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Interference-Causing Equipment Standard

Lighting Equipment

Preface

Interference-Causing Equipment Standard ICES-005, issue 5, *Lighting Equipment*, replaces ICES-005 issue 4, published in December 2015. This issue of the ICES-005 standard will come into force upon its publication on the Innovation, Science, and Economic Development Canada (ISED) website. However, a transition period is provided, according to section 2, within which compliance with either ICES-005 issue 4 or ICES-005 issue 5 is accepted.

Listed below are the changes:

- clarified what types of lighting equipment are in the scope of this standard or not, including examples (section 1);
- removed requirements that are specified in ICES-Gen and referred to ICES-Gen for all general requirements (section 4).

ISED strongly 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. ISED will transition this lighting equipment regulatory standard (i.e. ICES-005) to one solely based on CISPR 15 or a North American version of CISPR 15 within a maximum of two years from the publication of this issue of ICES-005.

Inquiries may be submitted by one of the following methods:

- 1) Online, using the [General inquiry form](#). (In the form, the Regulatory Standards Branch radio button should be selected and “ICES-005” should be specified in the General Inquiry field.)
- 2) 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

- 3) By [email](mailto:ic.consultationradiostandards-consultationnormesradio.ic@canada.ca): ic.consultationradiostandards-consultationnormesradio.ic@canada.ca

Comments and suggestions for improving this standard may be submitted online using the [Standard Change Request form](#), or by mail or email to the above addresses.

All spectrum and telecommunications related documents are available on ISED’s [Spectrum Management and Telecommunications](#) website.

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

Martin Proulx
Director General
Engineering, Planning and Standards Branch

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1. Scope

1.1 General

This Interference-Causing Equipment Standard (ICES) sets out limits and methods of measurement of radiated and conducted radio frequency emissions produced by lighting equipment of the categories listed below, as well as administrative requirements for such equipment:

- a) luminaires (i.e. lighting fixtures) and lamps whose primary function is to generate or distribute light intended for illumination purposes and which include active or switching electronic components or gas-discharge lighting equipment;
- b) the lighting part of multi-function equipment if one of the primary functions of this equipment is illumination (e.g. pendant luminaire-fan combination);
- c) modules or components with circuits operating at or above 9 kHz intended for use with lighting equipment and which are marketed independently (such as ballast, etc.);
- d) ultraviolet (UV) and infrared (IR) radiation apparatus;
- e) simple advertising signs (e.g. neon tube advertising signs or emergency exit signs);
- f) decorative and entertaining lighting (e.g. rope lights, disco lights, theatre/show floodlights);
- g) lighting equipment used inside recreational vehicles (RV) or boats/vessels for purposes that are similar to residential applications (such as lighting equipment used in the kitchen, dining or living areas inside the RV or boat/vessel);¹ and
- h) transport lighting installed inside the cabins of trains, buses, and vessels.

1.2 Lighting equipment that is out of scope of ICES-005

1.2.1 Passive lighting equipment and non-user-replaceable modules

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:

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

1.2.2 Other types of equipment

Excluded from the scope of ICES-005 are apparatus that include lighting devices or sub-assemblies, but whose primary function is not illumination or that are covered under other ISED standards. Examples of such apparatus are:

¹ Lighting equipment used in recreational vehicles or boats/vessels for purposes other than traffic signaling is subject to ICES-005, since such lighting is used when the vehicle/boat/vessel is operated as a residential dwelling.

- a) built-in lighting devices for display back-lighting or signalling;
- b) range hoods, refrigerators and freezers;²
- c) photocopiers and projectors; and
- d) large advertising signs that include many individual lamps and are capable of displaying complex images or moving pictures.

1.2.3 Equipment subject to other standards

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

- a) lighting equipment intended exclusively for installation on-board an aircraft;
- b) lighting equipment for airfield runways, provided it has been verified to be in compliance with [IEC 61000-6-4](#),³ otherwise, ICES-005 applies;
- c) lighting equipment that is factory-installed in/on road vehicles or boats/vessels by the original manufacturer (and which is consequently tested together with the vehicle or boat/vessel against ICES-002, [Vehicles, Boat and Other Devices Propelled by an Internal Combustion Engine, Electrical Mean or Both](#)), excluding lighting equipment described in 1.1g) and 1.1h); and
- d) lighting equipment that falls under the scope of ICES-001, [Industrial, Scientific and Medical \(ISM\) Radio Frequency Generators](#).

1.3 Lighting equipment with wireless power transfer functionality

Lighting equipment that includes functionality for wireless power transfer (WPT) shall meet the provisions and requirements of this standard while operating in the lighting mode and the provisions and requirements of Radio Standard Specification RSS-216, [Wireless Power Transfer Devices](#) while in the wireless power transfer mode.

1.4 Lighting equipment that incorporates wireless modules

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

² Lighting equipment is used within such apparatus for illumination. However, illumination is not the primary function for these types of devices, i.e. they can still perform their primary function even if the lamp is defective or missing.

³ Lighting equipment intended for runways, called “aeronautical ground lighting,” is subject to the [IEC 61827](#) standard, which covers many requirements. For emissions, IEC 61827 refers to the generic emission standard for industrial environments, IEC 61000-6-4.

2. Transition period

A transition period, ending June 1, 2019, is provided, within which compliance with ICES-005 issue 4 (available upon request by [email](#)) or ICES-005 issue 5 is accepted.

After the expiry of this transition period all products subject to this standard that continue to be manufactured, imported, distributed, leased, offered for sale, or sold in Canada shall comply with ICES-005 issue 5.

3. 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 and CISPR 15 can be purchased online at the [IEEE Standards Association](#) web page and the [IEC Webstore](#) web page, respectively.

4. ICES-Gen compliance

In addition to this standard, the requirements of ICES-Gen, [General Requirements for Compliance of Interference-Causing Equipment](#), shall apply, except where a requirement in ICES-Gen contradicts a requirement in this standard, in which case this standard shall take precedence.

5. Technical requirements (Alternative 1)

5.1 General

Lighting equipment shall comply either with the requirements set out in this section or with those in section 6.

5.2 Types of lighting equipment

For the purpose of the requirements set out in 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.

5.3 Classes of lighting equipment

For the purpose of the requirements set out in 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. The definitions of these two classes are specified in ICES-Gen.

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, for example LED lamps designed for MR16 sockets for replacement of halogen lamps.

5.4 Instrumentation, test methods and test facilities

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

5.5 Limits for Alternative 1

5.5.1 General

This section sets out applicable limits for conducted emissions into alternating current (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 and to lighting equipment other than gas-discharge.

5.5.2 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 (dB μ V, quasi-peak)	Class B GDLE (dB μ V, 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 (dB μ V)	Average (dB μ V)	Quasi-peak (dB μ V)	Average (dB μ V)
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 dB μ V decreases linearly with the logarithm of frequency.

5.5.3 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 (dB μ V/m, quasi-peak)		Class B (dB μ V/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:

- a) 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
- b) 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.

6. Technical requirements (Alternative 2)

6.1 General

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

6.2 Instrumentation, test methods and test facilities

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

6.3 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.

6.4 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.

7. Administrative requirements

7.1 Test report

The requirements specified in [ICES-Gen](#) shall apply. Additionally, the chosen alternative shall be specified in the test report.

7.2 Labelling and user manual requirements

The requirements specified in ICES-Gen shall apply. An example of an ISED compliance label, which is to be placed on each unit of an equipment model (or in the user manual, if allowed), is given below:

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

* If Alternative 1 has been used, insert either “A” or “B” in parenthesis to identify the applicable lighting equipment Class used for compliance verification. If Alternative 2 has been used, there is no need for additional information; therefore the parentheses are not needed in the label.

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