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7. Abstract

Radcalc is a spreadsheet currently used to calculate the generation of hydrogen gas in low-level radioactive waste containers for purposes of transportation and packaging. Radcalc is being enlarged and expanded. It will be offered as a Windows compatible software and will include some of the following enhancements: extended radionuclide library, updated gamma absorption fractions for an increased number of packages, inclusion of a $G(H_2)$ value data base, updated transportation information, thermal and pressure calculation update, testing and benchmarking. This report discusses the progress made on the new Radcalc program. It presents the new radionuclide library, the results of the gamma absorption fractions for the increased number of packages, and an extensive review of $G(H_2)$ values.

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PROGRESS REPORT FOR THE ENHANCEMENT OF RADCALC:
ISOTOPE DATABASE, GAMMA ABSORPTION FRACTIONS,
AND $G(H_2)$ VALUES

Packaging Safety Engineering

September 27, 1994

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LIST OF ACRONYMS

ANL	Argonne National Laboratory
BNL	Brookhaven National Laboratory
CAW	Current Acid Waste
CFR	U.S. Code of Federal Regulations
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DSS	Double Shell Slurry
EPRI	Electric Power Research Institute
H ₂	hydrogen gas
HLW	high level waste
LET	linear energy transfer
LLW	low level waste
MCNP	Monte Carlo N-Particle
NCAW	neutralized current acid waste
NRC	U.S. Nuclear Regulatory Commission
OD	outside diameter
OTC	Onsite Transfer Cask
SARP	Safety Analysis Report for Packaging
SRL	Savannah River Laboratory
SRS	Savannah River Site
TMI	Three Mile Island
WHC	Westinghouse Hanford Company

1.0 INTRODUCTION

1.1 BACKGROUND

High level and low level radioactive wastes are subjected to ionizing radiation that may lead to the radiolytic formation of a variety of gases. Carbon dioxide, carbon monoxide, hydrogen, oxygen, and methane are among the species created from the radiolysis of different types of radioactive wastes. To ensure the safe storage and transportation of radioactive waste materials, an analysis of the quantity and types of the gases, particularly flammable gases, that may be generated is necessary.

The generation of hydrogen in particular has been much studied. A calculational technique for quantifying the concentration of hydrogen generated by radiolysis in sealed radioactive waste containers was developed in a U.S. Department of Energy (DOE) study conducted by EG&G Idaho, Inc., and the Electric Power Research Institute (EPRI) TMI-2 Technology Transfer Office. The study resulted in report GEND-041, entitled "A Calculational Technique to Predict Combustible Gas Generation in Sealed Radioactive Waste Containers" (Flaherty, et al. 1986). The study also resulted in a presentation to the U.S. Nuclear Regulatory Commission (NRC) which gained acceptance of the methodology for use in ensuring compliance with NRC IE Information Notice No. 84-72 (NRC 1984) concerning the generation of hydrogen within packages.

NRC IE Information Notice No. 84-72: "Clarification of Conditions for Waste Shipments Subject to Hydrogen Gas Generation" applies to any package containing water and/or organic substances that could radiolytically generate combustible gases. The NRC requires that over a period of twice the expected shipment time:

- the hydrogen gas concentration is less than 5% by volume (or equivalent limits for other inflammable gases) of the secondary container gas void
- the secondary container and cask cavity must be inerted to ensure that oxygen is limited to 5% by volume in those portions of the package that could have hydrogen greater than 5%.

If the material being shipped is low specific activity and if it is shipped within 10 days after venting, the above requirements do not apply. Notice No. 84-72 is pertinent to shipments of resins, binders, waste sludge, and wet filters. The notice requires compliance by tests or measurements of a representative package. However, in April of 1985, the NRC accepted the calculational method presented in report GEND-041 to confirm the absence of hydrogen in low level waste (LLW) packages (Deltete 1987).

Subsequently, EPRI developed a simple computer program in a spreadsheet format utilizing GEND-041 calculational methodology to predict hydrogen gas concentrations. The computer code was extensively benchmarked against TMI-2

(Three Mile Island) EPICOR II resin bed measurements. The benchmarking showed that the model developed predicted hydrogen gas concentrations within 20% of the measured concentrations. The computer code has since been dubbed Radcalc and is still accepted today by the NRC for Certificates of Compliance for shipping casks containing materials which may result in the radiolytic formation of hydrogen gas. In addition to hydrogen gas concentration calculations, Radcalc currently provides transportation and packaging information such as: pressure buildup, total activity, decay heat, fissile activity, TRU activity, and transportation classifications.

1.2 RADCALC METHODOLOGY

Hydrogen generation occurs in radioactive waste materials through two main mechanisms. One of these mechanisms is the release of hydrogen from the oxidation of metals immersed in water and is not at issue in this report. The second mechanism resulting in the release of hydrogen is radiolysis.

Radioactive decay of a nucleus can produce ionizing radiation which will interact with and may cause reactions in a large quantity of molecules within an absorbing material. The chemical change which occurs in materials as a result of these interactions is referred to as radiolysis. Radiolysis occurring in the majority of radioactive waste materials is due to interactions initiated by alpha particles, beta particles, and photons (gamma rays and x-rays). As ionizing radiation travels through a medium, the atoms and molecules within the trajectory of the particle or photon will absorb energy and be ionized or left in an excited state. The initiating interacting radiation creates a track of excited ions and molecules. Freed electrons can, in turn, create secondary tracks or spurs branching off from the primary track. The length of the tracks and the distance traveled by the ionizing radiation will depend upon the energy and type of radiation and the chemical and physical properties of the medium. The species resulting from the interactions will depend upon the chemical structure of the absorbing medium and will for the most part be the same for different types of ionizing radiation. The quantity of the species formed will depend upon the amount of radiation energy absorbed within the material, the proximity of the different species formed which will affect the chances of species recombination, and in some part the chemical nature of the different components.

A chemical response initiated by ionizing radiation can cause a large number of intermediary reactions. For instance, in the radiolysis of water, Spinks (Spinks and Woods 1990) identifies 16 additional major reactions which follow as a result of the initial reactions caused by ionizing radiation. The formation of intermediary species and excited molecules can lead to the production of free radicals and in some cases to the formation of a flammable gas such as hydrogen.

The types of species produced radiolytically depend upon the chemical structure of the material through which the radiation is traveling. The major reactions in the radiolysis of water are:

The addition of substances such as nitrates to the water will change the chemical components produced and the quantities of these components. Some of the gases identified from the radiolysis of cation exchange resins are: H_2 , CO_2 , CO , SO_2 , O_2 , and CH_4 , and from the radiolysis of anion exchange resins: H_2 , CO_2 , CO , N_2 , N_2O , and NO .

In order to relate the quantity of a species produced radiolytically to the amount of energy absorbed, a term arbitrarily called the *G value* was defined (Burton 1952). The *G value* of a material is defined as the number of molecules formed or disassociated per 100 eV energy absorbed. *G values* are species and material specific; that is, $G(\text{H}_2)$ refers to the *G value* for the production of hydrogen gas and will differ for different absorbing media. *G values* are also radiation specific and depend upon the linear energy transfer (LET) of the radiation type. For instance, alpha particles have a much higher LET than beta particles and the *G value* will be correspondingly greater.

Using the *G value* concept, the production of hydrogen can be calculated by multiplying the total decay heat or energy produced over a specified period of time of radiation type *j* for radionuclide *i* by the fraction of decay heat or energy absorbed in the medium for that radiation type by the medium specific *G value* for the *j*th radiation type. Summing this product for all radiation types and radionuclides in the material and multiplying by the mass of the medium and a conversion factor will result in the quantity of hydrogen produced. This equation can be written as:

$$H_2 = \left(\sum_{ij} E_{ij} \times F_j \times G_j \right) \times M \times C \quad (1-1)$$

where

H_2 = hydrogen generated (cm^3)

E = the total ionizing radiation energy produced over a specified period of time for radiation type *j* of radionuclide *i* within the absorbing medium expressed as absorbed dose (rad)

F = the fraction of energy of radiation type *j* absorbed by the target (unitless)

G = the number of molecules formed or disassociated per 100 eV absorbed energy (molecules/100 eV) in the absorbing medium for radiation type *j*

M = mass of the absorbing medium (g)

C = conversion factor ($\text{eV cm}^3/\text{rad gram molecule}$)

This methodology is used in the Radcalc spreadsheet to calculate the concentration of hydrogen within packages which have been sealed for a specific length of time. The current spreadsheet contains information for 96 radionuclides and four waste container types and leaves the G value as a user input. The geometries include a 55 gallon drum, and cylinders with the approximate dimensions of: 4 ft by 4 ft (120 cm by 120 cm), 5 ft by 5 ft (140 cm by 140 cm), and 6 ft by 6 ft (180 cm by 180 cm). Radcalc assumes 100% of the alpha and beta particle energy is absorbed. Absorption fractions for gamma energies have been calculated using the QAD-FN point kernel computer code and are a function of material, energy, density, and geometry.

1.3 RADCALC ENHANCEMENTS

The current Radcalc program is being enlarged and enhanced. The original program was written as a Lotus 1-2-3 spreadsheet. The new program is being written in C programming language and will interface with a Windows environment using Microsoft Visual C++ compiler. The structure of the program is being changed to make it more robust and more versatile, and to enable it to deal with the larger libraries which will be included in it. The user interface of the new Radcalc will be more powerful and "user-friendly" and will give more flexibility in controlling the program. Additionally, the code will be easier to maintain and ensure quality assurance.

In addition, the radionuclide library is being expanded from 96 radionuclides to approximately 300 radionuclides. The current database used by the Radcalc spreadsheet is of unknown origin. The new Radcalc database has been compiled using the Evaluated Nuclear Data File, ENDF/B cross section data (BNL 1983). The ENDF/B data file is maintained by the National Nuclear Data Center at Brookhaven National Laboratory (BNL) under contract from the DOE. ENDF/B data is considered to be the most current, reliable nuclear data available. The inclusion of a greater number of radionuclides will enlarge the scope and usefulness of Radcalc.

Radcalc now supplies gamma absorption fractions as a function of density, energy, and container type. Four container types are included in the current spreadsheet for waste densities ranging from 0.6 to 2.0 g/cc and energies from 0.4 to 2 MeV. The updated Radcalc will include an additional ten containers commonly used in the transport of waste materials in the DOE complex. The density range has been expanded to 3.0 g/cc and the energy range to 5 MeV. The new Radcalc will also include a reduced DOS version of MCNP (Monte Carlo N-Particle), a code used to calculate the transport of neutrons, photons, or electrons (Carter 1994). The inclusion of this code will allow the user to input different dimensions for selected geometries. The reduced

MCNP code will then calculate the gamma absorption fractions for the user-specified dimensions of the selected container type.

Currently, the G values are left as user input and there is no available method for multiplying alpha absorbed dose by alpha G values and gamma and beta absorbed dose by lower LET G values. The new Radcalc will have an extensive G value library with information for a variety of materials found in low level radioactive waste. The new G value library has been compiled from an exhaustive review of the open literature and includes G values for high and low LET radiation. The code will automatically multiply the absorbed dose by the appropriate alpha, beta, or gamma G value.

Other changes being made in Radcalc include: expansion of the library of Title 49 *Code of Federal Regulations* Part 173 (49 CFR 173) A₁ and A₂ values to include all of the radionuclides now used in the program; transportation updates to comply with the latest U.S. Department of Transportation regulations; thermal output and pressure calculation checks. The code will be extensively tested and benchmarked. Documentation for the new Radcalc will include a final report and user's manual.

2.0 RADCALC ISOTOPE LIBRARY

The radcalc program requires decay and energy information for each isotope that is evaluated. The current database used by Radcalc is limited in the number of isotopes and the source of the information is unknown. In order to update the database, it was decided that a new expanded database will be created using the Evaluated Nuclear Data File, ENDF/B cross section data (BNL 1991).

The ENDF/B data file contains reference data sets for radionuclides and is maintained by the National Nuclear Data Center at Brookhaven National Laboratory (BNL) under contract to the DOE. Information is updated by the recommendation of the Cross Section Evaluation Working Group, a cooperative effort of many national laboratories coordinated by the National Nuclear Data Center. ENDF/B data is considered to be the most reliable current nuclear data available. Access to the ENDF/B data is performed by writing a computer code to extract the necessary information. A fortran program was written, using the information supplied by the National Nuclear Data Center, to read the ENDF/B data file and print out the desired information.

Section 6.0 contains a complete listing of the updated database created from the data file. The database in Section 6.0 contains the atomic number, the atomic mass, the half life in seconds, the average beta, alpha, and x-ray energies in eV and the most important gamma rays and the percentage of abundance. It should be noted that for isotopes with multiple gamma rays, the additional gamma ray lines, with gamma energy followed by abundance, are listed below the initial data line with a leading 0 in the left hand column to indicate that the line is a continuation of the previous data.

The original Radcalc computer code contained information for 96 radionuclides. The new Radcalc database contains information for approximately 300 radionuclides.

3.0 GAMMA ABSORPTION FRACTIONS

3.1 INTRODUCTION

The current Radcalc spreadsheet calculates time dependent hydrogen generation in radioactive waste shipping containers. The spreadsheet uses fitted curves for four container types to calculate the absorbed gamma dose in the waste material. The four container types are: a 55 gallon drum, 4x4 liner, 5x5 liner, and 6x6 liner. The absorbed gamma dose is a function of energy, waste density, material type, and geometry. The current spreadsheet uses curve fits for each of these containers for densities ranging from 0.6 to 2.0 g/cc and energies ranging from 0.4 to 2.0 MeV. The material inside the container is assumed to be water. The data for these fits were generated using the QAD-FN computer code. These same four curve fits have been recalculated using MCNP. Along with the four original containers included in the Radcalc spreadsheet, several additional containers have been added. The new containers are among those used in the DOE complex for the transportation of radioactive waste materials. Furthermore, the curve fits have been extended to include energies up to 5.0 MeV, and densities up to 3.0 g/cc. To accomplish the extension in the range of energies, a curve fit was found for energies between 0.4 and 2.0 MeV and another fit for energies between 2.0 and 5.0 MeV for each container.

3.2 CALCULATION OF ABSORBED GAMMA DOSE

The current Radcalc spreadsheet (Flaherty 1986), computes the volume of the hydrogen generated as a function of time ($H(t)$) with the following equation:

$$H(t) = D(t) \times G \times M \times C \quad (3-1)$$

where

$$D(t) = \sum_{ij} E_{ij}(t) \times F(p, e)_j \quad (3-2)$$

D is the time dependent sum of energy emitted (E) for radionuclide i and radiation type j times F which is the density and energy dependent fraction absorbed of radiation type j for all decay mechanisms up to time t . M is the waste mass, and G is the G-factor. The G-factor is defined as the molecules of hydrogen generated per 100 eV energy absorbed. C is a conversion factor based on the units of the equations.

Radcalc calculates the fraction of gamma energy absorbed in the waste material which is assumed to be water as a function of energy, density, and geometry. An independent fit is used for each individual container geometry. Each of these fits is a function of density and energy.

The fit is of the form:

$$F(\rho, e) = a_1 \rho e + a_2 \rho \sqrt{e} + a_3 \sqrt{\rho e} + a_4 \rho + a_5 \sqrt{\rho e} + a_6 e + a_7 \sqrt{\rho} + a_8 \sqrt{e} + a_9 \quad (3-3)$$

Where $F(\rho, e)$ is the fraction of energy absorbed, ρ is density in g/cc, and e is the emitted energy in MeV.

The current Radcalc has fits of this form for four geometries: the 55 gallon drum, 4x4 liner, 5x5 liner, and 6x6 liner. Each fit is valid for densities ranging from 0.6 to 2.0 g/cc and 0.4 to 2.0 MeV. The data for the fits were created using a point-kernel code called QAD-FN. The fits are least-squares fits of the data for each container geometry. The material inside the containers for the QAD-FN runs was assumed to be water.

The new Radcalc fits used a volumetric source of unity source strength (1 Bq/s) for each container. MCNP runs were generated for energies varying from 0.4 to 5.0 MeV and densities ranging from 0.6 to 3.0 g/cc. A Unix version of Mathematica (Wolfram Research, Inc. 1993) was used to perform least-squares fits from the MCNP data generated.

3.3 GEOMETRY

The original geometries were reproduced with the same dimensions (Flaherty et al. 1986), and in the case of the 55 gallon drum with more exact dimensions for drums used in the DOE complex. The new geometries are based on dimensions reported in their respective Safety Analysis Report for Packaging (SARP). The model for each container has its interior volume completely filled with water, representing an upper bound in the calculation of the absorption fraction. Both English and metric units are given for each container's dimensions. The first number given represents the original units used for the container in the document referenced for dimensions. The interior and exterior dimensions of each container model as well as the internal volume for each container model are shown in Table 3-1.

Table 3-1. Dimensions of Modeled Shipping Containers.

Container	Geometry	Inside Modeled Dimensions (Diameter x Height)	Outside Modeled Dimensions	Internal Volume
55 Gallon Drum	Cylinder	22.5 in. x 33.25 in. (57.2 cm x 84.46 cm)	22.6 in. x 33.41 in. (57.40 cm x 84.86 cm)	7.65 ft ³ (2.17E5 cc)
4x4 Liner	Cylinder	120 cm x 120 cm (47.24 in. x 47.24 in.)	NA	47.9 ft ³ (1.36E6 cc)
5x5 Liner	Cylinder	140 cm x 140 cm (55.12 in. x 55.12 in.)	NA	76.1 ft ³ (2.16E6 cc)

Container	Geometry	Inside Modeled Dimensions (Diameter x Height)	Outside Modeled Dimensions	Internal Volume
6x6 Liner	Cylinder	180 cm x 180 cm (70.87 in. x 70.87 in.)	NA	162 ft ³ (4.58E6 cc)
30 Gallon Drum	Cylinder	18 in. x 28 in. (45.72 cm x 71.12 cm)	18.1 in. x 28.1 in. (45.97 cm x 71.37 cm)	4.12 ft ³ (1.17E5 cc)
85 Gallon Drum	Cylinder	26 in. x 37.9 in. (66.04 cm x 96.27 cm)	26.13 in. x 38.03 in. (66.37 cm x 96.60 cm)	11.6 ft ³ (3.30E5 cc)
Doorstop Sample Carrier	Cylinder	4.5 in. x 5.625 in. (11.43 cm x 14.29 cm)	6.38 in. x 11.38 in. (16.21 cm x 28.91 cm)	0.0518 ft ³ (1470 cc)
Ion Exchange Column	Cylinder	17.5 in. x 69 in. (44.45 cm x 175.3 cm)	18 in. x 69.5 in. (45.72 cm x 176.5 cm)	9.60 ft ³ (2.72E5 cc)
LR-56	Cylinder	140 cm x 320 cm (55.12 in. x 126.0 in.)	338 cm x 518 cm (133.1 in. x 203.9 in.)	174 ft ³ (4.93E6 cc)
NCAW	Cylinder	3.375 in. x 40.2 in. (8.573 cm x 102.1 cm)	3.75 in. x 48.88 in. (9.53 cm x 124.2 cm)	0.208 ft ³ (5890 cc)
Onsite Transfer Cask	Cylinder	2.375 in. x 42.75 in. (6.033 cm x 108.59 cm)	5.505 in. x 45.87 in. (13.98 cm x 116.51 cm)	0.110 ft ³ (3104 cc)
PAS-1	Cylinder	18 in. x 21.88 in. (45.72 cm x 55.58 cm)	32.5 in. x 40 in. (82.55 cm x 101.6 cm)	3.22 ft ³ (91300 cc)
Sample Pig Carrier	Cylinder	2.06 in. x 4.875 in. (5.23 cm x 12.38 cm)	6.71 in. x 9.275 in. (17.04 cm x 23.56 cm)	9.40E-3 ft ³ (22.2 cc)
Single Pass Fuel Cask	Box	35.25 in. x 37.50 in. x 46.625 in. (89.54 cm x 95.25 cm x 118.4 cm)	57 in. x 59.25 in. x 69 in. (144.8 cm x 150.5 cm x 175.3 cm)	35.7 ft ³ (1.01E6 cc)

3.3.1 55 Gallon Drum

The 55 gallon drum was chosen for more intensive study than the other containers in order to better understand the general method used to create all other curve fits. Two different models were used in analysis of the 55 gallon drum. The first model is based on the model used for the original QAD-FN calculations. This model consists of a cylinder 60 cm (23.62 in.) in diameter, 90 cm (35.43 in.) tall, and includes only the source volume.

The second model consists of a source volume 22.5 in. (114.4 cm) in diameter, 33.25 in. (84.46 cm) tall (Cruse 1992). The source is encapsulated by 14 gauge steel (U.S. Standard, 0.0781 in./0.1984 cm) on top and bottom, and 18 gauge steel (U.S. Standard, 0.0500 in./0.1270 cm) on the side.

3.3.2 4x4 Liner

The model for the 4x4 liner is based on the dimensions used in creating the fit in the current spreadsheet. It consists only of the source volume, 120 cm (47.24 in.) in diameter, 120 cm (47.24 in.) tall.

3.3.3 5x5 Liner

The model for the 5x5 liner is based on the dimensions used in creating the fit in the current spreadsheet. It consists only of the source volume, 140 cm (55.12 in.) in diameter, 140 cm (55.12 in.) tall.

3.3.4 6x6 Liner

The model for the 6x6 liner is based on the dimensions used in creating the fit in the current spreadsheet. It consists only of the source volume, 180 cm (70.87 in.) in diameter, 180 cm (70.87 in.) tall.

3.3.5 30 Gallon Drum

The model for the 30 gallon drum is based on the DOT Specification 7A Type A Packaging (Cruse 1992). The interior of the 30 gallon drum is modeled as 18 in. (45.72 cm) diameter, 28 in. (71.12 cm) tall. The source volume is encapsulated in 18 gauge steel (U.S. Standard, 0.0500 in./0.1270 cm).

3.3.6 85 Gallon Drum

The model for the 85 gallon drum is also based on DOT 7A Type A Packaging Specification (Cruse 1992). The interior of the 85 Gallon drum is modeled as 26 in. (66.04 cm) diameter, 37.9 in. (96.27 cm) tall. The source volume is encapsulated in 16 gauge steel (U.S. Standard, 0.0625 in./0.1588 cm).

3.3.7 Doorstop Sample Carrier

The model for the Doorstop Sample Carrier is based on the Doorstop Sample Carrier SARP (WHC 1993a) and WHC Drawing H-2-32514. The doorstop interior is modeled as 4.5 in. (11.43 cm) diameter, 5.625 in. (14.29 cm) tall. The outside dimensions are 6.38 in. (16.21 cm) diameter, 11.38 in. (28.91 cm) tall. The shielding material is steel.

3.3.8 Ion Exchange Column

The model for the ion exchange column is based on the Big Bertha SARP (WHC 1991). The Big Bertha is the package currently used to transport ion exchange columns on the Hanford Site, Richland, Washington. The ion exchange column is simply modeled as a 69.5 in. (176.5 cm) long (exterior) section of 18 in. schedule 10 pipe (18 in./45.72 cm OD), capped on each end with a thickness equal to that on the sides (0.25 in./0.635 cm), leaving a total interior length of 69 in (175.3 cm).

3.3.9 LR-56

The model for the LR-56 is based on the *Packaging Design Criteria for the LR-56 Cask System* (WHC 1994). The interior of the LR-56 model is a

cylinder 320 cm (126.0 in.) long, 140 cm (55.12 in.) in diameter. The primary containment vessel is made from 8 mm (0.315 in.) thick steel. There is a 20 mm (0.787 in.) air gap, and a 6 mm (0.236 in.) steel secondary confinement vessel. The shielding consists of an additional 35 mm (1.38 in.) of lead and 30 mm (1.18 in.) of steel. There are also layers of wood and a final steel outer casing which are left out of the model, as they would have negligible effect in the calculation.

3.3.10 NCAW Cask

The model for the Neutralized Current Acid Waste (NCAW) cask is based on the SARP for the NCAW Packaging System (WHC 1992b). The inner dimensions of the NCAW cask are a 3.375 in. (8.573 cm) diameter and 40.2 in. (102.1 cm) height. The side shielding consists of a 3.75 in. (9.53 cm) OD, 0.375 in. (0.953 cm) thick pipe inside of a 16 in. schedule 40 pipe (16 in./40.64 cm OD), with the annulus filled with lead. The top of the model uses a 2.68 in. (6.81 cm) steel plug, and the bottom a 6 in. (15.24 cm) steel plug.

3.3.11 Onsite Transfer Cask

The model for the Onsite Transfer Cask (OTC) is based on the SARP for the OTC (WHC 1992c). The inner diameter of the OTC is modeled as 2.375 in. (6.0325 cm) and the height as 42.75 in. (108.59). The radial shielding consists of a 0.065 in. (0.165 cm) steel shell, 1 in. (2.54 cm) of lead, and another 0.5 in. (1.27 cm) of steel. The bottom shielding consists of 0.065 in. (0.165 cm) of steel, 1.55 in. (3.94 cm) of lead, and another 0.5 in. (1.27 cm) of steel. The top is capped by 1 in. (2.54 cm) of steel.

3.3.12 PAS-1 Cask

The model for the PAS-1 Cask is based on the *Packaging Design Criteria for PAS-1 Cask* (WHC 1993c). The interior of the PAS-1 cask is modeled as 21.88 in. (55.58 cm) tall, 18 in. (45.72 cm) in diameter. The outside diameter is modeled as 32.5 in. (82.55 cm) and the height as 40 in. (101.6 cm). There is 5.1 in. (12.95 cm) of lead shielding in the model. A layer of steel surrounding the interior volume is modeled as 1.5 in. (3.81 cm) thick on top, 1 in. (2.54 cm) thick on bottom, and 2.15 in. (5.46 cm) on the side. The steel on the side was calculated from the assumptions for the inside and outside diameter of the cask and the 5.1 in. (12.95 cm) lead shielding.

3.3.13 Sample Pig Carrier

The model for the Sample Pig Carrier came from the Sample Pig SARP (WHC 1992a). The interior diameter is 2.06 in. (5.23 cm) and the interior length is 4.875 in. (12.383 cm). The inner cavity is surrounded by 0.125 in. (0.318 cm) steel and 1.95 in. (4.95 cm) lead. There is also an outer steel cover 0.25 in. (0.635 cm) thick on the side and 0.125 in. (0.318 cm) thick on top and bottom.

3.3.14 Single Pass Fuel Cask

The model for the Single Pass Fuel Cask is based on the SARP for the cask (WHC 1993b). The Single Pass Fuel Cask is a box with outside dimensions of 57 in. (144.8 cm) x 59.25 in. (150.5 cm) x 69 in. (175.3 cm). The inner cavity is encased on the sides and bottom by a 3/8 in. steel inner shell, 10 in. lead, and a 1/2 in. steel outer shell. The lid is made of 10 in. lead encased in 3/4 in. steel. Based on the outer dimensions and thicknesses of the steel and lead shells reported in the SARP, 35.25 in. (89.54 cm) x 37.50 in. (95.25 cm) x 46.625 in. (118.43 cm). The outermost layer of steel was left out of the model, as it would not have a significant effect on the calculation.

3.4 RESULTS

The 55 gallon drum was chosen for more intensive study than the other containers. As discussed in the previous section, there were two MCNP models for the 55 gallon drum. The first model, referred to as the simple model, is identical to the model used in the original QAD-FN work (Flaherty 1986). Figure 3-1 shows a comparison of the data and fit generated in the original work to a parallel calculation using MCNP. The MCNP simple model gives a higher absorption fraction for higher energies than QAD-FN by as much as 5 percent, and a lower absorption fraction for lower energies by as much as 8 percent. In general, however, the fits are similar enough so that the accuracy of absorbed dose calculations in Radcalc will not be altered. The data point at 1.5 g/cc, 2.0 MeV for the QAD-FN is apparently reported incorrectly in Flaherty (Flaherty et al. 1986).

Figure 3-2 is a comparison of the MCNP simple model and the more detailed model. It shows the effect of going to a more detailed model incorporating shielding and more exact dimensions. The more detailed model has a smaller volume, closer to the actual dimensions of a 55 gallon drum, and includes the steel surrounding the source volume. The more detailed model gives absorption fractions up to 3 percent lower than the MCNP simple model due to the reduced volume.

Figure 3-3 shows the difference between a curve fit to data points from densities up to 2.0 g/cc and a curve fit to data points for densities up to 3.0 g/cc. The figure shows data fits for three different energy levels. There is less than 1 percent difference in the range of 0.6 to 2.0 g/cc between the two curves. When the fit created from data up to 2.0 g/cc is extrapolated to 3.0 g/cc, there is a difference of as much as 4 percent between it and the line generated from actual MCNP data for densities between 2.0 and 3.0 g/cc. The curve fit to data points up to 3.0 g/cc is considered to be the more accurate of the two and will be used in Radcalc.

Figure 3-4 shows a comparison of the original spreadsheet fit and final detailed MCNP fits for three different energies. The discrepancy between the

two models is greatest at low energies and low densities where the MCNP fit is lower by as much as 6%.

During analysis of the 55 gallon drum, it was found necessary to create a fit for energies between 0.4 and 2.0 MeV, and a second fit for energies between 2.0 and 5.0 MeV for the same geometry. Figure 3-5 is a graph of the absorption fractions versus energy. It shows the final fit for densities between 0.6 and 3.0 g/cc and energies between 0.4 and 5.0 MeV. Table 3-3 gives the original and final coefficients for the respective fits. The coefficients are the coefficients in the fit in the form of equation 3-3. The coefficients were developed using a least squares fitting algorithm in Mathematica. Although there appears to be a large discrepancy in the fitting coefficients between those used in the original Radcalc and those developed here, the fits themselves are quite good, as can be seen in Figures 3-4 and 3-5.

The data upon which the fits were generated for the 55 gallon drum are shown in Table 7-1 of Section 7.0. Notice that data was not available for a density of 3.0 g/cc and energies above 2.0 MeV in the original fit. The data is plotted along with their respective fits in Figures 3-4 and 3-5.

After analysis of the 55 gallon drum, the method was adopted for the other containers. Graphs 3-6 through 3-25 show final fits and comparisons for all containers. Each container has a graph which shows the final fit from 0.6 to 3.0 g/cc and 0.4 to 5.0 MeV. For the containers already included in the original spreadsheet, graphs have been developed comparing the original fits to the final fits for densities between 0.6 and 2.0 g/cc and energies between 0.4 and 5.0 MeV. Table 3-2 is an index to the appropriate graphs and tables for each container. Tables 3-3 through 3-16 show the coefficients used for the fits and the data from which these fits were created can be found in Section 7.0.

Table 3-2. Index to Tables and Graphs for Each Geometry.

Container	Table of Coefficients in Fits	Table of Data for Fits	Graph of Final Fits	Graph Comparing Original and Final Fits
55 Gallon Drum	Table 3-3	Table 7-1	Figure 3-5	Figure 3-4
4x4 Liner	Table 3-4	Table 7-2	Figure 3-7	Figure 3-6
5x5 Liner	Table 3-5	Table 7-3	Figure 3-9	Figure 3-8
6x6 Liner	Table 3-6	Table 7-4	Figure 3-11	Figure 3-10
30 Gallon Drum	Table 3-7	Table 7-5	Figure 3-12	NA
85 Gallon Drum	Table 3-8	Table 7-6	Figure 3-13	NA
Doorstop Sample Carrier	Table 3-9	Table 7-7	Figure 3-14	NA

Container	Table of Coefficients in Fits	Table of Data for Fits	Graph of Final Fits	Graph Comparing Original and Final Fits
Ion Exchange Column	Table 3-10	Table 7-8	Figure 3-15	NA
LR-56	Table 3-11	Table 7-9	Figure 3-16	NA
NCAW	Table 3-12	Table 7-10	Figure 3-17	NA
Onsite Transfer Cask	Table 3-13	Table 7-11	Figure 3-18	NA
PAS-1 Cask	Table 3-14	Table 7-12	Figure 3-19	NA
Sample Pig Carrier	Table 3-15	Table 7-13	Figure 3-20	NA
Single Pass Fuel Cask	Table 3-16	Table 7-14	Figure 3-21	NA

Figure 3-1. Comparison of Original Spreadsheet Fits (QAD-FN) and New Simple Fit (MCNP) for Three Energies.

Figure 3-2. Comparison of the Simple and Detailed MCNP 55 Gallon Drum Models for Three Energies.

Figure 3-3. 55 Gallon Drum Detailed MCNP Data. Extrapolated versus MCNP Data Fits for Three Different Energies.

Figure 3-4. Comparison of 55 Gallon Drum Original Fits (QAD-FN) and Detailed MCNP Fits for Three Energies.

Figure 3-5. Absorption Fraction versus Energy for the 55 Gallon Drum as a Function of Density.

Figure 3-6. Comparison of 4x4 Liner Fits (QAD-FN) and Detailed MCNP Fits for Three Energies.

Figure 3-7. Absorption Fraction versus Energy for 4x4 Liner as a Function of Density.

Figure 3-8. Comparison of 5x5 Linear Fits (QAD-FN) and Detailed MCNP Fits for Three Energies.

Figure 3-9. Absorption Fraction versus Energy for 5x5 Liner as a Function of Density.

Figure 3-10. Comparison of 6x6 Liner Fits (QAD-FN) and Detailed MCNP Fits for Three Energies.

Figure 3-11. Absorption Fraction versus Energy for 6x6 Liner as a Function of Density.

Figure 3-12. Absorption Fraction versus Energy for 30 Gallon Drum as a Function of Density.

Figure 3-13. Absorption Fraction versus Energy for 85 Gallon Drum as a Function of Density.

Figure 3-14. Absorption Fraction versus Energy for Doorstop Sample Carrier as a Function of Density.

Figure 3-15. Absorption Fraction versus Energy for Ion Exchange Column as a Function of Density.

Figure 3-16. Absorption Fraction versus Energy for LR-56 Cask as a Function of Density.

Figure 3-17. Absorption Fraction versus Energy for NCAW Cask as a Function of Density.

Figure 3-18. Absorption Fraction versus Energy for OTC as a Function of Density.

Figure 3-19. Absorption Fraction versus Energy for PAS-1 Cask as a Function of Density.

Figure 3-20. Absorption Fraction versus Energy for Sample Pig Carrier as a Function of Density.

Figure 3-21. Absorption Fraction versus Energy for Single Pass Fuel Cask as a Function of Density.

Table 3-3. Coefficients in Fits for the 55 Gallon Drum.

	Original Spreadsheet fit (0.6 to 2.0 g/cc)	Fit for Future Implementation (0.6 to 3.0 g/cc)	
	0.4 to 2.0 MeV	0.4 to 2.0 MeV	2.0 to 5.0 MeV
a_1	0.388	.00101	-.00830
a_2	-0.579	.102	.147
a_3	-0.871	.166	-.0297
a_4	-0.245	-.391	-.435
a_5	1.354	-.560	-.200
a_6	0.485	-.153	.0526
a_7	0.954	1.53	1.42
a_8	-0.937	.317	-.119
a_9	3.302E-6	-.494	-.289

Table 3-4. Coefficients in Fits for the 4x4 Liner.

	Original Spreadsheet fit (0.6 to 2.0 g/cc)	Fit for Future Implementation (0.6 to 3.0 g/cc)	
	0.4 to 2.0 MeV	0.4 to 2.0 MeV	2.0 to 5.0 MeV
a_1	-0.0430	-0.2519	0.0467
a_2	0.1060	0.4805	-0.1013
a_3	0.1117	0.7487	-0.1710
a_4	-0.5176	-0.5124	-0.2876
a_5	-0.1340	-1.3558	0.5118
a_6	-0.0547	-0.4187	0.1199
a_7	1.3710	1.6326	0.8330
a_8	-0.1371	0.6262	-0.5185
a_9	-9.974E-07	-0.2683	0.2719

Table 3-5. Coefficients in Fits for the 5x5 Liner.

	Original Spreadsheet fit (0.6 to 2.0 g/cc)	Fit for Future Implementation (0.6 to 3.0 g/cc)	
	0.4 to 2.0 MeV	0.4 to 2.0 MeV	2.0 to 5.0 MeV
a_1	-0.0977	-0.2248	0.0577
a_2	0.1972	0.3926	-0.1701
a_3	0.2759	0.6650	-0.1984
a_4	-0.5433	-0.4363	-0.2054
a_5	-0.4227	-1.1072	0.6970
a_6	-0.1576	-0.3517	0.1290
a_7	1.4278	1.4005	0.5762
a_8	0.0558	0.4535	-0.6044
a_9	-1.554E-06	-0.0773	0.4572

Table 3-6. Coefficients in Fits for the 6x6 Liner.

	Original Spreadsheet fit (0.6 to 2.0 g/cc)	Fit for Future Implementation (0.6 to 3.0 g/cc)	
	0.4 to 2.0 MeV	0.4 to 2.0 MeV	2.0 to 5.0 MeV
a_1	-0.3207	-0.1469	0.0707
a_2	0.5913	0.2187	-0.2684
a_3	0.7477	0.4192	-0.2212
a_4	-0.6337	-0.3129	-0.0598
a_5	-1.2520	-0.5743	0.9229
a_6	-0.4018	-0.1635	0.1318
a_7	1.5491	1.0011	0.1662
a_8	0.5016	0.0666	-0.6965
a_9	-2.947E-06	0.2549	0.7427

Table 3-7. Coefficients in Fits for the 30 Gallon Drum.

	Fit for Future Implementation (0.6 to 3.0 g/cc)			Fit for Future Implementation (0.6 to 3.0 g/cc)	
	0.4 to 2.0 MeV	2.0 to 5.0 MeV		0.4 to 2.0 MeV	2.0 to 5.0 MeV
a_1	0.0757	-0.0381	a_6	-0.0337	0.0073
a_2	-0.0134	0.2453	a_7	1.3683	1.5199
a_3	-0.0470	0.0507	a_8	0.1607	0.0640
a_4	-0.3161	-0.4544	a_9	-0.4864	-0.4315
a_5	-0.2457	-0.4911			

Table 3-8. Coefficients in Fits for the 85 Gallon Drum.

	Fit for Future Implementation (0.6 to 3.0 g/cc)			Fit for Future Implementation (0.6 to 3.0 g/cc)	
	0.4 to 2.0 MeV	2.0 to 5.0 MeV		0.4 to 2.0 MeV	2.0 to 5.0 MeV
a_1	-0.0460	0.0029	a_6	-0.1962	0.0688
a_2	0.1670	0.1039	a_7	1.5664	1.3546
a_3	0.2751	-0.0612	a_8	0.3380	-0.2045
a_4	-0.4231	-0.4307	a_9	-0.4365	-0.1980
a_5	-0.6844	-0.0605			

Table 3-9. Coefficients in Fits for the Doorstop Sample Carrier.

	Fit for Future Implementation (0.6 to 3.0 g/cc)			Fit for Future Implementation (0.6 to 3.0 g/cc)	
	0.4 to 2.0 MeV	2.0 to 5.0 MeV		0.4 to 2.0 MeV	2.0 to 5.0 MeV
a_1	0.0274	-0.0137	a_6	0.0153	-0.0185
a_2	-0.0545	0.0508	a_7	0.2080	0.4095
a_3	-0.0649	0.0493	a_8	-0.0011	0.0983
a_4	0.0670	-0.0002	a_9	-0.0914	-0.1644
a_5	0.0498	-0.2542			

Table 3-10. Coefficients in Fits for the Ion Exchange Column.

	Fit for Future Implementation (0.6 to 3.0 g/cc)			Fit for Future Implementation (0.6 to 3.0 g/cc)	
	0.4 to 2.0 MeV	2.0 to 5.0 MeV		0.4 to 2.0 MeV	2.0 to 5.0 MeV
a_1	0.0344	-0.0478	a_6	-0.0672	-0.0044
a_2	0.0526	0.2821	a_7	1.4381	1.6473
a_3	0.0323	0.0662	a_8	0.1705	0.0819
a_4	-0.3668	-0.5279	a_9	-0.4383	-0.4401
a_5	-0.3374	-0.5316			

Table 3-11. Coefficients in Fits for the LR-56 Drum.

	Fit for Future Implementation (0.6 to 3.0 g/cc)			Fit for Future Implementation (0.6 to 3.0 g/cc)	
	0.4 to 2.0 MeV	2.0 to 5.0 MeV		0.4 to 2.0 MeV	2.0 to 5.0 MeV
a_1	-0.1318	0.0237	a_6	-0.2163	0.0828
a_2	0.2193	-0.0776	a_7	1.1119	0.5732
a_3	0.4107	-0.1213	a_8	0.2043	-0.4850
a_4	-0.3461	-0.2369	a_9	0.1441	0.5214
a_5	-0.6290	0.5039			

Table 3-12. Coefficients in Fits for the NCAW Drum

	Fit for Future Implementation (0.6 to 3.0 g/cc)			Fit for Future Implementation (0.6 to 3.0 g/cc)	
	0.4 to 2.0 MeV	2.0 to 5.0 MeV		0.4 to 2.0 MeV	2.0 to 5.0 MeV
a_1	0.0418	-0.0051	a_6	0.0458	-0.0046
a_2	-0.0859	0.0152	a_7	0.1171	0.2765
a_3	-0.1131	0.0231	a_8	-0.0697	0.0380
a_4	0.0823	0.0333	a_9	-0.0423	-0.0936
a_5	0.1654	-0.1403			

Table 3-13. Coefficients in Fits for the OTC Drum.

	Fit for Future Implementation (0.6 to 3.0 g/cc)			Fit for Future Implementation (0.6 to 3.0 g/cc)	
	0.4 to 2.0 MeV	2.0 to 5.0 MeV		0.4 to 2.0 MeV	2.0 to 5.0 MeV
a_1	0.0032	-0.0151	a_6	0.0030	-0.0203
a_2	-0.0122	0.0500	a_7	0.1221	0.2972
a_3	-0.0273	0.0464	a_8	0.0091	0.0912
a_4	0.0538	0.0024	a_9	-0.0555	-0.1249
a_5	0.0163	-0.2118			

Table 3-14. Coefficients in Fits for the PAS-1 Drum.

	Fit for Future Implementation (0.6 to 3.0 g/cc)			Fit for Future Implementation (0.6 to 3.0 g/cc)	
	0.4 to 2.0 MeV	2.0 to 5.0 MeV		0.4 to 2.0 MeV	2.0 to 5.0 MeV
a_1	0.0648	-0.0375	a_6	-0.0284	-0.0206
a_2	0.0051	0.2097	a_7	1.1060	1.2686
a_3	-0.0664	0.0858	a_8	0.1916	0.1647
a_4	-0.2162	-0.3014	a_9	-0.4537	-0.4320
a_5	-0.2378	-0.5672			

Table 3-15. Coefficients in Fits for the Sample Pig Carrier.

	Fit for Future Implementation (0.6 to 3.0 g/cc)			Fit for Future Implementation (0.6 to 3.0 g/cc)	
	0.4 to 2.0 MeV	2.0 to 5.0 MeV		0.4 to 2.0 MeV	2.0 to 5.0 MeV
a_1	0.0030	-0.0011	a_6	0.0036	-0.0074
a_2	-0.0142	-0.0034	a_7	0.0758	0.1443
a_3	-0.0194	0.0181	a_8	0.0069	0.0391
a_4	0.0574	0.0508	a_9	-0.0373	-0.0608
a_5	0.0079	-0.0938			

Table 3-16. Coefficients in Fits for the Single Pass Fuel Cask.

	Fit for Future Implementation (0.6 to 3.0 g/cc)			Fit for Future Implementation (0.6 to 3.0 g/cc)	
	0.4 to 2.0 MeV	2.0 to 5.0 MeV		0.4 to 2.0 MeV	2.0 to 5.0 MeV
a_1	-0.0088	0.0415	a_6	-0.1320	0.1022
a_2	0.0062	-0.1201	a_7	1.1491	0.7474
a_3	0.1559	-0.1408	a_8	0.0653	-0.5095
a_4	-0.3120	-0.2337	a_9	-0.0476	0.2967
a_5	-0.2010	0.5028			

4.0 G VALUES FOR NET HYDROGEN PRODUCTION

4.1 INTRODUCTION

To aid in quantifying the production of a species from the radiolysis of a material, a term was defined which relates the absorption of energy to the species of interest. This term is referred to as the *G value* (Burton 1952). *G values* were originally defined in units of molecules formed or disassociated per 100 eV of energy absorbed. With the advent of SI (Système International d'Unités) units *G values* have been redefined as moles of material produced or changed per Joule (J) of absorbed energy. One molecule per 100 eV equals 0.1036 μ moles per J. However, the majority of the literature on *G values* has been written in terms of molecules per 100 eV; therefore, this report uses the original units as the primary number and provides SI conversions as the secondary value.

G values are dependent upon a number of different factors. *G values* are specific to the species being produced, e.g., $G(H_2)$ refers to the *G value* for the production of hydrogen gas. *G values* are also material specific. That is, they are dependent upon the physical-chemical properties of the material in which the radiation is deposited. Chemical composition, material density, temperature, and ambient pressure and atmosphere all affect the *G value* of a specific specie. *G values* are also dependent upon the type and characteristics of the initiating radiation. The energy and intensity of gamma radiation and the linear energy transfer (LET) of charged particles will affect *G values*. The LET refers to the average energy imparted within a limited volume of absorbing medium by a charged particle traversing a specified distance. Heavier particles such as alpha particles have higher LET values which result in a higher disruption in the absorbing material and higher *G values*. The amount of absorbed dose in the absorbing medium will also affect the *G value*.

4.2 COMPILED $G(H_2)$ VALUES

Radioactive waste may contain a wide variety of materials. These materials can range from absorbents like Kimwipes, to waste tank solutions and slurries, to contaminated pump oils. Table 4-1 is a list of the general material types for which *G values* have been identified for use in Radcalc.

Table 4-1. Materials Types for Listed $G(H_2)$ Values.

Water (vapor and liquid)
Temperature Dependence
Ion Exchange Resins
Cation Resin
Anion Resin
Mixed Resin
Inorganic Resin

High Level Waste Solutions
Hanford Tank Waste
Waste solution/water as a function of nitrate concentration (Mahlman values)
Walker and Bibler equation
Grout
Solidification Binders
Cement mixed with TRU incinerator ash
Commercial Lubricants
Polymers
Cellulose
Gloves
Saturated Hydrocarbons (vapor and liquid)
Unsaturated Hydrocarbons (vapor and liquid)
Aromatic Hydrocarbons (vapor and liquid)
Halogenated Hydrocarbons
Alcohols (vapor and liquid)
Ethers (vapor and liquid)
Aldehydes and Ketones
Carboxylic Acids
Esters
Phosphate Esters
Organic Nitrogen Compounds

The open literature was searched extensively for $G(H_2)$ values for the above materials. Several large compilations of $G(H_2)$ values were found and when possible the original sources of these listings were checked. Table 4-2 contains the $G(H_2)$ values identified for use in Radcalc. It lists the material name, the $G(H_2)$ value in molecules per 100 eV and the $G(H_2)$ value in μ mole per Joule. The table also has three columns labeled A, B, and G indicating whether the value applies to alpha, beta and/or gamma radiation. A comments column provides additional information for the listed value. The first reference column is the primary source of the information. Since the primary source frequently listed data compiled from other studies, the next reference column is the original source of the material. When possible, original sources of empirical data were reviewed to ensure the accuracy of the

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Table 4-2. Net $G(H_2)$ Values.

General Name	$G(H_2)$ m/100eV	$\mu\text{mol/l}$	A	B	G	Comments	Reference	Original Source
Water (vapor)	5.0E-01	5.2E-02			X		NuPac 1989	Spinks 1976
	4.8E-01	5.0E-02			X		Spinks and Woods 1990	Dixon 1970, Anderson 1968, Armstrong 1987
Water (liquid)	4.5E-01	4.7E-02			X		Elliot et al. 1993	Elliot et al. 1993
	5.3E-01	5.5E-02		X		H3-Beta particles (5.7 keV)	Spinks and Woods 1990	Collinson et al. 1962
	9.6E-01	9.9E-02	X			Alpha (32 MeV)	Spinks and Woods 1990	Appleby & Schwarz 1969
	1.1E+00	1.2E-01	X			Alpha (12 MeV)	Spinks and Woods 1990	Appleby & Schwarz 1969
	1.6E+00	1.6E-01	X			Alpha (5.3 MeV)	Spinks and Woods 1990	Lefort & Tarrago 1959
temperature dependence						*Equation 4.1; Figure 4-1	Elliot et al. 1993	Elliot et al. 1993
of pure water	4.5E-01	4.7E-02			X	25°C	Elliot et al. 1993	Elliot et al. 1993
	5.0E-01	5.2E-02			X	100°C	Elliot et al. 1993	Elliot et al. 1993
	5.4E-01	5.6E-02			X	200°C	Elliot et al. 1993	Elliot et al. 1993
	6.5E-01	6.7E-02			X	300°C	Elliot et al. 1993	Elliot et al. 1993
pH = 0.5	4.0E-01	4.1E-02			X		Kasten 1991	Kasten 1991
pH = 1.0	6.0E-01	6.2E-02		X			Kasten 1991	Kasten 1991
pH = 2-4	5.0E-01	5.2E-02			X		Kasten 1991	Kasten 1991
pH = 5	5.5E-01	5.7E-02			X		Kasten 1991	Kasten 1991
pH = 8	6.0E-01	6.2E-02			X		Kasten 1991	Kasten 1991
pH = 13	4.3E-01	4.4E-02		X			Kasten 1991	Kasten 1991
pH = 13	7.0E-01	7.3E-02			X		Kasten 1991	Kasten 1991
Ion Exchange Resins								
Cation Resins								
Sulfonic acid cation	1.3E-01	1.3E-02			X	H+ form, swollen, 55 wt % moisture	Swyler et al. 1983	Swyler et al. 1983
resin (IRN-77)	2.0E-01	2.1E-02			X	Na+ form, swollen, dehydrated	Swyler et al. 1983	Swyler et al. 1983
	1.2E-01	1.2E-02			X	Fully swollen	Swyler et al. 1982	Swyler et al. 1982
	1.0E-02	1.0E-03			X	Dried to 7 wt % moisture content	Sargent & Lundy 1988	Swyler et al. 1983
Styrene divinylbenzene	2.6E-02	2.7E-03			X	Vacuum, dry	Mohorcic & Kramer 1968	Mohorcic & Kramer 1968
copolymer (Dowex 50Wx10)	9.5E-02	9.8E-03			X	Vacuum, swollen	Mohorcic & Kramer 1968	Mohorcic & Kramer 1968
	1.7E+00	1.8E-01			X	Vacuum, immersed in water	Mohorcic & Kramer 1968	Mohorcic & Kramer 1968
	5.2E-01	5.4E-02		X	X	Immersed in tritiated H ₂ O, oxygen present	Mohorcic et al. 1974	Mohorcic et al. 1974
Phenosulfonic acid & formaldehyde (Zeo Carb 215)	5.1E-02	5.3E-03			X	Vacuum, dry	Mohorcic & Kramer 1968	Mohorcic & Kramer 1968
	1.2E-01	1.2E-02			X	Vacuum, swollen	Mohorcic & Kramer 1968	Mohorcic & Kramer 1968
	1.7E+00	1.8E-01			X	Vacuum, immersed in water	Mohorcic & Kramer 1968	Mohorcic & Kramer 1968
Dowex MSC-1	4.6E-01	4.8E-02			X	Covered by 0.5M HCl	Sargent & Lundy 1988	Kazanjan & Stevens 1983
Amberlite 252	5.3E-01	5.5E-02			X	Covered by 0.5M HCl	Sargent & Lundy 1988	Kazanjan & Stevens 1983
Duolite C-264	3.8E-01	3.9E-02			X	Covered by 0.5M HCl	Sargent & Lundy 1988	Kazanjan & Stevens 1983
Dowex 50W	1.0E-01	1.0E-02			X	Air dried, 66 wt % moisture	Sargent & Lundy 1988	Kazanjan & Horrell 1974
Dowex HCR-S	5.0E-02	5.2E-03			X	Na+ form, swollen, dehyd.	Sargent & Lundy 1988	McFarland 1982
Dowex 50	6.0E-02	6.2E-03			X	H+ form, swollen	Sargent & Lundy 1988	Mohorcic & Kramer 1968
	7.0E-02	7.3E-03			X	Li+ form, swollen	Sargent & Lundy 1988	Mohorcic & Kramer 1968

General Name	$\frac{G(H_2)}{m/100eV}$	$\frac{umol/J}{}$	A	B	G	Comments	Reference	Original Source
Ion Exchange Resins (continued)								
Dowex 50Wx10	2.6E-02	2.7E-03			X	H+ form, dry	Pillay 1986	Mohorcic & Kramer 1968
from	4.0E-02	4.1E-03			X	H+ form, 12-47 wt % water	Pillay 1986	Mohorcic et al. 1974
to	1.2E-01	1.2E-02			X			
	9.5E-02	9.8E-03			X	H+ form, swollen	Pillay 1986	Mohorcic & Kramer 1968
	1.7E+00	1.8E-01			X	H+ form, immersed in water	Pillay 1986	Mohorcic & Kramer 1968
	1.0E-03	1.0E-04			X	Li+ form, dry	Pillay 1986	Mohorcic & Kramer 1968
	9.5E-02	9.8E-03			X	Li+ form, swollen	Pillay 1986	Mohorcic & Kramer 1968
	1.7E+00	1.8E-01			X	Li+ form, immersed in water	Pillay 1986	Mohorcic & Kramer 1968
KU-2x8	1.1E+00	1.1E-01			X	H+ form, dry	Pillay 1986	Egorov & Novikov 1965
	1.0E+00	1.0E-01			X	Na+ form, dry	Pillay 1986	Egorov & Novikov 1965
KB-4P-2	1.2E+00	1.3E-01			X	H+ form, dry	Pillay 1986	Egorov & Novikov 1965
	3.1E+00	3.2E-01			X	Na+ form, dry	Pillay 1986	Egorov & Novikov 1965
Zeo-Karb 215	8.0E-02	8.3E-03			X	H+ form, swollen	Sargent & Lundy 1988	Mohorcic & Kramer 1968
	1.1E+00	1.1E-01			X	H+ form, immersed in water	Sargent & Lundy 1988	Mohorcic & Kramer 1968
	5.1E-02	5.3E-03			X	H+ form, dry	Pillay 1986	Mohorcic & Kramer 1968
	1.2E-01	1.2E-02			X	H+ form, swollen	Pillay 1986	Mohorcic & Kramer 1968
	1.7E+00	1.8E-01			X	H+ form, immersed in water	Pillay 1986	Mohorcic & Kramer 1968
Biorad AG MP-50	5.3E-02	5.5E-03			X	H+ form, air dry	Pillay 1986	Kazanjan & Killion 1982
Resorcinol-Formaldehyde	6.3E-01	6.5E-02			X	In pure water	Crawford et al. 1994	Crawford et al. 1994
	9.0E-02	9.3E-03			X	101-AW Hanford Simulant	Crawford et al. 1994	Crawford et al. 1994
Anlon Resins								
Quaternary ammonium anion resin (IRN-78)	6.2E-01	6.4E-02			X	OH- form, swollen, 58 wt % moisture	Swyler et al. 1983	Swyler et al. 1983
	3.4E-01	3.5E-02			X	Cl- form, swollen, dehydrated	Swyler et al. 1983	Swyler et al. 1983
	3.6E-01	3.7E-02			X	Fully swollen, 60 wt % moisture	Swyler et al. 1982	Swyler et al. 1982
Amberlite IRA-938	1.5E-01	1.6E-02			X	Nitrate form, air dry	Pillay 1986	Kazanjan & Stevens 1983
Dowex 1	9.0E-02	9.3E-03			X	Air dried, 48 w/o moisture	Sargent & Lundy 1988	Kazanjan & Horrell 1975
Dowex SBR-OH	3.8E-01	3.9E-02			X	Borate form, swollen, dehydrated	Sargent & Lundy 1988	McFarland 1982
Dowex 1x4	9.0E-02	9.3E-03			X	Nitrate form, air dry	Pillay 1986	Kazanjan & Horrell 1975
	2.0E-02	2.1E-03			X	Nitrate form, in 7.0M HNO3	Pillay 1986	Kazanjan & Horrell 1975
Dowex 11	1.0E-01	1.0E-02			X	Nitrate form, air dry	Pillay 1986	Kazanjan, personal letter
Mixed Resins								
IRN-150 (dehydrated-swollen)	5.0E-01	5.2E-02			X	HOH form, 55 wt % moisture	Swyler et al. 1983	Swyler et al. 1983
	3.0E-01	3.1E-02			X	NaCl form	Swyler et al. 1983	Swyler et al. 1983
D-Mix	2.4E-01	2.5E-02			X	TMI-2 resin, NaBO3, swollen	Sargent & Lundy 1988	Barletta et al. 1983
Dowex HGR-H	7.0E-02	7.3E-03			X	Dried resin	Sargent & Lundy 1988	Capolupo & Sheff 1983
Dowex 50	3.0E-02	3.1E-03			X	H+ form, dried resin	Sargent & Lundy 1988	Gangwer et al. 1977
	1.0E-03	1.0E-04			X	Li+ form, dried resin	Sargent & Lundy 1988	Gangwer et al. 1977
Zeo Karb 215	5.0E-02	5.2E-03			X	H+ form, dried resin	Sargent & Lundy 1988	Gangwer et al. 1977
Ionsiv IE-95	5.0E-02	5.2E-03			X	21-33 wt % water content	Sargent & Lundy 1988	Pillay 1980

General Name	G(H2) m/100eV	umol/J	A	B	G	Comments	Reference	Original Source
Ion Exchange Resins (continued)								
Sulfonated styrene divinyl benzene	2.5E+00	2.6E-01	X			Hanford site K basin resin	Marusich 1994	Marusich 1994
and ammoniated styrene divinyl benzene mixed (Duolite ARN-9381)	7.0E-01	7.3E-02	X	X		based on literature review		
Inorganic Resins								
Zeolite	4.3E-01	4.5E-02	X	X		Empirical Data	Henrie et al. 1985	Henrie et al. 1985
Zeolite (Linde IE-95)	7.5E-02	7.8E-03		X		Fully hydrated, air dry state	Capolupo & Sheff 1983	Capolupo & Sheff 1983
	1.8E-01	1.9E-02		X		Fully hydrated, air dry state, pressurized w/ Oxygen	Capolupo & Sheff 1983	Capolupo & Sheff 1983
High Level Waste Solutions								
Simulated alkaline waste solution (SRS)	3.1E-02	3.2E-03		X		[NaNO3]=2.8M, [NaNO2]=2.2M [NaOH]=2.0M	Walker et al. 1992	Walker et al. 1992
Simulated alkaline waste solution w/ EDTA or HEDTA (SRS)	6.2E-02	6.4E-03		X		Similar to Hanford tank waste containing complexant	Walker et al. 1992	Walker et al. 1992
Hanford Tank Waste								
101-SY	5.0E-01	5.2E-02		X		Bounding for all tanks (conservative by a factor of 2)	Hopkins 1994	Hopkins 1994
101-SY solution simulant with organic additives	8.0E-02	8.3E-03		X		Bounding value	Meisel et al. 1993	Meisel et al. 1993
101-SY slurry simulant with organic additives	1.1E-01	1.1E-02		X		Bounding value	Meisel et al. 1993	Meisel et al. 1993
Waste solution/water as a function of nitrate concentration								
Mahlman values						Figure 4-2	Mahlman 1961	Mahlman 1961
[NaNO3] M=0.0012	4.2E-01	4.4E-02		X		Pure water with nitrate ion		
M=0.079	3.9E-01	4.0E-02		X		in solution		
M=0.15	2.4E-01	2.5E-02		X				
M=0.51	1.5E-01	1.6E-02		X				
M=1.00	9.6E-02	9.9E-03		X				
M=2.00	5.9E-02	6.1E-03		X				
M=3.00	4.2E-02	4.4E-03		X				
M=4.00	3.8E-02	3.9E-03		X				
M=5.00	3.5E-02	3.6E-03		X				
M=6.00	2.9E-02	3.0E-03		X				
M=7.00	2.5E-02	2.6E-03		X				
Walker and Bibler equation (High Activity Waste Solution)			X	X		Equation applicable to 0.003-8.0M nitrate; Equation 4.2, Figure 4-2	Walker & Bibler 1991	Walker & Bibler 1991

General Name	G(H2) m/100eV	umol/J	A	B	G	Comments	Reference	Original Source
Grout								
Grout with Synthetic CAW	5.6E-01	5.8E-02	X			Synthetic Current Acid Waste	Henrie et al. 1985	Henrie et al. 1985
Grout with Synthetic DSS	3.0E-01	3.1E-02	X			G(all gases) for Double Shell Slurry 1.6M sodium nitrite present	Henrie et al. 1985	Henrie et al. 1985
Solidification Binders: cements, asphalts								
Vinyl ester styrene	3.0E-02	3.1E-03					Sargent & Lundy 1988	Haighton 1980
Epoxys	2.3E-01	2.4E-02		X		Spent fuel gamma	Sargent & Lundy 1988	Morgan et al. 1970
Cement (type 2)	3.5E-01	3.6E-02		X			Sargent & Lundy 1988	Colombo 1979
Portland cement	3.0E-02	3.1E-03		X		by SRL	Siskind 1992	Bibler 1977
from	1.1E-01	1.1E-02		X		by BNL	Siskind 1992	Colombo 1979
to	3.5E-01	3.6E-02						
from	1.4E-01	1.5E-02		X		by ANL	Siskind 1992	Lewis 1989
to	2.2E-01	2.3E-02						
	1.3E-01	1.3E-02			X	by Winfrith, UK	Siskind 1992	Holland 1985
Tritiated Portland cement	3.0E-01	3.1E-02		X		P. cement & gypsum perlite plaster	Bibler & Orebaugh 1977	Bibler & Orebaugh 1977
Cement mixed w/ TRU						50 wt% cement, 20 wt% ash, 30 wt% water	Bibler 1980	Bibler 1980
Incinerator ash								
Portland cement	3.2E-01	3.3E-02	X			PuO2	Bibler 1980	Bibler 1980
High-aluminum cement (HAC-1)	2.5E-01	2.6E-02	X			PuO2	Bibler 1980	Bibler 1980
High-aluminum cement (HAC-2)	2.9E-01	3.0E-02	X			Pu-238 (most like TRU waste)	Bibler 1980	Bibler 1980
Tritiated cement	3.0E-01	3.1E-02		X		Vermiculite sorbed with tritiated organic waste	Bibler & Orebaugh 1977	Bibler & Orebaugh 1977
Asphalt								
Asphalt	6.0E-01	6.2E-02					Sargent & Lundy 1988	Carleson 1983
Asphalt Pioneer 221	4.1E-01	4.2E-02		X			Sargent & Lundy 1988	Colombo & Nielsen 1979
Asphalt air blown	4.3E-01	4.5E-02		X		Fuel element gamma	Sargent & Lundy 1988	Duschner et al. 1977
Asphalt distilled	3.2E-01	3.3E-02		X		Fuel element gamma	Sargent & Lundy 1988	Duschner et al. 1977
Distilled Asphalt/ mixed resin	2.4E-01	3.3E-02		X		50/50 mix resin in LiBO3 form	Sargent & Lundy 1988	Duschner et al. 1977
Dow/Resin	5.7E-01	3.3E-02		X		2:1 resin to binder ratio	Sargent & Lundy 1988	Haighton 1980
Commercial Lubricants: Oils, grease								
Mineral oils	2.7E+00	2.8E-01		X		Vacuum	NuPac 1989	Arakawa 1983
Napthenic neutral oil	9.0E-01	9.3E-02		X		Vacuum	NuPac 1989	Arakawa 1983
Poly-alpha-olefin oil	2.3E+00	2.4E-01		X		Vacuum	NuPac 1989	Arakawa 1983
Ester lubricants	2.3E+00	2.4E-01		X		Vacuum	NuPac 1989	Arakawa 1983
Aromatic lubricants	5.0E-01	5.2E-02		X		Vacuum	NuPac 1989	Arakawa 1983
Silicones	6.0E-01	6.2E-02		X		Vacuum	NuPac 1989	Arakawa 1983
Texaco Regal-A machine oil	2.8E+00	2.9E-01	X			air, CaSiO3 paste	NuPac 1989	Kazanjan 1976
	2.3E+00	2.4E-01		X		Vacuum	NuPac 1989	Kazanjan 1969
	1.8E+00	1.9E-01		X		500 torr O2, 8.4 Mrad	NuPac 1989	Kazanjan 1969
	2.1E+00	2.2E-01		X		500 torr O2, 1.4 Mrad	NuPac 1989	Kazanjan 1969
Vacuum pump oil (Duoseal)	1.6E+00	1.7E-01	X			air, no O2, vermiculite	NuPac 1989	Zerwekh 1979
	2.7E+00	2.8E-01	X			air	NuPac 1989	Bibler 1977
	2.0E+00	2.1E-01	X			air, to zero dose	NuPac 1989	Bibler 1977

General Name	G(H2) m/100eV	umol/J	A	B	G	Comments	Reference	Original Source
Commercial Lubricants: Oils, grease (continued)								
	2.2E+00	2.3E-01		X		Trinitated waste sorbed onto vermiculite	Bibler & Orebaugh 1977	Bibler & Orebaugh 1977
	2.7E+00	2.8E-01	X			Waste sorbed onto vermiculite	Bibler & Orebaugh 1977	Bibler & Orebaugh 1977
	2.0E+00	2.1E-01		X		Waste sorbed onto vermiculite	Bibler & Orebaugh 1977	Bibler & Orebaugh 1977
Vacuum oil	2.0E+00	2.1E-01		X	X		Henrie et al. 1985	Bibler 1976
Rycon grease	1.0E+00	1.0E-01		X		Vacuum or air	NuPac 1989	Kazanjan 1969
Polymers: PVC, polyester, Styrofoam, cellulose, neoprene								
Polyethylene (LDPE)	5.0E+00	5.2E-01		X		800 keV	NuPac 1989	Chapiro 1962
(LDPE)	4.0E+00	4.1E-01				70°C, reactor	NuPac 1989	Chapiro 1962
(LDPE)	3.8E+00	3.9E-01			X		NuPac 1989	Chapiro 1962
(HDPE Marlex-50)	5.8E+00	6.0E-01		X		800 keV, HDPE, 240°C	NuPac 1989	Chapiro 1962
	3.8E+00	3.9E-01		X		80°C, vacuum	NuPac 1989	Kang 1966
	1.3E+00	1.3E-01	X			Oxygen present, LDPE	NuPac 1989	Bersch 1959
	6.2E+00	6.4E-01		X		Oxygen depleted, 130°C	NuPac 1989	Mandelkern 1972
	2.0E+00	2.1E-01	X		X	Test reactor	Sargent & Lundy 1988	Bopp & Sisman 1953
Polypropylene	3.3E+00	3.4E-01	X		X	CH-TRU, max. G value	NuPac 1989	NuPac 1989
	2.9E+00	3.0E-01		X		Isotactic, vacuum, room temperature	NuPac 1989	Hegazy 1981
	3.2E+00	3.3E-01		X		Iso pp film, vacuum, room temperature	NuPac 1989	Hegazy 1981
	2.5E+00	2.6E-01		X		150 torr O2, room temperature	NuPac 1989	Hegazy 1981
Polyisobutylene	1.6E+00	1.7E-01	X		X	CH-TRU, maximum G value	NuPac 1989	Bopp 1963, Sisman 1963
Polyvinyl alcohol	3.1E+00	3.2E-01	X		X	CH-TRU, maximum G value	NuPac 1989	Bopp 1963, Sisman 1963
Polyethylene glycol	3.5E+00	3.6E-01	X		X	CH-TRU, maximum G value	NuPac 1989	Bopp 1963, Sisman 1963
Cellulose	3.2E+00	3.3E-01	X		X	CH-TRU, maximum G value	NuPac 1989	Bopp 1963, Sisman 1963
Cotton cellulose I	1.2E+00	1.2E-01		X		Oxygen present, room temp, 67 Mrad	NuPac 1989	Arthur 1970
Mixed cellulotics	6.0E-01	6.2E-02	X			air, room temperature	NuPac 1989	Zerwekh 1979
Cheesecloth (wet)	1.4E+00	1.5E-01	X			air, room temperature	NuPac 1989	Zerwekh 1979
Kimwipes (dry)	6.0E-01	6.2E-02	X			air, room temperature	NuPac 1989	Kazanjan 1976
Kimwipes (wet)	4.0E-01	4.1E-02	X				NuPac 1989	Kazanjan 1976
Paper tissue	9.0E-01	9.3E-02	X			air, room temperature	NuPac 1989	Bibler 1976
Urea formaldehyde	2.4E+00	2.5E-01	X		X	CH-TRU, maximum G value	NuPac 1989	Bopp 1963, Sisman 1963
Polyoxymethylene	2.1E+00	2.2E-01	X		X	CH-TRU, maximum G value	NuPac 1989	Bopp 1963, Sisman 1963
Polypropylene oxide	1.1E+00	1.1E-01	X		X	CH-TRU, maximum G value	NuPac 1989	Bopp 1963, Sisman 1963
Polybutadiene	5.0E-01	5.2E-02	X		X	CH-TRU, maximum G value	NuPac 1989	Bopp 1963, Sisman 1963
Polyisoprene	7.0E-01	7.3E-02	X		X	CH-TRU, maximum G value	NuPac 1989	Bopp 1963, Sisman 1963
Polymethyl methacrylate	4.0E-01	4.1E-02	X		X	CH-TRU, maximum G value	NuPac 1989	Bopp 1963, Sisman 1963
Polyvinyl acetate	9.0E-01	9.3E-02	X		X	CH-TRU, maximum G value	NuPac 1989	Bopp 1963, Sisman 1963
Polystyrene (Styrofoam)	2.0E-01	2.1E-02	X		X	CH-TRU, maximum G value	NuPac 1989	Bopp 1963, Sisman 1963
	8.0E-03	8.3E-04	X		X	Test reactor	Sargent & Lundy 1988	Bopp & Sisman 1953
Polysulfone	1.0E-01	1.0E-02	X		X	CH-TRU, maximum G value	NuPac 1989	Bopp 1963, Sisman 1963
Polycarbonate	1.0E-01	1.0E-02	X		X	CH-TRU, maximum G value	NuPac 1989	Bopp 1963, Sisman 1963
Polyesters	3.0E-01	3.1E-02	X		X	CH-TRU, maximum G value	NuPac 1989	Bopp 1963, Sisman 1963

General Name	m/1000V	umol/l	A	B	G	Comments	Reference	Original Source
Polymers: PVC, polyester, Styrofoam, cellulose, neoprene (continued)								
Polyester I	1.0E-01	1.0E-02	X			Vacuum, room temperature	NuPac 1989	Krasnansky et al. 1961
Polyester II	1.0E-01	1.0E-02	X			Vacuum, room temperature, 6 Mrad	NuPac 1989	Krasnansky et al. 1961
Polyester III	3.0E-01	3.1E-02	X			Vacuum, room temperature, 6 Mrad	NuPac 1989	Krasnansky et al. 1961
Polyphenyl methacrylate	1.0E-01	1.0E-02	X			CH-TRU, maximum G value	NuPac 1989	Bopp 1963, Sisman 1963
Polyvinyl chloride	7.0E-01	7.3E-02	X			CH-TRU, maximum G value	NuPac 1989	Bopp 1963, Sisman 1963
	2.0E-01	2.1E-02	X			pure PVC, room temperature	NuPac 1989	Hegazy 1981
	6.0E-01	6.2E-02	X			No oxygen, plasticized film, O-ring	NuPac 1989	Kazanjian 1976
	1.1E-01	1.1E-02	X				Henrie et al. 1985	Kazanjian & Brown 1969
Polychloroprene	2.0E-01	2.1E-02	X			Vacuum, room temperature	NuPac 1989	Arakawa 1986
	3.0E-01	3.1E-02	X			Pure oxygen, room temperature	NuPac 1989	Arakawa 1986
Neoprene	1.0E-01	1.0E-02	X			No oxygen, room temperature	NuPac 1989	Zerwekh 1979
	1.0E-01	1.0E-02	X			Vacuum, model comp.	NuPac 1989	Arakawa 1986
Hypalon (pure)	6.0E-01	6.2E-02	X			Vacuum, room temperature	NuPac 1989	Arakawa 1986
Hypalon (commercial)	1.5E-01	1.6E-02	X			No oxygen, room temperature	NuPac 1989	Kosiewicz 1981
	3.0E-01	3.1E-02	X			Oxygen present, room temperature	NuPac 1989	Arakawa 1986
Chlorosulfonated polyethylene	3.0E-01	3.1E-02	X			CH-TRU, maximum G value	NuPac 1989	Bopp 1963, Sisman 1963
Polychlorotrifluoroethylene	0.0E+00	0.0E+00	X			CH-TRU, maximum G value	NuPac 1989	Bopp 1963, Sisman 1963
Polytetrafluoroethylene	0.0E+00	0.0E+00	X			CH-TRU, maximum G value	NuPac 1989	Bopp 1963, Sisman 1963
Chlorinated polyether	7.0E-01	7.3E-02	X			CH-TRU, maximum G value	NuPac 1989	Bopp 1963, Sisman 1963
Rubber hydrochloride	0.0E+00	0.0E+00	X			CH-TRU, maximum G value	NuPac 1989	Bopp 1963, Sisman 1963
Polyvinylidene chloride	0.0E+00	0.0E+00	X			CH-TRU, maximum G value	NuPac 1989	Bopp 1963, Sisman 1963
Polyamides	1.1E+00	1.1E-01	X			CH-TRU, maximum G value	NuPac 1989	Bopp 1963, Sisman 1963
Nylon 66	4.0E-01	4.1E-02	X			Vacuum, room temperature	NuPac 1989	Krasnansky 1961
Polyimid MXD-6	1.0E-01	1.0E-02	X			Vacuum, room temperature	NuPac 1989	Krasnansky 1961
Nylon II	1.1E+00	1.1E-01	X			Vacuum, room temperature	NuPac 1989	Krasnansky 1961
Gloves: latex, isoprene	5.0E-01	5.2E-02	X			Vacuum or air, room temperature	NuPac 1989	Bohm 1973
Polybutadiene/copolymers	4.0E-01	4.1E-02	X			No oxygen, room temperature	NuPac 1989	Kazanjian 1976
Latex gloves	4.0E-01	4.1E-02	X			No oxygen, room temperature	NuPac 1989	Zerwekh 1979
Isoprene gloves	7.0E-01	7.3E-02	X			No oxygen, room temperature	NuPac 1989	
Saturated Hydrocarbons (vapor): fuel, solvent, natural gas								
Methane	6.4E+00	6.6E-01	X				Spinks and Woods 1990	Back & Miller 1959
	6.4E+00	6.6E-01	X			22°C	Hall et al. 1963	Yang & Manno 1959
Ethane	6.9E+00	7.1E-01	X				Spinks and Woods 1990	Dyne & Jenkinson 1961
	6.8E+00	7.0E-01	X				Hall et al. 1963	Yang & Manno 1959
	5.6E+00	5.8E-01	X			22°C	Hall et al. 1963	Davison 1958
Propane	8.2E+00	8.5E-01	X			Vacuum	Spinks and Woods 1990	Back & Miller 1959
	5.9E+00	6.1E-01	X			22°C	Hall et al. 1963	Yang & Manno 1959
	3.8E+00	3.9E-01	X				Hall et al. 1963	Davison 1958
Methylpropane	7.4E+00	7.7E-01	X				Spinks and Woods 1990	Back & Miller 1959
Dimethylpropane	2.0E+00	2.1E-01	X				Spinks and Woods 1990	Back & Miller 1959

General Name	G(H ₂) m/100eV	umol/J	A	B	G	Comments	Reference	Original Source
Saturated Hydrocarbons (vapor): fuel, solvent, natural gas (continued)								
Butane	9.0E+00	9.3E-01	X			Vacuum	Spinks and Woods 1990	Back & Miller 1959
Isobutane	7.4E+00	7.7E-01	X			Vacuum	NuPac 1989	Spinks 1976
Pentane	7.3E+00	7.6E-01	X			Vacuum	Spinks and Woods 1990	Back & Miller 1959
	6.0E+00	6.2E-01		X		22°C	Hall et al. 1963	Futrell 1960
Neopentane	2.0E+00	2.1E-01	X			Vacuum	NuPac 1989	Spinks 1976
	4.3E+00	4.5E-01		X		27°C	Hall et al. 1963	Lampe 1957
Hexane	5.6E+00	5.8E-01	X			Vacuum	Spinks and Woods 1990	Back & Miller 1959
	4.3E+00	4.5E-01		X			Hall et al. 1963	Futrell 1959
Cyclohexane	8.0E+00	8.3E-01	X			108°C	Hall et al. 1963	Ramaradhya et al. 1961
Saturated Hydrocarbons (liquid): gasoline, kerosine, white gas, solvent...								
2,2-dimethylbutane	2.0E+00	2.1E-01				Vacuum	Spinks and Woods 1990	Dewhurst 1958
Pentane	4.2E+00	4.4E-01	X			800keV electron irr., vacuum	Spinks and Woods 1990	Dewhurst 1958
	4.2E+00	4.4E-01		X		22°C	Hall et al. 1963	de Vries et al. 1959
2-methylpentane	4.0E+00	4.1E-01				Vacuum	Spinks and Woods 1990	Dewhurst 1958
Neopentane	1.6E+00	1.7E-01		X		Vacuum	Spinks and Woods 1990	
	1.6E+00	1.6E-01		X		29°C	Hall et al. 1963	Taylor et al. 1960
Hexane	5.0E+00	5.2E-01	X			Vacuum	NuPac 1989	Spinks 1976
	5.3E+00	5.4E-01		X			Spinks and Woods 1990	Pancini et al. 1970
	5.0E+00	5.2E-01	X			800keV electron irr.	Spinks and Woods 1990	Dewhurst 1958
	5.0E+00	5.2E-01		X			Hall et al. 1963	Futrell 1959
Cyclohexane	5.6E+00	5.8E-01	X			Vacuum	NuPac 1989	Spinks 1976
	5.3E+00	5.5E-01	X			Vacuum	NuPac 1989	Spinks 1976
	5.6E+00	5.8E-01		X			Spinks and Woods 1990	Dewhurst 1959, Ho & Freeman 1964
	5.3E+00	5.4E-01	X			22°C	Hall et al. 1963	Dewhurst et al. 1959
Heptane	4.7E+00	4.9E-01		X		Vacuum	Spinks and Woods 1990	Dewhurst 1958
Octane	4.8E+00	5.0E-01		X		Vacuum	Spinks and Woods 1990	Dewhurst 1958
	4.6E+00	4.8E-01		X		Air	Spinks and Woods 1990	Dewhurst 1958
	4.2E+00	4.4E-01	X			Air	Spinks and Woods 1990	Dewhurst 1958
	4.5E+00	4.7E-01		X			Spinks and Woods 1990	Dewhurst 1958
	4.4E+00	4.6E-01		X		Tritiated waste sorbed	Bibler & Orebaugh 1977	Bibler & Orebaugh 1977
	4.2E+00	4.4E-01	X			Waste sorbed onto vermiculite	Bibler & Orebaugh 1977	Bibler & Orebaugh 1977
	4.6E+00	4.8E-01		X		Waste sorbed onto vermiculite	Bibler & Orebaugh 1977	Bibler & Orebaugh 1977
Nonane	5.0E+00	5.2E-01	X			Vacuum	Spinks and Woods 1990	Dewhurst 1958
Decane	5.2E+00	5.4E-01				Vacuum	Spinks and Woods 1990	Dewhurst 1958
Dodecane	4.9E+00	5.1E-01				Vacuum	Spinks and Woods 1990	Dewhurst 1958
Hexadecane	4.8E+00	5.0E-01				Vacuum	Spinks and Woods 1990	Dewhurst 1958
Unsaturated Hydrocarbons (vapor)								
Ethene (ethylene)	1.3E+00	1.3E-01	X				Spinks and Woods 1990	Klots et al. 1964
	1.2E+00	1.2E-01		X		25°C	Hall et al. 1963	Lampe 1959
Ethyne (acetylene)	0.0E+00	0.0E+00	X				Spinks and Woods 1990	Cramer 1967

General Name	<u>G(H2)</u> m/100eV	<u>umol/J</u>	<u>A</u>	<u>B</u>	<u>G</u>	Comments	Reference	Original Source
Unsaturated Hydrocarbons (liquid)								
1-hexene	8.0E-01	8.3E-02		X	X	22°C	Hall et al. 1963	Kharasch et al. 1958
Cyclohexene	1.3E+00	1.3E-01			X		Spinks and Woods 1990	Wakeford & Freeman 1964
	1.2E+00	1.2E-01			X	24°C	Hall et al. 1963	Freeman 1960
Aromatic Hydrocarbons (vapor)								
Benzene	3.0E-01	3.1E-02	X				Spinks and Woods 1990	Henri et al. 1952
	3.7E-02	4.0E-03			X		Spinks and Woods 1990	Manion & Burton 1952
	1.4E-01	1.5E-02			X		Henrie et al. 1985	Gauman & Hoigne 1978
Aromatic Hydrocarbons (liquid)								
Benzene	5.7E-01	5.9E-02	X			B-10 alpha	Spinks and Woods 1990	Henri et al. 1952, Burns & Barker 1968
	3.9E-02	4.0E-03			X		Spinks and Woods 1990	Henri et al. 1952, Burns & Barker 1968
from	1.2E-02	1.2E-03			X	Range of values	Henrie et al. 1985	Gaumann & Hoigne 1968
to	3.9E-02	4.0E-03						
Toluene (methyl benzene)	5.8E-01	6.0E-02	X				Spinks and Woods 1990	Hoigne et al. 1964
	1.1E-01	1.1E-02			X		Spinks and Woods 1990	Hoigne et al. 1964
	1.3E-01	1.3E-02		X		27°C	Hall et al. 1963	Sworski et al. 1951
Ethyl toluene, o-	1.9E-01	2.0E-02			X		Henrie et al. 1985	Gaumann & Hoigne 1968
m-	2.3E-01	2.4E-02			X		Henrie et al. 1985	Gaumann & Hoigne 1968
p-	2.3E-01	2.4E-02			X		Henrie et al. 1985	Gaumann & Hoigne 1968
xylene, p-	2.1E-01	2.2E-02			X		Spinks and Woods 1990	Verdin 1963
	1.8E-03	1.9E-04			X		Henrie et al. 1985	Gaumann & Hoigne 1968
o-	1.9E-01	2.0E-02			X		Henrie et al. 1985	Gaumann & Hoigne 1968
m-	2.3E-01	2.4E-02			X		Henrie et al. 1985	Gaumann & Hoigne 1968
Ethylbenzene	1.6E-01	1.7E-02			X		Spinks and Woods 1990	Verdin 1963, Hofer & Heusinger 1970
	1.8E-01	1.9E-02	X			27°C	Hall et al. 1963	Sworski et al. 1951
Isopropylbenzene	1.8E-01	1.9E-02			X		Spinks and Woods 1990	Hentz 1962
from	1.8E-01	1.9E-02			X	Range of values	Henrie et al. 1985	Gaumann & Hoigne 1968
to	1.9E-01	2.0E-02						
	1.7E-01	1.8E-02		X		27°C	Hall et al. 1963	Sworski et al. 1951
tert-butylbenzene	1.1E-01	1.1E-02		X		27°C	Hall et al. 1963	Sworski et al. 1951
Chlorobenzene	1.2E-02	1.2E-03			X		Henrie et al. 1985	Gaumann & Hoigne 1968
Mesitylene	2.4E-01	2.5E-02		X			Spinks and Woods 1990	Hentz & Burton 1951
p-terphenyl	5.0E-03	5.2E-04					Henrie et al. 1985	Gaumann & Hoigne 1968
(paradiphenyl benzene)	1.4E-02	1.5E-03		X		299°C	Hall et al. 1963	Burns et al. 1959
Biphenyl	1.0E-02	6.9E-04			X		Spinks and Woods 1990	Hall & Elder 1959
from	2.5E-02	2.6E-03			X	Range of values	Henrie et al. 1985	Gaumann & Hoigne 1968
to	9.0E-02	9.3E-03						

General Name	G(H2) m/100eV	umol/J	A	B	G	Comments	Reference	Original Source
Halogenated Hydrocarbons: CCl4, chloroform								
Carbon tetrachloride	0.7-0.8	0.07-0.8			X	Vacuum	NuPac 1989	Spinks 1976
	8.6E+00	8.9E-01			X	Oxygen	NuPac 1989	Spinks 1976
Chlorobenzene	9.7E-03	1.0E-03			X	Vacuum	Spinks and Woods 1990	Wendenburg & Henglein 1962
Bromobenzene	9.7E-03	1.0E-03			X	Vacuum	Spinks and Woods 1990	Buhler & Bossy 1974
Iodomethane (vapor)	5.5E-01	5.7E-02			X		Spinks and Woods 1990	Donovan & Hanrahan 1971
Iodomethane (liquid)	5.9E-02	6.2E-03			X		Spinks and Woods 1990	Gillis et al. 1961
Iodoethane (liquid)	2.3E-01	2.4E-02			X		Spinks and Woods 1990	Gillis et al. 1961
Butyl chloride (liquid)	1.4E+00	1.5E-01			X	Normal	Spinks and Woods 1990	Dismukes & Wilcox 1959
	9.7E-01	1.0E-01			X	Secondary	Spinks and Woods 1990	Dismukes & Wilcox 1959
	8.7E-01	9.0E-02			X	Iso	Spinks and Woods 1990	Dismukes & Wilcox 1959
	5.8E-01	6.0E-02			X	Tertiary	Spinks and Woods 1990	Dismukes & Wilcox 1959
Iodobenzene	0.0E+00	0.0E+00			X	Vacuum	NuPac 1989	Spinks 1976
1,1,1-trichloroethane	2.0E-01	2.1E-02	X			W or W/O O2 present	NuPac 1989	Kazanjan 1976
Alcohols (vapor)								
Methanol (wood alcohol)	1.1E+01	1.1E+00			X	Vacuum	Spinks and Woods 1990	Baxendale & Sedgwick 1961
								Meaburn & Mellows 1965
Ethanol (grain alcohol)	1.1E+01	1.1E+00		X		Vacuum	NuPac 1989	Spinks 1976
	1.1E+01	1.1E+00			X	25°C, 0.06 atm.	Spinks and Woods 1990	Sieck & Johnsen 1965
Alcohols (liquid): wood alcohol, grain alcohol, rubbing alcohol, solvents								
Methanol (wood alcohol)	3.5E+00	3.6E-01	X			Vacuum	NuPac 1989	Spinks 1976
	5.5E+00	5.7E-01	X			100mole/m3 methyl borate sol.	Spinks and Woods 1990	Choi & Lichtin 1964
	3.5E+00	3.6E-01	X			18°C	Hall et al. 1963	McDonell et al. 1954
	4.0E+00	4.1E-01		X		22°C	Hall et al. 1963	McDonell et al. 1955
Ethanol (grain alcohol)	5.0E+00	5.2E-01		X		Vacuum	NuPac 1989	Spinks 1976
	4.1E+00	4.2E-01	X			Vacuum	NuPac 1989	Hall et al. 1963
	5.0E+00	5.2E-01		X		25°C	Spinks and Woods 1990	Myron & Freeman 1965
	4.1E+00	4.2E-01	X			25°C	Hall et al. 1963	Newton & McDonell 1956
	3.5E+00	3.6E-01	X			18°C	Hall et al. 1963	McDonell et al. 1954
(solid)	4.4E+00	4.6E-01		X		-196°C	Spinks and Woods 1990	Fletcher & Freeman 1967
1-propanol	4.4E+00	4.6E-01		X		Vacuum	NuPac 1989	Spinks 1976
	2.8E+00	2.9E-01	X			Vacuum	NuPac 1989	Hall et al. 1963
	2.8E+00	2.9E-01	X			18°C	Hall et al. 1963	McDonell et al. 1954
	4.4E+00	4.6E-01		X			Spinks and Woods 1990	Basson & van der Linde 1967
2-propanol (rubbing alcohol)	3.7E+00	3.8E-01		X		Vacuum	Spinks and Woods 1990	Johnsen & Becker 1963
n-propanol	2.8E+00	2.9E-01	X			Vacuum	NuPac 1989	IEEE 1963
1-butanol	4.6E+00	4.8E-01		X		Vacuum	NuPac 1989	Spinks 1976
	3.6E+00	3.7E-01	X			Vacuum	NuPac 1989	Hall et al. 1963
	4.6E+00	4.7E-01		X			Spinks and Woods 1990	Ackerman et al. 1972
	3.6E+00	3.7E-01	X			18°C	Hall et al. 1963	McDonell et al. 1954

General Name	G(H2) m/100eV	umol/J	A	B	G	Comments	Reference	Original Source
Alcohols (liquid): wood alcohol, grain alcohol, rubbing alcohol, solvents						(continued)		
t-butanol	1.0E+00	1.0E-01			X	Vacuum	NuPac 1989	Spinks 1976
n-butanol	3.6E+00	3.7E-01	X			Vacuum	NuPac 1989	IEEE 1963
1-octanol	3.5E+00	3.6E-01	X			Vacuum	NuPac 1989	Hall et al. 1963
	3.5E+00	3.6E-01	X			18°C	Hall et al. 1963	McDonell et al. 1954
1-decanol	3.5E+00	3.6E-01	X			Vacuum	NuPac 1989	Hall et al. 1963
Ethers (vapor)	3.5E+00	3.6E-01	X			18°C	Hall et al. 1963	McDonell et al. 1954
Ethyl ether	6.4E+00	6.6E-01			X	25°C, 0.5 atm	Spinks and Woods 1990	Ng & Freeman 1965
	3.4E+00	3.5E-01			X	25°C, 0.5 atm	Spinks and Woods 1990	Ng & Freeman 1965
Ethers (liquid)								
Ethyl ether	3.4E+00	3.5E-01			X	Vacuum	NuPac 1989	Spinks 1976
	3.6E+00	3.7E-01	X			Vacuum	NuPac 1989	Hall et al. 1963
	3.6E+00	3.8E-01	X			30°C	Hall et al. 1963	Newton 1957c
Ethyl n-butyl ether	3.3E+00	3.4E-01	X			Vacuum	NuPac 1989	Hall et al. 1963
	3.3E+00	3.4E-01	X			30°C	Hall et al. 1963	Newton 1957c
	2.9E+00	3.0E-01	X			20°C	Hall et al. 1963	Newton 1957c
Dibutyl ether	2.9E+00	3.0E-01			X	Vacuum	NuPac 1989	Spinks 1976
n-butyl ether	2.7E+00	2.8E-01	X			Vacuum	NuPac 1989	Hall et al. 1963
	2.7E+00	2.8E-01	X			20°C	Hall et al. 1963	Newton 1957c
Ethyl tertbutyl ether	2.0E+00	2.1E-01	X			Vacuum, 20°C	Hall et al. 1963	Newton 1957c
Isopropyl ether	2.4E+00	2.5E-01	X			Vacuum	Newton 1957b	Newton 1957b
	2.2E+00	2.3E-01			X	Vacuum	Newton 1957b	Newton 1957b
	2.4E+00	2.5E-01			X	Vacuum	Newton 1975b	Newton 1957b
Di-isopropyl ether	2.4E+00	2.5E-01			X	Vacuum	NuPac 1989	Spinks 1976
Dioxan	2.1E+00	2.2E-01			X	Vacuum	NuPac 1989	Spinks 1976
Tetrahydrofuran	2.6E+00	2.7E-01			X	Vacuum	NuPac 1989	Spinks 1976
Aldehydes and Ketones: formaldehyde, acetone, solvents...								
Propionaldehyde (Disinfectant)	1.2E+00	1.2E-01			X	Vacuum	NuPac 1989	Hall et al. 1963
	1.2E+00	1.2E-01	X			22°C	Hall et al. 1963	Patrick et al. 1954
Propanone (Acetone)	1.0E+00	1.0E-01			X	Vacuum	NuPac 1989	Spinks 1976
	1.5E+00	1.6E-01	X			Vacuum	NuPac 1989	Spinks 1976
	5.0E-01	5.2E-02			X	22°C	Spinks and Woods 1990	Barker 1963
	8.8E-01	9.1E-02			X	27°C	Hall et al. 1963	Ausloos et al. 1958
	8.4E-01	8.7E-02			X	22°C	Hall et al. 1963	Strong et al. 1959
Methyl ethyl ketone	1.2E+00	1.2E-01			X	Vacuum	NuPac 1989	Hall et al. 1963
	1.2E+00	1.2E-01			X	27°C	Hall et al. 1963	Ausloos et al. 1958
Diethyl ketone	1.2E+00	1.2E-01			X	Vacuum	NuPac 1989	Hall et al. 1963
	1.2E+00	1.2E-01			X	27°C	Hall et al. 1963	Ausloos et al. 1958
Carboxylic Acids: acetic acid								
Etheric acid (Acetic acid)	5.0E-01	5.2E-02			X	Vacuum	NuPac 1989	Spinks 1976
	5.2E-01	5.4E-02	X			25°C, vacuum	Hall et al. 1963	Newton 1957a
(solid)	9.0E-01	9.3E-02	X			0°C	Hall et al. 1963	Whitehead et al. 1951

General Name	G(H2) m/100eV	umol/J	A	B	G	Comments	Reference	Original Source
Carboxylic Acids: acetic acid (continued)								
Potassium acetate	7.1E-01	7.4E-02			X		Spinks and Woods 1990	Lukac et al. 1972
Propionic acid	7.9E-01	8.2E-02	X			25°C	Hall et al. 1963	Newton 1957a
(solid)	7.0E-01	7.3E-02	X			-78°C	Hall et al. 1963	Whitehead et al. 1951
Octanoic acid (solid)	1.4E+00	1.5E-01	X			22°C	Hall et al. 1963	Whitehead et al. 1951
Dodecanoic acid (solid)	1.5E+00	1.6E-01	X			22°C	Hall et al. 1963	Whitehead et al. 1951
Hexadecanoic acid (solid)	1.7E+00	1.8E-01	X			22°C	Hall et al. 1963	Whitehead et al. 1951
Eicosanoic acid (solid)	1.4E+00	1.5E-01	X			22°C	Hall et al. 1963	Whitehead et al. 1951
Docosanoic acid (solid)	1.2E+00	1.2E-01	X			22°C	Hall et al. 1963	Whitehead et al. 1951
Triacotanoic acid (solid)	2.3E+00	2.4E-01	X			22°C	Hall et al. 1963	Whitehead et al. 1951
Esters: acetates								
Methyl acetate (vapor)	2.1E+00	2.2E-01			X	27°C	Spinks and Woods 1990	Ausloos & Trumbore 1959
Methyl acetate (liquid)	9.0E-01	9.3E-02			X	Vacuum	NuPac 1989	Hall et al. 1963
	6.0E-01	6.2E-02		X		Vacuum	NuPac 1989	Hall et al. 1963
	7.6E-01	7.9E-02			X	27°C	Spinks and Woods 1990	Ausloos & Trumbore 1959
	8.7E-01	9.0E-02			X	22°C	Hall et al. 1963	Hummel 1960
	6.3E-01	6.5E-02			X	30°C	Hall et al. 1963	Kinderman 1957
Ethyl acetate	9.0E-01	9.3E-02			X	Vacuum	NuPac 1989	Hall et al. 1963
	9.0E-01	9.3E-02			X	18°C	Hall et al. 1963	Adams et al. 1959
Isopropyl acetate	9.0E-01	9.3E-02	X			Vacuum	NuPac 1989	Hall et al. 1963
	5.0E-01	5.2E-02		X		Vacuum	NuPac 1989	Hall et al. 1963
	8.6E-01	8.9E-02	X			25°C	Hall et al. 1963	Pan et al. 1958
	5.1E-01	5.3E-02			X	30°C	Hall et al. 1963	Kinderman 1957
n-propyl acetate	7.7E-01	8.0E-02	X			Vacuum, 30°C	Hall et al. 1963	Kinderman 1957
Benzyl acetate	9.0E-02	9.3E-03	X			Vacuum, 30°C	Hall et al. 1963	Kinderman 1957
Di(2-ethyl)hexyl sebacate	1.0E+00	1.0E-01			X	Vacuum	NuPac 1989	IEEE 1963
	1.0E+00	1.0E-01			X	Vacuum	NuPac 1989	Arakawa 1983
Di(2-ethyl)hexyl adipate	9.0E-01	9.3E-02			X	Vacuum	NuPac 1989	Arakawa 1983
Pentaerythritol ester	8.0E-01	8.3E-02			X	Vacuum	NuPac 1989	Arakawa 1983
Phosphate Esters: TBP is an extractant of nuclear fuel								
Tricresyl phosphate	5.0E-02	5.2E-03			X	Vacuum, aromatic	NuPac 1989	Arakawa 1983
Tributyl phosphate (TBP)	2.0E+00	2.1E-01			X		NuPac 1989	Holland 1978
Trioctyl phosphate	2.3E+00	2.4E-01			X	Vacuum	NuPac 1989	Arakawa 1983
Organic Nitrogen Compounds: amides								
Acetonitrile	6.7E-01	6.9E-02			X	Vacuum	NuPac 1989	Spinks 1976, IEEE 1963
Methylamine	5.4E+00	5.6E-01			X	Vacuum	NuPac 1989	Spinks 1976
Aniline	1.2E-01	1.2E-02			X	Vacuum	NuPac 1989	Spinks 1976
Propionamide	1.4E-01	1.5E-02			X	Vacuum	NuPac 1989	Spinks 1976
Pyrrole	2.0E-01	2.1E-02			X	Vacuum	NuPac 1989	Spinks 1976
3-pyrroline	2.3E+00	2.4E-01			X	Vacuum	NuPac 1989	Spinks 1976
Pyrrolidine	6.4E+00	6.6E-01			X	Vacuum	NuPac 1989	Spinks 1976
Pyrazole	4.0E-02	4.1E-03			X	Vacuum	NuPac 1989	Spinks 1976

<u>General Name</u>	<u>G(H2)</u> m/100eV	<u>umol/J</u>	<u>A</u>	<u>B</u>	<u>G</u>	<u>Comments</u>	<u>Reference</u>	<u>Original Source</u>
Organic Nitrogen Compounds: amides (continued)								
Tetrazole	0.0E+00	0.0E+00			X	Vacuum	NuPac 1989	Spinks 1976
Pyridine	2.5E-02	2.6E-03			X	Vacuum	NuPac 1989	Spinks 1976
Pyridazine	4.6E-02	4.8E-03			X		Spinks and Woods 1990	Berk & Gisser 1973, Lahman & Ivanoff 1967
Pyrimidine	3.0E-02	3.1E-03			X	Vacuum	NuPac 1989	Spinks 1976
mono,n-butylamine	5.6E+00	5.8E-01			X	Vacuum	NuPac 1989	Mirichi 1981

Table 4-3. Common Names and Uses of Materials to be Listed in Radcalc.

General Name	Use
Water (vapor)	
Water (liquid)	
pH = 0.5	
pH = 1.0	
pH = 2-4	
pH = 5	
pH = 8	
pH = 13	
pH = 13	
temp dependence of pure water	
Ion Exchange Resins	
Cation Resins	Water softening, metal recovery from wastes, separations
Sulfonic acid cation resin (IRN-77)	
Styrene divinylbenzene copolymer (Dowex 50Wx10)	
Phenolsulfonic acid & formaldehyde (Zeo Karb 215)	
Dowex MSC-1	
Amberlite 252	
Duoilite C-264	
Dowex 50W	
Dowex HCR-S	
Dowex 50	
Dowex 50Wx10	
KU-2x8	
KB-4P-2	
Zeo-Karb 215	
Biorad AG MP-50	
Resorcinol-Formaldehyde	
Anion Resins	Water softening, metal recovery from wastes, separations
Quaternary ammonium anion resin (IRN-78)	
Amberlite IRA-938	
Dowex 1	
Dowex SBR-OH	
Dowex 1x4	
Dowex 11	
Mixed Resins	Water softening, metal recovery from wastes, separations
IRN-150 (dehydrated-swollen)	
D-Mix	
Dowex HGR-H	
Dowex 50	
Zeo Karb 215	
Ionsiv IE-95	
Sulfonated styrene divinyl benzene and ammoniated styrene divinyl benzene mixed (Duoilite ARN-9381)	
Inorganic Resins	Water softening, metal recovery from wastes, separations
Zeolite	
Zeolite (Linde IE-95)	

General Name	Use
High Level Waste Solutions	
Simulated alkaline waste solution	
Simulated alkaline waste solution w/ EDTA or HEDTA	
Hanford Tank Waste	
101-SY	
101-SY solution simulant with organic additives	
101-SY slurry simulant with organic additives	
Waste solution/water as a function of nitrate concentration	
Mahiman curve	
[NaNO ₃] M=0.0012	
M=0.079	
M=0.15	
M=0.51	
M=1.00	
M=2.00	
M=3.00	
M=4.00	
M=5.00	
M=6.00	
M=7.00	
Walker and Bibler equation (High Activity Waste Solution)	
Grout	Solidify LLW
Grout with Synthetic CAW	
Grout with Synthetic DSS	
Solidification Binders: cements, asphalts	Solidify LLW
Vinyl ester styrene	
Epoxy	
Cement (type 2)	
Portland cement	
Tritiated Portland cement	
Cement mixed w/ TRU incinerator ash	
Portland cement	
High-aluminum cement (HAC-1)	
High-aluminum cement (HAC-2)	
Tritiated cement	
Asphalt	
Asphalt Pioneer 221	
Asphalt air blown	
Asphalt distilled	
Distilled Asphalt/ mixed resin	
Dow/Resin	
Commercial Lubricants: Oils, grease	Lubrication
Mineral oils	
Napthenic neutral oil	
Poly-alpha-olefin oil	
Ester lubricants	
Aromatic lubricants	
Silicones	Adhesives, lubricants, coolants, brake fluids, polishes
Texaco Regal-A machine oil	

General Name	Use
Commercial Lubricants: Oils, grease (continued)	
Vacuum pump oil (Duoseal)	
Vacuum oil	
Rycon grease	
Polymers: PVC, polyester, Styrofoam, cellulose, neoprene	
Polyethylene (LDPE)	Drum liners, bottles, wire insulation, packaging, bags
(LDPE)	
(LDPE)	
(HDPE Marlex-50)	
Polypropylene	Packaging film, bottles, piping, filters, strapping
Polyisobutylene	Lubricating, oil additive, adhesives, sealants, insulation
Polyvinyl alcohol	Cements and mortars, imitation sponges, printing inks
Polyethylene glycol	Solvents, polishes, ointments
Cellulose	Cotton and paper products
Cotton cellulose I	
Mixed cellulotics	
Cheesecloth (wet)	Absorbent
Kimwipes (dry)	Absorbent
Kimwipes (wet)	Absorbent
Paper tissue	Absorbent
Urea formaldehyde	Flexible foams, insulation
Polyoxymethylene	Piping
Polypropylene oxide	Urethane foams
Polybutadiene	Coating resin (liquid)
Polyisoprene	Component of natural rubber
Polymethyl methacrylate	
Polyvinyl acetate	Latex water paints, adhesives, sealant, paper coatings
Polystyrene (Styrofoam)	Packaging, thermal insulation
Polysulfone	Electrical equipment, piping, computer components
Polycarbonate	Tubes and piping, molded products, street-light globes
Polyesters	Fiber products, resin, films, fabrics
Polyester I	Fiber products, resin, films, fabrics
Polyester II	Fiber products, resin, films, fabrics
Polyester III	Fiber products, resin, films, fabrics
Polyphenyl methacrylate	
Polyvinyl chloride	Piping, building materials, flooring, coating for paper, textiles
Polychloroprene	Rubber products, adhesive cement, sealant
Neoprene	Rubber products, adhesive cement, sealant
Hypalon (pure)	Synthetic rubber products
Hypalon (commercial)	Insulation for wire and cable, shoe soles, building components
Chlorosulfanated polyethylene	Insulation for wire and cable, shoe soles, building components
Polychlorotrifluoroethylene	Chemical piping, gaskets, tank linings, wire insulation
Polytetrafluoroethylene	Gaskets, liners, seals, bearing, seals, piston rings, tape
Chlorinated polyether	Solid and lined valves, pumps, pipe and fittings
Rubber hydrochloride	Machinery coatings, rain clothing, food packaging
Polyvinylidene chloride	Food packaging, chemical piping, latex coatings, fibers
Polyamides	
Nylon 66	Composites, gears, bearings, wire insulation, coatings
Polymid MXD-6	
Nylon II	Composites, gears, bearings, wire insulation, coatings
Gloves: latex, isoprene	
Polybutadiene/copolymers	
Latex gloves	
Isoprene gloves	

General Name	Use
Saturated Hydrocarbons (vapor): fuel, solvent, natural gas	
Methane	Fuel, petrochemicals
Ethane	Fuel, petrochemicals, refrigerant
Propane	Fuel, extraction, solvent, refrigerant, gas enricher
Methylpropane	Refrigerant, motor fuels, aerosol propellant, calibration fluid
Dimethylpropane	Butyl rubber, research.
Butane	Fuel, solvent, refrigerant
Saturated Hydrocarbons (vapor): fuel, solvent, natural gas	
Isobutane	Refrigerant, motor fuels, aerosol propellant, calibration fluid
Pentane	Solvent extraction, pesticide
Neopentane	Butyl rubber, research.
Hexane	Solvent, paint diluent, calibration fluid, alcohol denaturant.
Cyclohexane	
Saturated Hydrocarbons (liquid): gasoline, kerosine, white gas, solvent...	
2,2-dimethylbutane	High octane fuel
Pentane	Solvent extraction, pesticide
2-methylpentane	Solvent
Neopentane	Butyl rubber, research
Hexane	Solvent, paint diluent, calibration fluid, alcohol denaturant.
Cyclohexane	Solvent, chemicals, paint/varnish remover, solid fuels.
Heptane	Solvent
Octane	Solvent, calibration fluid; organic cleaning solvent
Nonane	Biodegradable detergents, distillation chaser.
Decane	Solvent, standardized hydrocarbon
Dodecane	Solvent, distillation chaser.
Hexadecane	Solvent, ignition standard for diesel fuels.
Unsaturated Hydrocarbons (vapor)	
Ethene (ethylene)	
Ethyne (acetylene)	
Unsaturated Hydrocarbons (liquid)	
1-hexene	Dyes, resins, polymer modifier, perfumes
Cyclohexene	Oil extraction, catalyst solvent, organic synthesis
Aromatic Hydrocarbons (vapor)	
Benzene	Aromatic
Aromatic Hydrocarbons (liquid)	
Benzene	Solvent
Toluene (methyl benzene)	Solvents, diluent and thinner, chemicals
Ethyl toluene, o-	
m-	
p-	
xylene, p-	Insecticides
o-	Dyes, insecticides, motor fuel
m-	Solvent, insecticide, synthesis intermediate for dyes, organics
Ethylbenzene	Solvent, intermediate in styrene production
Isopropylbenzene	Solvent
tert-butylbenzene	
Chlorobenzene	Solvent, pesticide intermediate, heat transfer
Mesitylene	Intermediate, UV oxidation stabilizers for plastics
p-terphenyl	Scintillation counter
(paradiphenyl benzene)	
Biphenyl	Heat transfer agent
Halogenated Hydrocarbons: CCl₄, chloroform	
Carbon tetrachloride	Refrigerants, metal degreasing, solvents
Chlorobenzene	Solvent, heat transfer
Bromobenzene	Solvent, lube oil additive
Iodomethane (vapor)	

General Name	Use
Halogenated Hydrocarbons: CCl₄, chloroform (continued)	
Iodomethane (liquid)	Organic synthesis, microscopy, testing for pyridine
Iodoethane (liquid)	Medicine, organic synthesis
Butyl chloride (liquid)	Organic synthesis, solvent, antihelmintic
Iodobenzene	
1,1,1-trichloroethane	Solvent, metal degreasing, pesticide
Alcohols (vapor)	
Methanol (wood alcohol)	
Ethanol (grain alcohol)	
Alcohols (liquid): wood alcohol, grain alcohol, rubbing alcohol, solvents	
Methanol (wood alcohol)	Antifreeze, solvent, fuel
Ethanol (grain alcohol)	Solvent, extractant, detergents, cleaners, antifreeze, gasohol
(solid)	
1-propanol	Solvents, polishing compositions, brake fluids, antiseptic
2-propanol (rubbing alcohol)	Denaturant, lotions extraction, deicers, solvents
n-propanol	Solvents, polishing compositions, brake fluids, antiseptic
1-butanol	Solvent, hydraulic fluids, detergents
t-butanol	
n-butanol	
1-octanol	
1-decanol	Detergents, synthetic lubricants, solvents
Ethers (vapor)	
Ethyl ether	Industrial solvent, anaesthetic, extractant
Ethers (liquid)	
Ethyl ether	Industrial solvent, anaesthetic, extractant
Ethyl n-butyl ether	Extraction, solvent
Dibutyl ether	Solvent, extractions
n-butyl ether	Solvent, extractions
Ethyl tertbutyl ether	Extraction, solvent
Isopropyl ether	Solvent, extraction, rubber cements, paint-varnish remover
Di-isopropyl ether	Solvent, extraction, rubber cements, paint-varnish remover
Dioxan	
Tetrahydrofuran	Solvent
Aldehydes and Ketones: formaldehyde, acetone, solvents...	
Propionaldehyde (Disinfectant)	Disinfectant, preservative
Propanone (Acetone)	Solvent, extraction
Methyl ethyl ketone	Paint remover, cements, cleaning fluids, acrylic coatings
Diethyl ketone	Organic synthesis
Carboxylic Acids: acetic acid	
Ethanic acid (Acetic acid)	Dyes, insecticides
(solid)	
Potassium acetate	Dehydration agent, crystal glass, reagent in analytical chem
Propionic acid	Herbicides
(solid)	
Octanoic acid (solid)	
Dodecanoic acid (solid)	
Hexadecanoic acid (solid)	
Eicosanoic acid (solid)	
Docosanoic acid (solid)	
Triacotanoic acid (solid)	
Esters: acetates	
Methyl acetate (vapor)	
Methyl acetate (liquid)	Paint remover, lacquer solvent
Ethyl acetate	General solvent in coatings and plastics
Isopropyl acetate	Solvent, paints, lacquers, printing inks
n-propyl acetate	Solvent, lacquers, plastics
Benzyl acetate	Solvent, resins, oils, lacquers, polishes, printing inks

General Name	Use
Esters: acetates (continued)	
Di(2-ethyl)hexyl sebacate	Plasticizer
Di(2-ethyl)hexyl adipate	Plasticizer, solvent
Pentaerythritol ester	Insecticides, synthetic lubricants, varnishes
Phosphate Esters: TBP is an extractant of nuclear fuel	
Tricresyl phosphate	Solvent, hydraulic fluid, fire retardant for plastics
Tributyl phosphate (TBP)	Solvent, extraction, heat exchange medium
Trioctyl phosphate	Solvent
Organic Nitrogen Compounds: amides	
Acetonitrile	Solvent
Methylamine	Insecticides, fungicides, fuel additives, solvent
Aniline	Dyes, herbicides, fungicides
Propionamide	
Pyrrole	
3-pyrroline	
Pyrolidine	Fungicides, insecticides
Pyrazole	
Tetrazole	
Pyridine	Solvent, rubber chemicals, fungicides, denaturant
Pyridazine	
Pyrimidine	
mono,n-butylamine	Insecticides, rubber chemicals, dyes

listing. Table 4-3 lists the material name and the common uses or common names of the materials as found in *Hayley's Condensed Chemical Dictionary* (Sax and Lewis 1987), *The Merck Index* (Budavari 1989), and a solvent guide (Burdick and Jackson 1980). The $G(H_2)$ value database will allow the user to cross reference materials by name and use.

The $G(H_2)$ values listed are the maximum $G(H_2)$ values found in the researched literature unless previous works have been superseded by additional research. When reporting $G(H_2)$ values it is necessary to discriminate between a net $G(H_2)$ value and $G(H_2)$ molecular. The net $G(H_2)$ value is based on the total concentration of H_2 generated in an absorbing medium. For instance, in the radiolytic production of H_2 in water, the following 3 reactions generate H_2 :

The total concentration of H_2 will depend upon $G(e_{aq}^-)$, $G(H)$, and $G(H_2)$ as well as a small prompt yield of H_2 (Elliot et al. 1993). The production of related species can be dependent upon temperature and the chemical constituents found in the water and may cause a variation in the net $G(H_2)$. For this reason every effort was made to ensure that, when available, the reported $G(H_2)$ values found in Table 4-2 are net $G(H_2)$ values obtained from empirical measurements of the total radiolytic H_2 yield.

4.3 VARIATIONS IN $G(H_2)$ VALUES

$G(H_2)$ values are dependent upon a variety of factors. Radiation type, temperature, ambient atmosphere and pressure, density, and chemical constituency can all change the net $G(H_2)$ value of an absorbing medium.

4.3.1 The Effect of Radiation Type

The degree to which radiation affects a material through which it traverses is directly related to its LET. Large particles have correspondingly large LET values and affect an absorbing medium by causing wider tracks and spurs, producing a greater quantity of the radiolytic species which occur. Table 4-4 is a listing of some mean LET values in water for radionuclides commonly found in radioactive waste. The mean LET of a 5.3 MeV alpha particle in water is 136 keV per μm whereas the mean LET of a beta particle can be as low as 0.20 keV per μm (Spinks 1991).

Table 4-4. The Mean LET Values in Water of Some Common Radiation Types^a

Isotope	Energy (MeV)	Mean LET (kev μm^{-1})
α Particles		
Ra ²²⁶	4.795	145
Po ²¹⁰	5.30	136
Rn ²²²	5.49	134
	6.4 ^b	140 ^b
	18.5 ^b	80 ^b
β Particles		
H ³	0.018	2.6
Sr ⁹⁰	0.544	0.27
γ ⁹⁰	2.25	0.20
P ³²	1.71	0.21
γ LET Equivalents		
Co ⁶⁰	1.25 (av)	0.27
Cs ¹³⁷	0.662	0.52

(a) Values are from Spinks 1991 unless otherwise indicated.

(b) Burns and Sims 1980.

LET is defined as the average energy locally imparted to the absorbing medium by a charged *particle*. Therefore, strictly speaking photons do not have LET values. Photons do not react in an absorbing medium in the same manner as charged particles. However, equivalent LET values based on average attenuation allow a basis for the comparison of the behaviors of photons and particles. An average ⁶⁰Co gamma energy of 1.25 MeV is cited as having the equivalent LET of 0.27 keV per μm in water (Burns and Sims 1980) (Spinks 1991). A look at the G(H₂) values for water in Table 4-2 reflects the direct relationship of LET to G(H₂) values. The gamma G(H₂) value in water is 0.45 molecules per 100 eV, tritium beta particles produce 0.53 molecules per 100 eV, and alpha values vary according to energy, but are as high as 1.6 molecules per 100 eV, 3.5 times the gamma G(H₂) value.

By far the greatest quantity of research for G values has been performed using ⁶⁰Co sources. The majority of Table 4-2 values are based on empirical data using ⁶⁰Co sources and thus are applicable to gamma rays. In most cases, however, the G values for gamma radiation can also be used for beta radiation, as the LET values for most beta emitters are in the 0.2 range. The exception to this are tritium beta particles which have an LET value of 2.6. Tritiated waste measured data verifies the higher production of H₂, therefore tritiated waste will have higher G(H₂) values than lower LET radiation.

Radcalc will use the radiation specific $G(H_2)$ value when it is available. When no radiation specific value is available it will automatically increase the G value to account for alpha absorbed dose.

4.3.2 The Effect of Temperature

Elliot et al. of Chalk River Laboratories, Canada have performed a number of studies to characterize the effect of rising temperature on the $G(H_2)$ values in the radiolysis of water (Elliot et al. 1990) (Elliot et al. 1993). The equation below represents the temperature dependence of the $G(H_2)$ value in water:

$$G(H_2) = 0.43 + 0.69 \times 10^{-3} t \quad (4-1)$$

where t is temperature in degrees Celsius. Figure 4-1 shows a graph of the equation above and measured data from the Elliot study which is also listed in Table 4-2. The fit to the data is quite good and the equation will provide additional $G(H_2)$ values when needed. Figure 4-1 demonstrates the minimal change in the $G(H_2)$ value from 25 °C to 100 °C -- only 0.05 molecules per 100 eV. Although these results represent the effect on the radiolytic production of H_2 in water, they give a good indication that low level waste (LLW) having temperatures within this lower range will not show a marked increase of hydrogen due to increase in temperature.

4.3.3 Ion Exchange Resins

Ion exchange resins are used for the removal of ionic species from aqueous media. They have become an integral part of the radiochemical processes used in the nuclear industry and have many applications including uses in the nuclear reactor coolant cycle, activation and fission product separation systems, plutonium and other transuranics recovery processes, radioisotope production, and waste management. Ion exchange resins are divided into synthetic organic resins and inorganic resins. The synthetic organic resins are high molecular weight polyacids or bases. They are cross linked polymer tridimensional networks with attached polar exchange groups. Synthetic organic ion exchange resins are broken into the following classifications: cation exchangers, anion exchangers, ampholytes, and multifunctional exchangers. Inorganic ion exchange resins are generally hydrous oxides (Pillay 1986). Table 4-2 uses the following general categories: cation resins, anion resins, mixed resins, and inorganic resins.

The radiolytic production of gases in ion exchange resins results primarily in H_2 and CO_2 . Cation exchange resins form H_2 , CO_2 , CO , SO_2 , O_2 , and CH_4 . Anion exchange irradiation results in the radiolytic formation of H_2 , CO_2 , CO , N_2 , N_2O , and NO . The $G(H_2)$ values used for the quantification of H_2 gas have been studied by, among others, Mohorcic (Mohorcic & Kramer 1968) (Mohorcic et al. 1974), Kazanjian (Kazanjian and Horrell 1974) (Kazanjian and Stevens 1983) (Kazanjian and Killion 1982), and Bibler (Walker et al. 1992). The values reported in Table 4-2 from these and other studies show that H_2 production in ion exchange resins is directly proportional to the quantity of water left in the resins. Decreasing the moisture content of the resins will cause a proportional drop in the quantity of H_2 produced. The atmosphere

Figure 4-1. The Effect of Temperature on $G(H_2)$ Values in Water. (a)

(a) Elliot et al. 1993

surrounding the tested medium also plays an important role in H_2 production. The presence of oxygen increases the $G(H_2)$ value whereas inert gases or vacuum decreases the G value. Absorbed dose also affects the $G(H_2)$ values. The values listed in Table 4-2 reflect maximum values.

Table 4-2 presents a compilation of $G(H_2)$ values for ion exchange resins. It identifies the form of the resin and when available the conditions under which the data was collected. It represents a wide variety of resins which have been identified by product name, category, and form.

4.3.4 High Level Waste (HLW) Solutions and Slurries

High level radioactive waste solutions and slurries are currently being stored in underground tanks at different locations in DOE complexes. These solutions and slurries resulted from the processing of nuclear materials and are primarily related to weapons production. Some of the high level aqueous wastes contain nitrates and organic compounds and result in the radiolytic formation of H_2 , O_2 , N_2O , NH_3 , and CH_4 . For purposes of transportation and packaging an upper bound $G(H_2)$ value is needed to calculate the radiolytic formation of H_2 .

Studies have been conducted on Hanford Tank Waste by Argonne National Laboratory (ANL) (Meisel et al. 1993) and on Savannah River Site (SRS) waste also by ANL (Walker et al. 1992). In these studies the radiolytic H_2 yield has been directly linked to the concentration of organics present in the waste and the efficiency of nitrate scavengers. Bounding values for the gamma-related $G(H_2)$ values for both Hanford tank slurry and solution with organic additives are reported in Table 4-2. An additional report produced by Hopkins (Hopkins 1994) gives a higher $G(H_2)$ value of 0.50 molecules per 100 eV. This $G(H_2)$ value is conservative by a factor of 2 and can be considered to be bounding for all solutions and slurries in tanks on the Hanford Site for use with gamma absorbed dose. SRS simulated waste $G(H_2)$ values are also reported in Table 4-2. Neither of the ANL studies found dependency of $G(H_2)$ values on quantity of absorbed dose at 30 °C.

The addition of nitrates to waste or water reduces the formation of hydrogen. Nitrate ions react rapidly with e^-_{aq} . Also, nitrate ions are reduced to form nitrite ions and the nitrite ions react with H atoms. Mahler (Mahler 1961) performed studies of the Co^{60} irradiation of aqueous solutions containing HNO_3 . This study is the basis for the values found in Table 4-2 for $G(H_2)$ values as a function of molar nitrate concentration. Walker and Bibler (Walker and Bibler 1991) have performed additional studies and have generated an equation representing $G(H_2)$ values as a function of nitrate molar concentration. The equation is:

$$G(H_2) = 0.536 - 0.651 \left([NO_3^-] \right)^{\frac{1}{3}} + 0.268 \left([NO_3^-] \right)^{\frac{2}{3}} - 0.0352 ([NO_3^-]) \quad (4-2)$$

Figure 4-2 is a graph of the Mahlman data and the Walker and Bibler equation. As can be seen in Figure 4-2, $G(H_2)$ values are reduced with increasing nitrate molarity.

Figure 4-2. $G(H_2)$ Values as a Function of Nitrate Concentration. (a) (b)

4.3.5 The Effects of Density

An empirical study conducted by Holroyd (Holroyd 1993) investigated the relationship between the radiolytic free ion yield (G_{fi}) in liquid hydrocarbons and a number of factors. One such factor was density. Holroyd determined empirically that increasing density resulted in increased recombination of radiolytically produced species and decreased G_{fi} . This would imply that as density increases $G(H_2)$ values would also decrease. However, in work conducted on ion exchange resins by Henrie (Henrie et al. 1985) a plot of $G(H_2)$ values versus the specific gravity of resins shows an increase in $G(H_2)$ values with an increase in specific gravity. The plot conveyed by Henrie is based on literature research, not on empirical data. It is recommended, therefore, that additional empirical studies be performed on the density dependence of G values before use is made of these reports.

4.4 CONCLUSION

G values for the production of hydrogen have been extensively researched in the open literature. The resulting data base will be used in the code Radcalc to calculate the generation of hydrogen related to transportation and packaging.

5.0 CONCLUSION

Radcalc is a computer code used to calculate the generation of hydrogen gas in low level radioactive waste containers for purposes of transportation and packaging. It is currently offered in spreadsheet format and is limited in scope and accuracy. A new version of Radcalc is being produced which will increase the usefulness and accuracy of Radcalc.

The new computer code will be written in C programming language and will be offered with a Windows compatible front end. The radionuclide data base has been expanded from 96 radionuclides to include approximately 300 radionuclides. The number of packages with pre-calculated gamma absorption fractions has been expanded from four to fourteen. An extensive $G(H_2)$ value data base has been compiled which contains information for a wide variety of materials found in low level waste and high level waste solutions and slurries. The new Radcalc will automatically adjust G values to correspond with radiation type.

Work in progress includes the expansion of the Radcalc library to include 49 CFR 173 transportation data for all radionuclides. Transportation updates will comply with the latest DOT regulations. Thermal output and pressure calculations will be checked and updated if necessary. Gamma absorption fractions will be calculated on-line for user-input dimensions of specific container types. The code will be extensively tested and benchmarked. Final documentation for Radcalc will include a User's Manual and technical report.

6.0 RADCALC ISOTOPE INFORMATION DATA FILE

Z	A	ISOTOPE	HALFLIFE	Avg.Beta (eV)	Low X-Ray (eV)	Avg. Alpha (eV)	Gamma (eV)	Abundance (%)
1	3	H3	0.389097E+09	0.569000E+04	0.000000E+00	0.000000E+00	0.000000E+00	
6	11	C11	0.122310E+04	0.384600E+06	0.000000E+00	0.000000E+00	0.000000E+00	
6	14	C14	0.180821E+12	0.494700E+05	0.000000E+00	0.000000E+00	0.000000E+00	
7	13	N13	0.597900E+03	0.490900E+06	0.296400E+04	0.000000E+00	0.000000E+00	
9	18	F18	0.658620E+04	0.242100E+06	0.990000E+06	0.000000E+00	0.000000E+00	
11	22	Na22	0.821111E+08	0.194030E+06	0.918700E+06	0.000000E+00	0.127450E+07	0.999440E+02
11	24	Na24	0.527724E+05	0.553710E+06	0.918700E+06	0.000000E+00	0.997700E+06	0.100000E-02
0					0.136860E+07	0.100000E+03		
0					0.275400E+07	0.999440E+02		
0					0.286960E+07	0.100000E-02		
0					0.386720E+07	0.520000E-01		
12	28	Mg28	0.752760E+05	0.154200E+06	0.918700E+06	0.000000E+00	0.306400E+05	0.660000E+02
0					0.400690E+06	0.366000E+02		
0					0.607100E+06	0.100000E-01		
0					0.647890E+06	0.900000E-01		
0					0.941450E+06	0.383000E+02		
0					0.982900E+06	0.200000E-01		
0					0.101350E+07	0.700000E-02		
0					0.134220E+07	0.526000E+02		
0					0.137290E+07	0.470000E+01		
0					0.158940E+07	0.420000E+01		
0					0.162000E+07	0.300000E+00		
14	31	Si31	0.943920E+04	0.595120E+06	0.149445E-05	0.000000E+00	0.126610E+07	0.700000E-01
15	32	P32	0.123206E+07	0.694900E+06	0.149445E-05	0.000000E+00	0.000000E+00	
16	35	S35	0.756100E+07	0.486300E+05	0.149445E-05	0.000000E+00	0.000000E+00	
17	36	Cl36	0.949863E+13	0.850000E+00	0.204000E+02	0.000000E+00	0.000000E+00	
17	38	Cl38	0.223400E+04	0.155000E+07	0.204000E+02	0.000000E+00	0.164270E+07	0.309960E+02
0					0.216770E+07	0.420000E+02		
0					0.381030E+07	0.256200E-01		
18	37	Ar37	0.302746E+07	0.000000E+00	0.360000E+03	0.000000E+00	0.000000E+00	
18	41	Ar41	0.657720E+04	0.463660E+06	0.360000E+03	0.000000E+00	0.129360E+07	0.991600E+02
0					0.167700E+07	0.515632E-01		
19	40	K40	0.402982E+17	0.200000E+01	0.432000E+02	0.000000E+00	0.146080E+07	0.106700E+02
19	42	K42	0.444960E+05	0.142500E+07	0.105000E-01	0.000000E+00	0.312350E+06	0.349680E+00
0					0.328410E+06	0.244400E-04		
0					0.693900E+06	0.338400E-02		
0					0.898990E+06	0.535800E-01		
0					0.102260E+07	0.208680E-01		
0					0.122760E+07	0.244400E-02		
0					0.152460E+07	0.188000E+02		
0					0.192180E+07	0.428640E-01		
0					0.242380E+07	0.208680E-01		
19	43	K43	0.803000E+05	0.314000E+06	0.105000E-01	0.000000E+00	0.184000E+06	0.266760E+00
0					0.372810E+06	0.867464E+02		
0					0.396930E+06	0.113620E+02		
0					0.404280E+06	0.108680E+00		
0					0.593390E+06	0.109668E+02		
0					0.617510E+06	0.800280E+02		
0					0.801200E+06	0.146224E+00		
0					0.990310E+06	0.326040E+00		
0					0.101510E+07	0.158080E+00		

0				0.102180E+07	0.186732E+01		
0				0.139460E+07	0.101764E+00		
20	45	Ca45	0.141523E+08	0.771000E+05	0.105000E-01	0.000000E+00	0.124700E+05 0.342000E-05
20	47	Ca47	0.391910E+06	0.351000E+06	0.700000E-01	0.000000E+00	0.410600E+05 0.614200E-02
0				0.489230E+06	0.651200E+01		
0				0.530600E+06	0.947200E-01		
0				0.731600E+06	0.125800E-01		
0				0.767100E+06	0.199060E+00		
0				0.807860E+06	0.651200E+01		
0				0.114660E+07	0.148000E-01		
0				0.129710E+07	0.740000E+02		
0				0.187800E+07	0.281200E-01		
21	46	Sc46	0.724118E+07	0.111970E+06	0.233000E+00	0.000000E+00	0.889280E+06 0.999840E+02
0				0.112050E+07	0.999870E+02		
0				0.201000E+07	0.130000E-04		
21	47	Sc47	0.289008E+06	0.162800E+06	0.383000E+01	0.000000E+00	0.159380E+06 0.679000E+02
21	48	Sc48	0.157320E+06	0.227000E+06	0.276000E+00	0.000000E+00	0.175360E+06 0.747000E+01
0				0.983520E+06	0.100000E+03		
0				0.103750E+07	0.975000E+02		
0				0.121290E+07	0.238000E+01		
0				0.131210E+07	0.100000E+03		
23	48	V48	0.138020E+07	0.146000E+06	0.512500E+06	0.000000E+00	0.803250E+06 0.150000E+00
0				0.928330E+06	0.770000E+00		
0				0.944130E+06	0.776000E+01		
0				0.983520E+06	0.100000E+03		
0				0.131210E+07	0.975000E+02		
0				0.143730E+07	0.120000E+00		
0				0.224040E+07	0.241000E+01		
0				0.225600E+07	0.400000E-02		
0				0.237510E+07	0.100000E-01		
0				0.242180E+07	0.100000E-01		
24	51	Cr51	0.239363E+07	0.000000E+00	0.112000E+04	0.000000E+00	0.320080E+06 0.100800E+02
25	52	Mn52	0.483100E+06	0.715000E+05	0.303500E+06	0.000000E+00	0.270000E-02 0.760000E-01
0				0.346020E+06	0.987000E+00		
0				0.398090E+06	0.890000E-01		
0				0.399570E+06	0.181000E+00		
0				0.502060E+06	0.213000E+00		
0				0.600160E+06	0.390000E+00		
0				0.647470E+06	0.409000E+00		
0				0.744230E+06	0.906000E+02		
0				0.848180E+06	0.335000E+01		
0				0.901890E+06	0.440000E-01		
0				0.935540E+06	0.949000E+02		
0				0.104570E+07	0.200000E-01		
0				0.124630E+07	0.423000E+01		
0				0.124790E+07	0.380000E+00		
0				0.133360E+07	0.507000E+01		
0				0.143410E+07	0.100000E+03		
0				0.144100E+07	0.300000E-02		
0				0.164580E+07	0.500000E-01		
0				0.183910E+07	0.500000E-02		
0				0.198110E+07	0.350000E-01		
0				0.225740E+07	0.270000E-02		
25	54	Mn54	0.269672E+08	0.000000E+00	0.137589E+04	0.000000E+00	0.834840E+06 0.999760E+02
25	56	Mn56	0.928260E+04	0.831000E+06	0.639000E+00	0.000000E+00	0.846750E+06 0.988700E+02
0				0.103780E+07	0.395480E-01		
0				0.123830E+07	0.988700E-01		
0				0.181070E+07	0.271892E+02		
0				0.211310E+07	0.143361E+02		
0				0.252290E+07	0.988700E+00		
0				0.259840E+07	0.187853E-01		
0				0.265740E+07	0.652542E+00		
0				0.295980E+07	0.306497E+00		

[illegible]

27	58	Co58	0.612714E+07	0.302010E+05	0.155000E+06	0.000000E+00	0.810770E+06	0.994530E+02
0					0.863960E+06	0.676280E+00		
0					0.167470E+07	0.517156E+00		
27	58	Co58m	0.329000E+05	0.210000E+05	0.186400E+04	0.000000E+00	0.248890E+05	0.369000E-01
27	60	Co60	0.166349E+09	0.964000E+05	0.830000E+00	0.000000E+00	0.346930E+06	0.760000E-02
0					0.826280E+06	0.760000E-02		
0					0.117320E+07	0.999000E+02		
0					0.133250E+07	0.999820E+02		
0					0.215880E+07	0.111000E-02		
0					0.250500E+07	0.200000E-05		
28	59	Ni59	0.236677E+13	0.000000E+00	0.295000E+04	0.000000E+00	0.000000E+00	
28	63	Ni63	0.315885E+10	0.171400E+05	0.295000E+04	0.000000E+00	0.000000E+00	
28	65	Ni65	0.907200E+04	0.635000E+06	0.295000E+04	0.000000E+00	0.366270E+06	0.460600E+01
0					0.507900E+06	0.279650E+00		
0					0.609500E+06	0.143350E+00		
0					0.770600E+06	0.846000E-01		
0					0.852700E+06	0.752000E-01		
0					0.954500E+06	0.940000E-02		
0					0.111550E+07	0.148285E+02		
0					0.148180E+07	0.235000E+02		
0					0.162340E+07	0.474700E+00		
0					0.172490E+07	0.387750E+00		
29	64	Cu64	0.457236E+05	0.498000E+05	0.184200E+06	0.000000E+00	0.134580E+07	0.484330E+00
29	67	Cu67	0.222900E+06	0.162000E+06	0.559200E+03	0.000000E+00	0.912660E+05	0.700000E+01
0					0.933110E+05	0.161000E+02		
0					0.184580E+06	0.487000E+02		
0					0.208950E+06	0.120000E+00		
0					0.300220E+06	0.797000E+00		
0					0.393530E+06	0.220000E+00		
30	65	Zn65	0.210730E+08	0.202000E+04	0.176000E+05	0.000000E+00	0.344950E+06	0.300000E-02
0					0.770600E+06	0.300000E-02		
0					0.111550E+07	0.507000E+02		
30	69	Zn69	0.338000E+04	0.321400E+06	0.176000E+05	0.000000E+00	0.318400E+06	0.120000E-02
30	69	Zn69m	0.495400E+05	0.220000E+05	0.189800E+03	0.000000E+00	0.438630E+06	0.947700E+02
31	67	Ga67	0.281750E+06	0.222370E+04	0.485000E+04	0.000000E+00	0.912660E+05	0.296000E+01
0					0.933110E+05	0.370000E+02		
0					0.184580E+06	0.204000E+02		
0					0.208950E+06	0.233000E+01		
0					0.300220E+06	0.166000E+02		
0					0.393530E+06	0.464000E+01		
0					0.494170E+06	0.680000E-01		
0					0.703110E+06	0.108000E-01		
0					0.794390E+06	0.509000E-01		
0					0.887690E+06	0.144000E+00		
31	68	Ga68	0.405770E+04	0.740000E+06	0.911200E+06	0.000000E+00	0.578400E+06	0.300000E-01
0					0.805900E+06	0.885000E-01		
0					0.107740E+07	0.300000E+01		
0					0.126130E+07	0.900000E-01		
0					0.188320E+07	0.129900E+00		
0					0.233800E+07	0.150000E-02		
0					0.282200E+07	0.450000E-03		
31	72	Ga72	0.507600E+05	0.500000E+06	0.477000E+01	0.000000E+00	0.545091E-01	0.100411E-01
0					0.430335E-01	0.135795E+00		
0					0.320360E+01	0.573780E-02		
0					0.200823E+01	0.109018E-01		
0					0.956300E+02	0.229512E-01		
0					0.913266E+00	0.191260E+00		
0					0.726788E-01	0.210386E-01		
0					0.987858E+01	0.219949E-01		
0					0.142489E+00	0.107106E+00		

0	0.765040E-01	0.272545E+00
0	0.259157E+00	0.325142E-01
0	0.110357E+01	0.197954E+00
0	0.334705E-01	0.937174E-01
0	0.798510E+00	0.908485E-01
0	0.650284E-01	0.564217E-01
0	0.210386E-01	0.545091E-01
0	0.691405E+01	0.121450E+00
0	0.105193E-01	0.553698E+01
0	0.745914E-01	0.247682E+02
0	0.353831E-01	0.367219E+00
0	0.788947E+00	0.545091E-01
0	0.145358E+01	0.430335E-01
0	0.112843E+01	0.320360E+01
0	0.156451E+01	0.200823E+01
0	0.564217E-01	0.956300E+02
0	0.851107E-01	0.913266E+00
0	0.354787E+01	0.726788E-01
0	0.191260E-01	0.987858E+01
0	0.315579E-01	0.142489E+00
0	0.162571E-01	0.765040E-01
0	0.198910E+00	0.259157E+00
0	0.817636E+00	0.110357E+01
0	0.423641E+01	0.334705E-01
0	0.392083E-01	0.798510E+00
0	0.325142E-01	0.650284E-01
0	0.898922E+00	0.210386E-01
0	0.388258E+00	0.691405E+01
0	0.449461E-01	0.105193E-01
0	0.209430E+00	0.745914E-01
0	0.525009E+01	0.353831E-01
0	0.231425E+00	0.788947E+00
0	0.157789E+00	0.145358E+01
0	0.111887E+00	0.112843E+01
0	0.123363E+00	0.156451E+01
0	0.104237E+01	0.564217E-01
0	0.259157E+02	0.851107E-01
0	0.177872E+00	0.354787E+01
0	0.239075E-01	0.191260E-01
0	0.153008E-01	0.315579E-01
0	0.767909E+01	0.162571E-01
0	0.127762E+02	0.198910E+00
0	0.249594E+00	0.817636E+00
0	0.143445E-01	0.423641E+01
0	0.181697E-01	0.392083E-01
0	0.131969E+00	0.325142E-01
0	0.145358E-01	0.898922E+00
0	0.297409E-01	0.388258E+00
0	0.430335E+00	0.449461E-01
0	0.478150E-02	0.209430E+00
0	0.105193E-01	0.525009E+01
0	0.382520E-02	0.231425E+00
0	0.545091E-01	0.157789E+00
0	0.459024E-02	0.111887E+00
0	0.286890E-02	0.123363E+00
0	0.167353E-01	0.104237E+01
0	0.306016E-02	0.259157E+02
0	0.325142E-02	0.177872E+00
0	0.240220E+07	0.239075E-01
0	0.240430E+07	0.153008E-01
0	0.249100E+07	0.767909E+01
0	0.250780E+07	0.127762E+02
0	0.251500E+07	0.249594E+00
0	0.258340E+07	0.143445E-01
0	0.260550E+07	0.181697E-01
0	0.262110E+07	0.131969E+00
0	0.263390E+07	0.145358E-01
0	0.278510E+07	0.297409E-01
0	0.284400E+07	0.430335E+00
0	0.289710E+07	0.478150E-02
0	0.293960E+07	0.105193E-01
0	0.295000E+07	0.382520E-02
0	0.298110E+07	0.545091E-01

0				0.303460E+07	0.459024E-02		
0				0.306700E+07	0.286890E-02		
0				0.309370E+07	0.167353E-01		
0				0.332460E+07	0.306016E-02		
0				0.333830E+07	0.325142E-02		
32	68	Ge68	0.233990E+08	0.000000E+00	0.964900E+06	0.000000E+00	0.000000E+00
32	71	Ge71	0.988000E+06	0.000000E+00	0.244000E+06	0.000000E+00	0.000000E+00
33	73	As73	0.693800E+07	0.258200E+04	0.103300E+05	0.000000E+00	0.132630E+05 0.890000E-01
0				0.534370E+05	0.103400E+02		
33	74	As74	0.153530E+07	0.129000E+06	0.301300E+06	0.000000E+00	0.595830E+06 0.590000E+02
0				0.608430E+06	0.552000E+00		
0				0.634780E+06	0.154000E+02		
0				0.715300E+06	0.710000E-02		
0				0.734200E+06	0.360000E-02		
0				0.867200E+06	0.457400E-02		
0				0.887000E+06	0.255000E-01		
0				0.993460E+06	0.184000E-01		
0				0.110110E+07	0.710000E-02		
0				0.120430E+07	0.285000E+00		
0				0.126960E+07	0.180000E-02		
0				0.160250E+07	0.710000E-02		
0				0.219820E+07	0.148000E-01		
33	76	As76	0.947520E+05	0.106600E+07	0.603000E+01	0.000000E+00	0.117000E+00 0.900000E-02
0				0.450000E-03	0.135000E-01		
0				0.121500E+00	0.234000E-01		
0				0.900000E-03	0.135000E-02		
0				0.450000E-02	0.355500E-01		
0				0.171000E-01	0.900000E-03		
0				0.225000E-02	0.450000E-02		
0				0.900000E-03	0.495000E-01		
0				0.112500E-01	0.585000E-02		
0				0.130500E+00	0.450000E+02		
0				0.585000E-01	0.120150E+01		
0				0.180000E-02	0.139500E+00		
0				0.900000E-03	0.675000E-01		
0				0.180000E-02	0.900000E-03		
0				0.180000E-02	0.360000E-02		
0				0.414000E-01	0.616500E+01		
0				0.900000E-03	0.360000E-01		
0				0.180000E-02	0.364500E+00		
0				0.360000E-02	0.900000E-02		
0				0.126000E+00	0.184500E-01		
0				0.180000E-01	0.117000E+00		
0				0.144000E+01	0.450000E-03		
0				0.342000E+01	0.121500E+00		
0				0.121500E+01	0.900000E-03		
0				0.279000E+00	0.450000E-02		
0				0.108000E+00	0.171000E-01		
0				0.900000E-03	0.225000E-02		
0				0.243000E-01	0.900000E-03		
0				0.180000E-02	0.112500E-01		
0				0.765000E-02	0.130500E+00		
0				0.765000E-02	0.585000E-01		
0				0.292500E+00	0.180000E-02		
0				0.135000E-02	0.900000E-03		
0				0.540000E-01	0.180000E-02		
0				0.900000E-03	0.180000E-02		
0				0.900000E-02	0.414000E-01		
0				0.549000E+00	0.900000E-03		
0				0.328500E+00	0.180000E-02		
0				0.135000E-02	0.360000E-02		
0				0.315000E-01	0.126000E+00		
0				0.436500E-01	0.180000E-01		
0				0.270000E-03	0.144000E+01		
0				0.121610E+07	0.342000E+01		
0				0.122850E+07	0.121500E+01		
0				0.143910E+07	0.279000E+00		
0				0.145360E+07	0.108000E+00		

0				0.146700E+07	0.900000E-03		
0				0.153280E+07	0.243000E-01		
0				0.156300E+07	0.180000E-02		
0				0.156790E+07	0.765000E-02		
0				0.161120E+07	0.765000E-02		
0				0.178770E+07	0.292500E+00		
0				0.180500E+07	0.135000E-02		
0				0.187000E+07	0.540000E-01		
0				0.188130E+07	0.900000E-03		
0				0.195570E+07	0.900000E-02		
0				0.209630E+07	0.549000E+00		
0				0.211080E+07	0.328500E+00		
0				0.212700E+07	0.135000E-02		
0				0.242900E+07	0.315000E-01		
0				0.265530E+07	0.436500E-01		
0				0.266970E+07	0.270000E-03		
33	77	As77	0.139788E+06	0.226100E+06	0.410000E+01	0.000000E+00	0.622000E+05 0.398500E-02
0					0.820000E+05	0.478200E-03	
0					0.880000E+05	0.274168E+00	
0					0.139200E+06	0.100422E-01	
0					0.200600E+06	0.956400E-03	
0					0.239100E+06	0.159400E+01	
0					0.250000E+06	0.406470E+00	
0					0.270800E+06	0.765120E-02	
0					0.281600E+06	0.541960E-01	
0					0.439700E+06	0.797000E-03	
0					0.520780E+06	0.425598E+00	
34	75	Se75	0.103481E+08	0.000000E+00	0.602000E+04	0.000000E+00	0.246000E+05 0.325050E-01
0					0.660600E+05	0.114063E+01	
0					0.810000E+05	0.709200E-02	
0					0.967340E+05	0.348099E+01	
0					0.121120E+06	0.173163E+02	
0					0.136000E+06	0.589818E+02	
0					0.198600E+06	0.147159E+01	
0					0.249200E+06	0.945600E-04	
0					0.264660E+06	0.591000E+02	
0					0.279540E+06	0.251766E+02	
0					0.303920E+06	0.134157E+01	
0					0.373500E+06	0.248220E-02	
0					0.400660E+06	0.115600E+02	
0					0.418800E+06	0.106380E-01	
0					0.468600E+06	0.354600E-03	
0					0.542200E+06	0.130020E-03	
0					0.556400E+06	0.354600E-04	
0					0.572200E+06	0.295500E-01	
0					0.617800E+06	0.366420E-02	
0					0.821600E+06	0.165480E-03	
34	79	Se79	0.104138E+13	0.529000E+05	0.602000E+04	0.000000E+00	0.000000E+00
35	77	Br77	0.205330E+06	0.112000E+04	0.134400E+05	0.000000E+00	0.117810E+01 0.288750E-01
0					0.231000E-01	0.207900E-01	
0					0.669900E-01	0.139986E+01	
0					0.623700E-02	0.924000E-02	
0					0.600600E-01	0.129360E+00	
0					0.924000E-02	0.254100E-02	
0					0.836220E+00	0.577500E-02	
0					0.224070E-01	0.110187E+01	
0					0.739200E-02	0.284130E+00	
0					0.164010E-01	0.577500E-01	
0					0.219450E-01	0.231000E-02	
0					0.156387E+01	0.121275E+01	
0					0.785400E-02	0.623700E-01	
0					0.100023E+01	0.231000E+02	
0					0.900900E-02	0.369600E-01	
0					0.161700E+00	0.297990E+01	
0					0.224070E+02	0.321090E+00	
0					0.392700E-01	0.323400E-01	
0					0.427350E+00	0.228690E+01	
0					0.857010E+00	0.415800E+01	
0					0.118734E+01	0.117810E+01	

0				0.295680E+01	0.231000E-01		
0				0.156849E+01	0.669900E-01		
0				0.214830E-01	0.623700E-02		
0				0.808500E-01	0.600600E-01		
0				0.159390E-01	0.924000E-02		
0				0.295680E-01	0.836220E+00		
0				0.166782E+01	0.224070E-01		
0				0.415800E-01	0.739200E-02		
0				0.924000E-02	0.164010E-01		
0				0.207900E+01	0.219450E-01		
0				0.131670E-01	0.156387E+01		
0				0.831600E-02	0.785400E-02		
0				0.254100E-02	0.100023E+01		
0				0.277200E-02	0.900900E-02		
0				0.369600E-02	0.161700E+00		
0				0.924000E+00	0.224070E+02		
0				0.161700E-02	0.392700E-01		
0				0.924000E-03	0.427350E+00		
0				0.567900E+06	0.857010E+00		
0				0.574640E+06	0.118734E+01		
0				0.578910E+06	0.295680E+01		
0				0.585480E+06	0.156849E+01		
0				0.610390E+06	0.214830E-01		
0				0.662430E+06	0.808500E-01		
0				0.704090E+06	0.159390E-01		
0				0.749550E+06	0.295680E-01		
0				0.755350E+06	0.166782E+01		
0				0.766110E+06	0.415800E-01		
0				0.791260E+06	0.924000E-02		
0				0.817790E+06	0.207900E+01		
0				0.824280E+06	0.131670E-01		
0				0.885710E+06	0.831600E-02		
0				0.911400E+06	0.254100E-02		
0				0.929400E+06	0.277200E-02		
0				0.980800E+06	0.369600E-02		
0				0.100500E+07	0.924000E+00		
0				0.118680E+07	0.161700E-02		
0				0.123050E+07	0.924000E-03		
35	82	B r82	0.127080E+06	0.144000E+06	0.293000E+02	0.000000E+00	0.793630E-01 0.718444E+00
0					0.618196E+00	0.701736E-01	
0					0.584780E-02	0.300744E-01	
0					0.175434E-01	0.152043E+00	
0					0.860462E-01	0.100248E-01	
0					0.264822E+02	0.226393E+01	
0					0.163154E+02	0.801984E+00	
0					0.742671E+00	0.902232E-01	
0					0.113614E+00	0.910586E-02	
0					0.250620E-01	0.707584E+02	
0					0.390967E-01	0.133664E-01	
0					0.606340E+06	0.121133E+01	
0					0.619110E+06	0.434408E+02	
0					0.698370E+06	0.284871E+02	
0					0.735640E+06	0.751860E-01	
0					0.776520E+06	0.835400E+02	
0					0.827830E+06	0.240345E+02	
0					0.952020E+06	0.367576E+00	
0					0.100760E+07	0.127148E+01	
0					0.104400E+07	0.272340E+02	
0					0.107300E+07	0.793630E-01	
0					0.108130E+07	0.618196E+00	
0					0.109950E+07	0.584780E-02	
0					0.117400E+07	0.175434E-01	
0					0.118030E+07	0.860462E-01	
0					0.131750E+07	0.264822E+02	
0					0.147490E+07	0.163154E+02	
0					0.165040E+07	0.742671E+00	
0					0.177970E+07	0.113614E+00	
0					0.187160E+07	0.250620E-01	
0					0.195670E+07	0.390967E-01	
36	85	Kr85	0.338290E+09	0.250800E+06	0.249000E+00	0.000000E+00	0.514010E+06 0.433854E+00

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0				0.928000E-02	0.139200E-01		
0				0.324800E-01	0.832880E+00		
0				0.928000E-02	0.164720E+00		
0				0.464000E-02	0.812000E+00		
0				0.417600E-01	0.464000E-02		
0				0.139200E-01	0.464000E-02		
0				0.968400E+06	0.116000E-02		
0				0.977150E+06	0.563760E+00		
0				0.993690E+06	0.160080E-01		
0				0.102510E+07	0.812000E-02		
0				0.104120E+07	0.533600E+00		
0				0.104790E+07	0.464000E-01		
0				0.106940E+07	0.603200E-01		
0				0.108770E+07	0.696000E-02		
0				0.109010E+07	0.208800E-01		
0				0.110000E+07	0.111360E+00		
0				0.110800E+07	0.510400E-01		
0				0.113640E+07	0.116000E-01		
0				0.136380E+07	0.464000E-02		
0				0.136810E+07	0.951200E+00		
0				0.138150E+07	0.928000E-02		
0				0.142780E+07	0.324800E-01		
0				0.148710E+07	0.928000E-02		
0				0.153600E+07	0.464000E-02		
0				0.155430E+07	0.417600E-01		
0				0.187400E+07	0.139200E-01		
37	86	Rb86	0.160972E+07	0.000000E+00	0.750000E+00	0.000000E+00	0.107700E+07 0.864000E+01
37	87	Rb87	0.151473E+19	0.817000E+05	0.750000E+00	0.000000E+00	0.000000E+00
38	85	Sr85	0.560218E+07	0.000000E+00	0.801830E+04	0.000000E+00	0.514010E+06 0.992700E+02
0					0.868350E+06	0.119124E-01	
38	85	Sr85m	0.405960E+04	0.000000E+00	0.130100E+04	0.000000E+00	0.694000E+04 0.393000E-05
0					0.151170E+06	0.121000E+02	
0					0.231650E+06	0.844100E+02	
0					0.238620E+06	0.340000E+00	
38	87	Sr87m	0.101160E+05	0.000000E+00	0.148000E+04	0.000000E+00	0.388400E+06 0.822625E+02
38	89	Sr89	0.436752E+07	0.583300E+06	0.148000E+04	0.000000E+00	0.000000E+00
38	90	Sr90	0.888327E+09	0.195900E+06	0.148000E+04	0.000000E+00	0.000000E+00
38	91	Sr91	0.342720E+05	0.642000E+06	0.852000E+01	0.000000E+00	0.574480E+00 0.734800E-01
0					0.634600E-01	0.447560E+00	
0					0.160320E+00	0.260520E+00	
0					0.668000E-01	0.103206E+01	
0					0.187040E+00	0.501000E-01	
0					0.701400E-01	0.146960E+00	
0					0.935200E-01	0.501000E-01	
0					0.384100E+01	0.801600E-01	
0					0.400800E-01	0.434200E-01	
0					0.434200E-01	0.334000E-01	
0					0.334000E+02	0.768200E-01	
0					0.223780E+00	0.935200E-01	
0					0.126920E+00	0.177020E+01	
0					0.931860E+00	0.434200E-01	
0					0.167000E-01	0.554440E+00	
0					0.400800E-01	0.297260E+01	
0					0.233800E-01	0.801600E+01	
0					0.978620E+00	0.367400E+00	
0					0.167000E+00	0.100200E+00	
0					0.133600E-01	0.236138E+02	
0					0.668000E-01	0.574480E+00	
0					0.167000E-01	0.634600E-01	
0					0.133600E-01	0.160320E+00	
0					0.300600E-02	0.668000E-01	
0					0.290580E+00	0.187040E+00	
0					0.160320E+00	0.701400E-01	
0					0.400800E-02	0.935200E-01	
0					0.434200E-02	0.384100E+01	

0				0.973900E+06	0.400800E-01		
0				0.992200E+06	0.434200E-01		
0				0.102430E+07	0.334000E+02		
0				0.105460E+07	0.223780E+00		
0				0.114080E+07	0.126920E+00		
0				0.128090E+07	0.931860E+00		
0				0.130530E+07	0.167000E-01		
0				0.132740E+07	0.400800E-01		
0				0.135350E+07	0.233800E-01		
0				0.141340E+07	0.978620E+00		
0				0.147380E+07	0.167000E+00		
0				0.148640E+07	0.133600E-01		
0				0.154590E+07	0.668000E-01		
0				0.155360E+07	0.167000E-01		
0				0.162680E+07	0.133600E-01		
0				0.164600E+07	0.300600E-02		
0				0.165140E+07	0.290580E+00		
0				0.172400E+07	0.160320E+00		
0				0.201600E+07	0.400800E-02		
0				0.241230E+07	0.434200E-02		
38	92	Sr92	0.975600E+04	0.176000E+06	0.129000E+01	0.000000E+00	0.241520E+06 0.297000E+01
0					0.352500E+06	0.540000E-01	
0					0.430560E+06	0.333000E+01	
0					0.463400E+06	0.360000E-01	
0					0.491300E+06	0.261000E+00	
0					0.650800E+06	0.369000E+00	
0					0.892200E+06	0.990000E-01	
0					0.953320E+06	0.360000E+01	
0					0.114230E+07	0.288000E+01	
0					0.138390E+07	0.900000E+02	
39	87	Y87	0.289100E+06	0.420000E+03	0.108700E+05	0.000000E+00	0.484900E+06 0.922000E+02
39	90	Y90	0.230760E+06	0.934000E+06	0.170000E+01	0.000000E+00	0.218630E+07 0.140000E-05
39	91	Y91	0.505526E+07	0.603400E+06	0.140000E-01	0.000000E+00	0.120490E+07 0.300000E+00
39	91	Y91m	0.298260E+04	0.272000E+05	0.459000E+03	0.000000E+00	0.555610E+06 0.949000E+02
39	92	Y92	0.127440E+05	0.143600E+07	0.353000E+01	0.000000E+00	0.448500E+06 0.233520E+01
0					0.492600E+06	0.485110E+00	
0					0.561100E+06	0.240470E+01	
0					0.844300E+06	0.125100E+01	
0					0.912800E+06	0.628280E+00	
0					0.934500E+06	0.139000E+02	
0					0.972300E+06	0.681100E-01	
0					0.113240E+07	0.243250E+00	
0					0.140540E+07	0.478160E+01	
0					0.184730E+07	0.360010E+00	
0					0.188510E+07	0.279390E-01	
0					0.198860E+07	0.611600E-02	
0					0.206700E+07	0.417000E-01	
0					0.210560E+07	0.190430E-01	
0					0.233990E+07	0.143170E-01	
0					0.243700E+07	0.305800E-02	
0					0.247340E+07	0.514300E-02	
0					0.281980E+07	0.417000E-02	
0					0.326390E+07	0.111200E-02	
0					0.337120E+07	0.305800E-02	
39	93	Y93	0.363600E+05	0.117200E+07	0.180000E+02	0.000000E+00	0.489600E-01 0.680000E+01
0					0.224400E-01	0.646000E-01	
0					0.224400E-01	0.700400E-01	
0					0.142800E+01	0.408000E-01	
0					0.144160E+00	0.680000E-03	
0					0.155040E+00	0.601120E+00	
0					0.612000E-02	0.156400E-01	
0					0.102000E-01	0.190400E+01	
0					0.102000E-01	0.108800E-01	
0					0.971000E+06	0.612000E-02	
0					0.987700E+06	0.952000E-02	
0					0.115850E+07	0.272000E-01	

0				0.116850E+07	0.136000E-01		
0				0.118350E+07	0.319600E-01		
0				0.118470E+07	0.183600E-01		
0				0.120330E+07	0.972400E-01		
0				0.123740E+07	0.224400E-01		
0				0.142530E+07	0.217600E+00		
0				0.145050E+07	0.296480E+00		
0				0.147010E+07	0.550800E-01		
0				0.164270E+07	0.489600E-01		
0				0.165170E+07	0.224400E-01		
0				0.182770E+07	0.224400E-01		
0				0.191770E+07	0.142800E+01		
0				0.218450E+07	0.144160E+00		
0				0.219080E+07	0.155040E+00		
0				0.245730E+07	0.612000E-02		
0				0.247380E+07	0.102000E-01		
0				0.260500E+07	0.102000E-01		
40	93	Zr93	0.482821E+14	0.190000E+05	0.180000E+02	0.000000E+00	0.000000E+00
40	95	Zr95	0.553133E+07	0.118400E+06	0.157000E+02	0.000000E+00	0.724200E+06 0.441450E+02
0					0.756730E+06	0.545000E+02	
40	97	Zr97	0.608400E+05	0.712000E+06	0.960000E+01	0.000000E+00	0.104225E+00 0.568500E-01
0					0.104225E+01	0.284250E-01	
0					0.284250E-01	0.379000E-01	
0					0.189500E+00	0.663250E-01	
0					0.123175E+00	0.180025E+00	
0					0.663250E+00	0.128860E+01	
0					0.568500E-01	0.284250E+00	
0					0.227400E+00	0.758000E-01	
0					0.341100E+00	0.379000E-01	
0					0.293725E+00	0.189500E-01	
0					0.284250E+00	0.151600E+00	
0					0.104225E+01	0.237822E+01	
0					0.284250E+00	0.388475E+00	
0					0.113700E+00	0.758000E-01	
0					0.265300E+01	0.530600E+01	
0					0.947500E+00	0.663250E+00	
0					0.132650E+01	0.568500E+00	
0					0.118437E+01	0.236875E+00	
0					0.454800E+00	0.137387E+01	
0					0.947500E-02	0.236875E+00	
0					0.699340E+06	0.104225E+00	
0					0.703700E+06	0.104225E+01	
0					0.707600E+06	0.284250E-01	
0					0.775000E+06	0.189500E+00	
0					0.795860E+06	0.123175E+00	
0					0.804320E+06	0.663250E+00	
0					0.814270E+06	0.568500E-01	
0					0.829720E+06	0.227400E+00	
0					0.854980E+06	0.341100E+00	
0					0.971550E+06	0.293725E+00	
0					0.101900E+07	0.284250E+00	
0					0.102120E+07	0.104225E+01	
0					0.102670E+07	0.284250E+00	
0					0.111010E+07	0.113700E+00	
0					0.114800E+07	0.265300E+01	
0					0.127590E+07	0.947500E+00	
0					0.136250E+07	0.132650E+01	
0					0.175050E+07	0.118437E+01	
0					0.185180E+07	0.454800E+00	
0					0.220300E+07	0.947500E-02	
41	93	Nb93m	0.509013E+09	0.271000E+05	0.188000E+04	0.000000E+00	0.307700E+05 0.550000E-03
41	94	Nb94	0.640606E+12	0.145000E+06	0.349000E+02	0.000000E+00	0.702650E+06 0.998001E+02
0					0.871120E+06	0.999000E+02	
41	95	Nb95	0.302141E+07	0.445600E+05	0.177000E+02	0.000000E+00	0.204120E+06 0.279412E-01
0					0.561880E+06	0.109769E-01	
0					0.765800E+06	0.997900E+02	

41	95	Nb95m	0.311904E+06	0.170000E+06	0.674000E+04	0.000000E+00	0.204120E+06	0.226540E+01
0					0.238350E+06	0.241000E+02		
0					0.582070E+06	0.537430E-01		
0					0.786160E+06	0.154240E-01		
0					0.820610E+06	0.385600E-03		
0					0.835130E+06	0.120500E-04		
41	97	Nb97	0.432600E+04	0.468200E+06	0.246000E+02	0.000000E+00	0.177970E+06	0.491950E-01
0					0.238350E+06	0.491950E-01		
0					0.549460E+06	0.491950E-01		
0					0.658080E+06	0.983900E+02		
0					0.719270E+06	0.885510E-01		
0					0.857600E+06	0.491950E-01		
0					0.909570E+06	0.393560E-01		
0					0.102450E+07	0.108229E+01		
0					0.111690E+07	0.885510E-01		
0					0.126860E+07	0.157424E+00		
0					0.151550E+07	0.118068E+00		
0					0.162910E+07	0.295170E-01		
42	99	Mo99	0.237384E+06	0.393900E+06	0.694000E+03	0.000000E+00	0.254730E-02	0.424550E-03
0					0.206210E-02	0.105288E+01		
0					0.230470E-01	0.452449E+01		
0					0.327510E-02	0.133430E-01		
0					0.424550E-03	0.946140E-02		
0					0.709605E-02	0.607713E+01		
0					0.121300E+02	0.145560E-02		
0					0.230470E-02	0.485200E-02		
0					0.434254E+01	0.630760E-02		
0					0.132217E+00	0.679280E-02		
0					0.606500E-02	0.253517E-02		
0					0.970400E-04	0.115235E+01		
0					0.101892E+00	0.849100E-02		
0					0.169820E-02	0.194080E-02		
0					0.545850E-02	0.109170E-02		
0					0.727800E-03	0.169820E-01		
0					0.849100E-03	0.485200E-02		
0					0.121300E-02	0.727800E-03		
0					0.606500E-03	0.533720E-01		
0					0.538600E+06	0.109170E-02		
0					0.580900E+06	0.254730E-02		
0					0.599600E+06	0.206210E-02		
0					0.620900E+06	0.230470E-01		
0					0.621000E+06	0.327510E-02		
0					0.689600E+06	0.424550E-03		
0					0.727100E+06	0.709605E-02		
0					0.739580E+06	0.121300E+02		
0					0.761800E+06	0.230470E-02		
0					0.778000E+06	0.434254E+01		
0					0.823000E+06	0.132217E+00		
0					0.861200E+06	0.606500E-02		
0					0.940000E+06	0.970400E-04		
0					0.961000E+06	0.101892E+00		
0					0.987500E+06	0.169820E-02		
0					0.100160E+07	0.545850E-02		
0					0.101700E+07	0.727800E-03		
0					0.105720E+07	0.849100E-03		
0					0.107190E+07	0.121300E-02		
0					0.108200E+07	0.606500E-03		
43	96	Tc96	0.370000E+06	0.000000E+00	0.118000E+05	0.000000E+00	0.977648E+02	0.399040E-01
0					0.997600E-01	0.399040E-01		
0					0.109736E+01	0.897840E-01		
0					0.151635E+02	0.243414E+01		
0					0.369112E+00	0.139664E+01		
0					0.538704E-01	0.698320E-01		
0					0.927768E-01	0.199520E-01		
0					0.352500E+06	0.199520E-01		
0					0.371800E+06	0.698320E-01		
0					0.434710E+06	0.748200E+00		
0					0.460040E+06	0.428968E+00		
0					0.481000E+06	0.798080E-01		
0					0.535780E+06	0.409016E+00		

0				0.568880E+06	0.917792E+00		
0				0.591300E+06	0.109736E+00		
0				0.719500E+06	0.199520E+00		
0				0.721500E+06	0.119712E+00		
0				0.778220E+06	0.997600E+02		
0				0.812540E+06	0.818032E+02		
0				0.847700E+06	0.189544E-01		
0				0.849860E+06	0.977648E+02		
0				0.885400E+06	0.997600E-01		
0				0.109130E+07	0.109736E+01		
0				0.112680E+07	0.151635E+02		
0				0.120020E+07	0.369112E+00		
0				0.144110E+07	0.538704E-01		
0				0.149770E+07	0.927768E-01		
43	96	Tc96m	0.309000E+04	0.000000E+00	0.665653E+04	0.000000E+00	0.342000E+05 0.248900E-01
0					0.480700E+06	0.340000E+00	
0					0.719550E+06	0.300000E+00	
0					0.778220E+06	0.190000E+01	
0					0.847600E+06	0.120000E+00	
0					0.849850E+06	0.280000E+00	
0					0.109130E+07	0.550000E-01	
0					0.110750E+07	0.280000E-02	
0					0.110980E+07	0.220000E-02	
0					0.120010E+07	0.110000E+01	
0					0.123780E+07	0.510000E-02	
0					0.149760E+07	0.120000E+00	
0					0.184620E+07	0.300000E-02	
0					0.195710E+07	0.100000E-01	
43	97	Tc97	0.820480E+14	0.000000E+00	0.117830E+05	0.000000E+00	0.000000E+00
43	97	Tc97m	0.781920E+07	0.830000E+05	0.900000E+04	0.000000E+00	0.965000E+05 0.314000E+00
43	99	Tc99	0.666167E+13	0.846000E+05	0.105000E+00	0.000000E+00	0.896500E+05 0.570000E-03
43	99	Tc99m	0.216360E+05	0.312000E+05	0.138000E+04	0.000000E+00	0.217260E+04 0.610000E-07
0					0.896500E+05	0.104000E-02	
0					0.140510E+06	0.891000E+02	
0					0.142630E+06	0.187000E-01	
0					0.232720E+06	0.850000E-05	
0					0.322410E+06	0.970000E-04	
44	97	Ru97	0.250560E+06	0.000000E+00	0.131700E+05	0.000000E+00	0.108800E+06 0.108192E+00
0					0.114300E+06	0.173880E-02	
0					0.185000E+06	0.463680E-02	
0					0.215700E+06	0.861672E+02	
0					0.324490E+06	0.102396E+02	
0					0.460560E+06	0.117852E+00	
0					0.483620E+06	0.222180E-02	
0					0.531170E+06	0.260820E-02	
0					0.560370E+06	0.318780E-01	
0					0.569310E+06	0.888720E+00	
0					0.639720E+06	0.879060E-02	
0					0.645210E+06	0.647220E-01	
0					0.670210E+06	0.850080E-02	
0					0.753960E+06	0.859740E-01	
0					0.785060E+06	0.821100E-01	
0					0.855400E+06	0.492660E-01	
0					0.898070E+06	0.183540E-03	
0					0.969720E+06	0.801780E-03	
44	103	Ru103	0.339206E+07	0.666000E+05	0.189000E+03	0.000000E+00	0.426300E+05 0.109080E-02
0					0.532850E+05	0.373599E+00	
0					0.624100E+05	0.427230E-03	
0					0.113250E+06	0.363600E-02	
0					0.114970E+06	0.809010E-02	
0					0.241880E+06	0.149985E-01	
0					0.292700E+06	0.272700E-02	
0					0.294980E+06	0.254520E+00	
0					0.317720E+06	0.618120E-05	
0					0.317770E+06	0.545400E-02	
0					0.357470E+06	0.909000E-02	

0				0.443800E+06	0.327240E+00		
0				0.497080E+06	0.909000E+02		
0				0.514460E+06	0.490860E-02		
0				0.557040E+06	0.845370E+00		
0				0.567870E+06	0.163620E-02		
0				0.610330E+06	0.572670E+01		
0				0.612020E+06	0.809010E-01		
0				0.651800E+06	0.172710E-03		
44	103	Ru103m	0.169000E-02	0.210000E+05	0.132300E+05	0.000000E+00	0.270000E+04 0.265720E+00
0					0.240000E+05	0.132860E+00	
0					0.210700E+06	0.910000E+02	
0					0.213400E+06	0.509600E+01	
44	105	Ru105	0.159840E+05	0.412000E+06	0.154000E+03	0.000000E+00	0.377454E+01 0.662200E-01
0					0.898700E-01	0.520300E-01	
0					0.227040E+01	0.473000E-01	
0					0.175483E+02	0.175010E+01	
0					0.184470E+00	0.156090E+00	
0					0.279070E-01	0.993300E-01	
0					0.548680E+00	0.122980E+00	
0					0.203390E+01	0.250690E-01	
0					0.553410E+00	0.662200E-01	
0					0.203390E+00	0.657470E+01	
0					0.113520E+00	0.283800E-01	
0					0.108790E+00	0.804100E-01	
0					0.946000E-02	0.111155E+02	
0					0.851400E+00	0.106425E+01	
0					0.189200E-01	0.666930E+00	
0					0.804100E-01	0.141900E-01	
0					0.297990E-01	0.283800E-01	
0					0.709500E-01	0.288530E+00	
0					0.151360E+00	0.101695E+01	
0					0.141900E-01	0.473000E-01	
0					0.222310E+00	0.377454E+01	
0					0.307450E+00	0.898700E-01	
0					0.208120E+01	0.227040E+01	
0					0.156563E+02	0.175483E+02	
0					0.189200E-01	0.184470E+00	
0					0.946000E-02	0.279070E-01	
0					0.473000E+02	0.548680E+00	
0					0.756800E-01	0.203390E+01	
0					0.454080E-01	0.553410E+00	
0					0.141900E-01	0.203390E+00	
0					0.212850E+00	0.113520E+00	
0					0.629090E+00	0.108790E+00	
0					0.283800E-01	0.946000E-02	
0					0.156090E+00	0.851400E+00	
0					0.250217E+01	0.189200E-01	
0					0.473000E+00	0.804100E-01	
0					0.529760E+00	0.297990E-01	
0					0.151360E-01	0.709500E-01	
0					0.210485E+01	0.151360E+00	
0					0.189200E-02	0.141900E-01	
0					0.104060E-01	0.222310E+00	
0					0.709500E-02	0.307450E+00	
0					0.321640E+00	0.208120E+01	
0					0.269610E-01	0.156563E+02	
0					0.804100E-02	0.189200E-01	
0					0.473000E-02	0.946000E-02	
0					0.331100E-02	0.473000E+02	
0					0.756800E-02	0.756800E-01	
0					0.614900E-02	0.454080E-01	
0					0.709500E-01	0.141900E-01	
0					0.184470E-01	0.212850E+00	
0					0.567600E-02	0.629090E+00	
0					0.189200E-02	0.283800E-01	
0					0.193930E-01	0.156090E+00	
0					0.203390E+00	0.250217E+01	
0					0.473000E-03	0.473000E+00	
0					0.236500E-02	0.529760E+00	
0					0.567600E-01	0.151360E-01	
0					0.614900E-02	0.210485E+01	

0				0.520300E-02	0.189200E-02		
0				0.946000E-03	0.104060E-01		
0				0.756800E-01	0.709500E-02		
0				0.473000E-03	0.321640E+00		
0				0.331100E-01	0.269610E-01		
0				0.189200E-03	0.804100E-02		
0				0.236500E-03	0.473000E-02		
0				0.756800E-03	0.331100E-02		
0				0.117260E+07	0.756800E-02		
0				0.120900E+07	0.614900E-02		
0				0.121540E+07	0.709500E-01		
0				0.122200E+07	0.184470E-01		
0				0.122950E+07	0.567600E-02		
0				0.123880E+07	0.189200E-02		
0				0.125190E+07	0.193930E-01		
0				0.132130E+07	0.203390E+00		
0				0.134000E+07	0.473000E-03		
0				0.135720E+07	0.236500E-02		
0				0.137710E+07	0.567600E-01		
0				0.144120E+07	0.614900E-02		
0				0.144830E+07	0.520300E-02		
0				0.157100E+07	0.946000E-03		
0				0.169810E+07	0.756800E-01		
0				0.170870E+07	0.473000E-03		
0				0.172140E+07	0.331100E-01		
0				0.176540E+07	0.189200E-03		
0				0.180900E+07	0.236500E-03		
0				0.182960E+07	0.756800E-03		
44	106	Ru106	0.321054E+08	0.100300E+05	0.154000E+03	0.000000E+00	0.000000E+00
45	103	Rh103m	0.336720E+04	0.363000E+05	0.165000E+04	0.000000E+00	0.397550E+05 0.684000E-01
45	105	Rh105	0.127296E+06	0.153200E+06	0.900000E+02	0.000000E+00	0.387200E+05 0.248300E-01
0					0.280100E+06	0.166170E+00	
0					0.306100E+06	0.509970E+01	
0					0.318900E+06	0.191000E+02	
0					0.442800E+06	0.420200E-01	
45	106	Rh106	0.298000E+02	0.141100E+07	0.235000E+02	0.000000E+00	0.320280E-01 0.510000E-03
0					0.591600E-02	0.489600E-02	
0					0.118320E-01	0.705840E-01	
0					0.403920E+00	0.224400E-02	
0					0.306000E-02	0.201960E-01	
0					0.163200E-03	0.126480E-01	
0					0.144840E-01	0.204000E+02	
0					0.573240E-01	0.836400E-02	
0					0.448800E-03	0.754800E+00	
0					0.571200E-03	0.993480E+01	
0					0.104040E-02	0.110160E-01	
0					0.132600E-02	0.550800E-02	
0					0.346800E-02	0.285600E-03	
0					0.632400E-03	0.999600E-02	
0					0.222360E-02	0.652800E-02	
0					0.206040E-02	0.108120E-02	
0					0.265200E-02	0.438600E+00	
0					0.122400E-02	0.571200E-03	
0					0.222360E-01	0.132600E-01	
0					0.673200E-02	0.155856E+01	
0					0.163200E+00	0.320280E-01	
0					0.183600E-03	0.591600E-02	
0					0.106080E-02	0.118320E-01	
0					0.550800E-03	0.403920E+00	
0					0.652800E-03	0.306000E-02	
0					0.222360E-02	0.163200E-03	
0					0.342720E-01	0.144840E-01	
0					0.126480E-02	0.573240E-01	
0					0.428400E-03	0.448800E-03	
0					0.277440E-01	0.571200E-03	
0					0.124440E-02	0.104040E-02	
0					0.142800E-02	0.132600E-02	
0					0.153000E-01	0.346800E-02	
0					0.183600E-03	0.632400E-03	

0				0.183600E-03	0.222360E-02		
0				0.261120E-01	0.206040E-02		
0				0.367200E-03	0.265200E-02		
0				0.344760E-01	0.122400E-02		
0				0.244800E-03	0.222360E-01		
0				0.489600E-02	0.673200E-02		
0				0.206040E-02	0.163200E+00		
0				0.136680E-02	0.183600E-03		
0				0.563040E-02	0.106080E-02		
0				0.636480E-02	0.550800E-03		
0				0.232560E-01	0.652800E-03		
0				0.650760E-02	0.222360E-02		
0				0.144840E-01	0.342720E-01		
0				0.459000E-02	0.126480E-02		
0				0.285600E-03	0.428400E-03		
0				0.897600E-03	0.277440E-01		
0				0.204000E-03	0.124440E-02		
0				0.295800E-02	0.142800E-02		
0				0.144840E-02	0.153000E-01		
0				0.652800E-03	0.183600E-03		
0				0.250920E-02	0.183600E-03		
0				0.373320E-02	0.261120E-01		
0				0.244800E-03	0.367200E-03		
0				0.836400E-04	0.344760E-01		
0				0.693600E-03	0.244800E-03		
0				0.120360E-02	0.489600E-02		
0				0.142800E-04	0.206040E-02		
0				0.652800E-04	0.136680E-02		
0				0.918000E-03	0.563040E-02		
0				0.102000E-02	0.636480E-02		
0				0.346800E-03	0.232560E-01		
0				0.285600E-04	0.650760E-02		
0				0.104040E-03	0.144840E-01		
0				0.510000E-04	0.459000E-02		
0				0.112200E-04	0.285600E-03		
0				0.124440E-04	0.897600E-03		
0				0.252520E+07	0.204000E-03		
0				0.254270E+07	0.295800E-02		
0				0.257110E+07	0.144840E-02		
0				0.265170E+07	0.652800E-03		
0				0.270500E+07	0.250920E-02		
0				0.270950E+07	0.373320E-02		
0				0.274010E+07	0.244800E-03		
0				0.278730E+07	0.836400E-04		
0				0.280960E+07	0.693600E-03		
0				0.282110E+07	0.120360E-02		
0				0.286500E+07	0.142800E-04		
0				0.290250E+07	0.652800E-04		
0				0.291790E+07	0.918000E-03		
0				0.303730E+07	0.102000E-02		
0				0.305500E+07	0.346800E-03		
0				0.316470E+07	0.285600E-04		
0				0.324980E+07	0.104040E-03		
0				0.327340E+07	0.510000E-04		
0				0.337590E+07	0.112200E-04		
0				0.340180E+07	0.124440E-04		
46	103	Pd103	0.146802E+07	0.000000E+00	0.144110E+05	0.000000E+00	0.532850E+05 0.273200E-04
0					0.624100E+05	0.103816E-02	
0					0.241880E+06	0.478100E-06	
0					0.294980E+06	0.280030E-02	
0					0.317720E+06	0.150260E-04	
0					0.357470E+06	0.220609E-01	
0					0.443800E+06	0.150260E-04	
0					0.497080E+06	0.396140E-02	
46	107	Pd107	0.205120E+15	0.930000E+04	0.144110E+05	0.000000E+00	0.000000E+00
47	105	Ag105	0.356700E+07	0.110800E+04	0.179800E+05	0.000000E+00	0.414000E+02 0.538200E-02
0					0.662400E-02	0.104742E+02	
0					0.496800E+00	0.144900E-01	
0					0.732780E+00	0.144900E-01	
0					0.455400E-02	0.227700E-01	

0				0.198306E+01	0.438840E+00		
0				0.173880E+00	0.227700E-01		
0				0.401580E-01	0.153180E-01		
0				0.285660E+00	0.351900E+00		
0				0.103500E+00	0.132480E-01		
0				0.248400E+00	0.227700E-01		
0				0.104742E+02	0.302220E+02		
0				0.124200E+00	0.952200E-01		
0				0.621000E-02	0.132480E+00		
0				0.993600E-01	0.877680E+00		
0				0.583740E+00	0.600300E-01		
0				0.703800E-02	0.434700E+01		
0				0.144900E-01	0.161460E+00		
0				0.144900E-01	0.153180E+00		
0				0.828000E-02	0.409860E+01		
0				0.178020E-01	0.414000E+02		
0				0.144900E-01	0.662400E-02		
0				0.372600E-02	0.496800E+00		
0				0.115506E+01	0.732780E+00		
0				0.110538E+02	0.455400E-02		
0				0.372600E-02	0.198306E+01		
0				0.253782E+01	0.173880E+00		
0				0.104742E+01	0.401580E-01		
0				0.447120E-01	0.285660E+00		
0				0.124200E+00	0.103500E+00		
0				0.571320E+00	0.248400E+00		
0				0.289800E-02	0.104742E+02		
0				0.115506E+01	0.124200E+00		
0				0.459540E-01	0.621000E-02		
0				0.289800E-02	0.993600E-01		
0				0.227700E-01	0.583740E+00		
0				0.227700E-01	0.703800E-02		
0				0.161460E-01	0.144900E-01		
0				0.124200E+00	0.144900E-01		
0				0.385020E+01	0.828000E-02		
0				0.140760E-01	0.178020E-01		
0				0.598600E+06	0.144900E-01		
0				0.610000E+06	0.372600E-02		
0				0.617850E+06	0.115506E+01		
0				0.644550E+06	0.110538E+02		
0				0.649200E+06	0.372600E-02		
0				0.650720E+06	0.253782E+01		
0				0.673210E+06	0.104742E+01		
0				0.681900E+06	0.447120E-01		
0				0.727220E+06	0.124200E+00		
0				0.743310E+06	0.571320E+00		
0				0.796250E+06	0.289800E-02		
0				0.807460E+06	0.115506E+01		
0				0.844890E+06	0.459540E-01		
0				0.860330E+06	0.289800E-02		
0				0.921040E+06	0.227700E-01		
0				0.921040E+06	0.227700E-01		
0				0.928890E+06	0.161460E-01		
0				0.962430E+06	0.124200E+00		
0				0.108790E+07	0.385020E+01		
0				0.112570E+07	0.140760E-01		
47	108	Ag108	0.142200E+03 0.112000E+04	0.330000E+04	0.000000E+00	0.383200E+06	0.900000E-03
0				0.388600E+06	0.185000E-02		
0				0.433940E+06	0.500000E+00		
0				0.497100E+06	0.225000E-02		
0				0.510100E+06	0.175000E-02		
0				0.618860E+06	0.262000E+00		
0				0.632980E+06	0.175000E+01		
0				0.880260E+06	0.320000E-02		
0				0.931120E+06	0.550000E-03		
0				0.100720E+07	0.139500E-01		
0				0.110600E+07	0.165000E-02		
0				0.144110E+07	0.305000E-02		
0				0.154000E+07	0.105000E-02		
47	110	Ag110m	0.215793E+08 0.739000E+05	0.277000E+03	0.000000E+00	0.397488E-02	0.136282E+01
0				0.280608E+01	0.804440E-02		

0	0.215779E+00	0.179816E-01
0	0.378560E-01	0.728728E-01
0	0.946400E+02	0.662480E-01
0	0.103536E+02	0.681408E-01
0	0.643552E+01	0.121139E-01
0	0.164390E+02	0.406952E-01
0	0.274456E+00	0.208208E-02
0	0.851760E-02	0.331240E-02
0	0.473200E+01	0.861224E-01
0	0.222877E+02	0.757120E-01
0	0.189280E-02	0.567840E-01
0	0.734406E+01	0.643552E-02
0	0.726835E+02	0.643552E-02
0	0.343638E+02	0.374774E+01
0	0.757120E-02	0.246064E-01
0	0.134389E+00	0.104104E-01
0	0.141960E-01	0.208208E-01
0	0.624624E-01	0.123032E-01
0	0.388024E-01	0.397488E-02
0	0.359632E-01	0.280608E+01
0	0.454272E-01	0.215779E+00
0	0.293384E-01	0.378560E-01
0	0.227136E-01	0.946400E+02
0	0.236600E-01	0.103536E+02
0	0.141014E+00	0.643552E+01
0	0.242846E+02	0.164390E+02
0	0.369096E-01	0.274456E+00
0	0.399570E+01	0.851760E-02
0	0.130414E+02	0.473200E+01
0	0.102874E+01	0.222877E+02
0	0.209154E-01	0.189280E-02
0	0.577304E-02	0.734406E+01
0	0.179816E-02	0.726835E+02
0	0.634088E-02	0.343638E+02
0	0.974792E-02	0.757120E-02
0	0.149531E-01	0.134389E+00
0	0.104104E-02	0.141960E-01
0	0.108550E+07	0.624624E-01
0	0.111750E+07	0.388024E-01
0	0.112570E+07	0.359632E-01
0	0.116320E+07	0.454272E-01
0	0.116500E+07	0.293384E-01
0	0.125110E+07	0.227136E-01
0	0.130000E+07	0.236600E-01
0	0.133430E+07	0.141014E+00
0	0.138430E+07	0.242846E+02
0	0.142010E+07	0.369096E-01
0	0.147580E+07	0.399570E+01
0	0.150500E+07	0.130414E+02
0	0.156230E+07	0.102874E+01
0	0.159270E+07	0.209154E-01
0	0.162970E+07	0.577304E-02
0	0.169850E+07	0.179816E-02
0	0.177540E+07	0.634088E-02
0	0.178350E+07	0.974792E-02
0	0.190350E+07	0.149531E-01
0	0.200470E+07	0.104104E-02
47	111 Ag111	0.643680E+06 0.354600E+06 0.530000E+02 0.000000E+00 0.967300E+05 0.200400E+00
0		0.245420E+06 0.123580E+01
0		0.278300E+06 0.487640E-03
0		0.342120E+06 0.668000E+01
0		0.374700E+06 0.287240E-02
0		0.509400E+06 0.133600E-02
0		0.522400E+06 0.100200E-02
0		0.524400E+06 0.233800E-02
0		0.619300E+06 0.420840E-02
0		0.620300E+06 0.187040E-01
0		0.622000E+06 0.587840E-02
0		0.754600E+06 0.267200E-02
0		0.865100E+06 0.334000E-02
0		0.866700E+06 0.514360E-02

48	109	Cd109	0.399686E+08	0.000000E+00	0.227000E+05	0.000000E+00	0.880340E+05	0.361000E+01
48	113	Cd113m	0.444953E+09	0.183400E+06	0.101700E+02	0.000000E+00	0.263590E+06	0.229600E-01
48	115	Cd115	0.192456E+06	0.317100E+06	0.860000E+03	0.000000E+00	0.355700E+05	0.421000E+00
0					0.231440E+06	0.740000E+00		
0					0.252000E+06	0.900000E-04		
0					0.260900E+06	0.194000E+01		
0					0.266980E+06	0.920000E-01		
0					0.328380E+06	0.330000E-02		
0					0.344200E+06	0.800000E-05		
0					0.363950E+06	0.610000E-02		
0					0.492350E+06	0.803000E+01		
0					0.527900E+06	0.274500E+02		
0					0.595370E+06	0.170000E-02		
0					0.690230E+06	0.610000E-03		
0					0.705180E+06	0.800000E-04		
0					0.856250E+06	0.220000E-02		
0					0.941420E+06	0.700000E-04		
0					0.951190E+06	0.280000E-03		
48	115	Cd115m	0.385344E+07	0.602600E+06	0.260000E+01	0.000000E+00	0.100000E-04	0.442000E-02
0					0.560000E-03	0.170200E-01		
0					0.231440E+06	0.880000E-03		
0					0.260890E+06	0.920000E-03		
0					0.316200E+06	0.248000E-02		
0					0.344600E+06	0.400000E-04		
0					0.370610E+06	0.800000E-05		
0					0.476670E+06	0.100000E-03		
0					0.484470E+06	0.290000E+00		
0					0.492350E+06	0.960000E-02		
0					0.507360E+06	0.260000E-03		
0					0.515050E+06	0.100000E-03		
0					0.544700E+06	0.800000E-04		
0					0.933840E+06	0.200000E+01		
0					0.941420E+06	0.240000E-03		
0					0.107820E+07	0.400000E-04		
0					0.113260E+07	0.856000E-01		
0					0.129060E+07	0.890000E+00		
0					0.141820E+07	0.184000E-02		
0					0.144880E+07	0.170000E-01		
0					0.147850E+07	0.100000E-04		
0					0.148610E+07	0.560000E-03		
49	111	In111	0.244500E+06	0.000000E+00	0.198000E+05	0.000000E+00	0.150810E+06	0.282000E-02
0					0.171280E+06	0.902400E+02		
0					0.245350E+06	0.940000E+02		
49	113	In113m	0.596880E+04	0.130000E+06	0.594000E+04	0.000000E+00	0.391690E+06	0.642000E+02
49	114	In114m	0.427766E+07	0.000000E+00	0.920000E+04	0.000000E+00	0.190340E+06	0.154000E+02
0					0.558430E+06	0.430000E+01		
0					0.725240E+06	0.430000E+01		
49	115	In115m	0.161496E+05	0.169000E+06	0.818000E+04	0.000000E+00	0.336240E+06	0.458000E+02
0					0.497370E+06	0.470000E-01		
50	113	Sn113	0.994378E+07	0.000000E+00	0.181000E+05	0.000000E+00	0.255060E+06	0.182400E+01
0					0.638030E+06	0.953600E-03		
0					0.646800E+06	0.384000E-05		
50	119	Sn119m	0.253152E+08	0.759000E+05	0.757000E+04	0.000000E+00	0.238700E+05	0.161000E+02
0					0.656600E+05	0.200000E-01		
50	123	Sn123	0.111629E+08	0.520300E+06	0.760000E-01	0.000000E+00	0.160330E+06	0.191400E-02
0					0.102100E+07	0.192600E-02		
0					0.103020E+07	0.310200E-01		
0					0.108860E+07	0.600000E+00		
0					0.110050E+07	0.840000E-04		
0					0.117710E+07	0.228000E-03		
0					0.118120E+07	0.294000E-03		
0					0.126090E+07	0.540000E-04		
0					0.133740E+07	0.756000E-03		

50	125	Sn125	0.832896E+06	0.811000E+06	0.110000E+02	0.000000E+00	0.813600E-02	0.325440E-01
0					0.271200E+00	0.180800E-01		
0					0.117520E-01	0.180800E-01		
0					0.632800E-02	0.994400E-01		
0					0.385104E+01	0.171760E-01		
0					0.768400E-01	0.542400E-02		
0					0.194360E+00	0.813600E-02		
0					0.298320E+00	0.131080E+01		
0					0.904000E+01	0.245888E+00		
0					0.111192E+01	0.271200E-02		
0					0.427592E+01	0.452000E-02		
0					0.126560E-01	0.226000E-01		
0					0.106672E+00	0.138312E+01		
0					0.289280E-01	0.117520E-01		
0					0.169048E+00	0.904000E-02		
0					0.813600E-02	0.144640E-01		
0					0.144640E-01	0.379680E-01		
0					0.723200E-02	0.994400E-02		
0					0.249504E+00	0.994400E+00		
0					0.289280E-01	0.398664E+01		
0					0.452000E-02	0.813600E-02		
0					0.551440E-01	0.271200E+00		
0					0.453808E+00	0.117520E-01		
0					0.379680E-02	0.632800E-02		
0					0.235040E-01	0.385104E+01		
0					0.138312E+00	0.768400E-01		
0					0.687040E-01	0.194360E+00		
0					0.298320E-02	0.298320E+00		
0					0.178992E+01	0.904000E+01		
0					0.271200E-02	0.111192E+01		
0					0.361600E-01	0.427592E+01		
0					0.169952E+00	0.126560E-01		
0					0.115120E+07	0.106672E+00		
0					0.116380E+07	0.289280E-01		
0					0.117330E+07	0.169048E+00		
0					0.118610E+07	0.813600E-02		
0					0.119870E+07	0.144640E-01		
0					0.120840E+07	0.723200E-02		
0					0.122090E+07	0.249504E+00		
0					0.125930E+07	0.289280E-01		
0					0.129130E+07	0.452000E-02		
0					0.134940E+07	0.551440E-01		
0					0.141970E+07	0.453808E+00		
0					0.155730E+07	0.379680E-02		
0					0.159140E+07	0.235040E-01		
0					0.180630E+07	0.138312E+00		
0					0.188950E+07	0.687040E-01		
0					0.198250E+07	0.298320E-02		
0					0.200180E+07	0.178992E+01		
0					0.203830E+07	0.271200E-02		
0					0.220070E+07	0.361600E-01		
0					0.227540E+07	0.169952E+00		
50	126	Sn126	0.315569E+13	0.107000E+06	0.810000E+04	0.000000E+00	0.216500E+05	0.123950E+01
0					0.232800E+05	0.640100E+01		
0					0.426400E+05	0.499500E+00		
0					0.642800E+05	0.958300E+01		
0					0.869400E+05	0.891700E+01		
0					0.875700E+05	0.370000E+02		
51	122	Sb122	0.233280E+06	0.170000E+02	0.610000E+03	0.000000E+00	0.564120E+06	0.693000E+02
0					0.617340E+06	0.110000E-01		
0					0.692790E+06	0.378000E+01		
0					0.793280E+06	0.160000E-01		
0					0.114030E+07	0.750000E+00		
0					0.118880E+07	0.420000E-02		
0					0.125690E+07	0.800000E+00		
0					0.175280E+07	0.900000E-02		
51	124	Sb124	0.520128E+07	0.390000E+06	0.121000E+03	0.000000E+00	0.273840E-01	0.391200E-01
0					0.880200E-01	0.978000E-02		
0					0.743280E+00	0.782400E-01		
0					0.782400E-01	0.195600E-01		

0 0.195600E-01 0.782400E-01
0 0.136920E-01 0.146700E+00
0 0.636700E-02 0.195600E+00
0 0.188754E+01 0.293400E-01
0 0.880200E-01 0.342300E-01
0 0.586800E-02 0.635700E-01
0 0.831300E-02 0.156480E+00
0 0.183864E+01 0.978000E+02
0 0.880200E-02 0.978000E-01
0 0.332520E-01 0.738390E+01
0 0.391200E-02 0.244500E-01
0 0.185820E-01 0.134964E+01
0 0.586800E-02 0.226896E+01
0 0.586800E-02 0.107580E+02
0 0.782400E-02 0.136920E+00
0 0.293400E-01 0.127140E+00
0 0.117360E-01 0.273840E-01
0 0.342300E-01 0.880200E-01
0 0.162348E+01 0.743280E+00
0 0.103668E+01 0.782400E-01
0 0.262104E+01 0.195600E-01
0 0.498780E+00 0.136920E-01
0 0.518340E-01 0.635700E-02
0 0.123228E+01 0.188754E+01
0 0.332520E+00 0.880200E-01
0 0.176040E-01 0.586800E-02
0 0.694380E+00 0.831300E-02
0 0.400980E+00 0.183864E+01
0 0.224940E-01 0.880200E-02
0 0.410760E+00 0.332520E-01
0 0.234720E-01 0.391200E-02
0 0.473352E+02 0.186820E-01
0 0.880200E-01 0.586800E-02
0 0.195600E-02 0.586800E-02
0 0.489000E-01 0.782400E-02
0 0.293400E-02 0.293400E-01
0 0.880200E-02 0.117360E-01
0 0.684600E-01 0.342300E-01
0 0.107580E-01 0.162348E+01
0 0.557460E+01 0.103668E+01
0 0.391200E-01 0.262104E+01
0 0.391200E-01 0.498780E+00
0 0.782400E-03 0.518340E-01
0 0.978000E-03 0.123228E+01
0 0.391200E-01 0.332520E+00
0 0.782400E-03 0.176040E-01
0 0.244500E-03 0.694380E+00
0 0.146700E-02 0.400980E+00
0 0.489000E-03 0.224940E-01
0 0.782400E-02 0.410760E+00
0 0.303180E-01 0.234720E-01
0 0.234720E-02 0.473352E+02
0 0.684600E-03 0.880200E-01
0 0.156480E-02 0.195600E-02
0 0.254280E-02 0.489000E-01
0 0.391200E-03 0.293400E-02
0 0.201500E+07 0.880200E-02
0 0.203930E+07 0.684600E-01
0 0.207850E+07 0.107580E-01
0 0.208090E+07 0.557460E+01
0 0.209910E+07 0.391200E-01
0 0.210810E+07 0.391200E-01
0 0.215150E+07 0.782400E-03
0 0.217200E+07 0.978000E-03
0 0.218260E+07 0.391200E-01
0 0.220300E+07 0.782400E-03
0 0.222400E+07 0.244500E-03
0 0.225390E+07 0.146700E-02
0 0.227400E+07 0.489000E-03
0 0.228330E+07 0.782400E-02
0 0.229370E+07 0.303180E-01
0 0.232310E+07 0.234720E-02
0 0.245440E+07 0.684600E-03

0					0.268200E+07	0.156480E-02	
0					0.269370E+07	0.254280E-02	
0					0.287170E+07	0.391200E-03	
51	125	Sb125	0.861504E+08	0.993000E+05	0.132000E+05	0.000000E+00	0.177800E+02 0.200000E-01
0					0.502000E+01	0.428000E+01	
0					0.113200E+02	0.900000E-03	
0					0.180000E+01	0.255000E+00	
0					0.146080E+06	0.620000E-03	
0					0.172610E+06	0.182000E+00	
0					0.176330E+06	0.679000E+01	
0					0.178780E+06	0.270000E-01	
0					0.198650E+06	0.130000E-01	
0					0.204130E+06	0.323000E+00	
0					0.208090E+06	0.236000E+00	
0					0.227910E+06	0.132000E+00	
0					0.314940E+06	0.420000E-02	
0					0.321030E+06	0.410000E+00	
0					0.380430E+06	0.152000E+01	
0					0.408010E+06	0.183000E+00	
0					0.427890E+06	0.294400E+02	
0					0.443500E+06	0.303000E+00	
0					0.463380E+06	0.104500E+02	
0					0.497360E+06	0.360000E-02	
0					0.600560E+06	0.177800E+02	
0					0.606640E+06	0.502000E+01	
0					0.635900E+06	0.113200E+02	
0					0.671410E+06	0.180000E+01	
51	126	Sb126	0.107136E+07	0.366000E+06	0.500000E+03	0.000000E+00	0.119640E+01 0.398800E+00
0					0.498500E+00	0.498500E+00	
0					0.677960E+01	0.139580E+01	
0					0.997000E+00	0.239280E+01	
0					0.897300E+00	0.498500E+00	
0					0.239280E+01	0.448650E+01	
0					0.279160E+00	0.997000E+00	
0					0.414800E+06	0.833492E+02	
0					0.555200E+06	0.169490E+01	
0					0.573000E+06	0.667990E+01	
0					0.593000E+06	0.747750E+01	
0					0.620200E+06	0.897300E+00	
0					0.639700E+06	0.897300E+00	
0					0.656300E+06	0.219340E+01	
0					0.666300E+06	0.997000E+02	
0					0.675000E+06	0.368890E+01	
0					0.695000E+06	0.997000E+02	
0					0.697000E+06	0.289130E+02	
0					0.720500E+06	0.538380E+02	
0					0.856700E+06	0.176469E+02	
0					0.954000E+06	0.119640E+01	
0					0.959600E+06	0.498500E+00	
0					0.989300E+06	0.677960E+01	
0					0.103480E+07	0.997000E+00	
0					0.106390E+07	0.897300E+00	
0					0.121300E+07	0.239280E+01	
0					0.147620E+07	0.279160E+00	
52	123	Te123m	0.103421E+08	0.980000E+05	0.143000E+05	0.000000E+00	0.884600E+05 0.899228E-01
0					0.159000E+06	0.840400E+02	
0					0.247460E+06	0.344564E-03	
52	125	Te125m	0.501120E+07	0.106400E+06	0.329000E+05	0.000000E+00	0.354920E+05 0.667000E+01
0					0.109270E+06	0.282000E+00	
0					0.144770E+06	0.390000E-06	
52	127	Te127	0.336600E+05	0.224300E+06	0.320000E+02	0.000000E+00	0.576100E+05 0.297000E-01
0					0.145250E+06	0.326700E-02	
0					0.172130E+06	0.297000E-03	
0					0.202860E+06	0.580140E-01	
0					0.215100E+06	0.387090E-01	
0					0.360300E+06	0.134640E+00	
0					0.374990E+06	0.297000E-03	
0					0.417900E+06	0.990000E+00	

0				0.618400E+06	0.128700E-03		
52	127	Te127m	0.941760E+07	0.792000E+05	0.106000E+05	0.000000E+00	0.576100E+05 0.500000E+00
0				0.882600E+05	0.840000E-01		
0				0.593300E+06	0.230000E-02		
0				0.628600E+06	0.800000E-04		
0				0.651000E+06	0.280000E-03		
0				0.658900E+06	0.122000E-01		
52	129	Te129	0.417600E+04	0.538000E+06	0.300000E+03	0.000000E+00	0.970200E-01 0.163240E+02
0				0.130900E-02	0.180180E+00		
0				0.462000E-04	0.130900E-02		
0				0.231000E-03	0.154000E-05		
0				0.123200E-02	0.382690E+00		
0				0.130900E-02	0.462000E-02		
0				0.374220E-01	0.566720E+00		
0				0.423500E-02	0.164780E+00		
0				0.716100E-03	0.154000E-02		
0				0.231000E-03	0.847000E-02		
0				0.191730E+00	0.492800E-01		
0				0.215600E-01	0.616000E-03		
0				0.639100E-02	0.616000E-03		
0				0.454300E-01	0.770000E+01		
0				0.616000E-03	0.141680E+01		
0				0.207900E-03	0.115500E-02		
0				0.160160E-01	0.877800E-01		
0				0.130900E-02	0.354200E-02		
0				0.223300E-02	0.138600E-02		
0				0.693000E-03	0.608300E-02		
0				0.693000E-03	0.970200E-01		
0				0.492800E+00	0.130900E-02		
0				0.190960E+00	0.462000E-04		
0				0.231000E-04	0.231000E-03		
0				0.115500E-03	0.123200E-02		
0				0.746900E-02	0.130900E-02		
0				0.111650E-01	0.374220E-01		
0				0.816200E-02	0.423500E-02		
0				0.277200E-03	0.716100E-03		
0				0.773540E+06	0.231000E-03		
0				0.802100E+06	0.191730E+00		
0				0.804600E+06	0.215600E-01		
0				0.829930E+06	0.639100E-02		
0				0.833280E+06	0.454300E-01		
0				0.918290E+06	0.616000E-03		
0				0.931570E+06	0.207900E-03		
0				0.982270E+06	0.160160E-01		
0				0.101360E+07	0.130900E-02		
0				0.101940E+07	0.223300E-02		
0				0.102240E+07	0.693000E-03		
0				0.105020E+07	0.693000E-03		
0				0.108380E+07	0.492800E+00		
0				0.111160E+07	0.190960E+00		
0				0.116880E+07	0.231000E-04		
0				0.118200E+07	0.115500E-03		
0				0.123280E+07	0.746900E-02		
0				0.126060E+07	0.111650E-01		
0				0.126420E+07	0.816200E-02		
0				0.129150E+07	0.277200E-03		
52	129	Te129m	0.290304E+07	0.270000E+06	0.800000E+04	0.000000E+00	0.520000E-02 0.270000E-01
0				0.100000E-03	0.320000E-03		
0				0.700000E+00	0.147000E+00		
0				0.270000E-01	0.270000E-03		
0				0.280000E-02	0.280000E-04		
0				0.300000E-03	0.700000E-03		
0				0.600000E-03	0.390000E-03		
0				0.900000E-01	0.600000E-03		
0				0.340000E-01	0.900000E-04		
0				0.700000E-03	0.520000E-03		
0				0.170000E-01	0.600000E-03		
0				0.180000E-01	0.700000E-04		
0				0.900000E-04	0.120000E-02		
0				0.240000E-03	0.240000E-03		

0					0.420000E-03	0.280000E-03		
0					0.220000E-03	0.120000E+00		
0					0.270000E-03	0.200000E-03		
0					0.350000E-02	0.250000E-01		
0					0.695880E+06	0.300000E+01		
0					0.701700E+06	0.250000E-01		
0					0.705520E+06	0.520000E-02		
0					0.716600E+06	0.100000E-03		
0					0.729570E+06	0.700000E+00		
0					0.740960E+06	0.270000E-01		
0					0.768770E+06	0.280000E-02		
0					0.771800E+06	0.300000E-03		
0					0.794600E+06	0.600000E-03		
0					0.817040E+06	0.900000E-01		
0					0.844810E+06	0.340000E-01		
0					0.100360E+07	0.700000E-03		
0					0.102240E+07	0.170000E-01		
0					0.105020E+07	0.180000E-01		
0					0.117600E+07	0.900000E-04		
0					0.120360E+07	0.240000E-03		
0					0.125410E+07	0.420000E-03		
0					0.128200E+07	0.220000E-03		
0					0.137370E+07	0.270000E-03		
0					0.140140E+07	0.350000E-02		
52	131	Te131m	0.108000E+06	0.191000E+06	0.650000E+04	0.000000E+00	0.793350E+01	0.119970E-01
0					0.464400E-01	0.619200E-02		
0					0.270900E-01	0.541800E-02		
0					0.309600E-01	0.116100E-02		
0					0.116100E-01	0.270900E-02		
0					0.387000E-02	0.580500E-02		
0					0.851400E-02	0.363780E-01		
0					0.580500E-02	0.425700E-02		
0					0.232200E-01	0.812700E-02		
0					0.696600E-01	0.232200E-01		
0					0.464400E-02	0.267030E-01		
0					0.708210E+00	0.154800E-01		
0					0.774000E-01	0.127710E+00		
0					0.774000E-01	0.406350E+01		
0					0.506970E+01	0.147060E+00		
0					0.774000E-01	0.387000E-02		
0					0.387000E-01	0.580500E-02		
0					0.127710E+00	0.135450E-01		
0					0.309600E-01	0.735300E-01		
0					0.116100E-01	0.170280E+00		
0					0.657900E-01	0.793350E+01		
0					0.735300E+00	0.464400E-01		
0					0.828180E+00	0.270900E-01		
0					0.154800E+00	0.309600E-01		
0					0.212850E+00	0.116100E-01		
0					0.503100E+00	0.387000E-02		
0					0.116100E+00	0.851400E-02		
0					0.754650E+01	0.580500E-02		
0					0.193500E-01	0.232200E-01		
0					0.387000E-01	0.696600E-01		
0					0.154800E-01	0.464400E-02		
0					0.116100E-01	0.708210E+00		
0					0.425700E+00	0.774000E-01		
0					0.154800E-01	0.774000E-01		
0					0.193500E+00	0.506970E+01		
0					0.928800E-01	0.774000E-01		
0					0.154800E-01	0.387000E-01		
0					0.758520E+01	0.127710E+00		
0					0.650160E+00	0.309600E-01		
0					0.309600E+00	0.116100E-01		
0					0.154800E-01	0.657900E-01		
0					0.154800E-01	0.735300E+00		
0					0.108360E+00	0.828180E+00		
0					0.178020E+01	0.154800E+00		
0					0.348300E-01	0.212850E+00		
0					0.387000E+00	0.503100E+00		
0					0.774000E-01	0.116100E+00		
0					0.503100E-01	0.754650E+01		

0	0.387000E-01	0.193500E-01
0	0.387000E-01	0.387000E-01
0	0.375390E+00	0.154800E-01
0	0.154800E-01	0.116100E-01
0	0.309600E-01	0.425700E+00
0	0.955890E+01	0.154800E-01
0	0.135450E+00	0.193500E+00
0	0.387000E+00	0.928800E-01
0	0.967500E-01	0.154800E-01
0	0.208980E+00	0.758520E+01
0	0.774000E-01	0.650160E+00
0	0.228330E+00	0.309600E+00
0	0.193500E-01	0.154800E-01
0	0.774000E-01	0.154800E-01
0	0.119970E+01	0.108360E+00
0	0.116100E-01	0.178020E+01
0	0.387000E-01	0.348300E-01
0	0.193500E-01	0.387000E+00
0	0.201240E+00	0.774000E-01
0	0.309600E-01	0.503100E-01
0	0.619200E-01	0.387000E-01
0	0.278640E+00	0.387000E-01
0	0.661770E+00	0.375390E+00
0	0.154800E+01	0.154800E-01
0	0.181890E+01	0.309600E-01
0	0.313470E+00	0.955890E+01
0	0.890100E-01	0.135450E+00
0	0.135450E+00	0.387000E+00
0	0.104490E+00	0.967500E-01
0	0.112230E+00	0.208980E+00
0	0.387000E-01	0.774000E-01
0	0.232200E-01	0.228330E+00
0	0.425700E-01	0.193500E-01
0	0.774000E-01	0.774000E-01
0	0.197370E+01	0.119970E+01
0	0.503100E-01	0.116100E-01
0	0.309600E+00	0.387000E-01
0	0.139320E+00	0.193500E-01
0	0.154800E-01	0.201240E+00
0	0.309600E-01	0.309600E-01
0	0.433440E+01	0.619200E-01
0	0.309600E-01	0.278640E+00
0	0.154800E+00	0.661770E+00
0	0.398610E+00	0.154800E+01
0	0.390870E+00	0.181890E+01
0	0.143190E+01	0.313470E+00
0	0.657900E-01	0.890100E-01
0	0.158670E+01	0.135450E+00
0	0.154800E-01	0.104490E+00
0	0.381582E+02	0.112230E+00
0	0.541800E+00	0.387000E-01
0	0.777870E+01	0.232200E-01
0	0.138546E+02	0.425700E-01
0	0.193500E-01	0.774000E-01
0	0.611460E+01	0.197370E+01
0	0.154800E+00	0.503100E-01
0	0.387000E-01	0.309600E+00
0	0.387000E+00	0.139320E+00
0	0.206271E+02	0.154800E-01
0	0.619200E+00	0.309600E-01
0	0.193500E+00	0.433440E+01
0	0.100620E+00	0.309600E-01
0	0.348300E-01	0.154800E+00
0	0.328950E+01	0.398610E+00
0	0.119970E+01	0.390870E+00
0	0.116100E+00	0.143190E+01
0	0.193500E-01	0.657900E-01
0	0.781740E+00	0.158670E+01
0	0.154800E+00	0.154800E-01
0	0.890100E-01	0.381582E+02
0	0.170280E+00	0.541800E+00
0	0.270900E-01	0.777870E+01
0	0.735300E-01	0.138546E+02

0				0.619200E-01	0.193500E-01		
0				0.774000E-02	0.611460E+01		
0				0.104490E+00	0.154800E+00		
0				0.154800E+01	0.387000E-01		
0				0.232200E-01	0.387000E+00		
0				0.232200E-01	0.206271E+02		
0				0.116100E-01	0.619200E+00		
0				0.114165E+02	0.193500E+00		
0				0.967500E+00	0.100620E+00		
0				0.774000E-02	0.348300E-01		
0				0.150930E+01	0.328950E+01		
0				0.212850E+00	0.119970E+01		
0				0.657900E+00	0.116100E+00		
0				0.270900E-01	0.193500E-01		
0				0.139320E+00	0.781740E+00		
0				0.116100E-01	0.154800E+00		
0				0.975240E+01	0.890100E-01		
0				0.619200E-01	0.170280E+00		
0				0.774000E-02	0.270900E-01		
0				0.657900E+00	0.735300E-01		
0				0.270900E-01	0.619200E-01		
0				0.696600E+00	0.774000E-02		
0				0.967500E-01	0.104490E+00		
0				0.387000E-01	0.154800E+01		
0				0.541800E-01	0.232200E-01		
0				0.100620E+00	0.232200E-01		
0				0.425700E-01	0.116100E-01		
0				0.154800E-01	0.114165E+02		
0				0.108360E+00	0.967500E+00		
0				0.116100E-01	0.774000E-02		
0				0.580500E-01	0.150930E+01		
0				0.696600E-01	0.212850E+00		
0				0.123840E+01	0.657900E+00		
0				0.154800E-01	0.270900E-01		
0				0.774000E-02	0.139320E+00		
0				0.619200E-01	0.116100E-01		
0				0.135450E+01	0.975240E+01		
0				0.387000E-02	0.619200E-01		
0				0.735300E-01	0.774000E-02		
0				0.309600E-01	0.657900E+00		
0				0.201240E+01	0.270900E-01		
0				0.348300E+00	0.696600E+00		
0				0.383130E+00	0.967500E-01		
0				0.270900E-02	0.387000E-01		
0				0.133380E+07	0.541800E-01		
0				0.134060E+07	0.100620E+00		
0				0.137680E+07	0.425700E-01		
0				0.138960E+07	0.154800E-01		
0				0.139480E+07	0.108360E+00		
0				0.140360E+07	0.116100E-01		
0				0.149650E+07	0.580500E-01		
0				0.154770E+07	0.696600E-01		
0				0.164600E+07	0.123840E+01		
0				0.169680E+07	0.154800E-01		
0				0.183060E+07	0.774000E-02		
0				0.188010E+07	0.619200E-01		
0				0.188770E+07	0.135450E+01		
0				0.192410E+07	0.387000E-02		
0				0.193610E+07	0.735300E-01		
0				0.198030E+07	0.309600E-01		
0				0.200090E+07	0.201240E+01		
0				0.216850E+07	0.348300E+00		
0				0.227060E+07	0.383130E+00		
0				0.233270E+07	0.270900E-02		
52	132	Te132	0.281520E+06	0.100400E+06	0.207000E+05	0.000000E+00	0.497200E+05 0.143766E+02
0					0.111760E+06	0.185220E+01	
0					0.116300E+06	0.194040E+01	
0					0.228160E+06	0.882000E+02	
53	123	I123	0.475000E+05	0.000000E+00	0.246900E+05	0.000000E+00	0.315707E+00 0.833000E+02
0					0.139111E+01	0.833000E-03	
0					0.381514E+00	0.129115E-01	

0				0.308210E-02	0.198254E-01		
0				0.108290E-02	0.333200E-02		
0				0.149940E-02	0.333200E-02		
0				0.258230E-02	0.108290E-02		
0				0.108290E-02	0.708050E-01		
0				0.833000E-01	0.149940E-02		
0				0.158270E-02	0.224910E-02		
0				0.267393E-01	0.791350E-01		
0				0.616420E-01	0.424830E-02		
0				0.591430E-01	0.158270E-02		
0				0.133280E-02	0.258230E-02		
0				0.141610E-02	0.115787E-01		
0				0.343730E+06	0.424830E-02		
0				0.346350E+06	0.125783E+00		
0				0.405020E+06	0.291550E-02		
0				0.440020E+06	0.428162E+00		
0				0.454760E+06	0.391510E-02		
0				0.505330E+06	0.315707E+00		
0				0.528960E+06	0.139111E+01		
0				0.538540E+06	0.381514E+00		
0				0.556050E+06	0.308210E-02		
0				0.562790E+06	0.108290E-02		
0				0.578260E+06	0.149940E-02		
0				0.599690E+06	0.258230E-02		
0				0.610050E+06	0.108290E-02		
0				0.624570E+06	0.833000E-01		
0				0.628260E+06	0.158270E-02		
0				0.687950E+06	0.267393E-01		
0				0.735780E+06	0.616420E-01		
0				0.783590E+06	0.591430E-01		
0				0.909120E+06	0.133280E-02		
0				0.106810E+07	0.141610E-02		
53	125	1125	0.519610E+07	0.000000E+00	0.398000E+05	0.000000E+00	0.354920E+05 0.666000E+01
53	126	1126	0.112500E+07	0.550000E+04	0.238800E+05	0.000000E+00	0.388630E+06 0.340000E+02
0					0.491240E+06	0.285000E+01	
0					0.666330E+06	0.331000E+02	
0					0.753820E+06	0.420000E+01	
0					0.879880E+06	0.750000E+00	
0					0.137900E+07	0.238000E-02	
0					0.142020E+07	0.295000E+00	
0					0.204510E+07	0.460000E-02	
53	129	1129	0.495444E+15	0.543000E+05	0.216000E+05	0.000000E+00	0.395810E+05 0.750000E+01
53	131	1131	0.694656E+06	0.191500E+06	0.149000E+04	0.000000E+00	0.801830E+05 0.262080E+01
0					0.859200E+05	0.907200E-04	
0					0.177210E+06	0.265104E+00	
0					0.232170E+06	0.141120E-02	
0					0.272490E+06	0.564480E-01	
0					0.284300E+06	0.605808E+01	
0					0.295830E+06	0.705600E-03	
0					0.302410E+06	0.453600E-02	
0					0.318080E+06	0.796320E-01	
0					0.324640E+06	0.221760E-01	
0					0.325780E+06	0.250992E+00	
0					0.358380E+06	0.917280E-02	
0					0.364480E+06	0.812448E+02	
0					0.404800E+06	0.564480E-01	
0					0.502990E+06	0.360864E+00	
0					0.636970E+06	0.726768E+01	
0					0.642700E+06	0.219744E+00	
0					0.722890E+06	0.180432E+01	
53	132	1132	0.822240E+04	0.486000E+06	0.284000E+03	0.000000E+00	0.177660E+00 0.789600E-01
0					0.503370E+01	0.236880E+00	
0					0.160881E+02	0.157920E+00	
0					0.523110E+00	0.187530E+00	
0					0.125349E+01	0.144102E+01	
0					0.592200E-01	0.394800E-01	
0					0.888300E-01	0.789600E+00	
0					0.394800E+00	0.493500E-02	

0	0.157920E+01	0.108570E+00
0	0.137193E+02	0.888300E-01
0	0.266490E+01	0.157920E+00
0	0.987000E+02	0.987000E-01
0	0.493500E+01	0.789600E-01
0	0.523110E+01	0.493500E+00
0	0.217140E+01	0.167790E+00
0	0.315840E+01	0.463890E+00
0	0.108570E+01	0.454020E+00
0	0.197400E-01	0.671160E+00
0	0.761964E+02	0.266490E+00
0	0.123375E+01	0.987000E-01
0	0.424410E+00	0.177660E+00
0	0.888300E-01	0.503370E+01
0	0.286230E+01	0.160881E+02
0	0.562590E+01	0.523110E+00
0	0.592200E+00	0.125349E+01
0	0.107583E+01	0.592200E-01
0	0.394800E-01	0.888300E-01
0	0.917910E+00	0.394800E+00
0	0.444150E+00	0.157920E+01
0	0.789600E-01	0.137193E+02
0	0.180621E+02	0.266490E+01
0	0.562590E+00	0.987000E+02
0	0.394800E-01	0.493500E+01
0	0.789600E-01	0.523110E+01
0	0.493500E-01	0.217140E+01
0	0.572460E+00	0.315840E+01
0	0.444150E-01	0.108570E+01
0	0.690900E-01	0.197400E-01
0	0.345450E-01	0.761964E+02
0	0.592200E-01	0.123375E+01
0	0.513240E-01	0.424410E+00
0	0.296100E+01	0.888300E-01
0	0.148050E+00	0.286230E+01
0	0.138180E+01	0.562590E+01
0	0.207270E+00	0.592200E+00
0	0.108570E+01	0.107583E+01
0	0.493500E-01	0.394800E-01
0	0.227010E-01	0.917910E+00
0	0.148050E+00	0.444150E+00
0	0.113505E+01	0.789600E-01
0	0.197400E+01	0.180621E+02
0	0.888300E+00	0.562590E+00
0	0.592200E-01	0.394800E-01
0	0.118440E+00	0.789600E-01
0	0.246750E+01	0.493500E-01
0	0.710640E+01	0.572460E+00
0	0.592200E-01	0.444150E-01
0	0.142128E+01	0.690900E-01
0	0.483630E-01	0.345450E-01
0	0.138180E+00	0.592200E-01
0	0.513240E-01	0.513240E-01
0	0.987000E-02	0.296100E+01
0	0.444150E-01	0.148050E+00
0	0.148050E-01	0.138180E+01
0	0.789600E-02	0.207270E+00
0	0.167790E-01	0.108570E+01
0	0.167790E-01	0.493500E-01
0	0.177660E-01	0.227010E-01
0	0.523110E-01	0.148050E+00
0	0.621810E-01	0.113505E+01
0	0.296100E-01	0.197400E+01
0	0.375060E+00	0.888300E+00
0	0.197400E-01	0.592200E-01
0	0.592200E-01	0.118440E+00
0	0.789600E-02	0.246750E+01
0	0.987000E-02	0.710640E+01
0	0.157920E-01	0.592200E-01
0	0.592200E-01	0.142128E+01
0	0.118440E+01	0.483630E-01
0	0.789600E-02	0.138180E+00
0	0.108570E+01	0.513240E-01

0					0.246750E+00	0.987000E-02		
0					0.187530E+00	0.444150E-01		
0					0.690900E-02	0.148050E-01		
0					0.118440E+00	0.789600E-02		
0					0.296100E-01	0.167790E-01		
0					0.394800E-02	0.167790E-01		
0					0.167790E+00	0.177660E-01		
0					0.987000E-02	0.523110E-01		
0					0.394800E-02	0.621810E-01		
0					0.296100E-02	0.296100E-01		
0					0.365190E-01	0.375060E+00		
0					0.197400E-02	0.197400E-01		
0					0.296100E-02	0.592200E-01		
0					0.296100E-02	0.789600E-02		
0					0.181440E+07	0.987000E-02		
0					0.187920E+07	0.157920E-01		
0					0.191430E+07	0.592200E-01		
0					0.192110E+07	0.118440E+01		
0					0.198550E+07	0.789600E-02		
0					0.200230E+07	0.108570E+01		
0					0.208680E+07	0.246750E+00		
0					0.217270E+07	0.187530E+00		
0					0.218690E+07	0.690900E-02		
0					0.222320E+07	0.118440E+00		
0					0.224910E+07	0.296100E-01		
0					0.229040E+07	0.394800E-02		
0					0.239050E+07	0.167790E+00		
0					0.240890E+07	0.987000E-02		
0					0.244410E+07	0.394800E-02		
0					0.245520E+07	0.296100E-02		
0					0.252510E+07	0.365190E-01		
0					0.254660E+07	0.197400E-02		
0					0.256970E+07	0.296100E-02		
0					0.271740E+07	0.296100E-02		
53	133	1133	0.748800E+05	0.570000E+10	0.181000E+03	0.000000E+00	0.200100E-01	0.295800E-01
0					0.348000E-02	0.783000E-01		
0					0.543750E+00	0.435000E-02		
0					0.565500E-01	0.348000E-01		
0					0.426300E-01	0.359310E+00		
0					0.217500E-01	0.117450E+00		
0					0.649890E+00	0.104400E+00		
0					0.150510E+01	0.113100E+00		
0					0.460230E+00	0.957000E-02		
0					0.504600E-01	0.452400E-01		
0					0.154860E+00	0.591600E-01		
0					0.124410E+01	0.153990E+00		
0					0.450660E+01	0.311460E+00		
0					0.214020E+00	0.400200E-01		
0					0.461100E-01	0.182700E+01		
0					0.609000E-02	0.435000E-02		
0					0.870000E-02	0.435000E-01		
0					0.555930E+00	0.870000E+02		
0					0.138330E+00	0.356700E-01		
0					0.121800E-01	0.435000E-03		
0					0.150510E+01	0.200100E-01		
0					0.234900E+01	0.348000E-02		
0					0.149640E+00	0.543750E+00		
0					0.870000E-02	0.565500E-01		
0					0.295800E-02	0.426300E-01		
0					0.678650E+06	0.217500E-01		
0					0.680250E+06	0.649890E+00		
0					0.706580E+06	0.150510E+01		
0					0.768380E+06	0.460230E+00		
0					0.789590E+06	0.504600E-01		
0					0.820510E+06	0.154860E+00		
0					0.856280E+06	0.124410E+01		
0					0.875330E+06	0.450660E+01		
0					0.909670E+06	0.214020E+00		
0					0.911490E+06	0.461100E-01		
0					0.101810E+07	0.609000E-02		
0					0.103560E+07	0.870000E-02		
0					0.105230E+07	0.555930E+00		

0					0.106010E+07	0.138330E+00		
0					0.108770E+07	0.121800E-01		
0					0.123640E+07	0.150510E+01		
0					0.129820E+07	0.234900E+01		
0					0.135040E+07	0.149640E+00		
0					0.138610E+07	0.870000E-02		
0					0.158990E+07	0.295800E-02		
53	134	1134	0.315600E+04	0.617000E+06	0.627000E+03	0.000000E+00	0.111618E+02	0.410220E+01
0					0.105894E+02	0.772740E+00		
0					0.220374E+01	0.105894E+00		
0					0.782280E+01	0.295740E+00		
0					0.829980E+00	0.791820E+00		
0					0.181260E+01	0.248040E+00		
0					0.705960E+00	0.219420E+01		
0					0.410220E+01	0.152640E+00		
0					0.591480E+00	0.467460E+00		
0					0.954000E+02	0.496080E+00		
0					0.696420E+01	0.734580E+01		
0					0.190800E+00	0.562860E+00		
0					0.648720E+02	0.419760E+01		
0					0.143100E+00	0.133560E+01		
0					0.400680E+01	0.362520E+00		
0					0.362520E+00	0.143100E+01		
0					0.477000E+01	0.221328E+01		
0					0.190800E+01	0.763200E+01		
0					0.667800E-01	0.944460E+00		
0					0.954000E-01	0.343440E+00		
0					0.149778E+02	0.111618E+02		
0					0.858600E-01	0.105894E+02		
0					0.686880E+00	0.220374E+01		
0					0.725040E+00	0.782280E+01		
0					0.915840E+01	0.829980E+00		
0					0.333900E+00	0.181260E+01		
0					0.133560E+00	0.705960E+00		
0					0.572400E-01	0.410220E+01		
0					0.352980E+00	0.591480E+00		
0					0.667800E-01	0.954000E+02		
0					0.209880E+00	0.696420E+01		
0					0.763200E-01	0.190800E+00		
0					0.562860E+00	0.648720E+02		
0					0.104940E+00	0.143100E+00		
0					0.143100E+00	0.400680E+01		
0					0.400680E+00	0.362520E+00		
0					0.763200E-01	0.477000E+01		
0					0.954000E-01	0.190800E+01		
0					0.219420E+00	0.667800E-01		
0					0.171720E+00	0.954000E-01		
0					0.171720E+00	0.149778E+02		
0					0.228960E+01	0.858600E-01		
0					0.753660E+00	0.686880E+00		
0					0.114480E+00	0.725040E+00		
0					0.505620E+00	0.915840E+01		
0					0.429300E+01	0.333900E+00		
0					0.200340E+00	0.133560E+00		
0					0.400680E+00	0.572400E-01		
0					0.228960E+00	0.352980E+00		
0					0.267120E+01	0.667800E-01		
0					0.553320E+01	0.209880E+00		
0					0.667800E-01	0.763200E-01		
0					0.572400E-01	0.562860E+00		
0					0.181260E+00	0.104940E+00		
0					0.954000E-01	0.143100E+00		
0					0.171720E+00	0.400680E+00		
0					0.209880E+00	0.763200E-01		
0					0.534240E+00	0.954000E-01		
0					0.954000E-01	0.219420E+00		
0					0.238500E+00	0.171720E+00		
0					0.753660E-01	0.171720E+00		
0					0.639180E-01	0.228960E+01		
0					0.143100E+00	0.753660E+00		
0					0.667800E-01	0.114480E+00		
0					0.667800E-01	0.505620E+00		

0				0.190800E-01	0.429300E+01		
0				0.324360E-01	0.200340E+00		
0				0.190800E-01	0.400680E+00		
0				0.165520E+07	0.228960E+00		
0				0.174150E+07	0.267120E+01		
0				0.180680E+07	0.553320E+01		
0				0.186850E+07	0.667800E-01		
0				0.189320E+07	0.572400E-01		
0				0.192590E+07	0.181260E+00		
0				0.194730E+07	0.954000E-01		
0				0.202060E+07	0.171720E+00		
0				0.215990E+07	0.209880E+00		
0				0.223670E+07	0.534240E+00		
0				0.226250E+07	0.954000E-01		
0				0.231240E+07	0.238500E+00		
0				0.240900E+07	0.753660E-01		
0				0.245290E+07	0.639180E-01		
0				0.246740E+07	0.143100E+00		
0				0.251330E+07	0.667800E-01		
0				0.262990E+07	0.667800E-01		
0				0.264600E+07	0.190800E-01		
0				0.269950E+07	0.324360E-01		
0				0.284000E+07	0.190800E-01		
53	135	1135	0.236520E+05	0.359000E+06	0.135500E+03	0.000000E+00	0.303450E+00 0.127160E-01
0					0.355470E+01	0.693600E-02	
0					0.306340E+00	0.982600E-02	
0					0.557770E+00	0.315010E-01	
0					0.317900E+00	0.236980E-01	
0					0.317900E-01	0.329460E-01	
0					0.719610E+01	0.176290E+01	
0					0.130050E+00	0.242760E+00	
0					0.520200E-01	0.289000E-01	
0					0.375700E-01	0.231200E-01	
0					0.459510E+00	0.184960E+00	
0					0.751400E-01	0.312120E+01	
0					0.549100E-01	0.306340E+00	
0					0.231200E-01	0.317900E-01	
0					0.130050E+00	0.956590E-01	
0					0.664700E+00	0.231200E-02	
0					0.153170E+00	0.375700E-01	
0					0.231200E-01	0.867000E-03	
0					0.173400E+00	0.187850E+00	
0					0.462400E-01	0.234090E+00	
0					0.673370E+01	0.303450E+00	
0					0.346800E-01	0.355470E+01	
0					0.147390E+00	0.306340E+00	
0					0.895900E+00	0.557770E+00	
0					0.121380E+01	0.317900E+00	
0					0.156060E+00	0.317900E-01	
0					0.800530E+01	0.719610E+01	
0					0.895900E-01	0.130050E+00	
0					0.161840E+01	0.520200E-01	
0					0.364140E+01	0.375700E-01	
0					0.227443E+02	0.459510E+00	
0					0.104040E+00	0.751400E-01	
0					0.881450E+00	0.549100E-01	
0					0.635800E-01	0.231200E-01	
0					0.433500E-01	0.130050E+00	
0					0.910350E+00	0.664700E+00	
0					0.578000E-02	0.153170E+00	
0					0.289000E+02	0.231200E-01	
0					0.578000E-01	0.173400E+00	
0					0.346800E-01	0.462400E-01	
0					0.664700E-01	0.673370E+01	
0					0.317900E-01	0.346800E-01	
0					0.780300E-01	0.147390E+00	
0					0.612680E+00	0.895900E+00	
0					0.317900E-01	0.121380E+01	
0					0.173400E-01	0.156060E+00	
0					0.317900E+00	0.800530E+01	
0					0.872780E+01	0.895900E-01	
0					0.108375E+01	0.161840E+01	

0				0.375700E-01	0.364140E+01		
0				0.260100E-01	0.227443E+02		
0				0.130050E+01	0.104040E+00		
0				0.260100E-01	0.881450E+00		
0				0.962370E+01	0.635800E-01		
0				0.413270E+01	0.433500E-01		
0				0.777410E+01	0.910350E+00		
0				0.583780E+00	0.578000E-02		
0				0.578000E-02	0.289000E+02		
0				0.297670E+00	0.578000E-01		
0				0.635800E-01	0.346800E-01		
0				0.878560E+00	0.664700E-01		
0				0.693600E-01	0.317900E-01		
0				0.225420E-01	0.780300E-01		
0				0.404600E-02	0.612680E+00		
0				0.130050E-01	0.317900E-01		
0				0.618460E+00	0.173400E-01		
0				0.962370E+00	0.317900E+00		
0				0.867000E-02	0.872780E+01		
0				0.722500E-01	0.108375E+01		
0				0.144500E-02	0.375700E-01		
0				0.154370E+07	0.260100E-01		
0				0.156640E+07	0.130050E+01		
0				0.161370E+07	0.260100E-01		
0				0.167800E+07	0.962370E+01		
0				0.170650E+07	0.413270E+01		
0				0.179120E+07	0.777410E+01		
0				0.183070E+07	0.583780E+00		
0				0.184530E+07	0.578000E-02		
0				0.192730E+07	0.297670E+00		
0				0.194850E+07	0.635800E-01		
0				0.204590E+07	0.878560E+00		
0				0.211240E+07	0.693600E-01		
0				0.215150E+07	0.225420E-01		
0				0.217970E+07	0.404600E-02		
0				0.218940E+07	0.130050E-01		
0				0.225550E+07	0.618460E+00		
0				0.240860E+07	0.962370E+00		
0				0.245280E+07	0.867000E-02		
0				0.246610E+07	0.722500E-01		
0				0.247710E+07	0.144500E-02		
54	127	Xe127	0.314496E+07	0.000000E+00	0.261100E+05	0.000000E+00	0.576100E+05 0.122257E+01
0					0.145250E+06	0.428924E+01	
0					0.172130E+06	0.255442E+02	
0					0.202860E+06	0.683000E+02	
0					0.374990E+06	0.172116E+02	
0					0.618400E+06	0.142064E-01	
54	133	Xe133	0.452995E+06	0.136400E+06	0.160000E+05	0.000000E+00	0.796230E+05 0.270000E+00
0					0.809970E+05	0.380000E+02	
0					0.160610E+06	0.660000E-01	
0					0.223230E+06	0.120000E-03	
0					0.302850E+06	0.480000E-02	
0					0.383850E+06	0.240000E-02	
54	135	Xe135	0.329040E+05	0.318000E+06	0.163000E+04	0.000000E+00	0.158260E+06 0.289542E+00
0					0.200190E+06	0.117260E-01	
0					0.249790E+06	0.902000E+02	
0					0.358380E+06	0.220990E+00	
0					0.373130E+06	0.153340E-01	
0					0.408010E+06	0.358996E+00	
0					0.454200E+06	0.360800E-02	
0					0.573360E+06	0.478060E-02	
0					0.608150E+06	0.290444E+01	
0					0.654430E+06	0.451000E-01	
0					0.731630E+06	0.550220E-01	
0					0.812630E+06	0.703560E-01	
0					0.106240E+07	0.405900E-02	
55	129	Cs129	0.115420E+06	0.000000E+00	0.322294E+05	0.000000E+00	0.606760E+00 0.298760E+01
0					0.283360E-01	0.246400E-02	

0					0.172480E-02	0.656040E+00		
0					0.323400E-01	0.271040E+00		
0					0.831600E-02	0.274120E+00		
0					0.221452E+00	0.214060E+00		
0					0.699160E-01	0.133056E+01		
0					0.282130E+06	0.243320E+00		
0					0.318180E+06	0.246400E+01		
0					0.321700E+06	0.708400E-01		
0					0.357520E+06	0.585200E-02		
0					0.371920E+06	0.308000E+02		
0					0.373360E+06	0.123200E-01		
0					0.411490E+06	0.224532E+02		
0					0.492780E+06	0.113960E-01		
0					0.533100E+06	0.954800E-02		
0					0.534550E+06	0.212520E-01		
0					0.548940E+06	0.341880E+01		
0					0.572730E+06	0.154000E-02		
0					0.586110E+06	0.129360E-01		
0					0.588550E+06	0.606760E+00		
0					0.624310E+06	0.283360E-01		
0					0.627880E+06	0.172480E-02		
0					0.864740E+06	0.323400E-01		
0					0.904310E+06	0.831600E-02		
0					0.906420E+06	0.221452E+00		
0					0.946050E+06	0.699160E-01		
55	131	Cs131	0.837200E+06	0.000000E+00	0.283000E+05	0.000000E+00	0.000000E+00	
55	134	Cs134	0.650704E+08	0.000000E+00	0.281000E+03	0.000000E+00	0.242690E+06	0.210000E-01
0					0.326510E+06	0.144000E-01		
0					0.475350E+06	0.146000E+01		
0					0.563230E+06	0.838000E+01		
0					0.569310E+06	0.154300E+02		
0					0.604700E+06	0.976000E+02		
0					0.795850E+06	0.854000E+02		
0					0.801930E+06	0.873000E+01		
0					0.847020E+06	0.300000E-03		
0					0.103860E+07	0.100000E+01		
0					0.116790E+07	0.180500E+01		
0					0.136520E+07	0.304000E+01		
55	134	Cs134m	0.104760E+05	0.104700E+06	0.104000E+05	0.000000E+00	0.112300E+05	0.939800E+00
0					0.127500E+06	0.127000E+02		
0					0.138720E+06	0.393700E-02		
55	135	Cs135	0.725809E+14	0.563000E+05	0.104000E+05	0.000000E+00	0.000000E+00	
55	136	Cs136	0.113702E+07	0.133700E+06	0.255000E+04	0.000000E+00	0.997040E-01	0.478579E+01
0					0.149556E-01	0.518461E+01		
0					0.109680E+06	0.209378E+00		
0					0.153250E+06	0.575292E+01		
0					0.166580E+06	0.368905E+00		
0					0.176600E+06	0.997040E+01		
0					0.187280E+06	0.358934E+00		
0					0.233500E+06	0.797632E-01		
0					0.273650E+06	0.110671E+02		
0					0.302400E+06	0.299112E-01		
0					0.315500E+06	0.199408E-01		
0					0.319910E+06	0.498520E+00		
0					0.340550E+06	0.421748E+02		
0					0.490000E+06	0.797632E-01		
0					0.507190E+06	0.967129E+00		
0					0.733000E+06	0.199408E-01		
0					0.818510E+06	0.887366E+02		
0					0.104810E+07	0.687958E+02		
0					0.123540E+07	0.200405E+02		
0					0.132160E+07	0.498520E-01		
0					0.153810E+07	0.997040E-01		
0					0.155130E+07	0.149556E-01		
55	137	Cs137	0.946708E+09	0.187540E+06	0.255000E+04	0.000000E+00	0.000000E+00	
56	131	Ba131	0.102000E+07	0.410000E+01	0.313400E+05	0.000000E+00	0.417900E-01	0.955200E-01

0				0.597000E-01	0.754210E+00		
0				0.398000E-01	0.199000E-01		
0				0.338300E+00	0.636800E+00		
0				0.189050E+01	0.290540E+02		
0				0.437800E+02	0.159200E-01		
0				0.597000E-02	0.218900E+01		
0				0.597000E-02	0.318400E-01		
0				0.159200E+00	0.199000E+00		
0				0.123380E+01	0.199000E+02		
0				0.157210E+01	0.240790E+01		
0				0.129350E+00	0.597000E+00		
0				0.147260E+00	0.280590E+01		
0				0.676600E-02	0.159200E+00		
0				0.199000E-01	0.995000E-02		
0				0.199000E-01	0.119400E+00		
0				0.218900E+00	0.298500E-01		
0				0.437800E-01	0.133330E+02		
0				0.796000E-02	0.129350E+01		
0				0.696500E+00	0.995000E-01		
0				0.338300E-01	0.417900E-01		
0				0.338300E-01	0.597000E-01		
0				0.199000E+00	0.398000E-01		
0				0.119400E+01	0.338300E+00		
0				0.298500E-02	0.189050E+01		
0				0.159200E-02	0.437800E+02		
0				0.159200E-02	0.597000E-02		
0				0.563400E+06	0.597000E-02		
0				0.572660E+06	0.159200E+00		
0				0.585020E+06	0.123380E+01		
0				0.620050E+06	0.157210E+01		
0				0.674410E+06	0.129350E+00		
0				0.696460E+06	0.147260E+00		
0				0.703440E+06	0.676600E-02		
0				0.795900E+06	0.199000E-01		
0				0.797410E+06	0.199000E-01		
0				0.831630E+06	0.218900E+00		
0				0.914090E+06	0.437800E-01		
0				0.919000E+06	0.796000E-02		
0				0.923860E+06	0.696500E+00		
0				0.954660E+06	0.338300E-01		
0				0.968870E+06	0.338300E-01		
0				0.104700E+07	0.199000E+00		
0				0.104760E+07	0.119400E+01		
0				0.112620E+07	0.298500E-02		
0				0.117000E+07	0.159200E-02		
0				0.120800E+07	0.159200E-02		
56	133	Ba133	0.331979E+09	0.000000E+00	0.394000E+05	0.000000E+00	0.531610E+05 0.219900E+01
0					0.796230E+05	0.262000E+01	
0					0.809970E+05	0.340600E+02	
0					0.160610E+06	0.645000E+00	
0					0.223230E+06	0.450000E+00	
0					0.276400E+06	0.716400E+01	
0					0.302850E+06	0.183300E+02	
0					0.356020E+06	0.620500E+02	
0					0.383850E+06	0.894000E+01	
56	137	Ba137m	0.153120E+03	0.638000E+05	0.245000E+04	0.000000E+00	0.661660E+06 0.901000E+02
56	140	Ba140	0.110177E+07	0.311000E+06	0.140000E+04	0.000000E+00	0.138500E+05 0.119511E+01
0					0.299550E+05	0.140974E+02	
0					0.113550E+06	0.187803E-01	
0					0.118900E+06	0.658530E-01	
0					0.132720E+06	0.219510E+00	
0					0.162670E+06	0.620969E+01	
0					0.304870E+06	0.429996E+01	
0					0.423730E+06	0.312192E+01	
0					0.437590E+06	0.190242E+01	
0					0.467500E+06	0.975600E-03	
0					0.537310E+06	0.243900E+02	
0					0.551200E+06	0.658530E-02	
57	140	La140	0.144988E+06	0.518000E+06	0.709000E+03	0.000000E+00	0.692604E+01 0.725040E-03

0				0.527562E+00	0.104940E-01		
0				0.858600E-02	0.763200E-01		
0				0.152640E-01	0.181260E+00		
0				0.219420E-01	0.419760E+00		
0				0.457920E-01	0.114480E+00		
0				0.639180E-01	0.429300E+00		
0				0.954000E+02	0.486540E+00		
0				0.400680E-01	0.200340E-01		
0				0.572400E-02	0.206064E+02		
0				0.112572E-01	0.744120E-01		
0				0.849060E+00	0.290970E+01		
0				0.763200E-02	0.667800E-03		
0				0.342486E+01	0.343440E-02		
0				0.103986E+00	0.442656E+02		
0				0.667800E-01	0.133560E-01		
0				0.257580E-01	0.424530E+01		
0				0.410220E-02	0.228960E+02		
0				0.867850E+06	0.559044E+01		
0				0.919550E+06	0.269982E+01		
0				0.925190E+06	0.692604E+01		
0				0.950990E+06	0.527562E+00		
0				0.992900E+06	0.858600E-02		
0				0.104500E+07	0.152640E-01		
0				0.109720E+07	0.219420E-01		
0				0.130350E+07	0.457920E-01		
0				0.140520E+07	0.639180E-01		
0				0.159620E+07	0.954000E+02		
0				0.187730E+07	0.400680E-01		
0				0.192460E+07	0.572400E-02		
0				0.208320E+07	0.112572E-01		
0				0.234790E+07	0.849060E+00		
0				0.246410E+07	0.763200E-02		
0				0.252140E+07	0.342486E+01		
0				0.254730E+07	0.103986E+00		
0				0.289960E+07	0.667800E-01		
0				0.311850E+07	0.257580E-01		
0				0.332040E+07	0.410220E-02		
58	139	Ce139	0.118921E+08	0.716600E-05	0.410100E+05	0.000000E+00	0.165850E+06 0.798840E+02
58	141	Ce141	0.280809E+07	0.170300E+06	0.645000E+04	0.000000E+00	0.145440E+06 0.482000E+02
58	143	Ce143	0.118800E+06	0.430000E+06	0.232000E+05	0.000000E+00	0.569240E+01 0.115560E+02
0				0.813200E-02	0.342400E-01		
0				0.856000E-03	0.770400E-01		
0				0.856000E-02	0.205440E+01		
0				0.856000E-02	0.428000E+02		
0				0.539280E+01	0.684800E-02		
0				0.214000E-02	0.323140E+01		
0				0.243960E-02	0.248240E-01		
0				0.316720E-02	0.363800E-01		
0				0.214000E-02	0.684800E-02		
0				0.132680E-01	0.158788E+00		
0				0.286760E-01	0.428000E-02		
0				0.312440E-01	0.149800E-01		
0				0.342400E-02	0.599200E-01		
0				0.103148E+01	0.216140E+01		
0				0.813200E-02	0.445120E-01		
0				0.128400E-02	0.316720E-01		
0				0.261080E-01	0.513600E-02		
0				0.128400E-02	0.266644E+00		
0				0.753280E-01	0.119840E-01		
0				0.128400E-02	0.569240E+01		
0				0.201160E-01	0.813200E-02		
0				0.119840E-01	0.856000E-03		
0				0.363800E-01	0.856000E-02		
0				0.415160E+00	0.856000E-02		
0				0.239680E-02	0.539280E+01		
0				0.158360E-02	0.214000E-02		
0				0.308160E-02	0.243960E-02		
0				0.767700E+06	0.316720E-02		
0				0.787420E+06	0.214000E-02		
0				0.791070E+06	0.132680E-01		

0				0.806340E+06	0.286760E-01		
0				0.809980E+06	0.312440E-01		
0				0.868100E+06	0.342400E-02		
0				0.880460E+06	0.103148E+01		
0				0.891470E+06	0.813200E-02		
0				0.907100E+06	0.128400E-02		
0				0.937820E+06	0.261080E-01		
0				0.956900E+06	0.128400E-02		
0				0.100290E+07	0.753280E-01		
0				0.101430E+07	0.128400E-02		
0				0.103120E+07	0.201160E-01		
0				0.104680E+07	0.119840E-01		
0				0.106020E+07	0.363800E-01		
0				0.110320E+07	0.415160E+00		
0				0.116060E+07	0.239680E-02		
0				0.132450E+07	0.158360E-02		
0				0.134010E+07	0.308160E-02		
58	144	Ce144	0.246154E+08	0.914000E+05	0.297000E+04	0.000000E+00	0.336200E+05
0					0.408900E+05	0.399240E+00	0.288340E+00
0					0.534300E+05	0.953740E-01	
0					0.801060E+05	0.113118E+01	
0					0.999600E+05	0.388150E-01	
0					0.133540E+06	0.110900E+02	
59	142	Pr142	0.688320E+05	0.000000E+00	0.450000E+01	0.000000E+00	0.508800E+06
0					0.641280E+06	0.220000E-02	0.230000E-01
0					0.157580E+07	0.370000E+01	
59	143	Pr143	0.117245E+07	0.315300E+06	0.160284E-05	0.000000E+00	0.742090E+06
							0.120000E-05
59	144	Pr144	0.103680E+04	0.120890E+07	0.211000E+01	0.000000E+00	0.624660E+06
0					0.675020E+06	0.277794E-02	0.114070E-02
0					0.696490E+06	0.134200E+01	
0					0.814150E+06	0.328790E-02	
0					0.864530E+06	0.259006E-02	
0					0.138800E+07	0.597190E-02	
0					0.148910E+07	0.272426E+00	
0					0.156200E+07	0.228140E-03	
0					0.218570E+07	0.700524E+00	
0					0.265460E+07	0.187880E-03	
59	144	Pr144m	0.432000E+03	0.454000E+05	0.119000E+05	0.000000E+00	0.590300E+05
0					0.696490E+06	0.400000E-01	0.794000E-01
0					0.814150E+06	0.400000E-01	
60	147	Nd147	0.948672E+06	0.268300E+06	0.185000E+05	0.000000E+00	0.911060E+05
0					0.120480E+06	0.396180E+00	0.279000E+02
0					0.196640E+06	0.203670E+00	
0					0.275370E+06	0.800730E+00	
0					0.319410E+06	0.195300E+01	
0					0.398150E+06	0.870480E+00	
0					0.410480E+06	0.139500E+00	
0					0.439890E+06	0.119970E+01	
0					0.489240E+06	0.153450E+00	
0					0.531020E+06	0.130851E+02	
0					0.589350E+06	0.457560E-01	
0					0.594800E+06	0.265050E+00	
0					0.680520E+06	0.195300E-01	
0					0.685900E+06	0.811890E+00	
60	149	Nd149	0.621000E+04	0.517000E+06	0.130000E+05	0.000000E+00	0.388500E-01
0					0.336700E-01	0.173530E-01	0.543900E-02
0					0.593110E+01	0.181300E-01	
0					0.492100E-01	0.129500E+01	
0					0.155400E+00	0.155400E-01	
0					0.103600E+00	0.310800E-01	
0					0.178710E+01	0.111370E+01	
0					0.569800E+00	0.984200E+00	
0					0.492100E-01	0.227920E+00	
0					0.139083E+01	0.414400E-01	
0					0.254597E+01	0.336700E-01	
0					0.259000E+02	0.145040E+01	

0	0.398860E+00	0.854700E-01
0	0.163170E+00	0.119140E+00
0	0.481740E+00	0.190365E+02
0	0.393680E+01	0.108780E+00
0	0.207200E+00	0.256410E+00
0	0.802900E+00	0.111370E+00
0	0.336700E-01	0.621600E-01
0	0.854700E-01	0.507640E+00
0	0.375550E+00	0.388500E-01
0	0.603470E+01	0.336700E-01
0	0.107226E+02	0.593110E+01
0	0.181300E+00	0.492100E-01
0	0.828800E-01	0.155400E+00
0	0.650090E+00	0.103600E+00
0	0.341880E+00	0.178710E+01
0	0.168350E-01	0.569800E+00
0	0.616420E+00	0.492100E-01
0	0.129500E-01	0.139083E+01
0	0.691530E+00	0.254597E+01
0	0.569800E+00	0.259000E+02
0	0.375550E+00	0.398860E+00
0	0.510230E+00	0.163170E+00
0	0.854700E-02	0.481740E+00
0	0.455840E+01	0.393680E+01
0	0.207200E-01	0.207200E+00
0	0.828800E-01	0.802900E+00
0	0.160580E+00	0.336700E-01
0	0.137529E+01	0.854700E-01
0	0.543900E-01	0.375550E+00
0	0.466200E-01	0.603470E+01
0	0.103600E-01	0.107226E+02
0	0.152810E+00	0.181300E+00
0	0.647500E-02	0.828800E-01
0	0.541310E+00	0.650090E+00
0	0.777000E-02	0.341880E+00
0	0.518000E-01	0.168350E-01
0	0.266770E+00	0.616420E+00
0	0.777000E-02	0.129500E-01
0	0.725200E-01	0.691530E+00
0	0.145040E-01	0.569800E+00
0	0.743330E+01	0.375550E+00
0	0.271950E+00	0.510230E+00
0	0.129500E-01	0.854700E-02
0	0.362600E-01	0.455840E+01
0	0.114996E+01	0.207200E-01
0	0.854700E-01	0.828800E-01
0	0.802900E-02	0.160580E+00
0	0.414400E-01	0.137529E+01
0	0.103600E-01	0.543900E-01
0	0.414400E-01	0.466200E-01
0	0.673400E-01	0.103600E-01
0	0.595700E-01	0.152810E+00
0	0.362600E-01	0.647500E-02
0	0.103600E-01	0.541310E+00
0	0.621600E-01	0.777000E-02
0	0.129500E-01	0.518000E-01
0	0.362600E-01	0.266770E+00
0	0.116550E-01	0.777000E-02
0	0.906500E-01	0.725200E-01
0	0.466200E-01	0.145040E-01
0	0.657860E+01	0.743330E+01
0	0.155400E-01	0.271950E+00
0	0.103600E-01	0.129500E-01
0	0.585340E+00	0.362600E-01
0	0.435120E+00	0.114996E+01
0	0.751100E-01	0.854700E-01
0	0.932400E-02	0.802900E-02
0	0.165760E-01	0.414400E-01
0	0.777000E-02	0.103600E-01
0	0.751100E-01	0.414400E-01
0	0.181300E-01	0.673400E-01
0	0.492100E-01	0.595700E-01
0	0.569800E-02	0.362600E-01

0	0.284900E-01	0.103600E-01
0	0.284900E-01	0.621600E-01
0	0.103600E-01	0.129500E-01
0	0.751100E-02	0.362600E-01
0	0.189070E+00	0.116550E-01
0	0.673400E-01	0.906500E-01
0	0.518000E-01	0.466200E-01
0	0.621600E-01	0.657860E+01
0	0.795130E+01	0.155400E-01
0	0.181300E-01	0.103600E-01
0	0.518000E-02	0.585340E+00
0	0.103600E-01	0.435120E+00
0	0.108780E-01	0.751100E-01
0	0.253820E-01	0.932400E-02
0	0.802900E-02	0.165760E-01
0	0.880600E-01	0.777000E-02
0	0.170940E+00	0.751100E-01
0	0.336700E-02	0.181300E-01
0	0.699300E-01	0.492100E-01
0	0.492100E-01	0.569800E-02
0	0.163170E-01	0.284900E-01
0	0.142450E-01	0.284900E-01
0	0.259000E-02	0.103600E-01
0	0.134680E-01	0.751100E-02
0	0.388500E-01	0.189070E+00
0	0.155400E-01	0.673400E-01
0	0.284900E-01	0.518000E-01
0	0.751100E-02	0.621600E-01
0	0.595700E-01	0.795130E+01
0	0.310800E-02	0.181300E-01
0	0.388500E-02	0.518000E-02
0	0.101010E-01	0.103600E-01
0	0.225330E-01	0.108780E-01
0	0.699300E-02	0.253820E-01
0	0.189070E+00	0.802900E-02
0	0.113960E-01	0.880600E-01
0	0.569800E-02	0.170940E+00
0	0.854700E-02	0.336700E-02
0	0.233100E-01	0.699300E-01
0	0.310800E-01	0.492100E-01
0	0.518000E-01	0.163170E-01
0	0.217560E-01	0.142450E-01
0	0.440300E-02	0.259000E-02
0	0.176120E-01	0.134680E-01
0	0.336700E-02	0.388500E-01
0	0.132090E-01	0.155400E-01
0	0.336700E-01	0.284900E-01
0	0.466200E-02	0.751100E-02
0	0.207200E-02	0.595700E-01
0	0.543900E-02	0.310800E-02
0	0.440300E-02	0.388500E-02
0	0.388500E-02	0.101010E-01
0	0.440300E-02	0.225330E-01
0	0.207200E-02	0.699300E-02
0	0.388500E-02	0.189070E+00
0	0.101010E+00	0.113960E-01
0	0.108780E-01	0.569800E-02
0	0.466200E-02	0.854700E-02
0	0.595700E-02	0.233100E-01
0	0.310800E-02	0.310800E-01
0	0.214970E-01	0.518000E-01
0	0.259000E-02	0.217560E-01
0	0.751100E-02	0.440300E-02
0	0.251230E-01	0.176120E-01
0	0.828800E-02	0.336700E-02
0	0.284900E-02	0.132090E-01
0	0.155400E-01	0.336700E-01
0	0.777000E-01	0.466200E-02
0	0.233100E-02	0.207200E-02
0	0.147630E-01	0.543900E-02
0	0.388500E-02	0.440300E-02
0	0.259000E-02	0.388500E-02
0	0.103600E+00	0.440300E-02

0				0.880600E-02	0.207200E-02		
0				0.440300E-02	0.388500E-02		
0				0.284900E-01	0.101010E+00		
0				0.440300E-02	0.108780E-01		
0				0.207200E-01	0.466200E-02		
0				0.631960E-01	0.595700E-02		
0				0.492100E-01	0.310800E-02		
0				0.150220E-01	0.214970E-01		
0				0.295260E-01	0.259000E-02		
0				0.310800E-02	0.751100E-02		
0				0.207200E-02	0.251230E-01		
0				0.259000E-02	0.828800E-02		
0				0.230510E-01	0.284900E-02		
0				0.103600E-02	0.155400E-01		
0				0.388500E-02	0.777000E-01		
0				0.336700E-02	0.233100E-02		
0				0.233100E-02	0.147630E-01		
0				0.673400E-02	0.388500E-02		
0				0.155400E-02	0.259000E-02		
0				0.155400E-02	0.103600E+00		
0				0.259000E-01	0.880600E-02		
0				0.181300E-02	0.440300E-02		
0				0.414400E-02	0.284900E-01		
0				0.751100E-02	0.440300E-02		
0				0.103600E-02	0.207200E-01		
0				0.155400E-02	0.631960E-01		
0				0.414400E-02	0.492100E-01		
0				0.777000E-03	0.150220E-01		
0				0.103600E-02	0.295260E-01		
0				0.725200E-02	0.310800E-02		
0				0.207200E-02	0.207200E-02		
0				0.207200E-02	0.259000E-02		
0				0.518000E-03	0.230510E-01		
0				0.129500E-02	0.103600E-02		
0				0.155400E-02	0.388500E-02		
0				0.518000E-03	0.336700E-02		
0				0.119030E+07	0.233100E-02		
0				0.119780E+07	0.673400E-02		
0				0.120230E+07	0.155400E-02		
0				0.122570E+07	0.155400E-02		
0				0.123410E+07	0.259000E-01		
0				0.123950E+07	0.181300E-02		
0				0.125960E+07	0.414400E-02		
0				0.126400E+07	0.751100E-02		
0				0.128030E+07	0.103600E-02		
0				0.128450E+07	0.155400E-02		
0				0.129010E+07	0.414400E-02		
0				0.129830E+07	0.777000E-03		
0				0.130760E+07	0.103600E-02		
0				0.131210E+07	0.725200E-02		
0				0.135730E+07	0.207200E-02		
0				0.138140E+07	0.207200E-02		
0				0.144810E+07	0.518000E-03		
0				0.145430E+07	0.129500E-02		
0				0.149580E+07	0.155400E-02		
0				0.156840E+07	0.518000E-03		
61	147	Pm147	0.827864E+08	0.619300E+05	0.920000E+00	0.000000E+00	0.761500E+05 0.102600E-07
0					0.121250E+06	0.285000E-02	
0					0.197350E+06	0.342000E-06	
61	148	Pm148	0.463968E+06	0.729000E+06	0.829000E+02	0.000000E+00	0.444000E-01 0.377400E-01
0					0.362800E+06	0.222000E-02	
0					0.393800E+06	0.155400E-01	
0					0.550270E+06	0.220002E+02	
0					0.592830E+06	0.352980E+00	
0					0.611260E+06	0.102120E+01	
0					0.819270E+06	0.133200E-01	
0					0.874180E+06	0.235320E+00	
0					0.896420E+06	0.981240E+00	
0					0.903940E+06	0.421800E-01	
0					0.914850E+06	0.114552E+02	
0					0.111390E+07	0.222000E-01	

0				0.115250E+07	0.288600E-02		
0				0.137130E+07	0.137640E-01		
0				0.145420E+07	0.510600E-01		
0				0.146510E+07	0.222000E+02		
0				0.150770E+07	0.555000E-02		
0				0.166410E+07	0.113220E-01		
0				0.173410E+07	0.386280E-01		
0				0.176370E+07	0.621600E-02		
0				0.228440E+07	0.444000E-01		
61	148	Pm148m	0.356746E+07	0.171700E+06	0.383000E+04	0.000000E+00	0.327000E+02 0.330000E-03
0					0.171000E+02	0.102000E+01	
0					0.202000E+02	0.246000E+01	
0					0.580000E-01	0.110000E+01	
0					0.288110E+06	0.125000E+02	
0					0.299100E+06	0.890000E-01	
0					0.311630E+06	0.390000E+01	
0					0.362090E+06	0.177000E+00	
0					0.414070E+06	0.186000E+02	
0					0.432780E+06	0.532000E+01	
0					0.460570E+06	0.416000E+00	
0					0.501260E+06	0.672000E+01	
0					0.533600E+06	0.280000E+00	
0					0.550270E+06	0.944000E+02	
0					0.553240E+06	0.400000E+00	
0					0.571950E+06	0.213000E+00	
0					0.599740E+06	0.124800E+02	
0					0.611260E+06	0.546000E+01	
0					0.629870E+06	0.886000E+02	
0					0.714710E+06	0.450000E-01	
0					0.725700E+06	0.327000E+02	
0					0.915330E+06	0.171000E+02	
0					0.101380E+07	0.202000E+02	
0					0.134450E+07	0.580000E-01	
61	149	Pm149	0.191088E+06	0.364700E+06	0.104000E+03	0.000000E+00	0.124000E-03 0.248000E-01
0					0.148800E-02	0.310000E-04	
0					0.114700E-01	0.145700E-02	
0					0.248000E-02	0.217000E-03	
0					0.161200E-02	0.186000E-03	
0					0.186000E-03	0.527000E-02	
0					0.589000E-03	0.341000E-03	
0					0.151900E-01	0.961000E-02	
0					0.186000E-01	0.288300E-01	
0					0.241800E-02	0.744000E-02	
0					0.691300E-01	0.310000E+01	
0					0.217000E-03	0.257300E-02	
0					0.148800E-01	0.279000E-03	
0					0.930000E-02	0.151900E-02	
0					0.775000E-03	0.372000E-02	
0					0.372000E-03	0.341000E-03	
0					0.164300E-01	0.148800E-02	
0					0.310000E-03	0.310000E-03	
0					0.124000E-03	0.148800E-02	
0					0.325500E-01	0.124000E-03	
0					0.331700E-01	0.124000E-03	
0					0.108500E-02	0.148800E-02	
0					0.108500E+00	0.114700E-01	
0					0.238700E-01	0.248000E-02	
0					0.930000E-05	0.161200E-02	
0					0.589000E-03	0.186000E-03	
0					0.217000E-03	0.589000E-03	
0					0.868000E-03	0.151900E-01	
0					0.310000E-05	0.186000E-01	
0					0.310000E-05	0.241800E-02	
0					0.590880E+06	0.691300E-01	
0					0.598420E+06	0.217000E-03	
0					0.613920E+06	0.148800E-01	
0					0.636500E+06	0.930000E-02	
0					0.664400E+06	0.775000E-03	
0					0.785230E+06	0.372000E-03	
0					0.808110E+06	0.164300E-01	
0					0.812920E+06	0.310000E-03	

0					0.824300E+06	0.124000E-03		
0					0.830530E+06	0.325500E-01		
0					0.833400E+06	0.331700E-01		
0					0.835550E+06	0.108500E-02		
0					0.859460E+06	0.108500E+00		
0					0.881980E+06	0.238700E-01		
0					0.915500E+06	0.930000E-05		
0					0.930200E+06	0.589000E-03		
0					0.950600E+06	0.217000E-03		
0					0.952800E+06	0.868000E-03		
0					0.964400E+06	0.310000E-05		
0					0.969600E+06	0.310000E-05		
62	147	Sm147	0.334503E+19	0.000000E+00	0.104000E+03	0.000000E+00	0.000000E+00	
62	151	Sm151	0.284012E+10	0.198300E+05	0.780000E+01	0.000000E+00	0.215400E+05	0.300000E-01
62	153	Sm153	0.166572E+06	0.270500E+06	0.280000E+05	0.000000E+00	0.148050E-02	0.172200E-02
0					0.163800E-01	0.367500E-01		
0					0.420000E-03	0.128100E-02		
0					0.357000E-03	0.551250E+01		
0					0.231000E-02	0.199500E+00		
0					0.787500E-02	0.220500E+00		
0					0.672000E-01	0.178500E+00		
0					0.336000E-01	0.735000E-02		
0					0.210000E-01	0.766500E+00		
0					0.283500E-02	0.297150E+02		
0					0.105000E-02	0.315000E-03		
0					0.535500E-02	0.882000E-02		
0					0.105000E-03	0.120750E-01		
0					0.346500E-02	0.630000E-03		
0					0.903000E-03	0.420000E-03		
0					0.357000E-03	0.735000E-01		
0					0.955500E-03	0.241500E-02		
0					0.120750E-01	0.241500E-02		
0					0.735000E-03	0.189000E-02		
0					0.325500E-02	0.378000E-03		
0					0.133350E-01	0.148050E-02		
0					0.840000E-03	0.163800E-01		
0					0.115500E-02	0.420000E-03		
0					0.115500E-03	0.357000E-03		
0					0.315000E-03	0.231000E-02		
0					0.199500E-02	0.787500E-02		
0					0.210000E-03	0.672000E-01		
0					0.840000E-04	0.336000E-01		
0					0.105000E-04	0.210000E-01		
0					0.735000E-05	0.283500E-02		
0					0.210000E-04	0.105000E-02		
0					0.262500E-04	0.535500E-02		
0					0.157500E-04	0.105000E-03		
0					0.231000E-03	0.346500E-02		
0					0.210000E-04	0.903000E-03		
0					0.262500E-04	0.357000E-03		
0					0.325500E-04	0.955500E-03		
0					0.596720E+06	0.120750E-01		
0					0.598400E+06	0.735000E-03		
0					0.603390E+06	0.325500E-02		
0					0.609220E+06	0.133350E-01		
0					0.615410E+06	0.840000E-03		
0					0.617710E+06	0.115500E-02		
0					0.630330E+06	0.115500E-03		
0					0.634610E+06	0.315000E-03		
0					0.636450E+06	0.199500E-02		
0					0.657550E+06	0.210000E-03		
0					0.662400E+06	0.840000E-04		
0					0.676900E+06	0.105000E-04		
0					0.682000E+06	0.735000E-05		
0					0.694400E+06	0.210000E-04		
0					0.701500E+06	0.262500E-04		
0					0.706200E+06	0.157500E-04		
0					0.713980E+06	0.231000E-03		
0					0.718500E+06	0.210000E-04		
0					0.760200E+06	0.262500E-04		

0				0.763800E+06	0.325500E-04		
63	152	Eu152	0.420654E+09	0.871000E+02	0.318000E+05	0.000000E+00	0.166800E-02 0.283769E+02
0				0.750600E-01	0.118845E-01		
0				0.123015E+00	0.396150E-01		
0				0.750600E-02	0.417000E-03		
0				0.271050E-01	0.688050E-02		
0				0.265838E+02	0.375300E-02		
0				0.896550E-02	0.437850E-02		
0				0.479550E-02	0.437850E-02		
0				0.859020E+00	0.195990E-01		
0				0.834000E-03	0.938250E-02		
0				0.500400E-02	0.417000E-02		
0				0.291900E-02	0.750600E+01		
0				0.125100E-02	0.625500E-01		
0				0.834000E-03	0.813150E-02		
0				0.223304E+01	0.729750E-01		
0				0.110505E+00	0.335685E-01		
0				0.271050E-02	0.110505E-01		
0				0.108420E-01	0.439935E+00		
0				0.321090E+00	0.506655E-01		
0				0.280016E+01	0.208500E-02		
0				0.271050E-01	0.166800E-02		
0				0.406575E+00	0.750600E-01		
0				0.938250E-02	0.123015E+00		
0				0.312750E-01	0.750600E-02		
0				0.458700E-02	0.271050E-01		
0				0.458700E-02	0.265838E+02		
0				0.152205E+00	0.896550E-02		
0				0.535845E-01	0.479550E-02		
0				0.148035E-01	0.859020E+00		
0				0.131355E-01	0.834000E-03		
0				0.429510E-01	0.500400E-02		
0				0.792300E-02	0.291900E-02		
0				0.417000E-02	0.125100E-02		
0				0.189735E-01	0.834000E-03		
0				0.396150E-02	0.223304E+01		
0				0.104250E-02	0.110505E+00		
0				0.250200E-01	0.271050E-02		
0				0.467040E+00	0.108420E-01		
0				0.129270E+00	0.321090E+00		
0				0.479550E-02	0.280016E+01		
0				0.460785E+00	0.271050E-01		
0				0.896550E-02	0.406575E+00		
0				0.583800E-02	0.938250E-02		
0				0.143865E+00	0.312750E-01		
0				0.187650E-01	0.458700E-02		
0				0.229350E-01	0.458700E-02		
0				0.189735E-01	0.152205E+00		
0				0.166800E+00	0.535845E-01		
0				0.469125E+00	0.148035E-01		
0				0.312750E-02	0.131355E-01		
0				0.191820E-01	0.429510E-01		
0				0.850680E+00	0.792300E-02		
0				0.354450E-02	0.417000E-02		
0				0.166800E-02	0.189735E-01		
0				0.959100E-01	0.396150E-02		
0				0.583800E-01	0.104250E-02		
0				0.266880E+00	0.250200E-01		
0				0.112590E-01	0.467040E+00		
0				0.583800E-02	0.129270E+00		
0				0.542100E-02	0.479550E-02		
0				0.175140E+00	0.460785E+00		
0				0.896550E-01	0.896550E-02		
0				0.129604E+02	0.583800E-02		
0				0.246030E-01	0.143865E+00		
0				0.127185E-01	0.187650E-01		
0				0.316920E+00	0.229350E-01		
0				0.164715E-01	0.189735E-01		
0				0.162630E+00	0.166800E+00		
0				0.421170E+01	0.469125E+00		
0				0.917400E-01	0.312750E-02		
0				0.150120E-01	0.191820E-01		

0				0.435765E+00	0.850680E+00		
0				0.264795E+00	0.354450E-02		
0				0.729750E-01	0.166800E-02		
0				0.312750E-02	0.959100E-01		
0				0.229350E-01	0.583800E-01		
0				0.133857E+00	0.266880E+00		
0				0.144866E+02	0.112590E-01		
0				0.271050E-02	0.583800E-02		
0				0.143865E-01	0.542100E-02		
0				0.308580E-01	0.175140E+00		
0				0.396150E-02	0.896550E-01		
0				0.646350E+00	0.129604E+02		
0				0.243945E+00	0.246030E-01		
0				0.991626E+01	0.127185E-01		
0				0.170970E+01	0.316920E+00		
0				0.183480E+00	0.164715E-01		
0				0.135608E+02	0.162630E+00		
0				0.125100E-02	0.421170E+01		
0				0.356535E-01	0.917400E-01		
0				0.150120E-01	0.150120E-01		
0				0.139695E+01	0.435765E+00		
0				0.183480E+00	0.264795E+00		
0				0.327345E-01	0.729750E-01		
0				0.102165E+00	0.312750E-02		
0				0.162630E+01	0.229350E-01		
0				0.168885E-01	0.133857E+00		
0				0.243945E-01	0.144866E+02		
0				0.479550E-02	0.271050E-02		
0				0.208500E+02	0.143865E-01		
0				0.496230E+00	0.308580E-01		
0				0.264795E+00	0.396150E-02		
0				0.750600E-02	0.646350E+00		
0				0.500400E-02	0.243945E+00		
0				0.145950E-03	0.991626E+01		
0				0.604650E-02	0.170970E+01		
0				0.875700E-02	0.183480E+00		
0				0.111210E+07	0.135608E+02		
0				0.113900E+07	0.125100E-02		
0				0.117100E+07	0.356535E-01		
0				0.120610E+07	0.150120E-01		
0				0.121290E+07	0.139695E+01		
0				0.124990E+07	0.183480E+00		
0				0.126130E+07	0.327345E-01		
0				0.129280E+07	0.102165E+00		
0				0.129910E+07	0.162630E+01		
0				0.134810E+07	0.168885E-01		
0				0.136380E+07	0.243945E-01		
0				0.139040E+07	0.479550E-02		
0				0.140800E+07	0.208500E+02		
0				0.145760E+07	0.496230E+00		
0				0.152810E+07	0.264795E+00		
0				0.160560E+07	0.750600E-02		
0				0.160840E+07	0.500400E-02		
0				0.163520E+07	0.145950E-03		
0				0.164730E+07	0.604650E-02		
0				0.176910E+07	0.875700E-02		
63	152	Eu152m	0.335520E+05	0.319000E+02	0.116000E+05	0.000000E+00	0.420000E-02 0.170000E-01
0					0.120000E-02	0.716000E+01	
0					0.700000E-03	0.150000E-02	
0					0.660000E-01	0.800000E-03	
0					0.720000E-01	0.700000E-03	
0					0.110000E-01	0.500000E-04	
0					0.680000E-01	0.140000E-03	
0					0.800000E-03	0.254000E-01	
0					0.360000E-02	0.110000E-02	
0					0.260000E-01	0.120000E-02	
0					0.700000E-03	0.760000E-01	
0					0.800000E-03	0.103000E-01	
0					0.145000E+02	0.500000E-02	
0					0.920000E-02	0.244000E+01	
0					0.900000E-01	0.800000E-03	
0					0.110000E-01	0.700000E-03	

[illegible]

0.200000E+00	0.250000E-01
0.119000E+02	0.980000E-02
0.603000E+00	0.225000E+00
0.720000E-01	0.130000E-01
0.900000E-02	0.420000E-02
0.100000E-02	0.120000E-02
0.140000E-01	0.700000E-03
0.630000E-02	0.660000E-01
0.300000E-02	0.720000E-01
0.950000E-03	0.110000E-01
0.950000E+00	0.680000E-01
0.766000E+00	0.800000E-03
0.800000E-03	0.360000E-02
0.450000E-01	0.260000E-01
0.600000E-03	0.700000E-03
0.160000E-02	0.800000E-03
0.680000E-02	0.145000E+02
0.830000E-02	0.920000E-02
0.560000E-02	0.900000E-01
0.260000E-02	0.110000E-01
0.961060E+06	0.200000E+00
0.963380E+06	0.119000E+02
0.970380E+06	0.603000E+00
0.995870E+06	0.720000E-01
0.103920E+07	0.900000E-02
0.111600E+07	0.100000E-02
0.113750E+07	0.140000E-01
0.116820E+07	0.630000E-02
0.120730E+07	0.300000E-02
0.129000E+07	0.950000E-03
0.131470E+07	0.950000E+00
0.138900E+07	0.766000E+00
0.140650E+07	0.800000E-03
0.141170E+07	0.450000E-01
0.142000E+07	0.600000E-03
0.146060E+07	0.160000E-02
0.151080E+07	0.680000E-02
0.155870E+07	0.830000E-02
0.168050E+07	0.560000E-02
0.175590E+07	0.260000E-02

63	154	Eu154	0.271137E+09	0.000000E+00	0.119000E+05	0.000000E+00	0.227200E+00	0.390500E-02
0					0.198800E-02	0.284000E-02		
0					0.241400E-02	0.337250E-02		
0					0.230750E-02	0.404700E+02		
0					0.198800E-02	0.710000E-02		
0					0.223650E-01	0.994000E-02		
0					0.603500E-02	0.138450E-01		
0					0.660300E+01	0.205900E-01		
0					0.198800E-02	0.994000E-02		
0					0.159750E-02	0.110050E-01		
0					0.138450E-01	0.994000E-03		
0					0.138450E-01	0.710000E-03		
0					0.710000E-02	0.259150E-01		
0					0.390500E-02	0.497000E-03		
0					0.355000E-04	0.994000E-02		
0					0.301750E-02	0.994000E-03		
0					0.340800E-02	0.994000E-03		
0					0.241400E-02	0.230750E-02		
0					0.138450E-02	0.461500E-02		
0					0.994000E-02	0.408250E-02		
0					0.177500E-01	0.227200E+00		
0					0.159750E-02	0.198800E-02		
0					0.145550E-01	0.241400E-02		
0					0.461500E-02	0.230750E-02		
0					0.106500E-02	0.198800E-02		
0					0.674500E-01	0.223650E-01		
0					0.120700E-01	0.603500E-02		
0					0.301750E-01	0.660300E+01		
0					0.887500E-03	0.198800E-02		
0					0.301750E-02	0.159750E-02		
0					0.532500E-02	0.138450E-01		
0					0.177500E-02	0.138450E-01		

0	0.994000E-02	0.710000E-02
0	0.301750E-01	0.390500E-02
0	0.209450E+00	0.355000E-04
0	0.269800E-01	0.301750E-02
0	0.497000E-02	0.340800E-02
0	0.390500E-02	0.241400E-02
0	0.120700E-02	0.138450E-02
0	0.280450E-02	0.994000E-02
0	0.259150E-02	0.177500E-01
0	0.504100E+00	0.159750E-02
0	0.280450E-02	0.145550E-01
0	0.426000E-02	0.461500E-02
0	0.568000E-01	0.106500E-02
0	0.216550E+00	0.674500E-01
0	0.497000E-02	0.120700E-01
0	0.497000E-02	0.301750E-01
0	0.390500E-02	0.887500E-03
0	0.220100E-02	0.301750E-02
0	0.710000E-02	0.532500E-02
0	0.603500E-02	0.177500E-02
0	0.365650E-01	0.994000E-02
0	0.326600E-01	0.301750E-01
0	0.461500E-01	0.209450E+00
0	0.110050E-01	0.269800E-01
0	0.230750E-01	0.497000E-02
0	0.230750E-01	0.390500E-02
0	0.106500E-01	0.120700E-02
0	0.255600E+00	0.280450E-02
0	0.994000E-02	0.259150E-02
0	0.841350E+00	0.504100E+00
0	0.482800E+01	0.280450E-02
0	0.568000E-02	0.426000E-02
0	0.603500E-02	0.568000E-01
0	0.603500E-02	0.216550E+00
0	0.340800E-01	0.497000E-02
0	0.603500E-02	0.497000E-02
0	0.923000E-01	0.390500E-02
0	0.923000E-02	0.220100E-02
0	0.308850E+00	0.710000E-02
0	0.390500E-02	0.603500E-02
0	0.745500E-01	0.365650E-01
0	0.994000E-02	0.326600E-01
0	0.291100E-02	0.461500E-01
0	0.291100E-01	0.110050E-01
0	0.120700E-01	0.230750E-01
0	0.139870E+00	0.230750E-01
0	0.169335E+01	0.106500E-01
0	0.461500E-02	0.255600E+00
0	0.173950E+00	0.994000E-02
0	0.197025E+02	0.841350E+00
0	0.745500E-01	0.482800E+01
0	0.745500E-02	0.568000E-02
0	0.433100E+01	0.603500E-02
0	0.994000E-02	0.603500E-02
0	0.110050E-01	0.340800E-01
0	0.326600E-01	0.603500E-02
0	0.465050E+00	0.923000E-01
0	0.497000E-02	0.923000E-02
0	0.550250E+00	0.308850E+00
0	0.230750E+00	0.390500E-02
0	0.115020E+02	0.745500E-01
0	0.816500E-01	0.994000E-02
0	0.461500E+00	0.291100E-02
0	0.198800E-02	0.291100E-01
0	0.823600E+00	0.120700E-01
0	0.120700E-01	0.139870E+00
0	0.124250E-01	0.169335E+01
0	0.603500E-01	0.461500E-02
0	0.497000E-02	0.173950E+00
0	0.816500E-02	0.197025E+02
0	0.639000E-02	0.745500E-01
0	0.102950E+02	0.745500E-02
0	0.178920E+02	0.433100E+01

0.291100E-02	0.994000E-02
0.710000E-02	0.110050E-01
0.120700E-01	0.326600E-01
0.142000E+00	0.465050E+00
0.173950E-01	0.497000E-02
0.390500E-02	0.550250E+00
0.301750E-02	0.230750E+00
0.102950E+00	0.115020E+02
0.710000E-02	0.816500E-01
0.266250E+00	0.461500E+00
0.745500E-02	0.198800E-02
0.216550E+00	0.823600E+00
0.138450E-01	0.120700E-01
0.440200E-01	0.124250E-01
0.426000E-02	0.603500E-01
0.816500E-01	0.497000E-02
0.355000E-02	0.816500E-02
0.923000E-02	0.639000E-02
0.131350E+00	0.102950E+02
0.898150E+00	0.178920E+02
0.355000E+02	0.291100E-02
0.113600E-01	0.710000E-02
0.131350E-01	0.120700E-01
0.390500E-02	0.142000E+00
0.198800E-02	0.173950E-01
0.198800E-01	0.390500E-02
0.301750E-02	0.301750E-02
0.209450E-01	0.102950E+00
0.390500E-02	0.710000E-02
0.213000E-02	0.266250E+00
0.674500E-02	0.745500E-02
0.131350E-02	0.216550E+00
0.248500E-02	0.138450E-01
0.301750E-02	0.440200E-01
0.649650E+00	0.426000E-02
0.497000E-02	0.816500E-01
0.603500E-03	0.355000E-02
0.603500E-03	0.923000E-02
0.603500E-02	0.131350E+00
0.497000E-01	0.898150E+00
0.142000E-02	0.355000E+02
0.102950E+01	0.113600E-01
0.182825E+01	0.131350E-01
0.198800E-02	0.390500E-02
0.138450E-02	0.198800E-02
0.603500E-03	0.198800E-01
0.284000E-03	0.301750E-02
0.816500E-03	0.209450E-01
0.603500E-03	0.390500E-02
0.141850E+07	0.213000E-02
0.141920E+07	0.674500E-02
0.142590E+07	0.131350E-02
0.146800E+07	0.248500E-02
0.148960E+07	0.301750E-02
0.149440E+07	0.649650E+00
0.151000E+07	0.497000E-02
0.152200E+07	0.603500E-03
0.152200E+07	0.603500E-03
0.153140E+07	0.603500E-02
0.153780E+07	0.497000E-01
0.155400E+07	0.142000E-02
0.159300E+07	0.102950E+01
0.159650E+07	0.182825E+01
0.166730E+07	0.198800E-02
0.167360E+07	0.138450E-02
0.171690E+07	0.603500E-03
0.177300E+07	0.284000E-03
0.183800E+07	0.816500E-03
0.189500E+07	0.603500E-03

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0				0.138000E+05	0.209920E-01		
0				0.187800E+05	0.557600E-01		
0				0.210200E+05	0.459200E-02		
0				0.245600E+05	0.820000E-02		
0				0.265130E+05	0.337840E+00		
0				0.314300E+05	0.754400E-02		
0				0.407500E+05	0.282080E-01		
0				0.452980E+05	0.135792E+01		
0				0.579800E+05	0.705200E-01		
0				0.600100E+05	0.121360E+01		
0				0.860620E+05	0.160720E+00		
0				0.865430E+05	0.328000E+02		
0				0.105310E+06	0.218448E+02		
0				0.107600E+06	0.426400E-02		
0				0.146060E+06	0.560880E-01		
63	156	Eu156	0.131242E+07	0.452000E+06	0.600000E+04	0.000000E+00	0.208453E+01 0.843900E+01
0					0.223100E-01	0.785700E-02	
0					0.388000E-01	0.102820E-01	
0					0.627881E+01	0.164900E-01	
0					0.135800E-01	0.737200E+00	
0					0.649900E-01	0.126100E-01	
0					0.875910E+00	0.873000E-02	
0					0.541842E+01	0.776000E-02	
0					0.873000E-01	0.873000E-02	
0					0.261900E-01	0.601400E-01	
0					0.494700E-01	0.101850E-01	
0					0.108640E+00	0.135800E-01	
0					0.970000E+01	0.145500E-01	
0					0.168780E+00	0.208550E+00	
0					0.814800E-01	0.144530E+00	
0					0.300700E-01	0.160050E+00	
0					0.207580E+00	0.145500E-01	
0					0.204670E+00	0.659600E-01	
0					0.188180E+00	0.174600E-01	
0					0.132793E+01	0.582000E-01	
0					0.397700E-01	0.208453E+01	
0					0.397700E-01	0.223100E-01	
0					0.320100E-01	0.388000E-01	
0					0.281300E-01	0.627881E+01	
0					0.133084E+01	0.135800E-01	
0					0.291970E+00	0.649900E-01	
0					0.144530E+01	0.875910E+00	
0					0.145500E+00	0.541842E+01	
0					0.339500E-01	0.873000E-01	
0					0.373450E+00	0.261900E-01	
0					0.315250E+00	0.494700E-01	
0					0.843900E-01	0.108640E+00	
0					0.128040E+00	0.970000E+01	
0					0.533500E-01	0.168780E+00	
0					0.501490E+00	0.814800E-01	
0					0.492178E+01	0.300700E-01	
0					0.337560E+00	0.207580E+00	
0					0.458907E+01	0.204670E+00	
0					0.417100E-01	0.188180E+00	
0					0.504400E-01	0.132793E+01	
0					0.134830E+00	0.397700E-01	
0					0.283240E+00	0.397700E-01	
0					0.679000E+01	0.320100E-01	
0					0.473360E+01	0.281300E-01	
0					0.130950E+00	0.133084E+01	
0					0.649900E-01	0.291970E+00	
0					0.265780E+00	0.144530E+01	
0					0.145500E-01	0.145500E+00	
0					0.194000E-01	0.339500E-01	
0					0.798310E+01	0.373450E+00	
0					0.660085E+01	0.315250E+00	
0					0.950600E-01	0.843900E-01	
0					0.288575E+01	0.128040E+00	
0					0.157237E+01	0.533500E-01	
0					0.455900E-01	0.501490E+00	
0					0.271600E+00	0.492178E+01	
0					0.239590E+00	0.337560E+00	

0					0.591700E-01	0.458907E+01		
0					0.151223E+01	0.417100E-01		
0					0.194388E+01	0.504400E-01		
0					0.164900E+00	0.134830E+00		
0					0.387030E+01	0.283240E+00		
0					0.327181E+01	0.679000E+01		
0					0.130950E+00	0.473360E+01		
0					0.380919E+01	0.130950E+00		
0					0.785700E-01	0.649900E-01		
0					0.114460E+00	0.265780E+00		
0					0.465600E-02	0.145500E-01		
0					0.322040E-01	0.194000E-01		
0					0.214176E+01	0.798310E+01		
0					0.348521E+01	0.660085E+01		
0					0.877850E+00	0.950600E-01		
0					0.983580E-01	0.288575E+01		
0					0.601400E-02	0.157237E+01		
0					0.114460E-01	0.455900E-01		
0					0.103111E+01	0.271600E+00		
0					0.224070E-01	0.239590E+00		
0					0.103790E-01	0.591700E-01		
0					0.397700E-02	0.151223E+01		
0					0.167810E-01	0.194388E+01		
0					0.194630E+07	0.164900E+00		
0					0.196590E+07	0.387030E+01		
0					0.202660E+07	0.327181E+01		
0					0.203250E+07	0.130950E+00		
0					0.209770E+07	0.380919E+01		
0					0.211050E+07	0.785700E-01		
0					0.211650E+07	0.114460E+00		
0					0.212130E+07	0.465600E-02		
0					0.217090E+07	0.322040E-01		
0					0.218090E+07	0.214176E+01		
0					0.218670E+07	0.348521E+01		
0					0.220540E+07	0.877850E+00		
0					0.221180E+07	0.983580E-01		
0					0.225550E+07	0.601400E-02		
0					0.225980E+07	0.114460E-01		
0					0.226990E+07	0.103111E+01		
0					0.229340E+07	0.224070E-01		
0					0.230100E+07	0.103790E-01		
0					0.234430E+07	0.397700E-02		
0					0.236120E+07	0.167810E-01		
64	153	Gd153	0.208742E+08	0.000000E+00	0.539000E+05	0.000000E+00	0.141000E+05	0.181200E-01
0					0.541900E+05	0.302000E-01		
0					0.682300E+05	0.120800E-01		
0					0.696730E+05	0.253680E+01		
0					0.754230E+05	0.785200E-01		
0					0.833680E+05	0.211400E+00		
0					0.894860E+05	0.694600E-01		
0					0.974320E+05	0.302000E+02		
0					0.103180E+06	0.214420E+02		
0					0.172850E+06	0.302000E-01		
64	159	Gd159	0.668160E+05	0.310000E+06	0.920000E+04	0.000000E+00	0.580000E+05	0.226800E+01
0					0.795200E+05	0.410400E-01		
0					0.137490E+06	0.648000E-02		
0					0.210900E+06	0.178200E-01		
0					0.226000E+06	0.211680E+00		
0					0.237500E+06	0.777600E-02		
0					0.274200E+06	0.583200E-02		
0					0.290300E+06	0.302400E-01		
0					0.305500E+06	0.594000E-01		
0					0.348170E+06	0.216000E+00		
0					0.363560E+06	0.108000E+02		
0					0.536800E+06	0.108000E-02		
0					0.559560E+06	0.216000E-01		
0					0.580850E+06	0.615600E-01		
0					0.616500E+06	0.216000E-02		
0					0.617700E+06	0.140400E-01		
0					0.674300E+06	0.367200E-03		
0					0.854900E+06	0.226800E-02		

65	160	Tb160	0.624672E+07	0.257000E+06	0.105000E+05	0.000000E+00	0.329000E+02	0.127652E+02
0					0.105280E+02	0.592200E-01		
0					0.271754E+02	0.526400E-02		
0					0.117453E+01	0.561274E+01		
0					0.101990E+00	0.440860E+01		
0					0.628390E+00	0.921200E-01		
0					0.167790E+01	0.756700E-02		
0					0.162197E+02	0.108570E-01		
0					0.257936E+01	0.227010E-01		
0					0.117453E+00	0.288862E+02		
0					0.813288E+01	0.947520E+00		
0					0.151340E-01	0.371770E+00		
0					0.167790E-02	0.154630E-01		
0					0.307615E+01	0.131600E-01		
0					0.392510E+06	0.147392E+01		
0					0.432660E+06	0.240170E-01		
0					0.486060E+06	0.950810E-01		
0					0.682310E+06	0.648130E+00		
0					0.765280E+06	0.236222E+01		
0					0.872030E+06	0.233590E+00		
0					0.879380E+06	0.329000E+02		
0					0.962320E+06	0.105280E+02		
0					0.966170E+06	0.271754E+02		
0					0.100290E+07	0.117453E+01		
0					0.106910E+07	0.101990E+00		
0					0.110260E+07	0.628390E+00		
0					0.111510E+07	0.167790E+01		
0					0.117800E+07	0.162197E+02		
0					0.119990E+07	0.257936E+01		
0					0.125130E+07	0.117453E+00		
0					0.127190E+07	0.813288E+01		
0					0.128560E+07	0.151340E-01		
0					0.129930E+07	0.167790E-02		
0					0.131210E+07	0.307615E+01		
66	165	Dy165	0.840240E+04	0.448000E+06	0.470000E+04	0.000000E+00	0.109200E-02	0.420000E-02
0					0.498120E+00	0.138600E-01		
0					0.840000E-03	0.142800E-01		
0					0.840000E+00	0.235200E-02		
0					0.106680E-01	0.142800E-01		
0					0.425040E-01	0.285600E-02		
0					0.142800E-02	0.357840E+01		
0					0.440160E-01	0.924000E-03		
0					0.344400E-02	0.840000E-03		
0					0.109200E-02	0.588000E-03		
0					0.319200E-02	0.714000E-02		
0					0.380520E-01	0.714000E-02		
0					0.562800E-02	0.504000E-03		
0					0.162120E+00	0.210000E-02		
0					0.132216E+00	0.571200E-02		
0					0.787080E-01	0.302400E-02		
0					0.327600E-02	0.109200E-02		
0					0.529200E-02	0.100800E-02		
0					0.974400E-01	0.420000E-03		
0					0.567840E+00	0.146160E-01		
0					0.266280E-01	0.109200E-02		
0					0.115920E-01	0.498120E+00		
0					0.534240E+00	0.840000E-03		
0					0.140280E-01	0.840000E+00		
0					0.806400E-02	0.106680E-01		
0					0.252000E-02	0.425040E-01		
0					0.226800E-03	0.142800E-02		
0					0.638400E-02	0.440160E-01		
0					0.551040E-01	0.344400E-02		
0					0.504000E-03	0.109200E-02		
0					0.312480E-01	0.319200E-02		
0					0.915600E-01	0.380520E-01		
0					0.100800E-02	0.562800E-02		
0					0.134400E-02	0.162120E+00		
0					0.462000E-03	0.132216E+00		
0					0.575560E+06	0.787080E-01		
0					0.588570E+06	0.327600E-02		
0					0.610290E+06	0.529200E-02		

0				0.620630E+06	0.974400E-01		
0				0.633420E+06	0.567840E+00		
0				0.660080E+06	0.266280E-01		
0				0.694080E+06	0.115920E-01		
0				0.715330E+06	0.534240E+00		
0				0.725390E+06	0.140280E-01		
0				0.820110E+06	0.806400E-02		
0				0.900410E+06	0.252000E-02		
0				0.976740E+06	0.226800E-03		
0				0.984920E+06	0.638400E-02		
0				0.995090E+06	0.551040E-01		
0				0.104560E+07	0.504000E-03		
0				0.105580E+07	0.312480E-01		
0				0.107960E+07	0.915600E-01		
0				0.109190E+07	0.100800E-02		
0				0.114040E+07	0.134400E-02		
0				0.118660E+07	0.462000E-03		
66	166	Dy166	0.293760E+06	0.162600E+06	0.262000E+05	0.000000E+00	0.282270E+05 0.113160E+01
0					0.542390E+05	0.814200E+00	
0					0.824700E+05	0.138000E+02	
0					0.290660E+06	0.138000E-01	
0					0.343510E+06	0.552000E-01	
0					0.371750E+06	0.524400E+00	
0					0.425990E+06	0.579600E+00	
67	166	Ho166	0.964800E+05	0.696000E+06	0.574000E+04	0.000000E+00	0.805740E+05 0.633000E+01
0					0.184410E+06	0.160000E-02	
0					0.520960E+06	0.300000E-03	
0					0.674020E+06	0.164000E-01	
0					0.705310E+06	0.127000E-01	
0					0.785890E+06	0.116000E-01	
0					0.126330E+07	0.140000E-02	
0					0.137940E+07	0.930000E+00	
0					0.144770E+07	0.930000E-03	
0					0.152860E+07	0.200000E-03	
0					0.158190E+07	0.183000E+00	
0					0.166250E+07	0.121000E+00	
0					0.174990E+07	0.260000E-01	
0					0.183060E+07	0.830000E-02	
68	169	Er169	0.812200E+06	0.102000E+06	0.656000E+00	0.000000E+00	0.840990E+04 0.156000E+00
0					0.109800E+06	0.129220E-02	
68	171	Er171	0.270700E+05	0.414000E+06	0.249200E+05	0.000000E+00	0.600000E-02 0.640000E-01
0					0.500000E-02	0.300900E-01	
0					0.200000E-02	0.600000E-01	
0					0.227000E-01	0.205000E+02	
0					0.177000E-01	0.230000E+01	
0					0.170000E-01	0.910000E+01	
0					0.466000E-01	0.890000E-01	
0					0.980000E-02	0.270000E-01	
0					0.400000E-02	0.700000E-02	
0					0.370000E-01	0.642000E+00	
0					0.200000E-01	0.302000E+00	
0					0.890000E-01	0.100000E-01	
0					0.500000E-02	0.580000E+00	
0					0.252000E+00	0.800000E-02	
0					0.220000E-01	0.289000E+02	
0					0.285000E+00	0.644000E+02	
0					0.150000E-01	0.197000E-01	
0					0.120000E-01	0.257000E+00	
0					0.976000E-01	0.830000E-01	
0					0.660000E-02	0.224000E-01	
0					0.450000E-02	0.600000E-02	
0					0.240000E+00	0.500000E-02	
0					0.640000E+00	0.200000E-02	
0					0.150000E-02	0.227000E-01	
0					0.550000E-01	0.177000E-01	
0					0.200000E-01	0.170000E-01	
0					0.385000E-01	0.466000E-01	
0					0.635000E+00	0.980000E-02	
0					0.770000E-01	0.400000E-02	

0					0.264000E-01	0.370000E-01		
0					0.700000E-03	0.200000E-01		
0					0.106000E-02	0.890000E-01		
0					0.679000E-02	0.500000E-02		
0					0.184000E-02	0.252000E+00		
0					0.280000E-02	0.220000E-01		
0					0.340000E-03	0.285000E+00		
0					0.280000E-02	0.150000E-01		
0					0.250000E-02	0.120000E-01		
0					0.732500E+06	0.976000E-01		
0					0.745000E+06	0.660000E-02		
0					0.767800E+06	0.450000E-02		
0					0.784090E+06	0.240000E+00		
0					0.796550E+06	0.640000E+00		
0					0.860000E+06	0.150000E-02		
0					0.869700E+06	0.550000E-01		
0					0.871500E+06	0.200000E-01		
0					0.882000E+06	0.385000E-01		
0					0.907700E+06	0.635000E+00		
0					0.912600E+06	0.770000E-01		
0					0.966100E+06	0.264000E-01		
0					0.976200E+06	0.700000E-03		
0					0.109690E+07	0.106000E-02		
0					0.110900E+07	0.679000E-02		
0					0.116840E+07	0.184000E-02		
0					0.122050E+07	0.280000E-02		
0					0.127120E+07	0.340000E-03		
0					0.139550E+07	0.280000E-02		
0					0.140050E+07	0.250000E-02		
69	170	Tm170	0.111100E+08	0.000000E+00	0.273900E+04	0.000000E+00	0.842600E+05	0.326000E+01
69	171	Tm171	0.606000E+08	0.254000E+05	0.528700E+03	0.000000E+00	0.667310E+05	0.143400E+00
70	169	Yb169	0.276670E+07	0.000000E+00	0.997128E+05	0.000000E+00	0.000000E+00	0.331930E+00
0					0.408798E-02	0.192170E+00		
0					0.185182E-02	0.436750E+02		
0					0.111808E-02	0.173652E+02		
0					0.489160E-02	0.192170E-01		
0					0.118190E+06	0.187977E+01		
0					0.130500E+06	0.111109E+02		
0					0.156660E+06	0.314460E-01		
0					0.177210E+06	0.214532E+02		
0					0.197960E+06	0.349400E+02		
0					0.240300E+06	0.128230E+00		
0					0.261080E+06	0.189724E+01		
0					0.285000E+06	0.279520E-02		
0					0.295000E+06	0.698800E-02		
0					0.304000E+06	0.838560E-01		
0					0.307740E+06	0.107965E+02		
0					0.328000E+06	0.698800E-02		
0					0.336500E+06	0.908440E-02		
0					0.354700E+06	0.199158E-01		
0					0.370800E+06	0.663860E-02		
0					0.494000E+06	0.000000E+00		
0					0.514890E+06	0.408798E-02		
0					0.579410E+06	0.185182E-02		
0					0.600200E+06	0.111808E-02		
0					0.624580E+06	0.489160E-02		
70	175	Yb175	0.362000E+06	0.130300E+06	0.220100E+04	0.000000E+00	0.113800E+06	0.191100E+01
0					0.137660E+06	0.117000E+00		
0					0.144860E+06	0.331500E+00		
0					0.251470E+06	0.845000E-01		
0					0.282520E+06	0.305500E+01		
0					0.396320E+06	0.650000E+01		
71	177	Lu177	0.579700E+06	0.146900E+06	0.351100E+04	0.000000E+00	0.716460E+05	0.154000E+00
0					0.112950E+06	0.640000E+01		
0					0.136730E+06	0.480000E-01		
0					0.208360E+06	0.110000E+02		
0					0.249690E+06	0.212000E+00		
0					0.321330E+06	0.219000E+00		

72	181	Hf181	0.366200E+07	0.196000E+06	0.172600E+05	0.000000E+00	0.390000E+04	0.161200E-02
0					0.624000E+04	0.967200E-02		
0					0.133030E+06	0.358670E+02		
0					0.136280E+06	0.580320E+01		
0					0.136860E+06	0.201500E+00		
0					0.345940E+06	0.150722E+02		
0					0.476000E+06	0.644800E+00		
0					0.482180E+06	0.806000E+02		
0					0.615170E+06	0.257920E+00		
0					0.618590E+06	0.403000E-01		
73	182	Ta182	0.993600E+07	0.206300E+06	0.246000E+05	0.000000E+00	0.208702E+01	0.628200E+00
0					0.240810E+00	0.244300E+00		
0					0.394370E+00	0.279200E+01		
0					0.349000E+02	0.411820E+02		
0					0.345510E+00	0.265240E+01		
0					0.642160E+00	0.140298E+02		
0					0.907400E-01	0.907400E-01		
0					0.164030E+02	0.191950E+01		
0					0.273267E+02	0.443230E+00		
0					0.209400E+00	0.715450E+01		
0					0.115519E+02	0.272220E+01		
0					0.151117E+01	0.314100E+01		
0					0.663100E+00	0.153560E+01		
0					0.140996E+01	0.753840E+01		
0					0.261750E+00	0.362960E+01		
0					0.230340E+00	0.362960E+01		
0					0.757330E-01	0.129130E-01		
0					0.408330E-01	0.523500E-01		
0					0.429270E-01	0.624710E+00		
0					0.959740E+06	0.355980E+00		
0					0.100170E+07	0.208702E+01		
0					0.104440E+07	0.240810E+00		
0					0.111340E+07	0.394370E+00		
0					0.112130E+07	0.349000E+02		
0					0.115750E+07	0.345510E+00		
0					0.115750E+07	0.642160E+00		
0					0.118070E+07	0.907400E-01		
0					0.118900E+07	0.164030E+02		
0					0.122140E+07	0.273267E+02		
0					0.122320E+07	0.209400E+00		
0					0.123100E+07	0.115519E+02		
0					0.125740E+07	0.151117E+01		
0					0.127370E+07	0.663100E+00		
0					0.128920E+07	0.140996E+01		
0					0.134270E+07	0.261750E+00		
0					0.137380E+07	0.230340E+00		
0					0.138740E+07	0.757330E-01		
0					0.141010E+07	0.408330E-01		
0					0.145300E+07	0.429270E-01		
74	181	W181	0.104717E+08	0.000000E+00	0.400000E+05	0.000000E+00	0.624000E+04	0.106777E+01
0					0.136280E+06	0.320330E-01		
0					0.152320E+06	0.841894E-01		
74	185	W185	0.648864E+07	0.126900E+06	0.260000E+02	0.000000E+00	0.125360E+06	0.186000E-01
74	187	W187	0.860400E+05	0.296000E+06	0.110000E+05	0.000000E+00	0.200400E-02	0.584500E-02
0					0.501000E-03	0.367400E-02		
0					0.150300E-02	0.167000E-02		
0					0.250500E-02	0.167000E-02		
0					0.334000E-02	0.107715E+02		
0					0.283900E-01	0.668000E-02		
0					0.211255E+02	0.584500E-02		
0					0.167000E-01	0.835000E-02		
0					0.250500E-01	0.246325E-01		
0					0.623745E+00	0.743150E-01		
0					0.491815E+01	0.250500E-02		
0					0.116900E-01	0.855875E+01		
0					0.501000E-03	0.417500E-02		
0					0.642950E-02	0.835000E-03		
0					0.918500E-03	0.250500E-02		
0					0.117735E+00	0.167000E-02		

0					0.200400E-02	0.137775E+00		
0					0.607045E+01	0.668000E-03		
0					0.105210E+01	0.835000E-01		
0					0.308950E-02	0.115230E+00		
0					0.751500E-03	0.200400E-02		
0					0.668000E-02	0.501000E-03		
0					0.263860E+02	0.150300E-02		
0					0.125250E-02	0.250500E-02		
0					0.288075E+00	0.334000E-02		
0					0.150300E-02	0.283900E-01		
0					0.398295E+01	0.211255E+02		
0					0.951900E-02	0.167000E-01		
0					0.225450E-03	0.250500E-01		
0					0.225450E-03	0.623745E+00		
0					0.233800E-03	0.491815E+01		
0					0.324815E+00	0.116900E-01		
0					0.136940E+00	0.501000E-03		
0					0.127755E-02	0.642950E-02		
0					0.217100E-03	0.918500E-03		
0					0.208750E-03	0.117735E+00		
0					0.167000E-04	0.200400E-02		
0					0.127755E-02	0.607045E+01		
0					0.625540E+06	0.105210E+01		
0					0.638650E+06	0.308950E-02		
0					0.647300E+06	0.751500E-03		
0					0.682340E+06	0.668000E-02		
0					0.685740E+06	0.263860E+02		
0					0.693060E+06	0.125250E-02		
0					0.745290E+06	0.288075E+00		
0					0.767400E+06	0.150300E-02		
0					0.772910E+06	0.398295E+01		
0					0.816560E+06	0.951900E-02		
0					0.825900E+06	0.225450E-03		
0					0.826650E+06	0.225450E-03		
0					0.844700E+06	0.233800E-03		
0					0.864710E+06	0.324815E+00		
0					0.879560E+06	0.136940E+00		
0					0.960170E+06	0.127755E-02		
0					0.105620E+07	0.217100E-03		
0					0.119040E+07	0.208750E-03		
0					0.122080E+07	0.167000E-04		
0					0.123010E+07	0.127755E-02		
75	186	Re186	0.326304E+06	0.000000E+00	0.577000E+04	0.000000E+00	0.122700E+06	0.686200E+00
0					0.137160E+06	0.864800E+01		
0					0.296900E+06	0.479400E-04		
0					0.333400E+06	0.564000E-04		
0					0.630330E+06	0.238760E-01		
0					0.767470E+06	0.268840E-01		
0					0.773500E+06	0.197400E-04		
75	187	Re187	0.157785E+19	0.650000E+03	0.577000E+04	0.000000E+00	0.000000E+00	
75	188	Re188	0.611300E+05	0.779000E+06	0.331600E+04	0.000000E+00	0.184830E-01	0.606000E-02
0					0.131300E-01	0.149480E+02		
0					0.525200E-02	0.464600E-02		
0					0.272700E-02	0.165640E-01		
0					0.114130E-01	0.727200E-01		
0					0.171700E-02	0.101000E+01		
0					0.184830E-01	0.767600E-01		
0					0.161600E-02	0.515100E-02		
0					0.959500E-01	0.909000E-03		
0					0.343400E-02	0.232300E-02		
0					0.102010E-01	0.125240E+01		
0					0.193920E-01	0.146450E+00		
0					0.360570E-01	0.109080E+00		
0					0.393900E-03	0.173720E-01		
0					0.515100E-02	0.402990E+00		
0					0.454500E-03	0.686800E-02		
0					0.191900E-02	0.545400E+00		
0					0.149480E-01	0.144430E-01		
0					0.161600E-02	0.838300E-01		
0					0.114970E+07	0.156550E-01		

0					0.117460E+07	0.184830E-01		
0					0.119180E+07	0.131300E-01		
0					0.130240E+07	0.525200E-02		
0					0.130490E+07	0.272700E-02		
0					0.132290E+07	0.114130E-01		
0					0.133190E+07	0.171700E-02		
0					0.145750E+07	0.184830E-01		
0					0.154930E+07	0.161600E-02		
0					0.161030E+07	0.959500E-01		
0					0.165240E+07	0.343400E-02		
0					0.166990E+07	0.102010E-01		
0					0.178600E+07	0.193920E-01		
0					0.180200E+07	0.360570E-01		
0					0.180950E+07	0.393900E-03		
0					0.186470E+07	0.515100E-02		
0					0.186720E+07	0.454500E-03		
0					0.194090E+07	0.191900E-02		
0					0.195690E+07	0.149480E-01		
0					0.202250E+07	0.161600E-02		
76	185	Os185	0.809000E+07	0.000000E+00	0.474900E+05	0.000000E+00	0.121200E+06	0.243000E-01
0					0.125360E+06	0.349110E+00		
0					0.157700E+06	0.000000E+00		
0					0.162850E+06	0.561330E+00		
0					0.229100E+06	0.000000E+00		
0					0.234160E+06	0.416340E+00		
0					0.717420E+06	0.412290E+01		
0					0.749460E+06	0.324000E-02		
0					0.768930E+06	0.364500E-02		
0					0.805700E+06	0.405000E-04		
0					0.874810E+06	0.660960E+01		
0					0.880520E+06	0.499770E+01		
0					0.931060E+06	0.494100E-01		
76	191	Os191	0.133100E+07	0.850000E+05	0.203300E+04	0.000000E+00	0.418500E+05	0.513300E-02
0					0.470500E+05	0.269700E-02		
0					0.824270E+05	0.255200E-01		
0					0.129430E+06	0.290000E+02		
76	191	Os191m	0.471600E+05	0.624000E+05	0.743600E+04	0.000000E+00	0.743800E+05	0.737000E-01
76	193	Os193	0.109800E+06	0.376000E+06	0.929500E+04	0.000000E+00	0.118500E-02	0.323900E+01
0					0.711000E-02	0.987500E-01		
0					0.987500E-02	0.165900E-01		
0					0.296250E+00	0.635950E+00		
0					0.711000E-01	0.426600E+01		
0					0.161950E-02	0.750500E-01		
0					0.138250E-01	0.300200E-01		
0					0.126005E+01	0.181700E+00		
0					0.474000E-02	0.193550E+00		
0					0.711000E-02	0.474000E-02		
0					0.545100E-01	0.276500E-02		
0					0.165900E+00	0.869000E-02		
0					0.916400E-01	0.276500E+00		
0					0.395000E+01	0.513500E-01		
0					0.169850E+00	0.217250E+00		
0					0.114550E-01	0.124425E+01		
0					0.158000E-02	0.142200E+00		
0					0.110600E-01	0.185650E+00		
0					0.237000E-02	0.127585E+01		
0					0.158000E-01	0.276500E-02		
0					0.829500E-01	0.118500E-02		
0					0.316000E-02	0.711000E-02		
0					0.130350E+01	0.987500E-02		
0					0.485850E+00	0.296250E+00		
0					0.276500E-02	0.711000E-01		
0					0.193550E-01	0.161950E-02		
0					0.750500E-02	0.138250E-01		
0					0.284400E-02	0.126005E+01		
0					0.205400E-02	0.474000E-02		
0					0.154050E-01	0.711000E-02		
0					0.106650E-02	0.545100E-01		
0					0.165900E-02	0.165900E+00		

0				0.671500E-03	0.916400E-01		
0				0.316000E-03	0.395000E+01		
0				0.189600E-01	0.169850E+00		
0				0.284400E-02	0.114550E-01		
0				0.512300E+06	0.158000E-02		
0				0.514950E+06	0.110600E-01		
0				0.516300E+06	0.237000E-02		
0				0.524980E+06	0.158000E-01		
0				0.532020E+06	0.829500E-01		
0				0.556000E+06	0.316000E-02		
0				0.557360E+06	0.130350E+01		
0				0.559260E+06	0.485850E+00		
0				0.560000E+06	0.276500E-02		
0				0.573330E+06	0.193550E-01		
0				0.639090E+06	0.750500E-02		
0				0.695120E+06	0.284400E-02		
0				0.709930E+06	0.205400E-02		
0				0.712100E+06	0.154050E-01		
0				0.735300E+06	0.106650E-02		
0				0.778480E+06	0.165900E-02		
0				0.784200E+06	0.671500E-03		
0				0.800900E+06	0.316000E-03		
0				0.874360E+06	0.189600E-01		
0				0.891260E+06	0.284400E-02		
77	190	lr190	0.101800E+07	0.000000E+00	0.596562E+05	0.000000E+00	0.243600E+02 0.974400E-01
0					0.464000E+01	0.533600E+02	
0					0.167040E+01	0.136880E+00	
0					0.255200E-01	0.348000E+01	
0					0.278400E+01	0.197200E+01	
0					0.259840E+01	0.232000E+00	
0					0.185600E+01	0.348000E+00	
0					0.742400E+00	0.120640E+01	
0					0.793440E+00	0.380480E+01	
0					0.127600E+01	0.431520E+00	
0					0.345680E+02	0.324800E-01	
0					0.306240E+02	0.122960E+00	
0					0.290000E+02	0.487200E+00	
0					0.406000E+02	0.167040E+01	
0					0.477920E+00	0.324800E+01	
0					0.765600E+00	0.132472E+02	
0					0.299280E+01	0.232000E+02	
0					0.858400E+00	0.206480E+01	
0					0.118320E+01	0.440800E-01	
0					0.533600E-01	0.665840E+01	
0					0.287680E+00	0.243600E+02	
0					0.742400E-01	0.464000E+01	
0					0.385120E+01	0.167040E+01	
0					0.371200E-01	0.255200E-01	
0					0.197200E+00	0.278400E+01	
0					0.255200E-01	0.259840E+01	
0					0.225040E+01	0.185600E+01	
0					0.329440E+00	0.742400E+00	
0					0.580000E+00	0.793440E+00	
0					0.352640E+01	0.127600E+01	
0					0.116000E+01	0.345680E+02	
0					0.127600E+00	0.306240E+02	
0					0.696000E-01	0.290000E+02	
0					0.997600E-01	0.406000E+02	
0					0.580000E-01	0.477920E+00	
0					0.245920E+01	0.765600E+00	
0					0.324800E-01	0.299280E+01	
0					0.436160E+00	0.858400E+00	
0					0.134560E+00	0.118320E+01	
0					0.348000E-01	0.533600E-01	
0					0.301600E-01	0.287680E+00	
0					0.447760E+00	0.742400E-01	
0					0.487200E+00	0.385120E+01	
0					0.696000E-01	0.371200E-01	
0					0.157760E+00	0.197200E+00	
0					0.153120E+00	0.255200E-01	
0					0.626400E-01	0.225040E+01	
0					0.821780E+06	0.329440E+00	

0					0.828000E+06	0.580000E+00		
0					0.828990E+06	0.352640E+01		
0					0.839140E+06	0.116000E+01		
0					0.916750E+06	0.127600E+00		
0					0.948000E+06	0.696000E-01		
0					0.952300E+06	0.997600E-01		
0					0.976400E+06	0.580000E-01		
0					0.103600E+07	0.245920E+01		
0					0.112380E+07	0.324800E-01		
0					0.113380E+07	0.436160E+00		
0					0.114730E+07	0.134560E+00		
0					0.115070E+07	0.348000E-01		
0					0.116040E+07	0.301600E-01		
0					0.120020E+07	0.447760E+00		
0					0.132430E+07	0.487200E+00		
0					0.135560E+07	0.696000E-01		
0					0.138690E+07	0.157760E+00		
0					0.139720E+07	0.153120E+00		
0					0.149490E+07	0.626400E-01		
77	192	Ir192	0.637900E+07	0.000000E+00	0.949900E+04	0.000000E+00	0.432000E+00	0.181000E+00
0					0.448000E+01	0.100000E-01		
0					0.432000E-01	0.454000E+00		
0					0.809000E+01	0.318000E+01		
0					0.526000E+01	0.130000E-02		
0					0.283900E+00	0.170000E-02		
0					0.524000E-01	0.249000E+00		
0					0.110000E-02	0.287300E+02		
0					0.130000E-02	0.297500E+02		
0					0.314800E+06	0.400000E-01		
0					0.314800E+06	0.400000E-01		
0					0.316500E+06	0.830000E+02		
0					0.374490E+06	0.709000E+00		
0					0.415400E+06	0.500000E-02		
0					0.416470E+06	0.664000E+00		
0					0.420530E+06	0.640000E-01		
0					0.468100E+06	0.477000E+02		
0					0.476500E+06	0.290000E-02		
0					0.484600E+06	0.314000E+01		
0					0.485040E+06	0.215800E-02		
0					0.489060E+06	0.432000E+00		
0					0.588600E+06	0.448000E+01		
0					0.593360E+06	0.432000E-01		
0					0.604400E+06	0.809000E+01		
0					0.612500E+06	0.526000E+01		
0					0.884500E+06	0.283900E+00		
0					0.106150E+07	0.524000E-01		
0					0.108900E+07	0.110000E-02		
0					0.137800E+07	0.130000E-02		
77	194	Ir194	0.689400E+05	0.811000E+06	0.610000E+03	0.000000E+00	0.501800E-01	0.169000E-02
0					0.126100E-01	0.299000E-02		
0					0.594100E+00	0.767000E-02		
0					0.461500E-01	0.253500E+01		
0					0.258700E-01	0.345800E+00		
0					0.257400E-01	0.130000E+02		
0					0.592800E+00	0.408200E-01		
0					0.182000E-02	0.452400E-01		
0					0.601900E-01	0.157300E-01		
0					0.301600E+00	0.139100E+00		
0					0.832000E-02	0.620100E-01		
0					0.557700E-01	0.390000E-02		
0					0.457600E-01	0.949000E-02		
0					0.128700E-02	0.332800E+00		
0					0.377000E-01	0.116220E+01		
0					0.624000E-03	0.247000E-02		
0					0.221000E-02	0.247000E-01		
0					0.113100E-02	0.247000E-02		
0					0.148200E-02	0.702000E-02		
0					0.162500E-02	0.169000E-02		
0					0.585000E-02	0.501800E-01		
0					0.189800E+00	0.126100E-01		
0					0.167700E-01	0.594100E+00		

0					0.144300E-02	0.461500E-01		
0					0.234000E-01	0.258700E-01		
0					0.131300E-01	0.257400E-01		
0					0.165100E-02	0.592800E+00		
0					0.205400E-01	0.182000E-02		
0					0.161200E-02	0.601900E-01		
0					0.193700E-02	0.301600E+00		
0					0.637000E-01	0.832000E-02		
0					0.572000E-02	0.557700E-01		
0					0.858000E-03	0.457600E-01		
0					0.130000E-02	0.128700E-02		
0					0.754000E-03	0.377000E-01		
0					0.247000E-02	0.624000E-03		
0					0.416000E-03	0.221000E-02		
0					0.520000E-02	0.113100E-02		
0					0.390000E-02	0.148200E-02		
0					0.174200E-01	0.162500E-02		
0					0.323700E-01	0.585000E-02		
0					0.442000E-03	0.189800E+00		
0					0.184600E-02	0.167700E-01		
0					0.176800E-02	0.144300E-02		
0					0.702000E-02	0.234000E-01		
0					0.260000E-02	0.131300E-01		
0					0.151880E+07	0.165100E-02		
0					0.156510E+07	0.205400E-01		
0					0.159580E+07	0.161200E-02		
0					0.160190E+07	0.193700E-02		
0					0.162220E+07	0.637000E-01		
0					0.167070E+07	0.572000E-02		
0					0.167520E+07	0.858000E-03		
0					0.171530E+07	0.130000E-02		
0					0.172450E+07	0.754000E-03		
0					0.173540E+07	0.247000E-02		
0					0.175730E+07	0.416000E-03		
0					0.178070E+07	0.520000E-02		
0					0.178570E+07	0.390000E-02		
0					0.179750E+07	0.174200E-01		
0					0.180570E+07	0.323700E-01		
0					0.181260E+07	0.442000E-03		
0					0.182960E+07	0.184600E-02		
0					0.192440E+07	0.176800E-02		
0					0.204370E+07	0.702000E-02		
0					0.211420E+07	0.260000E-02		
78	191	Pt191	0.251000E+06	0.000000E+00	0.693928E+05	0.000000E+00	0.320000E-02	0.400000E-01
0					0.128000E-01	0.488000E+01		
0					0.336000E+01	0.600000E-01		
0					0.600000E+01	0.328000E+01		
0					0.104000E-01	0.320000E+01		
0					0.112000E-01	0.240000E-01		
0					0.960000E-01	0.752000E-01		
0					0.800000E+01	0.352000E+01		
0					0.960000E-02	0.101600E+01		
0					0.544000E-01	0.400000E-01		
0					0.320000E-02	0.416000E+00		
0					0.336000E+01	0.320000E-02		
0					0.432000E-01	0.136000E+00		
0					0.568000E-01	0.880000E-02		
0					0.600000E-01	0.824000E+00		
0					0.960000E-02	0.116000E+00		
0					0.136800E+02	0.112000E+00		
0					0.368000E+00	0.320000E-02		
0					0.528000E-01	0.776000E+00		
0					0.117600E+00	0.164800E+01		
0					0.760000E-01	0.320000E-02		
0					0.136000E+00	0.128000E-01		
0					0.880000E-02	0.336000E+01		
0					0.140800E+01	0.600000E+01		
0					0.240000E-01	0.104000E-01		
0					0.640000E-02	0.112000E-01		
0					0.152000E-01	0.960000E-01		
0					0.480000E-02	0.800000E+01		
0					0.688000E-02	0.960000E-02		

0				0.416000E-02	0.544000E-01		
0				0.160000E-02	0.320000E-02		
0				0.120000E-01	0.336000E+01		
0				0.960000E-02	0.432000E-01		
0				0.376000E-02	0.568000E-01		
0				0.104000E-02	0.600000E-01		
0				0.120000E-01	0.960000E-02		
0				0.538870E+06	0.136800E+02		
0				0.541640E+06	0.368000E+00		
0				0.568810E+06	0.528000E-01		
0				0.576460E+06	0.117600E+00		
0				0.583610E+06	0.760000E-01		
0				0.587950E+06	0.136000E+00		
0				0.618700E+06	0.880000E-02		
0				0.624060E+06	0.140800E+01		
0				0.633180E+06	0.240000E-01		
0				0.636000E+06	0.640000E-02		
0				0.658750E+06	0.152000E-01		
0				0.667000E+06	0.480000E-02		
0				0.680000E+06	0.688000E-02		
0				0.748000E+06	0.416000E-02		
0				0.756600E+06	0.160000E-02		
0				0.762600E+06	0.120000E-01		
0				0.765000E+06	0.960000E-02		
0				0.806400E+06	0.376000E-02		
0				0.853600E+06	0.104000E-02		
0				0.935330E+06	0.120000E-01		
78	193	Pt193m	0.374000E+06	0.124200E+06	0.128205E+05	0.000000E+00	0.164200E+04 0.739200E-02
0					0.126340E+05	0.664400E+00	
0					0.135500E+06	0.110000E+00	
78	197	Pt197	0.659000E+05	0.251000E+06	0.444200E+04	0.000000E+00	0.773500E+05 0.172490E+02
0					0.191440E+06	0.367000E+01	
0					0.268780E+06	0.231210E+00	
79	193	Au193	0.635000E+05	0.874000E+03	0.764280E+05	0.000000E+00	0.536500E+00 0.223300E+00
0					0.536500E+00	0.232000E-01	
0					0.261000E+00	0.580000E-01	
0					0.669900E+01	0.116000E-01	
0					0.203000E+00	0.145000E-01	
0					0.388600E+01	0.101500E+00	
0					0.841000E+00	0.124700E+00	
0					0.156600E+00	0.841000E+00	
0					0.870000E-01	0.211700E+01	
0					0.261000E+00	0.783000E+00	
0					0.234900E+00	0.556800E+00	
0					0.348000E+00	0.182700E+00	
0					0.638000E-01	0.348000E+00	
0					0.261000E-01	0.290000E+01	
0					0.609000E-01	0.609000E-01	
0					0.507500E+00	0.100630E+02	
0					0.232000E-01	0.899000E+00	
0					0.379900E+00	0.899000E-01	
0					0.113100E+00	0.957000E-01	
0					0.130500E+00	0.783000E-01	
0					0.522000E-01	0.536500E+00	
0					0.150800E+00	0.536500E+00	
0					0.290000E-01	0.261000E+00	
0					0.493000E+00	0.669900E+01	
0					0.191400E+01	0.203000E+00	
0					0.116000E-01	0.388600E+01	
0					0.145000E-01	0.841000E+00	
0					0.290000E-01	0.156600E+00	
0					0.464000E+00	0.870000E-01	
0					0.118900E+00	0.261000E+00	
0					0.145000E-01	0.234900E+00	
0					0.232000E+00	0.348000E+00	
0					0.696000E+00	0.638000E-01	
0					0.957000E-01	0.261000E-01	
0					0.551000E-01	0.609000E-01	
0					0.783000E-01	0.507500E+00	
0					0.725000E-01	0.232000E-01	

0				0.377000E-01	0.379900E+00		
0				0.435000E-01	0.113100E+00		
0				0.667000E-01	0.130500E+00		
0				0.214600E-01	0.522000E-01		
0				0.638000E-01	0.150800E+00		
0				0.203000E-01	0.290000E-01		
0				0.348000E-01	0.493000E+00		
0				0.696000E-01	0.191400E+01		
0				0.464000E-01	0.116000E-01		
0				0.459200E+06	0.145000E-01		
0				0.464100E+06	0.290000E-01		
0				0.476980E+06	0.464000E+00		
0				0.478400E+06	0.118900E+00		
0				0.483000E+06	0.145000E-01		
0				0.489610E+06	0.232000E+00		
0				0.491280E+06	0.696000E+00		
0				0.505660E+06	0.957000E-01		
0				0.508260E+06	0.551000E-01		
0				0.520970E+06	0.783000E-01		
0				0.522660E+06	0.725000E-01		
0				0.529700E+06	0.377000E-01		
0				0.577600E+06	0.435000E-01		
0				0.628550E+06	0.667000E-01		
0				0.685000E+06	0.214600E-01		
0				0.698000E+06	0.638000E-01		
0				0.730000E+06	0.203000E-01		
0				0.743000E+06	0.348000E-01		
0				0.845000E+06	0.696000E-01		
0				0.112400E+07	0.464000E-01		
79	196	Au196	0.534211E+06	0.000000E+00	0.549000E+05	0.000000E+00	0.326200E+06 0.495330E-01
0					0.333030E+06	0.228547E+02	
0					0.355730E+06	0.869000E+02	
0					0.393400E+06	0.100804E-01	
0					0.426100E+06	0.721270E+01	
0					0.432000E+06	0.669130E-02	
0					0.521400E+06	0.388443E+00	
0					0.570800E+06	0.686510E-02	
0					0.659500E+06	0.364980E-02	
0					0.673500E+06	0.269390E-02	
0					0.688760E+06	0.608300E-02	
0					0.759100E+06	0.443190E-01	
0					0.100570E+07	0.269390E-02	
0					0.109140E+07	0.148599E+00	
0					0.136100E+07	0.434500E-03	
0					0.144630E+07	0.782100E-03	
79	198	Au198	0.232934E+06	0.327000E+06	0.218000E+04	0.000000E+00	0.411800E+06 0.955000E+02
0					0.675890E+06	0.803155E+00	
0					0.108770E+07	0.158912E+00	
79	199	Au199	0.271200E+06	0.143000E+06	0.134505E+05	0.000000E+00	0.498300E+05 0.328410E+00
0					0.158400E+06	0.369000E+02	
0					0.208200E+06	0.837630E+01	
80	197	Hg197	0.230800E+06	0.000000E+00	0.551640E+05	0.000000E+00	0.773500E+05 0.180000E+02
0					0.191360E+06	0.608400E+00	
0					0.268710E+06	0.378000E-01	
80	197	Hg197m	0.857000E+05	0.000000E+00	0.337088E+05	0.000000E+00	0.773500E+05 0.230000E-01
0					0.130200E+06	0.222000E+00	
0					0.133980E+06	0.340000E+02	
0					0.164970E+06	0.270000E+00	
0					0.201800E+06	0.720000E-01	
0					0.279000E+06	0.500000E+01	
80	203	Hg203	0.402728E+07	0.984000E+05	0.103300E+05	0.000000E+00	0.279200E+06 0.814600E+02
81	200	Tl200	0.940000E+05	0.184000E+04	0.657938E+05	0.000000E+00	0.322640E+00 0.305200E-01
0					0.784800E-01	0.165680E-01	
0					0.148240E-01	0.113360E+00	
0					0.784800E-01	0.130800E-01	
0					0.261600E-01	0.523200E-01	

0	0.252880E+00	0.784800E-02
0	0.436000E-01	0.279040E+00
0	0.261600E-01	0.959200E-01
0	0.610400E-01	0.348800E-01
0	0.959200E-01	0.514480E+00
0	0.348800E-01	0.261600E+00
0	0.137776E+02	0.261600E-01
0	0.287760E+00	0.174400E-01
0	0.244160E+00	0.872000E+02
0	0.784800E-01	0.523200E-01
0	0.100280E+01	0.156960E+00
0	0.227592E+01	0.226720E-01
0	0.113360E+00	0.209280E-01
0	0.348800E-01	0.261600E-01
0	0.129056E+01	0.610400E-01
0	0.270320E+00	0.322640E+00
0	0.436000E-01	0.784800E-01
0	0.436000E-01	0.148240E-01
0	0.566800E+00	0.784800E-01
0	0.102896E+01	0.261600E-01
0	0.108128E+02	0.252880E+00
0	0.174400E-01	0.436000E-01
0	0.523200E-01	0.261600E-01
0	0.202304E+01	0.610400E-01
0	0.619120E+00	0.959200E-01
0	0.610400E-01	0.348800E-01
0	0.784800E-01	0.137776E+02
0	0.610400E-01	0.287760E+00
0	0.122080E+00	0.244160E+00
0	0.104640E+00	0.784800E-01
0	0.113360E+00	0.100280E+01
0	0.174400E-01	0.227592E+01
0	0.113360E+00	0.113360E+00
0	0.299096E+02	0.348800E-01
0	0.335720E+01	0.129056E+01
0	0.933040E+00	0.270320E+00
0	0.784800E+00	0.436000E-01
0	0.331360E+01	0.436000E-01
0	0.601680E+00	0.566800E+00
0	0.427280E-01	0.102896E+01
0	0.148240E+00	0.108128E+02
0	0.340080E+01	0.174400E-01
0	0.872000E+00	0.523200E-01
0	0.144752E+01	0.202304E+01
0	0.151728E+00	0.619120E+00
0	0.401120E+01	0.610400E-01
0	0.270320E+00	0.784800E-01
0	0.523200E-01	0.610400E-01
0	0.116848E+01	0.122080E+00
0	0.810960E-01	0.104640E+00
0	0.793520E-01	0.113360E+00
0	0.331360E+00	0.174400E-01
0	0.566800E-01	0.113360E+00
0	0.139520E+00	0.299096E+02
0	0.436000E-01	0.335720E+01
0	0.139520E-01	0.933040E+00
0	0.784800E-02	0.784800E+00
0	0.305200E-01	0.331360E+01
0	0.114232E+00	0.601680E+00
0	0.645280E-01	0.427280E-01
0	0.610400E-02	0.148240E+00
0	0.156960E-01	0.340080E+01
0	0.453440E-01	0.872000E+00
0	0.427280E-01	0.144752E+01
0	0.287760E-01	0.151728E+00
0	0.348800E-02	0.401120E+01
0	0.165680E-01	0.270320E+00
0	0.348800E-02	0.523200E-01
0	0.331360E-01	0.116848E+01
0	0.163120E+07	0.810960E-01
0	0.169330E+07	0.793520E-01
0	0.171830E+07	0.331360E+00
0	0.174640E+07	0.566800E-01

0				0.175910E+07	0.139520E+00		
0				0.176000E+07	0.436000E-01		
0				0.178340E+07	0.139520E-01		
0				0.186100E+07	0.784800E-02		
0				0.187060E+07	0.305200E-01		
0				0.190630E+07	0.114232E+00		
0				0.192060E+07	0.645280E-01		
0				0.192870E+07	0.610400E-02		
0				0.196370E+07	0.156960E-01		
0				0.197530E+07	0.453440E-01		
0				0.200200E+07	0.427280E-01		
0				0.202060E+07	0.287760E-01		
0				0.222900E+07	0.348800E-02		
0				0.227400E+07	0.165680E-01		
0				0.228880E+07	0.348800E-02		
0				0.229640E+07	0.331360E-01		
81	201	Ti201	0.262480E+06	0.000000E+00	0.739864E+05	0.000000E+00	0.157000E+04 0.402800E+02
0					0.584000E+04	0.498200E+00	
0					0.263400E+05	0.911600E-02	
0					0.306000E+05	0.272420E+00	
0					0.321900E+05	0.275600E+00	
0					0.135340E+06	0.279840E+01	
0					0.141100E+06	0.604200E-02	
0					0.165880E+06	0.166420E+00	
0					0.167430E+06	0.106000E+02	
81	202	Ti202	0.105667E+07	0.160000E+00	0.607000E+05	0.000000E+00	0.439560E+06 0.914000E+02
0					0.520130E+06	0.584960E+00	
0					0.959700E+06	0.685500E-01	
81	204	Ti204	0.119285E+09	0.000000E+00	0.141000E+04	0.000000E+00	0.000000E+00
81	207	Ti207	0.286200E+03	0.495000E+06	0.380000E+01	0.000000E+00	0.897700E+06 0.240000E+00
82	201	Pb201	0.335900E+05	0.140000E+03	0.701784E+05	0.000000E+00	0.791000E-02 0.791000E+00
0					0.355950E+00	0.205660E-01	
0					0.672350E-01	0.435050E-01	
0					0.166110E+00	0.110740E+00	
0					0.261030E+00	0.142380E+00	
0					0.268940E+00	0.696080E-01	
0					0.316400E-01	0.100457E+00	
0					0.355950E+01	0.174020E+00	
0					0.324310E+00	0.791000E-01	
0					0.427140E+00	0.791000E-01	
0					0.427140E+01	0.110740E-01	
0					0.767270E+00	0.403410E-01	
0					0.142380E+00	0.767270E-01	
0					0.151872E+00	0.791000E+02	
0					0.316400E+01	0.102830E+00	
0					0.593250E+00	0.284760E+00	
0					0.151081E+01	0.988750E+01	
0					0.235718E+01	0.229390E+00	
0					0.569520E+01	0.165319E+00	
0					0.735630E+01	0.200914E+01	
0					0.474600E+00	0.791000E-02	
0					0.316400E-01	0.355950E+00	
0					0.640710E+00	0.672350E-01	
0					0.174020E-01	0.166110E+00	
0					0.245210E-01	0.261030E+00	
0					0.696080E-01	0.268940E+00	
0					0.113904E+01	0.316400E-01	
0					0.862190E+00	0.355950E+01	
0					0.182721E+01	0.324310E+00	
0					0.166110E+00	0.427140E+00	
0					0.102830E-01	0.427140E+01	
0					0.759360E+00	0.767270E+00	
0					0.134470E+00	0.142380E+00	
0					0.245210E-01	0.151872E+00	
0					0.117859E+01	0.316400E+01	
0					0.162946E+01	0.593250E+00	
0					0.648620E-01	0.151081E+01	
0					0.545790E+00	0.235718E+01	

0				0.237300E-01	0.569520E+01		
0				0.427140E+00	0.735630E+01		
0				0.189840E-01	0.474600E+00		
0				0.132097E+00	0.316400E-01		
0				0.917560E-01	0.640710E+00		
0				0.363860E-01	0.174020E-01		
0				0.163737E+00	0.245210E-01		
0				0.189840E-01	0.696080E-01		
0				0.466690E-02	0.113904E+01		
0				0.261030E-02	0.862190E+00		
0				0.245210E-01	0.182721E+01		
0				0.245210E-02	0.166110E+00		
0				0.348040E-02	0.102830E-01		
0				0.261030E-01	0.759360E+00		
0				0.419230E-02	0.134470E+00		
0				0.113113E-01	0.245210E-01		
0				0.450870E-02	0.117859E+01		
0				0.127710E+07	0.162946E+01		
0				0.128630E+07	0.648620E-01		
0				0.130840E+07	0.545790E+00		
0				0.133050E+07	0.237300E-01		
0				0.134080E+07	0.427140E+00		
0				0.138140E+07	0.189840E-01		
0				0.140130E+07	0.132097E+00		
0				0.142420E+07	0.917560E-01		
0				0.144580E+07	0.363860E-01		
0				0.147990E+07	0.163737E+00		
0				0.148620E+07	0.189840E-01		
0				0.155050E+07	0.466690E-02		
0				0.158760E+07	0.261030E-02		
0				0.161740E+07	0.245210E-01		
0				0.163090E+07	0.245210E-02		
0				0.163910E+07	0.348040E-02		
0				0.167200E+07	0.261030E-01		
0				0.167900E+07	0.419230E-02		
0				0.175530E+07	0.113113E-01		
0				0.181310E+07	0.450870E-02		
82	209	Pb209	0.117108E+05	0.197500E+06	0.701784E+05	0.000000E+00	0.000000E+00
82	210	Pb210	0.703719E+09	0.345000E+05	0.316000E+04	0.720000E-01	0.465200E+05 0.405000E+01
82	211	Pb211	0.216600E+04	0.453300E+06	0.662000E+03	0.000000E+00	0.708735E+00 0.766200E-01
0				0.380546E+01	0.446950E-01		
0				0.638500E-02	0.574650E-01		
0				0.217090E-01	0.166010E-01		
0				0.178780E-01	0.114930E-01		
0				0.153240E-01	0.178780E-01		
0				0.255400E-02	0.114930E-01		
0				0.510800E-02	0.306480E-01		
0				0.146855E+00	0.344790E-01		
0				0.127700E-01	0.383100E+01		
0				0.127700E-02	0.172395E+01		
0				0.893900E-02	0.638500E-02		
0				0.478000E+06	0.127700E-01		
0				0.481100E+06	0.255400E-01		
0				0.492000E+06	0.140470E-01		
0				0.500400E+06	0.114930E-01		
0				0.503300E+06	0.153240E-01		
0				0.609500E+06	0.229860E-01		
0				0.675000E+06	0.638500E-02		
0				0.704500E+06	0.481429E+00		
0				0.766340E+06	0.708735E+00		
0				0.831830E+06	0.380546E+01		
0				0.865600E+06	0.638500E-02		
0				0.951000E+06	0.217090E-01		
0				0.101470E+07	0.178780E-01		
0				0.108020E+07	0.153240E-01		
0				0.109050E+07	0.255400E-02		
0				0.110340E+07	0.510800E-02		
0				0.110950E+07	0.146855E+00		
0				0.119660E+07	0.127700E-01		
0				0.123430E+07	0.127700E-02		

0				0.127080E+07	0.893900E-02		
82	212	Pb212	0.383040E+05	0.174000E+06	0.303000E+05	0.000000E+00	0.115180E+06 0.591360E+00
0				0.164200E+06	0.457600E-02		
0				0.176660E+06	0.510400E-01		
0				0.238630E+06	0.436480E+02		
0				0.300090E+06	0.334400E+01		
0				0.415200E+06	0.281600E-01		
82	214	Pb214	0.160800E+04	0.294000E+06	0.191000E+05	0.000000E+00	0.363710E+00 0.110096E+01
0				0.786400E-01	0.589800E-01		
0				0.109113E+01	0.393200E-01		
0				0.586851E+00	0.491500E-01		
0				0.241910E+06	0.746097E+01		
0				0.258790E+06	0.550480E+00		
0				0.274530E+06	0.324390E+00		
0				0.295170E+06	0.191685E+02		
0				0.305600E+06	0.226090E-01		
0				0.314200E+06	0.786400E-01		
0				0.324300E+06	0.196600E-01		
0				0.351900E+06	0.370591E+02		
0				0.462100E+06	0.167110E+00		
0				0.470600E+06	0.983000E-02		
0				0.480420E+06	0.338152E+00		
0				0.487080E+06	0.439401E+00		
0				0.511000E+06	0.294900E-01		
0				0.533690E+06	0.189719E+00		
0				0.538700E+06	0.491500E-02		
0				0.544100E+06	0.226090E-01		
0				0.580150E+06	0.363710E+00		
0				0.766000E+06	0.786400E-01		
0				0.785910E+06	0.109113E+01		
0				0.839020E+06	0.586851E+00		
83	206	Bi206	0.539400E+06	0.000000E+00	0.906596E+05	0.000000E+00	0.375820E-01 0.227470E-01
0				0.111757E+00	0.356040E-01		
0				0.484610E+00	0.820870E-01		
0				0.575598E+01	0.158240E+02		
0				0.447028E+01	0.435160E-01		
0				0.190877E+01	0.241316E+00		
0				0.979110E-01	0.301645E+01		
0				0.157251E+00	0.000000E+00		
0				0.527137E+00	0.359007E+00		
0				0.000000E+00	0.234393E+02		
0				0.536038E+00	0.516258E+00		
0				0.989000E+02	0.107405E+02		
0				0.185932E+00	0.227470E-01		
0				0.661641E+02	0.375820E-01		
0				0.156559E+02	0.156262E+00		
0				0.306590E-01	0.534060E-01		
0				0.365930E-01	0.890100E-01		
0				0.759552E+01	0.153097E+02		
0				0.425270E-01	0.407468E+02		
0				0.563730E-01	0.304612E+02		
0				0.702190E-01	0.375820E-01		
0				0.134999E+02	0.111757E+00		
0				0.110768E+00	0.484610E+00		
0				0.662630E-01	0.575598E+01		
0				0.276920E+00	0.447028E+01		
0				0.494500E-01	0.190877E+01		
0				0.840650E-01	0.979110E-01		
0				0.652740E-01	0.157251E+00		
0				0.281865E+00	0.527137E+00		
0				0.425270E-01	0.000000E+00		
0				0.801090E-01	0.536038E+00		
0				0.176042E+00	0.989000E+02		
0				0.377798E+00	0.185932E+00		
0				0.303623E+00	0.661641E+02		
0				0.405490E-01	0.156559E+02		
0				0.501423E+01	0.306590E-01		
0				0.318458E+02	0.365930E-01		
0				0.573620E+00	0.759552E+01		
0				0.200767E+01	0.425270E-01		

0					0.349117E+00	0.563730E-01		
0					0.108790E-01	0.702190E-01		
0					0.128570E-01	0.134999E+02		
0					0.494500E-02	0.110768E+00		
0					0.148350E-01	0.662630E-01		
0					0.129559E+00	0.276920E+00		
0					0.138460E-01	0.494500E-01		
0					0.124650E+07	0.840650E-01		
0					0.128180E+07	0.652740E-01		
0					0.133230E+07	0.281865E+00		
0					0.142020E+07	0.425270E-01		
0					0.145990E+07	0.801090E-01		
0					0.149620E+07	0.176042E+00		
0					0.156030E+07	0.377798E+00		
0					0.156530E+07	0.303623E+00		
0					0.158820E+07	0.405490E-01		
0					0.159530E+07	0.501423E+01		
0					0.171870E+07	0.318458E+02		
0					0.184450E+07	0.573620E+00		
0					0.187860E+07	0.200767E+01		
0					0.190360E+07	0.349117E+00		
0					0.196320E+07	0.108790E-01		
0					0.202280E+07	0.128570E-01		
0					0.243900E+07	0.494500E-02		
0					0.247670E+07	0.148350E-01		
0					0.259960E+07	0.129559E+00		
0					0.275960E+07	0.138460E-01		
83	207	Bi207	0.101613E+10	0.460000E+02	0.650000E+05	0.000000E+00	0.328200E+06	0.869975E-03
0					0.569700E+06	0.977500E+02		
0					0.897700E+06	0.119255E+00		
0					0.106370E+07	0.740847E+02		
0					0.144220E+07	0.129030E+00		
0					0.177020E+07	0.686791E+01		
83	210	Bi210	0.433123E+06	0.389000E+06	0.170000E-01	0.630000E+01	0.265600E+06	0.448800E-04
0					0.304600E+06	0.567600E-04		
83	211	Bi211	0.128400E+03	0.970000E+04	0.202000E+04	0.667650E+07	0.351000E+06	0.127648E+02
83	212	Bi212	0.363300E+04	0.502600E+06	0.124000E+04	0.221700E+07	0.682860E-01	0.109976E+01
0					0.111414E+00	0.100632E-01		
0					0.164000E+06	0.467220E-02		
0					0.288070E+06	0.309084E+00		
0					0.295100E+06	0.240798E-01		
0					0.327960E+06	0.140166E+00		
0					0.433500E+06	0.125790E-01		
0					0.452830E+06	0.316272E+00		
0					0.473500E+06	0.467220E-01		
0					0.492700E+06	0.610980E-02		
0					0.576000E+06	0.790680E-03		
0					0.620400E+06	0.359400E-02		
0					0.727180E+06	0.664890E+01		
0					0.785420E+06	0.110695E+01		
0					0.893390E+06	0.366588E+00		
0					0.952100E+06	0.176106E+00		
0					0.107400E+07	0.158136E-01		
0					0.107860E+07	0.535506E+00		
0					0.151270E+07	0.312678E+00		
0					0.162060E+07	0.150948E+01		
0					0.167950E+07	0.682860E-01		
0					0.180600E+07	0.111414E+00		
83	213	Bi213	0.273540E+04	0.462000E+06	0.351000E+04	0.125600E+06	0.292860E+06	0.429000E+00
0					0.323810E+06	0.160000E+00		
0					0.440420E+06	0.261000E+02		
0					0.659810E+06	0.870000E-01		
0					0.807350E+06	0.292000E+00		
0					0.110010E+07	0.282000E+00		
83	214	Bi214	0.119400E+04	0.654000E+06	0.105100E+04	0.146000E+04	0.884520E-02	0.176904E+00
0					0.176904E-01	0.805896E-01		
0					0.570024E-02	0.324324E-01		

0	0.157248E-01	0.343980E-01
0	0.707616E-01	0.953316E-01
0	0.845208E-01	0.570024E-01
0	0.324324E-01	0.393120E-01
0	0.815724E-01	0.589680E-01
0	0.117936E-01	0.628992E-02
0	0.460933E+02	0.491400E-02
0	0.687960E-01	0.363636E+00
0	0.343980E-01	0.412776E+00
0	0.491400E-02	0.884520E-02
0	0.167076E-01	0.304668E-01
0	0.599508E-01	0.167076E+00
0	0.314496E-01	0.108108E+00
0	0.589680E-01	0.294840E-01
0	0.432432E-01	0.318427E+00
0	0.156265E+01	0.132678E+00
0	0.786240E-01	0.117936E+00
0	0.589680E-02	0.884520E-02
0	0.589680E-02	0.176904E-01
0	0.373464E-01	0.570024E-02
0	0.471744E+00	0.157248E-01
0	0.746928E-01	0.707616E-01
0	0.402948E+00	0.845208E-01
0	0.452088E-01	0.324324E-01
0	0.157248E-01	0.815724E-01
0	0.471744E-01	0.117936E-01
0	0.393120E-01	0.460933E+02
0	0.132678E+00	0.687960E-01
0	0.488452E+01	0.343980E-01
0	0.314496E+00	0.491400E-02
0	0.412776E-01	0.167076E-01
0	0.122850E+01	0.599508E-01
0	0.402948E-01	0.314496E-01
0	0.150368E+00	0.589680E-01
0	0.923832E-01	0.432432E-01
0	0.226044E-01	0.156265E+01
0	0.167076E-01	0.786240E-01
0	0.105160E+00	0.589680E-02
0	0.226044E-01	0.589680E-02
0	0.316462E+01	0.373464E-01
0	0.167076E-01	0.471744E+00
0	0.383292E+00	0.746928E-01
0	0.226044E-01	0.402948E+00
0	0.117936E-01	0.452088E-01
0	0.982800E-02	0.157248E-01
0	0.117936E-01	0.471744E-01
0	0.963144E-01	0.393120E-01
0	0.167076E-01	0.132678E+00
0	0.285012E-01	0.488452E+01
0	0.315479E+00	0.314496E+00
0	0.285012E-01	0.412776E-01
0	0.285012E+00	0.122850E+01
0	0.982800E-01	0.402948E-01
0	0.796068E-01	0.150368E+00
0	0.150368E+02	0.923832E-01
0	0.452088E-01	0.226044E-01
0	0.254545E+00	0.167076E-01
0	0.169042E+01	0.105160E+00
0	0.579852E-01	0.226044E-01
0	0.579852E-01	0.316462E+01
0	0.459950E+00	0.167076E-01
0	0.265356E-01	0.383292E+00
0	0.216216E-01	0.226044E-01
0	0.591646E+01	0.117936E-01
0	0.147420E+01	0.982800E-02
0	0.120884E+00	0.117936E-01
0	0.855036E-01	0.963144E-01
0	0.108108E-01	0.167076E-01
0	0.226044E-01	0.285012E-01
0	0.452088E-02	0.315479E+00
0	0.401965E+01	0.285012E-01
0	0.776412E+00	0.285012E+00
0	0.186732E-01	0.982800E-01

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0.138575E+01	0.796068E-01
0.247666E+01	0.150368E+02
0.511056E-02	0.452088E-01
0.117936E-01	0.254545E+00
0.687960E-01	0.169042E+01
0.219164E+01	0.579852E-01
0.412776E+00	0.579852E-01
0.353808E+00	0.459950E+00
0.717444E+00	0.265356E-01
0.265356E+00	0.216216E-01
0.334152E+00	0.591646E+01
0.186732E-01	0.147420E+01
0.737100E-01	0.120884E+00
0.114988E+01	0.855036E-01
0.235872E+00	0.108108E-01
0.304668E+01	0.226044E-01
0.159214E+02	0.452088E-02
0.157248E-01	0.401965E+01
0.117936E-01	0.776412E+00
0.383292E+00	0.186732E-01
0.212285E+01	0.138575E+01
0.226044E+00	0.247666E+01
0.894348E-01	0.511056E-02
0.176904E+00	0.117936E-01
0.628992E-01	0.687960E-01
0.511056E-01	0.219164E+01
0.540540E-02	0.412776E+00
0.294840E-02	0.353808E+00
0.491400E-01	0.717444E+00
0.186732E-01	0.265356E+00
0.697788E-01	0.334152E+00
0.982800E-02	0.186732E-01
0.560196E-01	0.737100E-01
0.874692E-01	0.114988E+01
0.120884E+01	0.235872E+00
0.157248E-01	0.304668E+01
0.393120E-02	0.159214E+02
0.609336E-01	0.157248E-01
0.499262E+01	0.117936E-01
0.687960E-02	0.383292E+00
0.884520E-02	0.212285E+01
0.176904E-01	0.226044E+00
0.294840E-02	0.894348E-01
0.511056E-02	0.176904E+00
0.324324E+00	0.628992E-01
0.117936E-01	0.511056E-01
0.186732E-02	0.540540E-02
0.216216E-01	0.294840E-02
0.186732E-02	0.491400E-01
0.294840E-02	0.186732E-01
0.117936E-01	0.697788E-01
0.196560E-02	0.982800E-02
0.589680E-02	0.560196E-01
0.155282E+01	0.874692E-01
0.206388E-02	0.120884E+01
0.589680E-02	0.157248E-01
0.393120E-03	0.393120E-02
0.452088E-03	0.609336E-01
0.884520E-03	0.499262E+01
0.294840E-03	0.687960E-02
0.324324E-01	0.884520E-02
0.275184E-02	0.176904E-01
0.176904E-02	0.294840E-02
0.255528E-01	0.511056E-02
0.589680E-02	0.324324E+00
0.245700E-02	0.117936E-01
0.343980E-03	0.186732E-02
0.923832E-02	0.216216E-01
0.638820E-02	0.186732E-02
0.157248E-01	0.294840E-02
0.117936E-02	0.117936E-01
0.570024E-03	0.196560E-02
0.167076E-02	0.589680E-02

0				0.147420E-01	0.155282E+01		
0				0.108108E-02	0.206388E-02		
0				0.884520E-02	0.589680E-02		
0				0.226044E-01	0.393120E-03		
0				0.432432E-02	0.452088E-03		
0				0.511056E-03	0.884520E-03		
0				0.343980E-03	0.294840E-03		
0				0.157248E-02	0.324324E-01		
0				0.511056E-03	0.275184E-02		
0				0.147420E-02	0.176904E-02		
0				0.196560E-03	0.255528E-01		
0				0.982800E-04	0.589680E-02		
0				0.282700E+07	0.245700E-02		
0				0.286090E+07	0.343980E-03		
0				0.288040E+07	0.923832E-02		
0				0.289360E+07	0.638820E-02		
0				0.292210E+07	0.157248E-01		
0				0.292870E+07	0.117936E-02		
0				0.293490E+07	0.570024E-03		
0				0.294000E+07	0.167076E-02		
0				0.297880E+07	0.147420E-01		
0				0.298870E+07	0.108108E-02		
0				0.300000E+07	0.884520E-02		
0				0.305390E+07	0.226044E-01		
0				0.308170E+07	0.432432E-02		
0				0.309390E+07	0.511056E-03		
0				0.313630E+07	0.343980E-03		
0				0.314260E+07	0.157248E-02		
0				0.316050E+07	0.511056E-03		
0				0.318360E+07	0.147420E-02		
0				0.323330E+07	0.196560E-03		
0				0.326970E+07	0.982800E-04		
84	210	Po210	0.119557E+08	0.810000E-01	0.681000E-02	0.540740E+07	0.803100E+06 0.105996E-02
84	213	Po213	0.420000E-05	0.000000E+00	0.681000E-02	0.000000E+00	0.000000E+00
84	214	Po214	0.164300E-03	0.820000E+00	0.700000E-01	0.783320E+07	0.298000E+06 0.500000E-04
0						0.799700E+06	0.104000E-01
84	215	Po215	0.178000E-02	0.520000E+00	0.700000E-01	0.752620E+07	0.438800E+06 0.399999E-01
84	218	Po218	0.186000E+03	0.160000E+02	0.700000E-01	0.000000E+00	0.000000E+00
85	211	At211	0.259700E+05	0.209800E-01	0.373835E+05	0.244650E+07	0.669600E+06 0.340000E-02
0						0.687000E+06	0.246000E+00
85	217	At217	0.323000E-01	0.280000E+02	0.373835E+05	0.000000E+00	0.000000E+00
86	222	Rn222	0.330350E+06	0.105000E+02	0.139000E+01	0.558980E+07	0.510000E+06 0.760000E-01
87	221	Fr221	0.294000E+03	0.862000E+04	0.300000E+04	0.647370E+07	0.995000E+05 0.110000E+00
0						0.118200E+06	0.400000E-01
0						0.150000E+06	0.700000E-01
0						0.171300E+06	0.700000E-01
0						0.217990E+06	0.115700E+02
0						0.282800E+06	0.100000E-01
0						0.324100E+06	0.200000E-01
0						0.359100E+06	0.400000E-01
0						0.381800E+06	0.400000E-01
0						0.409100E+06	0.140000E+00
87	223	Fr223	0.130800E+04	0.355000E+06	0.880000E+04	0.330000E+03	0.255000E-01 0.782000E+00
0						0.571200E+00	0.261800E-01
0						0.340000E-01	0.278800E-01
0						0.153000E-01	0.737800E+00
0						0.680000E-01	0.340000E+02
0						0.306000E-01	0.918000E+01
0						0.931600E-01	0.510000E+00
0						0.612000E-02	0.544000E+00
0						0.108800E+00	0.136000E+00
0						0.510000E-01	0.306000E+00
0						0.238000E-01	0.952000E+00

0	0.136000E-01	0.340000E+01
0	0.272000E-01	0.442000E-01
0	0.272000E-01	0.442000E-01
0	0.418200E+00	0.442000E-01
0	0.680000E-02	0.176800E-01
0	0.170000E-01	0.272000E+00
0	0.136000E-01	0.442000E-01
0	0.102000E-01	0.227800E-01
0	0.578000E-01	0.306000E-01
0	0.204000E-01	0.255000E-01
0	0.102000E-01	0.571200E+00
0	0.455600E-01	0.340000E-01
0	0.680000E-02	0.153000E-01
0	0.680000E-02	0.680000E-01
0	0.442000E-01	0.306000E-01
0	0.340000E-02	0.931600E-01
0	0.340000E-02	0.612000E-02
0	0.204000E-02	0.108800E+00
0	0.136000E-02	0.510000E-01
0	0.442000E-01	0.238000E-01
0	0.680000E-03	0.136000E-01
0	0.204000E-02	0.272000E-01
0	0.136000E-02	0.272000E-01
0	0.170000E-01	0.418200E+00
0	0.136000E-01	0.680000E-02
0	0.787400E+06	0.170000E-01
0	0.792600E+06	0.136000E-01
0	0.796800E+06	0.102000E-01
0	0.803500E+06	0.578000E-01
0	0.812200E+06	0.204000E-01
0	0.823100E+06	0.102000E-01
0	0.826000E+06	0.455600E-01
0	0.837300E+06	0.680000E-02
0	0.842200E+06	0.680000E-02
0	0.846700E+06	0.442000E-01
0	0.848700E+06	0.340000E-02
0	0.858800E+06	0.340000E-02
0	0.863000E+06	0.204000E-02
0	0.867500E+06	0.136000E-02
0	0.876200E+06	0.442000E-01
0	0.878200E+06	0.680000E-03
0	0.891000E+06	0.204000E-02
0	0.893000E+06	0.136000E-02
0	0.896100E+06	0.170000E-01
0	0.908200E+06	0.136000E-01
88	223 Ra223	0.987898E+06 0.676000E+05 0.473000E+05 0.579710E+07 0.900000E-02 0.118000E-01
0	0.370000E-01	0.100000E-01
0	0.350000E-01	0.250000E-01
0	0.310000E-01	0.100000E-03
0	0.320000E-01	0.170000E-01
0	0.500000E-02	0.220000E-01
0	0.600000E-02	0.480000E-01
0	0.136000E+02	0.900000E-02
0	0.154000E+00	0.119000E+01
0	0.390000E+01	0.500000E-02
0	0.198000E+00	0.326000E+01
0	0.990000E-01	0.559000E+01
0	0.278000E+01	0.688000E+00
0	0.200000E+00	0.500000E-02
0	0.430000E-01	0.170000E-01
0	0.800000E-02	0.400000E-02
0	0.200000E-01	0.470000E-01
0	0.490000E+00	0.153000E+00
0	0.400000E-02	0.300000E-02
0	0.140000E-01	0.330000E-01
0	0.300000E-02	0.900000E-02
0	0.190000E-01	0.370000E-01
0	0.330000E-01	0.350000E-01
0	0.127000E+01	0.310000E-01
0	0.100000E-01	0.320000E-01
0	0.710000E-01	0.500000E-02
0	0.900000E-01	0.600000E-02

0					0.630000E-01	0.136000E+02		
0					0.800000E-02	0.154000E+00		
0					0.350000E-02	0.390000E+01		
0					0.328500E+06	0.198000E+00		
0					0.333910E+06	0.990000E-01		
0					0.338320E+06	0.278000E+01		
0					0.342900E+06	0.200000E+00		
0					0.361450E+06	0.430000E-01		
0					0.368800E+06	0.800000E-02		
0					0.369500E+06	0.200000E-01		
0					0.371840E+06	0.490000E+00		
0					0.383000E+06	0.400000E-02		
0					0.388000E+06	0.140000E-01		
0					0.391000E+06	0.300000E-02		
0					0.430500E+06	0.190000E-01		
0					0.432600E+06	0.330000E-01		
0					0.444940E+06	0.127000E+01		
0					0.487600E+06	0.100000E-01		
0					0.527300E+06	0.710000E-01		
0					0.598600E+06	0.900000E-01		
0					0.609100E+06	0.630000E-01		
0					0.623400E+06	0.800000E-02		
0					0.711200E+06	0.350000E-02		
88	224	Ra224	0.316224E+06	0.220000E+04	0.426000E+03	0.577750E+07	0.240990E+06	0.397000E+01
0					0.292700E+06	0.600000E-02		
0					0.404200E+06	0.210000E-02		
0					0.422040E+06	0.290000E-02		
0					0.645500E+06	0.520000E-02		
88	225	Ra225	0.127872E+07	0.108000E+06	0.238000E+04	0.000000E+00	0.401000E+05	0.300000E+02
88	226	Ra226	0.504911E+11	0.371000E+04	0.685000E+03	0.486060E+07	0.186100E+06	0.350000E+01
0					0.262270E+06	0.490000E-02		
0					0.414600E+06	0.300000E-03		
0					0.449370E+06	0.190000E-03		
0					0.600660E+06	0.490000E-03		
88	228	Ra228	0.181452E+09	0.893000E+04	0.685000E+03	0.000000E+00	0.127600E+05	0.304000E+00
0					0.135200E+05	0.160000E+01		
0					0.155000E+05	0.160000E+00		
0					0.161800E+05	0.720000E+00		
0					0.188000E+05	0.208000E+00		
0					0.194000E+05	0.144000E-01		
89	225	Ac225	0.864000E+06	0.202000E+05	0.637000E+04	0.585400E+07	0.500000E-01	0.150000E-02
0					0.100000E-01	0.150000E-01		
0					0.280000E+00	0.950000E-02		
0					0.320000E+00	0.500000E-02		
0					0.600000E-01	0.190000E-01		
0					0.190000E+00	0.500000E-02		
0					0.500000E-01	0.550000E+00		
0					0.140000E-01	0.600000E-01		
0					0.400000E-01	0.500000E-02		
0					0.200000E-01	0.100000E-01		
0					0.130000E+00	0.100000E-01		
0					0.796000E+00	0.170000E-01		
0					0.400000E-01	0.320000E+00		
0					0.190000E+00	0.400000E-01		
0					0.310000E+00	0.150000E+00		
0					0.100000E-01	0.290000E+00		
0					0.200000E-01	0.160000E+00		
0					0.200000E-01	0.300000E-01		
0					0.460000E+00	0.640000E+00		
0					0.140000E+00	0.170000E+01		
0					0.200000E-01	0.500000E-01		
0					0.340000E+00	0.100000E-01		
0					0.800000E-01	0.280000E+00		
0					0.200000E-01	0.320000E+00		
0					0.200000E-01	0.600000E-01		
0					0.100000E+00	0.190000E+00		
0					0.300000E-01	0.500000E-01		
0					0.100000E-01	0.140000E-01		

0					0.110000E+00	0.400000E-01		
0					0.300000E-01	0.200000E-01		
0					0.100000E-01	0.130000E+00		
0					0.100000E-01	0.796000E+00		
0					0.152600E+06	0.400000E-01		
0					0.154000E+06	0.190000E+00		
0					0.157250E+06	0.310000E+00		
0					0.170600E+06	0.100000E-01		
0					0.178600E+06	0.200000E-01		
0					0.186100E+06	0.200000E-01		
0					0.188000E+06	0.460000E+00		
0					0.195690E+06	0.140000E+00		
0					0.198700E+06	0.200000E-01		
0					0.216200E+06	0.340000E+00		
0					0.224560E+06	0.800000E-01		
0					0.240700E+06	0.200000E-01		
0					0.248700E+06	0.200000E-01		
0					0.253500E+06	0.100000E+00		
0					0.279900E+06	0.300000E-01		
0					0.285500E+06	0.100000E-01		
0					0.452400E+06	0.110000E+00		
0					0.480500E+06	0.300000E-01		
0					0.515000E+06	0.100000E-01		
0					0.526600E+06	0.100000E-01		
89	227	Ac227	0.686994E+09	0.128000E+05	0.770000E+02	0.686000E+05	0.930000E+04	0.132480E-03
0					0.152000E+05	0.358800E-01		
0					0.245000E+05	0.345000E-02		
0					0.465000E+05	0.138000E-02		
0					0.695000E+05	0.552000E-02		
0					0.702000E+05	0.165600E-01		
0					0.100000E+06	0.317400E-01		
0					0.106500E+06	0.138000E-02		
0					0.121500E+06	0.552000E-02		
0					0.134100E+06	0.276000E-02		
0					0.147500E+06	0.828000E-02		
0					0.160400E+06	0.193200E-01		
0					0.171800E+06	0.414000E-02		
89	228	Ac228	0.221400E+05	0.436000E+06	0.920000E+04	0.240000E+00	0.303240E-01	0.931000E-02
0					0.558600E-01	0.199500E-01		
0					0.255360E-01	0.486780E+00		
0					0.305900E-01	0.263340E-01		
0					0.412300E-01	0.127680E+01		
0					0.343140E+01	0.957600E-01		
0					0.196840E+00	0.101080E-01		
0					0.638400E-01	0.244720E+01		
0					0.234080E+00	0.180880E-01		
0					0.343140E-01	0.242060E-01		
0					0.111720E+00	0.518700E-01		
0					0.295260E+01	0.162260E+00		
0					0.372400E+00	0.736820E+00		
0					0.112518E+02	0.133000E-01		
0					0.377720E+00	0.359100E-01		
0					0.175560E-01	0.718200E-01		
0					0.691600E-02	0.127680E+00		
0					0.252700E-01	0.324520E+00		
0					0.691600E-02	0.119700E+00		
0					0.106400E-01	0.388360E+01		
0					0.281960E-01	0.303240E-01		
0					0.303240E-01	0.558600E-01		
0					0.193648E+01	0.255360E-01		
0					0.135660E-01	0.305900E-01		
0					0.212800E-01	0.412300E-01		
0					0.125020E+00	0.343140E+01		
0					0.492100E-01	0.196840E+00		
0					0.159600E-01	0.638400E-01		
0					0.154280E-01	0.234080E+00		
0					0.444220E+01	0.343140E-01		
0					0.295260E-01	0.111720E+00		
0					0.133000E-01	0.295260E+01		
0					0.335160E-01	0.372400E+00		
0					0.226100E-01	0.112518E+02		

0	0.215460E+00	0.377720E+00
0	0.239400E-01	0.175560E-01
0	0.114380E-01	0.691600E-02
0	0.242060E-01	0.252700E-01
0	0.611800E-02	0.691600E-02
0	0.186200E+00	0.106400E-01
0	0.468160E+00	0.281960E-01
0	0.500080E-01	0.303240E-01
0	0.691600E-01	0.193648E+01
0	0.106400E+00	0.135660E-01
0	0.268660E-01	0.212800E-01
0	0.207480E+00	0.125020E+00
0	0.236740E-01	0.492100E-01
0	0.473480E-01	0.159600E-01
0	0.869820E+00	0.154280E-01
0	0.167580E+00	0.444220E+01
0	0.154280E+00	0.295260E-01
0	0.114380E+00	0.133000E-01
0	0.236740E-01	0.335160E-01
0	0.824600E-01	0.226100E-01
0	0.824600E-01	0.215460E+00
0	0.114380E-01	0.239400E-01
0	0.143640E-01	0.114380E-01
0	0.462840E-01	0.242060E-01
0	0.109060E-01	0.611800E-02
0	0.558600E-01	0.186200E+00
0	0.412300E-01	0.468160E+00
0	0.931000E-01	0.500080E-01
0	0.239400E-01	0.691600E-01
0	0.289940E-01	0.106400E+00
0	0.638400E-01	0.268660E-01
0	0.266000E-01	0.207480E+00
0	0.103740E+00	0.236740E-01
0	0.638400E-01	0.473480E-01
0	0.691600E-01	0.869820E+00
0	0.377720E-01	0.167580E+00
0	0.178220E+00	0.154280E+00
0	0.159600E+00	0.114380E+00
0	0.191520E-01	0.236740E-01
0	0.638400E+00	0.824600E-01
0	0.380380E-01	0.824600E-01
0	0.100548E+01	0.114380E-01
0	0.150290E+01	0.143640E-01
0	0.798000E-01	0.462840E-01
0	0.194180E-01	0.109060E-01
0	0.500080E+00	0.558600E-01
0	0.236740E-01	0.412300E-01
0	0.433580E+01	0.931000E-01
0	0.718200E-02	0.239400E-01
0	0.308560E-01	0.289940E-01
0	0.518700E-01	0.638400E-01
0	0.553280E+00	0.266000E-01
0	0.167580E+01	0.103740E+00
0	0.938980E+00	0.638400E-01
0	0.122360E-01	0.691600E-01
0	0.452200E-01	0.377720E-01
0	0.319200E-01	0.178220E+00
0	0.489440E-01	0.159600E+00
0	0.140980E-01	0.191520E-01
0	0.638400E-02	0.638400E+00
0	0.281960E-01	0.380380E-01
0	0.167580E-01	0.100548E+01
0	0.782040E+00	0.150290E+01
0	0.266000E+02	0.798000E-01
0	0.279300E-01	0.194180E-01
0	0.151620E-01	0.500080E+00
0	0.127680E-01	0.236740E-01
0	0.904400E-02	0.433580E+01
0	0.984200E-01	0.718200E-02
0	0.109060E+00	0.308560E-01
0	0.292600E+00	0.518700E-01
0	0.510720E+01	0.553280E+00
0	0.161728E+02	0.167580E+01

0	0.510720E-01	0.938980E+00
0	0.271320E-01	0.122360E-01
0	0.505400E-01	0.452200E-01
0	0.133000E+00	0.319200E-01
0	0.478800E-02	0.489440E-01
0	0.191520E-01	0.140980E-01
0	0.191520E-01	0.638400E-02
0	0.585200E-02	0.281960E-01
0	0.215460E-01	0.167580E-01
0	0.207480E+00	0.782040E+00
0	0.460180E-01	0.266000E+02
0	0.460180E-01	0.279300E-01
0	0.138320E-01	0.151620E-01
0	0.186200E-01	0.127680E-01
0	0.106400E-01	0.904400E-02
0	0.135660E+00	0.984200E-01
0	0.103740E-01	0.109060E+00
0	0.611800E-02	0.292600E+00
0	0.133000E+00	0.510720E+01
0	0.154280E-01	0.161728E+02
0	0.313880E+00	0.510720E-01
0	0.558600E-01	0.271320E-01
0	0.101080E-01	0.505400E-01
0	0.106400E-01	0.133000E+00
0	0.611800E-02	0.478800E-02
0	0.143640E+00	0.191520E-01
0	0.718200E-02	0.191520E-01
0	0.665000E-01	0.585200E-02
0	0.247380E-01	0.215460E-01
0	0.638400E-02	0.207480E+00
0	0.218120E-01	0.460180E-01
0	0.771400E-02	0.460180E-01
0	0.984200E-01	0.138320E-01
0	0.497420E+00	0.186200E-01
0	0.638400E-01	0.106400E-01
0	0.143640E-01	0.135660E+00
0	0.513380E-01	0.103740E-01
0	0.824600E-01	0.611800E-02
0	0.125020E-01	0.133000E+00
0	0.877800E-02	0.154280E-01
0	0.151620E-01	0.313880E+00
0	0.505400E-02	0.558600E-01
0	0.931000E-02	0.101080E-01
0	0.159600E-01	0.106400E-01
0	0.210140E-01	0.611800E-02
0	0.140980E-01	0.143640E+00
0	0.140980E-01	0.718200E-02
0	0.109060E-01	0.665000E-01
0	0.125020E-01	0.247380E-01
0	0.220780E-01	0.638400E-02
0	0.361760E-01	0.218120E-01
0	0.824600E-02	0.771400E-02
0	0.611800E-02	0.984200E-01
0	0.109060E-01	0.497420E+00
0	0.798000E+00	0.638400E-01
0	0.207480E-01	0.143640E-01
0	0.167580E-01	0.513380E-01
0	0.893760E+00	0.824600E-01
0	0.470820E+00	0.125020E-01
0	0.585200E-01	0.877800E-02
0	0.481460E-01	0.151620E-01
0	0.391020E-01	0.505400E-02
0	0.183540E+00	0.931000E-02
0	0.210140E-01	0.159600E-01
0	0.585200E-02	0.210140E-01
0	0.337820E-01	0.140980E-01
0	0.606480E+00	0.140980E-01
0	0.327180E+01	0.109060E-01
0	0.263340E+00	0.125020E-01
0	0.159600E+01	0.220780E-01
0	0.473480E+00	0.361760E-01
0	0.183540E+00	0.824600E-02
0	0.425600E-02	0.611800E-02

0				0.558600E-01	0.109060E-01		
0				0.151620E-01	0.798000E+00		
0				0.984200E-01	0.207480E-01		
0				0.103740E-01	0.167580E-01		
0				0.494760E-01	0.893760E+00		
0				0.877800E-02	0.470820E+00		
0				0.558600E-02	0.585200E-01		
0				0.585200E-02	0.481460E-01		
0				0.297920E-01	0.391020E-01		
0				0.180880E-01	0.183540E+00		
0				0.111720E-01	0.210140E-01		
0				0.824600E-02	0.585200E-02		
0				0.665000E-02	0.337820E-01		
0				0.824600E-02	0.606480E+00		
0				0.356440E-01	0.327180E+01		
0				0.186200E-02	0.263340E+00		
0				0.611800E-02	0.159600E+01		
0				0.133000E-02	0.473480E+00		
0				0.212800E-02	0.183540E+00		
0				0.212800E-02	0.425600E-02		
0				0.452200E-02	0.558600E-01		
0				0.452200E-01	0.151620E-01		
0				0.212800E-02	0.984200E-01		
0				0.388360E-01	0.103740E-01		
0				0.430920E-01	0.494760E-01		
0				0.452200E-02	0.877800E-02		
0				0.250040E-01	0.558600E-02		
0				0.133000E-02	0.585200E-02		
0				0.931000E-01	0.297920E-01		
0				0.292600E-02	0.180880E-01		
0				0.122360E-01	0.111720E-01		
0				0.798000E-03	0.824600E-02		
0				0.212800E-02	0.665000E-02		
0				0.204820E-01	0.824600E-02		
0				0.212800E-02	0.356440E-01		
0				0.212800E-02	0.186200E-02		
0				0.611800E-01	0.611800E-02		
0				0.798000E-03	0.133000E-02		
0				0.159600E-02	0.212800E-02		
0				0.210140E-01	0.212800E-02		
0				0.372400E-02	0.452200E-02		
0				0.186200E-02	0.452200E-01		
0				0.106400E-02	0.212800E-02		
0				0.186200E-02	0.388360E-01		
0				0.184210E+07	0.430920E-01		
0				0.185010E+07	0.452200E-02		
0				0.187080E+07	0.250040E-01		
0				0.187960E+07	0.133000E-02		
0				0.188710E+07	0.931000E-01		
0				0.190010E+07	0.292600E-02		
0				0.190720E+07	0.122360E-01		
0				0.191590E+07	0.798000E-03		
0				0.191950E+07	0.212800E-02		
0				0.192980E+07	0.204820E-01		
0				0.193630E+07	0.212800E-02		
0				0.194420E+07	0.212800E-02		
0				0.195230E+07	0.611800E-01		
0				0.195590E+07	0.798000E-03		
0				0.195840E+07	0.159600E-02		
0				0.196520E+07	0.210140E-01		
0				0.197190E+07	0.372400E-02		
0				0.197930E+07	0.186200E-02		
0				0.200090E+07	0.106400E-02		
0				0.202930E+07	0.186200E-02		
90	227	Th227	0.161724E+07	0.451000E+05	0.121000E+05	0.600800E+07	0.700000E-02 0.500000E-02
0					0.900000E-02	0.700000E-01	
0					0.800000E-01	0.200000E+00	
0					0.200000E-02	0.600000E-02	
0					0.240000E+00	0.100000E+00	
0					0.900000E-02	0.800000E-01	
0					0.280000E-01	0.140000E-01	
0					0.600000E-02	0.200000E-01	

0	0.700000E-02	0.400000E-01
0	0.570000E-02	0.500000E-01
0	0.400000E-01	0.230000E+00
0	0.900000E-02	0.700000E-02
0	0.280000E-01	0.130000E-01
0	0.190000E-01	0.100000E-01
0	0.900000E-02	0.200000E+00
0	0.210000E+01	0.850000E+01
0	0.340000E-02	0.160000E-01
0	0.140000E+01	0.300000E-02
0	0.120000E-01	0.800000E-02
0	0.600000E-01	0.500000E-02
0	0.200000E-02	0.700000E-02
0	0.130000E-01	0.900000E-02
0	0.860000E-01	0.800000E-01
0	0.120000E-02	0.200000E-02
0	0.400000E-01	0.240000E+00
0	0.700000E-02	0.900000E-02
0	0.600000E-02	0.280000E-01
0	0.500000E-02	0.600000E-02
0	0.800000E-02	0.700000E-02
0	0.560000E+00	0.570000E-02
0	0.150000E+00	0.400000E-01
0	0.170000E+00	0.900000E-02
0	0.120000E-01	0.280000E-01
0	0.800000E-02	0.190000E-01
0	0.500000E-02	0.900000E-02
0	0.300000E-02	0.210000E+01
0	0.270000E-01	0.340000E-02
0	0.320000E-01	0.140000E+01
0	0.130000E+00	0.120000E-01
0	0.100000E-01	0.600000E-01
0	0.700000E-02	0.200000E-02
0	0.140000E-01	0.130000E-01
0	0.300000E-02	0.860000E-01
0	0.100000E-02	0.120000E-02
0	0.130000E-01	0.400000E-01
0	0.180000E-01	0.700000E-02
0	0.200000E-02	0.600000E-02
0	0.330000E-01	0.500000E-02
0	0.120000E-01	0.800000E-02
0	0.200000E-01	0.560000E+00
0	0.200000E-01	0.150000E+00
0	0.600000E-02	0.170000E+00
0	0.230000E+00	0.120000E-01
0	0.150000E+00	0.800000E-02
0	0.230000E+00	0.500000E-02
0	0.113000E+01	0.300000E-02
0	0.700000E-01	0.270000E-01
0	0.170000E-01	0.320000E-01
0	0.600000E-01	0.130000E+00
0	0.400000E-01	0.100000E-01
0	0.150000E-01	0.700000E-02
0	0.700000E-03	0.140000E-01
0	0.450000E+00	0.300000E-02
0	0.112000E+02	0.100000E-02
0	0.110000E-01	0.130000E-01
0	0.700000E-02	0.180000E-01
0	0.370000E+00	0.200000E-02
0	0.130000E+00	0.330000E-01
0	0.110000E+00	0.120000E-01
0	0.800000E+00	0.200000E-01
0	0.680000E+01	0.200000E-01
0	0.100000E+00	0.600000E-02
0	0.250000E-02	0.230000E+00
0	0.100000E-01	0.150000E+00
0	0.800000E-02	0.230000E+00
0	0.320000E-01	0.113000E+01
0	0.490000E+00	0.700000E-01
0	0.150000E-02	0.170000E-01
0	0.700000E-01	0.600000E-01
0	0.700000E-02	0.400000E-01
0	0.160000E+00	0.150000E-01

0	0.500000E-01	0.700000E-03
0	0.550000E-01	0.450000E+00
0	0.158000E+01	0.112000E+02
0	0.900000E-02	0.110000E-01
0	0.600000E-01	0.700000E-02
0	0.430000E+00	0.370000E+00
0	0.200000E+01	0.130000E+00
0	0.200000E+00	0.110000E+00
0	0.105000E+01	0.800000E+00
0	0.150000E-01	0.680000E+01
0	0.480000E+00	0.100000E+00
0	0.300000E-01	0.250000E-02
0	0.460000E+00	0.100000E-01
0	0.600000E-02	0.800000E-02
0	0.220000E-01	0.320000E-01
0	0.600000E-02	0.490000E+00
0	0.500000E-02	0.150000E-02
0	0.275000E+01	0.700000E-01
0	0.100000E+01	0.700000E-02
0	0.140000E-02	0.160000E+00
0	0.350000E+00	0.500000E-01
0	0.750000E-02	0.550000E-01
0	0.600000E-02	0.158000E+01
0	0.110000E+00	0.900000E-02
0	0.100000E-01	0.600000E-01
0	0.500000E-02	0.430000E+00
0	0.500000E-02	0.200000E+01
0	0.700000E-02	0.200000E+00
0	0.140000E-02	0.105000E+01
0	0.600000E-02	0.150000E-01
0	0.600000E-02	0.480000E+00
0	0.480000E-01	0.300000E-01
0	0.900000E-02	0.460000E+00
0	0.900000E-02	0.600000E-02
0	0.120000E-01	0.220000E-01
0	0.170000E-02	0.600000E-02
0	0.500000E-02	0.500000E-02
0	0.150000E-03	0.275000E+01
0	0.100000E-03	0.100000E+01
0	0.700000E-04	0.140000E-02
0	0.500000E-04	0.350000E+00
0	0.500000E-04	0.750000E-02
0	0.300000E-03	0.600000E-02
0	0.140000E-03	0.110000E+00
0	0.550000E-03	0.100000E-01
0	0.400000E-03	0.500000E-02
0	0.180000E-03	0.500000E-02
0	0.150000E-03	0.700000E-02
0	0.100000E-03	0.140000E-02
0	0.110000E-02	0.600000E-02
0	0.230000E-03	0.600000E-02
0	0.220000E-03	0.480000E-01
0	0.600000E-03	0.900000E-02
0	0.130000E-03	0.900000E-02
0	0.130000E-03	0.120000E-01
0	0.600000E-04	0.170000E-02
0	0.100000E-04	0.500000E-02
0	0.180000E-03	0.150000E-03
0	0.600000E-04	0.100000E-03
0	0.160000E-03	0.700000E-04
0	0.140000E-03	0.500000E-04
0	0.200000E-04	0.500000E-04
0	0.500000E-04	0.300000E-03
0	0.200000E-04	0.140000E-03
0	0.600000E-04	0.550000E-03
0	0.400000E-04	0.400000E-03
0	0.800000E-04	0.180000E-03
0	0.400000E-04	0.150000E-03
0	0.300000E-04	0.100000E-03
0	0.380000E-03	0.110000E-02
0	0.270000E-03	0.230000E-03
0	0.100000E-03	0.220000E-03
0	0.160000E-03	0.600000E-03

.....

0.700000E-04	0.130000E-03
0.100000E-03	0.130000E-03
0.300000E-03	0.600000E-04
0.100000E-03	0.100000E-04
0.100000E-03	0.180000E-03
0.800000E-03	0.600000E-04
0.200000E-03	0.160000E-03
0.260000E-03	0.140000E-03
0.300000E-03	0.200000E-04
0.130000E-03	0.500000E-04
0.150000E-02	0.200000E-04
0.320000E-03	0.600000E-04
0.100000E-03	0.400000E-04
0.900000E-04	0.800000E-04
0.400000E-04	0.400000E-04
0.300000E-04	0.300000E-04
0.400000E-04	0.380000E-03
0.800000E-03	0.270000E-03
0.970000E-03	0.100000E-03
0.500000E-04	0.160000E-03
0.270000E-02	0.700000E-04
0.300000E-04	0.100000E-03
0.100000E-03	0.300000E-03
0.250000E-02	0.100000E-03
0.200000E-03	0.100000E-03
0.100000E-04	0.800000E-03
0.200000E-03	0.200000E-03
0.400000E-03	0.260000E-03
0.600000E-03	0.300000E-03
0.150000E-03	0.130000E-03
0.600000E-04	0.150000E-02
0.700000E-04	0.320000E-03
0.600000E-04	0.100000E-03
0.240000E-03	0.900000E-04
0.200000E-04	0.400000E-04
0.700000E-04	0.300000E-04
0.160000E-03	0.400000E-04
0.120000E-03	0.800000E-03
0.200000E-04	0.970000E-03
0.130000E-04	0.500000E-04
0.110000E-03	0.270000E-02
0.210000E-02	0.300000E-04
0.150000E-04	0.100000E-03
0.120000E-04	0.250000E-02
0.700000E-05	0.200000E-03
0.100000E-04	0.100000E-04
0.720000E-04	0.200000E-03
0.620000E-04	0.400000E-03
0.300000E-04	0.600000E-03
0.100000E-04	0.150000E-03
0.350000E-04	0.600000E-04
0.700000E-05	0.700000E-04
0.300000E-04	0.600000E-04
0.150000E-04	0.240000E-03
0.200000E-04	0.200000E-04
0.150000E-04	0.700000E-04
0.876200E+06	0.160000E-03
0.878200E+06	0.120000E-03
0.891000E+06	0.200000E-04
0.893000E+06	0.130000E-04
0.896100E+06	0.110000E-03
0.908200E+06	0.210000E-02
0.910000E+06	0.150000E-04
0.920000E+06	0.120000E-04
0.927000E+06	0.700000E-05
0.938000E+06	0.100000E-04
0.941600E+06	0.720000E-04
0.958700E+06	0.620000E-04
0.970000E+06	0.300000E-04
0.971700E+06	0.100000E-04
0.990000E+06	0.350000E-04
0.995000E+06	0.700000E-05
0.999800E+06	0.300000E-04

0				0.101520E+07	0.150000E-04		
0				0.102000E+07	0.200000E-04		
0				0.102500E+07	0.150000E-04		
90	228	Th228	0.603684E+08	0.198000E+05	0.154000E+04	0.550190E+07	0.744000E+05 0.420000E-03
0					0.843730E+05	0.122000E+01	
0					0.131610E+06	0.127000E+00	
0					0.142000E+06	0.140000E-05	
0					0.166410E+06	0.107000E+00	
0					0.182300E+06	0.540000E-05	
0					0.205930E+06	0.204000E-01	
0					0.215980E+06	0.260000E+00	
0					0.228500E+06	0.190000E-04	
0					0.700500E+06	0.320000E-05	
0					0.741800E+06	0.150000E-05	
0					0.832000E+06	0.150000E-04	
0					0.908100E+06	0.180000E-05	
0					0.992900E+06	0.150000E-05	
90	229	Th229	0.231628E+12	0.102000E+06	0.576000E+05	0.498980E+07	0.500000E-02 0.180000E+00
0					0.710000E-01	0.700000E-01	
0					0.141000E+00	0.130000E-02	
0					0.150000E+00	0.730000E-02	
0					0.620000E+00	0.360000E-01	
0					0.470000E-01	0.400000E-01	
0					0.800000E-02	0.980000E+00	
0					0.140000E+01	0.139000E+01	
0					0.260000E+01	0.800000E-01	
0					0.280000E-01	0.220000E-02	
0					0.280000E+00	0.660000E-01	
0					0.140000E-01	0.133000E+00	
0					0.190000E-01	0.762000E+00	
0					0.900000E-02	0.210000E-01	
0					0.809000E+00	0.220000E-01	
0					0.460000E-01	0.180000E-01	
0					0.128000E+00	0.180000E-01	
0					0.290000E-01	0.120000E-01	
0					0.180000E-01	0.280000E-02	
0					0.140000E-01	0.312000E+00	
0					0.500000E-01	0.500000E-02	
0					0.156000E+00	0.710000E-01	
0					0.700000E+00	0.141000E+00	
0					0.750000E+00	0.150000E+00	
0					0.200000E-01	0.620000E+00	
0					0.120000E-01	0.470000E-01	
0					0.170000E-01	0.800000E-02	
0					0.327000E+00	0.140000E+01	
0					0.130000E-01	0.260000E+01	
0					0.117100E+01	0.280000E-01	
0					0.120000E-01	0.280000E+00	
0					0.401000E+00	0.140000E-01	
0					0.170000E-01	0.190000E-01	
0					0.206000E+00	0.900000E-02	
0					0.885000E+00	0.809000E+00	
0					0.420000E-01	0.460000E-01	
0					0.800000E+00	0.128000E+00	
0					0.123700E+01	0.290000E-01	
0					0.500000E-01	0.180000E-01	
0					0.210000E-01	0.140000E-01	
0					0.212000E+00	0.500000E-01	
0					0.500000E-01	0.156000E+00	
0					0.190000E-01	0.700000E+00	
0					0.200000E-01	0.750000E+00	
0					0.120000E+00	0.200000E-01	
0					0.900000E-02	0.120000E-01	
0					0.200000E-01	0.170000E-01	
0					0.215000E+00	0.327000E+00	
0					0.146000E+00	0.130000E-01	
0					0.441000E+01	0.117100E+01	
0					0.300000E-01	0.120000E-01	
0					0.710000E-01	0.401000E+00	
0					0.595000E+00	0.170000E-01	
0					0.210000E+00	0.206000E+00	

0					0.297000E+01	0.885000E+00		
0					0.142000E+00	0.420000E-01		
0					0.190000E+00	0.800000E+00		
0					0.230000E-01	0.123700E+01		
0					0.740000E-01	0.500000E-01		
0					0.180000E+00	0.210000E-01		
0					0.980000E-01	0.212000E+00		
0					0.980000E-01	0.500000E-01		
0					0.350000E-01	0.190000E-01		
0					0.600000E-02	0.200000E-01		
0					0.130000E-01	0.120000E+00		
0					0.174220E+06	0.900000E-02		
0					0.174820E+06	0.200000E-01		
0					0.179760E+06	0.215000E+00		
0					0.183930E+06	0.146000E+00		
0					0.193510E+06	0.441000E+01		
0					0.194300E+06	0.300000E-01		
0					0.200810E+06	0.710000E-01		
0					0.204690E+06	0.595000E+00		
0					0.210150E+06	0.210000E+00		
0					0.210850E+06	0.297000E+01		
0					0.215100E+06	0.142000E+00		
0					0.218150E+06	0.190000E+00		
0					0.221220E+06	0.230000E-01		
0					0.225150E+06	0.740000E-01		
0					0.236250E+06	0.180000E+00		
0					0.242270E+06	0.980000E-01		
0					0.252430E+06	0.980000E-01		
0					0.259080E+06	0.350000E-01		
0					0.289500E+06	0.600000E-02		
0					0.296200E+06	0.130000E-01		
90	230	Th230	0.237876E+13	0.135000E+05	0.131000E+04	0.474740E+07	0.676720E+05	0.375611E+00
0					0.110000E+06	0.594130E-04		
0					0.143870E+06	0.486381E-01		
0					0.186050E+06	0.876090E-02		
0					0.205100E+06	0.513570E-05		
0					0.235000E+06	0.835810E-05		
0					0.253730E+06	0.110770E-01		
0					0.253800E+06	0.845880E-03		
0					0.551800E+06	0.543780E-06		
0					0.570500E+06	0.332310E-05		
0					0.620000E+06	0.795530E-06		
90	231	Th231	0.918720E+05	0.153000E+06	0.170000E+05	0.000000E+00	0.580000E-02	0.230000E+00
0					0.940000E+00	0.165000E+00		
0					0.450000E-01	0.146000E+02		
0					0.230000E-01	0.540000E+00		
0					0.120000E+00	0.350000E-01		
0					0.400000E+00	0.730000E-01		
0					0.710000E-02	0.300000E-01		
0					0.170000E-01	0.110000E+00		
0					0.100000E-02	0.160000E-01		
0					0.207000E-01	0.520000E-01		
0					0.600000E-01	0.580000E-01		
0					0.250000E-01	0.700000E-03		
0					0.840000E-01	0.340000E-01		
0					0.420000E-02	0.500000E+00		
0					0.710000E-03	0.230000E-01		
0					0.580000E-02	0.570000E-02		
0					0.320000E-01	0.260000E+00		
0					0.155000E+00	0.850000E+00		
0					0.390000E-02	0.370000E+00		
0					0.120000E-02	0.671000E+01		
0					0.181000E-01	0.580000E-02		
0					0.329000E-01	0.940000E+00		
0					0.320000E-02	0.450000E-01		
0					0.370000E-01	0.230000E-01		
0					0.890000E-02	0.120000E+00		
0					0.920000E-02	0.400000E+00		
0					0.280000E-03	0.710000E-02		
0					0.840000E-03	0.170000E-01		
0					0.780000E-03	0.100000E-02		

0					0.650000E-03	0.207000E-01		
0					0.116000E-02	0.600000E-01		
0					0.300000E-04	0.250000E-01		
0					0.390000E-03	0.840000E-01		
0					0.290000E-02	0.420000E-02		
0					0.800000E-04	0.710000E-03		
0					0.110000E-03	0.580000E-02		
0					0.700000E-04	0.320000E-01		
0					0.163100E+06	0.155000E+00		
0					0.165000E+06	0.390000E-02		
0					0.169660E+06	0.120000E-02		
0					0.174150E+06	0.181000E-01		
0					0.183500E+06	0.329000E-01		
0					0.188760E+06	0.320000E-02		
0					0.217940E+06	0.370000E-01		
0					0.224100E+06	0.890000E-02		
0					0.236010E+06	0.920000E-02		
0					0.240270E+06	0.280000E-03		
0					0.242500E+06	0.840000E-03		
0					0.249600E+06	0.780000E-03		
0					0.250450E+06	0.650000E-03		
0					0.267620E+06	0.116000E-02		
0					0.274100E+06	0.300000E-04		
0					0.308780E+06	0.390000E-03		
0					0.311000E+06	0.290000E-02		
0					0.317870E+06	0.800000E-04		
0					0.320150E+06	0.110000E-03		
0					0.351800E+06	0.700000E-04		
90	232	Th232	0.443375E+18	0.118000E+05	0.123000E+04	0.407300E+07	0.638200E+05	0.267000E+00
0					0.140860E+06	0.270000E-01		
90	234	Th234	0.208224E+07	0.601000E+05	0.170000E+04	0.000000E+00	0.200200E+05	0.915000E-02
0					0.294900E+05	0.146400E-02		
0					0.577500E+05	0.610000E-02		
0					0.628600E+05	0.195200E-01		
0					0.632900E+05	0.447130E+01		
0					0.833000E+05	0.732000E-01		
0					0.870200E+05	0.176900E-01		
0					0.923800E+05	0.259860E+01		
0					0.928000E+05	0.256200E+01		
0					0.103350E+06	0.366000E-02		
0					0.108000E+06	0.976000E-02		
0					0.112810E+06	0.256200E+00		
0					0.184800E+06	0.122000E-01		
91	230	Pa230	0.150000E+07	0.000000E+00	0.745081E+05	0.169800E+03	0.187000E+01	0.260000E-01
0					0.630000E+00	0.240000E+00		
0					0.250000E-01	0.000000E+00		
0					0.110000E+00	0.350000E+00		
0					0.550000E+01	0.300000E-02		
0					0.110000E-01	0.120000E-01		
0					0.630000E+01	0.140000E-01		
0					0.820000E+00	0.100000E+00		
0					0.710000E-01	0.380000E-01		
0					0.660000E-01	0.440000E-01		
0					0.220000E+00	0.121000E-01		
0					0.360000E+01	0.940000E-01		
0					0.198000E+01	0.160000E+00		
0					0.108000E+01	0.550000E-01		
0					0.132000E+00	0.140000E-01		
0					0.490000E-01	0.760000E-01		
0					0.450000E-01	0.290000E-01		
0					0.160000E-01	0.110000E-01		
0					0.490000E-01	0.330000E-01		
0					0.190000E+01	0.300000E+00		
0					0.100000E+00	0.187000E+01		
0					0.148000E+01	0.630000E+00		
0					0.800000E-01	0.250000E-01		
0					0.260000E-01	0.110000E+00		
0					0.580000E+01	0.550000E+01		
0					0.820000E+01	0.110000E-01		
0					0.291000E+02	0.630000E+01		

0					0.160000E+00	0.820000E+00		
0					0.160000E+01	0.710000E-01		
0					0.440000E+00	0.660000E-01		
0					0.140000E-01	0.220000E+00		
0					0.120000E-01	0.360000E+01		
0					0.108000E+01	0.198000E+01		
0					0.146000E+01	0.108000E+01		
0					0.750000E+00	0.132000E+00		
0					0.607500E+06	0.490000E-01		
0					0.624400E+06	0.450000E-01		
0					0.651800E+06	0.160000E-01		
0					0.677600E+06	0.490000E-01		
0					0.728200E+06	0.190000E+01		
0					0.772500E+06	0.100000E+00		
0					0.781350E+06	0.148000E+01		
0					0.835700E+06	0.800000E-01		
0					0.838700E+06	0.260000E-01		
0					0.898680E+06	0.580000E+01		
0					0.918480E+06	0.820000E+01		
0					0.951950E+06	0.291000E+02		
0					0.954000E+06	0.160000E+00		
0					0.956400E+06	0.160000E+01		
0					0.959300E+06	0.440000E+00		
0					0.970000E+06	0.140000E-01		
0					0.999400E+06	0.120000E-01		
0					0.100960E+07	0.108000E+01		
0					0.102600E+07	0.146000E+01		
0					0.107470E+07	0.750000E+00		
91	231	Pa231	0.103380E+13	0.364000E+05	0.852000E+04	0.505620E+07	0.400000E-01	0.220000E+00
0					0.550000E-02	0.354000E+00		
0					0.460000E-01	0.440000E-02		
0					0.580000E-02	0.350000E-02		
0					0.150000E-02	0.950000E-01		
0					0.350000E-02	0.111000E+02		
0					0.220000E-01	0.950000E-01		
0					0.570000E-01	0.760000E-02		
0					0.820000E-01	0.160000E-01		
0					0.230000E-01	0.143000E+00		
0					0.150000E-01	0.140000E-02		
0					0.390000E-02	0.120000E-01		
0					0.110000E-01	0.540000E-02		
0					0.430000E-02	0.700000E-02		
0					0.160000E-02	0.560000E-01		
0					0.110000E-01	0.223000E+00		
0					0.320000E-01	0.140000E-02		
0					0.680000E-02	0.900000E-01		
0					0.700000E-02	0.770000E-01		
0					0.107000E+00	0.480000E-02		
0					0.990000E-03	0.400000E-01		
0					0.182000E+00	0.550000E-02		
0					0.590000E-01	0.460000E-01		
0					0.690000E-01	0.580000E-02		
0					0.165000E+01	0.150000E-02		
0					0.104000E-01	0.350000E-02		
0					0.241000E+01	0.220000E-01		
0					0.247000E+01	0.570000E-01		
0					0.100000E-02	0.820000E-01		
0					0.990000E-01	0.230000E-01		
0					0.200000E-02	0.150000E-01		
0					0.350000E-01	0.390000E-02		
0					0.136000E+01	0.110000E-01		
0					0.178000E+00	0.430000E-02		
0					0.160000E-02	0.160000E-02		
0					0.970000E-01	0.110000E-01		
0					0.169000E+00	0.320000E-01		
0					0.860000E-02	0.680000E-02		
0					0.800000E-02	0.700000E-02		
0					0.470000E-02	0.107000E+00		
0					0.500000E-01	0.990000E-03		
0					0.390000E-02	0.182000E+00		
0					0.340000E-03	0.590000E-01		
0					0.680000E-02	0.690000E-01		

0					0.250000E-02	0.165000E+01		
0					0.960000E-02	0.104000E-01		
0					0.360000E-01	0.241000E+01		
0					0.170000E-02	0.247000E+01		
0					0.300000E-02	0.100000E-02		
0					0.460000E-02	0.990000E-01		
0					0.130000E-02	0.200000E-02		
0					0.150000E-02	0.350000E-01		
0					0.380000E-03	0.136000E+01		
0					0.700000E-03	0.178000E+00		
0					0.300000E-03	0.160000E-02		
0					0.150000E-02	0.970000E-01		
0					0.600000E-03	0.169000E+00		
0					0.800000E-03	0.860000E-02		
0					0.300000E-03	0.800000E-02		
0					0.300000E-03	0.470000E-02		
0					0.500000E-03	0.500000E-01		
0					0.384940E+06	0.390000E-02		
0					0.387250E+06	0.340000E-03		
0					0.391750E+06	0.680000E-02		
0					0.395750E+06	0.250000E-02		
0					0.398350E+06	0.960000E-02		
0					0.407830E+06	0.360000E-01		
0					0.410760E+06	0.170000E-02		
0					0.435380E+06	0.300000E-02		
0					0.438170E+06	0.460000E-02		
0					0.438970E+06	0.130000E-02		
0					0.486830E+06	0.150000E-02		
0					0.490900E+06	0.380000E-03		
0					0.501400E+06	0.700000E-03		
0					0.510000E+06	0.300000E-03		
0					0.516200E+06	0.150000E-02		
0					0.535600E+06	0.600000E-03		
0					0.546900E+06	0.800000E-03		
0					0.572400E+06	0.300000E-03		
0					0.583000E+06	0.300000E-03		
0					0.609000E+06	0.500000E-03		
91	233	Pa233	0.233280E+07	0.205000E+06	0.409000E+05	0.000000E+00	0.172600E+05	0.390000E-02
0					0.285400E+05	0.150000E+00		
0					0.403500E+05	0.390000E-01		
0					0.416500E+05	0.140000E-01		
0					0.579000E+05	0.390000E-02		
0					0.752800E+05	0.132000E+01		
0					0.865900E+05	0.197000E+01		
0					0.920000E+05	0.200000E-02		
0					0.103860E+06	0.870000E+00		
0					0.248500E+06	0.590000E-01		
0					0.258200E+06	0.390000E-02		
0					0.271480E+06	0.320000E+00		
0					0.298500E+06	0.350000E-01		
0					0.300120E+06	0.663000E+01		
0					0.311980E+06	0.386300E+02		
0					0.340500E+06	0.450000E+01		
0					0.375450E+06	0.680000E+00		
0					0.398620E+06	0.141000E+01		
0					0.415760E+06	0.174000E+01		
91	234	Pa234m	0.702000E+02	0.816000E+06	0.102000E+03	0.000000E+00	0.560000E-03	0.135000E-02
0					0.480000E-03	0.190000E-02		
0					0.300000E-03	0.107000E-01		
0					0.700000E-03	0.370000E-03		
0					0.210000E-02	0.900000E-03		
0					0.170000E-02	0.120000E-02		
0					0.500000E-03	0.440000E-03		
0					0.165000E-02	0.600000E-04		
0					0.200000E-02	0.400000E-03		
0					0.110000E-02	0.720000E-03		
0					0.150000E-02	0.920000E-03		
0					0.120000E-04	0.320000E-04		
0					0.220000E-04	0.350000E-03		
0					0.260000E-02	0.670000E-03		
0					0.140000E-04	0.570000E-01		

0	0.500000E-03	0.220000E-03
0	0.610000E-03	0.450000E-03
0	0.100000E-02	0.360000E-03
0	0.110000E-02	0.100000E-03
0	0.750000E-03	0.790000E-03
0	0.970000E-03	0.560000E-03
0	0.260000E-03	0.480000E-03
0	0.450000E-03	0.300000E-03
0	0.400000E-03	0.700000E-03
0	0.550000E-02	0.210000E-02
0	0.110000E-02	0.170000E-02
0	0.560000E-03	0.500000E-03
0	0.540000E-02	0.165000E-02
0	0.280000E-02	0.200000E-02
0	0.500000E-03	0.110000E-02
0	0.230000E-04	0.150000E-02
0	0.910000E-03	0.120000E-04
0	0.710000E-02	0.220000E-04
0	0.566000E-01	0.260000E-02
0	0.140000E-04	0.140000E-04
0	0.110000E-02	0.500000E-03
0	0.207000E+00	0.610000E-03
0	0.530000E-02	0.100000E-02
0	0.400000E-04	0.110000E-02
0	0.342000E-01	0.750000E-03
0	0.600000E-04	0.970000E-03
0	0.300000E-02	0.260000E-03
0	0.210000E-02	0.450000E-03
0	0.700000E-03	0.400000E-03
0	0.990000E-03	0.550000E-02
0	0.250000E-02	0.110000E-02
0	0.760000E-03	0.560000E-03
0	0.440000E-02	0.540000E-02
0	0.750000E-03	0.280000E-02
0	0.270000E-02	0.500000E-03
0	0.130000E-02	0.230000E-04
0	0.120000E-02	0.910000E-03
0	0.520000E-02	0.710000E-02
0	0.830000E-02	0.566000E-01
0	0.870000E-03	0.140000E-04
0	0.130000E-02	0.110000E-02
0	0.210000E-02	0.207000E+00
0	0.700000E-02	0.530000E-02
0	0.600000E-03	0.400000E-04
0	0.290000E-02	0.342000E-01
0	0.590000E+00	0.600000E-04
0	0.100000E-02	0.300000E-02
0	0.770000E-03	0.210000E-02
0	0.140000E-02	0.700000E-03
0	0.630000E-03	0.990000E-03
0	0.340000E-03	0.250000E-02
0	0.120000E-02	0.760000E-03
0	0.670000E-03	0.440000E-02
0	0.210000E-02	0.750000E-03
0	0.134000E-02	0.270000E-02
0	0.900000E-02	0.130000E-02
0	0.700000E-03	0.120000E-02
0	0.360000E-02	0.520000E-02
0	0.440000E-03	0.830000E-02
0	0.110000E-02	0.870000E-03
0	0.150000E-02	0.130000E-02
0	0.580000E-02	0.210000E-02
0	0.130000E-02	0.700000E-02
0	0.900000E-03	0.600000E-03
0	0.910000E-02	0.290000E-02
0	0.150000E-02	0.590000E+00
0	0.130000E-02	0.100000E-02
0	0.630000E-02	0.770000E-03
0	0.530000E-03	0.140000E-02
0	0.860000E-03	0.630000E-03
0	0.270000E-02	0.340000E-03
0	0.330000E-03	0.120000E-02
0	0.580000E-03	0.670000E-03

0					0.320000E-03	0.210000E-02		
0					0.230000E-03	0.134000E-02		
0					0.130000E-02	0.900000E-02		
0					0.142000E-01	0.700000E-03		
0					0.160000E-02	0.360000E-02		
0					0.610000E-02	0.440000E-03		
0					0.220000E-03	0.110000E-02		
0					0.300000E-02	0.150000E-02		
0					0.830000E-03	0.580000E-02		
0					0.112000E-01	0.130000E-02		
0					0.850000E-03	0.900000E-03		
0					0.530000E-02	0.910000E-02		
0					0.550000E-02	0.150000E-02		
0					0.150000E-02	0.130000E-02		
0					0.370000E-02	0.630000E-02		
0					0.310000E-03	0.530000E-03		
0					0.210000E-02	0.860000E-03		
0					0.390000E-03	0.270000E-02		
0					0.160180E+07	0.330000E-03		
0					0.166760E+07	0.580000E-03		
0					0.169410E+07	0.320000E-03		
0					0.172050E+07	0.230000E-03		
0					0.173220E+07	0.130000E-02		
0					0.173820E+07	0.142000E-01		
0					0.175910E+07	0.160000E-02		
0					0.176540E+07	0.610000E-02		
0					0.179620E+07	0.220000E-03		
0					0.180900E+07	0.300000E-02		
0					0.182040E+07	0.830000E-03		
0					0.183150E+07	0.112000E-01		
0					0.186380E+07	0.850000E-03		
0					0.186820E+07	0.530000E-02		
0					0.187550E+07	0.550000E-02		
0					0.189440E+07	0.150000E-02		
0					0.191180E+07	0.370000E-02		
0					0.192650E+07	0.310000E-03		
0					0.193770E+07	0.210000E-02		
0					0.197000E+07	0.390000E-03		
92	230	U230	0.179700E+07	0.194000E+05	0.161700E+04	0.596950E+07	0.722000E+05	0.600000E+00
0					0.154230E+06	0.125000E+00		
0					0.158180E+06	0.700000E-01		
0					0.230370E+06	0.122000E+00		
0					0.617000E+06	0.400000E-04		
92	232	U232	0.220267E+10	0.149000E+05	0.195000E+04	0.539480E+07	0.577590E+05	0.200000E+00
0					0.129060E+06	0.682000E-01		
0					0.141020E+06	0.310000E-05		
0					0.191350E+06	0.310000E-04		
0					0.209250E+06	0.110000E-04		
0					0.270240E+06	0.316000E-02		
0					0.328000E+06	0.283000E-02		
0					0.332370E+06	0.490000E-04		
0					0.338320E+06	0.370000E-04		
0					0.478300E+06	0.140000E-05		
0					0.503820E+06	0.145000E-04		
0					0.546450E+06	0.100000E-05		
0					0.774100E+06	0.470000E-05		
0					0.816710E+06	0.800000E-06		
0					0.874440E+06	0.320000E-06		
92	233	U233	0.502386E+13	0.500000E+04	0.101000E+04	0.490830E+07	0.180000E-03	0.121000E-02
0					0.750000E-04	0.120000E-01		
0					0.190000E-03	0.270000E-03		
0					0.140000E-03	0.990000E-03		
0					0.190000E-03	0.360000E-03		
0					0.440000E-03	0.862000E-01		
0					0.330000E-03	0.250000E-03		
0					0.140000E-02	0.430000E-02		
0					0.220000E-01	0.182000E-01		
0					0.600000E-04	0.320000E-04		
0					0.900000E-04	0.840000E-03		
0					0.100000E-03	0.320000E-03		

0	0.310000E-03	0.110000E-03
0	0.470000E-03	0.600000E-03
0	0.250000E-03	0.270000E-02
0	0.210000E-03	0.590000E-03
0	0.250000E-02	0.160000E-02
0	0.406000E-02	0.390000E-03
0	0.332000E-02	0.720000E-03
0	0.650000E-03	0.600000E-04
0	0.650000E-04	0.180000E-03
0	0.700000E-04	0.750000E-04
0	0.320000E-04	0.190000E-03
0	0.232000E-02	0.140000E-03
0	0.150000E-04	0.190000E-03
0	0.100000E-03	0.440000E-03
0	0.300000E-03	0.330000E-03
0	0.160000E-02	0.140000E-02
0	0.657000E-02	0.220000E-01
0	0.360000E-03	0.600000E-04
0	0.130000E-03	0.900000E-04
0	0.550000E-04	0.100000E-03
0	0.150000E-03	0.310000E-03
0	0.580000E-04	0.470000E-03
0	0.750000E-04	0.250000E-03
0	0.623000E-02	0.210000E-03
0	0.380000E-03	0.250000E-02
0	0.680000E-04	0.406000E-02
0	0.140000E-03	0.332000E-02
0	0.350000E-04	0.650000E-03
0	0.230000E-03	0.650000E-04
0	0.420000E-04	0.700000E-04
0	0.200000E-04	0.320000E-04
0	0.250000E-04	0.232000E-02
0	0.400000E-04	0.150000E-04
0	0.200000E-02	0.100000E-03
0	0.400000E-04	0.300000E-03
0	0.100000E-05	0.160000E-02
0	0.650000E-04	0.657000E-02
0	0.229000E-02	0.360000E-03
0	0.140000E-03	0.130000E-03
0	0.660000E-03	0.550000E-04
0	0.350000E-02	0.150000E-03
0	0.500000E-04	0.580000E-04
0	0.150000E-03	0.750000E-04
0	0.320000E-04	0.623000E-02
0	0.100000E-04	0.380000E-03
0	0.100000E-04	0.680000E-04
0	0.200000E-04	0.140000E-03
0	0.680000E-04	0.350000E-04
0	0.500000E-04	0.230000E-03
0	0.380000E-03	0.420000E-04
0	0.362000E-02	0.200000E-04
0	0.156000E-02	0.250000E-04
0	0.380000E-04	0.400000E-04
0	0.420000E-04	0.200000E-02
0	0.180000E-03	0.400000E-04
0	0.110000E-03	0.100000E-05
0	0.310000E-03	0.650000E-04
0	0.260000E-03	0.229000E-02
0	0.600000E-04	0.140000E-03
0	0.440000E-03	0.660000E-03
0	0.118000E-02	0.350000E-02
0	0.100000E-04	0.500000E-04
0	0.106000E-02	0.150000E-03
0	0.537000E-02	0.320000E-04
0	0.140000E-03	0.100000E-04
0	0.220000E-04	0.100000E-04
0	0.700000E-04	0.200000E-04
0	0.720000E-04	0.680000E-04
0	0.280000E-04	0.500000E-04
0	0.776000E-02	0.380000E-03
0	0.290000E-02	0.362000E-02
0	0.840000E-03	0.156000E-02
0	0.650000E-04	0.380000E-04

0				0.590000E-03	0.420000E-04		
0				0.800000E-05	0.180000E-03		
0				0.450000E-04	0.110000E-03		
0				0.580000E-04	0.310000E-03		
0				0.820000E-03	0.260000E-03		
0				0.100000E-03	0.600000E-04		
0				0.150000E-04	0.440000E-03		
0				0.800000E-05	0.118000E-02		
0				0.820000E-05	0.100000E-04		
0				0.820000E-05	0.106000E-02		
0				0.520000E-05	0.537000E-02		
0				0.100000E-04	0.140000E-03		
0				0.500000E-05	0.220000E-04		
0				0.100000E-04	0.700000E-04		
0				0.820000E-05	0.720000E-04		
0				0.150000E-04	0.280000E-04		
0				0.150000E-04	0.776000E-02		
0				0.420000E-05	0.290000E-02		
0				0.520000E-05	0.840000E-03		
0				0.240000E-05	0.650000E-04		
0				0.380000E-05	0.590000E-03		
0				0.500000E-05	0.800000E-05		
0				0.230000E-05	0.450000E-04		
0				0.300000E-05	0.580000E-04		
0				0.280000E-05	0.820000E-03		
0				0.210000E-05	0.100000E-03		
0				0.820000E-05	0.150000E-04		
0				0.820000E-05	0.800000E-05		
0				0.396700E+06	0.820000E-05		
0				0.402400E+06	0.820000E-05		
0				0.406700E+06	0.520000E-05		
0				0.416400E+06	0.100000E-04		
0				0.436600E+06	0.500000E-05		
0				0.449600E+06	0.100000E-04		
0				0.459800E+06	0.820000E-05		
0				0.471300E+06	0.150000E-04		
0				0.478700E+06	0.150000E-04		
0				0.484100E+06	0.420000E-05		
0				0.540300E+06	0.520000E-05		
0				0.545100E+06	0.240000E-05		
0				0.569400E+06	0.380000E-05		
0				0.578500E+06	0.500000E-05		
0				0.620900E+06	0.230000E-05		
0				0.657000E+06	0.300000E-05		
0				0.707500E+06	0.280000E-05		
0				0.867900E+06	0.210000E-05		
0				0.100300E+07	0.820000E-05		
0				0.111900E+07	0.820000E-05		
92	234	U234	0.775354E+13	0.123000E+05	0.178000E+04	0.484190E+07	0.532000E+05 0.123000E+00
0					0.120900E+06	0.342000E-01	
0					0.454950E+06	0.250000E-04	
0					0.503500E+06	0.950000E-06	
0					0.508200E+06	0.150000E-04	
0					0.581700E+06	0.120000E-04	
0					0.624400E+06	0.820000E-06	
0					0.677600E+06	0.100000E-05	
92	235	U235	0.222066E+17	0.372000E+05	0.166000E+05	0.447090E+07	0.100000E-01 0.160000E-01
0					0.340000E+00	0.370000E-01	
0					0.572000E+02	0.300000E-01	
0					0.630000E+00	0.600000E-01	
0					0.420000E-01	0.200000E-01	
0					0.108000E+01	0.150000E-01	
0					0.501000E+01	0.180000E-01	
0					0.270000E-01	0.110000E+00	
0					0.120000E+00	0.100000E-01	
0					0.800000E-02	0.600000E-01	
0					0.290000E-01	0.860000E-01	
0					0.750000E-01	0.154000E+01	
0					0.530000E-01	0.700000E-01	
0					0.200000E-01	0.260000E-01	
0					0.600000E-02	0.120000E-01	

0					0.490000E-01	0.220000E+00		
0					0.270000E+00	0.500000E-02		
0					0.600000E-02	0.109600E+02		
0					0.500000E-02	0.800000E-01		
0					0.700000E-02	0.508000E+01		
0					0.300000E-02	0.100000E-01		
0					0.330000E-01	0.340000E+00		
0					0.500000E-02	0.572000E+02		
0					0.400000E-02	0.630000E+00		
0					0.100000E-02	0.420000E-01		
0					0.400000E-03	0.108000E+01		
0					0.300000E-02	0.501000E+01		
0					0.380000E-01	0.270000E-01		
0					0.500000E-02	0.120000E+00		
0					0.380000E-01	0.800000E-02		
0					0.400000E-01	0.290000E-01		
0					0.300000E-02	0.750000E-01		
0					0.400000E-02	0.530000E-01		
0					0.100000E-02	0.200000E-01		
0					0.800000E-02	0.600000E-02		
0					0.400000E-03	0.490000E-01		
0					0.400000E-03	0.270000E+00		
0					0.600000E-03	0.600000E-02		
0					0.282920E+06	0.500000E-02		
0					0.289580E+06	0.700000E-02		
0					0.291650E+06	0.300000E-02		
0					0.294300E+06	0.330000E-01		
0					0.301700E+06	0.500000E-02		
0					0.310690E+06	0.400000E-02		
0					0.317100E+06	0.100000E-02		
0					0.325800E+06	0.400000E-03		
0					0.343500E+06	0.300000E-02		
0					0.345900E+06	0.380000E-01		
0					0.356030E+06	0.500000E-02		
0					0.387820E+06	0.380000E-01		
0					0.390300E+06	0.400000E-01		
0					0.410290E+06	0.300000E-02		
0					0.433000E+06	0.400000E-02		
0					0.448400E+06	0.100000E-02		
0					0.455100E+06	0.800000E-02		
0					0.517200E+06	0.400000E-03		
0					0.742500E+06	0.400000E-03		
0					0.794700E+06	0.600000E-03		
92	236	U236	0.739063E+15	0.100000E+05	0.160000E+04	0.455630E+07	0.493690E+05	0.780000E-01
0					0.112750E+06	0.190000E-01		
92	237	U237	0.583200E+06	0.184000E+06	0.684000E+05	0.000000E+00	0.420000E-01	0.990000E-01
0					0.110000E+00	0.243000E+01		
0					0.331950E+05	0.130000E+00		
0					0.434230E+05	0.240000E-01		
0					0.510100E+05	0.340000E+00		
0					0.595370E+05	0.345000E+02		
0					0.648300E+05	0.131000E+01		
0					0.697600E+05	0.950000E-03		
0					0.102980E+06	0.640000E-02		
0					0.164610E+06	0.187000E+01		
0					0.208000E+06	0.216000E+02		
0					0.221800E+06	0.205000E-01		
0					0.234400E+06	0.205000E-01		
0					0.267540E+06	0.730000E+00		
0					0.292770E+06	0.250000E-02		
0					0.309100E+06	0.270000E-03		
0					0.332360E+06	0.121000E+01		
0					0.335380E+06	0.970000E-01		
0					0.337700E+06	0.890000E-02		
0					0.340450E+06	0.165000E-02		
0					0.368590E+06	0.420000E-01		
0					0.370940E+06	0.110000E+00		
92	238	U238	0.140996E+18	0.810000E+04	0.130000E+04	0.426100E+07	0.495500E+05	0.640000E-01
0					0.113500E+06	0.102000E-01		

93	237	Np237	0.675318E+14	0.582000E+05	0.155000E+05	0.471940E+07	0.920000E-01	0.153000E+02
0					0.320000E-01	0.106000E+00		
0					0.710000E-01	0.382000E+00		
0					0.200000E-01	0.600000E-02		
0					0.180000E-01	0.120000E-01		
0					0.200000E-01	0.120000E-01		
0					0.300000E-02	0.110000E-01		
0					0.250000E-01	0.123000E+02		
0					0.490000E-01	0.138000E+00		
0					0.185000E+00	0.600000E+00		
0					0.200000E-01	0.530000E-01		
0					0.400000E-02	0.680000E-01		
0					0.440000E-01	0.260000E-02		
0					0.480000E-02	0.173000E+00		
0					0.160000E-01	0.860000E-01		
0					0.151000E+00	0.710000E-01		
0					0.450000E-01	0.500000E-02		
0					0.200000E-02	0.432000E+00		
0					0.140000E-01	0.234000E+00		
0					0.590000E-01	0.500000E-02		
0					0.500000E-02	0.920000E-01		
0					0.640000E-02	0.320000E-01		
0					0.680000E-02	0.710000E-01		
0					0.200000E-02	0.200000E-01		
0					0.176120E+06	0.180000E-01		
0					0.180810E+06	0.200000E-01		
0					0.186860E+06	0.300000E-02		
0					0.191460E+06	0.250000E-01		
0					0.193260E+06	0.490000E-01		
0					0.194950E+06	0.185000E+00		
0					0.196860E+06	0.200000E-01		
0					0.199950E+06	0.400000E-02		
0					0.201620E+06	0.440000E-01		
0					0.202900E+06	0.480000E-02		
0					0.209190E+06	0.160000E-01		
0					0.212290E+06	0.151000E+00		
0					0.214010E+06	0.450000E-01		
0					0.222600E+06	0.200000E-02		
0					0.229940E+06	0.140000E-01		
0					0.237860E+06	0.590000E-01		
0					0.248950E+06	0.500000E-02		
0					0.257090E+06	0.640000E-02		
0					0.262440E+06	0.680000E-02		
0					0.279650E+06	0.200000E-02		
93	239	Np239	0.203472E+06	0.243000E+06	0.652000E+05	0.000000E+00	0.160000E+01	0.104000E-01
0					0.207000E+01	0.910000E-01		
0					0.160000E-02	0.100000E+00		
0					0.380000E-02	0.104000E+00		
0					0.124000E-01	0.600000E-02		
0					0.260000E-03	0.129000E+01		
0					0.160000E-02	0.910000E-01		
0					0.106000E-02	0.600000E-02		
0					0.104000E-02	0.272000E+02		
0					0.600000E-02	0.480000E-01		
0					0.310000E-02	0.110000E-01		
0					0.310000E-02	0.170000E-01		
0					0.181710E+06	0.810000E-01		
0					0.209750E+06	0.342000E+01		
0					0.226380E+06	0.280000E+00		
0					0.228180E+06	0.112700E+02		
0					0.254420E+06	0.110000E+00		
0					0.272850E+06	0.770000E-01		
0					0.277600E+06	0.143800E+02		
0					0.285460E+06	0.790000E+00		
0					0.315880E+06	0.160000E+01		
0					0.334310E+06	0.207000E+01		
0					0.392400E+06	0.160000E-02		
0					0.429800E+06	0.380000E-02		
0					0.434900E+06	0.124000E-01		
0					0.448200E+06	0.260000E-03		
0					0.461900E+06	0.160000E-02		
0					0.469800E+06	0.106000E-02		

0				0.484300E+06	0.104000E-02		
0				0.492100E+06	0.600000E-02		
0				0.497800E+06	0.310000E-02		
0				0.498800E+06	0.310000E-02		
94	238	Pu238	0.276754E+10	0.905000E+04	0.202000E+04	0.557970E+07	0.230000E-06 0.395000E-01
0					0.110000E-05	0.350000E-07	
0					0.100000E-06	0.735000E-02	
0					0.830000E-06	0.100000E-07	
0					0.670000E-06	0.937000E-03	
0					0.130000E-06	0.500000E-08	
0					0.800000E-07	0.410000E-05	
0					0.140000E-05	0.130000E-07	
0					0.280000E-06	0.100000E-07	
0					0.110000E-06	0.110000E-06	
0					0.299200E+06	0.700000E-07	
0					0.706100E+06	0.140000E-06	
0					0.708420E+06	0.380000E-06	
0					0.742810E+06	0.760000E-05	
0					0.766410E+06	0.330000E-04	
0					0.783100E+06	0.300000E-07	
0					0.786270E+06	0.480000E-05	
0					0.805800E+06	0.180000E-06	
0					0.808250E+06	0.110000E-05	
0					0.851700E+06	0.190000E-05	
0					0.880510E+06	0.230000E-06	
0					0.883240E+06	0.110000E-05	
0					0.904370E+06	0.100000E-06	
0					0.926720E+06	0.830000E-06	
0					0.941900E+06	0.670000E-06	
0					0.946000E+06	0.130000E-06	
0					0.980500E+06	0.800000E-07	
0					0.100100E+07	0.140000E-05	
0					0.104190E+07	0.280000E-06	
0					0.108540E+07	0.110000E-06	
94	239	Pu239	0.760838E+12	0.437000E+04	0.850000E+03	0.523750E+07	0.230000E-03 0.217000E-03
0					0.462000E-03	0.105000E-01	
0					0.597000E-03	0.162000E-03	
0					0.320000E-04	0.165000E-03	
0					0.300000E-05	0.737000E-03	
0					0.160000E-08	0.580000E-04	
0					0.197000E-04	0.560000E-04	
0					0.613000E-04	0.271000E-01	
0					0.711000E-04	0.197000E-03	
0					0.631000E-02	0.113000E-02	
0					0.320000E-04	0.456000E-04	
0					0.174000E-04	0.164000E-03	
0					0.286000E-03	0.300000E-03	
0					0.124000E-03	0.110000E-03	
0					0.100000E-05	0.380000E-04	
0					0.620000E-05	0.410000E-03	
0					0.123000E-03	0.141000E-03	
0					0.290000E-05	0.300000E-04	
0					0.110000E-03	0.223000E-04	
0					0.300000E-08	0.122000E-02	
0					0.310000E-05	0.230000E-03	
0					0.660000E-04	0.462000E-03	
0					0.210000E-05	0.597000E-03	
0					0.109000E-04	0.320000E-04	
0					0.830000E-04	0.300000E-05	
0					0.890000E-05	0.160000E-08	
0					0.107000E-03	0.197000E-04	
0					0.370000E-05	0.613000E-04	
0					0.569000E-03	0.711000E-04	
0					0.120000E-05	0.631000E-02	
0					0.151000E-04	0.320000E-04	
0					0.144000E-04	0.174000E-04	
0					0.730000E-05	0.286000E-03	
0					0.253000E-04	0.124000E-03	
0					0.510000E-05	0.100000E-05	
0					0.720000E-05	0.620000E-05	
0					0.800000E-04	0.123000E-03	

0	0.265000E-04	0.290000E-05
0	0.160000E-05	0.110000E-03
0	0.210000E-05	0.300000E-08
0	0.190000E-05	0.310000E-05
0	0.498000E-04	0.660000E-04
0	0.510000E-05	0.210000E-05
0	0.550000E-05	0.109000E-04
0	0.258000E-04	0.830000E-04
0	0.132000E-04	0.890000E-05
0	0.480000E-05	0.107000E-03
0	0.542000E-04	0.370000E-05
0	0.539000E-04	0.569000E-03
0	0.494000E-03	0.120000E-05
0	0.112000E-03	0.151000E-04
0	0.662000E-04	0.144000E-04
0	0.556000E-03	0.730000E-05
0	0.180000E-05	0.253000E-04
0	0.730000E-06	0.510000E-05
0	0.122000E-04	0.720000E-05
0	0.890000E-04	0.800000E-04
0	0.880000E-04	0.265000E-04
0	0.155400E-02	0.160000E-05
0	0.305000E-03	0.210000E-05
0	0.259000E-03	0.190000E-05
0	0.205000E-03	0.498000E-04
0	0.348000E-03	0.510000E-05
0	0.590000E-05	0.550000E-05
0	0.250000E-05	0.258000E-04
0	0.680000E-05	0.132000E-04
0	0.180000E-07	0.480000E-05
0	0.146600E-02	0.542000E-04
0	0.122000E-03	0.539000E-04
0	0.233000E-04	0.494000E-03
0	0.100000E-05	0.112000E-03
0	0.430000E-05	0.662000E-04
0	0.880000E-05	0.556000E-03
0	0.840000E-06	0.180000E-05
0	0.189400E-03	0.730000E-06
0	0.149000E-05	0.122000E-04
0	0.227000E-05	0.890000E-04
0	0.280000E-06	0.880000E-04
0	0.540000E-07	0.155400E-02
0	0.460000E-05	0.305000E-03
0	0.265000E-06	0.259000E-03
0	0.870000E-06	0.205000E-03
0	0.460000E-07	0.348000E-03
0	0.570000E-07	0.590000E-05
0	0.300000E-06	0.250000E-05
0	0.420000E-06	0.680000E-05
0	0.380000E-07	0.180000E-07
0	0.860000E-07	0.146600E-02
0	0.615000E-06	0.122000E-03
0	0.153000E-06	0.233000E-04
0	0.390000E-07	0.100000E-05
0	0.167000E-05	0.430000E-05
0	0.200000E-06	0.880000E-05
0	0.120000E-06	0.840000E-06
0	0.116000E-06	0.189400E-03
0	0.950000E-06	0.149000E-05
0	0.134000E-05	0.227000E-05
0	0.204000E-05	0.280000E-06
0	0.121000E-05	0.540000E-07
0	0.457000E-06	0.460000E-05
0	0.253000E-05	0.265000E-06
0	0.256000E-05	0.870000E-06
0	0.870000E-05	0.460000E-07
0	0.152000E-04	0.570000E-07
0	0.710000E-06	0.300000E-06
0	0.270000E-06	0.420000E-06
0	0.660000E-05	0.380000E-07
0	0.225000E-05	0.860000E-07
0	0.970000E-05	0.615000E-06
0	0.166000E-05	0.153000E-06

0	0.390000E-07	0.390000E-07
0	0.900000E-08	0.167000E-05
0	0.515000E-06	0.200000E-06
0	0.870000E-06	0.120000E-06
0	0.111000E-06	0.116000E-06
0	0.900000E-06	0.950000E-06
0	0.300000E-07	0.134000E-05
0	0.740000E-07	0.204000E-05
0	0.790000E-07	0.121000E-05
0	0.512000E-06	0.457000E-06
0	0.395000E-05	0.253000E-05
0	0.520000E-07	0.256000E-05
0	0.790000E-07	0.870000E-05
0	0.280000E-05	0.152000E-04
0	0.485000E-07	0.710000E-06
0	0.124000E-06	0.270000E-06
0	0.300000E-07	0.660000E-05
0	0.380000E-07	0.225000E-05
0	0.810000E-07	0.970000E-05
0	0.347000E-05	0.166000E-05
0	0.320000E-07	0.390000E-07
0	0.275000E-06	0.900000E-08
0	0.119000E-04	0.515000E-06
0	0.280000E-07	0.870000E-06
0	0.136000E-06	0.111000E-06
0	0.860000E-07	0.900000E-06
0	0.350000E-07	0.300000E-07
0	0.200000E-07	0.740000E-07
0	0.150000E-07	0.790000E-07
0	0.640000E-07	0.512000E-06
0	0.270000E-07	0.395000E-05
0	0.121000E-06	0.520000E-07
0	0.450000E-07	0.790000E-07
0	0.240000E-07	0.280000E-05
0	0.500000E-07	0.485000E-07
0	0.180000E-07	0.124000E-06
0	0.133000E-06	0.300000E-07
0	0.296000E-07	0.380000E-07
0	0.190000E-07	0.810000E-07
0	0.480000E-07	0.347000E-05
0	0.134000E-06	0.320000E-07
0	0.360000E-07	0.275000E-06
0	0.750000E-07	0.119000E-04
0	0.750000E-08	0.280000E-07
0	0.180000E-07	0.136000E-06
0	0.750000E-08	0.860000E-07
0	0.140000E-07	0.350000E-07
0	0.840000E-08	0.200000E-07
0	0.130000E-07	0.150000E-07
0	0.500000E-07	0.640000E-07
0	0.310000E-07	0.270000E-07
0	0.320000E-07	0.121000E-06
0	0.280000E-07	0.450000E-07
0	0.280000E-07	0.240000E-07
0	0.110000E-07	0.500000E-07
0	0.210000E-07	0.180000E-07
0	0.270000E-07	0.133000E-06
0	0.180000E-07	0.296000E-07
0	0.140000E-07	0.190000E-07
0	0.450000E-07	0.480000E-07
0	0.843790E+06	0.134000E-06
0	0.879200E+06	0.360000E-07
0	0.891000E+06	0.750000E-07
0	0.895400E+06	0.750000E-08
0	0.898100E+06	0.180000E-07
0	0.905500E+06	0.750000E-08
0	0.911700E+06	0.140000E-07
0	0.918700E+06	0.840000E-08
0	0.931900E+06	0.130000E-07
0	0.940300E+06	0.500000E-07
0	0.955600E+06	0.310000E-07
0	0.957600E+06	0.320000E-07
0	0.968370E+06	0.280000E-07

0					0.979700E+06	0.280000E-07		
0					0.982700E+06	0.110000E-07		
0					0.986900E+06	0.210000E-07		
0					0.992700E+06	0.270000E-07		
0					0.100570E+07	0.180000E-07		
0					0.100940E+07	0.140000E-07		
0					0.105730E+07	0.450000E-07		
94	240	Pu240	0.207108E+12	0.891000E+04	0.189000E+04	0.524290E+07	0.452420E+05	0.447000E-01
0					0.104230E+06	0.714000E-02		
0					0.160310E+06	0.402000E-03		
0					0.212460E+06	0.290000E-04		
0					0.538110E+06	0.147000E-06		
0					0.642350E+06	0.130000E-04		
0					0.687590E+06	0.350000E-05		
0					0.873920E+06	0.580000E-06		
94	241	Pu241	0.452842E+09	0.524000E+04	0.133000E+01	0.118890E+03	0.442000E+05	0.420000E-05
0					0.448600E+05	0.840000E-06		
0					0.563200E+05	0.251000E-05		
0					0.567600E+05	0.980000E-06		
0					0.716000E+05	0.285000E-05		
0					0.771000E+05	0.207000E-04		
0					0.103680E+06	0.102000E-03		
0					0.114000E+06	0.620000E-05		
0					0.121200E+06	0.690000E-06		
0					0.148570E+06	0.185900E-03		
0					0.159950E+06	0.658000E-05		
94	242	Pu242	0.117865E+14	0.759000E+04	0.163000E+04	0.497230E+07	0.449150E+05	0.373000E-01
0					0.103500E+06	0.255000E-02		
0					0.158800E+06	0.300000E-03		
95	241	Am241	0.136547E+11	0.303000E+05	0.750000E+04	0.557000E+07	0.530000E-05	0.240000E+01
0					0.460000E-03	0.174000E-01		
0					0.740000E-04	0.120000E+00		
0					0.540000E-06	0.550000E-02		
0					0.140000E-05	0.710000E-01		
0					0.150000E-05	0.260000E-04		
0					0.720000E-04	0.181000E-01		
0					0.232000E-04	0.520000E-02		
0					0.172000E-03	0.359000E+02		
0					0.182000E-04	0.145000E-03		
0					0.220000E-05	0.420000E-03		
0					0.216000E-04	0.290000E-02		
0					0.490000E-06	0.590000E-03		
0					0.800000E-06	0.470000E-04		
0					0.290000E-05	0.200000E-01		
0					0.790000E-03	0.196000E-01		
0					0.424000E-04	0.490000E-05		
0					0.460000E-05	0.450000E-05		
0					0.660000E-06	0.100000E-02		
0					0.240000E-05	0.410000E-02		
0					0.540000E-06	0.530000E-05		
0					0.121000E-05	0.460000E-03		
0					0.900000E-05	0.740000E-04		
0					0.263000E-04	0.540000E-06		
0					0.640000E-06	0.140000E-05		
0					0.660000E-05	0.150000E-05		
0					0.440000E-06	0.720000E-04		
0					0.310000E-05	0.232000E-04		
0					0.142000E-04	0.172000E-03		
0					0.101000E-05	0.182000E-04		
0					0.140000E-05	0.220000E-05		
0					0.250000E-07	0.216000E-04		
0					0.150000E-03	0.490000E-06		
0					0.150000E-03	0.800000E-06		
0					0.495000E-03	0.290000E-05		
0					0.430000E-05	0.790000E-03		
0					0.430000E-05	0.424000E-04		
0					0.120000E-05	0.460000E-05		
0					0.220000E-03	0.660000E-06		
0					0.523000E-04	0.240000E-05		

0	0.138300E-03	0.540000E-06
0	0.282000E-04	0.121000E-05
0	0.490000E-06	0.900000E-05
0	0.590000E-05	0.263000E-04
0	0.200000E-05	0.640000E-06
0	0.490000E-06	0.660000E-05
0	0.145000E-05	0.440000E-06
0	0.310000E-05	0.310000E-05
0	0.287000E-04	0.142000E-04
0	0.246000E-04	0.101000E-05
0	0.115000E-05	0.140000E-05
0	0.350000E-05	0.250000E-07
0	0.490000E-06	0.150000E-03
0	0.240000E-05	0.150000E-03
0	0.970000E-05	0.495000E-03
0	0.360000E-05	0.430000E-05
0	0.100000E-05	0.430000E-05
0	0.288000E-05	0.120000E-05
0	0.100000E-05	0.220000E-03
0	0.440000E-06	0.523000E-04
0	0.115000E-05	0.138300E-03
0	0.260000E-05	0.282000E-04
0	0.900000E-06	0.490000E-06
0	0.460000E-06	0.590000E-05
0	0.740000E-06	0.200000E-05
0	0.740000E-06	0.490000E-06
0	0.125000E-05	0.145000E-05
0	0.230000E-06	0.310000E-05
0	0.131000E-05	0.287000E-04
0	0.286000E-05	0.246000E-04
0	0.741000E-05	0.115000E-05
0	0.594000E-04	0.350000E-05
0	0.560000E-06	0.490000E-06
0	0.126000E-05	0.240000E-05
0	0.710000E-05	0.970000E-05
0	0.377000E-04	0.360000E-05
0	0.360000E-03	0.100000E-05
0	0.490000E-06	0.288000E-05
0	0.380000E-06	0.100000E-05
0	0.640000E-06	0.440000E-06
0	0.313000E-05	0.115000E-05
0	0.325000E-04	0.260000E-05
0	0.368000E-05	0.900000E-06
0	0.534000E-05	0.460000E-06
0	0.641000E-05	0.740000E-06
0	0.196000E-03	0.740000E-06
0	0.133000E-05	0.125000E-05
0	0.470000E-06	0.230000E-06
0	0.800000E-05	0.131000E-05
0	0.350000E-06	0.286000E-05
0	0.760000E-05	0.741000E-05
0	0.167000E-05	0.594000E-04
0	0.200000E-06	0.560000E-06
0	0.500000E-05	0.126000E-05
0	0.474000E-05	0.710000E-05
0	0.266000E-05	0.377000E-04
0	0.610000E-07	0.360000E-03
0	0.250000E-06	0.490000E-06
0	0.150000E-06	0.380000E-06
0	0.620000E-06	0.640000E-06
0	0.390000E-06	0.313000E-05
0	0.940000E-06	0.325000E-04
0	0.136000E-05	0.368000E-05
0	0.310000E-06	0.534000E-05
0	0.610000E-06	0.641000E-05
0	0.400000E-06	0.196000E-03
0	0.220000E-06	0.133000E-05
0	0.240000E-06	0.470000E-06
0	0.210000E-06	0.800000E-05
0	0.400000E-07	0.350000E-06
0	0.270000E-06	0.760000E-05
0	0.380000E-06	0.167000E-05
0	0.200000E-06	0.200000E-06

0					0.820000E-07	0.500000E-05		
0					0.530000E-06	0.474000E-05		
0					0.460000E-06	0.266000E-05		
0					0.220000E-06	0.610000E-07		
0					0.700000E-07	0.250000E-06		
0					0.300000E-06	0.150000E-06		
0					0.250000E-06	0.620000E-06		
0					0.190000E-06	0.390000E-06		
0					0.550000E-07	0.940000E-06		
0					0.560000E-07	0.136000E-05		
0					0.580000E-06	0.310000E-06		
0					0.640000E-07	0.610000E-06		
0					0.819000E+06	0.400000E-06		
0					0.822600E+06	0.220000E-06		
0					0.828500E+06	0.240000E-06		
0					0.835600E+06	0.210000E-06		
0					0.841500E+06	0.400000E-07		
0					0.847400E+06	0.270000E-06		
0					0.851600E+06	0.380000E-06		
0					0.854700E+06	0.200000E-06		
0					0.860700E+06	0.820000E-07		
0					0.862700E+06	0.530000E-06		
0					0.870700E+06	0.460000E-06		
0					0.887300E+06	0.220000E-06		
0					0.898400E+06	0.700000E-07		
0					0.902500E+06	0.300000E-06		
0					0.912400E+06	0.250000E-06		
0					0.921500E+06	0.190000E-06		
0					0.928800E+06	0.550000E-07		
0					0.945700E+06	0.560000E-07		
0					0.955700E+06	0.580000E-06		
0					0.101470E+07	0.640000E-07		
95	242	Am242	0.576720E+05	0.000000E+00	0.194100E+05	0.000000E+00	0.421300E+05	0.383000E-01
0					0.445400E+05	0.139000E-01		
95	242	Am242m	0.444953E+10	0.382000E+05	0.580000E+04	0.239000E+05	0.486300E+05	0.141750E-03
0					0.493670E+05	0.184500E+00		
0					0.668980E+05	0.207000E-01		
0					0.679000E+05	0.720000E-02		
0					0.733000E+05	0.585000E-02		
0					0.866800E+05	0.360000E-01		
0					0.925000E+05	0.405000E-02		
0					0.109600E+06	0.238500E-01		
0					0.111100E+06	0.270000E-02		
0					0.121800E+06	0.585000E-02		
0					0.135170E+06	0.103500E-01		
0					0.136100E+06	0.945000E-02		
0					0.152750E+06	0.135000E-02		
0					0.153840E+06	0.450000E-02		
0					0.163240E+06	0.234000E-01		
95	243	Am243	0.232575E+12	0.198000E+05	0.395000E+04	0.535260E+07	0.311000E+05	0.750000E-01
0					0.431000E+05	0.660000E-01		
0					0.435300E+05	0.593000E+01		
0					0.506000E+05	0.300000E-02		
0					0.554000E+05	0.105000E-01		
0					0.746700E+05	0.682000E+02		
0					0.867900E+05	0.338000E+00		
0					0.985000E+05	0.950000E-02		
0					0.117600E+06	0.570000E+00		
0					0.142180E+06	0.120000E+00		
0					0.169000E+06	0.140000E-02		
0					0.195000E+06	0.950000E-03		
0					0.631090E+06	0.300000E-03		
0					0.662240E+06	0.120000E-02		
96	242	Cm242	0.140780E+08	0.805000E+04	0.208000E+04	0.614460E+07	0.500000E-06	0.325000E-01
0					0.200000E-05	0.250000E-02		
0					0.400000E-05	0.140000E-02		
0					0.160000E-05	0.150000E-04		
0					0.500000E-07	0.600000E-06		
0					0.170000E-06	0.600000E-06		

0					0.500000E-06	0.600000E-07		
0					0.280000E-06	0.450000E-05		
0					0.561020E+06	0.150000E-03		
0					0.605040E+06	0.110000E-03		
0					0.617220E+06	0.160000E-06		
0					0.617220E+06	0.800000E-05		
0					0.837010E+06	0.190000E-06		
0					0.882600E+06	0.620000E-07		
0					0.897330E+06	0.220000E-04		
0					0.918700E+06	0.540000E-06		
0					0.938910E+06	0.180000E-06		
0					0.962800E+06	0.530000E-06		
0					0.974500E+06	0.900000E-08		
0					0.979800E+06	0.260000E-06		
0					0.983000E+06	0.500000E-06		
0					0.984500E+06	0.200000E-05		
0					0.101000E+07	0.400000E-05		
0					0.102850E+07	0.160000E-05		
0					0.108170E+07	0.500000E-07		
0					0.111830E+07	0.170000E-06		
0					0.118460E+07	0.500000E-06		
0					0.122020E+07	0.280000E-06		
96	243	Cm243	0.899372E+09	0.000000E+00	0.598000E+05	0.593200E+07	0.786000E+04	0.109736E-01
0					0.446630E+05	0.119712E+00		
0					0.494120E+05	0.798080E-01		
0					0.572730E+05	0.897840E-01		
0					0.573000E+05	0.498800E-01		
0					0.614600E+05	0.109736E-01		
0					0.101960E+06	0.798080E-02		
0					0.106120E+06	0.269352E+00		
0					0.166390E+06	0.189544E-01		
0					0.209750E+06	0.329208E+01		
0					0.228180E+06	0.105746E+02		
0					0.254410E+06	0.109736E+00		
0					0.272870E+06	0.798080E-01		
0					0.277600E+06	0.139664E+02		
0					0.285460E+06	0.728248E+00		
0					0.311700E+06	0.169592E-01		
0					0.315880E+06	0.179568E-01		
0					0.322300E+06	0.698320E-02		
0					0.334310E+06	0.239424E-01		
96	244	Cm244	0.571180E+09	0.677000E+04	0.183000E+04	0.589170E+07	0.428240E+05	0.248000E-01
0					0.988600E+05	0.110000E-02		
0					0.152630E+06	0.990000E-03		
0					0.251200E+06	0.980000E-05		
0					0.263340E+06	0.539000E-04		
0					0.289210E+06	0.470000E-06		
0					0.302990E+06	0.166000E-04		
0					0.340700E+06	0.170000E-05		
0					0.506900E+06	0.800000E-05		
0					0.554500E+06	0.790000E-04		
0					0.597200E+06	0.490000E-04		
0					0.605800E+06	0.740000E-05		
0					0.758600E+06	0.130000E-04		
0					0.817800E+06	0.637000E-04		
0					0.857500E+06	0.540000E-05		
0					0.894700E+06	0.170000E-05		
0					0.900100E+06	0.120000E-05		
96	245	Cm245	0.268234E+12	0.700000E+05	0.720000E+05	0.545210E+07	0.419500E+05	0.349600E+00
0					0.537400E+05	0.665000E-01		
0					0.568100E+05	0.361000E-01		
0					0.653600E+05	0.114000E-01		
0					0.691700E+05	0.665000E-02		
0					0.792500E+05	0.150100E+00		
0					0.895800E+05	0.218500E-01		
0					0.938200E+05	0.361000E-01		
0					0.132990E+06	0.277400E+01		
0					0.136060E+06	0.112100E+00		
0					0.139810E+06	0.570000E-02		
0					0.161600E+06	0.855000E-02		

0				0.165300E+06	0.855000E-02		
0				0.174940E+06	0.950000E+01		
0				0.185800E+06	0.104500E-01		
0				0.189820E+06	0.192850E+00		
0				0.210600E+06	0.665000E-02		
0				0.232700E+06	0.152000E-01		
96	246	Cm246	0.149264E+12	0.656000E+04	0.168000E+04	0.546440E+07	0.445450E+05 0.275928E-01
97	249	Bk249	0.276480E+08	0.329000E+05	0.207000E-01	0.790000E+02	0.308220E+06 0.319000E-05
0					0.327430E+06	0.174000E-04	
98	249	Cf249	0.110639E+11	0.350000E+05	0.128000E+05	0.592920E+07	0.165000E-01 0.195360E-01
0					0.108240E-01	0.330000E-01	
0					0.237600E-02	0.264000E-01	
0					0.125400E-01	0.151800E+00	
0					0.844800E-02	0.132000E-01	
0					0.658800E+05	0.178200E-01	
0					0.666900E+05	0.264000E-01	
0					0.923500E+05	0.194700E+00	
0					0.120800E+06	0.204600E-01	
0					0.121500E+06	0.448800E-01	
0					0.198000E+06	0.132000E-01	
0					0.229500E+06	0.396000E-01	
0					0.241000E+06	0.192060E+00	
0					0.252870E+06	0.246840E+01	
0					0.255700E+06	0.429000E-01	
0					0.266800E+06	0.726000E+00	
0					0.295800E+06	0.135960E+00	
0					0.321400E+06	0.660000E-01	
0					0.333400E+06	0.143880E+02	
0					0.388300E+06	0.660000E+02	
0					0.390500E+06	0.165000E-01	
0					0.406000E+06	0.108240E-01	
0					0.589000E+06	0.237600E-02	
0					0.643200E+06	0.125400E-01	
0					0.718500E+06	0.844800E-02	
98	250	Cf250	0.412765E+09	0.429000E+04	0.137000E+04	0.611750E+07	0.428520E+05 0.139892E-01
98	252	Cf252	0.834681E+08	0.457000E+04	0.139000E+04	0.602630E+07	0.433990E+05 0.148269E-01
0					0.100200E+06	0.125980E-01	
0					0.160000E+06	0.193816E-02	
99	254	Es254	0.238000E+08	0.244010E+07	0.125400E+05	0.654100E+07	0.700000E-02 0.300000E+02
0					0.150000E-01	0.960000E+02	
0					0.500000E-01	0.300000E+02	
0					0.355000E+05	0.537200E-02	
0					0.426000E+05	0.100000E+03	
0					0.630000E+05	0.200000E+01	
0					0.697000E+05	0.100000E+01	
0					0.704000E+05	0.300000E+01	
0					0.808000E+05	0.100000E+01	
0					0.851000E+05	0.100000E+01	
0					0.949000E+05	0.102000E+00	
0					0.150000E+06	0.200000E-01	
0					0.233000E+06	0.800000E-02	
0					0.249000E+06	0.250000E-01	
0					0.264000E+06	0.500000E-01	
0					0.278000E+06	0.300000E-01	
0					0.285000E+06	0.100000E-01	
0					0.304000E+06	0.700000E-01	
0					0.316000E+06	0.150000E+00	
0					0.342000E+06	0.900000E-02	
0					0.348000E+06	0.700000E-02	
0					0.377000E+06	0.150000E-01	
0					0.385000E+06	0.500000E-01	

7.0 DATA FROM WHICH FITS WERE GENERATED

Table 7-1. Data for the 55 Gallon Drum Fits.

Energy (MeV)	Density (g/cc)	Data for Original Fit	Data for Final Fits	Energy (MeV)	Density (g/cc)	Data for Original Fit	Data for Final Fits
0.4	0.6	.457	.412	3.0	0.6	NA	.301
0.4	0.8	.545	.499	3.0	0.8	NA	.374
0.4	1.0	.609	.568	3.0	1.0	NA	.437
0.4	1.5	.706	.681	3.0	1.5	NA	.555
0.4	2.0	.756	.752	3.0	2.0	NA	.640
0.4	3.0	NA	.826	3.0	3.0	NA	.744
1.0	0.6	.401	.378	4.0	0.6	NA	.276
1.0	0.8	.483	.458	4.0	0.8	NA	.344
1.0	1.0	.547	.524	4.0	1.0	NA	.404
1.0	1.5	.651	.636	4.0	1.5	NA	.520
1.0	2.0	.708	.701	4.0	2.0	NA	.604
1.0	3.0	NA	.782	4.0	3.0	NA	.712
2.0	0.6	.343	.334	5.0	0.6	NA	.257
2.0	0.8	.430	.412	5.0	0.8	NA	.322
2.0	1.0	.482	.476	5.0	1.0	NA	.378
2.0	1.5	.492	.597	5.0	1.5	NA	.492
2.0	2.0	.659	.678	5.0	2.0	NA	.574
2.0	3.0	NA	.774	5.0	3.0	NA	.684

Table 7-2. Data for 4x4 Liner Fits.

Energy (MeV)	Density (g/cc)	Data for Original Fit	Data for Final Fits	Energy (MeV)	Density (g/cc)	Data for Original Fit	Data for Final Fits
0.40	0.60	0.639	0.599	3.00	0.60	NA	0.471
0.40	0.80	0.711	0.680	3.00	0.80	NA	0.556
0.40	1.00	0.755	0.733	3.00	1.00	NA	0.622
0.40	1.50	0.814	0.811	3.00	1.50	NA	0.728
0.40	2.00	0.840	0.854	3.00	2.00	NA	0.791
0.40	3.00	NA	0.897	3.00	3.00	NA	0.857
1.00	0.60	0.576	0.556	4.00	0.60	NA	0.438
1.00	0.80	0.653	0.635	4.00	0.80	NA	0.522
1.00	1.00	0.704	0.688	4.00	1.00	NA	0.587
1.00	1.50	0.774	0.768	4.00	1.50	NA	0.694
1.00	2.00	0.807	0.815	4.00	2.00	NA	0.761
1.00	3.00	NA	0.867	4.00	3.00	NA	0.836
2.00	0.60	0.511	0.512	5.00	0.60	NA	0.411
2.00	0.80	0.592	0.598	5.00	0.80	NA	0.492
2.00	1.00	0.648	0.661	5.00	1.00	NA	0.556
2.00	1.50	0.733	0.760	5.00	1.50	NA	0.667
2.00	2.00	0.777	0.815	5.00	2.00	NA	0.736
2.00	3.00	NA	0.872	5.00	3.00	NA	0.816

Table 7-3. Data for 5x5 Liner Fits.

Energy (MeV)	Density (g/cc)	Data for Original Fit	Data for Final Fits	Energy (MeV)	Density (g/cc)	Data for Original Fit	Data for Final Fits
0.40	0.60	0.681	0.643	3.00	0.60	NA	0.517
0.40	0.80	0.745	0.717	3.00	0.80	NA	0.602
0.40	1.00	0.785	0.764	3.00	1.00	NA	0.664
0.40	1.50	0.839	0.835	3.00	1.50	NA	0.763
0.40	2.00	0.855	0.872	3.00	2.00	NA	0.819
0.40	3.00	NA	0.912	3.00	3.00	NA	0.878
1.00	0.60	0.621	0.600	4.00	0.60	NA	0.483
1.00	0.80	0.692	0.672	4.00	0.80	NA	0.567
1.00	1.00	0.737	0.720	4.00	1.00	NA	0.630
1.00	1.50	0.798	0.794	4.00	1.50	NA	0.732
1.00	2.00	0.823	0.837	4.00	2.00	NA	0.793
1.00	3.00	NA	0.881	4.00	3.00	NA	0.858
2.00	0.60	0.556	0.558	5.00	0.60	NA	0.455
2.00	0.80	0.634	0.642	5.00	0.80	NA	0.536
2.00	1.00	0.637	0.701	5.00	1.00	NA	0.600
2.00	1.50	0.672	0.792	5.00	1.50	NA	0.704
2.00	2.00	0.800	0.839	5.00	2.00	NA	0.768
2.00	3.00	NA	0.889	5.00	3.00	NA	0.840

Table 7-4. Data for 6x6 Liner Fits.

Energy (MeV)	Density (g/cc)	Data for Original Fit	Data for Final Fits	Energy (MeV)	Density (g/cc)	Data for Original Fit	Data for Final Fits
0.40	0.60	0.742	0.709	3.00	0.60	NA	0.591
0.40	0.80	0.793	0.770	3.00	0.80	NA	0.671
0.40	1.00	0.825	0.811	3.00	1.00	NA	0.728
0.40	1.50	0.863	0.868	3.00	1.50	NA	0.813
0.40	2.00	0.877	0.897	3.00	2.00	NA	0.857
0.40	3.00	NA	0.930	3.00	3.00	NA	0.904
1.00	0.60	0.687	0.663	4.00	0.60	NA	0.556
1.00	0.80	0.747	0.726	4.00	0.80	NA	0.638
1.00	1.00	0.784	0.768	4.00	1.00	NA	0.694
1.00	1.50	0.832	0.832	4.00	1.50	NA	0.786
1.00	2.00	0.851	0.867	4.00	2.00	NA	0.836
1.00	3.00	NA	0.902	4.00	3.00	NA	0.889
2.00	0.60	0.627	0.632	5.00	0.60	NA	0.526
2.00	0.80	0.697	0.708	5.00	0.80	NA	0.608
2.00	1.00	0.742	0.760	5.00	1.00	NA	0.667
2.00	1.50	0.803	0.833	5.00	1.50	NA	0.761
2.00	2.00	0.831	0.872	5.00	2.00	NA	0.816
2.00	3.00	NA	0.912	5.00	3.00	NA	0.873

Table 7-5. Data for the 30 Gallon Drum Fits.

Energy (MeV)	Density (g/cc)	Data for Final Fits	Energy (MeV)	Density (g/cc)	Data for Final Fits
0.4	0.6	0.350	3.0	0.6	0.254
0.4	0.8	0.434	3.0	0.8	0.319
0.4	1.0	0.502	3.0	1.0	0.377
0.4	1.5	0.623	3.0	1.5	0.493
0.4	2.0	0.701	3.0	2.0	0.577
0.4	3.0	0.787	3.0	3.0	0.692
1.0	0.6	0.322	4.0	0.6	0.232
1.0	0.8	0.399	4.0	0.8	0.293
1.0	1.0	0.461	4.0	1.0	0.347
1.0	1.5	0.578	4.0	1.5	0.459
1.0	2.0	0.654	4.0	2.0	0.543
1.0	3.0	0.742	4.0	3.0	0.658
2.0	0.6	0.283	5.0	0.6	0.216
2.0	0.8	0.354	5.0	0.8	0.274
2.0	1.0	0.415	5.0	1.0	0.324
2.0	1.5	0.533	5.0	1.5	0.431
2.0	2.0	0.619	5.0	2.0	0.513
2.0	3.0	0.727	5.0	3.0	0.627

Table 7-6. Data for the 85 Gallon Drum Fits.

Energy (MeV)	Density (g/cc)	Data for Final Fits	Energy (MeV)	Density (g/cc)	Data for Final Fits
0.4	0.6	0.457	3.0	0.6	0.336
0.4	0.8	0.545	3.0	0.8	0.415
0.4	1.0	0.610	3.0	1.0	0.478
0.4	1.5	0.721	3.0	1.5	0.597
0.4	2.0	0.779	3.0	2.0	0.678
0.4	3.0	0.847	3.0	3.0	0.775
1.0	0.6	0.417	4.0	0.6	0.308
1.0	0.8	0.500	4.0	0.8	0.381
1.0	1.0	0.565	4.0	1.0	0.444
1.0	1.5	0.670	4.0	1.5	0.562
1.0	2.0	0.732	4.0	2.0	0.644
1.0	3.0	0.805	4.0	3.0	0.745
2.0	0.6	0.372	5.0	0.6	0.288
2.0	0.8	0.453	5.0	0.8	0.357
2.0	1.0	0.519	5.0	1.0	0.417
2.0	1.5	0.638	5.0	1.5	0.532
2.0	2.0	0.715	5.0	2.0	0.613
2.0	3.0	0.802	5.0	3.0	0.718

Table 7-7. Data for the Ion Exchange Column Fits.

Energy (MeV)	Density (g/cc)	Data for Final Fits	Energy (MeV)	Density (g/cc)	Data for Final Fits
0.4	0.6	0.408	3.0	0.6	0.298
0.4	0.8	0.495	3.0	0.8	0.368
0.4	1.0	0.562	3.0	1.0	0.430
0.4	1.5	0.681	3.0	1.5	0.550
0.4	2.0	0.750	3.0	2.0	0.633
0.4	3.0	0.828	3.0	3.0	0.743
1.0	0.6	0.375	4.0	0.6	0.274
1.0	0.8	0.454	4.0	0.8	0.340
1.0	1.0	0.517	4.0	1.0	0.398
1.0	1.5	0.635	4.0	1.5	0.514
1.0	2.0	0.707	4.0	2.0	0.599
1.0	3.0	0.788	4.0	3.0	0.711
2.0	0.6	0.329	5.0	0.6	0.253
2.0	0.8	0.406	5.0	0.8	0.318
2.0	1.0	0.470	5.0	1.0	0.372
2.0	1.5	0.590	5.0	1.5	0.485
2.0	2.0	0.671	5.0	2.0	0.569
2.0	3.0	0.774	5.0	3.0	0.680

Table 7-8. Data for Doorstop Sample Carrier Fits.

Energy (MeV)	Density (g/cc)	Data for Final Fits	Energy (MeV)	Density (g/cc)	Data for Final Fits
0.40	0.60	0.107	3.00	0.60	0.070
0.40	0.80	0.139	3.00	0.80	0.092
0.40	1.00	0.170	3.00	1.00	0.114
0.40	1.50	0.241	3.00	1.50	0.165
0.40	2.00	0.304	3.00	2.00	0.212
0.40	3.00	0.414	3.00	3.00	0.295
1.00	0.60	0.097	4.00	0.60	0.064
1.00	0.80	0.127	4.00	0.80	0.084
1.00	1.00	0.155	4.00	1.00	0.103
1.00	1.50	0.219	4.00	1.50	0.149
1.00	2.00	0.277	4.00	2.00	0.192
1.00	3.00	0.376	4.00	3.00	0.269
2.00	0.60	0.081	5.00	0.60	0.059
2.00	0.80	0.106	5.00	0.80	0.077
2.00	1.00	0.130	5.00	1.00	0.096
2.00	1.50	0.187	5.00	1.50	0.139
2.00	2.00	0.238	5.00	2.00	0.179
2.00	3.00	0.329	5.00	3.00	0.252

Table 7-9. Data for LR-56 Container Fits.

Energy (MeV)	Density (g/cc)	Data for Final Fits	Energy (MeV)	Density (g/cc)	Data for Final Fits
0.40	0.60	0.704	3.00	0.60	0.584
0.40	0.80	0.770	3.00	0.80	0.662
0.40	1.00	0.812	3.00	1.00	0.718
0.40	1.50	0.871	3.00	1.50	0.805
0.40	2.00	0.902	3.00	2.00	0.855
0.40	3.00	0.931	3.00	3.00	0.906
1.00	0.60	0.663	4.00	0.60	0.546
1.00	0.80	0.729	4.00	0.80	0.627
1.00	1.00	0.774	4.00	1.00	0.685
1.00	1.50	0.837	4.00	1.50	0.777
1.00	2.00	0.872	4.00	2.00	0.830
1.00	3.00	0.907	4.00	3.00	0.889
2.00	0.60	0.625	5.00	0.60	0.519
2.00	0.80	0.698	5.00	0.80	0.598
2.00	1.00	0.749	5.00	1.00	0.657
2.00	1.50	0.830	5.00	1.50	0.752
2.00	2.00	0.872	5.00	2.00	0.809
2.00	3.00	0.912	5.00	3.00	0.871

Table 7-10. Data for NCAW Cask Fits.

Energy (MeV)	Density (g/cc)	Data for Final Fits	Energy (MeV)	Density (g/cc)	Data for Final Fits
0.40	0.60	0.097	3.00	0.60	0.065
0.40	0.80	0.125	3.00	0.80	0.086
0.40	1.00	0.152	3.00	1.00	0.105
0.40	1.50	0.216	3.00	1.50	0.151
0.40	2.00	0.272	3.00	2.00	0.194
0.40	3.00	0.371	3.00	3.00	0.270
1.00	0.60	0.089	4.00	0.60	0.059
1.00	0.80	0.115	4.00	0.80	0.077
1.00	1.00	0.140	4.00	1.00	0.096
1.00	1.50	0.199	4.00	1.50	0.138
1.00	2.00	0.251	4.00	2.00	0.177
1.00	3.00	0.341	4.00	3.00	0.247
2.00	0.60	0.075	5.00	0.60	0.055
2.00	0.80	0.098	5.00	0.80	0.072
2.00	1.00	0.120	5.00	1.00	0.088
2.00	1.50	0.170	5.00	1.50	0.128
2.00	2.00	0.217	5.00	2.00	0.164
2.00	3.00	0.300	5.00	3.00	0.230

Table 7-11. Data for Onsite Transfer Cask Fits.

Energy (MeV)	Density (g/cc)	Data for Final Fits	Energy (MeV)	Density (g/cc)	Data for Final Fits
0.40	0.60	0.075	3.00	0.60	0.053
0.40	0.80	0.098	3.00	0.80	0.069
0.40	1.00	0.119	3.00	1.00	0.085
0.40	1.50	0.171	3.00	1.50	0.123
0.40	2.00	0.219	3.00	2.00	0.159
0.40	3.00	0.304	3.00	3.00	0.224
1.00	0.60	0.070	4.00	0.60	0.048
1.00	0.80	0.091	4.00	0.80	0.063
1.00	1.00	0.111	4.00	1.00	0.077
1.00	1.50	0.160	4.00	1.50	0.112
1.00	2.00	0.205	4.00	2.00	0.145
1.00	3.00	0.283	4.00	3.00	0.205
2.00	0.60	0.060	5.00	0.60	0.044
2.00	0.80	0.079	5.00	0.80	0.058
2.00	1.00	0.096	5.00	1.00	0.071
2.00	1.50	0.139	5.00	1.50	0.104
2.00	2.00	0.178	5.00	2.00	0.135
2.00	3.00	0.249	5.00	3.00	0.191

Table 7-12. Data for PAS-1 Cask Fits.

Energy (MeV)	Density (g/cc)	Data for Final Fits	Energy (MeV)	Density (g/cc)	Data for Final Fits
0.40	0.60	0.267	3.00	0.60	0.185
0.40	0.80	0.335	3.00	0.80	0.236
0.40	1.00	0.393	3.00	1.00	0.283
0.40	1.50	0.514	3.00	1.50	0.382
0.40	2.00	0.600	3.00	2.00	0.462
0.40	3.00	0.703	3.00	3.00	0.581
1.00	0.60	0.245	4.00	0.60	0.168
1.00	0.80	0.308	4.00	0.80	0.215
1.00	1.00	0.363	4.00	1.00	0.258
1.00	1.50	0.473	4.00	1.50	0.352
1.00	2.00	0.553	4.00	2.00	0.429
1.00	3.00	0.659	4.00	3.00	0.545
2.00	0.60	0.209	5.00	0.60	0.156
2.00	0.80	0.265	5.00	0.80	0.200
2.00	1.00	0.316	5.00	1.00	0.241
2.00	1.50	0.421	5.00	1.50	0.331
2.00	2.00	0.506	5.00	2.00	0.403
2.00	3.00	0.625	5.00	3.00	0.517

Table 7-13. Data for Sample Pig Carrier Fits:

Energy (MeV)	Density (g/cc)	Data for Final Fits	Energy (MeV)	Density (g/cc)	Data for Final Fits
0.40	0.60	0.056	3.00	0.60	0.038
0.40	0.80	0.073	3.00	0.80	0.050
0.40	1.00	0.090	3.00	1.00	0.062
0.40	1.50	0.132	3.00	1.50	0.091
0.40	2.00	0.172	3.00	2.00	0.119
0.40	3.00	0.244	3.00	3.00	0.171
1.00	0.60	0.051	4.00	0.60	0.034
1.00	0.80	0.068	4.00	0.80	0.045
1.00	1.00	0.083	4.00	1.00	0.056
1.00	1.50	0.121	4.00	1.50	0.083
1.00	2.00	0.157	4.00	2.00	0.108
1.00	3.00	0.223	4.00	3.00	0.156
2.00	0.60	0.043	5.00	0.60	0.032
2.00	0.80	0.057	5.00	0.80	0.042
2.00	1.00	0.071	5.00	1.00	0.052
2.00	1.50	0.104	5.00	1.50	0.076
2.00	2.00	0.135	5.00	2.00	0.100
2.00	3.00	0.193	5.00	3.00	0.145

Table 7-14. Data for Single Pass Fuel Cask Fits.

Energy (MeV)	Density (g/cc)	Data for Final Fits	Energy (MeV)	Density (g/cc)	Data for Final Fits
0.40	0.60	0.587	3.00	0.60	0.453
0.40	0.80	0.667	3.00	0.80	0.539
0.40	1.00	0.720	3.00	1.00	0.603
0.40	1.50	0.801	3.00	1.50	0.710
0.40	2.00	0.844	3.00	2.00	0.773
0.40	3.00	0.887	3.00	3.00	0.843
1.00	0.60	0.544	4.00	0.60	0.421
1.00	0.80	0.627	4.00	0.80	0.505
1.00	1.00	0.684	4.00	1.00	0.572
1.00	1.50	0.765	4.00	1.50	0.682
1.00	2.00	0.809	4.00	2.00	0.748
1.00	3.00	0.858	4.00	3.00	0.823
2.00	0.60	0.495	5.00	0.60	0.394
2.00	0.80	0.579	5.00	0.80	0.477
2.00	1.00	0.642	5.00	1.00	0.544
2.00	1.50	0.742	5.00	1.50	0.657
2.00	2.00	0.797	5.00	2.00	0.727
2.00	3.00	0.859	5.00	3.00	0.807

8.0 REFERENCES

- Ackerman, L. G. H., R. A. Basson, and H. J. van der Linde, 1972, *J. Chem. Soc., Faraday Trans. 1*, Vol. 68, Issue 7, p. 1258.
- Adams, G. E., J. H. Baxendale, and R. D. Sedgwick, 1959, "Some Radical and Molecular Yields in the γ Irradiation of Some Organic Liquids, *J. Phys. Chem.*, Vol. 63, Issue 6, p. 854, June 1959.
- Anderson, A. R., 1968, *Fundamental Processes in Radiation Chemistry*, Wiley-Interscience, New York, New York.
- Appleby, A., and H. A. Schwarz, 1969, "Radical and Molecular Yields Irradiated by γ Rays and Heavy Ions," *J. Phys. Chem.*, Vol. 73, p. 1937.
- Arakawa, K., and N. Hayakawa, 1983a, "Radiation-Induced Gas Evolution from Commercial Lubricant Base Oil," *Nuclear Technology* 61, p. 533-539.
- Arakawa, K., et al., 1983b, "Radiation-Induced Oxidation of Polymers. Effect of Antioxidant and Antirad Agent on Oxygen Consumption and Gas Evolution," *J. Polym. Sci.; Polym. Chem. Ed.* 21 (preprint).
- Arakawa, K., et al., 1986, "Radiation-Induced Gas Evolution in Chlorine-Containing Polymer. Poly (vinyl chloride), Chloroprene Rubber, and Chlorosulfonated-Polyethylene," *Radiat. Phys. Chem.* 27, p. 157-163.
- Armstrong, D. A., 1987, "The Radiation Chemistry of Gases," *Radiation Chemistry. Principles and Applications*, VCH Publishers, Inc., New York, New York.
- Arthur, J. C. Jr., 1970, "Graft Polymerization onto Polysaccharides," *Advances in Macromolecular Chemistry* 2, Academic Press, London, England, p. 1-87.
- Ausloos, P., and J. F. Paulson, 1958, "Radiolysis of Simple Ketones," *J. Am. Chem. Soc.*, Vol. 80, Issue 19, p. 5117.
- Ausloos, P., and C. N. Trumbore, 1959, "Radiolysis of $\text{CH}_3\text{COOCH}_3$ and $\text{CH}_3\text{COOCD}_3$ by Cobalt-60 Rays," *J. Am. Chem. Soc.*, Vol. 81, p. 3866.
- Back, R. A., and N. Miller, 1959, "The Radiolysis of of n-Pentane and Other Hydrocarbons in the Gas Phase," *Trans. Faraday Soc.*, Vol. 55, p. 911.
- Barker, R., 1963, "Gamma-Radiolysis of Liquid Acetone," *Trans. Faraday Soc.*, Vol. 59, p. 375.
- Barletta, R. E., K. J. Swyler, S. F. Chan, and R. E. Davis, 1983, *Solidification of Irradiated Epicor-II Waste Products*, NUREG/CR-2969, BNL-NUREG-51590, May 1983.

- Basson, R. A., and H. J. van der Linde, 1967, "The Radiation Chemistry of Propanol. I. Formation of the Major Products," *J. Chem. Soc., A*, p. 1182.
- Baumann, E. W., 1966, "Gamma Irradiation of Individual and Mixed Ion Exchange Resins," *Journal of Chemical and Engineering Data*, E. I. du Pont de Nemours & Company, Savannah River Laboratory, Aiken, South Carolina, Vol. 11, Issue 2, p. 256-260.
- Baxendale, J. H., and R. D. Sedgwick, 1961, "Radiolysis of Methanol Vapour," *Trans. Faraday Soc.*, Vol. 57, p. 2157.
- Becker, W., P. Colombo, and R. M. Neilson, Jr., 1979, *Properties of Radioactive Wastes and Waste Containers*, First Topical Report, NUREG/CR-0619, BNL-NUREG-50957, August 1979.
- Berk, S., and H. Gisser, 1973, *Radiat. Res.*, Vol. 56, p. 71.
- Bersch, C. F., et al., 1959, "Effect of Radiation on Plastic Films," *Modern Packaging*, Vol. 32, p. 117-168.
- Bibler, N. E., 1976, "Radiolytic Gas Production During Long-Term Storage of Nuclear Wastes," *American Chemical Society Meeting* (preprint), E. I. Du Pont de Nemours & Company, Savannah River Laboratory, DP-MS-76-51, October 27-29, 1976.
- Bibler, N. E., 1978, *Radiolytic Gas Generation from Concrete Containing Savannah River Plant Waste*, DP-1464, E. I. du Pont de Nemours and Company, Savannah River Laboratory, Aiken, South Carolina, January 1978.
- Bibler, N. E., 1979a, *Gas Production from Alpha Radiolysis of Concrete Containing TRU Incinerator Ash*, Progress Report 2, August 1-November 30, 1978, DPST-78-150-2, E. I. du Pont de Nemours and Company, Savannah River Laboratory, Aiken, South Carolina, April 1979.
- Bibler, N. E., 1979b, *Radiolytic Gas Generation in Concrete Made with Incinerator Ash Containing Transuranium Nuclides*, DP-MS-79-25, Symposium on the Scientific Basis for Nuclear Waste Management, Du Pont de Nemours (E.I.) and Co., Aiken, South Carolina.
- Bibler, N. E., 1980, "Radiolytic Gas Generation in Concrete Made With Incinerator Ash Containing Transuranium Nuclides," *Scientific Basis for Nuclear Waste Management*.
- Bibler, N. E., and E. G. Orebaugh, 1977, *Radiolytic Gas Production from Tritiated Waste Forms, Gamma and Alpha Radiolysis Studies*, DP-1459, E. I. du Pont de Nemours and Company, Savannah River Laboratory, Aiken, South Carolina, July 1977.

- Bibler, N. E., R. M. Wallace, and M. A. Ebra, 1981, *Effects of High Radiation Doses on Linde Ion Siv IE-95*, DP-MS-81-18, E. I. du Pont de Nemours & Company, Savannah River Laboratory, Aiken, South Carolina.
- BNL, 1991, *ENDF-201. ENDF/B-VI Summary Documentation*, BNL-NCS-17541, 4th edition, Brookhaven National Laboratory, Upton, New York, October 1991.
- Bohm, G. G. A., 1973, "Radiation Chemistry of Elastomers," *The Radiation Chemistry of Macromolecules*, Vol. II, Academic Press, New York, New York.
- Bopp, C. D., et al., 1963, "Plastics," *Radiation Effects on Organic Materials*, Academic Press, New York, New York.
- Bopp, C. D., and O. Sisman, 1953, *Radiation Stability of Plastics and Elastomers*, (Supplement to ORNL-928) ORNL-1373, Oak Ridge National Laboratory, Oak Ridge, Tennessee, July 23, 1953.
- Budavari, S., Editor, 1989, "The Merck Index, an Encyclopedia of Chemicals, Drugs, and Biologicals," 11th edition, Merck & Co., Inc., Rahway, New Jersey.
- Bühler, R. E., and J. M. Bossy, 1974, "Pulse Radiolysis of Organic Halogen Compounds. IV. Reaction Mechanism, Dose Rate Effects, and Product Back Reactions in Pure Bromobenzene," *Int. J. Radiat. Phys. Chem.*, Vol. 6, p. 95.
- Burns, W. G., and R. Barker, 1965, *Progress in Reaction Kinetics*, Vol. 3, p. 303, Pergamon, Oxford.
- Burns, W. G., and R. Barker, 1968, *Aspects of Hydrocarbon Radiolysis*, Academic Press, New York, New York.
- Burns, W. G., W. R. Marsh, and W. S. Walters, 1983, "The γ Irradiation-Enhanced Corrosion of Stainless and Mild Steels by Water in the Presence of Air, Argon, and Hydrogen," *Radiat. Phys. Chem.*, Vol. 21, Issue 3, p. 259-279, Pergamon Press Ltd., England.
- Burns, W. G., and H. E. Sims, 1981, "Effect of Radiation Type in Water Radiolysis," *J. Chem. Soc., Faraday Trans. 1* 77, p. 2803-2813.
- Burns, W. G., T. F. Williams, and W. Wild, 1959, "The Effects of Fast-Electron and Pile Irradiation on Polyphenyls at High Temperatures," *Proceedings of the Second International Conference on the Peaceful Uses of Atomic Energy, Geneva, 1958*, Vol. 29, p. 266, United Nations, New York.
- Burton, M., 1952, *Discuss. Faraday Soc.*, Vol. 12, p. 317.

- Capolupo, W. P., and J. R. Sheff, 1983, "Radiolytic Gas Generation and Oxygen Depletion in Ion Exchange Materials," *Scientific Basis for Nuclear Waste Management VI*, Materials Research Society Symposia Proceedings Volume 15, p. 447.
- Carleson, G., 1983, *Radiation Stability of Solidified Ion-Exchange Resin*, (in Swedish), Studsvik Technical Report NW-83/490.
- Carter, L. L., 1994, *Certification of MCNP Version 4A for the WHC Computer Platforms*, ECN-186710, SD-MP-SWD-30001, Rev. 6, January 1994.
- Chapiro, A., 1962, *Radiation Chemistry of Polymeric Systems*, Interscience Publishers, New York, New York.
- Choi, S. U., and N. N. Lichtin, 1964, "The Radiolysis of Methanol and Methanolic Solutions, III. The Effect of Oxygen on the Radiolysis of Liquid Methanol by Co_{60} Rays and by B Li Recoils," *J. Am. Chem. Soc.*, Vol. 86, p. 3948.
- Collinson, E., F. S. Dainton, and J. Kroh, 1960, "Effects of Linear Energy Transfer on the Radiolysis of Water and Heavy Water, *Nature*, Vol. 187, p. 475.
- Collinson, E., F. S. Dainton, and J. Kroh, 1962, "The Radiation Chemistry of Aqueous Solutions, II. Radical and Molecular Yields for Tritium beta-particles," *Proc. R. Soc. (London) Ser. A*, Vol. 265, p. 422.
- Cramer, W. A., 1967, "Radical Reactions in Liquid Cyclohexane, II. The Mercury-Photosensitized Decomposition of Cyclohexane," *J. Phys. Chem.*, Vol. 71, p. 1112.
- Crawford, C. L., N. E. Bibler, 1994, *Gas Production from Radiolysis of a Resorcinol-Formaldehyde Ion Exchange Resin*, Savannah River Technology Center, Aiken, South Carolina, June 1994.
- Crawford, C. L., N. E. Bibler, and J. P. Bibler, 1994, "An Investigation of the Radiolytic Stability of a Resorcinol-Formaldehyde Ion Exchange Resin," *Waste Management '94 Conference Proceedings*, Tucson, Arizona, February 27-March 3, 1994.
- Cruse, J. M., 1992, *Test and Evaluation Document for DOT Specification 7A Type A Packaging*, WHC-EP-0558, June 1992.
- Davison, W. H. T., 1958, "The Formation and Reactions of Free Radicals in the High Energy Irradiation of Hydrocarbons in the Gas Phase, *Chem. Soc. (London) Spec. Publ. No. 9*, p. 151.
- de Vries, A. E., and A. O. Allen, 1959, "Radiolysis of Liquid *n*-Pentane," *J. Phys. Chem.*, Vol. 63, Issue 6, p. 879, June 1959.

- Deltete, C. P., 1987, *Methodology for Calculating Combustible Gas Concentration in Radwaste Containers*, NP-4938, Research Project 2558, Final Report, Analytical Resources, Inc., Wyomissing, Pennsylvania, March 1987.
- Dewhurst, H. A., 1957, "Radiation Chemistry of Organic Compounds, I. n-Alkane Liquids," *J. Phys. Chem.*, Vol. 61, p. 1466.
- Dewhurst, H. A., 1958, "Radiation Chemistry of Organic Compounds, III. Branched Chain Alkanes," *J. Am. Chem. Soc.*, Vol. 80, p. 5607.
- Dewhurst, H. A., 1959, "Radiation Chemistry of Organic Compounds, IV. Cyclohexane," *J. Phys. Chem.*, Vol. 63, p. 813.
- Dewhurst, H. A., and R. H. Schuler, 1959, "A Comparison of the Decomposition of Hexane and Cyclohexane by Different Types of Radiation," *J. Am. Chem. Soc.*, Vol. 81, Issue 13, p. 3210, July 1959.
- Dismukes, E. B., and W. S. Wilcox, 1959, "The Gamma Radiolysis of Butyl Chlorides," *Radiat. Res.*, Vol. 11, p. 754.
- Dixon, R. S., 1970, "The Dissociation of Water Vapour by Photolytic, Radiolytic, and Electron Impact Methods," *Radiat. Res. Rev.*, Vol. 2, p. 237.
- Donovan, J. M., and R. J. Hanrahan, 1971, "Radiation Chemistry of Methyl Iodide in the Gas Phase," *Int. J. Radiat. Phys. Chem.*, Vol. 3, p. 491.
- Duschner, H., W. Schorr, and K. Starke, 1977, "Generation and Diffusion of Radiolysis Gases in Bituminized Radioactive Waste," *Radiochemica Acta*, Vol. 24, p. 133.
- Dyne, P. J., and W. M. Jenkinson, 1960, "Radiation Chemistry of Cyclohexane, I. Isotopic Composition of Hydrogen Evolved from Mixtures of C_6D_{12} and C_6H_{12} ," *Can. J. Chem.*, Vol. 38, p. 539.
- Dyne, P. J., and W. M. Jenkinson, 1961, "Radiation Chemistry of Cyclohexane, III. Effect of Benzene and Iodine on the Isotopic Composition of Radiolytic Hydrogen from C_6D_{12} - C_6H_{12} Mixtures," *Can. J. Chem.*, Vol. 39, p. 2163.
- Egorov, E. V., and P. D. Novikov, 1965, "Action of Ionizing Radiation on Ion-Exchange Materials," Atomizdat, Moscow, published in *Israel Program for Scientific Translations*, Jerusalem, 1967.
- Elliot, A. J., M. P. Chenier, and D. C. Ouellette, 1990, "G-Values for γ -Irradiated Water as a Function of Temperature," *Can. J. Chem.*, Vol. 68, p. 712.

- Elliot, A. J., M. P. Chenier, and D. C. Ouellette, 1993, "Temperature Dependence of G-Values for Water and Heavy Water Irradiated with Low Linear Energy Transfer Radiation," *J. Chem. Soc., Faraday Trans.*, Vol. 89, Issue 8, p. 1193-1197.
- EPRI, 1988, *Radwaste Radiolytic Gas Generation Literature Review*, EPRI NP-5977, Project 2724-1, Final Report, Sargent & Lundy Engineers, Electric Power Research Institute, Chicago, Illinois, September 1988.
- Eschrich, H., 1980, *Properties and Long-Term Behavior of Bitumen and Radioactive Waste-Bitumen Mixtures*, SKBK-KBS Technical Report 80-14, October 1980.
- Flaherty, J. E., et al., 1986, *A Calculational Technique to Predict Combustible Gas Generation in Sealed Radioactive Waste Containers*, EG&G Idaho, Inc., Idaho Falls, Idaho, May 1986.
- Flaherty, J. E., A. Fujita, C. P. Deltete, and G. J. Quinn, 1986, *A Calculational Technique to Predict Combustible Gas Generation in Sealed Radioactive Waste Containers*, General Public Utilities, Electric Power Research Institute, U.S. Nuclear Regulatory Commission, U.S. Department of Energy, GEND-041, May 1986.
- Fletcher, J. W., and G. R. Freeman, 1967, "The Radiolysis of Ethanol, VI. Hydrogen Precursors at -196 °C," *Can. J. Chem.*, Vol. 45, p. 635.
- Freeman, G. R., 1960, "The Radiolysis of Cyclohexane: II, Cyclohexane-Cyclohexene Solutions and Pure Cyclohexene," *Can. J. Chem.*, Vol. 38, Issue 7, p. 1043, July 1960.
- Friedman, H. A., L. R. Dole, T. M. Gilliam, and G. C. Rogers, 1985, "Radiolytic Gas Generation Rates from Hanford RHO-CAW Sludge and Double-Shell Slurry Immobilized in Grout," DE85013519, Oak Ridge National Laboratory, Oak Ridge, Tennessee.
- Futrell, J. H., 1959, "High Energy Electron Irradiation of *n*-Hexane," *J. Am. Chem. Soc.*, Vol. 81, Issue 22, p. 5921, November 1959.
- Futrell, J. H., 1960, "Gas Phase Radiolysis of *n*-Pentane," *J. Phys. Chem.*, Vol. 64, Issue 11, p. 1634, November 1960.
- Gangwer, T. E., M. Goldstein, and K. K. S. Pillay, 1977, *Radiation Effects on Ion Exchange Materials*, BNL-50781, Brookhaven National Laboratory, Upton, New York, November 1977.
- Gäumann, T., and J. Hoigné, Editors, 1968, *Aspects of Hydrocarbon Radiolysis*, Academic Press, London, England.

- Gillis, H. A., R. R. Williams, and W. H. Hamill, 1961, "Ionic and Free Radical Processes in the Radiolysis of Liquid Methyl and Ethyl Iodides," *J. Am. Chem. Soc.*, Vol. 83, p. 17.
- Haighton, A. P., 1980, *The Solidification of Ion Exchange Waste Part 6 - Characterization of a Vinyl Ester Binder*, NW/SSO/RR/75/80, Central Electric Generating Board, Manchester, United Kingdom.
- Hall, K. L., et al., 1963, "Radiation Chemistry of Pure Compounds," *Radiation Effects on Organic Materials*, Academic Press, New York, New York.
- Hall, K. L., and F. A. Elder, 1959, "Some Observations on Byphenyl Radiolysis," *J. Chem. Phys.*, Vol. 31, p. 1420.
- Hegazy, E. A., et al., 1981a, "Radiation-Induced Oxidative Degradation of Isotactic Polypropylene," *J. Appl. Polym. Sci.*, Vol. 26, p. 1361-1372.
- Hegazy, E. A., et al., 1981b, "Radiation-Induced Oxidative Degradation of Poly (vinyl Chloride)," *J. Appl. Polymer Sci.*, Vol. 26, p. 2947-2957.
- Henri, V. P., C. R. Maxwell, W. C. White, and D. C. Peterson, 1952, "The Chemical Effects of α -Particles Upon Some C-Hydrocarbons in the Vapor State," *J. Phys. Chem.*, Vol. 56, p. 153.
- Henrie, J. O., D. J. Flesher, G. J. Quinn, and J. Greenborg, 1985, *Hydrogen Control in the Handling, Shipping and Storage of Wet Radioactive Waste*, RHO-WM-EV-9P, Rockwell International, Rockwell Hanford Operations, Richland, Washington, December 1985.
- Hentz, R. R., 1962, " γ -Irradiation of Isopropylbenzene," *J. Phys. Chem.*, Vol. 66, p. 1622.
- Hentz, R. R., and M. Burton, 1951, "Studies in Photochemistry and Radiation Chemistry of Toulene, Mesitylene and Ethylbenzene," *J. Am. Chem. Soc.*, Vol. 73, p. 532.
- Ho, S. K., and G. R. Freeman, 1964, "Radiolysis of Cyclohexane, V. Purified Liquid Cyclohexane and Solutions of Additives," *J. Phys. Chem.*, Vol. 68, p. 2189.
- Hofer, H., and H. Heusinger, 1970, "Untersuchungen zum Mechanismus der Athylbenzolradiolyse," *Z. Phys. Chem. (Frankfurt)*, Vol. 69, p. 47.
- Hoigné, J., W. G. Burns, W. R. Marsh, and T. Gäumann, 1964, "LET-Effekta in Toluol," *Helv. Chim. Acta*, Vol. 47, p. 247.
- Holland, J. P., et al., 1978, "The Radiolysis of Dodecane-Tributylphosphate Solutions," *Nuclear Instruments and Methods*, Vol. 53, p. 589-593.

- Holland, T. R., 1985, *The Effect of Gamma Irradiation on the Stability of Cemented Winfrith Reactor (SGHWR) Sludge*, AEEW-R 1924, UKAEA, Winfrith, England, January 1985.
- Holroyd, R., 1993, *High Energy Ionization in Liquids - The Free Ion Yield*, BNL-49430, Brookhaven National Laboratory, Upton, New York.
- Hopkins, J. D., 1994, *Criteria for Flammable Gas Watch List Tanks*, WHC-EP-0702, Westinghouse Hanford Company, Richland, Washington, April 1994.
- Hummel, R. W., 1960, "The Radiolysis of Liquid Methyl Acetate with Co^{60} Gamma Radiation," *Faraday Soc.*, London Trans., Vol. 56, Part 2, p. 234, February 1960.
- IEEE, 1963, *Radiation Effects Handbook*, S-146, Institute of Electrical and Electronics Engineers, Inc., June 1963.
- Johnsen, R. H., and D. A. Becker, 1963, "The Radiation Chemistry of Some of the Higher Aliphatic Alcohols -- Further Studies on Radicals Trapped at Low Temperatures," *J. Phys. Chem.*, Vol. 67, p. 831.
- Kang, H. Y., et al., 1967, "The Radiation Chemistry of Polyethylene. IX. Temperature Coefficient of Cross-Linking and Other Effects," *J. Am. Chem. Soc.*, p. 1980-1986.
- Kasten, J. L., 1991, *A Literature Review of Radiolytic Gas Generation as a Result of the Decomposition of Sodium Nitrate Wastes*, DE91006930, Oak Ridge National Laboratory, Oak Ridge, Tennessee, January 1991.
- Kazanjian, A. R., 1976, *Radiolytic Gas Generation in Plutonium Contaminated Waste Materials*, Rockwell International, Rocky Flats Plant, RFP-2469, October 1976.
- Kazanjian, A. R., and A. K. Brown, 1969, *Radiation Chemistry of Materials Used in Plutonium Processing*, RFP-1376, The Dow Chemical Company, Rocky Flats Division, Golden, Colorado, December 1969.
- Kazanjian, A. R., and D. R. Horrell, 1974, *Radiation Effects on Ion Exchange Resins, Part I: Gamma Irradiation of Dowex 50W*, Dow Chemical Rocky Flats Division Report No. RFP-2140, May 10, 1974.
- Kazanjian, A. R., and D. R. Horrell, 1975, *Radiation Effects on Ion-Exchange Resins, Part II: Gamma Irradiation of Dowex 1*, U.S. AEC, Dow Chemical Rocky Flats Division Report No. RFP-2354, Golden, Colorado, February 27, 1975.
- Kazanjian, A. R., and M. E. Killion, 1982, *Radiation Effects on Amberlite IRA-938 and Bio-Rad AG-MP-50 Ion Exchange Resins*, Rockwell International Energy Systems Group, Rocky Flats, Colorado, RFP-3167.

- Kazanjan, A. R., and J. R. Stevens, 1983, *Radiation Effects on Dowex MSC-1, Amberlite 252, and Duolite C-264 Ion Exchange Resins*, Rockwell International Energy Systems Group, Report No. RFP-3541, Rocky Flats Plant, Golden, Colorado, September 12, 1983.
- Kharasch, M. S., P. C. Chang, and C. D. Wagner, 1958, "Radiolysis of 1-Hexene," *J. Org. Chem.*, Vol. 23, Issue 5, p. 779, May 1958.
- Kinderman, E. M., 1957, *Effects of High-Energy, High-Intensity Electromagnetic Radiation on Organic Liquids*, WADC-TR-57-465, Stanford Research Institute, Menlo Park, California, September 1957.
- Klots, C. E., Y. Raef, and R. E. Johnsen, 1964, "Commentary on Scavenging Plots in Radiation Chemical Studies of Liquid Cyclohexane," *J. Phys. Chem.*, Vol. 68, p. 2040.
- Kosiewicz, S. T., 1981, "Gas Generation from Organic Transuranic Wastes. I. Alpha Radiolysis at Atmospheric Pressure," *Nuclear Technology*, Vol. 54, p. 92-99.
- Krasnansky, V. J., et al., 1961, "Effect of Gamma Radiation on Chemical Structure of Plastics," *SPE (Society of Plastics Eng.) Trans.*, Vol. 1, p. 133-138.
- Lahmani, F., and N. Ivanoff, 1967, *Proc. 2nd Tihany Symp. Radiat. Chem.*, Akadémiai Kiadó, Budapest, p. 327.
- Lampe, F. W., 1957, "High-Energy Electron Irradiations of Neopentane," *J. Phys. Chem.*, Vol. 61, Issue 7, p. 1015, July 1957.
- Lampe, F. W., 1959, "The Direct Radiolysis and the Radiation-Sensitized Hydrogenation of Ethylene," *Radiation Research*, Vol. 10, Issue 6, p. 691, June 1959.
- Lefort, M., and X. Tarrago, 1959, "Radiolysis of Water by Particles of High Linear Energy Transfer. The Primary Yields in Aqueous Acid Solutions of Ferrous Sulfate, and in Mixtures of Thallous and Ceric Ions," *J. Phys. Chem.*, Vol. 63, p. 833.
- Lewis, M. A., and D. W. Warren, 1989, "Gas Generation from the Irradiation of Mortar," *The 91st Annual Meeting of the American Ceramic Society*, Indianapolis, Indiana.
- Lukáč, S., J. Teplý, and K. Vacek, 1972, "Radiolysis of Carboxylic Compounds, I. Comparison of Potassium Acetate and Acetic Acid Radiolysis," *J. Chem. Soc., Faraday Trans. I.*, Vol. 68, p. 1377.
- Mahlman, H. A., 1961, "The OH Yield in the Co^{60} γ Radiolysis of HNO_3 ," *The Journal of Chemical Physics*, Vol. 35, Issue 3, p. 936, September 1961.

- Mandelkern, L., 1972, "Radiation Chemistry of Linear Polyethylene," *The Radiation Chemistry of Macromolecules*, Vol. I, Academic Press, New York, New York.
- Manion, J. P., and M. Burton, 1952, "Radiolysis of Hydrocarbon Mixtures," *J. Phys. Chem.*, Vol. 56, p. 560.
- Marusich, R. M., 1994, *Hydrogen Production in the K-Basin Ion Exchange Columns and the Significance of That Production*, Draft, Westinghouse Hanford Company, Richland, Washington, May 26, 1994.
- McDonell, W. R., and S. Gordon, 1955, "Decomposition of Methyl Alcohol by Co^{60} Gamma Radiation," *J. Chem. Phys.*, Vol. 23, Issue 1, p. 208, January 1955.
- McDonell, W. R., and A. S. Newton, 1954, "The Radiation Chemistry of the Aliphatic Alcohols," *J. Am. Chem. Soc.*, Vol. 76, Issue 18, p. 4651, September 1954.
- McFarland, R. C., 1982, *Analysis of Irradiated Ion Exchange Materials*, Final Research Report, Project A60-11. Published as Appendix C to Morcos, N., et al., *Properties of Radioactive Wastes and Waste Containers*, NUREG/CR-2617, BNL-NUREG-51515, April 1982.
- Meaburn, M., and F. W. Mellows, 1965, "Effect of Hydrogen Atom and Electron Scavengers on the Radiolysis of Methanol Vapor," *J. Chem. Soc., Faraday Trans., I and II*, Vol. 61, p. 1701.
- Meisel, D., C. D. Jonah, S. Kapoor, M. S. Matheson, and M. C. Sauer, Jr., 1993, *Radiolytic and Radiolytically Induced Generation of Gases from Synthetic Wastes*, ANL-93/43, Argonne National Laboratory, Argonne, Illinois, October 1993.
- Mirichi, R., et al., 1981, "Selected Problems of Radiation Stability of Some Solvents and Amines Used in the Reprocessing of Nuclear Fuel," *Nukleonika* 26, p. 827-848.
- Mohorčič, G., and V. Kramer, 1968, "Gasses Evolved by Co^{60} Radiation Degradation of Strongly Acidic Ion Exchange Resins," International Symposium on Macromolecular Chemistry, Prague, 1965, *Journal of Polymer Science: Part C*, Number 16, p. 4185-4195.
- Mohorcic, G., V. Kramer, and M. Pregelj, 1974, "Interaction of a Sulfonic Acid Ion Exchange Resin with Tritiated Water on γ -Irradiation," *International Journal of Applied Radiation and Isotopes*, Vol. 25, p. 177-182, Pergamon Press, Northern Ireland.
- Morgan, J. T., et al., 1970, *Gas Evolution from Epoxy Resins by High Energy Radiation*, Rutherford High Energy Lab Report No. RHEL/R-196, August 1970.

- Myron, J. J. J., and G. R. Freeman, 1965, "The Radiolysis of Ethanol, III. Liquid Phase," *Can. J. Chem.*, Vol. 43, p. 381.
- Newton, A. S., 1957a, "Note on the Helium-Ion Radiolysis Products of Liquid Acetic and Propionic Acids," *J. Chem. Phys.*, Vol. 26, Issue 6, p. 1764, June 1957.
- Newton, A. S., 1957b, "Some Aspects of the Radiolysis of Isopropyl Ether," *J. Phys. Chem.*, Vol. 61, Issue 11, p. 1490, November 1957.
- Newton, A. S., 1957c, "A Survey of the Radiation Chemistry of Some Aliphatic Ethers," *J. Phys. Chem.*, Vol. 61, Issue 11, p. 1485, November 1957.
- Newton, A. S., 1963, "Chemical Effects of Ionizing Radiation," *Radiation Effects on Organic Materials*, Academic Press, New York, New York.
- Newton, A. S., and W. R. McDonell, 1956, "The Radiolysis Products from Ethyl Alcohol; Effect of Total Energy Input on the Radiolysis Products," *J. Am. Chem. Soc.*, Vol. 78, 18, p. 4554, September 1956.
- Newton, A. S., and P. O. Strom, 1958, "The Radiation Chemistry of Isopropyl Acetate and Isopropenyl Acetate," *J. Phys. Chem.*, Vol. 62, Issue 1, p. 24, January 1958.
- Ng, M. K. M., and G. R. Freeman, 1965a, "Radiolysis of Diethyl Ether, I. Liquid Phase," *J. Am. Chem. Soc.*, Vol. 87, p. 1635.
- Ng, M. K. M., and G. R. Freeman, 1965b, "Radiolysis of Diethyl Ether, II. Deuterium-Substituted Ethers in the Gas and Liquid Phases," *J. Am. Chem. Soc.*, Vol. 87, p. 1639.
- NRC, 1984, *Clarification of Conditions for Waste Shipments Subject to Hydrogen Gas Generation*, SSINS No. 6835, Information Notice 84-72, U.S. Nuclear Regulatory Commission, September 10, 1984.
- NuPac, 1989, *Safety Analysis Report for the TRUPACT-II Shipping Package*, Nuclear Packaging, Inc., Vol. 1-11, Federal Way, Washington, August 1989.
- Pan, H. P., S. A. Goldblith, and B. E. Proctor, 1958, "Trans-Isomerization of Oleic Acid and Potassium Oleate by Ionizing Radiation," *J. Am. Oil Chemists' Soc.*, Vol. 35, Issue 1, January 1958.
- Pancini, E., V. Santoro, and G. Spadaccini, 1970, " γ -Radiolysis of Alkanes, I. Liquid n-Pentane and n-Hexane," *Int. J. Radiat. Phys. Chem.*, Vol. 2, p. 147.
- Patrick, W. N., and M. Burton, 1954, "Radiation Chemistry of Mixtures: Propionaldehyde and Benzene- d_6 ," *J. Phys. Chem.*, Vol. 58, Issue 5, p. 424, May 1954.

- Pillay, K. K. S., 1980, *Radiation Effects on Ion Exchangers Used in Radioactive Waste Management*, Pennsylvania State University, NE/RWM-80-3, October 1980. Published as Appendix A of Morcos, N., and Weiss, A. J., *Properties of Radioactive Wastes and Waste Containers-Quarterly Progress Report July-Sept. 1980*, NUREG-CR-1868, BNL-NUREG-51316, January 1981.
- Pillay, K. K. S., 1986, "A Review of the Radiation Stability of Ion Exchange Materials," *Journal of Radioanalytical and Nuclear Chemistry, Articles*, Vol. 102, No. 1, p. 247-268.
- Przybytek, J. T., Ph.D., Editor, 1980, *High-Purity Solvent Guide*, Burdick & Jackson Laboratories, Inc., Muskegon, Michigan.
- Ramaradhya, J. M., and G. R. Freeman, 1961, "Radiolysis of Cyclohexane, III. Vapor Phase," *J. Chem. Phys.*, Vol. 34, Issue 5, p. 1726, May 1961.
- Sax, N. I., and R. J. Lewis, Sr., 1987, *Hawley's Condensed Chemical Dictionary*, 11th edition, Van Nostrand Reinhold Company, New York, New York.
- Sieck, L. W., and R. H. Johnsen, 1965, "The Vapor Phase Radiolysis of Ethanol," *J. Phys. Chem.*, Vol. 69, p. 1699.
- Siskind, B., 1992, *Gas Generation from Low-Level Radioactive Waste: Concerns for Disposal*, DE92009157, Brookhaven National Laboratory, Upton, New York.
- Sisman, O., et al., 1963, "Polymers," *Radiation Effects on Organic Materials*, Academic Press, New York, New York.
- Spinks, J. W. T., and R. J. Woods, 1976, *An Introduction to Radiation Chemistry*, 1st edition, John Wiley & Sons, New York, New York.
- Spinks, J. W. T., and R. J. Woods, 1990, *An Introduction to Radiation Chemistry*, 3rd edition, John Wiley & Sons, New York, New York.
- Strong, J. D., and J. G. Burr, 1959, "The Radiolysis of Organic Solutions: I, Acetone as a Trap for Hydrogen Atoms," *J. Am. Chem. Soc.*, Vol. 81, Issue 4, p. 775, February 1959.
- Sworski, T. J., and M. Burton, 1951, "A Study of Impingement-Particle Velocity in Radiolysis of Some Aromatic Hydrocarbons," *J. Am. Chem. Soc.*, Vol. 73, Issue 8, p. 3790, August 1951.
- Swyler, K. J., C. J. Dodge, and R. Dayal, 1983, *Irradiation Effects on the Storage and Disposal of Radwaste Containing Organic Ion-Exchange Media*, NUREG/CR-3383, BNL-NUREG-51691, Brookhaven National Laboratory, Upton, New York, October 1983.

- Swyler, K. J., C. E. Dodge, R. Dayal, and A. J. Weiss, 1982, *Irradiation Effects in the Storage and Disposal of Radioactive Ion-Exchange Resins*, BNL-NUREG-31894, Brookhaven National Laboratory, Upton, New York.
- Taylor, W. H., S. Mori, and M. Burton, 1960, "Radiolysis of Liquid Neopentane," *J. Am. Chem. Soc.*, Vol. 82, Issue 22, p. 5817, November 1960.
- Verdin, D., 1963, "The Radiolysis of the Xylene Isomers and Ethylbenzene," *J. Phys. Chem.*, Vol. 67, p. 1263.
- Wakeford, B. R., and G. R. Freeman, 1964, "Radiolysis of Cyclohexene, I. Pure Liquid," *J. Phys. Chem.*, Vol. 68, p. 2635.
- Walker, D. D., and N. E. Bibler, 1991, *The Dependence of Radiolytic H₂ Generation of the Nitrate Concentration in High-Level Waste Solutions (U)*, DE92040313, Westinghouse Savannah River Company, Aiken, South Carolina.
- Walker, D. D., D. T. Hobbs, J. B. Tiffany, N. E. Bibler, and D. Meisel, 1992, "Nitrous Oxide Production from Radiolysis of Simulated High-Level Nuclear Waste Solutions," DE92015256, *Proceedings of the Waste Management '92 Meeting*, Tucson, Arizona, March 1-5, 1992.
- Wendenburg, J., and A. Henglein, 1962, "Die γ -Radiolyse des Flüssigen Chlorbenzois," *Z. Naturforsch.*, Vol. 17(b), p. 590.
- WHC, 1982, *Door Stop Sample Carrier*, H-2-32514, Rev. 6, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1991, *Safety Analysis Report for Packaging (Onsite) OH-142 Mark I (Big Bertha)*, Rev. 1, WHC-SD-NR-SARP-002, Westinghouse Hanford Company, Richland, Washington, August 1991.
- WHC, 1992a, *Sample Pig Transport System Safety Analysis Report for Packaging (Onsite)*, Rev. 0, WHC-SD-TP-SARP-001, Westinghouse Hanford Company, Richland, Washington, April 1992.
- WHC, 1992b, *Safety Analysis Report for Packaging (Onsite) NCAW Packaging System*, WHC-SD-WM-SARP-005, Westinghouse Hanford Company, Richland, Washington, June 1992.
- WHC, 1992c, *Safety Analysis Report for Packaging (Onsite) Onsite Transfer Cask*, WHC-SD-TP-SARP-002, Westinghouse Hanford Company, Richland, Washington, September 1992.
- WHC, 1993a, *Safety Analysis Report for Packaging (Onsite) Doorstop Sample Carrier System*, WHC-SD-MP-SARP-001, Westinghouse Hanford Company, Richland, Washington, February 1993.

- WHC, 1993b, *Safety Analysis Report for Packaging (Onsite) Single Pass Fuel Cask*, UNI-3419, Westinghouse Hanford Company, Richland, Washington, April 1993.
- WHC, 1993c, *Packaging Design Criteria for PAS-1 Cask*, WHC-SD-TP-PDC-017, Westinghouse Hanford Company, Richland, Washington, December 1993.
- WHC, 1994, *Packaging Design Criteria for the LR-56 Cask System*, WHC-SD-TP-PDC-021, Westinghouse Hanford Company, Richland, Washington, March 1994.
- Whitehead, W. L., C. Goodman, and I. A. Breger, 1951, "The Decomposition of Fatty Acids by Alpha Particles," *J. Chim. Phys.*, Vol. 48, p. 184.
- Wolfram Research, Inc., 1993, *Mathematica*, Version 2.2, Champagne, Illinois.
- Yang, K., and P. J. Manno, 1959, "The Role of Free Radical Processes in the Gamma-Radiolysis of MEthane, Ethane, and Propane," *J. Am. Chem. Soc.*, Vol. 81, Issue 14, p. 3507, July 1959.
- Zerwekh, A., 1979, *Gas Generation from Radiolytic Attack of TRU-Contaminated Hydrogeneous Waste*, LA-7674-MS, Los Alamos National Laboratory, Los Alamos, New Mexico, June 1979.