

Limit values for Physical Hazards in Working Environment and Procedure for Measuring of Parameters of Hazards

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26.11.2004 no. 341 (RT I 2004, 82, 556) 5.12.2004

12.04.2007 no. 108 (RT I 2007, 34, 214) 30.04.2007

12.04.2007 no. 109 (RT I 2007, 34, 215) 30.04.2007

This Regulation is established on the basis of subsection 3 (4) of the Occupational Health and Safety Act.

Chapter 1

GENERAL PROVISIONS

§ 1. Scope of application

(1) This Regulation shall provide the maximum levels of noise, vibration and electromagnetic fields in the working environment and the procedure for measuring thereof.

(2) This Regulation shall be applied to all workstations for the purposes of subsection 4 (1) of the Occupational Health and Safety Act.

Chapter 2

[Repealed – RT I 2007, 34, 214 – entered into force 30.04.2007]

Chapter 3

[Repealed – RT I 2007, 34, 215 – entered into force 30.04.2007]

Chapter 4

ELECTROMAGNETIC FIELDS

§ 10. Terms

The terms used in this Regulation are explained as follows:

- 1) *protected zone* – a part of room where the maximum levels presented in this Regulation are in effect;
- 2) *controlled environment* – a working environment where the effect of the electromagnetic field can be assessed;
- 3) *uncontrolled environment* – a working environment where the effect of the electromagnetic field can not be directly assessed because the parameters of radiation of the devices causing the field and the interaction of the fields are unknown;
- 4) *maximum permitted exposure* M_{max} – effect of the electromagnetic field that is considered to be harmless for workers. The maximum permitted exposure is determined in relation to the type of danger through different maximum levels that characterise the electromagnetic field, for example power of the electric field, power of the magnetic field, etc.;
- 5) *time average or root-mean-square of the variables being measured* – in order to determine the exposure of an electromagnetic field that varies over time and to compare it with the maximum permitted values, the time average M_k or root-mean-square M_{kr} of the variables being measured will be found, using the following formulas:

$$M_k = 1/t_k \int_0^{t_k} M(t)dt$$
$$M_{kr} = \left[1/t_k \int_0^{t_k} M^2(t)dt \right]^{1/2}.$$

The exposure shall be considered to be continuous if the duration of the exposure t_e exceeds the averaging time t_k . The exposure shall be considered short-term if $t_e < t_k$. The maximum permitted exposure shall be determined by the following formula in case of short-term exposure:

$$(M_{max})_1 = M_{max} (t_k / t_e);$$

- 6) *partial exposure* – effect of the electromagnetic field on a part of human body in a non-homogeneous field;
- 7) *spatial average* – the parameter of the homogeneous electromagnetic field equivalent to the electromagnetic field active in the part of room being observed. Spatial averaging of the variables being measured shall be performed in order to determine the effect of the non-homogeneous field and compare it to the maximum permitted levels;
- 8) *cross-section average* – root-mean-squares of the variables characterising the electromagnetic waves over a surface equivalent that equals to the vertical cross-section of an adult person. The cross-section average shall be determined by scanning with a respective measuring sensor along the part of plane that is equivalent to the vertical cross-section of a standing adult and positioned in the protected zone being observed. Scanning the plane in a vertical direction in the middle of the protected zone within a range of 2 m shall generally suffice;
- 9) *radio frequencies (RF)* – frequency range used in radio broadcasting. Conventionally 0 to 3,000 GHz. In this Regulation, the RF is delimited to a frequency range from 3 kHz to 300 GHz;

10) *multi-frequency field* – an electromagnetic field caused by several radiation sources of different frequencies;

11) *area of near field (area of strong gradient)* – a part of a room surrounding the radiation source of the electromagnetic wave that is located near the radiation source. The electromagnetic wave spreading there is not considered to be plane and the electromagnetic field is not considered to be homogeneous;

12) *area of far field (area of free space)* – a part of room surrounding the radiation source of the electromagnetic wave where the spreading electromagnetic wave is considered to be plane and the electromagnetic field is considered to be homogeneous;

13) *"hot spot" of the radiofrequency field* – a strictly bounded part of room where the intensity of the radiofrequency field is substantially higher than the surroundings;

14) *specific absorption rate (A_p)* – absorbed (dispersed) power dP of the electromagnetic wave in a unit of mass of substance; $A_p = dP/dm$, unit W/kg.

§ 11. Maximum levels of electromagnetic field in controlled environment

(1) Maximum permitted exposure of electromagnetic field in a controlled environment is presented in Table 3:

Table 3

Frequency f (MHz)	Power of electric field E (V/m)	Power of magnetic field H (A/m)	Power density S (mW/cm ²)	Averaging time (min) E ² , H ² or S
0.003-0.1	614	163		6
0.1-3.0	614	16.3/f		6
3-30	1,842/f	16.3/f		6
30-100	61,4	16.3/f		6
100-300	61,4	0.163	1.0	6
300-3,000			f/300	6
3,000-15,000			10	6
15,000-200,000			10	616,000/f ^{1.2}

(2) Maximum levels of E and H for frequencies below 300 MHz are used in the area of the near field; maximum levels of S are used in the area of the far field (see Table 3).

(3) In case of multi-frequency fields, the $(M_{max})_i$ of each frequency range shall be determined and the ratios of their squares shall be added to squares of independently functioning powers of electric and magnetic fields in each frequency range. The resulting sums shall

$$\sum H_i^2 / (M_{max})_i^2 \leq 1 \text{ ja } \sum E_i^2 / (M_{max})_i^2 \leq 1.$$

§ 12. Maximum levels of radiofrequency induced and contact currents in controlled environment

(1) Maximum permitted exposure of radiofrequency induced and contact currents in a controlled environment are presented in Table 4:

Table 4

Frequency f (MHz)	Maximum permitted intensity of current I_m (mA)		
	Through both feet	Through one foot	Contact
0.003-0.1	2,000 f	1,000 f	1,000 f
0.1-100	200	100	100

(2) The maximum level of intensity of current in case of possible switching effects shall be $I_m = 1000 f$ mA on average per second ($t_k = 1$ sec) at frequencies 3 kHz to 100 kHz and $I_{mr} = 100$ mA root-mean squared every 6 minutes ($t_k = 6$ min) at frequencies 0.1 MHz to 100 MHz and 500 mA maximum value.

(3) If the contact of workers working in the electromagnetic field to metal objects is eliminated, the intensity of current shall be measured through one foot; if the contact is not eliminated, the intensity of current shall be determined with a measuring instrument of contact current through the equivalent of the electrical resistance of the human body.

(4) Measuring of induced current shall not be compulsory if the partial exposure of the electric field power does not exceed the M_{max} variables specified in Table 3 at frequencies that do not exceed 0.45 MHz and is less than $0.16 M_{max}$ in the frequency range of 2 to 50 MHz.

§ 13. Maximum levels of electromagnetic field in an uncontrolled environment

Maximum permitted exposure of electromagnetic field in an uncontrolled environment is presented in Table 5:

Table 5

Frequency f (MHz)	Power of electric field E (V/m)	Power of magnetic field H (A/m)	Power density S (mW/cm ²)	Averaging time	
				E ² or S (min)	H ² (min)
0.003-0.1	614	163		6	6
0.1-1.34	614	16.3/f		6	6
1.34-3.0	823.8/f	16.3/f		f ² /0.3	6
3-30	823.8/f	16.3/f		30	6
30-100	27.5	158.3/f ^{1.622}		30	0.0635/f ^{1.337}
100-300	27.5	0.0729	0.2	30	30
300-3,000			f/1,500	30	
3,000-15,000			f/1,500	90,000/f	
15,000-300,000			10	616,000/f ^{1.2}	

§ 14. Maximum levels of radiofrequency induced and contact currents in an uncontrolled environment

(1) Maximum permitted exposure of radiofrequency induced and contact currents in an uncontrolled environment are presented in Table 6:

Table 6

Frequency f (MHz)	Maximum permitted intensity of current I_m (mA)		
	Through both feet	Through one foot	Contact
0.003-0.1	900 f	450 f	450 f
0.1-100	90	45	45

(2) The maximum level of intensity of current in case of possible switching effects is $I_m=450$ f mA on average per second ($t_k = 1$ sec) at frequencies 3 kHz to 100 kHz and $I_{mr} = 45$ mA root-mean squared every 6 minutes ($t_k = 6$ min) at frequencies 0.1 MHz to 100 MHz and 220 mA maximum value.

(3) Measuring of induced current shall not be compulsory if the partial exposure of the electric field power does not exceed the M_{max} variables specified in Table 5 at frequencies that do not exceed 0.20 MHz and is less than 0.16 M_{max} in the frequency range of 2 to 50 MHz.

§ 15. Maximum levels in case of partial exposure of body

The maximum levels specified in Table 7 apply to all body parts except eyes and testicles:

Table 7

	Frequency f (GHz)	Root-mean square value of field power	Equivalent power density (mW/cm ²)
Controlled environment	0.0001- 0.3 0.3-6 6-95 96-300	$< 20 E^2$ or $20 H^{2*}$	< 20 $< 20 (f/6)^{1/4}$ 40
Uncontrolled environment	0.0001- 0.3 0.3-6 -96 96-300	$< 20 E^2$ or $20 H^{2**}$	4 f/1,5 20

* E and H are spatial averaged values from Table 3

** E and H are spatial averaged values from Table 5

§ 16. Exceptions in controlled environment

(1) The maximum levels specified in Table 3 may be exceeded in a frequency range from 100 kHz to 6 GHz if:

1) it can be proved with reliable technical devices that the specific absorption rate (A_p) is below 0.4 W/kg for the whole extent of the body and the spatial averaged A_{pV} does not exceed 8 W/kg whereas the averaging shall be performed in the extent of every 1g of the tissue of the body except the areas of hands, feet, wrists and ankles where the A_{pV} may not exceed 20 W/kg in the extent of every 10 g of the tissue;

2) the maximum levels of induced and contact currents (Table 4) have not been exceeded.

(2) The exceptions specified in subsection 1 shall only apply to devices that the operator of the device can control as to the radiofrequency radiation; the exceptions shall only apply to that operator. Exceptions of uncontrolled environments shall apply to persons in close quarters with the operator.

(3) The maximum levels specified in Table 3 may be exceeded in a frequency range from 100 kHz to 450 MHz if the radiation power of the device is 7 W or lower in free space.

(4) The maximum levels specified in Table 3 may be exceeded in a frequency range from 450 MHz to 1,500 MHz if the radiation power of the device does not exceed $7(450/f)W$ where f is the frequency in MHz.

(5) The averaging time of A_{pV} is 6 minutes. The maximum levels from Table 3 may be used in case of partial affect to the body at frequencies over 6 GHz.

(6) The exceptions specified in this section do not apply in the frequency range of 0.003-0.1 Mhz. However the exceptions specified in Table 3 may be exceeded if it is possible to show that the root-mean square current density per second for every 1 cm^2 of the tissue does not exceed $35 f \text{ mA/cm}^2$ where f is the frequency in MHz.

§ 17. Exceptions in uncontrolled environment

(1) The maximum levels specified in Table 5 may be exceeded in a frequency range from 100 kHz to 6 GHz if:

1) it can be proved with reliable technical devices that (A_p) is below 0.08 W/kg for the whole extent of the body and the spatial averaged A_{pV} does not exceed 1.6 W/kg whereas the averaging shall be performed in the extent of every 1 g of the tissue of the body except the areas of hands, feet, wrists and ankles where the A_{pV} may not exceed 4 W/kg in the extent of every 10 g of the tissue;

2) the maximum levels of induced and contact currents (Table 6) have not been exceeded.

The said exceptions shall apply to devices that have an unknown level of radiofrequency radiation and the operator of the device is not in control of that.

(2) The maximum levels specified in Table 5 may be exceeded in a frequency range from 100 kHz to 450 MHz if the radiation power of the device in free space does not exceed 1.4 W.

(3) The maximum levels specified in Table 5 may be exceeded in a frequency range from 450 MHz to 1,500 MHz if the radiation power of the device does not exceed $1.4(450/f)W$ where f is the frequency in MHz.

This exception does not apply to devices that have a radiation structure placed closer to the human body than 2.5 cm.

§ 18. Activities of employers

Employers shall:

- 1) ensure (map) the levels of electromagnetic fields in the protected zone and areas with increased health hazards;
- 2) prohibit work with uninspected devices of radiofrequency;
- 3) request information from the supplier of the devices of radiofrequency about the generated radiation field and the possibilities of reducing its effect. Organise measurement of the parameters of the electromagnetic field of the device if such information is not available or it is not reliable;
- 4) inspect the level of the radiation field of radiofrequency devices at least once in 3 years. Carry out additional measurement of the parameters of the electromagnetic field if the construction, screening or manner of use has been changed;
- 5) take measures to reduce the electromagnetic radiation of the workstation to the lowest possible level;
- 6) indicate the areas of hazardous radiofrequency radiation fields with relevant safety signs;
- 7) provide workers with relevant personal protective equipment if it is not possible to reduce the level of the radiation field to the maximum permitted level with collective technical protective equipment;
- 8) assess and inspect the efficiency of the measures taken to reduce the exposure of workers.

Chapter 5

PROCEDURE FOR MEASURING

§ 19. Measuring of parameters of physical hazards

The parameters of physical hazards specified in the Regulation shall be measured by a competent measurer for the purposes of the Metrology Act (RT I 2004, 18, 132).

[RT I 2004, 82, 556 – entered into force 5.12.2004]

Chapter 6

IMPLEMENTING PROVISIONS

§ 20. [omitted]