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**Specifikacija za merilne naprave in metode za merjenje radijskih motenj in odpornosti – 1-1. del: Merilne naprave za merjenje radijskih motenj in odpornosti – Merilne naprave (CISPR 16-1-1:2003)**

Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus (CISPR 16-1-1:2003)

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EUROPEAN STANDARD

EN 55016-1-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2004

ICS 33.100.10; 33.100.20

English version

**Specification for radio disturbance and immunity  
measuring apparatus and methods**  
**Part 1-1: Radio disturbance and immunity measuring apparatus -  
Measuring apparatus**  
(CISPR 16-1-1:2003)

Spécifications des méthodes et des appareils  
de mesure des perturbations radioélectriques  
et de l'immunité aux perturbations  
radioélectriques  
Partie 1-1: Appareils de mesure  
des perturbations radioélectriques  
et de l'immunité aux perturbations  
radioélectriques –  
Appareils de mesure  
(CISPR 16-1-1:2003)

Anforderungen an Geräte und Einrichtungen  
sowie Festlegung der Verfahren zur Messung  
der hochfrequenten Störaussendung  
(Funkstörungen) und Störfestigkeit  
Teil 1-1: Geräte und Einrichtungen  
zur Messung der hochfrequenten  
Störaussendung (Funkstörungen)  
und Störfestigkeit –  
Messgeräte  
(CISPR 16-1-1:2003)

SIST EN 55016-1-1:2005

This European Standard was approved by CENELEC on 2004-09-01. 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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

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

**CENELEC**

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

## Foreword

The text of the International Standard CISPR 16-1-1:2003, prepared by CISPR SCA, Radio-interference measurements and statistical methods, was submitted to the formal vote and was approved by CENELEC as EN 55016-1-1 on 2004-09-01 without any modification.

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) 2005-09-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2007-09-01

Annex ZA has been added by CENELEC.

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## Endorsement notice

The text of the International Standard CISPR 16-1-1:2003 was approved by CENELEC as a European Standard without any modification.

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## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

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.

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

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
CISPR 11	2003	Industrial scientific and medical (ISM) radio-frequency equipment - Electromagnetic disturbance characteristics - Limits and methods of measurement	-	-
CISPR 14-1	2000	Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus Part 1: Emission	EN 55014-1	2000
CISPR 16-1-2	2003	Specification for radio disturbance and immunity measuring apparatus and methods Part 1-2: Radio disturbance and immunity measuring apparatus - Ancillary equipment - Conducted disturbances	EN 55016-1-2	2004
CISPR 16-1-3	2003	Part 1-3: Radio disturbance and immunity measuring apparatus - Ancillary equipment - Disturbance power	EN 55016-1-3	2004
CISPR 16-1-4	2003	Specification for radio disturbance and immunity measuring apparatus and methods Part 1-4: Radio disturbance and immunity measuring apparatus - Ancillary equipment - Radiated disturbances	EN 55016-1-4	2004
CISPR 16-1-5	2003	Specification for radio disturbance and immunity measuring apparatus and methods Part 1-5: Radio disturbance and immunity measuring apparatus - Antenna calibration test sites for 30 MHz to 1 000 MHz	EN 55016-1-5	2004
CISPR 16-2-1	2003	Part 2-1: Methods of measurement of disturbances and immunity - Conducted disturbance measurements	EN 55016-2-1	2004

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
CISPR 16-2-2	2003	Part 2-2: Methods of measurement of disturbances and immunity - Measurement of disturbance power	EN 55016-2-2	2004
CISPR 16-2-3	2003	Part 2-3: Methods of measurement of disturbances and immunity - Radiated disturbance measurements	EN 55016-2-3	2004
CISPR 16-2-4	2003	Part 2-4: Methods of measurement of disturbances and immunity - Immunity measurements	EN 55016-2-4	2004
CISPR/TR 16-3	2003	Part 3: CISPR technical reports	-	-
CISPR/TR 16-4-1	2003	Part 4-1: Uncertainties, statistics and limit modeling - Uncertainties in standardized EMC tests	-	-
CISPR 16-4-2	2003	Part 4-2: Uncertainties, statistics and limit modelling - Uncertainty in EMC measurements	EN 55016-4-2	2004
CISPR/TR 16-4-3	2003	Part 4-3: Uncertainties, statistics and limit modelling - Statistical considerations in the determination of EMC compliance of mass-produced products	-	-
CISPR/TR 16-4-4	2003	Part 4-4: Uncertainties, statistics and limit modeling - Statistics of complaints and a model for the calculation of limits	-	-
IEC 60050-161	1990	International Electrotechnical Vocabulary (IEV) Chapter 161: Electromagnetic compatibility	-	-
IEC 60315-3 + corr. March	1989 1994	Methods of measurement on radio receivers for various classes of emission Part 3: Receivers for amplitude-modulated sound-broadcasting emissions	EN 60315-3	1999
IEC 60315-4	1997	Part 4: Receivers for frequency-modulated sound broadcasting emissions	EN 60315-4	1998
ITU-R Recommendation BS 468-4	1986	Measurement of audio-frequency noise voltage level in sound broadcasting	-	-
ITU-T Recommendation P.53 of blue book	1989	Volume V - Psophometers (apparatus for the objective measurement of circuit noise)	-	-
	1993	International Vocabulary of Basic and General Terms in Metrology, International Organization for Standardization		

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

**CISPR**  
**16-1-1**

First edition  
2003-11

INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

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**Specification for radio disturbance and immunity  
measuring apparatus and methods –**

**Part 1-1:**

**Radio disturbance and immunity measuring  
apparatus – Measuring apparatus  
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Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия

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## CONTENTS

FOREWORD.....	5
INTRODUCTION.....	9
TABLE RECAPITULATING CROSS-REFERENCES .....	11
1 Scope.....	13
2 Normative references .....	13
3 Definitions .....	17
4 Quasi-peak measuring receivers for the frequency range 9 kHz to 1 000 MHz.....	21
5 Peak measuring receivers for the frequency range 9 kHz to 1 000 MHz.....	45
6 Average measuring receivers for the frequency range 9 kHz to 1 000 MHz.....	49
7 RMS measuring receivers for the frequency range 9 kHz to 1 000 MHz .....	55
8 Spectrum analyzers and scanning receivers .....	59
9 Audio-frequency voltmeter.....	63
10 Disturbance analyzers .....	71
<b>iTeh STANDARD PREVIEW</b>	
Annex A (normative) Determination of response to repeated pulses of quasi-peak and r.m.s. measuring receivers (subclauses 3.2, 4.4.2, 7.2.2 and 7.4.1) .....	89
Annex B (normative) Determination of pulse generator spectrum (subclauses 4.4, 5.4, 6.4, 7.4).....	99
Annex C (normative) Accurate measurements of the output of nanosecond pulse generators (subclauses 4.4, 5.4, 6.4, 7.4).....	103
Annex D (normative) Influence of the quasi-peak measuring receiver characteristics on its pulse response (subclause 4.4.2).....	107
Annex E (normative) Response of average and peak measuring receivers (subclause 6.2.1).....	109
Annex F (normative) Performance check of the exceptions from the definitions of a click according to 4.2.3 of CISPR 14-1.....	117



INTERNATIONAL ELECTROTECHNICAL COMMISSION  
INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

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**SPECIFICATION FOR RADIO DISTURBANCE AND IMMUNITY  
MEASURING APPARATUS AND METHODS –**

**Part 1-1: Radio disturbance and immunity measuring apparatus –  
Measuring apparatus**

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

This first edition of CISPR 16-1-1, together with CISPR 16-1-2, CISPR 16-1-3, CISPR 16-1-4 and CISPR 16-1-5, cancels and replaces the second edition of CISPR 16-1, published in 1999, amendment 1 (2002) and amendment 2 (2003). It contains the relevant clauses of CISPR 16-1 without technical changes.

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

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.

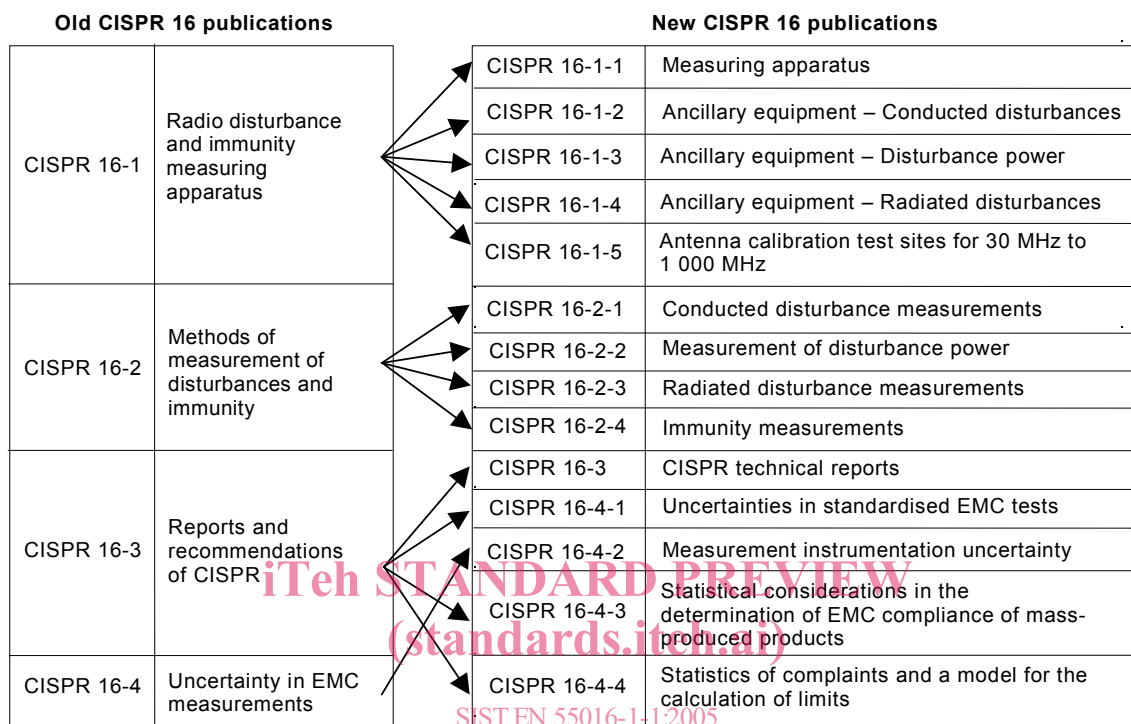
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## INTRODUCTION

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.



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More specific information on the relation between the 'old' CISPR 16-1 and the present 'new' CISPR 16-1-1 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 16-1 consists of the following parts, under the general title *Specification for radio disturbance and immunity measuring apparatus and methods – Radio disturbance and immunity measuring apparatus*:

- Part 1-1: Measuring apparatus,
- Part 1-2: Ancillary equipment – Conducted disturbances,
- Part 1-3: Ancillary equipment – Disturbance power,
- Part 1-4: Ancillary equipment – Radiated disturbances,
- Part 1-5: Antenna calibration test sites for 30 MHz to 1 000 MHz.

## TABLE RECAPITULATING CROSS-REFERENCES

Second edition of CISPR 16-1	First edition of CISPR 16-1-1
Clauses, subclauses	Clauses, subclauses
1	1
2	2
3	3
4.1	4
4.2	5
4.3	6
4.4	7
4.5	8
4.6	9
5.4	10
Annexes	Annexes
A	A
B	B
C	C
D	D
E	E
Y	F
Figures	Figures
1,...,3	1, 3
60, 61	4, 5
4,..,6	6,...,8
11, 12	9, 10
21, 22	E.1, E.2

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## SPECIFICATION FOR RADIO DISTURBANCE AND IMMUNITY MEASURING APPARATUS AND METHODS –

### Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus

#### 1 Scope

This part of CISPR 16 is designated a basic standard, which specifies the characteristics and performance of equipment for the measurement of radio disturbance voltages, currents and fields in the frequency range 9 kHz to 18 GHz. In addition, requirements are specified for specialized equipment for discontinuous disturbance measurements. The requirements include the measurement of broadband and narrowband types of radio disturbance.

The receiver types covered include the following:

- a) the quasi-peak measuring receiver,
- b) the peak measuring receiver,
- c) the average measuring receiver,
- d) the r.m.s. measuring receiver.

In addition there are specifications for spectrum analyzers, scanning receivers and audio-frequency voltmeters.

The requirements of this publication shall be complied with at all frequencies and for all levels of radio disturbance voltages, currents, power or field strengths within the CISPR indicating range of the measuring equipment.

Methods of measurement are covered in Part 2, and further information on radio disturbance is given in Part 3 of CISPR 16. Uncertainties, statistics and limit modelling are covered in Part 4 of CISPR 16.

#### 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 11:2003, *Industrial, scientific and medical (ISM) radio-frequency equipment – Electro-magnetic disturbance characteristics – Limits and methods of measurement*

CISPR 14-1:2000, *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission*

CISPR 16-1-2:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – Ancillary equipment – Conducted disturbances*

CISPR 16-1-3:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-3: Radio disturbance and immunity measuring apparatus – Ancillary equipment – Disturbance power*

CISPR 16-1-4:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Ancillary equipment - Radiated disturbances*

CISPR 16-1-5:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-5: Radio disturbance and immunity measuring apparatus – Antenna calibration test sites for 30 MHz to 1 000 MHz*

CISPR 16-2-1:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-1: Methods of measurement of immunity and disturbance – Conducted disturbance measurements*

CISPR 16-2-2:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-2: Methods of measurement of immunity and disturbance – Measurement of disturbance power*

CISPR 16-2-3:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-3: Methods of measurement of immunity and disturbance – Radiated disturbance measurements*

CISPR 16-2-4:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-4: Methods of measurement of immunity and disturbance – Immunity measurements*

CISPR 16-3:2003, *Specification for radio disturbance and Immunity measuring apparatus and methods – Part 3: CISPR technical reports*

CISPR 16-4-1:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-1: Uncertainties, statistics and limit modelling – Uncertainties in standardized EMC tests*

CISPR 16-4-2:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Measurement instrumentation uncertainty*

CISPR 16-4-3:2003, *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 16-4-4:2003, *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*

IEC 60050(161):1990, *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*  
Amendment 1:1997 and Amendment 2:1998

IEC 60315-3:1999, *Methods of measurement on radio receivers for various classes of emissions – Part 3: Receivers for amplitude-modulated sound-broadcasting emissions*

IEC 60315-4:1997, *Methods of measurement on radio receivers for various classes of emissions – Part 4: Radio-frequency measurements on receivers for frequency modulated sound-broadcasting emissions*

ITU-R Recommendation BS.468-4:1986, *Measurement of audio-frequency noise voltage level in sound broadcasting*

ITU-T Recommendation P. 53 of *Blue Book* (1989), Volume V – *Psophometers (apparatus for the objective measurement of circuit noise)*. See also ITU-R Rec. O.41 (10/94).

*International Vocabulary of Basic and General Terms in Metrology*, International Organization for Standardization, Geneva, 2nd edition, 1993

### 3 Definitions

For the purpose of this part of CISPR 16, the following definitions apply. Also see IEC 60050(161).

#### 3.1

##### **bandwidth ( $B_n$ )**

the width of the overall selectivity curve of the receiver between two points at a stated attenuation, below the midband response. The bandwidth is represented by the symbol  $B_n$ , where  $n$  is the stated attenuation in decibels.

#### 3.2

##### **impulse bandwidth ( $B_{\text{imp}}$ )**

$$B_{\text{imp}} = A(t)_{\text{max}} / (2 G_0 \times IS)$$

where

$A(t)_{\text{max}}$  is the peak of the envelope at the IF output of the receiver with an impulse area  $IS$  applied at the receiver input;

$G_0$  is the gain of the circuit at the centre frequency.

Specifically for two critically-coupled tuned transformers,

$$B_{\text{imp}} = 1,05 \times B_6 = 1,31 \times B_3$$

where

$B_6$  and  $B_3$  are respectively the bandwidths at the  $-6$  dB and  $-3$  dB points (see clause A.2 in annex A for further information).

#### 3.3

##### **impulse area ( $IS$ )**

the impulse area (sometimes called impulse strength,  $IS$ ) is the voltage-time area of a pulse defined by the integral:

$$IS = \int_{-\infty}^{+\infty} V(t) dt \quad (\text{expressed in } \mu\text{Vs or dB}(\mu\text{Vs}))$$

NOTE Spectral density ( $D$ ) is related to impulse area and expressed in  $\mu\text{V}/\text{MHz}$  or  $\text{dB}(\mu\text{V}/\text{MHz})$ . For rectangular impulses of pulse duration  $T$  at frequencies  $f \ll 1/T$ , the relationship  $D (\mu\text{V}/\text{MHz}) = 2 \times 10^6 IS (\mu\text{Vs})$  applies.

#### 3.4

##### **electrical charge time constant ( $T_C$ )**

the time needed after the instantaneous application of a constant sine-wave voltage to the stage immediately preceding the input of the detector for the output voltage of the detector to reach 63 % of its final value

NOTE This time constant is determined as follows: A sine-wave signal of constant amplitude and having a frequency equal to the mid-band frequency of the i.f. amplifier is applied to the input of the stage immediately preceding the detector. The indication,  $D$ , of an instrument having no inertia (e.g., a cathode-ray oscilloscope) connected to a terminal in the d.c. amplifier circuit so as not to affect the behaviour of the detector, is noted. The level of the signal is chosen such that the response of the stages concerned remains within the linear operating range. A sine-wave signal of this level, applied for a limited time only and having a wave train of rectangular envelope is gated such that the deflection registered is 0,63D. The duration of this signal is equal to the charge time of the detector.