



**Wireless Video Links operating
in the 1,3 GHz to 50 GHz frequency band;
Harmonised Standard covering the essential requirements
of article 3.2 of Directive 2014/53/EU**

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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.

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.

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 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. It also is intended to make it easier for the frequency management authorities to find harmonized frequency allocations.

Common technical specifications and harmonized frequency allocations are expected to reduce greatly the present problems of interference and illegal use.

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 a 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*".

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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 contains requirements to demonstrate that radio equipment both effectively uses and supports the efficient use of radio spectrum in order to avoid harmful interference.

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 <http://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.

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] 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] ETSI TR 100 027 (V1.2.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Methods of measurement for private mobile radio equipment".
- [i.3] ETSI EN 301 489-28: "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 28: Specific conditions for wireless digital video links".
- [i.4] ETSI TR 100 028-1 (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1".
- [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] CISPR 16-1: "Specification for radio disturbance and immunity measuring apparatus and methods; Part 1: Radio disturbance and immunity measuring apparatus".
- [i.8] Void.
- [i.9] IEC 60489-1: "Methods of measurement for radio equipment used in the mobile services. Part 1: General definitions and standard conditions of measurement".
- [i.10] ETSI TR 100 028-2 (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2".
- [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.

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in the Directive 2014/53/EU [i.1] and the following apply:

carrier grid: evenly spaced raster in a given frequency band for the allocation of carrier frequencies

NOTE: The minimum distance of two carriers in use is a multiple of the raster dependent on type and usage of the equipment.

channel bandwidth (B): minimum declared bandwidth, within which the transmitter's necessary bandwidth can be contained

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

dBc: decibels relative to the unmodulated carrier power of the emission

NOTE: In the cases which do not have a carrier, for example in some digital modulation schemes where the carrier is not accessible for measurement, the reference level equivalent to dBc is decibels relative to the mean power P.

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

integral antenna: antenna, with or without a connector, designed as, and declared as by the manufacturer, an indispensable part of the equipment

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, the width of the frequency band which is just sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions

operating frequency: nominal frequency at which the equipment can be operated; this is also referred to as the operating centre frequency

out of band emissions: emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious emissions

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 (DVB-T): is defined as BER 2×10^{-4} after Viterbi decoding

NOTE: Which virtually eliminates errors following the Reed-Solomon decode.

quasi-error-free (DVB-T2/DVB-S2): is defined as BER 10^{-7} after LDPC decoding

radiated measurements: measurements that involve the absolute measurement of a radiated electromagnetic field

reference bandwidth: bandwidth in which the spurious emission level is specified

spurious emissions: emissions on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information

NOTE: Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products but exclude out of band emissions.

unwanted emissions: consist of 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
Γ	total symbol duration
μF	microFarad
μW	microWatt
B	channel bandwidth
dBc	dB relative to the carrier level
E	field strength
E_0	reference field strength, (see annex C)
fc	carrier frequency
fo	operating frequency
GHz	GigaHertz
H	Henry
kHz	kiloHertz
MHz	MegaHertz
mW	milliWatt
nW	nanoWatt
P_{max}	rated output power
P_0	the corresponding effective isotropic radiated power of P_{max}
R	distance (see annex C)
R_0	reference distance (see annex C)

3.3 Abbreviations

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

ac	alternating current
AF	Audio Frequency
B	declared channel Bandwidth
BER	Bit Error Rate
CISPR	Comité International Spécial des Perturbations Radioélectriques
COFDM	Coded Orthogonal Frequency Division Multiplexing
DVB-S2	Digital Video Broadcast - Satellite (second generation)
DVB-T	Digital Video Broadcast - Terrestrial
DVB-T2	Digital Video Broadcast - Terrestrial (second generation)
EMC	ElectroMagnetic Compatibility
EFTA	European Free Trade Association
EUT	Equipment Under Test
FEC	Forward Error Correction
FER	Frame Error Rate
IEC	International Electrotechnical Commission
ISDB-T	Integrated Services Digital Broadcasting - Terrestrial
LDPC	Low-Density Parity Check
OATS	Open Area Test Site

PSK	Phase Shift Keying
QAM	Quadrature Amplitude Modulation
QEF	Quasi-Error-Free
QPSK	Quadrature Phase Shift Keying
RBW	Resolution BandWidth
RF	Radio Frequency
SINAD	SIgnal to Noise And Distortion
Tx	Transmitter
VBW	Video BandWidth
VSWR	Voltage Standing Wave Ratio

4 General

4.1 Presentation of equipment for testing purposes

4.1.1 Introduction

Each equipment submitted for testing shall fulfil the requirements of the present document on all channels over which it is intended to operate.

4.1.2 Choice of model for testing

4.1.2.1 Definitions of alignment and switching ranges

The alignment range is defined as the frequency range over which the receiver and the transmitter can be programmed and/or re-aligned, without any physical change of components other than:

- programmable read-only memories supplied by the manufacturer or the manufacturer's nominee;
- crystals;
- frequency setting elements (for the receiver and transmitter). These elements shall not be accessible to the end user and shall be declared by the applicant in the application form.

The switching range is the maximum frequency range over which the receiver or the transmitter can be operated without reprogramming or re-alignment.

The applicant shall, when submitting equipment for test, state the alignment ranges for the receiver and transmitter. The applicant shall also state the switching range of the receiver and the transmitter (which may differ).

4.1.2.2 Alignment range

The alignment range for the receiver and transmitter, which may be different, shall be within the applicable band.

4.1.3 Choice of frequencies

The frequencies for testing shall be chosen by the applicant, in accordance with clauses 4.1.6 to 4.1.8.

4.1.4 Testing of single channel equipment

Full tests shall be carried out on a channel closest to the centre frequency of the alignment range on one sample of the equipment.

4.1.5 Testing of two channel equipment

One sample shall be submitted to enable full tests to be carried out on the highest frequency and the lowest frequency of the switching range.

4.1.6 Testing of multi-channel equipment (more than two channels)

One sample of the equipment shall be submitted to enable tests to be carried out on three channels. The closest centre frequency of the switching range of the sample shall correspond to the closest centre frequency of the alignment range.

Full tests shall be carried out on a frequency closest to the centre frequency, and at the lowest and highest frequencies of the switching range.

4.1.7 Testing of equipment without a permanent external RF port

To facilitate relative measurements, use may be made of a test fixture as described in clause 6.2, or the equipment may be supplied with a permanent internal or temporary internal/external RF port.

4.1.8 Equipment with a permanent internal RF port

The way to access a permanent internal RF port shall be stated by the applicant with the aid of a diagram. The fact that use has been made of a permanent internal RF port shall be recorded in the test report.

4.1.9 Equipment with a temporary RF port

The applicant shall submit two sets of equipment to the test laboratory, one fitted with a temporary 50 Ω RF connector with the antenna disconnected and the other with the antenna connected. Each equipment shall be used for the appropriate tests.

The way the temporary RF port is implemented shall be stated by the applicant with the aid of a diagram. The fact that use has been made of the temporary RF port to facilitate measurements shall be stated in the test report. The addition of a temporary RF port should not influence the performance of the EUT.

4.1.10 Frequency tolerance

The manufacturer shall declare the frequency tolerance which is the maximum permissible departure from the centre frequency of the frequency band occupied by an emission from the assigned frequency under normal and extreme test conditions.

4.2 Mechanical and electrical design

4.2.1 General

The equipment submitted by the applicant shall be designed, constructed and manufactured in accordance with sound engineering practice, and with the aim of minimizing harmful interference to other equipment and services.

4.2.2 Controls

Those controls that, if maladjusted, might increase the interfering potential of the equipment shall only be accessible by partial or complete disassembly of the device and requiring the use of tools.

4.2.3 Performance testing with integral antenna

Performance testing of equipment with integral antenna only applies to that equipment together with the antenna originally supplied by the manufacturer for testing.