

**Monitoring levels (MÚ)****1. MÚ - Recording level (ZáznÚ); 2. MÚ - Investigation level (VÚ); 3. MÚ - Intervention level (ZÚ)**

Where the intervention level for an emergency exposure situation is not indicated, it is not determined in advance but on the basis of the development of a specific emergency exposure situation. There can be several intervention levels determined for different interventions.

**Table J\_0:** Overview of reference levels for determining the monitoring levels in an emergency exposure situation

Legislative source	Text	Value
Section 106 of Decree No. 422/2016 Coll. Reference levels for emergency exposure situations	The reference level for the exposure of an individual in an emergency exposure situation is 100 mSv for the sum of the effective dose from external exposure and the committed effective dose from internal exposure.	100 mSv
Annex 9 to Decree No. 359/2016 Coll. Operational intervention levels of urgent protective measures for the territory of the Czech Republic	The operational intervention level is the value of photon or ambient dose equivalent rate measured at a distance of 1 m above the contaminated ground and equal to a) for urgent protective measure for evacuation 1 mSv/h; b) for urgent protective measure for sheltering 0.1 mSv/h; c) for urgent protective measure for use of iodine prophylaxis in releases containing radioactive iodines 0.1 mSv/h.	1 mSv/h 0.1 mSv/h 0.1 mSv/h
Section 107(2) of Decree No. 422/2016 Coll. Protective measures for an emergency exposure situation	Urgent protective measures shall be always implemented if doses absorbed in organs could exceed, over less than 2 days in any individual, the levels specified in Annex 29 to this Decree.	
Annex 29 to Decree No. 422/2016 Coll. The amount of absorbed dose above which urgent protective measures must be implemented	Organ, tissue	The absorbed dose that is assumed or expected to be received over the course of less than 2 days [Gy]
	Whole body	1 <sup>1)</sup>
	Lungs	6
	Skin	3

<sup>1)</sup> The possibility of immediate damage to a foetus at anticipated doses greater than 0.1 Gy must be taken into consideration when justifying and optimising the current intervention level for urgent protective measure.

Legislative source	Text	Value
	Thyroid gland	5
	Lens of the eye	1.5
	Gonads	1
Section 107(3) of Decree No. 422/2016 Coll., Protective measures for an emergency exposure situation	A justified urgent protective measure refers to a) sheltering, if the averted effective dose is greater than 10 mSv over the period of sheltering, lasting no longer than 2 days, b) iodine prophylaxis, if 1. internal contamination by radioactive iodine is imminent, and 2. the averted committed equivalent dose in the thyroid gland caused by iodine radioisotopes is greater than 100 mSv, or c) evacuation, if the sum of the effective dose so far received in an emergency exposure situation when taking into account the effect of the already implemented protective measures and the effective dose, which could be averted by evacuation, is greater than 100 mSv over the first 7 days.	10 mSv/2 days  100 mSv  100 mSv/7 days
Section 107(4) of Decree No. 422/2016 Coll., Protective measures for an emergency exposure situation	A justified urgent recovery countermeasure refers to a) the limitation of the use of food, water and fodder contaminated by radionuclides, if the averted annual committed effective dose is greater than 1 mSv, and b) the relocation of members of the public, if it is not possible to ensure an effective dose for the members of the public, after their return to the affected territory, of lower than 20 mSv over the following 12 months.	1 mSv/year 20 mSv/year
Section 107(6) of Decree No. 422/2016 Coll., Protective measures for an emergency exposure situation	The cancellation of protective measure including sheltering, evacuation and relocation of members of the public is regarded as justified if the effective dose over the following 12 months after the cancellation of protective measure were lower than 20 mSv.	20 mSv/year
Section 110(2) of Decree No. 422/2016 Coll. Procedures for the optimisation of measures to manage lasting exposure resulting from an emergency exposure situation	Reference level for management of lasting exposure resulting from an emergency exposure situation is 20 mSv in 12 month as a maximum.	20 mSv/year

**Table J\_1:** Monitoring levels for the Early Warning Network, territorial network, monitored item; air

PPDE [microSv/h]					
Planned exposure situation			Emergency exposure situation		
Recording level	Investigation level <sup>2)</sup>	Intervention level	Investigation level	1. Intervention level <sup>3)</sup>	2. Intervention level <sup>4)</sup>
0.050	0.19 to 0.25	0.50	0.50	5	10

**Table J\_2:** Monitoring levels for the network of integral measurement, local and territorial network, monitored item; air

PPDE [microSv/h]		
Planned exposure situation		Emergency exposure situation
Investigation level <sup>2)</sup>	Intervention level	Investigation level
0.10 to 0.27	0.50	0.50

**Table J\_3:** Monitoring levels for the network of instantaneous measurement, territorial network, monitored item; air

PDE [microGy/h]		
Planned exposure situation		Emergency exposure situation
Investigation level	Intervention level	Investigation level
0.50	0.50	0.50

<sup>2)</sup> Values differ depending on the location of the measuring site within the Early Warning Network, see B-series tables.

<sup>3)</sup> In an annual permanent exposure (taking into account stay in the building for about three quarters of a day), this dose rate could lead to an effective dose close to 20 mSv, which is a reference level for relocation if exceeded, or cancellation of protective measure for sheltering, evacuation and relocation if the effective dose in a given location in an emergency exposure situation is less than 20 mSv per year.

<sup>4)</sup> This intervention level to decide on the relocation takes into account the period of stay of persons in a dwelling that would partially shield external exposure, and the downward trend for PPDE over time during the year.

**Table J\_4:** Monitoring levels for the network of monitoring routes, monitored item; air

PDE [microGy/h]				
Planned exposure situation		Emergency exposure situation		
Investigation level	Intervention level	Investigation level	1. Intervention level <sup>5)</sup>	2. Intervention level <sup>6)</sup>
0.25	0.50	0.50	100	1000

**Table J\_5:** Monitoring levels for the network of food chain sampling – planned exposure situation

Monitored item	Unit	Investigation level		Intervention level	
		<sup>137</sup> Cs	<sup>90</sup> Sr	<sup>137</sup> Cs	<sup>90</sup> Sr
Staple foods: meat (except game), fish, cereals, potatoes, bread, fruits, vegetables, mixed diet (according to the consumer basket)	Bq/kg	3	1	30	10
Minor food: game, mushrooms, berries	Bq/kg	600	10	6000	100
Milk, dairy produce; liquid food	Bq/l	3	1	30	10
Milk - baby food	Bq/l	0.50	0.3	5	3
Feed	Bq/kg	10	1	100	10

<sup>5)</sup> The value 100 µGy/h = 0.1 mGy/h serves as the value to set out the so-called “zone with restricted access” where it is possible to stay for approximately 10 hours to reach the dose of 1 mSv.

<sup>6)</sup> The value of the dose rate of 1 mGy/h should be the signal for the mobile group to evaluate the time effort needed to perform other tasks or to return so as not to exceed the reference level.

**Table J\_6:** Derived activity concentrations of selected radionuclides<sup>7)</sup> in water intended for human consumption (according to EURATOM 2013/51)

Radionuclide (1)	Activity concentration [Bq/l]
<sup>3</sup> H	100
<sup>14</sup> C	240
<sup>90</sup> Sr	4.9
<sup>239</sup> Pu/ <sup>240</sup> Pu	0.6
<sup>241</sup> Am	0.7
<sup>60</sup> Co	40
<sup>134</sup> Cs	7.2
<sup>137</sup> Cs	11
<sup>131</sup> I	6.2
<sup>238</sup> U <sup>8)</sup>	3.0
<sup>234</sup> U <sup>8)</sup>	2.8
<sup>226</sup> Ra	0.5

**Notes:**

The table contains the values of the most common natural and artificial radionuclides; these are the exact values calculated for the indicative dose of 0.1 mSv when receiving 730 litres per year and using the dose coefficients specified in Annex III, Table A of Directive 2013/59/Euratom; the derived concentration of other radionuclides can be calculated in the same way.

**Table J\_7:** Monitoring levels for the network of food chain sampling – emergency exposure situation

Investigation level		
<sup>131</sup> I	<sup>137</sup> Cs	<sup>134</sup> Cs
1000 Bq/kg	100 Bq/kg	100 Bq/kg

**Notes:**

The investigation level is considered to be exceeded if it is exceeded for at least one of the given radioisotopes.

<sup>137</sup>Cs and <sup>134</sup>Cs are first present in approximately equal concentrations, while <sup>137</sup>Cs prevails later, which has a longer half-life.

If we reduce contamination of food (mainly milk, leaf vegetables and meat) with the values given in this table, we can achieve an annual committed effective dose at the level of 1 mSv assuming supplies of uncontaminated water.

<sup>7)</sup> The values indicated can be used as the investigation levels for the radionuclides not shown in Table J\_5.

<sup>8)</sup> Only the radiological properties of uranium not its chemical toxicity are taken into consideration.

**Table J\_8:** Maximum permitted levels of radioactive contamination of food (according to EURATOM 2016/52)

Isotope group/Food group	Food (Bq/kg) <sup>9)</sup>					
	Infant food <sup>10)</sup>	Milk and dairy produce <sup>11)</sup>	Other food except minor food <sup>12)</sup>	Liquid food <sup>13)</sup>	Minor food	Feed <sup>14),15),16)</sup>
Sum of isotopes of strontium, notably <sup>90</sup> Sr	75	125	750	125	7500	
Sum of isotopes of iodine, notably <sup>131</sup> I	150	500	2000	500	20000	
Sum of <b>alpha</b> -emitting isotopes of plutonium and transplutonium elements, notably <sup>239</sup> Pu and <sup>241</sup> Am	1	2	80	20	800	
Sum of all other nuclides of half-life greater than 10 days, notably <sup>134</sup> Cs and <sup>137</sup> Cs <sup>17)</sup>	400	1000	1250	1000	12500	1250 2500 5000

<sup>9)</sup> The level applicable to concentrated or dried products is calculated on the basis of the reconstituted product as ready for consumption. Member States may make recommendations concerning the diluting conditions in order to ensure that the maximum permitted levels laid down in this Regulation are observed.

<sup>10)</sup> Infant food is defined as food intended for the feeding of infants during the first 12 months of life which meets, in itself, the nutritional requirements of this category of persons and is put up for retail sale in packages which are clearly identified and labelled as such.

<sup>11)</sup> Dairy produce is defined as products falling within the following CN codes including, where appropriate, any adjustments which might subsequently be made to them: 0401, 0402 (except 0402 29 11).

<sup>12)</sup> Minor food and the corresponding levels to be applied to them are set out in Annex II.

<sup>13)</sup> Liquid food is defined as products falling within heading 2009 and Chapter 22 of the Combined Nomenclature. Values are calculated taking into account consumption of tap-water and the same values could be applied to drinking water supplies at the discretion of competent authorities in Member States.

<sup>14)</sup> These levels are intended to contribute to the observance of the maximum permitted levels for food; they do not alone guarantee such observance in all circumstances and do not lessen the requirement for monitoring contamination levels in animal products destined for human consumption.

<sup>15)</sup> These levels apply to feed as ready for consumption.

<sup>16)</sup> the level is set out for <sup>134</sup>Cs and <sup>137</sup>Cs. Values in the table refer to feed for pigs – 1250, poultry, lambs, calves – 2500, other – 5000.

<sup>17)</sup> Carbon-14, tritium and potassium-40 are not included in this group.

**Table J\_9:** Monitoring levels for the network of environmental sampling; air

Monitored item	Unit	Radionuclide	Planned exposure situation		Emergency exposure situation
			Recording level	Investigation level	Investigation level
Aerosols	Bq/m <sup>3</sup>	<sup>137</sup> Cs	1E-06	1E-05	1E-05
		<sup>90</sup> Sr	1E-07	1E-06	1E-06
		Total beta	1E-04	1E-03	1E-03
		Pu	5E-09	5E-08	5E-08
		<sup>131</sup> I	1E-06	1E-05	1E-05
Gaseous forms	Bq/m <sup>3</sup>	<sup>131</sup> I	5E-04	5E-03	5E-03
Fallouts	Bq/m <sup>2</sup>	<sup>137</sup> Cs	0.1	1	1

**Table J\_10:** Monitoring levels for the network of environmental sampling; water

Monitored item	Unit	Radionuclide	Planned exposure situation		Emergency exposure situation
			Recording level	Investigation level	Investigation level
Precipitation	Bq/l	<sup>3</sup> H	3	30	30
Drinking water	Bq/l	<sup>137</sup> Cs	0.1	1	1
		<sup>90</sup> Sr	0.05	0.5	0.5
		<sup>3</sup> H	2	20	20
Surface water	Bq/l	<sup>137</sup> Cs	0.1	1	1
		<sup>90</sup> Sr	0.05	0.5	0.5
		<sup>3</sup> H	2	20	20
		Total alpha	0.1	1	1
Ground supply water	Bq/l	<sup>137</sup> Cs	0.1	1	1
		<sup>3</sup> H	3	30	30
		Unat	0.75	7.5	7.5
		<sup>226</sup> Ra	0.05	0.5	0.5
Sludge	Bq/kg	<sup>137</sup> Cs	1	10	10
Sediments	Bq/kg	<sup>137</sup> Cs	1	10	10

**Table J\_11:** Monitoring levels for the network of environmental sampling; soil

Monitored item	Unit	Radionuclide	Planned exposure situation		Emergency exposure situation
			Recording level	Investigation level	Investigation level
Soil and ground cover	Bq/kg	Natural	500	1000	--
	Bq/m <sup>2</sup>	<sup>137</sup> Cs	10	10000	10000
Soils – in situ	Bq/kg	Natural	500	1000	--
	Bq/m <sup>2</sup>	<sup>137</sup> Cs	1000	10000	10000
Ground cover and snow <sup>18</sup>	Bq/m <sup>2</sup>	<sup>137</sup> Cs	--	--	1000

**Table J\_12:** Monitoring levels for the network of human body measurement (except professionals working with unsealed sources)

Monitored item	Radionuclide	Unit	Planned exposure situation <sup>19)</sup>		Emergency exposure situation
			Recording level	Investigation level	Investigation level
Thyroid gland	<sup>131</sup> I	Bq	—	—	— <sup>20)</sup>
Whole body	<sup>137</sup> Cs	Bq	50	500	— <sup>20)</sup>
Excreta	<sup>137</sup> Cs	Bq/day	0.05	5	— <sup>20)</sup>

<sup>18)</sup> Ground cover and snow are only sampled in an emergency exposure situation.

<sup>19)</sup> The positively measured value of artificial radionuclide except <sup>137</sup>Cs is already above the investigation level.

<sup>20)</sup> It is determined *ad hoc* depending on the nature and phase of emergency exposure situation.

**Table J\_13:** The activity concentration of  $^{131}\text{I}$  in air corresponding to the equivalent dose in the thyroid gland  $H_{\text{Sz}} = 100 \text{ mSv}$ 

Quantity	Unit	Under the age of 5, repr. 1 year	Age of 6-15 years, repr. 10 years	Adult
V - air volume	$\text{m}^3/\text{year}$	1500	6500	8500
v - inhalation rate	$\text{m}^3/\text{h}$	0.17	0.74	0.97
T - inhalation time	h	48	48	48
$h_{\text{inh}}$ - conversion factor	$\text{Sv/Bq}$	7.20E-08	3.70E-08	7.40E-09
A - activity of $^{131}\text{I}$	$\text{kBq}/\text{m}^3$	8.5	3.8	14.5

Note:

Values V and  $h_{\text{inh}}$  are taken from Decree No. 422/2016 Coll.

**Table J\_14:** Reference values for sorting by surface contamination (according to the IAEA document: First response to a radiological emergency – training materials, 2009)

Purpose	Value <sup>21)</sup>	Recommendations
Sorting of people	$< 1 \mu\text{Sv}/\text{h}$	1. Take a shower and change clothes 2. Follow official recommendations in the media 3. Leave home
	$> 1 \mu\text{Sv}/\text{h}$	Decontamination, if not possible, perform 1., 2. a 3.
Sorting of objects	$> 1 \mu\text{Sv}/\text{h}$ and $< 10 \mu\text{Sv}/\text{h}$	Use for emergency rescue work
	$> 10 \mu\text{Sv}/\text{h}$ and $< 100 \mu\text{Sv}/\text{h}$	For critical emergency rescue work, use for a maximum of several hours
	$> 100 \mu\text{Sv}/\text{h}$	Shut down, use only at an explicit instruction

<sup>21)</sup> The gamma dose rate (where appropriate, gamma + beta) at a distance of 10 cm from the surface of the body or objects.

**Table J\_15:** Release levels of surface activity for the surface contamination of objects (according to Decree No. 422/2016 Coll.)

Type of radionuclide source	Surface activity [Bq/cm <sup>2</sup> ]
Beta- or gamma-emitting radioisotope sources and low toxic alpha-emitting radionuclide sources	0.4
Other alpha-emitting radionuclide sources	0.04

Notes:

Low toxic alpha-emitting radionuclide sources are:

1. natural uranium, depleted uranium, natural thorium, Th-228, Th-230, Th-232, U-235 and U-238 contained in the ores or chemical concentrates, or
2. alpha-emitting radionuclide source with a half-life less than ten days.