INTERNATIONAL STANDARD

IEC 61000-4-33

First edition
2005-09

BASIC EMC PUBLICATION

Electromagnetic compatibility (EMC) –

Part 4-33:
Testing and measurement techniques – Measurement methods for high-power transient parameters

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Reference number
IEC 61000-4-33:2005(E)

Publication numbering

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Международная Электротехническая Комиссия

PRICE CODE XB

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ELECTROMAGNETIC COMPATIBILITY (EMC) –

Part 4-33: Testing and measurement techniques – Measurement methods for high-power transient parameters

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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 61000-4-33 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/156/FDIS	77C/160/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.

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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

Each part is further subdivided into several parts and 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).

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ELECTROMAGNETIC COMPATIBILITY (EMC) –

Part 4-33: Testing and measurement techniques – Measurement methods for high-power transient parameters

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1 Scope

This part of IEC 61000 provides a basic description of the methods and means (e.g., instrumentation) for measuring responses arising from high-power transient electromagnetic parameters. These responses can include:

– the electric (*E*) and/or magnetic (*H*) fields (e.g., incident fields or incident plus scattered fields within a system under test);

– the current *I* (e.g., induced by a transient field or within a system under test);

– the voltage *V* (e.g., induced by a transient field or within a system under test);

– the charge *Q* induced on a cable or other conductor.

NOTE The charge *Q* on the conductor is a fundamental quantity that can be defined at any frequency. The voltage *V*, however, is a defined (e.g., secondary) quantity, which is valid only at low frequencies. At high frequencies, the voltage cannot be defined as the line integral of the E-field, since this integral is path-dependent. Thus, for very fast rising pulses (having a large high-frequency spectral content) the use of the voltage as a measurement observable is not valid. In this case, the charge is the desired quantity to be measured.

These measured quantities are generally complicated time-dependent waveforms, which can be described approximately by several scalar parameters, or “observables”. These parameters include:

– the peak amplitude of the response,

– the waveform rise-time,

– the waveform fall-time (or duration),

– the pulse width, and

– mathematically defined norms obtained from the waveform.

This International Standard provides information on the measurement of these waveforms and on the mathematical determination of the characterizing parameters. It does not provide information on specific level requirements for testing.

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 61000-2-9, *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 61000-4-20, *Electromagnetic compatibility (EMC) – Part 4-20: Testing and measurement techniques – Emission and immunity testing in transverse electromagnetic (TEM) waveguides*

IEC 61000-4-23, *Electromagnetic compatibility (EMC) – Part 4-23: Testing and measurement techniques – Test methods for protective devices for HPEM and other radiated disturbances*

IEC 61000-4-25, *Electromagnetic compatibility (EMC) – Part 4-25: Testing and measurement techniques – HEMP immunity test methods for equipment and systems*

3 Terms and definitions

For the purposes of this part of IEC 61000, the following terms and definitions, together with those in IEC 60050-161 apply.

3.1
electrically small
refers to the size of an object relative to the wavelength of the electromagnetic field. When the object is much smaller than the wavelength, it is said to be electrically small

3.2
equivalent area
an intrinsic parameter of a magnetic flux sensor (loop) that relates the open circuit voltage of the sensor to the time rate of change of the magnetic flux density linking the sensor

3.3
equivalent height
an intrinsic parameter of an electric field (dipole) sensor, which relates the measured voltage across the terminals of the sensor to the E-field component exciting the sensor

3.4
free-field sensor
an electromagnetic field sensor used at a location distant from any scattering body or ground plane

3.5
high power electromagnetic
HPEM
the general area or technology involved in producing intense electromagnetic radiated fields or conducted voltages and currents which have the capability to damage or upset electronic systems. Generally these disturbances exceed those produced under normal conditions (e.g. 100 V/m)

3.6
measurement chain
one or more electrical devices connected together for the purpose of measuring and recording an electromagnetic signal

3.7
Nyquist frequency
the Nyquist frequency is the bandwidth of a sampled signal, and is equal to half the sampling frequency of that signal. If the sampled signal represents a continuous spectral range starting at 0 Hz (which is the most common case for speech recordings), the Nyquist frequency is the highest frequency that the sampled signal can unambiguously represent

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