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# INTERNATIONAL STANDARD



INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

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PRODUCT FAMILY EMC STANDARD

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

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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## CONTENTS

FOREWORD .....	7
INTRODUCTION .....	10
1 Scope .....	14
2 Normative references .....	14
3 Terms, definitions and abbreviated terms .....	16
3.1 Terms and definitions .....	16
3.2 Abbreviated terms .....	21
4 Frequencies designated for ISM use .....	22
5 Classification of equipment .....	23
5.1 Separation into groups .....	23
5.2 Division into classes .....	23
5.3 Documentation for the user .....	23
6 Limits of electromagnetic disturbances .....	24
6.1 General .....	24
6.2 Group 1 equipment measured on a test site .....	24
6.2.1 Limits for conducted disturbances .....	24
6.2.2 Limits of electromagnetic radiation disturbance .....	29
6.3 Group 2 equipment measured on a test site .....	32
6.3.1 Limits for conducted disturbances .....	32
6.3.2 Limits of electromagnetic radiation disturbance .....	33
6.4 Group 1 and group 2 class A equipment measured in situ .....	39
6.4.1 Limits for conducted disturbances .....	39
6.4.2 Limits of electromagnetic radiation disturbance .....	39
7 Measurement requirements .....	42
7.1 General .....	42
7.2 Ambient noise .....	42
7.3 Measuring equipment .....	43
7.3.1 Measuring instruments .....	43
7.3.2 Artificial network (AN) .....	43
7.3.3 Voltage probe .....	44
7.3.4 Antennas .....	44
7.3.5 Artificial hand .....	45
7.4 Frequency measurement .....	46
7.5 Configuration of equipment under test .....	46
7.5.1 General .....	46
7.5.2 Interconnecting EUT cables and components .....	49
7.5.3 Connection to the electricity supply network on a test site .....	50
7.5.4 Measurements of robots .....	53
7.6 Load conditions of the EUT .....	57
7.6.1 General .....	57
7.6.2 Medical equipment .....	57
7.6.3 Industrial equipment .....	59
7.6.4 Scientific, laboratory and measuring equipment .....	59
7.6.5 Microwave cooking appliances .....	59
7.6.6 Other equipment in the frequency range 1 GHz to 18 GHz .....	59
7.6.7 Electric welding equipment .....	60

7.6.8	ISM RF lighting equipment.....	60
7.6.9	Medium voltage (MV) and high voltage (HV) switchgear.....	60
7.6.10	Grid connected power converters.....	60
7.6.11	Robots.....	61
7.7	Recording of test-site measurement results.....	61
7.7.1	General.....	61
7.7.2	Conducted emissions.....	62
7.7.3	Radiated emissions.....	62
8	Special provisions for test site measurements (9 kHz to 1 GHz).....	62
8.1	Ground planes.....	62
8.2	Measurement of conducted disturbances.....	62
8.2.1	General.....	62
8.2.2	Measurements on grid connected power converters.....	63
8.2.3	Handheld equipment which is normally operated without an earth connection.....	68
8.3	OATS and SAC for measurements in the range 9 kHz to 1 GHz.....	68
8.3.1	General.....	68
8.3.2	Validation of the radiation test site (9 kHz to 1 GHz).....	69
8.3.3	Disposition of equipment under test (9 kHz to 1 GHz).....	69
8.3.4	Radiation measurements (9 kHz to 1 GHz).....	70
8.4	Alternative radiation test sites for the frequency range 30 MHz to 1 GHz.....	70
8.5	FAR for measurements in the range 30 MHz to 1 GHz.....	70
9	Radiation measurements: 1 GHz to 18 GHz.....	70
9.1	Test arrangement.....	70
9.2	Receiving antenna.....	71
9.3	Validation <del>and calibration</del> of test site.....	71
9.4	Measuring procedure.....	71
9.4.1	General.....	71
9.4.2	Operating conditions of the EUT (group 2 equipment only).....	72
9.4.3	Peak measurements (group 2 equipment only).....	72
9.4.4	Weighted measurements (group 2 equipment only).....	73
10	Measurement <i>in situ</i> .....	74
11	Safety precautions for emission measurements on ISM RF equipment.....	75
12	Measurement uncertainty.....	75
Annex A (informative)	Examples of equipment classification.....	76
A.1	General.....	76
A.2	Group 1 equipment.....	76
A.2.1	General Group 1 equipment.....	76
A.2.2	Detailed Group 1 equipment.....	76
A.3	Group 2 equipment.....	77
A.3.1	General Group 2 equipment.....	77
A.3.2	Detailed Group 2 equipment.....	77
<del>Annex B (informative) Precautions to be taken in the use of a spectrum analyzer (see 7.3.1).....</del>		
Annex B (normative)	Measurement of electromagnetic radiation disturbance in the presence of signals from radio transmitters.....	79
<del>Annex D (informative) Propagation of interference from industrial radio-frequency equipment at frequencies between 30 MHz and 300 MHz.....</del>		

Annex C (informative) Recommendations of CISPR for protection of certain radio services in particular areas.....	81
C.1 General.....	81
C.2 Recommendations for protection of safety-related radio services .....	81
C.3 Recommendations for protection of specific sensitive radio services .....	83
<del>Annex F (informative) Frequency bands allocated for safety-related radio services.....</del>	<del>71</del>
<del>Annex G (informative) Frequency bands allocated for sensitive radio services .....</del>	<del>72</del>
<del>Annex H (informative) Statistical assessment of series produced equipment against the requirements of CISPR standards.....</del>	<del>74</del>
<del>Annex I (normative) Artificial Network (AN) for the assessment of disturbance voltages at d.c. power ports of semiconductor power converters.....</del>	<del>79</del>
Annex D (informative) Measurements on Grid Connected Power Converters (GCPC) – Setups for an effective test site configuration .....	100
D.1 General information and purpose .....	100
D.2 Setup of the test site.....	100
D.2.1 Block diagram of test site.....	100
D.2.2 DC power supply .....	101
D.2.3 AC power source.....	101
D.2.4 Other components .....	102
D.3 Other test setups .....	102
D.3.1 Configuration comprising laboratory AC power source and resistive load.....	102
D.3.2 Configuration with reverse power flow into the AC mains .....	104
Annex E (informative) <del>Test site configuration and instrumentation</del> —Guidance on prevention of saturation effects in mitigation filters of transformer-less power converters during <del>type tests according to this standard</del> .....	106
E.1 General information and purpose .....	106
E.2 Recommendations for avoidance of saturation effects in the range 9 kHz to 150 kHz.....	107
E.3 Detailed advice.....	107
E.3.1 General.....	107
E.3.2 Insert of series inductors (or common mode chokes) in the laboratory's DC power supply chain .....	108
E.3.3 Employment of additional common mode decoupling capacitors at the interface between the AE port of the DC-AN and the laboratory DC power supply port allocated in the test environment.....	109
E.4 Background information .....	110
Annex F (normative) Additional requirements for equipment with radio functionality.....	113
F.1 Configuration of the EUT during emission tests.....	113
F.2 Radiated emissions .....	113
F.3 Conducted emissions.....	113
Bibliography.....	115
List of comments.....	118
Figure 1 – Circuit for disturbance voltage measurements on mains supply .....	44
Figure 2 – Artificial hand, RC element.....	46
Figure 3 – Example for a typical cable arrangement for measurements of radiated disturbances in 3 m separation distance, Table-top EUT.....	48
Figure 4 – Example for a typical test set up for measurement of conducted and/or radiated disturbances from a floor standing EUT, 3D view .....	49

Figure 5 – EUT boundary determination for radiated disturbance measurements of robots with extendable/moving arm .....	53
Figure 6 – Example of a typical test setup for conducted disturbance measurement on a floor-standing robot system .....	54
Figure 7 – Example of a typical test setup for radiated disturbance measurement on a floor-standing robot system .....	55
Figure 8 – Example of a typical test setup for conducted disturbance measurement on a combination robot system .....	56
Figure 9 – Example of a typical test setup for radiated disturbance measurement on a combination robot system.....	57
Figure 10 – Disposition of medical equipment (capacitive type) and dummy load.....	58
Figure 11 – Typical arrangement for measurement of conducted disturbances at LV DC power ports with the DC-AN used as termination and decoupling unit to the laboratory DC power source .....	65
Figure 12 – Typical arrangement for measurement of conducted disturbances at LV DC power ports with the DC-AN used as termination and voltage probe.....	66
Figure 13 – Typical arrangement for measurement of conducted disturbances at LV DC power ports with the DC-AN used as voltage probe and with a current probe – 2D diagram .....	67
Figure 14 – Typical arrangement for measurement of conducted disturbances at LV DC power ports with a DC-AN used as voltage probe and with a current probe – 3D diagram .....	67
Figure 15 – Radiation test site .....	69
Figure 16 – Minimum size of metal ground plane.....	69
Figure 17 – Decision tree for the measurement of emissions from 1 GHz to 18 GHz of group 2 equipment operating at frequencies above 400 MHz .....	72
Figure D.1 – <del>Setup of the test site (Case 1) – 2D diagram</del> Test setup for Case 1 (schematic).....	100
Figure D.2 – <del>Setup of the test site (Case 1) – 3D diagram</del> Test setup for Case 1 (3D view) .....	101
Figure D.3 – <del>Setup of the test site (Case 2) – 2D diagram</del> Test setup for Case 2 (schematic).....	103
Figure D.4 – <del>Setup of the test site (Case 2) – 3D diagram</del> Test setup for Case 2 (3D view) .....	103
Figure D.5 – <del>Setup of the test site (Case 3) – 2D diagram</del> Test setup for Case 3 (schematic).....	104
Figure D.6 – <del>Setup of the test site (Case 3) – 3D diagram</del> Test setup for Case 3 (3D view) .....	105
Figure E.1 – Flow of the common mode RF current at test site configuration level.....	108
Figure E.2 – Blocking of flow of common mode RF current by insert of series inductors.....	109
Figure E.3 – Blocking of flow of common mode RF current by employment of additional CM decoupling capacitors .....	109
Figure E.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 .....	110
Figure E.5 – Prevention of saturation of mitigation filters by use of additional decoupling capacitors.....	111
Figure E.6 – Change in the resonant frequency caused by the increase and decrease in the decoupling capacitor's capacitance .....	111
Figure E.7 – DC-AN circuit example where capacitance of blocking capacitors of the LC decoupling circuit can be increased or decreased .....	112
Table 1 – Frequencies in the radio-frequency (RF) range designated by ITU for use as fundamental ISM frequencies .....	22

Table 2 – Disturbance voltage limits for class A group 1 equipment measured on a test site (AC mains power port) .....	26
Table 3 – Limits for conducted disturbances of class A group 1 equipment measured on a test site (DC power port).....	27
Table 4 – Disturbance voltage limits for class B group 1 equipment measured on a test site (AC mains power port) .....	27
Table 5 – Disturbance voltage limits for class B group 1 equipment measured on a test site (DC power port).....	28
Table 6 – Applicability of measurements at DC power ports.....	28
Table 7 – Limits for conducted disturbances measured on a test site (wired network port) .....	29
Table 8 – Electromagnetic radiation disturbance limits for class A group 1 equipment measured on a test site .....	30
Table 9 – Electromagnetic radiation disturbance limits for class B group 1 equipment measured on a test site .....	30
Table 10 – Required highest frequency for radiated measurements .....	31
Table 11 – Electromagnetic radiation disturbance limits for group 1 equipment measured on a test site .....	32
Table 12 – Disturbance voltage limits for class A group 2 equipment measured on a test site (AC mains power port) .....	33
Table 13 – Disturbance voltage limits for class B group 2 equipment measured on a test site (AC mains power port) .....	33
Table 14 – Electromagnetic radiation disturbance limits for class A group 2 equipment measured on a test site .....	35
Table 15 – Electromagnetic radiation disturbance limits for class A EDM and arc welding equipment measured on a test site .....	36
Table 16 – Electromagnetic radiation disturbance limits for class B group 2 equipment measured on a test site .....	37
Table 17 – Electromagnetic radiation disturbance peak limits for group 2 equipment operating at frequencies above 400 MHz .....	38
Table 18 – Electromagnetic radiation disturbance weighted limits for group 2 equipment operating at frequencies above 400 MHz .....	38
Table 19 – Electromagnetic radiation disturbance APD level corresponding to 10 <sup>-1</sup> limits for class B group 2 equipment operating at frequencies above 400 MHz .....	39
Table 20 – Electromagnetic radiation disturbance limits for class A group 1 equipment measured <i>in situ</i> .....	40
Table 21 – Electromagnetic radiation disturbance limits for class A group 2 equipment measured <i>in situ</i> .....	41
Table 22 – Operation modes for fixed robots .....	61
Table 23 – Operation modes for mobile robots .....	61
Table 24 – Frequency subranges to be used for weighted measurements .....	73
Table C.1 – Limits for electromagnetic radiation disturbances for <i>in situ</i> measurements to protect specific safety-related radio services in particular areas.....	81
Table C.2 – Frequency bands allocated for safety-related radio services.....	82
Table C.3 – Frequency bands allocated for sensitive radio services.....	84
Table F.1 – Disturbance voltage and current limits for group 1 and group 2 equipment measured on a test site (antenna port).....	114

INTERNATIONAL ELECTROTECHNICAL COMMISSION  
INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

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

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.
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**This commented version (CMV) of the official standard CISPR 11:2024 edition 7.0 allows the user to identify the changes made to the previous CISPR 11:2015+AMD1:2016+AMD2:2019 CSV edition 6.2. Furthermore, comments from CISPR Subcommittee B experts are provided to explain the reasons of the most relevant changes, or to clarify any part of the content.**

**A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text. Experts' comments are identified by a blue-background number. Mouse over a number to display a pop-up note with the comment.**

**This publication contains the CMV and the official standard. The full list of comments is available at the end of the CMV.**

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 seventh edition cancels and replaces the sixth edition published in 2015, Amendment 1:2016 and Amendment 2:2019. This edition constitutes a technical revision.

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

- a) introduction of limits for radiated disturbances in the frequency range above 1 GHz for group 1 equipment in line with the requirements given in the generic emission standards;
- b) introduction of limits for conducted disturbances on the wired network port in line with the requirements given in the generic emission standards;
- c) introduction of requirements for equipment which incorporates radio transmit/receive functions;
- d) introduction of definitions for various types of robots;
- e) consideration of some particular conditions when measuring robots, such as measurement setups and operating modes of robots.

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

Draft	Report on voting
CIS/B/831/FDIS	CIS/B/837/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 International Standard 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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

This document 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)*.

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](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

**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.**



The main content of this document 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 3.1.18 in this document. CISPR and ITU share their responsibilities 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 (2020)). 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 can~~ apply to individual ISM RF applications operated at frequencies outside designated ISM bands (see Table 1). They also ~~may can~~ 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 C of this document.

~~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~~

## ~~Introduction to the Amendment 2~~

~~This AMD 2 combines the contents of two fragments which have been circulated as CIS/B/688/CDV (f2) and CIS/B/697/CDV (f3).~~

~~Fragment 2: Requirements for semiconductor power converters (SPC)~~

~~CISPR 11 Ed. 6.1 needs to be supplemented with further information for full inclusion of type test requirements for SPCs specified hereafter. These requirements apply only to the following types of equipment:~~

- ~~a) power conversion equipment intended for assembly into photovoltaic power generating systems, such as grid-connected power converters (GCPCs) and d.c. to d.c. converters,~~
- ~~b) GCPCs intended for assembly into energy storage systems.~~

~~Fragment 3: Improvement of repeatability for measurements in the frequency range 1-18 GHz~~

~~Based on the comments from the National Committees on CIS/B/662/DC, CIS/B/WG1 decided on its meeting in Hangzhou 2016 to amend the test procedure for group 2 equipment in the frequency range 1 to 18 GHz for the following reasons:~~

- ~~a) CISPR 11 allows final measurements on group 2 equipment operating at frequencies above 400 MHz with two different weighting functions, the traditional "LogAV detector" with a video bandwidth of 10 Hz and the new APD method, where the Amplitude Probability Distribution is evaluated.~~

~~With the alignment of emission requirements for sources of fluctuating emissions with those generating CW-type emissions (Fraction 4 of the last general maintenance of CISPR 11) for most of the frequency range 1 to 18 GHz the peak detector is used mostly for preliminary~~

~~measurements, while the number of final measurements with the LogAV detector has been increased from 2 frequencies to max. 7 frequencies.~~

~~In parallel, with fraction 3, the APD detector has been introduced, but only with the traditional 2 final frequencies (one in the range 1 GHz to 2.4 GHz and one in the range 2,5 GHz to 18 GHz).~~

~~The number of final frequencies to be measured should be aligned for both weighting functions.~~

~~b) During practical measurements cases have been observed, where the critical frequency changed between preliminary and final measurement by more than 5 MHz. The range of 10 MHz for weighted measurements ( $\pm 5$  MHz from highest peak emission) seems therefore not always to be sufficient.~~

~~An extension of this frequency range seems advisable and could increase the repeatability.~~

~~In the range 11,7 to 12,7 GHz, an EUT fails immediately if one peak exceeds the limit of 73 dB[ $\mu$ V/m]. Observations on a big number of different microwave ovens have shown that during the final measurement (at least 2 min) such peaks may occur very seldom, and with a very short duration, and an estimated overall duration of less than 1 % of the measuring time.~~

~~A state-of-the-art digital communication service should be able to tolerate such peaks. Meanwhile, in countries where broadcasting systems, which are already standardized and widely spread and is difficult to avoid disturbance by such peaks, are under operation, additional limits could be separately introduced as necessary.~~

~~c) The repeatability of the peak measurement on microwave ovens is poor. Moreover, the sheer height of the highest peak emission, without information on its duration and repetition rate, provides very limited information on the real disturbance potential.~~

~~Measurements with both of the weighting methods have a significantly better repeatability and should, by their physical nature, give a better judgement for the disturbing potential of the EUT on digital radio services.~~

~~d) The conditions for preliminary and final measurements became ambiguous in Edition 6.0 (CISPR 11:2015), particularly regarding the required test time. Furthermore, it has been found that, in some cases, a duration of 20 s for the preliminary peak measurement may not be enough. To further increase the repeatability, WG1 decided not to divide the peak measurements anymore into preliminary and final measurements, but to require a 2-minute max hold peak measurement at every azimuth.~~

~~CISPR SC/B WG1 agreed to present the following proposals to the National Committees:~~

- ~~1) Define the same 7 final frequency ranges for the APD method as already defined for the LogAV method (detector).~~
- ~~2) Extend the frequency range for the final weighted measurement to 20 MHz.~~

~~For the APD method this would mean to measure on 5 final frequencies, the critical frequency itself,  $\pm 5$  MHz and  $\pm 10$  MHz.~~

~~For the LogAV detector, the requirement remains to perform for the final measurements at least 5 consecutive sweeps in max hold mode. The test time increases accordingly, and coverage of the fluctuations is the same as before.~~

- ~~3) Change the peak limit in Table 13 to a constant value of 70 dB[ $\mu$ V/m] throughout the frequency range and replace the requirement of a final peak measurement in the range 11,7 GHz to 12,7 GHz by a requirement of an additional weighted measurement at the frequency of the highest peak emission in this range. This may lead to a maximum of 8 final weighted measurements.~~
- ~~4) Discard the distinction between preliminary and final peak measurements and make instead the peak measurements on all azimuths for 2 minutes.~~

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

## 1 Scope

This document 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 document 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 (2020) (see Definition 3.1.18), this document covers emission requirements related to radio-frequency disturbances in the frequency range of 9 kHz to 18 GHz.

ISM equipment which incorporates radio transmit/receive functions (host equipment with radio functionality) is included in the scope of this document, see Annex F. However, the emission requirements in this document are not intended to be applicable to the intentional transmissions from a radio transmitter as defined by the ITU including their spurious emissions. **1**

NOTE 1 This exclusion only applies to emissions from the intentional radio transmitter. However, combination emissions, for example emissions resulting from intermodulation between the radio and the non-radio subassemblies of the ISM equipment, are not subject to this exclusion.

NOTE 2 Emission requirements for induction cooking appliances are specified in CISPR 14-1 [1]<sup>1</sup>.

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 document.

Robots used for industrial, scientific and medical applications are in the scope of this document. **2**

EXAMPLE Welding robots, spraying robots, handling robots, processing robots, assembly robots, medical robots, education and experimental robots. A comprehensive list of robots in the scope of this document is given on the IEC EMC zone.

NOTE 3 Flying robots, domestic helper robots, toy robots and entertainment robots are examples of robots in the scope of other CISPR standards.

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

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

CISPR 16-1-1:2010/2019, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus –*

<sup>1</sup> Figures in square brackets refer to the Bibliography.

*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 16-1-2:2014/AMD1:2017

CISPR 16-1-4:~~2010~~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:~~2010/AMD1:2012~~2019/AMD1:2020

CISPR 16-1-4:2019/AMD2:2023

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 16-2-1:2014/AMD1:2017

CISPR 16-2-3:~~2010~~2016, *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/AMD1:2010~~2016/AMD1:2019

CISPR 16-2-3:~~2010/AMD2:2014~~2016/AMD2:2023

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/AMD1:2014

CISPR 16-4-2:2011/AMD2:2018

CISPR 32:2015, *Electromagnetic compatibility of multimedia equipment – Emission requirements*

CISPR 32:2015/AMD1:2019

IEC 60050-161:1990, *International Electrotechnical Vocabulary (IEV) – Part 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~~2017, *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 61000-4-6:2023, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61307:2011<sup>2</sup>, *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~~2020), *Radio regulations* (available at <http://www.itu.int/en/myitu/Publications/2020/09/02/14/23/Radio-Regulations-2020>)

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<sup>2</sup> This publication was withdrawn.



# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



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

PRODUCT FAMILY EMC STANDARD  
NORME DE FAMILLE DE PRODUITS EN CEM

**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**

## CONTENTS

FOREWORD.....	7
INTRODUCTION.....	10
1 Scope.....	11
2 Normative references .....	11
3 Terms, definitions and abbreviated terms .....	13
3.1 Terms and definitions.....	13
3.2 Abbreviated terms.....	18
4 Frequencies designated for ISM use.....	19
5 Classification of equipment.....	20
5.1 Separation into groups.....	20
5.2 Division into classes .....	20
5.3 Documentation for the user.....	20
6 Limits of electromagnetic disturbances .....	21
6.1 General.....	21
6.2 Group 1 equipment measured on a test site .....	21
6.2.1 Limits for conducted disturbances.....	21
6.2.2 Limits of electromagnetic radiation disturbance.....	26
6.3 Group 2 equipment measured on a test site .....	29
6.3.1 Limits for conducted disturbances.....	29
6.3.2 Limits of electromagnetic radiation disturbance.....	30
6.4 Group 1 and group 2 class A equipment measured in situ .....	36
6.4.1 Limits for conducted disturbances.....	36
6.4.2 Limits of electromagnetic radiation disturbance.....	36
7 Measurement requirements .....	39
7.1 General.....	39
7.2 Ambient noise.....	39
7.3 Measuring equipment.....	40
7.3.1 Measuring instruments.....	40
7.3.2 Artificial network (AN).....	40
7.3.3 Voltage probe .....	41
7.3.4 Antennas .....	41
7.3.5 Artificial hand .....	42
7.4 Frequency measurement.....	42
7.5 Configuration of equipment under test.....	42
7.5.1 General .....	42
7.5.2 EUT cables and components .....	45
7.5.3 Connection to the electricity supply network on a test site .....	46
7.5.4 Measurements of robots .....	49
7.6 Load conditions of the EUT .....	53
7.6.1 General .....	53
7.6.2 Medical equipment.....	53
7.6.3 Industrial equipment .....	55
7.6.4 Scientific, laboratory and measuring equipment.....	55
7.6.5 Microwave cooking appliances.....	55
7.6.6 Other equipment in the frequency range 1 GHz to 18 GHz.....	55
7.6.7 Electric welding equipment .....	56

7.6.8	ISM RF lighting equipment.....	56
7.6.9	Medium voltage (MV) and high voltage (HV) switchgear .....	56
7.6.10	Grid connected power converters .....	56
7.6.11	Robots.....	57
7.7	Recording of test-site measurement results .....	57
7.7.1	General .....	57
7.7.2	Conducted emissions.....	58
7.7.3	Radiated emissions .....	58
8	Special provisions for test site measurements (9 kHz to 1 GHz) .....	58
8.1	Ground planes .....	58
8.2	Measurement of conducted disturbances .....	58
8.2.1	General .....	58
8.2.2	Measurements on grid connected power converters.....	59
8.2.3	Handheld equipment which is normally operated without an earth connection.....	63
8.3	OATS and SAC for measurements in the range 9 kHz to 1 GHz .....	63
8.3.1	General .....	63
8.3.2	Validation of the radiation test site (9 kHz to 1 GHz).....	64
8.3.3	Disposition of equipment under test (9 kHz to 1 GHz).....	64
8.3.4	Radiation measurements (9 kHz to 1 GHz) .....	65
8.4	Alternative radiation test sites for the frequency range 30 MHz to 1 GHz .....	65
8.5	FAR for measurements in the range 30 MHz to 1 GHz .....	65
9	Radiation measurements: 1 GHz to 18 GHz.....	65
9.1	Test arrangement.....	65
9.2	Receiving antenna .....	66
9.3	Validation of test site .....	66
9.4	Measuring procedure .....	66
9.4.1	General .....	66
9.4.2	Operating conditions of the EUT (group 2 equipment only) .....	67
9.4.3	Peak measurements (group 2 equipment only) .....	67
9.4.4	Weighted measurements (group 2 equipment only).....	68
10	Measurement <i>in situ</i> .....	69
11	Safety precautions for emission measurements on ISM RF equipment .....	70
12	Measurement uncertainty .....	70
Annex A (informative)	Examples of equipment classification .....	71
A.1	General.....	71
A.2	Group 1 equipment .....	71
A.2.1	General Group 1 equipment.....	71
A.2.2	Detailed Group 1 equipment .....	71
A.3	Group 2 equipment .....	72
A.3.1	General Group 2 equipment.....	72
A.3.2	Detailed Group 2 equipment .....	72
Annex B (normative)	Measurement of electromagnetic radiation disturbance in the presence of signals from radio transmitters.....	73
Annex C (informative)	Recommendations of CISPR for protection of certain radio services in particular areas .....	74
C.1	General.....	74
C.2	Recommendations for protection of safety-related radio services .....	74

C.3	Recommendations for protection of specific sensitive radio services .....	76
Annex D (informative)	Measurements on Grid Connected Power Converters (GCPC) – Setups for an effective test site configuration .....	79
D.1	General information and purpose .....	79
D.2	Setup of the test site .....	79
D.2.1	Block diagram of test site .....	79
D.2.2	DC power supply .....	80
D.2.3	AC power source .....	80
D.2.4	Other components .....	81
D.3	Other test setups .....	81
D.3.1	Configuration comprising laboratory AC power source and resistive load .....	81
D.3.2	Configuration with reverse power flow into the AC mains .....	82
Annex E (informative)	Guidance on prevention of saturation effects in mitigation filters of transformer-less power converters during tests .....	84
E.1	General information and purpose .....	84
E.2	Recommendations for avoidance of saturation effects in the range 9 kHz to 150 kHz .....	85
E.3	Detailed advice .....	85
E.3.1	General .....	85
E.3.2	Insert of series inductors (or common mode chokes) in the laboratory's DC power supply chain .....	86
E.3.3	Employment of additional common mode decoupling capacitors at the interface between the AE port of the DC-AN and the laboratory DC power supply port allocated in the test environment .....	87
E.4	Background information .....	87
Annex F (normative)	Additional requirements for equipment with radio functionality .....	90
F.1	Configuration of the EUT during emission tests .....	90
F.2	Radiated emissions .....	90
F.3	Conducted emissions .....	90
Bibliography	.....	92
Figure 1	– Circuit for disturbance voltage measurements on mains supply .....	41
Figure 2	– Artificial hand, RC element .....	42
Figure 3	– Example for a typical cable arrangement for measurements of radiated disturbances in 3 m separation distance, Table-top EUT .....	44
Figure 4	– Example for a typical test set up for measurement of conducted and/or radiated disturbances from a floor standing EUT, 3D view .....	45
Figure 5	– EUT boundary determination for radiated disturbance measurements of robots with extendable/moving arm .....	49
Figure 6	– Example of a typical test setup for conducted disturbance measurement on a floor-standing robot system .....	50
Figure 7	– Example of a typical test setup for radiated disturbance measurement on a floor-standing robot system .....	51
Figure 8	– Example of a typical test setup for conducted disturbance measurement on a combination robot system .....	52
Figure 9	– Example of a typical test setup for radiated disturbance measurement on a combination robot system .....	53
Figure 10	– Disposition of medical equipment (capacitive type) and dummy load .....	54

Figure 11 – Typical arrangement for measurement of conducted disturbances at LV DC power ports with the DC-AN used as termination and decoupling unit to the laboratory DC power source .....	60
Figure 12 – Typical arrangement for measurement of conducted disturbances at LV DC power ports with the DC-AN used as termination and voltage probe .....	61
Figure 13 – Typical arrangement for measurement of conducted disturbances at LV DC power ports with the DC-AN used as voltage probe and with a current probe – 2D diagram .....	62
Figure 14 – Typical arrangement for measurement of conducted disturbances at LV DC power ports with a DC-AN used as voltage probe and with a current probe – 3D diagram .....	62
Figure 15 – Radiation test site .....	64
Figure 16 – Minimum size of metal ground plane .....	64
Figure 17 – Decision tree for the measurement of emissions from 1 GHz to 18 GHz of group 2 equipment operating at frequencies above 400 MHz .....	67
Figure D.1 – Test setup for Case 1 (schematic) .....	79
Figure D.2 – Test setup for Case 1 (3D view).....	80
Figure D.3 – Test setup for Case 2 (schematic) .....	81
Figure D.4 – Test setup for Case 2 (3D view).....	82
Figure D.5 – Test setup for Case 3 (schematic) .....	83
Figure D.6 – Test setup for Case 3 (3D view).....	83
Figure E.1 – Flow of the common mode RF current at test site configuration level .....	86
Figure E.2 – Blocking of flow of common mode RF current by insert of series inductors.....	86
Figure E.3 – Blocking of flow of common mode RF current by employment of additional CM decoupling capacitors.....	87
Figure E.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.....	88
Figure E.5 – Prevention of saturation of mitigation filters by use of additional decoupling capacitors .....	88
Figure E.6 – Change in the resonant frequency caused by the increase and decrease in the decoupling capacitor's capacitance .....	89
Figure E.7 – DC-AN circuit example where capacitance of blocking capacitors of the LC decoupling circuit can be increased or decreased.....	89
Table 1 – Frequencies in the radio-frequency (RF) range designated by ITU for use as fundamental ISM frequencies.....	19
Table 2 – Disturbance voltage limits for class A group 1 equipment measured on a test site (AC mains power port).....	23
Table 3 – Limits for conducted disturbances of class A group 1 equipment measured on a test site (DC power port) .....	24
Table 4 – Disturbance voltage limits for class B group 1 equipment measured on a test site (AC mains power port).....	24
Table 5 – Disturbance voltage limits for class B group 1 equipment measured on a test site (DC power port).....	25
Table 6 – Applicability of measurements at DC power ports .....	25
Table 7 – Limits for conducted disturbances measured on a test site (wired network port).....	26
Table 8 – Electromagnetic radiation disturbance limits for class A group 1 equipment measured on a test site.....	27

Table 9 – Electromagnetic radiation disturbance limits for class B group 1 equipment measured on a test site.....	27
Table 10 – Required highest frequency for radiated measurements .....	28
Table 11 – Electromagnetic radiation disturbance limits for group 1 equipment measured on a test site.....	28
Table 12 – Disturbance voltage limits for class A group 2 equipment measured on a test site (AC mains power port).....	30
Table 13 – Disturbance voltage limits for class B group 2 equipment measured on a test site (AC mains power port).....	30
Table 14 – Electromagnetic radiation disturbance limits for class A group 2 equipment measured on a test site.....	32
Table 15 – Electromagnetic radiation disturbance limits for class A EDM and arc welding equipment measured on a test site.....	33
Table 16 – Electromagnetic radiation disturbance limits for class B group 2 equipment measured on a test site.....	33
Table 17 – Electromagnetic radiation disturbance peak limits for group 2 equipment operating at frequencies above 400 MHz .....	34
Table 18 – Electromagnetic radiation disturbance weighted limits for group 2 equipment operating at frequencies above 400 MHz .....	35
Table 19 – Electromagnetic radiation disturbance APD level corresponding to 10 <sup>-1</sup> limits for class B group 2 equipment operating at frequencies above 400 MHz.....	36
Table 20 – Electromagnetic radiation disturbance limits for class A group 1 equipment measured <i>in situ</i> .....	37
Table 21 – Electromagnetic radiation disturbance limits for class A group 2 equipment measured <i>in situ</i> .....	38
Table 22 – Operation modes for fixed robots.....	57
Table 23 – Operation modes for mobile robots.....	57
Table 24 – Frequency subranges to be used for weighted measurements .....	68
Table C.1 – Limits for electromagnetic radiation disturbances for <i>in situ</i> measurements to protect specific safety-related radio services in particular areas.....	74
Table C.2 – Frequency bands allocated for safety-related radio services .....	75
Table C.3 – Frequency bands allocated for sensitive radio services.....	77
Table F.1 – Disturbance voltage and current limits for group 1 and group 2 equipment measured on a test site (antenna port).....	91

INTERNATIONAL ELECTROTECHNICAL COMMISSION  
INTERNATIONAL SPECIAL COMMITTEE ON RADIO INTERFERENCE

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

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.
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- 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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

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 seventh edition cancels and replaces the sixth edition published in 2015, Amendment 1:2016 and Amendment 2:2019. This edition constitutes a technical revision.

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

- a) introduction of limits for radiated disturbances in the frequency range above 1 GHz for group 1 equipment in line with the requirements given in the generic emission standards;
- b) introduction of limits for conducted disturbances on the wired network port in line with the requirements given in the generic emission standards;

- c) introduction of requirements for equipment which incorporates radio transmit/receive functions;
- d) introduction of definitions for various types of robots;
- e) consideration of some particular conditions when measuring robots, such as measurement setups and operating modes of robots.

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

Draft	Report on voting
CIS/B/831/FDIS	CIS/B/837/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 International Standard 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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://www.iec.ch/publications).

This document 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)*.

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](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

**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.**



The main content of this document 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 3.1.18 in this document. CISPR and ITU share their responsibilities 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 both, equipment assessed by means of 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(2020)). 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 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 can apply to individual ISM RF applications operated at frequencies outside designated ISM bands (see Table 1). They also can apply to ISM RF applications operated at frequencies above 18 GHz.

Recommendations of CISPR for the protection of radio services in particular areas are found in Annex C of this document.

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

## 1 Scope

This document 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 document covers emission requirements related to radio-frequency (RF) disturbances in the frequency range of 9 kHz to 400 GHz.

For ISM RF applications in the meaning of the definition found in the ITU Radio Regulations (2020) (see Definition 3.1.18), this document covers emission requirements related to radio-frequency disturbances in the frequency range of 9 kHz to 18 GHz.

ISM equipment which incorporates radio transmit/receive functions (host equipment with radio functionality) is included in the scope of this document, see Annex F. However, the emission requirements in this document are not intended to be applicable to the intentional transmissions from a radio transmitter as defined by the ITU including their spurious emissions.

NOTE 1 This exclusion only applies to emissions from the intentional radio transmitter. However, combination emissions, for example emissions resulting from intermodulation between the radio and the non-radio subassemblies of the ISM equipment, are not subject to this exclusion.

NOTE 2 Emission requirements for induction cooking appliances are specified in CISPR 14-1 [1]<sup>1</sup>.

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 document.

Robots used for industrial, scientific and medical applications are in the scope of this document.

EXAMPLE Welding robots, spraying robots, handling robots, processing robots, assembly robots, medical robots, education and experimental robots. A comprehensive list of robots in the scope of this document is given on the IEC EMC zone.

NOTE 3 Flying robots, domestic helper robots, toy robots and entertainment robots are examples of robots in the scope of other CISPR standards.

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

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

CISPR 16-1-1:2019, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus*

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<sup>1</sup> Figures in square brackets refer to the Bibliography.

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 16-1-2:2014/AMD1:2017

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

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 16-2-1:2014/AMD1:2017

CISPR 16-2-3:2016, *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/AMD1:2019  
CISPR 16-2-3:2016/AMD2:2023

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IEC 61000-4-6:2023, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61307:2011<sup>2</sup>, *Industrial microwave heating installations – Test methods for the determination of power output*

ITU Radio Regulations (2020), *Radio regulations* (available at <http://www.itu.int/en/myitu/Publications/2020/09/02/14/23/Radio-Regulations-2020>)

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<sup>2</sup> This publication was withdrawn.

## SOMMAIRE

AVANT-PROPOS .....	101
INTRODUCTION.....	104
1 Domaine d'application .....	105
2 Références normatives .....	106
3 Termes, définitions et abréviations .....	107
3.1 Termes et définitions .....	107
3.2 Abréviations.....	113
4 Fréquences désignées pour être utilisées par les appareils ISM .....	113
5 Classification des appareils .....	114
5.1 Séparation en groupes.....	114
5.2 Division en classes .....	114
5.3 Documentation pour l'utilisateur.....	115
6 Limites des perturbations électromagnétiques .....	115
6.1 Généralités .....	115
6.2 Appareils du groupe 1 mesurés sur un site d'essai.....	116
6.2.1 Limites des perturbations conduites.....	116
6.2.2 Limites du rayonnement électromagnétique perturbateur .....	120
6.3 Appareils du groupe 2 mesurés sur un site d'essai.....	123
6.3.1 Limites des perturbations conduites.....	123
6.3.2 Limites du rayonnement électromagnétique perturbateur .....	125
6.4 Appareils de classe A, groupe 1 et groupe 2, mesurés <i>in situ</i> .....	131
6.4.1 Limites des perturbations conduites.....	131
6.4.2 Limites du rayonnement électromagnétique perturbateur .....	131
7 Exigences de mesure .....	134
7.1 Généralités .....	134
7.2 Bruit ambiant .....	134
7.3 Équipement de mesure .....	135
7.3.1 Appareils de mesure.....	135
7.3.2 Réseau fictif (AN) .....	135
7.3.3 Sonde de tension.....	136
7.3.4 Antennes .....	137
7.3.5 Main fictive .....	137
7.4 Mesurage de fréquence .....	138
7.5 Configuration du matériel en essai .....	138
7.5.1 Généralités.....	138
7.5.2 Câbles et composants de l'EUT .....	140
7.5.3 Raccordement au réseau d'alimentation électrique sur un site d'essai .....	141
7.5.4 Mesurages des robots .....	144
7.6 Conditions de charge de l'EUT.....	148
7.6.1 Généralités.....	148
7.6.2 Appareils médicaux .....	148
7.6.3 Appareils industriels .....	150
7.6.4 Équipement scientifique, de laboratoire et de mesure .....	150
7.6.5 Appareils de cuisson à micro-ondes.....	151
7.6.6 Autres appareils fonctionnant dans la plage de fréquences comprises entre 1 GHz et 18 GHz .....	151

7.6.7	Matériel de soudage électrique .....	151
7.6.8	Appareil d'éclairage ISM à fréquences radioélectriques .....	151
7.6.9	Appareillage moyenne tension (MT) et haute tension (HT) .....	151
7.6.10	Convertisseurs de puissance connectés au réseau .....	152
7.6.11	Robots .....	152
7.7	Enregistrement des résultats de mesure du site d'essai .....	153
7.7.1	Généralités .....	153
7.7.2	Émissions conduites .....	154
7.7.3	Émissions rayonnées .....	154
8	Dispositions spéciales pour les mesurages sur un site d'essai (9 kHz à 1 GHz) .....	154
8.1	Plans de masse .....	154
8.2	Mesurage des perturbations conduites .....	154
8.2.1	Généralités .....	154
8.2.2	Mesurages sur les convertisseurs de puissance connectés au réseau .....	155
8.2.3	Appareils tenus à la main fonctionnant normalement sans mise à la terre .....	160
8.3	OATS et SAC pour les mesurages dans la plage de 9 kHz à 1 GHz .....	160
8.3.1	Généralités .....	160
8.3.2	Validation du site d'essai en rayonnement (9 kHz à 1 GHz) .....	161
8.3.3	Disposition du matériel en essai (9 kHz à 1 GHz) .....	161
8.3.4	Mesurages de rayonnement (9 kHz à 1 GHz) .....	162
8.4	Autres sites d'essai en rayonnement pour la plage de fréquences comprises entre 30 MHz et 1 GHz .....	162
8.5	FAR pour les mesurages dans la plage de 30 MHz à 1 GHz .....	162
9	Mesurages de rayonnement: 1 GHz à 18 GHz .....	163
9.1	Configuration d'essai .....	163
9.2	Antenne de réception .....	163
9.3	Validation du site d'essai .....	163
9.4	Procédure de mesure .....	163
9.4.1	Généralités .....	163
9.4.2	Conditions de fonctionnement de l'EUT (appareils du groupe 2 uniquement) .....	164
9.4.3	Mesurages de crête (appareils du groupe 2 uniquement) .....	164
9.4.4	Mesurages pondérés (appareils du groupe 2 uniquement) .....	165
10	Mesurage <i>in situ</i> .....	167
11	Mesures de sécurité pour les mesurages des émissions sur les appareils ISM RF .....	167
12	Incertitude de mesure .....	167
Annexe A (informative) Exemples de classification des appareils .....		168
A.1	Généralités .....	168
A.2	Appareils du groupe 1 .....	168
A.2.1	Appareils du groupe 1 – Généralités .....	168
A.2.2	Appareils du groupe 1 – En détail .....	169
A.3	Appareils du groupe 2 .....	169
A.3.1	Appareils du groupe 2 – Généralités .....	169
A.3.2	Appareils du groupe 2 – En détail .....	170
Annexe B (normative) Mesurage du rayonnement électromagnétique perturbateur en présence de signaux provenant d'émetteurs radio .....		171
Annexe C (informative) Recommandations du CISPR concernant la protection de certains services radio dans des zones particulières .....		172

C.1	Généralités .....	172
C.2	Recommandations relatives à la protection des services radio liés à la sécurité.....	172
C.3	Recommandations relatives à la protection des services radio sensibles spécifiques .....	174
Annexe D (informative) Mesurages sur les convertisseurs de puissance connectés au réseau (GCPC) – Montages pour une configuration efficace du site d'essai .....		
D.1	Informations générales et objet .....	177
D.2	Montage du site d'essai .....	177
D.2.1	Organigramme du site d'essai .....	177
D.2.2	Alimentation en courant continu.....	179
D.2.3	Source d'alimentation en courant alternatif .....	179
D.2.4	Autres composantes .....	179
D.3	Autres montages d'essai.....	179
D.3.1	Configuration comprenant la source d'alimentation en courant alternatif de laboratoire et la charge résistive .....	179
D.3.2	Configuration avec flux de puissance inverse vers le réseau en courant alternatif .....	180
Annexe E (informative) Recommandations concernant la prévention des effets de saturation dans les filtres d'atténuation des convertisseurs de puissance sans transformateur pendant les essais .....		
E.1	Informations générales et objet .....	182
E.2	Recommandations pour éviter les effets de saturation dans la plage comprise entre 9 kHz et 150 kHz .....	183
E.3	Informations détaillées .....	184
E.3.1	Généralités .....	184
E.3.2	Insertion de bobines d'inductance en série (ou pièges en mode commun) dans la chaîne d'alimentation en courant continu de laboratoire .....	185
E.3.3	Utilisation de condensateurs de découplage en mode commun supplémentaires au niveau de l'interface entre l'accès AE du réseau DC-AN et l'accès d'alimentation en courant continu de laboratoire attribué dans l'environnement d'essai.....	186
E.4	Informations de base .....	186
Annexe F (normative) Exigences complémentaires relatives aux équipements avec une fonctionnalité radio.....		
F.1	Configuration de l'EUT pendant les essais d'émission.....	190
F.2	Émissions rayonnées .....	190
F.3	Émissions conduites .....	190
Bibliographie.....		
Figure 1 – Circuit pour le mesurage de tensions perturbatrices sur le réseau d'alimentation .....		
		136
Figure 2 – Main fictive, dipôle RC .....		
		138
Figure 3 – Exemple de disposition de câble type pour le mesurage des perturbations rayonnées à une distance de séparation de 3 m, EUT sur table .....		
		139
Figure 4 – Exemple de montage d'essai type pour le mesurage des perturbations conduites et/ou rayonnées provenant d'un EUT posé au sol, vue 3D .....		
		140
Figure 5 – Détermination de la limite de l'EUT pour le mesurage des perturbations rayonnées des robots avec bras extensible/mobile .....		
		145
Figure 6 – Exemple de montage d'essai type pour le mesurage des perturbations conduites sur un système robotique posé au sol .....		
		145

Figure 7 – Exemple de montage d'essai type pour le mesurage des perturbations rayonnées sur un système robotique posé au sol.....	146
Figure 8 – Exemple de montage d'essai type pour le mesurage des perturbations conduites sur un système robotique combiné.....	147
Figure 9 – Exemple de montage d'essai type pour le mesurage des perturbations rayonnées sur un système robotique combiné.....	148
Figure 10 – Disposition de l'appareil médical (type capacitif) et de la charge fictive .....	149
Figure 11 – Dispositif type pour le mesurage des perturbations conduites aux accès d'alimentation en courant continu à basse tension, avec le réseau DC-AN utilisé comme terminaison et unité de découplage à la source d'alimentation en courant continu de laboratoire .....	157
Figure 12 – Dispositif type pour le mesurage des perturbations conduites aux accès d'alimentation en courant continu à basse tension, avec le réseau DC-AN utilisé comme terminaison et sonde de tension .....	158
Figure 13 – Dispositif type pour le mesurage des perturbations conduites aux accès d'alimentation en courant continu à basse tension, avec le réseau DC-AN utilisé comme sonde de tension, et avec une sonde de courant – schéma 2D .....	159
Figure 14 – Dispositif type pour le mesurage des perturbations conduites aux accès d'alimentation en courant continu à basse tension, avec un réseau DC-AN utilisé comme sonde de tension, et avec une sonde de courant – schéma 3D .....	159
Figure 15 – Site d'essai en rayonnement .....	161
Figure 16 – Dimensions minimales du plan de masse métallique .....	161
Figure 17 – Arbre de décision pour le mesurage des émissions entre 1 GHz et 18 GHz des appareils du groupe 2 fonctionnant à des fréquences supérieures à 400 MHz .....	164
Figure D.1 – Montage du site d'essai (Cas 1) – Schéma 2D.....	178
Figure D.2 – Montage du site d'essai (Cas 1) – Schéma 3D.....	178
Figure D.3 – Montage du site d'essai (Cas 2) – Schéma 2D.....	180
Figure D.4 – Montage du site d'essai (Cas 2) – Schéma 3D.....	180
Figure D.5 – Montage du site d'essai (Cas 3) – Schéma 2D.....	181
Figure D.6 – Montage du site d'essai (Cas 3) – Schéma 3D.....	181
Figure E.1 – Flux du courant radioélectrique en mode commun au niveau de la configuration du site d'essai.....	184
Figure E.2 – Blocage du flux du courant radioélectrique en mode commun par insertion de bobines d'inductance en série .....	185
Figure E.3 – Blocage du flux du courant radioélectrique en mode commun par utilisation de condensateurs de découplage CM supplémentaires .....	186
Figure E.4 – Impédance de charge CM au niveau de l'accès de l'EUT d'un réseau DC-AN – Caractéristique amplitude/fréquence dans la plage comprise entre 3 kHz et 30 MHz (exemple).....	187
Figure E.5 – Prévention de la saturation des filtres d'atténuation à l'aide de condensateurs de découplage supplémentaires .....	188
Figure E.6 – Modification de la fréquence de résonance due à l'augmentation et à la réduction de capacité du condensateur de découplage .....	188
Figure E.7 – Exemple de circuit DC-AN dans lequel la capacité des condensateurs de blocage du circuit de découplage LC peut être augmentée ou réduite .....	189
Tableau 1 – Fréquences dans la plage de fréquences radioélectriques, désignées par l'UIT comme étant des fréquences fondamentales pour les appareils ISM.....	114
Tableau 2 – Limites de tensions perturbatrices des appareils de classe A, groupe 1, mesurées sur un site d'essai (accès d'alimentation secteur en courant alternatif) .....	117



Tableau 3 – Limites de perturbations conduites des appareils de classe A, groupe 1, mesurées sur un site d'essai (accès d'alimentation en courant continu) .....	118
Tableau 4 – Limites de tensions perturbatrices des appareils de classe B, groupe 1, mesurées sur un site d'essai (accès d'alimentation secteur en courant alternatif) .....	118
Tableau 5 – Limites de tensions perturbatrices des appareils de classe B, groupe 1, mesurées sur un site d'essai (accès d'alimentation en courant continu) .....	119
Tableau 6 – Applicabilité des mesurages aux accès d'alimentation en courant continu .....	119
Tableau 7 – Limites de perturbations conduites mesurées sur un site d'essai (accès de réseau câblé).....	120
Tableau 8 – Limites du rayonnement électromagnétique perturbateur des appareils de classe A, groupe 1, mesurées sur un site d'essai.....	121
Tableau 9 – Limites du rayonnement électromagnétique perturbateur des appareils de classe B, groupe 1, mesurées sur un site d'essai.....	122
Tableau 10 – Fréquence la plus élevée exigée pour les mesurages rayonnés.....	123
Tableau 11 – Limites du rayonnement électromagnétique perturbateur des appareils du groupe 1, mesurées sur un site d'essai.....	123
Tableau 12 – Limites de tensions perturbatrices des appareils de classe A, groupe 2, mesurées sur un site d'essai (accès d'alimentation secteur en courant alternatif) .....	124
Tableau 13 – Limites de tensions perturbatrices des appareils de classe B, groupe 2, mesurées sur un site d'essai (accès d'alimentation secteur en courant alternatif) .....	125
Tableau 14 – Limites du rayonnement électromagnétique perturbateur des appareils de classe A, groupe 2, mesurées sur un site d'essai.....	127
Tableau 15 – Limites du rayonnement électromagnétique perturbateur pour le matériel d'usinage par décharges électriques et le matériel de soudage à l'arc de classe A, mesurées sur un site d'essai.....	128
Tableau 16 – Limites du rayonnement électromagnétique perturbateur des appareils de classe B, groupe 2, mesurées sur un site d'essai.....	128
Tableau 17 – Limites en valeur crête du rayonnement électromagnétique perturbateur des appareils du groupe 2 fonctionnant à des fréquences supérieures à 400 MHz .....	129
Tableau 18 – Limites pondérées du rayonnement électromagnétique perturbateur des appareils du groupe 2 fonctionnant à des fréquences supérieures à 400 MHz.....	130
Tableau 19 – Niveau de DPA du rayonnement électromagnétique perturbateur correspondant aux limites $10^{-1}$ pour les appareils de classe B, groupe 2, fonctionnant à des fréquences supérieures à 400 MHz .....	131
Tableau 20 – Limites du rayonnement électromagnétique perturbateur des appareils de classe A, groupe 1, mesurées <i>in situ</i> .....	132
Tableau 21 – Limites du rayonnement électromagnétique perturbateur des appareils de classe A, groupe 2, mesurées <i>in situ</i> .....	133
Tableau 22 – Modes de fonctionnement des robots fixes .....	153
Tableau 23 – Modes de fonctionnement des robots mobiles .....	153
Tableau 24 – Sous-plages de fréquences à utiliser pour les mesurages pondérés .....	165
Tableau C.1 – Limites des rayonnements électromagnétiques perturbateurs pour les mesurages <i>in situ</i> afin de protéger les services radio spécifiques liés à la sécurité dans des zones particulières .....	172
Tableau C.2 – Bandes de fréquences attribuées pour les services radio liés à la sécurité.....	173
Tableau C.3 – Bandes de fréquences attribuées pour les services radio sensibles .....	175
Tableau F.1 – Limites de perturbation en tension et en courant pour les appareils du groupe 1 et du groupe 2 mesurés sur un site d'essai (port d'antenne).....	191

**COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE****COMITÉ INTERNATIONAL SPÉCIAL DES PERTURBATIONS RADIOÉLECTRIQUES****APPAREILS INDUSTRIELS, SCIENTIFIQUES ET MÉDICAUX –  
CARACTÉRISTIQUES DE PERTURBATIONS RADIOÉLECTRIQUES –  
LIMITES ET MÉTHODES DE MESURE****AVANT-PROPOS**

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Cette septième édition annule et remplace la sixième édition parue en 2015, l'Amendement 1:2016 et l'Amendement 2:2019. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

- a) introduction de limites pour les perturbations rayonnées dans la plage de fréquences supérieure à 1 GHz pour les appareils du groupe 1, conformément aux exigences données dans les normes d'émission génériques;
- b) introduction de limites pour les perturbations conduites sur l'accès de réseau câblé conformément aux exigences données dans les normes d'émission génériques;
- c) Introduction d'exigences relatives aux appareils qui intègrent des fonctions d'émission/réception radio;
- d) introduction de définitions pour les différents types de robots;
- e) prise en considération de certaines conditions particulières lors de la mesure des robots, comme les configurations de mesure et les modes de fonctionnement des robots.

Le texte de ce document est issu des documents suivants:

Projet	Rapport de vote
CIS/B/831/FDIS	CIS/B/837/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est l'anglais.

Ce document a été rédigé selon les directives ISO/IEC, Partie 2, il a été développé selon les directives ISO/IEC, Partie 1 et les directives ISO/IEC, Supplément IEC, disponibles sous [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs). Les principaux types de documents développés par l'IEC sont décrits plus en détail sous [www.iec.ch/publications](http://www.iec.ch/publications).

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Le contenu principal du présent document est fondé sur la Recommandation n° 39/2 du CISPR rappelée ci-dessous:

RECOMMANDATION n° 39/2

**Limites et méthodes de mesure des caractéristiques de perturbations  
électromagnétiques des appareils industriels, scientifiques et médicaux (ISM) à  
fréquences radioélectriques**

Le CISPR

CONSIDERANT

- a) que les appareils ISM à fréquences radioélectriques constituent une source importante de perturbations;
- b) que les méthodes de mesure de ces perturbations ont été spécifiées par le CISPR;
- c) que certaines fréquences sont désignées par l'Union Internationale des Télécommunications (UIT) pour un rayonnement non limité provenant des appareils ISM;

RECOMMANDE

que la dernière édition de la CISPR 11 soit utilisée pour appliquer des limites et méthodes de mesure des caractéristiques des appareils ISM.

## INTRODUCTION

Parmi les exigences communes relatives au contrôle des perturbations radioélectriques dues au matériel destiné à des applications industrielles, scientifiques et électromédicales, la présente publication du CISPR contient des exigences spécifiques relatives au contrôle des perturbations radioélectriques dues à des applications ISM à fréquences radioélectriques au sens de la définition donnée par l'Union Internationale des Télécommunications (UIT). Voir également la Définition 3.1.18 du présent document. Le CISPR et l'UIT se partagent la responsabilité de la protection des services radio en matière d'utilisation des applications ISM à fréquences radioélectriques.

Le CISPR est concerné par le contrôle des perturbations radioélectriques dues à des applications ISM à fréquences radioélectriques par le moyen d'une évaluation de ces perturbations, soit sur un site d'essai normalisé, soit, dans le cas d'une application ISM à fréquences radioélectriques qui ne peut pas être soumise à l'essai sur un tel site, sur son lieu de fonctionnement. Par conséquent, la présente publication du CISPR couvre les exigences relatives à l'évaluation des deux sortes d'appareils, à savoir, les appareils évalués par des essais sur des sites d'essai normalisés ou les appareils spécifiques évalués dans des conditions *in situ*.

L'UIT est concerné par le contrôle des perturbations radioélectriques dues à des applications ISM à fréquences radioélectriques pendant le fonctionnement normal et l'utilisation de l'appareil correspondant sur son lieu de fonctionnement (voir la Définition 1.15 dans le règlement des radiocommunications de l'UIT (2020)). Là, l'utilisation de l'énergie radioélectrique découplée de l'application ISM à fréquences radioélectriques par couplage rayonnant, inductif ou capacitif est limitée à l'emplacement de cette application.

Le paragraphe 6.3 de la présente publication du CISPR contient les exigences essentielles relatives aux émissions pour une évaluation des perturbations radioélectriques dues à des applications ISM à fréquences radioélectriques sur des sites d'essai normalisés. Ces exigences permettent des essais sur les applications ISM à fréquences radioélectriques qui fonctionnent à des fréquences jusqu'à 18 GHz. Le paragraphe 6.4 contient par ailleurs les exigences essentielles relatives aux émissions pour une évaluation *in situ* des perturbations radioélectriques dues à des applications ISM à fréquences radioélectriques dans la plage de fréquences jusqu'à 1 GHz. Toutes les exigences ont été établies en étroite collaboration avec l'UIT et jouissent de l'approbation de l'UIT.

Toutefois, pour le fonctionnement et l'utilisation de plusieurs types d'applications ISM à fréquences radioélectriques, il convient que le fabricant, l'installateur et/ou le client connaissent les dispositions nationales complémentaires concernant la réglementation et les besoins particuliers de protection des services et applications radio locaux. Selon le pays concerné, ces dispositions complémentaires peuvent s'appliquer à des applications ISM à fréquences radioélectriques qui fonctionnent à des fréquences situées à l'extérieur des bandes ISM désignées (voir le Tableau 1). Elles peuvent aussi s'appliquer à des applications ISM à fréquences radioélectriques qui fonctionnent à des fréquences supérieures à 18 GHz.

L'Annexe C du présent document donne des recommandations du CISPR relatives à la protection des services radio dans des zones particulières.

# APPAREILS INDUSTRIELS, SCIENTIFIQUES ET MÉDICAUX – CARACTÉRISTIQUES DE PERTURBATIONS RADIOÉLECTRIQUES – LIMITES ET MÉTHODES DE MESURE

## 1 Domaine d'application

Le présent document s'applique aux appareils industriels, scientifiques et électromédicaux qui fonctionnent dans la plage de fréquences de 0 Hz à 400 GHz, ainsi qu'aux appareils domestiques et similaires conçus pour produire et/ou utiliser, dans un espace réduit, de l'énergie radioélectrique.

Le présent document couvre les exigences d'émission relatives aux perturbations radioélectriques dans la plage de fréquences de 9 kHz à 400 GHz.

Pour les applications industrielles, scientifiques et médicales (ISM) à fréquences radioélectriques, au sens de la définition fournie par le règlement des radiocommunications de l'UIT (2020) (voir la Définition 3.1.18), le présent document couvre les exigences d'émission relatives aux perturbations à fréquences radioélectriques dans la plage de fréquences de 9 kHz à 18 GHz.

Les appareils ISM qui intègrent des fonctions d'émission/réception radio (équipement hôte avec une fonctionnalité radio) sont inclus dans le domaine d'application du présent document, voir l'Annexe F. Toutefois, les exigences d'émission du présent document ne sont pas destinées à s'appliquer aux transmissions intentionnelles d'un émetteur radio tel que défini par l'UIT, y compris leurs émissions parasites.

NOTE 1 Cette exclusion s'applique uniquement aux émissions de l'émetteur radio intentionnel. Toutefois, les émissions combinées, par exemple les émissions qui résultent de l'intermodulation entre la radio et les sous-ensembles non radioélectriques de l'appareil ISM, ne sont pas soumises à cette exclusion.

NOTE 2 Les exigences d'émission pour les appareils de cuisson à induction sont spécifiées dans la CISPR 14-1 [1]<sup>1</sup>.

Les exigences relatives aux appareils d'éclairage ISM à fréquences radioélectriques et aux générateurs de rayonnement UV qui fonctionnent dans les bandes de fréquences ISM définies par le règlement des radiocommunications de l'UIT sont spécifiées dans le présent document.

Les robots utilisés pour les applications industrielles, scientifiques et médicales relèvent du domaine d'application du présent document.

EXEMPLE Robots de soudage, robots de pulvérisation, robots de manutention, robots de traitement, robots d'assemblage, robots médicaux, robots éducatifs et expérimentaux. Une liste exhaustive des robots qui relèvent du domaine d'application de la présente norme est donnée dans la zone CEM de l'IEC.

NOTE 3 Les robots volants, les robots d'aide domestique, les robots jouets et les robots de divertissement sont des exemples de robots qui relèvent du domaine d'application des autres normes CISPR.

Les appareils couverts par d'autres normes de produits du CISPR et d'autres normes d'émission de famille de produits n'entrent pas dans le domaine d'application du présent document.

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1 Les chiffres entre crochets renvoient à la Bibliographie.

## 2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

CISPR 16-1-1:2019, *Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Partie 1-1: Appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Appareils de mesure*

CISPR 16-1-2:2014, *Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Partie 1-2: Appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Dispositifs de couplage pour la mesure des perturbations conduites*  
CISPR 16-1-2:2014/AMD1:2017

CISPR 16-1-4:2019, *Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Partie 1-4: Appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Antennes et emplacements d'essai pour les mesures des perturbations rayonnées*  
CISPR 16-1-4:2019/AMD1:2020  
CISPR 16-1-4:2019/AMD2:2023

CISPR 16-2-1:2014, *Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Partie 2-1: Méthodes de mesure des perturbations et de l'immunité – Mesures des perturbations conduites*  
CISPR 16-2-1:2014/AMD1:2017

CISPR 16-2-3:2016, *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/AMD1:2019  
CISPR 16-2-3:2016/AMD2:2023

CISPR 16-4-2:2011, *Spécifications des méthodes et des appareils de mesure des perturbations radioélectriques et de l'immunité aux perturbations radioélectriques – Partie 4-2: Incertitudes, statistiques et modélisation des limites – Incertitudes de mesure de l'instrumentation*  
CISPR 16-4-2:2011/AMD1:2014  
CISPR 16-4-2:2011/AMD2:2018

CISPR 32:2015, *Compatibilité électromagnétique des équipements multimédia – Exigences d'émission*  
CISPR 32:2015/AMD1:2019

IEC 60050-161:1990, *Vocabulaire Electrotechnique international (IEV) – Partie 161: Compatibilité électromagnétique*

IEC 60601-2-2:2017, *Appareils électromédicaux – Partie 2-2: Exigences particulières pour la sécurité de base et les performances essentielles des appareils d'électrochirurgie à courant haute fréquence et des accessoires d'électrochirurgie à courant haute fréquence*

IEC 61000-4-6:2023, *Compatibilité électromagnétique (CEM) – Partie 4-6: Techniques d'essai et de mesure – Immunité aux perturbations conduites, induites par les champs aux fréquences radioélectriques*

IEC 61307:2011<sup>2</sup>, *Installations industrielles de chauffage à hyperfréquence – Méthodes d'essai pour la détermination de la puissance de sortie*

Règlement des radiocommunications de l'UIT (2020), *Règlement des radiocommunications, disponible à l'adresse*  
<http://www.itu.int/en/myitu/Publications/2020/09/02/14/23/Radio-Regulations-2020>)

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<sup>2</sup> Cette publication a été supprimée.