NRPB-R306

Exempt Concentrations and Quantities for Radionuclides not included in the European Basic Safety Standards Directive

S F Mobbs and M P Harvey

Abstract

Annex 1 of the European Commission Basic Safety Standards Directive gives exemption levels for approximately 300 radionuclides. The same methodology has been used to calculate exemption levels for a further 500 radionuclides. These are given in this report, together with the BSS Annex 1 and IAEA transport values.

National Radiological Protection Board
Chilton
Didcot
Oxon OX11 0RQ

Approval date: December 1998
Publication date: April 1999
The Stationery Office, £10.00
ISBN 0 85951 429 3

This NRPB report reflects understanding and evaluation of the current scientific evidence as presented and referenced in this document.

Contents

1 Introduction

Annex 1 of the European Commission Basic Safety Standards[1] (BSS) Directive gives radionuclide specific activity concentrations and total activities below which reporting is not required. These values are commonly referred to as exemption levels. The set of 300 radionuclides for which exemption levels are presented in the BSS Directive is not exhaustive. However, the Directive states that exemption levels can be derived for other radionuclides if the same dose criteria are applied. The exemption values in Annex 1 of the BSS Directive were calculated using a methodology described in EC Report RP65[2]. This methodology and the BSS exemption criteria were subsequently applied to a further 100 or so radionuclides for the 1996 edition of the International Atomic Energy Agency (IAEA) transport regulations[3]. The same methodology and dose criteria have now been applied to a further 400 or so radionuclides. This report presents exemption values for the total of around 800: it contains the values given by the EC[1] and IAEA[3] and results for 400 or so additional radionuclides.

2 Methodology

2.1 General

The exemption values presented in the BSS Directive were based on a methodology[2] developed to calculate effective doses[1] and skin equivalent doses from various exposure scenarios and compare them with certain dose criteria. The exposure scenarios considered were use, misuse

[1] Unless otherwise indicated the word 'dose' in this report refers to the effective dose as defined in ICRP Publication 60[4]. The only exception is the equivalent dose to areas of the skin.

(accidents) and disposal of radioactive materials in different physical forms. A total of 24 exposure pathways made up these scenarios, and included exposure by external irradiation, and inhalation and ingestion of radionuclides. Doses from normal exposure to the radionuclides were compared to the BSS exemption criterion of 10 :Sv y^{-1}, based on the IAEA definition of a trivial dose[5]. Equivalent doses were compared with 50 mSv y^{-1}. Unlikely situations (such as accidents or misuse) were assigned a probability of 10^{-2} and the probability weighted effective dose was compared to 10 :Sv y^{-1}. This is the same as comparing the dose, if the accident occurs, with the dose limit recommended by the International Commission on Radiological Protection (ICRP)[4] for members of the public, 1 mSv y^{-1}. For equivalent dose to the skin, the dose if the accident occurs was compared with the equivalent dose limit for the skin, of 50 mSv y^{-1}.

The values calculated for the additional radionuclides presented in this report and for the extra 100 or so nuclides in reference 3 were performed using the same exposure scenarios and dose criteria as for Annex 1 of the BSS Directive, although updated dose coefficients have been used as described below.

2.2 Dose coefficients

Since the exemption values presented in the BSS Directive were calculated, the coefficients recommended by ICRP to relate radionuclide intake to dose ('dose coefficients') have changed. These revised dose coefficients, published in ICRP Publications 68[6] and 72[7], incorporate a new dosimetric and kinetic model of the respiratory tract[8] and new biokinetic models for selected radionuclides. Since these dose coefficients were not available when the exemption values were being calculated, values based on earlier models[9] were used in their derivation.

The transport exemption values (activity concentration for exempt material and activity limit for exempt consignment) were calculated using updated ICRP dose coefficients for workers[6] as the revised public values were not available. It should be noted that the dose coefficients for inhalation were based on a particle size of 1 :m Activity Median Aerodynamic Diameter (AMAD).

The exemption values for the additional 400 or so radionuclides are calculated using the updated ICRP dose coefficients for workers and the public[6,7] and using a particle size of 5 :m AMAD for workers and 1 :m AMAD for members of the public. This means the new concentrations and quantities contained in this document are not wholly consistent with the original EC exemption levels because they use more recent methods of calculating dose coefficients. However, they do use the same methodology and dose criteria.

2.3 Radioactive progeny

The BSS Annex 1 exemption values for a number of radionuclides included contributions from daughter radionuclides in secular equilibrium. These were denoted by '+' following the radionuclide name, for example Np-237+. The additional 100 or so radionuclides for the transport regulations included daughters in secular equilibrium if the half-life of the daughter was 10 days or less. All these daughter radionuclides are listed in Table 1. No daughters have been included for the extra 400 radionuclides. Hence Table 1 lists all the daughters considered for the complete set of 800 radionuclides. In fact, of the extra 400 radionuclides there are 37 which have daughters with half- lives of 10 days or less and which contribute 10% or greater to the dose. These are listed in Table 2. Ideally, for consistency with the 1996 IAEA transport regulations, these short-lived daughters should be included with the parent.

3 Results

The values of total activity and activity concentrations are presented in Table 3 for around 800 radionuclides calculated using the same methodology as used for the BSS Annex 1 exemption levels. The BSS Annex 1 and IAEA transport values are included in this table directly.

4 Summary and conclusions

The methodology used to calculate the 'exemption values' in Annex 1 of the EC Basic Safety Standards Directive has been used with the latest dose coefficients recommended by ICRP to calculate concentrations and quantities for around 400 radionuclides not considered in Annex 1 of the BSS Directive or the 1996 IAEA transport regulations. These are presented here, together with the BSS Annex 1 and IAEA transport values.

5 References

1 EC. Council Directive 96/29/EURATOM of 13 May 1996 laying down the Basic Safety Standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation. *Off. J. Eur. Commun.*, L159 (1996).

2 EC. Principles and methods for establishing concentrations and quantities (exemption values) below which reporting is not required in the European Directive. Brussels, Radiation Protection 65, Doc XI-028/93 (1993).

3 IAEA. Regulations for the safe transport of radioactive material. Vienna, IAEA, Safety Series No. ST1 (1996).

4 ICRP. Recommendations of the International Commission on Radiological Protection. ICRP Publication 60. *Ann. ICRP*, **21**, Nos 1–3 (1990).

5 IAEA. Principles for the exemption of radiation sources and practices from regulatory control. Vienna, IAEA Safety Series 89 (1988).

6 ICRP. Dose coefficients for intakes of radionuclides by workers. ICRP Publication 68. *Ann. ICRP*, **21**, No. 1 (1996).

7 ICRP. Age dependent doses to members of the public for intakes of radionuclides: Part 5. Compilation of ingestion and inhalation dose coefficients. ICRP Publication 72. *Ann. ICRP*, **26**, No. 1 (1996).

8 ICRP. Human respiratory tract model for respiratory protection. ICRP Publication 61. *Ann. ICRP*, **24**, Nos 1–4 (1994).

9 Phipps, A W, Kendall, G M, Stather, J W, and Fell, T P. Committed equivalent organ doses and committed effective doses from intakes of radionuclides. Chilton, NRPB-R245 (1991).

TABLE 1 (continued)

TABLE 1 Radionuclides with short-lived daughters included in secular equilibrium

Parent radionuclide	Decay product
Ac-225+	Fr-221, At-217, Bi-213, Po-213(0.978), Tl-209(0.0216), Pb-209(0.978)
Ac-227+	Fr-223(0.0138)
Ag-108m+	Ag-108(0.089)
Am-242m+	Am-242
Am-243+	Np-239
Ba-140+	La-140
Bi-210m +	Tl-206
Bi-212+	Tl-208(0.36), Po-212(0.64)
Ce-144+	Pr-144
Cs-137+	Ba-137m
Fe-60+	Co-60m
Gd-146+	Eu-146
Ge-68+	Ga-68
Hf-172+	Lu-172
Hg-194+	Au-194
Hg-195m+	Hg-195(0.542)
Ir-189+	Os-189m
Mg-28+	Al-28
Np-237+	Pa-233
Os-194+	Ir-194
Pb-210+	Bi-210, Po-210
Pb-212+	Bi-212, Tl-208(0.36), Po-212(0.64)
Pm-148m +	Pm-148(0.046)
Pt-188+	Ir-188
Ra-223+	Rn-219, Po-215, Pb-211, Bi-211,Tl-207
Ra-224+	Rn-220, Po-216, Pb-212, Bi-212, Tl-208(0.36), Po-212(0.64)
Ra-226+	Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
Ra-228+	Ac-228
Rb-83+	Kr-83m
Rn-220+	Po-216
Rn-222+	Po-218, Pb-214, Bi-214, Po-214

Ru-106+	Rh-106
Re-189+	Os-189m(0.241)
Sn-121m+	Sn-121(0.776)
Sn-126+	Sb-126m
Sr-82+	Rb-82
Sr-90+	Y-90
Tc-95m+	Tc-95(0.04)
Ti-44+	Sc-44
Th-226+	Ra-222, Rn-218, Po-214
Th-228+	Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208(0.36), Po-212(0.64)
Th-229+	Ra-225, Ac-225, Fr-221, At-217, Bi-213, Po-213(0.978), Pb-209(0.978)
Th-sec	Ra-228, Ac-228, Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208(0.36), Po-212(0.64)
Th-234+	Pa-234m
U-230+	Th-226, Ra-222, Rn-218, Po-214
U-232+	Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208(0.36), Po-212(0.64)
U-235+	Th-231
U-238+	Th-234, Pa-234m
U-sec	Th-234, Pa-234m, U-234, Th-230,Ra-226, Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
U-240+	Np-240m
W-178+	Ta-178
W-188+	Re-188
Xe-122+	I-122
Y-87+	Sr-87m
Zr-93+	Nb-93m
Zr-97+	Nb-97

Notes

(a) The radionuclides listed are those with short-lived daughters that were considered in Annex 1 of the BSS Directive[1] and IAEA Safety Standard No. ST1[3]. No short-lived daughters were considered for the extra 400 radionuclides.

(b) The number in parenthese

TABLE 2 (continued)

TABLE 2 Additional radionuclides which have short-lived daughters

Parent radionuclide	Decay product	Branching ratio
Sc-44m	Sc-44	0.986
Zn-72	Ga-72	1
Se-81m	Se-81	1
Br-80m	Br-80	1
Tc-95m	Tc-95	1
Pd-100	Rh-100	1
Cd-117	In-117m In-117	0.92 0.5124
Cd-117m	In-117 In-117m	1 0.01
In-117m	In-117	0.47
Sn-110	In-110 (short half-life)	1
Sn-128	Sb-128	1
Sb-127	Te-127	0.824
Sb-129	Te-129	0.775
Te-116	Sb-116	1
Ce-137m	Ce-137	0.99
Nd-136	Pr-136	1
Nd-139m	Pr-139 Nd-139	1 0.12
Ho-164m	Ho-164	1
Er-161	Ho-161	1
Yb-166	Tm-166	1
Yb-178	Lu-178	1
Lu-177m	Lu-177	0.21
Os-182	Re-182 (short half-life)	1

Ir-195m	Ir-195	0.04
Pt-200	Au-200	1
Au-200m	Au-200	0.18
Pb-211	Bi-211 Pb-214 Bi-214 Po-214	1 1 1 1
At-207	Bi-203	0.1
Fr-222	Ra-222	1
Ac-226	Th-226 Ra-222	0.828 0.828
Pa-227	Ac-223 Fr-219 At-215 Bi-211 Tl-207	0.85 0.85 0.85 0.85 0.85
Pa-228	Ac-224	0.02
Pu-245	Am-245	1
Pu-246	Am-246	1
Am-240	Np-236	1
Cm-238	Am-238	0.9
Cm-250	Bk-250	0.14

Note
The radionuclides listed are those with daughters with half-lives of 10 days or less which contribute 10% or greater to the dose, and which were not considered in Annex 1 of the BSS Directive[1] or in IAEA Safety Standard No. ST1[3]. These daughters have not been included in secular equilibrium in Table 3.

TABLE 3 Exempt quantities and concentrations calculated using EC 'exemption level' methodology

Element	Radionuclide	Exempt concentration (Bq g^{-1})	Exempt quantity (Bq)
Hydrogen	Tritiated compounds (inc OBT)	$1\ 10^{6}$	$1\ 10^{9}$
	Elemental	$1\ 10^{6}$	$1\ 10^{9}$
Beryllium	Be-7	$1\ 10^{3}$	$1\ 10^{7}$
	Be-10	$1\ 10^{4}$	$1\ 10^{6}$
Carbon	C-11	$1\ 10^{1}$	$1\ 10^{6}$
	C-11 monoxide	$1\ 10^{1}$	$1\ 10^{9}$
	C-11 dioxide	$1\ 10^{1}$	$1\ 10^{9}$
	C-14	$1\ 10^{4}$	$1\ 10^{7}$
	C-14 monoxide	$1\ 10^{8}$	$1\ 10^{11}$
	C-14 dioxide	$1\ 10^{7}$	$1\ 10^{11}$
Nitrogen	N-13	$1\ 10^{2}$	$1\ 10^{9}$
Neon	Ne-19	$1\ 10^{2}$	$1\ 10^{9}$
Oxygen	O-15	$1\ 10^{2}$	$1\ 10^{9}$
Fluorine	F-18	$1\ 10^{1}$	$1\ 10^{6}$
Sodium	Na-22	$1\ 10^{1}$	$1\ 10^{6}$
	Na-24	$1\ 10^{1}$	$1\ 10^{5}$
Magnesium	Mg-28+	$1\ 10^{1}$	$1\ 10^{5}$
Aluminium	Al-26	$1\ 10^{1}$	$1\ 10^{5}$
Silicon	Si-31	$1\ 10^{3}$	$1\ 10^{6}$
	Si-32	$1\ 10^{3}$	$1\ 10^{6}$
Phosphorus	P-32	$1\ 10^{3}$	$1\ 10^{5}$
	P-33	$1\ 10^{5}$	$1\ 10^{8}$
Sulphur	S-35	$1\ 10^{5}$	$1\ 10^{8}$
	S-35 (organic)	$1\ 10^{5}$	$1\ 10^{8}$
	S-35 (vapour)	$1\ 10^{6}$	$1\ 10^{9}$
Chlorine	Cl-36	$1\ 10^{4}$	$1\ 10^{6}$
	Cl-38	$1\ 10^{1}$	$1\ 10^{5}$
	Cl-39	$1\ 10^{1}$	$1\ 10^{5}$
Argon	Ar-37	$1\ 10^{6}$	$1\ 10^{8}$
	Ar-39	$1\ 10^{7}$	$1\ 10^{4}$
	Ar-41	$1\ 10^{2}$	$1\ 10^{9}$

Notes

(a) This table contains values for about 800 radionuclides. The values in Annex 1 of the BSS Directive[1] and IAEA Safety Standard No. ST1[3] are included here, together with values for an additional 400 or so radionuclides.

(b) The exempt quantity for Te-121m is incorrectly given as 10^{5} Bq in IAEA Safety Standard No. ST1[3]. The correct value (10^{6} Bq) is given here.

TABLE 3 (continued)

Element	Radionuclide	Exempt concentration (Bq g^{-1})	Exempt quantity (Bq)
Potassium	K-40	$1\ 10^{2}$	$1\ 10^{6}$
	K-42	$1\ 10^{2}$	$1\ 10^{6}$
	K-43	$1\ 10^{1}$	$1\ 10^{6}$
	K-44	$1\ 10^{1}$	$1\ 10^{5}$
	K-45	$1\ 10^{1}$	$1\ 10^{5}$
Calcium	Ca-41	$1\ 10^{5}$	$1\ 10^{7}$
	Ca-45	$1\ 10^{4}$	$1\ 10^{7}$
	Ca-47	$1\ 10^{1}$	$1\ 10^{6}$
Scandium	Sc-43	$1\ 10^{1}$	$1\ 10^{6}$
	Sc-44	$1\ 10^{1}$	$1\ 10^{5}$
	Sc-44m	$1\ 10^{2}$	$1\ 10^{7}$
	Sc-46	$1\ 10^{1}$	$1\ 10^{6}$
	Sc-47	$1\ 10^{2}$	$1\ 10^{6}$
	Sc-48	$1\ 10^{1}$	$1\ 10^{5}$
	Sc-49	$1\ 10^{3}$	$1\ 10^{5}$
Titanium	Ti-44+	$1\ 10^{1}$	$1\ 10^{5}$
	Ti-45	$1\ 10^{1}$	$1\ 10^{6}$
Vanadium	V-47	$1\ 10^{1}$	$1\ 10^{5}$
	V-48	$1\ 10^{1}$	$1\ 10^{5}$
	V-49	$1\ 10^{4}$	$1\ 10^{7}$
Chromium	Cr-48	$1\ 10^{2}$	$1\ 10^{6}$
	Cr-49	$1\ 10^{1}$	$1\ 10^{6}$
	Cr-51	$1\ 10^{3}$	$1\ 10^{7}$
Manganese	Mn-51	$1\ 10^{1}$	$1\ 10^{5}$
	Mn-52	$1\ 10^{1}$	$1\ 10^{5}$
	Mn-52m	$1\ 10^{1}$	$1\ 10^{5}$
	Mn-53	$1\ 10^{4}$	$1\ 10^{9}$
	Mn-54	$1\ 10^{1}$	$1\ 10^{6}$
	Mn-56	$1\ 10^{1}$	$1\ 10^{5}$
Iron	Fe-52	$1\ 10^{1}$	$1\ 10^{6}$
	Fe-55	$1\ 10^{4}$	$1\ 10^{6}$
	Fe-59	$1\ 10^{1}$	$1\ 10^{6}$
	Fe-60+	$1\ 10^{2}$	$1\ 10^{5}$
Cobalt	Co-55	$1\ 10^{1}$	$1\ 10^{6}$
	Co-56	$1\ 10^{1}$	$1\ 10^{5}$
	Co-57	$1\ 10^{2}$	$1\ 10^{6}$
	Co-58	$1\ 10^{1}$	$1\ 10^{6}$
	Co-58m	$1\ 10^{4}$	$1\ 10^{7}$
	Co-60	$1\ 10^{1}$	$1\ 10^{5}$
	Co-60m	$1\ 10^{3}$	$1\ 10^{6}$
	Co-61	$1\ 10^{2}$	$1\ 10^{6}$
	Co-62m	$1\ 10^{1}$	$1\ 10^{5}$
Nickel	Ni-56	$1\ 10^{1}$	$1\ 10^{6}$
	Ni-57	$1\ 10^{1}$	$1\ 10^{6}$
	Ni-59	$1\ 10^{4}$	$1\ 10^{8}$
	Ni-63	$1\ 10^{5}$	$1\ 10^{8}$

TABLE 3 (continued)

Element	Radionuclide	Exempt concentration (Bq g^{-1})	Exempt quantity (Bq)
	Ni-65	$1\ 10^{1}$	$1\ 10^{6}$
	Ni-66	$1\ 10^{4}$	$1\ 10^{7}$
Copper	Cu-60	$1\ 10^{1}$	$1\ 10^{5}$
	Cu-61	$1\ 10^{1}$	$1\ 10^{6}$
	Cu-64	$1\ 10^{2}$	$1\ 10^{6}$
	Cu-67	$1\ 10^{2}$	$1\ 10^{6}$
Zinc	Zn-62	$1\ 10^{2}$	$1\ 10^{6}$
	Zn-63	$1\ 10^{1}$	$1\ 10^{5}$
	Zn-65	$1\ 10^{1}$	$1\ 10^{6}$
	Zn-69	$1\ 10^{4}$	$1\ 10^{6}$
	Zn-69m	$1\ 10^{2}$	$1\ 10^{6}$
	Zn-71m	$1\ 10^{1}$	$1\ 10^{6}$
	Zn-72	$1\ 10^{2}$	$1\ 10^{6}$
Gallium	Ga-65	$1\ 10^{1}$	$1\ 10^{5}$
	Ga-66	$1\ 10^{1}$	$1\ 10^{5}$
	Ga-67	$1\ 10^{2}$	$1\ 10^{6}$
	Ga-68	$1\ 10^{1}$	$1\ 10^{5}$
	Ga-70	$1\ 10^{3}$	$1\ 10^{6}$
	Ga-72	$1\ 10^{1}$	$1\ 10^{5}$
	Ga-73	$1\ 10^{2}$	$1\ 10^{6}$
Germanium	Ge-66	$1\ 10^{1}$	$1\ 10^{6}$
	Ge-67	$1\ 10^{1}$	$1\ 10^{5}$
	Ge-68+	$1\ 10^{1}$	$1\ 10^{5}$
	Ge-69	$1\ 10^{1}$	$1\ 10^{6}$
	Ge-71	$1\ 10^{4}$	$1\ 10^{8}$
	Ge-75	$1\ 10^{3}$	$1\ 10^{6}$
	Ge-77	$1\ 10^{1}$	$1\ 10^{5}$
	Ge-78	$1\ 10^{2}$	$1\ 10^{6}$
Arsenic	As-69	$1\ 10^{1}$	$1\ 10^{5}$
	As-70	$1\ 10^{1}$	$1\ 10^{5}$
	As-71	$1\ 10^{1}$	$1\ 10^{6}$
	As-72	$1\ 10^{1}$	$1\ 10^{5}$
	As-73	$1\ 10^{3}$	$1\ 10^{7}$
	As-74	$1\ 10^{1}$	$1\ 10^{6}$
	As-76	$1\ 10^{2}$	$1\ 10^{5}$
	As-77	$1\ 10^{3}$	$1\ 10^{6}$
	As-78	$1\ 10^{1}$	$1\ 10^{5}$
Selenium	Se-70	$1\ 10^{1}$	$1\ 10^{6}$
	Se-73	$1\ 10^{1}$	$1\ 10^{6}$
	Se-73m	$1\ 10^{2}$	$1\ 10^{6}$
	Se-75	$1\ 10^{2}$	$1\ 10^{6}$
	Se-79	$1\ 10^{4}$	$1\ 10^{7}$
	Se-81	$1\ 10^{3}$	$1\ 10^{6}$
	Se-81m	$1\ 10^{3}$	$1\ 10^{7}$
	Se-83	$1\ 10^{1}$	$1\ 10^{5}$
Bromine	Br-74	$1\ 10^{1}$	$1\ 10^{5}$
	Br-74m	$1\ 10^{1}$	$1\ 10^{5}$

TABLE 3 (continued)

Element	Radionuclide	Exempt concentration (Bq g^{-1})	Exempt quantity (Bq)
	Br-75	$1\ 10^{1}$	$1\ 10^{6}$
	Br-76	$1\ 10^{1}$	$1\ 10^{5}$
	Br-77	$1\ 10^{2}$	$1\ 10^{6}$
	Br-80	$1\ 10^{2}$	$1\ 10^{5}$
	Br-80m	$1\ 10^{3}$	$1\ 10^{7}$
	Br-82	$1\ 10^{1}$	$1\ 10^{6}$
	Br-83	$1\ 10^{3}$	$1\ 10^{6}$
	Br-84	$1\ 10^{1}$	$1\ 10^{5}$
Krypton	Kr-74	$1\ 10^{2}$	$1\ 10^{9}$
	Kr-76	$1\ 10^{2}$	$1\ 10^{9}$
	Kr-77	$1\ 10^{2}$	$1\ 10^{9}$
	Kr-79	$1\ 10^{3}$	$1\ 10^{5}$
	Kr-81	$1\ 10^{4}$	$1\ 10^{7}$
	Kr-81m	$1\ 10^{3}$	$1\ 10^{10}$
	Kr-83m	$1\ 10^{5}$	$1\ 10^{12}$
	Kr-85	$1\ 10^{5}$	$1\ 10^{4}$
	Kr-85m	$1\ 10^{3}$	$1\ 10^{10}$
	Kr-87	$1\ 10^{2}$	$1\ 10^{9}$
	Kr-88	$1\ 10^{2}$	$1\ 10^{9}$
Rubidium	Rb-79	$1\ 10^{1}$	$1\ 10^{5}$
	Rb-81	$1\ 10^{1}$	$1\ 10^{6}$
	Rb-81m	$1\ 10^{3}$	$1\ 10^{7}$
	Rb-82m	$1\ 10^{1}$	$1\ 10^{6}$
	Rb-83+	$1\ 10^{2}$	$1\ 10^{6}$
	Rb-84	$1\ 10^{1}$	$1\ 10^{6}$
	Rb-86	$1\ 10^{2}$	$1\ 10^{5}$
	Rb-87	$1\ 10^{4}$	$1\ 10^{7}$
	Rb-88	$1\ 10^{1}$	$1\ 10^{5}$
	Rb-89	$1\ 10^{1}$	$1\ 10^{5}$
Strontium	Sr-80	$1\ 10^{3}$	$1\ 10^{7}$
	Sr-81	$1\ 10^{1}$	$1\ 10^{5}$
	Sr-82+	$1\ 10^{1}$	$1\ 10^{5}$
	Sr-83	$1\ 10^{1}$	$1\ 10^{6}$
	Sr-85	$1\ 10^{2}$	$1\ 10^{6}$
	Sr-85m	$1\ 10^{2}$	$1\ 10^{7}$
	Sr-87m	$1\ 10^{2}$	$1\ 10^{6}$
	Sr-89	$1\ 10^{3}$	$1\ 10^{6}$
	Sr-90+	$1\ 10^{2}$	$1\ 10^{4}$
	Sr-91	$1\ 10^{1}$	$1\ 10^{5}$
	Sr-92	$1\ 10^{1}$	$1\ 10^{6}$
Yttrium	Y-86	$1\ 10^{1}$	$1\ 10^{5}$
	Y-86m	$1\ 10^{2}$	$1\ 10^{7}$
	Y-87+	$1\ 10^{1}$	$1\ 10^{6}$
	Y-88	$1\ 10^{1}$	$1\ 10^{6}$
	Y-90	$1\ 10^{3}$	$1\ 10^{5}$
	Y-90m	$1\ 10^{1}$	$1\ 10^{6}$
	Y-91	$1\ 10^{3}$	$1\ 10^{6}$
	Y-91m	$1\ 10^{2}$	$1\ 10^{6}$
	Y-92	$1\ 10^{2}$	$1\ 10^{5}$
	Y-93	$1\ 10^{2}$	$1\ 10^{5}$
	Y-94	$1\ 10^{1}$	$1\ 10^{5}$

TABLE 3 (continued)

Element	Radionuclide	Exempt concentration (Bq g^{-1})	Exempt quantity (Bq)
	Y-95	$1\ 10^{1}$	$1\ 10^{5}$
Zirconium	Zr-86	$1\ 10^{2}$	$1\ 10^{7}$
	Zr-88	$1\ 10^{2}$	$1\ 10^{6}$
	Zr-89	$1\ 10^{1}$	$1\ 10^{6}$
	Zr-93+	$1\ 10^{3}$	$1\ 10^{7}$
	Zr-95	$1\ 10^{1}$	$1\ 10^{6}$
	Zr-97+	$1\ 10^{1}$	$1\ 10^{5}$
Niobium	Nb-88	$1\ 10^{1}$	$1\ 10^{5}$
	Nb-89 (2.03 hours)	$1\ 10^{1}$	$1\ 10^{5}$
	Nb-89 (1.01 hour)	$1\ 10^{1}$	$1\ 10^{5}$
	Nb-90	$1\ 10^{1}$	$1\ 10^{5}$
	Nb-93m	$1\ 10^{4}$	$1\ 10^{7}$
	Nb-94	$1\ 10^{1}$	$1\ 10^{6}$
	Nb-95	$1\ 10^{1}$	$1\ 10^{6}$
	Nb-95m	$1\ 10^{2}$	$1\ 10^{7}$
	Nb-96	$1\ 10^{1}$	$1\ 10^{5}$
	Nb-97	$1\ 10^{1}$	$1\ 10^{6}$
	Nb-98	$1\ 10^{1}$	$1\ 10^{5}$
Molybdenum	Mo-90	$1\ 10^{1}$	$1\ 10^{6}$
	Mo-93	$1\ 10^{3}$	$1\ 10^{8}$
	Mo-93m	$1\ 10^{1}$	$1\ 10^{6}$
	Mo-99	$1\ 10^{2}$	$1\ 10^{6}$
	Mo-101	$1\ 10^{1}$	$1\ 10^{6}$
Technetium	Tc-93	$1\ 10^{1}$	$1\ 10^{6}$
	Tc-93m	$1\ 10^{1}$	$1\ 10^{6}$
	Tc-94	$1\ 10^{1}$	$1\ 10^{6}$
	Tc-94m	$1\ 10^{1}$	$1\ 10^{5}$
	Tc-95	$1\ 10^{1}$	$1\ 10^{6}$
	Tc-95m+	$1\ 10^{1}$	$1\ 10^{6}$
	Tc-96	$1\ 10^{1}$	$1\ 10^{6}$
	Tc-96m	$1\ 10^{3}$	$1\ 10^{7}$
	Tc-97	$1\ 10^{3}$	$1\ 10^{8}$
	Tc-97m	$1\ 10^{3}$	$1\ 10^{7}$
	Tc-98	$1\ 10^{1}$	$1\ 10^{6}$
	Tc-99	$1\ 10^{4}$	$1\ 10^{7}$
	Tc-99m	$1\ 10^{2}$	$1\ 10^{7}$
	Tc-101	$1\ 10^{2}$	$1\ 10^{6}$
	Tc-104	$1\ 10^{1}$	$1\ 10^{5}$
Ruthenium	Ru-94	$1\ 10^{2}$	$1\ 10^{6}$
	Ru-97	$1\ 10^{2}$	$1\ 10^{7}$
	Ru-103	$1\ 10^{2}$	$1\ 10^{6}$
	Ru-105	$1\ 10^{1}$	$1\ 10^{6}$
	Ru-106+	$1\ 10^{2}$	$1\ 10^{5}$
Rhodium	Rh-99	$1\ 10^{1}$	$1\ 10^{6}$
	Rh-99m	$1\ 10^{1}$	$1\ 10^{6}$
	Rh-100	$1\ 10^{1}$	$1\ 10^{6}$
	Rh-101	$1\ 10^{2}$	$1\ 10^{7}$
	Rh-101m	$1\ 10^{2}$	$1\ 10^{7}$

TABLE 3 (continued)

Element	Radionuclide	Exempt concentration (Bq g^{-1})	Exempt quantity (Bq)
	Rh-102	$1\ 10^{1}$	$1\ 10^{6}$
	Rh-102m	$1\ 10^{2}$	$1\ 10^{6}$
	Rh-103m	$1\ 10^{4}$	$1\ 10^{8}$
	Rh-105	$1\ 10^{2}$	$1\ 10^{7}$
	Rh-106m	$1\ 10^{1}$	$1\ 10^{5}$
	Rh-107	$1\ 10^{2}$	$1\ 10^{6}$
Palladium	Pd-100	$1\ 10^{2}$	$1\ 10^{7}$
	Pd-101	$1\ 10^{2}$	$1\ 10^{6}$
	Pd-103	$1\ 10^{3}$	$1\ 10^{8}$
	Pd-107	$1\ 10^{5}$	$1\ 10^{8}$
	Pd-109	$1\ 10^{3}$	$1\ 10^{6}$
Silver	Ag-102	$1\ 10^{1}$	$1\ 10^{5}$
	Ag-103	$1\ 10^{1}$	$1\ 10^{6}$
	Ag-104	$1\ 10^{1}$	$1\ 10^{6}$
	Ag-104m	$1\ 10^{1}$	$1\ 10^{6}$
	Ag-105	$1\ 10^{2}$	$1\ 10^{6}$
	Ag-106	$1\ 10^{1}$	$1\ 10^{6}$
	Ag-106m	$1\ 10^{1}$	$1\ 10^{6}$
	Ag-108m+	$1\ 10^{1}$	$1\ 10^{6}$
	Ag-110m	$1\ 10^{1}$	$1\ 10^{6}$
	Ag-111	$1\ 10^{3}$	$1\ 10^{6}$
	Ag-112	$1\ 10^{1}$	$1\ 10^{5}$
	Ag-115	$1\ 10^{1}$	$1\ 10^{5}$
Cadmium	Cd-104	$1\ 10^{2}$	$1\ 10^{7}$
	Cd-107	$1\ 10^{3}$	$1\ 10^{7}$
	Cd-109	$1\ 10^{4}$	$1\ 10^{6}$
	Cd-113	$1\ 10^{3}$	$1\ 10^{6}$
	Cd-113m	$1\ 10^{3}$	$1\ 10^{6}$
	Cd-115	$1\ 10^{2}$	$1\ 10^{6}$
	Cd-115m	$1\ 10^{3}$	$1\ 10^{6}$
	Cd-117	$1\ 10^{1}$	$1\ 10^{6}$
	Cd-117m	$1\ 10^{1}$	$1\ 10^{6}$
Indium	In-109	$1\ 10^{1}$	$1\ 10^{6}$
	In-110 (4.9 hours)	$1\ 10^{1}$	$1\ 10^{6}$
	In-110 (69.1 min)	$1\ 10^{1}$	$1\ 10^{5}$
	In-111	$1\ 10^{2}$	$1\ 10^{6}$
	In-112	$1\ 10^{2}$	$1\ 10^{6}$
	In-113m	$1\ 10^{2}$	$1\ 10^{6}$
	In-114	$1\ 10^{3}$	$1\ 10^{5}$
	In-114m	$1\ 10^{2}$	$1\ 10^{6}$
	In-115	$1\ 10^{3}$	$1\ 10^{5}$
	In-115m	$1\ 10^{2}$	$1\ 10^{6}$
	In-116m	$1\ 10^{1}$	$1\ 10^{5}$
	In-117	$1\ 10^{1}$	$1\ 10^{6}$
	In-117m	$1\ 10^{2}$	$1\ 10^{6}$
	In-119m	$1\ 10^{2}$	$1\ 10^{5}$
Tin	Sn-110	$1\ 10^{2}$	$1\ 10^{7}$
	Sn-111	$1\ 10^{2}$	$1\ 10^{6}$
	Sn-113	$1\ 10^{3}$	$1\ 10^{7}$
	Sn-117m	$1\ 10^{2}$	$1\ 10^{6}$

TABLE 3 (continued)

Element	Radionuclide	Exempt concentration (Bq g^{-1})	Exempt quantity (Bq)
	Sn-119m	$1\ 10^{3}$	$1\ 10^{7}$
	Sn-121	$1\ 10^{5}$	$1\ 10^{7}$
	Sn-121m+	$1\ 10^{3}$	$1\ 10^{7}$
	Sn-123	$1\ 10^{3}$	$1\ 10^{6}$
	Sn-123m	$1\ 10^{2}$	$1\ 10^{6}$
	Sn-125	$1\ 10^{2}$	$1\ 10^{5}$
	Sn-126+	$1\ 10^{1}$	$1\ 10^{5}$
	Sn-127	$1\ 10^{1}$	$1\ 10^{6}$
	Sn-128	$1\ 10^{1}$	$1\ 10^{6}$
Antimony	Sb-115	$1\ 10^{1}$	$1\ 10^{6}$
	Sb-116	$1\ 10^{1}$	$1\ 10^{6}$
	Sb-116m	$1\ 10^{1}$	$1\ 10^{5}$
	Sb-117	$1\ 10^{2}$	$1\ 10^{7}$
	Sb-118m	$1\ 10^{1}$	$1\ 10^{6}$
	Sb-119	$1\ 10^{3}$	$1\ 10^{7}$
	Sb-120 (5.76 days)	$1\ 10^{1}$	$1\ 10^{6}$
	Sb-120 (15.89 min)	$1\ 10^{2}$	$1\ 10^{6}$
	Sb-122	$1\ 10^{2}$	$1\ 10^{4}$
	Sb-124	$1\ 10^{1}$	$1\ 10^{6}$
	Sb-124m	$1\ 10^{2}$	$1\ 10^{6}$
	Sb-125	$1\ 10^{2}$	$1\ 10^{6}$
	Sb-126	$1\ 10^{1}$	$1\ 10^{5}$
	Sb-126m	$1\ 10^{1}$	$1\ 10^{5}$
	Sb-127	$1\ 10^{1}$	$1\ 10^{6}$
	Sb-128 (9.01 hours)	$1\ 10^{1}$	$1\ 10^{5}$
	Sb-128 (10.4 min)	$1\ 10^{1}$	$1\ 10^{5}$
	Sb-129	$1\ 10^{1}$	$1\ 10^{6}$
	Sb-130	$1\ 10^{1}$	$1\ 10^{5}$
	Sb-131	$1\ 10^{1}$	$1\ 10^{6}$
Tellurium	Te-116	$1\ 10^{2}$	$1\ 10^{7}$
	Te-121	$1\ 10^{1}$	$1\ 10^{6}$
	Te-121m	$1\ 10^{2}$	$1\ 10^{6}$
	Te-123	$1\ 10^{3}$	$1\ 10^{6}$
	Te-123m	$1\ 10^{2}$	$1\ 10^{7}$
	Te-125m	$1\ 10^{3}$	$1\ 10^{7}$
	Te-127	$1\ 10^{3}$	$1\ 10^{6}$
	Te-127m	$1\ 10^{3}$	$1\ 10^{7}$
	Te-129	$1\ 10^{2}$	$1\ 10^{6}$
	Te-129m	$1\ 10^{3}$	$1\ 10^{6}$
	Te-131	$1\ 10^{2}$	$1\ 10^{5}$
	Te-131m	$1\ 10^{1}$	$1\ 10^{6}$
	Te-132	$1\ 10^{2}$	$1\ 10^{7}$
	Te-133	$1\ 10^{1}$	$1\ 10^{5}$
	Te-133m	$1\ 10^{1}$	$1\ 10^{5}$
	Te-134	$1\ 10^{1}$	$1\ 10^{6}$
Iodine	I-120	$1\ 10^{1}$	$1\ 10^{5}$
	I-120m	$1\ 10^{1}$	$1\ 10^{5}$
	I-121	$1\ 10^{2}$	$1\ 10^{6}$
	I-123	$1\ 10^{2}$	$1\ 10^{7}$
	I-124	$1\ 10^{1}$	$1\ 10^{6}$
	I-125	$1\ 10^{3}$	$1\ 10^{6}$
	I-126	$1\ 10^{2}$	$1\ 10^{6}$

TABLE 3 (continued)

Element	Radionuclide	Exempt concentration (Bq g^{-1})	Exempt quantity (Bq)
	I-128	$1\ 10^{2}$	$1\ 10^{5}$
	I-129	$1\ 10^{2}$	$1\ 10^{5}$
	I-130	$1\ 10^{1}$	$1\ 10^{6}$
	I-131	$1\ 10^{2}$	$1\ 10^{6}$
	I-132	$1\ 10^{1}$	$1\ 10^{5}$
	I-132m	$1\ 10^{2}$	$1\ 10^{6}$
	I-133	$1\ 10^{1}$	$1\ 10^{6}$
	I-134	$1\ 10^{1}$	$1\ 10^{5}$
	I-135	$1\ 10^{1}$	$1\ 10^{6}$
Xenon	Xe-120	$1\ 10^{2}$	$1\ 10^{9}$
	Xe-121	$1\ 10^{2}$	$1\ 10^{9}$
	Xe-122+	$1\ 10^{2}$	$1\ 10^{9}$
	Xe-123	$1\ 10^{2}$	$1\ 10^{9}$
	Xe-125	$1\ 10^{3}$	$1\ 10^{9}$
	Xe-127	$1\ 10^{3}$	$1\ 10^{5}$
	Xe-129m	$1\ 10^{3}$	$1\ 10^{4}$
	Xe-131m	$1\ 10^{4}$	$1\ 10^{4}$
	Xe-133m	$1\ 10^{3}$	$1\ 10^{4}$
	Xe-133	$1\ 10^{3}$	$1\ 10^{4}$
	Xe-135m	$1\ 10^{2}$	$1\ 10^{9}$
	Xe-135	$1\ 10^{3}$	$1\ 10^{10}$
	Xe-138	$1\ 10^{2}$	$1\ 10^{9}$
Caesium	Cs-125	$1\ 10^{1}$	$1\ 10^{4}$
	Cs-127	$1\ 10^{2}$	$1\ 10^{5}$
	Cs-129	$1\ 10^{2}$	$1\ 10^{5}$
	Cs-130	$1\ 10^{2}$	$1\ 10^{6}$
	Cs-131	$1\ 10^{3}$	$1\ 10^{6}$
	Cs-132	$1\ 10^{1}$	$1\ 10^{5}$
	Cs-134	$1\ 10^{1}$	$1\ 10^{4}$
	Cs-134m	$1\ 10^{3}$	$1\ 10^{5}$
	Cs-135	$1\ 10^{4}$	$1\ 10^{7}$
	Cs-135m	$1\ 10^{1}$	$1\ 10^{6}$
	Cs-136	$1\ 10^{1}$	$1\ 10^{5}$
	Cs-137+	$1\ 10^{1}$	$1\ 10^{4}$
	Cs-138	$1\ 10^{1}$	$1\ 10^{4}$
Barium	Ba-126	$1\ 10^{2}$	$1\ 10^{7}$
	Ba-128	$1\ 10^{2}$	$1\ 10^{7}$
	Ba-131	$1\ 10^{2}$	$1\ 10^{6}$
	Ba-131m	$1\ 10^{2}$	$1\ 10^{7}$
	Ba-133	$1\ 10^{2}$	$1\ 10^{6}$
	Ba-133m	$1\ 10^{2}$	$1\ 10^{6}$
	Ba-135m	$1\ 10^{2}$	$1\ 10^{6}$
	Ba-137m	$1\ 10^{1}$	$1\ 10^{6}$
	Ba-139	$1\ 10^{2}$	$1\ 10^{5}$
	Ba-140+	$1\ 10^{1}$	$1\ 10^{5}$
	Ba-141	$1\ 10^{1}$	$1\ 10^{5}$
	Ba-142	$1\ 10^{1}$	$1\ 10^{6}$
Lanthanum	La-131	$1\ 10^{1}$	$1\ 10^{6}$
	La-132	$1\ 10^{1}$	$1\ 10^{6}$
	La-135	$1\ 10^{3}$	$1\ 10^{7}$
	La-137	$1\ 10^{3}$	$1\ 10^{7}$

TABLE 3 (continued)

Element	Radionuclide	Exempt concentration (Bq g^{-1})	Exempt quantity (Bq)
	La-138	$1\ 10^{1}$	$1\ 10^{6}$
	La-140	$1\ 10^{1}$	$1\ 10^{5}$
	La-141	$1\ 10^{2}$	$1\ 10^{5}$
	La-142	$1\ 10^{1}$	$1\ 10^{5}$
	La-143	$1\ 10^{2}$	$1\ 10^{5}$
Cerium	Ce-134	$1\ 10^{3}$	$1\ 10^{7}$
	Ce-135	$1\ 10^{1}$	$1\ 10^{6}$
	Ce-137	$1\ 10^{3}$	$1\ 10^{7}$
	Ce-137m	$1\ 10^{3}$	$1\ 10^{6}$
	Ce-139	$1\ 10^{2}$	$1\ 10^{6}$
	Ce-141	$1\ 10^{2}$	$1\ 10^{7}$
	Ce-143	$1\ 10^{2}$	$1\ 10^{6}$
	Ce-144+	$1\ 10^{2}$	$1\ 10^{5}$
Praseodymium	Pr-136	$1\ 10^{1}$	$1\ 10^{5}$
	Pr-137	$1\ 10^{2}$	$1\ 10^{6}$
	Pr-138m	$1\ 10^{1}$	$1\ 10^{6}$
	Pr-139	$1\ 10^{2}$	$1\ 10^{7}$
	Pr-142	$1\ 10^{2}$	$1\ 10^{5}$
	Pr-142m	$1\ 10^{7}$	$1\ 10^{9}$
	Pr-143	$1\ 10^{4}$	$1\ 10^{6}$
	Pr-144	$1\ 10^{2}$	$1\ 10^{5}$
	Pr-145	$1\ 10^{3}$	$1\ 10^{5}$
	Pr-147	$1\ 10^{1}$	$1\ 10^{5}$
Neodymium	Nd-136	$1\ 10^{2}$	$1\ 10^{6}$
	Nd-138	$1\ 10^{3}$	$1\ 10^{7}$
	Nd-139	$1\ 10^{2}$	$1\ 10^{6}$
	Nd-139m	$1\ 10^{1}$	$1\ 10^{6}$
	Nd-141	$1\ 10^{2}$	$1\ 10^{7}$
	Nd-147	$1\ 10^{2}$	$1\ 10^{6}$
	Nd-149	$1\ 10^{2}$	$1\ 10^{6}$
	Nd-151	$1\ 10^{1}$	$1\ 10^{5}$
Promethium	Pm-141	$1\ 10^{1}$	$1\ 10^{5}$
	Pm-143	$1\ 10^{2}$	$1\ 10^{6}$
	Pm-144	$1\ 10^{1}$	$1\ 10^{6}$
	Pm-145	$1\ 10^{3}$	$1\ 10^{7}$
	Pm-146	$1\ 10^{1}$	$1\ 10^{6}$
	Pm-147	$1\ 10^{4}$	$1\ 10^{7}$
	Pm-148	$1\ 10^{1}$	$1\ 10^{5}$
	Pm-148m+	$1\ 10^{1}$	$1\ 10^{6}$
	Pm-149	$1\ 10^{3}$	$1\ 10^{6}$
	Pm-150	$1\ 10^{1}$	$1\ 10^{5}$
	Pm-151	$1\ 10^{2}$	$1\ 10^{6}$
Samarium	Sm-141	$1\ 10^{1}$	$1\ 10^{5}$
	Sm-141m	$1\ 10^{1}$	$1\ 10^{6}$
	Sm-142	$1\ 10^{2}$	$1\ 10^{7}$
	Sm-145	$1\ 10^{2}$	$1\ 10^{7}$
	Sm-146	$1\ 10^{1}$	$1\ 10^{5}$
	Sm-147	$1\ 10^{1}$	$1\ 10^{4}$
	Sm-151	$1\ 10^{4}$	$1\ 10^{8}$

TABLE 3 (continued)

Element	Radionuclide	Exempt concentration (Bq g^{-1})	Exempt quantity (Bq)
	Sm-153	$1\ 10^{2}$	$1\ 10^{6}$
	Sm-155	$1\ 10^{2}$	$1\ 10^{6}$
	Sm-156	$1\ 10^{2}$	$1\ 10^{6}$
Europium	Eu-145	$1\ 10^{1}$	$1\ 10^{6}$
	Eu-146	$1\ 10^{1}$	$1\ 10^{6}$
	Eu-147	$1\ 10^{2}$	$1\ 10^{6}$
	Eu-148	$1\ 10^{1}$	$1\ 10^{6}$
	Eu-149	$1\ 10^{2}$	$1\ 10^{7}$
	Eu-150 (34.2 years)	$1\ 10^{1}$	$1\ 10^{6}$
	Eu-150 (12.6 hours)	$1\ 10^{3}$	$1\ 10^{6}$
	Eu-152	$1\ 10^{1}$	$1\ 10^{6}$
	Eu-152m	$1\ 10^{2}$	$1\ 10^{6}$
	Eu-154	$1\ 10^{1}$	$1\ 10^{6}$
	Eu-155	$1\ 10^{2}$	$1\ 10^{7}$
	Eu-156	$1\ 10^{1}$	$1\ 10^{6}$
	Eu-157	$1\ 10^{2}$	$1\ 10^{6}$
	Eu-158	$1\ 10^{1}$	$1\ 10^{5}$
Gadolinium	Gd-145	$1\ 10^{1}$	$1\ 10^{5}$
	Gd-146+	$1\ 10^{1}$	$1\ 10^{6}$
	Gd-147	$1\ 10^{1}$	$1\ 10^{6}$
	Gd-148	$1\ 10^{1}$	$1\ 10^{4}$
	Gd-149	$1\ 10^{2}$	$1\ 10^{6}$
	Gd-151	$1\ 10^{2}$	$1\ 10^{7}$
	Gd-152	$1\ 10^{1}$	$1\ 10^{4}$
	Gd-153	$1\ 10^{2}$	$1\ 10^{7}$
	Gd-159	$1\ 10^{3}$	$1\ 10^{6}$
Terbium	Tb-147	$1\ 10^{1}$	$1\ 10^{6}$
	Tb-149	$1\ 10^{1}$	$1\ 10^{6}$
	Tb-150	$1\ 10^{1}$	$1\ 10^{6}$
	Tb-151	$1\ 10^{1}$	$1\ 10^{6}$
	Tb-153	$1\ 10^{2}$	$1\ 10^{7}$
	Tb-154	$1\ 10^{1}$	$1\ 10^{6}$
	Tb-155	$1\ 10^{2}$	$1\ 10^{7}$
	Tb-156	$1\ 10^{1}$	$1\ 10^{6}$
	Tb-156m (24.4 hours)	$1\ 10^{3}$	$1\ 10^{7}$
	Tb-156m (5 hours)	$1\ 10^{4}$	$1\ 10^{7}$
	Tb-157	$1\ 10^{4}$	$1\ 10^{7}$
	Tb-158	$1\ 10^{1}$	$1\ 10^{6}$
	Tb-160	$1\ 10^{1}$	$1\ 10^{6}$
	Tb-161	$1\ 10^{3}$	$1\ 10^{6}$
Dysprosium	Dy-155	$1\ 10^{1}$	$1\ 10^{6}$
	Dy-157	$1\ 10^{2}$	$1\ 10^{6}$
	Dy-159	$1\ 10^{3}$	$1\ 10^{7}$
	Dy-165	$1\ 10^{3}$	$1\ 10^{6}$
	Dy-166	$1\ 10^{3}$	$1\ 10^{6}$
Holmium	Ho-155	$1\ 10^{2}$	$1\ 10^{6}$
	Ho-157	$1\ 10^{2}$	$1\ 10^{6}$
	Ho-159	$1\ 10^{2}$	$1\ 10^{6}$
	Ho-161	$1\ 10^{2}$	$1\ 10^{7}$
	Ho-162	$1\ 10^{2}$	$1\ 10^{7}$

TABLE 3 (continued)

Element	Radionuclide	Exempt concentration (Bq g^{-1})	Exempt quantity (Bq)
	Ho-162m	$1\ 10^{1}$	$1\ 10^{6}$
	Ho-164	$1\ 10^{3}$	$1\ 10^{6}$
	Ho-164m	$1\ 10^{3}$	$1\ 10^{7}$
	Ho-166	$1\ 10^{3}$	$1\ 10^{5}$
	Ho-166m	$1\ 10^{1}$	$1\ 10^{6}$
	Ho-167	$1\ 10^{2}$	$1\ 10^{6}$
Erbium	Er-161	$1\ 10^{1}$	$1\ 10^{6}$
	Er-165	$1\ 10^{3}$	$1\ 10^{7}$
	Er-169	$1\ 10^{4}$	$1\ 10^{7}$
	Er-171	$1\ 10^{2}$	$1\ 10^{6}$
	Er-172	$1\ 10^{2}$	$1\ 10^{6}$
Thulium	Tm-162	$1\ 10^{1}$	$1\ 10^{6}$
	Tm-166	$1\ 10^{1}$	$1\ 10^{6}$
	Tm-167	$1\ 10^{2}$	$1\ 10^{6}$
	Tm-170	$1\ 10^{3}$	$1\ 10^{6}$
	Tm-171	$1\ 10^{4}$	$1\ 10^{8}$
	Tm-172	$1\ 10^{2}$	$1\ 10^{6}$
	Tm-173	$1\ 10^{2}$	$1\ 10^{6}$
	Tm-175	$1\ 10^{1}$	$1\ 10^{6}$
Ytterbium	Yb-162	$1\ 10^{2}$	$1\ 10^{7}$
	Yb-166	$1\ 10^{2}$	$1\ 10^{7}$
	Yb-167	$1\ 10^{2}$	$1\ 10^{6}$
	Yb-169	$1\ 10^{2}$	$1\ 10^{7}$
	Yb-175	$1\ 10^{3}$	$1\ 10^{7}$
	Yb-177	$1\ 10^{2}$	$1\ 10^{6}$
	Yb-178	$1\ 10^{3}$	$1\ 10^{6}$
Lutetium	Lu-169	$1\ 10^{1}$	$1\ 10^{6}$
	Lu-170	$1\ 10^{1}$	$1\ 10^{6}$
	Lu-171	$1\ 10^{1}$	$1\ 10^{6}$
	Lu-172	$1\ 10^{1}$	$1\ 10^{6}$
	Lu-173	$1\ 10^{2}$	$1\ 10^{7}$
	Lu-174	$1\ 10^{2}$	$1\ 10^{7}$
	Lu-174m	$1\ 10^{2}$	$1\ 10^{7}$
	Lu-176	$1\ 10^{2}$	$1\ 10^{6}$
	Lu-176m	$1\ 10^{3}$	$1\ 10^{6}$
	Lu-177	$1\ 10^{3}$	$1\ 10^{7}$
	Lu-177m	$1\ 10^{1}$	$1\ 10^{6}$
	Lu-178	$1\ 10^{2}$	$1\ 10^{5}$
	Lu-178m	$1\ 10^{1}$	$1\ 10^{5}$
	Lu-179	$1\ 10^{3}$	$1\ 10^{6}$
Hafnium	Hf-170	$1\ 10^{2}$	$1\ 10^{6}$
	Hf-172+	$1\ 10^{1}$	$1\ 10^{6}$
	Hf-173	$1\ 10^{2}$	$1\ 10^{6}$
	Hf-175	$1\ 10^{2}$	$1\ 10^{6}$
	Hf-177m	$1\ 10^{1}$	$1\ 10^{5}$
	Hf-178m	$1\ 10^{1}$	$1\ 10^{6}$
	Hf-179m	$1\ 10^{1}$	$1\ 10^{6}$
	Hf-180m	$1\ 10^{1}$	$1\ 10^{6}$
	Hf-181	$1\ 10^{1}$	$1\ 10^{6}$
	Hf-182	$1\ 10^{2}$	$1\ 10^{6}$

TABLE 3 (continued)

Element	Radionuclide	Exempt concentration (Bq g^{-1})	Exempt quantity (Bq)
	Hf-182m	$1\ 10^{1}$	$1\ 10^{6}$
	Hf-183	$1\ 10^{1}$	$1\ 10^{6}$
	Hf-184	$1\ 10^{2}$	$1\ 10^{6}$
Tantalum	Ta-172	$1\ 10^{1}$	$1\ 10^{6}$
	Ta-173	$1\ 10^{1}$	$1\ 10^{6}$
	Ta-174	$1\ 10^{1}$	$1\ 10^{6}$
	Ta-175	$1\ 10^{1}$	$1\ 10^{6}$
	Ta-176	$1\ 10^{1}$	$1\ 10^{6}$
	Ta-177	$1\ 10^{2}$	$1\ 10^{7}$
	Ta-178	$1\ 10^{1}$	$1\ 10^{6}$
	Ta-179	$1\ 10^{3}$	$1\ 10^{7}$
	Ta-180	$1\ 10^{1}$	$1\ 10^{6}$
	Ta-180m	$1\ 10^{3}$	$1\ 10^{7}$
	Ta-182	$1\ 10^{1}$	$1\ 10^{4}$
	Ta-182m	$1\ 10^{2}$	$1\ 10^{6}$
	Ta-183	$1\ 10^{2}$	$1\ 10^{6}$
	Ta-184	$1\ 10^{1}$	$1\ 10^{6}$
	Ta-185	$1\ 10^{2}$	$1\ 10^{5}$
	Ta-186	$1\ 10^{1}$	$1\ 10^{5}$
Tungsten	W-176	$1\ 10^{2}$	$1\ 10^{6}$
	W-177	$1\ 10^{1}$	$1\ 10^{6}$
	W-178+	$1\ 10^{1}$	$1\ 10^{6}$
	W-179	$1\ 10^{2}$	$1\ 10^{7}$
	W-181	$1\ 10^{3}$	$1\ 10^{7}$
	W-185	$1\ 10^{4}$	$1\ 10^{7}$
	W-187	$1\ 10^{2}$	$1\ 10^{6}$
	W-188+	$1\ 10^{2}$	$1\ 10^{5}$
Rhenium	Re-177	$1\ 10^{1}$	$1\ 10^{6}$
	Re-178	$1\ 10^{1}$	$1\ 10^{6}$
	Re-181	$1\ 10^{1}$	$1\ 10^{6}$
	Re-182 (64 hours)	$1\ 10^{1}$	$1\ 10^{6}$
	Re-182 (12.7 hours)	$1\ 10^{1}$	$1\ 10^{6}$
	Re-184	$1\ 10^{1}$	$1\ 10^{6}$
	Re-184m	$1\ 10^{2}$	$1\ 10^{6}$
	Re-186	$1\ 10^{3}$	$1\ 10^{6}$
	Re-186m	$1\ 10^{3}$	$1\ 10^{7}$
	Re-187	$1\ 10^{6}$	$1\ 10^{9}$
	Re-188	$1\ 10^{2}$	$1\ 10^{5}$
	Re-188m	$1\ 10^{2}$	$1\ 10^{7}$
	Re-189+	$1\ 10^{2}$	$1\ 10^{6}$
Osmium	Os-180	$1\ 10^{2}$	$1\ 10^{7}$
	Os-181	$1\ 10^{1}$	$1\ 10^{6}$
	Os-182	$1\ 10^{2}$	$1\ 10^{6}$
	Os-185	$1\ 10^{1}$	$1\ 10^{6}$
	Os-189m	$1\ 10^{4}$	$1\ 10^{7}$
	Os-191	$1\ 10^{2}$	$1\ 10^{7}$
	Os-191m	$1\ 10^{3}$	$1\ 10^{7}$
	Os-193	$1\ 10^{2}$	$1\ 10^{6}$
	Os-194+	$1\ 10^{2}$	$1\ 10^{5}$

TABLE 3 (continued)

Element	Radionuclide	Exempt concentration (Bq g^{-1})	Exempt quantity (Bq)
Iridium	Ir-182	$1\ 10^{1}$	$1\ 10^{5}$
	Ir-184	$1\ 10^{1}$	$1\ 10^{6}$
	Ir-185	$1\ 10^{1}$	$1\ 10^{6}$
	Ir-186 (15.8 hours)	$1\ 10^{1}$	$1\ 10^{6}$
	Ir-186 (1.75 hours)	$1\ 10^{1}$	$1\ 10^{6}$
	Ir-187	$1\ 10^{2}$	$1\ 10^{6}$
	Ir-188	$1\ 10^{1}$	$1\ 10^{6}$
	Ir-189+	$1\ 10^{2}$	$1\ 10^{7}$
	Ir-190	$1\ 10^{1}$	$1\ 10^{6}$
	Ir-190m (3.1 hours)	$1\ 10^{1}$	$1\ 10^{6}$
	Ir-190m (1.2 hours)	$1\ 10^{4}$	$1\ 10^{7}$
	Ir-192	$1\ 10^{1}$	$1\ 10^{4}$
	Ir-192m	$1\ 10^{2}$	$1\ 10^{7}$
	Ir-193m	$1\ 10^{4}$	$1\ 10^{7}$
	Ir-194	$1\ 10^{2}$	$1\ 10^{5}$
	Ir-194m	$1\ 10^{1}$	$1\ 10^{6}$
	Ir-195	$1\ 10^{2}$	$1\ 10^{6}$
	Ir-195m	$1\ 10^{2}$	$1\ 10^{6}$
Platinum	Pt-186	$1\ 10^{1}$	$1\ 10^{6}$
	Pt-188+	$1\ 10^{1}$	$1\ 10^{6}$
	Pt-189	$1\ 10^{2}$	$1\ 10^{6}$
	Pt-191	$1\ 10^{2}$	$1\ 10^{6}$
	Pt-193	$1\ 10^{4}$	$1\ 10^{7}$
	Pt-193m	$1\ 10^{3}$	$1\ 10^{7}$
	Pt-195m	$1\ 10^{2}$	$1\ 10^{6}$
	Pt-197	$1\ 10^{3}$	$1\ 10^{6}$
	Pt-197m	$1\ 10^{2}$	$1\ 10^{6}$
	Pt-199	$1\ 10^{2}$	$1\ 10^{6}$
	Pt-200	$1\ 10^{2}$	$1\ 10^{6}$
Gold	Au-193	$1\ 10^{2}$	$1\ 10^{7}$
	Au-194	$1\ 10^{1}$	$1\ 10^{6}$
	Au-195	$1\ 10^{2}$	$1\ 10^{7}$
	Au-198	$1\ 10^{2}$	$1\ 10^{6}$
	Au-198m	$1\ 10^{1}$	$1\ 10^{6}$
	Au-199	$1\ 10^{2}$	$1\ 10^{6}$
	Au-200	$1\ 10^{2}$	$1\ 10^{5}$
	Au-200m	$1\ 10^{1}$	$1\ 10^{6}$
	Au-201	$1\ 10^{2}$	$1\ 10^{6}$
Mercury	Hg-193	$1\ 10^{2}$	$1\ 10^{6}$
	Hg-193m	$1\ 10^{1}$	$1\ 10^{6}$
	Hg-194+	$1\ 10^{1}$	$1\ 10^{6}$
	Hg-195	$1\ 10^{2}$	$1\ 10^{6}$
	Hg-195m+ (organic)	$1\ 10^{2}$	$1\ 10^{6}$
	Hg-195m+ (inorganic)	$1\ 10^{2}$	$1\ 10^{6}$
	Hg-197	$1\ 10^{2}$	$1\ 10^{7}$
	Hg-197m (organic)	$1\ 10^{2}$	$1\ 10^{6}$
	Hg-197m (inorganic)	$1\ 10^{2}$	$1\ 10^{6}$
	Hg-199m	$1\ 10^{2}$	$1\ 10^{6}$
	Hg-203	$1\ 10^{2}$	$1\ 10^{5}$
Thallium	Tl-194	$1\ 10^{1}$	$1\ 10^{6}$
	Tl-194m	$1\ 10^{1}$	$1\ 10^{6}$

TABLE 3 (continued)

Element	Radionuclide	Exempt concentration (Bq g^{-1})	Exempt quantity (Bq)
	Tl-195	$1\ 10^{1}$	$1\ 10^{6}$
	Tl-197	$1\ 10^{2}$	$1\ 10^{6}$
	Tl-198	$1\ 10^{1}$	$1\ 10^{6}$
	Tl-198m	$1\ 10^{1}$	$1\ 10^{6}$
	Tl-199	$1\ 10^{2}$	$1\ 10^{6}$
	Tl-200	$1\ 10^{1}$	$1\ 10^{6}$
	Tl-201	$1\ 10^{2}$	$1\ 10^{6}$
	Tl-202	$1\ 10^{2}$	$1\ 10^{6}$
	Tl-204	$1\ 10^{4}$	$1\ 10^{4}$
Lead	Pb-195m	$1\ 10^{1}$	$1\ 10^{6}$
	Pb-198	$1\ 10^{2}$	$1\ 10^{6}$
	Pb-199	$1\ 10^{1}$	$1\ 10^{6}$
	Pb-200	$1\ 10^{2}$	$1\ 10^{6}$
	Pb-201	$1\ 10^{1}$	$1\ 10^{6}$
	Pb-202	$1\ 10^{3}$	$1\ 10^{6}$
	Pb-202m	$1\ 10^{1}$	$1\ 10^{6}$
	Pb-203	$1\ 10^{2}$	$1\ 10^{6}$
	Pb-205	$1\ 10^{4}$	$1\ 10^{7}$
	Pb-209	$1\ 10^{5}$	$1\ 10^{6}$
	Pb-210+	$1\ 10^{1}$	$1\ 10^{4}$
	Pb-211	$1\ 10^{2}$	$1\ 10^{6}$
	Pb-212+	$1\ 10^{1}$	$1\ 10^{5}$
	Pb-214	$1\ 10^{2}$	$1\ 10^{6}$
Bismuth	Bi-200	$1\ 10^{1}$	$1\ 10^{6}$
	Bi-201	$1\ 10^{1}$	$1\ 10^{6}$
	Bi-202	$1\ 10^{1}$	$1\ 10^{6}$
	Bi-203	$1\ 10^{1}$	$1\ 10^{6}$
	Bi-205	$1\ 10^{1}$	$1\ 10^{6}$
	Bi-206	$1\ 10^{1}$	$1\ 10^{5}$
	Bi-207	$1\ 10^{1}$	$1\ 10^{6}$
	Bi-210	$1\ 10^{3}$	$1\ 10^{6}$
	Bi-210m+	$1\ 10^{1}$	$1\ 10^{5}$
	Bi-212+	$1\ 10^{1}$	$1\ 10^{5}$
	Bi-213	$1\ 10^{2}$	$1\ 10^{6}$
	Bi-214	$1\ 10^{1}$	$1\ 10^{5}$
Polonium	Po-203	$1\ 10^{1}$	$1\ 10^{6}$
	Po-205	$1\ 10^{1}$	$1\ 10^{6}$
	Po-206	$1\ 10^{1}$	$1\ 10^{6}$
	Po-207	$1\ 10^{1}$	$1\ 10^{6}$
	Po-208	$1\ 10^{1}$	$1\ 10^{4}$
	Po-209	$1\ 10^{1}$	$1\ 10^{4}$
	Po-210	$1\ 10^{1}$	$1\ 10^{4}$
Astatine	At-207	$1\ 10^{1}$	$1\ 10^{6}$
	At-211	$1\ 10^{3}$	$1\ 10^{7}$
Francium	Fr-222	$1\ 10^{3}$	$1\ 10^{5}$
	Fr-223	$1\ 10^{2}$	$1\ 10^{6}$
Radon	Rn-220+	$1\ 10^{4}$	$1\ 10^{7}$
	Rn-222+	$1\ 10^{1}$	$1\ 10^{8}$

TABLE 3 (continued)

Element	Radionuclide	Exempt concentration (Bq g^{-1})	Exempt quantity (Bq)
Radium	Ra-223+	$1\ 10^{2}$	$1\ 10^{5}$
	Ra-224+	$1\ 10^{1}$	$1\ 10^{5}$
	Ra-225	$1\ 10^{2}$	$1\ 10^{5}$
	Ra-226+	$1\ 10^{1}$	$1\ 10^{4}$
	Ra-227	$1\ 10^{2}$	$1\ 10^{6}$
	Ra-228+	$1\ 10^{1}$	$1\ 10^{5}$
Actinium	Ac-224	$1\ 10^{2}$	$1\ 10^{6}$
	Ac-225+	$1\ 10^{1}$	$1\ 10^{4}$
	Ac-226	$1\ 10^{2}$	$1\ 10^{5}$
	Ac-227+	$1\ 10^{-1}$	$1\ 10^{3}$
	Ac-228	$1\ 10^{1}$	$1\ 10^{6}$
Thorium	Th-226+	$1\ 10^{3}$	$1\ 10^{7}$
	Th-227	$1\ 10^{1}$	$1\ 10^{4}$
	Th-228+	$1\ 10^{0}$	$1\ 10^{4}$
	Th-229+	$1\ 10^{0}$	$1\ 10^{3}$
	Th-230	$1\ 10^{0}$	$1\ 10^{4}$
	Th-231	$1\ 10^{3}$	$1\ 10^{7}$
	Th-232	$1\ 10^{1}$	$1\ 10^{4}$
	Th-232sec	$1\ 10^{0}$	$1\ 10^{3}$
	Th-234+	$1\ 10^{3}$	$1\ 10^{5}$
Protactinium	Pa-227	$1\ 10^{3}$	$1\ 10^{6}$
	Pa-228	$1\ 10^{1}$	$1\ 10^{6}$
	Pa-230	$1\ 10^{1}$	$1\ 10^{6}$
	Pa-231	$1\ 10^{0}$	$1\ 10^{3}$
	Pa-232	$1\ 10^{1}$	$1\ 10^{6}$
	Pa-233	$1\ 10^{2}$	$1\ 10^{7}$
	Pa-234	$1\ 10^{1}$	$1\ 10^{6}$
Uranium	U-230+	$1\ 10^{1}$	$1\ 10^{5}$
	U-231	$1\ 10^{2}$	$1\ 10^{7}$
	U-232+	$1\ 10^{0}$	$1\ 10^{3}$
	U-233	$1\ 10^{1}$	$1\ 10^{4}$
	U-234	$1\ 10^{1}$	$1\ 10^{4}$
	U-235+	$1\ 10^{1}$	$1\ 10^{4}$
	U-236	$1\ 10^{1}$	$1\ 10^{4}$
	U-237	$1\ 10^{2}$	$1\ 10^{6}$
	U-238+	$1\ 10^{1}$	$1\ 10^{4}$
	U-238 sec	$1\ 10^{0}$	$1\ 10^{3}$
	U-239	$1\ 10^{2}$	$1\ 10^{6}$
	U-240	$1\ 10^{3}$	$1\ 10^{7}$
	U-240+	$1\ 10^{1}$	$1\ 10^{6}$
Neptunium	Np-232	$1\ 10^{1}$	$1\ 10^{6}$
	Np-233	$1\ 10^{2}$	$1\ 10^{7}$
	Np-234	$1\ 10^{1}$	$1\ 10^{6}$
	Np-235	$1\ 10^{3}$	$1\ 10^{7}$
	Np-236 (1.15 10^{5} years)	$1\ 10^{2}$	$1\ 10^{5}$
	Np-236 (22.5 hours)	$1\ 10^{3}$	$1\ 10^{7}$
	Np-237+	$1\ 10^{0}$	$1\ 10^{3}$
	Np-238	$1\ 10^{2}$	$1\ 10^{6}$
	Np-239	$1\ 10^{2}$	$1\ 10^{7}$
	Np-240	$1\ 10^{1}$	$1\ 10^{6}$

TABLE 3 (continued)

Element	Radionuclide	Exempt concentration (Bq g^{-1})	Exempt quantity (Bq)
Plutonium	Pu-234	$1\ 10^{2}$	$1\ 10^{7}$
	Pu-235	$1\ 10^{2}$	$1\ 10^{7}$
	Pu-236	$1\ 10^{1}$	$1\ 10^{4}$
	Pu-237	$1\ 10^{3}$	$1\ 10^{7}$
	Pu-238	$1\ 10^{0}$	$1\ 10^{4}$
	Pu-239	$1\ 10^{0}$	$1\ 10^{4}$
	Pu-240	$1\ 10^{0}$	$1\ 10^{3}$
	Pu-241	$1\ 10^{2}$	$1\ 10^{5}$
	Pu-242	$1\ 10^{0}$	$1\ 10^{4}$
	Pu-243	$1\ 10^{3}$	$1\ 10^{7}$
	Pu-244	$1\ 10^{0}$	$1\ 10^{4}$
	Pu-245	$1\ 10^{2}$	$1\ 10^{6}$
	Pu-246	$1\ 10^{2}$	$1\ 10^{6}$
Americium	Am-237	$1\ 10^{2}$	$1\ 10^{6}$
	Am-238	$1\ 10^{1}$	$1\ 10^{6}$
	Am-239	$1\ 10^{2}$	$1\ 10^{6}$
	Am-240	$1\ 10^{1}$	$1\ 10^{6}$
	Am-241	$1\ 10^{0}$	$1\ 10^{4}$
	Am-242	$1\ 10^{3}$	$1\ 10^{6}$
	Am-242m+	$1\ 10^{0}$	$1\ 10^{4}$
	Am-243+	$1\ 10^{0}$	$1\ 10^{3}$
	Am-244	$1\ 10^{1}$	$1\ 10^{6}$
	Am-244m	$1\ 10^{4}$	$1\ 10^{7}$
	Am-245	$1\ 10^{3}$	$1\ 10^{6}$
	Am-246	$1\ 10^{1}$	$1\ 10^{5}$
	Am-246m	$1\ 10^{1}$	$1\ 10^{6}$
Curium	Cm-238	$1\ 10^{2}$	$1\ 10^{7}$
	Cm-240	$1\ 10^{2}$	$1\ 10^{5}$
	Cm-241	$1\ 10^{2}$	$1\ 10^{6}$
	Cm-242	$1\ 10^{2}$	$1\ 10^{5}$
	Cm-243	$1\ 10^{0}$	$1\ 10^{4}$
	Cm-244	$1\ 10^{1}$	$1\ 10^{4}$
	Cm-245	$1\ 10^{0}$	$1\ 10^{3}$
	Cm-246	$1\ 10^{0}$	$1\ 10^{3}$
	Cm-247	$1\ 10^{0}$	$1\ 10^{4}$
	Cm-248	$1\ 10^{0}$	$1\ 10^{3}$
	Cm-249	$1\ 10^{3}$	$1\ 10^{6}$
	Cm-250	$1\ 10^{-1}$	$1\ 10^{3}$
Berkelium	Bk-245	$1\ 10^{2}$	$1\ 10^{6}$
	Bk-246	$1\ 10^{1}$	$1\ 10^{6}$
	Bk-247	$1\ 10^{0}$	$1\ 10^{4}$
	Bk-249	$1\ 10^{3}$	$1\ 10^{6}$
	Bk-250	$1\ 10^{1}$	$1\ 10^{6}$
Californium	Cf-244	$1\ 10^{4}$	$1\ 10^{7}$
	Cf-246	$1\ 10^{3}$	$1\ 10^{6}$
	Cf-248	$1\ 10^{1}$	$1\ 10^{4}$
	Cf-249	$1\ 10^{0}$	$1\ 10^{3}$
	Cf-250	$1\ 10^{1}$	$1\ 10^{4}$
	Cf-251	$1\ 10^{0}$	$1\ 10^{3}$
	Cf-252	$1\ 10^{1}$	$1\ 10^{4}$

TABLE 3 (continued)

Element	Radionuclide	Exempt concentration (Bq g^{-1})	Exempt quantity (Bq)
	Cf-253	$1\ 10^{2}$	$1\ 10^{5}$
	Cf-254	$1\ 10^{0}$	$1\ 10^{3}$
Einsteinium	Es-250	$1\ 10^{2}$	$1\ 10^{6}$
	Es-251	$1\ 10^{2}$	$1\ 10^{7}$
	Es-253	$1\ 10^{2}$	$1\ 10^{5}$
	Es-254	$1\ 10^{1}$	$1\ 10^{4}$
	Es-254m	$1\ 10^{2}$	$1\ 10^{6}$
Fermium	Fm-252	$1\ 10^{3}$	$1\ 10^{6}$
	Fm-253	$1\ 10^{2}$	$1\ 10^{6}$
	Fm-254	$1\ 10^{4}$	$1\ 10^{7}$
	Fm-255	$1\ 10^{3}$	$1\ 10^{6}$
	Fm-257	$1\ 10^{1}$	$1\ 10^{5}$
Mendelevium	Md-257	$1\ 10^{2}$	$1\ 10^{7}$
	Md-258	$1\ 10^{2}$	$1\ 10^{5}$