
**Elektromagnetna združljivost (EMC) – 4-21. del: Preskusne in merilne tehnike –
Preskusne metode za odbojne sobe**

Electromagnetic compatibility (EMC) – Part 4-21: Testing and measurement
techniques – Reverberation chamber test methods

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**Electromagnetic compatibility (EMC)
Part 4-21: Testing and measurement techniques –
Reverberation chamber test methods
(IEC 61000-4-21:2003)**

Compatibilité électromagnétique (CEM)
Partie 4-21: Techniques d'essai
et de mesure –
Méthodes d'essai en chambre
réverbérante
(CEI 61000-4-21:2003)

Elektromagnetische Verträglichkeit (EMV)
Teil 4-21: Prüf- und Messverfahren -
Verfahren für die Prüfung
in der Modenverwirbelungskammer
(IEC 61000-4-21:2003)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document CISPR/A/455/FDIS, future edition 1 of IEC 61000-4-21, prepared by CISPR SC A, Radio-interference measurements and statistical methods, in cooperation with SC 77B, High-frequency phenomena, of IEC TC 77, Electromagnetic compatibility, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61000-4-21 on 2003-10-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2004-07-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2006-10-01

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annexes B, C, D, E and ZA are normative and annexes A, F, G, H, I, J are informative.

Annex ZA has been added by CENELEC.

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The text of the International Standard IEC 61000-4-21:2003 was approved by CENELEC as a European Standard without any modification.

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Annex ZA (normative)

Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050-161	1990	International Electrotechnical Vocabulary (IEV) Chapter 161: Electromagnetic compatibility	-	-
IEC 60068-1	- ¹⁾	Environmental testing Part 1: General and guidance	EN 60068-1	1994 ²⁾
IEC 61000-4-3	- ¹⁾	Electromagnetic compatibility (EMC) Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test	EN 61000-4-3	2002 ²⁾
IEC 61000-4-6	- ¹⁾	Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields	-	-
CISPR 16-1	- ¹⁾	Specification for radio disturbance and immunity measuring apparatus and methods Part 1: Radio disturbance and immunity measuring apparatus	-	-
CISPR 16-2	- ¹⁾	Part 2: Methods of measurement of disturbances and immunity	-	-

¹⁾ Undated reference.

²⁾ Valid edition at date of issue.

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Compatibilité électromagnétique (CEM) –

**Partie 4-21:
Techniques d'essai et de mesure –
Méthodes d'essai en chambre réverbérante**

iTeh STANDARD PREVIEW

Electromagnetic compatibility (EMC) –

**Part 4-21: IST EN 61000-4-21:2005
Testing and measurement techniques –
Reverberation chamber test methods**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTROMAGNETIC COMPATIBILITY (EMC) –**Part 4-21: Testing and measurement techniques –
Reverberation chamber test methods**

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, 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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International Standard IEC 61000-4-21 has been prepared by CISPR subcommittee A: Radio interference measurements and statistical methods, in cooperation with subcommittee 77B: High-frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility.

It forms Part 4-21 of IEC 61000. It has the status of a basic EMC publication in accordance with IEC Guide 107.

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

FDIS	Report on voting
CISPR/A/455/FDIS	CISPR/A/469/RVD

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

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

The committee has decided that the contents of this publication will remain unchanged until 2005. At this date, the publication will be

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

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INTRODUCTION

IEC 61000 is published in separate parts according to the following structure:

Part 1: General

General considerations (introduction, fundamental principles)
Definitions, terminology

Part 2: Environment

Description of the environment
Classification of the environment
Compatibility levels

Part 3: Limits

Emission limits
Immunity limits (in so far as they do not fall under the responsibility of the product committees)

Part 4: Testing and measurement techniques

Measurement techniques
Testing techniques

Part 5: Installation and mitigation guidelines

Installation guidelines
Mitigation methods and devices

Part 6: Generic standards

Part 9: Miscellaneous

Each part is further subdivided into several parts, published either as international standards or as technical specifications or technical reports, some of which have already been published as sections. Others will be published with the part number followed by a dash and a second number identifying the subdivision (example : 61000-6-1).

ELECTROMAGNETIC COMPATIBILITY (EMC) –

Part 4-21: Testing and measurement techniques – Reverberation chamber test methods

1 Scope

This part of IEC 61000 considers immunity and wanted and unwanted emissions tests for electric and/or electronic equipment and screening effectiveness tests. Only radiated phenomena are considered. It establishes the required test procedures for using reverberation chambers for performing radiated immunity, radiated emissions and screening effectiveness testing.

The object of this part is to establish a common reference for using reverberation chambers to evaluate the performance of electric and electronic equipment when subjected to radio-frequency electromagnetic fields and for determining the levels of radio-frequency radiation emitted from electric and electronic equipment.

NOTE Test methods are defined in this part for measuring the effect of electromagnetic radiation on equipment and the electromagnetic emissions from equipment concerned. The simulation and measurement of electromagnetic radiation is not adequately exact for quantitative determination of effects. The test methods defined are structured for the primary objective of establishing adequate repeatability of results at various test facilities for qualitative analysis of effects.

This part of IEC 61000 does not intend to specify the tests to be applied to particular apparatus or system(s). Its main aim is to give a general basic reference to all concerned product committees of the IEC. The product committees are to select emission limits and test methods in consultation with CISPR. The product committees remain responsible for the appropriate choice of the immunity tests and the immunity test limits to be applied to their equipment. This part of IEC 61000 describes other test methods than IEC 61000-4-3 and CISPR 16-2. The other methods may be used in consultation with CISPR and TC 77, if so specified by product committees.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

IEC 60068-1, *Environmental testing – Part 1: General and guidance*

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

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

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

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

3 Definitions and acronyms

3.1 Definitions

For the purposes of this part of IEC 61000-4, the following definitions, together with those in IEC 60050(161) apply.

3.1.1

antenna

that part of a radio transmitting or receiving system which is designed to provide the required coupling between a transmitter or a receiver and the medium in which the radio wave propagates

[IEV 712-01-01]

NOTE For the purpose of this procedure antennas are assumed to have an efficiency of 75 % or greater.

3.1.2

electromagnetic (EM) wave

variations of the conditions of a material medium or vacuum, characterized by a time-varying electromagnetic field, and moving with a velocity defined at each point and in each direction by the properties of the medium

NOTE An electromagnetic wave is produced by variations of electric charges or of electric currents.

[IEV 121-11-63]

3.1.3

far field region

that region of the electromagnetic field of an antenna wherein the predominant components of the field are those which represent a propagation of energy and wherein the angular field distribution is essentially independent of the distance from the antenna

NOTE 1 In the far field region, all the components of the electromagnetic field decrease in inverse proportion to the distance from the antenna.

NOTE 2 For a *broadside* antenna having a maximum overall dimension, D , which is large compared to the wavelength, λ , the far field region is commonly taken to exist at distances greater than $2D^2/\lambda$ from the antenna in the direction of maximum radiation.

[IEV 712-02-02]

3.1.4

field strength

measurement, made in the far field, of either the electric or the magnetic component of the field and expressed as V/m or A/m; any one of these measurements may be converted into the others

NOTE For measurements made in the near field, the term "electric field strength" or "magnetic field strength" is used according to whether the resultant electric or magnetic field, respectively, is measured. In this field region, the relationship between the electric and magnetic field strength and distance is complex and difficult to predict, being dependent on the specific configuration involved. Inasmuch as it is not generally feasible to determine the time and space phase relationship of the various components of the complex field, the power flux density of the field is similarly indeterminate.

The IEEE Std 100 definition is as follows:

field strength

(electromagnetic wave) A general term that usually means the magnitude of the electric field vector, commonly expressed in V/m, but that may also mean the magnitude of the magnetic field vector, commonly expressed in A/m.

NOTE At frequencies above about 100 MHz, and particularly above 1 000 MHz, field strength in the far zone is sometimes identified with power flux density P . For a linearly polarized wave in free space $P = E^2 \left(\sqrt{\mu_v / \epsilon_v} \right)$, where

E is the electric field strength, and

μ_v and ϵ_v are the magnetic and electric constants of free space, respectively.

When P is expressed in W/m² and E in V/m, the denominator is often rounded off to 120π . See also: electric field strength; magnetic field strength; measurement system.

3.1.5 polarization

\Rightarrow
 \vec{P}

at a given point within a domain of quasi-infinitesimal volume V , vector quantity equal to the vector electric dipole moment \vec{p} of the substance contained within the domain divided by the volume V

$$\vec{P} = \frac{\vec{p}}{V} \quad (1)$$

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NOTE 1 The electric polarization, \vec{P} , satisfies the relation

$$\vec{D} = \epsilon_0 \vec{E} + \vec{P} \quad (2)$$

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where

D is the electric flux density,

E the electric field strength, and

ϵ_0 the dielectric constant.

[IEV 121-11-37, modified]

NOTE 2 Magnetic polarization (symbols B_i , J) is the vector quantity equal to the product of the magnetization, M , and magnetic constant, μ_0 :

$$J = \mu_0 M \quad (3)$$

[IEV 121-11-54]

3.1.6 reverberation chamber

shielded enclosure that is generally equipped with mechanical tuners/stirrers which change (stir) the boundary conditions within the enclosure and, thus, alter the structure of the electromagnetic fields within the enclosure

NOTE Testing in a reverberation chamber can be described as a stochastic process in which the mechanical tuners/stirrers "stir" the "modes" inside the enclosure. The chambers are also called stirred-mode, mode-stirred or mode-tuned chambers.