IEC 60728-10

Edition 3.0 2014-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Cable networks for television signals, sound signals and interactive services – Part 10: System performance for return paths

Réseaux de distribution par câbles pour signaux de télévision, signaux de radiodiffusion sonore et services interactifs – Partie 10: Performances des systèmes de voie de retour

IEC 60728-10:2014-03(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 10: System performance for return paths

FOREWORD

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International Standard IEC 60728-10 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 2005 and constitutes a technical revision.

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

- update on the state-of-the-art of return path transmission in cable networks;
- provisions for DOCSIS 3.0 and EuroDOCSIS 3.0 transmission standards;
- revision of subclause 4.3 on measurement of channel level;
- new subclause 4.12 for method of measurement of noise power ratio (NPR) on return paths;

- new subclause 4.13 for 10-tone measurements;
- new subclause 4.14 for method of measurement of modulation error ratio (*MER*);
- revision of subclause 5.2 on analogue parameters influencing system performance.

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

FDIS	Report on voting
100/2247/FDIS	100/2283/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 list of all the 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.

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.

Specific equipment installed in cable networks for the operation of such return paths is standardised in the relevant equipment standards. See IEC 60728-3, IEC 60728-4, IEC 60728-5, IEC 60728-6.

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

Part 10: System performance for return paths

1 Scope

This part of IEC 60728 specifies the transparent return path of cable networks operated in the frequency range between 5 MHz and 85 MHz or parts thereof. The upper frequency limit of the return path is reduced to 65 MHz where FM radio signals are transmitted in a cable network. Higher frequencies may be used in fibre based networks.

NOTE In addition, it is possible to use the frequency range from 0 MHz to 5 MHz for return path transmissions, for example for NMS or other control, monitoring and signalling purposes. Applications below 5 MHz are not covered by this standard.

Specifications of transmission systems (e.g. DOCSIS) are not within the scope of this standard.

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

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

IEC 60728-2, *Cable networks for television signals, sound signals and interactive services – Part 2: Electromagnetic compatibility for equipment*

IEC 60728-5, *Cable networks for television signals, sound signals and interactive services – Part 5: Headend equipment*

IEC 60728-12, *Cabled distribution systems for television and sound signals – Part 12: Electromagnetic compatibility of systems*

ISO/IEC 13818-1:2007, *Information technology − Generic coding of moving pictures and associated audio information − Part 1: Systems*

ITU-R BT.470, *Conventional analogue television systems*

CLC/TR 50083-10-1:2009, *Guidelines for the implementation of return paths in cable networks*

ETSI ES 200 800, *Digital Video Broadcasting (DVB); DVB interaction channel for Cable TV distribution systems (CATV)*

ETSI EN 302 878-2, V.1.1.1 (2011-11), *Access, Terminals, Transmission and Multiplexing (ATTM); Third Generation Transmission Systems for Interactive Cable Television Services – IP Cable Modems; Part 2: Physical Layer; DOCSIS 3.0*

3 Terms, definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1.1
amplitude response variation
peak-to-peak variation in frequency amplitude response of a specified signal path over a specified frequency band

Note 1 to entry: The amplitude response variation is expressed in dB.

3.1.2
broadcast signal
signal comprising video and/or audio and/or data content distributed to several receivers simultaneously

3.1.3
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.

3.1.4
channel availability
percentage of the time during which the channel fulfils all performance requirements

Note 1 to entry: The duration of the observation time shall be published.

3.1.5
extended satellite television distribution network or system
distribution network or system designed to provide sound and television signals received by satellite receiving antennas to households in one or more buildings

Note 1 to entry: This kind of network or system can possibly 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.

3.1.6
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

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

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

3.1.7
forward path direction
direction of signal flow in a cable network from the headend or any other central point (node) of a cable network to the subscribers' area

3.1.8
forward path
part of a cable network by which signals are distributed in the forward path direction from the headend or any other central point (node) of a cable network to the subscribers' area

Note 1 to entry: The forward path was formerly referred to as downstream.

3.1.9
frequency error
quality of supply evaluated on the basis of the actual frequency of an electrical system compared to its nominal value

Note 1 to entry: Frequency error consists of initial error, and short term and long term frequency stability.

3.1.10
headend
equipment 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 may, for example, comprise antenna amplifiers, frequency converters, combiners, separators and generators.

3.1.11
hybrid fibre coaxial network
HFC
cable network which is comprised of optical equipment and cables and coaxial equipment and cables in different parts

3.1.12
impulse noise
noise caused by electromagnetic interference into cable networks

Note 1 to entry: Impulse noise is characterised by pulses with a duration of typically <10 μs.

3.1.13
individual satellite television receiving system
system designed to provide sound and television signals received from satellite(s) to an individual household

Note 1 to entry: This kind of 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.

3.1.14
individual terrestrial television receiving system
system designed to provide sound and television signals received via terrestrial broadcast networks to an individual household

Note 1 to entry: This kind of system could also carry other signals for special transmission systems (e.g. MoCA or WiFi) in the return path direction.

3.1.15
ingress noise
noise caused by electromagnetic interference into cable networks

Note 1 to entry: The power of the ingress noise decreases with increasing frequency. It is permanently present but it varies slowly in its intensity as a function of time.

3.1.16
interaction path
part of a cable network by which interactive signals are transmitted in the forward path direction (from the headend or node to the subscriber) and in the return path direction (from the subscriber to the headend or node)

3.1.17
local broadband cable network
network designed to provide sound and television signals as well as signals for interactive services to a local area (e.g. one town or one village)

3.1.18
location specific noise
noise which occurs at a specific area of a cable network or which occurs in a cable network located in a specific environment

3.1.19
MATV network
extended terrestrial television distribution networks or systems designed to provide sound and television signals received by terrestrial receiving antennas to households in one or more buildings

Note 1 to entry: Originally defined as master antenna television network.

Note 2 to entry: This kind of network or system can possibly be combined with a satellite antenna for the additional reception of TV and/or radio signals via satellite networks.

Note 3 to entry: This kind of network or system can also carry other signals for special transmission systems (e.g. MoCA or WiFi) in the return path direction.

3.1.20
multiple interference
interfering signal which consists of at least two signals that originated from at least two different sources

Note 1 to entry: On return path the multiple interference consists of ingress noise and intermodulation distortion products.

3.1.21
multimedia signal
signal comprising two or more different media contents, for example, video, audio, text, data, etc.

3.1.22
network management system
NMS
software based system for controlling and supervising cable networks

3.1.23
network segment
part of a cable network comprising a set of functions and/or a specific extent of the complete cable network

3.1.24
network termination
electrical termination of a cable network at any outlet on subscribers' side and headend or node side

3.1.25
node
central point of a network segment at which signals can be fed into the forward path or can be gathered from a number of subscribers out of the return path

3.1.26
regional broadband cable network
network designed to provide sound and television signals as well as signals for interactive services to a regional area covering several towns and/or villages

3.1.27
return path
part of a cable network by which signals are transmitted in the return path direction from any subscriber, connected to the network, to the headend or any other central point (node) of a cable network

Note 1 to entry: The return path was referred to as upstream before.

3.1.28
return path direction
direction of signal flow in a cable network from a subscriber to the headend or any other central point (node) of a cable network

3.1.29
SMATV network
extended distribution networks or systems designed to provide sound and television signals received by satellite receiving antennas to households in one or more buildings

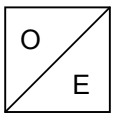
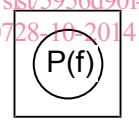
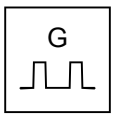
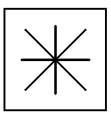
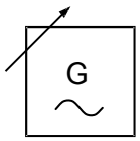
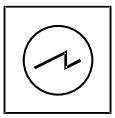
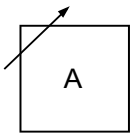
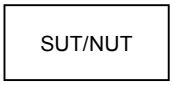
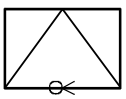
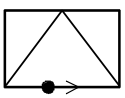
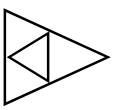
Note 1 to entry: Originally defined as satellite master antenna television network.

Note 2 to entry: This kind of network or system can possibly be combined with terrestrial antennas for the additional reception of TV and/or radio signals via terrestrial networks.

Note 3 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.

3.2 Symbols

The following graphical symbols are used in the figures of this standard. These symbols are either listed in IEC 60617, IEC 60417 or based on symbols defined in IEC 60617.

Symbols	Terms	Symbols	Terms
	Optical receiver [IEC 60617-S00213 (2001-07)]		Electrical spectrum analyzer [IEC 60617-S00910 (2001-07)]
	Test waveform generator [IEC 60617-S01225 (2001-07)]		Passive distribution network [IEC 60617-S00910 (2001-07)]
	Variable signal generator [IEC 60617-S00899 (2001-07), IEC 60617-S01403 (2001-09), IEC 60617-S00081 (2001-07)]		Oscilloscope [IEC 60617-S00059, IEC 60617-S00922 (2001-07)]
	Variable attenuator [IEC 60617-S01245 (2001-07)]		Low pass filter [IEC 60617-S01248 (2001-07)]
	High pass filter [IEC 60617-S01247 (2001-07)]		System under test/ Network under test [IEC 60617-S00060 (2007-07)]
	Demodulator [IEC 60417-5260 (2002-10)]		Modulator [IEC 60417-5261 (2002-10)]
	Amplifier with return path amplifier [IEC 60617-S00433 (2001-07)]		Bit error rate detector [IEC 60617-S00059, IEC 60617-S00910 (2001-07)]