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Wireless Digital Video Links operating in the 1,3 GHz to 50 GHz frequency band; Harmonised Standard for access to radio spectrum

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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.1].

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 covers Wireless Video Links operating between 1,3 GHz to 50 GHz.

National transposition dates	
Date of adoption of this EN:	24 October 2024
Date of latest announcement of this EN (doa):	31 January 2025
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 July 2025
Date of withdrawal of any conflicting National Standard (dow):	31 July 2026

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).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Introduction

The present document is intended to specify the minimum performance characteristics and the methods of measurement for Wireless Video Links operating in the 1,3 GHz to 50 GHz frequency band.

The present document provides the necessary parameters for equipment to obtain common approval throughout Europe.

The present document covers the minimum characteristics considered necessary in order to make the best use of the available frequencies. It does not necessarily include all the characteristics that may be required by a user, nor does it necessarily represent the optimum performance achievable.

The present document is a testing standard based on spectrum utilization parameters and does not include performance characteristics that may be required by the user or requirements for interfacing equipment.

In preparing the present document, much attention has been given to assure a low interference probability, while at the same time allowing maximum flexibility and service to the end-user.

It does not preclude any digital modulation technique, provided that the modulated signal lies within the prescribed limits.

Electromagnetic Compatibility (EMC) requirements are covered by ETSI EN 301 489-28 [i.3].

The present document contains instructions for the presentation of equipment for testing purposes.

Transmitter Power limits are defined in the terms and conditions of the users operating licence.

The present document is intended to cover the provisions of Directive 2014/53/EU [i.1], article 3.2, which states that "*… radio equipment shall be so constructed that it both effectively uses and supports the efficient use of radio spectrum in order to avoid harmful interference*".

1 Scope

The present document applies to terrestrial wireless digital video link equipment operating in the frequency band 1,3 GHz to 50 GHz. The present document does not apply to transmitter equipment where the output power exceeds 10 W. Equipment with an integral antenna is also excluded.

NOTE: The relationship between the present document and essential requirements of article 3.2 of Directive 2014/53/EU [i.1] 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/.

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 necessary for the application of the present document.

[1] CEPT/ERC/REC 74-01E (May 2019): "Unwanted emissions in the spurious domain".

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.

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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] 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.2] Void.

[i.3] ETSI EN 301 489-28: "ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 28: Specific conditions for wireless digital video links; Harmonised Standard for ElectroMagnetic Compatibility".

[i.4] Void.

[i.5] ANSI C63.5: "American National Standard for Calibration of Antennas Used for Radiated Emission Measurements in Electromagnetic Interference (EMI) Control-Calibration of Antennas (9 kHz to 40 GHz)".

[i.6] ETSI TR 102 273 (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties".

[i.7] ETSI EG 203 336: "Guide for the selection of technical parameters for the production of Harmonised Standards covering article 3.1(b) and article 3.2 of Directive 2014/53/EU".

[i.8] Void.

[i.9] Void.

[i.10] Void.

[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] Void.

[i.13] Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment.

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.1] and the following apply:

antenna port: port, where a radio frequency antenna is connected to equipment

channel bandwidth: minimum bandwidth within which the transmitter's necessary bandwidth can be contained

channel occupancy: ratio between the occupied bandwidth and the channel bandwidth, ($r = B_0 / B_c$)

conducted measurements: measurements that are made using a direct connection to the EUT

frequency range: range of operating frequencies over which the equipment can be adjusted

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

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

occupied bandwidth: bandwidth containing 99 % of the total modulated signal power

operating frequency: nominal frequency at which the equipment can be operated

NOTE: This is also referred to as the operating centre frequency.

Out Of Band (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

port: any connection point on or within the Equipment Under Test (EUT) intended for the connection of cables to or from that equipment

quasi-error-free: transmission error rate less than one uncorrected event per hour

radiated measurements: measurements that are made using a test antenna to receive signals radiated from the EUT

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

substitution antenna: antenna connected to a test signal generator for radiated tests

test antenna: antenna connected to a measurement receiver for measuring radiated signals from the EUT

unwanted emissions: spurious emissions and out of band emissions

3.2 Symbols

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

λ	wavelength in metres
β	bandwidth scale factor for spectrum analyser measurements
B_c	channel bandwidth
B_o	occupied bandwidth
d_1	largest dimension of the EUT/dipole after substitution (m)
d_2	largest dimension of the test antenna (m)
dB	decibel; logarithmic unit to express ratio between two quantities
dBd	logarithmic ratio of antenna gain relative to a dipole
dBm	power quantity relative to 1 mW
Δf	deviation from nominal carrier frequency
Δp	transmitter power accuracy
F_{block}	blocking interferer frequency offset
F_{min}	centre frequency of the lowest channel of operation
F_{med}	centre frequency of the channel closest to $(F_{max} + F_{min}) / 2$
F_{max}	centre frequency of the highest channel of operation
f	RF frequency
f_c	nominal carrier frequency
f_{TX}	measured carrier frequency for the transmitter under test
GHz	gigahertz
kHz	kilohertz
L_{XY}	loss of measurement signal path between points X and Y
MHz	megahertz
mW	milliwatt
N	integer multiplier
P_{mean}	nominal RF output power rating provided by the manufacturer
ppm	parts per million
P_{TX}	RF output power measured for the transmitter under test measured at the antenna port
P_{sens}	maximum limit of receiver sensitivity
r	channel occupancy
Γ	total symbol duration

3.3 Abbreviations

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

ACE	Active Constellation Extension
ACP	Adjacent Channel Power
ACPR	Adjacent Channel Power Ratio
ACS	Adjacent Channel Selectivity
BER	Bit Error Rate
C/N	Carrier to Noise ratio
COFDM	Coded Orthogonal Frequency Division Multiplexing
CW	Carrier Wave
DC	Direct Current
DVB-S2	Digital Video Broadcast - Satellite (second generation)
DVB-T	Digital Video Broadcast - Terrestrial
DVB-T2	Digital Video Broadcast - Terrestrial (second generation)
EC	European Commission
EFTA	European Free Trade Association
EMC	Electro-Magnetic Compatibility
ERC	former European Radio Committee in CEPT
EUT	Equipment Under Test

FEC	Forward Error Correction
FEF	Future Extension Frame
FFT	Fast discrete Fourier Transform
HEM	High Efficiency Mode
I/C	Interference to Carrier ratio
ISDB-T	Integrated Services Digital Broadcasting - Terrestrial
ISSY	Input Stream SYnchronizer
LDPC	Low Density Parity Check
MISO	Multiple Input Single Output
MPEG	Moving Picture Experts Group
NZIF	Near-Zero Intermediate Frequency
OATS	Open Area Test Site
PAPR	Peak to Average Power Ratio
PLP	Physical Layer Pipe
PSK	Phase Shift Keying
QAM	Quadrature Amplitude Modulation
QEF	Quasi Error Free
QPSK	Quadrature Phase Shift Keying
RBW	Resolution BandWidth
RF	Radio Frequency
RMS	Root Mean Square
SISO	Single Input Single Output
TFS	Time Frequency Slicing
TR	Tone Reservation
TS	Transport Stream
VBW	Video BandWidth
VSWR	Voltage Standing Wave Ratio

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 for transmitters

4.2.1 Transmitter emission classification

For transmitter equipment, the following performance classes are defined.

Table 1: Transmitter emission classification

Emission Classification	Notes
Class 0	A set of limits defining permitted relative emission levels into adjacent channels. This class applies for transmitters where the intended use does not include operation in channels adjacent to other video link equipment.
Class 1	A set of more stringent limits defining permitted relative emission levels into adjacent channels. This class applies for transmitters where the intended use does include operation in channels adjacent to other video link equipment.

4.2.2 Transmitter test signal configurations

Table 2 contains the set of representative parameters for the transmitter that are applicable to the conformance requirements laid out in the remainder of this clause.

Table 2: Generic transmitter configuration

Parameter	Minimum value	Median value	Maximum value
Frequency (see note 1)	F_{min}	F_{med}	F_{max}
Modulation	Lowest constellation density	-	Highest constellation density
Signal bandwidth (see note 2)	Minimum B_c	-	Maximum B_c
Transmitter output power	P_{min}		P_{max}
NOTE 1: F_{min} is the centre frequency of the lowest channel of operation of the EUT. F_{med} is the closest tuneable frequency to (F_{max} + F_{min}) / 2. F_{max} is the centre frequency of the highest channel of operation of the EUT. NOTE 2: B_c is the channel bandwidth. NOTE 3: P_{min} is the minimum power output setting of the EUT. P_{max} is the maximum power output setting of the EUT.			

4.2.3 Transmitter power accuracy

4.2.3.1 Definition

The transmitter power accuracy, Δp, is the ratio, expressed in dB, of the rated output power, P_{mean} to the measured power P_{TX} at the transmitter antenna port:

$$\Delta p = 10 \times log_{10}(P_{TX}/P_{mean})$$

4.2.3.2 Limit

The transmitter power accuracy shall be within the limits given in Table 3 over the tuning range of the equipment.

Table 3: Transmitter output power accuracy limits

RF Power output accuracy, Δp (dB)	
Maximum	**Minimum**
+0,8	-1,0

4.2.3.3 Conformance

The conformance tests for this requirement shall be as defined in clause 5.2.2.

4.2.4 Transmitter frequency stability

4.2.4.1 Definition

This is quantified by the deviation Δf, from the nominal carrier frequency, f_c over the tuning range of the equipment.

4.2.4.2 Limits

The maximum permissible deviation from the nominal carrier frequency is stated in Table 4.

Table 4: Frequency Offset Δf limits

Frequency range (GHz)	Δf (ppm)
1,3 ≤ f_c < 2,0	±15
f_c ≥ 2,0	±10