



# INTERNATIONAL STANDARD



INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

BASIC EMC PUBLICATION

**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 16-1-2:2014

<https://standards.iteh.ai/catalog/standards/iec/acd26098-41df-4338-a42f-f6ece656817d/cispr-16-1-2-2014>





**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.

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

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://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](http://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 - [webstore.iec.ch/advsearchform](http://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 It also gives information on projects, replaced and withdrawn publications.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](http://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](http://www.electropedia.org)**

The world's leading online dictionary of electronic and electrical terms containing 21 000 terms and definitions in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

**IEC Glossary - [std.iec.ch/glossary](http://std.iec.ch/glossary)**

67 000 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](http://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](mailto:sales@iec.ch).

[CISPR 16-1-2:2014](https://standards.iteh.ai/CISPR-16-1-2-2014)

<https://standards.iteh.ai/catalog/standards/iec/acd26098-41df-4338-a42f-f6ece656817d/cispr-16-1-2-2014>



CISPR 16-1-2

Edition 2.0 2014-03  
REDLINE VERSION

# INTERNATIONAL STANDARD



INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

BASIC EMC PUBLICATION

**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 16-1-2:2014

<https://standards.iteh.ai/catalog/standards/iec/acd26098-41df-4338-a42f-f6ece656817d/cispr-16-1-2-2014>

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

ICS 33.100.10; 33.100.20

ISBN 978-2-8322-1497-8

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## CONTENTS

FOREWORD.....	7
1 Scope.....	9
2 Normative references .....	9
3 <b>Terms, definitions and abbreviations</b> .....	10
<b>3.1 Terms and definitions</b> .....	10
<b>3.2 Abbreviations</b> .....	12
4 Artificial mains networks .....	13
<b>4.1 General</b> .....	13
<b>4.2 AMN impedance</b> .....	13
4.3 50 Ω/50 μH + 5 Ω artificial mains V-network (V-AMN) for use in the frequency range 9 kHz to 150 kHz .....	14
4.4 50 Ω/50 μH artificial mains V-network (V-AMN) for use in the frequency range 0,15 MHz to 30 MHz .....	15
4.5 50 Ω/5 μH + 1 Ω artificial mains V-network (V-AMN) for use in the frequency range 150 kHz to <del>100</del> 108 MHz.....	16
4.6 150 Ω artificial mains V-network (V-AMN) for use in the frequency range 150 kHz to 30 MHz .....	21
4.7 150 Ω artificial mains delta-network (Δ-AMN) for use in the frequency range 150 kHz to 30 MHz.....	21
<b>4.7.1 General parameters</b> .....	21
4.7.2 Balance of the 150 Ω artificial mains delta-network.....	21
4.8 Isolation.....	22
<b>4.8.1 Requirement</b> .....	22
<b>4.8.2 Measurement procedure</b> .....	23
4.9 Current carrying capacity and series voltage drop.....	23
4.10 Modified reference ground connection .....	23
4.11 Measurement of the voltage division factor of artificial mains V-networks.....	24
5 Current and voltage probes .....	25
5.1 Current probes.....	25
<b>5.1.1 General</b> .....	25
5.1.2 Construction .....	25
5.1.3 Characteristics.....	25
5.2 Voltage probe .....	26
<b>5.2.1 High impedance voltage probe</b> .....	26
<b>5.2.2 Capacitive voltage probe</b> .....	27
6 Coupling units for conducted current immunity measurement .....	29
<b>6.1 General</b> .....	29
6.2 Characteristics.....	29
<b>6.2.1 General</b> .....	29
6.2.2 Impedance.....	29
6.2.3 Insertion loss .....	29

7	Coupling devices for measuring signal lines .....	30
7.1	General .....	30
7.2	Requirements for AANs (or Y-networks) .....	31
7.3	Requirements for artificial networks for coaxial and other screened cables .....	34
8	The artificial hand and series RC element .....	35
8.1	General .....	35
8.2	Construction of the artificial hand and RC element .....	35
8.3	The use of the artificial hand .....	36
9	CDNE for measurement of disturbance voltage in frequency range 30 MHz to 300 MHz .....	39
9.1	Instrumentation .....	39
9.1.1	General .....	39
9.1.2	Description of the CDNE measurement .....	40
9.1.3	Description of the RGP .....	40
9.2	Technical requirements for the CDNE-X .....	41
9.2.1	Mechanical and electrical parameters .....	41
9.2.2	Validation of the CDNE .....	41
9.3	Technical requirement for the RGP .....	44
Annex A (normative)	AMNs .....	45
A.1	General .....	45
A.2	An example of the 50 $\Omega$ /50 $\mu$ H, 5 $\Omega$ artificial mains V-network .....	45
A.3	An example of the 50 $\Omega$ /50 $\mu$ H artificial mains V-network .....	46
A.4	Examples of the 50 $\Omega$ /5 $\mu$ H, 1 $\Omega$ artificial mains V-network .....	46
A.5	An example of the 150 $\Omega$ artificial mains V-network .....	47
A.6	Example of the 150 $\Omega$ artificial mains delta-network .....	48
A.7	Example design for an AMN with a 50 $\mu$ H inductor .....	49
A.7.1	The inductor .....	49
A.7.2	The case of the inductor .....	50
A.7.3	Isolation of the inductor .....	51
A.8	Measurement of the voltage division factor of an artificial mains V-network .....	51
Annex B (informative)	Construction, frequency range, and calibration of current probes .....	54
B.1	Physical and electrical considerations for current probes .....	54
B.2	Equivalent electrical circuit of current probe .....	55
B.3	Detrimental effects of current probe measurements .....	56
B.4	Typical frequency response characteristics of current probes .....	57
B.5	A shielding structure for use with current probes .....	58
B.5.1	General .....	58
B.5.2	Theoretical model .....	58
B.5.3	Construction of the shielding structure .....	59
B.5.4	High-pass filter .....	60
B.6	Calibration of current probes .....	60

Annex C (informative) Construction of the coupling units for current injection for the frequency range 0,15 MHz to 30 MHz .....	63
C.1 Coupling unit type A for coaxial antenna input .....	63
C.2 Coupling unit type M, for mains leads .....	63
C.3 Coupling unit type L, for loudspeaker leads.....	65
C.4 Coupling unit type Sw, for audio-frequency signals .....	66
C.5 Coupling unit type Sw, for audio, video, and control signals .....	67
Annex D (informative) Principle of operation and examples of coupling units for conducted current immunity measurements .....	68
D.1 Principle of operation .....	68
D.2 Types of unit and their construction .....	68
Annex E (normative) Example and measurement of the parameters of the asymmetric artificial network (AAN) .....	72
E.1 Description of an example of an AAN: the T-network.....	72
E.2 Measurements of the parameters of an asymmetric artificial network (AAN) .....	72
Annex F (normative) Example and measurement of the parameters of the AN for coaxial and other screened cables .....	79
F.1 Description of ANs for coaxial and other screened cables .....	79
F.2 Measurements of parameters of an AN for coaxial and other screened cables .....	79
<b>Annex G (informative) Construction and evaluation of capacitive voltage probe .....</b>	<b>81</b>
<b>G.1 General.....</b>	<b>81</b>
<b>G.2 Physical and electrical considerations for CVP .....</b>	<b>81</b>
<b>G.3 Determination of the frequency response of the voltage division factor .....</b>	<b>81</b>
<b>G.4 Method of measurement to determine the influence of external electric fields.....</b>	<b>82</b>
<b>G.4.1 Influence of external electric field .....</b>	<b>82</b>
<b>G.4.2 Method of measurement to determine the influence of the external electric field .....</b>	<b>82</b>
<b>G.5 Pulse response .....</b>	<b>82</b>
<b>G.6 Voltage division factor dependence.....</b>	<b>83</b>
<b>Annex H (informative) Rationale for the introduction of a minimum decoupling factor between mains and EUT/receiver ports for the V-AMN.....</b>	<b>88</b>
<b>Annex I (informative) Rationale for the introduction of a phase tolerance for the V-AMN input impedance.....</b>	<b>89</b>
<b>Annex J (informative) Example CDNE set-up diagrams .....</b>	<b>91</b>
<b>J.1 CDNE-M2 and CDNE-M3 .....</b>	<b>91</b>
<b>J.2 CDNE-Sx .....</b>	<b>93</b>
<b>Bibliography.....</b>	<b>94</b>
<b>Figure 1 – Impedance (magnitude and phase) of the V-network for Band A (see 4.3, the relevant frequency range is from 9 kHz to 150 kHz) .....</b>	<b>20</b>
<b>Figure 2 – Impedance (magnitude and phase) of the V-network for Band B (see 4.4).....</b>	<b>20</b>
<b>Figure 3 – Impedance (magnitude and phase) of the V-network for Bands B and C (from 150 kHz to 108 MHz; see 4.5).....</b>	<b>21</b>
<b>Figure 4 – Method for checking the balance of the arrangement for the measurement of symmetrical voltages .....</b>	<b>22</b>

Figure 5 – Example of artificial mains $50 \Omega/50 \mu\text{H} + 5 \Omega$ V-network (see 4.3 and A.2).....	24
Figure 6 – Example of artificial mains V-networks, $50 \Omega/50 \mu\text{H}$ , $50 \Omega/5 \mu\text{H} + 1 \Omega$ or $150 \Omega$ (see 4.4, 4.5, 4.6, A.3, A.4 and A.5, respectively) .....	24
Figure 7 – Circuit for RF voltage measurement on supply mains .....	27
<b>Figure 8 – Circuit used to make voltage measurements between a cable and reference ground .....</b>	<b>28</b>
Figure 9 – Measuring set-up to check the insertion loss of the coupling units in the frequency range 30 MHz to 150 MHz .....	30
Figure 10 – Principal circuit and <del>example</del> LCL requirements of an AAN .....	32
Figure 11 – Application of the artificial hand .....	38
Figure 12 – Examples of application of artificial hand to ITE .....	39
<b>Figure 13 – Arrangement for validation of a CDNE .....</b>	<b>42</b>
<b>Figure 14 – IMA arrangement for correcting the electrical length .....</b>	<b>43</b>
<b>Figure 15 – Test arrangement for the measurement of the symmetric impedance (<math>Z_{DM}</math>) .....</b>	<b>44</b>
Figure A.1 – Example of an alternative $50 \Omega/5 \mu\text{H} + 1 \Omega$ V-AMN for devices used with low impedance power sources .....	47
Figure A.2 – Example of a $\Delta$ -AMN for a measuring <del>apparatus receiver</del> with unbalanced input .....	48
Figure A.3 – Schematic of $50 \mu\text{H}$ inductor .....	50
Figure A.4 – General view of an AMN .....	50
Figure A.5 – Attenuation of an AMN filter .....	51
Figure A.6 – <b>Test set-up for determining the voltage division factor .....</b>	<b>52</b>
Figure B.1 – Typical current probe configuration .....	55
Figure B.2 – High-pass filter with cut-off frequency of 9 kHz .....	56
Figure B.3 – Transfer impedance of typical current probes .....	57
Figure B.4 – <b>Set-up for current measurement using the AMN .....</b>	<b>59</b>
Figure B.5 – Shield configuration used with current transformer .....	59
Figure B.6 – Schematic diagram of circuit with coaxial adaptor and current probe	
<b>Current probe factor <math>k</math> transfer admittance <math>Y_T</math> measurement .....</b>	<b>61</b>
Figure B.7 – <b>Current probe factor <math>k</math> Transfer admittance <math>Y_T</math> as a function of frequency .....</b>	<b>61</b>
Figure B.8 – Return loss of the coaxial adaptor terminated with $50 \Omega$ and with the current probe (also terminated with $50 \Omega$ ) inside .....	62
Figure B.9 – Current probe between the two halves of the coaxial adaptor .....	62
Figure C.1 – Example of coupling unit type A, for coaxial input schematic diagram and construction details (see C.1 and D.2) .....	64
Figure C.2 – Example of coupling unit type M, for mains leads, schematic diagram and construction details (see C.2 and D.2) .....	65
Figure C.3 – Example of coupling unit type L for loudspeaker leads, schematic diagram and simplified construction drawing (see D.2) .....	66
Figure C.4 – Example of coupling unit type Sw, for audio signals. Schematic diagram and simplified construction drawing (see D.2) .....	67
Figure C.5 – Example of coupling unit type Sw, for audio, video and control signals, schematic diagram and simplified construction drawing (see D.2) .....	67
Figure D.1 – General principle of the current-injection method (see D.1) .....	70
Figure D.2 – Coupling unit type Sr with load resistances – Schematic diagram and simplified construction drawing (see D.2) .....	71

Figure E.1 – Example of a T-network circuit for one pair of wires ..... 74

Figure E.2 – Arrangement for the termination impedance measurement..... 74

Figure E.3 – Arrangement for LCL probe verification..... 75

Figure E.4 – ~~Test~~ Arrangement for the LCL probe calibration using an L-circuit ..... 77

Figure E.5 – ~~Test arrangement for the~~ LCL measurement of the AAN ..... 76

Figure E.6 – Test set-up for the decoupling attenuation (isolation) of the AAN

$a_{\text{decoup}} = 20\lg\left|\frac{V_1}{V_2}\right| - a_{\text{vdiv}}$  in dB for asymmetric signals between AE port and EUT port ..... 77

Figure E.7 – Test set-up for the insertion loss (symmetric) of the AAN..... 77

Figure E.8 – Calibration test set-up for the AAN voltage division factor of the asymmetric circuit:  $F_{\text{AAN}} = a_{\text{vdiv}} = 20\lg\left|\frac{V_1}{V_2}\right|$  in dB ..... 78

Figure F.1 – Example of a coaxial cable AN..... 79

Figure F.2 – Test set-up for the coaxial and screened cable AN voltage division factor

$a_{\text{vdiv}} F_{\text{AN}} = 20\lg\left|\frac{V_1}{V_2}\right|$  in dB..... 80

Figure G.1 – Configuration of a CVP ..... 84

Figure G.2 – Equivalent circuit of a CVP ..... 85

Figure G.3 – Test set-up to measure the frequency response ..... 85

Figure G.4 – Electrostatic coupling model and its equivalent circuit ..... 86

Figure G.5 – Test set-up to measure the reduction, through the shielding effect, of the influence of the external electric field caused by electrostatic coupling ..... 86

Figure G.6 – Conversion factor deviation when cable position is changed..... 87

Figure G.7 – Investigation result of the cable radius dependence..... 87

Figure H.1 – Isolation measurement arrangement..... 88

Figure I.1 – Definition of impedance magnitude and phase tolerances ..... 89

Figure J.1 – CDNE-M3 with internal attenuator  $a_{\text{meas}}$  of at least 6 dB..... 91

Figure J.2 – CDNE-M2 with internal attenuator  $a_{\text{meas}}$  of at least 6 dB..... 92

Figure J.3 – CDNE-S<sub>x</sub> for screened cable with  $x$  internal wires and an internal attenuator of at least 6 dB..... 93

Table 1 – Magnitudes and phase angles of the V-network (see Figure 1)..... 14

Table 2 – Magnitudes and phase angles of the V-network (see Figure 2)..... 15

Table 3 – Magnitudes and phase angles of the V-network (see Figure 3)..... 16

Table 4 – Values of minimum isolation for V-networks ..... 22

Table 5 – Characteristics of the AAN for the measurement of asymmetric disturbance voltage..... 33

Table 6 – Characteristics of artificial networks for coaxial and other screened cables ..... 35

Table 7 – Electrical parameters of the CDNE-X..... 41

Table A.1 – Component values of 50 Ω/50 μH + 5 Ω V-network ..... 45

Table A.2 – Component values of 50 Ω/50 μH V-network ..... 46

Table A.3 – Component values of 50 Ω/5 μH + 1 Ω V-network ..... 47

Table A.4 – Component values of the 150 Ω V-network ..... 48

Table A.5 – Component values of the 150 Ω delta-network ..... 49

INTERNATIONAL ELECTROTECHNICAL COMMISSION  
INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

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

**Part 1-2: Radio disturbance and immunity measuring apparatus –  
~~Ancillary equipment – Conducted disturbances~~  
Coupling devices for 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 provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 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 redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.**

International Standard CISPR 16-1-2 has been prepared by subcommittee A: Radio-interference measurements and statistical methods, of IEC technical committee CISPR: International special committee on radio interference.

This second edition cancels and replaces the first edition published in 2003 and its Amendment 1 (2004) and Amendment 2 (2006). This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) requirements from CISPR 22 for the AAN have been copied to this standard;
- b) the CDNE for measurement of disturbance voltage in the frequency range 30 MHz to 300 MHz is added;
- c) additional maintenance is included.

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/1051/FDIS	CISPR/A/1059/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.

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.

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

The committee has decided that the contents of this publication will remain unchanged until 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 1-2: Radio disturbance and immunity measuring apparatus – ~~Ancillary equipment – Conducted disturbances~~ Coupling devices for conducted disturbance measurements

#### 1 Scope

This part of the CISPR 16 series ~~is designated a basic standard, which~~ specifies the characteristics and performance of equipment for the measurement of radio disturbance voltages and currents in the frequency range 9 kHz to 1 GHz.

**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.

Specifications for ancillary apparatus are included for artificial mains networks, current and voltage probes and coupling units for current injection on cables.

~~It is intended that the requirements of this publication shall be complied with~~ are fulfilled at all frequencies and for all levels of radio disturbance voltages and currents within the CISPR indicating range of the measuring equipment.

Methods of measurement are covered in the CISPR 16-2 series, and further information on radio disturbance is given in CISPR 16-3, ~~while uncertainties, statistics and limit modelling are covered in the CISPR 16-4 series.~~

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

CISPR 16-1-1:~~2003~~2010, Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus

CISPR 16-2-1:~~2003~~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 16-3:2003, Specification for radio disturbance and immunity measuring apparatus and methods – Part 3: CISPR Technical reports~~

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

CISPR 16-4-2:2003/2011, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Measurement instrumentation uncertainty*

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

~~IEC 60050(161):1990, International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility~~

IEC 61000-4-6:2008, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

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

### 3 Terms, definitions and abbreviations

#### 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050, as well as the following apply. ~~Also see IEC 60050(161).~~

##### 3.1.1

##### **ancillary equipment**

transducers 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

Note 1 to entry: Examples of transducers are current and voltage probes and artificial networks.

##### 3.1.2

##### **associated equipment**

**AE** apparatus that is not part of the system under test but is required for the functioning of the EUT

##### 3.1.3

##### **asymmetric voltage**

radio-frequency disturbance voltage appearing between the electrical mid-point of the mains terminals and ground, sometimes called the common mode voltage ~~and is half the vector sum of  $V_a$  and  $V_b$ , i.e.,  $(V_a + V_b)/2$~~

Note 1 to entry: If  $V_a$  is the vector voltage between one of the mains terminals and ground, and  $V_b$  is the vector voltage between the other mains terminal and ground, the asymmetric voltage is half the vector sum of  $V_a$  and  $V_b$ , i.e.  $(V_a + V_b)/2$ .

##### 3.1.4

##### **symmetric voltage**

radio-frequency disturbance voltage appearing between the two wires in a two-wire circuit, such as a single-phase mains supply, sometimes called the differential mode voltage. ~~If  $V_a$  is the vector voltage between one of the mains terminals and earth and  $V_b$  is the vector voltage between the other mains terminal and earth,~~

Note 1 to entry: The symmetric voltage is the vector difference  $(V_a - V_b)$ .

### 3.1.5

#### **unsymmetric voltage**

amplitude of the vector voltage,  $V_a$  or  $V_b$  defined in 3.1.3 and 3.1.4

Note 1 to entry: The unsymmetric voltage is the voltage measured by the use of an artificial mains V-network.

Note 2 to entry: See notes in 3.1.3 and 3.1.4 for details on  $V_a$  and  $V_b$ .

### 3.1.6

#### **artificial mains network**

##### **AMN**

network that provides a defined impedance to the EUT at radio frequencies, couples the disturbance voltage to the measuring receiver, and decouples the test circuit from the supply mains

Note 1 to entry: There are two basic types of this network, the V-network (V-AMN) which couple the unsymmetric voltages, and the delta-network ( $\Delta$ -AMN), which couple the symmetric and the unsymmetric voltages separately.

Note 2 to entry: The terms line impedance stabilization network (LISN) and V-AMN are used interchangeably .

### 3.1.7

#### **asymmetric artificial network**

##### **AAN**

network used to measure (or inject) asymmetric (common mode) voltages on unshielded symmetric signal (e.g. telecommunication) lines while rejecting the symmetric (differential mode) signal

Note 1 to entry: The term "Y-network" is a synonym for AAN.

### 3.5

#### **impedance stabilization network (ISN)**

generally an artificial network that provides a stabilized impedance to the EUT; often (e.g. in CISPR 22) used as a synonym for AAN

### 3.1.8

#### **auxiliary equipment**

##### **AuxEq**

peripheral equipment that is part of the system under test

### 3.1.9

#### **coupling/decoupling network**

##### **CDN**

artificial network for the measurement or injection of signals on one circuit while preventing signals from being measured or injected on another circuit

### 3.1.10

#### **CDNE-X**

coupling/decoupling network for emission measurement in the frequency range 30 MHz to 300 MHz; where the "X" suffix can be "M2" for unscreened two-wire mains, DC or control ports, "M3" for unscreened three-wire mains, DC or control ports, and "Sx" for screened cable with  $x$  internal wires

Note 1 to entry: See Annex J for further details on the CDNE-X.

**3.1.11****equipment under test****EUT**

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

**3.1.12****impedance measurement adaptor****IMA**

metallic vertical plane, 0,1 m by 0,1 m, bonded to the reference ground plane, which contains connection ports for a network analyzer and a CDNE

**3.1.13****longitudinal conversion loss****LCL**

in a one- or two-port network, a measure of the degree of unwanted transverse (symmetric mode) signal produced at the terminals of the network due to the presence of a longitudinal (asymmetric mode) signal on the connecting leads

**Note 1 to entry:** LCL is a ratio expressed in dB.

[SOURCE: ITU-T Recommendation O.9 [8] <sup>1)</sup>]

**3.1.14****reference ground plane****RGP**

flat conductive surface that is used as a common reference and that allows a defined parasitic capacitance to the surroundings of an EUT

**Note 1 to entry:** A reference ground plane is needed for conducted emission measurements, and serves as reference ground for the measurement of unsymmetrical and asymmetrical disturbance voltages.

**3.2 Abbreviations**

The following are abbreviations used in this standard that are not already provided in 3.1.

AN	Artificial network
CVP	Capacitive voltage probe
E.m.f.	Electromotive force
ISN	Impedance stabilization network
ITE	Information technology equipment
LCL	Longitudinal conversion loss
NWA	Network analyser
PE	Protective earth
RF	Radio frequency

1) Numbers in square brackets refer to the Bibliography.