



**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**

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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.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.

The present document is part 3 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 |
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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).

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Introduction

The product family of Short Range Devices covers a wide range of equipment types, which may have different sets of performance criteria set out in the relevant radio standards and/or product standards.

The present document is intended for all SRD types and applies a standard set of performance criteria. This includes the requirement that the equipment continues to operate as intended under certain standardised conditions of EMC stress.

The term "Short Range Device" (SRD) is intended to cover the radio equipment which provides either uni-directional or bi-directional communication and which have low capability of causing interference to other radio equipment. SRDs use either integral, dedicated or external antennas and all modes of modulation can be permitted subject to relevant standards. For Short Range Devices individual licenses are normally not required.

1 Scope

The present document, together with ETSI EN 301 489-1 [1], covers the assessment of Short Range Devices (SRD) and ancillary equipment in respect of ElectroMagnetic Compatibility (EMC).

The present document specifies the applicable test conditions, performance assessment, and performance criteria for Short Range Devices (SRD) and the associated ancillary equipment.

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

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

Technical specifications related to the antenna port of radio equipment and radiated emissions from the enclosure port of radio equipment and combinations of radio and associated ancillary equipment are not included in the present document. Such technical specifications are normally found in the relevant product standards for the effective use of the radio spectrum.

The present document, together with ETSI EN 301 489-1 [1], are aimed to cover requirements to demonstrate an adequate level of electromagnetic compatibility.

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 (V2.1.0) (04-2016): "ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Harmonised Standard covering the essential requirements of article 3.1(b) of the Directive 2014/53/EU and the essential requirements of article 6 of the Directive 2014/30/EU; Part 1: Common technical requirements".

NOTE: Available at http://www.etsi.org/deliver/etsi_en/301400_301499/30148901/02.01.00_20/en_30148901v020100a.pdf.

- [2] ETSI EN 300 220-1 (V3.1.0) (05-2016): "Short Range Devices (SRD) operating in the frequency range 25 MHz to 1 000 MHz; Part 1: Technical characteristics and methods of 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] ETSI TR 103 088: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Using the ETSI EN 301 489 series of EMC standards".
- [i.3] 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 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in ETSI EN 301 489-1 [1], ETSI EN 300 220-1 [2] and in the Directive 2014/53/EU [i.3] apply, unless otherwise specified below:

(relevant) radio standard: harmonised standard that is applied for the purposes of determining compliance of the EUT with Article 3.2 of the Directive 2014/53/EU [i.3]

receiver: stand alone receiver or receiver being part of a transceiver

transmitter: stand alone transmitter or transmitter being part of a transceiver

3.2 Symbols

For the purposes of the present document, the symbols given in ETSI EN 301 489-1 [1] and in ETSI EN 300 220-1 [2] apply.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI EN 301 489-1 [1] and in ETSI EN 300 220-1 [2] apply.

4 Test conditions

4.1 General

Clause 4 describes details of the configuration and connections for testing of the EUT.

For the purposes of the present document, the test conditions of ETSI EN 301 489-1 [1], clause 4, shall apply as appropriate, except as varied and/or extended herein.

4.2 Environmental profile

The equipment shall be tested under normal test conditions according to the relevant radio standard.

The technical requirements of the present document apply under the environmental profile for operation of the EUT, which shall be declared by the manufacturer. The EUT shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the declared operational environmental profile.

4.3 Test signal connections

4.3.1 General

For the purposes of the present document, the requirements of ETSI EN 301 489-1 [1], clause 4.2, shall apply as appropriate, except as varied and/or extended herein.

The coupling mechanism for wanted RF signals between the EUT and the measuring and/or test equipment may include attenuation to control the level of the signals. The coupling mechanism shall be entirely passive so that the reciprocal path loss is the same.

4.3.2 Equipment with an external antenna connector

This clause applies to EUT with a conventional RF antenna connector. If access to the antenna connector involves modification or dismantling of the EUT then this clause does not apply.

The EUT shall be tested with its 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. Adequate measures shall be taken to minimize the effect of common mode currents on the transmission line at the point of entry to the EUT and at the measuring/test equipment.

4.3.3 Equipment without an external antenna connector (integral antenna)

This clause applies to EUT to which clause 4.3.2 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 normal intended use.

4.3.4 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, then:

- If clause 4.3.2 applies to all the antenna ports, then the EUT shall be tested according to clause 4.3.2.
- Otherwise it shall be tested according to clause 4.3.3.

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

4.4 Narrow band responses of receivers

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

4.5 Arrangements for testing

4.5.1 Testing transmitter and receiver together (as a system)

The provisions of ETSI EN 301 489-1 [1], clause 4.2.5, shall not apply. Stand alone receivers and transmitters shall be tested separately. Transceivers shall be tested so that operation in each direction is confirmed.

4.5.2 Operating modes

The EUT, whether transmitter, receiver, transceiver or multi-mode, will generally have one or more of the following operating modes:

- Power Off
- Standby (there may be more than one level of standby)
- Receive
- Transmit
- Duplex such as Frequency Division Duplex (FDD) or Time Division Duplex (TDD), or Time Division Multiple Access (TDMA)

An "off" condition in which the EUT is able to respond to a wake up event, other than mechanical operation of a power switch, is really a form of standby mode.

4.6 RF Exclusion bands

4.6.1 General

The provisions of ETSI EN 301 489-1 [1], clause 4.3 shall not apply.

The frequencies on which the EUT is intended to operate shall be excluded from the conducted and radiated RF emission and immunity tests.

4.6.2 Exclusion bands for emissions testing

4.6.2.1 Transmitters

The exclusion band shall be those frequencies specified in the relevant radio standard as the operating frequency band and the Out of Band domain.

Where this is not so specified the exclusions bands shall be as below:

- For transmitters operating, or intended to operate, in a channelized frequency band, the exclusion band is five times (i.e. $\pm 250\%$) the maximum operating channel width (OCW) allowed for that service, centred around the operating frequency.
- For wide band transmitters, i.e. transmitters in a non-channelized frequency band, the exclusion band is twice the intended operating frequency band centred around the centre frequency of the intended operating frequency band.

The exclusion band shall only apply when the EUT is in transmit mode of operation.

4.6.2.2 Receivers

No exclusion band applies.

4.6.2.3 Duplex and multi mode equipment

In the case of EUT tested with a simultaneous transmit and receive mode, the exclusion band used shall be the one for the transmitter. I.e. only one exclusion bands shall be applied.

In the case of transmitters capable of operating on more than one frequency band, testing shall be carried out on each band separately.

4.6.3 Exclusion bands for immunity testing

4.6.3.1 Transmitters

The exclusion band shall be as specified for emissions testing in clause 4.6.2.1.

4.6.3.2 Receivers

The exclusion band is based on an extension value.

The lower limit of the exclusion band is the lower edge of the Operating Channel (OC) minus the extension value, or zero, whichever is the greater.

The upper limit is the upper edge of the OC plus the extension value.

The extension value is given in table 1. The OC is defined in the relevant radio standard.

Table 1: Extension values

| Receiver operating frequency f_o | Extension value |
|------------------------------------|---|
| < 300 kHz | 300 kHz |
| 300 kHz to < 30 MHz | 3 MHz |
| 30 MHz to < 1 GHz | 15 MHz, or $5 \% \times f_o$, whichever is greater |
| 1 GHz to < 6 GHz | 100 MHz |
| ≥ 6 GHz | $5 \% \times f_o$ |

NOTE: The receiver exclusion band range aligns with the blocking test range defined in ETSI EN 300 220-1 [2].

4.6.3.3 Duplex and multi mode equipment

In the case of EUT tested with a simultaneous transmit and receive mode, the exclusion band used shall be the combination of the exclusion band for the transmitter and the exclusion band for the receiver. I.e. both exclusion bands shall be applied.

In the case of transmitters capable of operating on more than one frequency band, testing shall be carried out on each band separately.

In the case of receivers operating on more than one frequency, the exclusion band used shall be the combination of the exclusion bands for each frequency, i.e. an exclusion band for each frequency shall be applied.

NOTE: Where the frequencies are in the same operational frequency band, the result will usually be an enlarged single exclusion band. Where the frequencies are widely spaced, e.g. in different bands, the result will be to create multiple separate exclusion bands.

5 Performance assessment

5.1 General

Clause 5 describes the means by which the correct functioning of the EUT shall be assessed.

Clauses 5.2 relates to equipment with a communications function.

Clause 5.3 applies to equipment with a function other than communications.

For the purposes of the present document, the provisions of ETSI EN 301 489-1 [1], clause 5, shall apply as appropriate, except as varied and/or extended herein.

5.2 Continuous and non-continuous communication links

For the purposes of the present document, the provisions of ETSI EN 301 489-1 [1], clauses 5.2 and 5.3, shall not apply to assessment of communications links.

For EUT providing a continuous link, assessment of the correct functioning can generally be made immediately the EMC stress is applied.

Where this is not the case, it is necessary to take into account the maximum acceptable latency in the function of the EUT. Correct functioning requires completing the relevant operation within the maximum latency time.

Where the maximum latency is specified in the relevant radio standard (in the wanted performance criterion, or an acknowledge requirement), that value shall be used.

Where this is not the case, then the value shall be specified by the manufacturer.

5.3 Functions other than a communications link

For the purposes of the present document, the provisions of ETSI EN 301 489-1 [1], clause 5.3, shall apply for assessment of functions other than communications links.

5.4 Associated test equipment

For the purposes of demonstrating correct functioning, the EUT may be required to interact with associated equipment, generally outside the measurement area.

The associated equipment may be:

- standard test or measuring equipment
- a device similar to the EUT
- ancillary equipment
- special test equipment
- a simulator

Where necessary the associated equipment may be specified and/or supplied by the provider.

5.5 Ancillary equipment

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

5.6 Equipment classification

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

6 Performance Criteria

6.1 Introduction

For the purposes of the present document the provisions of ETSI EN 301 489-1 [1], clause 6, shall not apply.

The performance criteria are used to make an assessment whether a radio equipment passes or fails immunity tests.

6.2 Performance Criteria

In the table below:

- performance criterion A applies for immunity tests with phenomena of a continuous nature;
- performance criterion B applies for immunity tests with phenomena of a transient nature.

NOTE: Whether a phenomenon is considered transient, continuous or otherwise is indicated in the test procedures for the phenomenon in ETSI EN 301 489-1 [1], clause 9.

Table 2: Performance Requirements

| Criterion | During test | After test |
|-----------|--|---|
| A | Operate as intended No loss of function No unintentional responses | Operate as intended No loss of function No degradation of performance No loss of stored data or user programmable functions |
| B | May show loss of function No unintentional responses | Operate as intended Lost function(s) shall be self-recoverable No degradation of performance No loss of stored data or user programmable functions |

Where "operate as intended" or "no loss of function" is specified, the EUT shall demonstrate correct functioning as described in clause 5.

Where the EUT has more than one mode of operation (see clause 4.5.2), an unplanned transition from one mode to another is considered as an unintentional response. The EUT shall be tested in sufficient modes to confirm there are no such unintentional responses.

7 Applicability Overview

7.1 General

For the purposes of the present document, the provisions of ETSI EN 301 489-1 [1], clause 7, shall apply as appropriate, except as varied herein.

7.2 Special conditions for emissions

The provisions of ETSI EN 301 489-1 [1], clause 7.1 shall apply.

7.3 Special conditions for immunity

The following special conditions set out in table 3, relate to the immunity test methods and performance criteria used in ETSI EN 301 489-1 [1], clause 9.

Table 3: Special conditions for EMC immunity tests

| Reference to clauses in ETSI EN 301 489-1 [1] | Special product-related conditions, additional to or modifying the test conditions in ETSI EN 301 489-1 [1], clause 9 |
|--|--|
| 9.2.2: Test method; Radio frequency electromagnetic field | <p>The test shall be performed over the range 80 MHz to 2 700 MHz with the exception of the exclusion bands defined in clause 4.6.</p> <p>Where the EUT is subject to EMC Immunity testing under a Harmonised Standard of a Directive other than the Directive 2014/53/EU [i.3] then the modulating signal frequency specified in the that Harmonised Standard may be used. If this alternative modulating frequency is used, then the applicable Directive, Harmonised Standard & modulating frequency shall be noted in the test report.</p> |
| 9.5.2: Test method; Radio frequency, common mode | <p>Where the EUT is subject to EMC Immunity testing under a Harmonised Standard of a Directive other than the Directive 2014/53/EU [i.3] then the modulating signal frequency specified in the that Harmonised Standard may be used. If this alternative modulating frequency is used, then the applicable Directive, Harmonised Standard & modulating frequency shall be noted in the test report.</p> |

Annex A (normative): 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 301 489-3 | | | | |
|---------------------------------------|--|------------------------------|----------------------------|--|
| Requirement | | | Requirement Conditionality | |
| No | Description | Reference: Clause No | U/C | Condition |
| 1 | Enclosure of ancillary equipment measured on a stand alone basis | 8.2 of ETSI EN 301 489-1 [1] | U | |
| 2 | DC power input/output ports | 8.3 of ETSI EN 301 489-1 [1] | C | Only where equipment has DC power input and/or output ports with a cable length greater than 3m or from a vehicle power supply |
| 3 | AC mains power input/output ports | 8.4 of ETSI EN 301 489-1 [1] | C | Only where equipment has AC mains power input and/or output ports |
| 4 | Harmonic current emission (AC mains input port) | 8.5 of ETSI EN 301 489-1 [1] | C | Only where equipment has AC mains power input ports |
| 5 | Voltage fluctuations and flicker (AC mains input ports) | 8.6 of ETSI EN 301 489-1 [1] | C | Only where equipment has AC mains power input ports |
| 6 | Wired network ports | 8.7 of ETSI EN 301 489-1 [1] | C | Only where equipment has wired network ports |
| 7 | Radio frequency electromagnetic field (80 MHz to 6 000 MHz) | 7.3 | U | |
| 8 | Electrostatic discharge | 9.3 of ETSI EN 301 489-1 [1] | U | |
| 9 | Fast transients common mode | 9.4 of ETSI EN 301 489-1 [1] | U | |
| 10 | Radio frequency common mode | 7.3 | U | |
| 11 | Transients and surges in the vehicular environment | 9.6 of ETSI EN 301 489-1 [1] | C | Only where equipment is connected to vehicle power supply |
| 12 | Voltage dips and interruptions | 9.7 of ETSI EN 301 489-1 [1] | C | Only where equipment has AC mains power input ports |
| 13 | Surges, line to line and line to ground | 9.8 of ETSI EN 301 489-1 [1] | C | Only where equipment has AC mains power input ports and/or wired network ports |

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 shall be unconditionally applicable (U) or is conditional upon the manufacturers claimed functionality of the equipment (C). |
| Condition | Explains the conditions when the requirement shall or shall not be 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): Examples of Short Range Devices (SRD) in the scope of the present document

The present document relates to article 3.1(b) of the Directive 2014/53/EU [i.3]. For the purposes of article 3.2, the SRDs that fall within the scope of the present document are covered by a range of ETSI standards.

Further guidance and a partial list of the relevant article 3.2 standards may be found in ETSI TR 103 088 [i.2].

Annex C (informative): Change History

| Date | Version | Information about changes |
|------|---------|----------------------------------|
| 2016 | 2.1.1 | First publication of RED version |

History

| Document history | | |
|------------------|----------------|---|
| V1.2.1 | August 2000 | Publication |
| V1.3.1 | November 2001 | Publication |
| V1.4.1 | August 2002 | Publication |
| V1.6.1 | August 2013 | Publication |
| V2.1.0 | September 2016 | EN Approval Procedure AP 20161212: 2016-09-13 to 2016-12-12 |