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Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless Video Links (WVL) operating in the 1,3 GHz to 50 GHz frequency band; Part 1: Technical characteristics and methods of measurement

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European Standard (Telecommunications series)

**Electromagnetic compatibility
and Radio spectrum Matters (ERM);
Wireless Video Links (WVL) operating
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Part 1: Technical characteristics and
methods of measurement**

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Foreword

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

For non-EU countries the present document may be used for regulatory (Type Approval) purposes.

The present document is part 1 of a multipart deliverable covering the technical characteristics and methods for Wireless Video Links (WVL) operating in the 1,3 GHz to 50 GHz frequency band, as identified below:

Part 1: "Technical characteristics and methods of measurement";

Part 2: "Harmonized EN under article 3.2 of the R&TTE Directive".

Annex A provides normative specifications concerning radiated measurements.

National transposition dates	
Date of latest announcement of this EN (doa):	31 October 2004
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 April 2005
Date of withdrawal of any conflicting National Standard (dow):	30 April 2005

Introduction

The present document is intended to specify the minimum performance characteristics and the methods of measurement for Wireless Video Links (WVL) 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 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.

1 Scope

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 applies to terrestrial wireless digital video link equipment operating on radio frequencies above 1,3 GHz. It does not preclude any digital modulation technique, provided that the modulated signal lies within the prescribed limits. Instructions for the presentation of equipment for testing purposes are included.

Electromagnetic Compatibility (EMC) requirements are covered by EN 301 489-28 (see Bibliography).

ES 202 239 [8] specifies the reference receiver performance parameters, which are required for the purpose of spectrum planning and methods of investigation including resolving interference issues. These parameters play an important role in the frequency planning and the respective compatibility analysis performed by responsible national administrations.

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. Refer to annex C for recommended frequency ranges (ERC/REC 25-10 [2] annex 2).

The user categories covered, are as follows:

- Category 1: typically used by broadcasters and programme-makers. Users require the highest video contribution quality and or minimum processing delay times to allow both real time inserts into programmes and easy accurate editing. These users normally operate on licensed frequencies.
- Category 2: typically used by professional and business. Users have quality requirements similar to above but are maybe not concerned with delay issues that affect the broadcaster and can, therefore, operate within a smaller spectrum mask.
- Category 3: typically used by industrial users. Examples include civil and industrial users, emergency services, automobile associations, the utility industries, etc. who need the good quality available from digital-based systems and who operate on licensed allocations.
- Category 4: typically used by industrial users including industrial security. Most of these systems could operate either in ISM bands or frequencies specifically allocated for the purpose.
- Category 5: typically used by consumers. Caters for consumers, hobbyists and amateur users. The proposed 5 MHz mask can be subdivided into $2 \times 2,5$ for two way visual communication and is primarily intended for indoor use.

The maximum allowable channel bandwidths for the equipment covered by the present document are shown in table 1.

Table 1: Maximum allowable channel bandwidth

Equipment	Maximum allowable
Category 1	20 MHz
Category 2	10 MHz
Category 3	10 MHz
Category 4	10 MHz
Category 5	5 MHz

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

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

- [1] ETSI TR 100 027 (V1.2.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Methods of measurement for private mobile radio equipment".
- [2] ERC/REC 25-10: "Frequency ranges for the use of temporary terrestrial audio and video SAP/SAB links (incl. ENG/OB)".
- [3] ETSI TR 100 028 (V1.4.1) (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".
- [4] 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)".
- [5] 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".
- [6] CISPR 16-1: "Specification for radio disturbance and immunity measuring apparatus and methods; Part 1: Radio disturbance and immunity measuring apparatus".
- [7] IEC 60489-3: "Methods of measurement for radio equipment used in the mobile services. Part 3: Receivers for A3E or F3E emissions".
- [8] ETSI ES 202 239: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless Digital Video Links operating above 1,3 GHz; Specification of Typical Receiver Performance Parameters for Spectrum Planning".
- [9] IEC 60489-1: "Methods of measurement for radio equipment used in the mobile services. Part 1: General definitions and standard conditions of measurement".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

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.

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): defined as the 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

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 sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions

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, which virtually eliminates errors following the Reed-Solomon decode

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

rated output power: or rated output power range is the mean power (or the range of power) that the transmitter shall deliver at its output under specified conditions of operation

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. 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 A)
f_c	carrier frequency
f_o	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 A)
R_0	reference distance (see annex A)

3.3 Abbreviations

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

ac	alternating current
B	declared channel Bandwidth (see table 1)
COFDM	Coded Orthogonal Frequency Division Multiplexing
DVB-T	Digital Video Broadcast - Terrestrial
eirp	effective isotropic radiated power
EMC	ElectroMagnetic Compatibility
EUT	Equipment Under Test
FWA	Fixed Wireless Access
OATS	Open Area Test Site
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

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

4.1.1 Choice of model for testing

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4.1.1.1 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).

4.1.1.2 Alignment range

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

4.1.2 Choice of frequencies

The frequencies for testing shall be chosen by the applicant, in accordance with clauses 4.1.5 to 4.1.7.