

ETSI EN 301 489-3 V2.1.1 (2019-03)



**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 Harmonised European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

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].

National transposition dates	
Date of adoption of this EN:	8 May 2017
Date of latest announcement of this EN (doa):	30 June 2019
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 December 2019
Date of withdrawal of any conflicting National Standard (dow):	31 December 2020

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).

~~Technical specifications related to the antenna port and emissions from the enclosure port of Short Range Devices (SRD) are not included in the present document. Such technical specifications are found in the relevant product standards for the effective use of the radio spectrum.~~

~~Examples of SRDs are given in annex A.~~

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 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 (~~V1.9.2~~) (09-2011): ~~"Electromagnetic compatibility and Radio spectrum Matters (ERM); 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 300 220-1 (V3.1.1) (02-2017): "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.

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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 1999/5/EC~~2014/53/EU of the European Parliament and of the Council of ~~9 March 1999~~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 telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE repealing Directive)- 1999/5/EC.
- [i.2] ~~Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations.~~
- [i.3] ~~ETSI EN 300 220-1~~ETSI TR 103 088: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment to be used in Using the 25 MHz to 1 000 MHz frequency range with power levels ranging up to 500 mW; Part 1: Technical characteristics and test methods".
- ETSI EN 301 489 series of EMC standards".
- [i.3] ~~ETSI EN 300 330-1: "Electromagnetic compatibility~~Commission Implementing Decision C(2015) 5376 final of 4.8.2015 on a standardisation request to the European Committee for Electrotechnical Standardisation and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio to the European Telecommunications Standards Institute as regards radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz; Part 1: Technical characteristics and test methods".
- [i.5] ~~ETSI EN 300 440-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short range devices; Radio equipment to be used in the 1 GHz to 40 GHz frequency range; Part 1: Technical characteristics and test methods".~~
- [i.6] ~~ETSI EN 305 550-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment to be used in the 40 GHz to 246 GHz frequency range; Part 1: Technical characteristics and test methods".~~
- [i.7] ~~support of Directive 98/48/EC~~2014/53/EU of the European Parliament and of the Council of ~~20 July 1998 amending Directive 98/34/EC~~ laying down a procedure for the provision of information in the field of technical standards and regulations.

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-[41], ~~clause 3~~ETSI EN 300 220-1 [2] and in the followingDirective 2014/53/EU [i.1] apply, unless otherwise specified below:

~~**device type:** classification of devices based on the risk assessment of communication link performance~~

(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.1]

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

~~**receiver category:** set of relevant receiver requirements and minimum performance criteria~~

Short Range Device (SRD): piece of apparatus which includes a transmitter, and/or a receiver and or parts thereof, used in alarm, telecommand and telemetry applications, etc. operating with analogue speech/music or data (analogue and/or digital) or with combined analogue speech/music and data, using any modulation type

NOTE: ~~These devices can be used in a fixed, mobile or portable application.~~

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

3.2 Abbreviations Symbols

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

3.3 Abbreviations

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

AC	Alternating Current
CR	Continuous phenomena applied to Receivers
CT	Continuous phenomena applied to Transmitters
DC	Direct Current
EMC	ElectroMagnetic Compatibility
EUT	Equipment Under Test
fo	operating frequency
RF	Radio Frequency
SINAD	Ratio of (Signal + Noise + Distortion) to (Noise + Distortion)
SRD	Short Range Device
TR	Transient phenomena applied to Receivers
TT	Transient phenomena applied to Transmitters

4 Test conditions

~~For the purposes of the present document, the test conditions of the EN 301 489-1 [1], clause 4, shall apply as appropriate. Further product related test conditions for Short Range Devices (SRD) are specified in the present document.~~

4.1 General

~~For emission~~ Clause 4 describes details of the configuration and immunity tests the normal test modulation, test arrangements, etc., as specified in connections for testing of the EUT.

~~For the purposes of the present document, clauses 4-5, shall apply as appropriate, except as varied and/or extended herein.~~

~~Whenever the Equipment Under Test (EUT) is provided with a detachable antenna, the EUT shall be tested with the antenna fitted in a manner typical of normal intended use, unless specified otherwise.~~

~~For the purpose~~ 4.2 Environmental profile

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

NOTE: The technical requirements of the present document Short Range Devices are divided into three types of primary function, based on the technical nature of the primary function.

Table 1: Technical nature of the primary function

Primary Function Type	Technical nature of the primary function
I	Transfer of messages (digital or analogue signals)
II	Transfer of audio (speech or music)
III	Others

4.2 — Arrangements for test signals

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

4.2.1 — Arrangements apply under the environmental profile for test signals at the input operation of the transmitter

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

The transmitter shall be modulated with normal test modulation as specified for that type of primary function (see clause 4.5). Where transmitters do not have a modulation input port, the internal equipment modulation shall be used.

4.2.2 — Arrangements for test signals at the output of the transmitter

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

The transmitter shall be operated at its maximum rated RF output power as specified for that type of primary function (see clause 4.5).

The EUT, which is declared by the manufacturer may provide a suitable companion receiver that can be used to set up a communications link and/or to receive messages.

4.2.3 — Arrangements for test signals at the input of the receiver

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

- the wanted RF input signal, coupled to the receiver, shall be modulated with normal test modulation as specified for that type of primary function (see clause 4.5);
- the level of the wanted RF input signal shall be chosen to a value significantly above the threshold sensitivity but below the overload characteristics of the receiver;
- the manufacturer may provide a suitable companion transmitter that can be used to set up a communications link and/or to transmit messages.

4.2.4 — Arrangements for test signals at the output of the receiver

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

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

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

The transmitter and receiver may be tested together, if appropriate (size of equipment, etc.). In this case the transmitter and the receiver shall be located inside the test environment and shall be exposed at the same time to the EMC phenomena. Instead of coupling the output signal of the transmitter to the measuring equipment outside the test environment, this signal shall be coupled, inside the test environment, to input of the receiver, via an attenuator, if required, to prevent overload of the receiver.

4.3 — Exclusion bands

The frequencies on which Short Range Devices (SRD) are intended to operate, shall be excluded from the conducted and radiated RF immunity tests.

The frequencies on which the SRD transmitters are intended to operate shall be excluded from conducted and radiated emission measurements when performed in transmit mode of operation.

There shall be no frequency exclusion band applied to emission measurements of SRD receivers, and/or associated ancillary equipment.

The emission measurement and immunity test exclusions are referred to as "exclusion bands" and are defined in clauses 4.3.1 and 4.3.2. The EUT should comply with all the technical requirements of the present document.

4.3.1 Exclusion bands for receivers

The exclusion band for receivers (including receivers part of transceivers) intended to be used in a channelized frequency band, is determined as follows:

For receivers capable of at all times when operating on only one single frequency and not having an alignment range, the lower frequency of the exclusion band is the lower frequency of the used frequency channel minus the extension value given in table 2, and the upper frequency of the exclusion band is the upper frequency of the used frequency channel plus the extension value given in table 2. The calculated extension value shall be based on the operating frequency 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

- For receivers capable of operating on only one single frequency and having an alignment range, the lower frequency of the exclusion band is the lower frequency of the alignment range minus the extension value given in table 2, and the upper frequency of the exclusion band is the upper frequency of the alignment range plus the extension value given in table 2. The calculated extension values shall be based on the centre frequency of

the alignment range. However, if the alignment range is more than 10 % of the upper frequency of the alignment range the calculated value shall be based on 10 % of the upper value of the alignment range.

- For receivers capable of operating on more than one frequency in an operating frequency band the width of which is less than 20 % of the centre frequency of the operating band, the lower frequency of the exclusion band is the lower frequency of the operating band minus the extension value given in table 2, and the upper frequency of the exclusion band is the upper frequency of the operating band plus the extension value given in table 2. The calculated extension value shall be based on the centre frequency of the operating band.
- For receivers capable of operating on a number of frequencies over a frequency band wider than the band specified above, immunity tests shall be made over a selected number of test frequencies. The selected test frequencies shall be located at three evenly spaced points per logarithmic decade of the frequency band. For each test frequency the lower frequency of the exclusion band is the lower frequency of the used test frequency channel minus the extension value given in table 2, and the upper frequency of the exclusion band is the upper frequency of the used test frequency channel plus the extension value given in table 2. The calculated extension value shall be based on the used test frequency.

For wide band receivers, i.e. receivers operating in a non-channelized frequency band, the lower frequency of the exclusion band is the lower frequency of the intended operating frequency band minus the extension value given in table 2 and the upper frequency of the exclusion band is the upper frequency of the intended operating band plus the extension value given in table 2, or the total exclusion band is twice the intended operating frequency band of the receiver centred around the centre frequency of the intended operating band, whichever is greater.

Table 2: 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 for Short Range Devices

Operating Receiver Frequency f_o	EMC exclusion band for SRDs		
	Receiver Category1	Receiver Category2	Receiver Category3
<300 kHz	$f_o \pm 200$ kHz (see note 1)	$f_o \pm 300$ kHz (see note 1)	$f_o \pm 300$ kHz (see note 1)
300 kHz to < 30 MHz	$f_o \pm 2$ MHz (see note 1)	$f_o \pm 3$ MHz (see note 1)	$f_o \pm 5$ MHz (see note 1)
30 MHz to < 1 GHz	$f_o \pm 10$ MHz, or $\pm 2\% \times f_o$, whichever is greater	$f_o \pm 15$ MHz, or $\pm 5\% \times f_o$, whichever is greater	$f_o \pm 15$ MHz, or $10\% \times f_o$ whichever is greater
1 GHz to < 2,7 GHz	$f_o \pm 75$ MHz (see note 2)	$f_o \pm 100$ MHz (see note 2)	$f_o \pm 300$ MHz (see note 2)

NOTE 1: Measurements shall not be carried out below 150 kHz.
NOTE 2: Operating frequencies above 2,7 GHz do not require an exclusion band as there are no immunity tests required above 2,7 GHz.

4.36.1 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 transmitters 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 ~~three~~ five times (i.e. $\pm 250\%$) the maximum ~~occupied bandwidth~~ 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 the receiver and transmitter are of EUT tested together as with a system (see EN 301 489-1 [1], clause 4.2.5) the exclusion band defined for receivers or simultaneous transmit and receive mode, the exclusion band used shall be the one for the transmitter. I.e. only one exclusion band 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_0	Extension value
<u>< 300 kHz</u>	<u>300 kHz</u>
<u>300 kHz to < 30 MHz</u>	<u>3 MHz</u>
<u>30 MHz to < 1 GHz</u>	<u>15 MHz, or $5 \% \times f_0$, whichever is greater</u>
<u>1 GHz to < 6 GHz</u>	<u>100 MHz</u>
<u>≥ 6 GHz</u>	<u>$5 \% \times f_0$</u>

NOTE: The receiver exclusion band frequency range aligns as far as possible with the blocking test frequency range defined for transmitters shall be used, whichever is greater, in ETSI EN 300 220-1 [2].

~~4.4 Narrow band responses of receivers~~

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

~~4.5 Normal test modulation~~

~~6.3.3 Duplex and multi-mode equipment with primary function type I~~

~~In the RF carrier shall be modulated case of EUT tested with a test signal, representing a practical selection of usable selective messages/commands. The agreed test signal may be formatted and may contain error detection, simultaneous transmit and correction. Where transmitters do not have a modulation input port receive mode, the internal equipment modulation is exclusion band used.~~

~~For equipment with primary function type II (audio equipment):~~

- ~~• shall be the wanted input signal combination of the receiver under test shall be set to exclusion band for the nominal frequency of the receiver, modulated with a sinusoidal audio frequency of 1 000 Hz having a modulation corresponding to 60 % of the peak system modulation;~~

~~the transmitter under test shall be modulated with a sinusoidal audio frequency of 1 000 Hz having a modulation corresponding to 60 % of the system peak modulation and the exclusion band for the receiver. I.e. both exclusion bands shall be applied.~~

~~For equipment with primary function type III the manufacturer shall specify the normal test modulation, if any.~~

~~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

~~The provision of EN 301 489-1 [1], clause Clause 5.1, shall apply.~~

The manufacturer shall ~~at~~ describes the time of submission of the equipment for test, supply the necessary general information as requested in EN 301 489 1 [1], clause 5.1. Additionally he shall supply the following product related information:

- ~~the applicable primary function type according to table 1 (see clause 4.1);~~
- ~~the device type selected means by the manufacturer according to table 3 (see clause 6.1).~~

The performance assessment is dependent on the primary function type (see clause 4.1).

For all equipment the performance assessment is based on:

- ~~the maintenance of function(s);~~
- ~~the way the eventual loss of function(s) can be recovered;~~

~~unintentional behaviour~~ which the correct functioning of the EUT shall be assessed.

Additionally:

~~for~~ Clause 5.2 relates to equipment with primary a communications function type I it shall be possible to assess,

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

- ~~For the performance purposes of the equipment by appropriately monitoring (observing) present document, the receiver reaction;~~
- ~~for equipment with primary function type II the degradation in performance during the radio frequency immunity tests is expressed in a minimum SINAD Decibel value;~~
- ~~for equipment with primary function type III the manufacturer shall specify the way the degradation in performance should be measured and expressed.~~

~~5.2~~ **Equipment which can provide a continuous communications link**

The provisions of ~~ETSI~~ EN 301 489-1-[+1], clause 5.2, shall apply.

~~5.3~~ **Equipment which does not provide a continuous communications link**

The provisions of EN 301 489 1 [1], clause 5.3, shall apply with the following modification:

- ~~for equipment with primary function type III the manufacturer shall always define the test method(s) for the assessment of the actual level of performance or degradation of performance during and/or after the EMC exposure.~~

~~5.4~~ **Ancillary equipment**

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

~~5.5~~ **Equipment classification**

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

6 Performance criteria

6.1 Classification of SRD equipment

The product family of Short Range Devices is divided by device type, each having its own set of performance criteria. This classification is based upon the impact on persons and/or goods in case the equipment does not operate above the specified performance level under EMC stress.

Table 3: Risk assessment of communication link performance per device type

Device Type	Risk assessment of communication link performance
1	Highly reliable SRD communication media; e.g. serving human life inherent systems (may result in a physical risk to a person)
2	Medium reliable SRD communication media; e.g. causing inconvenience to persons, which cannot simply be overcome by other means
3	Standard reliable SRD communication media; e.g. inconvenience to persons, which can simply be overcome by other means (e.g. manual)

6.2 General performance criteria

The performance criteria for SRD equipment with different device types (see table 3) in combination with the different primary function types (see table 1) during and after immunity test are specified in this clause:

- performance criteria A for immunity tests with phenomena of a continuous nature;
- performance criteria B for immunity tests with phenomena of a transient nature;
- performance criteria for immunity tests with power interruptions exceeding a certain time are specified in clause 7.2.2, table 6.

The equipment shall meet the performance criteria as specified in the following clauses, for the appropriate device type, except as varied and/or extended herein.

6.3 Performance table

Table 4: Performance Requirements of Device Types

Criteria	During test	Device Type 1	
		After test	
A	Operate as intended No loss of function For equipment with primary function type II the minimum performance shall be 12 dB SINAD No unintentional responses	Operate as intended For equipment with primary function type II the communication link shall be maintained No loss of function No degradation of performance No loss of stored data or user programmable functions	
B	May be loss of function (one or more) 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	
Criteria	During test	Device Type 2	
		After test	
A	Operate as intended No loss of function For equipment with primary function type II the minimum performance shall be 6 dB SINAD No unintentional responses	Operate as intended For equipment with primary function type II the communication link shall be maintained No loss of function No degradation of performance No loss of stored data or user programmable functions	
B	May be loss of function (one or more) 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	

Device Type 3		
Criteria	During test	After test
A and B	May be loss of function (one or more) No unintentional responses	Operate as intended, for equipment with primary function type II the communication link may be lost, but shall be recoverable by user No degradation of performance Lost functions shall be self-recoverable

6.4 Performance criteria for 5.2 Continuous phenomena 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 to Transmitters (CT).

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 primary function type I or II including ancillary equipment tested on
- special test equipment
- a stand alone basis, simulator

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

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 A of the applicable device type as given in clause 6.3 shall apply are used to make an assessment whether a radio equipment passes or fails immunity tests.

For equipment with primary function type II or III that requires a communication link that is maintained during the test, it shall be verified by appropriate means supplied by the manufacturer that the communication link is maintained during each individual exposure in the test sequence.

Where the EUT is a transmitter, tests shall be repeated with the EUT in standby mode to ensure that any unintentional transmission does not occur.

6.52 Performance criteria for Transient phenomena applied to Transmitters (TT)Criteria

For equipment with primary function type I or II, including ancillary equipment tested on a stand alone basis, the performance criteria B of the applicable device type as given in clause 6.3 shall apply, except for power interruptions exceeding a certain time the performance criteria deviations are specified in clause 7.2.2.

For equipment with primary function type II or III that requires a communication link that is maintained during the test, this shall be verified by appropriate means supplied by the manufacturer during each individual exposure in the test sequence.

Where the EUT is a transmitter, tests shall be repeated with the EUT in standby mode to ensure that any unintentional transmission does not occur.

6.6 Performance criteria for Continuous phenomena applied to Receivers (CR)

For equipment with primary function type I or II, including ancillary equipment tested on a stand alone basis, the performance criteria A of the applicable device type as given in clause 6.3 shall apply.

For equipment with primary function type II or III that requires a communication link that is maintained during the test, it shall be verified by appropriate means supplied by the manufacturer that the communication link is maintained during each individual exposure in the test sequence.

Where the EUT is a transceiver, under no circumstances shall the transmitter operate unintentionally during the test.

6.7 Performance criteria for Transient phenomena applied to Receivers (TR)

For equipment with primary function type I or II, including ancillary equipment tested on a stand alone basis, the performance criteria B of the applicable device type as given in clause 6.3 shall apply, except for power interruptions exceeding a certain time the performance criteria deviations are specified in clause 7.2.2.

For equipment with primary function type II or III that requires a communication link that is maintained during the test, this shall be verified by appropriate means supplied by the manufacturer during each individual exposure in the test sequence.

Where the EUT is a transceiver, under no circumstances shall the transmitter operate unintentionally during the test.

6.8 Performance criteria for ancillary equipment tested on a stand alone basis

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

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	<u>Operate as intended</u>	<u>Operate as intended</u>
	<u>No loss of function</u>	<u>No loss of function</u>
	<u>No unintentional responses</u>	<u>No degradation of performance</u> <u>No loss of stored data or user programmable functions</u>
B	<u>May show loss of function</u>	<u>Operate as intended</u>
	<u>No unintentional responses</u>	<u>Lost function(s) shall be self-recoverable</u> <u>No degradation of performance</u>
		<u>No loss of stored data or user programmable functions</u>

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~~ Overview

7.1 ~~Emission~~

7.1.1 ~~General~~

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

~~7.1~~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 53, relate to the ~~emission~~immunity test methods and performance criteria used in ETSI EN 301 489-1 [1], clause 89.

Table 5: Special conditions for EMC emission measurements

Reference to clauses in EN 301 489-1 [1]	Special product-related conditions, additional to or modifying the test conditions in EN 301 489-1 [1], clause 8
8.3.2 and 8.4.2: Test method; DC power input/output ports, and AC mains input/output ports	Attention: The exclusion band for transmitters shall be considered for transmitters operating at frequencies below 30 MHz (see clause 4.3.2).

7.2 Immunity

7.2.1 General

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

7.2.2 Special conditions

The following special conditions set out in table 6, relate to the immunity test methods and performance criteria used in EN 301 489-1 [1], clause 9.

Table 6: Special conditions for EMC immunity tests

Reference to clauses in EN 301 489-1 [1]	Special product-related conditions, additional to or modifying the test conditions in EN 301 489-1 [1], clause 9
9.2.2: Test method; Radio frequency electromagnetic field	<p>Attention: The width of the steps for the test frequency increments is device type-dependent:</p> <ul style="list-style-type: none"> • for device type 1 or device type 2, the stepped frequency increments shall be 1 % of the momentary used test frequency; • for device type 3, the stepped frequency increments shall be 10 % of the momentary used test frequency.
9.5.2: Test method; Radio frequency, common mode	<p>Attention: The width of the steps for the test frequency increments is device type-dependent:</p> <ul style="list-style-type: none"> • for device type 1 or device type 2, the stepped frequency increments shall be 1 % of the momentary used test frequency in the frequency range 5 MHz to 80 MHz; • for device type 3, the stepped frequency increments shall be 10 % of the momentary used test frequency in the frequency range 5 MHz to 80 MHz.
9.7.3: Performance criteria; Voltage dips and interruptions	<p>Attention: The performance criteria are device type dependent:</p> <p>For a voltage dip corresponding to a reduction of the supply voltage of 30 % for 10 ms the performance criteria CT or CR specified in clauses 6.4 or 6.6 shall apply as appropriate.</p> <p>For a voltage dip corresponding to a reduction of the supply voltage of 60 % for 100 ms the following class dependent performance criteria shall apply:</p> <ul style="list-style-type: none"> • for transmitters, belonging to device type 1, the performance criteria CT (see clause 6.4); • for transmitters, belonging to device type 2 or 3, the performance criteria TT (see clause 6.5); • for receivers, belonging to device type 1, the performance criteria CR (see clause 6.6); • for receivers, belonging to device type 2 or 3, the performance criteria TR (see clause 6.7). <p>For a voltage interruption corresponding to a reduction of the supply voltage of > 95 % for 5 000 ms the performance criteria TT or TR specified in clauses 6.5 or 6.7 shall apply as appropriate.</p>

<u>Reference to clauses in ETSI EN 301 489-1 [1]</u>	<u>Special product-related conditions, additional to or modifying the test conditions in ETSI EN 301 489-1 [1], clause 9</u>
<p>9.2.2: Test method; Radio frequency electromagnetic field</p>	<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.1] then the modulating signal frequency specified in 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>
<p>9.5.2: Test method; Radio frequency, common mode</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.1] then the modulating signal frequency specified in 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 (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 301 489-3				
Requirement			Requirement Conditionality	
No	Description	Reference: Clause No	U/C	Condition
1	Emissions: Enclosure of ancillary equipment measured on a stand alone basis	8.2 of ETSI EN 301 489-1 [1]	U	
2	Emissions: 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 3 m or from a vehicle power supply
3	Emissions: 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	Emissions: 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	Emissions: 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	Emissions: Wired network ports	8.7 of ETSI EN 301 489-1 [1]	C	Only where equipment has wired network ports
7	Immunity: Radio frequency electromagnetic field (80 MHz to 6 000 MHz)	7.3	U	
8	Immunity: Electrostatic discharge	9.3 of ETSI EN 301 489-1 [1]	U	
9	Immunity: Fast transients common mode	9.4 of ETSI EN 301 489-1 [1]	C	Only where equipment has AC mains power input ports or DC power ports or wired network ports with cables longer than 3 m
10	Immunity: Radio frequency common mode	7.3	C	Only where equipment has AC mains power input ports or DC power ports or wired network ports with cables longer than 3 m
11	Immunity: 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	Immunity: Voltage dips and interruptions	9.7 of ETSI EN 301 489-1 [1]	C	Only where equipment has AC mains power input ports
13	Immunity: 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 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):

Examples of Short Range Devices (SRD) in the scope of the present document

~~A.1 Short Range Devices (SRD) with RF power levels ranging up to 500 mW and intended for operation in the frequency range 25 MHz to 1 000 MHz~~

The present document applies to ~~Short Range Devices (SRD) with RF power levels ranging up to 500 mW and intended for operation in~~relates to article 3.1(b) of the Directive 2014/53/EU [i.1]. For the frequency range 25 MHz to 1 000 MHz, and associated ancillary equipment. Definitions of such SRD radio equipment and associated ancillary equipment are found in ~~purposes of article 3.2,~~ the following functional radio standard:

- ~~EN 300 220 1 [i.3]: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment to be used in SRDs that fall within the 25 MHz to 1 000 MHz frequency range with power levels ranging up to 500 mW; Part 1: Technical characteristics and test methods".~~

~~A.2 Short Range Devices (SRD) intended for operation in scope of the frequency range 9 kHz to 25 MHz, and inductive loop systems intended for operation in the frequency range 9 kHz to 30 MHz~~

The present document applies to ~~Short Range Devices (SRD) intended for operation in the frequency range 9 kHz to 25 MHz, inductive loop systems intended for operation in the frequency range 9 kHz to 30 MHz, and associated ancillary equipment. Definitions of such SRD radio equipment and associated ancillary equipment are found in the following functional radio standard:~~are covered by a range of ETSI standards.

- ~~EN 300 330 1 [i.4]: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz; Part 1: Technical characteristics and test methods".~~

~~A.3 Short Range Devices (SRD) intended for operation in the frequency range 1 GHz to 40 GHz~~

The present document applies to ~~Short Range Devices (SRD) with RF power levels ranging up to 4 W and intended for operation in the frequency range 1 GHz to 40 GHz, and associated ancillary equipment. Definitions of such SRD radio equipment and associated ancillary equipment are found in the following functional radio standard:~~

- ~~EN 300 440 1 [i.5]: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short range devices; Radio equipment to be used in the 1 GHz to 40 GHz frequency range; Part 1: Technical characteristics and test methods".~~

~~A.4 Short Range Devices (SRD) intended for operation in the frequency range 40 GHz to 246 GHz~~

The present document applies to ~~Short Range Devices (SRD) with RF power levels ranging up to 10 W and intended for operation in the frequency range 40 GHz to 246 GHz, and associated ancillary equipment. Definitions of such SRD radio equipment and associated ancillary equipment are found in the following functional radio standard:~~

- ~~EN 305 550 1 [i.6]: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment to be used in the 40 GHz to 246 GHz frequency range; Part 1: Technical characteristics and test methods".~~

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

<u>Version</u>	<u>Information about changes</u>
<u>2.1.1</u>	<u>First publication of RED version</u>

History

Document history		
V1.2.1	August 2000	Publication
V1.3.1	November 2001	Publication
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