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INTERNATIONAL STANDARD

Cable networks for television signals, sound signals and interactive services – Part 12: Electromagnetic compatibility of systems

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CABLE NETWORKS FOR TELEVISION SIGNALS, SOUND SIGNALS AND INTERACTIVE SERVICES –

Part 12: Electromagnetic compatibility of systems

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International Standard IEC 60728-12 has been prepared by technical area 5: Cable networks for television signals, sound signals and interactive services, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

This second edition cancels and replaces the first edition published in 2001. This edition constitutes a technical revision.

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

a) IEC 60728-12 with its methods of measurement and EMC performance requirements is explicitly dedicated to "under operating conditions (in situ)" to ensure the ongoing EMC integrity of cable networks.
b) The first intermediate frequency range (1st IF range) for satellite signal transmission was extended to cover now frequencies from 950 MHz up to 3 500 MHz.

c) The method of measurement and the requirements for in-band immunity were extended taking into account the new EMC environment due to the allocation of broadband wireless services in the frequency band 694 MHz to 862 MHz. As a consequence, the limits of in-band immunity were specified for analogue and additionally for digital signals in this frequency range.
d) The substitution method of measurement (power method) was deleted.
e) EMC measurements below 30 MHz were deleted.
f) New Annex D "Measurements at other distances than the standard distance of 3 m".
g) New Annex E "GPS based leakage detection system for cable networks".

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

FDIS	Report on voting
100/2895/FDIS	100/2926/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.

The reader's attention is drawn to the fact that Annex A lists all of the "in-some-country" clauses on differing practices of a less permanent nature relating to the subject of this standard.

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A list of all parts in the IEC 60728 series, published under the general title *Cable networks for television signals, sound signals and interactive services,* can be found on the IEC website.

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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

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

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

INTRODUCTION

Standards and deliverables of the IEC 60728 series deal with cable networks including equipment and associated methods of measurement for headend reception, processing and distribution of television and sound signals, and for processing, interfacing and transmitting all kinds of data signals for interactive services using all applicable transmission media. These signals are typically transmitted in networks by frequency-multiplexing techniques.

This includes, for instance:

- regional and local broadband cable networks,
- extended satellite and terrestrial television distribution systems,
- individual satellite and terrestrial television receiving systems,

and all kinds of equipment, systems and installations used in such cable networks, distribution and receiving systems.

The extent of this standardization work is from the antennas and/or special interfaces to the headend or other interface points to the network up to any terminal interface of the equipment on the customer's premises.

The standardization work will consider coexistence with users of the RF spectrum in wired and wireless transmission systems.

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The standardization of any user terminals (i.e. tuners, receivers, decoders, multimedia terminals, etc.) as well as of any coaxial, balanced and optical cables and accessories thereof is excluded.

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CABLE NETWORKS FOR TELEVISION SIGNALS, SOUND SIGNALS AND INTERACTIVE SERVICES –

Part 12: Electromagnetic compatibility of systems

1 Scope

This part of IEC 60728 applies to the radiation characteristics and immunity to electromagnetic disturbance of cable networks for television signals, sound signals and interactive services and covers the frequency range 0,15 MHz to 3,5 GHz.

NOTE 1 Measurements below 30 MHz are not generally considered useful in the context of cable networks and are difficult to perform in practice.

This document specifies methods of measurement and EMC performance requirements under operating conditions (in situ) to ensure the ongoing EMC integrity of cable networks.

Cable networks beyond the system outlets (e.g. the receiver lead, in simplest terms) that begin at the system outlet and end at the input to the subscriber's terminal equipment are not covered by this document. Requirements for the electromagnetic compatibility of receiver leads are specified in IEC 60966-2-4, IEC 60966-2-5 and IEC 60966-2-6.

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Cable networks and a wide range of radio services have to coexist. These include, for example, the emergency services, safety of life, broadcasting, aeronautical, radio navigation services and also land, mobile, amateur and cellular radio services. Frequency ranges of typical safety of life services are listed in Annex B. Additional protection for certain services may be required by national regulations. Annex A gives information on legal requirements in certain countries.

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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 60050-161:1990, *International Electrotechnical Vocabulary – Chapter 161: Electromagnetic compatibility* (available at: www.electropedia.org)

IEC 60096 (all parts), *Radio frequency cables*

IEC 60728 (all parts), *Cable networks for television signals, sound signals and interactive services*

CISPR 16-1-1, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus*

CISPR 16-1-4, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Antennas and test sites for radiated disturbance measurements*

3 Terms, definitions, symbols 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
building penetration loss
ability of buildings, in which networks for distribution of television and sound are located, to attenuate the influence of electromagnetic fields from outside the buildings or to suppress the radiation of electromagnetic fields from inside the buildings

3.1.2
carrier-to-interference ratio
minimum level difference measured at the output of an active equipment or at any other interface within the network between the wanted signal and

- intermodulation products of the wanted signal and/or unwanted signals generated due to non-linearities,
- harmonics generated by an unwanted signal,
- unwanted signals that have penetrated into the operating frequency range,
- unwanted signals that have been converted to the frequency range to be protected (operating frequency range)

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3.1.3
degradation
<of performance> undesired departure in the operational performance of any device, equipment or system from its intended performance

Note 1 to entry: The term "degradation" can apply to temporary or permanent failure.

[SOURCE: IEC 60050-161:1990, 161-01-19]

3.1.4
disturbance level
level of an electromagnetic disturbance at a given location, which results from all contributing (interference) sources

3.1.5
electromagnetic disturbance
any electromagnetic phenomenon which can degrade the performance of a device, equipment or system, or adversely affect living or inert matter

Note 1 to entry: An electromagnetic disturbance can be an electromagnetic noise, an unwanted signal or a change in the propagation medium itself.

[SOURCE: IEC 60050-161:1990, 161-01-05]

3.1.6
electromagnetic interference
EMI
degradation of the performance of an equipment, transmission channel or system caused by an electromagnetic disturbance

Note 1 to entry In French, the terms "perturbation électromagnétique" and "brouillage électromagnétique" designate respectively the cause and the effect, and should not be used indiscriminately.

Note 2 to entry In English, the terms "electromagnetic disturbance" and "electromagnetic interference" designate respectively the cause and the effect, but they are often used indiscriminately.

[SOURCE: IEC 60050-161:1990, 161-01-06]

3.1.7
electromagnetic radiation
radiation
1) phenomenon by which energy in the form of electromagnetic waves emanates from a source into space

2) energy transferred through space in the form of electromagnetic waves

Note 1 to entry: By extension, the term "electromagnetic radiation" sometimes also covers induction phenomena.

[SOURCE: IEC 60050-161:1990, 161-01-10]

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3.1.8
external immunity
ability of a device, equipment or network to perform without degradation in the presence of electromagnetic disturbances entering other than via its normal input terminals or antennas

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[SOURCE: IEC 60050-161:1990, 161-03-07]

3.1.9
headend
equipment that is connected between receiving antennas or other signal sources and the remainder of the cable network, to process the signals to be distributed

Note 1 to entry: The headend can, for example, comprise antenna amplifiers, frequency converters, combiners, separators and generators.

3.1.10
ignition noise
unwanted emission of electromagnetic energy arising from the ignition system within a vehicle or device

Note 1 to entry: Ignition noise is predominantly impulsive in content.

3.1.11
immunity
<to a disturbance> ability of a device, equipment or system to perform without degradation in the presence of an electromagnetic disturbance

[SOURCE: IEC 60050-161:1990, 161-01-20]

3.1.12
internal immunity
ability of a device, equipment or system to perform without degradation in the presence of electromagnetic disturbances appearing at its normal input terminals or antennas

[SOURCE: IEC 60050-161:1990, 161-03-06]

3.1.13
operating frequency range
passband for the wanted signals for which the equipment has been designed

3.1.14
receiver lead
lead that connects the system outlet to the subscriber's equipment

3.1.15
screening effectiveness
ability of equipment or a system to attenuate the influence of electromagnetic fields from outside the equipment or system or to suppress the radiation of electromagnetic fields from inside the equipment or system

3.1.16
spur network
cable network normally laid out inside buildings to which splitters, subscriber's taps or looped system outlets are connected

3.1.17
subscriber's feeder
feeder connecting a subscriber's tap to a system outlet or, where the latter is not used, directly to the subscriber's equipment

Note 1 to entry: A subscriber's feeder can include filters and balun transformer.

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3.1.18
system outlet
device for interconnecting a subscriber's feeder and a receiver lead

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3.2 Abbreviated terms

AM	Amplitude Modulation
DSC	Distress, Safety and Calling
DVB	Digital Video Broadcasting
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EPIRB	Emergency Position Indicating Radiobeacons
FM	Frequency Modulation
GPS	Global Positioning System
HFC	Hybrid Fibre Coax
IEV	International Electrotechnical Vocabulary
ILS	Instrument Landing System
LAS	Leakage Analysis Software
MIL	Military (use)
NAV	(Aeronautical) Navigation (Radio)
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
RF	Radio Frequency
SAT-IF	Satellite Intermediate Frequency
TV	Television
VOR	VHF Omnidirectional Range