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BASIC EMC PUBLICATION

PUBLICATION FONDAMENTALE EN CEM

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

**Compatibilité électromagnétique (CEM) –
Partie 4-3: Techniques d'essai et de mesure – Essai d'immunité aux champs
électromagnétiques rayonnés aux fréquences radioélectriques**



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IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTROMAGNETIC COMPATIBILITY (EMC) –**Part 4-3: Testing and measurement techniques –
Radiated, radio-frequency electromagnetic field immunity test**

FOREWORD

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International Standard IEC 61000-4-3 has been prepared by subcommittee 77B: High frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility.

It forms part 4-3 of IEC 61000. It has the status of a basic EMC publication in accordance with IEC Guide 107.

This fourth edition cancels and replaces the third edition published in 2006, Amendment 1:2007 and Amendment 2:2010. This edition constitutes a technical revision.

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

- a) testing using multiple test signals has been described;
- b) additional information on EUT and cable layout has been added;
- c) the upper frequency limitation has been removed to take account of new services;
- d) the characterization of the field as well as the checking of power amplifier linearity of the immunity chain are specified.

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

FDIS	Report on voting
77B/830/FDIS	77B/825/RVD

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

This document 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 document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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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

[IEC 61000-4-3:2020](#)

<https://standards.iteh.ai/catalog/standards/sist/638e504f-8e16-4c5a-850d-1005e9c6a600/iec-61000-4-3-2020>

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).

This part is an international standard which gives immunity requirements and test procedures related to radiated, radio-frequency, electromagnetic fields.

ELECTROMAGNETIC COMPATIBILITY (EMC) –

Part 4-3: Testing and measurement techniques – Radiated, radio-frequency electromagnetic field immunity test

1 Scope

This part of IEC 61000 is applicable to the immunity requirements of electrical and electronic equipment to radiated electromagnetic energy. It establishes test levels and the required test procedures.

The object of this document is to establish a common reference for evaluating the immunity of electrical and electronic equipment when subjected to radiated, radio-frequency electromagnetic fields. The test method documented in this part of IEC 61000 describes a consistent method to assess the immunity of an equipment or system against RF electromagnetic fields from RF sources not in close proximity to the EUT. The test environment is specified in Clause 6.

NOTE 1 As described in IEC Guide 107, this is a basic EMC publication for use by product committees of the IEC. As also stated in Guide 107, the IEC product committees are responsible for determining whether this immunity test standard should be applied or not, and if applied, they are responsible for determining the appropriate test levels and performance criteria. TC 77 and its sub-committees are prepared to co-operate with product committees in the evaluation of the value of particular immunity tests for their products.

NOTE 2 Immunity testing against RF sources in close proximity to the EUT is defined in IEC 61000-4-39.

Particular considerations are devoted to the protection against radio-frequency emissions from digital radiotelephones and other RF emitting devices.

NOTE 3 Test methods are defined in this part for evaluating the effect that electromagnetic radiation has on the equipment concerned. The simulation and measurement of electromagnetic radiation is not adequately exact for quantitative determination of effects. The test methods defined in this basic document have the primary objective of establishing an adequate reproducibility of testing configuration and repeatability of test results at various test facilities.

This document is an independent test method. It is not possible to use other test methods as substitutes for claiming compliance with 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.

IEC 60050-161, *International Electrotechnical Vocabulary (IEV) – Part 161: Electromagnetic compatibility* (available at www.electropedia.org)

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

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

amplitude modulation

AM

modulation in which the amplitude of a periodic carrier is a given function, generally linear, of the instantaneous values of the modulating signal

[SOURCE: IEC 60050-702:2016, 702-06-17]

3.1.2

anechoic chamber

shielded enclosure which is lined with radio-frequency absorbers to reduce reflections from the internal surfaces

3.1.3

fully anechoic chamber

shielded enclosure whose internal surfaces are totally lined with anechoic material

3.1.4

semi-anechoic chamber

shielded enclosure in which all surfaces except the metal floor are covered with material that absorbs electromagnetic energy (i.e. RF absorber) in the frequency range of interest

3.1.5

modified semi-anechoic chamber

semi-anechoic chamber which has additional absorbers installed on the ground plane

3.1.6

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

Note 1 to entry: In practice, the terminals of the antenna or the points to be considered as the interface between the antenna and the transmitter or receiver should be specified.

Note 2 to entry: If a transmitter or receiver is connected to its antenna by a feed line, the antenna may be considered to be a transducer between the guided waves of the feed line and the radiated waves in space.

[SOURCE: IEC 60050-712:1992, 712-01-01]

3.1.7

balun

device for transforming an unbalanced voltage to a balanced voltage or vice versa

[SOURCE: IEC 60050-161:1990 161-04-34]

3.1.8

common mode absorption device

CMAD

device that may be applied on cables leaving the test area in radiated immunity tests to damp resonances on cables

3.1.9 continuous wave CW

sinusoidal electromagnetic wave, the successive oscillations of which are identical under steady-state conditions, which can be interrupted or modulated to convey information

3.1.10 electromagnetic wave

wave characterized by the propagation of a time-varying electromagnetic field

Note 1 to entry: An electromagnetic wave is produced by variations of electric charges or of electric currents

[SOURCE: IEC 60050-705:1995, 705-01-09]

3.1.11 far field

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

Note 2 to entry: 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.

[SOURCE: IEC 60050-712:1992, 712-02-02, modified – the word "region" has been removed from the term]

3.1.12 field strength

magnitude of the electromagnetic field at a given point

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[SOURCE: IEC 60050-705:1995, 705-08-31, modified – the rest of the definition after "given point" has been deleted.]

3.1.13 frequency band

continuous set of frequencies lying between two specified limiting frequencies

Note 1 to entry: A frequency band is characterized by two values which define its position in the frequency spectrum, for instance its lower and upper limiting frequencies.

[SOURCE: IEC 60050-702:1992, 702-01-02]

3.1.14 full illumination method

test method in which the EUT being tested fits completely within the uniform field area (UFA)

Note 1 to entry: This test method may be applied for all test frequencies.

3.1.15 human body-mounted equipment

equipment which is intended for use when attached to or held in close proximity to the human body.

Note 1 to entry: This term includes hand-held devices which are carried by people while in operation (e.g. pocket devices) as well as electronic aid devices and implants.

3.1.16

intentional RF emitting device

device which radiates (transmits) an electromagnetic field intentionally

EXAMPLE: Digital mobile telephones and other radio devices.

3.1.17

intermodulation

interaction in non-linear device or transmission medium between the spectral components of the input signal or signals producing new spectral components having frequencies equal to linear combination with integral coefficients of the frequencies of the input spectral components

Note 1 to entry: Intermodulation can result from a single non-sinusoidal input signal or from several sinusoidal or non-sinusoidal input signals applied to the same or to different inputs

[SOURCE: IEC 60050-161:2017, 161-06-20]

3.1.18

isotropic field probe

field sensor, whose detection properties are independent of direction of propagation and polarization of an electromagnetic wave

[SOURCE: IEC 60050-731:1991, 731-03-08, modified – wording modified to apply to field probe.]

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3.1.19

maximum RMS value

highest short-term RMS value of a modulated RF signal during an observation time of one modulation period

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Note 1 to entry: The short-term RMS is evaluated over a single carrier cycle. For example, in Figure 1 b), the maximum RMS voltage is: $U_{\text{maximum rms}} = U_{\text{p-p}} / (2 \times \sqrt{2}) = 1,8 \text{ V}$

3.1.20

modulation factor

in linear amplitude modulation, the ratio, generally expressed as a percentage, of the difference between the maximum and minimum amplitudes of the modulated signal to the sum of these amplitudes, expressed as:

$$m = 100 \times \frac{U_{\text{p-p,max}} - U_{\text{p-p,min}}}{U_{\text{p-p,max}} + U_{\text{p-p,min}}}$$

SEE Table 2 and Figure 1.

[SOURCE: IEC 60050-702:1992, 702-06-19, modified – the formula has been added and the note removed.]

3.1.21

non-constant envelope modulation

RF modulation scheme in which the amplitude of the carrier wave varies slowly in time compared with the period of the carrier itself

EXAMPLE Conventional amplitude modulation and time division multiple access (TDMA).

3.1.22

partial illumination method

test method used when the EUT face cannot be illuminated at once using a single UFA

3.1.23**polarization**

orientation of the electric field vector of a radiated field

3.1.24**reference ground plane****RGP**

flat conductive surface that is at the same electric potential as the reference ground, which is used as a common reference, and which contributes to a reproducible parasitic capacitance with the surroundings of the equipment under test (EUT)

[SOURCE: IEC 60050-161:2014, 161-04-36, modified – notes have been deleted.]

3.1.25**shielded enclosure****screened room**

mesh or sheet metallic housing designed expressly for the purpose of separating electromagnetically the internal and the external environment

[SOURCE: IEC 60050-161:1990, 161-04-37]

3.1.26**time division multiple access****TDMA**

multiple access technique in which the various terminals having access to a link are allotted separate recurrent time intervals for transmission

[SOURCE: IEC 60050-725:1994, 725-14-12]

3.1.27**transceiver****transmitter-receiver**

combination in a single unit of a radio transmitter and a radio receiver employing common circuit components and usually the same antenna for both transmitting and receiving

[SOURCE: IEC 60050-713:1998, 713-08-02, modified – the note has been deleted.]

3.1.28**uniform field area****UFA**

vertical plane in which field strength variations are acceptably small

SEE: 6.3.

3.2 Abbreviated terms

AE	Auxillary equipment
AM	Amplitude modulation
CMAD	Common-mode absorption device
CW	Continuous wave
DECT	Digital enhanced cordless telecommunications
EM	Electromagnetic
ERP	Effective radiated power
EUT	Equipment under test
GSM	Groupe Special Mobile, later renamed to: Global System for Mobile Communications