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Spectrum Management and Telecommunications

Interference-Causing Equipment Standard

Lighting Equipment

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Canada

Preface

Interference-Causing Equipment Standard ICES-005, Issue 4, *Lighting Equipment*, replaces Issue 3, *Radio Frequency Lighting Devices (RFLDs)*, published in May 2009. ICES-005 sets out limits and methods of measurement of radiated and conducted radio frequency emissions produced by lighting equipment, as well as administrative requirements for such equipment.

This issue of the ICES-005 standard will come into force on the first day of December 2016, after which date compliance with ICES-005 Issue 3 will no longer be accepted.

Listed below are the changes:

1. The title of the standard has been changed from *Radio Frequency Lighting Devices (RFLDs)* to *Lighting Equipment*.
2. The scope of ICES-005 has been broadened to cover all lighting products capable of generating unwanted emissions that may cause radio frequency interference.
3. Issue 4 includes an alternative compliance verification test method and corresponding limits, which are based on CISPR 15, *Limits and Methods of Measurement of Radio Disturbance Characteristics of Electrical Lighting and Similar Equipment*.

Innovation, Science and Economic Development Canada encourages the industry to familiarize itself with the CISPR 15 international standard and participate in the development of a North American standard for lighting equipment based on CISPR 15. Innovation, Science and Economic Development Canada will transition this lighting equipment regulatory standard to one solely based on CISPR 15 or a North American version of CISPR 15 within four years from the publication of this issue of ICES-005.

Inquiries may be submitted online using the General Inquiry form at http://www.ic.gc.ca/eic/site/ceb-bhst.nsf/frm-eng/EABV-9X4GEH. (In the form, the Regulatory Standards Branch radio button must be selected and "ICES-005" must be specified in the General Inquiry field.)

Inquiries may also be submitted by mail to the following address:

Innovation, Science and Economic Development Canada
Engineering, Planning and Standards Branch
235 Queen Street
Ottawa, Ontario K1A 0H5
Canada
Attention: Regulatory Standards Directorate

Comments and suggestions for improving this standard may be submitted online using the Standard Change Request form at http://www.ic.gc.ca/eic/site/ceb-bhst.nsf/frm-eng/EABV-9VCLQJ.

All Spectrum Management and Telecommunications publications are available on the following website: http://www.ic.gc.ca/spectrum.

Issued under the authority of
the Minister of Innovation, Science and Economic Development Canada

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Daniel Duguay
Director General
Engineering, Planning and Standards Branch

Contents

1. Scope

This ICES sets out the technical requirements relative to radiated and conducted radio frequency (RF) emissions generated by the following categories of lighting equipment, as well as the administrative requirements applicable to such equipment:

- luminaires (i.e. lighting fixtures) and lamps whose primary function is to generate and/or distribute light intended for illumination purposes and which include active/switching electronic components and/or gas-discharge lighting equipment;
- the lighting part of multi-function equipment if one of the primary functions of this equipment is illumination;
- modules exclusively for use with lighting equipment and which are marketed independently;
- ultraviolet (UV) and infrared (IR) radiation apparatus;
- simple advertising signs (e.g. neon tube advertising signs or emergency exit signs); and
- decorative lighting.

The following categories of lighting equipment are deemed to comply with ICES-005 without testing and are exempt from all technical and administrative requirements set out in this standard:

- passive lighting equipment (lamps and luminaires), i.e. lighting equipment that does not include any active/switching electronic components nor any gas-discharge lighting devices or components; and
- modules intended to be built into lighting equipment, i.e. modules that are not user-replaceable.

Excluded from the scope of ICES-005 are apparatus that include lighting devices or sub-assemblies, but whose primary function is not illumination and that are covered under other Innovation, Science and Economic Development Canada standards.

Examples of such apparatus are:

- apparatus with built-in lighting devices for display back-lighting or signalling;
- range hoods, refrigerators and freezers;
- photocopiers and projectors; and
- large advertising signs that include many individual lamps and are capable of displaying complex images or moving pictures.

Also excluded from the scope of ICES-005 are the following categories of lighting equipment:

- lighting equipment for aircraft or airfield facilities (e.g. runways, service facilities and platforms);
- lighting equipment for road vehicles; and
- lighting equipment that falls under the scope of ICES-001.

Lighting equipment that includes functionality for wireless radio communication shall meet the provisions and requirements of both this standard and relevant Radio Standard Specifications (RSSs), as applicable to the specific radiocommunication technology.

2. Normative References

This ICES refers to the following publications and, where such reference is made, it shall be to the edition listed below:

- ANSI C63.4-2014, *American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz*; and
- CISPR 15 Edition 8.1, 2015-03, *Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment*.

Copies of ANSI C63.4-2014 and CISPR 15 can be purchased online at https://standards.ieee.org and http://webstore.iec.ch, respectively.

3. Determination of Interference

The following applies to all interference-causing equipment.

Where the Department determines that a model or several models of equipment cause or are likely to cause interference to radiocommunication, the Department shall give notice of the determination to the responsible parties.

Where the Department determines that a unit of equipment causes interference or obstructs radiocommunication, the Department shall order the persons in possession or control of the equipment to cease its operation until such time as it can be operated without causing interference, obstructing radiocommunication or producing such adverse effects.

4. Technical Requirements (Alternative 1)

Lighting equipment shall comply either with the requirements set out in this section or with those in Section 5.

4.1 Types of Lighting Equipment

For the purpose of the requirements set out in this section (Alternative 1), ICES-005 differentiates between two types of lighting equipment:

- gas-discharge lighting equipment (GDLE); and
- lighting equipment other than gas-discharge.

GDLE is a subset of lighting equipment that consists of luminaires and lamps that use radio frequency to excite a gas inside a bulb or tube in order to produce light intended for illumination purposes, including electronic ballasts and starters designed for use with such luminaires and lamps.

4.2 Classes of Lighting Equipment

For the purpose of the requirements set out in this section (Alternative 1), ICES-005 differentiates between two classes of lighting equipment, Class A and Class B, based on the characteristics and intended use of the equipment.

Class A lighting equipment is, by virtue of its characteristics, highly unlikely to be used in a residential environment, including a home business. Characteristics considered in this assessment include price, marketing and advertising methodology, the degree to which the functional design inhibits applications suitable to residential environments, or any combination of features that would effectively preclude the use of such lighting equipment in a residential environment.

Class B lighting equipment is any lighting equipment that cannot be classified as Class A.

Note: A self-ballasted gas-discharge or LED lamp equipped with an Edison screw base that allows mounting in standard incandescent lamp-holders and designed to be powered from the regular low-voltage public mains network, i.e. at 110-120 VAC 60 Hz, must comply with the Class B requirements, even if it is not marketed directly to the public. The same applies to other lamps under the scope of ICES-005 that are designed such that they can be installed in residential environments, e.g. LED lamps designed for MR16 sockets (for replacement of halogen lamps).

4.3 Instrumentation, Test Methods and Test Facilities

The instrumentation, test methods and test facilities used to demonstrate compliance with the limits defined in this section (Alternative 1) shall be in accordance with the requirements set out in ANSI C63.4.

4.4 Intentional Radiators

If the lighting equipment includes intentional radiators (e.g. for wireless light regulation control), it shall comply with both ICES-005 and the RSSs applicable to the specific wireless technology used in the equipment. The emission from the wireless transmitter shall not be considered when assessing compliance with ICES-005. This can be done either by switching off the wireless function of the lighting equipment (if possible and if it does not change in any way the typical non-intentional emissions) or by disregarding the intentional radiated emission. At the intentional radiation frequency or frequencies, the lighting equipment shall meet the requirements of the applicable RSS(s). Additionally, the lighting equipment shall meet all the other applicable requirements set out in RSS-Gen, *General Requirements for Compliance of Radio Apparatus* (e.g. those related to RF exposure and labelling).

Lighting equipment that includes intentional radiators is classified as Category I radio apparatus and requires a technical acceptance certificate (TAC), pursuant to subsections 4(2) of the *Radiocommunication Act* and 21(1) of the *Radiocommunication Regulations*. Either the Certification and Engineering Bureau of Innovation, Science and Economic Development Canada or a recognized certification body may issue a TAC (see RSS-Gen). The application for certification shall follow the procedures set out in Radio Standards Procedure RSP-100, *Certification of Radio Apparatus*.

4.5 Limits for Alternative 1

This section sets out applicable limits for conducted emissions into AC mains power lines and for radiated emissions, in the case where the test methods described in ANSI C63.4 are used for demonstrating compliance with ICES-005. Different limits apply to GDLE (see definition in Section 4.1) and to lighting equipment other than gas-discharge.

4.5.1 Conducted Emissions

The limits for the mains terminal disturbance voltages applicable to GDLE are presented in Table 1.

Table 1: Conducted Emissions Limits for GDLE (AC Mains Terminals)

Frequency range (MHz)	Class A GDLE (dBµV, quasi-peak)	Class B GDLE (dBµV, quasi-peak)
0.45 – 1.6	60	48
1.6 – 2.51	70	48
2.51 – 3	70	70
3 – 30	70	48
Note 1: The more stringent limit applies at transition frequencies. **Note 2:** No limits apply within the ISM frequency bands listed in Table A1 of Annex A.		

The limits for the mains terminal disturbance voltages applicable to lighting equipment other than gas-discharge are presented in Table 2.

Table 2: Conducted Emissions Limits for Lighting Equipment Other Than Gas-Discharge (AC Mains Terminals)

Frequency range (MHz)	Class A lighting equipment, other than gas-discharge		Class B lighting equipment, other than gas-discharge	
	Quasi-peak (dBµV)	Average (dBµV)	Quasi-peak (dBµV)	Average (dBµV)
0.15 – 0.5	79	66	66 to 56 (Note 2)	56 to 46 (Note 2)
0.5 – 5	73	60	56	46
5 – 30	73	60	60	50
Note 1: The more stringent limit applies at transition frequencies. **Note 2:** The limit level in dBµV decreases linearly with the logarithm of frequency.				

4.5.2 Radiated Emissions

For gas-discharge lighting equipment, radiated emissions need to be measured in the frequency range determined in accordance with Table 3.

Table 3: Frequency Range of Radiated Emissions Limits for GDLE

GDLE operating frequency (MHz)	Radiated emissions frequency range	
	From (MHz)	To (MHz)
$f < 1.705$	No radiated emissions measurement required	
$1.705 \leq f < 30$	30	400
$30 \leq f < 500$	30	1000
$f \geq 500$	Lowest frequency generated in the GDLE or 100 MHz, whichever is lower	1000

For equipment other than GDLE, radiated emissions shall be measured over the entire frequency range where limits are defined in Table 4 below (i.e. 30 – 1000 MHz).

The quasi-peak limits for the electric component of the radiated field strength emitted from lighting equipment, for a measurement distance of 3 m or 10 m, are presented in Table 4.

Table 4: Radiated Emissions Limits for Lighting Equipment

Frequency range (MHz)	Class A (dBµV/m, quasi-peak)		Class B (dBµV/m, quasi-peak)	
	3 m	10 m	3 m	10 m
30 – 88	49.5	39.1	40	29.5
88 – 216	54	43.5	43.5	33.1
216 – 1000	56.9	46.4	46	35.6

Note 1: The more stringent limit applies at transition frequencies.
Note 2: For GDLE, radiated emissions need only be measured in the frequency range determined in accordance with Table 3.
Note 3: For GDLE, no limits apply within the ISM frequency bands listed in Table A1 of Annex A.

The test site used for radiated emission measurements shall comply with all the applicable requirements set out in ANSI C63.4. Measurements at distances other than those in Table 4 are permitted only if the test site was validated for the selected measurement distance (as per the site validation procedures and acceptability criteria set out in ANSI C63.4). If a measurement distance other than 3 m or 10 m is selected, the radiated emission limits from Table 4 shall be adjusted to the selected measurement distance using a factor of 20 dB per decade of distance.

Radiated emission measurements at distances greater than 10 m are only permitted if it can be shown that the measurement system (i.e. receiver) is able to detect emissions generated by the equipment under test (EUT) with a sufficient signal-to-noise margin and if the noise floor of the receiver is at least 6 dB below the applicable limit in Table 4. Measurement distances greater than 30 m are not permitted.

Radiated emission measurements at a distance of 3 m are only permitted for small EUTs, such that the measurement antenna is not within the near-field zone with respect to the EUT (including its cables and accessories located within the measurement volume) at any frequency of measurement. Measurement distances smaller than 3 m are not permitted.

5. Technical Requirements (Alternative 2)

Lighting equipment shall comply either with the requirements set out in this section or with those in Section 4.

5.1 Instrumentation, Test Methods and Test Facilities

The instrumentation, test methods and test facilities used to demonstrate compliance with the limits defined in this section (Alternative 2) shall be in accordance with the requirements set out in CISPR 15.

5.2 Intentional Radiators

If the lighting equipment includes intentional radiators (e.g. for wireless light regulation control), it shall comply with both ICES-005 and the RSSs applicable to the specific wireless technology used in the equipment. The emission from the wireless transmitter shall not be considered when assessing compliance with ICES-005. This can be done either by switching off the wireless function of the lighting equipment (if possible and if it does not change in any way the typical non-intentional emissions) or by disregarding the intentional radiated emission. At the intentional radiation frequency or frequencies, the lighting equipment shall meet the requirements of the applicable RSS(s). Additionally, the lighting equipment shall meet all the other applicable requirements set out in RSS-Gen (e.g. those related to RF exposure and labelling).

Lighting equipment that includes intentional radiators is classified as Category I radio apparatus and requires a technical acceptance certificate (TAC), pursuant to subsections 4(2) of the *Radiocommunication Act* and 21(1) of the *Radiocommunication Regulations*. Either the Certification and Engineering Bureau of Innovation, Science and Economic Development Canada or a recognized certification body may issue a TAC (see RSS-Gen). The application for certification shall follow the procedures set out in RSP-100.

5.3 Statistical Analysis

Clause 10 of CISPR 15 ("*Interpretation of CISPR radio disturbance limits*") cannot be used for demonstrating compliance with ICES-005. Each unit of a lighting equipment model is required to be in compliance with ICES-005.

5.4 Limits for Alternative 2

The limits applicable to Alternative 2 are those set out in CISPR 15, with the following modification:

- The quasi-peak limit for the electric component of the radiated field strength emitted from lighting equipment set out in Table 3b of CISPR 15 is extended up to 1000 MHz. Specifically, the limit value at 300 MHz also applies within the 300 – 1000 MHz frequency range. The instrumentation,

test facility and method of measurement requirements defined in CISPR 15 for frequencies within 30 – 300 MHz also apply within 300 – 1000 MHz.

6. Administrative Requirements

6.1 Test Report

The test report shall comply with all applicable requirements set out in ANSI C63.4 or CISPR 15 (depending on which test method and limits were used for demonstrating compliance with ICES-005) and it shall include a record of all measurements and results required to demonstrate compliance with ICES-005. The test report shall also include a detailed description of the EUT and its setup and configuration used for each specific test case, as applicable, and shall indicate the date each test was completed. Additionally, for lighting equipment that includes intentional radiators, the test report shall comply with all requirements set out in RSS-Gen and the specific RSS(s) as applicable to the wireless technology used by the lighting equipment.

The manufacturer or importer shall retain a copy of the test report for as long as the lighting equipment is manufactured, imported, sold, offered for sale, leased and/or distributed in Canada and shall make the test report available to Innovation, Science and Economic Development Canada upon request.

6.2 Labelling and User Manual Requirements

The manufacturer, importer or distributor shall meet the labelling and user manual requirements set out in this section for every unit of lighting equipment.

6.2.1 General

Each unit of a lighting equipment model shall bear a label, which represents the manufacturer's or importer's self-declaration of compliance with Innovation, Science and Economic Development Canada's ICES-005. This label shall be permanently affixed to each unit of the lighting equipment or displayed electronically as per *Notice 2014 - DRS1003* and its text must be clearly legible. However, if the lighting equipment is too small or if it is not otherwise practical to place the label on the lighting equipment and if electronic labelling has not been implemented, the label may alternatively be placed in a prominent location in the user manual supplied with the equipment and/or on its packaging. The user manual may be in an electronic format, in which case it must be readily available.

This Innovation, Science and Economic Development Canada compliance label shall include the word "Canada" (or "CAN") and a reference to this standard, in both English and French. If Alternative 1 is used for verifying compliance, the label shall also include the Class of the lighting equipment. An example is given below:

CAN ICES-005 (*) / NMB-005 (*)

* Insert either "A" or "B", but not both, to identify the applicable Class of the lighting equipment.

The Class must only be included on the Innovation, Science and Economic Development Canada label if the lighting equipment was verified for compliance with ICES-005 using the requirements of Alternative 1 (Section 4). Below is an example of a label for cases where Alternative 2 is used for verifying compliance:

CAN ICES-005 / NMB-005

6.2.2 Requirements for Lighting Equipment With Intentional Radiators

These requirements are only applicable to lighting equipment that includes intentional radiators (e.g. wireless radio light control and/or wireless dimming) and are applicable to such equipment instead of the requirements set out in Section 6.2.1. Lighting equipment incorporating intentional radiators shall comply with the labelling and other administrative requirements (e.g. user manual notice, if applicable) set out in RSS-Gen, RSP-100 and the other RSS(s) applicable to the specific wireless technology used in the lighting equipment.

Annex A — Industrial, Scientific and Medical (ISM) Frequency Bands

For GDLE, no limits apply within the ISM frequency bands specified in Table A1.

Table A1: ISM Frequency Bands

Center frequency (MHz)	Bandwidth (MHz)	Lower limit (MHz)	Upper limit (MHz)
6.78	± 0.015	6.765	6.795
13.56	± 0.007	13.553	13.567
27.12	± 0.163	26.957	27.283
40.68	± 0.020	40.660	40.700
915	± 13	902	928
2,450	± 50	2,400	2,500
5,800	± 75	5,725	5,875
24,125	± 125	24,000	24,250
61,250	± 250	61,000	61,500
122,500	± 500	122,000	123,000
245,000	± 1,000	244,000	246,000