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Republic of Latvia

Cabinet

Regulation No 745

Adopted 5 September 2006

Labour Protection Requirements for the Protection of Workers from the Risk Arising from the Electromagnetic Field in the Work Environment

*Issued pursuant to
Section 25, Paragraph 18
of the Labour Protection Law*

I. General Provisions

1. These Regulations prescribe the requirements for the protection of workers from the risk arising or likely to arise from exposure to the electromagnetic fields in the work environment (hereinafter – the labour protection requirements).
2. For the purpose of these Regulations, the electromagnetic fields are static and varying electric, magnetic and electromagnetic fields, the frequencies of which do not exceed 300 GHz.
3. These Regulations shall be applicable to all fields of employment, where workers are exposed or may be exposed to the impact of the electromagnetic fields in the work environment, if such impact is established, temporary and transitional and if it does not cause a long-term effect on human health. Exposure to the electromagnetic field is caused by the induced current flux and absorption of energy in the body, as well as contact currents, except the risk that is caused by conductors under voltage.
4. If a workplace is publicly available to visitors, an employer is allowed not to perform the assessment, measurements or calculations of the risk arising from the electromagnetic field in conformity with the requirements specified in these Regulations, if they are carried out in accordance with the regulatory enactments regarding the restriction of exposure to the electromagnetic fields (from 0 Hz to 300 GHz) to residents.
5. An employer shall be liable for the compliance with these Regulations.
6. An employer shall not expose workers to the effect of the electromagnetic field, which exceeds the exposure limit values.
7. For the purpose of these Regulations, the exposure limit values are limits on exposure to the electromagnetic fields, which are specified on the basis of the effect thereof on human

health and by complying with which workers exposed to the effect of the electromagnetic fields are protected against the adverse health effects thereof.

8. The State Labour Inspection shall control the compliance with the labour protection requirements.

9. An employer, in accordance with the requirements specified in the Labour Protection Law, shall consult with workers or trusted representatives thereof regarding the issues that are related to the risk arising from the electromagnetic field in the work environment, as well as make possible the participation of workers in the solving of the relevant issues.

II. Determination of Exposure to the Electromagnetic Field and Assessment of the Risk Caused

10. An employer at all workplaces shall perform the initial assessment of the risk arising from the electromagnetic field, specifying whether it includes sources of the electromagnetic field radiation, which might harm human health.

11. If there is a source of the electromagnetic field radiation in the workplace, the employer shall assess the risk arising from the electromagnetic field in accordance with the regulatory enactments regarding the procedures for the performance of internal supervision of the work environment not less than once a year, as well as in the following cases:

11.1. if a new workplace is being created or significant changes in the working environment are being introduced (for example, changes in the working processes, methods, work equipment), which may increase the risk referred to; or

11.2. the results of health examinations of workers attest that health disorders of workers have been caused by exposure to the electromagnetic field. In such case the employer shall perform a re-assessment of the risk.

12. If during the examination of workplaces and after getting acquainted with the technical documentation of the work equipment an employer detects that the electromagnetic field causes or may cause risk to the safety and health of the workers, the employer shall ensure the assessment of the risk arising from the electromagnetic field and, where necessary, shall perform measurements or calculations of the electromagnetic field in accordance with the exposure action values specified in Annex 1 of these Regulations and the radiation levels specified by the manufacturer of the equipment, if the requirements for the equipment have been regulated.

13. The results of the measurements and the term for the following measurements of the electromagnetic field shall be indicated in the risk assessment:

13.1. if the results of the measurement are from 80% to 100% from the exposure action value, the following measurement shall be performed after three years;

13.2. if the results of the measurement are equal to the exposure action value or exceed it, the following measurement shall be performed each year.

14. The measurements of the electromagnetic field by using the measuring equipment, which, according to the manufacturer's instructions for the use, is fitted for the performance of the necessary measurements of the electromagnetic field and is verified in accordance with the

procedures specified in the regulatory enactments regarding the verification of the measuring devices, verification certificates and verification marks, shall be performed by:

- 14.1. the competent authorities;
- 14.2. the laboratories accredited by the State Agency “Latvian National Accreditation Bureau” in accordance with the standard LVS EN ISO/IEC 17025:2005, General requirements for the competence of testing and calibration laboratories, regarding which the Ministry of Economics has published a notice in the newspaper *Latvijas Vēstnesis* [the official Gazette of the Government of Latvia];
- 14.3. other institutions, which are accredited in the European Union Member States and are entitled to perform the measurements of the electromagnetic field;
- 14.4. the competent specialists;
- 14.5. the appropriately trained senior labour protection specialists (the profession standard PS 0100 Senior Labour Protection Specialist); or
- 14.6. the persons with a qualification appropriate for the performance of the measurements.

15. An employer, in assessing the risk of the work environment, shall pay particular attention to the following factors:

- 15.1. the level, frequency spectrum, duration and type of exposure of the electromagnetic field;
- 15.2. the exposure limit values and exposure action values, which are directly measurable values expressed as electric field strength (E), magnetic field strength (H), magnetic flux density (B) and power density (S);
- 15.3. the effect of the electromagnetic field on the safety and health of the workers who belong to particularly sensitive risk groups (for example, adolescents, pregnant women, women during the postpartum period);
- 15.4. the indirect effect of the electromagnetic field, including:
 - 15.4.1. failure in the operation of electronic medical equipment and devices, also cardiac pacemakers and other implanted devices;
 - 15.4.2. the risk of receiving a mechanical blow from ferromagnetic objects in the static magnetic fields with the magnetic flux density greater than 3 mT;
 - 15.4.3. the initiation of electro-explosive devices (detonators);
 - 15.4.4. fires and explosions resulting from the ignition of flammable materials by sparks caused by induced fields, contact currents or spark discharges;
- 15.5. the existence of such equipment designed to reduce the levels of exposure to electromagnetic fields;
- 15.6. the information, which is obtained in performing health examinations of the workers;
- 15.7. the existence of multiple sources of exposure to radiation of the electromagnetic field;
- 15.8. simultaneous exposure to multiple frequency fields.

16. An employer shall document and store all the results of the assessment of the risk arising from the electromagnetic field and measurement results for 10 years. After the specified period of time they shall be transferred for storage in the archive.

III. Prevention or Reduction of the Risk Arising from the Electromagnetic Field

17. If, in performing the risk assessment, it is detected that the exposure action values, which are indicated in Annex 1 of these Regulations, are exceeded, the employer shall perform one or several measures specified in Paragraph 20 of these Regulations in accordance with the procedures specified in the regulatory enactments regarding the internal supervision of the work environment.

18. In assessing or reducing the risk arising from the electromagnetic fields, an employer shall meet the general labour protection principles specified in the Labour Protection Law.

19. An employer, pursuant to the risk assessment, shall take the measures necessary for the prevention or reduction of the risk arising from the electromagnetic field to the minimum (the lowest practical level) on the basis of technical progress and using the latest means for the control of the risk source arising from the electromagnetic field.

20. If, pursuant to the risk assessment, the exposure action values specified in Annex 1 of these Regulations are exceeded in the workplace, but the exposure limit values specified in Annex 2 of these Regulations are not exceeded, the employer shall develop and implement a plan of labour protection measures. The plan of labour protection measures shall include the following organisational and technical measures:

20.1. other working methods that are related to less exposure to the electromagnetic field shall be used;

20.2. such equipment shall be chosen, which has less electromagnetic fields;

20.3. technical measures for the reduction of emission of the electromagnetic fields shall be taken, installing, where necessary, interlocks, shielding or similar health protection devices;

20.4. appropriate servicing and maintenance of the layout of the workplace and working equipment shall be ensured;

20.5. the design and layout of workplaces shall be optimised;

20.6. the duration and intensity of the exposure shall be limited;

20.7. the availability of adequate personal protective equipment shall be ensured.

21. In the workplaces referred to in Paragraphs 4 and 20 of these Regulations an employer shall place the appropriate safety signs in accordance with the regulatory enactments regarding the labour protection requirements for the utilisation of safety signs.

22. If in the workplaces referred to in Paragraph 20 of these Regulations there is a risk to technically exceed the exposure limit values, the employer shall limit the access to the dangerous area, which has been specified in the risk assessment.

23. If, after the measures taken by an employer for the reduction of the risk, the exposure limit values have been exceeded, the employer shall:

23.1. take measures without delay, in order not to allow the exposure of workers to such electromagnetic field and to reduce the effect thereof so far that it does not exceed the exposure limit values;

23.2. analyse and determine the reasons, due to which the effect of the electromagnetic field exceeds the admissible exposure limit values;

23.3. modify the work protection measures in order to prevent the admissible exposure limit values being exceeded again.

24. In performing the labour protection measures for the prevention or reduction of the risk arising from the electromagnetic field, the employer shall ensure that the measures shall also be suitable for the protection of such workers for whom, in accordance with regulatory enactments, special safeguards have been specified (for the persons under 18 years, pregnant women, women during the postpartum period, persons with special needs, persons who due to their health condition need, for example, cardiac pacemakers, metal prosthesis).

25. An employer shall ensure that workers, who are exposed to the risks arising from the electromagnetic field at the workplace, and their representatives are duly trained and receive information in a comprehensible manner regarding:

25.1. the effect of the electromagnetic field and the possible risk to the safety and health of workers;

25.2. the labour protection measures, which reduce the effect of the risk arising from the electromagnetic field on the safety and health of workers to the minimum;

25.3. the exposure limit values and exposure action values of the electromagnetic field and the possible risk related thereto;

25.4. the results obtained in the assessments, measurements or calculations of the level of exposure to the electromagnetic fields, which are performed in accordance with Chapter II of these Regulations;

25.5. the symptoms of the health disorders arising from exposure to the electromagnetic field, the significance of the timely detection of health disorders and the action if health disorders have occurred;

25.6. the circumstances, in which workers have the right to health surveillance and the significance thereof; and

25.7. the safe working methods, as well as the correct and safe utilisation of the work equipment in order to avoid the risk arising from the electromagnetic field.

IV. Health Examination of Workers

26. If a worker is subject to the effect of risk arising from the electromagnetic field, which exceeds the exposure action values specified in Annex 1 of these Regulations, the employer shall ensure health surveillance in accordance with the regulatory enactments regarding mandatory health examinations so as to detect as soon as possible health disorders caused by the electromagnetic field and to ensure good quality health protection of the workers.

27. An employer shall ensure the availability of the risk assessment results to a family doctor and a certified occupational physician who performs the health surveillance of the worker.

28. Where, as a result of a health examination, a worker is found to have health disorders, which are considered by a certified occupational physician to be the result of exposure to the electromagnetic field, the doctor shall inform the worker regarding the examination results and provide information and advice regarding health care also subsequent to exposure to the electromagnetic field, as well as inform the employer regarding the results of the health examination in accordance with the regulatory enactments regarding mandatory health examinations.

29. Health care practitioners and medical treatment institutions shall provide information to workers and employers regarding the results of health examinations, the necessary medical

treatment and additional examinations of the state of the workers' health in accordance with the procedures specified in the regulatory enactments regulating health care.

30. An employer shall systematically document the results of the workers' health examinations. Upon a justified request of a competent authority or the State Labour Inspection the employer shall issue copies of the results of the health examinations.

31. An employer shall take into account the results of the health examinations in planning and determining the labour protection measures for the prevention or reduction of the risk arising from the electromagnetic field to a permissible level.

32. An employer shall store all the results of the health examinations of a worker for 10 years. After the specified period of time they shall be transferred for storage in the archive.

V. Closing Provisions

33. The Ministry of Welfare shall provide the European Commission with a report regarding the implementation of the provision, indicating the opinion of social partners, once every five years, beginning with the day of coming into force of these Regulations.

34. These Regulations shall come into force on 1 January 2008.

Informative Reference to European Union Directive

These Regulations contain legal norms arising from Directive 2004/40/EC of the European Parliament and of the Council of 29 April 2004 on the minimum health and safety requirements regarding exposure of workers to the risks arising from physical agents (electromagnetic fields) (18th individual directive within the meaning of Article 16(1) of Directive 89/391/EEC).

Prime Minister

A. Kalvītis

Minister for Welfare

D. Staķe

Exposure Action Values

1. The exposure action values (admissible values of exposure to the electromagnetic field) shall be obtained from the exposure limit values in accordance with the rationale used by the International Commission on Non-ionising Radiation Protection (ICNIRP) in guidelines thereof on limiting exposure to non-ionising radiation (ICNIRP 7/99).
2. Contact current (IC) is the current flowing in the human body when it comes in contact with a conductor in the electromagnetic field, expressed in amperes (A).
3. Current density (J) is the current flowing through a unit cross section perpendicular to the direction of the current flux in a conductor, for example, the human body or a part thereof, expressed in amperes per square metre (A/m²).
4. Electric field strength (E) is a vector quantity that corresponds to the force exerted on a charged particle regardless of its motion in space, expressed in volts per metre (V/m).
5. Magnetic field strength (H) is a vector quantity, which, together with the magnetic flux density, specifies a magnetic field at any point in space, expressed in amperes per metre (A/m).
6. Magnetic flux density (B) is a vector quantity, resulting in a force that acts on moving charges, expressed in teslas (T). In free space and in biological materials, magnetic flux density and magnetic field strength may be interchanged using the equivalence $1 \text{ A/m} = 4 \pi \cdot 10^{-7} \text{ T}$.
7. Power density (S) is the quantity used for characterising very high frequencies, where the depth of penetration of the radiation in the body is low. The power density is determined, by the radiant power incident perpendicular to a body surface divided by the area of the surface. It is expressed in watts per square metre (W/m²).
8. Specific energy absorption (SA) is the energy absorbed per unit mass of biological tissue, and it is expressed in joules per kilogram (J/kg). It is used for limiting the non-thermal effects from microwave radiation.
9. Specific energy absorption rate (SAR) is the rate, at which energy is absorbed per unit mass of body, expressed in watts per kilogram (W/kg). The SAR is calculated on average for the whole body or for parts of the body. Whole body SAR is a measure, which determines the relationship between adverse thermal effects and exposure to the radio frequency (RF) field.

Frequency range	Electric field strength, E (V/m)	Magnetic field strength, H (A/m)	Magnetic flux density, B (μ T)	Equivalent plane wave power density, S_{eq} (W/m ²)	Contact current, I_c (mA)	Limb induced current, I_L (mA)
0-1 Hz	–	$1,63 \times 10^5$	2×10^5	–	1,0	–
1-8 Hz	20 000	$1,63 \times 10^5 / f^2$	$2 \times 10^5 / f^2$	–	1,0	–
8-25 Hz	20 000	$2 \times 10^4 / f$	$2,5 \times 10^4 / f$	–	1,0	–
0,025-0,82 kHz	500/f	20/f	25/f	–	1,0	–
0,82-2,5 kHz	610	24,4	30,7	–	1,0	–
2,5-65 kHz	610	24,4	30,7	–	$0,4f$	–
65-100 kHz	610	$1\ 600/f$	$2\ 000/f$	–	$0,4f$	–
0,1-1 MHz	610	$1,6/f$	$2/f$	–	40	–
1-10 MHz	$610/f$	$1,6/f$	$2/f$	–	40	–
10-110 MHz	61	0,16	0,2	10	40	100
110-400 MHz	61	0,16	0,2	10	–	–
400-2000 MHz	$3f^{1/2}$	$0,008f^{1/2}$	$0,01f^{1/2}$	$f/40$	–	–
2-300 GHz	137	0,36	0,45	50	–	–

10. f is the frequency in the units indicated in the frequency range column.

11. For frequencies between 100 kHz and 10 GHz the average S_{eq} , E^2 , H^2 , B^2 and I_L^2 values shall be calculated over any six-minute period.

12. For frequencies exceeding 10 GHz, the average S_{eq} , E^2 , H^2 , and B^2 values shall be calculated over $68/f^{0,05}$ minute period (f expressed in GHz).

13. For frequencies up to 100 kHz, peak action values for the field strengths may be obtained by multiplying the root mean square value by $(2)^{1/2}$. For pulses of duration t_p , the equivalent frequency, to which the exposure action values comply, shall be calculated using the formula $f = 1/(2t_p)$.

14. For frequencies between 100 kHz and 10 MHz, peak action values for the field strengths are calculated by multiplying the root mean square values by 10^a , where $a = [0,665 \log (f/10^5) + 0,176]$, f is expressed in Hz.

15. For frequencies between 10 MHz and 300 GHz, peak action values are calculated by multiplying the corresponding root mean square values by 32 for the field strengths and by 1 000 for the equivalent plane wave power density.

16. As regards pulsed or transient processes of electromagnetic fields or in case of simultaneous exposure to multiple frequency fields, appropriate methods of assessment, measurement or calculation, which allow to analyse the characteristics of the waveforms and nature of biological interactions, shall be applied, taking into account the applicable standards.

17. Pulsed modulated electromagnetic fields with carrier frequency above 10 MHz shall be such that the S_{eq} value over the average pulse width would not exceed the indicated admissible S_{eq} more than 1 000 times and the field strength would not exceed the admissible value of the field strength, which complies with the carrier frequency, more than 32 times.

Minister for Welfare

D. Staže

Exposure Limit Values

1. The exposure limit values are provided for current density for time-varying fields up to 1 Hz, in order to prevent the effect on the cardiovascular and central nervous system.
2. The exposure limit values are provided on current density from 1 Hz to 10 MHz, in order to prevent the effect on the central nervous system functions.
3. The exposure limit values are provided on SAR from 100 kHz to 10 GHz, in order to prevent whole-body heat stress and excessive localised heating of tissues. In the range from 100 kHz to 10 MHz, the exposure limit values on both current density and SAR are provided.
4. The exposure limit values are provided on power density from 10 GHz to 300 GHz, in order to prevent excessive tissue heating at or near the body surface.

Frequency range	Current density for head and trunk J (mA/m ²) (root mean value)	Whole body average SAR (W/kg)	Localised SAR (head and trunk) (W/kg)	Localised SAR (limbs) (W/kg)	Power density S (W/m ²)
Up to 1 Hz	40	–	–	–	–
1-4 Hz	$40/f^*$	–	–	–	–
4-1 000 Hz	10	–	–	–	–
1 000 Hz-100 kHz	$f^*/100$	–	–	–	–
100 kHz-10 MHz	$f^*/100$	0,4	10	20	–
10 MHz-10 GHz	–	0,4	10	20	–
10-300 GHz	–	–	–	–	50

Note. * f is the frequency in Hertz.

5. The exposure limit values on the current density are intended to protect against exposure effects on central nervous system tissues in the head and trunk of the body. The exposure limit values in the frequency range from 1 Hz to 10 MHz are based on established adverse effects on the central nervous system. Such effects are essentially instantaneous and there is no scientific justification to modify the exposure limits values for exposure of short duration. However, since the exposure limit values refer to adverse effects on the central nervous system, such exposure limit values may permit higher current densities in body tissues other than the central nervous system under the same exposure conditions.

6. Because of the electrical inhomogeneity of the body, current densities shall be calculated as averages over a cross section of 1 cm² perpendicular to the current direction.

7. For frequencies up to 100 kHz, peak current density values can be obtained by multiplying the root mean square value by $(2)^{1/2}$.

8. For frequencies up to 100 kHz and for pulsed magnetic fields, the peak current density value associated with the pulses may be calculated, taking into account the rise/fall times and the maximum rate of change of magnetic flux density. The induced current density may then be compared with the appropriate exposure limit value. For pulses of duration t_p , the equivalent frequency, to which the exposure limit values comply, shall be calculated using the formula $f = 1/(2t_p)$.

9. All SAR values shall be calculated as an arithmetic average value over any six-minute period.

10. The mass used for the calculation of the localised SAR indicator shall be 10 g of contiguous body tissues. The maximum SAR value so obtained shall be the value used for estimation of exposure. Such 10 g of tissue are intended to be a mass of contiguous tissue with nearly homogeneous electrical properties. In specifying a contiguous mass of tissue, it is recognised that this method may be used in computational dosimetry, but may present difficulties in carrying out direct physical measurements. A simple cubic tissue mass may be used if the calculated dosimetric quantities have conservative values relative to the exposure guidelines.

11. For pulsed exposures in the frequency range from 0,3 to 10 GHz and for localised exposure of the head, in order to limit and avoid auditory effects caused by thermoelastic expansion, an additional exposure value is recommended. Thus, SAR shall not exceed 10 mJ/kg averaged over 10 g of tissue.

12. The average power density shall be calculated over 20 cm² of exposed area and $68/f^{1,05}$ minute period (where f is GHz) in order to compensate for progressively shorter penetration depth as the frequency increases. The spatial maximum power density, which is calculated as average indicator over 1 cm², shall not exceed 50 W/m² '20.

13. As regards pulsed or transient electromagnetic fields or in case of simultaneous exposure to multiple frequency fields, appropriate methods of assessment, measurement or calculation, which allow to analyse the characteristics of the waveforms and nature of biological interactions, shall be applied, taking into account the applicable standards.

Minister for Welfare

D. Staķe