



# SLOVENSKI STANDARD SIST EN 60728-13-1:2012

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**Kabelska omrežja za televizijske in zvokovne signale ter interaktivne storitve - 13-1. del: Razširitev pasovne širine za radiodifuzijske signale po optičnih vlaknih do doma (FTTH)**

Cable networks for television signals, sound signals and interactive services -- Part 13-1: Bandwidth expansion for broadcast signal over FTTH system

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33.160.01	Avdio, video in avdiovizualni sistemi na splošno	Audio, video and audiovisual systems in general
33.180.01	Sistemi z optičnimi vlakni na splošno	Fibre optic systems in general

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 60728-13-1**

August 2012

ICS 33.160.01; 33.180.01

English version

**Cable networks for television signals, sound signals  
and interactive services -  
Part 13-1: Bandwidth expansion for broadcast signal  
over FTTH system  
(IEC 60728-13-1:2012)**

Réseaux de distribution par câbles  
pour signaux de télévision, signaux  
de radiodiffusion sonore et services  
interactifs -  
Partie 13-1: Extension de bande  
pour le signal de diffusion sur le système  
FTTH  
(CEI 60728-13-1:2012)

Kabelnetze für Fernsehsignale,  
Tonsignale und interaktive Dienste -  
Teil 13-1: Bandbreitenerweiterung  
für Rundfunksignale in FTTH-Systemen  
(IEC 60728-13-1:2012)

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Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**Management Centre: Avenue Marnix 17, B - 1000 Brussels**

## Foreword

The text of document 100/1801/CDV, future edition 1 of IEC 60728-13-1, prepared by Technical Area 5 "Cable networks for television signals, sound signal and interactive services" of IEC/TC 100 "Audio, video and multimedia systems and equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60728-13-1:2012.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2013-03-13
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2015-06-13

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## Endorsement notice

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In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60068 series	NOTE	Harmonised as EN 60068 series (not modified).
IEC 60825-1	NOTE	Harmonised as EN 60825-1.12
IEC 60825-2	NOTE	Harmonised as EN 60825-2. <a href="https://standards.iteh.ai/catalog/standards/sist/133c85e-d479-4acf-960f-8d97363d8c5b/sist-en-60728-13-1-2012">https://standards.iteh.ai/catalog/standards/sist/133c85e-d479-4acf-960f-8d97363d8c5b/sist-en-60728-13-1-2012</a>
IEC 60825-12	NOTE	Harmonised as EN 60825-12.
IEC 60875-1	NOTE	Harmonised as EN 60875-1.
IEC 61280-1-1	NOTE	Harmonised as EN 61280-1-1.
IEC 61280-2-9	NOTE	Harmonised as EN 61280-2-9.
IEC 61281-1	NOTE	Harmonised as EN 61281-1.
IEC 61290-1-2	NOTE	Harmonised as EN 61290-1-2.
IEC 61290-1-3	NOTE	Harmonised as EN 61290-1-3.
IEC 61291-1:2006	NOTE	Harmonised as EN 61291-1:2006 (not modified).
IEC 61300-3-2	NOTE	Harmonised as EN 61300-3-2.
IEC 61754-13	NOTE	Harmonised as EN 61754-13.
IEC 61755-1	NOTE	Harmonised as EN 61755-1.

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60068-1 + corr. October	1988 1988	Environmental testing - Part 1: General and guidance	EN 60068-1 <sup>1)</sup>	1994
IEC 60728-1	2007	Cable networks for television signals, sound signals and interactive services - Part 1: System performance of forward paths	EN 60728-1	2008
IEC 60728-6	2011	Cable networks for television signals, sound signals and interactive services - Part 6: Optical equipment	EN 60728-6	2011
IEC 60728-13 + corr. August	2010 2010	Cable networks for television signals, sound signals and interactive services - Part 13: Optical systems for broadcast signal transmissions	EN 60728-13	2010
IEC 61280-1-3	-	Fibre optic communication subsystem test procedures - Part 1-3: General communication subsystems - Central wavelength and spectral width measurement	EN 61280-1-3	-
ITU-T Recommendation G.694.1	-	Spectral grids for WDM applications: DWDM - frequency grid	-	-
ITU-T Recommendation G. 94.2	-	Spectral grids for WDM applications: CWDM - wavelength grid	-	-

<sup>1)</sup> EN 60068-1 includes A1 to IEC 60068-1 + corr. October.

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IEC 60728-13-1

Edition 1.0 2012-05

# INTERNATIONAL STANDARD



**Cable networks for television signals, sound signals and interactive services –  
Part 13-1: Bandwidth expansion for broadcast signal over FTTH system**

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## CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references .....	8
3 Terms, definitions, symbols and abbreviations.....	8
3.1 Terms and definitions .....	8
3.2 Symbols .....	16
3.3 Abbreviations .....	17
4 Optical system reference model.....	18
5 Preparation of measurement .....	19
5.1 Environmental conditions .....	19
5.1.1 Standard measurement conditions.....	19
5.1.2 Standard operating condition .....	19
5.1.3 Standard signal and measuring equipment .....	19
5.2 Accuracy of measuring equipment.....	20
5.3 Source power.....	20
6 Methods of measurement .....	20
6.1 Measuring points and parameters.....	20
6.1.1 General .....	20
6.1.2 Measuring points.....	20
6.1.3 Measuring parameters.....	21
6.2 Optical power .....	22
6.3 Optical wavelength.....	22
6.4 Carrier level and carrier-to-noise ratio .....	22
6.4.1 General .....	22
6.4.2 Measurement setup .....	22
6.4.3 Measurement conditions.....	23
6.4.4 Measurement method for xPSK signals .....	23
6.4.5 Presentation of the results.....	23
6.5 Carrier-to-noise ratio defined by optical signal.....	23
6.5.1 General .....	23
6.5.2 Measuring points and measurement setup.....	23
6.5.3 Measurement conditions.....	24
6.5.4 System <i>RIN</i> measurement method .....	24
6.5.5 <i>CIN</i> calculation based on <i>RIN</i> value .....	26
6.5.6 Calculation of component <i>RIN</i> .....	27
6.6 Optical modulation index .....	27
6.7 Carrier-to-crosstalk ratio ( <i>CCR</i> ).....	28
7 Specification of optical system for broadcast signal transmission .....	28
7.1 Analogue and digital broadcast system over optical network .....	28
7.2 International TV systems .....	28
7.3 Relationship between <i>RIN</i> and <i>CIN</i> .....	29
7.4 Optical wavelength.....	31
7.5 Frequency of source signal .....	32



7.6	Optical system specification for satellite signal transmission .....	32
7.7	<i>C/N</i> ratio specification for in-house and in-building wirings .....	32
7.8	Crosstalk due to optical fibre non-linearity .....	33
7.9	Single frequency interference level due to fibre non-linearity .....	33
7.10	Environment condition .....	33
Annex A (informative)	Actual service systems and design considerations .....	34
Annex B (informative)	Wavelength division multiplexing.....	46
Annex C (informative)	Minimum wavelength separation .....	53
Annex D (informative)	Relation between <i>C/N</i> degradation and rain attenuation .....	57
Bibliography	.....	59
Figure 1	– FTTH Cable TV system using one-wavelength .....	18
Figure 2	– FTTH Cable TV system using two wavelengths .....	18
Figure 3	– Performance specified points of the optical system .....	19
Figure 4	– Measuring points in a typical video distribution system.....	21
Figure 5	– Measurement of optical wavelength using WDM coupler .....	22
Figure 6	– Measurement of carrier level and carrier-to-noise ratio.....	22
Figure 7	– Measuring points in a typical FTTH system .....	23
Figure 8	– <i>RIN</i> measurement setup .....	24
Figure 9	– Performance allocation and measuring points .....	28
Figure 10	– Section of <i>C/N</i> ratio specification (38 dB) for in-house wiring.....	33
Figure 11	– Section of <i>C/N</i> ratio specification (24 dB) for in-building wiring (in case of coaxial cable distribution after V-ONU) .....	33
Figure A.1	– Example of a multi-channel service system of one million terminals .....	34
Figure A.2	– Example of a multi-channel service system of 2 000 terminals .....	35
Figure A.3	– Example of a multi-channel with CS supplementary service system of 2 000 terminals .....	35
Figure A.4	– Example of retransmission service system with 144 terminals.....	36
Figure A.5	– Example of retransmission service system with 72 terminals.....	36
Figure A.6	– System performance calculation Model No.1.....	39
Figure A.7	– System performance calculation Model No.2.....	40
Figure A.8	– System performance calculation Model No.3.....	41
Figure A.9	– System performance calculation Model No.4.....	42
Figure A.10	– System performance calculation Model No.5.....	43
Figure A.11	– System performance calculation model No.6.....	44
Figure B.1	– Linear crosstalk between two wavelengths.....	49
Figure B.2	– Wavelength dependency of Raman crosstalk .....	50
Figure B.3	– Nonlinear crosstalk between two wavelengths .....	50
Figure B.4	– Frequency dependency of cross phase modulation .....	51
Figure B.5	– <i>C/N</i> degradation (two wavelengths into one V-ONU case) .....	52
Figure C.1	– Experimental results of <i>RIN</i> degradation due to optical beat .....	54
Figure C.2	– Wavelength variation of DWDM transmitter against ambient temperature .....	54
Figure C.3	– Wavelength variation of CWDM transmitter against ambient temperature .....	55
Figure C.4	– Example of wavelength division multiplexing using WDM filter .....	55

Figure C.5 – Example of CWDM filter design .....	56
Figure C.6 – Example of wavelength division multiplexing using optical coupler.....	56
Table 1 – Level of RF signals.....	13
Table 2 – Measuring instruments .....	20
Table 3 – Measuring points and measured parameters .....	21
Table 4 – Parameters used to calculate the $C/N$ when signals of multiple wavelengths are received by a single V-ONU.....	27
Table 5 – Minimum RF signal-to-noise ratio requirements in operation.....	28
Table 6 – Types of broadcast services .....	30
Table 7 – Type of service and minimum operational $RIN$ values for Satellite services .....	31
Table 8 – Performance of optical wavelength and power.....	31
Table 9 – Optical system specification .....	32
Table 10 – Section of $C/N$ ratio specification for in-house/in-building wiring .....	32
Table 11 – Interference level due to fibre non-linearity.....	33
Table A.1 – Basic system parameters .....	37
Table B.1 – Example nominal central frequencies of the DWDM grid .....	47
Table B.2 – Nominal central wavelength for spacing of 20 nm (ITU-T G.694.2).....	49

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**CABLE NETWORKS FOR TELEVISION SIGNALS,  
SOUND SIGNALS AND INTERACTIVE SERVICES –**
**Part 13-1: Bandwidth expansion for broadcast signal  
over FTTH system**

## FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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. 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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International Standard IEC 60728-13-1 has been prepared by technical area 5: Cable networks for television signals, sound signal 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:

CDV	Report on voting
100/1801/CDV	100/1931/RVC

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 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.

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A bilingual version of this standard may be issued at a later date.

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## INTRODUCTION

Standards of the IEC 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 networks,
- MATV networks and SMATV networks,
- individual receiving networks

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

NOTE CATV encompasses the Hybrid Fibre Coaxial (HFC) networks used nowadays to provide telecommunications services, voice, data, audio and video both broadcast and narrowcast.

The extent of this standardization work is from the antennas, 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, terminals, etc.) as well as of any coaxial and optical cables and accessories thereof is excluded.

In this standard, informative Annex A describes the system composition and model system based on this standard, and Annex B describes basic concepts for optical wavelength division multiplexing and adds notes for system configuration. Annex C gives the minimum wavelength separation, and Annex D explains the relationship between *C/N* degradation and rain attenuation.

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This standard describes the pass-through method of satellite broadcast signals over the FTTH system which uses AM-FDM (SCM) transmission. For an FTTH system below 1 GHz refer to IEC 60728-13. This standard contains descriptions of the measurement methods and specifications for optical wavelength division multiplex and for PSK modulation systems. It specifies the downstream video signal transmission and thus the two-way optical transmission system is out of the scope of this standard. This standard applies to the FTTH system of broadband broadcast signal transmission which conveys satellite broadcast signals using one or multiple optical wavelengths. It is provided for cable/satellite operators to extend their broadband services in order to avoid interference between optical wavelengths based on the technologies described in IEC 60728-13.

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

## Part 13-1: Bandwidth expansion for broadcast signal over FTTH system

### 1 Scope

The purpose of this part of IEC 60728 is the precise description of the fibre to the home (FTTH) system for expanding broadband broadcast signal transmission from CATV services only, towards CATV plus broadcast satellite (BS) plus communication satellite (CS) services, additionally to other various signals such as data services.

The scope is limited to the RF signal transmission over the FTTH (fibre to the home) system. Thus, this part of IEC 60728 does not include IP transport technologies.

### 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 60068-1:1988, *Environmental testing – Part 1: General and guidance*

<https://standards.iteh.ai/catalog/standards/sist/13f3c85e-d479-4acf-960f-8d97763dfc5b/iec-60728-13-1-2012>

IEC 60728-1:2007, *Cable networks for television signals, sound signals and interactive services – Part 1: System performance of forward paths*

IEC 60728-6:2011, *Cable networks for television signals, sound signals and interactive services – Part 6: Optical equipment*

IEC 60728-13:2010, *Cable networks for television signals, sound signals and interactive services – Part 13: Optical systems for broadcast signal transmissions*

IEC 61280-1-3, *Fibre optic communication subsystem test procedures – Part 1-3 General communication subsystems – Central wavelength and spectral width measurement*

ITU-T Recommendation G.694.1, *Spectral grids for WDM applications: CWDM wavelength grid*

ITU-T Recommendation G.694.2, *Spectral grids for WDM applications: CWDM wavelength grid*

### 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****optical transmitting unit  
optical transmitter****Tx**

transmit fibre optic terminal device accepting at its input port an electrical signal and providing at its output port an optical carrier modulated by that input signal

[SOURCE: IEC 61931:1998, definition 2.9.6]

Note 1 to entry: For the purposes of this standard, optical transmitters may have more than one input port accepting electrical RF signals.

Note 2 to entry: This piece of equipment amplifies frequency multiplexed electrical signals and converts these electrical signals into optical signals. The optical wavelength is a 1 500 nm band ( $1\,550 \pm 10$  nm in 1 530 nm to 1 625 nm region).

Note 3 to entry: The wavelength and necessary wavelength separation are described in Annexes B and C, respectively.

[SOURCE: IEC 60728-13:2010, definition 3.1.1, modified – Note 3 has been added]

**3.1.2****optical receiving unit  
optical receiver****Rx**

receive fibre optic terminal device accepting at its input port a modulated optical carrier, and providing at its output port the corresponding demodulated electrical signal (with the associated clock, if digital)

Note 1 to entry: For the purposes of this standard, optical receivers may have more than one output port providing electrical RF signals.

[SOURCE: IEC/TR 61931:1998, definition 2.9.7, modified – Note 1 has been added]

**3.1.3****optical amplifier**

optical waveguide device containing a suitably pumped, active medium which is able to amplify an optical signal

Note 1 to entry: In this standard, Erbium Doped Fibre Amplifier (EDFA) is used for amplification in the 1 550 nm band.

Note 2 to entry: There are several methods based on wavelength to be used for amplification. The term “Erbium Doped Fibre Amplifier (EDFA)” is the synonym of optical amplifier in this standard.

[SOURCE: IEC/TR 61931:1998, definition 2.7.75, modified – Notes 1 and 2 have been added]

**3.1.4****fibre optic branching device  
optical fibre coupler  
splitter**

optical fibre device, possessing three or more optical ports, which shares optical power among its ports in a predetermined fashion, at the same wavelength or wavelengths, without wavelength conversion

Note 1 to entry: The ports may be connected to fibres, detectors, etc.

[SOURCE: IEC/TR 61931:1998, definition 2.6.21, modified – The term has been clarified]