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**ElectroMagnetic Compatibility (EMC)
standard for combined and/or integrated
radio and non-radio equipment;
Part 1: Requirements for equipment intended to be used
in residential, commercial and light industry locations**

Reference
REN/ERM-EMC-398

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Foreword

This draft 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 is part 1 of a multi-part deliverable covering ElectroMagnetic Compatibility (EMC) for combined and/or integrated equipment, as identified below:

Part 1: "Requirements for equipment intended to be used in residential, commercial and light industry locations";

Part 2: "Requirements for equipment intended to be used in industrial locations".

Proposed national transposition dates	
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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 not intended for citation under any new approach Directive.

The present document is based on the principles given in ETSI EG 203 367 [i.3] "Guide to the application of harmonised standards covering articles 3.1(b) and 3.2 of the Directive 2014/53/EU (RED) to multi-radio and combined radio and non-radio equipment".

The present document contains the measurements, emission limits and performance criteria that are necessary for the assessment of a combination of a non-radio and a radio product (which is called "Δ" in ETSI EG 203 367 [i.3]).

1 Scope

The present document defines requirements in respect of ElectroMagnetic Compatibility (EMC) for combined and/or integrated equipment intended to be used within residential, commercial and light industry locations.

The present document is only applicable to combined and/or integrated equipment where the radio function is within the scope of one or more of the standards listed in clause 2.1.2 (covering references [1] to [7]) and where the non-radio function is within the scope of one or more of the standards listed in clause 2.1.3 (covering references [8] to [39]).

Requirements applicable to the antenna port specifically related to the efficient use of radio spectrum are not included in the present document.

NOTE: These requirements are generally found in the applicable product standard(s) for the effective use of the radio spectrum.

2 References

2.1 Normative references

2.1.1 General

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 1: 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.

In addition, within the present document, some references are non-specific. The applicable version listed in the OJEU under the Directives 2014/53/EU [i.1] or 2014/30/EU [i.2] may be used.

NOTE 2: Before the date of withdrawal, a preceding version may be used (see clause 2.4 of the Technical Working Procedures in the ETSI Directives).

2.1.2 Radio EMC standards

[1] ETSI EN 301 489-1: "ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU".

[2] ETSI EN 301 489-3: "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 40 GHz".

[3] ETSI EN 301 489-5: "ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 5: Specific conditions for Private land Mobile Radio (PMR) and ancillary equipment (speech and non-speech) and Terrestrial Trunked Radio (TETRA) Harmonised Standard covering the essential requirements of article 3.1(b) of the Directive 2014/53/EU".

[4] ETSI EN 301 489-6: "ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 6: Specific conditions for Digital Enhanced Cordless Telecommunications (DECT) equipment; Harmonised Standard covering the essential requirements of article 3.1(b) of the Directive 2014/53/EU".

[5] ETSI EN 301 489-17: "ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU".

[6] ETSI EN 301 489-19: "Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 19: Specific conditions for Receive Only Mobile Earth Stations (ROMES) operating in the 1,5 GHz band providing data communications".

[7] ETSI EN 301 489-33: "ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 33: Specific conditions for Ultra-WideBand (UWB) devices; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU".

2.1.3 Non-radio EMC standards

[8] CENELEC EN 50065-1: "Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148,5 kHz - Part 1: General requirements, frequency bands and electromagnetic disturbances".

[9] CENELEC EN 50065-2-1: "Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148,5 kHz - Part 2-1: Immunity requirements for mains communications equipment and systems operating in the range of frequencies 95 kHz to 148,5 kHz and intended for use in residential, commercial and light industrial environments".

[10] CENELEC EN 50065-2-3: "Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148,5 kHz - Part 2-3: Immunity requirements for mains communications equipment and systems operating in the range of frequencies 3 kHz to 95 kHz and intended for use by electricity suppliers and distributors".

[11] CENELEC EN 50130-4: "Alarm systems - Part 4: Electromagnetic compatibility - Product family standard: Immunity requirements for components of fire, intruder, hold up, CCTV, access control and social alarm systems".

[12] CENELEC EN 50412-2-1: "Power line communication apparatus and systems used in low-voltage installations in the frequency range 1,6 MHz to 30 MHz - Part 2-1: Residential, commercial and industrial environment - Immunity requirements".

[13] CENELEC EN 50491-5-1: "General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) - Part 5-1: EMC requirements, conditions and test set-up".

[14] CENELEC EN 50491-5-2: "General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) - Part 5-2: EMC requirements for HBES/BACS used in residential, commercial and light industry environment".

[15] CENELEC EN 50561-1: "Power line communication apparatus used in low-voltage installations - Radio disturbance characteristics - Limits and methods of measurement - Part 1: Apparatus for in-home use".

[16] CENELEC EN 50561-3: "Power line communication apparatus used in low-voltage installations - Radio disturbance characteristics - Limits and methods of measurement - Part 3: Apparatus operating above 30 MHz".

[17] CENELEC EN 55011: "Industrial, scientific and medical equipment. Radio-frequency disturbance characteristics. Limits and methods of measurement".

[18] CENELEC EN 55014-1: "Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission".

[19] CENELEC EN 55014-2: "Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 2: Immunity - Product family standard".

[20] CENELEC EN 55015: "Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment".

[21] CENELEC EN 55020: "Sound and television broadcast receivers and associated equipment - Immunity characteristics - Limits and methods of measurement".

[22] CENELEC EN 55024: "Information technology equipment - Immunity characteristics - Limits and methods of measurement".

[23] CENELEC EN 55032: "Electromagnetic compatibility of multimedia equipment - Emission Requirements".

NOTE: CENELEC EN 55032 also covers broadcast receivers.

[24] CENELEC EN 55035: "Electromagnetic compatibility of multimedia equipment - Immunity requirements".

[25] CENELEC EN 55103-2: "Electromagnetic compatibility - Product family standard for audio, video, audio-visual and entertainment lighting control apparatus for professional use - Part 2: Immunity".

[26] CENELEC EN 50270: "Electromagnetic compatibility. Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen".

[27] CENELEC EN 60730-1: "Automatic electrical controls - Part 1: General requirements".

[28] CENELEC EN 60974-10: "Arc welding equipment - Part 10: Electromagnetic compatibility (EMC) requirements".

[29] CENELEC EN 61000-6-1: "Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments".

[30] CENELEC EN 61000-6-3: "Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments".

[31] CENELEC EN 61326-1: "Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements".

[32] CENELEC EN 61326-2-2: "Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-2: Particular requirements - Test configurations, operational conditions and performance criteria for portable test, measuring and monitoring equipment used in low-voltage distribution systems".

[33] CENELEC EN 61326-2-3: "Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-3: Particular requirements - Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning".

[34] CENELEC EN 61326-2-4 (2013): "Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-4: Particular requirements - Test configurations, operational conditions and performance criteria for insulation monitoring devices according to IEC 61557-8 and for equipment for insulation fault location according to IEC 61557-9".

[35] CENELEC EN 61326-2-5: "Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-5: Particular requirements - Test configurations, operational conditions and performance criteria for devices with field bus interfaces according to IEC 61784-1".

[36] CENELEC EN 61547: "Equipment for general lighting purposes - EMC immunity requirements".

[37] CENELEC EN 61800-3: "Adjustable speed electrical power drive systems - Part 3: EMC requirements and specific test methods".

[38] CENELEC EN 62135-2: "Resistance welding equipment - Part 2: Electromagnetic compatibility (EMC) requirements".

[39] ETSI EN 300 386: "Telecommunication network equipment; ElectroMagnetic Compatibility (EMC) requirements; Harmonised Standard covering the essential requirements of the Directive 2014/30/EU".

2.1.4 Other EMC standards

[40] CENELEC EN 61000-3-2 (2014): "Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)".

[41] CENELEC EN 61000-3-3 (2013): "Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current <= 16 A per phase and not subject to conditional connection".

[42] CENELEC EN 61000-3-11 (2000): "Electromagnetic compatibility (EMC) - Part 3-11: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems - Equipment with rated current <= 75 A and subject to conditional connection".

[43] CENELEC EN 61000-3-12 (2011): "Electromagnetic compatibility (EMC) - Part 3-12: Limits - Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current > 16 A and <= 75 A per phase".

[44] CENELEC EN 61000-6-3 (2007) and A1 (2011): "Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments".

[45] CENELEC EN 55032 (2015) and AC (2016): "Electromagnetic compatibility of multimedia equipment - Emission requirements".

NOTE: The standards referenced in clause 2.1.4 do not define the scope of the present document. They are only referenced in the sense of a basic standard for a specific measurement.

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] Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (recast).

[i.3] ETSI EG 203 367: "Guide to the application of harmonised standards covering articles 3.1b and 3.2 of the Directive 2014/53/EU (RED) to multi-radio and combined radio and non-radio equipment".

[i.4] Recommendation ITU-R SM.329: "Unwanted emissions in the spurious domain".

3 Definition of terms, symbols and abbreviations

3.1 Terms

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

AC mains power port: port that connects to the low voltage AC mains power network for the sole purpose of supplying electrical energy to the EUT

antenna port: port, for connection of an antenna used for intentional transmission and/or reception of radiated RF energy

auxiliary equipment: equipment needed to exercise and/or monitor the operation of the EUT

NOTE 1: Auxiliary equipment may be either local (within the measurement or test area) or remote.

NOTE 2: This is also known as associated equipment in other standards (e.g. CENELEC EN 55032 [45]).

combined equipment: equipment consisting of two or more products, at least one of which is radio communication or radio determination equipment and at least one of which is non-radio equipment

EXAMPLE: A radio enabled washing machine, where the radio functionality is embedded by incorporating a radio module, which may be assessed separated from the host.

commercial, public and light-industrial location: Location exemplified by areas of the city centre, offices, public transport systems (road/train/underground), and modern business centres containing a concentration of office automation equipment (PCs, fax machines, photocopiers, telephones, etc.), and characterized by the fact that equipment is directly connected to a low-voltage public mains network or connected to a dedicated DC source which is intended to interface between the equipment and the low-voltage mains network.

Examples of commercial, public or light-industrial locations are:

- retail outlets, for example shops, supermarkets;
- business premises, for example offices, banks, hotels, data centres;
- areas of public entertainment, for example cinemas, public bars, dance halls;
- places of worship, for example temples, churches, mosques, synagogues;
- outdoor locations, for example petrol stations, car parks, amusement and sports centres;
- general public locations for example park, amusement facilities, public offices;
- hospitals, educational institutions, for example schools, universities, colleges;
- public traffic area, railway stations, and public areas of an airport;
- light-industrial locations, for example workshops, laboratories, service centres.

conditional connection: Connection of equipment under specific conditions, as explained in CENELEC EN 61000-3-11 [42].

configuration: operational conditions of the EUT and AE, consisting of the set of hardware elements selected to comprise the EUT and AE, mode of operation used to exercise the EUT and arrangement of the EUT and AE

DC distribution network: local supply network in the infrastructure of a site or building intended for use by one or more different types of equipment and providing power independent of the public mains network

NOTE: Connection to a remote local battery is not regarded as a DC distribution network, if such a link comprises only power supply for a single piece of equipment.

DC power port: port used to connect to a low voltage DC power generating system, energy storage or DC distribution network to power the equipment

exclusion band(s): frequency range(s) where during immunity test, the radio functionality is not required to meet the performance criteria defined for the specific test and where the emissions are not assessed

NOTE: Further information on exclusion bands can be found in Annex B.

function: operation carried out by an equipment

NOTE: Functions are related to basic technologies incorporated in the equipment such as radio reception, radio transmission, emitting light, conversion of physical dimensions to electrical signals.

integrated equipment: combined equipment which cannot be physically separated into radio and non-radio constituent products that can be assessed individually

EXAMPLE: A radio enabled LED light bulb, where the radio functionality is completely incorporated on the printed circuit board (PCB) of the host appliance, and cannot be assessed separately from the host.

manufacturer: any natural or legal person who manufactures equipment or has equipment designed or manufactured, and markets that equipment under his name or trade mark

PLC port: port for the purpose of data transfer and communications that may also carry electrical energy to or from the EUT

NOTE 1: PLC ports are also called PLT ports.

NOTE 2: A PLC port is not considered a wired network port in the sense of this definition.

port: particular interface, of the specified equipment, with the electromagnetic environment

NOTE 1: For example, any connection point on an equipment intended for connection of cables to or from that equipment is considered as a port (see figure 1).

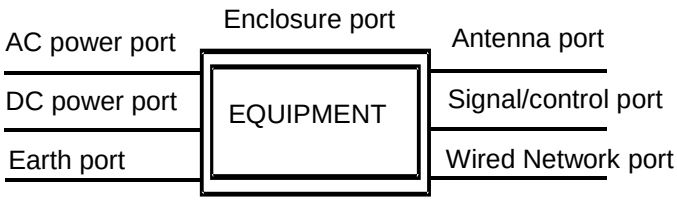

Figure 1: Examples of ports

NOTE 2: An interface, which uses optical fibre, is not a port for the purposes of testing because it does not interact with the electromagnetic environment within the frequency range, which is applicable for the present document. An optical fibre interface may still be used in the assessment of performance.

NOTE 3: In the case of integral antenna equipment the antenna port is the same as the enclosure port.

product: constituent part of a combined equipment (i.e. radio product or non-radio product)

radio equipment: "*An electrical or electronic product, which intentionally emits and/or receives radio waves for the purpose of radio communication and/or radio determination, or an electrical or electronic product which must be completed with an accessory, such as antenna, so as to intentionally emit and/or receive radio waves for the purpose of radio communication and/or radio determination*", definition from Directive 2014/53/EU [i.1].

radio module: piece of a radio equipment providing the radio function

residential location: location which exists as an area of land designated for the construction of domestic dwellings, and is characterized by the fact that equipment is directly connected to a low-voltage public mains network or connected to a dedicated DC source which is intended to interface between the equipment and the low-voltage mains network

NOTE: The function of a domestic dwelling is to provide a place for one or more people to live. A dwelling can be a single, separate building (as in a detached house) or a separate section of a larger building (as in an apartment in an apartment block).

wired network port: point of connection for voice, data and signalling transfers intended to interconnect widely dispersed systems by direct connection to a single-user or multi-user communication network (for example PSTN, ISDN, xDSL, LAN and similar networks)

NOTE: These ports may support screened or unscreened cables and may also carry AC or DC power where this is an integral part of the telecommunication specification.

3.2 Symbols

Void.

3.3 Abbreviations

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

AC	Alternating Current
AE	Auxiliary Equipment
DC	Direct Current
EM	ElectroMagnetic
EMC	ElectroMagnetic Compatibility
EUT	Equipment Under Test

NOTE: The complete combined and/or integrated equipment.

LAN	Local Area Network
OJEU	Official Journal of the European Union
PLC	Power Line Communication

4 EMC requirements

4.1 Introduction

The configuration(s) of the EUT in typical intended use shall be assessed according to the requirements in clauses 4.2 and 4.3. The configuration(s) of the EUT should be established in order to:

- maximize the emissions of the EUT;
- ensure the EUT is most susceptible to the effects of external electromagnetic interference.

Further guidance on the choice of test configuration(s) can be found in Annex A.

For the non-radio function, this configuration can be achieved by satisfying the requirements of the applicable non-radio EMC standard listed in clause 2.1.3. The configuration of the radio function shall be in accordance with the applicable radio EMC standard listed in clause 2.1.2. The configuration(s) used shall be recorded in the test report together with the rationale for these choices.

Where the applicable non-radio EMC standard and the applicable radio EMC standard refer to different editions of a basic test standard, for conducted tests the edition referred to in the applicable non-radio EMC standard shall be used, whereas for radiated tests the edition referred to in the applicable radio EMC standard shall be used.

Where there are alternative test methods and test configurations in the present document, those selected shall be detailed in the test report according to the applied standard, so that it is possible to use it for re-testing to ensure consistency of the results.

Where it has been shown from the electrical characteristics and intended usage of the EUT that one or more measurements are unnecessary, the decision and justification not to perform these measurements shall be recorded.

4.2 Emissions requirements

4.2.1 Radiated Emissions

For radiated emissions, the EUT with the radio function in standby or receive mode shall be assessed against the applicable non-radio EMC standard(s) as listed in clause 2.1.3.

Alternatively, the EUT may be assessed with the radio function in transmit mode. In this case, the EUT shall comply with the applicable non-radio EMC standard(s) as listed in clause 2.1.3 except within the exclusion band(s) defined in the applicable radio EMC standard(s) listed in clause 2.1.2.

NOTE 1: The transmit mode of the radio function is part of the assessment under article 3.2 of the Directive 2014/53/EU [i.1] applicable to the radio technology used.

NOTE 2: To prevent saturation of the measuring receiver, the good practice is to include filter(s) rejecting the transmitter frequency in the measurement chain.

If the upper frequency of this assessment is below 6 GHz, then the test requirements (while keeping the EUT configuration from the non-radio EMC standard as listed in clause 2.1.3) of CENELEC EN 55032 [45] shall apply from this upper frequency to the maximum derived from CENELEC EN 55032 [45] table 1.

NOTE 3: While applying table 1 of CENELEC EN 55032 [45] the EUT is considered to be the combined and/or integrated equipment as defined in the present document. Therefore the highest internal frequency of the EUT includes the radio module.

NOTE 4: During the assessment, it may be beneficial to utilize results from the spurious emission testing under the requirements of article 3.2 of Directive 2014/53/EU [i.1]. To convert between effective radiated power and field strength Recommendation ITU-R SM.329 [i.4] may be used.

4.2.2 Conducted Emissions

4.2.2.1 Special provisions

Where the wired network port provides AC or DC power as an integral part of a telecommunication function, they shall only be tested as wired network ports.

4.2.2.2 AC Power port

For conducted emissions on the AC power port(s), the EUT shall be assessed against the applicable non-radio EMC standard(s) as listed in clause 2.1.3.

The exclusion band(s) defined in the applicable radio EMC standard(s) listed in clause 2.1.2 shall be applied.

4.2.2.3 PLC port

Where the A.C power port of the equipment is also used for PLC communication up to 30 MHz, the EUT shall comply with the requirements of CENELEC EN 50561-1 [15], clause 6.

Where the A.C power port of the equipment is also used for PLC communication above 30 MHz, the EUT shall comply with the requirements of CENELEC EN 50561-3 [16], clause 6.

The exclusion band(s) defined in the applicable radio EMC standard(s) listed in clause 2.1.2 shall be applied.

4.2.2.4 DC power port

For conducted emissions on the DC power port(s), the EUT shall be assessed against the applicable non-radio EMC standard(s) as listed in clause 2.1.3.

Where the applicable non-radio EMC standard(s) listed in clause 2.1.3 do not contain test methods and limits and where according to the manufacturer's specification the DC power ports are connected to the power supply with a cable longer than 3 m, the EUT shall meet the requirements given in CENELEC EN 61000-6-3 [30] table 3.

The exclusion band(s) defined in the applicable radio EMC standard(s) listed in clause 2.1.2 shall be applied.

4.2.2.5 Wired network port

For conducted emissions on the wired network port(s), the EUT shall be assessed against the applicable non-radio EMC standard(s) as listed in clause 2.1.3.

Where the applicable non-radio EMC standard(s) listed in clause 2.1.3 do not contain test methods and limits, the EUT shall meet the requirements given in CENELEC EN 55032 [45].

The exclusion band(s) defined in the applicable radio EMC standard(s) listed in clause 2.1.2 shall be applied.

4.2.2.6 Antenna Port

Where the EUT has a port intended for the connection of an external antenna via coaxial cable longer than 3 m, the requirements of CENELEC EN 55032 [45], clause A.3 for antenna ports shall apply. In the case where non-compliance can be attributed to the transmission of the wanted signal from the EUT, these shall be disregarded.

The exclusion band(s) defined in the applicable radio EMC standard(s) listed in clause 2.1.2 shall be applied.

4.2.3 Harmonic current emissions (AC mains input port)

Harmonic current emissions shall be assessed according to the applicable non-radio EMC-Standard as listed in clause 2.1.3. If that standard does not contain requirements for harmonic current emissions, the following shall apply:

- the requirements of CENELEC EN 61000-3-2 [40] apply to equipment with a rated input current up to 16 A and intended to be connected to the public low voltage network; or
- the requirements of CENELEC EN 61000-3-12 [43] apply to equipment with a rated input current exceeding 16 A, up to and including 75 A and intended to be connected to the public low voltage network.

4.2.4 Voltage fluctuations and flicker (AC mains input port)

Voltage fluctuation and flicker shall be assessed according to the applicable non-radio EMC-Standard as listed in clause 2.1.3. If that standard does not contain requirements for voltage fluctuation and flicker, the following shall apply:

- the requirements of CENELEC EN 61000-3-3 [41] apply to equipment with a rated input current up to 16 A and intended to be connected to the public low voltage network. Alternatively, for such equipment the requirements of CENELEC EN 61000-3-11 [42] can be applied, if a conditional connection is needed; or
- the requirements of CENELEC EN 61000-3-11 [42] apply to equipment with a rated input current exceeding 16 A, up to and including 75 A and intended to be connected to the public low voltage network.

4.3 Immunity requirements

4.3.1 General

The radio function of the EUT shall be tested against the requirements of the applicable radio EMC standard(s) listed in clause 2.1.2 and the non-radio function of the EUT shall be tested against the applicable non-radio EMC standard(s) listed in clause 2.1.3. To reduce the amount of testing, it is recommended that one or more configuration(s) are selected that exercise these functions simultaneously during the application of each test.

Where the radio and the non-radio functions have been tested separately, an additional assessment of the EUT shall be performed.

NOTE 1: As an example, the evaluation of the print and radio functions of the EUT may be performed while receiving data from a Wireless LAN port. This allows the functions to be exercised in parallel during a single test, thus reducing test time.

Where immunity requirements are in conflict between those defined in the applicable radio EMC standard(s) defined in clause 2.1.2 and those defined in the applicable non-radio EMC standard(s) defined in clause 2.1.3, the least stringent requirement shall apply, unless otherwise defined in clauses 4.3.4 to 4.3.10.

NOTE 2: For example, the applicable product standard may apply criterion C whilst the radio standard applies criterion B, hence during testing the host may not operate so the radio function cannot be assessed, hence criterion C applies to the combined and/or integrated equipment.

4.3.2 Configuration of the equipment during immunity tests

The configuration(s) of the EUT as defined in the applicable non-radio EMC standard(s) listed in clause 2.1.3 shall be used.

The radio function shall be set into the operating mode(s) as defined in the applicable radio EMC standard(s) listed in clause 2.1.2.

In order to minimize the number of tests, when possible and when this is representative of a normal use, different operating modes may be tested simultaneously (e.g. printing or washing with Wi-Fi connection established).

Configuration(s) used during the tests shall be detailed in the test report.

4.3.3 Performance criteria

The performance of the radio communications function(s) shall comply with the performance criteria of the applicable radio EMC standard(s) listed in clause 2.1.2.

The other functions shall comply with the performance criteria defined in the applicable non-radio EMC standard(s) listed in clause 2.1.3.

Performance criteria applied during the tests shall be detailed in the test report.

4.3.4 Radiated Immunity

The radio and non-radio functions of the EUT shall meet the immunity requirements of the applicable non-radio EMC standard(s) listed in clause 2.1.3. Where the frequency range in these standards does not fully cover 80 MHz to 6 GHz, or where only spot frequencies in this range are specified, the radio function shall meet the requirements of the applicable radio EMC standard(s) listed in clause 2.1.2 for the frequency range(s) not covered within the 80 MHz to 6 GHz range.

Where the radio function is operational during the test, the exclusion band(s) defined in the applicable radio EMC standard(s) listed in clause 2.1.2 shall only be applied when assessing the radio function.

NOTE: Additional measures might be necessary to avoid damaging of the radio when performing tests within the frequency range of the exclusion band(s) (e.g. adding an attenuator to the antenna port or removal/shielding of the antenna).

4.3.5 Electrostatic discharge

The EUT shall be assessed against the requirements defined in the applicable non-radio EMC standard(s) listed in clause 2.1.3.

4.3.6 Fast transients, common mode

The EUT shall be assessed against the requirements defined in the applicable non-radio EMC standard(s) listed in clause 2.1.3.

4.3.7 Radio frequency, common mode

The EUT shall be assessed against the requirements defined in the applicable non-radio EMC standard(s) listed in clause 2.1.3.

The exclusion band(s) defined in the applicable radio EMC standard(s) listed in clause 2.1.2 shall only be applied when assessing the radio function.

NOTE: Additional measures might be necessary to avoid damaging of the radio when performing tests within the frequency range of the exclusion band(s) (e.g. adding an attenuator to the antenna port or removal/shielding of the antenna).

4.3.8 Voltage dips and interruptions

The EUT shall be assessed against the requirements defined in the applicable non-radio EMC standard(s) listed in clause 2.1.3.

4.3.9 Surges

The EUT shall be assessed against the requirements defined in the applicable non-radio EMC standard(s) listed in clause 2.1.3.

4.3.10 Other immunity tests

If the applicable non-radio EMC standard(s) listed in clause 2.1.3 contain(s) further immunity test requirements than those defined in the previous clauses, then these requirements also apply to the EUT.

Where these immunity tests are of a continuous nature like the tests covered by clauses 4.3.4 or 4.3.7, then the exclusion band(s) defined in the applicable radio EMC standard(s) listed in clause 2.1.2 shall only be applied when assessing the radio function.

NOTE: Additional measures might be necessary to avoid damaging of the radio when performing tests within the frequency range of the exclusion band(s) (e.g. adding an attenuator to the antenna port or removal/shielding of the antenna).

Annex A (informative): Guidance for the choice of configurations for the measurements on combined equipment

Clause 4.1 of the present document requires the test of at least one configuration of typical intended use according to the requirements in clauses 4.2 and 4.3 with both non-radio and radio functions operating at the same time.

These simultaneous test(s) have been introduced so that possible interactions, for example; intermodulation between the radio part and the non-radio part of the combined equipment are taken into account when determining compliance with the EMC requirements. Manufacturers should choose a configuration, which is stable enough to carry out the measurements without the use of special test modes. The configuration chosen should be able to maintain operation for the duration of the required test. Should special evaluation procedures be required, these will usually exist in the EMC product standard.

The test configuration includes:

- set of connected hardware elements (EUT and AE);
- arrangement of the EUT, AE and the cables;
- operating modes of the EUT.

To find a suitable configuration for testing, the manufacturer needs to follow the principles set out above and evaluate if different modes of operation of the EUT have an impact on the performance of the radio and thereby an impact on the EMC behaviour of the EUT. As a result of that evaluation a range of configurations or a simplified test may be chosen.

NOTE: If e.g. discontinuous disturbances caused by the switching of large loads in specific configurations do not influence the radio performance of the EUT, they may be disregarded for particular tests.

Annex B (informative): Exclusion bands

Where required by clauses in the present document exclusion bands are derived from the standard(s) referenced in table B.1 applicable to the radio technology deployed within the combined and/or integrated equipment under assessment. Where multiple radio technologies are deployed within the same equipment all of the relevant exclusion bands are applied.

It should be noted that the exclusion bands applied during immunity testing may differ from those applied during emission testing.

Table B.1: Exclusion band references

Radio technology	Exclusion bands defined in
Bluetooth® (Bluetooth® LE included), ZigBee®, Wi-Fi®	ETSI EN 301 489-17 [5], clause 4.3
Non-Specific SRD	ETSI EN 301 489-3 [2], clause 4.3
WiGig®	No exclusion bands applied
DECT®	ETSI EN 301 489-6 [4], clause 4.3
NOTE 1: Other technologies have their exclusion band(s) according to the applicable radio EMC standard(s) listed in clause 2.1.2 of the present document or ETSI EN 301 489-1 [1], clause 4.3 if a specific radio technology part does not exist.	
NOTE 2: The Bluetooth® word mark is a registered trademark owned by Bluetooth SIG, Incorporation. This information is given for the convenience of the user of the present document and does not constitute an endorsement by ETSI. Equivalent technology may be used if it can be shown to lead to the same results.	
NOTE 3: The ZigBee® word mark is a registered trademark owned by the ZigBee Alliance. This information is given for the convenience of the user of the present document and does not constitute an endorsement by ETSI. Equivalent technology may be used if it can be shown to lead to the same results.	
NOTE 4: The Wi-Fi®and WiGig® word marks are registered trademarks owned by the Wi-Fi Alliance. This information is given for the convenience of the user of the present document and does not constitute an endorsement by ETSI. Equivalent technology may be used if it can be shown to lead to the same results.	

Annex C (informative): Change History

Version	Information about changes
1.1.0	First draft version as a European harmonised standard developed under the Commission's standardisation request C(2015) 5376. NOTE: This version was never released.
1.2.0	First draft version as a European standard.

History

Document history				
V1.1.0	March 2017	EN Approval Procedure	AP 20170615:	2017-03-17 to 2017-06-15
V1.2.0	March 2019	EN Approval Procedure	AP 20190611:	2019-03-13 to 2019-06-11