



**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 for ElectroMagnetic Compatibility**

---

**Reference**REN/ERM-EMC-402

---

**Keywords**EMC, harmonised standard, SRD

---

**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 - APE 7112B  
Association à but non lucratif enregistrée à la  
Sous-Préfecture de Grasse (06) N° w061004871

---

**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 prevailing version of an ETSI deliverable is the one made publicly available in PDF format at [www.etsi.org/deliver](http://www.etsi.org/deliver).

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/CommitteeSupportStaff.aspx>

If you find a security vulnerability in the present document, please report it through our  
Coordinated Vulnerability Disclosure Program:

<https://www.etsi.org/standards/coordinated-vulnerability-disclosure>

---

**Notice of disclaimer & limitation of liability**

---

The information provided in the present deliverable is directed solely to professionals who have the appropriate degree of experience to understand and interpret its content in accordance with generally accepted engineering or other professional standard and applicable regulations.

No recommendation as to products and services or vendors is made or should be implied.

In no event shall ETSI be held liable for loss of profits or any other incidental or consequential damages.

Any software contained in this deliverable is provided "AS IS" with no warranties, express or implied, including but not limited to, the warranties of merchantability, fitness for a particular purpose and non-infringement of intellectual property rights and ETSI shall not be held liable in any event for any damages whatsoever (including, without limitation, damages for loss of profits, business interruption, loss of information, or any other pecuniary loss) arising out of or related to the use of or inability to use the software.

---

**Copyright Notification**

---

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2022.

All rights reserved.

# Contents

Intellectual Property Rights .....	5
Foreword.....	5
Modal verbs terminology.....	6
Introduction .....	6
1 Scope .....	7
2 References .....	9
2.1 Normative references .....	9
2.2 Informative references.....	9
3 Definition of terms, symbols and abbreviations.....	10
3.1 Terms.....	10
3.2 Symbols.....	10
3.3 Abbreviations .....	10
4 Test conditions .....	11
4.1 General .....	11
4.2 Arrangements for test signals .....	11
4.2.1 General.....	11
4.2.2 Receiver wanted input signal .....	11
4.2.2.1 General .....	11
4.2.2.2 Radiated immunity test wanted signal level.....	11
4.2.2.3 Radiated immunity test wanted separation.....	12
4.2.3 Equipment with an external antenna connector .....	12
4.2.4 Equipment without an external antenna connector (integral antenna) .....	12
4.2.5 Equipment with more than one antenna.....	12
4.3 RF Exclusion bands.....	12
4.3.1 General.....	12
4.3.2 Exclusion bands for emissions testing .....	12
4.3.2.1 Transmitters .....	12
4.3.2.2 Receivers.....	13
4.3.2.3 Duplex and multi-mode equipment.....	13
4.3.3 Exclusion bands for immunity testing .....	13
4.3.3.1 Transmitters .....	13
4.3.3.2 Receivers.....	13
4.3.3.3 Duplex and multi-mode equipment.....	13
4.4 Arrangements for testing .....	14
4.4.1 Operating modes.....	14
4.4.2 Associated test equipment .....	14
5 Ancillary equipment.....	14
6 Performance Criteria .....	15
6.1 Introduction .....	15
6.2 Continuous and non-continuous operation.....	15
6.3 Operating modes .....	15
7 Requirements.....	15
7.1 Emissions .....	15
7.1.1 General.....	15
7.1.2 Special conditions.....	16
7.2 Immunity .....	16
7.2.1 General.....	16
7.2.2 Special conditions.....	18
<b>Annex A (informative): Relationship between the present document and the essential requirements of Directive 2014/53/EU .....</b>	<b>19</b>

**Annex B (informative):**    **Change history** .....21  
History .....22

---

# Intellectual Property Rights

## Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The declarations pertaining to these essential IPRs, if any, are 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 Directives including the ETSI IPR Policy, no investigation regarding the essentiality of IPRs, 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.

## Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

**DECT™**, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members. **3GPP™** and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners. **oneM2M™** logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners. **GSM®** and the GSM logo are trademarks registered and owned by the GSM Association.

---

# 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.5] 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.2].

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]. A guide to using the series can be found in ETSI TR 103 088 [i.4].

<b>Proposed national transposition dates</b>	
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 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 standardized 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 covers the assessment of Short Range Devices (SRD) operating in the frequency range 9 kHz to 246 GHz 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.

The present document applies to the categories of SRD listed in Table 1 with the exception that the present document does not apply to devices for which a product specific harmonised EMC standard is available.

NOTE 1: The entries in Table 1 of the present document are based on the Decision (EU) 2019/1345 [i.1], Table 1.

**Table 1: Categories of short range device**

Category of Short Range Devices	Scope of the category
Non-specific SRD.	Covers all kinds of radio devices, regardless of the application or their purpose, which fulfil the technical conditions as specified for a given frequency band. Typical uses include telemetry, telecommand, alarms, data transmissions in general and other applications. (See note 1).
Active medical implant devices. (See note 2).	Covers the radio part of active implantable medical devices that are intended to be fully or partially introduced, surgically or medically, into the human body or that of an animal, and where applicable their peripherals. Active implantable medical devices are defined in Council Directive 90/385/EEC [i.3].
Assistive Listening Devices (ALDs). (See note 2).	Covers radio communications systems that allow persons with hearing impairment to increase their listening capability. Typical system installations include one or more radio transmitters and one or more radio receivers.
High duty cycle/continuous transmission devices.	Covers radio devices that rely on low latency and high duty cycle transmissions. These devices are typically used for personal wireless audio and multimedia streaming systems used for combined audio/video transmissions and audio/video sync signals, mobile phones, automotive or home entertainment system, wireless microphones, cordless loudspeakers, cordless headphones, radio devices carried on a person, assistive listening devices, in-ear monitoring, wireless microphones for use at concerts or other stage productions, and low power analogue FM transmitters.
Inductive devices.	Covers radio devices that use magnetic fields with inductive loop systems for near field communications. This typically includes devices for car immobilisation, animal identification, alarm systems, cable detection, waste management, personal identification, wireless voice links, access control, proximity sensors, anti-theft systems as well as RF anti-theft induction systems, data transfer to hand-held devices, automatic article identification, wireless control systems and automatic road tolling.
Low duty cycle/high reliability devices.	Covers radio devices that rely on low overall spectrum utilization and low duty cycle spectrum access rules to ensure highly reliable spectrum access and transmissions in shared bands. Typical applications include alarm systems that use radio communication for indicating an alert condition at a distant location and social alarm systems that allow reliable communication for a person in distress.
Medical data acquisition devices. (See note 2).	Covers the transmission of non-voice data to and from non-implantable medical devices in order to monitor, diagnose and treat patients in healthcare facilities or in their homes as prescribed by duly authorized healthcare professionals.

Category of Short Range Devices	Scope of the category
PMR446 devices.	Covers hand portable equipment (without base station or repeater use) carried on a person or manually operated, which uses integral antennas only in order to maximize sharing and minimize interference. PMR 446 equipment operates in short-range peer-to-peer mode and excludes use either as a part of infrastructure network or as a repeater.
Radio determination devices. (See note 2).	Covers radio devices used for determining the position, velocity and/or other characteristics of an object, or for obtaining information relating to these parameters. Radio determination equipment typically conducts measurements to obtain such characteristics. Radio determination devices exclude any kind of point-to-point or point-to-multipoint radio communications.
Radio Frequency Identification (RFID) devices.	Covers tag/interrogator based radio communications systems, consisting of (i) radio devices (tags) attached to animate or inanimate items and (ii) transmitter/receiver units (interrogators) which activate the tags and receive data back. Typical applications include the tracking and identification of items, for instance for the purpose of Electronic Article Surveillance (EAS), and collecting and transmitting data relating to the items to which tags are attached, which may be either battery-less, battery assisted or battery powered. The responses from a tag are validated by its interrogator and passed to its host system.
Transport and traffic telematics devices.	Covers radio devices that are used in the fields of transport (road, rail, water or air, depending on the relevant technical restrictions), traffic management, navigation, mobility management and in Intelligent Transport Systems (ITS). Typical applications include interfaces between different modes of transport, communication between vehicles (e.g. car to car), between vehicles and fixed locations (e.g. car to infrastructure) as well as communication from and to users.
Wideband data transmission devices. (See note 2).	Covers radio devices that use wideband modulation techniques to access the spectrum. Typical uses include wireless access systems such as Radio Local Area Networks (WAS/RLANs) or wideband SRDs in data networks.
<p>NOTE 1: The Annex of the Decision (EU) 2019/1345 [i.1] lists the frequency bands and associated conditions harmonised in the EU. There may be variations in individual countries.</p> <p>NOTE 2: A product specific harmonised EMC standard may be applicable for some devices and should be used in preference to the present document.</p>	

Technical specifications related to the antenna port of radio equipment and radiated emissions from the enclosure port of the radio 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.

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

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

NOTE 2: The relationship between the present document and essential requirements of article 3.1(b) of Directive 2014/53/EU [i.2] is given in Annex A.



---

## 2 References

### 2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <https://docbox.etsi.org/Reference/>.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

- [1] ETSI EN 301 489-1 (V2.2.3) (11-2019): "ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for ElectroMagnetic Compatibility".
- [2] Void.
- [3] Void.
- [4] EN 61000-4-4 (2012): "Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test" (produced by CENELEC).

### 2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] Commission Implementing Decision (EU) 2019/1345 of 2 August 2019 amending Decision 2006/771/EC updating harmonised technical conditions in the area of radio spectrum use for short-range devices.
- [i.2] 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.3] Council Directive 90/385/EEC of 20 June 1990 on the approximation of the laws of the Member States relating to active implantable medical devices (OJ L 189, 20.7.1990, p. 17).
- [i.4] ETSI TR 103 088: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Using the EN 301 489 series of EMC standards".
- [i.5] 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.
- [i.6] 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".

## 3 Definition of terms, symbols and abbreviations

### 3.1 Terms

For the purposes of the present document, the terms given in ETSI EN 301 489-1 [1], ETSI EN 300 220-1 [i.6], Directive 2014/53/EU [i.2] and the following apply:

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

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

- the equipment is intended for use with a receiver or transmitter to provide additional operational and/or control features to the radio equipment, (e.g. to extend control to another position or location);
- the ancillary equipment cannot be used without being connected to radio equipment to provide user functions independently of a receiver or transmitter; and
- the receiver or transmitter, to which it is connected, is capable of providing some intended operation such as transmitting and/or receiving without the ancillary equipment (i.e. it is not a sub-unit of the main equipment essential to the main equipment basic functions).

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

**applicable harmonised radio standard:** harmonised standard that is applied to the EUT in relation to article 3.2 of the Directive 2014/53/EU [i.2]

**corresponding equipment:** equipment with which the EUT interacts by means of radio waves as part of the EUT's intended use.

EXAMPLE 1: If the EUT is an interrogator or reader for RFID or access control, the corresponding equipment may be a tag, label or keycard.

EXAMPLE 2: If the EUT is a tag, label or keycard, the corresponding equipment may be a reader or interrogator.

**Operating Channel (OC):** range of frequencies that contains the transmitted or received signal

NOTE: Lower and upper frequency edges values of OC are denoted as  $FOC_{low}$  and  $FOC_{high}$ .

**operating frequency:** centre of transmitted or received signal

**Operating Frequency Band (OFB):** frequency band or sub-band within which the equipment is intended to operate

**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 ETSI EN 300 220-1 [i.6] apply.

### 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ETSI EN 301 489-1 [1], ETSI EN 300 220-1 [i.6] and the following apply:

FDD	Frequency Division Duplex
TDD	Time Division Duplex

---

## 4 Test conditions

### 4.1 General

The test conditions and provisions of ETSI EN 301 489-1 [1], clause 4 shall apply, with the modifications in clause 4 of the present document.

### 4.2 Arrangements for test signals

#### 4.2.1 General

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.

The wanted signals and/or controls required to exercise the EUT shall be representative of the EUT's intended use.

#### 4.2.2 Receiver wanted input signal

##### 4.2.2.1 General

For all tests except radiated immunity testing the level of the wanted signal at the input of the receiver or the enclosure port of the EUT shall be representative of the EUT intended use.

For radiated immunity testing the standard procedure is described in clause 4.2.2.2. The alternative procedure in clause 4.2.2.3 shall be applied when:

- the EUT is tested with corresponding equipment; and
- the maximum separation between the EUT and the corresponding equipment is not more than one-tenth of a wavelength at the operating frequency.

NOTE: The separation is measured as the air gap between the outer casings of the equipment.

In the case of equipment without an antenna connector the wanted signal level shall be established for each orientation in which the EUT is tested.

##### 4.2.2.2 Radiated immunity test wanted signal level

The level of the wanted signal at the input of the receiver or the enclosure port of the EUT, shall be 30 dB ( $\pm 3$  dB) above the minimum usable receiver signal level.

NOTE 1: A simple method to establish the required wanted signal level is to establish operation, reduce level to the point of failure then increase by 30 dB.

In the case that the dynamic range at the receiver input is insufficient to accommodate the above level, then the level shall be set as follows:

The maximum usable receiver input level shall be found. The level of the wanted signal shall be set to the geometric mean power level of the minimum and maximum usable signal levels.

NOTE 2: A simple method to establish the geometric mean power level is to take the arithmetic mean of the values in dBm.

#### 4.2.2.3 Radiated immunity test wanted separation

This clause is only applicable if the conditions in clause 4.2.2.1 are met.

The maximum usable separation between the EUT and the corresponding equipment shall be found.

With the EUT and the corresponding equipment in the same relative orientation the minimum usable separation shall be found. This may be at zero separation or at a separation below which correct operation does not occur.

With the EUT and the corresponding equipment in the same relative orientation the separation shall be set to the arithmetic mean of the minimum and maximum usable separations.

#### 4.2.3 Equipment with an external antenna connector

This clause applies to EUT with an externally mounted 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 antenna connector shall be terminated with a screened resistive load of the same impedance as the connector.

#### 4.2.4 Equipment without an external antenna connector (integral antenna)

This clause applies to EUT to which clause 4.2.3 does not apply.

The EUT shall be tested as configured for intended use.

#### 4.2.5 Equipment with more than one antenna

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

- If clause 4.2.3 applies to all the antenna ports, then the EUT shall be tested according to clause 4.2.3.
- Otherwise it shall be tested according to clause 4.2.4.

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

### 4.3 RF Exclusion bands

#### 4.3.1 General

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

#### 4.3.2 Exclusion bands for emissions testing

##### 4.3.2.1 Transmitters

Where the applicable harmonised radio standard specifies an Operating Channel and an Out of Band domain, then these together shall form the exclusion band.

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 all other transmitters, the exclusion band is twice the intended operating frequency band centred around the centre frequency of the intended operating frequency band.

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

#### 4.3.2.2 Receivers

No exclusion band applies.

#### 4.3.2.3 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 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.

### 4.3.3 Exclusion bands for immunity testing

#### 4.3.3.1 Transmitters

The exclusion band shall be as specified for emissions testing in clause 4.3.2.1.

#### 4.3.3.2 Receivers

The exclusion band is based on the lower edge ( $FOC_{low}$ ) and the upper edge ( $FOC_{high}$ ) and the centre ( $f_0$ ) of the Operating Channel (OC).

Where the OC is defined in the applicable harmonised radio standard, the values for that shall be used and  $f_0$  shall be the centre of the OC. In all other cases,  $f_0$  shall be the receiver operating frequency and the OC shall be  $\pm 0,05\%$  around  $f_0$ .

Tables 2 and 3 show the lower and upper limits of the exclusion band.

**Table 2: Lower limit of exclusion band**

Lower edge of OC, $FOC_{low}$	Lower limit of exclusion band
< 3 MHz	0
3 MHz to < 30 MHz	$FOC_{low} - 3$ MHz
30 MHz to < 42 MHz	27 MHz
42 MHz to < 1 GHz	$FOC_{low} - 15$ MHz, or $FOC_{low} - 0,05 \times f_0$ , whichever is lower
1 GHz to < 1,05 GHz	950 MHz
1,05 GHz to < 6 GHz	$FOC_{low} - 100$ MHz
6 GHz to < 6,3 GHz	5,9 GHz
$\geq 6,3$ GHz	$FOC_{low} - 0,05 \times f_0$

**Table 3: Upper limit of exclusion band**

Upper edge of OC, $FOC_{high}$	Upper limit of exclusion band
< 300 kHz	$FOC_{high} + 300$ kHz
300 kHz to < 30 MHz	$FOC_{high} + 3$ MHz
30 MHz to < 42 MHz	$FOC_{high} + 5$ MHz
42 MHz to < 1 GHz	$FOC_{high} + 15$ MHz, or $FOC_{high} + 0,05 \times f_0$ , whichever is higher
1 GHz to < 6 GHz	$FOC_{high} + 100$ MHz
$\geq 6$ GHz	$FOC_{high} + 0,05 \times f_0$

#### 4.3.3.3 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 operating frequency, i.e. an exclusion band for each operating frequency shall be applied.

NOTE: Where the operating 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.

## 4.4 Arrangements for testing

### 4.4.1 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, shall be considered a form of standby mode.

### 4.4.2 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.

---

## 5 Ancillary equipment

The provisions of ETSI EN 301 489-1 [1], clause 5, shall apply.

## 6 Performance Criteria

### 6.1 Introduction

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

Only the performance criteria specified in the present document or in ETSI EN 301 489-1 [1] where referenced shall apply.

The provisions of ETSI EN 301 489-1 [1], clause 6, shall apply together with clauses 6.2 and 6.3.

### 6.2 Continuous and non-continuous operation

Latency is the time delay between the initiation and the completion of operation of the EUT. Correct functioning requires completing the relevant operation within the maximum latency time.

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

Where this is not the case, then the maximum latency is that required by the intended use of the EUT.

### 6.3 Operating modes

Where the EUT has more than one mode of operation (see clause 4.4.1), an unplanned transition from one mode to another is considered as an unintentional response. The EUT shall be tested in all modes to confirm there are no such unintentional responses.

## 7 Requirements

### 7.1 Emissions

#### 7.1.1 General

Table 4 contains the EMC emission requirements for the relevant ports of radio and ancillary equipment.

**Table 4: Emission requirements**

Phenomenon	Port	Applicability			Reference clause
		Fixed use (e.g. base station equipment)	Vehicular use (e.g. mobile equipment)	Portable use (portable equipment)	
Radiated emission	Enclosure of ancillary equipment	Applicable	Applicable	Applicable	ETSI EN 301 489-1 [1], clause 8.2.
Conducted emission	DC power input/output	Applicable	Applicable	Not applicable	7.1.2
Conducted emission	AC mains input/output	Applicable	Not applicable	Not applicable	ETSI EN 301 489-1 [1], clause 8.4
Conducted emission	Wired network	Applicable	Not applicable	Not applicable	ETSI EN 301 489-1 [1], clause 8.7

Hand portable equipment, or combinations of equipment, capable of being powered for intended use by the main battery of a vehicle shall additionally be considered as vehicular mobile equipment.

Hand portable or mobile equipment, or combinations of equipment, capable of being powered for intended use by AC mains shall additionally be considered as fixed station equipment.

## 7.1.2 Special conditions

The following special conditions set out in Table 5 relate to the EMC emission measurements and limits used in ETSI EN 301 489-1 [1], clause 8.

**Table 5: Special conditions for EMC emission 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 8
8.3: DC power input/output ports	The requirements of ETSI EN 301 489-1 [1], clause 8.3 shall be applied where the cable length exceeds 3 m or is connected to a vehicle power supply.

## 7.2 Immunity

### 7.2.1 General

Table 6 contains the EMC immunity requirements for the relevant ports of radio equipment.



Table 6: Immunity requirements

Phenomenon	Port	Applicability			Reference clause	Performance Criteria clause
		Fixed use (e.g. base station equipment)	Vehicular use (e.g. mobile equipment)	Portable use (portable equipment)		
RF electromagnetic field (80 MHz to 6 000 MHz)	Enclosure	Applicable	Applicable	Applicable	7.2.2	6
Electrostatic discharge	Enclosure	Applicable	Applicable	Applicable	ETSI EN 301 489-1 [1], clauses 9.3.1 and 9.3.2	6
Fast transients common mode	Signal, wired network and control	Applicable	Not Applicable	Not applicable	7.2.2	6
	DC power	Applicable	Not applicable (see note)	Not applicable		6
	AC mains power	Applicable	Not applicable	Not applicable		6
RF common mode 0,15 MHz to 80 MHz	Signal, wired network and control	Applicable	Applicable	Not applicable	7.2.2	6
	DC power	Applicable	Applicable	Not applicable		6
	AC mains power	Applicable	Applicable	Not applicable		6
Transients and surges in the vehicular environment	DC power input	Not applicable	Applicable	Not applicable	ETSI EN 301 489-1 [1], clauses 9.6.1 and 9.6.2	6
Voltage dips and interruptions	AC mains power input	Applicable	Not applicable	Not applicable	ETSI EN 301 489-1 [1], clauses 9.7.1 and 9.7.2	6
Surges, line to line and line to ground	AC mains power input	Applicable	Not applicable	Not applicable	ETSI EN 301 489-1 [1], clauses 9.8.1 and 9.8.2	6
	Wired network	Applicable	Not applicable (see note)	Not applicable		6

NOTE: This requirement is covered by the transients and surges test on DC power input ports.

Hand portable equipment, or combinations of equipment, capable of being powered for intended use by the main battery of a vehicle shall additionally be considered as vehicular mobile equipment.

Hand portable or mobile equipment, or combinations of equipment, capable of being powered for intended use by AC mains shall additionally be considered as fixed station equipment.

## 7.2.2 Special conditions

The following special conditions set out in table 7 relate to the immunity test methods and performance criteria used in ETSI EN 301 489-1 [1], clause 9.

**Table 7: 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	Where the EUT is subject to EMC Immunity testing under a Harmonised Standard of a Directive other than the Directive 2014/53/EU [i.2] 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.
9.4: Fast transients common mode	The requirements of ETSI EN 301 489-1 [1], clauses 9.4.1 and 9.4.2 shall be applied with the exception of clause 7.4 of EN 61000-4-4 [4].
9.5.2: Test method; Radio frequency, common mode	Where the EUT is subject to EMC Immunity testing under a Harmonised Standard of a Directive other than the Directive 2014/53/EU [i.2] 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.

## 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.5] 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.2].

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	Essential requirements of Directive	Clause(s) of the present document	U/C	Condition
1	Emissions: Enclosure of ancillary equipment measured on a standalone basis	3.1(b)	7.1	U	
2	Emissions: DC power input/output ports	3.1(b)	7.1	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	3.1(b)	7.1	C	Only where equipment has AC mains power input and/or output ports
4	Emissions: Wired network ports	3.1(b)	7.1	C	Only applies to equipment intended for fixed use. Applies to equipment intended for fixed use
5	Immunity: Radio frequency electromagnetic field (80 MHz to 6 000 MHz)	3.1(b)	7.2	U	
6	Immunity: Electrostatic discharge	3.1(b)	7.2	U	
7	Immunity: Fast transients common mode	3.1(b)	7.2	C	Only applies to equipment intended for fixed use
8	Immunity: Radio frequency common mode	3.1(b)	7.2	C	Only applies to equipment intended for fixed and/or vehicular use
9	Immunity: Transients and surges in the vehicular environment	3.1(b)	7.2	C	Only applies to equipment intended for vehicular use
10	Immunity: Voltage dips and interruptions	3.1(b)	7.2	C	Only where equipment has AC mains power input ports
11	Immunity: Surges, line to line and line to ground	3.1(b)	7.2	C	Only applies to equipment intended for fixed use

**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.

**Essential requirements of Directive**

Identification of article(s) defining the requirement in the Directive.

**Clause(s) of the present document**

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): Change history

Version	Information about changes
2.1.1	First publication of Directive 2014/53/EU version.
2.2.0	Immunity testing extended to 6 GHz. Level of wanted signal more closely specified. Updated to new skeleton. Updated to refer to version 2.2.3 of ETSI EN 301 489-1.

## History

<b>Document history</b>				
V1.2.1	August 2000	Publication		
V1.3.1	November 2001	Publication		
V1.4.1	August 2002	Publication		
V1.6.1	August 2013	Publication		
V2.1.1	March 2019	Publication		
V2.1.2	March 2021	EN Approval Procedure	AP 20210622:	2021-03-24 to 2021-06-22
V2.2.0	November 2021	Vote	V 20220123:	2021-11-24 to 2022-01-24
V2.3.0	July 2022	EN Approval Procedure	AP 20220929:	2022-07-01 to 2022-09-29