BS EN 55016-4-2:2011+A2:2018
Incorporating corrigenda April 2013 and February 2019

BSI Standards Publication

Specification for radio disturbance and immunity measuring apparatus and methods

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

bsi.

National foreword

This British Standard is the UK implementation of EN 55016-4-2:2011+A2:2018. It is identical to CISPR 16-4-2:2011, incorporating amendments 1:2014 and 2:2018 and corrigenda April 2013 and January 2019. It supersedes BS EN 55016-4-2:2011+A1:2014, which will be withdrawn on 19 September 2021.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CISPR text carry the number of the amendment. For example, text altered by CISPR amendment A1 is indicated by [A1] 〈A1〉.

The UK participation in its preparation was entrusted to Technical Committee GEL/210/11, EMC - Standards Committee.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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ICS 33.100.20; 33.100.10

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 October 2011.

Amendments/corrigenda issued since publication

Date	Text affected
30 June 2013	Implementation of CISPR corrigendum April 2013: Footnote c inserted in Tables D.3 and Table D.4
30 September 2014	Implementation of CISPR amendment 1:2014 with CENELEC endorsement A1:2014
28 February 2019	Implementation of CISPR amendment 2:2018 with CENELEC endorsement A2:2018
28 February 2019	Implementation of CISPR corrigendum January 2019: Table B.8 and Note B26) in Clause B.10 amended

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 55016-4-2:2011/A2

October 2018

ICS 33.100.10; 33.100.20

English version

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)

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)

Anforderungen an Geräte und Einrichtungen sowie Festlegung der Verfahren zur Messung der hochfrequenten Störaussendung (Funkstörungen) und Störfestigkeit - Teil 4-2: Unsicherheiten, Statistik und Modelle zur Ableitung von Grenzwerten (Störmodell) - Messgeräte-Unsicherheit (CISPR 16-4-2:2011)

This European Standard was approved by CENELEC on 2011-07-13. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document CISPR/A/942/FDIS, future edition 2 of CISPR 16-4-2, prepared by CISPR SC A, "Radio-interference measurements and statistical methods", was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 55016-4-2 on 2011-07-13.

This European Standard supersedes EN 55016-4-2:2004.

EN 55016-4-2:2011 includes the following significant technical additions with respect to EN 55016-4-2:2004:

– 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2012-04-13
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2014-07-13

Annex ZA has been added by CENELEC.

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Endorsement notice

The text of the International Standard CISPR 16-4-2:2011 was approved by CENELEC as a European Standard without any modification.

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Foreword to Amendment A1

The text of document CISPR/A/1049/FDIS, future CISPR 16-4-2:2011/A1, prepared by CISPR SC A “Radio-interference measurements and statistical methods” of CISPR “International special committee on radio interference” was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 55016-4-2:2011/A1:2014.

The following dates are fixed:

– latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2015-02-01

– latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2017-03-21

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Endorsement notice

The text of the International Standard CISPR 16-4-2:2011/A1:2014 was approved by CENELEC as a European Standard without any modification.

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Foreword to Amendment A2

The text of document CISPR/A/1257/FDIS, future CISPR 16-4-2/A2, prepared by CISPR SC A "Radio-interference measurements and statistical methods" of CISPR "International special committee on radio interference" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 55016-4-2:2011/A2:2018.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2019-06-19
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2021-09-19

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This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association.

Endorsement notice

The text of the International Standard CISPR 16-4-2:2011/A2:2018 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

CISPR 16-1-4:2010	NOTE	Harmonized as EN 55016-1-4:2010 (not modified)
CISPR 16-1-6:2014	NOTE	Harmonized as EN 55016-1-6:2015 (not modified)
CISPR 32:2015	NOTE	Harmonized as EN 55032:2015 (not modified)

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
CISPR 16-2-3	2016	Specification for radio disturbance and immunity measuring apparatus and methods - Part 2-3: Methods of measurement of disturbances and immunity - Radiated disturbance measurements	EN 55016-2-3	2017

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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SPECIFICATION FOR RADIO DISTURBANCE AND IMMUNITY MEASURING APPARATUS AND METHODS –

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

FOREWORD

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

This second edition cancels and replaces the first edition published in 2003. It constitutes a technical revision.

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*.

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

FDIS	Report on voting
CISPR/A/942/FDIS	CISPR/A/952/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 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 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.

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 publication 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*