

INTERNATIONAL STANDARD

NORME INTERNATIONALE



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

AMENDMENT 1
AMENDEMENT 1

iTeh STANDARD PREVIEW
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Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement

CISPR 11:2015/AMD1:2016
<https://standards.iteh.ai/catalog/standards/sist/a1bc97b8-05d1-4071-a498-926ca0cffe90/cispr-11-2015-amd1-2016>

Appareils industriels, scientifiques et médicaux – Caractéristiques de perturbations radioélectriques – Limites et méthodes de mesure



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FOREWORD

This amendment has been prepared by CISPR Subcommittee B: 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.

The text of this standard is based on the following documents:

CDV	Report on voting
CISPR/B/627/CDV	CISPR/B/639A/RVC

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table.

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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Introduction to Amendment 1

This Amendment introduces the fully-anechoic room (FAR) for measurements of the disturbance field strength in the range 30 MHz to 1 GHz on equipment in the scope of CISPR 11.

It contains the complete set of requirements for measurement of radiated disturbances from equipment fitting into the validated test volume of a given FAR. It specifies a separation distance of 3 m and restricts use of the FAR to measurements on table-top equipment.

At the moment the FAR can be used:

- for measurements on table-top equipment fitting into the validated test volume of the given FAR,
- for a separation distance of 3 m only, and
- if the FAR was validated according to CISPR 16-1-4.

The limits for class A and class B group 1 equipment in this CDV base on the limits in the generic emission standards IEC 61000-6-3:2006/AMD 1 (2010) and IEC 61000-6-4:2006/AMD 1 (2010). The limits for class A and class B group 2 equipment were derived using the same approximation formula as used when deriving the limits for the generic emission standards in mid of the years 2000 to 2010. CISPR/H/104/INF, published in 2005, gives detailed explanations how these limits for the FAR were derived.

More detailed background information is still found in CISPR/B/627/CDV.

CISPR/B WG1 in October 2015

3 Terms and definitions

Add, after the existing definition 3.19, the following new terms and definitions:

3.20

fully-anechoic room FAR

shielded enclosure, the internal surfaces of which are lined with radio-frequency-energy absorbing material (i.e. RF absorber) that absorbs electromagnetic energy in the frequency range of interest

3.21

open-area test site OATS

facility used for measurements of electromagnetic fields the intention for which is to simulate a semi-free-space environment over a specified frequency range that is used for radiated emission testing of products

Note 1 to entry: An OATS typically is located outdoors in an open area, and has an electrically-conducting ground plane.

3.22

semi-anechoic chamber SAC

shielded enclosure, in which five of the six internal surfaces are lined with radio-frequency energy absorbing material (i.e. RF absorber) that absorbs electromagnetic energy in the frequency range of interest, and the bottom horizontal surface is a conducting ground plane for use with OATS test set-ups

6.1 General

Add, at the end of the existing text, the following new paragraph:

Where this standard gives options for testing particular requirements with a choice of test methods, compliance can be shown against any of the test methods, using the specified limits with the restrictions provided in the relevant tables. In any situation where it is necessary to retest the equipment, the test method originally chosen should be used in order to ensure consistency of the results.

6.2.2.3 Frequency range 150 kHz to 1 GHz

Replace, in the existing 4th paragraph of this subclause, the first sentence by the following new sentence:

On an open-area test site (OATS) or in a semi-anechoic chamber (SAC), class A equipment can be measured at a nominal distance of 3 m, 10 m or 30 m (see information in Table 6), and class B equipment at a nominal distance of 3 m or 10 m (see information in Table 7).

In a fully-anechoic room (FAR) class A or class B equipment can be measured at a nominal distance of 3 m (see information in Table 6 and Table 7), provided that the EUT fits into the validated test volume of the given FAR. In conjunction with measurements according to this standard, use of the FAR is restricted to table-top equipment.

Replace the existing table by the following:

Table 6 – Electromagnetic radiation disturbance limits for class A group 1 equipment measured on a test site

Frequency range MHz	OATS or SAC				FAR	
	10 m measuring distance		3 m measuring distance ^b		3 m measuring distance ^{b,c}	
	rated power of		rated power of		rated power of	
	≤ 20 kVA ^d	> 20 kVA ^{a, d}	≤ 20 kVA ^d	> 20 kVA ^{a, d}	≤ 20 kVA ^d	> 20 kVA ^{a, d}
	Quasi-peak dB(μV/m)	Quasi-peak dB(μV/m)	Quasi-peak dB(μV/m)	Quasi-peak dB(μV/m)	Quasi-peak dB(μV/m)	Quasi-peak dB(μV/m)
30 – 230	40	50	50	60	52 decreasing linearly with logarithm of frequency to 45	62 decreasing linearly with logarithm of frequency to 55
230 – 1 000	47	50	57	60	52	55

On an OATS or in a SAC, class A equipment can be measured at a nominal distance of 3 m, 10 m or 30 m. In case of measurements at a separation distance of 30 m, an inverse proportionality factor of 20 dB per decade shall be used to normalize the measured data to the specified distance for determining compliance.

At the transition frequency, the more stringent limit shall apply.

In the frequency range 30 MHz to 230 MHz, the limit for measurements in the FAR decreases linearly with the logarithm of frequency.

^a These limits apply to equipment with a rated power of > 20 kVA and intended to be used at locations where there is a distance greater than 30 m between the equipment and third party sensitive radio communications. The manufacturer shall indicate in the technical documentation that this equipment is intended to be used at locations where the separation distance to third party sensitive radio services is > 30 m. If these conditions are not met, then the limits for ≤ 20 kVA apply.

^b The 3 m separation distance applies only to small size equipment meeting the size criterion defined in 3.17.

^c The table-top equipment shall fit into the validated test volume of the FAR.

^d Selection of the appropriate set of limits shall be based on the rated a.c. power stated by the manufacturer.

Table 7 – Electromagnetic radiation disturbance limits for class B group 1 equipment measured on a test site

Replace the existing table by the following:

Table 7 – Electromagnetic radiation disturbance limits for class B group 1 equipment measured on a test site

	OATS or SAC		FAR
Frequency range MHz	10 m measuring distance	3 m measuring distance ^a	3 m measuring distance ^{a,b}
	Quasi-peak dB(μV/m)	Quasi-peak dB(μV/m)	Quasi-peak dB(μV/m)
30 – 230	30	40	42 Decreasing linearly with logarithm of frequency to 35
230 – 1 000	37	47	42

On an OATS or in a SAC, class B equipment can be measured at a nominal distance of 3 m or 10 m.
At the transition frequency, the more stringent limit shall apply.

^a The 3 m separation distance applies only to *small size equipment* meeting the size criterion defined in 3.17.
^b The table-top equipment shall fit into the validated test volume of the FAR.

6.3.2.3 Frequency range 150 kHz to 1 GHz

Replace the existing 9th and 10th paragraph of this subclause by the following new paragraphs:

On an open-area test site (OATS) or in a semi-anechoic chamber (SAC), class A equipment can be measured at a nominal distance of 3 m, 10 m or 30 m, and class B equipment at a nominal distance of 3 m or 10 m (see Tables 10 and 12).

In the frequency range 30 MHz to 1 GHz, a measuring distance of 3 m is allowed only for equipment which complies with the definition given in 3.17.

Add, before the existing Table 10, the following new paragraphs:

In a fully-anechoic room (FAR) class A or class B equipment can be measured at a nominal distance of 3 m, provided that the EUT fits into the validated test volume of the given FAR. In conjunction with measurements according to this standard, use of the FAR is restricted to table-top equipment.

For group 2 class A or B equipment other than EDM or arc welding, measurements in the FAR in the range 30 MHz to 1 GHz shall be supplemented by measurement of the magnetic component of the disturbance field strength in the range 150 kHz to 30 MHz, at an OATS or in a SAC, see also footnote b in Table 10 and footnote c in Table 12.

Table 10 – Electromagnetic radiation disturbance limits for class A group 2 equipment measured on a test site

Replace the existing table by the following:

Table 10 – Electromagnetic radiation disturbance limits for class A group 2 equipment measured on a test site

Frequency range MHz	OATS or SAC						FAR
	Limits for a measuring distance D in m						
	$D = 30$ m		$D = 10$ m		$D = 3$ m ^a		$D = 3$ m ^{a,b}
	Electric field Quasi-peak dB(µV/m)	Magnetic field Quasi-peak dB(µA/m)	Electric field Quasi-peak dB(µV/m)	Magnetic field Quasi-peak dB(µA/m)	Electric field Quasi-peak dB(µV/m)	Magnetic field Quasi-peak dB(µA/m)	Electric field Quasi-peak dB(µV/m)
0,15 – 0,49	–	33,5	–	57,5	–	82	–
0,49 – 1,705	–	23,5	–	47,5	–	72	–
1,705 – 2,194	–	28,5	–	52,5	–	77	–
2,194 – 3,95	–	23,5	–	43,5	–	68	–
3,95 – 11	–	8,5	–	18,5	–	68 decreasing linearly with logarithm of frequency to 28,5	–
11 – 20	–	8,5	–	18,5	–	28,5	–
20 – 30	–	–1,5	–	8,5	–	18,5	–
30 – 47	58	–	68	–	78	–	80 to 78
47 – 53,91	40	–	50	–	60	–	60
53,91 – 54,56	40	–	50	–	60	–	60
54,56 – 68	40	–	50	–	60	–	60 to 59
68 – 80,872	53	–	63	–	73	–	72
80,872 – 81,848	68	–	78	–	88	–	87
81,848 – 87	53	–	63	–	73	–	72 to 71
87 – 134,786	50	–	60	–	70	–	68 to 67
134,786 – 136,414	60	–	70	–	80	–	77
136,414 – 156	50	–	60	–	70	–	67 to 66
156 – 174	64	–	74	–	84	–	80
174 – 188,7	40	–	50	–	60	–	56
188,7 – 190,979	50	–	60	–	70	–	66
190,979 – 230	40	–	50	–	60	–	56 to 55
230 – 400	50	–	60	–	70	–	65
400 – 470	53	–	63	–	73	–	68
470 – 1 000	50	–	60	–	70	–	65

On an OATS or in a SAC, 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. In certain frequency ranges, the limit for measurements in the FAR decreases linearly with the logarithm of frequency.

^a In the frequency range 30 MHz to 1 GHz, the 3 m separation distance applies only to *small size equipment* meeting the size criterion defined in 3.17.

^b The table-top equipment shall fit into the validated test volume of the FAR. In the range below 30 MHz, such group 2 equipment shall be measured at an OATS or in a SAC (see limits in the respective magnetic field column in this table).

Table 11 – Electromagnetic radiation disturbance limits for class A EDM and arc welding equipment measured on a test site

Replace the existing table by the following:

**Table 11 – Electromagnetic radiation disturbance limits
for class A EDM and arc welding equipment measured on a test site**

	OATS or SAC		FAR
Frequency range MHz	10 m measuring distance	3 m measuring distance ^a	3 m measuring distance ^{a,b}
	Quasi-peak dB(μV/m)	Quasi-peak dB(μV/m)	Quasi-peak dB(μV/m)
30 – 230	80	90	102
	Decreasing linearly with logarithm of frequency to 60	Decreasing linearly with logarithm of frequency to 70	Decreasing linearly with logarithm of frequency to 75
230 – 1 000	60	70	75

On an OATS or in a SAC, class A equipment can be measured at a nominal distance of 3 m, 10 m or 30 m. In case of measurements at a separation distance of 30 m, an inverse proportionality factor of 20 dB per decade shall be used to normalize the measured data to the specified distance for determining compliance.

^a The 3 m separation distance applies only to *small size equipment* meeting the size criterion defined in 3.17.

^b The table-top equipment shall fit into the validated test volume of the FAR.

Table 12 – Electromagnetic radiation disturbance limits for class B group 2 equipment measured on a test site

Replace the existing table by the following:

Table 12 – Electromagnetic radiation disturbance limits for class B group 2 equipment measured on a test site

Frequency range MHz	OATS or SAC						FAR	
	Limits for a measuring distance <i>D</i> in m							
	<i>D</i> = 10 m		<i>D</i> = 3 m ^b		<i>D</i> = 3 m	<i>D</i> = 3 m ^c		
	Electric field				Magnetic field	Electric field		
	Quasi-peak	Average ^a	Quasi-peak	Average ^a	Quasi-peak	Quasi-peak	Average ^a	
	dB(μV/m)		dB(μV/m)		dB(μA/m)	dB(μV/m)		
0,15 – 30	–	–	–	–	39 Decreasing linearly with the logarithm of frequency to 3			
30 – 80,872	30	25	40	35	–	42 to 39	37 to 34	
80,872 – 81,848	50	45	60	55	–	59	54	
81,848 – 134,786	30	25	40	35	–	39 to 37	34 to 32	
134,786 – 136,414	50	45	60	55	–	57	52	
136,414 – 230	30	25	40	35	–	37 to 35	32 to 30	
230 – 1 000	37	32	47	42	–	42	37	
On an OATS or in a SAC, class B equipment can be measured at a nominal distance of 3 m or 10 m.								
At the transition frequency, the more stringent limit shall apply. In certain frequency ranges, the limit for measurements in the FAR decrease linearly with the logarithm of frequency.								
^a The average limits apply to magnetron driven equipment and microwave ovens only. If magnetron driven equipment or microwave ovens exceed the quasi-peak limit at certain frequencies, then the measurement shall be repeated at these frequencies with the average detector and the average limits specified in this table apply.								
^b In the frequency range 30 MHz to 1 GHz, the 3 m separation distance applies only to <i>small size equipment</i> meeting the size criterion defined in 3.17.								
^c The table-top equipment shall fit into the validated test volume of the FAR. In the range below 30 MHz, such group 2 equipment shall be measured at an OATS or in a SAC (see limits in the respective magnetic field column in this table).								

7.3.4.2 Frequency range from 30 MHz to 1 GHz

Replace the existing text of this subclause by the following new text and subclauses:

7.3.4.2.1 General

In the frequency range from 30 MHz to 1 GHz the antenna used shall be as specified in CISPR 16-1-4.

Other antennas may be used provided the results can be shown to be within ±2 dB of the results which would have been obtained using a balanced dipole antenna.

7.3.4.2.2 Open-area test site (OATS) and semi-anechoic chamber (SAC)

For measurements on an OATS or in a SAC, the centre of the antenna shall be varied between 1 m and 4 m height for maximum indication at each test frequency. The nearest point of the antenna to the ground shall be not less than 0,2 m. Measurements shall be performed with the antenna oriented in both, horizontal and subsequently in vertical polarization.

7.3.4.2.3 Fully-anechoic room (FAR)

For measurements in a FAR, the antenna height is fixed at the geometrical middle height of the validated test volume. Measurements shall be performed with the antenna oriented in both, horizontal and subsequently in vertical polarization.

7.3.4.2.4 Other sites

For measurements *in situ*, the centre of the antenna shall be fixed at $(2,0 \pm 0,2)$ m height above the ground.

7.5.1 General

Replace the entire text of this subclause, including Figures 3 and 4, by the following new text and figures:

7.5.1 General

Consistent with typical applications of the equipment under test, the level of the disturbance shall be maximized by varying the configuration of the equipment. An example of a typical setup for measurements of radiated disturbances from a table-top EUT is provided in Figure 3. The measurement arrangement shall be typical of normal installation practice and centred to the turntable's vertical axis.

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NOTE 1 The extent to which this subclause is applicable to the measurement of an installation *in situ* will depend on the flexibility inherent in each particular installation. The provisions of this subclause apply to *in situ* measurements in so far as a particular installation allows for the position of cables to be varied and different units within the installation to be operated independently, the extent to which the position of the installation can be moved within the premises, etc.

For measurement of radiated disturbances on an OATS or in a SAC with a separation distance of 3 m the assessment of the radiation from the cabling of the EUT shall be restricted to those fractions of interconnecting cables (see 7.5.2) and mains cables (see 7.5.3) which are within the test volume not exceeding 1,2 m diameter times 1,5 m height above ground.

For the measurement of radiated disturbances in a FAR, all cables dropping to the floor shall be visible from the position of the antenna reference point for at least 80 cm, see Figure 3b.

Peripheral equipment not fitting into the test volume shall be excluded from the measurements or decoupled from the test environment. If cables to peripheral equipment cannot be extended to run out of test volume, then the peripheral equipment shall be placed within the imaginary circle around the complete configuration of the EUT.

The measuring distance is defined from the reference point of the antenna to the boundaries of an imaginary circle around the complete configuration of the EUT, see Figure 3a.

NOTE 2 Restriction of radiation assessment to the cable fractions inside the test volume can be achieved for example by application of CMADs at the cables at the position where they leave the test volume. CISPR 16-2-3 gives further guidance on the application of CMADs.

Dimensions in metres

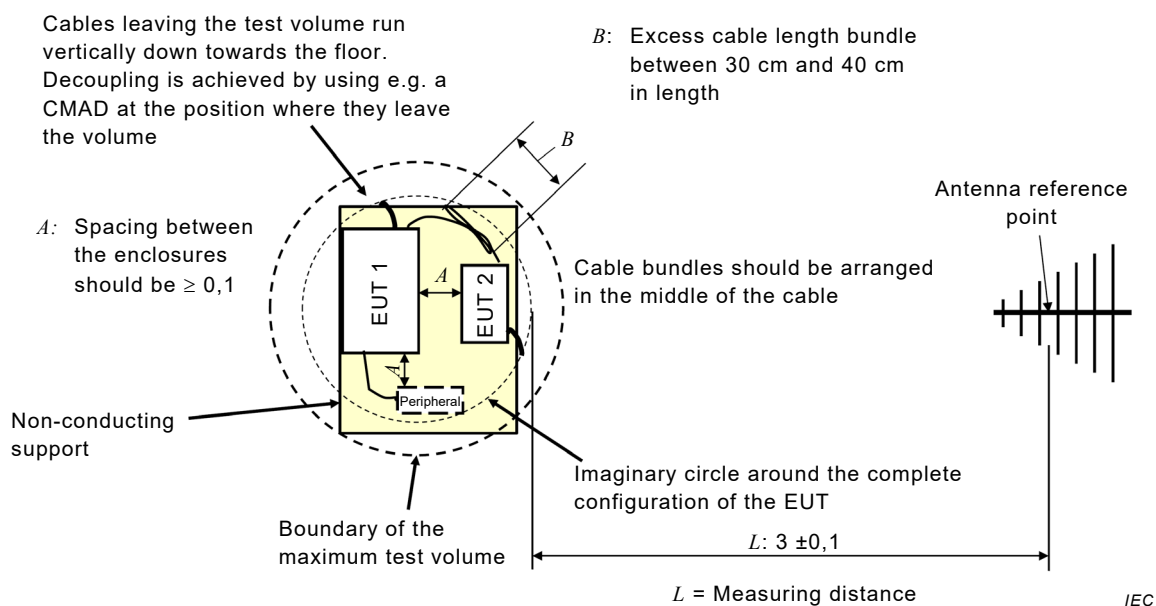


Figure 3a – Top view

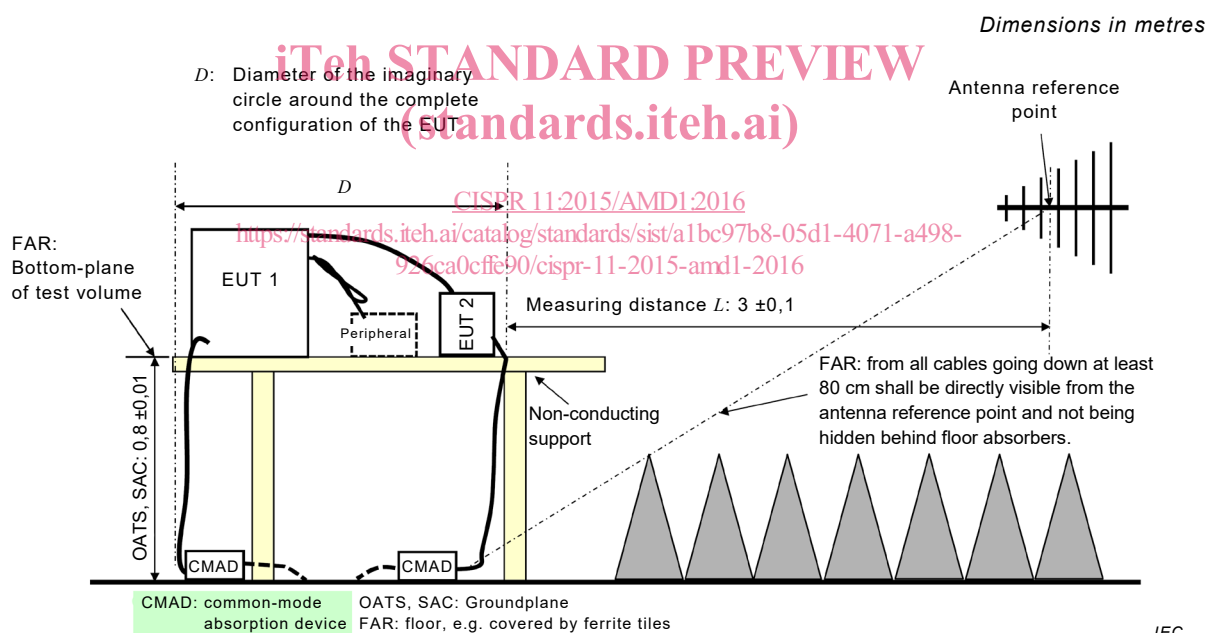


Figure 3b – Side view

Figure 3 – Example for a typical cable arrangement for measurements of radiated disturbances in 3 m separation distance, Table-top EUT

An example of a typical unified test set up for floor standing equipment suitable for measurement of conducted as well as radiated disturbances is shown in Figure 4. Further examples of typical arrangements of the EUT and associated peripherals are given in CISPR 16-2-3 and CISPR 16-2-1.