

INTERNATIONAL STANDARD

NORME INTERNATIONALE

INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE
COMITÉ INTERNATIONAL SPÉCIAL DES PERTURBATIONS RADIOÉLECTRIQUES

**Limits and methods of measurement of radio disturbance characteristics of
electrical lighting and similar equipment**

**Limites et méthodes de mesure des perturbations radioélectriques produites par
les appareils électriques d'éclairage et les appareils analogues**

CISPR 15:2005

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INTERNATIONAL ELECTROTECHNICAL COMMISSION
INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

**LIMITS AND METHODS OF MEASUREMENT OF
RADIO DISTURBANCE CHARACTERISTICS OF ELECTRICAL LIGHTING
AND SIMILAR EQUIPMENT**

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International Standard CISPR 15 has been prepared by CISPR subcommittee F: Interference relating to household appliances, tools, lighting equipment and similar apparatus.

This consolidated version of CISPR 15 consists of the seventh edition (2005) [documents CISPR/F/402/FDIS and CISPR/F/410/RVD], its amendment 1 (2006) [documents CISPR/F/434/FDIS and CISPR/F/439/RVD] and its amendment 2 (2008) [documents CISPR/F/489/FDIS and CISPR/F/493/RVD].

The technical content is therefore identical to the base edition and its amendments and has been prepared for user convenience.

It bears the edition number 7.2.

A vertical line in the margin shows where the base publication has been modified by amendments 1 and 2.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of the base publication and its amendments will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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LIMITS AND METHODS OF MEASUREMENT OF RADIO DISTURBANCE CHARACTERISTICS OF ELECTRICAL LIGHTING AND SIMILAR EQUIPMENT

1 Scope

This standard applies to the emission (radiated and conducted) of radiofrequency disturbances from:

- all lighting equipment with a primary function of generating and/or distributing light intended for illumination purposes, and intended either for connection to the low voltage electricity supply or for battery operation;
- the lighting part of multi-function equipment where one of the primary functions of this is illumination;
- independent auxiliaries exclusively for use with lighting equipment;
- UV and IR radiation equipment;
- neon advertising signs;
- street/flood lighting intended for outdoor use;
- transport lighting (installed in buses and trains).

Excluded from the scope of this standard are:

- lighting equipment operating in the ISM frequency bands (as defined in Resolution 63 (1979) of the ITU Radio Regulation);
- lighting equipment for aircraft and airports;
- apparatus for which the electromagnetic compatibility requirements in the radio-frequency range are explicitly formulated in other IEC or CISPR standards.

NOTE Examples are:

- built-in lighting devices in other equipment, for example scale illumination or neon devices;
- photocopiers;
- slide projectors;
- lighting equipment for road vehicles.

The frequency range covered is 9 kHz to 400 GHz.

Multi-function equipment which is subjected simultaneously to different clauses of this standard and/or other standards shall meet the provisions of each clause/standard with the relevant functions in operation.

The limits in this standard have been determined on a probabilistic basis to keep the suppression of disturbances within economically reasonable limits while still achieving an adequate level of radio protection and electromagnetic compatibility. In exceptional cases, additional provisions may be required.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050(161):1990, *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*

IEC 60155:1993, *Glow-starters for fluorescent lamps*

IEC 60598-1:2003, *Luminaires – Part 1: General requirements and tests*

IEC 61000-4-6:2003, *Electromagnetic compatibility (EMC) – Part 4.6. Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

CISPR 11:2003, *Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement*

CISPR 16-1-1:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus*

CISPR 16-1-2:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – Ancillary equipment – Conducted disturbances*

CISPR 16-1-4:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Ancillary equipment – Radiated disturbances*

CISPR 16-2-1:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-1: Methods of measurement of disturbances and immunity – Conducted disturbance measurements*

CISPR 16-4-2:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements*

CISPR 22:2005, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*

3 Terms and definitions

For the purposes of this document, the terms and definitions contained in IEC 60050(161) apply.

Continuous disturbance may be either broadband, for instance caused by the switching operations or by unstable gas-discharges in the lamp electrode region, or may be narrowband, for instance caused by electronic control devices operating at dedicated frequencies.

NOTE Instead of the concept of "broadband" and "narrowband", a distinction is made in this standard between two related kinds of disturbance, defined by the type of the applied detector. For this purpose, limits have been defined with respect to the measurement with the quasi-peak detector and with the average detector. By using this approach, a combination of broadband and narrowband disturbances can also be assessed.

4 Limits

4.1 Frequency ranges

In 4.2, 4.3 and 4.4, limits are given as a function of frequency range. No measurements need to be performed at frequencies where no limits are specified.

NOTE The World Administrative Radiocommunications Conference (WARC) has in 1979 reduced the lower frequency limit in region 1 to 148,5 kHz; for applications falling within the scope of this standard, tests at 150 kHz are considered adequate, since 148,5 kHz falls within the receiver bandwidth.

4.2 Insertion loss

The minimum values of the insertion loss for the frequency range 150 kHz to 1 605 kHz are given in Table 1.

Table 1 – Minimum values of insertion loss

Frequency range kHz	Minimum values dB
150 to 160	28
160 to 1 400	28 to 20 ^a
1 400 to 1 605	20

^a Decreasing linearly with the logarithm of frequency.

4.3 Disturbance voltages

4.3.1 Mains terminals

The limits of the mains terminal disturbance voltages for the frequency range 9 kHz to 30 MHz are given in Table 2a.

Table 2a – Disturbance voltage limits at mains terminals

Frequency range	Limits dB(μV) ^a	
	Quasi-peak	Average
9 kHz to 50 kHz	110	–
50 kHz to 150 kHz	90 to 80 ^b	–
150 kHz to 0,5 MHz	66 to 56 ^b	56 to 46 ^b
0,5 MHz to 5,0 MHz	56 ^c	46 ^c
5 MHz to 30 MHz	60	50

^a At the transition frequency, the lower limit applies.

^b The limit decreases linearly with the logarithm of the frequency in the ranges 50 kHz to 150 kHz and 150 kHz to 0,5 MHz.

^c For electrodeless lamps and luminaires, the limit in the frequency range of 2,51 MHz to 3,0 MHz is 73 dB(μV) quasi-peak and 63 dB(μV) average.

NOTE In Japan, the limits in the frequency range 9 kHz to 150 kHz do not apply.

4.3.2 Load terminals

The limits of the load terminal disturbance voltage for the frequency range 150 kHz to 30 MHz are given in Table 2b.

Table 2b – Disturbance voltage limits at load terminals

Frequency range MHz	Limits dB(μV) ^a	
	Quasi-peak	Average
0,15 to 0,50	80	70
0,50 to 30	74	64

^a At the transition frequency, the lower limit applies.

4.3.3 Control terminals

The limits of the control terminal disturbance voltage for the frequency range 150 kHz to 30 MHz are given in Table 2c.

Table 2c – Disturbance voltage limits at control terminals

Frequency range MHz	Limits dB(μV)	
	Quasi-peak	Average
0,15 to 0,50	84 to 74	74 to 64
0,50 to 30	74	64

NOTE 1 The limits decrease linearly with the logarithm of the frequency in the range 0,15 MHz to 0,5 MHz.
NOTE 2 The voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150 Ω to the control terminal.

4.4 Radiated electromagnetic disturbances

4.4.1 Frequency range 9 kHz to 30 MHz

The quasi-peak limits of the magnetic component of the radiated disturbance field strength in the frequency range 9 kHz to 30 MHz, measured as a current in 2 m, 3 m or 4 m loop antennas around the lighting equipment, are given in Table 3a.

The limits for the 2 m loop diameter apply to equipment not exceeding a length of 1,6 m, those for the 3 m loop diameter for equipment having a length in between 1,6 m and 2,6 m and those for the 4 m loop diameter for equipment having a length in between 2,6 m and 3,6 m.

Table 3a – Radiated disturbance limits in the frequency range 9 kHz to 30 MHz

Frequency range MHz	Limits for loop diameter dB(μ A) ^a		
	2 m	3 m	4 m
9 kHz to 70 kHz	88	81	75
70 kHz to 150 kHz	88 to 58 ^b	81 to 51 ^b	75 to 45 ^b
150 kHz to 3,0 MHz	58 to 22 ^b	51 to 15 ^b	45 to 9 ^b
3,0 MHz to 30 MHz	22	15 to 16 ^c	9 to 12 ^c

^a At the transition frequency, the lower limit applies.

^b Decreasing linearly with the logarithm of the frequency. For electrodeless lamps and luminaires, the limit in the frequency range of 2,2 MHz to 3,0 MHz is 58 dB(μ A) for 2 m, 51 dB(μ A) for 3 m, and 45 dB(μ A) for 4 m loop diameter.

^c Increasing linearly with the logarithm of the frequency.

NOTE In Japan, the limits for frequencies 9 kHz to 150 kHz do not apply.

4.4.2 Frequency range 30 MHz to 300 MHz

The quasi-peak limits of the electric component of the radiated disturbance field strength in the frequency range 30 MHz to 300 MHz, measured in accordance with the method specified in Clause 10 of CISPR 22, are given in Table 3b.

NOTE For reasons of repeatability it is advised to terminate the mains supply cable with a CDN positioned on the ground plane and terminated with a 50 Ω impedance.

Table 3b – Radiated disturbance limits in the frequency range 30 MHz to 300 MHz at a measuring distance of 10 m

Frequency range MHz	Quasi-peak limits dB(μ V/m) [*]
30 to 230	30
230 to 300	37

^{*} At the transition frequency, the lower limit applies.

Tests in the frequency range 30 MHz to 300 MHz may be conducted by the test specified in Annex B with the limits of Table B.1. If the lighting equipment complies with the requirements of Annex B, it is deemed to comply with the limits of this subclause.

5 Application of the limits

5.1 General

Applications of the limits for the various kinds of lighting equipment as mentioned in the scope of this standard are given in 5.2 to 5.10.

No emission requirements apply to lamps other than self-ballasted lamps nor to auxiliaries incorporated in luminaires, in self-ballasted lamps or in semi-luminaires. (See, however, note 2 of 5.3.1 in this respect.)

The disturbance caused by manual or automatic operation of a switch (external or included in equipment) to connect or disconnect the mains shall be disregarded. This includes manual on/off switches or, for example, switches activated by sensors or ripple control receivers. However, switches which will be repeatedly operated (e.g. such as those of advertising signs) are not included in this exception.

5.2 Indoor luminaires

5.2.1 General

The following conditions apply to all kinds of indoor luminaires irrespective of the environment in which they are used.

5.2.2 Incandescent lamp luminaires

Incandescent lamp luminaires where the lamps are a.c. mains or d.c. operated, or which do not incorporate a light regulating device or electronic switch, are not expected to produce electromagnetic disturbances. Therefore, they are deemed to fulfil all relevant requirements of this standard without further testing.

NOTE Where, in this standard, the term "incandescent lamp" is used, all types of incandescent lamps including halogen lamps are meant.

5.2.3 Fluorescent lamp luminaires

The minimum values of insertion loss of Table 1 shall apply where a fluorescent lamp luminaire is a starter switch operated type and designed for one of the following lamp types:

- linear fluorescent lamps with a nominal diameter of 15 mm, 25 mm or 38 mm;
- circular fluorescent lamps with a nominal diameter of 28 mm or 32 mm;
- U-type fluorescent lamps with a nominal diameter of 15 mm, 25 mm or 38 mm;
- single-capped fluorescent lamps, without integrated starter and with a nominal diameter of 15 mm;
- single-capped fluorescent lamps, linear shaped, twin and quad tube, with integrated starter and having a nominal tube diameter of 12 mm.

5.2.4 Other luminaires

Indoor luminaires other than described in 5.2.2 or 5.2.3 shall comply with the mains terminal voltage limits given in Table 2a.

Where the luminaire supplies the lamp(s) with a current having an operation frequency in excess of 100 Hz, it shall comply with the radiated disturbance limits given in Tables 3a and 3b.

Where the light output of the luminaire is regulated by an external device with separate control lines, the disturbance voltage at the control terminals shall comply with the requirements of 4.3.3.