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EUROPEAN STANDARD

EN 50083-5

NORME EUROPÉENNE

EUROPÄISCHE NORM

March 2001

ICS 33.060.40

Supersedes EN 50083-5:1994

English version

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

Réseaux de distribution par câbles
pour signaux de télévision, signaux
de radiodiffusion sonore et services
interactifs
Partie 5: Matériels de tête de réseau

Kabelnetze für Fernsehsignale,
Tonsignale und interaktive Dienste
Teil 5: Geräte für Kopfstellen

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

This European Standard was prepared by CENELEC Technical Committee TC 209, "Cable networks for television signals, sound signals and interactive services" on the basis of EN 50083-5:1994 and the first amendment to EN 50083-5.

The text of this first amendment was submitted to the Unique Acceptance Procedure and was approved by CENELEC on 1998-01-01 with the request to prepare a second edition of EN 50083-5, by incorporating this amendment into the European Standard EN 50083-5:1994.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2001-10-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2001-10-01

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annexes A, B and D are normative and annexes C and E are informative.

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1 Scope

1.1 General

Standards of EN 50083 series deal with cable networks for television signals, sound signals and interactive services including equipment, systems and installations

- for headend reception, processing and distribution of television and 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.

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 headend 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 therefor is excluded.

1.2 Specific scope of this part 5

This standard defines the characteristics of equipment used in the headends of terrestrial broadcast and satellite receiving systems (without satellite outdoor units and without those broadband amplifiers in the headend as described in EN 50083-3). The satellite outdoor units for FSS are described in standard ETS 300 158, for BSS in standard ETS 300 249. Test methods for both types (FSS and BSS) of satellite outdoor units are laid down in ETS 300 457.

This standard

- covers the frequency range 5 MHz to 3000 MHz;
- identifies performance requirements for certain parameters;
- lays down data publication requirements for certain parameters;
- stipulates methods of measurements;
- introduces minimum requirements defining quality grades (Q-grades).

As far as possible this standard only deals with the interfaces between headend equipment and only explains the function of the equipment if this is necessary to support the description of the interfaces.

Coder, transcoder, encrypter, decrypter etc. are not described in this standard. If such equipment are used in headends, the relevant parameters for RF, video, audio and data interfaces have to be met.

According to the definitions in clause 3 the headends are divided into the following three quality grades:

- Grade 1: local headend / remote headend
- Grade 2: hub headend
- Grade 3: MATV headend / individual reception headend

Practical experience has shown these types meet most of the technical requirements necessary for supplying a minimum signal quality to the subscribers. This classification shall not be considered as a requirement but as the information for users and manufacturers on the minimum quality criteria of the material required to install networks of different sizes. The system operator has to select appropriate material to meet the minimum signal quality at the subscriber's outlet and to optimise cost performance, taking into account the size of the network and local circumstances.

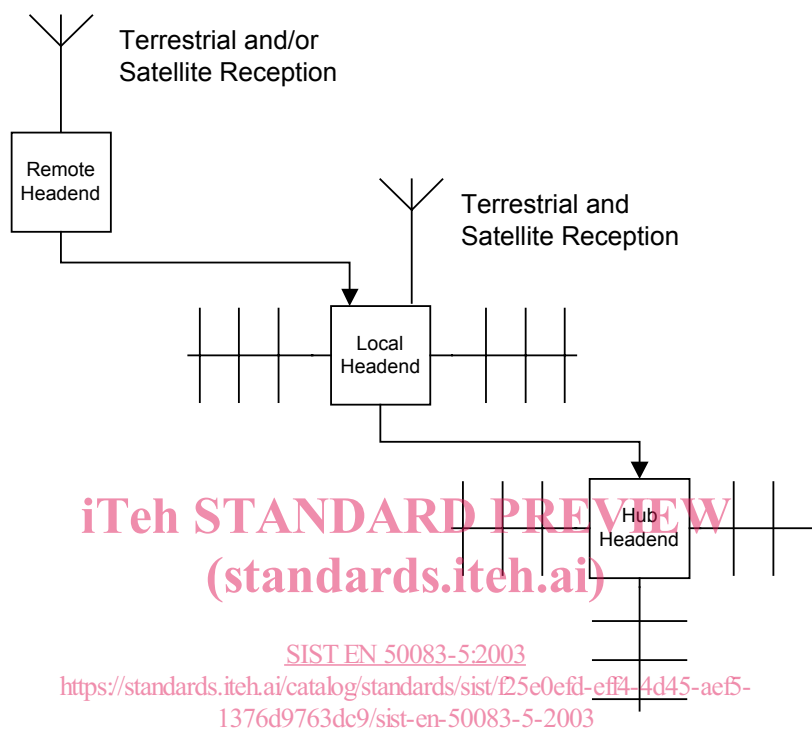


Figure 1 - Example of headends

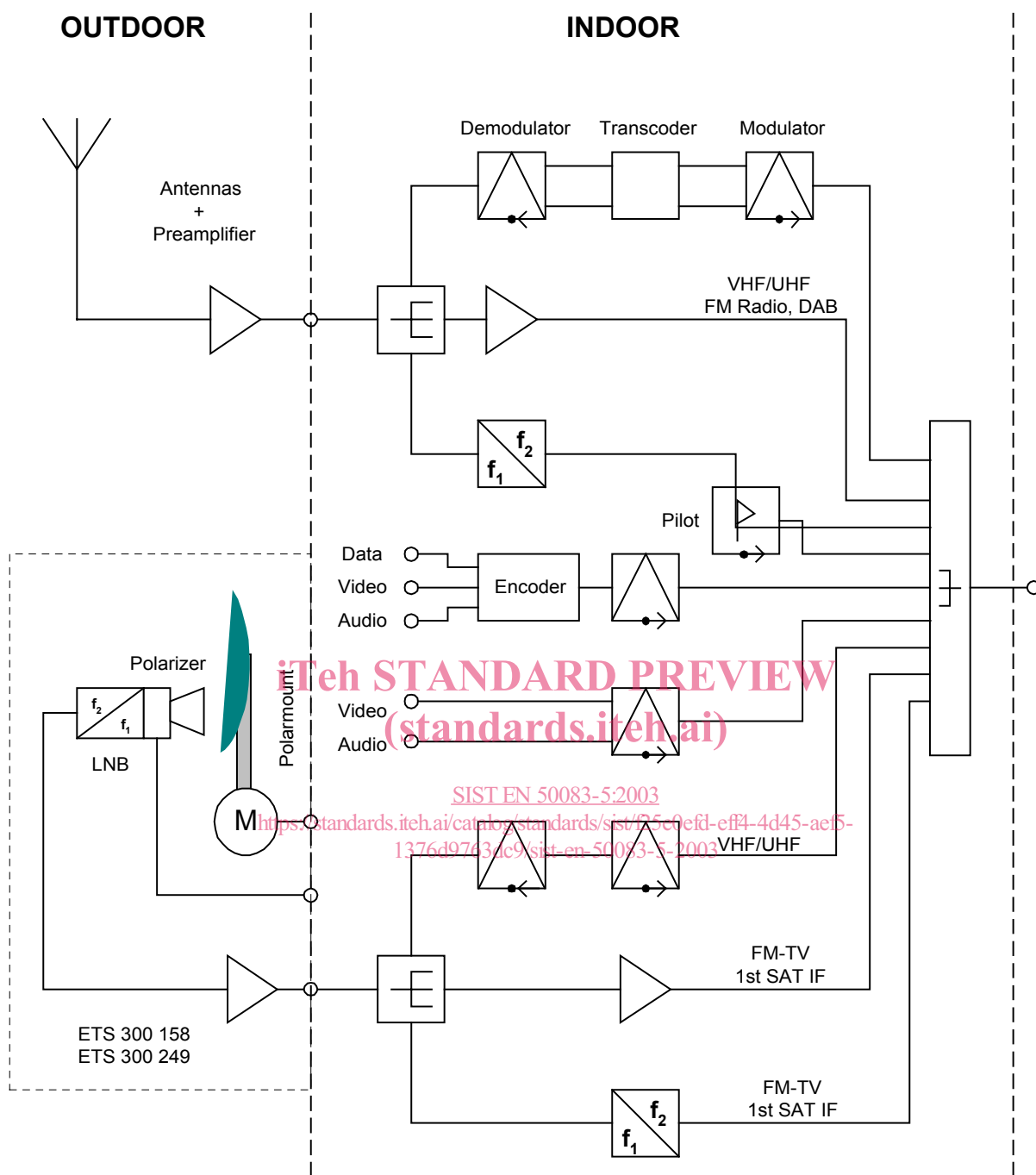


Figure 2 - Example of headend

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 50083		Cable networks for television signals, sound signals and interactive services
EN 50083-1 + A1 + A2	1993 1997 1997	Part 1: Safety requirements
EN 50083-2 + A1	1995 1997	Part 2: Electromagnetic compatibility for equipment
EN 50083-3	1998	Part 3: Active wideband equipment for coaxial cable networks
EN 60068/HD 323 series		Environmental testing/Basic environmental testing procedures (IEC 60068 series)
EN 60130-9	2000	Connectors for frequencies below 3 MHz – Part 9: Circular connectors for radio and associated sound equipment (IEC 60130-9:2000)
EN 60244-5	1994	Methods of measurement for radio transmitters Part 5: Performance characteristics for television transmitters (IEC 60244-5:1992)
EN 60417-1	1999	Graphical symbols for use on equipment Part 1: Overview and application (IEC 60417-1:1998)
EN 60417-2	1999	Graphical symbols for use on equipment Part 2: Symbol originals (IEC 60417-2:1998)
EN 60529 + corr. May	1991 1993	Degrees of protection provided by enclosures (IP Code) NOTE: Basic Safety Publication (IEC 60529:1989)
EN 300 163 V1.2.1	1998	Television systems - NICAM 728: Transmission of two-channel digital sound with terrestrial television systems B, G, H, I, K1 and L
EN 300 473 V1.1.2	1997	Digital Video Broadcasting (DVB) - Satellite Master Antenna Television (SMATV) distribution systems
HD 134.2 S2	1984	Radio frequency connectors - Part 2: Coaxial unmatched connector (IEC 60169-2:1965 + A1:1982)
HD 571 S1	1990	General principles for the creation of graphical symbols for use on equipment (IEC 60416:1988)

ETS 300 158	1992	Satellite Earth Stations and Systems (SES) - Television Receive Only (TVRO-FSS) Satellite Earth Stations operating in the 11/12 GHz FSS bands
ETS 300 249	1993	Satellite Earth Stations and Systems (SES) - Television Receive Only (TVRO) equipment used in the Broadcasting Satellite Service (BSS)
ETS 300 457	1995	Satellite Earth Stations and Systems (SES) - Test methods for Television Receive Only (TVRO) operating in the 11/12 GHz frequency bands
IEC 60169-8	1978	Radio frequency connectors -- Part 8: RF coaxial connectors with inner diameter of outer conductor 6,5 mm (0,25 in) with bayonet lock - Characteristic impedance 50 ohms (type BNC)
CCIR Rec. 468		Measurement of audio frequency noise in broadcasting and in sound recording systems
ITU-T Rec. J.61	06/90	Transmission performance of television circuits designed for use in international connections (Formerly ITU-R Rec. 567-3)
ITU-T Rec. J.101	06/90	Measurement methods and test procedures for teletext signals (Formerly ITU-R Rec. 720)
CCIR Report 624		Characteristics of television systems

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3 Terms, definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this standard, the following definitions apply.

3.1.1

headend

equipment which is connected between receiving antennas or other signal sources and the remainder of the cable network, to process the signals to be distributed.

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

3.1.2

hub headend

a headend used to feed the entire operating network in the service area

3.1.3

local headend

a headend which is directly connected to the system trunk feeders or to a short haul "trunk feeder replacement" link

3.1.4

remote headend

a headend from which signals are delivered to a local headend via a long-distance terrestrial link

3.1.5**MATV headend**

a headend used in blocks of flats and in built-up sites to feed TV channels and FM radio channels into the house network or the spur network.=

3.1.6**Satellite Master Antenna Television system (SMATV)**

a system which is designed to provide sound and television signals to the households of a building or group of buildings. Two system configurations are defined in EN 300 473 as follows:

- SMATV system A, based on transparent transmodulation of QPSK satellite signals into QAM signals to be distributed to the user
- SMATV system B, based on direct distribution of QPSK signals to the user, with two options:
 - SMATV-IF distribution in the satellite IF band (above 950 MHz)
 - SMATV-S distribution in the VHF/UHF band, for example in the extended S-band (230-470 MHz)

3.1.7**headend for individual reception**

a headend supplying an individual household. This type of installation may include one or more system outlets

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3.1.8**antenna preamplifier**

an amplifier (often a low noise type) associated with an antenna

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3.1.9**frequency converter**

a device for changing the carrier frequency of one or more signals

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3.1.10**combiner**

a device in which the signals arriving at two or more input ports are fed to a single output port

NOTE Some forms of this device may be used in the reverse direction as splitters.

3.1.11**decibel ratio**

ten times the logarithm of the ratio of two quantities of power P_1 to P_2 , i. e.

$$10 \lg \frac{P_1}{P_2} (\text{dB})$$

3.1.12**standard reference power and voltage**

in cable networks the standard reference power P_0 is 1/75 pW

NOTE This is the power dissipated in a 75 Ohm resistor with a voltage drop of $1 \mu\text{V}_{\text{RMS}}$ across it.

The standard reference voltage U_0 is 1 μV .

3.1.13**level**

the level of any power P_1 is the decibel ratio of that power to the standard reference power P_0 , i.e.

$$10 \lg \frac{P_1}{P_0}$$

The level of any voltage U_1 is the decibel ratio of that voltage to the standard reference voltage U_0 , i.e.

$$20 \lg \frac{U_1}{U_0}$$

This may be expressed in decibels (relative to 1 μV in 75 Ω) or more simply in dB(μV) if there is no risk of ambiguity.

3.1.14**image carrier power**

"power", in relation to a vision-modulated carrier, is defined as the power at the peak of the modulation envelope (i.e. the maximum RMS voltage squared, divided by the resistance)

3.1.15**attenuation**

the ratio of the input power to the output power of an equipment or a system, usually expressed in decibel

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3.1.16**gain**

the ratio of the output power to the input power of any equipment or system, usually expressed in decibel

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3.1.17**automatic gain control (AGC)**

the automatic control of a device to maintain the level of the signal at its output constant, using the signal to be controlled as the control stimulus

3.1.18**amplitude frequency response**

the gain or losses of an equipment or system plotted against frequency

3.1.19**intermodulation**

the process whereby the non-linearity of equipment in a system produces spurious output signals (called intermodulation products) at frequencies which are linear combinations of those of the input signals

3.1.20**carrier-to-intermodulation ratio**

the difference in decibels between the carrier level at a specified point in a system or in an equipment and the level of a specified intermodulation product or combination of products

3.1.21**carrier-to-noise ratio**

the difference in decibels between the vision or sound carrier level at a given point in the system and the noise level at that point (measured within a bandwidth appropriate to the television or radio system in use)

3.1.22**well-matched**

the matching condition when the return loss of the equipment complies with the requirements of Table 1 of EN 50083-3

NOTE Through mismatching of measurement instruments and the measurement object measurement errors are possible. Comments to the estimation of such errors are given in Annex E.

3.1.23**subscriber equipment**

equipment at the subscriber premises such as receivers, tuners, decoders, video recorders

3.1.24**out of band emissions**

emissions on a frequency or on frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious emissions









3.1.25**spurious emissions**







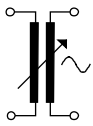


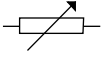
emissions on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products but exclude out of band emissions

3.1.26**unwanted emissions**

consist of spurious emissions and out of band emissions

3.2 Symbols

Symbols	Terms	Symbols	Terms
	voltmeter		amperemeter
	variable Generator		variable attenuator
	Device under Test		oscilloscope
	high pass filter		low pass filter

Symbols	Terms	Symbols	Terms
	frequency converter		amplifier
	splitter		pilotgenerator
	modulator		demodulator
	adjustable AC voltage source		detector with LF-amplifier
	ground		variable resistor

3.3 Abbreviation

AC	alternating current
AF	audio frequency
AGC	automatic gain control
ALC	automatic level control
AM	amplitude modulation
BSS	broadcast satellite services
CATV	community antenna television (system)
CH	channel
C/N	carrier to noise (ratio)
CW	continuous wave
DAB	digital audio broadcasting
DG _{PP}	peak-to-peak differential gain
DPH _{PP}	peak-to-peak differential phase
DSR	digital satellite radio
DUT	device under test
EMC	electromagnetic compatibility
FM	frequency modulation
FSS	fixed satellite services
HP	high pass
IF	intermediate frequency
IP	international protection
ITS	interval test signal
LF	low frequency

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LNC	low noise converter
LP	low pass
LUM NL	luminance non-linearity
MATV	master antenna television (system)
MPEG	motion picture experts group
MTBF	meantime between failure
NICAM	near-instantaneously companded audio multiplex
NF	noise figure
PAL	phase alternating line
QAM	quadrature amplitude modulation
Q grade(s)	quality grade(s)
QPSK	quadrature phase shift keying
RF	radio frequency
RMS	root mean square
SAT IF	(1st) satellite intermediate frequency
SECAM	Séquentiel couleur a mémoire
SMATV	satellite master antenna television (system)
S/N	signal to noise (ratio)
TV	television
TVRO	television receive only (system, ...)
UHF	ultra high frequency
VHF	very high frequency
VSB-IF	vestigial sideband intermediate frequency

NOTE Only the abbreviations used in the English version of this part of EN 50083 are mentioned in this subclause. The German and the French versions of this part may use other abbreviations. Refer to 3.3 of each language version for details.

4 Methods of measurement

4.1 Single-channel intermodulation

Specifications for channel amplifier / frequency converter

Frequencies and levels of test carriers as shown in Figure 3 simulate a colour television transmission where f_a , f_b and f_c respectively correspond to vision carrier, colour subcarrier and sound carrier. The most significant intermodulation products are:

$$P3_f = f_a + f_b - f_c$$

$$P3_g = f_a + f_c - f_b$$

The carrier levels for different television systems are given in Table 1.