INTERNATIONAL STANDARD

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Electromagnetic compatibility (EMC) –

Part 2-13: Environment – High-power electromagnetic (HPEM) environments – Radiated and conducted

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ELECTROMAGNETIC COMPATIBILITY (EMC) –

Part 2-13: Environment – High-power electromagnetic (HPEM) environments – Radiated and conducted

FOREWORD

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International Standard IEC 61000-2-13 has been prepared by subcommittee 77C: High power transient phenomena, of IEC technical committee 77: Electromagnetic compatibility.

It has the status of a basic EMC publication in accordance with IEC Guide 107.

The text of this standard is based on the following documents:

FDIS	Report on voting
77C/153/FDIS	77C/155/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.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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- withdrawn;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

A bilingual version of this publication may be issued at a later date.

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 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: 61000-6-1).

ELECTROMAGNETIC COMPATIBILITY (EMC) –

Part 2-13: Environment – High-power electromagnetic (HPEM) environments – Radiated and conducted

1 Scope

This part of IEC 61000 defines a set of typical radiated and conducted HPEM environment waveforms that may be encountered in civil facilities. Such threat environments can produce damaging effects on electrical and electronic equipment in the civilian sector, as described in IEC 61000-1-5. It is necessary to define the radiated and conducted environments, in order to develop protection methods.

For the purposes of this standard, high-power conditions are achieved when the peak electric field exceeds 100 V/m, corresponding to a plane-wave free-space power density of 26,5 W/m^2. This criterion is intended to define the application of this standard to EM radiated and conducted environments that are substantially higher than those considered for "normal" EMC applications, which are covered by the standards produced by IEC SC 77B.

The HPEM environment can be:

- radiated or conducted;
- a single pulse envelope with many cycles of a single frequency (an intense narrowband signal that may have some frequency agility and the pulse envelope may be modulated);
- a burst containing many pulses, with each pulse envelope containing many cycles of a single frequency;
- an ultrawideband transient pulse (spectral content from tens of MHz to several GHz);
- a burst of many ultrawideband transient pulses.

The HPEM signal could be from sources such as radar or other transmitters in the vicinity of an installation or from an intentional generator system targeting a civilian facility. Radiated signals can also induce conducted voltages and currents through the coupling process. In addition, conducted HPEM environments may also be directly injected into the wiring of an installation.

There is a critical distinction between the HEMP (high-altitude electromagnetic pulse) environment and the HPEM environment, in terms of the range or the distance of the affected electrical or electronic components from the source. In the context of HEMP, the range is immaterial, as the HEMP environment propagates downward from space to the earth's surface and is therefore relatively uniform over distances of 1 000 km. On the other hand, in the HPEM context the environment and its effects decrease strongly with range. In addition, the HEMP waveshape is a series of time domain pulses while the HPEM environment may have a wide variety of waveshapes.

Consequently, the standardization process for HPEM environments is more difficult. The recommended approach is to investigate the various types of HPEM environments that have been produced to date and are likely to be feasible in the near future, and then to develop suitable HPEM standard waveforms from such a study. Such HPEM environment standard waveforms can be amended in due course, depending on emerging technologies that make it possible to produce them.

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 (IEV) – Chapter 161: Electromagnetic compatibility*

IEC 61000-1-5, *Electromagnetic compatibility (EMC) – Part 1-5: General – High power electromagnetic (HPEM) effects on civil systems*

IEC 61000-2-9, *Electromagnetic compatibility (EMC) – Part 2: Environment – Section 9: Description of HEMP environment – Radiated disturbance*

IEC 61000-2-10, *Electromagnetic compatibility (EMC) – Part 2-10: Environment – Description of HEMP environment – Conducted disturbance*

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

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

IEC 61000-4-4, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Section 4: Electrical fast transient/burst immunity test.*

IEC 61000-4-5, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 5: Surge immunity test*

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

IEC 61000-4-12, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 12: Oscillatory waves immunity test*

3 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
attenuation
reduction in magnitude (as a result of absorption and scattering) of an electric or magnetic field or a current or voltage; usually expressed in decibels

3.2
bandratio
br
ratio of the high and low frequencies between which there is 90 % of the energy; if the spectrum has a large dc content, the lower limit is nominally defined as 1 Hz