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First edition
2003-10

**Cable networks for television signals,
sound signals and interactive services –**

**Part 7-1:
Hybrid Fibre Coax Outside Plant
Status Monitoring –
Physical (PHY) Layer Specification**

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International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch



Commission Electrotechnique Internationale
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**CABLE NETWORKS FOR TELEVISION SIGNALS,
SOUND SIGNALS AND INTERACTIVE SERVICES –**
**Part 7-1: Hybrid Fibre Coax Outside Plant status monitoring –
Physical (PHY) layer specification**

FOREWORD

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International Standard IEC 60728-7-1 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 standard was submitted to the national committees for voting under the Fast Track Procedure as the following documents:

CDV	Report on voting
100/576/CDV	100/683/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 committee has decided that the contents of this publication will remain unchanged until 2006. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

The following differences exist in some countries:

The Japanese *de facto* standard (NCTEA S-006) concerning requirements for the HFC outside plant management, which was published in 1995, has already been available in Japan. The purpose of this standard is to support the design and implementation of interoperable management systems for HFC cable networks used in Japan. (see Table 4)

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INTRODUCTION

Standards of the IEC 60728 series deal with cable networks for television signals, sound signals and interactive services including equipment, systems and installations for

- head-end reception, processing and distribution of television and sound signals and their associated data signals, and
- processing, interfacing and transmitting all kinds of signals for interactive services

using all applicable transmission media.

All kinds of networks like

- CATV-networks,
- MATV-networks and SMATV-networks,
- individual receiving networks

and all kinds of equipment, systems and installations installed in such networks, are within this scope.

The extent of this standardization work is from the antennas, special signal source inputs to the head-end or other interface points to the network up to the system outlet or the terminal input, where no system outlet exists.

The standardization of any user terminals (i.e. tuners, receivers, decoders, multimedia terminals, etc.) as well as of any coaxial and optical cables and accessories therefore is excluded.

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

Part 7-1: Hybrid Fibre Coax Outside Plant status monitoring – Physical (PHY) layer specification

1 Scope

This part of IEC 60728 specifies requirements for The Hybrid Fibre Coax (HFC) Outside Plant (OSP) Physical (PHY) Layer Specification and is part of the series of specifications developed by the Hybrid Management Sub-Layer (HMS) subcommittee under the SCTE. The purpose of the HMS specification is to support the design and implementation of interoperable management systems for evolving HFC cable networks. The HMS Physical (PHY) Layer Specification describes the physical layer portion of the protocol stack used for communication between HMS-compliant transponders interfacing to managed outside plant network elements (NE) and a centralized head-end element (HE).

This standard describes the PHY layer requirements that must be implemented by all *Type 2* and *Type 3* compliant OSP HMS transponders on the HFC plant and the controlling equipment in the head-end. Any exceptions to compliance with this standard will be specifically noted herein as necessary. Refer to Table 1 for a full definition of the type classifications.

Electromagnetic Compatibility (EMC) is not specified in this standard and is left to the vendor to ensure compliance with local EMC regulatory requirements. Other than operating temperature, physical parameters such as shock, vibration, humidity, etc., are also not specified and left to the vendor's discretion.

Transponder type classifications referenced within the HMS series of standards are defined in Table 1.

Table 1 – Transponder type classifications

Type	Description	Application
Type 0	Refers to legacy transponder equipment, which is incapable of supporting the HMS specifications	This transponder interfaces with legacy network equipment through proprietary means. This transponder could be managed through the same management applications as the other types through proxies or other means at the head-end
Type 1	Refers to stand-alone transponder equipment (legacy or new) which can be upgraded to support the HMS specifications	This transponder interfaces with legacy network equipment through proprietary means. Type 1 is a standards-compliant transponder (either manufactured to the standard or upgraded) that connects to legacy network equipment via a proprietary interface
Type 2	Refers to a stand-alone, HMS-compliant transponder	This transponder interfaces with network equipment designed to support the electrical and physical specifications defined in the HMS standards. It can be factory or field-installed. Its RF connection is independent of the monitored NE
Type 3	Refers to a stand-alone or embedded, HMS-compliant transponder	This transponder interfaces with network equipment designed to support the electrical specifications defined in the HMS standards. It may or may not support the physical specifications defined in the HMS standards. It can be factory-installed. It may or may not be field-installed. Its RF connection is through the monitored NE

2 Normative references

None.

3 Terms, definitions and abbreviations

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

3.1

forward spectrum

the pass-band of frequencies in HFC cable systems with a lower edge of between 48 MHz and 87,5 MHz, depending on the particular geographical area, and an upper edge that is typically in the range of 300 MHz to 860 MHz depending on implementation

3.2

full spectrum

combined forward and return spectrums in HFC cable systems and excludes any guard band

3.3

guard band

unused frequency band between the upper edge of the usable return spectrum and the lower edge of the usable forward spectrum in HFC cable systems

3.4

network element (NE)

active element in the outside plant that is capable of receiving commands from a head-end element (HE) in the head-end and, as necessary, providing status information and alarms back to the HE

3.5

open system interconnection (OSI)

framework of International Organization for Standardization (ISO) standards for communication between multi-vendor systems that organizes the communication process into seven different categories that are placed in a layered sequence based on the relationship to the user. Each layer uses the layer immediately below it and provides services to the layer above. Layers 7 through 4 deal with end-to-end communication between the message source and destination, and layers 3 through 1 deal with network functions

3.6

physical (PHY) layer

layer 1 in the Open System Interconnection (OSI) architecture; the layer that provides services to transmit bits or groups of bits over a transmission link between open systems and which entails electrical, mechanical and handshaking procedures

3.7

return spectrum

pass-band of frequencies in HFC cable systems with a lower edge of 5 MHz and an upper edge that is typically in the range of 42 MHz to 65 MHz depending on the particular geographical area

3.8

transponder

device in the outside plant that interfaces to outside plant NEs and relays status and alarm information to the HE. It can interface with an active NE via an arrangement of parallel analogue, parallel digital and serial ports

3.9

un-modulated carrier

carrier resting on the 'mark' frequency rather than on the channel's centre frequency

3.10 Abbreviated terms

ANSI	American National Standards Institute
BER	Bit Error Rate
C/R	Carrier-to-Noise Ratio
C/(N+I)	Carrier to Noise-plus-Interference Ratio
CW	Continuous Wave
EMC	Electromagnetic Compatibility
FSK	Frequency Shift Keying
HE	Head-end Element
HFC	Hybrid Fibre Coax
HMS	Hybrid Management Sub-Layer
LSB	Least Significant Bit
MSB	Most Significant Bit
NE	Network Element
MAC	Media Access Control
OSP	Outside Plant
PHY	Physical
RF	Radio Frequency
SCTE	Society of Cable Telecommunications Engineers

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