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Digital Terrestrial TV Broadcast Receivers; Harmonised Standard for access to radio spectrum

Reference

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Foreword

This Harmonised European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.11] to provide one voluntary means of conforming to the essential requirements of Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC [i.3].

Once the present document is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of the present document given in table A.1 confers, within the limits of the scope of the present document, a presumption of conformity with the corresponding essential requirements of that Directive and associated EFTA regulations.

The present document has a number of interference test data files that are contained in archive en_303340v010201p0.zip which accompanies the present document.

National transposition dates	
Date of adoption of this EN:	23 September 2020
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Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 June 2021
Date of withdrawal of any conflicting National Standard (dow):	30 June 2022

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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1 Scope

The present document specifies technical characteristics and methods of measurements for digital terrestrial television broadcast receivers fitted with an external antenna input (tuner port) capable of receiving DVB-T and/or DVB-T2 signals.

Receivers without external antenna connectors, receivers with diversity, and receivers intended for mobile or automotive reception are not covered by the present document.

NOTE: The relationship between the present document and essential requirements of article 3.2 of Directive 2014/53/EU [i.3] is given in annex A.

The present document includes considerations of interference from LTE transmissions in the 700 MHz and 800 MHz bands and DTT transmissions in UHF band IV. The requirements of the installation system (antenna, feeder cable, amplifiers, etc.) are not addressed.

Table 1: Broadcast frequency bands

Broadcast frequency bands
VHF III
UHF IV and V

There are country specific variations of frequency usage for digital terrestrial television reception and other users such as mobile broadband.

The tests in the present document only apply if the DTT broadcast receiver supports the wanted signal configuration used by the test in question. The applicable tests are summarized in annex E, table E.1.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at https://docbox.etsi.org/Reference/.

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The following referenced documents are necessary for the application of the present document.

Not applicable.

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] Nordig: "NorDig Unified Test Plan for Integrated Receiver Decoders v2.4".

[i.2] British Broadcasting Corporation and Arqiva, WHP288: "WSD Coexistence Testing at the Building Research Establishment: An Experimental Validation of Ofcom Regulatory Proposals".

[i.3] Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC.

[i.4] ETSI EN 300 744 (V1.6.1): "Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for digital terrestrial television".

[i.5] ETSI EN 302 755 (V1.3.1): "Digital Video Broadcasting (DVB); Frame structure channel coding and modulation for a second generation digital terrestrial television broadcasting system (DVB-T2)".

[i.6] Void.

[i.7] Void.

[i.8] Void.

[i.9] ECC Report 186 (2013): "Technical and operational requirements for the operation of white space devices under geo-location approach".

[i.10] Recommendation ITU-R BT.1729 (2005): "Common 16:9 or 4:3 aspect ratio digital television reference test pattern".

[i.11] Commission Implementing Decision C(2015) 5376 final of 4.8.2015 on a standardisation request to the European Committee for Electrotechnical Standardisation and to the European Telecommunications Standards Institute as regards radio equipment in support of Directive 2014/53/EU of the European Parliament and of the Council.

[i.12] Recommendation ITU-R BT.419-3 (1990): "Directivity and polarization discrimination of antennas in the reception of television broadcasting".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the following terms apply:

Adjacent Channel Leakage power Ratio (ACLR): ratio of the on-channel transmit power to the power measured in one of the adjacent channels with no active channel in the adjacent channel

NOTE: In the present document this definition also applies to an unwanted signal at a specified frequency offset in a non-adjacent channel.

Adjacent Channel Selectivity (ACS): measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted signal which differs in frequency from the wanted signal by an amount equal to the adjacent channel separation for which the equipment is intended

NOTE 1: In the present document adjacent channel selectivity is determined by the onset of picture degradation.

NOTE 2: The interference power I is equal to the licensed power of the interferer. This definition does not have the same meaning as the term "Adjacent Channel Selectivity" (ACS) used in other organizations such as ITU, CEPT, and in co-existence studies. The adjacent channel selectivity in the present document is equivalent to the measured I/C ratio.

NOTE 3: In the present document this definition also applies to an unwanted signal at a specified frequency offset in a non-adjacent channel.

blocking or desensitization: measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted signal at any frequency other than those of the spurious responses or of the adjacent channels

NOTE 1: In the present document receiver blocking is determined by the onset of picture degradation.

NOTE 2: The wanted signal level in the blocking tests of the present document is set at the specified receiver sensitivity level plus 6 dB.

broadcast receiver: digital terrestrial television broadcast receiver comprising of at least a tuner and demodulator

broadcast receiver tuner port: DTT receiver tuner RF input connector

licensed power: highest rms power of the active portions of the signal measured over a specific time period

NOTE: In the case of interference power measurements, this is the reference power used for I/C calculations in the present document. Typically for cases of LTE interference, this power is measured with a spectrum analyser in zero span with a gated power measurement function and rms detector over a period equal to an LTE symbol time. Alternatively it can be calculated by measuring the long term rms power and adding the appropriate LAPR from table 5.

long term rms power: rms power of the signal measured over a period long enough to smooth out any fluctuations in the signal power over time such as those due to transmission bursts

NOTE: This can be measured on an average power meter with an input filter time constant set high enough to average out fluctuations in the measured signal power or alternatively using a spectrum analyser with settings shown in table D.1.

onset of picture degradation: minimum time between successive errors in the displayed video is 15 seconds

radio equipment: product or relevant component thereof capable of communication by means of the emission and/or reception of radio waves utilizing the spectrum allocated to terrestrial/space radio communication

NOTE: For the purposes of the present document the radio equipment is a digital terrestrial television broadcast receiver comprising of at least a tuner and demodulator.

receiver overloading: interfering signal level expressed in dBm, above which the receiver begins to lose its ability to discriminate against interfering signals at frequencies differing from that of the wanted signal due to the onset of strong non-linear behaviour

NOTE 1: In the present document the overload level is determined by the onset of picture degradation.

NOTE 2: Above the overloading level the receiver will behave in a non-linear way, but does not necessarily fail immediately depending on the receiver and interference characteristics.

sensitivity: maximum usable sensitivity is defined as the minimum receiver Radio Frequency (RF) input signal level or field strength able to produce a specified analogue SINAD ratio or Bit Error Ratio (BER), or other specified output performance which depends on this input signal level

NOTE: In the present document receiver sensitivity is determined by the onset of picture degradation.

3.2 Symbols

For the purposes of the present document, the following symbols apply:

C	Wanted signal
G_C	Coupling Gain
I	Interferer signal
I_{lic}	Licensed power
I_{rms}	Long term rms power
P_{RX_UE}	Received UE interference power
P_{UE}	UE transmitted power

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

256-QAM	256-ary Quadrature Amplitude Modulation
64-QAM	64-ary Quadrature Amplitude Modulation
ACE	Active Constellation Extension
ACLR	Adjacent Channel Leakage power Ratio
ACS	Adjacent Channel Selectivity
AGC	Automatic Gain Control
AWGN	Additive White Gaussian Noise
BER	Bit Error Ratio
BS	Base Station for mobile communications
CEPT	European Conference of Postal and Telecommunications administrations
DTG	UK Digital TV Group
DTT	Digital Terrestrial Television
DVB-T	Digital Video Broadcast Terrestrial - first generation

NOTE: See ETSI EN 300 744 [i.4].

DVB-T2	Digital Video Broadcast Terrestrial - second generation

NOTE: See ETSI EN 302 755 [i.5].

EFTA	European Free Trade Association
FEC	Forward Error Correction
FEF	Future Extension Frame
FFT	Fast Fourier Transform
HEM	High Efficiency Mode
ISSY	Input Stream SYnchronizer
LAPR	Licensed to Average Power Ratio

NOTE: This is the ratio of the licensed power (described above) to the long term rms power (described above) of the signal.

LDPC	Low Density Parity Check (codes)
LTE	Long Term Evolution
PAPR	Peak to Average Power Ratio
PLP	Physical Layer Pipe
QAM	Quadrature Amplitude Modulation
RF	Radio Frequency
SINAD	(Signal + Noise + Distortion)/(Noise + Distortion) ratio
SISO	Single Input Single Output

NOTE: Meaning one transmitting and one receiving antenna.

TFS	Time-Frequency Slicing
UE	User Equipment for mobile communications

NOTE: Example handsets, dongles, etc.

UHF	Ultra High Frequency
VHF	Very High Frequency

4 Technical requirements specifications

4.1 Environmental profile

The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be in accordance with its intended use. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the declared operational environmental profile.

NOTE: The applicability of the different tests as defined in annex E may vary depending upon the selected country profile.

4.2 Conformance requirements

4.2.1 DVB-T and DVB-T2 configurations for testing

4.2.1.1 Modulation Parameters

Representative DVB-T and DVB-T2 configurations used for conformance specification and testing are shown in tables 2 and 3. These are used in the Nordig specification test plan [i.1].

Table 2: DVB-T configuration

Parameter	Value for "7 MHz" VHF tests	Value for "8 MHz" UHF tests
Bandwidth	6,66 MHz	7,61 MHz
FFT size	8K	8K
Modulation	64-QAM	64-QAM
Hierarchy	Non-Hierarchical	Non-Hierarchical
Guard interval	1/4	1/4
Code rate	2/3	2/3
Channel Bandwidth	7 MHz	8 MHz

Table 3: DVB-T2 configuration

Parameter	Value for "7 MHz" VHF tests	Value for "8 MHz" UHF tests
Bandwidth	6,66 MHz	7,77 MHz
FFT	32K	32K
Carrier mode	Normal	Extended
SISO/MISO	SISO	SISO
Guard Interval	1/16	1/16
Version	1.2.1	1.2.1
Number of symbols/frame (L_f)	42	62
Pilot pattern	PP4	PP4
TFS	No	No
FEF	Not used	Not used
Auxiliary streams	Not used	Not used
Subslices/T2 frame	1	1
Frames/Superframe	2	2
L1 post FEC type	16k LDPC (see note 1)	16k LDPC (see note 1)
L1 repetition	0	0
L1 post extension	No	No
L1 post modulation	64-QAM	64-QAM
L1 post scrambling	None	None
L1_ACE_MAX	0 (see note 2)	0 (see note 2)
L1 bias balancing cells	No	No
PAPR	L1-ACE & TR (see note 3)	L1-ACE & TR (see note 3)
PAPR: V_{clip}	3,1 V (see note 1)	3,1 V (see note 1)
PAPR: Number of iterations	10 (see note 1)	10 (see note 1)
TS bit rate (Mbit/s)	31,146	36,552