IEC 60728-1-1

Edition 2.0 2014-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Cable networks for television signals, sound signals and interactive services – Part 1-1: RF cabling for two way home networks

Réseaux de distribution par câbles pour signaux de télévision, signaux de radiodiffusion sonore et services interactifs – Partie 1-1: Câblage RF pour réseaux domestiques bidirectionnels

IEC 60728-1-1:2014-03(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

PRICE CODE XB
CODE PRIX

ICS 33.060.30; 33.160.01

ISBN 978-2-8322-1437-4

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 1-1: RF cabling for two way home networks

FOREWORD

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International Standard IEC 60728-1-1 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 2010, and constitutes a technical revision.

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

- update of performance requirements in Clause 5 to include those for DVB-T2 signals.

This International Standard is to be used in conjunction with IEC 60728-1:2014.

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

FDIS	Report on voting
100/2249/FDIS	100/2285/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.

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

The committee has decided that the contents of this publication will remain unchanged until the stability 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- withdrawn,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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

Standards and deliverables of 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 signal source inputs to the headend or other interface points to the network up to the terminal input 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.

The reception of television signals inside a building requires an outdoor antenna and a distribution network to convey the signal to the TV receivers.

This part of the IEC 60728 deals with the requirements and implementation guidelines for a home network that can be realised with different techniques. The following types of home networks (HN) are possible:

- passive coaxial home network;
- active coaxial home network;
- different home network types.

Figure 1 shows typical situations that are possible when considering RF home networks.

The RF home network can be realised using coaxial cables, balanced cables, optical cables or radio links.

Clause 5 defines the performance limits measured at system outlet or terminal input for an unimpaired (ideal) test signal applied at the HNI. Under normal operating conditions for any analogue channel and meeting these limits, the cumulative effect of the impairment of any single parameter at the HNI and that, due to the home network, will produce picture and sound signals not worse than grade four on the five-grade impairment scale contained in ITU-R BT.500. These requirements are given in IEC 60728-1-2. For digitally modulated signals the quality requirement is a QEF (Quasi Error Free) reception.

This standard describes the physical layer connection for home networks. Description of protocols required for Layer 2 and higher layers is out of the scope of this standard. Logical connections between devices within the home network are therefore not always guaranteed.

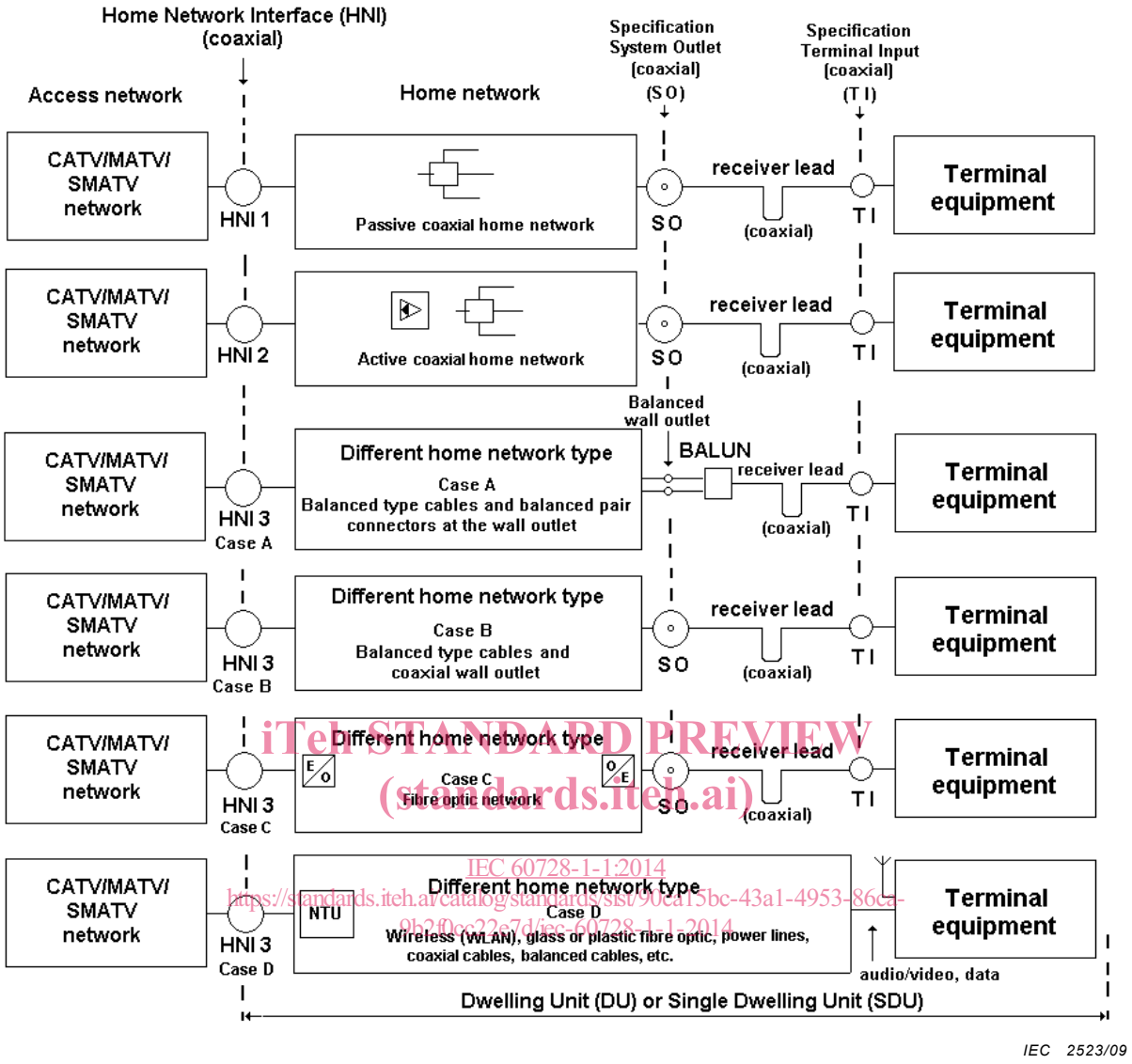

Figure 1 – Examples of RF home network types

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

Part 1-1: RF cabling for two way home networks

1 Scope

This part of IEC 60728 provides the requirements and describes the implementation guidelines of RF cabling for two-way home networks. This standard is applicable to any home network that distributes signals provided by CATV/MATV/SMATV cable networks (including individual receiving systems) having a coaxial cable output. This standard also applies to home networks where some part of the distribution network uses wireless links, for example instead of the receiver cord.

This part of IEC 60728 is therefore applicable to RF cabling for two-way home networks with wired cords or wireless links inside a room and primarily intended for television and sound signals operating between about 5 MHz and 3 000 MHz. The frequency range is extended to 6 000 MHz for distribution techniques that replace wired cords with a wireless two-way communication inside a room (or a small number of adjacent rooms) that uses the 5 GHz to 6 GHz band.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-705, *International Electrotechnical Vocabulary – Chapter 705: Radio wave propagation*

IEC 60050-712, *International Electrotechnical Vocabulary – Chapter 712: Antennas*

IEC 60050-725, *International Electrotechnical Vocabulary – Chapter 725: Space radiocommunications*

IEC 60728-1:2014, *Cable networks for television signals, sound signals and interactive services – Part 1: System performance of forward paths*

IEC 60728-1-2, *Cable networks for television signals, sound signals and interactive services – Part 1-2: Performance requirements for signals delivered at system outlet in operation*

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

IEC 60728-10, *Cable networks for television signals, sound signals and interactive services – Part 10: System performance of return paths*

IEC 60966 (all parts), *Radio frequency and coaxial cable assemblies*

IEC 60966-2 (all parts), *Radio frequency and coaxial cable assemblies – Part 2: Detail specification for cable assemblies for radio and TV receivers*

IEC 60966-2-4, *Radio frequency and coaxial cable assemblies – Part 2-4: Detail specification for cable assemblies for radio and TV receivers – Frequency range 0 MHz to 3 000 MHz, IEC 61169-2 connectors*

IEC 60966-2-5, *Radio frequency and coaxial cable assemblies – Part 2-5: Detail specification for cable assemblies for radio and TV receivers – Frequency range 0 MHz to 1 000 MHz, IEC 61169-2 connectors*

IEC 60966-2-6, *Radio frequency and coaxial cable assemblies – Part 2-6: Detail specification for cable assemblies for radio and TV receivers – Frequency range 0 MHz to 3 000 MHz, IEC 61169-24 connectors*

IEEE 802.11, *IEEE Standards for Information technology – Telecommunications and Information Exchange between Systems – Local and Metropolitan Area Network – Specific Requirements – Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications*[1]

IEEE 802.11a, *IEEE Standard for Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications – Amendment 1: High-speed Physical Layer in the 5 GHz band*

IEEE 802.11b, Supplement to 802.11-1999, *Wireless LAN MAC and PHY specifications: Higher speed Physical Layer (PHY) extension in the 2.4 GHz band*

IEEE 802.11e, *IEEE Standard for Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: Amendment 8: Medium Access Control (MAC) Quality of Service Enhancements*

IEEE 802.11g, *IEEE Standard for Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications – Amendment 4: Further Higher-Speed Physical Layer Extension in the 2.4 GHz Band*

IEEE 802.11h, *IEEE Standard for Information technology – Telecommunications and Information Exchange Between Systems – LAN/MAN Specific Requirements – Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Spectrum and Transmit Power Management Extensions in the 5GHz band in Europe*

IEEE 802.11n, *IEEE Standard for Information Technology – Telecommunications and information exchange between systems-Local and metropolitan area networks-Specific requirements – Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: Amendment 4: Enhancements for Higher Throughput*

IEEE 802.16, *IEEE Standard for Local and metropolitan area networks – Part 16: Air Interface for Fixed Broadband Wireless Access Systems (WiMax)*

ITU-R Recommendation BT.500, *Methodology for the subjective assessment of the quality of television pictures*

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[1] Parts of IEEE 802.11 are reproduced in ISO/IEC 8802-11:2005, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specification*

ITU-T Recommendation J.61, *Transmission performance of television circuits designed for use in international connections*

ITU-T Recommendation J.63, *Insertion of test signals in the field-blanking interval of monochrome and colour television signals*

EN 50117-2-4, *Coaxial cables – Part 2-4: Sectional specification for cables used in cabled distribution networks – Indoor drop cables for systems operating at 5 MHz to 3 000 MHz*

ETSI EN 300 421, *Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for 11/12 GHz satellite services*

ETSI EN 300 429, *Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for cable systems*

ETSI EN 300 473, *Digital Video Broadcasting (DVB); Satellite Master Antenna Television (SMATV) distribution systems*

ETSI EN 300 744, *Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for digital terrestrial television*

ETSI EN 302 307, *Digital Video Broadcasting (DVB) – Second generation framing structure, channel coding and modulation systems for Broadcasting, Interactive Services, News Gathering and other broadband satellite applications (DVB-S2)*

ETSI EN 302 755, *Digital Video Broadcasting (DVB) – Frame structure, channel coding and modulation for a second generation digital terrestrial television broadcasting system (DVB-T2)*

3 Terms, definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-705, IEC 60050-712 and IEC 60050-725, apply.

NOTE The most important definitions are repeated below.

3.1.1
active home network
home network that uses active equipment (for example, amplifiers) in addition to passive equipment like splitters, taps, system outlets, cables and connectors up to the coaxial RF interface (input and/or output) of the terminal equipment for distributing and combining RF signals

3.1.2
antenna
part of a radio transmitting or receiving system which is designed to provide the required coupling between a transmitter or receiver and the medium in which the radio wave propagates

Note 1 to entry: In practice, the terminals of the antenna or the points to be considered as the interface between the antenna and the transmitter or receiver should be specified.

Note 2 to entry: If the transmitter or receiver is connected to its antenna by a feeder line, the antenna may be considered to be a transducer between the guided radio waves of the feeder line and the radiated waves in space.

[SOURCE: IEC 60050-712:1992, 712-01-01, modified – The term feeder line instead of feed line has been used in note 2.]

3.1.3
attenuation
ratio of the input power to the output power of an equipment or system

Note 1 to entry: The ratio is expressed in decibels.

3.1.4
balun
device for transforming an unbalanced voltage to a balanced voltage or vice-versa

Note 1 to entry: The term is derived from balanced to unbalanced transformer.

3.1.5
bit error ratio
BER
ratio between erroneous bits and the total number of transmitted bits

3.1.6
broadcast and communication technologies
BCT
group of applications including RF distribution of sound signals and video signals

Note 1 to entry: For this standard, this is a group of applications using the HF band (3 MHz to 30 MHz), the VHF band (30 MHz to 300 MHz) and the UHF band (300 MHz to 3 000 MHz) for transmission of television signals, sound signals and interactive services, as well as for in-home inter-networking.

3.1.7
carrier-to-intermodulation ratio
C/I
difference between the carrier level at a specified point in a piece of equipment or a system and the level of a specified intermodulation product or combination of products

Note 1 to entry: The difference is given in decibels.

3.1.8
carrier-to-noise ratio
C/N
difference between the vision or sound carrier level at a given point in a piece of equipment or a system and the noise level at that point (measured within a bandwidth appropriate to the television or radio system in use)

Note 1 to entry: The difference is given in decibels.

3.1.9
CATV network
regional and local broadband cable networks designed to provide sound and television signals as well as signals for interactive services to a regional or local area

Note 1 to entry: Originally defined as Community Antenna Television network.

3.1.10
cross-modulation
undesired modulation of the carrier of a desired signal by the modulation of another signal as a result of equipment or system non-linearities

3.1.11
decibel ratio
ten times the logarithm to base 10 of the ratio of two quantities of power P_1 and P_2, i.e

$$10 \lg \frac{P_1}{P_2} \quad \text{in dB}$$

Note 1 to entry: May also be expressed in terms of voltages.

$$20 \lg \frac{U_1}{U_2} \quad \text{in dB}$$

3.1.12
designed receiving antenna
antenna that has the gain, the directivity and the polarization for receiving the wanted signal at the headend site with the required performance

3.1.13
directivity
attenuation between output port and interface or tap port minus the attenuation between input port and interface or tap port, of any equipment or system

3.1.14
DOCSIS
Euro-DOCSIS
standards defining interface specifications for cable modems and cable modem termination systems for high-speed data communication over RF cable networks

3.1.15
dwelling unit
DU
home or office where television and sound signals are distributed and that provides access to interactive services

3.1.16
echo rating
E
result of a system test with a 2*T* sine-squared pulse using the boundary line on a specified graticule within which all parts of the received pulse fall

EXAMPLE See Figure 25 of IEC 60728-1:2014.

Note 1 to entry: Echo rating is determined in ITU-T Recommendation J.61 and ITU-T Recommendation J.63.

Note 2 to entry: The object of the graticule design is to ensure that the subjective effect of an echo of rating *E* % is the same as that of a single echo, with displacement greater than 12*T*, of (*E*/2) % relative to the peak amplitude of the test pulse.

3.1.17
extended satellite television distribution network or system
distribution network or system designed to provide sound and television signals received by satellite receiving antenna to households in one or more buildings

Note 1 to entry: This kind of network or system can be combined with terrestrial antennas for the additional reception of TV and/or radio signals via terrestrial networks.

Note 2 to entry: This kind of network or system can also carry control signals for satellite switched systems or other signals for special transmission systems (e.g. MoCA or WiFi) in the return path direction.

3.1.18
extended terrestrial television distribution network or system
distribution network or system designed to provide sound and television signals received by terrestrial receiving antennas to households in one or more buildings