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Short Range Devices (SRD) operating in the frequency range 25 MHz to 1 000 MHz; Part 1: Technical characteristics and methods of measurement

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REN/ERM-TG28-533

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Foreword

This draft European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM), and is now submitted for Vote phase of the ETSI standards EN Approval Procedure.

The present document is part 1 of a multi-part deliverable covering Short Range Devices (SRD), as identified below:

Part 1: "Technical characteristics and methods of measurement";

Part 2: "Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU for non specific radio equipment";

Part 3-1: "Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU; Low duty cycle high reliability equipment, social alarms equipment operating on designated frequencies (869,200 MHz to 869,250 MHz)";

Part 3-2: "Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU; Wireless alarms operating in designated LDC/HR frequency bands 868,60 MHz to 868,70 MHz, 869,25 MHz to 869,40 MHz, 869,65 MHz to 869,70 MHz";

Part 4: "Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU; Metering devices operating in designated band 169,400 MHz to 169,475 MHz".

Other parts may be added in the future, as necessary, using the present document as a basis for Technical characteristics and methods of measurement.

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

Modal verbs terminology

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

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

Introduction

The present document includes improvements to the previous version of the standard that take advantage of technical developments within the SRD industry. It also serves the purpose of providing the requirements and associated measurement methods to improve the intra- SRD co-existence and promote efficient spectrum use.

The attention of the reader is brought on the fact that the present document includes "reference limits" which may be called by harmonised standards but which can also be different if requested for a specific application environment.

The present document is structured as follows:

Clause 2 provides references.

Clause 3 provides definitions of terms and abbreviations used.

Clause 4 provides conformance specifications.

Clause 5 specifies the list of parameters, reference limits and tests.

Annex A (normative): Technical performance of the test equipment.

Annex B (normative): Test Fixture, contains specifications for the test fixture.

Annex C (normative): Test sites and arrangements for radiated measurement, contains specifications concerning radiated measurements.

Annex D (informative): Bibliography.

Annex E (informative): Change History.

1 Scope

The present document specifies technical characteristics and test methods to be used in the conformance assessment of Short Range Device equipment in the frequency range 25 MHz to 1 GHz.

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 http://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] Recommendation ITU-T O.153: "Basic parameters for the measurement of error performance at bit rates below the primary rate".

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

[3] Void.

[4] Void.

[5] ETSI TS 103 060 (V1.1.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Method for a harmonized definition of Duty Cycle Template (DCT) transmission as a passive mitigation technique used by short range devices and related conformance test methods".

[6] ETSI TR 102 273-2 (V1.2.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties; Part 2: Anechoic chamber".

[7] ETSI TR 102 273-3 (V1.2.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties; Part 3: Anechoic chamber with a ground plane".

[8] ETSI TR 102 273-4 (V1.2.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties; Part 4: Open area test site".

2.2 Informative references

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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] CISPR 16 (2006) (parts 1-1, 1-4 and 1-5): "Specification for radio disturbance and immunity measuring apparatus and methods; Part 1: Radio disturbance and immunity measuring apparatus".

[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.

3 Definitions, symbols and abbreviations

3.1 Definitions

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

acknowledgement: brief communication (burst) from the responder to the message initiator confirming successful reception of the message

adaptive frequency agility: capability of an equipment to dynamically change the temporary operational channel within its available frequencies for proper operation

NOTE 1: For the purpose of the present document, non-overlapping channels are used.

NOTE 2: Dynamic change of a channel can be triggered by sensing an occupied channel (e.g. CCA), etc.

adjacent channel: frequency band, of width operating channel width (OCW), on either side of the operating channel

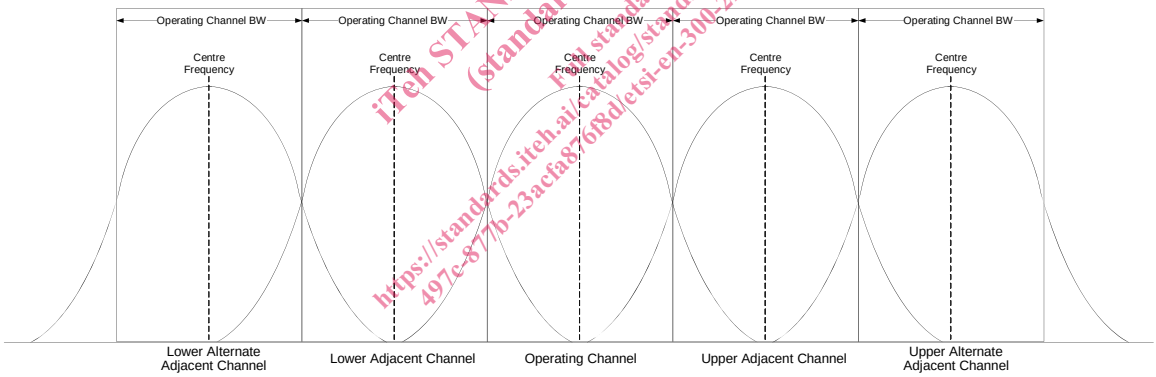


Figure 1: Adjacent Channels definition

alarm device: equipment devices that use radio communication to indicate an alert or danger condition to a distant location

alternate adjacent channels: those two channels offset from the nominal operating channel by double the operating channel width

ancillary equipment: equipment (apparatus), used in connection with a receiver or transmitter

NOTE: It is considered as an ancillary equipment (apparatus) if:

- the equipment is intended for use in conjunction 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); and
- the equipment cannot be used on a stand alone basis 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).

channel adaptivity: ability to adapt device behaviour without change of channel

channel spacing: distance, in hertz, between adjacent nominal centre frequencies

centre frequency: nominal centre frequency of a transmission

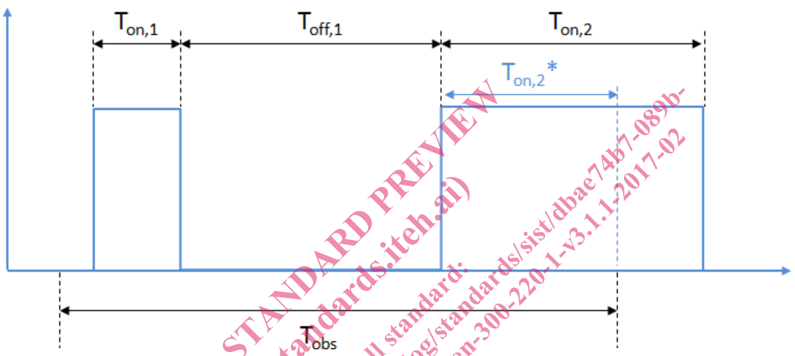
clear channel assessment: procedure of sensing the operating channel to determine whether or not it is occupied by a transmission

conducted measurements: measurements which are made using a direct 50 Ω connection to the equipment under test

continuous transmission: transmission without interruption for the period of the test

cumulative on time (T_{on_cum}): sum of T_{on} within T_{obs}

NOTE: See Figure 2.



In this example: $T_{on\_cum} = T_{on,1} + T_{on,2}$*

Figure 2: Illustration for Cumulative On-Time

dead time: time between the end of the CCA interval and the start of the transmission

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

deferral time: random time a transmission is deferred before a retry to CCA when a channel was not free

disregard time (T_{Dis}): manufacturer declared interval below which two separate radio emissions in an Operating Channel are considered a single continuous transmitted burst

NOTE: See Figure 4.

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

Duty Cycle Template (DCT): duty cycle respecting the constraint of T_{on_max} and T_{off_min} values for transmissions

frequency adaptivity: capability of a device to avoid using permitted operating channels that it has determined are temporarily or permanently unsuitable for its use

frequency agility: capability of a device to dynamically change operating channel

Frequency Hopping Spread Spectrum (FHSS): 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 frequency range is determined by the lowest and highest hop positions and the bandwidth per hop.

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

listen before transmit: mechanism by which an equipment applies Clear Channel Assessment (CCA) before transmission (also known as Listen Before Talk)

maintenance: process of external intervention intended to keep equipment operational

NOTE: Maintenance may be scheduled or in response to failure. Automatic processes by the equipment itself are not considered maintenance.

manufacturer: As given in article 2 of Directive 2014/53/EU [i.2].

maximum transmission duration (T_{On-Max}): longest permitted transmission T_{on}

Message Initiator (MI): device which generates a message to be transferred to another device, such as a Message Responder

Message Responder (MR): device which receives a message from another device, such as a Message Initiator

minimum inter-transmission interval ($T_{Off-Min}$): minimum interval in a channel between two transmissions by the same device

model control: devices used to control models (e.g. miniature representations of vehicles) in the air, on land or over or under the water surface

non-specific use: any type of application

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 (OBW): width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to 0,5 % of the total mean power of a given emission

NOTE: See Figure 3.

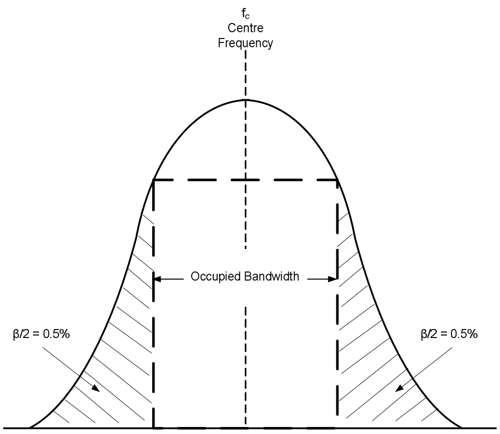


Figure 3: Signal occupied bandwidth

off time (T_{off}): time duration between two successive transmissions in the same operating channel

NOTE: See Figure 4.