CISPR TR 16-4-4

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CONSOLIDATED VERSION

TECHNICAL REPORT

colour inside

INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

Specification for radio disturbance and immunity measuring apparatus and methods –
Part 4-4: Uncertainties, statistics and limit modelling – Statistics of complaints and a model for the calculation of limits for the protection of radio services

CISPR TR 16-4-4:2007-07+AMD1:2017-06+AMD2:2020-04 CSV(en)

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This consolidated version of the official IEC Standard and its amendments has been prepared for user convenience.

CISPR 16-4-4 edition 2.2 contains the second edition (2007-07) [documents CISPR/H/147/DTR and CISPR/H/153/RVC], its amendment 1 (2017-06) [documents CIS/H/313/DTR and CIS/H/319/RVC] and its amendment 2 (2020-04) [documents CIS/H/402/DTR and CIS/H/407A/RVDTR].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendments 1 and 2. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a technical report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

This second edition of CISPR 16-4-4, which is a technical report, has been prepared by CISPR subcommittee H: Limits for the protection of radio services.

This second edition of CISPR 16-4-4 contains two thoroughly updated Clauses 4 and 5, compared with its first edition. It also contains, in its new Annex A, values of the classical CISPR mains decoupling factor which were determined by measurements in real LV AC mains grids in the 1960s. It is deemed that these mains decoupling factors are still valid and representative also for modern and well maintained LV AC mains grids around the world.

The information in Clause 4 – Statistics of complaints and sources of interference – was accomplished by the history and evolution of the CISPR statistics on complaints about radio frequency interference (RFI) and by background information on evolution in radio-based communication technologies. Furthermore, the forms for collation of actual RFI cases were detailed and structured in a way allowing for more qualified assessment and evaluation of compiled annual data in regard to the interference situation, as e.g. fixed or mobile radio reception, or analogue or digital modulation of the interfered with radio service or application concerned.

The information in Clause 5 – A model for the calculation of limits – was accomplished in several ways. The model itself was accomplished in respect of the remote coupling situation as well as the close coupling one. Further supplements of this model were incorporated regarding certain aspects of the coupling path via induction and wave propagation (radiation) of classical telecommunication networks. Furthermore, the calculation model on statistics and probability underwent revision and was brought in line with a more modern mathematical approach. Eventually the present model was extended for a possible determination of CISPR limits in the frequency range above 1 GHz.

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

The committee has decided that the contents of the base publication and its amendments 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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

SPECIFICATION FOR RADIO DISTURBANCE AND IMMUNITY MEASURING APPARATUS AND METHODS –

Part 4-4: Uncertainties, statistics and limit modelling – Statistics of complaints and a model for the calculation of limits for the protection of radio services

1 Scope

This part of CISPR 16 contains a recommendation on how to deal with statistics of radio interference complaints. Furthermore it describes the calculation of limits for disturbance field strength and voltage for the measurement on a test site based on models for the distribution of disturbances by radiated and conducted coupling, respectively.

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.

IEC 60050-161, *International Electrotechnical Vocabulary (IEV) – Part 161: Electromagnetic compatibility* (available at http://www.electropedia.org)

CISPR 11, *Industrial, scientific and medical ~~(ISM) radio-frequency~~ equipment – ~~Electromagnetic~~ Radio-frequency disturbance characteristics – Limits and methods of measurement*

CISPR 16-4-3, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-3: Uncertainties, statistics and limit modelling – Statistical considerations in the determination of EMC compliance of mass-produced products*

CISPR 15:2018, *Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1 Terms and definitions

3.1.1
complaint
~~a~~ request for assistance made to the RFI investigation service by the user of a radio receiving equipment who complains that reception is degraded by radio frequency interference (RFI)

3.1.2
RFI investigation service
institution having the task of investigating reported cases of radio frequency interference and which operates at the national basis

~~NOTE~~ EXAMPLE ~~Examples include a~~ Radio service provider, ~~a~~ CATV network provider, ~~an~~ administration, ~~or a~~ regulatory authority.

3.1.3
source
any type of electric or electronic equipment, system, or (part of) installation emanating disturbances in the radio frequency (RF) range which can cause radio frequency interference to a certain kind of radio receiving equipment

3.2 Symbols and abbreviated terms

E_{ir}	permissible interference field strength at the point A in space where the antenna of the victim receiver is located – without consideration of probability factors
E_{Limit}	permissible interference field strength at the point A in space where the antenna of the victim receiver is located – with consideration of probability factors
R_P	protection ratio
C_{PV}	coupling factor describing the proportionality of the field strength E with the square root of the power P injected as common mode into the radiating structure by the apparatus (GCPC)
Group A	defined PV generator group for single-family detached houses
Group B	defined PV generator group for multi-storey buildings with flat roof tops
Group C	defined PV generator group for sun tracking supports (“trees”)
Group D	defined PV generator group for large barns in the countryside
ρ_i	probability of an individual PV generator being a member of Group i
$\bar{C}_{PV}$	group-independent mean value for the coupling factor
P_S	disturbance power emitted by a GCPC with the complex source impedance Z_S
P_L	power injected into the PV generator eventually radiated via that installation
P_{TC}	disturbance power determined at the DC-AN on a standardized test site according to CISPR 11 with fixed impedance Z_{TC} = 150 Ω
U_{Limit}	permitted disturbance voltage limit
P_7	probability for time coincidence (μ_{P7} in dB)
P_8	probability for location coincidence (μ_{P8} in dB)
P_4	probability for frequency coincidence inclusive harmonics(μ_{P4} in dB)
m_L	mismatch loss in use case (between the GCPC with complex source impedance Z_S and the PV generator with complex load impedance Z_L)
m_{TC}	mismatch loss in test case (between the GCPC with complex source impedance Z_S and the DC-AN according to CISPR 11 with measurement impedance fixed to Z_{TC} = 150 Ω)
AMN	artificial mains network
CM	common mode
DC-AN	DC artificial network
DM	differential mode