



**Fixed Radio Systems;
Characteristics and requirements for
point-to-point equipment and antennas;
Part 2: Digital systems operating in frequency bands
from 1 GHz to 174,8 GHz;
Harmonised Standard for access to radio spectrum**

Reference

REN/ATTM-0458

Keywords

antenna, DFRS, digital, DRRS, FWS,
point-to-point, radio, regulation, transmission

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 the
[ETSI Search & Browse Standards](#) application.

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 on [ETSI deliver](#) repository.

Users should be aware that the present document may be revised or have its status changed,
this information is available in the [Milestones listing](#).

If you find errors in the present document, please send your comments to
the relevant service listed under [Committee Support Staff](#).

If you find a security vulnerability in the present document, please report it through our
[Coordinated Vulnerability Disclosure \(CVD\)](#) program.

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 2025.
All rights reserved.

Contents

Intellectual Property Rights	9
Foreword.....	9
Modal verbs terminology.....	10
Introduction	10
1 Scope	11
2 References	11
2.1 Normative references	11
2.2 Informative references.....	12
3 Definition of terms, symbols and abbreviations.....	15
3.1 Terms.....	15
3.2 Symbols.....	15
3.3 Abbreviations	16
4 Technical requirements specifications	16
4.0 Basic understanding of all requirements	16
4.1 Framework for categorization of system	17
4.1.0 Requirement selection.....	17
4.1.1 Introduction and equipment flexibility	17
4.1.2 Operating frequency bands and channel arrangements.....	18
4.1.3 Spectral efficiency classes	18
4.1.4 System alternatives	19
4.1.5 Channel arrangements and utilization.....	19
4.1.6 Specific requirements for frequency bands.....	20
4.1.7 Minimum RIC density for spectral efficiency class selection.....	21
4.1.8 System identification and traffic loading	22
4.1.9 Environmental profile	23
4.2 Transmitter requirements	23
4.2.0 General: system loading.....	23
4.2.1 Transmitter power and power environmental variation	24
4.2.1.1 Transmitter maximum power and EIRP.....	24
4.2.1.2 Transmitter combined nominal output power and EIRP limits	24
4.2.1.3 Transmitter output power environmental variation	24
4.2.2 Transmitter power and frequency control.....	25
4.2.2.1 Transmitter Power and Frequency Control (ATPC, RTPC and RFC)	25
4.2.2.1.0 General background.....	25
4.2.2.1.1 Automatic Transmit Power Control (ATPC).....	25
4.2.2.1.2 Remote Transmit Power Control (RTPC)	25
4.2.2.1.3 Transmitter Remote Frequency Control (RFC)	25
4.2.3 Transmitter Radio Frequency (RF) spectrum mask	25
4.2.3.1 Limits background	25
4.2.3.2 Limits	29
4.2.4 Transmitter discrete CW components exceeding the transmitter Radio Frequency spectrum mask limit.....	41
4.2.4.1 Transmitter discrete CW components at the symbol rate	41
4.2.4.2 Transmitter other discrete CW components exceeding the transmitter Radio Frequency spectrum mask limit.....	41
4.2.5 Transmitter unwanted emissions in the <i>spurious domain</i>	42
4.2.6 Transmitter dynamic Change of Modulation Order.....	43
4.2.7 Transmitter Frequency stability	44
4.2.8 Transmitter emission limitations outside the allocated band	44
4.3 Receiver requirements	44
4.3.0 General: System loading	44
4.3.1 Receiver unwanted emissions in the <i>spurious domain</i>	45
4.3.2 BER as a function of Receiver input Signal Level (RSL).....	45
4.3.3 Receiver selectivity.....	46

4.3.3.1	Introduction.....	46
4.3.3.2	Receiver co-channel, first and second adjacent channel interference sensitivity	46
4.3.3.2.1	Requirements basic.....	46
4.3.3.2.2	Limits for co-channel and first adjacent channel interference sensitivity.....	47
4.3.3.2.3	Limits for second adjacent channel interference sensitivity	47
4.3.3.3	Receiver Blocking (CW spurious interference sensitivity)	48
4.4	Antenna Characteristics.....	48
4.4.1	Integral antennas or dedicated antennas.....	48
4.4.1.1	Introduction.....	48
4.4.1.2	Radiation Pattern Envelope (Off-axis EIRP density).....	48
4.4.1.3	Antenna gain	49
4.4.1.4	Antenna Cross-Polar Discrimination (XPD).....	49
4.4.2	Guidelines for <i>stand-alone</i> antennas.....	49
5	Testing for compliance with technical requirements.....	49
5.1	Environmental and other conditions for testing.....	49
5.1.1	Environmental conditions	49
5.1.1.1	Generality.....	49
5.1.1.2	Minimum profile for equipment indoor use	50
5.1.1.3	Minimum profile for equipment outdoor use	50
5.1.2	Testing of equipment and antenna combination	50
5.1.3	Other basic conditions	50
5.2	Test methods for the transmitter.....	51
5.2.0	General test summary	51
5.2.1	Transmitter power and power environmental variation	52
5.2.1.1	Transmitter maximum power and EIRP.....	52
5.2.1.2	Transmitter combined nominal output power and EIRP limits	53
5.2.1.3	Transmitter output power environmental variation	53
5.2.2	Transmitter power and frequency control.....	53
5.2.2.1	Transmitter Power and Frequency Control (ATPC, RTPC and RFC)	53
5.2.2.1.1	Automatic Transmit Power Control (ATPC).....	53
5.2.2.1.2	Remote Transmit Power Control (RTPC)	53
5.2.2.1.3	Transmitter Remote Frequency Control (RFC).....	54
5.2.3	Transmitter Radio Frequency spectrum mask.....	54
5.2.4	Transmitter discrete CW components exceeding the transmitter Radio Frequency spectrum mask limit.....	54
5.2.5	Transmitter unwanted emissions in the <i>spurious domain</i>	54
5.2.6	Transmitter dynamic Change of Modulation Order.....	55
5.2.7	Transmitter Radio Frequency stability.....	55
5.2.8	Transmitter emission limitations outside the allocated band	55
5.3	Test methods for the receiver	55
5.3.0	General test summary	55
5.3.1	Receiver unwanted emissions in the spurious domain.....	56
5.3.2	BER as a function of Receiver input Signal Level (RSL).....	56
5.3.3	Receiver selectivity.....	57
5.3.3.1	Void.....	57
5.3.3.2	Receiver co-channel, first and second adjacent channel interference sensitivity	57
5.3.3.2.1	Void.....	57
5.3.3.2.2	Receiver co-channel and first adjacent channel.....	57
5.3.3.2.3	Receiver second adjacent channel	57
5.3.3.3	Receiver Blocking (CW spurious interference sensitivity)	57
5.4	Antenna test methods	58
5.4.1	Integral antennas or dedicated antenna	58
5.4.1.1	Summary	58
5.4.1.2	Radiation Pattern Envelope (Off-axis EIRP density).....	58
5.4.1.3	Antenna gain	58
5.4.1.4	Antenna Cross-Polar Discrimination (XPD).....	58
5.4.2	Information on <i>stand-alone</i> antennas tests.....	58

Annex A (informative):	Relationship between the present document and the essential requirements of Directive 2014/53/EU	59
-------------------------------	---	-----------

Annex B (normative):	Frequency bands from 1,4 GHz to 2,6 GHz	61
B.1	Introduction	61
B.2	General characteristics	61
B.2.1	Frequency characteristics and channel arrangements	61
B.2.2	Transmission capacities	62
B.3	Transmitter	63
B.3.1	General requirements	63
B.3.2	Transmitter Radio Frequency spectrum masks options	63
B.4	Receiver	64
B.4.1	General requirements	64
B.4.2	BER as a function of Receiver input Signal Level (RSL)	64
B.4.3	Receiver co-channel, first and second adjacent channels interference sensitivity	65
Annex C (normative):	Frequency bands from 3,5 GHz to 11 GHz (channel separation up to 30 MHz, 56/60 MHz and 112 MHz).....	66
C.1	Introduction	66
C.2	General characteristics	66
C.2.1	Frequency characteristics and channel arrangements	66
C.2.2	Transmission capacities	68
C.3	Transmitter	68
C.3.1	General requirements	68
C.3.2	Transmitter Radio Frequency (RF) spectrum masks	68
C.4	Receiver	69
C.4.1	General requirements	69
C.4.2	BER as a function of Receiver input Signal Level (RSL)	69
C.4.3	Receiver co-channel and first adjacent channel interference sensitivity	71
Annex D (normative):	Frequency bands from 4 GHz to 11 GHz (channel separation 40 MHz and 80 MHz).....	73
D.1	Introduction	73
D.2	General characteristics	73
D.2.1	Frequency characteristics and channel arrangements	73
D.2.2	Transmission capacities	74
D.3	Transmitter	75
D.3.1	General requirements	75
D.3.2	Transmitter Radio Frequency spectrum masks.....	75
D.4	Receiver	75
D.4.1	General requirements	75
D.4.2	BER as a function of Receiver input Signal Level (RSL)	75
D.4.3	Receiver co-channel and first adjacent channel interference sensitivity	77
Annex E (normative):	Frequency bands 13 GHz, 15 GHz and 18 GHz.....	78
E.1	Introduction	78
E.2	General characteristics	78
E.2.1	Frequency characteristics and channel arrangements	78
E.2.2	Transmission capacities	79
E.3	Transmitter	79
E.3.1	General requirements	79
E.3.2	Transmitter Radio Frequency spectrum masks.....	79
E.4	Receiver	80
E.4.1	General requirements	80
E.4.2	BER as a function of Receiver input Signal Level (RSL)	80

E.4.3	Receiver co-channel and first adjacent channel interference sensitivity	83
Annex F (normative):	Frequency bands from 23 GHz to 42 GHz	84
F.1	Introduction	84
F.2	General characteristics	84
F.2.1	Frequency characteristics and channel arrangements	84
F.2.2	Transmission capacities	85
F.3	Transmitter	85
F.3.1	General requirements	85
F.3.2	Transmitter Radio Frequency spectrum masks	86
F.4	Receiver	86
F.4.1	General requirements	86
F.4.2	BER as a function of Receiver input Signal Level (RSL)	86
F.4.3	Receiver co-channel and first adjacent channel interference sensitivity	89
Annex G (normative):	Frequency bands from 50 GHz to 55 GHz	90
G.1	Introduction	90
G.2	General characteristics	90
G.2.1	Frequency characteristics and channel arrangements	90
G.2.2	Transmission capacities	91
G.3	Transmitter	91
G.3.1	General requirements	91
G.3.2	Transmitter Radio Frequency (RF) spectrum masks	91
G.4	Receiver	92
G.4.1	General requirements	92
G.4.2	BER as a function of Receiver input Signal Level (RSL)	92
G.4.3	Receiver co-channel and first adjacent channel interference sensitivity	93
Annex H (informative):	Frequency band 57 GHz to 66 GHz	94
H.1	Information on FS use of the band	94
Annex I (informative):	Frequency band 64 GHz to 66 GHz	95
I.1	Information on FS use of the band	95
Annex J (normative):	Frequency bands from 71 GHz to 86 GHz	96
J.1	Introduction	96
J.2	General characteristics	96
J.2.1	Frequency characteristics and channel arrangements	96
J.2.2	Transmission capacities	97
J.3	Transmitter	98
J.3.1	General requirements	98
J.3.2	Transmitter power and EIRP limits	98
J.3.2.1	Transmitter maximum power and EIRP	98
J.3.2.2	Transmitter Combined nominal output power and EIRP limits	98
J.3.2.2.0	Generality	98
J.3.2.2.1	Equipment without ATPC as permanent feature	98
J.3.2.2.2	Equipment implementing ATPC as permanent feature	99
J.3.3	Transmitter Radio Frequency spectrum masks	101
J.3.4	Transmitter emissions limitations outside the 71 GHz to 76 GHz and 81 GHz to 86 GHz ranges	101
J.3.4.1	General requirements	101
J.3.4.2	Requirement for emissions falling in the 86 GHz to 92 GHz band	102
J.3.4.3	Conformance indications	102
J.4	Receiver	103
J.4.1	General requirements	103

J.4.2	BER as a function of Receiver input Signal Level (RSL)	103
J.4.3	Receiver co-channel and first adjacent channel interference sensitivity	105
J.5	Minimum antenna gain.....	107

Annex K (normative): Frequency bands from 92 GHz to 114,25 GHz108

K.1	Introduction	108
K.2	General characteristics	108
K.2.1	Frequency characteristics and channel arrangements	108
K.2.2	Transmission capacities.....	109
K.3	Transmitter	110
K.3.1	General requirements	110
K.3.2	Transmitter power and EIRP limits	110
K.3.2.1	Transmitter maximum power and EIRP	110
K.3.2.2	Transmitter Combined nominal output power and EIRP limits.....	111
K.3.2.2.0	Generality.....	111
K.3.2.2.1	Equipment without ATPC as permanent feature.....	111
K.3.2.2.2	Equipment implementing ATPC as permanent feature.....	111
K.3.3	Transmitter Radio Frequency (RF) spectrum masks	113
K.3.4	Transmitter emissions limitations outside the 92 GHz to 94 GHz, 94,1 GHz to 100 GHz, 102 GHz to 109,5 GHz and 111,8 to 114,25 GHz ranges	113
K.3.4.1	General requirement	113
K.3.4.2	Requirement for emissions falling in the 86 GHz to 92 GHz, 100 GHz to 102 GHz, 109,5 GHz to 111,8 GHz and 114,25 to 116 GHz ranges	114
K.3.4.3	Conformance indications	115
K.4	Receiver.....	116
K.4.1	General requirements	116
K.4.2	BER as a function of Receiver input Signal Level (RSL)	116
K.4.3	Receiver co channel and first adjacent channel interference sensitivity.....	118
K.5	Minimum antenna gain.....	120

Annex L (normative): Frequency bands from 130 GHz to 174,8 GHz121

L.1	Introduction	121
L.2	General characteristics	121
L.2.1	Frequency characteristics and channel arrangements	121
L.2.2	Transmission capacities.....	122
L.3	Transmitter	123
L.3.1	General requirements	123
L.3.2	Transmitter power and EIRP limits	124
L.3.2.1	Transmitter maximum power and EIRP	124
L.3.2.2	Transmitter Combined nominal output power and EIRP limits.....	124
L.3.2.2.0	Generality.....	124
L.3.2.2.1	Equipment without ATPC as permanent feature.....	124
L.3.2.2.2	Equipment implementing ATPC as permanent feature.....	125
L.3.3	Transmitter Radio Frequency spectrum masks.....	127
L.3.4	Transmitter emissions limitations outside the 130 GHz to 134 GHz, 141 GHz to 148,5 GHz, 151,5 GHz to 164 GHz and 167 GHz to 174,8 GHz ranges	127
L.3.4.1	General requirement	127
L.3.4.2	Requirement for emissions falling in the 148,5 GHz to 151,5 GHz and 164 GHz to 167 GHz.....	128
L.3.4.3	Conformance indications	128
L.4	Receiver.....	129
L.4.1	General requirements	129
L.4.2	BER as a function of Receiver input Signal Level (RSL)	129
L.4.3	Receiver co channel and first adjacent channel interference sensitivity.....	132
L.5	Minimum antenna gain.....	136