



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

Standard PREVIEW
(standards.iteh.ai)
Full standard: https://standards.iteh.ai/catalog/standards/sis/4b7-089b-497c-877b-23acfa876f8d/etsi-en-300-220-1-v3-1-2016-02

Reference

REN/ERM-TG28-533

Keywords

radio, SRD, testing**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

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 only prevailing document is the print of the Portable Document Format (PDF) version kept on a specific network drive within ETSI Secretariat.

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/CommiteeSupportStaff.aspx>

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.

© European Telecommunications Standards Institute 2016.

All rights reserved.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are Trade Marks of ETSI registered for the benefit of its Members. **3GPP™** and **LTE™** are Trade Marks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

GSM® and the GSM logo are Trade Marks registered and owned by the GSM Association.

Contents

Intellectual Property Rights	8
Foreword.....	8
Modal verbs terminology.....	8
Introduction	9
1 Scope	10
2 References	10
2.1 Normative references	10
2.2 Informative references.....	10
3 Definitions, symbols and abbreviations	11
3.1 Definitions	11
3.2 Symbols.....	14
3.3 Abbreviations	14
4 Conformance specification.....	15
4.1 General performance criterion.....	15
4.2 Equipment conformance requirements specification.....	16
4.2.1 General.....	16
4.2.2 Transmitter shut-off facility.....	16
4.2.3 Receiver mute or squelch or battery saving circuit.....	16
4.2.4 Auxiliary test equipment.....	16
4.2.5 Receiver Category.....	16
4.2.5.1 Description	16
4.3 General conditions for testing	17
4.3.1 Test signals	17
4.3.1.1 Test signals for analogue speech.....	17
4.3.1.2 Test signals for data	17
4.3.2 Test power source	18
4.3.2.0 General	18
4.3.2.1 External test power source	18
4.3.2.2 Internal test power source	19
4.3.3 Normal test conditions	19
4.3.3.1 Normal temperature and humidity	19
4.3.3.2 Normal test power source.....	19
4.3.3.2.1 Mains voltage	19
4.3.3.2.2 Regulated lead-acid battery power sources	19
4.3.3.2.3 Other power sources	19
4.3.4 Extreme test conditions.....	19
4.3.4.0 General requirement.....	19
4.3.4.1 Extreme temperatures.....	19
4.3.4.1.0 Procedure for tests at extreme temperatures	19
4.3.4.1.1 General requirements.....	19
4.3.4.1.2 Extreme temperature ranges	20
4.3.4.2 Extreme test source voltages	20
4.3.4.2.1 Mains voltage	20
4.3.4.2.2 Regulated lead-acid battery power sources	21
4.3.4.2.3 Power sources using other types of batteries	21
4.3.4.2.4 Other power sources	21
4.3.5 Testing of frequency agile or hopping equipment	21
4.3.6 Testing of equipment with adaptive power levels.....	21
4.3.7 Artificial antenna	21
4.3.8 Equipment without an external RF connector.....	22
4.3.8.0 General conditions	22
4.3.8.1 Equipment with an internal connector.....	22
4.3.8.2 Equipment with a temporary antenna connector.....	22
4.3.8.3 Use of a Test Fixture	22

4.3.9	Conducted and radiated measurements	22
4.3.10	Measuring receiver	23
4.3.10.0	Description	23
4.3.10.1	Reference bandwidth.....	23
4.4	Interpretation of the measurement results	24
5	Parameters and tests	25
5.1	Operating frequency	25
5.1.1	Description.....	25
5.1.2	Conformance.....	25
5.2	Effective Radiated Power	25
5.2.1	Description.....	25
5.2.2	Conformance.....	25
5.2.2.1	Effective Radiated Power (conducted measurement).....	25
5.2.2.1.0	General	25
5.2.2.1.1	Test conditions	25
5.2.2.1.2	Measurement procedure	25
5.2.2.2	Effective radiated power (radiated measurement).....	26
5.2.2.2.0	General	26
5.2.2.2.1	Test conditions	26
5.2.2.2.2	Measurement procedure	26
5.3	Maximum Effective Radiated Power spectral density.....	27
5.3.1	Description.....	27
5.3.2	Conformance.....	27
5.3.2.1	Test conditions	27
5.3.2.1.1	General requirements.....	27
5.3.2.1.2	Measurement procedure	27
5.4	Duty Cycle.....	29
5.4.1	Description.....	29
5.4.2	Conformance.....	30
5.5	DCT.....	30
5.5.1	Description.....	30
5.5.2	Conformance.....	30
5.5.2.1	Test conditions	30
5.5.2.2	Measurement procedure	30
5.6	Occupied Bandwidth	32
5.6.1	Description.....	32
5.6.2	Reference limits	32
5.6.3	Conformance.....	32
5.6.3.1	Test conditions	32
5.6.3.2	Radiated measurement	32
5.6.3.3	Conducted measurement	32
5.6.3.4	Measurement procedure	33
5.6.3.4.0	General	33
5.6.3.4.1	Method using the build in measurement procedure of the spectrum analyser.....	33
5.6.3.4.2	Method using the -23 dBc measurement procedure	33
5.6.3.5	Recording.....	34
5.7	Frequency error	34
5.7.1	Description.....	34
5.7.2	Conformance.....	34
5.7.2.1	Test conditions	34
5.7.2.2	Conducted measurement	35
5.7.2.3	Radiated measurement	35
5.7.2.4	Measurement procedure	35
5.7.2.5	Recording.....	35
5.8	Tx Out Of Band Emissions.....	36
5.8.1	Description.....	36
5.8.2	Reference limits	37
5.8.3	Conformance.....	37
5.8.3.1	Test conditions	37
5.8.3.2	Radiated measurement	37
5.8.3.3	Conducted measurement	37

5.8.3.4	Measurement procedure	38
5.9	Unwanted emissions in the spurious domain.....	39
5.9.1	Description.....	39
5.9.1.1	Unwanted emissions for a TX mode	39
5.9.1.2	Unwanted emissions for all other modes	39
5.9.2	Reference limits	40
5.9.3	Conformance.....	40
5.9.3.1	Test conditions	40
5.9.3.2	Test conditions for TX mode	40
5.9.3.3	Measurement procedure	41
5.9.3.3.1	Conducted measurement.....	41
5.9.3.3.2	Radiated measurement.....	41
5.10	Transient power.....	42
5.10.1	Description.....	42
5.10.2	Reference limits	42
5.10.3	Conformance.....	42
5.10.3.1	Test conditions	42
5.10.3.2	Measurement procedure	42
5.11	Adjacent Channel Power	43
5.11.1	Description.....	43
5.11.2	Reference limits	43
5.11.2.1	Limits for equipment with operating channel width less than 25 kHz	43
5.11.3	Conformance.....	43
5.11.3.1	Test conditions	43
5.11.3.2	Radiated measurement	44
5.11.3.3	Conducted measurement	44
5.11.3.4	Measurement procedure	44
5.12	TX behaviour under Low Voltage Conditions	45
5.12.1	Description.....	45
5.12.2	Reference limits	45
5.12.3	Conformance.....	45
5.12.3.1	Test conditions	45
5.12.3.2	Measurement procedure	45
5.13	Void.....	45
5.14	Adaptive Power Control	45
5.14.1	Description.....	45
5.14.2	Reference limits	45
5.14.3	Conformance.....	46
5.14.3.1	Test conditions	46
5.14.3.2	Radiated measurement	46
5.14.3.3	Conducted measurement	46
5.14.3.4	Measurement procedure	46
5.15	RX sensitivity level	47
5.15.1	Description.....	47
5.15.2	Reference limits	47
5.15.3	Conformance.....	48
5.15.3.1	Test conditions	48
5.15.3.2	Radiated measurement	48
5.15.3.3	Conducted measurement	48
5.15.3.4	Measurement procedure	48
5.16	Adjacent channel selectivity.....	49
5.16.1	Description.....	49
5.16.2	Reference limit for receiver category 1.....	49
5.16.3	Conformance.....	49
5.16.3.1	Test conditions	49
5.16.3.2	Radiated measurement	49
5.16.3.3	Conducted measurement	49
5.16.3.4	Measurement procedure	50
5.17	Receiver saturation at Adjacent Channel.....	50
5.17.1	Description.....	50
5.17.2	Reference limit for receiver category 1.....	51
5.17.3	Conformance.....	51

5.17.3.1	Test Conditions	51
5.17.3.2	Radiated measurement	51
5.17.3.3	Conducted measurement	51
5.17.3.4	Measurement procedure	51
5.18	Spurious response rejection	52
5.18.1	Description	52
5.18.2	Reference limit for receiver category 1	52
5.18.3	Conformance	52
5.18.3.1	Test Conditions	52
5.18.3.2	Radiated measurement	52
5.18.3.3	Conducted measurement	52
5.18.3.4	Measurement procedure	52
5.19	Blocking	53
5.19.1	Description	53
5.19.2	Reference limits for receiver category 3	53
5.19.3	Reference limits for receiver category 2	54
5.19.4	Reference limits for receiver category 1.5	54
5.19.5	Reference limits for receiver category 1	54
5.19.6	Conformance	54
5.19.6.1	Test conditions	54
5.19.6.2	Radiated measurement	55
5.19.6.3	Conducted measurement	55
5.19.6.4	Measurement procedure	55
5.20	Behaviour at high wanted signal level	56
5.20.1	Description	56
5.20.2	Reference limits for receiver category 1	56
5.20.3	Conformance	56
5.21	Clear Channel Assessment threshold	56
5.21.1	Description	56
5.21.2	Reference CCA limits	57
5.21.3	Conformance	57
5.21.3.1	Test conditions	57
5.21.3.2	Radiated measurement	57
5.21.3.3	Conducted measurement	57
5.21.3.4	Measurement procedure	58
5.22	Polite spectrum access	59
5.22.1	Description	59
5.22.2	Reference limits for polite spectrum access	59
5.22.3	Conformance	59
5.23	Acknowledge transmissions	60
5.23.1	Description	60
5.23.2	Conformance	60
5.24	Adaptive Frequency Agility	60
5.24.1	Description	60
5.24.2	Conformance	60
Annex A (normative): Technical performance of the test equipment		61
A.1	Spectrum analyser	61
A.2	Signal Generators and Signal Sources	61
Annex B (normative): Test Fixture		62
B.0	Description of test-fixture	62
B.1	Validation of the test-fixture in the temperature chamber	63
B.2	Mode of use	65
Annex C (normative): Test sites and arrangements for radiated measurement		66
C.0	Introduction	66
C.1	Radiation test sites	66

C.1.1	Open Area Test Site (OATS)	66
C.1.2	Semi Anechoic Room.....	67
C.1.3	Fully Anechoic Room (FAR)	68
C.1.4	Measurement Distance	70
C.2	Antennas.....	70
C.2.0	General	70
C.2.1	Measurement antenna.....	70
C.2.2	Substitution antenna	70
C.3	Guidance on the use of radiation test sites	71
C.3.0	General	71
C.3.1	Power supplies for the battery powered EUT.....	71
C.3.2	Site preparation	71
C.4	Coupling of signals.....	72
C.4.1	General	72
C.4.2	Data Signals.....	72
C.5	Void.....	72
C.6	Measurement procedures for radiated measurement	72
C.6.0	General	72
C.6.1	Radiated measurements in an OATS or SAR.....	72
C.6.2	Radiated measurements in a FAR	73
C.6.3	Substitution measurement	73
C.6.4	Radiated measurement for receivers.....	73
C.7	Guidance for testing technical requirements	74
C.7.0	General	74
C.7.1	Radio test suites and corresponding test sites.....	74
Annex D (informative):	Bibliography	75
Annex E (informative):	Change History	76
History		77

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is 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 IPR Policy, no investigation, 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.

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 the combined Public Enquiry and 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 the Directive 2014/53/EU for non specific radio equipment";

Part 3-1: "Harmonised Standard covering the essential requirements of article 3.2 of the 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 the 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 the Directive 2014/53/EU; Metering devices operating in designated band 169,400 MHz to 169,475 MHz".

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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
<https://standards.iteh.ai/catalog/standards/sist/dbae74b7-089b-497c-877b-23acfa876f8d/etsi-en-300-220-1-v3.1.1-2017-02>

1 Scope

The present document specifies technical characteristics and test methods to be used in the conformance assessment of Short Range Device equipment.

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

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] 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".

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. LBT), etc.

adjacent channel: frequency band, of width Operating Channel bandwidth, on either side of the Operating Channel

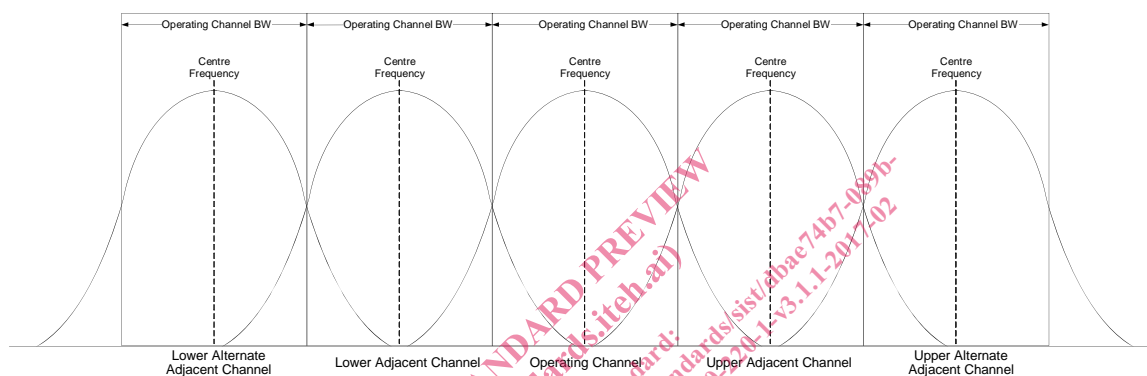


Figure 1: Adjacent Channels definition

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 Bandwidth

audio: wideband application where the activity factor is high (e.g. music)

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

channel spacing: distance, in hertz, between adjacent nominal Centre Frequencies

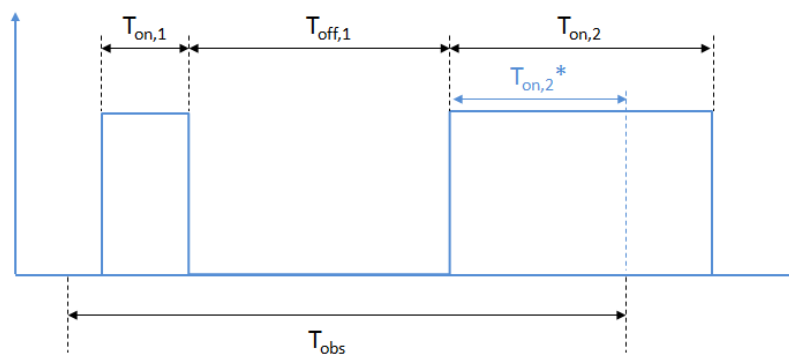
centre frequency: nominal centre frequency of a transmission

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}



In this example: $T_{on_cum} = T_{on,1} + T_{on,2}^*$

Figure 2: Illustration for Cumulative On-Time

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}): provider 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} . $DC = \left(\frac{T_{on_cum}}{T_{obs}} \right)_{F_{obs}}$ 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.

frequency range: See FHSS above.

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

inter transmission interval: time period between two successive transmissions

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.

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 ($T_{\text{Off-Min}}$): 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 overlapping channels: hopping positions separated by channel bandwidth of 90 % or more below the maximum power as measured with a spectrum analyser

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.

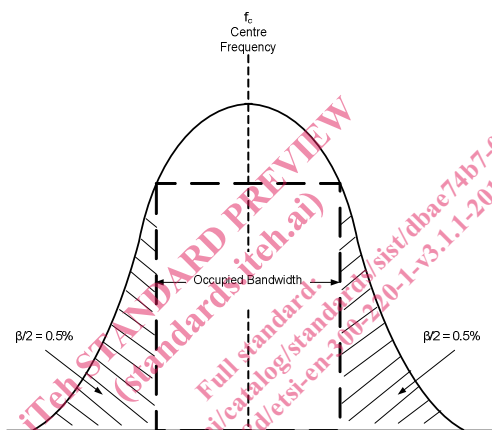


Figure 3: Signal Occupied Bandwidth

off time (T_{off}): time duration between two successive Transmissions

NOTE: See Figure 4.

on time (T_{on}): duration on a Transmission

NOTE: See Figure 4.

Operating Channel (OC): frequency range in which the Transmission from the equipment occurs; defined by two frequency edges values. Declared by manufacturer/provider

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

operating frequency: nominal centre frequency of Transmission

operational frequency band: frequency band or sub-band within which the device is intended to operate and to perform the intended function of the equipment

Out Of Band domain: spectrum area where Out Of Band Emissions occur

Out Of Band emissions: emission on a frequency or frequencies immediately outside the Operating Channel and which results from the modulation process, but excluding spurious emissions

polite spectrum access: techniques to access spectrum and mitigate interference that employ CCA

provider: manufacturer, or his authorized representative or the person responsible for placing the equipment on the market