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

**Industrial, scientific and medical equipment – Radio-frequency disturbance
characteristics – Limits and methods of measurement**

**Appareils industriels, scientifiques et médicaux – Caractéristiques de
perturbations radioélectriques – Limites et méthodes de mesure**



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

Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement

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CONTENTS

FOREWORD.....	7
INTRODUCTION.....	10
Introduction to Amendment 1	11
1 Scope.....	12
2 Normative references.....	12
3 Terms and definitions	13
4 Frequencies designated for ISM use	16
5 Classification of equipment	17
5.1 Separation into groups	17
5.2 Division into classes.....	17
5.3 Documentation for the user	18
6 Limits of electromagnetic disturbances.....	18
6.1 General.....	18
6.2 Group 1 equipment measured on a test site	19
6.2.1 Limits for conducted disturbances	19
6.2.2 Limits of electromagnetic radiation disturbance.....	22
6.3 Group 2 equipment measured on a test site	23
6.3.1 Limits for conducted disturbances	23
6.3.2 Limits of electromagnetic radiation disturbance.....	25
6.4 Group 1 and group 2 class A equipment measured in situ	30
6.4.1 Limits for conducted disturbances	30
6.4.2 Limits of electromagnetic radiation disturbance.....	31
7 Measurement requirements.....	33
7.1 General.....	33
7.2 Ambient noise	33
7.3 Measuring equipment.....	34
7.3.1 Measuring instruments	34
7.3.2 Artificial network (AN)	34
7.3.3 Voltage probe	35
7.3.4 Antennas	35
7.3.5 Artificial hand.....	36
7.4 Frequency measurement.....	37
7.5 Configuration of equipment under test	37
7.5.1 General	37
7.5.2 Interconnecting cables	41
7.5.3 Connection to the electricity supply network on a test site.....	42
7.6 Load conditions of equipment under test.....	44
7.6.1 General	44
7.6.2 Medical equipment.....	44
7.6.3 Industrial equipment.....	46
7.6.4 Scientific, laboratory and measuring equipment	46
7.6.5 Microwave cooking appliances	46
7.6.6 Other equipment in the frequency range 1 GHz to 18 GHz	46
7.6.7 Electric welding equipment.....	47
7.6.8 ISM RF lighting equipment	47

7.6.9	Medium voltage (MV) and high voltage (HV) switchgear	47
7.6.10	Grid connected power converters	47
7.7	Recording of test-site measurement results	48
7.7.1	General	48
7.7.2	Conducted emissions	48
7.7.3	Radiated emissions	48
8	Special provisions for test site measurements (9 kHz to 1 GHz)	48
8.1	Ground planes	48
8.2	Measurement of conducted disturbances	49
8.2.1	General	49
8.2.2	Measurements on grid connected power converters	49
8.2.3	Handheld equipment which are normally operated without an earth connection	54
8.3	Radiation test site for OATS and SAC for measurements in the range 9 kHz to 1 GHz	54
8.3.1	General	54
8.3.2	Validation of the radiation test site (9 kHz to 1 GHz)	55
8.3.3	Disposition of equipment under test (9 kHz to 1 GHz)	55
8.3.4	Radiation measurements (9 kHz to 1 GHz)	56
8.4	Alternative radiation test sites for the frequency range 30 MHz to 1 GHz	56
8.5	FAR for measurements in the range 30 MHz to 1 GHz	56
9	Radiation measurements: 1 GHz to 18 GHz	57
9.1	Test arrangement	57
9.2	Receiving antenna	57
9.3	Validation and calibration of test site	57
9.4	Measuring procedure	57
9.4.1	General	57
9.4.2	Operating conditions of the EUT	58
9.4.3	Preliminary measurement	58
9.4.4	Final measurement	59
10	Measurement <i>in situ</i>	60
11	Safety precautions for emission measurements on ISM RF equipment	61
12	Measurement uncertainty	61
	Annex A (informative) Examples of equipment classification	62
	Annex B (informative) Precautions to be taken in the use of a spectrum analyzer (see 7.3.1)	64
	Annex C (normative) Measurement of electromagnetic radiation disturbance in the presence of signals from radio transmitters	65
	Annex D (informative) Propagation of interference from industrial radio-frequency equipment at frequencies between 30 MHz and 300 MHz	66
	Annex E (informative) Recommendations of CISPR for protection of certain radio services in particular areas	67
E.1	General	67
E.2	Recommendations for protection of safety-related radio services	67
E.3	Recommendations for protection of specific sensitive radio services	67
	Annex F (informative) Frequency bands allocated for safety-related radio services	68
	Annex G (informative) Frequency bands allocated for sensitive radio services	69
	Annex H (informative) Statistical assessment of series produced equipment against the requirements of CISPR standards	71

H.1	Significance of a CISPR limit	71
H.2	Type tests	71
H.3	Statistical assessment of series produced equipment	71
H.3.1	Assessment based on a general margin to the limit	71
H.3.2	Assessment based on the non-central t -distribution	72
H.3.3	Assessment based on the binomial distribution	74
H.3.4	Equipment produced on an individual basis	75
Annex I (normative)	Artificial Network (AN) for the assessment of disturbance voltages at d.c. power ports of semiconductor power converters	76
I.1	General information and purpose	76
I.2	Structures for a DC-AN	76
I.2.1	AN suitable for measurement of unsymmetrical mode (UM) disturbances	76
I.2.2	AN suitable for measurement of common mode (CM) and differential mode (DM) disturbances	76
I.2.3	AN suitable for measurement of UM, CM and DM disturbances	77
I.3	Employment of DC-ANs for compliance measurements	77
I.3.1	General	77
I.3.2	Pseudo V-AN	77
I.3.3	Delta-AN	77
I.4	Normative technical requirements for the DC-AN	78
I.4.1	Parameters and associated tolerances in the range 150 kHz to 30 MHz	78
I.4.2	Parameters and associated tolerances in the range 9 kHz to 150 kHz	79
I.5	Examples of practical implementations of DC-ANs	79
Annex J (informative)	Measurements on Grid Connected Power Converters (GCPC) – Setups for an effective test site configuration	82
J.1	General information and purpose	82
J.2	Setup of the test site	82
J.2.1	Block diagram of test site	82
J.2.2	DC power supply	83
J.2.3	AC power source	83
J.2.4	Other components	84
J.3	Other test setups	84
J.3.1	Configuration comprising laboratory AC power source and resistive load	84
J.3.2	Configuration in case of reverse power flow to the AC mains	85
Annex K (informative)	Test site configuration and instrumentation – Guidance on prevention of saturation effects in mitigation filters of transformer-less power converters during type tests according to this standard	87
K.1	General information and purpose	87
K.2	Recommendations for avoidance of saturation effects in the range 9 kHz to 150 kHz	88
K.3	Detailed advice	88
K.3.1	General	88
K.3.2	Insert of series inductors (or common mode chokes) in the laboratory's d.c. power supply chain	89
K.3.3	Employment of additional common mode decoupling capacitors at the interface between the AE port of the DC-AN and the laboratory d.c. power supply port allocated in the test environment	90
K.4	Background information	91
Bibliography		93

Figure 1 – Circuit for disturbance voltage measurements on mains supply	35
Figure 2 – Artificial hand, RC element	37
Figure 3 – Example for a typical cable arrangement for measurements of radiated disturbances in 3 m separation distance, Table-top EUT	39
Figure 4 – Example for a typical test set up for measurement of conducted and/or radiated disturbances from a floor standing EUT, 3D view	40
Figure 5 – Disposition of medical (capacitive type) and dummy load	45
Figure 6 – Typical arrangement for measurement of conducted disturbances at LV d.c. power ports with the DC-AN used as termination and decoupling unit to the laboratory d.c. power source	51
Figure 7 – Typical arrangement for measurement of conducted disturbances at LV d.c. power ports with the DC-AN used as termination and voltage probe	52
Figure 8 – Typical arrangement for measurement of conducted disturbances at LV d.c. power ports with the DC-AN used as voltage probe and with a current probe – 2D diagram	53
Figure 9 – Typical arrangement for measurement of conducted disturbances at LV d.c. power ports with a DC-AN used as voltage probe and with a current probe – 3D diagram	53
Figure 10 – Test site	55
Figure 11 – Minimum size of metal ground plane	55
Figure 12 – Decision tree for the measurement of emissions from 1 GHz to 18 GHz of group 2 equipment operating at frequencies above 400 MHz	58
Figure H.1 – An example of possible difficulties	74
Figure I.1 – Practical implementation of a 150 Ω DC-AN suitable for measurement of UM disturbances (Example)	79
Figure I.2 – Practical implementation of a 150 Ω DC-AN suitable for measurement of CM and DM disturbances (Example, see also Figure A.2 in CISPR 16-1-2:2014)	80
Figure I.3 – Practical implementation of a 150 Ω DC-AN suitable for measurement of UM, or CM and DM disturbances (Example 1)	80
Figure I.4 – Practical implementation of a 150 Ω DC-AN suitable for measurement of UM, or CM and DM disturbances (Example 2)	81
Figure I.5 – Practical implementation of a 150 Ω DC-AN suitable for measurement of UM, or CM and DM disturbances (Example 3)	81
Figure J.1 – Setup of the test site (Case 1) – 2D diagram	82
Figure J.2 – Setup of the test site (Case 1) – 3D diagram	83
Figure J.3 – Setup of the test site (Case 2) – 2D diagram	84
Figure J.4 – Setup of the test site (Case 2) – 3D diagram	85
Figure J.5 – Setup of the test site (Case 3) – 2D diagram	86
Figure J.6 – Setup of the test site (Case 3) – 3D diagram	86
Figure K.1 – Flow of the common mode RF current at test site configuration level	89
Figure K.2 – Blocking of flow of common mode RF current by insert of series inductors	90
Figure K.3 – Blocking of flow of common mode RF current by employment of additional CM decoupling capacitors	90
Figure K.4 – CM termination impedance at the EUT port of a DC-AN – Magnitude-versus-frequency characteristic in the range 3 kHz to 30 MHz, Example	91
Figure K.5 – Prevention of saturation of mitigation filters by use of additional decoupling capacitors	92
Figure K.6 – Change in the resonant frequency caused by the increase and decrease in the decoupling capacitor's capacitance	92

Figure K.7 – DC-AN circuit example where capacitance of blocking capacitors of the LC decoupling circuit can be increased or decreased.....92

Table 1 – Frequencies in the radio-frequency (RF) range designated by ITU for use as fundamental ISM frequencies	17
Table 2 – Disturbance voltage limits for class A group 1 equipment measured on a test site (a.c. mains power port).....	20
Table 3 – Limits for conducted disturbances of class A group 1 equipment measured on a test site (d.c. power port).....	21
Table 4 – Disturbance voltage limits for class B group 1 equipment measured on a test site (a.c. mains power port).....	21
Table 5 – Disturbance voltage limits for class B group 1 equipment measured on a test site (d.c. power port).....	21
Table 6 – Electromagnetic radiation disturbance limits for class A group 1 equipment measured on a test site.....	22
Table 7 – Electromagnetic radiation disturbance limits for class B group 1 equipment measured on a test site.....	23
Table 8 – Disturbance voltage limits for class A group 2 equipment measured on a test site (a.c. mains power port).....	24
Table 9 – Disturbance voltage limits for class B group 2 equipment measured on a test site (a.c. mains power port).....	25
Table 10 – Electromagnetic radiation disturbance limits for class A group 2 equipment measured on a test site.....	27
Table 11 – Electromagnetic radiation disturbance limits for class A EDM and arc welding equipment measured on a test site	28
Table 12 – Electromagnetic radiation disturbance limits for class B group 2 equipment measured on a test site.....	28
Table 13 – Electromagnetic radiation disturbance peak limits for group 2 equipment operating at frequencies above 400 MHz	29
Table 14 – Electromagnetic radiation disturbance weighted limits for group 2 equipment operating at frequencies above 400 MHz	30
Table 15 – Electromagnetic radiation disturbance APD level corresponding to 10^{-1} limits for class B group 2 equipment operating at frequencies above 400 MHz	30
Table 16 – Electromagnetic radiation disturbance limits for class A group 1 equipment measured <i>in situ</i>	31
Table 17 – Electromagnetic radiation disturbance limits for class A group 2 equipment measured <i>in situ</i>	32
Table 18 – Frequency sub-ranges to be used for weighted measurements	60
Table E.1 – Limits for electromagnetic radiation disturbances for <i>in situ</i> measurements to protect specific safety-related radio services in particular areas	67
Table H.1 – General margin to the limit for statistical evaluation	72
Table H.2 – The non-central <i>t</i> -distribution factor <i>k</i> as a function of the sample size <i>n</i>	73
Table H.3 – Application of the binomial distribution.....	75
Table I.1 – Parameters and associated tolerances in the range 150 kHz to 30 MHz.....	78
Table I.2 – Parameters and associated tolerances in the range 9 kHz to 150 kHz.....	79

INTERNATIONAL ELECTROTECHNICAL COMMISSION

INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

INDUSTRIAL, SCIENTIFIC AND MEDICAL EQUIPMENT – RADIO-FREQUENCY DISTURBANCE CHARACTERISTICS – LIMITS AND METHODS OF MEASUREMENT

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This Consolidated version of CISPR 11 bears the edition number 6.1. It consists of the sixth edition (2015-06) [documents CISPR/B/628/FDIS and CISPR/B/631/RVD] and its amendment 1 (2016-06) [documents CISPR/B/627/CDV and CISPR/B/639A/RVC]. The technical content is identical to the base edition and its amendment.

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard CISPR 11 has been prepared by CISPR Subcommittee B: Interference relating to industrial, scientific and medical radio-frequency apparatus, to other (heavy) industrial equipment, to overhead power lines, to high voltage equipment and to electric traction.

This sixth edition introduces and permits type testing on components of power electronic equipment, systems and installations. Its emission limits apply now to low voltage (LV) a.c. and d.c. power ports, irrespective of the direction of power transmission. Several limits were adapted to the practical test conditions found at test sites. They are also applicable now to power electronic ISM RF equipment used for wireless power transfer (WPT), for instant power supply and charging purposes. The limits in the range 1 GHz to 18 GHz apply now to CW-type disturbances and to fluctuating disturbances in a similar, uniform and technology-neutral way. For these measurements, two alternative methods of measurement are available, the traditional log-AV method and the new APD method.

For measurements at LV d.c. power ports of power electronic equipment, a modern implementation of the 150 Ω Delta-network specified in CISPR 16-1-2 has been made available.

This International Standard CISPR 11 has the status of a Product Family EMC standard in accordance with IEC Guide 107, *Electromagnetic compatibility – Guide to the drafting of electromagnetic compatibility publications* (2014).

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

The committee has decided that the contents of the base publication and its amendment 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

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The main content of this standard is based on CISPR Recommendation No. 39/2 given below:

RECOMMENDATION No. 39/2

**Limits and methods of measurement of electromagnetic disturbance characteristics
of industrial, scientific and medical (ISM) radio-frequency equipment**

The CISPR

CONSIDERING

- a) that ISM RF equipment is an important source of disturbance;
- b) that methods of measuring such disturbances have been prescribed by the CISPR;
- c) that certain frequencies are designated by the International Telecommunication Union (ITU) for unrestricted radiation from ISM equipment,

RECOMMENDS

that the latest edition of CISPR 11 be used for the application of limits and methods of measurement of ISM equipment.

INTRODUCTION

This CISPR publication contains, amongst common requirements for the control of RF disturbances from equipment intended for use in industrial, scientific, and medical electrical applications, specific requirements for the control of RF disturbances caused by ISM RF applications in the meaning of the definition of the International Telecommunication Union (ITU), see also Definition 3.13 in this International Standard. CISPR and ITU share their responsibility for the protection of radio services in respect of the use of ISM RF applications.

The CISPR is concerned with the control of RF disturbances from ISM RF applications by means of an assessment of these disturbances either at a standardised test site or, for an individual ISM RF application which cannot be tested at such a site, at its place of operation. Consequently, this CISPR Publication covers requirements for conformity assessment of both, equipment assessed by means of type tests at standardised test sites or of individual equipment under in situ conditions.

The ITU is concerned with the control of RF disturbances from ISM RF applications during normal operation and use of the respective equipment at its place of operation (see Definition 1.15 in the ITU Radio Regulations). There, use of radio-frequency energy decoupled from the ISM RF application by radiation, induction or capacitive coupling is restricted to the location of that individual application.

This CISPR publication contains, in 6.3, the essential emission requirements for an assessment of RF disturbances from ISM RF applications at standardised test sites. These requirements allow for type testing of ISM RF applications operated at frequencies up to 18 GHz. It further contains, in 6.4, the essential emission requirements for an in situ assessment of RF disturbances from individual ISM RF applications in the frequency range up to 1 GHz. All requirements were established in close collaboration with the ITU and enjoy approval of the ITU.

However, for operation and use of several types of ISM RF applications the manufacturer, installer and/or customer should be aware of additional national provisions regarding possible licensing and particular protection needs of local radio services and applications. Depending on the country concerned, such additional provisions may apply to individual ISM RF applications operated at frequencies outside designated ISM bands (see Table 1). They also may apply to ISM RF applications operated at frequencies above 18 GHz. For the latter type of applications, local protection of radio services and appliances requires an accomplishment of the conformity assessment by application of the relevant national provisions in the frequency range above 18 GHz in accordance with vested interests of the ITU and national administrations. These additional national provisions may apply to spurious emissions, emissions appearing at harmonics of the operation frequency, and to wanted emissions at the operation frequency allocated outside a designated ISM band in the frequency range above 18 GHz.

Recommendations of CISPR for the protection of radio services in particular areas are found in Annex E of this International Standard.

Definition 1.15 of the ITU Radio Regulations reads as follows:

1.15 industrial, scientific and medical (ISM) applications (of radio frequency energy): Operation of equipment or appliances designed to generate and use locally radio frequency energy for industrial, scientific, medical, domestic or similar purposes, excluding applications in the field of telecommunications.

[ITU Radio Regulations Volume 1: 2012 – Chapter I, Definition 1.15]

Introduction to Amendment 1

This Amendment introduces the fully-anechoic room (FAR) for measurements of the disturbance field strength in the range 30 MHz to 1 GHz on equipment in the scope of CISPR 11.

It contains the complete set of requirements for measurement of radiated disturbances from equipment fitting into the validated test volume of a given FAR. It specifies a separation distance of 3 m and restricts use of the FAR to measurements on table-top equipment.

At the moment the FAR can be used:

- for measurements on table-top equipment fitting into the validated test volume of the given FAR,
- for a separation distance of 3 m only, and
- if the FAR was validated according to CISPR 16-1-4.

The limits for class A and class B group 1 equipment in this CDV base on the limits in the generic emission standards IEC 61000-6-3:2006/AMD 1 (2010) and IEC 61000-6-4:2006/AMD 1 (2010). The limits for class A and class B group 2 equipment were derived using the same approximation formula as used when deriving the limits for the generic emission standards in mid of the years 2000 to 2010. CISPR/H/104/INF, published in 2005, gives detailed explanations how these limits for the FAR were derived.

More detailed background information is still found in CISPR/B/627/CDV.

CISPR/B WG1 in October 2015

INDUSTRIAL, SCIENTIFIC AND MEDICAL EQUIPMENT – RADIO-FREQUENCY DISTURBANCE CHARACTERISTICS – LIMITS AND METHODS OF MEASUREMENT

1 Scope

This International Standard applies to industrial, scientific and medical electrical equipment operating in the frequency range 0 Hz to 400 GHz and to domestic and similar appliances designed to generate and/or use locally radio-frequency energy.

This standard covers emission requirements related to radio-frequency (RF) disturbances in the frequency range of 9 kHz to 400 GHz. Measurements need only be performed in frequency ranges where limits are specified in Clause 6.

For ISM RF applications in the meaning of the definition found in the ITU Radio Regulations (see Definition 3.13), this standard covers emission requirements related to radio-frequency disturbances in the frequency range of 9 kHz to 18 GHz.

NOTE Emission requirements for induction cooking appliances are specified in CISPR 14-1 [1]¹.

Requirements for ISM RF lighting equipment and UV irradiators operating at frequencies within the ISM frequency bands defined by the ITU Radio Regulations are contained in this standard.

Equipment covered by other CISPR product and product family emission standards are excluded from the scope of this standard.

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 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 16-1-1:2010/AMD 1:2010

CISPR 16-1-1:2010/AMD 2:2014

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

CISPR 16-1-4:2010, *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 16-1-4:2010/AMD 1:2012

¹ Figures in square brackets refer to the Bibliography.

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 16-2-3:2010, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements*

CISPR 16-2-3:2010/AMD 1:2010

CISPR 16-2-3:2010/AMD 2:2014

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

CISPR 16-4-2:2011/AMD 1:2014

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

IEC 60601-1-2:2014, *Medical electrical equipment – Part 1-2: General requirements for basic safety and essential performance – Collateral standard: Electromagnetic disturbances – Requirements and tests*

IEC 60601-2-2:2009, *Medical electrical equipment – Part 2-2: Particular requirements for the basic safety and essential performance of high frequency surgical equipment and high frequency surgical accessories*

IEC 60974-10:2014, *Arc welding equipment – Part 10: Electromagnetic compatibility (EMC) requirements*

IEC 61307:2011, *Industrial microwave heating installations – Test methods for the determination of power output*

IEC 62135-2:2007, *Resistance welding equipment – Part 2: Electromagnetic compatibility (EMC) requirements*

ITU Radio Regulations (2012), *Radio regulations, Volume 3 – Resolutions and recommendations, Resolution no. 63* (available at <http://www.itu.int/pub/R-REG-RR-2012>)

3 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

a.c. mains power port

port used to connect to a public low voltage a.c. mains power distribution network or other low voltage a.c. mains installation

3.2

arc welding equipment

equipment for applying current and voltage and having the required characteristics suitable for arc welding and allied processes