SLOVENSKI STANDARD
SIST EN 61000-4-3:1997/A1:2001

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

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Elektromagnetische Verträglichkeit (EMV) -- Teil 4-3: Prüf- und Meßverfahren - Prüfung der Störfestigkeit gegen hochfrequente elektromagnetische Felder

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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English version

Electromagnetic compatibility (EMC)
Part 4-3: Testing and measurement techniques
Radiated, radio-frequency, electromagnetic field immunity test
(IEC 61000-4-3:1995/A1:1998)

Compatibilité électromagnétique (CEM)
Partie 4-3: Techniques d'essai et de mesure - Essai d'immunité aux champs électromagnétiques rayonnés aux fréquences radioélectriques
(CEI 61000-4-3:1995/A1:1998)

Elektromagnetische Verträglichkeit (EMV)
Teil 4-3: Prüf- und Meßverfahren
Prüfung der Störfestigkeit gegen hochfrequente elektromagnetische Felder
(IEC 61000-4-3:1995/A1:1998)

This amendment A1 modifies the European Standard EN 61000-4-3:1996;it was approved by CENELEC on 1998-08-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment 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 amendment 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, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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 texts of documents 77B/234/FDIS and 77B/235/FDIS, future amendment 1 to IEC 61000-4-3:1995, prepared by SC 77B, High-frequency phenomena, of IEC TC 77, Electromagnetic compatibility, were submitted to the IEC-CENELEC parallel vote and were approved by CENELEC as amendment A1 to EN 61000-4-3:1996 on 1998-08-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1999-05-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2001-05-01

Endorsement notice

The text of amendment 1:1998 to the International Standard IEC 61000-4-3:1995 was approved by CENELEC as an amendment to the European Standard without any modification.

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Compatibilité électromagnétique (CEM) –

Partie 4-3:
Techniques d'essai et de mesure –
Essai d'immunité aux champs électromagnétiques rayonnés aux fréquences radioélectriques

Electromagnetic compatibility (EMC) –

Part 4-3:
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Radiated, radio-frequency, electromagnetic field immunity test

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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

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.
4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61000-4-3 has been prepared by subcommittee 65A: System aspects, of IEC technical committee 65: Industrial-process measurement and control.

It forms section 3 of part 4 of IEC 61000 and replaces the first edition of IEC 60801-3 issued in 1984. It has the status of a basic EMC publication in accordance with IEC Guide 107.

This consolidated version of IEC 61000-4-3 is based on the first edition (1995) and its amendment 1 (1998) [documents 77B/234, 77B/235/FDIS et 77B/238, 77B/239/RVD].

It bears the edition number 1.1.

A vertical line in the margin shows where the base publication has been modified by amendment 1.

Annexes A to I are for information only.

INTRODUCTION

This standard is part of the IEC 61000 series, 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 9: Miscellaneous

Each part is further subdivided into sections which are to be published either as International Standards or as technical reports.

This section 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 and object

This section of IEC 61000-4 is applicable to the immunity of electrical and electronic equipment to radiated electromagnetic energy. It establishes test levels and the required test procedures.

The object of this section is to establish a common reference for evaluating the performance of electrical and electronic equipment when subjected to radio-frequency electromagnetic fields.

This section deals with immunity tests related to general purposes. Particular considerations are devoted to the protection against radiofrequency emissions from digital radio telephones.

NOTE – Test methods are defined in this section for measuring 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 are structured for the primary objective of establishing adequate repeatability of results at various test facilities for qualitative analysis of effects.

This section does not intend to specify the tests to be applied to particular apparatus or systems. Its main aim is to give a general basic reference to all concerned product committees of the IEC. The product committees (or users and manufacturers of equipment) remain responsible for the appropriate choice of the tests and the severity level to be applied to their equipment.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61000. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 61000 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

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

IEC 61000-4-6:1996, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 6: Immunity to conducted disturbances induced by radio-frequency fields*

3 General

Most electronic equipment is, in some manner, affected by electromagnetic radiation. This radiation is frequently generated by such sources as the small hand-held radio transceivers that are used by operating, maintenance and security personnel, fixed-station radio and television transmitters, vehicle radio transmitters, and various industrial electromagnetic sources.

In recent years there has been a significant increase in the use of radio telephones and other radio transmitters operating at frequencies between 0,8 GHz and 3 GHz. Many of these services use modulation techniques with a non-constant envelope (e.g. TDMA).

In addition to electromagnetic energy deliberately generated, there is also spurious radiation caused by devices such as welders, thyristors, fluorescent lights, switches operating inductive loads, etc. For the most part, this interference manifests itself as conducted electrical interference and, as such, is dealt with in other parts of this standard. Methods employed to prevent effects from electromagnetic fields will normally also reduce the effects from these sources.

The electromagnetic environment is determined by the strength of the electromagnetic field (field strength in volts per metre). The field strength is not easily measured without sophisticated instrumentation nor is it easily calculated by classical equations and formulae because of the effect of surrounding structures or the proximity of other equipment that will distort and/or reflect the electromagnetic waves.

4 Definitions

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

4.1
amplitude modulation
process by which the amplitude of a carrier wave is varied following a specified law

4.2
anechoic chamber
shielded enclosure which is lined with radio-frequency absorbers to reduce reflections from the internal surfaces

4.2.1
fully anechoic chamber
shielded enclosure whose internal surfaces are totally lined with anechoic material

4.2
semi-anechoic chamber
shielded enclosure where all internal surfaces are covered with anechoic material with the exception of the floor, which shall be reflective (ground plane)

4.2.3
modified semi-anechoic chamber
semi-anechoic chamber which has additional absorbers installed on the ground plane

4.3
antenna
transducer which either emits radio-frequency power into space from a signal source or intercepts an arriving electromagnetic field, converting it into an electrical signal

4.4
balun
device for transforming an unbalanced voltage to a balanced voltage or vice versa [IEV 161-04-34]

4.5
continuous waves (CW)
electromagnetic waves, the successive oscillations of which are identical under steady-state conditions, which can be interrupted or modulated to convey information

4.6
electromagnetic (EM) wave
radiant energy produced by the oscillation of an electric charge characterized by oscillation of the electric and magnetic fields

4.7
far field
region where the power flux density from an antenna approximately obeys an inverse square law of the distance.

For a dipole this corresponds to distances greater than $\lambda/2\pi$, where λ is the wavelength of the radiation

4.8
field strength
the term "field strength" is applied only to measurements made in the far field. The measurement may be of either the electric or the magnetic component of the field and may be expressed as V/m, A/m or W/m²; any one of these 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.

4.9
frequency band
continuous range of frequencies extending between two limits

4.10
induction field
predominant electric and/or magnetic field existing at a distance $d < \lambda/2\pi$, where λ is the wavelength and the physical dimensions of the source are much smaller than distance d

4.11
isotropic
having properties of equal values in all directions

4.12
polarization
orientation of the electric field vector of a radiated field

4.13
shielded enclosure
screened or solid metal housing designed expressly for the purpose of isolating the internal from the external electromagnetic environment. The purpose is to prevent outside ambient electromagnetic fields from causing performance degradation and to prevent emission from causing interference to outside activities

4.14
stripline
terminated transmission line consisting of two parallel plates between which a wave is propagated in the transverse electromagnetic mode to produce a specified field for testing purposes [IEV 161-04-31]

4.15
spurious radiation
any undesired electromagnetic emission from an electrical device

4.16
sweep
continuous or incremental traverse over a range of frequencies

4.17
transceiver
combination of radio transmitting and receiving equipment in a common housing

4.18
human body-mounted equipment
equipment which is intended for use when attached to the human body. This definition includes hand-held devices which are carried by people while in operation (e.g. pocket devices) as well as electronic aid devices and implants

4.19
maximum RMS value
the highest short-term RMS value of a modulated RF signal during an observation time of one modulation period. The short-term RMS is evaluated over a single carrier cycle. For example, in figure 1b), the maximum RMS voltage is:

$$V_{\text{maximum RMS}} = V_{\text{p-p}} / (2 \times \sqrt{2}) = 1{,}8 \text{ volts}$$

4.20
non-constant envelope modulation
RF modulation schemes where the amplitude of the carrier wave varies slowly in time compared with the period of the carrier itself. Examples include conventional amplitude modulation and TDMA

4.21
TDMA (time division multiple access)
a time multiplexing modulation scheme which places several communication channels on the same carrier wave at an allocated frequency. Each channel is assigned a time slot during which, if the channel is active, the information is transmitted as a pulse of RF power. If the channel is not active no pulse is transmitted, thus the carrier envelope is not constant. During the pulse, the amplitude is constant and the RF carrier is frequency- or phase-modulated

5 Test levels

5.1 Test levels related to general purposes

The preferential range of test levels is given in table 1.

Frequency range: 80 MHz to 1 000 MHz.

Table 1 – Test levels

Level	Test field strength V/m
1	1
2	3
3	10
x	Special
NOTE – x is an open test level. This level may be given in the product specification.	

Table 1 gives details of the field strength of the unmodulated signal. For testing of equipment, this signal is 80 % amplitude modulated with a 1 kHz sinewave to simulate actual threats (see figure 1). Details of how the test is performed are given in clause 8.

NOTE 1 – Product committees may decide to choose a lower or higher transition frequency than 80 MHz between IEC 61000-4-3 and IEC 61000-4-6 (see annex H).

NOTE 2 – Product committees may select alternative modulation schemes.

NOTE 3 – IEC 61000-4-6 also defines test methods for establishing the immunity of electrical and electronic equipment against radiated electromagnetic energy. It covers frequencies below 80 MHz.

5.2 Test levels related to the protection against RF emissions from digital radio telephones

The preferred range of test levels is given in table 2 for the frequency ranges from 800 MHz to 960 MHz and from 1,4 GHz to 2,0 GHz.

Table 2 – Frequency ranges: 800 MHz to 960 MHz and 1,4 GHz to 2,0 GHz

Level	Test field strength V/m
1	1
2	3
3	10
4	30
x	Special
NOTE – x is an open test level. This level may be given in the product standard.	

The test field strength column gives values of the unmodulated carrier signal. For testing of equipment, this carrier signal is 80 % amplitude modulated with a 1 kHz sine wave to simulate actual threats (see figure 1). Details of how the test is performed are given in clause 8.