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**IEC
62028**

First edition
2002-02

General methods of measurement for digital television receivers

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Reference number
IEC 62028:2002(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE

X

For price, see current catalogue

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**GENERAL METHODS OF MEASUREMENT
FOR DIGITAL TELEVISION RECEIVERS**

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 62028 has been prepared by IEC technical committee 100: Audio, video and multimedia systems and equipment.

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

CDV	Report on voting
100/232/CDV	100/427/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.

Annexes A, B, and C form an integral part of this standard.

The committee has decided that the contents of this publication will remain unchanged until 2004. At this date, the publication will be

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- withdrawn;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

GENERAL METHODS OF MEASUREMENT FOR DIGITAL TELEVISION RECEIVERS

1 Scope

IEC 62028 deals with the standard conditions and methods of measurement on digital television receivers which receive digital television broadcast transmissions.

IEC 62028 deals with the determination of performance and allows the comparison of equipment by listing the characteristics which are useful for specifications and by laying down uniform measuring methods of these characteristics. Performance requirements are not specified, since they are specified by other international, regional or domestic standards for the systems.

It does not include the measurements specific to the transmission system, such as;

- measurements on receivers for satellite transmission systems,
- measurements on receivers for terrestrial transmission systems,
- measurements on receivers for cable transmission systems,
- measurements specific to sound channels, and
- measurements specific to data channels.

IEC 62028 does not include methods of measurement on outdoor units and antennas for satellite reception, for which reference is required to other appropriate IEC standards.

IEC 62028 does not deal with general safety matters, for which reference is required to IEC 60065, or other appropriate IEC safety standards, nor with radiation and immunity, which will be dealt with by CISPR.

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 60107-1:1997, *Methods of measurement on receivers for television broadcast transmissions – Part 1: General considerations – Measurements at radio and video frequencies*

ISO/IEC 13818-1:2000, *Information technology – Generic coding of moving pictures and associated audio: Systems*

ISO/IEC 13818-4:1998, *Information technology – Generic coding of moving pictures and associated audio information – Part 4: Conformance testing*

ISO/IEC 13818-9:1996, *Information technology – Generic coding of moving pictures and associated audio information – Part 9: Extension for real time interface for systems decoders*

ITU-R BT.500-10:2000, *Methodology for the subjective assessment of quality of television pictures*

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

EN 300 429 *Digital video broadcasting (DVB) – Framing structure, channel coding and modulation for cable systems*

EN 300 744 *Digital video broadcasting (DVB) – Framing structure, channel coding and modulation for digital terrestrial television”*

ETR 211:1997, *Digital video broadcasting (DVB) – Guidelines on implementation and usage of Service Information (SI)*

ETS 300 468:2000, *Digital video broadcasting (DVB) – Specification for Service Information (SI) in DVB systems*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this publication, the following terms and definitions apply:

3.1.1 MPEG-2

refers to the ISO/IEC 13818 series. System coding is defined in part 1, video coding is defined in part 2, audio coding is defined in part 3

3.1.2 multiplex

stream of all the digital data carrying one or more services within a single physical channel

3.1.3 service information (SI)

digital data describing the delivery system, content and scheduling/timing of broadcast data streams etc. It includes MPEG-2 program specific information (PSI) together with independently defined extensions.

3.1.4 transport stream (TS)

a data structure defined in ISO/IEC 13818-1

3.2 Abbreviations

AGC	Automatic Gain Controller
ARIB	Association of Radio Industries and Business
ASCII	American Standard Code for Information Interchange
ATM	Asynchronous Transfer Mode
ATSC	Advanced Television Systems Committee
BAT	Bouquet Association Table
BEP	Bit Error Probability
BER	Bit Error Rate
BPSK	Biphase Shift Keying
bslbf	bit string, left bit first
CA	Conditional Access
CAT	Conditional Access Table

CATV	Community Antenna TeleVision
COFDM	Coded Orthogonal Frequency Division Multiplexing
CPE	Common Phase Error
CRC	Cyclic Redundancy Check
D/A	Digital-to-Analogue converter
DBS	Direct Broadcast Satellite
DFT	Discrete Fourier Transform
DIRD	Digital Integrated Receiver Decoder
DIT	Discontinuity Information Table
DTS	Display Time-Stamp
DQPSK	Differential Quadrature Phase Shift Keying
DVB	Digital Video Broadcasting
DVB-C	DVB-Cable
DVB-S	DVB-Satellite
DVB-SI	DVB-Service Information
DVB-T	DVB-Terrestrial
EB	Error Block
ECM	Entitlement Control Message
EIT	Event Information Table
EMM	Entitlement Management Message
EN	European Standard
EPG	Electronic Programme Guide
ETR	ETSI Technical Report
ETS	European Telecommunication Standard
ETSI	European Telecommunications Standards Institute
FEC	Forward Error Correction
FFT	Fast Fourier Transform
FIFO	First-in, First-out shift register
FS	Full Scale
HDTV	High Definition TeleVision
HEX	Hexadecimal notation
HP	High Priority bit stream
ICI	Inter-Carrier Interference
IF	Intermediate Frequency
IFFT	Inverse Fast Fourier Transform
IRD	Integrated Receiver Decoder
ISDN	Integrated Services Digital Network
JTC	Joint Technical Committee
LP	Low Priority bit stream
LSB	Least Significant Bit
MER	Modulation Error Ratio
MP@ML	Main Profile at Main Level
MPEG	Moving Picture Experts Group

MSB	Most Significant Bit
MUX	Multiplex
NIT	Network Information Table
NVOD	Near Video On Demand
OCT	Octal notation
OFDM	Orthogonal Frequency Division Multiplex
PAT	Program Association Table
PCR	Program Clock Reference
PES	Packetized Elementary Stream
PID	Packet Identifier
PMT	Program Map Table
PRBS	Pseudo-Random Binary Sequence
PSK	Phase Shift Keying
PSI	Program System Information
PTS	Presentation Time-Stamp
PSTN	Public Switched Telephone Network
QAM	Quadrature Amplitude Modulation
QEF	Quasi Error Free
QPSK	Quaternary Phase Shift Keying
RF	Radio Frequency
rpchof	remainder polynomial coefficients, highest order first
RS	Reed-Solomon
RST	Running Status Table
SHF	Super High Frequency IEC 62028-2002
SDT	Service Description Table http://standards.iteh.ai/3c9e9c0d-53b3-46bd-b873-52e116dfc7b9/iec-62028-2002
SDTV	Standard Definition TeleVision
SI	Service Information
SIT	Selection Information Table
SMATV	Satellite Master Antenna TeleVision
SMD	System Management Descriptor
Smid	System Management identifier
ST	Stuffing Table
STB	Set Top Box
TC-8PSK	Trellis Code 8-level Phase Shift Keying
TDT	Time and Date Table
TEI	Transport Error Indicator
TOT	Time Offset Table
TPS	Transmission Parameter Signalling
TS	Transport Stream
TV	Television
uimsbf	unsigned integer most significant bit first
UTC	Universal Time, Co-ordinated
VSB	Vestigial Side Band

8VSB	8-level Vestigial Side Band
16VSB	16-level Vestigial Side Band
64QAM	64-level Quadrature Amplitude Modulation

4 Conceptual block diagram of digital television receivers

4.1 General

4.1.1 Types of receivers

Digital television receivers are usually designed to be capable of receiving digital television signals in a variety of ways. Examples are direct off-air reception or reception via cabled network in the VHF/UHF bands, and from satellite broadcasts in conjunction with an outdoor unit and a DBS tuner. Further digital signals can be delivered by the PSTN or ISDN. The signal will usually include information on the service supplied.

A return path can be present for interactive TV applications.

For non-broadcast signals, the receiver may be used as a monitor to display pre-recorded video or home movies.

The methods of measurement described in this standard take into account various options.

4.1.2 Peripheral connectors

Most receivers are provided with connectors for the interface with audio and video signals. Examples are the 21-pin connector described in IEC 60933-1 and IEC 60933-2 and the Y/C connector described in IEC 60933-5. An example for a digital interface is described in the IEC 61883 series and an example for an analogue interface is described in IEC 61880.

4.2 Basic common block diagram [IEC 62028:2002](#)

4.2.1 General

The basic common conceptual block diagram of digital television broadcasting system is shown in figure 1.

After audio and video signals are converted from analogue to digital, they are compressed. Data signals, which might include EPG (Electronic Program Guide), SI (Service Information), teletext program, etc., are multiplexed with compressed audio and video signals. After channel coding, the TS is modulated and transmitted via satellite, terrestrial, or cable.

In digital television receivers, the transmitted signal is demodulated and sent to the error correction block. After error correction, audio, video, and data signals are demultiplexed, and audio and video signals are decompressed respectively. Audio and video signals are sent to a conventional (analogue) TV receiver (through the peritelevision socket) or to a display and loud speakers, and the data signal is sent to a conventional (analogue) TV receiver (through the peritelevision socket) or to data equipment.

4.2.2 Satellite broadcasting system

When the digital television signal is transmitted via satellite, BPSK, QPSK and TC-8PSK modulation formats are used.

4.2.3 Terrestrial broadcasting system

COFDM, band-segmented OFDM and 8VSB modulation formats are used in the terrestrial broadcasting system.

4.2.4 CATV system

64QAM and 16VSB modulation formats are used for the CATV system.

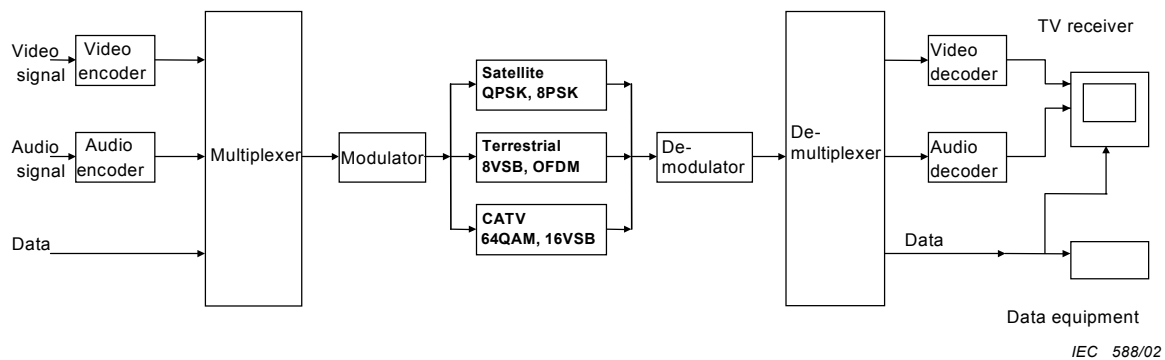


Figure 1 – Conceptual configuration of a digital broadcasting system

5 General notes on measurements

5.1 General conditions

General measuring conditions are according to 3.1 of IEC 60107-1.

5.2 Test signals

Test signals are common to all the transmission systems.

5.2.1 Video test signals

5.2.1.1 Still image video signal

The still image video signal shall be electronically generated.

- Colour bar signal;
- Ramp signal;
- Modulated ramp signal;
- Multiburst signal;
- 5-steps signal.

5.2.1.2 Moving picture video signal

Under consideration.

5.2.2 Audio test signals

1 kHz sine-wave signal is used.

Frequency variable sine-wave signal is used for measuring frequency characteristics.

5.2.3 Data test signals

Under consideration.