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Cabled distribution systems for television and sound signals –

Part 2:
Electromagnetic compatibility for equipment

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

CABLED DISTRIBUTION SYSTEMS FOR TELEVISION AND SOUND SIGNALS –

Part 2: Electromagnetic compatibility for equipment

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.
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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 60728-2 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.

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

FDIS	Report on voting
100/535/FDIS	100/570/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 this publication remains valid until 2005. At this date, in accordance with the committee's decision, the publication will be

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- withdrawn;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

INTRODUCTION

Standards of the IEC 60728 series deal with cabled distribution systems for television, sound and interactive multimedia signals including equipment, systems and installations

- for headend-reception, processing and distribution of sound and television signals and their associated data signals and
- for processing, interfacing and transmitting all kinds of interactive signals

using all applicable transmission media.

They cover all kinds of systems such as

- CATV-systems,
- MATV- and SMATV-systems,
- individual receiving systems

and all kinds of equipment installed in such systems.

The extent of these standards is from the antennas, special signal source inputs to the headend or other interface points to the system up to the system outlet or the terminal input, where no system outlet exists.

The standardisation of any user terminals (i.e. tuners, receivers, decoders, multimedia terminals, etc.) is excluded.

CABLED DISTRIBUTION SYSTEMS FOR TELEVISION AND SOUND SIGNALS –

Part 2: Electromagnetic compatibility for equipment

1 Scope

This standard

– applies to the radiation characteristics and immunity to electromagnetic disturbances of active and passive equipment for the reception, processing and distribution of television, sound and interactive services signals, as dealt with in the following parts of IEC 60728 series:

  IEC 60728-3 – "Active coaxial wideband distribution equipment"

  IEC 60728-4 – "Passive coaxial wideband distribution equipment"

  IEC 60728-5 – "Headend equipment"

  IEC 60728-6 – "Optical equipment"

– covers the following frequency ranges:

Disturbance voltage injected into the mains	9 kHz to 30 MHz
Radiation from active equipment	5 MHz to 25 GHz
Immunity of active equipment	150 kHz to 25 GHz
Screening effectiveness of passive equipment	5 MHz to 3 GHz (25 GHz)[1]

– specifies requirements for maximum allowed radiation, minimum immunity and minimum screening effectiveness.

– describes test methods for conformance testing.

Coaxial cables for cabled distribution systems do not fall under the scope of this standard. Reference is made to the EN 50117 series.

Standardisation in the field of electromagnetic compatibility for any user terminals (for example tuners, receivers, decoders, multimedia terminals etc.) is covered by the IEC CISPR 13 and CISPR 20.

Requirements for the electromagnetic compatibility of receiver leads are laid down in IEC 60966-2-4, IEC 60966-2-5 and IEC 60966-2-6.

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):1990, *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*
Amendment 1 (1997)
Amendment 2 (1998)

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[1] For the frequency range 3 GHz to 25 GHz for "Screening effectiveness of passive equipment" no requirements apply at present. Methods of measurement and limits are under investigation for inclusion in a future amendment or revised edition.

IEC 60728-3:2000, *Cabled distribution systems for television and sound signals – Part 3: Active coaxial wideband distribution equipment*

IEC 60728-4:2000, *Cabled distribution systems for television and sound signals – Part 4: Passive coaxial wideband distribution equipment*

IEC 60728-5:2001, *Cabled distribution systems for television and sound signals – Part 5: Headend equipment*

IEC 60728-6:2001, *Cabled distribution systems for television and sound signals – Part 6: Optical equipment*

IEC 60966-2-4:1997, *Radio frequency and coaxial cable assemblies – Part 2-4: Detail specification for cable assemblies for radio and TV receivers (Frequency range 0 to 3 000 MHz, IEC 60169-2 connectors*)

IEC 60966-2-5:1998, *Radio frequency and coaxial cable assemblies – Part 2-5: Detail specification for cable assemblies for radio and TV receivers – Frequency range 0 to 1 000 MHz, IEC 60169-2 connectors*

IEC 60966-2-6:1998, *Radio frequency and coaxial cable assemblies – Part 2-6: Detail specification for cable assemblies for radio and TV receivers – Frequency range 0 to 3 000 MHz, IEC 60169-24 connectors*

IEC 61000-3-2:2000, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)*
Amendment 1 (2001)

IEC 61000-4-2:1995, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*
Amendment 1 (1998)
Amendment 2 (2000)

IEC 61000-4-3 2002, *Electromagnetic compatibility (EMC – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4:1995, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 4: Electrical fast transient/burst immunity test.* Basic EMC Publication

Amendment 1 (2000)
Amendment 2 (2001)

IEC 61000-4-6:1996, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*
Amendment 1 (2000)

IEC 61000-6-1:1997, *Electromagnetic compatibility (EMC) – Part 6: Generic standards – Section 1: Immunity for residential, commercial and light-industrial environments*

IEC 61079-1:1992, *Methods of measurement on receivers for satellite broadcast transmissions in the 12 GHz band – Part 1: Radio-frequency measurements on outdoor units*

CISPR 13:2001, *Sound and television broadcast receivers and associated equipment – Radio disturbance characteristics – Limits and methods of measurement*

CISPR 16-1:1999, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1: Radio disturbance and immunity measuring apparatus*

CISPR 20:2002, *Sound and television broadcast receivers and associated equipment – Immunity characteristics – Limits and methods of measurement*

3 Terms, definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this standard, the definitions given in IEC 60050-161 as well as the following, apply.

3.1.1
radiation (electromagnetic)
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

[IEV 161-01-10]

NOTE By extension, the term “electromagnetic radiation” sometimes also covers induction phenomena.

3.1.2
immunity (to a disturbance)
ability of a device, equipment or system to perform without degradation in the presence of an electromagnetic disturbance

[IEV 161-01-20]

3.1.3
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 antenna

[IEV 161-03-06]

3.1.4
external immunity
ability of a device, equipment or system to perform without degradation in the presence of electromagnetic disturbances entering other than via its normal input terminals or antenna

[IEV 161-03-07]

3.1.5
mains immunity
immunity to mains-borne disturbance

[IEV 161-03-03]

3.1.6
immunity level
maximum level of a given electromagnetic disturbance incident on a particular device, equipment or system for which it remains capable of operating at a required level of performance

[IEV 161-03-14, modified]

3.1.7
immunity limit
specified minimum immunity level

[IEV 161-03-15]

3.1.8
immunity margin
difference between the immunity limit of a device, equipment or system and the electromagnetic compatibility level

[IEV 161-03-16]

3.1.9
electromagnetic disturbance
any electromagnetic phenomenon which may degrade the performance of a device, equipment or system, or adversely affect living or inert matter

[IEV 161-01-05]

NOTE An electromagnetic disturbance may be an electromagnetic noise, an unwanted signal or a change in the propagation medium itself.

3.1.10
screening effectiveness
ability of an equipment or 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

3.1.11
well-matched
matching condition when the return loss of the equipment complies with the requirements of IEC 60728-3, Table 1

3.1.12
well-screened
test set-up can be considered "well-screened" if its radiation level, when terminated with a matched load, is at least 20 dB below the expected radiation level of the equipment under test, the test set-up and the equipment being supplied with the same input signal level

3.1.13
electromagnetic interference
EMI
degradation of the performance of an equipment, transmission channel or system caused by an electromagnetic disturbance

3.1.14
operating frequency range
passband for the wanted signals for which the equipment has been designed

3.1.15
wanted signal
during measurements, the wanted signal shall be simulated using a sinewave test signal having the frequency within the operating frequency range and the appropriate level

3.1.16
unwanted signal
signals inside and outside of the operating frequency range that are not considered as wanted signals

NOTE When measuring immunity (to unwanted signals), the unwanted signal shall be simulated using two sinewave test signals.

3.1.17
first satellite intermediate frequency range
output frequency range of the outdoor unit which is comprised of the frequency band between 950 MHz and at least 3 GHz or parts thereof

3.1.18
carrier-to-interference ratio
minimum level difference measured at the output of an active equipment 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).

3.1.19
individual receiving system
system designed to provide television and sound signals to an individual household

3.1.20
spurious signals
all unwanted signals in the frequency range of interest

3.1.21
band
nominal operating frequency range of the equipment

3.1.22
electrostatic discharge (ESD)
transfer of electric charge between bodies of different electrostatic potential in proximity or through direct contact

[IEV 161-01-22]

3.1.23
transient (adjective and noun)
pertaining to or designating a phenomenon or a quantity which varies between two consecutive steady states during a time interval short compared with the time-scale of interest

[IEV 161-02-01]

3.1.24
burst
sequence of a limited number of distinct pulses or an oscillation of limited duration

[IEV 161-02-07]

3.1.25
test levels
the preferential range of test level for ESD or fast transient test

3.1.26
port
particular interface of the specific equipment with the external electromagnetic environment