Draft ETSI EN 303 446-1 V1.1.0 (2017-03)

**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;
Harmonised Standard covering the essential requirements
of article 3.1(b) of Directive 2014/53/EU**

Reference
DEN/ERM-EMC-348-1

Keywords
EMC, harmonised standard

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

The present document can be downloaded from:
http://www.etsi.org/standards-search

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the only prevailing document is the print of the Portable Document Format (PDF) version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status.
Information on the current status of this and other ETSI documents is available at
https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx

If you find errors in the present document, please send your comment to one of the following services:
https://portal.etsi.org/People/CommiteeSupportStaff.aspx

Copyright Notification

Contents

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (https://ipr.etsi.org/).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

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.3] to provide one voluntary means of conforming to the essential requirements of Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC [i.1].

Once the present document is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of the present document given in table A.1 confers, within the limits of the scope of the present document, a presumption of conformity with the corresponding essential requirements of that Directive and associated EFTA regulations.

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	18 months after doa

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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

Introduction

The present document is based on the principles given in 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].

For equipment in the scope the present document contains all requirements for showing compliance of the combined and/or integrated equipment with article 3.1(b) of Directive 2014/53/EU [i.1]. For this purpose normative references to the appropriate product EMC standards are provided for the radio part(s), as well as for the non-radio part(s) of the combined and/or integrated equipment.

Furthermore it is determined which additional measurements, emission limits or performance criteria are necessary for the combination of a non-radio and a radio product (which is called "Δ" in ETSI EG 203 367 [i.4]).

Requirements for article 3.2 of Directive 2014/53/EU [i.1] (effective use of the spectrum) are not in the scope of the present document.

1 Scope

The present document defines requirements in respect of ElectroMagnetic Compatibility (EMC) under article 3.1(b) of Directive 2014/53/EU [i.1] 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 2.1.1 and where the non-radio function is within the scope of one or more of the standards listed in clause 2.1.2.

NOTE: Requirements applicable to the antenna port specifically related to the efficient use of radio spectrum are not included in the present document. These requirements are found in the applicable product standards for the effective use of the radio spectrum under article 3.2 of Directive 2014/53/EU [i.1].

2 References

2.1 Normative references

2.1.1 Radio EMC standards

References are specific, identified by date of publication and/or edition number or version number. Only the cited version 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 (V2.2.0) (03-2017): "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 (V2.1.1) (03-2017): "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 246 GHz; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU".

[3] ETSI EN 301 489-6 (V2.2.0) (03-2017): "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".

[4] ETSI EN 301 489-17 (V3.2.0) (03-2017): "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".

[5] ETSI EN 301 489-33 (V2.2.0) (03-2017): "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".

[6] ETSI EN 301 489-52 (V1.1.0) (11-2016): "ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 52: Specific conditions for Cellular Communication Mobile and portable (UE) radio and ancillary equipment; Harmonised Standard covering the essential requirements of article 3.1b of Directive 2014/53/EU".

2.1.2 Non-radio EMC standards

[7] CENELEC EN 50065-1 (2011): "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".

[8] CENELEC EN 50065-2-1 (2003) and A1 (2005): "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".

[9] CENELEC EN 50065-2-3 (2003) and A1 (2005): "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".

[10] CENELEC EN 50130-4 (2011) and A1 (2014): "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".

[11] CENELEC EN 50412-2-1 (2005): "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".

[12] CENELEC EN 50491-5-1 (2010): "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".

[13] CENELEC EN 50491-5-2 (2010): "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".

[14] CENELEC EN 55011 (2016): "Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement".

[15] CENELEC EN 55014-1 (2016): "Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission".

[16] CENELEC EN 55014-2 (2015): "Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 2: Immunity - Product family standard".

[17] CENELEC EN 55015 (2013) and A1 (2015): "Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment".

[18] CENELEC EN 55024 (2010) and A1 (2015): "Information technology equipment - Immunity characteristics - Limits and methods of measurement".

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

[20] CENELEC EN 60974-10 (2014) and A1 (2015): "Arc welding equipment - Part 10: Electromagnetic compatibility (EMC) requirements".

[21] CENELEC EN 61000-6-3 (2007), A1 (2011) and AC (2012): "Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments".

[22] CENELEC EN 61000-6-1 (2007): "Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments".

[23] CENELEC EN 61326-1 (2013): "Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements".

[24] CENELEC EN 61326-2-2 (2013): "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".

[25] CENELEC EN 61326-2-3 (2013): "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".

[26] 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".

[27] CENELEC EN 61326-2-5 (2013): "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".

[28] CENELEC EN 61547 (2009): "Equipment for general lighting purposes - EMC immunity requirements".

[29] CENELEC EN 61800-3 (2004) and A1 (2012): "Adjustable speed electrical power drive systems - Part 3: EMC requirements and specific test methods".

[30] CENELEC EN 62135-2 (2015): "Resistance welding equipment - Part 2: Electromagnetic compatibility (EMC) requirements".

[31] ETSI EN 300 386 (V1.6.1) (09-2012): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Telecommunication network equipment; ElectroMagnetic Compatibility (EMC) requirements".

[32] ETSI EN 300 386 (V2.1.1) (07-2016): "Telecommunication network equipment; ElectroMagnetic Compatibility (EMC) requirements; Harmonised Standard covering the essential requirements of the Directive 2014/30/EU".

[33] CENELEC EN 50561-1 (2013) and AC (2015): "Power line communication apparatus used in low-voltage installations - Radio disturbance characteristics - Limits and methods of measurement - Part 1: Apparatus for in-home use".

[34] CENELEC EN 50561-3 (2016): "Power line communication apparatus used in low-voltage installations - Radio disturbance characteristics - Limits and methods of measurement - Part 3: Apparatus operating above 30 MHz".

2.1.3 Other EMC standards

[35] 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)".

[36] 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".

[37] 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".

[38] 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".

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] Commission Implementing Decision C(2015) 5376 final of 04.08.2015 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.

[i.4] 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".

3 Definitions and abbreviations

3.1 Definitions

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

applicable non-radio EMC standard: standard that would be applicable to the equipment under the EMCD [i.2] if it did not contain any radio functionality

applicable radio EMC standard: standard that is applicable under RED article 3.1(b) [i.1] to the embedded radio transmitter and/or receiver depending on the used radio functionality

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

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 centers;
- 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 centers;
- 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 centers.

conditional connection: connection of equipment under specific conditions, as explained in CENELEC EN 61000-3-11 [37]

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

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

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, washing, etc.

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

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.

radio module: piece of a radio equipment allowing the radio function of this equipment

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 CATV, 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 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	Associated Equipment
DC	Direct Current
EM	ElectroMagnetic
EMC	ElectroMagnetic Compatibility
EUT	Equipment Under Test
PLC	Power Line Communication

4 EMC requirements

4.1 Introduction

At least one configuration of typical intended use shall be tested according to the requirements in clauses 4.2 and 4.3 with both non-radio and radio functions operating at the same time. The configuration of the EUT should be established in order to:

- maximize the emissions of the EUT;
- ensure the EUT is most susceptible;
- be typical of the intended use.

Further guidance on the choice of test configuration can be found in Annex B.

For the non-radio function, this configuration can be achieved by satisfying the requirements of the applicable non-radio EMC standard listed in clause 2.1.2. The configuration of the radio function shall be in accordance with the applicable radio EMC standard listed in clause 2.1.1. 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, either edition of the basic test standard may be applied when assessing the combined and/or integrated equipment.

Where a manufacturer determines 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 in the test report.

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.

4.2 Emissions requirements

4.2.1 Radiated Emissions

For radiated emissions, the EUT with the radio function in receive mode shall comply with the applicable non-radio EMC standard(s) as listed in clause 2.1.2.

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

Alternatively, the EUT may be assessed with the radio function in transmit mode. In this case the exclusion band(s) defined in the applicable radio EMC standard(s) listed in clause 2.1.1 shall be applied and the EUT still needs to comply with the applicable non-radio EMC standard(s) as listed in clause 2.1.2.

If the upper frequency range 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 2.1.2) of CENELEC EN 55032 [19] shall apply from this upper range frequency to a maximum of 6 GHz.

4.2.2 Conducted Emissions (AC power, PLC port, DC power, wired network ports)

4.2.2.1 Special provisions

Where the wired network port provides AC or DC power as part of a telecommunication specification, they shall 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 to the applicable non-radio EMC standard(s) as listed in clause 2.1.2.

The exclusion band(s) defined in the applicable radio EMC standard (s) listed in clause 2.1.1 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 [33], 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 [34], clause 6.

The exclusion band(s) defined in the applicable radio EMC standard (s) listed in clause 2.1.1 shall be applied.

4.2.2.4 DC power port

For conducted emissions on the DC power port(s), the EUT shall be assessed to the applicable non-radio EMC standard(s) listed in clause 2.1.1.

Where the applicable non-radio EMC standard(s) listed in clause 2.1.2 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 [21].

The exclusion band(s) defined in the applicable radio EMC standards listed in clause 2.1.1 shall be applied.

4.2.2.5 Wired network port

For conducted emissions on the wired network port(s), the EUT shall be assessed to the applicable non-radio EMC standard(s) as listed in clause 2.1.2.

Where the applicable non-radio EMC standard(s) listed in clause 2.1.2 do not contain test methods and limits, the EUT shall meet the requirements given in CENELEC EN 55032 [19].

The exclusion band(s) defined in the applicable radio EMC standards listed in clause 2.1.1 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, the requirements of CENELEC EN 55032 [19] for antenna ports shall apply. In the case where non compliances 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 standards listed in clause 2.1.1 shall be applied.

4.2.3 Harmonic current emissions (AC mains input port)

The requirements of CENELEC EN 61000-3-2 [35] apply to equipment with a rated input current up to 16 A and intended to be connected to the public low voltage network.

The requirements of CENELEC EN 61000-3-12 [38] 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)

The requirements of CENELEC EN 61000-3-3 [36] 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 [37] can be applied, if a conditional connection is needed.

The requirements of CENELEC EN 61000-3-11 [37] 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 2.1.1 and the non-radio function of the EUT shall be tested against the applicable non-radio EMC standard(s) defined in clause 2.1.2. To reduce the amount of testing, it is recommended to select one or more configuration 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 set of tests shall be performed with these functions operating simultaneously in a typical configuration of the EUT.

For this simultaneous testing, where immunity requirements are in conflict between those defined in the applicable radio EMC standard(s) defined in clause 2.1.1 and those defined in the applicable non-radio EMC standard(s) defined in clause 2.1.2, the least stringent requirement shall apply, unless otherwise defined in clauses 4.3.4 to 4.3.10.

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.

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.

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 2.1.2 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 2.1.1.

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 2.1.1.

The other functions shall comply with the performance criteria defined in the applicable non-radio EMC standard(s) listed in clause 2.1.2.

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 2.1.2. 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 2.1.1 for the frequency range(s) not covered.

When the radio function is operational during the test, the exclusion band(s) defined in the applicable radio EMC standard(s) listed in clause 2.1.1 shall be applied.

NOTE: If the radiated immunity test is also performed within the exclusion band(s), some additional measures might be necessary to avoid damage of the radio receiver.

4.3.5 Electrostatic discharge

The combined and/or integrated EUT shall be assessed to the requirements defined in the applicable non-radio EMC standard(s) listed in clause 2.1.2.

4.3.6 Fast transients, common mode

The combined and/or integrated EUT shall be assessed to the requirements defined in the applicable non-radio EMC standard(s) listed in clause 2.1.2.

4.3.7 Radio frequency, common mode

The exclusion band(s) defined in the applicable radio EMC standard(s) listed in clause 2.1.1 shall be applied.

NOTE: If the radio frequency common mode test is also performed within the exclusion band(s), some additional measures might be necessary to avoid damage of the radio receiver.

4.3.8 Voltage dips and interruptions

The combined and/or integrated EUT shall be assessed to the requirements defined in the applicable non-radio EMC standard(s) listed in clause 2.1.2.

4.3.9 Surges

The combined and/or integrated EUT shall be assessed to the requirements defined in the applicable non-radio EMC standard(s) listed in clause 2.1.2.

4.3.10 Other immunity tests

If the applicable non-radio EMC standard(s) listed in clause 2.1.2 contain(s) further immunity test requirements than defined in the previous clauses, than these requirements also apply to the combined and/or integrated EUT.

Where these immunity tests are of a continuous nature like the tests covered by clauses 4.3.4 or 4.3.7, than the exclusion band(s) defined in the applicable radio EMC standard (s) listed in clause 2.1.1 shall be applied.

NOTE: If other immunity tests are performed within the exclusion band(s), some additional measures might be necessary to avoid damage of the radio receiver.

Annex A (informative): Relationship between the present document and the essential requirements of Directive 2014/53/EU

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.3] 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.

Table A.1: Relationship between the present document and the essential requirements of Directive 2014/53/EU

Harmonised Standard ETSI EN 303 446-1				
Requirement			Requirement Conditionality	
No	**Description**	**Reference: Clause No**	**U/C**	**Condition**
1	Radiated Emissions	4.2.1	U	
2	Conducted Emissions, AC mains power ports	4.2.2.2	C	Only where equipment has AC mains power input and/or output ports
3	Conducted Emissions, PLC port	4.2.2.3	C	Only where equipment has a PLC port
4	Conducted Emissions, DC power ports	4.2.2.4	C	Only where equipment has DC power input and/or output ports with a cable length greater than 3 m
5	Conducted Emissions, Wired network ports	4.2.2.5	C	Only where equipment has wired network ports
6	Conducted Emissions, antenna port	4.2.2.6	C	Only where equipment has an antenna port
7	Harmonic current emission (AC mains input port)	4.2.3	C	Only where equipment has AC mains power input ports
8	Emission: Voltage fluctuations and flicker (AC mains input ports)	4.2.4	C	Only where equipment has AC mains power input ports
9	Radiated Immunity	4.3.4	U	
10	Immunity: Electrostatic discharge	4.3.5	U	
11	Immunity: Fast transients common mode	4.3.6	C	Only where equipment has AC mains, DC power input and/or output ports with a cable length greater than 3 m
12	Immunity: Radio frequency common mode	4.3.7	C	Only where equipment has AC mains, DC power input and/or output ports with a cable length greater than 3 m
13	Immunity: Voltage dips and interruptions	4.3.8	C	Only where equipment has AC mains power input ports
14	Immunity: Surges, line to line and line to ground	4.3.9	C	Only where equipment has AC mains power input ports and/or wired network ports
15	Immunity: Other immunity tests	4.3.10	C	If defined in the relevant non-radio EMC standards listed in clause 2.1.2

Key to columns:

Requirement:

No A unique identifier for one row of the table which may be used to identify a requirement.

Description A textual reference to the requirement.

Clause Number Identification of clause(s) defining the requirement in the present document unless another document is referenced explicitly.

Requirement Conditionality:

U/C Indicates whether the requirement is unconditionally applicable (U) or is conditional upon the manufacturer's claimed functionality of the equipment (C).

Condition Explains the conditions when the requirement is or is not applicable for a requirement which is classified "conditional".

Presumption of conformity stays valid only as long as a reference to the present document is maintained in the list published in the Official Journal of the European Union. Users of the present document should consult frequently the latest list published in the Official Journal of the European Union.

Other Union legislation may be applicable to the product(s) falling within the scope of the present document.

Annex B (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 article 3.1(b) of Directive 2014/53/EU [i.1]. 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 in clause 4.1 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 C (informative): Exclusion bands

Where required by clauses in the present document exclusion bands are derived from the standard(s) referenced in table C.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 C.1: Exclusion band references

Radio technology	Exclusion bands defined in
Cellular (GSM®, 3G, 4G and 5G included)	ETSI EN 301 489-52 [6], clause 4.3
Bluetooth® (Bluetooth® LE included), ZigBee®, Wi-Fi®	ETSI EN 301 489-17 [4], 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 [3], clause 4.3
NOTE 1: Other technologies have their exclusion band(s) according to the applicable radio EMC standard (s) listed in clause 2.1.1 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 D (informative): Change History

Version	Information about changes
1.1.1	First publication of the TS after approval by TC ERM at ERM#61 (21 – 24 February 2017, Sophia Antipolis) Rapporteur is Bettina Funk

History

Document history			
V1.1.0	March 2017	EN Approval Procedure	AP 20170615: 2017-03-17 to 2017-06-15