

Radioactive Decay Data Tables

**A Handbook of
Decay Data for Application to
Radiation Dosimetry and Radiological
Assessments**

David C. Kocher

Technical Information Center
U.S. Department of Energy



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David C. Kocher
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Radioactive Decay Data Tables

This compilation of radioactive decay data culminates 8 years of effort in the field of nuclear data compilation and evaluation. During the first 4½ years of this time, I worked with the Nuclear Data Project in the Physics Division at Oak Ridge National Laboratory (ORNL). The primary interest of this group is the evaluation of a wide variety of nuclear physics data to determine the structure and properties of atomic nuclei, and its most visible contribution to nuclear structure physics is the mass-chain evaluations published in the journal *Nuclear Data Sheets*.

In 1976, I joined the Technology Assessments Section of the Health and Safety Research Division at ORNL. Since that time I have been concerned with the evaluation and compilation of radioactive decay data from the point of view of its application to radiation dosimetry and radiological assessments. Initially, I prepared a data base of evaluated decay data for 240 radionuclides of potential importance in the nuclear fuel cycle. This data base was adopted for use by the U. S. Nuclear Regulatory Commission, and the data were published in August 1977 as the report ORNL/NUREG/TM-102.

The radioactive decay data tabulated in this handbook result from the continual expansion and updating of the data base published in the aforementioned report. In addition to the radionuclides of interest in the nuclear fuel cycle, the data base now comprises most of the nuclides occurring naturally in the environment, those of current interest in nuclear medicine and fusion reactor technology, and some (but hardly all!) additional radionuclides of interest to Committee 2 of the International Commission on Radiological Protection for the estimation of annual limits of intake and derived air concentrations for

occupationally exposed individuals. Approximately 500 radionuclides are contained in the current data base, and our recent experience suggests that almost all radionuclides of potential impact on the general public or occupationally exposed individuals have been included. The data for each radionuclide have been maintained on an up-to-date basis by examination of all recent experimental results published in the open literature and incorporation of these results into the data base whenever warranted. The data base takes into account all experimental results reported to me prior to July 1, 1979.

Several compilations of radioactive decay data similar in some respects to this one have been published in recent years. Particularly noteworthy are the compilations by L. T. Dillman and F. C. Von der Lage, published in 1975 in Pamphlet No. 10 of the Medical Internal Radiation Dose Committee, and M. J. Martin of the Nuclear Data Project, published in 1978 in Report No. 58 of the National Council on Radiation Protection and Measurements. The proliferation of published compilations containing data for large numbers of radionuclides is testimony to the successful application of computers to the processing of data bases of this type.

In spite of the apparent similarities between the different compilations, there are some differences of importance to potential users of the data. The most obvious is the particular selection of radionuclides. More subtle differences may result from the various methods used to select and evaluate data from the literature and to prepare the data sets. It is worth emphasizing that there is a considerable degree of subjectivity in this process and two knowledgeable compilers can therefore produce somewhat different decay schemes for a given radionuclide starting from

the same data in the literature. We note, however, that the differences would likely be within experimental uncertainties unless the decay scheme is poorly determined from the data.

In the preparation of the decay data in this handbook, the fundamental principle has been to critically evaluate the available data from all sources in the open literature and attempt to construct the most accurate decay scheme consistent with the data rather than simply to adopt a decay scheme proposed by another compiler or experimenter without further examination. The evaluation process is not always foolproof, however, since the compiler is occasionally faced with reconciling or choosing between disparate sets of data, and the choices made may not prove to be correct. It is clear, therefore, that the biases of the compiler can play an important role in the process of selecting and evaluating data. It is hoped that my biases and data-evaluation philosophy have been applied reasonably consistently to obtain the adopted data sets for all the radionuclides contained herein.

I cannot overemphasize the importance of the contributions of the staff of the Nuclear Data Project and other compilers who have published mass-chain compilations in the journals *Nuclear Data Sheets* and *Nuclear Physics* to the successful completion of this work. I am particularly grateful to W. B. Ewbank, director of the Nuclear Data Project, for his continual assistance and cooperation throughout this effort.

The Nuclear Data Project maintains a computer file called the Evaluated Nuclear Structure Data File (ENSDF). Radioactive decay data sets written in the ENSDF format were used to generate the tables of decay data given in this handbook. When work on this compilation began early in 1976, much of the radioactive decay data previously published in *Nuclear Data Sheets* and *Nuclear Physics* had not yet been entered in ENSDF. Consequently considerable

effort was required on my part to prepare many of the data sets in the proper format. In the meantime, however, ENSDF has been expanded to currently include more than 1500 radioactive decay data sets. If a compiler were to begin now to assemble a compilation such as the one presented in this handbook, he or she would be able to rely almost exclusively on data sets already contained in ENSDF, and little additional effort in evaluating data and producing new data sets would be required. Thus it is my intention in the future to rely on ENSDF rather than continually updating a separate data base of my own to provide additional radioactive decay data that might be needed in the radiological assessment activities of the Health and Safety Research Division.

It is worth noting that, with few exceptions, the decay data contained in this handbook are not likely to change significantly over the next few years as the result of new measurements. Most of the decay schemes have been studied with reasonable care and accuracy, and only minor improvements in the data of little significance for radiological applications can be expected. Thus I anticipate that the data contained in this handbook and in other recent compilations can be used with confidence for a considerable period of time.

I would like to express my appreciation to G. G. Killough, R. O. Chester, P. S. Rohwer, and S. V. Kaye of the Health and Safety Research Division at ORNL and to F. Swanberg, Jr., of the Division of Safeguards, Fuel Cycle, and Environmental Research at the Nuclear Regulatory Commission for their support and encouragement of this effort. This research was sponsored by the Office of Nuclear Regulatory Research, U. S. Nuclear Regulatory Commission, under Interagency Agreement DOE 40-550-75 with the U. S. Department of Energy under contract W-7405-eng-26 with the Union Carbide Corporation.

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Introduction

The estimation of radiation dose to man from either external or internal exposure to radionuclides requires a knowledge of the energies and intensities of the atomic and nuclear radiations emitted during the radioactive decay process. The availability of evaluated decay data for the large number of radionuclides of interest is thus of fundamental importance for radiation dosimetry.

This handbook contains a compilation of decay data for approximately 500 radionuclides. These data constitute an evaluated data file that I have constructed for use in the radiological assessment activities of the Technology Assessments Section of the Health and Safety Research Division at Oak Ridge National Laboratory.

The radionuclides selected for this handbook include those occurring naturally in the environment, those of potential importance in routine or accidental releases from the nuclear fuel cycle, those of current interest in nuclear medicine and fusion reactor technology, and some of those of interest to Committee 2 of the International Commission on Radiological Protection for the estimation of annual limits on intake via inhalation and ingestion for occupationally exposed individuals. This handbook supersedes a previous report,¹ which was concerned only with radionuclides from the nuclear fuel cycle.

The physical processes involved in radioactive decay which produce the different types of radiation observed are discussed in Chap. 2. The methods used to prepare the decay data sets for each radionuclide in the format of the computerized Evaluated Nuclear Structure Data File (ENSDF),² developed and maintained by the Nuclear Data Project at Oak Ridge National Laboratory, are described in Chap. 3. Some

of the discussion in Chaps. 2 and 3 is probably not comprehensible to readers lacking a basic knowledge of atomic and nuclear structure. Without deviating substantially from the scope of this handbook, it is difficult to adequately define such concepts as spin and parity, gamma-ray transition multipolarity, forbiddenness of beta transitions, and energy levels of nuclei and orbital atomic electrons. The inclusion of the material of a specialized nature should provide the interested reader with a reasonably self-contained description of the decay data and how they were obtained, but these discussions should not preclude proper interpretation of the data tables by any interested user.

Chapter 4 describes the tables of radioactive decay data and the computer code MEDLIST used to produce the tables.³ Some applications of the radioactive decay data to problems of interest in radiation dosimetry and radiological assessments are described in Chap. 5. The calculation of the activity of a daughter radionuclide relative to the activity of its parent in a radioactive decay chain is described in Chap. 6. Chapter 7 discusses the accuracy of the decay data in this handbook with particular emphasis on radionuclides for which the data may be significantly in error with regard to applications to radiation dosimetry.

The symbols appearing in the tables of decay data and their definitions are listed in Appendix 1. Appendix 2 provides an index of the tables of radioactive decay data, and Appendix 3 contains the literature references on which the tables are based. Appendix 4 gives diagrams of all decay chains involving two or more radionuclides in the present compilation. The tables of radioactive decay data are presented in Appendix 5.

This handbook is one of several similar compilations of radioactive decay data which have appeared in recent years. Particularly recommended is the compilation by Dillman and Von der Lage,⁴ which contains data for 122 radionuclides of interest to nuclear medicine, and the compilation prepared by M. J. Martin of the Nuclear Data Project for the National Council on Radiation Protection and Measurements,⁵ which contains data for about 210 radionuclides of interest primarily to nuclear medicine and the nuclear fuel cycle. I have independently reevaluated decay data for all radionuclides in the previous compilations which are included in this compilation.

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Review of Radioactive Decay Processes

The term "radioactivity" denotes those spontaneous changes of state in atomic nuclei which release energy in the form of electromagnetic or particle radiations. This chapter discusses briefly the different radioactive decay processes in sufficient detail to allow an understanding of the tables in Appendix 5. This presentation and the discussions in Chaps. 4 and 6 follow closely those given previously by Martin.^{1,2} For examples of more-detailed discussions of radioactive decay processes, the reader is referred to the report by Dillman³ and the reference work of Siegbahn.⁴

In this compilation we are concerned with alpha decay, beta decay [including β^- , β^+ , and electron capture (EC)], isomeric transitions (i.e., the decay of long-lived excited states of a nucleus to states of lower energy in the same nucleus), and the various atomic and nuclear radiations that accompany these processes. Nuclear radiations are those which result directly from a change of state of the nucleus and include alpha particles, β^- and β^+ particles, gamma rays, and internal conversion electrons. Atomic radiations are those which result from the subsequent changes of state of the orbital electrons in the daughter atom and include X rays and Auger electrons.

A radioactive decay process not considered in this compilation is spontaneous fission, which can be the most important mode of decay in terms of total energy released for some of the transuranic radio-nuclides. Methods for estimating energy distributions of neutrons, prompt and delayed gamma rays, and beta particles, as well as the average energies of these radiations, have been given by Dillman and Jones.⁵

A type of radiation also not considered in this compilation is bremsstrahlung, which is the gamma

radiation produced when electrons emitted in radioactive decay are slowed down by passage through matter. Bremsstrahlung forms a continuous spectrum of energies ranging from zero energy to the kinetic energy of the emitted electron with the intensity distribution considerably skewed toward the lower energies. Intensities of bremsstrahlung from slowing down of alpha particles and other heavy charged particles, such as recoil nuclei and fission fragments, are expected to be very small compared with electron bremsstrahlung. Bremsstrahlung consists of two types, external and internal. External bremsstrahlung results from the interaction of the emitted electrons with the atoms in the material surrounding the radiating atom; so the energy spectrum depends on the atomic composition of the surrounding medium. In some cases, particularly for radionuclides that emit only beta particles, external bremsstrahlung can be of importance in radiation dosimetry. Methods for calculating external bremsstrahlung in such materials as air, muscle, fat, and bone have been implemented by Dillman.³ Internal bremsstrahlung occurs as an electron is being ejected from the decaying nucleus itself and thus may be considered an inherent part of the radioactive decay process. Internal bremsstrahlung is also discussed in the report by Dillman.³ In general, this radiation can be neglected for the purposes of radiation dosimetry because of its low intensity and low average energy.

2-1 ALPHA DECAY

In alpha decay an atom with atomic number Z and mass number A emits an alpha particle (a ${}^4\text{He}$ nucleus with $Z = 2$ and $A = 4$) producing a daughter

atom with atomic number $Z-2$ and mass number $A-4$. The difference in total energy between the initial state in the parent atom and the final state in the daughter is divided between the emitted alpha particle and the recoil energy of the daughter. From conservation of energy and momentum, the energy of the alpha particle for a particular transition, E_α , can be written as

$$E_\alpha = \frac{E}{1 + (4.0026/M_d)} \quad (2.1)$$

$$E = Q_\alpha + E_p - E_L \quad (2.2)$$

where E = total transition energy

Q_α = difference in energy between the ground states of the parent and daughter atoms

E_p = excitation energy of the alpha-emitting level in the parent ($E_p = 0.0$ except for an isomeric level)

E_L = excitation energy of the level in the daughter fed by the alpha decay

M_d = atomic mass of the daughter

and 4.0026 is the atomic mass of an alpha particle. The recoil energy of the daughter is given by

$$E_r = E - E_\alpha = \frac{4.0026 E_\alpha}{M_d} \quad (2.3)$$

The recoil energy of the daughter has not been included in the tables of decay data in this handbook, but this energy should be taken into account, for example, in estimating the dose from internally deposited alpha-emitting radionuclides.

Alpha transitions that feed excited states of the daughter nucleus are usually accompanied by additional prompt radiations (e.g., gamma rays and internal conversion electrons) as the excited state decays to the ground state of the daughter. These processes are described in Sec. 2-3. Except for alpha decays to an isomeric state in the daughter, which is then treated as a separate radionuclide, these additional radiations are included in the decay scheme of the parent radionuclide.

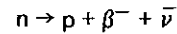
2-2 BETA DECAY

Beta decay includes the processes of β^- , β^+ , and electron capture decay. As with alpha decay, the prompt radiations resulting from the de-excitation of excited states in the daughter nucleus produced by

beta decay are included in the decay scheme of the parent radionuclide.

2-2.1 β^- Decay

In β^- decay, an antineutrino ($\bar{\nu}$) and a negative electron (β^-) are emitted from the nucleus as a result of the transformation of a neutron into a proton:



Therefore the decay increases the atomic number by one unit, but the mass number remains the same. Because two different radiations are emitted from the nucleus (beta decay is a so-called three-body process), the energy released in a single β^- transition is divided between the β^- particle and the antineutrino in a statistical manner. Thus, when a large number of transitions between the same two energy levels in the parent and daughter is considered, the β^- particles (and the antineutrinos) have a continuous kinetic energy distribution from zero energy to a maximum value called the endpoint energy. From conservation of energy, the endpoint energy for a β^- transition is given by

$$E^{\max}(\beta^-) = Q^- + E_p - E_L \quad (2.4)$$

where Q^- is the energy difference between the ground states of the parent and daughter atoms and E_p and E_L are the same as in Eq. 2.2.

For application to radiation dosimetry, the quantity of interest for a continuous spectrum from β^- decay is often the average energy, $\bar{E}(\beta^-)$, defined as

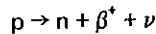
$$\bar{E}(\beta^-) = \frac{\int_0^{E^{\max}(\beta^-)} N_\beta^-(E) E dE}{\int_0^{E^{\max}(\beta^-)} N_\beta^-(E) dE} \quad (2.5)$$

where $N_\beta^-(E)$, called the probability distribution function, is the probability that a β^- particle has energy between E and $E + dE$. The probability distribution function is obtained from the Fermi theory of beta decay, as described by Gove and Martin.⁶ This function depends on the so-called degree of forbiddenness of the transition, which is determined by the changes in total angular momentum (spin) and parity between the initial state in the parent and the level fed in the daughter. In this compilation, the beta transitions are assumed to have the probability distribution function for an allowed transition unless the spin (J) and parity (π) change is

$\Delta J^\pi = 2^-$ or 3^+ , in which case the distribution function for a first-forbidden unique transition or a second-forbidden unique transition is used.

2-2.2 β^+ Decay

In β^+ decay a neutrino (ν) and a positron (β^+) are emitted from the nucleus as a result of the transformation of a proton into a neutron:



As in β^- decay, the β^+ particles emitted in a transition between particular levels in the parent and daughter nuclei have a continuous distribution of energies that can be characterized by the endpoint, $E^{\max}(\beta^+)$, and average, $\bar{E}(\beta^+)$, energies. The β^+ -decay process decreases the atomic number by one unit, and the mass number remains the same. From conservation of energy, the endpoint energy for a β^+ transition is given by

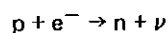
$$E^{\max}(\beta^+) = Q^+ + E_p - E_L - 2m_0c^2 \quad (2.6)$$

where Q^+ is the energy difference between the ground states of the parent and daughter atoms, m_0c^2 is the rest mass energy of an electron (511 keV), and E_p and E_L are as defined in Eq. 2.2. We note that β^+ decay cannot occur unless the energy difference between the parent and daughter levels is greater than $2m_0c^2 = 1022$ keV. That part of the total transition energy which is "lost" in the formation of the two electron rest masses is normally "regained" when the emitted positron annihilates at rest in the matter surrounding the decaying atom, producing two 511-keV annihilation gamma rays. The small probability of positron annihilation in flight can be ignored.

As with β^- decay, the probability distribution function $N_\beta^+(E)$ for β^+ particles is obtained by using the Fermi theory of beta decay for an allowed transition, with an appropriate correction for known first-forbidden unique or second-forbidden unique transitions.⁶

2-2.3 Electron Capture Decay

In electron capture decay an atomic electron is captured by the nucleus, which transforms a proton into a neutron, and a neutrino is emitted via the process



Thus, like β^+ decay, electron capture decay decreases the atomic number by one unit, and the mass number remains the same. The capture of an atomic electron leaves the daughter atom with a vacancy in one of its atomic energy levels, which are also called atomic shells. If Δ_X^E is defined as the electron binding energy for shell X in the daughter atom (i.e., the energy required to remove an electron in shell X from the atom), the total energy available for electron capture decay is

$$E_{EC} = Q^+ + E_p - E_L - \Delta_X^E \quad (2.7)$$

where Q^+ , E_p , and E_L are as defined in Secs. 2-1 and 2-2.2. Thus the energy available for electron capture decay is greater than that available for β^+ decay (see Eq. 2.6) by an amount equal to two electron rest masses minus a small correction for the orbital electron binding energy in the shell X from which electron capture occurs. The electron binding energies used in this work are obtained from Bearden and Burr.⁷

For a given transition, the vacancy resulting from atomic electron capture will be distributed among the various shells, denoted by K, L, M, etc., in order of decreasing binding energy. This distribution affects the relative intensities of X rays and Auger electrons that result from the filling of the initial vacancy by an electron from a higher (less tightly bound) atomic shell. The probabilities for K-, L-, and M-shell capture for allowed, first-forbidden unique, and second-forbidden unique electron capture transitions are calculated as described by Gove and Martin.⁶ If K-shell electron capture is energetically allowed, it generally has a higher probability than capture from higher atomic shells. The report by Dillman³ discusses electron capture decay in more detail.

Electron capture always competes with β^+ decay whenever the transition energy is greater than $2m_0c^2$ (1022 keV). In general, the probability for electron capture relative to positron emission increases with decreasing transition energy and with increasing atomic number. When the transition energy is too small to allow positron emission, only electron capture decay occurs.

2-3 ELECTROMAGNETIC DE-EXCITATION OF NUCLEAR ENERGY LEVELS

Most of the excited states of a daughter nucleus formed by alpha or beta decay of a parent decay very

rapidly via electromagnetic processes to states of lower energy (eventually to the ground state) in the daughter. The de-excitation results in the emission of either gamma rays or internal conversion electrons. Long-lived isomeric states may also decay to lower energy states in the same nucleus via electromagnetic transitions.

2-3.1 Gamma Radiation

When a gamma ray (γ) is emitted by a nucleus in a transition from a higher to a lower energy state, the gamma-ray energy is equal to the energy difference between the two levels minus the energy of nuclear recoil given by

$$E_r \approx 5.4 \times 10^{-7} \frac{[E(\gamma)]^2}{A} \text{ keV} \quad (2.8)$$

where $E(\gamma)$ is the gamma-ray energy in kilo electron volts (keV) and A is the mass number of the nucleus. The energy of nuclear recoil is usually negligible except for high-energy transitions in light nuclei.

2-3.2 Internal Conversion Electrons

The emission of internal conversion electrons (ce) competes with gamma-ray emission. In this process the energy difference between the initial and final states in the nucleus is transferred directly to a bound atomic electron which is then ejected from the atom. The energy of an internal conversion electron emitted from atomic shell X , $E_{ce,X}$, is given in terms of the corresponding gamma-ray energy $E(\gamma)$ by

$$E_{ce,X} = E(\gamma) - \Delta_X^E \quad (2.9)$$

where Δ_X^E is the electron binding energy in shell X .

The emission of K-shell internal conversion electrons can occur only if the transition energy is greater than the K-shell binding energy and similarly for higher electron shells. For a particular transition, the ratio of the probability for emission of a K-shell electron to the probability for emission of a gamma ray is called the K-shell internal conversion coefficient. Internal conversion coefficients for the other atomic shells are defined in an analogous manner. Internal conversion for shells above the K-shell is often divided according to the contributions from the different subshells; e.g., L-shell internal conversion is calculated separately for the L_1^- , L_2^- , and L_3^- subshells.

The internal conversion coefficients for the different atomic shells and subshells depend on the

transition energy, the atomic number of the nucleus, and the so-called transition multipolarity, which is determined by the spin-parity change between the initial and final states in the nucleus.* In general, the internal conversion coefficient for a particular atomic shell or subshell increases with decreasing transition energy (as long as the particular internal conversion process is energetically allowed), increasing atomic number, and increasing transition multipolarity. Internal conversion is often negligible for transitions in light nuclei but may occur with nearly 100% probability in isomeric transitions with high multipolarity or in low-energy transitions in heavy nuclei. Usually, the internal conversion coefficient for a given transition is largest for the innermost shell for which internal conversion is energetically possible and decreases for each higher shell. Exceptions occur, however, for transition energies slightly greater than the binding energy of an atomic shell. The ratios of internal conversion coefficients among the different subshells of the L or M shell are often a sensitive indicator of the transition multipolarity.

A special type of electromagnetic transition is the monopole transition, for which the spins of the initial and final states are both zero. In this case the emission of a single gamma ray is strictly forbidden. Electric monopole (E0) transitions usually occur entirely by means of internal conversion or, if energetically possible, by emission of a positron-electron pair. Emission of two gamma rays is also possible but is usually negligible. Magnetic monopole (M0) transitions are not encountered in this work.

In this compilation the theoretical internal conversion coefficients for shells K, $L_{1...3}$, and $M_{1...5}$ are obtained by spline interpolation from the tables of Hager and Seltzer⁸ and Band, Trzhaskovskaya, and Listengarten,⁹ for E5 and M5 transitions, the values are obtained by polynomial interpolation from the tables of Sliv and Band.^{10,11} Internal conversion coefficients for shells N + O + ... are obtained by spline interpolation from the tables of Dragoun,

*The emitted radiation is classified into two multipole types, electric and magnetic. For a spin change of L units, an electric multipole type EL involves a parity change of $(-1)^L$, and a magnetic multipole type ML has parity change $(-1)^{L+1}$. For example, E1 denotes an electric dipole transition between states differing in spin by one unit and having opposite parity, M1 is a magnetic dipole transition with $L = 1$ and no change in parity, and E2 is an electric quadrupole transition with $L = 2$ and no change in parity. For increasing L , the transition is said to be of higher multipolarity.

Plajner, and Schmutzler.¹² For E0 transitions, the conversion electron intensity ratios K/L_1 and L_1/L_2 are obtained by graphical interpolation from the tables of Hager and Seltzer.¹³

2-3.3 Other Radiations

Other radiation processes besides emission of a single gamma ray or internal conversion electron can occur during the de-excitation of a nuclear energy level. If the transition energy is greater than $2m_0c^2$ (1022 keV), an alternative decay mode is emission of a positron-electron pair, which is an electromagnetic process taking place in the Coulomb field of the excited nucleus. Since the probability of pair formation is normally 0.003 per emitted gamma ray or less,³ this process has been neglected in this compilation. We have also neglected other very unlikely processes, such as the emission of two gamma rays or one gamma ray and one internal conversion electron.

2-4 ATOMIC RADIATIONS

The nuclear decay processes of electron capture and internal conversion always produce a vacancy in an inner atomic electron shell. The filling of this vacancy by an electron from an outer shell to reduce the total energy of the atomic electrons results in the emission of either an X ray or an Auger electron, which we call the atomic radiations in the radioactive decay process. Vacancies that are created by the filling of the initial vacancy will, in turn, produce further X rays or Auger electrons. This cascade of radiations continues until the only remaining vacancies are in the outermost electron shell.

2-4.1 X Rays

An X ray is a photon emitted as a result of the filling of a vacancy in an atomic shell by an electron from a higher shell. The energy of the emitted X ray is just equal to the difference in energy between the two atomic shells.

The probability that a vacancy in a particular atomic shell results in the emission of an X ray is called the fluorescence yield for that shell. The K-shell fluorescence yield, for example, is denoted by ω_K . If n_K is the number of vacancies produced in the K-shell per decay of the parent, the number of K X rays per decay is $n_K\omega_K$ and similarly for higher shells. In this compilation we consider only K-shell

and L-shell X rays, for which the adopted fluorescence yields are obtained from the review of Bambynek et al.¹⁴

A K X ray results from the filling of a K-shell vacancy by an electron from a higher shell. A transition from shell Y to the K-shell is denoted by $K-Y$. In order of increasing intensity, the most important K X rays are $K_{\alpha 1} = K - L_3$, $K_{\alpha 2} = K - L_2$, $K_{\beta 1} = K - M_3$, $K_{\beta 2} = K - N_3$, $K_{\beta 3} = K - M_2$, $K_{\beta 4} = K - N_2$, and $K_{\beta 5} = K - M_4$. In this compilation the energies and intensities for three K X-ray groups are given explicitly—the $K_{\alpha 1}$ and $K_{\alpha 2}$ lines and the composite $K_{\beta} = \sum K_{\beta i}$ group. The X-ray energies are obtained from Bearden and Burr,⁷ and the intensity ratios K_{β}/K_{α} and $K_{\alpha 2}/K_{\alpha 1}$ are obtained from Rao, Chen, and Crasemann.¹⁵

As previously mentioned, the number of K X rays per decay is $n_K\omega_K$. The number of K-shell vacancies per decay is the sum of the vacancies produced by K-shell electron capture and those produced by internal conversion in the K-shell. Thus

$$n_K = \epsilon_K + I_{ce,K} \quad (2.10)$$

where ϵ_K is the number of K captures per decay and $I_{ce,K}$ is the number of K-shell internal conversion electrons per decay.

As with K-shell X rays, many separate transitions contribute to the L X-ray spectrum. However, since the relative intensities of the different transitions are not known for all atomic numbers and the energy differences between the strong transitions are small (≤ 3 keV for $Z \leq 92$), we have treated the total L X-ray intensity as a single group having the energy of the strongest transition.

The calculation of the number of L X rays per decay, $n_L\omega_L$, is similar to the calculation for K X rays, except that, in addition to initial vacancies produced by direct L-shell electron capture and by L-shell internal conversion, vacancies created by transfer of L-shell electrons to fill vacancies in the K-shell must be taken into account. Therefore the number of L-shell vacancies per decay is given by

$$n_L = \epsilon_L + I_{ce,L} + n_{KL} n_K \quad (2.11)$$

where n_{KL} is the number of vacancies in the L shell created per vacancy in the K-shell and the other symbols have meanings analogous to those in Eq. 2.10. The values of n_{KL} were obtained from Bambynek et al.¹⁴

2-4.2 Auger Electrons

The emission of Auger electrons competes with the emission of X rays as a means of carrying off the energy released by filling an inner-shell vacancy with an electron from an outer shell. A detailed discussion of the Auger process is given by Dillman.³

In the Auger process the filling of an inner-shell vacancy is accompanied by the simultaneous ejection of an outer-shell electron from the atom. The resulting atom is thus left with two vacancies. From the definition of the fluorescence yield given in the previous section, the yield of Auger electrons per decay of the parent for a particular atomic shell is $n_K(1 - \omega_K)$, $n_L(1 - \omega_L)$, etc.

If the initial vacancy is in the K-shell and if this vacancy is filled by an electron from shell X with the ejection of an electron from shell Y, the transition is denoted by KXY. The energy of the ejected electron is $E_K - E_X - E'_Y$, where E_K and E_X are the K- and X-shell electron binding energies in the neutral atom, respectively, and E'_Y is the binding energy of a Y-shell electron in an atom containing a vacancy in the X-shell. The most intense K Auger transitions are of the type KLL. In this compilation the K Auger electrons are treated as a single group having the energy of the strongest transition (KL_2L_3), because the relative intensities of the different electrons in the KLL group are not accurately known for all atomic numbers and the energy difference between transitions is small (≤ 5 keV for $Z \leq 92$). The energy of the strongest KLL transition is obtained from Bergstrom et al.^{1,6}

Very little is known about the energies or relative intensities of individual L Auger electrons. In this compilation the L Auger electrons are treated as a single group having the energy of an $L_3M_4M_5$ transition.

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Preparation of Radioactive Decay Data Sets

The tables of radioactive decay data given in Appendix 5 of this handbook were produced by the computer code MEDLIST,¹ which uses as input radioactive decay data sets consisting of card images written in the format of the Evaluated Nuclear Structure Data File (ENSDF).² In this chapter a sample data set is described, and the methods used in this compilation to prepare data sets in the ENSDF format are discussed.

3-1 ENSDF FORMATS

Radioactive decay data in ENSDF are organized into data sets, each of which summarizes the state of experimental knowledge for a distinct decay mode (alpha, beta, or isomeric transition) of a particular radionuclide. Thus, if a given radionuclide has more than one decay mode (e.g., isomeric transition and β^- decay), each of which necessarily leads to a different daughter nucleus, each decay mode is described by a separate data set. Each data set includes an adopted value for the radionuclide half-life and the decay branching fraction for the particular decay mode, adopted values for the energies and intensities of the nuclear radiations (alpha, β^- , β^+ , gamma, and internal conversion electrons) occurring in the decay mode, and an adopted uncertainty for each quantity. A decay data set also includes descriptive information on daughter radionuclides produced in the particular decay mode and their abundances.

Each decay data set in ENSDF is written in a uniform, standard format. The format is illustrated by means of the data set for ^{134}Cs β^- decay shown in Fig. 3.1.

The data set begins with an identification record giving the daughter nucleus (134BA); the data set name [134CS B- DECAY (2.062 Y)]; key numbers for the literature references as assigned by the Nuclear Data Project (75HE08, 75VA12, 76GR11); the characters HASRD-DCK, which appear on all data sets prepared for this compilation in the Health and Safety Research Division (HASRD) by myself (DCK), and the month and year when the data set was prepared or last revised (3/78).

Following the identification record are comment records denoted by the letter "C" following the daughter nucleus. Comment records are optional in ENSDF, but they are always used in this compilation to give information on the decay branching ratio if the particular decay mode does not occur 100% of the time, on decay branching ratios for other modes of decay or cross-references to decay data sets for the other decay modes, and on daughter radionuclides produced by the particular decay mode of the parent. In Fig. 3.1 the comments indicate that ^{134}Cs decays (99.9997 ± 0.0001)% by β^- decay and the remaining (0.0003 ± 0.0001)% by electron capture (EC) decay (see Appendix 1 for the conventions used for writing a number and its uncertainty). We emphasize again that, since decay modes other than β^- decay produce daughter nuclei different from ^{134}Ba , data for the alternate decay modes are not contained in this data set. In this case a separate data set for ^{134}Cs electron capture decay was not prepared since the branching ratio is less than the arbitrary cutoff of 0.1% chosen for this compilation.

The normalization record, denoted by "N," gives the factors by which the adopted relative gamma-ray intensities are multiplied to obtain absolute intensi-


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1348A 134CS B- DECAY (2.062 Y) 75HE08,75VA12,76GR11, HASRD-DCK, 3/78
1348A C 7B- DECAY=99.9997 1
1348A C 7EC DECAY=0.0003 1
1348A N 1.000003 1 0.999997 1
134CS P 0.0 4(+1) 2.062 Y 5 2058.4 4
1348A L 0.0 0+ STABLE
1348A L 604.704 14 2+
1348A B 0.008 4 14.0922
2 B EAV= 534.46 18s
1348A G 604.695 15 97.6 3 E2 0.00599 C
1348A2 G KC=0.00503s
1348A L 1167.933 17 2+
1348A B 0.045 15 12.5415
2 B EAV= 299.88 16s
1348A G 563.227 15 8.38 5 M1+E2 7.5 9 0.00726 1 CC
1348A G 1167.94 3 1.80 3 E2 C
1348A L 1400.537 21 4+
1348A B 70.1 5 8.884 4 C
2 B EAV= 210.11 15s
1348A G 795.845 22 85.4 4 E2 0.00305 CC
1348A2 G KC=0.00258s
1348A L 1643.310 25 3+
1348A B 2.48 5 9.655 9
2 B EAV= 123.40 14s
1348A G 242.89 5 0.0210 8 IF M1+E2 0.0880 23
1348A G 475.35 5 1.46 4 E2+(M1) 0.0114 C
1348A G 1038.571 26 1.00 1 M1+E2 -1.8 2
1348A L 1969.857 20 4+
1348A B 27.40 13 6.483 7
2 B EAV= 23.06 11s
1348A G 326.45 10 0.0144 6 IF M1+E2 0.0370 23
1348A G 569.315 15 15.43 11 M1+E2 -0.29 2 0.00952 3 C
1348A2 G KC=0.00813 3s
1348A G 801.932 22 8.73 4 M1+E2 0.010 4 0.00427 C
1348A G 1365.15 3 3.04 4 E2 C

```

Fig. 3.1 Data set for ^{134}Cs β^- decay written in ENSDF format.

ties. Multiplication by the first factor (1.000003 ± 0.000001) gives the number of gamma rays per 100 β^- decays of the parent. Multiplication of the resulting intensities by the second factor (0.999997 ± 0.000001), which is the decay branching fraction for the particular decay mode, gives the number of gamma rays per 100 decays of ^{134}Cs . We note in this case that the product of the two normalization factors is unity, which results from the fact that absolute gamma-ray intensities rather than relative values are given with the data set. It is more often the case that the adopted gamma-ray intensities are arbitrarily normalized to 100 units for the strongest transition, and therefore the first factor on the normalization record is different from unity.

Following the normalization record is the parent record, denoted by "P," which gives the parent nucleus (134CS), the excitation energy (0.0), and

spin-parity [4(+)] of the parent (the parentheses around the "+" denote an uncertain parity assignment), the adopted half-life (2.062 ± 0.005 years), and the adopted decay Q-value (2058.4 ± 0.4 keV), which is the total energy difference between the ground states of the parent and daughter atoms.

The remainder of the data set consists of a series of records giving data on the levels in the daughter nucleus which are fed in the decay, the direct β^- feeding to these levels, and gamma rays and internal conversion electrons from de-excitation of the levels.

The level records for the daughter nucleus are denoted by "L." They give the level energy (e.g., 604.704 ± 0.014 keV for the first excited state), the spin-parity (e.g., 2+), and the half-life if known (e.g., STABLE for the ground state).

Following each level record is the β^- record, denoted by "B," for that level, which is included only

if the direct β^- feeding to the level is nonzero. Each β^- record consists of two cards. The first card gives the number of β^- decays feeding the level per 100 decays of the parent (e.g., 0.008 ± 0.004 for the first excited state) and the log-ft value³ (14.09 ± 0.22). The blank columns preceding the beta intensity can be used to enter the beta endpoint energy and its uncertainty. In this compilation, however, this field is normally left blank, and the endpoint energy is calculated automatically when the data set is processed by other computer codes from the adopted level energy and Q-value given on the parent record and from the adopted level energy in the daughter given on the level record (see Chap. 2, Eq. 2.4). The second card of each beta record gives the average beta energy (e.g., 534.46 ± 0.18 for the first excited state). For β^+ and electron capture decay, the records comparable to the β^- records are denoted by "E" and have the same form as the β^- records except that on the first card the β^+ and electron capture intensities are given separately and the second card of each record also contains the fraction of decay by electron capture from the K, L, M, and all higher shells. For alpha decay, the record denoted by "A" consists of a single card giving the energy of the alpha particle feeding the level (this datum must be entered for alpha decay) and the number of alpha particles per 100 alpha decays of the parent. For isomeric transitions, there are no records corresponding to the B, E, or A records.

The gamma records, denoted by "G," describe gamma-ray transitions originating from the decay of the particular level in the daughter. (If a gamma or an alpha radiation properly belongs in a data set but cannot be associated with any particular level, the record is placed in the data set before the first level record.) A gamma record consists of either one or two cards. The first card gives the adopted gamma-ray energy (e.g., 563.227 ± 0.015 keV for the first gamma ray from the second excited state); the adopted relative gamma-ray intensity (e.g., 97.6 ± 0.3); the transition multipolarity, if known (e.g., M1 + E2, indicating a mixture of magnetic dipole and electric quadrupole radiation); the multipole mixing ratio, if known (e.g., 7.5 ± 0.9), for transitions involving more than one multipole (the square of the mixing ratio in this case gives the ratio of E2 to M1 radiation); the total internal conversion coefficient (e.g., 0.00726 ± 0.00001), defined as the total number of internal conversion electrons per gamma ray for the transition; and symbols (CC) denoting measured gamma-gamma coincidences. For

the transition multipolarity, the notation "IF M1 + E2" denotes a transition assumed to be M1 + E2 for the purpose of estimating the intensity of internal conversion electrons, and parentheses denote uncertain assignments. The second card of the gamma record gives internal conversion coefficients for the K, L, M, etc., shells. For example, the K-shell internal conversion coefficient (KC) for the decay of the first excited state is 0.00503. In this compilation an internal conversion coefficient is given on a second gamma card only if the resulting conversion electron intensity (i.e., the conversion coefficient for the particular shell multiplied by the number of gamma rays per 100 decays of the parent) is 0.1 per 100 decays or more.

Each decay data set written in the ENSDF format terminates with a blank card.

3-2 PREPARATION OF DECAY DATA SETS

In this section the methods used in this work to prepare radioactive decay data sets in the ENSDF format are described in some detail. All computer codes used in this process were developed by the Nuclear Data Project.

Preparation of the decay data sets normally involved the following procedures:

1. Evaluation of all available measurements reported in the literature, selection of adopted values for the measured quantities (the half-life and decay branching fraction, gamma-ray energies and relative intensities, energies and absolute intensities for β^- , β^+ , and alpha particles, relative conversion electron intensities, and gamma-ray multipole mixing ratios), and placement of the observed radiations in a decay scheme involving energy levels in the daughter nucleus.

2. Calculation of internal conversion coefficients for the gamma-ray transitions.

3. Normalization of the decay scheme to obtain absolute gamma-ray and conversion electron intensities.

4. Calculation of adopted level energies in the daughter and, for beta decays, the intensity of beta transitions feeding each level.

5. For beta decays, calculation of average beta energies and log-ft values for each transition.

These procedures are described in the following paragraphs.

3-2.1 Data Evaluation and Construction of the Decay Scheme

The process of evaluating all data reported in the literature and constructing the decay scheme for a given mode of decay of a given radionuclide was normally based on an examination of the data presented in the relevant mass-chain compilation published either in the journal *Nuclear Data Sheets* (for radionuclides with $A \geq 45$) or in the journal *Nuclear Physics* (for $A = 3$ to 44). Many of the decay schemes published in the mass-chain compilations had already been prepared by other compilers in the ENSDF format. For a few radionuclides, we began by examining the data sets in ENSDF format previously prepared by M. J. Martin of the Nuclear Data Project.⁴ Next, we examined all relevant papers published in the open literature since the cutoff date for papers included in the mass-chain compilation or in the existing data set in ENSDF format. The additional literature search was greatly facilitated by use of the issues of *Nuclear Data Sheets* called "Recent References."

All decay schemes adopted for use in this compilation are based on my evaluation of all data reported in the mass-chain compilations and "Recent References" through April 1979. If the date given with a data set precedes April 1979 (e.g., 3/78 on the first card in Fig. 3.1), this indicates that no new data were reported between the two dates. No previously proposed decay schemes were adopted for this compilation without further examination of all the data. For a few radionuclides, this reexamination produced significant changes in the decay scheme adopted for this compilation. Some of these cases are described in Chap. 7.

In this work the adopted values for the gamma-ray energies and multipole mixing ratios for a given decay data set were based on the most accurate measurements from any experiment and were not necessarily measured in the particular radioactive decay of concern. For example, the adopted gamma-ray energies in the beta decay of an isomeric state of a nucleus would be taken from measurements on the beta decay of the ground state of the same nucleus if more-accurate values were obtained in the latter experiment. Similarly, adopted gamma-ray energies for a β^- decay data set could be obtained from measurements following β^+ or electron capture decay leading to the same daughter nucleus and vice versa. Some of the adopted multipole mixing ratios were obtained from diverse experiments, such as Coulomb

excitation or in-beam gamma-ray spectroscopy. Consequently, if more than one radionuclide in the present compilation decays to the same daughter nucleus, all gamma rays common to the different decay schemes have the same adopted energy, multipole mixing ratio, and internal conversion coefficients.

3-2.2 Calculation of Internal Conversion Coefficients

Following construction of the decay scheme, internal conversion coefficients for the gamma-ray transitions in the daughter nucleus were calculated by using the computer code HSICC (Ref. 2). For transitions with multipolarity $L \geq 3$, the adopted internal conversion coefficients were taken to be 3% less than the values calculated by the code to provide better overall agreement between theory and experiment.⁵

For some transitions, the adopted multipolarity and multipole mixing ratio were determined directly from such measurements as the ratio of conversion electron to gamma-ray intensities, ratios of conversion electron intensities for different atomic shells or subshells, or angular correlations of two cascading gamma rays. For other transitions, the multipolarity was inferred from the known spin-parity change between the initial and final states. For example, any transition involving a state with spin-parity 0^+ has a multipolarity uniquely determined by the spin-parity of the other state. A transition involving a spin-parity change $\Delta J^\pi = 1^-$ was assumed to be E1 in the absence of other data because possible M2 admixtures are usually small. For spin changes $\Delta J \geq 2$, we assumed that the transition proceeds by the lowest possible multipole order. Appreciable multipole mixing often occurs whenever both M1 and E2 transitions are allowed. If no experimental data were available but the spin-parity change was known to be $\Delta J^\pi = 0^+$ or 1^+ , we normally assumed internal conversion coefficients equal to the average of the M1 and E2 values with an uncertainty equal to half the difference. Exceptions occurred, however, for some low-energy transitions in heavy nuclei if the E2 internal conversion coefficients resulted in an unreasonably large total transition intensity (gamma rays plus conversion electrons), in which case the transition was assumed to be pure M1.

If no data were available to determine the transition multipolarity or if the transition did not involve a known spin-parity change, no assumption

was made in this compilation concerning the transition multipolarity, and internal conversion was assumed to be zero.

An adopted value for the total internal conversion coefficient, denoted by α_T , is entered on the first card of the gamma record only if the relative transition intensity, $I_\gamma(1+\alpha_T)$, where I_γ is the relative gamma-ray intensity, differs from I_γ by at least one digit in the last significant figure. Internal conversion coefficients for the different atomic shells are entered on the second card of the gamma record only if the resulting conversion electron intensity is at least 0.1 per 100 decays of the parent. Internal conversion coefficients for as many as four shells can be entered—K, L, M, and N+, where N+ includes internal conversion for the N and higher shells. An entry for M+-shell internal conversion (M and higher shells as a single group) is made whenever the M-shell internal conversion electron intensity, $I_{ce,M}$, is at least 0.1 per 100 decays but $I_{ce,N+}$ is less than this amount or whenever $I_{ce,M}$ and $I_{ce,N+}$ are both less than 0.1 per 100 decays but their sum exceeds this amount.

3-2.3 Normalization of Decay Schemes

Normalization of a decay scheme is the process of obtaining the constants entered on the normalization record which determine the number of gamma rays and conversion electrons per 100 decays of the parent from the adopted relative gamma-ray intensities and internal conversion coefficients. One normalization constant determines the number of gamma rays and conversion electrons per 100 decays via the particular decay mode for the data set, and the second normalization constant is the decay branching fraction for the particular decay mode.

Depending on the data available, the normalization constants for a decay scheme were determined by one or more methods. For a decay mode with a branching fraction of unity, for example, one common method for normalizing the decay scheme is to use measurements, where available, of the number of gamma rays emitted per β^- or β^+ particle for a strong gamma-ray transition. Another method is to use the requirement that the total intensity of the direct beta decay to the ground state plus all gamma rays and internal conversion electrons feeding the ground state must be 100 per 100 decays of the parent (i.e., all decays of the parent eventually populate the ground state). This method is especially useful whenever the direct beta feeding to the ground state has been

accurately measured or can be assumed to be zero from the large spin change involved in the transition.

The system used in ENSDF, by which relative gamma-ray intensities are entered on the gamma records and all normalization factors for obtaining absolute intensities are entered on a single normalization record, has considerable advantages compared with entering absolute gamma-ray intensities directly on each gamma record. Suppose, for example, that the normalization for a decay scheme is determined by a measurement of the number of gamma rays per β^- decay for the strongest gamma-ray transition. If a new measurement changes the adopted value of this quantity, only a single entry has to be changed on the normalization record in the ENSDF format to obtain the new values of the absolute gamma-ray intensities, whereas the gamma-ray intensity on every gamma record would have to be changed if the normalization record were not used.

3-2.4 Calculation of Level Energies and Beta Decay Intensities

For each decay scheme, the adopted energies of the levels in the daughter nucleus were calculated by using the computer code GTOL,² which performs a least-squares adjustment of the energies of all gamma rays placed in the decay scheme. The calculations also take into account the recoil energy of the nucleus accompanying each transition.

For beta decay schemes, measured intensities of β^- or β^+ transitions feeding individual levels were adopted only if they were used to determine the normalization constants for the decay scheme. In general, it is very difficult to directly measure the intensity of each individual β^- or β^+ transition in a decay scheme containing more than one or two transitions, and intensities of electron capture transitions cannot be directly measured. Therefore the beta feedings to most levels in the daughter were calculated by the code GTOL as the difference between the number of gamma rays plus internal conversion electrons from decay of the level and the number of these radiations feeding the level from the de-excitation of higher excited states, with the intensities properly normalized to give transitions per 100 decays of the parent. For alpha decay schemes, measured alpha intensities were normally adopted for each level, but the calculations with the code GTOL were used to check that the measured alpha intensities agreed with those inferred from the gamma-ray plus conversion electron intensity balances.

3-2.5 Calculation of Average Energies and Log-ft Values for Beta Decay

For beta decay schemes, the average β^- or β^+ energy for a transition feeding a given level, the ratio of electron capture to β^+ intensity and the relative intensities for K-, L-, and M-shell electron capture, and the log-ft value were calculated by using the computer code LOGFT.³ All transitions were assumed to be allowed except for known first-forbidden unique or second-forbidden unique transitions. The endpoint energy for each β^- or β^+ transition and the total energy released in an electron capture transition were obtained from the level energy of the parent state and the decay Q-value contained on the parent record and the excitation energy of the particular level in the daughter given on the level record. For most decay schemes, the adopted Q-value was obtained from the recent atomic mass adjustment of Wapstra and Bos.⁶

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Computer Code MEDLIST and Description of Tables of Radioactive Decay Data

The radioactive decay data tables given in Appendix 5 of this handbook were generated by processing the decay data sets in ENSDF format with the computer code MEDLIST.¹ The MEDLIST code also uses computer files of the relevant Z-dependent constants (X-ray energies, ω_K , n_{KL} , etc.) described in Chap. 2, Sec. 2-4. For each data set, the code calculates the energies and intensities of the atomic radiations (X rays and Auger electrons). The code then combines the atomic radiations with the nuclear radiations contained in the data set in ENSDF format, sorts them according to radiation type (internal conversion and Auger electrons, alpha particles, β^- or β^+ particles, and gamma rays and X rays), and, within each type, arranges and numerically labels them in order of increasing energy.

Uncertainties in all experimental quantities, including the Z-dependent constants, are propagated consistently throughout the calculations. An uncertainty of 3% is assigned to all theoretical internal conversion coefficients and is combined with the experimental uncertainties.

Figure 4.1 shows the data table for ^{134}Cs β^- decay obtained from the data set in ENSDF format shown in Fig. 3.1 and discussed in Chap. 3, Sec. 3-1. The symbols used in the data tables and their definitions are listed in Appendix 1.

For each decay data set, the table contains data on the atomic and nuclear radiations of the following types: Auger electrons (shells K and L); X rays ($K_{\alpha 1}$, $K_{\alpha 2}$, K_{β} , and L); β^- particles; β^+ particles; alpha (α) particles; gamma rays (γ); and internal conversion electrons (ce) (shells K, L, M, and N+).

The data tables list all radiations with intensity greater than the variable low-intensity limit built into the MEDLIST code. In this compilation the low-

intensity limit is 0.1 per 100 decays, as indicated by the heading " $I(\text{min}) = 0.10\%$ " printed with the tables. Immediately following the listings for alpha, beta, and gamma radiations, the code prints a comment giving the number of radiations omitted from the list because of the low-intensity limit (provided that the total intensity of all omitted radiations of the particular type exceeds 0.01 per 100 decays), the average of the energies of the omitted radiations weighted by the respective intensities, and their total intensity. For ^{134}Cs β^- decay, for example, two weak β^- groups are omitted with weighted average energy of 335.3 keV and total intensity of 0.05 per 100 decays. For β^+ decays, the code prints a comment following the gamma-ray list giving the maximum possible intensity of the annihilation radiation, which is calculated as twice the total intensity of all emitted positrons.

It should be noted that a somewhat different convention is used in numerically labeling the alpha and beta radiations in the data tables compared with the labeling of gamma and conversion electron radiations. For alpha and beta radiations, only those transitions with intensity greater than 0.1 per 100 decays are given a numerical label in order of increasing energy. Thus, for example, one or more weak omitted β^- radiations could occur with energies between those for the transitions labeled " $\beta^- 1$ " and " $\beta^- 2$ " and similarly for alpha radiations. For gamma rays and their corresponding internal conversion electrons, however, the numerical labels are applied to *all* radiations contained in the data set in ENSDF format. These labels are maintained throughout the MEDLIST calculations and are carried into the output. Therefore, when gamma rays are omitted from the data table because of their low intensity, the

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
● ^{134}Cs β^- Decay (2.062 y 5) I (min) = 0.10%			
% β^- Decay = 99.9997 1			
%EC Decay = 0.0003 1			
Auger-L	3.67	0.66 5	≈0
ce-K- 5	531.874 15	0.125 1	0.0014
ce-K- 6	567.258 15	0.491 15	0.0059
ce-K- 7	758.404 22	0.220 7	0.0036
β^- 1 max	88.5 4		
avg	23.06 11	27.40 13	0.0135
β^- 2 max	415.1 4		
avg	123.40 14	2.48 5	0.0065
β^- 3 max	657.9 4		
avg	210.11 15	70.1 5	0.314
total β^-			
avg	156.8 3	100.0 6	0.334
2 weak β^- 's omitted: $E\beta$ (avg) = 335.3; $\Sigma I\beta$ = 0.05%			
X-ray $K\alpha_2$	31.8171 3	0.214 8	0.0001
X-ray $K\alpha_1$	32.1936 3	0.396 15	0.0003
X-ray $K\beta$	36.4	0.144 6	0.0001
γ 3	475.35 5	1.46 4	0.0148
γ 4	563.227 15	8.38 5	0.101
γ 5	569.315 15	15.43 11	0.187
γ 6	604.699 15	97.6 3	1.26
γ 7	795.845 22	85.4 4	1.45
γ 8	801.932 22	8.73 4	0.149
γ 9	1038.57 3	1.000 10	0.0221
γ 10	1167.94 3	1.80 3	0.0448
γ 11	1365.15 3	3.04 4	0.0884
2 weak γ 's omitted: $E\gamma$ (avg) = 276.9; $\Sigma I\gamma$ = 0.04%			

Fig. 4.1 Table of energies and intensities of atomic and nuclear radiations from ^{134}Cs β^- decay produced by the computer code MEDLIST from the data set in ENSDF format.

remaining radiations that are listed separately are not relabeled. In Fig. 4.1, for example, the list of gamma rays begins with γ 3, which indicates that the two weak gammas omitted are γ 1 and γ 2. The labeling of all gammas, whether or not they are listed separately in the tables, is maintained because an internal conversion electron line associated with an omitted gamma ray appears in the list if its intensity exceeds the low intensity cutoff. Suppose, for example, that the gamma listing contains the sequence γ 1, γ 2, γ 4, . . . , which indicates that γ 3, with energy between those of γ 2 and γ 4, has been omitted because of its low intensity. The conversion electron list would nonetheless contain an entry labeled ce-K-3 if the intensity for the K-shell internal conversion electron associated with γ 3 exceeds the low-intensity limit.

In each data table the radiations are listed in the first column by type. Particle radiations (Auger, ce, alpha, and beta) are listed first, followed by the electromagnetic radiations (X ray and gamma). Whenever more than one beta group occurs, the table contains a separate entry at the end of the beta listing, labeled "total β^- ," which gives the average energy and total intensity for the composite spectrum. This entry includes the contributions from the groups omitted from the list because of the low-intensity limit. For β^- decay, the total beta intensity should, in principle, be precisely equal to the decay branching ratio for the parent radionuclide [e.g., $(99.9997 \pm 0.0001)\%$ for ^{134}Cs and 100% for β^- emitters having no alternate mode of decay]. As indicated in Chap. 3, Sec. 3-2.4, however, the intensities of the individual β^- groups are usually deter-

mined indirectly from the gamma and ce intensity balances for the different levels in the daughter, and therefore the total β^- intensity does not normally equal the expected amount. This is particularly the case if there are levels in the daughter for which the gamma + ce intensity feeding the level from the de-excitation of higher excited states exceeds the gamma + ce intensity depopulating the level. The total β^- intensity could be replaced by the known branching ratio, but we have not done so in this compilation. We note that, for the decay data tables in Appendix 5, the total β^- intensity always agrees with the known branching ratio within experimental uncertainties.

The second and third columns in each table give the energy in keV and intensity in number per 100 decays of the parent, respectively. For beta groups, both the maximum (endpoint) and the average energies for each transition are given.

The last column gives the mean energy emitted per unit of cumulated activity, Δ , in units of gram-rads/microcurie-hour. For an infinite, homogeneous medium in which a radioactive source is uniformly dispersed with a concentration of $1 \mu\text{Ci-h/g}$, Δ gives the absorbed dose in rads. From the definitions of the curie as 3.7×10^{10} disintegrations per second and the rad as 100 ergs per gram, it is easy to show that, for a source concentration of $1 \mu\text{Ci-h/g}$, an energy release of 1 MeV per disintegration results in an absorbed dose of 2.13 rads.

The first entry in each data table (e.g., see Fig. 4.1) gives the title of the decay data set, the adopted half-life for the parent nucleus, and the low-intensity cutoff limit for the separate listing of radiations in the table. We note that the symbol "M" is not used with the mass number of the parent to denote a metastable isomeric state. Rather, an isomer is uniquely identified by the radionuclide name and the half-life.

The following policy concerning the use of " β^+ " and "EC" in data set names for positron and/or electron capture decay should be noted. The use of "EC" may denote either pure electron capture decay or electron capture and positron decay if positron emission is energetically allowed. In the latter case, the notation " β^+ " may also be used, especially if positron decay is more probable than electron capture.

If the given mode of decay produces a daughter nucleus that is also radioactive or if the parent radionuclide decays by more than one mode, comments are printed below the title for the data table. If

no comments are given, the parent decays 100% by the given decay mode to a stable daughter.

We first consider the comments for the case of a single decay mode for the parent leading to one or more radioactive daughters. The radionuclide ^{88}Kr , for example, decays entirely to the radionuclide ^{88}Rb ; thus the data set for $^{88}\text{Kr} \beta^-$ decay contains the comment "Feeds ^{88}Rb ." As a more complicated example, ^{91}Sr decays to both the ground state (58.51 d) and the isomeric state (49.71 m) of ^{91}Y . Thus the data set for $^{91}\text{Sr} \beta^-$ decay contains the comments "% Feeding to ^{91}Y (58.51 d) = 42.6 16" and "% Feeding to ^{91}Y (49.71 m) = 57.4 16." So that contributions to the decay of a parent when daughter radionuclides are produced can be correctly included, the radiations for each member of the decay chain must be combined by using the standard equations for parent-daughter activity relations and the known feeding of each member of the chain. The equations describing parent-daughter activity ratios are given in Chap. 6.

For a parent radionuclide that has more than one mode of decay, each decay mode is given in a separate table, provided the decay mode yields at least one radiation with intensity greater than 0.1 per 100 decays of the parent, and comments giving cross-references to the alternate modes of decay are given. For example, ^{64}Cu decays by both β^+ and β^- decay. Thus the data set for $^{64}\text{Cu} \beta^+$ decay contains the comment "See also $^{64}\text{Cu} \beta^-$ Decay" and the data set for $^{64}\text{Cu} \beta^-$ decay contains the comment "See also $^{64}\text{Cu} \beta^+$ Decay." Whenever alternate decay modes occur, the radiations from each data set can simply be combined to obtain all radiations from the particular parent. If a separate data set has not been prepared because an alternate decay mode produced no radiations above the low-intensity limit, the alternate decay branching ratio is given in a comment with the data set for the prevalent decay mode. In Fig. 4.1, for example, we find that ^{134}Cs also decays (0.0003 ± 0.0001)% via electron capture decay. Known decay branches for spontaneous fission, which is not included in this compilation, are also indicated in this manner. For example, the data table for ^{256}Fm alpha decay contains the comment "% Spontaneous Fission = 91.9 3."

REFERENCE

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Applications of Decay Data to Radiation Dosimetry and Radiological Assessments

In addition to the data tables given in Appendix 5, the MEDLIST code produces output in a decimal, computer-readable format suitable for use as input to further calculations. This chapter briefly describes some of the applications of the decay data in computer-readable format to the radiation dosimetry and radiological assessment activities of the Health and Safety Research Division at Oak Ridge National Laboratory.

The formats for the card images of the decimal output from the MEDLIST code are a close approximation to the formats proposed for radioactive decay data in the ENDF/B-V file by the National Neutron

Cross Section Center at Brookhaven National Laboratory.¹ The formats for the output produced by the MEDLIST code are available from the Nuclear Data Project upon request.

The MEDLIST decimal output is generally more extensive than required in applications to radiation dosimetry. Therefore the computer code CONVER² was written to prepare output of energies and intensities by radiation type in a simple format suitable for input to further calculations. The output from the CONVER code for ^{134}Cs β^- decay is shown in Fig. 5.1. The first card gives the radionuclide name, half-life, and atomic number. The

CS-134	2.062 Y	55.				
0						
4						
8.8543E-02	2.3060E-02	2.7400E-01	4.1509E-01	1.2340E-01	2.4800E-02	
6.5786E-01	2.1011E-01	7.0100E-01	9.7550E-01	3.3529E-01	5.3000E-04	
0						
5						
3.6700E-03	6.5531E-03	2.6400E-02	8.2834E-04	5.3187E-01	1.2545E-03	
5.6726E-01	4.9093E-03	7.5840E-01	2.2033E-03			
14						
4.4700E-03	8.9360E-04	3.1817E-02	2.1438E-03	3.2194E-02	3.9554E-03	
3.6400E-02	1.4394E-03	4.7535E-01	1.4600E-02	5.6323E-01	8.3800E-02	
5.6932E-01	1.5430E-01	6.0470E-01	9.7600E-01	7.9584E-01	8.5400E-01	
8.0192E-01	8.7300E-02	1.0386E 00	1.0000E-02	1.1679E 00	1.8000E-02	
1.3652E 00	3.0400E-02	2.7688E-01	3.5400E-04			

Fig. 5.1 Table of energies and intensities of radiations from ^{134}Cs β^- decay in card-image form produced by the computer code CONVER from the computer-readable output from the MEDLIST code.

atomic number of the parent is needed for the calculation of external dose from electrons from beta decay. The subsequent cards give the number of radiations for a particular type and the energies and intensities of the radiations of that type. The radiation type is listed in the following order: alpha particles, β^- particles, β^+ particles, Auger and internal conversion electrons, and gamma rays and X rays. In Fig. 5.1, for example, the "0" on the second card indicates that no alpha particles are emitted. The "4" on the next card indicates the number of β^- particles. The entries on the two cards following give the endpoint energy in million electron volts (MeV), the average energy in MeV, and the intensity in number per decay of the parent for the first β^- group, followed by similar data for the three remaining groups. The next "0" indicates the number of positrons emitted. The following "5" gives the number of Auger and internal conversion electrons. The entries on the next two cards give the energy in MeV and the intensity in number per decay for each of the five radiations. The data for the 14 gamma rays and X rays follow in the same format.

For application to radiation dosimetry, it is sensible to combine the data from the different modes of decay of a given radionuclide into a single data set. For example, ^{64}Cu decays by both β^+ and β^- decay, and two separate sets of decay data in decimal format are therefore produced by the MEDLIST code. The output from the code CONVER for each data set is then combined into a single data set giving all radiations from the decay of ^{64}Cu .

The MEDLIST decimal output in the simplified format illustrated in Fig. 5.1 has been used in the Health and Safety Research Division as input to two types of calculations in radiation dosimetry. First, the decay data published in a previous report³ have been used to calculate dose-rate conversion factors for external exposure to electron and photon radiations for three modes of exposure—immersion in contaminated air, immersion in contaminated water, and exposure to a contaminated ground surface. For a unit concentration of a given radionuclide of $1 \mu\text{Ci}/\text{cm}^3$ in air or water or $1 \mu\text{Ci}/\text{cm}^2$ on the ground, the decay data are used to calculate dose-equivalent rates in units of millirems per year for various body organs of an exposed individual.⁴ The second application concerns the calculation of S factors for internally deposited radionuclides.⁵ For unit residence of $1 \mu\text{Ci}\cdot\text{day}$ in a particular source organ in the body, the S factors give the dose equivalent in rems for various target organs, including the source organ

itself. The S factors are then combined with metabolic models for transport of radionuclides in the body following intake via inhalation or ingestion and models for retention of radionuclides in the various body organs to calculate dose conversion factors, which give the dose equivalent per unit intake for the organs of interest.^{6,7}

The applications of decay data to radiation dosimetry described in the preceding text essentially give the dose equivalent per unit activity to which man is exposed. Realistic estimates of concentrations of radionuclides in the environment require implementation of models to describe such phenomena as atmospheric transport and dispersion, transport of radionuclides through terrestrial and aquatic food chains leading to ingestion by man, and the use of consumer products containing radioactive materials.⁸

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8. G. G. Killough and L. R. McKay, *Methodology for Calculating Radiation Doses from Radioactivity Released to the Environment*, USAEC Report ORNL-4992, Oak Ridge National Laboratory, 1976, NTIS.

Parent-Daughter Activity Ratios

A common occurrence in radioactive decay is a parent radionuclide decaying to a daughter that is also radioactive. Estimates of radiation dose to man must properly account for the buildup and decay of the radioactive daughter products.

First consider the case of a radioactive parent (p) with half-life $T_{1/2}(p)$ and decay constant λ_p [$\lambda = (\ln 2)/T_{1/2}$] which feeds a radioactive daughter (d) with half-life $T_{1/2}(d)$ and decay constant λ_d in a fraction f of the parent decays. If we assume that the activity of the daughter is zero at time $t = 0$, it is easy to show from the exponential law of radioactive decay that the ratio of the daughter activity, $\lambda_d N_d$, where N_d is the number of atoms of the daughter, to the activity of the parent, $\lambda_p N_p$, at time t is given by¹

$$\frac{\lambda_d N_d}{\lambda_p N_p} = \frac{f T_{1/2}(p)}{T_{1/2}(p) - T_{1/2}(d)} [1 - e^{-(\lambda_d - \lambda_p)t}] \quad (6.1)$$

In many parent-daughter decay chains, the daughter is short lived compared with the parent, in which case the activity of the daughter relative to that of the parent approaches a value that is constant with time. For a time that is large compared with $[1/(\lambda_d - \lambda_p)]$, the daughter is in transient equilibrium with the parent, and the activity ratio reduces to

$$\frac{\lambda_d N_d}{\lambda_p N_p} = \frac{f T_{1/2}(p)}{T_{1/2}(p) - T_{1/2}(d)} \quad (6.2)$$

For example, the radionuclide ^{99}Mo , with $T_{1/2}(p) = 66.02 \pm 0.01$ hours, decays to the isomeric state in ^{99}Tc , with $T_{1/2}(d) = 6.02 \pm 0.02$ hours, in a fraction $f = 0.886 \pm 0.009$ of the decays. At transient equilibrium, which is essentially achieved for times greater than 10 half-lives of the daughter, the ratio of ^{99}Tc activity to ^{99}Mo activity is $(0.886 \pm 0.009)(1.1003 \pm 0.0004) = 0.975 \pm 0.010$. Therefore, so that all radiations from a ^{99}Mo source at transient equilibrium will be correctly accounted for, the intensities of the radiations from the decay of the daughter product ^{99}Tc (6.02 hours) should be multiplied by 0.975 ± 0.010 and combined with the radiations from ^{99}Mo decay.

For the general case of a parent that has a series of radioactive daughters, such as the alpha decay chains for many of the transuranic radionuclides, the activity of any daughter product as a function of time can be obtained from the general solution of the Bateman equations, which is given, for example, by Evans¹ and by Skrable et al.²

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Accuracy of the Data and Uncertain Decay Schemes

As described in Chap. 4, the uncertainties in the intensities given in the tables of decay data in Appendix 5 are based primarily on uncertainties in measurements estimated by the experimenters. For most of the radionuclides, it is evident from the tables that the experimental uncertainties are sufficiently small that the decay data may be used with confidence in applications to radiation dosimetry. For other radionuclides, however, the adopted uncertainties show that the available measurements are not sufficiently precise to determine the decay data with high accuracy. It is particularly the case that the intensities of some important β^- transitions, as obtained from gamma-ray plus conversion electron intensity balances, are relatively poorly determined. For some radionuclides, no experimental uncertainties have been given with the adopted intensities. In most of these cases, however, it is likely that the intensities of at least the stronger radiations have been determined with reasonable accuracy.

Other sources of error in the decay data may be more significant than the experimental uncertainties given in the data tables. One source of error arises from the subjective processes of choosing the adopted values for measured quantities from different sets of experimental results and constructing the adopted decay data set in the ENSDF format. The choices made may lead to significant errors in the decay data, particularly whenever conflicting sets of data are available. The extent to which subjective judgments have resulted in significant errors in this work is difficult to determine, but, for the radionuclides in common, the decay data given in this handbook are generally in good agreement with the results previously adopted by Martin.¹

A second potentially important source of error in the decay data arises from a lack of measurements necessary to determine the decay scheme accurately. In these cases the decay data given for some of the more intense radiations may be significantly in error, and other important radiations may have been left out of account.

The remainder of this chapter briefly discusses those radionuclides in this handbook for which, in my opinion, the adopted decay data may contain significant uncertainties or errors resulting from lack of appropriate experimental data. The radionuclides are divided into two classes—those of interest to the nuclear fuel cycle and the remaining radionuclides. In each case the reader is referred to the appropriate data tables in Appendix 5. The literature references in the text are denoted by key number and are given in Appendix 3.

7-1 UNCERTAIN DECAY DATA FOR RADIONUCLIDES FROM THE NUCLEAR FUEL CYCLE

The decay schemes for the following radionuclides of interest to the nuclear fuel cycle may be significantly in error: ^{92}Sr , ^{115}Cd (44.6 d), ^{133}Te (55.4 m), ^{141}La , ^{142}Ba , ^{166}Ho (1200 y), ^{227}Ac , ^{228}Ra , ^{229}Th , ^{234}Pa (6.70 h), and ^{245}Cm .

7-1.1 Strontium-92

The absolute intensities of the radiations from ^{92}Sr β^- decay are based on the measured intensity of $(90 \pm 10)\%$ for the 1384-keV gamma ray (72Ko60). As a consequence of the 10% uncertainty in this

measurement, the calculated β^- intensity for the highest energy transition ($\beta^- 4$) is consistent with zero but may be as large as 8%. Therefore the value of Δ for the total β^- spectrum may be in error by more than 10%. This uncertainty could be reduced by a direct measurement of the intensity of the β^- transition in question or by a more precise measurement of the intensity of the 1384-keV gamma ray.

7-1.2 Cadmium-115 (44.6 d)

The absolute intensities of the radiations from the β^- decay of ^{115}Cd (44.6 d) are based on the measured intensity of $\sim 98\%$ for the β^- transition feeding the ground state in the daughter nucleus ($^{75}\text{Ra}27$). A small error in this estimate would result in large errors in the absolute intensities of all gamma rays resulting from β^- transitions feeding excited states in the daughter. If, for example, the correct β^- intensity were only 2% less than the measured value, all gamma-ray intensities would be a factor of 2 larger than the adopted values. The absolute gamma-ray intensities could be determined independently of the measured β^- intensity from a measurement of the number of 934-keV gamma rays per β^- transition.

7-1.3 Tellurium-133 (55.4 m)

Of the 63 gamma rays assigned to the β^- decay of ^{133}Te (55.4 m), only three have been placed in a decay scheme involving energy levels in the daughter ($^{74}\text{He}27$). The unplaced gamma rays comprise 53% of the total gamma-ray intensity. Furthermore, the conversion electron intensities for some of the unplaced gamma rays of low energy may be significant. Therefore, although the total β^- intensity of $(87 \pm 3)\%$ is accurately known, the distribution of the total β^- intensity with energy and thus the total β^- energy per decay are quite uncertain. Careful gamma-gamma coincidence measurements to determine the placement of more of the gamma rays in the decay scheme and conversion electron measurements for relatively intense low-energy transitions are needed.

7-1.4 Lanthanum-141

Similarly to the case for ^{115}Cd (44.6 d), the absolute intensities of the radiations from ^{141}La β^- decay are based on the measured intensity of $\sim 97\%$ for the β^- transition feeding the ground state in the daughter nucleus ($^{78}\text{Tu}01$), and a small error in this measurement would therefore result in a large error in

the absolute intensities for all gamma rays. The absolute gamma-ray intensities could be determined independently of the measured β^- intensity from a measurement of the number of 1355-keV gamma rays per β^- transition.

7-1.5 Barium-142

The absolute intensities of the radiations from ^{142}Ba β^- decay are based on the assumption that the β^- feeding to the ground state in the daughter nucleus is zero. The resulting large uncertainty in the intensity of the highest energy β^- transition ($\beta^- 13$), deduced from the gamma-ray plus conversion electron intensity balance, is quite significant because the transition yields about one-third of the total β^- energy per decay. Furthermore, except for the 77.6-keV transition ($\gamma 3$), the transition multiplicities of the relatively intense low-energy gamma rays with energies between 69 and 255 keV are unknown ($^{78}\text{Tu}03$). If these transitions are M1 or E2, the conversion electron intensities could be as large as 5%, and the β^- intensities for the high-energy transitions $\beta^- 10 - \beta^- 13$ calculated from gamma-ray plus conversion electron intensity balances could be in error by comparable amounts. A direct measurement of the intensity of the highest energy β^- transition and a measurement of the conversion electron spectrum could reduce possible errors in the β^- intensities.

7-1.6 Holmium-166 (1200 y)

The previously adopted decay scheme for the β^- decay of ^{166}Ho (1200 y) assumed that all the β^- intensity was contained in the two lowest energy transitions ($\beta^- 1$ and $\beta^- 2$), even though measured beta-gamma coincidences and calculated gamma-ray plus conversion electron intensity balances indicated significant higher energy β^- transitions ($^{75}\text{Bu}06$). In this work we have adopted the additional β^- transitions ($\beta^- 3 - \beta^- 7$) obtained from the intensity balances. The assumed existence of these transitions clearly results in a significant increase in the value of Δ for the total β^- spectrum. The existence of these β^- transitions could be determined from measurements of the total β^- spectrum and beta-gamma coincidences. A determination of the spin and parity of the parent state in ^{166}Ho might also be useful in order to specify the levels in the daughter which could be directly fed in the decay on the basis of the known change in spin and parity.

7-1.7 Actinium-227

The adopted intensities of all radiations from the 98.6% decay branch for ^{227}Ac β^- decay are based on the crude estimates of the intensities for the three assumed β^- transitions (77Ma32), and all values, therefore, are subject to considerable error. We note, however, that the determination of a more accurate decay scheme for ^{227}Ac is probably not important for radiation dosimetry applications, because all radiations have low energies and the relatively short-lived ^{227}Th daughter product has many higher energy radiations with significant intensity.

7-1.8 Radium-228

The decay scheme for ^{228}Ra is not known, and therefore the data adopted in this handbook are quite uncertain (76Ho06). Several gamma rays between 6 and 31 keV are believed to belong to the decay scheme, but the intensities and transition multiplicities have not been established. As with ^{227}Ac , however, the determination of the decay scheme for ^{228}Ra is probably not important for radiation dosimetry applications because the relatively short-lived ^{228}Ac daughter product has many high-energy transitions with significant intensity.

7-1.9 Thorium-229

Most of the adopted gamma-ray intensities from ^{229}Th alpha decay are based on measured conversion electron intensities for which the relative uncertainties are 10 to 50% (78To04). Therefore many of the gamma-ray and conversion electron intensities are likely to be quite uncertain. Further indication of errors in the data is the fact that the adopted decay scheme (78To04, 73Ma66) contains significant intensity imbalances at several levels in the daughter nucleus ^{225}Ra up to 236 keV. Additional gamma-ray and conversion electron measurements are needed.

7-1.10 Protactinium-234 (6.70 h)

With the use of the adopted gamma-ray intensities and transition multiplicities in the β^- decay of ^{234}Pa (6.70 h), the total β^- intensity obtained from the gamma-ray plus conversion electron intensity balances at each level in the daughter nucleus is found to be 146% (77E106), which is clearly in error compared with the expected value of 100%. The larger value results from the fact that, for some levels in the daughter, the total gamma-ray plus conversion

electron intensity feeding the level exceeds the total intensity from decay of the level by more than the experimental uncertainties. This strongly suggests that some of the measured gamma-ray intensities are in error. In this work the adopted β^- intensities were obtained by dividing all values calculated from the decay scheme by a factor of 1.46 to give a total β^- intensity of 100%, but the resulting values for the individual transitions are clearly suspect. A re-measurement of relative gamma-ray intensities is needed. Protactinium-234 (6.70 h), however, is not an important radionuclide in the decay chain for the uranium series (see Appendix 4) since it is produced only by the 0.16% isomeric transition from the decay of ^{234}Pa (1.17 m).

7-1.11 Curium-245

Only two gamma rays have been observed in ^{245}Cm alpha decay, even though at least six levels in the daughter nucleus are known to be populated (76E101, 78E102). From the measured alpha-particle intensities, we can estimate that 6% of the expected gamma-ray plus conversion electron intensity has not been observed. The missing transitions should be observable from a measurement of the conversion electron spectrum.

7-2 UNCERTAIN DECAY SCHEMES FOR OTHER RADIONUCLIDES

The decay schemes for the following additional radionuclides in this handbook may be significantly in error: ^{67}Cu , ^{91}Nb (61 d), ^{95}Tc (61 d), ^{126}I , ^{194}Ir (171 d), ^{210}Tl , ^{231}U , ^{236}Np (1.15E5 y), ^{236}Np (22 h), ^{245}Pu , ^{246}Pu , ^{250}Cm , ^{251}Bk , ^{251}Cf , ^{253}Es , and ^{255}Es . These radionuclides, however, will not likely be of great importance in radiation dosimetry and radiological assessment activities.

7-2.1 Copper-67

The absolute intensities of the radiations from ^{67}Cu β^- decay are based on the measured intensity of $\sim 20\%$ for the β^- transition feeding the ground state in the daughter nucleus (75Au10). An error in this measurement would result in comparable errors in all other β^- and gamma-ray intensities. A more precise measurement of the ground-state β^- transition intensity or a measurement of the number of 185-keV gamma rays per β^- transition would determine all absolute intensities more accurately.

7-2.2 Niobium-91 (61 d) and Technetium-95 (61 d)

For both ^{91}Nb (61 d) and ^{95}Tc (61 d), the available measurements indicate that the branching ratios for electron capture decay and the isomeric transition may not be accurately determined (72Ve09, 75MeHo). An error in the branching ratios would result in errors in the intensities of all radiations from these decays. For each radionuclide, a remeasurement of the intensity of the gamma ray from the isomeric transition relative to the intensity of a strong gamma ray from electron capture decay is needed.

7-2.3 Iodine-126

Absolute intensities of the radiations from ^{126}I decay differing by as much as 30% can be obtained, depending on the data chosen to normalize the electron capture and β^- decay schemes (73Au10). The intensities adopted in this handbook are barely in agreement with those adopted by Martin (78NCRP). Additional measurements of both β^+ and β^- intensity ratios are needed to reduce possible errors in the two decay schemes.

7-2.4 Iridium-194 (171 d)

The β^- decay of ^{194}Ir (171 d) is assumed to proceed via a single β^- transition (77Ha46), but only an upper limit of 250 keV has been established for the endpoint energy. The endpoint energy could be determined from measurements of the β^- spectrum or beta-gamma coincidences.

7-2.5 Thallium-210

The only data on the gamma-ray spectrum from ^{210}Tl β^- decay are crude measurements made with scintillation detectors (71Lew1). Consequently the energies and intensities of all gamma rays and internal conversion electrons are poorly known. Furthermore, the energies and intensities of the β^- transitions could be estimated only from measurements of the total β^- spectrum, a procedure that may result in considerable error. Since the β^- feeding to the ground state in the daughter nucleus can be assumed to be zero from the probable spins of ^{210}Tl , the decay scheme could be determined from measurements of the gamma-ray spectrum with modern detection techniques.

7-2.6 Uranium-231

The intensities of all radiations from ^{231}U electron capture decay are based on unpublished data (77Sc15) and appear to be poorly determined. Additional measurements of the gamma-ray and conversion electron spectra are needed.

7-2.7 Neptunium-236 (1.15E5 y)

No gamma rays have been observed following the β^- decay of ^{236}Np (1.15E5 y), for which the branching ratio is 8.9% (77Sc13). Therefore the adopted intensities for this decay branch are uncertain.

7-2.8 Neptunium-236 (22 h)

In the electron capture and β^- decays of ^{236}Np (22 h), the gamma-ray and conversion electron intensities of the two 45-keV transitions are poorly determined (77Sc13). Therefore the intensities of the individual electron capture and β^- transitions are also uncertain.

7-2.9 Plutonium-245

From the adopted decay scheme for ^{245}Pu β^- decay (76E101), it is evident that nearly all the gamma rays resulting from the decay of levels in the daughter nucleus below 200 keV excitation energy have not been observed. Therefore it is likely that most of the conversion electron intensity from the decay of ^{245}Pu has been left out of account. In addition, the energies and intensities for the two highest energy β^- groups ($\beta^- 9$ and $\beta^- 10$) were estimated from measurements of the total β^- spectrum and thus could be in error since several separate transitions likely contribute to each group.

7-2.10 Plutonium-246

No transition multipolarities are known for any of the gamma rays following ^{246}Pu β^- decay (76Sc02). For relatively low-energy transitions in a heavy nucleus, the conversion electron intensities that have been left out of account are undoubtedly significant and, in some cases, are likely to be greater than the corresponding gamma-ray intensities. Furthermore, the β^- intensities obtained from the gamma-ray intensity balances without accounting for the conversion electron intensities are undoubtedly in error.

7-2.11 Curium-250

The decay of ^{250}Cm has not been observed (76Sc02), and the estimated decay branching ratios for the alpha and β^- decays are based on the systematic trends of data for other radionuclides of similar atomic number and mass. It is obvious, therefore, that the adopted decay data are quite uncertain.

7-2.12 Berkelium-251 and Einsteinium-255

The decay schemes for both ^{251}Bk β^- decay and the 92% β^- branch for the decay of ^{255}Es are unknown (76Sc09). In each case we have assumed that all the β^- decays directly feed the ground state in the daughter nucleus. However, many excited states are known in the daughters which could be fed by β^- transitions from the decay of each parent. Therefore it is likely that significant gamma-ray and conversion electron intensities have been left out of account in the adopted decay data.

7-2.13 Californium-251

From the adopted decay scheme for ^{251}Cf alpha decay (76Sc09), it is evident that several gamma rays and conversion electrons resulting from decay of levels in the daughter nucleus have not been observed. These transitions likely account for more than 10% of the total gamma-ray and conversion electron intensity.

7-2.14 Einsteinium-253

The adopted gamma-ray and conversion electron intensities for transitions in ^{253}Es alpha decay with energies below 136 keV appear to be quite uncertain (76Sc09). The uncertainties are particularly significant for the conversion electrons since the intensities are much greater than for the corresponding gamma rays.

REFERENCE

1. National Council on Radiation Protection and Measurements, *A Handbook of Radioactivity Measurements Procedures*, Report No. 58, 1978.

Symbols and Definitions

The symbols appearing in the tables of radioactive decay data in Appendix 5 and their definitions are:

Auger-K, Auger-L	K-shell, L-shell Auger electron	rad	Unit of absorbed dose, equal to 6.25×10^7 MeV/g
avg	Average	s	Second
ce-K-1, ce-L-2, etc.	K-shell internal conversion electron for gamma-ray 1, L-shell internal conversion electron for gamma-ray 2, etc.	y	Year
Ci	Curie	α	Alpha, as alpha decay in table headings
d	Day	$\alpha 1, \alpha 2, \text{etc.}$	Alpha particle corresponding to transition 1, 2, etc.
EC	Electron capture	β^+, β^-	Beta-plus, beta-minus, as beta decay in table headings
h	Hour	$\beta 1, \beta 2, \text{etc.}$	Beta particle corresponding to transition 1, 2, etc.
I(min)	Minimum intensity for separate listing of radiation in table	$\gamma 1, \gamma 2, \text{etc.}$	Gamma ray corresponding to transition 1, 2, etc.
IT	Isomeric transition	γ^\pm	Annihilation radiation
$K_{\alpha 1}, K_{\alpha 2}, K_{\beta}; L$	K X rays; L X rays	Δ	Mean energy emitted per unit of cumulated activity
m	Minute	$\mu\text{Ci-h}$	Microcurie-hour
max	Maximum	3.624 12	3.624 ± 0.012
		2.6 h 12	2.6 ± 1.2 h
		2.1E5 y 2	$(2.1 \pm 0.2) \times 10^5$ y

Index to Tables of Radioactive Decay Data

This appendix contains an index to the tables of radioactive decay data in Appendix 5. Each entry in the index gives the data set name (including the half-life if it is needed to identify the radionuclide), the key numbers for the literature references assigned by the Nuclear Data Project and listed in Appendix 3, the identifying characters "HASRD-DCK" for all sets in this compilation, and the month and year when the data set was prepared or last revised. We emphasize that the decay data in Appendix 5 take into account all mass-chain compilations and "Recent References" published in the journals *Nuclear Data Sheets* and *Nuclear Physics* through April 1979.

The tables of decay data are ordered by increasing mass number of the radionuclides. Within a given mass number, the order is by increasing atomic number. For a particular atomic number and mass number, the order is by increasing level energy in the parent nucleus. If a given radionuclide has more than one mode of decay, the separate data tables for each decay mode are ordered first by increasing mass number of the daughter nucleus and then, within a given mass number, by increasing atomic number of the daughter.

3HE	3H B- DECAY	75FI08, HASRD-DCK, 10/77
7LI	7BE EC DECAY	74AJ01, HASRD-DCK, 10/77
10B	10BE B- DECAY	74AJ01, HASRD-DCK, 10/77
11B	11C B+ DECAY	75AJ02, 75AZ01, HASRD-DCK, 10/77
13C	13N B+ DECAY	78NCRP, 77AZ01, HASRD-DCK, 1/78
14N	14C B- DECAY	78NCRP, HASRD-DCK, 10/77
15N	15O B+ DECAY	76AJ04, HASRD-DCK, 10/77
16O	16N B- DECAY	77AJ02, HASRD-DCK, 3/79
18O	18F B+ DECAY	78NCRP, HASRD-DCK, 10/77
22NE	22NA B+ DECAY	78NCRP, HASRD-DCK, 10/77
24MG	24NA B- DECAY	78NCRP, HASRD-DCK, 10/77
26MG	26AL B+ DECAY (7.2E5 Y)	78EN02, 78NCRP, HASRD-DCK, 3/79
27AL	27MG B- DECAY	78EN02, 78NCRP, HASRD-DCK, 3/79
28AL	28MG B- DECAY	78NCRP, 78DI05, HASRD-DCK, 6/79
28SI	28AL B- DECAY	78NCRP, HASRD-DCK, 10/77
31P	31SI B- DECAY	73ENVA, HASRD-DCK, 10/77
32P	32SI B- DECAY	78EN02, HASRD-DCK, 3/79
32S	32P B- DECAY	78NCRP, HASRD-DCK, 10/77
33S	33P B- DECAY	78NCRP, HASRD-DCK, 10/77
35CL	35S B- DECAY	78NCRP, HASRD-DCK, 10/77
36S	36CL EC DECAY	73ENVA, HASRD-DCK, 10/77
36AR	36CL B- DECAY	73ENVA, HASRD-DCK, 10/77
37CL	37AR EC DECAY	73ENVA, 75KI10, HASRD-DCK, 10/77
38AR	38CL B- DECAY	78NCRP, HASRD-DCK, 10/77
39K	39AR B- DECAY	75ENVA, HASRD-DCK, 10/77
40AR	40K EC DECAY	73ENVA, HASRD-DCK, 10/77
40CA	40K B- DECAY	73ENVA, HASRD-DCK, 10/77
41K	41AR B- DECAY	78NCRP, HASRD-DCK, 10/77
41K	41CA EC DECAY	73ENVA, 74MA30, HASRD-DCK, 10/77
42CA	42K B- DECAY	78NCRP, HASRD-DCK, 10/77
43CA	43K B- DECAY	78NCRP, HASRD-DCK, 10/77
44CA	44SC B+ DECAY (3.927 H)	78EN02, 78NCRP, HASRD-DCK, 3/79
44SC	44TI EC DECAY	78EN02, 78NCRP, HASRD-DCK, 3/79
45SC	45CA B- DECAY	78NCRP, HASRD-DCK, 10/77
45SC	45TI EC DECAY	77BE65, HASRD-DCK, 6/79
46TI	46SC B- DECAY (83.83 D)	78NCRP, HASRD-DCK, 10/77
46SC	46SC IT DECAY (18.72 S)	78AU04, HASRD-DCK, 3/79
47SC	47CA B- DECAY	78NCRP, HASRD-DCK, 10/77
47TI	47SC B- DECAY	78NCRP, HASRD-DCK, 10/77
48TI	48SC B- DECAY	78BE01, HASRD-DCK, 4/78
48TI	48V B+ DECAY	78BE01, HASRD-DCK, 4/78
49SC	49CA B- DECAY	78HA15, HASRD-DCK, 8/78
49TI	49SC B- DECAY	78HA15, HASRD-DCK, 8/78
49TI	49V EC DECAY	78HA15, HASRD-DCK, 8/78
49V	49CR B+ DECAY	78HA15, HASRD-DCK, 10/78
51V	51TI B- DECAY	78AU01, HASRD-DCK, 6/79
51V	51CR EC DECAY	78AU01, HASRD-DCK, 4/78
52CR	52V B- DECAY	78BE37, HASRD-DCK, 6/79
52CR	52MN B+ DECAY (5.591 D)	78BE37, HASRD-DCK, 10/78
52CR	52MN B+ DECAY (21.4 M)	78BE37, HASRD-DCK, 10/78
52MN	52MN IT DECAY (21.4 M)	78BE37, HASRD-DCK, 10/78
52MN	52FE B+ DECAY	78BE37, HASRD-DCK, 10/78
53CR	53MN EC DECAY	77AU08, HASRD-DCK, 4/79
54CR	54MN EC DECAY	78NCRP, HASRD-DCK, 10/77
55MN	55FE EC DECAY	78NCRP, HASRD-DCK, 10/77
56FE	56MN B- DECAY	77AU03, HASRD-DCK, 10/77
56FE	56CO B+ DECAY	77AU03, 77GE12, HASRD-DCK, 8/78
56CO	56NI EC DECAY	77AU03, HASRD-DCK, 10/77
57FE	57MN B- DECAY	77AU04, 78WY02, HASRD-DCK, 6/79
57FE	57CO EC DECAY	77AU04, HASRD-DCK, 10/77
57CO	57NI B+ DECAY	77AU04, HASRD-DCK, 2/78
58FE	58CO EC DECAY (70.80 D)	76K016, 76VA30, HASRD-DCK, 1/78
58CO	58CO IT DECAY (9.15 H)	76K016, HASRD-DCK, 1/78
59CO	59FE B- DECAY	76KI03, HASRD-DCK, 10/77
59CO	59NI EC DECAY	78NCRP, HASRD-DCK, 10/77
60NI	60CO B- DECAY (5.271 Y)	75KI19, 76CA18, 78FU05, HASRD-DCK, 12/78
60CO	60CO IT DECAY (10.47 M)	75KI19, HASRD-DCK, 4/79
60NI	60CO B- DECAY (10.47 M)	75KI19, HASRD-DCK, 4/79
61NI	61CO B- DECAY	75AU05, HASRD-DCK, 5/79
61NI	61CU B+ DECAY	75AU05, 78ME10, HASRD-DCK, 5/79
62NI	62CU B+ DECAY	79HA01, HASRD-DCK, 3/79
62CU	62ZN EC DECAY	79HA01, HASRD-DCK, 3/79
63CU	63NI B- DECAY	75AU03, HASRD-DCK, 10/77
64NI	64CU B+ DECAY	78NCRP, HASRD-DCK, 10/77
64ZN	64CU B- DECAY	78NCRP, HASRD-DCK, 10/77
65CU	65NI B- DECAY	75AU08, HASRD-DCK, 10/77
65CU	65ZN EC DECAY	75AU08, HASRD-DCK, 10/77
66ZN	66GA B+ DECAY	78NCRP, HASRD-DCK, 10/77
67ZN	67CU B- DECAY	75AU10, 78ME10, HASRD-DCK, 12/78

67ZN	67GA	EC	DECAY		75AU10,78ME10, HASRD-DCK, 12/78
68ZN	68GA	B+	DECAY		75LE12, HASRD-DCK, 10/77
68GA	68GE	EC	DECAY		78NCRP, HASRD-DCK, 10/77
69GA	69ZN	B-	DECAY (55.6 M)		76AU01, HASRD-DCK, 10/77
69ZN	69ZN	IT	DECAY (13.76 H)		76AU01,77HE20, HASRD-DCK, 5/78
71GA	71GE	EC	DECAY		73AL33, HASRD-DCK, 10/77
72GE	72GA	B-	DECAY		74AL54, HASRD-DCK, 5/79
72GE	72AS	B+	DECAY		74AL34, HASRD-DCK, 3/79
73GE	73AS	EC	DECAY		78NCRP, HASRD-DCK, 10/77
73AS	73SE	EC	DECAY (7.15 H)		74AL33, HASRD-DCK, 10/77
74GE	74AS	B+	DECAY		76K007,75CA37,76HA61, HASRD-DCK, 10/77
74SE	74AS	B-	DECAY		76K007,75CA37,76HA61, HASRD-DCK, 10/77
75AS	75SE	EC	DECAY		75H017,76HU11,77GE12, HASRD-DCK, 8/78
76SE	76AS	B-	DECAY		78NCRP, HASRD-DCK, 10/77
77AS	77GE	B-	DECAY (11.30 H)		78NCRP,74GU30,75CH32, HASRD-DCK, 11/77
77SE	77AS	B-	DECAY		78NCRP, HASRD-DCK, 11/77
77SE	77BR	EC	DECAY (57.04 H)		78NCRP,75WA28, HASRD-DCK, 11/77
79BR	79SE	B-	DECAY		75UR03, HASRD-DCK, 11/77
79BR	79KR	B+	DECAY (55.04 H)		78NCRP, HASRD-DCK, 11/77
80SE	80BR	EC	DECAY (17.4 M)		75GR19, HASRD-DCK, 11/77
80KR	80BR	B-	DECAY (17.4 M)		75GR19, HASRD-DCK, 11/77
80BR	80BR	IT	DECAY (4.42 H)		75GR19, HASRD-DCK, 11/77
81BR	81KR	EC	DECAY (2.1E5 Y)		78NCRP, HASRD-DCK, 11/77
81KR	81RB	EC	DECAY (4.58 H)		75LE08,75VA24,77LI14, HASRD-DCK, 5/78
82KR	82BR	B-	DECAY (35.30 H)		75LE11,77GE12, HASRD-DCK, 8/78
82KR	82RB	B+	DECAY (1.25 M)		75LE11, HASRD-DCK, 11/77
82RB	82SR	EC	DECAY		75LE11, HASRD-DCK, 11/77
83KR	83BR	B-	DECAY		75K007,76VA03, HASRD-DCK, 11/77
83KR	85KR	IT	DECAY (1.85 H)		75K007, HASRD-DCK, 11/77
83KR	83RB	EC	DECAY		75K007,76VA03, HASRD-DCK, 6/78
84KR	84BR	B-	DECAY		71AUB2,72HI05, HASRD-DCK, 11/77
84KR	84RB	B+	DECAY		78NCRP,76GI14, HASRD-DCK, 11/77
84SR	84RB	B-	DECAY		78NCRP,76GI14, HASRD-DCK, 11/77
85KR	85BR	B-	DECAY		71HOR1,75NU03, HASRD-DCK, 11/77
85RB	85KR	B-	DECAY (10.72 Y)		78NCRP, HASRD-DCK, 11/77
85KR	85KR	IT	DECAY (4.48 H)		78NCRP, HASRD-DCK, 11/77
85RB	85KR	B-	DECAY (4.48 H)		78NCRP, HASRD-DCK, 11/77
85RB	85SR	EC	DECAY (64.84 D)		78NCRP,77PR04, HASRD-DCK, 1/78
85RB	85SR	EC	DECAY (67.66 M)		71HOR1,71BU08,71V006, HASRD-DCK, 11/77
85SR	85SR	IT	DECAY (67.66 M)		71HOR1,71BU08,71V006, HASRD-DCK, 11/77
86SR	86RB	B-	DECAY		78TE01, HASRD-DCK, 12/78
86SR	86Y	B+	DECAY (14.74 M)		78TE01, HASRD-DCK, 3/79
86Y	86ZR	EC	DECAY		78TE01, HASRD-DCK, 5/79
87RB	87KR	B-	DECAY		78NCRP, HASRD-DCK, 11/77
87SR	87RB	B-	DECAY		79LU05, HASRD-DCK, 11/77
87RB	87SR	EC	DECAY (2.805 H)		78NCRP, HASRD-DCK, 11/77
87SR	87SR	IT	DECAY (2.805 H)		78NCRP, HASRD-DCK, 11/77
87SR	87Y	EC	DECAY		78NCRP, HASRD-DCK, 11/77
88RB	88KR	B-	DECAY		76BU07,76BU05,76W005, HASRD-DCK, 11/77
88SR	88RB	B-	DECAY		76BU07,76BU05,76W005, HASRD-DCK, 6/79
88SR	88Y	EC	DECAY		76BU07, HASRD-DCK, 11/77
88Y	88ZR	EC	DECAY		76BU07, HASRD-DCK, 2/78
89RB	89KR	B-	DECAY		75K021,76W005,78W015, HASRD-DCK, 6/79
89SR	89RB	B-	DECAY		75K021,76W005,78W004, HASRD-DCK, 6/79
89Y	89SR	B-	DECAY		78NCRP, HASRD-DCK, 11/77
89Y	89ZR	B+	DECAY		75K021, HASRD-DCK, 2/78
90RB	90KR	B-	DECAY		75K016,76W005, HASRD-DCK, 11/77
90SR	90RB	B-	DECAY (157 S)		75K016,77HU03, HASRD-DCK, 6/79
90RB	90RB	IT	DECAY (258 S)		75K016,77HU03, HASRD-DCK, 5/78
90SR	90RB	B-	DECAY (258 S)		75K016,77HU03, HASRD-DCK, 6/79
90Y	90SR	B-	DECAY		75K016, HASRD-DCK, 11/77
90ZR	90Y	B-	DECAY (64.1 H)		75K016, HASRD-DCK, 11/78
90Y	90Y	IT	DECAY (3.19 H)		75K016,78RA05, HASRD-DCK, 12/78
90ZR	90NB	B+	DECAY		75K016,75PA07,78BE12, HASRD-DCK, 5/79
91Y	91SR	B-	DECAY		72VE09,73HA11,77HD12, HASRD-DCK, 1/78
91ZR	91Y	B-	DECAY (58.51 D)		72VE09, HASRD-DCK, 11/77
91Y	91Y	IT	DECAY (49.71 M)		72VE09, HASRD-DCK, 11/77
91ZR	91NB	EC	DECAY (1E4 Y)		72VE09, HASRD-DCK, 2/78
91ZR	91NB	EC	DECAY (61 D)		72VE09, HASRD-DCK, 2/78
91NB	91NB	IT	DECAY (61 D)		72VE09, HASRD-DCK, 2/78
91NB	91MO	B+	DECAY (15.49 M)		72VE09,76DE37, HASRD-DCK, 6/79
92Y	92SR	B-	DECAY		72K060,72OLO5, HASRD-DCK, 11/77
92ZR	92Y	B-	DECAY		72K060, HASRD-DCK, 11/77
92ZR	92NB	EC	DECAY (3.6E7 Y)		72K060,78NE04, HASRD-DCK, 5/79
92ZR	92NB	EC	DECAY (10.15 D)		72K060, HASRD-DCK, 2/78
93Y	93SR	B-	DECAY		72HE41,74AC04,77B101, HASRD-DCK, 11/77
93ZR	93Y	B-	DECAY		72K059,73TA15, HASRD-DCK, 11/77
93NB	93ZR	B-	DECAY		72K059, HASRD-DCK, 1/78
93NB	93NB	IT	DECAY (14.6 Y)		72K059,77LLO1,77H007, HASRD-DCK, 1/78

93NB	93MO	EC	DECAY	72K059, HASRD-DCK, 1/78
94MO	94NB	B-	DECAY (2.03E4 Y)	73K043, HASRD-DCK, 3/79
94NB	94NB	IT	DECAY (6.26 M)	73K043, HASRD-DCK, 3/79
94MO	94NB	B-	DECAY (6.26 M)	73K043, HASRD-DCK, 3/79
95NB	95ZR	B-	DECAY	72MEHO,74AN22,76H004, HASRD-DCK, 11/77
95MO	95NB	B-	DECAY (35.06 D)	72MEHO,74AN22,76H004, HASRD-DCK, 10/78
95NB	95NB	IT	DECAY (86.6 H)	72MEHO,76H004, HASRD-DCK, 11/77
95MO	95NB	B-	DECAY (86.6 H)	72MEHO,74AN22,76H004, HASRD-DCK, 10/78
95MO	95TC	EC	DECAY (20.0 H)	72MEHO,77ME12, HASRD-DCK, 10/78
95MO	95TC	EC	DECAY (61 D)	72MEHO,75BE34,77ME12, HASRD-DCK, 10/78
95TC	95TC	IT	DECAY (61 D)	72MEHO, HASRD-DCK, 10/78
96MO	96NB	B-	DECAY	72ME28, HASRD-DCK, 2/78
96MO	96TC	EC	DECAY (4.28 D)	72ME28,74GA14, HASRD-DCK, 12/77
96MO	96TC	EC	DECAY (51.5 M)	72ME28,74GA14, HASRD-DCK, 12/77
96TC	96TC	IT	DECAY (51.5 M)	72ME28, HASRD-DCK, 12/77
97NB	97ZR	B-	DECAY	73ME29,73SA36,75CD26, HASRD-DCK, 8/78
97MO	97NB	B-	DECAY (72.1 M)	75ME29,76KR01, HASRD-DCK, 12/77
97NB	97NB	IT	DECAY (60 S)	73ME29, HASRD-DCK, 12/77
97MO	97TC	EC	DECAY (2.6E6 Y)	73ME29, HASRD-DCK, 12/77
97TC	97TC	IT	DECAY (89 D)	73ME29, HASRD-DCK, 12/77
97TC	97RU	EC	DECAY	73ME29,74HU05,77KR03, HASRD-DCK, 1/78
98RU	98TC	B-	DECAY	74ME34, HASRD-DCK, 5/79
99TC	99MO	B-	DECAY	74ME33,74GA01, HASRD-DCK, 12/77
99RU	99TC	B-	DECAY (2.15E5 Y)	74ME33,75LE10,74EN02, HASRD-DCK, 12/77
99TC	99TC	IT	DECAY (6.02 H)	74ME33,74GA01, HASRD-DCK, 12/77
101TC	101MO	B-	DECAY	75TO17,75AL16,75WR01, HASRD-DCK, 6/79
101RU	101TC	B-	DECAY	73TO17,75WR01, HASRD-DCK, 12/77
103RH	103RU	B-	DECAY	74K036,76MA37, HASRD-DCK, 12/77
103RH	103RH	IT	DECAY (56.119 M)	74K036, HASRD-DCK, 12/77
103RH	103PD	EC	DECAY	74K036,75CZ05,76MA37, HASRD-DCK, 12/77
105RH	105RU	B-	DECAY	74BE77,76BA59,77KR09, HASRD-DCK, 5/78
105PD	105RH	B-	DECAY (35.36 H)	74BE77,76BA39,77WI10, HASRD-DCK, 5/78
105RH	105RH	IT	DECAY (45 S)	74BE77, HASRD-DCK, 12/77
106RH	106RU	B-	DECAY	74BE76, HASRD-DCK, 12/77
106PD	106RH	B-	DECAY (29.92 S)	74BE76,75HS02,77OK02-3, HASRD-DCK, 5/79
106PD	106AG	EC	DECAY (8.46 D)	74BE76,77TI01,78GE01, HASRD-DCK, 5/79
107AG	107PD	B-	DECAY	72BEA6, HASRD-DCK, 12/77
108PD	108AG	EC	DECAY (2.37 M)	72BEA7,73SI02,74RY01, HASRD-DCK, 5/79
108CD	108AG	B-	DECAY (2.37 M)	72BEA7,73SI02,74RY01, HASRD-DCK, 3/79
108PD	108AG	EC	DECAY (127 Y)	72BEA7,73BE08,75MO34, HASRD-DCK, 3/79
108AG	108AG	IT	DECAY (127 Y)	72BEA7,72SC42, HASRD-DCK, 3/79
109AG	109PD	B-	DECAY (13.453 H)	78BE02,77GI11, HASRD-DCK, 4/78
109AG	109AG	IT	DECAY (39.6 S)	78BE02, HASRD-DCK, 4/78
109AG	109CD	EC	DECAY	78BE02, HASRD-DCK, 4/78
110PD	110AG	EC	DECAY (24.57 S)	77BE64, HASRD-DCK, 12/77
110CD	110AG	B-	DECAY (24.57 S)	77BE64, HASRD-DCK, 12/77
110AG	110AG	IT	DECAY (249.85 D)	77BE64, HASRD-DCK, 12/77
110CD	110AG	B-	DECAY (249.85 D)	77BE64,77GE12,78WA07, HASRD-DCK, 6/79
111CD	111AG	B-	DECAY (7.46 D)	71RA43,75SH29,77NE10, HASRD-DCK, 5/78
111CD	111CD	IT	DECAY (48.7 M)	71RA43,75SH29, HASRD-DCK, 1/78
111CD	111IN	EC	DECAY (2.85 D)	71RA45,72EM01,75SH29, HASRD-DCK, 1/78
113IN	113CD	B-	DECAY (9.3E15 Y)	71RA44, HASRD-DCK, 1/78
113IN	113CD	B-	DECAY (13.7 Y)	71RA44,72WA11, HASRD-DCK, 1/78
113IN	113IN	IT	DECAY (1.658 H)	71RA44,70GO48,76DE35, HASRD-DCK, 1/78
113IN	113SN	EC	DECAY	71RA44,73IN06,78HE08, HASRD-DCK, 12/78
114CD	114IN	EC	DECAY (71.9 S)	75KI17, HASRD-DCK, 1/78
114SN	114IN	B-	DECAY (71.9 S)	75KI17, HASRD-DCK, 1/78
114CD	114IN	EC	DECAY (49.51 D)	75KI17, HASRD-DCK, 1/78
114IN	114IN	IT	DECAY (49.51 D)	75KI17, HASRD-DCK, 1/78
115IN	115CD	B-	DECAY (53.46 H)	75RA27,78HE08, HASRD-DCK, 12/78
115IN	115CD	B-	DECAY (44.6 D)	75RA27,75BO29,78HE08, HASRD-DCK, 12/78
115SN	115IN	B-	DECAY (4.6E15 Y)	75RA27,78PF01, HASRD-DCK, 12/78
115IN	115IN	IT	DECAY (4.36 H)	75RA27,75BU24,78HE08, HASRD-DCK, 12/78
115SN	115IN	B-	DECAY (4.36 H)	75RA27,78HE08, HASRD-DCK, 12/78
116SN	116IN	B-	DECAY (54.15 M)	75CA10,74AR13,75YA08, HASRD-DCK, 4/79
117IN	117CD	B-	DECAY (2.49 H)	78AU06, HASRD-DCK, 5/79
117IN	117CD	B-	DECAY (3.36 H)	78AU06, HASRD-DCK, 5/79
117SN	117IN	B-	DECAY (45.8 M)	78AU06, HASRD-DCK, 5/79
117IN	117IN	IT	DECAY (116.5 M)	78AU06, HASRD-DCK, 5/79
117SN	117IN	B-	DECAY (116.5 M)	78AU06, HASRD-DCK, 5/79
117SN	117SN	IT	DECAY (13.60 D)	78AU06, HASRD-DCK, 11/78
117SN	117SB	EC	DECAY	78AU06, HASRD-DCK, 4/79
119SN	119SN	IT	DECAY (293.0 D)	79AU01, HASRD-DCK, 4/79
121SB	121TE	EC	DECAY (16.8 D)	79TA01, HASRD-DCK, 5/79
121SB	121TE	EC	DECAY (154 D)	79TA01, HASRD-DCK, 5/79
121TE	121TE	IT	DECAY (154 D)	79TA01, HASRD-DCK, 5/79
122SN	122SB	EC	DECAY	72BER1, HASRD-DCK, 1/78
122TE	122SB	B-	DECAY	72BER1, HASRD-DCK, 6/79
122TE	122I	B+	DECAY	72BER1, HASRD-DCK, 6/79

122I	122XE EC DECAY	72BER1,75LO10, HASRD-DCK, 6/79
123SB	123SN B- DECAY (129.2 D)	72AUB1,74RA03, HASRD-DCK, 1/78
125SB	125TE EC DECAY (1E15 Y)	72AUB1, HASRD-DCK, 1/78
123TE	123TE IT DECAY (119.7 D)	72AUB1,72EN01,73RA32, HASRD-DCK, 1/78
123TE	123I EC DECAY	72AUB1,76WA13, HASRD-DCK, 1/78
123I	123XE B+ DECAY	72AUB1,74JO16, HASRD-DCK, 6/79
124TE	124SB B- DECAY (60.20 D)	73BE78,74JO03, HASRD-DCK, 1/78
124TE	124I B+ DECAY	73BE78,73KA45, HASRD-DCK, 1/78
125SB	125SN B- DECAY (9.64 D)	72AU10,74GA03, HASRD-DCK, 1/78
125TE	125SB B- DECAY	72AU10,76WA13,77GE12, HASRD-DCK, 8/78
125TE	125TE IT DECAY (58 D)	72AU10,76WA13, HASRD-DCK, 1/78
125TE	125I EC DECAY	72AU10,76MI18, HASRD-DCK, 1/78
125I	125XE EC DECAY	72AU10,76LE23, HASRD-DCK, 6/79
126SB	126SN B- DECAY	73AU10,76SM01, HASRD-DCK, 2/78
126TE	126SB B- DECAY (12.4 D)	75AU10,75BA17, HASRD-DCK, 2/78
126SB	126SB IT DECAY (19.0 M)	73AU10, HASRD-DCK, 2/78
126TE	126SB B- DECAY (19.0 M)	73AU10, HASRD-DCK, 2/78
126TE	126I EC DECAY	73AU10,77JA04, HASRD-DCK, 2/78
126XE	126I B- DECAY	73AU10,77JA04, HASRD-DCK, 6/79
126XE	126CS B+ DECAY	75AU10,76PA11,78DR01, HASRD-DCK, 6/79
127TE	127SB B- DECAY	72AU09, HASRD-DCK, 2/78
127TE	127TE B- DECAY (9.35 H)	72AU09,77KUI7, HASRD-DCK, 5/78
127TE	127TE IT DECAY (109 D)	72AU09, HASRD-DCK, 2/78
127I	127TE B- DECAY (109 D)	72AU09, HASRD-DCK, 2/78
127I	127XE EC DECAY (36.406 D)	72AU09,74CO05,76LE23, HASRD-DCK, 2/78
128TE	128I EC DECAY	73AU11, HASRD-DCK, 5/79
128XE	128I B- DECAY	75AU11,75OK04, HASRD-DCK, 5/79
129TE	129SB B- DECAY	72HO55,74FO06, HASRD-DCK, 2/78
129I	129TE B- DECAY (69.6 M)	72HO55,74DE15,76MA35, HASRD-DCK, 2/78
129TE	129TE IT DECAY (33.6 D)	72HO55, HASRD-DCK, 2/78
129I	129TE B- DECAY (33.6 D)	72HO55,74DE15,76MA35, HASRD-DCK, 2/78
129XE	129I B- DECAY	72HO55, HASRD-DCK, 2/78
129XE	129XE IT DECAY (8.89 D)	72HO55,73MI08, HASRD-DCK, 4/79
129XE	129CS EC DECAY	72HO55,74MA24,76ME16, HASRD-DCK, 2/78
130XE	130I B- DECAY (12.36 H)	74HI08, HASRD-DCK, 2/78
131I	131TE B- DECAY (25.0 M)	76AU03, HASRD-DCK, 2/78
131TE	131TE IT DECAY (30 H)	76AU03, HASRD-DCK, 2/78
131I	131TE B- DECAY (30 H)	76AU03,75MI14,76DE43, HASRD-DCK, 2/78
131XE	131I B- DECAY	76AU03,76BA42,76KO29, HASRD-DCK, 2/78
131XE	131XE IT DECAY (11.84 D)	76AU03,75HO18, HASRD-DCK, 2/78
131XE	131CS EC DECAY	76AU03, HASRD-DCK, 2/78
131CS	131BA EC DECAY	76AU03,76GE14, HASRD-DCK, 2/78
132I	132TE B- DECAY	76HI02, HASRD-DCK, 2/78
132XE	132I B- DECAY (2.30 H)	76HI02,78NE08, HASRD-DCK, 6/79
132XE	132CS EC DECAY	76HI02, HASRD-DCK, 6/79
132BA	132CS B- DECAY	76HI02, HASRD-DCK, 4/79
133I	133TE B- DECAY (12.45 M)	74HE27, HASRD-DCK, 2/78
133TE	133TE IT DECAY (55.4 M)	74HE27, HASRD-DCK, 2/78
133I	133TE B- DECAY (55.4 M)	74HE27,74FU15, HASRD-DCK, 3/78
133XE	133I B- DECAY	74HE27,74KO26,76HE16, HASRD-DCK, 3/78
133CS	133XE B- DECAY (5.245 D)	74HE27,74CA27, HASRD-DCK, 3/78
133XE	133XE IT DECAY (2.19 D)	74HE27, HASRD-DCK, 3/78
133CS	133BA EC DECAY (10.5 Y)	74HE27,77GE12,77SC31, HASRD-DCK, 8/78
133BA	133BA IT DECAY (38.9 H)	74HE27, HASRD-DCK, 4/79
134I	134TE B- DECAY	75HE08,76ME07, HASRD-DCK, 3/78
134XE	134I B- DECAY (52.6 M)	75HE08,74GU20, HASRD-DCK, 3/78
134BA	134CS B- DECAY (2.062 Y)	75HE08,75VA12,76GR11, HASRD-DCK, 3/78
134CS	134CS IT DECAY (2.90 H)	75HE08, HASRD-DCK, 3/78
135XE	135I B- DECAY	75HE12, HASRD-DCK, 3/78
135CS	135XE B- DECAY (9.11 H)	75HE12, HASRD-DCK, 3/78
135XE	135XE IT DECAY (15.36 M)	75HE12,75FU12, HASRD-DCK, 3/78
135BA	135CS B- DECAY (2.3E6 Y)	75HE12, HASRD-DCK, 3/78
135BA	135BA IT DECAY (28.7 H)	75HE12, HASRD-DCK, 3/78
136XE	136I B- DECAY (83 S)	79PE02, HASRD-DCK, 5/79
136BA	136CS B- DECAY	79PE02, HASRD-DCK, 5/79
137CS	137XE B- DECAY	75BU12,75FR23,77HE02, HASRD-DCK, 3/78
137BA	137CS B- DECAY	75BU12, HASRD-DCK, 12/78
137BA	137BA IT DECAY (2.552 M)	75BU12,76BO16, HASRD-DCK, 3/78
138CS	138XE B- DECAY	76PA04, HASRD-DCK, 4/78
138BA	138CS B- DECAY (32.2 M)	76PA04,75FR23,78WU04, HASRD-DCK, 6/79
139BA	139CS B- DECAY	74GR46,78WU04, HASRD-DCK, 6/79
139LA	139BA B- DECAY	74GR46,78LA03, HASRD-DCK, 12/78
139LA	139CE EC DECAY	74GR46,73LE29,76VA30, HASRD-DCK, 4/78
140LA	140BA B- DECAY	74PE19,77GE12, HASRD-DCK, 8/78
140CE	140LA B- DECAY	74PE19,76LI06,77GE12, HASRD-DCK, 12/78
141LA	141BA B- DECAY	78TU01, HASRD-DCK, 4/78
141CE	141LA B- DECAY	78TU01, HASRD-DCK, 4/78
141PR	141CE B- DECAY	78TU01, HASRD-DCK, 4/78
142LA	142BA B- DECAY	78TU03, HASRD-DCK, 9/78

142CE	142LA	B-	DECAY		78TU05,	HASRD-DCK,	9/78
142ND	142PR	B-	DECAY	(19.13 H)	78TU03,	HASRD-DCK,	9/78
143PR	143CE	B-	DECAY		78TU05,	HASRD-DCK,	12/78
143ND	143PR	B-	DECAY		78TU05,	HASRD-DCK,	12/78
143ND	143PM	EC	DECAY		78TU05,	HASRD-DCK,	5/79
144PR	144CE	B-	DECAY		75BU19,	76CH33,77GE12,	HASRD-DCK, 8/78
144ND	144PR	B-	DECAY	(17.28 M)	75BU19,	76RA22,77GE12,	HASRD-DCK, 8/78
144PR	144PR	IT	DECAY	(7.2 M)	75BU19,	HASRD-DCK,	5/78
144ND	144PM	EC	DECAY		75BU19,	75AV01,	HASRD-DCK, 5/79
145ND	145PM	EC	DECAY		748UR1,	74T004,	HASRD-DCK, 4/79
146ND	146PM	EC	DECAY		75BU05,	74DR08,74SC06,	HASRD-DCK, 5/79
146SM	146PM	B-	DECAY		75BU05,	74DR08,74SC06,	HASRD-DCK, 5/79
147PM	147ND	B-	DECAY		78HA22,	HASRD-DCK,	9/78
147SM	147PM	B-	DECAY		78HA22,	HASRD-DCK,	9/78
143ND	147SM	A	DECAY		78HA22,	HASRD-DCK,	9/78
148SM	148PM	B-	DECAY	(5.37 D)	77HA16,	77KA14,	HASRD-DCK, 5/78
148PM	148PM	IT	DECAY	(41.3 D)	77HA16,	HASRD-DCK,	5/78
148SM	148PM	B-	DECAY	(41.3 D)	77HA16,	77KA14,	HASRD-DCK, 5/78
149PM	149ND	B-	DECAY		76HO17,	HASRD-DCK,	5/78
149SM	149PM	B-	DECAY		76HO17,	HASRD-DCK,	5/78
151SM	151PM	B-	DECAY		76HA35,	77BU12,77HO21,	HASRD-DCK, 5/78
151EU	151SM	B-	DECAY		76HA35,	HASRD-DCK,	5/78
152SM	152EU	EC	DECAY	(13.6 Y)	78NCRP,	77GE12,	HASRD-DCK, 8/78
152GD	152EU	B-	DECAY	(13.6 Y)	78NCRP,	75HE13,77GE12,	HASRD-DCK, 8/78
152SM	152EU	EC	DECAY	(9.52 H)	78NCRP,	75PRO5,75SC52,	HASRD-DCK, 6/78
152GD	152EU	B-	DECAY	(9.32 H)	78NCRP,	75PRO5,75SC32,	HASRD-DCK, 6/78
148SM	152GD	A	DECAY		78NCRP,	HASRD-DCK,	6/78
153EU	153SM	B-	DECAY		73KR24,	HASRD-DCK,	6/78
153EU	153GD	EC	DECAY		73KR24,	72EM01,74SE08,	HASRD-DCK, 6/78
154GD	154EU	B-	DECAY		79HA02,	HASRD-DCK,	5/79
155GD	155EU	B-	DECAY		75KR07,	75KR04,	HASRD-DCK, 6/78
156GD	156EU	B-	DECAY		76BU09,	76YA11,77CO22,	HASRD-DCK, 7/78
157GD	157TB	EC	DECAY		73TU06,	HASRD-DCK,	7/78
157TB	157DY	EC	DECAY		73TU06,	HASRD-DCK,	7/78
159TB	159GD	B-	DECAY		75TU05,	HASRD-DCK,	7/78
160DY	160TB	B-	DECAY		74TU07,	74FO27,76DA09,	HASRD-DCK, 7/78
162TB	162GD	B-	DECAY		76BU02,	HASRD-DCK,	7/78
162DY	162TB	B-	DECAY		76BU02,	77KA08,	HASRD-DCK, 7/78
165HO	165DY	B-	DECAY	(2.334 H)	74BU29,	74AR26,75AR12,	HASRD-DCK, 7/78
166HO	166DY	B-	DECAY		75BU06,	HASRD-DCK,	7/78
166ER	166HO	B-	DECAY	(26.80 H)	75BU06,	74GR41,77AL27,	HASRD-DCK, 7/78
166ER	166HO	B-	DECAY	(1200 Y)	75BU06,	77GE12,78SA14,	HASRD-DCK, 12/78
169TM	169ER	B-	DECAY		73HA76,	77MY02,	HASRD-DCK, 7/78
169TM	169TB	EC	DECAY		73HA76,	77GE12,78VE07,	HASRD-DCK, 6/79
170YB	170TM	B-	DECAY		75SC26,	75BO07,	HASRD-DCK, 7/78
171TB	171ER	B-	DECAY		74HOHA,	73EL13,75GO06,	HASRD-DCK, 7/78
171YB	171TM	B-	DECAY		74HOHA,	HASRD-DCK,	7/78
175LU	175YB	B-	DECAY		76MI07,	HASRD-DCK,	7/78
177HF	177LU	B-	DECAY	(6.71 D)	75ELO7,	77KE12,	HASRD-DCK, 7/78
177LU	177LU	IT	DECAY	(160.10 D)	75ELO7,	75MO14,75WA19,	HASRD-DCK, 7/78
177HF	177LU	B-	DECAY	(160.10 D)	75ELO7,	75MO14,75WA19,	HASRD-DCK, 7/78
181TA	181HF	B-	DECAY		75EL18,	76CA11,77FR10,	HASRD-DCK, 7/78
181TA	181W	EC	DECAY		73EL18,	73MY02,	HASRD-DCK, 7/78
182W	182TA	B-	DECAY		75SC13,	76HE18,77GE12,	HASRD-DCK, 5/79
182W	182RE	EC	DECAY	(64.0 H)	75SC13,	77JE02,	HASRD-DCK, 5/79
182W	182RE	EC	DECAY	(12.7 H)	75SC13,	HASRD-DCK,	5/79
183W	183RE	EC	DECAY		75ART1,	77BR22,	HASRD-DCK, 7/78
184W	184RE	EC	DECAY	(38.0 D)	77MA13,	HASRD-DCK,	5/79
184W	184RE	EC	DECAY	(169 D)	77MA13,	HASRD-DCK,	5/79
184RE	184RE	IT	DECAY	(169 D)	77MA13,	HASRD-DCK,	5/79
185RE	185W	B-	DECAY		74ELO8,	HASRD-DCK,	7/78
185RE	185OS	EC	DECAY		74ELO8,	77BR22,	HASRD-DCK, 7/78
186W	186RE	EC	DECAY	(90.64 H)	74SC38,	HASRD-DCK,	7/78
186OS	186RE	B-	DECAY	(90.64 H)	74SC58,	HASRD-DCK,	7/78
182W	186OS	A	DECAY		74SC38,	75VI01,	HASRD-DCK, 7/78
187RE	187W	B-	DECAY		75ELO2,	76BR09,	HASRD-DCK, 7/78
187OS	187RE	B-	DECAY		75ELO2,	HASRD-DCK,	7/78
188RE	188W	B-	DECAY		73SC41,	HASRD-DCK,	8/78
188OS	188RE	B-	DECAY		75SC41,	74BE75,75SV01,	HASRD-DCK, 8/78
190OS	190OS	IT	DECAY	(9.9 M)	73SC42,	74BA77,	HASRD-DCK, 9/78
190OS	190IR	EC	DECAY	(11.78 D)	73SC42,	74HE08,74YA02,	HASRD-DCK, 9/78
190IR	190IR	IT	DECAY	(1.2 H)	73SC42,	HASRD-DCK,	9/78
190OS	190IR	EC	DECAY	(3.2 H)	73SC42,	70BO22,	HASRD-DCK, 9/78
190IR	190IR	IT	DECAY	(3.2 H)	75SC42,	70BO22,	HASRD-DCK, 9/78
191IR	191OS	B-	DECAY	(15.4 D)	73LEW1,	HASRD-DCK,	9/78
191OS	191OS	IT	DECAY	(15.05 H)	75LEW1,	75LO05,	HASRD-DCK, 9/78
191IR	191PT	EC	DECAY		73LEW1,	75RU06,	HASRD-DCK, 9/78
192OS	192IR	EC	DECAY	(74.02 D)	73SC43,	73GE05,73WI10,	HASRD-DCK, 9/78
192PT	192IR	B-	DECAY	(74.02 D)	73SC43,	73GE05,73WI10,	HASRD-DCK, 9/78

193IR	193DS	B-	DECAY		72LEW1,73KR05, HASRD-DCK, 9/78
195IR	195IR	IT	DECAY	(11.9 D)	72LEW1, HASRD-DCK, 9/78
193IR	193PT	EC	DECAY	(50 Y)	72LEW1, HASRD-DCK, 9/78
193PT	193PT	IT	DECAY	(4.33 D)	72LEW1, HASRD-DCK, 9/78
194PT	194IR	B-	DECAY	(19.15 H)	77HA46, HASRD-DCK, 9/78
194PT	194IR	B-	DECAY	(171 D)	77HA46, HASRD-DCK, 5/79
194PT	194AU	EC	DECAY		77HA46,77VY01, HASRD-DCK, 6/79
195PT	195PT	IT	DECAY	(4.02 D)	78HA03, HASRD-DCK, 11/78
195PT	195AU	EC	DECAY	(183 D)	78HA03, HASRD-DCK, 9/78
195AU	195AU	IT	DECAY	(30.6 S)	78HA03, HASRD-DCK, 9/78
196PT	196AU	EC	DECAY	(6.183 D)	72SC50, HASRD-DCK, 9/78
196HG	196AU	B-	DECAY	(6.183 D)	72SC50, HASRD-DCK, 9/78
197AU	197PT	B-	DECAY	(18.3 H)	77HA15, HASRD-DCK, 9/78
197PT	197PT	IT	DECAY	(94.4 M)	77HA15, HASRD-DCK, 9/78
197AU	197PT	B-	DECAY	(94.4 M)	77HA15, HASRD-DCK, 9/78
197AU	197HG	EC	DECAY	(64.14 H)	77HA15, HASRD-DCK, 9/78
197AU	197HG	EC	DECAY	(23.8 H)	77HA15, HASRD-DCK, 9/78
197HG	197HG	IT	DECAY	(23.8 H)	77HA15, HASRD-DCK, 9/78
198HG	198AU	B-	DECAY	(2.696 D)	77HA26,78KE02, HASRD-DCK, 9/78
199HG	199AU	B-	DECAY		78HA12, HASRD-DCK, 9/78
200HG	200TL	EC	DECAY		79SC01, HASRD-DCK, 3/79
201HG	201TL	EC	DECAY		78SC15, HASRD-DCK, 3/79
202HG	202TL	EC	DECAY		78SC16, HASRD-DCK, 12/78
203TL	203HG	B-	DECAY		78SC05, HASRD-DCK, 10/78
203TL	203PB	EC	DECAY		78SC05, HASRD-DCK, 10/78
204HG	204TL	EC	DECAY		71MA78, HASRD-DCK, 10/78
204PB	204TL	B-	DECAY		71MA78, HASRD-DCK, 10/78
204PB	204PB	IT	DECAY	(66.9 M)	71MA78,72SI22, HASRD-DCK, 10/78
205TL	205PB	EC	DECAY		78SC01,78PE08, HASRD-DCK, 5/79
206PB	206BI	EC	DECAY		79WE01, HASRD-DCK, 3/79
207PB	207TL	B-	DECAY		77SC19,76BL15, HASRD-DCK, 12/78
207PB	207BI	EC	DECAY		77SC19,78YA04, HASRD-DCK, 12/78
208PB	208TL	B-	DECAY		71LEW1,75KO02,77GE12, HASRD-DCK, 10/78
208PB	208BI	EC	DECAY		71LEW1, HASRD-DCK, 5/79
209PB	209TL	B-	DECAY		77MA34,77VY02, HASRD-DCK, 10/78
209BI	209PB	B-	DECAY		77MA34, HASRD-DCK, 10/78
205PB	209PO	A	DECAY		77MA34, HASRD-DCK, 5/79
209BI	209PO	EC	DECAY		77MA34, HASRD-DCK, 5/79
210PB	210TL	B-	DECAY		71LEW2, HASRD-DCK, 10/78
210BI	210PB	B-	DECAY		71LEW2, HASRD-DCK, 10/78
210PO	210BI	B-	DECAY	(5.015 D)	71LEW2, HASRD-DCK, 10/78
206PB	210PO	A	DECAY		71LEW2,73GO39, HASRD-DCK, 10/78
211BI	211PB	B-	DECAY		78MA29,76BL15, HASRD-DCK, 12/78
207TL	211BI	A	DECAY		78MA29,76BL13, HASRD-DCK, 12/78
211PO	211BI	B-	DECAY		78MA29, HASRD-DCK, 10/78
207PB	211PO	A	DECAY	(0.516 S)	78MA29, HASRD-DCK, 12/78
207BI	211AT	A	DECAY		78MA29, HASRD-DCK, 12/78
211PO	211AT	EC	DECAY		78MA29, HASRD-DCK, 12/78
212BI	212PB	B-	DECAY		72PAMA,77KU25, HASRD-DCK, 12/78
208TL	212BI	A	DECAY		72PAMA, HASRD-DCK, 10/78
212PO	212BI	B-	DECAY		72PAMA, HASRD-DCK, 10/78
208PB	212PO	A	DECAY		72PAMA,74HU15,75SA06, HASRD-DCK, 10/78
209TL	215BI	A	DECAY		75MA65,77VY02, HASRD-DCK, 10/78
213PO	213BI	B-	DECAY		73MA63,77VY02, HASRD-DCK, 10/78
209PB	213PO	A	DECAY		73MA63,77VY02, HASRD-DCK, 10/78
214BI	214PB	B-	DECAY		77TO12,77ZO01, HASRD-DCK, 10/78
214PO	214BI	B-	DECAY		77TO12,77ZO01, HASRD-DCK, 10/78
210PB	214PO	A	DECAY		77TO12, HASRD-DCK, 10/78
211PB	215PO	A	DECAY		77MA29, HASRD-DCK, 10/78
212PB	216PO	A	DECAY		76ELO5,77KU15, HASRD-DCK, 10/78
213BI	217AT	A	DECAY		73MA64, HASRD-DCK, 10/78
214PB	218PO	A	DECAY		77TO13, HASRD-DCK, 10/78
214PO	218RN	A	DECAY		77TO13, HASRD-DCK, 10/78
215PO	219RN	A	DECAY		77MA30,76BL13, HASRD-DCK, 12/78
216PO	220RN	A	DECAY		76ELO4,77KU15, HASRD-DCK, 10/78
217AT	221FR	A	DECAY		73MA65, HASRD-DCK, 10/78
218PO	222RN	A	DECAY		77TO14, HASRD-DCK, 11/78
218RN	222RA	A	DECAY		77TO14, HASRD-DCK, 11/78
223RA	223FR	B-	DECAY		77MA31, HASRD-DCK, 11/78
219RN	225RA	A	DECAY		77MA51, HASRD-DCK, 11/78
220RN	224RA	A	DECAY		76ELO5,77KU15,77KU25, HASRD-DCK, 11/78
225AC	225RA	B-	DECAY		73MA66, HASRD-DCK, 11/78
221FR	225AC	A	DECAY		73MA66,72DZ14, HASRD-DCK, 11/78
222RN	226RA	A	DECAY		77TO09,77ZO01, HASRD-DCK, 11/78
222RA	226TH	A	DECAY		77TO09,76KU08, HASRD-DCK, 11/78
223FR	227AC	A	DECAY		77MA32, HASRD-DCK, 11/78
227TH	227AC	B-	DECAY		77MA52, HASRD-DCK, 11/78
223RA	227TH	A	DECAY		77MA32, HASRD-DCK, 11/78
228AC	228RA	B-	DECAY		76H006, HASRD-DCK, 12/78

228TH	228AC	B- DECAY	76H006, HASRD-DCK, 12/78
224RA	228TH	A DECAY	76H006,77KU15,77KU25, HASRD-DCK, 12/78
225RA	229TH	A DECAY	78T004, HASRD-DCK, 12/78
226RA	230TH	A DECAY	77EL03,78KU08, HASRD-DCK, 6/79
230TH	230PA	EC DECAY	77EL03, HASRD-DCK, 12/78
230U	230PA	B- DECAY	77EL03, HASRD-DCK, 12/78
226TH	230U	A DECAY	77EL03,76KU08, HASRD-DCK, 12/78
231PA	231TH	B- DECAY	77SC15, HASRD-DCK, 12/78
227AC	231PA	A DECAY	77SC15, HASRD-DCK, 12/78
231PA	231U	EC DECAY	77SC15, HASRD-DCK, 6/79
228RA	232TH	A DECAY	77SC13, HASRD-DCK, 1/79
228TH	232U	A DECAY	77SC15, HASRD-DCK, 1/79
233PA	233TH	B- DECAY	78EL04, HASRD-DCK, 6/79
233U	233PA	B- DECAY	78EL04, HASRD-DCK, 1/79
229TH	233U	A DECAY	78EL04, HASRD-DCK, 1/79
234PA	234TH	B- DECAY	77EL06, HASRD-DCK, 1/79
254U	254PA	B- DECAY (6.70 H)	77EL06, HASRD-DCK, 1/79
234PA	234PA	IT DECAY (1.17 M)	77EL06,78CH06, HASRD-DCK, 1/79
234U	234PA	B- DECAY (1.17 M)	77EL06, HASRD-DCK, 1/79
230TH	234U	A DECAY	77EL06, HASRD-DCK, 1/79
231TH	235U	A DECAY (7.038E8 Y)	77SC15, HASRD-DCK, 1/79
235U	255NP	EC DECAY	77SC15, HASRD-DCK, 2/79
232TH	236U	A DECAY	77SC13, HASRD-DCK, 1/79
236U	236NP	EC DECAY (1.15E5 Y)	77SC13, HASRD-DCK, 6/79
236PU	236NP	B- DECAY (1.15E5 Y)	77SC13, HASRD-DCK, 6/79
236U	236NP	EC DECAY (22.5 H)	77SC13,77PO05, HASRD-DCK, 6/79
256PU	256NP	B- DECAY (22.5 H)	77SC15, HASRD-DCK, 6/79
232U	236PU	A DECAY	77SC13, HASRD-DCK, 1/79
237NP	237U	B- DECAY	78EL01, HASRD-DCK, 1/79
233PA	237NP	A DECAY	78EL01, HASRD-DCK, 1/79
237NP	237PU	EC DECAY	78EL01, HASRD-DCK, 2/79
254TH	258U	A DECAY	77EL07, HASRD-DCK, 1/79
238PU	238NP	B- DECAY	77EL07, HASRD-DCK, 1/79
234U	238PU	A DECAY	77EL07, HASRD-DCK, 1/79
239NP	239U	B- DECAY	77SC15, HASRD-DCK, 6/79
239PU	239NP	B- DECAY	77SC15, HASRD-DCK, 1/79
235U	259PU	A DECAY	77SC15,77JA08, HASRD-DCK, 1/79
240NP	240U	B- DECAY	77SC13, HASRD-DCK, 1/79
240PU	240NP	B- DECAY (65 M)	77SC13, HASRD-DCK, 1/79
240NP	240NP	IT DECAY (7.4 M)	77SC13, HASRD-DCK, 1/79
240PU	240NP	B- DECAY (7.4 M)	77SC13, HASRD-DCK, 1/79
236U	240PU	A DECAY	77SC13,77BA69,78JA11, HASRD-DCK, 6/79
241AM	241PU	B- DECAY	78EL02, HASRD-DCK, 1/79
257NP	241AM	A DECAY	78EL02,78GE06,78OV01, HASRD-DCK, 2/79
238U	242PU	A DECAY	77EL08,76BU23, HASRD-DCK, 2/79
242PU	242AM	EC DECAY (16.02 H)	77EL08, HASRD-DCK, 2/79
242CM	242AM	B- DECAY (16.02 H)	77EL08, HASRD-DCK, 2/79
238NP	242AM	A DECAY (152 Y)	77EL08, HASRD-DCK, 2/79
242AM	242AM	IT DECAY (152 Y)	77EL08, HASRD-DCK, 2/79
238PU	242CM	A DECAY	77EL08, HASRD-DCK, 2/79
243AM	243PU	B- DECAY	76EL10, HASRD-DCK, 2/79
239NP	243AM	A DECAY	76EL10, HASRD-DCK, 2/79
239PU	243CM	A DECAY	76EL10, HASRD-DCK, 2/79
240U	244PU	A DECAY	76SC02, HASRD-DCK, 2/79
244CM	244AM	B- DECAY (10.1 H)	76SC02, HASRD-DCK, 2/79
240PU	244CM	A DECAY	76SC02, HASRD-DCK, 2/79
245AM	245PU	B- DECAY	76EL01, HASRD-DCK, 6/79
245CM	245AM	B- DECAY	76EL01, HASRD-DCK, 6/79
241PU	245CM	A DECAY	76EL01, HASRD-DCK, 2/79
246AM	246PU	B- DECAY	76SC02, HASRD-DCK, 2/79
246CM	246AM	B- DECAY (25.0 M)	76SC02,76MU03, HASRD-DCK, 2/79
242PU	246CM	A DECAY	76SC02, HASRD-DCK, 3/79
245PU	247CM	A DECAY	76EL02, HASRD-DCK, 5/79
244PU	248CM	A DECAY	76SC02,77BA69, HASRD-DCK, 3/79
244CM	248CF	A DECAY	76SC02, HASRD-DCK, 6/79
249BK	249CM	B- DECAY	76SC09, HASRD-DCK, 3/79
249CF	249BK	B- DECAY	76SC09, HASRD-DCK, 3/79
245CM	249CF	A DECAY	76SC09, HASRD-DCK, 3/79
246PU	250CM	A DECAY	76SC02, HASRD-DCK, 3/79
250BK	250CM	B- DECAY	76SC02, HASRD-DCK, 5/79
250CF	250BK	B- DECAY	76SC02, HASRD-DCK, 3/79
246CM	250CF	A DECAY	76SC02, HASRD-DCK, 5/79
251CF	251BK	B- DECAY	76SC09, HASRD-DCK, 3/79
247CM	251CF	A DECAY	76SC09, HASRD-DCK, 5/79
248CM	252CF	A DECAY	76SC02,76MO30, HASRD-DCK, 3/79
249CM	253CF	A DECAY	76SC09, HASRD-DCK, 3/79
253ES	253CF	B- DECAY	76SC09, HASRD-DCK, 3/79
249BK	253ES	A DECAY	76SC09, HASRD-DCK, 3/79
250CM	254CF	A DECAY	76SC02, HASRD-DCK, 5/79

2508K	254ES	A DECAY (275.7 D)	76SC02,	HASRD-DCK,	3/79
2508K	254ES	A DECAY (39.3 H)	76SC02,	HASRD-DCK,	3/79
254FM	254ES	B- DECAY (39.3 HI	76SC02,	HASRD-DCK,	3/79
250CF	254FM	A DECAY	76SC02,	HASRD-DCK,	3/79
251BK	255ES	A DECAY	76SC09,	HASRD-DCK,	3/79
255FM	255ES	B- DECAY	76SC09,	HASRD-DCK,	3/79
251CF	255FM	A DECAY	76SC09,	HASRD-DCK,	3/79
252CF	256FM	A DECAY	76SC02,	HASRD-DCK,	3/79

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Nuclear Data Sheets for A = 107
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Nuclear Data Sheets for A = 108
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Nuclear Data Sheets for A = 122
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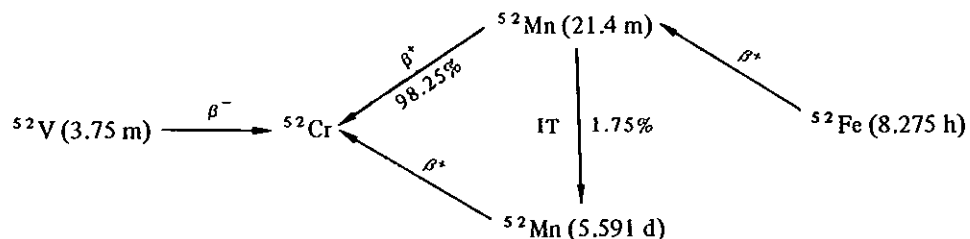
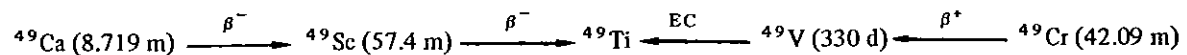
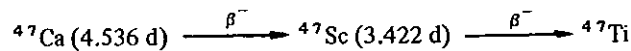
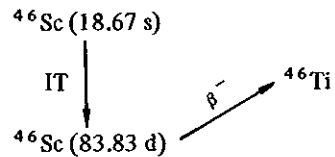
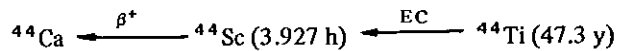
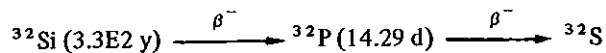
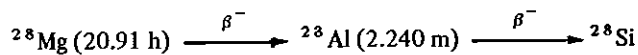
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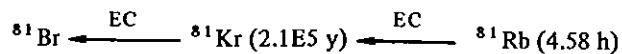
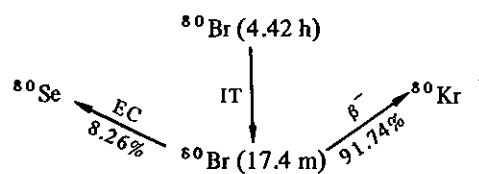
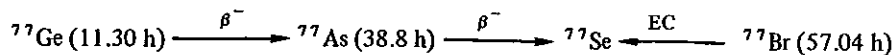
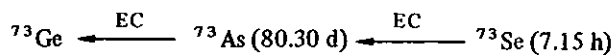
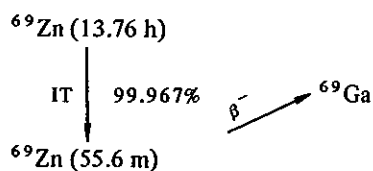
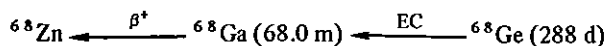
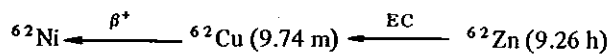
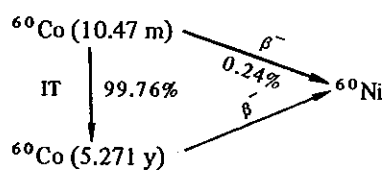
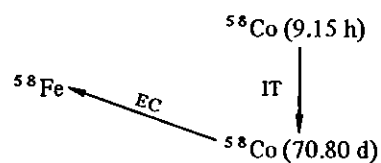
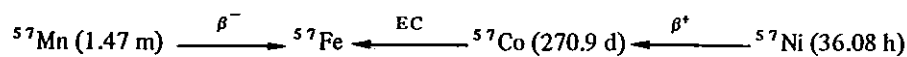
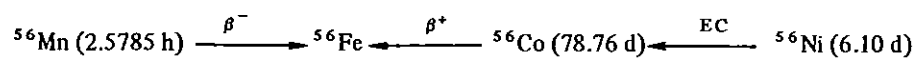
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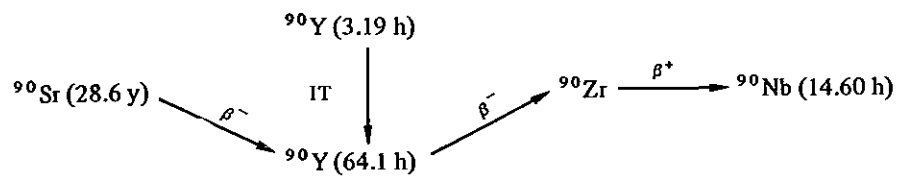
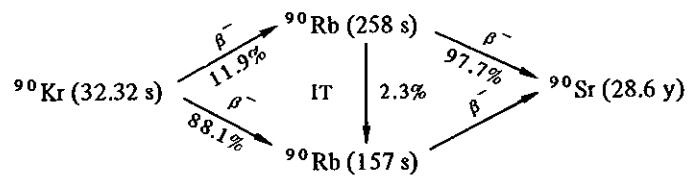
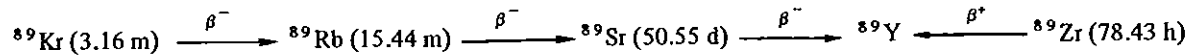
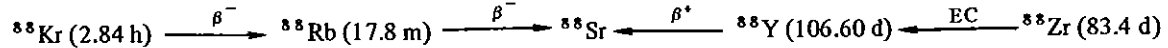
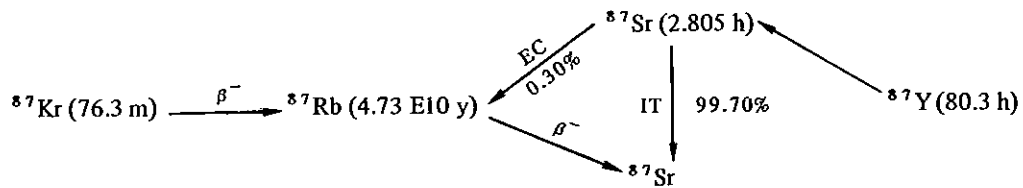
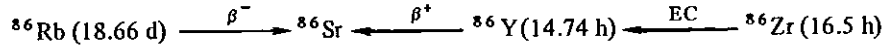
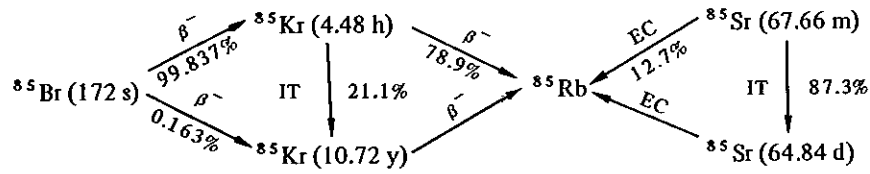
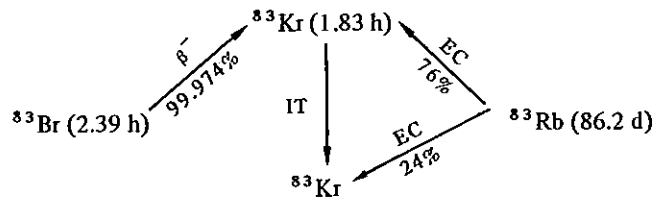
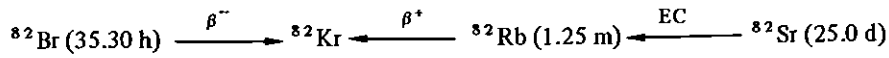
Diagrams of Radioactive Decay Chains

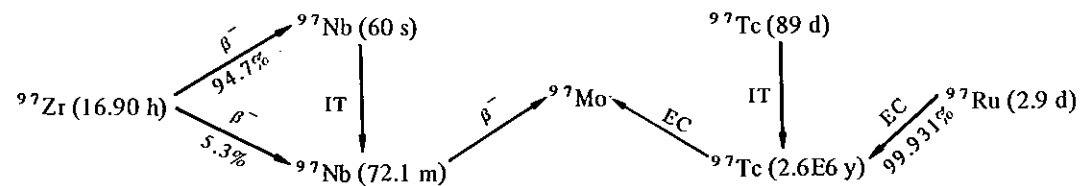
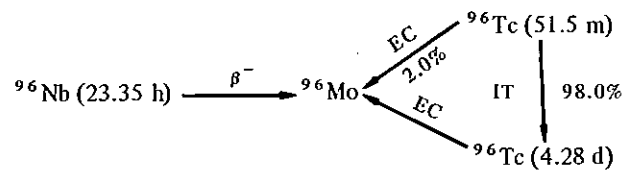
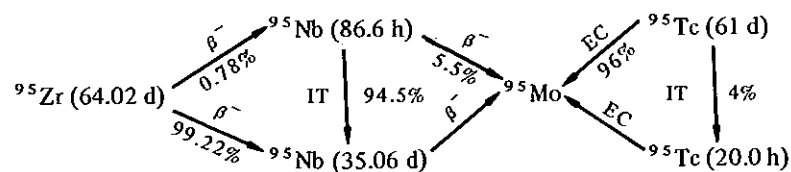
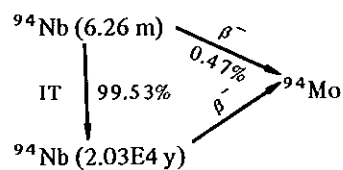
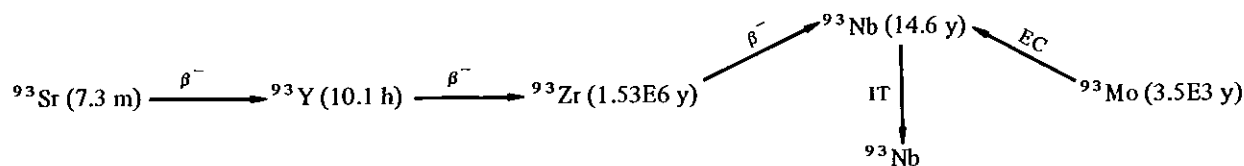
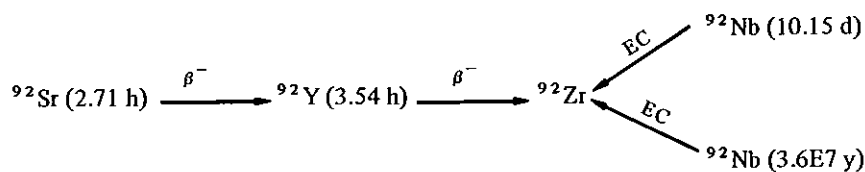
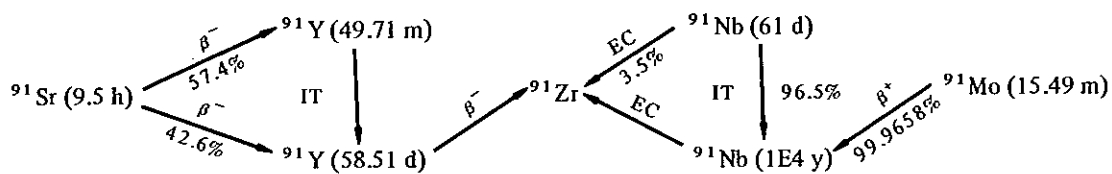
This appendix contains diagrams of the decay chains that involve two or more of the radionuclides considered in this handbook. The half-life, modes of decay, and decay branching ratios for each radio-

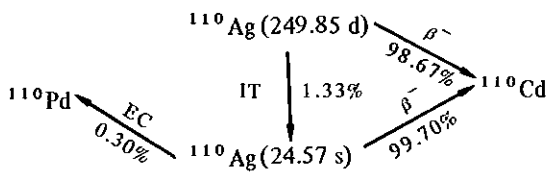
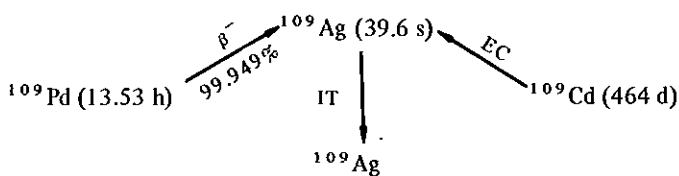
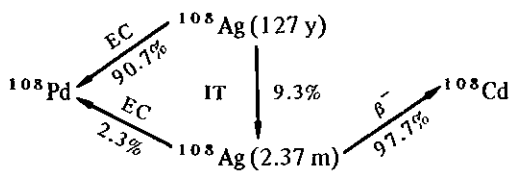
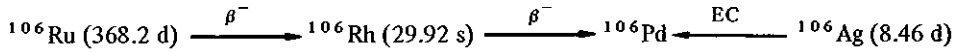
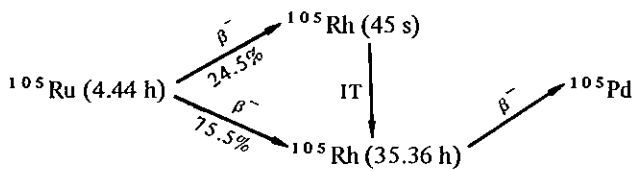
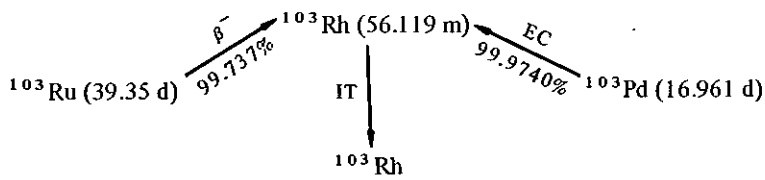
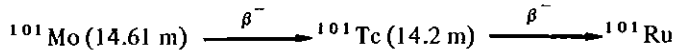
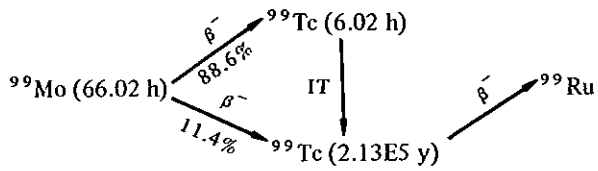
nuclide in the decay chain are shown. The branching ratios for spontaneous fission are not shown, and modes of decay with branching ratios less than 0.1% are omitted.

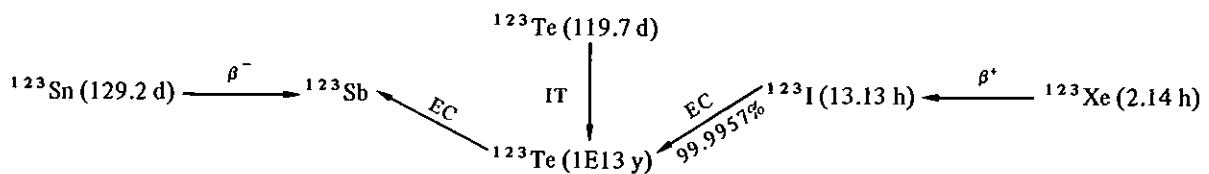
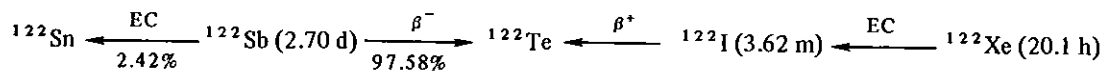
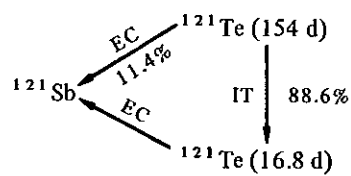
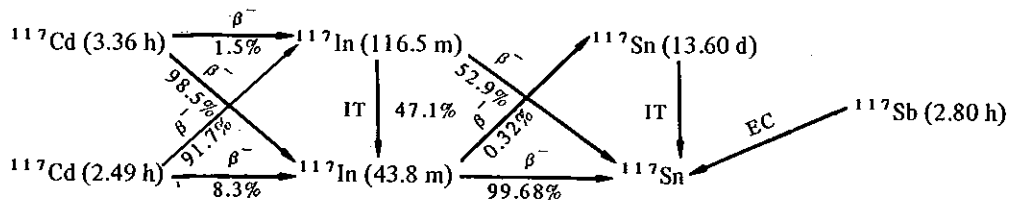
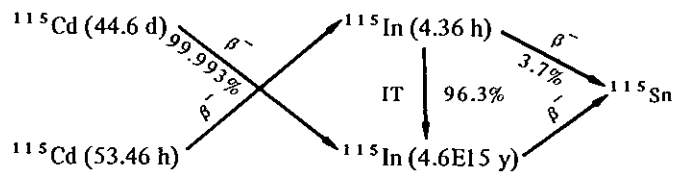
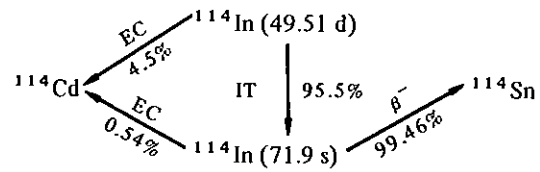
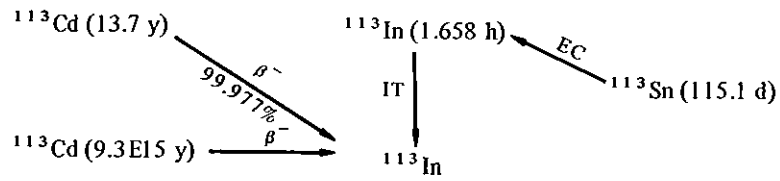


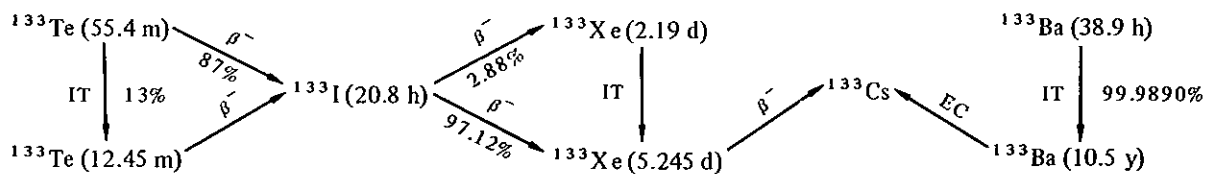
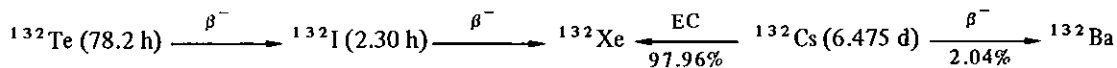
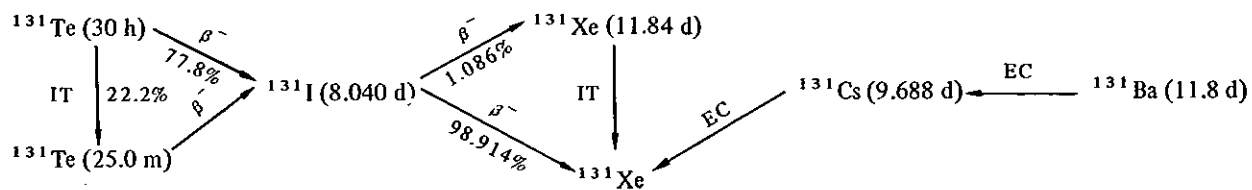
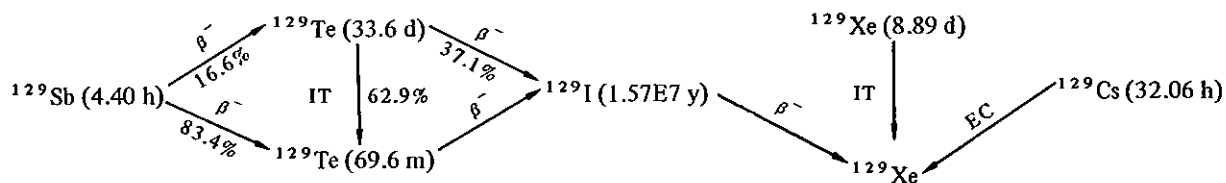
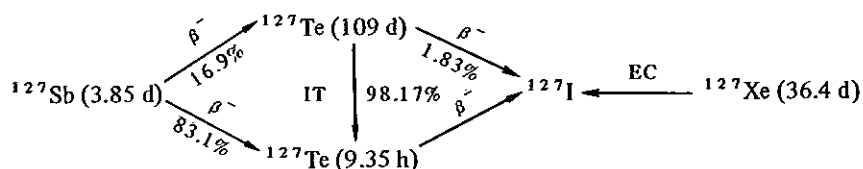
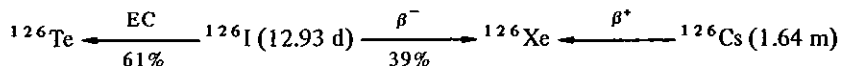
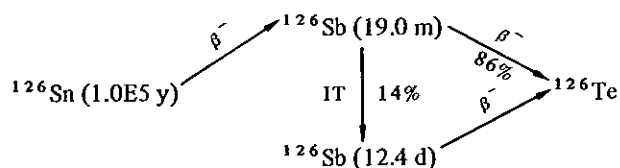
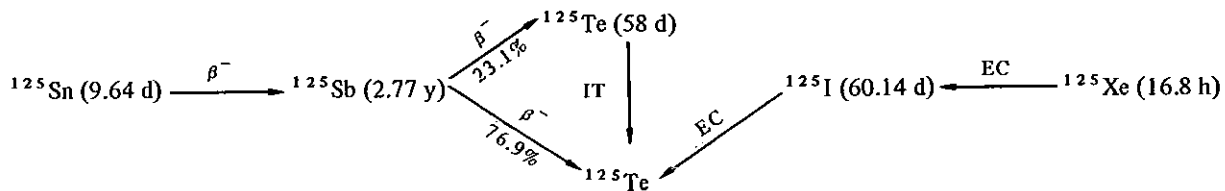


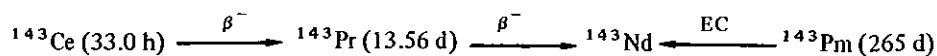
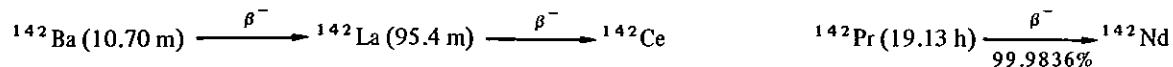
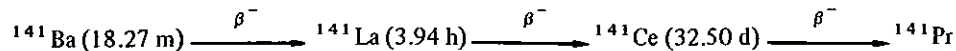
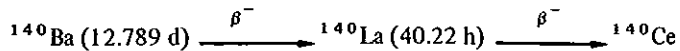
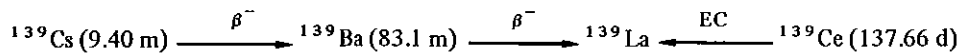
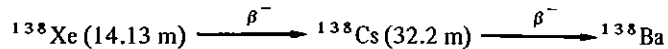
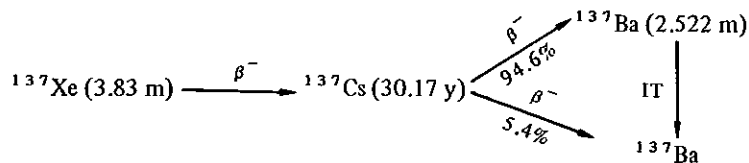
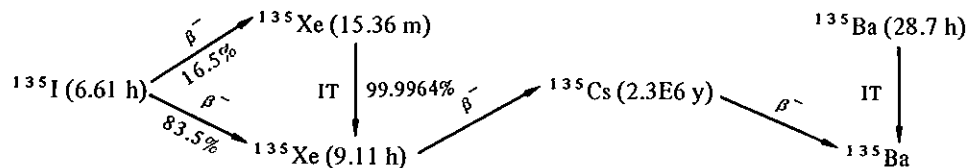
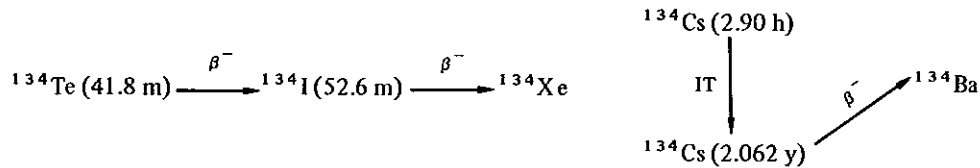


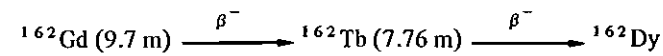
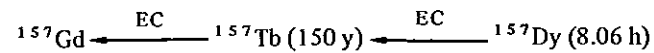
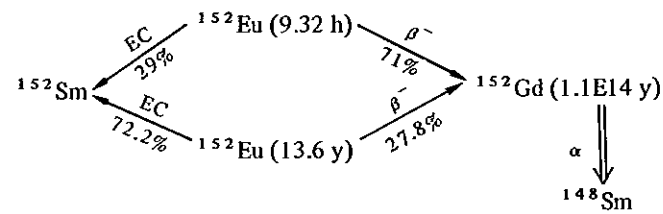
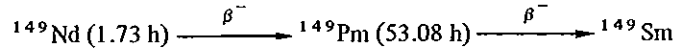
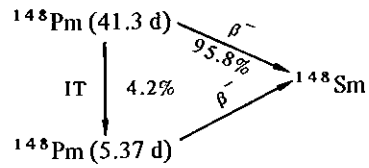
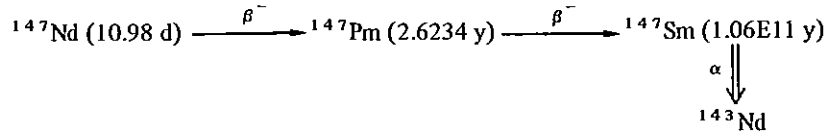
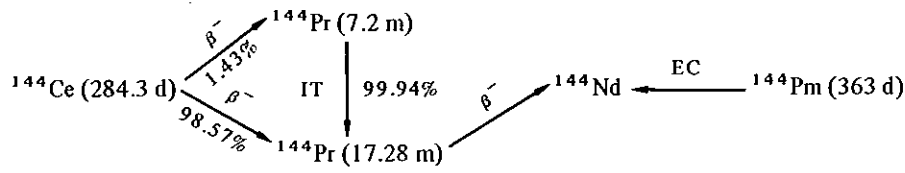


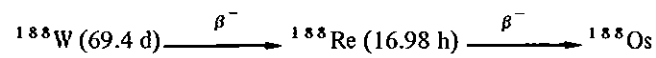
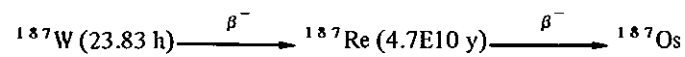
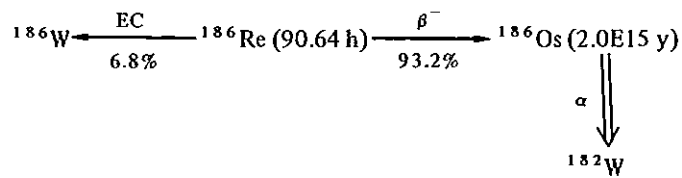
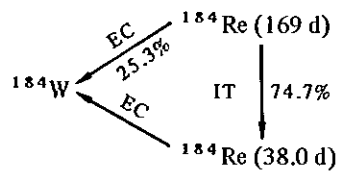
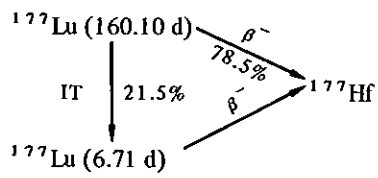
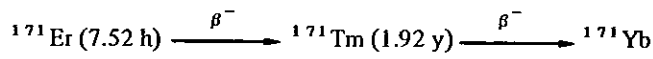
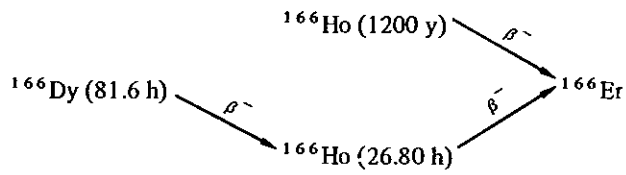


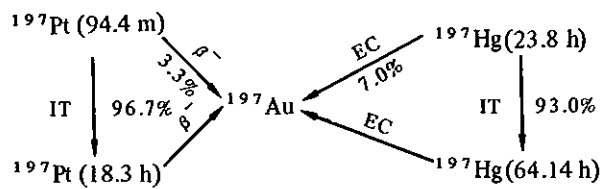
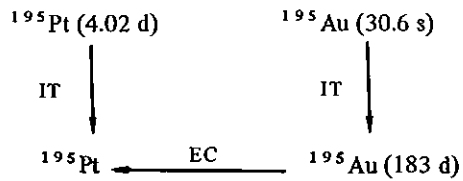
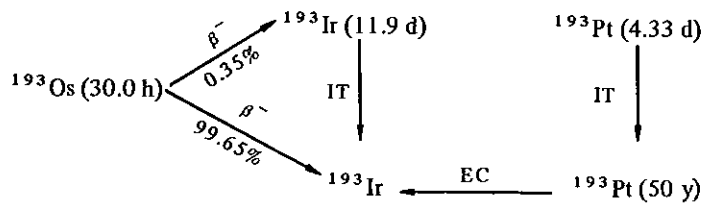
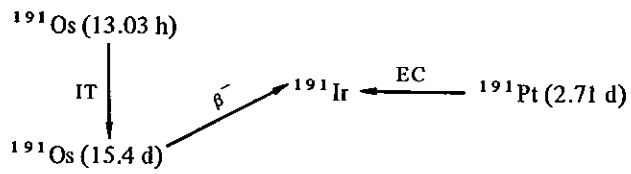
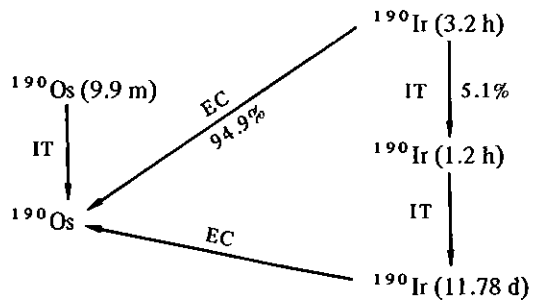




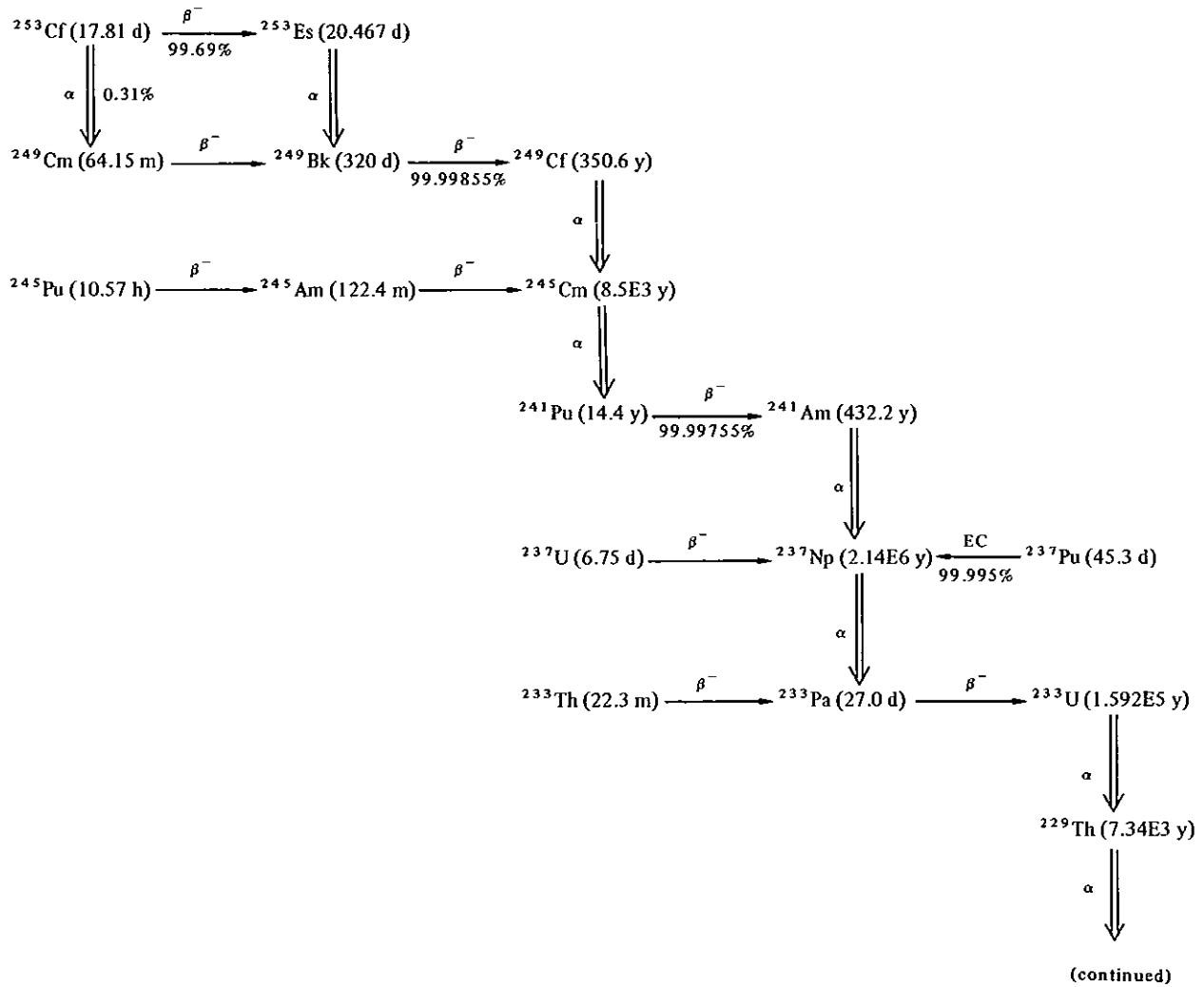


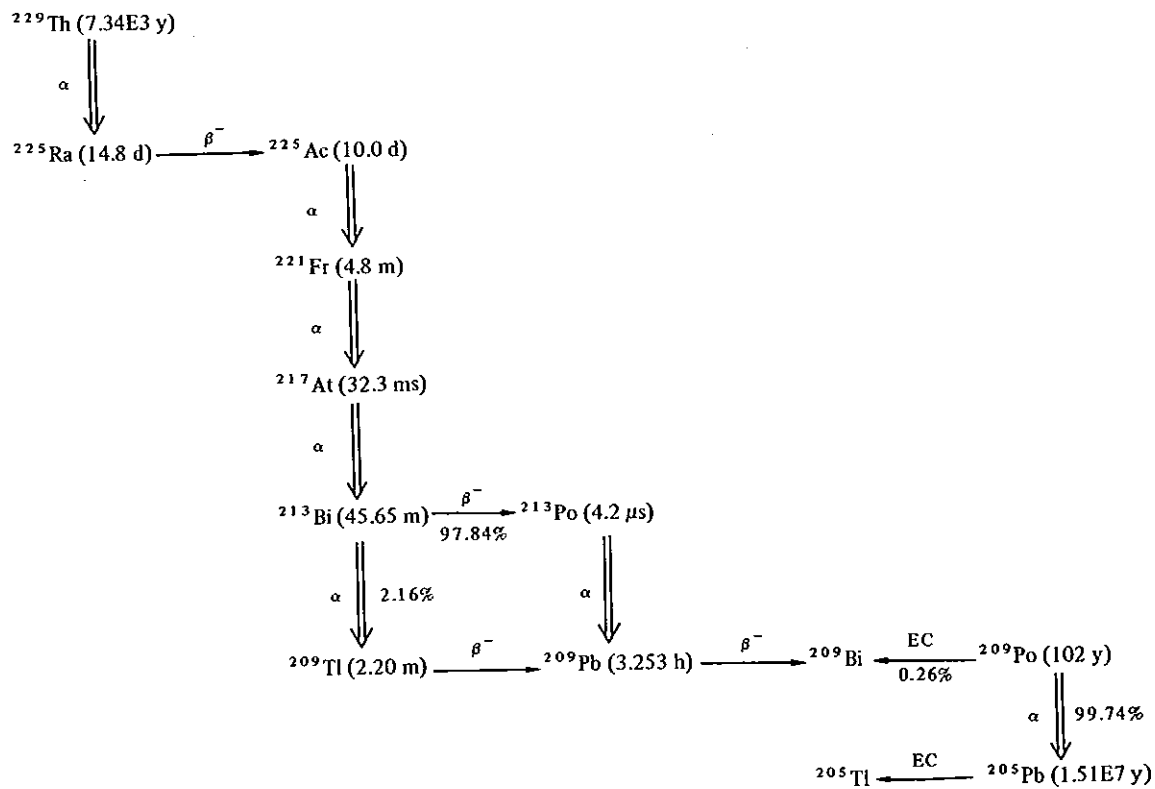




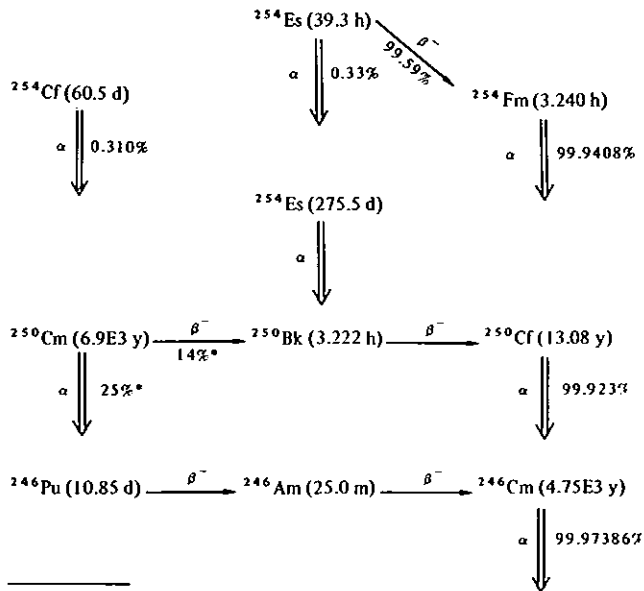


Neptunium Series

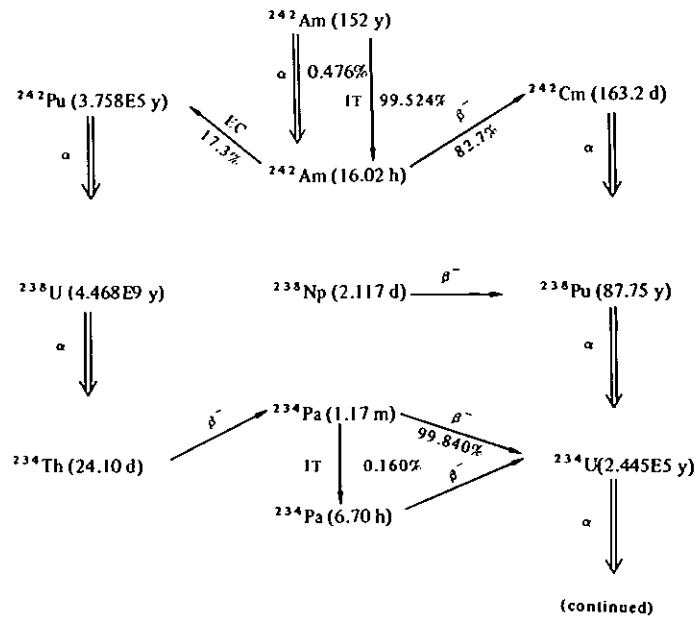


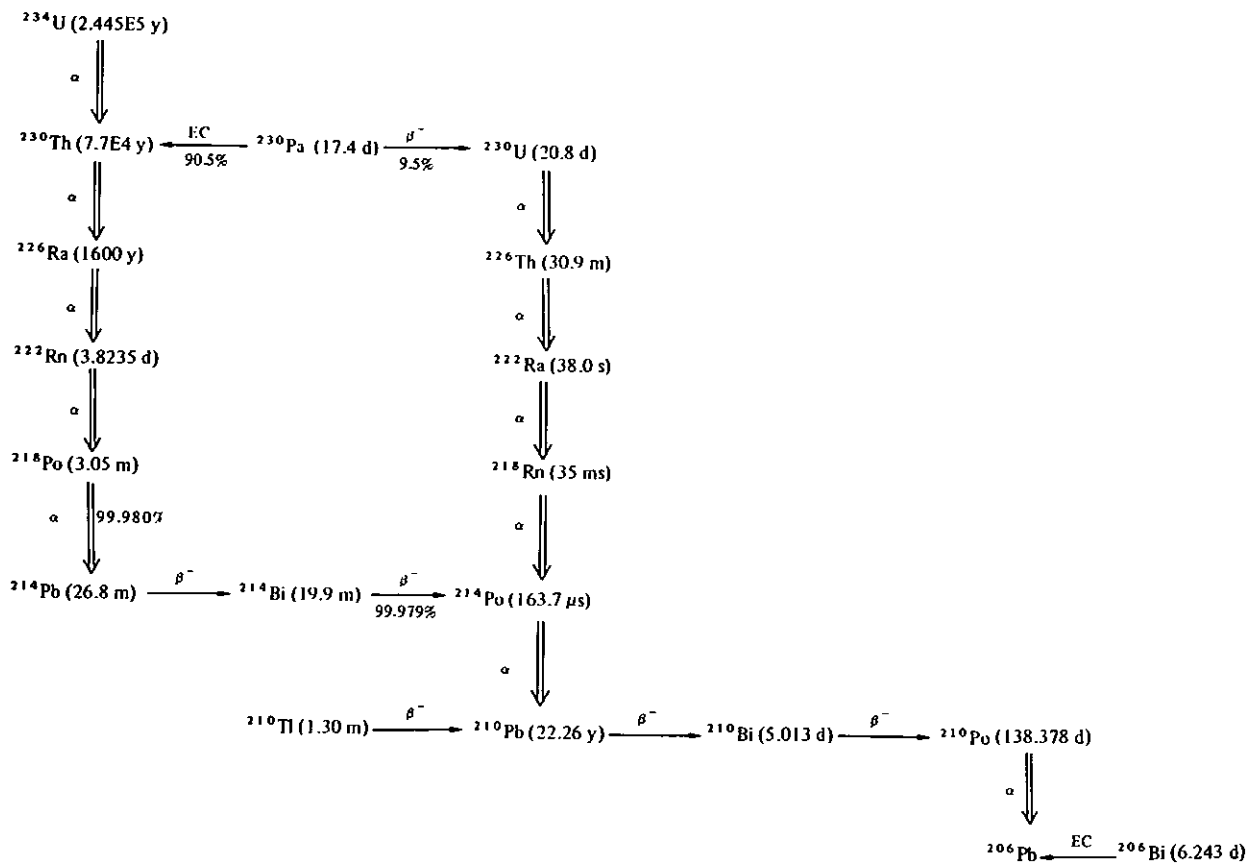


Uranium Series

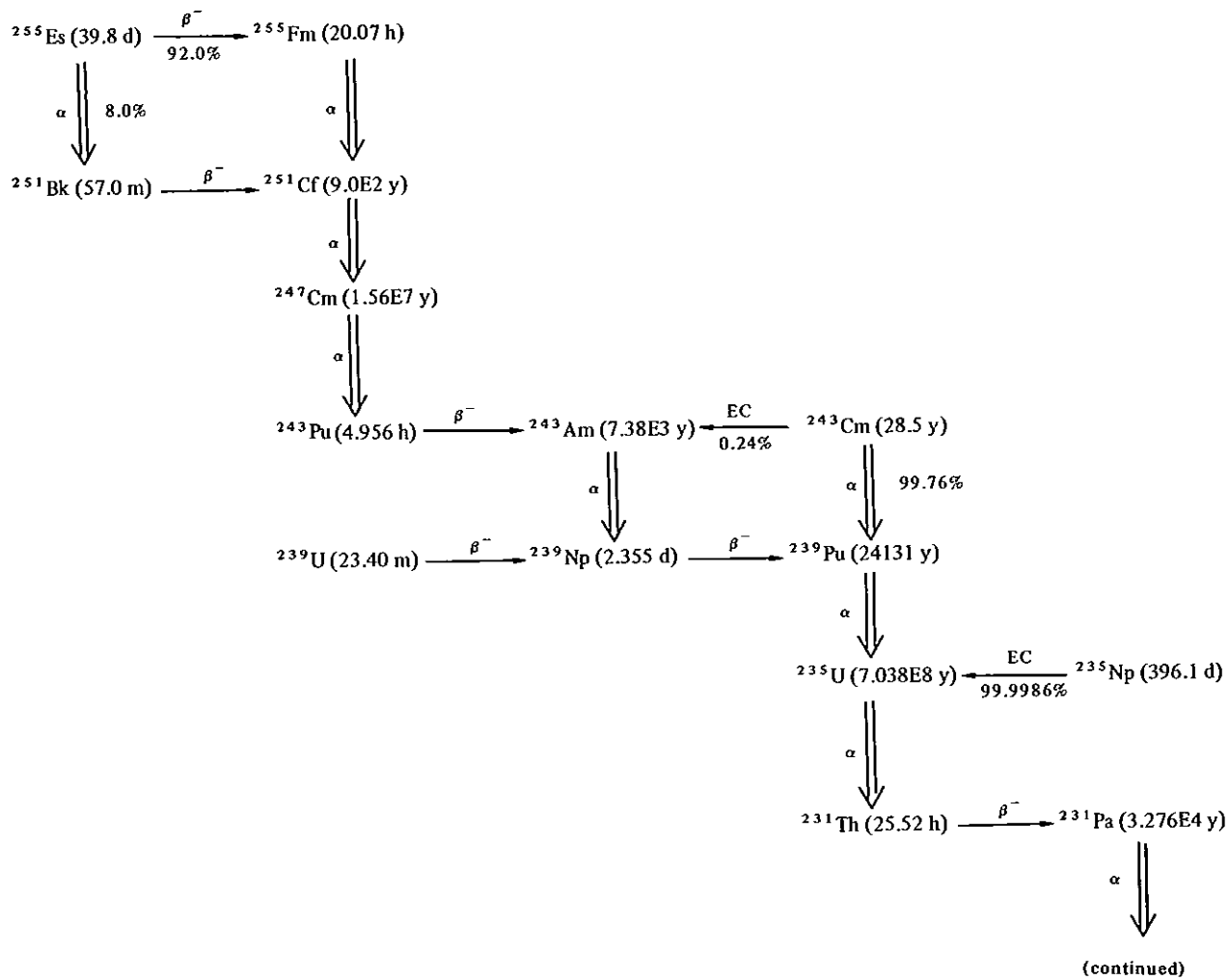


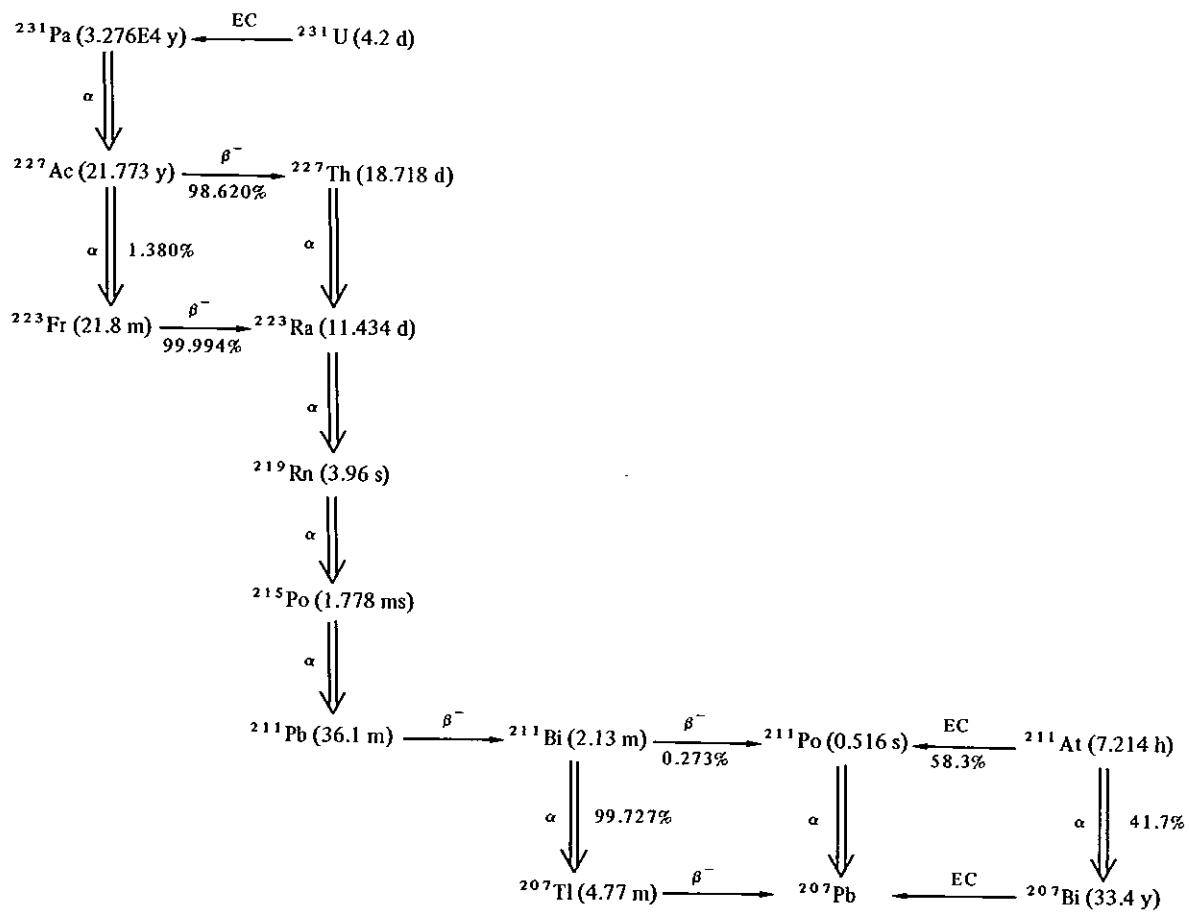
*Branching ratio based on systematics; decay has not been observed.



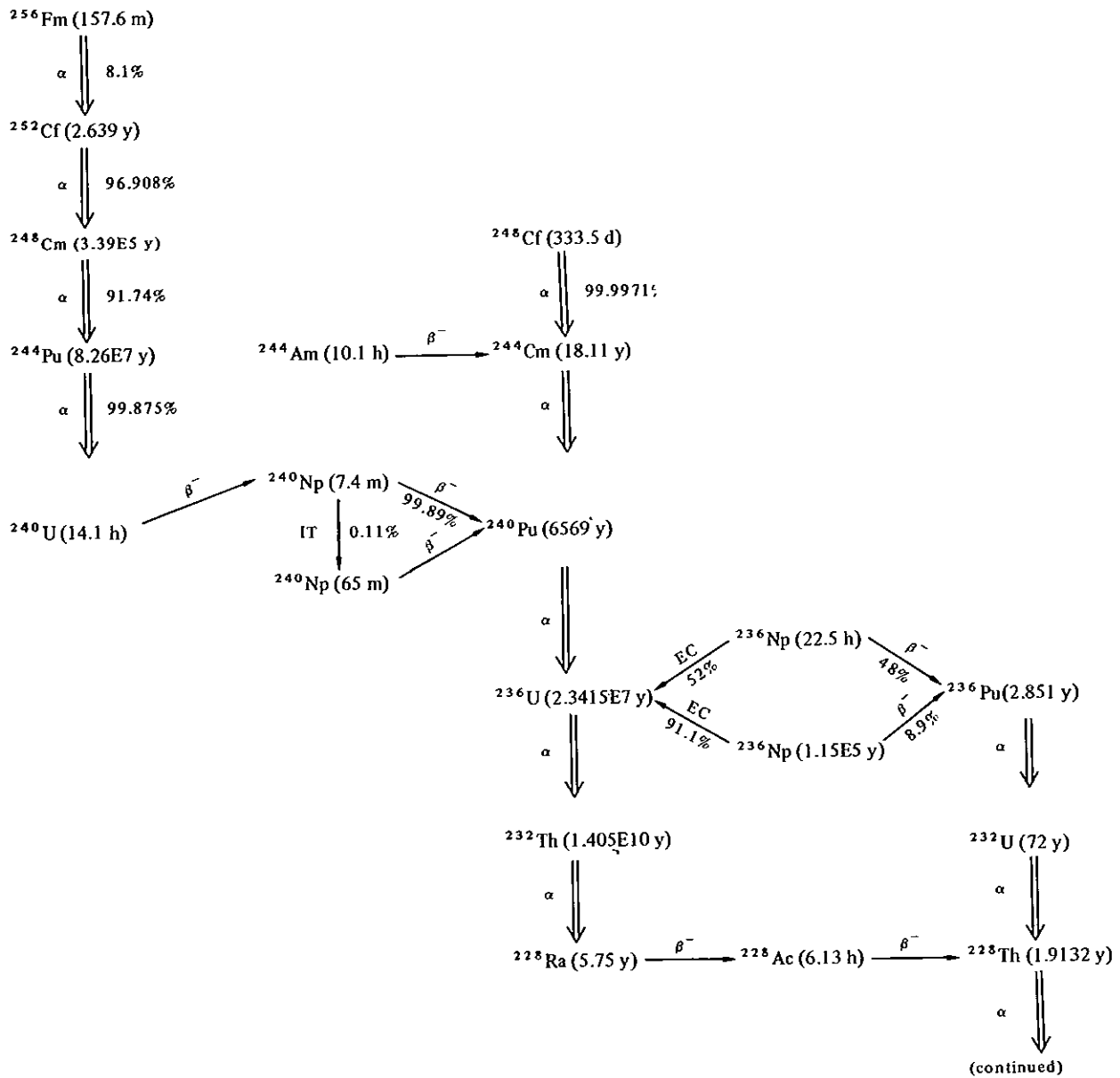


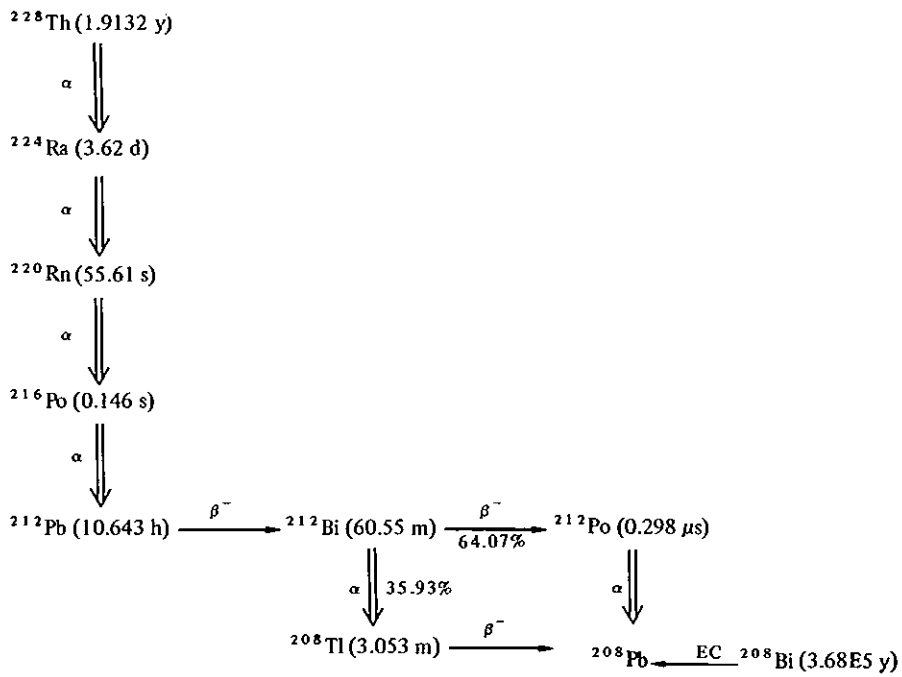
Actinium Series





Thorium Series





Tables
of Radioactive
Decay Data

Radiation Type	Energy (keV)	Intensity (%)	$\Delta(\text{g-rad}/\mu\text{Ci-h})$	Radiation Type	Energy (keV)	Intensity (%)	$\Delta(\text{g-rad}/\mu\text{Ci-h})$
● ${}^3\text{H}$ β^- Decay (12.28 y 3) I (min) = 0.10%				● ${}^{16}\text{N}$ β^- Decay (7.13 s 2) I (min) = 0.10%			
β^- 1 max	18.600 20			β^- 1 max	1546.8 24		
avg	5.685 7 100		0.0121	avg	630.4 11	1.00 20	0.0134
				β^- 2 max	3301.9 23		
				avg	1461.5 12	4.9 4	0.153
				β^- 3 max	4288.3 23		
				avg	1941.2 12	68.0 20	2.81
				β^- 4 max	10418.7 23		
				avg	4979.2 12	26.0 20	2.76
				total β^-			
				avg	2695.1 15	100 3	5.74
				1 weak β 's omitted: $E\beta(\text{avg}) = 1998.8$; $\Sigma I\beta = 0.01\%$			
				γ 3	1754.8 6	0.13 3	0.0049
				γ 5	2741.2 6	0.76 15	0.0444
				γ 8	6129.17 5	69.0 20	9.01
				γ 10	7115.15 20	5.0 4	0.758
				7 weak γ 's omitted: $E\gamma(\text{avg}) = 6334.2$; $\Sigma I\gamma = 0.16\%$			
				● ${}^{18}\text{F}$ β^+ Decay (109.74 m 4) I (min) = 0.10%			
				Auger-K	0.52	3.069 11	≈ 0
				β^+ 1 max	633.5 6		
				avg	249.8 3	96.73 4	0.515
				Maximum $\gamma\pm$ -intensity = 199.53%			
				Maximum $\gamma\pm$ -intensity = 193.46%			
				● ${}^{22}\text{Na}$ β^+ Decay (2.602 y 2) I (min) = 0.10%			
				Auger-K	0.82	9.20 5	0.0002
				β^+ 1 max	545.5 5		
				avg	215.54 21	89.84 9	0.412
				1 weak β 's omitted: $E\beta(\text{avg}) = 835.0$; $\Sigma I\beta = 0.06\%$			
				K X-ray	0.84	0.12 4	≈ 0
				γ 1	1274.540 20	99.940 20	2.71
				Maximum $\gamma\pm$ -intensity = 179.80%			
				● ${}^{24}\text{Na}$ β^- Decay (15.00 h 4) I (min) = 0.10%			
				β^- 1 max	1390.2 7		
				avg	553.9 4	99.935 4	1.18
				1 weak β 's omitted: $E\beta(\text{avg}) = 88.6$; $\Sigma I\beta = 0.06\%$			

(Continued)

²⁴Na-³⁵S

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
²⁴ Na β ⁻ Decay (15.00 h 4) (Continued)				K X-ray 1.48 0.97 24 ≈0			
γ 2	1368.53 5	99.9991 1	2.91	γ 1	30.640 20	66 4	0.0431
γ 3	2754.09 5	99.862 5	5.86	γ 2	400.690 20	36.6 10	0.312
4 weak γ's omitted: E _γ (avg) = 3823.6; ΣI _γ = 0.06%				γ 5	941.45 3	38.3 10	0.768
				γ 8	1342.25 3	52.6 16	1.50
				γ 9	1372.89 6	4.70 20	0.137
				γ 10	1589.36 3	4.20 20	0.142
				γ 11	1620.00 15	0.30 10	0.0104
				4 weak γ's omitted: E _γ (avg) = 717.6; ΣI _γ = 0.13%			
● ²⁶ Al β ⁺ Decay (7.2E5 y 3) I (min) = 0.10%				● ²⁸ Al β ⁻ Decay (2.240 m 1) I (min) = 0.10%			
Auger-K	1.18	16.20 19	0.0008	β ⁻ 1 max	2864.2 6		
β ⁺ 1 max	1174.2 5			avg	1242.3 3	100	2.65
avg	543.87 23	81.81 22	0.948	γ 1	1778.85 3	100	3.79
K X-ray	1.25	0.44 6	≈0	● ³¹ Si β ⁻ Decay (157.3 m 3) I (min) = 0.10%			
γ 1	129.67 10	2.50 20	0.0602	β ⁻ 1 max	1490.8 8		
γ 2	1808.65 7	99.76 4	3.84	avg	595.6 4	100	1.27
γ 3	2938.24 13	0.240 20	0.0150	1 weak β's omitted: E _β (avg) = 68.7; ΣI _β = 0.07%			
Maximum γ±-intensity = 163.62%				1 weak γ's omitted: E _γ (avg) = 1266.1; ΣI _γ = 0.07%			
● ²⁷ Mg β ⁻ Decay (9.458 m 12) I (min) = 0.10%				● ³² Si β ⁻ Decay (3.3E2 y 4) I (min) = 0.10%			
β ⁻ 1 max	1594.8 12			Feeds ³² P			
avg	645.7 6	29.0 4	0.399	β ⁻ 1 max	213 7		
β ⁻ 2 max	1765.5 12			avg	64.7 24	100	0.138
avg	724.4 6	71.0 4	1.10	● ³² P β ⁻ Decay (14.29 d 3) I (min) = 0.10%			
total β ⁻	701.6 6	100.0 6	1.49	β ⁻ 1 max	1710.4 6		
γ 1	170.686 15	0.84 3	0.0031	avg	694.9 3	100	1.48
γ 2	843.76 3	71.8 4	1.29	● ³³ P β ⁻ Decay (25.4 d 2) I (min) = 0.10%			
γ 3	1014.44 4	28.0 4	0.605	β ⁻ 1 max	249.0 20		
● ²⁸ Mg β ⁻ Decay (20.91 h 3) I (min) = 0.10%				avg	76.6 6	100	0.163
Feeds ²⁸ Al				● ³⁵ S β ⁻ Decay (87.44 d 7) I (min) = 0.10%			
Auger-K	1.39	26 6	0.0008	β ⁻ 1 max	167.47 19		
ce-K- 1	29.080 20	27 7	0.0168	avg	48.83 7	100	0.104
ce-L- 1	30.522 20	2.6 7	0.0017				
β ⁻ 1 max	211.8 20						
avg	65.2 7	4.70 20	0.0065				
β ⁻ 2 max	458.9 20						
avg	155.9 8	95.1 19	0.316				
β ⁻ 3 max	859.6 20						
avg	319.3 9	0.21 12	0.0014				
total β ⁻	152.0 9	100.0 20	0.324				

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
<p>● ³⁶Cl EC Decay (3.01E5 y 2) I (min) = 0.10% %(EC + β^+) Decay = 1.0 8 See also ³⁶Cl β^- Decay</p>				<p>● ⁴⁰K β^- Decay (1.277E9 y 8) I (min) = 0.10% %β^- Decay = 89.33 11 See also ⁴⁰K EC Decay</p>			
Auger-K	2.1	0.8 7	≈0	β^- 1 max	1311.6 5		
				avg	508.54 23	89.33 11	0.968
<p>● ³⁶Cl β^- Decay (3.01E5 y 2) I (min) = 0.10% %β^- Decay = 99.0 8 See also ³⁶Cl EC Decay</p>				<p>● ⁴¹Ar β^- Decay (1.827 h 7) I (min) = 0.10%</p>			
β^- 1 max	709.6 3			β^- 1 max	1198.3 8		
avg	251.33 13	99.0 8	0.530	avg	459.3 4	99.170 20	0.970
				β^- 2 max	2492.0 8		
				avg	1076.7 4	0.780 20	0.0179
				total β^-			
				avg	464.0 4	100.00 3	0.988
<p>● ³⁷Ar EC Decay (35.02 d 5) I (min) = 0.10%</p>				<p>1 weak β's omitted: $E\beta$(avg) = 294.0; $\Sigma I\beta$ = 0.05%</p>			
Auger-K	2.38	81.7 5	0.0041	γ 1	1293.64 4	99.160 20	2.73
K X-ray	2.62	8.5 5	0.0005	<p>1 weak γ's omitted: $E\gamma$(avg) = 1677.0; $\Sigma I\gamma$ = 0.05%</p>			
<p>● ³⁸Cl β^- Decay (37.21 m 4) I (min) = 0.10%</p>				<p>● ⁴¹Ca EC Decay (1.03E5 y 4) I (min) = 0.10%</p>			
β^- 1 max	1107.0 9			Auger-K	3	77.0 12	0.0049
avg	420.3 4	32.5 6	0.291	K X-ray	3.31	12.3 12	0.0009
β^- 2 max	2749.4 9			<p>● ⁴²K β^- Decay (12.36 h 1) I (min) = 0.10%</p>			
avg	1181.5 5	11.5 8	0.289	β^- 1 max	1683.7 16		
β^- 3 max	4917.0 9			avg	700.9 8	0.319 17	0.0048
avg	2244.1 5	56.0 5	2.68	β^- 2 max	1996.4 16		
total β^-				avg	822.3 8	17.5 5	0.307
avg	1529.2 8	100.0 12	3.26	β^- 3 max	3521.1 16		
γ 1	1642.42 6	32.5 6	1.14	avg	1563.9 8	82.1 5	2.73
γ 2	2167.51 5	44.0 5	2.03	total β^-			
<p>1 weak γ's omitted: $E\gamma$(avg) = 3809.0; $\Sigma I\gamma$ = 0.03%</p>				avg	1429.8 9	100.0 7	3.05
<p>● ³⁹Ar β^- Decay (269 y 3) I (min) = 0.10%</p>				<p>2 weak β's omitted: $E\beta$(avg) = 191.5; $\Sigma I\beta$ = 0.12%</p>			
β^- 1 max	565 5			γ 1	312.75 3	0.319 17	0.0021
avg	218.8 21	100	0.466	γ 6	1524.665 20	17.9 5	0.581
<p>● ⁴⁰K EC Decay (1.277E9 y 8) I (min) = 0.10% %(EC + β^+) Decay = 10.67 11 See also ⁴⁰K β^- Decay</p>				<p>6 weak γ's omitted: $E\gamma$(avg) = 1446.4; $\Sigma I\gamma$ = 0.14%</p>			
Auger-K	2.66	7.22 10	0.0004				
K X-ray	2.95	0.94 5	≈0				
γ 1	1460.81 4	10.67 11	0.332				

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
● ⁴³ K β ⁻ Decay (22.6 h 2) I (min) = 0.10%				● ⁴⁵ Ca β ⁻ Decay (162.7 d 4) I (min) = 0.10%			
β ⁻ 1 max	422 10			β ⁻ 1 max	256.9 10		
avg	137 4	2.24 9	0.0065	avg	77.2 4	99.998 1	0.164
β ⁻ 2 max	827 10			● ⁴⁵ Ti EC Decay (3.08 h 1) I (min) = 0.10%			
avg	298 5	92.2 14	0.585	Auger-L	0.37	22.6 5	0.0002
β ⁻ 3 max	1224 10			Auger-K	3.64	10.99 23	0.0009
avg	469 5	3.6 4	0.0360	β ⁺ 1 max 1040.6 24			
β ⁻ 4 max	1817 10			avg	439.1 11	84.82 16	0.793
avg	762 5	1.3 3	0.0211	1 weak β's omitted: Eβ(avg) = 133.4; ΣIβ = 0.01%			
total β ⁻				X-ray Kα ₂	4.08610 2	0.76 7	≈0
avg	307 6	99.3 15	0.649	X-ray Kα ₁	4.09060 2	1.52 13	0.0001
γ 1	184.00 20	0.27 6	0.0011	X-ray Kβ	4.46	0.30 3	≈0
γ 2	220.608 18	4.11 22	0.0193	γ 12	720.34 15	0.154 12	0.0024
γ 3	372.763 15	87.3 5	0.693	18 weak γ's omitted: Eγ(avg) = 1200.8; ΣIγ = 0.20% Maximum γ±-intensity = 169.67%			
γ 4	396.870 20	11.43 12	0.0966	● ⁴⁶ Sc β ⁻ Decay (83.83 d 2) I (min) = 0.10%			
γ 5	404.30 20	0.109 8	0.0009	β ⁻ 1 max	357.3 8		
γ 6	593.40 8	11.0 3	0.139	avg	112.0 3	99.996	0.239
γ 7	617.494 25	80.5 14	1.06	γ 1	889.25 3	99.983	1.89
γ 8	800.8 10	0.147 10	0.0025	γ 2	1120.51 5	99.987	2.39
γ 9	990.25 20	0.33 7	0.0069	● ⁴⁶ Sc IT Decay (18.72 s 6) I (min) = 0.10%			
γ 10	1015.1 10	0.16 7	0.0034	Feeds ⁴⁶ Sc (83.83 d)			
γ 11	1021.79 18	1.88 8	0.0409	Auger-L	0.37	54.7 15	0.0004
γ 12	1394.2 7	0.102 12	0.0030	Auger-K	3.64	26.6 8	0.0021
● ⁴⁴ Sc β ⁺ Decay (3.927 h 8) I (min) = 0.10%				ce-K- 1	138.035 3	32.8 7	0.0964
Auger-L	0.3	8.55 16	≈0	ce-L- 1	142.028 3	3.34 10	0.0101
Auger-K	3.3	4.22 9	0.0003	ce-MNO- 1	142.474 3	1.10 3	0.0033
β ⁺ 1 max	1476.3 20			X-ray L	0.4	0.11 4	≈0
avg	632.9 9	94.37 6	1.27	X-ray Kα ₂	4.08610 2	1.84 17	0.0002
X-ray Kα ₂	3.68809	0.244 25	≈0	X-ray Kα ₁	4.09060 2	3.7 4	0.0003
X-ray Kα ₁	3.69168	0.48 5	≈0	X-ray Kβ	4.46	0.72 7	≈0
γ 1	1157.002 11	99.881 15	2.46	γ 1	142.528 3	62.7 7	0.190
γ 2	1499.451 23	0.912 20	0.0291	● ⁴⁴ Ti EC Decay (47.3 y 12) I (min) = 0.10%			
γ 5	2656.41 3	0.112 4	0.0064	Feeds ⁴⁴ Sc (3.927 h)			
Maximum γ±-intensity = 188.74%				Auger-L	0.37	165 3	0.0013
● ⁴⁴ Ti EC Decay (47.3 y 12) I (min) = 0.10%				Auger-K	3.64	79.9 16	0.0062
Feeds ⁴⁴ Sc (3.927 h)				ce-K- 1	63.36 4	7.13 22	0.0096
Auger-L	0.37	165 3	0.0013	ce-L- 1	67.35 4	0.631 19	0.0009
Auger-K	3.64	79.9 16	0.0062	ce-MNO- 1	67.80 4	0.208	0.0003
ce-K- 1	63.36 4	7.13 22	0.0096	ce-K- 2	73.89 4	2.72 9	0.0043
ce-L- 1	67.35 4	0.631 19	0.0009	ce-L- 2	77.88 4	0.249 8	0.0004
ce-MNO- 1	67.80 4	0.208	0.0003	X-ray L	0.4	0.33 12	≈0
ce-K- 2	73.89 4	2.72 9	0.0043	X-ray Kα ₂	4.08610 2	5.5 5	0.0005
ce-L- 2	77.88 4	0.249 8	0.0004	X-ray Kα ₁	4.09060 2	11.0 10	0.0010
X-ray L	0.4	0.33 12	≈0	X-ray Kβ	4.46	2.17 19	0.0002
X-ray Kα ₂	4.08610 2	5.5 5	0.0005	γ 1	67.85 4	91.92 22	0.133
X-ray Kα ₁	4.09060 2	11.0 10	0.0010	γ 2	78.38 4	97.6 8	0.163
X-ray Kβ	4.46	2.17 19	0.0002	γ 3	147.0 15	0.10 3	0.0003
γ 1	67.85 4	91.92 22	0.133				
γ 2	78.38 4	97.6 8	0.163				
γ 3	147.0 15	0.10 3	0.0003				

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
<p>● ⁴⁷Ca β⁻ Decay (4.536 d 2) I (min) = 0.10% Feeds ⁴⁷Sc</p>				<p>● ⁴⁸V β⁺ Decay (15.971 d 4) I (min) = 0.10%</p>			
β ⁻ 1 max	690 4			Auger-L	0.42	73.6 21	0.0007
avg	240.9 15	81.7 20	0.419	Auger-K	4	34.8 10	0.0030
β ⁻ 2 max	1988 4			β ⁺ 1 max	697 3		
avg	816.8 17	18.0 20	0.313	avg	291.4 13	50.1 12	0.311
total β ⁻				X-ray L	0.45	0.15 6	≈0
avg	344.9 19	100 3	0.733	X-ray Kα ₂	4.50486	2.89 25	0.0003
<p>2 weak β's omitted: Eβ(avg) = 374.0; ΣIβ = 0.11%</p>				X-ray Kα ₁	4.51084	5.7 5	0.0006
γ 2	489.23 10	6.7 3	0.0702	X-ray Kβ	5	1.15 10	0.0001
γ 3	530.4 3	0.105 16	0.0012	γ 1	803.23 8	0.150 21	0.0026
γ 4	767.0 3	0.195 16	0.0032	γ 2	928.32 4	0.77 6	0.0152
γ 5	807.86 10	6.9 3	0.119	γ 3	944.101 7	7.76 18	0.156
γ 6	1297.09 10	74.9 18	2.07	γ 4	983.5010	20100.0 20	2.09
<p>2 weak γ's omitted: Eγ(avg) = 1542.2; ΣIγ = 0.03%</p>				γ 5	1312.087 3	97.5 20	2.72
<p>● ⁴⁷Sc β⁻ Decay (3.422 d 4) I (min) = 0.10%</p>				γ 6	1437.31 7	0.120 21	0.0037
Auger-L	0.42	0.59 5	≈0	γ 7	2240.341 17	2.41 7	0.115
Auger-K	4	0.300 21	≈0	<p>3 weak γ's omitted: Eγ(avg) = 2361.5; ΣIγ = 0.03% Maximum γ⁺-intensity = 100.20%</p>			
ce-K- 1	154.42 5	0.384 25	0.0013	<p>● ⁴⁹Ca β⁻ Decay (8.719 m 13) I (min) = 0.10% Feeds ⁴⁹Sc</p>			
β ⁻ 1 max	441.1 19			β ⁻ 1 max	530 4		
avg	142.7 8	68 3	0.207	avg	177.1 16	0.21 6	0.0008
β ⁻ 2 max	600.5 19			β ⁻ 2 max	775 4		
avg	204.0 8	32 3	0.139	avg	275.4 17	0.63 7	0.0037
total β ⁻				β ⁻ 3 max	1196 4		
avg	162.3 9	100 5	0.346	avg	456.1 18	7.1 8	0.0690
γ 1	159.39 5	68 3	0.231	β ⁻ 4 max	1751 4		
<p>● ⁴⁸Sc β⁻ Decay (43.67 h 9) I (min) = 0.10%</p>				avg	707.2 19	0.18 4	0.0027
Auger-L	0.42	0.23 19	≈0	β ⁻ 5 max	2184 4		
Auger-K	4	0.12 10	≈0	avg	908.6 19	91.5 7	1.77
ce-K- 1	170.391 5	0.15 12	0.0005	β ⁻ 6 max	2896 4		
β ⁻ 1 max	482 6			avg	1247.2 20	0.41 10	0.0109
avg	157.9 23	10.01 25	0.0337	total β ⁻			
β ⁻ 2 max	657 6			avg	872.0 20	100.0 11	1.86
avg	226.5 25	89.99 25	0.434	γ 2	856.1 5	0.13 3	0.0024
total β ⁻				γ 4	1144.5 5	0.11 3	0.0027
avg	220 3	100.0 4	0.468	γ 6	1408.90 20	0.63 7	0.0188
γ 1	175.357 5	7.47 17	0.0279	γ 7	2228.9 5	0.19 5	0.0092
γ 2	983.5010	20100.0 21	2.09	γ 8	2371.7 5	0.49 10	0.0247
γ 3	1037.4960	20 97.5 20	2.15	γ 9	3084.40 10	92.1 7	6.05
γ 4	1212.849 7	2.38 6	0.0615	γ 10	4071.90 10	7.0 8	0.607
γ 5	1312.087 3	100.0 21	2.79	γ 11	4738.20 20	0.21 6	0.0214
<p>3 weak γ's omitted: Eγ(avg) = 947.0; ΣIγ = 0.18%</p>							

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
● ⁴⁹ Sc β ⁻ Decay (57.4 m 2) I (min) = 0.10%				● ⁵¹ Cr EC Decay (27.704 d 4) I (min) = 0.10%			
β ⁻ 1 max	2004 4			Auger-L	0.47	144.7 12	0.0014
avg	823.1 19	99.940 10	1.75	Auger-K	4.38	66.9 7	0.0062
2 weak β's omitted: Eβ(avg) = 80.0; ΣIβ = 0.06%				X-ray L	0.5	0.33 12	≈0
2 weak γ's omitted: Eγ(avg) = 1738.7; ΣIγ = 0.06%				X-ray Kα ₂	4.94464	6.59 21	0.0007
				X-ray Kα ₁	4.95220	13.1 4	0.0014
				X-ray Kβ	5.43	2.62 9	0.0003
				γ 1	320.076 6	9.83 14	0.0670
				γ 2	608.55 5		
				γ 3	928.63 6		
● ⁴⁹ V EC Decay (330 d 15) I (min) = 0.10%				● ⁵² V β ⁻ Decay (3.75 m 1) I (min) = 0.10%			
Auger-L	0.42	147 4	0.0013	β ⁻ 1 max	1011.72 11		
Auger-K	4	69.7 16	0.0059	avg	372.57 5	0.116 2	0.0009
X-ray L	0.45	0.31 11	≈0	β ⁻ 2 max	1208.78 11		
X-ray Kα ₂	4.50486	5.8 5	0.0006	avg	458.36 5	0.570 11	0.0056
X-ray Kα ₁	4.51084	11.5 10	0.0011	β ⁻ 3 max	2542.42 11		
X-ray Kβ	5	2.29 20	0.0002	avg	1073.97 5	99.2 10	2.27
				total β ⁻	1069.03 5	100.0 10	2.28
				5 weak β's omitted: Eβ(avg) = 424.7; ΣIβ = 0.09%			
● ⁴⁹ Cr β ⁺ Decay (42.09 m 15) Feeds ⁴⁹ V I (min) = 0.10%				γ 6	1333.615 16	0.588 10	0.0167
Auger-L	0.47	18.3 5	0.0002	γ 7	1434.056 16	100.0 10	3.05
Auger-K	4.38	8.48 22	0.0008	γ 8	1530.670 10	0.116 2	0.0038
ce-K- 1	56.8239 21	1.17 6	0.0014	12 weak γ's omitted: Eγ(avg) = 1005.8; ΣIγ = 0.12%			
ce-L- 1	61.6608 21	0.113 6	0.0001				
ce-K- 2	85.1739 21	1.59 12	0.0029				
ce-L- 2	90.0108 21	0.152 12	0.0003				
ce-K- 3	147.4629 21	2.00 10	0.0063				
ce-L- 3	152.2998 21	0.192 9	0.0006				
β ⁺ 1 max	1453 3			● ⁵² Mn β ⁺ Decay (5.591 d 3) I (min) = 0.10%			
avg	625.5 14	46.3 16	0.617	Auger-L	0.54	99.4 17	0.0011
β ⁺ 2 max	1515 3			Auger-K	4.78	44.7 9	0.0046
avg	653.7 14	34.6 12	0.482	β ⁺ 1 max	575.3 23		
β ⁺ 3 max	1606 3			avg	241.6 10	29.4 7	0.151
total β ⁺	695.0 14	11 3	0.163	(Continued)			
avg	644.4 14	92 4	1.26				
X-ray Kα ₂	4.94464	0.84 4	≈0				
X-ray Kα ₁	4.95220	1.66 7	0.0002				
X-ray Kβ	5.43	0.332 14	≈0				
γ 1	62.2890 20	16.4 7	0.0217				
γ 2	90.6390 20	53.2 16	0.103				
γ 3	152.9280 20	30.3 12	0.0988				
13 weak γ's omitted: Eγ(avg) = 1450.9; ΣIγ = 0.12% Maximum γ-intensity = 183.80%							
● ⁵¹ Ti β ⁻ Decay (5.752 m 7) I (min) = 0.10%							
Auger-L	0.47	0.217 6	≈0				
Auger-K	4.38	0.107 3	≈0				
ce-K- 1	314.611 6	0.143 4	0.0010				

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
X-ray L	0.57	0.26 9	≈0
X-ray Kα ₂	5.40551	5.20 17	0.0006
X-ray Kα ₁	5.41472	10.3 4	0.0012
X-ray Kβ	6	2.06 8	0.0003
γ 2	346.03 3	0.980 20	0.0072
γ 4	399.56 5	0.183 8	0.0016
γ 5	502.05 5	0.210 20	0.0022
γ 6	600.18 4	0.390 20	0.0050
γ 7	647.450 20	0.400 20	0.0055
γ 8	744.214 11	90.0 19	1.43
γ 9	848.13 3	3.32 8	0.0600
γ 11	935.520 20	94.5 20	1.88
γ 13	1246.246 12	4.21 10	0.112
γ 14	1247.85 9	0.38 4	0.0101
γ 15	1333.615 16	5.07 11	0.144
γ 16	1434.056 16	100	3.05

9 weak γ's omitted:
E_γ(avg) = 884.5; ΣI_γ = 0.37%
Maximum γ_±-intensity = 58.80%

• ⁵²Mn β⁺ Decay (21.4 m 5) I (min) = 0.10%

%(EC + β⁺) Decay = 98.25 5
See also ⁵²Mn IT Decay (21.4 m)

Auger-L	0.54	2.37 5	≈0
Auger-K	4.78	1.067 24	0.0001
β ⁺ 1 max	905.1 23		
avg	382.9 10	0.164 8	0.0013
β ⁺ 2 max	2632.8 23		
avg	1173.8 11	96.4 20	2.41
total β ⁺			
avg	1172.1 11	96.6 20	2.41

4 weak β's omitted:
E_β(avg) = 410.2; ΣI_β = 0.05%

X-ray Kα ₂	5.40551	0.124 5	≈0
X-ray Kα ₁	5.41472	0.246 8	≈0
γ 5	1434.056 16	98.2 20	3.00
γ 7	1727.53 7	0.216 10	0.0080

14 weak γ's omitted:
E_γ(avg) = 1643.9; ΣI_γ = 0.17%
Maximum γ_±-intensity = 193.23%

• ⁵²Mn IT Decay (21.4 m 5) I (min) = 0.10%

%IT Decay = 1.75 5
Feeds ⁵²Mn (5.591 d)
See also ⁵²Mn β⁺ Decay (21.4 m)

γ 1	377.738 11	1.68 5	0.0135
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• ⁵²Fe β⁺ Decay (8.275 h 8) I (min) = 0.10%

Feeds ⁵²Mn (21.4 m)

Auger-L	0.6	66 5	0.0009
Auger-K	5.19	28.9 20	0.0032
ce-K- 1	162.145 11	3.0 22	0.0104
ce-L- 1	167.915 11	0.30 23	0.0011

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
β ⁺ 1 max	804 12		
avg	340 6	56.0 13	0.406
X-ray L	0.64	0.20 7	≈0
X-ray Kα ₂	5.88765	3.9 4	0.0005
X-ray Kα ₁	5.89875	7.8 8	0.0010
X-ray Kβ	6.49	1.57 16	0.0002
γ 1	168.684 11	96.6 25	0.347

Maximum γ_±-intensity = 112.00%

• ⁵³Mn EC Decay (3.7E6 y 4) I (min) = 0.10%

Auger-L	0.54	142.0 12	0.0016
Auger-K	4.78	63.9 7	0.0065

X-ray L	0.57	0.37 13	≈0
X-ray Kα ₂	5.40551	7.43 21	0.0009
X-ray Kα ₁	5.41472	14.7 4	0.0017
X-ray Kβ	6	2.95 10	0.0004

• ⁵⁴Mn EC Decay (312.7 d 3) I (min) = 0.10%

Auger-L	0.54	142.0 12	0.0016
Auger-K	4.78	63.9 7	0.0065

X-ray L	0.57	0.37 13	≈0
X-ray Kα ₂	5.40551	7.43 21	0.0009
X-ray Kα ₁	5.41472	14.7 4	0.0017
X-ray Kβ	6	2.94 10	0.0004
γ 1	834.827 21	99.975	1.78

• ⁵⁵Fe EC Decay (2.7 y 1) I (min) = 0.10%

Auger-L	0.6	139 4	0.0018
Auger-K	5.19	60.7 21	0.0067

X-ray L	0.64	0.42 14	≈0
X-ray Kα ₂	5.88765	8.2 7	0.0010
X-ray Kα ₁	5.89875	16.3 12	0.0020
X-ray Kβ	6.49	3.29 25	0.0005

• ⁵⁶Mn β⁻ Decay (2.5785 h 6) I (min) = 0.10%

β ⁻ 1 max	325.6 12		
avg	99.1 5	1.16 4	0.0024
β ⁻ 2 max	735.5 12		
avg	255.2 5	14.6 4	0.0794
β ⁻ 3 max	1037.9 12		
avg	381.9 6	27.8 8	0.226
β ⁻ 4 max	2848.6 12		
avg	1216.7 6	56.2 10	1.46
total β ⁻			
avg	829.8 9	99.9 14	1.77

3 weak β's omitted:
E_β(avg) = 373.1; ΣI_β = 0.12%

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
⁵⁶ Mn β ⁻ Decay (2.5785 h 6) (Continued)				● ⁵⁶ Ni EC Decay (6.10 d 2) I (min) = 0.10% Feeds ⁵⁶ Co			
γ 2	846.752 19	98.9 3	1.78	Auger-L	0.75	136 5	0.0022
γ 6	1810.69 4	27.2 8	1.05	Auger-K	6	55.5 25	0.0072
γ 7	2113.05 4	14.3 4	0.645	ce-K- 1	150.67 3	1.10 4	0.0035
γ 9	2522.88 6	0.99 3	0.0531	ce-L- 1	157.45 3	0.109 4	0.0004
γ 11	2657.45 5	0.653 20	0.0369	ce-K- 2	261.791 20	0.107 4	0.0006
γ 12	2959.77 6	0.306 10	0.0193				
γ 13	3369.60 7	0.168 10	0.0121	X-ray L	0.78	0.48 17	≈0
6 weak γ's omitted: E _γ (avg) = 1351.4; ΣI _γ = 0.16%				X-ray Kα ₂	6.91530	10.1 8	0.0015
				X-ray Kα ₁	6.93032	20.0 15	0.0029
				X-ray Kβ	7.65	4.1 3	0.0007
				γ 1	158.38 3	98.8 10	0.333
				γ 2	269.500 20	36.5 8	0.210
				γ 3	480.440 20	36.5 8	0.373
				γ 4	749.95 3	49.5 12	0.791
				γ 5	811.85 3	86.0 9	1.49
				γ 6	1561.80 5	14.0 6	0.466
● ⁵⁶ Co β ⁺ Decay (78.76 d 12) I (min) = 0.10%				● ⁵⁷ Mn β ⁻ Decay (1.47 m 4) I (min) = 0.10%			
Auger-L	0.67	109.8 14	0.0016	Auger-L	0.67	120 8	0.0017
Auger-K	5.62	46.5 7	0.0056	Auger-K	5.62	51 4	0.0061
				ce-K- 1	7.3007 10	77 6	0.0120
β ⁺ 1 max	422.6 19			ce-L- 1	13.5666 6	8.7 7	0.0025
avg	179.4 8	1.05 3	0.0040	ce-MMO- 1	14.3198 10	1.28 12	0.0004
β ⁺ 2 max	1460.5 19			ce-K- 2	114.951 4	0.222 13	0.0005
avg	631.9 9	18.7 7	0.252	ce-K- 3	129.364 4	0.192 13	0.0005
total β ⁺	607.8 10	19.7 7	0.256	β- 1 max	967 8		
X-ray L	0.7	0.34 11	≈0	avg	351 4	0.155 12	0.0012
X-ray Kα ₂	6.39084	7.33 21	0.0010	β- 2 max	1065 8		
X-ray Kα ₁	6.40384	14.5 4	0.0020	avg	393 4	0.85 5	0.0071
X-ray Kβ	7	2.92 9	0.0004	β- 3 max	1685 8		
γ 5	733.63 7	0.192 22	0.0030	avg	670 4	0.299 19	0.0043
γ 6	787.84 4	0.307 7	0.0051	β- 4 max	1986 8		
γ 7	846.752 19	99.958 5	1.80	avg	809 4	4.7 3	0.0810
γ 9	977.42 4	1.425 21	0.0297	β- 5 max	2325 8		
γ 10	996.9 4	0.14 3	0.0030	avg	968 4	1.65 10	0.0340
γ 11	1037.818 22	14.03 20	0.310	β- 6 max	2556 8		
γ 13	1140.32 14	0.126 15	0.0031	avg	1077 4	11.5 5	0.264
γ 15	1175.09 3	2.28 3	0.0570	β- 7 max	2678 8		
γ 17	1238.25 3	67.0 7	1.77	avg	1135 4	80.8 8	1.95
γ 19	1335.51 6	0.120 2	0.0034	total β-	1101 4	100.0 10	2.34
γ 20	1360.21 3	4.29 4	0.124	X-ray L	0.7	0.37 13	≈0
γ 21	1442.69 6	0.174 4	0.0053	X-ray Kα ₂	6.39084	8.0 6	0.0011
γ 24	1771.40 10	15.51 14	0.585	X-ray Kα ₁	6.40384	15.8 12	0.0022
γ 25	1810.69 4	0.650 10	0.0251	X-ray Kβ	7	3.19 25	0.0005
γ 26	1963.79 11	0.713 11	0.0298	γ 1	14.4127 4	10.6 10	0.0033
γ 27	2015.35 5	3.03 5	0.130	γ 2	122.063 3	10.3 6	0.0269
γ 28	2034.91 5	7.78 12	0.337	γ 3	136.476 3	1.43 9	0.0042
γ 29	2113.05 4	0.376 7	0.0169	γ 4	230.25 4	0.164 12	0.0008
γ 30	2213.01 11	0.388 15	0.0183	γ 5	339.60 6	0.127 14	0.0009
γ 31	2276.08 8	0.120 18	0.0058	γ 6	352.32 3	1.55 9	0.0117
γ 34	2598.48 9	16.9 3	0.935	γ 7	366.73 4	0.29 3	0.0023
γ 37	3009.67 14	1.06 3	0.0679	γ 8	569.93 5	0.384 25	0.0047
γ 38	3202.24 7	3.18 10	0.217	γ 9	692.00 3	4.09 24	0.0603
γ 39	3253.52 12	7.79 25	0.540	γ 10	706.42 6	0.176 12	0.0026
γ 40	3273.20 6	1.85 6	0.129	γ 11	870.68 5	0.192 13	0.0036
γ 42	3451.42 13	0.93 3	0.0683	γ 13	992.68 8	0.106 10	0.0022
γ 43	3548.14 10	0.190 6	0.0144				
18 weak γ's omitted: E _γ (avg) = 1452.8; ΣI _γ = 0.71% Maximum γ±-intensity = 39.50%				(Continued)			

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
γ 15	1260.54	8	0.241 17
γ 16	1612.82	7	0.54 4
γ 17	1725.18	11	0.123 11
2 weak γ's omitted: E _γ (avg) = 952.4; ΣI _γ = 0.10%			
● ⁵⁷ Co EC Decay (270.9 d 6) I (min) = 0.10%			
Auger-L	0.67	249 3	0.0036
Auger-K	5.62	105.5 13	0.0126
ce-K- 1	7.3007	10 69.5 3	0.0108
ce-L- 1	13.5666	6 7.78 22	0.0022
ce-MNO- 1	14.3198	10 1.15 7	0.0004
ce-K- 2	114.951	4 1.838 10	0.0045
ce-L- 2	121.217	3 0.183 1	0.0005
ce-K- 3	129.364	4 1.42 5	0.0039
ce-L- 3	135.630	3 0.147 5	0.0004
X-ray L	0.7	0.8 3	≈0
X-ray Kα ₂	6.39084	16.6 5	0.0023
X-ray Kα ₁	6.40384	32.8 8	0.0045
X-ray Kβ	7	6.62 21	0.0010
γ 1	14.4127	4 9.54 12	0.0029
γ 2	122.063	3 85.51 18	0.222
γ 3	136.476	3 10.60 18	0.0308
γ 9	692.00	3 0.160 5	0.0024
6 weak γ's omitted: E _γ (avg) = 536.0; ΣI _γ = 0.03%			
● ⁵⁷ Ni β ⁺ Decay (36.08 h 9) I (min) = 0.10%			
Feeds ⁵⁷ Co			
Auger-L	0.75	82 4	0.0013
Auger-K	6	33.6 20	0.0043
ce-K- 1	119.48	3 1.3 12	0.0033
ce-L- 1	126.26	3 0.14 12	0.0004
β ⁺ 1 max	302 7		
avg	130 3	0.41 5	0.0011
β ⁺ 2 max	463 7		
avg	197 3	0.87 10	0.0037
β ⁺ 3 max	716 7		
avg	304 3	5.7 7	0.0369
β ⁺ 4 max	843 7		
avg	359 3	33.1 17	0.253
total β ⁺ avg	345 3	40.1 19	0.295
X-ray L	0.78	0.29 10	≈0
X-ray Kα ₂	6.91530	6.1 5	0.0009
X-ray Kα ₁	6.93032	12.1 10	0.0018
X-ray Kβ	7.65	2.46 21	0.0004
γ 1	127.19	3 12.9 9	0.0350
γ 7	1046.40	20 0.124 2	0.0028
γ 9	1377.59	4 77.9 22	2.29
γ 11	1757.48	8 7.1 7	0.265
γ 13	1919.43	8 14.7 10	0.602
γ 16	2803.90	20 0.132 3	0.0079
11 weak γ's omitted: E _γ (avg) = 1192.5; ΣI _γ = 0.50% Maximum γ _i -intensity = 80.16%			

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
● ⁵⁸ Co EC Decay (70.80 d 7) I (min) = 0.10%			
Auger-L	0.67	116.5 13	0.0017
Auger-K	5.62	49.4 7	0.0059
β ⁺ 1 max	475.0 13		
avg	201.2 6	14.93 18	0.0640
X-ray L	0.7	0.36 12	≈0
X-ray Kα ₂	6.39084	7.78 21	0.0011
X-ray Kα ₁	6.40384	15.4 4	0.0021
X-ray Kβ	7	3.10 10	0.0005
γ 1	810.757	18 99.4 3	1.72
γ 2	863.935	18 0.74 4	0.0135
γ 3	1674.68	4 0.54 4	0.0192
Maximum γ _i -intensity = 29.86%			
● ⁵⁸ Co IT Decay (9.15 h 10) I (min) = 0.10%			
Feeds ⁵⁸ Co (70.80 d)			
Auger-L	0.75	130 4	0.0021
Auger-K	6	46.5 21	0.0060
ce-K- 1	17.180	21 75.2 6	0.0275
ce-L- 1	23.963	21 24.8 6	0.0127
ce-MNO- 1	24.788	21 8.17 23	0.0043
X-ray L	0.78	0.46 16	≈0
X-ray Kα ₂	6.91530	8.5 7	0.0013
X-ray Kα ₁	6.93032	16.8 12	0.0025
X-ray Kβ	7.65	3.4 3	0.0006
1 weak γ's omitted: E _γ (avg) = 24.9; ΣI _γ = 0.04%			
● ⁵⁹ Fe β ⁻ Decay (44.63 d 9) I (min) = 0.10%			
β ⁻ 1 max	130.8 22		
avg	35.7 7	1.37 9	0.0010
β ⁻ 2 max	273.4 22		
avg	81.0 8	45.2 11	0.0780
β ⁻ 3 max	465.8 22		
avg	149.2 9	53.1 11	0.169
β ⁻ 4 max	1565.0 22		
avg	614.5 10	0.18 4	0.0024
total β ⁻ avg	117.5 10	99.9 16	0.250
1 weak β's omitted: E _β (avg) = 22.2; ΣI _β = 0.09%			
γ 1	142.648	4 1.03 5	0.0031
γ 2	192.344	6 3.11 16	0.0127
γ 3	334.80	20 0.260 20	0.0019
γ 5	1099.224	25 56.5 10	1.32
γ 6	1291.56	3 43.2 10	1.19
2 weak γ's omitted: E _γ (avg) = 1227.9; ΣI _γ = 0.09%			

⁵⁹Ni-⁶²Cu

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
● ⁵⁹ Ni EC Decay (7.5E4 y 13) I (min) = 0.10%				● ⁶¹ Cu β ⁺ Decay (3.408 h 10) I (min) = 0.10%			
Auger-L	0.75	134 5	0.0021	Auger-L	0.84	51.5 20	0.0009
Auger-K	6	54.9 24	0.0071	Auger-K	6.54	20.4 11	0.0028
γ-ray L	0.78	0.47 17	≈0	ce-K- 1	59.079 3	0.48 4	0.0006
X-ray Kα ₂	6.91530	10.0 8	0.0015	β ⁺ 1 max	560.4 14		
X-ray Kα ₁	6.93032	19.8 14	0.0029	β ⁺ 1 avg	238.8 6	2.54 14	0.0129
X-ray Kβ	7.65	4.0 3	0.0007	β ⁺ 2 max	933.4 14		
				β ⁺ 2 avg	399.3 7	5.6 3	0.0476
				β ⁺ 3 max	1149.0 14		
				β ⁺ 3 avg	494.2 7	1.98 15	0.0208
				β ⁺ 4 max	1216.4 14		
				β ⁺ 4 avg	524.2 7	51.3 13	0.573
				total β ⁺			
				avg	499.8 8	61.5 14	0.654
				1 weak β ⁺ s omitted: Bβ (avg) = 133.1; ΣIβ = 0.04%			
				X-ray L	0.85	0.20 7	≈0
				X-ray Kα ₂	7.46089	4.3 3	0.0007
				X-ray Kα ₁	7.47815	8.4 6	0.0013
				X-ray Kβ	8.26	1.71 13	0.0003
				γ 1	67.412 3	3.87 23	0.0056
				γ 5	282.9560 20	12.3 6	0.0741
				γ 6	373.050 5	2.12 12	0.0168
				γ 7	529.169 22	0.41 8	0.0046
				γ 8	588.605 9	1.18 6	0.0148
				γ 11	656.008 4	10.5 6	0.147
				γ 13	816.692 13	0.355 19	0.0062
				γ 15	841.211 17	0.244 16	0.0044
				γ 17	908.631 17	1.19 7	0.0231
				γ 23	1099.560 19	0.279 17	0.0065
				γ 26	1185.234 15	3.63 20	0.0916
				23 weak γ ⁺ s omitted: Bγ (avg) = 1198.2; ΣIγ = 0.82% Maximum γ ⁺ -intensity = 122.91%			
				● ⁶² Cu β ⁺ Decay (9.74 m 2) I (min) = 0.10%			
				Auger-L	0.84	2.88 10	≈0
				Auger-K	6.54	1.14 6	0.0002
				(Continued)			
● ⁶⁰ Co β ⁻ Decay (5.271 y 1) I (min) = 0.10%				● ⁶⁰ Co β ⁻ Decay (10.47 m 2) I (min) = 0.10%			
β ⁻ 1 max	317.90 12			Auger-L	0.75	125 4	0.0020
β ⁻ 1 avg	95.79 4 100		0.204	Auger-K	6	48.8 22	0.0063
γ 3	1173.216 21 100		2.50	ce-K- 1	50.894 7 78.9 5		0.0855
γ 4	1332.486 22 100		2.84	ce-L- 1	57.677 7 14.2 5		0.0174
				ce-MNO- 1	58.502 7 4.67 17		0.0058
				X-ray L	0.78	0.44 16	≈0
				X-ray Kα ₂	6.91530	8.9 7	0.0013
				X-ray Kα ₁	6.93032	17.6 13	0.0026
				X-ray Kβ	7.65	3.6 3	0.0006
				γ 1	58.603 7 2.02 7		0.0025
				● ⁶⁰ Co β ⁻ Decay (10.47 m 2) I (min) = 0.10%			
				%β ⁻ Decay = 0.24 3 See also ⁶⁰ Co IT Decay (10.47 m)			
β ⁻ 1 max	1549.73 12			β ⁻ 1 max	1549.73 12		
β ⁻ 1 avg	606.38 5	0.23 3	0.0030	β ⁻ 1 avg	606.38 5	0.23 3	0.0030
γ 2	1332.486 22	0.24 3	0.0068	γ 2	1332.486 22	0.24 3	0.0068
				● ⁶¹ Co β ⁻ Decay (1.650 h 5) I (min) = 0.10%			
				Auger-L	0.84	15.5 7	0.0003
				Auger-K	6.54	6.1 4	0.0009
				ce-K- 1	59.079 3	10.5 4	0.0132
				ce-L- 1	66.404 3	1.09 4	0.0015
				ce-MNO- 1	67.300 3	0.359 1	0.0005

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
β ⁺ 1 max	1754 5			● ⁶⁴ Cu β ⁺ Decay (12.701 h 2) I (min) = 0.10%			
avg	767.5 23	0.132 10	0.0022	% (EC + β ⁺) Decay = 62.8 4			
β ⁺ 2 max	2927 5			See also ⁶⁴ Cu β ⁻ Decay			
avg	1316.0 24	97.59 3	2.74	Auger-L	0.84	59.1 21	0.0011
total β ⁺				Auger-K	6.54	23.3 12	0.0033
avg	1314.3 24	97.82 4	2.74	β ⁺ 1 max	652.9 8		
2 weak β's omitted: Eβ (avg) = 354.1; ΣIβ = 0.10%				avg	278.1 4	17.87 18	0.106
X-ray Kα ₂	7.46089	0.239 17	≈0	X-ray L	0.85	0.23 8	≈0
X-ray Kα ₁	7.47815	0.47 4	≈0	X-ray Kα ₂	7.46089	4.9 4	0.0008
γ 1	875.71 7	0.148 10	0.0028	X-ray Kα ₁	7.47815	9.6 7	0.0015
γ 4	1173.05 8	0.336 17	0.0084	X-ray Kβ	8.26	1.96 14	0.0003
12 weak γ's omitted: Eγ (avg) = 1966.1; ΣIγ = 0.09% Maximum γ±-intensity = 195.64%				γ 1	1345.9 3	0.49 4	0.0140
				Maximum γ±-intensity = 35.74%			
● ⁶² Zn EC Decay (9.26 h 2) I (min) = 0.10%				● ⁶⁴ Cu β ⁻ Decay (12.701 h 2) I (min) = 0.10%			
Feeds ⁶² Cu				%β ⁻ Decay = 37.2 4			
				See also ⁶⁴ Cu β ⁺ Decay			
Auger-L	0.92	142 4	0.0028	β ⁻ 1 max	578.2 15		
Auger-K	7	54.3 17	0.0081	avg	190.2 6	37.2 4	0.151
ce-K- 1	31.86 4	15.7 11	0.0106	● ⁶⁵ Ni β ⁻ Decay (2.520 h 2) I (min) = 0.10%			
ce-L- 1	39.74 4	1.67 11	0.0014	β ⁻ 1 max	412.1 16		
ce-MNO- 1	40.72 4	0.55 4	0.0005	avg	128.7 6	0.54 3	0.0015
β ⁺ 1 max	605.0 10			β ⁻ 2 max	513.6 16		
avg	258.6 5	7.6 7	0.0419	avg	166.1 6	0.84 4	0.0030
X-ray L	0.93	0.64 22	≈0	β ⁻ 3 max	655.2 16		
X-ray Kα ₂	8.027830	12.9 5	0.0022	avg	220.9 7	28.1 10	0.132
X-ray Kα ₁	8.047780	25.4 9	0.0044	β ⁻ 4 max	1021.5 16		
X-ray Kβ	9	5.18 20	0.0010	avg	372.0 7	9.8 5	0.0777
γ 1	40.84 4	26.9 16	0.0234	β ⁻ 5 max	2137.0 16		
γ 3	243.44 3	2.67 16	0.0138	avg	875.7 8	60.7 14	1.13
γ 4	247.04 4	2.01 13	0.0106	total β ⁻			
γ 5	260.50 6	1.43 9	0.0079	avg	632.3 11	100.0 18	1.35
γ 6	304.88 9	0.305 19	0.0020	γ 2	366.27 3	4.61 20	0.0359
γ 7	349.59 7	0.48 4	0.0035	γ 3	507.80 20	0.287 20	0.0031
γ 9	394.06 4	2.36 13	0.0199	γ 4	609.30 20	0.141 11	0.0018
γ 11	507.60 10	15.7 10	0.169	γ 8	1115.52 3	14.8 6	0.352
γ 12	548.41 4	16.2 10	0.190	γ 9	1481.84 5	23.5 8	0.742
γ 13	596.65 4	27.5 7	0.349	γ 10	1623.42 6	0.475 23	0.0164
γ 15	637.41 7	0.269 18	0.0037	γ 11	1724.92 6	0.388 21	0.0142
19 weak γ's omitted: Eγ (avg) = 921.2; ΣIγ = 0.20% Maximum γ±-intensity = 15.20%				4 weak γ's omitted: Eγ (avg) = 814.8; ΣIγ = 0.17%			
● ⁶³ Ni β ⁻ Decay (100.1 y 20) I (min) = 0.10%				● ⁶⁵ Zn EC Decay (244.4 d 2) I (min) = 0.10%			
β ⁻ 1 max	65.87 20			Auger-L	0.92	126.7 18	0.0025
avg	17.13 6	100	0.0365	Auger-K	7	48.3 8	0.0072
				β ⁺ 1 max	329.9 11		
				avg	143.0 5	1.415 23	0.0043

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)																																																			
⁶⁵ Zn EC Decay (244.4 d 2) (Continued)				<table border="0"> <tr> <td>γ 58</td> <td>4086.36</td> <td>1.16</td> <td>5</td> <td>0.101</td> </tr> <tr> <td>γ 59</td> <td>4295.70</td> <td>20</td> <td>3.56</td> <td>10</td> <td>0.326</td> </tr> <tr> <td>γ 60</td> <td>4462.01</td> <td>15</td> <td>0.726</td> <td>21</td> <td>0.0690</td> </tr> <tr> <td>γ 61</td> <td>4806.59</td> <td>15</td> <td>1.51</td> <td>5</td> <td>0.155</td> </tr> </table>				γ 58	4086.36	1.16	5	0.101	γ 59	4295.70	20	3.56	10	0.326	γ 60	4462.01	15	0.726	21	0.0690	γ 61	4806.59	15	1.51	5	0.155																												
γ 58	4086.36	1.16	5	0.101																																																						
γ 59	4295.70	20	3.56	10	0.326																																																					
γ 60	4462.01	15	0.726	21	0.0690																																																					
γ 61	4806.59	15	1.51	5	0.155																																																					
X-ray L	0.93	0.57	20	≈0	25 weak γ's omitted: E _γ (avg) = 1349.2; ΣI _γ = 1.05% Maximum γ±-intensity = 110.49%																																																					
X-ray Kα ₂	8.027830	11.5	3	0.0020																																																						
X-ray Kα ₁	8.047780	22.6	5	0.0039																																																						
X-ray Kβ	9	4.61	13	0.0009																																																						
γ 3	1115.52	3	50.75	10	1.21																																																					
Maximum γ±-intensity = 2.83%																																																										
● ⁶⁶ Ga β ⁺ Decay (9.40 h 7) I (min) = 0.10%				● ⁶⁷ Cu β ⁻ Decay (61.88 h 14) I (min) = 0.10%																																																						
Auger-L	0.99	57	3	0.0012	Auger-L	0.99	19.1	10	0.0004																																																	
Auger-K	7.53	20.7	13	0.0033	Auger-K	7.53	7.0	5	0.0011																																																	
β ⁺ 1 max	361	3			ce-K- 1	81.607	5	0.51	5	0.0009																																																
avg	156.8	13	0.98	5	0.0033	ce-K- 2	83.652	5	12.1	5	0.0215																																															
β ⁺ 2 max	720	3			0.0011	ce-L- 2	92.117	5	1.48	6	0.0029																																															
avg	308.7	13	0.166	6	0.0011	ce-MNO- 2	93.175	6	0.489	10	0.0010																																															
β ⁺ 3 max	772	3			0.0049	ce-K- 3	174.918	10	0.82	12	0.0031																																															
avg	330.9	13	0.699	23	0.0049	β ⁻ 1 max	181	8																																																		
β ⁺ 4 max	924	3			0.0313	avg	50.7	25	1	0.0012																																																
avg	397.0	14	3.70	12	0.0313	β ⁻ 2 max	390	8																																																		
β ⁺ 5 max	1780	3			0.0062	avg	121	3	57	0.147																																																
avg	781.5	14	0.372	18	0.0062	β ⁻ 3 max	482	8																																																		
β ⁺ 6 max	4153	3			2.00	avg	154	3	22	0.0722																																																
avg	1904.1	15	49.3	13	2.00	β ⁻ 4 max	575	8																																																		
total β ⁺					2.05	avg	189	3	20	0.0805																																																
	1739.1	21	55.2	13	2.05	total β ⁻			100	0.301																																																
						avg	141	4	100	0.301																																																
5 weak β ⁺ s omitted: E _β (avg) = 330.9; ΣI _β = 0.03%				<table border="0"> <tr> <td>X-ray Kα₂</td> <td>8.61578</td> <td>1.91</td> <td>14</td> <td>0.0004</td> </tr> <tr> <td>X-ray Kα₁</td> <td>8.63886</td> <td>3.8</td> <td>3</td> <td>0.0007</td> </tr> <tr> <td>X-ray Kβ</td> <td>9.57</td> <td>0.76</td> <td>6</td> <td>0.0002</td> </tr> <tr> <td>γ 1</td> <td>91.266</td> <td>5</td> <td>7.00</td> <td>10</td> <td>0.0136</td> </tr> <tr> <td>γ 2</td> <td>93.311</td> <td>5</td> <td>16.1</td> <td>3</td> <td>0.0320</td> </tr> <tr> <td>γ 3</td> <td>184.577</td> <td>10</td> <td>48.7</td> <td>6</td> <td>0.191</td> </tr> <tr> <td>γ 4</td> <td>208.951</td> <td>10</td> <td>0.115</td> <td>5</td> <td>0.0005</td> </tr> <tr> <td>γ 5</td> <td>300.219</td> <td>10</td> <td>0.797</td> <td>14</td> <td>0.0051</td> </tr> <tr> <td>γ 6</td> <td>393.529</td> <td>10</td> <td>0.220</td> <td>8</td> <td>0.0018</td> </tr> </table>				X-ray Kα ₂	8.61578	1.91	14	0.0004	X-ray Kα ₁	8.63886	3.8	3	0.0007	X-ray Kβ	9.57	0.76	6	0.0002	γ 1	91.266	5	7.00	10	0.0136	γ 2	93.311	5	16.1	3	0.0320	γ 3	184.577	10	48.7	6	0.191	γ 4	208.951	10	0.115	5	0.0005	γ 5	300.219	10	0.797	14	0.0051	γ 6	393.529	10	0.220	8	0.0018
X-ray Kα ₂	8.61578	1.91	14	0.0004																																																						
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γ 1	91.266	5	7.00	10	0.0136																																																					
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γ 3	184.577	10	48.7	6	0.191																																																					
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γ 5	300.219	10	0.797	14	0.0051																																																					
γ 6	393.529	10	0.220	8	0.0018																																																					
X-ray L	1	0.28	12	≈0	● ⁶⁷ Ga EC Decay (3.261 d 1) I (min) = 0.10%																																																					
X-ray Kα ₂	8.61578	5.7	4	0.0010	Auger-L	0.99	165	11	0.0035																																																	
X-ray Kα ₁	8.63886	11.1	8	0.0020	Auger-K	7.53	60	5	0.0097																																																	
X-ray Kβ	9.57	2.26	16	0.0005	ce-K- 2	81.607	5	0.208	21	0.0004																																																
γ 4	448.90	10	0.113	5	0.0011	ce-K- 3	83.652	5	26.8	17	0.0478																																															
γ 7	686.28	10	0.264	11	0.0039	ce-L- 3	92.117	5	3.28	21	0.0064																																															
γ 8	833.56	10	6.19	18	0.110	ce-MNO- 3	93.175	6	1.09	6	0.0022																																															
γ 10	856.70	10	0.124	5	0.0023	ce-K- 4	174.918	10	0.33	5	0.0012																																															
γ 11	907.0	3	0.116	9	0.0022	X-ray L	1	0.8	4	≈0																																																
γ 15	1039.29	10	38.8	10	0.859	X-ray Kα ₂	8.61578	16.5	14	0.0030																																																
γ 18	1190.36	10	0.136	13	0.0034	X-ray Kα ₁	8.63886	32	3	0.0059																																																
γ 20	1232.9	3	0.543	21	0.0143	X-ray Kβ	9.57	6.6	6	0.0013																																																
γ 21	1333.20	20	1.26	4	0.0359	γ 2	91.266	5	2.86	17	0.0056																																															
γ 22	1356.2	3	0.38	4	0.0110	γ 3	93.311	5	35.7	20	0.0710																																															
γ 23	1356.6	3	0.128	20	0.0037	γ 4	184.577	10	19.7	12	0.0775																																															
γ 24	1357	3	0.19	8	0.0056	γ 5	208.951	10	2.24	13	0.0100																																															
γ 25	1418.88	10	0.652	19	0.0197	γ 6	300.219	10	16.0	9	0.102																																															
γ 26	1459.2	3	0.101	5	0.0031	γ 7	393.529	10	4.5	3	0.0375																																															
γ 27	1508.33	10	0.590	20	0.0189	γ 14	887.693	15	0.139	8	0.0026																																															
γ 29	1899.18	10	0.438	17	0.0177	7 weak γ's omitted: E _γ (avg) = 629.4; ΣI _γ = 0.12%																																																				
γ 30	1918.64	10	2.19	6	0.0896																																																					
γ 32	2173.90	20	0.12	3	0.0056																																																					
γ 33	2190.00	20	5.82	17	0.271																																																					
γ 34	2213.60	20	0.144	9	0.0068																																																					
γ 36	2393.30	20	0.256	11	0.0131																																																					
γ 37	2422.70	10	1.99	6	0.103																																																					
γ 40	2752.10	20	23.7	7	1.39																																																					
γ 41	2780.50	20	0.130	6	0.0077																																																					
γ 42	2934.30	20	0.221	7	0.0138																																																					
γ 46	3229.26	10	1.52	4	0.105																																																					
γ 47	3256.57	15	0.101	12	0.0070																																																					
γ 48	3381.32	10	1.45	4	0.104																																																					
γ 49	3422.64	15	0.84	3	0.0614																																																					
γ 50	3433.00	15	0.287	9	0.0210																																																					
γ 53	3767.40	20	0.144	9	0.0115																																																					
γ 54	3791.47	10	1.04	3	0.0837																																																					

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
● ⁶⁸ Ga β ⁺ Decay (68.0 m 2) I (min) = 0.10%				● ⁷¹ Ge EC Decay (11.8 d 4) I (min) = 0.10%			
Auger-L	0.99	14.0 6	0.0003	Auger-L	1	121.9 18	0.0029
Auger-K	7.53	5.1 3	0.0008	Auger-K	8	42.9 7	0.0074
β ⁺ 1 max	821.7 12			X-ray L	1	0.67 19	≈0
β ⁺ 1 avg	352.6 6	1.22 10	0.0092	X-ray Kα ₂	9.22482	13.2 3	0.0026
β ⁺ 2 max	1899.1 12			X-ray Kα ₁	9.25174	25.9 5	0.0051
β ⁺ 2 avg	836.0 6	87.7 3	1.56	X-ray Kβ	10.3	5.52 14	0.0012
total β ⁺ avg	829.4 6	88.9 4	1.57	● ⁷² Ga β ⁻ Decay (14.1 h 2) I (min) = 0.10%			
X-ray Kα ₂	8.61578	1.40 10	0.0003	Auger-L	1.19	0.53 3	≈0
X-ray Kα ₁	8.63886	2.75 18	0.0005	Auger-K	8.56	0.194 13	≈0
X-ray Kβ	9.57	0.56 4	0.0001	ce-K- 20	680.10 20	0.421 12	0.0061
γ 3	1077.35 6	3.29 24	0.0755	β ⁻ 1 max	234 4		
γ 7	1883.09 7	0.142 12	0.0057	β ⁻ 1 avg	67.0 10	0.124 4	0.0002
7 weak γ's omitted: Eγ (avg) = 1014.5; ΣIγ = 0.24% Maximum γi-intensity = 177.84%				β ⁻ 2 max	313 4		
● ⁶⁸ Ge EC Decay (288 d 6) I (min) = 0.10%				β ⁻ 2 avg	93.2 11	0.769 19	0.0015
Feeds ⁶⁸ Ga				β ⁻ 3 max	425 4		
Auger-L	1	121.5 18	0.0028	β ⁻ 3 avg	132.4 12	0.222 6	0.0006
Auger-K	8	42.4 7	0.0073	β ⁻ 4 max	536 4		
X-ray L	1	0.67 19	≈0	β ⁻ 4 avg	173.3 12	0.341 9	0.0013
X-ray Kα ₂	9.22482	13.1 3	0.0026	β ⁻ 5 max	552 4		
X-ray Kα ₁	9.25174	25.6 5	0.0050	β ⁻ 5 avg	179.3 12	0.317 12	0.0012
X-ray Kβ	10.3	5.46 14	0.0012	β ⁻ 6 max	650 4		
● ⁶⁹ Zn β ⁻ Decay (55.6 m 16) I (min) = 0.10%				β ⁻ 6 avg	217.0 13	15.0 3	0.0693
β ⁻ 1 max	905 3			β ⁻ 7 max	667 4		
β ⁻ 1 avg	320.9 13	99.9986 2	0.684	β ⁻ 7 avg	223.5 13	21.52 24	0.102
● ⁶⁹ Zn IT Decay (13.756 h 18) I (min) = 0.10%				β ⁻ 8 max	956 4		
%IT Decay = 99.967 3				β ⁻ 8 avg	341.8 13	27.9 6	0.203
Feeds ⁶⁹ Zn (55.6 m)				β ⁻ 9 max	1048 4		
%β ⁻ Decay = 0.033 3				β ⁻ 9 avg	380.8 14	1.86 4	0.0151
Auger-L	0.99	6.3 3	0.0001	β ⁻ 10 max	1477 4		
Auger-K	7.53	2.29 15	0.0004	β ⁻ 10 avg	568.9 14	8.94 17	0.108
ce-K- 1	428.975 18	4.39 12	0.0401	β ⁻ 11 max	1528 4		
ce-L- 1	437.440 18	0.514 15	0.0048	β ⁻ 11 avg	591.8 14	0.14 4	0.0018
ce-MNO- 1	438.498 18	0.170 5	0.0016	β ⁻ 12 max	1589 4		
X-ray Kα ₂	8.61578	0.63 5	0.0001	β ⁻ 12 avg	619.6 14	0.242 15	0.0032
X-ray Kα ₁	8.63886	1.23 9	0.0002	β ⁻ 13 max	1927 4		
X-ray Kβ	9.57	0.250 18	≈0	β ⁻ 13 avg	774.0 15	3.03 15	0.0500
γ 1	438.634 18	94.89 15	0.887	β ⁻ 14 max	2263 4		
				β ⁻ 14 avg	930.6 15	0.81 24	0.0161
				β ⁻ 15 max	2528 4		
				β ⁻ 15 avg	1054.9 15	8.0 8	0.180
				β ⁻ 16 max	3158 4		
				β ⁻ 16 avg	1354.3 15	10.6 10	0.306
				total β ⁻ avg	497.7 20	100.1 15	1.06
				9 weak β's omitted: Eβ (avg) = 234.5; ΣIβ = 0.25%			
				X-ray Kα ₁	9.88642	0.131 8	≈0
				γ 2	112.52 3	0.136 6	0.0003
				γ 6	289.50 20	0.201 7	0.0012
				γ 9	336.60 20	0.107 3	0.0008
				γ 10	381.20 20	0.276 8	0.0022
				γ 12	428.40 20	0.184 8	0.0017
				γ 17	587.4 3	0.124 4	0.0016
				γ 18	600.85 3	5.59 14	0.0715
				γ 19	629.86 4	24.4 7	0.327
				γ 21	735.60 20	0.360 11	0.0056
				γ 24	786.43 5	3.17 7	0.0530
				γ 25	810.24 9	2.01 5	0.0347

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)																																																																																																																																				
⁷² Ga β ⁻ Decay (14.1 h 2) (Continued)				<table border="1"> <tr><td>γ 17</td><td>600.85</td><td>3</td><td>0.314</td><td>11</td><td>0.0040</td></tr> <tr><td>γ 18</td><td>629.86</td><td>4</td><td>7.86</td><td>21</td><td>0.105</td></tr> <tr><td>γ 23</td><td>786.43</td><td>5</td><td>0.469</td><td>17</td><td>0.0079</td></tr> <tr><td>γ 25</td><td>834.00</td><td>3</td><td>79.7</td><td>13</td><td>1.42</td></tr> <tr><td>γ 28</td><td>894.22</td><td>5</td><td>0.77</td><td>3</td><td>0.0146</td></tr> <tr><td>γ 38</td><td>1050.76</td><td>5</td><td>0.99</td><td>3</td><td>0.0221</td></tr> <tr><td>γ 43</td><td>1215.14</td><td>5</td><td>0.206</td><td>7</td><td>0.0053</td></tr> <tr><td>γ 47</td><td>1390.44</td><td>5</td><td>0.236</td><td>8</td><td>0.0070</td></tr> <tr><td>γ 48</td><td>1464.00</td><td>7</td><td>1.10</td><td>3</td><td>0.0343</td></tr> <tr><td>γ 49</td><td>1475.91</td><td>7</td><td>0.512</td><td>17</td><td>0.0161</td></tr> <tr><td>γ 51</td><td>1568.20</td><td>10</td><td>0.128</td><td>5</td><td>0.0043</td></tr> <tr><td>γ 57</td><td>1680.77</td><td>8</td><td>0.116</td><td>4</td><td>0.0042</td></tr> <tr><td>γ 58</td><td>1710.90</td><td>7</td><td>0.243</td><td>9</td><td>0.0089</td></tr> <tr><td>γ 63</td><td>1991.14</td><td>8</td><td>0.337</td><td>12</td><td>0.0143</td></tr> <tr><td>γ 65</td><td>2105.90</td><td>20</td><td>0.630</td><td>20</td><td>0.0283</td></tr> <tr><td>γ 66</td><td>2109.50</td><td>10</td><td>0.270</td><td>9</td><td>0.0121</td></tr> <tr><td>γ 68</td><td>2201.67</td><td>8</td><td>0.465</td><td>15</td><td>0.0218</td></tr> <tr><td>γ 70</td><td>2248.50</td><td>10</td><td>0.308</td><td>12</td><td>0.0148</td></tr> <tr><td>γ 75</td><td>2507.80</td><td>8</td><td>0.320</td><td>11</td><td>0.0171</td></tr> <tr><td>γ 80</td><td>2621.50</td><td>10</td><td>0.386</td><td>13</td><td>0.0215</td></tr> <tr><td>γ 89</td><td>2940.10</td><td>10</td><td>0.289</td><td>10</td><td>0.0181</td></tr> <tr><td>γ 108</td><td>3803.6</td><td>3</td><td>0.102</td><td>6</td><td>0.0083</td></tr> </table>				γ 17	600.85	3	0.314	11	0.0040	γ 18	629.86	4	7.86	21	0.105	γ 23	786.43	5	0.469	17	0.0079	γ 25	834.00	3	79.7	13	1.42	γ 28	894.22	5	0.77	3	0.0146	γ 38	1050.76	5	0.99	3	0.0221	γ 43	1215.14	5	0.206	7	0.0053	γ 47	1390.44	5	0.236	8	0.0070	γ 48	1464.00	7	1.10	3	0.0343	γ 49	1475.91	7	0.512	17	0.0161	γ 51	1568.20	10	0.128	5	0.0043	γ 57	1680.77	8	0.116	4	0.0042	γ 58	1710.90	7	0.243	9	0.0089	γ 63	1991.14	8	0.337	12	0.0143	γ 65	2105.90	20	0.630	20	0.0283	γ 66	2109.50	10	0.270	9	0.0121	γ 68	2201.67	8	0.465	15	0.0218	γ 70	2248.50	10	0.308	12	0.0148	γ 75	2507.80	8	0.320	11	0.0171	γ 80	2621.50	10	0.386	13	0.0215	γ 89	2940.10	10	0.289	10	0.0181	γ 108	3803.6	3	0.102	6	0.0083
γ 17	600.85	3	0.314	11	0.0040																																																																																																																																						
γ 18	629.86	4	7.86	21	0.105																																																																																																																																						
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γ 57	1680.77	8	0.116	4	0.0042																																																																																																																																						
γ 58	1710.90	7	0.243	9	0.0089																																																																																																																																						
γ 63	1991.14	8	0.337	12	0.0143																																																																																																																																						
γ 65	2105.90	20	0.630	20	0.0283																																																																																																																																						
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γ 68	2201.67	8	0.465	15	0.0218																																																																																																																																						
γ 70	2248.50	10	0.308	12	0.0148																																																																																																																																						
γ 75	2507.80	8	0.320	11	0.0171																																																																																																																																						
γ 80	2621.50	10	0.386	13	0.0215																																																																																																																																						
γ 89	2940.10	10	0.289	10	0.0181																																																																																																																																						
γ 108	3803.6	3	0.102	6	0.0083																																																																																																																																						
γ 26	834.00	3	95.65	7	1.70																																																																																																																																						
γ 27	861.11	5	0.912	25	0.0167																																																																																																																																						
γ 29	894.22	5	9.85	21	0.188																																																																																																																																						
γ 30	924.10	20	0.143	4	0.0028																																																																																																																																						
γ 32	939.35	8	0.259	7	0.0052																																																																																																																																						
γ 34	970.54	6	1.105	23	0.0228																																																																																																																																						
γ 36	999.86	6	0.796	23	0.0169																																																																																																																																						
γ 40	1050.76	5	6.93	15	0.155																																																																																																																																						
γ 44	1215.14	5	0.797	21	0.0206																																																																																																																																						
γ 45	1230.86	7	1.44	3	0.0379																																																																																																																																						
γ 46	1260.10	8	1.148	24	0.0308																																																																																																																																						
γ 47	1276.75	8	1.559	20	0.0424																																																																																																																																						
γ 50	1464.00	7	3.56	8	0.111																																																																																																																																						
γ 55	1568.20	10	0.199	7	0.0066																																																																																																																																						
γ 56	1571.70	20	0.835	24	0.0280																																																																																																																																						
γ 57	1596.65	9	4.24	9	0.144																																																																																																																																						
γ 60	1680.77	8	0.868	23	0.0311																																																																																																																																						
γ 61	1710.90	7	0.383	10	0.0139																																																																																																																																						
γ 63	1837.80	20	0.203	6	0.0079																																																																																																																																						
γ 64	1861.09	8	5.23	12	0.207																																																																																																																																						
γ 65	1878.0	3	0.231	6	0.0093																																																																																																																																						
γ 66	1920.20	20	0.159	5	0.0065																																																																																																																																						
γ 67	1991.14	8	0.112	3	0.0047																																																																																																																																						
γ 68	2029.1	4	0.124	4	0.0054																																																																																																																																						
γ 70	2109.50	10	1.034	22	0.0465																																																																																																																																						
γ 72	2201.67	8	26.1	6	1.22																																																																																																																																						
γ 73	2214.10	20	0.186	11	0.0088																																																																																																																																						
γ 77	2490.98	8	7.48	18	0.397																																																																																																																																						
γ 78	2507.80	8	12.8	3	0.685																																																																																																																																						
γ 79	2515.40	20	0.253	10	0.0135																																																																																																																																						
γ 82	2621.50	10	0.131	4	0.0073																																																																																																																																						
γ 85	2844.10	20	0.410	12	0.0249																																																																																																																																						
52 weak γ's omitted: Σγ (avg) = 1274.7; ΣIγ = 1.55%				<p>88 weak γ's omitted: Σγ (avg) = 1929.5; ΣIγ = 1.85% Maximum γ_i-intensity = 176.12%</p>																																																																																																																																							
● ⁷² As β ⁺ Decay (26.0 h 1) I (min) = 0.10%				● ⁷³ As EC Decay (80.30 d 6) I (min) = 0.10%																																																																																																																																							
Auger-L	1.19	15.5	6	0.0004	Auger-L	1.19	320	10	0.0081																																																																																																																																		
Auger-K	8.56	5.3	3	0.0010	ce-K- 1	2.160	17	27.8	6	0.0013																																																																																																																																	
ce-K- 19	680.10	20	0.87	8	0.0125	Auger-K	8.56	88	5	0.0160																																																																																																																																	
β ⁺ 1 max	814	7			ce-L- 1	11.849	15	60.3	7	0.0152																																																																																																																																	
avg	351	3	0.473	17	0.0035	ce-M- 1	13.083	15	8.93	24	0.0025																																																																																																																																
β ⁺ 2 max	927	7			ce-NOP- 1	13.263	15	2.95	9	0.0008																																																																																																																																	
avg	400	3	0.152	7	0.0013	ce-K- 2	42.334	12	75.1	6	0.0677																																																																																																																																
β ⁺ 3 max	1865	7			ce-L- 2	52.023	9	10.9	3	0.0121																																																																																																																																	
avg	822	4	5.78	18	0.101	ce-MNO- 2	53.257	9	3.61	11	0.0041																																																																																																																																
β ⁺ 4 max	2495	7																																																																																																																																									
avg	1115	4	64.7	12	1.54	X-ray L	1.19	1.9	7	≈0																																																																																																																																	
β ⁺ 5 max	2638	7				X-ray Kα ₂	9.85532	30.3	16	0.0064																																																																																																																																	
avg	1203	4	0.19	8	0.0049	X-ray Kα ₁	9.88642	59	3	0.0125																																																																																																																																	
β ⁺ 6 max	3329	7				X-ray KB	11	13.3	7	0.0031																																																																																																																																	
avg	1526	4	16.6	14	0.540	γ 2	53.437	9	10.3	3	0.0117																																																																																																																																
total β ⁺																																																																																																																																											
avg	1167	5	88.1	19	2.19																																																																																																																																						
8 weak β's omitted: Σβ (avg) = 358.5; ΣIβ = 0.17%				1 weak γ's omitted: Σγ (avg) = 13.3; ΣIγ = 0.09%																																																																																																																																							
X-ray Kα ₂	9.85532	1.82	10	0.0004	● ⁷³ Se EC Decay (7.15 h 8) I (min) = 0.10%																																																																																																																																						
X-ray Kα ₁	9.88642	3.56	18	0.0007	Feeds ⁷³ As																																																																																																																																						
X-ray KB	11	0.80	5	0.0002	Auger-L	1.24	67	4	0.0018																																																																																																																																		
					Auger-K	9.1	21.8	16	0.0042																																																																																																																																		
					ce-K- 1	55.13	10	19.1	4	0.0224																																																																																																																																	
					ce-L- 1	65.47	10	2.09	6	0.0029																																																																																																																																	
					ce-M- 1	66.80	10	0.327	9	0.0005																																																																																																																																	
					ce-NOP- 1	67.00	10	0.107	3	0.0002																																																																																																																																	
					ce-K- 2	349.23	10	1.12	4	0.0083																																																																																																																																	
					ce-L- 2	359.57	10	0.124	4	0.0009																																																																																																																																	

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
β ⁺ 1 max	1208 10			● ⁷⁴ As β ⁻ Decay (17.77 d 3) I (min) = 0.10%			
avg	525 5	0.49 25	0.0055	%β ⁻ Decay = 34.3 14			
β ⁺ 2 max	1290 10			See also ⁷⁴ As β ⁺ Decay			
avg	562 5	64.6 7	0.773	β ⁻ 1 max	718 3		
β ⁺ 3 max	1651 10			avg	242.9 11	15.5 9	0.0802
avg	725 5	0.71 19	0.0110	β ⁻ 2 max	1353 3		
total β ⁺				avg	530.9 12	18.8 10	0.213
avg	563 5	65.9 8	0.740	total β ⁻			
6 weak β's omitted: Σβ (avg) = 201.3; ΣIβ = 0.05%				avg	400.5 14	34.3 14	0.293
X-ray L	1.28	0.47 14	≈0	1 weak β's omitted: Σβ (avg) = 22.1; ΣIβ = 0.03%			
X-ray Kα ₂	10.50800 1	8.4 5	0.0019	γ 1	634.78 8	15.4 10	0.209
X-ray Kα ₁	10.54370 1	16.4 10	0.0037	2 weak γ's omitted: Σγ (avg) = 685.4; ΣIγ = 0.03%			
X-ray Kβ	11.7	3.79 23	0.0009	● ⁷⁵ Se EC Decay (119.78 d 7) I (min) = 0.10%			
γ 1	67.00 10	77.3 8	0.110	Auger-L	1.24	129 8	0.0034
γ 2	361.10 10	96.5 5	0.742	Auger-K	9.1	42 4	0.0081
γ 4	509.5 8	1.1 4	0.0115	ce-K- 1	12.53 20	5.0 11	0.0013
γ 8	764.4 8	0.135 20	0.0022	ce-L- 1	22.87 20	0.98 20	0.0005
γ 12	865.40 20	0.47 3	0.0087	ce-MNO- 1	24.20 20	0.21 5	0.0001
γ 14	901.2 4	0.145 20	0.0028	ce-K- 2	54.183 10	0.360 23	0.0004
γ 17	1111.0 4	0.183 20	0.0043	ce-K- 4	84.8663 22	2.65 16	0.0048
γ 19	1422.90 20	0.135 20	0.0041	ce-L- 4	95.2065 22	0.354 22	0.0007
13 weak γ's omitted: Σγ (avg) = 894.4; ΣIγ = 0.42% Maximum γt-intensity = 131.70%				ce-K- 5	109.248 3	0.62 3	0.0015
● ⁷⁴ As β ⁺ Decay (17.77 d 3) I (min) = 0.10%				ce-K- 6	124.133 5	1.56 8	0.0041
% (EC + β ⁺) Decay = 65.7 14				ce-L- 6	134.473 5	0.161 9	0.0005
See also ⁷⁴ As β ⁻ Decay				ce-K- 10	252.784 8	0.380 2	0.0021
Auger-L	1.19	43.4 21	0.0011	ce-K- 11	267.661 8	0.179 13	0.0010
Auger-K	8.56	14.6 10	0.0027	X-ray L	1.28	0.9 3	≈0
β ⁺ 1 max	944.5 17			X-ray Kα ₂	10.50800 1	16.1 11	0.0036
avg	408.0 8	26.6 11	0.231	X-ray Kα ₁	10.54370 1	31.4 20	0.0071
β ⁺ 2 max	1540.4 17			X-ray Kβ	11.7	7.3 5	0.0018
avg	701.1 8	3.0 12	0.0448	γ 2	66.050 10	1.02 3	0.0014
total β ⁺				γ 4	96.7330 20	3.41 18	0.0070
avg	437.5 9	29.6 17	0.276	γ 5	121.115 3	16.7 6	0.0432
1 weak β's omitted: Σβ (avg) = 147.6; ΣIβ = 0.02%				γ 6	136.000 5	59.2 25	0.171
X-ray L	1.19	0.26 9	≈0	γ 7	198.596 7	1.45 3	0.0061
X-ray Kα ₂	9.85532	5.1 3	0.0011	γ 10	264.651 8	59.8 3	0.337
X-ray Kα ₁	9.88642	9.9 6	0.0021	γ 11	279.528 8	25.2 3	0.150
X-ray Kβ	11	2.22 14	0.0005	γ 13	303.910 11	1.32 5	0.0086
γ 1	595.88 4	59.9 24	0.760	γ 16	400.646 9	11.4 4	0.0975
γ 2	608.40 5	0.55 3	0.0071	15 weak γ's omitted: Σγ (avg) = 332.6; ΣIγ = 0.10%			
γ 9	1204.29 6	0.287 22	0.0074	● ⁷⁶ As β ⁻ Decay (26.32 h 7) I (min) = 0.10%			
8 weak γ's omitted: Σγ (avg) = 1194.1; ΣIγ = 0.09% Maximum γt-intensity = 59.23%				β ⁻ 1 max	298.8 19		
				avg	87.8 6	0.63 4	0.0012
				β ⁻ 2 max	313.1 19		
				avg	92.6 7	1.20 7	0.0024
				β ⁻ 3 max	539.8 19		
				avg	173.7 7	1.88 12	0.0070
				β ⁻ 4 max	1180.9 18		
				avg	436.2 8	2.08 10	0.0193
				β ⁻ 5 max	1752.5 18		
				avg	691.5 9	7.6 5	0.112

(Continued)

⁷⁶As-⁷⁷Ge

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
⁷⁶ As β ⁻ Decay (26.32 h 7) (Continued)							
β ⁻ 6 max	1846.2 18			β ⁻ 12 max	1303 3		
avg	749.1 9	0.75 6	0.0120	avg	490.6 14	1.74 5	0.0182
β ⁻ 7 max	2409.5 18			β ⁻ 13 max	1356 3		
avg	996.3 9	34.7 15	0.736	avg	514.2 14	0.150 3	0.0016
β ⁻ 9 max	2968.6 18			β ⁻ 14 max	1382 3		
avg	1266.9 9	51.0 20	1.38	avg	525.5 14	0.568 12	0.0064
total β ⁻				β ⁻ 15 max	1512 3		
avg	1064.2 11	100 3	2.27	avg	583.5 14	19.2 4	0.239
5 weak β ⁻ 's omitted: Eβ (avg) = 373.8; ΣIβ = 0.22%				β ⁻ 16 max	1536 3		
γ 7	559.10 5	44.7 18	0.532	avg	594.6 14	0.168 3	0.0021
γ 8	563.23 8	1.17 6	0.0140	β ⁻ 17 max	1643 3		
γ 9	571.30 20	0.139 8	0.0017	avg	642.7 14	0.178 7	0.0024
γ 12	657.03 5	6.1 4	0.0851	β ⁻ 18 max	1812 3		
γ 14	665.31 7	0.39 4	0.0056	avg	720.1 14	0.301 16	0.0046
γ 17	740.12 8	0.116 7	0.0018	β ⁻ 19 max	1826 3		
γ 19	771.76 8	0.116 10	0.0019	avg	726.5 14	0.265 16	0.0041
γ 23	867.63 8	0.125 7	0.0023	β ⁻ 20 max	1917 3		
γ 29	1129.87 7	0.143 11	0.0034	avg	768.1 14	0.69 7	0.0111
γ 31	1212.72 18	1.63 11	0.0420	β ⁻ 21 max	2067 3		
γ 32	1216.02 7	3.84 24	0.0996	avg	837.7 14	0.964 24	0.0172
γ 33	1228.52 8	1.39 8	0.0363	β ⁻ 22 max	2070 3		
γ 35	1439.13 8	0.326 19	0.0100	avg	838.9 14	20.6 6	0.368
γ 36	1453.60 8	0.130 11	0.0040	β ⁻ 23 max	2087 3		
γ 42	1787.67 8	0.331 23	0.0126	avg	846.9 14	0.85 6	0.0153
γ 46	2096.33 14	0.66 5	0.0295	β ⁻ 24 max	2226 3		
γ 47	2110.79 15	0.393 24	0.0177	avg	911.7 14	17.2 9	0.334
34 weak γ's omitted: Eγ (avg) = 1152.0; ΣIγ = 0.65%				β ⁻ 25 max	2437 3		
				avg	1010.7 15	1.0 10	0.0215
				β ⁻ 26 max	2486 3		
				avg	1044.0 14	6.0 9	0.133
				total β ⁻			
				avg	646.7 18	99.7 19	1.37
				7 weak β ⁻ 's omitted: Eβ (avg) = 281.2; ΣIβ = 0.34%			
				X-ray Kα ₂	10.50800 1	0.57 10	0.0001
				X-ray Kα ₁	10.54370 1	1.12 20	0.0003
				X-ray Kβ	11.7	0.26 5	≈0
				γ 2	156.36 3	0.79 4	0.0026
				γ 3	159.11 15	0.228 9	0.0008
				γ 4	177.28 3	0.177 7	0.0007
				γ 5	194.762 20	1.75 6	0.0073
				γ 6	208.98 6	0.93 3	0.0042
				γ 7	211.031 19	30.5 9	0.137
				γ 8	215.505 22	28.3 9	0.130
				γ 9	219.1 3	0.288 5	0.0013
				γ 10	254.74 16	0.208 6	0.0011
				γ 11	264.440 17	53.3 9	0.300
				γ 12	268.10 22	0.586 10	0.0033
				γ 14	337.63 6	0.229 7	0.0016
				γ 15	338.66 4	0.661 20	0.0048
				γ 18	367.397 16	13.9 4	0.108
				γ 20	416.328 14	21.6 5	0.191
				γ 21	419.75 3	1.217 25	0.0109
				γ 23	439.438 20	0.200 4	0.0019
				γ 25	461.378 15	1.251 25	0.0123
				γ 27	475.433 17	0.979 19	0.0099
				γ 29	520	0.29 4	0.0032
				γ 33	558.018 13	15.9 3	0.189
				γ 36	582.537 14	0.771 14	0.0096
				γ 38	614.39	0.50 6	0.0066
				γ 40	624.76 9	0.180 4	0.0024
				γ 41	631.823 13	6.89 12	0.0927
				γ 42	634.389 15	2.06 4	0.0278
				γ 47	673	0.53 6	0.0076
				γ 48	673	0.132 14	0.0019
				γ 52	698.538 25	0.226 5	0.0034
				γ 53	705.24 8	0.105 2	0.0016
				γ 54	712.35 4	0.818 15	0.0124
				γ 55	714.345 12	7.07 13	0.108
				γ 57	743.649 25	0.175 4	0.0028

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	$\Delta(g\text{-rad}/\mu\text{Ci-h})$	Radiation Type	Energy (keV)	Intensity (%)	$\Delta(g\text{-rad}/\mu\text{Ci-h})$
γ 58	745.748	12	0.955 17	γ 3	87.876	20	0.20 6
γ 59	749.861	12	0.874 16	γ 6	161.933	20	0.13 4
γ 60	766.715	13	0.776 14	γ 9	238.999	20	1.6 4
γ 62	781.261	13	1.002 18	γ 10	249.790	20	0.42 11
γ 63	784.770	12	1.299 23	γ 15	520.652	20	0.61 16
γ 65	794.328	18	0.273 5				
γ 68	810.352	12	2.24 4				
γ 69	813.36	8	0.130 2				
γ 70	823.13	4	0.594 11				
γ 71	843.173	17	0.206 4				
γ 73	875.191	17	0.773 14				
γ 76	896.51	5	0.121 2				
γ 77	900.97	11	0.119 2				
γ 78	906.986	13	0.940 17				
γ 79	913.805	20	0.361 7				
γ 81	923.143	20	0.682 12				
γ 83	925.473	3	0.71 8				
γ 85	928.853	12	1.032 19				
γ 86	939.350	15	0.281 5				
γ 93	996.55	3	0.103 1				
γ 100	1061.699	23	0.149 3				
γ 101	1080.82	8	0.238 5				
γ 102	1085.188	13	5.98 11				
γ 104	1114.80	4	0.101 1				
γ 105	1124.99	3	0.116 2				
γ 108	1151.837	25	0.193 4				
γ 112	1193.263	13	2.54 5				
γ 114	1215.418	25	0.125 2				
γ 116	1242.183	15	0.393 7				
γ 117	1263.862	15	0.838 15				
γ 118	1279.957	20	0.172 3				
γ 121	1309.271	16	0.481 9				
γ 122	1312.802	16	0.354 7				
γ 123	1319.662	17	0.297 6				
γ 130	1368	3.3 4	0.0963				
γ 134	1452.59	4	0.119 2				
γ 138	1476.524	22	0.239 5				
γ 139	1479	0.126 13	0.0040				
γ 141	1495.597	17	0.492 9				
γ 143	1538.763	20	0.140 2				
γ 146	1573.688	20	0.650 12				
γ 151	1709.812	25	0.303 6				
γ 152	1719.656	22	0.394 7				
γ 154	1727.18	3	0.146 3				
γ 162	1846.41	3	0.169 3				
γ 168	2000.10	3	0.553 10				
γ 170	2077.20	3	0.230 4				
γ 171	2089.60	3	0.236 5				
γ 172	2126.15	4	0.201 4				
γ 176	2341.63	4	0.466 9				

10 weak γ 's omitted:
 $E_{\gamma}(\text{avg}) = 245.5$; $\Sigma I_{\gamma} = 0.10\%$

• ⁷⁷Br EC Decay (57.04 h 11) I (min) = 0.10%

Auger-L	1.32	115 7	0.0032
Auger-K	9.67	36 3	0.0073
ce-K- 4	75.218	20	0.161 18
ce-K- 9	149.275	20	0.79 4
ce-L- 9	160.279	21	0.134 6
ce-K- 15	226.341	20	0.219 7

β^+ 1 max	343 3		
avg	151.7 12	0.73 4	0.0024

X-ray L	1.38	1.05 24	≈ 0
X-ray $K\alpha_2$	11.18140	2 15.4 9	0.0037
X-ray $K\alpha_1$	11.22240	2 30.0 17	0.0072
X-ray $K\beta$	12.5	7.2 5	0.0019
γ 4	87.876	20	1.40 4
γ 6	138.95	9	0.129 6
γ 9	161.933	20	1.10 3
γ 10	180.68	7	0.284 10
γ 13	200.40	7	1.21 6
γ 15	238.999	20	23.1 5
γ 17	249.790	20	2.98 10
γ 18	270.83	7	0.321 14
γ 20	281.68	3	2.29 7
γ 21	297.23	9	4.16 21
γ 22	303.76	9	1.18 4
γ 28	384.99	8	0.84 3
γ 33	439.47	6	1.56 5
γ 35	484.57	7	1.00 4
γ 37	517.9	4	0.16 5
γ 38	520.652	20	22.4 6
γ 40	565.91	19	0.427 17
γ 41	567.90	8	0.86 3
γ 42	574.64	8	1.19 4
γ 43	578.91	7	2.96 10
γ 44	585.48	7	1.57 5
γ 49	755.35	7	1.67 5
γ 52	817.79	6	2.08 7
γ 60	1005.05	6	0.92 3

38 weak γ 's omitted:
 $E_{\gamma}(\text{avg}) = 428.2$; $\Sigma I_{\gamma} = 0.83\%$
 Maximum γ -intensity = 1.46%

• ⁷⁷As β^- Decay (38.8 h 3) I (min) = 0.10%

β^- 1 max	170 4		
avg	46.8 12	0.69 18	0.0007
β^- 2 max	441 4		
avg	137.1 14	0.66 17	0.0019
β^- 3 max	451 4		
avg	141.0 15	1.5 4	0.0045
β^- 4 max	690 4		
avg	231.8 16	97.1 8	0.479
total β^-			
avg	228.5 17	100.0 10	0.487

2 weak β 's omitted:
 $E_{\beta}(\text{avg}) = 117.1$; $\Sigma I_{\beta} = 0.02\%$

• ⁷⁹Se β^- Decay ($\leq 6.5E4$ y) I (min) = 0.10%

β^- 1 max	149 5		
avg	52.2 19	100	0.111

⁷⁹Kr-⁸¹Kr

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
● ⁷⁹ Kr β ⁺ Decay (35.04 h 10) I (min) = 0.10%			
Auger-L	1.4	105 5	0.0032
Auger-K	10.2	31 3	0.0067
ce-K- 1	30.7 4	0.214 22	0.0001
ce-K- 6	247.79 10	0.104 5	0.0005
β ⁺ 1 max	348 8		
avg	154 4	0.181 19	0.0006
β ⁺ 2 max	609 8		
avg	265 4	6.9 3	0.0389
total β ⁺			
avg	262 4	7.1 3	0.0396
2 weak β's omitted: Eβ (avg) = 102.8; ΣIβ = 0.02%			
X-ray L	1.48	1.1 4	≈0
X-ray Kα ₂	11.87760 2	14.9 9	0.0038
X-ray Kα ₁	11.92420 2	28.9 16	0.0078
X-ray Kβ	13.3	7.1 4	0.0020
γ 1	44.2 4	0.210 20	0.0002
γ 2	135.99 10	1.00 10	0.0029
γ 3	180.21 15	0.10 5	0.0004
γ 4	208.45 10	0.78 4	0.0035
γ 5	217.02 10	2.40 10	0.0111
γ 6	261.26 10	12.7 4	0.0707
γ 8	299.51 10	1.57 7	0.0100
γ 9	306.31 15	2.60 10	0.0170
γ 10	344.70 10	0.240 10	0.0018
γ 11	389.00 10	1.52 7	0.0126
γ 12	397.56 10	9.5 3	0.0804
γ 16	522.98 20	0.250 10	0.0028
γ 17	525.32 15	0.430 20	0.0048
γ 20	606.07 10	8.10 20	0.105
γ 27	832.04 10	1.26 6	0.0223
γ 32	934.81 15	0.126 7	0.0025
γ 33	1025.70 10	0.156 9	0.0034
γ 38	1115.1 3	0.370 20	0.0088
γ 42	1332.13 10	0.44 3	0.0125
24 weak γ's omitted: Eγ (avg) = 787.3; ΣIγ = 0.55% Maximum γ-intensity = 14.21%			
● ⁸⁰ Br EC Decay (17.4 m 2) I (min) = 0.10%			
% (EC + β ⁺) Decay = 8.26 17			
See also ⁸⁰ Br β ⁻ Decay (17.4 m)			
Auger-L	1.32	7.0 5	0.0002
Auger-K	9.67	2.16 19	0.0004
β ⁺ 1 max	848.3 20		
avg	367.8 9	2.20 7	0.0172
X-ray Kα ₂	11.18140 2	0.94 6	0.0002
X-ray Kα ₁	11.22240 2	1.82 11	0.0004
X-ray Kβ	12.5	0.44 3	0.0001
γ 1	665.80 20	1.05 12	0.0149

3 weak γ's omitted:
Eγ (avg) = 957.5; ΣIγ = 0.07%
Maximum γ-intensity = 4.40%

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
● ⁸⁰ Br β ⁻ Decay (17.4 m 2) I (min) = 0.10%			
%β ⁻ Decay = 91.74 17			
See also ⁸⁰ Br EC Decay (17.4 m)			
β ⁻ 1 max	686 11		
avg	229 5	0.19 3	0.0009
β ⁻ 2 max	750 11		
avg	254 5	0.32 4	0.0017
β ⁻ 3 max	1390 11		
avg	526 5	6.2 6	0.0695
β ⁻ 4 max	2006 11		
avg	805 5	85.0 6	1.46
total β ⁻			
avg	783 6	91.7 9	1.53
γ 1	616.2 5	6.6 6	0.0867
γ 2	639.40 20	0.26 3	0.0035
γ 3	703.80 20	0.19 3	0.0029
1 weak γ's omitted: Eγ (avg) = 1256.1; ΣIγ = 0.07%			
● ⁸⁰ Br IT Decay (4.42 h 1) I (min) = 0.10%			
Feeds ⁸⁰ Br (17.4 m)			
Auger-L	1.4	175 8	0.0053
Auger-K	10.2	48 4	0.0103
ce-K- 1	23.5783 21	53.6 7	0.0269
ce-L- 1	35.2700 21	6.04 17	0.0045
ce-K- 2	35.4 4	72.3 6	0.0546
ce-M- 1	36.7955 21	0.95 3	0.0007
ce-NOP- 1	37.0247 21	0.314 9	0.0002
ce-L- 2	47.1 4	22.4 5	0.0225
ce-M- 2	48.6 4	3.79 11	0.0039
ce-NOP- 2	48.9 4	1.25 4	0.0013
X-ray L	1.48	1.8 6	≈0
X-ray Kα ₂	11.87760 2	22.9 13	0.0058
X-ray Kα ₁	11.92420 2	44.4 24	0.0113
X-ray Kβ	13.3	11.0 7	0.0031
γ 1	37.0520 20	39.0 7	0.0308
γ 2	48.9 4	0.335 10	0.0003
● ⁸¹ Kr EC Decay (2.1E5 y 2) I (min) = 0.10%			
Auger-L	1.4	110 6	0.0033
Auger-K	10.2	31 3	0.0067
X-ray L	1.48	1.1 4	≈0
X-ray Kα ₂	11.87760 2	14.9 8	0.0038
X-ray Kα ₁	11.92420 2	28.9 16	0.0073
X-ray Kβ	13.3	7.1 4	0.0020
γ 1	275.990 11	3.6 5	0.0212

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	
● ⁸¹ Rb EC Decay (4.58 h 1) I (min) = 0.10%								
Feeds ⁸¹ Kr								
Auger-L	1.5	106 6	0.0034	γ 23	952.10 20	0.37 3	0.0074	
Auger-K	10.8	30 3	0.0068	γ 24	1007.57 9	1.268 18	0.0272	
ce-K- 7	175.97 3	25.6 8	0.0958	γ 25	1043.97 3	27.3 4	0.608	
ce-L- 7	188.38 3	4.37 14	0.0175	γ 27	1081.40 20	0.62 4	0.0144	
ce-MNO- 7	190.01 3	1.439 14	0.0058	γ 30	1317.47 5	26.9 4	0.755	
				γ 31	1426	0.11 5	0.0033	
β ⁺ 1 max	600 30			γ 32	1474.82 8	16.58 17	0.521	
avg	264 13	1.7 3	0.0096	γ 33	1650.30 10	0.741 11	0.0260	
β ⁺ 2 max	1050 30			γ 34	1779.60 20	0.113 1	0.0043	
avg	458 14	31.4 19	0.306	17 weak γ's omitted: Σγ (avg) = 743.6; ΣIγ = 0.76%				
total β ⁺	avg	448 15	33.1 20	0.316	● ⁸² Rb β ⁺ Decay (1.25 m 3) I (min) = 0.10%			
3 weak β's omitted: Σβ (avg) = 112.2; ΣIβ = 0.01%								
γ-ray L	1.59	1.4 6	≈0	Auger-L	1.5	5.0 3	0.0002	
γ-ray Kα ₂	12.5980 20	15.8 9	0.0042	Auger-K	10.8	1.41 13	0.0003	
X-ray Kα ₁	12.6490 20	30.6 17	0.0082	β ⁺ 1 max	1184 19			
γ-ray Kβ	14	7.8 5	0.0023	avg	517 9	0.276 17	0.0030	
γ 6	180.20 10	0.125 4	0.0005	β ⁺ 2 max	1881 19			
γ 7	190.30 3	65.7 6	0.266	avg	833 9	0.171 21	0.0030	
γ 9	243.80 8	0.204 7	0.0011	β ⁺ 3 max	2580 19			
γ 14	357.38 4	0.558 14	0.0043	avg	1157 9	11.7 5	0.288	
γ 16	388.84 6	0.283 7	0.0023	β ⁺ 4 max	3356 19			
γ 19	446.140 20	18.95 18	0.180	avg	1524 9	83.3 5	2.70	
γ 20	456.71 3	2.313 25	0.0225	total β ⁺	avg	1474 10	95.5 7	3.00
γ 21	476.68 3	0.388 8	0.0039	3 weak β's omitted: Σβ (avg) = 628.6; ΣIβ = 0.06%				
γ 23	510.5 5	0.5 3	0.0050	γ-ray Kα ₂	12.5980 20	0.75 4	0.0002	
γ 24	537.60 4	1.551 25	0.0178	γ-ray Kα ₁	12.6490 20	1.46 8	0.0004	
γ 26	549.05 4	0.328 8	0.0038	γ-ray Kβ	14	0.371 20	0.0001	
γ 27	568.90 4	0.394 8	0.0048	γ 2	698.330 20	0.147 20	0.0022	
γ 33	729.09 6	0.217 7	0.0034	γ 4	776.49 3	13.5 5	0.223	
γ 36	803.74 6	0.657 9	0.0112	γ 5	1395.2 3	0.509 24	0.0151	
γ 37	834.73 6	0.631 9	0.0112	8 weak γ's omitted: Σγ (avg) = 1633.8; ΣIγ = 0.33% Maximum γt-intensity = 191.01%				
γ 40	977.15 4	0.381 8	0.0079					
γ 43	1041.25 5	0.394 8	0.0087					
39 weak γ's omitted: Σγ (avg) = 626.6; ΣIγ = 1.03% Maximum γt-intensity = 66.23%								
● ⁸² Br β ⁻ Decay (35.30 h 3) I (min) = 0.10%								
β ⁻ 1 max	264.6 15			● ⁸² Sr EC Decay (25.0 d 4) I (min) = 0.10%				
avg	76.2 5	1.359 20	0.0022	Feeds ⁸² Rb (1.25 m)				
β ⁻ 2 max	444.3 15			Auger-L	1.68	107.2 18	0.0038	
avg	137.8 6	97.9 6	0.287	Auger-K	11.4	28.5 7	0.0069	
total β ⁻	avg	137.0 6	99.3 6	0.290	γ-ray L	1.69	1.6 6	≈0
1 weak β's omitted: Σβ (avg) = 171.6; ΣIβ = 0.09%				γ-ray Kα ₂	13.33580 2	16.8 4	0.0048	
γ 1	92.184 8	0.72 4	0.0014	γ-ray Kα ₁	13.39530 2	32.4 5	0.0093	
γ 4	137.40 20	0.142 25	0.0004	γ-ray Kβ	15	8.51 20	0.0027	
γ 6	221.45 3	2.26 7	0.0106					
γ 7	273.45 3	0.80 3	0.0047					
γ 12	554.320 20	70.6 5	0.833					
γ 14	606.30 10	1.17 9	0.0151					
γ 15	619.070 20	43.1 5	0.568					
γ 17	698.330 20	28.2 3	0.419					
γ 19	776.49 3	83.31 14	1.38					
γ 20	827.81 3	24.2 3	0.426					

⁸³Br-⁸⁴Br

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
<p>• ⁸³Br β^- Decay (2.39 h 2) I (min) = 0.10% % Feeding to ⁸³Kr (1.83 h) = 99.974 8</p>				<p>• ⁸⁴Br β^- Decay (31.80 m 8) I (min) = 0.10%</p>			
β^- 1 max	389 15			β^- 1 max	480 30		
avg	118 6	1.3 4	0.0033	avg	152 10	0.22 5	0.0007
β^- 2 max	918 15			β^- 2 max	560 30	2.1 4	0.0080
avg	323 7	98.6 4	0.678	avg	179 10		
total β^-				β^- 3 max	590 30	0.49 7	0.0020
avg	320 7	100.0 6	0.682	avg	191 10		
<p>2 weak β's omitted: $E\beta$(avg) = 112.7; $\Sigma I\beta$ = 0.10%</p>				β^- 4 max	750 30	11.7 13	0.0631
γ 6	529.640 10	1.3 4	0.0147	avg	253 11		
<p>9 weak γ's omitted: $E\gamma$(avg) = 537.4; $\Sigma I\gamma$ = 0.10%</p>				β^- 5 max	790 30	0.29 4	0.0017
<p>• ⁸³Kr IT Decay (1.83 h 2) I (min) = 0.10%</p>				avg	272 11		
Auger-L	1.5	165.2 21	0.0053	β^- 6 max	800 30	0.18 5	0.0011
ce-L- 1	7.469 10	77.7 6	0.0124	avg	276 11		
ce-M- 1	9.102 10	12.7 4	0.0025	β^- 7 max	970 30	2.5 3	0.0183
ce-NOP- 1	9.366 10	4.20 12	0.0008	avg	343 11		
Auger-K	10.8	8.6 8	0.0020	β^- 8 max	1200 30	0.49 14	0.0046
ce-K- 2	17.838 20	24.3 6	0.0092	avg	442 12		
ce-L- 2	30.239 20	61.7 7	0.0397	β^- 9 max	1310 30	9.5 11	0.0992
ce-M- 2	31.872 20	10.4 3	0.0071	avg	490 12		
ce-NOP- 2	32.136 20	3.44 10	0.0024	β^- 10 max	1590 30	3.9 4	0.0512
X-ray L	1.59	2.2 9	\approx 0	avg	616 12		
γ 1	9.390 10	5.41 16	0.0011	β^- 11 max	1910 30	1.13 22	0.0184
X-ray $K\alpha_2$	12.5980 20	4.57 25	0.0012	avg	763 12		
X-ray $K\alpha_1$	12.6490 20	8.9 5	0.0024	β^- 12 max	1970 30	7.4 9	0.125
X-ray $K\beta$	14	2.26 13	0.0007	avg	790 12		
<p>1 weak γ's omitted: $E\gamma$(avg) = 32.2; $\Sigma I\gamma$ = 0.05%</p>				β^- 13 max	2050 30	1.9 3	0.0334
<p>• ⁸³Rb EC Decay (86.2 d 1) I (min) = 0.10% % Feeding to ⁸³Kr (1.83 h) = 76 4</p>				avg	826 12		
Auger-L	1.5	127 8	0.0041	β^- 14 max	2180 30	0.34 7	0.0064
ce-L- 1	7.469 10	19 3	0.0029	avg	888 13		
ce-M- 1	9.102 10	3.0 5	0.0006	β^- 15 max	2330 30	1.6 4	0.0325
ce-NOP- 1	9.366 10	1.00 15	0.0002	avg	955 13		
Auger-K	10.8	31 3	0.0071	β^- 16 max	2780 30	12.1 20	0.301
X-ray L	1.59	1.7 7	\approx 0	avg	1166 13		
γ 1	9.390 10	1.29 20	0.0003	β^- 17 max	3790 30	13.7 16	0.481
X-ray $K\alpha_2$	12.5980 20	16.4 12	0.0044	avg	1650 13		
X-ray $K\alpha_1$	12.6490 20	31.8 23	0.0086	β^- 18 max	4670 30	32 5	1.41
X-ray $K\beta$	14	8.1 6	0.0024	avg	2072 13		
γ 5	520.41 3	46 3	0.509	total β^-		102 6	2.66
γ 6	529.640 10	30.3 19	0.342	avg	1230 21		
γ 7	552.650 20	16.4 11	0.193	<p>1 weak β's omitted: $E\beta$(avg) = 1194.0; $\Sigma I\beta$ = 0.06%</p>			
γ 11	790.14 5	0.67 4	0.0114	γ 1	230.20 20	0.31 5	0.0015
γ 12	799.36 5	0.243 14	0.0041	γ 3	354.70 20	0.31 5	0.0023
<p>6 weak γ's omitted: $E\gamma$(avg) = 591.9; $\Sigma I\gamma$ = 0.14%</p>				γ 4	382.00 20	0.57 10	0.0046
				γ 10	604.8 3	1.8 3	0.0228
				γ 12	736.5 3	1.31 24	0.0205
				γ 13	802.20 20	6.1 8	0.104
				γ 14	881.50 10	42 4	0.792
				γ 15	947.5 7	0.36 9	0.0072
				γ 17	987.3 4	0.78 14	0.0164
				γ 18	1005.7 7	0.46 14	0.0099
				γ 19	1015.90 10	6.2 8	0.135
				γ 20	1082.6 4	0.14 3	0.0033
				γ 21	1119.1 4	0.14 3	0.0034
				γ 23	1185.0 7	0.110 23	0.0028
				γ 24	1213.30 20	2.6 4	0.0676
				γ 27	1463.8 7	2.0 5	0.0618
				γ 28	1534.7 6	0.101 23	0.0033
				γ 29	1578.1 4	0.66 14	0.0221
				γ 30	1607.6 4	0.40 7	0.0137
				γ 31	1741.2 4	1.6 3	0.0610
				γ 34	1818.7 4	0.24 5	0.0095
				γ 35	1877.5 4	1.14 19	0.0456
				γ 36	1897.3 3	14.9 19	0.604
				γ 37	2029.6 5	2.1 5	0.0912
				γ 38	2094.2 5	0.22 5	0.0096
				γ 39	2200.7 4	1.18 20	0.0554
				γ 41	2484.1 3	6.8 9	0.357

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
γ 42	2593.7 6	0.14 4	0.0077	β ⁻ 6 max	2500 100		
γ 43	2622.9 5	0.30 7	0.0170	avg	1030 50	95.72 20	2.10
γ 44	2758.7 5	0.49 10	0.0290	total β ⁻			
γ 45	2824.1 4	1.14 19	0.0685	avg	1000 60	100.0 3	2.14
γ 46	2988.7 7	0.18 5	0.0113	4 weak β ⁻ 's omitted: Eβ (avg) = 465.0; ΣIβ = 0.20%			
γ 47	3045.4 4	2.5 5	0.164	γ 19	794.78 10	0.104 11	0.0018
γ 48	3202.1 7	0.21 5	0.0144	γ 21	802.41 10	2.56 16	0.0437
γ 49	3235.3 5	2.1 4	0.142	γ 25	861.76 8	0.228 20	0.0042
γ 50	3365.8 4	2.9 5	0.209	γ 26	865.22 8	0.178 15	0.0033
γ 51	3927.5 4	6.9 9	0.575	γ 27	913.31 9	0.134 12	0.0026
γ 52	4084.6 6	0.28 5	0.0242	γ 28	919.06 8	0.65 6	0.0127
15 weak γ's omitted: Eγ (avg) = 1122.9; ΣIγ = 0.67%				γ 29	924.63 8	1.63 13	0.0321
● ⁸⁴ Rb β ⁺ Decay (32.9 d 2) I (min) = 0.10%				γ 32	1037.83 8	0.103 11	0.0023
% (EC + β ⁺) Decay = 96.0 3				γ 40	1727.02 11	0.38 3	0.0140
See also ⁸⁴ Rb β ⁻ Decay				γ 42	1832.50 10	0.150 13	0.0059
Auger-L	1.5	75 4	0.0024	34 weak γ's omitted: Eγ (avg) = 789.3; ΣIγ = 1.08%			
Auger-K	10.8	21.4 19	0.0049	● ⁸⁵ Kr β ⁻ Decay (10.72 y 1) I (min) = 0.10%			
β ⁺ 1 max	777 3			β ⁻ 1 max	173.0 20		
avg	338.5 13	13.67 22	0.0986	avg	47.5 6	0.437 11	0.0004
β ⁺ 2 max	1658 3			β ⁻ 2 max	687.0 20		
avg	756.3 13	13.50 8	0.217	avg	251.4 8	99.563 11	0.533
total β ⁺				total β ⁻			
avg	546.1 16	27.17 24	0.316	avg	250.5 8	100.000 16	0.534
X-ray L	1.59	1.0 4	≈0	γ 1	513.990 10	0.434 11	0.0048
X-ray Kα ₂	12.5980 20	11.4 6	0.0030	● ⁸⁵ Kr IT Decay (4.48 h 1) I (min) = 0.10%			
X-ray Kα ₁	12.6490 20	22.0 11	0.0059	% IT Decay = 21.1 6			
X-ray Kβ	14	5.6 3	0.0017	Feeds ⁸⁵ Kr (10.72 y)			
γ 1	881.50 10	67.7 6	1.27	See also ⁸⁵ Kr β ⁻ Decay (4.48 h)			
γ 2	1015.90 10	0.318 21	0.0069	Auger-L	1.5	7.6 5	0.0002
γ 3	1897.3 3	0.927 10	0.0375	Auger-K	10.8	2.10 19	0.0005
Maximum γ±-intensity = 54.34%				ce-K- 1	290.544 20	5.93 19	0.0367
● ⁸⁴ Rb β ⁻ Decay (32.9 d 2) I (min) = 0.10%				ce-L- 1	302.949 20	0.90 4	0.0058
% β ⁻ Decay = 4.0 3				ce-MMO- 1	304.582 20	0.295 12	0.0019
See also ⁸⁴ Rb β ⁺ Decay				X-ray L	1.59	0.10 4	≈0
β ⁻ 1 max	890 4			X-ray Kα ₂	12.5980 20	1.12 7	0.0003
avg	331.2 15	4.0 3	0.0282	γ-ray Kα ₁	12.6490 20	2.16 13	0.0006
● ⁸⁵ Br β ⁻ Decay (172 s 2) I (min) = 0.10%				X-ray Kβ	14	0.55 4	0.0002
% Feeding to ⁸⁵ Kr (10.72 y) = 0.163 13				γ 1	304.870 20	14.0 5	0.0908
% Feeding to ⁸⁵ Kr (4.48 h) = 99.837 13				● ⁸⁵ Kr β ⁻ Decay (4.48 h 1) I (min) = 0.10%			
β ⁻ 1 max	660 100			% β ⁻ Decay = 78.9 6			
avg	220 40	0.41 3	0.0019	See also ⁸⁵ Kr IT Decay (4.48 h)			
β ⁻ 2 max	770 100			Auger-L	1.68	3.85 13	0.0001
avg	260 40	2.23 16	0.0123	Auger-K	11.4	1.04 4	0.0003
β ⁻ 3 max	860 100			ce-K- 2	135.980 10	3.15 10	0.0091
avg	300 50	0.110 12	0.0007	ce-L- 2	149.115 10	0.350 11	0.0011
β ⁻ 4 max	1580 100			ce-MMO- 2	150.858 10	0.115	0.0004
avg	610 50	0.52 5	0.0068				
β ⁻ 5 max	1690 100						
avg	660 50	0.85 10	0.0119				

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
⁸⁵ Kr β ⁻ Decay (4.48 h 1) (Continued)							
β ⁻ 1 max	710.8 20			Auger-K	12	0.68 7	0.0002
avg	238.2 8	0.290 9	0.0015	ce-K- 2	215.59 10	1.69 11	0.0077
β ⁻ 2 max	840.7 20			ce-K- 3	222.55 15	0.509 16	0.0024
avg	290.4 9	78.6 6	0.486	ce-L- 2	229.47 10	0.195 14	0.0010
total β ⁻				X-ray L	1.8	1.1 4	≈0
avg	290.2 9	78.9 6	0.488	Y-ray Kα ₂	14.09790 2	0.44 3	0.0001
1 weak β's omitted: Eβ (avg) = 74.6; ΣIβ = 0.02%				Y-ray Kα ₁	14.16500 2	0.85 6	0.0003
X-ray Kα ₂	13.33580 2	0.612 23	0.0002	Y-ray Kβ	15.8	0.228 15	≈0
Y-ray Kα ₁	13.39530 2	1.18 4	0.0003	γ 2	231.69 10	84.72 13	0.418
X-ray Kβ	15	0.310 12	≈0	γ 3	238.65 15	0.322	0.0016
γ 1	129.850 20	0.301 8	0.0008	● ⁸⁶ Rb β ⁻ Decay (18.66 d 2) I (min) = 0.10%			
γ 2	151.180 10	75.3 6	0.242	%β ⁻ Decay = 99.9948 5			
2 weak γ's omitted: Eγ (avg) = 581.3; ΣIγ = 0.02%				%EC Decay = 0.0052 5			
● ⁸⁵ Sr EC Decay (64.84 d 3) I (min) = 0.10%				β ⁻ 1 max	697.6 19		
Auger-L	1.68	108.2 19	0.0039	avg	232.5 8	8.78 8	0.0435
Auger-K	11.4	29.1 7	0.0071	β ⁻ 2 max	1774.4 19		
ce-K- 1	498.790 10	0.625 19	0.0066	avg	709.3 9	91.22 8	1.38
Y-ray L	1.69	1.6 6	≈0	total β ⁻			
Y-ray Kα ₂	13.33580 2	17.1 4	0.0048	avg	667.4 10	100.00 12	1.42
Y-ray Kα ₁	13.39530 2	33.0 5	0.0094	γ 1	1076.63 10	8.78 8	0.201
Y-ray Kβ	15	8.66 20	0.0028	● ⁸⁶ Y β ⁺ Decay (14.74 h 2) I (min) = 0.10%			
γ 1	513.990 10	99.270 22	1.09	Auger-L	1.79	70 4	0.0027
1 weak γ's omitted: Eγ (avg) = 868.5; ΣIγ = 0.01%				Auger-K	12	18.1 16	0.0047
● ⁸⁵ Sr EC Decay (67.66 m 7) I (min) = 0.10%				β ⁺ 1 max	420 10		
%EC Decay = 12.7				avg	187 5	0.31 4	0.0012
See also ⁸⁵ Sr IT Decay (67.66 m)				β ⁺ 2 max	485 10		
Auger-L	1.68	14.22 24	0.0005	avg	215 5	0.33 3	0.0015
Auger-K	11.4	3.84 10	0.0009	β ⁺ 3 max	606 10		
ce-K- 1	135.980 10	0.507 16	0.0015	avg	267 5	0.371 25	0.0021
Y-ray L	1.69	0.22 8	≈0	β ⁺ 4 max	889 10		
Y-ray Kα ₂	13.33580 2	2.26 5	0.0006	avg	389 5	0.198 16	0.0016
Y-ray Kα ₁	13.39530 2	4.37 7	0.0012	β ⁺ 5 max	933 10		
X-ray Kβ	15	1.15 3	0.0004	avg	408 5	1.28 20	0.0111
γ 1	151.180 10	12.125	0.0390	β ⁺ 6 max	1066 10		
● ⁸⁵ Sr IT Decay (67.66 m 7) I (min) = 0.10%				avg	467 5	2.0 5	0.0199
%IT Decay = 87.3				β ⁺ 7 max	1195 10		
Feeds ⁸⁵ Sr (64.84 d)				avg	524 5	1.41 12	0.0157
See also ⁸⁵ Sr EC Decay (67.66 m)				β ⁺ 8 max	1254 10		
Auger-L	1.79	69.9 6	0.0027	avg	550 5	12.4 5	0.145
ce-L- 1	4.74 18	68.5 5	0.0069	β ⁺ 9 max	1373 10		
ce-M- 1	6.60 18	13.7 4	0.0019	avg	603 5	0.72 12	0.0092
ce-NOP- 1	6.92 18	4.52 13	0.0007	β ⁺ 10 max	1578 10		
				avg	696 5	5.6 5	0.0830
				β ⁺ 11 max	1769 10		
				avg	783 5	1.7 10	0.0284
				β ⁺ 12 max	2021 10		
				avg	899 5	3.6 9	0.0689
				β ⁺ 13 max	2397 10		
				avg	1093 5	1.0 10	0.0233
				β ⁺ 14 max	3174 10		
				avg	1452 5	2.0 12	0.0619
				total β ⁺			
				avg	672 6	33.2 23	0.475
				9 weak β's omitted: Eβ (avg) = 355.0; ΣIβ = 0.27%			

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
X-ray L	1.8	1.1 4	≈0	γ 92	1854.38 13	17.2 5	0.678
X-ray Kα ₂	14.09790 2	11.7 6	0.0035	γ 83	1920.72 13	20.8 7	0.851
X-ray Kα ₁	14.16500 2	22.6 11	0.0068	γ 85	2017.1 6	0.132 17	0.0057
X-ray Kβ	15.8	6.1 3	0.0020	γ 86	2088.09 25	0.247 25	0.0110
γ 1	132.34 10	0.165 9	0.0005	γ 89	2291.8 5	0.124 9	0.0060
γ 3	182.34 20	0.11 4	0.0004	γ 90	2482.08 17	0.115 9	0.0061
γ 4	187.87 13	1.26 5	0.0051	γ 92	2567.97 19	2.25 11	0.123
γ 5	190.80 13	1.01 4	0.0041	γ 93	2610.11 20	1.24 8	0.0688
γ 6	209.80 23	0.396 17	0.0018	γ 94	2641.9 4	0.16 5	0.0093
γ 7	235.37 23	0.396 17	0.0020	γ 96	2794.9 4	0.206 17	0.0123
γ 8	237.9 3	0.132 25	0.0007	γ 99	2865.9 3	0.38 7	0.0232
γ 9	252.05 13	0.371 17	0.0020	γ 101	3069.7 4	0.115 17	0.0076
γ 11	264.53 13	0.536 25	0.0030	γ 102	3334.0 5	0.124 17	0.0088
γ 12	307.00 10	3.46 9	0.0227	23 weak γ's omitted: E _γ (avg) = 1366.1; ΣI _γ = 1.03% Maximum γ±-intensity = 66.37%			
γ 13	331.08 23	0.83 3	0.0059	● ⁸⁶ Zr EC Decay (16.5 h 1) I (min) = 0.10% Feeds ⁸⁶ Y (14.74 h)			
γ 15	370.28 17	0.82 5	0.0065	Auger-L	2	189 11	0.0077
γ 16	380.4 3	0.45 4	0.0037	ce-K- 1	12.06 10	70 6	0.0180
γ 17	382.86 23	3.63 12	0.0296	Auger-K	12.7	47 6	0.0126
γ 18	425.97 23	0.305 17	0.0028	ce-L- 1	26.73 10	8.7 7	0.0050
γ 19	439.5 3	0.20 7	0.0019	ce-MNO- 1	28.71 10	1.95 14	0.0012
γ 20	443.13 10	16.9 5	0.160	ce-K- 9	225.76 10	3.56 10	0.0171
γ 21	444.18 23	0.64 17	0.0061	ce-L- 9	240.43 10	0.446 13	0.0023
γ 23	469.24 25	0.297 25	0.0030	ce-MNO- 9	242.41 10	0.147 4	0.0008
γ 26	515.18 20	4.89 15	0.0537	X-ray L	2	4.3 14	0.0002
γ 27	580.57 10	4.78 15	0.0592	X-ray Kα ₂	14.88290 2	33.1 19	0.0105
γ 28	608.29 10	2.01 15	0.0261	X-ray Kα ₁	14.95840 2	64 4	0.0203
γ 29	618.2 4	0.21 4	0.0028	X-ray Kβ	16.7	17.5 11	0.0062
γ 30	627.72 10	32.6 10	0.436	γ 1	29.10 10	21.6 15	0.0134
γ 32	644.82	2.2 4	0.0306	γ 4	135.60 10	0.47 5	0.0014
γ 33	645.87	9.2 11	0.126	γ 9	242.80 10	95.80 10	0.495
γ 35	689.29 25	0.17 4	0.0025	γ 10	612.00 10	5.7 3	0.0743
γ 36	702.2 6	0.25 9	0.0037	γ 11	620.60 20	0.27 3	0.0036
γ 37	703.33 10	15.4 5	0.231	7 weak γ's omitted: E _γ (avg) = 169.3; ΣI _γ = 0.45%			
γ 38	709.90 10	2.62 8	0.0397	● ⁸⁷ Kr β ⁻ Decay (76.3 m 5) I (min) = 0.10% Feeds ⁸⁷ Rb			
γ 39	719.17 23	0.22 4	0.0034	Auger-L	1.68	0.194 8	≈0
γ 40	740.81 13	1.36 5	0.0215	ce-K- 2	387.378 20	0.174 6	0.0014
γ 41	767.63 13	2.4 4	0.0391	β- 1 max	580 5		
γ 42	768.25	0.32 11	0.0053	avg	187.8 19	0.50 3	0.0020
γ 43	777.37 10	22.4 6	0.372	β- 2 max	834 5		
γ 44	783.6 3	0.26 4	0.0044	avg	287.5 21	0.108 12	0.0007
γ 45	826.02 13	3.30 9	0.0581	β- 3 max	928 5		
γ 46	833.72	1.5 4	0.0264	avg	326.4 21	4.4 3	0.0306
γ 47	835.67	4.4 6	0.0778	β- 4 max	1078 5		
γ 48	882.96 17	0.25 9	0.0047	avg	389.3 22	0.58 4	0.0048
γ 49	887.40 17	0.44 5	0.0083	β- 5 max	1334 5		
γ 50	955.35 20	1.04 5	0.0212	avg	500.4 22	9.5 6	0.101
γ 51	971.43 18	0.27 4	0.0056	β- 6 max	1475 5		
γ 52	1017.93 23	0.18 12	0.0039	avg	562.6 23	5.51 22	0.0660
γ 53	1024.04 10	3.79 17	0.0828	β- 7 max	1511 5		
γ 54	1076.63 10	82.5 4	1.89	avg	578.7 23	0.42 6	0.0052
γ 56	1092.68 13	0.69 5	0.0161	(Continued)			
γ 57	1102.02 23	0.198 25	0.0046				
γ 58	1133.3 10	0.297 25	0.0072				
γ 61	1153.05 10	30.5 10	0.750				
γ 63	1163.03 10	1.18 5	0.0292				
γ 64	1253.11 10	1.53 5	0.0410				
γ 65	1270.46 13	0.65 10	0.0176				
γ 66	1283.96 13	0.29 11	0.0079				
γ 67	1294.9 3	0.29 9	0.0080				
γ 68	1296.03 23	0.54 4	0.0150				
γ 70	1349.15 10	2.95 10	0.0846				
γ 71	1404.8 4	0.18 5	0.0054				
γ 72	1415.20 23	0.33 9	0.0099				
γ 73	1507.86 10	0.35 5	0.0114				
γ 74	1533.19 13	0.22 4	0.0073				
γ 75	1535.67 13	0.12 4	0.0038				
γ 76	1564.4 5	0.18 5	0.0060				
γ 77	1696.25 13	0.635 17	0.0230				
γ 78	1711.6 7	0.17 4	0.0063				
γ 79	1724.15 10	0.55 5	0.0203				
γ 80	1790.90 10	1.00 5	0.0381				
γ 81	1801.70 10	1.65 5	0.0633				

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
⁸⁷ Kr β ⁻ Decay (76.3 m 5) (Continued)				● ⁸⁷ Sr IT Decay (2.805 h 3) I (min) = 0.10%			
				%IT Decay = 99.70 8			
				See also ⁸⁷ Sr EC Decay (2.805 h)			
β ⁻ 8 max	2148 5			Auger-L	1.79	17.9 10	0.0007
avg	870.0 24	0.62 10	0.0115	Auger-K	12	4.5 4	0.0012
β ⁻ 9 max	2311 5			ce-K- 1	372.30 8	14.6 4	0.115
avg	945.6 24	0.16 6	0.0032	ce-L- 1	386.18 8	2.13 6	0.0176
β ⁻ 10 max	2499 5			ce-MNO- 1	388.04 8	0.704 21	0.0058
avg	1033.7 24	0.124 11	0.0027	γ-ray L	1.8	0.29 10	≈0
β ⁻ 11 max	3044 5			γ-ray Kα ₂	14.09790 2	2.92 15	0.0009
avg	1294.2 24	6.9 4	0.190	γ-ray Kα ₁	14.16500 2	5.6 3	0.0017
β ⁻ 12 max	3486 5			X-ray Kβ	15.8	1.51 8	0.0005
avg	1502.0 24	40.7 14	1.30	γ 1	388.40 8	82.3 4	0.680
β ⁻ 13 max	3889 5			● ⁸⁷ Y EC Decay (80.3 h 3) I (min) = 0.10%			
avg	1694.8 24	30.4 24	1.10	Feeds ⁸⁷ Sr (2.805 h)			
total β ⁻				Auger-L	1.79	105 6	0.0040
avg	1324 3	100 3	2.82	Auger-K	12	27.0 23	0.0070
γ 2	402.578 20	49.5 16	0.424	ce-K- 2	468.60 20	0.235 7	0.0023
γ 6	673.87 4	1.91 10	0.0274	β ⁺ 1 max	451.3 13		
γ 7	814.25 7	0.168 12	0.0029	avg	200.5 6	0.160 20	0.0007
γ 8	836.37 6	0.75 4	0.0134	γ-ray L	1.8	1.7 6	≈0
γ 9	845.43 4	7.3 4	0.131	X-ray Kα ₂	14.09790 2	17.5 7	0.0053
γ 12	946.64 15	0.139 11	0.0028	X-ray Kα ₁	14.16500 2	33.8 13	0.0102
γ 15	1175.40 8	1.12 6	0.0281	X-ray Kβ	15.8	9.1 4	0.0031
γ 16	1337.96 8	0.65 4	0.0185	γ 2	484.70 20	93.94 9	0.970
γ 17	1382.53 7	0.287 18	0.0085	Maximum γ ₁ -intensity = 0.32%			
γ 18	1389.91 16	0.124 11	0.0037	● ⁸⁸ Kr β ⁻ Decay (2.84 h 3) I (min) = 0.10%			
γ 20	1531.2 4	0.36 6	0.0116	Feeds ⁸⁸ Rb			
γ 21	1577.99 14	0.129 11	0.0043	Auger-L	1.68	14.9 7	0.0005
γ 22	1611.16 16	0.104 20	0.0036	Auger-K	11.4	4.04 21	0.0010
γ 23	1740.52 8	2.05 10	0.0760	ce-K- 1	12.313 14	10.7 6	0.0028
γ 24	1842.61 24	0.139 11	0.0054	ce-K- 2	13.06 11	0.13 5	≈0
γ 25	2011.88 12	2.90 14	0.124	ce-L- 1	25.448 14	1.23 7	0.0007
γ 27	2408.50 20	0.213 17	0.0109	ce-MNO- 1	27.191 14	0.273 16	0.0002
γ 28	2554.80 20	9.3 6	0.506	ce-K- 4	150.78 4	0.208 21	0.0007
γ 29	2558.10 20	3.9 3	0.213	ce-K- 7	181.120 15	1.14 12	0.0044
γ 31	2811.40 20	0.317 23	0.0190	ce-L- 7	194.255 15	0.138 15	0.0006
γ 34	3308.50 20	0.450 25	0.0317	β ⁻ 1 max	142 17		
13 weak γ's omitted: Σγ (avg) = 1620.1; ΣIγ = 0.65%				avg	38 5	0.353 25	0.0003
● ⁸⁷ Rb β ⁻ Decay (4.73E10 y 3) I (min) = 0.10%				β ⁻ 2 max	365 17		
β ⁻ 1 max	273.3 19			avg	109 6	2.65 16	0.0062
avg	78.8 7	100	0.168	β ⁻ 3 max	521 17		
● ⁸⁷ Sr EC Decay (2.805 h 3) I (min) = 0.10%				avg	165 7	67 4	0.235
%EC Decay = 0.30 8				β ⁻ 4 max	681 17		
Feeds ⁸⁷ Rb				avg	227 7	9.1 5	0.0440
See also ⁸⁷ Sr IT Decay (2.805 h)				β ⁻ 5 max	824 17		
Auger-L	1.68	0.32 8	≈0	avg	284 7	0.14 3	0.0008
				β ⁻ 6 max	997 17		
				avg	355 8	0.204 19	0.0015
				β ⁻ 7 max	1198 17		
				avg	441 8	1.92 11	0.0180
				β ⁻ 8 max	1252 17		
				avg	464 8	0.23 4	0.0023

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
β- 9 max	1471 17		
avg	561 8	0.22 3	0.0026
β-10 max	1731 17		
avg	678 8	0.90 6	0.0130
β-11 max	1772 17		
avg	697 8	0.10 6	0.0015
β-12 max	2051 17		
avg	825 8	1.3 3	0.0228
β-13 max	2522 17		
avg	1052 8	0.26 9	0.0058
β-14 max	2717 17		
avg	1136 8	1.8 3	0.0436
β-15 max	2913 17		
avg	1233 8	14 4	0.368
total β-	359 13	100 6	0.766
2 weak β's omitted: Σβ (avg) = 233.8; ΣIβ = 0.10%			
γ-ray L	1.69	0.23 8	≈0
γ-ray Kα ₂	13.33580 2	2.37 12	0.0007
γ-ray Kα ₁	13.39530 2	4.59 22	0.0013
γ-ray Kβ	15	1.20 6	0.0004
γ 1	27.513 14	2.06 12	0.0012
γ 3	122.27 6	0.197 12	0.0005
γ 4	165.98 4	3.10 15	0.0110
γ 7	196.320 15	26.0 13	0.109
γ 8	240.71 4	0.253 14	0.0013
γ 9	311.69 3	0.107 9	0.0007
γ 10	334.71 3	0.145 10	0.0010
γ 12	362.226 13	2.25 12	0.0174
γ 14	390.543 11	0.64 6	0.0054
γ 16	421.70 18	0.128 25	0.0011
γ 17	471.80 3	0.73 4	0.0073
γ 25	677.34 5	0.235 18	0.0034
γ 30	788.28 4	0.53 3	0.0089
γ 31	790.32 7	0.125 12	0.0021
γ 34	834.830 3	13.0 7	0.231
γ 35	850.34 5	0.173 14	0.0031
γ 36	862.327 19	0.67 4	0.0123
γ 39	944.92 4	0.294 20	0.0059
γ 42	985.780 16	1.31 7	0.0276
γ 43	990.09 9	0.142 19	0.0030
γ 44	1039.59 3	0.48 3	0.0107
γ 45	1049.48 12	0.142 13	0.0032
γ 48	1141.33 6	1.28 7	0.0312
γ 49	1179.51 3	1.00 5	0.0250
γ 50	1184.95 4	0.69 5	0.0174
γ 51	1209.84 8	0.14 3	0.0037
γ 52	1212.73 17	0.14 5	0.0036
γ 54	1245.22 4	0.363 25	0.0096
γ 55	1250.67 4	1.12 6	0.0299
γ 58	1324.98 4	0.16 4	0.0045
γ 60	1352.32 11	0.159 22	0.0046
γ 61	1369.50 20	1.48 9	0.0431
γ 62	1406.94 10	0.218 20	0.0065
γ 63	1464.84 9	0.114 15	0.0036
γ 64	1518.39 3	2.15 12	0.0696
γ 65	1529.77 3	10.9 6	0.356
γ 66	1603.79 5	0.46 4	0.0156
γ 69	1685.6 4	0.66 8	0.0239
γ 73	1892.76 13	0.14 3	0.0056
γ 74	1908.7 4	0.100 15	0.0041
γ 75	2029.84 3	4.53 23	0.196
γ 76	2035.411 18	3.74 21	0.162
γ 77	2186.5 3	0.29 6	0.0134
γ 78	2195.842 7	13.2 7	0.617
γ 79	2231.772 21	3.39 17	0.161
γ 81	2352.08 4	0.73 4	0.0366
γ 83	2392.11 4	34.6 16	1.76

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
γ 84	2408.91 7	0.104 12	0.0053
γ 86	2548.40 3	0.62 3	0.0338
γ 87	2771.02 5	0.149 10	0.0088
37 weak γ's omitted: Σγ (avg) = 1003.2; ΣIγ = 1.88%			
● ⁸⁸ Rb β ⁻ Decay (17.8 m 1) I (min) = 0.10%			
β- 1 max	462 5		
avg	143.6 18	0.66 5	0.0020
β- 2 max	470 5		
avg	146.3 19	0.362 25	0.0011
β- 3 max	572 5		
avg	184.3 19	0.143 11	0.0006
β- 4 max	801 5		
avg	273.7 21	2.13 13	0.0124
β- 5 max	901 5		
avg	314.5 21	0.210 18	0.0014
β- 6 max	2097 5		
avg	844.5 24	0.98 7	0.0176
β- 7 max	2581 5		
avg	1070.6 24	13.3 8	0.303
β- 8 max	3479 5		
avg	1496.5 24	4.1 4	0.131
β- 9 max	5315 5		
avg	2372.4 24	78.0 12	3.94
total β-	2072 4	99.9 15	4.41
4 weak β's omitted: Σβ (avg) = 526.4; ΣIβ = 0.06%			
γ 5	898.021 19	14.0 8	0.269
γ 8	1366.26 12	0.103 14	0.0030
γ 9	1382.39 5	0.74 5	0.0219
γ 11	1779.83 7	0.216 18	0.0082
γ 13	1836.01 4	21.4 13	0.837
γ 14	2111.22 12	0.118 13	0.0053
γ 15	2118.85 7	0.42 3	0.0190
γ 17	2577.72 6	0.180 14	0.0099
γ 18	2677.86 5	1.96 12	0.112
γ 19	2734.03 7	0.109 9	0.0064
γ 20	3009.43 7	0.244 17	0.0156
γ 22	3218.48 8	0.214 14	0.0147
γ 23	3486.46 9	0.131 9	0.0097
γ 26	4742.69 11	0.143 11	0.0145
13 weak γ's omitted: Σγ (avg) = 1474.6; ΣIγ = 0.33%			
● ⁸⁸ Y EC Decay (106.60 d 4) I (min) = 0.10%			
Auger-L	1.79	105 6	0.0040
Auger-K	12	26.9 23	0.0069
β+ 1 max	755 4		
avg	355.2 15	0.217 16	0.0016

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
⁸⁸ Y EC Decay (106.60 d 4) (Continued)							
X-ray L	1.8	1.7 6	≈ 0	β -15 max	1000 60		
X-ray K α_2	14.09790 2	17.4 7	0.0052	avg	360 30	0.20 3	0.0015
X-ray K α_1	14.16500 2	33.7 13	0.0102	β -16 max	1070 60		
X-ray KB	15.8	9.0 4	0.0030	avg	390 30	0.17 3	0.0014
γ 3	898.021 19	93.4 4	1.79	β -17 max	1250 60		
γ 5	1836.01 4	99.380 20	3.89	avg	460 30	2.36 17	0.0231
γ 6	2734.03 7	0.596 20	0.0347	β -18 max	1250 60		
				avg	460 30	0.33 5	0.0032
4 weak γ 's omitted: E γ (avg) = 1198.3; $\Sigma I\gamma$ = 0.10% Maximum γ t-intensity = 0.43%							
● ⁸⁸ Zr EC Decay (83.4 d 3) I (min) = 0.10% Feeds ⁸⁸ Y							
Auger-L	2	105 6	0.0043	β -19 max	1440 60		
Auger-K	12.7	26 3	0.0069	avg	550 30	1.49 12	0.0175
ce-K- 1	375.86 10	2.26 7	0.0181	β -20 max	1500 60		
ce-L- 1	390.53 10	0.312 9	0.0026	avg	580 30	0.31 4	0.0038
ce-MO- 1	392.51 10	0.103 3	0.0009	β -21 max	1610 60		
				avg	620 30	1.55 13	0.0205
X-ray L	2	2.4 8	≈ 0	β -22 max	1600 60		
X-ray K α_2	14.88290 2	18.2 9	0.0058	avg	620 30	2.09 15	0.0276
X-ray K α_1	14.95840 2	35.1 16	0.0112	β -23 max	1640 60		
X-ray KB	16.7	9.6 5	0.0034	avg	640 30	2.00 15	0.0273
γ 1	392.90 10	97.32 8	0.814	β -24 max	1720 60		
				avg	670 30	0.27 4	0.0039
● ⁸⁹ Kr β^- Decay (3.16 m 4) I (min) = 0.10% Feeds ⁸⁹ Rb							
Auger-L	1.68	0.7 4	≈ 0	β -25 max	1950 60		
Auger-K	11.4	0.21 11	≈ 0	avg	780 30	0.85 13	0.0141
ce-K- 4	205.70 7	0.6 4	0.0027	β -26 max	2100 60		
				avg	850 30	4.0 3	0.0724
β - 1 max	340 60			β -27 max	2190 60		
avg	101 21	0.57 7	0.0012	avg	890 30	1.51 13	0.0286
β - 2 max	480 60			β -28 max	2180 60		
avg	151 23	0.36 4	0.0012	avg	890 30	0.28 4	0.0053
β - 3 max	490 60			β -29 max	2370 60		
avg	155 23	0.32 4	0.0011	avg	970 30	14.4 10	0.298
β - 4 max	570 60			β -30 max	2570 60		
avg	182 23	0.172 24	0.0007	avg	1070 30	5.7 5	0.130
β - 5 max	600 60			β -31 max	2580 60		
avg	196 24	0.59 5	0.0025	avg	1070 30	0.31 4	0.0071
β - 6 max	630 60			β -32 max	2600 60		
avg	206 24	0.214 20	0.0009	avg	1080 30	0.19 3	0.0044
β - 7 max	630 60			β -33 max	2750 60		
avg	207 24	0.158 23	0.0007	avg	1150 30	0.224 22	0.0055
β - 8 max	660 60			β -34 max	2810 60		
avg	219 24	0.14 3	0.0007	avg	1180 30	3.09 23	0.0777
β - 9 max	740 60			β -35 max	2970 60		
avg	249 24	0.20 6	0.0011	avg	1260 30	2.53 20	0.0679
β -10 max	750 60			β -36 max	3110 60		
avg	255 25	0.180 20	0.0010	avg	1320 30	0.47 6	0.0132
β -11 max	830 60			β -37 max	3150 60		
avg	284 25	0.58 6	0.0035	avg	1340 30	0.17 9	0.0049
β -12 max	890 60			β -38 max	3280 60		
avg	310 25	0.68 7	0.0045	avg	1400 30	10.2 10	0.304
β -13 max	920 60			β -39 max	3440 60		
avg	320 30	0.49 6	0.0033	avg	1480 30	2.9 3	0.0914
β -14 max	990 60			β -40 max	3630 60		
avg	350 30	0.45 6	0.0034	avg	1570 30	0.62 10	0.0207
				β -41 max	3650 60		
				avg	1580 30	3.6 4	0.121
				β -42 max	3970 60		
				avg	1730 30	1.3 3	0.0479
				β -43 max	4040 60		
				avg	1770 30	0.44 18	0.0166
				β -44 max	4380 60		
				avg	1930 30	2.3 11	0.0946
				β -45 max	4390 60		
				avg	1940 30	4.4 5	0.182
				β -46 max	4470 60		
				avg	1980 30	1.2 6	0.0506
				β -47 max	4970 60		
				avg	2210 30	23 4	1.08
				total β^-	1360 50	100 5	2.90
				4 weak β 's omitted: $\Sigma \beta$ (avg) = 478.8; $\Sigma I\beta$ = 0.29%			

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)		
γ -ray $K\alpha_2$	13.33580	2	0.12 7	≈ 0	γ 119	1468.5	3	0.19 3	0.0059
χ -ray $K\alpha_1$	13.39530	2	0.23 13	≈ 0	γ 120	1472.76	10	6.9 6	0.216
γ 1	196.2	5	0.22 10	0.0009	γ 123	1500.96	10	1.32 13	0.0422
γ 2	197.5	3	1.82 19	0.0077	γ 124	1506.2	3	0.112 21	0.0036
γ 3	205.03	20	0.124 25	0.0005	γ 125	1530.04	15	3.3 3	0.108
γ 4	220.90	7	20.0 17	0.0941	γ 126	1533.68	15	5.1 4	0.167
γ 6	264.11	10	0.66 6	0.0037	γ 127	1555.28	20	0.152 20	0.0050
γ 12	338.20	10	0.34 4	0.0025	γ 128	1573.78	20	0.190 21	0.0064
γ 13	345.03	10	1.18 11	0.0087	γ 131	1634.06	10	0.82 8	0.0285
γ 14	356.06	7	4.1 4	0.0314	γ 132	1643.82	10	0.34 4	0.0118
γ 15	364.88	10	0.90 8	0.0070	γ 134	1667.51	20	0.128 16	0.0045
γ 16	369.30	10	1.38 11	0.0109	γ 135	1676.9	3	0.140 24	0.0050
γ 18	402.25	20	0.32 4	0.0027	γ 137	1683.8	4	0.13 3	0.0047
γ 19	411.42	10	2.56 20	0.0224	γ 138	1692.0	12	0.26 11	0.0094
γ 21	438.08	10	0.96 9	0.0090	γ 139	1693.70	10	4.4 4	0.158
γ 22	466.13	10	0.80 8	0.0079	γ 142	1721.29	15	0.224 22	0.0082
γ 24	490.76	20	0.32 5	0.0034	γ 146	1777.60	10	0.76 8	0.0288
γ 25	497.5	3	6.6 7	0.0704	γ 147	1788.2	3	0.106 17	0.0040
γ 26	498.6	4	1.14 21	0.0121	γ 150	1810.73	20	0.140 18	0.0054
γ 30	557.30	20	0.160 19	0.0019	γ 154	1837.5	4	0.12 3	0.0046
γ 31	576.96	10	5.6 5	0.0693	γ 155	1839.72	25	0.35 4	0.0137
γ 32	585.80	7	16.6 14	0.207	γ 158	1868.47	25	0.196 21	0.0078
γ 35	626.20	10	0.60 6	0.0080	γ 159	1879.80	25	0.158 19	0.0063
γ 36	629.75	20	0.34 4	0.0046	γ 162	1903.40	10	1.04 12	0.0422
γ 40	665.72	20	0.114 18	0.0016	γ 165	1939.11	15	0.64 6	0.0264
γ 42	671.40	20	0.106 21	0.0015	γ 166	1966.55	20	0.132 16	0.0055
γ 43	674.11	20	0.23 3	0.0033	γ 168	1998.6	5	0.118 23	0.0050
γ 45	696.24	10	1.78 16	0.0264	γ 170	2012.23	10	1.56 14	0.0669
γ 46	707.01	20	0.50 5	0.0075	γ 171	2021.04	15	0.244 24	0.0105
γ 47	710.05	20	0.78 8	0.0118	γ 173	2046.47	15	0.262 25	0.0114
γ 48	729.63	20	0.30 4	0.0046	γ 176	2100.63	8	0.94 8	0.0421
γ 49	738.39	7	4.2 4	0.0661	γ 180	2160.02	9	0.53 5	0.0243
γ 50	747.4	3	0.11 3	0.0018	γ 183	2195.8	4	0.13 6	0.0060
γ 52	762.9	3	0.40 9	0.0065	γ 186	2280.2	3	0.20 5	0.0099
γ 53	762.9	3	0.92 13	0.0149	γ 190	2377.38	9	0.80 8	0.0405
γ 54	776.49	20	1.12 19	0.0185	γ 191	2400.99	9	0.72 8	0.0368
γ 56	826.75	10	0.76 8	0.0134	γ 201	2597.92	20	0.108 17	0.0060
γ 57	835.53	10	1.10 10	0.0196	γ 203	2645.26	15	0.42 4	0.0237
γ 58	857.37	15	0.29 3	0.0052	γ 208	2750.9	3	0.124 16	0.0073
γ 59	867.08	7	5.9 5	0.109	γ 212	2782.11	10	0.76 8	0.0450
γ 60	870.42	20	0.160 20	0.0030	γ 214	2793.75	20	0.68 6	0.0405
γ 61	904.27	7	7.2 6	0.138	γ 216	2819.58	25	0.132 18	0.0079
γ 63	930.95	10	0.62 6	0.0123	γ 217	2853.3	3	0.24 4	0.0146
γ 66	944.19	15	0.164 19	0.0033	γ 218	2866.23	10	1.74 14	0.106
γ 67	953.18	20	0.106 17	0.0022	γ 220	2878.69	25	0.32 4	0.0199
γ 68	960.42	10	0.32 4	0.0066	γ 224	3017.9	3	0.25 4	0.0163
γ 71	974.39	10	0.98 8	0.0203	γ 225	3029.16	25	0.27 3	0.0174
γ 72	997.37	10	0.66 6	0.0140	γ 228	3107.26	25	0.194 21	0.0128
γ 73	1010.84	20	0.108 16	0.0023	γ 229	3140.26	20	1.04 10	0.0696
γ 75	1044.40	10	0.41 4	0.0091	γ 232	3172.1	3	0.100 15	0.0068
γ 80	1076.48	20	0.24 3	0.0054	γ 234	3219.84	20	0.43 4	0.0294
γ 81	1088.07	10	0.36 4	0.0083	γ 243	3361.70	20	1.04 10	0.0745
γ 83	1103.18	20	0.90 8	0.0211	γ 244	3371.1	4	0.62 7	0.0445
γ 84	1107.78	10	2.92 25	0.0689	γ 245	3399.9	3	0.136 16	0.0098
γ 85	1116.61	7	1.66 14	0.0395	γ 249	3532.88	20	1.34 11	0.101
γ 86	1131.51	20	0.160 24	0.0039	γ 251	3583.9	3	0.258 25	0.0197
γ 88	1162.50	10	0.214 24	0.0053	γ 258	3717.8	4	0.84 8	0.0665
γ 90	1172.33	20	0.98 10	0.0245	γ 260	3732.5	6	0.14 5	0.0110
γ 91	1182.38	20	0.166 24	0.0042	γ 262	3781.4	4	0.132 14	0.0106
γ 92	1186.54	20	0.184 21	0.0047	γ 264	3827.4	4	0.138 18	0.0113
γ 96	1228.8	3	0.144 20	0.0038	γ 266	3842.7	4	0.110 14	0.0090
γ 97	1235.62	10	0.59 6	0.0156	γ 269	3901.76	4	0.134 22	0.0111
γ 101	1273.73	10	1.36 11	0.0369	γ 270	3923.0	4	0.41 4	0.0346
γ 104	1302.7	3	0.100 15	0.0028	γ 271	3965.5	4	0.208 20	0.0176
γ 106	1324.28	7	3.06 25	0.0863	γ 272	3977.5	4	0.27 6	0.0229
γ 107	1335.4	3	0.13 3	0.0038	γ 274	3996.0	4	0.142 15	0.0121
γ 108	1340.6	3	0.19 3	0.0055	γ 277	4048.0	5	0.116 14	0.0100
γ 109	1367.48	20	0.148 20	0.0043	γ 290	4341.1	6	0.104 12	0.0096
γ 110	1372.16	20	0.126 18	0.0037	γ 295	4489.2	8	0.134 14	0.0128
γ 112	1412.59	15	0.26 3	0.0079					
γ 113	1421.64	20	0.224 24	0.0068					
γ 117	1461.3	5	0.122 25	0.0039					
γ 118	1464.2	3	0.18 3	0.0056					

15⁹ weak γ 's omitted:
 $\Sigma\gamma$ (avg) = 2181.1; $\Sigma I\gamma$ = 7.12%

⁸⁹Rb-⁹⁰Kr

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
<p>● ⁸⁹Rb β⁻ Decay (15.44 m 22) I (min) = 0.10% Feeds ⁸⁹Sr</p>				<p>● ⁸⁹Zr β⁺ Decay (78.43 h 8) I (min) = 0.10%</p>			
β ⁻ 1 max	994 5			Auger-L	2	80 4	0.0032
avg	353.2 21	1.52 16	0.0114	Auger-K	12.7	19.6 21	0.0053
β ⁻ 2 max	1275 5			ce-K- 1	892.06 10	0.715 22	0.0136
avg	473.6 22	33 3	0.333				
β ⁻ 3 max	1796 5			β ⁺ 1 max	904.7 23		
avg	706.4 23	2.19 23	0.0330	avg	396.9 10	22.94 24	0.194
β ⁻ 4 max	1933 5						
avg	769.1 23	3.0 8	0.0491	X-ray L	2	1.8 6	≈0
β ⁻ 5 max	2223 5			X-ray Kα ₂	14.88290 2	14.0 7	0.0044
avg	903.1 24	34 4	0.654	X-ray Kα ₁	14.95840 2	26.9 12	0.0086
β ⁻ 6 max	2446 5			X-ray Kβ	16.7	7.4 4	0.0026
avg	1007.1 24	0.46 13	0.0099	γ 1	909.10 10	99.04 3	1.92
β ⁻ 7 max	2495 5			γ 4	1712.9 8	0.76 7	0.0278
avg	1030.4 24	0.49 20	0.0108	γ 5	1744.50 20	0.129 10	0.0048
β ⁻ 8 max	2563 5						
avg	1062.0 24	0.22 4	0.0050	2 weak γ's omitted: E _γ (avg) = 1642.1; ΣI _γ = 0.17% Maximum γ±-intensity = 45.88%			
β ⁻ 9 max	3030 5			● ⁹⁰ Kr β ⁻ Decay (32.32 s 9) I (min) = 0.10% % Feeding to ⁹⁰ Rb (157 s) = 88.1 14 % Feeding to ⁹⁰ Rb (258 s) = 11.9 14			
avg	1284.8 24	0.24 5	0.0066	Auger-L	1.68	11 7	0.0004
β ⁻ 10 max	4503 5			Auger-K	11.4	2.8 19	0.0007
avg	1987.4 24	25 5	1.06	ce-K- 1	90.85 3	0.15 11	0.0003
total β ⁻				ce-K- 3	105.72 3	0.7 5	0.0015
avg	1015 3	100 8	2.17	ce-K- 4	106.62 3	8 6	0.0175
7 weak β's omitted: E _β (avg) = 272.4; ΣI _β = 0.37%				ce-L- 4	119.75 3	1.1 9	0.0027
γ 3	272.45 10	1.42 14	0.0082	ce-KX0- 4	121.50 3	0.20 15	0.0005
γ 4	289.76 10	0.54 10	0.0033				
γ 8	657.71 7	10.0 10	0.140	β ⁻ 1 max	510 30		
γ 10	766.79 15	0.162 23	0.0027	avg	161 12	0.140 20	0.0005
γ 14	947.69 7	9.2 10	0.186	β ⁻ 2 max	690 30		
γ 16	1025.3 5	0.23 9	0.0049	avg	228 12	0.16 4	0.0008
γ 17	1031.88 7	58 6	1.27	β ⁻ 3 max	760 30		
γ 23	1220.32 10	0.22 3	0.0057	avg	260 12	0.100 20	0.0006
γ 24	1228.40 15	0.122 21	0.0032	β ⁻ 4 max	1150 30		
γ 26	1248.10 7	42 5	1.13	avg	421 13	0.18 4	0.0016
γ 29	1473.22 20	0.35 5	0.0111	β ⁻ 5 max	1300 30		
γ 30	1501.07 20	0.197 25	0.0063	avg	484 14	0.66 8	0.0068
γ 31	1538.08 10	2.6 3	0.0836	β ⁻ 6 max	1310 30		
γ 35	1940.2 3	0.33 4	0.0137	avg	488 14	1.84 21	0.0191
γ 37	2007.54 10	2.4 3	0.102	β ⁻ 7 max	1960 30		
γ 39	2058.0 11	0.23 9	0.0102	avg	781 14	0.29 4	0.0048
γ 40	2196.00 15	13.3 15	0.624	β ⁻ 8 max	2120 30		
γ 42	2280.06 10	0.180 24	0.0087	avg	856 14	0.10 3	0.0018
γ 45	2570.14 10	9.9 10	0.540	β ⁻ 9 max	2260 30		
γ 48	2707.20 10	2.03 21	0.117	avg	923 14	2.25 25	0.0442
γ 57	3508.84 25	1.15 13	0.0858	β ⁻ 10 max	2490 30		
41 weak γ's omitted: E _γ (avg) = 1950.3; ΣI _γ = 1.18%				avg	1029 14	0.34 5	0.0075
● ⁸⁹ Sr β ⁻ Decay (50.55 d 9) I (min) = 0.10%				β ⁻ 11 max	2610 30		
β ⁻ 1 max	1491 4			avg	1086 15	62 7	1.43
avg	583.0 15	99.985 5	1.24	β ⁻ 12 max	2700 30		
1 weak β's omitted: E _β (avg) = 187.6; ΣI _β = 0.02%				avg	1129 15	0.17 4	0.0041
1 weak γ's omitted: E _γ (avg) = 909.1; ΣI _γ = 0.02%				β ⁻ 13 max	3460 30		
				avg	1488 15	0.55 7	0.0174
				β ⁻ 14 max	3550 30		
				avg	1533 15	0.14 6	0.0046
				β ⁻ 15 max	3650 30		
				avg	1580 15	0.33 7	0.0111
				β ⁻ 16 max	3680 30		
				avg	1593 15	0.19 4	0.0064
				β ⁻ 17 max	3710 30		
				avg	1611 15	0.16 5	0.0055

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
β-18 max	3780 30			γ 90	2726.68 11	0.84 10	0.0485
avg	1640 15	0.19 7	0.0066	γ 92	2855.4 3	0.31 7	0.0188
β-19 max	4390 30			γ 93	2865.73 21	0.179 24	0.0109
avg	1935 15	29 4	1.20	γ 100	3344.3 3	0.108 19	0.0077
+total β-				γ 102	3855.3 4	0.116 17	0.0095
avg	1317 17	99 8	2.78				
4 weak β's omitted: Eβ (avg) = 925.6; ΣIβ = 0.24%				40 weak γ's omitted: Eγ (avg) = 1518.8; ΣIγ = 1.81%			
γ-ray L	1.69	0.16 11	≈0	● ⁹⁰ Rb β ⁻ Decay (157 s 3) I (min) = 0.10%			
X-ray Kα ₂	13.33580 2	1.7 11	0.0005	Feeds ⁹⁰ Sr			
X-ray Kα ₁	13.39530 2	3.2 21	0.0009	β- 1 max	731 15		
X-ray Kβ	15	0.8 6	0.0003	avg	246 6	0.20 8	0.0010
γ 1	106.05 3	0.38 5	0.0009	β- 2 max	930 15		
γ 3	120.92 3	2.7 4	0.0070	avg	326 7	0.44 12	0.0031
γ 4	121.82 3	32 4	0.0833	β- 3 max	1122 15		
γ 7	227.76 8	0.119 17	0.0006	avg	407 7	0.34 5	0.0029
γ 8	234.44 3	2.5 3	0.0125	β- 4 max	1220 15		
γ 9	242.19 3	9.6 11	0.0495	avg	450 7	0.52 5	0.0050
γ 10	249.32 3	1.28 17	0.0068	β- 5 max	1299 15		
γ 12	309.07 9	0.131 18	0.0009	avg	484 7	1.42 13	0.0146
γ 13	356.00 20	0.10 4	0.0008	β- 6 max	1366 15		
γ 14	386.48 9	0.123 17	0.0010	avg	513 7	4.9 4	0.0535
γ 17	419.12 5	0.31 4	0.0027	β- 7 max	1579 15		
γ 18	429.93 14	0.14 4	0.0013	avg	608 7	0.68 10	0.0088
γ 19	433.47 5	1.25 14	0.0115	β- 8 max	1634 15		
γ 22	470.34 8	0.23 3	0.0023	avg	633 7	0.37 4	0.0050
γ 23	476.10 11	0.127 18	0.0013	β- 9 max	1763 15		
γ 24	492.63 5	1.16 13	0.0121	avg	691 7	0.16 4	0.0024
γ 25	498.59 12	0.145 19	0.0015	β- 10 max	1868 15		
γ 27	539.49 4	29 4	0.339	avg	739 7	0.140 22	0.0022
γ 28	554.37 5	4.8 6	0.0573	β- 11 max	1907 15		
γ 29	565.19 8	0.20 3	0.0024	avg	757 7	3.1 3	0.0500
γ 30	569.20 5	0.58 7	0.0070	β- 12 max	1972 15		
γ 33	614.38 9	0.20 3	0.0026	avg	787 7	0.36 6	0.0060
γ 34	619.08 5	1.04 12	0.0137	β- 13 max	2187 15		
γ 36	626.49 8	0.27 4	0.0036	avg	886 7	14.2 12	0.268
γ 38	661.23 5	0.32 4	0.0045	β- 14 max	2417 15		
γ 39	677.69 7	0.37 5	0.0053	avg	994 7	8.5 8	0.180
γ 40	690.72 7	0.38 5	0.0056	β- 15 max	2516 15		
γ 41	705.47 12	0.119 17	0.0018	avg	1040 7	1.35 13	0.0299
γ 42	731.33 4	1.42 16	0.0221	β- 16 max	3170 15		
γ 45	925.49 9	0.21 3	0.0042	avg	1349 8	6.3 6	0.181
γ 46	941.86 5	1.28 14	0.0257	β- 17 max	3514 15		
γ 48	967.33 11	0.21 3	0.0042	avg	1513 8	0.48 7	0.0155
γ 49	980.29 11	0.179 24	0.0037	β- 18 max	4056 15		
γ 51	1039.11 8	0.40 5	0.0088	avg	1772 8	0.15 8	0.0057
γ 52	1103.92 7	0.33 4	0.0077	β- 19 max	4661 15		
γ 53	1118.69 5	37 4	0.889	avg	2063 8	4.7 5	0.207
γ 54	1165.56 6	0.79 9	0.0196	β- 20 max	5721 15		
γ 55	1240.34 11	0.34 5	0.0089	avg	2574 8	14.3 16	0.784
γ 58	1309.68 10	0.26 4	0.0074	β- 21 max	6553 15		
γ 59	1341.31 22	0.149 25	0.0043	avg	2976 8	37 5	2.35
γ 60	1386.62 15	0.19 3	0.0055	total β-			
γ 61	1423.77 6	2.8 3	0.0852	avg	1963 11	100 6	4.17
γ 63	1466.26 15	0.23 3	0.0073				
γ 65	1537.85 5	9.3 10	0.303	3 weak β's omitted: Eβ (avg) = 785.8; ΣIβ = 0.23%			
γ 66	1552.18 6	2.10 23	0.0694	γ 8	824.23 10	0.75 8	0.0132
γ 67	1620.22 22	0.145 22	0.0050	γ 9	831.69 5	33 3	0.578
γ 68	1658.18 6	1.27 14	0.0448	γ 14	997.85 6	0.51 5	0.0107
γ 72	1780.04 6	6.4 7	0.243	γ 17	1038.63 7	0.35 3	0.0076
γ 74	1885.42 15	0.22 3	0.0087	γ 18	1060.70 4	7.8 7	0.176
γ 75	1899.61 16	0.183 25	0.0074	γ 20	1140.50 6	0.132 12	0.0032
γ 76	1980.99 15	0.164 21	0.0069	γ 24	1302.2 3	0.117 19	0.0033
γ 77	2006.00 14	0.112 22	0.0048	γ 25	1326.50 20	0.147 20	0.0041
γ 78	2127.52 7	1.32 15	0.0597				
γ 79	2149.51 10	0.26 3	0.0121				
γ 81	2191.46 25	0.108 16	0.0050				
γ 84	2417.33 23	0.183 25	0.0094				
γ 86	2432.78 21	0.145 22	0.0075				
γ 87	2468.56 11	0.45 6	0.0235				

(Continued)

⁹⁰Rb-

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
⁹⁰ Rb β ⁻ Decay (157 s 3) (Continued)				● ⁹⁰ Rb β ⁻ Decay (258 s 4) I (min) = 0.10%			
γ 26	1375.36 3	0.35 4	0.0102	%β ⁻ Decay = 97.7 6			
γ 33	1590.3 3	0.156 24	0.0053	Feeds ⁹⁰ Sr			
γ 34	1631.78 20	0.189 23	0.0066	See also ⁹⁰ Rb IT Decay (258 s)			
γ 35	1665.61 7	0.37 3	0.0130	β- 1 max	832 15		
γ 36	1668.9 6	0.17 6	0.0059	avg	286 7	1.27 25	0.0077
γ 40	1804.10 7	0.67 6	0.0258	β- 2 max	875 15		
γ 41	1829.80 20	0.173 22	0.0067	avg	304 7	0.35 11	0.0023
γ 44	1892.28 8	0.44 4	0.0177	β- 3 max	1102 15		
γ 49	2139.33 19	0.36 4	0.0165	avg	399 7	0.59 6	0.0050
γ 50	2148.2 3	0.24 4	0.0112	β- 4 max	1374 15		
γ 51	2207.47 11	0.51 5	0.0238	avg	517 7	1.66 11	0.0183
γ 52	2216.29 15	0.59 6	0.0277	β- 5 max	1571 15		
γ 53	2239.7 8	0.18 10	0.0086	avg	604 7	1.42 10	0.0183
γ 58	2473.90 20	0.68 9	0.0359	β- 6 max	1619 15		
γ 59	2476.7 11	0.12 8	0.0064	avg	626 7	6.2 3	0.0827
γ 61	2688.9 5	0.14 3	0.0078	β- 7 max	1633 15		
γ 62	2724.30 20	0.160 24	0.0093	avg	633 7	0.53 7	0.0071
γ 63	2789.1 22	0.10 7	0.0060	β- 8 max	1713 15		
γ 65	2980.7 6	0.104 25	0.0066	avg	668 7	0.51 10	0.0073
γ 67	3039.17 12	0.82 8	0.0534	β- 9 max	1806 15		
γ 68	3081.3 4	0.17 4	0.0113	avg	711 7	0.35 7	0.0053
γ 69	3205.09 16	0.55 6	0.0378	β- 10 max	1851 15		
γ 70	3295.09 14	0.95 9	0.0668	avg	732 7	0.70 11	0.0109
γ 71	3303.91 13	0.98 9	0.0693	β- 11 max	1855 15		
γ 72	3317.00 12	0.31 3	0.0221	avg	733 7	0.46 5	0.0072
γ 73	3361.88 13	1.08 10	0.0770	β- 12 max	1856 15		
γ 74	3383.24 12	7.5 7	0.538	avg	734 7	0.50 10	0.0078
γ 75	3534.24 13	4.5 4	0.336	β- 13 max	2229 15		
γ 76	3538.6 6	0.17 4	0.0130	avg	906 7	0.96 13	0.0185
γ 77	3627.4 7	0.14 6	0.0108	β- 14 max	2255 15		
γ 79	3814.36 20	0.65 7	0.0524	avg	918 7	1.66 11	0.0325
γ 83	4061.7 3	0.264 21	0.0228	β- 15 max	2325 15		
γ 84	4087.30 20	0.28 3	0.0247	avg	950 7	9.6 4	0.194
γ 85	4135.51 17	7.5 7	0.658	β- 16 max	2467 15		
γ 88	4332.10 20	0.43 4	0.0400	avg	1017 7	0.88 7	0.0191
γ 89	4355.80 20	0.44 5	0.0457	β- 17 max	2511 15		
γ 90	4365.90 18	8.8 8	0.822	avg	1038 7	16.2 6	0.358
γ 92	4599.4 3	0.166 19	0.0163	β- 18 max	2706 15		
γ 94	4646.45 20	2.48 22	0.245	avg	1129 7	0.80 22	0.0192
γ 99	4974.1 3	0.228 25	0.0242	β- 19 max	3075 15		
γ 101	5070.2 3	0.160 13	0.0173	avg	1304 8	14.8 10	0.411
γ 102	5187.40 20	1.29 12	0.142	β- 20 max	3210 15		
γ 103	5254.3 3	0.26 3	0.0288	avg	1368 8	6.4 3	0.186
γ 105	5333.00 20	0.48 5	0.0544	β- 21 max	3515 15		
				avg	1514 8	0.30 6	0.0097
				β- 22 max	3627 15		
				avg	1567 8	1.03 10	0.0344
				β- 23 max	3732 15		
				avg	1617 8	1.08 14	0.0372
				β- 24 max	4089 15		
				avg	1789 8	1.38 12	0.0526
				β- 25 max	4132 15		
				avg	1809 8	2.10 11	0.0809
				β- 26 max	4163 15		
				avg	1821 8	0.87 22	0.0337
				β- 27 max	4453 15		
				avg	1959 8	3.7 10	0.154
				β- 28 max	4768 15		
				avg	2110 8	4.1 4	0.184
				β- 29 max	5004 15		
				avg	2229 8	2.3 5	0.109
				β- 30 max	5828 15		
				avg	2620 8	15 3	0.837
				total β-		98 4	2.95
				avg	1419 10		

54 weak γ's omitted:
Eγ(avg) = 2427.7; ΣIγ = 2.59%

● ⁹⁰Rb IT Decay (258 s 4) I (min) = 0.10%
%IT Decay = 2.3 6
Feeds ⁹⁰Rb (157 s)
See also ⁹⁰Rb β⁻ Decay (258 s)

Auger-L	1.68	2.2 5	≈0
Auger-K	11.4	0.56 15	0.0001
ce-K- 1	91.72 15	1.7 5	0.0033
ce-L- 1	104.85 15	0.34 9	0.0007
X-ray Kα ₂	13.33580 2	0.33 9	≈0
X-ray Kα ₁	13.39530 2	0.64 17	0.0002
X-ray Kβ	15	0.17 5	≈0
γ 1	106.92 15	0.20 6	0.0005

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
⁹⁰ Nb β ⁺ Decay (14.60 h 15) (Continued)				total β ⁻ avg 658.5 23 99.2 14 1.39			
β ⁺ 1 max	1500 4			3 weak β ⁺ 's omitted: Eβ(avg) = 110.2; ΣIβ = 0.13%			
avg	662.2 18	53 3	0.748	γ 2	261.20 20	0.435 14	0.0024
3 weak β ⁺ 's omitted: Eβ(avg) = 363.3; ΣIβ = 0.08%				γ 3	272.7 4	0.25 4	0.0015
X-ray L	2	2.2 8	≈0	γ 4	274.70 20	1.00 4	0.0059
X-ray Kα ₂	15.69090 2	13.9 9	0.0046	γ 6	379.90 10	0.143 6	0.0012
X-ray Kα ₁	15.77510 2	26.6 17	0.0090	γ 14	620.10 10	1.72 6	0.0228
X-ray Kβ	17.7	7.5 5	0.0028	γ 16	631.30 10	0.539 18	0.0073
γ 1	132.60 3	4.1 4	0.0117	γ 17	652.3 3	2.89 19	0.0402
γ 2	141.149 20	69 4	0.207	γ 18	652.90 20	7.8 4	0.108
γ 3	329.10 15	0.110 19	0.0008	γ 19	653.0 20	0.45 7	0.0063
γ 5	371.28 7	1.90 14	0.0150	γ 21	749.80 10	23.0 7	0.367
γ 7	518.22 25	0.49 10	0.0054	γ 22	761.40 10	0.559 19	0.0091
γ 8	561.52 8	0.129 19	0.0015	γ 24	820.80 20	0.156 6	0.0027
γ 10	827.71 8	0.90 8	0.0159	γ 26	879.70 10	0.182 6	0.0034
γ 11	890.60 8	1.73 12	0.0328	γ 29	925.80 20	3.74 11	0.0737
γ 12	1051.67 12	0.23 3	0.0052	γ 32	1024.30 10	32.5 9	0.709
γ 13	1129.14 8	92.0 9	2.21	γ 33	1054.60 10	0.218 7	0.0049
γ 14	1270.41 12	1.21 9	0.0329	γ 34	1140.80 10	0.123 5	0.0030
γ 15	1470.40 20	0.42 6	0.0133	γ 35	1280.90 10	0.91 3	0.0247
γ 16	1575.00 20	0.47 6	0.0157	γ 39	1413.40 10	0.95 3	0.0287
γ 17	1611.80 15	2.21 19	0.0758	γ 40	1473.80 10	0.162 6	0.0051
γ 18	1658.0 3	0.31 5	0.0110	γ 46	1651.4 5	0.283 9	0.0099
γ 19	1716.40 20	0.52 5	0.0192	γ 47	1724.0 5	0.156 6	0.0057
γ 20	1843.30 20	0.65 7	0.0256	27 weak γ's omitted: Eγ(avg) = 776.3; ΣIγ = 1.19%			
γ 21	1913.30 20	1.23 13	0.0502	• ⁹¹ Y β ⁻ Decay (58.51 d 6) I (min) = 0.10%			
γ 22	1984.7 3	0.63 8	0.0268	β ⁻ 1 max	338.1 22		
γ 24	2056.3 4	0.11 3	0.0048	avg	99.9 8	0.30 3	0.0006
γ 25	2186.40 20	18.0 10	0.840	β ⁻ 2 max	1543.0 20		
γ 26	2222.5 3	0.63 8	0.0296	avg	603.8 9	99.70 3	1.28
γ 27	2319.20 20	82.0 9	4.05	total β ⁻ avg	602.3 9	100.00 5	1.28
5 weak γ's omitted: Eγ(avg) = 1272.6; ΣIγ = 0.16% Maximum γ ⁻ -intensity = 106.16%				γ 1	1204.9 8	0.30 3	0.0077
• ⁹¹ Sr β ⁻ Decay (9.5 h 2) I (min) = 0.10%				• ⁹¹ Y IT Decay (49.71 m 4) I (min) = 0.10%			
% Feeding to ⁹¹ Y (58.51 d) = 42.6 16				Feeds ⁹¹ Y (58.51 d)			
% Feeding to ⁹¹ Y (49.71 m) = 57.4 16				Auger-L	2	5.0 3	0.0002
β ⁻ 1 max	405 4			Auger-K	12.7	1.21 14	0.0003
avg	122.9 14	0.231 10	0.0006	ce-K- 1	540.53 5	4.17 12	0.0480
β ⁻ 2 max	477 4			ce-L- 1	555.20 5	0.561 17	0.0066
avg	148.8 15	1.44 5	0.0046	ce-MNO- 1	557.18 5	0.185 6	0.0022
β ⁻ 3 max	617 4			X-ray L	2	0.11 4	≈0
avg	200.9 16	2.02 6	0.0086	X-ray Kα ₂	14.88290 2	0.86 5	0.0003
β ⁻ 4 max	704 4			X-ray Kα ₁	14.95840 2	1.65 9	0.0005
avg	234.3 16	0.361 12	0.0018	X-ray Kβ	16.7	0.45 3	0.0002
β ⁻ 5 max	1104 4			γ 1	557.57 5	95.08 14	1.13
avg	398.9 17	33.9 10	0.288				
β ⁻ 6 max	1138 4						
avg	413.4 18	1.77 6	0.0156				
β ⁻ 7 max	1210 4						
avg	444.5 18	0.185 9	0.0018				
β ⁻ 8 max	1379 4						
avg	518.0 18	24.4 8	0.269				
β ⁻ 9 max	1497 4						
avg	570.5 18	0.643 24	0.0078				
β ⁻ 10 max	2031 4						
avg	812.9 19	3.3 4	0.0571				
β ⁻ 11 max	2684 4						
avg	1121.2 19	30.8 4	0.736				

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
• ⁹¹Nb EC Decay (~1E4 y) I (min) = 0.10%			
Auger-L	2	100 6	0.0043
Auger-K	13.4	23 3	0.0067
β^+ 1 max	234 3		
avg	108.7 12	0.164 8	0.0004
X-ray L	2	2.8 10	0.0001
X-ray K α_2	15.69090 2	18.3 9	0.0061
X-ray K α_1	15.77510 2	35.2 16	0.0118
X-ray K β	17.7	9.9 5	0.0037
Maximum γ -intensity = 0.33%			
• ⁹¹Nb EC Decay (61 d) I (min) = 0.10%			
%EC Decay = 3.5			
See also ⁹¹ Nb IT Decay (61 d)			
Auger-L	2	3.48 18	0.0001
Auger-K	13.4	0.80 10	0.0002
X-ray K α_2	15.69090 2	0.63 3	0.0002
X-ray K α_1	15.77510 2	1.20 6	0.0004
X-ray K β	17.7	0.338 16	0.0001
γ 1	1204.9 8	3.5	0.0898
• ⁹¹Nb IT Decay (61 d) I (min) = 0.10%			
%IT Decay = 96.5			
Feeds ⁹¹ Nb (1E4 y)			
See also ⁹¹ Nb EC Decay (61 d)			
Auger-L	2.15	91 4	0.0042
Auger-K	14	16.5 21	0.0049
ce-K- 1	85.51 10	65.6 7	0.120
ce-L- 1	101.80 10	24.7 6	0.0536
ce-M- 1	104.03 10	4.73 14	0.0105
ce-NOP- 1	104.44 10	0.86 3	0.0019
X-ray L	2.17	2.8 10	0.0001
X-ray K α_2	16.52100 2	14.1 7	0.0050
X-ray K α_1	16.61510 2	27.1 13	0.0096
X-ray K β	18.6	7.8 4	0.0031
γ 1	104.50 10	0.578 18	0.0013
• ⁹¹Mo β^+ Decay (15.49 m 1) I (min) = 0.10%			
% Feeding to ⁹¹ Nb (1E4 y) = 99.9658 22			
Auger-L	2.15	6.2 4	0.0003
Auger-K	14	1.37 18	0.0004
β^+ 1 max	1779 13		
avg	790 6	0.224 12	0.0038
β^+ 2 max	1835 13		
avg	815 6	0.147 10	0.0026
β^+ 3 max	3416 13		
avg	1553 7	93.36 10	3.09
total β^+ avg	1549 7	93.78 11	3.10

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
9 weak β's omitted:			
$E\beta$ (avg) = 609.3; $\Sigma I\beta$ = 0.05%			
X-ray L	2.17	0.19 7	=0
X-ray K α_2	16.52100 2	1.17 6	0.0004
X-ray K α_1	16.61510 2	2.25 11	0.0008
X-ray K β	18.6	0.65 3	0.0003
γ 6	1581.50 10	0.226 14	0.0076
γ 8	1637.30 10	0.329 17	0.0115
γ 13	2632.10 20	0.118 7	0.0066
18 weak γ's omitted:			
$E\gamma$ (avg) = 2233.2; $\Sigma I\gamma$ = 0.30%			
Maximum γ -intensity = 187.57%			
• ⁹²Sr β^- Decay (2.71 h 1) I (min) = 0.10%			
Feeds ⁹² Y			
β^- 1 max	550 30		
avg	174 12	96 11	0.356
β^- 2 max	980 30		
avg	345 13	0.3 3	0.0022
β^- 3 max	1040 30		
avg	371 13	0.21 6	0.0017
β^- 4 max	1930 30		
avg	777 14	4 4	0.0662
total β^- avg	199 14	101 12	0.426
γ 1	241.52 3	3.0 4	0.0153
γ 3	430.56 5	3.3 5	0.0305
γ 4	491.30 20	0.26 5	0.0027
γ 5	650.70 20	0.37 5	0.0051
γ 7	953.32 9	3.6 5	0.0731
γ 8	1142.30 10	2.9 4	0.0701
γ 9	1383.94 6	90 10	2.65
2 weak γ's omitted:			
$E\gamma$ (avg) = 664.6; $\Sigma I\gamma$ = 0.17%			
• ⁹²Y β^- Decay (3.54 h 1) I (min) = 0.10%			
β^- 1 max	814 16		
avg	278 7	0.100 13	0.0006
β^- 2 max	1294 16		
avg	480 7	6.5 7	0.0665
β^- 3 max	1567 16		
avg	601 8	0.24 3	0.0031
β^- 4 max	1787 16		
avg	700 8	0.43 8	0.0064
β^- 5 max	2138 16		
avg	869 9	1.16 20	0.0215
β^- 6 max	2251 16		
avg	920 8	2.3 3	0.0451
β^- 7 max	2700 16		
avg	1123 8	3.4 10	0.0813
β^- 8 max	3634 16		
avg	1563 9	85.7 16	2.85
total β^- avg	1447 9	99.9 21	3.08
4 weak β's omitted:			
$E\beta$ (avg) = 183.4; $\Sigma I\beta$ = 0.04%			

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
γ 15	481.96 10	1.12 11	0.0115	γ 101	1538.71 25	0.101 21	0.0033
γ 16	483.73 8	1.65 13	0.0170	γ 103	1551.59 9	1.01 7	0.0333
γ 17	486.7 4	0.12 5	0.0013	γ 104	1609.77 20	0.195 21	0.0067
γ 18	518.50 15	0.128 21	0.0014	γ 105	1634.05 8	1.43 9	0.0498
γ 19	541.89 6	0.72 5	0.0083	γ 107	1647.53 8	0.88 6	0.0309
γ 20	545.81 7	0.39 3	0.0045	γ 109	1668.7 5	0.16 9	0.0057
γ 21	559.92 8	0.202 21	0.0024	γ 110	1684.84 13	0.71 6	0.0253
γ 22	571.96 16	0.21 3	0.0025	γ 111	1694.07 9	2.55 15	0.0921
γ 23	586.5 4	0.44 16	0.0055	γ 112	1699.06 9	3.29 21	0.119
γ 24	590.28 5	67.2 12	0.845	γ 113	1706.59 10	1.10 7	0.0398
γ 25	593.81 18	1.10 15	0.0139	γ 115	1765.36 9	1.06 6	0.0397
γ 26	596.15 13	1.32 15	0.0167	γ 116	1774.83 16	0.161 21	0.0061
γ 27	610.93 6	1.08 7	0.0140	γ 118	1811.45 10	1.39 9	0.0537
γ 28	630.97 16	0.19 3	0.0026	γ 119	1816.12 19	0.23 3	0.0088
γ 29	633.5 3	0.108 21	0.0015	γ 120	1894.1 3	0.121 21	0.0049
γ 30	650.56 15	0.188 21	0.0026	γ 122	1907.73 23	0.175 21	0.0071
γ 31	658.56 11	0.42 4	0.0058	γ 123	1928.79 10	1.16 7	0.0475
γ 32	663.58 6	1.63 10	0.0230	γ 125	1944.75 12	0.55 5	0.0228
γ 33	687.79 11	0.66 7	0.0096	γ 131	2010.80 25	0.120 17	0.0052
γ 34	690.06 12	1.00 9	0.0147	γ 132	2054.68 25	0.134 21	0.0059
γ 35	692.0 4	0.22 6	0.0033	γ 133	2063.64 12	0.62 5	0.0272
γ 36	710.40 5	21.5 12	0.325	γ 136	2104.78 15	0.31 3	0.0139
γ 37	716.8 5	0.29 16	0.0044	γ 138	2129.2 5	0.10 4	0.0046
γ 38	718.33 12	1.48 21	0.0226	γ 140	2179.49 20	0.29 4	0.0134
γ 40	771.19 6	1.15 7	0.0189	γ 143	2230.27 12	1.53 9	0.0728
γ 41	776.07 13	0.26 3	0.0043	γ 144	2296.13 14	0.73 5	0.0358
γ 42	782.83 15	0.22 3	0.0036	γ 145	2364.72 11	1.56 9	0.0785
γ 44	788.68 8	0.76 5	0.0128	γ 146	2416.3 3	0.108 21	0.0055
γ 45	791.10 14	0.26 3	0.0043	γ 148	2543.84 11	2.99 17	0.162
γ 46	795.29 12	0.228 21	0.0039	γ 149	2574.2 3	0.128 21	0.0070
γ 48	834.89 5	1.65 9	0.0294	γ 152	2688.65 12	2.10 13	0.120
γ 49	837.85 19	0.116 17	0.0021	γ 156	2828.54 20	0.169 17	0.0102
γ 50	858.47 7	0.72 5	0.0131	γ 158	2985.72 21	0.19 3	0.0124
γ 51	875.73 6	24.2 14	0.451	γ 160	3006.86 22	0.116 12	0.0074
γ 52	888.13 5	21.8 12	0.413				
γ 53	900.98 7	0.69 5	0.0132				
γ 54	910.18 8	0.81 5	0.0158				
γ 55	922.70 11	0.33 3	0.0065				
γ 56	927.69 8	0.63 5	0.0125				
γ 57	930.91 10	0.40 4	0.0080				
γ 58	952.58 23	0.108 21	0.0022				
γ 59	991.59 21	0.121 21	0.0026				
γ 60	1032.4 5	0.10 4	0.0022				
γ 61	1035.5 3	0.20 4	0.0044				
γ 62	1040.63 6	3.16 21	0.0700				
γ 65	1055.13 11	0.34 3	0.0077				
γ 66	1064.37 9	0.37 3	0.0084				
γ 67	1077.86 16	0.24 3	0.0054				
γ 68	1094.00 7	1.74 11	0.0406				
γ 69	1104.69 23	0.15 3	0.0035				
γ 71	1122.48 6	3.96 21	0.0948				
γ 72	1136.77 20	0.195 21	0.0047				
γ 73	1180.76 17	0.24 3	0.0061				
γ 74	1196.23 6	0.97 6	0.0247				
γ 76	1215.48 7	2.47 14	0.0639				
γ 77	1239.15 25	0.12 3	0.0032				
γ 78	1243.41 8	0.79 5	0.0210				
γ 81	1266.38 10	1.10 9	0.0297				
γ 82	1269.47 7	7.1 4	0.191				
γ 83	1277.99 9	0.86 7	0.0234				
γ 84	1308.60 9	0.40 3	0.0111				
γ 85	1321.24 7	2.58 14	0.0726				
γ 88	1332.5 5	0.5 3	0.0134				
γ 89	1334.50 10	0.67 5	0.0191				
γ 90	1378.98 10	0.35 3	0.0103				
γ 91	1387.11 7	3.43 21	0.101				
γ 92	1434.01 8	0.89 6	0.0273				
γ 93	1438.93 9	0.50 4	0.0152				
γ 94	1466.2 3	0.101 21	0.0031				
γ 95	1469.50 12	0.52 4	0.0162				
γ 96	1483.3 3	0.101 21	0.0032				
γ 97	1492.13 12	0.54 4	0.0173				
γ 100	1520.1 5	0.32 7	0.0102				

41 weak γ's omitted:
E_γ(avg) = 1801.5; ΣI_γ = 2.30%

• ⁹³Y β⁻ Decay (10.1 h 2) I (min) = 0.10%
Feeds ⁹³Zr

Auger-L	2	0.16 3	≈0
ce-K ⁻ 1	248.90 10	0.15 3	0.0008
β ⁻ 1 max	432 20		
avg	132 8	0.187 11	0.0005
β ⁻ 2 max	705 20		
avg	235 8	1.60 8	0.0080
β ⁻ 3 max	1420 20		
avg	535 9	0.145 9	0.0017
β ⁻ 4 max	1440 20		
avg	544 9	0.377 20	0.0044
β ⁻ 5 max	1465 20		
avg	555 9	0.266 14	0.0031
β ⁻ 6 max	1943 20		
avg	771 10	2.51 12	0.0412
β ⁻ 7 max	2623 20		
avg	1087 10	4.6 4	0.107
β ⁻ 8 max	2890 20		
avg	1214 10	90.2 5	2.33
total β ⁻			
avg	1173 11	100.0 7	2.50

4 weak β's omitted:
E_β(avg) = 310.5; ΣI_β = 0.12%

(Continued)

⁹³Y-⁹⁵Nb

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
⁹³ Y β^- Decay (10.1 h 2) (Continued)				● ⁹⁴ Nb IT Decay (6.26 m 1) I (min) = 0.10%			
γ 1	266.90 10	6.9 4	0.0389	%IT Decay = 99.53 9			
γ 2	680.20 10	0.61 3	0.0088	Feeds ⁹⁴ Nb (2.03E4 y)			
γ 4	947.10 10	1.95 11	0.0393	See also ⁹⁴ Nb β^- Decay (6.26 m)			
γ 11	1203.30 10	0.103 7	0.0026	Auger-L	2.15	91 4	0.0042
γ 13	1425.40 10	0.238 14	0.0072	Auger-K	14	14.4 19	0.0043
γ 14	1450.50 10	0.336 19	0.0104	ce-K- 1	21.96 4	57.1 7	0.0267
γ 19	1917.80 10	1.40 8	0.0574	ce-L- 1	38.25 4	33.6 7	0.0274
γ 20	2184.60 10	0.155 13	0.0072	ce-Nb- 1	40.48 4	8.71 24	0.0075
γ 21	2190.80 10	0.171 11	0.0080	X-ray L	2.17	2.8 10	0.0001
14 weak γ 's omitted: E_{γ} (avg) = 1413.3; ΣI_{γ} = 0.33%				X-ray K α_2	16.52100 2	12.3 6	0.0043
● ⁹³ Zr β^- Decay (1.53E6 y 10) I (min) = 0.10%				X-ray K α_1	16.61510 2	23.6 11	0.0084
Feeds ⁹³ Nb (14.6 y)				X-ray K β	18.6	6.8 4	0.0027
β^- 1 max	61.5 19			1 weak γ 's omitted: E_{γ} (avg) = 41.0; ΣI_{γ} = 0.08%			
avg	19.5 7	100	0.0415	● ⁹⁴ Nb β^- Decay (6.26 m 1) I (min) = 0.10%			
● ⁹³ Nb IT Decay (14.6 y 13) I (min) = 0.10%				% β^- Decay = 0.47 9			
Auger-L	2.15	79.4 15	0.0036	See also ⁹⁴ Nb IT Decay (6.26 m)			
ce-K- 1	11.784 20	15.0 4	0.0038	β^- 1 max	1215 3		
Auger-K	14	3.8 5	0.0011	avg	444.0 12	0.47 9	0.0044
ce-L- 1	28.072 20	66.1 7	0.0395	γ 2	871.099 18	0.47 9	0.0087
ce-M- 1	30.302 20	14.2 4	0.0092	● ⁹⁵ Zr β^- Decay (64.02 d 4) I (min) = 0.10%			
ce-Nb- 1	30.712 20	4.69 13	0.0031	% Feeding to ⁹⁵ Nb (35.06 d) = 99.22 4			
X-ray L	2.17	2.5 9	0.0001	% Feeding to ⁹⁵ Nb (86.6 h) = 0.78 4			
X-ray K α_2	16.52100 2	3.23 17	0.0011	β^- 1 max	366 3		
X-ray K α_1	16.61510 2	6.2 4	0.0022	avg	109.3 10	55.4 11	0.129
X-ray K β	18.6	1.78 10	0.0007	β^- 2 max	399 3		
● ⁹³ Mo EC Decay (3.5E3 y 7) I (min) = 0.10%				avg	120.4 10	43.7 8	0.112
Feeds ⁹³ Nb (14.6 y)				β^- 3 max	887 3		
Auger-L	2.15	98 5	0.0045	avg	327.0 11	0.78 4	0.0054
Auger-K	14	21 3	0.0063	β^- 4 max	1123 3		
X-ray L	2.17	3.0 11	0.0001	avg	405.4 12	0.10 3	0.0009
X-ray K α_2	16.52100 2	18.1 9	0.0064	total β^-	116.1 11	100.0 14	0.247
X-ray K α_1	16.61510 2	34.8 16	0.0123	γ 2	724.184 12	43.7 8	0.673
X-ray K β	18.6	10.0 5	0.0040	γ 3	756.715 15	55.3 11	0.892
● ⁹⁴ Nb β^- Decay (2.03E4 y 16) I (min) = 0.10%				● ⁹⁵ Nb β^- Decay (35.06 d 9) I (min) = 0.10%			
Auger-L	2.27	0.159 11	≈0	Auger-L	2.27	0.126 9	≈0
ce-K- 1	682.627 19	0.161 5	0.0023	ce-K- 3	745.790 10	0.128 4	0.0020
β^- 1 max	471 3			β^- 1 max	159.8 5		
avg	145.8 10	100	0.311	avg	43.35 15	99.970 5	0.0923
γ 1	702.627 19	100	1.50	1 weak β 's omitted: E_{β} (avg) = 321.9; ΣI_{β} = 0.03%			
γ 2	871.099 18	100	1.86	γ 3	765.790 10	99.808 6	1.63
				2 weak γ 's omitted: E_{γ} (avg) = 389.2; ΣI_{γ} = 0.03%			

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
⁹⁶ Nb β ⁻ Decay (23.35 h 5) (Continued)				● ⁹⁶ Tc EC Decay (51.5 m 10) I (min) = 0.10%			
X-ray Kα ₂	17.3743 14	0.114 6	≈0	%EC Decay = 2.0 5			
X-ray Kα ₁	17.47930 1	0.219 12	≈0	See also ⁹⁶ Tc IT Decay (51.5 m)			
γ 5	219.10 20	3.78 20	0.0176	Auger-L	2.27	2.0 4	≈0
γ 8	241.40 20	3.87 20	0.0199	Auger-K	14.8	0.42 11	0.0001
γ 12	349.90 20	0.73 8	0.0054	X-ray Kα ₂	17.3743 14	0.39 8	0.0001
γ 13	350.32 15	1.11 12	0.0083	X-ray Kα ₁	17.47930 1	0.75 16	0.0003
γ 14	352.50 15	0.82 10	0.0062	X-ray Kβ	19.6	0.22 5	≈0
γ 15	369.67 12	0.12 6	0.0009	γ 16	480.68 8	0.34 9	0.0035
γ 16	371.81 10	2.81 20	0.0222	γ 21	719.55 5	0.30 8	0.0045
γ 19	434.71 5	0.53 6	0.0049	γ 23	778.220 20	1.9 5	0.0310
γ 21	460.03 6	28.2 10	0.276	γ 25	847.67 11	0.12 3	0.0021
γ 22	477.67 6	0.12 6	0.0012	γ 26	849.86 4	0.28 8	0.0051
γ 23	480.68 8	6.3 4	0.0644	γ 37	1200.19 6	1.1 3	0.0273
γ 25	568.86 6	55.7 20	0.674	γ 41	1497.68 8	0.12 3	0.0037
γ 27	591.20 15	0.97 20	0.0122	39 weak γ's omitted: E _γ (avg) = 887.6; ΣI _γ = 0.56%			
γ 28	593.30 20	0.31 8	0.0039	● ⁹⁶ Tc IT Decay (51.5 m 10) I (min) = 0.10%			
γ 29	719.55 5	7.3 4	0.111	%IT Decay = 98.0 5			
γ 30	721.5 3	0.8 3	0.0119	Feeds ⁹⁶ Tc (4.28 d)			
γ 31	778.220 20	96.80 20	1.60	See also ⁹⁶ Tc EC Decay (51.5 m)			
γ 32	810.25 7	9.9 6	0.170	Auger-L	2.17	83 3	0.0038
γ 33	812.54 4	3.4 5	0.0586	ce-K- 1	13.4 4	43.6 8	0.0124
γ 34	847.67 11	1.6 4	0.0297	Auger-K	15.5	9.6 14	0.0032
γ 35	849.86 4	20.7 10	0.375	ce-L- 1	31.4 4	42.7 8	0.0285
γ 37	1091.30 4	49.4 20	1.15	ce-M- 1	33.9 4	8.71 24	0.0063
γ 38	1126.85 6	0.53 8	0.0128	ce-NOP- 1	34.3 4	2.87 9	0.0021
γ 40	1200.19 6	20.0 10	0.512	X-ray L	2.42	3.9 13	0.0002
γ 43	1441.14 10	0.40 4	0.0122	X-ray Kα ₂	18.2508 8	9.7 5	0.0038
γ 44	1497.68 8	3.00 20	0.0957	X-ray Kα ₁	18.3671 8	18.6 9	0.0073
				X-ray Kβ	20.6	5.6 3	0.0025
19 weak γ's omitted: E _γ (avg) = 589.2; ΣI _γ = 0.53%				1 weak γ's omitted: E _γ (avg) = 34.4; ΣI _γ = 0.03%			
● ⁹⁶ Tc EC Decay (4.28 d 6) I (min) = 0.10%				● ⁹⁷ Zr β ⁻ Decay (16.90 h 5) I (min) = 0.10%			
Auger-L	2.27	95 7	0.0046	% Feeding to ⁹⁷ Nb (72.1 m) = 5.3 3			
Auger-K	14.8	20 3	0.0064	% Feeding to ⁹⁷ Nb (60 s) = 94.7 3			
ce-K- 29	758.220 20	0.124 4	0.0020	β ⁻ 1 max	409.9 20		
X-ray L	2.29	4.0 14	0.0002	avg	124.3 7	0.49 4	0.0013
X-ray Kα ₂	17.3743 14	18.8 12	0.0070	β ⁻ 2 max	551.5 20		
X-ray Kα ₁	17.47930 1	36.0 22	0.0134	avg	175.3 8	5.5 4	0.0205
X-ray Kβ	19.6	10.6 7	0.0044	β ⁻ 3 max	893.0 20		
γ 10	318.27 5	2.43 24	0.0163	avg	309.2 9	1.88 21	0.0124
γ 11	316.50 6	1.40 20	0.0094	β ⁻ 4 max	906.9 20		
γ 17	434.71 5	0.75 5	0.0069	avg	314.9 9	0.5 3	0.0034
γ 19	460.03 6	0.43 4	0.0042	β ⁻ 5 max	1004.7 21		
γ 22	535.78 8	0.41 4	0.0047	avg	355.4 9	0.18 6	0.0014
γ 23	568.86 6	0.92 6	0.0111	β ⁻ 6 max	1109.1 20		
γ 25	591.20 15	0.11 6	0.0014	avg	399.4 9	0.38 8	0.0032
γ 27	719.55 5	0.20 5	0.0031	β ⁻ 7 max	1109.6 20		
γ 28	721.5 3	0.12 5	0.0018	avg	399.6 9	0.65 7	0.0055
γ 29	778.220 20	99.760 8	1.65	β ⁻ 8 max	1381.3 20		
γ 30	810.25 7	0.21 9	0.0036	avg	517.2 9	0.21 11	0.0023
γ 31	812.54 4	82 4	1.42	β ⁻ 9 max	1406.4 20		
γ 33	849.86 4	98 4	1.77	avg	528.3 9	4.4 6	0.0495
γ 35	1091.30 4	1.10 8	0.0255	(Continued)			
γ 36	1126.85 6	15.2 12	0.364				
γ 38	1200.19 6	-0.37 3	0.0094				
25 weak γ's omitted: E _γ (avg) = 650.9; ΣI _γ = 0.89%							

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
β-10 max	1914.1 20		
avg	756.6 10	86.0 6	1.39
total β- avg	696.1 11	100.2 11	1.49
γ 4	202.2 6	0.10 3	0.0004
γ 5	218.68 15	0.23 6	0.0011
γ 6	254.15 20	1.25 14	0.0068
γ 7	272.27 20	0.25 4	0.0015
γ 10	330.43 20	0.11 3	0.0008
γ 11	355.39 10	2.27 24	0.0172
γ 12	400.39 20	0.32 5	0.0028
γ 13	507.63 10	5.3 6	0.0572
γ 14	513.47 20	0.51 10	0.0056
γ 15	602.52 15	1.39 14	0.0179
γ 16	690.63 20	0.25 4	0.0037
γ 17	699.2 3	0.121 19	0.0018
γ 18	703.80 10	0.93 10	0.0139
γ 20	795.7 8	0.121 19	0.0020
γ 21	804.53 10	0.65 7	0.0111
γ 23	829.80 10	0.223 19	0.0039
γ 24	854.90 10	0.33 4	0.0061
γ 25	971.39 10	0.29 3	0.0060
γ 26	1021.3 3	1.21 19	0.0263
γ 27	1119.1 4	0.111 19	0.0027
γ 28	1147.95 10	2.6 3	0.0647
γ 29	1276.09 10	0.97 10	0.0265
γ 30	1362.66 10	1.35 14	0.0391
γ 31	1750.46 10	1.35 14	0.0502
γ 32	1851.55 10	0.35 4	0.0139

7 weak γ's omitted:
E_γ(avg) = 344.1; ΣI_γ = 0.21%

• ⁹⁷Nb β⁻ Decay (72.1 m 7) I (min) = 0.10%

Auger-L	2.27	0.175 12	≈0
ce-K- 5	637.90 10	0.177 6	0.0024
β- 1 max	303.8 20		
avg	88.2 7	0.118 17	0.0002
β- 2 max	417.3 20		
avg	126.6 7	0.167 22	0.0005
β- 3 max	664.3 20		
avg	217.6 8	0.206 22	0.0010
β- 4 max	908.4 21		
avg	314.9 9	1.08 10	0.0072
β- 5 max	1274.9 20		
avg	469.8 9	98.30 12	0.984
total β- avg	466.4 9	99.96 16	0.993

1 weak β's omitted:
E_β(avg) = 277.3; ΣI_β = 0.09%

γ 3	480.90 10	0.147 20	0.0015
γ 5	657.90 10	98.09 11	1.37
γ 9	1024.5 3	1.08 10	0.0235
γ 12	1268.60 10	0.157 20	0.0042
γ 13	1515.60 20	0.118 20	0.0038

9 weak γ's omitted:
E_γ(avg) = 798.3; ΣI_γ = 0.49%

• ⁹⁷Nb IT Decay (60 s 8) I (min) = 0.10%
Feeds ⁹⁷Nb (72.1 m)

Auger-L	2.15	1.99 12	≈0
Auger-K	14	0.44 6	0.0001
ce-K- 1	724.37 10	1.74 5	0.0268
ce-L- 1	740.66 10	0.225 7	0.0035

X-ray Kα ₂	16.52100 2	0.375 20	0.0001
X-ray Kα ₁	16.61510 2	0.72 4	0.0003
X-ray Kβ	18.6	0.207 12	≈0
γ 1	743.36 10	97.96 6	1.55

• ⁹⁷Tc EC Decay (2.6E6 y 4) I (min) = 0.10%

Auger-L	2.27	96 6	0.0046
Auger-K	14.8	20 3	0.0064

X-ray L	2.29	4.0 14	0.0002
X-ray Kα ₂	17.3743 14	18.9 9	0.0070
X-ray Kα ₁	17.47930 1	36.1 16	0.0134
X-ray Kβ	19.6	10.6 5	0.0044

• ⁹⁷Tc IT Decay (89 d 3) I (min) = 0.10%
Feeds ⁹⁷Tc (2.6E6 y)

Auger-L	2.17	89 4	0.0041
Auger-K	15.5	14.0 21	0.0046
ce-K- 1	75.46 10	63.2 7	0.102
ce-L- 1	93.46 10	29.4 6	0.0585
ce-M- 1	95.96 10	5.90 17	0.0121
ce-NOP- 1	96.43 10	1.17 3	0.0024

X-ray L	2.42	4.2 14	0.0002
X-ray Kα ₂	18.2508 8	14.1 7	0.0055
X-ray Kα ₁	18.3671 8	27.0 12	0.0106
X-ray Kβ	20.6	8.1 4	0.0036
γ 1	96.50 10	0.324 9	0.0007

• ⁹⁷Ru EC Decay (2.9 d 1) I (min) = 0.10%
% Feeding to ⁹⁷Tc (2.6E6 y) = 99.931 4

Auger-L	2.17	97 6	0.0045
Auger-K	15.5	20 3	0.0065
ce-K- 5	194.64 4	2.83 4	0.0117
ce-L- 5	212.64 4	0.340 6	0.0015
ce-K- 6	303.44 5	0.185 7	0.0012

X-ray L	2.42	4.6 16	0.0002
X-ray Kα ₂	18.2508 8	20.0 9	0.0078
X-ray Kα ₁	18.3671 8	38.3 16	0.0150
X-ray Kβ	20.6	11.5 6	0.0050
γ 2	108.80 4	0.108 12	0.0002
γ 5	215.68 4	85.50 18	0.393
γ 6	324.48 5	10.86 18	0.0750
γ 7	460.55 5	0.117 6	0.0011
γ 11	569.27 5	0.872 18	0.0106

14 weak γ's omitted:
E_γ(avg) = 599.3; ΣI_γ = 0.37%

⁹⁸Tc-¹⁰¹Mo

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
<p>● ⁹⁸Tc β⁻ Decay (4.2E6 y 3) I (min) = 0.10%</p>				<p>● ⁹⁹Tc IT Decay (6.02 h 2) I (min) = 0.10%</p>			
<p>Auger-L 2.53 0.358 24 ≈0</p>				<p>%IT Decay = 99.999902 7</p>			
<p>ce-K- 1 630.29 5 0.221 7 0.0030</p>				<p>Feeds ⁹⁹Tc (2.13E5 y)</p>			
<p>ce-K- 2 723.23 5 0.156 5 0.0024</p>				<p>%β⁻ Decay = 0.000098 7</p>			
<p>β⁻ 1 max 394 8</p>				<p>ce-M- 1 1.626 10 74.5 23 0.0026</p>			
<p>avg 118 3 100 0.251</p>				<p>ce-MOP- 1 2.102 11 24.6 7 0.0011</p>			
<p>X-ray Kα₁ 19.27920 2 0.163 8 ≈0</p>				<p>Auger-L 2.17 10.3 7 0.0005</p>			
<p>γ 1 652.41 5 99.745 8 1.39</p>				<p>Auger-K 15.5 2.1 3 0.0007</p>			
<p>γ 2 745.35 5 99.819 5 1.58</p>				<p>ce-K- 2 119.464 4 8.79 25 0.0224</p>			
				<p>ce-K- 3 121.59 3 0.61 4 0.0016</p>			
				<p>ce-L- 2 137.465 4 1.06 3 0.0031</p>			
				<p>ce-L- 3 139.59 3 0.191 12 0.0006</p>			
				<p>ce-MNO- 2 139.964 5 0.230 7 0.0007</p>			
				<p>γ-ray L 2.42 0.48 17 ≈0</p>			
				<p>X-ray Kα₂ 18.2508 8 2.10 11 0.0008</p>			
				<p>X-ray Kα₁ 18.3671 8 4.02 20 0.0016</p>			
				<p>X-ray Kβ 20.6 1.21 7 0.0005</p>			
				<p>γ 2 140.508 4 89.07 24 0.267</p>			
<p>● ⁹⁹Mo β⁻ Decay (66.02 h 1) I (min) = 0.10%</p>				<p>2 weak γ's omitted: E_γ(avg) = 142.6; ΣI_γ = 0.02%</p>			
<p>% Feeding to ⁹⁹Tc (2.13E5 y) = 11.4 9</p>							
<p>% Feeding to ⁹⁹Tc (6.02 h) = 88.6 9</p>							
<p>Auger-L 2.17 4.4 5 0.0002</p>							
<p>Auger-K 15.5 0.89 16 0.0003</p>							
<p>ce-K- 2 19.5400 22 2.9 4 0.0012</p>							
<p>ce-L- 2 37.5415 21 0.35 5 0.0003</p>							
<p>ce-K- 3 119.464 4 0.37 5 0.0010</p>							
<p>ce-K- 6 160.019 8 0.79 6 0.0027</p>							
<p>ce-L- 6 178.020 8 0.117 9 0.0004</p>							
<p>β⁻ 1 max 214.6 10</p>							
<p>avg 59.8 3 0.113 11 0.0001</p>							
<p>β⁻ 2 max 352.7 11</p>							
<p>avg 104.2 4 0.136 13 0.0003</p>							
<p>β⁻ 3 max 436.0 10</p>							
<p>avg 133.0 4 17.3 12 0.0490</p>							
<p>β⁻ 4 max 847.6 10</p>							
<p>avg 289.6 4 1.36 12 0.0084</p>							
<p>β⁻ 5 max 1214.0 10</p>							
<p>avg 442.7 5 82.7 12 0.780</p>							
<p>*total β⁻ avg 386.9 6 101.7 17 0.838</p>							
<p>4 weak β's omitted: E_β(avg) = 180.9; ΣI_β = 0.06%</p>							
<p>X-ray L 2.42 0.20 8 ≈0</p>							
<p>X-ray Kα₂ 18.2508 8 0.90 10 0.0004</p>							
<p>X-ray Kα₁ 18.3671 8 1.73 19 0.0007</p>							
<p>X-ray Kβ 20.6 0.52 6 0.0002</p>							
<p>γ 2 40.5840 20 0.88 12 0.0008</p>							
<p>γ 3 140.508 4 3.8 5 0.0113</p>							
<p>γ 6 181.063 8 6.2 5 0.0240</p>							
<p>γ 9 366.43 3 1.37 12 0.0107</p>							
<p>γ 21 739.58 6 12.8 8 0.202</p>							
<p>γ 23 778.00 20 4.5 4 0.0742</p>							
<p>γ 24 822.90 20 0.133 13 0.0023</p>							
<p>22 weak γ's omitted: E_γ(avg) = 680.1; ΣI_γ = 0.26%</p>							
<p>● ⁹⁹Tc β⁻ Decay (2.13E5 y 5) I (min) = 0.10%</p>				<p>● ¹⁰¹Mo β⁻ Decay (14.61 m 7) I (min) = 0.10%</p>			
<p>β⁻ 1 max 293.6 18</p>				<p>Feeds ¹⁰¹Tc</p>			
<p>avg 84.6 6 99.998 0.180</p>				<p>Auger-L 2.17 140 5 0.0065</p>			
				<p>ce-L- 1 3.238 7 61 3 0.0042</p>			
				<p>ce-MNO- 1 5.737 7 14.7 17 0.0018</p>			
				<p>ce-L- 2 6.274 10 75 3 0.0101</p>			
				<p>ce-MNO- 2 8.773 10 18.1 18 0.0034</p>			
				<p>ce-L- 3 12.563 15 1.45 24 0.0004</p>			
				<p>ce-MNO- 3 15.062 15 0.36 6 0.0001</p>			
				<p>Auger-K 15.5 1.6 3 0.0005</p>			
				<p>ce-K- 4 59.88 3 2.7 4 0.0034</p>			
				<p>ce-L- 4 77.88 3 0.37 9 0.0006</p>			
				<p>ce-K- 10 170.89 4 4.7 3 0.0173</p>			
				<p>ce-L- 10 188.89 4 0.66 4 0.0027</p>			
				<p>ce-MNO-10 191.39 4 0.145 8 0.0006</p>			
				<p>β⁻ 1 max 152 24</p>			
				<p>avg 41 7 0.178 14 0.0002</p>			
				<p>β⁻ 2 max 238 24</p>			
				<p>avg 67 8 0.34 4 0.0005</p>			
				<p>β⁻ 3 max 253 24</p>			
				<p>avg 72 8 1.36 10 0.0021</p>			
				<p>β⁻ 4 max 392 24</p>			
				<p>avg 118 9 0.129 12 0.0003</p>			
				<p>β⁻ 5 max 457 24</p>			
				<p>avg 140 9 0.17 6 0.0005</p>			
				<p>β⁻ 6 max 573 24</p>			
				<p>avg 182 9 0.56 4 0.0022</p>			
				<p>β⁻ 7 max 593 24</p>			
				<p>avg 190 9 0.17 4 0.0007</p>			
				<p>β⁻ 8 max 662 24</p>			
				<p>avg 216 10 0.129 21 0.0006</p>			
				<p>β⁻ 9 max 682 24</p>			
				<p>avg 224 10 2.30 12 0.0110</p>			
				<p>β⁻ 10 max 754 24</p>			
				<p>avg 252 10 3.13 16 0.0168</p>			
				<p>β⁻ 11 max 763 24</p>			
				<p>avg 256 10 20.7 9 0.113</p>			
				<p>β⁻ 12 max 810 24</p>			
				<p>avg 274 10 0.93 5 0.0054</p>			
				<p>β⁻ 13 max 849 24</p>			
				<p>avg 290 10 11.7 4 0.0723</p>			

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
β -14 max	882 24			γ 18	327.68 13	0.217 16	0.0015
avg	303 10	0.67 5	0.0043	γ 19	333.50 7	0.79 5	0.0056
β -15 max	913 24			γ 21	352.90 17	0.144 14	0.0011
avg	316 10	3.3 5	0.0222	γ 23	367.9 7	0.11 3	0.0009
β -16 max	918 24			γ 24	370.0 9	0.16 5	0.0013
avg	318 10	0.145 10	0.0010	γ 25	371.6 8	0.16 5	0.0012
β -17 max	1003 24			γ 26	377.9 5	0.17 5	0.0013
avg	353 10	0.41 6	0.0031	γ 27	379.3 3	0.23 10	0.0019
β -18 max	1005 24			γ 29	381.23 14	0.311 24	0.0025
avg	354 10	3.37 14	0.0254	γ 31	398.70 7	0.92 6	0.0078
β -19 max	1036 24			γ 32	408.53 6	1.63 9	0.0142
avg	367 10	1.55 19	0.0121	γ 33	421.41 14	0.42 8	0.0038
β -20 max	1133 24			γ 35	432.9 4	0.113 8	0.0010
avg	408 11	0.23 15	0.0020	γ 37	448.49 6	0.70 4	0.0067
β -21 max	1167 24			γ 39	469.04 22	0.119 12	0.0012
avg	422 11	1.00 20	0.0090	γ 43	497.0 8	0.14 5	0.0014
β -22 max	1193 24			γ 44	499.59 10	1.4 3	0.0145
avg	434 11	8.4 14	0.0777	γ 45	505.05 18	1.3 6	0.0145
β -23 max	1196 24			γ 46	505.88 5	12.1 8	0.130
avg	435 11	1.83 11	0.0170	γ 47	510.14 14	1.00 8	0.0108
β -24 max	1212 24			γ 48	512.18 17	1.79 13	0.0195
avg	442 11	0.13 7	0.0012	γ 49	514.1 4	0.83 8	0.0090
β -25 max	1217 24			γ 50	515.80 25	0.52 8	0.0057
avg	444 11	1.45 13	0.0137	γ 51	523.80 12	0.177 14	0.0020
β -26 max	1246 24			γ 52	533.51 11	0.41 3	0.0046
avg	456 11	0.27 3	0.0026	γ 55	566.51 10	0.75 12	0.0090
β -27 max	1363 24			γ 56	571.69 19	0.190 14	0.0023
avg	507 11	0.35 4	0.0038	γ 58	590.10 19	5.8 14	0.0724
β -28 max	1491 24			γ 59	590.82 5	16.7 16	0.210
avg	564 11	6.9 3	0.0829	γ 60	602.98 24	0.104 14	0.0013
β -29 max	1579 24			γ 61	606.8 3	0.217 18	0.0028
avg	603 11	0.20 4	0.0026	γ 62	608.32 8	1.09 7	0.0142
β -30 max	1670 24			γ 63	611.6 5	0.15 3	0.0019
avg	643 11	0.280 18	0.0038	γ 64	625.6 5	0.11 4	0.0014
β -31 max	1783 24			γ 66	642.58 5	1.27 7	0.0173
avg	694 11	6.9 16	0.102	γ 69	660.61 10	0.228 15	0.0032
β -32 max	2189 24			γ 72	695.53 7	6.0 6	0.0882
avg	880 11	0.46 5	0.0086	γ 73	701.80 13	0.34 3	0.0051
β -33 max	2195 24			γ 75	712.88 6	3.34 19	0.0507
avg	883 11	1.12 11	0.0211	γ 77	732.92 25	0.27 4	0.0042
β -34 max	2205 24			γ 79	739.54 13	0.307 21	0.0048
avg	887 11	6.7 16	0.127	γ 80	773.81 17	0.34 3	0.0056
β -35 max	2290 24			γ 81	775.8 8	0.109 20	0.0018
avg	927 12	1.2 6	0.0237	γ 82	778.17 8	0.98 7	0.0162
β -36 max	2417 24			γ 83	790.01 18	0.129 12	0.0022
avg	986 12	0.50 14	0.0105	γ 85	804.19 8	1.02 7	0.0174
β -37 max	2522 24			γ 86	815.20 18	0.182 16	0.0032
avg	1035 12	2.1 7	0.0463	γ 89	852.98 11	0.238 15	0.0043
β -38 max	2603 24			γ 90	859.09 19	0.113 10	0.0021
avg	1073 12	11.0 15	0.251	γ 91	869.7 3	0.35 6	0.0064
total β -				γ 92	871.11 10	1.57 11	0.0292
avg	504 15	103 4	1.10	γ 93	877.37 9	3.15 21	0.0588
				γ 94	883.31 9	0.64 4	0.0121
				γ 95	887.0 3	0.24 4	0.0045
				γ 96	888.7 3	0.23 3	0.0044
				γ 98	896.3 4	0.22 4	0.0041
				γ 99	903.41 15	0.205 16	0.0040
				γ 100	933.3 3	0.77 23	0.0153
				γ 101	934.20 9	0.35 3	0.0069
				γ 103	980.40 12	0.271 17	0.0057
				γ 104	987.94 17	0.161 14	0.0034
				γ 105	1007.4 3	0.180 18	0.0039
				γ 106	1011.05 14	1.8 4	0.0385
				γ 107	1011.05 14	0.5 5	0.0112
				γ 108	1012.50 8	13.1 9	0.282
				γ 109	1018.58 25	0.65 10	0.0142
				γ 110	1020.0 3	0.48 8	0.0104
				γ 112	1049.75 10	0.353 21	0.0079
				γ 113	1064.2 3	0.22 4	0.0050
				γ 114	1065.9 4	0.17 4	0.0037
				γ 115	1160.92 9	4.05 23	0.100
				γ 116	1168.99 17	0.240 18	0.0060
X-ray L	2.42	6.6 22	0.0003				
γ 1	6.281 7	0.54 8	=0				
γ 2	9.317 10	1.94 24	0.0004				
X-ray $K\alpha_2$	18.2508 8	1.66 13	0.0006				
X-ray $K\alpha_1$	18.3671 8	3.18 24	0.0012				
X-ray $K\beta$	20.6	0.95 8	0.0004				
γ 4	80.92 3	5.4 4	0.0093				
γ 5	104.70 8	0.163 20	0.0004				
γ 6	105.95 5	0.24 3	0.0005				
γ 7	115.80 15	0.169 24	0.0004				
γ 9	187.41 20	0.48 6	0.0019				
γ 10	191.93 4	19.2 11	0.0785				
γ 11	195.94 5	2.92 17	0.0122				
γ 12	212.00 8	0.52 6	0.0023				
γ 13	221.80 23	0.102 12	0.0005				
γ 17	317.77 13	0.240 18	0.0016				

3 weak β 's omitted:
 $E\beta$ (avg) = 310.1; $\Sigma I\beta$ = 0.26%

(Continued)

¹⁰¹Mo-¹⁰³Ru

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
¹⁰¹ Mo β ⁻ Decay (14.61 m 7) (Continued)				β ⁻ 1 max 624 24			
γ 117	1184.19 23	0.200 18	0.0050	avg	201 10	1.2 4	0.0051
γ 118	1186.59 9	1.06 7	0.0267	β ⁻ 2 max	687 24		
γ 119	1199.87 8	1.79 11	0.0456	avg	225 10	0.82 5	0.0039
γ 120	1209.88 22	0.134 12	0.0035	β ⁻ 3 max	696 24		
γ 122	1249.4 5	0.27 6	0.0072	avg	229 10	0.309 19	0.0015
γ 123	1251.10 9	4.7 3	0.125	β ⁻ 4 max	782 24		
γ 124	1260.5 3	0.156 18	0.0042	avg	263 10	1.94 7	0.0109
γ 125	1286.26 17	0.146 10	0.0040	β ⁻ 5 max	905 24		
γ 126	1290.7 3	0.117 12	0.0032	avg	312 10	0.16 3	0.0011
γ 127	1293.29 17	0.213 15	0.0059	β ⁻ 6 max	1080 24		
γ 128	1304.03 9	2.84 17	0.0789	avg	385 11	6.5 3	0.0533
γ 131	1314.28 25	0.236 18	0.0066	β ⁻ 7 max	1318 24		
γ 133	1326.1 6	0.17 5	0.0049	avg	487 11	89 5	0.923
γ 134	1336.6 3	0.142 14	0.0040	total β ⁻		100 5	0.999
γ 135	1339.36 20	0.179 14	0.0051	avg	469 12		
γ 136	1346.12 11	0.88 6	0.0253	γ-ray L	2.56	0.10 4	≈0
γ 138	1355.99 11	1.71 12	0.0494	γ-ray Kα ₂	19.15040 2	0.43 3	0.0002
γ 139	1377.72 20	0.250 18	0.0073	γ-ray Kα ₁	19.27920 2	0.81 5	0.0003
γ 140	1380.4 8	0.109 18	0.0032	X-ray Kβ	21.7	0.249 16	0.0001
γ 141	1382.73 10	1.17 7	0.0345	γ 1	127.24 4	2.82 12	0.0076
γ 143	1394.91 13	0.62 4	0.0185	γ 2	179.57 5	0.58 3	0.0022
γ 144	1414.16 10	0.51 3	0.0154	γ 3	184.11 5	1.62 7	0.0063
γ 145	1418.54 9	0.89 5	0.0270	γ 4	233.71 7	0.275 15	0.0014
γ 147	1430.0 6	0.14 3	0.0043	γ 5	238.26 7	0.307 17	0.0016
γ 148	1432.05 25	0.37 4	0.0112	γ 8	306.81 5	88 5	0.577
γ 150	1440.85 15	0.161 11	0.0049	γ 9	311.5 3	0.140 22	0.0009
γ 152	1485.90 20	0.106 8	0.0033	γ 11	393.33 17	0.112 16	0.0009
γ 154	1514.10 22	0.190 14	0.0061	γ 13	515.95 25	0.109 14	0.0012
γ 155	1517.8 4	0.225 24	0.0073	γ 14	531.49 6	1.02 6	0.0116
γ 156	1520.4 5	0.24 4	0.0078	γ 15	545.14 6	6.0 3	0.0697
γ 157	1523.0 3	0.30 3	0.0096	γ 18	627.05 13	0.42 4	0.0055
γ 158	1526.6 5	0.115 22	0.0037	γ 21	694.7 3	1.1 4	0.0170
γ 159	1530.3 5	0.28 5	0.0091	γ 22	715.52 11	0.69 4	0.0105
γ 160	1532.45 8	6.0 6	0.194	γ 23	720.00 20	0.19 3	0.0028
γ 163	1548.68 24	0.154 14	0.0051	γ 25	842.79 10	0.230 14	0.0041
γ 165	1589.61 12	0.288 17	0.0098	γ 26	928.71 15	0.127 12	0.0025
γ 167	1599.22 8	1.79 11	0.0608	10 weak γ's omitted: E _γ (avg) = 617.8; ΣI _γ = 0.48%			
γ 174	1662.43 9	0.13 6	0.0048	● ¹⁰³ Ru β ⁻ Decay (39.35 d 5) I (min) = 0.10%			
γ 175	1662.43 9	0.56 12	0.0197	% Feeding to ¹⁰³ Rh (56.119 m) = 99.737 14			
γ 176	1673.81 8	1.73 11	0.0616	Auger-L	2.39	1.01 8	≈0
γ 177	1712.76 17	0.205 15	0.0075	Auger-K	17	0.21 4	≈0
γ 179	1754.84 12	0.355 21	0.0133	ce-K- 3	30.055 10	0.68 5	0.0004
γ 180	1759.69 9	0.36 20	0.0137	ce-K- 13	473.860 20	0.407 21	0.0041
γ 181	1759.69 9	0.63 18	0.0237	β ⁻ 1 max	113 4		
γ 182	1768.22 19	0.152 11	0.0057	avg	29.8 10	6.4 4	0.0041
γ 183	1840.21 9	0.17 8	0.0068	β ⁻ 2 max	226 4		
γ 184	1840.21 9	1.23 20	0.0482	avg	63.2 12	90 5	0.121
γ 193	2028.1 9	0.106 18	0.0046	β ⁻ 3 max	468 4		
γ 194	2032.04 10	7.1 4	0.307	avg	143.8 13	0.238 13	0.0007
γ 195	2038.4 5	0.22 3	0.0095	β ⁻ 4 max	723 4		
γ 196	2041.22 11	2.15 13	0.0935	avg	239.2 14	3.5	0.0178
γ 198	2088.82 12	0.81 8	0.0359	total β ⁻		100 5	0.144
γ 199	2112.77 25	0.15 3	0.0068	avg	67.4 13		
γ 200	2114.49 16	0.46 3	0.0208	3 weak β's omitted: E _β (avg) = 38.7; ΣI _β = 0.10%			
γ 203	2223.28 14	0.169 11	0.0080				
66 weak γ's omitted: E _γ (avg) = 1109.9; ΣI _γ = 4.05%							
● ¹⁰¹ Tc β ⁻ Decay (14.2 m 1) I (min) = 0.10%							
Auger-L	2.53	1.92 14	0.0001				
Auger-K	16.2	0.39 6	0.0001				
ce-K- 1	105.12 4	0.56 5	0.0012				
ce-K- 3	161.99 5	0.121 19	0.0004				
ce-K- 8	284.69 5	1.20 7	0.0073				
ce-L- 8	303.59 5	0.140 9	0.0009				

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)		
X-ray $K\alpha_2$	20.07370	2	0.251 16	0.0001	β^- 4 max	541 4			
X-ray $K\alpha_1$	20.21610	2	0.48 3	0.0002	avg	170.1 14	1.32 5		
X-ray $K\beta$	22.7		0.149 10	≈ 0	β^- 5 max	573 4			
γ 3	53.275	10	0.373 23	0.0004	avg	181.8 14	4.47 16		
γ 9	294.980	20	0.249 13	0.0016	β^- 6 max	596 4			
γ 12	443.800	20	0.320 16	0.0030	avg	190.7 14	0.500 25		
γ 13	497.080	20	89 5	0.941	β^- 7 max	703 4			
γ 15	557.040	20	0.83 5	0.0098	avg	231.1 15	0.113 12		
γ 17	610.330	20	5.6 4	0.0728	β^- 8 max	948 4			
13 weak γ 's omitted: E_γ (avg) = 486.9; ΣI_γ = 0.12%				β^- 8 avg				329.3 16	5.22 24
● ¹⁰³ Rh IT Decay (56.119 m 9) I (min) = 0.10%				β^- 9 max				1112 4	
Auger-L	2.39	76.6 16	0.0039	avg	397.5 16	20.0 8	0.169		
ce-K- 1	16.528	8	9.5 3	0.0034	β^- 10 max	1132 4			
Auger-K	17		1.8 3	0.0007	avg	406.0 16	18.1 5		
ce-L- 1	36.336	8	71.3 6	0.0552	β^- 11 max	1156 4			
ce-M- 1	39.121	8	14.4 4	0.0120	avg	416.2 16	0.29 3		
ce-NCP- 1	39.667	8	4.75 14	0.0040	β^- 12 max	1193 4			
X-ray L	2.7	4.0 13	0.0002	avg	432.2 16	49.9 20	0.459		
X-ray $K\alpha_2$	20.07370	2	2.20 11	0.0009	β^- 13 max	1525 4			
X-ray $K\alpha_1$	20.21610	2	4.18 20	0.0018	avg	576.8 17	0.5 4		
X-ray $K\beta$	22.7	1.30 7	0.0006	total β^-	397.7 17	101.2 23	0.857		
1 weak γ 's omitted: E_γ (avg) = 39.7; ΣI_γ = 0.07%				2 weak β 's omitted: E_β (avg) = 140.3; ΣI_β = 0.16%					
● ¹⁰³ Pd EC Decay (16.961 d 16) I (min) = 0.10%				X-ray $K\alpha_2$	20.07370	2	0.17 6	≈ 0	
% Feeding to ¹⁰³ Rh (56.119 m) = 99.9740 10				X-ray $K\alpha_1$	20.21610	2	0.32 10	0.0001	
Auger-L	2.39	91 6	0.0046	γ 5	85.9 3	0.320 20	0.0006		
Auger-K	17	17 3	0.0060	γ 13	149.20 20	1.67 5	0.0053		
X-ray L	2.7	4.8 16	0.0003	γ 14	163.60 20	0.140 7	0.0005		
X-ray $K\alpha_2$	20.07370	2	19.8 9	0.0085	γ 15	183.60 20	0.100 7		
X-ray $K\alpha_1$	20.21610	2	37.7 15	0.0162	γ 16	225.00 20	0.150 9		
X-ray $K\beta$	22.7	11.7 5	0.0057	γ 19	262.90 20	7.2 3	0.0403		
9 weak γ 's omitted: E_γ (avg) = 359.6; ΣI_γ = 0.03%				γ 20	316.50 20	11.7 4	0.0789		
● ¹⁰⁵ Ru β^- Decay (4.44 h 2) I (min) = 0.10%				γ 21	326.10 20	1.18 6	0.0082		
% Feeding to ¹⁰⁵ Rh (35.36 h) = 75.5 11				γ 22	330.90 20	0.79 4	0.0056		
% Feeding to ¹⁰⁵ Rh (45 s) = 24.5 11				γ 23	350 5	0.30 10	0.0022		
Auger-L	2.39	0.67 22	≈ 0	γ 24	350.20 20	1.10 10	0.0082		
Auger-K	17	0.14 5	≈ 0	γ 27	393.40 20	4.20 20	0.0352		
ce-K- 5	62.7 3	0.35 23	0.0005	γ 28	407.5 3	0.180 20	0.0016		
ce-K- 13	125.98 20	0.204 20	0.0005	γ 29	413.50 20	2.48 12	0.0218		
ce-K- 19	239.68 20	0.167 8	0.0009	γ 30	469.40 20	17.5 10	0.175		
β^- 1 max	220 4			γ 31	470 3	1.30 20	0.0130		
avg	61.3 12	0.108 9	0.0001	γ 32	489.60 20	0.59 3	0.0062		
β^- 2 max	431 4			γ 33	499.20 20	2.40 12	0.0255		
avg	130.8 13	0.340 17	0.0009	γ 34	500.4 4	0.30 5	0.0032		
β^- 3 max	476 9			γ 35	513.70 20	0.36 4	0.0039		
avg	147 4	0.20 5	0.0006	γ 36	539.2 3	0.13 4	0.0015		
				γ 38	575 5	0.13 5	0.0016		
				γ 39	575.30 20	1.07 5	0.0131		
				γ 42	632.30 20	0.230 20	0.0031		
				γ 43	638.60 20	0.28 3	0.0038		
				γ 44	652.60 20	0.350 20	0.0049		
				γ 45	656 8	0.20 5	0.0028		
				γ 46	656.10 20	2.40 9	0.0335		
				γ 47	676.40 20	16.7 7	0.241		
				γ 48	724.50 20	49.0 20	0.756		
				γ 52	822.10 20	0.190 10	0.0033		
				γ 53	845.90 20	0.73 3	0.0132		
				γ 54	875.80 20	3.40 14	0.0634		
				γ 56	907.70 20	0.59 3	0.0114		
				γ 58	969.40 20	2.34 9	0.0483		
				γ 59	1017.20 20	0.340 17	0.0074		
				γ 64	1321.10 20	0.230 10	0.0065		
30 weak γ 's omitted: E_γ (avg) = 707.4; ΣI_γ = 1.28%									

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
<p>• ¹⁰⁵Rh β⁻ Decay (35.36 h 5) I (min) = 0.10%</p>				<p>β⁻ 6 max 3541 9 avg 1509 5 78.7 7 2.53 total β⁻ avg 1411 5 100.0 10 3.01</p>			
Auger-L	2.5	0.38 4	≈0	33 weak β's omitted: Eβ(avg) = 404.7; ΣIβ = 0.42%			
ce-K- 1	14.42 7	0.136 25	≈0	γ 7	511.85 3	20.6 6	0.225
ce-K- 4	294.55 10	0.288 10	0.0018	γ 12	616.17 3	0.70 7	0.0092
β ⁻ 1 max	248 3			γ 13	621.84 10	9.8 5	0.130
avg	69.9 9	19.7 4	0.0293	γ 21	873.60 20	0.416 21	0.0077
β ⁻ 2 max	261 3			γ 25	1050.47 7	1.73 10	0.0387
avg	73.9 10	5.22 22	0.0082	γ 29	1128.02 7	0.396 15	0.0095
β ⁻ 3 max	567 3			γ 50	1562.20 6	0.157 12	0.0052
avg	179.4 11	75.0 5	0.287	101 weak γ's omitted: Eγ(avg) = 1357.0; ΣIγ = 0.58%			
total β ⁻	152.3 12	100.0 7	0.324				
1 weak β's omitted: Eβ(avg) = 33.0; ΣIβ = 0.04%							
X-ray Kα ₁	21.17710 2	0.188 14	≈0				
γ 2	280.10 20	0.167 10	0.0010				
γ 3	306.10 20	5.13 21	0.0334				
γ 4	318.90 10	19.2 3	0.130				
2 weak γ's omitted: Eγ(avg) = 294.9; ΣIγ = 0.06%							
• ¹⁰⁵ Rh IT Decay (45 s) I (min) = 0.10%				• ¹⁰⁶ Ag EC Decay (8.46 d 10) I (min) = 0.10%			
Feeds ¹⁰⁵ Rh (35.36 h)				Auger-L 2.5 89 6 0.0047			
Auger-L	2.39	70 4	0.0035	Auger-K 17.7 15 3 0.0058			
Auger-K	17	9.9 16	0.0036	ce-K- 3 197.351 15 0.251 11 0.0011			
ce-K- 1	106.35 8	51.2 7	0.116	ce-K- 9 381.832 20 0.129 4 0.0010			
ce-L- 1	126.16 8	23.0 5	0.0618	ce-K- 17 487.50 3 0.424 19 0.0044			
ce-M- 1	128.94 8	4.48 13	0.0123	X-ray L 2.84 5.3 19 0.0003			
ce-NCP- 1	129.49 8	7.77 23	0.0214	X-ray Kα ₂ 21.02010 2 20.0 8 0.0089			
X-ray L	2.7	3.7 12	0.0002	X-ray Kα ₁ 21.17710 2 37.9 15 0.0171			
X-ray Kα ₂	20.07370 2	11.8 6	0.0051	X-ray Kβ 23.8 12.0 5 0.0061			
X-ray Kα ₁	20.21610 2	22.5 10	0.0097	γ 2 195.07 5 0.31 5 0.0013			
X-ray Kβ	22.7	7.0 3	0.0034	γ 3 221.701 15 6.6 3 0.0311			
γ 1	129.57 8	20.4 5	0.0563	γ 4 228.633 21 2.10 10 0.0103			
• ¹⁰⁶ Ru β ⁻ Decay (368.2 d 12) I (min) = 0.10%				γ 5 328.463 23 1.14 6 0.0080			
Feeds ¹⁰⁶ Rh (29.92 s)				γ 7 374.46 13 0.26 4 0.0021			
β ⁻ 1 max	39.4 3			γ 8 391.04 3 3.68 18 0.0307			
avg	10.03 8	100	0.0214	γ 9 406.182 20 13.4 4 0.116			
• ¹⁰⁶ Rh β ⁻ Decay (29.92 s 23) I (min) = 0.10%				γ 10 418.55 23 0.33 7 0.0030			
β ⁻ 1 max	1540 9			γ 12 429.646 22 13.2 4 0.120			
avg	582 4	0.427 21	0.0053	γ 15 450.976 22 28.2 8 0.271			
β ⁻ 2 max	1979 9			γ 16 474.06 3 0.93 6 0.0094			
avg	780 5	1.92 10	0.0319	γ 17 511.85 3 88 3 0.956			
β ⁻ 3 max	2407 9			γ 19 585.97 10 0.44 10 0.0055			
avg	977 5	9.8 5	0.204	γ 20 601.17 7 1.61 9 0.0207			
β ⁻ 4 max	2413 9			γ 21 616.17 3 21.6 7 0.283			
avg	979 5	0.58 7	0.0121	γ 23 646.03 5 1.46 10 0.0200			
β ⁻ 5 max	3029 9			γ 24 680.19 10 2.18 8 0.0316			
avg	1267 5	8.2 4	0.221	γ 25 703.11 8 4.47 18 0.0670			
				γ 26 717.27 3 28.9 8 0.442			
				γ 27 748.36 11 20.6 7 0.329			
				γ 28 793.17 10 5.9 3 0.0993			
				γ 29 804.28 10 12.4 6 0.212			
				γ 30 808.36 11 4.0 5 0.0695			
				γ 31 824.69 7 15.3 5 0.270			
				γ 32 847.6 2.456 14 0.0443			
				γ 33 848.2 1.929 11 0.0349			
				γ 34 874.81 18 0.33 5 0.0062			
				γ 35 949.5 3 0.19 4 0.0039			
				γ 36 956.22 23 0.47 8 0.0096			
				γ 37 1019.72 15 1.04 16 0.0227			
				γ 38 1045.83 8 29.6 10 0.658			
				γ 39 1050.47 7 0.26 14 0.0059			
				γ 40 1053.77 21 0.96 14 0.0217			
				γ 42 1121.59 18 0.57 7 0.0136			
				γ 43 1128.02 7 11.8 6 0.282			
				γ 45 1136.85 19 0.23 3 0.0055			

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Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
γ 47	1178.07 21	0.19 3	0.0048	● ¹⁰⁸ Ag EC Decay (127 y 21) I (min) = 0.10%			
γ 48	1199.39 10	11.2 6	0.287	%EC Decay = 90.7 7			
γ 49	1222.88 12	7.0 4	0.183	See also ¹⁰⁸ Ag IT Decay (127 y)			
γ 50	1349.5 6	0.12 5	0.0035	Auger-L	2.5	81 5	0.0043
γ 51	1394.35 14	1.49 19	0.0443	Auger-K	17.7	14.1 24	0.0053
γ 54	1527.65 19	16.3 14	0.531	ce-K- 1	409.577 9	0.707 22	0.0062
γ 56	1565.4 3	0.48 5	0.0161	ce-K- 2	590.02 10	0.264 9	0.0033
γ 57	1572.35 15	6.6 6	0.220	ce-K- 3	698.60 8	0.172 6	0.0026
γ 59	1722.76 18	1.40 19	0.0515	X-ray L	2.84	4.8 17	0.0003
γ 62	1839.05 10	2.0 3	0.0790	X-ray Kα ₂	21.02010 2	18.2 8	0.0082
18 weak γ's omitted: E _γ (avg) = 1043.2; ΣI _γ = 0.63%				X-ray Kα ₁	21.17710 2	34.6 14	0.0156
● ¹⁰⁷ Pd β ⁻ Decay (6.5E6 y 3) I (min) = 0.10%				X-ray Kβ	23.8	11.0 5	0.0056
β ⁻ 1 max	33 3			γ 1	433.927 9	89.9 7	0.831
avg	9.3 10	100	0.0198	γ 2	614.37 10	90.4 7	1.18
● ¹⁰⁸ Ag EC Decay (2.37 m 1) I (min) = 0.10%				γ 3	722.95 8	90.5 7	1.39
%EC Decay = 2.3 3				● ¹⁰⁸ Ag IT Decay (127 y 21) I (min) = 0.10%			
See also ¹⁰⁸ Ag β ⁻ Decay (2.37 m)				%IT Decay = 9.3 7			
Auger-L	2.5	1.9 3	≈0	Feeds ¹⁰⁸ Ag (2.37 m)			
Auger-K	17.7	0.33 8	0.0001	See also ¹⁰⁸ Ag EC Decay (127 y)			
β ⁺ 1 max	899 7			Auger-L	2.6	8.5 6	0.0005
avg	400 3	0.22 5	0.0019	ce-K- 1	4.87 6	0.245 20	≈0
X-ray L	2.84	0.11 5	≈0	Auger-K	18.5	0.37 6	0.0001
X-ray Kα ₂	21.02010 2	0.43 8	0.0002	ce-L- 1	26.57 6	6.8 6	0.0038
X-ray Kα ₁	21.17710 2	0.81 15	0.0004	ce-MKO- 1	29.66 6	2.26 19	0.0014
X-ray Kβ	23.8	0.26 5	0.0001	ce-K- 2	53.69 5	1.93 16	0.0022
γ 3	433.927 9	0.51 10	0.0047	ce-L- 2	75.39 5	0.238 19	0.0004
γ 6	618.86 5	0.27 6	0.0035	X-ray L	3	0.57 20	≈0
10 weak γ's omitted: E _γ (avg) = 913.4; ΣI _γ = 0.03%				X-ray Kα ₂	21.9903 3	0.51 4	0.0002
Maximum γ _{intensity} = 0.44%				X-ray Kα ₁	22.16290 1	0.97 8	0.0005
● ¹⁰⁸ Ag β ⁻ Decay (2.37 m 1) I (min) = 0.10%				X-ray Kβ	24.9	0.314 25	0.0002
%β ⁻ Decay = 97.7 3				γ 2	79.20 5	7.1 6	0.0120
See also ¹⁰⁸ Ag EC Decay (2.37 m)				● ¹⁰⁹ Pd β ⁻ Decay (13.453 h 11) I (min) = 0.10%			
β ⁻ 1 max	1017 8			% Feeding to ¹⁰⁹ Ag (39.6 s) = 99.949 5			
avg	356 4	1.75 10	0.0133	β ⁻ 1 max	1027.9 20		
β ⁻ 2 max	1650 8			avg	361.0 9	99.879 17	0.768
avg	629 4	95.9 3	1.28	12 weak β's omitted: E _β (avg) = 139.9; ΣI _β = 0.11%			
total β ⁻	624 4	97.6 4	1.30	36 weak γ's omitted: E _γ (avg) = 508.6; ΣI _γ = 0.14%			
avg				● ¹⁰⁹ Ag IT Decay (39.6 s 2) I (min) = 0.10%			
γ 1	632.98 5	1.74 17	0.0235	Auger-L	2.6	79 3	0.0044
				Auger-K	18.5	7.1 11	0.0028
				ce-K- 1	62.5180 21	41.7 7	0.0555
				ce-L- 1	84.2262 21	44.0 7	0.0789
				ce-M- 1	87.3145 21	8.94 24	0.0166
				ce-NCP- 1	87.9368 21	1.60 5	0.0030

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¹⁰⁹Ag-¹¹¹Ag

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	
¹⁰⁹ Ag IT Decay (39.6 s 2) (Continued)				X-ray Kα ₂	21.9903	3 0.196 17	≈0	
X-ray L	3	5.3 18	0.0003	X-ray Kα ₁	22.16290	1 0.37 3	0.0002	
X-ray Kα ₂	21.9903	3 9.9 4	0.0046	X-ray Kβ	24.9	0.119 10	≈0	
X-ray Kα ₁	22.16290	1 18.7 7	0.0088	● ¹¹⁰ Ag β ⁻ Decay (249.85 d 8) I (min) = 0.10%				
X-ray Kβ	24.9	6.03 24	0.0032	%β ⁻ Decay = 98.67 10				
γ 1	88.0320	20 3.72 11	0.0070	See also ¹¹⁰ Ag IT Decay (249.85 d)				
● ¹⁰⁹ Cd EC Decay (464 d 1) I (min) = 0.10%				Auger-L	2.72	0.228 17	≈0	
Feeds ¹⁰⁹ Ag (39.6 s)				ce-K- 26	631.038	10 0.257 9	0.0035	
Auger-L	2.6	87 5	0.0048	β ⁻ 1 max	83.9 19			
Auger-K	18.5	13.4 20	0.0053	avg	21.8 6	67.3 4	0.0313	
X-ray L	3	5.8 20	0.0004	β ⁻ 2 max	133.8 19			
X-ray Kα ₂	21.9903	3 18.6 7	0.0087	avg	35.7 6	0.407 12	0.0003	
X-ray Kα ₁	22.16290	1 35.3 12	0.0166	β ⁻ 3 max	530.7 19			
X-ray Kβ	24.9	11.4 5	0.0060	avg	165.6 7	30.5 4	0.108	
● ¹¹⁰ Ag EC Decay (24.57 s 23) I (min) = 0.10%				total β ⁻	avg	66.6 14	98.4 6	0.140
%EC Decay = 0.30 6				5 weak β's omitted:				
See also ¹¹⁰ Ag β ⁻ Decay (24.57 s)				Eβ (avg) = 92.8; ΣIβ = 0.19%				
Auger-L	2.5	0.27 5	≈0	X-ray Kα ₁	23.17360	2 0.116 6	≈0	
X-ray Kα ₁	21.17710	2 0.115 24	≈0	γ 12	365.441	15 0.106 9	0.0008	
● ¹¹⁰ Ag β ⁻ Decay (24.57 s 23) I (min) = 0.10%				γ 17	446.797	8 3.64 4	0.0347	
%β ⁻ Decay = 99.70 6				γ 23	620.346	11 2.77 3	0.0365	
See also ¹¹⁰ Ag EC Decay (24.57 s)				γ 24	626.246	10 0.234 7	0.0031	
β ⁻ 1 max	2235.0 19			γ 26	657.749	10 94.4 10	1.32	
avg	894.1 9	4.42 22	0.0842	γ 27	676.60	10 0.142 19	0.0020	
β ⁻ 2 max	2892.8 19			γ 28	677.606	11 10.62 11	0.154	
avg	1199.3 9	95.19 23	2.43	γ 29	686.988	11 6.47 7	0.0946	
total β ⁻	avg	1185.1 9	99.7 4	2.52	γ 30	706.670	13 16.62 17	0.251
8 weak β's omitted:				Eβ (avg) = 406.8; ΣIβ = 0.09%				
γ 2	657.749	10 4.49 22	0.0629	γ 31	708.115	20 0.28 10	0.0043	
12 weak γ's omitted:				Eγ (avg) = 1046.0; ΣIγ = 0.10%				
● ¹¹⁰ Ag IT Decay (249.85 d 8) I (min) = 0.10%				γ 32	744.260	13 4.64 5	0.0736	
%IT Decay = 1.33 10				γ 33	763.928	13 22.28 23	0.362	
Feeds ¹¹⁰ Ag (24.57 s)				γ 35	818.016	12 7.30 8	0.127	
See also ¹¹⁰ Ag β ⁻ Decay (249.85 d)				γ 36	884.667	13 72.6 8	1.37	
ce-MNO- 1	0.56 10	1.33 10	≈0	γ 37	937.478	13 34.2 4	0.682	
Auger-L	2.6	1.11 8	≈0	γ 39	997.233	18 0.125 5	0.0026	
Auger-K	18.5	0.140 24	≈0	γ 49	1334.304	17 0.132 10	0.0038	
ce-K- 2	90.97 5	0.83 7	0.0016	γ 50	1384.270	13 24.26 25	0.715	
ce-L- 2	112.67 5	0.39 3	0.0009	γ 52	1475.759	22 3.97 4	0.125	
				γ 53	1505.001	21 13.06 14	0.419	
				γ 54	1562.266	22 1.180 13	0.0393	
				40 weak γ's omitted:				
				Eγ (avg) = 734.5; ΣIγ = 0.91%				
				● ¹¹¹ Ag β ⁻ Decay (7.46 d 1) I (min) = 0.10%				
				ce-K- 4	315.419	20 0.102 6	0.0007	
				β ⁻ 1 max	686 3			
				avg	223.5 12	7.0 4	0.0333	
				β ⁻ 2 max	783 3			
				avg	278.9 12	1.10 7	0.0065	
				β ⁻ 3 max	1028 3			
				avg	360.4 13	91.9 4	0.705	
				total β ⁻	avg	349.8 13	100.1 6	0.745
				3 weak β's omitted:				
				Eβ (avg) = 67.8; ΣIβ = 0.06%				

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Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
γ 1	96.750 20	0.120 15	0.0002	● ¹¹³ In IT Decay (1.658 h 1) I (min) = 0.10%			
γ 2	245.390 20	1.23 7	0.0064	Auger-L	2.84	29.7 19	0.0018
γ 4	342.130 20	6.7 4	0.0487	Auger-K	20	4.2 9	0.0018
8 weak γ 's omitted: E γ (avg) = 654.7; $\Sigma I\gamma$ = 0.06%				ce-K- 1	363.748 15	28.2 6	0.218
● ¹¹¹ Cd IT Decay (48.7 m 2) I (min) = 0.10%				ce-L- 1	387.450 15	5.48 16	0.0452
Auger-L	2.72	63 4	0.0037	ce-M- 1	390.862 15	1.11 3	0.0092
Auger-K	19.3	7.8 15	0.0032	ce-NCP- 1	391.566 15	0.245 7	0.0020
ce-K- 1	124.10 3	43.8 7	0.116	X-ray L	3.29	2.3 8	0.0002
ce-L- 1	146.79 3	20.4 5	0.0638	X-ray K α_2	24.00200 2	6.8 3	0.0035
ce-M- 1	150.04 3	4.13 12	0.0132	X-ray K α_1	24.20970 2	12.9 6	0.0066
ce-NCP- 1	150.70 3	0.778 23	0.0025	X-ray K β	27.3	4.27 19	0.0025
ce-K- 2	218.679 20	5.03 14	0.0234	γ 1	391.688 15	64.9 7	0.541
ce-L- 2	241.372 20	0.785 23	0.0040	● ¹¹³ Sn EC Decay (115.1 d 3) I (min) = 0.10%			
ce-MNO- 2	244.620 20	0.182 5	0.0009	% Feeding to ¹¹³ In (1.658 h) = 99.999996 2			
X-ray L	3.13	4.5 15	0.0003	Auger-L	2.84	85 6	0.0052
X-ray K α_2	22.98410 2	11.7 5	0.0057	Auger-K	20	12.8 25	0.0055
X-ray K α_1	23.17360 2	22.1 9	0.0109	X-ray L	3.29	6.7 23	0.0005
X-ray K β	26	7.2 3	0.0040	X-ray K α_2	24.00200 2	20.7 8	0.0106
γ 1	150.81 3	30.9 7	0.0993	X-ray K α_1	24.20970 2	39.0 14	0.0201
γ 2	245.390 20	94.00 17	0.491	X-ray K β	27.3	12.9 5	0.0075
● ¹¹¹ In EC Decay (2.83 d 1) I (min) = 0.10%				γ 1	255.120 20	1.93 10	0.0105
Auger-L	2.72	100 6	0.0058	● ¹¹⁴ In EC Decay (71.9 s 1) I (min) = 0.10%			
Auger-K	19.3	16 3	0.0065	%EC Decay = 0.54 10			
ce-K- 2	144.57 3	8.41 23	0.0259	See also ¹¹⁴ In β^- Decay (71.9 s)			
ce-L- 2	167.26 3	1.05 3	0.0037	Auger-L	2.72	0.82 10	\approx 0
ce-MNO- 2	170.51 3	0.245 7	0.0009	Auger-K	19.3	0.13 3	\approx 0
ce-K- 3	218.679 20	5.04 16	0.0235	X-ray K α_2	22.98410 2	0.195 22	\approx 0
ce-L- 3	241.372 20	0.785 24	0.0040	X-ray K α_1	23.17360 2	0.37 4	0.0002
ce-MNO- 3	244.620 20	0.181	0.0009	X-ray K β	26	0.120 14	\approx 0
X-ray L	3.13	7.1 24	0.0005	2 weak γ 's omitted: E γ (avg) = 567.1; $\Sigma I\gamma$ = 0.01%			
X-ray K α_2	22.98410 2	23.6 9	0.0116	● ¹¹⁴ In β^- Decay (71.9 s 1) I (min) = 0.10%			
X-ray K α_1	23.17360 2	44.6 16	0.0220	% β^- Decay = 99.46 10			
X-ray K β	26	14.6 6	0.0081	See also ¹¹⁴ In EC Decay (71.9 s)			
γ 2	171.28 3	90.2 4	0.329	β^- 1 max	685 3		
γ 3	245.390 20	94.00 17	0.491	avg	222.3 11	0.199 12	0.0009
● ¹¹³ Cd β^- Decay (9.3E15 y 19) I (min) = 0.10%				β^- 2 max	1985 3		
β^- 1 max	322 5			avg	776.9 13	99.26 10	1.64
avg	93.3 17	100	0.199	total β^- avg	775.8 13	99.46 10	1.64
● ¹¹³ Cd β^- Decay (13.7 y 4) I (min) = 0.10%				γ 1	1299.83 7	0.199 14	0.0055
% β^- Decay = 99.977							
%IT Decay = 0.023							
β^- 1 max	586 5						
avg	185.4 19	100	0.395				

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
<p>• ¹¹⁴In EC Decay (49.51 d 1) I (min) = 0.10% %EC Decay = 4.5 3 See also ¹¹⁴In IT Decay (49.51 d)</p>				<p>γ 10 492.351 4 8.5 3 0.0893 γ 11 527.901 7 29.1 11 0.328</p> <p>12 weak γ's omitted: E_γ(avg) = 296.9; ΣI_γ = 0.11%</p>			
Auger-L	2.72	3.9 4	0.0002				
Auger-K	19.3	0.61 12	0.0003				
X-ray L	3.13	0.28 10	≈0				
X-ray Kα ₂	22.98410 2	0.91 7	0.0004				
X-ray Kα ₁	23.17360 2	1.73 13	0.0009				
X-ray Kβ	26	0.56 5	0.0003				
γ 1	558.43 3	4.5 3	0.0533				
γ 2	725.24 3	4.5 3	0.0693				
<p>• ¹¹⁴In IT Decay (49.51 d 1) I (min) = 0.10% %IT Decay = 95.5 3 Feeds ¹¹⁴In (71.9 s) See also ¹¹⁴In EC Decay (49.51 d)</p>				<p>• ¹¹⁵Cd β⁻ Decay (44.6 d 2) I (min) = 0.10% % Feeding to ¹¹⁵In (4.6E15 y) = 99.993</p>			
Auger-L	2.84	64 3	0.0039	β ⁻ 1 max	202.7 21		
Auger-K	20	6.0 12	0.0026	avg	55.8 6	0.196 4	0.0002
ce-K- 1	162.33 3	39.9 7	0.138	β ⁻ 2 max	330.4 21		
ce-L- 1	186.03 3	31.7 7	0.126	avg	96.0 7	0.605 15	0.0012
ce-M- 1	189.44 3	6.65 19	0.0268	β ⁻ 3 max	687.2 21		
ce-NCP- 1	190.15 3	1.34 4	0.0054	avg	241.7 8	1.145 6	0.0059
X-ray L	3.29	5.1 17	0.0004	β ⁻ 4 max	1621.0 21		
X-ray Kα ₂	24.00200 2	9.7 4	0.0049	avg	615.0 9	98	1.28
X-ray Kα ₁	24.20970 2	18.2 8	0.0094	total β ⁻			
X-ray Kβ	27.3	6.1 3	0.0035	avg	606.2 10	100.002 17	1.29
γ 1	190.27 3	15.9 4	0.0646	<p>4 weak β's omitted: E_β(avg) = 124.7; ΣI_β = 0.06%</p>			
<p>• ¹¹⁵Cd β⁻ Decay (53.46 h 8) I (min) = 0.10% % Feeding to ¹¹⁵In (4.36 h) = 99.99993 1</p>				<p>γ 11 484.471 15 0.193 4 0.0020 γ 17 933.838 4 1.330 4 0.0265 γ 21 1290.585 11 0.592 15 0.0163</p> <p>22 weak γ's omitted: E_γ(avg) = 932.7; ΣI_γ = 0.10%</p>			
Auger-L	2.84	4.6 3	0.0003	<p>• ¹¹⁵In β⁻ Decay (4.6E15 y 3) I (min) = 0.10%</p>			
ce-K- 1	7.574 3	4.14 15	0.0007	β ⁻ 1 max	495 8		
Auger-K	20	0.62 13	0.0003	avg	152 3	100	0.324
ce-L- 1	31.276 3	1.04 7	0.0007	<p>• ¹¹⁵In IT Decay (4.36 h 10) I (min) = 0.10% %IT Decay = 96.3 8 Feeds ¹¹⁵In (4.6E15 y) See also ¹¹⁵In β⁻ Decay (4.36 h)</p>			
ce-MO- 1	34.688 3	0.272 21	0.0002	Auger-L	2.84	42 3	0.0025
β ⁻ 1 max	583.4 20			Auger-K	20	5.9 12	0.0025
avg	184.6 8	35.2 12	0.138	ce-K- 1	308.361 3	39.2 8	0.257
β ⁻ 2 max	618.9 20			ce-L- 1	332.063 3	8.27 25	0.0585
avg	197.8 8	3.4 3	0.0143	ce-M- 1	335.475 3	1.69 5	0.0120
β ⁻ 3 max	850.4 20			ce-NCP- 1	336.179 3	0.373 12	0.0027
avg	287.5 8	1.25 7	0.0077	X-ray L	3.29	3.3 11	0.0002
β ⁻ 4 max	1111.3 20			X-ray Kα ₂	24.00200 2	9.5 4	0.0049
avg	394.4 9	60.1 12	0.505	X-ray Kα ₁	24.20970 2	17.9 8	0.0092
total β ⁻				X-ray Kβ	27.3	5.9 3	0.0035
avg	312.5 10	100.0 18	0.665	γ 1	336.301 3	46.7 8	0.335
<p>3 weak β's omitted: E_β(avg) = 70.4; ΣI_β = 0.02%</p>							
X-ray L	3.29	0.36 12	≈0				
X-ray Kα ₂	24.00200 2	1.00 6	0.0005				
X-ray Kα ₁	24.20970 2	1.89 10	0.0010				
X-ray Kβ	27.3	0.63 4	0.0004				
γ 1	35.514 3	0.446 16	0.0003				
γ 2	231.443 3	0.78 3	0.0039				
γ 4	260.896 3	2.06 8	0.0114				

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
● ¹¹⁵ In β ⁻ Decay (4.36 h 10) I (min) = 0.10%			
%β ⁻ Decay = 3.7 8			
See also ¹¹⁵ In IT Decay (4.36 h)			
β ⁻ 1 max	861 8		
avg	291 4	3.6 8	0.0223
1 weak β's omitted: Eβ(avg) = 107.0; ΣIβ = 0.05%			
1 weak γ's omitted: Eγ(avg) = 497.4; ΣIγ = 0.05%			
● ¹¹⁶ In β ⁻ Decay (54.15 m 6) I (min) = 0.10%			
Auger-L	3	1.13 10	≈0
Auger-K	21	0.16 4	≈0
ce-K- 5	109.126 8	0.86 8	0.0020
ce-L- 5	133.861 8	0.152 18	0.0004
ce-K- 15	387.79 4	0.297 18	0.0025
β ⁻ 1 max	304 8		
avg	87 3	0.36 4	0.0007
β ⁻ 2 max	354 8		
avg	104 3	2.69 13	0.0060
β ⁻ 3 max	395 8		
avg	118 3	0.44 6	0.0011
β ⁻ 4 max	599 8		
avg	190 3	10.2 5	0.0413
β ⁻ 5 max	871 8		
avg	295 4	32.8 14	0.206
β ⁻ 6 max	1009 8		
avg	351 4	50.8 20	0.380
total β ⁻			
avg	306 4	97.4 25	0.636
1 weak β's omitted: Eβ(avg) = 416.0; ΣIβ = 0.07%			
X-ray Kα ₂	25.04400 2	0.284 22	0.0002
X-ray Kα ₁	25.27130 2	0.53 4	0.0003
X-ray Kβ	28.5	0.180 14	0.0001
γ 5	138.326 8	3.30 17	0.0097
γ 9	262.95 8	0.144 17	0.0008
γ 12	303.80 7	0.118 17	0.0008
γ 14	355.36 4	0.84 6	0.0064
γ 15	416.99 4	27.8 14	0.247
γ 18	463.31 10	0.84 6	0.0083
γ 27	689.0 3	0.194 17	0.0029
γ 28	705.7 3	0.19 3	0.0028
γ 31	779.5 8	0.27 5	0.0045
γ 32	781.1 8	0.110 21	0.0018
γ 33	818.67 8	11.6 6	0.202
γ 37	972.550 25	0.46 4	0.0095
γ 39	1097.21 18	55.3 20	1.29
γ 42	1293.54 4	84.5 6	2.33
γ 44	1507.57 5	9.9 5	0.317
γ 46	1752.39 10	2.39 12	0.0893
γ 48	2112.30 8	15.4 7	0.692
32 weak γ's omitted: Eγ(avg) = 707.4; ΣIγ = 1.34%			

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
● ¹¹⁷ Cd β ⁻ Decay (2.49 h 4) I (min) = 0.10%			
% Feeding to ¹¹⁷ In (43.8 m) = 8.3 4			
% Feeding to ¹¹⁷ In (116.5 m) = 91.7 4			
Auger-L	2.84	7.3 6	0.0004
Auger-K	20	0.96 20	0.0004
ce-K- 1	43.180 20	0.155 23	0.0001
ce-K- 2	61.790 10	5.3 4	0.0070
ce-L- 2	85.492 10	1.62 12	0.0031
ce-MNO- 2	88.904 10	0.40 3	0.0008
ce-K- 12	245.409 18	0.95 15	0.0050
ce-L- 12	269.111 18	0.13 4	0.0008
β ⁻ 1 max	72 14		
avg	19 4	0.11 4	≈0
β ⁻ 2 max	183 14		
avg	50 5	0.35 9	0.0004
β ⁻ 3 max	200 14		
avg	55 5	0.40 7	0.0005
β ⁻ 4 max	216 14		
avg	60 5	6.6 3	0.0084
β ⁻ 5 max	356 14		
avg	105 5	1.87 15	0.0042
β ⁻ 6 max	415 14		
avg	125 5	0.13 9	0.0003
β ⁻ 7 max	418 14		
avg	126 5	1.64 13	0.0044
β ⁻ 8 max	464 14		
avg	141 5	1.49 13	0.0045
β ⁻ 9 max	506 14		
avg	156 5	2.15 15	0.0071
β ⁻ 10 max	531 14		
avg	165 5	8.2 4	0.0288
β ⁻ 11 max	636 14		
avg	204 6	32.2 11	0.140
β ⁻ 12 max	743 14		
avg	245 6	0.55 9	0.0029
β ⁻ 13 max	815 14		
avg	274 6	3.37 24	0.0197
β ⁻ 14 max	916 14		
avg	314 6	0.34 11	0.0023
β ⁻ 15 max	919 14		
avg	315 6	0.36 22	0.0024
β ⁻ 16 max	974 14		
avg	337 6	0.11 7	0.0008
β ⁻ 17 max	1089 14		
avg	385 6	0.12 4	0.0010
β ⁻ 18 max	1152 14		
avg	411 6	0.30 5	0.0026
β ⁻ 19 max	1779 14		
avg	685 7	13.0 9	0.190
β ⁻ 20 max	1868 14		
avg	726 7	1.7 8	0.0263
β ⁻ 21 max	1939 14		
avg	758 7	4.1 5	0.0662
β ⁻ 22 max	2213 14		
avg	882 7	21.0 20	0.395
total β ⁻			
avg	425 11	100 3	0.907
X-ray L	3.29	0.57 20	≈0
X-ray Kα ₂	24.00200 2	1.55 11	0.0008
X-ray Kα ₁	24.20970 2	2.92 21	0.0015
X-ray Kβ	27.3	0.97 7	0.0006
γ 1	71.120 20	0.39 6	0.0006
γ 2	89.730 10	3.26 22	0.0062
γ 6	160.8 3	0.25 12	0.0009
γ 10	220.92 3	1.17 9	0.0055
γ 12	273.349 18	27.9 8	0.162
γ 14	279.80 10	0.11 6	0.0007

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
¹¹⁷ Cd β^- Decay (2.49 h 4) (Continued)				• ¹¹⁷ Cd β^- Decay (3.36 h 5) I (min) = 0.10% % Feeding to ¹¹⁷ In (43.8 m) = 98.5 2 % Feeding to ¹¹⁷ In (116.5 m) = 1.5 2			
γ 16	292.05 3	0.64 9	0.0040	Auger-L	2.84	1.0 5	\approx 0
γ 20	344.459 10	17.9 7	0.131	Auger-K	20	0.14 7	\approx 0
γ 22	387.96 4	0.31 6	0.0025	ce-K- 3	69.76 4	0.9 5	0.0014
γ 23	397.20 10	0.20 6	0.0017	ce-L- 3	93.46 4	0.22 16	0.0004
γ 25	419.79 4	0.18 4	0.0016	β^- 1 max	124 14		
γ 26	434.190 17	9.8 5	0.0906	avg	33 4	0.23 6	0.0002
γ 27	439.39 7	0.11 6	0.0010	β^- 2 max	188 14		
γ 29	463.04 3	0.75 6	0.0074	avg	51 5	0.24 4	0.0003
γ 30	497.77 10	0.11 6	0.0012	β^- 3 max	202 14		
γ 33	527.0 5	0.14 6	0.0016	avg	56 5	0.212 24	0.0003
γ 35	627.01 11	0.11 3	0.0015	β^- 4 max	247 14		
γ 37	660.83 8	0.11 3	0.0016	avg	69 5	1.70 11	0.0025
γ 39	699.58 8	0.24 4	0.0036	β^- 5 max	259 14		
γ 40	712.71 5	0.56 17	0.0085	avg	73 5	3.7 4	0.0058
γ 41	716.43 7	0.20 4	0.0031	β^- 6 max	264 14		
γ 42	728.64 7	0.24 4	0.0037	avg	75 5	1.23 11	0.0020
γ 44	748.06 3	0.56 20	0.0089	β^- 7 max	342 14		
γ 47	831.80 3	2.26 11	0.0400	avg	100 5	8.6 3	0.0183
γ 48	840.21 4	0.81 6	0.0145	β^- 8 max	568 14		
γ 49	850.72 8	0.12 4	0.0022	avg	179 6	8.34 24	0.0318
γ 50	861.3 4	0.28 20	0.0051	β^- 9 max	569 14		
γ 51	862.60 5	0.61 6	0.0113	avg	179 6	21.6 9	0.0824
γ 52	880.710 17	3.96 23	0.0743	β^- 10 max	667 14		
γ 53	945.67 3	1.53 10	0.0309	avg	216 6	46.9 13	0.216
γ 54	949.63 8	0.22 4	0.0045	β^- 11 max	707 14		
γ 55	952.33 8	0.14 4	0.0028	avg	231 6	1.02 16	0.0050
γ 56	963.11 6	0.61 6	0.0126	β^- 12 max	1231 14		
γ 59	969.30 5	0.45 6	0.0092	avg	445 6	1.5 9	0.0142
γ 65	1035.61 7	0.24 4	0.0053	β^- 13 max	1430 14		
γ 67	1051.70 10	3.79 23	0.0850	avg	531 7	0.9 5	0.0102
γ 68	1052.70 10	0.73 17	0.0163	β^- 14 max	1455 14		
γ 70	1116.60 5	1.03 7	0.0246	avg	542 7	0.47 24	0.0054
γ 71	1120.05 7	0.24 4	0.0057	β^- 15 max	1598 14		
γ 72	1125.10 6	0.45 6	0.0107	avg	605 7	1.4 8	0.0180
γ 73	1142.43 3	1.67 13	0.0407	β^- 16 max	1916 14		
γ 74	1143.5 3	0.14 6	0.0034	avg	750 7	1.2 11	0.0192
γ 75	1183.40 10	0.13 4	0.0033	total β^-	204 7	99.2 25	0.431
γ 76	1229.11 7	0.61 6	0.0161	X-ray $K\alpha_2$	24.00200 2	0.23 11	0.0001
γ 77	1232.30 20	0.28 6	0.0073	X-ray $K\alpha_1$	24.20970 2	0.43 20	0.0002
γ 78	1247.89 4	1.20 7	0.0319	X-ray $K\beta$	27.3	0.14 7	\approx 0
γ 80	1260.00 3	1.14 7	0.0307	γ 3	97.70 4	1.05 14	0.0022
γ 81	1272.73 3	0.73 6	0.0197	γ 4	99.40 10	0.10 6	0.0002
γ 83	1291.00 4	0.67 6	0.0184	γ 9	168.63 5	0.29 6	0.0010
γ 84	1294.3 3	0.446 13	0.0123	γ 11	220.92 3	0.24 16	0.0011
γ 85	1303.27 3	18.4 7	0.510	γ 12	273.349 18	0.29 14	0.0017
γ 86	1314.71 6	0.59 6	0.0164	γ 13	292.05 3	0.10 11	0.0007
γ 89	1337.57 7	1.62 12	0.0461	γ 14	299.45 10	0.45 8	0.0028
γ 90	1362.40 8	0.24 4	0.0070	γ 15	310.26 15	0.50 11	0.0033
γ 91	1404.40 10	0.12 3	0.0036	γ 18	325.30 20	0.13 6	0.0009
γ 92	1408.72 3	1.28 7	0.0385	γ 19	344.459 10	0.26 16	0.0019
γ 93	1422.27 6	0.33 6	0.0101	γ 20	366.91 3	3.33 24	0.0260
γ 94	1430.97 5	0.98 7	0.0298	γ 24	439.39 7	0.18 8	0.0017
γ 95	1433.50 20	0.11 9	0.0034	γ 26	460.94 4	1.62 14	0.0159
γ 96	1450.15 7	0.61 6	0.0190	γ 28	484.79 3	1.02 14	0.0106
γ 98	1475.46 7	0.42 6	0.0132	γ 30	545.0 4	0.16 8	0.0018
γ 101	1562.24 4	1.42 7	0.0473	γ 31	564.397 16	14.7 8	0.0176
γ 103	1576.62 3	11.2 4	0.376	γ 32	597.34 20	0.131 1	0.0017
γ 104	1578.4 3	0.14 6	0.0047	γ 33	617.50 7	0.34 8	0.0045
γ 108	1652.10 20	0.28 12	0.0098	γ 34	627.26 15	0.236 3	0.0032
γ 109	1682.07 5	0.70 6	0.0250	γ 35	631.80 4	2.80 19	0.0377
γ 111	1706.93 4	1.00 7	0.0365	γ 36	663.50 6	0.68 8	0.0096
γ 112	1723.06 3	2.01 11	0.0737	γ 38	712.71 5	1.00 14	0.0151
γ 113	1739.13 9	0.13 4	0.0047	γ 39	730.8 4	0.104 1	0.0016
γ 116	1856.40 10	0.25 6	0.0099				
γ 117	1867.30 10	0.11 3	0.0042				
γ 118	2012.49 8	0.109 23	0.0047				

47 weak γ 's omitted:
 $E_{\gamma}(\text{avg}) = 959.7; \Sigma I_{\gamma} = 2.12\%$

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
γ 40	748.06 3	4.5 11	0.0710	● ¹¹⁷ In IT Decay (116.5 m 7) I (min) = 0.10%			
γ 41	762.72 4	1.73 14	0.0281	%IT Decay = 47.1 15			
γ 42	788.16 13	0.50 11	0.0084	Feeds ¹¹⁷ In (43.8 m)			
γ 43	827.60 10	0.26 8	0.0046	See also ¹¹⁷ In β ⁻ Decay (116.5 m)			
γ 44	860.41 4	7.9 3	0.145	Auger-L	2.84	23.3 16	0.0014
γ 45	880.710 17	0.7 3	0.0133	Auger-K	20	3.3 7	0.0014
γ 46	886.00 10	0.39 8	0.0074	ce-K- 1	287.362 13	21.7 8	0.133
γ 48	929.30 10	0.79 14	0.0156	ce-L- 1	311.064 13	4.76 21	0.0315
γ 49	931.37 4	3.64 24	0.0722	ce-M- 1	314.476 13	0.97 5	0.0065
γ 50	957.20 10	0.39 11	0.0080	ce-NCP- 1	315.180 13	0.215 10	0.0014
γ 52	1029.06 3	11.7 4	0.256	X-ray L	3.29	1.8 7	0.0001
γ 54	1065.98 3	23.1 6	0.523	X-ray Kα ₂	24.00200 2	5.3 3	0.0027
γ 55	1170.71 10	0.65 14	0.0163	X-ray Kα ₁	24.20970 2	9.9 5	0.0051
γ 56	1196.20 10	0.39 11	0.0100	X-ray Kβ	27.3	3.29 18	0.0019
γ 57	1205.5 3	0.13 4	0.0034	γ 1	315.302 13	19.5 7	0.131
γ 59	1209.0 4	0.13 8	0.0034	● ¹¹⁷ In β ⁻ Decay (116.5 m 7) I (min) = 0.10%			
γ 60	1209.0 4	0.18 8	0.0047	%β ⁻ Decay = 52.9 15			
γ 61	1234.59 3	11.0 4	0.289	See also ¹¹⁷ In IT Decay (116.5 m)			
γ 62	1256.90 20	0.18 8	0.0049	Auger-L	3	2.08 24	0.0001
γ 63	1339.3 5	2.07 24	0.0590	Auger-K	21	0.30 7	0.0001
γ 64	1365.54 5	1.65 11	0.0480	ce-K- 1	129.362 15	2.14 24	0.0059
γ 66	1432.91 3	13.4 4	0.410	ce-L- 1	154.097 15	0.27 3	0.0009
γ 68	1652.24 11	0.47 11	0.0166	β ⁻ 1 max	1612 8		
γ 69	1669.5 3	0.63 8	0.0224	β ⁻ 1 avg	610 4	18.3 19	0.238
γ 70	1957.50 20	0.16 4	0.0066	β ⁻ 2 max	1770 8		
γ 71	1997.33 3	26.2 3	1.11	β ⁻ 2 avg	680 4	34.5 25	0.500
γ 72	2096.40 4	7.44 18	0.332	total β ⁻	avg	655 4	53 4
γ 73	2322.75 8	7.86 21	0.389	avg			0.738
γ 74	2400.45 16	0.76 6	0.0388	2 weak β's omitted: Eβ (avg) = 249.4; ΣIβ = 0.03%			
γ 76	2417.40 10	1.02 6	0.0526	X-ray L	3.44	0.18 7	≈0
γ 78	2462.5 3	0.212 24	0.0111	X-ray Kα ₂	25.04400 2	0.52 6	0.0003
γ 79	2476.20 20	0.186 19	0.0098	X-ray Kα ₁	25.27130 2	0.98 12	0.0005
γ 80	2540.73 14	0.149 19	0.0081	X-ray Kβ	28.5	0.33 4	0.0002
				γ 1	158.562 15	15.9 17	0.0536
				4 weak γ's omitted: Eγ (avg) = 918.6; ΣIγ = 0.03%			
24 weak γ's omitted: Eγ (avg) = 865.4; ΣIγ = 0.71%				● ¹¹⁷ In β ⁻ Decay (43.8 m 7) I (min) = 0.10%			
% Feeding to ¹¹⁷ Sn (13.60 d) = 0.32				● ¹¹⁷ Sn IT Decay (13.60 d 4) I (min) = 0.10%			
Auger-L	3	11.7 7	0.0007	Auger-L	3	91 5	0.0057
Auger-K	21	1.7 4	0.0008	Auger-K	21	10.8 22	0.0048
ce-K- 2	129.362 15	11.6 3	0.0320	ce-K- 1	126.82 3	64.8 7	0.175
ce-L- 2	154.097 15	1.47 4	0.0048	ce-K- 2	129.362 15	11.7 3	0.0322
ce-MNO- 2	157.678 15	0.352 11	0.0012	ce-L- 1	151.56 3	26.1 6	0.0843
ce-K- 4	523.80 10	0.48 5	0.0053	ce-L- 2	154.097 15	1.48 4	0.0049
β ⁻ 1 max	743 8			ce-M- 1	155.14 3	5.64 16	0.0186
β ⁻ 1 avg	245 4	99.83	0.521	ce-NCP- 1	155.88 3	1.35 4	0.0045
β ⁻ 2 max	1140 8			ce-MNO- 2	157.678 15	0.354 11	0.0012
β ⁻ 2 avg	406 4	0.17	0.0015	(Continued)			
total β ⁻	avg	245 4	100	0.522			
X-ray L	3.44	1.0 4	≈0				
X-ray Kα ₂	25.04400 2	2.96 13	0.0016				
X-ray Kα ₁	25.27130 2	5.55 24	0.0030				
X-ray Kβ	28.5	1.87 9	0.0011				
γ 2	158.562 15	86 9	0.292				
γ 3	396.6 4	0.14 4	0.0012				
γ 4	553.00 10	99 10	1.17				

¹¹⁷Sn-¹²¹Te

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
¹¹⁷Sn IT Decay (13.60 d 4) (Continued)				ce-K- 2 35.057 13 0.49 3 0.0004			
γ-ray L	3.44	8 3	0.0006	ce-K- 4	477.100 11	0.127 3	0.0013
γ-ray Kα ₂	25.04400 2	18.7 7	0.0100	ce-K- 5	542.648 11	0.367 14	0.0042
γ-ray Kα ₁	25.27130 2	35.1 13	0.0189	γ-ray L	3.6	8 3	0.0006
γ-ray Kβ	28.5	11.8 5	0.0072	γ-ray Kα ₂	26.11080 2	21.4 8	0.0119
γ 1	156.02 3	2.11 6	0.0070	γ-ray Kα ₁	26.35910 2	40.2 14	0.0225
γ 2	158.562 15	86.4 4	0.292	γ-ray Kβ	29.7	13.7 6	0.0087
● ¹¹⁷Sb EC Decay (2.80 h 1) I (min) = 0.10%				γ 1 37.138 10 0.117 4 ≈0			
Auger-L	3	94 6	0.0059	γ 2 65.548 13	0.259 9	0.0004	
Auger-K	21	14 3	0.0061	γ 3 470.472 13	1.41 4	0.0141	
ce-K- 2	129.362 15	11.6 4	0.0320	γ 4 507.591 11	17.7 4	0.191	
ce-L- 2	154.097 15	1.47 5	0.0048	γ 5 573.139 11	80.3 18	0.980	
ce-MNO- 2	157.678 15	0.353 1	0.0012	● ¹²¹Te EC Decay (154 d 7) I (min) = 0.10%			
β ⁺ 1 max	564 18			%EC Decay = 11.4 11			
avg	258 8	1.70 22	0.0093	See also ¹²¹ Te IT Decay (154 d)			
γ-ray L	3.44	8 3	0.0006	Auger-L	3	18.0 19	0.0012
γ-ray Kα ₂	25.04400 2	23.5 9	0.0125	ce-K- 1	6.647 10	9.0 13	0.0013
γ-ray Kα ₁	25.27130 2	44.1 16	0.0237	Auger-K	21.8	2.5 6	0.0011
γ-ray Kβ	28.5	14.9 6	0.0090	ce-L- 1	32.440 10	1.17 17	0.0008
γ 2	158.562 15	86.1 4	0.291	ce-MNO- 1	36.194 10	0.31 5	0.0002
γ 6	861.35 5	0.31 4	0.0057	γ-ray L	3.6	1.7 6	0.0001
γ 7	1004.51 15	0.21 3	0.0044	γ-ray Kα ₂	26.11080 2	4.6 5	0.0026
γ 8	1020.6 5	0.103 18	0.0022	γ-ray Kα ₁	26.35910 2	8.6 9	0.0048
γ 9	1021.0 5	0.112 18	0.0024	γ-ray Kβ	29.7	2.9 4	0.0019
11 weak γ's omitted: E _γ (avg) = 1037.4; ΣI _γ = 0.26% Maximum γ _± -intensity = 3.40%				γ 1 37.138 10 0.94 14 0.0007			
● ¹¹⁹Sn IT Decay (293.0 d 13) I (min) = 0.10%				γ 8 1102.149 18 2.5 3 0.0596			
Auger-L	3	137 5	0.0086	8 weak γ's omitted: E _γ (avg) = 953.6; ΣI _γ = 0.16%			
ce-L- 1	19.405 8	66.6 7	0.0275	● ¹²¹Te IT Decay (154 d 7) I (min) = 0.10%			
Auger-K	21	4.5 9	0.0020	%IT Decay = 88.6 11			
ce-MNO- 1	22.986 8	17.3 4	0.0085	Feeds ¹²¹ Te (16.8 d)			
ce-K- 2	36.460 10	32.2 7	0.0250	See also ¹²¹ Te EC Decay (154 d)			
ce-L- 2	61.195 10	52.3 7	0.0682	Auger-L	3.19	72 4	0.0049
ce-M- 2	64.776 10	12.4 3	0.0171	Auger-K	22.7	5.1 12	0.0025
ce-NCP- 2	65.523 10	3.10 9	0.0043	ce-K- 1	49.974 15	34.5 8	0.0367
γ-ray L	3.44	12 4	0.0009	ce-L- 1	76.849 15	41.6 8	0.0680
γ 1	23.870 8	16.1 4	0.0082	ce-M- 1	80.782 15	9.9 3	0.0171
γ-ray Kα ₂	25.04400 2	7.9 4	0.0042	ce-NCP- 1	81.620 15	2.65 9	0.0046
γ-ray Kα ₁	25.27130 2	14.8 6	0.0080	ce-K- 2	180.38 3	6.12 19	0.0235
γ-ray Kβ	28.5	4.99 22	0.0030	ce-L- 2	207.25 3	0.81 3	0.0036
1 weak γ's omitted: E _γ (avg) = 65.7; ΣI _γ = 0.02%				ce-MNO- 2	211.18 3	0.214 7	0.0010
● ¹²¹Te EC Decay (16.8 d 4) I (min) = 0.10%				γ-ray L	3.77	7.1 24	0.0006
Auger-L	3	84 5	0.0055	γ-ray Kα ₂	27.20170 2	10.1 4	0.0059
ce-K- 1	6.647 10	1.12 3	0.0002	γ-ray Kα ₁	27.47230 2	18.9 8	0.0110
Auger-K	21.8	11.6 25	0.0054	γ-ray Kβ	31	6.5 3	0.0043
ce-L- 1	32.440 10	0.145 6	0.0001	γ 2	212.19 3	81.5 11	0.368
				1 weak γ's omitted: E _γ (avg) = 81.8; ΣI _γ = 0.05%			

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
<p>● ¹²²Sb EC Decay (2.70 d 1) I (min) = 0.10%</p> <p>%EC Decay = 2.42 12</p> <p>See also ¹²²Sb β⁻ Decay</p>				<p>X-ray L 3.77 2.0 7 0.0002</p> <p>Y-ray Kα₂ 27.20170 2 5.2 4 0.0030</p> <p>Y-ray Kα₁ 27.47230 2 9.7 7 0.0057</p> <p>Y-ray Kβ 31 3.37 24 0.0022</p> <p>γ 1 563.93 19 21 4 0.252</p> <p>γ 3 683.5 3 0.97 20 0.0141</p> <p>γ 4 692.8 3 1.5 3 0.0220</p> <p>γ 5 793.2 3 1.7 4 0.0280</p> <p>γ 8 1075.2 0.34 7 0.0077</p> <p>γ 11 1257.0 3 0.31 7 0.0084</p> <p>γ 15 1499.5 3 0.18 4 0.0058</p> <p>γ 19 1747.2 3 0.38 9 0.0141</p> <p>γ 22 1843.8 3 0.16 4 0.0062</p> <p>γ 28 2193.0 4 0.36 8 0.0167</p>			
Auger-L	3	2.02 17	0.0001	<p>37 weak γ's omitted:</p> <p>E_γ(avg) = 1861.9; ΣI_γ = 0.81%</p> <p>Maximum γ_i-intensity = 152.06%</p>			
Auger-K	21	0.29 7	0.0001	<p>● ¹²²Xe EC Decay (20.1 h 1) I (min) = 0.10%</p> <p>Feeds ¹²²I</p>			
Y-ray L	3.44	0.18 6	≈0	Auger-L	3.3	84 13	0.0059
Y-ray Kα ₂	25.04400 2	0.50 4	0.0003	Auger-K	23.6	10 3	0.0052
Y-ray Kα ₁	25.27130 2	0.94 8	0.0005	ce-K- 2	24.93 20	0.31 11	0.0002
Y-ray Kβ	28.5	0.32 3	0.0002	ce-K- 3	28.63 20	1.2 3	0.0007
γ 1	1140.2 10	0.77 9	0.0188	ce-K- 5	39.43 20	0.40 10	0.0003
<p>● ¹²²Sb β⁻ Decay (2.70 d 1) I (min) = 0.10%</p> <p>%β⁻ Decay = 97.58 12</p> <p>See also ¹²²Sb EC Decay</p>				ce-L- 2	52.91 20	0.14 12	0.0002
Auger-L	3.19	0.293 21	≈0	ce-L- 3	56.61 20	0.19 6	0.0002
ce-K- 1	532.12 19	0.353 11	0.0040	ce-K- 6	57.53 20	0.71 18	0.0009
β- 1 max	724 4			ce-L- 6	85.51 20	0.15 8	0.0003
avg	236.5 15	4.5 3	0.0227	ce-K- 10	115.63 20	0.81 19	0.0020
β- 2 max	1417 4			ce-L- 10	143.61 20	0.11 3	0.0003
avg	522.4 17	67.3 5	0.749	ce-K- 18	317.03 20	0.20 4	0.0013
β- 3 max	1981 4			Y-ray L	4	9 4	0.0007
avg	772.1 17	25.7 5	0.423	Y-ray Kα ₂	28.3172 4	22 4	0.0134
total β-	574.9 18	97.5 8	1.19	Y-ray Kα ₁	28.6120 3	41 7	0.0252
<p>2 weak β's omitted:</p> <p>E_β(avg) = 138.8; ΣI_β = 0.02%</p>				Y-ray Kβ	32.3	14.5 24	0.0100
Y-ray Kα ₁	27.47230 2	0.164 8	≈0	γ 3	61.80 20	0.44 10	0.0006
γ 1	563.93 19	70.6 4	0.849	γ 5	72.60 20	0.23 5	0.0004
γ 2	692.8 3	3.7 3	0.0553	γ 6	90.70 20	0.72 15	0.0014
γ 5	1257.0 3	0.78 7	0.0208	γ 9	116.3 3	0.12 3	0.0003
<p>3 weak γ's omitted:</p> <p>E_γ(avg) = 1179.2; ΣI_γ = 0.02%</p>				γ 10	148.80 20	3.7 9	0.0117
<p>● ¹²²I β⁺ Decay (3.62 m 6) I (min) = 0.10%</p>				γ 11	163.30 20	0.17 4	0.0006
Auger-L	3.19	19.8 16	0.0013	γ 12	174.7 4	0.18 6	0.0007
Auger-K	22.7	2.6 6	0.0013	γ 13	175.7 4	0.39 9	0.0014
ce-K- 1	532.12 19	0.105 21	0.0012	γ 14	187.10 20	0.74 16	0.0029
β+ 1 max	1180 40			γ 15	201.60 20	0.16 4	0.0007
avg	528 18	0.16 4	0.0018	γ 16	253.70 20	0.14 4	0.0007
β+ 2 max	1760 40			γ 17	288.40 20	0.55 13	0.0034
avg	789 19	0.54 13	0.0091	γ 18	350.20 20	9.2 18	0.0686
β+ 3 max	1860 40			γ 19	355.2 3	0.21 5	0.0016
avg	834 19	0.26 8	0.0046	γ 20	416.90 20	2.1 5	0.0184
β+ 4 max	2550 40			<p>5 weak γ's omitted:</p> <p>E_γ(avg) = 79.4; ΣI_γ = 0.27%</p>			
avg	1152 19	12 3	0.294				
β+ 5 max	3120 40						
avg	1414 19	63 4	1.90				
total β+	1363 20	76 5	2.21				
<p>10 weak β's omitted:</p> <p>E_β(avg) = 443.1; ΣI_β = 0.07%</p>							

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)				
<p>• ¹²³Sn β⁻ Decay (129.2 d 4) I (min) = 0.10%</p>				<p>γ-ray L 3.77 9 4 0.0007</p>							
β ⁻ 1 max	308 4			γ-ray Kα ₂	27.20170 2	24.6 9	0.0143				
avg	88.6 13	0.6	0.0011	γ-ray Kα ₁	27.47230 2	46.0 16	0.0269				
β ⁻ 2 max	1397 4			γ-ray Kβ	31	16.0 6	0.0105				
avg	523.1 17	99.4	1.11	γ 2	159.00 3	83.4 4	0.282				
total β ⁻				γ 20	346.35 5	0.126 5	0.0009				
avg	520.3 18	100	1.11	γ 23	440.02 5	0.429 14	0.0040				
<p>0 weak β's omitted: Eβ (avg) = 101.8; ΣIβ = 0.03%</p>				<p>γ 26 505.33 5 0.316 10 0.0034</p>							
γ 4	1088.64 10	0.6	0.0139	γ 27 528.96 5 1.39 5 0.0157			0.0044				
<p>8 weak γ's omitted: Eγ (avg) = 992.9; ΣIγ = 0.04%</p>				<p>γ 28 538.54 5 0.382 13 0.0044</p>							
<p>• ¹²³Te EC Decay (~1E13 y) I (min) = 0.10%</p>				<p>40 weak γ's omitted: Eγ (avg) = 494.4; ΣIγ = 0.48%</p>							
Auger-L	3	78 6	0.0051	<p>• ¹²³Xe β⁺ Decay (2.14 h 5) I (min) = 0.10%</p>							
Auger-K	21.8	7.3 17	0.0034	<p>Feeds ¹²³I</p>							
γ-ray L	3.6	7.2 25	0.0006	Auger-L	3.3	81 5	0.0057				
γ-ray Kα ₂	26.11080 2	13.6 11	0.0075	Auger-K	23.6	9.9 24	0.0050				
γ-ray Kα ₁	26.35910 2	25.4 21	0.0143	ce-K- 3	115.73 20	15.9 6	0.0392				
γ-ray Kβ	29.7	8.7 8	0.0055	ce-L- 3	143.71 20	3.95 15	0.0121				
<p>• ¹²³Te IT Decay (119.7 d 1) I (min) = 0.10%</p>				<td>ce-K- 4</td> <td>144.93 20</td> <td>2.3 5</td> <td>0.0072</td>				ce-K- 4	144.93 20	2.3 5	0.0072
<p>Feeds ¹²³Te (1E13 y)</p>				<td>ce-M- 3</td> <td>147.83 20</td> <td>0.82 3</td> <td>0.0026</td>				ce-M- 3	147.83 20	0.82 3	0.0026
Auger-L	3.19	88 4	0.0060	<td>ce-NCP- 3</td> <td>148.71 20</td> <td>0.192 7</td> <td>0.0006</td>				ce-NCP- 3	148.71 20	0.192 7	0.0006
Auger-K	22.7	7.0 16	0.0034	<td>ce-L- 4</td> <td>172.91 20</td> <td>0.41 18</td> <td>0.0015</td>				ce-L- 4	172.91 20	0.41 18	0.0015
ce-K- 1	56.65 3	42.7 7	0.0515	<td>ce-MNO- 4</td> <td>177.03 20</td> <td>0.10 5</td> <td>0.0004</td>				ce-MNO- 4	177.03 20	0.10 5	0.0004
ce-L- 1	83.52 3	44.1 7	0.0785	<td>ce-K- 6</td> <td>297.03 20</td> <td>0.210 13</td> <td>0.0013</td>				ce-K- 6	297.03 20	0.210 13	0.0013
ce-M- 1	87.45 3	10.4 3	0.0194	<td>β⁺ 1 max</td> <td>1324 15</td> <td></td> <td></td>				β ⁺ 1 max	1324 15		
ce-NCP- 1	88.29 3	2.76 8	0.0052	<td>avg</td> <td>593 7</td> <td>1.06 13</td> <td>0.0134</td>				avg	593 7	1.06 13	0.0134
ce-K- 2	127.19 3	13.7 4	0.0371	<td>β⁺ 2 max</td> <td>1476 15</td> <td></td> <td></td>				β ⁺ 2 max	1476 15		
ce-L- 2	154.06 3	1.77 5	0.0058	<td>avg</td> <td>661 7</td> <td>3.9 4</td> <td>0.0549</td>				avg	661 7	3.9 4	0.0549
ce-MNO- 2	157.99 3	0.436 13	0.0015	<td>β⁺ 3 max</td> <td>1505 15</td> <td></td> <td></td>				β ⁺ 3 max	1505 15		
γ-ray L	3.77	9 3	0.0007	<td>avg</td> <td>674 7</td> <td>17.2 6</td> <td>0.247</td>				avg	674 7	17.2 6	0.247
γ-ray Kα ₂	27.20170 2	14.0 6	0.0081	<td>total β⁺</td> <td></td> <td></td> <td></td>				total β ⁺			
γ-ray Kα ₁	27.47230 2	26.2 10	0.0153	<td>avg</td> <td>666 7</td> <td>22.3 8</td> <td>0.316</td>				avg	666 7	22.3 8	0.316
γ-ray Kβ	31	9.1 4	0.0060	<td colspan="4"> <p>8 weak β's omitted: Eβ (avg) = 257.4; ΣIβ = 0.10%</p> </td>				<p>8 weak β's omitted: Eβ (avg) = 257.4; ΣIβ = 0.10%</p>			
γ 2	159.00 3	84.1 4	0.285	<td>γ-ray L</td> <td>4</td> <td>8 3</td> <td>0.0007</td>				γ-ray L	4	8 3	0.0007
<p>2 weak γ's omitted: Eγ (avg) = 89.1; ΣIγ = 0.09%</p>				<td>γ-ray Kα₂</td> <td>28.3172 4</td> <td>21.0 8</td> <td>0.0127</td>				γ-ray Kα ₂	28.3172 4	21.0 8	0.0127
<p>• ¹²³I EC Decay (13.13 h 10) I (min) = 0.10%</p>				<td>γ-ray Kα₁</td> <td>28.6120 3</td> <td>39.1 15</td> <td>0.0238</td>				γ-ray Kα ₁	28.6120 3	39.1 15	0.0238
<p>% Feeding to ¹²³Te (1E13 y) = 99.9957 4</p>				<td>γ-ray Kβ</td> <td>32.3</td> <td>13.7 6</td> <td>0.0094</td>				γ-ray Kβ	32.3	13.7 6	0.0094
Auger-L	3.19	94 6	0.0064	<td>γ 2</td> <td>138.10 20</td> <td>0.240 25</td> <td>0.0007</td>				γ 2	138.10 20	0.240 25	0.0007
Auger-K	22.7	12 3	0.0060	<td>γ 3</td> <td>148.90 20</td> <td>48.0 10</td> <td>0.152</td>				γ 3	148.90 20	48.0 10	0.152
ce-K- 2	127.19 3	13.59 11	0.0368	<td>γ 4</td> <td>178.10 20</td> <td>14.6 8</td> <td>0.0555</td>				γ 4	178.10 20	14.6 8	0.0555
ce-L- 2	154.06 3	1.760 19	0.0058	<td>γ 6</td> <td>330.20 20</td> <td>8.4 6</td> <td>0.0591</td>				γ 6	330.20 20	8.4 6	0.0591
ce-MNO- 2	157.99 3	0.433 5	0.0015	<td>γ 7</td> <td>474.20 20</td> <td>0.101 15</td> <td>0.0010</td>				γ 7	474.20 20	0.101 15	0.0010
				<td>γ 9</td> <td>680.50 20</td> <td>0.197 15</td> <td>0.0029</td>				γ 9	680.50 20	0.197 15	0.0029
				<td>γ 10</td> <td>691.5 3</td> <td>0.110 15</td> <td>0.0016</td>				γ 10	691.5 3	0.110 15	0.0016
				<td>γ 11</td> <td>718.50 20</td> <td>0.168 15</td> <td>0.0026</td>				γ 11	718.50 20	0.168 15	0.0026
				<td>γ 12</td> <td>728.30 20</td> <td>0.120 15</td> <td>0.0019</td>				γ 12	728.30 20	0.120 15	0.0019
				<td>γ 14</td> <td>782.90 20</td> <td>0.44 5</td> <td>0.0073</td>				γ 14	782.90 20	0.44 5	0.0073
				<td>γ 24</td> <td>870.7 3</td> <td>0.28 4</td> <td>0.0052</td>				γ 24	870.7 3	0.28 4	0.0052
				<td>γ 25</td> <td>899.6 4</td> <td>2.40 25</td> <td>0.0460</td>				γ 25	899.6 4	2.40 25	0.0460
				<td>γ 28</td> <td>934.9 3</td> <td>0.31 4</td> <td>0.0061</td>				γ 28	934.9 3	0.31 4	0.0061
				<td>γ 31</td> <td>964.0 3</td> <td>0.53 5</td> <td>0.0108</td>				γ 31	964.0 3	0.53 5	0.0108
				<td>γ 32</td> <td>979.4 3</td> <td>0.28 4</td> <td>0.0058</td>				γ 32	979.4 3	0.28 4	0.0058
				<td>γ 34</td> <td>1011.3 5</td> <td>0.43 5</td> <td>0.0093</td>				γ 34	1011.3 5	0.43 5	0.0093
				<td>γ 35</td> <td>1013.5 5</td> <td>0.115 15</td> <td>0.0025</td>				γ 35	1013.5 5	0.115 15	0.0025
				<td>γ 37</td> <td>1048.9 3</td> <td>0.134 15</td> <td>0.0030</td>				γ 37	1048.9 3	0.134 15	0.0030
				<td>γ 38</td> <td>1060.7 4</td> <td>0.77 10</td> <td>0.0174</td>				γ 38	1060.7 4	0.77 10	0.0174
				<td>γ 39</td> <td>1064.3 4</td> <td>0.65 8</td> <td>0.0147</td>				γ 39	1064.3 4	0.65 8	0.0147
				<td>γ 40</td> <td>1093.4 3</td> <td>2.74 25</td> <td>0.0637</td>				γ 40	1093.4 3	2.74 25	0.0637
				<td>γ 41</td> <td>1113.1 3</td> <td>1.54 15</td> <td>0.0364</td>				γ 41	1113.1 3	1.54 15	0.0364
				<td>γ 44</td> <td>1161.3 3</td> <td>0.101 10</td> <td>0.0025</td>				γ 44	1161.3 3	0.101 10	0.0025
				<td>γ 48</td> <td>1242.0 4</td> <td>0.110 2</td> <td>0.0029</td>				γ 48	1242.0 4	0.110 2	0.0029

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
γ 49	1242.0	4	0.442 10	γ 21	713.82	4	2.38 10
γ 53	1310.3	3	0.130 10	γ 22	722.78	4	11.10 10
γ 56	1390.9	3	0.115 10	γ 23	735.67	10	0.127 10
γ 58	1534.9	3	0.30 3	γ 27	790.74	5	0.744 10
γ 59	1603.9	3	0.168 15	γ 34	968.20	4	1.92 5
γ 60	1625.9	3	0.58 5	γ 38	1045.16	5	1.86 4
γ 61	1656.8	4	0.130 15	γ 51	1325.50	4	1.50 8
γ 62	1686.8	3	0.60 8	γ 52	1355.24	5	1.00 6
γ 63	1715.9	3	0.187 25	γ 58	1368.21	5	2.51 13
γ 64	1732.2	3	0.139 20	γ 55	1376.25	6	0.440 20
γ 68	1807.3	3	1.22 13	γ 58	1436.60	5	1.14 11
γ 69	1822.3	3	0.120 15	γ 59	1445.15	11	0.215 20
γ 72	1884.5	3	0.62 8	γ 61	1489.06	8	0.63 5
γ 75	1934.2	3	0.216 25	γ 63	1526.35	9	0.401 10
γ 77	1974.3	3	0.134 20	γ 66	1579.90	20	0.196 10
γ 79	2003.3	4	0.182 25	γ 70	1691.02	4	49.0 6
γ 80	2037.6	4	0.24 3	γ 79	2091.00	5	5.73 14
γ 84	2071.9	4	0.163 20				
γ 85	2101.3	4	0.154 20				

67 weak γ's omitted:
E_γ(avg) = 1446.8; ΣI_γ = 2.70%
Maximum γ±-intensity = 44.52%

69 weak γ's omitted:
E_γ(avg) = 1208.5; ΣI_γ = 1.34%

• ¹²⁴Sb β⁻ Decay (60.20 d 3) I (min) = 0.10%

Auger-L	3.19	0.340 24	≈0
ce-K-16	570.894 23	0.411 13	0.0050
β ⁻ 1 max	130.1 19		
avg	34.6 6	0.52 4	0.0004
β ⁻ 2 max	203.2 19		
avg	55.9 6	0.502 23	0.0006
β ⁻ 3 max	211.3 19		
avg	58.3 6	8.76 19	0.0109
β ⁻ 4 max	421.6 19		
avg	126.2 7	0.37 10	0.0010
β ⁻ 5 max	611.3 19		
avg	194.0 7	52.8 6	0.218
β ⁻ 6 max	722.4 19		
avg	236.0 8	0.258 11	0.0013
β ⁻ 7 max	813.2 19		
avg	271.3 8	0.64 5	0.0037
β ⁻ 8 max	865.7 19		
avg	292.0 8	4.09 17	0.0254
β ⁻ 9 max	947.1 19		
avg	324.7 8	2.13 10	0.0147
β ⁻ 10 max	1579.5 19		
avg	593.4 9	5.14 22	0.0650
β ⁻ 11 max	1656.4 19		
avg	627.3 9	2.53 13	0.0338
β ⁻ 12 max	2302.3 19		
avg	918.6 9	21.9 7	0.428
total β ⁻			
avg	377.6 14	100.0 10	0.805

8 weak β's omitted:
E_β(avg) = 138.8; ΣI_β = 0.39%

X-ray Kα ₂	27.20170 2	0.102 5	≈0
X-ray Kα ₁	27.47230 2	0.191 9	0.0001
γ 7	400.03 6	0.129 15	0.0011
γ 8	443.99 5	0.21 8	0.0019
γ 14	525.50 10	0.17 5	0.0019
γ 16	602.708 23	97.87 8	1.26
γ 17	632.36 10	0.147 20	0.0020
γ 18	645.85 3	7.26 11	0.0999
γ 20	709.31 5	1.42 5	0.0214

• ¹²⁴I β⁺ Decay (4.18 d 3) I (min) = 0.10%

Auger-L	3.19	63 5	0.0043
Auger-K	22.7	8.3 19	0.0040
ce-K-16	570.894 23	0.248 23	0.0030
β ⁺ 1 max	809 4		
avg	365.7 18	0.27 3	0.0021
β ⁺ 2 max	1532 4		
avg	685.9 18	11.0 10	0.161
β ⁺ 3 max	2135 4		
avg	973.6 18	12.0 19	0.249
total β ⁺			
avg	830.5 19	23.3 22	0.412
γ-ray L	3.77	6.2 22	0.0005
X-ray Kα ₂	27.20170 2	16.5 11	0.0096
X-ray Kα ₁	27.47230 2	30.8 20	0.0180
X-ray Kβ	31	10.7 7	0.0071
γ 13	541.20 10	0.183 17	0.0021
γ 14	554.0 10	0.10 4	0.0012
γ 16	602.708 23	59 5	0.757
γ 18	645.85 3	0.92 9	0.0127
γ 20	695.0 10	0.18 7	0.0027
γ 23	713.82 4	0.106 15	0.0016
γ 24	722.78 4	9.7 9	0.150
γ 37	968.20 4	0.40 4	0.0083
γ 38	976.32 14	0.100 15	0.0021
γ 41	1045.16 5	0.41 5	0.0092
γ 42	1054.00 20	0.118 12	0.0026
γ 49	1325.50 4	1.40 13	0.0395
γ 52	1368.21 5	0.28 3	0.0081
γ 53	1376.25 6	1.62 14	0.0476
γ 58	1489.06 8	0.177 17	0.0056
γ 59	1509.49 4	2.91 25	0.0937
γ 60	1559.80 20	0.16 3	0.0053
γ 62	1637.7 5	0.189 20	0.0066
γ 64	1675.8 4	0.11 3	0.0038
γ 65	1691.02 4	10.1 9	0.366
γ 67	1720.20 8	0.165 19	0.0061
γ 70	1851.50 20	0.20 3	0.0079
γ 71	1918.58 4	0.165 23	0.0068
γ 73	2038.3 3	0.33 4	0.0143
γ 75	2078.86 7	0.34 3	0.0149
γ 76	2091.00 5	0.55 5	0.0247
γ 77	2099.09 9	0.136 13	0.0061
γ 78	2144.320 10	0.106 11	0.0049

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
¹²⁴ I β^+ Decay (4.18 d 3) (Continued)				\bullet ¹²⁵ Sb β^- Decay (2.77 y 4) I (min) = 0.10% % Feeding to ¹²⁵ Te (58 d) = 23.1 6			
γ 80	2232.25 7	0.55 5	0.0264	Auger-L	3.19	50 4	0.0034
γ 82	2283.25 8	0.64 7	0.0313	ce-K- 2	3.6781 6	50.0 24	0.0039
γ 89	2746.90 10	0.45 5	0.0262	ce-L- 1	14.94 15	0.18 11	≈ 0
59 weak γ 's omitted: E_γ (avg) = 1139.6; $\Sigma I_\gamma = 1.27\%$ Maximum γ -intensity = 46.55%				Auger-K	22.7	6.4 15	0.0031
\bullet ¹²⁵ Sn β^- Decay (9.64 d 3) I (min) = 0.10% Feeds ¹²⁵ Sb				ce-L- 2	30.5527 6	7.9 11	0.0051
β^- 1 max	62 6		≈ 0	ce-M- 2	34.4859 6	1.58 22	0.0012
avg	16.0 16	0.22 7	≈ 0	ce-NCP- 2	35.3236 6	0.52 8	0.0004
β^- 2 max	75 6		≈ 0	ce-K- 9	144.520 11	1.03 21	0.0032
avg	19.5 17	0.19 6	≈ 0	ce-L- 9	171.395 11	0.19 9	0.0007
β^- 3 max	96 6		≈ 0	ce-K- 19	396.075 15	0.337 18	0.0028
avg	25.2 17	0.11 4	≈ 0	β^- 1 max	95.4 20		
β^- 4 max	110 6		0.0003	avg	24.9 6	13.60 22	0.0072
avg	28.9 17	0.53 16	0.0003	β^- 2 max	124.7 20		
β^- 5 max	348 6		0.0048	avg	33.1 6	5.81 9	0.0041
avg	101.7 20	2.2 7	0.0048	β^- 3 max	130.8 20		
β^- 6 max	367 6		0.0090	avg	34.8 6	18.1 3	0.0134
avg	108.0 20	3.9 12	0.0090	β^- 4 max	241.6 20		
β^- 7 max	460 6		0.0176	avg	67.5 7	1.59 3	0.0023
avg	139.8 21	5.9 18	0.0176	β^- 5 max	303.4 20		
β^- 8 max	544 6		0.0005	avg	87.0 7	39.9 4	0.0739
avg	169.6 22	0.13 5	0.0005	β^- 6 max	445.7 20		
β^- 9 max	1001 6		0.0023	avg	134.5 7	7.4 5	0.0212
avg	347.3 25	0.31 10	0.0023	β^- 7 max	622.0 20		
β^- 10 max	1261 6		0.0262	avg	215.5 8	13.5 5	0.0620
avg	456 3	2.7 9	0.0262	total β^-	86.5 11	99.9 9	0.184
β^- 11 max	2350 6		1.66	γ -ray L	3.77	4.9 17	0.0004
avg	938 3	83 5	1.66	X-ray $K\alpha_2$	27.20170 2	12.8 8	0.0074
total β^-	813 5	99 6	1.72	γ -ray $K\alpha_1$	27.47230 2	23.9 14	0.0140
3 weak β 's omitted: E_β (avg) = 114.9; $\Sigma I_\beta = 0.08\%$				γ -ray $K\beta$	31	8.3 5	0.0055
γ 9	331.90 20	1.3 5	0.0091	γ 2	35.4919 5	4.16 15	0.0031
γ 10	350.9 5	0.22 7	0.0017	γ 5	116.952 11	0.261 9	0.0007
γ 15	469.7 5	1.3 5	0.0129	γ 8	172.615 15	0.181 7	0.0007
γ 20	800.5 5	0.9 3	0.0161	γ 9	176.334 11	6.89 22	0.0259
γ 21	822.6 5	3.8 12	0.0663	γ 12	204.129 25	0.323 12	0.0014
γ 22	893.7 5	0.23 8	0.0044	γ 13	208.088 25	0.243 8	0.0011
γ 23	915.5 5	3.8 12	0.0738	γ 14	227.91 4	0.131 6	0.0006
γ 25	934.7 5	0.15 5	0.0029	γ 16	321.03 4	0.417 8	0.0029
γ 26	1017.1 5	0.26 8	0.0056	γ 17	380.435 20	1.496 25	0.0121
γ 27	1066.6 5	8.6 25	0.195	γ 18	408.01 4	0.182 9	0.0016
γ 28	1087.4 10	0.9 3	0.0219	γ 19	427.889 15	29.33 25	0.267
γ 29	1088.9 10	4.0 13	0.0937	γ 20	443.50 4	0.302 12	0.0029
γ 32	1151.3 5	0.10 4	0.0025	γ 21	463.383 15	10.35 18	0.102
γ 34	1173.2 5	0.19 6	0.0047	γ 23	600.557 18	17.8 3	0.227
γ 38	1221.0 5	0.21 7	0.0056	γ 24	606.641 19	5.02 9	0.0649
γ 41	1419.5 5	0.46 15	0.0140	γ 25	635.895 18	11.32 20	0.153
γ 44	1805.7 5	0.15 5	0.0056	γ 26	671.409 20	1.81 3	0.0259
γ 47	2001.7 5	2.1 7	0.0880	9 weak γ 's omitted: E_γ (avg) = 159.0; $\Sigma I_\gamma = 0.07\%$			
γ 50	2275.2 5	0.18 6	0.0088	\bullet ¹²⁵ Te IT Decay (58 d 1) I (min) = 0.10%			
31 weak γ 's omitted: E_γ (avg) = 833.2; $\Sigma I_\gamma = 0.70\%$				Auger-L	3.19	153 9	0.0104
				ce-K- 1	3.6781 6	78 4	0.0061
				Auger-K	22.7	16 4	0.0078
				ce-L- 1	30.5527 6	12.3 16	0.0080
				ce-M- 1	34.4859 6	2.5 4	0.0018
				ce-NCP- 1	35.3236 6	0.81 12	0.0006
				ce-K- 2	77.462 15	51.9 7	0.0856
				ce-L- 2	104.337 15	37.3 7	0.0829
				ce-M- 2	108.270 15	8.59 24	0.0198
				ce-NCP- 2	109.108 15	2.25 7	0.0052

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
γ-ray L	3.77	15 5	0.0012
γ-ray Kα ₂	27.20170 2	32.3 15	0.0187
γ-ray Kα ₁	27.47230 2	60 3	0.0353
γ-ray Kβ	31	20.9 10	0.0138
γ 1	35.4919 5	6.49 21	0.0049
γ 2	109.276 15	0.283 8	0.0007

• ¹²⁵I EC Decay (60.14 d 11) I (min) = 0.10%

Auger-L	3.19	156 10	0.0106
ce-K- 1	3.6781 6	78 4	0.0061
Auger-K	22.7	20 5	0.0095
ce-L- 1	30.5527 6	12.3 16	0.0080
ce-M- 1	34.4859 6	2.5 4	0.0018
ce-NCP- 1	35.3236 6	0.81 12	0.0006

γ-ray L	3.77	15 6	0.0012
γ-ray Kα ₂	27.20170 2	39.2 17	0.0227
γ-ray Kα ₁	27.47230 2	73 3	0.0428
γ-ray Kβ	31	25.4 11	0.0168
γ 1	35.4919 5	6.49 21	0.0049

• ¹²⁵Xe EC Decay (16.8 h 2) I (min) = 0.10%
Feeds ¹²⁵I

Auger-L	3.3	109 7	0.0077
ce-K- 1	21.791 15	21.8 13	0.0101
Auger-K	23.6	14 4	0.0068
ce-K- 2	41.691 20	0.345 23	0.0003
ce-L- 1	49.772 15	2.89 14	0.0031
ce-M- 1	53.888 15	0.58 3	0.0007
ce-NOP- 1	54.774 15	0.142 7	0.0002
ce-L- 2	69.672 20	0.194 13	0.0003
ce-K- 3	80.40 3	0.217 11	0.0004
ce-K- 4	155.26 3	6.39 21	0.0211
ce-L- 4	183.24 3	0.904 12	0.0035
ce-MNO- 4	187.36 3	0.226 3	0.0009
ce-K- 6	210.23 4	1.89 9	0.0085
ce-L- 6	238.21 4	0.344 16	0.0017

X-ray L	4	11 4	0.0010
X-ray Kα ₂	28.3172 4	28.9 12	0.0174
X-ray Kα ₁	28.6120 3	53.9 21	0.0328
X-ray Kβ	32.3	18.9 8	0.0130
γ 1	54.960 15	6.0 3	0.0070
γ 2	74.860 20	0.118 7	0.0002
γ 3	113.57 3	0.479 23	0.0012
γ 4	188.43 3	55.1 6	0.221
γ 6	243.40 4	28.9 10	0.150
γ 7	372.08 6	0.248 12	0.0020
γ 8	453.83 5	4.24 18	0.00410
γ 11	635.8 4	0.105 11	0.0014
γ 12	635.8 4	0.121 11	0.0016
γ 17	846.5 4	1.04 4	0.0187
γ 18	901.5 4	0.540 23	0.0104
γ 19	937.3 4	0.116 11	0.0023
γ 20	992.5 4	0.105 6	0.0022
γ 21	1007.5 4	0.143 12	0.0031
γ 27	1138.4 4	0.287 17	0.0069
γ 28	1181.0 4	0.63 3	0.0159

20 weak γ's omitted:
E_γ(avg) = 904.8; ΣI_γ = 0.40%

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
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• ¹²⁶Sn β⁻ Decay (~1.0E5 y) I (min) = 0.10%
Feeds ¹²⁶Sb (19.0 m)

Auger-L	3	120 7	0.0079
ce-K- 5	12.149 10	3.2 4	0.0008
ce-L- 2	16.952 10	2.1 3	0.0008
ce-L- 3	18.00 7	58 5	0.0222
ce-L- 4	18.582 10	32 4	0.0125
ce-M- 2	20.706 10	0.41 6	0.0002
ce-NOP- 2	21.498 10	0.136 18	≈0
ce-M- 3	21.76 7	12.4 10	0.0057
Auger-K	21.8	4.5 10	0.0021
ce-M- 4	22.336 10	6.3 8	0.0030
ce-NCP- 3	22.55 7	4.1 3	0.0020
ce-NCP- 4	23.128 10	2.1 3	0.0010
ce-K- 6	33.789 10	5.4 7	0.0039
ce-L- 5	37.942 10	0.41 6	0.0003
ce-MNO- 5	41.696 10	0.108 14	≈0
ce-K- 7	56.449 10	16.4 21	0.0197
ce-K- 8	57.079 10	8.8 7	0.0107
ce-L- 6	59.582 10	0.72 9	0.0009
ce-MNO- 6	63.336 10	0.171 21	0.0002
ce-L- 7	82.242 10	6.3 8	0.0111
ce-L- 8	82.872 10	1.13 9	0.0020
ce-M- 7	85.996 10	1.30 17	0.0024
ce-MNO- 8	86.626 10	0.270 19	0.0005
ce-NCP- 7	86.788 10	0.28 4	0.0005

β- 1 max	250 30		
avg	70 10	100	0.149

γ-ray L	3.6	11 4	0.0009
γ 2	21.650 10	1.24 16	0.0006
γ 4	23.280 10	6.4 8	0.0032
X-ray Kα ₂	26.11080 2	8.3 7	0.0046
X-ray Kα ₁	26.35910 2	15.6 12	0.0088
X-ray Kβ	29.7	5.3 5	0.0034
γ 5	42.640 10	0.50 7	0.0005
γ 6	64.280 10	9.6 12	0.0131
γ 7	86.940 10	8.9 11	0.0165
γ 8	87.570 10	37.0 25	0.0690

2 weak γ's omitted:
E_γ(avg) = 22.7; ΣI_γ = 0.10%

• ¹²⁶Sb β⁻ Decay (12.4 d 1) I (min) = 0.10%

Auger-L	3.19	1.58 11	0.0001
Auger-K	22.7	0.22 5	0.0001
ce-K- 5	264.7 3	0.143 14	0.0008
ce-K- 7	382.89 20	0.99 4	0.0081
ce-L- 7	409.76 20	0.145 6	0.0013
ce-K- 15	634.517 6	0.324 10	0.0044
ce-K- 17	663.19 20	0.291 9	0.0041

β- 1 max	90 40		
avg	24 9	0.50 10	0.0003
β- 2 max	110 40		
avg	30 9	2.09 14	0.0013
β- 3 max	370 40		
avg	109 11	29 7	0.0673
β- 4 max	390 40		
avg	117 11	5.9 10	0.0147
β- 5 max	490 40		
avg	152 12	8.4 4	0.0272
β- 6 max	580 40		
avg	181 12	4.2 3	0.0162

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
¹²⁶ Sb β ⁻ Decay (12.4 d 1) (Continued)				● ¹²⁶ Sb β ⁻ Decay (19.0 m 3) I (min) = 0.10%			
				%β ⁻ Decay = 86 4			
				See also ¹²⁶ Sb IT Decay (19.0 m)			
β ⁻ 7 max	590 40			Auger-L	3.19	1.42 11	≈0
avg	204 12	0.56 23	0.0024	Auger-K	22.7	0.19 5	≈0
β ⁻ 8 max	730 40			ce-K- 1	382.89 20	1.02 8	0.0083
avg	237 13	0.50 21	0.0025	ce-L- 1	409.76 20	0.149 12	0.0013
β ⁻ 9 max	730 40			ce-K- 3	634.517 6	0.278 16	0.0038
avg	238 13	0.48 11	0.0024	ce-K- 4	663.19 20	0.250 14	0.0035
β ⁻ 10 max	750 40						
avg	248 13	8.1 6	0.0428	β ⁻ 1 max	750 40		
β ⁻ 11 max	800 40			avg	245 13	0.86 13	0.0045
avg	266 13	4.8 4	0.0272	β ⁻ 2 max	880 40		
β ⁻ 12 max	1070 40			avg	297 13	1.3 3	0.0082
avg	374 14	16 8	0.127	β ⁻ 3 max	1190 40		
β ⁻ 13 max	1170 40			avg	424 14	3.3 3	0.0298
avg	416 14	0.9 4	0.0080	β ⁻ 4 max	1810 40		
β ⁻ 14 max	1790 40			avg	694 15	81 4	1.20
avg	689 14	19 3	0.279	total β ⁻			
total β ⁻				avg	673 16	86 4	1.24
avg	289 21	100 12	0.619				
X-ray L	3.77	0.16 6	≈0	X-ray L	3.77	0.14 5	≈0
X-ray Kα ₂	27.20170 2	0.436 19	0.0003	X-ray Kα ₂	27.20170 2	0.386 24	0.0002
X-ray Kα ₁	27.47230 2	0.81 4	0.0005	X-ray Kα ₁	27.47230 2	0.72 5	0.0004
X-ray Kβ	31	0.282 13	0.0002	X-ray Kβ	31	0.250 16	0.0002
γ 1	149.30 20	0.40 20	0.0013	γ 1	414.70 20	86 6	0.757
γ 2	208.6 8	0.50 20	0.0022	γ 2	620.00 20	1.54 19	0.0204
γ 3	223.80 20	1.39 10	0.0066	γ 3	666.331 6	86 4	1.22
γ 4	278.60 20	2.4 6	0.0142	γ 4	695.00 20	86 4	1.27
γ 5	296.5 3	4.5 4	0.0283	γ 5	928.2 3	1.3 3	0.0254
γ 6	297.1 8	0.50 20	0.0032	γ 6	1034.80 20	1.80 19	0.0397
γ 7	414.70 20	83.3 21	0.736	γ 7	1061.30 20	0.51 9	0.0116
γ 8	415.3 8	1.0 3	0.0088	γ 8	1476.20 20	0.34 9	0.0108
γ 9	555.20 20	1.69 20	0.0290				
γ 10	573.80 20	6.7 3	0.0816	● ¹²⁶ I EC Decay (12.93 d 6) I (min) = 0.10%			
γ 11	593.00 20	7.5 4	0.0944	% (EC + β ⁺) Decay = 61 3			
γ 12	620.20 20	0.90 10	0.0118	See also ¹²⁶ I β ⁻ Decay			
γ 13	639.70 20	0.90 10	0.0122				
γ 14	656.30 20	2.19 10	0.0306	Auger-L	3.19	48 5	0.0033
γ 15	666.331 6	99.6 19 11	1.41	Auger-K	22.7	6.4 15	0.0031
γ 16	675.00 20	3.7 10	0.0530	ce-K- 1	634.517 6	0.131 8	0.0018
γ 17	695.00 20	99.6 19 11	1.47				
γ 18	697.00 20	29 7	0.429	β ⁺ 1 max	468 5		
γ 19	720.50 20	53.8 21	0.826	avg	216.8 22	0.244 17	0.0011
γ 20	856.80 20	17.6 9	0.322	β ⁺ 2 max	1134 5		
γ 21	954.00 20	1.20 10	0.0243	avg	530.2 22	0.83 17	0.0094
γ 22	959.60 20	0.50 10	0.0102	total β ⁺			
γ 23	989.30 20	6.8 3	0.143	avg	459 3	1.07 17	0.0105
γ 24	1034.80 20	1.00 5	0.0220				
γ 25	1061.30 20	0.20 10	0.0045	X-ray L	3.77	4.8 17	0.0004
γ 26	1063.90 20	0.90 6	0.0203	X-ray Kα ₂	27.20170 2	12.7 11	0.0074
γ 27	1213.00 20	2.39 20	0.0618	X-ray Kα ₁	27.47230 2	23.7 19	0.0139
γ 28	1476.20 20	0.28 3	0.0088	X-ray Kβ	31	8.2 7	0.0054
				γ 1	666.331 6	40.2 21	0.571
				γ 2	753.819 7	5.1 3	0.0812
				γ 5	1420.19 3	0.358 20	0.0108
				Maximum γ±-intensity = 2.15%			
● ¹²⁶ Sb IT Decay (19.0 m 3) I (min) = 0.10%							
%IT Decay = 14 4							
Feeds ¹²⁶ Sb (12.4 d)							
See also ¹²⁶ Sb β ⁻ Decay (19.0 m)							
Auger-L	3	10 3	0.0006				
ce-L- 1	13.0 3	11 3	0.0029				
ce-K- 1	16.8 3	2.5 8	0.0009				
ce-NOP- 1	17.5 3	0.84 25	0.0003				
X-ray L	3.6	0.9 4	≈0				

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
<p>● ¹²⁶I β⁻ Decay (12.93 d 6) I (min) = 0.10% %β⁻ Decay = 39.3 See also ¹²⁶I EC Decay</p>				<p>γ 19 1958.90 20 0.19 5 0.0079 γ 20 2067.00 20 0.30 7 0.0134 γ 23 2407.1 3 0.13 3 0.0064</p>			
Auger-L	3.43	0.37 4	≈0	7 weak γ's omitted: Σγ (avg) = 1849.6; ΣIγ = 0.38% Maximum γ±-intensity = 164.11%			
ce-K- 1	354.072 6	0.45 4	0.0034	● ¹²⁷ Sb β ⁻ Decay (3.85 d 5) I (min) = 0.10%			
β ⁻ 1 max	371 5			% Feeding to ¹²⁷ Te (9.35 h) = 83.1 6			
β ⁻ 1 avg	108.9 17	3.10 25	0.0072	% Feeding to ¹²⁷ Te (109 d) = 16.9 6			
β ⁻ 2 max	862 5			Auger-L	3.19	3.9 3	0.0003
β ⁻ 2 avg	289.7 20	27.2 22	0.168	Auger-K	22.7	0.53 13	0.0003
β ⁻ 3 max	1251 5			ce-K- 1	29.29 10	3.47 20	0.0022
β ⁻ 3 avg	458.6 21	9 4	0.0879	ce-L- 1	56.16 10	0.45 3	0.0005
total β ⁻				ce-K- 6	220.6 3	0.43 5	0.0020
avg	314.1 23	39 5	0.263	ce-K- 19	441.19 20	0.220 17	0.0021
γ-ray Kα ₂	29.4580 10	0.115 11	≈0	ce-K- 30	653.4 3	0.121 18	0.0017
γ-ray Kα ₁	29.7790 10	0.213 19	0.0001	β ⁻ 1 max	258 5		
γ 1	388.633 5	29.1 24	0.241	β ⁻ 1 avg	72.7 16	0.110 20	0.0002
γ 2	491.243 4	2.43 20	0.0254	β ⁻ 2 max	291 5		
γ 3	879.876 8	0.64 6	0.0121	β ⁻ 2 avg	82.9 16	0.61 5	0.0011
● ¹²⁶ Cs β ⁺ Decay (1.64 m 2) I (min) = 0.10%				β ⁻ 3 max	425 5		
Auger-L	3.43	15.0 15	0.0011	β ⁻ 3 avg	127.5 18	0.8 3	0.0022
Auger-K	24.6	1.8 4	0.0009	β ⁻ 4 max	441 5		
ce-K- 2	354.072 6	0.59 11	0.0045	β ⁻ 4 avg	132.8 18	1.25 20	0.0035
β ⁺ 1 max	1460 140			β ⁻ 5 max	504 5		
β ⁺ 1 avg	660 70	0.13 6	0.0018	β ⁻ 5 avg	155.1 18	5.22 15	0.0172
β ⁺ 2 max	2130 140			β ⁻ 6 max	657 5		
β ⁺ 2 avg	960 70	1.1 3	0.0225	β ⁻ 6 avg	211.1 19	1.25 25	0.0056
β ⁺ 3 max	2490 140			β ⁻ 7 max	795 5		
β ⁺ 3 avg	1120 70	3.1 8	0.0740	β ⁻ 7 avg	264.0 20	7.80 23	0.0439
β ⁺ 4 max	2930 140			β ⁻ 8 max	798 5		
β ⁺ 4 avg	1330 70	2.5 6	0.0708	β ⁻ 8 avg	265.1 20	17.2 4	0.0971
β ⁺ 5 max	3420 140			β ⁻ 9 max	896 5		
β ⁺ 5 avg	1560 70	24 5	0.797	β ⁻ 9 avg	304.1 20	34.9 4	0.226
β ⁺ 6 max	3810 140			β ⁻ 10 max	950 5		
β ⁺ 6 avg	1740 70	51 7	1.89	β ⁻ 10 avg	325.8 21	4.10 21	0.0285
total β ⁺				β ⁻ 11 max	1108 5		
avg	1640 80	82 9	2.86	β ⁻ 11 avg	390.9 21	22.8 9	0.190
5 weak β's omitted: Eβ (avg) = 652.4; ΣIβ = 0.23%				β ⁻ 12 max	1240 5		
γ-ray L	4.1	1.7 6	0.0001	β ⁻ 12 avg	446.5 22	2.4 3	0.0228
γ-ray Kα ₂	29.4580 10	4.1 4	0.0026	β ⁻ 13 max	1493 5		
γ-ray Kα ₁	29.7790 10	7.6 8	0.0048	β ⁻ 13 avg	561.9 21	2.0 5	0.0239
γ-ray Kβ	33.6	2.7 3	0.0019	total β ⁻			
γ 1	364.6 3	0.42 14	0.0032	avg	309.2 22	100.6 14	0.662
γ 2	388.633 5	38 7	0.315	2 weak β's omitted: Eβ (avg) = 164.4; ΣIβ = 0.14%			
γ 3	434.00 20	1.06 25	0.0098	γ-ray L	3.77	0.39 14	≈0
γ 4	491.243 4	4.1 8	0.0429	γ-ray Kα ₂	27.20170 2	1.06 7	0.0006
γ 5	548.7 3	0.61 16	0.0071	γ-ray Kα ₁	27.47230 2	1.97 12	0.0012
γ 6	553.4 5	0.27 9	0.0031	γ-ray Kβ	31	0.68 4	0.0005
γ 8	736.5 3	0.23 9	0.0036	γ 1	61.10 10	1.42 7	0.0018
γ 9	798.10 10	0.47 10	0.0080	γ 5	154.3 5	0.11 3	0.0004
γ 10	879.876 8	1.19 23	0.0222	γ 6	252.4 3	8.39 17	0.0451
γ 11	925.20 20	4.5 10	0.0884	γ 7	280.4 5	0.54 4	0.0032
γ 12	1033.4 5	0.27 9	0.0059	γ 8	290.8 5	1.82 8	0.0113
γ 13	1289.8 5	0.34 10	0.0094	γ 9	293.3 9	0.29 15	0.0018
γ 15	1608.0 5	0.11 5	0.0039	γ 10	310.0 7	0.20 4	0.0013
γ 16	1622.8 3	0.22 5	0.0077	γ 11	391.8 5	0.93 8	0.0077
γ 17	1674.5 5	0.19 9	0.0068	γ 12	405.0 10	0.114 18	0.0010
γ 18	1678.30 20	0.72 14	0.0257	γ 13	411.60 20	3.43 19	0.0300
				γ 15	440.7 7	0.25 11	0.0023
				γ 16	444.9 3	4.21 12	0.0399

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
¹²⁷ Sb β^- Decay (3.85 d 5) (Continued)				¹²⁷ Te β^- Decay (109 d 2) I (min) = 0.10%			
γ 17	451.0 7	0.18 8	0.0017	% β^- Decay = 1.83 24			
γ 19	456.0 10	0.11 8	0.0010	See also ¹²⁷ Te IT Decay (109 d)			
γ 19	473.00 20	25.0 8	0.252	Auger-L	3.3	1.16 21	≈ 0
γ 20	502.8 6	0.61 11	0.0065	Auger-K	23.6	0.14 5	≈ 0
γ 21	543.00 20	2.64 12	0.0306	ce-K- 1	24.431 20	1.21 24	0.0006
γ 22	584.2 11	0.32 18	0.0040	ce-L- 1	52.412 20	0.17 4	0.0002
γ 23	603.60 20	4.25 12	0.0546	β^- 1 max	725 5		
γ 25	637.8 5	0.36 4	0.0048	avg	252.9 19	1.82 24	0.0098
γ 26	653.5 7	0.25 4	0.0035	3 weak β^- 's omitted: % β (avg) = 20.1; $\Sigma I\beta$ = 0.01%			
γ 27	666.9 3	0.54 18	0.0076	γ -ray L	4	0.12 5	≈ 0
γ 29	682.3 10	0.54 25	0.0078	γ -ray $K\alpha_2$	28.3172 4	0.30 6	0.0002
γ 30	685.2 3	35.7 4	0.521	γ -ray $K\alpha_1$	28.6120 3	0.57 12	0.0003
γ 31	698.5 3	3.39 19	0.0505	γ -ray $K\beta$	32.3	0.20 4	0.0001
γ 32	722.2 5	1.75 8	0.0269	γ 1	57.600 20	0.38 8	0.0005
γ 33	745.9 5	0.11 4	0.0017	4 weak γ 's omitted: $E\gamma$ (avg) = 648.6; $\Sigma I\gamma$ = 0.01%			
γ 35	783.8 3	14.7 4	0.245	¹²⁷ Xe EC Decay (36.406 d 16) I (min) = 0.10%			
γ 37	817.3 5	0.27 3	0.0047	Auger-L	3.3	96 6	0.0068
γ 38	820.1 3	0.114 22	0.0020	Auger-K	23.6	12 3	0.0059
γ 39	923.5 7	0.46 3	0.0091	ce-K- 1	24.431 20	4.2 3	0.0022
γ 40	1141.2 7	0.36 8	0.0087	ce-L- 1	52.412 20	0.60 4	0.0007
γ 42	1290.3 8	0.35 4	0.0095	ce-MNO- 1	56.528 20	0.151 10	0.0002
10 weak γ 's omitted: $E\gamma$ (avg) = 736.7; $\Sigma I\gamma$ = 0.53%				ce-K- 2	112.05 3	1.53 9	0.0036
¹²⁷ Te β^- Decay (9.35 h 7) I (min) = 0.10%				ce-K- 3	138.93 3	3.53 18	0.0105
β^- 1 max	276 5			ce-L- 2	140.03 3	0.387 23	0.0012
avg	78.2 16	1.184 13	0.0020	ce-L- 3	166.91 3	0.462 19	0.0016
β^- 2 max	694 5			ce-K- 4	169.67 3	6.61 14	0.0239
avg	224.7 19	98.789 19	0.473	ce-MNO- 3	171.03 3	0.115 5	0.0004
total β^-				ce-L- 4	197.65 3	0.97 4	0.0041
avg	222.9 20	100.000 23	0.475	ce-MNO- 4	201.77 3	0.245 9	0.0011
3 weak β^- 's omitted: % β (avg) = 148.3; $\Sigma I\beta$ = 0.03%				ce-K- 5	341.79 5	0.292 19	0.0021
γ 6	360.30 10	0.134 1	0.0010	γ -ray L	4	10 4	0.0008
γ 8	417.90 10	0.988 10	0.0088	γ -ray $K\alpha_2$	28.3172 4	25.0 11	0.0151
7 weak γ 's omitted: $E\gamma$ (avg) = 172.7; $\Sigma I\gamma$ = 0.13%				γ -ray $K\alpha_1$	28.6120 3	46.6 19	0.0284
¹²⁷ Te IT Decay (109 d 2) I (min) = 0.10%				γ -ray $K\beta$	32.3	16.3 7	0.0112
%IT Decay = 98.17 24				γ 1	57.600 20	1.31 8	0.0016
Feeds ¹²⁷ Te (9.35 h)				γ 2	145.22 3	4.24 21	0.0131
See also ¹²⁷ Te β^- Decay (109 d)				γ 3	172.10 3	24.7 10	0.0905
Auger-L	3.19	74 4	0.0050	γ 4	202.84 3	68.1 13	0.294
Auger-K	22.7	5.2 12	0.0025	γ 5	374.96 5	17.4 10	0.139
ce-K- 1	56.45 8	41.8 7	0.0503	1 weak γ 's omitted: $E\gamma$ (avg) = 618.4; $\Sigma I\gamma$ = 0.01%			
ce-L- 1	83.32 8	43.3 7	0.0768	¹²⁸ I EC Decay (24.99 m 2) I (min) = 0.10%			
ce-M- 1	87.25 8	10.2 3	0.0190	%EC Decay = 5.0 2			
ce-NCP- 1	88.09 8	2.72 8	0.0051	See also ¹²⁸ I β^- Decay			
γ -ray L	3.77	7.3 25	0.0006	Auger-L	3.19	4.1 3	0.0003
γ -ray $K\alpha_2$	27.20170 2	10.4 4	0.0060	Auger-K	22.7	0.53 13	0.0003
γ -ray $K\alpha_1$	27.47230 2	19.4 8	0.0114	(Continued)			
γ -ray $K\beta$	31	6.7 3	0.0045				
1 weak γ 's omitted: $E\gamma$ (avg) = 88.3; $\Sigma I\gamma$ = 0.09%							

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
¹²⁹ Sb β ⁻ Decay (4.40 h 2) (Continued)				● ¹²⁹ Te IT Decay (33.6 d 2) I (min) = 0.10%			
γ 56	1280.8 10	0.59 14	0.0162	%IT Decay = 62.9 24			
γ 57	1300.0 12	0.27 10	0.0076	Feeds ¹²⁹ Te (69.6 m)			
γ 58	1317.2 10	0.37 10	0.0103	See also ¹²⁹ Te β ⁻ Decay (33.6 d)			
γ 59	1325.9 10	0.55 10	0.0155	Auger-L	3.19	48 3	0.0033
γ 60	1418.6 11	0.55 10	0.0166	Auger-K	22.7	4.0 9	0.0019
γ 61	1436.1 12	0.32 14	0.0098	ce-K- 1	73.69 5	31.6 13	0.0497
γ 62	1479.7 10	0.50 23	0.0158	ce-L- 1	100.56 5	24.0 11	0.0515
γ 64	1525.9 10	0.46 14	0.0149	ce-M- 1	104.49 5	5.6 3	0.0124
γ 65	1540.0 15	0.14 5	0.0045	ce-NCP- 1	105.33 5	1.46 7	0.0033
γ 66	1568.7 8	0.73 10	0.0244	γ-ray L	3.77	4.8 16	0.0004
γ 68	1598.5 9	0.55 14	0.0187	γ-ray K _{α2}	27.20170 2	7.9 5	0.0045
γ 69	1621.1 12	0.27 14	0.0095	γ-ray K _{α1}	27.47230 2	14.7 8	0.0086
γ 70	1654.6 10	1.05 23	0.0370	γ-ray K _β	31	5.1 3	0.0034
γ 72	1724.1 20	0.27 14	0.0101	γ 1	105.50 5	0.147 8	0.0003
γ 74	1736.5 10	6.4 8	0.235	● ¹²⁹ Te β ⁻ Decay (33.6 d 2) I (min) = 0.10%			
γ 75	1841.8	0.23 10	0.0090	%β ⁻ Decay = 37.1 24			
γ 76	1869.9 11	0.32 10	0.0127	Feeds ¹²⁹ I			
γ 81	2069.6 15	0.59 14	0.0262	See also ¹²⁹ Te IT Decay (33.6 d)			
γ 83	2113.0 15	0.37 14	0.0165	Auger-L	3.3	0.105 16	≈0
23 weak γ's omitted: Σγ (avg) = 1310.7; ΣIγ = 0.98%				ce-L- 1	22.582 20	0.116 17	≈0
● ¹²⁹ Te β ⁻ Decay (69.6 m 4) I (min) = 0.10%				β- 1 max	202 4		
Feeds ¹²⁹ I				avg	55.5 12	0.166 21	0.0002
Auger-L	3.3	59 10	0.0041	β- 2 max	874 4		
ce-L- 1	22.582 20	65 11	0.0312	avg	294.8 16	0.76 10	0.0048
ce-M- 1	26.698 20	13.0 22	0.0074	β- 3 max	908 4		
ce-NCP- 1	27.584 20	4.3 7	0.0025	avg	308.3 16	3.3 4	0.0217
β- 1 max	386 4			β- 4 max	1604 4		
avg	114.1 14	0.81 10	0.0020	avg	607.3 17	32.8 25	0.424
β- 2 max	668 4			+ total β-	571.0 18	37 3	0.451
avg	214.9 15	0.196 23	0.0009	avg			
β- 3 max	938 4			5 weak β's omitted: Σβ (avg) = 232.5; ΣIβ = 0.08%			
avg	320.6 17	0.23 3	0.0016	γ 13	556.652	0.129 17	0.0015
β- 4 max	1011 4			γ 15	695.892 20	3.3 4	0.0485
avg	350.0 17	8.6 10	0.0641	γ 19	729.570 20	0.76 10	0.0119
β- 5 max	1220 4			31 weak γ's omitted: Σγ (avg) = 742.5; ΣIγ = 0.31%			
avg	437.0 17	0.52 7	0.0048	● ¹²⁹ I β ⁻ Decay (1.57E7 y 4) I (min) = 0.10%			
β- 6 max	1470 4			Auger-L	3.43	74 4	0.0054
avg	544.5 18	90 10	1.04	ce-K- 1	5.020 15	78.9 5	0.0084
total β-				Auger-K	24.6	8.8 16	0.0046
avg	522.4 19	100 10	1.12	ce-L- 1	34.128 15	10.7 3	0.0078
4 weak β's omitted: Σβ (avg) = 74.5; ΣIβ = 0.06%				ce-M- 1	38.439 15	2.16 7	0.0018
γ-ray L	4	6.2 23	0.0005	ce-NCP- 1	39.373 15	0.714 22	0.0006
γ 1	27.770 20	16.3 25	0.0096	β- 1 max	152 4		
γ 2	208.960 15	0.166 20	0.0007	avg	40.9 12	100	0.0871
γ 5	250.615 15	0.35 5	0.0019	(Continued)			
γ 7	278.430 10	0.52 6	0.0031				
γ 8	281.262 15	0.152 18	0.0009				
γ 15	459.600 10	7.1 8	0.0695				
γ 16	487.390 20	1.31 16	0.0136				
γ 32	802.100 20	0.177 21	0.0030				
γ 42	1083.850 20	0.45 6	0.0105				
γ 43	1111.640 20	0.176 21	0.0042				
37 weak γ's omitted: Σγ (avg) = 656.9; ΣIγ = 0.38%							

Radiation Type	Energy (keV)	Intensity (%)	$\Delta(g\text{-rad}/\mu\text{Ci}\cdot\text{h})$
γ -ray L	4.1	8.2 25	0.0007
γ -ray $K\alpha_2$	29.4580 10	20.0 6	0.0125
γ -ray $K\alpha_1$	29.7790 10	37.0 10	0.0235
γ -ray $K\beta$	33.6	13.2 4	0.0094
γ 1	39.581 15	7.52 23	0.0063

• ¹²⁹Xe IT Decay (8.89 d 2) I (min) = 0.10%

Auger-L	3.43	147 8	0.0108
ce-K- 1	5.020 15	78.9 5	0.0084
Auger-K	24.6	16 3	0.0083
ce-L- 1	34.128 15	10.7 3	0.0078
ce-M- 1	38.439 15	2.16 7	0.0018
ce-MOP- 1	39.373 15	0.714 22	0.0006
ce-K- 2	162.00 3	63.9 7	0.220
ce-L- 2	191.11 3	24.4 6	0.0993
ce-M- 2	195.42 3	5.48 16	0.0228
ce-MOP- 2	196.35 3	1.48 4	0.0062

γ -ray L	4.1	16 5	0.0014
γ -ray $K\alpha_2$	29.4580 10	36.1 10	0.0227
γ -ray $K\alpha_1$	29.7790 10	67.0 17	0.0425
γ -ray $K\beta$	33.6	23.8 7	0.0170
γ 1	39.581 15	7.52 23	0.0063
γ 2	196.56 3	4.74 13	0.0198

• ¹²⁹Cs EC Decay (32.06 h 6) I (min) = 0.10%

Auger-L	3.43	110 8	0.0080
ce-K- 1	5.020 15	32 3	0.0034
Auger-K	24.6	13.1 25	0.0068
ce-L- 1	34.128 15	4.3 4	0.0031
ce-M- 1	38.439 15	0.87 7	0.0007
ce-MOP- 1	39.373 15	0.287 22	0.0002
ce-K- 3	58.768 4	0.58 5	0.0007
ce-K- 12	337.3566 23	0.59 4	0.0043
ce-K- 13	376.9286 23	0.33 4	0.0026

γ -ray L	4.1	12 4	0.0011
γ -ray $K\alpha_2$	29.4580 10	29.7 18	0.0197
γ -ray $K\alpha_1$	29.7790 10	55 4	0.0350
γ -ray $K\beta$	33.6	19.6 12	0.0140
γ 1	39.581 15	3.02 23	0.0025
γ 3	93.329 3	0.66 5	0.0013
γ 4	177.036 10	0.274 18	0.0010
γ 5	266.820 7	0.277 18	0.0016
γ 6	270.352 5	0.216 15	0.0012
γ 7	278.614 4	1.34 10	0.0080
γ 8	282.131 6	0.246 17	0.0015
γ 9	318.1800 20	2.49 17	0.0169
γ 12	371.9180 20	31.1 19	0.246
γ 13	411.4900 20	22.7 15	0.199
γ 17	548.945 8	3.45 22	0.0404
γ 22	588.549 8	0.61 5	0.0077
γ 27	906.425 6	0.224 15	0.0043

15 weak γ 's omitted:
 $\Sigma\gamma(\text{avg}) = 636.5; \Sigma I\gamma = 0.28\%$

Radiation Type	Energy (keV)	Intensity (%)	$\Delta(g\text{-rad}/\mu\text{Ci}\cdot\text{h})$
• ¹³⁰ I β^- Decay (12.36 h 1) I (min) = 0.10%			
Auger-L	3.43	1.35 9	≈ 0
Auger-K	24.6	0.19 4	≈ 0
ce-K- 9	383.449 20	0.47 5	0.0039
ce-K- 14	501.529 20	0.623 20	0.0067
ce-K- 20	633.979 10	0.341 11	0.0046
ce-K- 23	704.919 20	0.229 8	0.0034

β^- 1 max	232 10		
avg	64 3	0.316 16	0.0004
β^- 2 max	355 10		
avg	103 4	0.328 17	0.0007
β^- 3 max	376 10		
avg	110 4	0.492 14	0.0012
β^- 4 max	557 10		
avg	173 4	0.184 5	0.0007
β^- 5 max	622 10		
avg	197 4	46.7 3	0.196
β^- 6 max	812 10		
avg	270 4	2.14 3	0.0123
β^- 7 max	902 10		
avg	306 4	0.173 16	0.0011
β^- 8 max	1040 10		
avg	361 5	47.5 8	0.365
β^- 9 max	1176 10		
avg	418 5	1.43 5	0.0127
total β^-			
avg	279 5	99.5 9	0.591

5 weak β 's omitted:
 $\Sigma\beta(\text{avg}) = 91.4; \Sigma I\beta = 0.27\%$

γ -ray L	4.1	0.15 5	≈ 0
γ -ray $K\alpha_2$	29.4580 10	0.422 17	0.0003
γ -ray $K\alpha_1$	29.7790 10	0.78 3	0.0005
γ -ray $K\beta$	33.6	0.278 12	0.0002
γ 9	418.010 20	34.15 20	0.304
γ 12	457.720 20	0.237 15	0.0023
γ 13	510.350 20	0.852 21	0.0093
γ 14	536.090 20	99.0 7	1.13
γ 15	539.10 3	1.396 7	0.0160
γ 16	553.900 10	0.662 17	0.0078
γ 17	586.050 20	1.693 22	0.0211
γ 18	603.530 10	0.615 21	0.0079
γ 20	668.540 10	96.1 8	1.37
γ 21	685.990 10	1.069 21	0.0156
γ 23	739.480 20	82.3 8	1.30
γ 26	800.23 3	0.101 5	0.0017
γ 27	808.290 20	0.236 6	0.0041
γ 32	877.35 4	0.191 8	0.0036
γ 35	967.020 20	0.877 14	0.0181
γ 39	1096.48 3	0.552 10	0.0129
γ 40	1122.15 3	0.253 8	0.0061
γ 41	1157.470 10	11.31 11	0.279
γ 42	1222.56 3	0.179 5	0.0047
γ 43	1272.120 20	0.748 12	0.0203
γ 45	1403.900 20	0.345 12	0.0103

32 weak γ 's omitted:
 $\Sigma\gamma(\text{avg}) = 813.0; \Sigma I\gamma = 0.85\%$

• ¹³¹Te β^- Decay (25.0 m 1) I (min) = 0.10%
 Feeds ¹³¹I

Auger-L	3.3	13.8 10	0.0010
Auger-K	23.6	1.7 5	0.0009
ce-K- 4	116.547 5	14.5 5	0.0359

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
¹³¹ Te β^- Decay (25.0 m 1) (Continued)				● ¹³¹ Te IT Decay (30 h 2) I (min) = 0.10% %IT Decay = 22.2 16 Feeds ¹³¹ Te (25.0 m) See also ¹³¹ Te β^- Decay (30 h)			
ce-L- 4	144.528 5	1.87 7	0.0057	Auger-L	3.1 ⁰	16.9 13	0.0011
ce-M- 4	148.644 5	0.467 7	0.0015	Auger-K	22.7	1.8 5	0.0009
ce-X- 24	419.1536 21	0.193 17	0.0017	ce-K- 1	150.436 20	14.4 11	0.0462
β^- 1 max	748 6			ce-L- 1	177.311 20	5.4 5	0.0295
avg	245.6 24	1.199 22	0.0063	ce-M- 1	181.244 20	1.20 10	0.0046
β^- 2 max	805 6			ce- ¹⁰⁰ P- 1	182.082 20	0.304 24	0.0012
avg	267.6 24	1.186 22	0.0068	γ -ray L	3.77	1.7 6	0.0001
β^- 3 max	822 6			γ -ray K α_2	27.2017 ⁰ 2	3.6 3	0.0021
avg	274.2 24	1.34 3	0.0078	γ -ray K α_1	27.47230 2	6.7 6	0.0039
β^- 4 max	903 6			γ -ray K β	31	2.32 19	0.0015
avg	306.2 24	0.119 9	0.0008	γ 1	182.250 20	0.95 7	0.0033
β^- 5 max	951 6			● ¹³¹ Te β^- Decay (30 h 2) I (min) = 0.10% % β^- Decay = 77.8 16 Feeds ¹³¹ I See also ¹³¹ Te IT Decay (30 h)			
avg	325.6 25	0.54 9	0.0037	Auger-L	3.3	10.6 7	0.0007
β^- 6 max	1102 6			Auger-K	23.6	1.3 4	0.0007
avg	387.7 25	9.99 16	0.0825	ce-K- 14	47.971 20	4.80 21	0.0049
β^- 7 max	1151 6			ce-K- 21	68.891 10	4.88 22	0.0072
avg	408 3	2.59 5	0.0225	ce-L- 14	75.952 20	0.63 3	0.0010
β^- 8 max	1372 6			ce- ¹⁰⁰ P-14	80.068 20	0.157 5	0.0003
avg	502 3	1.178 23	0.0126	ce-L- 21	96.872 10	0.64 3	0.0013
β^- 9 max	1647 6			ce- ¹⁰⁰ P-21	100.988 10	0.159 5	0.0003
avg	622 3	21.8 3	0.289	ce-K- 36	116.547 5	1.07 15	0.0026
β^- 10 max	1756 6			ce-L- 36	144.528 5	0.138 19	0.0004
avg	670 3	0.78 5	0.0111	ce-X- 48	167.461 20	0.191 8	0.0007
β^- 11 max	2099 6			ce-K- 58	207.761 10	0.117 5	0.0005
avg	825 3	59.2 16	1.04	ce-K- 75	301.101 10	0.234 10	0.0015
total β^-				β^- 1 max	161 6		
avg	696 4	100.1 17	1.48	avg	43.3 18	0.56 4	0.0005
5 weak β^- 's omitted: $\Sigma\beta$ (avg) = 136.0; $\Sigma I\beta$ = 0.21%				β^- 2 max	190 6		
γ -ray L	4	1.4 5	0.0001	avg	51.8 18	0.31 4	0.0003
γ -ray K α_2	28.3172 4	3.68 18	0.0022	β^- 3 max	255 6		
γ -ray K α_1	28.6120 3	6.9 4	0.0042	avg	71.5 19	0.20 4	0.0003
γ -ray K β	32.3	2.40 12	0.0017	β^- 4 max	261 6		
γ 4	149.716 5	68.9 9	0.220	avg	73.3 19	0.45 4	0.0007
γ 5	151.10 10	0.17 7	0.0006	β^- 5 max	263 6		
γ 15	342.945 4	0.703 12	0.0051	avg	74.0 19	0.95 6	0.0015
γ 19	384.059 3	0.896 14	0.0073	β^- 6 max	317 6		
γ 24	452.3230 20	18.22 25	0.176	avg	91.3 20	1.65 21	0.0032
γ 25	492.660 10	4.84 7	0.0508	β^- 7 max	368 6		
γ 29	544.880 10	0.427 15	0.0050	avg	108.0 20	0.341 25	0.0008
γ 32	567.33 4	0.103 7	0.0012	β^- 8 max	420 6		
γ 34	602.039 3	4.20 6	0.0538	avg	125.6 21	2.27 17	0.0061
γ 35	605.550 20	0.117 7	0.0015	β^- 9 max	430 6		
γ 36	654.260 10	1.530 25	0.0213	avg	129.0 21	5.4 4	0.0148
γ 37	696.190 20	0.179 14	0.0027	β^- 10 max	451 6		
γ 40	727.000 20	0.469 10	0.0073	avg	136.2 21	36.9 10	0.107
γ 45	841.990 20	0.200 8	0.0036	β^- 11 max	507 6		
γ 48	856.08 3	0.131 7	0.0024	avg	155.7 22	2.14 13	0.0071
γ 50	898.54 3	0.138 8	0.0026	β^- 12 max	532 6		
γ 51	934.483 5	0.875 18	0.0174	avg	164.8 22	16.6 6	0.0583
γ 52	948.542 4	2.26 4	0.0457	β^- 13 max	544 6		
γ 53	951.390 20	0.331 9	0.0067	avg	169.0 22	1.50 8	0.0054
γ 54	997.250 10	3.34 5	0.0710	β^- 14 max	785 6		
γ 57	1007.960 10	0.799 13	0.0172	avg	259.9 24	2.5 3	0.0138
γ 60	1098.250 20	0.172 8	0.0040	56 weak γ 's omitted: $\Sigma\gamma$ (avg) = 696.0; $\Sigma I\gamma$ = 1.19%			
γ 61	1146.960 10	4.96 7	0.121	(Continued)			
γ 62	1148.51 6	0.110 7	0.0027				
γ 68	1277.440 10	0.118 5	0.0032				
γ 69	1298.340 20	0.482 10	0.0133				
γ 73	1427.140 20	0.105 4	0.0032				
γ 74	1500.62 3	0.115 4	0.0037				

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
¹³¹ I β ⁻ Decay (8.040 d 3) (Continued)							
γ 14	364.480 11	81.2 11	0.630	X-ray L	4.29	13 4	0.0012
γ 16	502.991 11	0.361 6	0.0039	X-ray Kα ₂	30.6251 3	27.7 7	0.0180
γ 17	636.973 10	7.26 10	0.0985	X-ray Kα ₁	30.9728 3	51.2 12	0.0338
γ 18	642.703 11	0.220 4	0.0030	X-ray Kβ	35	18.4 5	0.0137
γ 19	722.893 10	1.803 25	0.0278	γ 2	78.764 16	0.730 25	0.0012
10 weak γ's omitted: Σγ(avg) = 329.4; ΣIγ = 0.23%				γ 4	92.289 14	0.64 9	0.0013
				γ 5	123.802 8	29.0 9	0.0764
				γ 7	133.612 14	2.16 7	0.0061
				γ 9	157.147 9	0.190 6	0.0006
				γ 10	216.073 8	19.7 5	0.0909
				γ 11	239.623 8	2.40 5	0.0123
				γ 12	246.879 12	0.641 20	0.0034
				γ 13	249.426 8	2.82 7	0.0150
				γ 14	294.508 20	0.167 5	0.0010
				γ 15	351.188 24	0.102 7	0.0008
				γ 17	373.237 11	14.0 4	0.111
				γ 18	404.036 11	1.306 20	0.0112
				γ 21	461.246 24	0.103 1	0.0010
				γ 23	480.395 13	0.323 9	0.0033
				γ 24	486.510 12	2.07 4	0.0215
				γ 25	496.313 13	46.8 5	0.495
				γ 29	572.672 15	0.155 5	0.0019
				γ 30	585.026 15	1.221 13	0.0152
				γ 31	620.095 17	1.36 9	0.0180
				γ 32	674.415 20	0.133 4	0.0019
				γ 33	696.470 20	0.148 5	0.0022
				γ 37	831.60 3	0.231 7	0.0041
				γ 40	923.846 22	0.730 21	0.0144
				γ 44	1047.571 25	1.170 13	0.0261
				23 weak γ's omitted: Σγ(avg) = 501.8; ΣIγ = 0.58%			
• ¹³¹ Xe IT Decay (11.84 d 7) I (min) = 0.10%				• ¹³² Te β ⁻ Decay (78.2 h 8) I (min) = 0.10%			
Auger-L	3.43	75 4	0.0055	Feeds ¹³² I (2.30 h)			
Auger-K	24.6	6.8 13	0.0036	Auger-L	3.3	69 6	0.0049
ce-K- 1	129.369 13	61.2 7	0.169	ce-K- 1	16.551 10	64 4	0.0226
ce-L- 1	158.477 13	28.6 6	0.0965	Auger-K	23.6	8.6 21	0.0043
ce-M- 1	162.788 13	6.50 18	0.0225	ce-L- 1	44.532 10	8.5 6	0.0080
ce-NOP- 1	163.722 13	1.78 5	0.0062	ce-M- 1	48.648 10	1.70 11	0.0018
X-ray L	4.1	8 3	0.0007	ce-NOP- 1	49.534 10	0.56 8	0.0006
X-ray Kα ₂	29.4580 10	15.5 5	0.0097	ce-K- 2	78.59 8	0.88 10	0.0015
X-ray Kα ₁	29.7790 10	28.7 8	0.0182	ce-K- 3	83.13 8	0.82 10	0.0015
X-ray Kβ	33.6	10.2 4	0.0073	ce-L- 2	106.57 8	0.114 14	0.0003
γ 1	163.930 13	1.96 6	0.0068	ce-L- 3	111.11 8	0.107 12	0.0003
				ce-K- 4	194.99 6	7.1 5	0.0295
				ce-L- 4	222.97 6	1.34 9	0.0064
				ce-MNO- 4	227.09 6	0.338 20	0.0016
				B- 1 max	215 4		
				avg	59.4 12	100	0.127
				X-ray L	4	7.3 25	0.0006
				X-ray Kα ₂	28.3172 4	18.3 12	0.0110
				X-ray Kα ₁	28.6120 3	34.1 21	0.0208
				X-ray Kβ	32.3	11.9 8	0.0082
				γ 1	49.720 10	13.1 9	0.0139
				γ 2	111.76 8	1.85 21	0.0044
				γ 3	116.30 8	1.94 21	0.0048
				γ 4	228.16 6	88 5	0.428
• ¹³¹ Ba EC Decay (11.8 d 2) I (min) = 0.10%							
Feeds ¹³¹ Cs							
Auger-L	3.55	103 5	0.0078				
ce-K- 1	18.98 11	0.58 4	0.0002				
Auger-K	25.5	11.4 14	0.0062				
ce-K- 2	42.779 16	1.14 6	0.0010				
ce-L- 1	49.25 11	0.76 5	0.0008				
ce-MNO- 1	53.74 11	0.206 11	0.0002				
ce-K- 4	56.304 14	0.64 9	0.0008				
ce-L- 2	73.050 16	0.154 6	0.0002				
ce-K- 5	87.817 8	18.1 8	0.0338				
ce-K- 7	97.627 14	0.807 25	0.0017				
ce-L- 5	118.088 8	6.0 3	0.0151				
ce-M- 5	122.585 8	1.27 6	0.0033				
ce-NOP- 5	123.571 8	0.316 14	0.0008				
ce-L- 7	127.898 14	0.14 3	0.0004				
ce-K- 10	180.088 8	1.82 7	0.0070				
ce-K- 11	203.638 8	0.168 6	0.0007				
ce-I- 10	210.359 8	0.241 10	0.0011				
ce-K- 13	213.441 8	0.177 7	0.0008				
ce-K- 17	337.252 11	0.28 3	0.0020				
ce-K- 25	460.328 13	0.505 16	0.0050				

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
¹³² Cs EC Decay (6.475 d 10) (Continued)							
β ⁺ 1 max	421 23			β- 8 max	1660 60		
avg	198 10	0.36 9	0.0015	avg	630 30	7.0 8	0.0939
γ-ray L	4.1	9 3	0.0008	β- 9 max	2180 60		
γ-ray Kα ₂	29.4580 10	21.1 6	0.0132	avg	860 30	1.3 8	0.0238
γ-ray Kα ₁	29.7790 10	39.1 10	0.0248	β-10 max	2250 60		
γ-ray Kβ	33.6	13.9 4	0.0100	avg	890 30	33.3 10	0.631
γ 2	505.90 15	0.90 10	0.0086	β-11 max	2660 60		
γ 3	630.22 9	1.01 8	0.0136	avg	1080 30	28.6 12	0.658
γ 4	667.69 9	97.42 11	1.39	total β-		100.0 23	1.74
γ 6	1136.03 12	0.51 4	0.0123	avg	810 40		
γ 8	1317.80 20	0.58 5	0.0164	γ-ray L	4	0.25 9	≈0
4 weak γ's omitted: Eγ(avg) = 1090.3; ΣIγ = 0.27% Maximum γi-intensity = 0.72%				γ-ray Kα ₂	28.3172 4	0.628 24	0.0004
				γ-ray Kα ₁	28.6120 3	1.17 5	0.0007
				γ-ray Kβ	32.3	0.410 16	0.0003
				γ 1	311.99 8	70.8 7	0.470
				γ 2	384.6 5	0.28 7	0.0023
				γ 3	392.9 6	0.57 22	0.0047
				γ 4	407.63 7	30.1 7	0.261
				γ 5	474.72 13	1.2 3	0.0122
				γ 6	546.4 6	0.57 22	0.0066
				γ 7	587.1 5	0.50 15	0.0062
				γ 8	613.6 7	0.28 15	0.0037
				γ 9	719.65 10	6.7 5	0.102
				γ 10	786.77 10	5.6 5	0.0937
				γ 11	844.39 7	3.3 3	0.0586
				γ 12	930.67 10	4.5 6	0.0884
				γ 13	1000.77 11	6.2 8	0.133
				γ 14	1021.07 15	2.7 3	0.0585
				γ 15	1061.8 8	1.27 22	0.0288
				γ 16	1252.20 20	1.13 15	0.0302
				γ 17	1307.7 8	0.9 3	0.0256
				γ 18	1313.5 8	0.8 3	0.0218
				γ 19	1333.23 12	9.9 6	0.281
				γ 20	1405.70 20	0.57 15	0.0170
				γ 21	1478.0 10	0.35 15	0.0111
				γ 22	1518.6 8	0.50 7	0.0160
				γ 23	1588.2 9	0.28 15	0.0096
				γ 24	1717.65 15	3.4 3	0.124
				γ 25	1825.1 10	0.57 22	0.0220
				γ 26	1881.5 4	1.42 22	0.0567
				γ 27	2136.5 12	0.28 7	0.0129
				γ 28	2228.0 13	0.28 15	0.0134
				1 weak γ's omitted: Eγ(avg) = 2540.6; ΣIγ = 0.07%			
• ¹³² Cs β ⁻ Decay (6.475 d 10) I (min) = 0.10%				• ¹³³ Te IT Decay (55.4 m 4) I (min) = 0.10%			
%β ⁻ Decay = 2.04 10				%IT Decay = 13 3			
See also ¹³² Cs EC Decay				Feeds ¹³³ Te (12.45 m)			
				See also ¹³³ Te β ⁻ Decay (55.4 m)			
β- 1 max	247 24			Auger-L	3.19	6.1 12	0.0004
avg	69 8	0.37 4	0.0005	Auger-K	22.7	0.73 24	0.0004
β- 2 max	814 24			ce-K- 1	302.33 7	5.8 14	0.0377
avg	270 10	1.61 16	0.0093	ce-L- 1	329.20 7	1.4 4	0.0096
total β-				ce-MNO- 1	333.13 7	0.36 9	0.0025
avg	227 12	2.04 17	0.0099	γ-ray L	3.77	0.60 24	≈0
1 weak β's omitted: Eβ(avg) = 41.0; ΣIβ = 0.06%				γ-ray Kα ₂	27.20170 2	1.5 4	0.0008
				γ-ray Kα ₁	27.47230 2	2.7 7	0.0016
γ 1	464.55 6	1.89 17	0.0187	γ-ray Kβ	31	0.94 22	0.0006
γ 2	567.14 3	0.24 4	0.0029	γ 1	334.14 7	5.4 13	0.0387
γ 4	1031.70 3	0.123 13	0.0027				
1 weak γ's omitted: Eγ(avg) = 663.1; ΣIγ = 0.06%							
• ¹³³ Te β ⁻ Decay (12.45 m 28) I (min) = 0.10%							
Feeds ¹³³ I							
Auger-L	3.3	2.34 15	0.0002				
Auger-K	23.6	0.30 7	0.0001				
ce-K- 1	278.82 8	2.082 22	0.0124				
ce-L- 1	306.80 8	0.30 5	0.0020				
ce-K- 4	374.46 7	0.42 3	0.0034				
β- 1 max	430 60						
avg	129 21	0.35 15	0.0010				
β- 2 max	780 60						
avg	256 24	1.8 3	0.0098				
β- 3 max	830 60						
avg	279 24	0.85 23	0.0051				
β- 4 max	1250 60						
avg	450 30	8.7 7	0.0834				
β- 5 max	1410 60						
avg	520 30	4.4 4	0.0487				
β- 6 max	1600 60						
avg	600 30	0.50 15	0.0064				
β- 7 max	1640 60						
avg	620 30	13.2 7	0.174				

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
<p>• ¹³³Te β⁻ Decay (55.4 m 4) I (min) = 0.10% %β⁻ Decay = 87 3 Feeds ¹³³I See also ¹³³Te IT Decay (55.4 m)</p>							
Auger-L	3.3	16 3	0.0011	γ 43	863.91 13	19.5 11	0.359
Auger-K	23.6	1.7 6	0.0008	γ 44	882.83 12	5.7 8	0.106
ce-K- 1	40.93 20	8 3	0.0069	γ 45	897.7 4	0.435 15	0.0083
ce-K- 2	48.33 20	0.5 3	0.0005	γ 46	912.58 10	87 3	1.69
ce-K- 3	54.83 20	1.7 3	0.0020	γ 47	914.72 13	16.5 6	0.322
ce-K- 4	61.73 20	4.1 5	0.0054	γ 48	934.4 3	1.30 5	0.0260
ce-L- 1	68.91 20	2.3 9	0.0034	γ 49	978.19 9	9.5 11	0.198
ce-L- 3	82.81 20	0.4 3	0.0007	γ 50	980.40 20	2.35 8	0.0491
ce-L- 4	84.71 20	1.9 7	0.0037	γ 51	982.90 20	1.13 4	0.0237
β- 1 max	1530 60			γ 52	1007.5 10	1.0 4	0.0224
β- 1 avg	570 30	19.5 11	0.237	γ 53	1029.80 20	1.3 5	0.0286
β- 2 max	1740 60			γ 54	1348.90 20	2.52 9	0.0725
β- 2 avg	670 30	29.3 21	0.418	γ 55	1459.10 20	2.17 8	0.0676
β- 3 max	2390 60			γ 56	1516.1 3	0.96 4	0.0309
β- 3 avg	960 30	38.2 25	0.781	γ 57	1531.6 4	0.87 3	0.0284
total β- avg	770 40	87 4	1.44	γ 58	1683.30 20	5.7 7	0.206
X-ray L	4	1.7 7	0.0001	γ 59	1704.4 3	0.96 4	0.0347
X-ray Kα ₂	28.3172 4	3.6 8	0.0022	γ 60	1885.7 3	1.13 4	0.0454
X-ray Kα ₁	28.6120 3	6.6 14	0.0040	γ 61	2004.9 3	3.3 4	0.141
X-ray Kβ	32.3	2.3 5	0.0016	γ 62	2027.7 4	2.1 4	0.0902
γ 1	74.10 20	1.3 5	0.0021	γ 63	2049.2 4	1.0 3	0.0456
γ 2	81.50 20	0.7 4	0.0012				
γ 3	89.00 20	2.1 3	0.0039				
γ 4	94.90 20	8.7 10	0.0176				
γ 5	164.34 9	2.3 3	0.0082				
γ 6	168.87 9	11.5 14	0.0413				
γ 7	177.10 20	1.5 4	0.0056				
γ 8	178.20 20	0.87 3	0.0033				
γ 9	184.45 10	0.348 12	0.0014				
γ 10	193.22 10	0.6 3	0.0025				
γ 11	198.20 20	0.522 18	0.0022				
γ 12	213.36 8	2.9 3	0.0130				
γ 13	220.94 13	0.435 15	0.0020				
γ 14	224.03 13	0.348 12	0.0017				
γ 15	244.28 10	0.609 21	0.0032				
γ 16	251.49 10	0.522 18	0.0028				
γ 17	257.64 9	0.87 3	0.0048				
γ 18	261.55 7	15.7 15	0.0872				
γ 19	285.7 5	0.87 18	0.0053				
γ 20	344.50 20	2.3 8	0.0166				
γ 21	347.22 9	1.13 4	0.0084				
γ 22	355.57 14	1.5 4	0.0112				
γ 23	362.81 15	0.96 4	0.0074				
γ 24	376.83 14	0.522 18	0.0042				
γ 25	396.96 9	1.48 5	0.0125				
γ 26	429.02 11	1.22 18	0.0111				
γ 27	435.4 7	1.0 4	0.0097				
γ 28	444.90 9	2.3 3	0.0214				
γ 29	462.11 16	2.0 3	0.0197				
γ 30	471.85 9	2.00 7	0.0201				
γ 31	478.59 10	1.57 6	0.0160				
γ 32	519.60 20	0.435 15	0.0048				
γ 33	534.85 14	1.74 6	0.0198				
γ 34	574.04 10	2.3 4	0.0287				
γ 35	622.03 16	1.39 5	0.0184				
γ 36	647.40 8	29.3 21	0.404				
γ 37	702.75 12	3.74 13	0.0560				
γ 38	731.69 15	1.48 5	0.0231				
γ 39	733.89 10	2.87 10	0.0449				
γ 40	779.75 10	3.39 12	0.0564				
γ 41	795.7 4	1.30 5	0.0221				
γ 42	800.51 12	1.91 7	0.0326				
				<p>• ¹³³I β⁻ Decay (20.8 h 1) I (min) = 0.10% % Feeding to ¹³³Xe (5.245 d) = 97.12 2 % Feeding to ¹³³Xe (2.19 d) = 2.88 2</p>			
Auger-L	3.43	0.48 3	≅0	Auger-L	3.43	0.48 3	≅0
ce-K- 16	495.311 4	0.598 9	0.0063	ce-K- 16	495.311 4	0.598 9	0.0063
β- 1 max	170 30			β- 1 max	170 30		
β- 1 avg	46 9	0.410 14	0.0004	β- 1 avg	46 9	0.410 14	0.0004
β- 2 max	370 30			β- 2 max	370 30		
β- 2 avg	110 10	1.24 4	0.0029	β- 2 avg	110 10	1.24 4	0.0029
β- 3 max	410 30			β- 3 max	410 30		
β- 3 avg	122 11	0.397 10	0.0010	β- 3 avg	122 11	0.397 10	0.0010
β- 4 max	460 30			β- 4 max	460 30		
β- 4 avg	140 11	3.75 5	0.0112	β- 4 avg	140 11	3.75 5	0.0112
β- 5 max	520 30			β- 5 max	520 30		
β- 5 avg	162 11	3.13 6	0.0108	β- 5 avg	162 11	3.13 6	0.0108
β- 6 max	710 30			β- 6 max	710 30		
β- 6 avg	230 12	0.542 19	0.0027	β- 6 avg	230 12	0.542 19	0.0027
β- 7 max	880 30			β- 7 max	880 30		
β- 7 avg	299 12	4.16 10	0.0265	β- 7 avg	299 12	4.16 10	0.0265
β- 8 max	1020 30			β- 8 max	1020 30		
β- 8 avg	352 13	1.81 4	0.0136	β- 8 avg	352 13	1.81 4	0.0136
β- 9 max	1230 30			β- 9 max	1230 30		
β- 9 avg	441 13	83.5 4	0.784	β- 9 avg	441 13	83.5 4	0.784
β-10 max	1530 30			β-10 max	1530 30		
β-10 avg	573 13	1.07 4	0.0131	β-10 avg	573 13	1.07 4	0.0131
total β- avg	407 15	100.0 5	0.867	total β- avg	407 15	100.0 5	0.867
				<p>1 weak β's omitted: Eβ (avg) = 284.0; ΣIβ = 0.03%</p>			
X-ray Kα ₂	29.4580 10	0.151 5	≅0	X-ray Kα ₂	29.4580 10	0.151 5	≅0
X-ray Kα ₁	29.7790 10	0.281 8	0.0002	X-ray Kα ₁	29.7790 10	0.281 8	0.0002
γ 5	262.702 6	0.357 10	0.0020	γ 5	262.702 6	0.357 10	0.0020
γ 6	267.173 19	0.117 6	0.0007	γ 6	267.173 19	0.117 6	0.0007
γ 7	345.43 5	0.104 18	0.0008	γ 7	345.43 5	0.104 18	0.0008
γ 8	361.08 5	0.11 4	0.0009	γ 8	361.08 5	0.11 4	0.0009
γ 12	418.047 15	0.153 11	0.0014	γ 12	418.047 15	0.153 11	0.0014
γ 13	422.910 12	0.309 8	0.0028	γ 13	422.910 12	0.309 8	0.0028
γ 15	510.530 4	1.81 4	0.0197	γ 15	510.530 4	1.81 4	0.0197
γ 16	529.872 3	86.3 4	0.974	γ 16	529.872 3	86.3 4	0.974
γ 20	617.974 14	0.539 13	0.0071	γ 20	617.974 14	0.539 13	0.0071
γ 24	680.247 11	0.645 15	0.0093	γ 24	680.247 11	0.645 15	0.0093
γ 25	706.578 8	1.49 4	0.0225	γ 25	706.578 8	1.49 4	0.0225

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
¹³³ I β ⁻ Decay (20.8 h 1) (Continued)				● ¹³³ Ba EC Decay (10.5 y 1) I (min) = 0.10%			
γ 26	768.382 15	0.457 12	0.0075	Auger-L	3.55	136 6	0.0103
γ 28	820.506 22	0.154 6	0.0027	ce-K- 1	17.170 16	10.5 5	0.0038
γ 29	856.278 7	1.23 4	0.0225	Auger-K	25.5	14.1 17	0.0077
γ 30	875.329 5	4.47 9	0.0834	ce-K- 2	43.636 11	3.9 3	0.0036
γ 31	909.67 3	0.212 8	0.0041	ce-K- 3	45.012 5	48 4	0.0462
γ 35	1052.296 18	0.552 13	0.0124	ce-L- 1	47.441 16	1.56 10	0.0016
γ 36	1060.07 6	0.137 6	0.0031	ce-MNO- 1	51.938 16	0.403 25	0.0004
γ 38	1236.411 6	1.49 4	0.0393	ce-L- 2	73.907 11	0.56 4	0.0009
γ 39	1298.223 5	2.33 5	0.0644	ce-L- 3	75.283 5	7.4 5	0.0118
γ 40	1350.38 3	0.148 5	0.0043	ce-MNO- 2	78.404 11	0.146 10	0.0002
21 weak γ's omitted: E _γ (avg) = 535.2; ΣI _γ = 0.61%				ce-M- 3	79.780 5	1.51 10	0.0026
● ¹³³ Xe β ⁻ Decay (5.245 d 6) I (min) = 0.10%				ce-NOP- 3	80.766 5	0.39 3	0.0007
Auger-L	3.55	49.7 25	0.0038	ce-K- 4	124.62 4	0.143 9	0.0004
Auger-K	25.5	5.6 7	0.0031	ce-K- 6	240.412 12	0.319 18	0.0016
ce-K- 1	43.636 11	0.33 3	0.0003	ce-K- 7	266.854 8	0.67 4	0.0038
ce-K- 2	45.012 5	53.3 19	0.0511	ce-K- 8	320.020 17	1.28 7	0.0087
ce-L- 2	75.283 5	8.14 16	0.0130	ce-K- 9	347.866 20	0.147 9	0.0011
ce-M- 2	79.780 5	1.67 4	0.0028	ce-L- 8	350.291 17	0.211 12	0.0016
ce-NOP- 2	80.766 5	0.434 9	0.0007	γ-ray L	4.29	17 5	0.0015
β- 1 max	267 3			γ-ray Kα ₂	30.6251 3	34.2 12	0.0223
avg	75.1 10	0.69 6	0.0011	γ-ray Kα ₁	30.9728 3	63.4 21	0.0418
β- 2 max	346 3			γ-ray Kβ	35	22.8 9	0.0170
avg	100.6 10	99.30 6	0.213	γ 1	53.155 16	2.14 11	0.0024
total β-				γ 2	79.621 11	2.55 16	0.0043
avg	100.4 10	100.00 9	0.214	γ 3	80.997 5	33.0 22	0.0569
γ-ray L	4.29	6.1 17	0.0006	γ 4	160.60 4	0.60 4	0.0020
γ-ray Kα ₂	30.6251 3	13.6 6	0.0089	γ 5	223.11 4	0.442 24	0.0021
γ-ray Kα ₁	30.9728 3	25.3 10	0.0167	γ 6	276.397 12	6.9 4	0.0406
γ-ray Kβ	35	9.1 4	0.0068	γ 7	302.839 8	17.8 9	0.115
γ 1	79.621 11	0.217 19	0.0004	γ 8	356.005 17	60 3	0.459
γ 2	80.997 5	36.5 7	0.0629	γ 9	383.851 20	8.7 4	0.0709
4 weak γ's omitted: E _γ (avg) = 177.7; ΣI _γ = 0.07%				● ¹³³ Ba IT Decay (38.9 h 1) I (min) = 0.10%			
● ¹³³ Xe IT Decay (2.19 d 3) I (min) = 0.10%				%IT Decay = 99.9890 6			
Feeds ¹³³ Xe (5.245 d)				Feeds ¹³³ Ba (10.5 y)			
				%EC Decay = 0.0110 6			
Auger-L	3.43	70 4	0.0051	Auger-L	3.67	130 6	0.0102
Auger-K	24.6	7.0 13	0.0037	ce-L- 1	6.30 4	77.6 7	0.0104
ce-K- 1	198.660 15	63.3 7	0.268	ce-MNO- 1	11.00 4	21.1 7	0.0049
ce-L- 1	227.768 15	20.6 5	0.0999	Auger-K	26.4	5.8 16	0.0033
ce-M- 1	232.079 15	4.56 13	0.0225	ce-K- 2	238.65 15	58.9 7	0.299
ce-NOP- 1	233.013 15	1.22 4	0.0061	ce-L- 2	270.10 15	18.0 4	0.104
γ-ray L	4.1	7.8 24	0.0007	ce-M- 2	274.80 15	4.02 12	0.0235
γ-ray Kα ₂	29.4580 10	16.0 5	0.0100	ce-NOP- 2	275.84 15	1.15 3	0.0068
γ-ray Kα ₁	29.7790 10	29.7 8	0.0188	γ-ray L	4.47	18 5	0.0017
γ-ray Kβ	33.6	10.6 4	0.0076	γ 1	12.29 4	1.35 6	0.0004
γ 1	233.221 15	10.3 3	0.0512	γ-ray Kα ₂	31.8171 3	15.1 6	0.0102
				γ-ray Kα ₁	32.1936 3	27.8 9	0.0191
				γ-ray Kβ	36.4	10.1 4	0.0079
				γ 2	276.09 15	18.0 5	0.106
				● ¹³⁴ Te β ⁻ Decay (41.8 m 8) I (min) = 0.10%			
				Feeds ¹³⁴ I (52.6 m)			
				Auger-L	3.3	33.8 23	0.0024
				Auger-K	23.6	4.1 10	0.0021
				ce-K- 3	43.66 6	0.56 21	0.0005
				ce-K- 4	46.276 12	27.1 10	0.0267
				ce-K- 5	68.25 3	0.29 11	0.0004

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)				
ce-L- 3	71.64	6	0.22	17	0.0003						
ce-L- 4	74.257	12	4.2	6	0.0066						
ce-M- 4	78.373	12	0.84	13	0.0014						
ce-NOP- 4	79.259	12	0.20	3	0.0003						
ce-K- 8	147.722	15	2.7	5	0.0094						
ce-K- 10	168.066	15	0.94	14	0.0034						
ce-L- 8	175.703	15	0.49	20	0.0018						
ce-K- 11	177.296	16	2.06	25	0.0078						
ce-M- 8	179.819	15	0.12	5	0.0005						
ce-L- 10	196.047	15	0.16	7	0.0007						
ce-L- 11	205.277	16	0.35	11	0.0015						
ce-K- 13	244.782	8	0.88	5	0.0046						
ce-L- 13	272.763	8	0.132	24	0.0008						
ce-K- 14	401.89	4	0.218	21	0.0019						
ce-K- 15	427.828	22	0.109	10	0.0010						
ce-K- 17	532.823	13	0.112	14	0.0013						
β- 1 max	193.534	23									
β- 1 avg	52.941	7	14.7	7	0.0166						
β- 2 max	376.568	14									
β- 2 avg	110.830	5	42.9	15	0.101						
β- 3 max	453.312	16									
β- 3 avg	136.986	6	41.1	13	0.120						
total β-	113.100	7	98.7	21	0.238						
X-ray L	4	3.5	13		0.0003						
Y-ray Kα ₂	28.3172	4	8.8	5	0.0053						
Y-ray Kα ₁	28.6120	3	16.3	8	0.0099						
X-ray Kβ	32.3	5.7	3		0.0039						
γ 2	43.9	4	0.13	9	0.0001						
γ 3	76.83	6	0.279	25	0.0005						
γ 4	79.445	12	21.0	6	0.0355						
γ 5	101.42	3	0.33	6	0.0007						
γ 6	131.05	20	0.18	6	0.0005						
γ 8	180.891	15	18.0	8	0.0694						
γ 9	183.05	13	0.6	3	0.0023						
γ 10	201.235	15	8.7	4	0.0373						
γ 11	210.465	16	21.9	6	0.0982						
γ 12	259.8	3	0.48	9	0.0027						
γ 13	277.951	8	21.3	8	0.126						
γ 14	435.06	4	18.6	10	0.172						
γ 15	460.997	22	10.8	4	0.106						
γ 16	464.64	5	5.10	17	0.0505						
γ 17	565.992	13	18.9	8	0.228						
γ 18	636.26	10	1.71	22	0.0232						
γ 19	645.40	10	0.90	10	0.0124						
γ 20	665.85	10	1.20	19	0.0170						
γ 21	712.97	5	4.2	4	0.0638						
γ 22	742.586	18	14.7	7	0.233						
γ 23	767.196	21	30.0	10	0.490						
γ 24	844.06	5	1.2	3	0.0216						
γ 25	896.02	10	0.45	12	0.0086						
γ 26	925.55	7	1.65	19	0.0325						
γ 27	1027.00	10	0.45	12	0.0098						
2 weak γ's omitted: E _γ (avg) = 137.0; ΣI _γ = 0.09%											
• ¹³⁴ I β ⁻ Decay (52.6 m 5)				I (min) = 0.10%							
Auger-L	3.43	1.52	11		0.0001						
Auger-K	24.6	0.19	4		≈0						
ce-K- 1	100.838	22	1.14	8	0.0025						
ce-L- 1	129.946	22	0.150	10	0.0004						
ce-K- 7	200.91	3	0.141	14	0.0006						
ce-K- 11	370.890	20	0.112	10	0.0009						
ce-K- 30	812.46	3	0.193	6	0.0033						
ce-K- 33	849.53	3	0.119	4	0.0022						
β- 1 max	770	60									
β- 1 avg	255	24	1.48	9	0.0080						
β- 2 max	790	60									
β- 2 avg	261	24	0.33	4	0.0018						
β- 3 max	840	60									
β- 3 avg	279	24	0.153	19	0.0009						
β- 4 max	1070	60									
β- 4 avg	372	25	1.22	7	0.0097						
β- 5 max	1280	60									
β- 5 avg	460	30	32.5	8	0.318						
β- 6 max	1380	60									
β- 6 avg	500	30	0.53	4	0.0056						
β- 7 max	1500	60									
β- 7 avg	550	30	8.1	5	0.0949						
β- 8 max	1560	60									
β- 8 avg	580	30	16.3	5	0.201						
β- 9 max	1600	60									
β- 9 avg	600	30	3.67	17	0.0469						
β-10 max	1740	60									
β-10 avg	660	30	7.6	5	0.107						
β-11 max	1800	60									
β-11 avg	690	30	11.2	7	0.165						
β-12 max	1850	60									
β-12 avg	710	30	1.12	17	0.0169						
β-13 max	2230	60									
β-13 avg	880	30	3.7	9	0.0694						
β-14 max	2420	60									
β-14 avg	970	30	11.5	15	0.238						
total β-	610	40	99.6	23	1.28						
a weak β's omitted: E _β (avg) = 263.5; ΣI _β = 0.23%											
X-ray L	4.1	0.17	6		≈0						
X-ray Kα ₂	29.4580	10	0.432	23	0.0003						
X-ray Kα ₁	29.7790	10	0.90	4	0.0005						
X-ray Kβ	33.6	0.285	16		0.0002						
γ 1	135.399	22	3.76	22	0.0108						
γ 2	139.03	3	0.69	5	0.0020						
γ 3	151.98	15	0.106	12	0.0003						
γ 4	162.48	7	0.26	3	0.0009						
γ 5	188.47	4	0.70	4	0.0028						
γ 6	217.00	20	0.25	3	0.0011						
γ 7	235.47	3	1.98	16	0.0100						
γ 8	278.80	15	0.131	15	0.0008						
γ 9	319.81	6	0.52	5	0.0035						
γ 10	351.08	10	0.50	6	0.0037						
γ 11	405.451	20	7.3	4	0.0634						
γ 12	411.00	8	0.61	6	0.0053						
γ 13	433.35	3	4.19	24	0.0387						
γ 14	458.92	6	1.30	9	0.0127						
γ 15	465.50	10	0.36	4	0.0036						
γ 16	488.88	4	1.41	9	0.0147						
γ 17	514.40	3	2.34	14	0.0256						
γ 18	540.825	25	7.8	5	0.0901						
γ 19	565.52	4	0.88	6	0.0106						
γ 20	570.75	15	0.21	3	0.0026						
γ 21	595.362	20	11.4	6	0.144						
γ 22	621.790	25	10.6	6	0.140						
γ 23	627.96	3	2.37	14	0.0316						
γ 24	677.34	3	8.5	5	0.123						
γ 25	706.65	10	0.83	6	0.0125						
γ 26	730.74	4	1.91	12	0.0297						
γ 27	739.18	8	0.76	8	0.0120						
γ 28	766.68	4	4.1	3	0.0670						
γ 29	816.38	7	0.52	5	0.0091						
γ 30	847.025	25	95.4	1	1.72						
γ 31	857.29	3	6.96	20	0.127						
γ 32	864.0	3	0.19	3	0.0035						
γ 33	884.090	25	65.3	10	1.23						
γ 34	922.6	3	0.14	3	0.0028						

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
^{134}I β^- Decay (52.6 m 5) (Continued)							
γ 35	947.96 4	4.04 20	0.0815	γ 6	604.699 15	97.6 3	1.26
γ 36	966.40 5	0.35 4	0.0073	γ 7	795.845 22	85.4 4	1.45
γ 37	974.67 4	4.7 4	0.0971	γ 8	801.932 22	8.73 4	0.149
γ 38	1040.25 10	1.91 19	0.0423	γ 9	1038.57 3	1.000 10	0.0221
γ 41	1072.55 3	15.3 8	0.349	γ 10	1167.94 3	1.80 3	0.0448
γ 43	1100.07 12	0.69 6	0.0161	γ 11	1365.15 3	3.04 4	0.0884
γ 44	1103.18 12	0.73 6	0.0170	2 weak γ 's omitted: $\Sigma\gamma$ (avg) = 276.9; $\Sigma I\gamma$ = 0.04%			
γ 45	1136.16 4	9.7 5	0.236				
γ 46	1159.10 8	0.35 3	0.0087				
γ 47	1164.0 3	0.13 3	0.0033				
γ 49	1190.03 8	0.35 3	0.0089				
γ 51	1239.0 3	0.21 6	0.0055				
γ 53	1269.49 5	0.56 4	0.0152				
γ 54	1322.4 3	0.10 4	0.0030				
γ 55	1336.00 20	0.14 3	0.0041				
γ 56	1352.62 8	0.45 4	0.0129				
γ 59	1414.3 5	0.22 6	0.0066				
γ 60	1428.2 3	0.17 4	0.0052				
γ 61	1431.35 25	0.17 4	0.0052				
γ 62	1455.24 5	2.29 15	0.0710				
γ 63	1470.00 7	0.77 5	0.0242				
γ 64	1505.5 4	0.11 4	0.0037				
γ 65	1541.51 7	0.51 4	0.0166				
γ 66	1613.80 5	4.36 24	0.150				
γ 67	1629.24 8	0.26 4	0.0089				
γ 68	1644.25 7	0.40 5	0.0140				
γ 69	1655.19 10	0.23 3	0.0081				
γ 70	1741.49 5	2.67 19	0.0991				
γ 71	1806.84 4	5.7 4	0.220				
γ 74	1925.88 10	0.181 19	0.0074				
γ 76	2020.6 3	0.172 19	0.0074				
γ 77	2159.9 3	0.21 3	0.0097				
γ 80	2312.40 20	0.24 3	0.0117				
γ 83	2467.4 3	0.153 19	0.0080				
20 weak γ 's omitted: $\Sigma\gamma$ (avg) = 1787.2; $\Sigma I\gamma$ = 1.33%							
\bullet ^{134}Cs β^- Decay (2.062 y 5) I (min) = 0.10%							
% β^- Decay = 99.9997 1							
%EC Decay = 0.0003 1							
Auger-L	3.67	0.66 5	≈ 0	Auger-L	3.55	133 5	0.0100
ce-K- 5	531.874 15	0.125 1	0.0014	ce-L- 1	5.546 20	77.3 13	0.0091
ce-K- 6	567.258 15	0.091 15	0.0059	ce-M- 1	10.043 20	15.9 10	0.0034
ce-K- 7	758.404 22	0.220 7	0.0036	ce-NOP- 1	11.029 20	5.2 4	0.0012
β^- 1 max	88.5 4			Auger-K	25.5	3.7 5	0.0020
avg	23.06 11	27.40 13	0.0135	ce-K- 2	91.44 3	34.7 8	0.0676
β^- 2 max	415.1 4			ce-K- 3	102.70 3	0.4 3	0.0010
avg	123.40 14	2.48 5	0.0065	ce-L- 2	121.71 3	40.4 8	0.105
β^- 3 max	657.9 4			ce-N- 2	126.20 3	9.0 3	0.0242
avg	210.11 15	70.1 5	0.314	ce-NOP- 2	127.19 3	2.27 7	0.0062
total β^-				ce-L- 3	132.97 3	0.27 17	0.0008
avg	156.8 3	100.0 6	0.334	X-ray L	4.29	16 5	0.0015
2 weak β 's omitted: $\Sigma\beta$ (avg) = 335.3; $\Sigma I\beta$ = 0.05%							
X-ray $K\alpha_2$	31.8171 3	0.214 8	0.0001	γ 1	11.260 20	0.94 7	0.0002
X-ray $K\alpha_1$	32.1936 3	0.396 15	0.0003	X-ray $K\alpha_2$	30.6251 3	8.9 3	0.0058
X-ray $K\beta$	36.4	0.144 6	0.0001	X-ray $K\alpha_1$	30.9728 3	16.6 5	0.0109
γ 3	475.35 5	1.46 4	0.0148	X-ray $K\beta$	35	5.95 19	0.0044
γ 4	563.227 15	8.38 5	0.101	γ 2	127.42 3	12.9 3	0.0350
γ 5	569.315 15	15.43 11	0.187				
				\bullet ^{135}Cs IT Decay (2.90 h 1) I (min) = 0.10%			
				Feeds ^{134}Cs (2.062 y)			
				Auger-L 3.43 0.220 17 ≈ 0			
				ce-K- 7 185.941 15 0.150 14 0.0006			
				ce-K- 11 253.890 16 0.121 5 0.0007			
				β^- 1 max 240 30			
				avg 66 10 0.140 13 0.0002			
				β^- 2 max 240 30			
				avg 68 10 0.126 13 0.0002			
				β^- 3 max 260 30			
				avg 74 10 0.140 23 0.0002			
				β^- 4 max 300 30			
				avg 86 10 1.08 6 0.0020			
				β^- 5 max 340 30			
				avg 98 10 0.91 4 0.0019			
				β^- 6 max 350 30			
				avg 103 10 1.39 6 0.0030			
				β^- 7 max 460 30			
				avg 138 11 4.73 14 0.0139			
				β^- 8 max 480 30			
				avg 145 11 7.33 21 0.0226			
				β^- 9 max 620 30			
				avg 196 12 1.57 7 0.0066			
				β^- 10 max 670 30			
				avg 213 12 1.10 5 0.0050			
				β^- 11 max 740 30			
				avg 243 12 7.9 3 0.0409			
				β^- 12 max 820 30			
				avg 272 12 0.61 4 0.0035			
				(Continued)			

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
β-13 max	920 30		
avg	313 12	8.7 3	0.0580
β-14 max	1030 30		
avg	359 13	21.8 5	0.167
β-15 max	1150 30		
avg	405 13	7.9 3	0.0681
β-16 max	1250 30		
avg	451 13	7.4 3	0.0711
β-17 max	1260 30		
avg	454 13	0.10 5	0.0010
β-18 max	1450 30		
avg	535 13	23.6 4	0.269
β-19 max	1580 30		
avg	591 14	1.2 8	0.0151
β-20 max	2180 30		
avg	858 14	1.9 6	0.0347
total β-			
avg	369 16	99.8 14	0.784
4 weak β's omitted: Eβ(avg) = 207.2; ΣIβ = 0.15%			
X-ray Kα ₁	29.7790 10	0.127 8	≈0
γ 7	220.502 15	1.75 6	0.0082
γ 8	229.72 3	0.232 9	0.0011
γ 10	264.26 9	0.184 7	0.0010
γ 11	288.451 16	3.09 12	0.0190
γ 12	290.27 4	0.303 21	0.0019
γ 19	361.85 14	0.19 3	0.0014
γ 20	403.03 4	0.232 9	0.0020
γ 21	414.83 3	0.300 18	0.0027
γ 22	417.63 3	3.52 12	0.0313
γ 23	429.93 3	0.303 23	0.0028
γ 24	433.741 19	0.552 24	0.0051
γ 25	451.63 3	0.315 18	0.0030
γ 28	546.557 16	7.12 24	0.0829
γ 29	575.97 8	0.129 23	0.0016
γ 32	649.85 4	0.45 3	0.0063
γ 36	690.13 6	0.129 15	0.0019
γ 37	707.92 5	0.66 6	0.0099
γ 38	785.48 5	0.152 20	0.0025
γ 40	797.71 8	0.17 3	0.0029
γ 42	836.804 16	6.67 24	0.119
γ 44	961.46	0.15 3	0.0030
γ 45	972	0.89 6	0.0184
γ 46	972.6	1.20 6	0.0249
γ 47	995.09 10	0.15 3	0.0033
γ 48	1038.760 21	7.9 3	0.175
γ 50	1101.58 4	1.60 6	0.0376
γ 51	1124.00 4	3.60 12	0.0863
γ 52	1131.511 18	22.5 8	0.543
γ 54	1159.90 20	0.103 23	0.0025
γ 55	1169.04 4	0.87 4	0.0217
γ 58	1240.470 20	0.90 4	0.0238
γ 60	1260.409 17	28.6 4	0.768
γ 66	1367.89 4	0.61 4	0.0177
γ 68	1448.35 10	0.31 3	0.0097
γ 69	1457.56 3	8.6 3	0.268
γ 70	1502.79 4	1.07 5	0.0343
γ 72	1566.41 3	1.29 6	0.0430
γ 73	1678.03 3	9.5 4	0.341
γ 74	1706.46 3	4.09 18	0.149
γ 76	1791.20 3	7.70 25	0.294
γ 77	1830.69 4	0.58 3	0.0225
γ 79	1927.30 3	0.295 15	0.0121
γ 82	2045.88 4	0.87 4	0.0379
γ 87	2255.46 3	0.61 3	0.0294
γ 89	2408.65 4	0.95 5	0.0489

46 weak γ's omitted:
Eγ(avg) = 1073.4; ΣIγ = 1.49%

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
• ¹³⁵ Xe β ⁻ Decay (9.11 h 2) I (min) = 0.10%			
Feeds ¹³⁵ Cs (2.3E6 y)			
Auger-L	3.55	5.3 3	0.0004
Auger-K	25.5	0.60 7	0.0003
ce-K- 3	213.809 15	5.68 7	0.0259
ce-L- 3	244.080 15	0.92 19	0.0048
ce-MNO- 3	248.577 15	0.23 5	0.0012
β- 1 max	97 9		
avg	25.3 25	0.123 4	≈0
β- 2 max	551 9		
avg	171 4	3.13 10	0.0114
β- 3 max	751 9		
avg	246 4	0.585 17	0.0031
β- 4 max	909 9		
avg	308 4	96.1 5	0.630
total β-			
avg	303 4	100.0 6	0.645
1 weak β's omitted: Eβ(avg) = 48.0; ΣIβ = 0.08%			
X-ray L	4.29	0.66 18	≈0
X-ray Kα ₂	30.6251 3	1.45 4	0.0009
X-ray Kα ₁	30.9728 3	2.68 6	0.0018
X-ray Kβ	35	0.961 24	0.0007
γ 1	158.197 18	0.289 10	0.0010
γ 3	249.794 15	89.9 3	0.478
γ 4	358.39 4	0.220 9	0.0017
γ 6	407.990 20	0.358 13	0.0031
γ 9	608.185 16	2.89 9	0.0375
8 weak γ's omitted: Eγ(avg) = 684.3; ΣIγ = 0.21%			
• ¹³⁵ Xe IT Decay (15.36 m 14) I (min) = 0.10%			
%IT Decay = 99.9964			
Feeds ¹³⁵ Xe (9.11 h)			
%β ⁻ Decay = 0.0036			
Auger-L	3.43	14.9 9	0.0011
Auger-K	24.6	1.7 3	0.0009
ce-K- 1	492.000 17	15.2 4	0.159
ce-L- 1	521.108 17	2.89 8	0.0321
ce-MNO- 1	525.419 17	0.95 3	0.0107
X-ray L	4.1	1.7 5	0.0001
X-ray Kα ₂	29.4580 10	3.84 15	0.0024
X-ray Kα ₁	29.7790 10	7.1 3	0.0045
X-ray Kβ	33.6	2.54 10	0.0018
γ 1	526.561 17	81.0 5	0.908
• ¹³⁵ Cs β ⁻ Decay (2.3E6 y 3) I (min) = 0.10%			
β- 1 max	205 5		
avg	56.3 15	100	0.120

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
<p>• ¹³⁵Ba IT Decay (28.7 h 2) I (min) = 0.10%</p>				<p>β-26 max 5690 100 avg 2500 50 30.4 19 1.62 total β^- avg 1980 60 102 3 4.31</p> <p>^a weak β's omitted: $\Sigma\beta$(avg) = 459.3; $\Sigma I\beta = 0.28\%$</p>			
Auger-L	3.67	63 4	0.0050	γ 1	219.33 15	0.85 7	0.0040
Auger-K	26.4	5.9 16	0.0033	γ 2	240.50 20	0.24 5	0.0012
ce-K- 1	230.797 10	59.9 7	0.294	γ 3	270.2 3	0.22 6	0.0012
ce-L- 1	262.249 10	18.7 5	0.104	γ 4	309.10 20	0.35 4	0.0023
ce-M- 1	266.945 10	4.19 12	0.0238	γ 5	344.72 10	2.50 21	0.0183
ce-NCP- 1	267.985 10	1.20 4	0.0068	γ 6	362.5 4	0.132 21	0.0010
γ -ray L	4.47	8.6 22	0.0008	γ 7	381.37 6	0.86 9	0.0070
X-ray $K\alpha_2$	31.8171 3	15.3 6	0.0104	γ 8	396.00 20	0.44 6	0.0037
X-ray $K\alpha_1$	32.1936 3	28.3 10	0.0194	γ 9	431.38 12	0.21 7	0.0019
X-ray KB	36.4	10.3 4	0.0080	γ 10	434.18 11	0.83 7	0.0076
γ 1	269.238 10	16.0 4	0.0914	γ 11	597.80 20	0.37 5	0.0048
<p>• ¹³⁶I β^- Decay (83 s 1) I (min) = 0.10%</p>				γ 12	682.7 3	0.19 3	0.0028
β^- 1 max	380 100			γ 13	812.63 8	0.9 3	0.0156
avg	110 40	0.54 4	0.0013	γ 14	865.5 3	0.67 6	0.0123
β^- 2 max	800 100			γ 15	976.50 20	2.78 21	0.0577
avg	270 40	0.200 20	0.0012	γ 16	994.20 20	1.68 10	0.0356
β^- 3 max	870 100			γ 17	1057.4 4	0.30 5	0.0067
avg	290 40	0.10 3	0.0006	γ 18	1101.4 3	0.50 8	0.0117
β^- 4 max	900 100			γ 19	1178.6 3	0.23 4	0.0057
avg	300 40	0.24 3	0.0015	γ 20	1222.6 4	0.16 3	0.0042
β^- 5 max	950 100			γ 21	1246.84 10	2.36 13	0.0627
avg	320 40	0.170 20	0.0012	γ 22	1313.02 10	69.4 6	1.94
β^- 6 max	1170 100			γ 23	1321.08 10	25.8 19	0.726
avg	410 50	0.110 20	0.0010	γ 24	1399.9 5	0.11 3	0.0033
β^- 7 max	1200 100			γ 25	1536.41 10	1.35 8	0.0441
avg	430 50	0.31 3	0.0028	γ 26	1555.97 15	0.49 4	0.0161
β^- 8 max	1240 100			γ 27	1583.50 20	0.26 4	0.0089
avg	440 50	0.13 3	0.0012	γ 28	1624.8 3	0.24 4	0.0084
β^- 9 max	1390 100			γ 29	1635.20 20	0.39 5	0.0135
avg	510 50	0.25 6	0.0027	γ 30	1639.8 5	0.19 5	0.0068
β^- 10 max	1680 100			γ 32	1666.0 4	0.18 3	0.0064
avg	630 50	0.25 3	0.0034	γ 33	1686.1 3	0.32 4	0.0115
β^- 11 max	1980 100			γ 34	1689.0 3	0.27 4	0.0097
avg	770 50	0.52 9	0.0085	γ 35	1709.40 20	0.72 5	0.0263
β^- 12 max	2050 100			γ 36	1738.1 3	0.17 3	0.0062
avg	800 50	0.17 3	0.0029	γ 37	1820.0 3	0.22 3	0.0086
β^- 13 max	2460 100			γ 39	1962.2 3	2.37 14	0.0992
avg	990 50	0.157 24	0.0033	γ 40	1968.4 4	0.17 3	0.0073
β^- 14 max	2530 100			γ 41	1979.6 3	0.139 21	0.0059
avg	1020 50	0.38 3	0.0083	γ 42	2039.2 4	0.17 3	0.0072
β^- 15 max	2550 100			γ 44	2227.9 5	0.11 3	0.0053
avg	1030 50	1.38 7	0.0303	γ 45	2289.60 20	10.8 6	0.528
β^- 16 max	2730 100			γ 48	2382.7 3	0.22 3	0.0113
avg	1110 50	4.91 16	0.116	γ 49	2414.60 20	7.1 4	0.364
β^- 17 max	3130 100			γ 50	2427.8 3	0.19 3	0.0097
avg	1300 50	0.19 8	0.0053	γ 51	2480.4 4	0.14 3	0.0073
β^- 18 max	3790 100			γ 52	2548.2 4	0.13 3	0.0072
avg	1600 50	0.24 7	0.0082	γ 54	2601.8 9	0.12 7	0.0069
β^- 19 max	4020 100			γ 55	2634.20 20	7.0 4	0.393
avg	1710 50	0.33 5	0.0120	γ 58	2828.5 3	0.104 14	0.0063
β^- 20 max	4130 100			γ 60	2868.90 20	4.1 4	0.250
avg	1770 50	4.8 4	0.181	γ 62	2956.30 20	0.75 5	0.0472
β^- 21 max	4150 100			γ 63	2979.1 3	0.32 3	0.0203
avg	1770 50	1.17 10	0.0441	γ 65	3141.1 3	0.72 5	0.0483
β^- 22 max	4370 100			γ 66	3195.4 4	0.173 21	0.0118
avg	1880 50	35.4 19	1.42	γ 68	3211.8 3	0.53 4	0.0366
β^- 23 max	4440 100			γ 70	3349.2 3	0.201 21	0.0144
avg	1890 50	2.83 18	0.114	γ 73	3626.4 4	0.173 14	0.0134
β^- 24 max	4590 100			γ 75	3634.6 5	0.125 14	0.0097
avg	1980 50	6.3 4	0.266	γ 76	3673.9 4	0.173 14	0.0136
β^- 25 max	4710 100			γ 83	4063.9 4	0.173 21	0.0150
avg	2040 50	10.4 7	0.452	γ 85	4269.50 20	0.368 21	0.0334
				γ 87	4473.8 3	0.139 14	0.0132
				γ 95	4739.1 5	0.111 14	0.0112

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
γ 99	4889.3	4	0.153 21
γ 100	4929.4	3	0.119 13
γ 108	5608.0	4	0.15 4
γ 109	5800.5	4	0.13 3
γ 114	6104.2	6	0.14 3

51 weak γ's omitted:
Σγ (avg) = 4128.8; ΣIγ = 2.42%

• ¹³⁶Cs β⁻ Decay (13.16 d 3) I (min) = 0.10%

Auger-L	3.67	20.7 13	0.0016
Auger-K	26.4	1.9 5	0.0011
ce-K- 1	29.47 5	7.3 7	0.0046
ce-K- 2	48.85 5	1.84 11	0.0019
ce-L- 1	60.92 5	1.04 9	0.0014
ce-MNO- 1	65.62 5	0.267 22	0.0004
ce-K- 3	72.22 10	0.377 22	0.0006
ce-L- 2	80.30 5	0.253 15	0.0004
ce-L- 3	103.67 10	0.154 9	0.0003
ce-K- 4	115.78 5	2.38 9	0.0059
ce-K- 5	126.45 5	4.97 19	0.0134
ce-K- 6	129.09 10	0.141 15	0.0004
ce-K- 7	139.11 5	0.551 19	0.0016
ce-L- 4	147.23 5	0.673 25	0.0021
ce-MNO- 4	151.93 5	0.181 4	0.0006
ce-L- 5	157.90 5	3.98 15	0.0134
ce-M- 5	162.60 5	0.89 4	0.0031
ce-NCP- 5	163.64 5	0.233 9	0.0008
ce-K- 10	236.21 4	0.158 6	0.0008
ce-K- 14	303.13 5	1.21 4	0.0078
ce-L- 14	334.58 5	0.208 7	0.0015
ce-K- 18	781.06 4	0.241 8	0.0040
ce-K- 19	1010.63 7	0.112 4	0.0024

β ⁻ 1 max	174.4 20		
avg	47.2 6	2.49 10	0.0025
β ⁻ 2 max	191.6 20		
avg	52.3 6	0.21 3	0.0002
β ⁻ 3 max	341.0 20		
avg	98.8 7	95.1 18	0.200
β ⁻ 4 max	681.5 20		
avg	219.0 8	2.2 18	0.0103
total β ⁻			
avg	100.1 8	100 3	0.213

X-ray L	4.47	2.8 8	0.0003
X-ray Kα ₂	31.8171 3	4.95 24	0.0034
X-ray Kα ₁	32.1936 3	9.1 5	0.0063
X-ray Kβ	36.4	3.32 16	0.0026
γ 1	66.91 5	12.5 10	0.0178
γ 2	86.29 5	6.3 3	0.0115
γ 3	109.66 10	0.409 20	0.0010
γ 4	153.22 5	7.46 16	0.0243
γ 5	163.89 5	4.61 10	0.0161
γ 6	166.53 10	0.63 3	0.0022
γ 7	176.55 5	13.56 20	0.0510
γ 8	187.25 10	0.60 6	0.0024
γ 10	273.65 4	12.66 20	0.0738
γ 13	319.87 10	0.60 6	0.0041
γ 14	340.57 5	48.5 5	0.351
γ 16	507.21 10	0.98 5	0.0106
γ 18	818.50 4	99.700 10	1.74
γ 19	1048.07 7	79.6 8	1.78
γ 20	1235.34 5	19.7 8	0.519

8 weak γ's omitted:
Σγ (avg) = 787.2; ΣIγ = 0.33%

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
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• ¹³⁷Xe β⁻ Decay (3.83 m 1) I (min) = 0.10%
Feeds ¹³⁷Cs

Auger-L	3.55	0.29 5	≈0
ce-K- 3	419.505 3	0.36 6	0.0032

β ⁻ 1 max	1494 23		
avg	553 10	0.72 7	0.0095
β ⁻ 2 max	2276 23		
avg	902 11	0.136 16	0.0026
β ⁻ 3 max	2561 23		
avg	1032 11	0.38 4	0.0094
β ⁻ 4 max	2769 23		
avg	1128 11	0.172 20	0.0041
β ⁻ 5 max	3495 23		
avg	1465 11	0.64 7	0.0200
β ⁻ 6 max	3889 23		
avg	1649 11	30 3	1.05
β ⁻ 7 max	4344 23		
avg	1862 11	67 3	2.66
total β ⁻			
avg	1774 11	100 5	3.76

25 weak β's omitted:
Σβ (avg) = 783.5; ΣIβ = 0.57%

X-ray Kα ₁	30.9728 3	0.17 3	0.0001
γ 1	298.00 7	0.117 14	0.0007
γ 2	393.35 6	0.138 16	0.0012
γ 3	455.490 3	31 3	0.298
γ 11	848.95 6	0.61 7	0.0111
γ 13	982.25 5	0.206 23	0.0043
γ 20	1119.33 6	0.105 12	0.0025
γ 27	1273.23 10	0.22 3	0.0061
γ 35	1576.75 10	0.101 13	0.0034
γ 37	1612.52 6	0.123 15	0.0042
γ 46	1783.43 6	0.41 5	0.0155
γ 77	2849.80 10	0.181 19	0.0110

83 weak γ's omitted:
Σγ (avg) = 1490.6; ΣIγ = 1.31%

• ¹³⁷Cs β⁻ Decay (30.17 y 3) I (min) = 0.10%
% Feeding to ¹³⁷Ba (2.522 m) = 94.6 5

β ⁻ 1 max	511.6 9		
avg	156.8 4	94.6 5	0.316
β ⁻ 2 max	1173.2 9		
avg	415.2 4	5.4 5	0.0478
total β ⁻			
avg	170.8 5	100.0 7	0.364

• ¹³⁷Ba IT Decay (2.552 m 2) I (min) = 0.10%

Auger-L	3.67	7.6 5	0.0006
Auger-K	26.4	0.80 22	0.0004
ce-K- 1	624.208 5	8.08 22	0.107
ce-L- 1	655.660 5	1.46 4	0.0204
ce-MNO- 1	660.356 5	0.480 14	0.0068

X-ray L	4.47	1.0 3	≈0
X-ray Kα ₂	31.8171 3	2.07 9	0.0014
X-ray Kα ₁	32.1936 3	3.82 16	0.0026
X-ray Kβ	36.4	1.39 6	0.0011
γ 1	661.649 5	89.98 24	1.27

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
<p>• ¹³⁸Xe β⁻ Decay (14.13 m 5) I (min) = 0.10% Feeds ¹³⁸Cs (32.2 m)</p>							
Auger-L	3.55	49 4	0.0037	γ 21	537.76 13	0.117 17	0.0013
ce-M- 1	3.63 5	32 5	0.0025	γ 23	555.95 9	0.117 14	0.0014
ce-NOP- 1	4.62 5	10.6 17	0.0010	γ 24	568.53 6	0.306 19	0.0037
ce-L- 2	5.14 5	51 3	0.0056	γ 27	588.84 8	0.123 11	0.0015
ce-M- 2	9.63 5	10.4 6	0.0021	γ 30	654.08 9	0.145 14	0.0020
ce-NOP- 2	10.62 5	3.43 20	0.0008	γ 47	865.82 7	0.296 22	0.0055
Auger-K	25.5	0.42 6	0.0002	γ 49	869.35 6	0.62 4	0.0115
ce-K- 5	117.77 3	1.61 25	0.0040	γ 50	896.87 12	0.132 14	0.0025
ce-L- 5	148.04 3	0.34 16	0.0011	γ 52	912.51 7	0.328 22	0.0064
ce-K- 7	206.58 5	0.241 11	0.0011	γ 53	917.13 6	0.92 4	0.0180
ce-K- 8	222.33 5	1.80 9	0.0085	γ 54	936.36 11	0.135 14	0.0027
ce-L- 8	252.60 5	0.29 6	0.0016	γ 55	941.25 8	0.230 18	0.0046
ce-K- 14	360.45 5	0.108 13	0.0008	γ 60	1093.87 9	0.41 3	0.0095
ce-K- 17	398.51 5	0.27 4	0.0023	γ 61	1098.77 11	0.214 18	0.0050
				γ 62	1102.24 17	0.107 14	0.0025
				γ 63	1110.29 10	1.47 9	0.0350
				γ 64	1141.64 9	0.51 4	0.0125
				γ 65	1145.44 18	0.132 20	0.0032
				γ 80	1571.84 16	0.26 3	0.0089
				γ 82	1614.57 18	0.24 3	0.0081
				γ 84	1768.26 13	16.7 7	0.630
				γ 87	1812.54 18	0.180 20	0.0069
				γ 88	1850.86 13	1.42 7	0.0561
				γ 90	1925.36 14	0.56 4	0.0231
				γ 91	2004.75 14	5.35 23	0.229
				γ 92	2015.82 14	12.3 5	0.526
				γ 94	2079.17 14	1.44 7	0.0639
				γ 95	2252.26 14	2.29 11	0.110
				γ 97	2321.90 16	0.62 4	0.0307
				γ 99	2475.26 16	0.312 20	0.0164
				γ 101	2497.56 17	0.173 14	0.0092
				57 weak γ's omitted: Σγ (avg) = 1118.6; ΣIγ = 2.66%			
				• ¹³⁸ Cs β ⁻ Decay (32.2 m 1) I (min) = 0.10%			
				Auger-L	3.67	0.93 12	≈0
				Auger-K	26.4	0.10 3	≈0
				ce-K- 2	100.66 6	0.58 10	0.0012
				ce-L- 2	132.11 6	0.14 7	0.0004
				ce-K- 6	190.32 6	0.133 4	0.0005
				ce-K- 14	425.344 5	0.317 13	0.0029
				β- 1 max	700 40		
				avg	226 16	0.257 25	0.0012
				β- 2 max	820 40		
				avg	273 16	0.163 14	0.0009
				β- 3 max	1090 40		
				avg	380 17	0.100 8	0.0008
				β- 4 max	1250 40		
				avg	447 17	0.19 3	0.0018
				β- 5 max	1390 40		
				avg	509 18	0.48 6	0.0052
				β- 6 max	1410 40		
				avg	514 18	0.204 25	0.0022
				β- 7 max	1640 40		
				avg	614 18	0.30 3	0.0039
				β- 8 max	1680 40		
				avg	634 18	0.43 7	0.0058
				β- 9 max	1960 40		
				avg	759 18	0.227 14	0.0037
				β-10 max	1990 40		
				avg	771 18	0.171 20	0.0028
				β-11 max	2090 40		
				avg	815 18	0.273 20	0.0047
				β-12 max	2170 40		
				avg	850 19	0.34 3	0.0062
				3 weak β's omitted: Σβ (avg) = 637.2; ΣIβ = 0.17%			
				X-ray L	4.29	6.1 17	0.0006
				γ 1	4.85 5	0.19 3	≈0
				γ 2	10.85 5	0.70 4	0.0002
				X-ray Kα ₂	30.6251 3	1.03 7	0.0007
				X-ray Kα ₁	30.9728 3	1.90 13	0.0013
				X-ray Kβ	35	0.68 5	0.0005
				γ 5	153.75 3	5.95 25	0.0195
				γ 7	242.56 5	3.50 14	0.0181
				γ 8	258.31 5	31.5 13	0.173
				γ 9	282.51 6	0.428 20	0.0026
				γ 12	335.28 9	0.107 11	0.0008
				γ 13	371.44 5	0.50 3	0.0040
				γ 14	396.43 5	6.3 3	0.0532
				γ 15	401.36 5	2.17 13	0.0186
				γ 17	434.49 5	20.3 9	0.188
				γ 18	500.22 6	0.362 18	0.0039
				γ 19	530.07 7	0.252 16	0.0028

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)			
¹³⁹ Cs β ⁻ Decay (9.40 m 12) (Continued)										
β-25 max	2523 7			β- 1 max	885 5					
avg	1013 4	0.45 17	0.0097	avg	297.4 20	0.32 10	0.0020			
β-26 max	2583 7			β- 2 max	2140 5					
avg	1040 4	0.38 15	0.0084	avg	837.0 23	22 7	0.392			
β-27 max	2783 7			β- 3 max	2306 5					
avg	1132 4	0.38 16	0.0092	avg	912.0 23	78 5	1.52			
β-28 max	2896 7			total β-	893.2 23	100 9	1.91			
avg	1184 4	0.24 10	0.0061	14 weak β's omitted: ΣB (avg) = 304.7; ΣIβ = 0.06%						
β-29 max	2921 7			γ-ray L	4.65	0.48 18	≈0			
avg	1196 4	6.3 24	0.160	γ-ray Kα ₂	33.03410 2	0.9 3	0.0007			
β-30 max	4204 7			γ-ray Kα ₁	33.44180 2	1.7 6	0.0012			
avg	1794 4	84 6	3.21	γ-ray Kβ	37.8	0.63 21	0.0005			
total β-	1656 5	100 7	3.52	γ 1	165.853 7	17 6	0.0613			
30 weak β's omitted: ΣB (avg) = 508.4; ΣIβ = 1.27%				26 weak γ's omitted: Σγ (avg) = 1271.1; ΣIγ = 0.11%						
γ 20	454.66 6	0.13 5	0.0013	• ¹³⁹ Ce EC Decay (137.66 d 13) I (min) = 0.10%						
γ 24	531.98 4	0.21 9	0.0024	Auger-L	3.8	88 5	0.0072			
γ 29	567.72 5	0.13 6	0.0016	Auger-K	27.4	8.2 23	0.0048			
γ 37	627.24 3	1.5 6	0.0206	ce-K- 1	126.928 7	16.8 4	0.0454			
γ 54	827.52 7	0.11 5	0.0019	ce-L- 1	159.587 7	2.25 7	0.0076			
γ 61	929.18 6	0.23 9	0.0046	ce-M- 1	164.492 7	0.466 14	0.0016			
γ 63	946.46 8	0.10 9	0.0020	ce-NOP- 1	165.583 7	0.129 4	0.0005			
γ 80	1190.42 6	0.18 7	0.0047	X-ray L	4.65	13 4	0.0013			
γ 84	1283.23 5	7 3	0.197	X-ray Kα ₂	33.03410 2	22.5 8	0.0158			
γ 85	1306.09 11	0.11 4	0.0029	γ-ray Kα ₁	33.44180 2	41.4 15	0.0295			
γ 86	1308.13 6	0.37 15	0.0104	γ-ray Kβ	37.8	15.2 6	0.0122			
γ 88	1321.77 6	0.23 9	0.0066	γ 1	165.853 7	80.35 8	0.284			
γ 93	1410.58 7	0.15 6	0.0045	• ¹⁴⁰ Ba β ⁻ Decay (12.789 d 6) I (min) = 0.10%						
γ 94	1420.66 6	0.8 3	0.0242	Feeds ¹⁴⁰ La						
γ 107	1620.74 6	0.42 16	0.0144	Auger-L	3.8	98 16	0.0080			
γ 109	1680.72 6	0.60 23	0.0217	ce-L- 1	7.58 5	51 13	0.0082			
γ 111	1698.66 7	0.18 7	0.0064	ce-M- 1	12.49 5	10 3	0.0028			
γ 122	1877.45 7	0.34 13	0.0136	ce-NOP- 1	13.58 5	3.4 9	0.0010			
γ 123	1887.57 7	0.22 9	0.0088	ce-L- 2	23.70 5	61 12	0.0306			
γ 124	1904.50 7	0.12 5	0.0050	Auger-K	27.4	0.19 6	0.0001			
γ 125	1933.48 7	0.24 10	0.0101	ce-M- 2	28.61 5	12.5 25	0.0076			
γ 130	2020.76 25	0.13 7	0.0056	ce-NOP- 2	29.70 5	4.1 9	0.0026			
γ 134	2089.91 9	0.14 6	0.0061	ce-K- 5	123.72 5	1.60 23	0.0042			
γ 136	2110.91 6	0.66 25	0.0295	ce-L- 5	156.37 5	0.22 3	0.0007			
γ 139	2173.98 7	0.20 8	0.0093	ce-K- 6	265.915 20	0.20 3	0.0011			
γ 147	2349.92 6	0.56 22	0.0281	ce-K- 10	498.40 8	0.27 4	0.0028			
γ 150	2380.66 7	0.19 8	0.0095	β- 1 max	454 10					
γ 155	2531.84 7	0.42 16	0.0225	avg	136 4	26 4	0.0753			
γ 156	2605.75 6	0.24 10	0.0135	β- 2 max	567 10					
γ 157	2649.32 7	0.17 7	0.0094	avg	177 4	10.2 14	0.0385			
γ 161	2847.63 8	0.10 7	0.0061	β- 3 max	872 10					
γ 172	3464.34 9	0.11 5	0.0080	avg	306 4	4.4 7	0.0287			
γ 174	3665.61 8	0.14 10	0.0107	β- 4 max	991 10					
148 weak γ's omitted: Σγ (avg) = 1569.5; ΣIγ = 3.87%				β- 4 avg				340 4	37 4	0.268
• ¹³⁹ Ba β ⁻ Decay (83.1 m 8) I (min) = 0.10%				β- 5 max				1005 10		
Auger-L	3.8	3.2 10	0.0003	avg	357 4	22 6	0.167			
Auger-K	27.4	0.34 15	0.0002	total β-	272 5	100 9	0.578			
ce-K- 1	126.928 7	3.6 12	0.0098	(Continued)						
ce-L- 1	159.587 7	0.49 16	0.0017							
ce-MNO- 1	164.492 7	0.13 5	0.0005							

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
X-ray L	4.65	15 5	0.0015	γ 20	919.63 15	2.88 9	0.0565
γ 1	13.85 5	1.2 3	0.0003	γ 21	925.24 9	7.09 11	0.140
γ 2	29.97 5	14 3	0.0090	γ 23	950.9 3	0.53 5	0.0108
X-ray Kα ₂	33.03410 2	0.53 7	0.0004	γ 24	1596.49 24	95.49 7	3.25
X-ray Kα ₁	33.44180 2	0.98 12	0.0007	γ 27	2348.8 6	0.851 18	0.0426
X-ray Kβ	37.8	0.36 5	0.0003	γ 29	2521.7 5	3.46 8	0.186
γ 4	132.84 12	0.21 4	0.0006	γ 31	2547.1 8	0.104 3	0.0056
γ 5	162.64 5	6.7 10	0.0233	16 weak γ's omitted: Σγ (avg) = 1208.0; ΣIγ = 0.42%			
γ 6	304.840 20	4.5 6	0.0293	• ¹⁴¹ Ba β ⁻ Decay (18.27 m 7) I (min) = 0.10%			
γ 7	423.70 3	3.2 5	0.0293	Feeds ¹⁴¹ La			
γ 8	437.55 3	2.0 3	0.0186	Auger-L	3.8	6.7 6	0.0005
γ 9	467.57 5	0.15 3	0.0015	Auger-K	27.4	0.71 21	0.0004
γ 10	537.32 8	25 4	0.292	ce-K- 4	151.30 8	7.5 6	0.0244
1 weak γ's omitted: Σγ (avg) = 118.8; ΣIγ = 0.07%				ce-L- 4	183.95 8	1.01 8	0.0039
• ¹⁴⁰ La β ⁻ Decay (40.22 h 2) I (min) = 0.10%				ce-MMO- 4	188.86 8	0.266 19	0.0011
Auger-L	4	1.71 12	0.0001	β- 1 max	560 50		
ce-L- 1	18.046 4	0.25 3	≈0	avg	174 19	0.62 7	0.0023
Auger-K	28.4	0.16 5	≈0	β- 2 max	590 50		
ce-K- 3	28.473 6	0.19 4	0.0001	avg	184 19	0.24 4	0.0009
ce-K- 4	68.974 6	0.15 3	0.0002	β- 3 max	640 50		
ce-K- 5	90.678 8	0.24 5	0.0005	avg	205 19	0.17 4	0.0007
ce-K- 10	288.325 12	0.81 3	0.0050	β- 4 max	650 50		
ce-L- 10	322.219 12	0.107 4	0.0007	avg	208 19	0.82 14	0.0036
ce-K- 15	446.586 19	0.440 15	0.0042	β- 5 max	810 50		
				avg	269 20	0.65 7	0.0037
β- 1 max	1213.1 21			β- 6 max	850 50		
avg	438.2 9	0.64 5	0.0060	avg	283 20	0.48 6	0.0029
β- 2 max	1238.8 20			β- 7 max	1100 50		
avg	441.1 9	11.11 17	0.104	avg	386 21	2.26 16	0.0186
β- 3 max	1244.4 20			β- 8 max	1160 50		
avg	443.5 9	5.89 10	0.0556	avg	408 21	4.1 3	0.0356
β- 4 max	1279.3 20			β- 9 max	1190 50		
avg	458.2 9	1.19 10	0.0116	avg	420 21	2.60 16	0.0233
β- 5 max	1296.2 21			β-10 max	1290 50		
avg	465.3 9	5.63 8	0.0558	avg	463 22	2.51 18	0.0248
β- 6 max	1348.2 20			β-11 max	1400 50		
avg	487.4 9	44.5 6	0.462	avg	511 22	2.32 19	0.0253
β- 7 max	1412.3 20			β-12 max	1460 50		
avg	514.7 9	5.08 11	0.0557	avg	538 22	0.21 5	0.0024
β- 8 max	1677.0 20			β-13 max	1530 50		
avg	629.5 9	20.7 8	0.278	avg	566 22	6.7 5	0.0808
β- 9 max	2164.0 20			β-14 max	1600 50		
avg	846.2 9	5.2 9	0.0937	avg	599 22	0.39 8	0.0050
total β- avg	526.9 10	100.1 14	1.12	β-15 max	1840 50		
5 weak β's omitted: Σβ (avg) = 328.9; ΣIβ = 0.16%				avg	703 23	0.34 7	0.0051
X-ray L	4.84	0.25 6	≈0	β-16 max	1860 50		
X-ray Kα ₂	34.27890 2	0.472 24	0.0003	avg	711 23	1.58 17	0.0239
X-ray Kα ₁	34.71970 2	0.87 5	0.0006	β-17 max	1960 50		
X-ray Kβ	39.3	0.322 17	0.0003	avg	758 23	3.7 3	0.0597
γ 4	109.417 6	0.19 4	0.0004	β-18 max	2040 50		
γ 5	131.121 8	0.55 4	0.0015	avg	791 23	0.19 6	0.0032
γ 6	173.550 11	0.12 5	0.0005	β-19 max	2100 50		
γ 7	241.966 12	0.43 6	0.0022	avg	819 23	12.6 7	0.220
γ 8	266.551 14	0.49 6	0.0028	β-20 max	2200 50		
γ 10	328.768 12	20.5 3	0.144	avg	863 23	2.13 18	0.0392
γ 12	432.53 3	2.94 4	0.0271	β-21 max	2200 50		
γ 15	487.029 19	45.5 7	0.473	avg	866 23	0.54 16	0.0100
γ 17	751.79 8	4.40 9	0.0705	β-22 max	2380 50		
γ 18	815.85 7	23.5 5	0.408	avg	947 23	24.5 13	0.494
γ 19	867.82 14	5.63 8	0.104	β-23 max	2560 50		
				avg	1029 23	19.0 16	0.416
				β-24 max	2840 50		
				avg	1156 23	12 4	0.295
				total β- avg	840 30	101 5	1.80

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
¹⁴¹ Ba β ⁻ Decay (18.27 m 7) (Continued)							
X-ray L	4.65	1.00 25	≈0	γ 80	1345.27 25	0.23 4	0.0067
X-ray Kα ₂	33.034 10 2	1.95 16	0.0014	γ 81	1357.5 5	0.17 5	0.0048
X-ray Kα ₁	33.44 180 2	3.6 3	0.0026	γ 82	1376.99 14	0.74 8	0.0218
X-ray Kβ	37.8	1.32 11	0.0011	γ 83	1405.59 25	0.29 5	0.0086
γ 1	112.94 9	0.99 8	0.0024	γ 84	1436.84 13	0.87 8	0.0266
γ 2	162.96 12	0.47 5	0.0016	γ 85	1458.56 14	0.71 8	0.0222
γ 3	180.50 9	0.52 5	0.0020	γ 86	1501.82 21	0.33 5	0.0104
γ 4	190.22 8	49 4	0.197	γ 88	1550.55 19	0.33 4	0.0108
γ 7	276.99 8	24.6 16	0.145	γ 89	1568.81 25	0.27 5	0.0089
γ 9	304.24 8	26.6 17	0.172	γ 94	1653.95 12	0.79 7	0.0277
γ 10	343.71 8	15.0 10	0.110	γ 95	1682.35 10	1.41 11	0.0507
γ 11	349.35 20	0.30 6	0.0022	γ 96	1713.23 22	0.18 3	0.0066
γ 12	364.38 10	0.61 6	0.0048	γ 98	1735.6 4	0.19 4	0.0072
γ 13	381.31 22	0.121 25	0.0010	γ 99	1740.83 21	0.33 5	0.0123
γ 14	389.78 9	1.39 10	0.0116	γ 100	1795.85 18	0.51 6	0.0195
γ 16	457.58 8	5.1 4	0.0493	γ 104	1912.7 4	0.136 25	0.0055
γ 17	462.15 8	5.1 4	0.0498	γ 106	1990.3 3	0.19 3	0.0082
γ 18	467.26 8	5.8 4	0.0576	γ 107	2026.56 23	0.40 5	0.0172
γ 20	522.19 18	0.46 6	0.0051	γ 111	2136.7 4	0.117 20	0.0053
γ 21	524.20 20	0.43 6	0.0048	γ 112	2164.7 3	0.165 25	0.0076
γ 22	527.42 13	0.40 5	0.0045	γ 115	2278.9 5	0.102 25	0.0050
γ 25	561.9 5	0.10 4	0.0012	γ 116	2469.0 4	0.19 4	0.0102
γ 26	572.09 19	0.27 4	0.0033	28 weak γ's omitted; E _γ (avg) = 1252.0; ΣI _γ = 1.73%			
γ 27	572.09 19	0.27 4	0.0033				
γ 29	599.28 19	0.25 4	0.0032				
γ 30	608.91 18	0.26 4	0.0033				
γ 31	625.23 8	3.45 23	0.0460	● ¹⁴¹ La β ⁻ Decay (3.94 h 5) I (min) = 0.10%			
γ 32	636.05 20	0.30 5	0.0040	Feeds ¹⁴¹ Ce			
γ 33	641.38 16	0.38 5	0.0052				
γ 34	647.88 8	5.9 4	0.0818				
γ 35	670.04 24	0.19 4	0.0027				
γ 36	674.2 10	0.11 12	0.0016				
γ 37	675.7 5	0.23 12	0.0033				
γ 38	685.7 6	0.14 6	0.0021				
γ 39	687.8 7	0.11 5	0.0016				
γ 40	698.5 4	0.30 12	0.0044				
γ 41	700.0 5	0.22 12	0.0033				
γ 42	704.80 14	0.32 4	0.0047				
γ 43	739.10 8	4.5 3	0.0712				
γ 45	753.9 5	0.10 4	0.0016				
γ 46	762.2 4	0.15 4	0.0024				
γ 47	778.2 5	0.11 4	0.0019				
γ 49	805.4 5	0.10 4	0.0018				
γ 50	826.34 19	0.35 5	0.0061				
γ 51	831.72 9	1.60 12	0.0283				
γ 52	832.6 8	0.17 10	0.0030				
γ 54	867.9 4	0.16 4	0.0029				
γ 55	876.29 8	3.60 24	0.0671				
γ 56	880.6 3	0.21 5	0.0039				
γ 58	908.8 6	0.13 5	0.0025				
γ 59	929.47 10	0.73 6	0.0145				
γ 60	943.25 12	0.77 7	0.0154				
γ 62	981.63 13	0.82 8	0.0172				
γ 63	996.6 4	0.13 4	0.0028				
γ 64	1012.3 6	0.11 4	0.0023				
γ 65	1034.49 24	0.31 5	0.0069				
γ 66	1040.4 7	0.10 5	0.0023				
γ 67	1046.32 21	0.36 6	0.0081				
γ 68	1094.0 3	0.23 5	0.0054				
γ 69	1160.8 5	0.25 10	0.0062				
γ 70	1160.84 9	0.97 11	0.0240				
γ 71	1197.47 8	4.9 4	0.124				
γ 72	1224.79 16	0.43 5	0.0113				
γ 73	1235.5 4	0.15 4	0.0040				
γ 74	1264.20 14	0.87 9	0.0233				
γ 75	1273.64 19	0.54 7	0.0148				
γ 76	1278.24 16	0.69 8	0.0189				
γ 77	1309.1 7	0.25 12	0.0069				
γ 78	1311.2 3	0.63 15	0.0176				
γ 79	1323.72 10	1.00 8	0.0281				
				● ¹⁴¹ La β ⁻ Decay (3.94 h 5) I (min) = 0.10%			
				Feeds ¹⁴¹ Ce			
				β ⁻ 1 max 740 30			
				avg 239 12 0.120 10 0.0006			
				β ⁻ 2 max 1080 30			
				avg 373 13 2.61 18 0.0207			
				β ⁻ 3 max 2430 30			
				avg 967 14 97 2.00			
				total β ⁻ avg 948 15 99.99 18 2.02			
				13 weak β's omitted; E _β (avg) = 125.4; ΣI _β = 0.26%			
				γ 10 1354.52 9 2.62 18 0.0756			
				γ 19 1693.31 11 0.118 10 0.0043			
				25 weak γ's omitted; E _γ (avg) = 1678.7; ΣI _γ = 0.31%			
				● ¹⁴¹ Ce β ⁻ Decay (32.50 d 4) I (min) = 0.10%			
				Auger-L 4 16.3 9 0.0014			
				Auger-K 29.4 1.6 5 0.0010			
				ce-K- 1 103.449 10 18.8 6 0.0414			
				ce-L- 1 138.605 10 2.594 22 0.0077			
				ce-M- 1 143.929 10 0.542 17 0.0017			
				ce-NOP- 1 145.135 10 0.149 5 0.0005			
				β ⁻ 1 max 434.6 15			
				avg 129.6 6 70.5 6 0.195			
				β ⁻ 2 max 580.0 15			
				avg 180.7 6 29.5 6 0.114			
				total β ⁻ avg 144.7 7 100.0 9 0.308			

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
X-ray L	5	2.7 4	0.0003	γ 21	379.10 10	0.46 10	0.0037
X-ray Kα ₂	35.55020 2	4.88 22	0.0037	γ 22	417.8 3	0.34 9	0.0030
X-ray Kα ₁	36.02630 2	8.9 4	0.0069	γ 23	425.03 6	5.0 11	0.0451
X-ray Kβ	40.7	3.36 15	0.0029	γ 24	432.3 3	0.98 21	0.0090
γ 1	145.440 10	48.4 4	0.150	γ 25	434.4 4	0.30 7	0.0028
● ¹⁴² Ba β ⁻ Decay (10.70 m 10) I (min) = 0.10%				γ 26	448.1 5	0.21 7	0.0020
Feeds ¹⁴² La				γ 27	457.30 20	0.39 10	0.0038
Auger-L	3.8	26 8	0.0021	γ 28	473.40 20	0.30 7	0.0031
Auger-K	27.4	2.0 7	0.0012	γ 29	488.3 5	0.11 8	0.0011
ce-K- 3	38.68 10	22 5	0.0177	γ 30	513.3 5	0.23 10	0.0025
ce-L- 3	71.33 10	11 8	0.0161	γ 32	537.5 5	0.11 8	0.0012
ce-M- 3	76.24 10	2.3 19	0.0037	γ 33	558.3 3	0.30 7	0.0036
ce-NOP- 3	77.33 10	0.6 5	0.0010	γ 34	590.7 3	0.25 7	0.0031
β ⁻ 1 max	740 100			γ 35	599.84 8	1.6 3	0.0205
avg	240 40	12.6 21	0.0644	γ 36	604.2 3	0.32 9	0.0041
β ⁻ 2 max	920 100			γ 37	769.40 20	0.61 12	0.0099
avg	310 40	0.16 8	0.0011	γ 38	786.4 3	0.25 8	0.0042
β ⁻ 3 max	1000 100			γ 39	792.2 4	0.21 8	0.0036
avg	340 40	40 7	0.290	γ 40	823.4 3	0.41 10	0.0072
β ⁻ 4 max	1120 100			γ 41	840.23 7	3.0 7	0.0542
avg	390 50	18 4	0.150	γ 43	894.90 10	11.0 20	0.210
β ⁻ 5 max	1330 100			γ 44	948.75 6	8.9 18	0.180
avg	480 50	0.44 14	0.0045	γ 45	1000.86 5	7.8 16	0.167
β ⁻ 6 max	1390 100			γ 46	1032.8 3	0.48 10	0.0106
avg	510 50	0.30 7	0.0033	γ 47	1078.48 5	9.3 20	0.213
β ⁻ 7 max	1410 100			γ 48	1093.62 6	2.2 5	0.0514
avg	510 50	0.71 17	0.0077	γ 49	1122.6 3	0.30 7	0.0072
β ⁻ 8 max	1610 100			γ 50	1126.54 8	1.5 3	0.0367
avg	600 50	0.37 14	0.0047	γ 51	1148.3 3	0.39 8	0.0096
β ⁻ 9 max	1770 100			γ 52	1202.20 10	5.3 11	0.137
avg	670 50	4.6 10	0.0656	γ 53	1204.06 8	14 3	0.352
β ⁻ 10 max	1770 100			γ 54	1283.4 5	0.16 8	0.0044
avg	670 50	3.1 6	0.0442	γ 55	1379.90 10	3.4 7	0.0999
β ⁻ 11 max	1900 100			2 weak γ's omitted: E _γ (avg) = 685.1; ΣI _γ = 0.16%			
avg	730 50	0.27 7	0.0042	● ¹⁴² La β ⁻ Decay (95.4 m 18) I (min) = 0.10%			
β ⁻ 12 max	2050 100			Auger-L	4	0.191 17	≈0
avg	790 50	0.16 10	0.0027	ce-K- 11	600.73 3	0.250 14	0.0032
β ⁻ 13 max	2120 100			β ⁻ 1 max	474 6		
avg	830 50	18 14	0.318	avg	143.3 21	1.5 3	0.0046
total β ⁻	460 50	99 17	0.960	β ⁻ 2 max	542 6		
X-ray L	4.65	3.8 15	0.0004	avg	167.1 22	0.10 6	0.0004
X-ray Kα ₂	33.03410 2	5.5 12	0.0039	β ⁻ 3 max	667 6		
X-ray Kα ₁	33.44180 2	10.2 21	0.0073	avg	212.7 23	0.26 11	0.0012
X-ray Kβ	37.8	3.8 8	0.0030	β ⁻ 4 max	798 6		
γ 1	69.4 3	0.36 6	0.0005	avg	262.6 24	0.58 16	0.0032
γ 2	76.8 6	0.89 13	0.0015	β ⁻ 5 max	800 6		
γ 3	77.60 10	9.6 14	0.0159	avg	263.5 24	0.58 19	0.0033
γ 4	122.89 8	0.93 19	0.0024	β ⁻ 6 max	842 6		
γ 5	154.22 9	0.52 11	0.0017	avg	279.6 24	1.2 3	0.0071
γ 6	162.00 20	0.11 8	0.0004	β ⁻ 7 max	884 6		
γ 7	176.82 8	1.5 3	0.0056	avg	296.4 24	1.5 3	0.0095
γ 8	216.30 10	0.20 6	0.0009	β ⁻ 8 max	904 6		
γ 9	222.60 10	0.27 7	0.0013	avg	304.2 24	4.3 5	0.0279
γ 10	231.52 4	10.1 21	0.0500	β ⁻ 9 max	905 6		
γ 11	242.70 20	0.16 8	0.0008	avg	304.6 24	1.7 3	0.0110
γ 12	255.12 4	18 3	0.0967	β ⁻ 10 max	1047 6		
γ 13	269.33 9	0.68 14	0.0039	avg	361.9 25	0.63 17	0.0049
γ 14	283.9 3	0.18 8	0.0011	β ⁻ 11 max	1058 6		
γ 15	286.20 10	0.93 20	0.0056	avg	366.1 25	1.8 4	0.0140
γ 16	309.02 5	2.3 5	0.0149	β ⁻ 12 max	1097 6		
γ 17	334.80 10	1.2 3	0.0089	avg	382.1 25	2.5 4	0.0203
γ 18	337.10 20	0.25 7	0.0018	β ⁻ 13 max	1517 6		
γ 19	346.7 5	0.14 8	0.0011	avg	560 3	1.36 24	0.0162
γ 20	363.80 5	3.9 8	0.0303	β ⁻ 14 max	1775 6		
				avg	673 3	1.31 25	0.0188

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
¹⁴² La β^- Decay (95.4 m 18) (Continued)				γ 44	1389.30 10	0.47 16	0.0140
β -15 max	1821 6			γ 45	1395.30 20	0.21 11	0.0062
avg	693 3	8.1 7	0.120	γ 46	1402.20 20	0.16 11	0.0047
β -16 max	1850 6			γ 47	1445.5 3	0.16 11	0.0048
avg	706 3	3.7 5	0.0556	γ 48	1455.1 3	0.10 6	0.0033
β -17 max	1974 6			γ 49	1493.70 20	0.16 11	0.0050
avg	761 3	20.1 19	0.326	γ 50	1516.30 20	0.47 16	0.0153
β -18 max	2119 6			γ 51	1535.5 3	0.26 11	0.0086
avg	826 3	21.5 20	0.378	γ 52	1540.20 15	0.52 11	0.0172
β -19 max	2153 6			γ 53	1545.80 10	3.3 5	0.109
avg	841 3	2.0 4	0.0358	γ 54	1618.20 20	0.31 11	0.0109
β -20 max	2330 6			γ 55	1651.4 3	0.21 11	0.0074
avg	921 3	6.9 10	0.135	γ 56	1688.1 3	0.26 11	0.0094
β -21 max	2513 6			γ 57	1722.90 15	1.7 3	0.0617
avg	1004 3	2.1 5	0.0449	γ 58	1752.4 7	0.10 6	0.0039
β -22 max	2864 6			γ 59	1756.42 7	3.3 5	0.124
avg	1165 3	0.8 7	0.0199	γ 60	1768.0 5	0.21 11	0.0079
β -23 max	2981 6			γ 61	1771.0 5	0.21 11	0.0079
avg	1219 3	3.0 12	0.0779	γ 62	1793.8 8	0.10 6	0.0040
β -24 max	3876 6			γ 63	1806.3 5	0.16 11	0.0061
avg	1634 3	5.2 17	0.181	γ 64	1817.1 6	0.10 6	0.0041
β -25 max	4517 6			γ 65	1885.4 7	0.58 16	0.0232
avg	1910 3	7 5	0.285	γ 66	1901.32 8	8.7 8	0.353
total β^-				γ 67	1923.0 3	0.26 11	0.0108
avg	848 4	100 7	1.80	γ 68	1933.5 5	0.16 11	0.0065
				γ 69	1948.2 4	0.52 16	0.0218
				γ 70	1960.6 5	0.16 11	0.0066
				γ 71	2004.20 15	1.05 22	0.0448
X-ray $K\alpha_1$	34.71970 2	0.119 8	≈ 0	γ 72	2025.50 14	1.36 22	0.0589
γ 1	106.1 4	0.16 11	0.0004	γ 73	2038.70 20	1.10 22	0.0479
γ 2	174.1 4	0.10 6	0.0004	γ 74	2050.40 20	0.52 16	0.0229
γ 3	367.30 20	0.10 6	0.0008	γ 75	2055.17 7	2.9 4	0.129
γ 4	393.7 3	0.10 6	0.0009	γ 76	2076.90 20	0.73 17	0.0325
γ 5	420.80 10	0.26 11	0.0024	γ 77	2086.10 20	0.42 16	0.0187
γ 6	433.34 7	0.42 16	0.0039	γ 78	2100.40 20	1.05 22	0.0470
γ 7	514.7 3	0.16 11	0.0017	γ 79	2126.2 3	0.37 16	0.0166
γ 8	532.00 20	0.16 11	0.0018	γ 80	2139.30 20	0.58 16	0.0263
γ 9	578.09 4	1.36 22	0.0168	γ 81	2180.30 20	0.58 16	0.0268
γ 10	619.50 10	0.16 6	0.0021	γ 82	2187.20 10	5.8 8	0.271
γ 11	641.17 3	52.5 25	0.717	γ 83	2290.5 6	0.37 16	0.0179
γ 12	861.57 7	2.0 4	0.0366	γ 84	2358.40 20	0.84 17	0.0422
γ 13	878.2 3	0.21 11	0.0039	γ 85	2364.4 3	0.47 16	0.0238
γ 14	894.85 4	9.4 12	0.179	γ 86	2397.72 10	16.3 18	0.831
γ 15	946.5 3	0.10 6	0.0021	γ 87	2419.5 4	0.21 11	0.0108
γ 16	962.2 13	0.42 16	0.0086	γ 88	2459.4 4	0.42 16	0.0220
γ 17	991.2 3	0.10 6	0.0022	γ 89	2513.2 6	0.16 11	0.0084
γ 18	1006.70 20	0.26 11	0.0056	γ 90	2532.3 7	0.10 6	0.0057
γ 19	1011.38 6	4.4 6	0.0939	γ 91	2539.4 5	0.79 17	0.0426
γ 20	1039.2 3	0.10 6	0.0023	γ 92	2542.65 9	11.2 16	0.608
γ 21	1043.68 7	3.0 4	0.0677	γ 93	2663.5 3	0.79 17	0.0447
γ 22	1061.80 20	0.16 11	0.0036	γ 94	2666.80 15	1.9 3	0.107
γ 23	1070.3 3	0.16 11	0.0036	γ 95	2672.6 4	0.21 11	0.0120
γ 24	1074.2 3	0.10 6	0.0024	γ 96	2782.3 4	0.31 11	0.0187
γ 25	1088.90 15	0.26 11	0.0061	γ 97	2800.8 4	0.63 16	0.0376
γ 26	1112.6 3	0.10 6	0.0025	γ 98	2818.10 10	0.84 22	0.0504
γ 27	1116.7 3	0.10 6	0.0025	γ 99	2828.60 20	0.26 11	0.0158
γ 28	1130.60 15	0.52 16	0.0126	γ 100	2970.0 7	0.79 17	0.0498
γ 29	1144.50 20	0.16 11	0.0038	γ 101	2972.00 20	3.3 4	0.209
γ 30	1160.16 6	1.9 3	0.0480	γ 102	2991.7 5	0.10 6	0.0067
γ 31	1174.3 3	0.16 11	0.0039	γ 103	2999.90 20	0.52 16	0.0335
γ 32	1190.90 20	0.42 16	0.0107	γ 104	3007.1 5	0.21 11	0.0135
γ 33	1231.5 5	0.31 11	0.0083	γ 105	3012.90 20	0.73 17	0.0472
γ 34	1233.11 8	2.0 4	0.0538	γ 106	3022.3 7	0.10 6	0.0068
γ 35	1242.3 3	0.21 11	0.0056	γ 107	3034.30 20	0.58 16	0.0373
γ 36	1264.7 3	0.10 6	0.0028	γ 108	3046.90 20	0.42 16	0.0273
γ 37	1270.1 4	0.10 6	0.0028	γ 109	3075.9 3	0.16 11	0.0103
γ 38	1288.0 3	0.10 6	0.0029	γ 110	3155.0 3	0.21 11	0.0141
γ 39	1323.20 20	0.37 11	0.0104	γ 111	3181.0 3	0.31 11	0.0213
γ 40	1332.3 4	0.10 6	0.0030	γ 112	3236.70 20	0.31 11	0.0217
γ 41	1354.6 5	0.10 6	0.0030	γ 113	3242.4 3	0.21 11	0.0145
γ 42	1362.95 5	2.4 4	0.0686	γ 114	3273.2 3	0.16 11	0.0110
γ 43	1373.6 7	0.21 11	0.0061	γ 115	3314.70 20	1.36 22	0.0964

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
¹⁴⁴ Ce β ⁻ Decay (284.3 d 3) (Continued)				● ¹⁴⁴ Pm EC Decay (363 d 14) I (min) = 0.10%			
X-ray L	5	1.58 24	0.0002	Auger-L	4.23	73 4	0.0066
γ 1	33.620 20	0.283 25	0.0002	Auger-K	30.5	6.8 21	0.0044
X-ray Kα ₂	35.55020 2	2.43 15	0.0018	ce-K- 2	433.21 3	0.466 17	0.0043
X-ray Kα ₁	36.02630 2	4.5 3	0.0034	ce-K- 4	574.44 3	0.561 18	0.0069
X-ray Kβ	40.7	1.67 10	0.0015	ce-K- 6	652.921 20	0.425 13	0.0059
γ 2	40.93 3	0.39 5	0.0003	X-ray L	5.23	12.9 18	0.0014
γ 5	80.106 5	1.60 12	0.0027	X-ray Kα ₂	36.8474 3	22.2 8	0.0174
γ 7	133.544 5	10.8 7	0.0307	X-ray Kα ₁	37.3610 3	40.5 13	0.0322
3 weak γ's omitted: E _γ (avg) = 67.3; ΣI _γ = 0.13%				X-ray Kβ	42.3	15.4 6	0.0139
● ¹⁴⁴ Pr β ⁻ Decay (17.28 m 3) I (min) = 0.10%				γ 1	301.70 20	0.18 4	0.0012
β- 1 max	810 3			γ 2	476.78 3	42.0 8	0.426
avg	266.6 12	1.08 5	0.0061	γ 3	582.40 20	0.189 20	0.0023
β- 2 max	2300 3			γ 4	618.01 3	98.6 10	1.30
avg	894.4 13	1.17 5	0.0223	γ 5	694.00 20	0.55 10	0.0081
β- 3 max	2996 3			γ 6	696.490 20	99.492 15	1.48
avg	1221.4 14	97.74 10	2.54	γ 7	778.57 6	1.51 5	0.0251
total β-				γ 8	814.14 6	0.55 3	0.0095
avg	1207.2 15	100.00 13	2.57	2 weak γ's omitted: E _γ (avg) = 897.6; ΣI _γ = 0.04%			
5 weak β's omitted: E _β (avg) = 369.2; ΣI _β = 0.01%				● ¹⁴⁵ Pm EC Decay (17.7 y 4) I (min) = 0.10%			
γ 4	696.490 20	1.48 6	0.0220	%α Decay = 2.8E-7			
γ 9	1489.15 5	0.300 13	0.0095	Auger-L	4.23	82 4	0.0074
γ 11	2185.70 6	0.77 4	0.0360	ce-K- 1	23.63 10	2.31 14	0.0012
10 weak γ's omitted: E _γ (avg) = 1058.6; ΣI _γ = 0.02%				ce-K- 2	28.83 10	7.1 5	0.0043
● ¹⁴⁴ Pr IT Decay (7.2 m 3) I (min) = 0.10%				Auger-K	30.5	6.7 20	0.0043
%IT Decay = 99.94 4				ce-L- 1	60.07 10	3.34 19	0.0043
Feeds ¹⁴⁴ Pr (17.28 m)				ce-L- 2	65.27 10	1.73 25	0.0024
%β ⁻ Decay = 0.06 4				ce-M- 1	65.62 10	0.76 5	0.0011
Auger-L	4	68.1 22	0.0059	ce-NOP- 1	66.88 10	0.201 13	0.0003
ce-K- 1	17.04 3	33.4 7	0.0121	ce-M- 2	70.82 10	0.37 7	0.0006
Auger-K	29.4	2.8 9	0.0018	ce-NOP- 2	72.08 10	0.103 18	0.0002
ce-L- 1	52.20 3	50.2 7	0.0558	X-ray L	5.23	14.5 20	0.0016
ce-M- 1	57.52 3	12.5 3	0.0153	X-ray Kα ₂	36.8474 3	21.7 7	0.0171
ce-NOP- 1	58.73 3	3.83 11	0.0048	X-ray Kα ₁	37.3610 3	39.7 12	0.0316
X-ray L	5	11.1 16	0.0012	X-ray Kβ	42.3	15.1 5	0.0136
X-ray Kα ₂	35.55020 2	8.7 4	0.0066	γ 1	67.20 10	0.69 4	0.0010
X-ray Kα ₁	36.02630 2	15.9 6	0.0122	γ 2	72.40 10	2.31 16	0.0036
X-ray Kβ	40.7	5.97 23	0.0052	● ¹⁴⁶ Pm EC Decay (2020 d 18) I (min) = 0.10%			
1 weak γ's omitted: E _γ (avg) = 59.0; ΣI _γ = 0.08%				%EC Decay = 63.7 20 See also ¹⁴⁶ Pm β ⁻ Decay			
				Auger-L	4.23	46 4	0.0042
				Auger-K	30.5	4.3 14	0.0028
				ce-K- 2	410.33 20	0.80 4	0.0070
				ce-L- 2	446.77 20	0.134 6	0.0013
				X-ray L	5.23	8.2 13	0.0009
				X-ray Kα ₂	36.8474 3	13.9 10	0.0109
				X-ray Kα ₁	37.3610 3	25.4 18	0.0202
				X-ray Kβ	42.3	9.7 7	0.0087
				γ 1	146.2 13	0.21 4	0.0006
				γ 2	453.90 20	62.7 20	0.606
				γ 3	589.0 10	0.58 9	0.0072
				γ 4	735.90 20	22 3	0.344

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
● ¹⁴⁶ Pm β^- Decay (2020 d 18) I (min) = 0.10%			
% β^- Decay = 36.3 20			
See also ¹⁴⁶ Pm EC Decay			
Auger-L	4.53	0.103 9	≈ 0
ce-K- 2	700.30 10	0.144 9	0.0021
β^- 1 max	162 3		
avg	43.5 9	2.2 4	0.0020
β^- 2 max	795 3		
avg	259.9 12	34.1 19	0.189
total β^-			
avg	246.8 14	36.3 20	0.191
γ 1	633.02 14	2.2 4	0.0297
γ 2	747.13 10	36.1 20	0.575
● ¹⁴⁷ Nd β^- Decay (10.98 d 1) I (min) = 0.10%			
Feeds ¹⁴⁷ Pm			
Auger-L	4.38	41.6 23	0.0039
Auger-K	31.5	3.7 12	0.0025
ce-K- 1	45.922 20	48.7 17	0.0477
ce-K- 2	75.30 5	0.31 4	0.0005
ce-L- 1	83.678 20	7.11 14	0.0127
ce-N- 1	89.457 21	1.52 3	0.0029
ce-NOP- 1	90.776 21	0.431 9	0.0008
ce-K- 5	278.227 18	0.102 7	0.0006
ce-K- 10	485.832 22	0.183 11	0.0019
β^- 1 max	209.9 9		
avg	57.6 3	2.22 9	0.0027
β^- 2 max	364.8 9		
avg	106.1 3	15.3 8	0.0346
β^- 3 max	406.5 9		
avg	119.9 3	0.81 7	0.0021
β^- 4 max	485.3 9		
avg	146.7 4	0.58 16	0.0018
β^- 5 max	804.7 9		
avg	264.0 4	81.1 15	0.456
total β^-			
avg	233.3 5	100.1 18	0.497
1 weak β^- 's omitted: $E\beta$ (avg) = 59.2; $\Sigma I\beta$ = 0.07%			
X-ray L	5.43	7.9 11	0.0009
X-ray K α_2	38.1712 5	13.0 6	0.0105
X-ray K α_1	38.7247 5	23.6 11	0.0194
X-ray K β	43.8	9.1 5	0.0084
γ 1	91.106 20	28.0 5	0.0543
γ 2	120.48 5	0.40 5	0.0010
γ 3	196.64 4	0.204 18	0.0009
γ 4	275.374 15	0.80 5	0.0047
γ 5	319.411 18	1.96 12	0.0133
γ 6	398.155 20	0.87 6	0.0074
γ 7	410.48 3	0.140 9	0.0012
γ 8	439.895 22	1.20 9	0.0113
γ 9	489.24 3	0.154 9	0.0016
γ 10	531.016 22	13.1 8	0.149
γ 12	594.80 3	0.266 18	0.0034
γ 14	685.90 4	0.81 6	0.0119
2 weak γ 's omitted: $E\gamma$ (avg) = 616.6; $\Sigma I\gamma$ = 0.07%			

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
● ¹⁴⁷ Pm β^- Decay (2.6234 y 2) I (min) = 0.10%			
Feeds ¹⁴⁷ Sm			
β^- 1 max	224.7 4		
avg	61.96 12	99.9942 2	0.132
● ¹⁴⁷ Sm α Decay (1.06E11 y 2) I (min) = 0.10%			
α 1	2247.6 15	100	4.79
● ¹⁴⁸ Pm β^- Decay (5.37 d 1) I (min) = 0.10%			
Auger-L	4.53	0.130 9	≈ 0
ce-K- 3	503.44 3	0.182 7	0.0019
β^- 1 max	406 9		
avg	120 3	1.36 4	0.0035
β^- 2 max	999 9		
avg	340 4	33.3 8	0.241
β^- 3 max	1040 9		
avg	356 4	0.235 9	0.0018
β^- 4 max	1914 9		
avg	728 4	9.4 3	0.146
β^- 5 max	2464 9		
avg	975 4	55.5 11	1.15
total β^-			
avg	726 6	100.0 14	1.55
5 weak β^- 's omitted: $E\beta$ (avg) = 191.7; $\Sigma I\beta$ = 0.23%			
γ 3	550.27 3	22.0 6	0.258
γ 4	592.83 3	0.353 11	0.0045
γ 5	611.26 3	1.02 3	0.0133
γ 7	874.18 3	0.235 9	0.0044
γ 8	896.42 3	0.981 24	0.0187
γ 10	914.85 3	11.5 3	0.223
γ 15	1465.12 3	22.2 5	0.693
13 weak γ 's omitted: $E\gamma$ (avg) = 1293.9; $\Sigma I\gamma$ = 0.30%			
● ¹⁴⁸ Pm IT Decay (41.3 d 1) I (min) = 0.10%			
%IT Decay = 4.2 6			
Feeds ¹⁴⁸ Pm (5.37 d)			
See also ¹⁴⁸ Pm β^- Decay (41.3 d)			
Auger-L	4.38	4.9 5	0.0005
ce-K- 2	30.52 10	2.8 4	0.0018
Auger-K	31.5	0.21 8	0.0001
ce-L- 1	54.07 10	3.1 5	0.0035
ce-M- 1	59.85 10	0.87 13	0.0011
ce-NOP- 1	61.17 10	0.24 4	0.0003
ce-L- 2	68.27 10	0.39 6	0.0006
ce-MNO- 2	74.05 10	0.106 16	0.0002
X-ray L	5.43	0.94 15	0.0001
X-ray K α_2	38.1712 5	0.73 11	0.0006
X-ray K α_1	38.7247 5	1.32 20	0.0011
X-ray K β	43.8	0.51 8	0.0005
γ 2	75.70 10	0.93 14	0.0015

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
γ 21	198.928 9	1.44 16	0.0061
γ 22	208.148 10	2.9 4	0.0129
γ 23	211.307 8	27.2 19	0.122
γ 24	213.946 17	0.41 5	0.0019
γ 25	226.846 21	0.16 4	0.0008
γ 26	240.218 8	3.9 4	0.0202
γ 27	245.699 8	1.03 12	0.0054
γ 30	251.064 14	0.38 4	0.0021
γ 31	251.064 9	6.0 7	0.0344
γ 32	270.000 8	10.6 12	0.0610
γ 33	273.25 5	0.23 5	0.0013
γ 34	275.445 13	0.60 12	0.0035
γ 35	276.960 19	0.32 7	0.0019
γ 36	282.455 11	0.61 7	0.0037
γ 37	288.192 12	0.67 8	0.0041
γ 38	294.807 12	0.58 7	0.0036
γ 39	301.133 16	0.38 4	0.0024
γ 40	310.982 14	0.52 5	0.0034
γ 41	326.556 11	4.7 5	0.0324
γ 42	347.833 23	0.18 9	0.0014
γ 43	349.233 10	1.47 16	0.0109
γ 44	360.055 20	0.163 14	0.0013
γ 45	366.637 15	0.66 8	0.0052
γ 46	384.691 18	0.33 4	0.0027
γ 47	423.554 10	9.4 10	0.0849
γ 48	443.550 12	1.50 16	0.0141
γ 50	538.15 7	0.11 4	0.0012
γ 51	540.510 10	7.7 8	0.0883
γ 52	556.43 5	1.2 5	0.0139
γ 55	630.238 21	0.220 25	0.0030
γ 56	635.482 25	0.112 13	0.0015
γ 57	654.831 14	7.3 8	0.102
γ 58	686.933 25	0.103 12	0.0015
γ 59	696.266 25	0.171 19	0.0025
γ 71	808.834 22	0.169 19	0.0029
γ 77	923.876 25	0.114 13	0.0022
γ 81	979.02 4	0.112 13	0.0023
γ 83	1022.78 3	0.120 13	0.0026
γ 97	1234.12 5	0.29 3	0.0077

57 weak γ's omitted:
Eγ(avg) = 634.0; ΣIγ = 1.58%

• ¹⁴⁹Pm β⁻ Decay (53.08 h 5) I (min) = 0.10%

Auger-L	4.53	0.287 24	≈0
ce-L- 1	14.757 11	0.135 21	≈0
ce-K- 9	239.07 5	0.244 18	0.0012
β- 1 max	189 4		
avg	51.4 12	0.126 18	0.0001
β- 2 max	785 4		
avg	256.1 16	3.39 22	0.0185
β- 3 max	1071 4		
avg	369.0 17	96.23 25	0.756
total β-			
avg	364.2 17	100.0 4	0.776

7 weak β's omitted:
Eβ(avg) = 133.4; ΣIβ = 0.25%

X-ray Kα ₁	40.1181 3	0.117 9	≈0
γ 9	285.90 5	3.10 20	0.0189
γ 27	859.4 5	0.102 17	0.0019

26 weak γ's omitted:
Eγ(avg) = 598.3; ΣIγ = 0.30%

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
• ¹⁵¹ Pm β ⁻ Decay (28.40 h 4) I (min) = 0.10%			
Feeds ¹⁵¹ Sm			
ce-MNO- 1	3.098 4	50.8 25	0.0034
Auger-L	4.53	27.5 15	0.0026
ce-K- 6	16.069 16	0.175 16	≈0
ce-L- 2	17.943 20	1.49 14	0.0006
ce-K- 7	18.053 14	10.0 9	0.0038
ce-K- 8	19.000 14	5.7 6	0.0023
ce-K- 9	22.884 16	1.99 22	0.0010
ce-MNO- 2	23.957 20	0.43 4	0.0002
ce-L- 3	27.41 5	0.62 3	0.0004
ce-K- 10	29.385 18	0.51 5	0.0003
Auger-K	32.6	2.2 7	0.0015
ce-MNO- 3	33.43 5	0.188 8	0.0001
ce-K- 16	53.183 6	3.7 3	0.0042
ce-K- 18	55.099 6	0.290 21	0.0003
ce-L- 7	57.150 14	1.54 15	0.0019
ce-K- 20	58.005 6	4.5 4	0.0056
ce-L- 8	58.097 14	0.82 8	0.0010
ce-L- 9	61.981 16	0.32 4	0.0004
ce-MNO- 7	63.164 14	0.42 4	0.0006
ce-MNO- 8	64.111 14	0.223 20	0.0003
ce-L- 10	68.482 18	0.67 6	0.0010
ce-MNO-10	74.496 18	0.195 17	0.0003
ce-L- 16	92.280 6	0.53 4	0.0010
ce-K- 31	92.451 8	0.286 21	0.0006
ce-K- 33	96.337 11	0.102 16	0.0002
ce-L- 20	97.102 6	0.65 5	0.0013
ce-MNO-16	98.294 6	0.146 11	0.0003
ce-MNO-20	103.116 6	0.180 13	0.0004
ce-K- 42	116.757 14	0.59 4	0.0015
ce-K- 43	120.931 15	0.51 4	0.0013
ce-K- 44	121.55 5	0.30 3	0.0008
ce-K- 46	130.325 9	1.10 7	0.0030
ce-K- 55	162.176 8	0.329 24	0.0011
ce-L- 46	169.422 9	0.173 12	0.0006
ce-K- 60	185.59 3	0.145 15	0.0006
ce-K- 74	228.379 11	0.112 9	0.0005
ce-K- 99	293.247 6	0.211 11	0.0013
β- 1 max	224 10		
avg	62 3	0.159 15	0.0002
β- 2 max	235 10		
avg	65 3	1.04 6	0.0014
β- 3 max	301 10		
avg	85 4	0.32 4	0.0006
β- 4 max	310 10		
avg	88 4	2.35 14	0.0044
β- 5 max	365 10		
avg	106 4	6.2 4	0.0140
β- 6 max	414 10		
avg	122 4	1.15 8	0.0030
β- 7 max	447 10		
avg	133 4	3.16 17	0.0090
β- 8 max	524 10		
avg	160 4	0.205 14	0.0007
β- 9 max	667 10		
avg	212 4	0.75 15	0.0034
β-10 max	698 10		
avg	223 4	0.44 4	0.0021
β-11 max	742 10		
avg	240 4	7.1 4	0.0363
β-12 max	792 10		
avg	259 4	1.95 11	0.0108
β-13 max	843 10		
avg	278 4	42.7 18	0.253
β-14 max	864 10		
avg	287 4	3.33 19	0.0204
β-15 max	881 10		
avg	293 4	1.85 14	0.0115

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
¹⁵¹ Pm β ⁻ Decay (28.40 h 4) (Continued)				γ 130	440.880 11	1.53 11	0.0144
β-16 max	885 10			γ 132	445.693 10	4.1 3	0.0387
avg	295 4	0.19 7	0.0012	γ 134	451.420 20	0.300 22	0.0029
β-17 max	979 10			γ 148	490.30 3	0.128 11	0.0013
avg	332 4	2.42 17	0.0171	γ 155	516.25 6	0.202 16	0.0022
β-18 max	1020 10			γ 162	565.01 6	0.36 3	0.0044
avg	348 4	1.43 20	0.0106	γ 165	578.97 7	0.117 11	0.0014
β-19 max	1020 10			γ 179	636.23 5	1.47 11	0.0199
avg	348 4	8.5 7	0.0630	γ 180	654.25 7	0.250 19	0.0035
β-20 max	1083 10			γ 185	668.70 20	0.36 5	0.0052
avg	374 4	3.3 8	0.0263	γ 186	669.20 20	0.29 5	0.0041
β-21 max	1118 10			γ 187	671.30 6	0.93 7	0.0133
avg	388 4	2.7 13	0.0223	γ 190	704.22 9	0.353 25	0.0053
β-22 max	1188 10			γ 191	709.29 6	0.149 11	0.0022
avg	417 5	10 3	0.0888	γ 192	712.02 8	0.105 8	0.0016
total β ⁻				γ 194	717.75 9	4.1 3	0.0630
avg	278 5	102 4	0.601	γ 197	736.13 10	0.49 4	0.0076
11 weak β's omitted: Eβ(avg) = 191.3; ΣIβ = 0.32%				γ 199	752.83 10	1.33 9	0.0213
X-ray L	5.64	5.6 8	0.0007	γ 202	769.10 9	0.110 24	0.0018
γ 2	25.680 20	0.94 8	0.0005	γ 203	772.80 11	0.96 7	0.0158
X-ray Kα ₂	39.5224 3	8.1 4	0.0068	γ 204	785.07 8	0.229 19	0.0038
X-ray Kα ₁	40.1181 3	14.6 7	0.0125	γ 207	807.91 6	0.53 8	0.0091
X-ray Kβ	45.4	5.7 3	0.0055	γ 209	817.650 20	0.17 4	0.0030
γ 6	62.903 16	0.218 19	0.0003	γ 212	848.67 7	0.300 22	0.0054
γ 7	64.887 14	1.97 18	0.0027	γ 216	877.69 11	0.101 8	0.0019
γ 8	65.834 14	1.17 11	0.0016	γ 228	948.71 6	0.36 3	0.0074
γ 9	69.718 16	0.48 5	0.0007	162 weak γ's omitted: Eγ(avg) = 428.8; ΣIγ = 4.36%			
γ 10	76.219 18	0.211 18	0.0003	● ¹⁵¹ Sm β ⁻ Decay (90 y 6) I (min) = 0.10%			
γ 14	98.04 3	0.37 4	0.0008	Auger-L	4.69	0.48 11	≈0
γ 16	100.017 6	2.56 19	0.0055	ce-L- 1	13.488 6	0.59 13	0.0002
γ 18	101.933 6	1.31 9	0.0028	ce-MNO- 1	19.740 6	0.20 4	≈0
γ 20	104.839 6	3.55 25	0.0079	β- 1 max	54.6 6		
γ 31	139.285 8	0.51 4	0.0015	avg	13.96 16	0.88 6	0.0003
γ 33	143.171 11	0.218 17	0.0007	β- 2 max	76.1 6		
γ 36	147.55 3	0.149 11	0.0005	avg	19.68 16	99.12 6	0.0415
γ 40	156.18 5	0.151 15	0.0005	total β ⁻			
γ 41	162.950 20	0.89 8	0.0031	avg	19.63 16	100.00 9	0.0418
γ 42	163.591 14	1.63 12	0.0057	X-ray L	5.85	0.11 3	≈0
γ 43	167.765 15	8.8 7	0.0314	1 weak γ's omitted: Eγ(avg) = 21.5; ΣIγ = 0.03%			
γ 44	168.38 5	0.92 8	0.0033	● ¹⁵² Eu EC Decay (13.6 y 2) I (min) = 0.10%			
γ 45	176.54 3	0.87 8	0.0033	% (EC + β ⁺) Decay = 72.2 4 See also ¹⁵² Eu β ⁻ Decay (13.6 y)			
γ 46	177.159 9	3.87 24	0.0146	Auger-L	4.53	73 4	0.0071
γ 47	186.603 14	0.169 16	0.0007	Auger-K	32.6	5.7 19	0.0039
γ 50	201.959 8	0.94 7	0.0041	ce-K- 1	74.9451 6	19.5 8	0.0311
γ 51	204.15 3	0.131 11	0.0006	ce-L- 1	114.0425 6	10.6 4	0.0258
γ 55	209.010 8	1.79 12	0.0080	ce-M- 1	120.0565 9	2.43 9	0.0062
γ 57	227.204 17	0.34 4	0.0017	ce-NCP- 1	121.4336 10	0.668 25	0.0017
γ 60	232.42 3	1.05 10	0.0052	ce-K- 12	197.8585 10	0.609 23	0.0026
γ 63	236.60 20	0.163 20	0.0008	ce-L- 12	236.9559 10	0.156 6	0.0008
γ 64	236.70 20	0.20 5	0.0010	2 weak β's omitted: Eβ(avg) = 331.5; ΣIβ = 0.04%			
γ 65	237.02 3	0.53 10	0.0027	(Continued)			
γ 66	240.088 10	3.89 24	0.0199				
γ 70	254.300 25	0.165 16	0.0009				
γ 71	258.127 11	0.60 5	0.0033				
γ 74	275.213 11	7.2 5	0.0420				
γ 77	280.102 24	0.227 19	0.0014				
γ 78	290.756 10	0.88 7	0.0054				
γ 87	306.74 6	0.236 17	0.0015				
γ 94	323.946 8	1.21 9	0.0084				
γ 96	325.80 10	0.108 15	0.0007				
γ 98	329.761 15	0.211 16	0.0015				
γ 99	340.081 6	22.9 9	0.166				
γ 101	344.913 7	2.18 15	0.0160				
γ 104	349.833 22	0.135 15	0.0010				
γ 106	353.32 10	0.114 13	0.0009				
γ 114	379.87 3	0.97 7	0.0078				
γ 121	407.018 25	0.188 14	0.0016				

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
X-ray L	5.64	15.0 19	0.0018
X-ray Kα ₂	39.5224 3	20.9 7	0.0175
X-ray Kα ₁	40.1181 3	37.7 12	0.0322
X-ray Kβ	45.4	14.6 5	0.0142
γ 1	121.7793 3	28.4 7	0.0737
γ 12	244.6927 8	7.49 16	0.0391
γ 20	295.930 17	0.427 10	0.0027
γ 22	329.35 5	0.125 11	0.0009
γ 30	415.943 13	0.101 9	0.0009
γ 32	443.979 6	2.81 7	0.0266
γ 33	443.98 5	0.30 4	0.0029
γ 36	488.66 3	0.413 11	0.0043
γ 45	564.03 6	0.482 15	0.0058
γ 46	566.410 10	0.129 4	0.0016
γ 51	656.440 10	0.142 5	0.0020
γ 54	674.610 20	0.148 24	0.0021
γ 56	688.630 20	0.837 23	0.0123
γ 58	719.33 7	0.265 20	0.0041
γ 62	810.430 10	0.310 9	0.0054
γ 64	841.540 20	0.161 6	0.0029
γ 65	867.320 10	4.16 14	0.0769
γ 69	919.310 10	0.401 11	0.0079
γ 70	926.250 10	0.255 8	0.0050
γ 72	963.39 5	0.114 16	0.0023
γ 73	964.01 3	14.4 3	0.297
γ 75	1005.17	0.66 6	0.0141
γ 78	1084.91 8	0.246 8	0.0057
γ 79	1085.780 10	10.0 3	0.230
γ 80	1112.020 10	13.3 3	0.315
γ 85	1212.842 15	1.38 4	0.0357
γ 86	1249.80 11	0.178 6	0.0047
γ 87	1292.670 20	0.101 5	0.0028
γ 92	1407.954 10	20.7 5	0.622
γ 95	1457.540 20	0.488 19	0.0151
γ 96	1528.07 7	0.257 15	0.0084

69 weak γ's omitted:
E_γ(avg) = 685.8; ΣI_γ = 0.87%

• ¹⁵²Eu β⁻ Decay (13.6 y 2) I (min) = 0.10%
%β⁻ Decay = 27.8 4
Feeds ¹⁵²Gd
See also ¹⁵²Eu EC Decay (13.6 y)

Auger-L	4.84	0.71 4	≈0
ce-K- 8	294.0333 18	0.82 3	0.0052
ce-L- 8	335.8968 18	0.181 6	0.0013
β- 1 max	176 4		
avg	47.5 10	1.78 4	0.0018
β- 2 max	385 4		
avg	112.5 11	2.40 5	0.0058
β- 3 max	696 4		
avg	221.8 13	13.6 3	0.0643
β- 4 max	710 4		
avg	227.0 13	0.23 4	0.0011
β- 5 max	889 4		
avg	295.3 13	0.293 15	0.0018
β- 6 max	1064 4		
avg	364.8 14	0.89 3	0.0069
β- 7 max	1475 4		
avg	535.6 14	8.44 21	0.0963
total β- avg	300.8 19	27.8 4	0.178

6 weak β's omitted:
E_β(avg) = 74.3; ΣI_β = 0.19%

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
X-ray L	6	0.167 20	≈0
X-ray Kα ₂	42.3089 3	0.219 10	0.0002
X-ray Kα ₁	42.9962 3	0.395 17	0.0004
X-ray Kβ	48.7	0.156 7	0.0002
γ 8	344.2724 17	26.5 4	0.194
γ 10	367.710 10	0.856 19	0.0067
γ 11	411.111 8	2.21 4	0.0194
γ 15	503.385 12	0.151 4	0.0016
γ 20	586.26 3	0.453 13	0.0057
γ 24	678.580 10	0.469 13	0.0068
γ 27	764.840 20	0.168 7	0.0027
γ 28	778.890 9	12.74 25	0.211
γ 35	1089.680 10	1.68 4	0.0390
γ 36	1109.07 24	0.17 4	0.0039
γ 39	1299.04 3	1.61 4	0.0444

32 weak γ's omitted:
E_γ(avg) = 631.4; ΣI_γ = 0.71%

• ¹⁵²Eu EC Decay (9.32 h 2) I (min) = 0.10%
%(EC + β⁺) Decay = 29 3
See also ¹⁵²Eu β⁻ Decay (9.32 h)

Auger-L	4.53	27 4	0.0026
Auger-K	32.6	2.2 8	0.0015
ce-K- 1	74.9451 6	5.1 10	0.0081
ce-L- 1	114.0425 6	2.8 6	0.0068
ce-M- 1	120.0565 9	0.64 13	0.0016
ce-NCP- 1	121.4336 10	0.18 4	0.0005

X-ray L	5.64	5.5 11	0.0007
X-ray Kα ₂	39.5224 3	7.9 14	0.0066
X-ray Kα ₁	40.1181 3	14.3 25	0.0122
X-ray Kβ	45.4	5.5 10	0.0054
γ 1	121.7793 3	7.4 14	0.0193
γ 10	562.920 10	0.23 5	0.0028
γ 17	841.540 20	15 3	0.270
γ 19	961.06 22	0.21 4	0.0043
γ 20	963.39 5	12.4 23	0.255
γ 24	1389.11 7	0.88 17	0.0261

21 weak γ's omitted:
E_γ(avg) = 794.2; ΣI_γ = 0.41%

• ¹⁵²Eu β⁻ Decay (9.32 h 2) I (min) = 0.10%
%β⁻ Decay = 71 3
Feeds ¹⁵²Gd
See also ¹⁵²Eu EC Decay (9.32 h)

β- 1 max	550 4		
avg	168.9 12	1.67 25	0.0060
β- 2 max	817 4		
avg	267.5 13	0.131 21	0.0007
β- 3 max	1521 4		
avg	554.1 14	1.8 3	0.0212
β- 4 max	1865 4		
avg	704.1 15	67 3	1.00
total β- avg	686.2 16	71 3	1.03

2 weak β's omitted:
E_β(avg) = 46.7; ΣI_β = 0.06%

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
¹⁵² Eu β^- Decay (9.32 h 2) (Continued)				¹⁵³ Gd EC Decay (241.6 d 2) I (min) = 0.10%			
γ 6	344.2724	17 2.5 4	0.0183	Auger-L	4.69	114 6	0.0113
γ 18	970.38	3 0.62 10	0.0127	ce-L- 1	6.018	20 0.16 6	\approx 0
γ 21	1314.670	10 0.98 15	0.0273	ce-L- 2	11.758	20 0.40 9	\approx 0
21 weak γ 's omitted: E γ (avg) = 676.7; $\Sigma I\gamma$ = 0.32%				ce-MNO- 2	18.010	20 0.12 3	\approx 0
\bullet ¹⁵² Gd α Decay (1.1E14 y) I (min) = 0.10%				ce-K- 3	21.1533	9 11.5 9	0.0052
α 1	2150	4 100	4.58	Auger-K	33.7	9.3 21	0.0067
\bullet ¹⁵³ Sm β^- Decay (46.7 h 1) I (min) = 0.10%				ce-K- 5	34.8475	10 0.52 7	0.0004
Auger-L	4.69	54 3	0.0054	ce-K- 6	40.9648	12 0.16 5	0.0001
ce-L- 2	11.758	20 0.324 10	\approx 0	ce-K- 7	48.9109	12 8.1 6	0.0084
ce-K- 5	21.1533	9 23.2 14	0.0104	ce-K- 8	54.6601	12 32.2 23	0.0375
Auger-K	33.7	4.5 10	0.0032	ce-L- 3	61.6203	9 1.88 15	0.0025
ce-K- 7	34.8475	10 0.47 8	0.0004	ce-M- 3	67.8723	10 0.41 4	0.0006
ce-K- 8	40.9648	12 0.34 3	0.0003	ce-NCP- 3	69.3121	11 0.115 9	0.0002
ce-K- 10	48.9109	12 0.185 8	0.0002	ce-L- 5	75.3145	10 0.25 3	0.0004
ce-K- 11	54.6601	12 41.0 15	0.0478	ce-L- 7	89.3779	12 1.20 9	0.0023
ce-L- 5	61.6203	9 3.79 23	0.0050	ce-L- 8	95.1271	12 4.8 4	0.0098
ce-M- 5	67.8723	10 0.83 5	0.0012	ce-MNO- 7	95.6299	12 0.329 20	0.0007
ce-NCP- 5	69.3121	11 0.233 14	0.0003	ce-M- 8	101.3791	12 1.05 8	0.0023
ce-L- 7	75.3145	10 0.22 4	0.0004	ce-NCP- 8	102.8189	13 0.302 22	0.0007
ce-MNO- 7	81.5665	11 0.133 20	0.0002	X-ray L	5.85	25 3	0.0031
ce-L- 11	95.1271	12 6.17 23	0.0125	X-ray K α_2	40.9019	3 35.8 14	0.0312
ce-M- 11	101.3791	12 1.34 5	0.0029	X-ray K α_1	41.5422	3 64.7 23	0.0573
ce-NCP-11	102.8189	13 0.385 15	0.0008	X-ray K β	47	25.3 10	0.0254
β^- 1 max	632	3		γ 3	69.6723	8 2.57 19	0.0038
avg	198.6	11 34.1 17	0.144	γ 5	83.3665	9 0.22 3	0.0004
β^- 2 max	702	3		γ 7	97.4299	11 31.3 19	0.0650
avg	224.4	11 44.1 24	0.211	γ 8	103.1791	11 22.2 15	0.0488
β^- 3 max	708	3		5 weak γ 's omitted: E γ (avg) = 95.8; $\Sigma I\gamma$ = 0.22%			
avg	226.5	11 0.55 5	0.0027	\bullet ¹⁵⁴ Eu β^- Decay (8.8 y 1) I (min) = 0.10%			
β^- 4 max	805	3		% β^- Decay = 99.986 14			
avg	263.4	12 21.0 17	0.118	%EC Decay = 0.014 4			
total β^-				Auger-L	4.84	32.5 16	0.0034
avg	223.6	12 100 4	0.476	Auger-K	34.9	1.8 6	0.0013
10 weak β 's omitted: E β (avg) = 80.9; $\Sigma I\beta$ = 0.15%				ce-K- 3	72.831	4 26.8 13	0.0416
X-ray L	5.85	11.9 14	0.0015	ce-L- 3	114.694	4 16.8 8	0.0410
X-ray K α_2	40.9019	3 17.3 7	0.0150	ce-M- 3	121.189	4 3.90 19	0.0101
X-ray K α_1	41.5422	3 31.2 12	0.0276	ce-NCP- 3	122.694	4 1.10 6	0.0029
X-ray K β	47	12.2 5	0.0122	ce-K- 21	197.700	8 0.54 3	0.0023
γ 5	69.6723	8 5.2 3	0.0077	ce-L- 21	239.563	8 0.149 8	0.0008
γ 6	75.4220	10 0.194 19	0.0003	β^- 1 max	247.4	20	
γ 7	83.3665	9 0.20 3	0.0004	avg	68.8	6 27.9 10	0.0409
γ 8	89.4838	11 0.158 13	0.0003	β^- 2 max	306.1	20	
γ 10	97.4299	11 0.718 22	0.0015	avg	86.9	7 0.77 3	0.0014
γ 11	103.1791	11 28.3 6	0.0622	β^- 3 max	321.2	20	
54 weak γ 's omitted: E γ (avg) = 422.7; $\Sigma I\gamma$ = 0.28%				avg	91.7	7 0.149 5	0.0003
				β^- 4 max	349.8	20	
				avg	100.9	7 1.58 6	0.0034
				β^- 5 max	407.4	21	
				avg	119.8	7 0.117 8	0.0003
				β^- 6 max	435.7	20	
				avg	129.3	7 0.281 16	0.0008
				β^- 7 max	548.6	20	
				avg	168.3	7 0.188 6	0.0007
				β^- 8 max	569.4	20	
				avg	175.7	8 36.5 14	0.137
				β^- 9 max	703.2	20	
				avg	224.5	8 0.64 3	0.0031
				β^- 10 max	715.4	20	
				avg	229.0	8 0.245 11	0.0012

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
β-11 max	839.2 20			ce-L- 6	23.05 5	0.38 14	0.0002
β-11 avg	276.0 8	17.4 7	0.102	ce-MNO- 5	24.632 21	0.143 11	≈0
β-12 max	970.7 20			ce-MNO- 6	29.55 5	0.12 4	≈0
β-12 avg	327.5 8	2.0 5	0.0140	Auger-K	34.9	1.6 6	0.0012
β-13 max	1151.5 20			ce-K- 10	35.823 5	0.40 5	0.0003
β-13 avg	400.4 9	0.29 6	0.0025	ce-K- 11	36.306 3	11.2 8	0.0087
β-14 max	1596.0 20			ce-L- 7	36.9216 14	0.6 3	0.0005
β-14 avg	587.4 9	0.24 20	0.0030	ce-MNO- 7	43.4164 14	0.18 8	0.0002
β-15 max	1843.9 20			ce-L- 9	51.6344 19	1.67 11	0.0018
β-15 avg	695.0 9	11.4 18	0.169	ce-K- 12	55.069 3	4.4 4	0.0052
total β-				ce-M- 9	58.1292 19	0.369 24	0.0005
avg	225.4 12	100 3	0.480	ce-NCP- 9	59.6342 20	0.105 7	0.0001
9 weak β's omitted: Eβ(avg) = 131.3; ΣIβ = 0.21%				ce-L- 11	78.169 3	1.72 12	0.0029
X-ray L	6	7.6 9	0.0010	ce-M- 11	84.664 3	0.37 3	0.0007
X-ray Kα ₂	42.3089 3	7.3 4	0.0065	ce-NCP-11	86.169 3	0.164 8	0.0002
X-ray Kα ₁	42.9962 3	13.1 7	0.0120	ce-L- 12	96.932 3	0.66 5	0.0014
X-ray Kβ	48.7	5.2 3	0.0054	ce-MNO-12	103.427 3	0.184 12	0.0004
γ 3	123.070 4	40.5 15	0.106	β- 1 max	100 3		
γ 14	188.246 13	0.227 10	0.0009	avg	26.1 8	0.72 8	0.0004
γ 21	247.939 8	6.60 25	0.0349	β- 2 max	128 3		
γ 46	401.30 5	0.209 10	0.0018	avg	33.9 9	2.2 6	0.0016
γ 51	444.50 5	0.504 22	0.0048	β- 3 max	141 3		
γ 55	478.26 5	0.217 10	0.0022	avg	37.4 9	46 5	0.0366
γ 68	557.56 5	0.256 11	0.0030	β- 4 max	159 3		
γ 70	582.00 5	0.84 4	0.0104	avg	42.8 9	26 5	0.0237
γ 71	591.81 4	4.83 19	0.0609	β- 5 max	186 3		
γ 78	625.22 5	0.309 15	0.0041	avg	50.4 9	7.7 6	0.0083
γ 85	676.59 5	0.140 6	0.0020	β- 6 max	246 3		
γ 87	692.41 5	1.69 7	0.0250	avg	68.3 9	18 5	0.0262
γ 89	715.76 5	0.174 9	0.0027	total β-			
γ 91	723.30 4	19.7 8	0.303	avg	45.2 10	101 9	0.0968
γ 93	756.87 5	4.33 18	0.0698	X-ray L	6	8.0 11	0.0010
γ 98	815.55 5	0.465 21	0.0081	γ 5	26.513 21	0.318 24	0.0002
γ 100	845.39 5	0.550 25	0.0099	X-ray Kα ₂	42.3089 3	6.5 4	0.0058
γ 101	850.64 5	0.231 10	0.0042	X-ray Kα ₁	42.9962 3	11.7 6	0.0107
γ 102	873.19 5	11.5 5	0.214	γ 7	45.2972 13	1.29 10	0.0012
γ 104	892.73 5	0.461 21	0.0088	X-ray Kβ	48.7	4.60 23	0.0048
γ 106	904.05 5	0.82 4	0.0159	γ 9	60.0100 18	1.11 7	0.0014
γ 114	996.32 4	10.3 4	0.218	γ 10	86.062 5	0.151 18	0.0003
γ 115	1004.76 4	17.9 7	0.383	γ 11	86.545 3	30.9 19	0.0570
γ 119	1047.40 10	0.142 5	0.0032	γ 12	105.308 3	20.7 14	0.0464
γ 124	1118.50 10	0.103 5	0.0025	7 weak γ's omitted: Eγ(avg) = 69.3; ΣIγ = 0.18%			
γ 126	1128.40 10	0.266 11	0.0064	• ¹⁵⁶ Eu β- Decay (15.19 d 6)		I (min) = 0.10%	
γ 128	1140.90 10	0.217 10	0.0053	Auger-L	4.84	23 3	0.0024
γ 134	1241.60 20	0.131 6	0.0035	Auger-K	34.9	1.0 4	0.0007
γ 135	1246.20 20	0.90 4	0.0238	ce-K- 1	38.7246 25	14.3 22	0.0118
γ 136	1274.45 9	35.5 13	0.964	ce-L- 1	80.5881 25	16.4 25	0.0281
γ 151	1494.4 3	0.65 3	0.0207	ce-M- 1	87.0829 25	3.8 6	0.0071
γ 157	1593.00 20	1.03 12	0.0349	ce-NCP- 1	88.5879 25	1.07 17	0.0020
γ 158	1596.53 15	1.85 12	0.0628	ce-K- 5	148.971 10	0.125 16	0.0004
131 weak γ's omitted: Eγ(avg) = 710.5; ΣIγ = 1.58%				β- 1 max	183 9		
• ¹⁵⁵ Eu β- Decay (4.96 y 1)				avg	50 3	4.6 5	0.0049
ce-L- 1	2.024 20	1.2 4	≈0	β- 2 max	248 9		
Auger-L	4.84	34 3	0.0035	avg	69 3	2.4 3	0.0035
ce-MNO- 1	8.519 20	0.35 12	≈0	β- 3 max	250 9		
ce-K- 9	9.7709 19	8.3 6	0.0017	avg	69 3	0.16 4	0.0002
ce-L- 3	10.37 3	14 4	0.0030	β- 4 max	266 9		
ce-L- 4	12.644 20	0.95 9	0.0003	avg	75 3	11.3 13	0.0181
ce-M- 3	16.87 3	3.2 8	0.0011	β- 5 max	332 9		
ce-L- 5	18.137 21	0.49 4	0.0002	avg	95 3	0.127 18	0.0003
ce-NCP- 3	18.37 3	1.04 24	0.0004	(Continued)			
ce-MNO- 4	19.139 20	0.29 3	0.0001				

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
¹⁵⁶ Eu β ⁻ Decay (15.19 d 6) (Continued)				γ 79 1946.34 13 0.189 25 0.0078 γ 80 1965.95 12 4.2 5 0.176 γ 81 2026.61 10 3.5 4 0.153 γ 82 2032.51 12 0.130 18 0.0056 γ 83 2097.68 10 4.3 5 0.191 γ 85 2116.49 13 0.126 16 0.0057 γ 88 2180.91 11 2.4 3 0.113 γ 89 2186.71 11 4.0 6 0.184 γ 90 2205.38 13 1.0C 12 0.0469 γ 94 2269.90 12 1.12 13 0.0543 47 weak γ 's omitted: E_{γ} (avg) = 1102.7; ΣI_{γ} = 1.59%			
β ⁻ 6 max	426 9			● ¹⁵⁷ Tb EC Decay (150 y 30) I (min) = 0.10%			
β ⁻ 6 avg	126 3	6.0 7	0.0161	Auger-L	4.84	60 5	0.0062
β ⁻ 7 max	487 9			Auger-K	34.9	0.7 4	0.0005
β ⁻ 7 avg	147 4	32 4	0.100	X-ray L	6	14.1 19	0.0018
β ⁻ 8 max	501 9			X-ray Kα ₂	42.3089 3	2.7 14	0.0024
β ⁻ 8 avg	152 4	0.96 12	0.0031	X-ray Kα ₁	42.9962 3	4.8 24	0.0044
β ⁻ 9 max	507 9			X-ray Kβ	48.7	1.9 10	0.0020
β ⁻ 9 avg	154 4	0.44 6	0.0014	● ¹⁵⁷ Dy EC Decay (8.06 h 8) I (min) = 0.10%			
β ⁻ 10 max	1087 9			Feeds ¹⁵⁷ Tb			
β ⁻ 10 avg	374 4	2.4 4	0.0191	Auger-L	5	71 4	0.0076
β ⁻ 11 max	1211 9			ce-K- 1	8.82 7	3.6 23	0.0007
β ⁻ 11 avg	425 4	5.1 10	0.0462	ce-K- 2	31.01 4	1.9 5	0.0012
β ⁻ 12 max	1285 9			Auger-K	36	5.6 20	0.0043
β ⁻ 12 avg	456 4	4.5 7	0.0437	ce-L- 1	52.11 7	0.6 4	0.0007
β ⁻ 13 max	1404 9			ce-NNO- 1	58.85 7	0.17 11	0.0002
β ⁻ 13 avg	505 4	1.45 19	0.0156	ce-L- 2	74.30 4	0.27 7	0.0004
β ⁻ 14 max	2453 9			ce-K- 7	274.16 20	1.08 5	0.0063
β ⁻ 14 avg	966 4	27 9	0.556	ce-L- 7	317.45 20	0.149 7	0.0010
total β ⁻	394 9	99 10	0.828	X-ray L	6.27	17.8 20	0.0024
				X-ray Kα ₂	43.7441 3	23.5 12	0.0219
5 weak β's omitted: E _β (avg) = 44.6; ΣI _β = 0.20%				X-ray Kα ₁	44.4816 3	42.3 20	0.0400
X-ray L	6	5.4 9	0.0007	X-ray Kβ	50.4	16.8 8	0.0180
X-ray Kα ₂	42.3089 3	3.8 6	0.0035	γ 1	60.82 7	0.5 3	0.0006
X-ray Kα ₁	42.9962 3	6.9 11	0.0063	γ 2	83.01 4	0.58 15	0.0010
X-ray Kβ	48.7	2.7 5	0.0028	γ 4	182.20 20	1.65 16	0.0064
γ 1	88.9637 24	9.0 14	0.0171	γ 5	265.34 21	0.18 4	0.0010
γ 5	199.210 10	0.79 10	0.0034	γ 7	326.16 20	94 3	0.652
γ 14	434.40 9	0.22 3	0.0020	21 weak γ 's omitted: E_{γ} (avg) = 593.8; ΣI _γ = 0.47%			
γ 15	472.70 6	0.147 18	0.0015	● ¹⁵⁹ Gd β ⁻ Decay (18.56 h 8) I (min) = 0.10%			
γ 16	490.34 6	0.182 23	0.0019	Auger-L	5	13 4	0.0014
γ 21	599.47 5	2.3 3	0.0295	ce-K- 1	6.004 10	16 6	0.0020
γ 23	646.29 5	7.1 8	0.0976	ce-K- 2	27.51 12	0.12 5	≈0
γ 26	709.86 5	0.92 11	0.0138	Auger-K	36	1.0 5	0.0008
γ 27	723.47 5	6.0 7	0.0928	ce-L- 1	49.292 10	2.7 10	0.0028
γ 30	797.73 6	0.110 18	0.0019	ce-M- 1	56.032 10	0.60 22	0.0007
γ 31	811.77 5	10.4 11	0.180	ce-NCP- 1	57.602 10	0.17 6	0.0002
γ 32	820.36 5	0.160 20	0.0028	(Continued)			
γ 35	841.10 9	0.23 4	0.0040				
γ 36	858.36 12	0.126 19	0.0023				
γ 37	865.98 12	0.16 4	0.0029				
γ 38	867.01 8	1.40 20	0.0259				
γ 43	944.35 7	1.39 17	0.0280				
γ 44	947.46 15	0.31 10	0.0063				
γ 45	960.50 8	1.62 20	0.0332				
γ 46	961.0 6	0.16 4	0.0032				
γ 47	969.83 6	0.39 5	0.0080				
γ 48	1011.87 5	0.34 5	0.0073				
γ 50	1027.39 8	0.120 17	0.0026				
γ 52	1040.44 7	0.53 7	0.0118				
γ 54	1065.14 5	5.2 6	0.119				
γ 55	1075.99 20	0.37 8	0.0086				
γ 56	1079.16 5	4.9 7	0.112				
γ 59	1129.47 7	0.142 19	0.0034				
γ 60	1140.51 5	0.30 4	0.0072				
γ 61	1153.47 7	7.2 11	0.176				
γ 62	1154.09 5	5.3 7	0.130				
γ 63	1156.0 3	0.14 3	0.0035				
γ 66	1169.12 5	0.29 4	0.0073				
γ 69	1230.71 6	8.9 10	0.234				
γ 70	1242.42 5	6.8 8	0.179				
γ 72	1277.43 5	3.2 4	0.0874				
γ 73	1366.41 5	1.76 20	0.0512				
γ 75	1682.11 23	0.30 6	0.0108				
γ 76	1857.42 11	0.25 4	0.0101				
γ 77	1877.03 14	1.73 20	0.0690				
γ 78	1937.68 10	2.14 25	0.0884				

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	
β ⁻ 1 max	611.2 18			
avg	190.4 7	9 3	0.0365	
β ⁻ 2 max	626.5 18			
avg	196.0 7	0.22 8	0.0009	
β ⁻ 3 max	916.7 18			
avg	305.7 7	21 8	0.137	
β ⁻ 4 max	974.7 18			
avg	328.6 8	70 10	0.490	
total β ⁻	avg	310.9 8	100 14	0.664
4 weak β's omitted: Eβ(avg) = 97.6; ΣIβ = 0.08%				
X-ray L	6.27	3.3 11	0.0004	
X-ray Kα ₂	43.7441 3	4.3 16	0.0040	
X-ray Kα ₁	44.4816 3	8 3	0.0073	
X-ray Kβ	50.4	3.1 11	0.0033	
γ 1	58.000 10	1.8 7	0.0022	
γ 5	226.00 4	0.16 6	0.0008	
γ 10	348.17 8	0.17 6	0.0012	
γ 11	363.56 3	8 3	0.0650	
14 weak γ's omitted: Eγ(avg) = 364.0; ΣIγ = 0.21%				

• ¹⁶⁰Tb β⁻ Decay (72.3 d 2)

I (min) = 0.10%

Auger-L	5.16	40.2 22	0.0044	
ce-K- 1	32.9995 21	21.1 14	0.0149	
Auger-K	37.2	1.3 4	0.0011	
ce-L- 1	77.7422 21	31.7 21	0.0524	
ce-M- 1	84.7412 21	7.5 5	0.0136	
ce-NCP- 1	86.3717 21	2.07 14	0.0038	
ce-K- 4	143.246 7	0.82 5	0.0025	
ce-K- 5	161.857 8	0.126 7	0.0004	
ce-L- 4	187.989 7	0.315 17	0.0013	
ce-K- 10	244.784 5	0.401 24	0.0021	
β ⁻ 1 max	299.0 17			
avg	84.6 6	0.218 14	0.0004	
β ⁻ 2 max	434.5 17			
avg	128.6 6	4.40 21	0.0121	
β ⁻ 3 max	447.0 17			
avg	132.8 6	0.93 5	0.0026	
β ⁻ 4 max	474.8 17			
avg	142.3 6	9.4 4	0.0285	
β ⁻ 5 max	545.8 17			
avg	166.9 6	3.31 15	0.0118	
β ⁻ 6 max	568.7 17			
avg	175.0 6	45.6 20	0.170	
β ⁻ 7 max	677.7 17			
avg	214.4 7	0.170 21	0.0008	
β ⁻ 8 max	784.4 17			
avg	254.3 7	5.8 5	0.0314	
β ⁻ 9 max	867.3 17			
avg	286.0 7	24.6 14	0.150	
β ⁻ 10 max	1549.6 17			
avg	565.2 8	0.38 15	0.0046	
β ⁻ 11 max	1746.6 17			
avg	649.9 8	5 4	0.0692	
total β ⁻	avg	226.3 8	100 5	0.481
1 weak β's omitted: Eβ(avg) = 167.6; ΣIβ = 0.01%				

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
X-ray L	6.5	10.7 12	0.0015
X-ray Kα ₂	45.2078 4	6.0 4	0.0058
X-ray Kα ₁	45.9984 4	10.8 7	0.0106
X-ray Kβ	52	4.3 3	0.0048
γ 1	86.7880 20	13.3 8	0.0246
γ 4	197.035 7	4.90 21	0.0206
γ 5	215.646 8	3.71 17	0.0171
γ 10	298.573 5	27.1 14	0.172
γ 11	309.557 18	0.82 4	0.0054
γ 12	337.32 3	0.332 23	0.0024
γ 15	392.494 23	1.28 7	0.0107
γ 18	682.33 5	0.55 4	0.0080
γ 19	765.28 5	1.93 10	0.0314
γ 20	872.03 6	0.179 17	0.0033
γ 21	879.364 18	28.5 11	0.534
γ 22	962.295 20	9.0 6	0.185
γ 23	966.151 20	24.2 11	0.499
γ 24	1002.87 4	0.97 6	0.0207
γ 26	1102.61 4	0.52 4	0.0123
γ 27	1115.12 4	1.50 7	0.0357
γ 28	1177.934 24	14.4 8	0.362
γ 29	1199.89 4	2.36 12	0.0602
γ 31	1271.85 3	7.0 4	0.190
γ 34	1312.16 5	2.85 16	0.0797

14 weak γ's omitted:
Eγ(avg) = 651.4; ΣIγ = 0.51%

• ¹⁶²Gd β⁻ Decay (9.7 m 10)

I (min) = 0.10%

Feeds ¹⁶² Tb			
Auger-L	5	23 5	0.0025
ce-L- 1	30.09 20	28 7	0.0182
ce-M- 1	36.83 20	6.2 14	0.0048
ce-NCP- 1	38.40 20	2.0 5	0.0017
ce-K- 2	350.8 3	0.318 19	0.0024
ce-K- 3	389.6 3	0.30 4	0.0025
β ⁻ 1 max	960 100		
avg	320 40	100	0.682
X-ray L	6.27	5.8 14	0.0008
γ 1	38.80 20	6.5 15	0.0053
X-ray Kα ₂	43.7441 3	0.164 12	0.0002
X-ray Kα ₁	44.4816 3	0.294 20	0.0003
X-ray Kβ	50.4	0.117 8	0.0001
γ 2	402.8 3	46.2 24	0.396
γ 3	441.6 3	53 6	0.500

• ¹⁶²Tb β⁻ Decay (7.76 m 10)

I (min) = 0.10%

Auger-L	5.16	35.5 21	0.0039
ce-K- 1	26.8715 21	15.7 12	0.0090
Auger-K	37.2	1.1 4	0.0009
ce-L- 1	71.6142 21	28.5 22	0.0435
ce-M- 1	78.6132 21	6.8 5	0.0114
ce-NCP- 1	80.2437 21	1.85 14	0.0032
ce-K- 2	131.216 3	0.54 4	0.0015
ce-K- 3	131.500 5	0.72 6	0.0020
ce-L- 2	175.959 3	0.221 16	0.0008
ce-L- 3	176.243 5	0.104 8	0.0004
ce-K- 4	206.281 6	1.65 12	0.0072
ce-L- 4	251.024 6	0.234 18	0.0013
ce-K- 9	753.74 8	0.169 10	0.0027
ce-K- 13	834.41 8	0.124 8	0.0022

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
¹⁶² Tb β^- Decay (7.76 m 10) (Continued)				γ -ray L 6.72 2.1 4 0.0003 X-ray $K\alpha_2$ 46.6997 4 2.6 4 0.0026 X-ray $K\alpha_1$ 47.5467 4 4.6 6 0.0047 X-ray $K\beta$ 53.9 1.86 25 0.0021 γ 7 94.700 3 3.6 5 0.0072 γ 27 279.763 12 0.50 7 0.0030 γ 29 361.680 20 0.84 11 0.0065 γ 39 545.834 20 0.162 20 0.0019 γ 41 565.718 20 0.128 16 0.0015 γ 46 633.415 20 0.57 7 0.0077 γ 50 715.328 20 0.53 7 0.0081 55 weak γ 's omitted: $E\gamma$ (avg) = 641.4; $\Sigma I\gamma$ = 0.67%			
β^- 1 max	750 80			\bullet ¹⁶⁶ Dy β^- Decay (81.6 h 2) I (min) = 0.10% Feeds ¹⁶⁶ Ho (26.80 h)			
avg	240 30	0.136 8	0.0007	Auger-L	5.33	63 9	0.0071
β^- 2 max	780 80			ce-L- 1	18.833 5	14 4	0.0055
avg	250 30	0.164 10	0.0009	ce-M- 1	26.099 5	3.0 8	0.0017
β^- 3 max	840 80			ce-K- 3	26.8523 21	50 12	0.0288
avg	270 40	0.315 20	0.0018	ce-NCP- 1	27.791 5	1.0 3	0.0006
β^- 4 max	1250 80			Auger-K	38.4	2.9 13	0.0024
avg	440 40	0.133 14	0.0012	ce-L- 2	44.8450 8	16.9 19	0.0161
β^- 5 max	1380 80			ce-M- 2	52.1109 10	4.1 5	0.0045
avg	490 40	96 6	1.00	ce-NCP- 2	53.8035 11	1.11 12	0.0013
β^- 6 max	2530 80			ce-L- 3	73.0758 21	7.5 17	0.0117
avg	980 40	0.4	0.0083	ce-M- 3	80.3417 21	1.7 4	0.0028
total β^-				ce-NCP- 3	82.0343 22	0.48 11	0.0008
avg	490 40	97 6	1.02	β^- 1 max	58 5		
8 weak β 's omitted: $E\beta$ (avg) = 235.6; $\Sigma I\beta$ = 0.22%				avg	14.9 14	1.09 12	0.0003
X-ray L	6.5	9.4 11	0.0013	β^- 2 max	402 5		
X-ray $K\alpha_2$	45.2078 4	5.1 4	0.0049	avg	117.5 17	92 7	0.230
X-ray $K\alpha_1$	45.9984 4	9.1 6	0.0089	β^- 3 max	484 5		
X-ray $K\beta$	52	3.64 24	0.0040	avg	145.3 18	7 7	0.0217
γ 1	80.6600 20	8.5 6	0.0146	total β^-			
γ 2	185.005 3	2.65 17	0.0105	avg	118.3 18	100 10	0.252
γ 3	185.289 5	14.2 11	0.0560	1 weak β 's omitted: $E\beta$ (avg) = 29.1; $\Sigma I\beta$ = 0.01%			
γ 4	260.070 6	79 6	0.436	X-ray L	6.72	18 3	0.0025
γ 5	543.2 6	0.106 13	0.0012	γ 1	28.227 5	1.0 3	0.0006
γ 6	622.52 10	0.88 5	0.0116	X-ray $K\alpha_2$	46.6997 4	14 3	0.0135
γ 7	697.35 10	2.54 13	0.0377	X-ray $K\alpha_1$	47.5467 4	24 6	0.0245
γ 9	807.53 8	42.1 22	0.724	X-ray $K\beta$	53.9	9.8 22	0.0112
γ 12	882.32 8	13.2 7	0.248	γ 2	54.2392 7	0.70 8	0.0008
γ 13	888.20 8	38.1 20	0.720	γ 3	82.4700 20	13 3	0.0227
γ 18	1067.55 10	0.55 3	0.0124	γ 6	371.75 3	0.49 6	0.0039
γ 28	1287.6 5	0.152 18	0.0042	γ 7	425.99 3	0.54 7	0.0049
γ 34	1610.7 3	0.140 8	0.0048	2 weak γ 's omitted: $E\gamma$ (avg) = 333.9; $\Sigma I\gamma$ = 0.07%			
34 weak γ 's omitted: $E\gamma$ (avg) = 1453.3; $\Sigma I\gamma$ = 1.14%				\bullet ¹⁶⁶ Ho β^- Decay (26.80 h 2) I (min) = 0.10%			
\bullet ¹⁶⁵ Dy β^- Decay (2.334 h 6) I (min) = 0.10%				Auger-L	5.5	25.7 16	0.0030
ce-K- 2	2.246 5	0.15 3	\approx 0	ce-K- 1	23.104 5	10.6 8	0.0052
Auger-L	5.33	7.5 9	0.0008	Auger-K	39.7	0.58 23	0.0005
Auger-K	38.4	0.55 22	0.0004	ce-L- 1	70.838 5	24.5 18	0.0370
ce-K- 7	39.082 3	9.3 13	0.0077	ce-M- 1	78.382 5	5.9 5	0.0099
ce-L- 7	85.306 3	1.50 20	0.0027	ce-NOP- 1	80.140 5	1.62 12	0.0028
ce-MNO- 7	92.572 3	0.43 6	0.0008	(Continued)			
ce-K- 29	306.062 20	0.19 3	0.0013				
β^- 1 max	205 4						
avg	56.1 12	0.152 19	0.0002				
β^- 2 max	290 4						
avg	81.7 13	1.67 21	0.0029				
β^- 3 max	1190 4						
avg	414.1 16	14.6 19	0.129				
β^- 4 max	1285 4						
avg	453.1 17	83.4 21	0.805				
total β^-							
avg	440.2 18	100 3	0.937				
10 weak β 's omitted: $E\beta$ (avg) = 165.4; $\Sigma I\beta$ = 0.15%							

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)			
<p>• ¹⁶⁹Yb EC Decay (31.97 d 5) I (min) = 0.10%</p>				<p>• ¹⁷¹Er β^- Decay (7.52 h 3) I (min) = 0.10%</p> <p>Feeds ¹⁷¹Tm</p>						
ce-K- 3	3.729 7	39.9 18	0.0032	β^- 1 max	883.6 9					
Auger-L	5.67	160 9	0.0193	avg	290.4 4	24.0 10	0.148			
ce-MMO- 1	6.094 8	95 3	0.0123	β^- 2 max	967.9 9					
ce-L- 2	10.63 5	9.3 5	0.0021	avg	323.1 4	76.0 10	0.523			
ce-M- 2	18.44 5	2.07 11	0.0008	total β^-	315.3 4	100.0 15	0.671			
ce-NOP- 2	20.28 5	0.68 4	0.0003	X-ray L	7.42	4.0 6	0.0006			
ce-K- 4	34.223 7	8.37 25	0.0061	X-ray K α_2	51.3540 5	1.27 8	0.0014			
Auger-K	40.9	10 4	0.0088	X-ray K α_1	52.3889 5	2.25 14	0.0025			
ce-K- 5	50.387 7	34.9 9	0.0375	X-ray K β	59.4	0.93 6	0.0012			
ce-L- 3	53.003 7	7.1 4	0.0081	γ 1	84.253 7	3.26 16	0.0058			
ce-K- 7	58.797 7	1.33 6	0.0017	<p>• ¹⁷¹Er β^- Decay (7.52 h 3) I (min) = 0.10%</p> <p>Feeds ¹⁷¹Tm</p>						
ce-M- 3	60.812 7	1.58 7	0.0021	ce-L- 2	2.269 8	6.2 9	0.0003			
ce-NOP- 3	62.647 7	0.429 19	0.0006	ce-MMO- 1	2.718 6	91 5	0.0052			
ce-K- 8	71.130 7	6.0 3	0.0092	Auger-L	5.67	46 3	0.0055			
ce-L- 4	83.497 7	1.45 5	0.0026	ce-MMO- 2	10.078 8	1.8 3	0.0004			
ce-MMO- 4	91.306 7	0.420 13	0.0008	ce-K- 3	26.21 10	0.242 18	0.0001			
ce-L- 5	99.661 7	5.64 15	0.0120	Auger-K	40.9	2.5 10	0.0022			
ce-M- 5	107.470 7	1.26 4	0.0029	ce-K- 4	52.231 4	39.2 23	0.0436			
ce-L- 7	108.071 7	1.37 6	0.0032	ce-K- 5	57.266 6	1.69 9	0.0021			
ce-NCP- 5	109.305 7	0.368 10	0.0009	ce-K- 6	64.627 4	5.7 3	0.0078			
ce-MMO- 7	115.880 7	0.425 11	0.0010	ce-L- 4	101.505 4	6.4 4	0.0137			
ce-K- 10	117.820 7	10.3 3	0.0258	ce-L- 5	106.540 6	1.78 9	0.0040			
ce-L- 8	120.404 7	5.2 3	0.0132	ce-M- 4	109.314 4	1.42 7	0.0033			
ce-M- 8	128.213 7	1.25 7	0.0034	ce-NCP- 4	111.149 4	0.414 24	0.0010			
ce-NCP- 8	130.048 7	0.348 18	0.0010	ce-L- 6	113.901 4	5.3 3	0.0129			
ce-K- 12	138.563 7	12.7 5	0.0376	ce-M- 5	114.349 6	0.430 22	0.0010			
ce-L- 10	167.094 7	1.84 5	0.0065	ce-NOP- 5	116.184 6	0.121 6	0.0003			
ce-M- 10	174.903 7	0.416 11	0.0015	ce-M- 6	121.710 4	1.29 7	0.0033			
ce-NCP-10	176.738 7	0.119 4	0.0004	ce-NCP- 6	123.545 4	0.360 20	0.0009			
ce-L- 12	187.837 7	2.10 7	0.0084	ce-K- 14	236.511 14	0.486 20	0.0024			
ce-M- 12	195.646 7	0.468 16	0.0019	ce-K- 15	248.901 18	0.99 4	0.0052			
ce-NCP-12	197.481 7	0.134 5	0.0006	ce-L- 15	298.175 18	0.144 6	0.0009			
ce-K- 19	248.340 7	0.524 20	0.0028	β^- 1 max	205.4 12					
ce-L- 19	297.614 7	0.151 6	0.0010	avg	56.0 4	0.333 15	0.0004			
X-ray L	7.18	51 7	0.0077	β^- 2 max	491.8 12					
γ 1	8.401 8	0.330 15	=0	avg	147.6 5	0.50 3	0.0016			
γ 2	20.75 5	0.213 11	=0	β^- 3 max	577.4 12					
X-ray K α_2	49.7726 4	52.8 18	0.0560	avg	177.4 5	2.18 8	0.0082			
X-ray K α_1	50.7416 4	93 3	0.101	β^- 4 max	814.5 12					
X-ray K β	57.5	38.3 14	0.0469	avg	264.5 5	0.188 17	0.0011			
γ 3	63.119 7	43.7 15	0.0588	β^- 5 max	1065.5 12					
γ 4	93.613 7	2.66 8	0.0053	avg	362.2 5	94 4	0.725			
γ 5	109.777 7	17.4 5	0.0406	β^- 6 max	1485.4 12					
γ 7	118.187 7	1.88 5	0.0047	avg	534.7 5	2.30 20	0.0262			
γ 8	130.520 7	11.1 9	0.0307	total β^-	359.5 6	100 4	0.763			
γ 10	177.210 7	21.4 6	0.0809	γ 4	111.621 4	20.5 10	0.0487			
γ 12	197.953 7	34.9 12	0.147	γ 5	116.656 6	2.30 10	0.0057			
γ 14	240.30 10	0.122 7	0.0006	γ 6	124.017 4	9.1 4	0.0240			
γ 15	261.072 7	1.77 10	0.0098	γ 10	210.60 3	0.64 3	0.0029			
γ 19	307.730 7	10.81 25	0.0708	γ 11	237.14 4	0.302 14	0.0015			
				γ 12	277.43 5	0.58 3	0.0034			
				γ 14	295.901 14	28.9 12	0.182			
<p>32 weak γ's omitted: Eγ(avg) = 344.1; $\Sigma I\gamma$ = 0.18%</p>				<p>7 weak β's omitted: Eβ(avg) = 182.0; $\Sigma I\beta$ = 0.18%</p>						
<p>• ¹⁷⁰Tm β^- Decay (128.6 d 3) I (min) = 0.10%</p> <p>%β^- Decay = 99.854 2 %EC Decay = 0.146 2</p>				<p>X-ray L</p>				7.18	14.4 20	0.0022
Auger-L	5.84	12.1 8	0.0015	X-ray K α_2	49.7726 4	13.1 7	0.0139			
ce-K- 1	22.921 7	4.7 3	0.0023	X-ray K α_1	50.7416 4	23.2 13	0.0250			
Auger-K	42.2	0.23 10	0.0002	X-ray K β	57.5	9.5 6	0.0116			
ce-L- 1	73.767 7	12.2 7	0.0192	γ 4	111.621 4	20.5 10	0.0487			
ce-M- 1	81.855 7	3.01 18	0.0052	γ 5	116.656 6	2.30 10	0.0057			
ce-NCP- 1	83.766 7	0.83 5	0.0015	γ 6	124.017 4	9.1 4	0.0240			

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Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
γ 15	308.291 18	64 3	0.423	● ¹⁷⁷ Lu β ⁻ Decay (6.71 d 1) I (min) = 0.10%			
γ 17	371.96 9	0.257 13	0.0020	Auger-L	6.18	8.8 6	0.0012
γ 33	670.70 20	0.252 9	0.0036	ce-K- 1	6.2952 21	0.116 8	≈0
γ 35	676.1 3	0.285 11	0.0041	Auger-K	44.8	0.27 12	0.0003
γ 41	784.10 20	0.240 9	0.0040	ce-K- 2	47.601 3	5.2 4	0.0053
γ 42	796.60 20	0.640 24	0.0109	ce-L- 2	101.681 3	7.0 5	0.0152
γ 47	907.7 4	0.635 23	0.0123	ce-M- 2	110.351 3	1.74 11	0.0041
50 weak γ's omitted: E _γ (avg) = 535.2; ΣI _γ = 1.09%				ce-NCP- 2	112.414 3	0.50 4	0.0012
● ¹⁷¹ Tm β ⁻ Decay (1.92 y 1) I (min) = 0.10%				ce-K- 4	143.010 7	0.59 7	0.0018
ce-K- 1	5.386 7	1.076 7	0.0001	ce-L- 4	197.090 7	0.100 15	0.0004
Auger-L	5.84	1.23 6	0.0002	β- 1 max	175.8 10		
ce-L- 1	56.232 7	0.747 10	0.0009	avg	47.3 3	12.3 5	0.0124
ce-MNO- 1	64.320 7	0.230 1	0.0003	β- 2 max	384.1 10		
β- 1 max	30.0 10			avg	111.3 4	9.0 12	0.0213
avg	7.6 3	2.2	0.0004	β- 3 max	497.1 10		
β- 2 max	96.7 10			avg	148.9 4	78.7 14	0.250
avg	25.2 3	97.8	0.0525	total β-			
total β-				avg	133.0 5	100.0 20	0.283
avg	24.8 4	100	0.0529	1 weak β's omitted: E _β (avg) = 78.2; ΣI _β = 0.05%			
X-ray L	7.42	0.41 5	≈0	γ-ray L	7.9	3.3 4	0.0005
X-ray K _{α2}	51.3540 5	0.293 8	0.0003	X-ray K _{α2}	54.6114 8	1.63 11	0.0019
X-ray K _{α1}	52.3889 5	0.516 13	0.0006	γ-ray K _{α1}	55.7902 8	2.85 18	0.0034
X-ray K _β	59.4	0.213 6	0.0003	γ-ray K _β	63.2	1.20 8	0.0016
γ 1	66.718 7	0.158	0.0002	γ 1	71.6460 20	0.161 9	0.0002
● ¹⁷⁵ Yb β ⁻ Decay (4.19 d 1) I (min) = 0.10%				γ 2	112.952 3	6.4 4	0.0153
Auger-L	6	3.1 4	0.0004	γ 4	208.361 7	11.0 4	0.0488
Auger-K	43.5	0.19 9	0.0002	γ 5	249.686 25	0.212 14	0.0011
ce-K- 1	50.489 4	3.6 5	0.0039	γ 6	321.313 9	0.219 14	0.0015
ce-K- 2	74.342 6	0.116 21	0.0002	1 weak γ's omitted: E _γ (avg) = 136.7; ΣI _γ = 0.05%			
ce-L- 1	102.933 4	0.86 11	0.0019	● ¹⁷⁷ Lu IT Decay (160.10 d 18) I (min) = 0.10%			
ce-MNO- 1	111.312 4	0.26 4	0.0006	%IT Decay = 21.5 12			
ce-K- 6	333.008 20	0.24 4	0.0017	Feeds ¹⁷⁷ Lu (6.71 d)			
β- 1 max	71.6 15			See also ¹⁷⁷ Lu β ⁻ Decay (160.10 d)			
avg	18.4 4	10.3 13	0.0040	Auger-L	6	25.1 18	0.0032
β- 2 max	354.1 15			Auger-K	43.5	0.9 4	0.0008
avg	101.7 5	3.3 5	0.0071	ce-K- 1	52.52 4	1.41 16	0.0016
β- 3 max	467.9 15			ce-K- 2	58.306 3	9.0 10	0.0112
avg	139.2 5	86.5 17	0.256	ce-K- 3	83.851 5	3.2 4	0.0058
total β-				ce-L- 1	104.96 4	14.4 16	0.0323
avg	125.5 7	100.1 22	0.268	ce-K- 4	108.549 6	2.8 5	0.0065
γ-ray L	7.66	1.08 17	0.0002	ce-L- 2	110.750 3	2.2 3	0.0053
X-ray K _{α2}	52.9650 5	1.09 14	0.0012	ce-M- 1	113.34 4	3.8 5	0.0091
X-ray K _{α1}	54.0698 5	1.91 24	0.0022	ce-NCP- 1	115.32 4	1.07 12	0.0026
X-ray K _β	61.3	0.79 10	0.0010	ce-K- 2	119.129 3	0.53 7	0.0013
γ 1	113.803 4	1.88 25	0.0046	ce-NCP- 2	121.114 3	0.146 18	0.0004
γ 2	137.656 6	0.104 1 ^a	0.0003	ce-K- 5	132.254 7	0.37 6	0.0010
γ 3	144.861 5	0.34 6	0.0010	ce-L- 3	136.295 5	0.71 9	0.0021
γ 5	282.517 14	3.0 4	0.0182	ce-MNO- 3	144.674 5	0.208 24	0.0006
γ 6	396.322 20	6.5 8	0.0549	ce-K- 6	154.779 7	0.91 14	0.0030
1 weak γ's omitted: E _γ (avg) = 251.5; ΣI _γ = 0.09%				ce-L- 4	160.993 6	0.58 7	0.0020
				ce-MNO- 4	169.372 6	0.172 22	0.0006
				ce-K- 7	205.479 8	0.248 25	0.0011
				ce-L- 6	207.223 7	0.164 24	0.0007
				ce-K- 8	255.708 8	0.47 5	0.0026
				ce-L- 8	308.152 8	0.144 15	0.0009
				ce-K- 10	350.340 10	0.38 4	0.0028

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Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
¹⁷⁷Lu IT Decay (160.10 d 18) (Continued)							
γ-ray L	7.66	8.8 12	0.0014	ce-L- 21	222.575 7	0.277 20	0.0013
γ-ray Kα ₂	52.9650 5	5.1 4	0.0058	ce-M- 20	225.84 6	0.49 4	0.0023
γ-ray Kα ₁	54.0698 5	9.0 6	0.0104	ce-NCP-20	227.90 6	0.138 10	0.0007
γ-ray Kβ	61.3	3.8 3	0.0049	ce-K- 2A	231.10 8	0.31 3	0.0015
γ 1	115.83 4	0.68 8	0.0017	ce-L- 23	238.42 3	0.232 19	0.0012
γ 2	121.620 3	5.9 6	0.0152	ce-K- 33	262.335 9	0.76 6	0.0043
γ 3	147.165 5	3.6 4	0.0112	ce-L- 24	270.516 8	0.334 24	0.0019
γ 4	171.863 6	4.9 5	0.0179	ce-MNO-24	279.186 8	0.103 7	0.0006
γ 5	195.568 7	0.86 11	0.0036	ce-L- 28	285.18 8	0.106 10	0.0006
γ 6	218.093 7	3.0 5	0.0139	ce-K- 35	313.155 9	0.84 7	0.0056
γ 7	268.793 8	3.4 4	0.0194	ce-L- 33	316.415 9	0.238 17	0.0016
γ 8	319.022 8	10.3 10	0.0699	ce-K- 37	353.179 11	0.47 4	0.0035
γ 9	367.428 10	3.0 3	0.0232	ce-L- 35	367.235 9	0.230 17	0.0018
γ 10	413.654 10	16.4 16	0.144	ce-L- 37	407.259 11	0.118 9	0.0010
				β- 1 max	151.8 10		
				avg	40.5 3	78.5 12	0.0677
				γ-ray L	7.9	46 6	0.0078
				X-ray Kα ₂	54.6114 8	33.4 12	0.0388
				γ 2	55.150 20	1.20 25	0.0014
				γ-ray Kα ₁	55.7902 8	58.4 19	0.0695
				X-ray Kβ	63.2	24.5 9	0.0330
				γ 4	71.6460 20	0.89 10	0.0014
				γ 6	105.344 5	12.0 6	0.0269
				γ 7	112.952 3	21.5 15	0.0517
				γ 8	117.01 4	0.24 3	0.0006
				γ 9	128.495 5	15.3 11	0.0417
				γ 10	136.730 6	1.37 15	0.0040
				γ 11	145.59 6	0.90 11	0.0028
				γ 12	153.290 4	18.0 12	0.0588
				γ 13	159.92 8	0.60 8	0.0020
				γ 14	174.403 6	12.6 9	0.0468
				γ 15	177.05 8	3.5 3	0.0131
				γ 17	204.094 7	14.3 10	0.0621
				γ 18	208.361 7	61 4	0.272
				γ 19	214.431 7	6.6 5	0.0302
				γ 20	228.44 6	37.2 24	0.181
				γ 21	233.846 7	5.6 4	0.0281
				γ 23	249.686 25	6.1 5	0.0326
				γ 24	281.787 8	14.1 9	0.0843
				γ 25	283.42 13	0.52 8	0.0031
				γ 26	291.42 10	1.01 11	0.0063
				γ 27	292.51 10	0.80 10	0.0050
				γ 28	296.45 8	5.4 5	0.0341
				γ 29	299.03 10	1.72 15	0.0109
				γ 30	305.52 8	1.74 17	0.0113
				γ 31	313.69 8	1.38 12	0.0092
				γ 32	321.313 9	1.39 13	0.0095
				γ 33	327.686 9	17.5 12	0.122
				γ 34	341.64 8	1.79 18	0.0130
				γ 35	378.506 9	27.9 19	0.225
				γ 36	385.02 8	2.94 24	0.0241
				γ 37	418.530 11	20.1 14	0.179
				γ 38	426.29 10	0.41 6	0.0037
				γ 39	465.96 12	2.33 20	0.0231
				5 weak γ's omitted: E _γ (avg) = 167.1; ΣI _γ = 0.19%			
¹⁷⁷Lu β⁻ Decay (160.10 d 18) I (min) = 0.10%							
%β ⁻ Decay = 78.5 12							
See also ¹⁷⁷ Lu IT Decay (160.10 d)							
ce-L- 1	2.8893 4	23.4 14	0.0014				
Auger-L	6.18	125 7	0.0164				
ce-K- 4	6.2952 21	0.64 7	≈0				
ce-MNO- 1	11.5591 4	7.5 5	0.0018				
ce-K- 6	39.993 5	32.9 16	0.0280				
ce-L- 2	43.879 20	0.31 7	0.0003				
Auger-K	44.8	5.6 24	0.0054				
ce-K- 7	47.601 3	17.7 12	0.0179				
ce-L- 4	60.3753 21	0.121 15	0.0002				
ce-K- 9	63.144 5	23.6 16	0.0318				
ce-K- 10	71.379 6	0.77 13	0.0012				
ce-K- 11	80.24 6	0.101 13	0.0002				
ce-K- 12	87.939 4	16.8 12	0.0316				
ce-L- 6	94.073 5	6.8 4	0.0137				
ce-K- 13	94.57 8	0.24 13	0.0005				
ce-L- 7	101.681 3	23.6 17	0.0512				
ce-M- 6	102.743 5	1.59 8	0.0035				
ce-NOP- 6	104.806 5	0.468 23	0.0010				
ce-K- 14	109.052 6	8.3 6	0.0192				
ce-M- 7	110.351 3	5.8 4	0.0137				
ce-K- 15	111.70 8	0.235 20	0.0006				
ce-NCP- 7	112.414 3	1.68 11	0.0040				
ce-L- 9	117.224 5	4.6 3	0.0114				
ce-L- 10	125.459 6	0.62 8	0.0017				
ce-M- 9	125.894 5	1.05 8	0.0028				
ce-NOP- 9	127.957 5	0.310 21	0.0008				
ce-MNO- 10	134.129 6	0.196 23	0.0006				
ce-K- 17	138.743 7	6.0 5	0.0177				
ce-L- 12	142.019 4	3.12 22	0.0094				
ce-K- 18	143.010 7	3.3 5	0.0101				
ce-L- 13	148.65 8	0.13 3	0.0004				
ce-K- 19	149.080 7	2.49 19	0.0079				
ce-M- 12	150.689 4	0.72 5	0.0023				
ce-NCP-12	152.752 4	0.211 15	0.0007				
ce-K- 20	163.09 6	4.4 3	0.0151				
ce-L- 14	163.132 6	1.46 10	0.0051				
ce-K- 21	168.495 7	0.62 5	0.0022				
ce-MNO-14	171.802 6	0.43 3	0.0016				
ce-K- 23	184.34 3	0.56 5	0.0022				
ce-L- 17	192.823 7	1.03 8	0.0042				
ce-L- 18	197.090 7	0.56 9	0.0023				
ce-MNO-17	201.493 7	0.304 22	0.0013				
ce-L- 19	203.160 7	0.41 3	0.0018				
ce-MNO-18	205.760 7	0.165 22	0.0007				
ce-MNO-19	211.830 7	0.120 9	0.0005				
ce-K- 24	216.436 8	0.92 7	0.0042				
ce-L- 20	217.17 6	2.01 15	0.0093				
				¹⁸¹Hf β⁻ Decay (42.39 d 8) I (min) = 0.10%			
				ce-MNO- 1	1.19 10	5 3	0.0001
				ce-MNO- 2	3.50 3	0.47 11	≈0
				Auger-L	6.35	37.6 21	0.0051
				Auger-K	46.2	1.4 6	0.0014
				ce-K- 3	65.604 20	20.7 10	0.0289
				ce-K- 4	68.834 20	7.4 5	0.0109
				ce-K- 5	69.44 4	1.06 22	0.0016

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
ce-L- 3	121.338 20	24.3 12	0.0627	ce-NCP- 4	67.154 7	0.436 25	0.0006
ce-L- 4	124.568 20	1.43 9	0.0038	ce-L- 5	72.580 7	4.08 14	0.0063
ce-L- 5	125.18 4	0.20 5	0.0005	ce-T- 5	81.860 7	0.96 4	0.0017
ce-M- 3	130.312 20	6.0 3	0.0168	ce-K- 10	82.903 7	0.76 4	0.0013
ce-NCP- 3	132.454 20	1.75 9	0.0049	ce-NCP- 5	84.085 7	0.287 10	0.0005
ce-MNO- 4	133.542 20	0.431 25	0.0012	ce-K- 11	86.858 7	0.268 13	0.0005
ce-K- 6	278.43 20	0.66 3	0.0039	ce-L- 6	88.004 7	32.5 16	0.0609
ce-L- 6	334.17 20	0.206 10	0.0015	ce-M- 6	97.284 7	8.2 4	0.0169
ce-K- 8	414.61 10	1.508 16	0.0133	ce-NCP- 6	99.509 7	2.39 12	0.0051
ce-L- 8	470.35 10	0.344 3	0.0034	ce-L- 8	101.569 7	1.03 5	0.0022
ce-MNO- 8	479.32 10	0.104	0.0011	ce-K- 12	109.865 7	1.66 15	0.0039
				ce-MNO- 8	110.849 7	0.314 14	0.0007
g- 1 max	403 4			ce-K- 13	128.823 7	0.262 14	0.0007
avg	117.5 13	7 3	0.0175	ce-L- 10	140.328 7	0.126 9	0.0004
g- 2 max	407 4			ce-K- 14	152.578 7	0.304 12	0.0010
avg	118.7 13	93 3	0.235	ce-K- 15	159.791 8	0.430 21	0.0015
total β^-				ce-L- 12	167.290 7	0.459 22	0.0016
avg	118.6 13	100 5	0.253	ce-MNO-12	176.570 7	0.142 7	0.0005
				ce-L- 13	186.248 7	0.167 9	0.0007
X-ray L	8.15	14.6 17	0.0025	ce-K- 16	194.544 8	0.293 15	0.0012
X-ray $K\alpha_2$	56.2770 10	8.6 4	0.0103	ce-L- 15	217.216 8	0.223 11	0.0010
X-ray $K\alpha_1$	57.5320 10	15.0 7	0.0184	ce-L- 16	251.969 8	0.127 7	0.0007
X-ray KB	65.2	6.3 3	0.0088	ce-K- 25	1051.75 3	0.104 5	0.0023
γ 3	133.020 20	41.7 16	0.118				
γ 4	136.250 20	5.2 3	0.0152	g- 1 max	258 3		
γ 5	136.86 4	0.76 14	0.0022	avg	71.6 9	28.9 10	0.0441
γ 6	345.85 20	17.2 6	0.126	g- 2 max	301 3		
γ 7	476.00 20	0.42 9	0.0042	avg	84.8 9	0.128 7	0.0002
γ 8	482.03 10	82.8 8	0.851	g- 3 max	324 3		
γ 9	615.5 5	0.143 6	0.0019	avg	91.9 10	2.4 7	0.0047
				g- 4 max	368 3		
				avg	106.0 10	0.696 24	0.0016
				g- 5 max	437 3		
				avg	128.6 10	21.0 9	0.0575
				g- 6 max	480 3		
				avg	142.9 10	2.3 3	0.0070
				g- 7 max	522 3		
				avg	157.2 10	40.8 25	0.137
				g- 8 max	590 3		
				avg	180.7 11	3.2 22	0.0123
				total β^-			
				avg	124.7 11	99 4	0.264
				X-ray L	8.4	25 3	0.0045
				γ 1	31.737 7	0.80 8	0.0005
				γ 2	42.714 7	0.245 16	0.0002
				X-ray $K\alpha_2$	57.9817 5	10.4 4	0.0129
				X-ray $K\alpha_1$	59.31820 1	18.1 6	0.0229
				γ 3	65.721 7	2.80 16	0.0039
				X-ray KB	67.2	7.7 3	0.0110
				γ 4	67.749 7	42.3 21	0.0611
				γ 5	84.680 7	2.74 9	0.0049
				γ 6	100.104 7	14.1 5	0.0300
				γ 8	113.669 7	1.90 8	0.0046
				γ 9	116.417 7	0.441 18	0.0011
				γ 10	152.428 7	7.17 24	0.0233
				γ 11	156.383 7	2.72 10	0.0091
				γ 12	179.390 7	3.18 14	0.0122
				γ 13	198.348 7	1.51 7	0.0064
				γ 14	222.103 7	7.6 3	0.0358
				γ 15	229.316 8	3.64 14	0.0178
				γ 16	264.069 8	3.64 14	0.0205
				γ 19	927.99 7	0.623 20	0.0123
				γ 20	959.74 7	0.350 12	0.0072
				γ 21	1001.68 7	2.09 6	0.0447
				γ 23	1044.43 9	0.237 8	0.0053
				γ 24	1113.38 10	0.441 18	0.0105
				γ 25	1121.28 3	35.0 9	0.836
				γ 27	1157.30 20	0.63 14	0.0155
				γ 28	1158.10 20	0.35 11	0.0086
				γ 30	1189.05 4	16.3 5	0.413

3 weak γ 's omitted:
 $E_{\gamma}(\text{avg}) = 522.6$; $\Sigma I_{\gamma} = 0.03\%$

• ¹⁸¹W EC Decay (120.95 d 2) I (min) = 0.10%

ce-MNO- 1	3.50 3	80 30	0.0063
Auger-L	6.35	57 4	0.0078
Auger-K	46.2	3.0 13	0.0029
γ 1	6.21 3	0.99 20	0.0001
X-ray L	8.15	22 3	0.0039
X-ray $K\alpha_2$	56.2770 10	18.7 6	0.0224
X-ray $K\alpha_1$	57.5320 10	32.6 9	0.0400
X-ray KB	65.2	13.8 5	0.0191

2 weak γ 's omitted:
 $E_{\gamma}(\text{avg}) = 147.7$; $\Sigma I_{\gamma} = 0.14\%$

• ¹⁸²Ta β^- Decay (114.74 d 8) I (min) = 0.10%

Auger-L	6.53	59 3	0.0082
ce-K- 5	15.155 7	16.3 6	0.0053
ce-L- 1	19.637 7	1.03 10	0.0004
ce-MNO- 1	28.917 7	0.31 3	0.0002
ce-K- 6	30.579 7	12.6 6	0.0082
ce-L- 2	30.614 7	0.138 10	*0
ce-K- 8	44.144 7	4.88 21	0.0046
Auger-K	45.7	1.6 8	0.0016
ce-L- 3	53.621 7	6.5 4	0.0074
ce-L- 4	55.649 7	6.7 4	0.0079
ce-M- 3	62.901 7	1.48 9	0.0020
ce-T- 4	64.929 7	1.52 9	0.0021
ce-NOP- 3	65.126 7	0.45 3	0.0006

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
¹⁸²Ta β^- Decay (114.74 d 8) (Continued)							
γ 31	1221.418 25	27.1 8	0.704	γ 16	264.069 8	0.26 5	0.0015
γ 32	1223.9	0.21 4	0.0055	γ 17	470.26 20	1.98 22	0.0198
γ 33	1230.97 3	11.5 4	0.302	γ 18	536.04 20	0.21 4	0.0024
γ 34	1257.47 5	1.49 5	0.0400	γ 19	555.0 10	0.11 4	0.0013
γ 35	1273.75 6	0.651 20	0.0177	γ 20	598.56 20	0.40 5	0.0051
γ 36	1289.17 7	1.35 4	0.0372	γ 21	649.73 20	0.35 7	0.0049
γ 37	1342.72 6	0.252 8	0.0072	γ 22	734.53 20	0.38 5	0.0060
γ 38	1373.80 7	0.220 7	0.0064	γ 23	787.11 20	0.26 4	0.0043
9 weak γ 's omitted: $E_{\gamma}(\text{avg}) = 943.0$; $\Sigma I_{\gamma} = 0.40\%$				γ 24	800.0 10	0.15 4	0.0026
				γ 25	810.24 20	0.38 7	0.0066
				γ 26	835.98 20	0.48 7	0.0085
				γ 28	894.85 20	2.11 22	0.0401
				γ 29	900.80 20	0.35 7	0.0067
				γ 30	927.99 7	0.51 7	0.0101
				γ 31	959.74 7	0.38 7	0.0078
				γ 32	1001.68 7	0.220 17	0.0047
				γ 33	1044.43 9	0.179 24	0.0040
				γ 34	1121.28 3	31.9 16	0.762
				γ 35	1157.30 20	0.70 20	0.0173
				γ 37	1180.70 20	0.22 7	0.0056
				γ 38	1189.05 4	15.2 10	0.384
				γ 39	1221.418 25	24.7 13	0.642
				γ 41	1230.97 3	1.31 10	0.0343
				γ 42	1257.47 5	1.40 10	0.0376
				γ 43	1273.75 6	0.54 7	0.0147
				γ 44	1289.17 7	1.21 9	0.0333
				γ 45	1294.2	0.175 21	0.0048
				γ 46	1373.80 7	0.188 25	0.0055
				γ 56	1771.00 20	0.29 4	0.0108
				γ 57	1818.80 20	0.105 11	0.0041
				γ 59	1870.9 5	0.29 3	0.0117
				γ 63	1957.3 4	0.46 4	0.0192
				γ 65	2016.2 5	0.78 8	0.0336
				γ 67	2047.3 5	0.118 17	0.0051
				γ 68	2057.4 5	0.83 14	0.0363
				γ 76	2207.7 5	0.102 11	0.0048
				29 weak γ 's omitted: $E_{\gamma}(\text{avg}) = 1790.1$; $\Sigma I_{\gamma} = 0.89\%$ Maximum γ -intensity = 3.79%			
• ¹⁸²Re EC Decay (12.7 h 2) I (min) = 0.10%				• ¹⁸²Re EC Decay (64.0 h 5) I (min) = 0.10%			
Auger-L	6.53	104 7	0.0145	Auger-L	6.53	167 10	0.0232
ce-K- 5	15.155 7	15.8 16	0.0051	ce-L- 2	7.740 20	7.27 23	0.0012
ce-L- 1	19.637 7	0.94 10	0.0004	ce-K- 9	15.155 7	15.9 11	0.0051
ce-MNO- 1	28.917 7	0.29 3	0.0002	ce-MNO- 2	17.020 20	2.202 13	0.0008
ce-K- 6	30.579 7	12.8 12	0.0083	ce-L- 3	19.637 7	0.55 6	0.0002
ce-L- 2	30.614 7	0.130 17	≈ 0	ce-L- 4	27.000 20	3.1 7	0.0018
ce-K- 8	44.144 7	1.07 18	0.0010	ce-MNO- 3	28.917 7	0.168 17	0.0001
Auger-K	45.7	4.7 21	0.0046	ce-K- 10	30.579 7	13.0 11	0.0085
ce-L- 3	53.621 7	0.58 8	0.0007	ce-L- 5	30.614 7	0.157 13	0.0001
ce-L- 4	55.649 7	6.2 5	0.0073	ce-MNO- 4	36.280 20	0.93 20	0.0007
ce-MNO- 3	62.901 7	0.172 22	0.0002	ce-K- 11	37.625 20	3.1 3	0.0025
ce-M- 4	64.929 7	1.41 12	0.0020	ce-K- 12	39.025 20	2.15 23	0.0018
ce-NCP- 4	67.154 7	0.40 4	0.0006	ce-K- 15	44.144 7	11.3 8	0.0106
ce-L- 5	72.580 7	3.9 4	0.0061	Auger-K	45.7	8 4	0.0076
ce-M- 5	81.860 7	0.93 10	0.0016	ce-K- 16	46.892 7	0.103 10	0.0001
ce-K- 10	82.903 7	0.71 8	0.0013	ce-L- 6	48.460 20	0.30 18	0.0003
ce-NCP- 5	84.085 7	0.28 3	0.0005	ce-L- 7	53.621 7	6.1 6	0.0070
ce-L- 6	88.004 7	33 3	0.0622	ce-L- 8	55.649 7	3.5 3	0.0041
ce-M- 6	97.284 7	8.3 8	0.0173	ce-K- 17	61.275 20	11.9 11	0.0156
ce-NCP- 6	99.509 7	2.44 22	0.0052	ce-M- 7	62.901 7	1.40 14	0.0019
ce-L- 8	101.569 7	0.23 4	0.0005	ce-K- 19	64.245 20	4.05 13	0.0055
ce-K- 12	109.865 7	0.12 4	0.0003	ce-M- 8	64.929 7	0.79 7	0.0011
ce-L- 10	140.328 7	0.117 15	0.0004	ce-NCP- 7	65.126 7	0.42 5	0.0006
ce-K- 15	159.791 8	0.25 6	0.0009	ce-NCP- 8	67.154 7	0.227 19	0.0003
ce-L- 15	217.216 8	0.13 3	0.0006	ce-L- 9	72.580 7	4.0 3	0.0062
ce-K- 17	400.73 20	0.113 13	0.0010	ce-K- 21	78.095 20	0.86 11	0.0014
β^+ 1 max	1738 20						
avg	789 9	1.8 5	0.0303				
2 weak β 's omitted: $E_{\beta}(\text{avg}) = 254.4$; $\Sigma I_{\beta} = 0.10\%$							
X-ray L	8.4	45 5	0.0080				
γ 1	31.737 7	0.73 8	0.0005				
γ 2	42.714 7	0.23 3	0.0002				
X-ray $K\alpha_2$	57.9817 5	30.0 18	0.0371				
X-ray $K\alpha_1$	59.31820 1	52 3	0.0660				
γ 3	65.721 7	0.25 4	0.0003				
X-ray $K\beta$	67.2	22.2 14	0.0318				
γ 4	67.749 7	39 3	0.0566				
γ 5	84.680 7	2.6 3	0.0048				
γ 6	100.104 7	14.4 12	0.0306				
γ 8	113.669 7	0.41 7	0.0010				
γ 9	116.417 7	0.35 10	0.0009				
γ 10	152.428 7	6.7 8	0.0217				
γ 11	156.383 7	0.41 10	0.0014				
γ 12	179.390 7	0.24 7	0.0009				
γ 13	198.348 7	0.18 3	0.0008				
γ 14	222.103 7	0.67 8	0.0032				
γ 15	229.316 8	2.1 5	0.0104				

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
ce-K- 22	79.295 20	1.57 17	0.0027	ce-L- 51	244.330 20	0.453 24	0.0024
ce-K- 23	79.915 20	1.08 13	0.0018	ce-L- 52	251.969 8	0.132 6	0.0007
ce-K- 25	81.605 20	0.42 6	0.0007	ce-MNO-51	253.610 20	0.134 6	0.0007
ce-M- 9	81.860 7	0.94 6	0.0016	ce-L- 53	264.180 20	0.265 11	0.0015
ce-K- 26	82.903 7	0.88 8	0.0016	ce-L- 54	269.320 20	0.159 7	0.0009
ce-MCP- 9	84.085 7	0.280 19	0.0005	ce-K- 61	269.545 20	0.233 10	0.0013
ce-K- 27	84.425 20	0.23 9	0.0004	ce-L- 55	274.480 20	0.193 9	0.0011
ce-K- 28	86.858 7	0.73 4	0.0013	ce-K- 64	281.545 20	0.394 14	0.0024
ce-L- 10	88.004 7	34 3	0.0629	ce-L- 64	338.970 20	0.126 5	0.0009
ce-K- 29	90.585 20	0.19 6	0.0004	X-ray L	8.4	71 8	0.0128
ce-L- 11	95.050 20	1.40 12	0.0028	γ 3	31.737 7	0.43 5	0.0003
ce-L- 12	96.450 20	0.53 8	0.0011	γ 4	39.100 20	0.30 7	0.0002
ce-M- 10	97.284 7	8.4 7	0.0175	γ 5	42.714 7	0.278 22	0.0003
ce-MCP-10	99.509 7	2.47 20	0.0052	X-ray $K\alpha_2$	57.9817 5	49.9 16	0.0616
ce-K- 30	99.645 20	10.5 3	0.0222	X-ray $K\alpha_1$	59.31820 1	86.8 25	0.110
ce-L- 15	101.569 7	2.38 17	0.0051	γ 6	60.560 20	0.11 7	0.0001
ce-K- 31	103.355 20	2.84 13	0.0062	γ 7	65.721 7	2.6 3	0.0037
ce-M- 11	104.330 20	0.34 3	0.0008	X-ray $K\beta$	67.2	36.9 12	0.0528
ce-MNO-12	105.730 20	0.163 22	0.0004	γ 9	67.749 7	22.0 18	0.0318
ce-MCP-11	106.555 20	0.101 9	0.0002	γ 9	84.680 7	2.67 18	0.0048
ce-K- 32	108.915 20	0.154 12	0.0004	γ 10	100.104 7	14.5 11	0.0310
ce-K- 33	109.865 7	1.52 16	0.0036	γ 11	107.150 20	1.37 11	0.0031
ce-M- 15	110.849 7	0.56 4	0.0013	γ 12	108.550 20	0.77 7	0.0018
ce-MCP-15	113.074 7	0.168 12	0.0004	γ 13	110.40 20	0.100	0.0002
ce-L- 17	118.700 20	2.66 24	0.0067	γ 14	111.07 5	0.203 18	0.0005
ce-L- 19	119.220 20	0.107 4	0.0003	γ 15	113.669 7	4.4 3	0.0106
ce-K- 36	120.075 20	0.17 12	0.0004	γ 16	116.417 7	0.49 5	0.0012
ce-L- 19	121.670 20	0.76 3	0.0020	γ 17	130.800 20	7.3 7	0.0202
ce-K- 37	121.835 20	4.92 12	0.0128	γ 18	131.320 20	0.160	0.0004
ce-M- 17	127.980 20	0.62 6	0.0017	γ 19	133.770 20	2.46 7	0.0070
ce-K- 38	128.823 7	0.71 4	0.0019	γ 20	145.400 20	0.64 7	0.0020
ce-MCP-17	130.205 20	0.188 17	0.0005	γ 21	147.620 20	0.88 9	0.0028
ce-MNO-19	130.950 20	0.229 9	0.0006	γ 22	148.820 20	1.71 13	0.0054
ce-L- 21	135.520 20	0.25 3	0.0007	γ 23	149.440 20	0.88 9	0.0028
ce-L- 22	136.720 20	0.48 5	0.0014	γ 24	150.25 5	0.49 5	0.0016
ce-L- 23	137.340 20	0.190 22	0.0006	γ 25	151.130 20	0.43 5	0.0014
ce-K- 41	138.695 20	0.229 20	0.0007	γ 26	152.428 7	8.3 7	0.0271
ce-L- 25	139.030 20	0.105 12	0.0003	γ 27	153.950 20	0.24 9	0.0008
ce-K- 42	139.895 20	0.16 9	0.0005	γ 28	156.383 7	7.4 3	0.0247
ce-L- 26	140.328 7	0.146 14	0.0004	γ 29	160.110 20	0.231 18	0.0008
ce-L- 28	144.283 7	0.119 6	0.0004	γ 30	169.170 20	11.7 3	0.0420
ce-K- 43	144.775 20	0.49 5	0.0015	γ 31	172.880 20	3.48 15	0.0128
ce-MNO-22	146.000 20	0.149 14	0.0005	γ 32	178.440 20	2.20 15	0.0084
ce-K- 44	146.195 20	0.104 10	0.0003	γ 33	179.390 7	2.93 20	0.0112
ce-K- 45	147.995 20	0.135 10	0.0004	γ 34	187.34 5	0.31 4	0.0012
ce-K- 46	152.095 20	0.250 19	0.0008	γ 35	188.54 5	0.128 13	0.0005
ce-K- 47	152.578 7	0.34 4	0.0011	γ 36	189.600 20	0.38 17	0.0016
ce-K- 48	156.645 20	1.25 6	0.0042	γ 37	191.360 20	7.69 18	0.0314
ce-L- 30	157.070 20	1.70 5	0.0057	γ 38	198.348 7	4.08 18	0.0172
ce-K- 49	159.791 8	2.95 12	0.0100	γ 39	203.330 20	0.45 5	0.0019
ce-L- 31	160.780 20	0.488 22	0.0017	γ 40	205.950 20	0.49 7	0.0022
ce-M- 30	166.350 20	0.387 11	0.0014	γ 41	208.220 20	0.60 5	0.0027
ce-L- 33	167.290 7	0.42 3	0.0015	γ 42	209.420 20	0.47 5	0.0021
ce-MCP-30	168.575 20	0.117 4	0.0004	γ 43	214.300 20	1.07 9	0.0049
ce-MNO-31	170.060 20	0.145 10	0.0005	γ 44	215.720 20	0.75 7	0.0034
ce-MNO-33	176.570 7	0.131 9	0.0005	γ 45	217.520 20	3.18 22	0.0148
ce-K- 50	177.925 20	0.47 4	0.0018	γ 46	221.620 20	6.2 5	0.0293
ce-L- 37	179.260 20	0.78 3	0.0030	γ 47	222.103 7	8.3 9	0.0394
ce-L- 38	186.248 7	0.453 24	0.0018	γ 48	226.170 20	3.25 15	0.0156
ce-K- 51	186.905 20	2.88 15	0.0115	γ 49	229.316 8	25.0 7	0.122
ce-MNO-37	188.540 20	0.232 6	0.0009	γ 50	247.450 20	4.9 4	0.0258
ce-K- 52	194.544 8	0.303 13	0.0013	γ 51	256.430 20	10.0 5	0.0549
ce-MNO-38	195.528 7	0.145 7	0.0006	γ 52	264.069 8	3.76 11	0.0212
ce-K- 53	206.755 20	0.644 25	0.0028	γ 53	276.280 20	9.02 22	0.0531
ce-K- 54	211.895 20	0.394 17	0.0018	γ 54	281.420 20	5.79 18	0.0347
ce-L- 48	214.070 20	0.208 12	0.0009	γ 55	286.580 20	7.5 3	0.0459
ce-K- 55	217.055 20	0.487 23	0.0023	γ 56	295.67 10	0.19 7	0.0012
ce-L- 49	217.216 8	1.53 6	0.0071	γ 57	300.000 20	1.2 3	0.0078
ce-M- 49	226.496 8	0.378 15	0.0018	γ 58	300.480 20	1.6 4	0.0105
ce-MCP-49	228.721 8	0.110 5	0.0005	γ 59	313.900 20	0.60 5	0.0040
ce-K- 58	230.955 20	0.31 8	0.0015	γ 60	323.440 20	1.90 11	0.0131
ce-L- 50	235.350 20	0.221 18	0.0011				

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
¹⁸² Re EC Decay (64.0 h 5) (Continued)							
γ 61	339.070 20	5.60 16	0.0404	ce-η- 10	106.909 3	0.339 13	0.0008
γ 62	342.040 20	1.03 9	0.0075	ce-NCP-10	109.134 3	0.104 4	0.0002
γ 63	345.400 20	0.47 5	0.0035	ce-K- 16	123.118 6	0.130 6	0.0003
γ 64	351.070 20	10.32 18	0.0772	ce-K- 19	139.2870 21	1.38 8	0.0041
γ 65	357.120 20	0.51 5	0.0039	ce-L- 13	148.429 4	0.162 7	0.0005
γ 67	927.99 7	0.36 4	0.0071	ce-L- 15	150.223 5	4.07 11	0.0130
γ 68	943.01 20	0.22 4	0.0044	ce-η- 15	159.503 5	0.94 3	0.0032
γ 69	959.74 7	0.19 4	0.0040	ce-NCP-15	161.728 5	0.283 8	0.0010
γ 70	1001.68 7	2.41 9	0.0515	ce-K- 23	176.5370 21	0.423 17	0.0016
γ 71	1044.43 9	0.278 11	0.0062	ce-L- 19	196.7122 21	0.241 7	0.0010
γ 72	1076.30 20	10.2 3	0.234	ce-K- 24	222.198 7	0.196 8	0.0009
γ 73	1088.20 20	0.192 18	0.0045	X-ray L	8.4	60 7	0.0107
γ 74	1113.38 10	4.57 9	0.108	γ 2	46.4837 10	7.98 21	0.0079
γ 75	1121.28 3	21.37 12	0.510	γ 3	52.5950 20	2.22 9	0.0025
γ 76	1157.30 20	0.384 2	0.0095	X-ray Kα ₂	57.9817 5	34.2 11	0.0423
γ 77	1158.10 20	0.855 5	0.0211	X-ray Kα ₁	59.31820 1	59.5 17	0.0752
γ 78	1180.70 20	0.545 22	0.0137	X-ray Kβ	67.2	25.3 8	0.0362
γ 79	1189.05 4	8.76 22	0.222	γ 4	82.9180 20	0.254 9	0.0004
γ 80	1221.418 25	16.52 24	0.430	γ 5	84.7110 20	0.88 5	0.0016
γ 81	1223.9	0.185 1	0.0008	γ 6	99.0790 20	2.69 9	0.0057
γ 82	1230.97 3	14.4 3	0.378	γ 9	107.9320 20	2.18 7	0.0050
γ 83	1257.47 5	1.03 5	0.0277	γ 10	109.729 3	2.90 10	0.0068
γ 84	1273.75 6	0.92 5	0.0249	γ 12	144.129 5	0.116 4	0.0004
γ 86	1289.17 7	0.737 16	0.0202	γ 13	160.529 4	0.590 17	0.0020
γ 87	1292.00 20	0.227 22	0.0062	γ 14	161.342 5	0.36 5	0.0012
γ 88	1294.20 20	1.58 5	0.0436	γ 15	162.323 5	23.4 6	0.0808
γ 89	1331.00 20	0.35 3	0.0100	γ 16	192.643 6	0.257 9	0.0011
γ 90	1342.72 6	2.69 7	0.0770	γ 18	205.085 7	0.111 5	0.0005
γ 91	1373.80 7	0.288 11	0.0084	γ 19	208.8120 20	2.98 8	0.0132
γ 92	1387.40 8	0.26 3	0.0076	γ 20	209.879 13	0.263 10	0.0012
γ 93	1410.10 10	0.278 15	0.0083	γ 21	244.266 3	0.412 14	0.0021
γ 94	1427.30 20	9.45 18	0.287	γ 22	245.239 6	0.26 4	0.0013
γ 95	1439.40 20	0.156 11	0.0048	γ 23	246.0620 20	1.32 5	0.0069
				γ 24	291.723 7	3.17 8	0.0197
				γ 25	313.021 5	0.415 15	0.0028
				γ 26	353.998 5	0.536 17	0.0040

8 weak γ's omitted:
E_γ(avg) = 1073.6; ΣI_γ = 0.40%

7 weak γ's omitted:
E_γ(avg) = 254.0; ΣI_γ = 0.19%

• ¹⁸³Re EC Decay (70 d 2) I (min) = 0.10%

Auger-L	6.53	140 8	0.0194
ce-K- 4	13.3930 21	1.34 6	0.0004
ce-K- 5	15.1860 21	5.7 3	0.0018
ce-L- 1	28.8760 11	0.23 6	0.0001
ce-K- 6	29.5540 21	2.45 11	0.0015
ce-L- 2	34.3839 11	52.3 16	0.0383
ce-K- 9	38.4070 21	6.82 23	0.0056
ce-K- 10	40.204 3	8.9 3	0.0076
ce-L- 3	40.4952 21	10.5 5	0.0091
ce-HNO- 2	43.6641 11	16.0 5	0.0148
Auger-K	45.7	5.4 24	0.0052
ce-η- 3	49.7754 21	2.44 10	0.0026
ce-NCP- 3	52.0000 21	0.73 3	0.0008
ce-L- 4	70.8182 21	0.60 3	0.0009
ce-L- 5	72.6112 21	1.00 5	0.0015
ce-K- 12	74.604 5	0.166 8	0.0003
ce-HNO- 4	80.0984 21	0.191 8	0.0003
ce-HNO- 5	81.8914 21	0.299 16	0.0005
ce-L- 6	86.9792 21	6.5 3	0.0121
ce-K- 13	91.004 4	0.180 8	0.0003
ce-K- 14	91.817 5	0.36 5	0.0007
ce-K- 15	92.798 5	21.9 6	0.0432
ce-L- 9	95.8322 21	1.26 5	0.0026
ce-η- 6	96.2594 21	1.64 8	0.0034
ce-L- 10	97.629 3	1.49 6	0.0031
ce-NCP- 6	98.4840 21	0.482 22	0.0010
ce-HNO- 9	105.1124 21	0.379 14	0.0008

• ¹⁸⁴Re EC Decay (38.0 d 5) I (min) = 0.10%

Auger-L	6.53	81 5	0.0113
ce-K- 1	41.682 7	12.5 7	0.0111
Auger-K	45.7	4.0 18	0.0039
ce-L- 1	99.107 7	24.3 13	0.0514
ce-η- 1	108.387 7	6.1 4	0.0141
ce-NCP- 1	110.612 7	1.80 10	0.0042
ce-K- 7	183.320 10	0.27 3	0.0011
ce-L- 7	240.745 10	0.125 12	0.0006
ce-K- 15	722.542 22	0.223 10	0.0034
ce-K- 17	833.757 19	0.172 8	0.0031
γ-ray L	8.4	35 4	0.0062
X-ray Kα ₂	57.9817 5	25.5 10	0.0315
X-ray Kα ₁	59.31820 1	44.3 17	0.0560
X-ray Kβ	67.2	18.8 8	0.0270
γ 1	111.207 7	17.1 8	0.0406
γ 7	252.845 10	3.0 3	0.0162
γ 11	539.220 25	0.327 19	0.0038
γ 12	641.915 20	1.94 6	0.0265
γ 14	769.778 17	0.67 3	0.0109
γ 15	792.067 22	37.5 12	0.632
γ 16	894.760 19	15.6 5	0.297
γ 17	903.282 19	37.9 12	0.729

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
γ 20	1022.63	3	0.52 4
γ 23	1275.11	3	0.119 7
γ 26	1386.33	3	0.103 6
16 weak γ 's omitted: $E\gamma$ (avg) = 787.3; $\Sigma I\gamma$ = 0.29%			
● ¹⁸⁴ Re EC Decay (169 d 8) I (min) = 0.10%			
%EC Decay = 25.3 6			
See also ¹⁸⁴ Re IT Decay (169 d)			
Auger-L	6.53	41.3 24	0.0057
ce-K- 3	17.927 10	0.106 9	≈0
ce-K- 4	21.745 10	1.06 9	0.0005
ce-K- 5	41.682 7	4.3 4	0.0038
ce-L- 1	43.178 5	8.8 11	0.0081
Auger-K	45.7	1.3 6	0.0013
ce-L- 2	51.615 15	7.5 13	0.0092
ce-M- 1	52.458 5	2.00 24	0.0022
ce-NCP- 1	54.683 5	0.61 8	0.0007
ce-N- 2	60.895 15	1.9 4	0.0024
ce-NOP- 2	63.120 15	0.54 10	0.0007
ce-L- 4	79.170 10	0.42 4	0.0007
ce-MNO- 4	88.450 10	0.132 11	0.0002
ce-K- 9	91.744 15	5.8 4	0.0114
ce-L- 5	99.107 7	8.4 7	0.0177
ce-M- 5	108.387 7	2.11 18	0.0049
ce-NCP- 5	110.612 7	0.62 6	0.0015
ce-K- 10	145.801 12	0.123 9	0.0004
ce-K- 11	147.022 12	1.33 9	0.0042
ce-L- 9	149.169 15	1.25 8	0.0040
ce-MNO- 9	158.449 15	0.379 25	0.0013
ce-K- 14	183.320 10	0.99 7	0.0039
ce-L- 11	204.447 12	0.74 5	0.0032
ce-MNO-11	213.727 12	0.237 15	0.0011
ce-L- 14	240.745 10	0.45 3	0.0023
ce-K- 15	248.483 10	0.101 6	0.0005
ce-MNO-14	250.025 10	0.143 9	0.0008
X-ray L	8.4	17.7 19	0.0032
γ 1	55.278 5	2.4 3	0.0028
X-ray $K\alpha_2$	57.9817 5	8.5 3	0.0105
X-ray $K\alpha_1$	59.31820 1	14.8 5	0.0187
γ 2	63.715 15	0.38 7	0.0005
X-ray $K\beta$	67.2	6.29 23	0.0090
γ 3	87.452 10	0.244 19	0.0005
γ 4	91.270 10	0.260 19	0.0005
γ 5	111.207 7	5.9 5	0.0140
γ 6	124.060 20	0.152 12	0.0004
γ 9	161.269 15	6.6 4	0.0228
γ 10	215.326 12	2.84 18	0.0130
γ 11	216.547 12	9.6 6	0.0444
γ 12	226.748 10	1.51 10	0.0073
γ 14	252.845 10	10.9 7	0.0588
γ 15	318.008 10	5.9 4	0.0398
γ 17	384.250 12	3.20 19	0.0262
γ 18	536.674 15	3.37 20	0.0386
γ 20	641.915 20	0.352 23	0.0048
γ 21	769.778 17	0.240 21	0.0039
γ 22	792.067 22	3.77 23	0.0637
γ 23	857.25 3	0.166 11	0.0030
γ 24	894.760 19	2.81 19	0.0536
γ 25	903.282 19	3.82 23	0.0734
γ 26	920.933 21	8.3 5	0.163
γ 28	1022.63 3	0.184 19	0.0040
γ 29	1110.08 3	0.60 5	0.0141
γ 30	1173.77 3	1.24 10	0.0310
7 weak γ 's omitted: $E\gamma$ (avg) = 647.4; $\Sigma I\gamma$ = 0.27%			

● ¹⁸⁴ Re IT Decay (169 d 8) I (min) = 0.10%			
%IT Decay = 74.7 6			
Feeds ¹⁸⁴ Re (38.0 d)			
See also ¹⁸⁴ Re EC Decay (169 d)			
Auger-L	6.7	70 4	0.0100
ce-K- 1	11.60 4	1.41 6	0.0003
ce-K- 2	33.053 7	49.5 25	0.0349
Auger-K	47	2.1 10	0.0021
ce-L- 1	70.75 4	50.4 20	0.0759
ce-M- 1	80.35 4	16.8 7	0.0287
ce-NOP- 1	82.65 4	5.50 22	0.0097
ce-L- 2	92.202 7	9.1 4	0.0179
ce-M- 2	101.797 7	2.11 9	0.0046
ce-NCP- 2	104.104 7	0.65 3	0.0014
X-ray L	8.65	31 4	0.0058
X-ray $K\alpha_2$	59.7179 6	14.1 8	0.0179
X-ray $K\alpha_1$	61.1403 6	24.4 13	0.0318
X-ray $K\beta$	69.3	10.4 6	0.0154
γ 2	104.729 7	13.3 6	0.0296
● ¹⁸⁵ W β^- Decay (75.1 d 3) I (min) = 0.10%			
β^- 1 max	432.4 10		
avg	126.8 4	99.921 9	0.270
1 weak β 's omitted: $E\beta$ (avg) = 96.9; $\Sigma I\beta$ = 0.08%			
1 weak γ 's omitted: $E\gamma$ (avg) = 125.4; $\Sigma I\gamma$ = 0.02%			
● ¹⁸⁵ Os EC Decay (93.6 d 5) I (min) = 0.10%			
Auger-L	6.7	57 4	0.0082
Auger-K	47	3.1 14	0.0031
ce-K- 2	53.682 3	0.781 11	0.0009
ce-L- 1	58.7863 21	0.5 3	0.0006
ce-MNO- 1	68.3813 21	0.15 8	0.0002
ce-K- 3	91.176 7	0.611 10	0.0012
ce-L- 2	112.831 3	0.133 2	0.0003
ce-K- 4	162.481 9	0.152 3	0.0005
ce-K- 6	574.440 9	0.757 24	0.0093
ce-L- 6	633.589 9	0.157 5	0.0021
X-ray L	8.65	26 3	0.0047
X-ray $K\alpha_2$	59.7179 6	21.0 6	0.0267
X-ray $K\alpha_1$	61.1403 6	36.4 9	0.0474
X-ray $K\beta$	69.3	15.5 5	0.0229
γ 1	71.3130 20	0.25 13	0.0004
γ 2	125.358 3	0.346 5	0.0009
γ 3	162.852 7	0.556 8	0.0019
γ 4	234.157 9	0.412 7	0.0021
γ 5	592.066 10	1.315 14	0.0166
γ 6	646.116 9	80.2 7	1.10
γ 7	717.424 12	4.08 4	0.0624
γ 11	874.813 13	6.54 7	0.122
γ 12	880.272 19	4.95 5	0.0928
4 weak γ 's omitted: $E\gamma$ (avg) = 910.0; $\Sigma I\gamma$ = 0.06%			

¹⁸⁶Re-¹⁸⁷Re

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
<p>● ¹⁸⁶Re EC Decay (90.64 h 9) I (min) = 0.10%</p> <p>%EC Decay = 6.8 20</p> <p>See also ¹⁸⁶Re β⁻ Decay (90.64 h)</p>				<p>ce-L- 6 31.13 6 0.13 14 ≈0</p> <p>ce-MNO- 4 33.30 6 0.134 25 ≈0</p> <p>ce-K- 12 42.074 20 0.251 15 0.0002</p> <p>Auger-K 47 1.1 5 0.0011</p> <p>ce-L- 7 59.533 10 1.67 10 0.0021</p> <p>ce-K- 14 62.544 10 17.6 9 0.0234</p> <p>ce-MNO- 7 69.128 10 0.49 3 0.0007</p> <p>ce-L- 14 121.693 10 2.99 13 0.0077</p> <p>ce-M- 14 131.288 10 0.69 3 0.0019</p> <p>ce-MCP-14 133.595 10 0.210 9 0.0006</p> <p>ce-K- 19 134.61 3 0.396 22 0.0011</p> <p>ce-K- 28 407.854 10 0.427 22 0.0037</p> <p>ce-L- 28 467.003 10 0.109 6 0.0011</p> <p>ce-K- 39 546.694 10 0.17 3 0.0020</p>			
Auger-L	6.53	4.5 11	0.0006	β- 1 max	433.1 18		
Auger-K	45.7	0.25 14	0.0002	avg	127.0 6	0.484 20	0.0013
ce-K- 1	52.77 10	0.42 14	0.0005	β- 2 max	448.0 18		
ce-L- 1	110.20 10	0.64 22	0.0015	avg	131.9 6	0.67 3	0.0019
ce-MNO- 1	119.48 10	0.21 7	0.0005	β- 3 max	495.9 18		
γ-ray L	8.4	1.9 5	0.0003	avg	148.0 7	0.20 18	0.0006
γ-ray Kα ₂	57.9817 5	1.6 5	0.0020	β- 4 max	539.6 18		
γ-ray Kα ₁	59.31820 1	2.8 9	0.0035	avg	163.0 7	4.3 3	0.0149
γ-ray Kβ	67.2	1.2 4	0.0017	β- 5 max	626.7 18		
γ 1	122.30 10	0.70 23	0.0018	avg	193.5 7	58.7 23	0.242
<p>● ¹⁸⁶Re β⁻ Decay (90.64 h 9) I (min) = 0.10%</p> <p>%β⁻ Decay = 93.2 20</p> <p>Feeds ¹⁸⁶Os</p> <p>See also ¹⁸⁶Re EC Decay (90.64 h)</p>				<p>β- 6 max 687.0 18</p> <p>avg 215.1 7 5.5 6 0.0252</p> <p>β- 7 max 694.1 18</p> <p>avg 217.6 7 3.5 6 0.0162</p> <p>β- 8 max 800.7 18</p> <p>avg 256.8 7 0.10 4 0.0005</p> <p>β- 9 max 1178.3 18</p> <p>avg 401.7 7 2.3 9 0.0197</p> <p>β-10 max 1312.5 18</p> <p>avg 457.1 8 25.1 24 0.244</p> <p>total β- avg 263.8 9 101 4 0.567</p> <p>7 weak β's omitted: Σβ (avg) = 55.7; ΣIβ = 0.02%</p>			
Auger-L	6.88	6.5 8	0.0009	γ-ray L	8.65	8.7 10	0.0016
Auger-K	48.3	0.16 8	0.0002	γ-ray Kα ₂	59.7179 6	7.6 4	0.0097
ce-K- 1	63.286 8	4.2 7	0.0056	γ-ray Kα ₁	61.1403 6	13.2 6	0.0172
ce-L- 1	124.189 8	6.1 10	0.0161	γ-ray Kβ	69.3	5.6 3	0.0083
ce-M- 1	134.108 8	1.54 25	0.0044	γ 7	72.060 10	11.9 5	0.0183
ce-MCP- 1	136.503 8	0.47 8	0.0014	γ 14	134.220 10	9.5 4	0.0270
β- 1 max	939.4 18			γ 19	206.29 3	0.152 8	0.0007
avg	308.8 7	22 4	0.145	γ 22	246.180 10	0.127 7	0.0007
β- 2 max	1076.6 18			γ 28	479.530 10	23.4 10	0.239
avg	362.0 7	71 4	0.547	γ 31	511.760 10	0.69 3	0.0075
*total β- avg	349.3 7	93 6	0.692	γ 32	551.550 10	5.44 23	0.0639
<p>2 weak β's omitted: Σβ (avg) = 87.1; ΣIβ = 0.06%</p>				<p>γ 37 589.09 3 0.130 6 0.0016</p> <p>γ 39 618.370 10 6.7 3 0.0884</p> <p>γ 40 625.520 10 1.16 5 0.0155</p> <p>γ 44 685.810 10 29.2 13 0.426</p> <p>γ 46 745.210 20 0.318 14 0.0051</p> <p>γ 48 772.870 20 4.40 19 0.0725</p> <p>γ 53 864.550 10 0.359 16 0.0066</p> <p>γ 54 879.43 5 0.151 7 0.0028</p>			
γ-ray L	9	3.0 5	0.0006	<p>44 weak γ's omitted: Σγ (avg) = 276.2; ΣIγ = 0.42%</p>			
γ-ray Kα ₂	61.4867 7	1.16 19	0.0015	<p>● ¹⁸⁷Re β⁻ Decay (23.83 h 9) I (min) = 0.10%</p> <p>Feeds ¹⁸⁷Re</p>			
γ-ray Kα ₁	63.0005 7	2.0 4	0.0027	<p>ce-K- 7 0.384 10 8.7 5 ≈0</p>			
γ-ray Kβ	71.4	0.86 14	0.0013	<p>ce-MNO- 1 4.1683 4 3.5 6 0.0003</p>			
γ 1	137.157 8	9.5 15	0.0278	<p>Auger-L 6.7 19.3 13 0.0028</p>			
<p>5 weak γ's omitted: Σγ (avg) = 702.2; ΣIγ = 0.06%</p>				<p>ce-L- 3 16.70 3 0.107 25 ≈0</p>			
<p>● ¹⁸⁶Os α Decay (2.0E15 y 11) I (min) = 0.10%</p>				<p>ce-L- 4 23.70 6 0.42 8 0.0002</p>			
α 1	2756 3	100	5.87	<p>● ¹⁸⁷Re β⁻ Decay (4.7E10 y 8) I (min) = 0.10%</p>			
<p>● ¹⁸⁷W β⁻ Decay (23.83 h 9) I (min) = 0.10%</p> <p>Feeds ¹⁸⁷Re</p>				<p>β- 1 max 2.64 4</p> <p>avg 0.661 10 100 0.0014</p>			

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
¹⁹⁰ Ir EC Decay (11.78 d 10) (Continued)				● ¹⁹⁰ Ir EC Decay (3.2 h 2) I (min) = 0.10%			
γ-ray L	9	32.6	0.0061	%EC Decay = 94.9			
γ-ray Kα ₂	61.4867	7.25	0.0324	Feeds ¹⁹⁰ Os (9.9 m)			
γ-ray Kα ₁	63.0005	7.43	0.0573	See also ¹⁹⁰ Ir IT Decay (3.2 h)			
γ-ray Kβ	71.4	18.3	0.0279	Auger-L	6.88	52.5	0.0077
γ 2	186.725	25.49	0.198	Auger-K	48.3	2.9	0.0030
γ 3	190.52	20.0	0.0005	γ-ray L	9	25.3	0.0047
γ 4	196.85	15.3	0.0136	γ-ray Kα ₂	61.4867	7.20	0.0269
γ 5	198.08	20.1	0.0077	γ-ray Kα ₁	63.0005	7.35	0.0475
γ 6	199.3	3.0	0.0009	γ-ray Kβ	71.4	15.2	0.0231
γ 7	207.91	6.0	0.0014	● ¹⁹⁰ Ir IT Decay (3.2 h 2) I (min) = 0.10%			
γ 8	207.91	6.1	0.0050	%IT Decay = 5.1			
γ 9	223.81	5.3	0.0169	Feeds ¹⁹⁰ Ir (1.2 h)			
γ 10	235.50	12.0	0.0020	See also ¹⁹⁰ Ir EC Decay (3.2 h)			
γ 12	248.2	3.0	0.0006	Auger-L	7	2.50	0.0004
γ 13	282.93	6.0	0.0027	ce-K- 2	72.5890	5.1	0.0017
γ 14	288.22	10.1	0.0095	ce-L- 2	135.2815	3.2	0.0082
γ 15	294.75	12.6	0.0386	ce-M- 2	145.5263	7.0	0.0027
γ 16	361.09	5.12	0.0949	ce-NOP- 2	148.0099	4.0	0.0009
γ 17	371.24	5.21	0.171	γ-ray L	9.18	1.23	0.0002
γ 18	380.03	12.1	0.0156	γ-ray Kα ₂	63.2867	7.0	0.0004
γ 20	397.36	6.2	0.0525	γ-ray Kα ₁	64.8956	7.0	0.0007
γ 21	407.22	6.4	0.0375	γ-ray Kβ	73.6	0.22	0.0004
γ 22	407.22	6.22	0.197	2 weak γ's omitted: E _γ (avg) = 148.7; ΣI _γ = 0.01%			
γ 23	420.63	12.1	0.0139	● ¹⁹¹ Os β ⁻ Decay (15.4 d 1) I (min) = 0.10%			
γ 25	431.62	7.2	0.0238	ce-K- 3	6.287	7.0	≈0
γ 26	447.81	8.2	0.0231	Auger-L	7	87.5	0.0132
γ 27	477.8	3.1	0.0176	ce-L- 1	28.431	10.7	0.0431
γ 28	485.23	20.0	0.0071	ce-L- 2	33.63	3.0	0.0002
γ 29	490.76	7.0	0.0077	ce-MNO- 1	38.676	10.2	0.0238
γ 30	502.55	8.1	0.0127	ce-MNO- 2	43.88	3.0	≈0
γ 31	518.55	7.3	0.355	Auger-K	49.6	2.2	0.0023
γ 32	557.98	6.2	0.339	ce-K- 4	53.289	7.0	0.0653
γ 33	569.30	7.2	0.327	ce-L- 3	68.979	7.0	0.0002
γ 34	605.14	7.3	0.487	ce-L- 4	115.981	7.0	0.0305
γ 35	615.39	15.0	0.0058	ce-M- 4	126.226	7.0	0.0079
γ 36	628.4	3.0	0.0095	ce-NOP- 4	128.710	7.0	0.0025
γ 37	630.91	16.2	0.0374	β ⁻ 1 max	139	3	
γ 38	631	0.8	0.0107	avg	36.7	9	100
γ 39	656.02	8.1	0.0154	γ-ray L	9.18	43.4	0.0084
γ 41	690.04	8.0	0.0039	γ-ray Kα ₂	63.2867	7.1	0.0216
γ 43	726.22	8.3	0.0555	γ-ray Kα ₁	64.8956	7.2	0.0381
γ 45	740.19	14.0	0.0029	γ-ray Kβ	73.6	11.9	0.0186
γ 47	768.57	8.2	0.0343	γ 4	129.400	7.2	0.0714
γ 48	821.78	14.0	0.0054	3 weak γ's omitted: E _γ (avg) = 73.2; ΣI _γ = 0.04%			
γ 49	828	0.5	0.0095	Auger-L	7	47.0	0.0071
γ 50	828.99	7.3	0.0580	ce-L- 1	12.8815	3.7	0.0193
γ 51	839.14	12.0	0.0193	ce-MNO- 1	23.1263	7.2	0.0147
γ 52	916.75	25.0	0.0023	γ-ray L	9.18	23.2	0.0045
γ 56	1036.05	20.2	0.0505	● ¹⁹⁰ Ir IT Decay (1.2 h) I (min) = 0.10%			
γ 58	1133.77	20.0	0.0098	Feeds ¹⁹⁰ Ir (11.78 d)			
γ 59	1147.3	3.0	0.0031	Auger-L	7	47.0	0.0071
γ 62	1200.24	12.0	0.0107	ce-L- 1	12.8815	3.7	0.0193
γ 63	1324.30	18.0	0.0129	ce-MNO- 1	23.1263	7.2	0.0147
γ 65	1386.95	12.0	0.0043				
γ 66	1397.24	14.0	0.0042				
16 weak γ's omitted: E _γ (avg) = 823.7; ΣI _γ = 0.79%							

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
● ¹⁹¹ Os IT Decay (13.03 h 21) I (min) = 0.10%			
Feeds ¹⁹¹ Os (15.4 d)			
ce-K- 1	0.509 10	7.2 7	≈0
Auger-L	6.88	49.6 23	0.0073
Auger-K	48.3	0.28 14	0.0003
ce-L- 1	61.412 10	67.0 7	0.0876
ce-MNO- 1	71.331 10	25.8 6	0.0392
γ-ray L	9	23.3 22	0.0044
γ-ray Kα ₂	61.4867 7	1.99 20	0.0026
γ-ray Kα ₁	63.0005 7	3.4 4	0.0046
γ-ray Kβ	71.4	1.48 15	0.0023
1 weak γ's omitted: E _γ (avg) = 74.4; ΣI _γ = 0.06%			
● ¹⁹¹ Pt EC Decay (2.71 d 6) I (min) = 0.10%			
ce-K- 4	6.287 7	30 8	0.0040
Auger-L	7	102 11	0.0153
ce-K- 5	9.04 8	0.28 24	≈0
ce-K- 6	20.406 9	19 5	0.0083
ce-L- 1	28.431 10	0.72 19	0.0004
ce-L- 3	36.17 3	0.38 14	0.0003
ce-MNO- 1	38.676 10	0.29 8	0.0002
ce-MNO- 3	46.42 3	0.12 5	0.0001
Auger-K	49.6	5 3	0.0055
ce-K- 7	53.289 7	6.6 17	0.0075
ce-K- 9	64.773 15	0.13 6	0.0002
ce-L- 4	68.979 7	19 5	0.0278
ce-L- 5	71.73 8	0.23 17	0.0033
ce-M- 4	79.224 7	4.7 13	0.0080
ce-NOP- 4	81.708 7	1.4 4	0.0025
ce-L- 6	83.098 9	3.4 9	0.0060
ce-M- 6	93.343 9	0.79 20	0.0016
ce-NOP- 6	95.827 9	0.25 7	0.0005
ce-K- 10	96.079 20	3.7 10	0.0077
ce-K- 11	102.85 3	0.81 23	0.0018
ce-K- 12	111.58 4	0.26 7	0.0006
ce-L- 7	115.981 7	1.4 4	0.0035
ce-M- 7	126.226 7	0.34 9	0.0009
ce-NOP- 7	128.710 7	0.10 3	0.0003
ce-K- 16	143.54 5	0.11 3	0.0003
ce-L- 10	158.771 20	0.61 16	0.0020
ce-L- 11	165.54 3	0.18 5	0.0006
ce-MNO-10	169.016 20	0.18 5	0.0007
ce-K- 21	192.60 8	0.13 4	0.0005
ce-K- 23	275.06 3	0.54 14	0.0032
ce-K- 24	283.77 3	0.88 23	0.0053
ce-K- 28	333.329 20	0.84 22	0.0060
ce-L- 24	346.46 3	0.14 4	0.0010
ce-K- 31	380.36 5	0.24 7	0.0019
ce-L- 28	396.021 20	0.13 4	0.0011
ce-K- 35	462.76 5	0.58 16	0.0057
γ-ray L	9.18	50 7	0.0098
γ-ray Kα ₂	63.2867 7	38 4	0.0511
γ-ray Kα ₁	64.8956 7	65 7	0.0902
γ-ray Kβ	73.6	28 3	0.0442
γ 4	82.398 7	5.0 13	0.0088
γ 6	96.517 9	3.4 9	0.0069
γ 7	129.400 7	3.0 8	0.0082
γ 10	172.190 20	3.3 9	0.0123
γ 11	178.96 3	1.0 3	0.0039
γ 12	187.69 4	0.42 11	0.0017
γ 14	208.96 15	0.14 5	0.0006

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
γ 16	219.65 5	0.82 21	0.0039
γ 17	221.74 8	0.12 4	0.0005
γ 19	223.67 8	0.11 3	0.0005
γ 20	267.92 8	0.78 21	0.0044
γ 21	268.71 8	1.6 5	0.0094
γ 23	351.17 3	3.5 9	0.0259
γ 24	359.88 3	6.0 16	0.0460
γ 28	409.440 20	8.0 20	0.0698
γ 31	456.47 5	3.4 9	0.0327
γ 35	538.87 5	14 4	0.157
γ 36	541.64 10	0.37 10	0.0042
γ 39	576.46 8	0.12 3	0.0014
γ 40	587.95 8	0.14 4	0.0017
γ 42	624.06 6	1.4 4	0.0187
29 weak γ's omitted: E _γ (avg) = 404.2; ΣI _γ = 0.79%			
● ¹⁹² Ir EC Decay (74.02 d 18) I (min) = 0.10%			
%EC Decay = 4.69 10			
See also ¹⁹² Ir β ⁻ Decay (74.02 d)			
Auger-L	6.88	3.11 19	0.0005
Auger-K	48.3	0.16 8	0.0002
ce-K- 2	131.9247 5	0.52 3	0.0015
ce-L- 2	192.8275 4	0.365 18	0.0015
ce-MNO- 2	202.7470 4	0.118 5	0.0005
γ-ray L	9	1.46 15	0.0003
γ-ray Kα ₂	61.4867 7	1.13 4	0.0015
γ-ray Kα ₁	63.0005 7	1.96 7	0.0026
γ-ray Kβ	71.4	0.84 3	0.0013
γ 1	201.306 7	0.467 22	0.0020
γ 2	205.79549	3.29 13	0.0144
γ 3	283.257 17	0.261 15	0.0016
γ 5	374.476 7	0.73 3	0.0058
γ 7	484.5780 4	3.16 11	0.0326
γ 8	489.06 3	0.398 15	0.0042
3 weak γ's omitted: E _γ (avg) = 423.1; ΣI _γ = 0.08%			
● ¹⁹² Ir β ⁻ Decay (74.02 d 18) I (min) = 0.10%			
%β ⁻ Decay = 95.31 10			
See also ¹⁹² Ir EC Decay (74.02 d)			
Auger-L	7.24	7.6 5	0.0012
Auger-K	51	0.35 13	0.0004
ce-K- 1	57.951 3	0.12 5	0.0001
ce-L- 1	122.466 3	0.130 11	0.0003
ce-K- 2	217.5634 8	1.924 14	0.0089
ce-K- 3	230.0621 8	1.790 25	0.0088
ce-K- 4	238.1131 8	4.47 14	0.0226
ce-L- 2	282.0783 5	0.88 3	0.0053
ce-MNO- 2	292.6622 9	0.286 1	0.0018
ce-L- 3	294.5770 5	0.772 5	0.0048
ce-L- 4	302.6280 5	1.95 6	0.0126
ce-MNO- 3	305.1609 10	0.251 1	0.0016
ce-M- 4	313.2119 10	0.484 15	0.0032
ce-MOP- 4	315.7859 7	0.148 5	0.0010
ce-K- 6	389.6767 8	1.02 4	0.0085
ce-L- 6	454.1916 5	0.295 10	0.0028
ce-K- 10	526.0194 9	0.151 7	0.0017

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
¹⁹² Ir β ⁻ Decay (74.02 d 18) (Continued)							
β ⁻ 1 max	256 4			β ⁻ 5 max	575 5		
avq	70.8 12	5.65 9	0.0085	avq	174.7 18	2.43 19	0.0090
β ⁻ 2 max	536 4			β ⁻ 6 max	672 5		
avq	161.2 14	41.4 3	0.142	avq	208.9 18	8.0 5	0.0356
β ⁻ 3 max	672 4			β ⁻ 7 max	770 5		
avq	208.9 15	48.3 8	0.215	avq	244.7 19	0.79 7	0.0041
β ⁻ 4 max	845 4			β ⁻ 8 max	952 5		
avq	275.9 15	0.40 23	0.0024	avq	313.0 20	2.02 25	0.0135
total β ⁻				β ⁻ 9 max	993 5		
avq	180.2 16	95.9 9	0.368	avq	328.8 20	12.6 10	0.0882
2 weak β's omitted: Eβ(avq) = 24.9; ΣIβ = 0.10%				β-10 max	1059 5		
γ-ray L	9.44	4.1 5	0.0008	avq	354.4 20	19.4 14	0.146
γ-ray Kα ₂	65.1220 20	2.63 7	0.0037	β-11 max	1132 5		
γ-ray Kα ₁	66.8320 20	4.52 11	0.0064	avq	383.1 20	53 3	0.432
γ-ray Kβ	75.7	1.97 6	0.0032	total β ⁻			
γ 1	136.346 3	0.181 9	0.0005	avq	344.9 21	100 4	0.735
γ 2	295.95825 1	29.02 15	0.183	4 weak β's omitted: Eβ(avq) = 68.1; ΣIβ = 0.04%			
γ 3	308.45689 1	29.68 13	0.195	γ-ray L	9.18	9.6 10	0.0019
γ 4	316.50789 1	82.85 24	0.559	γ-ray Kα ₂	63.2867 7	3.57 19	0.0048
γ 5	416.460 8	0.664 13	0.0059	γ-ray Kα ₁	64.8956 7	6.1 3	0.0085
γ 6	468.0715 3	48.1 8	0.479	γ 2	73.012 7	3.48 22	0.0054
γ 8	588.5845 7	4.57 9	0.0573	γ-ray Kβ	73.6	2.65 14	0.0042
γ 10	604.4142 5	8.20 25	0.106	γ 4	96.82 3	0.100 10	0.0002
γ 11	612.4650 8	5.34 13	0.0696	γ 6	106.993 10	0.64 5	0.0015
γ 12	884.514 12	0.302 6	0.0057	γ 8	138.892 7	4.3 3	0.0128
5 weak γ's omitted: Eγ(avq) = 871.7; ΣIγ = 0.10%				γ 11	180.03 3	0.184 22	0.0007
				γ 12	181.81 3	0.196 23	0.0008
				γ 16	219.13 5	0.280 25	0.0013
				γ 19	251.62 4	0.220 20	0.0012
				γ 19	280.43 3	1.26 9	0.0075
				γ 20	288.79 5	0.144 14	0.0009
				γ 21	298.83 5	0.188 19	0.0012
				γ 23	321.56 3	1.29 9	0.0088
				γ 28	361.81 5	0.30 3	0.0023
				γ 32	387.46 4	1.28 9	0.0105
				γ 36	420.30 5	0.168 15	0.0015
				γ 38	460.49 3	4.00 20	0.0392
				γ 39	484.25 5	0.172 15	0.0018
				γ 47	557.36 8	1.32 14	0.0157
				γ 48	559.26 8	0.49 6	0.0059
				44 weak γ's omitted: Eγ(avq) = 400.7; ΣIγ = 0.67%			
● ¹⁹³ Os β ⁻ Decay (30.0 h 3) I (min) = 0.10%				● ¹⁹³ Ir IT Decay (11.9 d 5) I (min) = 0.10%			
% Feeding to ¹⁹³ Ir (11.9 d) = 0.35 3							
Auger-I	7	19.4 12	0.0029	ce-K- 1	4.16 4	0.507 15	≈0
ce-K- 4	20.71 3	0.55 6	0.0002	Auger-I	7	45.9 21	0.0069
ce-K- 6	30.882 10	2.72 20	0.0018	ce-L- 1	66.85 4	68.1 7	0.0970
Auger-F	49.6	0.49 24	0.0005	ce-M- 1	77.10 4	23.5 5	0.0386
ce-L- 2	59.593 7	16.4 10	0.0208	ce-NOP- 1	79.58 4	7.93 22	0.0134
ce-K- 8	62.781 7	8.1 6	0.0108	γ-ray L	9.18	22.6 21	0.0044
ce-K- 9	66.019 8	0.140 18	0.0002	γ-ray Kα ₂	63.2867 7	0.141 6	0.0002
ce-M- 2	69.838 7	4.07 25	0.0061	γ-ray Kα ₁	64.8956 7	0.242 9	0.0003
ce-NOP- 2	72.322 7	1.23 8	0.0019	γ-ray Kβ	73.6	0.105 4	0.0002
ce-L- 4	83.40 3	0.104 11	0.0002	● ¹⁹³ Pt EC Decay (50 y 9) I (min) = 0.10%			
ce-L- 6	93.574 10	0.47 4	0.0009	Auger-I	7	45.8 21	0.0069
ce-MNO- 6	103.819 10	0.144 11	0.0003	γ-ray L	9.18	22.6 21	0.0044
ce-K- 11	103.92 3	0.14 3	0.0003				
ce-K- 12	105.70 3	0.183 21	0.0004				
ce-L- 8	125.473 7	1.59 11	0.0042				
ce-M- 8	135.718 7	0.37 3	0.0011				
ce-NOP- 8	138.202 7	0.116 8	0.0003				
ce-K- 19	204.32 3	0.36 3	0.0016				
ce-K- 23	245.45 3	0.255 20	0.0013				
ce-K- 32	311.35 4	0.149 12	0.0010				
ce-K- 38	384.38 3	0.256 14	0.0021				
β ⁻ 1 max	392 5						
avq	113.3 17	0.35 4	0.0008				
β ⁻ 2 max	420 5						
avq	122.4 17	0.55 4	0.0014				
β ⁻ 3 max	437 5						
avq	128.0 17	0.104 13	0.0003				
β ⁻ 4 max	573 5						
avq	174.0 18	0.74 7	0.0027				

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
• ¹⁹³Pt IT Decay (4.33 d 3) I (min) = 0.10%			
Feeds ¹⁹³ Pt (50 y)			
ce-NCP- 1	0.9200	21100	0.0020
Auger-L	7.24	47 3	0.0072
ce-MNO- 2	9.338	8 99.260 20	0.0197
Auger-K	51	0.57 21	0.0006
ce-K- 3	57.11	3 15.5 4	0.0189
ce-L- 3	121.62	3 59.6 7	0.154
ce-M- 3	132.20	3 18.5 5	0.0524
ce-NCP- 3	134.78	3 6.25 18	0.0179
X-ray L	9.44	25 3	0.0051
γ 2	12.634	8 0.736 22	0.0002
X-ray Kα ₂	65.1220	20 4.31 14	0.0060
X-ray Kα ₁	66.8320	20 7.40 23	0.0105
X-ray Kβ	75.7	3.22 11	0.0052
γ 3	135.50	3 0.114 3	0.0093
• ¹⁹³Ir β⁻ Decay (19.15 h 3) I (min) = 0.10%			
Auger-L	7.24	0.60 7	≈0
ce-K- 8	215.146	14 0.169 22	0.0008
ce-K- 11	250.053	14 0.65 9	0.0034
ce-L- 11	314.568	14 0.27 4	0.0018
β- 1 max	453.6	20	
avg	133.4	7 0.34 5	0.0010
β- 2 max	628.9	20	
avg	193.4	7 0.173 22	0.0007
β- 3 max	739.1	20	
avg	233.0	8 0.56 7	0.0028
β- 4 max	771.8	20	
avg	244.9	8 0.62 8	0.0032
β- 5 max	983.8	20	
avg	324.7	8 1.77 22	0.0122
β- 6 max	1328.3	20	
avg	454.0	8 0.30 4	0.0029
β- 7 max	1629.0	20	
avg	583.9	9 1.34 21	0.0167
β- 8 max	1922.6	20	
avg	707.2	9 9.2 12	0.139
β- 9 max	2251.0	20	
avg	847.5	9 85.4 19	1.54
total β-			
avg	807.8	10 100.0 23	1.72
15 weak β's omitted: Eβ (avg) = 123.5; ΣIβ = 0.29%			
X-ray L	9.44	0.32 5	≈0
X-ray Kα ₂	65.1220	20 0.227 25	0.0003
X-ray Kα ₁	66.8320	20 0.39 5	0.0006
X-ray Kβ	75.7	0.169 19	0.0003
γ 8	293.541	14 2.6 4	0.0160
γ 9	300.741	14 0.35 5	0.0022
γ 11	328.448	14 13.1 17	0.0916
γ 17	589.179	17 0.140 18	0.0018
γ 21	621.971	19 0.34 5	0.0044
γ 22	645.146	20 1.17 15	0.0161
γ 32	938.71	3 0.60 8	0.0120
γ 39	1150.78	5 0.60 8	0.0146
γ 42	1183.52	5 0.30 4	0.0077
γ 56	1468.89	5 0.191 25	0.0060
76 weak γ's omitted: Eγ (avg) = 1092.6; ΣIγ = 0.88%			

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
• ¹⁹⁴Ir β⁻ Decay (171 d 11) I (min) = 0.10%			
Auger-L	7.24	22.8 16	0.0035
ce-K- 1	33.3	5 5.6 3	0.0039
Auger-K	51	0.64 23	0.0007
ce-L- 1	97.8	5 16.9 10	0.0352
ce-M- 1	108.4	5 4.37 24	0.0101
ce-K- 3	110.7152	7 0.32 6	0.0007
ce-NOP- 1	111.0	5 1.34 8	0.0032
ce-L- 3	175.2301	4 0.29 6	0.0011
ce-K- 6	250.053	14 4.58 13	0.0244
ce-K- 7	260.4	5 2.51 16	0.0139
ce-K- 8	312.4	5 0.414 25	0.0028
ce-L- 6	314.568	14 1.90 6	0.0127
ce-L- 7	324.9	5 1.01 7	0.0070
ce-M- 6	325.152	14 0.473 14	0.0033
ce-NOP- 6	327.726	14 0.145 4	0.0010
ce-MNO- 7	335.5	5 0.326 18	0.0023
ce-K- 10	404.46	3 1.93 12	0.0166
ce-L- 10	468.98	3 0.54 4	0.0054
ce-MNO-10	479.56	3 0.172 9	0.0018
ce-K- 11	484.0	5 0.49 3	0.0051
ce-K- 12	484.0	5 0.190 12	0.0020
ce-K- 13	522.1	5 0.77 5	0.0095
ce-L- 11	548.5	5 0.122 7	0.0014
ce-L- 13	586.6	5 0.180 11	0.0023
ce-K- 16	609.4	5 0.55 4	0.0071
ce-L- 16	673.9	5 0.119 7	0.0017
β- 1 max	252.5	22	
avg	69.7	7 100	0.148
X-ray L	9.44	12.3 15	0.0025
X-ray Kα ₂	65.1220	20 4.81 15	0.0067
X-ray Kα ₁	66.8320	20 8.26 23	0.0118
X-ray Kβ	75.7	3.59 12	0.0058
γ 1	111.7	5 8.9 4	0.0212
γ 3	189.1	1.6 3	0.0064
γ 5	324.0	5 2	0.0138
γ 6	328.448	14 92.90 20	0.650
γ 7	338.8	5 55 3	0.397
γ 8	390.8	5 35.1 18	0.292
γ 10	482.86	3 97 5	0.998
γ 11	562.4	5 34.7 17	0.416
γ 12	562.4	5 35.2 18	0.422
γ 13	600.5	5 62 3	0.793
γ 16	687.8	5 59 3	0.864
γ 17	1011.8	5 3.60 20	0.0776
5 weak γ's omitted: Eγ (avg) = 356.8; ΣIγ = 0.19%			
• ¹⁹⁴Au EC Decay (39.5 h 5) I (min) = 0.10%			
Auger-L	7.24	54 4	0.0084
ce-L- 1	35.7701	4 0.19 6	0.0001
Auger-K	51	3.0 11	0.0033
ce-K- 7	62.1452	7 0.130 15	0.0002
ce-K- 8	73.4352	7 0.100 14	0.0002
ce-K- 10	85.5552	7 0.168 18	0.0003
ce-K- 26	215.146	14 0.74 4	0.0034
ce-K- 29	250.053	14 3.15 11	0.0168
ce-L- 26	279.661	14 0.348 22	0.0021
ce-MNO-26	290.245	14 0.114 7	0.0007
ce-L- 29	314.568	14 1.31 5	0.0088
ce-MNO-29	325.152	14 0.424 7	0.0029
(Continued)			

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
¹⁹⁴ Au EC Decay (39.5 h 5) (Continued)				γ 109	1602.01 10	0.26 4	0.0087
β ⁺ 1 max	1159 15			γ 110	1617.73 15	0.22 4	0.0075
avg	535 7	0.64 4	0.0073	γ 111	1622.20 8	0.198 20	0.0068
β ⁺ 2 max	1487 15			γ 112	1632.86 15	0.246 17	0.0085
avg	679 7	1.02 8	0.0148	γ 113	1670.72 10	0.181 17	0.0064
total β ⁺				γ 114	1675.7 3	0.144 17	0.0051
avg	623 7	1.66 9	0.0220	γ 115	1689.70 20	0.18 3	0.0064
X-ray L	9.44	29 4	0.0059	γ 116	1715.23 6	0.71 6	0.0261
X-ray Kα ₂	65.1220 20	22.8 7	0.0316	γ 118	1735.31 10	0.30 3	0.0111
X-ray Kα ₁	66.8320 20	39.1 10	0.0556	γ 123	1785.47 7	0.41 5	0.0155
X-ray Kβ	75.7	17.0 5	0.0274	γ 124	1797.31 8	0.61 6	0.0232
γ 10	164	0.128 13	0.0004	γ 125	1803	0.19 6	0.0074
γ 16	203.01 10	0.34 4	0.0015	γ 126	1805.75 9	0.19 6	0.0071
γ 24	290.76	0.11 3	0.0007	γ 129	1829.41 10	0.249 20	0.0097
γ 26	293.541 14	11.2 6	0.0698	γ 130	1835.33 7	0.42 3	0.0165
γ 27	300.741 14	0.92 8	0.0059	γ 132	1885.9	1.85 20	0.0743
γ 28	318.14 8	0.33 6	0.0022	γ 133	1887	1.59 20	0.0641
γ 29	328.448 14	63.8 10	0.446	γ 135	1911.30 15	0.134 13	0.0055
γ 30	364.867 15	1.54 10	0.0120	γ 136	1924.18 5	2.11 12	0.0863
γ 33	449.36 7	0.172 13	0.0016	γ 137	1958.74 20	0.172 20	0.0072
γ 34	482.86 3	1.19 7	0.0122	γ 138	1969.65 7	0.46 3	0.0193
γ 35	528.76	1.72 3	0.0194	γ 140	2043.67 6	3.83 20	0.167
γ 36	530.17 3	0.56 5	0.0063	γ 145	2114.20 14	0.281 10	0.0126
γ 39	589.179 17	0.264 16	0.0033	γ 147	2215.5	0.179 13	0.0084
γ 40	593.35	0.351 6	0.0044	γ 149	2312.01 15	0.177 11	0.0087
γ 41	594.291 19	0.166 20	0.0021	70 weak γ's omitted: E _γ (avg) = 1020.2; ΣI _γ = 2.33% Maximum γ [±] -intensity = 3.32%			
γ 42	607.54 8	0.319 20	0.0041	● ¹⁹⁵ Pt IT Decay (4.02 d 1) I (min) = 0.10%			
γ 43	621.29 15	0.80 13	0.0106	ce-L- 1	6.0201 4	0.135 6	≈0
γ 44	621.971 19	1.47 12	0.0194	Auger-L	7.24	136 9	0.0209
γ 45	645.146 20	2.31 12	0.0317	ce-MNO- 1	16.6040 9	0.104 5	≈0
γ 46	668.27 10	0.116 8	0.0017	ce-L- 3	16.996 6	68.6 25	0.0248
γ 51	703.54 5	0.45 4	0.0067	ce-K- 4	20.485 20	66 4	0.0286
γ 52	736.23 15	0.133 11	0.0021	ce-MNO- 3	27.580 6	21.1 9	0.0124
γ 53	810.56 8	0.20 3	0.0034	Auger-K	51	3.0 11	0.0032
γ 55	843.89	0.134 20	0.0024	ce-K- 5	51.11 20	13.4 6	0.0145
γ 57	855.8	0.11 4	0.0020	ce-K- 6	51.362 20	1.33 9	0.0015
γ 60	889.98 4	0.17 5	0.0031	ce-L- 4	85.000 20	11.6 8	0.0209
γ 62	925.26 6	0.31 3	0.0060	ce-M- 4	95.584 20	2.68 15	0.0054
γ 63	938.71 3	1.19 7	0.0239	ce-NOP- 4	98.158 20	0.85 5	0.0018
γ 64	948.29 4	2.37 13	0.0478	ce-L- 5	115.62 20	60.7 22	0.14 ^a
γ 65	1000.12 4	0.22 5	0.0046	ce-L- 6	115.877 20	2.70 18	0.0067
γ 68	1038.56 8	0.33 5	0.0072	ce-M- 5	126.20 20	19.0 9	0.0512
γ 69	1048.58 5	0.90 6	0.0201	ce-M- 6	126.461 20	0.69 5	0.0019
γ 71	1104.06 5	2.16 12	0.0509	ce-NOP- 5	128.78 20	6.4 3	0.0177
γ 72	1119.7 4	0.13 3	0.0032	ce-NOP- 6	129.035 20	0.213 14	0.0006
γ 74	1150.78 5	1.46 9	0.0358	X-ray L	9.44	73 9	0.0147
γ 75	1156.61 6	0.45 5	0.0112	γ 3	30.876 6	2.27 11	0.0015
γ 76	1175.34 5	2.10 12	0.0525	X-ray Kα ₂	65.1220 20	22.4 12	0.0310
γ 77	1183.52 5	0.66 7	0.0167	X-ray Kα ₁	66.8320 20	38.3 19	0.0546
γ 80	1218.76 5	1.19 7	0.0308	X-ray Kβ	75.7	16.7 9	0.0269
γ 82	1291.7	0.11 3	0.0032	γ 4	98.880 20	11.3 7	0.0239
γ 83	1293.67 6	0.18 5	0.0049	γ 6	129.757 20	2.81 17	0.0078
γ 84	1302.29 8	0.28 4	0.0078	6 weak γ's omitted: E _γ (avg) = 174.4; ΣI _γ = 0.21%			
γ 85	1308.15 12	0.16 3	0.0044				
γ 87	1339.6 3	0.31 16	0.0087				
γ 88	1342.16 6	1.25 11	0.0357				
γ 89	1421.65 7	0.34 4	0.0104				
γ 90	1431.4 3	0.15 4	0.0047				
γ 92	1441.78 14	0.191 20	0.0059				
γ 93	1450.23 11	0.338 20	0.0104				
γ 94	1463.45 10	0.77 20	0.0239				
γ 95	1468.89 5	6.8 4	0.212				
γ 97	1487.05 8	0.14 4	0.0044				
γ 98	1492.18 13	0.19 3	0.0059				
γ 99	1500.5	0.402 21	0.0128				
γ 104	1562.8 3	0.33 3	0.0108				
γ 106	1592.4	1.1 6	0.0368				
γ 107	1593.5	0.6 4	0.0217				
γ 108	1595.77 10	1.9 6	0.0629				

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
• ¹⁹⁵Au EC Decay (183 d 2) I (min) = 0.10%							
Auger-L	7.24	105 8	0.0162	ce-L- 2	319.15 5	0.459 18	0.0031
ce-L- 1	16.996 6	22.6 12	0.0082	ce-MMO- 2	329.73 5	0.148 4	0.0010
ce-K- 2	20.485 20	63 4	0.0274	ce-L- 3	341.85 5	1.35 4	0.0098
ce-MMO- 1	27.580 6	6.9 4	0.0041	ce-M- 3	352.43 5	0.334 10	0.0025
Auger-K	51	3.9 14	0.0042	ce-NOP- 3	355.01 5	0.103 3	0.0008
ce-K- 3	51.362 20	0.386 19	0.0004	X-ray L	9.44	28 4	0.0056
ce-L- 2	85.000 20	11.1 7	0.0201	X-ray K α_2	65.1220 20	22.0 5	0.0305
ce-M- 2	95.584 20	2.56 15	0.0052	X-ray K α_1	66.8320 20	37.7 7	0.0537
ce-NOP- 2	98.158 20	0.81 5	0.0017	X-ray K β	75.7	16.4 4	0.0265
ce-L- 3	115.877 20	0.78 4	0.0019	γ 2	333.03 5	23.1 6	0.164
ce-MMO- 3	126.461 20	0.263 10	0.0007	γ 3	355.73 5	87.72 22	0.665
X-ray L	9.44	57 7	0.0114	γ 13	1091.40 20	0.150 7	0.0035
γ 1	30.876 6	0.75 4	0.0005	12 weak γ 's omitted: $\Sigma\gamma$ (avg) = 543.0; $\Sigma I\gamma$ = 0.17%			
X-ray K α_2	65.1220 20	29.0 14	0.0402	• ¹⁹⁶Au β^- Decay (6.183 d 10) I (min) = 0.10%			
X-ray K α_1	66.8320 20	49.7 22	0.0707	% β^- Decay = 6.93 17			
X-ray K β	75.7	21.6 11	0.0349	See also ¹⁹⁶ Au EC Decay (6.183 d)			
γ 2	98.880 20	10.9 7	0.0229	ce-K- 1	342.99 8	0.186 8	0.0014
γ 3	129.757 20	0.81 3	0.0023	β^- 1 max	258 4		
2 weak γ 's omitted: $\Sigma\gamma$ (avg) = 206.1; $\Sigma I\gamma$ = 0.02%				avg	71.3 12	6.93 17	0.0105
• ¹⁹⁵Au IT Decay (30.6 s 2) I (min) = 0.10%				γ 1	426.09 8	6.66 17	0.0604
Feeds ¹⁹⁵ Au (183 d)				• ¹⁹⁷Pt β^- Decay (18.3 h 3) I (min) = 0.10%			
Auger-L	7.42	62 4	0.0098	Auger-L	7.42	37 3	0.0059
ce-L- 1	42.45 3	71.5 6	0.0646	Auger-K	52.4	0.12 6	0.0001
ce-L- 2	47.11 3	1.50 15	0.0015	ce-L- 1	62.9992 21	54.6 24	0.0732
Auger-K	52.4	0.9 4	0.0010	ce-M- 1	73.9271 21	13.2 6	0.0208
ce-M- 1	53.38 3	21.2 5	0.0241	ce-NOP- 1	76.5932 21	4.15 19	0.0068
ce-NOP- 1	56.04 3	6.81 19	0.0081	ce-K- 2	110.70 3	3.3 3	0.0079
ce-M- 2	58.04 3	0.37 4	0.0005	ce-L- 2	177.07 3	0.57 5	0.0022
ce-NOP- 2	60.70 3	0.116 12	0.0001	ce-MMO- 2	188.00 3	0.174 15	0.0007
ce-K- 3	119.66 4	0.27 3	0.0007	β^- 1 max	450.2 6		
ce-K- 4	181.03 4	23.5 7	0.0905	avg	132.13 20	7.9 7	0.0222
ce-L- 3	186.03 4	0.241 25	0.0010	β^- 2 max	641.6 6		
ce-K- 5	237.88 10	0.22 3	0.0011	avg	197.67 22	82 4	0.345
ce-L- 4	247.40 4	4.41 13	0.0233	β^- 3 max	719.0 6		
ce-M- 4	258.33 4	1.03 3	0.0057	avg	225.32 22	11 3	0.0509
ce-NOP- 4	260.99 4	0.324 10	0.0018	total β^-	195.43 22	100 5	0.418
ce-L- 5	304.25 10	0.139 20	0.0009	avg			
X-ray L	9.7	35 4	0.0072	X-ray L	9.7	20.8 25	0.0043
γ 2	61.46 3	0.163 17	0.0002	X-ray K α_2	66.9895 8	0.93 9	0.0013
X-ray K α_2	66.9895 8	6.68 25	0.0095	X-ray K α_1	68.8037 8	1.60 14	0.0023
X-ray K α_1	68.8037 8	11.4 4	0.0167	γ 1	77.3520 20	17.0 7	0.0280
X-ray K β	78	5.00 19	0.0083	X-ray K β	78	0.70 7	0.0012
γ 3	200.38 4	1.56 15	0.0067	γ 2	191.42 3	3.5 3	0.0142
γ 4	261.75 4	68.2 7	0.380	γ 3	268.73 3	0.27 4	0.0016
2 weak γ 's omitted: $\Sigma\gamma$ (avg) = 196.7; $\Sigma I\gamma$ = 0.07%				• ¹⁹⁶Au EC Decay (6.183 d 10) I (min) = 0.10%			
%EC Decay = 93.07 17				See also ¹⁹⁶ Au β^- Decay (6.183 d)			
See also ¹⁹⁶ Au β^- Decay (6.183 d)							
Auger-L	7.24	52 4	0.0080				
Auger-K	51	2.9 11	0.0032				
ce-K- 2	254.64 5	1.20 3	0.0065				
ce-K- 3	277.34 5	3.56 11	0.0210				

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
• ¹⁹⁷ Pt IT Decay (94.4 m 8) I (min) = 0.10% %IT Decay = 96.7 10 Feeds ¹⁹⁷ Pt (18.3 h) See also ¹⁹⁷ Pt β^- Decay (94.4 m)							
Auger-L	7.24	90 6	0.0138	Auger-L	7.42	7.7 8	0.0012
ce-L- 1	39.07 5	71.7 10	0.0596	ce-K- 2	49.70 7	0.23 4	0.0002
ce-M- 1	49.65 5	18.4 6	0.0194	Auger-K	52.4	0.25 12	0.0003
Auger-K	51	1.8 7	0.0020	ce-L- 2	116.07 7	4.8 7	0.0118
ce-NOP- 1	52.23 5	5.59 17	0.0062	ce-M- 2	127.00 7	1.31 20	0.0035
ce-K- 2	268.11 20	48.6 9	0.278	ce-NOP- 2	129.66 7	0.42 7	0.0012
ce-L- 2	332.62 20	27.1 7	0.192	ce-K- 4	198.29 5	1.53 23	0.0065
ce-M- 2	343.20 20	7.26 22	0.0531	ce-L- 4	264.66 5	0.27 4	0.0015
ce-NOP- 2	345.78 20	2.30 8	0.0170	X-ray L	9.7	4.3 6	0.0009
X-ray L	9.44	48 6	0.0097	X-ray K α_2	66.9895 8	1.91 22	0.0027
γ 1	52.95 5	1.07 4	0.0012	X-ray K α_1	68.8037 8	3.3 4	0.0048
X-ray K α_2	65.1220 20	13.5 4	0.0188	X-ray K β	78	1.43 17	0.0024
X-ray K α_1	66.8320 20	23.2 6	0.0330	γ 2	130.42 7	0.23 4	0.0006
X-ray K β	75.7	10.1 3	0.0163	γ 4	279.01 5	5.0 8	0.0296
γ 2	346.50 20	11.4 4	0.0842	3 weak γ 's omitted: E γ (avg) = 194.6; $\Sigma I\gamma$ = 0.10%			
• ¹⁹⁷ Pt β^- Decay (94.4 m 8) I (min) = 0.10% % β^- Decay = 3.3 10 See also ¹⁹⁷ Pt IT Decay (94.4 m)							
Auger-L	7.42	2.0 5	0.0003	Auger-L	7.6	70 5	0.0113
ce-K- 2	49.70 7	0.11 4	0.0001	ce-K- 1	50.78 5	14.3 4	0.0155
ce-L- 2	116.07 7	2.2 7	0.0056	Auger-K	53.8	1.2 7	0.0014
ce-M- 2	127.00 7	0.62 19	0.0017	ce-K- 2	81.87 7	20.6 6	0.0358
ce-NOP- 2	129.66 7	0.20 6	0.0005	ce-L- 1	119.04 5	33.2 8	0.0842
ce-K- 4	198.29 5	0.72 22	0.0031	ce-M- 1	130.32 5	8.6 3	0.0240
ce-L- 4	264.66 5	0.13 4	0.0007	ce-NOP- 1	133.08 5	2.72 9	0.0077
β^- 1 max	709.1 7			ce-L- 2	150.13 7	51.1 9	0.163
avg	221.76 23	3.3 10	0.0156	ce-M- 2	161.41 7	15.7 4	0.0540
X-ray L	9.7	1.1 3	0.0002	ce-NOP- 2	164.17 7	5.36 16	0.0187
X-ray K α_2	66.9895 8	0.23 7	0.0003	X-ray L	10	43 5	0.0091
X-ray K α_1	68.8037 8	0.40 11	0.0006	X-ray K α_2	68.8950 20	9.8 3	0.0143
X-ray K β	78	0.17 5	0.0003	X-ray K α_1	70.8190 20	16.6 5	0.0251
γ 2	130.42 7	0.11 4	0.0003	X-ray K β	80.3	7.31 24	0.0125
γ 4	279.01 5	2.3 8	0.0139	γ 1	133.88 5	34.0 8	0.0971
3 weak γ 's omitted: E γ (avg) = 194.6; $\Sigma I\gamma$ = 0.04%				γ 2	164.97 7	0.274 9	0.0010
• ¹⁹⁷ Hg EC Decay (64.14 h 5) I (min) = 0.10%							
Auger-L	7.42	89 7	0.0141	Auger-L	7.6	2.08 16	0.0003
Auger-K	52.4	2.7 13	0.0030	ce-K- 1	328.7021 9	2.87 9	0.0201
ce-L- 1	62.9992 21	59 3	0.0797	ce-L- 1	396.9651 11	1.02 3	0.0086
ce-M- 1	73.9271 21	14.4 7	0.0227	ce-MNO- 1	408.2428 12	0.333	0.0029
ce-NOP- 1	76.5932 21	4.51 21	0.0074	β^- 1 max	284.8 7		
ce-K- 2	110.70 3	0.48 5	0.0011	avg	79.41 22	1.32 6	0.0022
X-ray L	9.7	50 6	0.0104	β^- 2 max	960.7 7		
X-ray K α_2	66.9895 8	20.7 13	0.0295	avg	314.6 3	98.65 14	0.661
X-ray K α_1	68.8037 8	35.4 22	0.0518	total β^-			
γ 1	77.3520 20	18.5 8	0.0305	avg	311.5 3	99.99 16	0.664
X-ray K β	78	15.5 10	0.0257	1 weak β^- 's omitted: E β (avg) = 467.2; $\Sigma I\beta$ = 0.03%			
γ 2	191.42 3	0.50 6	0.0020				
• ¹⁹⁸ Au β^- Decay (2.696 d 2) I (min) = 0.10%							
Auger-L	7.42	89 7	0.0141	Auger-L	7.6	2.08 16	0.0003
Auger-K	52.4	2.7 13	0.0030	ce-K- 1	328.7021 9	2.87 9	0.0201
ce-L- 1	62.9992 21	59 3	0.0797	ce-L- 1	396.9651 11	1.02 3	0.0086
ce-M- 1	73.9271 21	14.4 7	0.0227	ce-MNO- 1	408.2428 12	0.333	0.0029
ce-NOP- 1	76.5932 21	4.51 21	0.0074	β^- 1 max	284.8 7		
ce-K- 2	110.70 3	0.48 5	0.0011	avg	79.41 22	1.32 6	0.0022
X-ray L	9.7	50 6	0.0104	β^- 2 max	960.7 7		
X-ray K α_2	66.9895 8	20.7 13	0.0295	avg	314.6 3	98.65 14	0.661
X-ray K α_1	68.8037 8	35.4 22	0.0518	total β^-			
γ 1	77.3520 20	18.5 8	0.0305	avg	311.5 3	99.99 16	0.664
X-ray K β	78	15.5 10	0.0257	1 weak β^- 's omitted: E β (avg) = 467.2; $\Sigma I\beta$ = 0.03%			
γ 2	191.42 3	0.50 6	0.0020				

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
²⁰¹ Tl EC Decay (73.06 h 22) (Continued)				X-ray L	10.3	39 5	0.0086
ce-L- 6	152.59 7	2.62 14	0.0085	X-ray Kα ₂	70.8319 9	26.6 7	0.0402
ce-M- 6	163.87 7	0.61 3	0.0021	X-ray Kα ₁	72.8715 9	45.1 10	0.0701
ce-NOP- 6	166.63 7	0.196 10	0.0007	X-ray Kβ	82.6	20.0 6	0.0351
X-ray L	10	44 5	0.0095	γ 1	279.189 5	76.8 8	0.457
γ 2	30.60 3	0.220 23	0.0001	γ 2	401.315 12	3.30 16	0.0282
γ 3	32.19 3	0.220 23	0.0002	γ 3	680.502 15	0.67 8	0.0097
X-ray Kα ₂	68.8950 20	27.4 12	0.0401	● ²⁰⁴ Tl EC Decay (3.779 y 10) I (min) = 0.10%			
X-ray Kα ₁	70.8190 20	46.5 19	0.0702	%EC Decay = 2.58 6			
X-ray Kβ	80.3	20.5 9	0.0350	See also ²⁰⁴ Tl β ⁻ Decay			
γ 4	135.34 4	2.65 19	0.0076	Auger-L	7.6	1.24 10	0.0002
γ 5	165.88 7	0.160 13	0.0006	X-ray L	10	0.76 9	0.0002
γ 6	167.43 7	10.0 5	0.0357	X-ray Kα ₂	68.8950 20	0.425 15	0.0006
● ²⁰² Tl EC Decay (12.23 d 2) I (min) = 0.10%				X-ray Kα ₁	70.8190 20	0.723 25	0.0011
Auger-L	7.6	51 4	0.0083	X-ray Kβ	80.3	0.318 12	0.0005
Auger-K	53.8	2.8 17	0.0032	● ²⁰⁴ Tl β ⁻ Decay (3.779 y 10) I (min) = 0.10%			
ce-K- 1	356.458 10	2.38 8	0.0181	%β ⁻ Decay = 97.42 6			
ce-L- 1	424.721 10	0.79 3	0.0071	See also ²⁰⁴ Tl EC Decay			
ce-MNO- 1	435.998 10	0.256 3	0.0024	β ⁻ 1 max	763.40 20		
X-ray L	10	31 4	0.0067	avg	243.93 7	97.42 6	0.506
X-ray Kα ₂	68.8950 20	22.8 7	0.0335	● ²⁰⁴ Pb IT Decay (66.9 m 1) I (min) = 0.10%			
X-ray Kα ₁	70.8190 20	38.8 11	0.0586	Auger-L	8	7.1 5	0.0012
X-ray Kβ	80.3	17.1 6	0.0292	Auger-K	56.7	0.29 12	0.0004
γ 1	439.560 10	91.5 10	0.857	ce-K- 2	286.74 10	3.70 12	0.0226
γ 2	520.13 7	0.9 3	0.0101	ce-L- 2	358.88 10	1.61 5	0.0123
γ 3	959.7 4	0.12 3	0.0024	ce-M- 2	370.89 10	0.406 13	0.0032
● ²⁰³ Hg β ⁻ Decay (46.60 d 5) I (min) = 0.10%				ce-NOP- 2	373.85 10	0.131 4	0.0010
Auger-L	7.78	10.8 9	0.0018	ce-K- 5	811.15 10	0.648 20	0.0112
Auger-K	55.2	0.6 3	0.0007	ce-K- 6	823.74 15	4.83 15	0.0847
ce-K- 1	193.659 5	16.9 8	0.0697	ce-L- 5	883.29 10	0.133 4	0.0025
ce-L- 1	263.842 5	4.35 13	0.0244	ce-L- 6	895.88 15	2.83 9	0.0539
ce-M- 1	275.485 5	1.06 3	0.0062	ce-MNO- 6	907.89 15	0.911 3	0.0176
ce-NOP- 1	278.343 5	0.340 10	0.0020	X-ray L	10.6	4.9 5	0.0011
β ⁻ 1 max	212.2 20			X-ray Kα ₂	72.8042 9	2.58 8	0.0040
avg	57.7 6	100	0.123	X-ray Kα ₁	74.9694 9	4.36 12	0.0070
X-ray L	10.3	7.2 8	0.0016	X-ray Kβ	84.9	1.94 6	0.0035
X-ray Kα ₂	70.8319 9	4.75 25	0.0072	γ 1	289.25 15	0.172 22	0.0011
X-ray Kα ₁	72.8715 9	8.0 4	0.0125	γ 2	374.74 10	94.11 17	0.751
X-ray Kβ	82.6	3.55 19	0.0063	γ 3	622.2 7	0.22 3	0.0029
γ 1	279.189 5	77.3 8	0.460	γ 5	899.15 10	99.164 25	1.90
● ²⁰³ Pb EC Decay (52.02 h 5) I (min) = 0.10%				γ 6	911.74 15	91.1 3	1.77
Auger-L	7.78	59 5	0.0097	2 weak γ's omitted: E _γ (avg) = 779.7; ΣI _γ = 0.06%			
Auger-K	55.2	3.1 15	0.0037	● ²⁰⁵ Pb EC Decay (1.51E7 y 4) I (min) = 0.10%			
ce-K- 1	193.659 5	16.8 8	0.0694	Auger-L	7.78	34.0 23	0.0056
ce-L- 1	263.842 5	4.32 7	0.0243	X-ray L	10.3	22.7 23	0.0050
ce-M- 1	275.485 5	1.052 14	0.0062				
ce-NOP- 1	278.343 5	0.338 5	0.0020				
ce-K- 2	315.785 12	0.50 3	0.0034				

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
● ²⁰⁶ Bi EC Decay (6.243 d 3) I (min) = 0.10%							
Auger-L	8	70 5	0.0120	γ 64	1565.34 8	0.304 15	0.0101
Auger-K	56.7	3.6 15	0.0044	γ 66	1595.27 8	5.01 6	0.170
ce-K- 5	70.60 10	0.174 17	0.0003	γ 67	1718.70 7	31.8 4	1.17
ce-K- 6	96.02 3	22.2 5	0.0453	γ 68	1844.49 10	0.569 25	0.0223
ce-K- 10	146.26 7	0.170 9	0.0005	γ 69	1878.65 8	2.01 4	0.0803
ce-L- 6	168.16 3	3.84 14	0.0138	γ 70	1903.56 10	0.349 15	0.0142
ce-K- 11	174.71 5	1.57 3	0.0058	γ 75	2599.60 20	0.130 10	0.0072
ce-M- 6	180.17 3	0.900 17	0.0035	37 weak γ's omitted: E _γ (avg) = 928.7; ΣI _γ = 1.24%			
ce-NOP- 6	183.13 3	0.296 6	0.0012	● ²⁰⁷ Tl β ⁻ Decay (4.77 m 2) I (min) = 0.10%			
ce-L- 8	186.58 3	0.106 11	0.0004	β ⁻ 1 max	524 6		
ce-K- 13	225.67 7	0.116 5	0.0006	avg	156.3 21	0.25 5	0.0008
ce-L- 11	246.85 5	0.270 5	0.0014	β ⁻ 2 max	1422 6		
ce-K- 15	255.51 3	5.58 10	0.0304	avg	494.1 25	99.75 5	1.05
ce-K- 18	310.00 3	1.81 6	0.0120	total β ⁻			
ce-L- 15	327.65 3	0.973 15	0.0068	avg	493 3	100.00 7	1.05
ce-MNO-15	339.66 3	0.302 5	0.0022	γ 3	897.83 3	0.24 4	0.0046
ce-L- 18	382.14 3	0.309 10	0.0025	● ²⁰⁷ Bi EC Decay (33.4 y 8) I (min) = 0.10%			
ce-K- 25	409.06 4	1.428 15	0.0124	Auger-L	8	52 4	0.0088
ce-K- 26	428.18 4	1.94 7	0.0176	Auger-K	56.7	2.5 10	0.0030
ce-K- 27	449.45 4	2.15 6	0.0206	ce-K- 2	481.665 20	1.55 5	0.0159
ce-L- 25	481.20 4	0.242 8	0.0025	ce-L- 2	553.809 20	0.435 13	0.0051
ce-L- 26	500.32 4	1.21 4	0.0129	ce-MNO- 2	565.819 20	0.1436 1	0.0017
ce-MNO-26	512.33 4	0.399 4	0.0044	ce-K- 4	975.615 20	7.04 23	0.186
ce-L- 27	521.59 4	0.369 7	0.0041	ce-L- 4	1047.759 20	1.78 6	0.0398
ce-K- 31	532.48 5	0.295 8	0.0033	ce-MNO- 4	1059.769 20	0.587 8	0.0132
ce-MNO-27	533.60 4	0.121 2	0.0014	1 weak β's omitted: E _β (avg) = 386.0; ΣI _β = 0.04%			
ce-K- 32	544.25 5	0.217 7	0.0025	X-ray L	10.6	36 4	0.0081
ce-K- 39	715.10 5	0.799 24	0.0122	X-ray Kα ₂	72.8042 9	21.8 6	0.0338
ce-L- 39	787.24 5	0.174 6	0.0029	X-ray Kα ₁	74.9694 9	36.8 9	0.0588
ce-K- 42	793.01 5	0.449 15	0.0076	X-ray Kβ	84.9	16.3 5	0.0296
ce-K- 43	807.12 5	0.318 10	0.0055	γ 2	569.670 20	97.72 7	1.19
ce-K- 46	930.63 8	0.111 4	0.0022	γ 3	897.83 3	0.147 10	0.0028
X-ray L	10.6	49 5	0.0110	γ 4	1063.620 20	74.9 10	1.70
X-ray Kα ₂	72.8042 9	32.1 7	0.0497	γ 5	1442.20 20	0.147 20	0.0045
X-ray Kα ₁	74.9694 9	54.1 10	0.0865	γ 6	1770.23 4	6.84 20	0.258
X-ray Kβ	84.9	24.0 6	0.0435	● ²⁰⁸ Tl β ⁻ Decay (3.053 m 3) I (min) = 0.10%			
γ 6	184.02 3	15.8 3	0.0620	Auger-L	8	4.2 4	0.0007
γ 10	234.26 7	0.241 12	0.0012	Auger-K	56.7	0.23 10	0.0003
γ 11	262.71 5	3.02 5	0.0169	ce-K- 1	123.40 15	0.162 20	0.0004
γ 13	313.67 7	0.359 10	0.0024	ce-K- 2	145.36 15	0.13 10	0.0004
γ 15	343.51 3	23.4 3	0.171	ce-K- 3	164.61 10	0.27 20	0.0010
γ 17	386.20 7	0.516 10	0.0042	ce-K- 4	189.347 10	3.05 17	0.0123
γ 18	398.00 3	10.74 10	0.0910	ce-L- 4	261.490 10	0.52 3	0.0029
γ 22	452.84 8	0.156 8	0.0015	ce-MNO- 4	273.500 10	0.162 8	0.0009
γ 25	497.06 4	15.31 15	0.162	ce-K- 6	422.84 8	1.88 8	0.0169
γ 26	516.18 4	40.7 4	0.448	ce-L- 6	494.98 8	0.317 14	0.0033
γ 27	537.45 4	30.5 3	0.349	ce-K- 7	495.134 23	1.28 5	0.0135
γ 29	576.36 10	0.112 10	0.0014	ce-MNO- 6	506.99 8	0.104 5	0.0011
γ 30	581.97 8	0.485 25	0.0060	ce-L- 7	567.278 23	0.350 12	0.0042
γ 31	620.48 5	5.76 6	0.0761	(Continued)			
γ 32	632.25 5	4.47 5	0.0602				
γ 33	657.16 5	1.91 3	0.0267				
γ 35	739.24 8	0.157 8	0.0025				
γ 36	754.96 7	0.527 10	0.0085				
γ 38	784.58 7	0.536 10	0.0090				
γ 39	803.10 5	98.89 3	1.69				
γ 41	841.28 7	0.186 9	0.0033				
γ 42	881.01 5	66.2 7	1.24				
γ 43	895.12 5	15.65 16	0.298				
γ 46	1018.63 8	7.59 8	0.165				
γ 50	1098.26 7	13.50 15	0.316				
γ 51	1142.37 10	0.111 5	0.0027				
γ 53	1194.69 8	0.277 15	0.0070				
γ 54	1202.58 10	0.105 6	0.0027				
γ 58	1332.33 10	0.282 15	0.0080				
γ 59	1405.01 8	1.434 25	0.0429				
γ 62	1496.18 8	0.176 10	0.0056				
γ 63	1560.30 8	0.378 20	0.0126				

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
²⁰⁸ Tl β ⁻ Decay (3.053 m 3) (Continued)				● ²⁰⁹ Tl β ⁻ Decay (2.20 m 7) I (min) = 0.10% Feeds ²⁰⁹ Pb			
ce-MNO- 7	579.288 23	0.115 2	0.0014	Auger-L	8	12.5 10	0.0021
ce-K- 15	772.37 8	0.280 10	0.0046	ce-K- 1	29.207 21	18.3 5	0.0114
ce-K- 27	2526.66 10	0.160 5	0.0086	Auger-K	56.7	0.7 3	0.0008
β ⁻ 1 max	812 4			ce-L- 1	101.350 21	3.54 10	0.0076
avg	257.8 15	0.222 16	0.0012	ce-M- 1	113.360 21	0.831 25	0.0020
β ⁻ 2 max	867 4			ce-NOP- 1	116.317 21	0.266 8	0.0007
avg	278.2 15	0.164 13	0.0010	ce-K- 2	377.06 3	2.36 7	0.0190
β ⁻ 3 max	1031 4			ce-L- 2	449.20 3	0.799 24	0.0076
avg	340.2 16	2.92 24	0.0212	ce-MNO- 2	461.21 3	0.263 8	0.0026
β ⁻ 4 max	1072 4			ce-K- 3	1478.95 6	0.234 7	0.0074
avg	356.0 16	0.58 5	0.0044				
β ⁻ 5 max	1283 4			β ⁻ 1 max	1825 15		
avg	438.7 16	23.2 11	0.217	avg	659 7	100	1.40
β ⁻ 6 max	1517 4			X-ray L	10.6	8.7 9	0.0020
avg	532.5 17	22.7 6	0.257	X-ray Kα ₂	72.8042 9	5.88 19	0.0091
β ⁻ 7 max	1794 4			X-ray Kα ₁	74.9694 9	9.9 3	0.0159
avg	646.5 17	49.3 18	0.679	X-ray Kβ	84.9	4.41 15	0.0080
total β ⁻				γ 1	117.211 21	77.0 5	0.192
avg	558.8 18	99.3 22	1.18	γ 2	465.065 25	96.58 10	0.957
				γ 3	1566.95 6	99.689 9	3.33
6 weak β's omitted: Eβ(avg) = 223.5; ΣIβ = 0.20%				● ²⁰⁹ Pb β ⁻ Decay (3.253 h 14) I (min) = 0.10%			
X-ray L	10.6	2.9 3	0.0007	β ⁻ 1 max	644.6 12		
X-ray Kα ₂	72.8042 9	2.03 9	0.0031	avg	197.6 5	100	0.421
X-ray Kα ₁	74.9694 9	3.43 15	0.0055				
X-ray Kβ	84.9	1.52 7	0.0028	● ²⁰⁹ Po α Decay (102 y 5) I (min) = 0.10% %α Decay = 99.74 3 Feeds ²⁰⁹ Pb See also ²⁰⁹ Po EC Decay			
γ 1	211.40 15	0.170 20	0.0008	ce-NOP- 1	1.434 7	50 50	0.0015
γ 2	233.36 15	0.31 3	0.0015	ce-K- 3	172.50 5	0.129 15	0.0005
γ 3	252.61 10	0.80 5	0.0043	α 1	4617 5	0.565 14	0.0555
γ 4	277.351 10	6.8 3	0.0401	α 2	4882 3	99.17 4	10.31
γ 6	510.84 8	21.6 9	0.235	γ 3	260.50 5	0.262 13	0.0015
γ 7	583.139 23	84.2 14	1.05	9 weak γ's omitted: Eγ(avg) = 266.1; ΣIγ = 0.09%			
γ 11	722.04 12	0.203 14	0.0031	● ²⁰⁹ Po EC Decay (102 y 5) I (min) = 0.10% %EC Decay = 0.26 3 See also ²⁰⁹ Po α Decay			
γ 13	763.13 8	1.64 9	0.0266	Auger-L	8.15	0.119 15	≈ 0
γ 15	860.37 8	12.46 21	0.228	γ 1	896.40 20	0.25 3	0.0049
γ 17	927.60 20	0.125 11	0.0025				
γ 18	982.70 20	0.197 15	0.0041				
γ 19	1093.90 20	0.37 4	0.0086				
γ 27	2614.66 10	99.800 10	5.56				
14 weak γ's omitted: Eγ(avg) = 840.4; ΣIγ = 0.36%							
● ²⁰⁸ Bi EC Decay (3.68E5 y 4) I (min) = 0.10%							
Auger-L	8	45 4	0.0076				
Auger-K	56.7	1.4 6	0.0017				
ce-K- 1	2526.66 10	0.160 5	0.0086				
X-ray L	10.6	31 3	0.0070				
X-ray Kα ₂	72.8042 9	12.3 4	0.0191				
X-ray Kα ₁	74.9694 9	20.8 6	0.0332				
X-ray Kβ	84.9	9.2 3	0.0167				
γ 1	2614.66 10	99.800 10	5.56				

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
<p>● ²¹⁰Tl β⁻ Decay (1.30 m 3) I (min) = 0.10% Feeds ²¹⁰Pb</p>							
Auger-L	8	18 6	0.0031	β ⁻ 1 max	16.5 5		
ce-K- 1	10 30	2.1 11	0.0004	avg	4.14 13	80.2 16	0.0071
Auger-K	56.7	0.29 13	0.0003	β ⁻ 2 max	63.0 5		
ce-L- 1	80 30	20 10	0.0345	avg	16.13 14	19.8 16	0.0068
ce-M- 1	90 30	5 3	0.0104	total β ⁻	6.51 18	100.0 23	0.0139
ce-NOP- 1	100 30	1.7 9	0.0035	X-ray L	10.8	24.3 25	0.0056
ce-K- 2	210.0 10	5.3 7	0.0236	γ 1	46.503 15	4.05 8	0.0040
ce-K- 3	268 10	0.9 5	0.0052	<p>● ²¹⁰Bi β⁻ Decay (5.013 d 5) I (min) = 0.10% %β⁻ Decay = 99.99987 1 Feeds ²¹⁰Po %α Decay = 0.00013 1</p>			
ce-L- 2	282.1 10	3.1 4	0.0187	β ⁻ 1 max	1161.4 10		
ce-M- 2	294.1 10	0.80 11	0.0050	avg	389.0 4	99.9998	0.829
ce-NOP- 2	297.1 10	0.26 4	0.0016	<p>● ²¹⁰Po α Decay (138.378 d 7) I (min) = 0.10%</p>			
ce-L- 3	340 10	0.15 8	0.0011	α 1	5304.51 7	99.9989	11.30
ce-K- 7	711.70 10	0.807 25	0.0122	<p>● ²¹¹Pb β⁻ Decay (36.1 m 2) I (min) = 0.10% Feeds ²¹¹Bi</p>			
ce-L- 7	783.84 10	0.176 6	0.0029	Auger-L	8.15	0.38 8	≈0
β ⁻ 1 max	1320 100			ce-L- 1	49.032 14	0.31 10	0.0003
avg	450 40	25	0.240	ce-K- 11	314.317 10	0.24 7	0.0016
β ⁻ 2 max	1870 100			ce-K- 12	336.552 10	0.20 6	0.0014
avg	680 50	56	0.811	β ⁻ 1 max	264 6		
β ⁻ 3 max	2340 100			avg	72.8 18	0.66 19	0.0010
avg	870 50	19	0.352	β ⁻ 2 max	541 6		
total β ⁻	660 50	100	1.40	avg	161.9 21	5.0 15	0.0172
X-ray L	10.6	13 5	0.0028	β ⁻ 3 max	968 6		
X-ray Kα ₂	72.8042 9	2.5 4	0.0040	avg	315.6 23	1.3 4	0.0087
X-ray Kα ₁	74.9694 9	4.3 7	0.0069	β ⁻ 4 max	1373 6		
X-ray KB	84.9	1.9 3	0.0035	avg	473.3 24	93.0 20	0.938
γ 1	100 30	4.0 20	0.0082	total β ⁻	453 3	100 3	0.965
γ 2	298.0 10	79 10	0.503	<p>5 weak β⁻'s omitted: Σβ (avg) = 70.9; ΣIβ = 0.09%</p>			
γ 3	356 10	4.0 20	0.0300	X-ray L	10.8	0.28 6	≈0
γ 4	382 10	3.0 20	0.0242	X-ray Kα ₂	74.8148 10	0.12 3	0.0002
γ 5	480 20	2.0 10	0.0202	X-ray Kα ₁	77.1079 10	0.21 5	0.0003
γ 6	670 20	2.0 10	0.0282	γ 11	404.843 10	2.9 9	0.0254
γ 7	799.70 10	98.96 5	1.69	γ 12	427.078 10	1.3 4	0.0120
γ 8	860 30	6.9 20	0.127	γ 22	704.59 3	0.37 11	0.0055
γ 9	910 30	3.0 20	0.0575	γ 23	766.47 3	0.54 16	0.0088
γ 10	1060 20	12 5	0.268	γ 24	831.96 3	2.9 9	0.0507
γ 11	1110 20	6.9 20	0.164	<p>28 weak γ's omitted: Σγ (avg) = 517.6; ΣIγ = 0.47%</p>			
γ 12	1210 20	17 4	0.434	Auger-L	8.15	34 3	0.0058
γ 13	1310 20	21 5	0.580	ce-L- 1	30.115 15	57.9 21	0.0372
γ 14	1410 20	4.9 20	0.149	ce-MNO- 1	42.504 15	18.1 4	0.0164
γ 15	1490 20	2.0 10	0.0628	<p>● ²¹⁰Pb β⁻ Decay (22.26 y 22) I (min) = 0.10% %β⁻ Decay = 99.9999983 3 Feeds ²¹⁰Bi (5.013 d) %α Decay = 0.0000017 3</p>			
γ 16	1540 30	2.0 10	0.0649				
γ 17	1590 30	2.0 10	0.0670				
γ 18	1650 30	2.0 10	0.0696				
γ 19	2010 30	6.9 20	0.297				
γ 20	2090 30	4.9 20	0.220				
γ 21	2280 30	3.0 20	0.144				
γ 22	2360 30	8 3	0.398				
γ 23	2430 30	9 3	0.461				

²¹¹Bi--²¹²Bi

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
<p>● ²¹¹Bi α Decay (2.13 m 2) I (min) = 0.10% %α Decay = 99.727 4 Feeds ²⁰⁷Tl See also ²¹¹Bi β⁻ Decay</p>				<p>● ²¹²Pb β⁻ Decay (10.643 h 12) I (min) = 0.10% Feeds ²¹²Bi</p>			
Auger-L	7.78	1.57 12	0.0003	Auger-L	8.15	21.4 18	0.0037
ce-K- 1	265.54 5	2.66 8	0.0151	ce-K- 1	24.664 6	3.48 11	0.0018
ce-L- 1	335.72 5	0.462 15	0.0033	Auger-K	58.2	1.2 6	0.0015
ce-MNO- 1	347.37 5	0.142 5	0.0011	ce-L- 1	98.802 6	0.61 3	0.0013
α 1	6278.8 6	16.23 20	2.17	ce-MNO- 1	111.191 6	0.192 6	0.0005
α 2	6623.1 6	83.50 20	11.78	ce-K- 3	148.099 6	33.1 13	0.104
X-ray L	10.3	1.05 12	0.0002	ce-K- 4	209.561 10	1.34 6	0.0060
X-ray Kα ₂	70.8319 9	0.75 3	0.0011	ce-L- 3	222.238 6	5.71 22	0.0271
X-ray Kα ₁	72.8715 9	1.27 5	0.0020	ce-M- 3	234.626 6	1.35 5	0.0067
X-ray Kβ	82.6	0.560 20	0.0010	ce-MOP- 3	237.687 6	0.451 17	0.0023
γ 1	351.07 5	12.94 18	0.0968	ce-L- 4	283.699 10	0.232 10	0.0014
<p>● ²¹¹Bi β⁻ Decay (2.13 m 2) I (min) = 0.10% %β⁻ Decay = 0.273 4 Feeds ²¹¹Po (0.516 s) See also ²¹¹Bi α Decay</p>				<p>β⁻ 1 max 158 4 avg 41.9 11 5.22 15 0.0047 β⁻ 2 max 334 4 avg 94.4 12 85.1 20 0.171 β⁻ 3 max 573 4 avg 172.7 13 9.9 20 0.0364 total β⁻ avg 99.4 13 100 3 0.212</p>			
β ⁻ 1 max	579 6			X-ray L	10.8	15.5 16	0.0036
avg	174.6 21	0.273 4	0.0010	X-ray Kα ₂	74.8148 10	10.7 5	0.0170
<p>● ²¹¹Po α Decay (0.516 s 3) I (min) = 0.10%</p>				<p>X-ray Kα₁ 77.1079 10 18.0 7 0.0296 X-ray Kβ 87.3 8.0 4 0.0149 γ 1 115.190 6 0.602 18 0.0015 γ 3 238.625 6 44.6 10 0.227 γ 4 300.087 10 3.41 10 0.0218</p>			
α 1	6570.0 25	0.537 19	0.0751	<p>2 weak γ's omitted: E_γ(avg) = 176.7; ΣI_γ = 0.05%</p>			
α 2	6892.8 18	0.546 19	0.0802	<p>● ²¹²Bi α Decay (60.55 m 6) I (min) = 0.10% %α Decay = 35.93 6 Feeds ²⁰⁸Tl See also ²¹²Bi β⁻ Decay</p>			
α 3	7450.4 16	98.92 3	15.70	Auger-L	7.78	11.5 9	0.0019
γ 2	569.670 20	0.538 19	0.0065	ce-L- 1	24.510 5	19.1 8	0.0100
γ 3	897.83 3	0.52 4	0.0100	ce-MNO- 1	36.153 5	5.92 24	0.0046
<p>● ²¹¹At α Decay (7.214 h 7) I (min) = 0.10% %α Decay = 41.7 2 Feeds ²⁰⁷Bi See also ²¹¹At EC Decay</p>				<p>ce-K- 4 202.54 7 0.118 8 0.0005</p>			
α 1	5867.0 20	41.70 20	5.21	α 1	5607.1 3	0.402	0.0481
<p>● ²¹¹At EC Decay (7.214 h 7) I (min) = 0.10% %EC Decay = 58.3 2 Feeds ²¹¹Po (0.516 s) See also ²¹¹At α Decay</p>				<p>α 2 5768.1 3 0.600 8 0.0737 α 3 6050.77 7 25.22 9 3.25 α 4 6090.06 8 9.63 8 1.25</p>			
Auger-L	8.33	26.1 20	0.0046	<p>4 weak α's omitted: E_α(avg) = 5612.7; ΣI_α = 0.07%</p>			
Auger-K	59.7	1.3 7	0.0017	X-ray L	10.3	7.7 9	0.0017
X-ray L	11	19.7 20	0.0047	γ 1	39.857 5	1.02 4	0.0009
X-ray Kα ₂	76.862 5	12.7 3	0.0208	γ 4	288.07 7	0.317 17	0.0019
X-ray Kα ₁	79.290 5	21.3 4	0.0359	γ 6	327.96 10	0.130 11	0.0009
X-ray Kβ	89.8	9.55 22	0.0183	γ 8	452.83 10	0.348 18	0.0034
γ 1	687.00 10	0.245 16	0.0036	<p>5 weak γ's omitted: E_γ(avg) = 379.5; ΣI_γ = 0.09%</p>			

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
<p>• ²¹²Bi β^- Decay (60.55 m 6) I (min) = 0.10% %β^- Decay = 64.07 6 Feeds ²¹²Po See also ²¹²Bi α Decay</p>				<p>• ²¹³Bi β^- Decay (45.65 m 5) I (min) = 0.10% %β^- Decay = 97.84 11 Feeds ²¹³Po See also ²¹³Bi α Decay</p>			
ce-K- 1	634.06 10	0.125 5	0.0017	Auger-L	8.33	2.4 3	0.0004
<p>3 weak α's omitted: $\Sigma\alpha$ (avg) = 10367.5; $\Sigma I\alpha$ = 0.01%</p>				Auger-K	59.7	0.13 7	0.0002
β^- 1 max	440 4			ce-K- 1	199.75 10	0.34 6	0.0018
avg	128.1 13	1.17 5	0.0032	ce-K- 2	347.315 21	4.1 4	0.0302
β^- 2 max	567 4			ce-L- 2	423.481 23	0.72 7	0.0065
avg	170.3 14	0.43 3	0.0016	ce-MNO- 2	436.271 21	0.226 21	0.0021
β^- 3 max	625 4			β^- 1 max	320 10		
avg	190.6 14	3.44 10	0.0140	avg	90 3	1.06 10	0.0020
β^- 4 max	733 4			β^- 2 max	980 10		
avg	228.7 15	2.61 7	0.0127	avg	319 4	32 3	0.217
β^- 5 max	1519 4			β^- 3 max	1127 10		
avg	530.7 17	8.0 3	0.0904	avg	376 4	0.70 19	0.0056
β^- 6 max	2246 4			β^- 4 max	1420 10		
avg	831.6 17	48.4 3	0.857	avg	491 4	64 3	0.669
total β^-				total β^-			
avg	717.3 21	64.1 5	0.979	avg	430 5	98 5	0.894
<p>1 weak β's omitted: $\Sigma\beta$ (avg) = 129.7; $\Sigma I\beta$ = 0.05%</p>				X-ray L	11	1.83 23	0.0004
γ 1	727.17 10	11.8 3	0.183	X-ray K α_2	76.862 5	1.25 12	0.0020
γ 2	785.46 7	1.97 5	0.0329	X-ray K α_1	79.290 5	2.10 19	0.0035
γ 3	893.43 9	0.652 20	0.0124	X-ray K β	89.8	0.94 9	0.0018
γ 4	952.10 10	0.313 18	0.0064	γ 1	292.86 10	0.74 13	0.0046
γ 6	1078.62 10	0.95 3	0.0219	γ 2	440.420 20	28.0 25	0.262
γ 7	1512.75 10	0.56 5	0.0179	γ 3	659.81 10	0.148 19	0.0021
γ 8	1620.62 10	2.75 10	0.0949	γ 4	807.36 4	0.44 4	0.0076
γ 9	1679.5 5	0.121 20	0.0043	γ 5	1100.14 6	0.48 5	0.0112
γ 11	1806.0 5	0.20 4	0.0076	<p>• ²¹³Po α Decay (4.2E-6 s 8) I (min) = 0.10% Feeds ²⁰⁹Pb</p>			
<p>2 weak γ's omitted: $\Sigma\gamma$ (avg) = 1074.0; $\Sigma I\gamma$ = 0.03%</p>				α 1	8377 5	99.996 1	17.84
<p>• ²¹²Po α Decay (2.98E-7 s 3) I (min) = 0.10%</p>				<p>• ²¹⁴Pb β^- Decay (26.8 m) I (min) = 0.10% Feeds ²¹⁴Bi</p>			
α 1	8784.90 12	100	18.71	Auger-L	8.15	18.6 15	0.0032
<p>• ²¹³Bi α Decay (45.65 m 5) I (min) = 0.10% %α Decay = 2.16 11 Feeds ²⁰⁹Tl See also ²¹³Bi β^- Decay</p>				ce-L- 1	36.838 14	10.7 6	0.0084
α 1	5549 10	0.16 4	0.0189	ce-M- 1	49.227 14	2.51 13	0.0026
α 2	5870 6	2.00 11	0.250	ce-NOP- 1	52.288 14	0.84 5	0.0009
γ 1	323.81 5	0.13 3	0.0009	Auger-K	58.2	0.7 4	0.0008
<p>Auger-K</p>							
<p>ce-K- 5 151.455 8 5.29 16 0.0171</p>							
<p>ce-K- 6 168.26 6 0.19 14 0.0007</p>							
<p>ce-K- 8 204.687 8 7.5 4 0.0326</p>							
<p>ce-L- 5 225.593 8 0.92 3 0.0044</p>							
<p>ce-MNO- 5 237.982 8 0.290 9 0.0015</p>							
<p>ce-K- 12 261.395 8 9.1 6 0.0506</p>							
<p>ce-L- 8 278.825 8 1.34 5 0.0079</p>							
<p>ce-M- 8 291.214 8 0.316 11 0.0020</p>							
<p>ce-NOP- 8 294.275 8 0.105 4 0.0007</p>							
<p>ce-L- 12 335.533 8 1.60 7 0.0114</p>							
<p>ce-M- 12 347.922 8 0.376 13 0.0028</p>							
<p>ce-NOP-12 350.983 8 0.125 5 0.0009</p>							
<p>β^- 1 max 185 12</p>							
<p>avg 50 4 2.55 8 0.0027</p>							
<p>β^- 2 max 490 12</p>							
<p>avg 145 4 0.83 6 0.0026</p>							

(Continued)

²¹⁴Pb-²¹⁴Bi

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
²¹⁴ Pb β ⁻ Decay (26.8 m) (Continued)				6-13 max 1122 12			
β- 3 max	672 12			avg	374 5	0.43 6	0.0034
avg	207 5	48.0 14	0.212	β-14 max	1151 12		
β- 4 max	729 12			avg	385 5	4.43 15	0.0363
avg	227 5	42.5 12	0.205	β-15 max	1181 12		
β- 5 max	1024 12			avg	397 5	0.144 9	0.0012
avg	337 5	6.3 20	0.0452	β-16 max	1253 12		
total β- avg	219 6	100 3	0.468	avg	425 5	2.50 8	0.0226
X-ray L	10.8	13.5 14	0.0031	β-17 max	1259 12		
γ 1	53.226 14	1.11 6	0.0013	avg	427 5	1.50 6	0.0136
X-ray Kα ₂	74.8148 10	6.21 23	0.0099	β-18 max	1275 12		
X-ray Kα ₁	77.1079 10	10.5 4	0.0172	avg	434 5	1.19 5	0.0110
X-ray Kβ	87.3	4.67 18	0.0087	β-19 max	1380 12		
γ 5	241.981 8	7.49 21	0.0386	avg	475 5	1.59 7	0.0161
γ 6	258.79 6	0.553 25	0.0030	β-20 max	1423 12		
γ 7	274.53 5	0.33 5	0.0019	avg	492 5	8.34 23	0.0874
γ 8	295.213 8	19.2 6	0.121	β-21 max	1505 12		
γ 12	351.921 8	37.2 11	0.279	avg	525 5	17.7 5	0.198
γ 13	462.10 20	0.17 3	0.0017	β-22 max	1527 12		
γ 14	480.42 8	0.340 20	0.0035	avg	534 5	0.256 18	0.0029
γ 15	487.08 8	0.441 18	0.0046	β-23 max	1540 12		
γ 17	533.69 8	0.190 15	0.0022	avg	539 5	17.9 5	0.206
γ 20	580.15 4	0.365 18	0.0045	β-24 max	1609 12		
γ 21	785.910 20	1.10 4	0.0183	avg	567 5	0.88 12	0.0106
γ 22	839.025 15	0.59 3	0.0105	β-25 max	1727 12		
9 weak γ's omitted: E _γ (avg) = 280.7; ΣI _γ = 0.33%				avg	615 5	3.38 12	0.0443
● ²¹⁴ Bi β ⁻ Decay (19.9 m 4) I (min) = 0.10%				β-26 max	1855 12		
%β ⁻ Decay = 99.979 1				avg	668 5	1.01 6	0.0144
Feeds ²¹⁴ Po				β-27 max	1892 12		
%α Decay = 0.021 1				avg	684 5	7.86 24	0.115
Auger-L	8.33	0.69 6	0.0001	β-28 max	1995 12		
ce-K- 30	516.207 8	0.69 3	0.0076	avg	726 5	0.22 6	0.0034
ce-L- 30	592.373 13	0.195 8	0.0025	β-29 max	2661 12		
ce-K- 78	1027.182 11	0.192 12	0.0042	avg	1007 6	0.6 3	0.0129
ce-K- 98	1322.695 4	0.385 17	0.0109	β-30 max	3270 12		
β- 1 max	541 12			avg	1269 6	17.2 22	0.465
avg	162 4	0.41 3	0.0014	total β- avg	632 6	100.0 24	1.35
β- 2 max	551 12			18 weak β's omitted: E _β (avg) = 158.6; ΣI _β = 0.36%			
avg	165 4	0.211 15	0.0007	X-ray L	11	0.52 6	0.0001
β- 3 max	575 12			X-ray Kα ₂	76.862 5	0.360 13	0.0006
avg	173 5	0.118 11	0.0004	X-ray Kα ₁	79.290 5	0.603 20	0.0010
β- 4 max	762 12			X-ray Kβ	89.8	0.271 10	0.0005
avg	239 5	0.11 3	0.0006	γ 1	273.7 4	0.18 3	0.0010
β- 5 max	764 12			γ 11	387.0 3	0.37 6	0.0030
avg	240 5	0.205 21	0.0010	γ 12	389.1 3	0.41 5	0.0034
β- 6 max	788 12			γ 15	405.74 3	0.168 11	0.0014
avg	248 5	1.07 5	0.0057	γ 16	426.5 5	0.11 3	0.0010
β- 7 max	822 12			γ 18	454.77 12	0.320 16	0.0031
avg	261 5	2.81 13	0.0156	γ 19	469.69 12	0.133 9	0.0013
β- 8 max	977 12			γ 20	474.38 10	0.118 13	0.0012
avg	318 5	0.56 4	0.0038	γ 30	609.312 7	46.3 12	0.601
β- 9 max	1003 12			γ 39	665.453 22	1.57 7	0.0222
avg	328 5	0.14 5	0.0010	γ 44	703.11 4	0.474 23	0.0071
β-10 max	1061 12			γ 46	719.86 3	0.405 23	0.0062
avg	350 5	0.336 22	0.0025	γ 51	752.84 3	0.133 11	0.0021
β-11 max	1066 12			γ 52	768.356 10	5.04 15	0.0825
avg	352 5	5.61 17	0.0421	γ 53	786.1 4	0.32 10	0.0053
β-12 max	1077 12			γ 55	806.174 18	1.23 5	0.0212
avg	357 5	0.89 4	0.0068	γ 57	821.18 3	0.151 17	0.0026
				γ 61	904.25 25	0.106 14	0.0020
				γ 63	934.061 12	3.21 10	0.0638
				γ 65	964.08 3	0.385 22	0.0079
				γ 73	1051.96 3	0.317 16	0.0071
				γ 75	1069.96 8	0.286 21	0.0065
				γ 78	1120.287 10	15.1 5	0.361
				γ 80	1133.66 3	0.256 18	0.0062
				γ 81	1155.190 20	1.70 7	0.0418
				γ 83	1207.68 3	0.462 22	0.0119

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
γ 86	1238.110 12	5.94 17	0.157
γ 87	1280.960 20	1.48 7	0.0404
γ 88	1303.76 8	0.121 12	0.0034
γ 93	1377.669 12	4.11 13	0.120
γ 94	1385.31 3	0.78 4	0.0230
γ 96	1401.50 4	1.39 6	0.0415
γ 97	1407.98 4	2.49 8	0.0746
γ 102	1509.228 15	2.22 7	0.0714
γ 103	1538.50 6	0.41 6	0.0136
γ 104	1543.32 6	0.36 5	0.0117
γ 105	1583.22 4	0.72 4	0.0243
γ 106	1594.73 8	0.266 21	0.0091
γ 107	1599.31 6	0.336 22	0.0114
γ 110	1661.28 6	1.15 5	0.0409
γ 111	1683.99 4	0.237 21	0.0085
γ 112	1729.595 15	2.97 11	0.109
γ 113	1764.494 14	15.8 5	0.595
γ 116	1838.36 5	0.385 22	0.0151
γ 117	1847.420 25	2.09 7	0.0823
γ 118	1873.16 6	0.227 21	0.0091
γ 120	1896.3 3	0.178 21	0.0072
γ 132	2118.55 3	1.17 4	0.0530
γ 136	2204.22 4	4.98 16	0.234
γ 142	2293.36 12	0.326 22	0.0159
γ 151	2447.86 10	1.56 5	0.0813

131 weak γ's omitted:
E_γ(avg) = 1158.0; ΣI_γ = 3.51%

• ²¹⁴Po α Decay (1.637E-4 s 2) I (min) = 0.10%
Feeds ²¹⁰Pb

α 1	7687.09 6	99.989	16.37
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2 weak α's omitted:
E_α(avg) = 6892.4; ΣI_α = 0.01%

2 weak γ's omitted:
E_γ(avg) = 797.3; ΣI_γ = 0.01%

• ²¹⁵Po α Decay (0.001778 s 5) I (min) = 0.10%
%α Decay = 99.99977 2
Feeds ²¹¹Pb

α 1	7386.4 8	99.9437	15.72
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2 weak α's omitted:
E_α(avg) = 6954.1; ΣI_α = 0.06%

1 weak γ's omitted:
E_γ(avg) = 438.7; ΣI_γ = 0.03%

• ²¹⁶Po α Decay (0.146 s 3) I (min) = 0.10%
Feeds ²¹²Pb

α 1	6778.5 5	99.998	14.44
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Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
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• ²¹⁷At α Decay (0.0323 s 4) I (min) = 0.10%
Feeds ²¹³Bi

α 1	7066 3	99.934 13	15.04
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3 weak α's omitted:
E_α(avg) = 6622.3; ΣI_α = 0.07%

5 weak γ's omitted:
E_γ(avg) = 594.5; ΣI_γ = 0.04%

• ²¹⁸Po α Decay (3.05 m) I (min) = 0.10%
%α Decay = 99.980 2
Feeds ²¹⁴Pb

α 1	6002.55 9	99.978 2	12.78
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%β⁻ Decay = 0.020 2

• ²¹⁸Rn α Decay (0.035 s 5) I (min) = 0.10%
Feeds ²¹⁴Po

α 1	6535.0 20	0.127 5	0.0177
α 2	7133.0 20	99.873 7	15.17

γ 1	609.312 7	0.124 5	0.0016
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• ²¹⁹Rn α Decay (3.96 s 1) I (min) = 0.10%
Feeds ²¹⁵Po

Auger-L	8.33	1.38 12	0.0002
ce-K- 2	37.49 3	0.40 5	0.0003
ce-L- 2	113.65 4	0.111 12	0.0003
ce-K- 4	178.128 11	1.23 10	0.0047
ce-L- 4	254.294 15	0.72 3	0.0039
ce-M- 4	267.084 11	0.249 10	0.0014
ce-K- 12	308.706 11	0.230 13	0.0015
ce-L- 12	384.872 15	0.101 6	0.0008

α 1	6424.7	7.5 5	1.03
α 2	6529	0.12	0.0167
α 3	6552.8	12.9 6	1.80
α 4	6819.3 3	79.6 10	11.56

8 weak α's omitted:
E_α(avg) = 6230.7; ΣI_α = 0.09%

X-ray L	11	1.04 11	0.0002
X-ray Kα ₂	76.862 5	0.53 4	0.0009
X-ray Kα ₁	79.290 5	0.88 6	0.0015
X-ray Kβ	89.8	0.395 25	0.0008
γ 2	130.59 3	0.116 12	0.0003
γ 4	271.233 10	10.6 4	0.0612
γ 12	401.811 10	6.5 3	0.0556

19 weak γ's omitted:
E_γ(avg) = 388.4; ΣI_γ = 0.20%

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
<p>● ²²⁰Rn α Decay (55.61 s 4) I (min) = 0.10% Feeds ²¹⁶Po</p>				<p>● ²²²Ra α Decay (38.0 s 5) I (min) = 0.10% Feeds ²¹⁸Rn</p>			
α 1	6288.29 10	99.903 8	13.38	Auger-L	8.7	0.126 13	\approx 0
<p>1 weak α's omitted: $E\alpha$ (avg) = 5747.0; $\Sigma I\alpha$ = 0.10%</p>				ce-K- 2	225.82 6	0.163 7	0.0008
<p>1 weak γ's omitted: $E\gamma$ (avg) = 549.7; $\Sigma I\gamma$ = 0.10%</p>				ce-L- 2	306.17 7	0.107 5	0.0007
<p>● ²²¹Fr α Decay (4.8 m 1) I (min) = 0.10% Feeds ²¹⁷At</p>				α 1	6235 4	3.05 5	0.405
ce-K- 2	3.77 20	0.6 4	\approx 0	α 2	6556 5	96.90 10	13.53
Auger-L	8.52	2.8 4	0.0005	<p>3 weak α's omitted: $E\alpha$ (avg) = 5807.8; $\Sigma I\alpha$ = 0.01%</p>			
ce-K- 3	22.47 20	0.22 12	0.0001	X-ray L	11.7	0.112 13	\approx 0
ce-K- 4	54.27 20	0.11 5	0.0001	γ 2	324.22 5	2.77 8	0.0191
ce-L- 2	82.01 21	0.69 19	0.0012	<p>5 weak γ's omitted: $E\gamma$ (avg) = 499.1; $\Sigma I\gamma$ = 0.01%</p>			
ce-MNO- 2	95.18 20	0.24 7	0.0005	<p>● ²²³Fr β^- Decay (21.8 m 4) I (min) = 0.10% β^- Decay = 99.994 Feeds ²²³Ra $\% \alpha$ Decay = 0.006</p>			
ce-K- 6	121.87 20	1.75 8	0.0045	ce-L- 5	1.06 20	4.4 13	\approx 0
ce-L- 6	200.11 21	2.17 10	0.0093	ce-MNO- 1	1.5 3	5.54 25	0.0002
ce-M- 6	213.28 20	0.57 3	0.0026	Auger-L	9	34 5	0.0065
ce-NOP- 6	216.56 20	0.196 9	0.0009	ce-L- 7	10.3633 15	1.97 11	0.0004
α 1	5938.0 20	0.130 10	0.0164	ce-L- 8	10.673 11	20 4	0.0045
α 2	5965.0 25	0.100 20	0.0127	ce-L- 9	12.393 20	4.0 24	0.0011
α 3	5979.0 20	0.49 3	0.0624	ce-MNO- 5	15.48 20	1.5 5	0.0005
α 4	6075.0 20	0.130 20	0.0168	ce-MNO- 7	24.7780 15	0.63 3	0.0003
α 5	6125.5 20	15.10 20	1.97	ce-MNO- 8	25.088 11	7.0 12	0.0037
α 6	6241.8 20	1.35 7	0.179	ce-MNO- 9	26.808 20	1.4 8	0.0008
α 7	6339.8 20	83.4 8	11.26	ce-L- 13	30.66 10	0.4 3	0.0003
<p>7 weak α's omitted: $E\alpha$ (avg) = 5833.2; $\Sigma I\alpha$ = 0.12%</p>				ce-L- 14	30.86 10	16.9 9	0.0111
X-ray L	11.4	2.3 3	0.0006	ce-L- 17	42.26 20	1.8 10	0.0016
X-ray K α_2	78.950 10	0.77 12	0.0013	ce-MNO-13	45.08 10	0.10 8	\approx 0
X-ray K α_1	81.520 10	1.29 20	0.0022	ce-M- 14	45.28 10	4.12 22	0.0040
X-ray KB	92.3	0.58 9	0.0011	ce-NOP-14	48.89 10	1.39 8	0.0014
γ 2	99.50 20	0.16 3	0.0003	ce-L- 20	49.46 10	5.1 22	0.0053
γ 6	217.60 20	12.5 4	0.0579	ce-M- 17	56.68 20	0.49 25	0.0006
γ 11	412.0 20	0.100 20	0.0009	ce-NOP-17	60.29 20	0.18 9	0.0002
<p>8 weak γ's omitted: $E\gamma$ (avg) = 211.0; $\Sigma I\gamma$ = 0.33%</p>				ce-L- 22	60.56 10	1.17 14	0.0015
<p>● ²²²Rn α Decay (3.8235 d 3) I (min) = 0.10% Feeds ²¹⁸Po</p>				ce-M- 20	63.88 10	1.3 6	0.0018
α 1	5489.7 3	99.920 10	11.68	Auger-K	65.9	0.13 8	0.0002
<p>2 weak α's omitted: $E\alpha$ (avg) = 4986.0; $\Sigma I\alpha$ = 0.08%</p>				ce-NOP-20	67.49 10	0.46 20	0.0007
<p>1 weak γ's omitted: $E\gamma$ (avg) = 512.0; $\Sigma I\gamma$ = 0.08%</p>				ce-K- 28	69.48 20	0.19 17	0.0003
				ce-MNO-22	74.98 10	0.38 5	0.0006
				ce-L- 25	81.2 5	6.6 8	0.0115
				ce-M- 25	95.6 5	1.81 21	0.0037
				ce-NOP-25	99.2 5	0.65 9	0.0014
				ce-K- 33	101.08 20	1.79 20	0.0039
				ce-K- 39	131.0 3	3.2 4	0.0088
				ce-L- 33	185.76 20	0.34 4	0.0014
				ce-MNO-33	200.18 20	0.112 11	0.0005
				ce-L- 39	215.7 3	0.61 7	0.0028
				ce-MNO-39	230.1 3	0.197 20	0.0010
				β^- 1 max	221 3		
				avg	60.1 9	0.124 9	0.0002
				β^- 2 max	322 3		
				avg	90.2 9	0.49 5	0.0009
				β^- 3 max	344 3		
				avg	97.1 9	0.108 14	0.0002

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
β ⁻ 4 max	778 3		
avg	243.0 10	1.35 10	0.0070
β ⁻ 5 max	813 3		
avg	255.7 11	0.151 25	0.0008
β ⁻ 6 max	913 3		
avg	291.9 11	10.3 9	0.0640
β ⁻ 7 max	1017 3		
avg	330.9 11	17 4	0.120
β ⁻ 8 max	1068 3		
avg	349.9 11	12.7 15	0.0947
β ⁻ 9 max	1097 3		
avg	361.1 11	57 4	0.438
total β ⁻			
avg	343.0 12	100 6	0.728

12 weak β's omitted:
Eβ(avg) = 208.2; ΣIβ = 0.39%

γ 1	6.3 3	0.120 6	≈0
X-ray L	12.3	34 5	0.0088
γ 5	20.30 20	0.76 23	0.0003
γ 13	49.90 10	0.8 6	0.0008
γ 14	50.10 10	31.7 14	0.0338
γ 20	68.70 10	0.38 16	0.0006
γ 22	79.80 10	7.6 9	0.0129
X-ray Kα ₂	85.430 10	1.47 13	0.0027
X-ray Kα ₁	88.470 10	2.42 22	0.0046
X-ray Kβ	100	1.11 10	0.0024
γ 25	100.4 5	0.95 11	0.0020
γ 26	134.60 10	0.51 6	0.0015
γ 28	173.40 20	0.127 14	0.0005
γ 30	184.80 20	0.29 4	0.0011
γ 33	205.00 20	1.08 11	0.0047
γ 39	234.9 3	2.8 3	0.0141
γ 52	289.5 3	0.228 25	0.0014
γ 59	319.40 20	0.51 6	0.0035
γ 65	369.4 3	0.101 11	0.0008
γ 104	775.30 20	0.39 5	0.0064

118 weak γ's omitted:
Eγ(avg) = 482.0; ΣIγ = 1.23%

• ²²³Ra α Decay (11.434 d 2) I (min) = 0.10%
Feeds ²¹⁹Rn

ce-NOP- 1	3.34 5	51.8	0.0037
ce-MNO- 2	5.51 5	12.6873	0.0015
ce-K- 14	8.38 4	0.17 3	≈0
Auger-L	8.7	28 3	0.0052
ce-MNO- 3	9.95 6	12.6746	0.0027
ce-L- 4	13.55 11	1.2 4	0.0003
ce-K- 18	23.915 16	7.37 13	0.0038
ce-MNO- 4	27.12 10	0.42 13	0.0002
ce-K- 20	45.831 16	12.5 3	0.0122
ce-K- 21	55.805 16	18.1 4	0.0215
ce-K- 22	60.230 16	1.97 7	0.0025
Auger-K	62.7	1.5 8	0.0020
ce-K- 27	81.12 7	0.24 3	0.0004
ce-L- 15	92.81 4	0.176 15	0.0003
ce-L- 18	104.27 4	1.38 5	0.0031
ce-M- 18	117.837 12	0.330 6	0.0008
ce-NOP-18	121.222 12	0.115 2	0.0003
ce-L- 20	126.19 4	2.33 5	0.0063
ce-L- 21	136.16 4	3.29 7	0.0095
ce-M- 20	139.753 12	0.554 21	0.0016
ce-L- 22	140.58 4	0.377 9	0.0011
ce-NOP-20	143.138 12	1.93 5	0.0059
ce-M- 21	149.727 12	0.79 3	0.0025

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
ce-NOP-21	153.112 12	0.272 6	0.0009
ce-MNO-22	154.152 12	0.122 3	0.0004
ce-K- 37	171.058 16	9.04 23	0.0330
ce-K- 40	225.466 16	1.54 8	0.0074
ce-K- 43	239.88 10	0.95 7	0.0049
ce-L- 37	251.41 4	1.66 4	0.0089
ce-M- 37	264.980 12	0.392 9	0.0022
ce-NOP-37	268.365 12	0.135 3	0.0008
ce-K- 48	273.271 20	0.126 10	0.0007
ce-L- 40	305.82 4	0.281 11	0.0018
ce-L- 43	320.23 11	0.174 9	0.0012
ce-K- 56	346.627 17	0.205 11	0.0015

α 1	5288 3	0.16	0.0180
α 2	5339 3	0.13	0.0148
α 3	5367 3	0.13	0.0149
α 4	5435 3	2.27 20	0.263
α 5	5501 3	1.00 15	0.117
α 6	5537 3	9.2 3	1.08
α 7	5606 3	24.2 4	2.89
α 8	5715 3	52.5 8	6.39
α 9	5745.0 20	9.5 6	1.16
α 10	5857.5	0.32 4	0.0399
α 11	5870.0 20	0.85 4	0.106

15 weak α's omitted:
Eα(avg) = 5348.2; ΣIα = 0.29%

X-ray L	11.7	25 3	0.0062
γ 10	80.19 3	0.200 20	0.0003
X-ray Kα ₂	81.070 20	14.9 4	0.0257
X-ray Kα ₁	83.780 20	24.7 5	0.0441
X-ray Kβ	94.9	11.2 3	0.0226
γ 12	98.234 18	0.45 5	0.0009
γ 18	122.319 10	1.190 20	0.0031
γ 20	144.235 10	3.24 7	0.0100
γ 21	154.209 10	5.58 11	0.0183
γ 22	158.634 10	0.683 14	0.0023
γ 27	179.52 6	0.136 14	0.0005
γ 37	269.462 10	13.6 3	0.0781
γ 38	288.18 3	0.151 7	0.0009
γ 40	323.870 10	3.98 12	0.0268
γ 41	328.38 3	0.195 10	0.0014
γ 43	338.28 10	2.73 12	0.0197
γ 44	342.90 4	0.220 15	0.0016
γ 45	349.80 20	0.34 8	0.0025
γ 48	371.675 15	0.472 24	0.0037
γ 56	445.031 12	1.18 5	0.0112

50 weak γ's omitted:
Eγ(avg) = 292.1; ΣIγ = 1.35%

• ²²⁴Ra α Decay (3.62 d 1) I (min) = 0.10%
Feeds ²²⁰Rn

Auger-L	8.7	0.45 5	≈0
ce-K- 1	142.577 14	0.442 20	0.0013
ce-L- 1	222.93 4	0.490 22	0.0023
ce-MNO- 1	236.499 8	0.174 6	0.0009

α 1	5449	4.9 4	0.569
α 2	5685.56 20	95.1 4	11.52

3 weak α's omitted:
Eα(avg) = 5093.6; ΣIα = 0.02%

(Continued)

²²⁴Ra-²²⁶Ra

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
²²⁴Ra α Decay (3.62 d 1) (Continued)				ce-L- 22 82.16 11 0.188 6 0.0003			
X-ray L	11.7	0.40 5	≈0	ce-MNO-17	82.73 5	0.31 4	0.0006
X-ray Kα ₂	81.070 20	0.126 7	0.0002	ce-L- 24	89.76 11	0.66 8	0.0013
X-ray Kα ₁	83.780 20	0.209 10	0.0004	ce-MNO-18	90.25 20	0.14 6	0.0003
γ 1	240.981 6	3.95 13	0.0203	ce-K- 40	94.55 8	0.17 5	0.0003
4 weak γ's omitted: Eγ(avg) = 464.9; ΣIγ = 0.02%				ce-M- 20	94.90 10	0.38 5	0.0008
				ce-NOP-20	98.40 10	0.135 15	0.0003
				ce-MNO-24	103.75 10	0.225 25	0.0005
				ce-L- 35	138.61 7	0.195 20	0.0006
				α 1	5286 3	0.230 10	0.0259
				α 2	5444 3	0.130 10	0.0151
				α 3	5553 4	0.10	0.0118
				α 4	5579 3	1.20 10	0.143
				α 5	5608 3	1.10 10	0.131
				α 6	5636.2 20	4.4 3	0.528
				α 7	5681.0 20	1.40 20	0.169
				α 8	5722.6 25	2.9 5	0.353
				α 9	5731.0 20	10.00 10	1.22
				α 10	5791 4	8.6	1.06
				α 11	5792 3	18.1 20	2.23
				α 12	5829.0 20	51.6 15	6.41
				24 weak α's omitted: Eα(avg) = 5450.4; ΣIα = 0.38%			
				X-ray L	12	21 4	0.0054
				γ 7	62.90 5	0.55 5	0.0007
				γ 13	73.83 5	0.32 3	0.0005
				γ 16	82.9	0.15 4	0.0003
				X-ray Kα ₂	83.230 20	1.02 9	0.0018
				X-ray Kα ₁	86.100 20	1.68 15	0.0031
				γ 17	87.38 5	0.29 3	0.0005
				γ 18	94.90 20	0.16 6	0.0003
				X-ray Kβ	97.5	0.77 7	0.0016
				γ 20	99.55 10	0.65 7	0.0014
				γ 21	99.80 10	1.70 20	0.0036
				γ 24	108.40 10	0.28 3	0.0006
				γ 25	111.50 10	0.32 3	0.0008
				γ 28	123.80 10	0.190 20	0.0005
				γ 31	138.2	0.20 10	0.0006
				γ 32	145.00 20	0.13 3	0.0004
				γ 33	150.09 5	0.71 8	0.0023
				γ 34	154.00 10	0.19 5	0.0006
				γ 35	157.25 5	0.31 3	0.0010
				γ 39	188.00 10	0.46 5	0.0018
				γ 40	195.69 7	0.140 20	0.0006
				γ 46	253.50 7	0.100 10	0.0005
				γ 50	452.40 10	0.110 10	0.0011
				34 weak γ's omitted: Eγ(avg) = 165.2; ΣIγ = 0.93%			
				• ²²⁶Ra α Decay (1600 y 7) I (min) = 0.10%			
				Feeds ²²² Rn			
				Auger-L	8.7	0.90 9	0.0002
				ce-K- 1	87.807 16	0.633 20	0.0012
				ce-L- 1	168.16 4	1.20 4	0.0043
				ce-M- 1	181.729 12	0.319 10	0.0012
				ce-NOP- 1	185.114 12	0.111 4	0.0004
				α 1	4601.9 5	5.55 5	0.544
				α 2	4784.50 25	94.45 5	9.63
				(Continued)			
• ²²⁵Ra β⁻ Decay (14.8 d 2) I (min) = 0.10%							
				Feeds ²²⁵ Ac			
Auger-L	9.28	15.1 19	0.0030				
ce-L- 1	20.16 20	30.9 22	0.0133				
ce-MNO- 1	35.00 20	10.1 7	0.0076				
β ⁻ 1 max	322 12						
avg	90 4	72 5	0.138				
β ⁻ 2 max	362 12						
avg	103 4	28 5	0.0614				
total β ⁻							
avg	94 4	100 7	0.199				
X-ray L	12.7	15.8 19	0.0043				
γ 1	40.00 20	31.0 20	0.0264				
				• ²²⁵Ac α Decay (10.0 d 1) I (min) = 0.10%			
				Feeds ²²¹ Fr			
ce-K- 24	7.26 10	2.15 23	0.0003				
ce-L- 1	7.36 11	7 4	0.0011				
Auger-L	8.9	22 4	0.0042				
ce-L- 2	17.96 11	13 3	0.0050				
ce-L- 3	19.86 11	6.4 14	0.0027				
ce-MNO- 1	21.35 10	2.3 15	0.0011				
ce-K- 29	23.66 10	0.17 16	≈0				
ce-MNO- 2	31.95 10	4.6 9	0.0032				
ce-MNO- 3	33.85 10	2.3 5	0.0016				
ce-L- 7	44.26 7	4.8 5	0.0045				
ce-L- 8	45.46 11	0.9 4	0.0009				
ce-K- 33	48.95 6	0.101 12	0.0001				
ce-L- 9	51.16 11	0.15 3	0.0002				
ce-L- 11	53.06 11	0.290 25	0.0003				
ce-L- 12	54.96 11	0.48 15	0.0006				
ce-L- 14	55.76 21	1.3 16	0.0015				
ce-K- 35	56.11 6	0.97 12	0.0012				
ce-L- 15	56.26 21	0.6 5	0.0007				
ce-M- 7	58.25 5	1.14 11	0.0014				
ce-MNO- 8	59.45 10	0.32 12	0.0004				
ce-NOP- 7	61.75 5	0.40 4	0.0005				
ce-L- 16	64.26 4	1.5 10	0.0021				
ce-MNO-11	67.05 10	0.106 10	0.0002				
ce-L- 17	68.74 7	0.97 10	0.0014				
ce-MNO-12	68.95 10	0.18 5	0.0003				
ce-M- 14	69.75 20	0.3 5	0.0005				
ce-MNO-15	70.25 20	0.22 16	0.0003				
ce-NOP-14	73.25 20	0.12 15	0.0002				
ce-L- 18	76.26 21	0.44 17	0.0007				
ce-L- 19	77.66 21	0.15 3	0.0003				
ce-M- 16	78.248 5	0.4 3	0.0007				
ce-L- 20	80.91 11	1.58 18	0.0027				
ce-L- 21	81.16 11	0.140 17	0.0002				
ce-NOP-16	81.747 5	0.13 10	0.0002				

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
X-ray L	11.7	0.80 9	0.0002	8- 1 max	19.2 20		
X-ray K α_2	81.070 20	0.180 7	0.0003	8- 1 avg	4.8 5	10	0.0010
X-ray K α_1	83.780 20	0.299 11	0.0005	8- 2 max	34.4 20		
X-ray K β	94.9	0.136 6	0.0003	8- 2 avg	8.7 6	35	0.0065
γ 1	186.211 10	3.28 3	0.0130	8- 3 max	43.7 20		
				8- 3 avg	11.1 6	54	0.0128
				total 8-			
				avg	9.6 7	99	0.0203
<p>• ²²⁶Th α Decay (30.9 m) I (min) = 0.10% Feeds ²²²Ra</p>				<p>X-ray L 13 1.15 11 0.0003</p>			
ce-K- 1	7.20 4	0.98 7	0.0002	3 weak γ 's omitted: E γ (avg) = 17.4; $\Sigma I\gamma$ = 0.04%			
Auger-L	9	7.5 9	0.0015				
ce-L- 1	91.88 3	14.3 10	0.0280				
ce-M- 1	106.30 3	3.9 3	0.0088				
ce-NOP- 1	109.91 3	1.41 10	0.0033				
α 1	6025 5	0.205 8	0.0263				
α 2	6040 5	0.187 6	0.0241				
α 3	6100 5	1.27 5	0.165				
α 4	6234 5	22.80 20	3.03				
α 5	6338 5	75.5 3	10.19				
X-ray L	12.3	7.5 9	0.0020				
X-ray K α_2	85.430 10	0.281 20	0.0005				
X-ray K α_1	88.470 10	0.46 4	0.0009				
X-ray K β	100	0.212 16	0.0005				
γ 1	111.12 3	3.29 20	0.0078				
γ 2	131.02 5	0.278 13	0.0008				
γ 4	190.30 5	0.109 6	0.0004				
γ 5	206.23 5	0.189 8	0.0008				
γ 6	242.12 5	0.87 4	0.0045				
<p>• ²²⁷Ac α Decay (21.773 y 3) I (min) = 0.10% %α Decay = 1.380 4 Feeds ²²³Fr See also ²²⁷Ac β^- Decay</p>				<p>• ²²⁷Th α Decay (18.718 d 5) I (min) = 0.10% Feeds ²²³Ra</p>			
ce-MNO- 1	8.048 5	0.50 7	≈ 0	ce-L- 4	1.06 20	1.1 4	≈ 0
α 1	4938.1 20	0.50 5	0.0523	ce-MNO- 1	1.5 3	0.46	≈ 0
α 2	4950.5 20	0.68 5	0.0713	ce-MNO- 3	3.48 10	3	0.0002
				Auger-L	9	42 8	0.0081
				ce-K- 57	9.18 10	0.152 21	≈ 0
				ce-L- 6	10.3633 15	0.532 16	0.0001
				ce-L- 7	10.673 11	42 13	0.0045
				ce-L- 8	12.393 20	14 4	0.0038
				ce-MNO- 4	15.48 20	0.40 12	0.0001
				ce-L- 12	24.46 20	0.177 24	≈ 0
				ce-MNO- 6	24.7780 15	0.17	≈ 0
				ce-L- 14	24.8633 15	0.7 3	0.0004
				ce-L- 16	25.1 5	1.7 16	0.0009
				ce-MNO- 7	25.088 11	15 5	0.0078
				ce-MNO- 8	26.808 20	5.0 14	0.0028
				ce-L- 18	28.96 10	2.1 4	0.0013
				ce-L- 20	30.66 10	0.11 9	≈ 0
				ce-L- 21	30.86 10	4.5 3	0.0029
				ce-L- 22	31.5 5	1.6 15	0.0011
				ce-L- 24	34.9633 15	0.119 4	≈ 0
				ce-L- 26	37.3133 15	0.29 3	0.0002
				ce-MNO-14	39.2780 15	0.24 11	0.0002
				ce-MNO-16	39.5 5	0.6 6	0.0005
				ce-L- 28	42.26 20	6.4 15	0.0058
				ce-MNO-18	43.38 10	0.75 11	0.0007
				ce-L- 31	43.5 3	0.11 5	0.0001
				ce-M- 21	45.28 10	1.09 7	0.0011
				ce-M- 22	45.9 5	0.4 5	0.0004
				ce-NOP-21	48.89 10	0.369 21	0.0004
				ce-L- 35	49.46 10	0.44 14	0.0005
				ce-NOP-22	49.5 5	0.16 15	0.0002
				ce-MNO-26	51.7280 15	0.103 9	0.0001
				ce-L- 38	53.66 10	0.15 11	0.0002
				ce-L- 39	54.46 10	0.36 25	0.0004
				ce-M- 28	56.68 20	1.7 4	0.0021
				ce-NOP-28	60.29 20	0.63 14	0.0008
				ce-L- 42	60.56 10	0.31 4	0.0004
				ce-MNO-35	63.88 10	0.15 5	0.0002
				Auger-K	65.9	0.13 8	0.0002
				ce-MNO-39	68.88 10	0.13 10	0.0002
				ce-L- 44	74.76 10	0.140 15	0.0002
				ce-L- 45	75.96 20	0.107 19	0.0002
				ce-L- 49	81.2 5	0.56 12	0.0010
				ce-L- 56	93.86 10	0.7 4	0.0014
				ce-MNO-49	95.6 5	0.21 5	0.0004
				ce-K- 80	101.08 20	0.28 6	0.0006
				ce-MNO-56	108.28 10	0.25 15	0.0006
				ce-K- 90	131.0 3	0.52 10	0.0014
				ce-K- 91	132.08 10	0.57 3	0.0016
				ce-K- 94	146.18 10	0.27 23	0.0008
				ce-K- 98	152.28 10	0.66 6	0.0021

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)																												
²²⁷ Th α Decay (18.718 d 5) (Continued)				<table border="0"> <tr> <td>γ 118</td> <td>304.40 20</td> <td>1.35 11</td> <td>0.0088</td> </tr> <tr> <td>γ 121</td> <td>312.60 20</td> <td>0.43 4</td> <td>0.0029</td> </tr> <tr> <td>γ 122</td> <td>314.80 20</td> <td>0.42 4</td> <td>0.0028</td> </tr> <tr> <td>γ 128</td> <td>329.70 10</td> <td>2.90 16</td> <td>0.0204</td> </tr> <tr> <td>γ 129</td> <td>334.20 10</td> <td>1.15 10</td> <td>0.0082</td> </tr> <tr> <td>γ 132</td> <td>342.40 10</td> <td>0.34 3</td> <td>0.0025</td> </tr> <tr> <td>γ 135</td> <td>350.50 20</td> <td>0.118 12</td> <td>0.0009</td> </tr> </table>				γ 118	304.40 20	1.35 11	0.0088	γ 121	312.60 20	0.43 4	0.0029	γ 122	314.80 20	0.42 4	0.0028	γ 128	329.70 10	2.90 16	0.0204	γ 129	334.20 10	1.15 10	0.0082	γ 132	342.40 10	0.34 3	0.0025	γ 135	350.50 20	0.118 12	0.0009
γ 118	304.40 20	1.35 11	0.0088																																
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γ 132	342.40 10	0.34 3	0.0025																																
γ 135	350.50 20	0.118 12	0.0009																																
ce-K-111	182.18 10	0.98 6	0.0038	205 weak γ's omitted: Σγ (avg) = 185.0; ΣIγ = 1.73%																															
ce-K-115	192.68 20	0.24 3	0.0010	● ²²⁸ Ra β ⁻ Decay (5.75 y 3) I (min) = 0.10%																															
ce-K-118	200.48 20	0.64 6	0.0027	Feeds ²²⁸ Ac																															
ce-K-121	208.68 20	0.221 24	0.0010	ce-MNO- 2	1.668 5 100		0.0036																												
ce-L- 91	216.76 10	0.107 6	0.0005	β ⁻ 1 max	38.9 10																														
ce-K-129	230.28 10	0.38 4	0.0019	avg	9.9 3 100		0.0211																												
ce-L- 98	236.96 10	0.72 5	0.0036	● ²²⁸ Ac β ⁻ Decay (6.13 h) I (min) = 0.10%																															
ce-MNO-98	251.38 10	0.260 17	0.0014	Feeds ²²⁸ Th																															
ce-L-111	266.86 10	0.192 11	0.0011	Auger-L	9.48	36 5	0.0073																												
ce-L-118	285.16 20	0.130 11	0.0008	ce-K- 3	19.43 5	0.75 23	0.0003																												
α 1	5585.9 16	0.176 6	0.0209	ce-L- 1	37.31 5	57 4	0.0454																												
α 2	5600.6 18	0.170 17	0.0203	ce-K- 7	44.5 3	0.13 4	0.0001																												
α 3	5613.3 16	0.216 8	0.0258	ce-K- 1	52.60 5	15.6 9	0.0175																												
α 4	5668.0 15	2.06 12	0.249	ce-NOP- 1	56.45 5	5.7 4	0.0069																												
α 5	5693.0 16	1.50 10	0.182	Auger-K	69.2	0.18 15	0.0003																												
α 6	5700.8 16	3.63 20	0.441	ce-K- 9	74.85 20	5 4	0.0077																												
α 7	5709.0 16	8.2 3	0.997	ce-L- 2	78.98 8	4.0 16	0.0067																												
α 8	5713.2 16	4.89 20	0.595	ce-N- 2	94.27 8	1.0 4	0.0019																												
α 9	5757.06 15	20.3 10	2.49	ce-NOP- 2	98.12 8	0.36 14	0.0007																												
α 10	5762.3 15	0.228 10	0.0280	ce-K- 13	99.63 10	0.30 10	0.0006																												
α 11	5795.5 15	0.311 5	0.0384	ce-L- 3	108.61 5	7.1 22	0.0165																												
α 12	5807.5 15	1.270 20	0.157	ce-M- 3	123.90 5	2.0 6	0.0052																												
α 13	5866.6	2.42 10	0.302	ce-NOP- 3	127.75 5	0.73 23	0.0020																												
α 14	5909.9 15	0.174 8	0.0219	ce-K- 20	160.58 10	0.14 3	0.0005																												
α 15	5916.0 15	0.78 3	0.0983	ce-L- 9	164.03 20	1.0 7	0.0034																												
α 16	5959.7 15	3.00 15	0.381	ce-K- 21	169.3 10	0.19 6	0.0007																												
α 17	5977.92 10	23.4 10	2.98	ce-MNO- 9	179.32 20	0.30 20	0.0011																												
α 18	6008.8 15	2.90 15	0.371	ce-K- 27	228.67 10	0.26 6	0.0013																												
α 19	6038.21 15	24.5 10	3.15	ce-K- 28	231.4 3	0.12 10	0.0006																												
26 weak α's omitted: Σα (avg) = 5562.5; ΣIα = 0.20%				ce-K- 41	353.35 10	0.140 16	0.0011																												
γ 3	8.30 10	0.14	≅0	ce-K- 87	685.05 20	0.15 10	0.0022																												
X-ray L	12.3	42 8	0.0110	ce-K-100	801.42 3	0.252 12	0.0043																												
γ 4	20.30 20	0.20 6	≅0	ce-K-110	859.46 10	0.135 15	0.0025																												
γ 7	29.910 10	0.10 3	≅0	β ⁻ 1 max 127 7																															
γ 12	43.70 20	0.23 3	0.0002	avg	33.3 20	0.197 22	0.0001																												
γ 20	49.90 10	0.20 15	0.0002	β ⁻ 2 max 193 7																															
γ 21	50.10 10	8.4 4	0.0090	avg	51.7 20	0.29 4	0.0003																												
γ 30	62.20 10	0.24 3	0.0003	β ⁻ 3 max 237 7																															
γ 42	79.80 10	2.00 20	0.0034	avg	64.6 21	0.160 22	0.0002																												
X-ray Kα ₂	85.430 10	1.41 9	0.0026	β ⁻ 4 max 244 7																															
X-ray Kα ₁	88.470 10	2.32 14	0.0044	avg	66.7 21	0.215 20	0.0003																												
γ 44	94.00 10	1.40 14	0.0028	β ⁻ 5 max 377 7																															
X-ray Kβ	100	1.06 7	0.0023	avg	107.2 22	0.216 25	0.0005																												
γ 56	113.10 10	0.17 10	0.0004	β ⁻ 6 max 393 7																															
γ 57	113.10 10	0.54 7	0.0013	avg	112.3 23	0.37 5	0.0009																												
γ 58	117.20 10	0.180 20	0.0004	β ⁻ 7 max 401 7																															
γ 65	141.20 10	0.140 10	0.0004	avg	114.9 23	0.158 21	0.0004																												
γ 79	204.30 20	0.23 4	0.0010	β ⁻ 8 max 413 7																															
γ 80	205.00 20	0.17 3	0.0007	avg	118.5 23	1.59 20	0.0040																												
γ 81	206.00 20	0.26 4	0.0011	(Continued)																															
γ 83	210.60 10	1.26 9	0.0057																																
γ 90	234.9 3	0.46 8	0.0023																																
γ 91	236.00 10	11.5 5	0.0578																																
γ 94	250.10 10	0.49 5	0.0026																																
γ 96	252.50 20	0.11 3	0.0006																																
γ 97	254.7 3	0.91 12	0.0049																																
γ 98	256.20 10	6.3 4	0.0344																																
γ 99	262.90 20	0.100 10	0.0006																																
γ 104	273.00 20	0.49 7	0.0028																																
γ 108	281.30 10	0.170 20	0.0010																																
γ 111	286.10 10	1.60 8	0.0098																																
γ 115	296.60 20	0.42 4	0.0027																																
γ 116	299.80 10	1.84 14	0.0117																																
γ 117	300.3 3	0.28 4	0.0018																																

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
β- 9 max	449 7			γ 28	341.1 3	0.42 12	0.0030
avg	130.0 23	2.42 11	0.0067	γ 35	409.51 10	2.13 24	0.0186
β-10 max	454 7			γ 38	440.3 8	0.14 3	0.0013
avg	131.7 23	1.54 14	0.0043	γ 41	463.00 10	4.4 5	0.0437
β-11 max	491 7			γ 44	478.2 8	0.23 5	0.0023
avg	143.8 23	4.9 6	0.0150	γ 48	503.6 3	0.20 5	0.0022
β-12 max	494 7			γ 49	509.6 10	0.47 12	0.0051
avg	144.9 23	0.78 8	0.0024	γ 52	523.0 10	0.12 3	0.0013
β-13 max	499 7			γ 54	546.3 3	0.21 5	0.0024
avg	146.4 23	1.30 17	0.0041	γ 56	562.3 5	0.94 15	0.0113
β-14 max	598 7			γ 57	570.7 10	0.18 6	0.0022
avg	179.6 24	0.26 7	0.0010	γ 58	572.1 10	0.16 5	0.0019
β-15 max	606 7			γ 59	583.20 20	0.14 5	0.0018
avg	182.1 24	8 3	0.0310	γ 62	623.8 5	0.11 3	0.0015
β-16 max	687 7			γ 75	701.5 5	0.19 4	0.0028
avg	210.0 25	0.22 7	0.0010	γ 76	707.10 20	0.15 5	0.0023
β-17 max	793 7			γ 77	727.0 8	0.78 23	0.0120
avg	247 3	0.14 3	0.0007	γ 81	755.18 10	1.05 17	0.0169
β-18 max	910 7			γ 82	772.17 10	1.55 23	0.0255
avg	290 3	0.82 12	0.0051	γ 84	782.0 5	0.53 9	0.0088
β-19 max	962 7			γ 87	794.70 20	4.6 5	0.0783
avg	309 3	0.19 5	0.0013	γ 91	830.5 3	0.59 7	0.0104
β-20 max	969 7			γ 92	835.5 3	1.75 18	0.0311
avg	311 3	3.3 4	0.0219	γ 93	840.0 4	0.94 9	0.0169
β-21 max	983 7			γ 99	904.5 3	0.83 9	0.0160
avg	317 3	7 4	0.0473	γ 100	911.07 3	27.7 10	0.538
β-22 max	1014 7			γ 106	944.1 8	0.102 20	0.0021
avg	328 3	6.6 7	0.0461	γ 107	948.0 8	0.116 23	0.0023
β-23 max	1046 7			γ 108	958.5 5	0.30 7	0.0062
avg	340 3	0.24 21	0.0017	γ 109	964.6 3	5.2 6	0.107
β-24 max	1115 7			γ 110	969.11 10	16.6 18	0.343
avg	366 3	3.4 7	0.0265	γ 113	987.80 20	0.18 3	0.0038
β-25 max	1121 7			γ 118	1033.2 3	0.22 4	0.0048
avg	368 3	0.46 8	0.0036	γ 122	1065.1 5	0.141 23	0.0032
β-26 max	1158 7			γ 123	1095.7 5	0.127 20	0.0030
avg	382 3	0.21 5	0.0017	γ 125	1110.40 20	0.33 6	0.0079
β-27 max	1168 7			γ 130	1153.6 5	0.152 23	0.0037
avg	386 3	32 5	0.263	γ 135	1246.40 20	0.54 6	0.0143
β-28 max	1193 7			γ 138	1287.5 5	0.114 18	0.0031
avg	396 3	0.15 4	0.0013	γ 149	1459.30 20	1.00 15	0.0310
β-29 max	1618 7			γ 152	1495.8 5	1.00 12	0.0318
avg	538 3	0.11 10	0.0013	γ 153	1501.5 5	0.55 6	0.0177
β-30 max	1741 7			γ 159	1556.9 6	0.19 4	0.0064
avg	611 3	12 3	0.156	γ 161	1580.2 5	0.69 12	0.0233
β-31 max	2079 7			γ 162	1588.00 20	3.5 6	0.120
avg	748 3	8 6	0.127	γ 164	1624.7 5	0.30 7	0.0105
total β- avg	375 4	97 10	0.778	γ 165	1630.4 4	1.86 8	0.0646
				γ 166	1638.0 5	0.53 12	0.0184
				γ 167	1666.30 20	0.20 4	0.0071
				γ 183	1887.00 20	0.105 23	0.0042
2 weak β's omitted: Σβ(avg) = 78.8; ΣIβ = 0.10%				122 weak γ's omitted: Σγ(avg) = 947.8; ΣIγ = 4.12%			
X-ray L	13	39 5	0.0108	● ²²⁸ Th α Decay (1.9132 y 9) I (min) = 0.10%			
γ 1	57.78 5	0.501 23	0.0006	Feeds ²²⁴ Ra			
X-ray Kα ₂	89.9530 20	2.1 10	0.0041	Auger-L	9	9.6 11	0.0019
X-ray Kα ₁	93.3500 20	3.5 15	0.0069	ce-L- 2	65.134 4	19.1 11	0.0265
γ 2	99.45 8	1.3 5	0.0028	ce-M- 2	79.549 4	5.2 3	0.0088
X-ray Kβ	105	1.6 7	0.0036	ce-NOP- 2	83.163 4	1.88 11	0.0033
γ 3	129.08 5	2.8 9	0.0076				
γ 6	146.1 3	0.21 6	0.0007	α 1	5175	0.18	0.0198
γ 7	154.2 3	0.9 3	0.0031	α 2	5212	0.36	0.0400
γ 10	191.20 20	0.12 4	0.0005	α 3	5340.54 15	26.70 20	3.04
γ 11	199.70 20	0.33 12	0.0014	α 4	5423.33 22	72.70 20	8.40
γ 12	204.40 20	0.16 6	0.0007				
γ 13	209.28 10	4.4 14	0.0198	5 weak α's omitted: Σα(avg) = 5138.7; ΣIα = 0.05%			
γ 14	210.0 8	0.216 8	0.0010				
γ 20	270.23 10	3.6 8	0.0207				
γ 21	279.0 10	0.22 7	0.0013				
γ 23	321.7 6	0.24 5	0.0017				
γ 24	327.64 10	3.2 7	0.0224				
γ 26	332.36 10	0.44 9	0.0031				
γ 27	338.32 10	11.4 23	0.0818				

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
²²⁸ Th α Decay (1.9132 y 9) (Continued)				ce-L- 23 137.24 4 0.772 24 0.0023			
γ-ray L	12.3	9.6 11	0.0025	ce-MNO-19	138.13 10	0.1238	0.0004
γ 2	84.371 3	1.21 6	0.0022	ce-MNO-22	149.58 7	0.153816	0.0005
γ 3	131.610 4	0.124 6	0.0003	ce-MNO-23	151.66 4	0.25	0.0008
γ 8	215.979 5	0.239 13	0.0011	ce-L- 25	153.66 10	0.116 4	0.0004
10 weak γ's omitted: Eγ(avg) = 172.5; ΣIγ = 0.11%				ce-L- 26	160.56 20	0.255 8	0.0009
				ce-L- 27	164.76 10	0.104 4	0.0004
				ce-L- 28	174.39 6	1.73 6	0.0064
				ce-M- 28	188.81 6	0.413 13	0.0017
				ce-L- 29	191.73 10	0.97 3	0.0039
				ce-NOP-28	192.42 6	0.146 5	0.0006
				ce-MNO-29	206.15 10	0.311712	0.0014
● ²²⁹ Th α Decay (7.34E3 y 16) I (min) = 0.10%				α 1	4688	0.15	0.0150
Feeds ²²⁵ Ra				α 2	4761 3	0.63	0.0639
ce-K- 14	3.25 5	9.1 3	0.0006	α 3	4797.8 12	1.27	0.130
ce-L- 3	6.153 20	48.9 15	0.0064	α 4	4809	0.22	0.0225
Auger-L	9	81 9	0.0157	α 5	4814.6 12	9.30 8	0.954
ce-L- 4	12.06 20	7.59 23	0.0019	α 6	4833	0.29	0.0299
ce-MNO- 2	12.54 3	24.45	0.0065	α 7	4837	4.8	0.495
ce-MNO- 3	20.568 20	17.243	0.0076	α 8	4845.3 12	56.20 20	5.80
ce-K- 15	20.58 10	8.7 3	0.0038	α 9	4861	0.18	0.0186
ce-K- 16	20.78 10	4.33 13	0.0019	α 10	4901.0 12	10.20 8	1.06
ce-L- 5	23.52 3	10.1 3	0.0051	α 11	4929 3	0.1	0.0115
ce-MNO- 4	26.48 20	2.51736	0.0014	α 12	4967.5 12	5.97 6	0.632
ce-K- 17	28.05 5	1.96 6	0.0012	α 13	4978.5 12	3.17 4	0.336
ce-K- 18	33.11 6	8.8 3	0.0062	α 14	5033	0.24	0.0257
ce-L- 8	37.36 3	4.28 13	0.0034	α 15	5050	5.2	0.559
ce-MNO- 5	37.94 3	3.44352	0.0028	α 16	5052	1.6	0.172
ce-K- 19	39.03 10	2.05 7	0.0017	12 weak α's omitted: Eα(avg) = 4765.5; ΣIα = 0.27%			
ce-K- 20	44.38 20	0.204 7	0.0002	γ-ray L	12.3	81 9	0.0212
ce-L- 9	48.94 7	1.08 4	0.0011	γ 2	17.36 3	0.1734	≈0
ce-L- 10	49.66 4	4.66 14	0.0049	γ 4	31.30 20	4	0.0027
ce-K- 22	50.48 7	2.55 8	0.0027	γ 5	42.76 3	0.1632	0.0001
ce-M- 8	51.78 3	1.02 3	0.0011	γ 8	56.60 3	0.3264	0.0004
ce-K- 23	52.56 4	4.16 13	0.0047	γ 9	68.18 7	0.1	0.0001
ce-NOP- 8	55.39 3	0.362 11	0.0004	γ 10	68.90 4	0.1122	0.0002
ce-L- 11	55.96 7	14.2 5	0.0169	γ 11	75.20 7	0.52	0.0008
ce-MNO- 9	63.36 7	0.36516	0.0005	γ-ray Kα ₂	85.430 10	16.5 4	0.0300
ce-M- 10	64.08 4	1.26 4	0.0017	γ 12	86.30 10	0.3774	0.0007
Auger-K	65.9	1.5 9	0.0021	γ 13	86.44 5	3	0.0056
ce-L- 12	67.06 10	2.73 9	0.0039	γ-ray Kα ₁	88.470 10	27.1 6	0.0511
ce-L- 13	67.20 5	11.6 4	0.0166	γ-ray KB	100	12.4 3	0.0265
ce-NOP-10	67.69 4	0.452 14	0.0007	γ 14	107.17 5	0.8364	0.0019
ce-K- 25	68.98 10	0.626 19	0.0009	γ 15	124.50 10	1.224	0.0032
ce-M- 11	70.38 7	3.85 12	0.0058	γ 16	124.70 10	0.612	0.0016
ce-NOP-11	73.99 7	1.38 5	0.0022	γ 17	131.97 5	0.3264	0.0009
ce-K- 27	80.08 10	0.324 10	0.0006	γ 18	137.03 6	1.632	0.0048
ce-M- 12	81.48 10	0.710 22	0.0012	γ 19	142.95 10	0.4284	0.0013
ce-M- 13	81.62 5	2.78 9	0.0048	γ 20	148.30 20	1.3872	0.0044
ce-NOP-12	85.09 10	0.255 8	0.0005	γ 22	154.40 7	0.663	0.0022
ce-NOP-13	85.23 5	0.99 3	0.0018	γ 23	156.48 4	1.122	0.0037
ce-L- 14	87.93 5	1.71 6	0.0032	γ 25	172.90 10	0.2244	0.0008
ce-K- 28	89.71 6	9.3 3	0.0178	γ 26	179.80 20	0.5	0.0020
ce-M- 14	102.35 5	0.407 13	0.0009	γ 27	184.00 10	0.2346	0.0009
ce-L- 15	105.26 10	1.62 5	0.0036	γ 28	193.63 6	4.59	0.0189
ce-L- 16	105.46 10	0.808 25	0.0018	γ 29	210.97 10	3.264	0.0147
ce-NOP-14	105.96 5	0.146 5	0.0003	γ 30	218.10 20	0.1428	0.0007
ce-K- 29	107.05 10	5.19 16	0.0118	11 weak γ's omitted: Eγ(avg) = 130.8; ΣIγ = 0.07%			
ce-L- 17	112.73 5	0.366 11	0.0009				
ce-K- 30	114.18 20	0.207 7	0.0005				
ce-L- 18	117.79 6	1.65 5	0.0041				
ce-M- 15	119.68 10	0.388 12	0.0010				
ce-MNO-16	119.88 10	0.262	0.0007				
ce-NOP-15	123.29 10	0.138 5	0.0004				
ce-L- 19	123.71 10	0.381 12	0.0010				
ce-MNO-17	127.15 5	0.118483	0.0003				
ce-M- 18	132.21 6	0.392 12	0.0011				
ce-L- 22	135.16 7	0.473 15	0.0014				
ce-NOP-18	135.82 6	0.140 5	0.0004				

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
<p>● ²³⁰Th α Decay (7.7E4 y 3) I (min) = 0.10%</p> <p>Feeds ²²⁶Ra</p> <p>% Spontaneous Fission ≤ 5E-11</p>				<p>γ 41 728.23 7 1.87 15 0.0291</p> <p>γ 43 781.35 5 1.47 12 0.0244</p> <p>γ 46 898.65 10 5.8 5 0.110</p> <p>γ 47 918.50 10 8.1 7 0.159</p> <p>γ 48 951.95 10 28.8 20 0.584</p> <p>γ 49 953.0 10 0.16 4 0.0033</p> <p>γ 50 956.3 3 1.6 3 0.0321</p> <p>γ 51 959.3 3 0.49 12 0.0100</p> <p>γ 54 1009.60 20 1.07 9 0.0230</p> <p>γ 55 1026.05 10 1.44 12 0.0316</p> <p>γ 56 1074.68 10 0.74 6 0.0170</p>			
Auger-L	9	8.4 10	0.0016	28 weak γ's omitted: Eγ(avg) = 537.2; ΣIγ = 0.92%			
ce-L- 1	48.4353 25	16.9 11	0.0174				
ce-M- 1	62.8500 25	4.6 3	0.0061				
ce-NOP- 1	66.464 3	1.64 11	0.0023				
α 1	4476	0.12	0.0114				
α 2	4621.0 15	23.40 10	2.30				
α 3	4687.5 15	76.3 3	7.62				
5 weak α's omitted: Eα(avg) = 4367.8; ΣIα = 0.31%							
X-ray L	12.3	8.4 10	0.0022				
γ 1	67.6720 20	0.373 21	0.0005				
10 weak γ's omitted: Eγ(avg) = 168.1; ΣIγ = 0.07%							
● ²³⁰ Pa EC Decay (17.4 d 5) I (min) = 0.10%				● ²³⁰ Pa β ⁻ Decay (17.4 d 5) I (min) = 0.10%			
%EC Decay = 90.5 6				%β ⁻ Decay = 9.5 6			
Feeds ²³⁰ Th				Feeds ²³⁰ U			
See also ²³⁰ Pa β ⁻ Decay				See also ²³⁰ Pa EC Decay			
%α Decay = 0.0032 1				%α Decay = 0.0032 1			
Auger-L	9.89	3.0 7	0.0006	Auger-L	9.89	3.0 7	0.0006
ce-L- 1	29.99 5	6.8 12	0.0044	ce-L- 1	29.99 5	6.8 12	0.0044
ce-M- 1	46.20 5	1.9 4	0.0018	ce-M- 1	46.20 5	1.9 4	0.0018
ce-NOP- 1	50.31 5	0.70 13	0.0008	ce-NOP- 1	50.31 5	0.70 13	0.0008
β ⁻ 1 max	192 5			β ⁻ 1 max	192 5		
avg	51.6 15	0.20 4	0.0002	avg	51.6 15	0.20 4	0.0002
β ⁻ 2 max	507 5			β ⁻ 2 max	507 5		
avg	148.7 17	9.3 16	0.0295	avg	148.7 17	9.3 16	0.0295
total β ⁻				total β ⁻			
avg	146.1 18	9.5 16	0.0297	avg	146.1 18	9.5 16	0.0297
1 weak β's omitted: Eβ(avg) = 36.2; ΣIβ = 0.05%				1 weak β's omitted: Eβ(avg) = 36.2; ΣIβ = 0.05%			
X-ray L	13.6	3.8 8	0.0011	X-ray L	13.6	3.8 8	0.0011
γ 4	314.8 3	0.106 20	0.0007	γ 4	314.8 3	0.106 20	0.0007
5 weak γ's omitted: Eγ(avg) = 297.6; ΣIγ = 0.17%				5 weak γ's omitted: Eγ(avg) = 297.6; ΣIγ = 0.17%			
● ²³⁰ U α Decay (20.8 d) I (min) = 0.10%				● ²³⁰ U α Decay (20.8 d) I (min) = 0.10%			
Feeds ²²⁶ Th				Feeds ²²⁶ Th			
Auger-L	9.48	11.3 15	0.0023	Auger-L	9.48	11.3 15	0.0023
ce-L- 1	51.73 4	23.4 17	0.0257	ce-L- 1	51.73 4	23.4 17	0.0257
ce-M- 1	67.02 4	6.4 5	0.0092	ce-M- 1	67.02 4	6.4 5	0.0092
ce-NOP- 1	70.87 4	2.37 18	0.0036	ce-NOP- 1	70.87 4	2.37 18	0.0036
ce-L- 3	133.76 3	0.146 13	0.0004	ce-L- 3	133.76 3	0.146 13	0.0004
α 1	5662.6 7	0.26 3	0.0314	α 1	5662.6 7	0.26 3	0.0314
α 2	5667.2 7	0.38 4	0.0459	α 2	5667.2 7	0.38 4	0.0459
α 3	5817.7 7	32.00 20	3.97	α 3	5817.7 7	32.00 20	3.97
α 4	5888.5 7	67.4 4	8.45	α 4	5888.5 7	67.4 4	8.45
3 weak α's omitted: Eα(avg) = 5583.9; ΣIα = 0.01%				3 weak α's omitted: Eα(avg) = 5583.9; ΣIα = 0.01%			
X-ray L	13	60 7	0.0165	X-ray L	13	60 7	0.0165
γ 1	53.20 5	0.24 3	0.0003	γ 1	53.20 5	0.24 3	0.0003
X-ray Kα ₂	89.9530 20	18.8 16	0.0360	X-ray Kα ₂	89.9530 20	18.8 16	0.0360
X-ray Kα ₁	93.3500 20	30.7 25	0.0610	X-ray Kα ₁	93.3500 20	30.7 25	0.0610
X-ray Kβ	105	14.2 12	0.0317	X-ray Kβ	105	14.2 12	0.0317
γ 2	120.900 20	0.34 6	0.0009	γ 2	120.900 20	0.34 6	0.0009
γ 13	316.80 20	0.16 3	0.0011	γ 13	316.80 20	0.16 3	0.0011
γ 18	380.15 10	0.30 6	0.0024	γ 18	380.15 10	0.30 6	0.0024
γ 19	397.80 20	1.85 17	0.0156	γ 19	397.80 20	1.85 17	0.0156
γ 20	399.95 10	0.62 5	0.0053	γ 20	399.95 10	0.62 5	0.0053
γ 22	440.8 10	0.11 4	0.0010	γ 22	440.8 10	0.11 4	0.0010
γ 23	443.75 5	5.4 5	0.0513	γ 23	443.75 5	5.4 5	0.0513
γ 25	454.95 5	6.2 5	0.0600	γ 25	454.95 5	6.2 5	0.0600
γ 26	463.60 10	0.81 8	0.0080	γ 26	463.60 10	0.81 8	0.0080
γ 29	508.0 10	0.22 11	0.0024	γ 29	508.0 10	0.22 11	0.0024
γ 30	508.20 5	3.5 3	0.0382	γ 30	508.20 5	3.5 3	0.0382
γ 31	518.50 10	1.95 17	0.0216	γ 31	518.50 10	1.95 17	0.0216
γ 32	556.00 10	0.20 3	0.0023	γ 32	556.00 10	0.20 3	0.0023
γ 33	571.10 10	1.07 9	0.0130	γ 33	571.10 10	1.07 9	0.0130
γ 34	581.80 20	0.130 14	0.0016	γ 34	581.80 20	0.130 14	0.0016
γ 36	619.69 10	0.163 25	0.0022	γ 36	619.69 10	0.163 25	0.0022

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
²³⁰ U α Decay (20.8 d) (Continued)			
X-ray L	13	12.2 15	0.0034
γ 1	72.20 4	0.60 4	0.0009
γ 3	154.23 3	0.126 11	0.0004
γ 7	230.37 5	0.122 10	0.0006
8 weak γ 's omitted: E_{γ} (avg) = 169.9; ΣI_{γ} = 0.08%			
● ²³¹ Th β^- Decay (25.52 h 1) I (min) = 0.10%			
Feeds ²³¹ Pa			
ce-MNO- 1	3.8331 16	0.49 11	≈ 0
ce-L- 5	4.535 20	49 4	0.0047
ce-MNO- 2	4.8831 16	0.75 9	≈ 0
Auger-L	9.68	60 8	0.0124
ce-MNO- 3	11.8331 16	40 30	0.0092
ce-MNO- 4	12.7031 16	29 17	0.0077
ce-MNO- 5	20.273 20	16.7 14	0.0072
ce-L- 7	22.98 17	0.17 16	≈ 0
ce-K- 25	23.079 21	0.50 9	0.0002
ce-K- 29	33.339 21	0.11 4	≈ 0
ce-L- 8	37.465 20	55 4	0.0436
ce-L- 9	42.76 3	0.6 3	0.0005
ce-L- 10	47.40 10	0.31 8	0.0003
ce-K- 30	50.519 21	0.60 8	0.0006
ce-M- 8	53.203 20	15.1 10	0.0171
ce-NOP- 8	57.183 20	5.6 4	0.0068
ce-MNO- 9	58.49 3	0.20 10	0.0003
ce-L- 12	60.135 20	8 3	0.0102
ce-L- 13	61.005 20	2.37 21	0.0031
ce-L- 14	63.105 20	14.5 18	0.0195
ce-MNO-10	63.13 10	0.12 3	0.0002
ce-L- 15	68.845 20	0.114 10	0.0002
ce-M- 12	75.873 20	2.0 8	0.0033
ce-M- 13	76.743 20	0.57 5	0.0009
ce-L- 17	78.175 20	0.54 5	0.0009
ce-M- 14	78.843 20	3.7 7	0.0062
ce-NOP-12	79.853 20	0.8 4	0.0013
ce-NOP-13	80.723 20	0.210 18	0.0004
ce-NOP-14	82.823 20	0.84 15	0.0015
ce-MNO-17	93.913 20	0.189 17	0.0004
ce-L- 25	114.575 20	0.114 13	0.0003
ce-L- 30	142.015 20	0.129 10	0.0004
β^- 1 max	141.7 18		
avg	37.4 5	2.7 4	0.0022
β^- 2 max	170.8 18		
avg	45.5 5	0.32 22	0.0003
β^- 3 max	205.5 18		
avg	55.4 6	15 4	0.0177
β^- 4 max	214.8 18		
avg	58.1 6	1.25 24	0.0015
β^- 5 max	287.6 18		
avg	79.6 6	49 22	0.0831
β^- 6 max	304.8 18		
avg	84.8 6	35 20	0.0632
β^- 7 max	311.3 18		
avg	86.8 6	0.41 11	0.0008
total β^- avg	76.4 7	100 30	0.169
4 weak β 's omitted: E_{β} (avg) = 33.4; ΣI_{β} = 0.12%			

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
X-ray L	13.3	71 8	0.0200
γ 3	17.2	0.19 14	≈ 0
γ 5	25.640 20	14.7 12	0.0080
γ 8	58.570 20	0.48 3	0.0006
γ 11	72.780 20	0.248 18	0.0004
γ 12	81.240 20	0.88 6	0.0015
γ 13	82.110 20	0.40 4	0.0007
γ 14	84.210 20	6.4 5	0.0115
γ 15	89.950 20	0.93 7	0.0018
X-ray $K\alpha_2$	92.2870 20	0.35 4	0.0007
X-ray $K\alpha_1$	95.8680 20	0.57 6	0.0012
γ 17	99.280 20	0.119 9	0.0003
γ 18	102.270 20	0.41 4	0.0009
X-ray $K\beta$	108	0.26 3	0.0006
γ 30	163.120 20	0.153 11	0.0005
37 weak γ 's omitted: E_{γ} (avg) = 114.3; ΣI_{γ} = 0.57%			
● ²³¹ Pa α Decay (3.276E4 y 11) I (min) = 0.10%			
Feeds ²²⁷ Ac			
% Spontaneous Fission $\leq 3E-10$			
ce-L- 3	3.760 18	0.755	≈ 0
ce-L- 4	4.86 11	0.668 20	≈ 0
ce-L- 5	5.70 7	13.7 5	0.0017
ce-L- 6	7.520 21	25.1 8	0.0040
Auger-L	9.28	42 5	0.0082
ce-L- 7	10.11 3	20.2 21	0.0044
ce-MNO- 2	13.898 5	41.664	0.0123
ce-L- 11	18.36 3	8.0 9	0.0031
ce-MNO- 3	18.598 5	0.24	≈ 0
ce-MNO- 4	19.70 10	0.214	≈ 0
ce-MNO- 5	20.54 6	4.356	0.0019
ce-MNO- 6	22.358 12	8.4537	0.0040
ce-L- 16	24.32 3	1.80 22	0.0009
ce-MNO- 7	24.948 21	6.9 7	0.0037
ce-L- 17	26.53 3	0.140 5	≈ 0
ce-L- 19	32.90 3	1.50 17	0.0011
ce-MNO-11	33.198 21	2.6 3	0.0018
ce-L- 22	37.26 11	0.7 6	0.0005
ce-L- 23	37.35 4	4.3 5	0.0034
ce-MNO-16	39.158 21	0.57 7	0.0005
ce-L- 25	43.83 4	3.3 4	0.0031
ce-M- 19	47.738 21	0.36 4	0.0004
ce-NCP-19	51.471 21	0.131 15	0.0001
ce-MNO-22	52.10 10	0.25 20	0.0003
ce-N- 23	52.19 3	1.17 13	0.0013
ce-L- 29	54.34 5	0.79 10	0.0009
ce-NCP-23	55.92 3	0.42 5	0.0005
ce-L- 30	57.52 4	0.39 5	0.0005
ce-N- 25	58.67 3	0.89 10	0.0011
ce-NOP-25	62.40 3	0.32 4	0.0004
ce-MNO-29	69.18 4	0.29 4	0.0004
ce-L- 31	77.04 4	0.79 9	0.0013
ce-L- 32	81.08 5	0.24 4	0.0004
ce-L- 33	82.7 4	0.30 11	0.0005
ce-MNO-31	91.88 3	0.29 3	0.0006
ce-K- 52	193.32 6	1.51 8	0.0062
ce-K- 59	223.315 6	0.66 11	0.0031
ce-L- 52	280.24 7	0.281 15	0.0017
ce-L- 59	310.230 18	0.122 20	0.0008
α 1	4631.0 20	0.10	0.0099
α 2	4642.0 20	0.10	0.0099
α 3	4680.0 20	1.5	0.150
α 4	4712.0 20	1	0.100
α 5	4736.0 20	8.4	0.847

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
α 6	4851.0 20	1.4	0.145	● ²³² Th α Decay (1.405E10 y 6) I (min) = 0.10%			
α 7	4933.0 20	3	0.315	Feeds ²²⁸ Ra			
α 8	4950	22.8	2.40	% Spontaneous Fission < 1E-9			
α 9	4974.0 20	0.4	0.0424	Auger-L	9	8.4 14	0.0016
α 10	4984.0 20	1.4	0.149	ce-L- 1	39.8 10	16.7 22	0.0141
α 11	5011.0 20	25.4	2.71	ce-M- 1	54.2 10	4.5 6	0.0052
α 12	5028	20	2.14	ce-NOP- 1	57.8 10	1.62 22	0.0020
α 13	5030.5 20	2.5	0.268	ce-L- 2	105.7633 15	0.11 5	0.0002
α 14	5057.3 20	11	1.18	α 1	3830	0.20 8	0.0163
6 weak α's omitted: Eα (avg) = 4706.2; ΣIα = 0.07%				α 2	3953	23 3	1.94
X-ray L	12.7	43 5	0.0117	α 3	4010 5	77 3	6.58
γ 2	18.9	0.35	0.0001	X-ray L	12.3	8.4 14	0.0022
γ 6	27.360 10	9.3	0.0054	γ 1	59.0 10	0.19 3	0.0002
γ 11	38.200 20	0.149 15	0.0001	1 weak γ's omitted: Eγ (avg) = 125.0; ΣIγ = 0.04%			
γ 17	46.370 20	0.208 2	0.0002	● ²³² U α Decay (72 y 2) I (min) = 0.10%			
X-ray Kα ₂	87.670 10	0.62 4	0.0012	Feeds ²²⁸ Th			
X-ray Kα ₁	90.884 6	1.02 7	0.0020	% Spontaneous Fission = 9E-11 7			
X-ray Kβ	102	0.47 3	0.0010	Auger-L	9.48	11.1 14	0.0022
γ 45	255.80 7	0.101 6	0.0006	ce-L- 1	37.31 5	22.9 14	0.0182
γ 47	260.22 8	0.173 11	0.0010	ce-M- 1	52.60 5	6.3 4	0.0070
γ 51	283.67 6	1.60 10	0.0097	ce-NOP- 1	56.45 5	2.29 14	0.0028
γ 52	300.08 6	2.30 10	0.0147	ce-L- 2	108.61 5	0.174 11	0.0004
γ 54	302.67 6	2.30 10	0.0148	α 1	5139.0 20	0.280 20	0.0306
γ 59	330	1.30 20	0.0091	α 2	5263.54 9	31.2 4	3.50
γ 60	340.81 7	0.165 8	0.0012	α 3	5320.30 14	68.6 4	7.77
γ 64	357.16 7	0.173 10	0.0013	X-ray L	13	12.0 14	0.0033
76 weak γ's omitted: Eγ (avg) = 165.5; ΣIγ = 1.45%				γ 1	57.78 5	0.201 10	0.0002
● ²³¹ U EC Decay (4.2 d 1) I (min) = 0.10%				14 weak γ's omitted: Eγ (avg) = 142.0; ΣIγ = 0.07%			
Feeds ²³¹ Pa				● ²³³ Th β ⁻ Decay (22.3 m 1) I (min) = 0.10%			
ce-MNO- 1	3.8331 16	0.52	≈0	Feeds ²³³ Pa			
ce-L- 4	4.535 20	39.8 12	0.0038	ce-MNO- 1	1.31 5	52 8	0.0015
Auger-L	9.68	84 10	0.0174	ce-MNO- 2	2.85 5	16.3	0.0010
ce-MNO- 2	11.8331 16	0.17	≈0	ce-L- 4	8.268 11	5.85 18	0.0010
ce-MNO- 3	12.7031 16	1	0.0003	Auger-L	9.68	8.1 10	0.0017
ce-MNO- 4	20.273 20	13.68	0.0059	ce-MNO- 3	12.03 5	0.12	≈0
ce-L- 6	37.465 20	50.6 16	0.0404	ce-MNO- 4	24.006 11	2	0.0010
ce-L- 7	47.40 10	0.299 9	0.0003	ce-L- 7	36.05 4	7.02 21	0.0054
ce-M- 6	53.203 20	13.9 5	0.0158	ce-M- 7	51.78 4	1.93 6	0.0021
ce-NOP- 6	57.183 20	5.15 16	0.0063	ce-L- 10	53.60 20	1.1 8	0.0013
ce-L- 8	60.135 20	0.13 5	0.0002	ce-NOP- 7	55.76 4	0.713 22	0.0008
ce-L- 9	61.005 20	0.113	0.0001	ce-L- 12	65.398 20	3.05 22	0.0042
ce-L- 10	63.105 20	15.8 15	0.0213	ce-K- 29	66.40 20	0.104 4	0.0001
ce-MNO- 7	63.13 10	0.11275	0.0002	ce-M- 10	69.33 20	0.31 21	0.0005
Auger-K	70.8	1.4 10	0.0021	ce-NOP-10	73.31 20	0.11 8	0.0002
ce-M- 10	78.843 20	4.0 7	0.0067	ce-K- 32	77.94 8	0.357 11	0.0006
ce-NOP-10	82.823 20	0.91 14	0.0016	ce-M- 12	81.136 20	0.74 5	0.0013
X-ray L	13.3	99 10	0.0280	ce-NOP-12	85.116 20	0.262 17	0.0005
γ 4	25.640 20	12	0.0066	ce-K- 63	346.60 20	0.343 11	0.0025
γ 6	58.570 20	0.44	0.0005				
γ 10	84.210 20	7	0.0126				
X-ray Kα ₂	92.2870 20	17.3 21	0.0340				
X-ray Kα ₁	95.8680 20	28 4	0.0575				
X-ray Kβ	108	13.1 16	0.0300				
γ 18	217.94 3	0.8	0.0037				
γ 19	236.01 3	0.18	0.0009				
17 weak γ's omitted: Eγ (avg) = 178.4; ΣIγ = 0.22%							

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
²³³ Th β ⁻ Decay (22.3 m 1) (Continued)				ce-L- 7 53.523 10 10.7 8 0.0122			
β ⁻ 1 max	260.4 21			ce-L- 8	64.833 10	10.6 14	0.0147
avg	71.5 7	0.25	0.0004	ce-M- 7	69.732 10	2.59 18	0.0039
β ⁻ 2 max	433.6 21			Auger-K	72.6	0.8 6	0.0013
avg	125.0 7	0.5	0.0014	ce-NOP- 7	73.839 10	0.94 7	0.0015
β ⁻ 3 max	480.7 21			ce-M- 8	81.042 10	2.6 4	0.0045
avg	140.2 7	1.6	0.0048	ce-L- 10	82.103 20	2.7 5	0.0048
β ⁻ 4 max	659.7 21			ce-NCP- 8	85.149 10	0.95 12	0.0017
avg	200.3 8	0.23	0.0010	ce-M- 10	98.312 20	0.67 11	0.0014
β ⁻ 5 max	691.3 21			ce-NOP-10	102.419 20	0.24 4	0.0005
avg	211.2 8	1.7	0.0076	ce-K- 15	184.51 3	5.6 4	0.0220
β ⁻ 6 max	790.6 21			ce-K- 16	196.37 3	29.4 10	0.123
avg	246.1 8	0.29	0.0015	ce-K- 17	224.89 4	2.3 5	0.0108
β ⁻ 7 max	797.4 21			ce-L- 15	278.36 3	1.09 7	0.0065
avg	248.6 8	1.2	0.0064	ce-L- 16	290.22 3	5.71 19	0.0353
β ⁻ 8 max	1076.0 21			ce-MNO-15	294.57 3	0.359 18	0.0023
avg	350.5 8	1.9	0.0142	ce-K- 20	300.15 4	0.167 24	0.0011
β ⁻ 9 max	1150.5 21			ce-M- 16	306.43 3	1.37 5	0.0090
avg	378.5 8	13	0.105	ce-NOP-16	310.54 3	0.502 16	0.0033
β ⁻ 10 max	1238.6 21			ce-L- 17	318.74 4	0.47 7	0.0032
avg	412.1 8	51	0.448	ce-MNO-17	334.95 4	0.158 22	0.0011
β ⁻ 11 max	1245.2 21			β ⁻ 1 max	156.5 24		
avg	414.6 8	30	0.265	avg	41.5 7	24.3 12	0.0215
total β ⁻				β ⁻ 2 max	173.8 24		
avg	394.3 9	101.852	0.855	avg	46.3 7	15.7 20	0.0155
3 weak β's omitted: Eβ(avg) = 227.9; ΣIβ = 0.17%				β ⁻ 3 max	231.8 24		
X-ray L	13.3	9.6 10	0.0027	avg	63.0 7	28 4	0.0376
γ 4	29.373 10	2.5	0.0016	β ⁻ 4 max	260.4 24		
γ 12	86.503 20	2.7	0.0050	avg	71.4 8	33 4	0.0502
γ 13	88.04 16	0.3	0.0006	total β ⁻		58.0 8	101 7
X-ray Kα ₂	92.2870 20	0.232 7	0.0005	avg			0.125
γ 14	94.66 5	0.8	0.0016	X-ray L	13.6	49 7	0.0142
X-ray Kα ₁	95.8680 20	0.378 10	0.0008	γ 7	75.280 10	1.26 8	0.0020
X-ray Kβ	108	0.175 6	0.0004	γ 8	86.590 10	1.89 24	0.0035
γ 25	162.50 6	0.17	0.0006	X-ray Kα ₂	94.6650 20	10.8 4	0.0219
γ 26	162.5	0.15	0.0005	X-ray Kα ₁	98.4390 20	17.6 7	0.0368
γ 27	169.17 5	0.34	0.0012	γ 10	103.860 20	0.74 8	0.0016
γ 28	170.7 3	0.13	0.0005	X-ray Kβ	111	8.2 3	0.0193
γ 32	190.54 8	0.13	0.0005	γ 13	271.48 8	0.30 4	0.0018
γ 33	195.096 20	0.16	0.0007	γ 15	300.12 3	6.6 4	0.0424
γ 49	359.90 20	0.12	0.0009	γ 16	311.98 3	38.6 4	0.257
γ 60	441.0 3	0.23	0.0022	γ 17	340.50 4	4.5 5	0.0328
γ 61	447.7 3	0.15	0.0014	γ 18	375.45 4	0.62 12	0.0049
γ 63	459.20 20	1.4	0.0137	γ 19	398.62 8	1.27 16	0.0108
γ 66	490.8 3	0.17	0.0018	γ 20	415.76 4	1.62 16	0.0144
γ 68	499.0 3	0.2	0.0022	10 weak γ's omitted: Eγ(avg) = 120.5; ΣIγ = 0.21%			
γ 78	595.20 20	0.16	0.0020	● ²³³ U α Decay (1.592E5 y 7) I (min) = 0.10%			
γ 83	669.80 20	0.68	0.0097	Feeds ²²⁹ Th			
γ 96	764.4 4	0.12	0.0020	ce-L- 2	4.80 12	0.20 4	≈0
γ 111	890.1 5	0.14	0.0027	ce-L- 5	8.68 9	0.73 15	0.0001
110 weak γ's omitted: Eγ(avg) = 484.7; ΣIγ = 1.88%				Auger-L	9.48	3.6 11	0.0007
● ²³³ Pa β ⁻ Decay (27.0 d 1) I (min) = 0.10%				ce-L- 10	22.01 3	5.8 21	0.0027
Feeds ²³³ U				ce-MNO- 5	23.97 9	0.23 5	0.0001
ce-L- 2	6.78 5	17.1 21	0.0025	ce-L- 15	34.27 5	0.54 11	0.0004
Auger-L	9.89	38 6	0.0081	ce-MNO-10	37.30 3	2.1 8	0.0016
ce-MNO- 1	11.7120 4	1.949 21	0.0005	ce-MNO-15	49.56 5	0.19 4	0.0002
ce-L- 3	18.593 10	9 6	0.0037	ce-L- 22	51.37 4	0.102 21	0.0001
ce-MNO- 2	22.99 5	5.8 8	0.0028	ce-L- 36	76.67 5	0.20 4	0.0003
ce-MNO- 3	34.802 10	3.5 21	0.0026	(Continued)			
ce-L- 6	36.1426 3	0.122 4	≈0				

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
α 1	4729	1.6	0.162	ce-L- 4	36.44 6	1.13 4	0.0009
α 2	4754	0.163	0.0165	ce-K- 18	37.09 3	1.51 13	0.0012
α 3	4783.5 12	13.20 20	1.34	ce-MNO- 2	37.932 10	23.7456	0.0192
α 4	4796	0.28	0.0286	ce-MNO- 3	39.64 5	1.8	0.0015
α 5	4824.2 12	84.4 5	8.67	ce-L- 5	41.24 20	1.05 8	0.0009
26 weak α 's omitted: $E\alpha$ (avg) = 4673.6; $\Sigma I\alpha$ = 0.28%				ce-L- 6	45.34 7	2.47 8	0.0024
X-ray L	13	3.9 12	0.0011	ce-M- 4	52.65 6	0.312 10	0.0004
149 weak γ 's omitted: $E\gamma$ (avg) = 114.5; $\Sigma I\gamma$ = 0.18%				ce-K- 21	55.09 20	2.1 5	0.0024
\bullet ^{234}Th β^- Decay (24.10 d 3) I (min) = 0.10%				ce-NOP- 4	56.76 6	0.116 4	0.0001
Feeds ^{234}Pa (1.17 m)				ce-MNO- 5	57.45 20	0.346 22	0.0004
ce-L- 2	8.385 20	4.4 4	0.0008	ce-L- 8	57.93 8	3.51 11	0.0043
Auger-L	9.68	8.1 10	0.0017	ce-K- 22	59.0 3	0.4 4	0.0005
ce-MNO- 1	14.653 20	1.7 5	0.0005	ce-M- 6	61.55 7	0.674 21	0.0009
ce-MNO- 2	24.123 20	1.58 14	0.0008	ce-NCP- 6	65.66 7	0.249 8	0.0003
ce-L- 4	41.755 20	0.35 6	0.0003	ce-K- 23	70.39 20	6.5 10	0.0098
ce-L- 5	42.185 20	1.18 10	0.0011	Auger-K	72.6	1.2 9	0.0018
ce-MNO- 4	57.493 20	0.120 21	0.0001	ce-N- 8	74.14 8	0.97 3	0.0015
ce-M- 5	57.923 20	0.289 24	0.0004	ce-K- 24	78.0 3	1.8 3	0.0029
ce-NOP- 5	61.903 20	0.101 9	0.0001	ce-L- 9	78.103 10	48.6 15	0.0809
ce-L- 10	71.275 11	11.5 10	0.0175	ce-NCP- 8	78.25 8	0.364 11	0.0006
ce-L- 11	71.695 20	0.30 3	0.0005	ce-K- 25	80.79 20	1.00 3	0.0017
ce-M- 10	87.013 11	2.78 24	0.0052	ce-L- 10	81.65 10	1.03 3	0.0018
ce-NCP-10	90.993 11	1.02 9	0.0020	ce-K- 26	84.09 20	1.3 4	0.0023
β^- 1 max	75.8 20			ce-K- 27	85.37 5	0.18 5	0.0003
avg	19.5 6	2.0 5	0.0008	ce-K- 28	87.4 3	1.08 19	0.0020
β^- 2 max	95.8 20			ce-M- 9	94.312 10	13.5 4	0.0270
avg	24.8 6	6.8 7	0.0036	ce-M- 10	97.86 10	0.286 9	0.0006
β^- 3 max	96.2 20			ce-NCP- 9	98.419 10	5.09 16	0.0107
avg	24.9 6	18.5 15	0.0098	ce-NOP-10	101.97 10	0.108 4	0.0002
β^- 4 max	188.6 20			ce-L- 11	103.6 3	3.5 11	0.0078
avg	50.6 6	72.5 20	0.0781	ce-K- 30	104.2 3	0.41 21	0.0009
total β^-				ce-L- 12	109.44 20	0.96 3	0.0022
avg	43.5 7	100 3	0.0924	ce-K- 31	110.8 4	5.46 17	0.0129
X-ray L	13.3	9.6 11	0.0027	ce-K- 32	111.59 20	10.3 3	0.0244
γ 5	63.290 20	3.8 3	0.0051	ce-L- 13	112.61 14	0.338 11	0.0008
γ 10	92.380 10	2.72 22	0.0054	ce-L- 15	118.54 20	1.66 20	0.0042
γ 11	92.800 20	2.69 21	0.0053	ce-M- 11	119.9 3	1.0 3	0.0025
γ 15	112.81 5	0.242 19	0.0006	ce-L- 16	122.2 5	0.57 14	0.0015
13 weak γ 's omitted: $E\gamma$ (avg) = 76.8; $\Sigma I\gamma$ = 0.13%				ce-NOP-11	124.0 3	0.37 12	0.0010
\bullet ^{234}Pa β^- Decay (6.70 h 5) I (min) = 0.10%				ce-MNO-12	125.65 20	0.3162	0.0008
Feeds ^{234}U				ce-L- 17	128.4426 3	0.314 10	0.0009
ce-K- 11	9.8 3	0.22 7	*0	ce-MNO-13	128.82 14	0.112	0.0003
Auger-L	9.89	89 13	0.0188	ce-K- 33	129.59 20	1.4 3	0.0038
ce-L- 1	12.54 4	6.03 18	0.0016	ce-L- 18	130.94 3	9.8 8	0.0273
ce-K- 12	15.59 20	4.24 13	0.0014	ce-K- 34	133.29 20	0.136 15	0.0004
ce-K- 13	18.76 14	1.73 6	0.0007	ce-M- 15	134.75 20	0.44 6	0.0013
ce-L- 2	21.723 10	64.9 20	0.0300	ce-MNO-16	138.5 5	0.20 6	0.0006
ce-L- 3	23.43 5	4.93 15	0.0025	ce-NOP-15	138.86 20	0.165 19	0.0005
ce-K- 15	24.69 20	2.7 4	0.0014	ce-M- 18	147.15 3	2.71 22	0.0085
ce-K- 16	28.4 5	1.2 12	0.0007	ce-L- 21	148.94 20	0.41 9	0.0013
ce-MNO- 1	28.75 4	2.2	0.0013	ce-NOP-18	151.26 3	1.01 9	0.0033
				ce-L- 22	152.8 3	0.16 4	0.0005
				ce-K- 36	156.49 20	1.13 4	0.0038
				ce-K- 37	159.9 8	0.16 15	0.0005
				ce-L- 23	164.24 20	1.28 20	0.0045
				ce-MNO-21	165.15 20	0.13 3	0.0005
				ce-L- 24	171.8 3	0.34 6	0.0013
				ce-L- 25	174.64 20	0.193 6	0.0007
				ce-L- 26	177.94 20	0.25 8	0.0010
				ce-K- 41	178.1 3	1.79 15	0.0068
				ce-L- 27	179.22 5	0.48 14	0.0019
				ce-M- 23	180.45 20	0.31 5	0.0012
				ce-L- 28	181.2 3	0.54 9	0.0021
				ce-NOP-23	184.56 20	0.113 18	0.0004
				ce-MNO-24	188.1 3	0.113 19	0.0005
				ce-MNO-27	195.43 5	0.18 5	0.0008
				ce-K- 43	196.8939 16	0.13 11	0.0005
				ce-MNO-28	197.5 3	0.19 4	0.0008
				ce-L- 31	204.6 4	1.85 6	0.0081
				ce-L- 32	205.44 20	2.00 6	0.0088
				ce-K- 47	215.0 4	0.22 19	0.0010
				ce-M- 31	220.9 4	0.474 15	0.0022

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
²³⁴ Pa β ⁻ Decay (6.70 h 5) (Continued)				total β ⁻ avg 223.6 22 99.7 0.475			
ce-M- 32	221.65 20	0.484 15	0.0023	X-ray L	13.6	114 13	0.0329
ce-L- 33	223.44 20	0.27 6	0.0013	γ 2	43.480 10	0.1224	0.0001
ce-NCP-31	225.0 4	0.174 6	0.0008	γ 5	63.00 20	3.26 21	0.0044
ce-NCP-32	225.76 20	0.176 6	0.0008	γ 7	69.9	0.2346	0.0003
ce-L- 36	250.34 20	0.220 7	0.0012	γ 8	79.69 8	0.1224	0.0002
ce-K- 49	254.2 4	1.42 16	0.0077	X-ray Kα ₂	94.6650 20	15.7 7	0.0317
ce-K- 50	256.8 4	0.51 8	0.0028	X-ray Kα ₁	98.4390 20	25.4 10	0.0533
ce-L- 41	271.9 3	0.51 5	0.0030	γ 9	99.860 10	4.9	0.0104
ce-NPO-41	288.2 3	0.178 14	0.0011	γ 10	103.41 10	0.1224	0.0003
ce-K- 56	343.2 3	0.185 14	0.0014	X-ray Kβ	111	11.8 5	0.0280
ce-L- 49	348.0 4	0.27 3	0.0020	γ 11	125.4 3	1.0 3	0.0027
ce-L- 50	350.6 4	0.105 17	0.0008	γ 12	131.20 20	20.4	0.0570
ce-K- 66	398.1 5	0.15 13	0.0012	γ 13	134.37 14	0.2142	0.0006
ce-K- 69	412.4 10	0.11 4	0.0010	γ 14	137.7 5	0.153	0.0004
ce-K- 73	450.3 10	0.16 7	0.0015	γ 15	140.30 20	0.92 11	0.0027
ce-K- 74	453.1 5	0.459 14	0.0044	γ 16	144.0 5	0.36 5	0.0011
ce-K- 75	453.9 5	1.63 5	0.0157	γ 17	150.2	0.2	0.0007
ce-K- 81	495.9 6	0.10 5	0.0011	γ 18	152.70 3	6.8 5	0.0222
ce-L- 75	547.7 5	0.312 10	0.0036	γ 19	159.1 4	0.71 21	0.0024
ce-NPO-75	564.0 5	0.1	0.0012	γ 21	170.70 20	0.51 11	0.0019
ce-K- 99	577.1 5	0.14 5	0.0017	γ 22	174.6 3	0.20 5	0.0008
ce-K-100	583.4 5	0.41 3	0.0051	γ 23	186.00 20	2.0 3	0.0081
ce-K-105	617.4 5	0.67 7	0.0088	γ 24	193.6 3	0.61 11	0.0025
ce-K-119	680.7 5	0.14 10	0.0021	γ 26	199.70 20	0.49 16	0.0021
ce-K-120	688.7 7	0.184 6	0.0027	γ 27	200.98 5	1.1 3	0.0048
ce-K-122	692.64 15	0.186 6	0.0027	γ 28	203.0 3	1.22 21	0.0053
ce-K-123	694.4 7	0.152	0.0022	γ 30	219.8 3	0.20 11	0.0010
ce-K-127	710.7 6	0.14 10	0.0021	γ 31	226.4 4	6	0.0290
ce-L-105	711.2 5	0.128 13	0.0019	γ 32	227.20 20	5.6	0.0271
ce-K-136	767.63 4	0.13 5	0.0021	γ 33	245.20 20	0.92 21	0.0048
ce-K-141	810.4 8	0.109 20	0.0019	γ 34	248.90 20	2.9 3	0.0151
ce-K-144	833.3939 16	0.20 13	0.0035	γ 35	267.1 8	0.1734	0.0010
				γ 36	272.10 20	1	0.0059
β ⁻ 1 max	64 5			γ 37	275.5 8	0.27 9	0.0016
avg	16.3 14	0.47	0.0002	γ 39	286.1 8	0.1428	0.0009
β ⁻ 2 max	326 5			γ 40	289.6 8	0.1122	0.0007
avg	91.0 16	1.2	0.0023	γ 41	293.7 3	4.0 3	0.0249
β ⁻ 3 max	396 5			γ 42	309.6 8	0.1	0.0007
avg	112.7 16	0.98	0.0024	γ 43	312.5	0.3	0.0020
β ⁻ 4 max	424 5			γ 44	316.3 8	0.1224	0.0008
avg	121.9 16	4	0.0104	γ 45	320.7 8	0.1224	0.0008
β ⁻ 5 max	445 5			γ 46	328	0.3	0.0021
avg	128.6 17	2	0.0058	γ 47	330.6 4	0.612	0.0043
β ⁻ 6 max	469 5			γ 48	351.9 3	0.61 11	0.0046
avg	136.3 17	2.3	0.0067	γ 49	369.8 4	3.0 3	0.0233
β ⁻ 7 max	484 5			γ 50	372.4 4	1.33 21	0.0105
avg	141.0 17	24	0.0721	γ 51	409.8 4	0.41 21	0.0036
β ⁻ 8 max	484 5			γ 52	416.3	0.1	0.0009
avg	141.2 17	11	0.0331	γ 53	426.8 4	0.6 3	0.0056
β ⁻ 9 max	514 5			γ 55	446.5 5	0.1224	0.0012
avg	150.8 17	4.2	0.0135	γ 56	458.8 3	1.53 11	0.0150
β ⁻ 10 max	654 5			γ 57	461.8 10	0.1632	0.0016
avg	198.1 18	16	0.0675	γ 58	467.5 10	0.4 3	0.0041
β ⁻ 11 max	711 5			γ 59	472.1 10	0.2448	0.0025
avg	217.6 18	3.8	0.0176	γ 60	473.5 10	0.1836	0.0019
β ⁻ 12 max	932 5			γ 61	478.7 10	0.3	0.0031
avg	296.6 19	0.96	0.0061	γ 62	480.4 8	0.41 11	0.0042
β ⁻ 13 max	1115 5			γ 63	482.5 7	0.31 11	0.0031
avg	364.3 19	7.7	0.0597	γ 64	498.9 10	0.1	0.0011
β ⁻ 14 max	1138 5			γ 65	506.8 5	1.6 3	0.0176
avg	372.9 19	2.3	0.0183	γ 66	513.7 5	1.33 21	0.0145
β ⁻ 15 max	1183 5			γ 67	520.2 5	0.612	0.0068
avg	390.0 19	10	0.0831	γ 68	521.0 5	0.918	0.0102
β ⁻ 16 max	1238 5			γ 69	528.0 10	0.61 21	0.0069
avg	410.7 19	6.2	0.0542	γ 70	533.2 10	0.2	0.0023
β ⁻ 17 max	1244 5			γ 71	537.1 10	0.1632	0.0019
avg	413.3 20	1.7	0.0150	γ 72	557.0 10	0.2652	0.0031
β ⁻ 18 max	1259 5			γ 73	565.9 10	1.4 3	0.0172
avg	418.9 20	0.8	0.0071	γ 74	568.7 5	3	0.0371

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
γ 75	569.5	5 11	0.132	γ 154	1044.9	0.5	0.0114
γ 76	574.0	10 2	0.0249	γ 155	1074.6	10 0.25	0.0058
γ 77	585.8	8 0.153	0.0019	γ 156	1083.2	8 0.76	0.0177
γ 79	596.6	5 0.51 21	0.0065	γ 157	1108.5	8 0.31	0.0072
γ 80	602.8	5 0.9 4	0.0118	γ 158	1122.3	8 0.51	0.0122
γ 81	611.5	6 0.8 4	0.0106	γ 159	1126.0	6 0.82	0.0196
γ 82	616.2	5 0.2	0.0027	γ 160	1153.1	7 0.31	0.0075
γ 83	623.6	5 0.82 21	0.0108	γ 161	1171.3	8 0.24	0.0061
γ 84	627.5	5 0.82 21	0.0109	γ 162	1208	0.3	0.0079
γ 85	630.6	10 0.4	0.0055	γ 163	1217.5	10 0.38	0.0098
γ 86	634.5	10 0.3	0.0041	γ 164	1229	0.3	0.0080
γ 87	639.7	10 0.2	0.0028	γ 165	1240.5	8 0.5	0.0135
γ 88	643.2	10 0.2	0.0028	γ 166	1251	0.3	0.0082
γ 89	646.0	10 0.3	0.0042	γ 167	1277.4	8 0.20	0.0056
γ 90	653.7	6 0.9 4	0.0128	γ 168	1292.7	8 0.61	0.0169
γ 91	655.0	8 0.61 21	0.0085	γ 169	1353.3	6 1.7	0.0500
γ 92	658.0	5 0.9 4	0.0129	γ 170	1358.5	10 0.1224	0.0035
γ 93	660.6	10 0.3	0.0043	γ 171	1394.1	5 3.1	0.0909
γ 94	664.8	10 1.3 4	0.0188	γ 172	1399.7	10 0.23	0.0070
γ 95	666.7	6 1.6 4	0.0232	γ 173	1427.5	10 0.20	0.0062
γ 96	669.9	5 1.4 4	0.0204	γ 174	1446.0	8 0.41	0.0126
γ 97	683.3	8 0.2448	0.0036	γ 175	1452.7	10 1.02	0.0316
γ 98	687.0	20 0.2856	0.0042	γ 176	1460	0.3	0.0095
γ 99	692.7	5 1.5 5	0.0226	γ 177	1493.7	10 0.20	0.0065
γ 100	699.0	5 4.7 3	0.0699	γ 178	1516	0.4	0.0132
γ 101	706.1	3 3.2 7	0.0476	γ 179	1549.4	10 0.10	0.0034
γ 103	711.2	8 0.2	0.0031	γ 180	1579.7	10 0.17	0.0058
γ 104	713.8	8 0.16 5	0.0025	γ 181	1585.4	10 0.25	0.0086
γ 105	733.0	5 8.8 9	0.137	γ 182	1593.8	8 0.61	0.0208
γ 106	738.0	8 1.0 4	0.0160	γ 183	1627.9	10 0.15	0.0053
γ 107	742.81	3 2.4 8	0.0387	γ 184	1638.0	10 0.41	0.0142
γ 108	746.5	8 0.1326	0.0021	γ 185	1656	3 0.153	0.0054
γ 109	755.6	10 1.4 8	0.0230	γ 186	1668.5	10 1.22	0.0435
γ 110	760.0	10 0.1632	0.0026	γ 187	1686.2	10 0.51	0.0183
γ 111	766.360	20 0.3	0.0050	γ 188	1694.6	8 1.2	0.0442
γ 113	768.7	10 0.5712	0.0094	γ 189	1699.8	10 0.15	0.0055
γ 114	777.9	10 0.2	0.0034	γ 191	1737.6	7 0.10	0.0038
γ 115	780.7	6 1.1 4	0.0187	γ 192	1741.7	10 0.10	0.0038
γ 116	783.1	10 0.5	0.0085	γ 194	1756	0.255	0.0095
γ 117	786.27	3 1.4 4	0.0239	γ 196	1772.3	15 0.10	0.0039
γ 118	793.6	10 1.53	0.0259	γ 197	1797.3	10 0.31	0.0117
γ 119	796.3	5 3.9 5	0.0657	γ 202	1890.1	10 0.19	0.0078
γ 120	804.3	7 0.4	0.0070	γ 203	1897.1	10 0.15	0.0062
γ 121	805.6	3 3.4 5	0.0578	γ 204	1905	0.2856	0.0116
γ 124	812.5	15 0.5	0.0088	γ 205	1926.0	6 0.51	0.0209
γ 125	819.6	6 2.7 5	0.0463				
γ 127	826.3	6 4.1 9	0.0718				
γ 128	831.6	8 5.6 8	0.0994				
γ 129	841.9	10 0.1428	0.0026				
γ 130	844.0	10 0.51 21	0.0092				
γ 131	851.70	10 0.1224	0.0022				
γ 132	872.9	10 0.1224	0.0023				
γ 133	876.4	8 4.1 21	0.0762				
γ 134	880.5	1 1	0.0191				
γ 135	880.51	4 12.24	0.230				
γ 136	883.24	4 12 4	0.230				
γ 137	899.0	5 4.2 9	0.0801				
γ 138	904.37	15 0.51 21	0.0098				
γ 139	920	0.41 21	0.0080				
γ 140	925.0	10 3	0.0583				
γ 141	926.0	8 11.2 21	0.221				
γ 142	926.72	15 9 3	0.181				
γ 143	946.00	3 12 7	0.247				
γ 144	949	8.16	0.165				
γ 145	960.0	10 0.1	0.0021				
γ 146	966.0	5 0.6 12	0.0126				
γ 147	978.8	10 1.4 8	0.0298				
γ 148	980.5	5 3	0.0639				
γ 149	980.5	5 2	0.0426				
γ 151	984.0	10 1.9 7	0.0406				
γ 152	1022.6	8 0.6 3	0.0133				
γ 153	1028.3	8 0.8 3	0.0179				

27 weak γ's omitted:
 $\Sigma\gamma$ (avg) = 955.6; $\Sigma I\gamma = 1.01\%$

• ²³⁴Pa IT Decay (1.17 m 3) I (min) = 0.10%
 %IT Decay = 0.160 18
 Feeds ²³⁴Pa (6.70 h)
 See also ²³⁴Pa β⁻ Decay (1.17 m)

ce-L- 1 52.815 20 0.111 13 0.0001

1 weak γ's omitted:
 $\Sigma\gamma$ (avg) = 73.9; $\Sigma I\gamma = 0.01\%$

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
<p>• ²³⁴Pa β Decay (1.17 m 3) I (min) = 0.10%</p> <p>%_β Decay = 99.840 18</p> <p>Feeds ²³⁴U</p> <p>See also ²³⁴Pa IT Decay (1.17 m)</p>							
Auger-L	9.89	0.35 5	≈0	ce-L- 5	30.83 10	4 3	0.0027
ce-L- 1	21.723 10	0.476 15	0.0002	ce-L- 6	33.6279 5	1.74 22	0.0012
ce-MMO- 1	37.932 10	0.174 3	0.0001	ce-K- 16	34.109 20	1.72 15	0.0013
ce-K- 64	694.4 7	0.3992	0.0059	ce-MMO- 3	36.2 3	0.4 3	0.0003
β- 1 max	1236 5			ce-MMO- 4	36.78 15	6.7 5	0.0052
β- 1 avg	410.2 19	0.74	0.0065	ce-K- 18	41.289 20	0.20 19	0.0002
β- 2 max	1471 5			ce-M- 5	46.12 10	1.1 9	0.0011
β- 2 avg	500.8 20	0.62	0.0066	ce-M- 6	48.9177 3	0.45 7	0.0005
β- 3 max	2281 5			ce-NCP- 5	49.97 10	0.4 3	0.0004
β- 3 avg	825.4 21	98.6	1.73	ce-L- 7	52.23 20	4.15 13	0.0046
total β- avg	819.2 21	100.14782	1.75	ce-NCP- 6	52.7705 4	0.163 24	0.0002
19 weak β's omitted:				ce-K- 19	53.699 20	0.57 6	0.0007
E _β (avg) = 208.8; ΣI _β = 0.19%				ce-M- 7	67.52 20	1.13 4	0.0016
X-ray L	13.6	0.44 5	0.0001	Auger-K	69.2	0.23 16	0.0003
X-ray Kα ₂	94.6650 20	0.115 2	0.0002	ce-NCP- 7	71.37 20	0.419 13	0.0006
X-ray Kα ₁	98.4390 20	0.187 4	0.0004	ce-K- 22	73.05 20	0.6 6	0.0009
γ 57	766.410 20	0.267 8	0.0034	ce-K- 23	74.064 5	4.96 15	0.0078
γ 82	1001.03 3	0.5890 1	0.0126	ce-L- 10	75.618 20	0.87 12	0.0014
125 weak γ's omitted:				ce-L- 11	88.668 20	0.107 15	0.0002
E _γ (avg) = 926.2; ΣI _γ = 0.37%				ce-MMO-10	90.908 20	0.33 5	0.0006
				ce-K- 26	92.469 20	1.1 10	0.0022
				ce-K- 27	95.660 10	0.33 3	0.0007
				ce-L- 13	99.5279 5	0.521 7	0.0011
				ce-MMO-13	114.8177 3	0.196 5	0.0005
				ce-L- 16	123.288 20	0.37 3	0.0010
				ce-MMO-16	138.578 20	0.120 10	0.0004
				ce-L- 19	142.878 20	0.118 11	0.0004
				ce-L- 22	162.23 20	0.22 3	0.0008
				ce-L- 23	163.243 5	1.00 3	0.0035
				ce-MMO-23	178.533 5	0.32778	0.0012
				ce-L- 26	181.648 20	0.38 5	0.0015
				ce-MMO-26	196.938 20	0.133 14	0.0006
				α 1	4150 5	0.90 20	0.0796
				α 2	4217 3	5.7 6	0.512
				α 3	4219 6	0.9	0.0809
				α 4	4271 5	0.4	0.0364
				α 5	4325	4.6 5	0.424
				α 6	4344	1.5	0.139
				α 7	4364 5	11	1.02
				α 8	4370 4	6	0.558
				α 9	4396 3	55 3	5.15
				α 10	4414 4	2.10 20	0.197
				α 11	4435 5	0.7	0.0661
				α 12	4502.0 20	1.70 20	0.163
				α 13	4556.0 20	4.2 3	0.408
				α 14	4598.0 20	5.0 5	0.490
				X-ray L	13	31 11	0.0086
				γ 7	72.70 20	0.1	0.0002
				X-ray Kα ₂	89.9530 20	2.7 4	0.0052
				X-ray Kα ₁	93.3500 20	4.5 6	0.0089
				X-ray KB	105	2.1 3	0.0046
				γ 11	109.140 20	1.50 20	0.0035
				γ 13	120	0.15	0.0004
				γ 15	140.77 8	0.22 3	0.0007
				γ 16	143.760 20	10.5 8	0.0322
				γ 19	163.350 20	4.7 4	0.0164
				γ 22	182.70 20	0.40 5	0.0016
				γ 23	185.715 5*	54	0.211
				γ 24	194.940 10	0.59 6	0.0024
				γ 26	202.120 20	1.00 10	0.0043
				γ 27	205.311 10	4.7 4	0.0206
				γ 29	221.380 20	0.100 10	0.0005
42 weak γ's omitted:							
E _γ (avg) = 190.3; ΣI _γ = 0.92%							
				*Correction made in September 1983 printing.			
• ²³⁵ U α Decay (7.038E8 y 5) I (min) = 0.10%							
Feeds ²³¹ Th							
% Spontaneous Fission < 4.2E-8							
Auger-L	9.48	29 10	0.0058				
ce-L- 2	11.0779 5	18 19	0.0042				
ce-MMO- 1	14.4077 3	68 4	0.0209				
ce-L- 3	20.9 3	1.2 8	0.0005				
ce-L- 4	21.49 15	19.6 10	0.0090				
ce-MMO- 2	26.3677 3	7 7	0.0037				

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
● ²³⁵ Np EC Decay (396.1 d 12) I (min) = 0.10%			
%EC Decay = 99.9986 2			
Feeds ²³⁵ U			
% α Decay = 0.0014 2			
Auger-L	9.89	30 4	0.0062
X-ray L	13.6	38 5	0.0109
X-ray K α_2	94.6650 20	0.51 15	0.0010
X-ray K α_1	98.4390 20	0.83 24	0.0017
X-ray K β	111	0.39 11	0.0009
● ²³⁶ U α Decay (2.3415E7 y 14) I (min) = 0.10%			
Feeds ²³² Th			
Auger-L	9.48	9.2 17	0.0019
ce-L- 1	28.897 9	19 3	0.0117
ce-MNO- 1	44.187 9	6.9 11	0.0065
ce-L- 2	92.278 15	0.159 7	0.0003
α 1	4332 8	0.260 10	0.0240
α 2	4445 5	26 4	2.46
α 3	4494 3	74 4	7.08
X-ray L	13	10.0 18	0.0028
2 weak γ 's omitted: E γ (avg) = 68.2; $\Sigma I\gamma$ = 0.11%			
● ²³⁶ Np EC Decay (1.15E5 y 12) I (min) = 0.10%			
%EC Decay = 91.1 20			
Feeds ²³⁶ U			
See also ²³⁶ Np β^- Decay (1.15E5 y)			
Auger-L	9.89	103 15	0.0217
ce-L- 1	23.485 6	66.6 16	0.0333
ce-MNO- 1	39.694 6	24.4 8	0.0206
ce-K- 3	44.704 9	5.85 22	0.0056
Auger-K	72.6	1.6 12	0.0024
ce-L- 2	82.476 5	60.6 15	0.106
ce-M- 2	98.685 5	16.8 6	0.0352
ce-NCP- 2	102.792 5	6.32 23	0.0138
ce-L- 3	138.553 8	31.7 12	0.0937
ce-M- 3	154.762 8	8.8 4	0.0290
ce-NCP- 3	158.869 8	3.28 13	0.0111
X-ray L	13.6	131 15	0.0380
γ 1	45.242 6	0.152 6	0.0001
X-ray K α_2	94.6650 20	20.7 5	0.0417
X-ray K α_1	98.4390 20	33.6 7	0.0703
γ 2	104.233 5	7.47 25	0.0166
X-ray K β	111	15.6 4	0.0369
γ 3	160.310 8	27.6 6	0.0943

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
● ²³⁶ Np β^- Decay (1.15E5 y 12) I (min) = 0.10%			
% β^- Decay = 8.9 20			
Feeds ²³⁶ Pu			
See also ²³⁶ Np EC Decay (1.15E5 y)			
Auger-L	10.3	5.9 15	0.0013
ce-L- 1	21.50 10	6.5 15	0.0030
ce-K- 3	38 6	0.3 3	0.0002
ce-MNO- 1	38.67 10	2.4 6	0.0020
ce-L- 2	77 3	6.0 14	0.0099
ce-M- 2	94 3	1.7 4	0.0034
ce-NOP- 2	98 3	0.65 15	0.0014
ce-L- 3	137 6	2.0 21	0.0058
ce-M- 3	154 6	0.6 6	0.0018
ce-NCP- 3	158 6	0.21 22	0.0007
β^- 1 max	195 5		
avg	52.3 15	5 5	0.0056
β^- 2 max	355 3		
avg	105.6 9	5 5	0.0112
total β^-			
avg	78.9 15	10 7	0.0168
X-ray L	14.3	8.8 20	0.0027
γ 2	100 3	0.52 12	0.0011
X-ray K α_1	103.76 5	0.13 14	0.0003
γ 3	160 6	1.4 15	0.0049
1 weak γ 's omitted: E γ (avg) = 44.6; $\Sigma I\gamma$ = 0.01%			
● ²³⁶ Np EC Decay (22.5 h 4) I (min) = 0.10%			
%EC Decay = 52 1			
Feeds ²³⁶ U			
See also ²³⁶ Np β^- Decay (22.5 h)			
Auger-L	9.89	20 3	0.0042
ce-L- 1	23.485 6	5.4 3	0.0027
ce-MNO- 1	39.694 6	1.96 12	0.0017
Auger-K	72.6	0.9 7	0.0013
ce-K- 4	526.72 10	0.155 16	0.0017
X-ray L	13.6	26 3	0.0074
X-ray K α_2	94.6650 20	11.26 24	0.0227
X-ray K α_1	98.4390 20	18.2 4	0.0382
X-ray K β	111	8.50 20	0.0201
γ 4	642.33 10	1.38 8	0.0189
γ 5	687.52 10	0.367 21	0.0054
3 weak γ 's omitted: E γ (avg) = 304.6; $\Sigma I\gamma$ = 0.03%			
● ²³⁶ Np β^- Decay (22.5 h 4) I (min) = 0.10%			
% β^- Decay = 48 1			
Feeds ²³⁶ Pu			
See also ²³⁶ Np EC Decay (22.5 h)			
Auger-L	10.3	2.4 4	0.0005
ce-L- 1	21.50 10	6.06 23	0.0028
ce-MNO- 1	38.67 10	2.24 5	0.0018

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
²³⁶ Np β ⁻ Decay (22.5 h 4) (Continued)				β ⁻ 1 max	148.5 11		
				avg	39.2 3	0.185 14	0.0002
β ⁻ 1 max	491 8			β ⁻ 2 max	150.8 11		
avg	143 3	8.3	0.0253	avg	39.9 3	0.248 16	0.0002
β ⁻ 2 max	536 8			β ⁻ 3 max	187.0 11		
avg	158 3	39.7	0.134	avg	50.1 4	3.4 3	0.0036
total β ⁻				β ⁻ 4 max	238.0 11		
avg	155 3	48	0.159	avg	64.8 4	53.1 20	0.0733
X-ray L	14.3	3.6 4	0.0011	β ⁻ 5 max	251.9 11		
				avg	68.8 4	43.7 19	0.0640
				total β ⁻			
				avg	65.9 4	101 3	0.141
				γ 1	13.810 20	0.103 4	≈0
				X-ray L	13.9	71 9	0.0211
				γ 2	26.3450 10	2.28 24	0.0013
				γ 3	33.205 10	0.11 5	≈0
				γ 7	51.01 3	0.21 10	0.0002
				γ 8	59.5370 10	34 4	0.0431
				γ 9	64.830 20	1.18 13	0.0016
				X-ray Kα ₂	97.08 4	16.3 7	0.0337
				X-ray Kα ₁	101.07 4	26.3 11	0.0567
				X-ray KB	114	12.3 6	0.0299
				γ 14	164.610 20	1.86 7	0.0065
				γ 15	208.005 23	22.0 5	0.0976
				γ 18	267.54 3	0.723 21	0.0041
				γ 20	332.350 20	1.22 6	0.0086
				γ 24	370.93 3	0.112 7	0.0009
				13 weak γ's omitted: E _γ (avg) = 262.9; ΣI _γ = 0.25%			
				● ²³⁶ Pu α Decay (2.851 y 8) I (min) = 0.10% Feeds ²³² U % Spontaneous Fission = 8.1E-8 23			
Auger-L	9.89	10.2 15	0.0022				
ce-L- 1	25.89 5	23.3 7	0.0128				
ce-MNO- 1	42.10 5	8.5 3	0.0077				
α 1	5614	0.18	0.0215				
α 2	5721.9 10	31.8 9	3.88				
α 3	5770.1 10	68.1 8	8.37				
X-ray L	13.6	13.0 15	0.0038				
				7 weak γ's omitted: E _γ (avg) = 60.9; ΣI _γ = 0.08%			
				● ²³⁷ U β ⁻ Decay (6.75 d 1) I (min) = 0.10% Feeds ²³⁷ Np			
ce-L- 2	3.9182 14	15.3 18	0.0013	ce-MNO- 1	1.31 5	2.5 5	≈0
ce-MNO- 1	8.087 21	53.4 20	0.0092	ce-MNO- 2	2.85 5	4.8 7	0.0003
Auger-L	10	52 9	0.0111	ce-K- 17	5.08 3	1.6 4	0.0002
ce-L- 3	10.778 10	16 7	0.0036	ce-L- 4	8.268 11	33 6	0.0058
ce-MNO- 2	20.622 4	5.2 7	0.0023	Auger-L	9.68	50 8	0.0104
ce-L- 6	20.996 10	4.1 5	0.0018	ce-MNO- 3	12.03 5	25 7	0.0065
ce-MNO- 3	27.482 11	5.3 23	0.0031	ce-K- 19	21.63 4	0.3 3	0.0001
ce-L- 7	28.58 3	0.12 6	≈0	ce-MNO- 4	24.006 11	11.1 20	0.0057
ce-L- 8	37.1102 14	29 4	0.0231	ce-K- 21	30.61 3	2.4 4	0.0016
ce-MNO- 6	37.700 11	1.45 15	0.0012	ce-L- 6	36.05 4	54 8	0.0415
ce-L- 9	42.403 20	0.36 4	0.0003	ce-K- 22	38.77 4	1.17 22	0.0010
ce-K- 14	45.93 4	0.370 18	0.0004	ce-L- 7	41.4 5	0.6 5	0.0006
ce-M- 8	53.814 4	7.2 10	0.0083	ce-L- 8	42.83 6	1.2 4	0.0011
ce-NOP- 8	58.0363 13	2.6 4	0.0032	ce-L- 9	49.65 10	0.5 4	0.0005
ce-MNO- 9	59.107 21	0.120 13	0.0002	ce-M- 6	51.78 4	14.8 21	0.0164
Auger-K	74.3	1.2 9	0.0019	ce-NOP- 6	55.76 4	5.5 8	0.0065
ce-K- 15	89.33 4	55.0 21	0.105	ce-MNO- 7	57.1 5	0.23 18	0.0003
ce-K- 17	115.72 6	0.116 9	0.0003	ce-M- 8	58.56 6	0.34 9	0.0004
ce-L- 14	142.183 20	2.09 10	0.0063	ce-NCP- 8	62.54 6	0.13 4	0.0002
ce-K- 18	148.86 5	0.56 4	0.0018	ce-MNO- 9	65.38 10	0.16 14	0.0002
ce-M- 14	158.887 21	0.58 3	0.0019	ce-L- 11	65.398 20	14.2 18	0.0198
ce-NCP-14	163.109 20	0.220 11	0.0008	Auger-K	70.8	0.13 9	0.0002
ce-L- 15	185.578 23	11.1 5	0.0439	ce-M- 11	81.136 20	3.5 5	0.0060
ce-M- 15	202.282 24	2.71 11	0.0117	ce-L- 14	85.02 5	0.41 7	0.0007
ce-NOP-15	206.504 23	1.01 4	0.0044	ce-NOP-11	85.116 20	1.22 15	0.0022
ce-L- 18	245.11 3	0.181 11	0.0009	ce-L- 15	86.8954 18	0.21 5	0.0004
				ce-L- 17	96.58 3	0.40 8	0.0008
				ce-MNO-14	100.75 5	0.155 23	0.0003
				ce-MNO-17	112.31 3	0.14 3	0.0003
				ce-L- 19	113.13 4	0.13 4	0.0003
				ce-L- 21	122.10 3	0.52 8	0.0013
				ce-L- 22	130.27 4	0.26 5	0.0007
				ce-MNO-21	137.84 3	0.172 25	0.0005

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
α 1	4581.1 20	0.40 4	0.0390
α 2	4598.7 20	0.34 4	0.0333
α 3	4639.5 20	6.18 12	0.611
α 4	4659.2 20	0.57	0.0566
α 5	4664.1 20	3.32 10	0.330
α 6	4694.5 20	0.48 20	0.0480
α 7	4708.3 20	1	0.100
α 8	4712.4	0.126	0.0126
α 9	4766.1 15	8 3	0.812
α 10	4771.1 15	25 6	2.54
α 11	4788.1 15	47 9	4.79
α 12	4803.4 20	1.56	0.160
α 13	4817.4 20	2.5 4	0.257
α 14	4862.9 20	0.24	0.0249
α 15	4871 3	0.3	0.0311
α 16	4873.1 20	2.60 20	0.270

5 weak α's omitted:
Eα (avg) = 4587.3; ΣIα = 0.19%

X-ray L	13.3	59 8	0.0168
γ 4	29.373 10	14.0 25	0.0088
γ 5	46.53 4	0.140 25	0.0001
γ 6	57.15 4	0.42 6	0.0005
γ 11	86.503 20	12.6 13	0.0232
γ 12	88.04 16	0.16 3	0.0003
X-ray Kα ₂	92.2870 20	1.58 18	0.0031
γ 13	94.66 5	0.83 13	0.0017
X-ray Kα ₁	95.8680 20	2.6 3	0.0053
X-ray Kβ	108	1.20 14	0.0027
γ 17	117.68 3	0.17 3	0.0004
γ 21	143.208 25	0.42 6	0.0013
γ 22	151.37 4	0.25 4	0.0008
γ 35	195.096 20	0.21 3	0.0009
γ 41	212.415 25	0.16 3	0.0007

38 weak γ's omitted:
Eγ (avg) = 163.6; ΣIγ = 1.05%

• ²³⁷Pu EC Decay (45.3 d 2) I (min) = 0.10%
%EC Decay = 99.995 2
Feeds ²³⁷Np
%α Decay = 0.005 2

ce-L- 1	3.9182 14	1.61 15	0.0001
Auger-L	10	38 6	0.0082
ce-L- 2	10.778 10	11.7 9	0.0027
ce-MNO- 1	20.622 4	0.55 6	0.0002
ce-MNO- 2	27.482 11	3.9 3	0.0023
ce-L- 6	37.1102 14	2.82 24	0.0022
ce-M- 6	53.814 4	0.70 6	0.0008
ce-NCP- 6	58.0363 13	0.246 22	0.0003
Auger-K	74.3	0.9 7	0.0015
X-ray L	13.9	53 6	0.0156
γ 1	26.3450 10	0.240 16	0.0001
γ 6	59.5370 10	3.28 20	0.0042
X-ray Kα ₂	97.08 4	12.8 6	0.0264
X-ray Kα ₁	101.07 4	20.6 9	0.0444
X-ray Kβ	114	9.7 5	0.0235

10 weak γ's omitted:
Eγ (avg) = 33.2; ΣIγ = 0.08%

• ²³⁸U α Decay (4.468E9 y 3) I (min) = 0.10%
Feeds ²³⁴Th
% Spontaneous Fission = 5.4E-5 8

Auger-L	9.48	8.2 17	0.0016
ce-L- 1	29.08 6	17 3	0.0104
ce-MNO- 1	44.37 6	6.1 11	0.0058
ce-L- 2	90 7	0.15 5	0.0003
α 1	4039 5	0.23 7	0.0198
α 2	4147 5	23 4	2.03
α 3	4196 5	77 4	6.88
X-ray L	13	8.8 18	0.0024

2 weak γ's omitted:
Eγ (avg) = 66.4; ΣIγ = 0.10%

• ²³⁸Np β⁻ Decay (2.117 d 2) I (min) = 0.10%
Feeds ²³⁸Pu

Auger-L	10.3	25 4	0.0055
ce-L- 1	20.98 3	60 3	0.0266
ce-MNO- 1	38.15 3	22.0 11	0.0178
ce-L- 2	78.783 20	2.24 11	0.0038
ce-M- 2	95.947 20	0.63 3	0.0013
ce-L- 4	97.04 5	0.262 17	0.0005
ce-NOP- 2	100.321 20	0.241 11	0.0005
ce-K- 26	862.63 5	0.228 9	0.0042
ce-K- 28	906.72 5	0.154 11	0.0030
β ⁻ 1 max	89.3 11		
avg	23.0 3	0.48 3	0.0002
β ⁻ 2 max	222.0 11		
avg	60.0 4	10.8 5	0.0138
β ⁻ 3 max	263.4 11		
avg	72.2 4	42.4 15	0.0652
β ⁻ 4 max	306.4 11		
avg	85.1 4	0.51 3	0.0009
β ⁻ 5 max	308.9 12		
avg	85.8 4	0.17 7	0.0003
β ⁻ 6 max	329.1 11		
avg	91.9 4	1.21 6	0.0024
β ⁻ 7 max	1247.8 11		
avg	412.4 5	45 3	0.395
total β ⁻			
avg	223.2 9	101 4	0.479

2 weak β's omitted:
Eβ (avg) = 204.4; ΣIβ = 0.12%

X-ray L	14.3	37 4	0.0114
γ 1	44.08 3	0.102 6	≈ 0
X-ray Kα ₂	99.55 5	0.111 5	0.0002
γ 2	101.880 20	0.209 8	0.0005
X-ray Kα ₁	103.76 5	0.179 8	0.0004
γ 13	561.15 7	0.102 6	0.0012
γ 17	882.63 3	0.76 5	0.0143
γ 18	918.69 4	0.51 3	0.0101
γ 19	923.980 20	2.48 14	0.0487
γ 21	936.61 6	0.331 19	0.0066
γ 23	941.38 5	0.45 3	0.0091
γ 24	962.77 3	0.61 4	0.0125

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
²³⁸ Np β^- Decay (2.117 d 2) (Continued)				γ 7 74.670 3 48.0 20 0.0763			
γ 26	984.450 20	23.8 6	0.499	γ 11	117.66 3	0.139 6	0.0003
γ 27	1025.870 20	8.2 5	0.179	γ 64	662.24 3	0.178 8	0.0025
γ 28	1028.540 20	17.4 11	0.381	γ 75	748.08 4	0.101 5	0.0016
16 weak γ 's omitted: E_{γ} (avg) = 503.9; ΣI_{γ} = 0.54%				γ 84	819.22 4	0.144 6	0.0025
● ²³⁸ Pu α Decay (87.75 y 3) I (min) = 0.10%				γ 87	844.10 4	0.158 7	0.0028
Feeds ²³⁴ U % Spontaneous Fission = 1.84E-7 6				111 weak γ 's omitted: E_{γ} (avg) = 611.2; ΣI_{γ} = 0.92%			
Auger-L	9.89	9.1 14	0.0019	● ²³⁹ Np β^- Decay (2.355 d 4) I (min) = 0.10%			
ce-L- 2	21.723 10	20.7 11	0.0096	Feeds ²³⁹ Pu			
ce-MNO- 2	37.932 10	7.6 4	0.0061	ce-MNO- 1	1.927 4	62 5	0.0025
α 1	5357.7	0.10 3	0.0114	ce-K- 13	2.60 5	0.119 21	\approx 0
α 2	5456.5 4	28.3 6	3.29	Auger-L	10.3	41 7	0.0090
α 3	5499.21 20	71.6 6	8.39	ce-MNO- 2	12.4671 14	7 3	0.0019
X-ray L	13.6	11.6 14	0.0034	ce-L- 3	21.566 6	6.4 17	0.0029
35 weak γ 's omitted: E_{γ} (avg) = 55.3; ΣI_{γ} = 0.05%				ce-L- 4	26.315 5	9.5 22	0.0053
● ²³⁹ U β^- Decay (23.40 m 5) I (min) = 0.10%				ce-L- 5	34.176 5	25 4	0.0180
Feeds ²³⁹ Np				ce-L- 6	34.2028 16	0.10 8	\approx 0
ce-L- 1	8.67 15	7.0 4	0.0013	ce-L- 7	38.383 5	0.34 6	0.0003
Auger-L	10	9.6 14	0.0021	ce-MNO- 3	38.730 6	2.2 6	0.0018
ce-L- 2	20.6732 9	1.94 9	0.0009	ce-MNO- 4	43.479 5	3.4 8	0.0032
ce-L- 3	21.107 4	3.72 23	0.0017	ce-L- 8	44.784 8	6.6 17	0.0063
ce-MNO- 1	25.38 15	2.41 18	0.0013	ce-M- 5	51.340 5	6.9 10	0.0075
ce-MNO- 2	37.377 4	0.68 4	0.0005	ce-MNO- 7	55.547 5	0.116 18	0.0001
ce-MNO- 3	37.811 5	1.24 7	0.0010	ce-NOP- 5	55.714 4	2.6 4	0.0031
ce-L- 6	48.7732 9	0.103 5	0.0001	ce-K- 15	59.90 5	0.45 6	0.0006
ce-L- 7	52.243 4	10.1 6	0.0112	ce-M- 8	61.908 8	1.8 5	0.0024
ce-M- 7	68.947 5	2.49 13	0.0037	ce-NCP- 8	66.282 7	0.70 18	0.0010
ce-NOP- 7	73.169 4	0.88 5	0.0014	Auger-K	76	1.0 11	0.0016
β^- 1 max	302 3			ce-L- 11	83.033 11	5 5	0.0088
avg	83.7 8	0.2	0.0004	ce-L- 12	83.40 3	0.42 8	0.0007
β^- 2 max	422 3			ce-K- 16	87.93 5	8.9 8	0.0166
avg	120.9 8	0.24	0.0006	ce-M- 11	100.197 10	1.4 14	0.0029
β^- 3 max	447 3			ce-MNO-12	100.57 3	0.16 3	0.0003
avg	128.8 8	0.26	0.0007	ce-K- 17	104.57 5	0.58 9	0.0013
β^- 4 max	604 3			ce-NOP-11	104.571 10	0.5 5	0.0011
avg	180.5 9	0.25	0.0010	ce-K- 18	106.37 5	23.0 14	0.0522
β^- 5 max	1148 3			ce-K- 19	132.59 10	0.16 3	0.0004
avg	375.8 10	2.8	0.0224	ce-K- 20	151.02 9	0.102 14	0.0003
β^- 6 max	1191 3			ce-K- 21	155.79 5	17.2 5	0.0571
avg	392.0 10	68 3	0.568	ce-L- 16	186.653 11	1.78 15	0.0071
β^- 7 max	1265.8 25			ce-L- 17	203.286 13	0.139 18	0.0006
avg	420.3 10	28 3	0.251	ce-M- 16	203.817 10	0.43 4	0.0019
total β^-				ce-L- 18	205.087 13	4.6 3	0.0202
avg	396.4 10	100 5	0.845	ce-NCP-16	208.191 10	0.161 13	0.0007
17 weak β 's omitted: E_{β} (avg) = 177.5; ΣI_{β} = 0.28%				ce-M- 18	222.251 12	1.13 8	0.0053
X-ray L	13.9	13.3 15	0.0039	ce-NOP-18	226.625 12	0.42 3	0.0020
γ 3	43.534 3	4.27 23	0.0040	ce-L- 21	254.507 16	3.47 10	0.0188
● ²³⁹ U β^- Decay (23.40 m 5) I (min) = 0.10%				ce-M- 21	271.671 16	0.847 25	0.0049
Feeds ²³⁹ Np				ce-NCP-21	276.045 16	0.316 9	0.0019
				β^- 1 max	209.6 19		
				avg	56.5 6	1.96 19	0.0024
				β^- 2 max	329.8 19		
				avg	92.1 6	35 7	0.0687
				β^- 3 max	391.3 19		
				avg	111.2 6	7.1 22	0.0168
				β^- 4 max	435.9 19		
				avg	125.3 6	52 8	0.139
				β^- 5 max	713.5 19		
				avg	217.8 7	4.0 20	0.0186
				total β^-			
				avg	115.0 7	100 11	0.245
				4 weak β 's omitted: E_{β} (avg) = 59.8; ΣI_{β} = 0.03%			

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
X-ray L	14.3	62 8	0.0188
γ 4	49.412 4	0.100 22	0.0001
γ 5	57.273 4	0.151 21	0.0002
γ 7	61.480 4	0.96 15	0.0013
X-ray Kα ₂	99.55 5	14.7 6	0.0312
X-ray Kα ₁	103.76 5	23.7 10	0.0523
γ 11	106.130 10	22.7 13	0.0513
X-ray Kβ	117	11.1 5	0.0277
γ 15	181.715 10	0.111 15	0.0004
γ 16	209.750 10	3.24 25	0.0145
γ 17	226.383 12	0.34 5	0.0016
γ 18	228.184 12	10.7 7	0.0521
γ 19	254.41 8	0.100 18	0.0005
γ 21	277.604 16	14.1 4	0.0834
γ 22	285.41 3	0.78 8	0.0047
γ 24	315.88 4	1.59 11	0.0107
γ 26	334.30 5	2.03 18	0.0145

26 weak γ's omitted:
E_γ(avg) = 151.5; ΣI_γ = 0.39%

• ²³⁹Pu α Decay (24131 y 16) I (min) = 0.10%
Feeds ²³⁵U
% Spontaneous Fission = 4.4E-10 13

ce-MNO- 2	7.3920 4	19.0 12	0.0030
ce-L- 3	8.33 10	0.18 17	≈0
Auger-L	9.89	3.5 6	0.0007
ce-L- 4	16.93 3	2.8 6	0.0010
ce-L- 6	24.46 5	0.11 10	≈0
ce-L- 8	29.86 3	4.78 21	0.0030
ce-MNO- 4	33.14 3	1.00 24	0.0007
ce-M- 8	46.07 3	1.32 6	0.0013
ce-NCP- 8	50.18 3	0.493 22	0.0005

α 1	5104.6 10	11.50 20	1.25
α 2	5142.9 8	15.10 20	1.65
α 3	5155.4 7	73.3 7	8.05

20 weak α's omitted:
E_α(avg) = 5007.5; ΣI_α = 0.11%

X-ray L	13.6	4.4 6	0.0013
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173 weak γ's omitted:
E_γ(avg) = 112.9; ΣI_γ = 0.05%

• ²⁴⁰U β⁻ Decay (14.1 h 2) I (min) = 0.10%
Feeds ²⁴⁰Np (7.4 m)

Auger-L	10	31 5	0.0067
ce-L- 2	21.67 7	74.3 6	0.0343
ce-MNO- 2	38.38 7	24.0 5	0.0196

β ⁻ 1 max	440 60		
avg	125 20	100	0.266

X-ray L	13.9	43 5	0.0128
γ 2	44.10 7	1.65 5	0.0015

• ²⁴⁰Np β⁻ Decay (65 m 3) I (min) = 0.10%
Feeds ²⁴⁰Pu

Auger-L	10.3	73 12	0.0160
ce-L- 1	19.727 9	73.0 6	0.0307
ce-K- 4	25.38 5	6 6	0.0030
ce-K- 5	30.81 5	1.67 5	0.0011
ce-MNO- 1	36.891 9	27.0 6	0.0212
ce-K- 8	70.9 3	12 12	0.0184
ce-L- 2	75.763 13	62.5 7	0.101
Auger-K	76	0.6 7	0.0009
ce-M- 2	92.927 13	17.5 5	0.0347
ce-NCP- 2	97.301 13	6.70 19	0.0139
ce-L- 4	124.1028 16	2.4 4	0.0064
ce-L- 5	129.533 20	14.1 5	0.0389
ce-M- 4	141.2671 14	0.64 14	0.0019
ce-M- 5	145.6414 8	0.24 6	0.0007
ce-K- 9	146.697 20	3.95 12	0.0123
ce-K- 9	149.0 3	6 5	0.0185
ce-NCP- 5	151.071 20	1.50 5	0.0048
ce-L- 8	169.6 3	4.4 4	0.0159
ce-K- 11	173.18 5	0.688 21	0.0025
ce-K- 12	185.18 5	0.105 4	0.0004
ce-M- 8	186.8 3	1.150 7	0.0046
ce-NCP- 8	191.1 3	0.432 6	0.0018
ce-L- 9	247.7 3	1.8 5	0.0092
ce-M- 9	264.9 3	0.44 10	0.0025
ce-NCP- 9	269.2 3	0.17 4	0.0010
ce-L- 11	271.9028 16	0.136 4	0.0008
ce-L- 12	283.9028 16	0.127 4	0.0008
ce-K- 15	326.4 3	0.240 8	0.0017
ce-K- 20	444.58 21	2.7 22	0.0255
ce-K- 22	479.28 5	0.167 5	0.0017
ce-L- 20	543.30 20	0.6 4	0.0072
ce-MNO-20	560.47 20	0.22 11	0.0026
ce-K- 33	865.94 8	0.12 8	0.0021

β ⁻ 1 max	780 60		
avg	241 22	100	0.513

X-ray L	14.3	109 13	0.0333
γ 1	42.824 8	0.11124	0.0001
γ 2	98.860 13	5	0.0107
X-ray Kα ₂	99.55 5	9 4	0.0181
X-ray Kα ₁	103.76 5	14 7	0.0303
X-ray Kβ	117	6 3	0.0161
γ 3	134.6	0.37	0.0011
γ 4	147.2	1.4	0.0044
γ 5	152.630 20	8.343	0.0271
γ 6	175	6	0.0225
γ 7	182.6	0.927	0.0036
γ 8	192.7 3	6.767	0.0278
γ 9	270.8 3	8.343	0.0481
γ 10	280.20 20	0.37	0.0022
γ 11	295	0.6489	0.0041
γ 12	307	1.4	0.0091
γ 15	448.2 3	16.686	0.159
γ 16	462.2	1.4	0.0137
γ 17	467.4	2	0.0203
γ 18	507.20 10	1.854	0.0200
γ 20	566.40 20	26.883	0.324
γ 22	601	20.4	0.261
γ 23	606.10 7	1.5759	0.0203
γ 24	847	4.635	0.0836
γ 25	867.40 20	8.343	0.154
γ 26	884.9	3.7	0.0699
γ 27	888.80 5	1.1124	0.0211
γ 28	896.5 5	13	0.248
γ 29	915.98 9	1.4	0.0271
γ 30	959.1 3	2.3175	0.0473
γ 32	973.90 20	21.32	0.442

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/ μCi-h)
²⁴⁰ Np β ⁻ Decay (65 m 3) (Continued)				β ⁻ 14 max 2070 60 avg 733 25 52 3 0.812			
γ 33	987.76 6	4.635	0.0975	total β ⁻	600 30	98 4	1.26
γ 34	1074.4	0.927	0.0212	7 weak β's omitted: Σβ (avg) = 214.8; ΣIβ = 0.33%			
γ 35	1088.5 3	0.4635	0.0107	X-ray L	14.3	34 13	0.0103
γ 36	1131.30 20	0.6489	0.0156	γ 2	66.50 10	0.27 3	0.0004
γ 38	1163	0.6489	0.0161	γ 3	98.860 13	0.17 3	0.0004
γ 39	1167.6 6	4.635	0.115	X-ray Kα ₂	99.55 5	0.129 5	0.0003
γ 40	1180.3 3	0.6489	0.0163	X-ray Kα ₁	103.76 5	0.208 8	0.0005
γ 42	1223.2 3	0.4635	0.0121	γ 4	189.50 10	0.250 20	0.0010
7 weak γ's omitted: Σγ (avg) = 422.7; ΣIγ = 0.20%				γ 5	251.46 7	0.96 7	0.0051
● ²⁴⁰ Np IT Decay (7.4 m 2) I (min) = 0.10%				γ 6	263.35 7	1.17 8	0.0066
%IT Decay = 0.11 3				γ 10	302.98 7	1.12 6	0.0072
Feeds ²⁴⁰ Np (65 m)				γ 16	507.20 10	0.79 4	0.0085
See also ²⁴⁰ Np β ⁻ Decay (7.4 m)				γ 18	554.60 7	22.4 11	0.264
ce-MNO- 1	14.277 4	0.11 3	≈ 0	γ 19	597.40 7	12.5 6	0.159
● ²⁴⁰ Np β ⁻ Decay (7.4 m 2) I (min) = 0.10%				γ 20	606.10 7	0.74 5	0.0095
%β ⁻ Decay = 99.89 3				γ 22	758.62 8	1.19 6	0.0192
Feeds ²⁴⁰ Pu				γ 23	789.59 10	0.210 20	0.0035
See also ²⁴⁰ Np IT Decay (7.4 m)				γ 24	813.43 14	0.211 25	0.0037
Auger-L	10.3	22 9	0.0049	γ 25	817.88 11	1.24 6	0.0216
ce-L- 1	19.727 9	54 21	0.0225	γ 27	841.11 10	0.166 12	0.0030
ce-MNO- 1	36.891 9	20 8	0.0156	γ 28	857.46 10	0.47 3	0.0086
ce-L- 3	75.763 13	2.1 4	0.0034	γ 32	900.46 11	0.130 20	0.0025
ce-M- 3	92.927 13	0.58 11	0.0012	γ 33	910.09 10	0.170 20	0.0033
ce-NOP- 3	97.301 13	0.22 4	0.0005	γ 34	915.98 9	1.04 6	0.0203
ce-L- 4	166.40 10	0.164 14	0.0006	γ 35	928.59 10	0.170 20	0.0034
ce-K- 18	432.78 9	0.213 13	0.0020	γ 36	938.04 10	1.29 5	0.0257
ce-K- 19	475.58 9	0.104 6	0.0010	γ 37	942.37 11	0.110 20	0.0022
ce-K- 29	738.88 5	0.1262	0.0020	γ 40	961.64 11	0.144 10	0.0029
β ⁻ 1 max 480 60				γ 64	1445.30 10	0.36 3	0.0111
avg 138 20 0.235 20 0.0007				γ 66	1488.20 10	0.210 20	0.0066
β ⁻ 2 max 550 60				γ 67	1496.90 10	1.31 7	0.0417
avg 163 20 0.342 24 0.0012				γ 69	1539.64 9	0.79 10	0.0259
β ⁻ 3 max 570 60				γ 76	1633.26 10	0.144 15	0.0050
avg 169 21 2.22 13 0.0080				54 weak γ's omitted: Σγ (avg) = 1020.0; ΣIγ = 1.26%			
β ⁻ 4 max 580 60				● ²⁴⁰ Pu α Decay (6569 y 6) I (min) = 0.10%			
avg 174 21 0.205 22 0.0008				Feeds ²³⁶ U			
β ⁻ 5 max 620 60				% Spontaneous Fission = 4.95E-6 20			
avg 186 21 0.57 4 0.0023				Auger-L	9.89	8.7 13	0.0018
β ⁻ 6 max 670 60				ce-L- 1	23.485 6	19.7 7	0.0098
avg 203 21 0.378 24 0.0016				ce-MNO- 1	39.694 6	7.20 8	0.0061
β ⁻ 7 max 700 60				α 1	5123.43 23	26.39 21	2.88
avg 213 21 0.21 3 0.0010				α 2	5168.30 15	73.5 4	8.09
β ⁻ 8 max 1020 60				3 weak α's omitted: Σα (avg) = 5017.0; ΣIα = 0.07%			
avg 327 23 0.62 5 0.0043				X-ray L	13.6	11.0 13	0.0032
β ⁻ 9 max 1150 60				9 weak γ's omitted: Σγ (avg) = 54.3; ΣIγ = 0.05%			
avg 376 23 1.18 7 0.0095							
β ⁻ 10 max 1170 60							
avg 384 23 1.45 6 0.0119							
β ⁻ 11 max 1210 60							
avg 398 23 3.50 13 0.0297							
β ⁻ 12 max 1250 60							
avg 413 23 2.65 11 0.0233							
β ⁻ 13 max 1510 60							
avg 514 24 31.9 13 0.349							

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
● ²⁴¹ Pu β ⁻ Decay (14.4 y 2) I (min) = 0.10%			
%β ⁻ Decay = 99.99755 8			
Feeds ²⁴¹ Am			
%α Decay = 0.00245 8			
β ⁻ 1 max	20.81 20		
avg	5.23 5	99.9975	0.0111
● ²⁴¹ Am α Decay (432.2 y 5) I (min) = 0.10%			
Feeds ²³⁷ Np			
% Spontaneous Fission = 3.77E-10 8			
ce-L- 2	3.9182 14	16.1 12	0.0013
Auger-L	10	31 5	0.0067
ce-L- 5	10.778 10	14.8 17	0.0034
ce-L- 7	20.30 5	1.6 4	0.0007
ce-MNO- 2	20.622 4	5.5 6	0.0024
ce-L- 8	20.996 10	9.1 10	0.0040
ce-MNO- 5	27.482 11	5.0 6	0.0029
ce-L- 10	33.133 20	0.89 12	0.0006
ce-MNO- 7	37.01 5	0.59 12	0.0005
ce-L- 12	37.1102 14	30.9 19	0.0244
ce-MNO- 8	37.700 11	3.2 4	0.0026
ce-MNO-10	49.837 21	0.33 4	0.0003
ce-M- 12	53.814 4	7.6 5	0.0088
ce-NOP-12	58.0363 13	2.69 19	0.0033
ce-L- 18	76.543 20	0.27 6	0.0004
ce-MNO-18	93.247 21	0.104 22	0.0002
α 1	5388.0 10	1.40 20	0.161
α 2	5442.98 13	12.80 20	1.48
α 3	5485.74 12	85.2 8	9.96
α 4	5512.0 20	0.20 5	0.0235
α 5	5544.3 3	0.34 5	0.0402
20 weak α's omitted: Eα (avg) = 5308.2; ΣIα = 0.03%			
X-ray L	13.9	43 5	0.0126
γ 2	26.3450 10	2.40 10	0.0013
γ 5	33.205 10	0.106 11	≈0
γ 12	59.5370 10	35.9 6	0.0455
137 weak γ's omitted: Eγ (avg) = 69.2; ΣIγ = 0.18%			
● ²⁴² Pu α Decay (3.758E5 y 26) I (min) = 0.10%			
Feeds ²³⁸ U			
% Spontaneous Fission = 5.50E-4 6			
Auger-L	9.89	7.2 12	0.0015
ce-L- 1	23.158 13	16.3 15	0.0080
ce-MNO- 1	39.367 13	6.0 5	0.0050
α 1	4856.3 12	22.4 20	2.32
α 2	4900.6 12	78 3	8.14
2 weak α's omitted: Eα (avg) = 4752.5; ΣIα = 0.10%			

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
X-ray L	13.6	9.1 13	0.0026
3 weak γ's omitted: Eγ (avg) = 56.5; ΣIγ = 0.04%			
● ²⁴² Am EC Decay (16.02 h 2) I (min) = 0.10%			
%EC Decay = 17.3 3			
Feeds ²⁴² Pu			
See also ²⁴² Am β ⁻ Decay (16.02 h)			
Auger-L	10.3	8.4 13	0.0019
ce-L- 1	21.448 10	7.7 3	0.0035
ce-MNO- 1	38.612 10	2.84 13	0.0023
Auger-K	76	0.3 3	0.0004
X-ray L	14.3	12.7 14	0.0039
X-ray Kα ₂	99.55 5	3.66 17	0.0078
X-ray Kα ₁	103.76 5	5.9 3	0.0130
X-ray Kβ	117	2.77 13	0.0069
1 weak γ's omitted: Eγ (avg) = 44.5; ΣIγ = 0.01%			
● ²⁴² Am β ⁻ Decay (16.02 h 2) I (min) = 0.10%			
%β ⁻ Decay = 82.7 3			
Feeds ²⁴² Cm			
See also ²⁴² Am EC Decay (16.02 h)			
Auger-L	10.7	11.1 22	0.0025
ce-L- 1	17.67 11	31 3	0.0116
ce-MNO- 1	35.86 11	11.4 12	0.0087
β ⁻ 1 max	619.0 18		
avg	184.8 6	42 4	0.165
β ⁻ 2 max	661.2 18		
avg	199.0 7	41 5	0.174
total β ⁻			
avg	191.8 7	83 7	0.339
X-ray L	15	20 3	0.0063
1 weak γ's omitted: Eγ (avg) = 42.2; ΣIγ = 0.04%			
● ²⁴² Am α Decay (152 y 7) I (min) = 0.10%			
%α Decay = 0.476 14			
Feeds ²³⁸ Np			
See also ²⁴² Am IT Decay (152 y)			
% Spontaneous Fission = 1.6E-8 6			
Auger-L	10	0.28 11	≈0
ce-L- 3	26.94 3	0.122 6	≈0
ce-L- 7	45.4732 9	0.30 23	0.0003
ce-L- 10	64.2732 9	0.237 10	0.0003
α 1	5205	0.424 13	0.0470
10 weak α's omitted: Eα (avg) = 5227.5; ΣIα = 0.05%			

(Continued)

²⁴²Am-²⁴³Am

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
²⁴² Am α Decay (152 y 7) (Continued)							
X-ray L	13.9	0.38 14	0.0001	β- 1 max	116 4		
γ 3	49.37 3	0.195 6	0.0002	avg	30.3 11	1.23 14	0.0008
21 weak γ's omitted; Eγ(avg) = 108.3; ΣIγ = 0.16%				β- 2 max	473 4		
				avg	136.9 13	0.25 17	0.0007
				β- 3 max	486 4		
				avg	141.0 13	4 4	0.0132
				β- 4 max	498 4		
				avg	145.1 13	29 3	0.0896
				β- 5 max	540 4		
				avg	158.7 14	6 4	0.0203
				β- 6 max	582 4		
				avg	172.7 14	59 4	0.217
				total β-		100 8	0.342
				avg	160.6 15		
				2 weak β's omitted; Eβ(avg) = 13.9; ΣIβ = 0.02%			
● ²⁴² Am IT Decay (152 y 7) I (min) = 0.10%							
%IT Decay = 99.524 14							
Feeds ²⁴² Am (16.02 h)							
See also ²⁴² Am α Decay (152 y)							
% Spontaneous Fission = 1.6E-8 6							
Auger-L	10.5	18 3	0.0041	X-ray L	14.6	11.9 21	0.0037
ce-L- 1	24.82 6	48.3 7	0.0255	γ 3	41.80 20	0.76 10	0.0007
ce-MNO- 1	42.50 6	51.3 7	0.0464	γ 6	67	0.23 12	0.0003
				γ 7	84.00 20	23.0 20	0.0412
				X-ray Kα1	106.49 3	0.147 19	0.0003
				γ 10	109.30 20	0.161 22	0.0004
				γ 13	356.4 3	0.131 17	0.0010
				γ 14	381.7 3	0.55 7	0.0045
				13 weak γ's omitted; Eγ(avg) = 137.2; ΣIγ = 0.18%			
● ²⁴² Cm α Decay (163.2 d 4) I (min) = 0.10%				● ²⁴³ Am α Decay (7.38E3 y 4) I (min) = 0.10%			
Feeds ²³⁸ Pu				Feeds ²³⁹ Np			
% Spontaneous Fission = 6.8E-6 7							
Auger-L	10.3	7.7 14	0.0017	ce-L- 1	8.67 15	40 30	0.0074
ce-L- 1	20.98 3	19.2 19	0.0086	Auger-L	10	28 14	0.0061
ce-MNO- 1	38.15 3	7.1 7	0.0058	ce-L- 2	20.6732 9	7.8 4	0.0034
				ce-L- 3	21.107 4	4.8 5	0.0022
				ce-MNO- 1	25.38 15	15 12	0.0078
				ce-L- 5	32.9732 9	0.85 5	0.0006
				ce-MNO- 2	37.377 4	2.74 14	0.0022
				ce-MNO- 3	37.811 5	1.61 14	0.0013
				ce-MNO- 5	49.677 4	0.317 15	0.0003
				ce-L- 6	52.243 4	13.9 8	0.0154
				ce-M- 6	68.947 5	3.42 19	0.0050
				ce-MCP- 6	73.169 4	1.21 7	0.0019
				ce-L- 8	76.0732 9	0.106 6	0.0002
				α 1	5181.0 10	1	0.121
				α 2	5233.5 10	10.6	1.18
				α 3	5275.4 10	87.9	9.88
				α 4	5321.0 10	0.12	0.0136
				α 5	5350.0 10	0.16	0.0182
				8 weak α's omitted; Eα(avg) = 5032.0; ΣIα = 0.02%			
● ²⁴³ Pu β- Decay (4.956 h 3) I (min) = 0.10%							
Feeds ²⁴³ Am							
ce-L- 2	10.194 17	2.17 20	0.0005	X-ray L	13.9	39 19	0.0116
Auger-L	10.5	7.3 16	0.0016	γ 3	43.534 3	5.5 5	0.0051
ce-L- 3	17.99 20	0.77 10	0.0003	γ 6	74.670 3	66 3	0.105
ce-L- 4	18.4 5	9.0 9	0.0035	γ 7	86.72 7	0.34 4	0.0006
ce-MNO- 2	27.875 12	0.80 7	0.0005	γ 9	117.66 3	0.55 9	0.0014
ce-L- 5	30.194 17	3 3	0.0019	γ 10	142.18 15	0.125 15	0.0004
ce-MNO- 3	35.68 20	0.26 4	0.0002	9 weak γ's omitted; Eγ(avg) = 48.4; ΣIγ = 0.16%			
ce-MNO- 4	36.1 5	3.1 3	0.0024				
ce-M- 5	47.875 12	0.9 7	0.0009				
ce-MCP- 5	52.384 20	0.3 3	0.0004				
ce-L- 7	60.19 20	3.7 4	0.0048				
ce-L- 8	72.6 4	0.21 4	0.0003				
ce-M- 7	77.88 20	0.93 9	0.0015				
ce-MCP- 7	82.38 20	0.33 3	0.0006				
ce-K- 14	256.7 3	0.32 4	0.0017				

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
<p>● ²⁴³Cm α Decay (28.5 y 2) I (min) = 0.10%</p> <p>%α Decay = 99.76</p> <p>Feeds ²³⁹Pu</p> <p>%EC Decay = 0.24</p>				<p>● ²⁴⁴Pu α Decay (8.26E7 y 9) I (min) = 0.10%</p> <p>%α Decay = 99.875 6</p> <p>Feeds ²⁴⁰U</p> <p>% Spontaneous Fission = 0.125 6</p>			
ce-MNO- 1	1.927 4	67.8368	0.0028	Auger-L	9.89	6.2 9	0.0013
Auger-L	10.3	41 7	0.0089	ce-L- 1	22.2 10	14.2 6	0.0067
ce-MNO- 2	12.4671 14	7	0.0019	ce-MNO- 1	38.5 10	5.19 25	0.0043
ce-L- 3	21.566 6	8.5 15	0.0039	α 1	4546.0 10	19.4 8	1.88
ce-L- 4	26.315 5	9.5 20	0.0053	α 2	4589.0 10	80.5 8	7.87
ce-L- 5	34.176 5	22.9 18	0.0167	γ-ray L	13.6	7.9 10	0.0023
ce-L- 6	34.2028 16	1.8 14	0.0013	1 weak γ's omitted:			
ce-MNO- 3	38.730 6	2.9 5	0.0024	E _γ (avg) = 44.0; ΣI _γ = 0.03%			
ce-MNO- 4	43.479 5	3.4 8	0.0031	● ²⁴⁴ Am β ⁻ Decay (10.1 h 1) I (min) = 0.10%			
ce-L- 8	44.744 8	9.99 9	0.0095	Feeds ²⁴⁴ Cm			
ce-M- 5	51.340 5	6.4 5	0.0070	Auger-L	10.7	66 11	0.0150
ce-M- 6	51.3671 14	0.5 4	0.0006	ce-L- 1	18.37 11	72.7 6	0.0284
ce-NCP- 5	55.714 4	2.43 19	0.0029	ce-K- 3	25.7 10	3.18 9	0.0017
ce-NCP- 6	55.7414 8	0.20 16	0.0002	ce-MNO- 1	36.56 11	27.2 6	0.0212
ce-MNO- 8	61.908 8	2.79 7	0.0037	ce-L- 2	74.87 11	68.3 6	0.109
ce-NCP- 8	66.282 7	1.06 3	0.0015	Auger-K	79.6	0.15 16	0.0003
Auger-K	76	1.0 10	0.0016	ce-M- 2	93.06 11	19.3 5	0.0383
ce-L- 12	83.40 3	0.148 5	0.0003	ce-NCP- 2	97.71 11	7.59 21	0.0158
ce-K- 14	87.93 5	9.0 4	0.0168	ce-L- 3	129.5 10	34.4 5	0.0949
ce-K- 15	106.37 5	22.7 7	0.0515	ce-M- 3	147.7 10	9.7 3	0.0306
ce-K- 16	132.59 10	0.172 16	0.0005	ce-NCP- 3	152.3 10	3.79 11	0.0123
ce-K- 17	151.02 9	0.105 14	0.0003	ce-L- 4	181 4	0.143 3	0.0006
ce-K- 18	155.79 5	17.0 5	0.0565	ce-K- 6	617.7 10	4.2 3	0.0555
ce-L- 14	186.653 11	1.80 9	0.0072	ce-L- 6	721.5 10	0.93 4	0.0143
ce-M- 14	203.817 10	0.438 19	0.0019	ce-MNO- 6	739.7 10	0.308 16	0.0048
ce-L- 15	205.087 13	4.56 13	0.0199	ce-K- 7	771.7 10	0.339 12	0.0056
ce-NCP-14	208.191 10	0.163 7	0.0007	ce-L- 7	875.5 10	0.160 3	0.0019
ce-M- 15	222.251 12	1.11 5	0.0053	β ⁻ 1 max	387.0 23		
ce-NCP-15	226.625 12	0.413 17	0.0020	avg	109.6 7	100	0.233
ce-L- 18	254.507 16	3.44 10	0.0186	X-ray L	15	117 11	0.0374
ce-M- 18	271.671 16	0.839 25	0.0049	γ 2	99.40 10	4.83 14	0.0102
ce-NCP-18	276.045 16	0.313 9	0.0018	X-ray Kα ₂	104.61 5	2.26 11	0.0050
α 1	5639 3	0.14	0.0168	X-ray Kα ₁	109.29 5	3.61 16	0.0084
α 2	5682 3	0.2	0.0241	X-ray Kβ	123	1.71 9	0.0045
α 3	5686 3	1.6	0.193	γ 3	154.0 10	18	0.0590
α 4	5741.6 10	11.4724	1.40	γ 4	206 4	0.26	0.0011
α 5	5784.5 10	73.3236	9.03	γ 5	540.0 20	0.38	0.0044
α 6	5876 3	0.6	0.0749	γ 6	746.0 10	67	1.06
α 7	5993 3	5.58656	0.713	γ 7	900.0 10	28	0.537
α 8	6010 3	1.0	0.128	1 weak γ's omitted:			
α 9	6057 3	4.68872	0.605	E _γ (avg) = 42.9; ΣI _γ = 0.09%			
α 10	6067 3	1.5	0.193	● ²⁴⁴ Cm α Decay (18.11 y 2) I (min) = 0.10%			
19 weak α's omitted:				Feeds ²⁴⁰ Pu			
E _α (avg) = 5700.1; ΣI _α = 0.34%				% Spontaneous Fission = 1.347E-4 2			
X-ray L	14.3	61 7	0.0185	Auger-L	10.3	6.9 11	0.0015
γ 3	44.663 5	0.120 20	0.0001	ce-L- 1	19.727 9	17.20 21	0.0072
γ 5	57.273 4	0.140 10	0.0002	ce-MNO- 1	36.891 9	6.37 16	0.0050
γ 8	67.841 7	0.14	0.0002	(Continued)			
X-ray Kα ₂	99.55 5	14.3 5	0.0303				
X-ray Kα ₁	103.76 5	23.0 7	0.0508				
γ 11	106.130 10	0.259 20	0.0006				
X-ray Kβ	117	10.8 4	0.0269				
γ 14	209.750 10	3.29 10	0.0147				
γ 15	228.184 12	10.6 3	0.0514				
γ 16	254.41 8	0.110 10	0.0006				
γ 18	277.604 16	14.0 4	0.0826				
γ 19	285.41 3	0.728 20	0.0044				
14 weak γ's omitted:							
E _γ (avg) = 167.0; ΣI _γ = 0.33%							

²⁴⁴Cm-²⁴⁵Am

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
²⁴⁴ Cm α Decay (18.11 y 2) (Continued)				γ 3	280.29 20	1.4 4	0.0082
α 1	5762.84 3	23.60 20	2.90	γ 6	308.11 20	5.2 13	0.0343
α 2	5804.96 5	76.40 20	9.45	γ 8	327.31 20	27 7	0.188
6 weak α's omitted: Eα (avg) = 5633.0; ΣIα = 0.03%				γ 10	341.00 20	0.11 3	0.0008
X-ray L	14.3	10.3 11	0.0031	γ 11	348.73 20	1.0 3	0.0076
16 weak γ's omitted: Eγ (avg) = 56.9; ΣIγ = 0.03%				γ 13	376.58 20	3.4 9	0.0274
● ²⁴⁵ Pu β ⁻ Decay (10.57 h 4) I (min) = 0.10%				γ 15	387.88 20	0.31 10	0.0025
Feeds ²⁴⁵ Am				γ 17	395.87 20	0.11 5	0.0009
ce-L- 1	4.2 10	2.0 12	0.0002	γ 18	411.74 20	0.52 13	0.0086
Auger-L	10.5	11 3	0.0024	γ 21	428.51 20	0.56 14	0.0051
ce-MNO- 1	21.9 10	0.7 4	0.0003	γ 23	445.34 20	0.32 9	0.0031
Auger-K	77.8	0.5 6	0.0009	γ 29	491.50 20	2.9 8	0.0302
ce-K- 3	155.29 21	1.2 4	0.0041	γ 31	514.60 20	0.18 6	0.0020
ce-K- 6	183.11 21	4.2 15	0.0163	γ 33	525.08 20	0.29 8	0.0032
ce-K- 8	202.31 21	18 8	0.0756	γ 36	560.03 20	5.8 14	0.0687
ce-K- 11	223.73 21	0.4 4	0.0020	γ 38	591.6 3	0.18 6	0.0023
ce-K- 13	251.58 21	1.7 6	0.0092	γ 40	598.8 3	0.13 5	0.0016
ce-L- 3	256.48 20	0.31 9	0.0017	γ 41	624.4 4	0.23 7	0.0031
ce-MNO- 3	274.16 20	0.11 3	0.0006	γ 42	630.04 20	2.9 8	0.0386
ce-L- 6	284.30 20	0.9 3	0.0057	γ 45	657.2 7	0.14 8	0.0020
ce-MNO- 6	301.98 20	0.32 9	0.0021	γ 46	660.20 20	0.90 24	0.0127
ce-L- 8	303.50 20	4.0 13	0.0262	γ 48	669.28 20	0.36 10	0.0051
ce-K- 21	303.51 21	0.13 11	0.0008	γ 53	707.98 20	0.29 9	0.0043
ce-N- 8	321.18 20	1.0 3	0.0068	γ 55	730.40 20	0.20 6	0.0031
ce-L- 11	324.92 20	0.10 6	0.0007	γ 57	737.96 20	0.23 8	0.0037
ce-NCP- 8	325.69 20	0.30 11	0.0026	γ 58	740.2 7	0.14 7	0.0023
ce-L- 13	352.77 20	0.36 11	0.0027	γ 59	743.70 20	0.16 5	0.0026
ce-K- 29	366.50 21	0.10 3	0.0008	γ 62	762.73 20	0.76 19	0.0123
ce-MNO-13	370.45 20	0.12 4	0.0010	γ 63	766.59 15	0.38 10	0.0062
ce-K- 36	435.03 21	0.10 5	0.0017	γ 64	776.66 20	0.22 6	0.0036
ce-K- 42	505.04 21	0.35 13	0.0037	γ 66	786.54 20	0.40 11	0.0066
β ⁻ 1 max	70 30			γ 67	796.37 20	0.27 10	0.0046
avg	19 8	0.12 3	≈0	γ 68	799.87 20	1.7 5	0.0285
β ⁻ 2 max	150 30			γ 69	817.04 20	0.90 22	0.0157
avg	39 9	0.60 19	0.0006	γ 72	833.14 20	0.56 14	0.0099
β ⁻ 3 max	190 30			γ 74	840.56 20	1.4 4	0.0245
avg	52 9	1.7 4	0.0019	γ 75	859.53 20	0.54 14	0.0099
β ⁻ 4 max	240 30			γ 76	868.8 4	0.13 5	0.0023
avg	64 9	1.1 4	0.0015	γ 78	874.16 20	0.14 5	0.0027
β ⁻ 5 max	270 30			γ 81	887.14 20	0.76 19	0.0143
avg	75 9	3.1 8	0.0050	γ 84	910.46 20	1.5 4	0.0286
β ⁻ 6 max	300 30			γ 89	938.40 20	1.1 3	0.0216
avg	84 9	8.3 19	0.0149	γ 90	941.0 10	0.27 19	0.0054
β ⁻ 7 max	340 30			γ 93	957.59 20	1.0 3	0.0213
avg	95 10	2.5 6	0.0051	γ 97	975.0 10	0.27 19	0.0056
β ⁻ 8 max	370 30			γ 98	977.20 20	0.41 21	0.0086
avg	105 10	15 4	0.0335	γ 101	987.60 20	1.4 4	0.0295
β ⁻ 9 max	930 30			γ 102	996.0 3	0.22 6	0.0046
avg	295 11	57 8	0.358	γ 104	1005.1 3	0.29 13	0.0062
β ⁻ 10 max	1210 30			γ 105	1007.31 20	0.43 15	0.0093
avg	398 12	11 9	0.0933	γ 106	1013.2 3	0.11 5	0.0023
total β ⁻				γ 107	1018.33 20	1.1 3	0.0238
avg	240 15	100 13	0.514	γ 108	1023.32 20	0.50 17	0.0126
X-ray L	14.6	17 5	0.0054	66 weak γ's omitted: Eγ (avg) = 762.0; ΣIγ = 2.35%			
γ 1	28.0 10	0.7 4	0.0004	● ²⁴⁵ Am β ⁻ Decay (122.4 m 13) I (min) = 0.10%			
X-ray Kα ₂	102.05 3	7.5 22	0.0164	Feeds ²⁴⁵ Cm			
X-ray Kα ₁	106.49 3	12 4	0.0274	Auger-L	10.7	6.2 12	0.0014
X-ray Kβ	120	5.7 17	0.0146	ce-L- 1	18.28 8	4.0 10	0.0015
				ce-L- 2	30.20 8	0.88 20	0.0006
				ce-MNO- 1	36.47 8	1.3 3	0.0010
				ce-MNO- 2	48.39 8	0.34 8	0.0003
				Auger-K	79.6	0.25 25	0.0004
				ce-K- 4	112.94 11	0.61 20	0.0015
				ce-K- 5	124.59 7	11.5 12	0.0306
				ce-K- 6	167.58 7	0.26 9	0.0009

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ (g-rad/ μ Ci-h)
ce-L- 4	216.67 11	0.14 4	0.0007	β^- 2 max	150 10		
ce-L- 5	228.32 6	2.40 24	0.0117	avg	40 3	73	0.0622
ce-M- 5	246.51 6	0.59 6	0.0031	β^- 3 max	330 10		
ce-NCP- 5	251.16 6	0.223 22	0.0012	avg	92 3	27	0.0529
β^- 1 max	600.3 21			total β^-			
avg	178.5 7	7.0 14	0.0266	avg	54 4	100.8	0.115
β^- 2 max	643.2 21			γ 2	27.580 20	4.2 5	0.0025
avg	192.9 7	15.6 19	0.0641	γ 3	43.810 20	30.0 15	0.0280
β^- 3 max	896.1 21			γ 4	66.600 20	0.306 21	0.0004
avg	281.0 8	77.4 23	0.463	γ 5	75.640 20	0.22 3	0.0003
total β^-				γ 8	179.940 20	11.6 6	0.0446
avg	260.1 8	100 4	0.554	γ 10	216.55 4	0.135 21	0.0006
X-ray L	15	11.0 14	0.0035	γ 11	223.750 20	28.2 21	0.134
X-ray $K\alpha_2$	104.61 5	3.6 4	0.0081	γ 13	255.54 3	0.276 21	0.0015
X-ray $K\alpha_1$	109.29 5	5.8 6	0.0135	6 weak γ 's omitted: E_γ (avg) = 202.9; ΣI_γ = 0.30%			
X-ray $K\beta$	123	2.7 3	0.0072	• ²⁴⁶Am β^- Decay (25.0 m 2) I (min) = 0.10%			
γ 4	241.20 10	0.34 8	0.0018	Feeds ²⁴⁶ Cm			
γ 5	252.85 5	6.1 6	0.0329	ce-L- 1	10.27 4	3.9 4	0.0009
γ 6	295.84 5	0.22 7	0.0014	Auger-L	10.7	22 4	0.0050
3 weak γ 's omitted: E_γ (avg) = 95.9; ΣI_γ = 0.10%				ce-L- 2	18.32 4	51.8 9	0.0202
• ²⁴⁵Cm α Decay (8.5E3 y 1) I (min) = 0.10%				ce-MKO- 1	28.464 18	1.45 19	0.0009
Feeds ²⁴¹ Pu				ce-MKO- 2	36.516 19	19.4 6	0.0151
Auger-L	10.3	42 17	0.0093	ce-K- 8	42.76 12	0.15 16	0.0001
ce-K- 2	11.2 10	30 40	0.0075	ce-L- 5	74.67 21	2.39 20	0.0038
ce-L- 1	18.9 10	47 24	0.0188	ce-M- 5	92.86 20	0.67 6	0.0013
ce-MKO- 1	36.1 10	17 9	0.0131	ce-NCP- 5	97.51 20	0.265 22	0.0006
ce-K- 3	52.2 10	15 15	0.0171	ce-K- 11	108.97 6	0.17 16	0.0004
Auger-K	76	0.9 12	0.0015	ce-K- 12	110.38 6	0.18 17	0.0004
ce-L- 2	109.9 10	16 7	0.0382	ce-K- 13	115.77 6	0.8 7	0.0019
ce-M- 2	127.1 10	4.3 19	0.0115	ce-K- 16	133.47 7	0.14 13	0.0004
ce-NCP- 2	131.4 10	1.6 8	0.0046	ce-K- 20	141.81 6	1.37 8	0.0042
ce-L- 3	150.9 10	6.0 19	0.0194	ce-L- 13	219.50 5	0.25 7	0.0012
ce-M- 3	168.1 10	1.6 5	0.0056	ce-L- 20	245.54 5	0.311 13	0.0016
ce-NCP- 3	172.4 10	0.60 20	0.0022	ce-MKO-20	263.73 4	0.107 4	0.0006
α 1	5234.6	0.32	0.0357	ce-K- 98	623.80 6	0.118 8	0.0016
α 2	5303.8	5	0.561	ce-K-104	670.54 6	0.131 5	0.0019
α 3	5362	93.18	10.64	β^- 1 max	520 50		
α 4	5488.7	0.83	0.0970	avg	152 17	0.283 12	0.0009
α 5	5529.2	0.58	0.0683	β^- 2 max	620 50		
4 weak α 's omitted: E_α (avg) = 5318.9; ΣI_α = 0.12%				avg	185 17	0.167 21	0.0007
X-ray L	14.3	64 24	0.0194	β^- 3 max	630 50		
γ 1	42.0 10	0.12 12	0.0001	avg	188 17	0.427 16	0.0017
X-ray $K\alpha_2$	99.55 5	14 11	0.0289	β^- 4 max	640 50		
X-ray $K\alpha_1$	103.76 5	22 17	0.0484	avg	191 17	0.361 11	0.0015
X-ray $K\beta$	117	10 e	0.0257	β^- 5 max	670 50		
γ 2	133.0 10	6.3 21	0.0178	avg	201 18	0.66 4	0.0028
γ 3	174.0 10	6.4 20	0.0237	β^- 6 max	680 50		
• ²⁴⁶Pu β^- Decay (10.85 d 2) I (min) = 0.10%				avg	205 18	1.00 3	0.0044
Feeds ²⁴⁶ Am (25.0 m)				β^- 7 max	700 50		
β^- 1 max	75 10			avg	211 18	0.209 7	0.0009
avg	19 3	0.8	0.0003	β^- 8 max	700 50		
				avg	212 18	0.967 25	0.0044
				β^- 9 max	710 50		
				avg	214 18	1.85 6	0.0084
				β^- 10 max	770 50		
				avg	238 18	1.67 4	0.0085
				β^- 11 max	850 50		
				avg	264 18	0.118 12	0.0007
				β^- 12 max	930 50		
				avg	294 18	1.13 25	0.0071
				β^- 13 max	950 50		
				avg	301 19	4.8 8	0.0308

(Continued)

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
²⁴⁶ Am β ⁻ Decay (25.0 m 2) (Continued)				γ 183 1637.95 5 0.162 20 0.0056 γ 185 1661.63 5 0.227 8 0.0080 γ 190 1737.94 5 0.112 8 0.0041 202 weak γ 's omitted: $E_{\gamma}(\text{avg}) = 914.7$; $\Sigma I_{\gamma} = 2.96\%$			
β-14 max	980 50			● ²⁴⁶ Cm α Decay (4.75E3 y 5) I (min) = 0.10%			
β-14 avg	312 19	0.279 9	0.0019	%α Decay = 99.97386 5			
β-15 max	1050 50			Feeds ²⁴² Pu			
β-15 avg	337 19	0.49 18	0.0035	% Spontaneous Fission = 0.02614 5			
β-16 max	1170 50			Auger-L	10.3	6.1 10	0.0013
β-16 avg	382 19	1.90 19	0.0155	ce-L- 1	21.448 10	15.3 8	0.0070
β-17 max	1180 50			ce-MMO- 1	38.612 10	5.6 3	0.0046
β-17 avg	383 19	0.192 16	0.0016	α 1	5343	21.0 10	2.39
β-18 max	1200 50			α 2	5386	79.0 10	9.06
β-18 avg	390 19	14.9 9	0.124	X-ray L	14.3	9.2 11	0.0028
β-19 max	1220 50			1 weak γ 's omitted: $E_{\gamma}(\text{avg}) = 44.5$; $\Sigma I_{\gamma} = 0.03\%$			
β-19 avg	400 19	37.6 12	0.320	● ²⁴⁷ Cm α Decay (1.56E7 y 5) I (min) = 0.10%			
β-20 max	1420 50			Feeds ²⁴³ Pu			
β-20 avg	477 20	7.0 5	0.0711	Auger-L	10.3	4.0 7	0.0009
β-21 max	1460 50			ce-L- 2	34.8028 16	5.83 7	0.0043
β-21 avg	490 20	16.3 6	0.170	ce-M- 2	51.9671 14	1.60 17	0.0018
β-22 max	2160 50			ce-NCP- 2	56.3414 8	0.61 8	0.0007
β-22 avg	723 20	0.6 3	0.0092	ce-K- 6	153.28 21	0.4 4	0.0012
β-23 max	2260 50			ce-K- 7	156.2 8	0.13 3	0.0004
β-23 avg	804 20	7	0.120	ce-K- 8	165.6 3	2.2 7	0.0078
total β-	426 21	100.6 20	0.913	ce-K- 10	211.2 10	0.14 14	0.0006
30 weak β's omitted: $E_{\beta}(\text{avg}) = 215.2$; $\Sigma I_{\beta} = 0.69\%$				ce-L- 6	252.00 20	0.10 5	0.0006
X-ray L	15	39 4	0.0125	ce-L- 8	264.3 3	0.44 14	0.0025
γ 5	99.20 20	0.167 13	0.0004	ce-K- 13	280.8 3	1.29 12	0.0077
X-ray Kα ₂	104.61 5	0.88 23	0.0020	ce-MMO- 8	281.5 3	0.14 5	0.0008
X-ray Kα ₁	109.29 5	1.4 4	0.0033	ce-L- 13	379.5 3	0.245 22	0.0020
X-ray Kβ	123	0.67 17	0.0018	α 1	4818 4	4.7 3	0.482
γ 11	237.23 4	0.144 8	0.0007	α 2	4868 4	71.0 10	7.36
γ 12	238.64 3	0.147 8	0.0007	α 3	4941 4	1.60 20	0.168
γ 13	244.03 3	0.68 3	0.0036	α 4	4983 4	2.00 20	0.212
γ 16	261.73 5	0.157 6	0.0009	α 5	5145 4	1.20 20	0.132
γ 20	270.07 3	1.03 4	0.0059	α 6	5210 4	5.7 5	0.633
γ 23	287.78 3	0.129 5	0.0008	α 7	5265 4	13.8 7	1.55
γ 45	401.68 3	0.266 9	0.0023	X-ray L	14.3	5.9 8	0.0018
γ 64	493.46 4	0.108 4	0.0011	X-ray Kα ₂	99.55 5	1.20 23	0.0025
γ 80	602.54 6	0.234 13	0.0030	X-ray Kα ₁	103.76 5	1.9 4	0.0043
γ 83	649.48 4	0.369 14	0.0051	X-ray Kβ	117	0.91 18	0.0023
γ 87	684.28 5	0.588 22	0.0086	γ 6	275.10 20	0.52 19	0.0030
γ 88	698.27 5	0.117 8	0.0017	γ 7	278.0 8	3.4 7	0.0201
γ 89	717.24 5	0.254 11	0.0039	γ 8	287.4 3	2.0 3	0.0122
γ 90	724.79 4	0.214 8	0.0033	γ 10	333.0 10	0.34 17	0.0024
γ 93	734.41 4	1.17 4	0.0183	γ 11	346.0 8	1.3	0.0096
γ 94	745.05 4	0.237 8	0.0038	γ 13	402.6 3	72 6	0.617
γ 98	752.06 4	0.82 4	0.0132	7 weak γ 's omitted: $E_{\gamma}(\text{avg}) = 116.1$; $\Sigma I_{\gamma} = 0.11\%$			
γ 99	759.59 4	0.645 22	0.0104				
γ 102	781.28 6	0.169 13	0.0028				
γ 104	798.80 4	24.9 3	0.424				
γ 108	833.60 4	1.79 6	0.0318				
γ 115	986.03 4	0.96 4	0.0202				
γ 117	1036.00 4	12.7 4	0.281				
γ 120	1062.04 4	17.2 4	0.389				
γ 121	1078.86 4	27.9 11	0.641				
γ 122	1081.40 6	0.249 3	0.0057				
γ 123	1085.15 6	1.53 5	0.0355				
γ 127	1124.29 4	0.261 11	0.0063				
γ 136	1206.96 4	0.149 6	0.0038				
γ 139	1249.79 4	0.149 6	0.0040				
γ 141	1274.72 4	0.269 9	0.0073				
γ 149	1348.81 4	0.121 5	0.0035				
γ 158	1479.43 4	0.229 8	0.0072				
γ 163	1529.00 7	0.224 11	0.0073				
γ 169	1550.94 9	0.27 3	0.0090				
γ 177	1590.68 5	0.52 4	0.0177				
γ 179	1604.14 5	0.102 4	0.0035				
γ 180	1618.80 4	0.116 5	0.0040				

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
<p>• ²⁴⁸Cm α Decay (3.39E5 y 3) I (min) = 0.10%</p> <p>%α Decay = 91.74 3</p> <p>Feeds ²⁴⁴Pu</p> <p>% Spontaneous Fission = 8.26 3</p>				<p>X-ray L 15.3 0.38 7 0.0001</p> <p>X-ray Kα₁ 112.14 5 0.120 17 0.0003</p> <p>γ 14 368.76 6 0.350 20 0.0027</p> <p>γ 22 560.39 6 0.84 6 0.0100</p> <p>γ 24 621.87 6 0.182 13 0.0024</p> <p>γ 25 634.31 6 1.50 10 0.0203</p> <p>γ 26 652.80 6 0.143 10 0.0020</p> <p>21 weak γ's omitted: Eγ (avg) = 389.9; ΣIγ = 0.24%</p>			
Auger-L	10.3	4.8 8	0.0011				
ce-L- 1	21.1 4	12.11 17	0.0054				
ce-MNO- 1	38.3 4	4.49 11	0.0037				
α 1	5035.06 25	16.54 18	1.77				
α 2	5078.58 25	75.1 4	8.13				
<p>1 weak α's omitted: Eα (avg) = 4931.1; ΣIα = 0.07%</p>				<p>• ²⁴⁹Bk β⁻ Decay (320 d 6) I (min) = 0.10%</p> <p>%β⁻ Decay = 99.99855 8</p> <p>Feeds ²⁴⁹Cf</p> <p>%α Decay = 0.00145 8</p> <p>% Spontaneous Fission = 4.7E-8 2</p>			
X-ray L	14.3	7.3 8	0.0022	β ⁻ 1 max	126.4 19		
<p>2 weak γ's omitted: Eγ (avg) = 56.2; ΣIγ = 0.03%</p>				avg	33.0 6	99.9985	0.0703
<p>• ²⁴⁸Cf α Decay (333.5 d 28) I (min) = 0.10%</p> <p>%α Decay = 99.9971 3</p> <p>Feeds ²⁴⁴Cm</p> <p>% Spontaneous Fission = 0.0029 3</p>				<p>• ²⁴⁹Cf α Decay (350.6 y 21) I (min) = 0.10%</p> <p>Feeds ²⁴⁴Cm</p> <p>% Spontaneous Fission = 5.2E-7 2</p>			
Auger-L	10.7	4.4 8	0.0010	Auger-L	10.7	17 4	0.0039
ce-L- 1	18.37 11	12.4 4	0.0048	ce-L- 2	18.28 8	2.61 18	0.0010
ce-MNO- 1	36.56 11	4.62 17	0.0036	ce-L- 4	30.20 8	34 4	0.0221
α 1	6220	17.0 5	2.25	ce-L- 5	30.20 4	0.73 13	0.0005
α 2	6260 30	83.0 5	11.07	ce-MNO- 2	36.47 8	0.85 5	0.0007
X-ray L	15	7.9 8	0.0025	ce-L- 6	41.34 16	0.7 5	0.0006
<p>1 weak γ's omitted: Eγ (avg) = 42.9; ΣIγ = 0.02%</p>				ce-L- 8	42.18 16	1.3 3	0.0012
				ce-M- 4	48.39 8	9.5 12	0.0098
				ce-MNO- 5	48.394 18	0.28 4	0.0003
				ce-NCP- 4	53.04 8	3.7 5	0.0042
				ce-MNO- 6	59.53 16	0.26 20	0.0003
				ce-M- 8	60.37 16	0.37 10	0.0005
				ce-NCP- 8	65.02 16	0.14 4	0.0002
				Auger-K	79.6	0.15 15	0.0003
				ce-L- 11	97.0 4	0.26 8	0.0005
				ce-K- 14	112.94 11	0.40 9	0.0010
				ce-K- 15	124.59 7	5.16 21	0.0137
				ce-K- 18	167.58 7	0.171 9	0.0006
				ce-K- 20	205.18 7	0.428 19	0.0019
				ce-L- 15	228.32 6	1.08 5	0.0052
				ce-MNO-15	246.51 6	0.363 14	0.0019
				ce-K- 21	259.69 7	1.34 6	0.0074
				ce-L- 21	363.42 6	0.265 12	0.0020
<p>• ²⁴⁹Cm β⁻ Decay (64.15 m 3) I (min) = 0.10%</p> <p>Feeds ²⁴⁹Bk</p>				α 1	5694.0 20	0.2	0.0243
ce-MNO- 1	2.26 11	99.976 3	0.0048	α 2	5759.7 10	3.66	0.449
ce-L- 2	5.57 6	0.255 23	≠0	α 3	5783.5	0.26	0.0320
Auger-L	10.9	0.19 5	≠0	α 4	5813.5 10	84.4	10.45
ce-L- 5	59.92 8	0.11 6	0.0001	α 5	5849.5 10	1	0.130
ce-K- 14	237.18 8	0.122 23	0.0006	α 6	5903.4 10	2.79	0.351
ce-K- 22	428.81 8	0.13 3	0.0012	α 7	5946.2 10	4	0.507
β ⁻ 1 max	238 9			α 8	6072.1 10	0.24	0.0310
avg	65 3	0.36 3	0.0005	α 9	6139.5 7	1.1	0.145
β ⁻ 2 max	257 9			α 10	6194.0 7	2.17	0.286
avg	70 3	1.80 15	0.0027	<p>22 weak α's omitted: Eα (avg) = 5662.3; ΣIα = 0.14%</p>			
β ⁻ 3 max	331 9						
avg	92 3	1.04 8	0.0020				
β ⁻ 4 max	522 9						
avg	153 3	0.49 5	0.0016				
β ⁻ 5 max	891 9						
avg	279 4	96.27 15	0.572				
total β ⁻	272 5	99.96 24	0.579				

(Continued)

²⁴⁹Cf-²⁵¹Cf

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
²⁴⁹ Cf α Decay (350.6 y 21) (Continued)				²⁴⁹ Cf α Decay (350.6 y 21) (Continued)			
X-ray L	15	30 4	0.0097	X-ray L	15.7	31 4	0.0104
γ 4	54.73 7	0.211 10	0.0002	γ 2	98.2 5	0.120 5	0.0003
γ 9	92.30 5	0.297 12	0.0006	X-ray Kα ₂	109.87 5	0.262 10	0.0006
X-ray Kα ₂	104.61 5	2.19 9	0.0049	X-ray Kα ₁	115.07 5	0.415 14	0.0010
X-ray Kα ₁	109.29 5	3.50 14	0.0081	X-ray Kβ	129	0.199 9	0.0005
X-ray Kβ	123	1.66 8	0.0044	γ 3	889.98 15	1.64 5	0.0311
γ 14	241.20 10	0.224 8	0.0012	γ 4	929.28 15	1.37 5	0.0271
γ 15	252.85 5	2.73 11	0.0147	γ 5	988.96 15	45.1 7	0.950
γ 17	266.73 5	0.75 3	0.0042	γ 6	1028.58 15	4.39 12	0.0961
γ 18	295.84 5	0.143 6	0.0009	γ 7	1031.76 15	35.1 4	0.771
γ 20	333.44 5	15.5 5	0.110	1 weak γ's omitted: E _γ (avg) = 42.2; ΣI _γ = 0.04%			
γ 21	387.95 5	66.0 20	0.545	<ul style="list-style-type: none"> ²⁵⁰Cf α Decay (13.08 y 9) I (min) = 0.10% %α Decay = 99.923 3 Feeds ²⁴⁶Cm % Spontaneous Fission = 0.077 3 			
26 weak γ's omitted: E _γ (avg) = 283.7; ΣI _γ = 0.43%				<ul style="list-style-type: none"> Auger-L 10.7 4.4 8 0.0010 ce-L- 1 18.32 4 12.0 9 0.0047 ce-MKO- 1 36.516 19 4.5 4 0.0035 ce-L- 2 74.67 21 0.204 1 0.0003 			
<ul style="list-style-type: none"> ²⁵⁰Cm α Decay (~6.9E3 y) I (min) = 0.10% %α Decay = 25 (Systematics) Feeds ²⁴⁶Pu See also ²⁵⁰Cm β⁻ Decay % Spontaneous Fission = 61 (Systematics) 				<ul style="list-style-type: none"> α 1 5890 0.29976 0.0376 α 2 5989.1 6 16.2 12 2.07 α 3 6030.8 6 83.4 12 10.72 			
<ul style="list-style-type: none"> ²⁵⁰Cm β⁻ Decay (~6.9E3 y) I (min) = 0.10% %β⁻ Decay = 14 (Systematics) Feeds ²⁵⁰Bk See also ²⁵⁰Cm α Decay % Spontaneous Fission = 61 (Systematics) 				<ul style="list-style-type: none"> X-ray L 15 7.8 10 0.0025 <li colspan="4">3 weak γ's omitted: E_γ(avg) = 76.6; ΣI_γ = 0.03% 			
<ul style="list-style-type: none"> β⁻ 1 max 37 12 avg 9 4 14 0.0027 				<ul style="list-style-type: none"> ²⁵¹Bk β⁻ Decay (57.0 m 17) I (min) = 0.10% Feeds ²⁵¹Cf β⁻ 1 max 1120 avg 360.46 100 0.768 			
<ul style="list-style-type: none"> ²⁵⁰Bk β⁻ Decay (3.222 h 5) I (min) = 0.10% Feeds ²⁵⁰Cf 				<ul style="list-style-type: none"> ²⁵¹Cf α Decay (9.0E2 y 4) I (min) = 0.10% Feeds ²⁴⁷Cm 			
Auger-L	11.2	15 4	0.0035	Auger-L	10.7	34 7	0.0076
ce-L- 1	16.2 5	42.8 6	0.0147	ce-L- 1	37.0 3	13 5	0.0102
ce-MKO- 1	35.4 5	16.2 4	0.0122	ce-K- 8	48.34 11	3.0 3	0.0031
ce-L- 2	72.2 5	2.14 7	0.0033	ce-M- 1	55.2 3	3.2 13	0.0037
ce-M- 2	91.4 5	0.610 24	0.0012	ce-NCP- 1	59.8 3	1.2 5	0.0015
ce-NCP- 2	96.4 5	0.243 10	0.0005	Auger-K	79.6	1.1 11	0.0018
ce-K- 5	853.99 16	0.519 18	0.0094	ce-K- 10	98.7 10	50 9	0.105
ce-K- 7	896.79 16	0.376 12	0.0072	ce-L- 5	110.47 4	0.348 11	0.0008
ce-L- 5	962.94 16	0.152 5	0.0031	ce-MKO- 5	128.664 18	0.137	0.0004
ce-L- 7	1005.74 16	0.107 4	0.0023	ce-L- 8	152.07 11	18.8 17	0.0608
<ul style="list-style-type: none"> β⁻ 1 max 709 4 avg 214.4 14 5.89 15 0.0269 β⁻ 2 max 748 4 avg 228.0 14 83.1 11 0.404 β⁻ 3 max 1780 4 avg 574.4 15 5.5 0.0673 β⁻ 4 max 1737 4 avg 594.1 16 5.5 0.0696 total β⁻ avg 266.4 16 100.0 12 0.567 				<ul style="list-style-type: none"> ce-NCP- 8 174.91 11 2.05 19 0.0076 ce-L- 10 202.5 10 19 4 0.0831 ce-M- 10 220.7 10 5.1 10 0.0242 ce-NCP-10 225.3 10 2.0 4 0.0096 			

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
α 1	5501 5	0.30 10	0.0352	α 1	5979 5	0.29 4	0.0374
α 2	5566.0 20	1.50 20	0.178	1 weak α's omitted: Eα (avg) = 5921.0; ΣIα = 0.02%			
α 3	5603 7	0.22	0.0263	X-ray L	15	0.134 22	≈0
α 4	5632.0 10	4.5 10	0.540	● ²⁵³ Cf β ⁻ Decay (17.81 d 8) I (min) = 0.10%			
α 5	5648.0 10	3.5 13	0.421	%β ⁻ Decay = 99.69 4			
α 6	5677.0 10	35.0 10	4.23	Feeds ²⁵³ Es			
α 7	5738 7	1.0 3	0.122	See also ²⁵³ Cf α Decay			
α 8	5762 3	3.8 4	0.466	β ⁻ 1 max	287 10		
α 9	5793.0 10	2.0 3	0.247	avg	79 3	99.69 4	0.168
α 10	5814 4	4.2 4	0.520	● ²⁵³ Es α Decay (20.467 d 24) I (min) = 0.10%			
α 11	5852.0 10	27.0 10	3.37	Feeds ²⁴⁹ Bk			
α 12	5943 4	0.60 10	0.0760	% Spontaneous Fission = 8.7E-6 3			
α 13	6014 3	11.6 5	1.49	ce-MNO- 1	2.26 11	2.7 3	0.0001
α 14	6074 3	2.7 3	0.349	ce-L- 2	5.57 6	1.37 15	0.0002
X-ray L	15	60 9	0.0190	Auger-L	10.9	2.4 6	0.0005
γ 1	61.5 3	0.56 22	0.0007	ce-L- 3	16.52 6	4.6 5	0.0016
γ 2	68	0.2	0.0003	ce-L- 4	17.71 5	0.71 8	0.0003
γ 3	73	0.3	0.0005	ce-MNO- 2	24.29 6	0.45 5	0.0002
γ 4	83	0.10	0.0002	ce-L- 5	26.68 5	0.233 25	0.0001
X-ray Kα ₂	104.61 5	15 3	0.0345	ce-MNO- 3	35.24 6	1.55 16	0.0012
X-ray Kα ₁	109.29 5	25 5	0.0575	ce-MNO- 4	36.43 4	0.234 24	0.0002
X-ray Kβ	123	11.7 20	0.0307	α 1	6498.0 20	0.260 10	0.0360
γ 5	135	0.10	0.0003	α 2	6540.0 20	0.850 20	0.118
γ 6	144	0.10	0.0003	α 3	6552.0 20	0.710 20	0.0991
γ 7	154	0.2	0.0007	α 4	6592.0 20	6.60 10	0.927
γ 8	176.60 10	17.7 15	0.0666	α 5	6594	0.7	0.0983
γ 9	214	0.2	0.0009	α 6	6624	0.8	0.113
γ 10	227.0 10	6.3 11	0.0305	α 7	6632.73 5	89.80 20	12.69
γ 11	255	0.2	0.0011	21 weak α's omitted: Eα (avg) = 6358.7; ΣIα = 0.27%			
γ 12	262	0.2	0.0011	X-ray L	15.3	4.6 6	0.0015
γ 13	266.0 3	0.50 20	0.0028	72 weak γ's omitted: Eγ (avg) = 203.0; ΣIγ = 0.14%			
γ 14	270	0.2	0.0012	● ²⁵⁴ Cf α Decay (60.5 d 2) I (min) = 0.10%			
γ 15	285.00 20	1.4 3	0.0085	%α Decay = 0.310 16			
γ 16	291.0 3	0.40 20	0.0025	% Spontaneous Fission = 99.690 16			
● ²⁵² Cf α Decay (2.639 y 5) I (min) = 0.10%				α 1	5834 5	0.257 15	0.0320
%α Decay = 96.908 8				1 weak α's omitted: Eα (avg) = 5792.0; ΣIα = 0.05%			
Feeds ²⁴⁸ Cm							
% Spontaneous Fission = 3.092 8							
Auger-L	10.7	4.1 7	0.0009				
ce-L- 1	18.87 5	11.22 23	0.0045				
ce-MNO- 1	37.06 4	4.18 13	0.0033				
ce-L- 2	76.07 4	0.16 3	0.0003				
α 1	5976.6	0.23 4	0.0296				
α 2	6075.7 5	15.2 3	1.97				
α 3	6118.3 5	81.6 3	10.63				
X-ray L	15	7.3 7	0.0023				
2 weak γ's omitted: Eγ (avg) = 68.2; ΣIγ = 0.03%							
● ²⁵³ Cf α Decay (17.81 d 8) I (min) = 0.10%							
%α Decay = 0.31 4							
Feeds ²⁴⁹ Cm							
See also ²⁵³ Cf β ⁻ Decay							
ce-L- 1	24 7	0.21 3	0.0001				
ce-MNO- 1	43 7	0.101 14	≈0				

²⁵⁴Es-²⁵⁴Fm

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
<p>• ²⁵⁴Es α Decay (275.7 d 5) I (min) = 0.10% Feeds ²⁵⁰Bk</p>				<p>• ²⁵⁴Es β⁻ Decay (39.3 h 2) I (min) = 0.10% %β⁻ Decay = 99.59 1 Feeds ²⁵⁴Fm See also ²⁵⁴Es α Decay (39.3 h) %EC Decay = 0.078 7</p>			
ce-MNO- 2	1.755 18	96.1 10	0.0036	Auger-L	11.6	16 6	0.0039
ce-L- 3	9.13 11	21.9 7	0.0043	ce-L- 2	17.40 3	50 7	0.0185
ce-L- 4	10.23 11	50.1 5	0.0109	ce-MNO- 2	37.782 16	19.2 25	0.154
Auger-L	10.9	51 11	0.0118	ce-L- 3	76.77 3	3.4 5	0.0055
ce-L- 5	17.33 11	72.8 19	0.0269	ce-M- 3	97.154 17	0.98 13	0.0020
ce-MNO- 3	27.85 11	8.1 8	0.0048	ce-NCP- 3	102.406 24	0.40 5	0.0009
ce-MNO- 4	28.95 11	19.9 5	0.0123	ce-K- 5	442.35 6	0.111 13	0.0010
ce-MNO- 5	36.05 11	27 3	0.0207	ce-K- 6	506.83 6	0.89 10	0.0096
ce-L- 6	37.7 20	0.73 8	0.0006	ce-K- 7	546.71 6	0.35 4	0.0041
ce-L- 7	44.43 11	0.712 8	0.0007	ce-K- 8	551.81 6	0.68 8	0.0079
ce-L- 8	45.13 11	2.136 21	0.0021	ce-L- 6	621.21 6	0.42 5	0.0056
ce-L- 9	55.53 11	0.704 6	0.0008	ce-MNO- 6	641.59 6	0.140 15	0.0019
ce-MNO- 6	56.5 20	0.246 25	0.0003	ce-L- 7	661.09 6	0.154 17	0.0022
ce-L- 10	59.83 11	0.700 8	0.0009	ce-L- 8	666.19 6	0.30 4	0.0042
ce-MNO- 7	63.15 11	0.27 3	0.0004	β ⁻ 1 max	437 6		
ce-M- 8	63.85 11	0.59 7	0.0008	β ⁻ 1 avg	124.7 17	19.0 19	0.0505
ce-NCP- 8	68.65 11	0.23 3	0.0003	β ⁻ 2 max	477 6		
ce-MNO- 9	74.25 11	0.27 3	0.0004	β ⁻ 2 avg	137.3 18	67 6	0.196
ce-MNO-10	78.55 11	0.27 3	0.0005	β ⁻ 3 max	1126 6		
α 1	6048 5	0.16	0.0206	β ⁻ 3 avg	360.6 20	13 8	0.0999
α 2	6105.0 20	0.340 20	0.0442	total β ⁻	164.2 20	99 11	0.346
α 3	6266.0 20	0.22 4	0.0294	X-ray L	16.4	40 8	0.0140
α 4	6275	0.140 20	0.0187	γ 3	104.360 12	0.21 3	0.0005
α 5	6347.0 20	0.75 5	0.101	X-ray Kα ₂	115.32 4	0.60 4	0.0015
α 6	6358.6 20	2.6 3	0.352	X-ray Kα ₁	121.10 4	0.95 7	0.0024
α 7	6415.8 20	1.80 10	0.246	X-ray Kβ	136	0.46 4	0.0013
α 8	6428.8 20	93.1 10	12.75	γ 4	544.46 5	1.07 13	0.0124
α 9	6476	0.23 4	0.0317	γ 5	584.32 5	3.4 4	0.0428
9 weak α's omitted: Eα(avg) = 6225.8; ΣIα = 0.22%				2 weak γ's omitted: Eγ(avg) = 45.0; ΣIγ = 0.06%			
X-ray L	15.3	99 11	0.0322				
γ 5	42.60 10	0.14 12	0.0001				
γ 6	63.0 20	2.00 20	0.0027				
γ 19	316.0 20	0.15	0.0010				
20 weak γ's omitted: Eγ(avg) = 221.8; ΣIγ = 0.44%							
• ²⁵⁴ Es α Decay (39.3 h 2) I (min) = 0.10% %α Decay = 0.33 1 Feeds ²⁵⁰ Bk See also ²⁵⁴ Es β ⁻ Decay (39.3 h) %EC Decay = 0.078 7				• ²⁵⁴ Fm α Decay (3.240 h 2) I (min) = 0.10% %α Decay = 99.9408 2 Feeds ²⁵⁰ Cf % Spontaneous Fission = 0.0592 2			
α 1	6382.0 20	0.247 9	0.0336	Auger-L	11.2	3.7 9	0.0009
11 weak α's omitted: Eα(avg) = 6452.9; ΣIα = 0.08%				ce-L- 1	16.2 5	10.9 8	0.0037
15 weak γ's omitted: Eγ(avg) = 159.4; ΣIγ = 0.23%				ce-MNO- 1	35.4 5	4.1 3	0.0031
				ce-L- 2	72.2 5	0.62 7	0.0010
				ce-MNO- 2	91.4 5	0.25 3	0.0005
				α 1	7050	0.90 10	0.135
				α 2	7147	14.0 10	2.13
				α 3	7189 5	84.9 10	13.01
				X-ray L	15.7	7.8 10	0.0026
				2 weak γ's omitted: Eγ(avg) = 84.9; ΣIγ = 0.05%			

Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)	Radiation Type	Energy (keV)	Intensity (%)	Δ(g-rad/μCi-h)
<p>● ²⁵⁵Es α Decay (39.8 d 12) I (min) = 0.10% %α Decay = 8.0 4 Feeds ²⁵¹Bk See also ²⁵⁵Es β⁻ Decay % Spontaneous Fission = 0.0041 2</p>				<p>ce-M- 4 51.147 24 1.07 16 0.0012 ce-M- 5 51.722 24 5.7 3 0.0063 ce-M- 6 53.249 24 1.07 24 0.0012 ce-L- 9 54.90 6 11.9 4 0.0139 ce-L- 10 55.46 4 34.4 11 0.0407 ce-NCP- 4 56.092 25 0.42 7 0.0005 ce-NCP- 5 56.667 25 2.20 10 0.0027 ce-NCP- 6 58.194 25 0.41 10 0.0005 ce-L- 11 59.98 11 0.15 8 0.0002 ce-MNO- 8 66.29 4 0.171 12 0.0002 ce-M- 9 74.16 6 3.37 11 0.0053 ce-M- 10 74.72 3 9.8 3 0.0156 ce-NCP- 9 79.11 6 1.35 4 0.0023 ce-NCP-10 79.67 3 3.91 12 0.0066</p>			
Auger-L	10.9	0.29 7	≈0	α 1	6807.0 20	0.110 6	0.0159
ce-L- 1	14.73 4	0.72 5	0.0002	α 2	6892.0 20	0.620 10	0.0910
ce-L- 2	22.73 4	0.146 8	≈0	α 3	6963.0 20	5.04 6	0.747
ce-MNO- 1	33.455 18	0.27 3	0.0002	α 4	6983.0 20	0.130 10	0.0193
α 1	6213	0.200 10	0.0265	α 5	7022.0 20	93.4 3	13.97
α 2	6260	0.78 4	0.105	α 6	7080.0 20	0.40 3	0.0603
α 3	6299.5 15	7.0 4	0.941	16 weak α's omitted: Eα (avg) = 6923.4; ΣIα = 0.34%			
X-ray L	15.3	0.57 7	0.0002	X-ray L	15.7	60 7	0.0202
<p>● ²⁵⁵Es β⁻ Decay (39.8 d 12) I (min) = 0.10% %β⁻ Decay = 92.0 4 Feeds ²⁵⁵Fm See also ²⁵⁵Es α Decay % Spontaneous Fission = 0.0041 2</p>				<p>γ 1 23.001 17 0.15 3 ≈0 γ 2 24.824 15 0.2 0.0001 γ 4 57.902 15 0.1 0.0001 γ 5 58.477 15 0.67 0.0008 γ 6 60.004 15 0.120 20 0.0002 γ 9 80.92 5 0.27 0.0005 γ 10 81.477 20 0.8 0.0014</p>			
β ⁻ 1 max	280			42 weak γ's omitted: Eγ (avg) = 142.8; ΣIγ = 0.15%			
avg	76.69	92.0 4	0.150	<p>● ²⁵⁶Fm α Decay (157.6 m 13) I (min) = 0.10% %α Decay = 8.1 3 Feeds ²⁵²Cf % Spontaneous Fission = 91.9 3</p>			
<p>● ²⁵⁵Fm α Decay (20.07 h 7) I (min) = 0.10% Feeds ²⁵¹Cf % Spontaneous Fission = 2.4E-5 10</p>				<p>α 1 6915 5 8.1 3 1.19</p>			
Auger-L	11.2	28 7	0.0068				
ce-MNO- 1	16.246 25	27 6	0.0092				
ce-MNO- 2	18.069 24	93	0.0358				
ce-L- 3	21.81 4	10.3 12	0.0048				
ce-L- 4	31.88 4	4.3 6	0.0029				
ce-L- 5	32.46 4	23.0 8	0.0159				
ce-L- 6	33.98 4	4.2 10	0.0030				
ce-MNO- 3	41.075 24	3.9 4	0.0034				
ce-L- 8	47.03 5	0.50 4	0.0005				

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Reevaluations of Dosimetric Factors Hiroshima and Nagasaki

DOE Symposium Series

There are profound implications, not only health and environmental but also economic, social, and industrial, in recent research on radiation dosimetry—research which indicates that the tentative dose estimates used in the past may have to be changed. This book is the result of a workshop held to determine the current status of research efforts and to assess directions and levels of research efforts in the immediate future. A reasonably clear view has emerged of what remains to be done and of how and when it is to be accomplished.

Proceedings of a symposium held at
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U. S. Department of Energy

This volume is the result of recent research which indicates that significant revisions may have to be made in the estimates of radiation doses to survivors of the atomic bombs at Hiroshima and Nagasaki. Studies of health effects among these survivors and their correlation with the doses estimated in the late 1950's and early 1960's have provided a fundamental data base for estimating radiation risk. Because of the profound implications of any substantial modifications of the estimated neutron and gamma doses in the two cities, this book explores the current status of research and assesses future directions and priorities.

The thirteen papers provide a comprehensive discussion of the many factors that affect the dose estimates, including weapon yields, prompt and delayed neutron and gamma source terms, air transport, and structure and body shielding. Taken as a whole, the volume contains detailed information on the historical perspective, recent developments (notably in significant improvements in source terms and air-transport calculations), and plans for future research efforts.

Although subsequent work has yielded new information and modified some of the data presented, there is little in this volume that has or will soon become outdated. In terms of delineating the key issues and presenting the main elements of the research plan, this volume will be of interest both to physicists concerned with state-of-the-art radiation dosimetry and to radiobiologists interested in the application of such data to risk assessment.

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TRANSURANIC ELEMENTS IN THE ENVIRONMENT

(A Summary of Environmental Research on Transuranium Radionuclides Funded by the U. S. Department of Energy Through Calendar Year 1979)

Editor: Wayne C. Hanson, Pacific Northwest Laboratory

In 1973, an environmental team from the U. S. Atomic Energy Commission, Division of Biomedical and Environmental Research, performed an intensive study of its research efforts in support of the development of nuclear power, especially the Liquid Metal Fast Breeder Reactor (LMFBR). After reviewing the information on transuranic cycling in various environments, the team concluded that a comprehensive description of the environmental hazards of plutonium and other transuranic elements associated with the LMFBR could not be made with the available data. The AEC (followed by ERDA and DOE) then developed a program to develop the missing information and to build as comprehensive an information base as possible for future assessments of the impacts of transuranic radionuclides from all states in the nuclear cycle.

Some of the results have been published in laboratory reports, government documents, and reference journals. This volume is an accumulation of all available information in one place. It will serve as a synthesis document to provide an up-to-date interpretation of the environmental behavior of the transuranium elements.

CONTENTS: Synthesis of the Research Literature; Introduction; Source Terms; Inventory and Distribution; Terrestrial Ecosystems (Experimental Studies; Field Studies; Models); Aquatic Ecosystems (Marine Studies; Freshwater); Biological Effects; Index.

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