

TECHNICAL REPORT

CISPR 16-4-4

First edition
2003-11

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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION
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**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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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".

CISPR 16-4-4, which is a technical report, has been prepared by CISPR subcommittee A: Radio interference measurements and statistical methods.

This first edition of CISPR 16-4-4, together with CISPR 16-4-1, CISPR 16-4-3 and the second edition of CISPR 16-3, cancels and replaces the first edition of CISPR 16-3, published in 2000, and its amendment 1 (2002). It contains the relevant clauses of CISPR 16-3 without technical changes.

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

A bilingual version of this publication may be issued at a later date.

The committee has decided that the contents of this publication will remain unchanged until 2004. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

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

Recommendation 2/2 – p/o CISPR 7B, 1975; CIS/A(CO)67 , 1992; CIS/A(CO)67A, 1993;
Report 61 – CISPR 23:1987; CISPR/A(Sec)81, 1987.

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INTRODUCTION

CISPR 16-1, CISPR 16-2, CISPR 16-3 and CISPR 16-4 have been reorganised into 14 parts, to accommodate growth and easier maintenance. The new parts have also been renumbered. See the list given below.

Old CISPR 16 publications		New CISPR 16 publications	
CISPR 16-1	Radio disturbance and immunity measuring apparatus	→	CISPR 16-1-1 Measuring apparatus
		→	CISPR 16-1-2 Ancillary equipment – Conducted disturbances
		→	CISPR 16-1-3 Ancillary equipment – Disturbance power
		→	CISPR 16-1-4 Ancillary equipment – Radiated disturbances
		→	CISPR 16-1-5 Antenna calibration test sites for 30 MHz to 1 000 MHz
CISPR 16-2	Methods of measurement of disturbances and immunity	→	CISPR 16-2-1 Conducted disturbance measurements
		→	CISPR 16-2-2 Measurement of disturbance power
		→	CISPR 16-2-3 Radiated disturbance measurements
		→	CISPR 16-2-4 Immunity measurements
CISPR 16-3	Reports and recommendations of CISPR	→	CISPR 16-3 CISPR technical reports
		→	CISPR 16-4-1 Uncertainties in standardised EMC tests
		→	CISPR 16-4-2 Measurement instrumentation uncertainty
CISPR 16-4	Uncertainty in EMC measurements	→	CISPR 16-4-3 Statistical considerations in the determination of EMC compliance of mass-produced products
		→	CISPR 16-4-4 Statistics of complaints and a model for the calculation of limits

More specific information on the relation between the 'old' CISPR 16-3 and the present 'new' CISPR 16-4-4 is given in the table after this introduction (TABLE RECAPITULATING CROSS REFERENCES).

Measurement instrumentation specifications are given in five new parts of CISPR 16-1, while the methods of measurement are covered now in four new parts of CISPR 16-2. Various reports with further information and background on CISPR and radio disturbances in general are given in CISPR 16-3. CISPR 16-4 contains information related to uncertainties, statistics and limit modelling.

CISPR 16-4 consists of the following parts, under the general title *Specification for radio disturbance and immunity measuring apparatus and methods - Uncertainties, statistics and limit modelling*:

- Part 4-1: Uncertainties in standardised EMC tests,
- Part 4-2: Uncertainty in EMC measurements,
- 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 practical reasons, standardised EMC tests are drastic simplifications of all possible EMI scenarios that a product may encounter in practice. Consequently, in an EMC standard the measurand, the limit, measurement instruments, set-up, measurement procedure and measurement conditions shall be simplified but still meaningful. Meaningful means that there is a statistical correlation between compliance of the product with a standardized EMC test and a high probability of actual EMC of the same product during its life cycle. Part 4-4 provides statistically based methods to derive meaningful disturbance limits for the protection of radio services.

In general, a standardized EMC test must be developed such that reproducible results are obtained if different parties perform the same test with the same product. However, various uncertainty sources and influence quantities cause that the reproducibility of a standardized EMC test is limited. Part 4-1 consists of a collection of informative reports that deal with all relevant uncertainty sources that may be encountered during EMC compliance tests. Typical examples of uncertainty sources are the product itself, the measurement instrumentation, the set-up of the product, the test procedures and the environmental conditions.

Part 4-2, deals with a limited and specific category of uncertainties, i.e. the measurement instrumentation uncertainties. In Part 4-2, examples of measurement instrumentation uncertainty budgets are given for most of the CISPR test methods. In this part, also normative requirements are given on how to incorporate the measurement instrumentation uncertainty in the compliance criterion.

If a compliance test is performed using different samples of the same product, then the spread of the EMC performance of the product samples shall be incorporated also in the compliance criterion. Part 4-3 deals with the statistical treatment of test results in case compliance test are performed using samples of mass-produced products. This treatment is well known as the 80%-80% rule.

Part 4-4 contains forms for statistics of complaints to be applied by National Authorities and describes methods to determine limits. For this purpose the basis for the protection of radio services, the probability of interferences, the measurement procedures and the characteristic of radio services are described. On the basis of the models for the generation of disturbance for the radiation coupling and for mains coupling respectively the limits of disturbance field strength and disturbance voltage are calculated for the measurement on the test site.

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TABLE RECAPITULATING CROSS-REFERENCES

First edition of CISPR 16-3
Clauses, subclauses

First edition of CISPR 16-4-4
Clauses

1.1

1

1.2

2

1.3

3

2.1

4

3

5

Annex 3.6-A

Annex 5.6-A

Figures

Figures

15, 16

1, 2

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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

1 Scope

This part of CISPR 16-4 describes the calculation of limits for disturbance field strength and disturbance voltage for the measurement on the test site on the basis of models for the generation of disturbance for radiation coupling respectively for mains coupling.

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 (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement*

CISPR 16-1 (all parts), *Specification for radio disturbance and immunity measuring apparatus and methods – Radio disturbance and immunity measuring apparatus*

CISPR 16-2, (all parts), *Specification for radio disturbance and immunity measuring apparatus and methods – Methods of measurement of disturbances and immunity*

CISPR 16-3, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 3. CISPR technical reports*

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

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*

3 Definitions

None of the definitions of CISPR 16-3:2000 apply to this part of CISPR 16. For further definitions see IEC 60050(161).

4 Recommendation 2/3: Statistics of complaints and sources of interference

(This recommendation replaces Recommendation 2/2 in CISPR 7B).

The CISPR,

CONSIDERING

- a) that many administrations regularly publish statistics on interference complaints;
- b) that it would be useful to be able to compare the figures for certain categories;
- c) that, at present, varied and ambiguous presentation often renders this comparison difficult,

RECOMMENDS

- 1 that the statistics supplied by National Committees should be in such a form that the following information may be readily extracted:
 - 1.1 number of complaints as a percentage of the total number of receiving licences for television, sound broadcasting and other services;
 - 1.2 the relative aggressivity of the various sources of interference in the different frequency bands;
 - 1.3 the comparison of the interference caused by the same source in different frequency bands;
 - 1.4 the effectiveness of limits (CISPR or national) and other counter-measures on subclauses 1.1, 1.2 and 1.3;
- 2 that the terms used in publication of statistics as recommended in clause 3 should have the following meaning:
 - 2.1 *complaint*: a request for assistance made to the interference service by a listener or a viewer who complains that his reception is degraded by interference. For the purpose of these statistics, one complaint will be recorded for each frequency band for which a confirmed complaint has been received;
 - 2.2 *source*: a source of interference is the apparatus or installation which causes interference. Interference may be caused by a group of devices, for example, a number of fluorescent lamps on one circuit. In such cases, the number to be entered in the statistics is determined by the interference service;

NOTE To facilitate comparison of statistics, the method used to determine the number of sources should be stated.

one source may cause many complaints and one complaint may be caused by more than one source. Therefore, it is clear that the number of sources and the number of complaints against any classification code may not be related;

for the purpose of these statistics, both active generators of electrical energy and apparatus and installations which cause interference by secondary effects (secondary modulation) are included. See also Appendix II for a complete list;
 - 2.3 *cause of complaint other than a source*: a reason for unsatisfactory reception in a case in which no source is concerned. See also Appendix II for a complete list;
- 3 that statistics should cover a complete calendar year; they should whenever possible be presented in the following form, without necessarily employing the finer categories listed in Appendix II. It is not intended to exclude further subdivisions; these are desirable, but they should fit into the scheme of the standard form;

the code numbers refer to the items listed in Appendices I and II;

Statistics of interference complaints

Source of interference or other cause of complaint				Number of complaints per service from each source						
Classification code			Description	Total number in each classification	Broadcasting ^a					Other services ^b
					Sound ^c		Television ^c			
					LF/ MF/ HF	II	I	III	IV/V	
A	1	1	etc. as in the appendices							
	2	1								
				Totals						

^a LF = low frequency (long waves);
 MF = medium frequency (medium waves);
 HF = high frequency (short waves).
 These three bands may either be grouped together, as shown, or dealt with separately.
 II = Band II (VHF/FM)
 I = Band I (VHF/television)
 III = Band III (VHF/television);
 IV/V = Band IV/V (UHF/television).

^b The service and band affected should be stated.

^c At the time of receipt of complaints of interference, i.e. before they have been investigated fully, it may not be possible to apportion the complaints accurately to the various broadcasting services. If this is so, then the number of complaints should be stated separately for sound broadcasting and television.

**Appendix I to Recommendation 2/3:
 Classification of sources of interference
 and other causes of complaint**

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Main categories

Classification code	Description of the source
A	Industrial scientific and medical RF apparatus
A.1	Industrial and scientific RF apparatus
A.1.1	Apparatus tuned to free radiation frequency
A.1.2	Apparatus not tuned to free radiation frequencies
A.2	Medical radio-frequency apparatus
A.2.1	Apparatus tuned to free radiation frequencies
A.2.2	Apparatus not tuned to free radiation frequencies
A.3	Sparking apparatus (except ignition)
B	Electric power supply, distribution and traction
B.1	AC voltages exceeding 100 kV
B.1.1	Power lines overhead
B.1.2	Generating and switching stations
B.2	DC voltages exceeding 100 kV
B.2.1	Power lines overhead
B.2.2	Converting stations