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INTERNATIONAL STANDARD

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

BASIC EMC PUBLICATION
PUBLICATION FONDAMENTALE EN CEM

AMENDMENT 1
AMENDEMENT 1

Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements

Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Partie 2-3: Méthodes de mesure des perturbations et de l'immunité – Mesurages des perturbations rayonnées

CISPR 16-2-3:2016-09/AMD1:2019-06(en-fr)

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FOREWORD

This amendment has been prepared by CISPR subcommittee A: Radio-interference measurements and statistical methods.

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

FDIS	Report on voting
CISPR/A/1278/FDIS	CISPR/A/1283/RVD

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- withdrawn,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

Amendment of CISPR 16-2-3 regarding EUT volume specifications for radiated disturbance measurements depending on test method and on measurement distance

2 Normative references

Replace the undated reference to CISPR 16-4-2 by the following:

CISPR 16-4-2:2011[1], *Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Measurement instrumentation uncertainty*
CISPR 16-4-2:2011/AMD1:2014
CISPR 16-4-2:2011/AMD2:2018

[1] A consolidated version of this publication exists, comprising CISPR 16-4-2:2011, CISPR 16-4-2:2011/AMD1:2014 and CISPR 16-4-2:2011/AMD2:2018.

Replace the dated reference to CISPR 16-1-4 by the following:

CISPR 16-1-4:2018, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Antennas and test sites for radiated disturbance measurements*

3.1 Terms and definitions

3.1.1
absorber-lined OATS/SAC

Add the following note:

Note 1 to entry: CISPR 16-1-4 uses the analogous term free-space open-area test site (FSOATS).

3.1.9
common-mode absorption device

Replace the existing source by the following:

[SOURCE: CISPR 16-1-4:2018, 3.1.7]

3.1.16
loop-antenna system
LAS

Replace the existing term by the following new term and new abbreviation (the definition does not change):

large loop-antenna system
LLAS

The instruction to replace the existing Note to entry only applies to the French language.

Add, after the existing term and definition 3.1.28, the following new terms and definitions:

3.1.29
compliance test site
COMTS
environment that assures valid, reproducible measurement results of the disturbance field strength from equipment under test for comparison to a compliance limit

3.1.30
far-field region
region of the electromagnetic field of a radiating EUT or antenna where the predominant components of the field represent a propagation of energy and where the radiation pattern is essentially independent of the distance from the radiating EUT or antenna

Note 1 to entry: In the far-field region, all the components of the electromagnetic field change with an inverse proportion to the distance from the radiating EUT or antenna.

[SOURCE: IEC 60050-712:1992 [14], 712-02-02, modified – Replacement of "far field region" by "far-field region" in the term itself, replacement of "antenna" by "radiating EUT or antenna", replacement of "angular field distribution" by "radiation pattern" and deletion of Note 2 to entry.]

3.1.31
near-field effect
deviation of the field propagation from far-field propagation

Note 1 to entry: The near-field effect occurs in the zone close to the EUT where reactive (non-radiating) field-strength components exist. Although not contributing to far-field radiation, they are real measurable field strengths.

Note 2 to entry: A criterion can be set to limit the deviation from far-field propagation, e.g. 1 dB. If E_1 and E_2 are field-strength levels in dB(µV/m) at distances d_1 and d_2 from an EUT, then e.g. the following inequality describes the criterion: $(20\lg(d_2/d_1) - 1\ \text{dB}) \leq (E_1 - E_2) \leq (20\lg(d_2/d_1) + 1\ \text{dB})$, which can be reduced to $-1\ \text{dB} \leq [(E_1 - E_2) - 20\lg(d_2/d_1)] \leq 1\ \text{dB}$, where $(E_1 - E_2) \geq 6\ \text{dB}$.

3.1.32
test volume
validated volume within a test facility in which an EUT may be positioned

Note 1 to entry: Validation procedures in CISPR 16-1-4 are used to determine the test volume.

Note 2 to entry: The test volume as defined in this document is cylindrical in shape. Different test volume shapes have been defined in other documents, e.g. in a cubic form in IEC 61000-4-20 (TEM waveguides).

3.1.33
EUT volume
cylinder defined by EUT boundary diameter and height that fully encompasses all portions of the actual EUT, including cable racks and 1,6 m of cable length (for 30 MHz to 1 GHz), or 0,3 m of cable length (for 1 GHz and above)

Note 1 to entry: The test volume is one of several criteria limiting the EUT volume.

Note 2 to entry: The EUT volume has a diameter D (boundary diameter) and a height h.

3.1.34
protection distance
distance between the source of a radiated disturbance and the victim receiver at the edge-of-service area used for the derivation of a specific CISPR radiated disturbance limit

Note 1 to entry: The edge-of-service area is defined by the minimum value of the wanted field strength of a radio service or application derived from ITU-R specifications.

Note 2 to entry: This definition can vary in other publications, when conducted disturbances are concerned.

Note 3 to entry: Every limit has an associated protection distance; the protection distance can vary with frequency.

3.1.35
small EUT
equipment under test, including its cables, either positioned on a tabletop or standing on the floor, that fits in a cylindrical volume of 1,5 m (2,0 m) in diameter and 1,5 m (2,0 m) in height measured from the floor with a measurement distance of 3 m (5 m) at an OATS/SAC

3.2 Abbreviated terms

*Delete from the existing list the abbreviation "*RGP*".*

Add to the existing list the following new abbreviations:

AF	Antenna factor
FSOATS	free-space OATS
GP	ground plane
HPBW	Half-power beamwidth
RE	radiated emission
RI	radiated immunity

6.2.2 Compliance (conformity assessment) testing

*Replace in the 1st sentence "*test site*" by "*compliance test site (COMTS)*"*

6.4.1.1 General

Replace in the existing twelfth paragraph the abbreviation **"**RGP**"** *by* **"**GP**".**

6.4.1.2 Tabletop arrangement

Replace in the existing third paragraph the abbreviation "RGP" *by* "GP".

6.4.1.3 Floor-standing arrangement

Replace in the existing first three paragraphs the abbreviation "RGP" *by* "GP".

6.4.1.4 Combinations of tabletop and floor-standing equipment arrangement

Replace in this subclause the abbreviation "RGP" *by* "GP".

7.1 Introductory remarks

Replace the existing title by the following new title:

7.1 General

Replace the existing content of this subclause (including Table 3), by the following new 7.1.1, and 7.1.2:

7.1.1 General remarks and overview of test methods

Clause 7 sets forth the general procedures for the measurement of the field strength of radio disturbance produced by devices and systems. Most experience with radiated disturbance measurements exists for OATS/SAC with 10 m distance in the frequency range 30 MHz to 1 000 MHz. In this frequency range this is therefore called the established test method to which other test methods are compared regarding the level of radio protection (see also CISPR TR 16-4-5). The effects of leads and cables associated with the EUT in terms of length, layout, and termination shall be taken into account (see Garbe and Battermann [21], Garbe [22]). Table 8 provides a summary list of CISPR radiated disturbance test sites and measurement methods, and the related cross-references to subclauses within this document or to other documents. Tables 9, 10, 11 and 12 provide information on maximum EUT volumes associated with the various measurement methods. Background on the criteria for EUT volumes is given in Annex F.

For some products, it can be required to measure the electric field strength, the magnetic field strength, or both components of the radiated disturbance. Sometimes a measurement of a quantity related to radiated power is more appropriate. Normally measurements should be made of both the horizontal and vertical components of the disturbance relative to the installation floor or ground plane. The results of measurements of either the electric field-strength component or magnetic field-strength component may be expressed in peak, quasi-peak, average, or rms-average values.

The magnetic field-strength component of a disturbance is normally measured at frequencies up to 30 MHz. In magnetic field-strength measurements, only the horizontal component of the field at the position of the receive antenna is measured when using the distant single antenna procedure. If an LLAS is used, the three orthogonal magnetic dipole moments of the EUT are measured.

NOTE 1 In the magnetic field-strength measurement method using a distant single antenna (e.g. 60 cm loop antenna), the horizontal components of the field at the position of the antenna are determined by the horizontal and vertical dipole moments of the EUT.

NOTE 2 A future amendment to this document (CISPR 16-2-3/AMD2[2]) is under consideration for modifying the magnetic field-strength measurement method such that measurements of all three orthogonal components (using three orthogonal positions of a single receive antenna) will be required for measurement distances of 3 m and 5 m,

[2] Under preparation. Stage at the time of publication: CISPR/CDM 16-2-3/AMD2:2018.

whereas the present measurement method (where only the horizontal components of the field strength are measured) will continue to be used for larger measurement distances.

Table 8 – Applicable frequency ranges and document references for CISPR radiated disturbance test sites and measurement methods

Site / method	9 kHz to 30 MHz	30 MHz to 1 000 MHz	1 GHz to 18 GHz
Outdoor site	tbd	7.3.8	n/a
LLAS	7.2	n/a	n/a
OATS or SAC	tbd	7.3	n/a
FAR	n/a	7.4	7.6
Common RE/RI	n/a	7.5 (RI starts 80 MHz)	n/a
Absorber-lined OATS/SAC	n/a	n/a	7.6
In situ	7.7.2	7.7.3, 7.7.4.2	7.7.3, 7.7.4.3
Substitution method	n/a	7.8	7.8
Reverberation chamber	n/a	7.9 (Starts 80 MHz)	7.9
TEM waveguide	IEC 61000-4-20	7.10	7.10
n/a = not applicable; tbd = to be determined or is under consideration			

7.1.2 Overview of maximum EUT volumes depending on measurement method, frequency range, and measurement distance

7.1.2.1 Frequency range 9 kHz to 30 MHz

a) Maximum EUT dimensions for large-loop antenna system (LLAS) measurements are listed in Table 9.

It is recommended to use a 3 m LLAS for 1,6 m < EUT dimensions ≤ 2,4 m, and to use a 4 m LLAS for 2,4 m < EUT dimensions ≤ 3,2 m.

Table 9 – Maximum EUT dimensions for different LLAS diameters, 9 kHz to 30 MHz

LLAS diameter	2 m	3 m	4 m
EUT dimension[a]	1,6 m	2,4 m	3,2 m

[a] The specified EUT dimension applies for the diameter of a sphere that fully encompasses the EUT; e.g. for an EUT in the form of a cube, the maximum cube side length for a 2 m LLAS will be (1,6 m)/√3 = 0,92 m; for a 3 m LLAS: (2,4 m)/√3 = 1,39 m; and for a 4 m LLAS: (3,2 m)/√3 = 1,85 m. These maximum EUT dimensions are the same as specified in CISPR 16-1-4.

b) Recommended maximum EUT dimensions for an OATS/SAC or an outdoor site are listed in Table 10.

NOTE At present this document does not include a measurement method for magnetic field strength using a distant single antenna (e.g. 60 cm loop antenna), so these recommended EUT dimensions apply for product standards containing limits for magnetic field strength, e.g. CISPR 11.

Table 10 – Recommended maximum EUT-volume diameter D (in m) and height h (in m), OATS/SAC and outdoor site, 9 kHz to 30 MHz

Measurement distance	3 m	5 m	10 m	30 m
D by h at OATS/SAC[a]	1,5 by 1,5 [b]	2,0 by 2,0 [b]	5,0 by 4,0	15 by 4,0[d]
D by h at outdoor site[c]	1,5 by 1,5 [b]	2,0 by 2,0 [b]	5,0 by 4,0	15 by 4,0[d]

[a] Test site specifications and validation methods for OATS/SAC are under development.

[b] EUT volumes less than or equal to those for d = 3 m (5 m) are small EUTs, as defined in 3.1.35. Disturbance limits for larger EUTs can be defined for these distances taking the EUT volume diameter into account (see e.g. [18]). Work is in progress to define conditions for medium-sized EUT volumes.

[c] An outdoor site is a non-validated test site without a conducting ground plane.

[d] The EUT diameter for 30 m is proportional to the diameters for 3 m and 10 m. The distance of 30 m is regarded as a protection distance, where any EUT volume that is encompassed by the receive antenna beamwidth is acceptable. This table includes the 30 m distance because it is specified in CISPR 11, regardless that an associated validation method is not available or in preparation for the frequency range 9 kHz to 30 MHz. EUT height is limited to 4 m, because heights greater than 4 m are not practically needed.

c) Maximum EUT dimensions in a TEM waveguide are as follows.

The usable test volume is 0,6W by 0,6L by 0,33H, where W = the (average) septum width, H = the (average) septum height, and $L = z_{max} - z_{min}$, i.e. the region where the TEM mode requirements are fulfilled (see IEC 61000-4-20). The EUT volume is limited by the test volume.

7.1.2.2 Frequency range 30 MHz to 1 000 MHz

a) Maximum EUT dimensions for an OATS/SAC and a FAR are listed in Table 11.

Table 11 – Maximum EUT-volume diameter D (in m) and height h (in m), OATS/SAC and FAR, 30 MHz to 1 000 MHz

Measurement distance	3 m	5 m	10 m	30 m
D by h at OATS/SAC	1,5 by 1,5	2,0 by 2,0	5,0 by 4,0[a]	15 by 4,0[a]
D by h in FAR	1,5 by 1,5	2,0 by 2,0[b]	3,0 by 3,0[b]	-

NOTE EUT volumes less than or equal to those for d = 3 m (5 m) are small EUTs as defined in 3.1.35. Work is in progress to define conditions for medium-sized EUT volumes.

[a] For an OATS/SAC, the EUT volume at 10 m and 30 m distances is a recommendation only because these distances may be regarded as protection distances, where any EUT volume that is encompassed by the receive antenna beamwidth is accepted, provided that the test volume fulfils the validation criteria.

[b] Table 14 of CISPR 16-1-4 specifies maximum diameters and heights of the EUT volume for radiated disturbance measurements in a FAR as 1,5 m, 2,5 m, and 5 m for measurement distances d = 3 m, 5 m, and 10 m, respectively. The reason why the maximum EUT dimensions are less than 2,5 m and 5 m at d = 5 m and 10 m, respectively, is mainly due to the near-field effect and the fact that a FAR is an alternative test site.

b) Maximum EUT dimensions in a TEM waveguide are as follows.

The usable test volume is 0,6w by 0,6L by 0,33h. For definitions of w, L, and h, see 7.1.2.1 c).

c) Maximum EUT dimensions in a reverberation chamber (RC) are as follows.

At the lowest usable frequency of an RC, the EUT shall be at least $\lambda/4$ away from the chamber walls. Additional space is required for the tuner/stirrer and for the transmit antenna and receive antenna; see IEC 61000-4-21 for details.

7.1.2.3 Frequency range 1 GHz to 18 GHz

a) Recommended maximum EUT dimensions for an absorber-lined OATS/SAC and FAR are listed in Table 12.

Table 12 – Recommended maximum EUT-volume diameter D (in m) and height h (in m) – for reduced near-field uncertainty; absorber-lined OATS/SAC and FAR, 1 GHz to 18 GHz

Measurement distance	3 m	5 m	10 m
D by h in 1 GHz to 6 GHz[a,b]	1,5 by 1,5	2,0 by 2,0	5,0 by 3,0
D by h in 6 GHz to 18 GHz[a]	1,5 by 1,5	2,0 by 2,0	5,0 by 3,0

[a] The minimum antenna beamwidths required for the EUT volumes in this table are 28° (for d = 3 m), 22,6° (for d = 5 m) and 22,6° (for d = 10 m), as determined using Equation (13); see also Table 5.

[b] At present CISPR 32 does not specify disturbance limits for frequencies above 6 GHz. If CISPR disturbance limits for frequencies above 6 GHz are adopted, the EUT dimension recommendations might have to be amended.

b) Maximum EUT dimensions in a TEM waveguide are as follows.

The usable test volume is 0,6w by 0,6L by 0,33h. For definitions of w, L, and h, see 7.1.2.1 c).

c) Maximum EUT dimensions in a reverberation chamber (RC) – see 7.1.2.2 c).

7.2.1 General

Replace, in the first sentence, the term "loop antenna system (LAS)" *by the abbreviation* "LLAS".

Replace, in the entire text, the abbreviation "LAS" *by the abbreviation* "LLAS".

7.2.2 General measurement method

Replace, in the entire text, the abbreviation "LAS" *by the abbreviation* "LLAS".

Add "strength" *to read* "magnetic field strength" *in the first and second paragraphs.*

7.2.3 Test environment

Replace, in the entire text, the abbreviation "LAS" *by the abbreviation* "LLAS".

7.2.4 Configuration of the equipment under test

Replace, in the entire text, the abbreviation "LAS" *by the abbreviation* "LLAS".

7.2.5 Measurement uncertainty for LAS

Replace, in the title, the abbreviaion "LAS" by the abbreviation "LLAS".

7.3.1 Measurand

Replace, in the ninth paragraph of this subclause "(see Equation (35) of CISPR 16-1-4:2010/AMD1:2012)*" by "*(see Equation (13) of CISPR 16-1-4:2018)".

7.3.2 Test site requirements

Replace, in the first sentence, "test site" *by* "compliance test site (COMTS)".

7.3.4 Measurement distance

Replace in list item a) "$d \geq \lambda/6$" *by* "$d \geq \lambda/(2\pi)$"*, and replace* "a tuned dipole antenna" *by* "an electrically small antenna, where $D << \lambda$"

Replace in list item b) "a tuned dipole antenna" *by* "an electrically small antenna, where $D << \lambda$"

Replace the existing item c) by the following new item:

c) $d \geq D^2/(2\lambda)$, where D is the largest dimension of either the EUT or the antenna determining the minimum aperture for the illumination of the EUT, which applies to cases where $D >> \lambda$ with deviations up to 1 dB; see Annex F for details about near-field effects.

7.6.1 Quantity to measure

Replace the existing title of this subclause by the following new title:

7.6.1 Measurand

Replace the existing first paragraph by the following text:

The quantity to be measured (measurand) is the maximum electric field strength emitted by the EUT as a function of horizontal and vertical polarization over all angles of the azimuth plane with the receive antenna height at the test volume centre at a preferred horizontal distance of 3 m. This quantity shall be determined with the following provisions:

a) the frequency range of interest is 1 GHz to 18 GHz;

b) the quantity shall be expressed in terms of field strength units that correspond with the units used to express the limit levels of this quantity;

c) the measurements shall be performed at an absorber-lined OATS/SAC or FAR test site, and with a positioning table (if applicable), that complies with the validation requirements in CISPR 16-1-4;

d) a measuring receiver compliant with CISPR 16-1-1 shall be used;

e) the use of alternative measurement distances shall comply with the criteria in 7.6.2 and Table 12 (antenna beamwidth);

f) the measurement distance is the horizontal projection of the distance between the boundary of the EUT and the antenna reference point to the floor;

g) the EUT is configured and operated in accordance with the CISPR specifications;

h) free-space antenna factors shall be used.

7.6.2 Measurement distance

Replace the existing first dashed item by the following new item:

– shorter distances in the case of high ambient noise, or to reduce the effect of unwanted reflections; the measurement distance should be greater than or equal to $D^2/(2\lambda)$ so that deviations are not greater than 1 dB, where D is the largest dimension of the radiating source or measurement antenna effective area (at the frequency of interest);

Add to the end of the penultimate paragraph, the following new paragraph:

In many cases the largest dimension of the measurement antenna (e.g. DRH or LPDA antenna) does not determine the radiation characteristics. For more realistic values, rather than the largest dimension of the antenna, the measurement antenna effective area, A_e, at the frequency of interest can be used to determine D^2 ($\approx A_e = \lambda^2 G/4\pi$, where G is the isotropic antenna gain) for calculation of the minimum measurement distance.

7.6.5 Measurement instrumentation

Replace in the second paragraph, "the peak measuring spectrum analyser or receiver" *by* "a measuring receiver with peak detector".

Replace the existing third paragraph by the following paragraph:

Measurements to comply with a linear average limit shall be performed using a measuring receiver with linear average detector and a measurement bandwidth of 1 MHz (impulse bandwidth) as defined in CISPR 16-1-1.

After the revised third paragraph, insert the following new paragraph:

Measurements to comply with a logarithmic average limit shall be performed using a measuring receiver with logarithmic average detector and a measurement bandwidth of 1 MHz (impulse bandwidth) as defined in CISPR 16-1-1.

Delete the existing last paragraph.

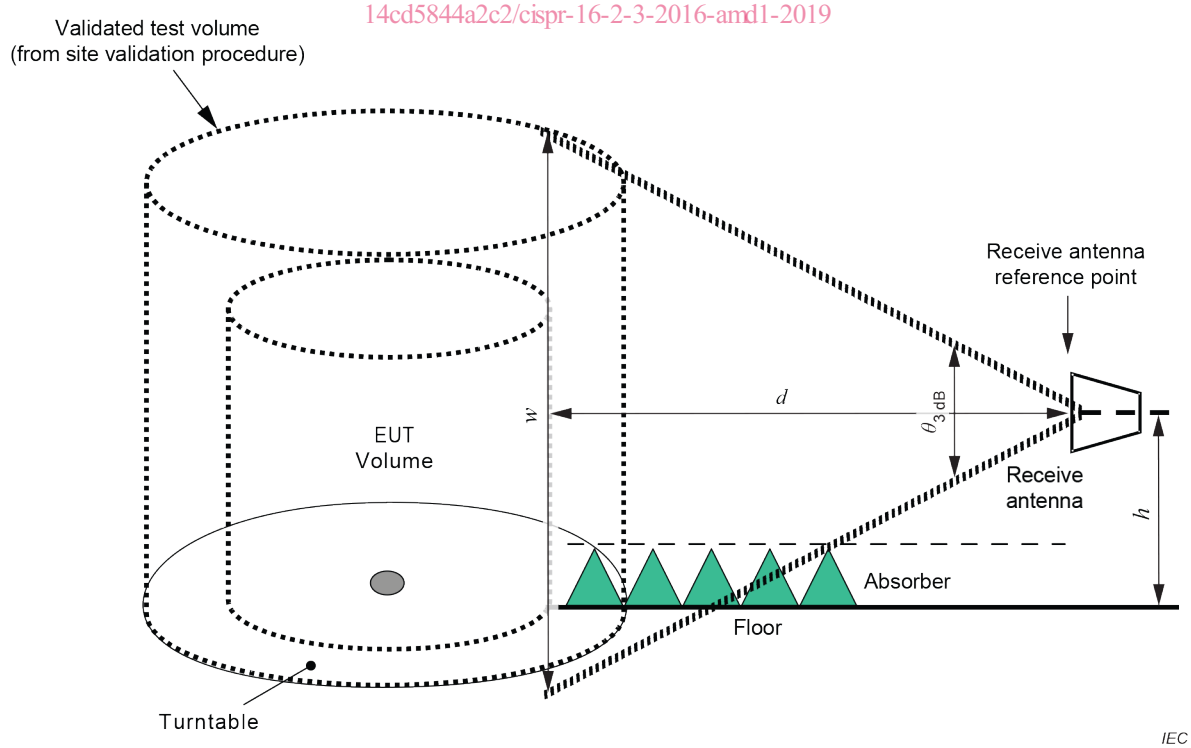
7.6.6.1 General description of the radiated field measurement method above 1 GHz

Replace the existing title of 7.6.6.1 by the following new title:

7.6.6.1 General description of the radiated field-strength measurement method above 1 GHz

Figure 20 – Measurement method above 1 GHz, receive antenna in vertical polarization

Replace the existing diagram of Figure 20 by the new diagram as attached below:



Replace in the second bulleted item the term "EUT (volume)" *by* "EUT volume".

Replace, in the second bulleted item, the first sentence by "cylinder defined by EUT boundary diameter and height that fully encompasses all portions of the actual EUT, including cable racks and 0,3 m of cable length (as defined in 3.1.33 of this document)."

Replace in the fourth and fifth bulleted items the term "EUT" *by* "EUT volume".

Replace in the fifth bulleted item the reference "Equation (15)" *by* "Equation (13)", *and delete the last line* "w shall be of the minimum dimension as specified in Table 4."

Replace the paragraph immediately after the last bulleted item (beginning with "Table 4") by the following new paragraph:

The selection of measurement distance d and antenna type shall be made such that w is greater than or equal to the EUT volume height at any field strength measurement frequency. Table 5 gives example values of w calculated using Equation (13) for three antenna types, at measurement distances of 1 m, 3 m, and 10 m.

Delete the second paragraph after the last bulleted item (beginning with "The maximum emission…").

Delete Table 4 and Figure 21.

Delete the paragraph below the existing Figure 21 (begining with "For any EUT").

Delete the second paragraph below the existing Figure 21 (begining with "When a height scan") *and add the following note:*

NOTE Due to the EUT radiation pattern in the vertical direction, the measurement result can vary with antenna height. Therefore antenna height variation, while keeping the EUT volume within the antenna beamwidth, can improve reproducibility.

Replace the existing last paragraph of this subclause by the following new paragraph:

Regarding the horizontal extent of w, the width of the EUT volume shall be fully within w.

7.6.6.2.3 Preliminary measurement procedure

From list item f) delete "for all the height levels required by 7.6.6.1 (and Figure 21) and"

From list item g) delete "and height steps", *and delete* "/height" *(from* "rotation/height"*)*

7.6.6.2.4 Final measurement procedure

Delete from list item a) "(see Figure 21a))"

Replace the existing list item b) by the following new paragraph:

b) for any EUT volume with maximum vertical dimension larger than w, the measurement distance d shall be increased to 5 m or to 10 m such that the EUT is encompassed by the receive antenna beamwidth. The antenna beamwidth shall be known. The test site shall be validated for the measurement distance applied for final measurements. Free-space far-field propagation shall be assumed, and the measured field strength shall be adjusted to the preferred distance of 3 m using Equation (22).

$$E_{3\,\mathrm{m}} = E_{\mathrm{d}} + 20\lg(d/3) \qquad (22)$$

where

$E_{3\,\mathrm{m}}$ is the field strength in dB(μV/m) at 3 m distance

E_d is the field strength in dB(μV/m) at distance d

and the factor 3 in the denominator of the lg argument is the 3 m reference distance.

Replace the existing list item 2) by the following new item:

2) the measurement distance shall be increased if the EUT volume (diameter and height) is larger than w at the preferred distance.

7.7.2.1 Measurement method

Replace, in the second paragraph of this subclause, “CISPR 16-1-4:2010” *by* “CISPR 16-1-4:2018”.

7.7.4.2.1 Measurement distance

Change the second bullet of Equation (15) to read:

$d \geq D^2/2\lambda$

A.1 General

Replace, in the second paragraph of this Clause, “5.2.4 of CISPR 16-1-4:2010" *by* "6.2.4 of CISPR 16-1-4:2018”.

A.4.2 Pre-testing the EUT in a shielded room

Replace, in the first paragraph of this subclause, the words “Annex E of CISPR 16-1-4:2010, (Annex A of [4]))" *by* "6.5 of CISPR 16-1-4:2018”.

Add after the existing Annex E the following new Annex F:

Annex F
(informative)

Background for EUT-volume specifications depending on measurement distance and frequency range

F.1 General

The following four criteria limit the EUT volume depending on measurement distance and frequency range:

– limitation of field-strength underestimation effects when making radiated disturbance measurements at a short distance for an EUT with a given EUT volume diameter, compared to measurements of the same EUT at the protection distance;

– limitation due to near-field effects;

– limitation due to the receive antenna beamwidth;

– limitation due to the results of test-site validation.

The criterion yielding the smallest volume for each frequency range shall be applied.

Regarding the criteria for the specification of EUT volumes in 7.1, except for 7.1.2.1 a) and c), background is provided in Clauses F.2, F.3, F.4 and F.5.

NOTE In case of the LLAS, the TEM waveguide and the reverberation chamber, the restrictions are not based on the same criteria as for the other test methods.

F.2 Criterion 1 – Limitation of field-strength underestimations due to a large ratio of EUT volume diameter-to-measurement distance for short-distance measurements

F.2.1 General

Disturbance measurements performed at short distances are intended to support demonstrating compliance to a disturbance limit at the protection distance. The protection distance is the distance for which the radiated disturbance limit was originally developed. Here it is assumed that the protection distance for the frequency range 9 kHz to 30 MHz is 30 m, and for the frequency range 30 MHz to 1 000 MHz is 10 m. Test configurations with distances of 3 m (for 9 kHz to 1 000 MHz) and 10 m (for 9 kHz to 30 MHz) are alternative test configurations that were developed for ease of testing.

Results with an alternative test method need to be comparable with the results of established test methods. A good example of field strength conversion for the frequency range 9 kHz to 30 MHz is given in [19], [20]. CISPR TR 16-4-5 describes conditions for the use of alternative test methods; however, it does not contain any considerations for large EUTs nor near-field effects, and the examples in its Annex B are limited to small EUTs.

F.2.2 9 kHz to 30 MHz

Below about 1,6 MHz at the protection distance of 30 m, the measurement antenna is in the reactive near field of the EUT, and the magnetic field strength decreases proportionally to $1/d^3$. For the distance of 10 m, the measurement antenna is in the reactive near field at all frequencies below about 4,8 MHz, while for the 3 m distance the measurement antenna is in the reactive near field of the EUT for all frequencies below about 16 MHz.