	319.9	195m Ir	3.80 H	Pt
297.3	165 Tm	30.10 H	Tm	320.1	51 Cr	27.80 D	Cr
297.4	73 Ga	4.80 H	Ge	320.1	51 Cr	27.80 D	Fe
298.5	160 Tb	72.10 D	Tb	320.6	101 Pd	8.50 H	Pd
298.5	160 Tb	72.10 D	Dy	320.8	73m Se	39.00 M	Se
298.6	113 Ag	5.30 H	Cd	321.3	167 Ho	3.10 H	Er
299.9	135 Ce	17.00 H	Ce	323.2	90 Mo	5.67 H	Mo
300.2	67 Cu	58.50 H	Zn	323.9	172 Lu	6.70 H	Lu
300.2	67 Ga	78.10 H	Ga	324.4	97 Ru	2.88 D	Ru
301.0	95 Ru	1.65 H	Ru	325.3	105 Ag	40.00 D	Ag
302.3	138m Pr	2.10 H	Pr	325.6	178m Hf	4.30 S	Hf
302.7	133 Ba	10.70 Y	Ba	325.6	178n Lu	23.00 M	Hf
302.8	107 Rh	21.70 M	Pd	325.7	73 Ga	4.80 H	Ge
303.8	77 Br	56.00 H	Br	325.7	178a Ta	2.10 H	Ta
303.9	75 Se	120.00 D	Se	326.0	101 Rh	3.00 Y	Rh
305.0	105 Ag	40.00 D	Ag	326.0	101 Rh	3.00 D	Pd
305.0	105 Ag	40.00 D	Cd	326.4	157 Dy	8.06 H	Dy
305.6	159 Gd	18.00 H	Gd	326.6	149 Nd	1.80 H	Nd
306.0	48 Cr	23.00 H	Cr	327.7	149 Eu	93.10 D	Eu
306.0	173 Hf	23.60 H	Hf	328.2	140 La	40.27 H	U
306.3	105 Rh	35.88 H	Th	328.5	194 Ir	19.15 H	Pt
306.3	105 Rh	35.88 H	U	328.5	194 Au	39.50 H	Au
306.8	101 Tc	14.00 M	Ru	328.8	140 La	40.27 H	La
306.8	101m Rh	4.30 D	Rh	328.8	140 La	40.27 H	Ce
306.8	101m Rh	4.30 D	Pd	330.4	172 Lu	6.70 H	Lu
306.8	101 Tc	14.00 M	Th	331.1	201 Pb	9.40 H	Pb
306.8	101 Tc	14.00 M	U	331.6	178n Lu	23.00 M	Hf
307.0	N. I.		Ca	331.9	178a Ta	2.10 H	Ta
307.5	169 Yb	31.80 D	Yb	332.0	105 Ag	40.00 D	Ag
307.7	105 Cd	56.00 M	Cd	332.0	105 Ag	40.00 D	Cd
308.4	192 Ir	74.20 D	Ir	332.0	N. I.		W
308.4	192 Ir	74.20 D	Pt	332.2	180m Hf	5.50 H	Ta
309.0	N. I.		Er	332.4	237 U	6.75 D	U
309.5	160 Tb	72.10 D	Tb	333.0	196 Au	6.18 D	Au
309.5	163 Tb	19.50 M	Dy	333.0	196 Au	6.18 D	Hg
311.0	149 Nd	1.80 H	Nd	333.9	150 Pm	2.68 H	Sm
311.0	173 Hf	23.60 H	Hf	333.9	150a Eu	12.80 H	Eu
311.3	109 Pd	13.47 H	Pd	334.1	150b Eu	5.00 Y	Eu
311.5	148m Pm	43.00 D	Sm	336.3	115 Cd	53.50 H	Cd
312.1	133 Te	12.50 M	Th	336.3	115m In	53.50 H	Cd
312.1	133 Te	12.50 M	U	336.3	115m In	4.50 H	In
313.1	183 Ta	5.00 D	W	336.3	115m In	4.50 H	Sn
314.0	N. I.		Sn	336.4	95 Ru	1.65 H	Ru
314.0	128a Sb	10.80 M	Te	338.6	163 Tb	19.50 M	Dy
314.7	161 Er	3.24 H	Er	340.1	151 Pm	27.80 H	Sm
315.3	117m In	1.93 H	Sn	340.6	136 Cs	13.70 D	Ba
316.2	113 Ag	5.30 H	Cd	340.8	155 Tb	5.30 D	Dy
316.3	163 Tb	19.50 M	Dy	342.0	N. I.		Ti
316.5	192 Ir	74.20 D	Ir	342.6	129 Te	69.60 M	Te
316.5	192 Ir	74.20 D	Pt	343.5	206 Bi	6.24 D	Bi

Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad	Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad
343.6	175 Hf	70.00 D	Hf	372.9	61 Cu	3.41 H	Cu
344.0	N.I.		Ta	373.0	157 Eu	15.15 H	Gd
344.2	105 Ag	40.00 D	Ag	373.2	131 Ba	11.50 D	Ba
344.2	105 Ag	40.00 D	Cd	374.1	199m Hg	42.60 M	Hg
344.2	152m Eu	9.30 H	Eu	374.4	192 Ir	74.20 D	Pt
344.3	152 Eu	12.70 Y	Eu	374.7	204m Pb	66.90 M	Pb
346.3	197m Pt	86.00 M	Pt	377.2	53 Fe	8.51 M	Fe
346.5	167 Ho	3.10 H	Er	377.5	172 Lu	6.70 H	Lu
347.1	105 Cd	56.00 M	Cd	379.0	140 La	40.27 H	Ce
347.9	163 Tb	19.50 M	Dy	379.3	73 Ga	4.80 H	Ge
348.2	107 Rh	21.70 M	Pd	380.1	190 Ir	11.00 D	Ir
348.2	159 Gd	18.00 H	Gd	381.0	87m Y	14.00 H	Y
348.4	168 Tm	85.00 D	Tm	381.1	156 Tb	5.30 D	Tb
349.2	149 Nd	1.80 H	Nd	381.5	83 Sr	33.00 H	Sr
350.1	149 Eu	93.10 D	Eu	381.9	107 Rh	21.70 M	Pd
351.1	163 Tb	19.50 M	Dy	382.0	N.I.		Dy
351.2	191 Pt	3.00 D	Pt	382.1	183 Os	14.00 H	Os
353.6	175 Hf	70.00 D	Hf	383.7	133 Ba	10.70 Y	Ba
354.0	183 Ta	5.00 D	W	384.2	184 Ta	8.70 H	W
354.3	163 Tb	19.50 M	Dy	384.7	149 Nd	1.80 H	Nd
355.1	101 Pd	8.50 H	Pd	385.1	77 Br	56.00 H	Br
355.6	57 Ni	36.00 H	Ni	386.2	167 Ho	3.10 H	Er
355.7	196 Au	6.18 D	Au	386.5	163 Tb	19.50 M	Dy
355.7	196 Au	6.18 D	Hg	388.0	N.I.		Pd
355.9	133 Ba	10.70 Y	Ba	388.4	87m Sr	2.81 H	Sr
356.0	83 Se	22.60 M	Th	388.4	87m Sr	2.81 H	Y
356.0	83 Se	22.60 M	U	388.4	87m Sr	2.81 H	Zr
356.5	156 Tb	5.30 D	Tb	388.5	126 I	12.80 D	I
357.6	103 Pd	17.00 D	Pd	388.8	43 K	22.00 H	Ca
358.8	129 Sb	4.32 H	Te	389.2	83 Sr	33.00 H	Sr
359.9	191 Pt	3.00 D	Pt	389.7	163 Tb	19.50 M	Dy
360.0	105 Ag	40.00 D	Cd	390.8	106m Ag	8.50 D	Ag
361.0	N.I.		Ag	391.0	N.I.		Pt
361.1	73 Se	7.20 H	Se	391.6	127 Sb	3.85 D	Te
361.2	190m Os	9.90 M	Os	391.7	113m In	1.66 H	In
361.2	190 Ir	11.00 D	Ir	391.7	113 Sn	115.00 D	Sn
361.2	190m Os	9.90 M	Ir	391.7	113m In	1.66 H	Sn
361.2	192 Ir	74.20 D	Pt	392.4	129m Ba	2.13 H	Ba
363.6	159 Gd	18.00 H	Gd	392.4	160 Tb	72.10 D	Tb
364.0	175 Tm	20.00 M	Yb	392.4	160 Tb	72.10 D	Dy
364.5	131 I	8.06 D	Th	392.5	107 Rh	21.70 M	Pd
364.5	131 I	8.06 D	U	392.5	105 Ag	40.00 D	Cd
364.9	195m Ir	3.80 H	Pt	392.8	88 Zr	85.00 D	Zr
365.6	183 Ta	5.00 D	W	392.8	88 Zr	85.00 D	Mo
366.4	99 Mo	66.20 H	Mo	393.6	62 Zn	9.30 H	Zn
366.6	149 Nd	1.80 H	Nd	393.6	67 Cu	58.50 H	Zn
367.0	94 Ru	51.80 M	Ru	393.6	67 Ga	78.10 H	Ga
367.3	107 Rh	21.70 M	Pd	393.6	73m Se	39.00 M	Se
367.4	155 Tb	5.30 D	Dy	394.4	185 Ta	49.00 M	W
368.0	200 Au	48.40 M	Hg	396.1	175 Yb	4.21 D	Yb
368.0	200 Tl	26.10 H	Tl	396.9	43 K	22.00 H	Ca
370.0	105 Ag	40.00 D	Cd	397.0	190 Ir	11.00 D	Ir
371.0	N.I.		Ag	397.0	190 Ir	11.00 D	Pt
371.1	190 Ir	11.00 D	Ir	397.9	206 Bi	6.24 D	Bi
371.1	190 Ir	11.00 D	Pt	398.2	147 Nd	11.06 D	Nd
371.8	96 Nb	23.35 H	Mo	399.0	173 Tm	8.20 H	Yb
371.9	129 Cs	32.06 H	Ba	399.8	172 Lu	6.70 H	Lu
372.0	43 Sc	3.92 H	Sc	400.7	75 Se	120.00 D	Se
372.5	172 Lu	6.70 H	Lu	401.3	203 Pb	52.10 H	Pb
372.8	43 K	22.00 H	Ca	401.5	105 Ag	40.00 D	Cd

Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad	Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad
401.6	73m Se	39.00 M	Se	432.6	140 La	40.27 H	La
401.9	163 Tb	19.50 M	Dy	432.6	148m Pm	43.00 D	Sm
402.7	105 Ag	40.00 D	Cd	432.6	148 Eu	54.00 D	Eu
403.0	167 Ho	3.10 H	Er	432.8	175 Hf	70.00 D	Hf
403.8	166 Tm	7.70 H	Tm	432.8	190 Ir	11.00 D	Ir
404.3	131 Ba	11.50 D	Ba	432.9	195m Ir	3.80 H	Pt
405.4	134 I	53.00 M	Th	433.1	105 Cd	56.00 M	Cd
405.4	134 I	53.00 M	U	433.4	155 Dy	9.60 H	Dy
405.9	106m Ag	8.50 D	Ag	434.8	163 Tb	19.50 M	Dy
406.1	106m Rh	2.17 H	Pd	434.8	134 Te	41.80 M	Th
406.5	150a Eu	12.80 H	Eu	434.8	134 Te	41.80 M	U
406.6	183 Ta	5.00 D	W	436.2	175 Tm	20.00 M	Yb
407.2	190 Ir	11.00 D	Ir	437.0	N. I.		Ce
407.2	190 Ir	11.00 D	Pt	438.2	83 Sr	33.00 H	Sr
407.9	133 Te	12.50 M	Th	438.9	69m Zn	13.80 H	Zn
407.9	133 Te	12.50 M	U	438.9	69m Zn	13.80 H	Ga
409.0	138 Cs	32.30 M	Th	438.9	69m Zn	13.80 H	Ge
409.0	138 Cs	32.30 M	U	439.2	150b Eu	5.00 Y	Eu
409.4	191 Pt	3.00 D	Pt	439.6	202 Tl	12.00 D	Tl
410.0	147 Nd	11.06 D	Nd	439.6	202 Tl	12.00 D	Pb
410.3	172 Lu	6.70 H	Lu	439.7	77 Br	56.00 H	Br
411.0	157 Eu	15.15 H	Gd	439.8	147 Nd	11.06 D	Nd
411.1	152 Eu	12.70 Y	Eu	442.9	128 I	24.99 M	I
411.3	129 Cs	32.06 H	Ba	443.1	180m Hf	5.50 H	Ta
411.8	127 Sb	3.85 D	Te	443.4	105 Ag	40.00 D	Ag
411.8	198 Au	2.70 D	Au	443.4	105 Ag	40.00 D	Cd
411.8	198 Au	2.70 D	Hg	443.6	149 Nd	1.80 H	Nd
413.0	157 Eu	15.15 H	Gd	443.8	103 Ru	39.60 D	Ru
413.1	184 Ta	8.70 H	W	444.0	N. I.		Ba
413.9	148 Eu	54.00 D	Eu	444.0	N. I.		Hf
414.1	148m Pm	43.00 D	Sm	445.0	127 Sb	3.85 D	Te
414.1	148 Eu	54.00 D	Eu	445.4	90 Mo	5.67 H	Mo
414.4	105 Ag	40.00 D	Cd	445.7	151 Pm	27.80 H	Sm
415.0	N. I.		Hf	446.0	137 Ce	9.00 H	Ce
415.1	163 Tb	19.50 M	Dy	446.2	100 Rh	20.80 H	Rh
416.7	111 In	2.83 D	Sn	446.2	100 Rh	20.80 H	Pd
417.0	116m In	54.00 M	In	447.5	168 Tm	85.00 D	Tm
417.0	116m In	54.00 M	Sn	447.5	190 Ir	11.00 D	Ir
417.9	127 Te	9.35 H	Te	450.6	106m Ag	8.50 D	Ag
418.6	75 Ge	82.20 M	Ge	450.9	106m Rh	2.17 H	Pd
418.6	83 Sr	33.00 H	Sr	453.6	101 Pd	8.50 H	Pd
420.0	N. I.		Cr	454.0	N. I.		Sm
420.2	129m Ba	2.13 H	Ba	456.5	191 Pt	3.00 D	Pt
421.0	N. I.		Ir	457.0	173 Lu	1.37 Y	Lu
421.9	163 Tb	19.50 M	Dy	459.3	166 Tm	7.70 H	Tm
422.1	202m Pb	3.62 H	Pb	459.5	129 Te	69.60 M	Te
422.2	168 Tm	85.00 D	Tm	459.6	129m Ba	2.13 H	Ba
423.5	83 Sr	33.00 H	Sr	460.0	167 Ho	3.10 H	Er
423.6	149 Nd	1.80 H	Nd	460.0	184 Ta	8.70 H	W
424.7	162m Ho	68.00 M	Ho	460.1	96 Nb	23.35 H	Mo
426.0	196 Au	6.18 D	Au	462.4	163 Tb	19.50 M	Dy
426.2	178n Lu	23.00 M	Hf	462.7	138 Cs	32.30 M	Th
427.0	178m Hf	4.30 S	Hf	462.7	138 Cs	32.30 M	U
427.0	178a Ta	2.10 H	Ta	463.0	167 Ho	3.10 H	Er
427.7	163 Tb	19.50 M	Dy	463.7	84m Rb	20.00 M	Rb
429.0	N. I.		W	463.7	84m Rb	20.00 M	Sr
429.3	106m Ag	8.50 D	Ag	464.5	132 Cs	6.59 D	Cs
429.6	106m Rh	2.17 H	Pd	465.0	173 Tm	8.20 H	Yb
432.0	79 As	9.00 M	Se	467.9	162m Ho	68.00 M	Ho
432.5	172 Lu	6.70 H	Lu	468.1	192 Ir	74.20 D	Ir

Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad	Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad
468.1	192 Ir	74.20 D	Pt	511.4	106m Ag	8.50 D	Ag
468.4	148 Eu	54.00 D	Eu	511.6	106 Ag	24.00 M	Ag
468.6	102 Rh	206.00 D	Rh	514.0	85 Sr	64.50 D	Sr
468.7	75 Ge	82.20 M	Ge	514.5	175 Tm	20.00 M	Yb
470.0	182m Re	12.70 H	Re	516.1	206 Bi	6.24 D	Bi
470.4	121 Te	17.00 D	Te	517.1	135 Ce	17.00 H	Ce
473.0	127 Sb	3.85 D	Te	518.4	190 Ir	11.00 D	Ir
473.8	106m Ag	8.50 D	Ag	518.4	190 Ir	11.00 D	Pt
475.0	102m Rh	3.00 Y	Rh	520.3	202 Tl	12.00 D	Tl
475.0	102 Rh	206.00 D	Rh	520.4	83 Rb	83.00 D	Rb
475.0	102 Rh	206.00 D	Pd	520.4	83 Rb	83.00 D	Sr
475.4	163 Tb	19.50 M	Dy	520.9	77 As	38.80 H	Se
477.3	175 Tm	20.00 M	Yb	521.0	77 Br	56.00 H	Br
477.6	7 Be	53.30 D	C	523.3	129 Sb	4.32 H	Te
478.0	190 Ir	11.00 D	Ir	526.5	135 I	6.68 H	Th
478.1	188 Ir	41.00 H	Ir	526.5	135 I	6.68 H	U
479.5	187 W	24.00 H	W	527.9	115 Cd	53.50 H	Cd
480.5	135 La	19.50 H	Ce	528.2	172 Lu	6.70 H	Lu
480.7	56 Ni	6.10 D	Ni	528.5	149 Eu	93.10 D	Eu
481.1	96 Nb	23.35 H	Mo	528.8	194 Au	39.50 H	Au
481.6	129m Ba	2.13 H	Ba	529.4	61 Cu	3.41 H	Cu
482.0	N. I.		Pt	529.7	83 Rb	83.00 D	Rb
482.4	135 Ce	17.00 H	Ce	529.7	83 Rb	83.00 D	Sr
482.5	90m Y	3.19 H	Zr	529.9	133 I	20.30 H	Th
483.0	N. I.		Hf	529.9	133 I	20.30 H	U
484.4	155 Dy	9.60 H	Dy	530.0	201 Au	26.00 M	Hg
484.6	192 Ir	74.20 D	Ir	531.0	147 Nd	11.06 D	Nd
484.6	192 Ir	74.20 D	Pt	531.4	153 Sm	46.80 H	Sm
484.7	87 Y	80.00 H	Y	531.5	167 Tm	9.25 D	Tm
484.8	77 Br	56.00 H	Br	531.5	167 Tm	9.25 D	Yb
484.9	115m Cd	43.00 D	Cd	531.8	129 Te	69.60 M	Te
487.0	N. I.		Ti	532.2	69 Ge	39.00 H	Ge
487.0	140 La	40.27 H	La	533.1	163 Tb	19.50 M	Dy
487.0	140 La	40.27 H	Ce	534.3	156 Tb	5.30 D	Tb
487.0	140 La	40.27 H	Th	536.0	130 Cs	30.00 M	Cs
487.0	140 La	40.27 H	U	537.4	206 Bi	6.24 D	Bi
487.4	129 Te	69.60 M	Te	538.2	81 Se	18.60 M	Se
488.9	47 Ca	4.54 D	Ca	538.9	191 Pt	3.00 D	Pt
489.2	147 Nd	11.06 D	Nd	539.0	N. I.		Hf
490.4	172 Lu	6.70 H	Lu	539.2	184 Re	38.00 D	Re
491.3	126 I	12.80 D	I	539.6	100 Rh	20.80 H	Rh
492.3	115 Cd	53.50 H	Cd	539.6	100 Rh	20.80 H	Pd
494.3	67 Ga	78.10 H	Ga	540.0	184 Ta	8.70 H	W
494.5	163 Tb	19.50 M	Dy	540.2	172 Lu	6.70 H	Lu
496.3	131 Ba	11.50 D	Ba	540.5	149 Nd	1.80 H	Nd
496.9	103 Ru	39.60 D	Ru	541.7	185 Ta	49.00 M	W
496.9	103 Ru	39.60 D	U	543.0	127 Sb	3.85 D	Te
497.2	103 Pd	17.00 D	Pd	543.8	129 Sb	4.32 H	Te
497.2	206 Bi	6.24 D	Bi	545.0	101m Rh	4.30 D	Rh
498.8	155 Dy	9.60 H	Dy	545.0	101m Rh	4.30 D	Pd
501.3	148m Pm	43.00 D	Sm	545.3	163 Tb	19.50 M	Dy
503.0	190m Os	9.90 M	Ir	545.7	78 As	91.00 M	Se
505.7	132 Cs	6.59 D	Cs	546.6	135 I	6.68 H	Th
506.1	149 Eu	93.10 D	Eu	546.6	135 I	6.68 H	U
507.5	121 Te	17.00 D	Te	546.8	129m Ba	2.13 H	Ba
507.5	163 Tb	19.50 M	Dy	546.8	168 Tm	85.00 D	Tm
507.9	97 Zr	17.00 H	U	548.3	62 Zn	9.30 H	Zn
508.2	155 Dy	9.60 H	Dy	549.0	173 Hf	23.60 H	Hf
509.8	202 Tl	12.00 D	Tl	549.3	129 Cs	32.06 H	Ba
511.0	22 Na	2.60 Y	Mg	549.9	155 Dy	9.60 H	Dy

Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad	Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad
550.2	148m Pm	43.00 D	Sm	574.2	140 La	40.27 H	La
550.2	148 Pm	5.40 D	Sm	575.1	77 Br	56.00 H	Br
550.2	148 Eu	54.00 D	Eu	576.5	135 Ce	17.00 H	Ce
551.5	187 W	24.00 H	W	577.8	73m Se	39.00 M	Se
551.6	95 Ru	1.65 H	Ru	579.3	200 Tl	26.10 H	Tl
552.4	81 Se	18.60 M	Se	579.4	77 Br	56.00 H	Br
552.6	83 Rb	83.00 D	Rb	579.8	205 Bi	15.31 D	Bi
552.6	83 Rb	83.00 D	Sr	580.5	185 Ta	49.00 M	W
552.9	117 In	40.00 M	Sn	581.1	159 Gd	18.00 H	Gd
553.0	106 Ag	24.00 M	Ag	582.2	95m Tc	61.00 D	Ru
553.2	148 Eu	54.00 D	Eu	583.1	208 Tl	BGND	
553.3	69 Ge	39.00 H	Ge	583.7	113 Ag	5.30 H	Cd
554.1	129m Ba	2.13 H	Ba	584.0	150b Eu	5.00 Y	Eu
554.3	82 Br	35.40 H	Br	584.0	163 Tb	19.50 M	Dy
554.3	82m Rb	6.40 H	Rb	585.1	195 Hg	9.50 H	Hg
555.0	N. I.		Hf	585.3	106m Ag	8.50 D	Ag
555.6	91 Sr	9.67 H	Th	585.9	77 Br	56.00 H	Br
555.6	91m Y	50.30 M	Th	586.1	130 Cs	30.00 M	Cs
555.6	91 Sr	9.67 H	U	587.8	69 Ge	39.00 H	Ge
555.6	91m Y	50.30 M	U	588.2	100 Rh	20.80 H	Rh
555.8	104m Ag	29.80 M	Ag	588.2	100 Rh	20.80 H	Pd
555.8	104 Ag	67.00 M	Ag	588.5	61 Cu	3.41 H	Cu
555.8	104m Ag	29.80 M	Cd	588.6	192 Ir	74.20 D	Ir
555.8	104 Ag	67.00 M	Cd	588.6	192 Ir	74.20 D	Pt
556.4	149 Nd	1.80 H	Nd	588.7	185 Ta	49.00 M	W
556.5	102 Rh	206.00 D	Rh	590.4	101 Pd	8.50 H	Pd
557.0	103 Ru	39.60 D	Ru	591.4	95 Ru	1.65 H	Ru
557.5	173 Lu	1.37 Y	Lu	592.0	185 Os	94.00 D	Os
557.8	190 Ir	11.00 D	Ir	592.7	161 Er	3.24 H	Er
557.8	190 Ir	11.00 D	Pt	593.7	43 K	22.00 H	Ca
558.3	114m In	50.00 D	In	594.8	147 Nd	11.06 D	Nd
559.1	76 As	26.30 H	As	595.0	166 Tm	7.70 H	Tm
559.1	76 As	26.30 H	Se	595.7	74 As	17.70 D	As
559.6	163 Tb	19.50 M	Dy	595.7	74 As	17.70 D	Se
559.9	159 Gd	18.00 H	Gd	595.7	74 As	17.70 D	Br
560.2	195m Hg	41.00 H	Hg	596.6	62 Zn	9.30 H	Zn
560.9	105 Ag	40.00 D	Cd	596.7	134 Te	41.80 M	Th
561.1	92 Y	3.53 H	Zr	596.7	134 Te	41.80 M	U
563.0	152m Eu	9.30 H	Eu	596.9	129m Ba	2.13 H	Ba
564.1	122 Sb	2.70 D	Sb	599.3	156 Eu	15.19 D	Gd
564.1	122 Sb	2.70 D	Te	599.5	148m Pm	43.00 D	Sm
565.6	134 Te	41.80 M	Th	599.7	195 Hg	9.50 H	Hg
565.6	134 Te	41.80 M	U	600.0	N. I.		Tb
565.9	101 Pd	8.50 H	Pd	600.5	106m Ag	8.50 D	Ag
566.0	81 Se	18.60 M	Se	600.9	72 Ga	14.10 H	Ge
566.1	129m Ba	2.13 H	Ba	601.6	49 Cr	41.90 M	Cr
566.5	77 Br	56.00 H	Br	602.7	124 Sb	60.20 D	Sb
567.0	132 Cs	6.59 D	Cs	602.7	124 Sb	60.20 D	Te
568.9	189 Pt	11.00 H	Pt	602.7	126 I	12.80 D	I
569.0	96 Nb	23.35 H	Mo	604.4	192 Ir	74.20 D	Ir
569.3	190 Ir	11.00 D	Ir	604.4	192 Ir	74.20 D	Pt
569.3	190 Ir	11.00 D	Pt	604.7	134 Cs	2.05 Y	Ba
569.7	207 Bi	30.20 Y	Bi	605.3	190 Ir	11.00 D	Ir
569.7	207m Pb	0.80 S	Bi	605.3	190 Ir	11.00 D	Pt
570.0	97 Ru	2.88 D	Ru	605.7	135 Ce	17.00 H	Ce
571.2	135 Ce	17.00 H	Ce	606.1	112 Ag	3.14 H	Cd
571.9	148 Eu	54.00 D	Eu	606.4	112 In	4.40 M	In
573.1	121 Te	17.00 D	Te	606.6	105 Cd	56.00 M	Cd
573.3	49 Cr	41.90 M	Cr	607.2	172 Lu	6.70 H	Lu
574.0	69 Ge	39.00 H	Ge	607.6	189 Pt	11.00 H	Pt

Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad	Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad
608.4	163 Tb	19.50 M	Dy	638.3	57 Ni	36.00 H	Ni
608.5	74 As	17.70 D	As	639.0	175 Tm	20.00 M	Yb
608.6	135 Xe	9.14 H	Th	639.0	N. I.		Hf
608.6	135 Xe	9.14 H	U	640.4	80 Br	17.60 M	Br
610.2	103 Ru	39.60 D	Ru	641.2	142 La	92.00 M	Th
611.3	148m Pm	43.00 D	Sm	641.2	142 La	92.00 M	U
611.3	148 Eu	54.00 D	Eu	641.4	155 Dy	9.60 H	Dy
612.4	192 Ir	74.20 D	Ir	641.8	184 Re	38.00 D	Re
612.4	192 Ir	74.20 D	Pt	645.0	105 Ag	40.00 D	Ag
613.7	78 As	91.00 M	Se	645.0	105 Ag	40.00 D	Cd
615.9	106m Ag	8.50 D	Ag	645.2	194 Au	39.50 H	Au
615.9	106 Ag	24.00 M	Ag	645.3	194 Ir	19.15 H	Pt
616.0	106m Rh	2.17 H	Pd	645.7	168 Tm	85.00 D	Tm
616.4	190m Os	9.90 M	Ir	645.8	124 Sb	60.20 D	Te
616.6	106 Ag	24.00 M	Ag	646.0	N. I.		Tb
616.8	112 Ag	3.14 H	Cd	646.0	185 Os	94.00 D	Os
617.0	80 Br	17.60 M	Br	646.1	156 Eu	15.19 D	Gd
617.6	43 K	22.00 H	Ca	646.3	106m Ag	8.50 D	Ag
617.7	159 Gd	18.00 H	Gd	647.3	109 Pd	13.47 H	Pd
617.8	75 Ge	82.20 M	Ge	647.8	105 Cd	56.00 M	Cd
618.0	105 Ag	40.00 D	Cd	649.8	81 Se	18.60 M	Se
618.2	112 In	4.40 M	In	651.1	105 Ag	840.00 D	Cd
618.2	187 W	24.00 H	W	652.8	95 Ru	1.65 H	Ru
619.1	82 Br	35.40 H	Br	654.3	129 Sb	4.32 H	Te
619.1	82m Rb	6.40 H	Rb	654.8	149 Nd	1.80 H	Nd
619.1	82m Rb	6.40 H	Sr	655.9	190 Ir	11.00 D	Ir
620.5	206 Bi	6.24 D	Bi	656.0	61 Cu	3.41 H	Cu
621.8	134 Te	41.80 M	Th	656.4	129m Ba	2.13 H	Ba
621.8	134 Te	41.80 M	U	657.0	N. I.		Dy
622.0	194 Au	39.50 H	Au	657.1	76 As	26.30 H	As
622.8	106 Ag	24.00 M	Ag	657.1	76 As	26.30 H	Se
624.1	191 Pt	3.00 D	Pt	657.2	206 Bi	6.24 D	Bi
624.4	129 Te	69.60 M	Te	657.7	110m Ag	250.40 D	Cd
625.4	187 W	24.00 H	W	657.7	110m In	4.90 H	In
626.8	95 Ru	1.65 H	Ru	657.7	110 In	69.10 M	Sn
628.0	102m Rh	3.00 Y	Rh	657.9	97 Nb	72.00 M	Mo
628.0	102 Rh	206.00 D	Rh	658.6	83 Sr	33.00 H	Sr
628.0	102 Rh	206.00 D	Pd	661.4	200 Tl	26.10 H	Tl
628.6	200 Tl	26.10 H	Tl	661.6	137m Ba	2.55 M	Ba
629.8	132 Cs	6.59 D	Cs	661.6	137 Cs	30.00 Y	Th
629.9	72 Ga	14.10 H	re	661.6	137 Cs	30.00 Y	U
629.9	72 As	26.00 H	Se	661.6	137 Cs	BGND	
629.9	148m Pm	43.00 D	Sm	663.0	77 Br	56.00 H	Br
629.9	148 Eu	54.00 D	Eu	663.6	49 Cr	41.90 M	Cr
630.1	163 Tb	19.50 M	Dy	664.4	135 Ce	17.00 H	Ce
630.8	190 Ir	11.00 D	Ir	664.5	155 Dy	9.60 H	Dy
631.1	102m Rh	3.00 Y	Rh	664.9	159 Eu	18.10 M	Gd
631.7	168 Tm	85.00 D	Tm	665.7	80 Br	17.60 M	Br
632.3	206 Bi	6.24 D	Bi	665.8	76 As	26.30 H	Se
633.0	188 Re	16.80 H	Os	666.2	126 I	12.80 D	I
633.0	N. I.		Pt	667.6	171 Lu	8.30 D	Lu
633.1	188 Ir	41.00 H	Ir	667.7	132 Cs	6.59 D	Cs
633.5	129 Sb	4.32 H	Te	667.7	132 Cs	6.59 D	Ba
634.8	74 As	17.70 D	As	667.7	132 I	2.28 H	Th
634.8	74 As	17.70 D	Se	667.7	132 I	2.28 H	U
634.8	74 As	17.70 D	Br	667.8	132 Te	78.00 H	Th
636.2	173 Lu	1.37 Y	Lu	667.8	132 Te	78.00 H	U
636.4	109 Pd	13.47 H	Pd	668.9	163 Tb	19.50 M	Dy
636.8	102 Rh	206.00 D	Rh	669.6	63 Zn	38.40 M	Zn
636.9	131 I	8.06 D	U	670.0	107 Rh	21.70 M	Pd

Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad	Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad
672.4	113 Ag	5.30 H	Cd	721.4	189 Pt	11.00 H	Pt
672.9	166 Tm	7.70 H	Tm	722.3	98 Nb	51.00 M	Mo
672.9	166 Tm	7.70 H	Yb	722.8	124 Sb	60.20 D	Sb
674.0	105 Ag	40.00 D	Ag	722.8	124 Sb	60.20 D	Te
674.0	105 Ag	40.00 D	Cd	722.8	124 I	4.17 D	I
675.6	166 Tm	7.70 H	Tm	723.0	N.I.		Tb
676.6	159 Eu	18.10 M	Gd	723.3	156 Eu	15.19 D	Gd
677.0	N.I.		Te	723.8	101 Pd	8.50 H	Pd
677.3	134 Te	41.80 M	Th	724.2	95 Zr	65.50 D	Zr
677.3	134 Te	41.80 M	U	724.2	95 Zr	65.50 D	Th
678.9	129m Ba	2.13 H	Ba	724.2	95 Zr	65.50 D	U
679.8	106m Ag	8.50 D	Ag	725.2	114m In	50.00 D	In
680.5	203 Pb	52.10 H	Pb	725.7	148m Pm	43.00 D	Sm
680.6	102 Rh	206.00 D	Rh	726.4	190 Ir	11.00 D	Ir
680.9	113 Ag	5.30 H	Cd	727.0	105 Ag	40.00 D	Cd
681.7	90m Y	3.19 H	Zr	729.6	129m Te	33.60 D	Te
681.9	159 Eu	18.10 M	Gd	730.6	168 Tm	85.00 D	Tm
682.0	N.I.		V	733.0	N.I.		Tb
682.2	160 Tb	72.10 D	Tb	733.0	163 Tb	19.50 M	Dy
683.0	N.I.		Lu	735.0	95 Ru	1.65 H	Ru
683.5	129 Sb	4.32 H	Te	736.8	83 Sr	33.00 H	Sr
684.9	195m Ir	3.80 H	Pt	739.0	73 Ga	4.80 H	Ge
685.5	127 Sb	3.85 D	Te	739.5	102 Rh	206.00 D	Rh
685.7	187 W	24.00 H	W	739.7	99 Mo	66.20 H	Mo
685.9	147 Nd	11.06 D	Nd	739.7	99 Mo	66.20 H	Th
686.3	156 Tb	5.30 D	Tb	739.7	99 Mo	66.20 H	U
688.7	196 Au	6.18 D	Au	739.8	171 Lu	8.30 D	Lu
689.4	129m Ba	2.13 H	Ba	740.4	150a Eu	12.80 H	Eu
690.0	190 Ir	11.00 D	Ir	740.6	104 Ag	67.00 M	Ag
692.4	166 Tm	7.70 H	Tm	741.1	129 Te	69.60 M	Te
692.4	166 Tm	7.70 H	Yb	741.3	168 Tm	85.00 D	Tm
692.8	122 Sb	2.70 D	Sb	742.0	143 Pm	265.00 D	Sm
694.2	112 Ag	3.14 H	Cd	743.2	128a Sb	10.80 M	Te
694.9	78 As	91.00 M	Se	743.4	97 Zr	17.00 H	Th
696.0	129m Te	33.60 D	Te	743.4	97 Zr	17.00 H	U
697.1	102m Rh	3.00 Y	Rh	744.0	105 Ag	40.00 D	Cd
697.3	172 Lu	6.70 H	Lu	744.2	52 Mn	5.60 D	Mn
698.4	82 Br	35.40 H	Br	744.2	52 Mn	5.60 D	Fe
700.6	129m Ba	2.13 H	Ba	744.3	159 Eu	18.10 M	Gd
701.6	200 Tl	26.10 H	Tl	748.0	N.I.		Hf
702.6	94 Tc	4.88 H	Ru	748.2	106m Rh	2.17 H	Pd
703.1	106m Ag	8.50 D	Ag	748.2	106m Ag	8.50 D	Ag
704.3	80 Br	17.60 M	Br	748.3	168 Tm	85.00 D	Tm
705.0	N.I.		Ir	748.5	95 Ru	1.65 H	Ru
706.3	166 Tm	7.70 H	Tm	748.5	100 Rh	20.80 H	Rh
706.3	166 Tm	7.70 H	Yb	748.6	129m Ba	2.13 H	Ba
707.5	163 Tb	19.50 M	Dy	749.8	91 Sr	9.67 H	Th
709.3	104 Cd	58.00 M	Cd	749.8	91 Sr	9.67 H	U
710.0	N.I.		Lu	750.6	56 Ni	6.10 D	Ni
711.0	N.I.		Sn	751.8	140 La	40.27 H	La
711.0	N.I.		Au	753.8	126 I	12.80 D	I
712.0	N.I.		Se	753.9	128a Sb	10.80 M	Te
712.2	129m Ba	2.13 H	Ba	756.0	77 Br	56.00 H	Br
715.0	N.I.		Dy	756.0	N.I.		Ru
716.2	106m Ag	8.50 D	Ag	756.0	N.I.		Ir
717.0	173 Hf	23.60 H	Hf	756.7	95 Zr	65.50 D	Zr
717.1	106m Rh	2.17 H	Pd	756.7	95 Zr	65.50 D	Th
717.2	185 Os	94.00 D	Os	756.7	95 Zr	65.50 D	U
719.6	45 Ti	3.08 H	Ti	756.8	28 Al	2.31 M	Si
720.3	168 Tm	85.00 D	Tm	758.6	104 Ag	67.00 M	Ag

Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad	Element	Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad	Element
759.0	166 Tm	7.70 H	Tm	Tm	794.7	67 Ga	78.10 H	Ga	Ga
759.1	196 Au	6.18 D	Au	Au	795.0	132 Cs	6.59 D	Cs	Cs
760.8	129 Sb	4.32 H	Te	Te	795.8	134 Cs	2.05 Y	Ba	Ba
761.7	111 Sn	35.00 M	Sn	Sn	802.2	129m Te	33.60 D	Te	Te
762.5	83 Sr	33.00 H	Sr	Sr	802.5	129m Ba	2.13 H	Ba	Ba
763.0	69 Ge	39.00 H	Ge	Ge	803.0	206 Bi	6.24 D	Bi	Bi
763.9	110m Ag	250.40 D	Cd	Cd	803.7	106m Ag	8.50 D	Ag	Ag
765.2	160 Tb	72.10 D	Tb	Tb	804.0	106m Rh	2.17 H	Pd	Pd
765.2	160 Tb	72.10 D	Dy	Dy	804.7	159 Eu	18.10 M	Gd	Gd
765.8	95 Nb	35.00 D	Zr	Zr	806.3	95 Ru	1.65 H	Ru	Ru
765.8	95 Nb	35.00 D	Mo	Mo	807.0	162 Tb	7.60 M	Dy	Dy
765.8	95 Tc	20.00 H	Ru	Ru	807.0	N.I.		W	W
766.7	134 Te	41.80 M	Th	Th	807.8	47 Ca	4.54 D	Ca	Ca
766.7	134 Te	41.80 M	U	U	807.8	105 Ag	40.00 D	Ag	Ag
766.8	102m Rh	3.00 Y	Rh	Rh	807.8	105 Ag	40.00 D	Cd	Cd
767.4	104 Ag	67.00 M	Ag	Ag	810.0	184 Ta	8.70 H	W	W
767.4	104 Ag	67.00 M	Cd	Cd	810.1	172 Lu	6.70 H	Lu	Lu
767.9	73 Ga	4.80 H	Ge	Ge	810.2	72 Ga	14.10 H	Ge	Ge
768.5	190 Ir	11.00 D	Ir	Ir	810.2	96 Nb	23.35 H	Mo	Mo
769.7	184 Re	38.00 D	Re	Re	810.6	58 Co	71.30 D	Co	Co
772.4	132 Cs	6.59 D	Cs	Cs	810.6	58 Co	71.30 D	Cu	Cu
772.8	187 W	24.00 H	W	W	811.0	N.I.		Tb	Tb
773.1	129 Sb	4.32 H	Te	Te	811.1	175 Tm	20.00 M	Yb	Yb
776.5	82 Br	35.40 H	Br	Br	811.7	156 Eu	15.19 D	Gd	Gd
776.8	82m Rb	6.40 H	Rb	Rb	812.2	56 Ni	6.10 D	Ni	Ni
776.8	82m Rb	6.40 H	Sr	Sr	812.6	129 Sb	4.32 H	Te	Te
778.0	N.I.		Ge	Ge	812.8	96 Tc	4.35 D	Ru	Ru
778.0	N.I.		Yb	Yb	814.1	88 Y	107.00 D	Y	Y
778.2	99 Mo	66.20 H	Th	Th	814.1	88 Y	107.00 D	Zr	Zr
778.2	99 Mo	66.20 H	U	U	815.8	140 La	40.27 H	La	La
778.3	96 Tc	4.35 D	Ru	Ru	815.8	140 La	40.27 H	Ce	Ce
778.4	83 Sr	33.00 H	Sr	Sr	815.8	140 La	40.27 H	Th	Th
778.4	96 Nb	23.35 H	Mo	Mo	815.8	140 La	40.27 H	U	U
778.9	152 Eu	12.70 Y	Eu	Eu	816.0	168 Tm	85.00 D	Tm	Tm
779.8	195 Hg	9.50 H	Hg	Hg	816.8	61 Cu	3.41 H	Cu	Cu
780.0	166 Tm	7.70 H	Tm	Tm	817.2	129m Te	33.60 D	Te	Te
780.2	156 Tb	5.30 D	Tb	Tb	818.0	116m In	54.00 M	In	In
780.2	158 Tb	150.00 Y	Tb	Tb	818.0	110 In	69.10 M	Sn	Sn
780.6	129m Ba	2.13 H	Ba	Ba	818.0	136m Ba	0.32 S	Ba	Ba
781.4	109 Pd	13.47 H	Pd	Pd	818.5	77 Br	56.00 H	Br	Br
782.0	N.I.		In	In	818.5	136 Cs	13.70 D	Ba	Ba
782.8	135 Ce	17.00 H	Ce	Ce	818.6	83 Sr	33.00 H	Sr	Sr
783.8	127 Sb	3.85 D	Te	Te	818.8	116m In	54.00 M	Sn	Sn
785.0	192 Ir	74.20 D	Ir	Ir	819.0	95 Ru	1.65 H	Ru	Ru
785.0	N.I.		Pt	Pt	820.6	95m Tc	61.00 D	Ru	Ru
785.7	104 Ag	67.00 M	Ag	Ag	821.1	168 Tm	85.00 D	Tm	Tm
785.7	104 Ag	67.00 M	Cd	Cd	822.5	100 Rh	20.80 H	Rh	Rh
786.2	95m Tc	61.00 D	Ru	Ru	822.5	100 Rh	20.80 H	Pd	Pd
786.5	72 Ga	14.10 H	Ge	Ge	823.1	99 Mo	66.20 H	Mo	Mo
787.0	N.I.		La	La	824.4	106m Ag	8.50 D	Ag	Ag
787.1	166 Tm	7.70 H	Tm	Tm	825.1	77 Br	56.00 H	Br	Br
787.2	98 Nb	51.00 M	Mo	Mo	826.6	161 Er	3.24 H	Er	Er
788.0	69 Ge	39.00 H	Ge	Ge	827.5	135 Ce	17.00 H	Ce	Ce
789.0	138m Pr	2.10 H	Fr	Fr	828.0	78 As	91.00 M	Se	Se
789.2	56 Mn	2.58 H	Mn	Mn	828.3	200 Tl	26.10 H	Tl	Tl
789.2	56 Mn	2.58 H	Fe	Fe	829.0	190 Ir	11.00 D	Ir	Ir
792.0	184 Re	38.00 D	Re	Re	829.0	190 Ir	11.00 D	Pt	Pt
792.4	106m Ag	8.50 D	Ag	Ag	829.9	168 Tm	85.00 D	Tm	Tm
793.0	184 Ta	8.70 H	W	W	830.0	188 Ir	41.00 H	Ir	Ir
793.9	61 Cu	3.41 H	Cu	Cu	831.8	150a Eu	12.80 H	Eu	Eu

Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad	Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad
831.9	150 Pm	2.68 H	Sm	878.5	79 As	9.00 M	Se
833.4	129 Te	69.60 M	Te	879.3	160 Tb	72.10 D	Tb
833.4	163 Tb	19.50 M	Dy	879.3	160 Tb	72.10 D	Dy
833.5	129m Te	33.60 D	Te	879.8	126 I	12.80 D	I
833.6	129m Ba	2.13 H	Ba	880.0	N.I.		Br
833.9	72 Ga	14.10 H	Ge	880.3	185 Os	94.00 D	Os
834.0	72 As	26.00 H	As	880.5	N.I.		Mo
834.0	72 As	26.00 H	Se	881.0	206 Bi	6.24 D	Bi
834.8	27 Mg	9.48 M	Al	881.3	101 Pd	8.50 H	Pd
834.8	54 Mn	312.50 D	Mn	881.5	84 Rb	33.00 D	Rb
834.8	54 Mn	312.50 D	Fe	881.5	84 Rb	33.00 D	Sr
834.8	54 Mn	312.50 D	Co	882.0	162 Tb	7.60 M	Dy
835.1	95m Tc	61.00 D	Ru	883.0	N.I.		Se
836.9	135 I	6.68 H	Th	884.0	113 Ag	5.30 H	Cd
836.9	135 I	6.68 H	U	884.1	134 I	53.00 M	Th
839.2	190 Ir	11.00 D	Ir	884.1	134 I	53.00 M	U
841.0	61 Cu	3.41 H	Cu	884.5	192 Ir	74.20 D	Ir
841.6	152m Eu	9.30 H	Eu	884.7	110m Ag	250.40 D	Cd
842.1	95 Ru	1.65 H	Ru	884.7	110m In	4.90 H	In
843.8	27 Mg	9.48 M	Si	886.2	200 Tl	26.10 H	Tl
844.9	129m Te	33.60 D	Te	888.0	67 Ga	78.10 H	Ga
846.0	N.I.		La	888.0	162 Tb	7.60 M	Dy
846.6	56 Mn	2.58 H	Mn	888.3	78 As	91.00 M	Se
846.6	56 Mn	2.58 H	Fe	889.3	46 Sc	83.90 D	Ti
846.6	56 Mn	2.58 H	Co	889.3	46 Sc	83.90 D	V
846.8	56 Co	77.30 D	Co	890.0	94 Ru	51.80 M	Ru
846.8	56 Co	77.30 D	Ni	891.1	155 Dy	9.60 H	Dy
847.0	134 I	53.00 M	Th	892.7	129m Ba	2.13 H	Ba
847.0	134 I	53.00 M	U	894.0	130 Cs	30.00 M	Cs
847.3	106m Ag	8.50 D	Ag	894.2	175 Tm	20.00 M	Yb
849.7	94 Tc	4.88 H	Ru	894.7	184 Re	38.00 D	Re
850.2	96 Nb	23.35 H	Mo	894.9	182m Re	12.70 H	Re
850.3	96 Tc	4.35 D	Ru	894.9	142 La	92.00 M	Th
851.1	112 Ag	3.14 H	Cd	894.9	142 La	92.00 M	U
853.7	101 Pd	8.50 H	Pd	895.0	184 Ta	8.70 H	W
857.3	134 I	53.00 M	U	895.0	206 Bi	6.24 D	Bi
857.7	104 Ag	67.00 M	Ag	897.6	57 Ni	36.00 H	Ni
857.7	104 Ag	67.00 M	Cd	898.0	88 Y	107.00 D	Y
857.7	175 Tm	20.00 M	Yb	898.0	88 Y	107.00 D	Zr
863.1	104 Ag	67.00 M	Ag	898.0	N.I.		Gd
863.6	58 Co	71.30 D	Co	898.0	173 Hf	23.60 H	Hf
863.6	58 Co	71.30 D	Cu	898.9	204m Pb	66.90 M	Pb
864.8	161 Er	3.24 H	Er	899.0	158 Eu	46.00 M	Gd
865.0	N.I.		Gd	900.7	172 Lu	6.70 H	Lu
866.6	57 Ni	36.00 H	Ni	902.0	N.I.		In
867.4	152 Eu	12.70 Y	Eu	903.0	61 Cu	3.41 H	Cu
867.9	140 La	40.27 H	La	903.0	N.I.		Ta
870.0	148 Eu	54.00 D	Eu	903.2	184 Re	38.00 D	Re
870.5	135 Ce	17.00 H	Ce	904.0	184 Ta	8.70 H	W
870.9	94m Tc	52.00 M	Ru	904.9	135 Ce	17.00 H	Ce
870.9	94 Tc	4.88 H	Ru	905.0	N.I.		Ir
872.0	69 Ge	39.00 H	Ge	905.2	155 Dy	9.60 H	Dy
872.0	184 Ta	8.70 H	W	906.8	57 Ni	36.00 H	Ni
872.5	129m Ba	2.13 H	Ba	907.5	83 Sr	33.00 H	Sr
873.4	106 Ag	24.00 M	Ag	907.7	201 Pb	9.40 H	Pb
874.8	185 Os	94.00 D	Os	908.0	104 Ag	67.00 M	Ag
875.5	133 I	20.30 H	Th	908.6	61 Cu	3.41 H	Cu
875.5	133 I	20.30 H	U	909.0	96 Nb	23.35 H	Mo
876.0	129 Sb	4.32 H	Te	909.1	89 Zr	78.40 H	Zr
877.0	166 Tm	7.70 H	Tm	911.4	204m Pb	66.90 M	Pb

Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad	Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad
912.0	148 Pm	5.40 D	Sm	957.3	129m Ba	2.13 H	Ba
912.1	172 Tm	3.60 H	Yb	960.0	N.I.		Ru
912.1	172 Lu	6.70 H	Lu	960.0	202 Tl	12.00 D	Tl
912.9	92m Nb	10.16 D	Nb	960.7	202m Pb	3.62 H	Pb
913.0	133m Te	50.00 M	Th	961.0	99 Mo	66.20 H	Mo
913.0	133m Te	50.00 M	U	961.1	105 Cd	56.00 M	Cd
914.7	129 Sb	4.32 H	Te	961.9	63 Zn	38.40 M	Zn
914.7	133m Te	50.00 M	Th	962.2	158 Tb	150.00 Y	Tb
914.7	133m Te	50.00 M	U	962.5	160 Tb	72.10 D	Tb
914.9	168 Tm	85.00 D	Tm	962.5	160 Tb	72.10 D	Dy
915.2	148m Pm	43.00 D	Sm	963.0	105 Ag	40.00 D	Ag
915.2	148 Eu	54.00 D	Eu	963.0	105 Ag	40.00 D	Cd
919.6	140 La	40.27 H	La	963.5	152m Eu	9.30 H	Eu
920.0	N.I.		Ir	964.0	152 Eu	12.70 Y	Eu
921.0	N.I.		Mo	965.0	185 Ta	49.00 M	W
921.7	150a Eu	12.80 H	Eu	966.2	160 Tb	72.10 D	Dy
922.2	184 Ta	8.70 H	W	966.6	129 Sb	4.32 H	Te
923.2	104 Ag	67.00 M	Ag	970.0	N.I.		Re
923.2	104 Ag	67.00 M	Cd	970.3	152m Eu	9.30 H	Eu
924.0	127 Sb	3.85 D	Te	972.3	135 I	6.68 H	U
925.3	140 La	40.27 H	La	976.0	N.I.		Ir
925.9	104 Ag	67.00 M	Ag	978.0	158 Eu	46.00 M	Gd
925.9	104 Ag	67.00 M	Cd	982.1	175 Tm	20.00 M	Yb
926.0	156 Tb	5.30 D	Tb	982.4	129 Te	69.60 M	Te
926.0	190 Ir	11.00 D	Ir	983.3	48 Sc	1.82 D	Ti
928.6	155 Dy	9.60 H	Dy	983.5	48 V	16.10 D	V
929.1	172 Lu	6.70 H	Lu	983.5	48 Sc	1.82 D	V
930.5	148 Eu	54.00 D	Eu	983.5	48 V	16.10 D	Cr
930.8	195 Hg	9.50 H	Hg	989.8	43 K	22.00 H	Ca
931.0	N.I.		Sr	990.0	95 Ru	1.65 H	Ru
931.7	161 Er	3.24 H	Er	992.0	N.I.		Lu
933.4	129m Ba	2.13 H	Ba	992.8	101 Pd	8.50 H	Pd
934.0	N.I.		Ta	993.2	185 Ta	49.00 M	W
934.1	115m Cd	43.00 D	Cd	994.2	83 Sr	33.00 H	Sr
934.5	92 Y	3.53 H	Zr	998.7	113 Ag	5.30 H	Cd
934.5	92m Nb	10.16 D	Nb	999.5	155 Dy	9.60 H	Dy
934.5	92m Nb	10.16 D	Mo	999.7	129m Ba	2.13 H	Ba
934.5	92 Y	3.53 H	Th	1001.5	44m Sc	2.44 D	Sc
934.5	92 Y	3.53 H	U	1002.8	172 Lu	6.70 H	Lu
935.5	129m Ba	2.13 H	Ba	1005.7	77 Br	56.00 H	Br
935.6	52 Mn	5.60 D	Mn	1005.8	184 Re	38.00 D	Re
935.6	52 Mn	5.60 D	Fe	1009.7	138 Cs	32.30 M	Th
937.2	162m Ho	68.00 M	Ho	1009.7	138 Cs	32.30 M	U
937.5	110m Ag	250.40 D	Cd	1010.6	95 Ru	1.65 H	Ru
937.5	110m In	4.90 H	In	1013.8	148m Pm	43.00 D	Sm
938.8	194 Au	39.50 H	Au	1014.2	166 Tm	7.70 H	Tm
939.4	129 Sb	4.32 H	Te	1014.4	27 Mg	9.48 M	Al
940.9	175 Tm	20.00 M	Yb	1014.4	27 Mg	9.48 M	Si
941.5	90 Mo	5.67 H	Mo	1015.9	84 Rb	33.00 D	Rb
941.6	104 Ag	67.00 M	Ag	1018.6	206 Bi	6.24 D	Bi
941.6	104 Ag	67.00 M	Cd	1019.3	106m Ag	8.50 D	Ag
944.3	48 V	16.10 D	Cr	1021.4	43 K	22.00 H	Ca
946.0	158 Eu	46.00 M	Gd	1022.3	172 Lu	6.70 H	Lu
946.0	201 Pb	9.40 H	Pb	1022.6	184 Re	38.00 D	Re
946.8	93 Y	10.30 H	Th	1023.1	120m Sb	5.80 D	Sb
946.8	93 Y	10.30 H	U	1024.3	91 Sr	9.67 H	Th
947.8	95 Tc	20.00 H	Ru	1024.3	91 Sr	9.67 H	U
948.2	194 Au	39.50 H	Au	1024.5	97 Nb	72.00 M	Mo
949.3	156 Tb	5.30 D	Tb	1030.4	129 Sb	4.32 H	Te
954.0	175 Tm	20.00 M	Yb	1031.4	132 Cs	6.59 D	Cs

Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad	Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad
1031.7	166 Tm	7.70 H	Tm	1084.0	129 Te	69.60 M	Te
1032.0	61 Cu	3.41 H	Cu	1085.2	140 La	40.27 H	La
1034.0	N. I.		Hf	1085.8	152 Eu	12.70 Y	Eu
1034.1	148 Eu	54.00 D	Eu	1087.0	N. I.		Ir
1034.3	100 Rh	20.80 H	Rh	1088.7	105 Ag	40.00 D	Ag
1035.1	129m Ba	2.13 H	Ba	1088.7	105 Ag	40.00 D	Cd
1035.7	190 Ir	11.00 D	Ir	1089.8	155 Dy	9.60 H	Dy
1037.0	173 Hf	23.60 H	Hf	1090.0	152 Eu	12.70 Y	Eu
1037.4	48 Sc	1.82 D	Ti	1090.6	56 Mn	2.58 H	Mn
1037.4	48 Sc	1.82 D	V	1090.6	56 Mn	2.58 H	Fe
1037.8	56 Co	77.30 D	Ni	1091.3	196 Au	6.18 D	Au
1037.9	156 Tb	5.30 D	Tb	1091.5	96 Nb	23.35 H	Mo
1038.2	138m Pr	2.10 H	Pr	1093.6	172 Lu	6.70 H	Lu
1038.8	135 I	6.68 H	Th	1093.7	172 Tm	3.60 H	Yb
1038.8	135 I	6.68 H	U	1094.8	159 Eu	18.10 M	Gd
1039.3	95m Tc	61.00 D	Ru	1096.8	95 Ru	1.65 H	Ru
1040.6	156 Tb	5.30 D	Tb	1097.1	116m In	54.00 M	In
1040.9	172 Lu	6.70 H	Lu	1097.1	116m In	54.00 M	Sn
1043.7	83 Sr	33.00 H	Sr	1098.0	83 Sr	33.00 H	Sr
1044.0	82 Br	35.40 H	Br	1098.2	206 Bi	6.24 D	Bi
1044.1	82m Rb	6.40 H	Rb	1101.0	61 Cu	3.41 H	Cu
1044.7	129m Ba	2.13 H	Ba	1102.1	121m Te	154.00 D	Te
1045.1	106m Ag	8.50 D	Ag	1102.1	183m Os	10.00 H	Os
1045.7	106m Rh	2.17 H	Pd	1102.8	160 Tb	72.10 D	Tb
1046.6	102m Rh	3.00 Y	Rh	1103.4	102 Rh	206.00 D	Rh
1047.6	129m Ba	2.13 H	Ba	1104.1	194 Au	39.50 H	Au
1048.1	136 Cs	13.70 D	Ba	1104.5	129 Sb	4.32 H	Te
1049.8	106 Ag	24.00 M	Ag	1106.5	34m Cl	32.00 M	Cl
1050.0	136m Ba	0.32 S	Ba	1106.5	69 Ge	39.00 H	Ge
1050.7	72 Ga	14.10 H	Ge	1106.5	74 As	17.70 D	As
1050.7	95 Ru	1.65 H	Ru	1107.1	100 Rh	20.80 H	Rh
1050.8	118m Sb	5.10 H	Sb	1107.1	100 Rh	20.80 H	Pd
1051.8	69 Ge	39.00 H	Ge	1108.0	158 Eu	46.00 M	Gd
1053.7	83 Sr	33.00 H	Sr	1108.0	183m Os	10.00 H	Os
1058.2	166 Tm	7.70 H	Tm	1111.0	184 Ta	8.70 H	W
1058.7	185 Ta	49.00 M	W	1111.0	195 Hg	9.50 H	Hg
1062.0	192 Ir	74.20 D	Ir	1111.8	129m Te	33.60 D	Te
1063.6	207 Bi	30.20 Y	Bi	1111.8	129 Te	69.60 M	Te
1063.6	207m Pb	0.80 S	Bi	1112.1	152 Eu	12.70 Y	Eu
1064.5	95 Ru	1.65 H	Ru	1112.7	102m Rh	3.00 Y	Rh
1065.0	N. I.		Ge	1112.9	120m Sb	5.80 D	Sb
1065.1	156 Eu	15.19 D	Gd	1113.2	172 Lu	6.70 H	Lu
1065.3	61 Cu	3.41 H	Cu	1115.5	65 Zn	243.80 D	Zn
1065.3	156 Tb	5.30 D	Tb	1117.5	61 Cu	3.41 H	Cu
1071.1	105 Cd	56.00 M	Cd	1120.1	95 Ru	1.65 H	Ru
1072.5	134 I	53.00 M	Th	1120.5	46 Sc	83.90 D	Ti
1072.5	134 I	53.00 M	U	1120.5	46 Sc	83.90 D	V
1074.1	95 Tc	20.00 H	Ru	1120.6	106m Ag	8.50 D	Ag
1074.5	61 Cu	3.41 H	Cu	1121.2	182 Ta	115.00 D	Ta
1075.9	84 Rb	33.00 D	Rb	1121.2	182 Ta	115.00 D	W
1076.0	N. I.		Ir	1121.3	182m Re	12.70 H	Re
1076.6	86 Y	14.60 H	Y	1122.4	129m Ba	2.13 H	Ba
1077.4	68 Ga	68.30 M	Ga	1122.4	156 Tb	5.30 D	Tb
1077.4	68 Ga	68.30 M	Ge	1124.0	N. I.		Ir
1078.1	73m Se	39.00 M	Se	1124.0	135 I	6.68 H	Th
1078.7	86 Rb	18.60 D	Rb	1124.0	135 I	6.68 H	U
1078.8	86 Rb	18.60 D	Sr	1125.9	110 In	69.10 M	Sn
1078.9	156 Eu	15.19 D	Gd	1126.8	141 Nd	2.60 H	Nd
1080.8	172 Lu	6.70 H	Lu	1127.2	44m Sc	2.44 D	Sc
1084.0	129m Te	33.60 D	Te	1127.2	96 Tc	4.35 D	Ru

Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad	Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad
1127.3	106m Ag	8.50 D	Ag	1178.7	95 Ru	1.65 H	Ru
1127.8	106m Rh	2.17 H	Pd	1179.6	72 Ga	14.10 H	Ge
1127.8	106 Ag	24.00 M	Ag	1183.1	135 Ce	17.00 H	Ce
1128.2	122 Sb	2.70 D	Sb	1184.3	172 Lu	6.70 H	Lu
1129.1	90 Nb	14.60 H	Nb	1186.0	61 Cu	3.41 H	Cu
1129.1	90 Nb	14.60 H	Mo	1187.2	156 Tb	5.30 D	Tb
1131.6	135 I	6.68 H	Th	1188.0	158 Eu	46.00 M	Gd
1131.6	135 I	6.68 H	U	1189.0	182 Ta	115.00 D	Ta
1132.5	61 Cu	3.41 H	Cu	1189.0	182 Ta	115.00 D	W
1133.6	190 Ir	11.00 D	Ir	1189.0	182m Re	12.70 H	Re
1135.0	N. I.		Ge	1194.0	N. I.		Ag
1135.8	132 Cs	6.59 D	Cs	1194.8	113 Ag	5.30 H	Cd
1140.6	122 Sb	2.70 D	Sb	1199.0	106m Ag	8.50 D	Ag
1141.4	127 Sb	3.85 D	Te	1199.1	106m Rh	2.17 H	Pd
1144.8	38 K	7.71 M	K	1199.9	160 Tb	72.10 D	Tb
1146.9	148 Eu	54.00 D	Eu	1199.9	160 Tb	72.10 D	Dy
1147.1	141 Nd	2.60 H	Nd	1199.9	190 Ir	11.00 D	Ir
1147.3	83 Sr	33.00 H	Sr	1200.5	96 Nb	23.35 H	Mo
1150.9	194 Au	39.50 H	Au	1202.0	83 Sr	33.00 H	Sr
1152.0	N. I.		Si	1202.0	101 Pd	8.50 H	Pd
1152.2	160 Tb	72.10 D	Tb	1204.0	173 Hf	23.60 H	Hf
1152.5	111 Sn	35.00 M	Sn	1204.3	74 As	17.70 D	As
1153.3	156 Eu	15.19 D	Gd	1204.4	166 Tm	7.70 H	Tm
1153.6	166 Tm	7.70 H	Tm	1204.9	91 Y	58.51 D	Nb
1153.9	156 Eu	15.19 D	Gd	1205.0	N. I.		Mo
1154.2	156 Tb	5.30 D	Tb	1205.7	200 Tl	26.10 H	Tl
1155.3	155 Dy	9.60 H	Dy	1206.3	69 Ge	39.00 H	Ge
1157.0	44m Sc	2.44 D	Sc	1209.2	129m Ba	2.13 H	Ba
1157.0	44 Sc	3.92 H	Sc	1210.0	188 Ir	41.00 H	Ir
1157.0	44 Sc	3.92 H	Ti	1212.4	48 Sc	1.82 D	Ti
1157.4	182m Re	12.70 H	Re	1212.6	119m Te	4.68 D	Te
1158.1	102 Rh	206.00 D	Rh	1213.0	76 As	26.30 H	As
1158.4	95 Ru	1.65 H	Ru	1214.8	83 Sr	33.00 H	Sr
1159.0	N. I.		Ba	1216.3	76 As	26.30 H	As
1159.1	156 Tb	5.30 D	Tb	1216.3	76 As	26.30 H	Se
1160.0	83 Sr	33.00 H	Sr	1217.4	166 Tm	7.70 H	Tm
1163.0	N. I.		Ir	1218.3	101 Pd	8.50 H	Pd
1164.0	90 Nb	14.60 H	Nb	1218.9	194 Au	39.50 H	Au
1164.6	129m Ba	2.13 H	Ba	1220.0	120m Sb	5.80 D	Sb
1165.7	150a Eu	12.80 H	Eu	1220.0	162m Ho	68.00 M	Ho
1165.8	150 Pm	2.68 H	Sm	1221.3	182 Ta	115.00 D	Ta
1166.5	155 Dy	9.60 H	Dy	1221.3	182 Ta	115.00 D	W
1167.0	61 Cu	3.41 H	Cu	1221.4	182m Re	12.70 H	Re
1171.3	120m Sb	5.80 D	Sb	1221.8	129m Ba	2.13 H	Ba
1172.4	195 Hg	9.50 H	Hg	1222.5	106m Ag	8.50 D	Ag
1173.0	184 Ta	8.70 H	W	1222.8	106m Rh	2.17 H	Pd
1173.2	60 Co	5.26 Y	Co	1223.0	150a Eu	12.80 H	Eu
1173.2	60 Co	5.26 Y	Ni	1225.5	200 Tl	26.10 H	Tl
1173.2	60 Co	5.26 Y	Cu	1225.9	200 Au	48.40 M	Hg
1173.2	60 Co	BGND		1228.6	76 As	26.30 H	As
1175.0	178 Lu	30.00 M	Hf	1228.6	76 As	26.30 H	Se
1175.4	194 Au	39.50 H	Au	1229.5	118m Sb	5.10 H	Sb
1177.0	N. I.		Te	1229.5	118 Sb	3.50 M	Sb
1177.4	34m Cl	32.00 M	Cl	1230.0	182 Ta	115.00 D	W
1177.4	34m Cl	32.00 M	K	1230.7	156 Eu	15.19 D	Gd
1177.6	101 Pd	8.50 H	Pd	1230.7	156 Tb	5.30 D	Tb
1177.8	166 Tm	7.70 H	Tm	1230.9	182 Ta	115.00 D	Ta
1177.8	166 Tm	7.70 H	Yb	1231.0	182m Re	12.70 H	Re
1178.0	160 Tb	72.10 D	Tb	1233.3	129 Te	69.60 M	Te
1178.0	160 Tb	72.10 D	Dy	1235.4	136 Cs	13.70 D	Ba

Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad	Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad
1236.7	166 Tm	7.70 H	Tm	1300.0	N.I.		Tm
1237.6	83 Sr	33.00 H	Sr	1300.2	56 Mn	2.58 H	Mn
1238.2	56 Co	77.30 D	Ni	1300.2	114m In	50.00 D	In
1240.1	78 As	91.00 M	Se	1300.2	114 In	72.00 S	In
1241.8	174 Lu	3.60 Y	Lu	1301.8	105 Cd	56.00 M	Cd
1242.4	156 Eu	15.19 D	Gd	1303.0	95 Ru	1.65 H	Ru
1242.5	156 Tb	5.30 D	Tb	1308.4	78 As	91.00 M	Se
1250.8	129m Ba	2.13 H	Ba	1311.3	101 Pd	8.50 H	Pd
1250.8	155 Dy	9.60 H	Dy	1311.6	48 V	16.10 D	Cr
1252.6	112 In	4.40 M	In	1311.6	105 Cd	56.00 M	Cd
1256.7	80 Br	17.60 M	Br	1311.7	48 Sc	1.82 D	Ti
1256.8	122 Sb	2.70 D	Sb	1311.7	48 V	16.10 D	V
1257.5	182m Re	12.70 H	Re	1311.7	48 Sc	1.82 D	V
1260.0	N.I.		Ag	1312.2	160 Tb	72.10 D	Tb
1260.5	135 I	6.68 H	Th	1312.2	160 Tb	72.10 D	Dy
1260.5	135 I	6.68 H	U	1313.0	178 Lu	30.00 M	Hf
1260.8	129 Te	69.60 M	Te	1315.0	152m Eu	9.30 H	Eu
1261.0	120m Sb	5.80 D	Sb	1317.2	82m Rb	6.40 H	Rb
1261.1	129 Sb	4.32 H	Te	1317.4	82 Br	35.40 H	Br
1261.7	95 Ru	1.65 H	Ru	1317.7	132 Cs	6.59 D	Cs
1262.0	N.I.		I	1319.6	162m Ho	68.00 M	Ho
1263.1	200 Au	48.40 M	Hg	1320.0	139 Pr	4.50 H	Pr
1264.4	129 Te	69.60 M	Te	1321.6	58 Co	71.30 D	Co
1266.6	156 Tb	5.30 D	Tb	1321.6	58 Co	71.30 D	Cu
1267.0	N.I.		V	1323.9	190 Ir	11.00 D	Ir
1267.4	39 Cl	56.20 M	K	1324.5	150 Pm	2.68 H	Sm
1267.8	28 Al	2.31 M	Si	1324.6	83 Sr	33.00 H	Sr
1270.5	90 Nb	14.60 H	Nb	1325.1	88 Y	107.00 D	Y
1271.3	90 Mo	5.67 H	Mo	1325.1	88 Y	107.00 D	Zr
1271.9	160 Tb	72.10 D	Tb	1325.5	124 I	4.17 D	I
1271.9	160 Tb	72.10 D	Dy	1326.9	129 Sb	4.32 H	Te
1272.0	178 Lu	30.00 M	Hf	1332.5	60 Co	5.26 Y	Co
1273.0	29 Al	6.60 M	Si	1332.5	60 Co	5.26 Y	Ni
1273.5	200 Tl	26.10 H	Tl	1332.5	60 Co	5.26 Y	Cu
1273.6	204m Pb	66.90 M	Pb	1332.5	60 Co	BGND	
1273.7	182m Re	12.70 H	Re	1334.5	156 Tb	5.30 D	Tb
1274.5	22 Na	2.60 Y	Na	1336.2	69 Ge	39.00 H	Ge
1274.5	22 Na	2.60 Y	Mg	1336.4	92m Nb	10.16 D	Nb
1275.1	184 Re	38.00 D	Re	1336.7	155 Dy	9.60 H	Dy
1275.3	166 Tm	7.70 H	Tm	1339.8	95 Ru	1.65 H	Ru
1275.3	166 Tm	7.70 H	Yb	1341.2	104m Ag	29.80 M	Ag
1277.0	N.I.		Tb	1341.2	104 Ag	67.00 M	Ag
1277.4	168 Tm	85.00 D	Tm	1341.6	100 Rh	20.80 H	Rh
1277.5	156 Eu	15.19 D	Gd	1341.6	100 Rh	20.80 H	Pd
1280.8	129 Sb	4.32 H	Te	1344.6	148 Eu	54.00 D	Eu
1284.0	114m In	50.00 D	In	1345.8	64 Cu	12.80 H	Cu
1286.1	204m Pb	66.90 M	Pb	1347.0	N.I.		Tm
1289.0	101 Pd	8.50 H	Pd	1347.0	178 Lu	30.00 M	Hf
1289.3	182m Re	12.70 H	Re	1347.4	139 Pr	4.50 H	Pr
1289.9	115m Cd	43.00 D	Cd	1349.5	69 Ge	39.00 H	Ge
1291.0	127 Sb	3.85 D	Te	1351.7	95 Ru	1.65 H	Ru
1292.8	141 Nd	2.60 H	Nd	1354.1	100 Rh	20.80 H	Rh
1293.4	116m In	54.00 M	In	1354.1	100 Rh	20.80 H	Pd
1293.4	116m In	54.00 M	Sn	1354.7	95 Ru	1.65 H	Ru
1296.0	83 Sr	33.00 H	Sr	1355.0	N.I.		Ce
1296.8	47 Ca	4.54 D	Ca	1355.0	190 Ir	11.00 D	Ir
1297.0	90 Nb	14.60 H	Nb	1362.0	N.I.		Cr
1297.0	90 Nb	14.60 H	Mo	1362.1	100 Rh	20.80 H	Rh
1298.4	133 I	20.30 H	U	1362.1	102 Rh	206.00 D	Rh
1298.7	141 Nd	2.60 H	Nd	1362.1	100 Rh	20.80 H	Pd

Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad	Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad
1362.9	200 Tl	26.10 H	Tl	1459.2	95 Ru	1.65 H	Ru
1366.5	156 Eu	15.19 D	Gd	1459.3	129m Ba	2.13 H	Ba
1367.6	155 Dy	9.60 H	Dy	1460.5	148 Eu	54.00 D	Eu
1368.0	120m Sb	5.80 D	Sb	1460.8	40 K	BGND	
1368.6	24 Na	15.00 H	Na	1461.7	168 Tm	85.00 D	Tm
1368.6	24 Na	15.00 H	Mg	1464.0	72 Ga	14.10 H	Ge
1368.6	24 Na	15.00 H	Al	1465.1	148 Pm	5.40 D	Sm
1369.0	N.I.		Ba	1466.1	172 Tm	3.60 H	Yb
1372.8	162m Ho	68.00 M	Ho	1466.1	172 Lu	6.70 H	Lu
1373.4	78 As	91.00 M	Se	1468.2	112 Ag	3.14 H	Cd
1374.9	166 Tm	7.70 H	Tm	1469.1	194 Au	39.50 H	Au
1375.7	139 Pr	4.50 H	Pr	1470.5	172 Lu	6.70 H	Lu
1376.3	124 I	4.17 D	I	1474.8	82m Rb	6.40 H	Rb
1377.0	175 Tm	20.00 M	Yb	1475.7	110 In	69.10 M	Sn
1377.6	57 Ni	36.00 H	Ni	1477.2	93m Mo	6.95 H	Mo
1381.8	78 As	91.00 M	Se	1480.7	129 Sb	4.32 H	Te
1383.9	92 Sr	2.71 H	Th	1485.7	72 Ga	14.10 H	Ge
1383.9	92 Sr	2.71 H	U	1487.0	69 Ge	39.00 H	Ge
1384.2	110m Ag	250.40 D	Cd	1489.0	172 Lu	6.70 H	Lu
1386.4	184 Re	38.00 D	Re	1497.7	96 Nb	23.35 H	Mo
1387.0	112 Ag	3.14 H	Cd	1499.0	57 Ni	36.00 H	Ni
1387.2	172 Lu	6.70 H	Lu	1499.6	44 Sc	3.92 H	Sc
1387.3	172 Tm	3.60 H	Yb	1499.6	44 Sc	3.92 H	Ti
1387.4	90 Mo	5.67 H	Mo	1505.0	110m Ag	250.40 D	Cd
1387.9	105 Cd	56.00 M	Cd	1506.6	166 Tm	7.70 H	Tm
1388.9	152m Eu	9.30 H	Eu	1507.7	116m In	54.00 M	In
1389.0	N.I.		Ba	1507.7	116m In	54.00 M	Sn
1391.2	84 Rb	33.00 D	Rb	1509.5	124 I	4.17 D	I
1394.5	106m Ag	8.50 D	Ag	1514.9	200 Tl	26.10 H	Tl
1402.9	172 Lu	6.70 H	Lu	1515.0	N.I.		Cr
1404.0	29 Al	6.60 M	Si	1517.0	N.I.		I
1405.0	69 Ge	39.00 H	Ge	1517.4	39 Cl	56.20 M	K
1405.0	206 Bi	6.24 D	Bi	1522.0	94m Tc	52.00 M	Ru
1405.4	92 Y	3.53 H	U	1524.7	42 K	12.36 H	Ca
1407.0	178 Lu	30.00 M	Hf	1525.0	175 Tm	20.00 M	Yb
1407.6	200 Tl	26.10 H	Tl	1525.6	69 Ge	39.00 H	Ge
1407.9	152 Eu	12.70 Y	Eu	1526.0	129 Sb	4.32 H	Te
1408.1	45 Ti	3.08 H	Ti	1527.4	106m Rh	2.17 H	Pd
1408.6	57 Ni	36.00 H	Ni	1528.5	106m Ag	8.50 D	Ag
1411.0	95 Ru	1.65 H	Ru	1529.9	172 Tm	3.60 H	Yb
1411.9	63 Zn	38.40 M	Zn	1530.2	78 As	91.00 M	Se
1412.0	152m Eu	9.30 H	Eu	1538.1	112 Ag	3.14 H	Cd
1413.0	N.I.		Te	1541.6	95 Ru	1.65 H	Ru
1415.0	105 Cd	56.00 M	Cd	1541.6	111 Sn	35.00 M	Sn
1415.2	129 Sb	4.32 H	Te	1542.9	172 Lu	6.70 H	Lu
1420.0	126 I	12.80 D	I	1543.6	64 Cu	12.80 H	Cu
1421.7	156 Tb	5.30 D	Tb	1553.4	100 Rh	20.80 H	Rh
1433.5	95 Ru	1.65 H	Ru	1553.4	100 Rh	20.80 H	Pd
1434.3	52 Mn	5.60 D	Mn	1557.0	N.I.		Ag
1434.3	52 Mn	5.60 D	Fe	1557.4	105 Cd	56.00 M	Cd
1435.0	105 Cd	56.00 M	Cd	1562.2	95 Ru	1.65 H	Ru
1435.7	138 Cs	32.30 M	Th	1562.5	56 Ni	6.10 D	Ni
1435.7	138 Cs	32.30 M	U	1562.5	83 Sr	33.00 H	Sr
1436.0	N.I.		Cr	1563.6	139 Pr	4.50 H	Pr
1438.0	N.I.		Se	1564.9	106m Ag	8.50 D	Ag
1440.5	172 Lu	6.70 H	Lu	1570.1	129 Sb	4.32 H	Te
1446.7	64 Cu	12.80 H	Cu	1570.6	200 Tl	26.10 H	Tl
1454.5	90 Mo	5.67 H	Mo	1571.0	N.I.		Cr
1457.6	135 I	6.68 H	Th	1572.0	106m Ag	8.50 D	Ag
1457.6	135 I	6.68 H	U	1572.1	106m Rh	2.17 H	Pd

Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad	Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad
1573.0	69 Ge	39.00 H	Ge	1706.8	130 Cs	30.00 M	Cs
1575.0	N.I.		Ir	1713.0	89 Zr	78.40 H	Zr
1576.0	N.I.		Sm	1714.0	N.I.		Se
1576.6	56 Co	77.30 D	Ni	1717.0	188 Ir	41.00 H	Ir
1584.2	172 Lu	6.70 H	Lu	1718.7	206 Bi	6.24 D	Bi
1592.7	194 Au	39.50 H	Au	1721.9	106m Ag	8.50 D	Ag
1595.3	206 Bi	6.24 D	Bi	1722.0	106m Rh	2.17 H	Pd
1596.2	140 La	40.27 H	La	1724.4	172 Lu	6.70 H	Lu
1596.2	140 La	40.27 H	Ce	1730.4	64 Cu	12.80 H	Cu
1596.2	140 La	40.27 H	Th	1732.1	24 Na	15.00 H	Na
1596.2	140 La	40.27 H	U	1732.1	24 Na	15.00 H	Mg
1596.6	139 Pr	4.50 H	Pr	1732.1	24 Na	15.00 H	Al
1596.8	72 Ga	14.10 H	Ge	1738.1	129 Sb	4.32 H	Te
1599.9	129 Sb	4.32 H	Te	1744.4	89 Zr	78.40 H	Zr
1604.5	200 Tl	26.10 H	Tl	1750.0	N.I.		Te
1608.0	N.I.		Pd	1753.0	116m In	54.00 M	In
1608.6	172 Tm	3.60 H	Yb	1757.6	57 Ni	36.00 H	Ni
1609.4	111 Sn	35.00 M	Sn	1764.3	205 Bi	15.31 D	Bi
1610.0	129m Ba	2.13 H	Ba	1770.2	207 Bi	30.20 Y	Bi
1612.0	90 Nb	14.60 H	Nb	1771.5	56 Co	77.30 D	Ni
1612.0	90 Nb	14.60 H	Mo	1778.8	28 Al	2.31 M	Si
1613.2	112 Ag	3.14 H	Cd	1780.0	104m Ag	29.80 M	Ag
1614.6	130 Cs	30.00 M	Cs	1780.0	104 Ag	67.00 M	Ag
1617.5	34m Cl	32.00 M	Cl	1785.4	95 Ru	1.65 H	Ru
1620.6	89 Zr	78.40 H	Zr	1785.5	22 Na	2.60 Y	Na
1621.5	148 Eu	54.00 D	Eu	1788.0	76 As	26.30 H	As
1622.0	172 Lu	6.70 H	Lu	1791.4	135 I	6.68 H	Th
1623.8	129m Ba	2.13 H	Ba	1791.4	135 I	6.68 H	U
1625.4	104 Ag	67.00 M	Ag	1792.7	78 As	91.00 M	Se
1627.5	100 Rh	20.80 H	Rh	1794.0	N.I.		Ag
1629.0	N.I.		Ag	1798.2	112 Ag	3.14 H	Cd
1629.4	150a Eu	12.80 H	Eu	1805.4	129m Ba	2.13 H	Ba
1630.6	139 Pr	4.50 H	Pr	1808.0	90 Nb	14.60 H	Nb
1638.0	N.I.		Pd	1808.0	90 Nb	14.60 H	Mo
1641.2	129m Ba	2.13 H	Ba	1811.2	56 Mn	2.58 H	Mn
1646.2	156 Tb	5.30 D	Tb	1811.2	56 Mn	2.58 H	Fe
1655.8	38 K	7.71 M	K	1811.2	56 Mn	2.58 H	Co
1655.9	129 Sb	4.32 H	Te	1812.0	N.I.		Pb
1656.9	89 Zr	78.40 H	Zr	1813.0	172 Lu	6.70 H	Lu
1660.9	45 Ti	3.08 H	Ti	1814.0	95 Ru	1.65 H	Ru
1662.9	64 Cu	12.80 H	Cu	1815.3	156 Tb	5.30 D	Tb
1664.6	105 Cd	56.00 M	Cd	1830.4	129m Ba	2.13 H	Ba
1665.1	155 Dy	9.60 H	Dy	1832.0	N.I.		Ru
1668.0	44 Sc	3.92 H	Sc	1832.0	N.I.		Dy
1668.0	44 Sc	3.92 H	Ti	1835.0	N.I.		Gd
1670.2	172 Lu	6.70 H	Lu	1836.1	88 Y	107.00 D	Y
1674.8	58 Co	71.30 D	Co	1836.1	88 Y	107.00 D	Zr
1674.8	58 Co	71.30 D	Cu	1836.1	88 Y	107.00 D	Nb
1678.3	135 I	6.68 H	Th	1836.1	88 Y	107.00 D	Mo
1680.8	72 Ga	14.10 H	Ge	1836.7	78 As	91.00 M	Se
1687.3	130 Cs	30.00 M	Cs	1838.2	106m Rh	2.17 H	Pd
1689.4	76 As	26.30 H	As	1838.3	106m Ag	8.50 D	Ag
1691.0	124 Sb	60.20 D	Sb	1844.5	206 Bi	6.24 D	Bi
1691.0	124 Sb	60.20 D	Te	1845.5	156 Tb	5.30 D	Tb
1691.0	124 I	4.17 D	I	1847.4	92m Nb	10.16 D	Nb
1692.0	N.I.		Ru	1855.0	N.I.		Ru
1692.9	105 Cd	56.00 M	Cd	1861.1	72 Ga	14.10 H	Ge
1698.0	N.I.		Ru	1861.7	205 Bi	15.31 D	Bi
1706.7	135 I	6.68 H	Th	1865.1	100 Rh	20.80 H	Rh
1706.7	135 I	6.68 H	U	1867.9	166 Tm	7.70 H	Tm

Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad	Gamma Energy (keV)	Emitting Nuclide	Half Life	Element Irrad
1868.8	94m Tc	52.00 M	Ru	1913.8	111 Sn	35.00 M	Sn
1869.0	N.I.		Nb	1919.6	57 Ni	36.00 H	Ni
1877.0	156 Eu	15.19 D	Gd	1924.0	69 Ge	39.00 H	Ge
1877.0	N.I.		Tb	1924.1	194 Au	39.50 H	Au
1879.0	206 Bi	6.24 D	Bi	1929.7	100 Rh	20.80 H	Rh
1883.7	68 Ga	68.30 M	Ga	1929.7	100 Rh	20.80 H	Pd
1885.9	194 Au	39.50 H	Au	1931.1	95 Ru	1.65 H	Ru
1887.0	194 Au	39.50 H	Au	1937.8	156 Eu	15.19 D	Gd
1892.0	69 Ge	39.00 H	Ge	1963.0	150a Eu	12.80 H	Eu
1895.1	166 Tm	7.70 H	Tm	1966.0	156 Eu	15.19 D	Gd
1896.5	57 Ni	36.00 H	Ni	1967.0	N.I.		Tb
1897.0	84 Rb	33.00 D	Rb				

TABLE 2
NUCLEAR INTERFERENCES OBSERVED

Element Determined	Nuclide Measured	Mode of Production	Specific Activity c ksec ⁻¹ μg ⁻¹	Apparent Concentration (%) due to Interfering element	
				This Work (40-44 MeV)	Reference 33 (30 MeV)
Na	²² Na	²³ Na (γ, n)	0.07	100.0	100.0
		²⁴ Mg (γ, np)	0.003	4.30	0.40
		²⁷ Al (γ, na)	-	-	0.10
Mg	²⁴ Na	²⁵ Mg (γ, p)	10.49	100.0	100.0
		²³ Na (n, γ)	0.32	3.05	4.20
		²⁷ Al (n, α)	0.13	1.25	0.50
Al	²⁷ Mg	²⁷ Al (n, p)	9.47	100.0	-
		²⁹ Si (γ, 2p)	1.36	14.35	-
Cl	^{34m} Cl	³⁵ Cl (γ, n)	1173	100.0	100.0
		³⁹ K (γ, na)	27.2	2.30	0.10
K	³⁸ K	³⁹ K (γ, n)	121	100.0	100.0
		⁴⁰ Ca (γ, np)	6.3	5.20	1.10
Sc	⁴⁴ Sc	⁴⁵ Sc (γ, n)	925	100.0	100.0
		⁴⁶ Ti (γ, np)	3.47	0.38	2x10 ⁻⁴
Sc	^{44m} Sc	⁴⁵ Sc (γ, n)	75	100.0	100.0
		⁴⁶ Ti (γ, np)	0.089	0.10	1x10 ⁻⁴
Ti	⁴⁶ Sc	⁴⁷ Ti (γ, p)	0.18	100.0	100.0
		⁴⁵ Sc (n, γ)	0.012	6.65	37.70
		⁵¹ V (γ, na)	0.003	1.65	0.40
Ti	⁴⁷ Sc	⁴⁸ Ti (γ, p)	133	100.0	100.0
		⁴⁸ Ca (γ, n), β ⁻	0.30 ⁽¹⁾	0.25	-
		⁵¹ V (γ, α)	4.2	3.15	4.60
Ti	⁴⁸ Sc	⁴⁹ Ti (γ, p)	1.75	100.0	-
		⁵¹ V (γ, α)	0.002	0.10	-
Cr	⁴⁸ V	⁵⁰ Cr (γ, np)	0.026	100.0	100.0
		⁵⁰ V (γ, 2n)	0.004	15.40	11.85
Cr	⁴⁹ Cr	⁵⁰ Cr (γ, n)	285.3	100.0	100.0
		⁵⁴ Fe (γ, na)	0.439	0.15	0.10
Cr	⁵¹ Cr	⁵² Cr (γ, n)	3.27	100.0	100.0
		⁵⁶ Fe (γ, na)	0.005	0.15	4x10 ⁻⁴
Fe	⁵² Mn	⁵⁴ Fe (γ, 2n), EC, β ⁺	0.009	100.0	-
		⁵⁵ Mn (γ, 3n)	0.0006	6.70	-
Mn	⁵⁴ Mn	⁵⁵ Mn (γ, n)	1.43	100.0	100.0
		⁵⁶ Fe (γ, np)	0.033	2.30	1.40
		⁵⁹ Co (γ, na)	0.003	0.20	0.30
Fe	⁵⁶ Mn	⁵⁷ Fe (γ, p)	13.3	100.0	100.0
		⁵⁵ Mn (n, γ)	6.4	48.10	192.5
		⁵⁹ Co (n, α)	0.13	1.00	-

Element Determined	Nuclide Measured	Mode of Production	Specific Activity c ksec ⁻¹ μg ⁻¹	Apparent Concentration (%) due to Interfering element	
				This Work (40-44 MeV)	Reference 33 (30 MeV)
Ni	⁵⁶ Co	⁵⁸ Ni (γ, 2n), β ⁺	0.0357	100.0	-
		⁵⁹ Co (γ, 3n)	0.0017	4.75	-
Ni	⁵⁷ Co	⁵⁸ Ni (γ, p) *	14.85	100.0	100.0
		⁵⁹ Co (γ, 2n)	1.268	8.55	5.95
		⁶³ Cu (γ, 2na)	0.0034	0.003	-
Co	⁵⁸ Co	⁵⁹ Co (γ, n)	5.18	100.0	100.0
		⁶⁰ Ni (γ, np)	0.063	1.20	2.65
		⁶³ Cu (γ, na)	0.017	0.35	0.10
Ni	⁶⁰ Co	⁶¹ Ni (γ, p)	0.010	100.0	100.0
		⁵⁹ Co (n, γ)	0.007	70.0	71.4
		⁶⁵ Cu (γ, na)	0.0001	1.00	0.70
Cu	⁶⁴ Cu	⁶⁵ Cu (γ, n)	0.986	100.0	100.0
		⁶⁶ Zn (γ, np)	0.168	1.70	0.80
		⁶⁹ Ga (γ, na)	0.0096	0.95	0.30
Zn	⁶⁵ Zn	⁶⁶ Zn (γ, n)	0.22	100.0	100.0
		⁷⁰ Ge (γ, na)	0.0018	0.80	0.40
Ga	^{69m} Zn	⁷¹ Ga (γ, np)	3.12	100.0	100.0
		⁷⁰ Zn (γ, n)	3.04	97.4	292.50
		⁷⁴ Ge (γ, na)	0.38	12.20	2107.5
Ga	⁶⁸ Ga	⁶⁹ Ga (γ, n)	120.7	100.0	100.0
		⁷⁰ Ge (γ, np)	0.9	0.75	0.30
Ge	⁷² Ga	⁷³ Ge (γ, p)	6.88	100.0	100.0
		⁷¹ Ga (n, γ)	0.29	4.20	73.3
Ge	⁶⁹ Ge	⁷⁰ Ge (γ, n)	13.5	100.0	100.0
		⁷⁴ Ge (γ, na)	0.0009	7x10 ⁻³	7x10 ⁻⁴
Ge	⁷⁵ Ge	⁷⁶ Ge (γ, n)	400	100.0	100.0
		⁸⁰ Se (γ, na)	10.4	2.74	1.50
As	⁷² As	⁷⁵ As (γ, 3n)	0.205	100.0	-
		⁷⁶ Se (γ, nt)	0.020	9.75	-
As	⁷⁴ As	⁷⁵ As (γ, n)	16.65	100.0	100.0
		⁷⁶ Se (γ, np)	0.35	2.10	1x10 ⁻⁴
		⁷⁹ Br (γ, na)	0.004	2.5x10 ⁻²	4x10 ⁻⁵
Se	⁷⁶ As	⁷⁷ Se (γ, p)	1.78	100.0	33.6
		⁷⁵ As (n, γ)	1.74	97.8	100.0
		⁸¹ Br (γ, na)	0.024	1.35	39.5
Sr	^{82m} Rb	⁸⁴ Sr (γ, np)	77.1	100.0	-
		⁸⁵ Rb (γ, 3n)	0.10	0.15	-
Rb	⁸³ Rb	⁸⁵ Rb (γ, 2n)	0.377	100.0	100.0
		⁸⁴ Sr (γ, p) *	0.009	2.40	5.70
Rb	^{84m} Rb	⁸⁵ Rb (γ, n)	2668	100.0	100.0
		⁸⁶ Sr (γ, np)	83.7	3.15	3x10 ⁻⁴
		⁸⁹ Y (γ, na)	-	-	4x10 ⁻⁶

Element Determined	Nuclide Measured	Mode of Production	Specific Activity c ksec ⁻¹ μg ⁻¹	Apparent Concentration (%) due to Interfering element	
				This Work (40-44 MeV)	Reference 33 (30 MeV)
Rb	⁸⁴ Rb	⁸⁵ Rb (γ, n)	8.9	100.0	100.0
		⁸⁶ Sr (γ, np)	0.005	6x10 ⁻²	3x10 ⁻⁵
Rb	⁸⁶ Rb	⁸⁷ Rb (γ, n)	1.218	100.0	-
		⁸⁸ Sr (γ, np)	0.013	1.05	-
Sr	^{87m} Sr	⁸⁸ Sr (γ, n)	6660	100.0	100.0
		⁸⁹ Y (γ, np)	73	1.10	0.20
		⁸⁹ Y (γ, 2n), β ⁺	32 ⁽²⁾	0.50	"
		⁹¹ Zr (γ, α)	0.63	9.5x10 ⁻³	0.10
Y	⁸⁸ Y	⁸⁹ Y (γ, n)	3.42	100.0	100.0
		⁹⁰ Zr (γ, np)	0.007	0.20	4x10 ⁻⁴
		⁹³ Nb (γ, na)	0.005	0.15	-
		⁹² Mo (γ, α), EC.	0.002	0.06	-
Zr	⁸⁸ Zr	⁹⁰ Zr (γ, 2n)	0.382	100.0	-
		⁹² Mo (γ, α)	0.022	5.76	-
Mo	⁹⁰ Nb	⁹² Mo (γ, 2n), β ⁺	2.54	100.0	-
		⁹³ Nb (γ, 3n)	1.93	76.0	-
Nb	^{92m} Nb	⁹³ Nb (γ, n)	38.8	100.0	100.0
		⁹⁴ Mo (γ, np)	0.03	0.075	5x10 ⁻⁴
Mo	⁹⁵ Nb	⁹⁶ Mo (γ, p)	0.222	100.0	-
		⁹⁶ Zr (γ, n), β ⁻	0.047	21.2	-
Mo	^{99m} Tc	¹⁰⁰ Mo (γ, n), β ⁻	193 ⁽³⁾	100.0	-
		¹⁰⁰ Ru (γ, p)	60.8	31.5	-
		¹⁰³ Rh (γ, α)	9.54	4.95	-
Rh	¹⁰⁰ Rh	¹⁰³ Rh (γ, 3n)	2.564	100.0	-
		¹⁰² Pd (γ, np)	0.532	20.8	-
Rh	¹⁰¹ Rh	¹⁰³ Rh (γ, 2n)	0.215	100.0	100.0
		¹⁰² Pd (γ, p) *	0.0044	2.05	0.705
Rh	^{101m} Rh	¹⁰³ Rh (γ, 2n)	62	100.0	33.5
		¹⁰² Pd (γ, p) *	8.3	13.4	100.0
Rh	¹⁰² Rh + ^{102m} Rh	¹⁰³ Rh (γ, n)	3.014	100.0	100.0 ⁽⁴⁾
		¹⁰⁴ Pd (γ, np)	0.0011	0.035	0.15 ⁽⁴⁾
Cd	¹⁰⁴ Ag	¹⁰⁶ Cd (γ, np)	45.35	100.0	-
		¹⁰⁷ Ag (γ, 3n)	9.57 ⁽⁵⁾	21.1	-
Ag	¹⁰⁵ Ag	¹⁰⁷ Ag (γ, 2n)	1.18	100.0	100.0
		¹⁰⁶ Cd (γ, p) *	0.31	26.3	1.63
Ag	¹⁰⁶ Ag	¹⁰⁷ Ag (γ, n)	337.4	100.0	100.0
		¹⁰⁸ Cd (γ, np)	1.45	0.43	0.20
Ag	^{110m} Ag	¹⁰⁹ Ag (n, γ)	0.0033	100.0	3x10 ⁻⁴
		¹¹¹ Cd (γ, p)	0.0009	27.3	100.0
Sn	¹¹¹ In	¹¹² Sn (γ, p) *	14.0	100.0	100.0
		¹¹³ In (γ, 2n)	8.40	60.0	7.2

Element Determined	Nuclide Measured	Mode of Production	Specific Activity c ksec ⁻¹ μg ⁻¹	Apparent Concentration (%) due to Interfering element	
				This Work (40-44 MeV)	Reference 33 (30 MeV)
In	^{113m} In	¹¹⁵ In (γ, 2n)	817	100.0	100.0
		¹¹⁴ Sn (γ, p) *	5.0 ⁽⁶⁾	0.60	2.0
In	^{115m} In	¹¹⁵ In (γ, γ')	150	100.0	0.20
		¹¹⁶ Sn (γ, p)	18.0	12.0	100.0
		¹¹⁶ Cd (γ, n)	38	25.3	-
In	^{116m} In	¹¹⁵ In (n, γ)	52.6	100.0	100.0
		¹¹⁷ Sn (γ, p)	13.6	25.9	0.40
Sb	¹²² Sb	¹²³ Sb (γ, n)	181	100.0	100.0
		¹²³ Te (γ, p)	0.084	0.045	2x10 ⁻⁴
Te	¹²⁴ Sb	¹²⁵ Te (γ, p)	0.0265	100.0	100.0
		¹²³ Sb (n, γ)	0.009	34.0	93.8
Cs	¹³² Cs	¹³³ Cs (γ, n)	99	100.0	-
		¹³⁴ Ba (γ, np)	0.016	0.015	-
La	¹⁴⁰ La	¹³⁹ La (n, γ)	0.19	100.0	-
		¹⁴² Ce (γ, np)	0.052	27.4	-
Ce	¹³⁹ Ce	¹⁴⁰ Ce (γ, n)	31	100.0	-
		¹⁴¹ Pr (γ, np)	2.70 ⁽⁷⁾	8.7	-
		¹⁴⁴ Nd (γ, nα)	0.009	0.030	-
Tb	¹⁶⁰ Tb	¹⁵⁹ Tb (n, γ)	0.027	100.0	100.0
		¹⁶¹ Dy (γ, p)	0.015	55.6	4.2
Tm	¹⁶⁷ Tm	¹⁶⁹ Tm (γ, 2n)	18	100.0	100.0
		¹⁶⁸ Yb (γ, p) *	0.15 ⁽⁸⁾	0.83	0.80
Hf	¹⁷⁷ Lu	¹⁷⁸ Hf (γ, p) *	0.135	100.0	73.6
		¹⁷⁶ Lu (n, γ)	0.023	17.1	100.0
Ta	¹⁸² Ta	¹⁸¹ Ta (n, γ)	0.0018	100.0	96.9
		¹⁸³ W (γ, p)	0.0013	72.2	100.0
Re	¹⁸³ Re	¹⁸⁵ Re (γ, 2n)	1.482	100.0	100.0
		¹⁸⁴ Os (γ, p) *	0.025 ⁽⁹⁾	1.7	17.0
Re	¹⁸⁶ Re	¹⁸⁷ Re (γ, n)	63.47	100.0	100.0
		¹⁸⁷ Os (γ, p)	0.019	0.03	45.8
Re	¹⁸⁸ Re	¹⁸⁷ Re (n, γ)	1.318	100.0	100.0
		¹⁸⁹ Os (γ, p)	1.02	77.4	1.4
Ir	¹⁸⁹ Ir	¹⁹¹ Ir (γ, 2n)	1.178	100.0	-
		¹⁹⁰ Pt (γ, n), EC.	0.003	0.25	-
Ir	¹⁹⁰ Ir	¹⁹¹ Ir (γ, n)	18.62	100.0	-
		¹⁹² Pt (γ, np)	0.003	0.015	-
Ir	¹⁹² Ir	¹⁹³ Ir (γ, n)	21	100.0	-
		¹⁹⁴ Pt (γ, np)	0.005	0.025	-
Au	¹⁹⁶ Au	¹⁹⁷ Au (γ, n)	222	100.0	-
		¹⁹⁸ Hg (γ, np)	0.021	9x10 ⁻³	-

Element Determined	Nuclide Measured	Mode of Production	Specific Activity c ksec ⁻¹ μg ⁻¹	Apparent Concentration (%) due to Interfering element	
				This Work (40-44 MeV)	Reference 33 (30 MeV)
Au	¹⁹⁸ Au	¹⁹⁷ Au (n, γ)	1.04	100.0	100.0
		¹⁹⁹ Hg (γ, p)	0.84	80.8	5.8
Tl	²⁰² Tl	²⁰³ Tl (γ, n)	33	100.0	-
		²⁰⁴ Pb (γ, np)	0.015	0.05	-

- (1) After 2.5 hours decay.
 - (2) After ⁸⁷Y fully decayed.
 - (3) Calculated after decay of ⁹⁰Nb using 66.2 hour half life of ⁹⁹Mo parent. Actual half life is 6.02 hours.
 - (4) Mean of values quoted for ¹⁰²Rh and ^{102m}Rh.
 - (5) After ^{104m}Ag fully decayed.
 - (6) Also formed by decay of ¹¹³Sn. Specific activity calculated after 4 hours decay.
 - (7) After ¹³⁹Pr fully decayed.
 - (8) After ¹⁶⁷Yb fully decayed.
 - (9) Includes a trace of 162.7 KeV 94 day ¹⁸⁵Os.
- * An equally possible mode of production is by the (γ, n) β⁺ reaction on the same target isotope. The specific activities quoted for the resulting isotopes, in this work, were measured after the parent isotope had fully decayed.