

INTERNATIONAL STANDARD

NORME INTERNATIONALE



INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE
COMITÉ INTERNATIONAL SPÉCIAL DES PERTURBATIONS RADIOÉLECTRIQUES

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 © 2013 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 la CEI ou du Comité national de la CEI du pays du demandeur.
Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI 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.

Useful links:

IEC publications search - www.iec.ch/searchpub

The advanced search enables you 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 on-line 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 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) on-line.

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 la CEI

La Commission Electrotechnique Internationale (CEI) 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 CEI

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

Liens utiles:

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

La recherche avancée vous permet de trouver des publications CEI 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.

Just Published CEI - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications de la CEI. 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 au monde 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 les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (VEI) en ligne.

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.

INTERNATIONAL STANDARD

NORME INTERNATIONALE



INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE
COMITÉ INTERNATIONAL SPÉCIAL DES PERTURBATIONS RADIOÉLECTRIQUES

**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

ICS 33.100.10; 33.100.20

ISBN 978-2-8322-0692-8

**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.....	7
INTRODUCTION (to amendment 1)	9
1 Scope.....	10
2 Normative references	10
3 Definitions	10
4 Types of disturbance to be measured	16
4.1 General	16
4.2 Types of disturbance	16
4.3 Detector functions	17
5 Connection of measuring equipment.....	17
5.1 General	17
5.2 Connection of ancillary equipment.....	17
5.3 Connections to RF reference ground	17
5.4 Connection between the EUT and the artificial mains network	19
6 General measurement requirements and conditions	19
6.1 General	19
6.2 Disturbance not produced by the equipment under test	19
6.2.1 General	19
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.....	20
6.4 Operating conditions of the EUT EUT arrangement and measurement conditions.....	20
6.4.1 General EUT arrangement.....	20
6.4.2 Normal load conditions	20
6.4.3 Duration of operation	23
6.4.4 Running-in/Warm-up time	23
6.4.5 Supply	23
6.4.6 Mode of operation.....	23
6.4.7 Operation of multifunction equipment.....	23
6.4.8 Determination of EUT arrangement(s) that maximizes emissions.....	24
6.4.9 Recording of measurement results	24
6.5 Interpretation of measuring results	23
6.5.1 Continuous disturbance	24
6.5.2 Discontinuous disturbance.....	24
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	Introduction	33
7.2	Measuring equipment (receivers, etc.)	34
7.2.1	General	34
7.2.2	Use of detectors for conducted disturbance measurements	34
7.3	Ancillary measuring equipment	34
7.3.1	General	34
7.3.2	Artificial networks (AN)	34
7.3.3	Voltage probes	35
7.3.4	Current probes	35
7.4	Equipment under test configuration	36
7.4.1	Arrangement of the EUT and its connection to the AN	36
7.4.2	Procedure for the measurement of unsymmetric disturbance voltages with V-networks (AMNs)	44
7.4.3	Measurement of common mode voltages at differential mode signal terminals	51
7.4.4	Measurements using voltage probes	52
7.4.5	Measurement using a capacitive voltage probe (CVP)	54
7.4.6	Measurements using current probes	55
7.5	System test configuration for conducted emissions measurements	55
7.5.1	General approach to system measurements	55
7.5.2	System configuration	56
7.5.3	Measurements of interconnecting lines	58
7.5.4	Decoupling of system components	58
7.6	<i>In situ</i> measurements	59
7.6.1	General	59
7.6.2	Reference ground	59
7.6.3	Measurement with voltage probes	59
7.6.4	Selection of measuring points	60
8	Automated measurement of emissions	60
8.1	Introduction. Precautions for automating measurements	60
8.2	Generic measurement procedure	60
8.3	Prescan measurements	61
8.4	Data reduction	62
8.5	Emission maximization and final measurement	62
8.6	Post processing and reporting	62
8.7	Emission measurement strategies with FFT-based measuring instruments	62
	Annex A (informative) Guidelines to connection of electrical equipment to the artificial mains network (see Clause 5)	63
	Annex B (informative) Use of spectrum analyzers and scanning receivers (see Clause 6)	70
	Annex C (informative) Decision tree for use of detectors for conducted measurements (see 7.2.2)	73

Annex D (informative) Scan rates and measurement times for use with the average detector	75
Annex E (informative) Guidelines for the improvement of the test setup with ANs	79
Annex F (normative) Determination of suitability of spectrum analyzers for compliance tests	84
Annex G (informative) Guidance for measurements on telecommunications ports	85
Annex H (normative) Specifics for conducted disturbance on telecommunication ports	92
Annex I (informative) Examples of AANs and ANs for screened cables	99
Bibliography.....	108
Figure 1 – Example of a recommended test setup with PE chokes with three AMNs and a sheath current absorber on the RF cable.....	18
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 emission spectrum.....	30
Figure 6 – Test configuration: table-top equipment for conducted disturbance measurements on power mains.....	38
Figure 7 – Arrangement of EUT and AMN at 40 cm distance with a) vertical RGP and b) horizontal RGP	27
Figure 8 – Optional example test configuration for an EUT with only a power cord attached	40
Figure 9 – Test configuration: floor-standing equipment (see 7.4.1 and 7.5.2.2).....	42
Figure 10 – Example Test configuration: floor-standing and table-top equipment (see 7.4.1 and 7.5.2.2)	43
Figure 11 – Schematic of disturbance voltage measurement configuration (see also 7.5.2.2).....	45
Figure 12a – Schematic for measurement and power circuit.....	46
Figure 12b – Equivalent voltage source and measurement circuit	46
Figure 12 – Equivalent circuit for measurement of common mode disturbance voltage for class I (grounded) EUT.....	46
Figure 13a – Schematic for power and measurement circuit.....	47
Figure 13b – Equivalent RFI source and measurement circuit	47
Figure 13 – Equivalent circuit for measurement of common mode disturbance voltage for class II (ungrounded) EUT	47
Figure 14 – RC element for artificial hand	49
Figure 15 – Portable electric drill with artificial hand	49
Figure 16 – Portable electric saw with artificial hand.....	49
Figure 17 – Measuring example for voltage probes	53
Figure 18 – Measurement arrangement for two-terminal regulating controls.....	53
Figure 19 – FFT scan in segments	32
Figure 20 – Frequency resolution enhanced by FFT-based measuring instrument.....	33
Figure 21 – Illustration of current I_{CCM}	36

Figure A.1	63
Figure A.2	64
Figure A.3	64
Figure A.4	64
Figure A.5	65
Figure A.6	65
Figure A.7	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. (The AMN used has a flat frequency response of the VDF, which may be different for other AMNs)	80
Figure E.5 – Arrangement showing the measurement grounding sheet (shown with dotted lines) when measuring the impedance with reference to RGP. The impedance measurement cable ground is connected to the measurement grounding sheet, whereas the inner conductor is connected to the EUT port pin.	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	82
Figure E.8 – Attenuation of a sheath current absorber measured in a 150-Ω test arrangement	83
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.....	25
Table 2 – Minimum measurement times for the four CISPR bands.....	26
Table A.1.....	69
Table A.2.....	69
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.

This consolidated version of CISPR 16-2-1 consists of the second edition (2008) [documents CISPR/A/798/FDIS and CISPR/A/809/RVD, its amendment 1 (2010) [documents CISPR/A/874/CDV and CISPR/A/897/RVC] and its amendment 2 (2013) [documents CISPR/A/1023/FDIS and CISPR/A/1029/RVD]. It bears the edition number 2.2.

The technical content is therefore identical to the base edition and its amendments and has been prepared for user convenience. A vertical line in the margin shows where the base publication has been modified by amendments 1 and 2. Additions and deletions are displayed in red, with deletions being struck through.

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

This edition includes significant technical changes with respect to the previous edition. In general, this new edition aims at reducing compliance uncertainty in correspondence with findings in CISPR 16-4-1. Guidelines are given on

- resonance-free connection of the AMN to reference ground,
- avoidance of ground loops, and
- avoidance of ambiguities of the test setup of EUT and AMN with respect to the reference ground plane.

In addition, terms are clarified, a new type of ancillary equipment (CVR) is applied, and a clarification for the use of the AAN and AMN on the same EUT is provided.

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 the base publication and its amendments will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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

IMPORTANT – The “colour inside” logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this publication using a colour printer.

INTRODUCTION (to amendment 1)

All stated specifications in CISPR 16-2-1 are met by an instrument independent of the selected implementation or technology in order to be considered suitable for measurements in accordance with CISPR standards. The addition of FFT-based measuring instrumentation requires further specifications as addressed in this amendment. A new Annex F is added as a result of provisions recently introduced into CISPR 16-1-1 on the use of spectrum analyzers for compliance measurements.

Withdrawing

iTech Standards
(<https://standards.iteh.ai>)
Document Preview

<https://standards.iteh.ai/c/iec/standards/iec/a79e94bc-1e9d-4a56-a7f4-a53df15e83ae/cispr-16-2-1-2008>

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.

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.

IEC 60050-161:1990, *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic Compatibility*

IEC 60364-4 (all parts), *Electrical installations of buildings – Part 4: Protection for safety*

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

Amendment 1:2004

Amendment 2:2006

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

~~Amendment 1:2005~~

~~Amendment 2:2006~~

3 Definitions

For the purposes of this part of CISPR 16, the definitions of IEC 60050-161 apply, as well as the following.

3.1

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

**3.2
associated equipment**

AE

apparatus, which is not part of the system under test, but needed to help exercise the EUT

**3.3
auxiliary equipment**

AuxEq

peripheral equipment which is part of the system under test

**3.4
EUT**

equipment (devices, appliances and systems) subjected to EMC (emission) compliance tests

**3.5
product publication**

publication specifying EMC requirements for a product or product family, taking into account specific aspects of such a product or product family

**3.6
emission limit (from a disturbing source)**

specified maximum emission level of a source of electromagnetic disturbance

[IEV 161-03-12]

3.7

~~**ground reference**~~

~~connection that constitutes a defined parasitic capacitance to the surrounding of an EUT and serves as reference potential~~

~~NOTE – See also IEC 161-04-36 (modified).~~

~~**reference ground plane**~~

~~**RGP**~~

~~flat conductive surface that constitutes a defined parasitic capacitance to the surrounding of an EUT and serves as reference potential~~

~~NOTE 1 See also IEC 60050-161, 161-04-36.~~

~~NOTE 2 A reference ground plane is needed for conducted emission measurements, and serves as reference ground for unsymmetrical and asymmetrical disturbance voltage measurements.~~

**3.8
(electromagnetic) emission**

phenomenon by which electromagnetic energy emanates from a source

[IEV 161-01-08]

**3.9
coaxial cable**

cable containing one or more coaxial lines, typically used for a matched connection of associated equipment to the measuring equipment or (test-)signal generator providing a specified characteristic impedance and a specified maximum allowable cable transfer impedance

3.10**common mode (asymmetrical) voltage**

RF voltage between the artificial midpoint of a two-conductor line and reference ground, or in case of a bundle of lines, the effective RF disturbance voltage of the whole bundle (vector sum of the unsymmetrical voltages) against the reference ground measured with a clamp (current transformer) at a defined terminating impedance

NOTE See also IEC 161-04-09.

3.11**common mode current**

vector sum of the currents flowing through two or more conductors at a specified cross-section of a "mathematical" plane intersected by these conductors

3.12**differential mode (symmetrical) voltage**

RF disturbance voltage between the wires of a two conductor line

[IEV 161-04-08, modified]

3.13**differential mode current**

half the vector difference of the currents flowing in any two of a specified set of active conductors at a specified cross-section of a "mathematical" plane intersected by these conductors

3.14**unsymmetrical mode (V-terminal) voltage**

voltage between a conductor or terminal of a device, equipment or system and a specified ground reference. For the case of a two-port network, the two unsymmetrical voltages are given by:

- a) the vector sum of the asymmetrical voltage and half of the symmetrical voltage; and
- b) the vector difference between the asymmetrical voltage and half of the symmetrical voltage.

NOTE See also IEC 161-04-13.

3.15**measuring receiver**

~~receiver for the measurement of disturbances with different detectors~~

~~NOTE—The receiver is specified according to CISPR 16-1-1.~~

~~instrument such as a tunable voltmeter, an EMI receiver, a spectrum analyzer or an FFT-based measuring instrument, with or without preselection, that meets the relevant clauses of CISPR 16-1-1~~

~~NOTE See Annex I of CISPR 16-1-1 for further information.~~

3.16**test configuration**

combination that gives the specified measurement arrangement of the EUT in which an emission level is measured

~~NOTE—The emission and immunity levels are measured as required by IEC 161-03-11, IEC 161-03-12, IEC 161-03-14 and IEC 161-03-15, definitions of emission level.~~