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BASIC EMC PUBLICATION

**Electromagnetic compatibility (EMC) –
Part 4-36: Testing and measurement techniques – IEMI immunity test methods
for equipment and systems**

IEC 61000-4-36:2020

<https://standards.iteh.ai/catalog/standards/sist/c5b3bb32-0fa8-400f-97d1-3b57529c4ae5/iec-61000-4-36-2020>



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTROMAGNETIC COMPATIBILITY (EMC) –**Part 4-36: Testing and measurement techniques –
IEMI immunity test methods for equipment and systems**

FOREWORD

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International Standard IEC 61000-4-36 has been prepared by subcommittee 77C: High power transient phenomena, of IEC technical committee 77: Electromagnetic compatibility.

It forms part 4-36 of IEC 61000. It has the status of a basic EMC publication in accordance with IEC Guide 107.

This second edition cancels and replaces the first edition published in 2014. This edition constitutes a technical revision.

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

- a) addition of a hyperband and mesoband radiated transients immunity test method in Annex H;
- b) addition of a calibration method of sensors for radiated hyperband and mesoband transient fields and measurement uncertainty in Annex I.

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

FDIS	Report on voting
77C/295/FDIS	77C/299/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.

A list of all parts in 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 publication will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
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- 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

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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: IEC 61000-6-1).

ELECTROMAGNETIC COMPATIBILITY (EMC) –

Part 4-36: Testing and measurement techniques – IEMI immunity test methods for equipment and systems

1 Scope

This part of IEC 61000 provides methods to determine test levels for the assessment of the immunity of equipment and systems to intentional electromagnetic interference (IEMI) sources. It introduces the general IEMI problem, IEMI source parameters, derivation of test limits and summarises practical test methods.

2 Normative references

There are no normative references in this document.

3 Terms, definitions and abbreviated terms

For the purposes of this document, the following terms, definitions and abbreviated terms 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 Terms and definitions

3.1.1

attenuation

reduction in magnitude (as a result of absorption and/or scattering) of an electric or magnetic field or a current or voltage, usually expressed in decibels

[SOURCE: IEC 61000-2-13:2005 [3]¹, 3.1]

3.1.2

bandratio

ratio of the high and low frequencies between which there is 90 % of the energy

Note 1 to entry: If the spectrum has a large DC content, the lower limit is nominally defined as 1 Hz (see IEC 61000-2-13 [3] for further details).

[SOURCE: IEC 61000-2-13:2005 [3], 3.2, modified – The second part of the definition has been made into a note.]

3.1.3

bandratio decades

bandratio expressed in decades as: bandratio decades = $\log_{10}(\text{bandratio})$

¹ Numbers in square brackets refer to the Bibliography.

[SOURCE: IEC 61000-2-13:2005 [3], 3.3]

3.1.4 burst

sequence of a limited number of distinct pulses or oscillations of limited duration

Note 1 to entry: When multiple bursts occur, the time between bursts is usually defined.

SOURCE: [IEC 60050-161:1990 [19], 161-02-07, modified – The note has been added.]

3.1.5 conducted HPEM environment

high-power electromagnetic currents and voltages that are either coupled or directly injected to cables and wires with voltage levels that typically exceed 1 kV

[SOURCE: IEC 61000-2-13:2005 [3], 3.5]

3.1.6 continuous wave CW

time waveform that has a fixed frequency and is continuous

[SOURCE: IEC 61000-2-13:2005 [3], 3.6]

3.1.7 electromagnetic compatibility EMC

ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment

[SOURCE: IEC 60050-161:2018, 161-01-07.]

3.1.8 electromagnetic disturbance

any electromagnetic phenomenon which can degrade the performance of a device, equipment or system

[SOURCE: IEC 60050-161:2018, [19] 161-01-05, modified – The last part of the definition, "or adversely affect living or inert matter", has been removed.]

3.1.9 electromagnetic interference EMI

degradation of the performance of a device, transmission channel or system caused by an electromagnetic disturbance

Note 1 to entry: Disturbance and interference are respectively cause and effect.

[SOURCE: IEC 60050-161:2018 [19], 161-01-06, modified – Notes 1 and 2 have been removed and a new Note 1 has been added.]

3.1.10 shield

<electromagnetic> electrically continuous housing for a facility, area, or component used to attenuate incident electric and magnetic fields by both absorption and reflection

**3.1.11
(electromagnetic) susceptibility**

possibility of degradation to the performance of a device, equipment or system in the presence of an electromagnetic field

Note 1 to entry: Susceptibility is a lack of immunity.

**3.1.12
high-altitude electromagnetic pulse
HEMP**

electromagnetic pulse produced by a nuclear explosion outside the earth's atmosphere

Note 1 to entry: Typically above an altitude of 30 km.

[SOURCE: IEC 61000-2-13:2005 [3], 3.12]

**3.1.13
high-power microwave
HPM**

narrowband signals, nominally with peak power in a pulse, in excess of 100 MW at the source

Note 1 to entry: This is a historical definition that depended on the strength of the source. The interest in this document is mainly on the EM field incident on an electronic system.

[SOURCE: IEC 61000-2-13:2005 [3], 3.13]

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**3.1.14
hyperband signal**

signal or waveform with a pbw (see 3.1.19) value between 163,4 % and 200 % or a bandratio > 10

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[SOURCE: IEC 61000-2-13:2005 [3], 3.14]

**3.1.15
hypoband signal**

narrowband signal or waveform with a pbw (see 3.1.19) of < 1 % or a bandratio < 1,01

[SOURCE: IEC 61000-2-13:2005 [3], 3.15, modified – The second term "narrowband signal" has been removed.]

**3.1.16
intentional electromagnetic interference
IEMI**

intentional malicious generation of electromagnetic energy introducing noise or signals into electric and electronic systems, thus disrupting, confusing or damaging these systems for terrorist or criminal purposes

[SOURCE: IEC 61000-2-13:2005 [3], 3.16]

**3.1.17
L band**

radar frequency band between 1 GHz and 2 GHz

[SOURCE: IEC 61000-2-13:2005 [3], 3.17]

**3.1.18
mesoband signal**

signal or waveform with a pbw (see 3.1.19) value between 1 % and 100 % or a bandratio between 1,01 and 3

[SOURCE: IEC 61000-2-13:2005 [3], 3.18]

3.1.19

percentage bandwidth

pbw

bandwidth of a waveform expressed as a percentage of the centre frequency of that waveform

Note 1 to entry: The pbw has a maximum value of 200 % when the centre frequency is the mean of the high and low frequencies. The pbw does not apply to signals with a large DC content (e.g., HEMP) for which the bandratio decades is used.

[SOURCE: IEC 61000-2-13:2005 [3], 3.19]

3.1.20

port-of-entry

PoE

physical location (point) on an electromagnetic barrier, where EM energy may enter or exit a topological volume, unless an adequate PoE protective device is provided

Note 1 to entry: A PoE is not limited to a geometrical point.

Note 2 to entry: PoEs are classified as aperture PoEs or conductive PoEs according to the type of penetration. They are also classified as architectural, mechanical, structural or electrical PoEs according to the functions they serve.

[SOURCE: IEC 61000-2-13:2005 [3], 3.20, modified – The second term "point-of-entry" has been removed.]

3.1.21

pulse

transient waveform that usually rises to a peak value and then decays, or a similar waveform that is an envelope of an oscillating waveform

[SOURCE: IEC 61000-2-13:2005 [3], 3.21]

3.1.22

pulse repetition frequency

prf

number of pulses per unit time, measured in Hz

3.1.23

radiated HPEM environment

high-power electromagnetic fields with peak electric field levels that typically exceed 100 V/m

[SOURCE: IEC 61000-2-13:2005 [3], 3.22]

3.1.24

rE_{far}

measured or known electric field multiplied by the distance at which it was measured to give an equivalent voltage at a distance of 1 m from the antenna

3.1.25

sub-hyperband signal

signal or a waveform with a pbw value between 100 % and 163,4 % or a bandratio between 3 and 10

[SOURCE: IEC 61000-2-13:2005 [3], 3.23]