

# NRRC Specific Regulations

## Compliance with Dose Limits

NRRC-R-01-SR02



هيئة الرقابة النووية والإشعاعية  
Nuclear and Radiological Regulatory Commission

2023

**Specific Regulation**

Compliance with Dose Limits

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NRRC-R-01-SR02



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## Preamble

In accordance with the provisions of the Radiation Safety Regulation (NRRC-R-01), approved by the NRRC's Board of Directors in resolution No. (R/1/1/2022), dated (20) April 2022, in chapter (2) section (10) article (25), this specific regulation establishes specific criteria, conversion factors and other references values that shall be used to support the verification of compliance with the dose limits.

This specific regulation has been prepared on the basis of International Atomic Energy Agency (IAEA) standards, as well as the and the international best practices and the experiences of similar international regulatory bodies, and in accordance with the Kingdom's international commitments, and it has been approved by the NRRC's CEO resolution No. 1125, dated 09/04/2023.

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## Chapter 1: Objective, Scope, and Definitions

### Section 1: Objective

1. The objective of this specific regulation is to provide specific criteria, conversion factors and parameters to support the verification of compliance with the dose limit established in the Regulation on Radiation Safety (NRRC-R-01).

### Section 2: Scope

2. This specific regulation shall apply to assessing the occupational and public exposure with the purpose of verifying compliance with dose limits.

### Section 3: Definitions

#### *Committed effective dose, $E(\tau)$*

The quantity  $E(\tau)$ , defined as:

$$E(\tau) = \sum_T w_T H_T(\tau)$$

where  $H_T(\tau)$  is the committed equivalent dose to tissue or organ T over the integration time  $\tau$  elapsed after an intake of radioactive substances and  $w_T$  is the tissue weighting factor for tissue or organ T. When  $\tau$  is not specified, it will be taken to be 50 years for adults and the time to age 70 years for intakes by children.

#### *Directional dose equivalent, $H'(d, \Omega)$*

The dose equivalent that would be produced by the corresponding expanded field in the International Commission on Radiation Units and Measurements ICRU sphere at a depth  $d$  on a radius in a specified direction  $\Omega$ .



- Parameter defined at a point in a radiation field. Used as a directly measurable proxy (i.e. substitute) for equivalent dose in the skin for use in monitoring of external exposure.
- The recommended value of "d" for weakly penetrating radiation is 0.07 mm

***kerma, K***

The quantity K, defined as:

$$K = \frac{dE}{dm}$$

where  $dE_{tr}$  is the sum of the initial kinetic energies of all charged ionizing particles liberated by uncharged ionizing particles in a material of mass  $dm$ .

The SI unit for kerma is joule per kilogram (J/kg), termed the gray (Gy).

***Air kerma.***

The kerma value for air.

- Under charged particle equilibrium conditions, the air kerma (in grays) is numerically approximately equal to the absorbed dose in air (in grays).

***Reference air kerma rate.***

The kerma rate to air, in air, at a reference distance of 1 m, corrected for air attenuation and scattering.

-This quantity is expressed in  $\mu\text{Gy/h}$  at 1 m.

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**Particle fluence,  $\Phi$ .**

A measure of the density of particles in a radiation field, defined as:

$$\Phi = \frac{dN}{da}$$

where  $dN$  is the number of particles incident on a sphere of cross-sectional area  $da$ .

**Personal dose equivalent,  $H_p(d)$**

The dose equivalent in soft tissue below a specified point on the body at an appropriate depth  $d$ .

- Parameter used as a directly measurable proxy (i.e. substitute) for equivalent dose in tissues or organs or (with  $d = 10$  mm) for effective dose, in individual monitoring of external exposure.
- The recommended values of "d" are 10 mm for strongly penetrating radiation and 0.07 mm for weakly penetrating radiation for whole body monitoring.
- $H_p(0.07)$  is used for monitoring for hands and feet for all radiation types.
- $H_p(3)$  is used for monitoring exposure of the lens of the eye.
- 'Soft tissue' is commonly interpreted as the International Commission on Radiation Units and Measurements ICRU sphere.



## **Chapter 2: Compliance with Dose Limits**

3. The effective dose limits specified in the Regulation on Radiation Safety (NRRC-R-01) shall apply to the sum of the relevant doses from external exposure in the specified period and the relevant committed doses from intakes in the same period; the period for calculating the committed dose shall normally be 50 years for intakes by adults and shall be up to age 70 years for intakes by children.
4. For occupational exposure, the Personal Dose Equivalent Hp (10) may be used as an approximation of the Effective Dose from external exposure to penetrating radiation.
5. The equivalent dose limits for the skin apply to the average dose over 1 cm<sup>2</sup> of the most highly irradiated area of the skin. The dose to the skin also contributes to the effective dose. This contribution is the average dose to the entire skin multiplied by the tissue weighting factor for the skin.
6. Values of the Effective Dose per unit air kerma free-in-air and per unit particle fluence are given in Tables I.A – I.D.
7. Doses per unit intake (dose coefficients) for the estimation of the Committed Effective Dose for ingestion and inhalation of radionuclides are given in Tables II.A – II. H.

**Table I.A. conversion coefficients from air kerma free-in-air to Hp(10,0°) in an international commission on radiation units and measurements icru slab (photons)**

Photon energy (MeV)	Hp(0.07,0°)/K (Sv/Gy)	Photon energy (MeV)	Hp(0.07,0°)/K (Sv/Gy)
0.010	0.009	0.150	1.607
0.0125	0.098	0.200	1.492
0.015	0.264	0.300	1.369
0.0175	0.445	0.400	1.300
0.020	0.611	0.500	1.256
0.025	0.883	0.600	1.226
0.030	1.112	0.800	1.190
0.040	1.490	1.0	1.167
0.050	1.766	1.5	1.139
0.060	1.892	3.0	1.117
0.080	1.903	6.0	1.109
0.100	1.811	10.0	1.111
0.125	1.696		

**TABLE I.B. Conversion Coefficients From Air Kerma Free-In-Air To H<sub>p</sub> (0.07,0°) In An International Commission On Radiation Units And Measurements Icru Slab (Photons)**

Neutron energy (MeV)	Hp(0.07,0°)/K (Sv/Gy)	Neutron energy (MeV)	Hp(0.07,0°)/K (Sv/Gy)
0.005	0.750	0.100	1.669
0.010	0.947	0.150	1.518
0.015	0.981	0.200	1.432
0.020	1.045	0.300	1.336
0.030	1.230	0.400	1.280
0.040	1.444	0.500	1.244
0.050	1.632	0.600	1.220
0.060	1.716	0.800	1.189
0.080	1.732	1.000	1.173

**Table I.C. Effective Dose Per Unit Neutron Fluence  $E/\Phi$  for Monoenergetic Neutrons Incident In International Organization for Standardization Geometry on An Adult Anthropomorphic Computational Phantom**

Electron energy (MeV)	$E/\Phi$ (pSv·cm <sup>2</sup> )	Neutron energy (MeV)	$E/\Phi$ (pSv·cm <sup>2</sup> )
$1.00 \times 10^{-9}$	2.40	$1.50 \times 10^{-1}$	35.2
$1.00 \times 10^{-8}$	2.89	$2.00 \times 10^{-1}$	42.4
$2.53 \times 10^{-8}$	3.30	$3.00 \times 10^{-1}$	54.7
$1.00 \times 10^{-7}$	4.13	$5.00 \times 10^{-1}$	75.0
$2.00 \times 10^{-7}$	4.59	$7.00 \times 10^{-1}$	92.8
$5.00 \times 10^{-7}$	5.20	$9.00 \times 10^{-1}$	108
$1.00 \times 10^{-6}$	5.63	$1.00 \times 10^0$	116
$2.00 \times 10^{-6}$	5.96	$1.20 \times 10^0$	130
$5.00 \times 10^{-6}$	6.28	$2.00 \times 10^0$	178
$1.00 \times 10^{-5}$	6.44	$3.00 \times 10^0$	220
$2.00 \times 10^{-5}$	6.51	$4.00 \times 10^0$	250
$5.00 \times 10^{-5}$	6.51	$5.00 \times 10^0$	272
$1.00 \times 10^{-4}$	6.45	$6.00 \times 10^0$	282
$2.00 \times 10^{-4}$	6.32	$7.00 \times 10^0$	290
$5.00 \times 10^{-4}$	6.14	$8.00 \times 10^0$	297
$1.00 \times 10^{-3}$	6.04	$9.00 \times 10^0$	303
$2.00 \times 10^{-3}$	6.05	$1.00 \times 10^1$	309
$5.00 \times 10^{-3}$	6.52	$1.20 \times 10^1$	322
$1.00 \times 10^{-2}$	7.70	$1.40 \times 10^1$	333
$2.00 \times 10^{-2}$	10.2	$1.50 \times 10^1$	338
$3.00 \times 10^{-2}$	12.7	$1.60 \times 10^1$	342
$5.00 \times 10^{-2}$	17.3	$1.80 \times 10^1$	345
$7.00 \times 10^{-2}$	21.5	$2.00 \times 10^1$	343
$1.00 \times 10^{-1}$	25.2		

**Table I.D. Reference Conversion Coefficients From Fluence To Directional Dose Equiva-Lent For Monoenergetic Electrons and Normal Incidence**

Electron energy (MeV)	$H\Phi(0.07,0^\circ)/\Phi$ (nSv·cm <sup>2</sup> )	$H'(3,0^\circ)/\Phi$ (nSv·cm <sup>2</sup> )	$H'(10,0^\circ)/\Phi$ (nSv·cm <sup>2</sup> )
0.07	0.221		
0.08	1.056		
0.09	1.527		
0.1	1.661		
0.1125	1.627		
0.125	1.513		
0.15	1.229		
0.2	0.834		
0.3	0.542		
0.4	0.455		
0.5	0.403		
0.6	0.366		
0.7	0.344	0	
0.8	0.329	0.045	
1	0.312	0.301	
1.25	0.296	0.486	
1.5	0.287	0.524	
1.75	0.282	0.512	0
2	0.279	0.481	0.005
2.5	0.278	0.417	0.156
3	0.276	0.373	0.336
3.5	0.274	0.351	0.421
4	0.272	0.334	0.447
5	0.271	0.317	0.43
6	0.271	0.309	0.389
7	0.271	0.306	0.36
8	0.271	0.305	0.341
10	0.275	0.303	0.33

Table II.A. Workers: Committed Effective Dose Per Unit Intake E(G) Via Inhalation and Ingestion (Sv/Bq)

Radionuclides	Physical half-life	Inhalation			Ingestion		
		Type	$f_i$	$e(g)_{1\mu m}$	$e(g)_{5\mu m}$	$f_i$	$e(g)$
<b>Hydrogen</b>							
Tritiated water	12.3 a					1.000	$1.8 \times 10^{-11}$
Organically bound tritium	12.3 a					1.000	$4.2 \times 10^{-11}$
<b>Beryllium</b>							
Be-7	53.3 d	M	0.005	$4.8 \times 10^{-11}$	$4.3 \times 10^{-11}$	0.005	$2.8 \times 10^{-11}$
		S	0.005	$5.2 \times 10^{-11}$	$4.6 \times 10^{-11}$		
Be	$1.60 \times 10^6$ a	M	0.005	$9.1 \times 10^{-9}$	$6.7 \times 10^{-9}$	0.005	$1.1 \times 10^{-9}$
		S	0.005	$3.2 \times 10^{-8}$	$1.9 \times 10^{-8}$		
<b>Carbon</b>							
C-11	0.340 h					1.000	$2.4 \times 10^{-11}$
C-14	$5.73 \times 10^3$ a					1.000	$5.8 \times 10^{-10}$
<b>Fluorine</b>							
F-18	1.83 h	F	1.000	$3.0 \times 10^{-11}$	$5.4 \times 10^{-11}$	1.000	$4.9 \times 10^{-11}$
		M	1.000	$5.7 \times 10^{-11}$	$8.9 \times 10^{-11}$		
		S	1.000	$6.0 \times 10^{-11}$	$9.3 \times 10^{-11}$		

Table II.A. Workers: Committed Effective Dose Per Unit Intake E(G) Via Inhalation and Ingestion (Sv/Bq)

Radionuclides	Physical half-life	Type	Inhalation		Ingestion		
			$f_1$	$e(g)_{1\mu m}$	$e(g)_{5\mu m}$	$f_1$	$e(g)$
<b>Sodium</b>							
Na-22	2.60 a	F	1.000	$1.3 \times 10^{-9}$	$2.0 \times 10^{-9}$	1.000	$3.2 \times 10^{-9}$
Na-24	15.0 h	F	1.000	$2.9 \times 10^{-10}$	$5.3 \times 10^{-10}$	1.000	$4.3 \times 10^{-10}$
<b>Magnesium</b>							
Mg-28	20.9 h	F	0.500	$6.4 \times 10^{-10}$	$1.1 \times 10^{-9}$	0.500	$2.2 \times 10^{-9}$
		M	0.500	$1.2 \times 10^{-9}$	$1.7 \times 10^{-9}$		
<b>Aluminium</b>							
Al-26	$7.16 \times 10^5$ a	F	0.010	$1.1 \times 10^{-8}$	$1.4 \times 10^{-8}$	0.010	$3.5 \times 10^{-9}$
		M	0.010	$1.8 \times 10^{-8}$	$1.2 \times 10^{-8}$		
						1.000	$2.4 \times 10^{-11}$
<b>Silicon</b>							
Si-31	2.62 h	F	0.010	$2.9 \times 10^{-11}$	$5.1 \times 10^{-11}$	0.010	$1.6 \times 10^{-10}$
		M	0.010	$7.5 \times 10^{-11}$	$1.1 \times 10^{-10}$		
		S	0.010	$8.0 \times 10^{-11}$	$1.1 \times 10^{-10}$		
Si-32	$4.50 \times 10^2$ a	F	0.010	$3.2 \times 10^{-9}$	$3.7 \times 10^{-9}$	0.010	$5.6 \times 10^{-10}$
		M	0.010	$1.5 \times 10^{-8}$	$9.6 \times 10^{-9}$		
		S	0.010	$1.1 \times 10^{-7}$	$5.5 \times 10^{-8}$		

Table II.A. Workers: Committed Effective Dose Per Unit Intake E(G) Via Inhalation and Ingestion (Sv/Bq)

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{1\mu m}$	$f_1$	$e(g)$
<b>Phosphorus</b>						
P-32	14.3 d	F	0.800	$8.0 \times 10^{-10}$	0.800	$2.4 \times 10^{-9}$
		M	0.800	$3.2 \times 10^{-9}$		
P-33	25.4 d	F	0.800	$9.6 \times 10^{-11}$	0.800	$2.4 \times 10^{-10}$
		M	0.800	$1.4 \times 10^{-9}$		
<b>Sulphur</b>						
S-35	87.4 d	F	0.800	$5.3 \times 10^{-11}$	0.800	$1.4 \times 10^{-10}$
(inorganic)		M	0.800	$1.3 \times 10^{-9}$	0.100	$1.9 \times 10^{-10}$
S-35	87.4 d				1.000	$7.7 \times 10^{-10}$
(organic)						
<b>Chlorine</b>						
Cl-36	$3.01 \times 10^5$ a	F	1.000	$3.4 \times 10^{-10}$	1.000	$9.3 \times 10^{-10}$
		M	1.000	$6.9 \times 10^{-9}$		
Cl-38	0.620 h	F	1.000	$2.7 \times 10^{-11}$	1.000	$1.2 \times 10^{-10}$
		M	1.000	$4.7 \times 10^{-11}$		
Cl-39	0.927 h	F	1.000	$2.7 \times 10^{-11}$	1.000	$8.5 \times 10^{-11}$
		S	0.010	$1.1 \times 10^{-7}$		
		M	1.000	$4.8 \times 10^{-11}$		
<b>Potassium</b>						
K-40	$1.28 \times 10^9$ a	F	1.000	$2.1 \times 10^{-9}$	1.000	$6.2 \times 10^{-9}$
K-42	12.4 h	F	1.000	$1.3 \times 10^{-10}$	1.000	$4.3 \times 10^{-10}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{\mu m}$	$f_1$	$e(g)$
K-43	22.6 h	F	1.000	$1.5 \times 10^{-10}$	1.000	$2.5 \times 10^{-10}$
K-44	0.369 h	F	1.000	$2.1 \times 10^{-11}$	1.000	$8.4 \times 10^{-11}$
K-45	0.333 h	F	1.000	$1.6 \times 10^{-11}$	1.000	$5.4 \times 10^{-11}$
<b>Calcium</b>						
Ca-41	$1.40 \times 10^5$ a	M	0.300	$1.7 \times 10^{-10}$	0.300	$2.9 \times 10^{-10}$
Ca-45	163 d	M	0.300	$2.7 \times 10^{-9}$	0.300	$7.6 \times 10^{-10}$
Ca-47	4.53 d	M	0.300	$1.8 \times 10^{-9}$	0.300	$1.6 \times 10^{-9}$
<b>Scandium</b>						
Sc-43	3.89 h	S	$1.0 \times 10^{-4}$	$1.2 \times 10^{-10}$	$1.0 \times 10^{-4}$	$1.9 \times 10^{-10}$
Sc-44	3.93 h	S	$1.0 \times 10^{-4}$	$1.9 \times 10^{-10}$	$1.0 \times 10^{-4}$	$3.5 \times 10^{-10}$
Sc-44m	2.44 d	S	$1.0 \times 10^{-4}$	$1.5 \times 10^{-9}$	$1.0 \times 10^{-4}$	$2.4 \times 10^{-9}$
Sc-46	83.8 d	S	$1.0 \times 10^{-4}$	$6.4 \times 10^{-9}$	$1.0 \times 10^{-4}$	$1.5 \times 10^{-9}$
Sc-47	3.35 d	S	$1.0 \times 10^{-4}$	$7.0 \times 10^{-10}$	$1.0 \times 10^{-4}$	$5.4 \times 10^{-10}$
Sc-48	1.82 d	S	$1.0 \times 10^{-4}$	$1.1 \times 10^{-9}$	$1.0 \times 10^{-4}$	$1.7 \times 10^{-9}$
Sc-49	0.956 h	S	$1.0 \times 10^{-4}$	$4.1 \times 10^{-11}$	$1.0 \times 10^{-4}$	$8.2 \times 10^{-11}$
<b>Titanium</b>						
Ti-44	47.3 a	F	0.010	$6.1 \times 10^{-8}$	0.010	$5.8 \times 10^{-9}$
		M	0.010	$4.0 \times 10^{-8}$		
		S	0.010	$1.2 \times 10^{-7}$		



Table II.A. Workers: Committed Effective Dose Per Unit Intake E(G) Via Inhalation and Ingestion (Sv/Bq) (Cont.)

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{1\mu m}$	$f_1$	$e(g)_{5\mu m}$
<b>Manganese</b>						
Mn-51	0.770 h	F	0.100	$2.4 \times 10^{-11}$		$4.2 \times 10^{-11}$
		M	0.100	$4.3 \times 10^{-11}$		$6.8 \times 10^{-11}$
Mn-52	5.59 d	F	0.100	$9.9 \times 10^{-10}$		$1.6 \times 10^{-9}$
		M	0.100	$1.4 \times 10^{-9}$		$1.8 \times 10^{-9}$
Mn-52m	0.352 h	F	0.100	$2.0 \times 10^{-11}$		$3.5 \times 10^{-11}$
		M	0.100	$3.0 \times 10^{-11}$		$5.0 \times 10^{-11}$
Mn-53	$3.70 \times 10^6$ a	F	0.100	$2.9 \times 10^{-11}$		$3.6 \times 10^{-11}$
		M	0.100	$5.2 \times 10^{-11}$		$3.6 \times 10^{-11}$
Mn-54	312 d	F	0.100	$8.7 \times 10^{-10}$		$1.1 \times 10^{-9}$
		M	0.100	$1.5 \times 10^{-9}$		$1.2 \times 10^{-9}$
Mn-56	2.58 h	F	0.100	$6.9 \times 10^{-11}$		$1.2 \times 10^{-10}$
		M	0.100	$1.3 \times 10^{-10}$		$2.0 \times 10^{-10}$
<b>Iron</b>						
Fe-52	8.28 h	F	0.100	$4.1 \times 10^{-10}$		$6.9 \times 10^{-10}$
		M	0.100	$6.3 \times 10^{-10}$		$9.5 \times 10^{-10}$
Fe-55	2.70 a	F	0.100	$7.7 \times 10^{-10}$		$9.2 \times 10^{-10}$
		M	0.100	$3.7 \times 10^{-10}$		$3.3 \times 10^{-10}$
Fe-59	44.5 d	F	0.100	$2.2 \times 10^{-9}$		$3.0 \times 10^{-9}$
		M	0.100	$3.5 \times 10^{-9}$		$3.2 \times 10^{-9}$
Fe-60	$1.00 \times 10^5$ a	F	0.100	$2.8 \times 10^{-7}$		$3.3 \times 10^{-7}$
		M	0.100	$1.3 \times 10^{-7}$		$1.2 \times 10^{-7}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{1\mu m}$	$f_1$	$e(g)_{5\mu m}$
Cobalt						
Co-55	17.5 h	M	0.100	$5.1 \times 10^{-10}$		$1.0 \times 10^{-9}$
		S	0.050	$5.5 \times 10^{-10}$		$1.1 \times 10^{-9}$
Co-56	78.7 d	M	0.100	$4.6 \times 10^{-9}$		$2.5 \times 10^{-9}$
		S	0.050	$6.3 \times 10^{-9}$		$2.3 \times 10^{-9}$
Co-57	271 d	M	0.100	$5.2 \times 10^{-10}$		$2.1 \times 10^{-10}$
		S	0.050	$9.4 \times 10^{-10}$		$1.9 \times 10^{-10}$
Co-58	70.8 d	M	0.100	$1.5 \times 10^{-9}$		$7.4 \times 10^{-10}$
		S	0.050	$2.0 \times 10^{-9}$		$7.0 \times 10^{-10}$
Co-58m	9.15 h	M	0.100	$1.3 \times 10^{-11}$		$2.4 \times 10^{-11}$
		S	0.050	$1.6 \times 10^{-11}$		$2.4 \times 10^{-11}$
Co-60	5.27 a	M	0.100	$9.6 \times 10^{-9}$		$3.4 \times 10^{-9}$
		S	0.050	$2.9 \times 10^{-8}$		$2.5 \times 10^{-9}$
Co-60m	0.174 h	M	0.100	$1.1 \times 10^{-12}$		$1.7 \times 10^{-12}$
		S	0.050	$1.3 \times 10^{-12}$		$1.7 \times 10^{-12}$
Co-61	1.65 h	M	0.100	$4.8 \times 10^{-11}$		$7.4 \times 10^{-11}$
		S	0.050	$5.1 \times 10^{-11}$		$7.4 \times 10^{-11}$
Co-62m	0.232 h	M	0.100	$2.1 \times 10^{-11}$		$4.7 \times 10^{-11}$
		S	0.050	$2.2 \times 10^{-11}$		$4.7 \times 10^{-11}$

Table II.A. Workers: Committed Effective Dose Per Unit Intake E(G) Via Inhalation and Ingestion (Sv/Bq) (Cont.)

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_i$	$e(g)_{1\mu m}$	$f_i$	$e(g)$
<b>Nickel</b>						
Ni-56	6.10 d	F	0.050	$5.1 \times 10^{-10}$	0.050	$8.6 \times 10^{-10}$
		M	0.050	$8.6 \times 10^{-10}$		
Ni-57	1.50 d	F	0.050	$2.8 \times 10^{-10}$	0.050	$8.7 \times 10^{-10}$
		M	0.050	$5.1 \times 10^{-10}$		
Ni-59	$7.50 \times 10^4$ a	F	0.050	$1.8 \times 10^{-10}$	0.050	$6.3 \times 10^{-11}$
		M	0.050	$1.3 \times 10^{-10}$		
Ni-63	96.0 a	F	0.050	$4.4 \times 10^{-10}$	0.050	$1.5 \times 10^{-10}$
		M	0.050	$4.4 \times 10^{-10}$		
Ni-65	2.52 h	F	0.050	$4.4 \times 10^{-11}$	0.050	$1.8 \times 10^{-10}$
		M	0.050	$8.7 \times 10^{-11}$		
Ni-66	2.27 d	F	0.050	$4.5 \times 10^{-10}$	0.050	$3.0 \times 10^{-9}$
		M	0.050	$1.6 \times 10^{-9}$		
<b>Copper</b>						
Cu-60	0.387 h	F	0.500	$2.4 \times 10^{-11}$	0.500	$7.0 \times 10^{-11}$
		M	0.500	$3.5 \times 10^{-11}$		
		S	0.500	$3.6 \times 10^{-11}$		
Cu-61	3.41 h	F	0.500	$4.0 \times 10^{-11}$	0.500	$1.2 \times 10^{-10}$
		M	0.500	$7.6 \times 10^{-11}$		

Table II.A. Workers: Committed Effective Dose Per Unit Intake E(G) Via Inhalation and Ingestion (Sv/Bq) (Cont.)

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_i$	$e(g)_{\mu m}$	$f_i$	$e(g)$
Cu-64	12.7 h	F	0.500	$3.8 \times 10^{-11}$	0.500	$1.2 \times 10^{-10}$
		M	0.500	$1.1 \times 10^{-10}$		
		S	0.500	$1.2 \times 10^{-10}$		
Cu-67	2.58 d	F	0.500	$1.1 \times 10^{-10}$	0.500	$3.4 \times 10^{-10}$
		M	0.500	$5.2 \times 10^{-10}$		
		S	0.500	$5.8 \times 10^{-10}$		
<b>Zinc</b>						
Zn-62	9.26 h	S	0.500	$4.7 \times 10^{-10}$	0.500	$9.4 \times 10^{-10}$
Zn-63	0.635 h	S	0.500	$3.8 \times 10^{-11}$	0.500	$7.9 \times 10^{-11}$
Zn-65	244 d	S	0.500	$2.9 \times 10^{-9}$	0.500	$3.9 \times 10^{-9}$
Zn-69	0.950 h	S	0.500	$2.8 \times 10^{-11}$	0.500	$3.1 \times 10^{-11}$
Zn-69m	13.8 h	S	0.500	$2.6 \times 10^{-10}$	0.500	$3.3 \times 10^{-10}$
Zn-71m	3.92 h	S	0.500	$1.6 \times 10^{-10}$	0.500	$2.4 \times 10^{-10}$
Zn-72	1.94 d	S	0.500	$1.2 \times 10^{-9}$	0.500	$1.4 \times 10^{-9}$
<b>Gallium</b>						
Ga-65	0.253 h	F	0.001	$1.2 \times 10^{-11}$	0.001	$3.7 \times 10^{-11}$
Ga-66	9.40 h	M	0.001	$1.8 \times 10^{-11}$		
		F	0.001	$2.7 \times 10^{-10}$	0.001	$1.2 \times 10^{-9}$
		M	0.001	$4.6 \times 10^{-10}$		
Ga-67	3.26 d	F	0.001	$6.8 \times 10^{-11}$	0.001	$1.9 \times 10^{-10}$
Ga-67	3.26 d	M	0.001	$2.3 \times 10^{-10}$		
						$2.8 \times 10^{-10}$

Table II.A. Workers: Committed Effective Dose Per Unit Intake E(G) Via Inhalation and Ingestion (Sv/Bq) (Cont.)

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_i$	$e(g)_{1\mu m}$	$f_i$	$e(g)$
Cu-64	12.7 h	F	0.500	$3.8 \times 10^{-11}$	0.500	$1.2 \times 10^{-10}$
		M	0.500	$1.1 \times 10^{-10}$		
		S	0.500	$1.2 \times 10^{-10}$		
Cu-67	2.58 d	F	0.500	$1.1 \times 10^{-10}$	0.500	$3.4 \times 10^{-10}$
		M	0.500	$5.2 \times 10^{-10}$		
		S	0.500	$5.8 \times 10^{-10}$		
<b>Zinc</b>						
Zn-62	9.26 h	S	0.500	$4.7 \times 10^{-10}$	0.500	$9.4 \times 10^{-10}$
Zn-63	0.635 h	S	0.500	$3.8 \times 10^{-11}$	0.500	$7.9 \times 10^{-11}$
Zn-65	244 d	S	0.500	$2.9 \times 10^{-9}$	0.500	$3.9 \times 10^{-9}$
Zn-69	0.950 h	S	0.500	$2.8 \times 10^{-11}$	0.500	$3.1 \times 10^{-11}$
Zn-69m	13.8 h	S	0.500	$2.6 \times 10^{-10}$	0.500	$3.3 \times 10^{-10}$
Zn-71m	3.92 h	S	0.500	$1.6 \times 10^{-10}$	0.500	$2.4 \times 10^{-10}$
Zn-72	1.94 d	S	0.500	$1.2 \times 10^{-9}$	0.500	$1.4 \times 10^{-9}$
<b>Gallium</b>						
Ga-65	0.253 h	F	0.001	$1.2 \times 10^{-11}$	0.001	$3.7 \times 10^{-11}$
		M	0.001	$1.8 \times 10^{-11}$		
Ga-66	9.40 h	F	0.001	$2.7 \times 10^{-10}$	0.001	$1.2 \times 10^{-9}$
		M	0.001	$4.6 \times 10^{-10}$		
Ga-67	3.26 d	F	0.001	$6.8 \times 10^{-11}$	0.001	$1.9 \times 10^{-10}$
		M	0.001	$2.3 \times 10^{-10}$		

Table II.A. Workers: Committed Effective Dose Per Unit Intake E(G) Via Inhalation and Ingestion (Sv/Bq) (Cont.)

Radionuclides	Physical half-life	Type	Inhalation		Ingestion		
			$f_1$	$e(g)_{1\mu m}$	$e(g)_{5\mu m}$	$f_1$	$e(g)$
Ga-68	1.13 h	F	0.001	$2.8 \times 10^{-11}$	$4.9 \times 10^{-11}$	0.001	$1.0 \times 10^{-10}$
		M	0.001	$5.1 \times 10^{-11}$	$8.1 \times 10^{-11}$		
Ga-70	0.353 h	F	0.001	$9.3 \times 10^{-12}$	$1.6 \times 10^{-11}$	0.001	$3.1 \times 10^{-11}$
		M	0.001	$1.6 \times 10^{-11}$	$2.6 \times 10^{-11}$		
Ga-72	14.1 h	F	0.001	$3.1 \times 10^{-10}$	$5.6 \times 10^{-10}$	0.001	$1.1 \times 10^{-9}$
		M	0.001	$5.5 \times 10^{-10}$	$8.4 \times 10^{-10}$		
Ga-73	4.91 h	F	0.001	$5.8 \times 10^{-11}$	$1.0 \times 10^{-10}$	0.001	$2.6 \times 10^{-10}$
		M	0.001	$1.5 \times 10^{-10}$	$2.0 \times 10^{-10}$		
<b>Germanium</b>							
Ge-66	2.27 h	F	1.000	$5.7 \times 10^{-11}$	$9.9 \times 10^{-11}$	1.000	$1.0 \times 10^{-10}$
		M	1.000	$9.2 \times 10^{-11}$	$1.3 \times 10^{-10}$		
Ge-67	0.312 h	F	1.000	$1.6 \times 10^{-11}$	$2.8 \times 10^{-11}$	1.000	$6.5 \times 10^{-11}$
		M	1.000	$2.6 \times 10^{-11}$	$4.2 \times 10^{-11}$		
Ge-68	288 d	F	1.000	$5.4 \times 10^{-10}$	$8.3 \times 10^{-10}$	1.000	$1.3 \times 10^{-9}$
		M	1.000	$1.3 \times 10^{-8}$	$7.9 \times 10^{-9}$		
Ge-69	1.63 d	F	1.000	$1.4 \times 10^{-10}$	$2.5 \times 10^{-10}$	1.000	$2.4 \times 10^{-10}$
		M	1.000	$2.9 \times 10^{-10}$	$3.7 \times 10^{-10}$		
Ge-71	11.8 d	F	1.000	$5.0 \times 10^{-12}$	$7.8 \times 10^{-12}$	1.000	$1.2 \times 10^{-11}$
		M	1.000	$1.0 \times 10^{-11}$	$1.1 \times 10^{-11}$		
Ge-75	1.38 h	F	1.000	$1.6 \times 10^{-11}$	$2.7 \times 10^{-11}$	1.000	$4.6 \times 10^{-11}$
		M	1.000	$3.7 \times 10^{-11}$	$5.4 \times 10^{-11}$		

Table II.A. workers: committed effective dose per unit intake e(g) via inhalation and ingestion (sv/bq) (cont.)

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{1\mu m}$	$f_1$	$e(g)_{5\mu m}$
Ge-77	11.3 h	F	1.000	$1.5 \times 10^{-10}$	1.000	$3.3 \times 10^{-10}$
		M	1.000	$3.6 \times 10^{-10}$		
Ge-78	1.45 h	F	1.000	$4.8 \times 10^{-11}$	1.000	$1.2 \times 10^{-10}$
		M	1.000	$9.7 \times 10^{-11}$		
<b>Arsenic</b>						
As-69	0.253 h	M	0.500	$2.2 \times 10^{-11}$	0.500	$5.7 \times 10^{-11}$
As-70	0.876 h	M	0.500	$7.2 \times 10^{-11}$	0.500	$1.3 \times 10^{-10}$
As-71	2.70 d	M	0.500	$4.0 \times 10^{-10}$	0.500	$4.6 \times 10^{-10}$
As-72	1.08 d	M	0.500	$9.2 \times 10^{-10}$	0.500	$1.8 \times 10^{-9}$
As-73	80.3 d	M	0.500	$9.3 \times 10^{-10}$	0.500	$2.6 \times 10^{-10}$
As-74	17.8 d	M	0.500	$2.1 \times 10^{-9}$	0.500	$1.3 \times 10^{-9}$
As-76	1.10 d	M	0.500	$7.4 \times 10^{-10}$	0.500	$1.6 \times 10^{-9}$
As-77	1.62 d	M	0.500	$3.8 \times 10^{-10}$	0.500	$4.0 \times 10^{-10}$
As-78	1.51 h	M	0.500	$9.2 \times 10^{-11}$	0.500	$2.1 \times 10^{-10}$
<b>Selenium</b>						
Se-70	0.683 h	F	0.800	$4.5 \times 10^{-11}$	0.800	$1.2 \times 10^{-10}$
Se-73	7.15 h	M	0.800	$7.3 \times 10^{-11}$	0.050	$1.4 \times 10^{-10}$
		F	0.800	$8.6 \times 10^{-11}$	0.800	$2.1 \times 10^{-10}$
Se-73m	0.650 h	M	0.800	$1.6 \times 10^{-10}$	0.050	$3.9 \times 10^{-10}$
		F	0.800	$9.9 \times 10^{-12}$	0.800	$2.8 \times 10^{-11}$
		M	0.800	$1.8 \times 10^{-11}$	0.050	$4.1 \times 10^{-11}$

Table II.A. Workers: Committed Effective Dose Per Unit Intake E(G) Via Inhalation and Ingestion (Sv/Bq) (Cont.)

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_i$	$e(g)_{i\mu m}$	$f_i$	$e(g)$
Se-75	120 d	F	0.800	$1.0 \times 10^{-9}$	0.800	$2.6 \times 10^{-9}$
		M	0.800	$1.4 \times 10^{-9}$	0.050	$4.1 \times 10^{-10}$
Se-79	$6.50 \times 10^4$ a	F	0.800	$1.2 \times 10^{-9}$	0.800	$2.9 \times 10^{-9}$
		M	0.800	$2.9 \times 10^{-9}$	0.050	$3.9 \times 10^{-10}$
Se-81	0.308 h	F	0.800	$8.6 \times 10^{-12}$	0.800	$2.7 \times 10^{-11}$
		M	0.800	$1.5 \times 10^{-11}$	0.050	$2.7 \times 10^{-11}$
Se-81m	0.954 h	F	0.800	$1.7 \times 10^{-11}$	0.800	$5.3 \times 10^{-11}$
		M	0.800	$4.7 \times 10^{-11}$	0.050	$5.9 \times 10^{-11}$
Se-83	0.375 h	F	0.800	$1.9 \times 10^{-11}$	0.800	$4.7 \times 10^{-11}$
		M	0.800	$3.3 \times 10^{-11}$	0.050	$5.1 \times 10^{-11}$
<b>Bromine</b>						
Br-74	0.422 h	F	1.000	$2.8 \times 10^{-11}$	1.000	$8.4 \times 10^{-11}$
		M	1.000	$4.1 \times 10^{-11}$		
Br-74m	0.691 h	F	1.000	$4.2 \times 10^{-11}$	1.000	$1.4 \times 10^{-10}$
		M	1.000	$6.5 \times 10^{-11}$		
Br-75	1.63 h	F	1.000	$3.1 \times 10^{-11}$	1.000	$7.9 \times 10^{-11}$
		M	1.000	$5.5 \times 10^{-11}$		
Br-76	16.2 h	F	1.000	$2.6 \times 10^{-10}$	1.000	$4.6 \times 10^{-10}$
		M	1.000	$4.2 \times 10^{-10}$		
Br-77	2.33 d	F	1.000	$6.7 \times 10^{-11}$	1.000	$9.6 \times 10^{-11}$
		M	1.000	$8.7 \times 10^{-11}$		
Br-80	0.290 h	F	1.000	$6.3 \times 10^{-12}$	1.000	$3.1 \times 10^{-11}$



Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_i$	$e(g)_{1\mu m}$	$f_i$	$e(g)$
Br-80m	4.42 h	M	1.000	$1.0 \times 10^{-11}$		
		F	1.000	$3.5 \times 10^{-11}$	1.000	$1.1 \times 10^{-10}$
		M	1.000	$7.6 \times 10^{-11}$		
Br-82	1.47 d	F	1.000	$3.7 \times 10^{-10}$	1.000	$5.4 \times 10^{-10}$
		M	1.000	$6.4 \times 10^{-10}$		
Br-83	2.39 h	F	1.000	$1.7 \times 10^{-11}$	1.000	$4.3 \times 10^{-11}$
		M	1.000	$4.8 \times 10^{-11}$		
Br-84	0.530 h	F	1.000	$2.3 \times 10^{-11}$	1.000	$8.8 \times 10^{-11}$
		M	1.000	$3.9 \times 10^{-11}$		
<b>Rubidium</b>						
Rb-79	0.382 h	F	1.000	$1.7 \times 10^{-11}$	1.000	$5.0 \times 10^{-11}$
Rb-81	4.58 h	F	1.000	$3.7 \times 10^{-11}$	1.000	$5.4 \times 10^{-11}$
Rb-81m	0.533 h	F	1.000	$7.3 \times 10^{-12}$	1.000	$9.7 \times 10^{-12}$
Rb-82m	6.20 h	F	1.000	$1.2 \times 10^{-10}$	1.000	$1.3 \times 10^{-10}$
Rb-83	86.2 d	F	1.000	$7.1 \times 10^{-10}$	1.000	$1.9 \times 10^{-9}$
Rb-84	32.8 d	F	1.000	$1.1 \times 10^{-9}$	1.000	$2.8 \times 10^{-9}$
Rb-86	18.6 d	F	1.000	$9.6 \times 10^{-10}$	1.000	$2.8 \times 10^{-9}$
Rb-87	$4.70 \times 10^{10}$ a	F	1.000	$5.1 \times 10^{-10}$	1.000	$1.5 \times 10^{-9}$
Rb-88	0.297 h	F	1.000	$1.7 \times 10^{-11}$	1.000	$9.0 \times 10^{-11}$
Rb-89	0.253 h	F	1.000	$1.4 \times 10^{-11}$	1.000	$4.7 \times 10^{-11}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion		
			$f_1$	$e(g)_{I\mu m}$	$e(g)_{5\mu m}$	$f_1$	$e(g)$
<b>Strontium</b>							
Sr-80	1.67 h	F	0.300	$7.6 \times 10^{-11}$	$1.3 \times 10^{-10}$	0.300	$3.4 \times 10^{-10}$
		S	0.010	$1.4 \times 10^{-10}$	$2.1 \times 10^{-10}$	0.010	$3.5 \times 10^{-10}$
Sr-81	0.425 h	F	0.300	$2.2 \times 10^{-11}$	$3.9 \times 10^{-11}$	0.300	$7.7 \times 10^{-11}$
		S	0.010	$3.8 \times 10^{-11}$	$6.1 \times 10^{-11}$	0.010	$7.8 \times 10^{-11}$
Sr-82	25.0 d	F	0.300	$2.2 \times 10^{-9}$	$3.3 \times 10^{-9}$	0.300	$6.1 \times 10^{-9}$
		S	0.010	$1.0 \times 10^{-8}$	$7.7 \times 10^{-9}$	0.010	$6.0 \times 10^{-9}$
Sr-83	1.35 d	F	0.300	$1.7 \times 10^{-10}$	$3.0 \times 10^{-10}$	0.300	$4.9 \times 10^{-10}$
		S	0.010	$3.4 \times 10^{-10}$	$4.9 \times 10^{-10}$	0.010	$5.8 \times 10^{-10}$
Sr-85	64.8 d	F	0.300	$3.9 \times 10^{-10}$	$5.6 \times 10^{-10}$	0.300	$5.6 \times 10^{-10}$
		S	0.010	$7.7 \times 10^{-10}$	$6.4 \times 10^{-10}$	0.010	$3.3 \times 10^{-10}$
Sr-85m	1.16 h	F	0.300	$3.1 \times 10^{-12}$	$5.6 \times 10^{-12}$	0.300	$6.1 \times 10^{-12}$
		S	0.010	$4.5 \times 10^{-12}$	$7.4 \times 10^{-12}$	0.010	$6.1 \times 10^{-12}$
Sr-87m	2.80 h	F	0.300	$1.2 \times 10^{-11}$	$2.2 \times 10^{-11}$	0.300	$3.0 \times 10^{-11}$
		S	0.010	$2.2 \times 10^{-11}$	$3.5 \times 10^{-11}$	0.010	$3.3 \times 10^{-11}$
Sr-89	50.5 d	F	0.300	$1.0 \times 10^{-9}$	$1.4 \times 10^{-9}$	0.300	$2.6 \times 10^{-9}$
		S	0.010	$7.5 \times 10^{-9}$	$5.6 \times 10^{-9}$	0.010	$2.3 \times 10^{-9}$
Sr-90	29.1 a	F	0.300	$2.4 \times 10^{-8}$	$3.0 \times 10^{-8}$	0.300	$2.8 \times 10^{-8}$
		S	0.010	$1.5 \times 10^{-7}$	$7.7 \times 10^{-8}$	0.010	$2.7 \times 10^{-9}$
Sr-91	9.50 h	F	0.300	$1.7 \times 10^{-10}$	$2.9 \times 10^{-10}$	0.300	$6.5 \times 10^{-10}$
		S	0.010	$4.1 \times 10^{-10}$	$5.7 \times 10^{-10}$	0.010	$7.6 \times 10^{-10}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion		
			$f_1$	$e(g)_{I\mu m}$	$e(g)_{5\mu m}$	$f_1$	$e(g)$
Sr-92	2.71 h	F	0.300	$1.1 \times 10^{-10}$	$1.8 \times 10^{-10}$	0.300	$4.3 \times 10^{-10}$
		S	0.010	$2.3 \times 10^{-10}$	$3.4 \times 10^{-10}$	0.010	$4.9 \times 10^{-10}$
Yttrium	14.7 h	M	$1.0 \times 10^{-4}$	$4.8 \times 10^{-10}$	$8.0 \times 10^{-10}$	$1.0 \times 10^{-4}$	$9.6 \times 10^{-10}$
		S	$1.0 \times 10^{-4}$	$4.9 \times 10^{-10}$	$8.1 \times 10^{-10}$		
Y-86m	0.800 h	M	$1.0 \times 10^{-4}$	$2.9 \times 10^{-11}$	$4.8 \times 10^{-11}$	$1.0 \times 10^{-4}$	$5.6 \times 10^{-11}$
		S	$1.0 \times 10^{-4}$	$3.0 \times 10^{-11}$	$4.9 \times 10^{-11}$		
Y-87	3.35 d	M	$1.0 \times 10^{-4}$	$3.8 \times 10^{-10}$	$5.2 \times 10^{-10}$	$1.0 \times 10^{-4}$	$5.5 \times 10^{-10}$
		S	$1.0 \times 10^{-4}$	$4.0 \times 10^{-10}$	$5.3 \times 10^{-10}$		
Y-88	107 d	M	$1.0 \times 10^{-4}$	$3.9 \times 10^{-9}$	$3.3 \times 10^{-9}$	$1.0 \times 10^{-4}$	$1.3 \times 10^{-9}$
		S	$1.0 \times 10^{-4}$	$4.1 \times 10^{-9}$	$3.0 \times 10^{-9}$		
Y-90	2.67 d	M	$1.0 \times 10^{-4}$	$1.4 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.0 \times 10^{-4}$	$2.7 \times 10^{-9}$
		S	$1.0 \times 10^{-4}$	$1.5 \times 10^{-9}$	$1.7 \times 10^{-9}$		
Y-90m	3.19 h	M	$1.0 \times 10^{-4}$	$9.6 \times 10^{-11}$	$1.3 \times 10^{-10}$	$1.0 \times 10^{-4}$	$1.7 \times 10^{-10}$
		S	$1.0 \times 10^{-4}$	$1.0 \times 10^{-10}$	$1.3 \times 10^{-10}$		
Y-91	58.5 d	M	$1.0 \times 10^{-4}$	$6.7 \times 10^{-9}$	$5.2 \times 10^{-9}$	$1.0 \times 10^{-4}$	$2.4 \times 10^{-9}$
		S	$1.0 \times 10^{-4}$	$8.4 \times 10^{-9}$	$6.1 \times 10^{-9}$		
Y-91m	0.828 h	M	$1.0 \times 10^{-4}$	$1.0 \times 10^{-11}$	$1.4 \times 10^{-11}$	$1.0 \times 10^{-4}$	$1.1 \times 10^{-11}$
		S	$1.0 \times 10^{-4}$	$1.1 \times 10^{-11}$	$1.5 \times 10^{-11}$		
Y-92	3.54 h	M	$1.0 \times 10^{-4}$	$1.9 \times 10^{-10}$	$2.7 \times 10^{-10}$	$1.0 \times 10^{-4}$	$4.9 \times 10^{-10}$
		S	$1.0 \times 10^{-4}$	$2.0 \times 10^{-10}$	$2.8 \times 10^{-10}$		

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{I\mu m}$	$f_1$	$e(g)$
Y-93	10.1 h	M	$1.0 \times 10^{-4}$	$4.1 \times 10^{-10}$	$1.0 \times 10^{-4}$	$1.2 \times 10^{-9}$
		S	$1.0 \times 10^{-4}$	$4.3 \times 10^{-10}$		
Y-94	0.318 h	M	$1.0 \times 10^{-4}$	$2.8 \times 10^{-11}$	$1.0 \times 10^{-4}$	$8.1 \times 10^{-11}$
		S	$1.0 \times 10^{-4}$	$2.9 \times 10^{-11}$		
Y-95	0.178 h	M	$1.0 \times 10^{-4}$	$1.6 \times 10^{-11}$	$1.0 \times 10^{-4}$	$4.6 \times 10^{-11}$
		S	$1.0 \times 10^{-4}$	$1.7 \times 10^{-11}$		
<b>Zirconium</b>						
Zr-86	16.5 h	F	0.002	$3.0 \times 10^{-10}$	0.002	$8.6 \times 10^{-10}$
		M	0.002	$4.3 \times 10^{-10}$		
		S	0.002	$4.5 \times 10^{-10}$		
Zr-88	83.4 d	F	0.002	$3.5 \times 10^{-9}$	0.002	$3.3 \times 10^{-10}$
		M	0.002	$2.5 \times 10^{-9}$		
		S	0.002	$3.3 \times 10^{-9}$		
Zr-89	3.27 d	F	0.002	$3.1 \times 10^{-10}$	0.002	$7.9 \times 10^{-10}$
		M	0.002	$5.3 \times 10^{-10}$		
		S	0.002	$5.5 \times 10^{-10}$		
Zr-93	$1.53 \times 10^6$ a	F	0.002	$2.5 \times 10^{-8}$	0.002	$2.8 \times 10^{-10}$
		M	0.002	$9.6 \times 10^{-9}$		
		S	0.002	$3.1 \times 10^{-9}$		
Zr-95	64.0 d	F	0.002	$2.5 \times 10^{-9}$	0.002	$8.8 \times 10^{-10}$
		M	0.002	$4.5 \times 10^{-9}$		
		S	0.002	$5.5 \times 10^{-9}$		

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_i$	$e(g)_{lum}$	$f_i$	$e(g)$
Zr-97	16.9 h	F	0.002	$4.2 \times 10^{-10}$	0.002	$2.1 \times 10^{-9}$
		M	0.002	$9.4 \times 10^{-10}$		
		S	0.002	$1.0 \times 10^{-9}$		
<b>Niobium</b>						
Nb-88	0.238 h	M	0.010	$2.9 \times 10^{-11}$	0.010	$6.3 \times 10^{-11}$
		S	0.010	$3.0 \times 10^{-11}$		
Nb-89	2.03 h	M	0.010	$1.2 \times 10^{-10}$	0.010	$3.0 \times 10^{-10}$
		S	0.010	$1.3 \times 10^{-10}$		
Nb-89m	1.10 h	M	0.010	$7.1 \times 10^{-11}$	0.010	$1.4 \times 10^{-10}$
		S	0.010	$7.4 \times 10^{-11}$		
Nb-90	14.6 h	M	0.010	$6.6 \times 10^{-10}$	0.010	$1.2 \times 10^{-9}$
		S	0.010	$6.9 \times 10^{-10}$		
Nb-93m	13.6 a	M	0.010	$4.6 \times 10^{-10}$	0.010	$1.2 \times 10^{-10}$
		S	0.010	$1.6 \times 10^{-9}$		
Nb-94	$2.03 \times 10^4$ a	M	0.010	$1.0 \times 10^{-8}$	0.010	$1.7 \times 10^{-9}$
		S	0.010	$4.5 \times 10^{-8}$		
Nb-95	35.1 d	M	0.010	$1.4 \times 10^{-9}$	0.010	$5.8 \times 10^{-10}$
		S	0.010	$1.6 \times 10^{-9}$		
Nb-95m	3.61 d	M	0.010	$7.6 \times 10^{-10}$	0.010	$5.6 \times 10^{-10}$
		S	0.010	$8.5 \times 10^{-10}$		
Nb-96	23.3 h	M	0.010	$6.5 \times 10^{-10}$	0.010	$1.1 \times 10^{-9}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{I\mu m}$	$f_1$	$e(g)$
Nb-97	1.20 h	S	0.010	$6.8 \times 10^{-10}$		
		M	0.010	$4.4 \times 10^{-11}$	0.010	$6.8 \times 10^{-11}$
		S	0.010	$4.7 \times 10^{-11}$		
Nb-98	0.858 h	M	0.010	$5.9 \times 10^{-11}$	0.010	$1.1 \times 10^{-10}$
		S	0.010	$6.1 \times 10^{-11}$		
<b>Molybdenum</b>						
Mo-90	5.67 h	F	0.800	$1.7 \times 10^{-10}$	0.800	$3.1 \times 10^{-10}$
Mo-93	$3.50 \times 10^3$ a	S	0.050	$3.7 \times 10^{-10}$	0.050	$6.2 \times 10^{-10}$
		F	0.800	$1.0 \times 10^{-9}$	0.800	$2.6 \times 10^{-9}$
		S	0.050	$2.2 \times 10^{-9}$	0.050	$2.0 \times 10^{-10}$
Mo-93m	6.85 h	F	0.800	$1.0 \times 10^{-10}$	0.800	$1.6 \times 10^{-10}$
		S	0.050	$1.8 \times 10^{-10}$	0.050	$2.8 \times 10^{-10}$
Mo-99	2.75 d	F	0.800	$2.3 \times 10^{-10}$	0.800	$7.4 \times 10^{-10}$
		S	0.050	$9.7 \times 10^{-10}$	0.050	$1.2 \times 10^{-9}$
Mo1	0.244 h	F	0.800	$1.5 \times 10^{-11}$	0.800	$4.2 \times 10^{-11}$
		S	0.050	$2.7 \times 10^{-11}$	0.050	$4.2 \times 10^{-11}$
<b>Technetium</b>						
Tc-93	2.75 h	F	0.800	$3.4 \times 10^{-11}$	0.800	$4.9 \times 10^{-11}$
		M	0.800	$3.6 \times 10^{-11}$		
Tc-93m	0.725 h	F	0.800	$1.5 \times 10^{-11}$	0.800	$2.4 \times 10^{-11}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion		
			$f_1$	$e(g)_{I_{\mu m}}$	$e(g)_{5\mu m}$	$f_1$	$e(g)$
Tc-94	4.88 h	M	0.800	$1.7 \times 10^{-11}$	$3.1 \times 10^{-11}$		
		F	0.800	$1.2 \times 10^{-10}$	$2.1 \times 10^{-10}$	0.800	$1.8 \times 10^{-10}$
		M	0.800	$1.3 \times 10^{-10}$	$2.2 \times 10^{-10}$		
Tc-94m	0.867 h	F	0.800	$4.3 \times 10^{-11}$	$6.9 \times 10^{-11}$	0.800	$1.1 \times 10^{-10}$
		M	0.800	$4.9 \times 10^{-11}$	$8.0 \times 10^{-11}$		
		F	0.800	$1.0 \times 10^{-10}$	$1.8 \times 10^{-10}$	0.800	$1.6 \times 10^{-10}$
Tc-95	20.0 h	M	0.800	$1.0 \times 10^{-10}$	$1.8 \times 10^{-10}$		
		F	0.800	$1.0 \times 10^{-10}$	$1.8 \times 10^{-10}$		
		M	0.800	$3.1 \times 10^{-10}$	$4.8 \times 10^{-10}$	0.800	$6.2 \times 10^{-10}$
Tc-95m	61.0 d	M	0.800	$8.7 \times 10^{-10}$	$8.6 \times 10^{-10}$		
		F	0.800	$6.0 \times 10^{-10}$	$9.8 \times 10^{-10}$	0.800	$1.1 \times 10^{-9}$
		M	0.800	$7.1 \times 10^{-10}$	$1.0 \times 10^{-9}$		
Tc-96m	0.858 h	F	0.800	$6.5 \times 10^{-12}$	$1.1 \times 10^{-11}$	0.800	$1.3 \times 10^{-11}$
		M	0.800	$7.7 \times 10^{-12}$	$1.1 \times 10^{-11}$		
		F	0.800	$4.5 \times 10^{-11}$	$7.2 \times 10^{-11}$	0.800	$8.3 \times 10^{-11}$
Tc-97m	87.0 d	M	0.800	$2.1 \times 10^{-10}$	$1.6 \times 10^{-10}$		
		F	0.800	$2.8 \times 10^{-10}$	$4.0 \times 10^{-10}$	0.800	$6.6 \times 10^{-10}$
		M	0.800	$3.1 \times 10^{-9}$	$2.7 \times 10^{-9}$		
Tc-98	$4.20 \times 10^6$ a	F	0.800	$1.0 \times 10^{-9}$	$1.5 \times 10^{-9}$	0.800	$2.3 \times 10^{-9}$
		M	0.800	$8.1 \times 10^{-9}$	$6.1 \times 10^{-9}$		
		F	0.800	$2.9 \times 10^{-10}$	$4.0 \times 10^{-10}$	0.800	$7.8 \times 10^{-10}$
Tc-99m	6.02 h	M	0.800	$3.9 \times 10^{-9}$	$3.2 \times 10^{-9}$		
		F	0.800	$1.2 \times 10^{-11}$	$2.0 \times 10^{-11}$	0.800	$2.2 \times 10^{-11}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion		
			$f_1$	$e(g)_{Ipm}$	$e(g)_{5\mu m}$	$f_1$	$e(g)$
Tc-101	0.237 h	M	0.800	$1.9 \times 10^{-11}$	$2.9 \times 10^{-11}$		
		F	0.800	$8.7 \times 10^{-12}$	$1.5 \times 10^{-11}$	0.800	$1.9 \times 10^{-11}$
		M	0.800	$1.3 \times 10^{-11}$	$2.1 \times 10^{-11}$		
Tc-104	0.303 h	F	0.800	$2.4 \times 10^{-11}$	$3.9 \times 10^{-11}$	0.800	$8.1 \times 10^{-11}$
		M	0.800	$3.0 \times 10^{-11}$	$4.8 \times 10^{-11}$		
<b>Ruthenium</b>							
Ru-94	0.863 h	F	0.050	$2.7 \times 10^{-11}$	$4.9 \times 10^{-11}$	0.050	$9.4 \times 10^{-11}$
		M	0.050	$4.4 \times 10^{-11}$	$7.2 \times 10^{-11}$		
		S	0.050	$4.6 \times 10^{-11}$	$7.4 \times 10^{-11}$		
Ru-97	2.90 d	F	0.050	$6.7 \times 10^{-11}$	$1.2 \times 10^{-10}$	0.050	$1.5 \times 10^{-10}$
		M	0.050	$1.1 \times 10^{-10}$	$1.6 \times 10^{-10}$		
		S	0.050	$1.1 \times 10^{-10}$	$1.6 \times 10^{-10}$		
Ru-103	39.3 d	F	0.050	$4.9 \times 10^{-10}$	$6.8 \times 10^{-10}$	0.050	$7.3 \times 10^{-10}$
		M	0.050	$2.3 \times 10^{-9}$	$1.9 \times 10^{-9}$		
		S	0.050	$2.8 \times 10^{-9}$	$2.2 \times 10^{-9}$		
Ru-105	4.44 h	F	0.050	$7.1 \times 10^{-11}$	$1.3 \times 10^{-10}$	0.050	$2.6 \times 10^{-10}$
		M	0.050	$1.7 \times 10^{-10}$	$2.4 \times 10^{-10}$		
		S	0.050	$1.8 \times 10^{-10}$	$2.5 \times 10^{-10}$		
Ru-106	1.01 a	F	0.050	$8.0 \times 10^{-9}$	$9.8 \times 10^{-9}$	0.050	$7.0 \times 10^{-9}$
		M	0.050	$2.6 \times 10^{-8}$	$1.7 \times 10^{-8}$		
		S	0.050	$6.2 \times 10^{-8}$	$3.5 \times 10^{-8}$		



Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{1\mu m}$	$f_1$	$e(g)$
Rhodium Rh-99	16.0 d	F	0.050	$3.3 \times 10^{-10}$	0.050	$5.1 \times 10^{-10}$
		M	0.050	$7.3 \times 10^{-10}$		
		S	0.050	$8.3 \times 10^{-10}$		
Rh-99m	4.70 h	F	0.050	$3.0 \times 10^{-11}$	0.050	$6.6 \times 10^{-11}$
		M	0.050	$4.1 \times 10^{-11}$		
		S	0.050	$4.3 \times 10^{-11}$		
Rh-100	20.8 h	F	0.050	$2.8 \times 10^{-10}$	0.050	$7.1 \times 10^{-10}$
		M	0.050	$3.6 \times 10^{-10}$		
		S	0.050	$3.7 \times 10^{-10}$		
Rh-101	3.20 a	F	0.050	$1.4 \times 10^{-9}$	0.050	$5.5 \times 10^{-10}$
		M	0.050	$2.2 \times 10^{-9}$		
		S	0.050	$5.0 \times 10^{-9}$		
Rh-101m	4.34 d	F	0.050	$1.0 \times 10^{-10}$	0.050	$2.2 \times 10^{-10}$
		M	0.050	$2.0 \times 10^{-10}$		
		S	0.050	$2.1 \times 10^{-10}$		
Rh-102	2.90 a	F	0.050	$7.3 \times 10^{-9}$	0.050	$2.6 \times 10^{-9}$
		M	0.050	$6.5 \times 10^{-9}$		
		S	0.050	$1.6 \times 10^{-8}$		
Rh-102m	207 d	F	0.050	$1.5 \times 10^{-9}$	0.050	
		M	0.050	$3.8 \times 10^{-9}$		
		S	0.050	$6.7 \times 10^{-9}$		

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{Ipm}$	$f_1$	$e(g)_{5\mu m}$
Rh-103m	0.935 h	F	0.050	$8.6 \times 10^{-13}$	0.050	$1.2 \times 10^{-12}$
		M	0.050	$2.3 \times 10^{-12}$		$2.4 \times 10^{-12}$
		S	0.050	$2.5 \times 10^{-12}$		$2.5 \times 10^{-12}$
Rh-105	1.47 d	F	0.050	$8.7 \times 10^{-11}$	0.050	$1.5 \times 10^{-10}$
		M	0.050	$3.1 \times 10^{-10}$		$4.1 \times 10^{-10}$
		S	0.050	$3.4 \times 10^{-10}$		$4.4 \times 10^{-10}$
Rh-106m	2.20 h	F	0.050	$7.0 \times 10^{-11}$	0.050	$1.3 \times 10^{-10}$
		M	0.050	$1.1 \times 10^{-10}$		$1.8 \times 10^{-10}$
		S	0.050	$1.2 \times 10^{-10}$		$1.9 \times 10^{-10}$
Rh-107	0.362 h	F	0.050	$9.6 \times 10^{-12}$	0.050	$1.6 \times 10^{-11}$
		M	0.050	$1.7 \times 10^{-11}$		$2.7 \times 10^{-11}$
		S	0.050	$1.7 \times 10^{-11}$		$2.8 \times 10^{-11}$
<b>Palladium</b>						
Pd-100	3.63 d	F	0.005	$4.9 \times 10^{-10}$	0.005	$7.6 \times 10^{-10}$
		M	0.005	$7.9 \times 10^{-10}$		$9.5 \times 10^{-10}$
		S	0.005	$8.3 \times 10^{-10}$		$9.7 \times 10^{-10}$
Pd-101	8.27 h	F	0.005	$4.2 \times 10^{-11}$	0.005	$7.5 \times 10^{-11}$
		M	0.005	$6.2 \times 10^{-11}$		$9.8 \times 10^{-11}$
		S	0.005	$6.4 \times 10^{-11}$		$1.0 \times 10^{-10}$
Pd-103	17.0 d	F	0.005	$9.0 \times 10^{-11}$	0.005	$1.2 \times 10^{-10}$
		M	0.005	$3.5 \times 10^{-10}$		$3.0 \times 10^{-10}$
		S	0.005	$4.0 \times 10^{-10}$		$2.9 \times 10^{-10}$

Radionuclides	Physical half-life	Type	Inhalation		$e(g)_{sum}$	Ingestion	
			$f_1$	$e(g)_{lum}$		$f_1$	$e(g)$
Pd-107	$6.50 \times 10^6$ a	F	0.005	$2.6 \times 10^{-11}$	$3.3 \times 10^{-11}$	0.005	$3.7 \times 10^{-11}$
		M	0.005	$8.0 \times 10^{-11}$	$5.2 \times 10^{-11}$		
		S	0.005	$5.5 \times 10^{-10}$	$2.9 \times 10^{-10}$		
Pd-109	13.4 h	F	0.005	$1.2 \times 10^{-10}$	$2.1 \times 10^{-10}$	0.005	$5.5 \times 10^{-10}$
		M	0.005	$3.4 \times 10^{-10}$	$4.7 \times 10^{-10}$		
		S	0.005	$3.6 \times 10^{-10}$	$5.0 \times 10^{-10}$		
Silver							
Ag-102	0.215 h	F	0.050	$1.4 \times 10^{-11}$	$2.4 \times 10^{-11}$	0.050	$4.0 \times 10^{-11}$
		M	0.050	$1.8 \times 10^{-11}$	$3.2 \times 10^{-11}$		
		S	0.050	$1.9 \times 10^{-11}$	$3.2 \times 10^{-11}$		
Ag-103	1.09 h	F	0.050	$1.6 \times 10^{-11}$	$2.8 \times 10^{-11}$	0.050	$4.3 \times 10^{-11}$
		M	0.050	$2.7 \times 10^{-11}$	$4.3 \times 10^{-11}$		
		S	0.050	$2.8 \times 10^{-11}$	$4.5 \times 10^{-11}$		
Ag-104	1.15 h	F	0.050	$3.0 \times 10^{-11}$	$5.7 \times 10^{-11}$	0.050	$6.0 \times 10^{-11}$
		M	0.050	$3.9 \times 10^{-11}$	$6.9 \times 10^{-11}$		
		S	0.050	$4.0 \times 10^{-11}$	$7.1 \times 10^{-11}$		
Ag-104m	0.558 h	F	0.050	$1.7 \times 10^{-11}$	$3.1 \times 10^{-11}$	0.050	$5.4 \times 10^{-11}$
		M	0.050	$2.6 \times 10^{-11}$	$4.4 \times 10^{-11}$		
		S	0.050	$2.7 \times 10^{-11}$	$4.5 \times 10^{-11}$		
Ag-105	41.0 d	F	0.050	$5.4 \times 10^{-10}$	$8.0 \times 10^{-10}$	0.050	$4.7 \times 10^{-10}$
		M	0.050	$6.9 \times 10^{-10}$	$7.0 \times 10^{-10}$		
		S	0.050	$7.8 \times 10^{-10}$	$7.3 \times 10^{-10}$		

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{I\mu m}$	$f_1$	$e(g)_{5\mu m}$
Ag106	0.399 h	F	0.050	$9.8 \times 10^{-12}$	0.050	$1.7 \times 10^{-11}$
		M	0.050	$1.6 \times 10^{-11}$		$2.6 \times 10^{-11}$
		S	0.050	$1.6 \times 10^{-11}$		$2.7 \times 10^{-11}$
Ag106m	8.41 d	F	0.050	$1.1 \times 10^{-9}$	0.050	$1.6 \times 10^{-9}$
		M	0.050	$1.1 \times 10^{-9}$		$1.5 \times 10^{-9}$
		S	0.050	$1.1 \times 10^{-9}$		$1.4 \times 10^{-9}$
Ag108m	$1.27 \times 10^2$ a	F	0.050	$6.1 \times 10^{-9}$	0.050	$7.3 \times 10^{-9}$
		M	0.050	$7.0 \times 10^{-9}$		$5.2 \times 10^{-9}$
		S	0.050	$3.5 \times 10^{-8}$		$1.9 \times 10^{-8}$
Ag-110m	250 d	F	0.050	$5.5 \times 10^{-9}$	0.050	$6.7 \times 10^{-9}$
		M	0.050	$7.2 \times 10^{-9}$		$5.9 \times 10^{-9}$
		S	0.050	$1.2 \times 10^{-8}$		$7.3 \times 10^{-9}$
Ag-111	7.45 d	F	0.050	$4.1 \times 10^{-10}$	0.050	$5.7 \times 10^{-10}$
		M	0.050	$1.5 \times 10^{-9}$		$1.5 \times 10^{-9}$
		S	0.050	$1.7 \times 10^{-9}$		$1.6 \times 10^{-9}$
Ag-112	3.12 h	F	0.050	$8.2 \times 10^{-11}$	0.050	$1.4 \times 10^{-10}$
		M	0.050	$1.7 \times 10^{-10}$		$2.5 \times 10^{-10}$
		S	0.050	$1.8 \times 10^{-10}$		$2.6 \times 10^{-10}$
Ag-115	0.333 h	F	0.050	$1.6 \times 10^{-11}$	0.050	$2.6 \times 10^{-11}$
		M	0.050	$2.8 \times 10^{-11}$		$4.3 \times 10^{-11}$
		S	0.050	$3.0 \times 10^{-11}$		$4.4 \times 10^{-11}$

Radionuclides	Physical half-life	Type	Inhalation		$e(g)_{5\mu m}$	Ingestion	
			$f_1$	$e(g)_{1\mu m}$		$f_1$	$e(g)$
<b>Cadmium</b>							
Cd104	0.961 h	F	0.050	$2.7 \times 10^{-11}$	$5.0 \times 10^{-11}$	0.050	$5.8 \times 10^{-11}$
		M	0.050	$3.6 \times 10^{-11}$	$6.2 \times 10^{-11}$		
		S	0.050	$3.7 \times 10^{-11}$	$6.3 \times 10^{-11}$		
Cd107	6.49 h	F	0.050	$2.3 \times 10^{-11}$	$4.2 \times 10^{-11}$	0.050	$6.2 \times 10^{-11}$
		M	0.050	$8.1 \times 10^{-11}$	$1.0 \times 10^{-10}$		
		S	0.050	$8.7 \times 10^{-11}$	$1.1 \times 10^{-10}$		
Cd109	1.27 a	F	0.050	$8.1 \times 10^{-9}$	$9.6 \times 10^{-9}$	0.050	$2.0 \times 10^{-9}$
		M	0.050	$6.2 \times 10^{-9}$	$5.1 \times 10^{-9}$		
		S	0.050	$5.8 \times 10^{-9}$	$4.4 \times 10^{-9}$		
Cd-113	$9.30 \times 10^{15}$ a	F	0.050	$1.2 \times 10^{-7}$	$1.4 \times 10^{-7}$	0.050	$2.5 \times 10^{-8}$
		M	0.050	$5.3 \times 10^{-8}$	$4.3 \times 10^{-8}$		
		S	0.050	$2.5 \times 10^{-8}$	$2.1 \times 10^{-8}$		
Cd-113m	13.6a	F	0.050	$1.1 \times 10^{-7}$	$1.3 \times 10^{-7}$	0.050	$2.3 \times 10^{-8}$
		M	0.050	$5.0 \times 10^{-8}$	$4.0 \times 10^{-8}$		
		S	0.050	$3.0 \times 10^{-8}$	$2.4 \times 10^{-8}$		
Cd-115	2.23 d	F	0.050	$3.7 \times 10^{-10}$	$5.4 \times 10^{-10}$	0.050	$1.4 \times 10^{-9}$
		M	0.050	$9.7 \times 10^{-10}$	$1.2 \times 10^{-9}$		
		S	0.050	$1.1 \times 10^{-9}$	$1.3 \times 10^{-9}$		
Cd-115m	44.6 d	F	0.050	$5.3 \times 10^{-9}$	$6.4 \times 10^{-9}$	0.050	$3.3 \times 10^{-9}$
		M	0.050	$5.9 \times 10^{-9}$	$5.5 \times 10^{-9}$		

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{lum}$	$f_1$	$e(g)$
Cd-117	2.49 h	S	0.050	$7.3 \times 10^{-9}$		
		F	0.050	$7.3 \times 10^{-11}$	0.050	$2.8 \times 10^{-10}$
		M	0.050	$1.6 \times 10^{-10}$		
Cd-117m	3.36 h	S	0.050	$1.7 \times 10^{-10}$		
		F	0.050	$1.0 \times 10^{-10}$	0.050	$2.8 \times 10^{-10}$
		M	0.050	$2.0 \times 10^{-10}$		
Indium		S	0.050	$2.1 \times 10^{-10}$		
		F	0.020	$3.2 \times 10^{-11}$	0.020	$6.6 \times 10^{-11}$
		M	0.020	$4.4 \times 10^{-11}$		
In-110	4.90 h	F	0.020	$1.2 \times 10^{-10}$	0.020	$2.4 \times 10^{-10}$
		M	0.020	$1.4 \times 10^{-10}$		
		F	0.020	$3.1 \times 10^{-11}$	0.020	$1.0 \times 10^{-10}$
In-111	2.83 d	M	0.020	$5.0 \times 10^{-11}$		
		F	0.020	$1.3 \times 10^{-10}$	0.020	$2.9 \times 10^{-10}$
		M	0.020	$2.3 \times 10^{-10}$		
In-112	0.240 h	F	0.020	$5.0 \times 10^{-12}$	0.020	$1.0 \times 10^{-11}$
		M	0.020	$7.8 \times 10^{-12}$		
		F	0.020	$1.0 \times 10^{-11}$	0.020	$2.8 \times 10^{-11}$
In-114m	49.5 d	M	0.020	$2.0 \times 10^{-11}$		
		F	0.020	$9.3 \times 10^{-9}$	0.020	$4.1 \times 10^{-9}$
		F	0.020	$1.1 \times 10^{-8}$		

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{I\mu m}$	$f_1$	$e(g)$
In-115	$5.10 \times 10^{15}$ a	M	0.020	$5.9 \times 10^{-9}$		
		F	0.020	$3.9 \times 10^{-7}$	0.020	$3.2 \times 10^{-8}$
		M	0.020	$1.5 \times 10^{-7}$		
In-115m	4.49 h	F	0.020	$2.5 \times 10^{-11}$	0.020	$8.6 \times 10^{-11}$
		M	0.020	$6.0 \times 10^{-11}$		
In-116m	0.902 h	F	0.020	$3.0 \times 10^{-11}$	0.020	$6.4 \times 10^{-11}$
		M	0.020	$4.8 \times 10^{-11}$		
In-117	0.730 h	F	0.020	$1.6 \times 10^{-11}$	0.020	$3.1 \times 10^{-11}$
		M	0.020	$3.0 \times 10^{-11}$		
In-117m	1.94 h	F	0.020	$3.1 \times 10^{-11}$	0.020	$1.2 \times 10^{-10}$
		M	0.020	$7.3 \times 10^{-11}$		
In-119m	0.300 h	F	0.020	$1.1 \times 10^{-11}$	0.020	$4.7 \times 10^{-11}$
		M	0.020	$1.8 \times 10^{-11}$		
<b>Tin</b>						
Sn-110	4.00 h	F	0.020	$1.1 \times 10^{-10}$	0.020	$3.5 \times 10^{-10}$
		M	0.020	$1.6 \times 10^{-10}$		
Sn-111	0.588 h	F	0.020	$8.3 \times 10^{-12}$	0.020	$2.3 \times 10^{-11}$
		M	0.020	$1.4 \times 10^{-11}$		
Sn-113	115 d	F	0.020	$5.4 \times 10^{-10}$	0.020	$7.3 \times 10^{-10}$
		M	0.020	$2.5 \times 10^{-9}$		
Sn-117m	13.6 d	F	0.020	$2.9 \times 10^{-10}$	0.020	$7.1 \times 10^{-10}$
		M	0.020	$2.3 \times 10^{-9}$		

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{1\mu m}$	$f_1$	$e(g)_{5\mu m}$
Sn-119m	293 d	F	0.020	$2.9 \times 10^{-10}$	0.020	$3.6 \times 10^{-10}$
		M	0.020	$2.0 \times 10^{-9}$		
Sn-121	1.13 d	F	0.020	$6.4 \times 10^{-11}$	0.020	$1.0 \times 10^{-10}$
		M	0.020	$2.2 \times 10^{-10}$		
Sn-121m	55.0 a	F	0.020	$8.0 \times 10^{-10}$	0.020	$9.7 \times 10^{-10}$
		M	0.020	$4.2 \times 10^{-9}$		
Sn-123	129 d	F	0.020	$1.2 \times 10^{-9}$	0.020	$1.6 \times 10^{-9}$
		M	0.020	$7.7 \times 10^{-9}$		
Sn-123m	0.668 h	F	0.020	$1.4 \times 10^{-11}$	0.020	$2.4 \times 10^{-11}$
		M	0.020	$2.8 \times 10^{-11}$		
Sn-125	9.64 d	F	0.020	$9.2 \times 10^{-10}$	0.020	$1.3 \times 10^{-9}$
		M	0.020	$3.0 \times 10^{-9}$		
Sn-126	$1.00 \times 10^5$ a	F	0.020	$1.1 \times 10^{-8}$	0.020	$1.4 \times 10^{-8}$
		M	0.020	$2.7 \times 10^{-8}$		
Sn-127	2.10 h	F	0.020	$6.9 \times 10^{-11}$	0.020	$1.2 \times 10^{-10}$
		M	0.020	$1.3 \times 10^{-10}$		
Sn-128	0.985 h	F	0.020	$5.4 \times 10^{-11}$	0.020	$9.5 \times 10^{-11}$
		M	0.020	$9.6 \times 10^{-11}$		
<b>Antimony</b>						
Sb-115	0.530 h	F	0.100	$9.2 \times 10^{-12}$	0.100	$1.7 \times 10^{-11}$
		M	0.010	$1.4 \times 10^{-11}$		



Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{I\mu m}$	$f_1$	$e(g)_{5\mu m}$
Sb-116	0.263 h	F	0.100	$9.9 \times 10^{-12}$	0.100	$1.8 \times 10^{-11}$
		M	0.010	$1.4 \times 10^{-11}$		$2.3 \times 10^{-11}$
Sb-116m	1.00 h	F	0.100	$3.5 \times 10^{-11}$	0.100	$6.4 \times 10^{-11}$
		M	0.010	$5.0 \times 10^{-11}$		$8.5 \times 10^{-11}$
Sb-117	2.80 h	F	0.100	$9.3 \times 10^{-12}$	0.100	$1.7 \times 10^{-11}$
		M	0.010	$1.7 \times 10^{-11}$		$2.7 \times 10^{-11}$
Sb-118m	5.00 h	F	0.100	$1.0 \times 10^{-10}$	0.100	$1.9 \times 10^{-10}$
		M	0.010	$1.3 \times 10^{-10}$		$2.3 \times 10^{-10}$
Sb-119	1.59 d	F	0.100	$2.5 \times 10^{-11}$	0.100	$4.5 \times 10^{-11}$
		M	0.010	$3.7 \times 10^{-11}$		$5.9 \times 10^{-11}$
Sb-120	0.265 h	F	0.100	$4.9 \times 10^{-12}$	0.100	$8.5 \times 10^{-12}$
		M	0.010	$7.4 \times 10^{-12}$		$1.2 \times 10^{-11}$
Sb-120m	5.76 d	F	0.100	$5.9 \times 10^{-10}$	0.100	$9.8 \times 10^{-10}$
		M	0.010	$1.0 \times 10^{-9}$		$1.3 \times 10^{-9}$
Sb-122	2.70 d	F	0.100	$3.9 \times 10^{-10}$	0.100	$6.3 \times 10^{-10}$
		M	0.010	$1.0 \times 10^{-9}$		$1.2 \times 10^{-9}$
Sb-124	60.2 d	F	0.100	$1.3 \times 10^{-9}$	0.100	$1.9 \times 10^{-9}$
		M	0.010	$6.1 \times 10^{-9}$		$4.7 \times 10^{-9}$
Sb-124m	0.337 h	F	0.100	$3.0 \times 10^{-12}$	0.100	$5.3 \times 10^{-12}$
		M	0.010	$5.5 \times 10^{-12}$		$8.3 \times 10^{-12}$
Sb-125	2.77 a	F	0.100	$1.4 \times 10^{-9}$	0.100	$1.7 \times 10^{-9}$
		M	0.010	$4.5 \times 10^{-9}$		$3.3 \times 10^{-9}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{1\mu m}$	$f_1$	$e(g)$
Sb-126	12.4 d	F	0.100	$1.1 \times 10^{-9}$	0.100	$2.4 \times 10^{-9}$
		M	0.010	$2.7 \times 10^{-9}$		
Sb-126m	0.317 h	F	0.100	$1.3 \times 10^{-11}$	0.100	$3.6 \times 10^{-11}$
		M	0.010	$2.0 \times 10^{-11}$		
Sb-127	3.85 d	F	0.100	$4.6 \times 10^{-10}$	0.100	$1.7 \times 10^{-9}$
		M	0.010	$1.6 \times 10^{-9}$		
Sb-128	9.01 h	F	0.100	$2.5 \times 10^{-10}$	0.100	$7.6 \times 10^{-10}$
		M	0.010	$4.2 \times 10^{-10}$		
Sb-128m	0.173 h	F	0.100	$1.1 \times 10^{-11}$	0.100	$3.3 \times 10^{-11}$
		M	0.010	$1.5 \times 10^{-11}$		
Sb-129	4.32 h	F	0.100	$1.1 \times 10^{-10}$	0.100	$4.2 \times 10^{-10}$
		M	0.010	$2.4 \times 10^{-10}$		
Sb-130	0.667 h	F	0.100	$3.5 \times 10^{-11}$	0.100	$9.1 \times 10^{-11}$
		M	0.010	$5.4 \times 10^{-11}$		
Sb-131	0.383 h	F	0.100	$3.7 \times 10^{-11}$	0.100	$1.0 \times 10^{-10}$
		M	0.010	$5.2 \times 10^{-11}$		
<b>Tellurium</b>						
Te-116	2.49 h	F	0.300	$6.3 \times 10^{-11}$	0.300	$1.7 \times 10^{-10}$
		M	0.300	$1.1 \times 10^{-10}$		
Te-121	17.0 d	F	0.300	$2.5 \times 10^{-10}$	0.300	$4.3 \times 10^{-10}$
		M	0.300	$3.9 \times 10^{-10}$		

Radionuclides	Physical half-life	Type	Inhalation		$e(g)_{5\mu m}$	Ingestion	
			$f_1$	$e(g)_{I\mu m}$		$f_1$	$e(g)$
Te-121m	154 d	F	0.300	$1.8 \times 10^{-9}$	$2.3 \times 10^{-9}$	0.300	$2.3 \times 10^{-9}$
		M	0.300	$4.2 \times 10^{-9}$	$3.6 \times 10^{-9}$		
Te-123	$1.00 \times 10^{13}$ a	F	0.300	$4.0 \times 10^{-9}$	$5.0 \times 10^{-9}$	0.300	$4.4 \times 10^{-9}$
		M	0.300	$2.6 \times 10^{-9}$	$2.8 \times 10^{-9}$		
Te-123m	120 d	F	0.300	$9.7 \times 10^{10}$	$1.2 \times 10^{-9}$	0.300	$1.4 \times 10^{-9}$
		M	0.300	$3.9 \times 10^{-9}$	$3.4 \times 10^{-9}$		
Te-125m	58.0 d	F	0.300	$5.1 \times 10^{-10}$	$6.7 \times 10^{-10}$	0.300	$8.7 \times 10^{-10}$
		M	0.300	$3.3 \times 10^{-9}$	$2.9 \times 10^{-9}$		
Te-127	9.35 h	F	0.300	$4.2 \times 10^{-11}$	$7.2 \times 10^{-11}$	0.300	$1.7 \times 10^{-10}$
		M	0.300	$1.2 \times 10^{-10}$	$1.8 \times 10^{-10}$		
Te-127m	109 d	F	0.300	$1.6 \times 10^{-9}$	$2.0 \times 10^{-9}$	0.300	$2.3 \times 10^{-9}$
		M	0.300	$7.2 \times 10^{-9}$	$6.2 \times 10^{-9}$		
Te-129	1.16 h	F	0.300	$1.7 \times 10^{-11}$	$2.9 \times 10^{-11}$	0.300	$6.3 \times 10^{-11}$
		M	0.300	$3.8 \times 10^{-11}$	$5.7 \times 10^{-11}$		
Te-129m	33.6 d	F	0.300	$1.3 \times 10^{-9}$	$1.8 \times 10^{-9}$	0.300	$3.0 \times 10^{-9}$
		M	0.300	$6.3 \times 10^{-9}$	$5.4 \times 10^{-9}$		
Te-131	0.417 h	F	0.300	$2.3 \times 10^{-11}$	$4.6 \times 10^{-11}$	0.300	$8.7 \times 10^{-11}$
		M	0.300	$3.8 \times 10^{-11}$	$6.1 \times 10^{-11}$		
Te-131m	1.25 d	F	0.300	$8.7 \times 10^{-10}$	$1.2 \times 10^{-9}$	0.300	$1.9 \times 10^{-9}$
		M	0.300	$1.1 \times 10^{-9}$	$1.6 \times 10^{-9}$		
Te-132	3.26 d	F	0.300	$1.8 \times 10^{-9}$	$2.4 \times 10^{-9}$	0.300	$3.7 \times 10^{-9}$
		M	0.300	$2.2 \times 10^{-9}$	$3.0 \times 10^{-9}$		

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{1\mu m}$	$f_1$	$e(g)$
Te-133	0.207 h	F	0.300	$2.0 \times 10^{-11}$	0.300	$7.2 \times 10^{-11}$
		M	0.300	$2.7 \times 10^{-11}$		
Te-133m	0.923 h	F	0.300	$8.4 \times 10^{-11}$	0.300	$2.8 \times 10^{-10}$
		M	0.300	$1.2 \times 10^{-10}$		
Te-134	0.696 h	F	0.300	$5.0 \times 10^{-11}$	0.300	$1.1 \times 10^{-10}$
		M	0.300	$7.1 \times 10^{-11}$		
<b>Iodine</b>						
I-120	1.35 h	F	1.000	$1.0 \times 10^{-10}$	1.000	$3.4 \times 10^{-10}$
I-120m	0.883 h	F	1.000	$8.7 \times 10^{-11}$	1.000	$2.1 \times 10^{-10}$
I-121	2.12 h	F	1.000	$2.8 \times 10^{-11}$	1.000	$8.2 \times 10^{-11}$
I-123	13.2 h	F	1.000	$7.6 \times 10^{-11}$	1.000	$2.1 \times 10^{-10}$
I-124	4.18 d	F	1.000	$4.5 \times 10^{-9}$	1.000	$1.3 \times 10^{-8}$
I-125	60.1 d	F	1.000	$5.3 \times 10^{-9}$	1.000	$1.5 \times 10^{-8}$
I-126	13.0 d	F	1.000	$1.0 \times 10^{-8}$	1.000	$2.9 \times 10^{-8}$
I-128	0.416 h	F	1.000	$1.4 \times 10^{-11}$	1.000	$4.6 \times 10^{-11}$
I-129	$1.57 \times 10^7$ a	F	1.000	$3.7 \times 10^{-8}$	1.000	$1.1 \times 10^{-7}$
I-130	12.4 h	F	1.000	$6.9 \times 10^{-10}$	1.000	$2.0 \times 10^{-9}$
I-131	8.04 d	F	1.000	$7.6 \times 10^{-9}$	1.000	$2.2 \times 10^{-8}$
I-132	2.30 h	F	1.000	$9.6 \times 10^{-11}$	1.000	$2.9 \times 10^{-10}$
I-132m	1.39 h	F	1.000	$8.1 \times 10^{-11}$	1.000	$2.2 \times 10^{-10}$
I-133	20.8 h	F	1.000	$1.5 \times 10^{-9}$	1.000	$4.3 \times 10^{-9}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion		
			$f_1$	$e(g)_{I_{\mu m}}$	$e(g)_{5\mu m}$	$f_1$	$e(g)$
I-134	0.876 h	F	1.000	$4.8 \times 10^{-11}$	$7.9 \times 10^{-11}$	1.000	$1.1 \times 10^{-10}$
I-135	6.61 h	F	1.000	$3.3 \times 10^{-10}$	$4.6 \times 10^{-10}$	1.000	$9.3 \times 10^{-10}$
<b>Caesium</b>							
Cs-125	0.750 h	F	1.000	$1.3 \times 10^{-11}$	$2.3 \times 10^{-11}$	1.000	$3.5 \times 10^{-11}$
Cs-127	6.25 h	F	1.000	$2.2 \times 10^{-11}$	$4.0 \times 10^{-11}$	1.000	$2.4 \times 10^{-11}$
Cs-129	1.34 d	F	1.000	$4.5 \times 10^{-11}$	$8.1 \times 10^{-11}$	1.000	$6.0 \times 10^{-11}$
Cs-130	0.498 h	F	1.000	$8.4 \times 10^{-12}$	$1.5 \times 10^{-11}$	1.000	$2.8 \times 10^{-11}$
Cs-131	9.69 d	F	1.000	$2.8 \times 10^{-11}$	$4.5 \times 10^{-11}$	1.000	$5.8 \times 10^{-11}$
Cs-132	6.48 d	F	1.000	$2.4 \times 10^{-10}$	$3.8 \times 10^{-10}$	1.000	$5.0 \times 10^{-10}$
Cs-134	2.06 a	F	1.000	$6.8 \times 10^{-9}$	$9.6 \times 10^{-9}$	1.000	$1.9 \times 10^{-8}$
Cs-134m	2.90 h	F	1.000	$1.5 \times 10^{-11}$	$2.6 \times 10^{-11}$	1.000	$2.0 \times 10^{-11}$
Cs-135	$2.30 \times 10^6$ a	F	1.000	$7.1 \times 10^{-10}$	$9.9 \times 10^{-10}$	1.000	$2.0 \times 10^{-9}$
Cs-135m	0.883 h	F	1.000	$1.3 \times 10^{-11}$	$2.4 \times 10^{-11}$	1.000	$1.9 \times 10^{-11}$
Cs-136	13.1 d	F	1.000	$1.3 \times 10^{-9}$	$1.9 \times 10^{-9}$	1.000	$3.0 \times 10^{-9}$
Cs-137	30.0 a	F	1.000	$4.8 \times 10^{-9}$	$6.7 \times 10^{-9}$	1.000	$1.3 \times 10^{-8}$
Cs-138	0.536 h	F	1.000	$2.6 \times 10^{-11}$	$4.6 \times 10^{-11}$	1.000	$9.2 \times 10^{-11}$
<b>Barium</b>							
Ba-126	1.61 h	F	0.100	$7.8 \times 10^{-11}$	$1.2 \times 10^{-10}$	0.100	$2.6 \times 10^{-10}$
Ba-128	2.43 d	F	0.100	$8.0 \times 10^{-10}$	$1.3 \times 10^{-9}$	0.100	$2.7 \times 10^{-9}$
Ba-131	11.8 d	F	0.100	$2.3 \times 10^{-10}$	$3.5 \times 10^{-10}$	0.100	$4.5 \times 10^{-10}$
Ba-131m	0.243 h	F	0.100	$4.1 \times 10^{-12}$	$6.4 \times 10^{-12}$	0.100	$4.9 \times 10^{-12}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion		
			$f_1$	$e(g)_{Ipm}$	$e(g)_{5\mu m}$	$f_1$	$e(g)$
Ba-133	10.7 a	F	0.100	$1.5 \times 10^{-9}$	$1.8 \times 10^{-9}$	0.100	$1.0 \times 10^{-9}$
Ba-133m	1.62 d	F	0.100	$1.9 \times 10^{-10}$	$2.8 \times 10^{-10}$	0.100	$5.5 \times 10^{-10}$
Ba-135m	1.20 d	F	0.100	$1.5 \times 10^{-10}$	$2.3 \times 10^{-10}$	0.100	$4.5 \times 10^{-10}$
Ba-139	1.38 h	F	0.100	$3.5 \times 10^{-11}$	$5.5 \times 10^{-11}$	0.100	$1.2 \times 10^{-10}$
Ba-140	12.7 d	F	0.100	$1.0 \times 10^{-9}$	$1.6 \times 10^{-9}$	0.100	$2.5 \times 10^{-9}$
Ba-141	0.305 h	F	0.100	$2.2 \times 10^{-11}$	$3.5 \times 10^{-11}$	0.100	$7.0 \times 10^{-11}$
Ba-142	0.177 h	F	0.100	$1.6 \times 10^{-11}$	$2.7 \times 10^{-11}$	0.100	$3.5 \times 10^{-11}$
<b>Lanthanum</b>							
La-131	0.983 h	F	$5.0 \times 10^{-4}$	$1.4 \times 10^{-11}$	$2.4 \times 10^{-11}$	$5.0 \times 10^{-4}$	$3.5 \times 10^{-11}$
		M	$5.0 \times 10^{-4}$	$2.3 \times 10^{-11}$	$3.6 \times 10^{-11}$		
La-132	4.80 h	F	$5.0 \times 10^{-4}$	$1.1 \times 10^{-10}$	$2.0 \times 10^{-10}$	$5.0 \times 10^{-4}$	$3.9 \times 10^{-10}$
		M	$5.0 \times 10^{-4}$	$1.7 \times 10^{-10}$	$2.8 \times 10^{-10}$		
La-135	19.5 h	F	$5.0 \times 10^{-4}$	$1.1 \times 10^{-11}$	$2.0 \times 10^{-11}$	$5.0 \times 10^{-4}$	$3.0 \times 10^{-11}$
		M	$5.0 \times 10^{-4}$	$1.5 \times 10^{-11}$	$2.5 \times 10^{-11}$		
La-137	$6.00 \times 10^4$ a	F	$5.0 \times 10^{-4}$	$8.6 \times 10^{-9}$	$1.0 \times 10^{-8}$	$5.0 \times 10^{-4}$	$8.1 \times 10^{-11}$
		M	$5.0 \times 10^{-4}$	$3.4 \times 10^{-9}$	$2.3 \times 10^{-9}$		
La-138	$1.35 \times 10^{11}$ a	F	$5.0 \times 10^{-4}$	$1.5 \times 10^{-7}$	$1.8 \times 10^{-7}$	$5.0 \times 10^{-4}$	$1.1 \times 10^{-9}$
		M	$5.0 \times 10^{-4}$	$6.1 \times 10^{-8}$	$4.2 \times 10^{-8}$		
La-140	1.68 d	F	$5.0 \times 10^{-4}$	$6.0 \times 10^{-10}$	$1.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.0 \times 10^{-9}$
		M	$5.0 \times 10^{-4}$	$1.1 \times 10^{-9}$	$1.5 \times 10^{-9}$		
La-141	3.93 h	F	$5.0 \times 10^{-4}$	$6.7 \times 10^{-11}$	$1.1 \times 10^{-10}$	$5.0 \times 10^{-4}$	$3.6 \times 10^{-10}$

Radionuclides	Physical half-life	Type	Inhalation		$e(g)_{sum}$	Ingestion	
			$f_1$	$e(g)_{i\mu m}$		$f_1$	$e(g)$
La-142	1.54 h	M	$5.0 \times 10^{-4}$	$1.5 \times 10^{-10}$	$2.2 \times 10^{-10}$		
		F	$5.0 \times 10^{-4}$	$5.6 \times 10^{-11}$	$1.0 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.8 \times 10^{-10}$
La-143	0.237 h	M	$5.0 \times 10^{-4}$	$9.3 \times 10^{-11}$	$1.5 \times 10^{-10}$		
		F	$5.0 \times 10^{-4}$	$1.2 \times 10^{-11}$	$2.0 \times 10^{-11}$	$5.0 \times 10^{-4}$	$5.6 \times 10^{-11}$
M			$5.0 \times 10^{-4}$	$2.2 \times 10^{-11}$	$3.3 \times 10^{-11}$		
<b>Cerium</b>							
Ce-134	3.00 d	M	$5.0 \times 10^{-4}$	$1.3 \times 10^{-9}$	$1.5 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.5 \times 10^{-9}$
		S	$5.0 \times 10^{-4}$	$1.3 \times 10^{-9}$	$1.6 \times 10^{-9}$		
Ce-135	17.6 h	M	$5.0 \times 10^{-4}$	$4.9 \times 10^{-10}$	$7.3 \times 10^{-10}$	$5.0 \times 10^{-4}$	$7.9 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$5.1 \times 10^{-10}$	$7.6 \times 10^{-10}$		
Ce-137	9.00 h	M	$5.0 \times 10^{-4}$	$1.0 \times 10^{-11}$	$1.8 \times 10^{-11}$	$5.0 \times 10^{-4}$	$2.5 \times 10^{-11}$
		S	$5.0 \times 10^{-4}$	$1.1 \times 10^{-11}$	$1.9 \times 10^{-11}$		
Ce-137m	1.43 d	M	$5.0 \times 10^{-4}$	$4.0 \times 10^{-10}$	$5.5 \times 10^{-10}$	$5.0 \times 10^{-4}$	$5.4 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$4.3 \times 10^{-10}$	$5.9 \times 10^{-10}$		
Ce-139	138 d	M	$5.0 \times 10^{-4}$	$1.6 \times 10^{-9}$	$1.3 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.6 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$1.8 \times 10^{-9}$	$1.4 \times 10^{-9}$		
Ce-141	32.5 d	M	$5.0 \times 10^{-4}$	$3.1 \times 10^{-9}$	$2.7 \times 10^{-9}$	$5.0 \times 10^{-4}$	$7.1 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$3.6 \times 10^{-9}$	$3.1 \times 10^{-9}$		
Ce-143	1.38 d	M	$5.0 \times 10^{-4}$	$7.4 \times 10^{-10}$	$9.5 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.1 \times 10^{-9}$
		S	$5.0 \times 10^{-4}$	$8.1 \times 10^{-10}$	$1.0 \times 10^{-9}$		

Radionuclides	Physical half-life	Type	Inhalation		$e(g)_{5\mu m}$	Ingestion	
			$f_1$	$e(g)_{1\mu m}$		$f_1$	$e(g)$
Ce-144	284 d	M	$5.0 \times 10^{-4}$	$3.4 \times 10^{-8}$	$2.3 \times 10^{-8}$	$5.0 \times 10^{-4}$	$5.2 \times 10^{-9}$
		S	$5.0 \times 10^{-4}$	$4.9 \times 10^{-8}$	$2.9 \times 10^{-8}$		
<b>Praseodymium</b>							
Pr-136	0.218 h	M	$5.0 \times 10^{-4}$	$1.4 \times 10^{-11}$	$2.4 \times 10^{-11}$	$5.0 \times 10^{-4}$	$3.3 \times 10^{-11}$
		S	$5.0 \times 10^{-4}$	$1.5 \times 10^{-11}$	$2.5 \times 10^{-11}$		
Pr-137	1.28 h	M	$5.0 \times 10^{-4}$	$2.1 \times 10^{-11}$	$3.4 \times 10^{-11}$	$5.0 \times 10^{-4}$	$4.0 \times 10^{-11}$
		S	$5.0 \times 10^{-4}$	$2.2 \times 10^{-11}$	$3.5 \times 10^{-11}$		
Pr-138m	2.10 h	M	$5.0 \times 10^{-4}$	$7.6 \times 10^{-11}$	$1.3 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$7.9 \times 10^{-11}$	$1.3 \times 10^{-10}$		
Pr-139	4.51 h	M	$5.0 \times 10^{-4}$	$1.9 \times 10^{-11}$	$2.9 \times 10^{-11}$	$5.0 \times 10^{-4}$	$3.1 \times 10^{-11}$
		S	$5.0 \times 10^{-4}$	$2.0 \times 10^{-11}$	$3.0 \times 10^{-11}$		
Pr-142	19.1 h	M	$5.0 \times 10^{-4}$	$5.3 \times 10^{-10}$	$7.0 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-9}$
		S	$5.0 \times 10^{-4}$	$5.6 \times 10^{-10}$	$7.4 \times 10^{-10}$		
Pr-142m	0.243 h	M	$5.0 \times 10^{-4}$	$6.7 \times 10^{-12}$	$8.9 \times 10^{-12}$	$5.0 \times 10^{-4}$	$1.7 \times 10^{-11}$
		S	$5.0 \times 10^{-4}$	$7.1 \times 10^{-12}$	$9.4 \times 10^{-12}$		
Pr-143	13.6 d	M	$5.0 \times 10^{-4}$	$2.1 \times 10^{-9}$	$1.9 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.2 \times 10^{-9}$
		S	$5.0 \times 10^{-4}$	$2.3 \times 10^{-9}$	$2.2 \times 10^{-9}$		
Pr-144	0.288 h	M	$5.0 \times 10^{-4}$	$1.8 \times 10^{-11}$	$2.9 \times 10^{-11}$	$5.0 \times 10^{-4}$	$5.0 \times 10^{-11}$
		S	$5.0 \times 10^{-4}$	$1.9 \times 10^{-11}$	$3.0 \times 10^{-11}$		
Pr-145	5.98 h	M	$5.0 \times 10^{-4}$	$1.6 \times 10^{-10}$	$2.5 \times 10^{-10}$	$5.0 \times 10^{-4}$	$3.9 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$1.7 \times 10^{-10}$	$2.6 \times 10^{-10}$		



Radionuclides	Physical half-life	Type	Inhalation		$e(g)_{5\mu m}$	Ingestion	
			$f_1$	$e(g)_{I\mu m}$		$f_1$	$e(g)$
Pr-147	0.227 h	M	$5.0 \times 10^{-4}$	$1.8 \times 10^{-11}$	$2.9 \times 10^{-11}$	$5.0 \times 10^{-4}$	$3.3 \times 10^{-11}$
		S	$5.0 \times 10^{-4}$	$1.9 \times 10^{-11}$	$3.0 \times 10^{-11}$		
Neodymium	0.844 h	M	$5.0 \times 10^{-4}$	$5.3 \times 10^{-11}$	$8.5 \times 10^{-11}$	$5.0 \times 10^{-4}$	$9.9 \times 10^{-11}$
		S	$5.0 \times 10^{-4}$	$5.6 \times 10^{-11}$	$8.9 \times 10^{-11}$		
Nd-138	5.04 h	M	$5.0 \times 10^{-4}$	$2.4 \times 10^{-10}$	$3.7 \times 10^{-10}$	$5.0 \times 10^{-4}$	$6.4 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$2.6 \times 10^{-10}$	$3.8 \times 10^{-10}$		
Nd-139	0.495 h	M	$5.0 \times 10^{-4}$	$1.0 \times 10^{-11}$	$1.7 \times 10^{-11}$	$5.0 \times 10^{-4}$	$2.0 \times 10^{-11}$
		S	$5.0 \times 10^{-4}$	$1.1 \times 10^{-11}$	$1.7 \times 10^{-11}$		
Nd-139m	5.50 h	M	$5.0 \times 10^{-4}$	$1.5 \times 10^{-10}$	$2.5 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.5 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$1.6 \times 10^{-10}$	$2.5 \times 10^{-10}$		
Nd-141	2.49 h	M	$5.0 \times 10^{-4}$	$5.1 \times 10^{-12}$	$8.5 \times 10^{-12}$	$5.0 \times 10^{-4}$	$8.3 \times 10^{-12}$
		S	$5.0 \times 10^{-4}$	$5.3 \times 10^{-12}$	$8.8 \times 10^{-12}$		
Nd-147	11.0 d	M	$5.0 \times 10^{-4}$	$2.0 \times 10^{-9}$	$1.9 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.1 \times 10^{-9}$
		S	$5.0 \times 10^{-4}$	$2.3 \times 10^{-9}$	$2.1 \times 10^{-9}$		
Nd-149	1.73 h	M	$5.0 \times 10^{-4}$	$8.5 \times 10^{-11}$	$1.2 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.2 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$9.0 \times 10^{-11}$	$1.3 \times 10^{-10}$		
Nd-151	0.207 h	M	$5.0 \times 10^{-4}$	$1.7 \times 10^{-11}$	$2.8 \times 10^{-11}$	$5.0 \times 10^{-4}$	$3.0 \times 10^{-11}$
		S	$5.0 \times 10^{-4}$	$1.8 \times 10^{-11}$	$2.9 \times 10^{-11}$		

Radionuclides	Physical half-life	Type	Inhalation		$e(g)_{sum}$	Ingestion	
			$f_1$	$e(g)_{Ipm}$		$f_1$	$e(g)$
<b>Promethium</b>							
Pm-141	0.348 h	M	$5.0 \times 10^{-4}$	$1.5 \times 10^{-11}$	$2.4 \times 10^{-11}$	$5.0 \times 10^{-4}$	$3.6 \times 10^{-11}$
		S	$5.0 \times 10^{-4}$	$1.6 \times 10^{-11}$	$2.5 \times 10^{-11}$		
Pm-143	265 d	M	$5.0 \times 10^{-4}$	$1.4 \times 10^{-9}$	$9.6 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.3 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$1.3 \times 10^{-9}$	$8.3 \times 10^{-10}$		
Pm-144	363 d	M	$5.0 \times 10^{-4}$	$7.8 \times 10^{-9}$	$5.4 \times 10^{-9}$	$5.0 \times 10^{-4}$	$9.7 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$7.0 \times 10^{-9}$	$3.9 \times 10^{-9}$		
Pm-145	17.7 a	M	$5.0 \times 10^{-4}$	$3.4 \times 10^{-9}$	$2.4 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.1 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$2.1 \times 10^{-9}$	$1.2 \times 10^{-9}$		
Pm-146	5.53 a	M	$5.0 \times 10^{-4}$	$1.9 \times 10^{-8}$	$1.3 \times 10^{-8}$	$5.0 \times 10^{-4}$	$9.0 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$1.6 \times 10^{-8}$	$9.0 \times 10^{-9}$		
Pm-147	2.62 a	M	$5.0 \times 10^{-4}$	$4.7 \times 10^{-9}$	$3.5 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.6 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$4.6 \times 10^{-9}$	$3.2 \times 10^{-9}$		
Pm-148	5.37 d	M	$5.0 \times 10^{-4}$	$2.0 \times 10^{-9}$	$2.1 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.7 \times 10^{-9}$
		S	$5.0 \times 10^{-4}$	$2.1 \times 10^{-9}$	$2.2 \times 10^{-9}$		
Pm-148m	41.3 d	M	$5.0 \times 10^{-4}$	$4.9 \times 10^{-9}$	$4.1 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.8 \times 10^{-9}$
		S	$5.0 \times 10^{-4}$	$5.4 \times 10^{-9}$	$4.3 \times 10^{-9}$		
Pm-149	2.21 d	M	$5.0 \times 10^{-4}$	$6.6 \times 10^{-10}$	$7.6 \times 10^{-10}$	$5.0 \times 10^{-4}$	$9.9 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$7.2 \times 10^{-10}$	$8.2 \times 10^{-10}$		
Pm-150	2.68 h	M	$5.0 \times 10^{-4}$	$1.3 \times 10^{-10}$	$2.0 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.6 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$1.4 \times 10^{-10}$	$2.1 \times 10^{-10}$		

Radionuclides	Physical half-life	Type	Inhalation		$e(g)_{5\mu m}$	Ingestion	
			$f_1$	$e(g)_{I\mu m}$		$f_1$	$e(g)$
Pm-151	1.18 d	M	$5.0 \times 10^{-4}$	$4.2 \times 10^{-10}$	$6.1 \times 10^{-10}$	$5.0 \times 10^{-4}$	$7.3 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$4.5 \times 10^{-10}$	$6.4 \times 10^{-10}$		
<b>Samarium</b>							
Sm-141	0.170 h	M	$5.0 \times 10^{-4}$	$1.6 \times 10^{-11}$	$2.7 \times 10^{-11}$	$5.0 \times 10^{-4}$	$3.9 \times 10^{-11}$
Sm-141m	0.377 h	M	$5.0 \times 10^{-4}$	$3.4 \times 10^{-11}$	$5.6 \times 10^{-11}$	$5.0 \times 10^{-4}$	$6.5 \times 10^{-11}$
Sm-142	1.21 h	M	$5.0 \times 10^{-4}$	$7.4 \times 10^{-11}$	$1.1 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.9 \times 10^{-10}$
Sm-145	340 d	M	$5.0 \times 10^{-4}$	$1.5 \times 10^{-9}$	$1.1 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.1 \times 10^{-10}$
Sm-146	$1.03 \times 10^8$ a	M	$5.0 \times 10^{-4}$	$9.9 \times 10^{-6}$	$6.7 \times 10^{-6}$	$5.0 \times 10^{-4}$	$5.4 \times 10^{-8}$
Sm-147	$1.06 \times 10^{11}$ a	M	$5.0 \times 10^{-4}$	$8.9 \times 10^{-6}$	$6.1 \times 10^{-6}$	$5.0 \times 10^{-4}$	$4.9 \times 10^{-8}$
Sm-151	90.0 a	M	$5.0 \times 10^{-4}$	$3.7 \times 10^{-9}$	$2.6 \times 10^{-9}$	$5.0 \times 10^{-4}$	$9.8 \times 10^{-11}$
Sm-153	1.95 d	M	$5.0 \times 10^{-4}$	$6.1 \times 10^{-10}$	$6.8 \times 10^{-10}$	$5.0 \times 10^{-4}$	$7.4 \times 10^{-10}$
Sm-155	0.368 h	M	$5.0 \times 10^{-4}$	$1.7 \times 10^{-11}$	$2.8 \times 10^{-11}$	$5.0 \times 10^{-4}$	$2.9 \times 10^{-11}$
Sm-156	9.40 h	M	$5.0 \times 10^{-4}$	$2.1 \times 10^{-10}$	$2.8 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.5 \times 10^{-10}$
<b>Europium</b>							
Eu-145	5.94 d	M	$5.0 \times 10^{-4}$	$5.6 \times 10^{-10}$	$7.3 \times 10^{-10}$	$5.0 \times 10^{-4}$	$7.5 \times 10^{-10}$
Eu-146	4.61 d	M	$5.0 \times 10^{-4}$	$8.2 \times 10^{-10}$	$1.2 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-9}$
Eu-147	24.0 d	M	$5.0 \times 10^{-4}$	$1.0 \times 10^{-9}$	$1.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$4.4 \times 10^{-10}$
Eu-148	54.5 d	M	$5.0 \times 10^{-4}$	$2.7 \times 10^{-9}$	$2.3 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-9}$
Eu-149	93.1 d	M	$5.0 \times 10^{-4}$	$2.7 \times 10^{-10}$	$2.3 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.0 \times 10^{-10}$
Eu-150	34.2 a	M	$5.0 \times 10^{-4}$	$5.0 \times 10^{-8}$	$3.4 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-9}$
Eu-150m	12.6 h	M	$5.0 \times 10^{-4}$	$1.9 \times 10^{-10}$	$2.8 \times 10^{-10}$	$5.0 \times 10^{-4}$	$3.8 \times 10^{-10}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion		
			$f_1$	$e(g)_{Ipm}$	$e(g)_{5um}$	$f_1$	$e(g)$
Eu-152	13.3 a	M	$5.0 \times 10^{-4}$	$3.9 \times 10^{-8}$	$2.7 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.4 \times 10^{-9}$
Eu-152m	9.32 h	M	$5.0 \times 10^{-4}$	$2.2 \times 10^{-10}$	$3.2 \times 10^{-10}$	$5.0 \times 10^{-4}$	$5.0 \times 10^{-10}$
Eu-154	8.80 a	M	$5.0 \times 10^{-4}$	$5.0 \times 10^{-8}$	$3.5 \times 10^{-8}$	$5.0 \times 10^{-4}$	$2.0 \times 10^{-9}$
Eu-155	4.96 a	M	$5.0 \times 10^{-4}$	$6.5 \times 10^{-9}$	$4.7 \times 10^{-9}$	$5.0 \times 10^{-4}$	$3.2 \times 10^{-10}$
Eu-156	15.2 d	M	$5.0 \times 10^{-4}$	$3.3 \times 10^{-9}$	$3.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.2 \times 10^{-9}$
Eu-157	15.1 h	M	$5.0 \times 10^{-4}$	$3.2 \times 10^{-10}$	$4.4 \times 10^{-10}$	$5.0 \times 10^{-4}$	$6.0 \times 10^{-10}$
Eu-158	0.765 h	M	$5.0 \times 10^{-4}$	$4.8 \times 10^{-11}$	$7.5 \times 10^{-11}$	$5.0 \times 10^{-4}$	$9.4 \times 10^{-11}$
<b>Gadolinium</b>							
Gd-145	0.382 h	F	$5.0 \times 10^{-4}$	$1.5 \times 10^{-11}$	$2.6 \times 10^{-11}$	$5.0 \times 10^{-4}$	$4.4 \times 10^{-11}$
		M	$5.0 \times 10^{-4}$	$2.1 \times 10^{-11}$	$3.5 \times 10^{-11}$		
Gd-146	48.3 d	F	$5.0 \times 10^{-4}$	$4.4 \times 10^{-9}$	$5.2 \times 10^{-9}$	$5.0 \times 10^{-4}$	$9.6 \times 10^{-10}$
		M	$5.0 \times 10^{-4}$	$6.0 \times 10^{-9}$	$4.6 \times 10^{-9}$		
Gd-147	1.59 d	F	$5.0 \times 10^{-4}$	$2.7 \times 10^{-10}$	$4.5 \times 10^{-10}$	$5.0 \times 10^{-4}$	$6.1 \times 10^{-10}$
		M	$5.0 \times 10^{-4}$	$4.1 \times 10^{-10}$	$5.9 \times 10^{-10}$		
Gd-148	93.0 a	F	$5.0 \times 10^{-4}$	$2.5 \times 10^{-5}$	$3.0 \times 10^{-5}$	$5.0 \times 10^{-4}$	$5.5 \times 10^{-8}$
		M	$5.0 \times 10^{-4}$	$1.1 \times 10^{-5}$	$7.2 \times 10^{-6}$		
Gd-149	9.40 d	F	$5.0 \times 10^{-4}$	$2.6 \times 10^{-10}$	$4.5 \times 10^{-10}$	$5.0 \times 10^{-4}$	$4.5 \times 10^{-10}$
		M	$5.0 \times 10^{-4}$	$7.0 \times 10^{-10}$	$7.9 \times 10^{-10}$		
Gd-151	120 d	F	$5.0 \times 10^{-4}$	$7.8 \times 10^{-10}$	$9.3 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.0 \times 10^{-10}$
		M	$5.0 \times 10^{-4}$	$8.1 \times 10^{-10}$	$6.5 \times 10^{-10}$		

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{lum}$	$f_1$	$e(g)$
Gd-152	$1.08 \times 10^{14}$ a	F	$5.0 \times 10^{-4}$	$1.9 \times 10^{-5}$	$5.0 \times 10^{-4}$	$4.1 \times 10^{-8}$
		M	$5.0 \times 10^{-4}$	$7.4 \times 10^{-6}$		
Gd-153	242 d	F	$5.0 \times 10^{-4}$	$2.1 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.7 \times 10^{-10}$
		M	$5.0 \times 10^{-4}$	$1.9 \times 10^{-9}$		
Gd-159	18.6 h	F	$5.0 \times 10^{-4}$	$1.1 \times 10^{-10}$	$5.0 \times 10^{-4}$	$4.9 \times 10^{-10}$
		M	$5.0 \times 10^{-4}$	$2.7 \times 10^{-10}$		
<b>Terbium</b>						
Tb-147	1.65 h	M	$5.0 \times 10^{-4}$	$7.9 \times 10^{-11}$	$5.0 \times 10^{-4}$	$1.6 \times 10^{-10}$
Tb-149	4.15 h	M	$5.0 \times 10^{-4}$	$4.3 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.5 \times 10^{-10}$
Tb-150	3.27 h	M	$5.0 \times 10^{-4}$	$1.1 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.5 \times 10^{-10}$
Tb-151	17.6 h	M	$5.0 \times 10^{-4}$	$2.3 \times 10^{-10}$	$5.0 \times 10^{-4}$	$3.4 \times 10^{-10}$
Tb-153	2.34 d	M	$5.0 \times 10^{-4}$	$2.0 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.5 \times 10^{-10}$
Tb-154	21.4 h	M	$5.0 \times 10^{-4}$	$3.8 \times 10^{-10}$	$5.0 \times 10^{-4}$	$6.5 \times 10^{-10}$
Tb-155	5.32 d	M	$5.0 \times 10^{-4}$	$2.1 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.1 \times 10^{-10}$
Tb-156	5.34 d	M	$5.0 \times 10^{-4}$	$1.2 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.2 \times 10^{-9}$
Tb-156m	1.02 d	M	$5.0 \times 10^{-4}$	$2.0 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.7 \times 10^{-10}$
Tb-156m'	5.00 h	M	$5.0 \times 10^{-4}$	$9.2 \times 10^{-11}$	$5.0 \times 10^{-4}$	$8.1 \times 10^{-11}$
Tb-157	$7.1 \times 10^1$ a	M	$5.0 \times 10^{-4}$	$1.1 \times 10^{-9}$	$5.0 \times 10^{-4}$	$3.4 \times 10^{-11}$
Tb-158	$1.80 \times 10^2$ a	M	$5.0 \times 10^{-4}$	$4.3 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.1 \times 10^{-9}$
Tb-160	72.3 d	M	$5.0 \times 10^{-4}$	$6.6 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.6 \times 10^{-9}$
Tb-161	6.91 d	M	$5.0 \times 10^{-4}$	$1.2 \times 10^{-9}$	$5.0 \times 10^{-4}$	$7.2 \times 10^{-10}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{I\mu m}$	$f_1$	$e(g)_{5\mu m}$
<b>Dysprosium</b>						
Dy-155	10.0 h	M	$5.0 \times 10^{-4}$	$8.0 \times 10^{-11}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-10}$
Dy-157	8.10 h	M	$5.0 \times 10^{-4}$	$3.2 \times 10^{-11}$	$5.0 \times 10^{-4}$	$6.1 \times 10^{-11}$
Dy-159	144 d	M	$5.0 \times 10^{-4}$	$3.5 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.0 \times 10^{-10}$
Dy-165	2.33 h	M	$5.0 \times 10^{-4}$	$6.1 \times 10^{-11}$	$5.0 \times 10^{-4}$	$1.1 \times 10^{-10}$
Dy-166	3.40 d	M	$5.0 \times 10^{-4}$	$1.8 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.6 \times 10^{-9}$
<b>Holmium</b>						
Ho-155	0.800 h	M	$5.0 \times 10^{-4}$	$2.0 \times 10^{-11}$	$5.0 \times 10^{-4}$	$3.7 \times 10^{-11}$
Ho-157	0.210 h	M	$5.0 \times 10^{-4}$	$4.5 \times 10^{-12}$	$5.0 \times 10^{-4}$	$6.5 \times 10^{-12}$
Ho-159	0.550 h	M	$5.0 \times 10^{-4}$	$6.3 \times 10^{-12}$	$5.0 \times 10^{-4}$	$7.9 \times 10^{-12}$
Ho-161	2.50 h	M	$5.0 \times 10^{-4}$	$6.3 \times 10^{-12}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-11}$
Ho-162	0.250 h	M	$5.0 \times 10^{-4}$	$2.9 \times 10^{-12}$	$5.0 \times 10^{-4}$	$3.3 \times 10^{-12}$
Ho-162m	1.13 h	M	$5.0 \times 10^{-4}$	$2.2 \times 10^{-11}$	$5.0 \times 10^{-4}$	$2.6 \times 10^{-11}$
Ho-164	0.483 h	M	$5.0 \times 10^{-4}$	$8.6 \times 10^{-12}$	$5.0 \times 10^{-4}$	$9.5 \times 10^{-12}$
Ho-164m	0.625 h	M	$5.0 \times 10^{-4}$	$1.2 \times 10^{-11}$	$5.0 \times 10^{-4}$	$1.6 \times 10^{-11}$
Ho-166	1.12 d	M	$5.0 \times 10^{-4}$	$6.6 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.4 \times 10^{-9}$
Ho-166m	$1.20 \times 10^3$ a	M	$5.0 \times 10^{-4}$	$1.1 \times 10^{-7}$	$5.0 \times 10^{-4}$	$2.0 \times 10^{-9}$
Ho-167	3.10 h	M	$5.0 \times 10^{-4}$	$7.1 \times 10^{-11}$	$5.0 \times 10^{-4}$	$8.3 \times 10^{-11}$
<b>Erbium</b>						
Er-161	3.24 h	M	$5.0 \times 10^{-4}$	$5.1 \times 10^{-11}$	$5.0 \times 10^{-4}$	$8.0 \times 10^{-11}$

Radionuclides	Physical half-life	Type	Inhalation		$e(g)_{sum}$	Ingestion	
			$f_i$	$e(g)_{i_{um}}$		$f_i$	$e(g)$
Er-165	10.4 h	M	$5.0 \times 10^{-4}$	$8.3 \times 10^{-12}$	$1.4 \times 10^{-11}$	$5.0 \times 10^{-4}$	$1.9 \times 10^{-11}$
Er-169	9.30 d	M	$5.0 \times 10^{-4}$	$9.8 \times 10^{-10}$	$9.2 \times 10^{-10}$	$5.0 \times 10^{-4}$	$3.7 \times 10^{-10}$
Er-171	7.52 h	M	$5.0 \times 10^{-4}$	$2.2 \times 10^{-10}$	$3.0 \times 10^{-10}$	$5.0 \times 10^{-4}$	$3.6 \times 10^{-10}$
Er-172	2.05 d	M	$5.0 \times 10^{-4}$	$1.1 \times 10^{-9}$	$1.2 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.0 \times 10^{-9}$
<b>Thulium</b>							
Tm-162	0.362 h	M	$5.0 \times 10^{-4}$	$1.6 \times 10^{-11}$	$2.7 \times 10^{-11}$	$5.0 \times 10^{-4}$	$2.9 \times 10^{-11}$
Tm-166	7.70 h	M	$5.0 \times 10^{-4}$	$1.8 \times 10^{-10}$	$2.8 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.8 \times 10^{-10}$
Tm-167	9.24 d	M	$5.0 \times 10^{-4}$	$1.1 \times 10^{-9}$	$1.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$5.6 \times 10^{-10}$
Tm-170	1.29 d	M	$5.0 \times 10^{-4}$	$6.6 \times 10^{-9}$	$5.2 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-9}$
Tm-171	1.92 a	M	$5.0 \times 10^{-4}$	$1.3 \times 10^{-9}$	$9.1 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.1 \times 10^{-10}$
Tm-172	2.65 d	M	$5.0 \times 10^{-4}$	$1.1 \times 10^{-9}$	$1.4 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.7 \times 10^{-9}$
Tm-173	8.24 h	M	$5.0 \times 10^{-4}$	$1.8 \times 10^{-10}$	$2.6 \times 10^{-10}$	$5.0 \times 10^{-4}$	$3.1 \times 10^{-10}$
Tm-175	0.253 h	M	$5.0 \times 10^{-4}$	$1.9 \times 10^{-11}$	$3.1 \times 10^{-11}$	$5.0 \times 10^{-4}$	$2.7 \times 10^{-11}$
<b>Ytterbium</b>							
Yb-162	0.315 h	M	$5.0 \times 10^{-4}$	$1.4 \times 10^{-11}$	$2.2 \times 10^{-11}$	$5.0 \times 10^{-4}$	$2.3 \times 10^{-11}$
Yb-166	2.36 d	M	$5.0 \times 10^{-4}$	$1.4 \times 10^{-11}$	$2.3 \times 10^{-11}$	$5.0 \times 10^{-4}$	$9.5 \times 10^{-10}$
Yb-167	0.292 h	M	$5.0 \times 10^{-4}$	$7.2 \times 10^{-10}$	$9.1 \times 10^{-10}$	$5.0 \times 10^{-4}$	$6.7 \times 10^{-12}$
Yb-169	32.0 d	M	$5.0 \times 10^{-4}$	$7.6 \times 10^{-10}$	$9.5 \times 10^{-10}$	$5.0 \times 10^{-4}$	$7.1 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$6.5 \times 10^{-12}$	$9.0 \times 10^{-12}$	$5.0 \times 10^{-4}$	
		S	$5.0 \times 10^{-4}$	$6.9 \times 10^{-12}$	$9.5 \times 10^{-12}$		
		M	$5.0 \times 10^{-4}$	$2.4 \times 10^{-9}$	$2.1 \times 10^{-9}$	$5.0 \times 10^{-4}$	
		S	$5.0 \times 10^{-4}$	$2.8 \times 10^{-9}$	$2.4 \times 10^{-9}$		

Radionuclides	Physical half-life	Type	Inhalation		$e(g)_{5\mu m}$	Ingestion	
			$f_1$	$e(g)_{Ipm}$		$f_1$	$e(g)$
Yb-175	4.19 d	M	$5.0 \times 10^{-4}$	$6.3 \times 10^{-10}$	$6.4 \times 10^{-10}$	$5.0 \times 10^{-4}$	$4.4 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$7.0 \times 10^{-10}$	$7.0 \times 10^{-10}$		
Yb-177	1.90 h	M	$5.0 \times 10^{-4}$	$6.4 \times 10^{-11}$	$8.8 \times 10^{-11}$	$5.0 \times 10^{-4}$	$9.7 \times 10^{-11}$
		S	$5.0 \times 10^{-4}$	$6.9 \times 10^{-11}$	$9.4 \times 10^{-11}$		
Yb-178	1.23 h	M	$5.0 \times 10^{-4}$	$7.1 \times 10^{-11}$	$1.0 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.2 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$7.6 \times 10^{-11}$	$1.1 \times 10^{-10}$		
<b>Lutetium</b>							
Lu-169	1.42 d	M	$5.0 \times 10^{-4}$	$3.5 \times 10^{-10}$	$4.7 \times 10^{-10}$	$5.0 \times 10^{-4}$	$4.6 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$3.8 \times 10^{-10}$	$4.9 \times 10^{-10}$		
Lu-170	2.00 d	M	$5.0 \times 10^{-4}$	$6.4 \times 10^{-10}$	$9.3 \times 10^{-10}$	$5.0 \times 10^{-4}$	$9.9 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$6.7 \times 10^{-10}$	$9.5 \times 10^{-10}$		
Lu-171	8.22 d	M	$5.0 \times 10^{-4}$	$7.6 \times 10^{-10}$	$8.8 \times 10^{-10}$	$5.0 \times 10^{-4}$	$6.7 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$8.3 \times 10^{-10}$	$9.3 \times 10^{-10}$		
Lu-172	6.70 d	M	$5.0 \times 10^{-4}$	$1.4 \times 10^{-9}$	$1.7 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-9}$
		S	$5.0 \times 10^{-4}$	$1.5 \times 10^{-9}$	$1.8 \times 10^{-9}$		
Lu-173	1.37 a	M	$5.0 \times 10^{-4}$	$2.0 \times 10^{-9}$	$1.5 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.6 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$2.3 \times 10^{-9}$	$1.4 \times 10^{-9}$		
Lu-174	3.31 a	M	$5.0 \times 10^{-4}$	$4.0 \times 10^{-9}$	$2.9 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.7 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$3.9 \times 10^{-9}$	$2.5 \times 10^{-9}$		
Lu-174m	142 d	M	$5.0 \times 10^{-4}$	$3.4 \times 10^{-9}$	$2.4 \times 10^{-9}$	$5.0 \times 10^{-4}$	$5.3 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$3.8 \times 10^{-9}$	$2.6 \times 10^{-9}$		



Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_i$	$e(g)_{I\mu m}$	$f_i$	$e(g)$
Lu-176	$3.60 \times 10^{10}$ a	M	$5.0 \times 10^{-4}$	$6.6 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.8 \times 10^{-9}$
		S	$5.0 \times 10^{-4}$	$5.2 \times 10^{-8}$		
Lu-176m	3.68 h	M	$5.0 \times 10^{-4}$	$1.1 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.7 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$1.2 \times 10^{-10}$		
Lu-177	6.71 d	M	$5.0 \times 10^{-4}$	$1.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$5.3 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$1.1 \times 10^{-9}$		
Lu-177m	161 d	M	$5.0 \times 10^{-4}$	$1.2 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.7 \times 10^{-9}$
		S	$5.0 \times 10^{-4}$	$1.5 \times 10^{-8}$		
Lu-178	0.473 h	M	$5.0 \times 10^{-4}$	$2.5 \times 10^{-11}$	$5.0 \times 10^{-4}$	$4.7 \times 10^{-11}$
		S	$5.0 \times 10^{-4}$	$2.6 \times 10^{-11}$		
Lu-178m	0.378 h	M	$5.0 \times 10^{-4}$	$3.3 \times 10^{-11}$	$5.0 \times 10^{-4}$	$3.8 \times 10^{-11}$
		S	$5.0 \times 10^{-4}$	$3.5 \times 10^{-11}$		
Lu-179	4.59 h	M	$5.0 \times 10^{-4}$	$1.1 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.1 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$1.2 \times 10^{-10}$		
<b>Hafnium</b>						
Hf-170	16.0 h	F	0.002	$1.7 \times 10^{-10}$	0.002	$4.8 \times 10^{-10}$
		M	0.002	$3.2 \times 10^{-10}$		
Hf-172	1.87 a	F	0.002	$3.2 \times 10^{-8}$	0.002	$1.0 \times 10^{-9}$
		M	0.002	$1.9 \times 10^{-8}$		
Hf-173	24.0 h	F	0.002	$7.9 \times 10^{-11}$	0.002	$2.3 \times 10^{-10}$
		M	0.002	$1.6 \times 10^{-10}$		

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{I\mu m}$	$f_1$	$e(g)_{5\mu m}$
Hf-175	70.0 d	F	0.002	$7.2 \times 10^{-10}$	0.002	$8.7 \times 10^{-10}$
		M	0.002	$1.1 \times 10^{-9}$		$8.8 \times 10^{-10}$
Hf-177m	0.856 h	F	0.002	$4.7 \times 10^{-11}$	0.002	$8.4 \times 10^{-11}$
		M	0.002	$9.2 \times 10^{-11}$		$1.5 \times 10^{-10}$
Hf-178m	31.0 a	F	0.002	$2.6 \times 10^{-7}$	0.002	$3.1 \times 10^{-7}$
		M	0.002	$1.1 \times 10^{-7}$		$7.8 \times 10^{-8}$
Hf-179m	25.1 d	F	0.002	$1.1 \times 10^{-9}$	0.002	$1.4 \times 10^{-9}$
		M	0.002	$3.6 \times 10^{-9}$		$3.2 \times 10^{-9}$
Hf-180m	5.50 h	F	0.002	$6.4 \times 10^{-11}$	0.002	$1.2 \times 10^{-10}$
		M	0.002	$1.4 \times 10^{-10}$		$2.0 \times 10^{-10}$
Hf-181	42.4 d	F	0.002	$1.4 \times 10^{-9}$	0.002	$1.8 \times 10^{-9}$
		M	0.002	$4.7 \times 10^{-9}$		$4.1 \times 10^{-9}$
Hf-182	$9.00 \times 10^6$ a	F	0.002	$3.0 \times 10^{-7}$	0.002	$3.6 \times 10^{-7}$
		M	0.002	$1.2 \times 10^{-7}$		$8.3 \times 10^{-8}$
Hf-182m	1.02 h	F	0.002	$2.3 \times 10^{-11}$	0.002	$4.0 \times 10^{-11}$
		M	0.002	$4.7 \times 10^{-11}$		$7.1 \times 10^{-11}$
Hf-183	1.07 h	F	0.002	$2.6 \times 10^{-11}$	0.002	$4.4 \times 10^{-11}$
		M	0.002	$5.8 \times 10^{-11}$		$8.3 \times 10^{-11}$
Hf-184	4.12 h	F	0.002	$1.3 \times 10^{-10}$	0.002	$2.3 \times 10^{-10}$
		M	0.002	$3.3 \times 10^{-10}$		$4.5 \times 10^{-10}$
<b>Tantalum</b>						
Ta-172	0.613 h	M	0.001	$3.4 \times 10^{-11}$	0.001	$5.5 \times 10^{-11}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{I_{\text{um}}}$	$f_1$	$e(g)_{\text{Sum}}$
Ta-173	3.65 h	S	0.001	$3.6 \times 10^{-11}$		$5.7 \times 10^{-11}$
		M	0.001	$1.1 \times 10^{-10}$	0.001	$1.6 \times 10^{-10}$
		S	0.001	$1.2 \times 10^{-10}$		$1.6 \times 10^{-10}$
Ta-174	1.20 h	M	0.001	$4.2 \times 10^{-11}$	0.001	$6.3 \times 10^{-11}$
		S	0.001	$4.4 \times 10^{-11}$		$6.6 \times 10^{-11}$
Ta-175	10.5 h	M	0.001	$1.3 \times 10^{-10}$	0.001	$2.0 \times 10^{-10}$
		S	0.001	$1.4 \times 10^{-10}$		$2.0 \times 10^{-10}$
Ta-176	8.08 h	M	0.001	$2.0 \times 10^{-10}$	0.001	$3.2 \times 10^{-10}$
		S	0.001	$2.1 \times 10^{-10}$		$3.3 \times 10^{-10}$
Ta-177	2.36 d	M	0.001	$9.3 \times 10^{-11}$	0.001	$1.2 \times 10^{-10}$
		S	0.001	$1.0 \times 10^{-10}$		$1.3 \times 10^{-10}$
Ta-178	2.20 h	M	0.001	$6.6 \times 10^{-11}$	0.001	$1.0 \times 10^{-10}$
		S	0.001	$6.9 \times 10^{-11}$		$1.1 \times 10^{-10}$
Ta-179	1.82 a	M	0.001	$2.0 \times 10^{-10}$	0.001	$1.3 \times 10^{-10}$
		S	0.001	$5.2 \times 10^{-10}$		$2.9 \times 10^{-10}$
Ta-180	$1.00 \times 10^{13}$ a	M	0.001	$6.0 \times 10^{-9}$	0.001	$4.6 \times 10^{-9}$
		S	0.001	$2.4 \times 10^{-8}$		$1.4 \times 10^{-8}$
Ta-180m	8.10 h	M	0.001	$4.4 \times 10^{-11}$	0.001	$5.8 \times 10^{-11}$
		S	0.001	$4.7 \times 10^{-11}$		$6.2 \times 10^{-11}$
Ta-182	115 d	M	0.001	$7.2 \times 10^{-9}$	0.001	$5.8 \times 10^{-9}$
		S	0.001	$9.7 \times 10^{-9}$		$7.4 \times 10^{-9}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{Ipm}$	$f_1$	$e(g)_{5um}$
Ta-182m	0.264 h	M	0.001	$2.1 \times 10^{-11}$	0.001	$3.4 \times 10^{-11}$
		S	0.001	$2.2 \times 10^{-11}$		$3.6 \times 10^{-11}$
Ta-183	5.10 d	M	0.001	$1.8 \times 10^{-9}$	0.001	$1.8 \times 10^{-9}$
		S	0.001	$2.0 \times 10^{-9}$		$2.0 \times 10^{-9}$
Ta-184	8.70 h	M	0.001	$4.1 \times 10^{-10}$	0.001	$6.0 \times 10^{-10}$
		S	0.001	$4.4 \times 10^{-10}$		$6.3 \times 10^{-10}$
Ta-185	0.816 h	M	0.001	$4.6 \times 10^{-11}$	0.001	$6.8 \times 10^{-11}$
		S	0.001	$4.9 \times 10^{-11}$		$7.2 \times 10^{-11}$
Ta-186	0.175 h	M	0.001	$1.8 \times 10^{-11}$	0.001	$3.0 \times 10^{-11}$
		S	0.001	$1.9 \times 10^{-11}$		$3.1 \times 10^{-11}$
<b>Tungsten</b>						
W-176	2.30 h	F	0.300	$4.4 \times 10^{-11}$	0.300	$7.6 \times 10^{-11}$
					0.010	$1.1 \times 10^{-10}$
W-177	2.25 h	F	0.300	$2.6 \times 10^{-11}$	0.300	$4.6 \times 10^{-11}$
					0.010	$6.1 \times 10^{-11}$
W-178	21.7 d	F	0.300	$7.6 \times 10^{-11}$	0.300	$1.2 \times 10^{-10}$
					0.010	$2.5 \times 10^{-10}$
W-179	0.625 h	F	0.300	$9.9 \times 10^{-13}$	0.300	$1.8 \times 10^{-12}$
					0.010	$3.3 \times 10^{-12}$
W-181	121 d	F	0.300	$2.8 \times 10^{-11}$	0.300	$4.3 \times 10^{-11}$
					0.010	$7.6 \times 10^{-11}$
W-185	75.1 d	F	0.300	$1.4 \times 10^{-10}$	0.300	$2.2 \times 10^{-10}$
					0.010	$8.2 \times 10^{-11}$
					0.300	$4.4 \times 10^{-10}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_i$	$e(g)_{I\mu m}$	$f_i$	$e(g)$
W-187	23.9 h	F	0.300	$2.0 \times 10^{-10}$	0.010	$5.0 \times 10^{-10}$
W-188	69.4 d	F	0.300	$5.9 \times 10^{-10}$	0.300	$6.3 \times 10^{-10}$
<b>Rhenium</b>					0.010	$7.1 \times 10^{-10}$
Re-177	0.233 h	F	0.800	$1.0 \times 10^{-11}$	0.800	$2.2 \times 10^{-11}$
Re-178	0.220 h	M	0.800	$1.4 \times 10^{-11}$	0.800	$2.5 \times 10^{-11}$
Re-181	20.0 h	F	0.800	$1.1 \times 10^{-11}$	0.800	$2.5 \times 10^{-11}$
Re-182	2.67 d	M	0.800	$1.5 \times 10^{-11}$	0.800	$4.2 \times 10^{-10}$
Re-182m	12.7 h	F	0.800	$1.9 \times 10^{-10}$	0.800	$4.2 \times 10^{-10}$
Re-184	38.0 d	M	0.800	$2.5 \times 10^{-10}$	0.800	$1.4 \times 10^{-9}$
Re-184m	165 d	F	0.800	$6.8 \times 10^{-10}$	0.800	$1.4 \times 10^{-9}$
Re-186	3.78 d	F	0.800	$1.3 \times 10^{-9}$	0.800	$1.4 \times 10^{-9}$
		M	0.800	$1.5 \times 10^{-10}$	0.800	$2.7 \times 10^{-10}$
		F	0.800	$2.0 \times 10^{-10}$	0.800	$2.7 \times 10^{-10}$
		M	0.800	$4.6 \times 10^{-10}$	0.800	$1.0 \times 10^{-9}$
		F	0.800	$1.8 \times 10^{-9}$	0.800	$1.5 \times 10^{-9}$
		M	0.800	$6.1 \times 10^{-10}$	0.800	$1.5 \times 10^{-9}$
		F	0.800	$6.1 \times 10^{-9}$	0.800	$1.5 \times 10^{-9}$
		M	0.800	$5.3 \times 10^{-10}$	0.800	$1.5 \times 10^{-9}$
		F	0.800	$1.1 \times 10^{-9}$	0.800	$1.5 \times 10^{-9}$
		M	0.800	$1.2 \times 10^{-9}$	0.800	$1.5 \times 10^{-9}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion		
			$f_1$	$e(g)_{Ipm}$	$e(g)_{5\mu m}$	$f_1$	$e(g)$
Re-186m	$2.00 \times 10^5$ a	F	0.800	$8.5 \times 10^{-10}$	$1.2 \times 10^{-9}$	0.800	$2.2 \times 10^{-9}$
		M	0.800	$1.1 \times 10^{-8}$	$7.9 \times 10^{-9}$		
Re-187	$5.00 \times 10^{10}$ a	F	0.800	$1.9 \times 10^{-12}$	$2.6 \times 10^{-12}$	0.800	$5.1 \times 10^{-12}$
		M	0.800	$6.0 \times 10^{-12}$	$4.6 \times 10^{-12}$		
Re-188	17.0 h	F	0.800	$4.7 \times 10^{-10}$	$6.6 \times 10^{-10}$	0.800	$1.4 \times 10^{-9}$
		M	0.800	$5.5 \times 10^{-10}$	$7.4 \times 10^{-10}$		
Re-188m	0.3 h	F	0.800	$1.0 \times 10^{-11}$	$1.6 \times 10^{-11}$	0.800	$3.0 \times 10^{-11}$
		M	0.800	$1.4 \times 10^{-11}$	$2.0 \times 10^{-11}$		
Re-189	1.01 d	F	0.800	$2.7 \times 10^{-10}$	$4.3 \times 10^{-10}$	0.800	$7.8 \times 10^{-10}$
		M	0.800	$4.3 \times 10^{-10}$	$6.0 \times 10^{-10}$		
<b>Osmium</b>							
Os-180	0.366 h	F	0.010	$8.8 \times 10^{-12}$	$1.6 \times 10^{-11}$	0.010	$1.7 \times 10^{-11}$
		M	0.010	$1.4 \times 10^{-11}$	$2.4 \times 10^{-11}$		
		S	0.010	$1.5 \times 10^{-11}$	$2.5 \times 10^{-11}$		
Os-181	1.75 h	F	0.010	$3.6 \times 10^{-11}$	$6.4 \times 10^{-11}$	0.010	$8.9 \times 10^{-11}$
		M	0.010	$6.3 \times 10^{-11}$	$9.6 \times 10^{-11}$		
		S	0.010	$6.6 \times 10^{-11}$	$1.0 \times 10^{-10}$		
Os-182	22.0 h	F	0.010	$1.9 \times 10^{-10}$	$3.2 \times 10^{-10}$	0.010	$5.6 \times 10^{-10}$
		M	0.010	$3.7 \times 10^{-10}$	$5.0 \times 10^{-10}$		
		S	0.010	$3.9 \times 10^{-10}$	$5.2 \times 10^{-10}$		
Os-185	94.0 d	F	0.010	$1.1 \times 10^{-9}$	$1.4 \times 10^{-9}$	0.010	$5.1 \times 10^{-10}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{1\mu m}$	$f_1$	$e(g)$
Os-189m	6.00 h	M	0.010	$1.2 \times 10^{-9}$		
		S	0.010	$1.5 \times 10^{-9}$		
		F	0.010	$2.7 \times 10^{-12}$	0.010	$1.8 \times 10^{-11}$
Os-191	15.4 d	M	0.010	$5.1 \times 10^{-12}$		
		S	0.010	$5.4 \times 10^{-12}$		
Os-191m	13.0 h	F	0.010	$2.5 \times 10^{-10}$	0.010	$5.7 \times 10^{-10}$
		M	0.010	$1.5 \times 10^{-9}$		
Os-193	1.25 d	S	0.010	$1.8 \times 10^{-9}$		
		F	0.010	$2.6 \times 10^{-11}$	0.010	$9.6 \times 10^{-11}$
		M	0.010	$1.3 \times 10^{-10}$		
Os-194	6.00a	S	0.010	$1.5 \times 10^{-10}$		
		F	0.010	$1.7 \times 10^{-10}$	0.010	$8.1 \times 10^{-10}$
Iridium	0.250 h	M	0.010	$4.7 \times 10^{-10}$		
		S	0.010	$5.1 \times 10^{-10}$		
		F	0.010	$1.1 \times 10^{-8}$	0.010	$2.4 \times 10^{-9}$
Ir-182	0.250 h	M	0.010	$2.0 \times 10^{-8}$		
		S	0.010	$7.9 \times 10^{-8}$		
Os-193	1.25 d	F	0.010	$2.6 \times 10^{-11}$	0.010	$4.8 \times 10^{-11}$
		M	0.010	$1.3 \times 10^{-10}$		
		S	0.010	$1.4 \times 10^{-10}$		
Os-194	6.00a	F	0.010	$2.8 \times 10^{-10}$		
		M	0.010	$6.4 \times 10^{-10}$		
Os-194	6.00a	S	0.010	$6.8 \times 10^{-10}$		
		F	0.010	$1.3 \times 10^{-8}$	0.010	$2.4 \times 10^{-9}$
Iridium	0.250 h	M	0.010	$1.3 \times 10^{-8}$		
		S	0.010	$4.2 \times 10^{-8}$		
Os-193	1.25 d	F	0.010	$2.6 \times 10^{-11}$	0.010	$4.8 \times 10^{-11}$
		M	0.010	$1.5 \times 10^{-11}$		
		S	0.010	$2.4 \times 10^{-11}$		
Os-194	6.00a	F	0.010	$2.5 \times 10^{-11}$		
		M	0.010	$2.4 \times 10^{-11}$		
Os-194	6.00a	S	0.010	$4.0 \times 10^{-11}$		
		F	0.010	$2.6 \times 10^{-11}$	0.010	$4.8 \times 10^{-11}$
Iridium	0.250 h	M	0.010	$1.3 \times 10^{-8}$		
		S	0.010	$7.9 \times 10^{-8}$		

Radionuclides	Physical half-life	Type	Inhalation		Ingestion		
			$f_1$	$e(g)_{Ipm}$	$e(g)_{5\mu m}$	$f_1$	$e(g)$
Ir-184	3.02 h	F	0.010	$6.7 \times 10^{-11}$	$1.2 \times 10^{-10}$	0.010	$1.7 \times 10^{-10}$
		M	0.010	$1.1 \times 10^{-10}$	$1.8 \times 10^{-10}$		
		S	0.010	$1.2 \times 10^{-10}$	$1.9 \times 10^{-10}$		
Ir-185	14.0 h	F	0.010	$8.8 \times 10^{-11}$	$1.5 \times 10^{-10}$	0.010	$2.6 \times 10^{-10}$
		M	0.010	$1.8 \times 10^{-10}$	$2.5 \times 10^{-10}$		
		S	0.010	$1.9 \times 10^{-10}$	$2.6 \times 10^{-10}$		
Ir-186	15.8 h	F	0.010	$1.8 \times 10^{-10}$	$3.3 \times 10^{-10}$	0.010	$4.9 \times 10^{-10}$
		M	0.010	$3.2 \times 10^{-10}$	$4.8 \times 10^{-10}$		
		S	0.010	$3.3 \times 10^{-10}$	$5.0 \times 10^{-10}$		
Ir-186m	1.75 h	F	0.010	$2.5 \times 10^{-11}$	$4.5 \times 10^{-11}$	0.010	$6.1 \times 10^{-11}$
		M	0.010	$4.3 \times 10^{-11}$	$6.9 \times 10^{-11}$		
		S	0.010	$4.5 \times 10^{-11}$	$7.1 \times 10^{-11}$		
Ir-187	10.5 h	F	0.010	$4.0 \times 10^{-11}$	$7.2 \times 10^{-11}$	0.010	$1.2 \times 10^{-10}$
		M	0.010	$7.5 \times 10^{-11}$	$1.1 \times 10^{-10}$		
		S	0.010	$7.9 \times 10^{-11}$	$1.2 \times 10^{-10}$		
Ir-188	1.73 d	F	0.010	$2.6 \times 10^{-10}$	$4.4 \times 10^{-10}$	0.010	$6.3 \times 10^{-10}$
		M	0.010	$4.1 \times 10^{-10}$	$6.0 \times 10^{-10}$		
		S	0.010	$4.3 \times 10^{-10}$	$6.2 \times 10^{-10}$		
Ir-189	13.3 d	F	0.010	$1.1 \times 10^{-10}$	$1.7 \times 10^{-10}$	0.010	$2.4 \times 10^{-10}$
		M	0.010	$4.8 \times 10^{-10}$	$4.1 \times 10^{-10}$		
		S	0.010	$5.5 \times 10^{-10}$	$4.6 \times 10^{-10}$		



Radionuclides	Physical half-life	Type	Inhalation		Ingestion		
			$f_1$	$e(g)_{I_{\text{Inm}}}$	$e(g)_{5\text{um}}$	$f_1$	$e(g)$
Ir-190	12.1 d	F	0.010	$7.9 \times 10^{-10}$	$1.2 \times 10^{-9}$	0.010	$1.2 \times 10^{-9}$
		M	0.010	$2.0 \times 10^{-9}$	$2.3 \times 10^{-9}$		
		S	0.010	$2.3 \times 10^{-9}$	$2.5 \times 10^{-9}$		
Ir-190m	3.10 h	F	0.010	$5.3 \times 10^{-11}$	$9.7 \times 10^{-11}$	0.010	$1.2 \times 10^{-10}$
		M	0.010	$8.3 \times 10^{-11}$	$1.4 \times 10^{-10}$		
		S	0.010	$8.6 \times 10^{-11}$	$1.4 \times 10^{-10}$		
Ir-190m'	1.20 h	F	0.010	$3.7 \times 10^{-12}$	$5.6 \times 10^{-12}$	0.010	$8.0 \times 10^{-12}$
		M	0.010	$9.0 \times 10^{-12}$	$1.0 \times 10^{-11}$		
		S	0.010	$1.0 \times 10^{-11}$	$1.1 \times 10^{-11}$		
Ir-192	74.0 d	F	0.010	$1.8 \times 10^{-9}$	$2.2 \times 10^{-9}$	0.010	$1.4 \times 10^{-9}$
		M	0.010	$4.9 \times 10^{-9}$	$4.1 \times 10^{-9}$		
		S	0.010	$6.2 \times 10^{-9}$	$4.9 \times 10^{-9}$		
Ir-192m	$2.41 \times 10^2$ a	F	0.010	$4.8 \times 10^{-9}$	$5.6 \times 10^{-9}$	0.010	$3.1 \times 10^{-10}$
		M	0.010	$5.4 \times 10^{-9}$	$3.4 \times 10^{-9}$		
		S	0.010	$3.6 \times 10^{-8}$	$1.9 \times 10^{-8}$		
Ir-193m	11.9 d	F	0.010	$1.0 \times 10^{-10}$	$1.6 \times 10^{-10}$	0.010	$2.7 \times 10^{-10}$
		M	0.010	$1.0 \times 10^{-9}$	$9.1 \times 10^{-10}$		
		S	0.010	$1.2 \times 10^{-9}$	$1.0 \times 10^{-9}$		
Ir-194	19.1 h	F	0.010	$2.2 \times 10^{-10}$	$3.6 \times 10^{-10}$	0.010	$1.3 \times 10^{-9}$
		M	0.010	$5.3 \times 10^{-10}$	$7.1 \times 10^{-10}$		
		S	0.010	$5.6 \times 10^{-10}$	$7.5 \times 10^{-10}$		

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{1\mu m}$	$f_1$	$e(g)_{5\mu m}$
Ir-194m	171 d	F	0.010	$5.4 \times 10^{-9}$	0.010	$6.5 \times 10^{-9}$
		M	0.010	$8.5 \times 10^{-9}$		$6.5 \times 10^{-9}$
		S	0.010	$1.2 \times 10^{-8}$		$8.2 \times 10^{-9}$
Ir-195	2.50 h	F	0.010	$2.6 \times 10^{-11}$	0.010	$4.5 \times 10^{-11}$
		M	0.010	$6.7 \times 10^{-11}$		$9.6 \times 10^{-11}$
		S	0.010	$7.2 \times 10^{-11}$		$1.0 \times 10^{-10}$
Ir-195m	3.80 h	F	0.010	$6.5 \times 10^{-11}$	0.010	$1.1 \times 10^{-10}$
		M	0.010	$1.6 \times 10^{-10}$		$2.3 \times 10^{-10}$
		S	0.010	$1.7 \times 10^{-10}$		$2.4 \times 10^{-10}$
<b>Platinum</b>						
Pt-186	2.00 h	F	0.010	$3.6 \times 10^{-11}$	0.010	$6.6 \times 10^{-11}$
Pt-188	10.2 d	F	0.010	$4.3 \times 10^{-10}$	0.010	$6.3 \times 10^{-10}$
Pt-189	10.9 h	F	0.010	$4.1 \times 10^{-11}$	0.010	$7.3 \times 10^{-11}$
Pt-191	2.80 d	F	0.010	$1.1 \times 10^{-10}$	0.010	$1.9 \times 10^{-10}$
Pt-193	50.0 a	F	0.010	$2.1 \times 10^{-11}$	0.010	$2.7 \times 10^{-11}$
Pt-193m	4.33 d	F	0.010	$1.3 \times 10^{-10}$	0.010	$2.1 \times 10^{-10}$
Pt-195m	4.02 d	F	0.010	$1.9 \times 10^{-10}$	0.010	$3.1 \times 10^{-10}$
Pt-197	18.3 h	F	0.010	$9.1 \times 10^{-11}$	0.010	$1.6 \times 10^{-10}$
Pt-197m	1.57 h	F	0.010	$2.5 \times 10^{-11}$	0.010	$4.3 \times 10^{-11}$
Pt-199	0.513 h	F	0.010	$1.3 \times 10^{-11}$	0.010	$2.2 \times 10^{-11}$
Pt-200	12.5 h	F	0.010	$2.4 \times 10^{-10}$	0.010	$4.0 \times 10^{-10}$

Radionuclides	Physical half-life	Type	Inhalation		$e(g)_{sum}$	Ingestion	
			$f_1$	$e(g)_{lum}$		$f_1$	$e(g)$
<b>Gold</b>							
Au-193	17.6 h	F	0.100	$3.9 \times 10^{-11}$	$7.1 \times 10^{-11}$	0.100	$1.3 \times 10^{-10}$
		M	0.100	$1.1 \times 10^{-10}$	$1.5 \times 10^{-10}$		
		S	0.100	$1.2 \times 10^{-10}$	$1.6 \times 10^{-10}$		
Au-194	1.64 d	F	0.100	$1.5 \times 10^{-10}$	$2.8 \times 10^{-10}$	0.100	$4.2 \times 10^{-10}$
		M	0.100	$2.4 \times 10^{-10}$	$3.7 \times 10^{-10}$		
		S	0.100	$2.5 \times 10^{-10}$	$3.8 \times 10^{-10}$		
Au-195	183 d	F	0.100	$7.1 \times 10^{-11}$	$1.2 \times 10^{-10}$	0.100	$2.5 \times 10^{-10}$
		M	0.100	$1.0 \times 10^{-9}$	$8.0 \times 10^{-10}$		
		S	0.100	$1.6 \times 10^{-9}$	$1.2 \times 10^{-9}$		
Au-198	2.69 d	F	0.100	$2.3 \times 10^{-10}$	$3.9 \times 10^{-10}$	0.100	$1.0 \times 10^{-9}$
		M	0.100	$7.6 \times 10^{-10}$	$9.8 \times 10^{-10}$		
		S	0.100	$8.4 \times 10^{-10}$	$1.1 \times 10^{-9}$		
Au-198m	2.30 d	F	0.100	$3.4 \times 10^{-10}$	$5.9 \times 10^{-10}$	0.100	$1.3 \times 10^{-9}$
		M	0.100	$1.7 \times 10^{-9}$	$2.0 \times 10^{-9}$		
		S	0.100	$1.9 \times 10^{-9}$	$1.9 \times 10^{-9}$		
Au-199	3.14 d	F	0.100	$1.1 \times 10^{-10}$	$1.9 \times 10^{-10}$	0.100	$4.4 \times 10^{-10}$
		M	0.100	$6.8 \times 10^{-10}$	$6.8 \times 10^{-10}$		
		S	0.100	$7.5 \times 10^{-10}$	$7.6 \times 10^{-10}$		
Au-200	0.807 h	F	0.100	$1.7 \times 10^{-11}$	$3.0 \times 10^{-11}$	0.100	$6.8 \times 10^{-11}$
		M	0.100	$3.5 \times 10^{-11}$	$5.3 \times 10^{-11}$		
		S	0.100	$3.6 \times 10^{-11}$	$5.6 \times 10^{-11}$		

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{1\mu m}$	$f_1$	$e(g)_{5\mu m}$
Au-200m	18.7 h	F	0.100	$3.2 \times 10^{-10}$	0.100	$5.7 \times 10^{-10}$
		M	0.100	$6.9 \times 10^{-10}$		$9.8 \times 10^{-10}$
		S	0.100	$7.3 \times 10^{-10}$		$1.0 \times 10^{-9}$
Au-201	0.440 h	F	0.100	$9.2 \times 10^{-12}$	0.100	$1.6 \times 10^{-11}$
		M	0.100	$1.7 \times 10^{-11}$		$2.8 \times 10^{-11}$
		S	0.100	$1.8 \times 10^{-11}$		$2.9 \times 10^{-11}$
Mercury						
Hg-193 (organic)	3.50 h	F	0.400	$2.6 \times 10^{-11}$	1.000	$4.7 \times 10^{-11}$
Hg-193 (inorganic)	3.50 h	F	0.020	$2.8 \times 10^{-11}$	0.400	$6.6 \times 10^{-11}$
Hg-193m (organic)	11.1 h	M	0.020	$7.5 \times 10^{-11}$	0.020	$8.2 \times 10^{-11}$
Hg-193m (inorganic)	11.1 h	F	0.400	$1.1 \times 10^{-10}$	1.000	$2.0 \times 10^{-10}$
Hg-194 (organic)	$2.60 \times 10^2$ a	M	0.020	$1.2 \times 10^{-10}$	0.400	$3.0 \times 10^{-10}$
Hg-194 (inorganic)	$2.60 \times 10^2$ a	F	0.020	$2.6 \times 10^{-10}$	0.020	$4.0 \times 10^{-10}$
Hg-194 (organic)	$2.60 \times 10^2$ a	F	0.400	$1.5 \times 10^{-8}$	1.000	$1.9 \times 10^{-8}$
Hg-194 (inorganic)	$2.60 \times 10^2$ a	F	0.020	$1.3 \times 10^{-8}$	0.400	$2.1 \times 10^{-8}$
Hg-195	9.90 h	F	0.400	$2.4 \times 10^{-11}$	0.020	$1.5 \times 10^{-8}$
					1.000	$5.3 \times 10^{-9}$
					1.000	$4.4 \times 10^{-11}$
					1.000	$3.4 \times 10^{-11}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion		
			$f_1$	$e(g)_{I\mu m}$	$e(g)_{5\mu m}$	$f_1$	$e(g)$
(organic)							
Hg-195	9.90 h	F	0.020	$2.7 \times 10^{-11}$	$4.8 \times 10^{-11}$	0.400	$7.5 \times 10^{-11}$
(inorganic)		M	0.020	$7.2 \times 10^{-11}$	$9.2 \times 10^{-11}$	0.020	$9.7 \times 10^{-11}$
Hg-195m	1.73 d	F	0.400	$1.3 \times 10^{-10}$	$2.2 \times 10^{-10}$	1.000	$2.2 \times 10^{-10}$
(organic)						0.400	$4.1 \times 10^{-10}$
Hg-195m	1.73 d	F	0.020	$1.5 \times 10^{-10}$	$2.6 \times 10^{-10}$	0.020	$5.6 \times 10^{-10}$
(inorganic)		M	0.020	$5.1 \times 10^{-10}$	$6.5 \times 10^{-10}$		
Hg-197	2.67 d	F	0.400	$5.0 \times 10^{-11}$	$8.5 \times 10^{-11}$	1.000	$9.9 \times 10^{-11}$
(organic)						0.400	$1.7 \times 10^{-10}$
Hg-197	2.67 d	F	0.020	$6.0 \times 10^{-11}$	$1.0 \times 10^{-10}$	0.020	$2.3 \times 10^{-10}$
(inorganic)		M	0.020	$2.9 \times 10^{-10}$	$2.8 \times 10^{-10}$		
Hg-197m	23.8 h	F	0.400	$1.0 \times 10^{-10}$	$1.8 \times 10^{-10}$	1.000	$1.5 \times 10^{-10}$
(organic)						0.400	$3.4 \times 10^{-10}$
Hg-197m	23.8 h	F	0.020	$1.2 \times 10^{-10}$	$2.1 \times 10^{-10}$	0.020	$4.7 \times 10^{-10}$
(inorganic)		M	0.020	$5.1 \times 10^{-10}$	$6.6 \times 10^{-10}$		
Hg-199m	0.710 h	F	0.400	$1.6 \times 10^{-11}$	$2.7 \times 10^{-11}$	1.000	$2.8 \times 10^{-11}$
(organic)						0.400	$3.1 \times 10^{-11}$
Hg-199m	0.710 h	F	0.020	$1.6 \times 10^{-11}$	$2.7 \times 10^{-11}$	0.020	$3.1 \times 10^{-11}$
(inorganic)		M	0.020	$3.3 \times 10^{-11}$	$5.2 \times 10^{-11}$		
Hg-203	46.6 d	F	0.400	$5.7 \times 10^{-10}$	$7.5 \times 10^{-10}$	1.000	$1.9 \times 10^{-9}$
(organic)						0.400	$1.1 \times 10^{-9}$
Hg-203	46.6 d	F	0.020	$4.7 \times 10^{-10}$	$5.9 \times 10^{-10}$	0.020	$5.4 \times 10^{-10}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{1\mu m}$	$f_1$	$e(g)$
(inorganic)		M	0.020	$2.3 \times 10^{-9}$		
<b>Thallium</b>						
Tl-194	0.550 h	F	1.000	$4.8 \times 10^{-12}$	1.000	$8.1 \times 10^{-12}$
Tl-194m	0.546 h	F	1.000	$2.0 \times 10^{-11}$	1.000	$4.0 \times 10^{-11}$
Tl-195	1.16 h	F	1.000	$1.6 \times 10^{-11}$	1.000	$2.7 \times 10^{-11}$
Tl-197	2.84 h	F	1.000	$1.5 \times 10^{-11}$	1.000	$2.3 \times 10^{-11}$
Tl-198	5.30 h	F	1.000	$6.6 \times 10^{-11}$	1.000	$7.3 \times 10^{-11}$
Tl-198m	1.87 h	F	1.000	$4.0 \times 10^{-11}$	1.000	$5.4 \times 10^{-11}$
Tl-199	7.42 h	F	1.000	$2.0 \times 10^{-11}$	1.000	$2.6 \times 10^{-11}$
Tl-200	1.09 d	F	1.000	$1.4 \times 10^{-10}$	1.000	$2.0 \times 10^{-10}$
Tl-201	3.04 d	F	1.000	$4.7 \times 10^{-11}$	1.000	$9.5 \times 10^{-11}$
Tl-202	12.2 d	F	1.000	$2.0 \times 10^{-10}$	1.000	$4.5 \times 10^{-10}$
Tl-204	3.78 a	F	1.000	$4.4 \times 10^{-10}$	1.000	$1.3 \times 10^{-9}$
<b>Lead</b>						
Pb-195m	0.263 h	F	0.200	$1.7 \times 10^{-11}$	0.200	$2.9 \times 10^{-11}$
Pb-198	2.40 h	F	0.200	$4.7 \times 10^{-11}$	0.200	$1.0 \times 10^{-10}$
Pb-199	1.50 h	F	0.200	$2.6 \times 10^{-11}$	0.200	$5.4 \times 10^{-11}$
Pb-200	21.5 h	F	0.200	$1.5 \times 10^{-10}$	0.200	$4.0 \times 10^{-10}$
Pb-201	9.40 h	F	0.200	$6.5 \times 10^{-11}$	0.200	$1.6 \times 10^{-10}$
Pb-202	$3.00 \times 10^5$ a	F	0.200	$1.1 \times 10^{-8}$	0.200	$8.7 \times 10^{-9}$
Pb-202m	3.62 h	F	0.200	$6.7 \times 10^{-11}$	0.200	$1.3 \times 10^{-10}$
Pb-203	2.17 d	F	0.200	$9.1 \times 10^{-11}$	0.200	$2.4 \times 10^{-10}$

Radionuclides	Physical half-life	Type	Inhalation		$e(g)_{sum}$	Ingestion	
			$f_i$	$e(g)_{i\mu m}$		$f_i$	$e(g)$
Pb-205	$1.43 \times 10^7$ a	F	0.200	$3.4 \times 10^{-10}$	$4.1 \times 10^{-10}$	0.200	$2.8 \times 10^{-10}$
Pb-209	3.25 h	F	0.200	$1.8 \times 10^{-11}$	$3.2 \times 10^{-11}$	0.200	$5.7 \times 10^{-11}$
Pb-210	22.3 a	F	0.200	$8.9 \times 10^{-7}$	$1.1 \times 10^{-6}$	0.200	$6.8 \times 10^{-7}$
Pb-211	0.601 h	F	0.200	$3.9 \times 10^{-9}$	$5.6 \times 10^{-9}$	0.200	$1.8 \times 10^{-10}$
Pb-212	10.6 h	F	0.200	$1.9 \times 10^{-8}$	$3.3 \times 10^{-8}$	0.200	$5.9 \times 10^{-9}$
Pb-214	0.447 h	F	0.200	$2.9 \times 10^{-9}$	$4.8 \times 10^{-9}$	0.200	$1.4 \times 10^{-10}$
<b>Bismuth</b>							
Bi-200	0.606 h	F	0.050	$2.4 \times 10^{-11}$	$4.2 \times 10^{-11}$	0.050	$5.1 \times 10^{-11}$
		M	0.050	$3.4 \times 10^{-11}$	$5.6 \times 10^{-11}$		
Bi-201	1.80 h	F	0.050	$4.7 \times 10^{-11}$	$8.3 \times 10^{-11}$	0.050	$1.2 \times 10^{-10}$
		M	0.050	$7.0 \times 10^{-11}$	$1.1 \times 10^{-10}$		
Bi-202	1.67 h	F	0.050	$4.6 \times 10^{-11}$	$8.4 \times 10^{-11}$	0.050	$8.9 \times 10^{-11}$
		M	0.050	$5.8 \times 10^{-11}$	$1.0 \times 10^{-10}$		
Bi-203	11.8 h	F	0.050	$2.0 \times 10^{-10}$	$3.6 \times 10^{-10}$	0.050	$4.8 \times 10^{-10}$
		M	0.050	$2.8 \times 10^{-10}$	$4.5 \times 10^{-10}$		
Bi-205	15.3 d	F	0.050	$4.0 \times 10^{-10}$	$6.8 \times 10^{-10}$	0.050	$9.0 \times 10^{-10}$
		M	0.050	$9.2 \times 10^{-10}$	$1.0 \times 10^{-9}$		
Bi-206	6.24 d	F	0.050	$7.9 \times 10^{-10}$	$1.3 \times 10^{-9}$	0.050	$1.9 \times 10^{-9}$
		M	0.050	$1.7 \times 10^{-9}$	$2.1 \times 10^{-9}$		
Bi-207	38.0 a	F	0.050	$5.2 \times 10^{-10}$	$8.4 \times 10^{-10}$	0.050	$1.3 \times 10^{-9}$
		M	0.050	$5.2 \times 10^{-9}$	$3.2 \times 10^{-9}$		

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{Ipm}$	$f_1$	$e(g)$
Bi-210	5.01 d	F	0.050	$1.1 \times 10^{-9}$	0.050	$1.3 \times 10^{-9}$
		M	0.050	$8.4 \times 10^{-8}$		
Bi-210m	$3.00 \times 10^6$ a	F	0.050	$4.5 \times 10^{-8}$	0.050	$1.5 \times 10^{-8}$
		M	0.050	$3.1 \times 10^{-6}$		
Bi-212	1.01 h	F	0.050	$9.3 \times 10^{-9}$	0.050	$2.6 \times 10^{-10}$
		M	0.050	$3.0 \times 10^{-8}$		
Bi-213	0.761 h	F	0.050	$1.1 \times 10^{-8}$	0.050	$2.0 \times 10^{-10}$
		M	0.050	$2.9 \times 10^{-8}$		
Bi-214	0.332 h	F	0.050	$7.2 \times 10^{-9}$	0.050	$1.1 \times 10^{-10}$
		M	0.050	$1.4 \times 10^{-8}$		
<b>Polonium</b>						
Po-203	0.612 h	F	0.100	$2.5 \times 10^{-11}$	0.100	$5.2 \times 10^{-11}$
		M	0.100	$3.6 \times 10^{-11}$		
Po-205	1.80 h	F	0.100	$3.5 \times 10^{-11}$	0.100	$5.9 \times 10^{-11}$
		M	0.100	$6.4 \times 10^{-11}$		
Po-207	5.83 h	F	0.100	$6.3 \times 10^{-11}$	0.100	$1.4 \times 10^{-10}$
		M	0.100	$8.4 \times 10^{-11}$		
Po-210	138 d	F	0.100	$6.0 \times 10^{-7}$	0.100	$2.4 \times 10^{-7}$
		M	0.100	$3.0 \times 10^{-6}$		
<b>Astatine</b>						
At-207	1.80 h	F	1.000	$3.5 \times 10^{-10}$	1.000	$2.3 \times 10^{-10}$



Radionuclides	Physical half-life	Type	Inhalation		$e(g)_{sum}$	Ingestion	
			$f_1$	$e(g)_{I_{um}}$		$f_1$	$e(g)$
At-211	7.21 h	M	1.000	$2.1 \times 10^{-9}$	$1.9 \times 10^{-9}$		
		F	1.000	$1.6 \times 10^{-8}$	$2.7 \times 10^{-8}$	1.000	$1.1 \times 10^{-8}$
		M	1.000	$9.8 \times 10^{-8}$	$1.1 \times 10^{-7}$		
<b>Francium</b>							
Fr-222	0.240 h	F	1.000	$1.4 \times 10^{-8}$	$2.1 \times 10^{-8}$	1.000	$7.1 \times 10^{-10}$
Fr-223	0.363 h	F	1.000	$9.1 \times 10^{-10}$	$1.3 \times 10^{-9}$	1.000	$2.3 \times 10^{-9}$
<b>Radium</b>							
Ra-223	11.4 d	M	0.200	$6.9 \times 10^{-6}$	$5.7 \times 10^{-6}$	0.200	$1.0 \times 10^{-7}$
Ra-224	3.66 d	M	0.200	$2.9 \times 10^{-6}$	$2.4 \times 10^{-6}$	0.200	$6.5 \times 10^{-8}$
Ra-225	14.8 d	M	0.200	$5.8 \times 10^{-6}$	$4.8 \times 10^{-6}$	0.200	$9.5 \times 10^{-8}$
Ra-226	$1.60 \times 10^3$ a	M	0.200	$3.2 \times 10^{-6}$	$2.2 \times 10^{-6}$	0.200	$2.8 \times 10^{-7}$
Ra-227	0.703 h	M	0.200	$2.8 \times 10^{-10}$	$2.1 \times 10^{-10}$	0.200	$8.4 \times 10^{-11}$
Ra-228	5.75 a	M	0.200	$2.6 \times 10^{-6}$	$1.7 \times 10^{-6}$	0.200	$6.7 \times 10^{-7}$
<b>Actinium</b>							
Ac-224	2.90 h	F	$5.0 \times 10^{-4}$	$1.1 \times 10^{-8}$	$1.3 \times 10^{-8}$	$5.0 \times 10^{-4}$	$7.0 \times 10^{-10}$
		M	$5.0 \times 10^{-4}$	$1.0 \times 10^{-7}$	$8.9 \times 10^{-8}$		
		S	$5.0 \times 10^{-4}$	$1.2 \times 10^{-7}$	$9.9 \times 10^{-8}$		
Ac-225	10.0 d	F	$5.0 \times 10^{-4}$	$8.7 \times 10^{-7}$	$1.0 \times 10^{-6}$	$5.0 \times 10^{-4}$	$2.4 \times 10^{-8}$
		M	$5.0 \times 10^{-4}$	$6.9 \times 10^{-6}$	$5.7 \times 10^{-6}$		
		S	$5.0 \times 10^{-4}$	$7.9 \times 10^{-6}$	$6.5 \times 10^{-6}$		
Ac-226	1.21 d	F	$5.0 \times 10^{-4}$	$9.5 \times 10^{-8}$	$2.2 \times 10^{-7}$	$5.0 \times 10^{-4}$	$1.0 \times 10^{-8}$

Radionuclides	Physical half-life	Type	Inhalation		$e(g)_{5\mu m}$	Ingestion	
			$f_1$	$e(g)_{1\mu m}$		$f_1$	$e(g)$
Ac-227	21.8 a	M	$5.0 \times 10^{-4}$	$1.1 \times 10^{-6}$	$9.2 \times 10^{-7}$		
		S	$5.0 \times 10^{-4}$	$1.2 \times 10^{-6}$	$1.0 \times 10^{-6}$		
		F	$5.0 \times 10^{-4}$	$5.4 \times 10^{-4}$	$6.3 \times 10^{-4}$	$5.0 \times 10^{-4}$	$1.1 \times 10^{-6}$
Ac-228	6.13 h	M	$5.0 \times 10^{-4}$	$2.1 \times 10^{-4}$	$1.5 \times 10^{-4}$		
		S	$5.0 \times 10^{-4}$	$6.6 \times 10^{-5}$	$4.7 \times 10^{-5}$		
		F	$5.0 \times 10^{-4}$	$2.5 \times 10^{-8}$	$2.9 \times 10^{-8}$	$5.0 \times 10^{-4}$	$4.3 \times 10^{-10}$
Thorium		M	$5.0 \times 10^{-4}$	$1.6 \times 10^{-8}$	$1.2 \times 10^{-8}$		
		S	$5.0 \times 10^{-4}$	$1.4 \times 10^{-8}$	$1.2 \times 10^{-8}$		
Th-226	0.515 h	M	$5.0 \times 10^{-4}$	$5.5 \times 10^{-8}$	$7.4 \times 10^{-8}$	$5.0 \times 10^{-4}$	$3.5 \times 10^{-10}$
		S	$2.0 \times 10^{-4}$	$5.9 \times 10^{-8}$	$7.8 \times 10^{-8}$	$2.0 \times 10^{-4}$	$3.6 \times 10^{-10}$
Th-227	18.7 d	M	$5.0 \times 10^{-4}$	$7.8 \times 10^{-6}$	$6.2 \times 10^{-6}$	$5.0 \times 10^{-4}$	$8.9 \times 10^{-9}$
		S	$2.0 \times 10^{-4}$	$9.6 \times 10^{-6}$	$7.6 \times 10^{-6}$	$2.0 \times 10^{-4}$	$8.4 \times 10^{-9}$
Th-228	1.91 a	M	$5.0 \times 10^{-4}$	$3.1 \times 10^{-5}$	$2.3 \times 10^{-5}$	$5.0 \times 10^{-4}$	$7.0 \times 10^{-8}$
		S	$2.0 \times 10^{-4}$	$3.9 \times 10^{-5}$	$3.2 \times 10^{-5}$	$2.0 \times 10^{-4}$	$3.5 \times 10^{-8}$
Th-229	$7.34 \times 10^3$ a	M	$5.0 \times 10^{-4}$	$9.9 \times 10^{-5}$	$6.9 \times 10^{-5}$	$5.0 \times 10^{-4}$	$4.8 \times 10^{-7}$
		S	$2.0 \times 10^{-4}$	$6.5 \times 10^{-5}$	$4.8 \times 10^{-5}$	$2.0 \times 10^{-4}$	$2.0 \times 10^{-7}$
Th-230	$7.70 \times 10^4$ a	M	$5.0 \times 10^{-4}$	$4.0 \times 10^{-5}$	$2.8 \times 10^{-5}$	$5.0 \times 10^{-4}$	$2.1 \times 10^{-7}$
		S	$2.0 \times 10^{-4}$	$1.3 \times 10^{-5}$	$7.2 \times 10^{-6}$	$2.0 \times 10^{-4}$	$8.7 \times 10^{-8}$
Th-231	1.06 d	M	$5.0 \times 10^{-4}$	$2.9 \times 10^{-10}$	$3.7 \times 10^{-10}$	$5.0 \times 10^{-4}$	$3.4 \times 10^{-10}$
		S	$2.0 \times 10^{-4}$	$3.2 \times 10^{-10}$	$4.0 \times 10^{-10}$	$2.0 \times 10^{-4}$	$3.4 \times 10^{-10}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_i$	$e(g)_{I\mu m}$	$f_i$	$e(g)$
Th-232	$1.40 \times 10^{10}$ a	M	$5.0 \times 10^{-4}$	$4.2 \times 10^{-5}$	$5.0 \times 10^{-4}$	$2.2 \times 10^{-7}$
		S	$2.0 \times 10^{-4}$	$2.3 \times 10^{-5}$	$2.0 \times 10^{-4}$	$9.2 \times 10^{-8}$
Th-234	24.1 d	M	$5.0 \times 10^{-4}$	$6.3 \times 10^{-9}$	$5.0 \times 10^{-4}$	$3.4 \times 10^{-9}$
		S	$2.0 \times 10^{-4}$	$7.3 \times 10^{-9}$	$2.0 \times 10^{-4}$	$3.4 \times 10^{-9}$
<b>Protactinium</b>						
Pa-227	0.638 h	M	$5.0 \times 10^{-4}$	$7.0 \times 10^{-8}$	$5.0 \times 10^{-4}$	$4.5 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$7.6 \times 10^{-8}$		
Pa-228	22.0 h	M	$5.0 \times 10^{-4}$	$5.9 \times 10^{-8}$	$5.0 \times 10^{-4}$	$7.8 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$6.9 \times 10^{-8}$		
Pa-230	17.4 d	M	$5.0 \times 10^{-4}$	$5.6 \times 10^{-7}$	$5.0 \times 10^{-4}$	$9.2 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$7.1 \times 10^{-7}$		
Pa-231	$3.27 \times 10^4$ a	M	$5.0 \times 10^{-4}$	$1.3 \times 10^{-4}$	$5.0 \times 10^{-4}$	$7.1 \times 10^{-7}$
		S	$5.0 \times 10^{-4}$	$3.2 \times 10^{-5}$		
Pa-232	1.31 d	M	$5.0 \times 10^{-4}$	$9.5 \times 10^{-9}$	$5.0 \times 10^{-4}$	$7.2 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$3.2 \times 10^{-9}$		
Pa-233	27.0 d	M	$5.0 \times 10^{-4}$	$3.1 \times 10^{-9}$	$5.0 \times 10^{-4}$	$8.7 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$3.7 \times 10^{-9}$		
Pa-234	6.70 h	M	$5.0 \times 10^{-4}$	$3.8 \times 10^{-10}$	$5.0 \times 10^{-4}$	$5.1 \times 10^{-10}$
		S	$5.0 \times 10^{-4}$	$4.0 \times 10^{-10}$		
<b>Uranium</b>						
U-230	20.8 d	F	0.020	$3.6 \times 10^{-7}$	0.020	$5.5 \times 10^{-8}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion		
			$f_1$	$e(g)_{1\mu m}$	$e(g)_{5\mu m}$	$f_1$	$e(g)$
		M	0.020	$1.2 \times 10^{-5}$	$1.0 \times 10^{-5}$	0.002	$2.8 \times 10^{-8}$
		S	0.002	$1.5 \times 10^{-5}$	$1.2 \times 10^{-5}$		
U-231	4.20 d	F	0.020	$8.3 \times 10^{-11}$	$1.4 \times 10^{-10}$	0.020	$2.8 \times 10^{-10}$
		M	0.020	$3.4 \times 10^{-10}$	$3.7 \times 10^{-10}$	0.002	$2.8 \times 10^{-10}$
		S	0.002	$3.7 \times 10^{-10}$	$4.0 \times 10^{-10}$		
U-232	72.0 a	F	0.020	$4.0 \times 10^{-6}$	$4.7 \times 10^{-6}$	0.020	$3.3 \times 10^{-7}$
		M	0.020	$7.2 \times 10^{-6}$	$4.8 \times 10^{-6}$	0.002	$3.7 \times 10^{-8}$
		S	0.002	$3.5 \times 10^{-5}$	$2.6 \times 10^{-5}$		
U-233	$1.58 \times 10^5$ a	F	0.020	$5.7 \times 10^{-7}$	$6.6 \times 10^{-7}$	0.020	$5.0 \times 10^{-8}$
		M	0.020	$3.2 \times 10^{-6}$	$2.2 \times 10^{-6}$	0.002	$8.5 \times 10^{-9}$
		S	0.002	$8.7 \times 10^{-6}$	$6.9 \times 10^{-6}$		
U-234	$2.44 \times 10^5$ a	F	0.020	$5.5 \times 10^{-7}$	$6.4 \times 10^{-7}$	0.020	$4.9 \times 10^{-8}$
		M	0.020	$3.1 \times 10^{-6}$	$2.1 \times 10^{-6}$	0.002	$8.3 \times 10^{-9}$
		S	0.002	$8.5 \times 10^{-6}$	$6.8 \times 10^{-6}$		
U-235	$7.04 \times 10^8$ a	F	0.020	$5.1 \times 10^{-7}$	$6.0 \times 10^{-7}$	0.020	$4.6 \times 10^{-8}$
		M	0.020	$2.8 \times 10^{-6}$	$1.8 \times 10^{-6}$	0.002	$8.3 \times 10^{-9}$
		S	0.002	$7.7 \times 10^{-6}$	$6.1 \times 10^{-6}$		
U-236	$2.34 \times 10^7$ a	F	0.020	$5.2 \times 10^{-7}$	$6.1 \times 10^{-7}$	0.020	$4.6 \times 10^{-8}$
		M	0.020	$2.9 \times 10^{-6}$	$1.9 \times 10^{-6}$	0.002	$7.9 \times 10^{-9}$
		S	0.002	$7.9 \times 10^{-6}$	$6.3 \times 10^{-6}$		

Radionuclides	Physical half-life	Type	Inhalation		$e(g)_{5\mu m}$	Ingestion	
			$f_1$	$e(g)_{I\mu m}$		$f_1$	$e(g)$
U-237	6.75 d	F	0.020	$1.9 \times 10^{-10}$	$3.3 \times 10^{-10}$	0.020	$7.6 \times 10^{-10}$
		M	0.020	$1.6 \times 10^{-9}$	$1.5 \times 10^{-9}$	0.002	$7.7 \times 10^{-10}$
		S	0.002	$1.8 \times 10^{-9}$	$1.7 \times 10^{-9}$		
U-238	$4.47 \times 10^9$ a	F	0.020	$4.9 \times 10^{-7}$	$5.8 \times 10^{-7}$	0.020	$4.4 \times 10^{-8}$
		M	0.020	$2.6 \times 10^{-6}$	$1.6 \times 10^{-6}$	0.002	$7.6 \times 10^{-9}$
		S	0.002	$7.3 \times 10^{-6}$	$5.7 \times 10^{-6}$		
U-239	0.392 h	F	0.020	$1.1 \times 10^{-11}$	$1.8 \times 10^{-11}$	0.020	$2.7 \times 10^{-11}$
		M	0.020	$2.3 \times 10^{-11}$	$3.3 \times 10^{-11}$	0.002	$2.8 \times 10^{-11}$
		S	0.002	$2.4 \times 10^{-11}$	$3.5 \times 10^{-11}$		
U-240	14.1 h	F	0.020	$2.1 \times 10^{-10}$	$3.7 \times 10^{-10}$	0.020	$1.1 \times 10^{-9}$
		M	0.020	$5.3 \times 10^{-10}$	$7.9 \times 10^{-10}$	0.002	$1.1 \times 10^{-9}$
		S	0.002	$5.7 \times 10^{-10}$	$8.4 \times 10^{-10}$		
<b>Neptunium</b>							
Np-232	0.245 h	M	$5.0 \times 10^{-4}$	$4.7 \times 10^{-11}$	$3.5 \times 10^{-11}$	$5.0 \times 10^{-4}$	$9.7 \times 10^{-12}$
Np-233	0.603 h	M	$5.0 \times 10^{-4}$	$1.7 \times 10^{-12}$	$3.0 \times 10^{-12}$	$5.0 \times 10^{-4}$	$2.2 \times 10^{-12}$
Np-234	4.40 d	M	$5.0 \times 10^{-4}$	$5.4 \times 10^{-10}$	$7.3 \times 10^{-10}$	$5.0 \times 10^{-4}$	$8.1 \times 10^{-10}$
Np-235	1.08 a	M	$5.0 \times 10^{-4}$	$4.0 \times 10^{-10}$	$2.7 \times 10^{-10}$	$5.0 \times 10^{-4}$	$5.3 \times 10^{-11}$
Np-236	$1.15 \times 10^5$ a	M	$5.0 \times 10^{-4}$	$3.0 \times 10^{-6}$	$2.0 \times 10^{-6}$	$5.0 \times 10^{-4}$	$1.7 \times 10^{-8}$
Np-236m	22.5 h	M	$5.0 \times 10^{-4}$	$5.0 \times 10^{-9}$	$3.6 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.9 \times 10^{-10}$
Np-237	$2.14 \times 10^6$ a	M	$5.0 \times 10^{-4}$	$2.1 \times 10^{-5}$	$1.5 \times 10^{-5}$	$5.0 \times 10^{-4}$	$1.1 \times 10^{-7}$
Np-238	2.12 d	M	$5.0 \times 10^{-4}$	$2.0 \times 10^{-9}$	$1.7 \times 10^{-9}$	$5.0 \times 10^{-4}$	$9.1 \times 10^{-10}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{I\mu m}$	$f_1$	$e(g)$
Np-239	2.36 d	M	$5.0 \times 10^{-4}$	$9.0 \times 10^{-10}$	$5.0 \times 10^{-4}$	$8.0 \times 10^{-10}$
Np-240	1.08 h	M	$5.0 \times 10^{-4}$	$8.7 \times 10^{-11}$	$5.0 \times 10^{-4}$	$8.2 \times 10^{-11}$
<b>Plutonium</b>						
Pu-234	8.80 h	M	$5.0 \times 10^{-4}$	$1.9 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.6 \times 10^{-10}$
		M	$5.0 \times 10^{-4}$	$1.9 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.6 \times 10^{-10}$
		S	$1.0 \times 10^{-5}$	$2.2 \times 10^{-8}$	$1.0 \times 10^{-5}$	$1.5 \times 10^{-10}$
Pu-235	0.422 h				$1.0 \times 10^{-4}$	$1.6 \times 10^{-10}$
		M	$5.0 \times 10^{-4}$	$1.5 \times 10^{-12}$	$5.0 \times 10^{-4}$	$2.1 \times 10^{-12}$
		S	$1.0 \times 10^{-5}$	$1.6 \times 10^{-12}$	$1.0 \times 10^{-5}$	$2.1 \times 10^{-12}$
Pu-236	2.85 a				$1.0 \times 10^{-4}$	$2.1 \times 10^{-12}$
		M	$5.0 \times 10^{-4}$	$1.8 \times 10^{-5}$	$5.0 \times 10^{-4}$	$8.6 \times 10^{-8}$
		S	$1.0 \times 10^{-5}$	$9.6 \times 10^{-6}$	$1.0 \times 10^{-5}$	$6.3 \times 10^{-9}$
Pu-237	45.3 d				$1.0 \times 10^{-4}$	$2.1 \times 10^{-8}$
		M	$5.0 \times 10^{-4}$	$3.3 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.0 \times 10^{-10}$
		S	$1.0 \times 10^{-5}$	$3.6 \times 10^{-10}$	$1.0 \times 10^{-5}$	$1.0 \times 10^{-10}$
Pu-238	87.7 a				$1.0 \times 10^{-4}$	$1.0 \times 10^{-10}$
		M	$5.0 \times 10^{-4}$	$4.3 \times 10^{-5}$	$5.0 \times 10^{-4}$	$2.3 \times 10^{-7}$
		S	$1.0 \times 10^{-5}$	$1.5 \times 10^{-5}$	$1.0 \times 10^{-5}$	$8.8 \times 10^{-9}$
					$1.0 \times 10^{-4}$	$4.9 \times 10^{-8}$
Pu-239	$2.41 \times 10^4$ a	M	$5.0 \times 10^{-4}$	$4.7 \times 10^{-5}$	$5.0 \times 10^{-4}$	$2.5 \times 10^{-7}$
		S	$1.0 \times 10^{-5}$	$1.5 \times 10^{-5}$	$1.0 \times 10^{-5}$	$9.0 \times 10^{-9}$
					$1.0 \times 10^{-4}$	$5.3 \times 10^{-8}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{I\mu m}$	$f_1$	$e(g)$
Pu-240	$6.54 \times 10^3$ a	M	$5.0 \times 10^{-4}$	$4.7 \times 10^{-5}$	$5.0 \times 10^{-4}$	$2.5 \times 10^{-7}$
		S	$1.0 \times 10^{-5}$	$1.5 \times 10^{-5}$	$1.0 \times 10^{-5}$	$9.0 \times 10^{-9}$
Pu-241	14.4 a	M	$5.0 \times 10^{-4}$	$8.5 \times 10^{-7}$	$5.0 \times 10^{-4}$	$4.7 \times 10^{-9}$
		S	$1.0 \times 10^{-5}$	$1.6 \times 10^{-7}$	$1.0 \times 10^{-5}$	$1.1 \times 10^{-10}$
Pu-242	$3.76 \times 10^5$ a	M	$5.0 \times 10^{-4}$	$4.4 \times 10^{-5}$	$5.0 \times 10^{-4}$	$2.4 \times 10^{-7}$
		S	$1.0 \times 10^{-5}$	$1.4 \times 10^{-5}$	$1.0 \times 10^{-5}$	$8.6 \times 10^{-9}$
Pu-243	4.95 h	M	$5.0 \times 10^{-4}$	$8.2 \times 10^{-11}$	$5.0 \times 10^{-4}$	$5.0 \times 10^{-8}$
		S	$1.0 \times 10^{-5}$	$8.5 \times 10^{-11}$	$1.0 \times 10^{-5}$	$8.5 \times 10^{-11}$
Pu-244	$8.26 \times 10^7$ a	M	$5.0 \times 10^{-4}$	$4.4 \times 10^{-5}$	$5.0 \times 10^{-4}$	$2.4 \times 10^{-7}$
		S	$1.0 \times 10^{-5}$	$1.3 \times 10^{-5}$	$1.0 \times 10^{-5}$	$1.1 \times 10^{-8}$
Pu-245	10.5 h	M	$5.0 \times 10^{-4}$	$4.5 \times 10^{-10}$	$5.0 \times 10^{-4}$	$7.2 \times 10^{-10}$
		S	$1.0 \times 10^{-5}$	$4.8 \times 10^{-10}$	$1.0 \times 10^{-5}$	$7.2 \times 10^{-10}$
Pu-246	10.9 d	M	$5.0 \times 10^{-4}$	$7.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$3.3 \times 10^{-9}$
		S	$1.0 \times 10^{-5}$	$7.6 \times 10^{-9}$	$1.0 \times 10^{-5}$	$3.3 \times 10^{-9}$
					$1.0 \times 10^{-4}$	$3.3 \times 10^{-9}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion		
			$f_1$	$e(g)_{1\mu m}$	$e(g)_{5\mu m}$	$f_1$	$e(g)$
<b>Americium</b>							
Am-237	1.22 h	M	$5.0 \times 10^{-4}$	$2.5 \times 10^{-11}$	$3.6 \times 10^{-11}$	$5.0 \times 10^{-4}$	$1.8 \times 10^{-11}$
Am-238	1.63 h	M	$5.0 \times 10^{-4}$	$8.5 \times 10^{-11}$	$6.6 \times 10^{-11}$	$5.0 \times 10^{-4}$	$3.2 \times 10^{-11}$
Am-239	11.9 h	M	$5.0 \times 10^{-4}$	$2.2 \times 10^{-10}$	$2.9 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.4 \times 10^{-10}$
Am-240	2.12 d	M	$5.0 \times 10^{-4}$	$4.4 \times 10^{-10}$	$5.9 \times 10^{-10}$	$5.0 \times 10^{-4}$	$5.8 \times 10^{-10}$
Am-241	$4.32 \times 10^2$ a	M	$5.0 \times 10^{-4}$	$3.9 \times 10^{-5}$	$2.7 \times 10^{-5}$	$5.0 \times 10^{-4}$	$2.0 \times 10^{-7}$
Am-242	16.0 h	M	$5.0 \times 10^{-4}$	$1.6 \times 10^{-8}$	$1.2 \times 10^{-8}$	$5.0 \times 10^{-4}$	$3.0 \times 10^{-10}$
Am-242m	$1.52 \times 10^2$ a	M	$5.0 \times 10^{-4}$	$3.5 \times 10^{-5}$	$2.4 \times 10^{-5}$	$5.0 \times 10^{-4}$	$1.9 \times 10^{-7}$
Am-243	$7.38 \times 10^3$ a	M	$5.0 \times 10^{-4}$	$3.9 \times 10^{-5}$	$2.7 \times 10^{-5}$	$5.0 \times 10^{-4}$	$2.0 \times 10^{-7}$
Am-244	10.1 h	M	$5.0 \times 10^{-4}$	$1.9 \times 10^{-9}$	$1.5 \times 10^{-9}$	$5.0 \times 10^{-4}$	$4.6 \times 10^{-10}$
Am-244m	0.433 h	M	$5.0 \times 10^{-4}$	$7.9 \times 10^{-11}$	$6.2 \times 10^{-11}$	$5.0 \times 10^{-4}$	$2.9 \times 10^{-11}$
Am-245	2.05 h	M	$5.0 \times 10^{-4}$	$5.3 \times 10^{-11}$	$7.6 \times 10^{-11}$	$5.0 \times 10^{-4}$	$6.2 \times 10^{-11}$
Am-246	0.650 h	M	$5.0 \times 10^{-4}$	$6.8 \times 10^{-11}$	$1.1 \times 10^{-10}$	$5.0 \times 10^{-4}$	$5.8 \times 10^{-11}$
Am-246m	0.417 h	M	$5.0 \times 10^{-4}$	$2.3 \times 10^{-11}$	$3.8 \times 10^{-11}$	$5.0 \times 10^{-4}$	$3.4 \times 10^{-11}$
<b>Curium</b>							
Cm-238	2.40 h	M	$5.0 \times 10^{-4}$	$4.1 \times 10^{-9}$	$4.8 \times 10^{-9}$	$5.0 \times 10^{-4}$	$8.0 \times 10^{-11}$
Cm-241	32.8 d	M	$5.0 \times 10^{-4}$	$3.4 \times 10^{-8}$	$2.6 \times 10^{-8}$	$5.0 \times 10^{-4}$	$9.1 \times 10^{-10}$
Cm-242	163 d	M	$5.0 \times 10^{-4}$	$4.8 \times 10^{-6}$	$3.7 \times 10^{-6}$	$5.0 \times 10^{-4}$	$1.2 \times 10^{-8}$
Cm-243	28.5 a	M	$5.0 \times 10^{-4}$	$2.9 \times 10^{-5}$	$2.0 \times 10^{-5}$	$5.0 \times 10^{-4}$	$1.5 \times 10^{-7}$
Cm-244	18.1 a	M	$5.0 \times 10^{-4}$	$2.5 \times 10^{-5}$	$1.7 \times 10^{-5}$	$5.0 \times 10^{-4}$	$1.2 \times 10^{-7}$



Radionuclides	Physical half-life	Type	Inhalation		Ingestion	
			$f_1$	$e(g)_{1\mu m}$	$f_1$	$e(g)$
Cm-245	$8.50 \times 10^3$ a	M	$5.0 \times 10^{-4}$	$4.0 \times 10^{-5}$	$5.0 \times 10^{-4}$	$2.1 \times 10^{-7}$
Cm-246	$4.73 \times 10^3$ a	M	$5.0 \times 10^{-4}$	$4.0 \times 10^{-5}$	$5.0 \times 10^{-4}$	$2.1 \times 10^{-7}$
Cm-247	$1.56 \times 10^7$ a	M	$5.0 \times 10^{-4}$	$3.6 \times 10^{-5}$	$5.0 \times 10^{-4}$	$1.9 \times 10^{-7}$
Cm-248	$3.39 \times 10^5$ a	M	$5.0 \times 10^{-4}$	$1.4 \times 10^{-4}$	$5.0 \times 10^{-4}$	$7.7 \times 10^{-7}$
Cm-249	1.07 h	M	$5.0 \times 10^{-4}$	$3.2 \times 10^{-11}$	$5.0 \times 10^{-4}$	$3.1 \times 10^{-11}$
Cm-250	$6.90 \times 10^3$ a	M	$5.0 \times 10^{-4}$	$7.9 \times 10^{-4}$	$5.0 \times 10^{-4}$	$4.4 \times 10^{-6}$
<b>Berkelium</b>						
Bk-245	4.94 d	M	$5.0 \times 10^{-4}$	$2.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$5.7 \times 10^{-10}$
Bk-246	1.83 d	M	$5.0 \times 10^{-4}$	$3.4 \times 10^{-10}$	$5.0 \times 10^{-4}$	$4.8 \times 10^{-10}$
Bk-247	$1.38 \times 10^3$ a	M	$5.0 \times 10^{-4}$	$6.5 \times 10^{-5}$	$5.0 \times 10^{-4}$	$3.5 \times 10^{-7}$
Bk-249	320 d	M	$5.0 \times 10^{-4}$	$1.5 \times 10^{-7}$	$5.0 \times 10^{-4}$	$9.7 \times 10^{-10}$
Bk-250	3.22 h	M	$5.0 \times 10^{-4}$	$9.6 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.4 \times 10^{-10}$
<b>Californium</b>						
Cf-244	0.323 h	M	$5.0 \times 10^{-4}$	$1.3 \times 10^{-8}$	$5.0 \times 10^{-4}$	$7.0 \times 10^{-11}$
Cf-246	1.49 d	M	$5.0 \times 10^{-4}$	$4.2 \times 10^{-7}$	$5.0 \times 10^{-4}$	$3.3 \times 10^{-9}$
Cf-248	334 d	M	$5.0 \times 10^{-4}$	$8.2 \times 10^{-6}$	$5.0 \times 10^{-4}$	$2.8 \times 10^{-8}$
Cf-249	$3.50 \times 10^2$ a	M	$5.0 \times 10^{-4}$	$6.6 \times 10^{-5}$	$5.0 \times 10^{-4}$	$3.5 \times 10^{-7}$
Cf-250	13.1 a	M	$5.0 \times 10^{-4}$	$3.2 \times 10^{-5}$	$5.0 \times 10^{-4}$	$1.6 \times 10^{-7}$
Cf-251	$8.98 \times 10^2$ a	M	$5.0 \times 10^{-4}$	$6.7 \times 10^{-5}$	$5.0 \times 10^{-4}$	$3.6 \times 10^{-7}$

Radionuclides	Physical half-life	Type	Inhalation		Ingestion		
			$f_1$	$e(g)_{1\mu m}$	$e(g)_{5\mu m}$	$f_1$	$e(g)$
Cf-252	2.64 a	M	$5.0 \times 10^{-4}$	$1.8 \times 10^{-5}$	$1.3 \times 10^{-5}$	$5.0 \times 10^{-4}$	$9.0 \times 10^{-8}$
Cf-253	17.8 d	M	$5.0 \times 10^{-4}$	$1.2 \times 10^{-6}$	$1.0 \times 10^{-6}$	$5.0 \times 10^{-4}$	$1.4 \times 10^{-9}$
Cf-254	60.5 d	M	$5.0 \times 10^{-4}$	$3.7 \times 10^{-5}$	$2.2 \times 10^{-5}$	$5.0 \times 10^{-4}$	$4.0 \times 10^{-7}$
<b>Einsteinium</b>							
Es-250	2.10 h	M	$5.0 \times 10^{-4}$	$5.9 \times 10^{-10}$	$4.2 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.1 \times 10^{-11}$
Es-251	1.38 d	M	$5.0 \times 10^{-4}$	$2.0 \times 10^{-9}$	$1.7 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.7 \times 10^{-10}$
Es-253	20.5 d	M	$5.0 \times 10^{-4}$	$2.5 \times 10^{-6}$	$2.1 \times 10^{-6}$	$5.0 \times 10^{-4}$	$6.1 \times 10^{-9}$
Es-254	276 d	M	$5.0 \times 10^{-4}$	$8.0 \times 10^{-6}$	$6.0 \times 10^{-6}$	$5.0 \times 10^{-4}$	$2.8 \times 10^{-8}$
Es-254m	1.64 d	M	$5.0 \times 10^{-4}$	$4.4 \times 10^{-7}$	$3.7 \times 10^{-7}$	$5.0 \times 10^{-4}$	$4.2 \times 10^{-9}$
<b>Fermium</b>							
Fm-252	22.7 h	M	$5.0 \times 10^{-4}$	$3.0 \times 10^{-7}$	$2.6 \times 10^{-7}$	$5.0 \times 10^{-4}$	$2.7 \times 10^{-9}$
Fm-253	3.00 d	M	$5.0 \times 10^{-4}$	$3.7 \times 10^{-7}$	$3.0 \times 10^{-7}$	$5.0 \times 10^{-4}$	$9.1 \times 10^{-10}$
Fm-254	3.24 h	M	$5.0 \times 10^{-4}$	$5.6 \times 10^{-8}$	$7.7 \times 10^{-8}$	$5.0 \times 10^{-4}$	$4.4 \times 10^{-10}$
Fm-255	20.1 h	M	$5.0 \times 10^{-4}$	$2.5 \times 10^{-7}$	$2.6 \times 10^{-7}$	$5.0 \times 10^{-4}$	$2.5 \times 10^{-9}$
Fm-257	101 d	M	$5.0 \times 10^{-4}$	$6.6 \times 10^{-6}$	$5.2 \times 10^{-6}$	$5.0 \times 10^{-4}$	$1.5 \times 10^{-8}$
<b>Mendelevium</b>							
Md-257	5.20 h	M	$5.0 \times 10^{-4}$	$2.3 \times 10^{-8}$	$2.0 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.2 \times 10^{-10}$
Md-258	55.0 d	M	$5.0 \times 10^{-4}$	$5.5 \times 10^{-6}$	$4.4 \times 10^{-6}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-8}$

<sup>a</sup> m and m' denote metastable states of the radionuclide. The metastable state m' is of higher energy than the metastable state m.

Note: Types F, M and S denote fast, moderate and slow absorption from the lung, respectively;  $f_1$ : gut transfer factor;  $e(g)$ : effective dose per unit intake by age group.

**Table II.B. Compounds And Values of Gut Transfer Factor  $f_1$  Used to Cal-Culate Committed Effective Dose Per Unit Intake Via Ingestion For Workers**

Element	Gut transfer factor $f_1$	Compounds
Hydrogen	1.000	Tritiated water (ingested)
	1.000	Organically bound tritium
Beryllium	0.005	All compounds
Carbon	1.000	Labelled organic compounds
Fluorine	1.000	All compounds
Sodium	1.000	All compounds
Magnesium	0.500	All compounds
Aluminium	0.010	All compounds
Silicon	0.010	All compounds
Phosphorus	0.800	All compounds
Sulphur	0.800	Inorganic compounds
	0.100	Elemental sulphur
	1.000	Organic sulphur
Chlorine	1.000	All compounds
Potassium	1.000	All compounds
Calcium	0.300	All compounds
Scandium	$1.0 \times 10^{-4}$	All compounds
Titanium	0.010	All compounds
Vanadium	0.010	All compounds
Chromium	0.100	Hexavalent compounds
	0.010	Trivalent compounds
Manganese	0.100	All compounds
Iron	0.100	All compounds
Cobalt	0.100	All unspecified compounds
	0.050	Oxides, hydroxides and inorganic compounds
Nickel	0.050	All compounds
Copper	0.500	All compounds

Element	Gut transfer factor $f_1$	Compounds
Zinc	0.500	All compounds
Gallium	0.001	All compounds
Germanium	1.000	All compounds
Arsenic	0.500	All compounds
Selenium	0.800	All unspecified compounds
	0.050	Elemental selenium and selenides
Bromine	1.000	All compounds
Rubidium	1.000	All compounds
Strontium	0.300	All unspecified compounds
	0.010	Strontium titanate (SrTiO <sub>3</sub> )
Yttrium	$1.0 \times 10^{-4}$	All compounds
Zirconium	0.002	All compounds
Niobium	0.010	All compounds
Molybdenum	0.800	All unspecified compounds
	0.050	Molybdenum sulphide
Technetium	0.800	All compounds
Ruthenium	0.050	All compounds
Rhodium	0.050	All compounds
Palladium	0.005	All compounds
Silver	0.050	All compounds
Cadmium	0.050	All inorganic compounds
Indium	0.020	All compounds
Tin	0.020	All compounds
Antimony	0.100	All compounds
Tellurium	0.300	All compounds
Iodine	1.000	All compounds
Caesium	1.000	All compounds
Barium	0.100	All compounds
Lanthanum	$5.0 \times 10^{-4}$	All compounds
Cerium	$5.0 \times 10^{-4}$	All compounds

<b>Element</b>	<b>Gut transfer factor <math>f_1</math></b>	<b>Compounds</b>
Praseodymium	$5.0 \times 10^{-4}$	All compounds
Neodymium	$5.0 \times 10^{-4}$	All compounds
Promethium	$5.0 \times 10^{-4}$	All compounds
Samarium	$5.0 \times 10^{-4}$	All compounds
Europium	$5.0 \times 10^{-4}$	All compounds
Gadolinium	$5.0 \times 10^{-4}$	All compounds
Terbium	$5.0 \times 10^{-4}$	All compounds
Dysprosium	$5.0 \times 10^{-4}$	All compounds
Holmium	$5.0 \times 10^{-4}$	All compounds
Erbium	$5.0 \times 10^{-4}$	All compounds
Thulium	$5.0 \times 10^{-4}$	All compounds
Ytterbium	$5.0 \times 10^{-4}$	All compounds
Lutetium	$5.0 \times 10^{-4}$	All compounds
Hafnium	0.002	All compounds
Tantalum	0.001	All compounds
Tungsten	0.300	All unspecified compounds
	0.010	Tungstic acid
Rhenium	0.800	All compounds
Osmium	0.010	All compounds
Iridium	0.010	All compounds
Platinum	0.010	All compounds
Gold	0.100	All compounds
Mercury	0.020	All inorganic compounds
Mercury	1.000	Methyl mercury
	0.400	All unspecified organic compounds
Thallium	1.000	All compounds
Lead	0.200	All compounds
Bismuth	0.050	All compounds
Polonium	0.100	All compounds
Astatine	1.000	All compounds

Element	Gut transfer factor $f_1$	Compounds
Francium	1.000	All compounds
Radium	0.200	All compounds
Actinium	$5.0 \times 10^{-4}$	All compounds
Thorium	$5.0 \times 10^{-4}$	All unspecified com-pounds
	$2.0 \times 10^{-4}$	Oxides and hy-droxides
Protactinium	$5.0 \times 10^{-4}$	All compounds
Uranium	0.020	All unspecified compounds
	0.002	Most tetravalent compounds, e.g. UO <sub>2</sub> , U <sub>3</sub> O <sub>8</sub> , UF <sub>4</sub>
Neptunium	$5.0 \times 10^{-4}$	All compounds
Plutonium	$5.0 \times 10^{-4}$	All unspecified com-pounds
	$1.0 \times 10^{-4}$	Nitrates
	$1.0 \times 10^{-5}$	Insoluble oxides
Insoluble oxides		
Americium	$5.0 \times 10^{-4}$	All compounds
Curium	$5.0 \times 10^{-4}$	All compounds
Berkelium	$5.0 \times 10^{-4}$	All compounds
Californium	$5.0 \times 10^{-4}$	All compounds
Einsteinium	$5.0 \times 10^{-4}$	All compounds
Fermium	$5.0 \times 10^{-4}$	All compounds
Mendelevium	$5.0 \times 10^{-4}$	All compounds



Table II.C. Compounds, Lung Absorption Types and Values of Gut Transfer Factor  $f_1$  Used to Calculate Committed Effective Dose Per Unit Intake Via Inhalation For Workers

Element	Absorption Type(s)	Gut transfer factor $f_1$	Compounds
Beryllium	M	0.005	All unspecified compounds
Fluorine	S	0.005	Oxides, halides and nitrates
	F	1.000	Determined by combining cation
Sodium	M	1.000	Determined by combining cation
	S	1.000	Determined by combining cation
Sodium	F	1.000	All compounds
Magnesium	F	0.500	All unspecified compounds
	M	0.500	Oxides, hydroxides, carbides, halides and nitrates
Aluminium	F	0.010	All unspecified compounds
	M	0.010	Oxides, hydroxides, carbides, halides, nitrates and metallic aluminium
Silicon	F	0.010	All unspecified compounds
	M	0.010	Oxides, hydroxides, carbides and nitrates
Phosphorus	S	0.010	Aluminosilicate glass aerosol
	F	0.800	All unspecified compounds
Sulphur	M	0.800	Some phosphates: determined by combining cation
	F	0.800	Sulphides and sulphates: determined by combining cation
	M	0.800	Elemental sulphur; Sulphides and sulphates: determined by combining cation

Element	Absorption Type(s)	Gut transfer factor $f_1$	Compounds
Chlorine	F	1.000	Determined by combining cation
	M	1.000	Determined by combining cation
Potassium	F	1.000	All compounds
Calcium	M	0.300	All compounds
Scandium	S	$1.0 \times 10^{-4}$	All compounds
Titanium	F	0.010	All unspecified compounds
	M	0.010	Oxides, hydroxides, carbides, halides and nitrates
Vanadium	S	0.010	Strontium titanate (SrTiO <sub>3</sub> )
	F	0.010	All unspecified compounds
Chromium	M	0.010	Oxides, hydroxides, carbides and halides
	F	0.100	All unspecified compounds
Manganese	M	0.100	Halides and nitrates
	S	0.100	Oxides and hydroxides
Iron	F	0.100	All unspecified compounds
	M	0.100	Oxides, hydroxides, halides and nitrates
Cobalt	F	0.100	All unspecified compounds
	M	0.100	Oxides, hydroxides and halides
Nickel	S	0.050	All unspecified compounds
	F	0.050	Oxides, hydroxides, halides and nitrates
	M	0.050	All unspecified compounds
		0.050	Oxides, hydroxides and carbides



Element	Absorption Type(s)	Gut transfer factor $f_1$	Compounds
Copper	F	0.500	All unspecified inorganic compounds
	M	0.500	Sulphides, halides and nitrates
	S	0.500	Oxides and hydroxides
Zinc	S	0.500	All compounds
	F	0.001	All unspecified compounds
Germanium	M	0.001	Oxides, hydroxides, carbides, halides and nitrates
	F	1.000	All unspecified compounds
Arsenic	M	1.000	Oxides, sulphides and halides
	M	0.500	All compounds
Selenium	F	0.800	All unspecified inorganic compounds
	M	0.800	Elemental selenium, oxides, hydroxides and carbides
Bromine	F	1.000	Determined by combining cation
	M	1.000	Determined by combining cation
Rubidium	F	1.000	All compounds
Strontium	F	0.300	All unspecified compounds
	S	0.010	Strontium titanate (SrTiO <sub>3</sub> )
Yttrium	M	$1.0 \times 10^{-4}$	All unspecified compounds
	S	$1.0 \times 10^{-4}$	Oxides and hydroxides
Zirconium	F	0.002	All unspecified compounds
	M	0.002	Oxides, hydroxides, halides and nitrates
Niobium	S	0.002	Zirconium carbide
	M	0.010	All unspecified compounds

Element	Absorption Type(s)	Gut transfer factor $f_1$	Compounds
	S	0.010	Oxides and hydroxides
Molybdenum	F	0.800	All unspecified compounds
	S	0.050	Molybdenum sulphide, oxides and hydroxides
Technetium	F	0.800	All unspecified compounds
	M	0.800	Oxides, hydroxides, halides and nitrates
Ruthenium	F	0.050	All unspecified compounds
	M	0.050	Halides
	S	0.050	Oxides and hydroxides
Rhodium	F	0.050	All unspecified compounds
	M	0.050	Halides
	S	0.050	Oxides and hydroxides
Palladium	F	0.005	All unspecified compounds
	M	0.005	Nitrates and halides
	S	0.005	Oxides and hydroxides
Silver	F	0.050	All unspecified compounds and metallic silver
	M	0.050	Nitrates and sulphides
	S	0.050	Oxides, hydroxides and carbides
Cadmium	F	0.050	All unspecified compounds
	M	0.050	Sulphides, halides and nitrates
	S	0.050	Oxides and hydroxides
Indium	F	0.020	All unspecified compounds

Element	Absorption Type(s)	Gut transfer factor $f_1$	Compounds
Tin	M	0.020	Oxides, hydroxides, halides and nitrates
	F	0.020	All unspecified compounds
Antimony	M	0.020	Stannic phosphate, sulphides, oxides, hydroxides, halides and nitrates
	F	0.100	All unspecified compounds
Tellurium	M	0.010	Oxides, hydroxides, halides, sulphides, sulphates and nitrates
	F	0.300	All unspecified compounds
Iodine	M	0.300	Oxides, hydroxides and nitrates
Iodine	F	1.000	All compounds
Caesium	F	1.000	All compounds
Barium	F	0.100	All compounds
Lanthanum	F	$5.0 \times 10^{-4}$	All unspecified compounds
	M	$5.0 \times 10^{-4}$	Oxides and hydroxides
Cerium	M	$5.0 \times 10^{-4}$	All unspecified compounds
	S	$5.0 \times 10^{-4}$	Oxides, hydroxides and fluorides
Praseodymium	M	$5.0 \times 10^{-4}$	All unspecified compounds
	S	$5.0 \times 10^{-4}$	Oxides, hydroxides, carbides and fluorides
Neodymium	M	$5.0 \times 10^{-4}$	All unspecified compounds
	S	$5.0 \times 10^{-4}$	Oxides, hydroxides, carbides and fluorides
Promethium	M	$5.0 \times 10^{-4}$	All unspecified compounds

Element	Absorption Type(s)	Gut transfer factor $f_i$	Compounds
Samarium	S	$5.0 \times 10^{-4}$	Oxides, hydroxides, carbides and fluorides
Europium	M	$5.0 \times 10^{-4}$	All compounds
Gadolinium	M	$5.0 \times 10^{-4}$	All compounds
	F	$5.0 \times 10^{-4}$	All unspecified compounds
Terbium	M	$5.0 \times 10^{-4}$	Oxides, hydroxides and fluorides
	M	$5.0 \times 10^{-4}$	All compounds
Dysprosium	M	$5.0 \times 10^{-4}$	All compounds
Holmium	M	$5.0 \times 10^{-4}$	All unspecified compounds
Erbium	M	$5.0 \times 10^{-4}$	All compounds
Thulium	M	$5.0 \times 10^{-4}$	All compounds
Ytterbium	M	$5.0 \times 10^{-4}$	All unspecified compounds
	S	$5.0 \times 10^{-4}$	Oxides, hydroxides and fluorides
Lutetium	M	$5.0 \times 10^{-4}$	All unspecified compounds
	S	$5.0 \times 10^{-4}$	Oxides, hydroxides and fluorides
Hafnium	F	0.002	All unspecified compounds
	M	0.002	Oxides, hydroxides, halides, carbides and nitrates
Tantalum	M	0.001	All unspecified compounds
	S	0.001	Elemental tantalum, oxides, hydroxides, halides, carbides, nitrates and nitrides
Rhenium	F	0.800	All unspecified compounds
	M	0.800	Oxides, hydroxides, halides and nitrates

Element	Absorption Type(s)	Gut transfer factor $f_1$	Compounds
Osmium	F	0.010	All unspecified compounds
	M	0.010	Halides and nitrates
	S	0.010	Oxides and hydroxides
Iridium	F	0.010	All unspecified compounds
	M	0.010	Metallic iridium, halides and nitrates
	S	0.010	Oxides and hydroxides
Platinum	F	0.010	All compounds
Gold	F	0.100	All unspecified compounds
	M	0.100	Halides and nitrates
	S	0.100	Oxides and hydroxides
Mercury	F	0.020	Sulphates
	M	0.020	Oxides, hydroxides, halides, nitrates and sulphides
Mercury	F	0.400	All organic compounds
Thallium	F	1.000	All compounds
Lead	F	0.200	All compounds
Bismuth	F	0.050	Bismuth nitrate
	M	0.050	All unspecified compounds
Polonium	F	0.100	All unspecified compounds
	M	0.100	Oxides, hydroxides and nitrates
Astatine	F	1.000	Determined by combining cation
	M	1.000	Determined by combining cation

Element	Absorption Type(s)	Gut transfer factor $f_1$	Compounds
Francium	F	1.000	All compounds
Radium	M	0.200	All compounds
Actinium	F	$5.0 \times 10^{-4}$	All unspecified compounds
	M	$5.0 \times 10^{-4}$	Halides and nitrates
	S	$5.0 \times 10^{-4}$	Oxides and hydroxides
Thorium	M	$5.0 \times 10^{-4}$	All unspecified compounds
	S	$2.0 \times 10^{-4}$	Oxides and hydroxides
Protactinium	M	$5.0 \times 10^{-4}$	All unspecified compounds
	S	$5.0 \times 10^{-4}$	Oxides and hydroxides
Uranium	F	0.020	Most hexavalent compounds, e.g. $UF_6$ , $UO_2F_2$ and $UO_2(NO_3)_2$
	M	0.020	Less soluble compounds, e.g. $UO_3$ , $UF_4$ , $UCl_4$ and most other hexavalent compounds
	S	0.002	Highly insoluble compounds, e.g. $UO_2$ and $U_3O_8$
Neptunium	M	$5.0 \times 10^{-4}$	All compounds
Plutonium	M	$5.0 \times 10^{-4}$	All unspecified compounds
	S	$1.0 \times 10^{-4}$	Insoluble oxides
Americium	M	$5.0 \times 10^{-4}$	All compounds
Curium	M	$5.0 \times 10^{-4}$	All compounds
Berkelium	M	$5.0 \times 10^{-4}$	All compounds
Californium	M	$5.0 \times 10^{-4}$	All compounds

Element	Absorption Type(s)	Gut transfer factor $f_1$	Compounds
Einsteinium	M	$5.0 \times 10^{-4}$	All compounds
Fermium	M	$5.0 \times 10^{-4}$	All compounds
Mendelevium	M	$5.0 \times 10^{-4}$	All compound

Note: Types F, M and S denote fast, moderate and slow absorption from the lung, respectively.

TABLE II.D. Members of The Public: Committed Effective Dose Per Unit Intake E(G) Via Ingestion (Sv/Bq)

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for g > 1 a	Age 1-2		2-7 a		7-12 a		12-17 a		>17 a	
		$f_1$	e(g)		g > 1 a	e(g)	e(g)	e(g)	e(g)	e(g)	e(g)			
<b>Hydrogen</b>														
Tritiated water	12.3 a	1.000	$6.4 \times 10^{-11}$	1.000	$4.8 \times 10^{-11}$	$3.1 \times 10^{-11}$	$3.1 \times 10^{-11}$	$2.3 \times 10^{-11}$	$1.8 \times 10^{-11}$	$1.8 \times 10^{-11}$	$1.8 \times 10^{-11}$	$1.8 \times 10^{-11}$	$1.8 \times 10^{-11}$	$1.8 \times 10^{-11}$
Organically bound tritium	12.3 a	1.000	$1.2 \times 10^{-10}$	1.000	$1.2 \times 10^{-10}$	$7.3 \times 10^{-11}$	$7.3 \times 10^{-11}$	$5.7 \times 10^{-11}$	$4.2 \times 10^{-11}$	$4.2 \times 10^{-11}$	$4.2 \times 10^{-11}$	$4.2 \times 10^{-11}$	$4.2 \times 10^{-11}$	$4.2 \times 10^{-11}$
<b>Beryllium</b>														
Be-7	53.3 d	0.020	$1.8 \times 10^{-10}$	0.005	$1.3 \times 10^{-10}$	$7.7 \times 10^{-11}$	$7.7 \times 10^{-11}$	$5.3 \times 10^{-11}$	$3.5 \times 10^{-11}$	$3.5 \times 10^{-11}$	$3.5 \times 10^{-11}$	$3.5 \times 10^{-11}$	$2.8 \times 10^{-11}$	$2.8 \times 10^{-11}$
Be	$1.60 \times 10^6$ a	0.020	$1.4 \times 10^{-8}$	0.005	$8.0 \times 10^{-9}$	$4.1 \times 10^{-9}$	$4.1 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.1 \times 10^{-9}$	$1.1 \times 10^{-9}$
<b>Carbon</b>														
C-11	0.340 h	1.000	$2.6 \times 10^{-10}$	1.000	$1.5 \times 10^{-10}$	$7.3 \times 10^{-11}$	$7.3 \times 10^{-11}$	$4.3 \times 10^{-11}$	$3.0 \times 10^{-11}$	$3.0 \times 10^{-11}$	$3.0 \times 10^{-11}$	$3.0 \times 10^{-11}$	$2.4 \times 10^{-11}$	$2.4 \times 10^{-11}$
C-14	$5.73 \times 10^3$ a	1.000	$1.4 \times 10^{-9}$	1.000	$1.6 \times 10^{-9}$	$9.9 \times 10^{-10}$	$9.9 \times 10^{-10}$	$8.0 \times 10^{-10}$	$5.7 \times 10^{-10}$	$5.7 \times 10^{-10}$	$5.7 \times 10^{-10}$	$5.7 \times 10^{-10}$	$5.8 \times 10^{-10}$	$5.8 \times 10^{-10}$
<b>Fluorine</b>														
F-18	1.83 h	1.000	$5.2 \times 10^{-10}$	1.000	$3.0 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.5 \times 10^{-10}$	$9.1 \times 10^{-11}$	$6.2 \times 10^{-11}$	$6.2 \times 10^{-11}$	$6.2 \times 10^{-11}$	$6.2 \times 10^{-11}$	$4.9 \times 10^{-11}$	$4.9 \times 10^{-11}$
<b>Sodium</b>														
Na-22	2.60 a	1.000	$2.1 \times 10^{-8}$	1.000	$1.5 \times 10^{-8}$	$8.4 \times 10^{-9}$	$8.4 \times 10^{-9}$	$5.5 \times 10^{-9}$	$3.7 \times 10^{-9}$	$3.7 \times 10^{-9}$	$3.7 \times 10^{-9}$	$3.7 \times 10^{-9}$	$3.2 \times 10^{-9}$	$3.2 \times 10^{-9}$
Na-24	15.0 h	1.000	$3.5 \times 10^{-9}$	1.000	$2.3 \times 10^{-9}$	$1.2 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.7 \times 10^{-10}$	$5.2 \times 10^{-10}$	$5.2 \times 10^{-10}$	$5.2 \times 10^{-10}$	$5.2 \times 10^{-10}$	$4.3 \times 10^{-10}$	$4.3 \times 10^{-10}$
<b>Magnesium</b>														
Mg-28	20.9 h	1.000	$1.2 \times 10^{-8}$	0.500	$1.4 \times 10^{-8}$	$7.4 \times 10^{-9}$	$7.4 \times 10^{-9}$	$4.5 \times 10^{-9}$	$2.7 \times 10^{-9}$	$2.7 \times 10^{-9}$	$2.7 \times 10^{-9}$	$2.7 \times 10^{-9}$	$2.2 \times 10^{-9}$	$2.2 \times 10^{-9}$
<b>Aluminium</b>														
Al-26	$7.16 \times 10^5$ a	0.020	$3.4 \times 10^{-8}$	0.010	$2.1 \times 10^{-8}$	$1.1 \times 10^{-8}$	$1.1 \times 10^{-8}$	$7.1 \times 10^{-8}$	$4.3 \times 10^{-9}$	$4.3 \times 10^{-9}$	$4.3 \times 10^{-9}$	$4.3 \times 10^{-9}$	$3.5 \times 10^{-9}$	$3.5 \times 10^{-9}$



Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 g > 1 a	2-7 a	7-12 a	12-17 a	>17 a
		$f_1$	e(g)					
<b>Silicon</b>								
Si-31	2.62 h	0.020	$1.9 \times 10^{-9}$	$1.0 \times 10^{-9}$	$5.1 \times 10^{-10}$	$3.0 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.6 \times 10^{-10}$
Si-32	$4.50 \times 10^2$ a	0.020	$7.3 \times 10^{-9}$	$4.1 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.0 \times 10^{-10}$	$5.6 \times 10^{-10}$
<b>Phosphorus</b>								
P-32	14.3 d	1.000	$3.1 \times 10^{-8}$	$1.9 \times 10^{-8}$	$9.4 \times 10^{-9}$	$5.3 \times 10^{-9}$	$3.1 \times 10^{-9}$	$2.4 \times 10^{-9}$
P-33	25.4 d	1.000	$2.7 \times 10^{-9}$	$1.8 \times 10^{-9}$	$9.1 \times 10^{-10}$	$5.3 \times 10^{-10}$	$3.1 \times 10^{-10}$	$2.4 \times 10^{-10}$
<b>Sulphur</b>								
S-35 (inorganic)	87.4 d	1.000	$1.3 \times 10^{-9}$	$8.7 \times 10^{-10}$	$4.4 \times 10^{-10}$	$2.7 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.3 \times 10^{-10}$
S-35 (organic)	87.4 d	1.000	$7.7 \times 10^{-9}$	$5.4 \times 10^{-9}$	$2.7 \times 10^{-9}$	$1.6 \times 10^{-9}$	$9.5 \times 10^{-10}$	$7.7 \times 10^{-10}$
<b>Chlorine</b>								
Cl-36	$3.01 \times 10^5$ a	1.000	$9.8 \times 10^{-9}$	$6.3 \times 10^{-9}$	$3.2 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.2 \times 10^{-9}$	$9.3 \times 10^{-10}$
Cl-38	0.620 h	1.000	$1.4 \times 10^{-9}$	$7.7 \times 10^{-10}$	$3.8 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.2 \times 10^{-10}$
Cl-39	0.927 h	1.000	$9.7 \times 10^{-10}$	$5.5 \times 10^{-10}$	$2.7 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.1 \times 10^{-10}$	$8.5 \times 10^{-11}$
<b>Potassium</b>								
K-40	$1.28 \times 10^9$ a	1.000	$6.2 \times 10^{-8}$	$4.2 \times 10^{-8}$	$2.1 \times 10^{-8}$	$1.3 \times 10^{-8}$	$7.6 \times 10^{-9}$	$6.2 \times 10^{-9}$
K-42	12.4 h	1.000	$5.1 \times 10^{-9}$	$3.0 \times 10^{-9}$	$1.5 \times 10^{-9}$	$8.6 \times 10^{-10}$	$5.4 \times 10^{-10}$	$4.3 \times 10^{-10}$
K-43	22.6 h	1.000	$2.3 \times 10^{-9}$	$1.4 \times 10^{-9}$	$7.6 \times 10^{-10}$	$4.7 \times 10^{-10}$	$3.0 \times 10^{-10}$	$2.5 \times 10^{-10}$
K-44	0.369 h	1.000	$1.0 \times 10^{-9}$	$5.5 \times 10^{-10}$	$2.7 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.1 \times 10^{-10}$	$8.4 \times 10^{-11}$
K-45	0.333 h	1.000	$6.2 \times 10^{-10}$	$3.5 \times 10^{-10}$	$1.7 \times 10^{-10}$	$9.9 \times 10^{-11}$	$6.8 \times 10^{-11}$	$5.4 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12-17 a $e(g)$	>17 a $e(g)$
		$f_1$	$e(g)$						
<b>Calcium<sup>b</sup></b>									
Ca-41	1.40 × 10 <sup>5</sup> a	0.600	1.2 × 10 <sup>-9</sup>	0.300	5.2 × 10 <sup>-10</sup>	3.9 × 10 <sup>-10</sup>	4.8 × 10 <sup>-10</sup>	5.0 × 10 <sup>-10</sup>	1.9 × 10 <sup>-10</sup>
Ca-45	163 d	0.600	1.1 × 10 <sup>-8</sup>	0.300	4.9 × 10 <sup>-9</sup>	2.6 × 10 <sup>-9</sup>	1.8 × 10 <sup>-9</sup>	1.3 × 10 <sup>-9</sup>	7.1 × 10 <sup>-10</sup>
Ca-47	4.53 d	0.600	1.3 × 10 <sup>-8</sup>	0.300	9.3 × 10 <sup>-9</sup>	4.9 × 10 <sup>-9</sup>	3.0 × 10 <sup>-9</sup>	1.8 × 10 <sup>-9</sup>	1.6 × 10 <sup>-9</sup>
<b>Scandium</b>									
K-43	22.6 h	1.000	2.3 × 10 <sup>-9</sup>	1.000	1.4 × 10 <sup>-9</sup>	7.6 × 10 <sup>-10</sup>	4.7 × 10 <sup>-10</sup>	3.0 × 10 <sup>-10</sup>	2.5 × 10 <sup>-10</sup>
K-44	0.369 h	1.000	1.0 × 10 <sup>-9</sup>	1.000	5.5 × 10 <sup>-10</sup>	2.7 × 10 <sup>-10</sup>	1.6 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	8.4 × 10 <sup>-11</sup>
K-45	0.333 h	1.000	6.2 × 10 <sup>-10</sup>	1.000	3.5 × 10 <sup>-10</sup>	1.7 × 10 <sup>-10</sup>	9.9 × 10 <sup>-11</sup>	6.8 × 10 <sup>-11</sup>	5.4 × 10 <sup>-11</sup>
Sc-44m	2.44 d	0.001	2.4 × 10 <sup>-8</sup>	1.0 × 10 <sup>-4</sup>	1.6 × 10 <sup>-8</sup>	8.3 × 10 <sup>-9</sup>	5.1 × 10 <sup>-9</sup>	3.1 × 10 <sup>-9</sup>	2.4 × 10 <sup>-9</sup>
Sc-46	83.8 d	0.001	1.1 × 10 <sup>-8</sup>	1.0 × 10 <sup>-4</sup>	7.9 × 10 <sup>-9</sup>	4.4 × 10 <sup>-9</sup>	2.9 × 10 <sup>-9</sup>	1.8 × 10 <sup>-9</sup>	1.5 × 10 <sup>-9</sup>
Sc-47	3.35 d	0.001	6.1 × 10 <sup>-9</sup>	1.0 × 10 <sup>-4</sup>	3.9 × 10 <sup>-9</sup>	2.0 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>	6.8 × 10 <sup>-10</sup>	5.4 × 10 <sup>-10</sup>
Sc-48	1.82 d	0.001	1.3 × 10 <sup>-8</sup>	1.0 × 10 <sup>-4</sup>	9.3 × 10 <sup>-9</sup>	5.1 × 10 <sup>-9</sup>	3.3 × 10 <sup>-9</sup>	2.1 × 10 <sup>-9</sup>	1.7 × 10 <sup>-9</sup>
Sc-49	0.956 h	0.001	1.0 × 10 <sup>-9</sup>	1.0 × 10 <sup>-4</sup>	5.7 × 10 <sup>-10</sup>	2.8 × 10 <sup>-10</sup>	1.6 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>	8.2 × 10 <sup>-11</sup>
<b>Titanium</b>									
Ti-44	47.3 a	0.020	5.5 × 10 <sup>-8</sup>	0.010	3.1 × 10 <sup>-8</sup>	1.7 × 10 <sup>-8</sup>	1.1 × 10 <sup>-8</sup>	6.9 × 10 <sup>-9</sup>	5.8 × 10 <sup>-9</sup>
Ti-45	3.08 h	0.020	1.6 × 10 <sup>-9</sup>	0.010	9.8 × 10 <sup>-10</sup>	5.0 × 10 <sup>-10</sup>	3.1 × 10 <sup>-10</sup>	1.9 × 10 <sup>-10</sup>	1.5 × 10 <sup>-10</sup>
<b>Vanadium</b>									
V-47	0.543 h	0.020	7.3 × 10 <sup>-10</sup>	0.010	4.1 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	8.0 × 10 <sup>-11</sup>	6.3 × 10 <sup>-11</sup>
V-48	16.2 d	0.020	1.5 × 10 <sup>-8</sup>	0.010	1.1 × 10 <sup>-8</sup>	5.9 × 10 <sup>-9</sup>	3.9 × 10 <sup>-9</sup>	2.5 × 10 <sup>-9</sup>	2.0 × 10 <sup>-9</sup>
V-49	330 d	0.020	2.2 × 10 <sup>-10</sup>	0.010	1.4 × 10 <sup>-10</sup>	6.9 × 10 <sup>-11</sup>	4.0 × 10 <sup>-11</sup>	2.3 × 10 <sup>-11</sup>	1.8 × 10 <sup>-11</sup>

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		f <sub>i</sub> for g > 1 a	Age 1-2 g > 1 a	2-7 a e(g)	7-12 a e(g)	12-17 a e(g)	>17 a e(g)
		f <sub>i</sub>	e(g)						
<b>Chromium</b>									
Cr-48	23.0 h	0.200	1.4 × 10 <sup>-9</sup>	0.100	9.9 × 10 <sup>-10</sup>	5.7 × 10 <sup>-10</sup>	3.8 × 10 <sup>-10</sup>	2.5 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>
		0.020	1.4 × 10 <sup>-9</sup>	0.010	9.9 × 10 <sup>-10</sup>	5.7 × 10 <sup>-10</sup>	3.8 × 10 <sup>-10</sup>	2.5 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>
Cr-49	0.702 h	0.200	6.8 × 10 <sup>-10</sup>	0.100	3.9 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	7.7 × 10 <sup>-11</sup>	6.1 × 10 <sup>-11</sup>
		0.020	6.8 × 10 <sup>-10</sup>	0.010	3.9 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	7.7 × 10 <sup>-11</sup>	6.1 × 10 <sup>-11</sup>
Cr-51	27.7 d	0.200	3.5 × 10 <sup>-10</sup>	0.100	2.3 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	7.8 × 10 <sup>-11</sup>	4.8 × 10 <sup>-11</sup>	3.8 × 10 <sup>-11</sup>
		0.020	3.3 × 10 <sup>-10</sup>	0.010	2.2 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	7.5 × 10 <sup>-11</sup>	4.6 × 10 <sup>-11</sup>	3.7 × 10 <sup>-11</sup>
<b>Manganese</b>									
Mn-51	0.770 h	0.200	1.1 × 10 <sup>-9</sup>	0.100	6.1 × 10 <sup>-10</sup>	3.0 × 10 <sup>-10</sup>	1.8 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	9.3 × 10 <sup>-11</sup>
Mn-52	5.59 d	0.200	1.2 × 10 <sup>-8</sup>	0.100	8.8 × 10 <sup>-9</sup>	5.1 × 10 <sup>-9</sup>	3.4 × 10 <sup>-9</sup>	2.2 × 10 <sup>-9</sup>	1.8 × 10 <sup>-9</sup>
Mn-52m	0.352 h	0.200	7.8 × 10 <sup>-10</sup>	0.100	4.4 × 10 <sup>-10</sup>	2.2 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	8.8 × 10 <sup>-11</sup>	6.9 × 10 <sup>-11</sup>
	3.70 × 10 <sup>6</sup> a	0.200	4.1 × 10 <sup>-10</sup>	0.100	2.2 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	6.5 × 10 <sup>-11</sup>	3.7 × 10 <sup>-11</sup>	3.0 × 10 <sup>-11</sup>
Mn-54	312 d	0.200	5.4 × 10 <sup>-9</sup>	0.100	3.1 × 10 <sup>-9</sup>	1.9 × 10 <sup>-9</sup>	1.3 × 10 <sup>-9</sup>	8.7 × 10 <sup>-10</sup>	7.1 × 10 <sup>-10</sup>
	2.58 h	0.200	2.7 × 10 <sup>-9</sup>	0.100	1.7 × 10 <sup>-9</sup>	8.5 × 10 <sup>-10</sup>	5.1 × 10 <sup>-10</sup>	3.2 × 10 <sup>-10</sup>	2.5 × 10 <sup>-10</sup>
<b>Iron<sup>c</sup></b>									
Fe-52	8.28 h	0.600	1.3 × 10 <sup>-8</sup>	0.100	9.1 × 10 <sup>-9</sup>	4.6 × 10 <sup>-9</sup>	2.8 × 10 <sup>-9</sup>	1.7 × 10 <sup>-9</sup>	1.4 × 10 <sup>-9</sup>
Fe-55	2.70 a	0.600	7.6 × 10 <sup>-9</sup>	0.100	2.4 × 10 <sup>-9</sup>	1.7 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	7.7 × 10 <sup>-10</sup>	3.3 × 10 <sup>-10</sup>
Fe-59	44.5 d	0.600	3.9 × 10 <sup>-8</sup>	0.100	1.3 × 10 <sup>-8</sup>	7.5 × 10 <sup>-9</sup>	4.7 × 10 <sup>-9</sup>	3.1 × 10 <sup>-9</sup>	1.8 × 10 <sup>-9</sup>
	1.00 × 10 <sup>5</sup> a	0.600	7.9 × 10 <sup>-7</sup>	0.100	2.7 × 10 <sup>-7</sup>	2.7 × 10 <sup>-7</sup>	2.5 × 10 <sup>-7</sup>	2.3 × 10 <sup>-7</sup>	1.1 × 10 <sup>-7</sup>
<b>Cobalt<sup>d</sup></b>									
Co-55	17.5 h	0.600	6.0 × 10 <sup>-9</sup>	0.100	5.5 × 10 <sup>-9</sup>	2.9 × 10 <sup>-9</sup>	1.8 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	1.0 × 10 <sup>-9</sup>

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2		2-7 a		7-12 a		12-17 a		>17 a	
		$f_1$	e(g)		g > 1 a	e(g)	e(g)	e(g)	e(g)	e(g)	e(g)	e(g)		
Co-56	78.7 d	0.600	$2.5 \times 10^{-8}$	0.100	$1.5 \times 10^{-8}$	$8.8 \times 10^{-9}$	$5.8 \times 10^{-9}$	$3.8 \times 10^{-9}$	$2.5 \times 10^{-9}$	$3.8 \times 10^{-9}$	$3.8 \times 10^{-9}$	$2.5 \times 10^{-9}$	$2.5 \times 10^{-9}$	$2.5 \times 10^{-9}$
Co-57	271 d	0.600	$2.9 \times 10^{-9}$	0.100	$1.6 \times 10^{-9}$	$8.9 \times 10^{-10}$	$5.8 \times 10^{-10}$	$3.7 \times 10^{-10}$	$2.1 \times 10^{-10}$	$5.8 \times 10^{-10}$	$3.7 \times 10^{-10}$	$2.1 \times 10^{-10}$	$2.1 \times 10^{-10}$	$2.1 \times 10^{-10}$
Co-58	70.8 d	0.600	$7.3 \times 10^{-9}$	0.100	$4.4 \times 10^{-9}$	$2.6 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.1 \times 10^{-9}$	$7.4 \times 10^{-10}$	$1.7 \times 10^{-9}$	$1.1 \times 10^{-9}$	$7.4 \times 10^{-10}$	$7.4 \times 10^{-10}$	$7.4 \times 10^{-10}$
Co-58m	9.15 h	0.600	$2.0 \times 10^{-10}$	0.100	$1.5 \times 10^{-10}$	$7.8 \times 10^{-11}$	$4.7 \times 10^{-11}$	$2.8 \times 10^{-11}$	$2.4 \times 10^{-11}$	$4.7 \times 10^{-11}$	$2.8 \times 10^{-11}$	$2.4 \times 10^{-11}$	$2.4 \times 10^{-11}$	$2.4 \times 10^{-11}$
Co-62m	0.232 h	0.600	$5.3 \times 10^{-10}$	0.100	$3.0 \times 10^{-10}$	$1.5 \times 10^{-10}$	$8.7 \times 10^{-11}$	$6.0 \times 10^{-11}$	$4.7 \times 10^{-11}$	$8.7 \times 10^{-11}$	$6.0 \times 10^{-11}$	$4.7 \times 10^{-11}$	$4.7 \times 10^{-11}$	$4.7 \times 10^{-11}$
<b>Nickel</b>														
Ni-56	6.10 d	0.100	$5.3 \times 10^{-9}$	0.050	$4.0 \times 10^{-9}$	$2.3 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.1 \times 10^{-9}$	$8.6 \times 10^{-10}$	$1.6 \times 10^{-9}$	$1.1 \times 10^{-9}$	$8.6 \times 10^{-10}$	$8.6 \times 10^{-10}$	$8.6 \times 10^{-10}$
Ni-57	1.50 d	0.100	$6.8 \times 10^{-9}$	0.050	$4.9 \times 10^{-9}$	$2.7 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.1 \times 10^{-9}$	$8.7 \times 10^{-10}$	$1.7 \times 10^{-9}$	$1.1 \times 10^{-9}$	$8.7 \times 10^{-10}$	$8.7 \times 10^{-10}$	$8.7 \times 10^{-10}$
Ni-59	$7.50 \times 10^4$ a	0.100	$6.4 \times 10^{-10}$	0.050	$3.4 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.1 \times 10^{-10}$	$7.3 \times 10^{-11}$	$6.3 \times 10^{-11}$	$1.1 \times 10^{-10}$	$7.3 \times 10^{-11}$	$6.3 \times 10^{-11}$	$6.3 \times 10^{-11}$	$6.3 \times 10^{-11}$
Ni-63	96.0 a	0.100	$1.6 \times 10^{-9}$	0.050	$8.4 \times 10^{-10}$	$4.6 \times 10^{-10}$	$2.8 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.5 \times 10^{-10}$	$2.8 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.5 \times 10^{-10}$
Ni-65	2.52 h	0.100	$2.1 \times 10^{-9}$	0.050	$1.3 \times 10^{-9}$	$6.3 \times 10^{-10}$	$3.8 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.8 \times 10^{-10}$	$3.8 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.8 \times 10^{-10}$
Ni-66	2.27 d	0.100	$3.3 \times 10^{-8}$	0.050	$2.2 \times 10^{-8}$	$1.1 \times 10^{-8}$	$6.6 \times 10^{-9}$	$3.7 \times 10^{-9}$	$3.0 \times 10^{-9}$	$6.6 \times 10^{-9}$	$3.7 \times 10^{-9}$	$3.0 \times 10^{-9}$	$3.0 \times 10^{-9}$	$3.0 \times 10^{-9}$
<b>Copper</b>														
Cu-60	0.387 h	1.000	$7.0 \times 10^{-10}$	0.500	$4.2 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.3 \times 10^{-10}$	$8.9 \times 10^{-11}$	$7.0 \times 10^{-11}$	$1.3 \times 10^{-10}$	$8.9 \times 10^{-11}$	$7.0 \times 10^{-11}$	$7.0 \times 10^{-11}$	$7.0 \times 10^{-11}$
Cu-61	3.41 h	1.000	$7.1 \times 10^{-10}$	0.500	$7.5 \times 10^{-10}$	$3.9 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.2 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.2 \times 10^{-10}$	$1.2 \times 10^{-10}$	$1.2 \times 10^{-10}$
Cu-64	12.7 h	1.000	$5.2 \times 10^{-10}$	0.500	$8.3 \times 10^{-10}$	$4.2 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.2 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.2 \times 10^{-10}$	$1.2 \times 10^{-10}$	$1.2 \times 10^{-10}$
Cu-67	2.58 d	1.000	$2.1 \times 10^{-9}$	0.500	$2.4 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.2 \times 10^{-10}$	$4.2 \times 10^{-10}$	$3.4 \times 10^{-10}$	$7.2 \times 10^{-10}$	$4.2 \times 10^{-10}$	$3.4 \times 10^{-10}$	$3.4 \times 10^{-10}$	$3.4 \times 10^{-10}$
<b>Zinc</b>														
Zn-62	9.26 h	1.000	$4.2 \times 10^{-9}$	0.500	$6.5 \times 10^{-9}$	$3.3 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.2 \times 10^{-9}$	$9.4 \times 10^{-10}$	$2.0 \times 10^{-9}$	$1.2 \times 10^{-9}$	$9.4 \times 10^{-10}$	$9.4 \times 10^{-10}$	$9.4 \times 10^{-10}$
Zn-63	0.635 h	1.000	$8.7 \times 10^{-10}$	0.500	$5.2 \times 10^{-10}$	$2.6 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.0 \times 10^{-10}$	$7.9 \times 10^{-11}$	$1.5 \times 10^{-10}$	$1.0 \times 10^{-10}$	$7.9 \times 10^{-11}$	$7.9 \times 10^{-11}$	$7.9 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		f <sub>1</sub> for g > 1 a	Age 1-2 g > 1 a	2-7 a e(g)	7-12 a e(g)	12-17 a e(g)	>17 a e(g)
		f <sub>1</sub>	e(g)						
Zn-65	244 d	1.000	3.6 × 10 <sup>-8</sup>	0.500	1.6 × 10 <sup>-8</sup>	9.7 × 10 <sup>-9</sup>	6.4 × 10 <sup>-9</sup>	4.5 × 10 <sup>-9</sup>	3.9 × 10 <sup>-9</sup>
Zn-69	0.950 h	1.000	3.5 × 10 <sup>-10</sup>	0.500	2.2 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	6.0 × 10 <sup>-11</sup>	3.9 × 10 <sup>-11</sup>	3.1 × 10 <sup>-11</sup>
Zn-69m	13.8 h	1.000	1.3 × 10 <sup>-9</sup>	0.500	2.3 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>	7.0 × 10 <sup>-10</sup>	4.1 × 10 <sup>-10</sup>	3.3 × 10 <sup>-10</sup>
Zn-71m	3.92 h	1.000	1.4 × 10 <sup>-9</sup>	0.500	1.5 × 10 <sup>-9</sup>	7.8 × 10 <sup>-10</sup>	4.8 × 10 <sup>-10</sup>	3.0 × 10 <sup>-10</sup>	2.4 × 10 <sup>-10</sup>
Zn-72	1.94 d	1.000	8.7 × 10 <sup>-9</sup>	0.500	8.6 × 10 <sup>-9</sup>	4.5 × 10 <sup>-9</sup>	2.8 × 10 <sup>-9</sup>	1.7 × 10 <sup>-9</sup>	1.4 × 10 <sup>-9</sup>
<b>Gallium</b>									
Ga-65	0.253 h	0.010	4.3 × 10 <sup>-10</sup>	0.001	2.4 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	6.9 × 10 <sup>-11</sup>	4.7 × 10 <sup>-11</sup>	3.7 × 10 <sup>-11</sup>
Ga-66	9.40 h	0.010	1.2 × 10 <sup>-8</sup>	0.001	7.9 × 10 <sup>-9</sup>	4.0 × 10 <sup>-9</sup>	2.5 × 10 <sup>-9</sup>	1.5 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>
Ga-67	3.26 d	0.010	1.8 × 10 <sup>-9</sup>	0.001	1.2 × 10 <sup>-9</sup>	6.4 × 10 <sup>-10</sup>	4.0 × 10 <sup>-10</sup>	2.4 × 10 <sup>-10</sup>	1.9 × 10 <sup>-10</sup>
Ga-68	1.13 h	0.010	1.2 × 10 <sup>-9</sup>	0.001	6.7 × 10 <sup>-10</sup>	3.4 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>
Ga-70	0.353 h	0.010	3.9 × 10 <sup>-10</sup>	0.001	2.2 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>	5.9 × 10 <sup>-11</sup>	4.0 × 10 <sup>-11</sup>	3.1 × 10 <sup>-11</sup>
Ga-72	14.1 h	0.010	1.0 × 10 <sup>-8</sup>	0.001	6.8 × 10 <sup>-9</sup>	3.6 × 10 <sup>-9</sup>	2.2 × 10 <sup>-9</sup>	1.4 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>
Ga-73	4.91 h	0.010	3.0 × 10 <sup>-9</sup>	0.001	1.9 × 10 <sup>-9</sup>	9.3 × 10 <sup>-10</sup>	5.5 × 10 <sup>-10</sup>	3.3 × 10 <sup>-10</sup>	2.6 × 10 <sup>-10</sup>
<b>Germanium</b>									
Ge-66	2.27 h	1.000	8.3 × 10 <sup>-10</sup>	1.000	5.3 × 10 <sup>-10</sup>	2.9 × 10 <sup>-10</sup>	1.9 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>
Ge-67	0.312 h	1.000	7.7 × 10 <sup>-10</sup>	1.000	4.2 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	8.2 × 10 <sup>-11</sup>	6.5 × 10 <sup>-11</sup>
Ge-68	288 d	1.000	1.2 × 10 <sup>-8</sup>	1.000	8.0 × 10 <sup>-9</sup>	4.2 × 10 <sup>-9</sup>	2.6 × 10 <sup>-9</sup>	1.6 × 10 <sup>-9</sup>	1.3 × 10 <sup>-9</sup>
Ge-69	1.63 d	1.000	2.0 × 10 <sup>-9</sup>	1.000	1.3 × 10 <sup>-9</sup>	7.1 × 10 <sup>-10</sup>	4.6 × 10 <sup>-10</sup>	3.0 × 10 <sup>-10</sup>	2.4 × 10 <sup>-10</sup>
Ge-71	11.8 d	1.000	1.2 × 10 <sup>-10</sup>	1.000	7.8 × 10 <sup>-11</sup>	4.0 × 10 <sup>-11</sup>	2.4 × 10 <sup>-11</sup>	1.5 × 10 <sup>-11</sup>	1.2 × 10 <sup>-11</sup>

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 g > 1 a	2-7 a	7-12 a	12-17 a	>17 a
		$f_1$	e(g)					
Ge-75	1.38 h	1.000	$5.5 \times 10^{-10}$	$3.1 \times 10^{-10}$	$1.5 \times 10^{-10}$	$8.7 \times 10^{-11}$	$5.9 \times 10^{-11}$	$4.6 \times 10^{-11}$
Ge-77	11.3 h	1.000	$3.0 \times 10^{-9}$	$1.8 \times 10^{-9}$	$9.9 \times 10^{-10}$	$6.2 \times 10^{-10}$	$4.1 \times 10^{-10}$	$3.3 \times 10^{-10}$
Ge-78	1.45 h	1.000	$1.2 \times 10^{-9}$	$7.0 \times 10^{-10}$	$3.6 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.2 \times 10^{-10}$
Arsenic								
As-69	0.253 h	1.000	$6.6 \times 10^{-10}$	$3.7 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.1 \times 10^{-10}$	$7.2 \times 10^{-11}$	$5.7 \times 10^{-11}$
As-70	0.876 h	1.000	$1.2 \times 10^{-9}$	$7.8 \times 10^{-10}$	$4.1 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.3 \times 10^{-10}$
As-71	2.70 d	1.000	$2.8 \times 10^{-9}$	$2.8 \times 10^{-9}$	$1.5 \times 10^{-9}$	$9.3 \times 10^{-10}$	$5.7 \times 10^{-10}$	$4.6 \times 10^{-10}$
As-72	1.08 d	1.000	$1.1 \times 10^{-8}$	$1.2 \times 10^{-8}$	$6.3 \times 10^{-9}$	$3.8 \times 10^{-9}$	$2.3 \times 10^{-9}$	$1.8 \times 10^{-9}$
As-73	80.3 d	1.000	$2.6 \times 10^{-9}$	$1.9 \times 10^{-9}$	$9.3 \times 10^{-10}$	$5.6 \times 10^{-10}$	$3.2 \times 10^{-10}$	$2.6 \times 10^{-10}$
As-74	17.8 d	1.000	$1.0 \times 10^{-8}$	$8.2 \times 10^{-9}$	$4.3 \times 10^{-9}$	$2.6 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.3 \times 10^{-9}$
As-76	110 d	1.000	$1.0 \times 10^{-8}$	$1.1 \times 10^{-8}$	$5.8 \times 10^{-9}$	$3.4 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.6 \times 10^{-9}$
As-77	1.62 d	1.000	$2.7 \times 10^{-9}$	$2.9 \times 10^{-9}$	$1.5 \times 10^{-9}$	$8.7 \times 10^{-10}$	$5.0 \times 10^{-10}$	$4.0 \times 10^{-10}$
As-78	1.51 h	1.000	$2.0 \times 10^{-9}$	$1.4 \times 10^{-9}$	$7.0 \times 10^{-10}$	$4.1 \times 10^{-10}$	$2.7 \times 10^{-10}$	$2.1 \times 10^{-10}$
Selenium								
Se-70	0.683 h	1.000	$1.0 \times 10^{-9}$	$7.1 \times 10^{-10}$	$3.6 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.2 \times 10^{-10}$
Se-73	7.15 h	1.000	$1.6 \times 10^{-9}$	$1.4 \times 10^{-9}$	$7.4 \times 10^{-10}$	$4.8 \times 10^{-10}$	$2.5 \times 10^{-10}$	$2.1 \times 10^{-10}$
Se-73m	0.650 h	1.000	$2.6 \times 10^{-10}$	$1.8 \times 10^{-10}$	$9.5 \times 10^{-11}$	$5.9 \times 10^{-11}$	$3.5 \times 10^{-11}$	$2.8 \times 10^{-11}$
Se-81m	0.954 h	1.000	$6.0 \times 10^{-10}$	$3.7 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.1 \times 10^{-10}$	$6.7 \times 10^{-11}$	$5.3 \times 10^{-11}$
Se-83	0.375 h	1.000	$4.6 \times 10^{-10}$	$2.9 \times 10^{-10}$	$1.5 \times 10^{-10}$	$8.7 \times 10^{-11}$	$5.9 \times 10^{-11}$	$4.7 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $g > 1$ a	2-7 a	7-12 a	12-17 a	>17 a
		$f_1$	e(g)						
<b>Bromine</b>									
Br-74	0.422 h	1.000	$9.0 \times 10^{-10}$	1.000	$5.2 \times 10^{-10}$	$2.6 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.1 \times 10^{-10}$	$8.4 \times 10^{-11}$
Br-74m	0.691 h	1.000	$1.5 \times 10^{-9}$	1.000	$8.5 \times 10^{-10}$	$4.3 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.4 \times 10^{-10}$
Br-75	1.63 h	1.000	$8.5 \times 10^{-10}$	1.000	$4.9 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.5 \times 10^{-10}$	$9.9 \times 10^{-11}$	$7.9 \times 10^{-11}$
Br-76	16.2 h	1.000	$4.2 \times 10^{-9}$	1.000	$2.7 \times 10^{-9}$	$1.4 \times 10^{-9}$	$8.7 \times 10^{-10}$	$5.6 \times 10^{-10}$	$4.6 \times 10^{-10}$
Br-77	2.33 d	1.000	$6.3 \times 10^{-10}$	1.000	$4.4 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.1 \times 10^{-10}$	$9.6 \times 10^{-11}$
Br-80	0.290 h	1.000	$3.9 \times 10^{-10}$	1.000	$2.1 \times 10^{-10}$	$1.0 \times 10^{-10}$	$5.8 \times 10^{-11}$	$3.9 \times 10^{-11}$	$3.1 \times 10^{-11}$
Br-80m	4.42 h	1.000	$1.4 \times 10^{-9}$	1.000	$8.0 \times 10^{-10}$	$3.9 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.1 \times 10^{-10}$
Br-82	1.47 d	1.000	$3.7 \times 10^{-9}$	1.000	$2.6 \times 10^{-9}$	$1.5 \times 10^{-9}$	$9.5 \times 10^{-10}$	$6.4 \times 10^{-10}$	$5.4 \times 10^{-10}$
Br-83	2.39 h	1.000	$5.3 \times 10^{-10}$	1.000	$3.0 \times 10^{-10}$	$1.4 \times 10^{-10}$	$8.3 \times 10^{-11}$	$5.5 \times 10^{-11}$	$4.3 \times 10^{-11}$
Br-84	0.530 h	1.000	$1.0 \times 10^{-9}$	1.000	$5.8 \times 10^{-10}$	$2.8 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.1 \times 10^{-10}$	$8.8 \times 10^{-11}$
<b>Rubidium</b>									
Rb-79	0.382 h	1.000	$5.7 \times 10^{-10}$	1.000	$3.2 \times 10^{-10}$	$1.6 \times 10^{-10}$	$9.2 \times 10^{-11}$	$6.3 \times 10^{-11}$	$5.0 \times 10^{-11}$
Rb-81	4.58 h	1.000	$5.4 \times 10^{-10}$	1.000	$3.2 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.0 \times 10^{-10}$	$6.7 \times 10^{-11}$	$5.4 \times 10^{-11}$
Rb-81m	0.533 h	1.000	$1.1 \times 10^{-10}$	1.000	$6.2 \times 10^{-11}$	$3.1 \times 10^{-11}$	$1.8 \times 10^{-11}$	$1.2 \times 10^{-11}$	$9.7 \times 10^{-12}$
Rb-82m	6.20 h	1.000	$8.7 \times 10^{-10}$	1.000	$5.9 \times 10^{-10}$	$3.4 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.3 \times 10^{-10}$
Rb-83	86.2 d	1.000	$1.1 \times 10^{-8}$	1.000	$8.4 \times 10^{-9}$	$4.9 \times 10^{-9}$	$3.2 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.9 \times 10^{-9}$
Rb-84	32.8 d	1.000	$2.0 \times 10^{-8}$	1.000	$1.4 \times 10^{-8}$	$7.9 \times 10^{-9}$	$5.0 \times 10^{-9}$	$3.3 \times 10^{-9}$	$2.8 \times 10^{-9}$
Rb-86	18.7 d	1.000	$3.1 \times 10^{-8}$	1.000	$2.0 \times 10^{-8}$	$9.9 \times 10^{-9}$	$5.9 \times 10^{-9}$	$3.5 \times 10^{-9}$	$2.8 \times 10^{-9}$
Rb-87	$4.70 \times 10^{10}$ a	1.000	$1.5 \times 10^{-8}$	1.000	$1.0 \times 10^{-8}$	$5.2 \times 10^{-9}$	$3.1 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.5 \times 10^{-9}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2		2-7 a		7-12 a		12-17 a		>17 a	
		$f_1$	e(g)		$g > 1$ a	e(g)	e(g)	e(g)	e(g)	e(g)	e(g)	e(g)		
Rb-88	0.297 h	1.000	$1.1 \times 10^{-9}$	1.000	$6.2 \times 10^{-10}$	$3.0 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.2 \times 10^{-10}$	$1.2 \times 10^{-10}$	$1.2 \times 10^{-10}$	$1.2 \times 10^{-10}$	$1.2 \times 10^{-10}$	$9.0 \times 10^{-11}$	$9.0 \times 10^{-11}$
Rb-89	0.253 h	1.000	$5.4 \times 10^{-10}$	1.000	$3.0 \times 10^{-10}$	$1.5 \times 10^{-10}$	$8.6 \times 10^{-11}$	$5.9 \times 10^{-11}$	$5.9 \times 10^{-11}$	$5.9 \times 10^{-11}$	$5.9 \times 10^{-11}$	$5.9 \times 10^{-11}$	$4.7 \times 10^{-11}$	$4.7 \times 10^{-11}$
<b>Strontium</b>														
Sr-80	1.67 h	0.600	$3.7 \times 10^{-9}$	0.300	$2.3 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.5 \times 10^{-10}$	$4.2 \times 10^{-10}$	$4.2 \times 10^{-10}$	$4.2 \times 10^{-10}$	$4.2 \times 10^{-10}$	$4.2 \times 10^{-10}$	$3.4 \times 10^{-10}$	$3.4 \times 10^{-10}$
Sr-81	0.425 h	0.600	$8.4 \times 10^{-10}$	0.300	$4.9 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.4 \times 10^{-10}$	$9.6 \times 10^{-11}$	$9.6 \times 10^{-11}$	$9.6 \times 10^{-11}$	$9.6 \times 10^{-11}$	$9.6 \times 10^{-11}$	$7.7 \times 10^{-11}$	$7.7 \times 10^{-11}$
Sr-82	25.0 d	0.600	$7.2 \times 10^{-8}$	0.300	$4.1 \times 10^{-8}$	$2.1 \times 10^{-8}$	$1.3 \times 10^{-8}$	$8.7 \times 10^{-9}$	$8.7 \times 10^{-9}$	$8.7 \times 10^{-9}$	$8.7 \times 10^{-9}$	$8.7 \times 10^{-9}$	$6.1 \times 10^{-9}$	$6.1 \times 10^{-9}$
Sr-83	1.35 d	0.600	$3.4 \times 10^{-9}$	0.300	$2.7 \times 10^{-9}$	$1.4 \times 10^{-9}$	$9.1 \times 10^{-10}$	$5.7 \times 10^{-10}$	$5.7 \times 10^{-10}$	$5.7 \times 10^{-10}$	$5.7 \times 10^{-10}$	$5.7 \times 10^{-10}$	$4.9 \times 10^{-10}$	$4.9 \times 10^{-10}$
Sr-85	64.8 d	0.600	$7.7 \times 10^{-9}$	0.300	$3.1 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.3 \times 10^{-9}$	$5.6 \times 10^{-10}$	$5.6 \times 10^{-10}$
Sr-85m	1.16 h	0.600	$4.5 \times 10^{-11}$	0.300	$3.0 \times 10^{-11}$	$1.7 \times 10^{-11}$	$1.1 \times 10^{-11}$	$7.8 \times 10^{-12}$	$7.8 \times 10^{-12}$	$7.8 \times 10^{-12}$	$7.8 \times 10^{-12}$	$7.8 \times 10^{-12}$	$6.1 \times 10^{-12}$	$6.1 \times 10^{-12}$
Sr-87m	2.80 h	0.600	$2.4 \times 10^{-10}$	0.300	$1.7 \times 10^{-10}$	$9.0 \times 10^{-11}$	$5.6 \times 10^{-11}$	$3.6 \times 10^{-11}$	$3.6 \times 10^{-11}$	$3.6 \times 10^{-11}$	$3.6 \times 10^{-11}$	$3.6 \times 10^{-11}$	$3.0 \times 10^{-11}$	$3.0 \times 10^{-11}$
Sr-89	50.5 d	0.600	$3.6 \times 10^{-8}$	0.300	$1.8 \times 10^{-8}$	$8.9 \times 10^{-9}$	$5.8 \times 10^{-9}$	$4.0 \times 10^{-9}$	$4.0 \times 10^{-9}$	$4.0 \times 10^{-9}$	$4.0 \times 10^{-9}$	$4.0 \times 10^{-9}$	$2.6 \times 10^{-9}$	$2.6 \times 10^{-9}$
Sr-90	29.1 a	0.600	$2.3 \times 10^{-7}$	0.300	$7.3 \times 10^{-8}$	$4.7 \times 10^{-8}$	$6.0 \times 10^{-8}$	$8.0 \times 10^{-8}$	$8.0 \times 10^{-8}$	$8.0 \times 10^{-8}$	$8.0 \times 10^{-8}$	$8.0 \times 10^{-8}$	$2.8 \times 10^{-8}$	$2.8 \times 10^{-8}$
Sr-91	9.50 h	0.600	$5.2 \times 10^{-9}$	0.300	$4.0 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.4 \times 10^{-10}$	$7.4 \times 10^{-10}$	$7.4 \times 10^{-10}$	$7.4 \times 10^{-10}$	$7.4 \times 10^{-10}$	$6.5 \times 10^{-10}$	$6.5 \times 10^{-10}$
Sr-92	2.71 h	0.600	$3.4 \times 10^{-9}$	0.300	$2.7 \times 10^{-9}$	$1.4 \times 10^{-9}$	$8.2 \times 10^{-10}$	$4.8 \times 10^{-10}$	$4.8 \times 10^{-10}$	$4.8 \times 10^{-10}$	$4.8 \times 10^{-10}$	$4.8 \times 10^{-10}$	$4.3 \times 10^{-10}$	$4.3 \times 10^{-10}$
<b>Yttrium</b>														
Y-86	14.7 h	0.001	$7.6 \times 10^{-9}$	$1.0 \times 10^{-4}$	$5.2 \times 10^{-9}$	$2.9 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.2 \times 10^{-9}$	$1.2 \times 10^{-9}$	$1.2 \times 10^{-9}$	$1.2 \times 10^{-9}$	$1.2 \times 10^{-9}$	$9.6 \times 10^{-10}$	$9.6 \times 10^{-10}$
Y-86m	0.800 h	0.001	$4.5 \times 10^{-10}$	$1.0 \times 10^{-4}$	$3.1 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.1 \times 10^{-10}$	$7.1 \times 10^{-11}$	$7.1 \times 10^{-11}$	$7.1 \times 10^{-11}$	$7.1 \times 10^{-11}$	$7.1 \times 10^{-11}$	$5.6 \times 10^{-11}$	$5.6 \times 10^{-11}$
Y-87	3.35 d	0.001	$4.6 \times 10^{-9}$	$1.0 \times 10^{-4}$	$3.2 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.1 \times 10^{-9}$	$7.0 \times 10^{-10}$	$7.0 \times 10^{-10}$	$7.0 \times 10^{-10}$	$7.0 \times 10^{-10}$	$7.0 \times 10^{-10}$	$5.5 \times 10^{-10}$	$5.5 \times 10^{-10}$
Y-88	107 d	0.001	$8.1 \times 10^{-9}$	$1.0 \times 10^{-4}$	$6.0 \times 10^{-9}$	$3.5 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.3 \times 10^{-9}$
Y-90	2.67 d	0.001	$3.1 \times 10^{-8}$	$1.0 \times 10^{-4}$	$2.0 \times 10^{-8}$	$1.0 \times 10^{-8}$	$5.9 \times 10^{-9}$	$3.3 \times 10^{-9}$	$3.3 \times 10^{-9}$	$3.3 \times 10^{-9}$	$3.3 \times 10^{-9}$	$3.3 \times 10^{-9}$	$2.7 \times 10^{-9}$	$2.7 \times 10^{-9}$



Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1a$	Age 1-2 $g > 1a$	2-7 a $e(g)$	7-12 a $e(g)$	12-17 a $e(g)$	>17 a $e(g)$
		$f_1$	$e(g)$						
Y-90m	3.19 h	0.001	$1.8 \times 10^{-9}$	$1.0 \times 10^{-4}$	$1.2 \times 10^{-9}$	$6.1 \times 10^{-10}$	$3.7 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.7 \times 10^{-10}$
Y-91	58.5 d	0.001	$2.8 \times 10^{-8}$	$1.0 \times 10^{-4}$	$1.8 \times 10^{-8}$	$8.8 \times 10^{-9}$	$5.2 \times 10^{-9}$	$2.9 \times 10^{-9}$	$2.4 \times 10^{-9}$
Y-91m	0.828 h	0.001	$9.2 \times 10^{-11}$	$1.0 \times 10^{-4}$	$6.0 \times 10^{-11}$	$3.3 \times 10^{-11}$	$2.1 \times 10^{-11}$	$1.4 \times 10^{-11}$	$1.1 \times 10^{-11}$
Y-92	3.54 h	0.001	$5.9 \times 10^{-9}$	$1.0 \times 10^{-4}$	$3.6 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.2 \times 10^{-10}$	$4.9 \times 10^{-10}$
Y-93	10.1 h	0.001	$1.4 \times 10^{-8}$	$1.0 \times 10^{-4}$	$8.5 \times 10^{-9}$	$4.3 \times 10^{-9}$	$2.5 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.2 \times 10^{-9}$
Y-94	0.318 h	0.001	$9.9 \times 10^{-10}$	$1.0 \times 10^{-4}$	$5.5 \times 10^{-10}$	$2.7 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.0 \times 10^{-10}$	$8.1 \times 10^{-11}$
Y-95	0.178 h	0.001	$5.7 \times 10^{-10}$	$1.0 \times 10^{-4}$	$3.1 \times 10^{-10}$	$1.5 \times 10^{-10}$	$8.7 \times 10^{-11}$	$5.9 \times 10^{-11}$	$4.6 \times 10^{-11}$
<b>Zirconium</b>									
Zr-86	16.5 h	0.020	$6.9 \times 10^{-9}$	0.010	$4.8 \times 10^{-9}$	$2.7 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.1 \times 10^{-9}$	$8.6 \times 10^{-10}$
Zr-88	83.4 d	0.020	$2.8 \times 10^{-9}$	0.010	$2.0 \times 10^{-9}$	$1.2 \times 10^{-9}$	$8.0 \times 10^{-10}$	$5.4 \times 10^{-10}$	$4.5 \times 10^{-10}$
Zr-89	3.27 d	0.020	$6.5 \times 10^{-9}$	0.010	$4.5 \times 10^{-9}$	$2.5 \times 10^{-9}$	$1.6 \times 10^{-9}$	$9.9 \times 10^{-10}$	$7.9 \times 10^{-10}$
Zr-93	$1.53 \times 10^6$ a	0.020	$1.2 \times 10^{-9}$	0.010	$7.6 \times 10^{-10}$	$5.1 \times 10^{-10}$	$5.8 \times 10^{-10}$	$8.6 \times 10^{-10}$	$1.1 \times 10^{-9}$
Zr-95	64.0 d	0.020	$8.5 \times 10^{-9}$	0.010	$5.6 \times 10^{-9}$	$3.0 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.2 \times 10^{-9}$	$9.5 \times 10^{-10}$
Zr-97	16.9 h	0.020	$2.2 \times 10^{-8}$	0.010	$1.4 \times 10^{-8}$	$7.3 \times 10^{-9}$	$4.4 \times 10^{-9}$	$2.6 \times 10^{-9}$	$2.1 \times 10^{-9}$
<b>Niobium</b>									
Nb-88	0.238 h	0.020	$6.7 \times 10^{-10}$	0.010	$3.8 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.1 \times 10^{-10}$	$7.9 \times 10^{-11}$	$6.3 \times 10^{-11}$
Nb-89	2.03 h	0.020	$3.0 \times 10^{-9}$	0.010	$2.0 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.0 \times 10^{-10}$	$3.4 \times 10^{-10}$	$2.7 \times 10^{-10}$
Nb-89m	1.10 h	0.020	$1.5 \times 10^{-9}$	0.010	$8.7 \times 10^{-10}$	$4.4 \times 10^{-10}$	$2.7 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.4 \times 10^{-10}$
Nb-90	14.6 h	0.020	$1.1 \times 10^{-8}$	0.010	$7.2 \times 10^{-9}$	$3.9 \times 10^{-9}$	$2.5 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.2 \times 10^{-9}$
Nb-93m	13.6 a	0.020	$1.5 \times 10^{-9}$	0.010	$9.1 \times 10^{-10}$	$4.6 \times 10^{-10}$	$2.7 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.2 \times 10^{-10}$
Nb-94	$2.03 \times 10^4$ a	0.020	$1.5 \times 10^{-8}$	0.010	$9.7 \times 10^{-9}$	$5.3 \times 10^{-9}$	$3.4 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.7 \times 10^{-9}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12-17 a $e(g)$	>17 a $e(g)$
		$f_1$	$e(g)$						
Nb-95	35.1 d	0.020	$4.6 \times 10^{-9}$	0.010	$3.2 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.1 \times 10^{-9}$	$7.4 \times 10^{-10}$	$5.8 \times 10^{-10}$
Nb-95m	3.61 d	0.020	$6.4 \times 10^{-9}$	0.010	$4.1 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.1 \times 10^{-10}$	$5.6 \times 10^{-10}$
Nb-96	23.3 h	0.020	$9.2 \times 10^{-9}$	0.010	$6.3 \times 10^{-9}$	$3.4 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.1 \times 10^{-9}$
Nb-97	1.20 h	0.020	$7.7 \times 10^{-10}$	0.010	$4.5 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.3 \times 10^{-10}$	$8.7 \times 10^{-11}$	$6.8 \times 10^{-11}$
Nb-98	0.858 h	0.020	$1.2 \times 10^{-9}$	0.010	$7.1 \times 10^{-10}$	$3.6 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.1 \times 10^{-10}$
<b>Molybdenum</b>									
Mo-90	5.67 h	1.000	$1.7 \times 10^{-9}$	1.000	$1.2 \times 10^{-9}$	$6.3 \times 10^{-10}$	$4.0 \times 10^{-10}$	$2.7 \times 10^{-10}$	$2.2 \times 10^{-10}$
Mo-93	$3.50 \times 10^3$ a	1.000	$7.9 \times 10^{-9}$	1.000	$6.9 \times 10^{-9}$	$5.0 \times 10^{-9}$	$4.0 \times 10^{-9}$	$3.4 \times 10^{-9}$	$3.1 \times 10^{-9}$
Mo-93m	6.85 h	1.000	$8.0 \times 10^{-10}$	1.000	$5.4 \times 10^{-10}$	$3.1 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.1 \times 10^{-10}$
Mo-99	2.75 d	1.000	$5.5 \times 10^{-9}$	1.000	$3.5 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.1 \times 10^{-9}$	$7.6 \times 10^{-10}$	$6.0 \times 10^{-10}$
MoI	0.244 h	1.000	$4.8 \times 10^{-10}$	1.000	$2.7 \times 10^{-10}$	$1.3 \times 10^{-10}$	$7.6 \times 10^{-11}$	$5.2 \times 10^{-11}$	$4.1 \times 10^{-11}$
<b>Technetium</b>									
Tc-93	2.75 h	1.000	$2.7 \times 10^{-10}$	0.500	$2.5 \times 10^{-10}$	$1.5 \times 10^{-10}$	$9.8 \times 10^{-11}$	$6.8 \times 10^{-11}$	$5.5 \times 10^{-11}$
Tc-93m	0.725 h	1.000	$2.0 \times 10^{-10}$	0.500	$1.3 \times 10^{-10}$	$7.3 \times 10^{-11}$	$4.6 \times 10^{-11}$	$3.2 \times 10^{-11}$	$2.5 \times 10^{-11}$
Tc-94	4.88 h	1.000	$1.2 \times 10^{-9}$	0.500	$1.0 \times 10^{-9}$	$5.8 \times 10^{-10}$	$3.7 \times 10^{-10}$	$2.5 \times 10^{-10}$	$2.0 \times 10^{-10}$
Tc-94m	0.867 h	1.000	$1.3 \times 10^{-9}$	0.500	$6.5 \times 10^{-10}$	$3.3 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.0 \times 10^{-10}$
Tc-95	20.0 h	1.000	$9.9 \times 10^{-10}$	0.500	$8.7 \times 10^{-10}$	$5.0 \times 10^{-10}$	$3.3 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.8 \times 10^{-10}$
Tc-95m	61.0 d	1.000	$4.7 \times 10^{-9}$	0.500	$2.8 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.0 \times 10^{-9}$	$7.0 \times 10^{-10}$	$5.6 \times 10^{-10}$
Tc-96	4.28 d	1.000	$6.7 \times 10^{-9}$	0.500	$5.1 \times 10^{-9}$	$3.0 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.1 \times 10^{-9}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $g > 1$ a	2-7 a	7-12 a	12-17 a	>17 a
		$f_1$	e(g)						
Tc-96m	0.858 h	1.000	$1.0 \times 10^{-10}$	0.500	$6.5 \times 10^{-11}$	$3.6 \times 10^{-11}$	$2.3 \times 10^{-11}$	$1.6 \times 10^{-11}$	$1.2 \times 10^{-11}$
Tc-97	$2.60 \times 10^6$ a	1.000	$9.9 \times 10^{-10}$	0.500	$4.9 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.4 \times 10^{-10}$	$8.8 \times 10^{-11}$	$6.8 \times 10^{-11}$
Tc-97m	87.0 d	1.000	$8.7 \times 10^{-9}$	0.500	$4.1 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.1 \times 10^{-9}$	$7.0 \times 10^{-10}$	$5.5 \times 10^{-10}$
Tc-98	$4.20 \times 10^6$ a	1.000	$2.3 \times 10^{-8}$	0.500	$1.2 \times 10^{-8}$	$6.1 \times 10^{-9}$	$3.7 \times 10^{-9}$	$2.5 \times 10^{-9}$	$2.0 \times 10^{-9}$
Tc-99	$2.13 \times 10^5$ a	1.000	$1.0 \times 10^{-8}$	0.500	$4.8 \times 10^{-9}$	$2.3 \times 10^{-9}$	$1.3 \times 10^{-9}$	$8.2 \times 10^{-10}$	$6.4 \times 10^{-10}$
Tc-99m	6.02 h	1.000	$2.0 \times 10^{-10}$	0.500	$1.3 \times 10^{-10}$	$7.2 \times 10^{-11}$	$4.3 \times 10^{-11}$	$2.8 \times 10^{-11}$	$2.2 \times 10^{-11}$
Tc1	0.237 h	1.000	$2.4 \times 10^{-10}$	0.500	$1.3 \times 10^{-10}$	$6.1 \times 10^{-11}$	$3.5 \times 10^{-11}$	$2.4 \times 10^{-11}$	$1.9 \times 10^{-11}$
Tc4	0.303 h	1.000	$1.0 \times 10^{-9}$	0.500	$5.3 \times 10^{-10}$	$2.6 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.0 \times 10^{-10}$	$8.0 \times 10^{-11}$
<b>Ruthenium</b>									
Ru-94	0.863 h	0.100	$9.3 \times 10^{-10}$	0.050	$5.9 \times 10^{-10}$	$3.1 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.2 \times 10^{-10}$	$9.4 \times 10^{-11}$
Ru-97	2.90 d	0.100	$1.2 \times 10^{-9}$	0.050	$8.5 \times 10^{-10}$	$4.7 \times 10^{-10}$	$3.0 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.5 \times 10^{-10}$
Ru103	39.3 d	0.100	$7.1 \times 10^{-9}$	0.050	$4.6 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.5 \times 10^{-9}$	$9.2 \times 10^{-10}$	$7.3 \times 10^{-10}$
Ru105	4.44 h	0.100	$2.7 \times 10^{-9}$	0.050	$1.8 \times 10^{-9}$	$9.1 \times 10^{-10}$	$5.5 \times 10^{-10}$	$3.3 \times 10^{-10}$	$2.6 \times 10^{-10}$
Ru106	1.01 a	0.100	$8.4 \times 10^{-8}$	0.050	$4.9 \times 10^{-8}$	$2.5 \times 10^{-8}$	$1.5 \times 10^{-8}$	$8.6 \times 10^{-9}$	$7.0 \times 10^{-9}$
<b>Rhodium</b>									
Rh-99	16.0 d	0.100	$4.2 \times 10^{-9}$	0.050	$2.9 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.5 \times 10^{-10}$	$5.1 \times 10^{-10}$
Rh-99m	4.70 h	0.100	$4.9 \times 10^{-10}$	0.050	$3.5 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.3 \times 10^{-10}$	$8.3 \times 10^{-11}$	$6.6 \times 10^{-11}$
Rh0	20.8 h	0.100	$4.9 \times 10^{-9}$	0.050	$3.6 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.4 \times 10^{-9}$	$8.8 \times 10^{-10}$	$7.1 \times 10^{-10}$
Rh1	3.20 a	0.100	$4.9 \times 10^{-9}$	0.050	$2.8 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.7 \times 10^{-10}$	$5.5 \times 10^{-10}$
Rh1m	4.34 d	0.100	$1.7 \times 10^{-9}$	0.050	$1.2 \times 10^{-9}$	$6.8 \times 10^{-10}$	$4.4 \times 10^{-10}$	$2.8 \times 10^{-10}$	$2.2 \times 10^{-10}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12-17 a $e(g)$	>17 a $e(g)$
		$f_1$	$e(g)$						
Rh2	2.90 a	0.100	$1.9 \times 10^{-8}$	0.050	$1.0 \times 10^{-8}$	$6.4 \times 10^{-9}$	$4.3 \times 10^{-9}$	$3.0 \times 10^{-9}$	$2.6 \times 10^{-9}$
Rh2m	207 d	0.100	$1.2 \times 10^{-8}$	0.050	$7.4 \times 10^{-9}$	$3.9 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.2 \times 10^{-9}$
Rh3m	0.935 h	0.100	$4.7 \times 10^{-11}$	0.050	$2.7 \times 10^{-11}$	$1.3 \times 10^{-11}$	$7.4 \times 10^{-12}$	$4.8 \times 10^{-12}$	$3.8 \times 10^{-12}$
Rh5	1.47 d	0.100	$4.0 \times 10^{-9}$	0.050	$2.7 \times 10^{-9}$	$1.3 \times 10^{-9}$	$8.0 \times 10^{-10}$	$4.6 \times 10^{-10}$	$3.7 \times 10^{-10}$
Rh6m	2.20 h	0.100	$1.4 \times 10^{-9}$	0.050	$9.7 \times 10^{-10}$	$5.3 \times 10^{-10}$	$3.3 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.6 \times 10^{-10}$
Rh7	0.362 h	0.100	$2.9 \times 10^{-10}$	0.050	$1.6 \times 10^{-10}$	$7.9 \times 10^{-11}$	$4.5 \times 10^{-11}$	$3.1 \times 10^{-11}$	$2.4 \times 10^{-11}$
<b>Palladium</b>									
Pd100	3.63 d	0.050	$7.4 \times 10^{-9}$	0.005	$5.2 \times 10^{-9}$	$2.9 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.2 \times 10^{-9}$	$9.4 \times 10^{-10}$
Pd101	8.27 h	0.050	$8.2 \times 10^{-10}$	0.005	$5.7 \times 10^{-10}$	$3.1 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.2 \times 10^{-10}$	$9.4 \times 10^{-11}$
Pd103	17.0 d	0.050	$2.2 \times 10^{-9}$	0.005	$1.4 \times 10^{-9}$	$7.2 \times 10^{-10}$	$4.3 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.9 \times 10^{-10}$
Pd107	$6.50 \times 10^6$ a	0.050	$4.4 \times 10^{-10}$	0.005	$2.8 \times 10^{-10}$	$1.4 \times 10^{-10}$	$8.1 \times 10^{-11}$	$4.6 \times 10^{-11}$	$3.7 \times 10^{-11}$
Pd109	13.4 h	0.050	$6.3 \times 10^{-9}$	0.005	$4.1 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.2 \times 10^{-9}$	$6.8 \times 10^{-10}$	$5.5 \times 10^{-10}$
<b>Silver</b>									
Ag102	0.215 h	0.100	$4.2 \times 10^{-10}$	0.050	$2.4 \times 10^{-10}$	$1.2 \times 10^{-10}$	$7.3 \times 10^{-11}$	$5.0 \times 10^{-11}$	$4.0 \times 10^{-11}$
Ag103	1.09 h	0.100	$4.5 \times 10^{-10}$	0.050	$2.7 \times 10^{-10}$	$1.4 \times 10^{-10}$	$8.3 \times 10^{-11}$	$5.5 \times 10^{-11}$	$4.3 \times 10^{-11}$
Ag104	1.15 h	0.100	$4.3 \times 10^{-10}$	0.050	$2.9 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.1 \times 10^{-10}$	$7.5 \times 10^{-11}$	$6.0 \times 10^{-11}$
Ag104m	0.558 h	0.100	$5.6 \times 10^{-10}$	0.050	$3.3 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.0 \times 10^{-10}$	$6.8 \times 10^{-11}$	$5.4 \times 10^{-11}$
Ag105	41.0 d	0.100	$3.9 \times 10^{-9}$	0.050	$2.5 \times 10^{-9}$	$1.4 \times 10^{-9}$	$9.1 \times 10^{-10}$	$5.9 \times 10^{-10}$	$4.7 \times 10^{-10}$
Ag106	0.399 h	0.100	$3.7 \times 10^{-10}$	0.050	$2.1 \times 10^{-10}$	$1.0 \times 10^{-10}$	$6.0 \times 10^{-11}$	$4.1 \times 10^{-11}$	$3.2 \times 10^{-11}$
Ag106m	8.41 d	0.100	$9.7 \times 10^{-9}$	0.050	$6.9 \times 10^{-9}$	$4.1 \times 10^{-9}$	$2.8 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.5 \times 10^{-9}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1a$	Age 1-2 $g > 1a$	2-7 a	7-12 a	12-17 a	>17 a
		$f_1$	e(g)						
Ag-108m	1.27 × 10 <sup>2</sup> a	0.100	2.1 × 10 <sup>-8</sup>	0.050	1.1 × 10 <sup>-8</sup>	6.5 × 10 <sup>-9</sup>	4.3 × 10 <sup>-9</sup>	2.8 × 10 <sup>-9</sup>	2.3 × 10 <sup>-9</sup>
Ag-110m	250 d	0.100	2.4 × 10 <sup>-8</sup>	0.050	1.4 × 10 <sup>-8</sup>	7.8 × 10 <sup>-9</sup>	5.2 × 10 <sup>-9</sup>	3.4 × 10 <sup>-9</sup>	2.8 × 10 <sup>-9</sup>
Ag-111	7.45 d	0.100	1.4 × 10 <sup>-8</sup>	0.050	9.3 × 10 <sup>-9</sup>	4.6 × 10 <sup>-9</sup>	2.7 × 10 <sup>-9</sup>	1.6 × 10 <sup>-9</sup>	1.3 × 10 <sup>-9</sup>
Ag-112	3.12 h	0.100	4.9 × 10 <sup>-9</sup>	0.050	3.0 × 10 <sup>-9</sup>	1.5 × 10 <sup>-9</sup>	8.9 × 10 <sup>-10</sup>	5.4 × 10 <sup>-10</sup>	4.3 × 10 <sup>-10</sup>
Ag-115	0.333 h	0.100	7.2 × 10 <sup>-10</sup>	0.050	4.1 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	7.7 × 10 <sup>-11</sup>	6.0 × 10 <sup>-11</sup>
<b>Cadmium</b>									
Cd4	0.961 h	0.100	4.2 × 10 <sup>-10</sup>	0.050	2.9 × 10 <sup>-10</sup>	1.7 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	7.2 × 10 <sup>-11</sup>	5.4 × 10 <sup>-11</sup>
Cd7	6.49 h	0.100	7.1 × 10 <sup>-10</sup>	0.050	4.6 × 10 <sup>-10</sup>	2.3 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	7.8 × 10 <sup>-11</sup>	6.2 × 10 <sup>-11</sup>
Cd9	1.27 a	0.100	2.1 × 10 <sup>-8</sup>	0.050	9.5 × 10 <sup>-9</sup>	5.5 × 10 <sup>-9</sup>	3.5 × 10 <sup>-9</sup>	2.4 × 10 <sup>-9</sup>	2.0 × 10 <sup>-9</sup>
Cd-113	9.30 × 10 <sup>15</sup> a	0.100	1.0 × 10 <sup>-7</sup>	0.050	4.8 × 10 <sup>-8</sup>	3.7 × 10 <sup>-8</sup>	3.0 × 10 <sup>-8</sup>	2.6 × 10 <sup>-8</sup>	2.5 × 10 <sup>-8</sup>
Cd-113m	13.6 a	0.100	1.2 × 10 <sup>-7</sup>	0.050	5.6 × 10 <sup>-8</sup>	3.9 × 10 <sup>-8</sup>	2.9 × 10 <sup>-8</sup>	2.4 × 10 <sup>-8</sup>	2.3 × 10 <sup>-8</sup>
Cd-115	2.23 d	0.100	1.4 × 10 <sup>-8</sup>	0.050	9.7 × 10 <sup>-9</sup>	4.9 × 10 <sup>-9</sup>	2.9 × 10 <sup>-9</sup>	1.7 × 10 <sup>-9</sup>	1.4 × 10 <sup>-9</sup>
Cd-115m	44.6 d	0.100	4.1 × 10 <sup>-8</sup>	0.050	1.9 × 10 <sup>-8</sup>	9.7 × 10 <sup>-9</sup>	6.9 × 10 <sup>-9</sup>	4.1 × 10 <sup>-9</sup>	3.3 × 10 <sup>-9</sup>
Cd-117	2.49 h	0.100	2.9 × 10 <sup>-9</sup>	0.050	1.9 × 10 <sup>-9</sup>	9.5 × 10 <sup>-10</sup>	5.7 × 10 <sup>-10</sup>	3.5 × 10 <sup>-10</sup>	2.8 × 10 <sup>-10</sup>
Cd-117m	3.36 h	0.100	2.6 × 10 <sup>-9</sup>	0.050	1.7 × 10 <sup>-9</sup>	9.0 × 10 <sup>-10</sup>	5.6 × 10 <sup>-10</sup>	3.5 × 10 <sup>-10</sup>	2.8 × 10 <sup>-10</sup>
<b>Indium</b>									
In9	4.20 h	0.040	5.2 × 10 <sup>-10</sup>	0.020	3.6 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	8.2 × 10 <sup>-11</sup>	6.6 × 10 <sup>-11</sup>
In-110	4.90 h	0.040	1.5 × 10 <sup>-9</sup>	0.020	1.1 × 10 <sup>-9</sup>	6.5 × 10 <sup>-10</sup>	4.4 × 10 <sup>-10</sup>	3.0 × 10 <sup>-10</sup>	2.4 × 10 <sup>-10</sup>
In-110m	1.15 h	0.040	1.1 × 10 <sup>-9</sup>	0.020	6.4 × 10 <sup>-10</sup>	3.2 × 10 <sup>-10</sup>	1.9 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>
In-111	2.83 d	0.040	2.4 × 10 <sup>-9</sup>	0.020	1.7 × 10 <sup>-9</sup>	9.1 × 10 <sup>-10</sup>	5.9 × 10 <sup>-10</sup>	3.7 × 10 <sup>-10</sup>	2.9 × 10 <sup>-10</sup>
In-112	0.240 h	0.040	1.2 × 10 <sup>-10</sup>	0.020	6.7 × 10 <sup>-11</sup>	3.3 × 10 <sup>-11</sup>	1.9 × 10 <sup>-11</sup>	1.3 × 10 <sup>-11</sup>	1.0 × 10 <sup>-11</sup>

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12-17 a $e(g)$	>17 a $e(g)$
		$f_1$	$e(g)$						
In-113m	1.66 h	0.040	$3.0 \times 10^{-10}$	0.020	$1.8 \times 10^{-10}$	$9.3 \times 10^{-11}$	$6.2 \times 10^{-11}$	$3.6 \times 10^{-11}$	$2.8 \times 10^{-11}$
In-114m	49.5 d	0.040	$5.6 \times 10^{-8}$	0.020	$3.1 \times 10^{-8}$	$1.5 \times 10^{-8}$	$9.0 \times 10^{-9}$	$5.2 \times 10^{-9}$	$4.1 \times 10^{-9}$
In-115	$5.10 \times 10^{15}$ a	0.040	$1.3 \times 10^{-7}$	0.020	$6.4 \times 10^{-8}$	$4.8 \times 10^{-8}$	$4.3 \times 10^{-8}$	$3.6 \times 10^{-8}$	$3.2 \times 10^{-8}$
In-115m	4.49 h	0.040	$9.6 \times 10^{-10}$	0.020	$6.0 \times 10^{-10}$	$3.0 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.1 \times 10^{-10}$	$8.6 \times 10^{-11}$
In-116m	0.902 h	0.040	$5.8 \times 10^{-10}$	0.020	$3.6 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.2 \times 10^{-10}$	$8.0 \times 10^{-11}$	$6.4 \times 10^{-11}$
In-117	0.730 h	0.040	$3.3 \times 10^{-10}$	0.020	$1.9 \times 10^{-10}$	$9.7 \times 10^{-11}$	$5.8 \times 10^{-11}$	$3.9 \times 10^{-11}$	$3.1 \times 10^{-11}$
In-117m	1.94 h	0.040	$1.4 \times 10^{-9}$	0.020	$8.6 \times 10^{-10}$	$4.3 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.2 \times 10^{-10}$
In-119m	0.300 h	0.040	$5.9 \times 10^{-10}$	0.020	$3.2 \times 10^{-10}$	$1.6 \times 10^{-10}$	$8.8 \times 10^{-11}$	$6.0 \times 10^{-11}$	$4.7 \times 10^{-11}$
<b>Tin</b>									
Sn-110	4.00 h	0.040	$3.5 \times 10^{-9}$	0.020	$2.3 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.4 \times 10^{-10}$	$4.4 \times 10^{-10}$	$3.5 \times 10^{-10}$
Sn-111	0.588 h	0.040	$2.5 \times 10^{-10}$	0.020	$1.5 \times 10^{-10}$	$7.4 \times 10^{-11}$	$4.4 \times 10^{-11}$	$3.0 \times 10^{-11}$	$2.3 \times 10^{-11}$
Sn-113	115 d	0.040	$7.8 \times 10^{-9}$	0.020	$5.0 \times 10^{-9}$	$2.6 \times 10^{-9}$	$1.6 \times 10^{-9}$	$9.2 \times 10^{-10}$	$7.3 \times 10^{-10}$
Sn-117m	13.6 d	0.040	$7.7 \times 10^{-9}$	0.020	$5.0 \times 10^{-9}$	$2.5 \times 10^{-9}$	$1.5 \times 10^{-9}$	$8.8 \times 10^{-10}$	$7.1 \times 10^{-10}$
Sn-119m	293 d	0.040	$4.1 \times 10^{-9}$	0.020	$2.5 \times 10^{-9}$	$1.3 \times 10^{-9}$	$7.5 \times 10^{-10}$	$4.3 \times 10^{-10}$	$3.4 \times 10^{-10}$
Sn-121	1.13 d	0.040	$2.6 \times 10^{-9}$	0.020	$1.7 \times 10^{-9}$	$8.4 \times 10^{-10}$	$5.0 \times 10^{-10}$	$2.8 \times 10^{-10}$	$2.3 \times 10^{-10}$
Sn-121m	55.0 a	0.040	$4.6 \times 10^{-9}$	0.020	$2.7 \times 10^{-9}$	$1.4 \times 10^{-9}$	$8.2 \times 10^{-10}$	$4.7 \times 10^{-10}$	$3.8 \times 10^{-10}$
Sn-123	129 d	0.040	$2.5 \times 10^{-8}$	0.020	$1.6 \times 10^{-8}$	$7.8 \times 10^{-9}$	$4.6 \times 10^{-9}$	$2.6 \times 10^{-9}$	$2.1 \times 10^{-9}$
Sn-123m	0.668 h	0.040	$4.7 \times 10^{-10}$	0.020	$2.6 \times 10^{-10}$	$1.3 \times 10^{-10}$	$7.3 \times 10^{-11}$	$4.9 \times 10^{-11}$	$3.8 \times 10^{-11}$
Sn-125	9.64 d	0.040	$3.5 \times 10^{-8}$	0.020	$2.2 \times 10^{-8}$	$1.1 \times 10^{-8}$	$6.7 \times 10^{-9}$	$3.8 \times 10^{-9}$	$3.1 \times 10^{-9}$
Sn-126	$1.00 \times 10^5$ a	0.040	$5.0 \times 10^{-8}$	0.020	$3.0 \times 10^{-8}$	$1.6 \times 10^{-8}$	$9.8 \times 10^{-9}$	$5.9 \times 10^{-9}$	$4.7 \times 10^{-9}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		f <sub>1</sub> for g > 1 a	Age 1-2 g > 1 a	2-7 a e(g)	7-12 a e(g)	12-17 a e(g)	>17 a e(g)
		f <sub>1</sub>	e(g)						
Sn-127	2.10 h	0.040	2.0 × 10 <sup>-9</sup>	0.020	1.3 × 10 <sup>-9</sup>	6.6 × 10 <sup>-10</sup>	4.0 × 10 <sup>-10</sup>	2.5 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>
Sn-128	0.985 h	0.040	1.6 × 10 <sup>-9</sup>	0.020	9.7 × 10 <sup>-10</sup>	4.9 × 10 <sup>-10</sup>	3.0 × 10 <sup>-10</sup>	1.9 × 10 <sup>-10</sup>	1.5 × 10 <sup>-10</sup>
<b>Antimony</b>									
Sb-115	0.530 h	0.200	2.5 × 10 <sup>-10</sup>	0.100	1.5 × 10 <sup>-10</sup>	7.5 × 10 <sup>-11</sup>	4.5 × 10 <sup>-11</sup>	3.1 × 10 <sup>-11</sup>	2.4 × 10 <sup>-11</sup>
Sb-116	0.263 h	0.200	2.7 × 10 <sup>-10</sup>	0.100	1.6 × 10 <sup>-10</sup>	8.0 × 10 <sup>-11</sup>	4.8 × 10 <sup>-11</sup>	3.3 × 10 <sup>-11</sup>	2.6 × 10 <sup>-11</sup>
Sb-116m	1.00 h	0.200	5.0 × 10 <sup>-10</sup>	0.100	3.3 × 10 <sup>-10</sup>	1.9 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	8.3 × 10 <sup>-11</sup>	6.7 × 10 <sup>-11</sup>
Sb-117	2.80 h	0.200	1.6 × 10 <sup>-10</sup>	0.100	1.0 × 10 <sup>-10</sup>	5.6 × 10 <sup>-11</sup>	3.5 × 10 <sup>-11</sup>	2.2 × 10 <sup>-11</sup>	1.8 × 10 <sup>-11</sup>
Sb-118m	5.00 h	0.200	1.3 × 10 <sup>-9</sup>	0.100	1.0 × 10 <sup>-9</sup>	5.8 × 10 <sup>-10</sup>	3.9 × 10 <sup>-10</sup>	2.6 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>
Sb-119	1.59 d	0.200	8.4 × 10 <sup>-10</sup>	0.100	5.8 × 10 <sup>-10</sup>	3.0 × 10 <sup>-10</sup>	1.8 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>	8.0 × 10 <sup>-11</sup>
Sb-120	0.265 h	0.200	1.7 × 10 <sup>-10</sup>	0.100	9.4 × 10 <sup>-11</sup>	4.6 × 10 <sup>-11</sup>	2.7 × 10 <sup>-11</sup>	1.8 × 10 <sup>-11</sup>	1.4 × 10 <sup>-11</sup>
Sb-120m	5.76 d	0.200	8.1 × 10 <sup>-9</sup>	0.100	6.0 × 10 <sup>-9</sup>	3.5 × 10 <sup>-9</sup>	2.3 × 10 <sup>-9</sup>	1.6 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>
Sb-122	2.70 d	0.200	1.8 × 10 <sup>-8</sup>	0.100	1.2 × 10 <sup>-8</sup>	6.1 × 10 <sup>-9</sup>	3.7 × 10 <sup>-9</sup>	2.1 × 10 <sup>-9</sup>	1.7 × 10 <sup>-9</sup>
Sb-124	60.2 d	0.200	2.5 × 10 <sup>-8</sup>	0.100	1.6 × 10 <sup>-8</sup>	8.4 × 10 <sup>-9</sup>	5.2 × 10 <sup>-9</sup>	3.2 × 10 <sup>-9</sup>	2.5 × 10 <sup>-9</sup>
Sb-124m	0.337 h	0.200	8.5 × 10 <sup>-11</sup>	0.100	4.9 × 10 <sup>-11</sup>	2.5 × 10 <sup>-11</sup>	1.5 × 10 <sup>-11</sup>	1.0 × 10 <sup>-11</sup>	8.0 × 10 <sup>-12</sup>
Sb-125	2.77 a	0.200	1.1 × 10 <sup>-8</sup>	0.100	6.1 × 10 <sup>-9</sup>	3.4 × 10 <sup>-9</sup>	2.1 × 10 <sup>-9</sup>	1.4 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>
Sb-126	12.4 d	0.200	2.0 × 10 <sup>-8</sup>	0.100	1.4 × 10 <sup>-8</sup>	7.6 × 10 <sup>-9</sup>	4.9 × 10 <sup>-9</sup>	3.1 × 10 <sup>-9</sup>	2.4 × 10 <sup>-9</sup>
Sb-126m	0.317 h	0.200	3.9 × 10 <sup>-10</sup>	0.100	2.2 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	6.6 × 10 <sup>-11</sup>	4.5 × 10 <sup>-11</sup>	3.6 × 10 <sup>-11</sup>
Sb-127	3.85 d	0.200	1.7 × 10 <sup>-8</sup>	0.100	1.2 × 10 <sup>-8</sup>	5.9 × 10 <sup>-9</sup>	3.6 × 10 <sup>-9</sup>	2.1 × 10 <sup>-9</sup>	1.7 × 10 <sup>-9</sup>
Sb-128	9.01 h	0.200	6.3 × 10 <sup>-9</sup>	0.100	4.5 × 10 <sup>-9</sup>	2.4 × 10 <sup>-9</sup>	1.5 × 10 <sup>-9</sup>	9.5 × 10 <sup>-10</sup>	7.6 × 10 <sup>-10</sup>
Sb-128	0.173 h	0.200	3.7 × 10 <sup>-10</sup>	0.100	2.1 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>	6.0 × 10 <sup>-11</sup>	4.1 × 10 <sup>-11</sup>	3.3 × 10 <sup>-11</sup>
Sb-129	4.32 h	0.200	4.3 × 10 <sup>-9</sup>	0.100	2.8 × 10 <sup>-9</sup>	1.5 × 10 <sup>-9</sup>	8.8 × 10 <sup>-10</sup>	5.3 × 10 <sup>-10</sup>	4.2 × 10 <sup>-10</sup>

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2		2-7 a	7-12 a	12-17 a	>17 a
		$f_1$	e(g)		g > 1 a	e(g)				
Sb-130	0.667 h	0.200	$9.1 \times 10^{-10}$	0.100	$5.4 \times 10^{-10}$	$2.8 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.2 \times 10^{-10}$	$9.1 \times 10^{-11}$	
Sb-131	0.383 h	0.200	$1.1 \times 10^{-9}$	0.100	$7.3 \times 10^{-10}$	$3.9 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.0 \times 10^{-10}$	
<b>Tellurium</b>										
Te <sup>-116</sup>	2.49 h	0.600	$1.4 \times 10^{-9}$	0.300	$1.0 \times 10^{-9}$	$5.5 \times 10^{-10}$	$3.4 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.7 \times 10^{-11}$	
Te-121	17.0 d	0.600	$3.1 \times 10^{-9}$	0.300	$2.0 \times 10^{-9}$	$1.2 \times 10^{-9}$	$8.0 \times 10^{-10}$	$5.4 \times 10^{-10}$	$4.3 \times 10^{-11}$	
Te-121m	154 d	0.600	$2.7 \times 10^{-8}$	0.300	$1.2 \times 10^{-8}$	$6.9 \times 10^{-9}$	$4.2 \times 10^{-9}$	$2.8 \times 10^{-9}$	$2.3 \times 10^{-9}$	
Te-123	$1.00 \times 10^{13}$ a	0.600	$2.0 \times 10^{-8}$	0.300	$9.3 \times 10^{-9}$	$6.9 \times 10^{-9}$	$5.4 \times 10^{-9}$	$4.7 \times 10^{-9}$	$4.4 \times 10^{-9}$	
Te-123m	120 d	0.600	$1.9 \times 10^{-8}$	0.300	$8.8 \times 10^{-9}$	$4.9 \times 10^{-9}$	$2.8 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.4 \times 10^{-9}$	
Te-125m	58.0 d	0.600	$1.3 \times 10^{-8}$	0.300	$6.3 \times 10^{-9}$	$3.3 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.1 \times 10^{-9}$	$8.7 \times 10^{-10}$	
Te-127	9.35 h	0.600	$1.5 \times 10^{-9}$	0.300	$1.2 \times 10^{-9}$	$6.2 \times 10^{-10}$	$3.6 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.7 \times 10^{-10}$	
Te-127m	109 d	0.600	$4.1 \times 10^{-8}$	0.300	$1.8 \times 10^{-8}$	$9.5 \times 10^{-9}$	$5.2 \times 10^{-9}$	$3.0 \times 10^{-9}$	$2.3 \times 10^{-9}$	
Te-129	1.16 h	0.600	$7.5 \times 10^{-10}$	0.300	$4.4 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.2 \times 10^{-10}$	$8.0 \times 10^{-11}$	$6.3 \times 10^{-11}$	
Te-129m	33.6 d	0.600	$4.4 \times 10^{-8}$	0.300	$2.4 \times 10^{-8}$	$1.2 \times 10^{-8}$	$6.6 \times 10^{-9}$	$3.9 \times 10^{-9}$	$3.0 \times 10^{-9}$	
Te-131	0.417 h	0.600	$9.0 \times 10^{-10}$	0.300	$6.6 \times 10^{-10}$	$3.5 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.2 \times 10^{-10}$	$8.7 \times 10^{-11}$	
Te-131m	1.25 d	0.600	$2.0 \times 10^{-8}$	0.300	$1.4 \times 10^{-8}$	$7.8 \times 10^{-9}$	$4.3 \times 10^{-9}$	$2.7 \times 10^{-9}$	$1.9 \times 10^{-9}$	
Te-132	3.26 d	0.600	$4.8 \times 10^{-8}$	0.300	$3.0 \times 10^{-8}$	$1.6 \times 10^{-8}$	$8.3 \times 10^{-9}$	$5.3 \times 10^{-9}$	$3.8 \times 10^{-9}$	
Te-133	0.207 h	0.600	$8.4 \times 10^{-10}$	0.300	$6.3 \times 10^{-10}$	$3.3 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.1 \times 10^{-10}$	$7.2 \times 10^{-11}$	
Te-133m	0.923 h	0.600	$3.1 \times 10^{-9}$	0.300	$2.4 \times 10^{-9}$	$1.3 \times 10^{-9}$	$6.3 \times 10^{-10}$	$4.1 \times 10^{-10}$	$2.8 \times 10^{-10}$	
Te-134	0.696 h	0.600	$1.1 \times 10^{-9}$	0.300	$7.5 \times 10^{-10}$	$3.9 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.1 \times 10^{-10}$	
<b>Iodine</b>										
I-120	1.35 h	1.000	$3.9 \times 10^{-9}$	1.000	$2.8 \times 10^{-9}$	$1.4 \times 10^{-9}$	$7.2 \times 10^{-10}$	$4.8 \times 10^{-10}$	$3.4 \times 10^{-10}$	



Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_i$ for $g > 1a$	Age 1-2		2-7 a	7-12 a	12-17 a	>17 a
		$f_i$	e(g)		$g > 1a$	e(g)				
I-120m	0.883 h	1.000	$2.3 \times 10^{-9}$	1.000	$1.5 \times 10^{-9}$	$7.8 \times 10^{-10}$	$4.2 \times 10^{-10}$	$2.9 \times 10^{-10}$	$2.1 \times 10^{-10}$	
I-121	2.12 h	1.000	$6.2 \times 10^{-10}$	1.000	$5.3 \times 10^{-10}$	$3.1 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.2 \times 10^{-10}$	$8.2 \times 10^{-11}$	
I-123	13.2 h	1.000	$2.2 \times 10^{-9}$	1.000	$1.9 \times 10^{-9}$	$1.1 \times 10^{-9}$	$4.9 \times 10^{-10}$	$3.3 \times 10^{-10}$	$2.1 \times 10^{-10}$	
I-124	4.18 d	1.000	$1.2 \times 10^{-7}$	1.000	$1.1 \times 10^{-7}$	$6.3 \times 10^{-8}$	$3.1 \times 10^{-8}$	$2.0 \times 10^{-8}$	$1.3 \times 10^{-8}$	
I-125	60.1 d	1.000	$5.2 \times 10^{-8}$	1.000	$5.7 \times 10^{-8}$	$4.1 \times 10^{-8}$	$3.1 \times 10^{-8}$	$2.2 \times 10^{-8}$	$1.5 \times 10^{-8}$	
I-126	13.0 d	1.000	$2.1 \times 10^{-7}$	1.000	$2.1 \times 10^{-7}$	$1.3 \times 10^{-7}$	$6.8 \times 10^{-8}$	$4.5 \times 10^{-8}$	$2.9 \times 10^{-8}$	
I-128	0.416 h	1.000	$5.7 \times 10^{-10}$	1.000	$3.3 \times 10^{-10}$	$1.6 \times 10^{-10}$	$8.9 \times 10^{-11}$	$6.0 \times 10^{-11}$	$4.6 \times 10^{-11}$	
I-129	$1.57 \times 10^7$ a	1.000	$1.8 \times 10^{-7}$	1.000	$2.2 \times 10^{-7}$	$1.7 \times 10^{-7}$	$1.9 \times 10^{-7}$	$1.4 \times 10^{-7}$	$1.1 \times 10^{-7}$	
I-130	12.4 h	1.000	$2.1 \times 10^{-8}$	1.000	$1.8 \times 10^{-8}$	$9.8 \times 10^{-9}$	$4.6 \times 10^{-9}$	$3.0 \times 10^{-9}$	$2.0 \times 10^{-9}$	
I-131	8.04 d	1.000	$1.8 \times 10^{-7}$	1.000	$1.8 \times 10^{-7}$	$1.0 \times 10^{-7}$	$5.2 \times 10^{-8}$	$3.4 \times 10^{-8}$	$2.2 \times 10^{-8}$	
I-132	2.30 h	1.000	$3.0 \times 10^{-9}$	1.000	$2.4 \times 10^{-9}$	$1.3 \times 10^{-9}$	$6.2 \times 10^{-10}$	$4.1 \times 10^{-10}$	$2.9 \times 10^{-10}$	
I-132m	1.39 h	1.000	$2.4 \times 10^{-9}$	1.000	$2.0 \times 10^{-9}$	$1.1 \times 10^{-9}$	$5.0 \times 10^{-10}$	$3.3 \times 10^{-10}$	$2.2 \times 10^{-10}$	
I-133	20.8 h	1.000	$4.9 \times 10^{-8}$	1.000	$4.4 \times 10^{-8}$	$2.3 \times 10^{-8}$	$1.0 \times 10^{-8}$	$6.8 \times 10^{-9}$	$4.3 \times 10^{-9}$	
I-134	0.876 h	1.000	$1.1 \times 10^{-9}$	1.000	$7.5 \times 10^{-10}$	$3.9 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.1 \times 10^{-10}$	
I-135	6.61 h	1.000	$1.0 \times 10^{-8}$	1.000	$8.9 \times 10^{-9}$	$4.7 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.4 \times 10^{-9}$	$9.3 \times 10^{-10}$	
<b>Caesium</b>										
Cs-125	0.750 h	1.000	$3.9 \times 10^{-10}$	1.000	$2.2 \times 10^{-10}$	$1.1 \times 10^{-10}$	$6.5 \times 10^{-11}$	$4.4 \times 10^{-11}$	$3.5 \times 10^{-11}$	
Cs-127	6.25 h	1.000	$1.8 \times 10^{-10}$	1.000	$1.2 \times 10^{-10}$	$6.6 \times 10^{-11}$	$4.2 \times 10^{-11}$	$2.9 \times 10^{-11}$	$2.4 \times 10^{-11}$	
Cs-129	1.34 d	1.000	$4.4 \times 10^{-10}$	1.000	$3.0 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.1 \times 10^{-10}$	$7.2 \times 10^{-11}$	$6.0 \times 10^{-11}$	
Cs-130	0.498 h	1.000	$3.3 \times 10^{-10}$	1.000	$1.8 \times 10^{-10}$	$9.0 \times 10^{-11}$	$5.2 \times 10^{-11}$	$3.6 \times 10^{-11}$	$2.8 \times 10^{-11}$	
Cs-131	9.69 d	1.000	$4.6 \times 10^{-10}$	1.000	$2.9 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.0 \times 10^{-10}$	$6.9 \times 10^{-11}$	$5.8 \times 10^{-11}$	

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 g > 1 a	2-7 a e(g)	7-12 a e(g)	12-17 a e(g)	>17 a e(g)
		$f_1$	e(g)					
Cs-132	6.48 d	1.000	$2.7 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.1 \times 10^{-9}$	$7.7 \times 10^{-10}$	$5.7 \times 10^{-10}$	$5.0 \times 10^{-10}$
Cs-134	2.06 a	1.000	$2.6 \times 10^{-8}$	$1.6 \times 10^{-8}$	$1.3 \times 10^{-8}$	$1.4 \times 10^{-8}$	$1.9 \times 10^{-8}$	$1.9 \times 10^{-8}$
Cs-134m	2.90 h	1.000	$2.1 \times 10^{-10}$	$1.2 \times 10^{-10}$	$5.9 \times 10^{-11}$	$3.5 \times 10^{-11}$	$2.5 \times 10^{-11}$	$2.0 \times 10^{-11}$
Cs-135	$2.30 \times 10^6$ a	1.000	$4.1 \times 10^{-9}$	$2.3 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.7 \times 10^{-9}$	$2.0 \times 10^{-9}$	$2.0 \times 10^{-9}$
Cs-135m	0.883 h	1.000	$1.3 \times 10^{-10}$	$8.6 \times 10^{-11}$	$4.9 \times 10^{-11}$	$3.2 \times 10^{-11}$	$2.3 \times 10^{-11}$	$1.9 \times 10^{-11}$
Cs-136	13.1 d	1.000	$1.5 \times 10^{-8}$	$9.5 \times 10^{-9}$	$6.1 \times 10^{-9}$	$4.4 \times 10^{-9}$	$3.4 \times 10^{-9}$	$3.0 \times 10^{-9}$
Cs-137	30.0 a	1.000	$2.1 \times 10^{-8}$	$1.2 \times 10^{-8}$	$9.6 \times 10^{-9}$	$1.0 \times 10^{-8}$	$1.3 \times 10^{-8}$	$1.3 \times 10^{-8}$
Cs-138	0.536 h	1.000	$1.1 \times 10^{-9}$	$5.9 \times 10^{-10}$	$2.9 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.2 \times 10^{-10}$	$9.2 \times 10^{-11}$
<b>Barium<sup>f</sup></b>								
Ba-126	1.61 h	0.600	$2.7 \times 10^{-9}$	$1.7 \times 10^{-9}$	$8.5 \times 10^{-10}$	$5.0 \times 10^{-10}$	$3.1 \times 10^{-10}$	$2.6 \times 10^{-10}$
Ba-128	2.43 d	0.600	$2.0 \times 10^{-8}$	$1.7 \times 10^{-8}$	$9.0 \times 10^{-9}$	$5.2 \times 10^{-9}$	$3.0 \times 10^{-9}$	$2.7 \times 10^{-9}$
Ba-131	11.8 d	0.600	$4.2 \times 10^{-9}$	$2.6 \times 10^{-9}$	$1.4 \times 10^{-9}$	$9.4 \times 10^{-10}$	$6.2 \times 10^{-10}$	$4.5 \times 10^{-10}$
Ba-131m	0.243 h	0.600	$5.8 \times 10^{-11}$	$3.2 \times 10^{-11}$	$1.6 \times 10^{-11}$	$9.3 \times 10^{-12}$	$6.3 \times 10^{-12}$	$4.9 \times 10^{-12}$
Ba-133	10.7 a	0.600	$2.2 \times 10^{-8}$	$6.2 \times 10^{-9}$	$3.9 \times 10^{-9}$	$4.6 \times 10^{-9}$	$7.3 \times 10^{-9}$	$1.5 \times 10^{-9}$
Ba-133m	1.62 d	0.600	$4.2 \times 10^{-9}$	$3.6 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.1 \times 10^{-9}$	$5.9 \times 10^{-10}$	$5.4 \times 10^{-10}$
Ba-135m	1.20 d	0.600	$3.3 \times 10^{-9}$	$2.9 \times 10^{-9}$	$1.5 \times 10^{-9}$	$8.5 \times 10^{-10}$	$4.7 \times 10^{-10}$	$4.3 \times 10^{-10}$
Ba-139	1.38 h	0.600	$1.4 \times 10^{-9}$	$8.4 \times 10^{-10}$	$4.1 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.2 \times 10^{-10}$
Ba-140	12.7 d	0.600	$3.2 \times 10^{-8}$	$1.8 \times 10^{-8}$	$9.2 \times 10^{-9}$	$5.8 \times 10^{-9}$	$3.7 \times 10^{-9}$	$2.6 \times 10^{-9}$
Ba-141	0.305 h	0.600	$7.6 \times 10^{-10}$	$4.7 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.3 \times 10^{-10}$	$8.6 \times 10^{-11}$	$7.0 \times 10^{-11}$
Ba-142	0.177 h	0.600	$3.6 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.1 \times 10^{-10}$	$6.6 \times 10^{-11}$	$4.3 \times 10^{-11}$	$3.5 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $g > 1$ a	2-7 a	7-12 a	12-17 a	>17 a
		$f_1$	e(g)						
<b>Lanthanum</b>									
La-131	0.983 h	0.005	$3.5 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.1 \times 10^{-10}$	$1.1 \times 10^{-10}$	$6.6 \times 10^{-11}$	$4.4 \times 10^{-11}$	$3.5 \times 10^{-11}$
La-132	4.80 h	0.005	$3.8 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.4 \times 10^{-9}$	$1.3 \times 10^{-9}$	$7.8 \times 10^{-10}$	$4.8 \times 10^{-10}$	$3.9 \times 10^{-10}$
La-135	19.5 h	0.005	$2.8 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.9 \times 10^{-10}$	$1.0 \times 10^{-10}$	$6.4 \times 10^{-11}$	$3.9 \times 10^{-11}$	$3.0 \times 10^{-11}$
La-137	$6.00 \times 10^4$ a	0.005	$1.1 \times 10^{-9}$	$5.0 \times 10^{-4}$	$4.5 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.0 \times 10^{-10}$	$8.1 \times 10^{-11}$
La-138	$1.35 \times 10^{11}$ a	0.005	$1.3 \times 10^{-8}$	$5.0 \times 10^{-4}$	$4.6 \times 10^{-9}$	$2.7 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.1 \times 10^{-9}$
La-140	1.68 d	0.005	$2.0 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-8}$	$6.8 \times 10^{-9}$	$4.2 \times 10^{-9}$	$2.5 \times 10^{-9}$	$2.0 \times 10^{-9}$
La-141	3.93 h	0.005	$4.3 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.6 \times 10^{-9}$	$1.3 \times 10^{-9}$	$7.6 \times 10^{-10}$	$4.5 \times 10^{-10}$	$3.6 \times 10^{-10}$
La-142	1.54 h	0.005	$1.9 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.1 \times 10^{-9}$	$5.8 \times 10^{-10}$	$3.5 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.8 \times 10^{-10}$
La-143	0.237 h	0.005	$6.9 \times 10^{-10}$	$5.0 \times 10^{-4}$	$3.9 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.1 \times 10^{-10}$	$7.1 \times 10^{-11}$	$5.6 \times 10^{-11}$
<b>Cerium</b>									
Ce-134	3.00 d	0.005	$2.8 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.8 \times 10^{-8}$	$9.1 \times 10^{-9}$	$5.5 \times 10^{-9}$	$3.2 \times 10^{-9}$	$2.5 \times 10^{-9}$
Ce-135	17.6 h	0.005	$7.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$4.7 \times 10^{-9}$	$2.6 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.0 \times 10^{-9}$	$7.9 \times 10^{-10}$
Ce-137	9.00 h	0.005	$2.6 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.7 \times 10^{-10}$	$8.8 \times 10^{-11}$	$5.4 \times 10^{-11}$	$3.2 \times 10^{-11}$	$2.5 \times 10^{-11}$
Ce-137m	1.43 d	0.005	$6.1 \times 10^{-9}$	$5.0 \times 10^{-4}$	$3.9 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.2 \times 10^{-9}$	$6.8 \times 10^{-10}$	$5.4 \times 10^{-10}$
Ce-139	138 d	0.005	$2.6 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.6 \times 10^{-9}$	$8.6 \times 10^{-10}$	$5.4 \times 10^{-10}$	$3.3 \times 10^{-10}$	$2.6 \times 10^{-10}$
Ce-141	32.5 d	0.005	$8.1 \times 10^{-9}$	$5.0 \times 10^{-4}$	$5.1 \times 10^{-9}$	$2.6 \times 10^{-9}$	$1.5 \times 10^{-9}$	$8.8 \times 10^{-10}$	$7.1 \times 10^{-10}$
Ce-143	1.38 d	0.005	$1.2 \times 10^{-8}$	$5.0 \times 10^{-4}$	$8.0 \times 10^{-9}$	$4.1 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.1 \times 10^{-9}$
Ce-144	284 d	0.005	$6.6 \times 10^{-8}$	$5.0 \times 10^{-4}$	$3.9 \times 10^{-8}$	$1.9 \times 10^{-8}$	$1.1 \times 10^{-8}$	$6.5 \times 10^{-9}$	$5.2 \times 10^{-9}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12-17 a $e(g)$	>17 a $e(g)$
		$f_1$	$e(g)$						
<b>Praseodymium</b>									
Pr-136	0.218 h	0.005	$3.7 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.1 \times 10^{-10}$	$1.0 \times 10^{-10}$	$6.1 \times 10^{-11}$	$4.2 \times 10^{-11}$	$3.3 \times 10^{-11}$
Pr-137	1.28 h	0.005	$4.1 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.5 \times 10^{-10}$	$1.3 \times 10^{-10}$	$7.7 \times 10^{-11}$	$5.0 \times 10^{-11}$	$4.0 \times 10^{-11}$
Pr-138m	2.10 h	0.005	$1.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$7.4 \times 10^{-10}$	$4.1 \times 10^{-10}$	$2.6 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.3 \times 10^{-10}$
Pr-139	4.51 h	0.005	$3.2 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.0 \times 10^{-10}$	$1.1 \times 10^{-10}$	$6.5 \times 10^{-11}$	$4.0 \times 10^{-11}$	$3.1 \times 10^{-11}$
Pr-142	19.1 h	0.005	$1.5 \times 10^{-8}$	$5.0 \times 10^{-4}$	$9.8 \times 10^{-9}$	$4.9 \times 10^{-9}$	$2.9 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.3 \times 10^{-9}$
Pr-142m	0.243 h	0.005	$2.0 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.2 \times 10^{-10}$	$6.2 \times 10^{-11}$	$3.7 \times 10^{-11}$	$2.1 \times 10^{-11}$	$1.7 \times 10^{-11}$
Pr-143	13.6 d	0.005	$1.4 \times 10^{-8}$	$5.0 \times 10^{-4}$	$8.7 \times 10^{-9}$	$4.3 \times 10^{-9}$	$2.6 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.2 \times 10^{-9}$
Pr-144	0.288 h	0.005	$6.4 \times 10^{-10}$	$5.0 \times 10^{-4}$	$3.5 \times 10^{-10}$	$1.7 \times 10^{-10}$	$9.5 \times 10^{-11}$	$6.5 \times 10^{-11}$	$5.0 \times 10^{-11}$
Pr-145	5.98 h	0.005	$4.7 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.9 \times 10^{-9}$	$1.4 \times 10^{-9}$	$8.5 \times 10^{-10}$	$4.9 \times 10^{-10}$	$3.9 \times 10^{-10}$
Pr-147	0.227 h	0.005	$3.9 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.2 \times 10^{-10}$	$1.1 \times 10^{-10}$	$6.1 \times 10^{-11}$	$4.2 \times 10^{-11}$	$3.3 \times 10^{-11}$
<b>Neodymium</b>									
Nd-136	0.844 h	0.005	$1.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$6.1 \times 10^{-10}$	$3.1 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.2 \times 10^{-10}$	$9.9 \times 10^{-11}$
Nd-138	5.04 h	0.005	$7.2 \times 10^{-9}$	$5.0 \times 10^{-4}$	$4.5 \times 10^{-9}$	$2.3 \times 10^{-9}$	$1.3 \times 10^{-9}$	$8.0 \times 10^{-10}$	$6.4 \times 10^{-10}$
Nd-139	0.495 h	0.005	$2.1 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.2 \times 10^{-10}$	$6.3 \times 10^{-11}$	$3.7 \times 10^{-11}$	$2.5 \times 10^{-11}$	$2.0 \times 10^{-11}$
Nd-139m	5.50 h	0.005	$2.1 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.4 \times 10^{-9}$	$7.8 \times 10^{-10}$	$5.0 \times 10^{-10}$	$3.1 \times 10^{-10}$	$2.5 \times 10^{-10}$
Nd-141	2.49 h	0.005	$7.8 \times 10^{-11}$	$5.0 \times 10^{-4}$	$5.0 \times 10^{-11}$	$2.7 \times 10^{-11}$	$1.6 \times 10^{-11}$	$1.0 \times 10^{-11}$	$8.3 \times 10^{-12}$
Nd-147	11.0 d	0.005	$1.2 \times 10^{-8}$	$5.0 \times 10^{-4}$	$7.8 \times 10^{-9}$	$3.9 \times 10^{-9}$	$2.3 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.1 \times 10^{-9}$
Nd-149	1.73 h	0.005	$1.4 \times 10^{-9}$	$5.0 \times 10^{-4}$	$8.7 \times 10^{-10}$	$4.3 \times 10^{-10}$	$2.6 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.2 \times 10^{-10}$
Nd-151	0.207 h	0.005	$3.4 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.0 \times 10^{-10}$	$9.7 \times 10^{-11}$	$5.7 \times 10^{-11}$	$3.8 \times 10^{-11}$	$3.0 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $g > 1$ a	2-7 a	7-12 a	12-17 a	>17 a
		$f_1$	e(g)						
<b>Promethium</b>									
Pm-141	0.348 h	0.005	$4.2 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.4 \times 10^{-10}$	$1.2 \times 10^{-10}$	$6.8 \times 10^{-11}$	$4.6 \times 10^{-11}$	$3.6 \times 10^{-11}$
Pm-143	265 d	0.005	$1.9 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.2 \times 10^{-9}$	$6.7 \times 10^{-10}$	$4.4 \times 10^{-10}$	$2.9 \times 10^{-10}$	$2.3 \times 10^{-10}$
Pm-144	363 d	0.005	$7.6 \times 10^{-9}$	$5.0 \times 10^{-4}$	$4.7 \times 10^{-9}$	$2.7 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.2 \times 10^{-9}$	$9.7 \times 10^{-10}$
Pm-145	17.7 a	0.005	$1.5 \times 10^{-9}$	$5.0 \times 10^{-4}$	$6.8 \times 10^{-10}$	$3.7 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.1 \times 10^{-10}$
Pm-146	5.53 a	0.005	$1.0 \times 10^{-8}$	$5.0 \times 10^{-4}$	$5.1 \times 10^{-9}$	$2.8 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.1 \times 10^{-9}$	$9.0 \times 10^{-10}$
Pm-147	2.62 a	0.005	$3.6 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.9 \times 10^{-9}$	$9.6 \times 10^{-10}$	$5.7 \times 10^{-10}$	$3.2 \times 10^{-10}$	$2.6 \times 10^{-10}$
Pm-148	5.37 d	0.005	$3.0 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.9 \times 10^{-8}$	$9.7 \times 10^{-9}$	$5.8 \times 10^{-9}$	$3.3 \times 10^{-9}$	$2.7 \times 10^{-9}$
Pm-148m	41.3 d	0.005	$1.5 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.0 \times 10^{-8}$	$5.5 \times 10^{-9}$	$3.5 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.7 \times 10^{-9}$
Pm-149	2.21 d	0.005	$1.2 \times 10^{-8}$	$5.0 \times 10^{-4}$	$7.4 \times 10^{-9}$	$3.7 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.2 \times 10^{-9}$	$9.9 \times 10^{-10}$
Pm-150	2.68 h	0.005	$2.8 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.7 \times 10^{-9}$	$8.7 \times 10^{-10}$	$5.2 \times 10^{-10}$	$3.2 \times 10^{-10}$	$2.6 \times 10^{-10}$
Pm-151	1.18 d	0.005	$8.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$5.1 \times 10^{-9}$	$2.6 \times 10^{-9}$	$1.6 \times 10^{-9}$	$9.1 \times 10^{-10}$	$7.3 \times 10^{-10}$
<b>Samarium</b>									
Sm-141	0.170 h	0.005	$4.5 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.5 \times 10^{-10}$	$1.3 \times 10^{-10}$	$7.3 \times 10^{-11}$	$5.0 \times 10^{-11}$	$3.9 \times 10^{-11}$
Sm-141m	0.377 h	0.005	$7.0 \times 10^{-10}$	$5.0 \times 10^{-4}$	$4.0 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.2 \times 10^{-10}$	$8.2 \times 10^{-11}$	$6.5 \times 10^{-11}$
Sm-142	1.21 h	0.005	$2.2 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-9}$	$6.2 \times 10^{-10}$	$3.6 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.9 \times 10^{-10}$
Sm-145	340 d	0.005	$2.4 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.4 \times 10^{-9}$	$7.3 \times 10^{-10}$	$4.5 \times 10^{-10}$	$2.7 \times 10^{-10}$	$2.1 \times 10^{-10}$
Sm-146	$1.03 \times 10^8$ a	0.005	$1.5 \times 10^{-6}$	$5.0 \times 10^{-4}$	$1.5 \times 10^{-7}$	$1.0 \times 10^{-7}$	$7.0 \times 10^{-8}$	$5.8 \times 10^{-8}$	$5.4 \times 10^{-8}$
Sm-147	$1.06 \times 10^{11}$ a	0.005	$1.4 \times 10^{-6}$	$5.0 \times 10^{-4}$	$1.4 \times 10^{-7}$	$9.2 \times 10^{-8}$	$6.4 \times 10^{-8}$	$5.2 \times 10^{-8}$	$4.9 \times 10^{-8}$
Sm-151	90.0 a	0.005	$1.5 \times 10^{-9}$	$5.0 \times 10^{-4}$	$6.4 \times 10^{-10}$	$3.3 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.2 \times 10^{-10}$	$9.8 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12-17 a $e(g)$	>17 a $e(g)$
		$f_1$	$e(g)$						
Sm-153	1.95 d	0.005	$8.4 \times 10^{-9}$	$5.0 \times 10^{-4}$	$5.4 \times 10^{-9}$	$2.7 \times 10^{-9}$	$1.6 \times 10^{-9}$	$9.2 \times 10^{-10}$	$7.4 \times 10^{-10}$
Sm-155	0.368 h	0.005	$3.6 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.0 \times 10^{-10}$	$9.7 \times 10^{-11}$	$5.5 \times 10^{-11}$	$3.7 \times 10^{-11}$	$2.9 \times 10^{-11}$
Sm-156	9.40 h	0.005	$2.8 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.8 \times 10^{-9}$	$9.0 \times 10^{-10}$	$5.4 \times 10^{-10}$	$3.1 \times 10^{-10}$	$2.5 \times 10^{-10}$
<b>Europium</b>									
Eu-145	5.94 d	0.005	$5.1 \times 10^{-9}$	$5.0 \times 10^{-4}$	$3.7 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.4 \times 10^{-9}$	$9.4 \times 10^{-10}$	$7.5 \times 10^{-10}$
Eu-146	4.61 d	0.005	$8.5 \times 10^{-9}$	$5.0 \times 10^{-4}$	$6.2 \times 10^{-9}$	$3.6 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.3 \times 10^{-9}$
Eu-147	24.0 d	0.005	$3.7 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.5 \times 10^{-9}$	$1.4 \times 10^{-9}$	$8.9 \times 10^{-10}$	$5.6 \times 10^{-10}$	$4.4 \times 10^{-10}$
Eu-148	54.5 d	0.005	$8.5 \times 10^{-9}$	$5.0 \times 10^{-4}$	$6.0 \times 10^{-9}$	$3.5 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.3 \times 10^{-9}$
Eu-149	93.1 d	0.005	$9.7 \times 10^{-10}$	$5.0 \times 10^{-4}$	$6.3 \times 10^{-10}$	$3.4 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.0 \times 10^{-10}$
Eu-150	34.2 a	0.005	$1.3 \times 10^{-8}$	$5.0 \times 10^{-4}$	$5.7 \times 10^{-9}$	$3.4 \times 10^{-9}$	$2.3 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.3 \times 10^{-9}$
Eu-150m	12.6 h	0.005	$4.4 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.8 \times 10^{-9}$	$1.4 \times 10^{-9}$	$8.2 \times 10^{-10}$	$4.7 \times 10^{-10}$	$3.8 \times 10^{-10}$
Eu-152	13.3 a	0.005	$1.6 \times 10^{-8}$	$5.0 \times 10^{-4}$	$7.4 \times 10^{-9}$	$4.1 \times 10^{-9}$	$2.6 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.4 \times 10^{-9}$
Eu-152m	9.32 h	0.005	$5.7 \times 10^{-9}$	$5.0 \times 10^{-4}$	$3.6 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.2 \times 10^{-10}$	$5.0 \times 10^{-10}$
Eu-154	8.80 a	0.005	$2.5 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.2 \times 10^{-8}$	$6.5 \times 10^{-9}$	$4.1 \times 10^{-9}$	$2.5 \times 10^{-9}$	$2.0 \times 10^{-9}$
Eu-155	4.96 a	0.005	$4.3 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.2 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.8 \times 10^{-10}$	$4.0 \times 10^{-10}$	$3.2 \times 10^{-10}$
Eu-156	15.2 d	0.005	$2.2 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.5 \times 10^{-8}$	$7.5 \times 10^{-9}$	$4.6 \times 10^{-9}$	$2.7 \times 10^{-9}$	$2.2 \times 10^{-9}$
Eu-157	15.1 h	0.005	$6.7 \times 10^{-9}$	$5.0 \times 10^{-4}$	$4.3 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.3 \times 10^{-9}$	$7.5 \times 10^{-10}$	$6.0 \times 10^{-10}$
Eu-158	0.765 h	0.005	$1.1 \times 10^{-9}$	$5.0 \times 10^{-4}$	$6.2 \times 10^{-10}$	$3.1 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.2 \times 10^{-10}$	$9.4 \times 10^{-11}$
<b>Gadolinium</b>									
Gd-145	0.382 h	0.005	$4.5 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.6 \times 10^{-10}$	$1.3 \times 10^{-10}$	$8.1 \times 10^{-11}$	$5.6 \times 10^{-11}$	$4.4 \times 10^{-11}$
Gd-146	48.3 d	0.005	$9.4 \times 10^{-9}$	$5.0 \times 10^{-4}$	$6.0 \times 10^{-9}$	$3.2 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.2 \times 10^{-9}$	$9.6 \times 10^{-10}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2		2-7 a		7-12 a		12-17 a		>17 a	
		$f_1$	e(g)		g > 1 a	e(g)	e(g)	e(g)	e(g)	e(g)	e(g)	e(g)		
Gd-147	1.59 d	0.005	$4.5 \times 10^{-9}$	$5.0 \times 10^{-4}$	$3.2 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.7 \times 10^{-10}$	$6.1 \times 10^{-10}$					
Gd-148	93.0 a	0.005	$1.7 \times 10^{-6}$	$5.0 \times 10^{-4}$	$1.6 \times 10^{-7}$	$1.1 \times 10^{-7}$	$7.3 \times 10^{-8}$	$5.9 \times 10^{-8}$	$5.6 \times 10^{-8}$					
Gd-149	9.40 d	0.005	$4.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.7 \times 10^{-9}$	$1.5 \times 10^{-9}$	$9.3 \times 10^{-10}$	$5.7 \times 10^{-10}$	$4.5 \times 10^{-10}$					
Gd-151	120 d	0.005	$2.1 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-9}$	$6.8 \times 10^{-10}$	$4.2 \times 10^{-10}$	$2.4 \times 10^{-10}$	$2.0 \times 10^{-10}$					
Gd-152	$1.08 \times 10^{14}$ a	0.005	$1.2 \times 10^{-6}$	$5.0 \times 10^{-4}$	$1.2 \times 10^{-7}$	$7.7 \times 10^{-8}$	$5.3 \times 10^{-8}$	$4.3 \times 10^{-8}$	$4.1 \times 10^{-8}$					
Gd-153	242 d	0.005	$2.9 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.8 \times 10^{-9}$	$9.4 \times 10^{-10}$	$5.8 \times 10^{-10}$	$3.4 \times 10^{-10}$	$2.7 \times 10^{-10}$					
Gd-159	18.6 h	0.005	$5.7 \times 10^{-9}$	$5.0 \times 10^{-4}$	$3.6 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.2 \times 10^{-10}$	$4.9 \times 10^{-10}$					
<b>Terbium</b>														
Tb-147	1.65 h	0.005	$1.5 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.0 \times 10^{-9}$	$5.4 \times 10^{-10}$	$3.3 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.6 \times 10^{-10}$					
Tb-149	4.15 h	0.005	$2.4 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.5 \times 10^{-9}$	$8.0 \times 10^{-10}$	$5.0 \times 10^{-10}$	$3.1 \times 10^{-10}$	$2.5 \times 10^{-10}$					
Tb-150	3.27 h	0.005	$2.5 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.6 \times 10^{-9}$	$8.3 \times 10^{-10}$	$5.1 \times 10^{-10}$	$3.2 \times 10^{-10}$	$2.5 \times 10^{-10}$					
Tb-151	17.6 h	0.005	$2.7 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.9 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.7 \times 10^{-10}$	$4.2 \times 10^{-10}$	$3.4 \times 10^{-10}$					
Tb-153	2.34 d	0.005	$2.3 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.5 \times 10^{-9}$	$8.2 \times 10^{-10}$	$5.1 \times 10^{-10}$	$3.1 \times 10^{-10}$	$2.5 \times 10^{-10}$					
Tb-154	21.4 h	0.005	$4.7 \times 10^{-9}$	$5.0 \times 10^{-4}$	$3.4 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.3 \times 10^{-9}$	$8.1 \times 10^{-10}$	$6.5 \times 10^{-10}$					
Tb-155	5.32 d	0.005	$1.9 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-9}$	$6.8 \times 10^{-10}$	$4.3 \times 10^{-10}$	$2.6 \times 10^{-10}$	$2.1 \times 10^{-10}$					
Tb-156	5.34 d	0.005	$9.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$6.3 \times 10^{-9}$	$3.5 \times 10^{-9}$	$2.3 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.2 \times 10^{-9}$					
Tb-156m	1.02 d	0.005	$1.5 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.0 \times 10^{-9}$	$5.6 \times 10^{-10}$	$3.5 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.7 \times 10^{-10}$					
Tb-156m <sup>1</sup>	5.00 h	0.005	$8.0 \times 10^{-10}$	$5.0 \times 10^{-4}$	$5.2 \times 10^{-10}$	$2.7 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.0 \times 10^{-10}$	$8.1 \times 10^{-11}$					
Tb-157	$1.50 \times 10^3$ a	0.005	$4.9 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.2 \times 10^{-10}$	$1.1 \times 10^{-10}$	$6.8 \times 10^{-11}$	$4.1 \times 10^{-11}$	$3.4 \times 10^{-11}$					
Tb-158	$1.50 \times 10^2$ a	0.005	$1.3 \times 10^{-8}$	$5.0 \times 10^{-4}$	$5.9 \times 10^{-9}$	$3.3 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.1 \times 10^{-9}$					
Tb-160	72.3 d	0.005	$1.6 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.0 \times 10^{-8}$	$5.4 \times 10^{-9}$	$3.3 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.6 \times 10^{-9}$					

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12-17 a $e(g)$	>17 a $e(g)$
		$f_1$	$e(g)$						
Tb-161	6.91 d	0.005	$8.3 \times 10^{-9}$	$5.0 \times 10^{-4}$	$5.3 \times 10^{-9}$	$2.7 \times 10^{-9}$	$1.6 \times 10^{-9}$	$9.0 \times 10^{-10}$	$7.2 \times 10^{-10}$
<b>Dysprosium</b>									
Dy-155	10.0 h	0.005	$9.7 \times 10^{-10}$	$5.0 \times 10^{-4}$	$6.8 \times 10^{-10}$	$3.8 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.3 \times 10^{-10}$
Dy-157	8.10 h	0.005	$4.4 \times 10^{-10}$	$5.0 \times 10^{-4}$	$3.1 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.2 \times 10^{-10}$	$7.7 \times 10^{-11}$	$6.1 \times 10^{-11}$
Dy-159	144 d	0.005	$1.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$6.4 \times 10^{-10}$	$3.4 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.0 \times 10^{-10}$
Dy-165	2.33 h	0.005	$1.3 \times 10^{-9}$	$5.0 \times 10^{-4}$	$7.9 \times 10^{-10}$	$3.9 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.1 \times 10^{-10}$
Dy-166	3.40 d	0.005	$1.9 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.2 \times 10^{-8}$	$6.0 \times 10^{-9}$	$3.6 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.6 \times 10^{-9}$
<b>Holmium</b>									
Ho-155	0.800 h	0.005	$3.8 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.3 \times 10^{-10}$	$1.2 \times 10^{-10}$	$7.1 \times 10^{-11}$	$4.7 \times 10^{-11}$	$3.7 \times 10^{-11}$
Ho-157	0.210 h	0.005	$5.8 \times 10^{-11}$	$5.0 \times 10^{-4}$	$3.6 \times 10^{-11}$	$1.9 \times 10^{-11}$	$1.2 \times 10^{-11}$	$8.1 \times 10^{-12}$	$6.5 \times 10^{-12}$
Ho-159	0.550 h	0.005	$7.1 \times 10^{-11}$	$5.0 \times 10^{-4}$	$4.3 \times 10^{-11}$	$2.3 \times 10^{-11}$	$1.4 \times 10^{-11}$	$9.9 \times 10^{-12}$	$7.9 \times 10^{-12}$
Ho-161	2.50 h	0.005	$1.4 \times 10^{-10}$	$5.0 \times 10^{-4}$	$8.1 \times 10^{-11}$	$4.2 \times 10^{-11}$	$2.5 \times 10^{-11}$	$1.6 \times 10^{-11}$	$1.3 \times 10^{-11}$
Ho-162	0.250 h	0.005	$3.5 \times 10^{-11}$	$5.0 \times 10^{-4}$	$2.0 \times 10^{-11}$	$1.0 \times 10^{-11}$	$6.0 \times 10^{-12}$	$4.2 \times 10^{-12}$	$3.3 \times 10^{-12}$
Ho-162m	1.13 h	0.005	$2.4 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.5 \times 10^{-10}$	$7.9 \times 10^{-11}$	$4.9 \times 10^{-11}$	$3.3 \times 10^{-11}$	$2.6 \times 10^{-11}$
Ho-164	0.483 h	0.005	$1.2 \times 10^{-10}$	$5.0 \times 10^{-4}$	$6.5 \times 10^{-11}$	$3.2 \times 10^{-11}$	$1.8 \times 10^{-11}$	$1.2 \times 10^{-11}$	$9.5 \times 10^{-12}$
Ho-164m	0.625 h	0.005	$2.0 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.1 \times 10^{-10}$	$5.5 \times 10^{-11}$	$3.2 \times 10^{-11}$	$2.1 \times 10^{-11}$	$1.6 \times 10^{-11}$
Ho-166	1.12 d	0.005	$1.6 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.0 \times 10^{-8}$	$5.2 \times 10^{-9}$	$3.1 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.4 \times 10^{-9}$
Ho-166m	$1.20 \times 10^3$ a	0.005	$2.6 \times 10^{-8}$	$5.0 \times 10^{-4}$	$9.3 \times 10^{-9}$	$5.3 \times 10^{-9}$	$3.5 \times 10^{-9}$	$2.4 \times 10^{-9}$	$2.0 \times 10^{-9}$
Ho-167	3.10 h	0.005	$8.8 \times 10^{-10}$	$5.0 \times 10^{-4}$	$5.5 \times 10^{-10}$	$2.8 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.0 \times 10^{-10}$	$8.3 \times 10^{-11}$



Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2		2-7 a		7-12 a		12-17 a		>17 a	
		$f_1$	e(g)		$g > 1$ a	e(g)	$g > 1$ a	e(g)	$g > 1$ a	e(g)	$g > 1$ a	e(g)	$g > 1$ a	e(g)
<b>Erbium</b>														
Er-161	3.24 h	0.005	$6.5 \times 10^{-10}$	$5.0 \times 10^{-4}$	$4.4 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.0 \times 10^{-10}$	$8.0 \times 10^{-11}$	$1.0 \times 10^{-10}$	$1.0 \times 10^{-10}$	$8.0 \times 10^{-11}$	$1.0 \times 10^{-10}$	$8.0 \times 10^{-11}$
Er-165	10.4 h	0.005	$1.7 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.1 \times 10^{-10}$	$6.2 \times 10^{-11}$	$3.9 \times 10^{-11}$	$2.4 \times 10^{-11}$	$1.9 \times 10^{-11}$	$2.4 \times 10^{-11}$	$2.4 \times 10^{-11}$	$1.9 \times 10^{-11}$	$2.4 \times 10^{-11}$	$1.9 \times 10^{-11}$
Er-169	9.30 d	0.005	$4.4 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.8 \times 10^{-9}$	$1.4 \times 10^{-9}$	$8.2 \times 10^{-10}$	$4.7 \times 10^{-10}$	$3.7 \times 10^{-10}$	$4.7 \times 10^{-10}$	$4.7 \times 10^{-10}$	$3.7 \times 10^{-10}$	$4.7 \times 10^{-10}$	$3.7 \times 10^{-10}$
Er-171	7.52 h	0.005	$4.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.5 \times 10^{-9}$	$1.3 \times 10^{-9}$	$7.6 \times 10^{-10}$	$4.5 \times 10^{-10}$	$3.6 \times 10^{-10}$	$4.5 \times 10^{-10}$	$4.5 \times 10^{-10}$	$3.6 \times 10^{-10}$	$4.5 \times 10^{-10}$	$3.6 \times 10^{-10}$
Er-172	2.05 d	0.005	$1.0 \times 10^{-8}$	$5.0 \times 10^{-4}$	$6.8 \times 10^{-9}$	$3.5 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.0 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.0 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.0 \times 10^{-9}$
<b>Thulium</b>														
Tm-162	0.362 h	0.005	$2.9 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.7 \times 10^{-10}$	$8.7 \times 10^{-11}$	$5.2 \times 10^{-11}$	$3.6 \times 10^{-11}$	$2.9 \times 10^{-11}$	$3.6 \times 10^{-11}$	$3.6 \times 10^{-11}$	$2.9 \times 10^{-11}$	$3.6 \times 10^{-11}$	$2.9 \times 10^{-11}$
Tm-166	7.70 h	0.005	$2.1 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.5 \times 10^{-9}$	$8.3 \times 10^{-10}$	$5.5 \times 10^{-10}$	$3.5 \times 10^{-10}$	$2.8 \times 10^{-10}$	$3.5 \times 10^{-10}$	$3.5 \times 10^{-10}$	$2.8 \times 10^{-10}$	$3.5 \times 10^{-10}$	$2.8 \times 10^{-10}$
Tm-167	9.24 d	0.005	$6.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$3.9 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.0 \times 10^{-10}$	$5.6 \times 10^{-10}$	$7.0 \times 10^{-10}$	$7.0 \times 10^{-10}$	$5.6 \times 10^{-10}$	$7.0 \times 10^{-10}$	$5.6 \times 10^{-10}$
Tm-170	129 d	0.005	$1.6 \times 10^{-8}$	$5.0 \times 10^{-4}$	$9.8 \times 10^{-9}$	$4.9 \times 10^{-9}$	$2.9 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.3 \times 10^{-9}$
Tm-171	1.92 a	0.005	$1.5 \times 10^{-9}$	$5.0 \times 10^{-4}$	$7.8 \times 10^{-10}$	$3.9 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.1 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.1 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.1 \times 10^{-10}$
Tm-172	2.65 d	0.005	$1.9 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.2 \times 10^{-8}$	$6.1 \times 10^{-9}$	$3.7 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.7 \times 10^{-9}$	$2.1 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.7 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.7 \times 10^{-9}$
Tm-173	8.24 h	0.005	$3.3 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.1 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.5 \times 10^{-10}$	$3.8 \times 10^{-10}$	$3.1 \times 10^{-10}$	$3.8 \times 10^{-10}$	$3.8 \times 10^{-10}$	$3.1 \times 10^{-10}$	$3.8 \times 10^{-10}$	$3.1 \times 10^{-10}$
Tm-175	0.253 h	0.005	$3.1 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.7 \times 10^{-10}$	$8.6 \times 10^{-11}$	$5.0 \times 10^{-11}$	$3.4 \times 10^{-11}$	$2.7 \times 10^{-11}$	$3.4 \times 10^{-11}$	$3.4 \times 10^{-11}$	$2.7 \times 10^{-11}$	$3.4 \times 10^{-11}$	$2.7 \times 10^{-11}$
<b>Ytterbium</b>														
Yb-162	0.315 h	0.005	$2.2 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-10}$	$6.9 \times 10^{-11}$	$4.2 \times 10^{-11}$	$2.9 \times 10^{-11}$	$2.3 \times 10^{-11}$	$2.9 \times 10^{-11}$	$2.9 \times 10^{-11}$	$2.3 \times 10^{-11}$	$2.9 \times 10^{-11}$	$2.3 \times 10^{-11}$
Yb-166	2.36 d	0.005	$7.7 \times 10^{-9}$	$5.0 \times 10^{-4}$	$5.4 \times 10^{-9}$	$2.9 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.2 \times 10^{-9}$	$9.5 \times 10^{-10}$	$1.2 \times 10^{-9}$	$1.2 \times 10^{-9}$	$9.5 \times 10^{-10}$	$1.2 \times 10^{-9}$	$9.5 \times 10^{-10}$
Yb-167	0.292 h	0.005	$7.0 \times 10^{-11}$	$5.0 \times 10^{-4}$	$4.1 \times 10^{-11}$	$2.1 \times 10^{-11}$	$1.2 \times 10^{-11}$	$8.4 \times 10^{-12}$	$6.7 \times 10^{-12}$	$8.4 \times 10^{-12}$	$8.4 \times 10^{-12}$	$6.7 \times 10^{-12}$	$8.4 \times 10^{-12}$	$6.7 \times 10^{-12}$
Yb-169	32.0 d	0.005	$7.1 \times 10^{-9}$	$5.0 \times 10^{-4}$	$4.6 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.5 \times 10^{-9}$	$8.8 \times 10^{-10}$	$7.1 \times 10^{-10}$	$8.8 \times 10^{-10}$	$8.8 \times 10^{-10}$	$7.1 \times 10^{-10}$	$8.8 \times 10^{-10}$	$7.1 \times 10^{-10}$
Yb-175	4.19 d	0.005	$5.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$3.2 \times 10^{-9}$	$1.6 \times 10^{-9}$	$9.5 \times 10^{-10}$	$5.4 \times 10^{-10}$	$4.4 \times 10^{-10}$	$5.4 \times 10^{-10}$	$5.4 \times 10^{-10}$	$4.4 \times 10^{-10}$	$5.4 \times 10^{-10}$	$4.4 \times 10^{-10}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12-17 a $e(g)$	>17 a $e(g)$
		$f_1$	$e(g)$						
Yb-177	1.90 h	0.005	$1.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$6.8 \times 10^{-10}$	$3.4 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.1 \times 10^{-10}$	$8.8 \times 10^{-11}$
Yb-178	1.23 h	0.005	$1.4 \times 10^{-9}$	$5.0 \times 10^{-4}$	$8.4 \times 10^{-10}$	$4.2 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.2 \times 10^{-10}$
<b>Lutetium</b>									
Lu-169	1.42 d	0.005	$3.5 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.4 \times 10^{-9}$	$1.4 \times 10^{-9}$	$8.9 \times 10^{-10}$	$5.7 \times 10^{-10}$	$4.6 \times 10^{-10}$
Lu-170	2.00 d	0.005	$7.4 \times 10^{-9}$	$5.0 \times 10^{-4}$	$5.2 \times 10^{-9}$	$2.9 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.2 \times 10^{-9}$	$9.9 \times 10^{-10}$
Lu-171	8.22 d	0.005	$5.9 \times 10^{-9}$	$5.0 \times 10^{-4}$	$4.0 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.4 \times 10^{-9}$	$8.5 \times 10^{-10}$	$6.7 \times 10^{-10}$
Lu-172	6.70 d	0.005	$1.0 \times 10^{-8}$	$5.0 \times 10^{-4}$	$7.0 \times 10^{-9}$	$3.9 \times 10^{-9}$	$2.5 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.3 \times 10^{-9}$
Lu-173	1.37 a	0.005	$2.7 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.6 \times 10^{-9}$	$8.6 \times 10^{-10}$	$5.3 \times 10^{-10}$	$3.2 \times 10^{-10}$	$2.6 \times 10^{-10}$
Lu-174	3.31 a	0.005	$3.2 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.7 \times 10^{-9}$	$9.1 \times 10^{-10}$	$5.6 \times 10^{-10}$	$3.3 \times 10^{-10}$	$2.7 \times 10^{-10}$
Lu-174m	142 d	0.005	$6.2 \times 10^{-9}$	$5.0 \times 10^{-4}$	$3.8 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.6 \times 10^{-10}$	$5.3 \times 10^{-10}$
Lu-176	$3.60 \times 10^{10}$ a	0.005	$2.4 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.1 \times 10^{-8}$	$5.7 \times 10^{-9}$	$3.5 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.8 \times 10^{-9}$
Lu-176m	3.68 h	0.005	$2.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.2 \times 10^{-9}$	$6.0 \times 10^{-10}$	$3.5 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.7 \times 10^{-10}$
Lu-177	6.71 d	0.005	$6.1 \times 10^{-9}$	$5.0 \times 10^{-4}$	$3.9 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.2 \times 10^{-9}$	$6.6 \times 10^{-10}$	$5.3 \times 10^{-10}$
Lu-177m	161 d	0.005	$1.7 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.1 \times 10^{-8}$	$5.8 \times 10^{-9}$	$3.6 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.7 \times 10^{-9}$
Lu-178	0.473 h	0.005	$5.9 \times 10^{-10}$	$5.0 \times 10^{-4}$	$3.3 \times 10^{-10}$	$1.6 \times 10^{-10}$	$9.0 \times 10^{-11}$	$6.1 \times 10^{-11}$	$4.7 \times 10^{-11}$
Lu-178m	0.378 h	0.005	$4.3 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.4 \times 10^{-10}$	$1.2 \times 10^{-10}$	$7.1 \times 10^{-11}$	$4.9 \times 10^{-11}$	$3.8 \times 10^{-11}$
Lu-179	4.59 h	0.005	$2.4 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.5 \times 10^{-9}$	$7.5 \times 10^{-10}$	$4.4 \times 10^{-10}$	$2.6 \times 10^{-10}$	$2.1 \times 10^{-10}$
<b>Hafnium</b>									
Hf-170	16.0 h	0.020	$3.9 \times 10^{-9}$	0.002	$2.7 \times 10^{-9}$	$1.5 \times 10^{-9}$	$9.5 \times 10^{-10}$	$6.0 \times 10^{-10}$	$4.8 \times 10^{-10}$
Hf-172	1.87 a	0.020	$1.9 \times 10^{-8}$	0.002	$6.1 \times 10^{-9}$	$3.3 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.0 \times 10^{-9}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1a$	Age 1-2 $g > 1a$	2-7 a	7-12 a	12-17 a	>17 a
		$f_1$	e(g)						
Hf-173	24.0 h	0.020	$1.9 \times 10^{-9}$	0.002	$1.3 \times 10^{-9}$	$7.2 \times 10^{-10}$	$4.6 \times 10^{-10}$	$2.8 \times 10^{-10}$	$2.3 \times 10^{-10}$
Hf-175	70.0 d	0.020	$3.8 \times 10^{-9}$	0.002	$2.4 \times 10^{-9}$	$1.3 \times 10^{-9}$	$8.4 \times 10^{-10}$	$5.2 \times 10^{-10}$	$4.1 \times 10^{-10}$
Hf-177m	0.856 h	0.020	$7.8 \times 10^{-10}$	0.002	$4.7 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.0 \times 10^{-10}$	$8.1 \times 10^{-11}$
Hf-178m	31.0 a	0.020	$7.0 \times 10^{-8}$	0.002	$1.9 \times 10^{-8}$	$1.1 \times 10^{-8}$	$7.8 \times 10^{-9}$	$5.5 \times 10^{-9}$	$4.7 \times 10^{-9}$
Hf-179m	25.1 d	0.020	$1.2 \times 10^{-8}$	0.002	$7.8 \times 10^{-9}$	$4.1 \times 10^{-9}$	$2.6 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.2 \times 10^{-9}$
Hf-180m	5.50 h	0.020	$1.4 \times 10^{-9}$	0.002	$9.7 \times 10^{-10}$	$5.3 \times 10^{-10}$	$3.3 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.7 \times 10^{-10}$
Hf-181	42.4 d	0.020	$1.2 \times 10^{-8}$	0.002	$7.4 \times 10^{-9}$	$3.8 \times 10^{-9}$	$2.3 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.1 \times 10^{-9}$
Hf-182	$9.00 \times 10^6$ a	0.020	$5.6 \times 10^{-8}$	0.002	$7.9 \times 10^{-9}$	$5.4 \times 10^{-9}$	$4.0 \times 10^{-9}$	$3.3 \times 10^{-9}$	$3.0 \times 10^{-9}$
Hf-182m	1.02 h	0.020	$4.1 \times 10^{-10}$	0.002	$2.5 \times 10^{-10}$	$1.3 \times 10^{-10}$	$7.8 \times 10^{-11}$	$5.2 \times 10^{-11}$	$4.2 \times 10^{-11}$
Hf-183	1.07 h	0.020	$8.1 \times 10^{-10}$	0.002	$4.8 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.4 \times 10^{-10}$	$9.3 \times 10^{-11}$	$7.3 \times 10^{-11}$
Hf-184	4.12 h	0.020	$5.5 \times 10^{-9}$	0.002	$3.6 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.6 \times 10^{-10}$	$5.2 \times 10^{-10}$
<b>Tantalum</b>									
Ta-172	0.613 h	0.010	$5.5 \times 10^{-10}$	0.001	$3.2 \times 10^{-10}$	$1.6 \times 10^{-10}$	$9.8 \times 10^{-11}$	$6.6 \times 10^{-11}$	$5.3 \times 10^{-11}$
Ta-173	3.65 h	0.010	$2.0 \times 10^{-9}$	0.001	$1.3 \times 10^{-9}$	$6.5 \times 10^{-10}$	$3.9 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.9 \times 10^{-10}$
Ta-174	1.20 h	0.010	$6.2 \times 10^{-10}$	0.001	$3.7 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.1 \times 10^{-10}$	$7.2 \times 10^{-11}$	$5.7 \times 10^{-11}$
Ta-175	10.5 h	0.010	$1.6 \times 10^{-9}$	0.001	$1.1 \times 10^{-9}$	$6.2 \times 10^{-10}$	$4.0 \times 10^{-10}$	$2.6 \times 10^{-10}$	$2.1 \times 10^{-10}$
Ta-176	8.08 h	0.010	$2.4 \times 10^{-9}$	0.001	$1.7 \times 10^{-9}$	$9.2 \times 10^{-10}$	$6.1 \times 10^{-10}$	$3.9 \times 10^{-10}$	$3.1 \times 10^{-10}$
Ta-177	2.36 d	0.010	$1.0 \times 10^{-9}$	0.001	$6.9 \times 10^{-10}$	$3.6 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.1 \times 10^{-10}$
Ta-178	2.20 h	0.010	$6.3 \times 10^{-10}$	0.001	$4.5 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.5 \times 10^{-10}$	$9.1 \times 10^{-11}$	$7.2 \times 10^{-11}$
Ta-179	1.82 a	0.010	$6.2 \times 10^{-10}$	0.001	$4.1 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.3 \times 10^{-10}$	$8.1 \times 10^{-11}$	$6.5 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2		2-7 a		7-12 a		12-17 a		>17 a	
		$f_1$	e(g)		g > 1 a	e(g)	e(g)	e(g)	e(g)	e(g)	e(g)	e(g)		
Ta-180	$1.00 \times 10^{13}$ a	0.010	$8.1 \times 10^{-9}$	0.001	$5.3 \times 10^{-9}$	$2.8 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.1 \times 10^{-9}$	$1.1 \times 10^{-9}$	$1.1 \times 10^{-9}$	$1.1 \times 10^{-9}$	$1.1 \times 10^{-9}$	$8.4 \times 10^{-10}$	
Ta-180m	8.10 h	0.010	$5.8 \times 10^{-10}$	0.001	$3.7 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.1 \times 10^{-10}$	$6.7 \times 10^{-11}$	$6.7 \times 10^{-11}$	$6.7 \times 10^{-11}$	$6.7 \times 10^{-11}$	$6.7 \times 10^{-11}$	$5.4 \times 10^{-11}$	
Ta-182	115 d	0.010	$1.4 \times 10^{-8}$	0.001	$9.4 \times 10^{-9}$	$5.0 \times 10^{-9}$	$3.1 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.5 \times 10^{-9}$	
Ta-182m	0.264 h	0.010	$1.4 \times 10^{-10}$	0.001	$7.5 \times 10^{-11}$	$3.7 \times 10^{-11}$	$2.1 \times 10^{-11}$	$1.5 \times 10^{-11}$	$1.5 \times 10^{-11}$	$1.5 \times 10^{-11}$	$1.5 \times 10^{-11}$	$1.5 \times 10^{-11}$	$1.2 \times 10^{-11}$	
Ta-183	5.10 d	0.010	$1.4 \times 10^{-8}$	0.001	$9.3 \times 10^{-9}$	$4.7 \times 10^{-9}$	$2.8 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.3 \times 10^{-9}$	
Ta-184	8.70 h	0.010	$6.7 \times 10^{-9}$	0.001	$4.4 \times 10^{-9}$	$2.3 \times 10^{-9}$	$1.4 \times 10^{-9}$	$8.5 \times 10^{-10}$	$8.5 \times 10^{-10}$	$8.5 \times 10^{-10}$	$8.5 \times 10^{-10}$	$8.5 \times 10^{-10}$	$6.8 \times 10^{-10}$	
Ta-185	0.816 h	0.010	$8.3 \times 10^{-10}$	0.001	$4.6 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.3 \times 10^{-10}$	$8.6 \times 10^{-11}$	$8.6 \times 10^{-11}$	$8.6 \times 10^{-11}$	$8.6 \times 10^{-11}$	$8.6 \times 10^{-11}$	$6.8 \times 10^{-11}$	
Ta-186	0.175 h	0.010	$3.8 \times 10^{-10}$	0.001	$2.1 \times 10^{-10}$	$1.1 \times 10^{-10}$	$6.1 \times 10^{-11}$	$4.2 \times 10^{-11}$	$4.2 \times 10^{-11}$	$4.2 \times 10^{-11}$	$4.2 \times 10^{-11}$	$4.2 \times 10^{-11}$	$3.3 \times 10^{-11}$	
<b>Tungsten</b>														
W-176	2.30 h	0.600	$6.8 \times 10^{-10}$	0.300	$5.5 \times 10^{-10}$	$3.0 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.0 \times 10^{-10}$	
W-177	2.25 h	0.600	$4.4 \times 10^{-10}$	0.300	$3.2 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.1 \times 10^{-10}$	$7.2 \times 10^{-11}$	$7.2 \times 10^{-11}$	$7.2 \times 10^{-11}$	$7.2 \times 10^{-11}$	$7.2 \times 10^{-11}$	$5.8 \times 10^{-11}$	
W-178	21.7 d	0.600	$1.8 \times 10^{-9}$	0.300	$1.4 \times 10^{-9}$	$7.3 \times 10^{-10}$	$4.5 \times 10^{-10}$	$2.7 \times 10^{-10}$	$2.7 \times 10^{-10}$	$2.7 \times 10^{-10}$	$2.7 \times 10^{-10}$	$2.7 \times 10^{-10}$	$2.2 \times 10^{-10}$	
W-179	0.625 h	0.600	$3.4 \times 10^{-11}$	0.300	$2.0 \times 10^{-11}$	$1.0 \times 10^{-11}$	$6.2 \times 10^{-12}$	$4.2 \times 10^{-12}$	$4.2 \times 10^{-12}$	$4.2 \times 10^{-12}$	$4.2 \times 10^{-12}$	$4.2 \times 10^{-12}$	$3.3 \times 10^{-12}$	
W-181	121 d	0.600	$6.3 \times 10^{-10}$	0.300	$4.7 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.6 \times 10^{-10}$	$9.5 \times 10^{-11}$	$9.5 \times 10^{-11}$	$9.5 \times 10^{-11}$	$9.5 \times 10^{-11}$	$9.5 \times 10^{-11}$	$7.6 \times 10^{-11}$	
W-185	75.1 d	0.600	$4.4 \times 10^{-9}$	0.300	$3.3 \times 10^{-9}$	$1.6 \times 10^{-9}$	$9.7 \times 10^{-10}$	$5.5 \times 10^{-10}$	$5.5 \times 10^{-10}$	$5.5 \times 10^{-10}$	$5.5 \times 10^{-10}$	$5.5 \times 10^{-10}$	$4.4 \times 10^{-10}$	
W-187	23.9 h	0.600	$5.5 \times 10^{-9}$	0.300	$4.3 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.3 \times 10^{-9}$	$7.8 \times 10^{-10}$	$7.8 \times 10^{-10}$	$7.8 \times 10^{-10}$	$7.8 \times 10^{-10}$	$7.8 \times 10^{-10}$	$6.3 \times 10^{-10}$	
W-188	69.4 d	0.600	$2.1 \times 10^{-8}$	0.300	$1.5 \times 10^{-8}$	$7.7 \times 10^{-9}$	$4.6 \times 10^{-9}$	$2.6 \times 10^{-9}$	$2.6 \times 10^{-9}$	$2.6 \times 10^{-9}$	$2.6 \times 10^{-9}$	$2.6 \times 10^{-9}$	$2.1 \times 10^{-9}$	
<b>Rhenium</b>														
Re-177	0.233 h	1.000	$2.5 \times 10^{-10}$	0.800	$1.4 \times 10^{-10}$	$7.2 \times 10^{-11}$	$4.1 \times 10^{-11}$	$2.8 \times 10^{-11}$	$2.8 \times 10^{-11}$	$2.8 \times 10^{-11}$	$2.8 \times 10^{-11}$	$2.8 \times 10^{-11}$	$2.2 \times 10^{-11}$	

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1a$	Age 1-2 $g > 1a$	2-7 a	7-12 a	12-17 a	>17 a
		$f_1$	e(g)						
Re-178	0.220 h	1.000	$2.9 \times 10^{-10}$	0.800	$1.6 \times 10^{-10}$	$7.9 \times 10^{-11}$	$4.6 \times 10^{-11}$	$3.1 \times 10^{-11}$	$2.5 \times 10^{-11}$
Re-181	20.0 h	1.000	$4.2 \times 10^{-9}$	0.800	$2.8 \times 10^{-9}$	$1.4 \times 10^{-9}$	$8.2 \times 10^{-10}$	$5.4 \times 10^{-10}$	$4.2 \times 10^{-10}$
Re-182	2.67 d	1.000	$1.4 \times 10^{-8}$	0.800	$8.9 \times 10^{-9}$	$4.7 \times 10^{-9}$	$2.8 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.4 \times 10^{-9}$
Re-182	12.7 h	1.000	$2.4 \times 10^{-9}$	0.800	$1.7 \times 10^{-9}$	$8.9 \times 10^{-10}$	$5.2 \times 10^{-10}$	$3.5 \times 10^{-10}$	$2.7 \times 10^{-10}$
Re-184	38.0 d	1.000	$8.9 \times 10^{-9}$	0.800	$5.6 \times 10^{-9}$	$3.0 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.0 \times 10^{-9}$
Re-184m	165 d	1.000	$1.7 \times 10^{-8}$	0.800	$9.8 \times 10^{-9}$	$4.9 \times 10^{-9}$	$2.8 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.5 \times 10^{-9}$
Re-186	3.78 d	1.000	$1.9 \times 10^{-8}$	0.800	$1.1 \times 10^{-8}$	$5.5 \times 10^{-9}$	$3.0 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.5 \times 10^{-9}$
Re-186m	$2.00 \times 10^5$ a	1.000	$3.0 \times 10^{-8}$	0.800	$1.6 \times 10^{-8}$	$7.6 \times 10^{-9}$	$4.4 \times 10^{-9}$	$2.8 \times 10^{-9}$	$2.2 \times 10^{-9}$
Re-187	$5.00 \times 10^{10}$ a	1.000	$6.8 \times 10^{-11}$	0.800	$3.8 \times 10^{-11}$	$1.8 \times 10^{-11}$	$1.0 \times 10^{-11}$	$6.6 \times 10^{-12}$	$5.1 \times 10^{-12}$
Re-188	17.0 h	1.000	$1.7 \times 10^{-8}$	0.800	$1.1 \times 10^{-8}$	$5.4 \times 10^{-9}$	$2.9 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.4 \times 10^{-9}$
Re-188m	0.310 h	1.000	$3.8 \times 10^{-10}$	0.800	$2.3 \times 10^{-10}$	$1.1 \times 10^{-10}$	$6.1 \times 10^{-11}$	$4.0 \times 10^{-11}$	$3.0 \times 10^{-11}$
Re-189	1.01 d	1.000	$9.8 \times 10^{-9}$	0.800	$6.2 \times 10^{-9}$	$3.0 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.0 \times 10^{-9}$	$7.8 \times 10^{-10}$
<b>Osmium</b>									
Os-180	0.366 h	0.020	$1.6 \times 10^{-10}$	0.010	$9.8 \times 10^{-11}$	$5.1 \times 10^{-11}$	$3.2 \times 10^{-11}$	$2.2 \times 10^{-11}$	$1.7 \times 10^{-11}$
Os-181	1.75 h	0.020	$7.6 \times 10^{-10}$	0.010	$5.0 \times 10^{-10}$	$2.7 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.1 \times 10^{-10}$	$8.9 \times 10^{-11}$
Os-182	22.0 h	0.020	$4.6 \times 10^{-9}$	0.010	$3.2 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.1 \times 10^{-9}$	$7.0 \times 10^{-10}$	$5.6 \times 10^{-10}$
Os-185	94.0 d	0.020	$3.8 \times 10^{-9}$	0.010	$2.6 \times 10^{-9}$	$1.5 \times 10^{-9}$	$9.8 \times 10^{-10}$	$6.5 \times 10^{-10}$	$5.1 \times 10^{-10}$
Os-189m	6.00 h	0.020	$2.1 \times 10^{-10}$	0.010	$1.3 \times 10^{-10}$	$6.5 \times 10^{-11}$	$3.8 \times 10^{-11}$	$2.2 \times 10^{-11}$	$1.8 \times 10^{-11}$
Os-191	15.4 d	0.020	$6.3 \times 10^{-9}$	0.010	$4.1 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.0 \times 10^{-10}$	$5.7 \times 10^{-10}$
Os-191m	13.0 h	0.020	$1.1 \times 10^{-9}$	0.010	$7.1 \times 10^{-10}$	$3.5 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.2 \times 10^{-10}$	$9.6 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12-17 a $e(g)$	>17 a $e(g)$
		$f_1$	$e(g)$						
Os-193	1.25 d	0.020	$9.3 \times 10^{-9}$	0.010	$6.0 \times 10^{-9}$	$3.0 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.0 \times 10^{-9}$	$8.1 \times 10^{-10}$
Os-194	6.00 a	0.020	$2.9 \times 10^{-8}$	0.010	$1.7 \times 10^{-8}$	$8.8 \times 10^{-9}$	$5.2 \times 10^{-9}$	$3.0 \times 10^{-9}$	$2.4 \times 10^{-9}$
<b>Iridium</b>									
Ir-182	0.250 h	0.020	$5.3 \times 10^{-10}$	0.010	$3.0 \times 10^{-10}$	$1.5 \times 10^{-10}$	$8.9 \times 10^{-11}$	$6.0 \times 10^{-11}$	$4.8 \times 10^{-11}$
Ir-184	3.02 h	0.020	$1.5 \times 10^{-9}$	0.010	$9.7 \times 10^{-10}$	$5.2 \times 10^{-10}$	$3.3 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.7 \times 10^{-10}$
Ir-185	14.0 h	0.020	$2.4 \times 10^{-9}$	0.010	$1.6 \times 10^{-9}$	$8.6 \times 10^{-10}$	$5.3 \times 10^{-10}$	$3.3 \times 10^{-10}$	$2.6 \times 10^{-10}$
Ir-186	15.8 h	0.020	$3.8 \times 10^{-9}$	0.010	$2.7 \times 10^{-9}$	$1.5 \times 10^{-9}$	$9.6 \times 10^{-10}$	$6.1 \times 10^{-10}$	$4.9 \times 10^{-10}$
Ir-186m	1.75 h	0.020	$5.8 \times 10^{-10}$	0.010	$3.6 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.3 \times 10^{-10}$	$7.7 \times 10^{-11}$	$6.1 \times 10^{-11}$
Ir-187	10.5 h	0.020	$1.1 \times 10^{-9}$	0.010	$7.3 \times 10^{-10}$	$3.9 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.2 \times 10^{-10}$
Ir-188	1.73 d	0.020	$4.6 \times 10^{-9}$	0.010	$3.3 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.9 \times 10^{-10}$	$6.3 \times 10^{-10}$
Ir-189	13.3 d	0.020	$2.5 \times 10^{-9}$	0.010	$1.7 \times 10^{-9}$	$8.6 \times 10^{-10}$	$5.2 \times 10^{-10}$	$3.0 \times 10^{-10}$	$2.4 \times 10^{-10}$
Ir-190	12.1 d	0.020	$1.0 \times 10^{-8}$	0.010	$7.1 \times 10^{-9}$	$3.9 \times 10^{-9}$	$2.5 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.2 \times 10^{-9}$
Ir-190m	3.10 h	0.020	$9.4 \times 10^{-10}$	0.010	$6.4 \times 10^{-10}$	$3.5 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.2 \times 10^{-10}$
Ir-190m'	1.20 h	0.020	$7.9 \times 10^{-11}$	0.010	$5.0 \times 10^{-11}$	$2.6 \times 10^{-11}$	$1.6 \times 10^{-11}$	$1.0 \times 10^{-11}$	$8.0 \times 10^{-12}$
Ir-192	74.0 d	0.020	$1.3 \times 10^{-8}$	0.010	$8.7 \times 10^{-9}$	$4.6 \times 10^{-9}$	$2.8 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.4 \times 10^{-9}$
Ir-192m	$2.41 \times 10^2$ a	0.020	$2.8 \times 10^{-9}$	0.010	$1.4 \times 10^{-9}$	$8.3 \times 10^{-10}$	$5.5 \times 10^{-10}$	$3.7 \times 10^{-10}$	$3.1 \times 10^{-10}$
Ir-193m	11.9 d	0.020	$3.2 \times 10^{-9}$	0.010	$2.0 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.0 \times 10^{-10}$	$3.4 \times 10^{-10}$	$2.7 \times 10^{-10}$
Ir-194	19.1 h	0.020	$1.5 \times 10^{-8}$	0.010	$9.8 \times 10^{-9}$	$4.9 \times 10^{-9}$	$2.9 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.3 \times 10^{-9}$
Ir-194m	171 d	0.020	$1.7 \times 10^{-8}$	0.010	$1.1 \times 10^{-8}$	$6.4 \times 10^{-9}$	$4.1 \times 10^{-9}$	$2.6 \times 10^{-9}$	$2.1 \times 10^{-9}$
Ir-195	2.50 h	0.020	$1.2 \times 10^{-9}$	0.010	$7.3 \times 10^{-10}$	$3.6 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.0 \times 10^{-10}$
Ir-195m	3.80 h	0.020	$2.3 \times 10^{-9}$	0.010	$1.5 \times 10^{-9}$	$7.3 \times 10^{-10}$	$4.3 \times 10^{-10}$	$2.6 \times 10^{-10}$	$2.1 \times 10^{-10}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $g > 1$ a	2-7 a	7-12 a	12-17 a	>17 a
		$f_1$	e(g)						
<b>Platinum</b>									
Pt-186	2.00 h	0.020	$7.8 \times 10^{-10}$	0.010	$5.3 \times 10^{-10}$	$2.9 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.2 \times 10^{-10}$	$9.3 \times 10^{-11}$
Pt-188	10.2 d	0.020	$6.7 \times 10^{-9}$	0.010	$4.5 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.5 \times 10^{-9}$	$9.5 \times 10^{-10}$	$7.6 \times 10^{-10}$
Pt-189	10.9 h	0.020	$1.1 \times 10^{-9}$	0.010	$7.4 \times 10^{-10}$	$3.9 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.2 \times 10^{-10}$
Pt-191	2.80 d	0.020	$3.1 \times 10^{-9}$	0.010	$2.1 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.9 \times 10^{-10}$	$4.2 \times 10^{-10}$	$3.4 \times 10^{-10}$
Pt-193	50.0 a	0.020	$3.7 \times 10^{-10}$	0.010	$2.4 \times 10^{-10}$	$1.2 \times 10^{-10}$	$6.9 \times 10^{-11}$	$3.9 \times 10^{-11}$	$3.1 \times 10^{-11}$
Pt-193m	4.33 d	0.020	$5.2 \times 10^{-9}$	0.010	$3.4 \times 10^{-9}$	$1.7 \times 10^{-9}$	$9.9 \times 10^{-10}$	$5.6 \times 10^{-10}$	$4.5 \times 10^{-10}$
Pt-195m	4.02 d	0.020	$7.1 \times 10^{-9}$	0.010	$4.6 \times 10^{-9}$	$2.3 \times 10^{-9}$	$1.4 \times 10^{-9}$	$7.9 \times 10^{-10}$	$6.3 \times 10^{-10}$
Pt-197	18.3 h	0.020	$4.7 \times 10^{-9}$	0.010	$3.0 \times 10^{-9}$	$1.5 \times 10^{-9}$	$8.8 \times 10^{-10}$	$5.1 \times 10^{-10}$	$4.0 \times 10^{-10}$
Pt-197m	1.57 h	0.020	$1.0 \times 10^{-9}$	0.010	$6.1 \times 10^{-10}$	$3.0 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.1 \times 10^{-10}$	$8.4 \times 10^{-11}$
Pt-199	0.513 h	0.020	$4.7 \times 10^{-10}$	0.010	$2.7 \times 10^{-10}$	$1.3 \times 10^{-10}$	$7.5 \times 10^{-11}$	$5.0 \times 10^{-11}$	$3.9 \times 10^{-11}$
Pt-200	12.5 h	0.020	$1.4 \times 10^{-8}$	0.010	$8.8 \times 10^{-9}$	$4.4 \times 10^{-9}$	$2.6 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.2 \times 10^{-9}$
<b>Gold</b>									
Au-193	17.6 h	0.200	$1.2 \times 10^{-9}$	0.100	$8.8 \times 10^{-10}$	$4.6 \times 10^{-10}$	$2.8 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.3 \times 10^{-10}$
Au-194	1.65 d	0.200	$2.9 \times 10^{-9}$	0.100	$2.2 \times 10^{-9}$	$1.2 \times 10^{-9}$	$8.1 \times 10^{-10}$	$5.3 \times 10^{-10}$	$4.2 \times 10^{-10}$
Au-195	183 d	0.200	$2.4 \times 10^{-9}$	0.100	$1.7 \times 10^{-9}$	$8.9 \times 10^{-10}$	$5.4 \times 10^{-10}$	$3.2 \times 10^{-10}$	$2.5 \times 10^{-10}$
Au-198	2.69 d	0.200	$1.0 \times 10^{-8}$	0.100	$7.2 \times 10^{-9}$	$3.7 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.0 \times 10^{-9}$
Au-198m	2.30 d	0.200	$1.2 \times 10^{-8}$	0.100	$8.5 \times 10^{-9}$	$4.4 \times 10^{-9}$	$2.7 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.3 \times 10^{-9}$
Au-199	3.14 d	0.200	$4.5 \times 10^{-9}$	0.100	$3.1 \times 10^{-9}$	$1.6 \times 10^{-9}$	$9.5 \times 10^{-10}$	$5.5 \times 10^{-10}$	$4.4 \times 10^{-10}$
Au-200	0.807 h	0.200	$8.3 \times 10^{-10}$	0.100	$4.7 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.3 \times 10^{-10}$	$8.7 \times 10^{-11}$	$6.8 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12-17 a $e(g)$	>17 a $e(g)$
		$f_1$	$e(g)$						
Au-200m	18.7 h	0.200	$9.2 \times 10^{-9}$	0.100	$6.6 \times 10^{-9}$	$3.5 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.1 \times 10^{-9}$
Au-201	0.440 h	0.200	$3.1 \times 10^{-10}$	0.100	$1.7 \times 10^{-10}$	$8.2 \times 10^{-11}$	$4.6 \times 10^{-11}$	$3.1 \times 10^{-11}$	$2.4 \times 10^{-11}$
<b>Mercury</b>									
Hg-193	3.50 h	1.000	$3.3 \times 10^{-10}$	1.000	$1.9 \times 10^{-10}$	$9.8 \times 10^{-11}$	$5.8 \times 10^{-11}$	$3.9 \times 10^{-11}$	$3.1 \times 10^{-11}$
(organic)		0.800	$4.7 \times 10^{-10}$	0.400	$4.4 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.4 \times 10^{-10}$	$8.3 \times 10^{-11}$	$6.6 \times 10^{-11}$
Hg-193	3.50 h	0.040	$8.5 \times 10^{-10}$	0.020	$5.5 \times 10^{-10}$	$2.8 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.0 \times 10^{-10}$	$8.2 \times 10^{-11}$
(inorganic)									
Hg-193m	11.1 h	1.000	$1.1 \times 10^{-9}$	1.000	$6.8 \times 10^{-10}$	$3.7 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.3 \times 10^{-10}$
(organic)		0.800	$1.6 \times 10^{-9}$	0.400	$1.8 \times 10^{-9}$	$9.5 \times 10^{-10}$	$6.0 \times 10^{-10}$	$3.7 \times 10^{-10}$	$3.0 \times 10^{-10}$
Hg-193m	11.1 h	0.040	$3.6 \times 10^{-9}$	0.020	$2.4 \times 10^{-9}$	$1.3 \times 10^{-9}$	$8.1 \times 10^{-10}$	$5.0 \times 10^{-10}$	$4.0 \times 10^{-10}$
(inorganic)									
Hg-194	$2.60 \times 10^2$ a	1.000	$1.3 \times 10^{-7}$	1.000	$1.2 \times 10^{-7}$	$8.4 \times 10^{-8}$	$6.6 \times 10^{-8}$	$5.5 \times 10^{-8}$	$5.1 \times 10^{-8}$
(organic)		0.800	$1.1 \times 10^{-7}$	0.400	$4.8 \times 10^{-8}$	$3.5 \times 10^{-8}$	$2.7 \times 10^{-8}$	$2.3 \times 10^{-8}$	$2.1 \times 10^{-8}$
Hg-194	$2.60 \times 10^2$ a	0.040	$7.2 \times 10^{-9}$	0.020	$3.6 \times 10^{-9}$	$2.6 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.4 \times 10^{-9}$
(inorganic)									
Hg-195	9.90 h	1.000	$3.0 \times 10^{-10}$	1.000	$2.0 \times 10^{-10}$	$1.0 \times 10^{-10}$	$6.4 \times 10^{-11}$	$4.2 \times 10^{-11}$	$3.4 \times 10^{-11}$
(organic)		0.800	$4.6 \times 10^{-10}$	0.400	$4.8 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.5 \times 10^{-10}$	$9.3 \times 10^{-11}$	$7.5 \times 10^{-11}$
Hg-195	9.90 h	0.040	$9.5 \times 10^{-10}$	0.020	$6.3 \times 10^{-10}$	$3.3 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.2 \times 10^{-10}$	$9.7 \times 10^{-11}$
(inorganic)									
Hg-195m	1.73 d	1.000	$2.1 \times 10^{-9}$	1.000	$1.3 \times 10^{-9}$	$6.8 \times 10^{-10}$	$4.2 \times 10^{-10}$	$2.7 \times 10^{-10}$	$2.2 \times 10^{-10}$



Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		f <sub>1</sub> for g > 1 a	Age 1-2 g > 1 a	2-7 a e(g)	7-12 a e(g)	12-17 a e(g)	>17 a e(g)
		f <sub>1</sub>	e(g)						
(organic)		0.800	2.6 × 10 <sup>-9</sup>	0.400	2.8 × 10 <sup>-9</sup>	1.4 × 10 <sup>-9</sup>	8.7 × 10 <sup>-10</sup>	5.1 × 10 <sup>-10</sup>	4.1 × 10 <sup>-10</sup>
Hg-195m	1.73 d	0.040	5.8 × 10 <sup>-9</sup>	0.020	3.8 × 10 <sup>-9</sup>	2.0 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>	7.0 × 10 <sup>-10</sup>	5.6 × 10 <sup>-10</sup>
(inorganic)									
Hg-197	2.67 d	1.000	9.7 × 10 <sup>-10</sup>	1.000	6.2 × 10 <sup>-10</sup>	3.1 × 10 <sup>-10</sup>	1.9 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	9.9 × 10 <sup>-11</sup>
(organic)		0.800	1.3 × 10 <sup>-9</sup>	0.400	1.2 × 10 <sup>-9</sup>	6.1 × 10 <sup>-10</sup>	3.7 × 10 <sup>-10</sup>	2.2 × 10 <sup>-10</sup>	1.7 × 10 <sup>-10</sup>
Hg-197	2.67 d	0.040	2.5 × 10 <sup>-9</sup>	0.020	1.6 × 10 <sup>-9</sup>	8.3 × 10 <sup>-10</sup>	5.0 × 10 <sup>-10</sup>	2.9 × 10 <sup>-10</sup>	2.3 × 10 <sup>-10</sup>
(inorganic)									
Hg-197m	23.8 h	1.000	1.5 × 10 <sup>-9</sup>	1.000	9.5 × 10 <sup>-10</sup>	4.8 × 10 <sup>-10</sup>	2.9 × 10 <sup>-10</sup>	1.8 × 10 <sup>-10</sup>	1.5 × 10 <sup>-10</sup>
(organic)		0.800	2.2 × 10 <sup>-9</sup>	0.400	2.5 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>	7.3 × 10 <sup>-10</sup>	4.2 × 10 <sup>-10</sup>	3.4 × 10 <sup>-10</sup>
Hg-197m	23.8 h	0.040	5.2 × 10 <sup>-9</sup>	0.020	3.4 × 10 <sup>-9</sup>	1.7 × 10 <sup>-9</sup>	1.0 × 10 <sup>-9</sup>	5.9 × 10 <sup>-10</sup>	4.7 × 10 <sup>-10</sup>
(inorganic)									
Hg-199m	0.710 h	1.000	3.4 × 10 <sup>-10</sup>	1.000	1.9 × 10 <sup>-10</sup>	9.3 × 10 <sup>-11</sup>	5.3 × 10 <sup>-11</sup>	3.6 × 10 <sup>-11</sup>	2.8 × 10 <sup>-11</sup>
(organic)		0.800	3.6 × 10 <sup>-10</sup>	0.400	2.1 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>	5.8 × 10 <sup>-11</sup>	3.9 × 10 <sup>-11</sup>	3.1 × 10 <sup>-11</sup>
Hg-199m	0.710 h	0.040	3.7 × 10 <sup>-10</sup>	0.020	2.1 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>	5.9 × 10 <sup>-11</sup>	3.9 × 10 <sup>-11</sup>	3.1 × 10 <sup>-11</sup>
(inorganic)									
Hg-203	46.6 d	1.000	1.5 × 10 <sup>-8</sup>	1.000	1.1 × 10 <sup>-8</sup>	5.7 × 10 <sup>-9</sup>	3.6 × 10 <sup>-9</sup>	2.3 × 10 <sup>-9</sup>	1.9 × 10 <sup>-9</sup>
(organic)		0.800	1.3 × 10 <sup>-8</sup>	0.400	6.4 × 10 <sup>-9</sup>	3.4 × 10 <sup>-9</sup>	2.1 × 10 <sup>-9</sup>	1.3 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>
Hg-203	46.6 d	0.040	5.5 × 10 <sup>-9</sup>	0.020	3.6 × 10 <sup>-9</sup>	1.8 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	6.7 × 10 <sup>-10</sup>	5.4 × 10 <sup>-10</sup>
(inorganic)									

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 g > 1 a	2-7 a	7-12 a	12-17 a	>17 a
		$f_1$	e(g)					
<b>Thallium</b>								
Tl-194	0.550 h	1.000	$6.1 \times 10^{-11}$	$3.9 \times 10^{-11}$	$2.2 \times 10^{-11}$	$1.4 \times 10^{-11}$	$1.0 \times 10^{-11}$	$8.1 \times 10^{-12}$
Tl-194m	0.546 h	1.000	$3.8 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.2 \times 10^{-10}$	$7.0 \times 10^{-11}$	$4.9 \times 10^{-11}$	$4.0 \times 10^{-11}$
Tl-195	1.16 h	1.000	$2.3 \times 10^{-10}$	$1.4 \times 10^{-10}$	$7.5 \times 10^{-11}$	$4.7 \times 10^{-11}$	$3.3 \times 10^{-11}$	$2.7 \times 10^{-11}$
Tl-197	2.84 h	1.000	$2.1 \times 10^{-10}$	$1.3 \times 10^{-10}$	$6.7 \times 10^{-11}$	$4.2 \times 10^{-11}$	$2.8 \times 10^{-11}$	$2.3 \times 10^{-11}$
Tl-198	5.30 h	1.000	$4.7 \times 10^{-10}$	$3.3 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.2 \times 10^{-10}$	$8.7 \times 10^{-11}$	$7.3 \times 10^{-11}$
Tl-198m	1.87 h	1.000	$4.8 \times 10^{-10}$	$3.0 \times 10^{-10}$	$1.6 \times 10^{-10}$	$9.7 \times 10^{-11}$	$6.7 \times 10^{-11}$	$5.4 \times 10^{-11}$
Tl-199	7.42 h	1.000	$2.3 \times 10^{-10}$	$1.5 \times 10^{-10}$	$7.7 \times 10^{-11}$	$4.8 \times 10^{-11}$	$3.2 \times 10^{-11}$	$2.6 \times 10^{-11}$
Tl-200	1.09 d	1.000	$1.3 \times 10^{-9}$	$9.1 \times 10^{-10}$	$5.3 \times 10^{-10}$	$3.5 \times 10^{-10}$	$2.4 \times 10^{-10}$	$2.0 \times 10^{-10}$
Tl-201	3.04 d	1.000	$8.4 \times 10^{-10}$	$5.5 \times 10^{-10}$	$2.9 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.2 \times 10^{-10}$	$9.5 \times 10^{-11}$
Tl-202	12.2 d	1.000	$2.9 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.9 \times 10^{-10}$	$5.4 \times 10^{-10}$	$4.5 \times 10^{-10}$
Tl-204	3.78 a	1.000	$1.3 \times 10^{-8}$	$8.5 \times 10^{-9}$	$4.2 \times 10^{-9}$	$2.5 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.2 \times 10^{-9}$
<b>Lead<sup>b</sup></b>								
Pb-195m	0.263 h	0.600	$2.6 \times 10^{-10}$	$1.6 \times 10^{-10}$	$8.4 \times 10^{-11}$	$5.2 \times 10^{-11}$	$3.5 \times 10^{-11}$	$2.9 \times 10^{-11}$
Pb-198	2.40 h	0.600	$5.9 \times 10^{-10}$	$4.8 \times 10^{-10}$	$2.7 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.1 \times 10^{-10}$	$1.0 \times 10^{-10}$
Pb-199	1.50 h	0.600	$3.5 \times 10^{-10}$	$2.6 \times 10^{-10}$	$1.5 \times 10^{-10}$	$9.4 \times 10^{-11}$	$6.3 \times 10^{-11}$	$5.4 \times 10^{-11}$
Pb-200	21.5 h	0.600	$2.5 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.1 \times 10^{-9}$	$7.0 \times 10^{-10}$	$4.4 \times 10^{-10}$	$4.0 \times 10^{-10}$
Pb-201	9.40 h	0.600	$9.4 \times 10^{-10}$	$7.8 \times 10^{-10}$	$4.3 \times 10^{-10}$	$2.7 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.6 \times 10^{-10}$
Pb-202	$3.00 \times 10^5$ a	0.600	$3.4 \times 10^{-8}$	$1.6 \times 10^{-8}$	$1.3 \times 10^{-8}$	$1.9 \times 10^{-8}$	$2.7 \times 10^{-8}$	$8.8 \times 10^{-9}$
Pb-202m	3.62 h	0.600	$7.6 \times 10^{-10}$	$6.1 \times 10^{-10}$	$3.5 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.3 \times 10^{-10}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		f <sub>1</sub> for g > 1 a	Age 1-2		2-7 a	7-12 a	12-17 a	>17 a
		f <sub>1</sub>	e(g)		g > 1 a	e(g)				
Pb-203	2.17 d	0.600	1.6 × 10 <sup>-9</sup>	0.200	1.3 × 10 <sup>-9</sup>	6.8 × 10 <sup>-10</sup>	4.3 × 10 <sup>-10</sup>	2.7 × 10 <sup>-10</sup>	2.4 × 10 <sup>-10</sup>	
Pb-205	1.43 × 10 <sup>7</sup> a	0.600	2.1 × 10 <sup>-9</sup>	0.200	9.9 × 10 <sup>-10</sup>	6.2 × 10 <sup>-10</sup>	6.1 × 10 <sup>-10</sup>	6.5 × 10 <sup>-10</sup>	2.8 × 10 <sup>-10</sup>	
Pb-209	3.25 h	0.600	5.7 × 10 <sup>-10</sup>	0.200	3.8 × 10 <sup>-10</sup>	1.9 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	6.6 × 10 <sup>-11</sup>	5.7 × 10 <sup>-11</sup>	
Pb-210	22.3 a	0.600	8.4 × 10 <sup>-6</sup>	0.200	3.6 × 10 <sup>-6</sup>	2.2 × 10 <sup>-6</sup>	1.9 × 10 <sup>-6</sup>	1.9 × 10 <sup>-6</sup>	6.9 × 10 <sup>-7</sup>	
Pb-211	0.601 h	0.600	3.1 × 10 <sup>-9</sup>	0.200	1.4 × 10 <sup>-9</sup>	7.1 × 10 <sup>-10</sup>	4.1 × 10 <sup>-10</sup>	2.7 × 10 <sup>-10</sup>	1.8 × 10 <sup>-10</sup>	
Pb-212	10.6 h	0.600	1.5 × 10 <sup>-7</sup>	0.200	6.3 × 10 <sup>-8</sup>	3.3 × 10 <sup>-8</sup>	2.0 × 10 <sup>-8</sup>	1.3 × 10 <sup>-8</sup>	6.0 × 10 <sup>-9</sup>	
Pb-214	0.447 h	0.600	2.7 × 10 <sup>-9</sup>	0.200	1.0 × 10 <sup>-9</sup>	5.2 × 10 <sup>-10</sup>	3.1 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	
<b>Bismuth</b>										
Bi-200	0.606 h	0.100	4.2 × 10 <sup>-10</sup>	0.050	2.7 × 10 <sup>-10</sup>	1.5 × 10 <sup>-10</sup>	9.5 × 10 <sup>-11</sup>	6.4 × 10 <sup>-11</sup>	5.1 × 10 <sup>-11</sup>	
Bi-201	1.80 h	0.100	1.0 × 10 <sup>-9</sup>	0.050	6.7 × 10 <sup>-10</sup>	3.6 × 10 <sup>-10</sup>	2.2 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	
Bi-202	1.67 h	0.100	6.4 × 10 <sup>-10</sup>	0.050	4.4 × 10 <sup>-10</sup>	2.5 × 10 <sup>-10</sup>	1.6 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	8.9 × 10 <sup>-11</sup>	
Bi-203	11.8 h	0.100	3.5 × 10 <sup>-9</sup>	0.050	2.5 × 10 <sup>-9</sup>	1.4 × 10 <sup>-9</sup>	9.3 × 10 <sup>-10</sup>	6.0 × 10 <sup>-10</sup>	4.8 × 10 <sup>-10</sup>	
Bi-205	15.3 d	0.100	6.1 × 10 <sup>-9</sup>	0.050	4.5 × 10 <sup>-9</sup>	2.6 × 10 <sup>-9</sup>	1.7 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	9.0 × 10 <sup>-10</sup>	
Bi-206	6.24 d	0.100	1.4 × 10 <sup>-8</sup>	0.050	1.0 × 10 <sup>-8</sup>	5.7 × 10 <sup>-9</sup>	3.7 × 10 <sup>-9</sup>	2.4 × 10 <sup>-9</sup>	1.9 × 10 <sup>-9</sup>	
Bi-207	38.0 a	0.100	1.0 × 10 <sup>-8</sup>	0.050	7.1 × 10 <sup>-9</sup>	3.9 × 10 <sup>-9</sup>	2.5 × 10 <sup>-9</sup>	1.6 × 10 <sup>-9</sup>	1.3 × 10 <sup>-9</sup>	
Bi-210	5.01 d	0.100	1.5 × 10 <sup>-8</sup>	0.050	9.7 × 10 <sup>-9</sup>	4.8 × 10 <sup>-9</sup>	2.9 × 10 <sup>-9</sup>	1.6 × 10 <sup>-9</sup>	1.3 × 10 <sup>-9</sup>	
Bi-210m	3.00 × 10 <sup>6</sup> a	0.100	2.1 × 10 <sup>-7</sup>	0.050	9.1 × 10 <sup>-8</sup>	4.7 × 10 <sup>-8</sup>	3.0 × 10 <sup>-8</sup>	1.9 × 10 <sup>-8</sup>	1.5 × 10 <sup>-8</sup>	
Bi-212	1.01 h	0.100	3.2 × 10 <sup>-9</sup>	0.050	1.8 × 10 <sup>-9</sup>	8.7 × 10 <sup>-10</sup>	5.0 × 10 <sup>-10</sup>	3.3 × 10 <sup>-10</sup>	2.6 × 10 <sup>-10</sup>	
Bi-213	0.761 h	0.100	2.5 × 10 <sup>-9</sup>	0.050	1.4 × 10 <sup>-9</sup>	6.7 × 10 <sup>-10</sup>	3.9 × 10 <sup>-10</sup>	2.5 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	
Bi-214	0.332 h	0.100	1.4 × 10 <sup>-9</sup>	0.050	7.4 × 10 <sup>-10</sup>	3.6 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12-17 a $e(g)$	>17 a $e(g)$
		$f_1$	$e(g)$						
<b>Polonium</b>									
Po-203	0.612 h	1.000	$2.9 \times 10^{-10}$	0.500	$2.4 \times 10^{-10}$	$1.3 \times 10^{-10}$	$8.5 \times 10^{-11}$	$5.8 \times 10^{-11}$	$4.6 \times 10^{-11}$
Po-205	1.80 h	1.000	$3.5 \times 10^{-10}$	0.500	$2.8 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.1 \times 10^{-10}$	$7.2 \times 10^{-11}$	$5.8 \times 10^{-11}$
Po-207	5.83 h	1.000	$4.4 \times 10^{-10}$	0.500	$5.7 \times 10^{-10}$	$3.2 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.1 \times 10^{-10}$
Po-210	138 d	1.000	$2.6 \times 10^{-5}$	0.500	$8.8 \times 10^{-6}$	$4.4 \times 10^{-6}$	$2.6 \times 10^{-6}$	$1.6 \times 10^{-6}$	$1.2 \times 10^{-6}$
<b>Astatine</b>									
At-207	1.80 h	1.000	$2.5 \times 10^{-9}$	1.000	$1.6 \times 10^{-9}$	$8.0 \times 10^{-10}$	$4.8 \times 10^{-10}$	$2.9 \times 10^{-10}$	$2.4 \times 10^{-10}$
At-211	7.21 h	1.000	$1.2 \times 10^{-7}$	1.000	$7.8 \times 10^{-8}$	$3.8 \times 10^{-8}$	$2.3 \times 10^{-8}$	$1.3 \times 10^{-8}$	$1.1 \times 10^{-8}$
<b>Francium</b>									
Fr-222	0.240 h	1.000	$6.2 \times 10^{-9}$	1.000	$3.9 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.3 \times 10^{-9}$	$8.5 \times 10^{-10}$	$7.2 \times 10^{-10}$
Fr-223	0.363 h	1.000	$2.6 \times 10^{-8}$	1.000	$1.7 \times 10^{-8}$	$8.3 \times 10^{-9}$	$5.0 \times 10^{-9}$	$2.9 \times 10^{-9}$	$2.4 \times 10^{-9}$
<b>Radium</b> <sup>b</sup>									
Ra-223	11.4 d	0.600	$5.3 \times 10^{-6}$	0.200	$1.1 \times 10^{-6}$	$5.7 \times 10^{-7}$	$4.5 \times 10^{-7}$	$3.7 \times 10^{-7}$	$1.0 \times 10^{-7}$
Ra-224	3.66 d	0.600	$2.7 \times 10^{-6}$	0.200	$6.6 \times 10^{-7}$	$3.5 \times 10^{-7}$	$2.6 \times 10^{-7}$	$2.0 \times 10^{-7}$	$6.5 \times 10^{-8}$
Ra-225	14.8 d	0.600	$7.1 \times 10^{-6}$	0.200	$1.2 \times 10^{-6}$	$6.1 \times 10^{-7}$	$5.0 \times 10^{-7}$	$4.4 \times 10^{-7}$	$9.9 \times 10^{-8}$
Ra-226	$1.60 \times 10^3$ a	0.600	$4.7 \times 10^{-6}$	0.200	$9.6 \times 10^{-7}$	$6.2 \times 10^{-7}$	$8.0 \times 10^{-7}$	$1.5 \times 10^{-6}$	$2.8 \times 10^{-7}$
Ra-227	0.703 h	0.600	$1.1 \times 10^{-9}$	0.200	$4.3 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.3 \times 10^{-10}$	$8.1 \times 10^{-11}$
Ra-228	5.75 a	0.600	$3.0 \times 10^{-5}$	0.200	$5.7 \times 10^{-6}$	$3.4 \times 10^{-6}$	$3.9 \times 10^{-6}$	$5.3 \times 10^{-6}$	$6.9 \times 10^{-7}$
<b>Actinium</b>									
Ac-224	2.90 h	0.005	$1.0 \times 10^{-8}$	$5.0 \times 10^{-4}$	$5.2 \times 10^{-9}$	$2.6 \times 10^{-9}$	$1.5 \times 10^{-9}$	$8.8 \times 10^{-10}$	$7.0 \times 10^{-10}$
Ac-225	10.0 d	0.005	$4.6 \times 10^{-7}$	$5.0 \times 10^{-4}$	$1.8 \times 10^{-7}$	$9.1 \times 10^{-8}$	$5.4 \times 10^{-8}$	$3.0 \times 10^{-8}$	$2.4 \times 10^{-8}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1a$	Age 1-2 $g > 1a$	2-7 a $e(g)$	7-12 a $e(g)$	12-17 a $e(g)$	>17 a $e(g)$
		$f_1$	$e(g)$						
Ac-226	1.21 d	0.005	$1.4 \times 10^{-7}$	$5.0 \times 10^{-4}$	$7.6 \times 10^{-8}$	$3.8 \times 10^{-8}$	$2.3 \times 10^{-8}$	$1.3 \times 10^{-8}$	$1.0 \times 10^{-8}$
Ac-227	21.8 a	0.005	$3.3 \times 10^{-5}$	$5.0 \times 10^{-4}$	$3.1 \times 10^{-6}$	$2.2 \times 10^{-6}$	$1.5 \times 10^{-6}$	$1.2 \times 10^{-6}$	$1.1 \times 10^{-6}$
Ac-228	6.13 h	0.005	$7.4 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.8 \times 10^{-9}$	$1.4 \times 10^{-9}$	$8.7 \times 10^{-10}$	$5.3 \times 10^{-10}$	$4.3 \times 10^{-10}$
<b>Thorium</b>									
Th-226	0.515 h	0.005	$4.4 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.4 \times 10^{-9}$	$1.2 \times 10^{-9}$	$6.7 \times 10^{-10}$	$4.5 \times 10^{-10}$	$3.5 \times 10^{-10}$
Th-227	18.7 d	0.005	$3.0 \times 10^{-7}$	$5.0 \times 10^{-4}$	$7.0 \times 10^{-8}$	$3.6 \times 10^{-8}$	$2.3 \times 10^{-8}$	$1.5 \times 10^{-8}$	$8.8 \times 10^{-9}$
Th-228	1.91 a	0.005	$3.7 \times 10^{-6}$	$5.0 \times 10^{-4}$	$3.7 \times 10^{-7}$	$2.2 \times 10^{-7}$	$1.5 \times 10^{-7}$	$9.4 \times 10^{-8}$	$7.2 \times 10^{-8}$
Th-229	$7.34 \times 10^3$ a	0.005	$1.1 \times 10^{-5}$	$5.0 \times 10^{-4}$	$1.0 \times 10^{-6}$	$7.8 \times 10^{-7}$	$6.2 \times 10^{-7}$	$5.3 \times 10^{-7}$	$4.9 \times 10^{-7}$
Th-230	$7.70 \times 10^4$ a	0.005	$4.1 \times 10^{-6}$	$5.0 \times 10^{-4}$	$4.1 \times 10^{-7}$	$3.1 \times 10^{-7}$	$2.4 \times 10^{-7}$	$2.2 \times 10^{-7}$	$2.1 \times 10^{-7}$
Th-231	1.06 d	0.005	$3.9 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.5 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.4 \times 10^{-10}$	$4.2 \times 10^{-10}$	$3.4 \times 10^{-10}$
Th-232	$1.40 \times 10^{10}$ a	0.005	$4.6 \times 10^{-6}$	$5.0 \times 10^{-4}$	$4.5 \times 10^{-7}$	$3.5 \times 10^{-7}$	$2.9 \times 10^{-7}$	$2.5 \times 10^{-7}$	$2.3 \times 10^{-7}$
Th-234	24.1 d	0.005	$4.0 \times 10^{-8}$	$5.0 \times 10^{-4}$	$2.5 \times 10^{-8}$	$1.3 \times 10^{-8}$	$7.4 \times 10^{-9}$	$4.2 \times 10^{-9}$	$3.4 \times 10^{-9}$
<b>Protactinium</b>									
Pa-227	0.638 h	0.005	$5.8 \times 10^{-9}$	$5.0 \times 10^{-4}$	$3.2 \times 10^{-9}$	$1.5 \times 10^{-9}$	$8.7 \times 10^{-10}$	$5.8 \times 10^{-10}$	$4.5 \times 10^{-10}$
Pa-228	22.0 h	0.005	$1.2 \times 10^{-8}$	$5.0 \times 10^{-4}$	$4.8 \times 10^{-9}$	$2.6 \times 10^{-9}$	$1.6 \times 10^{-9}$	$9.7 \times 10^{-10}$	$7.8 \times 10^{-10}$
Pa-230	17.4 d	0.005	$2.6 \times 10^{-8}$	$5.0 \times 10^{-4}$	$5.7 \times 10^{-9}$	$3.1 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.1 \times 10^{-9}$	$9.2 \times 10^{-10}$
Pa-231	$3.27 \times 10^4$ a	0.005	$1.3 \times 10^{-5}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-6}$	$1.1 \times 10^{-6}$	$9.2 \times 10^{-7}$	$8.0 \times 10^{-7}$	$7.1 \times 10^{-7}$
Pa-232	1.31 d	0.005	$6.3 \times 10^{-9}$	$5.0 \times 10^{-4}$	$4.2 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.4 \times 10^{-9}$	$8.9 \times 10^{-10}$	$7.2 \times 10^{-10}$
Pa-233	27.0 d	0.005	$9.7 \times 10^{-9}$	$5.0 \times 10^{-4}$	$6.2 \times 10^{-9}$	$3.2 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.1 \times 10^{-9}$	$8.7 \times 10^{-10}$
Pa-234	6.70 h	0.005	$5.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$3.2 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.4 \times 10^{-10}$	$5.1 \times 10^{-10}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $g > 1$ a	2-7 a	7-12 a	12-17 a	>17 a
		$f_1$	e(g)						
<b>Uranium</b>									
U-230	20.8 d	0.040	$7.9 \times 10^{-7}$	0.020	$3.0 \times 10^{-7}$	$1.5 \times 10^{-7}$	$1.0 \times 10^{-7}$	$6.6 \times 10^{-8}$	$5.6 \times 10^{-8}$
U-231	4.20 d	0.040	$3.1 \times 10^{-9}$	0.020	$2.0 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.1 \times 10^{-10}$	$3.5 \times 10^{-10}$	$2.8 \times 10^{-10}$
U-232	72.0 a	0.040	$2.5 \times 10^{-6}$	0.020	$8.2 \times 10^{-7}$	$5.8 \times 10^{-7}$	$5.7 \times 10^{-7}$	$6.4 \times 10^{-7}$	$3.3 \times 10^{-7}$
U-233	$1.58 \times 10^5$ a	0.040	$3.8 \times 10^{-7}$	0.020	$1.4 \times 10^{-7}$	$9.2 \times 10^{-8}$	$7.8 \times 10^{-8}$	$7.8 \times 10^{-8}$	$5.1 \times 10^{-8}$
U-234	$2.44 \times 10^5$ a	0.040	$3.7 \times 10^{-7}$	0.020	$1.3 \times 10^{-7}$	$8.8 \times 10^{-8}$	$7.4 \times 10^{-8}$	$7.4 \times 10^{-8}$	$4.9 \times 10^{-8}$
U-235	$7.04 \times 10^8$ a	0.040	$3.5 \times 10^{-7}$	0.020	$1.3 \times 10^{-7}$	$8.5 \times 10^{-8}$	$7.1 \times 10^{-8}$	$7.0 \times 10^{-8}$	$4.7 \times 10^{-8}$
U-236	$2.34 \times 10^7$ a	0.040	$3.5 \times 10^{-7}$	0.020	$1.3 \times 10^{-7}$	$8.4 \times 10^{-8}$	$7.0 \times 10^{-8}$	$7.0 \times 10^{-8}$	$4.7 \times 10^{-8}$
U-237	6.75 d	0.040	$8.3 \times 10^{-9}$	0.020	$5.4 \times 10^{-9}$	$2.8 \times 10^{-9}$	$1.6 \times 10^{-9}$	$9.5 \times 10^{-10}$	$7.6 \times 10^{-10}$
U-238	$4.47 \times 10^9$ a	0.040	$3.4 \times 10^{-7}$	0.020	$1.2 \times 10^{-7}$	$8.0 \times 10^{-8}$	$6.8 \times 10^{-8}$	$6.7 \times 10^{-8}$	$4.5 \times 10^{-8}$
U-239	0.392 h	0.040	$3.4 \times 10^{-10}$	0.020	$1.9 \times 10^{-10}$	$9.3 \times 10^{-11}$	$5.4 \times 10^{-11}$	$3.5 \times 10^{-11}$	$2.7 \times 10^{-11}$
U-240	14.1 h	0.040	$1.3 \times 10^{-8}$	0.020	$8.1 \times 10^{-9}$	$4.1 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.1 \times 10^{-9}$
<b>Neptunium</b>									
Np-232	0.245 h	0.005	$8.7 \times 10^{-11}$	$5.0 \times 10^{-4}$	$5.1 \times 10^{-11}$	$2.7 \times 10^{-11}$	$1.7 \times 10^{-11}$	$1.2 \times 10^{-11}$	$9.7 \times 10^{-12}$
Np-233	0.603 h	0.005	$2.1 \times 10^{-11}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-11}$	$6.6 \times 10^{-12}$	$4.0 \times 10^{-12}$	$2.8 \times 10^{-12}$	$2.2 \times 10^{-12}$
Np-234	4.40 d	0.005	$6.2 \times 10^{-9}$	$5.0 \times 10^{-4}$	$4.4 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.0 \times 10^{-9}$	$8.1 \times 10^{-10}$
Np-235	1.08 a	0.005	$7.1 \times 10^{-10}$	$5.0 \times 10^{-4}$	$4.1 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.2 \times 10^{-10}$	$6.8 \times 10^{-11}$	$5.3 \times 10^{-11}$
Np-236	$1.15 \times 10^5$ a	0.005	$1.9 \times 10^{-7}$	$5.0 \times 10^{-4}$	$2.4 \times 10^{-8}$	$1.8 \times 10^{-8}$	$1.8 \times 10^{-8}$	$1.8 \times 10^{-8}$	$1.7 \times 10^{-8}$
Np-236m	22.5 h	0.005	$2.5 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-9}$	$6.6 \times 10^{-10}$	$4.0 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.9 \times 10^{-10}$
Np-237	$2.14 \times 10^6$ a	0.005	$2.0 \times 10^{-6}$	$5.0 \times 10^{-4}$	$2.1 \times 10^{-7}$	$1.4 \times 10^{-7}$	$1.1 \times 10^{-7}$	$1.1 \times 10^{-7}$	$1.1 \times 10^{-7}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2		2-7 a	7-12 a	12-17 a	>17 a
		$f_1$	e(g)		g > 1 a	e(g)				
Np-238	2.12 d	0.005	$9.5 \times 10^{-9}$	$5.0 \times 10^{-4}$	$6.2 \times 10^{-9}$	$3.2 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.1 \times 10^{-9}$	$1.1 \times 10^{-9}$	$9.1 \times 10^{-10}$
Np-239	2.36 d	0.005	$8.9 \times 10^{-9}$	$5.0 \times 10^{-4}$	$5.7 \times 10^{-9}$	$2.9 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.0 \times 10^{-9}$	$1.0 \times 10^{-9}$	$8.0 \times 10^{-10}$
Np-240	1.08 h	0.005	$8.7 \times 10^{-10}$	$5.0 \times 10^{-4}$	$5.2 \times 10^{-10}$	$2.6 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.0 \times 10^{-10}$	$1.0 \times 10^{-10}$	$8.2 \times 10^{-11}$
<b>Plutonium</b>										
Pu-234	8.80 h	0.005	$2.1 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.1 \times 10^{-9}$	$5.5 \times 10^{-10}$	$3.3 \times 10^{-10}$	$2.0 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.6 \times 10^{-10}$
Pu-235	0.422 h	0.005	$2.2 \times 10^{-11}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-11}$	$6.5 \times 10^{-12}$	$3.9 \times 10^{-12}$	$2.7 \times 10^{-12}$	$2.7 \times 10^{-12}$	$2.1 \times 10^{-12}$
Pu-236	2.85 a	0.005	$2.1 \times 10^{-6}$	$5.0 \times 10^{-4}$	$2.2 \times 10^{-7}$	$1.4 \times 10^{-7}$	$1.0 \times 10^{-7}$	$8.5 \times 10^{-8}$	$8.5 \times 10^{-8}$	$8.7 \times 10^{-8}$
Pu-237	45.3 d	0.005	$1.1 \times 10^{-9}$	$5.0 \times 10^{-4}$	$6.9 \times 10^{-10}$	$3.6 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.0 \times 10^{-10}$
Pu-238	87.7 a	0.005	$4.0 \times 10^{-6}$	$5.0 \times 10^{-4}$	$4.0 \times 10^{-7}$	$3.1 \times 10^{-7}$	$2.4 \times 10^{-7}$	$2.2 \times 10^{-7}$	$2.2 \times 10^{-7}$	$2.3 \times 10^{-7}$
Pu-239	$2.41 \times 10^4$ a	0.005	$4.2 \times 10^{-6}$	$5.0 \times 10^{-4}$	$4.2 \times 10^{-7}$	$3.3 \times 10^{-7}$	$2.7 \times 10^{-7}$	$2.4 \times 10^{-7}$	$2.4 \times 10^{-7}$	$2.5 \times 10^{-7}$
Pu-240	$6.54 \times 10^3$ a	0.005	$4.2 \times 10^{-6}$	$5.0 \times 10^{-4}$	$4.2 \times 10^{-7}$	$3.3 \times 10^{-7}$	$2.7 \times 10^{-7}$	$2.4 \times 10^{-7}$	$2.4 \times 10^{-7}$	$2.5 \times 10^{-7}$
Pu-241	14.4 a	0.005	$5.6 \times 10^{-8}$	$5.0 \times 10^{-4}$	$5.7 \times 10^{-9}$	$5.5 \times 10^{-9}$	$5.1 \times 10^{-9}$	$4.8 \times 10^{-9}$	$4.8 \times 10^{-9}$	$4.8 \times 10^{-9}$
Pu-242	$3.76 \times 10^5$ a	0.005	$4.0 \times 10^{-6}$	$5.0 \times 10^{-4}$	$4.0 \times 10^{-7}$	$3.2 \times 10^{-7}$	$2.6 \times 10^{-7}$	$2.3 \times 10^{-7}$	$2.3 \times 10^{-7}$	$2.4 \times 10^{-7}$
Pu-243	4.95 h	0.005	$1.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$6.2 \times 10^{-10}$	$3.1 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.1 \times 10^{-10}$	$1.1 \times 10^{-10}$	$8.5 \times 10^{-11}$
Pu-244	$8.26 \times 10^7$ a	0.005	$4.0 \times 10^{-6}$	$5.0 \times 10^{-4}$	$4.1 \times 10^{-7}$	$3.2 \times 10^{-7}$	$2.6 \times 10^{-7}$	$2.3 \times 10^{-7}$	$2.3 \times 10^{-7}$	$2.4 \times 10^{-7}$
Pu-245	10.5 h	0.005	$8.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$5.1 \times 10^{-9}$	$2.6 \times 10^{-9}$	$1.5 \times 10^{-9}$	$8.9 \times 10^{-10}$	$8.9 \times 10^{-10}$	$7.2 \times 10^{-10}$
Pu-246	10.9 d	0.005	$3.6 \times 10^{-8}$	$5.0 \times 10^{-4}$	$2.3 \times 10^{-8}$	$1.2 \times 10^{-8}$	$7.1 \times 10^{-9}$	$4.1 \times 10^{-9}$	$4.1 \times 10^{-9}$	$3.3 \times 10^{-9}$
<b>Americium</b>										
Am-237	1.22 h	0.005	$1.7 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.0 \times 10^{-10}$	$5.5 \times 10^{-11}$	$3.3 \times 10^{-11}$	$2.2 \times 10^{-11}$	$2.2 \times 10^{-11}$	$1.8 \times 10^{-11}$
Am-238	1.63 h	0.005	$2.5 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.6 \times 10^{-10}$	$9.1 \times 10^{-11}$	$5.9 \times 10^{-11}$	$4.0 \times 10^{-11}$	$4.0 \times 10^{-11}$	$3.2 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1a$	Age 1-2 $g > 1a$	2-7 a $e(g)$	7-12 a $e(g)$	12-17 a $e(g)$	>17 a $e(g)$
		$f_1$	$e(g)$						
Am-239	11.9 h	0.005	$2.6 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.7 \times 10^{-9}$	$8.4 \times 10^{-10}$	$5.1 \times 10^{-10}$	$3.0 \times 10^{-10}$	$2.4 \times 10^{-10}$
Am-240	2.12 d	0.005	$4.7 \times 10^{-9}$	$5.0 \times 10^{-4}$	$3.3 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.3 \times 10^{-10}$	$5.8 \times 10^{-10}$
Am-241	$4.32 \times 10^2$ a	0.005	$3.7 \times 10^{-6}$	$5.0 \times 10^{-4}$	$3.7 \times 10^{-7}$	$2.7 \times 10^{-7}$	$2.2 \times 10^{-7}$	$2.0 \times 10^{-7}$	$2.0 \times 10^{-7}$
Am-242	16.0 h	0.005	$5.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.2 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.4 \times 10^{-10}$	$3.7 \times 10^{-10}$	$3.0 \times 10^{-10}$
Am-242m	$1.52 \times 10^2$ a	0.005	$3.1 \times 10^{-6}$	$5.0 \times 10^{-4}$	$3.0 \times 10^{-7}$	$2.3 \times 10^{-7}$	$2.0 \times 10^{-7}$	$1.9 \times 10^{-7}$	$1.9 \times 10^{-7}$
Am-243	$7.38 \times 10^3$ a	0.005	$3.6 \times 10^{-6}$	$5.0 \times 10^{-4}$	$3.7 \times 10^{-7}$	$2.7 \times 10^{-7}$	$2.2 \times 10^{-7}$	$2.0 \times 10^{-7}$	$2.0 \times 10^{-7}$
Am-244	10.1 h	0.005	$4.9 \times 10^{-9}$	$5.0 \times 10^{-4}$	$3.1 \times 10^{-9}$	$1.6 \times 10^{-9}$	$9.6 \times 10^{-10}$	$5.8 \times 10^{-10}$	$4.6 \times 10^{-10}$
Am-244m	0.433 h	0.005	$3.7 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.0 \times 10^{-10}$	$9.6 \times 10^{-11}$	$5.5 \times 10^{-11}$	$3.7 \times 10^{-11}$	$2.9 \times 10^{-11}$
Am-245	2.05 h	0.005	$6.8 \times 10^{-10}$	$5.0 \times 10^{-4}$	$4.5 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.3 \times 10^{-10}$	$7.9 \times 10^{-11}$	$6.2 \times 10^{-11}$
Am-246	0.650 h	0.005	$6.7 \times 10^{-10}$	$5.0 \times 10^{-4}$	$3.8 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.1 \times 10^{-10}$	$7.3 \times 10^{-11}$	$5.8 \times 10^{-11}$
Am-246m	0.417 h	0.005	$3.9 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.2 \times 10^{-10}$	$1.1 \times 10^{-10}$	$6.4 \times 10^{-11}$	$4.4 \times 10^{-11}$	$3.4 \times 10^{-11}$
<b>Curium</b>									
Cm-238	2.40 h	0.005	$7.8 \times 10^{-10}$	$5.0 \times 10^{-4}$	$4.9 \times 10^{-10}$	$2.6 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.0 \times 10^{-10}$	$8.0 \times 10^{-11}$
Cm-240	27.0 d	0.005	$2.2 \times 10^{-7}$	$5.0 \times 10^{-4}$	$4.8 \times 10^{-8}$	$2.5 \times 10^{-8}$	$1.5 \times 10^{-8}$	$9.2 \times 10^{-9}$	$7.6 \times 10^{-9}$
Cm-241	32.8 d	0.005	$1.1 \times 10^{-8}$	$5.0 \times 10^{-4}$	$5.7 \times 10^{-9}$	$3.0 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.1 \times 10^{-9}$	$9.1 \times 10^{-10}$
Cm-242	163 d	0.005	$5.9 \times 10^{-7}$	$5.0 \times 10^{-4}$	$7.6 \times 10^{-8}$	$3.9 \times 10^{-8}$	$2.4 \times 10^{-8}$	$1.5 \times 10^{-8}$	$1.2 \times 10^{-8}$
Cm-243	28.5 a	0.005	$3.2 \times 10^{-6}$	$5.0 \times 10^{-4}$	$3.3 \times 10^{-7}$	$2.2 \times 10^{-7}$	$1.6 \times 10^{-7}$	$1.4 \times 10^{-7}$	$1.5 \times 10^{-7}$
Cm-244	18.1 a	0.005	$2.9 \times 10^{-6}$	$5.0 \times 10^{-4}$	$2.9 \times 10^{-7}$	$1.9 \times 10^{-7}$	$1.4 \times 10^{-7}$	$1.2 \times 10^{-7}$	$1.2 \times 10^{-7}$
Cm-245	$8.50 \times 10^3$ a	0.005	$3.7 \times 10^{-6}$	$5.0 \times 10^{-4}$	$3.7 \times 10^{-7}$	$2.8 \times 10^{-7}$	$2.3 \times 10^{-7}$	$2.1 \times 10^{-7}$	$2.1 \times 10^{-7}$
Cm-246	$4.73 \times 10^3$ a	0.005	$3.7 \times 10^{-6}$	$5.0 \times 10^{-4}$	$3.7 \times 10^{-7}$	$2.8 \times 10^{-7}$	$2.2 \times 10^{-7}$	$2.1 \times 10^{-7}$	$2.1 \times 10^{-7}$



Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		f <sub>i</sub> for g > 1 a	Age 1-2		2-7 a		7-12 a		12-17 a		>17 a	
		f <sub>i</sub>	e(g)		g > 1 a	e(g)	e(g)	e(g)	e(g)	e(g)	e(g)	e(g)		
Cm-247	1.56 × 10 <sup>7</sup> a	0.005	3.4 × 10 <sup>-6</sup>	5.0 × 10 <sup>-4</sup>	3.5 × 10 <sup>-7</sup>	2.6 × 10 <sup>-7</sup>	2.1 × 10 <sup>-7</sup>	1.9 × 10 <sup>-7</sup>	1.9 × 10 <sup>-7</sup>	1.9 × 10 <sup>-7</sup>	1.9 × 10 <sup>-7</sup>	1.9 × 10 <sup>-7</sup>	1.9 × 10 <sup>-7</sup>	1.9 × 10 <sup>-7</sup>
Cm-248	3.39 × 10 <sup>5</sup> a	0.005	1.4 × 10 <sup>-5</sup>	5.0 × 10 <sup>-4</sup>	1.4 × 10 <sup>-6</sup>	1.0 × 10 <sup>-6</sup>	8.4 × 10 <sup>-7</sup>	7.7 × 10 <sup>-7</sup>	7.7 × 10 <sup>-7</sup>	7.7 × 10 <sup>-7</sup>	7.7 × 10 <sup>-7</sup>	7.7 × 10 <sup>-7</sup>	7.7 × 10 <sup>-7</sup>	7.7 × 10 <sup>-7</sup>
Cm-249	1.07 h	0.005	3.9 × 10 <sup>-10</sup>	5.0 × 10 <sup>-4</sup>	2.2 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	6.1 × 10 <sup>-11</sup>	4.0 × 10 <sup>-11</sup>	4.0 × 10 <sup>-11</sup>	4.0 × 10 <sup>-11</sup>	4.0 × 10 <sup>-11</sup>	4.0 × 10 <sup>-11</sup>	4.0 × 10 <sup>-11</sup>	3.1 × 10 <sup>-11</sup>
Cm-250	6.90 × 10 <sup>3</sup> a	0.005	7.8 × 10 <sup>-5</sup>	5.0 × 10 <sup>-4</sup>	8.2 × 10 <sup>-6</sup>	6.0 × 10 <sup>-6</sup>	4.9 × 10 <sup>-6</sup>	4.4 × 10 <sup>-6</sup>	4.4 × 10 <sup>-6</sup>	4.4 × 10 <sup>-6</sup>	4.4 × 10 <sup>-6</sup>	4.4 × 10 <sup>-6</sup>	4.4 × 10 <sup>-6</sup>	4.4 × 10 <sup>-6</sup>
<b>Berkelium</b>														
Bk-245	4.94 d	0.005	6.1 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	3.9 × 10 <sup>-9</sup>	2.0 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>	7.2 × 10 <sup>-10</sup>	7.2 × 10 <sup>-10</sup>	7.2 × 10 <sup>-10</sup>	7.2 × 10 <sup>-10</sup>	7.2 × 10 <sup>-10</sup>	7.2 × 10 <sup>-10</sup>	5.7 × 10 <sup>-10</sup>
Bk-246	1.83 d	0.005	3.7 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	2.6 × 10 <sup>-9</sup>	1.4 × 10 <sup>-9</sup>	9.4 × 10 <sup>-10</sup>	6.0 × 10 <sup>-10</sup>	6.0 × 10 <sup>-10</sup>	6.0 × 10 <sup>-10</sup>	6.0 × 10 <sup>-10</sup>	6.0 × 10 <sup>-10</sup>	6.0 × 10 <sup>-10</sup>	4.8 × 10 <sup>-10</sup>
Bk-247	1.38 × 10 <sup>3</sup> a	0.005	8.9 × 10 <sup>-6</sup>	5.0 × 10 <sup>-4</sup>	8.6 × 10 <sup>-7</sup>	6.3 × 10 <sup>-7</sup>	4.6 × 10 <sup>-7</sup>	3.8 × 10 <sup>-7</sup>	3.8 × 10 <sup>-7</sup>	3.8 × 10 <sup>-7</sup>	3.8 × 10 <sup>-7</sup>	3.8 × 10 <sup>-7</sup>	3.8 × 10 <sup>-7</sup>	3.5 × 10 <sup>-7</sup>
Bk-249	320 d	0.005	2.2 × 10 <sup>-8</sup>	5.0 × 10 <sup>-4</sup>	2.9 × 10 <sup>-9</sup>	1.9 × 10 <sup>-9</sup>	1.4 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	9.7 × 10 <sup>-10</sup>
Bk-250	3.22 h	0.005	1.5 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	8.5 × 10 <sup>-10</sup>	4.4 × 10 <sup>-10</sup>	2.7 × 10 <sup>-10</sup>	1.7 × 10 <sup>-10</sup>	1.7 × 10 <sup>-10</sup>	1.7 × 10 <sup>-10</sup>	1.7 × 10 <sup>-10</sup>	1.7 × 10 <sup>-10</sup>	1.7 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>
<b>Californium</b>														
Cf-244	0.323 h	0.005	9.8 × 10 <sup>-10</sup>	5.0 × 10 <sup>-4</sup>	4.8 × 10 <sup>-10</sup>	2.4 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	8.9 × 10 <sup>-11</sup>	8.9 × 10 <sup>-11</sup>	8.9 × 10 <sup>-11</sup>	8.9 × 10 <sup>-11</sup>	8.9 × 10 <sup>-11</sup>	8.9 × 10 <sup>-11</sup>	7.0 × 10 <sup>-11</sup>
Cf-246	1.49 d	0.005	5.0 × 10 <sup>-8</sup>	5.0 × 10 <sup>-4</sup>	2.4 × 10 <sup>-8</sup>	1.2 × 10 <sup>-8</sup>	7.3 × 10 <sup>-9</sup>	4.1 × 10 <sup>-9</sup>	4.1 × 10 <sup>-9</sup>	4.1 × 10 <sup>-9</sup>	4.1 × 10 <sup>-9</sup>	4.1 × 10 <sup>-9</sup>	4.1 × 10 <sup>-9</sup>	3.3 × 10 <sup>-9</sup>
Cf-248	334 d	0.005	1.5 × 10 <sup>-6</sup>	5.0 × 10 <sup>-4</sup>	1.6 × 10 <sup>-7</sup>	9.9 × 10 <sup>-8</sup>	6.0 × 10 <sup>-8</sup>	3.3 × 10 <sup>-8</sup>	3.3 × 10 <sup>-8</sup>	3.3 × 10 <sup>-8</sup>	3.3 × 10 <sup>-8</sup>	3.3 × 10 <sup>-8</sup>	3.3 × 10 <sup>-8</sup>	2.8 × 10 <sup>-8</sup>
Cf-249	3.50 × 10 <sup>2</sup> a	0.005	9.0 × 10 <sup>-6</sup>	5.0 × 10 <sup>-4</sup>	8.7 × 10 <sup>-7</sup>	6.4 × 10 <sup>-7</sup>	4.7 × 10 <sup>-7</sup>	3.8 × 10 <sup>-7</sup>	3.8 × 10 <sup>-7</sup>	3.8 × 10 <sup>-7</sup>	3.8 × 10 <sup>-7</sup>	3.8 × 10 <sup>-7</sup>	3.8 × 10 <sup>-7</sup>	3.5 × 10 <sup>-7</sup>
Cf-250	13.1 a	0.005	5.7 × 10 <sup>-6</sup>	5.0 × 10 <sup>-4</sup>	5.5 × 10 <sup>-7</sup>	3.7 × 10 <sup>-7</sup>	2.3 × 10 <sup>-7</sup>	1.7 × 10 <sup>-7</sup>	1.7 × 10 <sup>-7</sup>	1.7 × 10 <sup>-7</sup>	1.7 × 10 <sup>-7</sup>	1.7 × 10 <sup>-7</sup>	1.7 × 10 <sup>-7</sup>	1.6 × 10 <sup>-7</sup>
Cf-251	8.98 × 10 <sup>2</sup> a	0.005	9.1 × 10 <sup>-6</sup>	5.0 × 10 <sup>-4</sup>	8.8 × 10 <sup>-7</sup>	6.5 × 10 <sup>-7</sup>	4.7 × 10 <sup>-7</sup>	3.9 × 10 <sup>-7</sup>	3.9 × 10 <sup>-7</sup>	3.9 × 10 <sup>-7</sup>	3.9 × 10 <sup>-7</sup>	3.9 × 10 <sup>-7</sup>	3.9 × 10 <sup>-7</sup>	3.6 × 10 <sup>-7</sup>
Cf-252	2.64 a	0.005	5.0 × 10 <sup>-6</sup>	5.0 × 10 <sup>-4</sup>	5.1 × 10 <sup>-7</sup>	3.2 × 10 <sup>-7</sup>	1.9 × 10 <sup>-7</sup>	1.0 × 10 <sup>-7</sup>	1.0 × 10 <sup>-7</sup>	1.0 × 10 <sup>-7</sup>	1.0 × 10 <sup>-7</sup>	1.0 × 10 <sup>-7</sup>	1.0 × 10 <sup>-7</sup>	9.0 × 10 <sup>-8</sup>
Cf-253	17.8 d	0.005	1.0 × 10 <sup>-7</sup>	5.0 × 10 <sup>-4</sup>	1.1 × 10 <sup>-8</sup>	6.0 × 10 <sup>-9</sup>	3.7 × 10 <sup>-9</sup>	1.8 × 10 <sup>-9</sup>	1.8 × 10 <sup>-9</sup>	1.8 × 10 <sup>-9</sup>	1.8 × 10 <sup>-9</sup>	1.8 × 10 <sup>-9</sup>	1.8 × 10 <sup>-9</sup>	1.4 × 10 <sup>-9</sup>

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2		2-7 a		7-12 a		12-17 a		>17 a	
		$f_1$	e(g)		$g > 1$ a	e(g)	e(g)	e(g)	e(g)	e(g)	e(g)	e(g)		
Cf-254	60.5 d	0.005	$1.1 \times 10^{-5}$	$5.0 \times 10^{-4}$	$2.6 \times 10^{-6}$	$1.4 \times 10^{-6}$	$8.4 \times 10^{-7}$	$5.0 \times 10^{-7}$	$4.0 \times 10^{-7}$					
<b>Einsteinium</b>														
Es-250	2.10 h	0.005	$2.3 \times 10^{-10}$	$5.0 \times 10^{-4}$	$9.9 \times 10^{-11}$	$5.7 \times 10^{-11}$	$3.7 \times 10^{-11}$	$2.6 \times 10^{-11}$	$2.1 \times 10^{-11}$					
Es-251	1.38 d	0.005	$1.9 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.2 \times 10^{-9}$	$6.1 \times 10^{-10}$	$3.7 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.7 \times 10^{-10}$					
Es-253	20.5 d	0.005	$1.7 \times 10^{-7}$	$5.0 \times 10^{-4}$	$4.5 \times 10^{-8}$	$2.3 \times 10^{-8}$	$1.4 \times 10^{-8}$	$7.6 \times 10^{-9}$	$6.1 \times 10^{-9}$					
Es-254	276 d	0.005	$1.4 \times 10^{-6}$	$5.0 \times 10^{-4}$	$1.6 \times 10^{-7}$	$9.8 \times 10^{-8}$	$6.0 \times 10^{-8}$	$3.3 \times 10^{-8}$	$2.8 \times 10^{-8}$					
Es-254m	1.64 d	0.005	$5.7 \times 10^{-8}$	$5.0 \times 10^{-4}$	$3.0 \times 10^{-8}$	$1.5 \times 10^{-8}$	$9.1 \times 10^{-9}$	$5.2 \times 10^{-9}$	$4.2 \times 10^{-9}$					
<b>Fermium</b>														
Fm-252	22.7 h	0.005	$3.8 \times 10^{-8}$	$5.0 \times 10^{-4}$	$2.0 \times 10^{-8}$	$9.9 \times 10^{-9}$	$5.9 \times 10^{-9}$	$3.3 \times 10^{-9}$	$2.7 \times 10^{-9}$					
Fm-253	3.00 d	0.005	$2.5 \times 10^{-8}$	$5.0 \times 10^{-4}$	$6.7 \times 10^{-9}$	$3.4 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.1 \times 10^{-9}$	$9.1 \times 10^{-10}$					
Fm-254	3.24 h	0.005	$5.6 \times 10^{-9}$	$5.0 \times 10^{-4}$	$3.2 \times 10^{-9}$	$1.6 \times 10^{-9}$	$9.3 \times 10^{-10}$	$5.6 \times 10^{-10}$	$4.4 \times 10^{-10}$					
Fm-255	20.1 h	0.005	$3.3 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.9 \times 10^{-8}$	$9.5 \times 10^{-9}$	$5.6 \times 10^{-9}$	$3.2 \times 10^{-9}$	$2.5 \times 10^{-9}$					
Fm-257	101 d	0.005	$9.8 \times 10^{-7}$	$5.0 \times 10^{-4}$	$1.1 \times 10^{-7}$	$6.5 \times 10^{-8}$	$4.0 \times 10^{-8}$	$1.9 \times 10^{-8}$	$1.5 \times 10^{-8}$					
<b>Mendelevium</b>														
Md-257	5.20 h	0.005	$3.1 \times 10^{-9}$	$5.0 \times 10^{-4}$	$8.8 \times 10^{-10}$	$4.5 \times 10^{-10}$	$2.7 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.2 \times 10^{-10}$					
Md-258	55.0 d	0.005	$6.3 \times 10^{-7}$	$5.0 \times 10^{-4}$	$8.9 \times 10^{-8}$	$5.0 \times 10^{-8}$	$3.0 \times 10^{-8}$	$1.6 \times 10^{-8}$	$1.3 \times 10^{-8}$					

<sup>a</sup>m and m' denote metastable states of the radionuclide. <sup>b</sup>The metastable state m' is of higher energy than the metastable state m.

<sup>b</sup>The  $f_1$  value for calcium for 1-15 year olds is 0.4.

<sup>c</sup>The  $f_1$  value for iron for 1-15 year olds is 0.2.

<sup>d</sup>The  $f_1$  value for cobalt for 1-15 year olds is 0.3.

<sup>e</sup>The  $f_1$  value for strontium for 1-15 year olds is 0.4.

<sup>f</sup>The  $f_1$  value for barium for 1-15 year olds is 0.3.

<sup>g</sup>The  $f_1$  value for lead for 1-15 year olds is 0.4.

<sup>h</sup>The  $f_1$  value for radium for 1-15 year olds is 0.3.

Note:  $f_1$ : gut transfer factor; e(g): effective dose per unit intake by age group.

Table II.E. Members Of The Public: Committed Effective Dose Per Unit Intake E(G) Via Inhalation

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		f <sub>1</sub> for g > 1 a	Age 1-2 f <sub>1</sub> for	2-7 a e(g)	7-12 a e(g)	12t-17 a e(g)	>17 a e(g)
		Type	f <sub>1</sub>						
Hydrogen	12.3 a	F	1.000	2.6 × 10 <sup>-11</sup>	2.0 × 10 <sup>-11</sup>	1.1 × 10 <sup>-11</sup>	8.2 × 10 <sup>-12</sup>	5.9 × 10 <sup>-12</sup>	6.2 × 10 <sup>-12</sup>
		M	0.200	3.4 × 10 <sup>-10</sup>	2.7 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	8.2 × 10 <sup>-11</sup>	5.3 × 10 <sup>-11</sup>	4.5 × 10 <sup>-11</sup>
		S	0.020	1.2 × 10 <sup>-9</sup>	1.0 × 10 <sup>-9</sup>	6.3 × 10 <sup>-10</sup>	3.8 × 10 <sup>-10</sup>	2.8 × 10 <sup>-10</sup>	2.6 × 10 <sup>-10</sup>
Beryllium	53.3 d	M	0.020	2.5 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	8.3 × 10 <sup>-11</sup>	6.2 × 10 <sup>-11</sup>	5.0 × 10 <sup>-11</sup>
		S	0.020	2.8 × 10 <sup>-10</sup>	2.4 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	9.6 × 10 <sup>-11</sup>	6.8 × 10 <sup>-11</sup>	5.5 × 10 <sup>-11</sup>
		M	0.020	4.1 × 10 <sup>-8</sup>	3.4 × 10 <sup>-8</sup>	2.0 × 10 <sup>-8</sup>	1.3 × 10 <sup>-8</sup>	1.1 × 10 <sup>-8</sup>	9.6 × 10 <sup>-9</sup>
Carbon	1.60 × 10 <sup>6</sup> a	S	0.020	9.9 × 10 <sup>-8</sup>	9.1 × 10 <sup>-8</sup>	6.1 × 10 <sup>-8</sup>	4.2 × 10 <sup>-8</sup>	3.7 × 10 <sup>-8</sup>	3.5 × 10 <sup>-8</sup>
		F	1.000	1.0 × 10 <sup>-10</sup>	7.0 × 10 <sup>-11</sup>	3.2 × 10 <sup>-11</sup>	2.1 × 10 <sup>-11</sup>	1.3 × 10 <sup>-11</sup>	1.1 × 10 <sup>-11</sup>
		M	0.200	1.5 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	4.9 × 10 <sup>-11</sup>	3.2 × 10 <sup>-11</sup>	2.1 × 10 <sup>-11</sup>	1.8 × 10 <sup>-11</sup>
C-11	0.340 h	S	0.020	1.6 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	5.1 × 10 <sup>-11</sup>	3.3 × 10 <sup>-11</sup>	2.2 × 10 <sup>-11</sup>	1.8 × 10 <sup>-11</sup>
		F	1.000	6.1 × 10 <sup>-10</sup>	6.7 × 10 <sup>-10</sup>	3.6 × 10 <sup>-10</sup>	2.9 × 10 <sup>-10</sup>	1.9 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>
		F	1.000	6.1 × 10 <sup>-10</sup>	6.7 × 10 <sup>-10</sup>	3.6 × 10 <sup>-10</sup>	2.9 × 10 <sup>-10</sup>	1.9 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>
C-14	5.73 × 10 <sup>3</sup> a	M	0.200	8.3 × 10 <sup>-9</sup>	6.6 × 10 <sup>-9</sup>	4.0 × 10 <sup>-9</sup>	2.8 × 10 <sup>-9</sup>	2.5 × 10 <sup>-9</sup>	2.0 × 10 <sup>-9</sup>
		S	0.020	1.9 × 10 <sup>-8</sup>	1.7 × 10 <sup>-8</sup>	1.1 × 10 <sup>-8</sup>	7.4 × 10 <sup>-9</sup>	6.4 × 10 <sup>-9</sup>	5.8 × 10 <sup>-9</sup>
		F	1.000	2.6 × 10	1.9 × 10 <sup>-10</sup>	9.1 × 10 <sup>-11</sup>	5.6 × 10 <sup>-11</sup>	3.4 × 10 <sup>-11</sup>	2.8 × 10 <sup>-11</sup>
Fluorine	1.83 h	M	1.000	4.1 × 10 <sup>-10</sup>	2.9 × 10 <sup>-10</sup>	1.5 × 10 <sup>-10</sup>	9.7 × 10 <sup>-11</sup>	6.9 × 10 <sup>-11</sup>	5.6 × 10 <sup>-11</sup>
		S	1.000	4.2 × 10 <sup>-10</sup>	3.1 × 10 <sup>-10</sup>	1.5 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>	7.3 × 10 <sup>-11</sup>	5.9 × 10 <sup>-11</sup>
		F	1.000	2.6 × 10	1.9 × 10 <sup>-10</sup>	9.1 × 10 <sup>-11</sup>	5.6 × 10 <sup>-11</sup>	3.4 × 10 <sup>-11</sup>	2.8 × 10 <sup>-11</sup>

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$						
<b>Sodium</b>									
Na-22	2.60 a	F	1.000	1.000	$7.3 \times 10^{-9}$	$3.8 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.3 \times 10^{-9}$
Na-24	15.0 h	F	1.000	1.000	$1.8 \times 10^{-9}$	$9.3 \times 10^{-10}$	$5.7 \times 10^{-10}$	$3.4 \times 10^{-10}$	$2.7 \times 10^{-10}$
<b>Magnesium</b>									
Mg-28	20.9 h	F	1.000	0.500	$4.7 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.3 \times 10^{-9}$	$7.3 \times 10^{-10}$	$6.0 \times 10^{-10}$
<b>Aluminium</b>									
Al-26	$7.16 \times 10^5$ a	F	0.020	0.010	$6.2 \times 10^{-8}$	$3.2 \times 10^{-8}$	$2.0 \times 10^{-8}$	$1.3 \times 10^{-8}$	$1.1 \times 10^{-8}$
<b>Silicon</b>									
Si-31	2.62 h	F	0.020	0.010	$2.3 \times 10^{-10}$	$9.5 \times 10^{-11}$	$5.9 \times 10^{-11}$	$3.2 \times 10^{-11}$	$2.7 \times 10^{-11}$
<b>Si-32</b>									
	$4.50 \times 10^2$ a	F	0.020	0.010	$4.4 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.3 \times 10^{-10}$	$8.9 \times 10^{-11}$	$7.4 \times 10^{-11}$
		S	0.020	0.010	$4.7 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.4 \times 10^{-10}$	$9.5 \times 10^{-11}$	$7.9 \times 10^{-11}$
		F	0.02	0.010	$2.3 \times 10^{-8}$	$1.1 \times 10^{-8}$	$6.4 \times 10^{-9}$	$3.8 \times 10^{-9}$	$3.2 \times 10^{-9}$
		M	0.02	0.010	$6.0 \times 10^{-8}$	$3.6 \times 10^{-8}$	$2.4 \times 10^{-8}$	$1.9 \times 10^{-8}$	$1.7 \times 10^{-8}$
		S	0.02	0.010	$2.7 \times 10^{-7}$	$1.9 \times 10^{-7}$	$1.3 \times 10^{-7}$	$1.1 \times 10^{-7}$	$1.1 \times 10^{-7}$
<b>Phosphorus</b>									
P-32	14.3 d	F	1	0.800	$7.5 \times 10^{-9}$	$3.2 \times 10^{-9}$	$1.8 \times 10^{-9}$	$9.8 \times 10^{-10}$	$7.7 \times 10^{-10}$
		M	1	0.800	$1.5 \times 10^{-8}$	$8.0 \times 10^{-9}$	$5.3 \times 10^{-9}$	$4.0 \times 10^{-9}$	$3.4 \times 10^{-9}$
P-33	25.4 d	F	1	0.800	$7.8 \times 10^{-10}$	$3.0 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.1 \times 10^{-10}$	$9.2 \times 10^{-11}$
<b>Sulphur</b>									
S-35	87.4 d	F	1.000	0.800	$4.6 \times 10^{-9}$	$2.8 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.5 \times 10^{-9}$
		F	1.000	0.800	$3.9 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.1 \times 10^{-10}$	$6.0 \times 10^{-11}$	$5.1 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$	
		Type	$f_1$							$e(g)$
(inorganic)		M	0.200	$5.9 \times 10^{-9}$	0.100	$4.5 \times 10^{-9}$	$2.8 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.4 \times 10^{-9}$
		S	0.020	$7.7 \times 10^{-9}$	0.010	$6.0 \times 10^{-9}$	$3.6 \times 10^{-9}$	$2.6 \times 10^{-9}$	$2.3 \times 10^{-9}$	$1.9 \times 10^{-9}$
<b>Chlorine</b>										
Cl-36	$3.01 \times 10^5$ a	F	1.000	$3.9 \times 10^{-9}$	1.000	$2.6 \times 10^{-9}$	$1.1 \times 10^{-9}$	$7.1 \times 10^{-10}$	$3.9 \times 10^{-10}$	$3.3 \times 10^{-10}$
		M	1.000	$3.1 \times 10^{-8}$	1.000	$2.6 \times 10^{-8}$	$2.6 \times 10^{-8}$	$1.5 \times 10^{-8}$	$8.8 \times 10^{-9}$	$7.3 \times 10^{-9}$
Cl-38	0.620 h	F	1.000	$2.9 \times 10^{-10}$	1.000	$1.9 \times 10^{-10}$	$8.4 \times 10^{-11}$	$5.1 \times 10^{-11}$	$3.0 \times 10^{-11}$	$2.5 \times 10^{-11}$
		M	1.000	$4.7 \times 10^{-10}$	1.000	$3.0 \times 10^{-10}$	$1.4 \times 10^{-10}$	$8.5 \times 10^{-11}$	$5.4 \times 10^{-11}$	$4.5 \times 10^{-11}$
Cl-39	0.927 h	F	1.000	$2.7 \times 10^{-10}$	1.000	$1.8 \times 10^{-10}$	$8.4 \times 10^{-11}$	$5.1 \times 10^{-11}$	$3.1 \times 10^{-11}$	$2.5 \times 10^{-11}$
		M	1.000	$4.3 \times 10^{-10}$	1.000	$2.8 \times 10^{-10}$	$1.3 \times 10^{-10}$	$8.5 \times 10^{-11}$	$5.6 \times 10^{-11}$	$4.6 \times 10^{-11}$
<b>Potassium</b>										
K-40	$1.28 \times 10^9$ a	F	1.000	$2.4 \times 10^{-8}$	1.000	$1.7 \times 10^{-8}$	$7.5 \times 10^{-9}$	$4.5 \times 10^{-9}$	$2.5 \times 10^{-9}$	$2.1 \times 10^{-9}$
K-42	12.4 h	F	1.000	$1.6 \times 10^{-9}$	1.000	$1.0 \times 10^{-9}$	$4.4 \times 10^{-10}$	$2.6 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.2 \times 10^{-10}$
K-43	22.6 h	F	1.000	$1.3 \times 10^{-9}$	1.000	$9.7 \times 10^{-10}$	$4.7 \times 10^{-10}$	$2.9 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.4 \times 10^{-10}$
K-44	0.369 h	F	1.000	$2.2 \times 10^{-10}$	1.000	$1.4 \times 10^{-10}$	$6.5 \times 10^{-11}$	$4.0 \times 10^{-11}$	$2.4 \times 10^{-11}$	$2.0 \times 10^{-11}$
K-45	0.333 h	F	1.000	$1.5 \times 10^{-10}$	1.000	$1.0 \times 10^{-10}$	$4.8 \times 10^{-11}$	$3.0 \times 10^{-11}$	$1.8 \times 10^{-11}$	$1.5 \times 10^{-11}$
<b>Calcium<sup>b</sup></b>										
Ca-41	$1.40 \times 10^5$ a	F	0.600	$6.7 \times 10^{-10}$	0.300	$3.8 \times 10^{-10}$	$2.6 \times 10^{-10}$	$3.3 \times 10^{-10}$	$3.3 \times 10^{-10}$	$1.7 \times 10^{-10}$
		M	0.200	$4.2 \times 10^{-10}$	0.100	$2.6 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.6 \times 10^{-10}$	$9.5 \times 10^{-11}$
		S	0.020	$6.7 \times 10^{-10}$	0.010	$6.0 \times 10^{-10}$	$3.8 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.8 \times 10^{-10}$
Ca-45	163 d	F	0.600	$5.7 \times 10^{-9}$	0.300	$3.0 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.0 \times 10^{-9}$	$7.6 \times 10^{-10}$	$4.6 \times 10^{-10}$
		M	0.200	$1.2 \times 10^{-8}$	0.100	$8.8 \times 10^{-9}$	$5.3 \times 10^{-9}$	$3.9 \times 10^{-9}$	$3.5 \times 10^{-9}$	$2.7 \times 10^{-9}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$	
		Type	$f_1$							$e(g)$
Ca-47	4.53 d	S	0.020	$1.5 \times 10^{-8}$	0.010	$1.2 \times 10^{-8}$	$5.1 \times 10^{-9}$	$4.6 \times 10^{-9}$	$3.7 \times 10^{-9}$	
		F	0.600	$4.9 \times 10^{-9}$	0.300	$3.6 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.1 \times 10^{-10}$	$5.5 \times 10^{-10}$
		M	0.200	$1.0 \times 10^{-8}$	0.100	$7.7 \times 10^{-9}$	$4.2 \times 10^{-9}$	$2.9 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.9 \times 10^{-9}$
		S	0.020	$1.2 \times 10^{-8}$	0.010	$8.5 \times 10^{-9}$	$4.6 \times 10^{-9}$	$3.3 \times 10^{-9}$	$2.6 \times 10^{-9}$	$2.1 \times 10^{-9}$
<b>Scandium</b>										
Sc-43	3.89 h	S	0.001	$9.3 \times 10^{-10}$	$1.0 \times 10^{-4}$	$6.7 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.1 \times 10^{-10}$	
Sc-44	3.93 h	S	0.001	$1.6 \times 10^{-9}$	$1.0 \times 10^{-4}$	$1.2 \times 10^{-9}$	$3.6 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.8 \times 10^{-10}$	
Sc-44m	2.44 d	S	0.001	$1.1 \times 10^{-8}$	$1.0 \times 10^{-4}$	$8.4 \times 10^{-9}$	$4.2 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.4 \times 10^{-9}$	
Sc-46	83.8 d	S	0.001	$2.8 \times 10^{-8}$	$1.0 \times 10^{-4}$	$2.3 \times 10^{-8}$	$1.4 \times 10^{-8}$	$8.4 \times 10^{-9}$	$6.8 \times 10^{-9}$	
Sc-47	3.35 d	S	0.001	$4.0 \times 10^{-9}$	$1.0 \times 10^{-4}$	$2.8 \times 10^{-9}$	$1.5 \times 10^{-9}$	$9.2 \times 10^{-10}$	$7.3 \times 10^{-10}$	
Sc-48	1.82 d	S	0.001	$7.8 \times 10^{-9}$	$1.0 \times 10^{-4}$	$5.9 \times 10^{-9}$	$3.1 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.1 \times 10^{-9}$	
Sc-49	0.956 h	S	0.001	$3.9 \times 10^{-10}$	$1.0 \times 10^{-4}$	$2.4 \times 10^{-10}$	$1.1 \times 10^{-10}$	$4.7 \times 10^{-11}$	$4.0 \times 10^{-11}$	
<b>Titanium</b>										
Ti-44	47.3 a	F	0.020	$3.1 \times 10^{-7}$	0.010	$2.6 \times 10^{-7}$	$1.5 \times 10^{-7}$	$6.6 \times 10^{-8}$	$6.1 \times 10^{-8}$	
		M	0.020	$1.7 \times 10^{-7}$	0.010	$1.5 \times 10^{-7}$	$9.2 \times 10^{-8}$	$4.6 \times 10^{-8}$	$4.2 \times 10^{-8}$	
		S	0.020	$3.2 \times 10^{-7}$	0.010	$3.1 \times 10^{-7}$	$2.1 \times 10^{-7}$	$1.3 \times 10^{-7}$	$1.2 \times 10^{-7}$	
Ti-45	3.08 h	F	0.020	$4.4 \times 10^{-10}$	0.010	$3.2 \times 10^{-10}$	$1.5 \times 10^{-10}$	$5.1 \times 10^{-11}$	$4.2 \times 10^{-11}$	
		M	0.020	$7.4 \times 10^{-10}$	0.010	$5.2 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.1 \times 10^{-10}$	$8.8 \times 10^{-11}$	
		S	0.020	$7.7 \times 10^{-10}$	0.010	$5.5 \times 10^{-10}$	$2.7 \times 10^{-10}$	$1.1 \times 10^{-10}$	$9.3 \times 10^{-11}$	
<b>Vanadium</b>										
V-47	0.543 h	F	0.020	$1.8 \times 10^{-10}$	0.010	$1.2 \times 10^{-10}$	$5.6 \times 10^{-11}$	$2.1 \times 10^{-11}$	$1.7 \times 10^{-11}$	
		M	0.020	$2.8 \times 10^{-10}$	0.010	$1.9 \times 10^{-10}$	$8.6 \times 10^{-11}$	$3.5 \times 10^{-11}$	$2.9 \times 10^{-11}$	

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2	2-7 a	7-12 a	12t-17 a	>17 a
		Type	f <sub>1</sub>					
V-48	16.2 d	F	0.020	8.4 × 10 <sup>-9</sup>	6.4 × 10 <sup>-9</sup>	2.1 × 10 <sup>-9</sup>	1.3 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>
		M	0.020	1.4 × 10 <sup>-8</sup>	1.1 × 10 <sup>-8</sup>	6.3 × 10 <sup>-9</sup>	4.3 × 10 <sup>-9</sup>	2.9 × 10 <sup>-9</sup>
V-49	330 d	F	0.020	2.0 × 10 <sup>-10</sup>	1.6 × 10 <sup>-10</sup>	4.3 × 10 <sup>-11</sup>	2.5 × 10 <sup>-11</sup>	2.1 × 10 <sup>-11</sup>
		M	0.020	2.8 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	6.3 × 10 <sup>-11</sup>	4.0 × 10 <sup>-11</sup>
<b>Chromium</b>								
Cr-48	23.0 h	F	0.200	7.6 × 10 <sup>-10</sup>	6.0 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	9.9 × 10 <sup>-11</sup>
		M	0.200	1.1 × 10 <sup>-9</sup>	9.1 × 10 <sup>-10</sup>	3.4 × 10 <sup>-10</sup>	2.5 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>
Cr-49	0.702 h	S	0.200	1.2 × 10 <sup>-9</sup>	9.8 × 10 <sup>-10</sup>	3.7 × 10 <sup>-10</sup>	2.8 × 10 <sup>-10</sup>	2.2 × 10 <sup>-10</sup>
		F	0.200	1.9 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	6.0 × 10 <sup>-11</sup>	2.2 × 10 <sup>-11</sup>	1.9 × 10 <sup>-11</sup>
		M	0.200	3.0 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	9.5 × 10 <sup>-11</sup>	4.0 × 10 <sup>-11</sup>	3.3 × 10 <sup>-11</sup>
		S	0.200	3.1 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>	9.9 × 10 <sup>-11</sup>	6.4 × 10 <sup>-11</sup>	3.5 × 10 <sup>-11</sup>
Cr-51	27.7 d	F	0.200	1.7 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	4.0 × 10 <sup>-11</sup>	2.4 × 10 <sup>-11</sup>	2.0 × 10 <sup>-11</sup>
		M	0.200	2.6 × 10 <sup>-10</sup>	1.9 × 10 <sup>-10</sup>	6.4 × 10 <sup>-11</sup>	3.9 × 10 <sup>-11</sup>	3.2 × 10 <sup>-11</sup>
		S	0.200	2.6 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>	6.6 × 10 <sup>-11</sup>	3.7 × 10 <sup>-11</sup>
<b>Manganese</b>								
Mn-51	0.770 h	F	0.200	2.5 × 10 <sup>-10</sup>	1.7 × 10 <sup>-10</sup>	4.6 × 10 <sup>-11</sup>	2.7 × 10 <sup>-11</sup>	2.3 × 10 <sup>-11</sup>
		M	0.200	4.0 × 10 <sup>-10</sup>	2.7 × 10 <sup>-10</sup>	7.8 × 10 <sup>-11</sup>	5.0 × 10 <sup>-11</sup>	4.1 × 10 <sup>-11</sup>
Mn-52	5.59 d	F	0.200	7.0 × 10 <sup>-9</sup>	5.5 × 10 <sup>-9</sup>	1.8 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	9.4 × 10 <sup>-10</sup>
		M	0.200	8.6 × 10 <sup>-9</sup>	6.8 × 10 <sup>-9</sup>	3.7 × 10 <sup>-9</sup>	2.4 × 10 <sup>-9</sup>	1.4 × 10 <sup>-9</sup>
Mn-52m	0.352 h	F	0.200	1.9 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	3.8 × 10 <sup>-11</sup>	2.2 × 10 <sup>-11</sup>	1.9 × 10 <sup>-11</sup>
		M	0.200	2.8 × 10 <sup>-10</sup>	1.9 × 10 <sup>-10</sup>	8.7 × 10 <sup>-11</sup>	3.4 × 10 <sup>-11</sup>	2.9 × 10 <sup>-11</sup>

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2	2-7 a	7-12 a	12t-17 a	>17 a				
		Type	$f_1$						$e(g)$	$f_1$ for $g > 1 a$	$e(g)$	$e(g)$
Mn-53	$3.70 \times 10^6 a$	F	0.200	$3.2 \times 10^{-10}$	0.100	$2.2 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.1 \times 10^{-10}$	$6.0 \times 10^{-11}$	$3.4 \times 10^{-11}$	$3.4 \times 10^{-11}$	$2.9 \times 10^{-11}$
		M	0.200	$4.6 \times 10^{-10}$	0.100	$3.4 \times 10^{-10}$	$1.0 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.0 \times 10^{-10}$	$6.4 \times 10^{-11}$	$6.4 \times 10^{-11}$	$5.4 \times 10^{-11}$
Mn-54	312 d	F	0.200	$5.2 \times 10^{-9}$	0.100	$4.1 \times 10^{-9}$	$2.2 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.5 \times 10^{-9}$	$9.9 \times 10^{-10}$	$9.9 \times 10^{-10}$	$8.5 \times 10^{-10}$
		M	0.200	$7.5 \times 10^{-9}$	0.100	$6.2 \times 10^{-9}$	$3.8 \times 10^{-9}$	$3.8 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.5 \times 10^{-9}$
Mn-56	2.58 h	M	0.200	$6.9 \times 10^{-10}$	0.100	$4.9 \times 10^{-10}$	$2.3 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.4 \times 10^{-10}$	$7.8 \times 10^{-11}$	$7.8 \times 10^{-11}$	$6.4 \times 10^{-11}$
		M	0.200	$1.1 \times 10^{-9}$	0.100	$7.8 \times 10^{-10}$	$3.7 \times 10^{-10}$	$3.7 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.2 \times 10^{-10}$
<b>Ironc</b>												
Fe-52	8.28 h	F	0.600	$5.2 \times 10^{-9}$	0.100	$3.6 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.5 \times 10^{-9}$	$8.9 \times 10^{-10}$	$4.9 \times 10^{-10}$	$4.9 \times 10^{-10}$	$3.9 \times 10^{-10}$
		M	0.200	$5.8 \times 10^{-9}$	0.100	$4.1 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.4 \times 10^{-10}$	$7.4 \times 10^{-10}$	$6.0 \times 10^{-10}$
		S	0.020	$6.0 \times 10^{-9}$	0.010	$4.2 \times 10^{-9}$	$2.0 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.3 \times 10^{-9}$	$7.7 \times 10^{-10}$	$7.7 \times 10^{-10}$	$6.3 \times 10^{-10}$
Fe-55	2.70 a	F	0.600	$4.2 \times 10^{-9}$	0.100	$3.2 \times 10^{-9}$	$2.2 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.4 \times 10^{-9}$	$9.4 \times 10^{-10}$	$9.4 \times 10^{-10}$	$7.7 \times 10^{-10}$
		M	0.200	$1.9 \times 10^{-9}$	0.100	$1.4 \times 10^{-9}$	$9.9 \times 10^{-10}$	$9.9 \times 10^{-10}$	$6.2 \times 10^{-10}$	$4.4 \times 10^{-10}$	$4.4 \times 10^{-10}$	$3.8 \times 10^{-10}$
		S	0.020	$1.0 \times 10^{-9}$	0.010	$8.5 \times 10^{-10}$	$5.0 \times 10^{-10}$	$5.0 \times 10^{-10}$	$2.9 \times 10^{-10}$	$2.0 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.8 \times 10^{-10}$
Fe-59	44.5 d	F	0.600	$2.1 \times 10^{-8}$	0.100	$1.3 \times 10^{-8}$	$7.1 \times 10^{-9}$	$7.1 \times 10^{-9}$	$4.2 \times 10^{-9}$	$2.6 \times 10^{-9}$	$2.6 \times 10^{-9}$	$2.2 \times 10^{-9}$
		M	0.200	$1.8 \times 10^{-8}$	0.100	$1.3 \times 10^{-8}$	$7.9 \times 10^{-9}$	$7.9 \times 10^{-9}$	$5.5 \times 10^{-9}$	$4.6 \times 10^{-9}$	$4.6 \times 10^{-9}$	$3.7 \times 10^{-9}$
		S	0.020	$1.7 \times 10^{-8}$	0.010	$1.3 \times 10^{-8}$	$8.1 \times 10^{-9}$	$8.1 \times 10^{-9}$	$5.8 \times 10^{-9}$	$5.1 \times 10^{-9}$	$5.1 \times 10^{-9}$	$4.0 \times 10^{-9}$
Fe-60	$1.00 \times 10^5 a$	F	0.600	$4.4 \times 10^{-7}$	0.100	$3.9 \times 10^{-7}$	$3.5 \times 10^{-7}$	$3.5 \times 10^{-7}$	$3.2 \times 10^{-7}$	$2.9 \times 10^{-7}$	$2.9 \times 10^{-7}$	$2.8 \times 10^{-7}$
		M	0.200	$2.0 \times 10^{-7}$	0.100	$1.7 \times 10^{-7}$	$1.6 \times 10^{-7}$	$1.6 \times 10^{-7}$	$1.4 \times 10^{-7}$	$1.4 \times 10^{-7}$	$1.4 \times 10^{-7}$	$1.4 \times 10^{-7}$
		S	0.020	$9.3 \times 10^{-8}$	0.010	$8.8 \times 10^{-8}$	$6.7 \times 10^{-8}$	$6.7 \times 10^{-8}$	$5.2 \times 10^{-8}$	$4.9 \times 10^{-8}$	$4.9 \times 10^{-8}$	$4.9 \times 10^{-8}$
<b>Cobalt<sup>d</sup></b>												
Co-55	17.5 h	F	0.600	$2.2 \times 10^{-9}$	0.100	$1.8 \times 10^{-9}$	$9.0 \times 10^{-10}$	$9.0 \times 10^{-10}$	$5.5 \times 10^{-10}$	$3.1 \times 10^{-10}$	$3.1 \times 10^{-10}$	$2.7 \times 10^{-10}$



Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1a$	Age 1-2 $f_1$ for	2-7 a e(g)	7-12 a e(g)	12t-17 a e(g)	>17 a e(g)
		Type	$f_1$						
Co-56	78.7 d	M	0.200	$4.1 \times 10^{-9}$	0.100	$1.5 \times 10^{-9}$	$9.8 \times 10^{-10}$	$6.1 \times 10^{-10}$	$5.0 \times 10^{-10}$
		S	0.020	$4.6 \times 10^{-9}$	0.010	$3.3 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.6 \times 10^{-10}$
Co-57	271 d	F	0.600	$1.4 \times 10^{-8}$	0.100	$5.5 \times 10^{-9}$	$3.5 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.8 \times 10^{-9}$
		M	0.200	$2.5 \times 10^{-8}$	0.100	$2.1 \times 10^{-8}$	$7.4 \times 10^{-9}$	$5.8 \times 10^{-9}$	$4.8 \times 10^{-9}$
Co-58	70.8 d	S	0.020	$2.9 \times 10^{-8}$	0.010	$1.5 \times 10^{-8}$	$1.0 \times 10^{-8}$	$8.0 \times 10^{-9}$	$6.7 \times 10^{-9}$
		F	0.600	$1.5 \times 10^{-9}$	0.100	$1.1 \times 10^{-9}$	$3.7 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.9 \times 10^{-10}$
Co-58m	9.15 h	M	0.200	$2.8 \times 10^{-9}$	0.100	$2.2 \times 10^{-9}$	$8.5 \times 10^{-10}$	$6.7 \times 10^{-10}$	$5.5 \times 10^{-10}$
		S	0.020	$4.4 \times 10^{-9}$	0.010	$3.7 \times 10^{-9}$	$2.3 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.0 \times 10^{-9}$
Co-60	5.27 a	F	0.600	$4.0 \times 10^{-9}$	0.100	$1.6 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.4 \times 10^{-10}$	$5.3 \times 10^{-10}$
		M	0.200	$7.3 \times 10^{-9}$	0.100	$6.5 \times 10^{-9}$	$3.5 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.6 \times 10^{-9}$
Co-60m	0.174 h	S	0.020	$9.0 \times 10^{-9}$	0.010	$7.5 \times 10^{-9}$	$4.5 \times 10^{-9}$	$2.6 \times 10^{-9}$	$2.1 \times 10^{-9}$
		F	0.600	$4.8 \times 10^{-11}$	0.100	$3.6 \times 10^{-11}$	$1.7 \times 10^{-11}$	$5.9 \times 10^{-12}$	$5.2 \times 10^{-12}$
Co-61	1.65 h	M	0.200	$1.1 \times 10^{-10}$	0.100	$7.6 \times 10^{-11}$	$3.8 \times 10^{-11}$	$1.6 \times 10^{-11}$	$1.3 \times 10^{-11}$
		S	0.020	$1.3 \times 10^{-10}$	0.010	$9.0 \times 10^{-11}$	$4.5 \times 10^{-11}$	$2.0 \times 10^{-11}$	$1.7 \times 10^{-11}$
Co-61	1.65 h	F	0.600	$3.0 \times 10^{-8}$	0.100	$2.3 \times 10^{-8}$	$1.4 \times 10^{-8}$	$8.9 \times 10^{-9}$	$5.2 \times 10^{-9}$
		M	0.200	$4.2 \times 10^{-8}$	0.100	$3.4 \times 10^{-8}$	$2.1 \times 10^{-8}$	$1.5 \times 10^{-8}$	$1.0 \times 10^{-8}$
Co-61	1.65 h	S	0.020	$9.2 \times 10^{-8}$	0.010	$8.6 \times 10^{-8}$	$5.9 \times 10^{-8}$	$4.0 \times 10^{-8}$	$3.1 \times 10^{-8}$
		F	0.600	$4.4 \times 10^{-12}$	0.100	$2.8 \times 10^{-12}$	$1.5 \times 10^{-12}$	$1.0 \times 10^{-12}$	$8.3 \times 10^{-13}$
Co-61	1.65 h	M	0.200	$7.1 \times 10^{-12}$	0.100	$4.7 \times 10^{-12}$	$2.7 \times 10^{-12}$	$1.8 \times 10^{-12}$	$1.2 \times 10^{-12}$
		S	0.020	$7.6 \times 10^{-12}$	0.010	$5.1 \times 10^{-12}$	$2.9 \times 10^{-12}$	$2.0 \times 10^{-12}$	$1.4 \times 10^{-12}$
Co-61	1.65 h	F	0.600	$2.1 \times 10^{-10}$	0.100	$1.4 \times 10^{-10}$	$6.0 \times 10^{-11}$	$3.8 \times 10^{-11}$	$2.2 \times 10^{-11}$
		M	0.200	$2.1 \times 10^{-10}$	0.100	$1.4 \times 10^{-10}$	$6.0 \times 10^{-11}$	$3.8 \times 10^{-11}$	$2.2 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a			Age 1-2 $f_1$ for $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$	
		Type	$f_1$	$e(g)$						
Co-62m	0.232 h	M	0.200	$4.0 \times 10^{-10}$	0.100	$1.2 \times 10^{-10}$	$8.2 \times 10^{-11}$	$5.7 \times 10^{-11}$	$4.7 \times 10^{-11}$	
		S	0.020	$4.3 \times 10^{-10}$	0.010	$1.3 \times 10^{-10}$	$8.8 \times 10^{-11}$	$6.1 \times 10^{-11}$	$5.1 \times 10^{-11}$	
		F	0.600	$1.4 \times 10^{-10}$	0.100	$4.5 \times 10^{-11}$	$2.8 \times 10^{-11}$	$1.7 \times 10^{-11}$	$1.4 \times 10^{-11}$	
		M	0.200	$1.9 \times 10^{-10}$	0.100	$1.3 \times 10^{-10}$	$3.8 \times 10^{-11}$	$2.4 \times 10^{-11}$	$2.0 \times 10^{-11}$	
		S	0.020	$2.0 \times 10^{-10}$	0.100	$1.3 \times 10^{-10}$	$6.3 \times 10^{-11}$	$4.0 \times 10^{-11}$	$2.5 \times 10^{-11}$	$2.1 \times 10^{-11}$
<b>Nickel</b>										
Ni-56	6.10 d	F	0.100	$3.3 \times 10^{-9}$	0.050	$1.5 \times 10^{-9}$	$9.3 \times 10^{-10}$	$5.8 \times 10^{-10}$	$4.9 \times 10^{-10}$	
		M	0.100	$4.9 \times 10^{-9}$	0.050	$2.3 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.1 \times 10^{-9}$	$8.7 \times 10^{-10}$	
		S	0.020	$5.5 \times 10^{-9}$	0.010	$4.6 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.0 \times 10^{-9}$	
Ni-57	1.50 d	F	0.100	$2.2 \times 10^{-9}$	0.050	$8.9 \times 10^{-10}$	$5.5 \times 10^{-10}$	$3.1 \times 10^{-10}$	$2.5 \times 10^{-10}$	
		M	0.100	$3.6 \times 10^{-9}$	0.050	$2.8 \times 10^{-9}$	$9.5 \times 10^{-10}$	$6.2 \times 10^{-10}$	$5.0 \times 10^{-10}$	
		S	0.020	$3.9 \times 10^{-9}$	0.010	$3.0 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.6 \times 10^{-10}$	$5.3 \times 10^{-10}$	
Ni-59	$7.50 \times 10^4$ a	F	0.100	$9.6 \times 10^{-10}$	0.050	$4.5 \times 10^{-10}$	$2.8 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.8 \times 10^{-10}$	
		M	0.100	$7.9 \times 10^{-10}$	0.050	$3.4 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.3 \times 10^{-10}$	
		S	0.020	$1.7 \times 10^{-9}$	0.010	$1.5 \times 10^{-9}$	$9.5 \times 10^{-10}$	$4.6 \times 10^{-10}$	$4.4 \times 10^{-10}$	
Ni-63	96.0 a	F	0.100	$2.3 \times 10^{-9}$	0.050	$1.1 \times 10^{-9}$	$6.7 \times 10^{-10}$	$4.6 \times 10^{-10}$	$4.4 \times 10^{-10}$	
		M	0.100	$2.5 \times 10^{-9}$	0.050	$1.1 \times 10^{-9}$	$7.0 \times 10^{-10}$	$5.3 \times 10^{-10}$	$4.8 \times 10^{-10}$	
		S	0.020	$4.8 \times 10^{-9}$	0.010	$4.3 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.3 \times 10^{-9}$	
Ni-65	2.52 h	F	0.100	$4.4 \times 10^{-10}$	0.050	$1.4 \times 10^{-10}$	$8.5 \times 10^{-11}$	$4.9 \times 10^{-11}$	$4.1 \times 10^{-11}$	
		M	0.100	$7.7 \times 10^{-10}$	0.050	$2.4 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.0 \times 10^{-10}$	$8.5 \times 10^{-11}$	
		S	0.020	$8.1 \times 10^{-10}$	0.010	$2.6 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.1 \times 10^{-10}$	$9.0 \times 10^{-11}$	

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2	2-7 a	7-12 a	12t-17 a	>17 a		
		Type	f <sub>1</sub>						e(g)	f <sub>1</sub> for g > 1 a
Ni-66	2.27 d	F	0.100	5.7 × 10 <sup>-9</sup>	0.050	3.8 × 10 <sup>-9</sup>	1.6 × 10 <sup>-9</sup>	1.0 × 10 <sup>-9</sup>	5.1 × 10 <sup>-10</sup>	4.2 × 10 <sup>-10</sup>
		M	0.100	1.3 × 10 <sup>-8</sup>	0.050	9.4 × 10 <sup>-9</sup>	4.5 × 10 <sup>-9</sup>	2.9 × 10 <sup>-9</sup>	2.0 × 10 <sup>-9</sup>	1.6 × 10 <sup>-9</sup>
		S	0.020	1.5 × 10 <sup>-8</sup>	0.010	1.0 × 10 <sup>-8</sup>	5.0 × 10 <sup>-9</sup>	3.2 × 10 <sup>-9</sup>	2.2 × 10 <sup>-9</sup>	1.8 × 10 <sup>-9</sup>
<b>Copper</b>										
Cu-60	0.387 h	F	1.000	2.1 × 10 <sup>-10</sup>	0.500	1.6 × 10 <sup>-10</sup>	7.5 × 10 <sup>-11</sup>	4.6 × 10 <sup>-11</sup>	2.8 × 10 <sup>-11</sup>	2.3 × 10 <sup>-11</sup>
		M	1.000	3.0 × 10 <sup>-10</sup>	0.500	2.2 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>	6.5 × 10 <sup>-11</sup>	4.0 × 10 <sup>-11</sup>	3.3 × 10 <sup>-11</sup>
		S	1.000	3.1 × 10 <sup>-10</sup>	0.500	2.2 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	6.7 × 10 <sup>-11</sup>	4.2 × 10 <sup>-11</sup>	3.4 × 10 <sup>-11</sup>
Cu-61	3.41 h	F	1.000	3.1 × 10 <sup>-10</sup>	0.500	2.7 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	7.9 × 10 <sup>-11</sup>	4.5 × 10 <sup>-11</sup>	3.7 × 10 <sup>-11</sup>
		M	1.000	4.9 × 10 <sup>-10</sup>	0.500	4.4 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	9.1 × 10 <sup>-11</sup>	7.4 × 10 <sup>-11</sup>
		S	1.000	5.1 × 10 <sup>-10</sup>	0.500	4.5 × 10 <sup>-10</sup>	2.2 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	9.6 × 10 <sup>-11</sup>	7.8 × 10 <sup>-11</sup>
Cu-64	12.7 h	F	1.000	2.8 × 10 <sup>-10</sup>	0.500	2.7 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	7.6 × 10 <sup>-11</sup>	4.2 × 10 <sup>-11</sup>	3.5 × 10 <sup>-11</sup>
		M	1.000	5.5 × 10 <sup>-10</sup>	0.500	5.4 × 10 <sup>-10</sup>	2.7 × 10 <sup>-10</sup>	1.9 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>
		S	1.000	5.8 × 10 <sup>-10</sup>	0.500	5.7 × 10 <sup>-10</sup>	2.9 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>
Cu-67	2.58 d	F	1.000	9.5 × 10 <sup>-10</sup>	0.500	8.0 × 10 <sup>-10</sup>	3.5 × 10 <sup>-10</sup>	2.2 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>
		M	1.000	2.3 × 10 <sup>-9</sup>	0.500	2.0 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	8.1 × 10 <sup>-10</sup>	6.9 × 10 <sup>-10</sup>	5.5 × 10 <sup>-10</sup>
		S	1.000	2.5 × 10 <sup>-9</sup>	0.500	2.1 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>	8.9 × 10 <sup>-10</sup>	7.7 × 10 <sup>-10</sup>	6.1 × 10 <sup>-10</sup>
<b>Zinc</b>										
Zn-62	9.26 h	F	1.000	1.7 × 10 <sup>-9</sup>	0.500	1.7 × 10 <sup>-9</sup>	7.7 × 10 <sup>-10</sup>	4.6 × 10 <sup>-10</sup>	2.5 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>
		M	0.200	4.5 × 10 <sup>-9</sup>	0.100	3.5 × 10 <sup>-9</sup>	1.6 × 10 <sup>-9</sup>	1.0 × 10 <sup>-9</sup>	6.0 × 10 <sup>-10</sup>	5.0 × 10 <sup>-10</sup>
		S	0.020	5.1 × 10 <sup>-9</sup>	0.010	3.4 × 10 <sup>-9</sup>	1.8 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	6.6 × 10 <sup>-10</sup>	5.5 × 10 <sup>-10</sup>
Zn-63	0.635 h	F	1.000	2.1 × 10 <sup>-10</sup>	0.500	1.4 × 10 <sup>-10</sup>	6.5 × 10 <sup>-11</sup>	4.0 × 10 <sup>-11</sup>	2.4 × 10 <sup>-11</sup>	2.0 × 10 <sup>-11</sup>
		M	0.200	3.4 × 10 <sup>-10</sup>	0.100	2.3 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>	6.6 × 10 <sup>-11</sup>	4.2 × 10 <sup>-11</sup>	3.5 × 10 <sup>-11</sup>
		S	0.020	3.6 × 10 <sup>-10</sup>	0.010	2.4 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	6.9 × 10 <sup>-11</sup>	4.4 × 10 <sup>-11</sup>	3.7 × 10 <sup>-11</sup>

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a			$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$	$e(g)$						
Zn-65	244 d	F	1.000	$1.5 \times 10^{-8}$	0.500	$1.0 \times 10^{-8}$	$5.7 \times 10^{-9}$	$3.8 \times 10^{-9}$	$2.5 \times 10^{-9}$	$2.2 \times 10^{-9}$
		M	0.200	$8.5 \times 10^{-9}$	0.100	$6.5 \times 10^{-9}$	$3.7 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.6 \times 10^{-9}$
		S	0.020	$7.6 \times 10^{-9}$	0.010	$6.7 \times 10^{-9}$	$4.4 \times 10^{-9}$	$2.9 \times 10^{-9}$	$2.4 \times 10^{-9}$	$2.0 \times 10^{-9}$
Zn-69	0.950 h	F	1.000	$1.1 \times 10^{-10}$	0.500	$7.4 \times 10^{-11}$	$3.2 \times 10^{-11}$	$2.1 \times 10^{-11}$	$1.2 \times 10^{-11}$	$1.1 \times 10^{-11}$
		M	0.200	$2.2 \times 10^{-10}$	0.100	$1.4 \times 10^{-10}$	$6.5 \times 10^{-11}$	$4.4 \times 10^{-11}$	$3.1 \times 10^{-11}$	$2.6 \times 10^{-11}$
		S	0.020	$2.3 \times 10^{-10}$	0.010	$1.5 \times 10^{-10}$	$6.9 \times 10^{-11}$	$4.7 \times 10^{-11}$	$3.4 \times 10^{-11}$	$2.8 \times 10^{-11}$
Zn-69m	13.8 h	F	1.000	$6.6 \times 10^{-10}$	0.500	$6.7 \times 10^{-10}$	$3.0 \times 10^{-10}$	$1.8 \times 10^{-10}$	$9.9 \times 10^{-11}$	$8.2 \times 10^{-11}$
		M	0.200	$2.1 \times 10^{-9}$	0.100	$1.5 \times 10^{-9}$	$7.5 \times 10^{-10}$	$5.0 \times 10^{-10}$	$3.0 \times 10^{-10}$	$2.4 \times 10^{-10}$
		S	0.020	$2.2 \times 10^{-9}$	0.010	$1.7 \times 10^{-9}$	$8.2 \times 10^{-10}$	$5.4 \times 10^{-10}$	$3.3 \times 10^{-10}$	$2.7 \times 10^{-10}$
Zn-71m	3.92 h	F	1.000	$6.2 \times 10^{-10}$	0.500	$5.5 \times 10^{-10}$	$2.6 \times 10^{-10}$	$1.6 \times 10^{-10}$	$9.1 \times 10^{-11}$	$7.4 \times 10^{-11}$
		M	0.200	$1.3 \times 10^{-9}$	0.100	$9.4 \times 10^{-10}$	$4.6 \times 10^{-10}$	$2.9 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.5 \times 10^{-10}$
		S	0.020	$1.4 \times 10^{-9}$	0.010	$1.0 \times 10^{-9}$	$4.9 \times 10^{-10}$	$3.1 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.6 \times 10^{-10}$
Zn-72	1.94 d	F	1.000	$4.3 \times 10^{-9}$	0.500	$3.5 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.0 \times 10^{-9}$	$5.9 \times 10^{-10}$	$4.9 \times 10^{-10}$
		M	0.200	$8.8 \times 10^{-9}$	0.100	$6.5 \times 10^{-9}$	$3.4 \times 10^{-9}$	$2.3 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.2 \times 10^{-9}$
		S	0.020	$9.7 \times 10^{-9}$	0.010	$7.0 \times 10^{-9}$	$3.6 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.3 \times 10^{-9}$
<b>Gallium</b>										
Ga-65	0.253 h	F	0.010	$1.1 \times 10^{-10}$	0.001	$7.3 \times 10^{-11}$	$3.4 \times 10^{-11}$	$2.1 \times 10^{-11}$	$1.3 \times 10^{-11}$	$1.1 \times 10^{-11}$
Ga-66	9.40 h	M	0.010	$1.6 \times 10^{-10}$	0.001	$1.1 \times 10^{-10}$	$4.8 \times 10^{-11}$	$3.1 \times 10^{-11}$	$2.0 \times 10^{-11}$	$1.7 \times 10^{-11}$
		F	0.010	$2.8 \times 10^{-9}$	0.001	$2.0 \times 10^{-9}$	$9.2 \times 10^{-10}$	$5.7 \times 10^{-10}$	$3.0 \times 10^{-10}$	$2.5 \times 10^{-10}$
Ga-67	3.26 d	F	0.010	$6.4 \times 10^{-10}$	0.001	$4.6 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.4 \times 10^{-10}$	$5.3 \times 10^{-10}$	$4.4 \times 10^{-10}$
		M	0.010	$1.4 \times 10^{-9}$	0.001	$1.0 \times 10^{-9}$	$5.0 \times 10^{-10}$	$3.6 \times 10^{-10}$	$7.7 \times 10^{-11}$	$6.4 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$						
Ga-68	1.13 h	F	0.010	0.001	$1.9 \times 10^{-10}$	$8.8 \times 10^{-11}$	$5.4 \times 10^{-11}$	$3.0 \times 10^{-10}$	$2.4 \times 10^{-10}$
Ga-70	0.353 h	M	0.010	0.001	$3.1 \times 10^{-10}$	$1.4 \times 10^{-10}$	$9.2 \times 10^{-11}$	$3.1 \times 10^{-11}$	$2.6 \times 10^{-11}$
		F	0.010	0.001	$6.0 \times 10^{-11}$	$2.6 \times 10^{-11}$	$1.6 \times 10^{-11}$	$5.9 \times 10^{-11}$	$4.9 \times 10^{-11}$
Ga-72	14.1 h	M	0.010	0.001	$9.6 \times 10^{-11}$	$4.3 \times 10^{-11}$	$2.8 \times 10^{-11}$	$1.0 \times 10^{-11}$	$8.8 \times 10^{-12}$
		F	0.010	0.001	$2.2 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.4 \times 10^{-10}$	$1.8 \times 10^{-11}$	$1.6 \times 10^{-11}$
Ga-73	4.91 h	M	0.010	0.001	$3.3 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.0 \times 10^{-9}$	$3.6 \times 10^{-10}$	$2.9 \times 10^{-10}$
		F	0.010	0.001	$4.5 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.2 \times 10^{-10}$	$6.5 \times 10^{-10}$	$5.3 \times 10^{-10}$
		M	0.010	0.001	$8.4 \times 10^{-10}$	$4.0 \times 10^{-10}$	$2.6 \times 10^{-10}$	$6.4 \times 10^{-11}$	$5.4 \times 10^{-11}$
		M	0.010	0.001	$8.4 \times 10^{-10}$	$4.0 \times 10^{-10}$	$2.6 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.4 \times 10^{-10}$
<b>Germanium</b>									
Ge-66	2.27 h	F	1.000	1.000	$3.5 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.1 \times 10^{-10}$	$6.7 \times 10^{-11}$	$5.4 \times 10^{-11}$
		M	1.000	1.000	$4.8 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.1 \times 10^{-10}$	$9.1 \times 10^{-11}$
Ge-67	0.312 h	F	1.000	1.000	$1.1 \times 10^{-10}$	$4.9 \times 10^{-11}$	$3.1 \times 10^{-11}$	$1.8 \times 10^{-11}$	$1.5 \times 10^{-11}$
		M	1.000	1.000	$1.6 \times 10^{-10}$	$7.3 \times 10^{-11}$	$4.6 \times 10^{-11}$	$2.9 \times 10^{-11}$	$2.5 \times 10^{-11}$
Ge-68	288 d	F	1.000	1.000	$3.8 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.3 \times 10^{-10}$	$5.2 \times 10^{-10}$
		M	1.000	1.000	$5.0 \times 10^{-8}$	$3.0 \times 10^{-8}$	$2.0 \times 10^{-8}$	$1.6 \times 10^{-8}$	$1.4 \times 10^{-8}$
Ge-69	1.63 d	F	1.000	1.000	$9.0 \times 10^{-10}$	$4.6 \times 10^{-10}$	$2.8 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.3 \times 10^{-10}$
		M	1.000	1.000	$1.4 \times 10^{-9}$	$7.4 \times 10^{-10}$	$4.9 \times 10^{-10}$	$3.6 \times 10^{-10}$	$2.9 \times 10^{-10}$
Ge-71	11.8 d	F	1.000	1.000	$2.0 \times 10^{-11}$	$4.8 \times 10^{-12}$	$1.1 \times 10^{-11}$	$6.1 \times 10^{-12}$	$4.8 \times 10^{-12}$
		M	1.000	1.000	$8.6 \times 10^{-11}$	$4.1 \times 10^{-11}$	$2.4 \times 10^{-11}$	$1.3 \times 10^{-11}$	$1.1 \times 10^{-11}$
Ge-75	1.38 h	F	1.000	1.000	$1.0 \times 10^{-10}$	$4.3 \times 10^{-11}$	$2.8 \times 10^{-11}$	$1.7 \times 10^{-11}$	$1.5 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$					
			$e(g)$					
Ge-77	11.3 h	M	1.000	1.9 × 10 <sup>-10</sup>	8.9 × 10 <sup>-11</sup>	6.1 × 10 <sup>-11</sup>	4.4 × 10 <sup>-11</sup>	3.6 × 10 <sup>-11</sup>
		F	1.000	1.3 × 10 <sup>-9</sup>	4.7 × 10 <sup>-10</sup>	2.9 × 10 <sup>-10</sup>	1.7 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>
		M	1.000	2.3 × 10 <sup>-9</sup>	8.8 × 10 <sup>-10</sup>	6.0 × 10 <sup>-10</sup>	4.5 × 10 <sup>-10</sup>	3.7 × 10 <sup>-10</sup>
Ge-78	1.45 h	F	1.000	4.3 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	8.9 × 10 <sup>-11</sup>	5.5 × 10 <sup>-11</sup>	4.5 × 10 <sup>-11</sup>
		M	1.000	7.3 × 10 <sup>-10</sup>	2.5 × 10 <sup>-10</sup>	1.6 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	9.5 × 10 <sup>-11</sup>
<b>Arsenic</b>								
As-69	0.253 h	M	1.000	2.1 × 10 <sup>-10</sup>	6.3 × 10 <sup>-11</sup>	4.0 × 10 <sup>-11</sup>	2.5 × 10 <sup>-11</sup>	2.1 × 10 <sup>-11</sup>
As-70	0.876 h	M	1.000	5.7 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	8.3 × 10 <sup>-11</sup>	6.7 × 10 <sup>-11</sup>
As-71	2.70 d	M	1.000	2.2 × 10 <sup>-9</sup>	1.0 × 10 <sup>-9</sup>	6.8 × 10 <sup>-10</sup>	5.0 × 10 <sup>-10</sup>	4.0 × 10 <sup>-10</sup>
As-72	1.08 d	M	1.000	5.9 × 10 <sup>-9</sup>	2.7 × 10 <sup>-9</sup>	1.7 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	9.0 × 10 <sup>-10</sup>
As-73	80.3 d	M	1.000	5.4 × 10 <sup>-9</sup>	2.3 × 10 <sup>-9</sup>	1.5 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>	1.0 × 10 <sup>-9</sup>
As-74	17.8 d	M	1.000	1.1 × 10 <sup>-8</sup>	4.7 × 10 <sup>-9</sup>	3.3 × 10 <sup>-9</sup>	2.6 × 10 <sup>-9</sup>	2.1 × 10 <sup>-9</sup>
As-76	1.10 d	M	1.000	5.1 × 10 <sup>-9</sup>	2.2 × 10 <sup>-9</sup>	1.4 × 10 <sup>-9</sup>	8.8 × 10 <sup>-10</sup>	7.4 × 10 <sup>-10</sup>
As-77	1.62 d	M	1.000	2.2 × 10 <sup>-9</sup>	8.9 × 10 <sup>-10</sup>	6.2 × 10 <sup>-10</sup>	5.0 × 10 <sup>-10</sup>	3.9 × 10 <sup>-10</sup>
As-78	1.51 h	M	1.000	8.0 × 10 <sup>-10</sup>	2.7 × 10 <sup>-10</sup>	1.7 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	8.9 × 10 <sup>-11</sup>
<b>Selenium</b>								
Se-70	0.683 h	F	1.000	3.9 × 10 <sup>-10</sup>	1.5 × 10 <sup>-10</sup>	9.0 × 10 <sup>-11</sup>	5.1 × 10 <sup>-11</sup>	4.2 × 10 <sup>-11</sup>
		M	0.200	6.5 × 10 <sup>-10</sup>	2.3 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	8.9 × 10 <sup>-11</sup>	7.3 × 10 <sup>-11</sup>
		S	0.020	6.8 × 10 <sup>-10</sup>	2.3 × 10 <sup>-10</sup>	1.5 × 10 <sup>-10</sup>	9.4 × 10 <sup>-11</sup>	7.6 × 10 <sup>-11</sup>
Se-73	7.15 h	F	1.000	7.7 × 10 <sup>-10</sup>	3.3 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>	8.0 × 10 <sup>-11</sup>
		M	0.200	1.6 × 10 <sup>-9</sup>	5.9 × 10 <sup>-10</sup>	3.8 × 10 <sup>-10</sup>	2.4 × 10 <sup>-10</sup>	1.9 × 10 <sup>-10</sup>
		S	0.020	1.8 × 10 <sup>-9</sup>	6.3 × 10 <sup>-10</sup>	4.0 × 10 <sup>-10</sup>	2.6 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1a$	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$						
Se-73m	0.650 h	F	1.000	0.800	$7.2 \times 10^{-11}$	$3.5 \times 10^{-11}$	$2.3 \times 10^{-11}$	$1.1 \times 10^{-11}$	$9.2 \times 10^{-12}$
		M	0.200	0.100	$1.3 \times 10^{-10}$	$6.1 \times 10^{-11}$	$3.9 \times 10^{-11}$	$2.5 \times 10^{-11}$	$2.0 \times 10^{-11}$
		S	0.020	0.010	$1.3 \times 10^{-10}$	$6.5 \times 10^{-11}$	$4.1 \times 10^{-11}$	$2.6 \times 10^{-11}$	$2.2 \times 10^{-11}$
Se-75	120 d	F	1.000	0.800	$6.0 \times 10^{-9}$	$3.4 \times 10^{-9}$	$2.5 \times 10^{-9}$	$1.2 \times 10^{-9}$	$1.0 \times 10^{-9}$
		M	0.200	0.100	$4.5 \times 10^{-9}$	$2.5 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.1 \times 10^{-9}$
		S	0.020	0.010	$4.7 \times 10^{-9}$	$2.9 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.3 \times 10^{-9}$
Se-79	$6.50 \times 10^4$ a	F	1.000	0.800	$1.3 \times 10^{-8}$	$7.7 \times 10^{-9}$	$5.6 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.1 \times 10^{-9}$
		M	0.200	0.100	$1.1 \times 10^{-8}$	$6.9 \times 10^{-9}$	$4.9 \times 10^{-9}$	$3.3 \times 10^{-9}$	$2.6 \times 10^{-9}$
		S	0.020	0.010	$2.0 \times 10^{-8}$	$1.3 \times 10^{-8}$	$8.7 \times 10^{-9}$	$7.6 \times 10^{-9}$	$6.8 \times 10^{-9}$
Se-81	0.308 h	F	1.000	0.800	$5.4 \times 10^{-11}$	$2.3 \times 10^{-11}$	$1.5 \times 10^{-11}$	$9.2 \times 10^{-12}$	$8.0 \times 10^{-12}$
		M	0.200	0.100	$8.5 \times 10^{-11}$	$3.8 \times 10^{-11}$	$2.5 \times 10^{-11}$	$1.6 \times 10^{-11}$	$1.4 \times 10^{-11}$
		S	0.020	0.010	$8.9 \times 10^{-11}$	$3.9 \times 10^{-11}$	$2.6 \times 10^{-11}$	$1.7 \times 10^{-11}$	$1.5 \times 10^{-11}$
Se-81m	0.954 h	F	1.000	0.800	$1.2 \times 10^{-10}$	$5.4 \times 10^{-11}$	$3.4 \times 10^{-11}$	$1.9 \times 10^{-11}$	$1.6 \times 10^{-11}$
		M	0.200	0.100	$2.5 \times 10^{-10}$	$1.2 \times 10^{-10}$	$8.0 \times 10^{-11}$	$5.8 \times 10^{-11}$	$4.7 \times 10^{-11}$
		S	0.020	0.010	$2.7 \times 10^{-10}$	$1.3 \times 10^{-10}$	$8.5 \times 10^{-11}$	$6.2 \times 10^{-11}$	$5.1 \times 10^{-11}$
Se-83	0.375 h	F	1.000	0.800	$1.2 \times 10^{-10}$	$5.8 \times 10^{-11}$	$3.6 \times 10^{-11}$	$2.1 \times 10^{-11}$	$1.8 \times 10^{-11}$
		M	0.200	0.100	$1.9 \times 10^{-10}$	$9.2 \times 10^{-11}$	$5.9 \times 10^{-11}$	$3.9 \times 10^{-11}$	$3.2 \times 10^{-11}$
		S	0.020	0.010	$2.0 \times 10^{-10}$	$9.6 \times 10^{-11}$	$6.2 \times 10^{-11}$	$4.1 \times 10^{-11}$	$3.4 \times 10^{-11}$
<b>Bromine</b>									
Br-74	0.422 h	F	1.000	1.000	$1.8 \times 10^{-10}$	$8.6 \times 10^{-11}$	$5.3 \times 10^{-11}$	$3.2 \times 10^{-11}$	$2.6 \times 10^{-11}$
		M	1.000	1.000	$2.5 \times 10^{-10}$	$1.2 \times 10^{-10}$	$7.5 \times 10^{-11}$	$4.6 \times 10^{-11}$	$3.8 \times 10^{-11}$
Br-74m	0.691 h	F	1.000	1.000	$2.8 \times 10^{-10}$	$1.3 \times 10^{-10}$	$8.1 \times 10^{-11}$	$4.8 \times 10^{-11}$	$3.9 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$					
			$e(g)$					
Br-75	1.63 h	M	1.000	1.000	$1.9 \times 10^{-10}$	$1.2 \times 10^{-10}$	$7.5 \times 10^{-11}$	$6.2 \times 10^{-11}$
		F	1.000	1.000	$9.7 \times 10^{-11}$	$5.9 \times 10^{-11}$	$3.5 \times 10^{-11}$	$2.9 \times 10^{-11}$
		M	1.000	1.000	$3.1 \times 10^{-10}$	$1.5 \times 10^{-10}$	$9.7 \times 10^{-11}$	$6.5 \times 10^{-11}$
Br-76	16.2 h	F	1.000	1.000	$8.4 \times 10^{-10}$	$5.1 \times 10^{-10}$	$3.0 \times 10^{-10}$	$2.4 \times 10^{-10}$
		M	1.000	1.000	$2.3 \times 10^{-9}$	$7.5 \times 10^{-10}$	$5.0 \times 10^{-10}$	$4.1 \times 10^{-10}$
		F	1.000	1.000	$4.4 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.3 \times 10^{-10}$	$7.7 \times 10^{-11}$
Br-77	2.33 d	M	1.000	1.000	$5.1 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.1 \times 10^{-10}$	$8.4 \times 10^{-11}$
		F	1.000	1.000	$4.4 \times 10^{-11}$	$1.8 \times 10^{-11}$	$6.9 \times 10^{-12}$	$5.9 \times 10^{-12}$
		M	1.000	1.000	$6.5 \times 10^{-11}$	$1.8 \times 10^{-11}$	$1.1 \times 10^{-11}$	$9.4 \times 10^{-12}$
Br-80m	4.42 h	F	1.000	1.000	$2.8 \times 10^{-10}$	$7.2 \times 10^{-11}$	$4.0 \times 10^{-11}$	$3.3 \times 10^{-11}$
		M	1.000	1.000	$4.5 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.4 \times 10^{-10}$	$9.3 \times 10^{-11}$
		F	1.000	1.000	$2.2 \times 10^{-9}$	$7.0 \times 10^{-10}$	$4.2 \times 10^{-10}$	$3.5 \times 10^{-10}$
Br-82	1.47 d	M	1.000	1.000	$3.0 \times 10^{-9}$	$1.1 \times 10^{-9}$	$7.9 \times 10^{-10}$	$6.3 \times 10^{-10}$
		F	1.000	1.000	$1.1 \times 10^{-10}$	$4.7 \times 10^{-11}$	$3.0 \times 10^{-11}$	$1.8 \times 10^{-11}$
		M	1.000	1.000	$2.3 \times 10^{-10}$	$1.1 \times 10^{-10}$	$7.7 \times 10^{-11}$	$5.9 \times 10^{-11}$
Br-83	2.39 h	F	1.000	1.000	$7.1 \times 10^{-11}$	$4.4 \times 10^{-11}$	$2.6 \times 10^{-11}$	$2.2 \times 10^{-11}$
		M	1.000	1.000	$1.6 \times 10^{-10}$	$1.1 \times 10^{-10}$	$4.4 \times 10^{-11}$	$2.6 \times 10^{-11}$
		F	1.000	1.000	$2.4 \times 10^{-10}$	$1.1 \times 10^{-10}$	$6.9 \times 10^{-11}$	$4.4 \times 10^{-11}$
Br-84	0.530 h	M	1.000	1.000	$2.4 \times 10^{-10}$	$6.9 \times 10^{-11}$	$4.4 \times 10^{-11}$	$3.7 \times 10^{-11}$
		F	1.000	1.000	$1.1 \times 10^{-10}$	$5.0 \times 10^{-11}$	$3.2 \times 10^{-11}$	$1.9 \times 10^{-11}$
		M	1.000	1.000	$1.1 \times 10^{-10}$	$5.0 \times 10^{-11}$	$3.2 \times 10^{-11}$	$1.9 \times 10^{-11}$
Rubidium	0.382 h	F	1.000	1.000	$2.5 \times 10^{-10}$	$7.1 \times 10^{-11}$	$4.2 \times 10^{-11}$	$3.4 \times 10^{-11}$
		F	1.000	1.000	$4.6 \times 10^{-11}$	$2.2 \times 10^{-11}$	$8.5 \times 10^{-12}$	$7.0 \times 10^{-12}$
		F	1.000	1.000	$7.3 \times 10^{-10}$	$3.9 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.1 \times 10^{-10}$
Rb-79	4.58 h	F	1.000	1.000	$8.6 \times 10^{-10}$	$3.9 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.1 \times 10^{-10}$
		F	1.000	1.000	$1.6 \times 10^{-10}$	$5.0 \times 10^{-11}$	$3.2 \times 10^{-11}$	$1.6 \times 10^{-11}$
		F	1.000	1.000	$3.2 \times 10^{-10}$	$1.2 \times 10^{-10}$	$7.1 \times 10^{-11}$	$4.2 \times 10^{-11}$
Rb-81m	0.533 h	F	1.000	1.000	$6.2 \times 10^{-11}$	$2.2 \times 10^{-11}$	$8.5 \times 10^{-12}$	$7.0 \times 10^{-12}$
		F	1.000	1.000	$2.2 \times 10^{-11}$	$8.5 \times 10^{-12}$	$7.0 \times 10^{-12}$	$7.0 \times 10^{-12}$
		F	1.000	1.000	$8.6 \times 10^{-10}$	$3.9 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.1 \times 10^{-10}$
Rb-82m	6.20 h	F	1.000	1.000	$8.6 \times 10^{-10}$	$3.9 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.1 \times 10^{-10}$
		F	1.000	1.000	$1.6 \times 10^{-10}$	$5.0 \times 10^{-11}$	$3.2 \times 10^{-11}$	$1.6 \times 10^{-11}$
		F	1.000	1.000	$3.2 \times 10^{-10}$	$1.2 \times 10^{-10}$	$7.1 \times 10^{-11}$	$4.2 \times 10^{-11}$



Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$ $e(g)$						
Rb-83	86.2 d	F	1.000	1.000	$3.8 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.3 \times 10^{-9}$	$7.9 \times 10^{-10}$	$6.9 \times 10^{-10}$
Rb-84	32.8 d	F	1.000	1.000	$6.4 \times 10^{-9}$	$3.1 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.2 \times 10^{-9}$	$1.0 \times 10^{-9}$
Rb-86	18.7 d	F	1.000	1.000	$7.7 \times 10^{-9}$	$3.4 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.1 \times 10^{-9}$	$9.3 \times 10^{-10}$
Rb-87	$4.70 \times 10^{10}$ a	F	1.000	1.000	$4.1 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.0 \times 10^{-10}$	$5.0 \times 10^{-10}$
Rb-88	0.297 h	F	1.000	1.000	$1.2 \times 10^{-10}$	$5.2 \times 10^{-11}$	$3.2 \times 10^{-11}$	$1.9 \times 10^{-11}$	$1.6 \times 10^{-11}$
Rb-89	0.253 h	F	1.000	1.000	$9.3 \times 10^{-11}$	$4.3 \times 10^{-11}$	$2.7 \times 10^{-11}$	$1.6 \times 10^{-11}$	$1.4 \times 10^{-11}$
<b>Strontium<sup>e</sup></b>									
Sr-80	1.67 h	F	0.600	0.300	$5.4 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.4 \times 10^{-10}$	$7.9 \times 10^{-11}$	$7.1 \times 10^{-11}$
		M	0.200	0.100	$9.0 \times 10^{-10}$	$4.1 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.3 \times 10^{-10}$
		S	0.020	0.010	$9.4 \times 10^{-10}$	$4.3 \times 10^{-10}$	$2.7 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.4 \times 10^{-10}$
Sr-81	0.425 h	F	0.600	0.300	$1.5 \times 10^{-10}$	$6.7 \times 10^{-11}$	$4.1 \times 10^{-11}$	$2.4 \times 10^{-11}$	$2.1 \times 10^{-11}$
		M	0.200	0.100	$2.2 \times 10^{-10}$	$1.0 \times 10^{-10}$	$6.6 \times 10^{-11}$	$4.2 \times 10^{-11}$	$3.5 \times 10^{-11}$
		S	0.020	0.010	$2.3 \times 10^{-10}$	$1.1 \times 10^{-10}$	$6.9 \times 10^{-11}$	$4.4 \times 10^{-11}$	$3.7 \times 10^{-11}$
Sr-82	25.0 d	F	0.600	0.300	$1.5 \times 10^{-8}$	$6.6 \times 10^{-9}$	$4.6 \times 10^{-9}$	$3.2 \times 10^{-9}$	$2.1 \times 10^{-9}$
		M	0.200	0.100	$4.0 \times 10^{-8}$	$2.1 \times 10^{-8}$	$1.4 \times 10^{-8}$	$1.0 \times 10^{-8}$	$8.9 \times 10^{-9}$
		S	0.020	0.010	$4.6 \times 10^{-8}$	$2.5 \times 10^{-8}$	$1.7 \times 10^{-8}$	$1.2 \times 10^{-8}$	$1.1 \times 10^{-8}$
Sr-83	1.35 d	F	0.600	0.300	$1.1 \times 10^{-9}$	$5.5 \times 10^{-10}$	$3.4 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.6 \times 10^{-10}$
		M	0.200	0.100	$1.9 \times 10^{-9}$	$9.5 \times 10^{-10}$	$6.0 \times 10^{-10}$	$3.9 \times 10^{-10}$	$3.1 \times 10^{-10}$
		S	0.020	0.010	$2.0 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.5 \times 10^{-10}$	$4.2 \times 10^{-10}$	$3.4 \times 10^{-10}$
Sr-85	64.8 d	F	0.600	0.300	$2.3 \times 10^{-9}$	$1.1 \times 10^{-9}$	$9.6 \times 10^{-10}$	$8.3 \times 10^{-10}$	$3.8 \times 10^{-10}$
		M	0.200	0.100	$3.1 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.2 \times 10^{-9}$	$8.8 \times 10^{-10}$	$6.4 \times 10^{-10}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for g > 1 a	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$	
		Type	$f_1$						$e(g)$
Sr-85m	1.16 h	S	0.020	$4.4 \times 10^{-9}$	$3.7 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.0 \times 10^{-9}$	$8.1 \times 10^{-10}$	
		F	0.600	$2.4 \times 10^{-11}$	$1.9 \times 10^{-11}$	$9.6 \times 10^{-12}$	$6.0 \times 10^{-12}$	$3.7 \times 10^{-12}$	$2.9 \times 10^{-12}$
		M	0.200	$3.1 \times 10^{-11}$	$2.5 \times 10^{-11}$	$1.3 \times 10^{-11}$	$8.0 \times 10^{-12}$	$5.1 \times 10^{-12}$	$4.1 \times 10^{-12}$
Sr-87m	2.80 h	S	0.020	$3.2 \times 10^{-11}$	$2.6 \times 10^{-11}$	$8.3 \times 10^{-12}$	$5.4 \times 10^{-12}$	$4.3 \times 10^{-12}$	
		F	0.600	$9.7 \times 10^{-11}$	$7.8 \times 10^{-11}$	$3.8 \times 10^{-11}$	$2.3 \times 10^{-11}$	$1.3 \times 10^{-11}$	$1.1 \times 10^{-11}$
		M	0.200	$1.6 \times 10^{-10}$	$1.2 \times 10^{-10}$	$5.9 \times 10^{-11}$	$3.8 \times 10^{-11}$	$2.5 \times 10^{-11}$	$2.0 \times 10^{-11}$
Sr-89	50.5 d	S	0.020	$1.7 \times 10^{-10}$	$1.2 \times 10^{-10}$	$4.0 \times 10^{-11}$	$2.6 \times 10^{-11}$	$2.1 \times 10^{-11}$	
		F	0.600	$1.5 \times 10^{-8}$	$7.3 \times 10^{-9}$	$3.2 \times 10^{-9}$	$2.3 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.0 \times 10^{-9}$
		M	0.200	$3.3 \times 10^{-8}$	$2.4 \times 10^{-8}$	$1.3 \times 10^{-8}$	$9.1 \times 10^{-9}$	$7.3 \times 10^{-9}$	$6.1 \times 10^{-9}$
Sr-90	29.1 a	S	0.020	$3.9 \times 10^{-8}$	$3.0 \times 10^{-8}$	$1.7 \times 10^{-8}$	$9.3 \times 10^{-9}$	$7.9 \times 10^{-9}$	
		F	0.600	$1.3 \times 10^{-7}$	$5.2 \times 10^{-8}$	$3.1 \times 10^{-8}$	$4.1 \times 10^{-8}$	$5.3 \times 10^{-8}$	$2.4 \times 10^{-8}$
		M	0.200	$1.5 \times 10^{-7}$	$1.1 \times 10^{-7}$	$6.5 \times 10^{-8}$	$5.1 \times 10^{-8}$	$5.0 \times 10^{-8}$	$3.6 \times 10^{-8}$
Sr-91	9.50 h	S	0.020	$4.2 \times 10^{-7}$	$4.0 \times 10^{-7}$	$2.7 \times 10^{-7}$	$1.8 \times 10^{-7}$	$1.6 \times 10^{-7}$	
		F	0.600	$1.4 \times 10^{-9}$	$1.1 \times 10^{-9}$	$5.2 \times 10^{-10}$	$3.1 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.6 \times 10^{-10}$
		M	0.200	$3.1 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.9 \times 10^{-10}$	$4.4 \times 10^{-10}$	$3.7 \times 10^{-10}$
Sr-92	2.71 h	S	0.020	$3.5 \times 10^{-9}$	$2.5 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.7 \times 10^{-10}$	$4.1 \times 10^{-10}$	
		F	0.600	$9.0 \times 10^{-10}$	$7.1 \times 10^{-10}$	$3.3 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.0 \times 10^{-10}$	$9.8 \times 10^{-11}$
		M	0.200	$1.9 \times 10^{-9}$	$1.4 \times 10^{-9}$	$6.5 \times 10^{-10}$	$4.1 \times 10^{-10}$	$2.5 \times 10^{-10}$	$2.1 \times 10^{-10}$
Yttrium		S	0.020	$2.2 \times 10^{-9}$	$1.5 \times 10^{-9}$	$7.0 \times 10^{-10}$	$4.5 \times 10^{-10}$	$2.7 \times 10^{-10}$	

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2	2-7 a	7-12 a	12t-17 a	>17 a		
		Type	f <sub>i</sub>						e(g)	f <sub>i</sub> for g > 1 a
Y-86	14.7 h	M	0.001	3.7 × 10 <sup>-9</sup>	1.0 × 10 <sup>-4</sup>	2.9 × 10 <sup>-9</sup>	1.5 × 10 <sup>-9</sup>	9.3 × 10 <sup>-10</sup>	5.6 × 10 <sup>-10</sup>	4.5 × 10 <sup>-10</sup>
		S	0.001	3.8 × 10 <sup>-9</sup>	1.0 × 10 <sup>-4</sup>	3.0 × 10 <sup>-9</sup>	1.5 × 10 <sup>-9</sup>	9.6 × 10 <sup>-10</sup>	5.8 × 10 <sup>-10</sup>	4.7 × 10 <sup>-10</sup>
Y-86m	0.800 h	M	0.001	2.2 × 10 <sup>-10</sup>	1.0 × 10 <sup>-4</sup>	1.7 × 10 <sup>-10</sup>	8.7 × 10 <sup>-11</sup>	5.6 × 10 <sup>-11</sup>	3.4 × 10 <sup>-11</sup>	2.7 × 10 <sup>-11</sup>
		S	0.001	2.3 × 10 <sup>-10</sup>	1.0 × 10 <sup>-4</sup>	1.8 × 10 <sup>-10</sup>	9.0 × 10 <sup>-11</sup>	5.7 × 10 <sup>-11</sup>	3.5 × 10 <sup>-11</sup>	2.8 × 10 <sup>-11</sup>
Y-87	3.35 d	M	0.001	2.7 × 10 <sup>-9</sup>	1.0 × 10 <sup>-4</sup>	2.1 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	7.0 × 10 <sup>-10</sup>	4.7 × 10 <sup>-10</sup>	3.7 × 10 <sup>-10</sup>
		S	0.001	2.8 × 10 <sup>-9</sup>	1.0 × 10 <sup>-4</sup>	2.2 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	7.3 × 10 <sup>-10</sup>	5.0 × 10 <sup>-10</sup>	3.9 × 10 <sup>-10</sup>
Y-88	107 d	M	0.001	1.9 × 10 <sup>-8</sup>	1.0 × 10 <sup>-4</sup>	1.6 × 10 <sup>-8</sup>	1.0 × 10 <sup>-8</sup>	6.7 × 10 <sup>-9</sup>	4.9 × 10 <sup>-9</sup>	4.1 × 10 <sup>-9</sup>
		S	0.001	2.0 × 10 <sup>-8</sup>	1.0 × 10 <sup>-4</sup>	1.7 × 10 <sup>-8</sup>	9.8 × 10 <sup>-9</sup>	6.6 × 10 <sup>-9</sup>	5.4 × 10 <sup>-9</sup>	4.4 × 10 <sup>-9</sup>
Y-90	2.67 d	M	0.001	1.3 × 10 <sup>-8</sup>	1.0 × 10 <sup>-4</sup>	8.4 × 10 <sup>-9</sup>	4.0 × 10 <sup>-9</sup>	2.6 × 10 <sup>-9</sup>	1.7 × 10 <sup>-9</sup>	1.4 × 10 <sup>-9</sup>
		S	0.001	1.3 × 10 <sup>-8</sup>	1.0 × 10 <sup>-4</sup>	8.8 × 10 <sup>-9</sup>	4.2 × 10 <sup>-9</sup>	2.7 × 10 <sup>-9</sup>	1.8 × 10 <sup>-9</sup>	1.5 × 10 <sup>-9</sup>
Y-90m	3.19 h	M	0.001	7.2 × 10 <sup>-10</sup>	1.0 × 10 <sup>-4</sup>	5.7 × 10 <sup>-10</sup>	2.8 × 10 <sup>-10</sup>	1.8 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	9.5 × 10 <sup>-11</sup>
		S	0.001	7.5 × 10 <sup>-10</sup>	1.0 × 10 <sup>-4</sup>	6.0 × 10 <sup>-10</sup>	2.9 × 10 <sup>-10</sup>	1.9 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>
Y-91	58.5 d	M	0.001	3.9 × 10 <sup>-8</sup>	1.0 × 10 <sup>-4</sup>	3.0 × 10 <sup>-8</sup>	1.6 × 10 <sup>-8</sup>	1.1 × 10 <sup>-8</sup>	1.2 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>
		S	0.001	4.3 × 10 <sup>-8</sup>	1.0 × 10 <sup>-4</sup>	3.4 × 10 <sup>-8</sup>	1.9 × 10 <sup>-8</sup>	1.3 × 10 <sup>-8</sup>	8.4 × 10 <sup>-9</sup>	7.1 × 10 <sup>-9</sup>
Y-91m	0.828 h	M	0.001	7.0 × 10 <sup>-11</sup>	1.0 × 10 <sup>-4</sup>	5.5 × 10 <sup>-11</sup>	2.9 × 10 <sup>-11</sup>	1.8 × 10 <sup>-11</sup>	1.0 × 10 <sup>-8</sup>	8.9 × 10 <sup>-9</sup>
		S	0.001	7.4 × 10 <sup>-11</sup>	1.0 × 10 <sup>-4</sup>	5.9 × 10 <sup>-11</sup>	3.1 × 10 <sup>-11</sup>	2.0 × 10 <sup>-11</sup>	1.2 × 10 <sup>-11</sup>	1.0 × 10 <sup>-11</sup>
Y-92	3.54 h	M	0.001	1.8 × 10 <sup>-9</sup>	1.0 × 10 <sup>-4</sup>	1.2 × 10 <sup>-9</sup>	5.3 × 10 <sup>-10</sup>	3.3 × 10 <sup>-10</sup>	1.4 × 10 <sup>-11</sup>	1.1 × 10 <sup>-11</sup>
		S	0.001	1.9 × 10 <sup>-9</sup>	1.0 × 10 <sup>-4</sup>	1.2 × 10 <sup>-9</sup>	5.5 × 10 <sup>-10</sup>	3.5 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.7 × 10 <sup>-10</sup>
Y-93	10.1 h	M	0.001	4.4 × 10 <sup>-9</sup>	1.0 × 10 <sup>-4</sup>	2.9 × 10 <sup>-9</sup>	1.3 × 10 <sup>-9</sup>	8.1 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>	1.8 × 10 <sup>-10</sup>
		S	0.001	4.6 × 10 <sup>-9</sup>	1.0 × 10 <sup>-4</sup>	3.0 × 10 <sup>-9</sup>	1.4 × 10 <sup>-9</sup>	8.5 × 10 <sup>-10</sup>	4.7 × 10 <sup>-10</sup>	4.0 × 10 <sup>-10</sup>
Y-94	0.318 h	M	0.001	2.8 × 10 <sup>-10</sup>	1.0 × 10 <sup>-4</sup>	1.8 × 10 <sup>-10</sup>	8.1 × 10 <sup>-11</sup>	5.0 × 10 <sup>-11</sup>	5.0 × 10 <sup>-10</sup>	4.2 × 10 <sup>-10</sup>
		S	0.001	2.9 × 10 <sup>-10</sup>	1.0 × 10 <sup>-4</sup>	1.9 × 10 <sup>-10</sup>	8.4 × 10 <sup>-11</sup>	5.2 × 10 <sup>-11</sup>	3.1 × 10 <sup>-11</sup>	2.7 × 10 <sup>-11</sup>

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$					
			$e(g)$					
Y-95	0.178 h	M	0.001	$1.0 \times 10^{-4}$	$4.4 \times 10^{-11}$	$2.8 \times 10^{-11}$	$3.3 \times 10^{-11}$	$2.8 \times 10^{-11}$
		S	0.001	$1.0 \times 10^{-4}$	$4.5 \times 10^{-11}$	$2.9 \times 10^{-11}$	$1.8 \times 10^{-11}$	$1.5 \times 10^{-11}$
Zirconium	16.5 h	F	0.020	0.002	$9.5 \times 10^{-9}$	$5.9 \times 10^{-10}$	$3.4 \times 10^{-10}$	$2.7 \times 10^{-10}$
		M	0.020	0.002	$1.3 \times 10^{-9}$	$8.4 \times 10^{-10}$	$5.2 \times 10^{-10}$	$4.2 \times 10^{-10}$
	S	0.020	0.002	0.002	$1.4 \times 10^{-9}$	$8.7 \times 10^{-10}$	$5.4 \times 10^{-10}$	$4.3 \times 10^{-10}$
	F	0.020	0.002	0.002	$8.3 \times 10^{-9}$	$4.7 \times 10^{-9}$	$3.6 \times 10^{-9}$	$3.5 \times 10^{-9}$
	M	0.020	0.002	0.002	$7.8 \times 10^{-9}$	$3.6 \times 10^{-9}$	$3.0 \times 10^{-9}$	$2.6 \times 10^{-9}$
	S	0.020	0.002	0.002	$1.2 \times 10^{-8}$	$7.7 \times 10^{-9}$	$5.2 \times 10^{-9}$	$4.3 \times 10^{-9}$
Zr-89	3.27 d	F	0.020	0.002	$9.9 \times 10^{-9}$	$6.1 \times 10^{-10}$	$3.6 \times 10^{-10}$	$2.9 \times 10^{-10}$
		M	0.020	0.002	$2.8 \times 10^{-9}$	$1.5 \times 10^{-9}$	$9.6 \times 10^{-10}$	$6.5 \times 10^{-10}$
Zr-93	$1.53 \times 10^6$ a	S	0.020	0.002	$1.5 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.8 \times 10^{-10}$	$5.5 \times 10^{-10}$
		F	0.020	0.002	$4.8 \times 10^{-9}$	$9.7 \times 10^{-9}$	$1.8 \times 10^{-8}$	$2.5 \times 10^{-8}$
Zr-95	64.0 d	M	0.020	0.002	$3.1 \times 10^{-9}$	$2.8 \times 10^{-9}$	$4.1 \times 10^{-9}$	$1.0 \times 10^{-8}$
		S	0.020	0.002	$6.4 \times 10^{-9}$	$4.5 \times 10^{-9}$	$3.3 \times 10^{-9}$	$3.3 \times 10^{-9}$
		F	0.020	0.002	$1.1 \times 10^{-8}$	$6.4 \times 10^{-9}$	$4.2 \times 10^{-9}$	$2.8 \times 10^{-9}$
		M	0.020	0.002	$1.6 \times 10^{-8}$	$9.7 \times 10^{-9}$	$6.8 \times 10^{-9}$	$5.9 \times 10^{-9}$
Zr-97	16.9 h	S	0.020	0.002	$1.9 \times 10^{-8}$	$1.2 \times 10^{-8}$	$8.3 \times 10^{-9}$	$7.3 \times 10^{-9}$
		F	0.020	0.002	$3.4 \times 10^{-9}$	$1.5 \times 10^{-9}$	$9.1 \times 10^{-10}$	$4.8 \times 10^{-10}$
		M	0.020	0.002	$5.3 \times 10^{-9}$	$2.8 \times 10^{-9}$	$1.1 \times 10^{-9}$	$9.2 \times 10^{-10}$
		S	0.020	0.002	$5.6 \times 10^{-9}$	$2.9 \times 10^{-9}$	$1.9 \times 10^{-9}$	$8.9 \times 10^{-10}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$ $e(g)$					
Niobium								
Nb-88	0.238 h	F	0.020 $1.8 \times 10^{-10}$	0.010 $1.3 \times 10^{-10}$	$6.3 \times 10^{-11}$	$3.9 \times 10^{-11}$	$2.4 \times 10^{-11}$	$1.9 \times 10^{-11}$
		M	0.020 $2.5 \times 10^{-10}$	0.010 $1.8 \times 10^{-10}$	$8.5 \times 10^{-11}$	$5.3 \times 10^{-11}$	$3.3 \times 10^{-11}$	$2.7 \times 10^{-11}$
		S	0.020 $2.6 \times 10^{-10}$	0.010 $1.8 \times 10^{-10}$	$8.7 \times 10^{-11}$	$5.5 \times 10^{-11}$	$3.5 \times 10^{-11}$	$2.8 \times 10^{-11}$
Nb-89	2.03 h	F	0.020 $7.0 \times 10^{-10}$	0.010 $4.8 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.3 \times 10^{-10}$	$7.4 \times 10^{-11}$	$6.1 \times 10^{-11}$
		M	0.020 $1.1 \times 10^{-9}$	0.010 $7.6 \times 10^{-10}$	$3.6 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.1 \times 10^{-10}$
		S	0.020 $1.2 \times 10^{-9}$	0.010 $7.9 \times 10^{-10}$	$3.7 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.2 \times 10^{-10}$
Nb-89m	1.10 h	F	0.020 $4.0 \times 10^{-10}$	0.010 $2.9 \times 10^{-10}$	$1.4 \times 10^{-10}$	$8.3 \times 10^{-11}$	$4.8 \times 10^{-11}$	$3.9 \times 10^{-11}$
		M	0.020 $6.2 \times 10^{-10}$	0.010 $4.3 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.3 \times 10^{-10}$	$8.2 \times 10^{-11}$	$6.8 \times 10^{-11}$
		S	0.020 $6.4 \times 10^{-10}$	0.010 $4.4 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.4 \times 10^{-10}$	$8.6 \times 10^{-11}$	$7.1 \times 10^{-11}$
Nb-90	14.6 h	F	0.020 $3.5 \times 10^{-9}$	0.010 $2.7 \times 10^{-9}$	$1.3 \times 10^{-9}$	$8.2 \times 10^{-10}$	$4.7 \times 10^{-10}$	$3.8 \times 10^{-10}$
		M	0.020 $5.1 \times 10^{-9}$	0.010 $3.9 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.3 \times 10^{-9}$	$7.8 \times 10^{-10}$	$6.3 \times 10^{-10}$
		S	0.020 $5.3 \times 10^{-9}$	0.010 $4.0 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.3 \times 10^{-9}$	$8.1 \times 10^{-10}$	$6.6 \times 10^{-10}$
Nb-93m	13.6 a	F	0.020 $1.8 \times 10^{-9}$	0.010 $1.4 \times 10^{-9}$	$7.0 \times 10^{-10}$	$4.4 \times 10^{-10}$	$2.7 \times 10^{-10}$	$2.2 \times 10^{-10}$
		M	0.020 $3.1 \times 10^{-9}$	0.010 $2.4 \times 10^{-9}$	$1.3 \times 10^{-9}$	$8.2 \times 10^{-10}$	$5.9 \times 10^{-10}$	$5.1 \times 10^{-10}$
		S	0.020 $7.4 \times 10^{-9}$	0.010 $6.5 \times 10^{-9}$	$4.0 \times 10^{-9}$	$2.5 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.8 \times 10^{-9}$
Nb-94	$2.03 \times 10^4$ a	F	0.020 $3.1 \times 10^{-8}$	0.010 $2.7 \times 10^{-8}$	$1.5 \times 10^{-8}$	$1.0 \times 10^{-8}$	$6.7 \times 10^{-9}$	$5.8 \times 10^{-9}$
		M	0.020 $4.3 \times 10^{-8}$	0.010 $3.7 \times 10^{-8}$	$2.3 \times 10^{-8}$	$1.6 \times 10^{-8}$	$1.3 \times 10^{-8}$	$1.1 \times 10^{-8}$
		S	0.020 $1.2 \times 10^{-7}$	0.010 $1.2 \times 10^{-7}$	$8.3 \times 10^{-8}$	$5.8 \times 10^{-8}$	$5.2 \times 10^{-8}$	$4.9 \times 10^{-8}$
Nb-95	35.1 d	F	0.020 $4.1 \times 10^{-9}$	0.010 $3.1 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.5 \times 10^{-10}$	$5.7 \times 10^{-10}$
		M	0.020 $6.8 \times 10^{-9}$	0.010 $5.2 \times 10^{-9}$	$3.1 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.5 \times 10^{-9}$
		S	0.020 $7.7 \times 10^{-9}$	0.010 $5.9 \times 10^{-9}$	$3.6 \times 10^{-9}$	$2.5 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.8 \times 10^{-9}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2	2-7 a	7-12 a	12t-17 a	>17 a		
		Type	f <sub>1</sub>						e(g)	f <sub>1</sub> for g > 1 a
Nb-95m	3.61 d	F	0.020	2.3 × 10 <sup>-9</sup>	0.010	1.6 × 10 <sup>-9</sup>	7.0 × 10 <sup>-10</sup>	4.2 × 10 <sup>-10</sup>	2.4 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>
		M	0.020	4.3 × 10 <sup>-9</sup>	0.010	3.1 × 10 <sup>-9</sup>	1.7 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>	1.0 × 10 <sup>-9</sup>	7.9 × 10 <sup>-10</sup>
		S	0.020	4.6 × 10 <sup>-9</sup>	0.010	3.4 × 10 <sup>-9</sup>	1.9 × 10 <sup>-9</sup>	1.3 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	8.8 × 10 <sup>-10</sup>
Nb-96	23.3 h	F	0.020	3.1 × 10 <sup>-9</sup>	0.010	2.4 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>	7.3 × 10 <sup>-10</sup>	4.2 × 10 <sup>-10</sup>	3.4 × 10 <sup>-10</sup>
		M	0.020	4.7 × 10 <sup>-9</sup>	0.010	3.6 × 10 <sup>-9</sup>	1.8 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>	7.8 × 10 <sup>-10</sup>	6.3 × 10 <sup>-10</sup>
		S	0.020	4.9 × 10 <sup>-9</sup>	0.010	3.7 × 10 <sup>-9</sup>	1.9 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>	8.3 × 10 <sup>-10</sup>	6.6 × 10 <sup>-10</sup>
Nb-97	1.20 h	F	0.020	2.2 × 10 <sup>-10</sup>	0.010	1.5 × 10 <sup>-10</sup>	6.8 × 10 <sup>-11</sup>	4.2 × 10 <sup>-11</sup>	2.5 × 10 <sup>-11</sup>	2.1 × 10 <sup>-11</sup>
		M	0.020	3.7 × 10 <sup>-10</sup>	0.010	2.5 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	7.7 × 10 <sup>-11</sup>	5.2 × 10 <sup>-11</sup>	4.3 × 10 <sup>-11</sup>
		S	0.020	3.8 × 10 <sup>-10</sup>	0.010	2.6 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	8.1 × 10 <sup>-11</sup>	5.5 × 10 <sup>-11</sup>	4.5 × 10 <sup>-11</sup>
Nb-98	0.858 h	F	0.020	3.4 × 10 <sup>-10</sup>	0.010	2.4 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	6.9 × 10 <sup>-11</sup>	4.1 × 10 <sup>-11</sup>	3.3 × 10 <sup>-11</sup>
		M	0.020	5.2 × 10 <sup>-10</sup>	0.010	3.6 × 10 <sup>-10</sup>	1.7 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	6.8 × 10 <sup>-11</sup>	5.6 × 10 <sup>-11</sup>
		S	0.020	5.3 × 10 <sup>-10</sup>	0.010	3.7 × 10 <sup>-10</sup>	1.8 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	7.1 × 10 <sup>-11</sup>	5.8 × 10 <sup>-11</sup>
<b>Molybdenum</b>										
Mo-90	5.67 h	F	1.000	1.2 × 10 <sup>-9</sup>	0.800	1.1 × 10 <sup>-9</sup>	5.3 × 10 <sup>-10</sup>	3.2 × 10 <sup>-10</sup>	1.9 × 10 <sup>-10</sup>	1.5 × 10 <sup>-10</sup>
		M	0.200	2.6 × 10 <sup>-9</sup>	0.100	2.0 × 10 <sup>-9</sup>	9.9 × 10 <sup>-10</sup>	6.5 × 10 <sup>-10</sup>	4.2 × 10 <sup>-10</sup>	3.4 × 10 <sup>-10</sup>
		S	0.020	2.8 × 10 <sup>-9</sup>	0.010	2.1 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	6.9 × 10 <sup>-10</sup>	4.5 × 10 <sup>-10</sup>	3.6 × 10 <sup>-10</sup>
Mo-93	3.50 × 10 <sup>3</sup> a	F	1.000	3.1 × 10 <sup>-9</sup>	0.800	2.6 × 10 <sup>-9</sup>	1.7 × 10 <sup>-9</sup>	1.3 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	1.0 × 10 <sup>-9</sup>
		M	0.200	2.2 × 10 <sup>-9</sup>	0.100	1.8 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	7.9 × 10 <sup>-10</sup>	6.6 × 10 <sup>-10</sup>	5.9 × 10 <sup>-10</sup>
		S	0.020	6.0 × 10 <sup>-9</sup>	0.010	5.8 × 10 <sup>-9</sup>	4.0 × 10 <sup>-9</sup>	2.8 × 10 <sup>-9</sup>	2.4 × 10 <sup>-9</sup>	2.3 × 10 <sup>-9</sup>
Mo-93m	6.85 h	F	1.000	7.3 × 10 <sup>-10</sup>	0.800	6.4 × 10 <sup>-10</sup>	3.3 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	9.6 × 10 <sup>-11</sup>
		M	0.200	1.2 × 10 <sup>-9</sup>	0.100	9.7 × 10 <sup>-10</sup>	5.0 × 10 <sup>-10</sup>	3.2 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.6 × 10 <sup>-10</sup>
		S	0.020	1.2 × 10 <sup>-9</sup>	0.100	9.7 × 10 <sup>-10</sup>	5.0 × 10 <sup>-10</sup>	3.2 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.6 × 10 <sup>-10</sup>

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$	
		Type	$f_1$ $e(g)$							
Mo-99	2.75 d	S	0.020	$1.3 \times 10^{-9}$	0.010	$1.0 \times 10^{-9}$	$3.4 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.7 \times 10^{-10}$	
		F	1.000	$2.3 \times 10^{-9}$	0.800	$1.7 \times 10^{-9}$	$7.7 \times 10^{-10}$	$4.7 \times 10^{-10}$	$2.6 \times 10^{-10}$	
		M	0.200	$6.0 \times 10^{-9}$	0.100	$4.4 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.1 \times 10^{-9}$	$8.9 \times 10^{-10}$
		S	0.020	$6.9 \times 10^{-9}$	0.010	$4.8 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.2 \times 10^{-9}$	$9.9 \times 10^{-10}$
Mo-101	0.244 h	F	1.000	$1.4 \times 10^{-10}$	0.800	$9.7 \times 10^{-11}$	$2.8 \times 10^{-11}$	$1.7 \times 10^{-11}$	$1.4 \times 10^{-11}$	
		M	0.200	$2.2 \times 10^{-10}$	0.100	$1.5 \times 10^{-10}$	$7.0 \times 10^{-11}$	$4.5 \times 10^{-11}$	$3.0 \times 10^{-11}$	
		S	0.020	$2.3 \times 10^{-10}$	0.010	$1.6 \times 10^{-10}$	$7.2 \times 10^{-11}$	$4.7 \times 10^{-11}$	$3.1 \times 10^{-11}$	
<b>Technetium</b>										
Tc-93	2.75 h	F	1.000	$2.4 \times 10^{-10}$	0.800	$2.1 \times 10^{-10}$	$6.7 \times 10^{-11}$	$4.0 \times 10^{-11}$	$3.2 \times 10^{-11}$	
		M	0.200	$2.7 \times 10^{-10}$	0.100	$2.3 \times 10^{-10}$	$1.2 \times 10^{-10}$	$7.5 \times 10^{-11}$	$4.4 \times 10^{-11}$	
		S	0.020	$2.8 \times 10^{-10}$	0.010	$2.3 \times 10^{-10}$	$1.2 \times 10^{-10}$	$7.6 \times 10^{-11}$	$4.5 \times 10^{-11}$	
		F	1.000	$1.2 \times 10^{-10}$	0.800	$9.8 \times 10^{-11}$	$4.9 \times 10^{-11}$	$2.9 \times 10^{-11}$	$1.8 \times 10^{-11}$	
Tc-93m	0.725 h	M	0.200	$1.4 \times 10^{-10}$	0.100	$1.1 \times 10^{-10}$	$3.4 \times 10^{-11}$	$2.1 \times 10^{-11}$	$1.7 \times 10^{-11}$	
		S	0.020	$1.4 \times 10^{-10}$	0.010	$1.1 \times 10^{-10}$	$5.4 \times 10^{-11}$	$3.4 \times 10^{-11}$	$2.1 \times 10^{-11}$	
		F	1.000	$8.9 \times 10^{-10}$	0.800	$7.5 \times 10^{-10}$	$3.9 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.4 \times 10^{-10}$	
		M	0.200	$9.8 \times 10^{-10}$	0.100	$8.1 \times 10^{-10}$	$4.2 \times 10^{-10}$	$2.6 \times 10^{-10}$	$1.6 \times 10^{-10}$	
Tc-94	4.88 h	S	0.020	$9.9 \times 10^{-10}$	0.010	$8.2 \times 10^{-10}$	$2.7 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.3 \times 10^{-10}$	
		F	1.000	$4.8 \times 10^{-10}$	0.800	$3.4 \times 10^{-10}$	$1.6 \times 10^{-10}$	$8.6 \times 10^{-11}$	$5.2 \times 10^{-11}$	
		M	0.200	$4.4 \times 10^{-10}$	0.100	$3.0 \times 10^{-10}$	$1.4 \times 10^{-10}$	$8.8 \times 10^{-11}$	$5.5 \times 10^{-11}$	
		S	0.020	$4.3 \times 10^{-10}$	0.010	$3.0 \times 10^{-10}$	$1.4 \times 10^{-10}$	$8.8 \times 10^{-11}$	$5.6 \times 10^{-11}$	
Tc-94m	0.867 h	F	1.000	$7.5 \times 10^{-10}$	0.800	$6.3 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.2 \times 10^{-10}$	$9.6 \times 10^{-11}$	
Tc-95	20.0 h	F	1.000	$7.5 \times 10^{-10}$	0.800	$6.3 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.2 \times 10^{-10}$	$9.6 \times 10^{-11}$	

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$	
		Type	$f_1$						$e(g)$
		M	0.200	$8.3 \times 10^{-10}$	$3.6 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.0 \times 10^{-10}$	
		S	0.020	$8.5 \times 10^{-10}$	$3.6 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.1 \times 10^{-10}$	
Tc-95m	61.0 d	F	1.000	$2.4 \times 10^{-9}$	$9.3 \times 10^{-9}$	$5.7 \times 10^{-10}$	$1.5 \times 10^{-11}$	$1.2 \times 10^{-11}$	
		M	0.200	$4.9 \times 10^{-9}$	$2.3 \times 10^{-9}$	$1.5 \times 10^{-9}$	$2.4 \times 10^{-11}$	$1.9 \times 10^{-11}$	
		S	0.020	$6.0 \times 10^{-9}$	$2.7 \times 10^{-9}$	$1.8 \times 10^{-9}$	$2.5 \times 10^{-11}$	$2.0 \times 10^{-11}$	
Tc-96	4.28 d	F	1.000	$4.2 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.1 \times 10^{-9}$	$9.7 \times 10^{-12}$	$8.2 \times 10^{-12}$	
		M	0.200	$4.7 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.4 \times 10^{-11}$	$1.2 \times 10^{-11}$	
		S	0.020	$4.8 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.4 \times 10^{-11}$	$1.2 \times 10^{-11}$	
Tc-96m	0.858 h	F	1.000	$5.3 \times 10^{-11}$	$2.1 \times 10^{-11}$	$1.3 \times 10^{-11}$	$2.8 \times 10^{-11}$	$2.3 \times 10^{-11}$	
		M	0.200	$5.6 \times 10^{-11}$	$2.3 \times 10^{-11}$	$1.4 \times 10^{-11}$	$3.3 \times 10^{-11}$	$2.8 \times 10^{-11}$	
		S	0.020	$5.7 \times 10^{-11}$	$2.3 \times 10^{-11}$	$1.5 \times 10^{-11}$	$3.4 \times 10^{-11}$	$2.9 \times 10^{-11}$	
Tc-97	$2.60 \times 10^6$ a	F	1.000	$5.2 \times 10^{-10}$	$1.7 \times 10^{-10}$	$9.4 \times 10^{-11}$	$5.6 \times 10^{-11}$	$4.3 \times 10^{-11}$	
		M	0.200	$1.2 \times 10^{-9}$	$5.7 \times 10^{-10}$	$3.6 \times 10^{-10}$	$2.8 \times 10^{-10}$	$2.2 \times 10^{-10}$	
		S	0.020	$5.0 \times 10^{-9}$	$3.3 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.8 \times 10^{-9}$	
Tc-97m	87.0 d	F	1.000	$3.4 \times 10^{-9}$	$9.8 \times 10^{-10}$	$5.6 \times 10^{-10}$	$3.0 \times 10^{-10}$	$2.7 \times 10^{-10}$	
		M	0.200	$1.3 \times 10^{-8}$	$6.1 \times 10^{-9}$	$4.4 \times 10^{-9}$	$4.1 \times 10^{-9}$	$3.2 \times 10^{-9}$	
		S	0.020	$1.6 \times 10^{-8}$	$7.8 \times 10^{-9}$	$5.7 \times 10^{-9}$	$5.2 \times 10^{-9}$	$4.1 \times 10^{-9}$	
Tc-98	$4.20 \times 10^6$ a	F	1.000	$1.0 \times 10^{-8}$	$3.2 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.2 \times 10^{-9}$	$9.7 \times 10^{-10}$	
		M	0.200	$3.5 \times 10^{-8}$	$1.7 \times 10^{-8}$	$1.2 \times 10^{-8}$	$1.0 \times 10^{-8}$	$8.3 \times 10^{-9}$	
		S	0.020	$1.1 \times 10^{-7}$	$7.6 \times 10^{-8}$	$5.4 \times 10^{-8}$	$4.8 \times 10^{-8}$	$4.5 \times 10^{-8}$	



Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$								
		Type	$f_1$							$e(g)$							
Tc-99	2.13 × 10 <sup>5</sup> a	F	1.000	0.800	2.5 × 10 <sup>-9</sup>	1.0 × 10 <sup>-9</sup>	5.9 × 10 <sup>-10</sup>	3.6 × 10 <sup>-10</sup>	2.9 × 10 <sup>-10</sup>								
		M	0.200	0.100	1.3 × 10 <sup>-8</sup>	8.0 × 10 <sup>-9</sup>	5.7 × 10 <sup>-9</sup>	5.0 × 10 <sup>-9</sup>	4.0 × 10 <sup>-9</sup>								
		S	0.020	0.010	3.7 × 10 <sup>-8</sup>	2.4 × 10 <sup>-8</sup>	1.7 × 10 <sup>-8</sup>	1.5 × 10 <sup>-8</sup>	1.3 × 10 <sup>-8</sup>								
Tc-99m	6.02 h	F	1.000	0.800	8.7 × 10 <sup>-11</sup>	4.1 × 10 <sup>-11</sup>	2.4 × 10 <sup>-11</sup>	1.5 × 10 <sup>-11</sup>	1.2 × 10 <sup>-11</sup>								
		M	0.200	0.100	9.9 × 10 <sup>-11</sup>	5.1 × 10 <sup>-11</sup>	3.4 × 10 <sup>-11</sup>	2.4 × 10 <sup>-11</sup>	1.9 × 10 <sup>-11</sup>								
		S	0.020	0.010	1.0 × 10 <sup>-10</sup>	5.2 × 10 <sup>-11</sup>	3.5 × 10 <sup>-11</sup>	2.5 × 10 <sup>-11</sup>	2.0 × 10 <sup>-11</sup>								
Tc101	0.237 h	F	1.000	0.800	5.6 × 10 <sup>-11</sup>	2.5 × 10 <sup>-11</sup>	1.6 × 10 <sup>-11</sup>	9.7 × 10 <sup>-12</sup>	8.2 × 10 <sup>-12</sup>								
		M	0.200	0.100	7.1 × 10 <sup>-11</sup>	3.2 × 10 <sup>-11</sup>	2.1 × 10 <sup>-11</sup>	1.4 × 10 <sup>-11</sup>	1.2 × 10 <sup>-11</sup>								
		S	0.020	0.010	7.3 × 10 <sup>-11</sup>	3.3 × 10 <sup>-11</sup>	1.4 × 10 <sup>-11</sup>	1.2 × 10 <sup>-11</sup>	1.2 × 10 <sup>-11</sup>								
Tc104	0.303 h	F	1.000	0.800	1.8 × 10 <sup>-10</sup>	8.0 × 10 <sup>-11</sup>	2.8 × 10 <sup>-11</sup>	2.3 × 10 <sup>-11</sup>	2.3 × 10 <sup>-11</sup>								
		M	0.200	0.100	1.9 × 10 <sup>-10</sup>	8.6 × 10 <sup>-11</sup>	3.3 × 10 <sup>-11</sup>	2.8 × 10 <sup>-11</sup>	2.8 × 10 <sup>-11</sup>								
		S	0.020	0.010	1.9 × 10 <sup>-10</sup>	8.7 × 10 <sup>-11</sup>	3.4 × 10 <sup>-11</sup>	2.9 × 10 <sup>-11</sup>	2.9 × 10 <sup>-11</sup>								
<b>Ruthenium</b>																	
Ru-94	0.863 h	F	0.100	0.050	1.9 × 10 <sup>-10</sup>	9.0 × 10 <sup>-11</sup>	5.4 × 10 <sup>-11</sup>	3.1 × 10 <sup>-11</sup>	2.5 × 10 <sup>-11</sup>								
		M	0.100	0.050	2.8 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	8.4 × 10 <sup>-11</sup>	5.2 × 10 <sup>-11</sup>	4.2 × 10 <sup>-11</sup>								
		S	0.020	0.010	2.9 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	8.7 × 10 <sup>-11</sup>	5.4 × 10 <sup>-11</sup>	4.4 × 10 <sup>-11</sup>								
Ru-97	2.90 d	F	0.100	0.050	4.4 × 10 <sup>-10</sup>	2.2 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	7.7 × 10 <sup>-11</sup>	6.2 × 10 <sup>-11</sup>								
		M	0.100	0.050	6.1 × 10 <sup>-10</sup>	3.1 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>								
		S	0.020	0.010	6.3 × 10 <sup>-10</sup>	3.3 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>								
Ru103	39.3 d	F	0.100	0.050	3.0 × 10 <sup>-9</sup>	1.5 × 10 <sup>-9</sup>	9.3 × 10 <sup>-10</sup>	5.6 × 10 <sup>-10</sup>	4.8 × 10 <sup>-10</sup>								
		M	0.100	0.050	8.4 × 10 <sup>-9</sup>	5.0 × 10 <sup>-9</sup>	3.5 × 10 <sup>-9</sup>	3.0 × 10 <sup>-9</sup>	2.4 × 10 <sup>-9</sup>								
		S	0.020	0.010	8.4 × 10 <sup>-9</sup>	5.0 × 10 <sup>-9</sup>	3.5 × 10 <sup>-9</sup>	3.0 × 10 <sup>-9</sup>	2.4 × 10 <sup>-9</sup>								

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for g > 1 a	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$			
		Type	$f_1$						$e(g)$		
Ru-105	4.44 h	S	0.020	$1.3 \times 10^{-8}$	0.010	$1.0 \times 10^{-8}$	$6.0 \times 10^{-9}$	$4.2 \times 10^{-9}$	$3.7 \times 10^{-9}$	$3.0 \times 10^{-9}$	
		F	0.100	$7.1 \times 10^{-10}$	0.050	$5.1 \times 10^{-10}$	$2.3 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.4 \times 10^{-10}$	$7.9 \times 10^{-11}$	$6.5 \times 10^{-11}$
		M	0.100	$1.3 \times 10^{-9}$	0.050	$9.2 \times 10^{-10}$	$4.5 \times 10^{-10}$	$3.0 \times 10^{-10}$	$3.0 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.7 \times 10^{-10}$
Ru-106	1.01 a	S	0.020	$1.4 \times 10^{-9}$	0.010	$9.8 \times 10^{-10}$	$4.8 \times 10^{-10}$	$3.2 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.8 \times 10^{-10}$	
		F	0.100	$7.2 \times 10^{-8}$	0.050	$5.4 \times 10^{-8}$	$2.6 \times 10^{-8}$	$1.6 \times 10^{-8}$	$9.2 \times 10^{-9}$	$7.9 \times 10^{-9}$	
		M	0.100	$1.4 \times 10^{-7}$	0.050	$1.1 \times 10^{-7}$	$6.4 \times 10^{-8}$	$4.1 \times 10^{-8}$	$3.1 \times 10^{-8}$	$2.8 \times 10^{-8}$	
Rhodium		S	0.020	$2.6 \times 10^{-7}$	0.010	$2.3 \times 10^{-7}$	$1.4 \times 10^{-7}$	$9.1 \times 10^{-8}$	$7.1 \times 10^{-8}$	$6.6 \times 10^{-8}$	
		F	0.100	$2.6 \times 10^{-9}$	0.050	$2.0 \times 10^{-9}$	$9.9 \times 10^{-10}$	$6.2 \times 10^{-10}$	$3.8 \times 10^{-10}$	$3.2 \times 10^{-10}$	
		M	0.100	$4.5 \times 10^{-9}$	0.050	$3.5 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.3 \times 10^{-9}$	$9.6 \times 10^{-10}$	$7.7 \times 10^{-10}$	
Rh-99m	4.70 h	S	0.100	$4.9 \times 10^{-9}$	0.050	$3.8 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.1 \times 10^{-9}$	$8.7 \times 10^{-10}$	
		F	0.100	$2.4 \times 10^{-10}$	0.050	$2.0 \times 10^{-10}$	$1.0 \times 10^{-10}$	$6.1 \times 10^{-11}$	$3.5 \times 10^{-11}$	$2.8 \times 10^{-11}$	
		M	0.100	$3.1 \times 10^{-10}$	0.050	$2.5 \times 10^{-10}$	$1.3 \times 10^{-10}$	$8.0 \times 10^{-11}$	$4.9 \times 10^{-11}$	$3.9 \times 10^{-11}$	
Rh100	20.8 h	S	0.100	$3.2 \times 10^{-10}$	0.050	$2.6 \times 10^{-10}$	$1.3 \times 10^{-10}$	$8.2 \times 10^{-11}$	$5.1 \times 10^{-11}$	$4.0 \times 10^{-11}$	
		F	0.100	$2.1 \times 10^{-9}$	0.050	$1.8 \times 10^{-9}$	$9.1 \times 10^{-10}$	$5.6 \times 10^{-10}$	$3.3 \times 10^{-10}$	$2.6 \times 10^{-10}$	
		M	0.100	$2.7 \times 10^{-9}$	0.050	$2.2 \times 10^{-9}$	$1.1 \times 10^{-9}$	$7.1 \times 10^{-10}$	$4.3 \times 10^{-10}$	$3.4 \times 10^{-10}$	
Rh101	3.20 a	S	0.100	$2.8 \times 10^{-9}$	0.050	$2.2 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.3 \times 10^{-10}$	$4.4 \times 10^{-10}$	$3.5 \times 10^{-10}$	
		F	0.100	$7.4 \times 10^{-9}$	0.050	$6.1 \times 10^{-9}$	$3.5 \times 10^{-9}$	$2.3 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.4 \times 10^{-9}$	
		M	0.100	$9.8 \times 10^{-9}$	0.050	$8.0 \times 10^{-9}$	$4.9 \times 10^{-9}$	$3.4 \times 10^{-9}$	$2.8 \times 10^{-9}$	$2.3 \times 10^{-9}$	
		S	0.100	$1.9 \times 10^{-8}$	0.050	$1.7 \times 10^{-8}$	$1.1 \times 10^{-8}$	$7.4 \times 10^{-9}$	$6.2 \times 10^{-9}$	$5.4 \times 10^{-9}$	

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2	2-7 a	7-12 a	12t-17 a	>17 a		
		Type	f <sub>i</sub>						e(g)	f <sub>i</sub> for g > 1 a
Rh101m	4.34 d	F	0.100	8.4 × 10 <sup>-10</sup>	0.050	6.6 × 10 <sup>-10</sup>	3.3 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	9.7 × 10 <sup>-11</sup>
		M	0.100	1.3 × 10 <sup>-9</sup>	0.050	9.8 × 10 <sup>-10</sup>	5.2 × 10 <sup>-10</sup>	3.5 × 10 <sup>-10</sup>	2.5 × 10 <sup>-10</sup>	1.9 × 10 <sup>-10</sup>
Rh102	2.90 a	S	0.100	1.3 × 10 <sup>-9</sup>	0.050	1.0 × 10 <sup>-9</sup>	5.5 × 10 <sup>-10</sup>	3.7 × 10 <sup>-10</sup>	2.7 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>
		F	0.100	3.3 × 10 <sup>-8</sup>	0.050	2.8 × 10 <sup>-8</sup>	1.7 × 10 <sup>-8</sup>	1.1 × 10 <sup>-8</sup>	7.9 × 10 <sup>-9</sup>	7.3 × 10 <sup>-9</sup>
Rh102m	207 d	M	0.100	3.0 × 10 <sup>-8</sup>	0.050	2.5 × 10 <sup>-8</sup>	1.5 × 10 <sup>-8</sup>	1.0 × 10 <sup>-8</sup>	7.9 × 10 <sup>-9</sup>	6.9 × 10 <sup>-9</sup>
		S	0.100	5.4 × 10 <sup>-8</sup>	0.050	5.0 × 10 <sup>-8</sup>	3.5 × 10 <sup>-8</sup>	2.4 × 10 <sup>-8</sup>	2.0 × 10 <sup>-8</sup>	1.7 × 10 <sup>-8</sup>
Rh103m	0.935 h	F	0.100	1.2 × 10 <sup>-8</sup>	0.050	8.7 × 10 <sup>-9</sup>	4.4 × 10 <sup>-9</sup>	2.7 × 10 <sup>-9</sup>	1.7 × 10 <sup>-9</sup>	1.5 × 10 <sup>-9</sup>
		M	0.100	2.0 × 10 <sup>-8</sup>	0.050	1.6 × 10 <sup>-8</sup>	9.0 × 10 <sup>-9</sup>	6.0 × 10 <sup>-9</sup>	4.7 × 10 <sup>-9</sup>	4.0 × 10 <sup>-9</sup>
Rh105	1.47 d	S	0.100	3.0 × 10 <sup>-8</sup>	0.050	2.5 × 10 <sup>-8</sup>	1.5 × 10 <sup>-8</sup>	1.0 × 10 <sup>-8</sup>	8.2 × 10 <sup>-9</sup>	7.1 × 10 <sup>-9</sup>
		F	0.100	8.6 × 10 <sup>-12</sup>	0.050	5.9 × 10 <sup>-12</sup>	2.7 × 10 <sup>-12</sup>	1.6 × 10 <sup>-12</sup>	1.0 × 10 <sup>-12</sup>	8.6 × 10 <sup>-13</sup>
Rh106m	2.20 h	M	0.100	1.9 × 10 <sup>-11</sup>	0.050	1.2 × 10 <sup>-11</sup>	6.3 × 10 <sup>-12</sup>	4.0 × 10 <sup>-12</sup>	3.0 × 10 <sup>-12</sup>	2.5 × 10 <sup>-12</sup>
		S	0.100	2.0 × 10 <sup>-11</sup>	0.050	1.3 × 10 <sup>-11</sup>	6.7 × 10 <sup>-12</sup>	4.3 × 10 <sup>-12</sup>	3.2 × 10 <sup>-12</sup>	2.7 × 10 <sup>-12</sup>
Rh107	0.362 h	F	0.100	1.0 × 10 <sup>-9</sup>	0.050	6.9 × 10 <sup>-10</sup>	3.0 × 10 <sup>-10</sup>	1.8 × 10 <sup>-10</sup>	9.6 × 10 <sup>-11</sup>	8.2 × 10 <sup>-11</sup>
		M	0.100	2.2 × 10 <sup>-9</sup>	0.050	1.6 × 10 <sup>-9</sup>	7.4 × 10 <sup>-10</sup>	5.2 × 10 <sup>-10</sup>	4.1 × 10 <sup>-10</sup>	3.2 × 10 <sup>-10</sup>
Rh107	0.362 h	S	0.100	2.4 × 10 <sup>-9</sup>	0.050	1.7 × 10 <sup>-9</sup>	8.0 × 10 <sup>-10</sup>	5.6 × 10 <sup>-10</sup>	4.5 × 10 <sup>-10</sup>	3.5 × 10 <sup>-10</sup>
		F	0.100	5.7 × 10 <sup>-10</sup>	0.050	4.5 × 10 <sup>-10</sup>	2.2 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	8.0 × 10 <sup>-11</sup>	6.5 × 10 <sup>-11</sup>
Rh107	0.362 h	M	0.100	8.2 × 10 <sup>-10</sup>	0.050	6.3 × 10 <sup>-10</sup>	3.2 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>
		S	0.100	8.5 × 10 <sup>-10</sup>	0.050	6.5 × 10 <sup>-10</sup>	3.3 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>
Rh107	0.362 h	F	0.100	8.9 × 10 <sup>-11</sup>	0.050	5.9 × 10 <sup>-11</sup>	2.6 × 10 <sup>-11</sup>	1.7 × 10 <sup>-11</sup>	1.0 × 10 <sup>-11</sup>	9.0 × 10 <sup>-12</sup>
		M	0.100	1.4 × 10 <sup>-10</sup>	0.050	9.3 × 10 <sup>-11</sup>	4.2 × 10 <sup>-11</sup>	2.8 × 10 <sup>-11</sup>	1.9 × 10 <sup>-11</sup>	1.6 × 10 <sup>-11</sup>
Rh107	0.362 h	S	0.100	1.5 × 10 <sup>-10</sup>	0.050	9.7 × 10 <sup>-11</sup>	4.4 × 10 <sup>-11</sup>	2.9 × 10 <sup>-11</sup>	1.9 × 10 <sup>-11</sup>	1.7 × 10 <sup>-11</sup>

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$	
		Type	$f_1$ $e(g)$						
Palladium	3.63 d	F	0.050	0.005	$1.5 \times 10^{-9}$	$9.7 \times 10^{-10}$	$5.8 \times 10^{-10}$	$4.7 \times 10^{-10}$	
		M	0.050	0.005	$2.2 \times 10^{-9}$	$1.4 \times 10^{-9}$	$9.9 \times 10^{-10}$	$8.0 \times 10^{-10}$	
		S	0.050	0.005	$4.1 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.0 \times 10^{-9}$	$8.5 \times 10^{-10}$
Pd101	8.27 h	F	0.050	0.005	$1.4 \times 10^{-10}$	$8.6 \times 10^{-11}$	$4.9 \times 10^{-11}$	$3.9 \times 10^{-11}$	
		M	0.050	0.005	$3.8 \times 10^{-10}$	$1.2 \times 10^{-10}$	$7.5 \times 10^{-11}$	$5.9 \times 10^{-11}$	
		S	0.050	0.005	$3.9 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.2 \times 10^{-10}$	$7.8 \times 10^{-11}$	$6.2 \times 10^{-11}$
Pd103	17.0 d	F	0.050	0.005	$3.0 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.1 \times 10^{-10}$	$8.9 \times 10^{-11}$	
		M	0.050	0.005	$1.6 \times 10^{-9}$	$9.0 \times 10^{-10}$	$5.9 \times 10^{-10}$	$3.8 \times 10^{-10}$	
		S	0.050	0.005	$1.8 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.8 \times 10^{-10}$	$5.3 \times 10^{-10}$	$4.5 \times 10^{-10}$
Pd107	$6.50 \times 10^6$ a	F	0.050	0.005	$1.8 \times 10^{-10}$	$8.2 \times 10^{-11}$	$3.1 \times 10^{-11}$	$2.5 \times 10^{-11}$	
		M	0.050	0.005	$5.0 \times 10^{-10}$	$2.6 \times 10^{-10}$	$1.0 \times 10^{-10}$	$8.5 \times 10^{-11}$	
		S	0.050	0.005	$2.0 \times 10^{-9}$	$1.3 \times 10^{-9}$	$7.8 \times 10^{-10}$	$6.2 \times 10^{-10}$	$5.9 \times 10^{-10}$
Pd109	13.4 h	F	0.050	0.005	$9.9 \times 10^{-10}$	$4.2 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.2 \times 10^{-10}$	
		M	0.050	0.005	$1.8 \times 10^{-9}$	$8.8 \times 10^{-10}$	$4.3 \times 10^{-10}$	$3.4 \times 10^{-10}$	
		S	0.050	0.005	$1.9 \times 10^{-9}$	$9.3 \times 10^{-10}$	$6.3 \times 10^{-10}$	$4.6 \times 10^{-10}$	$3.7 \times 10^{-10}$
Silver	0.215 h	F	0.100	0.050	$8.6 \times 10^{-11}$	$2.6 \times 10^{-11}$	$1.5 \times 10^{-11}$	$1.3 \times 10^{-11}$	
		M	0.100	0.050	$1.1 \times 10^{-10}$	$5.5 \times 10^{-11}$	$3.4 \times 10^{-11}$	$2.1 \times 10^{-11}$	
		S	0.020	0.010	$1.2 \times 10^{-10}$	$5.6 \times 10^{-11}$	$3.5 \times 10^{-11}$	$2.2 \times 10^{-11}$	$1.8 \times 10^{-11}$
Ag-103	1.09 h	F	0.100	0.050	$1.0 \times 10^{-10}$	$4.9 \times 10^{-11}$	$3.0 \times 10^{-11}$	$1.8 \times 10^{-11}$	$1.4 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $f_1$ for	2-7 a	7-12 a	12t-17 a	>17 a		
		Type	$f_1$						e(g)	e(g)
Ag-104	1.15 h	M	0.100	$2.2 \times 10^{-10}$	0.050	$1.6 \times 10^{-10}$	$7.6 \times 10^{-11}$	$4.8 \times 10^{-11}$	$3.2 \times 10^{-11}$	$2.6 \times 10^{-11}$
		S	0.020	$2.3 \times 10^{-10}$	0.010	$1.6 \times 10^{-10}$	$7.9 \times 10^{-11}$	$5.1 \times 10^{-11}$	$3.3 \times 10^{-11}$	$2.7 \times 10^{-11}$
		F	0.100	$2.3 \times 10^{-10}$	0.050	$1.9 \times 10^{-10}$	$9.8 \times 10^{-11}$	$5.9 \times 10^{-11}$	$3.5 \times 10^{-11}$	$2.8 \times 10^{-11}$
		M	0.100	$2.9 \times 10^{-10}$	0.050	$2.3 \times 10^{-10}$	$1.2 \times 10^{-10}$	$7.4 \times 10^{-11}$	$4.5 \times 10^{-11}$	$3.6 \times 10^{-11}$
		S	0.020	$2.9 \times 10^{-10}$	0.010	$2.4 \times 10^{-10}$	$1.2 \times 10^{-10}$	$7.6 \times 10^{-11}$	$4.6 \times 10^{-11}$	$3.7 \times 10^{-11}$
Ag-104m	0.558 h	F	0.100	$1.6 \times 10^{-10}$	0.050	$1.1 \times 10^{-10}$	$5.5 \times 10^{-11}$	$3.4 \times 10^{-11}$	$2.0 \times 10^{-11}$	$1.6 \times 10^{-11}$
		M	0.100	$2.3 \times 10^{-10}$	0.050	$1.6 \times 10^{-10}$	$7.7 \times 10^{-11}$	$4.8 \times 10^{-11}$	$3.0 \times 10^{-11}$	$2.5 \times 10^{-11}$
		S	0.020	$2.4 \times 10^{-10}$	0.010	$1.7 \times 10^{-10}$	$8.0 \times 10^{-11}$	$5.0 \times 10^{-11}$	$3.1 \times 10^{-11}$	$2.6 \times 10^{-11}$
		F	0.100	$3.9 \times 10^{-9}$	0.050	$3.4 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.4 \times 10^{-10}$	$5.4 \times 10^{-10}$
		M	0.100	$4.5 \times 10^{-9}$	0.050	$3.5 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.3 \times 10^{-9}$	$9.0 \times 10^{-10}$	$7.3 \times 10^{-10}$
Ag-106	0.399 h	S	0.020	$4.5 \times 10^{-9}$	0.010	$3.6 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.0 \times 10^{-9}$	$8.1 \times 10^{-10}$
		F	0.100	$9.4 \times 10^{-11}$	0.050	$6.4 \times 10^{-11}$	$2.9 \times 10^{-11}$	$1.8 \times 10^{-11}$	$1.1 \times 10^{-11}$	$9.1 \times 10^{-12}$
		M	0.100	$1.4 \times 10^{-10}$	0.050	$9.5 \times 10^{-11}$	$4.4 \times 10^{-11}$	$2.8 \times 10^{-11}$	$1.8 \times 10^{-11}$	$1.5 \times 10^{-11}$
		S	0.020	$1.5 \times 10^{-10}$	0.010	$9.9 \times 10^{-11}$	$4.5 \times 10^{-11}$	$2.9 \times 10^{-11}$	$1.9 \times 10^{-11}$	$1.6 \times 10^{-11}$
		F	0.100	$7.7 \times 10^{-9}$	0.050	$6.1 \times 10^{-9}$	$3.2 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.1 \times 10^{-9}$
Ag-106m	8.41 d	M	0.100	$7.2 \times 10^{-9}$	0.050	$5.8 \times 10^{-9}$	$3.2 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.1 \times 10^{-9}$
		S	0.020	$7.0 \times 10^{-9}$	0.010	$5.7 \times 10^{-9}$	$3.2 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.1 \times 10^{-9}$
		F	0.100	$3.5 \times 10^{-8}$	0.050	$2.8 \times 10^{-8}$	$1.6 \times 10^{-8}$	$1.0 \times 10^{-8}$	$6.9 \times 10^{-9}$	$6.1 \times 10^{-9}$
		M	0.100	$3.3 \times 10^{-8}$	0.050	$2.7 \times 10^{-8}$	$1.7 \times 10^{-8}$	$1.1 \times 10^{-8}$	$8.6 \times 10^{-9}$	$7.4 \times 10^{-9}$
		S	0.020	$8.9 \times 10^{-8}$	0.010	$8.7 \times 10^{-8}$	$6.2 \times 10^{-8}$	$4.4 \times 10^{-8}$	$3.9 \times 10^{-8}$	$3.7 \times 10^{-8}$
Ag-110m	250 d	F	0.100	$3.5 \times 10^{-8}$	0.050	$2.8 \times 10^{-8}$	$1.5 \times 10^{-8}$	$9.7 \times 10^{-9}$	$6.3 \times 10^{-9}$	$5.5 \times 10^{-9}$
		M	0.100	$3.5 \times 10^{-8}$	0.050	$2.8 \times 10^{-8}$	$1.7 \times 10^{-8}$	$1.2 \times 10^{-8}$	$9.2 \times 10^{-9}$	$7.6 \times 10^{-9}$
		S	0.020	$4.6 \times 10^{-8}$	0.010	$4.1 \times 10^{-8}$	$2.6 \times 10^{-8}$	$1.8 \times 10^{-8}$	$1.5 \times 10^{-8}$	$1.2 \times 10^{-8}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2	2-7 a	7-12 a	12t-17 a	>17 a		
		Type	f <sub>1</sub> e(g)						f <sub>1</sub> for g > 1 a	e(g)
Ag-111	7.45 d	F	0.100	4.8 × 10 <sup>-9</sup>	0.050	3.2 × 10 <sup>-9</sup>	1.4 × 10 <sup>-9</sup>	8.8 × 10 <sup>-10</sup>	4.8 × 10 <sup>-10</sup>	4.0 × 10 <sup>-10</sup>
		M	0.100	9.2 × 10 <sup>-9</sup>	0.050	6.6 × 10 <sup>-9</sup>	3.5 × 10 <sup>-9</sup>	2.4 × 10 <sup>-9</sup>	1.9 × 10 <sup>-9</sup>	1.5 × 10 <sup>-9</sup>
		S	0.020	9.9 × 10 <sup>-9</sup>	0.010	7.1 × 10 <sup>-9</sup>	3.8 × 10 <sup>-9</sup>	2.7 × 10 <sup>-9</sup>	2.1 × 10 <sup>-9</sup>	1.7 × 10 <sup>-9</sup>
Ag-112	3.12 h	F	0.100	9.8 × 10 <sup>-10</sup>	0.050	6.4 × 10 <sup>-10</sup>	2.8 × 10 <sup>-10</sup>	1.7 × 10 <sup>-10</sup>	9.1 × 10 <sup>-11</sup>	7.6 × 10 <sup>-11</sup>
		M	0.100	1.7 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	5.1 × 10 <sup>-10</sup>	3.2 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.6 × 10 <sup>-10</sup>
		S	0.020	1.8 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>	5.4 × 10 <sup>-10</sup>	3.4 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>	1.7 × 10 <sup>-10</sup>
Ag-115	0.333 h	F	0.100	1.6 × 10 <sup>-10</sup>	0.050	1.0 × 10 <sup>-10</sup>	4.6 × 10 <sup>-11</sup>	2.9 × 10 <sup>-11</sup>	1.7 × 10 <sup>-11</sup>	1.5 × 10 <sup>-11</sup>
		M	0.100	2.5 × 10 <sup>-10</sup>	0.050	1.7 × 10 <sup>-10</sup>	7.6 × 10 <sup>-11</sup>	4.9 × 10 <sup>-11</sup>	3.2 × 10 <sup>-11</sup>	2.7 × 10 <sup>-11</sup>
		S	0.020	2.7 × 10 <sup>-10</sup>	0.010	1.7 × 10 <sup>-10</sup>	8.0 × 10 <sup>-11</sup>	5.2 × 10 <sup>-11</sup>	3.4 × 10 <sup>-11</sup>	2.9 × 10 <sup>-11</sup>
<b>Cadmium</b>										
Cd104	0.961 h	F	0.100	2.0 × 10 <sup>-10</sup>	0.050	1.7 × 10 <sup>-10</sup>	8.7 × 10 <sup>-11</sup>	5.2 × 10 <sup>-11</sup>	3.1 × 10 <sup>-11</sup>	2.4 × 10 <sup>-11</sup>
		M	0.100	2.6 × 10 <sup>-10</sup>	0.050	2.1 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	6.9 × 10 <sup>-11</sup>	4.2 × 10 <sup>-11</sup>	3.4 × 10 <sup>-11</sup>
		S	0.100	2.7 × 10 <sup>-10</sup>	0.050	2.2 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	7.0 × 10 <sup>-11</sup>	4.4 × 10 <sup>-11</sup>	3.5 × 10 <sup>-11</sup>
Cd107	6.49 h	F	0.100	2.3 × 10 <sup>-10</sup>	0.050	1.7 × 10 <sup>-10</sup>	7.4 × 10 <sup>-11</sup>	4.6 × 10 <sup>-11</sup>	2.5 × 10 <sup>-11</sup>	2.1 × 10 <sup>-11</sup>
		M	0.100	5.2 × 10 <sup>-10</sup>	0.050	3.7 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	8.8 × 10 <sup>-11</sup>	8.3 × 10 <sup>-11</sup>
		S	0.100	5.5 × 10 <sup>-10</sup>	0.050	3.9 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	9.7 × 10 <sup>-11</sup>	7.7 × 10 <sup>-11</sup>
Cd109	1.27 a	F	0.100	4.5 × 10 <sup>-8</sup>	0.050	3.7 × 10 <sup>-8</sup>	2.1 × 10 <sup>-8</sup>	1.4 × 10 <sup>-8</sup>	9.3 × 10 <sup>-9</sup>	8.1 × 10 <sup>-9</sup>
		M	0.100	3.0 × 10 <sup>-8</sup>	0.050	2.3 × 10 <sup>-8</sup>	1.4 × 10 <sup>-8</sup>	9.5 × 10 <sup>-9</sup>	7.8 × 10 <sup>-9</sup>	6.6 × 10 <sup>-9</sup>
		S	0.100	2.7 × 10 <sup>-8</sup>	0.050	2.1 × 10 <sup>-8</sup>	1.3 × 10 <sup>-8</sup>	8.9 × 10 <sup>-9</sup>	7.6 × 10 <sup>-9</sup>	6.2 × 10 <sup>-9</sup>
Cd-113	9.30 × 10 <sup>15</sup> a	F	0.100	2.6 × 10 <sup>-7</sup>	0.050	2.4 × 10 <sup>-7</sup>	1.7 × 10 <sup>-7</sup>	1.4 × 10 <sup>-7</sup>	1.2 × 10 <sup>-7</sup>	1.2 × 10 <sup>-7</sup>
		M	0.100	1.2 × 10 <sup>-7</sup>	0.050	1.0 × 10 <sup>-7</sup>	7.6 × 10 <sup>-8</sup>	6.1 × 10 <sup>-8</sup>	5.7 × 10 <sup>-8</sup>	5.5 × 10 <sup>-8</sup>

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		f <sub>1</sub> for g > 1 a	Age 1-2 f <sub>1</sub> for	2-7 a e(g)	7-12 a e(g)	12t-17 a e(g)	>17 a e(g)	
		Type	f <sub>1</sub>							e(g)
Cd-113m	13.6 a	S	0.100	7.8 × 10 <sup>-8</sup>	0.050	5.8 × 10 <sup>-8</sup>	4.1 × 10 <sup>-8</sup>	3.0 × 10 <sup>-8</sup>	2.7 × 10 <sup>-8</sup>	2.6 × 10 <sup>-8</sup>
		F	0.100	3.0 × 10 <sup>-7</sup>	0.050	2.7 × 10 <sup>-7</sup>	1.8 × 10 <sup>-7</sup>	1.3 × 10 <sup>-7</sup>	1.1 × 10 <sup>-7</sup>	1.1 × 10 <sup>-7</sup>
		M	0.100	1.4 × 10 <sup>-7</sup>	0.050	1.2 × 10 <sup>-7</sup>	8.1 × 10 <sup>-8</sup>	6.0 × 10 <sup>-8</sup>	5.3 × 10 <sup>-8</sup>	5.2 × 10 <sup>-8</sup>
		S	0.100	1.1 × 10 <sup>-7</sup>	0.050	8.4 × 10 <sup>-8</sup>	5.5 × 10 <sup>-8</sup>	3.9 × 10 <sup>-8</sup>	3.3 × 10 <sup>-8</sup>	3.1 × 10 <sup>-8</sup>
Cd-115	2.23 d	F	0.100	4.0 × 10 <sup>-9</sup>	0.050	2.6 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>	7.5 × 10 <sup>-10</sup>	4.3 × 10 <sup>-10</sup>	3.5 × 10 <sup>-10</sup>
		M	0.100	6.7 × 10 <sup>-9</sup>	0.050	4.8 × 10 <sup>-9</sup>	2.4 × 10 <sup>-9</sup>	1.7 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>	9.8 × 10 <sup>-10</sup>
		S	0.100	7.2 × 10 <sup>-9</sup>	0.050	5.1 × 10 <sup>-9</sup>	2.6 × 10 <sup>-9</sup>	1.8 × 10 <sup>-9</sup>	1.3 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>
		F	0.100	4.6 × 10 <sup>-8</sup>	0.050	3.2 × 10 <sup>-8</sup>	1.5 × 10 <sup>-8</sup>	1.0 × 10 <sup>-8</sup>	6.4 × 10 <sup>-9</sup>	5.3 × 10 <sup>-9</sup>
Cd-115m	44.6 d	M	0.100	4.0 × 10 <sup>-8</sup>	0.050	2.5 × 10 <sup>-8</sup>	1.4 × 10 <sup>-8</sup>	9.4 × 10 <sup>-9</sup>	7.3 × 10 <sup>-9</sup>	6.2 × 10 <sup>-9</sup>
		S	0.100	3.9 × 10 <sup>-8</sup>	0.050	3.0 × 10 <sup>-8</sup>	1.7 × 10 <sup>-8</sup>	8.9 × 10 <sup>-9</sup>	8.9 × 10 <sup>-9</sup>	7.7 × 10 <sup>-9</sup>
		F	0.100	7.4 × 10 <sup>-10</sup>	0.050	5.2 × 10 <sup>-10</sup>	2.4 × 10 <sup>-10</sup>	1.5 × 10 <sup>-10</sup>	8.1 × 10 <sup>-11</sup>	6.7 × 10 <sup>-11</sup>
		M	0.100	1.3 × 10 <sup>-9</sup>	0.050	9.3 × 10 <sup>-10</sup>	4.5 × 10 <sup>-10</sup>	2.9 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.6 × 10 <sup>-10</sup>
Cd-117	2.49 h	S	0.100	1.4 × 10 <sup>-9</sup>	0.050	9.8 × 10 <sup>-10</sup>	4.8 × 10 <sup>-10</sup>	3.1 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>	1.7 × 10 <sup>-10</sup>
		F	0.100	8.9 × 10 <sup>-10</sup>	0.050	6.7 × 10 <sup>-10</sup>	3.3 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	9.4 × 10 <sup>-11</sup>
		M	0.100	1.5 × 10 <sup>-9</sup>	0.050	1.1 × 10 <sup>-9</sup>	5.5 × 10 <sup>-10</sup>	3.6 × 10 <sup>-10</sup>	2.4 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>
		S	0.100	1.5 × 10 <sup>-9</sup>	0.050	1.1 × 10 <sup>-9</sup>	5.7 × 10 <sup>-10</sup>	3.8 × 10 <sup>-10</sup>	2.6 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>
Indium	4.20 h	F	0.040	2.6 × 10 <sup>-10</sup>	0.020	2.1 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>	6.3 × 10 <sup>-11</sup>	3.6 × 10 <sup>-11</sup>	2.9 × 10 <sup>-11</sup>
		M	0.040	3.3 × 10 <sup>-10</sup>	0.020	2.6 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	8.4 × 10 <sup>-11</sup>	5.3 × 10 <sup>-11</sup>	4.2 × 10 <sup>-11</sup>
		F	0.040	8.2 × 10 <sup>-10</sup>	0.020	7.1 × 10 <sup>-10</sup>	3.7 × 10 <sup>-10</sup>	2.3 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>
		M	0.040	9.9 × 10 <sup>-10</sup>	0.020	8.3 × 10 <sup>-10</sup>	4.4 × 10 <sup>-10</sup>	2.7 × 10 <sup>-10</sup>	1.6 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>
In-110m	1.15 h	F	0.040	3.0 × 10 <sup>-10</sup>	0.020	2.1 × 10 <sup>-10</sup>	9.9 × 10 <sup>-11</sup>	6.0 × 10 <sup>-11</sup>	3.5 × 10 <sup>-11</sup>	2.8 × 10 <sup>-11</sup>
		M	0.040	4.5 × 10 <sup>-10</sup>	0.020	3.1 × 10 <sup>-10</sup>	1.5 × 10 <sup>-10</sup>	9.2 × 10 <sup>-11</sup>	5.8 × 10 <sup>-11</sup>	4.7 × 10 <sup>-11</sup>

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a			$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a	7-12 a	12t-17 a	>17 a
		Type	$f_1$	e(g)						
In-111	2.83 d	F	0.040	$1.2 \times 10^{-9}$	0.020	$8.6 \times 10^{-10}$	$4.2 \times 10^{-10}$	$2.6 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.3 \times 10^{-10}$
		M	0.040	$1.5 \times 10^{-9}$	0.020	$1.2 \times 10^{-9}$	$6.2 \times 10^{-10}$	$4.1 \times 10^{-10}$	$2.9 \times 10^{-10}$	$2.3 \times 10^{-10}$
In-112	0.240 h	F	0.040	$4.4 \times 10^{-11}$	0.020	$3.0 \times 10^{-11}$	$1.3 \times 10^{-11}$	$8.7 \times 10^{-12}$	$5.4 \times 10^{-12}$	$4.7 \times 10^{-12}$
		M	0.040	$6.5 \times 10^{-11}$	0.020	$4.4 \times 10^{-11}$	$2.0 \times 10^{-11}$	$1.3 \times 10^{-11}$	$8.7 \times 10^{-12}$	$7.4 \times 10^{-12}$
In-113m	1.66 h	F	0.040	$1.0 \times 10^{-10}$	0.020	$7.0 \times 10^{-11}$	$3.2 \times 10^{-11}$	$2.0 \times 10^{-11}$	$1.2 \times 10^{-11}$	$9.7 \times 10^{-12}$
		M	0.040	$1.6 \times 10^{-10}$	0.020	$1.1 \times 10^{-10}$	$5.5 \times 10^{-11}$	$3.6 \times 10^{-11}$	$2.4 \times 10^{-11}$	$2.0 \times 10^{-11}$
In-114m	49.5 d	F	0.040	$1.2 \times 10^{-7}$	0.020	$7.7 \times 10^{-8}$	$3.4 \times 10^{-8}$	$1.9 \times 10^{-8}$	$1.1 \times 10^{-8}$	$9.3 \times 10^{-9}$
		M	0.040	$4.8 \times 10^{-8}$	0.020	$3.3 \times 10^{-8}$	$1.6 \times 10^{-8}$	$1.0 \times 10^{-8}$	$7.8 \times 10^{-9}$	$6.1 \times 10^{-9}$
In-115	$5.10 \times 10^{15}$ a	F	0.040	$8.3 \times 10^{-7}$	0.020	$7.8 \times 10^{-7}$	$5.5 \times 10^{-7}$	$5.0 \times 10^{-7}$	$4.2 \times 10^{-7}$	$3.9 \times 10^{-7}$
		M	0.040	$3.0 \times 10^{-7}$	0.020	$2.8 \times 10^{-7}$	$2.1 \times 10^{-7}$	$1.9 \times 10^{-7}$	$1.7 \times 10^{-7}$	$1.6 \times 10^{-7}$
In-115m	4.49 h	F	0.040	$2.8 \times 10^{-10}$	0.020	$1.9 \times 10^{-10}$	$8.4 \times 10^{-11}$	$5.1 \times 10^{-11}$	$2.8 \times 10^{-11}$	$2.4 \times 10^{-11}$
		M	0.040	$4.7 \times 10^{-10}$	0.020	$3.3 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.0 \times 10^{-10}$	$7.2 \times 10^{-11}$	$5.9 \times 10^{-11}$
In-116m	0.902 h	F	0.040	$2.5 \times 10^{-10}$	0.020	$1.9 \times 10^{-10}$	$9.2 \times 10^{-11}$	$5.7 \times 10^{-11}$	$3.4 \times 10^{-11}$	$2.8 \times 10^{-11}$
		M	0.040	$3.6 \times 10^{-10}$	0.020	$2.7 \times 10^{-10}$	$1.3 \times 10^{-10}$	$8.5 \times 10^{-11}$	$5.6 \times 10^{-11}$	$4.5 \times 10^{-11}$
In-117	0.730 h	F	0.040	$1.4 \times 10^{-10}$	0.020	$9.7 \times 10^{-11}$	$4.5 \times 10^{-11}$	$2.8 \times 10^{-11}$	$1.7 \times 10^{-11}$	$1.5 \times 10^{-11}$
		M	0.040	$2.3 \times 10^{-10}$	0.020	$1.6 \times 10^{-10}$	$7.5 \times 10^{-11}$	$5.0 \times 10^{-11}$	$3.5 \times 10^{-11}$	$2.9 \times 10^{-11}$
In-117m	1.94 h	F	0.040	$3.4 \times 10^{-10}$	0.020	$2.3 \times 10^{-10}$	$1.0 \times 10^{-10}$	$6.2 \times 10^{-11}$	$3.5 \times 10^{-11}$	$2.9 \times 10^{-11}$
		M	0.040	$6.0 \times 10^{-10}$	0.020	$4.0 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.3 \times 10^{-10}$	$8.7 \times 10^{-11}$	$7.2 \times 10^{-11}$
In-119m	0.300 h	F	0.040	$1.2 \times 10^{-10}$	0.020	$7.3 \times 10^{-11}$	$3.1 \times 10^{-11}$	$2.0 \times 10^{-11}$	$1.2 \times 10^{-11}$	$1.0 \times 10^{-11}$
		M	0.040	$1.8 \times 10^{-10}$	0.020	$1.1 \times 10^{-10}$	$4.9 \times 10^{-11}$	$3.2 \times 10^{-11}$	$2.0 \times 10^{-11}$	$1.7 \times 10^{-11}$
<b>Tin</b>										



Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $f_1$ for $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$					
			$e(g)$					
Sn-110	4.00 h	F	0.040	0.020	$3.6 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.2 \times 10^{-10}$	$9.9 \times 10^{-11}$
Sn-111	0.588 h	M	0.040	0.020	$5.1 \times 10^{-10}$	$3.2 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.6 \times 10^{-10}$
		F	0.040	0.020	$2.6 \times 10^{-11}$	$1.6 \times 10^{-11}$	$9.4 \times 10^{-12}$	$7.8 \times 10^{-12}$
Sn-113	115 d	M	0.040	0.020	$3.8 \times 10^{-11}$	$2.5 \times 10^{-11}$	$1.6 \times 10^{-11}$	$1.3 \times 10^{-11}$
		F	0.040	0.020	$1.8 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.4 \times 10^{-10}$	$5.4 \times 10^{-10}$
Sn-117m	13.6 d	M	0.040	0.020	$1.0 \times 10^{-8}$	$4.0 \times 10^{-9}$	$3.2 \times 10^{-9}$	$2.7 \times 10^{-9}$
		F	0.040	0.020	$3.3 \times 10^{-9}$	$1.0 \times 10^{-9}$	$3.4 \times 10^{-10}$	$2.8 \times 10^{-10}$
Sn-119m	293 d	M	0.040	0.020	$7.7 \times 10^{-9}$	$4.6 \times 10^{-9}$	$3.1 \times 10^{-9}$	$2.4 \times 10^{-9}$
		F	0.040	0.020	$2.2 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.0 \times 10^{-10}$	$2.8 \times 10^{-10}$
Sn-121	1.13 d	M	0.040	0.020	$7.9 \times 10^{-9}$	$4.7 \times 10^{-9}$	$2.6 \times 10^{-9}$	$2.2 \times 10^{-9}$
		F	0.040	0.020	$5.0 \times 10^{-10}$	$2.2 \times 10^{-10}$	$7.0 \times 10^{-11}$	$6.0 \times 10^{-11}$
Sn-121m	55.0 a	M	0.040	0.020	$1.1 \times 10^{-9}$	$5.1 \times 10^{-10}$	$2.9 \times 10^{-10}$	$2.3 \times 10^{-10}$
		F	0.040	0.020	$6.9 \times 10^{-9}$	$2.8 \times 10^{-9}$	$9.4 \times 10^{-10}$	$8.0 \times 10^{-10}$
Sn-123	129 d	M	0.040	0.020	$1.5 \times 10^{-8}$	$9.2 \times 10^{-9}$	$5.5 \times 10^{-9}$	$4.5 \times 10^{-9}$
		F	0.040	0.020	$1.4 \times 10^{-8}$	$4.5 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.2 \times 10^{-9}$
Sn-123m	0.668 h	M	0.040	0.020	$3.1 \times 10^{-8}$	$1.8 \times 10^{-8}$	$9.5 \times 10^{-9}$	$8.1 \times 10^{-9}$
		F	0.040	0.020	$8.9 \times 10^{-11}$	$3.9 \times 10^{-11}$	$1.5 \times 10^{-11}$	$1.3 \times 10^{-11}$
Sn-125	9.64 d	M	0.040	0.020	$1.5 \times 10^{-10}$	$7.0 \times 10^{-11}$	$3.2 \times 10^{-11}$	$2.7 \times 10^{-11}$
		F	0.040	0.020	$8.0 \times 10^{-9}$	$3.5 \times 10^{-9}$	$1.1 \times 10^{-9}$	$8.9 \times 10^{-10}$
Sn-126	$1.00 \times 10^5$ a	M	0.040	0.020	$1.5 \times 10^{-8}$	$7.6 \times 10^{-9}$	$3.6 \times 10^{-9}$	$3.1 \times 10^{-9}$
		F	0.040	0.020	$5.9 \times 10^{-8}$	$3.2 \times 10^{-8}$	$2.0 \times 10^{-8}$	$1.1 \times 10^{-8}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2	2-7 a	7-12 a	12t-17 a	>17 a			
		Type	$f_1$						$e(g)$	$f_1$ for $g > 1 a$	$e(g)$
Sn-127	2.10 h	M	0.040	$1.2 \times 10^{-7}$	0.020	$1.0 \times 10^{-7}$	$6.2 \times 10^{-8}$	$4.1 \times 10^{-8}$	$3.3 \times 10^{-8}$	$2.8 \times 10^{-8}$	
		F	0.040	$6.6 \times 10^{-10}$	0.020	$4.7 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.4 \times 10^{-10}$	$7.9 \times 10^{-11}$	$6.5 \times 10^{-11}$
		M	0.040	$1.0 \times 10^{-9}$	0.020	$7.4 \times 10^{-10}$	$3.7 \times 10^{-10}$	$2.4 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.3 \times 10^{-10}$
Sn-128	0.985 h	F	0.040	$5.1 \times 10^{-10}$	0.020	$3.6 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.0 \times 10^{-10}$	$1.0 \times 10^{-10}$	$6.1 \times 10^{-11}$	$5.0 \times 10^{-11}$
		M	0.040	$8.0 \times 10^{-10}$	0.020	$5.5 \times 10^{-10}$	$2.7 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.1 \times 10^{-10}$	$1.1 \times 10^{-10}$	$9.2 \times 10^{-11}$
<b>Antimony</b>											
Sb-115	0.530 h	F	0.200	$8.1 \times 10^{-11}$	0.100	$5.9 \times 10^{-11}$	$2.8 \times 10^{-11}$	$1.7 \times 10^{-11}$	$1.0 \times 10^{-11}$	$1.0 \times 10^{-11}$	$8.5 \times 10^{-12}$
		M	0.020	$1.2 \times 10^{-10}$	0.010	$8.3 \times 10^{-11}$	$4.0 \times 10^{-11}$	$2.5 \times 10^{-11}$	$2.5 \times 10^{-11}$	$1.6 \times 10^{-11}$	$1.3 \times 10^{-11}$
		S	0.020	$1.2 \times 10^{-10}$	0.010	$8.6 \times 10^{-11}$	$4.1 \times 10^{-11}$	$2.6 \times 10^{-11}$	$2.6 \times 10^{-11}$	$1.7 \times 10^{-11}$	$1.4 \times 10^{-11}$
Sb-116	0.263 h	F	0.200	$8.4 \times 10^{-11}$	0.100	$6.2 \times 10^{-11}$	$3.0 \times 10^{-11}$	$1.9 \times 10^{-11}$	$1.1 \times 10^{-11}$	$1.1 \times 10^{-11}$	$9.1 \times 10^{-12}$
		M	0.020	$1.1 \times 10^{-10}$	0.010	$8.2 \times 10^{-11}$	$4.0 \times 10^{-11}$	$2.5 \times 10^{-11}$	$2.5 \times 10^{-11}$	$1.5 \times 10^{-11}$	$1.3 \times 10^{-11}$
		S	0.020	$1.2 \times 10^{-10}$	0.010	$8.5 \times 10^{-11}$	$4.1 \times 10^{-11}$	$2.6 \times 10^{-11}$	$2.6 \times 10^{-11}$	$1.6 \times 10^{-11}$	$1.3 \times 10^{-11}$
Sb-116m	1.00 h	F	0.200	$2.6 \times 10^{-10}$	0.100	$2.1 \times 10^{-10}$	$1.1 \times 10^{-10}$	$6.6 \times 10^{-11}$	$4.0 \times 10^{-11}$	$4.0 \times 10^{-11}$	$3.2 \times 10^{-11}$
		M	0.020	$3.6 \times 10^{-10}$	0.010	$2.8 \times 10^{-10}$	$1.5 \times 10^{-10}$	$9.1 \times 10^{-11}$	$9.1 \times 10^{-11}$	$5.9 \times 10^{-11}$	$4.7 \times 10^{-11}$
		S	0.020	$3.7 \times 10^{-10}$	0.010	$2.9 \times 10^{-10}$	$1.5 \times 10^{-10}$	$9.4 \times 10^{-11}$	$9.4 \times 10^{-11}$	$6.1 \times 10^{-11}$	$4.9 \times 10^{-11}$
Sb-117	2.80 h	F	0.200	$7.7 \times 10^{-11}$	0.100	$6.0 \times 10^{-11}$	$2.9 \times 10^{-11}$	$1.8 \times 10^{-11}$	$1.0 \times 10^{-11}$	$1.0 \times 10^{-11}$	$8.5 \times 10^{-12}$
		M	0.020	$1.2 \times 10^{-10}$	0.010	$9.1 \times 10^{-11}$	$4.6 \times 10^{-11}$	$3.0 \times 10^{-11}$	$3.0 \times 10^{-11}$	$2.0 \times 10^{-11}$	$1.6 \times 10^{-11}$
		S	0.020	$1.3 \times 10^{-10}$	0.010	$9.5 \times 10^{-11}$	$4.8 \times 10^{-11}$	$3.1 \times 10^{-11}$	$3.1 \times 10^{-11}$	$2.2 \times 10^{-11}$	$1.7 \times 10^{-11}$
Sb-118m	5.00 h	F	0.200	$7.3 \times 10^{-10}$	0.100	$6.2 \times 10^{-10}$	$3.3 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.2 \times 10^{-10}$	$1.2 \times 10^{-10}$	$9.3 \times 10^{-11}$
		M	0.020	$9.3 \times 10^{-10}$	0.010	$7.6 \times 10^{-10}$	$4.0 \times 10^{-10}$	$2.5 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.2 \times 10^{-10}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$	
		Type	$f_1$ $e(g)$							
Sb-119	1.59 d	S	0.020	$9.5 \times 10^{-10}$	0.010	$7.8 \times 10^{-10}$	$4.1 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.2 \times 10^{-10}$
		F	0.200	$2.7 \times 10^{-10}$	0.100	$2.0 \times 10^{-10}$	$9.4 \times 10^{-11}$	$5.5 \times 10^{-11}$	$2.9 \times 10^{-11}$	$2.3 \times 10^{-11}$
		M	0.020	$4.0 \times 10^{-10}$	0.010	$2.8 \times 10^{-10}$	$1.3 \times 10^{-10}$	$7.9 \times 10^{-11}$	$4.4 \times 10^{-11}$	$3.5 \times 10^{-11}$
		S	0.020	$4.1 \times 10^{-10}$	0.010	$2.9 \times 10^{-10}$	$1.4 \times 10^{-10}$	$8.2 \times 10^{-11}$	$4.5 \times 10^{-11}$	$3.6 \times 10^{-11}$
Sb-120	0.265 h	F	0.200	$4.6 \times 10^{-11}$	0.100	$3.1 \times 10^{-11}$	$1.4 \times 10^{-11}$	$8.9 \times 10^{-12}$	$5.4 \times 10^{-12}$	$4.6 \times 10^{-12}$
		M	0.020	$6.6 \times 10^{-11}$	0.010	$4.4 \times 10^{-11}$	$2.0 \times 10^{-11}$	$1.3 \times 10^{-11}$	$8.3 \times 10^{-12}$	$7.0 \times 10^{-12}$
		S	0.020	$6.8 \times 10^{-11}$	0.010	$4.6 \times 10^{-11}$	$2.1 \times 10^{-11}$	$1.4 \times 10^{-11}$	$8.7 \times 10^{-12}$	$7.3 \times 10^{-12}$
Sb-120m	5.76 d	F	0.200	$4.1 \times 10^{-9}$	0.100	$3.3 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.7 \times 10^{-10}$	$5.5 \times 10^{-10}$
		M	0.020	$6.3 \times 10^{-9}$	0.010	$5.0 \times 10^{-9}$	$2.8 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.0 \times 10^{-9}$
		S	0.020	$6.6 \times 10^{-9}$	0.010	$5.3 \times 10^{-9}$	$2.9 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.1 \times 10^{-9}$
Sb-122	2.70 d	F	0.200	$4.2 \times 10^{-9}$	0.100	$2.8 \times 10^{-9}$	$1.4 \times 10^{-9}$	$8.4 \times 10^{-10}$	$4.4 \times 10^{-10}$	$3.6 \times 10^{-10}$
		M	0.020	$8.3 \times 10^{-9}$	0.010	$5.7 \times 10^{-9}$	$2.8 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.0 \times 10^{-9}$
		S	0.020	$8.8 \times 10^{-9}$	0.010	$6.1 \times 10^{-9}$	$3.0 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.1 \times 10^{-9}$
Sb-124	60.2 d	F	0.200	$1.2 \times 10^{-8}$	0.100	$8.8 \times 10^{-9}$	$4.3 \times 10^{-9}$	$2.6 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.3 \times 10^{-9}$
		M	0.020	$3.1 \times 10^{-8}$	0.010	$2.4 \times 10^{-8}$	$1.4 \times 10^{-8}$	$9.6 \times 10^{-9}$	$7.7 \times 10^{-9}$	$6.4 \times 10^{-9}$
		S	0.020	$3.9 \times 10^{-8}$	0.010	$3.1 \times 10^{-8}$	$1.8 \times 10^{-8}$	$1.3 \times 10^{-8}$	$1.0 \times 10^{-8}$	$8.6 \times 10^{-9}$
Sb-124m	0.337 h	F	0.200	$2.7 \times 10^{-11}$	0.100	$1.9 \times 10^{-11}$	$9.0 \times 10^{-12}$	$5.6 \times 10^{-12}$	$3.4 \times 10^{-12}$	$2.8 \times 10^{-12}$
		M	0.020	$4.3 \times 10^{-11}$	0.010	$3.1 \times 10^{-11}$	$1.5 \times 10^{-11}$	$9.6 \times 10^{-12}$	$6.5 \times 10^{-12}$	$5.4 \times 10^{-12}$
		S	0.020	$4.6 \times 10^{-11}$	0.010	$3.3 \times 10^{-11}$	$1.6 \times 10^{-11}$	$1.0 \times 10^{-11}$	$7.2 \times 10^{-12}$	$5.9 \times 10^{-12}$
Sb-125	2.77 a	F	0.200	$8.7 \times 10^{-9}$	0.100	$6.8 \times 10^{-9}$	$3.7 \times 10^{-9}$	$2.3 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.4 \times 10^{-9}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	> 17 a $e(g)$	
		Type	$f_1$							$e(g)$
Sb-126	1.24 d	M	0.020	$2.0 \times 10^{-8}$	0.010	$1.6 \times 10^{-8}$	$1.0 \times 10^{-8}$	$6.8 \times 10^{-9}$	$5.8 \times 10^{-9}$	$4.8 \times 10^{-9}$
		S	0.020	$4.2 \times 10^{-8}$	0.010	$3.8 \times 10^{-8}$	$2.4 \times 10^{-8}$	$1.6 \times 10^{-8}$	$1.4 \times 10^{-8}$	$1.2 \times 10^{-8}$
		F	0.200	$8.8 \times 10^{-9}$	0.100	$6.6 \times 10^{-9}$	$3.3 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.2 \times 10^{-9}$	$1.0 \times 10^{-9}$
Sb-126m	0.317 h	M	0.020	$1.7 \times 10^{-8}$	0.010	$1.3 \times 10^{-8}$	$7.4 \times 10^{-9}$	$5.1 \times 10^{-9}$	$3.5 \times 10^{-9}$	$2.8 \times 10^{-9}$
		S	0.020	$1.9 \times 10^{-8}$	0.010	$1.5 \times 10^{-8}$	$8.2 \times 10^{-9}$	$5.0 \times 10^{-9}$	$4.0 \times 10^{-9}$	$3.2 \times 10^{-9}$
		F	0.200	$1.2 \times 10^{-10}$	0.100	$8.2 \times 10^{-11}$	$3.8 \times 10^{-11}$	$2.4 \times 10^{-11}$	$1.5 \times 10^{-11}$	$1.2 \times 10^{-11}$
Sb-127	3.85 d	M	0.020	$1.7 \times 10^{-10}$	0.010	$1.2 \times 10^{-10}$	$5.5 \times 10^{-11}$	$3.5 \times 10^{-11}$	$2.3 \times 10^{-11}$	$1.9 \times 10^{-11}$
		S	0.020	$1.8 \times 10^{-10}$	0.010	$1.2 \times 10^{-10}$	$5.7 \times 10^{-11}$	$3.7 \times 10^{-11}$	$2.4 \times 10^{-11}$	$2.0 \times 10^{-11}$
		F	0.200	$5.1 \times 10^{-9}$	0.100	$3.5 \times 10^{-9}$	$1.6 \times 10^{-9}$	$9.7 \times 10^{-10}$	$5.2 \times 10^{-10}$	$4.3 \times 10^{-10}$
Sb-128	9.01 h	M	0.020	$1.0 \times 10^{-8}$	0.010	$7.3 \times 10^{-9}$	$3.9 \times 10^{-9}$	$2.7 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.7 \times 10^{-9}$
		S	0.020	$1.1 \times 10^{-8}$	0.010	$7.9 \times 10^{-9}$	$4.2 \times 10^{-9}$	$3.0 \times 10^{-9}$	$2.3 \times 10^{-9}$	$1.9 \times 10^{-9}$
		F	0.200	$2.1 \times 10^{-9}$	0.100	$1.7 \times 10^{-9}$	$8.3 \times 10^{-10}$	$5.1 \times 10^{-10}$	$2.9 \times 10^{-10}$	$2.3 \times 10^{-10}$
Sb-128m	0.173 h	M	0.020	$3.3 \times 10^{-9}$	0.010	$2.5 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.9 \times 10^{-10}$	$5.0 \times 10^{-10}$	$4.0 \times 10^{-10}$
		S	0.020	$3.4 \times 10^{-9}$	0.010	$2.6 \times 10^{-9}$	$1.3 \times 10^{-9}$	$8.3 \times 10^{-10}$	$5.2 \times 10^{-10}$	$4.2 \times 10^{-10}$
		F	0.200	$9.8 \times 10^{-11}$	0.100	$6.9 \times 10^{-11}$	$3.2 \times 10^{-11}$	$2.0 \times 10^{-11}$	$1.2 \times 10^{-11}$	$1.0 \times 10^{-11}$
Sb-129	4.32 h	M	0.020	$1.3 \times 10^{-10}$	0.010	$9.2 \times 10^{-11}$	$4.3 \times 10^{-11}$	$2.7 \times 10^{-11}$	$1.7 \times 10^{-11}$	$1.4 \times 10^{-11}$
		S	0.020	$1.4 \times 10^{-10}$	0.010	$9.4 \times 10^{-11}$	$4.4 \times 10^{-11}$	$2.8 \times 10^{-11}$	$1.8 \times 10^{-11}$	$1.5 \times 10^{-11}$
		F	0.200	$1.1 \times 10^{-9}$	0.100	$8.2 \times 10^{-10}$	$3.8 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.0 \times 10^{-10}$
Sb-130	0.667 h	M	0.020	$2.0 \times 10^{-9}$	0.010	$1.4 \times 10^{-9}$	$6.8 \times 10^{-10}$	$4.4 \times 10^{-10}$	$2.9 \times 10^{-10}$	$2.3 \times 10^{-10}$
		S	0.020	$2.1 \times 10^{-9}$	0.010	$1.5 \times 10^{-9}$	$7.2 \times 10^{-10}$	$4.6 \times 10^{-10}$	$3.0 \times 10^{-10}$	$2.5 \times 10^{-10}$
		F	0.200	$3.0 \times 10^{-10}$	0.100	$2.2 \times 10^{-10}$	$1.1 \times 10^{-10}$	$6.6 \times 10^{-11}$	$4.0 \times 10^{-11}$	$3.3 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2	2-7 a	7-12 a	12t-17 a	>17 a		
		Type	f <sub>1</sub>						e(g)	f <sub>1</sub> for g > 1 a
Sb-131	0.383 h	M	0.020	4.5 × 10 <sup>-10</sup>	0.010	3.2 × 10 <sup>-10</sup>	1.6 × 10 <sup>-10</sup>	9.8 × 10 <sup>-11</sup>	6.3 × 10 <sup>-11</sup>	5.1 × 10 <sup>-11</sup>
		S	0.020	4.6 × 10 <sup>-10</sup>	0.010	3.3 × 10 <sup>-10</sup>	1.6 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>	6.5 × 10 <sup>-11</sup>	5.3 × 10 <sup>-11</sup>
		F	0.200	3.5 × 10 <sup>-10</sup>	0.100	2.8 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	7.7 × 10 <sup>-11</sup>	4.6 × 10 <sup>-11</sup>	3.5 × 10 <sup>-11</sup>
		M	0.020	3.9 × 10 <sup>-10</sup>	0.010	2.6 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	8.0 × 10 <sup>-11</sup>	5.3 × 10 <sup>-11</sup>	4.4 × 10 <sup>-11</sup>
		S	0.020	3.8 × 10 <sup>-10</sup>	0.010	2.6 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	7.9 × 10 <sup>-11</sup>	5.3 × 10 <sup>-11</sup>	4.4 × 10 <sup>-11</sup>
Tellurium	2.49 h	F	0.600	5.3 × 10 <sup>-10</sup>	0.300	4.2 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	7.2 × 10 <sup>-11</sup>	5.8 × 10 <sup>-11</sup>
		M	0.200	8.6 × 10 <sup>-10</sup>	0.100	6.4 × 10 <sup>-10</sup>	3.2 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>
		S	0.020	9.1 × 10 <sup>-10</sup>	0.010	6.7 × 10 <sup>-10</sup>	3.3 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>
		F	0.600	1.7 × 10 <sup>-9</sup>	0.300	1.4 × 10 <sup>-9</sup>	7.2 × 10 <sup>-10</sup>	4.6 × 10 <sup>-10</sup>	2.9 × 10 <sup>-10</sup>	2.4 × 10 <sup>-10</sup>
		M	0.200	2.3 × 10 <sup>-9</sup>	0.100	1.9 × 10 <sup>-9</sup>	1.0 × 10 <sup>-9</sup>	6.8 × 10 <sup>-10</sup>	4.7 × 10 <sup>-10</sup>	3.8 × 10 <sup>-10</sup>
Te-121m	154 d	S	0.020	2.4 × 10 <sup>-9</sup>	0.010	2.0 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	7.2 × 10 <sup>-10</sup>	5.1 × 10 <sup>-10</sup>	4.1 × 10 <sup>-10</sup>
		F	0.600	1.4 × 10 <sup>-8</sup>	0.300	1.0 × 10 <sup>-8</sup>	5.3 × 10 <sup>-9</sup>	3.3 × 10 <sup>-9</sup>	2.1 × 10 <sup>-9</sup>	1.8 × 10 <sup>-9</sup>
		M	0.200	1.9 × 10 <sup>-8</sup>	0.100	1.5 × 10 <sup>-8</sup>	8.8 × 10 <sup>-9</sup>	6.1 × 10 <sup>-9</sup>	5.1 × 10 <sup>-9</sup>	4.2 × 10 <sup>-9</sup>
		S	0.020	2.3 × 10 <sup>-8</sup>	0.010	1.9 × 10 <sup>-8</sup>	1.2 × 10 <sup>-8</sup>	8.1 × 10 <sup>-9</sup>	6.9 × 10 <sup>-9</sup>	5.7 × 10 <sup>-9</sup>
		F	0.600	1.1 × 10 <sup>-8</sup>	0.300	9.1 × 10 <sup>-9</sup>	6.2 × 10 <sup>-9</sup>	4.8 × 10 <sup>-9</sup>	4.0 × 10 <sup>-9</sup>	3.9 × 10 <sup>-9</sup>
Te-123m	120 d	M	0.200	5.6 × 10 <sup>-9</sup>	0.100	4.4 × 10 <sup>-9</sup>	3.0 × 10 <sup>-9</sup>	2.3 × 10 <sup>-9</sup>	2.0 × 10 <sup>-9</sup>	1.9 × 10 <sup>-9</sup>
		S	0.020	5.3 × 10 <sup>-9</sup>	0.010	5.0 × 10 <sup>-9</sup>	3.5 × 10 <sup>-9</sup>	2.4 × 10 <sup>-9</sup>	2.1 × 10 <sup>-9</sup>	2.0 × 10 <sup>-9</sup>
		F	0.600	9.8 × 10 <sup>-9</sup>	0.300	6.8 × 10 <sup>-9</sup>	3.4 × 10 <sup>-9</sup>	1.9 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	9.5 × 10 <sup>-10</sup>
		M	0.200	1.8 × 10 <sup>-8</sup>	0.100	1.3 × 10 <sup>-8</sup>	8.0 × 10 <sup>-9</sup>	5.7 × 10 <sup>-9</sup>	5.0 × 10 <sup>-9</sup>	4.0 × 10 <sup>-9</sup>
		S	0.020	2.0 × 10 <sup>-8</sup>	0.010	1.6 × 10 <sup>-8</sup>	9.8 × 10 <sup>-9</sup>	7.1 × 10 <sup>-9</sup>	6.3 × 10 <sup>-9</sup>	5.1 × 10 <sup>-9</sup>

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$					
			$e(g)$					
Te-125m	58.0 d	F	0.600	$6.2 \times 10^{-9}$	$4.2 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.1 \times 10^{-10}$	$5.1 \times 10^{-10}$
		M	0.200	$1.5 \times 10^{-8}$	$1.1 \times 10^{-8}$	$4.8 \times 10^{-9}$	$4.3 \times 10^{-9}$	$3.4 \times 10^{-9}$
		S	0.020	$1.7 \times 10^{-8}$	$1.3 \times 10^{-8}$	$7.8 \times 10^{-9}$	$5.3 \times 10^{-9}$	$4.2 \times 10^{-9}$
Te-127	9.35 h	F	0.600	$4.3 \times 10^{-10}$	$3.2 \times 10^{-10}$	$8.5 \times 10^{-11}$	$4.5 \times 10^{-11}$	$3.9 \times 10^{-11}$
		M	0.200	$1.0 \times 10^{-9}$	$7.3 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.3 \times 10^{-10}$
		S	0.020	$1.2 \times 10^{-9}$	$7.9 \times 10^{-10}$	$2.6 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.4 \times 10^{-10}$
Te-127m	109 d	F	0.600	$2.1 \times 10^{-8}$	$1.4 \times 10^{-8}$	$3.5 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.5 \times 10^{-9}$
		M	0.200	$3.5 \times 10^{-8}$	$2.6 \times 10^{-8}$	$1.5 \times 10^{-8}$	$9.2 \times 10^{-9}$	$7.4 \times 10^{-9}$
		S	0.020	$4.1 \times 10^{-8}$	$3.3 \times 10^{-8}$	$2.0 \times 10^{-8}$	$1.2 \times 10^{-8}$	$9.8 \times 10^{-9}$
Te-129	1.16 h	F	0.600	$1.8 \times 10^{-10}$	$1.2 \times 10^{-10}$	$3.2 \times 10^{-11}$	$1.9 \times 10^{-11}$	$1.6 \times 10^{-11}$
		M	0.200	$3.3 \times 10^{-10}$	$2.2 \times 10^{-10}$	$9.9 \times 10^{-11}$	$4.4 \times 10^{-11}$	$3.7 \times 10^{-11}$
		S	0.020	$3.5 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.0 \times 10^{-10}$	$4.7 \times 10^{-11}$	$3.9 \times 10^{-11}$
Te-129m	33.6 d	F	0.600	$2.0 \times 10^{-8}$	$1.3 \times 10^{-8}$	$3.1 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.3 \times 10^{-9}$
		M	0.200	$3.5 \times 10^{-8}$	$2.6 \times 10^{-8}$	$1.4 \times 10^{-8}$	$8.0 \times 10^{-9}$	$6.6 \times 10^{-9}$
		S	0.020	$3.8 \times 10^{-8}$	$2.9 \times 10^{-8}$	$1.7 \times 10^{-8}$	$9.6 \times 10^{-9}$	$7.9 \times 10^{-9}$
Te-131	0.417 h	F	0.600	$2.3 \times 10^{-10}$	$2.0 \times 10^{-10}$	$5.3 \times 10^{-11}$	$3.3 \times 10^{-11}$	$2.3 \times 10^{-11}$
		M	0.200	$2.6 \times 10^{-10}$	$1.7 \times 10^{-10}$	$5.2 \times 10^{-11}$	$3.5 \times 10^{-11}$	$2.8 \times 10^{-11}$
		S	0.020	$2.4 \times 10^{-10}$	$1.6 \times 10^{-10}$	$4.9 \times 10^{-11}$	$3.3 \times 10^{-11}$	$2.8 \times 10^{-11}$
Te-131m	1.25 d	F	0.600	$8.7 \times 10^{-9}$	$7.6 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.2 \times 10^{-9}$	$8.6 \times 10^{-10}$
		M	0.200	$7.9 \times 10^{-9}$	$5.8 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.2 \times 10^{-9}$	$9.4 \times 10^{-10}$
		S	0.020	$7.0 \times 10^{-9}$	$5.1 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.1 \times 10^{-9}$	$9.1 \times 10^{-10}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		f <sub>1</sub> for g > 1 a	Age 1-2 f <sub>1</sub> for	2-7 a e(g)	7-12 a e(g)	12t-17 a e(g)	>17 a e(g)	
		Type	f <sub>1</sub>							e(g)
Te-132	3.26 d	F	0.600	2.2 × 10 <sup>-8</sup>	1.8 × 10 <sup>-8</sup>	8.5 × 10 <sup>-9</sup>	4.2 × 10 <sup>-9</sup>	2.6 × 10 <sup>-9</sup>	1.8 × 10 <sup>-9</sup>	
		M	0.200	1.6 × 10 <sup>-8</sup>	1.3 × 10 <sup>-8</sup>	6.4 × 10 <sup>-9</sup>	4.0 × 10 <sup>-9</sup>	2.6 × 10 <sup>-9</sup>	2.0 × 10 <sup>-9</sup>	
		S	0.020	1.5 × 10 <sup>-8</sup>	1.1 × 10 <sup>-8</sup>	5.8 × 10 <sup>-9</sup>	3.8 × 10 <sup>-9</sup>	2.5 × 10 <sup>-9</sup>	2.0 × 10 <sup>-9</sup>	
Te-133	0.207 h	F	0.600	2.4 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>	9.6 × 10 <sup>-11</sup>	4.6 × 10 <sup>-11</sup>	2.8 × 10 <sup>-11</sup>	1.9 × 10 <sup>-11</sup>	
		M	0.200	2.0 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	6.1 × 10 <sup>-11</sup>	3.8 × 10 <sup>-11</sup>	2.4 × 10 <sup>-11</sup>	2.0 × 10 <sup>-11</sup>	
		S	0.020	1.7 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	5.4 × 10 <sup>-11</sup>	3.5 × 10 <sup>-11</sup>	2.2 × 10 <sup>-11</sup>	1.9 × 10 <sup>-11</sup>	
Te-133m	0.923 h	F	0.600	1.0 × 10 <sup>-9</sup>	8.9 × 10 <sup>-10</sup>	4.1 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	8.1 × 10 <sup>-11</sup>	
		M	0.200	8.5 × 10 <sup>-10</sup>	5.8 × 10 <sup>-10</sup>	2.8 × 10 <sup>-10</sup>	1.7 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	8.7 × 10 <sup>-11</sup>	
		S	0.020	7.4 × 10 <sup>-10</sup>	5.1 × 10 <sup>-10</sup>	2.5 × 10 <sup>-10</sup>	1.6 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>	8.4 × 10 <sup>-11</sup>	
Te-134	0.696 h	F	0.600	4.7 × 10 <sup>-10</sup>	3.7 × 10 <sup>-10</sup>	1.8 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>	6.0 × 10 <sup>-11</sup>	4.7 × 10 <sup>-11</sup>	
		M	0.200	5.5 × 10 <sup>-10</sup>	3.9 × 10 <sup>-10</sup>	1.9 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	8.1 × 10 <sup>-11</sup>	6.6 × 10 <sup>-11</sup>	
		S	0.020	5.6 × 10 <sup>-10</sup>	4.0 × 10 <sup>-10</sup>	1.9 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	8.4 × 10 <sup>-11</sup>	6.8 × 10 <sup>-11</sup>	
<b>Iodine</b>										
		I-120	1.35 h	F	1.000	1.3 × 10 <sup>-9</sup>	1.0 × 10 <sup>-9</sup>	4.8 × 10 <sup>-10</sup>	2.3 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>
				M	0.200	1.1 × 10 <sup>-9</sup>	7.3 × 10 <sup>-10</sup>	3.4 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>
I-120m	0.883 h	S	0.020	1.0 × 10 <sup>-9</sup>	6.9 × 10 <sup>-10</sup>	3.2 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>	
		F	1.000	8.6 × 10 <sup>-10</sup>	6.9 × 10 <sup>-10</sup>	3.3 × 10 <sup>-10</sup>	1.8 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	8.2 × 10 <sup>-11</sup>	
		M	0.200	8.2 × 10 <sup>-10</sup>	5.9 × 10 <sup>-10</sup>	2.9 × 10 <sup>-10</sup>	1.8 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	8.7 × 10 <sup>-11</sup>	
I-121	2.12 h	S	0.020	8.2 × 10 <sup>-10</sup>	5.8 × 10 <sup>-10</sup>	2.8 × 10 <sup>-10</sup>	1.8 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	8.8 × 10 <sup>-11</sup>	
		F	1.000	2.3 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	6.0 × 10 <sup>-11</sup>	3.8 × 10 <sup>-11</sup>	2.7 × 10 <sup>-11</sup>	

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $g > 1$ a	2-7 a	7-12 a	12t-17 a	>17 a
		Type	$f_1$					
			e(g)					
I-123	13.2 h	M	0.200	0.100	$7.8 \times 10^{-11}$	$4.9 \times 10^{-11}$	$3.2 \times 10^{-11}$	$2.5 \times 10^{-11}$
		S	0.020	0.010	$7.0 \times 10^{-11}$	$4.5 \times 10^{-11}$	$3.0 \times 10^{-11}$	$2.4 \times 10^{-11}$
		F	1.000	1.000	$3.8 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.1 \times 10^{-10}$	$7.4 \times 10^{-11}$
I-124	4.18 d	M	0.200	0.100	$2.0 \times 10^{-10}$	$1.2 \times 10^{-10}$	$8.2 \times 10^{-11}$	$6.4 \times 10^{-11}$
		S	0.020	0.010	$3.2 \times 10^{-10}$	$1.1 \times 10^{-10}$	$7.6 \times 10^{-11}$	$6.0 \times 10^{-11}$
		F	1.000	1.000	$4.5 \times 10^{-8}$	$1.1 \times 10^{-8}$	$6.7 \times 10^{-9}$	$4.4 \times 10^{-9}$
I-125	60.1 d	M	0.200	0.100	$4.6 \times 10^{-9}$	$2.5 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.2 \times 10^{-9}$
		S	0.020	0.010	$4.4 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.4 \times 10^{-9}$	$7.7 \times 10^{-10}$
		F	1.000	1.000	$2.3 \times 10^{-8}$	$1.1 \times 10^{-8}$	$7.2 \times 10^{-9}$	$5.1 \times 10^{-9}$
I-126	13.0 d	M	0.200	0.100	$3.6 \times 10^{-9}$	$2.6 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.4 \times 10^{-9}$
		S	0.020	0.010	$1.8 \times 10^{-9}$	$1.0 \times 10^{-9}$	$4.8 \times 10^{-10}$	$3.8 \times 10^{-10}$
		F	1.000	1.000	$8.3 \times 10^{-8}$	$4.5 \times 10^{-8}$	$2.4 \times 10^{-8}$	$9.8 \times 10^{-9}$
I-128	0.416 h	M	0.200	0.100	$9.5 \times 10^{-9}$	$5.5 \times 10^{-9}$	$3.8 \times 10^{-9}$	$2.7 \times 10^{-9}$
		S	0.020	0.010	$3.3 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.4 \times 10^{-9}$
		F	1.000	1.000	$1.1 \times 10^{-10}$	$4.7 \times 10^{-11}$	$1.6 \times 10^{-11}$	$1.3 \times 10^{-11}$
I-129	$1.57 \times 10^7$ a	M	0.200	0.100	$5.3 \times 10^{-11}$	$3.4 \times 10^{-11}$	$2.2 \times 10^{-11}$	$1.9 \times 10^{-11}$
		S	0.020	0.010	$1.2 \times 10^{-10}$	$3.5 \times 10^{-11}$	$2.3 \times 10^{-11}$	$2.0 \times 10^{-11}$
		F	1.000	1.000	$8.6 \times 10^{-8}$	$6.1 \times 10^{-8}$	$4.6 \times 10^{-8}$	$3.6 \times 10^{-8}$
I-130	12.4 h	M	0.200	0.100	$2.4 \times 10^{-8}$	$2.4 \times 10^{-8}$	$1.9 \times 10^{-8}$	$1.5 \times 10^{-8}$
		S	0.020	0.010	$1.8 \times 10^{-8}$	$1.3 \times 10^{-8}$	$1.1 \times 10^{-8}$	$9.8 \times 10^{-9}$
		F	1.000	1.000	$7.4 \times 10^{-9}$	$3.5 \times 10^{-9}$	$1.6 \times 10^{-9}$	$6.7 \times 10^{-10}$



Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$	
		Type	$f_1$							$e(g)$
I-131	8.04 d	M	0.200	$4.3 \times 10^{-9}$	0.100	$3.1 \times 10^{-9}$	$1.5 \times 10^{-9}$	$9.2 \times 10^{-10}$	$5.8 \times 10^{-10}$	$4.5 \times 10^{-10}$
		S	0.020	$3.3 \times 10^{-9}$	0.010	$2.4 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.9 \times 10^{-10}$	$5.1 \times 10^{-10}$	$4.1 \times 10^{-10}$
		F	1.000	$7.2 \times 10^{-8}$	1.000	$7.2 \times 10^{-8}$	$3.7 \times 10^{-8}$	$1.9 \times 10^{-8}$	$1.1 \times 10^{-8}$	$7.4 \times 10^{-9}$
		M	0.200	$2.2 \times 10^{-8}$	0.100	$1.5 \times 10^{-8}$	$8.2 \times 10^{-9}$	$4.7 \times 10^{-9}$	$3.4 \times 10^{-9}$	$2.4 \times 10^{-9}$
		S	0.020	$8.8 \times 10^{-9}$	0.010	$6.2 \times 10^{-9}$	$3.5 \times 10^{-9}$	$2.4 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.6 \times 10^{-9}$
I-132	2.30 h	F	1.000	$1.1 \times 10^{-9}$	1.000	$9.6 \times 10^{-10}$	$4.5 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.3 \times 10^{-10}$	$9.4 \times 10^{-11}$
		M	0.200	$9.9 \times 10^{-10}$	0.100	$7.3 \times 10^{-10}$	$3.6 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.1 \times 10^{-10}$
		S	0.020	$9.3 \times 10^{-10}$	0.010	$6.8 \times 10^{-10}$	$3.4 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.1 \times 10^{-10}$
I-132m	1.39 h	F	1.000	$9.6 \times 10^{-10}$	1.000	$8.4 \times 10^{-10}$	$4.0 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.2 \times 10^{-10}$	$7.9 \times 10^{-11}$
		M	0.200	$7.2 \times 10^{-10}$	0.100	$5.3 \times 10^{-10}$	$2.6 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.1 \times 10^{-10}$	$8.7 \times 10^{-11}$
		S	0.020	$6.6 \times 10^{-10}$	0.010	$4.8 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.1 \times 10^{-10}$	$8.5 \times 10^{-11}$
I-133	20.8 h	F	1.000	$1.9 \times 10^{-8}$	1.000	$1.8 \times 10^{-8}$	$8.3 \times 10^{-9}$	$3.8 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.5 \times 10^{-9}$
		M	0.200	$6.6 \times 10^{-9}$	0.100	$4.4 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.4 \times 10^{-10}$	$5.5 \times 10^{-10}$
		S	0.020	$3.8 \times 10^{-9}$	0.010	$2.9 \times 10^{-9}$	$1.4 \times 10^{-9}$	$9.0 \times 10^{-10}$	$5.3 \times 10^{-10}$	$4.3 \times 10^{-10}$
I-134	0.876 h	F	1.000	$4.6 \times 10^{-10}$	1.000	$3.7 \times 10^{-10}$	$1.8 \times 10^{-10}$	$9.7 \times 10^{-11}$	$5.9 \times 10^{-11}$	$4.5 \times 10^{-11}$
		M	0.200	$4.8 \times 10^{-10}$	0.100	$3.4 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.0 \times 10^{-10}$	$6.7 \times 10^{-11}$	$5.4 \times 10^{-11}$
		S	0.020	$4.8 \times 10^{-10}$	0.010	$3.4 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.1 \times 10^{-10}$	$6.8 \times 10^{-11}$	$5.5 \times 10^{-11}$
I-135	6.61 h	F	1.000	$4.1 \times 10^{-9}$	1.000	$3.7 \times 10^{-9}$	$1.7 \times 10^{-9}$	$7.9 \times 10^{-10}$	$4.8 \times 10^{-10}$	$3.2 \times 10^{-10}$
		M	0.200	$2.2 \times 10^{-9}$	0.100	$1.6 \times 10^{-9}$	$7.8 \times 10^{-10}$	$4.7 \times 10^{-10}$	$3.0 \times 10^{-10}$	$2.4 \times 10^{-10}$
		S	0.020	$1.8 \times 10^{-9}$	0.010	$1.3 \times 10^{-9}$	$6.5 \times 10^{-10}$	$4.2 \times 10^{-10}$	$2.7 \times 10^{-10}$	$2.2 \times 10^{-10}$
<b>Caesium</b>										

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a			f <sub>1</sub> for g > 1 a	Age 1-2 f <sub>1</sub> for	2-7 a e(g)	7-12 a e(g)	12t-17 a e(g)	>17 a e(g)
		Type	f <sub>1</sub>	e(g)						
Cs-125	0.750 h	F	1.000	1.2 × 10 <sup>-10</sup>	1.000	8.3 × 10 <sup>-11</sup>	3.9 × 10 <sup>-11</sup>	2.4 × 10 <sup>-11</sup>	1.4 × 10 <sup>-11</sup>	1.2 × 10 <sup>-11</sup>
		M	0.200	2.0 × 10 <sup>-10</sup>	0.100	1.4 × 10 <sup>-10</sup>	6.5 × 10 <sup>-11</sup>	4.2 × 10 <sup>-11</sup>	2.7 × 10 <sup>-11</sup>	2.2 × 10 <sup>-11</sup>
		S	0.020	2.1 × 10 <sup>-10</sup>	0.010	1.4 × 10 <sup>-10</sup>	6.8 × 10 <sup>-11</sup>	4.4 × 10 <sup>-11</sup>	2.8 × 10 <sup>-11</sup>	2.3 × 10 <sup>-11</sup>
Cs-127	6.25 h	F	1.000	1.6 × 10 <sup>-10</sup>	1.000	1.3 × 10 <sup>-10</sup>	6.9 × 10 <sup>-11</sup>	4.2 × 10 <sup>-11</sup>	2.5 × 10 <sup>-11</sup>	2.0 × 10 <sup>-11</sup>
		M	0.200	2.8 × 10 <sup>-10</sup>	0.100	2.2 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	7.3 × 10 <sup>-11</sup>	4.6 × 10 <sup>-11</sup>	3.6 × 10 <sup>-11</sup>
		S	0.020	3.0 × 10 <sup>-10</sup>	0.010	2.3 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	7.6 × 10 <sup>-11</sup>	4.8 × 10 <sup>-11</sup>	3.8 × 10 <sup>-11</sup>
Cs-129	1.34 d	F	1.000	3.4 × 10 <sup>-10</sup>	1.000	2.8 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	8.7 × 10 <sup>-11</sup>	5.2 × 10 <sup>-11</sup>	4.2 × 10 <sup>-11</sup>
		M	0.200	5.7 × 10 <sup>-10</sup>	0.100	4.6 × 10 <sup>-10</sup>	2.4 × 10 <sup>-10</sup>	1.5 × 10 <sup>-10</sup>	9.1 × 10 <sup>-11</sup>	7.3 × 10 <sup>-11</sup>
		S	0.020	6.3 × 10 <sup>-10</sup>	0.010	4.9 × 10 <sup>-10</sup>	2.5 × 10 <sup>-10</sup>	1.6 × 10 <sup>-10</sup>	9.7 × 10 <sup>-11</sup>	7.7 × 10 <sup>-11</sup>
Cs-130	0.498 h	F	1.000	8.3 × 10 <sup>-11</sup>	1.000	5.6 × 10 <sup>-11</sup>	2.5 × 10 <sup>-11</sup>	1.6 × 10 <sup>-11</sup>	9.4 × 10 <sup>-12</sup>	7.8 × 10 <sup>-12</sup>
		M	0.200	1.3 × 10 <sup>-10</sup>	0.100	8.7 × 10 <sup>-11</sup>	4.0 × 10 <sup>-11</sup>	2.5 × 10 <sup>-11</sup>	1.6 × 10 <sup>-11</sup>	1.4 × 10 <sup>-11</sup>
		S	0.020	1.4 × 10 <sup>-10</sup>	0.010	9.0 × 10 <sup>-11</sup>	4.1 × 10 <sup>-11</sup>	2.6 × 10 <sup>-11</sup>	1.7 × 10 <sup>-11</sup>	1.4 × 10 <sup>-11</sup>
Cs-131	9.69 d	F	1.000	2.4 × 10 <sup>-10</sup>	1.000	1.7 × 10 <sup>-10</sup>	8.4 × 10 <sup>-11</sup>	5.3 × 10 <sup>-11</sup>	3.2 × 10 <sup>-11</sup>	2.7 × 10 <sup>-11</sup>
		M	0.200	3.5 × 10 <sup>-10</sup>	0.100	2.6 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	8.5 × 10 <sup>-11</sup>	5.5 × 10 <sup>-11</sup>	4.4 × 10 <sup>-11</sup>
		S	0.020	3.8 × 10 <sup>-10</sup>	0.010	2.8 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	9.1 × 10 <sup>-11</sup>	5.9 × 10 <sup>-11</sup>	4.7 × 10 <sup>-11</sup>
Cs-132	6.48 d	F	1.000	1.5 × 10 <sup>-9</sup>	1.000	1.2 × 10 <sup>-9</sup>	6.4 × 10 <sup>-10</sup>	4.1 × 10 <sup>-10</sup>	2.7 × 10 <sup>-10</sup>	2.3 × 10 <sup>-10</sup>
		M	0.200	1.9 × 10 <sup>-9</sup>	0.100	1.5 × 10 <sup>-9</sup>	8.4 × 10 <sup>-10</sup>	5.4 × 10 <sup>-10</sup>	3.7 × 10 <sup>-10</sup>	2.9 × 10 <sup>-10</sup>
		S	0.020	2.0 × 10 <sup>-9</sup>	0.010	1.6 × 10 <sup>-9</sup>	8.7 × 10 <sup>-10</sup>	5.6 × 10 <sup>-10</sup>	3.8 × 10 <sup>-10</sup>	3.0 × 10 <sup>-10</sup>
Cs-134	2.06 a	F	1.000	1.1 × 10 <sup>-8</sup>	1.000	7.3 × 10 <sup>-9</sup>	5.2 × 10 <sup>-9</sup>	5.3 × 10 <sup>-9</sup>	6.3 × 10 <sup>-9</sup>	6.6 × 10 <sup>-9</sup>
		M	0.200	3.2 × 10 <sup>-8</sup>	0.100	2.6 × 10 <sup>-8</sup>	1.6 × 10 <sup>-8</sup>	1.2 × 10 <sup>-8</sup>	1.1 × 10 <sup>-8</sup>	9.1 × 10 <sup>-9</sup>
		S	0.020	7.0 × 10 <sup>-8</sup>	0.010	6.3 × 10 <sup>-8</sup>	4.1 × 10 <sup>-8</sup>	2.8 × 10 <sup>-8</sup>	2.3 × 10 <sup>-8</sup>	2.0 × 10 <sup>-8</sup>

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$	
		Type	$f_1$							$e(g)$
Cs-134m	2.90 h	F	1.000	1.3 × 10 <sup>-10</sup>	1.000	8.6 × 10 <sup>-11</sup>	3.8 × 10 <sup>-11</sup>	2.5 × 10 <sup>-11</sup>	1.6 × 10 <sup>-11</sup>	1.4 × 10 <sup>-11</sup>
		M	0.200	3.3 × 10 <sup>-10</sup>	0.100	2.3 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	8.3 × 10 <sup>-11</sup>	6.6 × 10 <sup>-11</sup>	5.4 × 10 <sup>-11</sup>
		S	0.020	3.6 × 10 <sup>-10</sup>	0.010	2.5 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	9.2 × 10 <sup>-11</sup>	7.4 × 10 <sup>-11</sup>	6.0 × 10 <sup>-11</sup>
Cs-135	2.30 × 10 <sup>6</sup> a	F	1.000	1.7 × 10 <sup>-9</sup>	1.000	9.9 × 10 <sup>-10</sup>	6.2 × 10 <sup>-10</sup>	6.1 × 10 <sup>-10</sup>	6.8 × 10 <sup>-10</sup>	6.9 × 10 <sup>-10</sup>
		M	0.200	1.2 × 10 <sup>-8</sup>	0.100	9.3 × 10 <sup>-9</sup>	5.7 × 10 <sup>-9</sup>	4.1 × 10 <sup>-9</sup>	3.8 × 10 <sup>-9</sup>	3.1 × 10 <sup>-9</sup>
		S	0.020	2.7 × 10 <sup>-8</sup>	0.010	2.4 × 10 <sup>-8</sup>	1.6 × 10 <sup>-8</sup>	1.1 × 10 <sup>-8</sup>	9.5 × 10 <sup>-9</sup>	8.6 × 10 <sup>-9</sup>
Cs-135m	0.883 h	F	1.000	9.2 × 10 <sup>-11</sup>	1.000	7.8 × 10 <sup>-11</sup>	4.1 × 10 <sup>-11</sup>	2.4 × 10 <sup>-11</sup>	1.5 × 10 <sup>-11</sup>	1.2 × 10 <sup>-11</sup>
		M	0.200	1.2 × 10 <sup>-10</sup>	0.100	9.9 × 10 <sup>-11</sup>	5.2 × 10 <sup>-11</sup>	3.2 × 10 <sup>-11</sup>	1.9 × 10 <sup>-11</sup>	1.5 × 10 <sup>-11</sup>
		S	0.020	1.2 × 10 <sup>-10</sup>	0.010	1.0 × 10 <sup>-10</sup>	5.3 × 10 <sup>-11</sup>	3.3 × 10 <sup>-11</sup>	2.0 × 10 <sup>-11</sup>	1.6 × 10 <sup>-11</sup>
Cs-136	13.1 d	F	1.000	7.3 × 10 <sup>-9</sup>	1.000	5.2 × 10 <sup>-9</sup>	2.9 × 10 <sup>-9</sup>	2.0 × 10 <sup>-9</sup>	1.4 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>
		M	0.200	1.3 × 10 <sup>-8</sup>	0.100	1.0 × 10 <sup>-8</sup>	6.0 × 10 <sup>-9</sup>	3.7 × 10 <sup>-9</sup>	3.1 × 10 <sup>-9</sup>	2.5 × 10 <sup>-9</sup>
		S	0.020	1.5 × 10 <sup>-8</sup>	0.010	1.1 × 10 <sup>-8</sup>	5.7 × 10 <sup>-9</sup>	4.1 × 10 <sup>-9</sup>	3.5 × 10 <sup>-9</sup>	2.8 × 10 <sup>-9</sup>
Cs-137	30.0 a	F	1.000	8.8 × 10 <sup>-9</sup>	1.000	5.4 × 10 <sup>-9</sup>	3.6 × 10 <sup>-9</sup>	3.7 × 10 <sup>-9</sup>	4.4 × 10 <sup>-9</sup>	4.6 × 10 <sup>-9</sup>
		M	0.200	3.6 × 10 <sup>-8</sup>	0.100	2.9 × 10 <sup>-8</sup>	1.8 × 10 <sup>-8</sup>	1.3 × 10 <sup>-8</sup>	1.1 × 10 <sup>-8</sup>	9.7 × 10 <sup>-9</sup>
		S	0.020	1.1 × 10 <sup>-7</sup>	0.010	1.0 × 10 <sup>-7</sup>	7.0 × 10 <sup>-8</sup>	4.8 × 10 <sup>-8</sup>	4.2 × 10 <sup>-8</sup>	3.9 × 10 <sup>-8</sup>
Cs-138	0.536 h	F	1.000	2.6 × 10 <sup>-10</sup>	1.000	1.8 × 10 <sup>-10</sup>	8.1 × 10 <sup>-11</sup>	5.0 × 10 <sup>-11</sup>	2.9 × 10 <sup>-11</sup>	2.4 × 10 <sup>-11</sup>
		M	0.200	4.0 × 10 <sup>-10</sup>	0.100	2.7 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	7.8 × 10 <sup>-11</sup>	4.9 × 10 <sup>-11</sup>	4.1 × 10 <sup>-11</sup>
		S	0.020	4.2 × 10 <sup>-10</sup>	0.010	2.8 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	8.2 × 10 <sup>-11</sup>	5.1 × 10 <sup>-11</sup>	4.3 × 10 <sup>-11</sup>
<b>Barium<sup>f</sup></b>										
Ba-126	1.61 h	F	0.600	6.7 × 10 <sup>-10</sup>	0.200	5.2 × 10 <sup>-10</sup>	2.4 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	6.9 × 10 <sup>-11</sup>	7.4 × 10 <sup>-11</sup>
		M	0.200	1.0 × 10 <sup>-9</sup>	0.100	7.0 × 10 <sup>-10</sup>	3.2 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$	
		Type	$f_1$						
			$e(g)$						
Ba-128	2.43 d	S	0.020	0.010	$3.3 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.1 \times 10^{-10}$	
		F	0.600	0.200	$2.5 \times 10^{-9}$	$1.4 \times 10^{-9}$	$7.4 \times 10^{-10}$	$7.6 \times 10^{-10}$	
		M	0.200	0.100	$7.8 \times 10^{-9}$	$3.7 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.3 \times 10^{-9}$
Ba-131	11.8 d	S	0.020	0.010	$4.0 \times 10^{-9}$	$2.6 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.4 \times 10^{-9}$	
		F	0.600	0.200	$1.4 \times 10^{-9}$	$4.7 \times 10^{-10}$	$3.1 \times 10^{-10}$	$2.2 \times 10^{-10}$	
		M	0.200	0.100	$3.1 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.1 \times 10^{-9}$	$9.7 \times 10^{-10}$	$7.6 \times 10^{-10}$
Ba-131m	0.243 h	S	0.020	0.010	$1.8 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.1 \times 10^{-9}$	$8.7 \times 10^{-10}$	
		F	0.600	0.200	$2.1 \times 10^{-11}$	$6.7 \times 10^{-12}$	$4.7 \times 10^{-12}$	$4.0 \times 10^{-12}$	
		M	0.200	0.100	$3.3 \times 10^{-11}$	$1.7 \times 10^{-11}$	$1.2 \times 10^{-11}$	$9.0 \times 10^{-12}$	$7.4 \times 10^{-12}$
Ba-133	10.7 a	S	0.020	0.010	$1.8 \times 10^{-11}$	$1.2 \times 10^{-11}$	$9.5 \times 10^{-12}$	$7.8 \times 10^{-12}$	
		F	0.600	0.200	$4.5 \times 10^{-9}$	$2.6 \times 10^{-9}$	$3.7 \times 10^{-9}$	$6.0 \times 10^{-9}$	$1.5 \times 10^{-9}$
		M	0.200	0.100	$1.0 \times 10^{-8}$	$6.4 \times 10^{-9}$	$5.1 \times 10^{-9}$	$5.5 \times 10^{-9}$	$3.1 \times 10^{-9}$
Ba-133m	1.62 d	S	0.020	0.010	$2.0 \times 10^{-8}$	$1.3 \times 10^{-8}$	$1.1 \times 10^{-8}$	$1.0 \times 10^{-8}$	
		F	0.600	0.200	$1.1 \times 10^{-9}$	$4.9 \times 10^{-10}$	$3.1 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.8 \times 10^{-10}$
		M	0.200	0.100	$2.2 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.9 \times 10^{-10}$	$5.2 \times 10^{-10}$	$4.2 \times 10^{-10}$
Ba-135m	1.20 d	S	0.020	0.010	$1.1 \times 10^{-9}$	$7.6 \times 10^{-10}$	$5.8 \times 10^{-10}$	$4.6 \times 10^{-10}$	
		F	0.600	0.200	$1.0 \times 10^{-9}$	$4.6 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.2 \times 10^{-10}$	$1.4 \times 10^{-10}$
		M	0.200	0.100	$1.8 \times 10^{-9}$	$8.9 \times 10^{-10}$	$5.4 \times 10^{-10}$	$4.1 \times 10^{-10}$	$3.3 \times 10^{-10}$
Ba-139	1.38 h	S	0.020	0.010	$1.9 \times 10^{-9}$	$8.6 \times 10^{-10}$	$4.5 \times 10^{-10}$	$3.6 \times 10^{-10}$	
		F	0.600	0.200	$2.4 \times 10^{-10}$	$1.1 \times 10^{-10}$	$6.0 \times 10^{-11}$	$3.1 \times 10^{-11}$	$3.4 \times 10^{-11}$
		M	0.200	0.100	$3.5 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.0 \times 10^{-10}$	$6.6 \times 10^{-11}$	$5.6 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2	2-7 a	7-12 a	12t-17 a	>17 a			
		Type	f <sub>1</sub>						e(g)	f <sub>1</sub> for g > 1 a	e(g)
Ba-140	12.7 d	S	0.020	5.7 × 10 <sup>-10</sup>	0.010	3.6 × 10 <sup>-10</sup>	1.6 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	7.0 × 10 <sup>-11</sup>	5.9 × 10 <sup>-11</sup>	
		F	0.600	1.4 × 10 <sup>-8</sup>	0.200	7.8 × 10 <sup>-9</sup>	3.6 × 10 <sup>-9</sup>	2.4 × 10 <sup>-9</sup>	2.4 × 10 <sup>-9</sup>	1.6 × 10 <sup>-9</sup>	1.0 × 10 <sup>-9</sup>
		M	0.200	2.7 × 10 <sup>-8</sup>	0.100	2.0 × 10 <sup>-8</sup>	1.1 × 10 <sup>-8</sup>	7.6 × 10 <sup>-9</sup>	7.6 × 10 <sup>-9</sup>	6.2 × 10 <sup>-9</sup>	5.1 × 10 <sup>-9</sup>
		S	0.020	2.9 × 10 <sup>-8</sup>	0.010	2.2 × 10 <sup>-8</sup>	1.2 × 10 <sup>-8</sup>	8.6 × 10 <sup>-9</sup>	8.6 × 10 <sup>-9</sup>	7.1 × 10 <sup>-9</sup>	5.8 × 10 <sup>-9</sup>
Ba-141	0.305 h	F	0.600	1.9 × 10 <sup>-10</sup>	0.200	1.4 × 10 <sup>-10</sup>	6.4 × 10 <sup>-11</sup>	3.8 × 10 <sup>-11</sup>	2.1 × 10 <sup>-11</sup>	2.1 × 10 <sup>-11</sup>	
		M	0.200	3.0 × 10 <sup>-10</sup>	0.100	2.0 × 10 <sup>-10</sup>	9.3 × 10 <sup>-11</sup>	5.9 × 10 <sup>-11</sup>	3.8 × 10 <sup>-11</sup>	3.2 × 10 <sup>-11</sup>	
		S	0.020	3.2 × 10 <sup>-10</sup>	0.010	2.1 × 10 <sup>-10</sup>	9.7 × 10 <sup>-11</sup>	6.2 × 10 <sup>-11</sup>	4.0 × 10 <sup>-11</sup>	3.4 × 10 <sup>-11</sup>	
Ba-142	0.177 h	F	0.600	1.3 × 10 <sup>-10</sup>	0.200	9.6 × 10 <sup>-11</sup>	4.5 × 10 <sup>-11</sup>	2.7 × 10 <sup>-11</sup>	1.6 × 10 <sup>-11</sup>	1.5 × 10 <sup>-11</sup>	
		M	0.200	1.8 × 10 <sup>-10</sup>	0.100	1.3 × 10 <sup>-10</sup>	6.1 × 10 <sup>-11</sup>	3.9 × 10 <sup>-11</sup>	2.5 × 10 <sup>-11</sup>	2.1 × 10 <sup>-11</sup>	
Lanthanum	0.983 h F	S	0.020	1.9 × 10 <sup>-10</sup>	0.010	1.3 × 10 <sup>-10</sup>	6.2 × 10 <sup>-11</sup>	4.0 × 10 <sup>-11</sup>	2.6 × 10 <sup>-11</sup>	2.2 × 10 <sup>-11</sup>	
		F	0.005	1.2 × 10 <sup>-10</sup>	5.0 × 10 <sup>-4</sup>	8.7 × 10 <sup>-11</sup>	4.2 × 10 <sup>-11</sup>	2.6 × 10 <sup>-11</sup>	1.5 × 10 <sup>-11</sup>	1.3 × 10 <sup>-11</sup>	
		M	0.005	1.8 × 10 <sup>-10</sup>	5.0 × 10 <sup>-4</sup>	1.3 × 10 <sup>-10</sup>	6.4 × 10 <sup>-11</sup>	4.1 × 10 <sup>-11</sup>	2.8 × 10 <sup>-11</sup>	2.3 × 10 <sup>-11</sup>	
		F	0.005	1.0 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	7.7 × 10 <sup>-10</sup>	3.7 × 10 <sup>-10</sup>	2.2 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>	
La-135	19.5 h F	M	0.005	1.5 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	1.1 × 10 <sup>-9</sup>	5.4 × 10 <sup>-10</sup>	3.4 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.6 × 10 <sup>-10</sup>	
		F	0.005	1.0 × 10 <sup>-10</sup>	5.0 × 10 <sup>-4</sup>	7.7 × 10 <sup>-11</sup>	3.8 × 10 <sup>-11</sup>	2.3 × 10 <sup>-11</sup>	1.3 × 10 <sup>-11</sup>	1.0 × 10 <sup>-11</sup>	
La-137	6.00 × 10 <sup>4</sup> a F	M	0.005	1.3 × 10 <sup>-10</sup>	5.0 × 10 <sup>-4</sup>	1.0 × 10 <sup>-10</sup>	4.9 × 10 <sup>-11</sup>	3.0 × 10 <sup>-11</sup>	1.7 × 10 <sup>-11</sup>	1.4 × 10 <sup>-11</sup>	
		F	0.005	2.5 × 10 <sup>-8</sup>	5.0 × 10 <sup>-4</sup>	2.3 × 10 <sup>-8</sup>	1.5 × 10 <sup>-8</sup>	1.1 × 10 <sup>-8</sup>	8.9 × 10 <sup>-9</sup>	8.7 × 10 <sup>-9</sup>	
		M	0.005	8.6 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	8.1 × 10 <sup>-9</sup>	5.6 × 10 <sup>-9</sup>	4.0 × 10 <sup>-9</sup>	3.6 × 10 <sup>-9</sup>	3.6 × 10 <sup>-9</sup>	
La-138	1.35 × 10 <sup>11</sup> a F	F	0.005	3.7 × 10 <sup>-7</sup>	5.0 × 10 <sup>-4</sup>	3.5 × 10 <sup>-7</sup>	2.4 × 10 <sup>-7</sup>	1.8 × 10 <sup>-7</sup>	1.6 × 10 <sup>-7</sup>	1.5 × 10 <sup>-7</sup>	

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$	
		Type	$f_1$						$e(g)$
La-140	1.68 d F	M	0.005	$1.3 \times 10^{-7}$	$9.1 \times 10^{-8}$	$6.8 \times 10^{-8}$	$6.4 \times 10^{-8}$	$6.4 \times 10^{-8}$	
		F	0.005	$5.8 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.2 \times 10^{-9}$	$6.9 \times 10^{-10}$	$5.7 \times 10^{-10}$	
		M	0.005	$8.8 \times 10^{-9}$	$6.3 \times 10^{-9}$	$3.1 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.1 \times 10^{-9}$
La-141	3.93 h F	F	0.005	$8.6 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.4 \times 10^{-10}$	$7.5 \times 10^{-11}$	$6.3 \times 10^{-11}$	
		M	0.005	$1.4 \times 10^{-9}$	$4.3 \times 10^{-10}$	$2.8 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.5 \times 10^{-10}$	
		F	0.005	$5.3 \times 10^{-10}$	$3.8 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.1 \times 10^{-10}$	$6.3 \times 10^{-11}$	
La-142	1.54 h F	M	0.005	$8.1 \times 10^{-10}$	$2.7 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.1 \times 10^{-10}$	$8.9 \times 10^{-11}$	
		F	0.005	$1.4 \times 10^{-10}$	$8.6 \times 10^{-11}$	$3.7 \times 10^{-11}$	$2.3 \times 10^{-11}$	$1.2 \times 10^{-11}$	
		M	0.005	$2.1 \times 10^{-10}$	$1.3 \times 10^{-10}$	$6.0 \times 10^{-11}$	$3.9 \times 10^{-11}$	$2.5 \times 10^{-11}$	
<b>Cerium</b>									
Ce-134	3.00 d	F	0.005	$7.6 \times 10^{-9}$	$2.3 \times 10^{-9}$	$1.4 \times 10^{-9}$	$7.7 \times 10^{-10}$	$5.7 \times 10^{-10}$	
		M	0.005	$1.1 \times 10^{-8}$	$7.6 \times 10^{-9}$	$3.7 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.3 \times 10^{-9}$
		S	0.005	$1.2 \times 10^{-8}$	$8.0 \times 10^{-9}$	$3.8 \times 10^{-9}$	$2.5 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.3 \times 10^{-9}$
Ce-135	17.6 h	F	0.005	$2.3 \times 10^{-9}$	$1.7 \times 10^{-9}$	$8.5 \times 10^{-10}$	$3.0 \times 10^{-10}$	$2.4 \times 10^{-10}$	
		M	0.005	$3.6 \times 10^{-9}$	$2.7 \times 10^{-9}$	$1.4 \times 10^{-9}$	$8.9 \times 10^{-10}$	$5.9 \times 10^{-10}$	$4.8 \times 10^{-10}$
		S	0.005	$3.7 \times 10^{-9}$	$2.8 \times 10^{-9}$	$1.4 \times 10^{-9}$	$9.4 \times 10^{-10}$	$6.3 \times 10^{-10}$	$5.0 \times 10^{-10}$
Ce-137	9.00 h	F	0.005	$7.5 \times 10^{-11}$	$5.6 \times 10^{-11}$	$2.7 \times 10^{-11}$	$8.7 \times 10^{-12}$	$7.0 \times 10^{-12}$	
		M	0.005	$1.1 \times 10^{-10}$	$7.6 \times 10^{-11}$	$3.6 \times 10^{-11}$	$2.2 \times 10^{-11}$	$1.2 \times 10^{-11}$	$9.8 \times 10^{-12}$
		S	0.005	$1.1 \times 10^{-10}$	$7.8 \times 10^{-11}$	$3.7 \times 10^{-11}$	$2.3 \times 10^{-11}$	$1.3 \times 10^{-11}$	$1.0 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$	
		Type	$f_1$ $e(g)$							
Ce-137m	1.43 d	F	0.005	$1.6 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.1 \times 10^{-9}$	$4.6 \times 10^{-10}$	$2.8 \times 10^{-10}$	$1.2 \times 10^{-10}$	
		M	0.005	$3.1 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.2 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.7 \times 10^{-10}$	$4.1 \times 10^{-10}$	
		S	0.005	$3.3 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.3 \times 10^{-9}$	$1.0 \times 10^{-9}$	$7.3 \times 10^{-10}$	$5.6 \times 10^{-10}$	$4.4 \times 10^{-10}$
Ce-139	138 d	F	0.005	$1.1 \times 10^{-8}$	$5.0 \times 10^{-4}$	$8.5 \times 10^{-9}$	$4.5 \times 10^{-9}$	$2.8 \times 10^{-9}$	$1.5 \times 10^{-9}$	
		M	0.005	$7.5 \times 10^{-9}$	$5.0 \times 10^{-4}$	$6.1 \times 10^{-9}$	$3.6 \times 10^{-9}$	$2.5 \times 10^{-9}$	$1.7 \times 10^{-9}$	
		S	0.005	$7.8 \times 10^{-9}$	$5.0 \times 10^{-4}$	$6.3 \times 10^{-9}$	$3.9 \times 10^{-9}$	$2.7 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.9 \times 10^{-9}$
Ce-141	32.5 d	F	0.005	$1.1 \times 10^{-8}$	$5.0 \times 10^{-4}$	$7.3 \times 10^{-9}$	$3.5 \times 10^{-9}$	$2.0 \times 10^{-9}$	$9.3 \times 10^{-10}$	
		M	0.005	$1.4 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.1 \times 10^{-8}$	$6.3 \times 10^{-9}$	$4.6 \times 10^{-9}$	$3.2 \times 10^{-9}$	
		S	0.005	$1.6 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.2 \times 10^{-8}$	$7.1 \times 10^{-9}$	$5.3 \times 10^{-9}$	$4.8 \times 10^{-9}$	$3.8 \times 10^{-9}$
Ce-143	1.38 d	F	0.005	$3.6 \times 10^{-9}$	$5.0 \times 10^{-4}$	$2.3 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.2 \times 10^{-10}$	$2.7 \times 10^{-10}$	
		M	0.005	$5.6 \times 10^{-9}$	$5.0 \times 10^{-4}$	$3.9 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.3 \times 10^{-9}$	$9.3 \times 10^{-10}$	
		S	0.005	$5.9 \times 10^{-9}$	$5.0 \times 10^{-4}$	$4.1 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.0 \times 10^{-9}$	$8.3 \times 10^{-10}$
Ce-144	284 d	F	0.005	$3.6 \times 10^{-7}$	$5.0 \times 10^{-4}$	$2.7 \times 10^{-7}$	$1.4 \times 10^{-7}$	$7.8 \times 10^{-8}$	$4.0 \times 10^{-8}$	
		M	0.005	$1.9 \times 10^{-7}$	$5.0 \times 10^{-4}$	$1.6 \times 10^{-7}$	$8.8 \times 10^{-8}$	$5.5 \times 10^{-8}$	$4.1 \times 10^{-8}$	
		S	0.005	$2.1 \times 10^{-7}$	$5.0 \times 10^{-4}$	$1.8 \times 10^{-7}$	$1.1 \times 10^{-7}$	$7.3 \times 10^{-8}$	$5.8 \times 10^{-8}$	$5.3 \times 10^{-8}$
<b>Praseodymium</b>										
Pr-136	0.218 h	M	0.005	$1.3 \times 10^{-10}$	$5.0 \times 10^{-4}$	$8.8 \times 10^{-11}$	$4.2 \times 10^{-11}$	$2.6 \times 10^{-11}$	$1.6 \times 10^{-11}$	$1.3 \times 10^{-11}$
		S	0.005	$1.3 \times 10^{-10}$	$5.0 \times 10^{-4}$	$9.0 \times 10^{-11}$	$4.3 \times 10^{-11}$	$2.7 \times 10^{-11}$	$1.7 \times 10^{-11}$	$1.4 \times 10^{-11}$
Pr-137	1.28 h	M	0.005	$1.8 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-10}$	$6.1 \times 10^{-11}$	$3.9 \times 10^{-11}$	$2.4 \times 10^{-11}$	$2.0 \times 10^{-11}$
		S	0.005	$1.9 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-10}$	$6.4 \times 10^{-11}$	$4.0 \times 10^{-11}$	$2.5 \times 10^{-11}$	$2.1 \times 10^{-11}$
Pr-138m	2.10 h	M	0.005	$5.9 \times 10^{-10}$	$5.0 \times 10^{-4}$	$4.5 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.4 \times 10^{-10}$	$7.2 \times 10^{-11}$	

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$						
			$e(g)$						
Pr-139	4.51 h	S	0.005	$5.0 \times 10^{-4}$	$4.7 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.5 \times 10^{-10}$	$9.3 \times 10^{-11}$	$7.4 \times 10^{-11}$
		M	0.005	$5.0 \times 10^{-4}$	$1.1 \times 10^{-10}$	$5.5 \times 10^{-11}$	$3.5 \times 10^{-11}$	$2.3 \times 10^{-11}$	$1.8 \times 10^{-11}$
		S	0.005	$5.0 \times 10^{-4}$	$1.2 \times 10^{-10}$	$5.7 \times 10^{-11}$	$3.7 \times 10^{-11}$	$2.4 \times 10^{-11}$	$2.0 \times 10^{-11}$
Pr-142	19.1 h	M	0.005	$5.0 \times 10^{-4}$	$3.5 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.2 \times 10^{-10}$	$5.2 \times 10^{-10}$
		S	0.005	$5.0 \times 10^{-4}$	$3.7 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.6 \times 10^{-10}$	$5.5 \times 10^{-10}$
		M	0.005	$5.0 \times 10^{-4}$	$4.5 \times 10^{-11}$	$2.0 \times 10^{-11}$	$1.3 \times 10^{-11}$	$7.9 \times 10^{-12}$	$6.6 \times 10^{-12}$
Pr-142m	0.243 h	S	0.005	$5.0 \times 10^{-4}$	$4.7 \times 10^{-11}$	$2.2 \times 10^{-11}$	$1.4 \times 10^{-11}$	$8.4 \times 10^{-12}$	$7.0 \times 10^{-12}$
		M	0.005	$5.0 \times 10^{-4}$	$8.4 \times 10^{-9}$	$4.6 \times 10^{-9}$	$3.2 \times 10^{-9}$	$2.7 \times 10^{-9}$	$2.2 \times 10^{-9}$
		S	0.005	$5.0 \times 10^{-4}$	$9.2 \times 10^{-9}$	$5.1 \times 10^{-9}$	$3.6 \times 10^{-9}$	$3.0 \times 10^{-9}$	$2.4 \times 10^{-9}$
Pr-144	0.288 h	M	0.005	$5.0 \times 10^{-4}$	$1.2 \times 10^{-10}$	$5.0 \times 10^{-11}$	$3.2 \times 10^{-11}$	$2.1 \times 10^{-11}$	$1.8 \times 10^{-11}$
		S	0.005	$5.0 \times 10^{-4}$	$1.2 \times 10^{-10}$	$5.2 \times 10^{-11}$	$3.4 \times 10^{-11}$	$2.1 \times 10^{-11}$	$1.8 \times 10^{-11}$
		M	0.005	$5.0 \times 10^{-4}$	$1.0 \times 10^{-9}$	$4.7 \times 10^{-10}$	$3.0 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.6 \times 10^{-10}$
Pr-145	5.98 h	S	0.005	$5.0 \times 10^{-4}$	$1.1 \times 10^{-9}$	$4.9 \times 10^{-10}$	$3.2 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.7 \times 10^{-10}$
		M	0.005	$5.0 \times 10^{-4}$	$1.0 \times 10^{-10}$	$4.8 \times 10^{-11}$	$3.1 \times 10^{-11}$	$2.1 \times 10^{-11}$	$1.8 \times 10^{-11}$
		S	0.005	$5.0 \times 10^{-4}$	$1.1 \times 10^{-10}$	$5.0 \times 10^{-11}$	$3.3 \times 10^{-11}$	$2.2 \times 10^{-11}$	$1.8 \times 10^{-11}$
Pr-147	0.227 h	M	0.005	$5.0 \times 10^{-4}$	$3.2 \times 10^{-10}$	$1.6 \times 10^{-10}$	$9.8 \times 10^{-11}$	$6.3 \times 10^{-11}$	$5.1 \times 10^{-11}$
		S	0.005	$5.0 \times 10^{-4}$	$3.3 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.0 \times 10^{-10}$	$6.6 \times 10^{-11}$	$5.4 \times 10^{-11}$
		M	0.005	$5.0 \times 10^{-4}$	$1.7 \times 10^{-9}$	$7.7 \times 10^{-10}$	$4.8 \times 10^{-10}$	$2.8 \times 10^{-10}$	$2.3 \times 10^{-10}$
Neodymium	0.844 h	S	0.005	$5.0 \times 10^{-4}$	$1.8 \times 10^{-9}$	$8.0 \times 10^{-10}$	$5.0 \times 10^{-10}$	$3.0 \times 10^{-10}$	$2.5 \times 10^{-10}$
		M	0.005	$5.0 \times 10^{-4}$	$6.2 \times 10^{-11}$	$3.0 \times 10^{-11}$	$1.9 \times 10^{-11}$	$1.2 \times 10^{-11}$	$9.9 \times 10^{-12}$
		M	0.005	$5.0 \times 10^{-4}$	$3.2 \times 10^{-10}$	$1.6 \times 10^{-10}$	$9.8 \times 10^{-11}$	$6.3 \times 10^{-11}$	$5.1 \times 10^{-11}$
Nd-136	5.04 h	S	0.005	$5.0 \times 10^{-4}$	$3.3 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.0 \times 10^{-10}$	$6.6 \times 10^{-11}$	$5.4 \times 10^{-11}$
		M	0.005	$5.0 \times 10^{-4}$	$1.7 \times 10^{-9}$	$7.7 \times 10^{-10}$	$4.8 \times 10^{-10}$	$2.8 \times 10^{-10}$	$2.3 \times 10^{-10}$
		S	0.005	$5.0 \times 10^{-4}$	$1.8 \times 10^{-9}$	$8.0 \times 10^{-10}$	$5.0 \times 10^{-10}$	$3.0 \times 10^{-10}$	$2.5 \times 10^{-10}$
Nd-138	0.495 h	M	0.005	$5.0 \times 10^{-4}$	$6.2 \times 10^{-11}$	$3.0 \times 10^{-11}$	$1.9 \times 10^{-11}$	$1.2 \times 10^{-11}$	$9.9 \times 10^{-12}$
		S	0.005	$5.0 \times 10^{-4}$	$3.0 \times 10^{-11}$	$1.6 \times 10^{-10}$	$9.8 \times 10^{-11}$	$6.3 \times 10^{-11}$	$5.1 \times 10^{-11}$
		M	0.005	$5.0 \times 10^{-4}$	$3.3 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.0 \times 10^{-10}$	$6.6 \times 10^{-11}$	$5.4 \times 10^{-11}$



Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1a$	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$ $e(g)$						
Nd-139m	5.50 h	S	0.005 $9.4 \times 10^{-11}$	$5.0 \times 10^{-4}$	$6.4 \times 10^{-11}$	$3.1 \times 10^{-11}$	$2.0 \times 10^{-11}$	$1.3 \times 10^{-11}$	$1.0 \times 10^{-11}$
Nd-141	2.49 h	M	0.005 $1.1 \times 10^{-9}$	$5.0 \times 10^{-4}$	$8.8 \times 10^{-10}$	$4.5 \times 10^{-10}$	$2.9 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.5 \times 10^{-10}$
Nd-147	11.0 d	S	0.005 $1.2 \times 10^{-9}$	$5.0 \times 10^{-4}$	$9.1 \times 10^{-10}$	$4.6 \times 10^{-10}$	$3.0 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.5 \times 10^{-10}$
Nd-149	1.73 h	M	0.005 $4.1 \times 10^{-11}$	$5.0 \times 10^{-4}$	$3.1 \times 10^{-11}$	$1.5 \times 10^{-11}$	$9.6 \times 10^{-12}$	$6.0 \times 10^{-12}$	$4.8 \times 10^{-12}$
Nd-151	0.207 h	S	0.005 $4.3 \times 10^{-11}$	$5.0 \times 10^{-4}$	$3.2 \times 10^{-11}$	$1.6 \times 10^{-11}$	$1.0 \times 10^{-11}$	$6.2 \times 10^{-12}$	$5.0 \times 10^{-12}$
Promethium									
Pm-141	0.348 h	M	0.005 $1.1 \times 10^{-8}$	$5.0 \times 10^{-4}$	$8.0 \times 10^{-9}$	$4.5 \times 10^{-9}$	$3.2 \times 10^{-9}$	$2.6 \times 10^{-9}$	$2.1 \times 10^{-9}$
Pm-143	265 d	S	0.005 $1.2 \times 10^{-8}$	$5.0 \times 10^{-4}$	$8.6 \times 10^{-9}$	$4.9 \times 10^{-9}$	$3.5 \times 10^{-9}$	$3.0 \times 10^{-9}$	$2.4 \times 10^{-9}$
Pm-144	363 d	M	0.005 $6.8 \times 10^{-10}$	$5.0 \times 10^{-4}$	$4.6 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.0 \times 10^{-10}$	$8.4 \times 10^{-11}$
Pm-145	17.7 a	S	0.005 $7.1 \times 10^{-10}$	$5.0 \times 10^{-4}$	$4.8 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.1 \times 10^{-10}$	$8.9 \times 10^{-11}$
Pm-146	5.53 a	M	0.005 $1.5 \times 10^{-10}$	$5.0 \times 10^{-4}$	$9.9 \times 10^{-11}$	$4.6 \times 10^{-11}$	$3.0 \times 10^{-11}$	$2.0 \times 10^{-11}$	$1.7 \times 10^{-11}$
		S	0.005 $1.5 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.0 \times 10^{-10}$	$4.8 \times 10^{-11}$	$3.1 \times 10^{-11}$	$2.1 \times 10^{-11}$	$1.7 \times 10^{-11}$
		M	0.005 $1.4 \times 10^{-10}$	$5.0 \times 10^{-4}$	$9.4 \times 10^{-11}$	$4.3 \times 10^{-11}$	$2.7 \times 10^{-11}$	$1.7 \times 10^{-11}$	$1.4 \times 10^{-11}$
		S	0.005 $1.5 \times 10^{-10}$	$5.0 \times 10^{-4}$	$9.7 \times 10^{-11}$	$4.4 \times 10^{-11}$	$2.8 \times 10^{-11}$	$1.8 \times 10^{-11}$	$1.5 \times 10^{-11}$
		M	0.005 $6.2 \times 10^{-9}$	$5.0 \times 10^{-4}$	$5.4 \times 10^{-9}$	$3.3 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.5 \times 10^{-9}$
		S	0.005 $5.5 \times 10^{-9}$	$5.0 \times 10^{-4}$	$4.8 \times 10^{-9}$	$3.1 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.4 \times 10^{-9}$
		M	0.005 $3.1 \times 10^{-8}$	$5.0 \times 10^{-4}$	$2.8 \times 10^{-8}$	$1.8 \times 10^{-8}$	$1.2 \times 10^{-8}$	$9.3 \times 10^{-9}$	$8.2 \times 10^{-9}$
		S	0.005 $2.6 \times 10^{-8}$	$5.0 \times 10^{-4}$	$2.4 \times 10^{-8}$	$1.6 \times 10^{-8}$	$1.1 \times 10^{-8}$	$8.9 \times 10^{-9}$	$7.5 \times 10^{-9}$
		M	0.005 $1.1 \times 10^{-8}$	$5.0 \times 10^{-4}$	$9.8 \times 10^{-9}$	$6.4 \times 10^{-9}$	$4.3 \times 10^{-9}$	$3.7 \times 10^{-9}$	$3.6 \times 10^{-9}$
		S	0.005 $7.1 \times 10^{-9}$	$5.0 \times 10^{-4}$	$6.5 \times 10^{-9}$	$4.3 \times 10^{-9}$	$2.9 \times 10^{-9}$	$2.4 \times 10^{-9}$	$2.3 \times 10^{-9}$
		M	0.005 $6.4 \times 10^{-8}$	$5.0 \times 10^{-4}$	$5.9 \times 10^{-8}$	$3.9 \times 10^{-8}$	$2.6 \times 10^{-8}$	$2.2 \times 10^{-8}$	$2.1 \times 10^{-8}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		f <sub>1</sub> for g > 1 a	Age 1-2 f <sub>1</sub> for	2-7 a e(g)	7-12 a e(g)	12t-17 a e(g)	>17 a e(g)	
		Type	f <sub>1</sub>							e(g)
Pm-147	2.62 a	S	0.005	5.3 × 10 <sup>-8</sup>	4.9 × 10 <sup>-8</sup>	3.3 × 10 <sup>-8</sup>	2.2 × 10 <sup>-8</sup>	1.9 × 10 <sup>-8</sup>	1.7 × 10 <sup>-8</sup>	
		M	0.005	2.1 × 10 <sup>-8</sup>	1.8 × 10 <sup>-8</sup>	1.1 × 10 <sup>-8</sup>	7.0 × 10 <sup>-9</sup>	5.7 × 10 <sup>-9</sup>	5.0 × 10 <sup>-9</sup>	
Pm-148	5.37 d	S	0.005	1.9 × 10 <sup>-8</sup>	1.6 × 10 <sup>-8</sup>	1.0 × 10 <sup>-8</sup>	6.8 × 10 <sup>-9</sup>	5.8 × 10 <sup>-9</sup>	4.9 × 10 <sup>-9</sup>	
		M	0.005	1.5 × 10 <sup>-8</sup>	1.0 × 10 <sup>-8</sup>	5.2 × 10 <sup>-9</sup>	3.4 × 10 <sup>-9</sup>	2.4 × 10 <sup>-9</sup>	2.0 × 10 <sup>-9</sup>	
Pm-148m	41.3 d	S	0.005	1.5 × 10 <sup>-8</sup>	1.1 × 10 <sup>-8</sup>	5.5 × 10 <sup>-9</sup>	3.7 × 10 <sup>-9</sup>	2.6 × 10 <sup>-9</sup>	2.2 × 10 <sup>-9</sup>	
		M	0.005	2.4 × 10 <sup>-8</sup>	1.9 × 10 <sup>-8</sup>	1.1 × 10 <sup>-8</sup>	7.7 × 10 <sup>-9</sup>	6.3 × 10 <sup>-9</sup>	5.1 × 10 <sup>-9</sup>	
Pm-149	2.21 d	S	0.005	2.5 × 10 <sup>-8</sup>	2.0 × 10 <sup>-8</sup>	1.2 × 10 <sup>-8</sup>	8.3 × 10 <sup>-9</sup>	7.1 × 10 <sup>-9</sup>	5.7 × 10 <sup>-9</sup>	
		M	0.005	5.0 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	3.5 × 10 <sup>-9</sup>	1.7 × 10 <sup>-9</sup>	8.3 × 10 <sup>-10</sup>	6.7 × 10 <sup>-10</sup>	
Pm-150	2.68 h	S	0.005	5.3 × 10 <sup>-9</sup>	3.6 × 10 <sup>-9</sup>	1.8 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>	9.0 × 10 <sup>-10</sup>	7.3 × 10 <sup>-10</sup>	
		M	0.005	1.2 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	7.9 × 10 <sup>-10</sup>	3.8 × 10 <sup>-10</sup>	2.4 × 10 <sup>-10</sup>	1.5 × 10 <sup>-10</sup>	
Pm-151	1.18 d	S	0.005	1.2 × 10 <sup>-9</sup>	8.2 × 10 <sup>-10</sup>	3.9 × 10 <sup>-10</sup>	2.5 × 10 <sup>-10</sup>	1.6 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	
		M	0.005	3.3 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	2.5 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>	8.3 × 10 <sup>-10</sup>	5.3 × 10 <sup>-10</sup>	
Samarium	90.0 a	S	0.005	3.4 × 10 <sup>-9</sup>	2.6 × 10 <sup>-9</sup>	1.3 × 10 <sup>-9</sup>	7.9 × 10 <sup>-10</sup>	5.7 × 10 <sup>-10</sup>	4.6 × 10 <sup>-10</sup>	
		M	0.005	1.5 × 10 <sup>-10</sup>	5.0 × 10 <sup>-4</sup>	1.0 × 10 <sup>-10</sup>	4.7 × 10 <sup>-11</sup>	2.9 × 10 <sup>-11</sup>	1.8 × 10 <sup>-11</sup>	
Sm-141m	0.377 h	M	0.005	3.0 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>	9.7 × 10 <sup>-11</sup>	6.1 × 10 <sup>-11</sup>	3.9 × 10 <sup>-11</sup>	3.2 × 10 <sup>-11</sup>	
Sm-142	1.21 h	M	0.005	7.5 × 10 <sup>-10</sup>	4.8 × 10 <sup>-10</sup>	2.2 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	8.5 × 10 <sup>-11</sup>	7.1 × 10 <sup>-11</sup>	
Sm-145	340 d	M	0.005	8.1 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	4.0 × 10 <sup>-9</sup>	2.5 × 10 <sup>-9</sup>	1.9 × 10 <sup>-9</sup>	1.6 × 10 <sup>-9</sup>	
Sm-146	1.03 × 10 <sup>8</sup> a	M	0.005	2.7 × 10 <sup>-5</sup>	5.0 × 10 <sup>-4</sup>	1.7 × 10 <sup>-5</sup>	1.2 × 10 <sup>-5</sup>	1.1 × 10 <sup>-5</sup>	1.1 × 10 <sup>-5</sup>	
Sm-147	1.06 × 10 <sup>11</sup> a	M	0.005	2.5 × 10 <sup>-5</sup>	5.0 × 10 <sup>-4</sup>	1.6 × 10 <sup>-5</sup>	1.1 × 10 <sup>-5</sup>	9.6 × 10 <sup>-6</sup>	9.6 × 10 <sup>-6</sup>	
Sm-151	90.0 a	M	0.005	1.1 × 10 <sup>-8</sup>	5.0 × 10 <sup>-4</sup>	6.7 × 10 <sup>-9</sup>	4.5 × 10 <sup>-9</sup>	4.0 × 10 <sup>-9</sup>	4.0 × 10 <sup>-9</sup>	

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$						
Sm-153	1.95 d	M	0.005	$5.0 \times 10^{-4}$	$2.9 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.0 \times 10^{-9}$	$7.9 \times 10^{-10}$	$6.3 \times 10^{-10}$
Sm-155	0.368 h	M	0.005	$5.0 \times 10^{-4}$	$9.9 \times 10^{-11}$	$4.4 \times 10^{-11}$	$2.9 \times 10^{-11}$	$2.0 \times 10^{-11}$	$1.7 \times 10^{-11}$
Sm-156	9.40 h	M	0.005	$5.0 \times 10^{-4}$	$1.1 \times 10^{-9}$	$5.8 \times 10^{-10}$	$3.5 \times 10^{-10}$	$2.7 \times 10^{-10}$	$2.2 \times 10^{-10}$
<b>Europium</b>									
Eu-145	5.94 d	M	0.005	$5.0 \times 10^{-4}$	$2.9 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.8 \times 10^{-10}$	$5.5 \times 10^{-10}$
Eu-146	4.61 d	M	0.005	$5.0 \times 10^{-4}$	$4.4 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.0 \times 10^{-9}$	$8.0 \times 10^{-10}$
Eu-147	24.0 d	M	0.005	$5.0 \times 10^{-4}$	$3.7 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.1 \times 10^{-9}$
Eu-148	54.5 d	M	0.005	$5.0 \times 10^{-4}$	$1.2 \times 10^{-8}$	$6.8 \times 10^{-9}$	$4.6 \times 10^{-9}$	$3.2 \times 10^{-9}$	$2.6 \times 10^{-9}$
Eu-149	93.1 d	M	0.005	$5.0 \times 10^{-4}$	$1.1 \times 10^{-7}$	$7.8 \times 10^{-8}$	$5.7 \times 10^{-8}$	$5.3 \times 10^{-8}$	$5.3 \times 10^{-8}$
Eu-150	34.2 a	M	0.005	$5.0 \times 10^{-4}$	$1.1 \times 10^{-9}$	$5.2 \times 10^{-10}$	$3.4 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.9 \times 10^{-10}$
Eu-150m	12.6 h	M	0.005	$5.0 \times 10^{-4}$	$1.0 \times 10^{-7}$	$7.0 \times 10^{-8}$	$4.9 \times 10^{-8}$	$4.3 \times 10^{-8}$	$4.2 \times 10^{-8}$
Eu-152	13.3 a	M	0.005	$5.0 \times 10^{-4}$	$1.3 \times 10^{-9}$	$6.6 \times 10^{-10}$	$4.2 \times 10^{-10}$	$2.4 \times 10^{-10}$	$2.2 \times 10^{-10}$
Eu-152m	9.32 h	M	0.005	$5.0 \times 10^{-4}$	$1.5 \times 10^{-7}$	$9.7 \times 10^{-8}$	$6.5 \times 10^{-8}$	$5.6 \times 10^{-8}$	$5.3 \times 10^{-8}$
Eu-154	8.80 a	M	0.005	$5.0 \times 10^{-4}$	$2.3 \times 10^{-8}$	$1.4 \times 10^{-8}$	$9.2 \times 10^{-9}$	$7.6 \times 10^{-9}$	$6.9 \times 10^{-9}$
Eu-155	4.96 a	M	0.005	$5.0 \times 10^{-4}$	$1.4 \times 10^{-8}$	$7.7 \times 10^{-9}$	$5.3 \times 10^{-9}$	$4.2 \times 10^{-9}$	$3.4 \times 10^{-9}$
Eu-156	15.2 d	M	0.005	$5.0 \times 10^{-4}$	$1.9 \times 10^{-9}$	$8.9 \times 10^{-10}$	$5.9 \times 10^{-10}$	$3.5 \times 10^{-10}$	$2.8 \times 10^{-10}$
Eu-157	15.1 h	M	0.005	$5.0 \times 10^{-4}$	$2.9 \times 10^{-10}$	$1.3 \times 10^{-10}$	$8.5 \times 10^{-11}$	$5.6 \times 10^{-11}$	$4.7 \times 10^{-11}$
Eu-158	0.765 h	M	0.005	$5.0 \times 10^{-4}$	$2.9 \times 10^{-10}$	$1.3 \times 10^{-10}$	$8.5 \times 10^{-11}$	$5.6 \times 10^{-11}$	$4.7 \times 10^{-11}$
<b>Gadolinium</b>									
Gd-145	0.382 h	F	0.005	$5.0 \times 10^{-4}$	$9.6 \times 10^{-11}$	$4.7 \times 10^{-11}$	$2.9 \times 10^{-11}$	$1.7 \times 10^{-11}$	$1.4 \times 10^{-11}$
		M	0.005	$5.0 \times 10^{-4}$	$1.3 \times 10^{-10}$	$6.2 \times 10^{-11}$	$3.9 \times 10^{-11}$	$2.4 \times 10^{-11}$	$2.0 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$	
		Type	$f_1$						$e(g)$
Gd-146	48.3 d	F	0.005	$2.9 \times 10^{-8}$	$2.3 \times 10^{-8}$	$1.2 \times 10^{-8}$	$5.1 \times 10^{-9}$	$4.4 \times 10^{-9}$	
		M	0.005	$2.8 \times 10^{-8}$	$2.2 \times 10^{-8}$	$1.3 \times 10^{-8}$	$9.3 \times 10^{-9}$	$7.9 \times 10^{-9}$	$6.4 \times 10^{-9}$
Gd-147	1.59 d	F	0.005	$2.1 \times 10^{-9}$	$1.7 \times 10^{-9}$	$8.4 \times 10^{-10}$	$3.1 \times 10^{-10}$	$2.6 \times 10^{-10}$	
		M	0.005	$2.8 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.1 \times 10^{-9}$	$7.5 \times 10^{-10}$	$5.1 \times 10^{-10}$	$4.0 \times 10^{-10}$
Gd-148	93.0 a	F	0.005	$8.3 \times 10^{-5}$	$7.6 \times 10^{-5}$	$4.7 \times 10^{-5}$	$3.2 \times 10^{-5}$	$2.6 \times 10^{-5}$	
		M	0.005	$3.2 \times 10^{-5}$	$2.9 \times 10^{-5}$	$1.9 \times 10^{-5}$	$1.3 \times 10^{-5}$	$1.2 \times 10^{-5}$	$1.1 \times 10^{-5}$
Gd-149	9.40 d	F	0.005	$2.6 \times 10^{-9}$	$2.0 \times 10^{-9}$	$8.0 \times 10^{-10}$	$5.1 \times 10^{-10}$	$3.1 \times 10^{-10}$	
		M	0.005	$3.6 \times 10^{-9}$	$3.0 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.1 \times 10^{-9}$	$9.2 \times 10^{-10}$	$7.3 \times 10^{-10}$
Gd-151	120 d	F	0.005	$2.6 \times 10^{-9}$	$5.0 \times 10^{-4}$	$4.9 \times 10^{-9}$	$2.5 \times 10^{-9}$	$9.2 \times 10^{-10}$	
		M	0.005	$4.5 \times 10^{-9}$	$3.5 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.0 \times 10^{-9}$	$8.6 \times 10^{-10}$
Gd-152	$1.08 \times 10^{14}$ a	F	0.005	$5.9 \times 10^{-5}$	$5.4 \times 10^{-5}$	$3.4 \times 10^{-5}$	$2.4 \times 10^{-5}$	$1.9 \times 10^{-5}$	
		M	0.005	$2.1 \times 10^{-5}$	$1.9 \times 10^{-5}$	$1.3 \times 10^{-5}$	$8.9 \times 10^{-6}$	$7.9 \times 10^{-6}$	$8.0 \times 10^{-6}$
Gd-153	242 d	F	0.005	$1.5 \times 10^{-8}$	$1.2 \times 10^{-8}$	$6.5 \times 10^{-9}$	$3.9 \times 10^{-9}$	$2.4 \times 10^{-9}$	
		M	0.005	$9.9 \times 10^{-9}$	$7.9 \times 10^{-9}$	$4.8 \times 10^{-9}$	$3.1 \times 10^{-9}$	$2.5 \times 10^{-9}$	$2.1 \times 10^{-9}$
Gd-159	18.6 h	F	0.005	$1.2 \times 10^{-9}$	$8.9 \times 10^{-10}$	$3.8 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.0 \times 10^{-10}$	
		M	0.005	$2.2 \times 10^{-9}$	$1.5 \times 10^{-9}$	$7.3 \times 10^{-10}$	$4.9 \times 10^{-10}$	$3.4 \times 10^{-10}$	$2.7 \times 10^{-10}$
<b>Terbium</b>									
Tb-147	1.65 h	M	0.005	$6.7 \times 10^{-10}$	$4.8 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.5 \times 10^{-10}$	$9.3 \times 10^{-11}$	
Tb-149	4.15 h	M	0.005	$2.1 \times 10^{-8}$	$1.5 \times 10^{-8}$	$9.6 \times 10^{-9}$	$6.6 \times 10^{-9}$	$5.8 \times 10^{-9}$	
Tb-150	3.27 h	M	0.005	$1.0 \times 10^{-9}$	$7.4 \times 10^{-10}$	$3.5 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.3 \times 10^{-10}$	
Tb-151	17.6 h	M	0.005	$1.6 \times 10^{-9}$	$1.2 \times 10^{-9}$	$6.3 \times 10^{-10}$	$4.2 \times 10^{-10}$	$2.8 \times 10^{-10}$	

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		f <sub>1</sub> for g > 1 a	Age 1-2 f <sub>1</sub> for	2-7 a e(g)	7-12 a e(g)	12t-17 a e(g)	>17 a e(g)
		Type	f <sub>1</sub> e(g)						
Tb-153	2.34 d	M	0.005	1.4 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	1.0 × 10 <sup>-9</sup>	5.4 × 10 <sup>-10</sup>	3.6 × 10 <sup>-10</sup>	1.9 × 10 <sup>-10</sup>
Tb-154	21.4 h	M	0.005	2.7 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	2.1 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	7.1 × 10 <sup>-10</sup>	3.6 × 10 <sup>-10</sup>
Tb-155	5.32 d	M	0.005	1.4 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	1.0 × 10 <sup>-9</sup>	5.6 × 10 <sup>-10</sup>	3.4 × 10 <sup>-10</sup>	2.2 × 10 <sup>-10</sup>
Tb-156	5.34 d	M	0.005	7.0 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	5.4 × 10 <sup>-9</sup>	3.0 × 10 <sup>-9</sup>	2.0 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>
Tb-156m	1.02 d	M	0.005	1.1 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	9.4 × 10 <sup>-10</sup>	4.7 × 10 <sup>-10</sup>	2.7 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>
Tb-156m'	5.00 h	M	0.005	6.2 × 10 <sup>-10</sup>	5.0 × 10 <sup>-4</sup>	4.5 × 10 <sup>-10</sup>	2.4 × 10 <sup>-10</sup>	1.7 × 10 <sup>-10</sup>	9.6 × 10 <sup>-11</sup>
Tb-157	1.50 × 10 <sup>2</sup> a	M	0.005	3.2 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	3.0 × 10 <sup>-9</sup>	2.0 × 10 <sup>-9</sup>	1.4 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>
Tb-158	1.50 × 10 <sup>2</sup> a	M	0.005	1.1 × 10 <sup>-7</sup>	5.0 × 10 <sup>-4</sup>	1.0 × 10 <sup>-7</sup>	7.0 × 10 <sup>-8</sup>	4.7 × 10 <sup>-8</sup>	4.6 × 10 <sup>-8</sup>
Tb-160	72.3 d	M	0.005	3.2 × 10 <sup>-8</sup>	5.0 × 10 <sup>-4</sup>	2.5 × 10 <sup>-8</sup>	1.5 × 10 <sup>-8</sup>	8.6 × 10 <sup>-9</sup>	7.0 × 10 <sup>-9</sup>
Tb-161	6.91 d	M	0.005	6.6 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	4.7 × 10 <sup>-9</sup>	2.6 × 10 <sup>-9</sup>	1.6 × 10 <sup>-9</sup>	1.3 × 10 <sup>-9</sup>
<b>Dysprosium</b>									
Dy-155	10.0 h	M	0.005	5.6 × 10 <sup>-10</sup>	5.0 × 10 <sup>-4</sup>	4.4 × 10 <sup>-10</sup>	2.3 × 10 <sup>-10</sup>	1.5 × 10 <sup>-10</sup>	7.7 × 10 <sup>-11</sup>
Dy-157	8.10 h	M	0.005	2.4 × 10 <sup>-10</sup>	5.0 × 10 <sup>-4</sup>	1.9 × 10 <sup>-10</sup>	9.9 × 10 <sup>-11</sup>	6.2 × 10 <sup>-11</sup>	3.0 × 10 <sup>-11</sup>
Dy-159	144 d	M	0.005	2.1 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	1.7 × 10 <sup>-9</sup>	9.6 × 10 <sup>-10</sup>	6.0 × 10 <sup>-10</sup>	3.7 × 10 <sup>-10</sup>
Dy-165	2.33 h	M	0.005	5.2 × 10 <sup>-10</sup>	5.0 × 10 <sup>-4</sup>	3.4 × 10 <sup>-10</sup>	1.6 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	6.0 × 10 <sup>-11</sup>
Dy-166	3.40 d	M	0.005	1.2 × 10 <sup>-8</sup>	5.0 × 10 <sup>-4</sup>	8.3 × 10 <sup>-9</sup>	4.4 × 10 <sup>-9</sup>	2.3 × 10 <sup>-9</sup>	1.9 × 10 <sup>-9</sup>
<b>Holmium</b>									
Ho-155	0.800 h	M	0.005	1.7 × 10 <sup>-10</sup>	5.0 × 10 <sup>-4</sup>	1.2 × 10 <sup>-10</sup>	5.8 × 10 <sup>-11</sup>	3.7 × 10 <sup>-11</sup>	2.0 × 10 <sup>-11</sup>
Ho-157	0.210 h	M	0.005	3.4 × 10 <sup>-11</sup>	5.0 × 10 <sup>-4</sup>	2.5 × 10 <sup>-11</sup>	1.3 × 10 <sup>-11</sup>	8.0 × 10 <sup>-12</sup>	4.2 × 10 <sup>-12</sup>
Ho-159	0.550 h	M	0.005	4.6 × 10 <sup>-11</sup>	5.0 × 10 <sup>-4</sup>	3.3 × 10 <sup>-11</sup>	1.7 × 10 <sup>-11</sup>	1.1 × 10 <sup>-11</sup>	6.1 × 10 <sup>-12</sup>
Ho-161	2.50 h	M	0.005	5.7 × 10 <sup>-11</sup>	5.0 × 10 <sup>-4</sup>	4.0 × 10 <sup>-11</sup>	2.0 × 10 <sup>-11</sup>	1.2 × 10 <sup>-11</sup>	6.0 × 10 <sup>-12</sup>
Ho-162	0.250 h	M	0.005	2.1 × 10 <sup>-11</sup>	5.0 × 10 <sup>-4</sup>	1.5 × 10 <sup>-11</sup>	7.2 × 10 <sup>-12</sup>	4.8 × 10 <sup>-12</sup>	2.8 × 10 <sup>-12</sup>

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$		
		Type	$f_1$						$e(g)$	
Ho-162m	1.13 h	M	0.005	$1.5 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.1 \times 10^{-10}$	$5.8 \times 10^{-11}$	$3.8 \times 10^{-11}$	$2.6 \times 10^{-11}$	$2.1 \times 10^{-11}$
Ho-164	0.483 h	M	0.005	$6.8 \times 10^{-11}$	$5.0 \times 10^{-4}$	$4.5 \times 10^{-11}$	$2.1 \times 10^{-11}$	$1.4 \times 10^{-11}$	$9.9 \times 10^{-12}$	$8.4 \times 10^{-12}$
Ho-164m	0.625 h	M	0.005	$9.1 \times 10^{-11}$	$5.0 \times 10^{-4}$	$5.9 \times 10^{-11}$	$3.0 \times 10^{-11}$	$2.0 \times 10^{-11}$	$1.3 \times 10^{-11}$	$1.2 \times 10^{-11}$
Ho-166	1.12 d	M	0.005	$6.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$4.0 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.9 \times 10^{-10}$	$6.5 \times 10^{-10}$
Ho-166m	$1.20 \times 10^3$ a	M	0.005	$2.6 \times 10^{-7}$	$5.0 \times 10^{-4}$	$2.5 \times 10^{-7}$	$1.8 \times 10^{-7}$	$1.3 \times 10^{-7}$	$1.2 \times 10^{-7}$	$1.2 \times 10^{-7}$
Ho-167	3.10 h	M	0.005	$5.2 \times 10^{-10}$	$5.0 \times 10^{-4}$	$3.6 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.2 \times 10^{-10}$	$8.7 \times 10^{-11}$	$7.1 \times 10^{-11}$
<b>Erbium</b>										
Er-161	3.24 h	M	0.005	$3.8 \times 10^{-10}$	$5.0 \times 10^{-4}$	$2.9 \times 10^{-10}$	$1.5 \times 10^{-10}$	$9.5 \times 10^{-11}$	$6.0 \times 10^{-11}$	$4.8 \times 10^{-11}$
Er-165	10.4 h	M	0.005	$7.2 \times 10^{-11}$	$5.0 \times 10^{-4}$	$5.3 \times 10^{-11}$	$2.6 \times 10^{-11}$	$1.6 \times 10^{-11}$	$9.6 \times 10^{-12}$	$7.9 \times 10^{-12}$
Er-169	9.30 d	M	0.005	$4.7 \times 10^{-9}$	$5.0 \times 10^{-4}$	$3.5 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.0 \times 10^{-9}$
Er-171	7.52 h	M	0.005	$1.8 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.2 \times 10^{-9}$	$5.9 \times 10^{-10}$	$3.9 \times 10^{-10}$	$2.7 \times 10^{-10}$	$2.2 \times 10^{-10}$
Er-172	2.05 d	M	0.005	$6.6 \times 10^{-9}$	$5.0 \times 10^{-4}$	$4.7 \times 10^{-9}$	$2.5 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.1 \times 10^{-9}$
<b>Thulium</b>										
Tm-162	0.362 h	M	0.005	$1.3 \times 10^{-10}$	$5.0 \times 10^{-4}$	$9.6 \times 10^{-11}$	$4.7 \times 10^{-11}$	$3.0 \times 10^{-11}$	$1.9 \times 10^{-11}$	$1.6 \times 10^{-11}$
Tm-166	7.70 h	M	0.005	$1.3 \times 10^{-9}$	$5.0 \times 10^{-4}$	$9.9 \times 10^{-10}$	$5.2 \times 10^{-10}$	$3.3 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.7 \times 10^{-10}$
Tm-167	9.24 d	M	0.005	$5.6 \times 10^{-9}$	$5.0 \times 10^{-4}$	$4.1 \times 10^{-9}$	$2.3 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.1 \times 10^{-9}$
Tm-170	129 d	M	0.005	$3.6 \times 10^{-8}$	$5.0 \times 10^{-4}$	$2.8 \times 10^{-8}$	$1.6 \times 10^{-8}$	$1.1 \times 10^{-8}$	$8.5 \times 10^{-9}$	$7.0 \times 10^{-9}$
Tm-171	1.92 a	M	0.005	$6.8 \times 10^{-9}$	$5.0 \times 10^{-4}$	$5.7 \times 10^{-9}$	$3.4 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.4 \times 10^{-9}$
Tm-172	2.65 d	M	0.005	$8.4 \times 10^{-9}$	$5.0 \times 10^{-4}$	$5.8 \times 10^{-9}$	$2.9 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.1 \times 10^{-9}$
Tm-173	8.24 h	M	0.005	$1.5 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.0 \times 10^{-9}$	$5.0 \times 10^{-10}$	$3.3 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.8 \times 10^{-10}$
Tm-175	0.253 h	M	0.005	$1.6 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.1 \times 10^{-10}$	$5.0 \times 10^{-11}$	$3.3 \times 10^{-11}$	$2.2 \times 10^{-11}$	$1.8 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$ $e(g)$						
<b>Ytterbium</b>									
Yb-162	0.315 h	M	0.005	$1.1 \times 10^{-10}$	$7.9 \times 10^{-11}$	$3.9 \times 10^{-11}$	$2.5 \times 10^{-11}$	$1.6 \times 10^{-11}$	$1.3 \times 10^{-11}$
		S	0.005	$1.2 \times 10^{-10}$	$8.2 \times 10^{-11}$	$4.0 \times 10^{-11}$	$2.6 \times 10^{-11}$	$1.7 \times 10^{-11}$	$1.4 \times 10^{-11}$
Yb-166	2.36 d	M	0.005	$4.7 \times 10^{-9}$	$3.5 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.3 \times 10^{-9}$	$9.0 \times 10^{-10}$	$7.2 \times 10^{-10}$
		S	0.005	$4.9 \times 10^{-9}$	$3.7 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.3 \times 10^{-9}$	$9.6 \times 10^{-10}$	$7.7 \times 10^{-10}$
Yb-167	0.292 h	M	0.005	$4.4 \times 10^{-11}$	$3.1 \times 10^{-11}$	$1.6 \times 10^{-11}$	$1.1 \times 10^{-11}$	$7.9 \times 10^{-12}$	$6.5 \times 10^{-12}$
		S	0.005	$4.6 \times 10^{-11}$	$3.2 \times 10^{-11}$	$1.7 \times 10^{-11}$	$1.1 \times 10^{-11}$	$8.4 \times 10^{-12}$	$6.9 \times 10^{-12}$
Yb-169	32.0 d	M	0.005	$1.2 \times 10^{-8}$	$8.7 \times 10^{-9}$	$5.1 \times 10^{-9}$	$3.7 \times 10^{-9}$	$3.2 \times 10^{-9}$	$2.5 \times 10^{-9}$
		S	0.005	$1.3 \times 10^{-8}$	$9.8 \times 10^{-9}$	$5.9 \times 10^{-9}$	$4.2 \times 10^{-9}$	$3.7 \times 10^{-9}$	$3.0 \times 10^{-9}$
Yb-175	4.19 d	M	0.005	$3.5 \times 10^{-9}$	$2.5 \times 10^{-9}$	$1.4 \times 10^{-9}$	$9.8 \times 10^{-10}$	$8.3 \times 10^{-10}$	$6.5 \times 10^{-10}$
		S	0.005	$3.7 \times 10^{-9}$	$2.7 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.1 \times 10^{-9}$	$9.2 \times 10^{-10}$	$7.3 \times 10^{-10}$
Yb-177	1.90 h	M	0.005	$5.0 \times 10^{-10}$	$3.3 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.1 \times 10^{-10}$	$7.8 \times 10^{-11}$	$6.4 \times 10^{-11}$
		S	0.005	$5.3 \times 10^{-10}$	$3.5 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.2 \times 10^{-10}$	$8.4 \times 10^{-11}$	$6.9 \times 10^{-11}$
Yb-178	1.23 h	M	0.005	$5.9 \times 10^{-10}$	$3.9 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.2 \times 10^{-10}$	$8.5 \times 10^{-11}$	$7.0 \times 10^{-11}$
		S	0.005	$6.2 \times 10^{-10}$	$4.1 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.3 \times 10^{-10}$	$9.1 \times 10^{-11}$	$7.5 \times 10^{-11}$
<b>Lutetium</b>									
Lu-169	1.42 d	M	0.005	$2.3 \times 10^{-9}$	$1.8 \times 10^{-9}$	$9.5 \times 10^{-10}$	$6.3 \times 10^{-10}$	$4.4 \times 10^{-10}$	$3.5 \times 10^{-10}$
		S	0.005	$2.4 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.7 \times 10^{-10}$	$4.8 \times 10^{-10}$	$3.8 \times 10^{-10}$
Lu-170	2.00 d	M	0.005	$4.3 \times 10^{-9}$	$3.4 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.8 \times 10^{-10}$	$6.3 \times 10^{-10}$
		S	0.005	$4.5 \times 10^{-9}$	$3.5 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.2 \times 10^{-9}$	$8.2 \times 10^{-10}$	$6.6 \times 10^{-10}$
Lu-171	8.22 d	M	0.005	$5.0 \times 10^{-9}$	$3.7 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.2 \times 10^{-9}$	$9.8 \times 10^{-10}$	$8.0 \times 10^{-10}$
		S	0.005	$4.7 \times 10^{-9}$	$3.9 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.1 \times 10^{-9}$	$8.8 \times 10^{-10}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a			$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$	$e(g)$						
Lu-172	6.70 d	M	0.005	$8.7 \times 10^{-9}$	$5.0 \times 10^{-4}$	$6.7 \times 10^{-9}$	$3.8 \times 10^{-9}$	$2.6 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.4 \times 10^{-9}$
		S	0.005	$9.3 \times 10^{-9}$	$5.0 \times 10^{-4}$	$7.1 \times 10^{-9}$	$4.0 \times 10^{-9}$	$2.8 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.6 \times 10^{-9}$
Lu-173	1.37 a	M	0.005	$1.0 \times 10^{-8}$	$5.0 \times 10^{-4}$	$8.5 \times 10^{-9}$	$5.1 \times 10^{-9}$	$3.2 \times 10^{-9}$	$2.5 \times 10^{-9}$	$2.2 \times 10^{-9}$
		S	0.005	$1.0 \times 10^{-8}$	$5.0 \times 10^{-4}$	$8.7 \times 10^{-9}$	$5.4 \times 10^{-9}$	$3.6 \times 10^{-9}$	$2.9 \times 10^{-9}$	$2.4 \times 10^{-9}$
Lu-174	3.31 a	M	0.005	$1.7 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.5 \times 10^{-8}$	$9.1 \times 10^{-9}$	$5.8 \times 10^{-9}$	$4.7 \times 10^{-9}$	$4.2 \times 10^{-9}$
		S	0.005	$1.6 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.4 \times 10^{-8}$	$8.9 \times 10^{-9}$	$5.9 \times 10^{-9}$	$4.9 \times 10^{-9}$	$4.2 \times 10^{-9}$
Lu-174m	142 d	M	0.005	$1.9 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.4 \times 10^{-8}$	$8.6 \times 10^{-9}$	$5.4 \times 10^{-9}$	$4.3 \times 10^{-9}$	$3.7 \times 10^{-9}$
		S	0.005	$2.0 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.5 \times 10^{-8}$	$9.2 \times 10^{-9}$	$6.1 \times 10^{-9}$	$5.0 \times 10^{-9}$	$4.2 \times 10^{-9}$
Lu-176	$3.60 \times 10^{10}$ a	M	0.005	$1.8 \times 10^{-7}$	$5.0 \times 10^{-4}$	$1.7 \times 10^{-7}$	$1.1 \times 10^{-7}$	$7.8 \times 10^{-8}$	$7.1 \times 10^{-8}$	$7.0 \times 10^{-8}$
		S	0.005	$1.5 \times 10^{-7}$	$5.0 \times 10^{-4}$	$1.4 \times 10^{-7}$	$9.4 \times 10^{-8}$	$6.5 \times 10^{-8}$	$5.9 \times 10^{-8}$	$5.6 \times 10^{-8}$
Lu-176m	3.68 h	M	0.005	$8.9 \times 10^{-10}$	$5.0 \times 10^{-4}$	$5.9 \times 10^{-10}$	$2.8 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.2 \times 10^{-10}$	$1.1 \times 10^{-10}$
		S	0.005	$9.3 \times 10^{-10}$	$5.0 \times 10^{-4}$	$6.2 \times 10^{-10}$	$3.0 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.2 \times 10^{-10}$	$1.2 \times 10^{-10}$
Lu-177	6.71 d	M	0.005	$5.3 \times 10^{-9}$	$5.0 \times 10^{-4}$	$3.8 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.1 \times 10^{-9}$
		S	0.005	$5.7 \times 10^{-9}$	$5.0 \times 10^{-4}$	$4.1 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.2 \times 10^{-9}$
Lu-177m	161 d	M	0.005	$5.8 \times 10^{-8}$	$5.0 \times 10^{-4}$	$4.6 \times 10^{-8}$	$2.8 \times 10^{-8}$	$1.9 \times 10^{-8}$	$1.6 \times 10^{-8}$	$1.3 \times 10^{-8}$
		S	0.005	$6.5 \times 10^{-8}$	$5.0 \times 10^{-4}$	$5.3 \times 10^{-8}$	$3.2 \times 10^{-8}$	$2.3 \times 10^{-8}$	$2.0 \times 10^{-8}$	$1.6 \times 10^{-8}$
Lu-178	0.473 h	M	0.005	$2.3 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.5 \times 10^{-10}$	$6.6 \times 10^{-11}$	$4.3 \times 10^{-11}$	$2.9 \times 10^{-11}$	$2.4 \times 10^{-11}$
		S	0.005	$2.4 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.5 \times 10^{-10}$	$6.9 \times 10^{-11}$	$4.5 \times 10^{-11}$	$3.0 \times 10^{-11}$	$2.6 \times 10^{-11}$
Lu-178m	0.378 h	M	0.005	$2.6 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.8 \times 10^{-10}$	$8.3 \times 10^{-11}$	$5.6 \times 10^{-11}$	$3.8 \times 10^{-11}$	$3.2 \times 10^{-11}$
		S	0.005	$2.7 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.9 \times 10^{-10}$	$8.7 \times 10^{-11}$	$5.8 \times 10^{-11}$	$4.0 \times 10^{-11}$	$3.3 \times 10^{-11}$
Lu-179	4.59 h	M	0.005	$9.9 \times 10^{-10}$	$5.0 \times 10^{-4}$	$6.5 \times 10^{-10}$	$3.0 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.2 \times 10^{-10}$	$1.1 \times 10^{-10}$



Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$ $e(g)$					
<b>Hafnium</b>								
Hf-170	16.0 h	F	0.020 $1.4 \times 10^{-9}$	0.002 $1.1 \times 10^{-9}$	$5.4 \times 10^{-10}$	$3.4 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.6 \times 10^{-10}$
		M	0.020 $2.2 \times 10^{-9}$	0.002 $1.7 \times 10^{-9}$	$8.7 \times 10^{-10}$	$5.8 \times 10^{-10}$	$3.9 \times 10^{-10}$	$3.2 \times 10^{-10}$
Hf-172	1.87 a	F	0.020 $1.5 \times 10^{-7}$	0.002 $1.3 \times 10^{-7}$	$7.8 \times 10^{-8}$	$4.9 \times 10^{-8}$	$3.5 \times 10^{-8}$	$3.2 \times 10^{-8}$
		M	0.020 $8.1 \times 10^{-8}$	0.002 $6.9 \times 10^{-8}$	$4.3 \times 10^{-8}$	$2.8 \times 10^{-8}$	$2.3 \times 10^{-8}$	$2.0 \times 10^{-8}$
Hf-173	24.0 h	F	0.020 $6.6 \times 10^{-10}$	0.002 $5.0 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.5 \times 10^{-10}$	$8.9 \times 10^{-11}$	$7.4 \times 10^{-11}$
		M	0.020 $1.1 \times 10^{-9}$	0.002 $8.2 \times 10^{-10}$	$4.3 \times 10^{-10}$	$2.9 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.6 \times 10^{-10}$
Hf-175	70.0 d	F	0.020 $5.4 \times 10^{-9}$	0.002 $4.0 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.3 \times 10^{-9}$	$8.5 \times 10^{-10}$	$7.2 \times 10^{-10}$
		M	0.020 $5.8 \times 10^{-9}$	0.002 $4.5 \times 10^{-9}$	$2.6 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.2 \times 10^{-9}$
Hf-177m	0.856 h	F	0.020 $3.9 \times 10^{-10}$	0.002 $2.8 \times 10^{-10}$	$1.3 \times 10^{-10}$	$8.5 \times 10^{-11}$	$5.2 \times 10^{-11}$	$4.4 \times 10^{-11}$
		M	0.020 $6.5 \times 10^{-10}$	0.002 $4.7 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.1 \times 10^{-10}$	$9.0 \times 10^{-11}$
Hf-178m	31.0 a	F	0.020 $6.2 \times 10^{-7}$	0.002 $5.8 \times 10^{-7}$	$4.0 \times 10^{-7}$	$3.1 \times 10^{-7}$	$2.7 \times 10^{-7}$	$2.6 \times 10^{-7}$
		M	0.020 $2.6 \times 10^{-7}$	0.002 $2.4 \times 10^{-7}$	$1.7 \times 10^{-7}$	$1.3 \times 10^{-7}$	$1.2 \times 10^{-7}$	$1.2 \times 10^{-7}$
Hf-179m	25.1 d	F	0.020 $9.7 \times 10^{-9}$	0.002 $6.8 \times 10^{-9}$	$3.4 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.2 \times 10^{-9}$	$1.1 \times 10^{-9}$
		M	0.020 $1.7 \times 10^{-8}$	0.002 $1.3 \times 10^{-8}$	$7.6 \times 10^{-9}$	$5.5 \times 10^{-9}$	$4.8 \times 10^{-9}$	$3.8 \times 10^{-9}$
Hf-180m	5.50 h	F	0.020 $5.4 \times 10^{-10}$	0.002 $4.1 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.3 \times 10^{-10}$	$7.2 \times 10^{-11}$	$5.9 \times 10^{-11}$
		M	0.020 $9.1 \times 10^{-10}$	0.002 $6.8 \times 10^{-10}$	$3.6 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.3 \times 10^{-10}$
Hf-181	42.4 d	F	0.020 $1.3 \times 10^{-8}$	0.002 $9.6 \times 10^{-9}$	$4.8 \times 10^{-9}$	$2.8 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.4 \times 10^{-9}$
		M	0.020 $2.2 \times 10^{-8}$	0.002 $1.7 \times 10^{-8}$	$9.9 \times 10^{-9}$	$7.1 \times 10^{-9}$	$6.3 \times 10^{-9}$	$5.0 \times 10^{-9}$
Hf-182	$9.00 \times 10^6$ a	F	0.020 $6.5 \times 10^{-7}$	0.002 $6.2 \times 10^{-7}$	$4.4 \times 10^{-7}$	$3.6 \times 10^{-7}$	$3.1 \times 10^{-7}$	$3.1 \times 10^{-7}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$					
			$e(g)$					
Hf-182m	1.02 h	M	0.020	0.002	$1.7 \times 10^{-7}$	$1.3 \times 10^{-7}$	$1.3 \times 10^{-7}$	$1.3 \times 10^{-7}$
		F	0.020	0.002	$6.6 \times 10^{-11}$	$4.2 \times 10^{-11}$	$2.6 \times 10^{-11}$	$2.1 \times 10^{-11}$
		M	0.020	0.002	$2.3 \times 10^{-10}$	$1.2 \times 10^{-10}$	$7.8 \times 10^{-11}$	$5.6 \times 10^{-11}$
Hf-183	1.07 h	F	0.020	0.002	$7.9 \times 10^{-11}$	$4.9 \times 10^{-11}$	$2.8 \times 10^{-11}$	$2.4 \times 10^{-11}$
		M	0.020	0.002	$3.0 \times 10^{-10}$	$1.5 \times 10^{-10}$	$9.8 \times 10^{-11}$	$7.0 \times 10^{-11}$
		F	0.020	0.002	$9.6 \times 10^{-10}$	$4.3 \times 10^{-10}$	$2.7 \times 10^{-10}$	$1.4 \times 10^{-10}$
Hf-184	4.12 h	M	0.020	0.002	$8.9 \times 10^{-9}$	$5.9 \times 10^{-10}$	$4.0 \times 10^{-10}$	$3.3 \times 10^{-10}$
<b>Tantalum</b>								
Ta-172	0.613 h	M	0.010	0.001	$9.3 \times 10^{-11}$	$6.0 \times 10^{-11}$	$4.0 \times 10^{-11}$	$3.3 \times 10^{-11}$
		S	0.010	0.001	$9.8 \times 10^{-11}$	$6.3 \times 10^{-11}$	$4.2 \times 10^{-11}$	$3.5 \times 10^{-11}$
Ta-173	3.65 h	M	0.010	0.001	$3.0 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.1 \times 10^{-10}$
		S	0.010	0.001	$6.5 \times 10^{-10}$	$3.2 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.1 \times 10^{-10}$
Ta-174	1.20 h	M	0.010	0.001	$1.1 \times 10^{-10}$	$7.1 \times 10^{-11}$	$5.0 \times 10^{-11}$	$4.1 \times 10^{-11}$
		S	0.010	0.001	$1.1 \times 10^{-10}$	$7.5 \times 10^{-11}$	$5.3 \times 10^{-11}$	$4.3 \times 10^{-11}$
Ta-175	10.5 h	M	0.010	0.001	$3.7 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.2 \times 10^{-10}$
		S	0.010	0.001	$7.3 \times 10^{-10}$	$3.8 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.3 \times 10^{-10}$
Ta-176	8.08 h	M	0.010	0.001	$5.7 \times 10^{-10}$	$3.7 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.9 \times 10^{-10}$
		S	0.010	0.001	$1.1 \times 10^{-9}$	$5.9 \times 10^{-10}$	$3.8 \times 10^{-10}$	$2.0 \times 10^{-10}$
Ta-177	2.36 d	M	0.010	0.001	$4.7 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.2 \times 10^{-10}$	$9.6 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2	2-7 a	7-12 a	12t-17 a	>17 a		
		Type	f <sub>1</sub>						e(g)	f <sub>1</sub> for g > 1 a
Ta-178	2.20 h	S	0.010	6.9 × 10 <sup>-10</sup>	0.001	5.0 × 10 <sup>-10</sup>	2.7 × 10 <sup>-10</sup>	1.7 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>
		M	0.010	4.4 × 10 <sup>-10</sup>	0.001	3.3 × 10 <sup>-10</sup>	1.7 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	8.0 × 10 <sup>-11</sup>	6.5 × 10 <sup>-11</sup>
		S	0.010	4.6 × 10 <sup>-10</sup>	0.001	3.4 × 10 <sup>-10</sup>	1.8 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	8.5 × 10 <sup>-11</sup>	6.8 × 10 <sup>-11</sup>
Ta-179	1.82 a	M	0.010	1.2 × 10 <sup>-9</sup>	0.001	9.6 × 10 <sup>-10</sup>	5.5 × 10 <sup>-10</sup>	3.5 × 10 <sup>-10</sup>	2.6 × 10 <sup>-10</sup>	2.2 × 10 <sup>-10</sup>
		S	0.010	2.4 × 10 <sup>-9</sup>	0.001	2.1 × 10 <sup>-9</sup>	1.3 × 10 <sup>-9</sup>	8.3 × 10 <sup>-10</sup>	6.4 × 10 <sup>-10</sup>	5.6 × 10 <sup>-10</sup>
Ta-180	1.00 × 10 <sup>13</sup> a	M	0.010	2.7 × 10 <sup>-8</sup>	0.001	2.2 × 10 <sup>-8</sup>	1.3 × 10 <sup>-8</sup>	9.2 × 10 <sup>-9</sup>	7.9 × 10 <sup>-9</sup>	6.4 × 10 <sup>-9</sup>
		S	0.010	7.0 × 10 <sup>-8</sup>	0.001	6.5 × 10 <sup>-8</sup>	4.5 × 10 <sup>-8</sup>	3.1 × 10 <sup>-8</sup>	2.8 × 10 <sup>-8</sup>	2.6 × 10 <sup>-8</sup>
Ta-180m	8.10 h	M	0.010	3.1 × 10 <sup>-10</sup>	0.001	2.2 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	7.4 × 10 <sup>-11</sup>	4.8 × 10 <sup>-11</sup>	4.4 × 10 <sup>-11</sup>
		S	0.010	3.3 × 10 <sup>-10</sup>	0.001	2.3 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	7.9 × 10 <sup>-11</sup>	5.2 × 10 <sup>-11</sup>	4.2 × 10 <sup>-11</sup>
Ta-182	115 d	M	0.010	3.2 × 10 <sup>-8</sup>	0.001	2.6 × 10 <sup>-8</sup>	1.5 × 10 <sup>-8</sup>	1.1 × 10 <sup>-8</sup>	9.5 × 10 <sup>-9</sup>	7.6 × 10 <sup>-9</sup>
		S	0.010	4.2 × 10 <sup>-8</sup>	0.001	3.4 × 10 <sup>-8</sup>	2.1 × 10 <sup>-8</sup>	1.5 × 10 <sup>-8</sup>	1.3 × 10 <sup>-8</sup>	1.0 × 10 <sup>-8</sup>
Ta-182m	0.264 h	M	0.010	1.6 × 10 <sup>-10</sup>	0.001	1.1 × 10 <sup>-10</sup>	4.9 × 10 <sup>-11</sup>	3.4 × 10 <sup>-11</sup>	2.4 × 10 <sup>-11</sup>	2.0 × 10 <sup>-11</sup>
		S	0.010	1.6 × 10 <sup>-10</sup>	0.001	1.1 × 10 <sup>-10</sup>	5.2 × 10 <sup>-11</sup>	3.6 × 10 <sup>-11</sup>	2.5 × 10 <sup>-11</sup>	2.1 × 10 <sup>-11</sup>
Ta-183	5.10 d	M	0.010	1.0 × 10 <sup>-8</sup>	0.001	7.4 × 10 <sup>-9</sup>	4.1 × 10 <sup>-9</sup>	2.9 × 10 <sup>-9</sup>	2.4 × 10 <sup>-9</sup>	1.9 × 10 <sup>-9</sup>
		S	0.010	1.1 × 10 <sup>-8</sup>	0.001	8.0 × 10 <sup>-9</sup>	4.5 × 10 <sup>-9</sup>	3.2 × 10 <sup>-9</sup>	2.7 × 10 <sup>-9</sup>	2.1 × 10 <sup>-9</sup>
Ta-184	8.70 h	M	0.010	3.2 × 10 <sup>-9</sup>	0.001	2.3 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	7.5 × 10 <sup>-10</sup>	5.0 × 10 <sup>-10</sup>	4.1 × 10 <sup>-10</sup>
		S	0.010	3.4 × 10 <sup>-9</sup>	0.001	2.4 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>	7.9 × 10 <sup>-10</sup>	5.4 × 10 <sup>-10</sup>	4.3 × 10 <sup>-10</sup>
Ta-185	0.816 h	M	0.010	3.8 × 10 <sup>-10</sup>	0.001	2.5 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	7.7 × 10 <sup>-11</sup>	5.4 × 10 <sup>-11</sup>	4.5 × 10 <sup>-11</sup>
		S	0.010	4.0 × 10 <sup>-10</sup>	0.001	2.6 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	8.2 × 10 <sup>-11</sup>	5.7 × 10 <sup>-11</sup>	4.8 × 10 <sup>-11</sup>
Ta-186	0.175 h	M	0.010	1.6 × 10 <sup>-10</sup>	0.001	1.1 × 10 <sup>-10</sup>	4.8 × 10 <sup>-11</sup>	3.1 × 10 <sup>-11</sup>	2.0 × 10 <sup>-11</sup>	1.7 × 10 <sup>-11</sup>
		S	0.010	1.6 × 10 <sup>-10</sup>	0.001	1.1 × 10 <sup>-10</sup>	5.0 × 10 <sup>-11</sup>	3.2 × 10 <sup>-11</sup>	2.1 × 10 <sup>-11</sup>	1.8 × 10 <sup>-11</sup>
<b>Tungsten</b>										
W-176	2.30 h	F	0.600	3.3 × 10 <sup>-10</sup>	0.300	2.7 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	8.6 × 10 <sup>-11</sup>	5.0 × 10 <sup>-11</sup>	4.1 × 10 <sup>-11</sup>

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a			$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$	$e(g)$						
W-177	2.25 h	F	0.600	$2.0 \times 10^{-10}$	0.300	$1.6 \times 10^{-10}$	$8.2 \times 10^{-11}$	$5.1 \times 10^{-11}$	$3.0 \times 10^{-11}$	$2.4 \times 10^{-11}$
W-178	21.7 d	F	0.600	$7.2 \times 10^{-10}$	0.300	$5.4 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.6 \times 10^{-10}$	$8.7 \times 10^{-11}$	$7.2 \times 10^{-11}$
W-179	0.625 h	F	0.600	$9.3 \times 10^{-12}$	0.300	$6.8 \times 10^{-12}$	$3.3 \times 10^{-12}$	$2.0 \times 10^{-12}$	$1.2 \times 10^{-12}$	$9.2 \times 10^{-13}$
W-181	121 d	F	0.600	$2.5 \times 10^{-10}$	0.300	$1.9 \times 10^{-10}$	$9.2 \times 10^{-11}$	$5.7 \times 10^{-11}$	$3.2 \times 10^{-11}$	$2.7 \times 10^{-11}$
W-185	75.1 d	F	0.600	$1.4 \times 10^{-9}$	0.300	$1.0 \times 10^{-9}$	$4.4 \times 10^{-10}$	$2.7 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.2 \times 10^{-10}$
W-187	23.9 h	F	0.600	$2.0 \times 10^{-9}$	0.300	$1.5 \times 10^{-9}$	$7.0 \times 10^{-10}$	$4.3 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.9 \times 10^{-10}$
W-188	69.4 d	F	0.600	$7.1 \times 10^{-9}$	0.300	$5.0 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.3 \times 10^{-9}$	$6.8 \times 10^{-10}$	$5.7 \times 10^{-10}$
<b>Rhenium</b>										
Re-177	0.233 h	F	1.000	$9.4 \times 10^{-11}$	0.800	$6.7 \times 10^{-11}$	$3.2 \times 10^{-11}$	$1.9 \times 10^{-11}$	$1.2 \times 10^{-11}$	$9.7 \times 10^{-12}$
		M	1.000	$1.1 \times 10^{-10}$	0.800	$7.9 \times 10^{-11}$	$3.9 \times 10^{-11}$	$2.5 \times 10^{-11}$	$1.7 \times 10^{-11}$	$1.4 \times 10^{-11}$
Re-178	0.220 h	F	1.000	$9.9 \times 10^{-11}$	0.800	$6.8 \times 10^{-11}$	$3.1 \times 10^{-11}$	$1.9 \times 10^{-11}$	$1.2 \times 10^{-11}$	$1.0 \times 10^{-11}$
		M	1.000	$1.3 \times 10^{-10}$	0.800	$8.5 \times 10^{-11}$	$3.9 \times 10^{-11}$	$2.6 \times 10^{-11}$	$1.7 \times 10^{-11}$	$1.4 \times 10^{-11}$
Re-181	20.0 h	F	1.000	$2.0 \times 10^{-9}$	0.800	$1.4 \times 10^{-9}$	$6.7 \times 10^{-10}$	$3.8 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.8 \times 10^{-10}$
		M	1.000	$2.1 \times 10^{-9}$	0.800	$1.5 \times 10^{-9}$	$7.4 \times 10^{-10}$	$4.6 \times 10^{-10}$	$3.1 \times 10^{-10}$	$2.5 \times 10^{-10}$
Re-182	2.67 d	F	1.000	$6.5 \times 10^{-9}$	0.800	$4.7 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.3 \times 10^{-9}$	$8.0 \times 10^{-10}$	$6.4 \times 10^{-10}$
		M	1.000	$8.7 \times 10^{-9}$	0.800	$6.3 \times 10^{-9}$	$3.4 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.2 \times 10^{-9}$
Re-182m	12.7 h	F	1.000	$1.3 \times 10^{-9}$	0.800	$1.0 \times 10^{-9}$	$4.9 \times 10^{-10}$	$2.8 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.4 \times 10^{-10}$
		M	1.000	$1.4 \times 10^{-9}$	0.800	$1.1 \times 10^{-9}$	$5.7 \times 10^{-10}$	$3.6 \times 10^{-10}$	$2.5 \times 10^{-10}$	$2.0 \times 10^{-10}$
Re-184	38.0 d	F	1.000	$4.1 \times 10^{-9}$	0.800	$2.9 \times 10^{-9}$	$1.4 \times 10^{-9}$	$8.6 \times 10^{-10}$	$5.4 \times 10^{-10}$	$4.4 \times 10^{-10}$
		M	1.000	$9.1 \times 10^{-9}$	0.800	$6.8 \times 10^{-9}$	$4.0 \times 10^{-9}$	$2.8 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.9 \times 10^{-9}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1a$	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$	
		Type	$f_1$							$e(g)$
Re-184m	165 d	F	1.000	$6.6 \times 10^{-9}$	0.800	$4.6 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.3 \times 10^{-10}$	$5.9 \times 10^{-10}$
Re-186	3.78 d	M	1.000	$2.9 \times 10^{-8}$	0.800	$2.2 \times 10^{-8}$	$1.3 \times 10^{-8}$	$9.3 \times 10^{-9}$	$8.1 \times 10^{-9}$	$6.5 \times 10^{-9}$
		F	1.000	$7.3 \times 10^{-9}$	0.800	$4.7 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.6 \times 10^{-10}$	$5.2 \times 10^{-10}$
Re-186m	$2.00 \times 10^5$ a	M	1.000	$8.7 \times 10^{-9}$	0.800	$5.7 \times 10^{-9}$	$2.8 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.1 \times 10^{-9}$
		F	1.000	$1.2 \times 10^{-8}$	0.800	$7.0 \times 10^{-9}$	$2.9 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.0 \times 10^{-9}$	$8.3 \times 10^{-10}$
Re-187	$5.00 \times 10^{10}$ a	M	1.000	$5.9 \times 10^{-8}$	0.800	$4.6 \times 10^{-8}$	$2.7 \times 10^{-8}$	$1.8 \times 10^{-8}$	$1.4 \times 10^{-8}$	$1.2 \times 10^{-8}$
		F	1.000	$2.6 \times 10^{-11}$	0.800	$1.6 \times 10^{-11}$	$6.8 \times 10^{-12}$	$3.8 \times 10^{-12}$	$2.3 \times 10^{-12}$	$1.8 \times 10^{-12}$
Re-188	17.0 h	M	1.000	$5.7 \times 10^{-11}$	0.800	$4.1 \times 10^{-11}$	$2.0 \times 10^{-11}$	$1.2 \times 10^{-11}$	$7.5 \times 10^{-12}$	$6.3 \times 10^{-12}$
		F	1.000	$6.5 \times 10^{-9}$	0.800	$4.4 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.1 \times 10^{-10}$	$4.6 \times 10^{-10}$
Re-188m	0.310 h	M	1.000	$6.0 \times 10^{-9}$	0.800	$4.0 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.8 \times 10^{-10}$	$5.4 \times 10^{-10}$
		F	1.000	$1.4 \times 10^{-10}$	0.800	$9.1 \times 10^{-11}$	$4.0 \times 10^{-11}$	$2.1 \times 10^{-11}$	$1.3 \times 10^{-11}$	$1.0 \times 10^{-11}$
Re-189	1.01 d	M	1.000	$1.3 \times 10^{-10}$	0.800	$8.6 \times 10^{-11}$	$4.0 \times 10^{-11}$	$2.7 \times 10^{-11}$	$1.6 \times 10^{-11}$	$1.3 \times 10^{-11}$
		F	1.000	$3.7 \times 10^{-9}$	0.800	$2.5 \times 10^{-9}$	$1.1 \times 10^{-9}$	$5.8 \times 10^{-10}$	$3.5 \times 10^{-10}$	$2.7 \times 10^{-10}$
<b>Osmium</b>										
Os-180	0.366 h	M	1.000	$3.9 \times 10^{-9}$	0.800	$2.6 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.6 \times 10^{-10}$	$5.5 \times 10^{-10}$	$4.3 \times 10^{-10}$
		F	0.020	$7.1 \times 10^{-11}$	0.010	$5.3 \times 10^{-11}$	$2.6 \times 10^{-11}$	$1.6 \times 10^{-11}$	$1.0 \times 10^{-11}$	$8.2 \times 10^{-12}$
Os-181	1.75 h	M	0.020	$4.5 \times 10^{-10}$	0.010	$3.4 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.1 \times 10^{-10}$	$7.6 \times 10^{-11}$	$6.2 \times 10^{-11}$
		S	0.020	$1.1 \times 10^{-10}$	0.010	$8.2 \times 10^{-11}$	$4.1 \times 10^{-11}$	$2.6 \times 10^{-11}$	$1.8 \times 10^{-11}$	$1.5 \times 10^{-11}$
Os-181	1.75 h	F	0.020	$3.0 \times 10^{-10}$	0.010	$2.3 \times 10^{-10}$	$1.1 \times 10^{-10}$	$7.0 \times 10^{-11}$	$4.1 \times 10^{-11}$	$3.3 \times 10^{-11}$
		M	0.020	$4.5 \times 10^{-10}$	0.010	$3.4 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.1 \times 10^{-10}$	$7.6 \times 10^{-11}$	$6.2 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $g > 1$ a	2-7 a	7-12 a	12t-17 a	>17 a	
		Type	$f_1$						$e(g)$
Os-182	22.0 h	S	0.020	$4.7 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.2 \times 10^{-10}$	$8.1 \times 10^{-11}$	$6.5 \times 10^{-11}$	
		F	0.020	$1.6 \times 10^{-9}$	$6.0 \times 10^{-10}$	$3.7 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.7 \times 10^{-10}$	
		M	0.020	$2.5 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.6 \times 10^{-10}$	$4.5 \times 10^{-10}$	$3.6 \times 10^{-10}$	
Os-185	94.0 d	S	0.020	$2.6 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.9 \times 10^{-10}$	$4.8 \times 10^{-10}$	$3.8 \times 10^{-10}$	
		F	0.020	$7.2 \times 10^{-9}$	$3.1 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.2 \times 10^{-9}$	$1.1 \times 10^{-9}$	
		M	0.020	$6.6 \times 10^{-9}$	$5.4 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.3 \times 10^{-9}$	
Os-189m	6.00 h	S	0.020	$7.0 \times 10^{-9}$	$3.6 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.6 \times 10^{-9}$	
		F	0.020	$3.8 \times 10^{-11}$	$2.8 \times 10^{-11}$	$1.2 \times 10^{-11}$	$7.0 \times 10^{-12}$	$2.5 \times 10^{-12}$	
		M	0.020	$6.5 \times 10^{-11}$	$4.1 \times 10^{-11}$	$1.8 \times 10^{-11}$	$1.1 \times 10^{-11}$	$6.0 \times 10^{-12}$	
Os-191	15.4 d	S	0.020	$6.8 \times 10^{-11}$	$4.3 \times 10^{-11}$	$1.9 \times 10^{-11}$	$6.3 \times 10^{-12}$	$5.3 \times 10^{-12}$	
		F	0.020	$2.8 \times 10^{-9}$	$1.9 \times 10^{-9}$	$8.5 \times 10^{-10}$	$3.0 \times 10^{-10}$	$2.5 \times 10^{-10}$	
		M	0.020	$8.0 \times 10^{-9}$	$5.8 \times 10^{-9}$	$3.4 \times 10^{-9}$	$2.4 \times 10^{-9}$	$2.0 \times 10^{-9}$	
Os-191m	13.0 h	S	0.020	$9.0 \times 10^{-9}$	$6.5 \times 10^{-9}$	$3.9 \times 10^{-9}$	$2.7 \times 10^{-9}$	$1.9 \times 10^{-9}$	
		F	0.020	$3.0 \times 10^{-10}$	$2.0 \times 10^{-10}$	$8.8 \times 10^{-11}$	$5.4 \times 10^{-11}$	$2.9 \times 10^{-11}$	
		M	0.020	$7.8 \times 10^{-10}$	$5.4 \times 10^{-10}$	$3.1 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.7 \times 10^{-10}$	
Os-193	1.25 d	S	0.020	$8.5 \times 10^{-10}$	$6.0 \times 10^{-10}$	$3.4 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.6 \times 10^{-10}$	
		F	0.020	$1.9 \times 10^{-9}$	$1.2 \times 10^{-9}$	$5.2 \times 10^{-10}$	$3.2 \times 10^{-10}$	$1.8 \times 10^{-10}$	
		M	0.020	$3.8 \times 10^{-9}$	$2.6 \times 10^{-9}$	$1.3 \times 10^{-9}$	$8.4 \times 10^{-10}$	$5.9 \times 10^{-10}$	
Os-194	6.00 a	S	0.020	$4.0 \times 10^{-9}$	$2.7 \times 10^{-9}$	$1.3 \times 10^{-9}$	$9.0 \times 10^{-10}$	$5.2 \times 10^{-10}$	
		F	0.020	$8.7 \times 10^{-8}$	$6.8 \times 10^{-8}$	$3.4 \times 10^{-8}$	$2.1 \times 10^{-8}$	$1.3 \times 10^{-8}$	
		M	0.020	$9.9 \times 10^{-8}$	$8.3 \times 10^{-8}$	$4.8 \times 10^{-8}$	$3.1 \times 10^{-8}$	$2.4 \times 10^{-8}$	

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$ $e(g)$					
<b>Iridium</b>								
Ir-182	0.250 h	F	0.020 $1.4 \times 10^{-10}$	0.010 $9.8 \times 10^{-11}$	$4.5 \times 10^{-11}$	$2.8 \times 10^{-11}$	$1.7 \times 10^{-11}$	$1.4 \times 10^{-11}$
		M	0.020 $2.1 \times 10^{-10}$	0.010 $1.4 \times 10^{-10}$	$6.7 \times 10^{-11}$	$4.3 \times 10^{-11}$	$2.8 \times 10^{-11}$	$2.3 \times 10^{-11}$
		S	0.020 $2.2 \times 10^{-10}$	0.010 $1.5 \times 10^{-10}$	$6.9 \times 10^{-11}$	$4.4 \times 10^{-11}$	$2.9 \times 10^{-11}$	$2.4 \times 10^{-11}$
Ir-184	3.02 h	F	0.020 $5.7 \times 10^{-10}$	0.010 $4.4 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.3 \times 10^{-10}$	$7.6 \times 10^{-11}$	$6.2 \times 10^{-11}$
		M	0.020 $8.6 \times 10^{-10}$	0.010 $6.4 \times 10^{-10}$	$3.2 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.1 \times 10^{-10}$
		S	0.020 $8.9 \times 10^{-10}$	0.010 $6.6 \times 10^{-10}$	$3.4 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.2 \times 10^{-10}$
Ir-185	14.0 h	F	0.020 $8.0 \times 10^{-10}$	0.010 $6.1 \times 10^{-10}$	$2.9 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.0 \times 10^{-10}$	$8.2 \times 10^{-11}$
		M	0.020 $1.3 \times 10^{-9}$	0.010 $9.7 \times 10^{-10}$	$4.9 \times 10^{-10}$	$3.2 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.8 \times 10^{-10}$
		S	0.020 $1.4 \times 10^{-9}$	0.010 $1.0 \times 10^{-9}$	$5.2 \times 10^{-10}$	$3.4 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.9 \times 10^{-10}$
Ir-186	15.8 h	F	0.020 $1.5 \times 10^{-9}$	0.010 $1.2 \times 10^{-9}$	$5.9 \times 10^{-10}$	$3.6 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.7 \times 10^{-10}$
		M	0.020 $2.2 \times 10^{-9}$	0.010 $1.7 \times 10^{-9}$	$8.8 \times 10^{-10}$	$5.8 \times 10^{-10}$	$3.8 \times 10^{-10}$	$3.1 \times 10^{-10}$
		S	0.020 $2.3 \times 10^{-9}$	0.010 $1.8 \times 10^{-9}$	$9.2 \times 10^{-10}$	$6.0 \times 10^{-10}$	$4.0 \times 10^{-10}$	$3.2 \times 10^{-10}$
Ir-186m	1.75 h	F	0.020 $2.1 \times 10^{-10}$	0.010 $1.6 \times 10^{-10}$	$7.7 \times 10^{-11}$	$4.8 \times 10^{-11}$	$2.8 \times 10^{-11}$	$2.3 \times 10^{-11}$
		M	0.020 $3.3 \times 10^{-10}$	0.010 $2.4 \times 10^{-10}$	$1.2 \times 10^{-10}$	$7.7 \times 10^{-11}$	$5.1 \times 10^{-11}$	$4.2 \times 10^{-11}$
		S	0.020 $3.4 \times 10^{-10}$	0.010 $2.5 \times 10^{-10}$	$1.2 \times 10^{-10}$	$8.1 \times 10^{-11}$	$5.4 \times 10^{-11}$	$4.4 \times 10^{-11}$
Ir-187	10.5 h	F	0.020 $3.6 \times 10^{-10}$	0.010 $2.8 \times 10^{-10}$	$1.4 \times 10^{-10}$	$8.2 \times 10^{-11}$	$4.6 \times 10^{-11}$	$3.7 \times 10^{-11}$
		M	0.020 $5.8 \times 10^{-10}$	0.010 $4.3 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.4 \times 10^{-10}$	$9.2 \times 10^{-11}$	$7.4 \times 10^{-11}$
		S	0.020 $6.0 \times 10^{-10}$	0.010 $4.5 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.5 \times 10^{-10}$	$9.7 \times 10^{-11}$	$7.9 \times 10^{-11}$
Ir-188	1.73 d	F	0.020 $2.0 \times 10^{-9}$	0.010 $1.6 \times 10^{-9}$	$8.0 \times 10^{-10}$	$5.0 \times 10^{-10}$	$2.9 \times 10^{-10}$	$2.4 \times 10^{-10}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$ $e(g)$						
		M	0.020	0.010	$2.1 \times 10^{-9}$	$1.1 \times 10^{-9}$	$7.5 \times 10^{-10}$	$5.0 \times 10^{-10}$	$4.0 \times 10^{-10}$
		S	0.020	0.010	$2.2 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.8 \times 10^{-10}$	$5.2 \times 10^{-10}$	$4.2 \times 10^{-10}$
Ir-189	13.3 d	F	0.020	0.010	$8.2 \times 10^{-10}$	$3.8 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.1 \times 10^{-10}$
		M	0.020	0.010	$1.9 \times 10^{-9}$	$1.1 \times 10^{-9}$	$7.7 \times 10^{-10}$	$6.4 \times 10^{-10}$	$5.2 \times 10^{-10}$
		S	0.020	0.010	$2.2 \times 10^{-9}$	$1.3 \times 10^{-9}$	$8.7 \times 10^{-10}$	$7.3 \times 10^{-10}$	$6.0 \times 10^{-10}$
Ir-190	12.1 d	F	0.020	0.010	$4.7 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.5 \times 10^{-9}$	$6.0 \times 10^{-11}$	$4.9 \times 10^{-11}$
		M	0.020	0.010	$8.6 \times 10^{-9}$	$4.4 \times 10^{-9}$	$3.1 \times 10^{-9}$	$9.9 \times 10^{-11}$	$7.9 \times 10^{-11}$
		S	0.020	0.010	$9.4 \times 10^{-9}$	$4.8 \times 10^{-9}$	$3.5 \times 10^{-9}$	$1.0 \times 10^{-10}$	$8.3 \times 10^{-11}$
Ir-190m	3.10 h	F	0.020	0.010	$3.4 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.0 \times 10^{-10}$	$4.3 \times 10^{-12}$	$3.6 \times 10^{-12}$
		M	0.020	0.010	$4.7 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.2 \times 10^{-11}$	$9.3 \times 10^{-12}$
		S	0.020	0.010	$4.8 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.3 \times 10^{-11}$	$1.0 \times 10^{-11}$
Ir-190m'	1.20 h	F	0.020	0.010	$2.4 \times 10^{-11}$	$1.2 \times 10^{-11}$	$7.2 \times 10^{-12}$	$2.1 \times 10^{-9}$	$1.8 \times 10^{-9}$
		M	0.020	0.010	$4.2 \times 10^{-11}$	$2.0 \times 10^{-11}$	$1.4 \times 10^{-11}$	$6.4 \times 10^{-9}$	$5.2 \times 10^{-9}$
		S	0.020	0.010	$4.5 \times 10^{-11}$	$2.2 \times 10^{-11}$	$1.6 \times 10^{-11}$	$8.1 \times 10^{-9}$	$6.6 \times 10^{-9}$
Ir-192	74.0 d	F	0.020	0.010	$1.1 \times 10^{-8}$	$5.7 \times 10^{-9}$	$3.3 \times 10^{-9}$	$5.4 \times 10^{-9}$	$4.8 \times 10^{-9}$
		M	0.020	0.010	$1.8 \times 10^{-8}$	$1.1 \times 10^{-8}$	$7.6 \times 10^{-9}$	$6.6 \times 10^{-9}$	$5.8 \times 10^{-9}$
		S	0.020	0.010	$2.2 \times 10^{-8}$	$1.3 \times 10^{-8}$	$9.5 \times 10^{-9}$	$4.0 \times 10^{-8}$	$3.9 \times 10^{-8}$
Ir-192m	$2.41 \times 10^3$ a	F	0.020	0.010	$2.3 \times 10^{-8}$	$1.4 \times 10^{-8}$	$8.2 \times 10^{-9}$	$5.4 \times 10^{-9}$	$4.8 \times 10^{-9}$
		M	0.020	0.010	$2.1 \times 10^{-8}$	$1.3 \times 10^{-8}$	$8.4 \times 10^{-9}$	$6.6 \times 10^{-9}$	$5.8 \times 10^{-9}$
		S	0.020	0.010	$9.1 \times 10^{-8}$	$6.5 \times 10^{-8}$	$4.5 \times 10^{-8}$	$4.0 \times 10^{-8}$	$3.9 \times 10^{-8}$
Ir-193m	11.9 d	F	0.020	0.010	$8.4 \times 10^{-10}$	$3.7 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.2 \times 10^{-10}$	$1.0 \times 10^{-10}$



Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$	
		Type	$f_1$ $e(g)$							
Ir-194	19.1 h	M	0.020	$4.8 \times 10^{-9}$	0.010	$3.5 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.5 \times 10^{-9}$	$1.1 \times 10^{-9}$	
		S	0.020	$5.4 \times 10^{-9}$	0.010	$4.0 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.6 \times 10^{-9}$	
		F	0.020	$2.9 \times 10^{-9}$	0.010	$1.9 \times 10^{-9}$	$8.1 \times 10^{-10}$	$4.9 \times 10^{-10}$	$2.5 \times 10^{-10}$	$2.1 \times 10^{-10}$
Ir-194m	171 d	M	0.020	$5.3 \times 10^{-9}$	0.010	$3.5 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.3 \times 10^{-10}$	
		S	0.020	$5.5 \times 10^{-9}$	0.010	$3.7 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.7 \times 10^{-10}$	
		F	0.020	$3.4 \times 10^{-8}$	0.010	$2.7 \times 10^{-8}$	$1.4 \times 10^{-8}$	$9.5 \times 10^{-9}$	$6.2 \times 10^{-9}$	$5.4 \times 10^{-9}$
Ir-195	2.50 h	M	0.020	$3.9 \times 10^{-8}$	0.010	$3.2 \times 10^{-8}$	$1.9 \times 10^{-8}$	$1.3 \times 10^{-8}$	$1.1 \times 10^{-8}$	
		S	0.020	$5.0 \times 10^{-8}$	0.010	$4.2 \times 10^{-8}$	$2.6 \times 10^{-8}$	$1.8 \times 10^{-8}$	$1.5 \times 10^{-8}$	
		F	0.020	$2.9 \times 10^{-10}$	0.010	$1.9 \times 10^{-10}$	$8.1 \times 10^{-11}$	$5.1 \times 10^{-11}$	$2.9 \times 10^{-11}$	$2.4 \times 10^{-11}$
Ir-195m	3.80 h	M	0.020	$5.4 \times 10^{-10}$	0.010	$3.6 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.1 \times 10^{-10}$	$8.1 \times 10^{-11}$	
		S	0.020	$5.7 \times 10^{-10}$	0.010	$3.8 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.2 \times 10^{-10}$	$8.7 \times 10^{-11}$	
		F	0.020	$6.9 \times 10^{-10}$	0.010	$4.8 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.3 \times 10^{-10}$	$7.2 \times 10^{-11}$	$6.0 \times 10^{-11}$
Platinum		M	0.020	$1.2 \times 10^{-9}$	0.010	$8.6 \times 10^{-10}$	$4.2 \times 10^{-10}$	$2.7 \times 10^{-10}$	$1.9 \times 10^{-10}$	
		S	0.020	$1.3 \times 10^{-9}$	0.010	$9.0 \times 10^{-10}$	$4.4 \times 10^{-10}$	$2.9 \times 10^{-10}$	$2.0 \times 10^{-10}$	
		F	0.020	$3.0 \times 10^{-10}$	0.010	$2.4 \times 10^{-10}$	$1.2 \times 10^{-10}$	$7.2 \times 10^{-11}$	$4.1 \times 10^{-11}$	
Pt-186	2.00 h	F	0.020	$3.6 \times 10^{-9}$	0.010	$2.7 \times 10^{-9}$	$1.3 \times 10^{-9}$	$8.4 \times 10^{-10}$	$5.0 \times 10^{-10}$	$4.2 \times 10^{-10}$
Pt-188	10.2 d	F	0.020	$3.8 \times 10^{-10}$	0.010	$2.9 \times 10^{-10}$	$1.4 \times 10^{-10}$	$8.4 \times 10^{-11}$	$4.7 \times 10^{-11}$	$3.8 \times 10^{-11}$
Pt-189	10.9 h	F	0.020	$1.1 \times 10^{-9}$	0.010	$7.9 \times 10^{-10}$	$3.7 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.1 \times 10^{-10}$
Pt-191	2.80 d	F	0.020	$2.2 \times 10^{-10}$	0.010	$1.6 \times 10^{-10}$	$7.2 \times 10^{-11}$	$4.3 \times 10^{-11}$	$2.5 \times 10^{-11}$	$2.1 \times 10^{-11}$
Pt-193	50.0 a	F	0.020	$1.6 \times 10^{-9}$	0.010	$1.0 \times 10^{-9}$	$4.5 \times 10^{-10}$	$2.7 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.2 \times 10^{-10}$
Pt-193m	4.33 d	F	0.020	$1.6 \times 10^{-9}$	0.010	$1.0 \times 10^{-9}$	$4.5 \times 10^{-10}$	$2.7 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.2 \times 10^{-10}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2	2-7 a	7-12 a	12t-17 a	>17 a
		Type	$f_1$					
Pt-195m	4.02 d	F	0.020	0.010	$6.4 \times 10^{-10}$	$3.9 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.8 \times 10^{-10}$
Pt-197	18.3 h	F	0.020	0.010	$3.1 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.0 \times 10^{-10}$	$8.5 \times 10^{-11}$
Pt-197m	1.57 h	F	0.020	0.010	$7.9 \times 10^{-11}$	$4.9 \times 10^{-11}$	$2.8 \times 10^{-11}$	$2.4 \times 10^{-11}$
Pt-199	0.513 h	F	0.020	0.010	$3.6 \times 10^{-11}$	$2.3 \times 10^{-11}$	$1.4 \times 10^{-11}$	$1.2 \times 10^{-11}$
Pt-200	12.5 h	F	0.020	0.010	$7.2 \times 10^{-10}$	$5.1 \times 10^{-10}$	$2.6 \times 10^{-10}$	$2.2 \times 10^{-10}$
<b>Gold</b>								
Au-193	17.6 h	F	0.200	0.100	$1.3 \times 10^{-10}$	$7.9 \times 10^{-11}$	$4.3 \times 10^{-11}$	$3.6 \times 10^{-11}$
		M	0.200	0.100	$2.8 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.1 \times 10^{-10}$
		S	0.200	0.100	$3.0 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.2 \times 10^{-10}$
Au-194	1.65 d	F	0.200	0.100	$4.9 \times 10^{-10}$	$3.0 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.4 \times 10^{-10}$
		M	0.200	0.100	$1.4 \times 10^{-9}$	$4.6 \times 10^{-10}$	$2.9 \times 10^{-10}$	$2.3 \times 10^{-10}$
		S	0.200	0.100	$7.3 \times 10^{-10}$	$4.7 \times 10^{-10}$	$3.0 \times 10^{-10}$	$2.4 \times 10^{-10}$
Au-195	183 d	F	0.200	0.100	$2.5 \times 10^{-10}$	$1.5 \times 10^{-10}$	$8.1 \times 10^{-11}$	$6.6 \times 10^{-11}$
		M	0.200	0.100	$4.1 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.1 \times 10^{-9}$
		S	0.200	0.100	$3.9 \times 10^{-9}$	$2.6 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.7 \times 10^{-9}$
Au-198	2.69 d	F	0.200	0.100	$7.6 \times 10^{-10}$	$4.7 \times 10^{-10}$	$2.5 \times 10^{-10}$	$2.1 \times 10^{-10}$
		M	0.200	0.100	$4.1 \times 10^{-9}$	$1.3 \times 10^{-9}$	$9.7 \times 10^{-10}$	$7.8 \times 10^{-10}$
		S	0.200	0.100	$4.4 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.1 \times 10^{-9}$	$8.6 \times 10^{-10}$
Au-198m	2.30 d	F	0.200	0.100	$1.1 \times 10^{-9}$	$6.9 \times 10^{-10}$	$3.7 \times 10^{-10}$	$3.2 \times 10^{-10}$
		M	0.200	0.100	$3.6 \times 10^{-9}$	$2.6 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.8 \times 10^{-9}$
		S	0.200	0.100	$4.0 \times 10^{-9}$	$2.9 \times 10^{-9}$	$2.5 \times 10^{-9}$	$2.0 \times 10^{-9}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$ $e(g)$					
Au-199	3.14 d	F	0.200 $1.1 \times 10^{-9}$	0.100 $7.9 \times 10^{-10}$	$3.5 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.1 \times 10^{-10}$	$9.8 \times 10^{-11}$
		M	0.200 $3.4 \times 10^{-9}$	0.100 $2.5 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.0 \times 10^{-9}$	$9.0 \times 10^{-10}$	$7.1 \times 10^{-10}$
		S	0.200 $3.8 \times 10^{-9}$	0.100 $2.8 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.2 \times 10^{-9}$	$1.0 \times 10^{-9}$	$7.9 \times 10^{-10}$
Au-200	0.807 h	F	0.200 $1.9 \times 10^{-10}$	0.100 $1.2 \times 10^{-10}$	$5.2 \times 10^{-11}$	$3.2 \times 10^{-11}$	$1.9 \times 10^{-11}$	$1.6 \times 10^{-11}$
		M	0.200 $3.2 \times 10^{-10}$	0.100 $2.1 \times 10^{-10}$	$9.3 \times 10^{-11}$	$6.0 \times 10^{-11}$	$4.0 \times 10^{-11}$	$3.3 \times 10^{-11}$
		S	0.200 $3.4 \times 10^{-10}$	0.100 $2.1 \times 10^{-10}$	$9.8 \times 10^{-11}$	$6.3 \times 10^{-11}$	$4.2 \times 10^{-11}$	$3.5 \times 10^{-11}$
Au-200m	18.7 h	F	0.200 $2.7 \times 10^{-9}$	0.100 $2.1 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.4 \times 10^{-10}$	$3.6 \times 10^{-10}$	$2.9 \times 10^{-10}$
		M	0.200 $4.8 \times 10^{-9}$	0.100 $3.7 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.2 \times 10^{-9}$	$8.4 \times 10^{-10}$	$6.8 \times 10^{-10}$
		S	0.200 $5.1 \times 10^{-9}$	0.100 $3.9 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.3 \times 10^{-9}$	$8.9 \times 10^{-10}$	$7.2 \times 10^{-10}$
Au-201	0.440 h	F	0.200 $9.0 \times 10^{-11}$	0.100 $5.7 \times 10^{-11}$	$2.5 \times 10^{-11}$	$1.6 \times 10^{-11}$	$1.0 \times 10^{-11}$	$8.7 \times 10^{-12}$
		M	0.200 $1.5 \times 10^{-10}$	0.100 $9.6 \times 10^{-11}$	$4.3 \times 10^{-11}$	$2.9 \times 10^{-11}$	$2.0 \times 10^{-11}$	$1.7 \times 10^{-11}$
		S	0.200 $1.5 \times 10^{-10}$	0.100 $1.0 \times 10^{-10}$	$4.5 \times 10^{-11}$	$3.0 \times 10^{-11}$	$2.1 \times 10^{-11}$	$1.7 \times 10^{-11}$
<b>Mercury</b>								
Hg-193 (organic)	3.50 h	F	0.800 $2.2 \times 10^{-10}$	0.400 $1.8 \times 10^{-10}$	$8.2 \times 10^{-11}$	$5.0 \times 10^{-11}$	$2.9 \times 10^{-11}$	$2.4 \times 10^{-11}$
Hg-193 (inorganic)	3.50 h	F	0.040 $2.7 \times 10^{-10}$	0.020 $2.0 \times 10^{-10}$	$8.9 \times 10^{-11}$	$5.5 \times 10^{-11}$	$3.1 \times 10^{-11}$	$2.6 \times 10^{-11}$
		M	0.040 $5.3 \times 10^{-10}$	0.020 $3.8 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.3 \times 10^{-10}$	$9.2 \times 10^{-11}$	$1.0 \times 10^{-10}$
Hg-193m(organic)	11.1 h	F	0.800 $8.4 \times 10^{-10}$	0.400 $7.6 \times 10^{-10}$	$3.7 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.1 \times 10^{-10}$
		F	0.040 $1.1 \times 10^{-9}$	0.020 $8.5 \times 10^{-10}$	$4.1 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.4 \times 10^{-10}$	$2.6 \times 10^{-10}$
Hg-193m (inorganic)	11.1 h	F						
Hg-194 (organic)	$2.60 \times 10^2$ a	F	0.800 $4.9 \times 10^{-8}$	0.400 $3.7 \times 10^{-8}$	$2.4 \times 10^{-8}$	$1.9 \times 10^{-8}$	$1.1 \times 10^{-10}$	$1.3 \times 10^{-8}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$						
Hg-194	$2.60 \times 10^2$ a	F	0.040	0.020	$2.9 \times 10^{-8}$	$2.0 \times 10^{-8}$	$1.6 \times 10^{-8}$	$1.4 \times 10^{-8}$	$1.3 \times 10^{-8}$
(inorganic)		M	0.040	0.020	$1.9 \times 10^{-8}$	$1.3 \times 10^{-8}$	$1.0 \times 10^{-8}$	$8.9 \times 10^{-9}$	$8.3 \times 10^{-9}$
Hg-195	1.73 d	F	0.800	0.400	$9.7 \times 10^{-10}$	$4.4 \times 10^{-10}$	$2.7 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.2 \times 10^{-10}$
(organic)									
Hg-195m	1.73 d	F	0.040	0.020	$1.1 \times 10^{-9}$	$5.1 \times 10^{-10}$	$3.1 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.4 \times 10^{-10}$
(inorganic)		M	0.040	0.020	$2.6 \times 10^{-9}$	$1.4 \times 10^{-9}$	$8.5 \times 10^{-10}$	$6.7 \times 10^{-10}$	$5.3 \times 10^{-10}$
Hg-197	2.67 d	F	0.800	0.400	$4.0 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.1 \times 10^{-10}$	$5.8 \times 10^{-11}$	$4.7 \times 10^{-11}$
(organic)									
Hg-197	2.67 d	F	0.040	0.020	$4.7 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.3 \times 10^{-10}$	$6.8 \times 10^{-11}$	$5.6 \times 10^{-11}$
(inorganic)		M	0.040	0.020	$1.2 \times 10^{-9}$	$6.6 \times 10^{-10}$	$4.6 \times 10^{-10}$	$3.8 \times 10^{-10}$	$3.0 \times 10^{-10}$
Hg-197m	23.8 h	F	0.800	0.400	$7.8 \times 10^{-10}$	$3.4 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.1 \times 10^{-10}$	$9.6 \times 10^{-11}$
(organic)									
Hg-197m	23.8 h	F	0.040	0.020	$9.3 \times 10^{-10}$	$4.0 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.1 \times 10^{-10}$
(inorganic)		M	0.040	0.020	$2.5 \times 10^{-9}$	$1.1 \times 10^{-9}$	$8.2 \times 10^{-10}$	$6.7 \times 10^{-10}$	$5.3 \times 10^{-10}$
Hg-199m	0.710 h	F	0.800	0.400	$9.6 \times 10^{-11}$	$4.2 \times 10^{-11}$	$2.7 \times 10^{-11}$	$1.7 \times 10^{-11}$	$1.5 \times 10^{-11}$
(organic)									
Hg-199m	0.710 h	F	0.040	0.020	$9.6 \times 10^{-11}$	$4.2 \times 10^{-11}$	$2.7 \times 10^{-11}$	$1.7 \times 10^{-11}$	$1.5 \times 10^{-11}$
(inorganic)		M	0.040	0.020	$1.7 \times 10^{-10}$	$7.9 \times 10^{-11}$	$5.4 \times 10^{-11}$	$3.8 \times 10^{-11}$	$3.2 \times 10^{-11}$
Hg-203	46.6 d	F	0.800	0.400	$3.7 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.6 \times 10^{-10}$	$5.6 \times 10^{-10}$
(organic)									
Hg-203	46.6 d	F	0.040	0.020	$2.9 \times 10^{-9}$	$1.4 \times 10^{-9}$	$9.0 \times 10^{-10}$	$5.5 \times 10^{-10}$	$4.6 \times 10^{-10}$
(inorganic)		M	0.040	0.020	$7.9 \times 10^{-9}$	$4.7 \times 10^{-9}$	$3.4 \times 10^{-9}$	$3.0 \times 10^{-9}$	$2.4 \times 10^{-9}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $f_1$ for	2-7 a e(g)	7-12 a e(g)	12t-17 a e(g)	>17 a e(g)
		Type	$f_1$					
<b>Thallium</b>								
Tl-194	0.550 h	F	1.000	$3.6 \times 10^{-11}$	$1.5 \times 10^{-11}$	$9.2 \times 10^{-12}$	$5.5 \times 10^{-12}$	$4.4 \times 10^{-12}$
Tl-194m	0.546 h	F	1.000	$1.7 \times 10^{-10}$	$6.1 \times 10^{-11}$	$3.8 \times 10^{-11}$	$2.3 \times 10^{-11}$	$1.9 \times 10^{-11}$
Tl-195	1.16 h	F	1.000	$1.3 \times 10^{-10}$	$5.3 \times 10^{-11}$	$3.2 \times 10^{-11}$	$1.9 \times 10^{-11}$	$1.5 \times 10^{-11}$
Tl-197	2.84 h	F	1.000	$1.3 \times 10^{-10}$	$4.7 \times 10^{-11}$	$2.9 \times 10^{-11}$	$1.7 \times 10^{-11}$	$1.4 \times 10^{-11}$
Tl-198	5.30 h	F	1.000	$4.7 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.3 \times 10^{-10}$	$7.5 \times 10^{-11}$	$6.0 \times 10^{-11}$
Tl-198m	1.87 h	F	1.000	$3.2 \times 10^{-10}$	$1.2 \times 10^{-10}$	$7.5 \times 10^{-11}$	$4.5 \times 10^{-11}$	$3.7 \times 10^{-11}$
Tl-199	7.42 h	F	1.000	$1.7 \times 10^{-10}$	$6.4 \times 10^{-11}$	$3.9 \times 10^{-11}$	$2.3 \times 10^{-11}$	$1.9 \times 10^{-11}$
Tl-200	1.09 d	F	1.000	$1.0 \times 10^{-9}$	$4.6 \times 10^{-10}$	$2.8 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.3 \times 10^{-10}$
Tl-201	3.04 d	F	1.000	$4.5 \times 10^{-10}$	$1.5 \times 10^{-10}$	$9.4 \times 10^{-11}$	$5.4 \times 10^{-11}$	$4.4 \times 10^{-11}$
Tl-202	12.2 d	F	1.000	$1.5 \times 10^{-9}$	$5.9 \times 10^{-10}$	$3.8 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.9 \times 10^{-10}$
Tl-204	3.78 a	F	1.000	$5.0 \times 10^{-9}$	$1.5 \times 10^{-9}$	$8.8 \times 10^{-10}$	$4.7 \times 10^{-10}$	$3.9 \times 10^{-10}$
<b>Leadg</b>								
Pb-195m	0.263 h	F	0.600	$1.3 \times 10^{-10}$	$4.9 \times 10^{-11}$	$3.1 \times 10^{-11}$	$1.9 \times 10^{-11}$	$1.6 \times 10^{-11}$
		M	0.200	$2.0 \times 10^{-10}$	$7.1 \times 10^{-11}$	$4.6 \times 10^{-11}$	$3.1 \times 10^{-11}$	$2.5 \times 10^{-11}$
		S	0.020	$2.1 \times 10^{-10}$	$7.4 \times 10^{-11}$	$4.8 \times 10^{-11}$	$3.2 \times 10^{-11}$	$2.7 \times 10^{-11}$
Pb-198	2.40 h	F	0.600	$3.4 \times 10^{-10}$	$1.5 \times 10^{-10}$	$8.9 \times 10^{-11}$	$5.2 \times 10^{-11}$	$4.3 \times 10^{-11}$
		M	0.200	$5.0 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.3 \times 10^{-10}$	$8.3 \times 10^{-11}$	$6.6 \times 10^{-11}$
		S	0.020	$5.4 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.4 \times 10^{-10}$	$8.7 \times 10^{-11}$	$7.0 \times 10^{-11}$
Pb-199	1.50 h	F	0.600	$1.9 \times 10^{-10}$	$8.2 \times 10^{-11}$	$4.9 \times 10^{-11}$	$2.9 \times 10^{-11}$	$2.3 \times 10^{-11}$
		M	0.200	$2.8 \times 10^{-10}$	$1.1 \times 10^{-10}$	$7.1 \times 10^{-11}$	$4.5 \times 10^{-11}$	$3.6 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a			Age 1-2 $f_1$ for $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$	
		Type	$f_1$	$e(g)$						
Pb-200	21.5 h	S	0.020	$2.9 \times 10^{-10}$	0.010	$2.3 \times 10^{-10}$	$7.4 \times 10^{-11}$	$4.7 \times 10^{-11}$	$3.7 \times 10^{-11}$	
		F	0.600	$1.1 \times 10^{-9}$	0.200	$9.3 \times 10^{-10}$	$4.6 \times 10^{-10}$	$2.8 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.4 \times 10^{-10}$
		M	0.200	$2.2 \times 10^{-9}$	0.100	$1.7 \times 10^{-9}$	$8.6 \times 10^{-10}$	$5.7 \times 10^{-10}$	$4.1 \times 10^{-10}$	$3.3 \times 10^{-10}$
Pb-201	9.40 h	S	0.020	$2.4 \times 10^{-9}$	0.010	$1.8 \times 10^{-9}$	$6.2 \times 10^{-10}$	$4.4 \times 10^{-10}$	$3.5 \times 10^{-10}$	
		F	0.600	$4.8 \times 10^{-10}$	0.200	$4.1 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.2 \times 10^{-10}$	$7.1 \times 10^{-11}$	$6.0 \times 10^{-11}$
		M	0.200	$8.0 \times 10^{-10}$	0.100	$6.4 \times 10^{-10}$	$3.3 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.1 \times 10^{-10}$
Pb-202	$3.00 \times 10^5$ a	S	0.020	$8.8 \times 10^{-10}$	0.010	$6.7 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.2 \times 10^{-10}$	
		F	0.600	$1.9 \times 10^{-8}$	0.200	$1.3 \times 10^{-8}$	$8.9 \times 10^{-9}$	$1.3 \times 10^{-8}$	$1.8 \times 10^{-8}$	$1.1 \times 10^{-8}$
		M	0.200	$1.2 \times 10^{-8}$	0.100	$8.9 \times 10^{-9}$	$6.2 \times 10^{-9}$	$6.7 \times 10^{-9}$	$8.7 \times 10^{-9}$	$6.3 \times 10^{-9}$
Pb-202m	3.62 h	S	0.020	$2.8 \times 10^{-8}$	0.010	$2.8 \times 10^{-8}$	$2.0 \times 10^{-8}$	$1.4 \times 10^{-8}$	$1.3 \times 10^{-8}$	$1.2 \times 10^{-8}$
		F	0.600	$4.7 \times 10^{-10}$	0.200	$4.0 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.3 \times 10^{-10}$	$7.5 \times 10^{-11}$	$6.2 \times 10^{-11}$
		M	0.200	$6.9 \times 10^{-10}$	0.100	$5.6 \times 10^{-10}$	$2.9 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.2 \times 10^{-10}$	$9.5 \times 10^{-11}$
Pb-203	2.17 d	S	0.020	$7.3 \times 10^{-10}$	0.010	$5.8 \times 10^{-10}$	$3.0 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.0 \times 10^{-10}$
		F	0.600	$7.2 \times 10^{-10}$	0.200	$5.8 \times 10^{-10}$	$2.8 \times 10^{-10}$	$1.7 \times 10^{-10}$	$9.9 \times 10^{-11}$	$8.5 \times 10^{-11}$
		M	0.200	$1.3 \times 10^{-9}$	0.100	$1.0 \times 10^{-9}$	$5.4 \times 10^{-10}$	$3.6 \times 10^{-10}$	$2.5 \times 10^{-10}$	$2.0 \times 10^{-10}$
Pb-205	$1.43 \times 10^7$ a	S	0.020	$1.5 \times 10^{-9}$	0.010	$1.1 \times 10^{-9}$	$5.8 \times 10^{-10}$	$3.8 \times 10^{-10}$	$2.8 \times 10^{-10}$	$2.2 \times 10^{-10}$
		F	0.600	$1.1 \times 10^{-9}$	0.200	$6.9 \times 10^{-10}$	$4.0 \times 10^{-10}$	$4.1 \times 10^{-10}$	$4.3 \times 10^{-10}$	$3.3 \times 10^{-10}$
		M	0.200	$1.1 \times 10^{-9}$	0.100	$7.7 \times 10^{-10}$	$4.3 \times 10^{-10}$	$3.2 \times 10^{-10}$	$2.9 \times 10^{-10}$	$2.5 \times 10^{-10}$
Pb-209	3.25 h	S	0.020	$2.9 \times 10^{-9}$	0.010	$2.7 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.1 \times 10^{-9}$	$9.2 \times 10^{-10}$	$8.5 \times 10^{-10}$
		F	0.600	$1.8 \times 10^{-10}$	0.200	$1.2 \times 10^{-10}$	$5.3 \times 10^{-11}$	$3.4 \times 10^{-11}$	$1.9 \times 10^{-11}$	$1.7 \times 10^{-11}$
		M	0.200	$4.0 \times 10^{-10}$	0.100	$2.7 \times 10^{-10}$	$1.3 \times 10^{-10}$	$9.2 \times 10^{-11}$	$6.9 \times 10^{-11}$	$5.6 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2	2-7 a	7-12 a	12t-17 a	>17 a			
		Type	f <sub>1</sub>						e(g)	f <sub>1</sub> for g > 1 a	e(g)
Pb-210	22.3 a	S	0.020	4.4 × 10 <sup>-10</sup>	0.010	2.9 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	9.9 × 10 <sup>-11</sup>	7.5 × 10 <sup>-11</sup>	6.1 × 10 <sup>-11</sup>	
		F	0.600	4.7 × 10 <sup>-6</sup>	0.200	2.9 × 10 <sup>-6</sup>	2.9 × 10 <sup>-6</sup>	1.5 × 10 <sup>-6</sup>	1.4 × 10 <sup>-6</sup>	1.3 × 10 <sup>-6</sup>	9.0 × 10 <sup>-7</sup>
		M	0.200	5.0 × 10 <sup>-6</sup>	0.100	3.7 × 10 <sup>-6</sup>	3.7 × 10 <sup>-6</sup>	2.2 × 10 <sup>-6</sup>	1.5 × 10 <sup>-6</sup>	1.3 × 10 <sup>-6</sup>	1.1 × 10 <sup>-6</sup>
Pb-211	0.601 h	S	0.020	1.8 × 10 <sup>-5</sup>	0.010	1.8 × 10 <sup>-5</sup>	1.1 × 10 <sup>-5</sup>	7.2 × 10 <sup>-6</sup>	5.9 × 10 <sup>-6</sup>	5.6 × 10 <sup>-6</sup>	
		F	0.600	2.5 × 10 <sup>-8</sup>	0.200	1.7 × 10 <sup>-8</sup>	8.7 × 10 <sup>-9</sup>	6.1 × 10 <sup>-9</sup>	4.6 × 10 <sup>-9</sup>	3.9 × 10 <sup>-9</sup>	
		M	0.200	6.2 × 10 <sup>-8</sup>	0.100	4.5 × 10 <sup>-8</sup>	2.5 × 10 <sup>-8</sup>	1.9 × 10 <sup>-8</sup>	1.4 × 10 <sup>-8</sup>	1.1 × 10 <sup>-8</sup>	
Pb-212	10.6 h	S	0.020	6.6 × 10 <sup>-8</sup>	0.010	4.8 × 10 <sup>-8</sup>	2.7 × 10 <sup>-8</sup>	2.0 × 10 <sup>-8</sup>	1.5 × 10 <sup>-8</sup>	1.2 × 10 <sup>-8</sup>	
		F	0.600	1.9 × 10 <sup>-7</sup>	0.200	1.2 × 10 <sup>-7</sup>	5.4 × 10 <sup>-8</sup>	3.5 × 10 <sup>-8</sup>	2.0 × 10 <sup>-8</sup>	1.8 × 10 <sup>-8</sup>	
		M	0.200	6.2 × 10 <sup>-7</sup>	0.100	4.6 × 10 <sup>-7</sup>	3.0 × 10 <sup>-7</sup>	2.2 × 10 <sup>-7</sup>	2.2 × 10 <sup>-7</sup>	1.7 × 10 <sup>-7</sup>	
Pb-214	0.447 h	S	0.020	6.7 × 10 <sup>-7</sup>	0.010	5.0 × 10 <sup>-7</sup>	3.3 × 10 <sup>-7</sup>	2.5 × 10 <sup>-7</sup>	2.4 × 10 <sup>-7</sup>	1.9 × 10 <sup>-7</sup>	
		F	0.600	2.2 × 10 <sup>-8</sup>	0.200	1.5 × 10 <sup>-8</sup>	6.9 × 10 <sup>-9</sup>	4.8 × 10 <sup>-9</sup>	3.3 × 10 <sup>-9</sup>	2.8 × 10 <sup>-9</sup>	
		M	0.200	6.4 × 10 <sup>-8</sup>	0.100	4.6 × 10 <sup>-8</sup>	2.6 × 10 <sup>-8</sup>	1.9 × 10 <sup>-8</sup>	1.4 × 10 <sup>-8</sup>	1.4 × 10 <sup>-8</sup>	
Bismuth		S	0.020	6.9 × 10 <sup>-8</sup>	0.010	5.0 × 10 <sup>-8</sup>	2.8 × 10 <sup>-8</sup>	2.1 × 10 <sup>-8</sup>	1.5 × 10 <sup>-8</sup>	1.5 × 10 <sup>-8</sup>	
		F	0.100	1.9 × 10 <sup>-10</sup>	0.050	1.5 × 10 <sup>-10</sup>	7.4 × 10 <sup>-11</sup>	4.5 × 10 <sup>-11</sup>	2.7 × 10 <sup>-11</sup>	2.2 × 10 <sup>-11</sup>	
		M	0.100	2.5 × 10 <sup>-10</sup>	0.050	1.9 × 10 <sup>-10</sup>	9.9 × 10 <sup>-11</sup>	6.3 × 10 <sup>-11</sup>	4.1 × 10 <sup>-11</sup>	3.3 × 10 <sup>-11</sup>	
Bi-201	1.80 h	F	0.100	4.0 × 10 <sup>-10</sup>	0.050	3.1 × 10 <sup>-10</sup>	1.5 × 10 <sup>-10</sup>	9.3 × 10 <sup>-11</sup>	5.4 × 10 <sup>-11</sup>	4.4 × 10 <sup>-11</sup>	
		M	0.100	5.5 × 10 <sup>-10</sup>	0.050	4.1 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	8.3 × 10 <sup>-11</sup>	6.6 × 10 <sup>-11</sup>	
		F	0.100	3.4 × 10 <sup>-10</sup>	0.050	2.8 × 10 <sup>-10</sup>	1.5 × 10 <sup>-10</sup>	9.0 × 10 <sup>-11</sup>	5.3 × 10 <sup>-11</sup>	4.3 × 10 <sup>-11</sup>	
Bi-203	11.8 h	M	0.100	4.2 × 10 <sup>-10</sup>	0.050	3.4 × 10 <sup>-10</sup>	1.8 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	6.9 × 10 <sup>-11</sup>	5.5 × 10 <sup>-11</sup>	
		F	0.100	1.5 × 10 <sup>-9</sup>	0.050	1.2 × 10 <sup>-9</sup>	6.4 × 10 <sup>-10</sup>	4.0 × 10 <sup>-10</sup>	2.3 × 10 <sup>-10</sup>	1.9 × 10 <sup>-10</sup>	

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2	2-7 a	7-12 a	12t-17 a	>17 a	
		Type	$f_1$						$f_1$ for $g > 1$ a
Bi-205	15.3 d	M	0.100	0.050	$1.6 \times 10^{-9}$	$8.2 \times 10^{-10}$	$5.3 \times 10^{-10}$	$3.3 \times 10^{-10}$	$2.6 \times 10^{-10}$
		F	0.100	0.050	$2.4 \times 10^{-9}$	$1.3 \times 10^{-9}$	$8.0 \times 10^{-10}$	$4.7 \times 10^{-10}$	$3.8 \times 10^{-10}$
Bi-206	6.24 d	M	0.100	0.050	$4.4 \times 10^{-9}$	$2.5 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.2 \times 10^{-9}$	$9.3 \times 10^{-10}$
		F	0.100	0.050	$4.8 \times 10^{-9}$	$2.5 \times 10^{-9}$	$1.6 \times 10^{-9}$	$9.1 \times 10^{-10}$	$7.4 \times 10^{-10}$
Bi-207	38.0 a	M	0.100	0.050	$8.0 \times 10^{-9}$	$4.4 \times 10^{-9}$	$2.9 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.7 \times 10^{-9}$
		F	0.100	0.050	$3.3 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.0 \times 10^{-10}$	$4.9 \times 10^{-10}$
Bi-210	5.01 d	M	0.100	0.050	$2.0 \times 10^{-8}$	$1.2 \times 10^{-8}$	$8.2 \times 10^{-9}$	$6.5 \times 10^{-9}$	$5.6 \times 10^{-9}$
		F	0.100	0.050	$6.9 \times 10^{-9}$	$3.2 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.1 \times 10^{-9}$
Bi-210m	$3.00 \times 10^6$ a	M	0.100	0.050	$3.0 \times 10^{-7}$	$1.9 \times 10^{-7}$	$1.3 \times 10^{-7}$	$1.1 \times 10^{-7}$	$9.3 \times 10^{-8}$
		F	0.100	0.050	$2.6 \times 10^{-7}$	$1.3 \times 10^{-7}$	$8.3 \times 10^{-8}$	$5.6 \times 10^{-8}$	$4.6 \times 10^{-8}$
Bi-212	1.01 h	M	0.100	0.050	$1.1 \times 10^{-5}$	$7.0 \times 10^{-6}$	$4.8 \times 10^{-6}$	$4.1 \times 10^{-6}$	$3.4 \times 10^{-6}$
		F	0.100	0.050	$4.5 \times 10^{-8}$	$2.1 \times 10^{-8}$	$1.5 \times 10^{-8}$	$1.0 \times 10^{-8}$	$9.1 \times 10^{-9}$
Bi-213	0.761 h	M	0.100	0.050	$1.1 \times 10^{-7}$	$6.0 \times 10^{-8}$	$4.4 \times 10^{-8}$	$3.8 \times 10^{-8}$	$3.1 \times 10^{-8}$
		F	0.100	0.050	$5.3 \times 10^{-8}$	$2.5 \times 10^{-8}$	$1.7 \times 10^{-8}$	$1.2 \times 10^{-8}$	$1.0 \times 10^{-8}$
Bi-214	0.332 h	M	0.100	$1.6 \times 10^{-7}$	$1.2 \times 10^{-7}$	$6.0 \times 10^{-8}$	$3.6 \times 10^{-8}$	$3.0 \times 10^{-8}$	
		F	0.100	0.050	$3.5 \times 10^{-8}$	$1.6 \times 10^{-8}$	$1.1 \times 10^{-8}$	$8.2 \times 10^{-9}$	$7.1 \times 10^{-9}$
Polonium	0.612 h	M	0.100	0.050	$6.1 \times 10^{-8}$	$3.1 \times 10^{-8}$	$2.2 \times 10^{-8}$	$1.7 \times 10^{-8}$	$1.4 \times 10^{-8}$
		F	0.200	0.100	$1.5 \times 10^{-10}$	$7.7 \times 10^{-11}$	$4.7 \times 10^{-11}$	$2.8 \times 10^{-11}$	$2.3 \times 10^{-11}$
		M	0.200	0.100	$2.1 \times 10^{-10}$	$1.1 \times 10^{-10}$	$6.7 \times 10^{-11}$	$4.3 \times 10^{-11}$	$3.5 \times 10^{-11}$
		S	0.020	0.010	$2.2 \times 10^{-10}$	$1.1 \times 10^{-10}$	$7.0 \times 10^{-11}$	$4.5 \times 10^{-11}$	$3.6 \times 10^{-11}$



Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2	2-7 a	7-12 a	12t-17 a	>17 a
		Type	f <sub>1</sub>					
Po-205	1.80 h	F	0.200	0.100	2.1 × 10 <sup>-10</sup>	6.6 × 10 <sup>-11</sup>	4.1 × 10 <sup>-11</sup>	3.3 × 10 <sup>-11</sup>
		M	0.200	0.100	3.1 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	8.1 × 10 <sup>-11</sup>	6.5 × 10 <sup>-11</sup>
		S	0.020	0.010	3.2 × 10 <sup>-10</sup>	1.8 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	8.5 × 10 <sup>-11</sup>
		F	0.200	0.100	4.0 × 10 <sup>-10</sup>	2.1 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	7.3 × 10 <sup>-11</sup>
Po-207	5.83 h	M	0.200	0.100	5.1 × 10 <sup>-10</sup>	1.6 × 10 <sup>-10</sup>	9.9 × 10 <sup>-11</sup>	7.8 × 10 <sup>-11</sup>
		S	0.020	0.010	5.3 × 10 <sup>-10</sup>	1.7 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>	8.2 × 10 <sup>-11</sup>
		F	0.200	0.100	4.8 × 10 <sup>-6</sup>	2.2 × 10 <sup>-6</sup>	1.3 × 10 <sup>-6</sup>	7.7 × 10 <sup>-7</sup>
		M	0.200	0.100	1.1 × 10 <sup>-5</sup>	6.7 × 10 <sup>-6</sup>	4.6 × 10 <sup>-6</sup>	3.3 × 10 <sup>-6</sup>
Astatine	138 d	S	0.020	0.010	1.4 × 10 <sup>-5</sup>	8.6 × 10 <sup>-6</sup>	5.1 × 10 <sup>-6</sup>	4.3 × 10 <sup>-6</sup>
		F	1.000	1.000	1.7 × 10 <sup>-9</sup>	8.9 × 10 <sup>-10</sup>	4.0 × 10 <sup>-10</sup>	3.3 × 10 <sup>-10</sup>
		M	1.000	1.000	6.7 × 10 <sup>-9</sup>	4.3 × 10 <sup>-9</sup>	2.9 × 10 <sup>-9</sup>	2.3 × 10 <sup>-9</sup>
		F	1.000	1.000	9.7 × 10 <sup>-8</sup>	4.3 × 10 <sup>-8</sup>	1.7 × 10 <sup>-8</sup>	1.6 × 10 <sup>-8</sup>
Francium	7.21 h	M	1.000	1.000	3.7 × 10 <sup>-7</sup>	1.9 × 10 <sup>-7</sup>	1.3 × 10 <sup>-7</sup>	1.1 × 10 <sup>-7</sup>
		F	1.000	1.000	6.3 × 10 <sup>-8</sup>	3.0 × 10 <sup>-8</sup>	1.6 × 10 <sup>-8</sup>	1.4 × 10 <sup>-8</sup>
		F	1.000	1.000	7.3 × 10 <sup>-9</sup>	3.2 × 10 <sup>-9</sup>	1.9 × 10 <sup>-9</sup>	8.9 × 10 <sup>-10</sup>
		F	1.000	1.000	9.1 × 10 <sup>-8</sup>	2.1 × 10 <sup>-8</sup>	1.6 × 10 <sup>-8</sup>	1.4 × 10 <sup>-8</sup>
Radium <sup>b</sup>	0.240 h	F	0.600	0.200	1.0 × 10 <sup>-6</sup>	4.9 × 10 <sup>-7</sup>	3.3 × 10 <sup>-7</sup>	1.2 × 10 <sup>-7</sup>
		M	0.200	0.100	2.8 × 10 <sup>-5</sup>	1.3 × 10 <sup>-5</sup>	9.9 × 10 <sup>-6</sup>	7.4 × 10 <sup>-6</sup>
		S	0.020	0.010	3.2 × 10 <sup>-5</sup>	1.5 × 10 <sup>-5</sup>	1.1 × 10 <sup>-5</sup>	8.7 × 10 <sup>-6</sup>
		F	0.600	0.200	1.5 × 10 <sup>-6</sup>	2.9 × 10 <sup>-7</sup>	2.2 × 10 <sup>-7</sup>	1.7 × 10 <sup>-7</sup>
Ra-223	0.363 h	F	1.000	1.000	3.0 × 10 <sup>-8</sup>	1.6 × 10 <sup>-8</sup>	1.0 × 10 <sup>-8</sup>	8.9 × 10 <sup>-9</sup>
		M	1.000	1.000	9.1 × 10 <sup>-8</sup>	4.9 × 10 <sup>-7</sup>	3.3 × 10 <sup>-7</sup>	1.2 × 10 <sup>-7</sup>
		S	0.020	0.010	3.2 × 10 <sup>-5</sup>	1.5 × 10 <sup>-5</sup>	1.1 × 10 <sup>-5</sup>	8.7 × 10 <sup>-6</sup>
		F	0.600	0.200	1.5 × 10 <sup>-6</sup>	2.9 × 10 <sup>-7</sup>	2.2 × 10 <sup>-7</sup>	1.7 × 10 <sup>-7</sup>
Ra-224	11.4 d	F	0.600	0.200	3.0 × 10 <sup>-8</sup>	1.6 × 10 <sup>-8</sup>	1.0 × 10 <sup>-8</sup>	8.9 × 10 <sup>-9</sup>
		M	0.200	0.100	2.8 × 10 <sup>-5</sup>	1.3 × 10 <sup>-5</sup>	9.9 × 10 <sup>-6</sup>	7.4 × 10 <sup>-6</sup>
		S	0.020	0.010	3.2 × 10 <sup>-5</sup>	1.5 × 10 <sup>-5</sup>	1.1 × 10 <sup>-5</sup>	8.7 × 10 <sup>-6</sup>
		F	0.600	0.200	1.5 × 10 <sup>-6</sup>	2.9 × 10 <sup>-7</sup>	2.2 × 10 <sup>-7</sup>	1.7 × 10 <sup>-7</sup>

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$					
			$e(g)$					
Ra-225	14.8 d	M	0.200	0.100	$5.3 \times 10^{-6}$	$3.9 \times 10^{-6}$	$3.7 \times 10^{-6}$	$3.0 \times 10^{-6}$
		S	0.020	0.010	$5.9 \times 10^{-6}$	$4.4 \times 10^{-6}$	$4.2 \times 10^{-6}$	$3.4 \times 10^{-6}$
		F	0.600	0.200	$5.6 \times 10^{-7}$	$4.6 \times 10^{-7}$	$3.8 \times 10^{-7}$	$1.3 \times 10^{-7}$
Ra-226	$1.60 \times 10^3$ a	M	0.200	0.100	$1.1 \times 10^{-5}$	$8.4 \times 10^{-6}$	$7.9 \times 10^{-6}$	$6.3 \times 10^{-6}$
		S	0.020	0.010	$1.4 \times 10^{-5}$	$1.0 \times 10^{-5}$	$9.8 \times 10^{-6}$	$7.7 \times 10^{-6}$
		F	0.600	0.200	$9.4 \times 10^{-7}$	$7.2 \times 10^{-7}$	$1.3 \times 10^{-6}$	$3.6 \times 10^{-7}$
Ra-227	0.703 h	M	0.200	0.100	$7.0 \times 10^{-6}$	$4.9 \times 10^{-6}$	$4.5 \times 10^{-6}$	$3.5 \times 10^{-6}$
		S	0.020	0.010	$1.9 \times 10^{-5}$	$1.2 \times 10^{-5}$	$1.0 \times 10^{-5}$	$9.5 \times 10^{-6}$
		F	0.600	0.200	$7.8 \times 10^{-10}$	$6.1 \times 10^{-10}$	$5.3 \times 10^{-10}$	$4.6 \times 10^{-10}$
Ra-228	5.75 a	M	0.200	0.100	$4.4 \times 10^{-10}$	$3.2 \times 10^{-10}$	$2.9 \times 10^{-10}$	$2.8 \times 10^{-10}$
		S	0.020	0.010	$4.4 \times 10^{-10}$	$2.9 \times 10^{-10}$	$2.4 \times 10^{-10}$	$2.2 \times 10^{-10}$
		F	0.600	0.200	$3.1 \times 10^{-6}$	$3.6 \times 10^{-6}$	$4.6 \times 10^{-6}$	$9.0 \times 10^{-7}$
Actinium	2.90 h	M	0.200	0.100	$6.3 \times 10^{-6}$	$4.6 \times 10^{-6}$	$4.4 \times 10^{-6}$	$2.6 \times 10^{-6}$
		S	0.020	0.010	$3.2 \times 10^{-5}$	$2.0 \times 10^{-5}$	$1.6 \times 10^{-5}$	$1.6 \times 10^{-5}$
		F	0.005	$5.0 \times 10^{-4}$	$4.8 \times 10^{-5}$			
Ac-224	2.90 h	M	0.005	$5.0 \times 10^{-4}$	$4.7 \times 10^{-8}$	$3.1 \times 10^{-8}$	$1.4 \times 10^{-8}$	$1.1 \times 10^{-8}$
		S	0.005	$5.0 \times 10^{-4}$	$2.0 \times 10^{-7}$	$1.5 \times 10^{-7}$	$1.4 \times 10^{-7}$	$1.1 \times 10^{-7}$
		F	0.005	$5.0 \times 10^{-4}$	$3.5 \times 10^{-7}$	$1.7 \times 10^{-7}$	$1.6 \times 10^{-7}$	$1.3 \times 10^{-7}$
Ac-225	10.0 d	M	0.005	$5.0 \times 10^{-4}$	$4.0 \times 10^{-6}$	$2.6 \times 10^{-6}$	$1.1 \times 10^{-6}$	$8.8 \times 10^{-7}$
		S	0.005	$5.0 \times 10^{-4}$	$1.3 \times 10^{-5}$	$1.0 \times 10^{-5}$	$9.3 \times 10^{-6}$	$7.4 \times 10^{-6}$
		F	0.005	$5.0 \times 10^{-4}$	$2.3 \times 10^{-5}$	$1.1 \times 10^{-5}$	$1.1 \times 10^{-5}$	$8.5 \times 10^{-6}$
Ac-226	1.21 d	F	0.005	$5.0 \times 10^{-4}$	$4.0 \times 10^{-7}$	$2.6 \times 10^{-7}$	$1.2 \times 10^{-7}$	$9.6 \times 10^{-8}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$	
		Type	$f_1$ $e(g)$							
Ac-227	21.8 a	M	0.005	$4.3 \times 10^{-6}$	$5.0 \times 10^{-4}$	$3.2 \times 10^{-6}$	$2.1 \times 10^{-6}$	$1.5 \times 10^{-6}$	$1.2 \times 10^{-6}$	
		S	0.005	$4.7 \times 10^{-6}$	$5.0 \times 10^{-4}$	$3.5 \times 10^{-6}$	$2.3 \times 10^{-6}$	$1.7 \times 10^{-6}$	$1.6 \times 10^{-6}$	
		F	0.005	$1.7 \times 10^{-3}$	$5.0 \times 10^{-4}$	$1.6 \times 10^{-3}$	$1.0 \times 10^{-3}$	$7.2 \times 10^{-4}$	$5.6 \times 10^{-4}$	$5.5 \times 10^{-4}$
		M	0.005	$5.7 \times 10^{-4}$	$5.0 \times 10^{-4}$	$5.5 \times 10^{-4}$	$3.9 \times 10^{-4}$	$2.6 \times 10^{-4}$	$2.3 \times 10^{-4}$	$2.2 \times 10^{-4}$
		S	0.005	$2.2 \times 10^{-4}$	$5.0 \times 10^{-4}$	$2.0 \times 10^{-4}$	$1.3 \times 10^{-4}$	$8.7 \times 10^{-5}$	$7.6 \times 10^{-5}$	$7.2 \times 10^{-5}$
Ac-228	6.13 h	F	0.005	$1.8 \times 10^{-7}$	$5.0 \times 10^{-4}$	$1.6 \times 10^{-7}$	$9.7 \times 10^{-8}$	$5.7 \times 10^{-8}$	$2.9 \times 10^{-8}$	$2.5 \times 10^{-8}$
		M	0.005	$8.4 \times 10^{-8}$	$5.0 \times 10^{-4}$	$7.3 \times 10^{-8}$	$4.7 \times 10^{-8}$	$2.9 \times 10^{-8}$	$2.0 \times 10^{-8}$	$1.7 \times 10^{-8}$
		S	0.005	$6.4 \times 10^{-8}$	$5.0 \times 10^{-4}$	$5.3 \times 10^{-8}$	$3.3 \times 10^{-8}$	$2.2 \times 10^{-8}$	$1.9 \times 10^{-8}$	$1.6 \times 10^{-8}$
<b>Thorium</b>										
Th-226	0.515 h	F	0.005	$1.4 \times 10^{-7}$	$5.0 \times 10^{-4}$	$1.0 \times 10^{-7}$	$4.8 \times 10^{-8}$	$3.4 \times 10^{-8}$	$2.5 \times 10^{-8}$	$2.2 \times 10^{-8}$
		M	0.005	$3.0 \times 10^{-7}$	$5.0 \times 10^{-4}$	$2.1 \times 10^{-7}$	$1.1 \times 10^{-7}$	$8.3 \times 10^{-8}$	$7.0 \times 10^{-8}$	$5.8 \times 10^{-8}$
Th-227	18.7 d	S	0.005	$3.1 \times 10^{-7}$	$5.0 \times 10^{-4}$	$2.2 \times 10^{-7}$	$1.2 \times 10^{-7}$	$8.8 \times 10^{-8}$	$7.5 \times 10^{-8}$	$6.1 \times 10^{-8}$
		F	0.005	$8.4 \times 10^{-6}$	$5.0 \times 10^{-4}$	$5.2 \times 10^{-6}$	$2.6 \times 10^{-6}$	$1.6 \times 10^{-6}$	$1.0 \times 10^{-6}$	$6.7 \times 10^{-7}$
		M	0.005	$3.2 \times 10^{-5}$	$5.0 \times 10^{-4}$	$2.5 \times 10^{-5}$	$1.6 \times 10^{-5}$	$1.1 \times 10^{-5}$	$1.1 \times 10^{-5}$	$8.5 \times 10^{-6}$
		S	0.005	$3.9 \times 10^{-5}$	$5.0 \times 10^{-4}$	$3.0 \times 10^{-5}$	$1.9 \times 10^{-5}$	$1.4 \times 10^{-5}$	$1.3 \times 10^{-5}$	$1.0 \times 10^{-5}$
Th-228	1.91 a	F	0.005	$1.8 \times 10^{-4}$	$5.0 \times 10^{-4}$	$1.5 \times 10^{-4}$	$8.3 \times 10^{-5}$	$5.2 \times 10^{-5}$	$3.6 \times 10^{-5}$	$2.9 \times 10^{-5}$
		M	0.005	$1.3 \times 10^{-4}$	$5.0 \times 10^{-4}$	$1.1 \times 10^{-4}$	$6.8 \times 10^{-5}$	$4.6 \times 10^{-5}$	$3.9 \times 10^{-5}$	$3.2 \times 10^{-5}$
Th-229	$7.34 \times 10^3$ a	S	0.005	$1.6 \times 10^{-4}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-4}$	$8.2 \times 10^{-5}$	$5.5 \times 10^{-5}$	$4.7 \times 10^{-5}$	$4.0 \times 10^{-5}$
		F	0.005	$5.4 \times 10^{-4}$	$5.0 \times 10^{-4}$	$5.1 \times 10^{-4}$	$3.6 \times 10^{-4}$	$2.9 \times 10^{-4}$	$2.4 \times 10^{-4}$	$2.4 \times 10^{-4}$
		M	0.005	$2.3 \times 10^{-4}$	$5.0 \times 10^{-4}$	$2.1 \times 10^{-4}$	$1.6 \times 10^{-4}$	$1.2 \times 10^{-4}$	$1.1 \times 10^{-4}$	$1.1 \times 10^{-4}$
Th-230	$7.70 \times 10^4$ a	S	0.005	$2.1 \times 10^{-4}$	$5.0 \times 10^{-4}$	$1.9 \times 10^{-4}$	$1.3 \times 10^{-4}$	$8.7 \times 10^{-5}$	$7.6 \times 10^{-5}$	$7.1 \times 10^{-5}$
		F	0.005	$2.1 \times 10^{-4}$	$5.0 \times 10^{-4}$	$2.0 \times 10^{-4}$	$1.4 \times 10^{-4}$	$1.1 \times 10^{-4}$	$9.9 \times 10^{-5}$	$1.0 \times 10^{-4}$
		M	0.005	$7.7 \times 10^{-5}$	$5.0 \times 10^{-4}$	$7.4 \times 10^{-5}$	$5.5 \times 10^{-5}$	$4.3 \times 10^{-5}$	$4.2 \times 10^{-5}$	$4.3 \times 10^{-5}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a			Age 1-2 $f_1$ for $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$	
		Type	$f_1$	$e(g)$						
Th-231	1.06 d	S	0.005	$4.0 \times 10^{-5}$	$3.5 \times 10^{-5}$	$2.4 \times 10^{-5}$	$1.6 \times 10^{-5}$	$1.5 \times 10^{-5}$	$1.4 \times 10^{-5}$	
		F	0.005	$1.1 \times 10^{-9}$	$7.2 \times 10^{-10}$	$2.6 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.6 \times 10^{-10}$	$9.2 \times 10^{-11}$	$7.8 \times 10^{-11}$
		M	0.005	$2.2 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.6 \times 10^{-9}$	$8.0 \times 10^{-10}$	$4.8 \times 10^{-10}$	$3.8 \times 10^{-10}$	$3.1 \times 10^{-10}$
Th-232	$1.40 \times 10^{10}$ a	S	0.005	$2.4 \times 10^{-9}$	$1.7 \times 10^{-9}$	$7.6 \times 10^{-10}$	$5.2 \times 10^{-10}$	$4.1 \times 10^{-10}$	$3.3 \times 10^{-10}$	
		F	0.005	$2.3 \times 10^{-4}$	$2.2 \times 10^{-4}$	$1.6 \times 10^{-4}$	$1.3 \times 10^{-4}$	$1.2 \times 10^{-4}$	$1.1 \times 10^{-4}$	
		M	0.005	$8.3 \times 10^{-5}$	$8.1 \times 10^{-5}$	$6.3 \times 10^{-5}$	$5.0 \times 10^{-5}$	$4.7 \times 10^{-5}$	$4.5 \times 10^{-5}$	$4.5 \times 10^{-5}$
Protactinium		S	0.005	$5.4 \times 10^{-5}$	$5.0 \times 10^{-5}$	$3.7 \times 10^{-5}$	$2.6 \times 10^{-5}$	$2.5 \times 10^{-5}$	$2.5 \times 10^{-5}$	
		M	0.005	$3.6 \times 10^{-7}$	$2.6 \times 10^{-7}$	$1.4 \times 10^{-7}$	$1.0 \times 10^{-7}$	$1.0 \times 10^{-7}$	$9.0 \times 10^{-8}$	$7.4 \times 10^{-8}$
		S	0.005	$3.8 \times 10^{-7}$	$2.8 \times 10^{-7}$	$1.5 \times 10^{-7}$	$1.1 \times 10^{-7}$	$1.1 \times 10^{-7}$	$8.1 \times 10^{-8}$	$8.0 \times 10^{-8}$
Pa-228	22.0 h	M	0.005	$2.6 \times 10^{-7}$	$2.1 \times 10^{-7}$	$1.3 \times 10^{-7}$	$8.8 \times 10^{-8}$	$7.7 \times 10^{-8}$	$6.4 \times 10^{-8}$	
		S	0.005	$2.9 \times 10^{-7}$	$2.4 \times 10^{-7}$	$1.5 \times 10^{-7}$	$1.0 \times 10^{-7}$	$1.0 \times 10^{-7}$	$9.1 \times 10^{-8}$	$7.5 \times 10^{-8}$
		M	0.005	$2.4 \times 10^{-6}$	$1.8 \times 10^{-6}$	$1.1 \times 10^{-6}$	$8.3 \times 10^{-7}$	$8.3 \times 10^{-7}$	$7.6 \times 10^{-7}$	$6.1 \times 10^{-7}$
Pa-230	17.4 d	S	0.005	$2.9 \times 10^{-6}$	$2.2 \times 10^{-6}$	$1.4 \times 10^{-6}$	$1.0 \times 10^{-6}$	$9.6 \times 10^{-7}$	$7.6 \times 10^{-7}$	
		M	0.005	$2.2 \times 10^{-4}$	$2.3 \times 10^{-4}$	$1.9 \times 10^{-4}$	$1.5 \times 10^{-4}$	$1.5 \times 10^{-4}$	$1.5 \times 10^{-4}$	$1.4 \times 10^{-4}$
		S	0.005	$7.4 \times 10^{-5}$	$6.9 \times 10^{-5}$	$5.2 \times 10^{-5}$	$3.9 \times 10^{-5}$	$3.9 \times 10^{-5}$	$3.6 \times 10^{-5}$	$3.4 \times 10^{-5}$
Pa-232	1.31 d	M	0.005	$1.9 \times 10^{-8}$	$1.8 \times 10^{-8}$	$1.4 \times 10^{-8}$	$1.1 \times 10^{-8}$	$1.0 \times 10^{-8}$	$1.0 \times 10^{-8}$	
		S	0.005	$1.0 \times 10^{-8}$	$8.7 \times 10^{-9}$	$5.9 \times 10^{-9}$	$4.1 \times 10^{-9}$	$4.1 \times 10^{-9}$	$3.7 \times 10^{-9}$	$3.5 \times 10^{-9}$
		M	0.005	$1.5 \times 10^{-8}$	$1.1 \times 10^{-8}$	$6.5 \times 10^{-9}$	$4.7 \times 10^{-9}$	$4.7 \times 10^{-9}$	$4.1 \times 10^{-9}$	$3.3 \times 10^{-9}$
Pa-233	27.0 d	S	0.005	$1.7 \times 10^{-8}$	$1.3 \times 10^{-8}$	$7.5 \times 10^{-9}$	$5.5 \times 10^{-9}$	$4.9 \times 10^{-9}$	$3.9 \times 10^{-9}$	
		M	0.005	$2.8 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.8 \times 10^{-10}$	$6.8 \times 10^{-10}$	$4.7 \times 10^{-10}$	$3.8 \times 10^{-10}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2	2-7 a	7-12 a	12t-17 a	>17 a			
		Type	f <sub>1</sub>						e(g)	f <sub>1</sub> for g > 1 a	e(g)
Uraniumt	20.8 d	S	0.005	2.9 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	2.1 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	7.1 × 10 <sup>-10</sup>	5.0 × 10 <sup>-10</sup>	4.0 × 10 <sup>-10</sup>	
		F	0.040	3.2 × 10 <sup>-6</sup>	0.020	1.5 × 10 <sup>-6</sup>	7.2 × 10 <sup>-7</sup>	7.2 × 10 <sup>-7</sup>	5.4 × 10 <sup>-7</sup>	4.1 × 10 <sup>-7</sup>	3.8 × 10 <sup>-7</sup>
		M	0.040	4.9 × 10 <sup>-5</sup>	0.020	3.7 × 10 <sup>-5</sup>	2.4 × 10 <sup>-5</sup>	2.4 × 10 <sup>-5</sup>	1.8 × 10 <sup>-5</sup>	1.7 × 10 <sup>-5</sup>	1.3 × 10 <sup>-5</sup>
U-231	4.20 d	S	0.020	5.8 × 10 <sup>-5</sup>	0.002	4.4 × 10 <sup>-5</sup>	2.8 × 10 <sup>-5</sup>	2.1 × 10 <sup>-5</sup>	2.0 × 10 <sup>-5</sup>	1.6 × 10 <sup>-5</sup>	
		F	0.040	8.9 × 10 <sup>-10</sup>	0.020	6.2 × 10 <sup>-10</sup>	3.1 × 10 <sup>-10</sup>	3.1 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	1.0 × 10 <sup>-10</sup>	6.2 × 10 <sup>-11</sup>
		M	0.040	2.4 × 10 <sup>-9</sup>	0.020	1.7 × 10 <sup>-9</sup>	9.4 × 10 <sup>-10</sup>	9.4 × 10 <sup>-10</sup>	5.5 × 10 <sup>-10</sup>	4.6 × 10 <sup>-10</sup>	3.8 × 10 <sup>-10</sup>
U-232	72.0 a	S	0.020	2.6 × 10 <sup>-9</sup>	0.002	1.9 × 10 <sup>-9</sup>	9.0 × 10 <sup>-10</sup>	6.1 × 10 <sup>-10</sup>	4.9 × 10 <sup>-10</sup>	4.0 × 10 <sup>-10</sup>	
		F	0.040	1.6 × 10 <sup>-5</sup>	0.020	1.0 × 10 <sup>-5</sup>	6.9 × 10 <sup>-6</sup>	6.8 × 10 <sup>-6</sup>	6.8 × 10 <sup>-6</sup>	7.5 × 10 <sup>-6</sup>	4.0 × 10 <sup>-6</sup>
		M	0.040	3.0 × 10 <sup>-5</sup>	0.020	2.4 × 10 <sup>-5</sup>	1.6 × 10 <sup>-5</sup>	1.6 × 10 <sup>-5</sup>	1.1 × 10 <sup>-5</sup>	1.0 × 10 <sup>-5</sup>	7.8 × 10 <sup>-6</sup>
U-233	1.58 × 10 <sup>5</sup> a	S	0.020	1.0 × 10 <sup>-4</sup>	0.002	9.7 × 10 <sup>-5</sup>	6.6 × 10 <sup>-5</sup>	4.3 × 10 <sup>-5</sup>	3.8 × 10 <sup>-5</sup>	3.7 × 10 <sup>-5</sup>	
		F	0.040	2.2 × 10 <sup>-6</sup>	0.020	1.4 × 10 <sup>-6</sup>	9.4 × 10 <sup>-7</sup>	9.4 × 10 <sup>-7</sup>	8.4 × 10 <sup>-7</sup>	8.6 × 10 <sup>-7</sup>	5.8 × 10 <sup>-7</sup>
		M	0.040	1.5 × 10 <sup>-5</sup>	0.020	1.1 × 10 <sup>-5</sup>	7.2 × 10 <sup>-6</sup>	7.2 × 10 <sup>-6</sup>	4.9 × 10 <sup>-6</sup>	4.3 × 10 <sup>-6</sup>	3.6 × 10 <sup>-6</sup>
U-234	2.44 × 10 <sup>5</sup> a	S	0.020	3.4 × 10 <sup>-5</sup>	0.002	3.0 × 10 <sup>-5</sup>	1.9 × 10 <sup>-5</sup>	1.2 × 10 <sup>-5</sup>	1.1 × 10 <sup>-5</sup>	9.6 × 10 <sup>-6</sup>	
		F	0.040	2.1 × 10 <sup>-6</sup>	0.020	1.4 × 10 <sup>-6</sup>	9.0 × 10 <sup>-7</sup>	9.0 × 10 <sup>-7</sup>	8.0 × 10 <sup>-7</sup>	8.2 × 10 <sup>-7</sup>	5.6 × 10 <sup>-7</sup>
		M	0.040	1.5 × 10 <sup>-5</sup>	0.020	1.1 × 10 <sup>-5</sup>	7.0 × 10 <sup>-6</sup>	7.0 × 10 <sup>-6</sup>	4.8 × 10 <sup>-6</sup>	4.2 × 10 <sup>-6</sup>	3.5 × 10 <sup>-6</sup>
U-235	7.04 × 10 <sup>8</sup> a	S	0.020	3.3 × 10 <sup>-5</sup>	0.002	2.9 × 10 <sup>-5</sup>	1.9 × 10 <sup>-5</sup>	1.2 × 10 <sup>-5</sup>	1.0 × 10 <sup>-5</sup>	9.4 × 10 <sup>-6</sup>	
		F	0.040	2.0 × 10 <sup>-6</sup>	0.020	1.3 × 10 <sup>-6</sup>	8.5 × 10 <sup>-7</sup>	8.5 × 10 <sup>-7</sup>	7.5 × 10 <sup>-7</sup>	7.7 × 10 <sup>-7</sup>	5.2 × 10 <sup>-7</sup>
		M	0.040	1.3 × 10 <sup>-5</sup>	0.020	1.0 × 10 <sup>-5</sup>	6.3 × 10 <sup>-6</sup>	6.3 × 10 <sup>-6</sup>	4.3 × 10 <sup>-6</sup>	3.7 × 10 <sup>-6</sup>	3.1 × 10 <sup>-6</sup>
U-236	2.34 × 10 <sup>7</sup> a	S	0.020	3.0 × 10 <sup>-5</sup>	0.002	2.6 × 10 <sup>-5</sup>	1.7 × 10 <sup>-5</sup>	1.1 × 10 <sup>-5</sup>	9.2 × 10 <sup>-6</sup>	8.5 × 10 <sup>-6</sup>	
		F	0.040	2.0 × 10 <sup>-6</sup>	0.020	1.3 × 10 <sup>-6</sup>	8.5 × 10 <sup>-7</sup>	8.5 × 10 <sup>-7</sup>	7.5 × 10 <sup>-7</sup>	7.8 × 10 <sup>-7</sup>	5.3 × 10 <sup>-7</sup>

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for g > 1 a	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$	
		Type	$f_1$						
			$e(g)$						
U-237	6.75 d	M	0.040	$1.4 \times 10^{-5}$	$6.5 \times 10^{-6}$	$4.5 \times 10^{-6}$	$3.9 \times 10^{-6}$	$3.2 \times 10^{-6}$	
		S	0.020	$3.1 \times 10^{-5}$	$1.8 \times 10^{-5}$	$1.1 \times 10^{-5}$	$9.5 \times 10^{-6}$	$8.7 \times 10^{-6}$	
		F	0.040	$1.8 \times 10^{-9}$	$1.5 \times 10^{-9}$	$6.6 \times 10^{-10}$	$4.2 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.8 \times 10^{-10}$
		M	0.040	$7.8 \times 10^{-9}$	$5.7 \times 10^{-9}$	$3.3 \times 10^{-9}$	$2.4 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.7 \times 10^{-9}$
		S	0.020	$8.7 \times 10^{-9}$	$6.4 \times 10^{-9}$	$3.7 \times 10^{-9}$	$2.7 \times 10^{-9}$	$2.4 \times 10^{-9}$	$1.9 \times 10^{-9}$
		F	0.040	$1.9 \times 10^{-6}$	$1.3 \times 10^{-6}$	$8.2 \times 10^{-7}$	$7.3 \times 10^{-7}$	$7.4 \times 10^{-7}$	$5.0 \times 10^{-7}$
U-238	$4.47 \times 10^9$ a	M	0.040	$1.2 \times 10^{-5}$	$5.9 \times 10^{-6}$	$4.0 \times 10^{-6}$	$3.4 \times 10^{-6}$	$2.9 \times 10^{-6}$	
		S	0.020	$2.9 \times 10^{-5}$	$1.6 \times 10^{-5}$	$1.0 \times 10^{-5}$	$8.7 \times 10^{-6}$	$8.0 \times 10^{-6}$	
		F	0.040	$1.0 \times 10^{-10}$	$6.6 \times 10^{-11}$	$2.9 \times 10^{-11}$	$1.9 \times 10^{-11}$	$1.2 \times 10^{-11}$	$1.0 \times 10^{-11}$
		M	0.040	$1.8 \times 10^{-10}$	$1.2 \times 10^{-10}$	$5.6 \times 10^{-11}$	$3.8 \times 10^{-11}$	$2.7 \times 10^{-11}$	$2.2 \times 10^{-11}$
		S	0.020	$1.9 \times 10^{-10}$	$1.2 \times 10^{-10}$	$5.9 \times 10^{-11}$	$4.0 \times 10^{-11}$	$2.9 \times 10^{-11}$	$2.4 \times 10^{-11}$
		F	0.040	$2.4 \times 10^{-9}$	$1.6 \times 10^{-9}$	$7.1 \times 10^{-9}$	$4.5 \times 10^{-9}$	$2.3 \times 10^{-9}$	$2.0 \times 10^{-9}$
U-240	14.1 h	M	0.040	$4.6 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.5 \times 10^{-10}$	$5.3 \times 10^{-10}$	
		S	0.020	$4.9 \times 10^{-9}$	$3.3 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.1 \times 10^{-9}$	$7.0 \times 10^{-10}$	$5.8 \times 10^{-10}$
		F	0.005	$2.0 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.2 \times 10^{-10}$	$1.1 \times 10^{-10}$	$1.1 \times 10^{-10}$	$1.2 \times 10^{-10}$
		M	0.005	$8.9 \times 10^{-11}$	$8.1 \times 10^{-11}$	$5.5 \times 10^{-11}$	$4.5 \times 10^{-11}$	$4.7 \times 10^{-11}$	$5.0 \times 10^{-11}$
		S	0.005	$1.2 \times 10^{-10}$	$9.7 \times 10^{-11}$	$5.8 \times 10^{-11}$	$3.9 \times 10^{-11}$	$2.5 \times 10^{-11}$	$2.4 \times 10^{-11}$
		F	0.005	$1.1 \times 10^{-11}$	$8.7 \times 10^{-12}$	$4.2 \times 10^{-12}$	$2.5 \times 10^{-12}$	$1.4 \times 10^{-12}$	$1.1 \times 10^{-12}$
Neptunium	0.603 h	M	0.005	$1.5 \times 10^{-11}$	$5.5 \times 10^{-12}$	$3.3 \times 10^{-12}$	$2.1 \times 10^{-12}$	$1.6 \times 10^{-12}$	
		S	0.005	$1.5 \times 10^{-11}$	$1.2 \times 10^{-11}$	$5.7 \times 10^{-12}$	$3.4 \times 10^{-12}$	$2.1 \times 10^{-12}$	$1.7 \times 10^{-12}$
		F	0.005	$2.0 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.9 \times 10^{-10}$	$1.2 \times 10^{-10}$	$1.1 \times 10^{-10}$	$1.2 \times 10^{-10}$
		M	0.005	$8.9 \times 10^{-11}$	$5.0 \times 10^{-4}$	$8.1 \times 10^{-11}$	$5.5 \times 10^{-11}$	$4.7 \times 10^{-11}$	$5.0 \times 10^{-11}$
		S	0.005	$1.2 \times 10^{-10}$	$5.0 \times 10^{-4}$	$9.7 \times 10^{-11}$	$5.8 \times 10^{-11}$	$3.9 \times 10^{-11}$	$2.4 \times 10^{-11}$
		F	0.005	$1.1 \times 10^{-11}$	$5.0 \times 10^{-4}$	$8.7 \times 10^{-12}$	$4.2 \times 10^{-12}$	$2.5 \times 10^{-12}$	$1.1 \times 10^{-12}$
Np-232	0.245 h	M	0.005	$1.5 \times 10^{-11}$	$5.0 \times 10^{-4}$	$1.1 \times 10^{-11}$	$2.1 \times 10^{-12}$	$1.6 \times 10^{-12}$	
		S	0.005	$1.5 \times 10^{-11}$	$5.0 \times 10^{-4}$	$1.2 \times 10^{-11}$	$3.4 \times 10^{-12}$	$2.1 \times 10^{-12}$	$1.7 \times 10^{-12}$
		F	0.005	$2.0 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.9 \times 10^{-10}$	$1.2 \times 10^{-10}$	$1.1 \times 10^{-10}$	$1.2 \times 10^{-10}$
		M	0.005	$8.9 \times 10^{-11}$	$5.0 \times 10^{-4}$	$8.1 \times 10^{-11}$	$5.5 \times 10^{-11}$	$4.7 \times 10^{-11}$	$5.0 \times 10^{-11}$
		S	0.005	$1.2 \times 10^{-10}$	$5.0 \times 10^{-4}$	$9.7 \times 10^{-11}$	$5.8 \times 10^{-11}$	$3.9 \times 10^{-11}$	$2.4 \times 10^{-11}$
		F	0.005	$1.1 \times 10^{-11}$	$5.0 \times 10^{-4}$	$8.7 \times 10^{-12}$	$4.2 \times 10^{-12}$	$2.5 \times 10^{-12}$	$1.1 \times 10^{-12}$
Np-233	0.603 h	M	0.005	$1.5 \times 10^{-11}$	$5.0 \times 10^{-4}$	$1.1 \times 10^{-11}$	$2.1 \times 10^{-12}$	$1.6 \times 10^{-12}$	
		S	0.005	$1.5 \times 10^{-11}$	$5.0 \times 10^{-4}$	$1.2 \times 10^{-11}$	$3.4 \times 10^{-12}$	$2.1 \times 10^{-12}$	$1.7 \times 10^{-12}$
		F	0.005	$2.0 \times 10^{-10}$	$5.0 \times 10^{-4}$	$1.9 \times 10^{-10}$	$1.2 \times 10^{-10}$	$1.1 \times 10^{-10}$	$1.2 \times 10^{-10}$
		M	0.005	$8.9 \times 10^{-11}$	$5.0 \times 10^{-4}$	$8.1 \times 10^{-11}$	$5.5 \times 10^{-11}$	$4.7 \times 10^{-11}$	$5.0 \times 10^{-11}$
		S	0.005	$1.2 \times 10^{-10}$	$5.0 \times 10^{-4}$	$9.7 \times 10^{-11}$	$5.8 \times 10^{-11}$	$3.9 \times 10^{-11}$	$2.4 \times 10^{-11}$
		F	0.005	$1.1 \times 10^{-11}$	$5.0 \times 10^{-4}$	$8.7 \times 10^{-12}$	$4.2 \times 10^{-12}$	$2.5 \times 10^{-12}$	$1.1 \times 10^{-12}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$ $e(g)$						
Np-234	4.40 d	F	0.005	$5.0 \times 10^{-4}$	$2.2 \times 10^{-9}$	$1.1 \times 10^{-9}$	$7.2 \times 10^{-10}$	$4.3 \times 10^{-10}$	$3.5 \times 10^{-10}$
		M	0.005	$5.0 \times 10^{-4}$	$3.0 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.5 \times 10^{-10}$	$5.3 \times 10^{-10}$
		S	0.005	$5.0 \times 10^{-4}$	$3.1 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.0 \times 10^{-9}$	$6.8 \times 10^{-10}$	$5.5 \times 10^{-10}$
Np-235	1.08 a	F	0.005	$5.0 \times 10^{-4}$	$3.5 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.1 \times 10^{-9}$	$7.5 \times 10^{-10}$	$6.3 \times 10^{-10}$
		M	0.005	$5.0 \times 10^{-4}$	$1.9 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.8 \times 10^{-10}$	$5.1 \times 10^{-10}$	$4.2 \times 10^{-10}$
		S	0.005	$5.0 \times 10^{-4}$	$2.2 \times 10^{-9}$	$1.3 \times 10^{-9}$	$8.3 \times 10^{-10}$	$6.3 \times 10^{-10}$	$5.2 \times 10^{-10}$
Np-236	$1.15 \times 10^5$ a	F	0.005	$5.0 \times 10^{-4}$	$9.1 \times 10^{-6}$	$7.2 \times 10^{-6}$	$7.5 \times 10^{-6}$	$7.9 \times 10^{-6}$	$8.0 \times 10^{-6}$
		M	0.005	$5.0 \times 10^{-4}$	$3.1 \times 10^{-6}$	$2.7 \times 10^{-6}$	$2.7 \times 10^{-6}$	$3.1 \times 10^{-6}$	$3.2 \times 10^{-6}$
		S	0.005	$5.0 \times 10^{-4}$	$1.6 \times 10^{-6}$	$1.3 \times 10^{-6}$	$1.0 \times 10^{-6}$	$1.0 \times 10^{-6}$	$1.0 \times 10^{-6}$
Np-236m	22.5 h	F	0.005	$5.0 \times 10^{-4}$	$2.6 \times 10^{-8}$	$1.5 \times 10^{-8}$	$1.1 \times 10^{-8}$	$8.9 \times 10^{-9}$	$9.0 \times 10^{-9}$
		M	0.005	$5.0 \times 10^{-4}$	$1.4 \times 10^{-8}$	$8.9 \times 10^{-9}$	$6.2 \times 10^{-9}$	$5.6 \times 10^{-9}$	$5.3 \times 10^{-9}$
		S	0.005	$5.0 \times 10^{-4}$	$1.3 \times 10^{-8}$	$8.5 \times 10^{-9}$	$5.7 \times 10^{-9}$	$4.8 \times 10^{-9}$	$4.2 \times 10^{-9}$
Np-237	$2.14 \times 10^6$ a	F	0.005	$5.0 \times 10^{-4}$	$9.3 \times 10^{-5}$	$6.0 \times 10^{-5}$	$5.0 \times 10^{-5}$	$4.7 \times 10^{-5}$	$5.0 \times 10^{-5}$
		M	0.005	$5.0 \times 10^{-4}$	$4.0 \times 10^{-5}$	$2.8 \times 10^{-5}$	$2.2 \times 10^{-5}$	$2.2 \times 10^{-5}$	$2.3 \times 10^{-5}$
		S	0.005	$5.0 \times 10^{-4}$	$3.2 \times 10^{-5}$	$2.1 \times 10^{-5}$	$1.4 \times 10^{-5}$	$1.3 \times 10^{-5}$	$1.2 \times 10^{-5}$
Np-238	2.12 d	F	0.005	$5.0 \times 10^{-4}$	$7.9 \times 10^{-9}$	$4.8 \times 10^{-9}$	$3.7 \times 10^{-9}$	$3.3 \times 10^{-9}$	$3.5 \times 10^{-9}$
		M	0.005	$5.0 \times 10^{-4}$	$5.8 \times 10^{-9}$	$3.4 \times 10^{-9}$	$2.5 \times 10^{-9}$	$2.2 \times 10^{-9}$	$2.1 \times 10^{-9}$
		S	0.005	$5.0 \times 10^{-4}$	$6.2 \times 10^{-9}$	$3.2 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.7 \times 10^{-9}$	$1.5 \times 10^{-9}$
Np-239	2.36 d	F	0.005	$5.0 \times 10^{-4}$	$1.4 \times 10^{-9}$	$6.3 \times 10^{-10}$	$3.8 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.7 \times 10^{-10}$
		M	0.005	$5.0 \times 10^{-4}$	$4.2 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.4 \times 10^{-9}$	$2.7 \times 10^{-11}$	$2.2 \times 10^{-11}$
		S	0.005	$5.0 \times 10^{-4}$	$4.0 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.6 \times 10^{-9}$	$2.9 \times 10^{-11}$	$2.4 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		f <sub>1</sub> for g > 1 a	Age 1-2 f <sub>1</sub> for	2-7 a e(g)	7-12 a e(g)	12t-17 a e(g)	>17 a e(g)	
		Type	f <sub>1</sub>							e(g)
<b>Plutonium</b>	1.08 h	F	0.005	3.6 × 10 <sup>-10</sup>	2.6 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	7.7 × 10 <sup>-11</sup>	2.3 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	
		M	0.005	6.3 × 10 <sup>-10</sup>	4.4 × 10 <sup>-10</sup>	2.2 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	6.5 × 10 <sup>-10</sup>	5.3 × 10 <sup>-10</sup>	
		S	0.005	6.5 × 10 <sup>-10</sup>	5.0 × 10 <sup>-4</sup>	4.6 × 10 <sup>-10</sup>	2.3 × 10 <sup>-10</sup>	1.5 × 10 <sup>-10</sup>	7.0 × 10 <sup>-10</sup>	5.8 × 10 <sup>-10</sup>
Pu-234	8.80 h	F	0.005	3.0 × 10 <sup>-8</sup>	2.0 × 10 <sup>-8</sup>	9.8 × 10 <sup>-9</sup>	5.7 × 10 <sup>-9</sup>	3.6 × 10 <sup>-9</sup>	3.0 × 10 <sup>-9</sup>	
		M	0.005	7.8 × 10 <sup>-8</sup>	5.0 × 10 <sup>-4</sup>	5.9 × 10 <sup>-8</sup>	3.7 × 10 <sup>-8</sup>	2.8 × 10 <sup>-8</sup>	2.6 × 10 <sup>-8</sup>	2.1 × 10 <sup>-8</sup>
		S	1.0 × 10 <sup>-4</sup>	8.7 × 10 <sup>-8</sup>	1.0 × 10 <sup>-5</sup>	6.6 × 10 <sup>-8</sup>	4.2 × 10 <sup>-8</sup>	3.1 × 10 <sup>-8</sup>	3.0 × 10 <sup>-8</sup>	2.4 × 10 <sup>-8</sup>
Pu-235	0.422 h	F	0.005	1.0 × 10 <sup>-11</sup>	5.0 × 10 <sup>-4</sup>	3.9 × 10 <sup>-12</sup>	2.2 × 10 <sup>-12</sup>	1.3 × 10 <sup>-12</sup>	1.0 × 10 <sup>-12</sup>	
		M	0.005	1.3 × 10 <sup>-11</sup>	5.0 × 10 <sup>-4</sup>	1.0 × 10 <sup>-11</sup>	5.0 × 10 <sup>-12</sup>	2.9 × 10 <sup>-12</sup>	1.9 × 10 <sup>-12</sup>	1.4 × 10 <sup>-12</sup>
		S	1.0 × 10 <sup>-4</sup>	1.3 × 10 <sup>-11</sup>	1.0 × 10 <sup>-5</sup>	1.0 × 10 <sup>-11</sup>	5.1 × 10 <sup>-12</sup>	3.0 × 10 <sup>-12</sup>	1.9 × 10 <sup>-12</sup>	1.5 × 10 <sup>-12</sup>
Pu-236m	2.85 a	F	0.005	1.0 × 10 <sup>-4</sup>	5.0 × 10 <sup>-4</sup>	6.1 × 10 <sup>-5</sup>	4.4 × 10 <sup>-5</sup>	3.7 × 10 <sup>-5</sup>	4.0 × 10 <sup>-5</sup>	
		M	0.005	4.8 × 10 <sup>-5</sup>	5.0 × 10 <sup>-4</sup>	4.3 × 10 <sup>-5</sup>	2.9 × 10 <sup>-5</sup>	2.1 × 10 <sup>-5</sup>	1.9 × 10 <sup>-5</sup>	2.0 × 10 <sup>-5</sup>
		S	1.0 × 10 <sup>-4</sup>	3.6 × 10 <sup>-5</sup>	1.0 × 10 <sup>-5</sup>	3.1 × 10 <sup>-5</sup>	2.0 × 10 <sup>-5</sup>	1.4 × 10 <sup>-5</sup>	1.2 × 10 <sup>-5</sup>	1.0 × 10 <sup>-5</sup>
Pu-237	45.3 d	F	0.005	2.2 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	1.6 × 10 <sup>-9</sup>	4.8 × 10 <sup>-10</sup>	2.9 × 10 <sup>-10</sup>	2.6 × 10 <sup>-10</sup>	
		M	0.005	1.9 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	1.4 × 10 <sup>-9</sup>	8.2 × 10 <sup>-10</sup>	5.4 × 10 <sup>-10</sup>	4.3 × 10 <sup>-10</sup>	3.5 × 10 <sup>-10</sup>
		S	1.0 × 10 <sup>-4</sup>	2.0 × 10 <sup>-9</sup>	1.0 × 10 <sup>-5</sup>	1.5 × 10 <sup>-9</sup>	8.8 × 10 <sup>-10</sup>	4.8 × 10 <sup>-10</sup>	4.8 × 10 <sup>-10</sup>	3.9 × 10 <sup>-10</sup>
Pu-238	87.7 a	F	0.005	2.0 × 10 <sup>-4</sup>	5.0 × 10 <sup>-4</sup>	1.4 × 10 <sup>-4</sup>	1.1 × 10 <sup>-4</sup>	1.0 × 10 <sup>-4</sup>	1.1 × 10 <sup>-4</sup>	
		M	0.005	7.8 × 10 <sup>-5</sup>	5.0 × 10 <sup>-4</sup>	7.4 × 10 <sup>-5</sup>	5.6 × 10 <sup>-5</sup>	4.4 × 10 <sup>-5</sup>	4.3 × 10 <sup>-5</sup>	4.6 × 10 <sup>-5</sup>
		S	1.0 × 10 <sup>-4</sup>	4.5 × 10 <sup>-5</sup>	1.0 × 10 <sup>-5</sup>	4.0 × 10 <sup>-5</sup>	2.7 × 10 <sup>-5</sup>	1.9 × 10 <sup>-5</sup>	1.7 × 10 <sup>-5</sup>	1.6 × 10 <sup>-5</sup>
Pu-239	2.41 × 10 <sup>4</sup> a	F	0.005	2.1 × 10 <sup>-4</sup>	5.0 × 10 <sup>-4</sup>	1.5 × 10 <sup>-4</sup>	1.2 × 10 <sup>-4</sup>	1.1 × 10 <sup>-4</sup>	1.2 × 10 <sup>-4</sup>	
		M	0.005	8.0 × 10 <sup>-5</sup>	5.0 × 10 <sup>-4</sup>	7.7 × 10 <sup>-5</sup>	6.0 × 10 <sup>-5</sup>	4.8 × 10 <sup>-5</sup>	4.7 × 10 <sup>-5</sup>	5.0 × 10 <sup>-5</sup>
		S	0.005	8.0 × 10 <sup>-5</sup>	5.0 × 10 <sup>-4</sup>	7.7 × 10 <sup>-5</sup>	6.0 × 10 <sup>-5</sup>	4.8 × 10 <sup>-5</sup>	4.7 × 10 <sup>-5</sup>	5.0 × 10 <sup>-5</sup>



Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a			$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$	$e(g)$						
Pu-240	6.54 × 10 <sup>3</sup> a	S	1.0 × 10 <sup>-4</sup>	4.3 × 10 <sup>-5</sup>	1.0 × 10 <sup>-5</sup>	3.9 × 10 <sup>-5</sup>	2.7 × 10 <sup>-5</sup>	1.9 × 10 <sup>-5</sup>	1.7 × 10 <sup>-5</sup>	1.6 × 10 <sup>-5</sup>
		F	0.005	2.1 × 10 <sup>-4</sup>	5.0 × 10 <sup>-4</sup>	2.0 × 10 <sup>-4</sup>	1.5 × 10 <sup>-4</sup>	1.2 × 10 <sup>-4</sup>	1.1 × 10 <sup>-4</sup>	1.2 × 10 <sup>-4</sup>
		M	0.005	8.0 × 10 <sup>-5</sup>	5.0 × 10 <sup>-4</sup>	7.7 × 10 <sup>-5</sup>	6.0 × 10 <sup>-5</sup>	4.8 × 10 <sup>-5</sup>	4.7 × 10 <sup>-5</sup>	5.0 × 10 <sup>-5</sup>
Pu-241	14.4 a	S	1.0 × 10 <sup>-4</sup>	4.3 × 10 <sup>-5</sup>	1.0 × 10 <sup>-5</sup>	3.9 × 10 <sup>-5</sup>	2.7 × 10 <sup>-5</sup>	1.9 × 10 <sup>-5</sup>	1.7 × 10 <sup>-5</sup>	1.6 × 10 <sup>-5</sup>
		F	0.005	2.8 × 10 <sup>-6</sup>	5.0 × 10 <sup>-4</sup>	2.9 × 10 <sup>-6</sup>	2.6 × 10 <sup>-6</sup>	2.4 × 10 <sup>-6</sup>	2.2 × 10 <sup>-6</sup>	2.3 × 10 <sup>-6</sup>
		M	0.005	9.1 × 10 <sup>-7</sup>	5.0 × 10 <sup>-4</sup>	9.7 × 10 <sup>-7</sup>	9.2 × 10 <sup>-7</sup>	8.3 × 10 <sup>-7</sup>	8.6 × 10 <sup>-7</sup>	9.0 × 10 <sup>-7</sup>
Pu-242	3.76 × 10 <sup>5</sup> a	S	1.0 × 10 <sup>-4</sup>	2.2 × 10 <sup>-7</sup>	1.0 × 10 <sup>-5</sup>	2.3 × 10 <sup>-7</sup>	2.0 × 10 <sup>-7</sup>	1.7 × 10 <sup>-7</sup>	1.7 × 10 <sup>-7</sup>	1.7 × 10 <sup>-7</sup>
		F	0.005	2.0 × 10 <sup>-4</sup>	5.0 × 10 <sup>-4</sup>	5.0 × 10 <sup>-4</sup>	1.4 × 10 <sup>-4</sup>	1.2 × 10 <sup>-4</sup>	1.1 × 10 <sup>-4</sup>	1.1 × 10 <sup>-4</sup>
		M	0.005	7.6 × 10 <sup>-5</sup>	5.0 × 10 <sup>-4</sup>	7.3 × 10 <sup>-5</sup>	5.7 × 10 <sup>-5</sup>	4.5 × 10 <sup>-5</sup>	4.5 × 10 <sup>-5</sup>	4.8 × 10 <sup>-5</sup>
Pu-243	4.95 h	S	1.0 × 10 <sup>-4</sup>	4.0 × 10 <sup>-5</sup>	1.0 × 10 <sup>-5</sup>	3.6 × 10 <sup>-5</sup>	2.5 × 10 <sup>-5</sup>	1.7 × 10 <sup>-5</sup>	1.6 × 10 <sup>-5</sup>	1.5 × 10 <sup>-5</sup>
		F	0.005	2.7 × 10 <sup>-10</sup>	5.0 × 10 <sup>-4</sup>	1.9 × 10 <sup>-10</sup>	8.8 × 10 <sup>-11</sup>	5.7 × 10 <sup>-11</sup>	3.5 × 10 <sup>-11</sup>	3.2 × 10 <sup>-11</sup>
		M	0.005	5.6 × 10 <sup>-10</sup>	5.0 × 10 <sup>-4</sup>	3.9 × 10 <sup>-10</sup>	1.9 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	8.7 × 10 <sup>-11</sup>	8.3 × 10 <sup>-11</sup>
Pu-244	8.26 × 10 <sup>7</sup> a	S	1.0 × 10 <sup>-4</sup>	6.0 × 10 <sup>-10</sup>	1.0 × 10 <sup>-5</sup>	4.1 × 10 <sup>-10</sup>	2.0 × 10 <sup>-10</sup>	1.4 × 10 <sup>-10</sup>	9.2 × 10 <sup>-11</sup>	8.6 × 10 <sup>-11</sup>
		F	0.005	2.0 × 10 <sup>-4</sup>	5.0 × 10 <sup>-4</sup>	1.9 × 10 <sup>-4</sup>	1.4 × 10 <sup>-4</sup>	1.2 × 10 <sup>-4</sup>	1.1 × 10 <sup>-4</sup>	1.1 × 10 <sup>-4</sup>
		M	0.005	7.4 × 10 <sup>-5</sup>	5.0 × 10 <sup>-4</sup>	7.2 × 10 <sup>-5</sup>	5.6 × 10 <sup>-5</sup>	4.5 × 10 <sup>-5</sup>	4.4 × 10 <sup>-5</sup>	4.7 × 10 <sup>-5</sup>
Pu-245	10.5 h	S	1.0 × 10 <sup>-4</sup>	3.9 × 10 <sup>-5</sup>	1.0 × 10 <sup>-5</sup>	3.5 × 10 <sup>-5</sup>	2.4 × 10 <sup>-5</sup>	1.7 × 10 <sup>-5</sup>	1.5 × 10 <sup>-5</sup>	1.5 × 10 <sup>-5</sup>
		F	0.005	1.8 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	1.3 × 10 <sup>-9</sup>	5.6 × 10 <sup>-10</sup>	3.5 × 10 <sup>-10</sup>	1.9 × 10 <sup>-10</sup>	1.6 × 10 <sup>-10</sup>
		M	0.005	3.6 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	2.5 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>	8.0 × 10 <sup>-10</sup>	5.0 × 10 <sup>-10</sup>	4.0 × 10 <sup>-10</sup>
Pu-246		S	1.0 × 10 <sup>-4</sup>	3.8 × 10 <sup>-9</sup>	1.0 × 10 <sup>-5</sup>	2.6 × 10 <sup>-9</sup>	1.3 × 10 <sup>-9</sup>	8.5 × 10 <sup>-10</sup>	5.4 × 10 <sup>-10</sup>	4.3 × 10 <sup>-10</sup>
		F	0.005	2.0 × 10 <sup>-8</sup>	5.0 × 10 <sup>-4</sup>	1.4 × 10 <sup>-8</sup>	7.0 × 10 <sup>-9</sup>	4.4 × 10 <sup>-9</sup>	2.8 × 10 <sup>-9</sup>	2.5 × 10 <sup>-9</sup>
		M	0.005	3.5 × 10 <sup>-8</sup>	5.0 × 10 <sup>-4</sup>	2.6 × 10 <sup>-8</sup>	1.5 × 10 <sup>-8</sup>	1.1 × 10 <sup>-8</sup>	9.1 × 10 <sup>-9</sup>	7.4 × 10 <sup>-9</sup>
		S	1.0 × 10 <sup>-4</sup>	3.8 × 10 <sup>-8</sup>	1.0 × 10 <sup>-5</sup>	2.8 × 10 <sup>-8</sup>	1.6 × 10 <sup>-8</sup>	1.2 × 10 <sup>-8</sup>	1.0 × 10 <sup>-8</sup>	8.0 × 10 <sup>-9</sup>

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$						
Americium Am-237	1.22 h	F	0.005	$9.8 \times 10^{-11}$	$7.3 \times 10^{-11}$	$3.5 \times 10^{-11}$	$2.2 \times 10^{-11}$	$1.3 \times 10^{-11}$	$1.1 \times 10^{-11}$
		M	0.005	$1.7 \times 10^{-10}$	$1.2 \times 10^{-10}$	$6.2 \times 10^{-11}$	$4.1 \times 10^{-11}$	$3.0 \times 10^{-11}$	$2.5 \times 10^{-11}$
		S	0.005	$1.7 \times 10^{-10}$	$1.3 \times 10^{-10}$	$6.5 \times 10^{-11}$	$4.3 \times 10^{-11}$	$3.2 \times 10^{-11}$	$2.6 \times 10^{-11}$
Am-238	1.63 h	F	0.005	$4.1 \times 10^{-10}$	$3.8 \times 10^{-10}$	$2.5 \times 10^{-10}$	$2.0 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.9 \times 10^{-10}$
		M	0.005	$3.1 \times 10^{-10}$	$2.6 \times 10^{-10}$	$1.3 \times 10^{-10}$	$9.6 \times 10^{-11}$	$8.8 \times 10^{-11}$	$9.0 \times 10^{-11}$
		S	0.005	$2.7 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.3 \times 10^{-10}$	$8.2 \times 10^{-11}$	$6.1 \times 10^{-11}$	$5.4 \times 10^{-11}$
Am-239	11.9 h	F	0.005	$8.1 \times 10^{-10}$	$5.8 \times 10^{-10}$	$2.6 \times 10^{-10}$	$1.6 \times 10^{-10}$	$9.1 \times 10^{-11}$	$7.6 \times 10^{-11}$
		M	0.005	$1.5 \times 10^{-9}$	$1.1 \times 10^{-9}$	$5.6 \times 10^{-10}$	$3.7 \times 10^{-10}$	$2.7 \times 10^{-10}$	$2.2 \times 10^{-10}$
		S	0.005	$1.6 \times 10^{-9}$	$1.1 \times 10^{-9}$	$5.9 \times 10^{-10}$	$4.0 \times 10^{-10}$	$2.5 \times 10^{-10}$	$2.4 \times 10^{-10}$
Am-240	2.12 d	F	0.005	$2.0 \times 10^{-9}$	$1.7 \times 10^{-9}$	$8.8 \times 10^{-10}$	$5.7 \times 10^{-10}$	$3.6 \times 10^{-10}$	$2.3 \times 10^{-10}$
		M	0.005	$2.9 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.7 \times 10^{-10}$	$5.3 \times 10^{-10}$	$4.3 \times 10^{-10}$
		S	0.005	$3.0 \times 10^{-9}$	$2.3 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.8 \times 10^{-10}$	$5.3 \times 10^{-10}$	$4.3 \times 10^{-10}$
Am-241	$4.32 \times 10^2$ a	F	0.005	$1.8 \times 10^{-4}$	$1.8 \times 10^{-4}$	$1.2 \times 10^{-4}$	$1.0 \times 10^{-4}$	$9.2 \times 10^{-5}$	$9.6 \times 10^{-5}$
		M	0.005	$7.3 \times 10^{-5}$	$6.9 \times 10^{-5}$	$5.1 \times 10^{-5}$	$4.0 \times 10^{-5}$	$4.0 \times 10^{-5}$	$4.2 \times 10^{-5}$
		S	0.005	$4.6 \times 10^{-5}$	$4.0 \times 10^{-5}$	$2.7 \times 10^{-5}$	$1.9 \times 10^{-5}$	$1.7 \times 10^{-5}$	$1.6 \times 10^{-5}$
Am-242	16.0 h	F	0.005	$9.2 \times 10^{-8}$	$7.1 \times 10^{-8}$	$3.5 \times 10^{-8}$	$2.1 \times 10^{-8}$	$1.4 \times 10^{-8}$	$1.1 \times 10^{-8}$
		M	0.005	$7.6 \times 10^{-8}$	$5.9 \times 10^{-8}$	$3.6 \times 10^{-8}$	$2.4 \times 10^{-8}$	$2.1 \times 10^{-8}$	$1.7 \times 10^{-8}$
		S	0.005	$8.0 \times 10^{-8}$	$6.2 \times 10^{-8}$	$3.9 \times 10^{-8}$	$2.7 \times 10^{-8}$	$2.4 \times 10^{-8}$	$2.0 \times 10^{-8}$
Am-242m	$1.52 \times 10^2$ a	F	0.005	$1.6 \times 10^{-4}$	$1.5 \times 10^{-4}$	$1.1 \times 10^{-4}$	$9.4 \times 10^{-5}$	$8.8 \times 10^{-5}$	$9.2 \times 10^{-5}$
		M	0.005	$5.2 \times 10^{-4}$	$5.3 \times 10^{-5}$	$4.1 \times 10^{-5}$	$3.4 \times 10^{-5}$	$3.5 \times 10^{-5}$	$3.7 \times 10^{-5}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for	2-7 a	7-12 a	12t-17 a	>17 a	
		Type	$f_1$						$e(g)$
Am-243	7.38 × 10 <sup>3</sup> a	S	0.005	5.0 × 10 <sup>-4</sup>	1.7 × 10 <sup>-5</sup>	1.2 × 10 <sup>-5</sup>	1.1 × 10 <sup>-5</sup>	1.1 × 10 <sup>-5</sup>	
		F	0.005	5.0 × 10 <sup>-4</sup>	1.7 × 10 <sup>-4</sup>	1.2 × 10 <sup>-4</sup>	1.0 × 10 <sup>-4</sup>	9.1 × 10 <sup>-5</sup>	9.6 × 10 <sup>-5</sup>
		M	0.005	5.0 × 10 <sup>-4</sup>	6.8 × 10 <sup>-5</sup>	5.0 × 10 <sup>-5</sup>	4.0 × 10 <sup>-5</sup>	4.0 × 10 <sup>-5</sup>	4.1 × 10 <sup>-5</sup>
		S	0.005	5.0 × 10 <sup>-4</sup>	3.9 × 10 <sup>-5</sup>	2.6 × 10 <sup>-5</sup>	1.8 × 10 <sup>-5</sup>	1.6 × 10 <sup>-5</sup>	1.5 × 10 <sup>-5</sup>
		F	0.005	5.0 × 10 <sup>-4</sup>	9.2 × 10 <sup>-9</sup>	5.6 × 10 <sup>-9</sup>	4.1 × 10 <sup>-9</sup>	3.5 × 10 <sup>-9</sup>	3.7 × 10 <sup>-9</sup>
Am-244	10.1 h	M	0.005	5.0 × 10 <sup>-4</sup>	3.2 × 10 <sup>-9</sup>	2.2 × 10 <sup>-9</sup>	2.0 × 10 <sup>-9</sup>	2.0 × 10 <sup>-9</sup>	
		S	0.005	5.0 × 10 <sup>-4</sup>	4.8 × 10 <sup>-9</sup>	2.4 × 10 <sup>-9</sup>	1.6 × 10 <sup>-9</sup>	1.4 × 10 <sup>-9</sup>	1.2 × 10 <sup>-9</sup>
		F	0.005	5.0 × 10 <sup>-4</sup>	4.0 × 10 <sup>-10</sup>	2.4 × 10 <sup>-10</sup>	1.8 × 10 <sup>-10</sup>	1.5 × 10 <sup>-10</sup>	1.6 × 10 <sup>-10</sup>
Am-244m	0.433 h	M	0.005	5.0 × 10 <sup>-4</sup>	2.1 × 10 <sup>-10</sup>	9.2 × 10 <sup>-11</sup>	8.3 × 10 <sup>-11</sup>	8.4 × 10 <sup>-11</sup>	
		S	0.005	5.0 × 10 <sup>-4</sup>	2.2 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	8.1 × 10 <sup>-11</sup>	5.5 × 10 <sup>-11</sup>	5.7 × 10 <sup>-11</sup>
		F	0.005	5.0 × 10 <sup>-4</sup>	1.4 × 10 <sup>-10</sup>	6.2 × 10 <sup>-11</sup>	4.0 × 10 <sup>-11</sup>	2.4 × 10 <sup>-11</sup>	2.1 × 10 <sup>-11</sup>
		M	0.005	5.0 × 10 <sup>-4</sup>	2.6 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	8.7 × 10 <sup>-11</sup>	6.4 × 10 <sup>-11</sup>	5.3 × 10 <sup>-11</sup>
		S	0.005	5.0 × 10 <sup>-4</sup>	2.8 × 10 <sup>-10</sup>	1.3 × 10 <sup>-10</sup>	9.2 × 10 <sup>-11</sup>	6.8 × 10 <sup>-11</sup>	5.6 × 10 <sup>-11</sup>
Am-246	0.650 h	F	0.005	5.0 × 10 <sup>-4</sup>	2.0 × 10 <sup>-10</sup>	6.1 × 10 <sup>-11</sup>	3.8 × 10 <sup>-11</sup>	3.3 × 10 <sup>-11</sup>	
		M	0.005	5.0 × 10 <sup>-4</sup>	3.4 × 10 <sup>-10</sup>	1.6 × 10 <sup>-10</sup>	1.1 × 10 <sup>-10</sup>	7.9 × 10 <sup>-11</sup>	6.6 × 10 <sup>-11</sup>
		S	0.005	5.0 × 10 <sup>-4</sup>	3.6 × 10 <sup>-10</sup>	1.7 × 10 <sup>-10</sup>	1.2 × 10 <sup>-10</sup>	8.3 × 10 <sup>-11</sup>	6.9 × 10 <sup>-11</sup>
Am-246m	0.417 h	F	0.005	5.0 × 10 <sup>-4</sup>	8.9 × 10 <sup>-11</sup>	2.6 × 10 <sup>-11</sup>	1.6 × 10 <sup>-11</sup>	1.4 × 10 <sup>-11</sup>	
		M	0.005	5.0 × 10 <sup>-4</sup>	1.3 × 10 <sup>-10</sup>	6.1 × 10 <sup>-11</sup>	4.0 × 10 <sup>-11</sup>	2.6 × 10 <sup>-11</sup>	2.2 × 10 <sup>-11</sup>
		S	0.005	5.0 × 10 <sup>-4</sup>	1.4 × 10 <sup>-10</sup>	6.4 × 10 <sup>-11</sup>	4.1 × 10 <sup>-11</sup>	2.7 × 10 <sup>-11</sup>	2.3 × 10 <sup>-11</sup>
<b>Curium</b>									
Cm-238	2.40 h	F	0.005	5.0 × 10 <sup>-4</sup>	5.4 × 10 <sup>-9</sup>	1.8 × 10 <sup>-9</sup>	9.2 × 10 <sup>-10</sup>	7.8 × 10 <sup>-10</sup>	

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$	
		Type	$f_1$							$e(g)$
Cm-240	27.0 d	M	0.005	$2.1 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.5 \times 10^{-8}$	$7.9 \times 10^{-9}$	$5.6 \times 10^{-9}$	$4.5 \times 10^{-9}$	
		S	0.005	$2.2 \times 10^{-8}$	$5.0 \times 10^{-4}$	$1.6 \times 10^{-8}$	$8.6 \times 10^{-9}$	$6.4 \times 10^{-9}$	$6.1 \times 10^{-9}$	
		F	0.005	$8.3 \times 10^{-6}$	$5.0 \times 10^{-4}$	$6.3 \times 10^{-6}$	$3.2 \times 10^{-6}$	$2.0 \times 10^{-6}$	$1.5 \times 10^{-6}$	$1.3 \times 10^{-6}$
Cm-241	32.8 d	M	0.005	$1.2 \times 10^{-5}$	$5.0 \times 10^{-4}$	$9.1 \times 10^{-6}$	$5.8 \times 10^{-6}$	$4.2 \times 10^{-6}$	$3.8 \times 10^{-6}$	
		S	0.005	$1.3 \times 10^{-5}$	$5.0 \times 10^{-4}$	$9.9 \times 10^{-6}$	$6.4 \times 10^{-6}$	$4.6 \times 10^{-6}$	$4.3 \times 10^{-6}$	$3.5 \times 10^{-6}$
		F	0.005	$1.1 \times 10^{-7}$	$5.0 \times 10^{-4}$	$8.9 \times 10^{-8}$	$4.9 \times 10^{-8}$	$3.5 \times 10^{-8}$	$2.8 \times 10^{-8}$	$2.7 \times 10^{-8}$
Cm-242	163 d	M	0.005	$1.3 \times 10^{-7}$	$5.0 \times 10^{-4}$	$1.0 \times 10^{-7}$	$6.6 \times 10^{-8}$	$4.8 \times 10^{-8}$	$4.4 \times 10^{-8}$	$3.7 \times 10^{-8}$
		S	0.005	$1.4 \times 10^{-7}$	$5.0 \times 10^{-4}$	$1.1 \times 10^{-7}$	$6.9 \times 10^{-8}$	$4.9 \times 10^{-8}$	$4.5 \times 10^{-8}$	$3.7 \times 10^{-8}$
		F	0.005	$2.7 \times 10^{-5}$	$5.0 \times 10^{-4}$	$2.1 \times 10^{-5}$	$1.0 \times 10^{-5}$	$6.1 \times 10^{-6}$	$4.0 \times 10^{-6}$	$3.3 \times 10^{-6}$
Cm-243	28.5 a	M	0.005	$2.2 \times 10^{-5}$	$5.0 \times 10^{-4}$	$1.8 \times 10^{-5}$	$1.1 \times 10^{-5}$	$7.3 \times 10^{-6}$	$6.4 \times 10^{-6}$	$5.2 \times 10^{-6}$
		S	0.005	$2.4 \times 10^{-5}$	$5.0 \times 10^{-4}$	$1.9 \times 10^{-5}$	$1.2 \times 10^{-5}$	$8.2 \times 10^{-6}$	$7.3 \times 10^{-6}$	$5.9 \times 10^{-6}$
		F	0.005	$1.6 \times 10^{-4}$	$5.0 \times 10^{-4}$	$1.5 \times 10^{-4}$	$9.5 \times 10^{-5}$	$7.3 \times 10^{-5}$	$6.5 \times 10^{-5}$	$6.9 \times 10^{-5}$
Cm-244	18.1 a	M	0.005	$6.7 \times 10^{-5}$	$5.0 \times 10^{-4}$	$6.1 \times 10^{-5}$	$4.2 \times 10^{-5}$	$3.1 \times 10^{-5}$	$3.0 \times 10^{-5}$	$3.1 \times 10^{-5}$
		S	0.005	$4.6 \times 10^{-5}$	$5.0 \times 10^{-4}$	$4.0 \times 10^{-5}$	$2.6 \times 10^{-5}$	$1.8 \times 10^{-5}$	$1.6 \times 10^{-5}$	$1.5 \times 10^{-5}$
		F	0.005	$1.5 \times 10^{-4}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-4}$	$8.3 \times 10^{-5}$	$6.1 \times 10^{-5}$	$5.3 \times 10^{-5}$	$5.7 \times 10^{-5}$
Cm-245	$8.50 \times 10^3$ a	M	0.005	$6.2 \times 10^{-5}$	$5.0 \times 10^{-4}$	$5.7 \times 10^{-5}$	$3.7 \times 10^{-5}$	$2.7 \times 10^{-5}$	$2.6 \times 10^{-5}$	$2.7 \times 10^{-5}$
		S	0.005	$4.4 \times 10^{-5}$	$5.0 \times 10^{-4}$	$3.8 \times 10^{-5}$	$2.5 \times 10^{-5}$	$1.7 \times 10^{-5}$	$1.5 \times 10^{-5}$	$1.3 \times 10^{-5}$
		F	0.005	$1.9 \times 10^{-4}$	$5.0 \times 10^{-4}$	$1.8 \times 10^{-4}$	$1.2 \times 10^{-4}$	$1.0 \times 10^{-4}$	$9.4 \times 10^{-5}$	$9.9 \times 10^{-5}$
Cm-246	$4.73 \times 10^3$ a	M	0.005	$7.3 \times 10^{-5}$	$5.0 \times 10^{-4}$	$6.9 \times 10^{-5}$	$5.1 \times 10^{-5}$	$4.1 \times 10^{-5}$	$4.1 \times 10^{-5}$	$4.2 \times 10^{-5}$
		S	0.005	$4.5 \times 10^{-5}$	$5.0 \times 10^{-4}$	$4.0 \times 10^{-5}$	$2.7 \times 10^{-5}$	$1.9 \times 10^{-5}$	$1.7 \times 10^{-5}$	$1.6 \times 10^{-5}$
		F	0.005	$1.9 \times 10^{-4}$	$5.0 \times 10^{-4}$	$1.8 \times 10^{-4}$	$1.2 \times 10^{-4}$	$1.0 \times 10^{-4}$	$9.4 \times 10^{-5}$	$9.8 \times 10^{-5}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a			$f_1$ for $g > 1$ a	Age 1-2 $f_1$ for	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$
		Type	$f_1$	$e(g)$						
Cm-247	1.56 × 10 <sup>7</sup> a	M	0.005	7.3 × 10 <sup>-5</sup>	5.0 × 10 <sup>-4</sup>	6.9 × 10 <sup>-5</sup>	5.1 × 10 <sup>-5</sup>	4.1 × 10 <sup>-5</sup>	4.1 × 10 <sup>-5</sup>	4.2 × 10 <sup>-5</sup>
		S	0.005	4.6 × 10 <sup>-5</sup>	5.0 × 10 <sup>-4</sup>	4.0 × 10 <sup>-5</sup>	2.7 × 10 <sup>-5</sup>	1.9 × 10 <sup>-5</sup>	1.7 × 10 <sup>-5</sup>	1.6 × 10 <sup>-5</sup>
		F	0.005	1.7 × 10 <sup>-4</sup>	5.0 × 10 <sup>-4</sup>	1.6 × 10 <sup>-4</sup>	1.1 × 10 <sup>-4</sup>	9.4 × 10 <sup>-5</sup>	8.6 × 10 <sup>-5</sup>	8.6 × 10 <sup>-5</sup>
Cm-248	3.39 × 10 <sup>5</sup> a	M	0.005	6.7 × 10 <sup>-5</sup>	5.0 × 10 <sup>-4</sup>	6.3 × 10 <sup>-5</sup>	4.7 × 10 <sup>-5</sup>	3.7 × 10 <sup>-5</sup>	3.7 × 10 <sup>-5</sup>	3.9 × 10 <sup>-5</sup>
		S	0.005	4.1 × 10 <sup>-5</sup>	5.0 × 10 <sup>-4</sup>	3.6 × 10 <sup>-5</sup>	2.4 × 10 <sup>-5</sup>	1.7 × 10 <sup>-5</sup>	1.5 × 10 <sup>-5</sup>	1.4 × 10 <sup>-5</sup>
		F	0.005	6.8 × 10 <sup>-4</sup>	5.0 × 10 <sup>-4</sup>	6.5 × 10 <sup>-4</sup>	4.5 × 10 <sup>-4</sup>	3.7 × 10 <sup>-4</sup>	3.4 × 10 <sup>-4</sup>	3.6 × 10 <sup>-4</sup>
Cm-249	1.07 h	M	0.005	2.5 × 10 <sup>-4</sup>	5.0 × 10 <sup>-4</sup>	2.4 × 10 <sup>-4</sup>	1.8 × 10 <sup>-4</sup>	1.4 × 10 <sup>-4</sup>	1.4 × 10 <sup>-4</sup>	1.5 × 10 <sup>-4</sup>
		S	0.005	1.4 × 10 <sup>-4</sup>	5.0 × 10 <sup>-4</sup>	1.2 × 10 <sup>-4</sup>	8.2 × 10 <sup>-5</sup>	5.6 × 10 <sup>-5</sup>	5.0 × 10 <sup>-5</sup>	4.8 × 10 <sup>-5</sup>
		F	0.005	1.8 × 10 <sup>-10</sup>	5.0 × 10 <sup>-4</sup>	9.8 × 10 <sup>-11</sup>	5.9 × 10 <sup>-11</sup>	4.6 × 10 <sup>-11</sup>	4.0 × 10 <sup>-11</sup>	4.0 × 10 <sup>-11</sup>
Cm-250	6.90 × 10 <sup>3</sup> a	M	0.005	2.4 × 10 <sup>-10</sup>	5.0 × 10 <sup>-4</sup>	1.6 × 10 <sup>-10</sup>	8.2 × 10 <sup>-11</sup>	5.8 × 10 <sup>-11</sup>	3.7 × 10 <sup>-11</sup>	3.3 × 10 <sup>-11</sup>
		S	0.005	2.4 × 10 <sup>-10</sup>	5.0 × 10 <sup>-4</sup>	1.6 × 10 <sup>-10</sup>	7.8 × 10 <sup>-11</sup>	5.3 × 10 <sup>-11</sup>	3.9 × 10 <sup>-11</sup>	3.3 × 10 <sup>-11</sup>
		F	0.005	3.9 × 10 <sup>-3</sup>	5.0 × 10 <sup>-4</sup>	3.7 × 10 <sup>-3</sup>	2.6 × 10 <sup>-3</sup>	2.1 × 10 <sup>-3</sup>	2.0 × 10 <sup>-3</sup>	2.1 × 10 <sup>-3</sup>
Berkelium		M	0.005	1.4 × 10 <sup>-3</sup>	5.0 × 10 <sup>-4</sup>	1.3 × 10 <sup>-3</sup>	9.9 × 10 <sup>-4</sup>	7.9 × 10 <sup>-4</sup>	7.9 × 10 <sup>-4</sup>	8.4 × 10 <sup>-4</sup>
		S	0.005	7.2 × 10 <sup>-4</sup>	5.0 × 10 <sup>-4</sup>	6.5 × 10 <sup>-4</sup>	4.4 × 10 <sup>-4</sup>	3.0 × 10 <sup>-4</sup>	2.7 × 10 <sup>-4</sup>	2.6 × 10 <sup>-4</sup>
		F	0.005	8.8 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	6.6 × 10 <sup>-9</sup>	4.0 × 10 <sup>-9</sup>	2.9 × 10 <sup>-9</sup>	2.6 × 10 <sup>-9</sup>	2.1 × 10 <sup>-9</sup>
Bk-246	1.83 d	M	0.005	2.1 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	1.7 × 10 <sup>-9</sup>	9.3 × 10 <sup>-10</sup>	6.0 × 10 <sup>-10</sup>	4.0 × 10 <sup>-10</sup>	3.3 × 10 <sup>-10</sup>
		M	0.005	1.5 × 10 <sup>-4</sup>	5.0 × 10 <sup>-4</sup>	1.5 × 10 <sup>-4</sup>	1.1 × 10 <sup>-4</sup>	7.9 × 10 <sup>-5</sup>	7.2 × 10 <sup>-5</sup>	6.9 × 10 <sup>-5</sup>
		M	0.005	3.3 × 10 <sup>-7</sup>	5.0 × 10 <sup>-4</sup>	3.3 × 10 <sup>-7</sup>	2.4 × 10 <sup>-7</sup>	1.8 × 10 <sup>-7</sup>	1.6 × 10 <sup>-7</sup>	1.6 × 10 <sup>-7</sup>
Bk-249	320 d	M	0.005	3.4 × 10 <sup>-9</sup>	5.0 × 10 <sup>-4</sup>	3.1 × 10 <sup>-9</sup>	2.0 × 10 <sup>-9</sup>	1.3 × 10 <sup>-9</sup>	1.1 × 10 <sup>-9</sup>	1.0 × 10 <sup>-9</sup>
		M	0.005	7.6 × 10 <sup>-8</sup>	5.0 × 10 <sup>-4</sup>	5.4 × 10 <sup>-8</sup>	2.8 × 10 <sup>-8</sup>	2.0 × 10 <sup>-8</sup>	1.6 × 10 <sup>-8</sup>	1.4 × 10 <sup>-8</sup>
Californium										
Cf-244	0.323 h	M	0.005	7.6 × 10 <sup>-8</sup>	5.0 × 10 <sup>-4</sup>	5.4 × 10 <sup>-8</sup>	2.8 × 10 <sup>-8</sup>	2.0 × 10 <sup>-8</sup>	1.6 × 10 <sup>-8</sup>	1.4 × 10 <sup>-8</sup>

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2 $f_1$ for $g > 1$ a	2-7 a $e(g)$	7-12 a $e(g)$	12t-17 a $e(g)$	>17 a $e(g)$		
		Type	$f_1$							
			$e(g)$							
Cf-246	1.49 d	M	0.005	$1.7 \times 10^{-6}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-6}$	$8.3 \times 10^{-7}$	$6.1 \times 10^{-7}$	$5.7 \times 10^{-7}$	$4.5 \times 10^{-7}$
Cf-248	334 d	M	0.005	$3.8 \times 10^{-5}$	$5.0 \times 10^{-4}$	$3.2 \times 10^{-5}$	$2.1 \times 10^{-5}$	$1.4 \times 10^{-5}$	$1.0 \times 10^{-5}$	$8.8 \times 10^{-6}$
Cf-249	$3.50 \times 10^2$ a	M	0.005	$1.6 \times 10^{-4}$	$5.0 \times 10^{-4}$	$1.5 \times 10^{-4}$	$1.1 \times 10^{-4}$	$8.0 \times 10^{-5}$	$7.2 \times 10^{-5}$	$7.0 \times 10^{-5}$
Cf-250	13.1 a	M	0.005	$1.1 \times 10^{-4}$	$5.0 \times 10^{-4}$	$9.8 \times 10^{-5}$	$6.6 \times 10^{-5}$	$4.2 \times 10^{-5}$	$3.5 \times 10^{-5}$	$3.4 \times 10^{-5}$
Cf-251	$8.98 \times 10^2$ a	M	0.005	$1.6 \times 10^{-4}$	$5.0 \times 10^{-4}$	$1.5 \times 10^{-4}$	$1.1 \times 10^{-4}$	$8.1 \times 10^{-5}$	$7.3 \times 10^{-5}$	$7.1 \times 10^{-5}$
Cf-252	2.64 a	M	0.005	$9.7 \times 10^{-5}$	$5.0 \times 10^{-4}$	$8.7 \times 10^{-5}$	$5.6 \times 10^{-5}$	$3.2 \times 10^{-5}$	$2.2 \times 10^{-5}$	$2.0 \times 10^{-5}$
Cf-253	17.8 d	M	0.005	$5.4 \times 10^{-6}$	$5.0 \times 10^{-4}$	$4.2 \times 10^{-6}$	$2.6 \times 10^{-6}$	$1.9 \times 10^{-6}$	$1.7 \times 10^{-6}$	$1.3 \times 10^{-6}$
Cf-254	60.5 d	M	0.005	$2.5 \times 10^{-4}$	$5.0 \times 10^{-4}$	$1.9 \times 10^{-4}$	$1.1 \times 10^{-4}$	$7.0 \times 10^{-5}$	$4.8 \times 10^{-5}$	$4.1 \times 10^{-5}$
<b>Einsteinium</b>										
Es-250	2.10 h	M	0.005	$2.0 \times 10^{-9}$	$5.0 \times 10^{-4}$	$1.8 \times 10^{-9}$	$1.2 \times 10^{-9}$	$7.8 \times 10^{-10}$	$6.4 \times 10^{-10}$	$6.3 \times 10^{-10}$
Es-251	1.38 d	M	0.005	$7.9 \times 10^{-9}$	$5.0 \times 10^{-4}$	$6.0 \times 10^{-9}$	$3.9 \times 10^{-9}$	$2.8 \times 10^{-9}$	$2.6 \times 10^{-9}$	$2.1 \times 10^{-9}$
Es-253	20.5 d	M	0.005	$1.1 \times 10^{-5}$	$5.0 \times 10^{-4}$	$8.0 \times 10^{-6}$	$5.1 \times 10^{-6}$	$3.7 \times 10^{-6}$	$3.4 \times 10^{-6}$	$2.7 \times 10^{-6}$
Es-254	276 d	M	0.005	$3.7 \times 10^{-5}$	$5.0 \times 10^{-4}$	$3.1 \times 10^{-5}$	$2.0 \times 10^{-5}$	$1.3 \times 10^{-5}$	$1.0 \times 10^{-5}$	$8.6 \times 10^{-6}$
Es-254m	1.64 d	M	0.005	$1.7 \times 10^{-6}$	$5.0 \times 10^{-4}$	$1.3 \times 10^{-6}$	$8.4 \times 10^{-7}$	$6.3 \times 10^{-7}$	$5.9 \times 10^{-7}$	$4.7 \times 10^{-7}$
<b>Fermium</b>										
Fm-252	22.7 h	M	0.005	$1.2 \times 10^{-6}$	$5.0 \times 10^{-4}$	$9.0 \times 10^{-7}$	$5.8 \times 10^{-7}$	$4.3 \times 10^{-7}$	$4.0 \times 10^{-7}$	$3.2 \times 10^{-7}$
Fm-253	3.00 d	M	0.005	$1.5 \times 10^{-6}$	$5.0 \times 10^{-4}$	$1.2 \times 10^{-6}$	$7.3 \times 10^{-7}$	$5.4 \times 10^{-7}$	$5.0 \times 10^{-7}$	$4.0 \times 10^{-7}$
Fm-254	3.24 h	M	0.005	$3.2 \times 10^{-7}$	$5.0 \times 10^{-4}$	$2.3 \times 10^{-7}$	$1.3 \times 10^{-7}$	$9.8 \times 10^{-8}$	$7.6 \times 10^{-8}$	$6.1 \times 10^{-8}$
Fm-255	20.1 h	M	0.005	$1.2 \times 10^{-6}$	$5.0 \times 10^{-4}$	$7.3 \times 10^{-7}$	$4.7 \times 10^{-7}$	$3.5 \times 10^{-7}$	$3.4 \times 10^{-7}$	$2.7 \times 10^{-7}$
Fm-257	101 d	M	0.005	$3.3 \times 10^{-5}$	$5.0 \times 10^{-4}$	$2.6 \times 10^{-5}$	$1.6 \times 10^{-5}$	$1.1 \times 10^{-5}$	$8.8 \times 10^{-6}$	$7.1 \times 10^{-6}$

Radionuclide <sup>a</sup>	Physical half-life	Age ≤ 1a		Age 1-2	2-7 a	7-12 a	12t-17 a	>17 a
		Type	$f_1$					
Mendelevium				$f_1$ for g > 1 a				
Md-257	5.20 h	M	0.005	$1.0 \times 10^{-7}$	$5.0 \times 10^{-4}$	$8.2 \times 10^{-8}$	$5.1 \times 10^{-8}$	$3.1 \times 10^{-8}$
Md-258	55.0 d	M	0.005	$2.4 \times 10^{-5}$	$5.0 \times 10^{-4}$	$1.9 \times 10^{-5}$	$1.2 \times 10^{-5}$	$7.3 \times 10^{-6}$

<sup>a</sup> m and m' denote metastable states of the radionuclide. The metastable state m' is of higher energy than the metastable state m.

<sup>b</sup> The  $f_1$  value for calcium for 1-15 year olds for Type F is 0.4.

<sup>c</sup> The  $f_1$  value for iron for 1-15 year olds for Type F is 0.2.

<sup>d</sup> The  $f_1$  value for cobalt for 1-15 year olds for Type F is 0.3.

<sup>e</sup> The  $f_1$  value for strontium for 1-15 year olds for Type F is 0.4.

<sup>f</sup> The  $f_1$  value for barium for 1-15 year olds for Type F is 0.3.

<sup>g</sup> The  $f_1$  value for lead for 1-15 year olds for Type F is 0.4.

<sup>h</sup> The  $f_1$  value for radium for 1-15 year olds for Type F is 0.3.

**Note:** Types F, M and S denote fast, moderate and slow absorption from the lung, respectively;  $f_1$ : gut transfer factor;  $e(g)$ : effective dose

**TABLE II.F. Lung Absorption Types Used to Calculate Committed Effective Dose Per Unit Intake Via Inhalation for Exposure Due to Particulate Aerosols Or Due to Gases and Vapours for Members of the Public**

<b>Element</b>	<b>Absorption type(s)</b>	<b>ICRP Publication No. for details of biokinetic model and absorption type(s)</b>
Hydrogen	F, M <sup>b</sup> , S, G	Publications 56 [1], 67 [2] and 71 [3]
Beryllium	M, S	Publication 30, Part 3 [4]
Carbon	F, M <sup>b</sup> , S, G	Publications 56 [1], 67 [2] and 71 [3]
Fluorine	F, M, S	Publication 30, Part 2 [4]
Sodium	F	Publication 30, Part 2 [4]
Magnesium	F, M	Publication 30, Part 3 [4]
Aluminium	F, M	Publication 30, Part 3 [4]
Silicon	F, M, S	Publication 30, Part 3 [4]
Phosphorus	F, M	Publication 30, Part 1 [4]
Sulphur	F, M <sup>b</sup> , S, G	Publications 67 [2] and 71 [3]
Chlorine	F, M	Publication 30, Part 2 [4]
Potassium	F	Publication 30, Part 2 [4]
Calcium	F, M, S	Publication 71 [3]
Scandium	S	Publication 30, Part 3 [4]
Titanium	F, M, S	Publication 30, Part 3 [4]
Vanadium	F, M	Publication 30, Part 3 [4]
Chromium	F, M, S	Publication 30, Part 2 [4]
Manganese	F, M	Publication 30, Part 1 [4]
Iron	F, M <sup>b</sup> , S	Publications 69 [5] and 71 [3]
Cobalt	F, M <sup>b</sup> , S	Publications 67 [2] and 71 [3]
Nickel	F, M <sup>b</sup> , S, G	Publications 67 [2] and 71 [3]
Copper	F, M, S	Publication 30, Part 2 [4]
Zinc	F, M <sup>b</sup> , S	Publications 67 [2] and 71 [3]
Gallium	F, M	Publication 30, Part 3 [4]
Germanium	F, M	Publication 30, Part 3 [4]
Arsenic	M	Publication 30, Part 3 [4]
Selenium	F <sup>b</sup> , M, S	Publications 69 [5] and 71 [3]



Element	Absorption type(s)	ICRP Publication No. for details of biokinetic model and absorption type(s)
Bromine	F, M	Publication 30, Part 2 [4]
Rubidium	F	Publication 30, Part 2 [4]
Strontium	F, M <sup>b</sup> , S	Publications 67 [2] and 71 [3]
Yttrium	M, S	Publication 30, Part 2 [4]
Zirconium	F, M <sup>b</sup> , S	Publications 56 [1], 67 [2] and 71 [3]
Niobium	F, M <sup>b</sup> , S	Publications 56 [1], 67 [2] and 71 [3]
Molybdenum	F, M <sup>b</sup> , S	Publications 67 [2] and 71 [3]
Technetium	F, M <sup>b</sup> , S	Publications 67 [2] and 71 [3]
Ruthenium	F, M <sup>b</sup> , S, G	Publications 56 [1], 67 [2] and 71 [3]
Rhodium	F, M, S	Publication 30, Part 2 [4]
Palladium	F, M, S	Publication 30, Part 3 [4]
Silver	F, M <sup>b</sup> , S	Publications 67 [2] and 71 [3]
Cadmium	F, M, S	Publication 30, Part 2 [4]
Indium	F, M	Publication 30, Part 2 [4]
Tin	F, M	Publication 30, Part 3 [4]
Antimony	F, M <sup>b</sup> , S	Publications 69 [5] and 71 [3]
Tellurium	F, M <sup>b</sup> , S, G	Publications 67 [2] and 71 [3]
Iodine	F <sup>b</sup> , M, S, G	Publications 56 [1], 67 [2] and 71 [3]
Caesium	F <sup>b</sup> , M, S	Publications 56 [1], 67 [2] and 71 [3]
Barium	F, M <sup>b</sup> , S	Publications 67 [2] and 71 [3]
Lanthanum	F, M	Publication 30, Part 3 [4]
Cerium	F, M <sup>b</sup> , S	Publications 56 [1], 67 [2] and 71 [3]
Praseodymium	M, S	Publication 30, Part 3 [4]
Neodymium	M, S	Publication 30, Part 3 [4]
Promethium	M, S	Publication 30, Part 3 [4]
Samarium	M	Publication 30, Part 3 [4]
Europium	M	Publication 30, Part 3 [4]
Gadolinium	F, M	Publication 30, Part 3 [4]
Terbium	M	Publication 30, Part 3 [4]
Dysprosium	M	Publication 30, Part 3 [4]
Holmium	M	Publication 30, Part 3 [4]

Element	Absorption type(s)	ICRP Publication No. for details of biokinetic model and absorption type(s)
Erbium	M	Publication 30, Part 3 [4]
Thulium	M	Publication 30, Part 3 [4]
Ytterbium	M, S	Publication 30, Part 3 [4]
Lutetium	M, S	Publication 30, Part 3 [4]
Hafnium	F, M	Publication 30, Part 3 [4]
Tantalum	M, S	Publication 30, Part 3 [4]
Tungsten	F	Publication 30, Part 3 [4]
Rhenium	F, M	Publication 30, Part 2 [4]
Osmium	F, M, S	Publication 30, Part 2 [4]
Iridium	F, M, S	Publication 30, Part 2 [4]
Platinum	F	Publication 30, Part 3 [4]
Gold	F, M, S	Publication 30, Part 2 [4]
Mercury	F, M, G	Publication 30, Part 2 [4]
Thallium	F	Publication 30, Part 3 [4]
Lead	F, M <sup>b</sup> , S, G	Publications 67 [2] and 71 [3]
Bismuth	F, M	Publication 30, Part 2 [4]
Polonium	F, M <sup>b</sup> , S, G	Publications 67 [2] and 71 [3]
Astatine	F, M	Publication 30, Part 3 [4]
Francium	F	Publication 30, Part 3 [4]
Radium	F, M <sup>b</sup> , S	Publications 67 [2] and 71 [3]
Actinium	F, M, S	Publication 30, Part 3 [4]
Thorium	F, M, S <sup>b</sup>	Publications 69 [5] and 71 [3]
Protactinium	M, S	Publication 30, Part 3 [4]
Uranium	F, M <sup>b</sup> , S	Publications 69 [5] and 71 [3]
Neptunium	F, M <sup>b</sup> , S	Publications 67 [2] and 71 [3]
Plutonium	F, M <sup>b</sup> , S	Publications 67 [2] and 71 [3]
Americium	F, M <sup>b</sup> , S	Publications 67 [2] and 71 [3]
Curium	F, M <sup>b</sup> , S	Publication 71 [3]

<b>Element</b>	<b>Absorption type(s)</b>	<b>ICRP Publication No. for details of biokinetic model and absorption type(s)</b>
Berkelium	M	Publication 30, Part 4 [4]
Californium	M	Publication 30, Part 4 [4]
Einsteinium	M	Publication 30, Part 4 [4]
Fermium	M	Publication 30, Part 4 [4]

<sup>a</sup> For particulates: F: fast; M: moderate; S: slow; G: gases and vapours.

<sup>b</sup> Recommended default absorption type for particulate aerosol when no specific information is available (see ICRP Publication No. 71 [3]).

- [1.] INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION, Age-dependent Doses to Members of the Public from Intake of Radionuclides — Part 1, Publication 56, Pergamon Press, Oxford and New York (1990).
- [2.] INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION, Age-dependent Doses to Members of the Public from Intake of Radionuclides — Part 2 Ingestion Dose Coefficients, Publication 67, Pergamon Press, Oxford and New York (1992).
- [3.] INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION, Age-dependent Doses to Members of the Public from Intake of Radionuclides — Part 4 Inhalation Dose Coefficients, Publication 71, Pergamon Press, Oxford and New York (1995).
- [4.] INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION, Limits for In-takes of Radionuclides by Workers, Publication 30 (Suppl. B to Part 3), Pergamon Press, Oxford and New York (1982).
- [5.] INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION, Age-dependent Doses to Members of the Public from Intake of Radionuclides — Part 3 Ingestion Dose Coefficients, Publication 69, Pergamon Press, Oxford and New York (1995).



**TABLE II. G. Inhalation: Committed Effective Dose Per Unit Intake E(G) (Sv/Bq) for Soluble Or Reactive Gases and Vapours**

Radionuclide <sup>a</sup>	Physical half-life	Absorption <sup>a</sup>	% deposits	Age ≤ 1 a		$f_1$ for g> 1 a	Age ≤ 1 a e(g)	2-7 a e(g)	7-12 a e(g)	12-17 a e(g)	>17 a e(g)
				$f_1$	e(g)						
Tritiated water	12.3 a	V	100	1.000	$6.4 \times 10^{-11}$	1.000	$4.8 \times 10^{-11}$	$3.1 \times 10^{-11}$	$2.3 \times 10^{-11}$	$1.8 \times 10^{-11}$	$1.8 \times 10^{-11}$
Elemental hydrogen	12.3 a	V	0.01	1.000	$6.4 \times 10^{-15}$	1.000	$4.8 \times 10^{-15}$	$3.1 \times 10^{-15}$	$2.3 \times 10^{-15}$	$1.8 \times 10^{-15}$	$1.8 \times 10^{-15}$
Tritiated methane	12.3 a	V	1	1.000	$6.4 \times 10^{-13}$	1.000	$4.8 \times 10^{-13}$	$3.1 \times 10^{-13}$	$2.3 \times 10^{-13}$	$1.8 \times 10^{-13}$	$1.8 \times 10^{-13}$
Organically bound tritium	12.3 a	V	100	1.000	$1.1 \times 10^{-10}$	1.000	$1.1 \times 10^{-10}$	$7.0 \times 10^{-11}$	$5.5 \times 10^{-11}$	$4.1 \times 10^{-11}$	$4.1 \times 10^{-11}$
Carbon-11 vapour	0.40 h	V	100	1.000	$2.8 \times 10^{-11}$	1.000	$1.8 \times 10^{-11}$	$9.7 \times 10^{-12}$	$6.1 \times 10^{-12}$	$3.8 \times 10^{-12}$	$3.2 \times 10^{-12}$
Carbon-11 dioxide	0.40 h	V	100	1.000	$1.8 \times 10^{-11}$	1.000	$1.2 \times 10^{-11}$	$6.5 \times 10^{-12}$	$4.1 \times 10^{-12}$	$2.5 \times 10^{-12}$	$2.2 \times 10^{-12}$
Carbon-11 monoxide	0.40 h	V	40	1.000	$1.0 \times 10^{-11}$	1.000	$6.7 \times 10^{-12}$	$3.5 \times 10^{-12}$	$2.2 \times 10^{-12}$	$1.4 \times 10^{-12}$	$1.2 \times 10^{-12}$
Carbon-14 vapour	$5.73 \times 10^3$ a	V	100	1.000	$1.3 \times 10^{-9}$	1.000	$1.6 \times 10^{-9}$	$9.7 \times 10^{-10}$	$7.9 \times 10^{-10}$	$5.7 \times 10^{-10}$	$5.8 \times 10^{-10}$
Carbon-14 dioxide	$5.73 \times 10^3$ a	V	100	1.000	$1.9 \times 10^{-11}$	1.000	$1.9 \times 10^{-11}$	$1.1 \times 10^{-11}$	$8.9 \times 10^{-12}$	$6.3 \times 10^{-12}$	$6.2 \times 10^{-12}$
Carbon-14 monoxide	$5.73 \times 10^3$ a	V	40	1.000	$9.1 \times 10^{-12}$	1.000	$5.7 \times 10^{-12}$	$2.8 \times 10^{-12}$	$1.7 \times 10^{-12}$	$9.9 \times 10^{-13}$	$8.0 \times 10^{-13}$
Carbon disulphide-35	87.4 d	F	100	1.000	$9.4 \times 10^{-10}$	0.800	$6.6 \times 10^{-10}$	$3.4 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.1 \times 10^{-10}$
Sulphur-35	87.4 d	F	85	1.000	$9.4 \times 10^{-10}$	0.800	$6.6 \times 10^{-10}$	$3.4 \times 10^{-10}$	$2.1 \times 10^{-10}$	$1.3 \times 10^{-10}$	$1.1 \times 10^{-10}$
Nickel-56 carbonyl	6.10 d	c	100	1.000	$6.8 \times 10^{-9}$	1.000	$5.2 \times 10^{-9}$	$3.2 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.4 \times 10^{-9}$	$1.2 \times 10^{-9}$
Nickel-57 carbonyl	1.50 d	c	100	1.000	$3.1 \times 10^{-9}$	1.000	$2.3 \times 10^{-9}$	$1.4 \times 10^{-9}$	$9.2 \times 10^{-10}$	$6.5 \times 10^{-10}$	$5.6 \times 10^{-10}$
Nickel-59 carbonyl	$7.50 \times 10^4$ a	c	100	1.000	$4.0 \times 10^{-9}$	1.000	$3.3 \times 10^{-9}$	$2.0 \times 10^{-9}$	$1.3 \times 10^{-9}$	$9.1 \times 10^{-10}$	$8.3 \times 10^{-10}$
Nickel-63 carbonyl	96.0 a	c	100	1.000	$9.5 \times 10^{-9}$	1.000	$8.0 \times 10^{-9}$	$4.8 \times 10^{-9}$	$3.0 \times 10^{-9}$	$2.2 \times 10^{-9}$	$2.0 \times 10^{-9}$
Nickel-65 carbonyl	2.52 h	c	100	1.000	$2.0 \times 10^{-9}$	1.000	$1.4 \times 10^{-9}$	$8.1 \times 10^{-10}$	$5.6 \times 10^{-10}$	$4.0 \times 10^{-10}$	$3.6 \times 10^{-10}$
Nickel-66 carbonyl	2.27 d	c	100	1.000	$1.0 \times 10^{-8}$	1.000	$7.1 \times 10^{-9}$	$4.0 \times 10^{-9}$	$2.7 \times 10^{-9}$	$1.8 \times 10^{-9}$	$1.6 \times 10^{-9}$

Radionuclide <sup>a</sup>	Physical half-life	Absorption <sup>a</sup>	% deposits	Age ≤ 1 a		$f_1$ for $g > 1$ a	Age ≤ 1 a e(g)	2-7 a e(g)	7-12 a e(g)	12-17 a e(g)	>17 a e(g)
				$f_1$	e(g)						
Ruthenium-94 tetroxide	0.863 h	F	100	0.100	$5.5 \times 10^{-10}$	0.050	$3.5 \times 10^{-10}$	$1.8 \times 10^{-10}$	$1.1 \times 10^{-10}$	$7.0 \times 10^{-11}$	$5.6 \times 10^{-11}$
Ruthenium-97 tetroxide	2.90 d	F	100	0.100	$8.7 \times 10^{-10}$	0.050	$6.2 \times 10^{-10}$	$3.4 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.4 \times 10^{-10}$	$1.2 \times 10^{-10}$
Ruthenium-3	39.3 d	F	100	0.100	$9.0 \times 10^{-9}$	0.050	$6.2 \times 10^{-9}$	$3.3 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.3 \times 10^{-9}$	$1.1 \times 10^{-9}$
Ruthenium-6 tetroxide	1.01 a	F	100	0.100	$1.6 \times 10^{-7}$	0.050	$1.1 \times 10^{-7}$	$6.1 \times 10^{-8}$	$3.7 \times 10^{-8}$	$2.2 \times 10^{-8}$	$1.8 \times 10^{-8}$
Tellurium-116 vapour	2.49 h	F	100	0.600	$5.9 \times 10^{-10}$	0.300	$4.4 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.1 \times 10^{-10}$	$8.7 \times 10^{-11}$
Tellurium-121 vapour	17.0 d	F	100	0.600	$3.0 \times 10^{-9}$	0.300	$2.4 \times 10^{-9}$	$1.4 \times 10^{-9}$	$9.6 \times 10^{-10}$	$6.7 \times 10^{-10}$	$5.1 \times 10^{-10}$
Tellurium-121m vapour	154 d	F	100	0.600	$3.5 \times 10^{-8}$	0.300	$2.7 \times 10^{-8}$	$1.6 \times 10^{-8}$	$9.8 \times 10^{-9}$	$6.6 \times 10^{-9}$	$5.5 \times 10^{-9}$
Tellurium-123 vapour	$1.00 \times 10^{13}$ a	F	100	0.600	$2.8 \times 10^{-8}$	0.300	$2.5 \times 10^{-8}$	$1.9 \times 10^{-8}$	$1.5 \times 10^{-8}$	$1.3 \times 10^{-8}$	$1.2 \times 10^{-8}$
Tellurium-123m vapour	120 d	F	100	0.600	$2.5 \times 10^{-8}$	0.300	$1.8 \times 10^{-8}$	$1.0 \times 10^{-8}$	$5.7 \times 10^{-9}$	$3.5 \times 10^{-9}$	$2.9 \times 10^{-9}$
Tellurium-125m vapour	58.0 d	F	100	0.600	$1.5 \times 10^{-8}$	0.300	$1.1 \times 10^{-8}$	$5.9 \times 10^{-9}$	$3.2 \times 10^{-9}$	$1.9 \times 10^{-9}$	$1.5 \times 10^{-9}$
Tellurium-127 vapour	9.35 h	F	100	0.600	$6.1 \times 10^{-10}$	0.300	$4.4 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.4 \times 10^{-10}$	$9.2 \times 10^{-11}$	$7.7 \times 10^{-11}$
Tellurium-127m vapour	109 d	F	100	0.600	$5.3 \times 10^{-8}$	0.300	$3.7 \times 10^{-8}$	$1.9 \times 10^{-8}$	$1.0 \times 10^{-8}$	$6.1 \times 10^{-9}$	$4.6 \times 10^{-9}$
Tellurium-129 vapour	1.16 h	F	100	0.600	$2.5 \times 10^{-10}$	0.300	$1.7 \times 10^{-10}$	$9.4 \times 10^{-11}$	$6.2 \times 10^{-11}$	$4.3 \times 10^{-11}$	$3.7 \times 10^{-11}$
Tellurium-129m vapour	3.6 d	F	100	0.600	$4.8 \times 10^{-8}$	0.300	$3.2 \times 10^{-8}$	$1.6 \times 10^{-8}$	$8.5 \times 10^{-9}$	$5.1 \times 10^{-9}$	$3.7 \times 10^{-9}$
Tellurium-11 vapour	0.417 h	F	100	0.600	$5.1 \times 10^{-10}$	0.300	$4.5 \times 10^{-10}$	$2.6 \times 10^{-10}$	$1.4 \times 10^{-10}$	$9.5 \times 10^{-11}$	$6.8 \times 10^{-11}$
Tellurium-11m vapour	1.25 d	F	100	0.600	$2.1 \times 10^{-8}$	0.300	$1.9 \times 10^{-8}$	$1.1 \times 10^{-8}$	$5.6 \times 10^{-9}$	$3.7 \times 10^{-9}$	$2.4 \times 10^{-9}$
Tellurium-12 vapour	3.26 d	F	100	0.600	$5.4 \times 10^{-8}$	0.300	$4.5 \times 10^{-8}$	$2.4 \times 10^{-8}$	$1.2 \times 10^{-8}$	$7.6 \times 10^{-9}$	$5.1 \times 10^{-9}$
Tellurium-13 vapour	0.207 h	F	100	0.600	$5.5 \times 10^{-10}$	0.300	$4.7 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.2 \times 10^{-10}$	$8.1 \times 10^{-11}$	$5.6 \times 10^{-11}$
Tellurium-13m vapour	0.923 h	F	100	0.600	$2.3 \times 10^{-9}$	0.300	$2.0 \times 10^{-9}$	$1.1 \times 10^{-9}$	$5.0 \times 10^{-10}$	$3.3 \times 10^{-10}$	$2.2 \times 10^{-10}$
Tellurium-14 vapour	0.696 h	F	100	0.600	$6.8 \times 10^{-10}$	0.300	$5.5 \times 10^{-10}$	$3.0 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.1 \times 10^{-10}$	$8.4 \times 10^{-11}$

Radionuclide <sup>a</sup>	Physical half-life	Absorption <sup>a</sup>	% deposits	Age ≤ 1 a		$f_1$ for $g > 1$ a	Age ≤ 1 a e(g)	2-7 a e(g)	7-12 a e(g)	12-17 a e(g)	>17 a e(g)
				$f_1$	e(g)						
Elemental iodine-120	1.35 h	V	100	1.000	$3.0 \times 10^{-9}$	1.000	$2.4 \times 10^{-9}$	$1.3 \times 10^{-9}$	$6.4 \times 10^{-10}$	$4.3 \times 10^{-10}$	$3.0 \times 10^{-1}$
Elemental iodine-120m	0.883 h	V	100	1.000	$1.5 \times 10^{-9}$	1.000	$1.2 \times 10^{-9}$	$6.4 \times 10^{-10}$	$3.4 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.8 \times 10^{-10}$
Elemental iodine-121	2.12 h	V	100	1.000	$5.7 \times 10^{-10}$	1.000	$5.1 \times 10^{-10}$	$3.0 \times 10^{-10}$	$1.7 \times 10^{-10}$	$1.2 \times 10^{-10}$	$8.6 \times 10^{-11}$
Elemental iodine-123	13.2 h	V	100	1.000	$2.1 \times 10^{-9}$	1.000	$1.8 \times 10^{-9}$	$1.0 \times 10^{-9}$	$4.7 \times 10^{-10}$	$3.2 \times 10^{-10}$	$2.1 \times 10^{-10}$
Elemental iodine-124	4.18 d	V	100	1.000	$1.1 \times 10^{-7}$	1.000	$1.0 \times 10^{-7}$	$5.8 \times 10^{-8}$	$2.8 \times 10^{-8}$	$1.8 \times 10^{-8}$	$1.2 \times 10^{-8}$
Elemental iodine-125	60.1 d	V	100	1.000	$4.7 \times 10^{-8}$	1.000	$5.2 \times 10^{-8}$	$3.7 \times 10^{-8}$	$2.8 \times 10^{-8}$	$2.0 \times 10^{-8}$	$1.4 \times 10^{-8}$
Elemental iodine-126	13.0 d	V	100	1.000	$1.9 \times 10^{-7}$	1.000	$1.9 \times 10^{-7}$	$1.1 \times 10^{-7}$	$6.2 \times 10^{-8}$	$4.1 \times 10^{-8}$	$2.6 \times 10^{-8}$
Elemental iodine-128	0.416 h	V	100	1.000	$4.2 \times 10^{-10}$	1.000	$2.8 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.0 \times 10^{-10}$	$7.5 \times 10^{-11}$	$6.5 \times 10^{-11}$
Elemental iodine-129	$1.57 \times 10^7$ a	V	100	1.000	$1.7 \times 10^{-7}$	1.000	$2.0 \times 10^{-7}$	$1.6 \times 10^{-7}$	$1.7 \times 10^{-7}$	$1.3 \times 10^{-7}$	$9.6 \times 10^{-8}$
Elemental iodine-130	12.4 h	V	100	1.000	$1.9 \times 10^{-8}$	1.000	$1.7 \times 10^{-8}$	$9.2 \times 10^{-9}$	$4.3 \times 10^{-9}$	$2.8 \times 10^{-9}$	$1.9 \times 10^{-9}$
Elemental iodine-131	8.04 d	V	100	1.000	$1.7 \times 10^{-7}$	1.000	$1.6 \times 10^{-7}$	$9.4 \times 10^{-8}$	$4.8 \times 10^{-8}$	$3.1 \times 10^{-8}$	$2.0 \times 10^{-8}$
Elemental iodine-132	2.30 h	V	100	1.000	$2.8 \times 10^{-9}$	1.000	$2.3 \times 10^{-9}$	$1.3 \times 10^{-9}$	$6.4 \times 10^{-10}$	$4.3 \times 10^{-10}$	$3.1 \times 10^{-10}$
Elemental iodine-133m	1.39 h	V	100	1.000	$2.4 \times 10^{-9}$	1.000	$2.1 \times 10^{-9}$	$1.1 \times 10^{-9}$	$5.6 \times 10^{-10}$	$3.8 \times 10^{-10}$	$2.7 \times 10^{-10}$
Elemental iodine-134	20.8 h	V	100	1.000	$4.5 \times 10^{-8}$	1.000	$4.1 \times 10^{-8}$	$2.1 \times 10^{-8}$	$9.7 \times 10^{-9}$	$6.3 \times 10^{-9}$	$4.0 \times 10^{-9}$
Elemental iodine-144	0.876 h	V	100	1.000	$8.7 \times 10^{-10}$	1.000	$6.9 \times 10^{-10}$	$3.9 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.6 \times 10^{-10}$	$1.5 \times 10^{-10}$
Elemental iodine-135	6.61 h	V	100	1.000	$9.7 \times 10^{-9}$	1.000	$8.5 \times 10^{-9}$	$4.5 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.4 \times 10^{-9}$	$9.2 \times 10^{-10}$
Methyl iodide-120	1.35 h	V	70	1.000	$2.3 \times 10^{-9}$	1.000	$1.9 \times 10^{-9}$	$1.0 \times 10^{-9}$	$4.8 \times 10^{-10}$	$3.1 \times 10^{-10}$	$2.0 \times 10^{-10}$
Methyl iodide-120m	0.883 h	V	70	1.000	$1.0 \times 10^{-9}$	1.000	$8.7 \times 10^{-10}$	$4.6 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.5 \times 10^{-10}$	$1.0 \times 10^{-10}$
Methyl iodide-121	2.12 h	V	70	1.000	$4.2 \times 10^{-10}$	1.000	$3.8 \times 10^{-10}$	$2.2 \times 10^{-10}$	$1.2 \times 10^{-10}$	$8.3 \times 10^{-11}$	$5.6 \times 10^{-11}$
Methyl iodide-123	13.2 h	V	70	1.000	$1.6 \times 10^{-9}$	1.000	$1.4 \times 10^{-9}$	$7.7 \times 10^{-10}$	$3.6 \times 10^{-10}$	$2.4 \times 10^{-10}$	$1.5 \times 10^{-10}$
Methyl iodide-124	4.18 d	V	70	1.000	$8.5 \times 10^{-8}$	1.000	$8.0 \times 10^{-8}$	$4.5 \times 10^{-8}$	$2.2 \times 10^{-8}$	$1.4 \times 10^{-8}$	$9.2 \times 10^{-9}$
Methyl iodide-125	60.1 d	V	70	1.000	$3.7 \times 10^{-8}$	1.000	$4.0 \times 10^{-8}$	$2.9 \times 10^{-8}$	$2.2 \times 10^{-8}$	$1.6 \times 10^{-8}$	$1.1 \times 10^{-8}$
Methyl iodide-126	13.0 d	V	70	1.000	$1.5 \times 10^{-7}$	1.000	$1.5 \times 10^{-7}$	$9.0 \times 10^{-8}$	$4.8 \times 10^{-8}$	$3.2 \times 10^{-8}$	$2.0 \times 10^{-8}$

Radionuclide <sup>a</sup>	Physical half-life	Absorption <sup>a</sup>	% deposits	Age ≤ 1 a		$f_1$ for $g > 1$ a	Age ≤ 1 a e(g)	2-7 a e(g)	7-12 a e(g)	12-17 a e(g)	>17 a e(g)
				$f_1$	e(g)						
Methyl iodide-128	0.416 h	V	70	1.000	$1.5 \times 10^{-10}$	1.000	$1.2 \times 10^{-10}$	$6.3 \times 10^{-11}$	$3.0 \times 10^{-11}$	$1.9 \times 10^{-11}$	$1.3 \times 10^{-11}$
Methyl iodide-129	$1.57 \times 10^7$ a	V	70	1.000	$1.3 \times 10^{-7}$	1.000	$1.5 \times 10^{-7}$	$1.2 \times 10^{-7}$	$1.3 \times 10^{-7}$	$9.9 \times 10^{-8}$	$7.4 \times 10^{-8}$
Methyl iodide-130	12.4 h	V	70	1.000	$1.5 \times 10^{-8}$	1.000	$1.3 \times 10^{-8}$	$7.2 \times 10^{-9}$	$3.3 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.4 \times 10^{-9}$
Methyl iodide-131	8.04 d	V	70	1.000	$1.3 \times 10^{-7}$	1.000	$1.3 \times 10^{-7}$	$7.4 \times 10^{-8}$	$3.7 \times 10^{-8}$	$2.4 \times 10^{-8}$	$1.5 \times 10^{-8}$
Methyl iodide-12	2.30 h	V	70	1.000	$2.0 \times 10^{-9}$	1.000	$1.8 \times 10^{-9}$	$9.5 \times 10^{-10}$	$4.4 \times 10^{-10}$	$2.9 \times 10^{-10}$	$1.9 \times 10^{-10}$
Methyl iodide-12m	1.39 h	V	70	1.000	$1.8 \times 10^{-9}$	1.000	$1.6 \times 10^{-9}$	$8.3 \times 10^{-10}$	$3.9 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.6 \times 10^{-10}$
Methyl iodide-13	20.8 h	V	70	1.000	$3.5 \times 10^{-8}$	1.000	$3.2 \times 10^{-8}$	$1.7 \times 10^{-8}$	$7.6 \times 10^{-9}$	$4.9 \times 10^{-9}$	$3.1 \times 10^{-9}$
Methyl iodide-14	0.876 h	V	70	1.000	$5.1 \times 10^{-10}$	1.000	$4.3 \times 10^{-10}$	$2.3 \times 10^{-10}$	$1.1 \times 10^{-10}$	$7.4 \times 10^{-11}$	$5.0 \times 10^{-11}$
Methyl iodide-135	6.61 h	V	70	1.000	$7.5 \times 10^{-9}$	1.000	$6.7 \times 10^{-9}$	$3.5 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.1 \times 10^{-9}$	$6.8 \times 10^{-10}$
Mercury-193 vapour	3.50 h	d	70	1	$4.2 \times 10^{-9}$	1	$3.4 \times 10^{-9}$	$2.2 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.2 \times 10^{-9}$	$1.1 \times 10^{-9}$
Mercury-193m vapour	11.1 h	d	70	1	$1.2 \times 10^{-8}$	1	$9.4 \times 10^{-9}$	$6.1 \times 10^{-9}$	$4.5 \times 10^{-9}$	$3.4 \times 10^{-9}$	$3.1 \times 10^{-9}$
Mercury-194 vapour	$2.60 \times 10^2$ a	d	70	1	$9.4 \times 10^{-8}$	1	$8.3 \times 10^{-8}$	$6.2 \times 10^{-8}$	$5.0 \times 10^{-8}$	$4.3 \times 10^{-8}$	$4.0 \times 10^{-8}$
Mercury-195 vapour	9.90 h	d	70	1	$5.3 \times 10^{-9}$	1	$4.3 \times 10^{-9}$	$2.8 \times 10^{-9}$	$2.1 \times 10^{-9}$	$1.6 \times 10^{-9}$	$1.4 \times 10^{-9}$
Mercury-195m vapour	1.73 d	d	70	1	$3.0 \times 10^{-8}$	1	$2.5 \times 10^{-8}$	$1.6 \times 10^{-8}$	$1.2 \times 10^{-8}$	$8.8 \times 10^{-9}$	$8.2 \times 10^{-9}$
Mercury-197 vapour	2.67 d	d	70	1.000	$1.6 \times 10^{-8}$	1.000	$1.3 \times 10^{-8}$	$8.4 \times 10^{-9}$	$6.3 \times 10^{-9}$	$4.7 \times 10^{-9}$	$4.4 \times 10^{-9}$
Mercury-197m vapour	23.8 h	d	70	1.000	$2.1 \times 10^{-8}$	1.000	$1.7 \times 10^{-8}$	$1.1 \times 10^{-8}$	$8.2 \times 10^{-9}$	$6.2 \times 10^{-9}$	$5.8 \times 10^{-9}$
Mercury-199m vapour	0.710 h	d	70	1.000	$6.5 \times 10^{-10}$	1.000	$5.3 \times 10^{-10}$	$3.4 \times 10^{-10}$	$2.5 \times 10^{-10}$	$1.9 \times 10^{-10}$	$1.8 \times 10^{-10}$
Mercury-203 vapour	46.6 d	d	70	1.000	$3.0 \times 10^{-8}$	1.000	$2.3 \times 10^{-8}$	$1.5 \times 10^{-8}$	$1.0 \times 10^{-8}$	$7.7 \times 10^{-9}$	$7.0 \times 10^{-9}$

a F: fast; V: material is taken to be completely and instantaneously transferred to body fluids.

b Applicable to both workers and adult members of the public.

c Deposition: 30%:10%:20%:40% (extrathoracic:bronchial:bronchiolar:alveolar-interstitial; 0.1 d retention half-time).

d Deposition: 10%:20%:40% (bronchial:bronchiolar:alveolar-interstitial); 1.7 d retention half-time

**Table III.2H. Effective Dose Rate For Exposure Due To Inert Gases For Adults<sup>a</sup>**

Radionuclide	Physical half-life	Effective dose rate per unit integrated air concentration (Sv d <sup>-1</sup> /Bq m <sup>-3</sup> ) <sup>a</sup>
<b>Argon</b>		
Ar-37	35.0 d	$4.1 \times 10^{-15}$
Ar-39	269 a	$1.1 \times 10^{-11}$
Ar-41	1.83 h	$5.3 \times 10^{-9}$
<b>Krypton</b>		
Kr-74	0.192 h	$4.5 \times 10^{-9}$
Kr-76	14.8 h	$1.6 \times 10^{-9}$
Kr-77	1.245 h	$3.9 \times 10^{-9}$
Kr-79	1.46 d	$9.7 \times 10^{-10}$
Kr-81	$2.10 \times 10^5$ a	$2.1 \times 10^{-11}$
Kr-83m	1.83 h	$2.1 \times 10^{-13}$
Kr-85	10.7 a	$2.2 \times 10^{-11}$
Kr-85m	4.48 h	$5.9 \times 10^{-10}$
Kr-87	1.27 h	$3.4 \times 10^{-9}$
Kr-88	2.84 h	$8.4 \times 10^{-9}$
<b>Xenon</b>		
Xe-120	0.667 h	$1.5 \times 10^{-9}$
Xe-121	0.668 h	$7.5 \times 10^{-9}$
Xe-122	20.1 h	$1.9 \times 10^{-10}$
Xe-123	2.08 h	$2.4 \times 10^{-9}$
Xe-125	17.0 h	$9.3 \times 10^{-10}$
Xe-127	36.4 d	$9.7 \times 10^{-10}$
Xe-129m	8.0 d	$8.1 \times 10^{-11}$
Xe-11m	11.9 d	$3.2 \times 10^{-11}$
Xe-13	5.24 d	$1.2 \times 10^{-10}$
Xe-13m	2.19 d	$1.1 \times 10^{-10}$
Xe-135	9.10 h	$9.6 \times 10^{-10}$
Xe-135m	0.255 h	$1.6 \times 10^{-9}$
Xe-138	0.237 h	$4.7 \times 10^{-9}$

<sup>a</sup> Applicable to both workers and adult members of the public



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