

STN	Špecifikácia metód a meracích prístrojov na meranie rádiového rušenia a odolnosti proti nemu. Časť 2-1: Metódy merania rušenia a odolnosti proti nemu. Meranie rušenia šíreného vedením.	STN EN 55016-2-1 33 4216
------------	---	--

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 11/14

Obsahuje: CISPR 16-2-1:2014, EN 55016-2-1:2014

Oznámením tejto normy sa od 02.04.2017 ruší
STN EN 55016-2-1 (33 4216) z júla 2009

119773

Úrad pre normalizáciu, metrológiu a skúšobníctvo SR, odbor SÚTN, 2014
Podľa zákona č. 264/1999 Z. z. v znení neskorších predpisov sa môžu slovenské technické normy rozmnožovať a rozširovať iba so súhlasom Úradu pre normalizáciu, metrológiu a skúšobníctvo SR.

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 55016-2-1

July 2014

ICS 33.100.10; 33.100.20

Supersedes EN 55016-2-1:2009

English Version

Specification for radio disturbance and immunity measuring
apparatus and methods - Part 2-1: Methods of measurement of
disturbances and immunity - Conducted disturbance
measurements
(CISPR 16-2-1:2014)

Spécifications des méthodes et des appareils de mesure
des perturbations radioélectriques et de l'immunité aux
perturbations radioélectriques - Partie 2-1: Méthodes de
mesure des perturbations et de l'immunité - Mesures des
perturbations conduites
(CISPR 16-2-1:2014)

Anforderungen an Geräte und Einrichtungen sowie
Festlegung der Verfahren zur Messung der hochfrequenten
Störaussendung (Funkstörungen) und Störfestigkeit - Teil 2-
1: Verfahren zur Messung der hochfrequenten
Störaussendung (Funkstörungen) und Störfestigkeit -
Messung der leitungsgeführten Störaussendung
(CISPR 16-2-1:2014)

This European Standard was approved by CENELEC on 2014-04-02. 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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Foreword

The text of document CISPR/A/1053/FDIS, future edition 3 of CISPR 16-2-1, prepared by SC A “Radio-interference measurements and statistical methods” of IEC/TC CISPR “International special committee on radio interference” was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 55016-2-1:2014.

The following dates are fixed:

- latest date by which the document has to be (dop) 2015-01-11
implemented at national level by
publication of an identical national
standard or by endorsement
- latest date by which the national (dow) 2017-04-02
standards conflicting with the
document have to be withdrawn

This document supersedes EN 55016-2-1:2009.

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

Endorsement notice

The text of the International Standard CISPR 16-2-1:2014 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 11:2003 + A1:2004	NOTE	Harmonized as EN 55011:2007 ¹⁾ (modified).
CISPR 16-1-4:2010	NOTE	Harmonized as EN 55016-1-4:2010 (not modified).
CISPR 16-2-3:2010	NOTE	Harmonized as EN 55016-2-3:2010 (not modified).
IEC 60364-4 Series	NOTE	Harmonized as HD 60364-4 Series (modified).
IEC 61000-4-6:2008	NOTE	Harmonized as EN 61000-4-6:2009 (modified).
IEC 61010-1:2001	NOTE	Harmonized as EN 61010-1:2001 (modified).

¹⁾ Superseded by EN 55011:2009 (CISPR 11:2009, mod.)

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When 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

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
CISPR 14-1	-	Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission	EN 55014-1	-
CISPR 16-1-1	2010	Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus	EN 55016-1-1	2010
CISPR 16-1-2	2014	Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-2: Radio disturbance and immunity measuring apparatus - Coupling devices for conducted disturbance measurements	EN 55016-1-2	2014
CISPR 16-4-2	-	Specification for radio disturbance and immunity measuring apparatus and methods - Part 4-2: Uncertainties, statistics and limit modelling - Measurement instrumentation uncertainty	EN 55016-4-2	-
IEC 60050	Series	International Electrotechnical Vocabulary	-	-



CISPR 16-2-1

Edition 3.0 2014-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE



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 2-1: Methods of measurement of disturbances and immunity – Conducted disturbance measurements

Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques –

Partie 2-1: Méthodes de mesure des perturbations et de l'immunité – Mesures des perturbations conduites



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2014 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 14 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

More than 55 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Catalogue IEC - webstore.iec.ch/catalogue

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 14 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

Plus de 55 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.



CISPR 16-2-1

Edition 3.0 2014-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE



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 2-1: Methods of measurement of disturbances and immunity – Conducted disturbance measurements**

**Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques –
Partie 2-1: Méthodes de mesure des perturbations et de l'immunité – Mesures des perturbations conduites**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX

XE

ICS 33.100.10, 33.100.20

ISBN 978-2-8322-1445-9

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	8
1 Scope.....	10
2 Normative references	10
3 Terms, definitions and abbreviations	11
3.1 Terms and definitions.....	11
3.2 Abbreviations.....	16
4 Types of disturbance to be measured	17
4.1 General.....	17
4.2 Types of disturbance.....	17
4.3 Detector functions.....	17
5 Connection of measuring equipment.....	18
5.1 General.....	18
5.2 Connection of ancillary equipment	18
5.3 Connections to RF reference ground.....	18
5.4 Connection between the EUT and the artificial mains network.....	19
6 General measurement requirements and conditions	20
6.1 General.....	20
6.2 Disturbance not produced by the equipment under test.....	20
6.2.1 General	20
6.2.2 Compliance testing	20
6.3 Measurement of continuous disturbance	20
6.3.1 Narrowband continuous disturbance	20
6.3.2 Broadband continuous disturbance	20
6.3.3 Use of spectrum analyzers and scanning receivers.....	21
6.4 EUT arrangement and measurement conditions	21
6.4.1 EUT arrangement	21
6.4.2 Normal load conditions	23
6.4.3 Duration of operation	23
6.4.4 Running-in/warm-up time	23
6.4.5 Supply	24
6.4.6 Mode of operation.....	24
6.4.7 Operation of multifunction equipment.....	24
6.4.8 Determination of EUT arrangement(s) that maximize(s) emissions	24
6.4.9 Recording of measurement results.....	24
6.5 Interpretation of measuring results.....	24
6.5.1 Continuous disturbance	24
6.5.2 Discontinuous disturbance.....	25
6.5.3 Measurement of the duration of disturbances.....	25
6.6 Measurement times and scan rates for continuous disturbance	25
6.6.1 General	25
6.6.2 Minimum measurement times	25
6.6.3 Scan rates for scanning receivers and spectrum analyzers	26
6.6.4 Scan times for stepping receivers	27
6.6.5 Strategies for obtaining a spectrum overview using the peak detector	28

6.6.6	Timing considerations using FFT-based instruments.....	31
7	Measurement of disturbances conducted along leads, 9 kHz to 30 MHz	33
7.1	General.....	33
7.2	Measuring equipment (receivers, etc.)	33
7.2.1	General	33
7.2.2	Use of detectors for conducted disturbance measurements	33
7.3	Ancillary measuring equipment	34
7.3.1	General	34
7.3.2	Artificial networks (ANs)	34
7.3.3	Voltage probes	34
7.3.4	Current probes	35
7.4	Equipment under test configuration.....	35
7.4.1	Arrangement of the EUT and its connection to the AN	35
7.4.2	Procedure for the measurement of unsymmetric disturbance voltages with V-networks (AMNs)	40
7.4.3	Measurement of common mode voltages at differential mode signal terminals	47
7.4.4	Measurements using voltage probes	48
7.4.5	Measurement using a capacitive voltage probe (CVP)	51
7.4.6	Measurements using current probes	51
7.5	System test configuration for conducted emissions measurements	51
7.5.1	General approach to system measurements	51
7.5.2	System configuration	52
7.5.3	Measurements of interconnecting lines	54
7.5.4	Decoupling of system components.....	55
7.6	In situ measurements.....	55
7.6.1	General	55
7.6.2	Reference ground	55
7.6.3	Measurement with voltage probes.....	56
7.6.4	Selection of measuring points.....	56
8	Automated measurement of disturbances	56
8.1	Precautions for automating measurements.....	56
8.2	Generic measurement procedure	57
8.3	Prescan measurements	57
8.4	Data reduction	58
8.5	Disturbance maximization and final measurement.....	58
8.6	Post processing and reporting.....	59
8.7	Disturbance measurement strategies with FFT-based measuring instruments	59
9	Test set-up and measurement procedure using the CDNE in the frequency range 30 MHz to 300 MHz	59
9.1	General.....	59
9.2	Test set-up	60
9.3	Measurement procedure	62
Annex A (informative)	Guidelines for connection of electrical equipment to the artificial mains network	63
A.1	General.....	63
A.2	Classification of the possible cases.....	63
A.2.1	Well-shielded but poorly filtered EUT (Figures A.1 and A.2).....	63

A.2.2	Well-filtered but incompletely shielded EUT (Figures A.3 and A.4)	64
A.2.3	Practical general case	64
A.3	Method of grounding	66
A.4	Conditions of grounding	66
A.4.1	General	66
A.4.2	Classification of typical testing conditions	67
A.5	Connection of the AMN as a voltage probe	68
Annex B (informative)	Use of spectrum analyzers and scanning receivers	70
B.1	General.....	70
B.2	Overload	70
B.3	Linearity test.....	70
B.4	Selectivity	70
B.5	Normal response to pulses.....	70
B.6	Peak detection	70
B.7	Frequency scan rate	71
B.8	Signal interception	71
B.9	Average detection.....	71
B.10	Sensitivity	71
B.11	Amplitude accuracy.....	72
Annex C (informative)	Decision tree for use of detectors for conducted disturbance measurements	73
Annex D (informative)	Scan rates and measurement times for use with the average detector	75
D.1	General.....	75
D.2	Suppression of impulsive disturbance	75
D.2.1	General	75
D.2.2	Suppression of impulsive disturbance by digital averaging.....	76
D.3	Suppression of amplitude modulation.....	76
D.4	Measurement of slowly intermittent, unsteady or drifting narrowband disturbances	76
D.5	Recommended procedure for automated or semi-automated measurements	78
Annex E (informative)	Guidelines for the improvement of the test set-up with ANs	79
E.1	In situ verification of the AN impedance and voltage division factor.....	79
E.2	PE chokes and sheath current absorbers for the suppression of ground loops.....	82
Annex F (normative)	Determination of suitability of spectrum analyzers for compliance tests	84
Annex G (informative)	Basic guidance for measurements on telecommunications ports	85
G.1	Limits.....	85
G.2	Combination of current probe and capacitive voltage probe (CVP)	86
G.3	Basic ideas of the capacitive voltage probe.....	86
G.4	Combination of current limit and voltage limit	87
G.5	Adjusting the TCM impedance with ferrites	89
G.6	Ferrite specifications for use with methods of Annex H	89
Annex H (normative)	Specific guidance for conducted disturbance measurements on telecommunication ports	92
H.1	General.....	92

H.2	Characteristics of AANs	93
H.3	Characteristics of current probe	94
H.4	Characteristics of capacitive voltage probe	94
H.5	Procedures for common mode measurements	94
H.5.1	General	94
H.5.2	Measurement procedure using AANs	94
H.5.3	Measurement procedure using a 150 Ω load connected to the outside surface of the cable screen	95
H.5.4	Measurement procedure using a combination of current probe and capacitive voltage probe	96
H.5.5	Measurement of cable, ferrite and AE common mode impedance	97
Annex I (informative)	Examples of AANs and ANs for screened cables	99
Bibliography		108

Figure 1	– Example of a recommended test set-up with PE chokes with three AMNs and a sheath current absorber on the RF cable	19
Figure 2	– Measurement of a combination of a CW signal (“NB”) and an impulsive signal (“BB”) using multiple sweeps with maximum hold	28
Figure 3	– Example of a timing analysis	29
Figure 4	– A broadband spectrum measured with a stepped receiver	30
Figure 5	– Intermittent narrowband disturbances measured using fast short repetitive sweeps with maximum hold function to obtain an overview of the disturbance spectrum	30
Figure 6	– FFT scan in segments	32
Figure 7	– Frequency resolution enhanced by FFT-based measuring instrument	32
Figure 8	– Illustration of current I_{CCM}	35
Figure 9	– Test configuration: table-top equipment for conducted disturbance measurements on power mains	37
Figure 10	– Arrangement of EUT and AMN at 40 cm distance, with a) vertical RGP and b) horizontal RGP	38
Figure 11	– Optional example test configuration for an EUT with only a power cord attached	38
Figure 12	– Test configuration: floor-standing equipment (see 7.4.1 and 7.5.2.3)	39
Figure 13	– Example test configuration: floor-standing and table-top equipment (see 7.4.1 and 7.5.2.3)	40
Figure 14	– Schematic of disturbance voltage measurement configuration (see also 7.5.2.3)	42
Figure 15	– Equivalent circuit for measurement of unsymmetric disturbance voltage for safety-class I (grounded) EUT	43
Figure 16	– Equivalent circuit for measurement of unsymmetric disturbance voltage for safety-class II (ungrounded) EUT	44
Figure 17	– RC element for artificial hand	46
Figure 18	– Portable electric drill with artificial hand	46
Figure 19	– Portable electric saw with artificial hand	46
Figure 20	– Measuring example for voltage probes	49
Figure 21	– Measurement arrangement for two-terminal regulating controls	50
Figure 22	– Generic process to help reduce measurement time	57
Figure 23	– Test set-up for measurement of an EUT with one cable	61

Figure 24 – Test set-up for measurement of an EUT with two cables connected adjacent surfaces of the EUT	61
Figure 25 – Test set-up for measurement of an EUT with two cables connected on the same surface of the EUT	62
Figure A.1 – Basic schematic of well-shielded but poorly filtered EUT	63
Figure A.2 – Detail of well-shielded but poorly filtered EUT	64
Figure A.3 – Well-filtered but incompletely shielded EUT	64
Figure A.4 – Well-filtered but incompletely shielded EUT, with U_2 reduced to zero	64
Figure A.5 – Disturbance supply through shielded conductors	65
Figure A.6 – Disturbance supply through unshielded but filtered conductors	65
Figure A.7 – Disturbance supply through ordinary conductors	66
Figure A.8 – AMN configurations	68
Figure C.1 – Decision tree for optimizing speed of conducted disturbance measurements with peak, quasi-peak and average detectors	73
Figure D.1 – Weighting function of a 10 ms pulse for peak (“PK”) and average detections with (“CISPR AV”) and without (“AV”) peak reading; meter time constant 160 ms	77
Figure D.2 – Weighting functions of a 10 ms pulse for peak (“PK”) and average detections with (“CISPR AV”) and without (“AV”) peak reading; meter time constant 100 ms	77
Figure D.3 – Example of weighting functions (of a 1 Hz pulse) for peak (“PK”) and average detections as a function of pulse width; meter time constant 160 ms	78
Figure D.4 – Example of weighting functions (of a 1 Hz pulse) for peak (“PK”) and average detections as a function of pulse width; meter time constant 100 ms	78
Figure E.1 – Parallel resonance of enclosure capacitance and ground strap inductance	79
Figure E.2 – Connection of an AMN to RGP using a wide grounding sheet for low inductance grounding	80
Figure E.3 – Impedance measured with the arrangement of Figure E.2 both with reference to the front panel ground and to the grounding sheet	80
Figure E.4 – VDF in the configuration of Figure E.2 measured with reference to the front panel ground and to the grounding sheet	80
Figure E.5 – Arrangement showing the measurement grounding sheet (shown with dotted lines) when measuring the impedance with reference to RGP	81
Figure E.6 – Impedance measured with the arrangement of Figure E.5 with reference to the RGP	81
Figure E.7 – VDF measured with parallel resonances in the AMN grounding	81
Figure E.8 – Attenuation of a sheath current absorber measured in a 150 Ω test arrangement	82
Figure E.9 – Arrangement for the measurement of attenuation due to PE chokes and sheath current absorbers	83
Figure G.1 – Basic circuit for considering the limits with a defined TCM impedance of 150 Ω	88
Figure G.2 – Basic circuit for the measurement with unknown TCM impedance	88
Figure G.3 – Impedance layout of the components used in Figure H.2	90
Figure G.4 – Basic test set-up to measure combined impedance of the 150 Ω and ferrites	91
Figure H.1 – Measurement set-up using an AAN	95

Figure H.2 – Measurement set-up using a 150 Ω load to the outside surface of the shield.....	96
Figure H.3 – Measurement set-up using current and capacitive voltage probes.....	97
Figure H.4 – Characterization set-up.....	98
Figure I.1 – Example AAN for use with unscreened single balanced pairs.....	99
Figure I.2 – Example AAN with high LCL for use with either one or two unscreened balanced pairs.....	100
Figure I.3 – Example AAN with high LCL for use with one, two, three, or four unscreened balanced pairs.....	101
Figure I.4 – Example AAN, including a 50 Ω source matching network at the voltage measuring port, for use with two unscreened balanced pairs.....	102
Figure I.5 – Example AAN for use with two unscreened balanced pairs.....	103
Figure I.6 – Example AAN, including a 50 Ω source matching network at the voltage measuring port, for use with four unscreened balanced pairs.....	104
Figure I.7 – Example AAN for use with four unscreened balanced pairs.....	105
Figure I.8 – Example AN for use with coaxial cables, employing an internal common mode choke created by bifilar winding an insulated centre-conductor wire and an insulated screen-conductor wire on a common magnetic core (for example, a ferrite toroid).....	106
Figure I.9 – Example AN for use with coaxial cables, employing an internal common mode choke created by miniature coaxial cable (miniature semi-rigid solid copper screen or miniature double-braided screen coaxial cable) wound on ferrite toroids.....	106
Figure I.10 – Example AN for use with multi-conductor screened cables, employing an internal common mode choke created by bifilar winding multiple insulated signal wires and an insulated screen-conductor wire on a common magnetic core (for example, a ferrite toroid).....	107
Figure I.11 – Example AN for use with multi-conductor screened cables, employing an internal common mode choke created by winding a multi-conductor screened cable on ferrite toroids.....	107
Table 1 – Minimum scan times for the three CISPR bands with peak and quasi-peak detectors.....	26
Table 2 – Minimum measurement times for the four CISPR bands.....	26
Table A.2 – Testing conditions for types of EUTs – Screened cable.....	69
Table B.1 – Sweep time/frequency or fastest scan rate.....	71
Table D.1 – Pulse suppression factors and scan rates for a 100 Hz video bandwidth.....	76
Table D.2 – Meter time constants and the corresponding video bandwidths and maximum scan rates.....	77
Table F.1 – Maximum amplitude difference between peak and quasi-peak detected signals.....	84
Table G.1 – Summary of advantages and disadvantages of the methods described in the specific subclauses of Annex H.....	86
Table H.1 – Telecommunication port disturbance measurement procedure selection.....	92
Table H.2 – a_{LCL} values.....	93

INTERNATIONAL ELECTROTECHNICAL COMMISSION
INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

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

**Part 2-1: Methods of measurement of disturbances and immunity –
Conducted disturbance measurements**

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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard CISPR 16-2-1 has been prepared by CISPR subcommittee A: Radio-interference measurements and statistical methods.

This third edition cancels and replaces the second edition published in 2008, Amendment 1:2010 and Amendment 2:2013. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition: Methods of measurement using a new type of ancillary equipment – the CDNE – are added.

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

FDIS	Report on voting
CISPR/A/1053/FDIS	CISPR/A/1062/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 CISPR 16 series under the general title *Specification for radio disturbance and immunity measuring apparatus and methods*, can be found 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 document using a colour printer.

SPECIFICATION FOR RADIO DISTURBANCE AND IMMUNITY MEASURING APPARATUS AND METHODS –

Part 2-1: Methods of measurement of disturbances and immunity – Conducted disturbance measurements

1 Scope

This part of CISPR 16 is designated a basic standard, which specifies the methods of measurement of disturbance phenomena in general in the frequency range 9 kHz to 18 GHz and especially of conducted disturbance phenomena in the frequency range 9 kHz to 30 MHz. With a CDNE, the frequency range is 9 kHz to 300 Hz.

NOTE In accordance with IEC Guide 107, CISPR 16 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 product committees in the evaluation of the value of particular EMC tests for specific products.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

CISPR 16-1-1:2010, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus*

CISPR 16-1-2:2014, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – Coupling devices for conducted disturbance measurements*

CISPR 16-4-2, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements*

IEC 60050 (all parts), *International Electrotechnical Vocabulary* (available at <http://www.electropedia.org>)

koniec náhľadu – text ďalej pokračuje v platenej verzii STN