

Final draft **ETSI EN 302 296** V2.2.1 (2021-03)



**Digital Terrestrial TV Transmitters;
Harmonised Standard for access to radio spectrum
(standards.iteh.ai)**

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Foreword

This final draft Harmonised European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM), and is now submitted for the Vote phase of the ETSI standards EN Approval Procedure. (standards.iteh.ai)

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.3] 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.2].

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.

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	18 months after doa

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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Introduction

The present document has been produced to update the existing ETSI EN 302 296 in line with the requirements of article 3.2 of Directive 2014/53/EU [i.2].

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1 Scope

The present document specifies technical characteristics and methods of measurements for digital terrestrial television transmitters as defined in table 1.1 and in table 1.2. The power classification (table 1.1) and emission classification (table 1.2) are combined to define a transmitter category. For example, power classification H and emission classification 0 denote a high power transmitter (category H0) whose OOB emissions comply with a non-critical mask.

Table 1.1: Transmitter power classification

Power Class	Description	Notes
H	High power transmitter	Transmitter with an output power ≥ 25 W operating in the VHF band (174 MHz to 230 MHz) or UHF band (470 MHz to 694 MHz).
L	Low power transmitter	Transmitter with an output power < 25 W operating in the VHF band (174 MHz to 230 MHz) or UHF band (470 MHz to 694 MHz).

Table 1.2: Transmitter emission classification

Emission Classification	Conformance approach	Notes
0	Non-critical mask	For high power transmitters, the mask defines the level of the OOB emissions relative to the channel power (dBc). For low power transmitters the mask defines the absolute power limit of the OOB emissions (dBm). The former approach is mandated by RRC-06 (non-critical case) [i.4] for transmitters subject to coordination.
1	Critical mask	A similar but more stringent approach based on ITU RRC-06 (sensitive case) [i.4].
2	Non-critical ACLR	A set of ACLR limits defining permitted relative emission levels into adjacent channels.
3	Critical ACLR	A set of more stringent ACLR limits defining permitted relative emission levels into adjacent channels.

NOTE: The relationship between the present document and essential requirements of article 3.2 of Directive 2014/53/EU [i.2] is given in annex A.

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

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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] ETSI TR 101 290 (V1.2.1) (05-2001): "Digital Video Broadcasting (DVB); Measurement guidelines for DVB systems".
- [i.2] 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.3] 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.4] ITU RRC-06: "Final Acts of the Regional Radiocommunication Conference for planning of the digital terrestrial broadcasting service in parts of Regions 1 and 3, in the frequency bands 174-230 MHz and 470-862 MHz", Geneva, 15 May - 16 June 2006.
- [i.5] ETSI EN 300 744 (V1.6.2) (10-2015): "Digital Video Broadcasting (DVB); Framing structure, channel coding and modulation for digital terrestrial television".
- [i.6] ETSI EN 302 755 (V1.4.1) (07-2015): "Digital Video Broadcasting (DVB); Frame structure channel coding and modulation for a second generation digital terrestrial television broadcasting system (DVB-T2)".
<https://standards.iteh.ai/catalog/standards/sist/5c5c5d75-6c12-4bce-8c5a-e958e22e3b35/etsi-en-302-296-v2-2-1-2021-03>
- [i.7] ETSI TR 100 028 (all parts) (V1.4.1) (12-2001): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".
- [i.8] ETSI TR 100 028-2 (V1.4.1) (12-2001): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2".
- [i.9] EN 55016-4-2:2011/A1:2014: "Specification for radio disturbance and immunity measuring apparatus and methods. Part 4-2: Uncertainties, statistics and limit modelling - Measurement instrumentation uncertainty", produced by CENELEC.
- [i.10] Recommendation ITU-R SM.329-12 (09/2012): "Unwanted emissions in the spurious domain".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in Directive 2014/53/EU [i.2] and the following apply:

adjacent channel leakage ratio: ratio of the wanted mean power of the DVB-T/T2 signal to the unwanted mean power measured in the receiver bandwidth of a given adjacent victim service

antenna port: port of an apparatus intended to be connected to an antenna using coaxial cable or coaxial line; typically the output of the channel filter or combiner

carrier power: mean power supplied to the antenna port by a transmitter with COFDM

channel bandwidth: bandwidth supporting a single DVB-T or DVB-T2 signal

NOTE: There are two possible channel bandwidths: 7 MHz or 8 MHz.

composite approach: measurement method whereby the power amplifier emissions are measured separately to the frequency response of subsequent frequency selective components and the overall emissions of the transmitter are calculated by combining the two sets of measurements

co-sited: DVB-T/T2 transmitters which are located at the same physical site so minimizing the effects of adjacent channel interference

critical mask: mask used for the sensitive case in ITU RRC-06 [i.4]

dBc: decibels relative to the *mean power P* of the emission

digital signal: discretely timed signal in which information is represented by a finite number of well-defined discrete values that its characteristic quantities may take in time

digital television: television in which all information is represented by a digital signal

environmental profile: range of environmental conditions under which equipment is expected to operate within the scope of the present document

harmonic: component of order greater than 1 of the Fourier series of a periodic quantity

high power transmitter: transmitter whose output power is greater than or equal to 25 W

NOTE: This category of transmitter also includes medium power category of transmitters as defined in ITU-R.

intermodulation products: unwanted frequencies resulting from intermodulation between carriers or harmonics of emission, or between any oscillations generated to produce the carrier

low power transmitter: transmitter whose output power is less than 25 W

mean power: average power supplied to the antenna port by a transmitter during an interval of time sufficiently long compared with the lowest frequency encountered in the modulation taken under normal operating conditions

moding: operation of a coaxial component in unwanted waveguide modes (e.g. Transverse Electric (TE) or Transverse Magnetic (TM)) resulting in anomalous behaviour from that associated with the intended Transverse Electromagnetic (TEM) mode

necessary bandwidth: for a given class of emission, the width of the frequency band which is sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions

non-critical mask: mask used for the non-critical case in ITU RRC-06 [i.4]

OOB emissions: unwanted emissions which fall at frequencies separated from the centre frequency of the wanted emission by less than or equal to 250 % of the channel bandwidth

output power: conducted power delivered by a transmitter under specified conditions of operation

receiver bandwidth: bandwidth used for victim service ACLR measurements, i.e. 7,6 MHz for 8 MHz DVB-T, 6,7 MHz for 7 MHz DVB-T, 7,8 MHz for 8 MHz DVB-T2, 6,8 MHz for 7 MHz DVB-T2 and 9 MHz for LTE

reference bandwidth: bandwidth in which the emission level is specified

spurious domain emissions: unwanted emissions at frequencies separated by more than 250 % of the channel bandwidth from the centre of the occupied spectrum

3.2 Symbols

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

m	milli
μ	micro
n	nano
"	inch

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI EN 300 744 [i.5], ETSI EN 302 755 [i.6] and the following apply:

ACLR	Adjacent Channel Leakage Ratio
COFDM	Coded Orthogonal Frequency Division Multiplexing
CSV	Comma Separated Values
dB	Logarithmic ratio (tenths of a "Bel")
dBm	dB relative to one milliwatt
DIN	Deutsches Institut für Normung
DTT	Digital Terrestrial Television
DVB	Digital Video Broadcasting
DVB-T	Digital Video Broadcasting - Terrestrial
DVB-T2	Digital Video Broadcasting - Second Generation Terrestrial
EFTA	European Free Trade Association
END	Equivalent Noise Degradation
EUT	Equipment Under Test
FFT	Fast Fourier Transform
GHz	GigaHertz
ITU	International Telecommunication Union
ITU-R	International Telecommunication Union - Radiocommunication
kHz	kiloHertz
LTE	Long Term Evolution
MER	Modulation Error Ratio
MHz	MegaHertz
OOB	Out-Of-Band
PA	Power Amplifier
QAM	Quadrature Amplitude Modulation
RBW	Reference Bandwidth
RF	Radio Frequency
RMS	Root Mean Square
RRC	Regional Radiocommunication Conference
TV	TeleVision
UHF	Ultra High Frequency
VBW	Video Bandwidth
VHF	Very High Frequency
W	Watt

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 operational environmental profile defined by its intended use.

4.2 Conformance requirements

4.2.1 Introduction

The essential parameters and corresponding technical requirements aiming to meet the requirements of article 3.2 of Directive 2014/53/EU [i.2] are shown in table 4.1. To fulfil this essential parameter the compliance with all the corresponding technical requirements in table 4.1 shall be verified.

Table 4.1: Cross references

Essential parameter	Corresponding technical requirements
Conducted emissions at the antenna port	4.2.2 Spurious emissions
	4.2.3 Out-of-band emissions

Both spurious emission limits and OOB limits are defined in terms of output power at the antenna port.

The boundary between spurious domain emissions and out-of-band emissions is shown in figure 4.1.

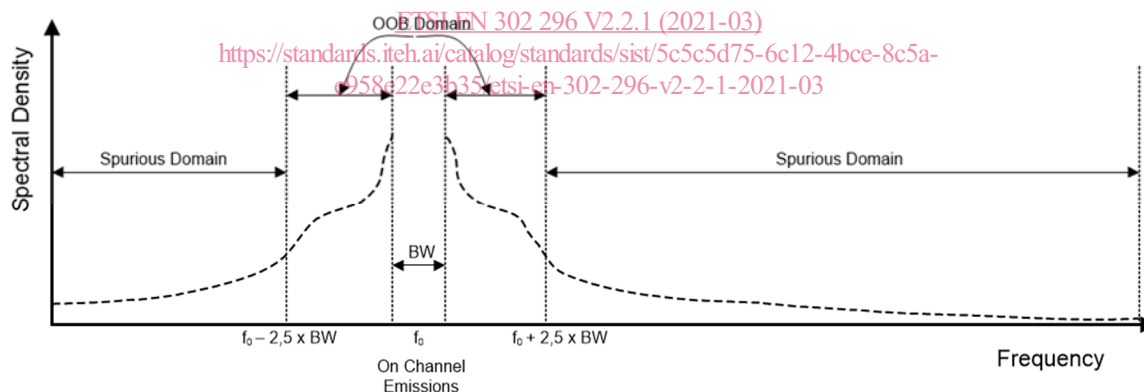


Figure 4.1: Definition of out-of-band and Spurious Domains

4.2.2 Spurious emissions

4.2.2.1 Definition

Spurious emissions are unwanted emissions at frequencies separated by more than 250 % of the channel bandwidth from the centre of the occupied spectrum. These include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products but exclude out-of-band emissions.

For the purposes of the present document spurious emissions are emissions at frequencies outside the frequency range $f_0 \pm 17,5$ MHz for 7 MHz channels, $f_0 \pm 20$ MHz for 8 MHz channels, where f_0 is the centre frequency of the channel, irrespective of the number of carriers employed.

4.2.2.2 Limits

Spurious emissions shall not exceed the values set out in table 4.2 additionally shown in figure 4.2, for the frequency range 9 kHz to 3 GHz.

Table 4.2: Spurious emission limits for DVB-T/T2 transmitters

Frequency range of the spurious emission	Limits of the spurious emission		Reference bandwidth
9 kHz to 470 MHz	≤ -36 dBm (250 nW) ≥ 105 dBc	for $P \leq 69$ dBm for 69 dBm $< P$	100 kHz
> 470 MHz to 694 MHz	≤ -36 dBm ≥ 75 dBc ≤ -25 dBm (3 μ W)	for $P \leq 39$ dBm for 39 dBm $< P \leq 50$ dBm for 50 dBm $< P$	100 kHz
> 694 MHz	≤ -36 dBm (250 nW) ≥ 105 dBc	for $P \leq 69$ dBm for 69 dBm $< P$	100 kHz

NOTE: P = mean power of the transmitter measured at the antenna port.

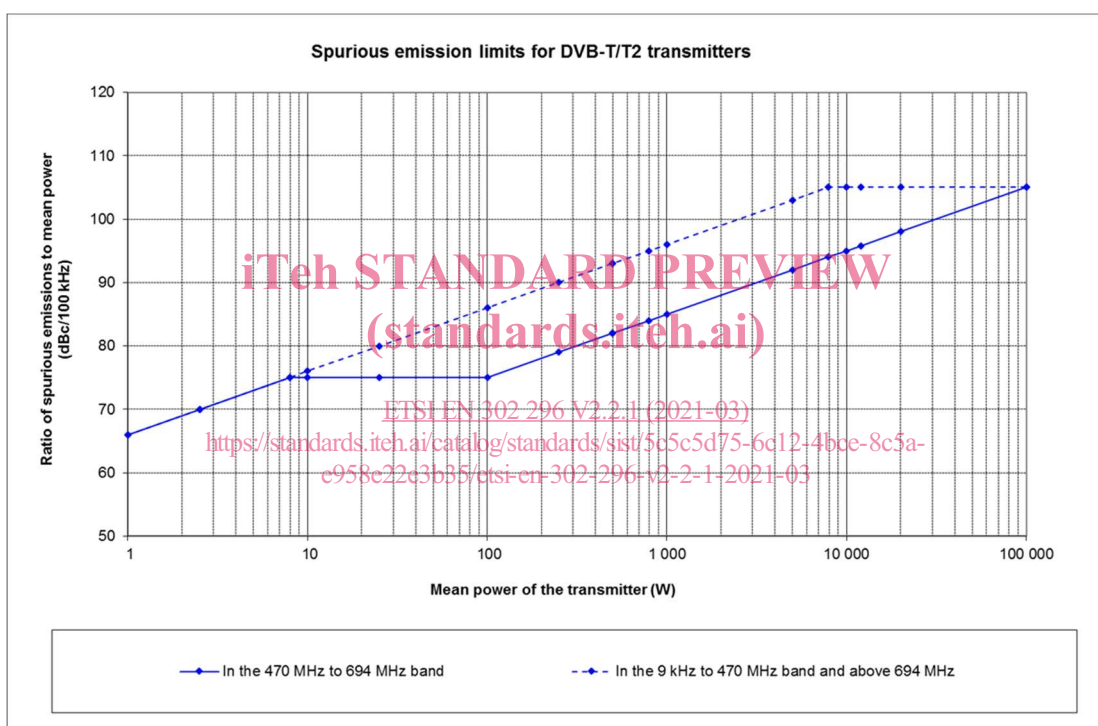


Figure 4.2: Spurious emission limits measured at the antenna port (100 kHz reference bandwidth)

4.2.2.3 Conformance test

Conformance tests described in clause 5.4.2 shall be carried out.

4.2.3 Out-of-band emissions

4.2.3.1 Definition

Out-of-band emissions are unwanted emissions which fall at frequencies separated from the centre frequency of the wanted emission by less than or equal to 250 % of the channel bandwidth. For the purposes of the present document out-of-band emissions are emissions at frequencies outside the necessary bandwidth and within the frequency ranges $f_0 \pm 17,5$ MHz for 7 MHz channels, $f_0 \pm 20$ MHz for 8 MHz channels where f_0 is the centre frequency of the channel, irrespective of the number of carriers employed.