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**ElectroMagnetic Compatibility (EMC)
standard for radio equipment and services;
Part 17: Specific conditions for
Broadband and Wideband Data Transmission Systems;
Harmonised Standard for ElectroMagnetic Compatibility**

Reference
REN/ERM-EMC-409

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Foreword

This 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 combined Public Enquiry and 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.12] 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 is part 17 of a multi-part deliverable. Full details of the entire series can be found in part 1 [1].

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).

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

1 Scope

The present document specifies technical characteristics and methods of measurements for broadband and wideband data transmission system equipment including the associated ancillary equipment in respect of electromagnetic compatibility, as detailed in table 1.

Technical specifications related to the radio function of the radio equipment 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 test conditions, performance assessment and performance criteria for broadband and wideband data transmission systems as detailed in table 1.

NOTE 1: In the context of the present document, broadband and wideband are interchangeable.

Table 1: Radio Technologies in scope of the present document

Technology	ETSI Standard
Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band	ETSI EN 300 328 [i.8]
5 GHz RLAN	ETSI EN 301 893 [i.3]
6 GHz WAS/RLAN	ETSI EN 303 687 [i.2]
Wireless Access Systems (WAS); 5,8 GHz fixed broadband data transmitting systems	ETSI EN 302 502 [i.4]
Multi-Gigabit Wireless Systems (MGWS) in the 60 GHz band	ETSI EN 302 567 [i.6]
Wideband Data Transmission Systems (WDTS) for Fixed Network Radio Equipment operating in the 57 GHz to 71 GHz band	ETSI EN 303 722 [i.5]

Emissions requirements in the present document are specified for frequencies above 9 kHz.

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

NOTE 2: The relationship between the present document and essential requirements of article 3.1(b) 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] ETSI EN 301 489-1 (V2.2.3) (11-2019): "ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for ElectroMagnetic Compatibility".

[2] EN 55032 (2015)+A11 (2020): "Electromagnetic compatibility of multimedia equipment - Emission Requirements" (produced by CENELEC).

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.

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 EN 303 687: "6 GHz WAS/RLAN; Harmonised Standard for access to radio spectrum".

[i.3] ETSI EN 301 893: "5 GHz RLAN; Harmonised Standard for access to radio spectrum".

[i.4] ETSI EN 302 502 (V2.1.3): "Wireless Access Systems (WAS); 5,8 GHz fixed broadband data transmitting systems; Harmonised Standard for access to radio spectrum".

[i.5] ETSI EN 303 722: "Wideband Data Transmission Systems (WDTS) for Fixed Network Radio Equipment operating in the 57 GHz to 71 GHz band; Harmonised Standard for access to radio spectrum".

[i.6] ETSI EN 302 567: "Multiple-Gigabit/s radio equipment operating in the 60 GHz band; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU".

[i.7] Void.

[i.8] ETSI EN 300 328: "Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band; Harmonised Standard for access to radio spectrum".

[i.9] Void.

[i.10] Void.

[i.11] Void.

[i.12] 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 Definition of terms, symbols and abbreviations

3.1 Terms

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

ancillary equipment: electrical or electronic equipment, that is intended to be used with a receiver or transmitter

NOTE 1: It is considered as an ancillary equipment if:

- the equipment is intended for use with a receiver or transmitter to provide additional operational and/or control features to the radio equipment, (e.g. to extend control to another position or location); and
- the ancillary equipment cannot be used without being connected to radio equipment to provide user functions independently of a receiver or transmitter; and

- the receiver or transmitter, to which it is connected, is capable of providing some intended operation such as transmitting and/or receiving without the ancillary equipment (i.e. it is not a sub-unit of the main equipment essential to the main equipment basic functions).

NOTE 2: An example of ancillary equipment would be a docking station for radio equipment whose interface is dedicated to a particular product or range of products.

Equipment Under Test (EUT): equipment subject to the performance requirements of the present document

fixed equipment: equipment intended for use in a fixed location and fitted with one or more antennas

NOTE: The equipment may be fitted with either antenna socket(s) or integral antenna(s) or both.

host: any equipment which has complete user functionality when not connected to the radio equipment part and to which the radio equipment part provides additional functionality and to which connection is necessary for the radio equipment part to offer functionality

plug-in radio device: equipment, including slide-in radio cards, intended to be used with or within a variety of host systems, using their control functions and power supply

portable equipment: radio equipment intended for portable use and powered by integral batteries or battery

NOTE: Devices will typically be handheld.

stand-alone radio equipment: equipment that is intended primarily as communications equipment and that is normally used on a stand-alone basis

vehicular equipment: radio equipment intended for installation and use in a vehicle, and powered by the main battery of the vehicle

3.2 Symbols

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

Pmin minimum power required to establish a communication link

3.3 Abbreviations

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

AC	Alternating Current
ACK	ACKnowledgement
ARQ	Automatic Retransmission reQuest
DC	Direct Current
EMC	ElectroMagnetic Compatibility
ERM	EMC and Radio spectrum Matters
EUT	Equipment Under Test
FER	Frame Error Rate
MGWS	Multi-Gigabit Wireless Systems
NACK	Not ACKnowledgement
PER	Packet Error Rate
RF	Radio Frequency
RLAN	Radio Local Area Network
WAS	Wireless Access Systems
WDTS	Wideband Data Transmission Systems

4 Test conditions

4.1 General

For the purposes of the present document, the test conditions of ETSI EN 301 489-1 [1], clause 4, shall apply as appropriate. Further product related test conditions for wideband data communications systems are specified in clauses 4.2 to 4.5.

The radio equipment may take forms which may require special software and/or test fixtures. Equipment which requires connection to a host equipment to function shall use a test configuration representative of the EUT's intended use and shall be recorded in the test report.

4.2 Arrangements for test signals

4.2.1 Arrangements for test signals at the input of transmitters

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

The wanted signals and/or controls required to establish a communication link and shall be representative of the EUTs intended use.

The transmitter shall be operated at maximum rated power.

4.2.2 Arrangements for test signals at the output of transmitters

The provisions of ETSI EN 301 489-1 [1], clause 4.2.2 shall apply with the following modifications.

A suitable companion receiver shall be used to receive messages or to set up a communication link.

4.2.3 Arrangements for test signals at the input of receivers

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

For radiated immunity tests, the level of the wanted signal at the input of the receiver or the enclosure port of the EUT, shall be 30 dB (±6 dB) above the Pmin for the EUT. For all other tests the level of the wanted signal, required to establish a communication link, shall be representative of the EUT intended use.

NOTE: Simple method to establish the required communication link is establish link, reduce the wanted signal power at the EUT to a point of link failure, then increase the wanted signal level by 30 dB (±6 dB).

4.2.4 Arrangements for test signals at the output of receivers

The measuring equipment for the output signal from the receiver under test shall be located outside the test environment.

It shall be possible to assess the performance of the equipment by appropriately monitoring the receiver output.

If the receiver has an output connector or port providing the wanted output signal, then this port shall be used via a cable, consistent with the standard cable used in normal operation, connected to the external measuring equipment outside the test environment.

A suitable companion transmitter shall be used to transmit messages or to set up a communication link.

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

Standalone receivers and transmitters shall be tested separately. Transceivers shall be tested so that operation in each direction is confirmed.

A suitable companion transceiver or transmitter and receiver shall be used to send and receive messages or to set up a communication link.

Both the EUT and the companion equipment shall transmit the normal test modulation. Further, the output of the radio equipment under test shall be monitored by the test system.

4.2.6 Equipment with an external antenna connector

If access to the antenna connector involves modification or dismantling of the EUT then this clause does not apply.

The EUT may be tested with its antenna removed.

In the case of testing with the antenna removed, the wanted RF input and output signals shall be delivered between the EUT antenna connector and the measuring and/or test equipment by a shielded transmission line, such as a coaxial cable.

4.2.7 Equipment without an external antenna connector (integral antenna)

This clause applies to EUT to which clause 4.2.6 does not apply. Such EUT are generally known as integral antenna or dedicated antenna equipment.

The EUT shall be tested with its antenna fitted in a manner typical of intended use.

4.2.8 Equipment with more than one antenna

If the EUT has more than one antenna port, e.g. separate antennas for Tx and Rx or separate antennas for different operating frequencies or diversity antennas, then:

- If clause 4.2.6 applies to all the antenna ports, then the EUT may be tested according to clause 4.2.6, with all antenna ports treated the same.
- Otherwise it shall be tested according to clause 4.2.7.

NOTE: The reason is that replacing one antenna by a transmission line may affect the operation of any other antennas.

4.3 Exclusion bands

4.3.1 General

The frequencies on which the transmitter part of the EUT is intended to operate shall be excluded from radiated emission measurements when performed in transmit mode of operation.

There shall be no frequency exclusion band applied to emission measurements of the receiver part of transceivers or the standalone receiver under test, and/or associated ancillary equipment.

For EUT that operate above 6 GHz there is no exclusion band specified as test ranges stop at 6 GHz.

NOTE: All of the receiver exclusion band ranges detailed within clauses 4.3.2, 4.3.3 and 4.3.4 also cover the relevant blocking test ranges specified in the relevant product standards for the effective use of the radio spectrum (see table 1).

4.3.2 Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band

The exclusion band for immunity testing of equipment operating in the 2,4 GHz band shall be:

- lower limit of exclusion band = lowest allocated band edge frequency -120 MHz, i.e. 2 280 MHz;
- upper limit of exclusion band = highest allocated band edge frequency +120 MHz, i.e. 2 603,5 MHz.

NOTE: This is based upon a channel size of 40 MHz and a value of n = 3 from ETSI EN 301 489-1 [1], clause 4.3.3. These values also take into account the blocking test frequencies from ETSI EN 300 328 [i.8].

4.3.3 5 GHz RLAN

The exclusion band for immunity testing of equipment operating in the 5 GHz RLAN band shall be:

- lower limit of exclusion band = lowest allocated band edge frequency -320 MHz, i.e. 4 830 MHz;
- as the immunity requirements have an upper frequency range of 6 GHz and any upper edge exclusion band would be greater than this for both the 5 470 MHz to 5 725 MHz and 5 725 MHz to 5 850 MHz bands. Therefore, the test stops at the lower limit of exclusion band (i.e. 4 830 MHz).

NOTE: This is based upon a channel size of 80 MHz and a value of n = 4 from ETSI EN 301 489-1 [1], clause 4.3.3. These values also take into account the blocking test frequencies from ETSI EN 301 893 [i.3].

4.3.4 Wireless Access Systems (WAS); 5,8 GHz fixed broadband data transmitting systems

The exclusion band for immunity testing of wireless access systems operating in the 5,8 GHz band shall be:

- lower limit of exclusion band = lowest allocated band edge frequency -440 MHz, i.e. 5 285 MHz;
- as the immunity requirements have an upper frequency range of 6 GHz and any upper edge exclusion band would be greater than this for the 5,8 GHz band. Therefore, the test stops at the lower limit of exclusion band (i.e. 5 285 MHz).

NOTE: This is based upon a channel size of 40 MHz and a value of n = 11 from ETSI EN 301 489-1 [1], clause 4.3.3. These values also take into account the blocking test frequencies from ETSI EN 302 502 [i.4].

4.3.5 6 GHz RLAN

The exclusion band for immunity testing of equipment operating in 6 GHz WLAN band shall be:

- lower limit of exclusion band = lowest allocated band edge frequency -480 MHz, i.e. 5 465 MHz;
- as the immunity requirements have an upper frequency range of 6 GHz and any upper edge exclusion band would be greater than this for the 5 945 MHz to 6 425 MHz band. Therefore, the test stops at the lower limit of exclusion band (i.e. 5 465 MHz).

NOTE: This is based upon a channel size of 160 MHz and a value of n = 3 from ETSI EN 301 489-1 [1], clause 4.3.3. These values also take into account the blocking test frequencies from ETSI EN 303 687 [i.2].