IEC TR 60728-3-2

Edition 1.0 2016-10

TECHNICAL REPORT

colour inside

Cable networks for television signals, sound signals and interactive services – Part 3-2: Method of measurement of 5th order non-linearity for active electronic equipment using five carriers

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 3-2: Method of measurement of 5th order non-linearity for active electronic equipment using five carriers

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IEC TR 60728-3-2, which is a technical report, 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.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
100/2708/DTR	100/2761/RVC

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

The list of all 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 document has been drafted in accordance with the ISO/IEC Directives, Part 2.

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

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- withdrawn,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

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

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

Standards and 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.

This includes, for instance:

- 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 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 on 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.

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

Part 3-2: Method of measurement of 5th order non-linearity for active electronic equipment using five carriers

1 Scope

This part of IEC 60728 is applicable to the measurement of 5th order non-linearity for active electronic equipment which carries only digitally modulated television signals, sound signals and signals for interactive services. This method of measurement is specifically applicable to MATV installations but could be applied to broadband and channel selective amplifiers used in all kinds of cable networks.

NOTE 1 The methods of measurement of non-linearity (intermodulation products) applicable to active equipment, when loaded with analogue signals, considered that third order intermodulation products were the most important ones. The new era of television digital signals, transmitted according to DVB-S/S2, DVB-C/C2 and DVB-T/T2 modulation formats, has shown that the non-linear distortions (intermodulation products) in active equipment, when loaded with digital signals, are significant up to the 5th order.

NOTE 2 With this method of measurement it is possible to obtain information on non-linear distortions (intermodulation products) up to the 5th order in active wideband equipment, using only 5 carriers, placed in an appropriate and suitable way in the equipment bandwidth. Moreover, with this method of measurement it is possible to obtain information on non-linear distortions (up to the 5th order) in narrowband equipment (channel amplifiers and channel frequency converters) carrying DVB-C/C2 and/or DVB-T/T2 signals.

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

3 Terms, definitions, symbols and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60728-3 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1.1
extended satellite television distribution network or system
distribution network or system designed to provide sound and television signals received by a satellite receiving antenna to households in one or more buildings

Note 1 to entry: This kind of network or system could be combined with terrestrial antennas for the additional reception of TV and/or radio signals via terrestrial networks.

Note 2 to entry: This kind of network or system could also carry control signals for satellite switched systems or other signals for special transmission systems (e.g. MoCA or WiFi) in the return path direction.

[SOURCE: IEC 60728-1:2014, 3.1.35]

3.1.2
extended terrestrial television distribution network or system
distribution network or system designed to provide sound and television signals received by a terrestrial receiving antenna to households in one or more buildings

Note 1 to entry: This kind of network or system could be combined with a satellite antenna for the additional reception of TV and/or radio signals via satellite networks.

Note 2 to entry: This kind of network or system could also carry other signals for special transmission systems (e.g. MoCA or WiFi) in the return path direction.

[SOURCE: IEC 60728-1:2014, 3.1.36]

3.1.3
individual satellite television receiving system
system designed to provide sound and television signals received from one or more satellites to an individual household

Note 1 to entry: This kind of system could also carry control signals for satellite switched systems or other signals for special transmission systems (e.g. MoCA or WiFi) in the return path direction.

[SOURCE: IEC 60728-1:2014, 3.1.51]

3.1.4
individual terrestrial television receiving system
system designed to provide sound and television signals received via terrestrial broadcast networks to an individual household

Note 1 to entry: This kind of system could also carry other signals for special transmission systems (e.g. MoCA or WiFi) in the return path direction.

[SOURCE: IEC 60728-1:2014, 3.1.52]

3.1.5
local broadband cable network
network designed to provide sound and television signals as well as signals for interactive services to a local area (e.g. one town or one village)

[SOURCE: IEC 60728-1:2014, 3.1.56]

3.1.6
MATV network
extended terrestrial television distribution networks or systems designed to provide sound and television signals received by terrestrial receiving antennas to households in one or more buildings

Note 1 to entry: Originally defined as Master Antenna Television network.

Note 2 to entry: This kind of network or system could be combined with a satellite antenna for the additional reception of TV and/or radio signals via satellite networks.

Note 3 to entry: This kind of network or system could also carry other signals for special transmission systems (e.g. MoCA or WiFi) in the return path direction.

[SOURCE: IEC 60728-1:2014, 3.1.60]

3.1.7
regional broadband cable network
network designed to provide sound and television signals as well as signals for interactive services to a regional area covering several towns and/or villages

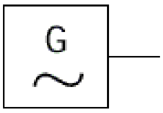
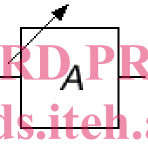
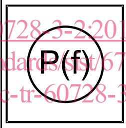
[SOURCE: IEC 60728-1:2014, 3.1.75]

3.1.8
maximum operating output level
output level of the EUT when measured with an input signal containing five carriers equally spaced, at distance D, that produces a given C/I_5 intermodulation ratio at frequencies −2D, −D lower than the lowest carrier and at frequencies +D, +2D higher than the highest carrier of the applied signal

SEE: Figure 2.

3.2 Symbols

The following graphical symbols are used in the figures of this document. These symbols are either listed in IEC 60617 or based on symbols defined in IEC 60617.

Symbols	Terms	Symbols	Terms
	sine-wave generator [IEC 60617-S01226 (2001-07)]		variable attenuator [IEC 60617-S01245 (2001-07)]
Σ	combiner based on [IEC 60617-S00059 (2001-07)]		spectrum analyzer (electrical) based on [IEC 60617-S00910 (2001-07)]
EUT	equipment under test based on [IEC 60617-S00059 (2001-07)]		

3.3 Abbreviated terms

DVB Digital Video Broadcasting
EUT Equipment Under Test
MATV Master Antenna TeleVision (system)
MoCA Multimedia over Coax Alliance
QAM Quadrature Amplitude Modulation
RF Radio Frequency
UHF Ultra-High Frequency
VHF Very-High Frequency
U_{M5C} maximum operating output level with five carriers applied
U_{MNC} maximum operating output level with N carriers applied
WiFi synonym of WLAN