# Final draft ETSI EN 300 440 V2.1.1 (2017-01)


**Short Range Devices (SRD);**
**Radio equipment to be used in**
**the 1 GHz to 40 GHz frequency range;**
**Harmonised Standard covering the essential requirements**
**of article 3.2 of Directive 2014/53/EU**

Reference
REN/ERM-TG28-522

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***ETSI***

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

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

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



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# Foreword

This final 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 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.6] to provide one voluntary means of conforming to the essential requirements of Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC [i.1].

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



| Proposed national transposition dates | |
|---|---|
| Date of latest announcement of this EN (doa): | 3 months after ETSI publication |
| Date of latest publication of new National Standard or endorsement of this EN (dop/e): | 6 months after doa |
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# Modal verbs terminology

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

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# Introduction

The present document defines technical requirements to support the essential requirements of clause 3.2 of the Radio Equipment Directive [i.1] which states *"Radio equipment shall be so constructed that it both effectively uses and supports the efficient use of radio spectrum in order to avoid harmful interference"*.

The present document describes performance requirements and conformance test procedures for licence exempt Short Range Devices (SRDs) intending to use frequency bands within the range of 1 GHz to 40 GHz.

Equipment covered by the present document may operate on a specific frequency or may be channel agile and operate on a number of different frequencies.

The present document is structured as follows:

- Clause 2 provides references.
- Clause 3 provides definitions of terms and abbreviations used.
- Clause 4 provides technical requirements specifications.
- Clause 5 provides conditions for testing for compliance with technical requirements.
- Annex A (informative): Relationship between the present document and the essential requirements of Directive 2014/53/EU
- Annex B (normative): Radiated measurements
- Annex C (normative): General description of measurement methods
- Annex D (normative): Power limits for RFID systems operating in the 2,45 GHz band
- Annex E (informative): Example of implementation for restriction of 4 W RFID to in-building use only
- Annex F (normative): Limits for GBSAR operating in the frequency range 17,1 GHz to 17,3 GHz
- Annex G (informative): Bibliography
- Annex H (informative): Change History

# 1 Scope

The present document specifies technical characteristics and methods of measurements for the following equipment types:

1) Non specific Short Range Devices, including alarms, telecommand, telemetry, data transmission in general, etc.

2) Radio Frequency IDentification (RFID) devices.

3) Radiodetermination devices including detection, movement and alert applications.

These radio equipment types are capable of operating in the permitted frequency bands within the 1 GHz to 40 GHz range as specified in table 1:

1) with either a Radio Frequency (RF) output connection and dedicated antenna or an integral antenna;

2) for all types of modulation;

3) with or without speech.

Table 1 shows a list of the frequency bands as designated by the European Commission Decisions on Short Range Devices [i.5] and the CEPT/ERC Recommendation 70-03 [i.2] as known at the date of publication of the present document.



**Table 1: Short Range Devices within the 1 GHz to 40 GHz permitted frequency bands**

| | Frequency Bands | Applications | Notes |
|---|---|---|---|
| Transmit and Receive | 2 400 MHz to 2 483,5 MHz | Non-specific short range devices | |
| Transmit and Receive | 2 400 MHz to 2 483,5 MHz | Radio determination devices | |
| Transmit and Receive | (a) 2 446 MHz to 2 454 MHz | Radio Frequency Identification (RFID) devices | See annex D |
| Transmit and Receive | (b) 2 446 MHz to 2 454 MHz | Radio Frequency Identification (RFID) devices | See annex D |
| Transmit and Receive | 5 725 MHz to 5 875 MHz | Non-specific short range devices | |
| Transmit and Receive | 9 200 MHz to 9 500 MHz | Radio determination devices | |
| Transmit and Receive | 9 500 MHz to 9 975 MHz | Radio determination devices | |
| Transmit and Receive | 10,5 GHz to 10,6 GHz | Radio determination devices | |
| Transmit and Receive | 13,46 GHz to 14,0 GHz | Radio determination devices | |
| Transmit and Receive | 17,1 GHz to 17,3 GHz | Radio determination devices | See annex F |
| Transmit and Receive | 24,00 GHz to 24,25 GHz | Non-specific short range devices and Radio determination devices | |
| NOTE: (a) and (b) refer to two different operational restrictions for different power levels in the same frequency band. | | | |

NOTE 1: Table 1 represents the most widely implemented position within the European Union [i.5] and the CEPT countries [i.2], but it should not be assumed that all designated bands are available in all countries.

NOTE 2: In addition, it should be noted that other frequency bands may be available in a country within the frequency range 1 GHz to 40 GHz covered by the present document. See the European Commission Decisions on Short Range Devices [i.5] and the CEPT ERC Recommendation 70-03 [i.2] as implemented through National Radio Interfaces (NRI) and additional NRI as relevant.

NOTE 3: On non-harmonised parameters, national administrations may impose certain conditions such as the type of modulation, frequency, channel/frequency separations, maximum transmitter radiated power, duty cycle, and the inclusion of an automatic transmitter shut-off facility, as a condition for the issue of an individual or general licence, or as a condition for the issuing of Individual Rights for use of spectrum or General Authorization, or as a condition for use "under licence exemption" as it is in most cases for Short Range Devices.

The present document covers fixed stations, mobile stations and portable stations.

Applications using Ultra Wide Band (UWB) technology are not covered by the present document.

The present document covers the essential requirements of article 3.2 of Directive 2014/53/EU [i.6] under the conditions identified in annex A.

# 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/.

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

[1] CISPR 16-1-1 (2015): "Specification for radio disturbance and immunity measuring apparatus and methods; Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus".

[2] CISPR 16-1-4 (2010): "Specification for radio disturbance and immunity measuring apparatus and methods; Part 1-4: Radio disturbance and immunity measuring apparatus - Antennas and test sites for radiated disturbance measurements".

[3] CISPR 16-1-5 (2015): "Specification for radio disturbance and immunity measuring apparatus and methods; Part 1-5: Radio disturbance and immunity measuring apparatus - Antenna calibration sites and reference test sites for 5 MHz to 18 GHz".

[4] Recommendation ITU-T O.41 (1994): "Psophometer for use on telephone-type circuits".

[5] Recommendation ITU-T O.153 (1992): "Basic parameters for the measurement of error performance at bit rates below the primary rate".



## 2.2 Informative references

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

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

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

[i.1] Directive 2014/53/EC 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 (RE-Directive).

[i.2] CEPT/ERC Recommendation 70-03: "Relating to the use of Short Range Devices (SRD)".

[i.3] Recommendation ITU-R SM.1755: "Characteristics of ultra-wideband technology".

[i.4] ETSI TR 100 028 (V1.4.1) (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".

[i.5] Commission Decision 2013/752/EC on harmonization of the radio spectrum for use by short-range devices as amended by subsequent Commission Decisions.

[i.6] 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.7] Recommendation ITU-R SM.329-12 (2012): "Unwanted emissions in the spurious domain".

[i.8] CEPT/ERC/Recommendation 74-01E: "Unwanted emissions in the spurious domain".

# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

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

**adjacent channels:** two channels offset from the nominal channel by the nominal channel bandwidth

**alarm:** use of radio communication for indicating an alarm condition at a distant location

**alternate adjacent channels:** two channels offset from the nominal channel by double the channel bandwidth

NOTE 1: The operating channel width is described by the occupied bandwidth (see definition below) of the wanted emissions; i.e. the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0,5 % of the total mean power of a given emission. In addition, the occupied bandwidth of the emissions as defined by the ITU-R radio regulations is not to exceed the operating channel width.



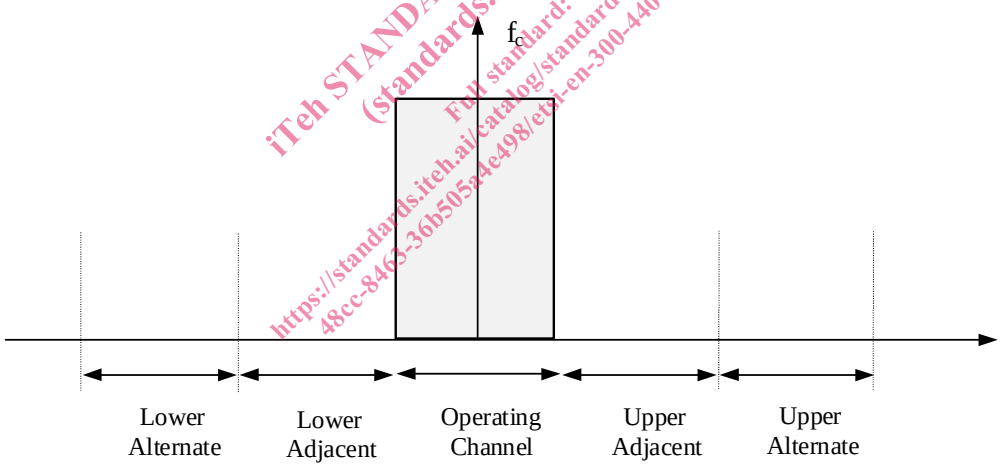


**Figure 1: Adjacent and alternate adjacent channel definitions**

NOTE 2: For equipment to be used in a frequency band where channelization is not defined by regulation, the channel spacing of the equipment is defined by the manufacturer.

**artificial antenna:** non-radiating dummy load equal to the nominal impedance specified by the manufacturer

**assigned frequency band:** frequency band within which the device is authorized to operate and to perform the intended function of the equipment

**chip:** unit of modulation used in Direct Sequence Spread Spectrum (DSSS) modulation

**chip rate:** number of chips per second

**conducted measurements:** measurements which are made using a direct connection to the equipment under test

**cumulative on time ($T_{on\_cum}$):** sum of $T_{on}$, within $T_{obs}$

**dedicated antenna:** removable antenna supplied and tested with the radio equipment, designed as an indispensable part of the equipment

**Direct Sequence Spread Spectrum (DSSS):** form of modulation where a combination of data to be transmitted and a fixed code sequence (chip sequence) is used to directly modulate a carrier, e.g. by phase shift keying

NOTE: The code rate determines the occupied bandwidth.

**Duty Cycle (DC):** ratio expressed as a percentage, of the cumulative duration of transmissions $T_{on\_cum}$ within an observation interval $T_{obs}$. $DC = \left(\frac{T_{on\_cum}}{T_{obs}}\right)_{F_{obs}}$ on an observation bandwidth $F_{obs}$

**equivalent isotropically radiated power:** maximum radiated power of the transmitter and its antenna

**fixed station:** equipment intended for use in a fixed location

**Frequency Hopping Spread Spectrum (FHSS):** spread spectrum technique in which the transmitter signal occupies a number of frequencies in time, each for some period of time, referred to as the dwell time

NOTE: Transmitter and receiver follow the same frequency hop pattern. The number of hop positions and the bandwidth per hop position determine the occupied bandwidth.

**identification system:** equipment consisting of a transmitter(s), receiver(s) (or a combination of the two) and an antenna(s) to identify objects by means of a transponder

**integral antenna:** permanent fixed antenna, which may be built-in, designed as an indispensable part of the equipment

**mobile station:** equipment normally fixed in a vehicle or used as a transportable station

**observation bandwidth ($F_{obs}$):** bandwidth in which the energy of an equipment is considered for the purposes of assessing transmission timings

**observation period ($T_{obs}$):** reference interval of time

**occupied bandwidth:** width of a frequency band such that, below the lower and above the upper frequency limits

NOTE: The mean powers emitted are each equal to 0,5 % of the total mean power of a given emission.

**off time (Toff):** time duration between two successive transmissions

**on time (Ton):** duration on a Transmission Operating Channel (OC)

NOTE: Frequency range in which the Transmission from the equipment occurs; defined by two frequency edges values. Declared by manufacturer.

**Operating Channel Width (OCW):** bandwidth between the two frequencies declared as operating channel

**operating frequency:** nominal frequency at which equipment is operated; this is also referred to as the operating centre frequency

NOTE: Equipment may be able to operate at more than one operating frequency.

**operating frequency range:** range of operating frequencies over which the equipment can be adjusted through tuning, switching or reprogramming

**out of band emissions:** emission on a frequency or frequencies immediately outside the occupied bandwidth which results from the modulation process, but excluding spurious emissions

**portable station:** equipment intended to be carried, attached or implanted

**radiated measurements:** measurements which involve the absolute measurement of a radiated field

**radio determination:** determination of the position, velocity and/or other characteristics of an object, or the obtaining of information relating to these parameters, by means of the propagation properties of radio waves

**spread spectrum:** modulation technique in which the energy of a transmitted signal is spread throughout a large portion of the frequency spectrum