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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 4-2: Uncertainties, statistics and limit modelling – Measurement instrumentation uncertainty

Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Partie 4-2: Incertitudes, statistiques et modélisation des limites – Incertitudes de mesure de l'instrumentation

CISPR 16-4-2:2011-06+AMD1:2014-02+AMD2:2018-08 CSV(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

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This Consolidated version of CISPR 16-4-2 bears the edition number 2.1. It consists of the second edition (2011-06) [documents CISPR/A/942/FDIS and CISPR/A/952/RVD] and its corrigendum (2013-04), its amendment 1 (2014-02) [documents CISPR/A/1049/FDIS and CISPR/A/1058/RVD] and its amendment 2 (2018-08) [documents CISPR/A/1257/FDIS and CISPR/A/1259/RVD]. The technical content is identical to the base edition and its amendments.

This Final version does not show where the technical content is modified by amendments 1 and 2. A separate Redline version with all changes highlighted is available in this publication.

International Standard CISPR 16-4-2 has been prepared by CISPR subcommittee A: Radio-interference measurements and statistical methods.

This edition includes the following significant technical additions with respect to the previous edition:

– Methods of conducted disturbance measurements
  - on the mains port using a voltage probe,
  - on the telecommunication port using an AAN (ISN),
  - on the telecommunication port using a CVP, and
  - on the telecommunication port using a current probe.
– Methods of radiated disturbance measurements
  - in the frequency range 30 MHz to 1 000 MHz using a FAR, and
  - in the frequency range 1 GHz to 18 GHz using a FAR.

This publication has the status of a basic EMC standard in accordance with IEC Guide 107:2009, *Electromagnetic compatibility – Guide to the drafting of electromagnetic compatibility publications*.

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

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

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.

INTRODUCTION

The CISPR 16-4 series, *Specification for radio disturbance and immunity measuring apparatus and methods – Uncertainties, statistics and limit modelling, contains information related to uncertainties, statistics and limit modelling*, and consists of the following five parts:

- Part 4-1: Uncertainties in standardized EMC tests,
- Part 4-2: Measurement instrumentation uncertainty,
- Part 4-3: Statistical considerations in the determination of EMC compliance of mass-produced products,
- Part 4-4: Statistics of complaints and a model for the calculation of limits for the protection of radio services, and
- Part 4-5: Conditions for the use of alternative test methods.

For practical reasons, standardized electromagnetic compatibility (EMC) tests are simplified representations of possible electromagnetic interference (EMI) scenarios that a product may encounter in practice. Consequently, in an EMC standard, the measurand, the limit, measurement instruments, measurement set-up, measurement procedure and measurement conditions are simplified but are still meaningful (representative). Here meaningful means that there is a statistical correlation between compliance of the product with a limit, based on a standardized EMC test using standardized test equipment, and a high probability of actual EMC of the same product during its life cycle. Part 4-4 provides methods based on statistics to derive meaningful disturbance limits to protect radio services.

In general, a standardized EMC test should be developed such that reproducible results are obtained if different parties perform the same test with the same EUT. However, various uncertainty sources limit the reproducibility of a standardized EMC.

Part 4-1 is a technical report that consists of a collection of informative reports that address all relevant uncertainty sources that may be encountered during EMC compliance tests. Typical examples of uncertainty sources are the EUT itself, the measurement instrumentation, the set-up of the EUT, the test procedures and the environmental conditions.

Part 4-2 describes a specific category of uncertainties, i.e. measurement instrumentation uncertainties. In this part, examples of MIU budgets are given for most of the CISPR measurement methods. Also in this part, normative requirements are given on how to apply the MIU when determining compliance of an EUT with a disturbance limit (i.e. conformity assessment decision).

Part 4-3 is a technical report that describes the statistical treatment of test results when compliance tests are performed on samples of mass-produced products. This treatment is known as the 80 %/80 % rule.

Part 4-4 is a technical report that contains CISPR recommendations for the collation of statistical data on interference complaints and for the classification of interference sources. Also, models for the calculation of limits for various modes of interference coupling are given.

Part 4-5 is a technical report describing a method to enable product committees to develop limits for alternative test methods, using conversions from established limits.

SPECIFICATION FOR RADIO DISTURBANCE AND IMMUNITY MEASURING APPARATUS AND METHODS –

Part 4-2: Uncertainties, statistics and limit modelling – Measurement instrumentation uncertainty

1 Scope

This part of CISPR 16-4 specifies the method of applying Measurement Instrumentation Uncertainty (MIU) when determining compliance with CISPR disturbance limits. The material is also relevant to any EMC test when interpretation of the results and conclusions reached will be impacted by the uncertainty of the measurement instrumentation used during testing.

NOTE In accordance with IEC Guide 107, CISPR 16-4-2 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 technical committees and product committees in the evaluation of the applicability of this standard for specific products.

The annexes contain the background material used in providing the amount of MIU found in generating the CISPR values shown in Clauses 4 through 8 and hence provide valuable background material for those needing both initial and further information on MIU and how to take individual uncertainties in the measurement chain into account. The annexes, however, are not intended to be a tutorial or user manual or to be copied when making uncertainty calculations. For that purpose, the references shown in the bibliography, or other widely recognized documents, may be used.

Measurement instrumentation specifications are given in the CISPR 16-1 series, while the methods of measurement are covered in the CISPR 16-2 series. Further information and background on CISPR and radio disturbances is given in CISPR 16-3. The other parts of the CISPR 16-4 series contain further information on uncertainties in general, statistics and limit modelling. See the introduction of this part for more information on the background and on the content of the CISPR 16-4 series.

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 11, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*

CISPR 12, *Vehicles, boats and internal combustion engines – Radio disturbance characteristics – Limits and methods of measurement for the protection of off-board receivers*

CISPR 13, *Sound and television broadcast receivers and associated equipment – Radio disturbance characteristics – Limits and methods of measurement*

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*