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INTERNATIONAL STANDARD

NORME INTERNATIONALE

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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 2-1: Methods of measurement of disturbances and immunity – Conducted disturbance measurements

Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Partie 2-1: Méthodes de mesure des perturbations et de l'immunité – Mesures des perturbations conduites

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International Standard CISPR 16-2-1 has been prepared by CISPR subcommittee A: Radio-interference measurements and statistical methods.

This third edition cancels and replaces the second edition published in 2008, Amendment 1:2010 and Amendment 2:2013. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition: Methods of measurement using a new type of ancillary equipment – the CDNE – are added.

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

FDIS	Report on voting
CISPR/A/1053/FDIS	CISPR/A/1062/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 CISPR 16 series 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- withdrawn,
- replaced by a revised edition, or
- amended.

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SPECIFICATION FOR RADIO DISTURBANCE AND IMMUNITY MEASURING APPARATUS AND METHODS –

Part 2-1: Methods of measurement of disturbances and immunity – Conducted disturbance measurements

1 Scope

This part of CISPR 16 is designated a basic standard, which specifies the methods of measurement of disturbance phenomena in general in the frequency range 9 kHz to 18 GHz and especially of conducted disturbance phenomena in the frequency range 9 kHz to 30 MHz. With a CDNE, the frequency range is 9 kHz to 300 Hz.

NOTE In accordance with IEC Guide 107, CISPR 16 is a basic EMC standard 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 documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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, *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission*

CISPR 16-1-1:2010, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus*

CISPR 16-1-2:2014, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – Coupling devices for conducted disturbance measurements*

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*

IEC 60050 (all parts), *International Electrotechnical Vocabulary* (available at <http://www.electropedia.org>)

3 Terms, definitions and abbreviations

3.1 Terms and definitions

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

3.1.1
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

3.1.2
artificial network
AN
agreed reference load (simulation) impedance presented to the EUT by actual networks (e.g. extended power or communication lines) across which the RF disturbance voltage is measured

Note 1 to entry: This note applies to the French language only.

3.1.3
artificial mains network
AMN
network that provides a defined impedance to the EUT at radio frequencies, couples the disturbance voltage to the measuring receiver, and decouples the test circuit from the supply mains

Note 1 to entry: There are two basic types of this network, the V-network (V-AMN) which couple the unsymmetric voltages, and the delta-network (Δ-AMN), which couple the symmetric and the unsymmetric voltages separately.

Note 2 to entry: The terms line impedance stabilization network (LISN) and V-AMN are used interchangeably .

Note 3 to entry: This note applies to the French language only.

3.1.4
associated equipment
AE
apparatus, which is not part of the system under test, but needed to help exercise the EUT

Note 1 to entry: This note applies to the French language only.

3.1.5
asymmetric artificial network
AAN
network used to measure (or inject) asymmetric (common mode) voltages on unshielded symmetric signal (e.g. telecommunication) lines while rejecting the symmetric (differential mode) signal

Note 1 to entry: An AAN is an AN (artifical network) that provides a simulation of the asymmetric load realized by the telecommunication network.

Note 2 to entry: The term “Y-network” is a synonym for AAN.

Note 3 to entry: The AAN can also be used for immunity testing, where the receiver measurement port becomes the disturbance injection port.

Note 4 to entry: This note applies to the French language only.

3.1.6
asymmetric voltage
radio-frequency disturbance voltage appearing between the electrical mid-point of the mains terminals and ground, sometimes called the common mode voltage

Note 1 to entry: If V_a is the vector voltage between one of the mains terminals and ground, and V_b is the vector voltage between the other mains terminal and ground, the asymmetric voltage is half the vector sum of V_a and V_b, i.e. $(V_a + V_b)/2$.

3.1.7
symmetric voltage
radio-frequency disturbance voltage appearing between the two wires in a two-wire circuit, such as a single-phase mains supply, sometimes called the differential mode voltage

Note 1 to entry: The symmetric voltage is the vector difference $(V_a - V_b)$.

3.1.8
unsymmetric mode voltage
amplitude of the vector voltage, V_a or V_b (defined in 3.6 and 3.7)

Note 1 to entry: The unsymmetric voltage is the voltage measured by the use of an artificial mains V-network.

Note 2 to entry: See notes in 3.6 and 3.7 for details on V_a and V_b.

3.1.9
auxiliary equipment
AuxEq
peripheral equipment which is part of the system under test

Note 1 to entry: This note applies to the French language only.

3.1.10
CDNE-*X*
coupling decoupling network for emission measurement in the frequency range 30 MHz to 300 MHz; where the "*X*" suffix can be "M2" for unscreened two-wire mains, DC or control ports, "M3" for unscreened three-wire mains, DC or control ports, and "S*x*" for screened cable with x internal wires

Note 1 to entry: See Annex J in CISPR 16-1-2: 2014 for example CDNE-*X* set-up diagrams.

3.1.11
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

3.1.12
common mode current
vector sum of the currents flowing through two or more conductors at a specified cross-section of a "mathematical" plane intersected by these conductors

3.1.13
continuous disturbance
RF disturbance with a duration of more than 200 ms at the IF-output of a measuring receiver, which causes a deflection on the meter of a measuring receiver in quasi-peak detection mode which does not decrease immediately

3.1.14
differential mode current
half the vector difference of the currents flowing in any two of a specified set of active conductors at a specified cross-section of a "mathematical" plane intersected by these conductors

3.1.15
discontinuous disturbance
for counted clicks, disturbance with a duration of less than 200 ms at the IF-output of a measuring receiver, which causes a transient deflection on the meter of a measuring receiver in quasi-peak detection mode

Note 1 to entry: For impulsive disturbance, see IEC 60050-161:1990, 161-02-08.

3.1.16
(electromagnetic) emission
phenomenon by which electromagnetic energy emanates from a source

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

3.1.17
emission limit (from a disturbance source)
specified maximum emission level of a source of electromagnetic disturbance

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

3.1.18
equipment under test
EUT
equipment (devices, appliances and systems) subjected to EMC (emission) compliance tests

Note 1 to entry: This note applies to the French language only.

3.1.19 Measurement, scan and sweep times

3.1.19.1

measurement
process of experimentally obtaining one or more quantity values that can reasonably be attributed to a quantity

[SOURCE: JCGM 200:2012, 2.1 [12][1]]

3.1.19.2

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 r.m.s. detector, the effective time to determine the r.m.s. of the signal envelope

1 Numbers in square brackets refer to the Bibliography.