

# EXEMPTION OF RADIATION USE FROM SAFETY LICENSING

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This Guide is valid as of 1 November 2013 until further notice. It replaces Guide ST 1.5, Exemption of the Use of Radiation from the Safety Licence and Reporting Obligation, issued on 1 July 1999.

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# Authorization

Under section 70, paragraph 2, of the Radiation Act (592/1991), STUK – Radiation and Nuclear Safety Authority (Finland) issues general instructions, known as Radiation Safety Guides (ST Guides), concerning the use of radiation and operations involving radiation.

The Radiation Act stipulates that the party running a radiation practice is responsible for the safety of the operations. The responsible party is obliged to ensure that the level of safety specified in the ST Guides is attained and maintained.

Translation. In the event of any differences in interpretation of this guide, the Finnish and Swedish versions shall take precedence over this translation.

This Guide includes the requirements relating to the implementation of Council Directive 96/29/Euratom; OJ No. L 159, 29.6.1996, p. 1.

# 1 General

The primary means of controlling the use of radiation is the safety licence procedure. In the Radiation Act, certain practices are exempted from safety licensing. In addition to the practices mentioned in the law, the Radiation and Nuclear Safety Authority (STUK) may on certain conditions exempt other radiation uses, too, from safety licensing. In connection with the exemption it may be ruled that the radiation use in question shall be notifiable to STUK and the radiation appliances used shall be registered in a database maintained by STUK.

This Safety Guide presents the criteria and requirements applied by STUK when it makes its decision on whether a radiation use can be exempted from safety licensing. The Guide also lists the exemption values of radioactive substances as well as the clearance levels of radioactive materials, which apply to the reuse, recycling and final disposal of radioactive materials for the purpose of exempting radioactive materials from all subsequent regulatory control. In addition, the Guide lists the cases where the use of an appliance emitting ionizing radiation electrically is exempt from safety licensing automatically, i.e. without a decision from STUK.

This Safety Guide is not applicable to practices for handling or possessing natural radioactive materials only.

This Safety Guide does not apply to the use of nuclear energy.

The radiation legislation does not apply to natural background radiation which is caused by cosmic radiation prevailing at ground level, radioactive substances contained in the undisturbed earth's crust or radioactive substances found naturally in the human body.

The definitions of the terms used in the Guide are presented in Appendix A.

*The safety licence, and the granting of the licence, are regulated in section 16 of the Radiation Act (592/1991). Section 17 of the Radiation Act stipulates the exemption of certain practices from safety licensing, as well as the right of STUK to exempt other kinds of radiation uses from safety licensing and the notification of exempted practices to STUK. Section 20 of the Radiation Decree*

*(1512/1991) stipulates the notification of radiation appliances exempted from safety licensing to a register maintained by STUK.*

*Section 29 of the Radiation Decree stipulates notifications in respect of operations relating to natural radioactive materials.*

*The Nuclear Energy Act (990/1987) and Nuclear Energy Decree (161/1988) stipulate the use of nuclear energy and the necessary notifications.*

## 2 Radiation use exempted by STUK's decision

### 2.1 General requirements

A use of radiation may be exempted from safety licensing provided that it will cause no detriment or danger to health. To exempt a given use of radiation from safety licensing, STUK needs to be able to ascertain with sufficient reliability that:

- the radiological risks to individuals caused by the exempted practice are so minor that applying the licensing procedure is not appropriate
- the exposure to the public caused by the exempted practice is sufficiently low as to be of no regulatory concern under the prevailing circumstances
- the exempted practice is inherently without radiological significance, with no appreciable likelihood of scenarios that could lead to a failure to meet the criteria mentioned above.

In addition to the above-mentioned basic criteria STUK also assesses whether or not the additional requirements mentioned in Appendix B are met.

*Section 17 of the Radiation Act stipulates the right of STUK to exempt a radiation use from safety licensing.*

*The decisions on exempted practices can be found on STUK's website.*

### 2.2 Exempted practice requiring notification

On the basis of a justification and optimization assessment, STUK may exempt a given practice from safety licensing even in the case that all criteria listed under item 2.1 and the additional requirements mentioned in Appendix B are not met. In that case the exempted practice is

ordered notifiable to STUK. Possible orders on notification to a register are included in the decision on exemption.

*Section 17 of the Radiation Act stipulates the right of STUK to exempt a radiation use from safety licensing on certain conditions and to order it notifiable to STUK.*

*Section 20 of the Radiation Decree stipulates the notification of exempted appliances to a register maintained by STUK.*

*The decisions on notifiable exempted practices can be found on STUK's website.*

## 3 Exempted use of radioactive substances

### 3.1 Exemption values

No safety licence will be required for the use of a radioactive substance if the activity or activity concentration of the radioactive substance used is smaller than or equal to the exemption value set for the radionuclide in question. However, a record must be kept of such radioactive substances used.

The exemption values for the activity or activity concentration of radionuclides of radioactive substances are presented in Appendix C. For certain compounds labelled with radionuclides for which the exemption value is defined on the basis of the internal radiation exposure (e.g. tritiated thymidine), STUK may establish exemption values that are lower than those presented in Appendix C. Appendix D lists the radioactive decay series; when defining the exemption values in this instance, the values already take account of the occurrence of daughter nuclides in secular equilibrium with a parent nuclide. For those radionuclides that are not mentioned in Appendix C, the exemption values will be established whenever necessary by STUK on the basis of the basic criteria for exemption.

In the case of a mixture of radionuclides or more than one radionuclide, a safety licence will not be needed for the use of radiation, nor is a notification required, if the following condition is met:

$$\sum_k \frac{A_k}{A_{E,k}} \leq 1 \text{ or } \sum_k \frac{C_k}{C_{E,k}} \leq 1 \quad (1)$$

where

$A_k$  is the activity of radionuclide  $k$

$A_{E,k}$  is the exemption value for the activity of radionuclide  $k$

$C_k$  is the activity concentration of radionuclide  $k$

$C_{E,k}$  is the exemption value for the activity concentration of radionuclide  $k$ .

A record shall be kept of radioactive substances exempted on this basis.

*The exemption values are presented in STUK's Decision 5/3020/2013.*

### 3.2 Practices to which exemption values do not apply

Exemption values do not apply to the following practices:

- medical use of radiation as referred to in section 38 of the Radiation Act
- the manufacture, trading and import and export of radiopharmaceuticals
- the administration of radioactive substances to animals for purposes of diagnosis, treatment or research
- the manufacture, introduction into markets, trading and import and export of consumer goods containing radioactive substances.

The practices mentioned above always require a safety licence unless the radiation source in question is used as a consumer product exempted from safety licensing by decision issued by STUK.

The exemption values do not apply to the use of materials containing natural radioactive substances.

### 3.3 Reuse, recycling and disposal of radioactive material

STUK's approval must be sought for the reuse, recycling and disposal of radioactive materials originating from practices subject to the safety licence or notification obligation. STUK decides whether the materials in question can be released from all subsequent regulatory control. STUK's approval will not be required if the activity concentration of the radioactive material

to be reused, recycled or disposed as waste is smaller than or equal to the clearance level set for the radionuclide in question. The clearance levels for the radionuclides are presented in Appendix E. Appendix D lists the radioactive decay series; when defining the exemption values in this instance, the values already take account of the occurrence of daughter nuclides in secular equilibrium with a parent nuclide. For radionuclides that are not mentioned in Appendix E, the clearance levels will be confirmed whenever necessary by STUK.

If a radioactive material contains several different radionuclides, no approval is required if the following condition is met:

$$\sum_k \frac{C_k}{C_{C,k}} \leq 1 \quad (2)$$

where

$C_k$  is the activity concentration of radionuclide  $k$

$C_{C,k}$  is the clearance level for radionuclide  $k$ .

*Requirements for the handling of radioactive waste are presented in Guide ST 6.2.*

*The clearance levels are presented in STUK's Decision 4/3020/2013.*

## 4 Exempted use of electrical apparatus emitting ionizing radiation

The use of an electrical apparatus emitting ionizing radiation does not require a safety licence nor is subject to the notification if the

apparatus:

- contains no parts operating at a voltage higher than 5 kV
- operates at a voltage not higher than 30 kV and does not cause at any point at a distance of 10 cm from an accessible surface of the appliance a dose rate greater than 1  $\mu\text{Sv/h}$ .

*The use of electrical apparatus emitting ionizing radiation at a voltage lower than 5 kV is exempt from safety licensing on the basis of STUK's Decision 7/3020/2013.*

*The use of electrical apparatus emitting ionizing radiation at a voltage lower than 30 kV is exempt from safety licensing on the basis of STUK's Decision 6/3020/2013.*

## Literature

1. Council directive 96/29/Euratom of 13 May 1996 laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation. Official Journal of the European Communities No. L 159, 29.6.1996.
2. National Radiological Protection Board. Exempt Concentrations and Quantities for Radionuclides not Included in the European Basic Safety Standards Directive. NRPB Report R306. Didcot: NRPB; 1999.
3. International Atomic Energy Agency. Application of the concepts of exclusion, exemption and clearance. IAEA Safety Standards Series. Safety Guide RS-G-1.7. Vienna: IAEA; 2004.

## **APPENDIX A**

### **Definitions**

#### **Exemption value**

A value, expressed as the activity or activity concentration of a radioactive substance, defining the threshold below which no safety licence or notification is required.

#### **Clearance level**

A value, expressed as the activity concentration of solid radioactive materials resulting as by-products from practices subject to the safety licence or notification, below which the final

disposal, recycling or reuse of a material is released from all regulatory control and requires no approval from STUK.

#### **Radioactive substance**

A substance which decays by itself and emits ionizing radiation.

#### **Radioactive material**

Solid material containing a radioactive substance or contaminated by a radioactive substance.

## APPENDIX B

### Additional requirements for exempting a use of radiation from safety licensing

A use of radiation can be exempted from safety licensing on the basis of the basic criteria presented under item 3.1 if the following additional requirements are met in all circumstances:

- The radiation appliance does not cause at any point at a distance of 10 cm from an accessible surface of the appliance a dose rate greater than 1  $\mu\text{Sv/h}$ .
- The effective dose expected to be incurred by any person due to the practice in question is 10  $\mu\text{Sv}$  or less in a year.
- The collective effective dose caused to members of the public by one year of performance of the practice is 1 manSv or less in a year.
- Assessment of the radiation exposure caused by the practice does not require a case-by-case study and the practice is carried out in compliance with the regulations of the radiation legislation.

If an exempted radiation use involves an appliance containing a radioactive substance in excess of the exemption value, the appliance shall meet the following additional conditions:

- the radioactive substance comprises a sealed source
- STUK has defined the conditions for the final disposal of the radioactive substance.

STUK may also exempt from safety licensing another kind of radiation use if a justification and optimization assessment carried out by STUK indicates that exemption is a better alternative than applying the safety licensing procedure.

## APPENDIX C

## Exemption values of radioactive substances

Radionuclide	Exemption value	
	Activity (Bq)	Activity concentration (Bq/g) *)
H-3	10 <sup>9</sup>	10 <sup>6</sup>
Be-7	10 <sup>7</sup>	10 <sup>3</sup>
C-11	10 <sup>6</sup>	10
C-14	10 <sup>7</sup>	10 <sup>4</sup>
N-13	10 <sup>9</sup>	10 <sup>2</sup>
O-15	10 <sup>9</sup>	10 <sup>2</sup>
F-18	10 <sup>6</sup>	10
Na-22	10 <sup>6</sup>	10
Na-24	10 <sup>5</sup>	10
Mg-28	10 <sup>5</sup>	10
Si-31	10 <sup>6</sup>	10 <sup>3</sup>
P-32	10 <sup>5</sup>	10 <sup>3</sup>
P-33	10 <sup>8</sup>	10 <sup>5</sup>
S-35	10 <sup>8</sup>	10 <sup>5</sup>
Cl-36	10 <sup>6</sup>	10 <sup>4</sup>
Cl-38	10 <sup>5</sup>	10
Ar-37	10 <sup>8</sup>	10 <sup>6</sup>
Ar-41	10 <sup>9</sup>	10 <sup>2</sup>
K-40	10 <sup>6</sup>	10 <sup>2</sup>
K-42	10 <sup>6</sup>	10 <sup>2</sup>
K-43	10 <sup>6</sup>	10
Ca-45	10 <sup>7</sup>	10 <sup>4</sup>
Ca-47	10 <sup>6</sup>	10
Sc-46	10 <sup>6</sup>	10
Sc-47	10 <sup>6</sup>	10 <sup>2</sup>
Sc-48	10 <sup>5</sup>	10
V-48	10 <sup>5</sup>	10
Cr-51	10 <sup>7</sup>	10 <sup>3</sup>
Mn-51	10 <sup>5</sup>	10
Mn-52	10 <sup>5</sup>	10
Mn-52m	10 <sup>5</sup>	10
Mn-53	10 <sup>9</sup>	10 <sup>4</sup>
Mn-54	10 <sup>6</sup>	10
Mn-56	10 <sup>5</sup>	10
Fe-52	10 <sup>6</sup>	10
Fe-55	10 <sup>6</sup>	10 <sup>4</sup>
Fe-59	10 <sup>6</sup>	10
Co-55	10 <sup>6</sup>	10
Co-56	10 <sup>5</sup>	10
Co-57	10 <sup>6</sup>	10 <sup>2</sup>
Co-58	10 <sup>6</sup>	10

Radionuclide	Exemption value	
	Activity (Bq)	Activity concentration (Bq/g) *)
Co-58m	10 <sup>7</sup>	10 <sup>4</sup>
Co-60	10 <sup>5</sup>	10
Co-60m	10 <sup>6</sup>	10 <sup>3</sup>
Co-61	10 <sup>6</sup>	10 <sup>2</sup>
Co-62m	10 <sup>5</sup>	10
Ni-59	10 <sup>8</sup>	10 <sup>4</sup>
Ni-63	10 <sup>8</sup>	10 <sup>5</sup>
Ni-65	10 <sup>6</sup>	10
Cu-64	10 <sup>6</sup>	10 <sup>2</sup>
Cu-67	10 <sup>6</sup>	10 <sup>2</sup>
Zn-65	10 <sup>6</sup>	10
Zn-69	10 <sup>6</sup>	10 <sup>4</sup>
Zn-69m	10 <sup>6</sup>	10 <sup>2</sup>
Ga-67	10 <sup>6</sup>	10 <sup>2</sup>
Ga-72	10 <sup>5</sup>	10
Ge-68	10 <sup>5</sup>	10
Ge-71	10 <sup>8</sup>	10 <sup>4</sup>
As-73	10 <sup>7</sup>	10 <sup>3</sup>
As-74	10 <sup>6</sup>	10
As-76	10 <sup>5</sup>	10 <sup>2</sup>
As-77	10 <sup>6</sup>	10 <sup>3</sup>
Se-73	10 <sup>6</sup>	10
Se-75	10 <sup>6</sup>	10 <sup>2</sup>
Br-75	10 <sup>6</sup>	10
Br-76	10 <sup>5</sup>	10
Br-82	10 <sup>6</sup>	10
Kr-74	10 <sup>9</sup>	10 <sup>2</sup>
Kr-76	10 <sup>9</sup>	10 <sup>2</sup>
Kr-77	10 <sup>9</sup>	10 <sup>2</sup>
Kr-79	10 <sup>5</sup>	10 <sup>3</sup>
Kr-81	10 <sup>7</sup>	10 <sup>4</sup>
Kr-83m	10 <sup>12</sup>	10 <sup>5</sup>
Kr-85	10 <sup>4</sup>	10 <sup>5</sup>
Kr-85m	10 <sup>10</sup>	10 <sup>3</sup>
Kr-87	10 <sup>9</sup>	10 <sup>2</sup>
Kr-88	10 <sup>9</sup>	10 <sup>2</sup>
Rb-81	10 <sup>6</sup>	10
Rb-86	10 <sup>5</sup>	10 <sup>2</sup>
Sr-85	10 <sup>6</sup>	10 <sup>2</sup>
Sr-85m	10 <sup>7</sup>	10 <sup>2</sup>
Sr-87m	10 <sup>6</sup>	10 <sup>2</sup>



Radionuclide	Exemption value	
	Activity (Bq)	Activity concentration (Bq/g) *)
Sr-89	10 <sup>6</sup>	10 <sup>3</sup>
Sr-90 +	10 <sup>4</sup>	10 <sup>2</sup>
Sr-91	10 <sup>5</sup>	10
Sr-92	10 <sup>6</sup>	10
Y-88	10 <sup>6</sup>	10
Y-90	10 <sup>5</sup>	10 <sup>3</sup>
Y-91	10 <sup>6</sup>	10 <sup>3</sup>
Y-91m	10 <sup>6</sup>	10 <sup>2</sup>
Y-92	10 <sup>5</sup>	10 <sup>2</sup>
Y-93	10 <sup>5</sup>	10 <sup>2</sup>
Zr-93 +	10 <sup>7</sup>	10 <sup>3</sup>
Zr-95	10 <sup>6</sup>	10
Zr-97 +	10 <sup>5</sup>	10
Nb-93m	10 <sup>7</sup>	10 <sup>4</sup>
Nb-94	10 <sup>6</sup>	10
Nb-95	10 <sup>6</sup>	10
Nb-97	10 <sup>6</sup>	10
Nb-98	10 <sup>5</sup>	10
Mo-90	10 <sup>6</sup>	10
Mo-93	10 <sup>8</sup>	10 <sup>3</sup>
Mo-99	10 <sup>6</sup>	10 <sup>2</sup>
Mo-101	10 <sup>6</sup>	10
Tc-95m	10 <sup>6</sup>	10
Tc-96	10 <sup>6</sup>	10
Tc-96m	10 <sup>7</sup>	10 <sup>3</sup>
Tc-97	10 <sup>8</sup>	10 <sup>3</sup>
Tc-97m	10 <sup>7</sup>	10 <sup>3</sup>
Tc-99	10 <sup>7</sup>	10 <sup>4</sup>
Tc-99m	10 <sup>7</sup>	10 <sup>2</sup>
Ru-97	10 <sup>7</sup>	10 <sup>2</sup>
Ru-103	10 <sup>6</sup>	10 <sup>2</sup>
Ru-105	10 <sup>6</sup>	10
Ru-106 +	10 <sup>5</sup>	10 <sup>2</sup>
Rh-103m	10 <sup>8</sup>	10 <sup>4</sup>
Rh-105	10 <sup>7</sup>	10 <sup>2</sup>
Pd-103	10 <sup>8</sup>	10 <sup>3</sup>
Pd-109	10 <sup>6</sup>	10 <sup>3</sup>
Ag-105	10 <sup>6</sup>	10 <sup>2</sup>
Ag-108m +	10 <sup>6</sup>	10
Ag-110m	10 <sup>6</sup>	10
Ag-111	10 <sup>6</sup>	10 <sup>3</sup>
Cd-109	10 <sup>6</sup>	10 <sup>4</sup>
Cd-115	10 <sup>6</sup>	10 <sup>2</sup>
Cd-115m	10 <sup>6</sup>	10 <sup>3</sup>
In-111	10 <sup>6</sup>	10 <sup>2</sup>

Radionuclide	Exemption value	
	Activity (Bq)	Activity concentration (Bq/g) *)
In-113m	10 <sup>6</sup>	10 <sup>2</sup>
In-114m	10 <sup>6</sup>	10 <sup>2</sup>
In-115m	10 <sup>6</sup>	10 <sup>2</sup>
Sn-113	10 <sup>7</sup>	10 <sup>3</sup>
Sn-117m	10 <sup>6</sup>	10 <sup>2</sup>
Sn-121	10 <sup>7</sup>	10 <sup>5</sup>
Sn-125	10 <sup>5</sup>	10 <sup>2</sup>
Sb-122	10 <sup>4</sup>	10 <sup>2</sup>
Sb-124	10 <sup>6</sup>	10
Sb-125	10 <sup>6</sup>	10 <sup>2</sup>
Te-123m	10 <sup>7</sup>	10 <sup>2</sup>
Te-125m	10 <sup>7</sup>	10 <sup>3</sup>
Te-127	10 <sup>6</sup>	10 <sup>3</sup>
Te-127m	10 <sup>7</sup>	10 <sup>3</sup>
Te-129	10 <sup>6</sup>	10 <sup>2</sup>
Te-129m	10 <sup>6</sup>	10 <sup>3</sup>
Te-131	10 <sup>5</sup>	10 <sup>2</sup>
Te-131m	10 <sup>6</sup>	10
Te-132	10 <sup>7</sup>	10 <sup>2</sup>
Te-133	10 <sup>5</sup>	10
Te-133m	10 <sup>5</sup>	10
Te-134	10 <sup>6</sup>	10
I-123	10 <sup>7</sup>	10 <sup>2</sup>
I-124	10 <sup>6</sup>	10
I-125	10 <sup>6</sup>	10 <sup>3</sup>
I-126	10 <sup>6</sup>	10 <sup>2</sup>
I-129	10 <sup>5</sup>	10 <sup>2</sup>
I-130	10 <sup>6</sup>	10
I-131	10 <sup>6</sup>	10 <sup>2</sup>
I-132	10 <sup>5</sup>	10
I-133	10 <sup>6</sup>	10
I-134	10 <sup>5</sup>	10
I-135	10 <sup>6</sup>	10
Xe-131m	10 <sup>4</sup>	10 <sup>4</sup>
Xe-133	10 <sup>4</sup>	10 <sup>3</sup>
Xe-135	10 <sup>10</sup>	10 <sup>3</sup>
Cs-129	10 <sup>5</sup>	10 <sup>2</sup>
Cs-131	10 <sup>6</sup>	10 <sup>3</sup>
Cs-132	10 <sup>5</sup>	10
Cs-134m	10 <sup>5</sup>	10 <sup>3</sup>
Cs-134	10 <sup>4</sup>	10
Cs-135	10 <sup>7</sup>	10 <sup>4</sup>
Cs-136	10 <sup>5</sup>	10
Cs-137 +	10 <sup>4</sup>	10
Cs-138	10 <sup>4</sup>	10

Radionuclide	Exemption value	
	Activity (Bq)	Activity concentration (Bq/g) *)
Ba-131	10 <sup>6</sup>	10 <sup>2</sup>
Ba-133	10 <sup>6</sup>	10 <sup>2</sup>
Ba-140 +	10 <sup>5</sup>	10
La-140	10 <sup>5</sup>	10
Ce-139	10 <sup>6</sup>	10 <sup>2</sup>
Ce-141	10 <sup>7</sup>	10 <sup>2</sup>
Ce-143	10 <sup>6</sup>	10 <sup>2</sup>
Ce-144 +	10 <sup>5</sup>	10 <sup>2</sup>
Pr-142	10 <sup>5</sup>	10 <sup>2</sup>
Pr-143	10 <sup>6</sup>	10 <sup>4</sup>
Nd-147	10 <sup>6</sup>	10 <sup>2</sup>
Nd-149	10 <sup>6</sup>	10 <sup>2</sup>
Pm-147	10 <sup>7</sup>	10 <sup>4</sup>
Pm-149	10 <sup>6</sup>	10 <sup>3</sup>
Sm-147	10 <sup>4</sup>	10
Sm-151	10 <sup>8</sup>	10 <sup>4</sup>
Sm-153	10 <sup>6</sup>	10 <sup>2</sup>
Eu-152	10 <sup>6</sup>	10
Eu-152m	10 <sup>6</sup>	10 <sup>2</sup>
Eu-154	10 <sup>6</sup>	10
Eu-155	10 <sup>7</sup>	10 <sup>2</sup>
Gd-153	10 <sup>7</sup>	10 <sup>2</sup>
Gd-159	10 <sup>6</sup>	10 <sup>3</sup>
Tb-160	10 <sup>6</sup>	10
Dy-165	10 <sup>6</sup>	10 <sup>3</sup>
Dy-166	10 <sup>6</sup>	10 <sup>3</sup>
Ho-166	10 <sup>5</sup>	10 <sup>3</sup>
Ho-166m	10 <sup>6</sup>	10
Er-161	10 <sup>6</sup>	10
Er-169	10 <sup>7</sup>	10 <sup>4</sup>
Er-171	10 <sup>6</sup>	10 <sup>2</sup>
Tm-170	10 <sup>6</sup>	10 <sup>3</sup>
Tm-171	10 <sup>8</sup>	10 <sup>4</sup>
Yb-169	10 <sup>7</sup>	10 <sup>2</sup>
Yb-175	10 <sup>7</sup>	10 <sup>3</sup>
Lu-177	10 <sup>7</sup>	10 <sup>3</sup>
Hf-181	10 <sup>6</sup>	10
Ta-182	10 <sup>4</sup>	10
W-181	10 <sup>7</sup>	10 <sup>3</sup>
W-185	10 <sup>7</sup>	10 <sup>4</sup>
W-187	10 <sup>6</sup>	10 <sup>2</sup>
W-188	10 <sup>5</sup>	10 <sup>2</sup>
Re-186	10 <sup>6</sup>	10 <sup>3</sup>
Re-188	10 <sup>5</sup>	10 <sup>2</sup>
Os-185	10 <sup>6</sup>	10

Radionuclide	Exemption value	
	Activity (Bq)	Activity concentration (Bq/g) *)
Os-191	10 <sup>7</sup>	10 <sup>2</sup>
Os-191m	10 <sup>7</sup>	10 <sup>3</sup>
Os-193	10 <sup>6</sup>	10 <sup>2</sup>
Ir-190	10 <sup>6</sup>	10
Ir-192	10 <sup>4</sup>	10
Ir-194	10 <sup>5</sup>	10 <sup>2</sup>
Pt-191	10 <sup>6</sup>	10 <sup>2</sup>
Pt-193m	10 <sup>7</sup>	10 <sup>3</sup>
Pt-197	10 <sup>6</sup>	10 <sup>3</sup>
Pt-197m	10 <sup>6</sup>	10 <sup>2</sup>
Au-198	10 <sup>6</sup>	10 <sup>2</sup>
Au-199	10 <sup>6</sup>	10 <sup>2</sup>
Hg-195m	10 <sup>6</sup>	10 <sup>2</sup>
Hg-197	10 <sup>7</sup>	10 <sup>2</sup>
Hg-197m	10 <sup>6</sup>	10 <sup>2</sup>
Hg-203	10 <sup>5</sup>	10 <sup>2</sup>
Tl-200	10 <sup>6</sup>	10
Tl-201	10 <sup>6</sup>	10 <sup>2</sup>
Tl-202	10 <sup>6</sup>	10 <sup>2</sup>
Tl-204	10 <sup>4</sup>	10 <sup>4</sup>
Pb-203	10 <sup>6</sup>	10 <sup>2</sup>
Pb-210 +	10 <sup>4</sup>	10
Pb-212 +	10 <sup>5</sup>	10
Bi-206	10 <sup>5</sup>	10
Bi-207	10 <sup>6</sup>	10
Bi-210	10 <sup>6</sup>	10 <sup>3</sup>
Bi-212 +	10 <sup>5</sup>	10
Bi-213	10 <sup>6</sup>	10 <sup>2</sup>
Po-203	10 <sup>6</sup>	10
Po-205	10 <sup>6</sup>	10
Po-207	10 <sup>6</sup>	10
Po-210	10 <sup>4</sup>	10
At-211	10 <sup>7</sup>	10 <sup>3</sup>
Rn-220 +	10 <sup>7</sup>	10 <sup>4</sup>
Rn-222 +	10 <sup>8</sup>	10
Ra-223 +	10 <sup>5</sup>	10 <sup>2</sup>
Ra-224 +	10 <sup>5</sup>	10
Ra-225	10 <sup>5</sup>	10 <sup>2</sup>
Ra-226 +	10 <sup>4</sup>	10
Ra-227	10 <sup>6</sup>	10 <sup>2</sup>
Ra-228 +	10 <sup>5</sup>	10
Ac-225	10 <sup>4</sup>	10
Ac-227	10 <sup>3</sup>	10 <sup>-1</sup>
Ac-228	10 <sup>6</sup>	10
Th-226 +	10 <sup>7</sup>	10 <sup>3</sup>

Radionuclide	Exemption value	
	Activity (Bq)	Activity concentration (Bq/g) *)
Th-227	10 <sup>4</sup>	10
Th-228 +	10 <sup>4</sup>	1
Th-229 +	10 <sup>3</sup>	1
Th-230	10 <sup>4</sup>	1
Th-231	10 <sup>7</sup>	10 <sup>3</sup>
Th-232sec	10 <sup>3</sup>	1
Th-234 +	10 <sup>5</sup>	10 <sup>3</sup>
Pa-230	10 <sup>6</sup>	10
Pa-231	10 <sup>3</sup>	1
Pa-233	10 <sup>7</sup>	10 <sup>2</sup>
U-230 +	10 <sup>5</sup>	10
U-231	10 <sup>7</sup>	10 <sup>2</sup>
U-232 +	10 <sup>3</sup>	1
U-233	10 <sup>4</sup>	10
U-234	10 <sup>4</sup>	10
U-235 +	10 <sup>4</sup>	10
U-236	10 <sup>4</sup>	10
U-237	10 <sup>6</sup>	10 <sup>2</sup>
U-238 +	10 <sup>4</sup>	10
U-238sec	10 <sup>3</sup>	1
U-239	10 <sup>6</sup>	10 <sup>2</sup>
U-240	10 <sup>7</sup>	10 <sup>3</sup>
U-240 +	10 <sup>6</sup>	10
Np-237 +	10 <sup>3</sup>	1
Np-239	10 <sup>7</sup>	10 <sup>2</sup>
Np-240	10 <sup>6</sup>	10
Pu-234	10 <sup>7</sup>	10 <sup>2</sup>
Pu-235	10 <sup>7</sup>	10 <sup>2</sup>
Pu-236	10 <sup>4</sup>	10
Pu-237	10 <sup>7</sup>	10 <sup>3</sup>
Pu-238	10 <sup>4</sup>	1
Pu-239	10 <sup>4</sup>	1
Pu-240	10 <sup>3</sup>	1
Pu-241	10 <sup>5</sup>	10 <sup>2</sup>
Pu-242	10 <sup>4</sup>	1
Pu-243	10 <sup>7</sup>	10 <sup>3</sup>
Pu-244	10 <sup>4</sup>	1
Am-241	10 <sup>4</sup>	1
Am-242	10 <sup>6</sup>	10 <sup>3</sup>
Am-242m +	10 <sup>4</sup>	1
Am-243 +	10 <sup>3</sup>	1
Cm-242	10 <sup>5</sup>	10 <sup>2</sup>
Cm-243	10 <sup>4</sup>	1
Cm-244	10 <sup>4</sup>	10
Cm-245	10 <sup>3</sup>	1

Radionuclide	Exemption value	
	Activity (Bq)	Activity concentration (Bq/g) *)
Cm-246	10 <sup>3</sup>	1
Cm-247	10 <sup>4</sup>	1
Cm-248	10 <sup>3</sup>	1
Bk-249	10 <sup>6</sup>	10 <sup>3</sup>
Cf-246	10 <sup>6</sup>	10 <sup>3</sup>
Cf-248	10 <sup>4</sup>	10
Cf-249	10 <sup>3</sup>	1
Cf-250	10 <sup>4</sup>	10
Cf-251	10 <sup>3</sup>	1
Cf-252	10 <sup>4</sup>	10
Cf-253	10 <sup>5</sup>	10 <sup>2</sup>
Cf-254	10 <sup>3</sup>	1
Es-253	10 <sup>5</sup>	10 <sup>2</sup>
Es-254	10 <sup>4</sup>	10
Es-254m	10 <sup>6</sup>	10 <sup>2</sup>
Fm-254	10 <sup>7</sup>	10 <sup>4</sup>
Fm-255	10 <sup>6</sup>	10 <sup>3</sup>

Nuclides carrying the suffix “+” or “sec” represent parent nuclides in equilibrium with their correspondent daughter nuclides as listed in Appendix D. In this case the exemption values refer to the parent nuclide alone, but already take account of the daughter nuclide(s) present.

\*) Activity concentrations of the exemption values do not apply to bulk amounts of material (> 1000 kg).

#### Literature:

1. Council directive 96/29/Euratom of 13 May 1996 laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation. Official Journal of the European Communities No. L 159, 29.6.1996.
2. National Radiological Protection Board. Exempt Concentrations and Quantities for Radionuclides not Included in the European Basic Safety Standards Directive. NRPB Report R306. Didcot: NRPB; 1999.

**APPENDIX D****List of radionuclides in secular equilibrium**

<b>Parent nuclide</b>	<b>Daughter nuclides</b>
Sr-80 +	Rb-80
Sr-90 +	Y-90
Zr-93 +	Nb-93m
Zr-97 +	Nb-97
Ru-106 +	Rh-106
Ag-108m +	Ag-108
Cs-137 +	Ba-137
Ba-140 +	La-140
Ce-134 +	La-134
Ce-144 +	Pr-144
Pb-210 +	Bi-210, Po-210
Pb-212 +	Bi-212, Tl-208, Po-212
Bi-212 +	Tl-208, Po-212
Rn-220 +	Po-216
Rn-222 +	Po-218, Pb-214, Bi-214, Po-214
Ra-223 +	Rn-219, Po-215, Pb-211, Bi-211, Tl-207
Ra-224 +	Rn-220, Po-216, Pb-212, Bi-212, Tl-208, Po-212
Ra-226 +	Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
Ra-228 +	Ac-228
Th-226 +	Ra-222, Rn-218, Po-214
Th-228 +	Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208, Po-212
Th-229 +	Ra-225, Ac-225, Fr-221, At-217, Bi-213, Po-213, Pb-209
Th-232sec	Ra-228, Ac-228, Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208, Po-212
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, Po-212
U-235 +	Th-231
U-238 +	Th-234, Pa-234m
U-238sec	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-240
Np-237 +	Pa-233
Am-242m +	Am-242
Am-243 +	Np-239

## APPENDIX E

## Clearance levels of radioactive materials

Radionuclide	Clearance level
	Activity concentration (Bq/g)
H-3	10 <sup>2</sup>
Be-7	10
C-14	1
F-18 *	10
Na-22	0.1
Na-24*	1
Si-31	10 <sup>3</sup>
P-32	10 <sup>3</sup>
P-33	10 <sup>3</sup>
S-35	10 <sup>2</sup>
Cl-36	1
Cl-38*	10
K-42	10 <sup>2</sup>
K-43 *	10
Ca-45	10 <sup>2</sup>
Ca-47	10
Sc-46	0.1
Sc-47	10 <sup>2</sup>
Sc-48	1
V-48	1
Cr-51	10 <sup>2</sup>
Mn-51*	10
Mn-52	1
Mn-52m *	10
Mn-53	10 <sup>2</sup>
Mn-54	0.1
Mn-56*	10
Fe-52 *	10
Fe-55	10 <sup>3</sup>
Fe-59	1
Co-55 *	10
Co-56	0.1
Co-57	1
Co-58	1
Co-58m*	10 <sup>4</sup>
Co-60	0.1
Co-60m*	10 <sup>3</sup>
Co-61*	10 <sup>2</sup>
Co-62m*	10
Ni-59	10 <sup>2</sup>
Ni-63	10 <sup>2</sup>

Radionuclide	Clearance level
	Activity concentration (Bq/g)
Ni-65*	10
Cu-64*	10 <sup>2</sup>
Zn-65	0.1
Zn-69*	10 <sup>3</sup>
Zn-69m*	10
Ga-72*	10
Ge-71	10 <sup>4</sup>
As-73	10 <sup>3</sup>
As-74*	10
As-76*	10
As-77	10 <sup>3</sup>
Se-75	1
Br-82	1
Rb-86	10 <sup>2</sup>
Sr-85	1
Sr-85m*	10 <sup>2</sup>
Sr-87m*	10 <sup>2</sup>
Sr-89	10 <sup>3</sup>
Sr-90	1
Sr-91*	10
Sr-92*	10
Y-90	10 <sup>3</sup>
Y-91	10 <sup>2</sup>
Y-91m*	10 <sup>2</sup>
Y-92*	10 <sup>2</sup>
Y-93*	10 <sup>2</sup>
Zr-93*	10
Zr-95	1
Zr-97*	10
Nb-93m	10
Nb-94	0.1
Nb-95	1
Nb-97*	10
Nb-98*	10
Mo-90*	10
Mo-93	10
Mo-99	10
Mo-101*	10
Tc-96	1
Tc-96m*	10 <sup>3</sup>
Tc-97	10

Radionuclide	Clearance level
	Activity concentration (Bq/g)
Tc-97m	10 <sup>2</sup>
Tc-99	1
Tc-99m*	10 <sup>2</sup>
Ru-97	10
Ru-103	1
Ru-105*	10
Ru-106	0.1
Rh-103m*	10 <sup>4</sup>
Rh-105	10 <sup>2</sup>
Pd-103	10 <sup>3</sup>
Pd-109	10 <sup>2</sup>
Ag-105	1
Ag-110m	0.1
Ag-111	10 <sup>2</sup>
Cd-109	1
Cd-115	10
Cd-115m	10 <sup>2</sup>
In-111	10
In-113m*	10 <sup>2</sup>
In-114m	10
In-115m*	10 <sup>2</sup>
Sn-113	1
Sn-125	10
Sb-122	10
Sb-124	1
Sb-125	0.1
Te-123m	1
Te-125m	10 <sup>3</sup>
Te-127	10 <sup>3</sup>
Te-127m	10
Te-129*	10 <sup>2</sup>
Te-129m	10
Te-131*	10 <sup>2</sup>
Te-131m	10
Te-132	1
Te-133*	10
Te-133m*	10
Te-134*	10
I-123	10 <sup>2</sup>
I-125	10 <sup>2</sup>
I-126	10
I-129	0.01
I-130*	10
I-131	10
I-132*	10
I-133*	10

Radionuclide	Clearance level
	Activity concentration (Bq/g)
I-134*	10
I-135*	10
Cs-129	10
Cs-131	10 <sup>3</sup>
Cs-132	10
Cs-134	0.1
Cs-134m*	10 <sup>3</sup>
Cs-135	10 <sup>2</sup>
Cs-136	1
Cs-137	0.1
Cs-138*	10
Ba-131	10
Ba-140	1
La-140	1
Ce-139	1
Ce-141	10 <sup>2</sup>
Ce-143	10
Ce-144	10
Pr-142*	10 <sup>2</sup>
Pr-143	10 <sup>3</sup>
Nd-147	10 <sup>2</sup>
Nd-149*	10 <sup>2</sup>
Pm-147	10 <sup>3</sup>
Pm-149	10 <sup>3</sup>
Sm-151	10 <sup>3</sup>
Sm-153	10 <sup>2</sup>
Eu-152	0.1
Eu-152m*	10 <sup>2</sup>
Eu-154	0.1
Eu-155	1
Gd-153	10
Gd-159*	10 <sup>2</sup>
Tb-160	1
Dy-165*	10 <sup>3</sup>
Dy-166	10 <sup>2</sup>
Ho-166	10 <sup>2</sup>
Er-169	10 <sup>3</sup>
Er-171*	10 <sup>2</sup>
Tm-170	10 <sup>2</sup>
Tm-171	10 <sup>3</sup>
Yb-175	10 <sup>2</sup>
Lu-177	10 <sup>2</sup>
Hf-181	1
Ta-182	0.1
W-181	10
W-185	10 <sup>3</sup>

Radionuclide	Clearance level
	Activity concentration (Bq/g)
W-187	10
Re-186	10 <sup>3</sup>
Re-188*	10 <sup>2</sup>
Os-185	1
Os-191	10 <sup>2</sup>
Os-191m*	10 <sup>3</sup>
Os-193	10 <sup>2</sup>
Ir-190	1
Ir-192	1
Ir-194*	10 <sup>2</sup>
Pt-191	10
Pt-193m	10 <sup>3</sup>
Pt-197*	10 <sup>3</sup>
Pt-197m*	10 <sup>2</sup>
Au-198	10
Au-199	10 <sup>2</sup>
Hg-197	10 <sup>2</sup>
Hg-197m	10 <sup>2</sup>
Hg-203	10
Tl-200	10
Tl-201	10 <sup>2</sup>
Tl-202	10
Tl-204	1
Pb-203	10
Bi-206	1
Bi-207	0.1
Po-203*	10
Po-205*	10
Po-207*	10
At-211	10 <sup>3</sup>
Ra-225	10
Ra-227	10 <sup>2</sup>
Th-226	10 <sup>3</sup>
Th-229	0.1
Pa-230	10
Pa-233	10
U-230	10
U-231	10 <sup>2</sup>
U-232	0.1
U-233	1
U-236	10
U-237	10 <sup>2</sup>
U-239*	10 <sup>2</sup>
U-240*	10 <sup>2</sup>
Np-237	1
Np-239	10 <sup>2</sup>

Radionuclide	Clearance level
	Activity concentration (Bq/g)
Np-240*	10
Pu-234*	10 <sup>2</sup>
Pu-235*	10 <sup>2</sup>
Pu-236	1
Pu-237	10 <sup>2</sup>
Pu-238	0.1
Pu-239	0.1
Pu-240	0.1
Pu-241	10
Pu-242	0.1
Pu-243*	10 <sup>3</sup>
Pu-244	0.1
Am-241	0.1
Am-242*	10 <sup>3</sup>
Am-242m	0.1
Am-243	0.1
Cm-242	10
Cm-243	1
Cm-244	1
Cm-245	0.1
Cm-246	0.1
Cm-247	0.1
Cm-248	0.1
Bk-249	10 <sup>2</sup>
Cf-246	10 <sup>3</sup>
Cf-248	1
Cf-249	0.1
Cf-250	1
Cf-251	0.1
Cf-252	1
Cf-253	10 <sup>2</sup>
Cf-254	1
Es-253	10 <sup>2</sup>
Es-254	0.1
Es-254m	10
Fm-254*	10 <sup>4</sup>
Fm-255*	10 <sup>2</sup>

Nuclides marked with an asterisk “\*” have a half-life shorter than 24 hours.

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