

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

**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 – Mesures des perturbations rayonnées**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION
INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

**SPECIFICATION FOR RADIO DISTURBANCE AND IMMUNITY
MEASURING APPARATUS AND METHODS –**

**Part 2-3: Methods of measurement of disturbances and immunity –
Radiated disturbance measurements**

FOREWORD

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International Standard CISPR 16-2-3 has been prepared by CISPR subcommittee A: Radio-interference measurements and statistical methods.

This third edition of CISPR 16-2-3 cancels and replaces the second edition published in 2006. It is a technical revision.

This edition includes the following significant technical changes with respect to the previous edition: addition of the measurand for radiated emissions measurements in an OATS and a SAC in the range of 30 MHz to 1 000 MHz, and addition of a new normative annex on the determination of suitability of spectrum analysers for compliance tests. Also, numerous maintenance items are addressed to make the standard current with respect to other parts of the CISPR 16 series.

It has the status of a basic EMC publication in accordance with IEC Guide 107, *Electromagnetic compatibility – Guide to the drafting of electromagnetic compatibility publications*.

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

FDIS	Report on voting
CISPR/A/886/FDIS	CISPR/A/892/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the CISPR 16 series, published under the general title *Specification for radio disturbance and immunity measuring apparatus and methods*, can be found on the IEC website.

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

- reconfirmed,
- withdrawn,
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SPECIFICATION FOR RADIO DISTURBANCE AND IMMUNITY MEASURING APPARATUS AND METHODS –

Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements

1 Scope

This part of CISPR 16 specifies the methods of measurement of radiated disturbance phenomena in the frequency range of 9 kHz to 18 GHz. The aspects of measurement uncertainty are specified in CISPR 16-4-1 and CISPR 16-4-2.

NOTE In accordance with IEC Guide 107, CISPR 16-2-3 is a basic EMC publication for use by product committees of the IEC. As stated in Guide 107, product committees are responsible for determining the applicability of the EMC standard. CISPR and its sub-committees are prepared to co-operate with product committees in the evaluation of the value of particular EMC tests for specific products.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

CISPR 14-1:2005, *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission*

CISPR 16-1-1, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus*

CISPR 16-1-2:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – Ancillary equipment – Conducted disturbances*
Amendment 1 (2004)
Amendment 2 (2006)

CISPR 16-1-4:2010, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Ancillary equipment – Radiated disturbances*

CISPR 16-2-1:2008, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-1: Methods of measurement of disturbances and immunity – Conducted disturbance measurements*

CISPR 16-4-1, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-1: Uncertainties, statistics and limit modelling – Uncertainties in standardized EMC tests*

CISPR 16-4-2, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements*

CISPR 16-4-5, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-5: Uncertainties, statistics and limit modelling – Conditions for the use of alternative test methods*

IEC 60050-161:1990, *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*

Amendment 1 (1997)

Amendment 2 (1998)

IEC 61000-4-3:2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*
Amendment 1 (2007)

IEC 61000-4-20, *Electromagnetic compatibility (EMC) – Part 4-20: Testing and measurement techniques – Emission and immunity testing in transverse electromagnetic (TEM) waveguides*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-161, as well as the following apply.

3.1

absorber-lined OATS/SAC

OATS or SAC with ground plane partially covered by RF-energy absorbing material

3.2

ancillary equipment

transducers (e.g. current and voltage probes and artificial networks) connected to a measuring receiver or (test) signal generator and used in the disturbance signal transfer between the EUT and the measuring or test equipment

3.3

antenna beam

main lobe of the antenna pattern (gain pattern) of the receive antenna (usually the direction with maximum sensitivity or lowest antenna factor) that is directed towards the EUT

3.4

antenna beamwidth

angle between the half-power (3 dB) points of the main lobe of the antenna beam, when referenced to the maximum power of the main lobe. It may be expressed for the *H* plane or for the *E* plane of the antenna

NOTE Antenna beamwidth is expressed in degrees.

3.5

associated equipment

AE

apparatus, that is not part of the system under test, but needed to help exercise the EUT

3.6

auxiliary equipment

AuxEq

peripheral equipment that is part of the system under test

3.7

basic standard

standard that has a wide-ranging coverage or contains general provisions for one particular field

NOTE A basic standard may function as a standard for direct application or as a basis for other standards.

[ISO/IEC Guide 2, definition 5.1]

3.8

coaxial cable

cable containing one or more coaxial lines, typically used for a matched connection of ancillary equipment to the measuring equipment or (test-) signal generator providing a specified characteristic impedance and a specified maximum allowable cable transfer impedance

3.9

common-mode absorption device

CMAD

device that may be applied on cables leaving the test volume in radiated emission measurements to reduce the compliance uncertainty

[CISPR 16-1-4, 3.1.4]

3.10

conformity assessment

demonstration that specified requirements relating to a product, process, system, person or body are fulfilled

NOTE The subject field of conformity assessment includes activities defined elsewhere in ISO/IEC 17000:2004, such as testing, inspection and certification, as well as the accreditation of conformity assessment bodies.

[ISO/IEC 17000:2004, 2.1, modified]

3.11

continuous disturbance

RF disturbance with duration of more than 200 ms at the IF-output of a measuring receiver that causes a deflection on the meter of a measuring receiver in quasi-peak detection mode, and that does not decrease immediately

[IEC 60050-161:1990, 161-02-11, modified]

3.12

(electromagnetic) emission

phenomenon by that electromagnetic energy emanates from a source

[IEC 60050-161:1990, 161-01-08]

3.13

emission limit (from a disturbing source)

specified maximum emission level of a source of electromagnetic disturbance

[IEC 60050-161:1990, 161-03-12]

3.14

equipment-under-test

EUT

equipment (devices, appliances and systems) subjected to EMC (emission) compliance (conformity assessment) tests

3.15

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

3.16**loop-antenna system****LAS**

antenna system consisting of three orthogonally-oriented loop antennas that are used to measure the three orthogonal magnetic dipole moments of an EUT located in the centre of the three loops

3.17**measurement, scan and sweep times****3.17.1****measurement time**

T_m
effective, coherent time for a measurement result at a single frequency (in some areas also called dwell time)

- for the peak detector, the effective time to detect the maximum of the signal envelope
- for the quasi-peak detector, the effective time to measure the maximum of the weighted envelope
- for the average detector, the effective time to average the signal envelope
- for the rms detector, the effective time to determine the rms of the signal envelope

3.17.2**scan**

continuous or stepped frequency variation over a given frequency span

3.17.3**span**

Δf
difference between stop and start frequencies of a sweep or scan

3.17.4**sweep**

continuous frequency variation over a given frequency span

3.17.5**sweep or scan rate**

frequency span divided by the sweep or scan time

3.17.6**sweep or scan time**

T_s
time between start and stop frequencies of a sweep or scan

3.17.7**observation time**

T_o
sum of measurement times T_m on a certain frequency in case of multiple sweeps; if n is the number of sweeps or scans, then $T_o = n \times T_m$

3.17.8**total observation time**

T_{tot}
effective time for an overview of the spectrum (either single or multiple sweeps); if c is the number of channels within a scan or sweep, then $T_{tot} = c \times n \times T_m$

3.18

measuring receiver

instrument such as a tunable voltmeter, an EMI receiver, a spectrum analyzer or an FFT-based measuring instrument, with or without preselection, that meets the relevant parts of CISPR 16-1-1

3.19

number of sweeps per time unit (e.g. per second)

n_s

reciprocal of the sum of sweep time and retrace time, i.e. $1 / (\text{sweep time} + \text{retrace time})$

3.20

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. An OATS typically is located outdoors in an open area, and has an electrically-conducting ground plane.

3.21

product standard

standard that specifies requirements to be fulfilled by a product or group of products, to establish its fitness for purpose

NOTE 1 A product standard may include, in addition to the fitness-for-purpose requirements, directly or by reference, aspects such as terminology, sampling, testing, packaging and labelling and, sometimes, processing requirements.

NOTE 2 A product standard can either be complete or not, according to whether it specifies all or only a part of the necessary requirements. In this respect, one may differentiate between standards such as dimensional, material and technical delivery standards.

[ISO/IEC Guide 2, definition 5.4]

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

3.23

test configuration

combination that gives the specified measurement arrangement of the EUT in which an emission level is measured

3.24

weighting (of e.g. impulsive disturbance)

pulse-repetition-frequency (PRF) dependent conversion (mostly reduction) of a peak-detected impulse voltage level to an indication that corresponds to the interference effect on radio reception

NOTE 1 For the analogue receiver, the psychophysical annoyance of the interference is a subjective quantity (audible or visual) usually not a certain number of misunderstandings of a spoken text

NOTE 2 For the digital receiver, the interference effect is an objective quantity that may be defined by the critical bit error ratio (BER) or bit error probability (BEP) for that perfect error correction can still occur or by another, objective and reproducible parameter