Sisaldab värvilisi lehekülgi
Colour inside

RAADIOHÄIRINGUTE JA HÄIRINGUTALUVUSE MÕÕTESEADMED JA -MEETODID. OSA 2-3: HÄIRINGUTE JA HÄIRINGUTALUVUSE MÕÕTEMEETODID. KIIRGUSHÄIRINGUTE MÕÕTMINE

Specification for radio disturbance and immunity measuring apparatus and methods - Part 2-3: Methods of measurement of disturbances and immunity - Radiated disturbance measurements (CISPR 16-2-3:2016 + CISPR 16-2-3:2016/A1:2019 + CISPR 16-2-3:2016/AMD2:2023)

EVS • EESTI STANDARDIMIS- JA AKREDITEERIMISKESKUS
ESTONIAN CENTRE FOR STANDARDISATION AND ACCREDITATION

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 55016-2-3:2017 +A1+A2:2023 sisaldab Euroopa standardi EN 55016-2-3:2017 ja selle muudatuste A1:2019 ja A2:2023, ingliskeelset teksti.	This Estonian standard EVS-EN 55016-2-3:2017+A1+A2:2023 consists of the English text of the European standard EN 55016-2-3:2017 and its amendments A1:2019 and A2:2023.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas. Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 28.04.2017, muudatused A1 20.09.2019 ja A2 04.08.2023.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation. Date of Availability of the European standard is 28.04.2017, for A1 20.09.2019 and A2 04.08.2023.
Muudatusega A1 lisatud või muudetud teksti algus ja lõpp on tekstis tähistatud sümbolitega [A1] ⟨A1⟩. Muudatusega A2 lisatud või muudetud teksti algus ja lõpp on tekstis tähistatud sümbolitega [A2] ⟨A2⟩. Standard on kättesaadav Eesti Standardimis-ja Akrediteerimiskeskusest.	The start and finish of text introduced or altered by amendment A1 is indicated in the text by tags [A1] ⟨A1⟩. The start and finish of text introduced or altered by amendment A2 is indicated in the text by tags [A2] ⟨A2⟩. The standard is available from the Estonian Centre for Standardisation and Accreditation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 33.100.10; 33.100.20

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 55016-2-3 + A1 + A2

April 2017, September 2019, August 2023

ICS 33.100.10; 33.100.20

Supersedes EN 55016-2-3:2010

English Version

Specification for radio disturbance and immunity measuring apparatus and methods - Part 2-3: Methods of measurement of disturbances and immunity - Radiated disturbance measurements (CISPR 16-2-3:2016 + CISPR 16-2-3:2016/A1:2019 + CISPR 16-2-3:2016/AMD2:2023)

Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques - Partie 2-3: Méthodes de mesure des perturbations et de l'immunité - Mesures des perturbations rayonnées
(CISPR 16-2-3:2016 + CISPR 16-2-3:2016/A1:2019 + CISPR 16-2-3:2016/AMD2:2023)

Anforderungen an Geräte und Einrichtungen sowie Festlegung der Verfahren zur Messung der hochfrequenten Störaussendung (Funkstörungen) und Störfestigkeit - Teil 2-3: Verfahren zur Messung der hochfrequenten Störaussendung (Funkstörungen) und Störfestigkeit - Messung der gestrahlten Störaussendung
(CISPR 16-2-3:2016 + CISPR 16-2-3:2016/A1:2019 + CISPR 16-2-3:2016/AMD2:2023)

This European Standard was approved by CENELEC on 2016-10-20. Amendment A1 was approved by CENELEC on 2019-07-30. Amendment A2 was approved by CENELEC on 2023-07-19. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard and its amendments 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 and its Amendments A1 and A2 exist 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, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye 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

Ref. No. EN 55016-2-3:2017 E
+ EN 55016-2-3:2017/A1:2019 E
+ EN 55016-2-3:2017/A2:2023 E

European foreword

The text of document CISPR/A/1176A/FDIS, future edition 4 of CISPR 16-2-3, prepared by CISPR SC A "Radio-Interference measurements and statistical methods" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 55016-2-3:2017.

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)	2017-10-28
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2020-04-28

This document supersedes EN 55016-2-3:2010.

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 16-2-3:2016 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 11:2015	NOTE	Harmonized as EN 55011:2016.
CISPR 16-1-6:2014	NOTE	Harmonized as EN 55016-1-6:2015.
CISPR 22:2008	NOTE	Harmonized as EN 55022:2010.
IEC 61140:2016	NOTE	Harmonized as EN 61140:2016.
ISO/IEC Guide 2:2004	NOTE	Harmonized as EN 45020:2006.
ISO/IEC 17000:2004	NOTE	Harmonized as EN ISO/IEC 17000:2004.
IEC 61000-4-21	NOTE	Harmonized as EN 61000-4-21.

A1 Amendment A1 European foreword

The text of document CIS/A/1278/FDIS, future CISPR 16-2-3/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 55016-2-3:2017/A1:2019.

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) 2020-04-25
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2022-07-25

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

Endorsement notice

The text of the International Standard CISPR 16-2-3:2016/A1:2019 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 11:2015	NOTE	Harmonized as EN 55011:2016
CISPR 32:2015	NOTE	Harmonized as EN 55032:2015 (not modified)

A1

A2 Amendment A2 European foreword

The text of document CIS/A/1391/FDIS, future CISPR 16-2-3/AMD2, 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 55016-2-3:2017/A2:2023.

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) 2024-04-19
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2026-07-19

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

This document has been prepared under a standardization request addressed to CENELEC by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard CISPR 16-2-3:2016/AMD2:2023 was approved by CENELEC as a European Standard without any modification. /A2

CISPR 16-2-3

Edition 4.2 2023-06
CONSOLIDATED VERSION

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

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 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements

Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Partie 2-3: Méthodes de mesure des perturbations et de l'immunité – Mesurages des perturbations rayonnées

CISPR 16-2-3:2016-09+AMD1:2019-06+AMD2:2023-06 CSV(en-fr)

IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
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 corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
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 once a month by email.

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: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

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.

Recherche de publications IEC - webstore.iec.ch/advsearchform
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 une fois par mois par email.

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

IEC Products & Services Portal - products.iec.ch
Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org
Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 300 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 19 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

CISPR 16-2-3

Edition 4.2 2023-06
CONSOLIDATED VERSION

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

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 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements

Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Partie 2-3: Méthodes de mesure des perturbations et de l'immunité – Mesurages des perturbations rayonnées

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 33.100.10; 33.100.20

ISBN 978-2-8322-7143-8

CONTENTS

FOREWORD....9
[A1] Amendment A1 FOREWORD [A1]....11
[A2] Amendment A2 FOREWORD [A2]....12
[A1] Amendment A1 INTRODUCTION [A1]....13
1 Scope....14
2 Normative references....14
3 Terms, definitions and abbreviations....15
3.1 Terms and definitions....15
3.2 Abbreviated terms....21
4 Types of disturbance to be measured....22
4.1 General....22
4.2 Types of disturbance....22
4.3 Detector functions....23
5 Connection of measuring equipment....23
6 General measurement requirements and conditions....23
6.1 General....23
6.2 Disturbance not produced by the equipment under test....24
6.2.1 General....24
6.2.2 Compliance (conformity assessment) testing....24
6.3 Measurement of continuous disturbance....24
6.3.1 Narrowband continuous disturbance....24
6.3.2 Broadband continuous disturbance....24
6.3.3 Use of spectrum analyzers and scanning receivers....24
6.4 EUT arrangement and measurement conditions....24
6.4.1 General arrangement of the EUT....24
6.4.2 Operation of the EUT....27
6.4.3 EUT time of operation....27
6.4.4 EUT running-in time....27
6.4.5 EUT supply....27
6.4.6 EUT mode of operation....27
6.4.7 Operation of multifunction equipment....28
6.4.8 Determination of arrangement(s) causing maximum emissions....28
6.4.9 Recording of measurements....28
6.5 Interpretation of measuring results....28
6.5.1 Continuous disturbance....28
6.5.2 Discontinuous disturbance....29
6.5.3 Measurement of the duration of disturbance....29
6.6 Measurement times and scan rates for continuous disturbance....29
6.6.1 General....29
6.6.2 Minimum measurement times....29
6.6.3 Scan rates for scanning receivers and spectrum analyzers....30
6.6.4 Scan times for stepping receivers....31
6.6.5 Strategies for obtaining a spectrum overview using the peak detector....32
6.6.6 Timing considerations using FFT-based instruments....35
7 Measurement of radiated disturbances....39

7.1 [A1] General [A1] 39
7.1.1 General remarks and overview of test methods 39
7.1.2 Overview of maximum EUT volumes depending on measurement method, frequency range, and measurement distance 40
7.2 Loop-antenna system measurements (9 kHz to 30 MHz) 42
7.2.1 General 42
7.2.2 General measurement method 42
7.2.3 Test environment 43
7.2.4 Configuration of the equipment under test 43
7.2.5 Measurement uncertainty for [A1] LLAS [A1] 44
7.3 Open-area test site or semi-anechoic chamber measurements (30 MHz to 1 GHz) 44
7.3.1 Measurand 44
7.3.2 Test site requirements 47
7.3.3 General measurement method 47
7.3.4 Measurement distance 48
7.3.5 Antenna height variation 49
7.3.6 Product specification details 49
7.3.7 Measurement instrumentation 51
7.3.8 Field-strength measurements on other outdoor sites 51
7.3.9 Measurement uncertainty for OATS and SAC 51
7.4 Fully-anechoic room measurements (30 MHz to 1 GHz) 51
7.4.1 Test set-up and site geometry 51
7.4.2 EUT position 54
7.4.3 Cable layout and termination 55
7.4.4 Measurement uncertainty for FAR 56
7.5 Radiated emission measurement method (30 MHz to 1 GHz) and radiated immunity test method (80 MHz to 1 GHz) with common test set-up in semi-anechoic chamber 56
7.5.1 Applicability 56
7.5.2 EUT perimeter definition and antenna-to-EUT separation distance 56
7.5.3 Uniform test volume 57
7.5.4 Specifications for EUT set-up in common emissions/immunity test set-up 58
7.5.5 Measurement uncertainty for common emission/immunity set-up and method 64
7.6 Fully-anechoic room and absorber-lined OATS/SAC measurements (1 GHz to 18 GHz) 64
7.6.1 [A1] Measurand [A1] 64
7.6.2 Measurement distance 65
7.6.3 Set-up and operating conditions of the equipment under test (EUT) 65
7.6.4 Measurement site 66
7.6.5 Measurement instrumentation 66
7.6.6 Measurement procedure 66
7.6.7 Measurement uncertainty for FAR 72
7.7 *In situ* measurements (9 kHz to 18 GHz) 72
7.7.1 Applicability of and preparation for *in situ* measurements 72
7.7.2 Field-strength measurements *in situ* in the frequency range 9 kHz to 30 MHz 73
7.7.3 Field-strength measurements *in situ* in the frequency range above 30 MHz 74

7.7.4 *In situ* measurement of the disturbance effective radiated power using the substitution method 75
7.7.5 Documentation of the measurement results 79
7.7.6 Measurement uncertainty for *in situ* method 79
7.8 Substitution measurements (30 MHz to 18 GHz) 79
7.8.1 General 79
7.8.2 Test site 80
7.8.3 Test antennas 80
7.8.4 EUT configuration 81
7.8.5 Test procedure 81
7.8.6 Measurement uncertainty for substitution method 81
7.9 Reverberation chamber measurements (80 MHz to 18 GHz) 81
7.10 TEM waveguide measurements (30 MHz to 18 GHz) 81
A2 7.11 Open-area test site or semi-anechoic chamber measurements (9 kHz to 30 MHz) 82
7.11.1 Measurand 82
7.11.2 Test site requirements 83
7.11.3 General measurement method 83
7.11.4 Measurement distance and EUT dimensions 85
7.11.5 Antenna height 85
7.11.6 Product standard specification details 85
7.11.7 Measurement uncertainty for OATS and SAC 86
7.11.8 Field strength measurements at other sites A2 86
8 Automated measurement of emissions 86
8.1 Introduction – Precautions for automated measurements 86
8.2 Generic measurement procedure 86
8.3 Pre-scan measurements 87
8.3.1 General 87
8.3.2 Determination of the required measurement time 87
8.3.3 Pre-scan requirements for different types of measurements 88
8.4 Data reduction 89
8.5 Emission maximization and final measurement 89
8.6 Post-processing and reporting 90
8.7 Emission measurement strategies with FFT-based measuring instruments 90
Annex A (informative) Measurement of disturbances in the presence of ambient emissions 91
A.1 General 91
A.2 Terms and definitions 91
A.3 Problem description 91
A.4 Proposed solution 91
A.4.1 Overview 91
A.4.2 Pre-testing the EUT in a shielded room 94
A.4.3 Method of measurement of EUT disturbances in the presence of narrowband ambient emissions 95
A.4.4 Method of measurement of EUT disturbance in the presence of broadband ambient emissions 98
A.5 Determination of the EUT disturbance in case of superposition 100
Annex B (informative) Use of spectrum analyzers and scanning receivers 105
B.1 General 105

B.2 Overload 105
B.3 Linearity test 105
B.4 Selectivity 105
B.5 Normal response to pulses 105
B.6 Peak detection 105
B.7 Frequency scan rate 106
B.8 Signal interception 106
B.9 Average detection 106
B.10 Sensitivity 106
B.11 Amplitude accuracy 107
Annex C (informative) Scan rates and measurement times for use with the average detector 108
C.1 Purpose 108
C.2 Suppression of disturbances 108
C.2.1 Suppression of impulsive disturbance 108
C.2.2 Suppression of impulsive disturbance by digital averaging 109
C.2.3 Suppression of amplitude modulation 109
C.3 Measurement of slowly intermittent, unsteady or drifting narrowband disturbances 109
C.4 Recommended procedure for automated or semi-automated measurements 111
Annex D (informative) Explanation of the APD measurement method applying to the compliance test 112
Annex E (normative) Determination of suitability of spectrum analyzers for compliance tests 114
〈A1〉 Annex F (informative) Background for EUT-volume specifications depending on measurement distance and frequency range 115
F.1 General 115
F.2 Criterion 1 – Limitation of field-strength underestimations due to a large ratio of EUT volume diameter-to-measurement distance for short-distance measurements 115
F.2.1 General 115
F.2.2 9 kHz to 30 MHz 115
F.2.3 30 MHz to 1 000 MHz 116
F.2.4 1 GHz to 18 GHz 116
F.3 Criterion 2 – Limitation due to near-field effects 117
F.3.1 General 117
F.3.2 9 kHz to 30 MHz 117
F.3.3 30 MHz to 1 000 MHz 117
F.3.4 1 GHz to 18 GHz 120
F.4 Criterion 3 – Limitation due to receive antenna beamwidth 120
F.4.1 General 120
F.4.2 9 kHz to 30 MHz 120
F.4.3 30 MHz to 1 000 MHz 121
F.4.4 1 GHz to 18 GHz 122
F.5 Criterion 4 – Limitation due to the results of test site validation 125
F.5.1 General 125
F.5.2 9 kHz to 30 MHz 125
F.5.3 30 MHz to 1 000 MHz 125
F.5.4 1 GHz to 6 GHz or to 18 GHz 〈A1〉 125

Annex ZA (normative) Normative references to international publications with their corresponding European publications 126
Bibliography 128

Figure 1 – Measurement of a combination of a CW signal (NB) and an impulsive signal (BB) using multiple sweeps with maximum hold 32
Figure 2 – Example of a timing analysis 33
Figure 3 – A broadband spectrum measured with a stepped receiver 34
Figure 4 – Intermittent narrowband disturbances measured using fast short repetitive sweeps with maximum hold function to obtain an overview of the emission spectrum 35
Figure 5 – FFT scan in segments 37
Figure 6 – Frequency resolution enhanced by FFT-based measuring instrument 38
Figure 7 – Concept of magnetic field induced current measurements made with the loop antenna system 43
Figure 8 – Measurement distance 45
Figure 9 – Separation distance relative to the phase centre of an LPDA antenna 47
Figure 10 – Concept of electric field strength measurements made on an open-area test site (OATS) or semi-anechoic chamber (SAC) showing the direct and reflected rays arriving at the receiving antenna 48
Figure 11 – Position of CMAD for table-top equipment on OATS or in SAC 51
Figure 12 – Typical FAR site geometry, where a, b, c, e depend upon the room performance 52
Figure 13 – Typical test set-up for table-top equipment within the test volume of a FAR 53
Figure 14 – Typical test set-up for floor-standing equipment within the test volume of a FAR 54
Figure 15 – Positions of reference planes for uniform field calibration (top-view) 57
Figure 16 – Test set-up for table-top equipment 61
Figure 17 – Test set-up for table-top equipment – Top view 62
Figure 18 – Test set-up for floor-standing equipment 63
Figure 19 – Test set-up for floor-standing equipment – Top view 64
Figure 20 – Measurement method above 1 GHz, receive antenna in vertical polarization 67
Figure 22 – Determination of the transition distance 78
Figure 23 – Substitution method set-up geometries for: a) measurement, b) calibration 80
Figure 25 – Concept of magnetic field strength measurement set-up at an OATS or in a SAC for table-top EUT 83
Figure 26 – Concept of magnetic field strength measurement set-up at an OATS or in a SAC for floor-standing EUT 84
Figure 27 – Feed point location 84
Figure 24 – Process to give reduction of measurement time 87
Figure A.1 – Flow diagram for the selection of bandwidths and detectors and the estimated measurement errors due to that selection 93
Figure A.2 – Relative difference in adjacent emission amplitudes during preliminary testing 95
Figure A.3 – Disturbance by an unmodulated signal (dotted line) 96
Figure A.4 – Disturbance by an amplitude-modulated signal (dotted line) 96

Figure A.5 – Indication of an amplitude-modulated signal as a function of modulation frequency with the QP detector in CISPR bands B, C and D 97
Figure A.6 – Indication of a pulse-modulated signal (pulse width 50 μs) as a function of pulse repetition frequency with peak, QP and average detectors 98
Figure A.7 – Disturbance by a broadband signal (dotted line) 98
Figure A.8 – Unmodulated EUT disturbance (dotted line) 99
Figure A.9 – Amplitude-modulated EUT disturbance (dotted line) 100
Figure A.10 – Increase of peak value with superposition of two unmodulated signals 101
Figure A.11 – Determination of the amplitude of the disturbance signal by means of the amplitude ratio d and the factor i (see Equation (A.3) and Equation (A.6)) 102
Figure A.12 – Increase of average indication measured with a real receiver and calculated from Equation (A.8) 103
Figure C.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 110
Figure C.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 110
Figure C.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 111
Figure C.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 111
Figure D.1 – Example of APD measurement Method 1 for fluctuating disturbances 112
Figure D.2 – Example of APD measurement Method 2 for fluctuating disturbances 113

Table 1 – Minimum measurement times for the four CISPR bands 29
Table 2 – Minimum scan times for the three CISPR bands with peak and quasi-peak detectors 30
Table 8 – Applicable frequency ranges and document references for CISPR radiated disturbance test sites and measurement methods 40
Table 9 – Maximum EUT dimensions for different LLAS diameters, 9 kHz to 30 MHz 40
Table 10 – Recommended maximum EUT-volume diameter D (in m) and height h (in m), OATS/SAC and outdoor site, 9 kHz to 30 MHz 41
Table 11 – Maximum EUT-volume diameter D (in m) and height h (in m), OATS/SAC and FAR, 30 MHz to 1 000 MHz 41
Table 12 – Recommended maximum EUT-volume diameter D (in m) and height h (in m) – for reduced near-field uncertainty; absorber-lined OATS/SAC and FAR, 1 GHz to 18 GHz 42
Table 5 – Example values of w for three antenna types 68
Table 6 – Horizontal polarization correction factors as a function of frequency 78
Table 7 – Recommended antenna heights to guarantee signal interception (for pre-scan) in the frequency range 30 MHz to 1 000 MHz 88
Table A.1 – Combinations of EUT disturbance and ambient emissions 92
Table A.2 – Measurement error depending on the detector type and on the combination of ambient and disturbing signal spectra 104
Table C.1 – Pulse suppression factors and scan rates for a 100 Hz video bandwidth 109
Table C.2 – Meter time constants and the corresponding video bandwidths and minimum scan times 110
Table E.1 – Maximum amplitude difference between peak and quasi-peak detected signals 114

Table F.1 – Maximum EUT volume diameters (D_{max}) and heights (h_{max}) per Formula (F.1) for various measurement distances (d) 118

INTERNATIONAL ELECTROTECHNICAL COMMISSION

INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

_____

SPECIFICATION FOR RADIO DISTURBANCE AND IMMUNITY MEASURING APPARATUS AND METHODS –

Part 2-3: Methods of measurement of disturbances and immunity – Radiated 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 16-2-3 has been prepared by CISPR subcommittee A: Radio-interference measurements and statistical methods.

This fourth edition edition cancels and replaces the third edition published in 2010, its Amendment 1:2010 and its Amendment 2:2014. This edition constitutes a technical revision.

This edition includes the following significant technical change with respect to the previous edition: addition of content on correction of the electric field strength to account for phase centre of log-periodic dipole array antennas.

It has the status of a basic EMC publication in accordance with IEC Guide 107, *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/1176A/FDIS	CISPR/A/1182/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, published 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 website 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.

〈A1〉 Amendment A1 FOREWORD

This amendment has been prepared by CISPR subcommittee A: Radio-interference measurements and statistical methods.

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

FDIS	Report on voting
CISPR/A/1278/FDIS	CISPR/A/1283/RVD

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table.

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the stability date indicated on the IEC website 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.

〈A1〉

A2 Amendment A2 FOREWORD

Amendment 2 to CISPR 16-2-3:2016 has been prepared by CISPR subcommittee A: Radio-interference measurements and statistical methods.

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

Draft	Report on voting
CIS/A/1391/FDIS	CIS/A/1397/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Amendment is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications/.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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

IMPORTANT – The "colour inside" logo on the cover page of this document 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.

A2

〖A1〗 Amendment A1 INTRODUCTION

Amendment of CISPR 16-2-3 regarding EUT volume specifications for radiated disturbance measurements depending on test method and on measurement distance 〈A1〗

SPECIFICATION FOR RADIO DISTURBANCE AND IMMUNITY MEASURING APPARATUS AND METHODS –

Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements

1 Scope

This part of CISPR 16 specifies the methods of measurement of radiated disturbance phenomena in the frequency range of 9 kHz to 18 GHz. The aspects of measurement uncertainty are specified in CISPR 16-4-1 and CISPR 16-4-2.

NOTE In accordance with IEC Guide 107 [13][1], CISPR 16-2-3 is a basic EMC publication 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 subcommittees 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 14-1:2016, *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission*

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*

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*

▌A2⟩ CISPR 16-1-4:2019, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Antennas and test sites for radiated disturbance measurements*
CISPR 16-1-4:2019/AMD1:2020
CISPR 16-1-4:2019/AMD2:2023 ⟨A2▌

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

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

---

1 Numbers in square brackets refer to the Bibliography.

[A1] CISPR 16-4-2:2011[2], *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/AMD1:2014
CISPR 16-4-2:2011/AMD2:2018 [A1]

CISPR TR 16-4-5, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-5: Uncertainties, statistics and limit modelling – Conditions for the use of alternative test methods*

IEC 60050-161, *International Electrotechnical Vocabulary – Chapter 161: Electromagnetic compatibility*

IEC 61000-4-3:2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*
IEC 61000-4-3:2006/AMD1:2007
IEC 61000-4-3:2006/AMD2:2010

IEC 61000-4-20, *Electromagnetic compatibility (EMC) – Part 4-20: Testing and measurement techniques – Emission and immunity testing in transverse electromagnetic (TEM) waveguides*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-161, as well as the following apply.

3.1.1
absorber-lined OATS/SAC
OATS or SAC with ground plane partially covered by RF-energy absorbing material

[A1] Note 1 to entry: CISPR 16-1-4 uses the analogous term free-space open-area test site (FSOATS). [A1]

3.1.2
ancillary equipment
transducers (e.g. current and voltage probes and artificial networks) connected to a measuring receiver or (test) signal generator and used in the disturbance signal transfer between the EUT and the measuring or test equipment

3.1.3
antenna beam
main lobe of the antenna pattern (gain pattern) of the receive antenna (usually the direction with maximum sensitivity or lowest antenna factor) that is directed towards the EUT

3.1.4
antenna beamwidth
angle between the half-power (3 dB) points of the main lobe of the antenna beam, when referenced to the maximum power of the main lobe

Note 1 to entry: It may be expressed for the H plane or for the E plane of the antenna.

Note 2 to entry: Antenna beamwidth is expressed in degrees.

[2] A consolidated version of this publication exists, comprising CISPR 16-4-2:2011, CISPR 16-4-2:2011/AMD1:2014 and CISPR 16-4-2:2011/AMD2:2018.