

**Electromagnetic compatibility (EMC) - Part 4-20:  
Testing and measurement techniques - Emission  
and immunity testing in transverse electromagnetic  
(TEM) waveguides**

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 61000-4-20:2010 sisaldab Euroopa standardi EN 61000-4-20:2010 ingliskeelset teksti.

Standard on kinnitatud Eesti Standardikeskuse 31.12.2010 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.

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Standard on kättesaadav Eesti standardiorganisatsioonist.

This Estonian standard EVS-EN 61000-4-20:2010 consists of the English text of the European standard EN 61000-4-20:2010.

This standard is ratified with the order of Estonian Centre for Standardisation dated 31.12.2010 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.

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English version

**Electromagnetic compatibility (EMC) -  
Part 4-20: Testing and measurement techniques -  
Emission and immunity testing in transverse electromagnetic (TEM)  
waveguides  
(IEC 61000-4-20:2010)**

Compatibilité électromagnétique (CEM) -  
Partie 4-20: Techniques d'essai et de  
mesure -  
Essais d'émission et d'immunité dans les  
guides d'onde TEM  
(CEI 61000-4-20:2010)

Elektromagnetische  
Verträglichkeit (EMV) -  
Teil 4-20: Prüf- und Messverfahren -  
Messung der Störaussendung und  
Störfestigkeit in transversal-  
elektromagnetischen (TEM-)Wellenleitern  
(IEC 61000-4-20:2010)

This European Standard was approved by CENELEC on 2010-10-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

**CENELEC**

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

**Management Centre: Avenue Marnix 17, B - 1000 Brussels**

## Foreword

The text of document 77B/637/FDIS, future edition 2 of IEC 61000-4-20, prepared by 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 61000-4-20 on 2010-10-01.

This European Standard supersedes EN 61000-4-20:2003 + A1:2007.

The main changes with respect to EN 61000-4-20:2003 + A1:2007 are the following:

- consistency of terms (e.g. test, measurement, etc.) has been improved;
- clauses covering test considerations, evaluations and the test report have been added;
- references to large TEM waveguides have been eliminated;
- a new informative annex has been added to deal with calibration of E-field probes.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

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) | 2011-07-01 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn                                               | (dow) | 2013-10-01 |

Annex ZA has been added by CENELEC.

## Endorsement notice

The text of the International Standard IEC 61000-4-20:2010 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

CISPR 20	NOTE Harmonized as EN 55020.
CISPR 25	NOTE Harmonized as EN 55025.
IEC 60068-1	NOTE Harmonized as EN 60068-1.
IEC 60118-13	NOTE Harmonized as EN 60118-13.
IEC 61967-2	NOTE Harmonized as EN 61967-2.
IEC 62132-2	NOTE Harmonized as EN 62132-2.
[11] CISPR 14 series	NOTE Harmonized in EN 55014 series (not modified).
[23] IEC 61000-2-9	NOTE Harmonized as EN 61000-2-9.
[42] IEC 61000-4-3	NOTE Harmonized as EN 61000-4-3.
[44] CISPR 16-4-2	NOTE Harmonized as EN 55016-4-2.

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

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.

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	-	International Electrotechnical Vocabulary (IEV) - Chapter 161: Electromagnetic compatibility	-	-
IEC 61000-2-11	1999	Electromagnetic compatibility (EMC) - Part 2-11: Environment - Classification of HEMP environments	-	-
IEC 61000-4-23	-	Electromagnetic compatibility (EMC) - Part 4-23: Testing and measurement techniques - Test methods for protective devices for HEMP and other radiated disturbances	EN 61000-4-23	-
IEC/TR 61000-4-32	-	Electromagnetic compatibility (EMC) - Part 4-32: Testing and measurement techniques - High-altitude electromagnetic pulse (HEMP) simulator compendium	-	-
IEC/TR 61000-5-3	-	Electromagnetic compatibility (EMC) - Part 5: Installation and mitigation guidelines - Section 3: HEMP protection concepts	-	-
CISPR 16-1-1	-	Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus	EN 55016-1-1	-
CISPR 16-1-4	-	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	EN 55016-1-4	-
CISPR 16-2-3	2006	Specification for radio disturbance and immunity measuring apparatus and methods - Part 2-3: Methods of measurement of disturbances and immunity - Radiated disturbance measurements	EN 55016-2-3 <sup>1)</sup>	2006
CISPR 22 (mod)	-	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	EN 55022	-

<sup>1)</sup> EN 55016-2-3 is superseded by EN 55016-2-3:2010, which is based on CISPR 16-2-3:2010.

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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, Technical Specifications or Technical Reports, some of which have already been published as sections. Others are and will be published with the part number followed by a dash and a second number identifying the subdivision (example: IEC 61000-6-1).

This part of IEC 61000 is an International Standard which gives emission, immunity and HEMP transient testing requirements.



## ELECTROMAGNETIC COMPATIBILITY (EMC) –

### Part 4-20: Testing and measurement techniques – Emission and immunity testing in transverse electromagnetic (TEM) waveguides

#### 1 Scope and object

This part of IEC 61000 relates to emission and immunity test methods for electrical and electronic equipment using various types of transverse electromagnetic (TEM) waveguides. These types include open structures (for example, striplines and electromagnetic pulse simulators) and closed structures (for example, TEM cells). These structures can be further classified as one-, two-, or multi-port TEM waveguides. The frequency range depends on the specific testing requirements and the specific TEM waveguide type.

The object of this standard is to describe

- TEM waveguide characteristics, including typical frequency ranges and EUT-size limitations;
- TEM waveguide validation methods for EMC tests;
- the EUT (i.e. EUT cabinet and cabling) definition;
- test set-ups, procedures, and requirements for radiated emission testing in TEM waveguides and
- test set-ups, procedures, and requirements for radiated immunity testing in TEM waveguides.

NOTE Test methods are defined in this standard for measuring the effects 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 for all end-use installations. The test methods defined are structured for a primary objective of establishing adequate repeatability of results at various test facilities for qualitative analysis of effects.

This standard does not intend to specify the tests to be applied to any particular apparatus or system(s). The main intention of this standard is to provide a general basic reference for all interested product committees of the IEC. For radiated emissions testing, product committees should select emission limits and test methods in consultation with CISPR standards. For radiated immunity testing, product committees remain responsible for the appropriate choice of immunity tests and immunity test limits to be applied to equipment within their scope. This standard describes test methods that are separate from those of IEC 61000-4-3.<sup>1</sup>

#### 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), *International Electrotechnical Vocabulary – Chapter 161: Electromagnetic compatibility*

IEC 61000-2-11:1999, *Electromagnetic compatibility (EMC) – Part 2-11: Environment – Classification of HEMP environments*

<sup>1</sup> These other distinct test methods may be used when so specified by product committees, in consultation with CISPR and TC 77.

IEC 61000-4-23, *Electromagnetic compatibility (EMC) – Part 4-23: Testing and measurement techniques – Test methods for protective devices for HEMP and other radiated disturbances*

IEC/TR 61000-4-32, *Electromagnetic compatibility (EMC) – Part 4-32: Testing and measurement techniques – High-altitude electromagnetic pulse (HEMP) simulator compendium*

IEC/TR 61000-5-3, *Electromagnetic compatibility (EMC) – Part 5-3: Installation and mitigation guidelines – HEMP protection concepts*

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

CISPR 16-1-4, *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 16-2-3:2006, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements*

CISPR 22, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*

### **3 Terms, definitions and abbreviations**

#### **3.1 Terms and definitions**

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

##### **3.1.1**

##### **transverse electromagnetic mode**

##### **TEM mode**

waveguide mode in which the components of the electric and magnetic fields in the propagation direction are much less than the primary field components across any transverse cross-section

##### **3.1.2**

##### **TEM waveguide**

open or closed transmission line system, in which a wave is propagated in the transverse electromagnetic mode to produce a specific field for testing purposes

##### **3.1.3**

##### **TEM cell**

closed TEM waveguide, often a rectangular coaxial transmission line, in which a wave is propagated in the transverse electromagnetic mode to produce a specific field for testing purposes and with an outer conductor completely enclosing an inner conductor

##### **3.1.4**

##### **two-port TEM waveguide**

TEM waveguide with input/output ports at both ends

##### **3.1.5**

##### **one-port TEM waveguide**

TEM waveguide with a single input/output port