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Mobile and portable DVB-T/H radio access – Part 1: Interface specification

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

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International Standard IEC 62002-1 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 bee 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.

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

CDV	Report on voting
100/1289/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.

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- withdrawn;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.

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

The contents of the corrigendum of July 2008 have been included in this copy.

MOBILE AND PORTABLE DVB-T/H RADIO ACCESS –

Part 1: Interface specification

1 Scope

This part of IEC 62002 is a radio access specification for mobile, portable and hand-held portable devices capable of receiving DVB-T/H services. It includes informative system aspects as well as specifications for minimum RF-performance. It covers terminals in three main classes, namely integrated car terminals, portable digital TV sets and hand-held portable convergence terminals. Interoperability with integrated cellular radios is also considered. The specification covers the following areas.

- Frequency ranges
- Supported modes
- Definition of receiving conditions
- Definition of the receiver RF-reference model
- Definition of degradation criteria
- Antenna characteristics
- Channel models
- *C/N*-performance with different channels
- Minimum and maximum input levels
- Immunity to interfering signals
- Definition of an ensemble of interference patterns
- Tolerance to impulse interference
- SFN-performance
- Transmitter minimum performance
- Interoperability of cellular radios
- EMC aspects

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.

CISPR 13, *Sound and television broadcast receivers and associated equipment – Radio disturbance characteristics – Limits and methods of measurement*

CISPR 20, *Sound and television broadcast receivers and associated equipment – Immunity characteristics – Limits and methods of measurement*

IEC 60169-2, *Radio-frequency connectors – Part 2: Coaxial unmatched connector*

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

ETSI ETS 300 342-1, *Radio Equipment and Systems (RES); ElectroMagnetic Compatibility (EMC) for European digital cellular telecommunications system (GSM 900 MHz and DCS 1 800 MHz); Part 1: Mobile and portable radio and ancillary equipment*

ETSI EN 300 607-1, *Digital cellular telecommunications system (Phase 2+) (GSM) – Mobile Station (MS) conformance specification – Part 1: Conformance specification*

ETSI EN 302 304:2004, *Digital Video Broadcasting (DVB); Transmission System for Handheld Terminals (DVB-H), V1.1.1*

ETSI TR 101 190 V1.2.2, *Digital Video Broadcasting (DVB); Implementation guidelines for DVB terrestrial services; Transmission aspects*

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

3 Abbreviations

For the purposes of this document, 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 = 3,0x10^8 m/s
Ci	Power contribution from the i-th signal
Ct	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
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
Im	Implementation margin
ICI	Intercarrier interference
J	joule
k	Boltzmann's constant $k = 1{,}38 \times 10^{-26}$ 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
P_{in}	Input power W
P_{in} (dB(mW))	Input power dB compared to 1 mW
P_{max}	Maximum power

P_{min}	Minimum 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
R_{DQEF}	Minimum level of performance
RF	Radio frequency
RS	Reed Solomon
Rx	Receiver
S1,S2	Selectivity patterns
SECAM, SECAM L	Sequential à 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
TPS	Transmission Parameter Signalling
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 Terminal categories

In this standard three different terminal categories are considered. The requirements are covering all categories unless otherwise stated.

The terminal categories are:

a) Integrated car terminals

This category covers DVB-T/H terminals installed in a car and where the antenna is integral with the car.

b) Portable digital TV sets

This category covers terminals, which are intended for receiving normal DVB-T MPEG-2 based digital TV services indoors and outdoors with terminal attached antennas. This category is divided into two subcategories.

1) The receiver screen size is typically greater than 25 cm and the receiver may be battery or mains powered. Typically, the terminal is stationary during the reception. An example of the antenna construction may be an adjustable telescope or wide-band design, either active or passive, attached to the receiver.

2) Pocketable digital TV-receiver. The terminal is battery operated and can be moved during use. Usually the antenna is integral with the terminal.

c) Hand-held portable convergence terminals

This category covers small battery powered hand-held convergence terminals with built in cellular radio like GSM, GPRS or UMTS. The terminals have the functionality of a mobile phone and can receive IP-based services using DVB-H over DVB-T physical layer. The DVB-T antenna and the cellular antenna are both integral with the terminal.

5 Definition of receiving conditions

5.1 Portable reception

This is when a portable receiver (terminal category b1) with an attached or integral antenna is used indoors or outdoors at a minimum height of 1,5 m above floor or ground level. It is assumed that the receiving antenna is omni-directional. It is also assumed that the antenna and any nearby large objects are stationary. Extreme cases, such as reception in completely shielded rooms, are disregarded. [1][1)]

As a special case of portable reception a small hand-held portable receiver (terminal category b2 or c) is used indoors or outdoors at a minimum height of 1,0 m above floor or ground level. It is assumed that the receiving antenna is omni-directional. It is also assumed that the channel conditions can change due to slow movements (≤3 km/h) of the antenna and any nearby large objects. Extreme cases, such as reception in completely shielded rooms, are disregarded.

The main difference between portable and hand-held portable reception is the antenna gain of the terminal.

5.2 Mobile reception

This applies to the use of integrated car terminals (terminal category a) with speeds higher than 3 km/h. It is assumed that the receiving antenna is omni directional with a minimum height above ground level of 1,5 m. Other vehicles such as buses or high-speed trains could be considered as special cases.

A small hand-held portable receiver (terminal category b2 or c) used within a car or train could also be considered as a case of mobile reception. [2]

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1) Figures in square brackets refer to the Bibliography.

6 Frequencies and channel bandwidths

6.1 Channel frequencies

The channel frequencies of bands III, IV and V are given below 6 MHz, 7 MHz and 8 MHz channel rasters are used in various countries. The centre frequencies *fc* of the incoming DVB-T RF-signals are the following.

VHF III

For countries using 8 MHz channel raster

fc = 178 MHz +(N-6) × 8 MHz +$f\ offset$

N = {6, …,12} (VHF channel number)

For countries using 7 MHz channel raster

fc = 177,5 MHz +(N-5) × 7 MHz +$f\ offset$

N = {5, …,12} (VHF channel number)

For countries using 6 MHz channel raster

fc = 177,0 MHz + (N-7) × 6 MHz +$f\ offset$

N = {7, …,13} (VHF channel number)

In some countries offsets may be used:

Preferred offset is ± n × 1/6 MHz. n = { 1, 2,…}

UHF IV and V

For countries using 8 MHz channel raster

fc = 474 MHz + (N-21) × 8 MHz +$f\ offset$

n = {21, …,69} (UHF channel number)

For countries using 7 MHz channel raster

fc = 529,5 MHz +(N-28) × 7 MHz +$f\ offset$

n = {28, …,67} (UHF channel number)

For countries using 6 MHz channel raster

fc = 473,0 MHz +(N-14) × 6 MHz +$f\ offset$

n = {14, …,83} (UHF channel number)

In some countries offsets may be used:

Preferred offset is ± n × 1/6 MHz. n = { 1, 2,…}
In the UK n = 1.

The error in the centre frequency (*fc*) of the transmitted RF-signal should not exceed 500 Hz in MFN. In SFN the error in the centre frequency (*fc*) of the transmitted RF-signal should not exceed 1 Hz.

6.2 Supported frequency ranges

The receivers in terminal categories a and b1 shall be able to receive all channels in the VHF band III and UHF bands IV and V. VHF III can be left out in market areas, where it is not used. The receivers in terminal category b2 shall be able to receive all channels in UHF bands IV and V, VHF III is an option depending on the market area needs. The receivers in terminal category c shall be able to receive all channels in UHF band IV and V, provided that the terminal does not support GSM 900.

In case GSM 900 is used in a convergence terminal (category c), the usable frequency range is limited to channel 55 [746 MHz] due to the interoperability considerations. Supported frequency ranges are shown in Table 1.