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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Mobile and portable DVB-T/H radio access –
Part 2: Interface conformance testing

Accès radio mobile et portable en DVB-T/H –
Partie 2: Essais de conformité de l'interface

IEC 62002-2:2008

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

MOBILE AND PORTABLE DVB-T/H RADIO ACCESS –

Part 2: Interface conformance testing

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International Standard IEC 62002-2 has been prepared by technical area 1: Terminals for audio, video and data services and content, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

This second edition cancels and replaces the first edition, published in 2005 and constitutes a technical revision.

The main changes with respect to the previous edition are listed below.

- DVB-H has been included as a part of the main specification.
- All the performance figures have been revised as new simulation results have been made available as well as new reference receivers for DVB-H have been developed.
- DVB-H now includes all the different MPE-FEC code rates.
- New portable indoor and portable outdoor channel models have been included as well as performance figures for those.
- A new 2x TU-6 mobile SFN test channel has been included.

- A new L4 linearity pattern has been added.
- Dedicated performance figures for DVB-H for S1, S2, L1 to L4 interference patterns have been included.
- A new GSM-interference measurement method has been added.

This bilingual version (2012-03) corresponds to the monolingual English version, published in 2008-05.

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

CDV	Report on voting
100/1290/CDV	100/1381/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.

The French version of this standard has not been voted upon.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 62002 series, under the general title *Mobile and portable DVB-T/H radio access*, can be found on the IEC website.

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.

MOBILE AND PORTABLE DVB-T/H RADIO ACCESS –

Part 2: Interface conformance testing

1 Scope

This part of IEC 62002 provides the conformance testing rules and guidelines for equipment built to meet the Mobile and portable DVB-T/H radio access interface specification (IEC 62002-1).

One aim is to limit the number of tests to a practical level. Nevertheless, the manufacturer is responsible of guaranteeing that the terminal fulfils all aspects of the mobile and portable DVB-T/H radio access interface specification (see IEC 62002-1).

2 Normative references

The following references 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 62002-1, *Mobile and portable DVB-T/H radio access – Part 1: Interface specification*

ETSI EN 300 744:2007, *Digital Video Broadcasting (DVB) – Framing structure, channel coding and modulation for digital terrestrial television*, V1.5.2

ITU-R BT.1701-1, *Characteristics of radiated signals of conventional analogue television systems*

3 Abbreviations

For the purposes of part of IEC 62002, the following abbreviations apply.

λ	Lambda, wavelength (λ = c/f)
A2	German analogue TV-stereo system
A_A	Coupling between antennas
AGC	Automatic Gain Control
A_{GSM}	Stop band attenuation of the GSM reject filter
B	Bandwidth
BER	Bit Error Ratio
C	Carrier power (In band carrier power including any echoes)
c	Speed of light c = 3,0 × 10^8 m/s
C_i	Power contribution from the i-th signal
C_t	Total useful carrier power
C/N	Carrier to Noise ratio
C/N_{min}	Minimum C/N
CPE	Common Phase Error
CR	Code rate
dB	Decibel

dBc	dB compared to carrier power C
dBd	Antenna gain in dB compared to reference dipole (0 dBd = –2,14 dBi)
dBi	Antenna gain in dB compared to isotropic antenna (0 dBi = 2,14 dBd)
dB(mW)	Power in dB compared to 1 mW
DUT	Device Under Test
DVB, DVB-T	Digital Video Broadcasting, Terrestrial Digital Video Broadcasting
DVB-H	Digital Video Broadcasting to hand-held terminals
DVB-RCT	DVB Terrestrial Return Channel
E	Field strength V/m
E(dBμV/m)	Field strength in dB compared to 1 μV
EDGE	Enhanced Data rates for GSM/Global Evolution
EMC	Electromagnetic Compatibility
END	Equivalent Noise Degradation
ENF	Equivalent Noise Floor
ESR	Erroneous Second Ratio
f	Frequency in Hz
f (MHz)	Frequency in MHz
fc	Centre frequency
F	Noise factor
fd, Fd	Doppler Frequency
Fd_{3dB}	Doppler Frequency with minimum C/N requirement raised by 3 dB
FER	Frame Error Rate
G	Gain
Ga	Antenna gain
GI	Guard Interval
GPRS	General Packet Radio Service
GSM	Global System for Mobile communications
I	Interfering power
ICI	Intercarrier Interference
J	joule
k	Boltzmann's constant k = 1,38 x 10^{-26} J/K
K	kelvin
L1, L2, L3, L4	Linearity patterns
L_{GSM}	Insertion loss of the GSM reject filter
LNA	Low Noise Amplifier
MER	Modulation Error Ratio
$MFER$	MPE-FEC Frame Error Rate
MHz	Megahertz
MPE-FEC	Multi Protocol Encapsulation Forward Error Correction
MPEG-2	Motion Pictures Expert Group, Video compression standard
n, m, N	Channel indexes
NF	Noise figure in dB
NICAM	Additional sound carrier for analogue TV, modulated with a Near Instantaneous Companded Audio Multiplex.
PA	Power Amplifier
PAL, PAL B, PAL G, PAL I, PAL I1	Phase Alternation Line, TV-systems using PAL

PER	Packet Error Ratio
PFP	Picture Failure Point
P_{in}	Input power W
P_{in} (dB(mW))	Input power dB compared to 1 mW
P_{max}	Maximum power
ppm	Parts per million
PSI/SI	Program Specific Information, Service Information
P_{TX}	Transmission power
P_x	Excess noise Power dBc
QAM16, QAM64	Quadrature Amplitude Modulation, 16-level and 64-level versions
QEF	Quasi Error Free
QoS	Quality of Service
QPSK	Quaternary Phase Shift Keying
RF	Radio Frequency
RS	Reed Solomon
Rx	Receiver
S1,S2	Selectivity Patterns
SECAM, SECAM L	Sequential á mémoire, TV-system using SECAM
SFN	Single Frequency Network
SFP	Subjective Failure Point
T	Temperature in kelvin
Tc	Corner point
Te	Total duration of the gating pulses
ti	Time of arrival for the i-th signal
TS	Transport Stream
Tg	Guard Interval duration
Tu	Active symbol duration
Tx	Transmitter
UHF	Ultra High Frequency
UMTS	Universal Mobile Telecommunications System
VHF	Very High Frequency
W	watt
WCDMA	Wide-band Code Division Multiple Access
Wi	Weighting coefficient for the i-th component

4 Test conditions

4.1 General test conditions

4.1.1 General

The general test conditions are set out below. Manufacturers should note that the actual conditions of use could be more stringent.

4.1.2 Temperature

The terminal shall be tested in the normal laboratory conditions defined below:

+15 °C to + 35 °C For normal conditions (with relative humidity of 25 % to 75 %)

4.1.3 Voltage

All tests are performed under nominal operating voltage as defined by the manufacturer.

4.2 Terminal categories and summarized measurement conditions

Table 1 shows which conformance measurements are performed with different terminal categories and provides a summary of the measurement conditions.

Table 1 – Valid conformance measurements for different terminal categories

Clause	Conditions	Terminal category a car terminals	Terminal category b1 portable TVs	Terminal category b2 pocketable TVs	Terminal Category c hand-held convergence terminals
5 *C/N* performance		Ch 45			
	Gaussian	All modulations, 2k/4k/8k			
	Portable	All modulations, 2k/4k/8k			
	PI / PO	16-QAM 2/3, 3/4, 64-QAM 2/3, *GI* 1/4, 8k			QPSK 1/2, 2/3, 16-QAM 1/2, 2/3, MPE-FEC 3/4, *GI* 1/4, 8k
	Mobile	QPSK 1/2, 2/3, 16-QAM 1/2, 2/3, 64-QAM 2/3 *GI* 1/4, 8k	-	-	QPSK 1/2, 2/3 16-QAM 1/2, 2/3, MPE-FEC 3/4, *GI* 1/4, 8k
6 Receiver minimum and maximum input signal levels	Minimum and maximum input levels	Ch 21, 45, 64 (UHF), Ch 8, 12 (VHF)			
		QPSK 1/2			
7 Immunity to analogue and/or digital signals in other channels	S1	*N* ± 1: Ch 45 (UHF), Ch 8 (VHF) with 64-QAM 2/3 additionally Ch 21, 64 (UHF), Ch 5, 12 (VHF). *N* ± 2: Ch 45 (UHF), Ch 8 (VHF)			
		16-QAM 3/4 , 16-QAM 2/3, 16-QAM 1/2 , 64-QAM 3/4 , 64-QAM 2/3 *GI* 1/8			
	S2	Ch 45 (UHF), Ch 8 (VHF)			
		QPSK 1/2, 2/3, 16-QAM 1/2, 2/3, 3/4, 64-QAM 2/3, 3/4, *GI* 1/8			
	L1-L3	Ch 21,45,64 (UHF) Ch 8 (VHF)			
		16-QAM 1/2, 2/3, 3/4, 64-QAM 2/3, *GI* 1/8, 8k	16-QAM 1/2, 2/3, 3/4, 64-QAM 2/3, *GI* 1/8, 8k	16-QAM 1/2, 2/3, 3/4, 64-QAM 2/3, *GI* 1/8, 8k	QPSK 1/2, 2/3, 16-QAM 1/2, 2/3, *GI* 1/8, 8k
	L4	Ch 43			
		QPSK 1/2, 2/3, 16-QAM 1/2, 2/3, *GI* 1/8, 8k	QPSK 1/2, 2/3, 16-QAM 1/2, 2/3, *GI* 1/8, 8k	QPSK 1/2, 2/3, 16-QAM 1/2, 2/3, *GI* 1/8, 8k	QPSK 1/2, 2/3, 16-QAM 1/2, 2/3, *GI* 1/8, 8k
8 Immunity to co-channel interference from analogue TV signals		Ch 45 (UHF)			
		16-QAM 1/2, 2/3, 3/4, 64-QAM 2/3, 3/4, *GI* 1/8			QPSK 1/2, 2/3, 16-QAM 1/2, 2/3, MPE-FEC 3/4, *GI* 1/4, 8k
9 Guard interval utilization: echoes within guard interval		Ch 45 (UHF)			
		8k, 64-QAM 2/3, *GI* 1/8 8k, 16-QAM 1/2, *GI* 1/8			

Clause	Conditions	Terminal category a car terminals	Terminal category b1 portable TVs	Terminal category b2 pocketable TVs	Terminal Category c hand-held convergence terminals
10 Guard interval utilization: echoes outside the guard interval		Ch 45 (UHF)			
		8k, 64-QAM 2/3, *GI* 1/8 8k, 16-QAM 1/2, *GI* 1/8 8k, 16-QAM 2/3, *GI* 1/8			
11 Tolerance to impulse interference		Ch 45 (UHF)			
		8k, 64-QAM 2/3, *GI* 1/8, 8k 8k, 16-QAM 1/2, *GI* 1/8, 8k 8k, 16-QAM 2/3, *GI* 1/8, 8k			
12 GSM900 TX signal blocking test					8k, *GI* 1/4, QPSK 1/2CR MPE-FEC 3/4, C55
13 Mobile SFN channel test					8k, *GI* 1/4, 16-QAM 1/2 MPE-FEC 3/4, C45

4.3 Required equipment

The following list gives an overview of the measurement equipment required for the entire set of conformance testing. Capabilities and features of the actual equipment may vary and there could be alternative ways of performing the measurements. Therefore no detailed instructions for various measurements are given and the list of the required equipment is an example.

- 3 DVB-T/H signal sources;
- Wideband noise source;
- 2 PAL/SECAM analogue TV-signal sources;
- Spectrum analyser;
- Channel simulator;
- RF-power meter;
- Impulse noise source;
- MPEG-2 source;
- MPEG-2 decoder;
- DVB-H IP encapsulator;
- MPEG-2 TS player;
- Step attenuators, power dividers, cables and other standard RF-measurement accessories.

4.4 Reference model and test point

The receiver performance is defined according to the reference model shown in Figure 1.

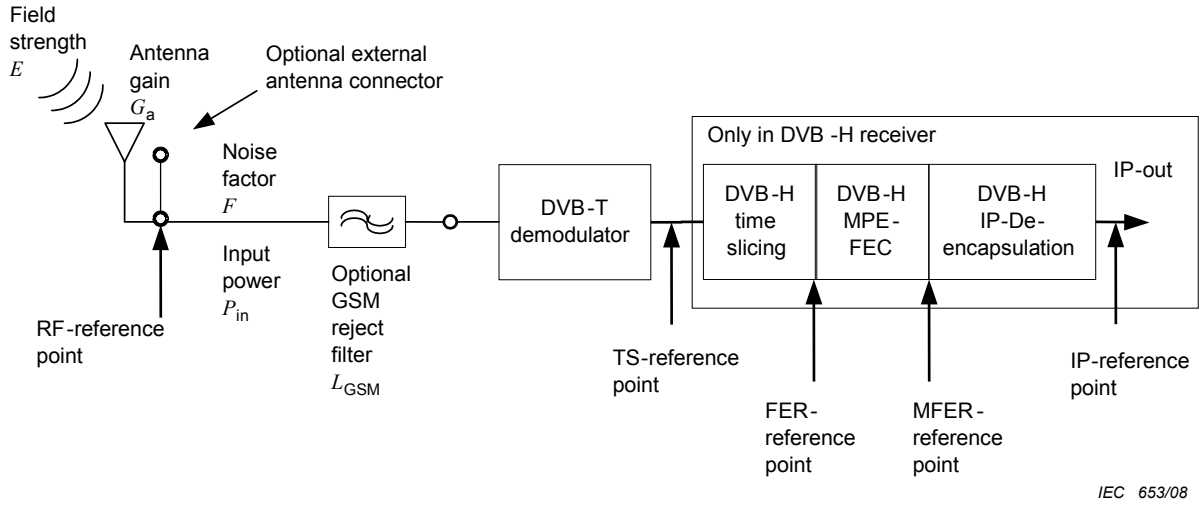

Figure 1 – Reference model

The receiver performance figures are all specified at the reference point, which is the input of the receiver. All conformance testing is performed at the same point.

In the case where the GSM rejection filter is included (terminal category c), the measurements will be carried out in the front of the GSM rejection filter.

In the case of a DVB-H receiver, the manufacturer shall provide the specified test mode in which the following parameters can be monitored:

- TS-*BER* after Viterbi decoder,
- TS-*PER*,
- MPE *FER (FER)* (Frame Error Rate before MPE-FEC),
- MPE-FEC *FER (MFER)* (Frame Error rate after MPE-FEC).

4.5 Degradation criteria and resynchronization

Four different degradation criteria are used. The criteria a and b are used in the non-mobile cases for DVB-T. Criterion c is for mobile reception in DVB-T and criterion d for DVB-H reception. A receiver must be able to acquire a degraded signal and a resynchronization test must be done to ensure the C/N or C/I value is valid. Once the degradation criterion is achieved, all receiver input signals are removed for a period of 5 seconds and then re-applied. The same degradation criterion must be achieved within a further 5 seconds. If that is not the case, then the only degradation criterion that can be used for receiver measurement has to be based upon successful signal acquisition.

a) Reference *BER*, defined as *BER* = 2×10^{-4} after Viterbi decoding.

   This corresponds to the quasi error free (QEF) criterion in the DVB-T standard, which states: ”less than one uncorrected error event per hour”. In the stationary reception cases, QEF is equivalent to the reference BER after Viterbi decoding.

b) Picture failure point (PFP).

   The picture failure point is defined as the *C/N* or *C/I* value when picture errors become visible. This is preferred if BER measurements are unstable or unavailable. A more objective definition can be made using the ESR_5 (5 % erroneous second ratio) criterion, which allows one erroneous second within the 20 s observation period in the transport stream. Note that the reception quality is poor at picture failure point as one possible error