SCHEDULE

PART 2

Direct biophysical effects of exposure

Action levels – non-thermal effects

Table AL1 – ALs for exposure to electromagnetic fields from 1 Hz to 10 MHz

Frequency range	*External electric field strength Low ALs (E) [Vm⁻¹]*	*External electric field strength High ALs (E) [Vm⁻¹]*
$1 \leq f < 25$ Hz	2.0×10^4	2.0×10^4
$25 \leq f < 50$ Hz	$5.0 \times 10^5/f$	2.0×10^4
50 Hz $\leq f < 1.64$ kHz	$5.0 \times 10^5/f$	$1.0 \times 10^6/f$
$1.64 \leq f < 3$ kHz	$5.0 \times 10^5/f$	6.1×10^2
3 kHz $\leq f \leq 10$ MHz	1.7×10^2	6.1×10^2
Exposure levels not exceeding the ALs will be compliant with:	Tables ELV2 and ELV3	

Notes

1. Between the Low and High ALs, exposure will be below the ELVs but spark discharges may occur. These can be prevented through the provision of information and training under regulation 10 and the use of suitable technical and personal protection measures.

2. The ALs in Tables AL1 and AL2 are root mean square (RMS) values of the field strength. These RMS values are equal to the peak values divided by √2 for sinusoidal fields. The corresponding ELVs in Tables ELV2 and ELV3 are peak values in time, which are equal to the RMS values multiplied by √2 for sinusoidal fields. In the case of non-sinusoidal fields the exposure assessment under regulation 5 must be based on the weighted peak method (filtering in time domain) or on a scientifically proven and validated exposure evaluation procedure which produces comparable results to the weighted peak method.

3. The ALs represent the maximum field values at any place where an employee may be working, before the entry of any person into the field. In the case of an electromagnetic field source in the immediate vicinity of the body, compliance with the ELVs must be determined dosimetrically, case by case.

Table AL2 – ALs for exposure to electromagnetic fields from 1 Hz to 10 MHz

Frequency range	*Magnetic flux density Low ALs (B)[µT]*	*Magnetic flux density High ALs (B)[µT]*	*Magnetic flux density ALs for exposure of limbs to a localised magnetic field (B) [µT]*
$1 \leq f < 8$ Hz	$2.0 \times 10^5/f^2$	$3.0 \times 10^5/f$	$9.0 \times 10^5/f$

Frequency range	Magnetic flux density Low ALs (B)[μT]	Magnetic flux density High ALs (B)[μT]	Magnetic flux density ALs for exposure of limbs to a localised magnetic field (B) [μT]
$8 \leq f < 25$ Hz	$2.5 \times 10^4/f$	$3.0 \times 10^5/f$	$9.0 \times 10^5/f$
$25 \leq f < 300$ Hz	1.0×10^3	$3.0 \times 10^5/f$	$9.0 \times 10^5/f$
300 Hz $\leq f < 3$ kHz	$3.0 \times 10^5/f$	$3.0 \times 10^5/f$	$9.0 \times 10^5/f$
3 kHz $\leq f \leq 10$ MHz	1.0×10^2	1.0×10^2	3.0×10^2
Exposure levels not exceeding the ALs will be compliant with:	At and below 400 Hz: the sensory effect ELVs in Table ELV3 Above 400 Hz: the health effect ELVs in Table ELV2	The health effect ELVs in Table ELV2	

Notes

1. Between the Low and High ALs for exposure up to 400 Hz, exposure in the head of the employee will be below the health effect ELVs but may exceed the sensory effect ELVs in Table ELV3.

2. Notes 2 and 3 to Table AL1 apply.

Action levels – thermal effects

Table AL3 – ALs for exposure to electromagnetic fields from 100 kHz to 300 GHz

Frequency range	External electric field strength ALs (E) [Vm^{-1}]	Magnetic flux density ALs (B) [μT]	Power density AL (S)[Wm^{-2}]
100 kHz $\leq f < 1$ MHz	6.1×10^2	$2.0 \times 10^6/f$	
$1 \leq f < 10$ MHz	$6.1 \times 10^8/f$	$2.0 \times 10^6/f$	
$10 \leq f < 400$ MHz	61	0.2	
400 MHz $\leq f < 2$ GHz	$3 \times 10^{-3} \ f^{1/2}$	$1.0 \times 10^{-5} \ f^{1/2}$	
$2 \leq f < 6$ GHz	1.4×10^2	4.5×10^{-1}	
$6 \leq f \leq 300$ GHz	1.4×10^2	4.5×10^{-1}	50
Exposure levels not exceeding the ALs will be compliant with:	Up to 6 GHz: the health effect ELVs in Table ELV4 6 - 300 GHz: the health effect ELV in Table ELV6		The health effect ELV in Table ELV6

Notes

  1. The electric field strength and magnetic flux density ALs are root mean square values.

  2. For radiofrequency pulses, the peak power density averaged over the pulse width must not exceed 1000 times the respective AL (S) value. For multi-frequency fields, the analysis must be based on summation.

  3. Note 3 to Table AL1 applies in relation to the ALs for external electric field strength and magnetic flux density.

  4. The power density is the maximum level averaged over any 20cm^2 of exposed area. Spatial maximum power densities averaged over 1cm^2 must not exceed 20 times the value of 50 Wm^{-2}.

  5. From 6 to 10 GHz, power density must be averaged over a six minute period. Above 10 GHz, it must be averaged over a $68/f^{1.05}$-minute period (where "f" is the frequency in GHz).

Table AL4 – AL for exposure to electromagnetic fields from 10 to 110MHz

Frequency range	*Limb current AL (I_L) [mA]*
$10 \leq f \leq 110$ MHz	100
Exposure levels not exceeding the ALs will be compliant with:	The health effect ELV in Table ELV4 - localised SAR in the limbs

Note

The AL is a root mean square value.

Exposure limit values – non-thermal effects

Table ELV1 – ELVs for exposure to electromagnetic fields from 0 to 1 Hz

	Sensory effect ELVs – magnetic flux density (B_0) [T]
Head and trunk	2
Limbs	8
	Health effect ELV – magnetic flux density (B_0) [T]
Any part of the body	8

Note

The sensory effect ELVs may be exceeded during an employee's shift where the employer ensures that—

  (a) they are only exceeded temporarily;

  (b) protection measures have been adopted which minimise, so far as is reasonably practicable, the sensory effects related to movement in static magnetic fields, including nausea and vertigo;

  (c) adequate information is provided to the employee on the possibility of those sensory effects; and

(d) where any of those sensory effects are reported to the employer, the exposure assessment under regulation 5, and the protection measures, are updated where necessary.

**Table ELV2 – Health effect ELVs for exposure
to electromagnetic fields from 1 Hz to 10 MHz**

Frequency range	*Health effect ELVs – internal electric field strength (E) [Vm^{-1}]*
1 Hz ≤ f < 3 kHz	1.1
3 kHz ≤ f ≤ 10 MHz	3.8×10^{-4} f

Notes

1. The ELVs are limits for electric fields induced in the body from exposure to time-varying electric and magnetic fields.

2. The ELVs are spatial peak values in the entire body of the employee.

3. Note 2 to Table AL1 applies in relation to methods of determining exposure.

Table ELV3 – Sensory effect ELVs for exposure to electromagnetic fields from 1 to 400 Hz

Frequency range	*Sensory effect ELVs – internal electric field strength in the head (E) [Vm^{-1}]*
1 ≤ f < 10 Hz	0.7/f
10 ≤ f < 25 Hz	0.07
25 ≤ f ≤ 400 Hz	0.0028 f

Notes

1. The ELVs are spatial peak values induced in the head of the exposed employee, and can arise from exposure to either external electric or external magnetic fields.

2. The ELVs may be exceeded during an employee's shift where the employer ensures that—

(a) they are only exceeded temporarily;

(b) hazardous spark discharges, and contact currents in excess of those in Table AL5, are prevented through the provision of information and training under regulation 10 and the use of suitable technical and personal protection measures;

(c) adequate information is provided to the employee on the possibility of sensory effects related to time-varying magnetic fields, including retinal phosphenes; and

(d) where any of those sensory effects are reported to the employer, the risk assessment is updated where necessary.

3. Note 2 to Table AL1 applies in relation to methods of determining exposure.

Exposure limit values – thermal effects

**Table ELV4 – Health effect ELVs for exposure
to electromagnetic fields from 100 kHz to 6 GHz**

Area of exposure	Health effect ELVs – specific energy absorption rate (SAR) $[Wkg^{-1}]$
Whole body	0.4 (averaged SAR in the body)
Head and trunk	10 (localised SAR in the head and trunk)
Limbs	20 (localised SAR in the limbs)

Notes

1. The ELVs correspond to the SAR values averaged over a six minute period.

2. Localised SAR in the body and limbs can be assessed by either computational dosimetry or physical measurement of 10 grams of tissue. For computational dosimetry, 10 grams of contiguous tissue with approximately homogeneous electrical properties must be used for the SAR average. For direct physical measurements a simple geometry, such as cubic or spherical tissue mass, may be used. The maximum value obtained must be assessed against the ELVs.

**Table ELV5 – Sensory effect ELV for exposure to
electromagnetic fields from 300 MHz to 6 GHz**

Frequency range	Sensory effect ELV – specific energy absorption in the head (SA) $[mJkg^{-1}]$
300 MHz ≤ f ≤ 6GHz	10

Notes

1. When determining SA, energy absorption must be averaged over 10 grams of tissue.

2. The ELV may be exceeded during an employee's shift where the employer ensures that—

    (a) it is only exceeded temporarily;

    (b) adequate information is provided to the employee on the possibility of sensory effects related to pulsed microwave radiation, including auditory sensations; and

    (c) where any of those sensory effects are reported to the employer, the risk assessment is updated where necessary.

Table ELV6 – Health effect ELV for exposure to electromagnetic fields from 6 to 300 GHz

Frequency range	Health effect ELV – power density (S) $[Wm^{-2}]$
6 GHz ≤ f ≤ 300GHz	50

Notes

1. The power density is the maximum level averaged over any $20cm^2$ of exposed area. Spatial maximum power densities averaged over $1cm^2$ must not exceed 20 times the value of 50 Wm^{-2}.

2. From 6 to 10 GHz, power density must be averaged over a six minute period. Above 10 GHz, it must be averaged over a $68/f^{1.05}$-minute period (where "f" is the frequency in GHz).