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

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN IEC 61000-4-20:2022 sisaldab Euroopa standardi EN IEC 61000-4-20:2022 ingliskeelset teksti.	This Estonian standard EVS-EN IEC 61000-4-20:2022 consists of the English text of the European standard EN IEC 61000-4-20:2022.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 01.04.2022.	Date of Availability of the European standard is 01.04.2022.
Standard on kättesaadav Eesti Standardimis-ja Akrediteerimiskeskusest.	The standard is available from the Estonian Centre for Standardisation and Accreditation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 33.100.10, 33.100.20

EUROPEAN STANDARD

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EUROPÄISCHE NORM

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Supersedes EN 61000-4-20:2010 and all of its amendments and corrigenda (if any)

English Version

Electromagnetic compatibility (EMC) - Part 4-20: Testing and measurement techniques - Emission and immunity testing in transverse electromagnetic (TEM) waveguides (IEC 61000-4-20:2022)

Compatibilité électromagnétique (CEM) - Partie 4-20: Techniques d'essai et de mesure - Essais d'émission et d'immunité dans les guides d'onde TEM (IEC 61000-4-20:2022)

Elektromagnetische Verträglichkeit (EMV) - Teil 4-20: Prüf- und Messverfahren - Messung der Störaussendung und Prüfung der Störfestigkeit in transversal-elektromagnetischen (TEM-)Wellenleitern (IEC 61000-4-20:2022)

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Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 77B/853/FDIS, future edition 3 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 approved by CENELEC as EN IEC 61000-4-20:2022.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2022-12-25
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2025-03-25

This document supersedes EN 61000-4-20:2010 and all of its amendments and corrigenda (if any).

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The text of the International Standard IEC 61000-4-20:2022 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:

IEC 60068-1	NOTE Harmonized as EN 60068-1
IEC 60118-13	NOTE Harmonized as EN IEC 60118-13
IEC 61967-2	NOTE Harmonized as EN 61967-2
IEC 62132-2	NOTE Harmonized as EN 62132-2
CISPR 25	NOTE Harmonized as EN IEC 55025
CISPR 14 (series)	NOTE Harmonized as EN IEC 55014-2 (series)
CISPR 16-4-2	NOTE Harmonized as EN 55016-4-2
IEC 61000-2-9	NOTE Harmonized as EN 61000-2-9
IEC 61000-4-3	NOTE Harmonized as EN IEC 61000-4-3
CISPR 16-2-3:2016	NOTE Harmonized as EN 55016-2-3:2017 (not modified)
CISPR 32	NOTE Harmonized as EN 55032
CISPR 20:2006	NOTE Harmonized as EN 55020:2007 (not modified) +A11:2011

IEC 61000-4-20

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INTERNATIONAL STANDARD

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BASIC EMC PUBLICATION

PUBLICATION FONDAMENTALE EN CEM

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

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

IEC 61000-4-20:2022-02(en-fr)

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

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BASIC EMC PUBLICATION

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

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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ELECTROMAGNETIC COMPATIBILITY (EMC) –

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

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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International Standard IEC 61000-4-20 has been prepared by subcommittee 77B: High frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility, in cooperation with CISPR (International Special Committee on Radio Interference) subcommittee A: Radio-interference measurements and statistical methods.

It forms Part 4-20 of IEC 61000. It has the status of a basic EMC publication in accordance with IEC Guide 107.

This third edition cancels and replaces the second edition published in 2010. This edition constitutes a technical revision.

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

a) provide information on the testing of large EUTs (including cables);

b) apply the work on measurement uncertainties by adapting the work completed in CISPR and TC 77 (for emissions and immunity);

c) update the validation procedure for the test volume regarding field uniformity and TEM mode verification;

d) provide information concerning two-port and four-port TEM waveguides;

e) add a new informative annex (Annex I) dealing with transient TEM waveguide characterization; and

f) add information dealing with dielectric test stands for EUTs.

The text of this International Standard is based on the following documents:

Draft	Report on voting
77B/853/FDIS	77B/855/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. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts of the IEC 61000 series, published under the general title *Electromagnetic compatibility (EMC)*, can be found on the IEC website.

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 in the data related to the specific document. At this date, the document will be

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

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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 is an International Standard which gives emission, immunity and HEMP and IEMI transient testing requirements.

ELECTROMAGNETIC COMPATIBILITY (EMC) –

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

1 Scope

This part of IEC 61000 focuses on 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-port, two-port, or multi-port TEM waveguides. The frequency range depends on the specific testing requirements and the specific TEM waveguide type.

The object of this document is to describe

– TEM waveguide characteristics, including typical frequency ranges and equipment-under-test (EUT) size limitations;

– TEM waveguide validation methods for electromagnetic compatibility (EMC) tests;

– the EUT (i.e. EUT cabinet and cabling) definition;

– test set-ups, procedures, and requirements for radiated emission measurements in TEM waveguides; and

– test set-ups, procedures, and requirements for radiated immunity testing in TEM waveguides.

NOTE Test methods are defined in this document to measure the effects of electromagnetic radiation on equipment and the electromagnetic emissions from the equipment concerned. The simulation and measurement of electromagnetic radiation is not adequately exact for the quantitative determination of effects for all end-use installations. The test methods defined are structured for a primary objective of establishing adequate reproducibility of results at various test facilities for qualitative analysis of effects.

This document does not intend to specify the tests to be applied to any particular apparatus or system(s). The main intention of this document is to provide a general basic reference for all interested product committees of the IEC. For radiated emission measurements, product committees select emission limits and measurement 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 document describes test methods that are separate from those of IEC 61000-4-3 [34].[1]

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[1] Numbers in square brackets refer to the Bibliography.

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

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.

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

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*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-161and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1.1
anechoic material
material that exhibits the property of absorbing, or otherwise reducing, the level of electromagnetic energy reflected from that material

3.1.2
broadband transmission-line termination
termination which combines a low-frequency discrete-component load, to match the characteristic impedance of the TEM waveguides (typically 50 Ω), and a volume of high-frequency anechoic material

3.1.3
characteristic impedance
for any constant phase wave-front, magnitude of the ratio of the voltage between the inner conductor and the outer conductor to the current on either conductor and which is independent of the voltage/current magnitudes and depends only on the cross-sectional geometry of the transmission line

Note 1 to entry: TEM waveguides are typically designed to have a characteristic impedance of 50 Ω. TEM waveguides with a characteristic impedance of 100 Ω are often used for transient testing.

3.1.4
correlation algorithm
mathematical routine for converting TEM waveguide voltage measurements to open-area test sites (OATS), semi-anechoic chamber (SAC), or free space field strength levels