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

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COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 1: System performance of forward paths

FOREWORD

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International Standard IEC 60728-1 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 fourth edition cancels and replaces the third edition published in 2001, of which it constitutes a technical revision.

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

- redrafting of introduction and scope to reflect the current scope of IEC TC 100/TA 5;
- redrafting of measurement procedure for bit error ratio (BER);
- updating of performance requirements in Clause 5;
- inclusion of new Clause 6;
- inclusion of new Clause 7;

- inclusion of new Annex K.

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

FDIS	Report on voting
100/1242/FDIS	100/1274/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.

For the differences in some countries, see Annex J.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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- withdrawn;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.

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

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[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.

The reception of television signals inside a building requires an outdoor antenna and a distribution network to convey the signal to the TV receivers.

The installation of an outdoor antenna for each TV receiver should be avoided for several obvious technical, economical and practical reasons.

In a building divided into apartment blocks, the installation of a master antenna television system for terrestrial (MATV) and/or satellite (SMATV) reception, as shown in Figures 1, 2, 3, 4 and 5, describing as an example the various parts of the system is usual. Most of the terms used in the IEC 60728 series can be referred to these figures.

When signals to be conveyed to the TV receivers are picked up far away, for geographical reasons, and the number of users (subscribers) is very high, the installation of a cable network using coaxial cables and/or fibre optic cables is used, as indicated in Figure 4, describing as an example the various parts of the system.

A system model of a cable network is shown in Figure 5, where the main parts of the systems are indicated, as defined in Clause 3.

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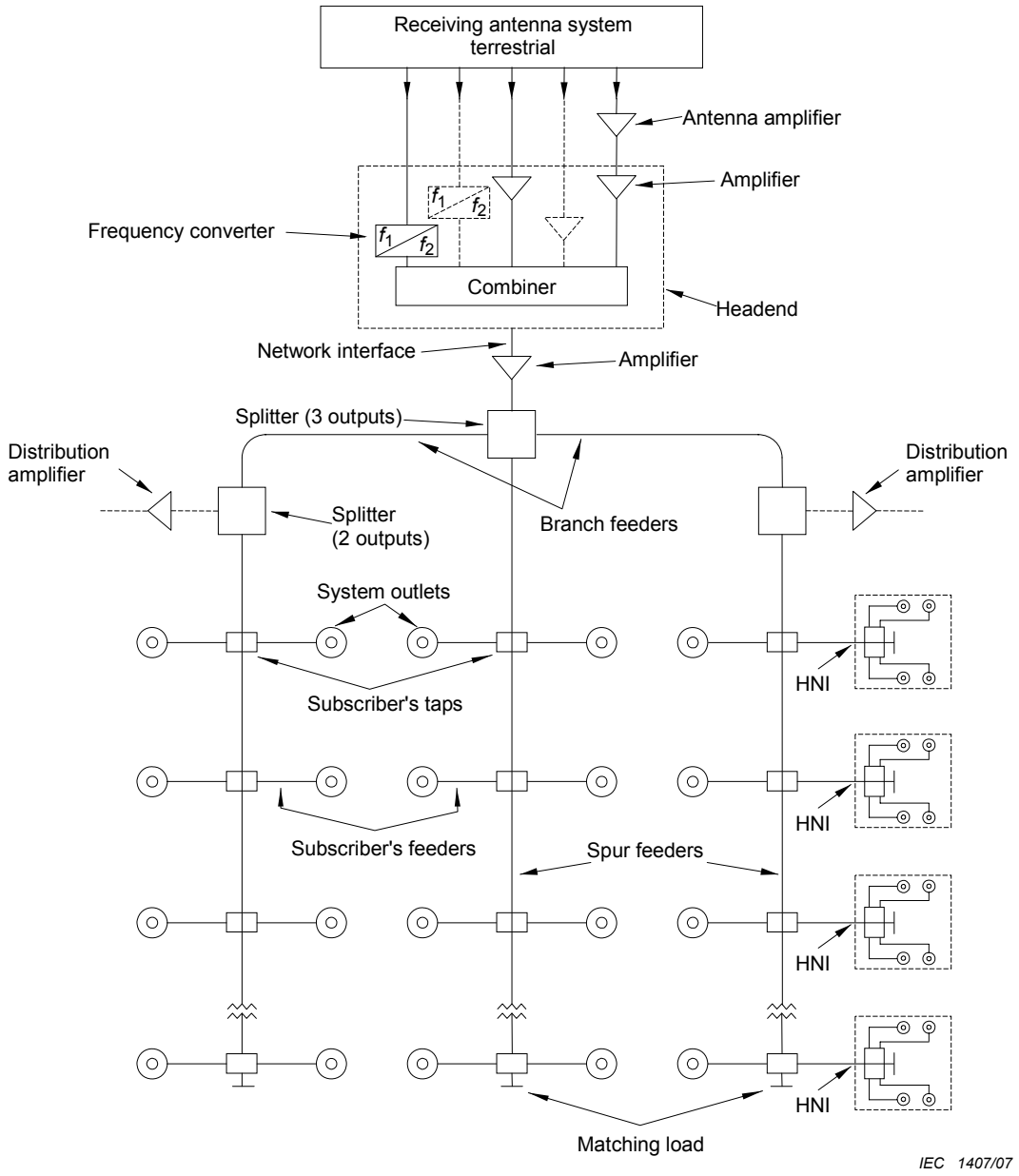
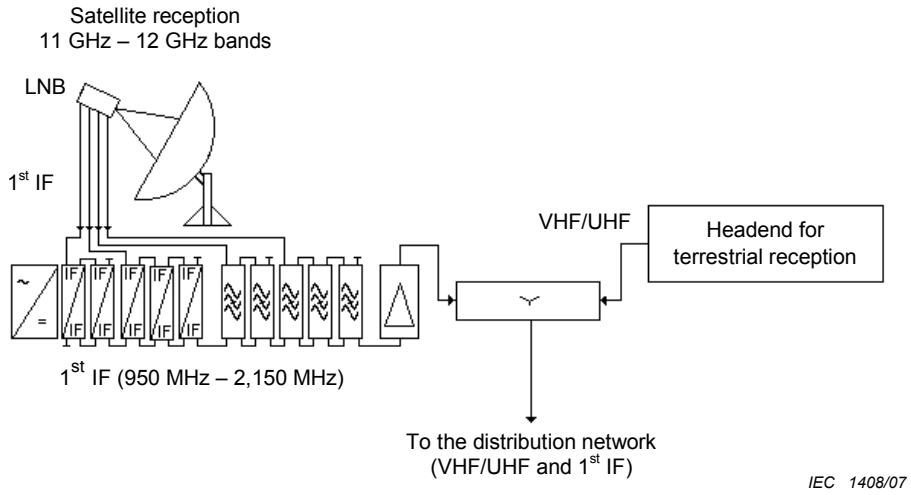
[1] This word encompasses the HFC networks used nowadays to provide telecommunications services, voice, data, audio and video both broadcast and narrowcast.



Some apartments (dwelling units) are served with a home network (HN), interfaced to the MATV system by the Home Network Interface (HNI).

Figure 1 – Example of a master antenna television system (MATV) for terrestrial reception



NOTE Distribution at the 1st IF on the same cable as terrestrial VHF/UHF channels.

Figure 2 – Example of the headend of a master antenna television system for satellite (SMATV) reception

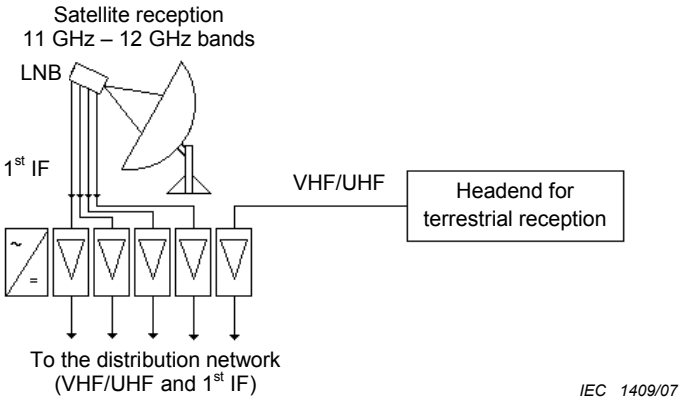
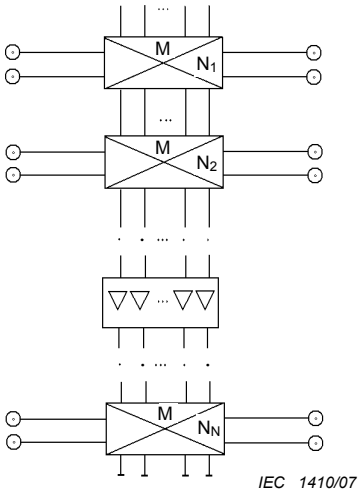


Figure 3a – Headend for terrestrial and satellite reception using multicable distribution



Fifgure 3b – Distribution with switching matrix at each flat

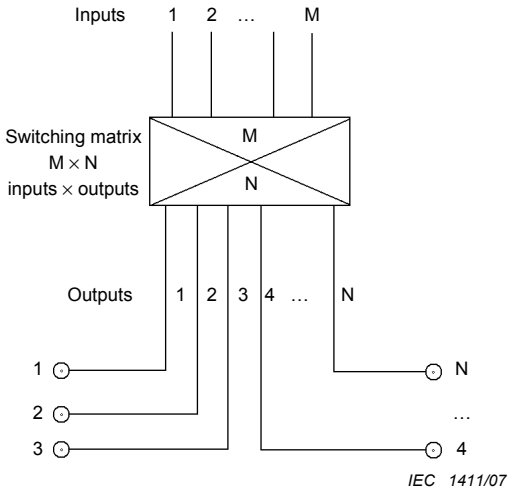


Figure3c – Distribution with switching matrix: star configuration

NOTE Distribution at the 1st IF using multicable and multi-switch technique.

Figure 3 – Example of a master antenna television system for terrestrial and satellite (SMATV) reception

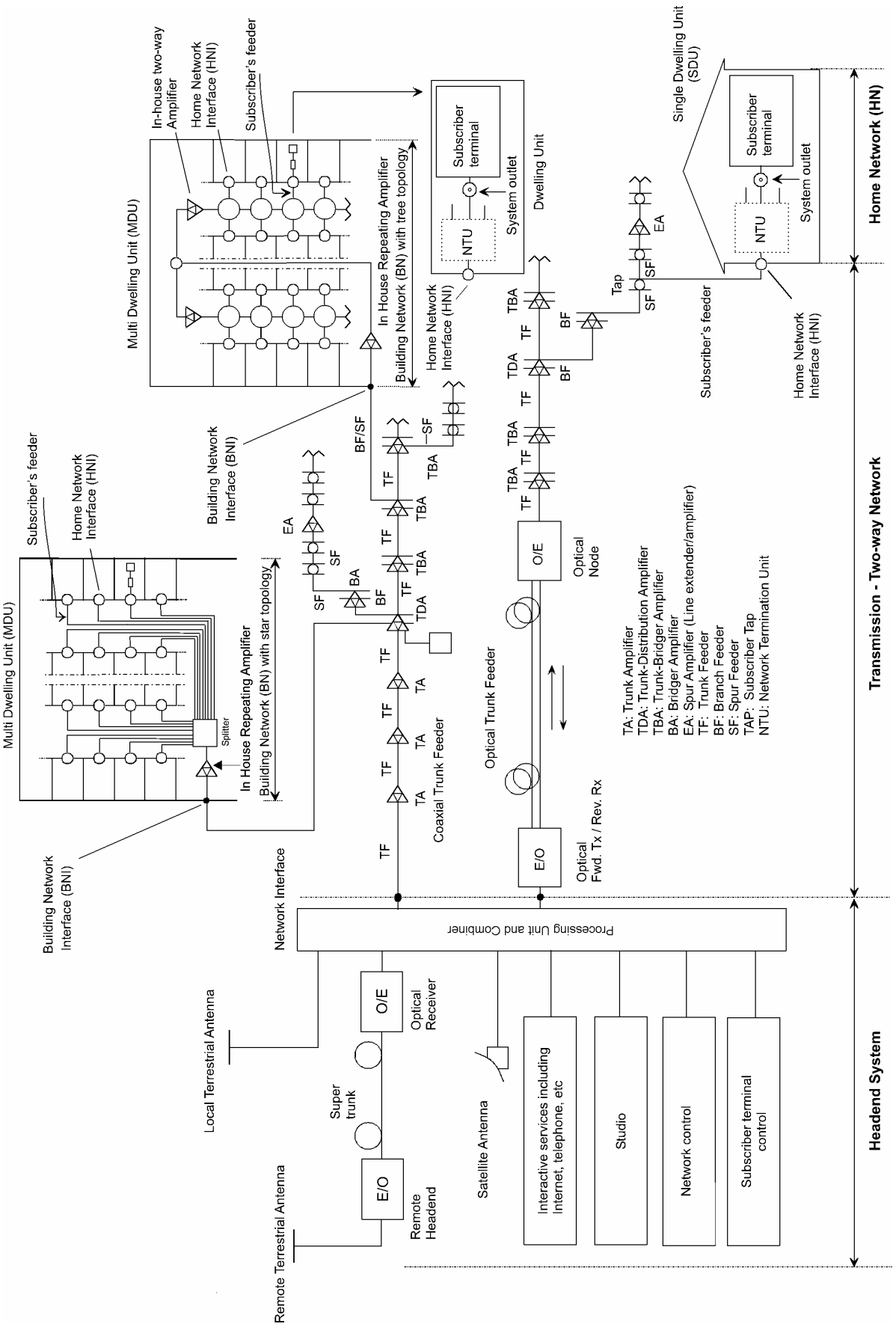


Figure 4 – Example of a cabled distribution system for television and sound signals

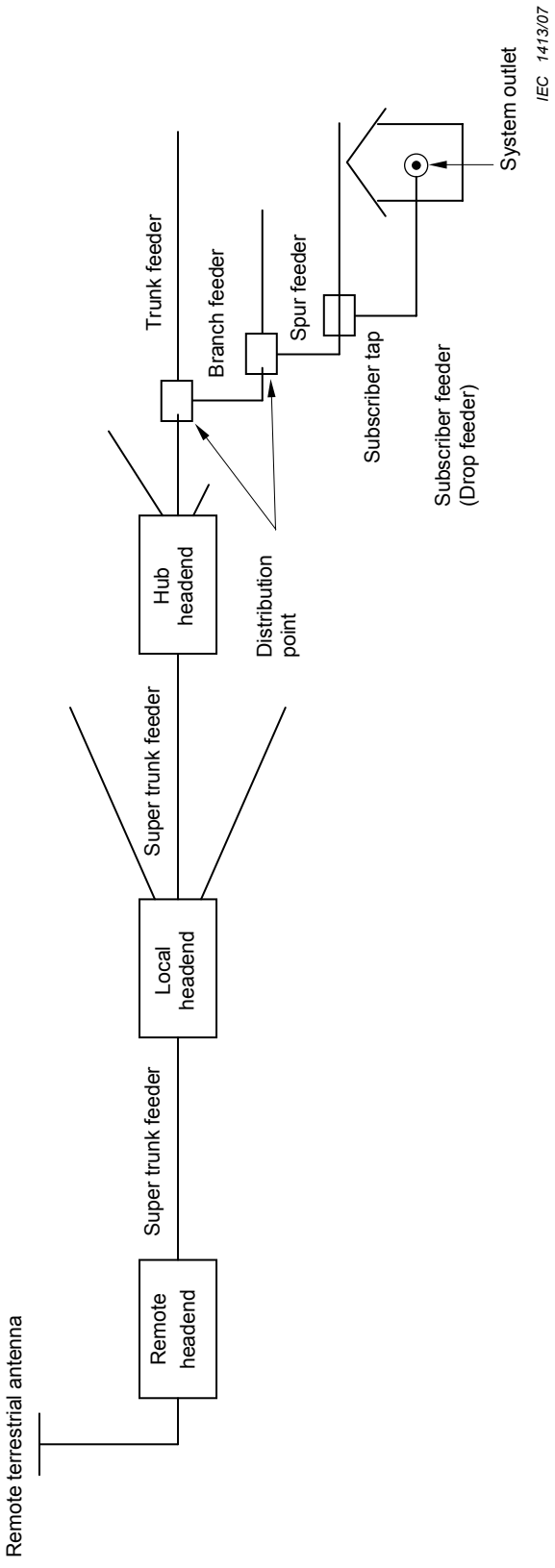


Figure 5 – System model for downstream direction of a cable network for television and sound signals (CATV)

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

Part 1: System performance of forward paths

1 Scope

This part of IEC 60728 is applicable to any cable network (including individual receiving systems) having in the forward path a coaxial cable output and primarily intended for television and sound signals operating between about 30 MHz and 3 000 MHz.

This standard specifies the basic methods of measurement of the operational characteristics of cable network having coaxial cable outputs in order to assess the performance of these systems and their performance limits.

All requirements refer to the performance limits, which shall be obtained between the input(s) to the headend or headends and any system outlet when terminated in a resistance equal to the nominal load impedance of the system, unless otherwise specified. Where system outlets are not used, the above applies at the subscriber's end of the subscriber's feeder. Also the requirements which are obtained between the input(s) to the headend or headends and any home network interface (HNI) are given.

NOTE 1 Methods of measurement described in this standard are considered as basic. However, any equivalent method that ensures at least the same accuracy may be used.

NOTE 2 If the system operator wishes to subdivide the system into a number of parts or wishes to use different transmission media (for example, coaxial cabling, balanced cabling, optical cabling), the accumulation of degradations should not exceed the figures given in this standard.

NOTE 3 System performance requirements of return paths as well as specific methods of measurement for the use of the return paths in cable networks are described in IEC 60728-10.

Clause 5 defines the system performance limits which will, with an unimpaired input, (headend input signal), produce picture and sound signals (at system outlets) where the impairment to any single parameter will be not worse, in normal operating conditions for any analogue channel, than Grade four on the five-grade impairment scale contained in ITU-BT 500-10. For digitally modulated signals, the quality requirement is a quasi-error-free (QEF) reception.

Appropriate performance requirements for the signals at the receiving antennas site are given in Clause 6 in order to provide at the input of the headend of the cable network both analogue and digital television signals with suitable quality.

Clause 7 is applicable to home networks (including those of individual receiving systems) using coaxial cables, balanced cables or optical cables and primarily intended for television signals, sound signals and interactive services, operating between about 30 MHz and 3 000 MHz.

This clause, considering the basic operational characteristics of a home network, specifies the requirements which shall be obtained at the home network interface (HNI) taking into account the performance requirements given at the system outlet or at the terminal input.

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.

IEC 60050-705, *International Electrotechnical Vocabulary (IEV) – Chapter 705: Radio wave propagation*

IEC 60050-712, *International Electrotechnical Vocabulary (IEV) – Chapter 712: Antennas*

IEC 60050-713, *International Electrotechnical Vocabulary (IEV) – Part 713: Radiocommunications: transmitters, receivers, networks and operation*

IEC 60050-725, *International Electrotechnical Vocabulary (IEV) – Chapter 725: Space radiocommunications*

IEC 60617, *Graphical symbols for diagrams*

IEC 60728-2, *Cabled distribution systems for television and sound signals – Part 2: Electromagnetic compatibility for equipment*

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

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

IEC 60728-10*, 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 60728-12, *Cabled distribution systems for television and sound signals – Part 12: Electromagnetic compatibility of systems*

IEC 60966-2-4, *Radio frequency and coaxial cable assemblies – Part 2-4: Detail specification for cable assemblies for radio and TV receivers – Frequency range 0 to 3 000 MHz, IEC 61169-2 connectors*

IEC 60966-2-5, *Radio frequency and coaxial cable assemblies – Part 2-5: Detail specification for cable assemblies for radio and TV receivers – Frequency range 0 to 1 000 MHz, IEC 61169-2 connectors*

IEC 60966-2-6, *Radio frequency and coaxial cable assemblies – Part 2-6: Detail specification for cable assemblies for radio and TV receivers – Frequency range 0 to 3 000 MHz, IEC 61169-24 connectors*

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

ISO/IEC 13818-2, *Information technology – Generic coding of moving pictures and associated audio information: Video*

ISO/IEC 13818-3*, Information technology – Generic coding of moving pictures and associated audio information – Part 3: Audio*

ISO/IEC 13818-4, *Information technology – Generic coding of moving pictures and associated audio information – Part 4: Conformance testing*

ISO/IEC 14496-1, *Information technology – Coding of audio-visual objects – Part 1: Systems*

ISO/IEC 14496-2, *Information technology – Coding of audio-visual objects – Part 2: Visu*al

ISO/IEC 14496-3, *Information technology – Coding of audio-visual objects – Part 3: Audio*

ISO/IEC 14496-4, *Information technology – Coding of audio-visual objects – Part 4: Conformance testing*

ITU-R Recommendation BS.412-9, *Planning standards for terrestrial FM sound broadcasting at VHF*

ITU-R Recommendation BT.417-4, *Minimum field strengths for which protection may be sought in planning an analogue terrestrial television service*

ITU-R Recommendation BT.470-7, *Conventional analogue television systems*

ITU-R Recommendation BT.500-11, *Methodology for the subjective assessment of the quality of television pictures*

ITU-T Recommendation J.61, *Transmission performance of television circuits designed for use in international connections*

ITU-T Recommendation J.63, *Insertion of test signals in the field-blanking interval of monochrome and colour television signals*

EN 50117-2-4, Coaxial cables – Part 2-4: *Sectional specification for cables used in cabled distribution networks - Indoor drop cables for systems operating at 5 MHz - 3 000 MHz*

EN 50248, *Characteristics of DAB receivers*

ETSI EN 300 421, *Digital Video Broadcasting (DVB) – Framing structure, channel coding and modulation for 11/12 GHz satellite services*

ETSI EN 300 429, *Digital Video Broadcasting (DVB) – Framing structure, channel coding and modulation for cable systems*

ETSI EN 300 468, *Digital Video Broadcasting (DVB) – Specification for Service Information (SI) in DVB systems*

ETSI EN 300 473, *Digital Video Broadcasting (DVB) – Satellite Master Antenna Television (SMATV) distribution systems*

ETSI EN 300 744, *Digital Video Broadcasting (DVB) – Framing structure, channel coding and modulation for digital terrestrial television*

ETSI EN 300 748, *Digital Video Broadcasting (DVB) – Multipoint Video Distribution Systems (MVDS) at 10 GHz and above*

ETSI EN 300 749, *Digital Video Broadcasting (DVB) – Microwave Multipoint Distribution Systems (MMDS) below 10 GHz*

ETSI EN 302 307 *Digital Video Broadcasting (DVB) – Second generation framing structure, channel coding and modulation systems for Broadcasting, Interactive Services, News Gathering and other broadband satellite applications*

ETSI TR 101 211, *Digital Video Broadcasting (DVB) – Guidelines on implementation and usage of Service Information (SI)*

ETSI ETS 300 784, *Satellite Earth Stations and Systems (SES) – TeleVision Receive-Only (TVRO) satellite earth stations operating in the 11/12 GHz frequency bands*

ETSI TR 101 290, *Digital Video Broadcasting (DVB) – Measurement guidelines for DVB systems*