

# ETSI EN 301 489-28 V1.1.1 (2004-09)

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*Candidate Harmonized European Standard (Telecommunications series)*

**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**

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Reference

DEN/ERM-EMC-237-28

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Keywords

digital, EMC, radio, regulation, video

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## Foreword

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

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 98/34/EC [4] (as amended) laying down a procedure for the provision of information in the field of technical standards and regulations.

The present document together with EN 301 489-1 [1] is intended to become a Harmonized Standard, the reference of which will be published in the Official Journal of the European Communities referencing the Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility ("the EMC Directive") (89/336/EEC [3] as amended) and Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity ("the R&TTE Directive" [2]).

The present document is part 28 of a multi-part deliverable. Full details of the entire series can be found in part 1 [1].

<b>National transposition dates</b>	
Date of adoption of this EN:	3 September 2004
Date of latest announcement of this EN (doa):	31 December 2004
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 June 2005
Date of withdrawal of any conflicting National Standard (dow):	31 December 2007

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# 1 Scope

The present document, together with EN 301 489-1 [1], covers the assessment of wireless digital video links in respect of ElectroMagnetic Compatibility (EMC).

Technical specifications related to the antenna port and emissions from the enclosure port of wireless digital video links are not included in the present document. Such technical specifications are found in the relevant product standards for the effective use of the radio spectrum.

The present document specifies the applicable EMC tests, the test methods, the limits and the performance criteria for wireless digital video links. Examples of equipment types covered by the present document are given in annex A.

In case of differences (for instance concerning special conditions, definitions, abbreviations) between the present document and EN 301 489-1 [1], the provisions of the present document take precedence.

The environmental classification and the emission and immunity requirements used in the present document are as stated in EN 301 489-1 [1], except for any special conditions included in the present document.

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# 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 EN 301 489-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements".
- [2] Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive).
- [3] Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility (EMC Directive).
- [4] Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations.
- [5] ETSI EN 302 064-1: "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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## 3 Definitions and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in EN 301 489-1 [1] and the following apply:

**integral antenna:** antenna designed to be connected to the equipment without the use of a 50  $\Omega$  external connector and considered to be part of the equipment

NOTE: An integral antenna may be fitted internally or externally to the equipment.

**quasi-error-free (DVB-T):** defined as BER  $2 \times 10^{-4}$  after Viterbi decoding, which virtually eliminates errors following the Reed-Solomon decode

**switching range:** maximum frequency range over which the receiver or transmitter can be operated without reprogramming or realignment

### 3.2 Abbreviations

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

BER	Bit Error Rate
CHS	CHannel Separation
CR	Continuous Receivers
CT	Continuous Transmitters
DVB-T	Digital Video Broadcast-Terrestrial
EMC	ElectroMagnetic Compatibility
EUT	Equipment Under Test
IF	Intermediate Frequency
LONM	Loss Of Noise Margin
QEF	Quasi-Error-Free
RF	Radio Frequency
TR	Transient Receivers
TT	Transient Transmitters

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## 4 Test conditions

For the purposes of the present document, the test conditions of EN 301 489-1 [1], clause 4 shall apply as appropriate.

### 4.1 General

For emission and immunity tests the test modulation, test arrangements, etc., as specified in the present document, clauses 4.1 to 4.4 shall apply.

For the purpose of EMC tests, body worn or hand held transmitters shall be mounted on a non-conductive stand at least 0,8 m from any conducting surface. The EUT and any other equipment required for the performance assessment before, during, and after the conclusion of the tests, shall be connected in a manner typical of normal intended use.

Whenever the EUT is provided with a detachable antenna, it shall be tested with the antenna fitted in a manner typical of normal intended use.

For immunity tests, if the equipment is of a category which permits it, a communications link shall be established at the start of the test and maintained during the test.

The test conditions shall be as follows:

- the transmitter shall be operated at its normal maximum RF output power modulated with a suitable modulation signal (see clause 4.2.1);

- for stand alone receivers or receivers of transceivers operating in simplex mode, the wanted RF input signal, coupled to the receiver, shall be modulated with a suitable modulation signal (see clause 4.2.3);
- for duplex transceivers, the wanted RF input signal, coupled to the receiver, shall be modulated with a suitable modulation signal (see clause 4.2.3). The transmitter shall be operated at its normal maximum output power, modulated with the test modulation signal, coupled to the transmitter from the output of the receiver (repeater mode).

## 4.2 Arrangements for test signals

The provisions of EN 301 489-1 [1], clause 4.2 shall apply.

### 4.2.1 Arrangements for test signals at the input of transmitters

The provisions of EN 301 489-1 [1], clause 4.2.1 shall apply with the following modifications.

For the purpose of the present document, the transmitter video or combined video/audio input signal shall be supplied by a generator at the correct impedance applied at the connections of the stated inputs, unless otherwise stated (see figures 1 and 2). The manufacturer shall specify a representative test signal.

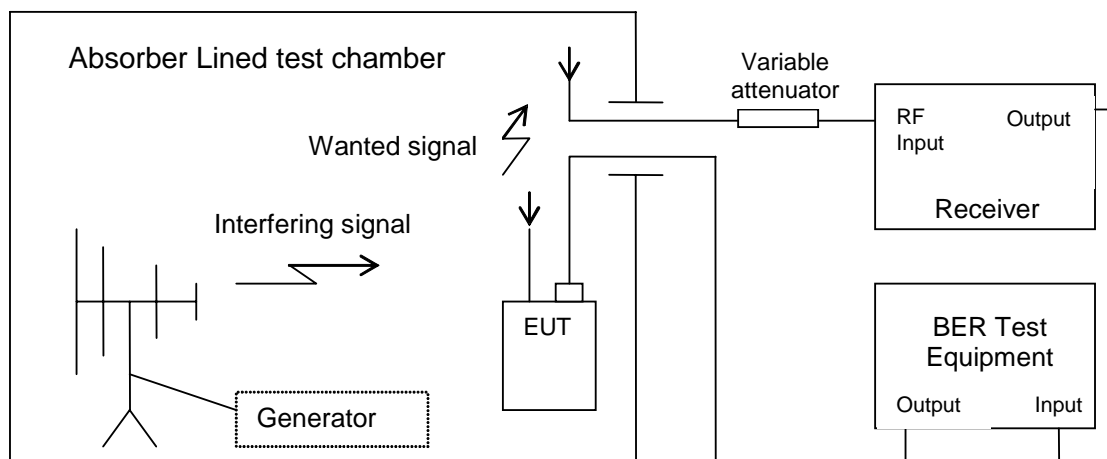
### 4.2.2 Arrangements for test signals at the output of transmitters

The provisions of EN 301 489-1 [1], clause 4.2.2 shall apply.

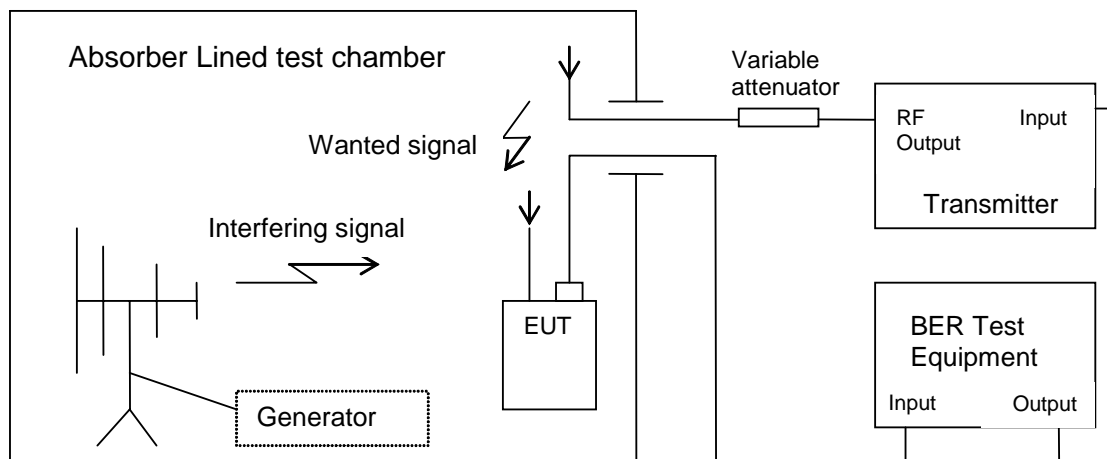
### 4.2.3 Arrangements for test signals at the input of receivers

The provisions of EN 301 489-1 [1], clause 4.2.3 shall apply with the following modifications.

For the purpose of the present document, the transmitter video or combined video/audio input signal shall be supplied by a generator at the correct impedance applied at the connections of the stated inputs, unless otherwise stated (see figures 1 and 2). The manufacturer shall specify a representative test signal.



**Figure 1: Test configuration for integral antenna; transmitter operation - electrical input**



**Figure 2: Test configuration for integral antenna; receiver operation**

#### 4.2.4 Arrangements for test signals at the output of receivers

The provisions of part 1 EN 301 489-1 [1], clause 4.2.4 shall apply.

#### 4.2.5 Arrangements for testing transmitter and receiver together (as a system)

The provisions of EN 301 489-1 [1], clause 4.2.5 shall apply.

### 4.3 Exclusion bands

The provisions of EN 301 489-1 [1], clause 4.3 shall apply.

#### 4.3.1 Receiver and receivers of transceivers exclusion band

The exclusion band for receivers and receivers of transceivers is the frequency range determined by the switching range, as declared by the manufacturer, extended as follows:

- the lower frequency of the exclusion band is the lower frequency of the switching range, minus 5 % of the centre frequency of the switching range;
- the upper frequency of the exclusion band is the upper frequency of the switching range, plus 5 % of the centre frequency of the switching range.

#### 4.3.2 Transmitter exclusion band

Exclusion bands shall not be applied when measuring transmitters in standby mode.

For the purpose of the present document, the exclusion band shall extend over the frequencies above and below the fundamental transmitting frequency, but separated from the centre frequency of the emission by 250 % of the relevant Channel Separation (CHS) of the radio-frequency channel arrangement where the system is to be placed. When the CHS is not defined the exclusion band shall extend over the frequencies above and below the fundamental transmitting frequency but separated from the centre frequency of the emission by 250 % of the necessary bandwidth.



## 4.4 Narrow band responses of receivers

The provision of EN 301 489-1 [1], clause 4.4 shall apply.

The nominal frequency offset used for the identification of narrowband responses shall be twice the bandwidth of the receiver IF filter immediately preceding the demodulator, as declared by the manufacturer, for the first part of the identification procedure, and two and one half times the bandwidth of the receiver for its second part.

The narrowband response shall be limited to less than 3 times the declared channel bandwidth (B) of the system. See EN 302 064-1 [5].

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# 5 Performance assessment

## 5.1 General

The provision of EN 301 489-1 [1], clause 5.1 shall apply with the following modification.

In addition, the manufacturer shall at the time of submission of the equipment for test, supply the following information to be recorded in the test report:

- the coupling means to be used for the application of the modulation signal to the EUT and for monitoring the output of the EUT; and
- the level and make up of the RF test signal for the establishment of the communications link;
- description of test fixtures.

## 5.2 Equipment which can provide a continuous communications link

The provision of EN 301 489-1 [1], clause 5.2 shall apply.

## 5.3 Equipment which does not provide a continuous communications link

The provision of EN 301 489-1 [1], clause 5.3 shall apply.

## 5.4 Ancillary equipment

The provision of EN 301 489-1 [1], clause 5.4 shall apply.

## 5.5 Equipment classification

The provision of EN 301 489-1 [1], clause 5.5 shall apply.

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## 6 Performance criteria

### 6.1 General performance criteria

The equipment shall meet the performance criteria specified in this clause and clauses 6.2, 6.3, 6.4, 6.5 and 6.6 as appropriate.

The establishment and maintenance of a communications link and the assessment of loss of noise margin at the Quasi-Error-Free (QEF) point are used as performance criteria to ensure that all primary functions of the transmitter and receiver are evaluated during the immunity tests. In addition, the test shall also be performed in idle mode to ensure the transmitter does not unintentionally operate. The maintenance of a communications link shall be assessed using an indicator which may be part of the test system or the EUT.

If an equipment is of a specialized nature, such that the performance criteria described in the following clauses are not appropriate, then the manufacturer shall declare, for inclusion in the test report, his own specification for an acceptable level of performance or degradation of performance during and/or after the immunity tests. The performance specification shall be included in the product description and documentation.

### 6.2 Performance criteria for Continuous phenomena applied to Transmitters (CT)

A communication link shall be established at the start of the test, and maintained during the test, see clauses 4.2.2, 4.2.3, 4.2.4 and 4.2.5.

Prior to the test, the attenuator at the support receiver input shall be adjusted to obtain operation at the QEF point (or equivalent).

During the test, the attenuator shall be readjusted so that the communication link is again operating at the QEF point.

The degree of the attenuator adjustment required to achieve this shall be noted. This shall be known as the Loss of Noise Margin (LONM).

The LONM shall not exceed 3 dB.

Where it is not practical to measure BER the manufacturer shall state a level of picture degradation deemed equivalent to operation at the QEF point.

At the conclusion of the test, the EUT shall operate as intended with no loss of user control functions or stored data, and the communication link shall have been maintained. In addition to confirming the above performance during normal operation, the test shall also be performed in idle mode, and the transmitter shall not unintentionally operate.

### 6.3 Performance criteria for Transient phenomena applied to Transmitters (TT)

A communications link shall be established at the start of the test, see clauses 4.2.2, 4.2.3, 4.2.4 and 4.2.5.

Prior to the test, the attenuator at the support receiver input shall be adjusted to obtain operation at the QEF point (or equivalent).

During the test, the attenuator shall be readjusted so that the communication link is again operating at the QEF point. The degree of the attenuator adjustment required to achieve this shall be noted. This shall be known as the Loss Of Noise Margin (LONM).

The LONM shall not exceed 3 dB.

Where it is not practical to measure BER the manufacturer shall state a level of picture degradation deemed equivalent to operation at the QEF point.

At the conclusion of each exposure the EUT shall operate with no user noticeable loss of the communication link.

At the conclusion of the total test comprising the series of individual exposures, the EUT shall operate as intended with no loss of user control functions or stored data, as declared by the manufacturer, and the communication link shall have been maintained. In addition to confirming the above performance during normal operation, the test shall also be performed in idle mode, and the transmitter shall not unintentionally operate.

## 6.4 Performance criteria for Continuous phenomena applied to Receivers (CR)

A communications link shall be established at the start of the test, clauses 4.2.1, 4.2.2, 4.2.3 and 4.2.4.

Prior to the test, the attenuator at the support transmitter output shall be adjusted to obtain operation at the QEF point (or equivalent).

During the test, the attenuator shall be readjusted so that the communication link is again operating at the QEF point. The degree of the attenuator adjustment required to achieve this shall be noted. This shall be known as the loss of noise margin (LONM).

The LONM shall not exceed 3 dB.

Where it is not practical to measure BER the manufacturer shall state a level of picture degradation deemed equivalent to operation at the QEF point.

At the conclusion of the test, the EUT shall operate as intended with no loss of user control functions or stored data, and the communication link shall have been maintained.

## 6.5 Performance criteria for Transient phenomena applied to Receivers (TR)

A communications link shall be established at the start of the test, clauses 4.2.1, 4.2.2, 4.2.3 and 4.2.4.

Prior to the test, the attenuator at the support transmitter output shall be adjusted to obtain operation at the QEF point (or equivalent).

During the test, the attenuator shall be readjusted so that the communication link is again operating at the QEF point.

The degree of the attenuator adjustment required to achieve this shall be noted. This shall be known as the loss of noise margin (LONM).

The LONM shall not exceed 3 dB.

Where it is not practical to measure BER the manufacturer shall state a level of picture degradation deemed equivalent to operation at the QEF point.

At the conclusion of each exposure the EUT shall operate with no user noticeable loss of the communication link.

At the conclusion of the total test comprising the series of individual exposures, the EUT shall operate as intended with no loss of user control functions or stored data, as declared by the manufacturer, and the communication link shall have been maintained.

## 6.6 Performance criteria for ancillary equipment tested on a stand alone basis

The provision of EN 301 489-1 [1], clause 6.4 shall apply.

## 7 Applicability overview

### 7.1 Emission

#### 7.1.1 General

EN 301 489-1 [1], table 2, contains the applicability of EMC emission measurements to the relevant ports of radio and/or associated ancillary equipment.

#### 7.1.2 Special conditions

The following special conditions set out in table 1, relate to the emission test methods used in EN 301 489-1 [1], clause 8.

**Table 1: Special conditions for EMC emission measurements**

Reference to clauses in EN 301 489-1 [1]	Special product-related conditions, additional to or modifying the test conditions in EN 301 489-1 [1], clause 8
8.1 Test configuration; Methods of measurement and limits for EMC emissions	The radio equipment shall be operated on one channel frequency, which is close to the middle of the switching range declared by the manufacturer. In transmit mode of operation, the transmitter shall be operated to obtain its maximum rated RF power.

### 7.2 Immunity

#### 7.2.1 General

EN 301 489-1 [1], table 3, contains the applicability of EMC immunity measurements to the relevant ports of radio and/or associated ancillary equipment.

#### 7.2.2 Special conditions

The following special conditions set out in table 2, relate to the immunity test methods and performance criteria used in EN 301 489-1 [1], clause 9.

**Table 2: Special conditions for EMC immunity tests**

Reference to clauses in EN 301 489-1 [1]	Special product-related conditions, additional to or modifying the test conditions in EN 301 489-1 [1], clause 9
9.1 Test configuration; Test methods and levels for immunity tests	For immunity tests of transmitters, the transmitter shall be operated at its maximum rated RF output power.

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## Annex A (normative): Examples of equipment covered by the present document

The categories of equipment covered, are as follows:

- Category 1: This category of equipment is typically used by broadcasters and programme makers that require the highest video contribution quality and or minimum processing delay times to allow both real time inserts into programmes and easy accurate editing. This category of equipment normally operate on licensed frequencies e.g. 2,5 GHz, 3,5 GHz, 5 GHz, 7 GHz and 12 GHz bands.
- Category 2: This category of equipment is typically used by professional and business users and has quality requirements similar to category 1, but the users are less concerned with delay issues, that affect the broadcaster and can therefore operate within a reduced spectrum mask, than category 1 equipment.
- Category 3: This category of equipment is typically used by civil and industrial users, emergency services, Automobile Associations, and the utilities etc who need good quality available from digital based systems and who operate on licensed frequencies.
- Category 4: This category of equipment is typically used in Industrial applications (e.g. industrial security), operating either in ISM bands or on frequencies specifically allocated for the purpose.
- Category 5: This category of equipment is typically used by consumers, hobbyists and amateur users. Its 5 MHz mask can be subdivided into  $2 \times 2,5$  for two way visual communication and is primarily intended for indoor use.

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## Annex B (informative): Bibliography

- CEPT ERC/REC 70-03: "Relating to the use of Short Range Devices (SRD)".

## Annex C (informative): The EN title in the official languages

Language	EN title
Czech	
Danish	
Dutch	
English	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
Estonian	
Finnish	
French	
German	
Greek	
Hungarian	
Icelandic	
Italian	
Latvian	
Lithuanian	
Maltese	
Polish	Kompatybilność Elektromagnetyczna i Zagadnienia Widma Radiowego (ERM) - Norma kompatybilności elektromagnetycznej (EMC) dotycząca urządzeń i systemów radiowych - Część 28: Wymagania szczegółowe dla bezprzewodowych cyfrowych łączy wizyjnych
Portuguese	
Slovak	Elektromagnetická kompatibilita a závislosti rádiového spektra (ERM). Elektromagnetická kompatibilita (EMC), norma na rádiové zariadenia a služby. Časť 28: Osobitné podmienky na bezdrôtové digitálne videospoje
Slovenian	
Spanish	
Swedish	

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## History

<b>Document history</b>		
V1.1.1	December 2003	Public Enquiry PE 20040423: 2003-12-24 to 2004-04-23
V1.1.1	July 2004	Vote V 20040903: 2004-07-05 to 2004-09-03
V1.1.1	September 2004	Publication