

INTERNATIONAL STANDARD

**Cable networks for television signals, sound signals and interactive services -
Part 114: Optical transmission systems using RFoG technology**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**Cable networks for television signals,
sound signals and interactive services -
Part 114: Optical transmission systems using RFoG technology**

FOREWORD

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IEC 60728-14 has been prepared by IEC technical committee 100: Audio, video and multimedia systems and equipment. It is an International Standard.

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

Draft	Report on voting
100/4513/FDIS	100/4560/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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.

This standard follows closely (where applicable) the ANSI/SCTE 174 2018 standard "Radio Frequency over Glass / Fiber-to-the-Home (RFG) Specification / Extension". In agreement with SCTE¹ major parts of ANSI/SCTE 174:2018 have been copied into this standard.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

¹ SCTE = Society of Cable Telecommunications Engineers

INTRODUCTION

Standards and other 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:

- 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 systems 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 equipment of the customer's premises.

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 annexes provide the following information:

- Annex A describes implementation notes with design considerations based on the content of this document;
- Annex B describes the system loss specification;
- Annex C describes multiple CMTS operation;
- Annex D gives a design guideline of housings for R-ONU protection;
- Annex E contains information on the effect of off-state optical power on the SNR of the transmission signal.

1 Scope

This part of IEC 60728 describes the system and equipment specification of FTTH/FTTB (fibre to the home/fibre to the building) networks where information is transmitted in both forward and return path directions using RF subcarrier multiplexing technology, and where the return path transmission uses additionally time division multiple access technique imposed by the transmission of the return path signals using a TDMA (e.g. TDMA mode of DOCSIS) protocol. Such systems are called RF over glass (RFOG) and consist of an RFOG optical network unit (R-ONU), an optical distribution network based on xPON structure, and an RFOG optical return path receiver. This document specifies the basic system parameters and methods of measurement for RFOG systems in order to assess the system performance and its performance limits.

The detailed description of physical layer is out of the scope of this document and it does not include IP transport technologies.

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.

IEC 60068-2 (all parts), *Environmental testing*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

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

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

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

IEC 60728-10:2014, *Cable networks for television signals, sound signals and interactive services – Part 10: System performance of return paths*

IEC 60728-11, *Cable networks for television signals, sound signals and interactive services - Part 11: Safety*

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

IEC 60728-113:2023, *Cable networks for television signals, sound signals and interactive services - Part 113: Optical systems for broadcast signal transmissions loaded with digital channels only*

IEC 60728-106:2023, *Cable networks for television signals, sound signals and interactive services - Part 106: Optical equipment for systems loaded with digital channels only*

IEC 60794-3-11:2010, *Optical fibre cables - Part 3-11: Outdoor cables - Product specification for duct, directly buried, and lashed aerial single-mode optical fibre telecommunication cables*

IEC 60825-1, *Safety of laser products - Part 1: Equipment classification and requirements*

IEC 61169-2, *Radio-frequency connectors - Part 2: Sectional specification - Radio frequency coaxial connectors of type 9,52*

IEC 61169-24, *Radio-frequency connectors - Part 24: Sectional specification - Radio-frequency coaxial connectors with screw coupling, typically for use in 75 Ω cable networks (type F)*

IEC 61280-1-1, *Fibre optic communication subsystem basic test procedures - Part 1-1: Test procedures for general communication subsystems - Transmitter output optical power measurement for single-mode optical fibre cable*

IEC 61280-1-3, *Fibre optic communication subsystem test procedures - Part 1-3: General communication subsystems - Measurement of central wavelength, spectral width and additional spectral characteristics*

IEC 61754-4, *Fibre optic interconnecting devices and passive components - Fibre optic connector interfaces - Part 4: Type SC connector family*

ISO/IEC/IEEE Standard 8802-3:2021, *Standard for Ethernet*

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IEC 60050-731, *International Electrotechnical Vocabulary - Chapter 731: Optical fibre communication*

IEC 60068-1, *Environmental testing - Part 1: General and guidance*

IEC 60417, *Graphical symbols for use on equipment*, available at <http://www.graphical-symbols.info/equipment>

IEC 60617, *Graphical symbols for diagrams*, available at <http://std.iec.ch/iec60617>

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

IEC TR 60728-6-1, *Cable networks for television signals, sound signals and interactive services - Part 6-1: System guidelines for analogue optical transmission systems*

IEC 60793-2-50:2018, *Optical fibres - Part 2-50: Product specifications - Sectional specification for class B single-mode fibres*

IEC 60825-2, *Safety of laser products - Part 2: Safety of optical fibre communication systems (OFCS)*

IEC 61280-2-2, *Fibre optic communication subsystem test procedures - Part 2-2: Digital systems - Optical eye pattern, waveform and extinction ratio measurement*

IEC 61280-4-2, *Fibre optic communication subsystem test procedures - Part 4-2: Installed cable plant - Single-mode attenuation and optical return loss measurement*

IEC 61281-1, *Fibre optic communication subsystems - Part 1: Generic specification*

IEC TR 61282-4, *Fibre optic communication system design guides - Part 4: Accommodation and utilization of non-linear effects*

IEC 61290-1-1, *Optical amplifiers - Test methods - Part 1-1: Power and gain parameters - Optical spectrum analyzer method*

IEC 61290-1-2, *Optical amplifiers - Test methods - Part 1-2: Power and gain parameters - Electrical spectrum analyzer method*

IEC 61290-6-1, *Optical fibre amplifiers - Basic specification - Part 6-1: Test methods for pump leakage parameters - Optical demultiplexer*

IEC 61291-4, *Optical amplifiers - Part 4: Multichannel applications - Performance specification template*

IEC TR 61292-4, *Optical amplifiers - Part 4: Maximum permissible optical power for the damage-free and safe use of optical amplifiers, including Raman amplifiers*

IEC TR 61931:1998, *Fibre optic - Terminology*

IEC 80416 (all parts), *Basic principles for graphical symbols for use on equipment*

ITU G.692, *Optical interfaces for multichannel systems with optical amplifiers*

ITU J.186, *Transmission equipment for multi-channel television signals over optical access networks by sub-carrier multiplexing (SCM)*

ANSI/SCTE 96, *Cable Telecommunications Testing Guidelines*

GR-49, *Generic Requirements for Outdoor Telecommunication Network Interface Devices (NIDs)*

GR-487, *Generic Requirements for Electronic Equipment Cabinets*
