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Introduction

This draft standard is based on international discussions in which the UK has taken an active part. Your comments on this draft are welcome and will assist in the preparation of the consequent standard. There is a high probability that this text could be adopted by CENELEC as a reference document for harmonization or as a European Standard. Recipients of this draft are requested to comment on the text bearing in mind this possibility.

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	(7)
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/ Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



CISPR/B/663/CD

COMMITTEE DRAFT (CD)

IEC/TC or SC: CISPR B	Project number CISPR 11 Ed. 6 AMD2 f1	
Title of TC/SC: Interference relating to industrial, scientific and medical radio-frequency apparatus, to other (heavy) industrial equipment, to overhead power lines, to high voltage equipment and to electric traction	Date of circulation 2016-06-17	Closing date for comments 2016-10-07
Also of interest to the following committees CISPR H, TC 69	Supersedes document B/648/DC, B/660/INF, B/661/RR	
Proposed horizontal standard ☐ Other TC/SCs are requested to indicate their interest, if any, in this CD to the TC/SC secretary		
Functions concerned: ☐ Safety ☒ EMC ☐ Environment ☐ Quality assurance		
Secretary: Ryoji Hayashi	THIS DOCUMENT IS STILL UNDER STUDY AND SUBJECT TO CHANGE. IT SHOULD NOT BE USED FOR REFERENCE PURPOSES. RECIPIENTS OF THIS DOCUMENT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.	

Title:

Amendment 2 (f1) to CISPR 11 Ed. 6: Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement - Requirements for air-gap wireless power transfer (WPT)

(Titre) :

Introductory note

This CD bases on CISPR/B/648/DC and resolutions for the comments of the NCs compiled in CISPR/B/660/INF.

The appropriate review report is found in CISPR/B/661/RR. The CD was prepared by WG1 Task Force WPT.

It contains an instruction list with modifications in the text of Edition 6 of CISPR 11 aiming at the introduction of requirements for air-gap wireless power transfer (WPT).

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For full inclusion of type test requirements for power electronic WPT equipment CISPR 11 Ed.6.0 needs to be supplemented with various further information belonging to frequency ranges used for WPT, emission limits, test arrangements, site instrumentation and load conditions during testing inclusive descriptions of artificial loads. The instructions for execution of this task read as follows.

Start of the instruction list

1 Necessary amendments in Clause 3 – Terms and definitions

Observing the existing alphabetic order, insert, in clause 3, the following new terms and definitions:

3.xa

Wireless Power Transfer (WPT)

transfer of electrical energy from a power source to an electrical load via electric and/or magnetic fields or electromagnetic waves

3.xb

WPT system

system realizing a WPT function and consisting of the primary equipment (i.e. the primary device and power supply components) and another corresponding secondary equipment (i.e. the secondary device, power rectifier components and electrical load).

NOTE 1 to entry: The WPT system may have a set of data communication components associated with the WPT function itself, for controlling the power transfer operation.

3.xc

Primary device (of a WPT system)

Power source operated at a single radio frequency and generating narrowband electromagnetic RF energy for local wireless transmission to another mobile or portable secondary device by electromagnetic, inductive or capacitive coupling via an air gap or other short distance

3.xd

Secondary device (of a WPT system)

Power sink (energy storage, load) receiving locally the electromagnetic RF energy generated by the primary device by inductive or capacitive coupling via an air gap or other short distance

3.xe

Artificial load for type testing of WPT primary equipment

Standardised object (associate equipment – AE) with defined mechanical and technical parameters used for type tests of power electronic WPT systems and replacing the secondary device during measurements of the primary device

NOTE to entry: the artificial load simulates the load to the primary device and can be represented by a resistive or electric load.

3.xf

Alignment (of a WPT system)

process of finding the relative position of primary device to secondary device for which the most efficient power transfer is possible and which is indicated by means of markings on the primary device or through a visual or audible indicator

2 Necessary amendments in Clause 4 – Frequencies designated for ISM use

Clause 4 will get a new title since it will inform the user of CISPR 11 about general aspects of utilization of radio frequencies for ISM purposes (and also including WPT), also outside dedicated ISM bands. It will indicate radio frequency ranges which are used for ISM purposes too, but with limits for control of intentional ISM (inclusive WPT) emissions. The new title of clause 4 reads as follows:

4 Utilisation of radio frequencies for ISM purposes

Insert the following new text and paragraphs in front of Table 1:

The limits of this standard do not apply to radiated intentional emissions of ISM RF applications which operate at a frequency allocated inside an ISM frequency band as specified in Table 1.

Nonetheless the limits of this standard apply to:

- any unwanted emissions appearing outside the ISM (Table 1) and outside the candidate WPT (Table A) frequency bands
- intended WPT emissions inside the candidate WPT (Table A) frequency bands
- Intended emissions appearing outside the ISM (Table 1) and outside the candidate WPT (Table A) frequency bands.

It should be noted that sensitive radio services such as e.g. standard time and frequency radio broadcasting transmissions allocated in certain frequency bands require particular protection. For information about the frequency ranges concerned, see Annex G. Finally it should be noted that existing national regulation may prescribe adherence to more stringent emission limits than specified in this standard, for these sensitive radio services.

Examples for regional and national emission limits for protection of sensitive radio services are found in Annex E Table E.2.

Below Table 1, add the following new paragraph and new Table A:

Table A lists the candidate frequency bands for use with a range of power electronic ISM equipment offering wireless power transmission (WPT).

Table A – Candidate frequency bands also used for wireless power transmission (WPT)

Frequency range kHz	Typical WPT use ^c	Emission limits for type tests according to this standard
19 to 25	Local WPT via an air gap in cm range, throughput power up to 200 kW – automated in-plant transportation systems, trams and electric buses	See Clause 6.3
36 to 40	Local WPT via an air gap in cm range, throughput power up to 200 kW – automated in-plant transportation systems, trams, and electric buses	
55 to 65 ^a	Local WPT via an air gap in cm range, throughput power up to 200 kW – automated in-plant transportation systems, trams and electric buses	
79 to 90 ^b	Local WPT via an air gap in cm range, throughput power in the range up to 22 kW – electric passenger vehicles	

^a It should be noted that 60 kHz is being used as a standard frequency and time signal service.

^b Candidate WPT frequency range for global harmonization. The frequency range of 79 kHz to 90 kHz is being considered for Electric Vehicles (see the Preliminary Draft New Recommendation ITU-R SM.[WPT](2015)).

^c The power for WPT systems is given for information only and is not related to any limits.

3 Necessary amendments in Clause 5.1 – Separation into groups

The definition for group 2 equipment will be supplemented with the example WPT – wireless power transmission – to read as follows:

Group 2 equipment: group 2 contains all ISM RF equipment in which radio-frequency energy in the frequency range 9 kHz to 400 GHz is intentionally generated and used or only used locally, in the form of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment of material, for inspection/analysis purposes, or for transfer of electromagnetic energy (i.e. for wireless power transfer – WPT).

4 Necessary amendments in Clause 6.3 – Limits of electromagnetic disturbances – Group 2 equipment measured on a test site

The limits for group 2 ISM equipment are covered in Clause 6.3. They also apply to power electronic equipment with WPT function. In order to also cover modern implementations of power electronic WPT equipment, limits for intentional and unwanted WPT emissions will also be specified in the range 9 kHz to 150 kHz. The existing emission limits in the range 150 kHz to 30 MHz might be checked and possibly be adapted to the needs of accommodation of unwanted WPT emissions appearing at low order integer harmonics of the WPT operation frequency allocated in the range below 150 kHz.

6.3.1 Limits for conducted disturbances

6.3.1.2 Frequency range 9 kHz to 150 kHz

Amend the existing text in clause 6.3.1.2 to read as follows:

In the frequency range 9 kHz to 150 kHz, limits are not specified other than power electronic WPT equipment.

In the frequency range 9 kHz to 150 kHz, limits for conducted disturbances of WPT equipment are under consideration.

Editor's note: *A study on the impact of common mode currents on the WPT side is intended to be carried out.*

6.3.2 Limits of electromagnetic radiation disturbance

6.3.2.1 General

Correct the wording in the second paragraph to read as follows:

Up to 30 MHz the limits refer to the magnetic field strength component of the electromagnetic radiation disturbance. Above 30 MHz the limits refer to the electric field strength component of the electromagnetic radiation disturbance.

6.3.2.2 Frequency range 9 kHz to 150 kHz

Replace the existing text as follows:

The limits specified in this sub-clause apply only to ISM RF equipment intended for use in power electronic WPT systems inclusive of WPT charging stations for electric vehicles (EVs) and utilizing an operation (or fundamental) frequency in the frequency range below 150 kHz.

The electromagnetic radiation disturbance limits for the frequency range 9 kHz to 150 kHz for group 2 class A equipment are specified in Table X; and for group 2 class B equipment in Table Y.

For radiated unwanted emissions of power electronic WPT equipment appearing at the second, third, fourth, and up to the ninth integer harmonic of the operation frequency of the EUT the limits of Table X and Y may be relaxed by 10 dB. This relaxation applies in the surrounding frequency interval with a bandwidth to 1 % of the respective harmonic frequency or to 4,5 kHz (whichever is the smaller interval width), centered on the respective integer multiple of the actual operation frequency of the EUT.

NOTE In respect of use of WPT equipment and systems in the field, national regulation can prescribe compliance with more stringent limits than specified in this clause, for adequate protection of sensitive radio services and/or other radio-communication devices like short range devices (SRDs) used e.g. in railway signaling applications. In most cases, only a couple of frequencies are concerned, see also Annex E and G.

Table X – Electromagnetic radiation disturbance limits for class A power electronic WPT equipment for EV measured on a test site

Frequency range kHz	Limits for a measuring distance D in m		
	On a test site $D = 30$ m from the equipment	On a test site $D = 10$ m from the equipment	On a test site $D = 3$ m from the equipment
	Magnetic field Quasi-peak dB(μ A/m)	Magnetic field Quasi-peak dB(μ A/m)	Magnetic field Quasi-peak dB(μ A/m)
9 - 19	18 decreasing linearly with logarithm of frequency to 14,8	42 decreasing linearly with logarithm of frequency to 38,8	66,5 decreasing linearly with logarithm of frequency to 63,3
19 - 25	63	87	111,5
25 - 36	13,6 decreasing linearly with logarithm of frequency to 12	37,6 decreasing linearly with logarithm of frequency to 36	62,1 decreasing linearly with logarithm of frequency to 60,5
36 - 40	62,2	86,2	110,7
40 - 55	11,6 decreasing linearly with logarithm of frequency to 10,3	35,6 decreasing linearly with logarithm of frequency to 34,3	60,1 decreasing linearly with logarithm of frequency to 58,8
55 - 65	60,4	84,4	108,9
65 - 79	9,5 decreasing linearly with logarithm of frequency to 8,7	33,5 decreasing linearly with logarithm of frequency to 32,7	58,1 decreasing linearly with logarithm of frequency to 57,2
79 - 90	58,8	82,8	107,3
90 – 150	8,2 decreasing linearly with logarithm of frequency to 6	32,2 decreasing linearly with logarithm of frequency to 30	56,7 decreasing linearly with logarithm of frequency to 54,5
On a test site, class A equipment can be measured at a nominal distance of 3 m, 10 m or 30 m. A measuring distance less than 10 m is allowed only for equipment which complies with the definition given in 3.17. At the transition frequency, the more stringent limit shall apply. Specific sensitive radio services in this frequency range are listed in Table E.2 as examples. The respect of the limits for such radio services used in each country is needed for keeping co-existence.			

Table Y – Electromagnetic radiation disturbance limits for class A power electronic WPT equipment for EV measured on a test site

Frequency range kHz	Limits for a measuring distance D in m		
	On a test site $D = 30$ m from the equipment	On a test site $D = 10$ m from the equipment	On a test site $D = 3$ m from the equipment
	Magnetic field Quasi-peak dB(μ A/m)	Magnetic field Quasi-peak dB(μ A/m)	Magnetic field Quasi-peak dB(μ A/m)
9 - 19	3 decreasing linearly with logarithm of frequency to - 0,2	27 decreasing linearly with logarithm of frequency to 23,8	51,5 decreasing linearly with logarithm of frequency to 48,3
19 - 25	48	72	96,5
25 - 36	- 1,4 decreasing linearly with logarithm of frequency to - 3	22,6 decreasing linearly with logarithm of frequency to 21	47,1 decreasing linearly with logarithm of frequency to 45,5
36 - 40	47,2	71,2	95,7
40 - 55	- 3,4 decreasing linearly with logarithm of frequency to - 4,7	20,6 decreasing linearly with logarithm of frequency to 19,3	45,1 decreasing linearly with logarithm of frequency to 43,8
55 - 65	45,4	69,4	93,9
65 - 79	- 5,5 decreasing linearly with logarithm of frequency to - 6,3	18,5 decreasing linearly with logarithm of frequency to 17,7	43 decreasing linearly with logarithm of frequency to 42,2
79 - 90	43,8	67,8	92,3
90 – 150	- 6,8 decreasing linearly with logarithm of frequency to - 9	17,2 decreasing linearly with logarithm of frequency to 15	41,7 decreasing linearly with logarithm of frequency to 39,5
On a test site, class B equipment can be measured at a nominal distance of 3 m or 10 m. A measuring distance less than 10 m is allowed only for equipment which complies with the definition given in 3.17. At the transition frequency, the more stringent limit shall apply. Specific sensitive radio services in this frequency range are listed in Table E.2 as examples. The respect of the limits for such radio services used in each country is needed for keeping co-existence.			

In case of in-situ emission measurement of WPT equipment (e.g. for rolling stock on railway lines), experienced limit values and measurement procedures given in product standards shall be regarded.

6.3.2.3 Frequency range 150 kHz to 1 GHz

Insert the following new text after the 7th paragraph of the existing text in Clause 6.3.2.3:

The limits of Table Z apply to unwanted emissions in the range 150 kHz to 30 MHz. In the range 30 MHz to 1 000 MHz, the limits of Table 10 apply to all emissions.

For class B power electronic WPT equipment, the limits of Table 12 apply to intentional and unwanted emissions, in the frequency range 150 kHz to 1 000 MHz.

For radiated unwanted emissions of power electronic WPT equipment, operating in the frequency bands given in Table A, appearing at the second, third, fourth, and up to the ninth integer harmonic of the operation frequency of the EUT the limits of Table Z and Table 12 may be relaxed by 10 dB. This relaxation applies in the surrounding frequency interval of a band.