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Cable networks for television signals, sound signals and interactive services – Part 2: Electromagnetic compatibility for equipment

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

Part 2: Electromagnetic compatibility for equipment

FOREWORD

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This 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.

This third edition cancels and replaces the second edition published in 2010. This edition constitutes a technical revision.

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

a) Frequency extensions
    1) The upper frequency limit of conventional cable network equipment was extended from 862 MHz to 1 000 MHz due to market demands.
    2) 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.

3) The methods of measurement and the EMC requirements in the overlapping frequency range from 950 MHz to 1 000 MHz were allocated in relation to the upper frequency limit, 1 000 MHz, and the lower frequency limit, 950 MHz, of the relevant equipment under test.

b) New EMC environment in the 800 MHz band

1) The European Commission has requested CENELEC and ETSI to draft immunity requirements for equipment, to protect against disturbance from the new wireless service in the 790 MHz to 862 MHz band.

NOTE The lower frequency has been reconsidered in this document, as new frequency bands are allocated for wireless services starting from 694 MHz.

2) A CENELEC/ETSI Joint Working Group “Digital Dividend” was formed to describe the new EMC environment and to advise on appropriate test methods and limits.

3) IEC 60728-2 is the document specifying immunity requirements for active and passive cable network equipment.

4) The method of measurement and the requirements for in-band immunity were extended taking into account this 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.

5) Consequently it is recommended, that, where cable networks and wireless networks coexist, only the transmission of digitally modulated signals should be used in the frequency range 694 MHz to 862 MHz.

6) For passive equipment, Class A and Class B specifications were kept in the standard but a note was added recommending that only Class A equipment should be used in the planning and implementation of new networks.

c) Indoor antennas

1) The methods of measurement for all kinds of indoor antennas were combined in the new 4.9.

d) Bibliography

1) A Bibliography has been added at the end of the document referencing, for example, CEPT Report 30 on “The identification of common and minimal (least restrictive) technical conditions for 790-862 MHz for the digital dividend in the European Union”.

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

CDV	Report on voting
100/2715/CDV	100/2859A/RVC

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 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 customer premises equipment.

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

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.

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

Part 2: Electromagnetic compatibility for equipment

1 Scope

This part of IEC 60728:

- applies to the radiation characteristics and immunity to electromagnetic disturbance of EM-active equipment (active and passive equipment) for the reception, processing and distribution of television, sound and interactive multimedia signals as dealt with in the following parts of IEC 60728 series:
  - IEC 60728-3, *Active wideband equipment for cable networks*;
  - IEC 60728-4, *Passive wideband equipment for coaxial cable networks*;
  - IEC 60728-5, *Headend equipment*;
  - IEC 60728-6, *Optical equipment*;
- covers the following frequency ranges:

disturbance voltage injected into the mains	150 kHz to 30 MHz;
radiation from active equipment	5 MHz to 25 GHz;
immunity of active equipment	150 kHz to 25 GHz [1)];
screening effectiveness of passive equipment	5 MHz to 3,5 GHz (25 GHz) [2)];

- specifies requirements for maximum allowed radiation, minimum immunity and minimum screening effectiveness;
- describes test methods for conformance testing.

No measurement needs to be performed at frequencies where no requirement is specified.

Due to the fact that cable networks, the former cabled distribution systems for television and sound signals, are more and more used for interactive services, these networks also incorporate equipment that carries, besides the cable network equipment ports, also one or more telecom signal port(s). This equipment is called "multimedia network equipment".

The EMC behaviour of cable network equipment, telecommunication network equipment and multimedia network equipment can be described by the port structure given in Table 1:

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1) For "inband immunity of active equipment" and "out-of-band immunity of active equipment", no requirements apply at present for the frequency range 3,5 GHz to 25 GHz. Methods of measurement and limits are investigated for inclusion in a future amendment or revised edition.

2) For "screening effectiveness of passive equipment", no requirements apply at present for the frequency range 3,5 GHz to 25 GHz. Methods of measurement and limits are being investigated for inclusion in a future amendment or revised edition.

Table 1 – Port structure of different network equipment

Port name	Cable network equipment	Telecommunication network equipment	Multimedia network equipment
Enclosure	X	X	X
Earth	X	X	X
AC/DC power supply	X	X	X
Control (e.g. alarm)	X	X	X
Antenna input port	X		X
RF network port	X		X
Telecom signal port		X	X

Table 1 shows that cable network equipment and telecommunication network equipment have four common ports and, respectively, two and one individual ports. Multimedia network equipment carry, besides the common ports, an antenna input port and/or a RF network port as well as a telecom signal port.

The electromagnetic compatibility requirements for "telecommunication network equipment only" are standardized in ETSI EN 300 386 (mainly) and in ETSI EN 301 489-4, those for "cable network equipment only" are given in this document.

Equipment for multimedia networks of the above-mentioned type has to work under the same EMC conditions as equipment that is falling under the cable network and the telecommunication network EMC-standards. Due to the fact that this equipment has to work in close proximity, e.g. in the same operating room, the EMC environmental conditions for all three types of equipment are the same.

This means that multimedia network equipment has to fulfil the EMC requirements of one of the above mentioned standards and in addition the EMC requirements, laid down in the other EMC standard, for the additional port, by which it is connected to the other network.

By this procedure, it is ensured that multimedia network equipment fulfils the EMC conditions of one of the above-mentioned networks and will neither disturb the respective other system nor will be disturbed by the respective other system via the connecting port.

Coaxial cables for cable networks do not fall under the scope of this standard; reference is made to the EN 50117 series. Coaxial cable assemblies for radio and TV receivers (receiver leads) do not fall under the scope of this standard; reference is made to the IEC 60966 series. 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.

This document also covers indoor receiving antennas for broadcast signals for which the requirements and the applicable methods of measurement are limited to the emission and the electrostatic discharge phenomena.

Standardization in the field of "Electromagnetic compatibility" for any broadcast terminals (e.g. tuners, receivers, decoders, etc.) is covered by CISPR 13 and CISPR 16 and for multimedia terminals by CISPR 22 and CISPR 24.

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.

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

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*

IEC 60728-3:2010, *Cable networks for television signals, sound signals and interactive services – Part 3: Active wideband equipment for cable networks*

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

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

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 – Electrical fast transient/burst 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 61000-6-1:2016, *Electromagnetic compatibility (EMC) – Part 6-1: Generic standards – 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: Radiofrequency measurements on outdoor units*

ETSI EN 300 386 V1.5.1, *Electromagnetic compatibility and Radio spectrum Matters (ERM); Telecommunication network equipment; ElectroMagnetic Compatibility (EMC) requirements*

IEC 60050-161:1990, *International Electrotechnical Vocabulary (IEV), Chapter 161: Electromagnetic compatibility*
IEC 60050-161:1990/AMD1:1997
IEC 60050-161:1990/AMD2:1998