SLOVENSKI STANDARD
SIST-TP CLC/TR 50083-10-1:2009

01-april-2009

Kabelska omrežja za televizijske in zvokovne signale ter interaktivne elemente - 10 -1. del: Smernice za uporabo povratnih poti v kabelskih omrežjih

Cable networks for television signals, sound signals and interactive services - Part 10-1: Guidelines for the implementation of return paths in cable networks

Kabelnetze für Fernsehsignale, Tonsignale und interaktive Dienste - Teil 10-1: Leitfaden für die Einrichtung von Rückkanälen in Kabelnetzen

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Réseaux de distribution par câbles pour signaux de télévision, signaux de radiodiffusion sonore et services interactifs - Partie 10-1: Lignes directrices relatives à la mise en oeuvre de la voie de retour dans les réseaux câblés

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Ta slovenski standard je istoveten z: **CLC/TR 50083-10-1:2009**

ICS:

33.060.40 Kabelski razdelilni sistemi Cabled distribution systems

SIST-TP CLC/TR 50083-10-1:2009 **en**

2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

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TECHNICAL REPORT

RAPPORT TECHNIQUE

TECHNISCHER BERICHT

CLC/TR 50083-10-1

February 2009

ICS 33.060.40

English version

Cable networks for television signals, sound signals and interactive services - Part 10-1: Guidelines for the implementation of return paths in cable networks

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This Technical Report was approved by CENELEC on 2008-12-05.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

This Technical Report was prepared by the Technical Committee CENELEC TC 209, Cable networks for television signals, sound signals and interactive services.

The text of the draft was submitted to the vote in accordance with the Internal Regulations, Part 2, Subclause 11.4.3.3 (simple majority) and was approved by CENELEC as CLC/TR 50083-10-1 on 2008-12-05.

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1 Scope

1.1 General

Standards of the EN 50083 and EN 60728 series deal with cable networks including equipment and associated methods of measurement for headend reception, processing and distribution of television signals, sound signals and their associated data signals and for processing, interfacing and transmitting all kinds of signals for interactive services using all applicable transmission media.

This includes

- CATV[1)]-networks;
- MATV-networks and SMATV-networks;
- individual receiving networks;

and all kinds of equipment, systems and installations installed in such networks.

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.

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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1.2 Specific scope of this Technical Report

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This document is intended to provide guidance to network designers on the issues which should be addressed, when considering the design of a CATV (HFC) return path.

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Items such as return path architecture & design, channel performance, channel planning & sources of interference, measurements, segmentation & re-segmentation, in home networks, distortion and commissioning are included. This document is not intended as a design reference but provides details which need to be addressed on individual issues relating to the design of the CATV/HFC return path.

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.

EN 50083-2	Cable networks for television signals, sound signals and interactive services - Part 2: Electromagnetic compatibility for equipment
EN 50083-8	Cable networks for television signals, sound signals and interactive services - Part 8: Electromagnetic compatibility for networks
EN 55013 + A1 + A2	Sound and television broadcast receivers and associated equipment - Radio disturbance characteristics - Limits and methods of measurement (CISPR 13, mod. + A1 + A2)
EN 55020	Sound and television broadcast receivers and associated equipment - Immunity characteristics - Limits and methods of measurement (CISPR 20)

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1) This word encompasses the HFC networks used nowadays to provide telecommunications services, voice, data, audio and video, both broadcast and narrowcast.

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EN 55022 + A1	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement (CISPR 22, mod. + A1)
EN 55024 + A1 + A2	Information technology equipment - Immunity characteristics - Limits and methods of measurement (CISPR 24, mod. + A1 + A2)
EN 60728-1	Cable networks for television signals, sound signals and interactive services - Part 1: System performance (IEC 60728-1)
EN 60728-3	Cable networks for television signals, sound signals and interactive services - Part 3: Active wideband equipment for coaxial cable networks (IEC 60728-3)
EN 60728-4	Cable networks for television signals, sound signals and interactive services - Part 4: Passive wideband equipment for coaxial cable networks (IEC 60728-4)
EN 60728-5	Cable networks for television signals, sound signals and interactive services - Part 5: Headend equipment (IEC 60728-5)
EN 60728-6	Cable networks for television signals, sound signals and interactive services - Part 6: Optical equipment (IEC 60728-6)
EN 60728-10	Cable networks for television signals, sound signals and interactive services - Part 10: System performance for return paths (IEC 60728-10)
EN 61280-2-2	Fibre optic communication subsystem test procedures - Part 2-2: Digital systems - Optical eye pattern, waveform and extinction ratio measurement (IEC 61280-2-2)
ETSI EN 300 386	Electromagnetic compatibility and Radio spectrum Matters (ERM); Telecommunication network equipment; Electromagnetic Compatibility (EMC) requirements
ETSI ES 201 488-1	Access and Terminals (AT); Data Over Cable Systems; Part 1: General
ETSI ES 201 488-2	Access and Terminals (AT); Data Over Cable Systems; Part 2: Radio Frequency Interface Specification
ETSI ES 202 488-1	Access and Terminals (AT); Second Generation Transmission Systems for Interactive Cable Television Services - IP Cable Modems; Part 1: General
ETSI ES 202 488-2	Access and Terminals (AT); Second Generation Transmission Systems for Interactive Cable Television Services - IP Cable Modems; Part 2: Radio frequency interface specification
ETSI ETS 300 800	Digital Video Broadcasting (DVB);Interaction channel for Cable TV distribution systems (CATV)
IEC 60050	International Electrotechnical Vocabulary (IEV)
IEC 60617 database	Graphical symbols for diagrams
IEC/TR 61931	Fibre optic - Terminology
ISO/IEC 13818-1	Information technology - Generic coding of moving pictures and associated audio information: Systems

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3 Terms, definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this technical report, the terms and definitions listed hereafter apply. As far as possible the available terms and definitions are taken from IEC 60050 series and are repeated below. The relevant IEV-numbers or other references are given in rectangular brackets after the definition text.

3.1.1
common path distortion
intermodulation distortion of downstream signals, mainly due to nonlinearities found at metallic junctions. The distortions are manifest as a series of beats (caused by analogue downstream channels) or a band(s) of noise (caused by digital downstream channels) most noticeably in the upstream path. CPD may also be present in the downstream path, but since it adds with other downstream distortions (i.e. CTB and CSO), caused by active components, it is difficult to differentiate between the two. The nonlinear behaviour found at passive junctions may be due to a number of reasons including corrosion, typically from exposure to the elements, dissimilar metals, contact pressure, and junctions involving connectors contaminated with carbonaceous materials

3.1.2
downstream direction
direction of signal flow in a cable network from the headend or any other central point (node) of a cable network towards the subscriber
[EN 60728-10, modified]

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3.1.3
forward path (downstream)
physical part of a cable network by which signals are distributed in the downstream direction from the headend or any other central point (node) of a cable network towards the subscriber
[EN 60728-10, modified]

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3.1.4
gateway
functional unit that connects two computer networks with different network architectures

EXAMPLES – LAN gateway, mail gateway

NOTE The computer networks may be either local area networks, wide area networks or other types of networks.

[IEV 732-01-16]

3.1.5
headend
assembly of equipment feeding signals into a cable network from local or external sources, including equipment for reception and signal processing
[IEV 723-09-11, modified]

NOTE The headend may, for example, comprise antenna amplifiers, frequency converters, combiners, separators and generators.

3.1.6
hub
local area distribution point for the insertion and recovery of two-way narrowcast signals such as DOCSIS/EuroDOCSIS with broadcast transmissions from the headend in the RF domain (frequency multiplexing)

3.1.7
hybrid fibre coaxial network
HFC network
cable network which comprises optical equipment and cables and coaxial equipment and cables in different parts
[EN 60728-10]

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3.1.8
ingress noise
noise which is caused by electromagnetic interference into cable networks. Its power decreases with increasing frequency. It is permanently present but slowly varies in its intensity as a function of time
[EN 60728-10]

3.1.9
(network) segment
part of a cable network comprising a set of functions and/or a specific extent of the complete cable network
[EN 60728-10]

3.1.10
network termination unit
NTU
equipment for access to the cable network connected between home network interface (HNI) and system outlet

3.1.11
node
any point in a cable network where two or more links are interconnected
[IEV 715-08-06, modified]

3.1.12
Optical Modulation Index
OMI
the Optical Modulation Index is defined as:

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$$m = \frac{\phi_h - \phi_l}{\phi_h + \phi_l}$$

where ϕ_h is the highest and ϕ_l is the lowest instantaneous optical power of the intensity modulated optical signal. This term is mainly used for analogue systems.
[EN 60728-6]

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NOTE This definition doesn't apply to systems where the input signals are converted and transported as digital baseband signals. In this case the terms modulation depth or extinction ratio defined in 2.6.79 and 2.7.46 of IEC/TR 61931 have to be used. A test procedure for extinction ratio is described in EN 61280-2-2.

3.1.13
return path (upstream)
physical part of a cable network by which signals are transmitted from any subscriber, connected to the network, to the headend or any other central point (node) of a cable network
[EN 60728-10, modified]

3.1.14
upstream direction
direction of signal flow in a cable network from a subscriber towards the headend or any other central point (node) of a cable network
[EN 60728-10, modified]

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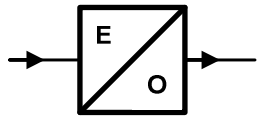
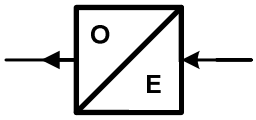
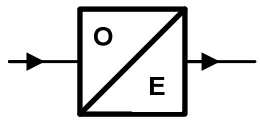
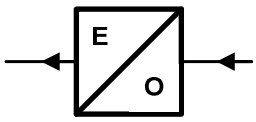
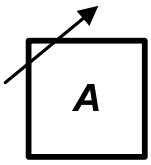
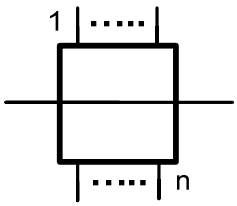
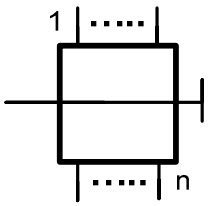
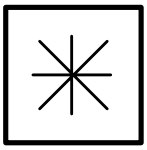
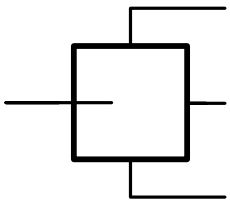
3.2 Symbols

The following graphical symbols are used in the figures of this Technical Report. These symbols are either listed in IEC 60617 or based on symbols defined in IEC 60617:

Symbol	Function	Symbol	Function
	**Optical transmitter forward path**		**Optical transmitter return path**
	**Optical receiver forward path**		**Optical receiver return path**
	**Analogue-Digital Converter**		**Digital-Analogue Converter**
	**Multiplexer** [IEC 60617-S01626]		**De-multiplexer** [IEC 60617-S01626, modified]
	**Attenuator (fixed)** [IEC 60617-S01244]		**Adjustable attenuator** [IEC 60617-S01245]
	**Tap-off (n ports)**		**Multi-tap (n ports) with terminated feeder line**
	**Distribution network**		**Splitter** **Combiner (in the reverse direction)**

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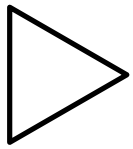
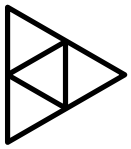
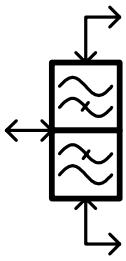
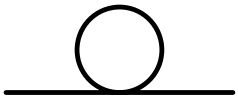
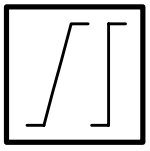
Symbol	Function	Symbol	Function
	**Amplifier, one-way** [IEC 60617-S01239]		**Amplifier, two-way** [IEC 60617-S00433]
	**Low-pass filter** [IEC 60617-S01248]		**High-pass filter** [IEC 60617-S01247]
	**Diplexer**		**Band-pass filter** [IEC 60617-S01249]
	**Fibre cable**		**Multiplier**
	**Equalizer**		

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3.3 Abbreviations

For the purposes of this document, the following abbreviations apply.

AC	Alternating current
ADC	Analogue-to-digital converter
ALSC	Automatic level & slope control
AM	Amplitude modulation
BNI	Building network interface
BNTU	Building network termination unit
C/NLD	Carrier to non linear distortion ratio
CATV	Community antenna television
CB	Citizens band
CF	Centre frequency
CMTS(s)	Cable modem termination system(s)
CPD	Common path distortion
CPE	Customer premises equipment

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CSO	Composite second order
CTB	Composite triple beat
CW	Continuous wave
CWDM	Coarse wavelength division multiplex
DAC	Digital-to-analogue converter
DAVIC	Digital Audio Visual Council
DC	Direct Current
DeMUX	De-multiplexer
DFB	Distributed feedback (laser)
DOCSIS	Data-over-cable service interface specification
DS	Downstream
DVB	Digital video broadcasting
DWDM	Dense wavelength division multiplex
EDFA	Erbium doped fibre amplifier
EMS	Element management system
EuroDOCSIS	European data-over-cable service interface specification
EUT	Equipment under test
FM	Frequency modulation
FP	Fabry-Perot (laser)
FSK	Frequency shift keying
HE	Headend
HF	High frequency
HFC	Hybrid-fibre-coax
HNI	Home network interface
IP	Internet protocol
ISF	Ingress suppression filter
MATV	Master antenna television
MDU	Multiple dwelling unit
MER	Modulation error ratio
MUX	Multiplexer
NGN	Next generation network
NLD	Non-linear distortion
NPR	Noise power ratio
NTU	Network termination unit
OMI	Optical modulation index
PID	Packet identifier
PIM	Passive intermodulation
PMD	Polarization mode dispersion
PRBS	Pseudo random bit sequence
PSTN	Public switched telephone network

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