

---

**Fiksni radijski sistemi - Karakteristike in zahteve za opremo in antene tipa točka-točka - 2. del: Digitalni sistemi, ki delujejo v frekvenčnih pasovih od 1 GHz do 86 GHz - Harmonizirani standard za dostop do radijskega spektra**

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 86 GHz - Harmonised Standard for access to radio spectrum

**Ta slovenski standard je istoveten z: ETSI EN 302 217-2 V3.2.0 (2019-03)**

**ICS:**

33.060.30	Radiorelejni in fiksni satelitski komunikacijski sistemi	Radio relay and fixed satellite communications systems
33.120.40	Antene	Aerials

**oSIST prEN 302 217-2 V3.2.0:2019**      **en**

**ITeH STANDARD PREVIEW**  
**(standards.iteh.ai)**

Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/09f3169f-282d-43a2-b42a-b5bdd6fdae-20/osist-pr-en-302-217-2-v3.2.0-2019>

# Draft ETSI EN 302 217-2 V3.2.0 (2019-03)



**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 86 GHz;  
Harmonised Standard for access to radio spectrum**

*PREVIEW*  
<https://standards.etsi.org/standards-search/302217-2-3.2.0-2019>  
[43a2-b42a-b51bd6a7-2019-03-01-195149f-282d-](https://standards.etsi.org/standards-search/302217-2-3.2.0-2019)

---

**Reference**

REN/ATTM-0438

---

**Keywords**

antenna, DFRS, digital, DRRS, FWA, 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 - 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 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/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.

© ETSI 2019.  
All rights reserved.

**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.

# 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 .....	15
4 Technical requirements specifications .....	15
4.1 Framework for categorisation of system .....	15
4.1.0 Generality .....	15
4.1.1 Introduction and equipment flexibility .....	15
4.1.2 Operating frequency bands and channel arrangements.....	17
4.1.3 Spectral efficiency classes .....	17
4.1.4 System alternatives .....	18
4.1.5 Channel arrangements and utilization.....	18
4.1.6 Specific Requirements for frequency bands.....	19
4.1.7 Minimum RIC density for spectral efficiency class selection.....	20
4.1.8 Payload flexibility.....	20
4.1.9 System identification and traffic loading .....	21
4.1.10 Environmental profile .....	22
4.2 Transmitter requirements .....	22
4.2.0 General: system loading.....	22
4.2.1 Transmitter power and power environmental variation .....	23
4.2.1.1 Maximum power and EIRP.....	23
4.2.1.2 Combined TX power output and EIRP limits .....	23
4.2.1.3 Output power environmental variation.....	24
4.2.2 Transmitter power and frequency control.....	24
4.2.2.1 Power Control (ATPC and RTPC).....	24
4.2.2.1.0 General background.....	24
4.2.2.1.1 Automatic Transmit Power Control (ATPC).....	24
4.2.2.1.2 Remote Transmit Power Control (RTPC) .....	24
4.2.2.2 Remote Frequency Control (RFC) .....	24
4.2.3 Radio Frequency (RF) spectrum mask.....	25
4.2.3.1 Limits background .....	25
4.2.3.2 Limits .....	28
4.2.4 Discrete CW components exceeding the spectrum mask limit .....	41
4.2.4.1 Discrete CW components at the symbol rate .....	41
4.2.4.2 Other discrete CW components exceeding the spectrum mask limit .....	41
4.2.5 Unwanted emissions in the <i>spurious domain</i> - external.....	42
4.2.6 Dynamic Change of Modulation Order .....	43
4.2.7 Frequency tolerance .....	43
4.2.8 Emission limitations outside the allocated band .....	44
4.3 Receiver requirements .....	44
4.3.0 General: System loading .....	44
4.3.1 Unwanted emissions in the <i>spurious domain</i> - external.....	44
4.3.2 BER as a function of receiver input signal level RSL .....	44
4.3.3 Receiver selectivity.....	45
4.3.3.1 Introduction.....	45
4.3.3.2 Co-channel "external", first and second adjacent channel interference sensitivity .....	45

4.3.3.2.1	Requirements basic.....	45
4.3.3.2.2	Limits for co-channel and first adjacent channel.....	46
4.3.3.2.3	Limits for second adjacent channel interference.....	46
4.3.3.3	CW spurious interference (blocking & spurious response rejection).....	47
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.....	48
4.4.1.4	Antenna Cross-Polar Discrimination (XPD).....	48
4.4.2	Guidelines for <i>stand-alone</i> antennas.....	48
5	Testing for compliance with technical requirements.....	49
5.1	Environmental and other conditions for testing.....	49
5.1.1	Environmental conditions.....	49
5.1.2	Other basic conditions.....	49
5.2	Test methods for the transmitter.....	50
5.2.0	General test summary.....	50
5.2.1	Transmitter power and power environmental variation.....	51
5.2.1.1	Transmitter power and EIRP.....	51
5.2.1.2	Combined TX power output and EIRP limits.....	52
5.2.1.3	Output power environmental variation.....	52
5.2.2	Transmitter power and frequency control.....	52
5.2.2.1	Transmitter Power Control (ATPC and RTPC).....	52
5.2.2.1.1	ATPC.....	52
5.2.2.1.2	RTPC.....	52
5.2.2.2	Remote Frequency Control (RFC).....	52
5.2.3	RF spectrum mask.....	53
5.2.4	Discrete CW components exceeding the spectrum mask limit.....	53
5.2.5	Unwanted emissions in the spurious domain - external.....	53
5.2.6	Dynamic Change of Modulation Order.....	53
5.2.7	Radio frequency tolerance.....	54
5.3	Test methods for the receiver.....	54
5.3.0	General test summary.....	54
5.3.1	Unwanted emissions in the spurious domain - external.....	55
5.3.2	BER as a function of receiver input signal level (RSL).....	55
5.3.3	Receiver selectivity.....	56
5.3.3.1	Void.....	56
5.3.3.2	Co-channel "external", first and second adjacent channel interference sensitivity.....	56
5.3.3.2.1	Co-channel and first adjacent channel.....	56
5.3.3.2.2	Second adjacent channel.....	56
5.3.3.3	CW spurious interference.....	56
5.4	Antenna test methods for systems with integral or dedicated antenna.....	56
5.4.0	General test summary.....	56
5.4.1	Radiation Pattern Envelope (Off-axis EIRP density).....	57
5.4.2	Antenna gain.....	57
5.4.3	Antenna Cross-Polar Discrimination (XPD).....	57
<b>Annex A (informative):</b>	<b>Relationship between the present document and the essential requirements of Directive 2014/53/EU.....</b>	<b>58</b>
<b>Annex B (normative):</b>	<b>Frequency bands from 1,4 GHz to 2,6 GHz.....</b>	<b>60</b>
B.1	Introduction.....	60
B.2	General characteristics.....	60
B.2.1	Frequency characteristics and channel arrangements.....	60
B.2.2	Transmission capacities.....	60
B.3	Transmitter.....	61
B.3.1	General requirements.....	61
B.3.2	RF spectrum masks options.....	62
B.4	Receiver.....	62

B.4.1	General requirements .....	62
B.4.2	BER as a function of receiver input signal level (RSL) .....	62
B.4.3	Co-channel "external" and adjacent channels interference sensitivity .....	63
<b>Annex C (normative): Frequency bands from 3,5 GHz to 11 GHz (channel separation up to 30 MHz and 56/60 MHz) .....</b>		<b>65</b>
C.1	Introduction .....	65
C.2	General characteristics .....	65
C.2.1	Frequency characteristics and channel arrangements .....	65
C.2.2	Transmission capacities .....	66
C.3	Transmitter .....	67
C.3.1	General requirements .....	67
C.3.2	RF spectrum masks .....	67
C.4	Receiver .....	67
C.4.1	General requirements .....	67
C.4.2	BER as a function of Receiver input Signal Level (RSL) .....	67
C.4.3	Co-channel "external" and adjacent channel interference sensitivity .....	69
<b>Annex D (normative): Frequency bands from 4 GHz to 11 GHz (channel separation 40 MHz) .....</b>		<b>70</b>
D.1	Introduction .....	70
D.2	General characteristics .....	70
D.2.1	Frequency characteristics and channel arrangements .....	70
D.2.2	Transmission capacities .....	70
D.3	Transmitter .....	71
D.3.1	General requirements .....	71
D.3.2	RF spectrum masks .....	71
D.4	Receiver .....	72
D.4.1	General requirements .....	72
D.4.2	BER as a function of Receiver input Signal Level (RSL) .....	72
D.4.3	Co-channel "external" and adjacent channel interference sensitivity .....	73
<b>Annex E (normative): Frequency bands 13 GHz, 15 GHz and 18 GHz .....</b>		<b>74</b>
E.1	Introduction .....	74
E.2	General characteristics .....	74
E.2.1	Frequency characteristics and channel arrangements .....	74
E.2.2	Transmission capacities .....	75
E.3	Transmitter .....	75
E.3.1	General requirements .....	75
E.3.2	RF spectrum masks .....	75
E.4	Receiver .....	76
E.4.1	General requirements .....	76
E.4.2	BER as a function of Receiver input Signal Level (RSL) .....	76
E.4.3	Co-channel "external" and adjacent channel interference sensitivity .....	79
<b>Annex F (normative): Frequency bands from 23 GHz to 42 GHz .....</b>		<b>80</b>
F.1	Introduction .....	80
F.2	General characteristics .....	80
F.2.1	Frequency characteristics and channel arrangements .....	80
F.2.2	Transmission capacities .....	81
F.3	Transmitter .....	81
F.3.1	General requirements .....	81
F.3.2	RF spectrum masks .....	82

F.4	Receiver.....	82
F.4.1	General requirements .....	82
F.4.2	BER as a function of Receiver input Signal Level (RSL) .....	82
F.4.3	Co-channel "external" and adjacent channel interference sensitivity .....	85
<b>Annex G (normative):      Frequency bands from 50 GHz to 55 GHz .....</b>		<b>86</b>
G.1	Introduction .....	86
G.2	General characteristics .....	86
G.2.1	Frequency characteristics and channel arrangements .....	86
G.2.2	Transmission capacities.....	87
G.3	Transmitter .....	87
G.3.1	General requirements .....	87
G.3.2	RF spectrum masks .....	87
G.4	Receiver.....	87
G.4.1	General requirements .....	87
G.4.2	BER as a function of Receiver input Signal Level (RSL) .....	88
G.4.3	Co-channel "external" and adjacent channel interference sensitivity .....	88
<b>Annex H (normative):      Frequency band 57 GHz to 66 GHz .....</b>		<b>89</b>
H.1	Introduction .....	89
H.2	General characteristics .....	89
H.2.1	Frequency characteristics and channel arrangements .....	89
H.2.2	Transmission capacities.....	89
H.3	Transmitter .....	90
H.3.1	General requirements .....	90
H.3.2	Combined TX power output and EIRP limits.....	90
H.3.2.1	Maximum power and EIRP .....	90
H.3.2.2	Equipment without ATPC as permanent feature .....	91
H.3.2.3	Equipment implementing ATPC as permanent feature.....	91
H.3.3	RF spectrum masks .....	94
H.3.4	Emissions outside the 57 GHz to 66 GHz range .....	94
H.4	Receiver.....	94
H.4.1	General requirements .....	94
H.4.2	BER as a function of Receiver input Signal Level (RSL) .....	94
H.4.3	Co-channel "external" and adjacent channel interference sensitivity .....	95
H.5	Minimum antenna gain.....	96
<b>Annex I (normative):      Frequency band 64 GHz to 66 GHz .....</b>		<b>97</b>
I.1	Introduction .....	97
I.2	General characteristics .....	97
I.2.1	Frequency characteristics and channel arrangements .....	97
I.2.2	Transmission capacities.....	98
I.2.2.1	Channel arrangement based on $N \times 50$ MHz .....	98
I.2.2.2	Channel arrangement based on $N \times 30$ MHz .....	98
I.3	Transmitter .....	99
I.3.1	General requirements .....	99
I.3.2	Combined TX power and EIRP limits.....	99
I.3.2.1	Generality .....	99
I.3.2.2	Equipment without ATPC as permanent feature .....	99
I.3.2.3	Equipment implementing ATPC as permanent feature.....	100
I.3.3	RF spectrum mask .....	103
I.3.4	Emissions outside the 64 GHz to 66 GHz range .....	103
I.4	Receiver.....	103
I.4.1	General requirements .....	103

I.4.2	BER as a function of Receiver input Signal Level (RSL) .....	103
I.4.2.1	Channel arrangement based on $N \times 50$ MHz .....	103
I.4.2.2	Channel arrangement based on $N \times 30$ MHz .....	103
I.4.3	Co-channel "external" and adjacent channel interference sensitivity .....	104
I.4.3.1	Channel arrangement based on $N \times 50$ MHz .....	104
I.4.3.2	Channel arrangement based on $N \times 30$ MHz .....	105
I.5	Minimum antenna gain .....	105
<b>Annex J (normative): Frequency bands from 71 GHz to 86 GHz .....</b>		<b>106</b>
J.1	Introduction .....	106
J.2	General characteristics .....	106
J.2.1	Frequency characteristics and channel arrangements .....	106
J.2.2	Transmission capacities .....	107
J.3	Transmitter .....	108
J.3.1	General requirements .....	108
J.3.2	Combined maximum transmitter power and EIRP .....	108
J.3.2.1	Generality .....	108
J.3.2.2	Equipment without ATPC as permanent feature .....	108
J.3.2.3	Equipment implementing ATPC as permanent feature .....	109
J.3.3	RF spectrum masks .....	111
J.3.4	Emissions outside the 71 GHz to 76 GHz and 81 GHz to 86 GHz ranges .....	111
J.3.4.1	General requirement .....	111
J.3.4.2	Requirement for emissions above 86 GHz band edge .....	111
J.3.4.3	Conformance statement (see note) .....	112
J.4	Receiver .....	113
J.4.1	General requirements .....	113
J.4.2	BER as a function of Receiver input Signal Level (RSL) .....	113
J.4.3	Co-channel "external" and adjacent channel interference sensitivity .....	115
J.5	Minimum antenna gain .....	117
<b>Annex K:</b>	<b>Void .....</b>	<b>118</b>
<b>Annex L:</b>	<b>Void .....</b>	<b>119</b>
<b>Annex M:</b>	<b>Void .....</b>	<b>120</b>
<b>Annex N (normative): Definition of equivalent data rates for packet data, PDH/SDH and other signals on the traffic interface .....</b>		<b>121</b>
N.1	Introduction .....	121
N.2	General characteristics .....	121
N.2.1	Frequency characteristics and channel arrangements .....	121
N.2.2	Transmission capacities .....	121
N.3	System parameters .....	124
N.3.0	Introduction .....	124
N.3.1	Transmitter .....	124
N.3.2	Receiver .....	124
N.3.3	FER as a function of BER .....	124
<b>Annex O (normative): Test report in relation to flexible systems applications .....</b>		<b>126</b>
O.1	Wide radio-frequency band covering units .....	126
O.2	Multirate/multiple modulation format equipment .....	128
O.2.0	Introduction .....	128
O.2.1	Generic required tests in the test report .....	129
O.2.2	Reduced set of required tests in the test report .....	129
O.2.2.0	Introduction .....	129

O.2.2.1	Reduced transmitter tests .....	129
O.2.2.2	Reduced receiver tests .....	130
O.2.3	Bandwidth adaptive test set requirements .....	131
O.3	BER and C/I measurement in <i>multi-channels</i> systems (including <i>channels-aggregation</i> ) when common SDH or Ethernet single/multiple-interfaces payload is provided.....	131
O.3.0	Introduction .....	131
O.3.1	Case 1: multi-interfaces/two-channels systems where each interface payload is transmitted on one channel only .....	132
O.3.2	Case 2: single interface or multi-interfaces/two-channels system where each payload interface is transmitted equally split on both channels .....	132
O.4	Test provisions for <i>channels-aggregation</i> equipment.....	134
O.4.1	General requirements and test method .....	134
O.4.2	Limits combination for <i>single-port</i> case.....	136
<b>Annex P (informative):</b>	<b>Technical background for receiver selectivity and C/I interference sensitivity evaluation.....</b>	<b>139</b>
P.1	Receiver selectivity .....	139
P.1.1	Introduction .....	139
P.1.2	Graphical representation of WBSEL.....	140
P.2	C/I interference sensitivity .....	141
P.2.1	Introduction .....	141
P.2.2	Ideal selectivity and best case C/I value for 2nd adjacent CS .....	142
<b>Annex Q (informative):</b>	<b>Guidelines for using stand-alone antennas.....</b>	<b>145</b>
<b>Annex R (informative):</b>	<b>Test interpretation and measurement uncertainty .....</b>	<b>146</b>
<b>Annex S (informative):</b>	<b>Bibliography.....</b>	<b>147</b>
<b>Annex T (informative):</b>	<b>Change history .....</b>	<b>148</b>
History .....		149

---

## Intellectual Property Rights

### Essential patents

IPRs essential or potentially essential to normative deliverables 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.

### 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.

---

## Foreword

This draft Harmonised European Standard (EN) has been produced by ETSI Technical Committee Access, Terminals, Transmission and Multiplexing (ATTM), 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.62] 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.

The present document is part 2 of a multi-part deliverable covering Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas. Full details of the entire series can be found in ETSI EN 302 217-1 [4].

<b>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

Major changes with respect to previously published versions are summarized in annex T.

---

## 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 ETSI EN 302 217 series has been produced in order to rationalize a large number of previous ETSI ENs dealing with equipment and antennas for Point-to-Point (P-P) Fixed Service applications. For more details, see foreword in ETSI EN 302 217-1 [4].

**ITeH STANDARD PREVIEW**  
(standards.iteh.ai)  
Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/09113169f-282d-43a2-b42a-b51bd6fdae-2019/sist-pr-en-302-217-2-v3.2.0-2019>

---

# 1 Scope

The present document specifies technical characteristics and methods of measurements for Point-to-point (P-P) Digital Fixed Radio Systems (DFRS) operating in frequency bands allocated to Fixed Service (FS) from 1 GHz to 86 GHz, corresponding to the appropriate frequency bands from 1,4 GHz to 86 GHz as described in annex B to annex J.

Systems in the scope of the present document are generally intended to operate in full frequency division duplex (FDD) and covers also unidirectional applications. Time division duplex (TDD) applications, when possibly applicable in a specific band, are explicitly mentioned as appropriate in annex B through annex J.

The present document covers requirements to demonstrate that radio equipment both effectively uses and supports the efficient use of radio spectrum in order to avoid harmful interference

NOTE: The relationship between the present document and the essential requirements of article 3.2 of Directive 2014/53/EU [i.1] is given 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 <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] ETSI EN 301 126-1 (V1.1.2) (09-1999): "Fixed Radio Systems; Conformance testing; Part 1: Point-to-point equipment - Definitions, general requirements and test procedures".
- [2] ETSI EN 301 126-3-1 (V1.1.2) (12-2002): "Fixed Radio Systems; Conformance testing; Part 3-1: Point-to-Point antennas; Definitions, general requirements and test procedures".
- [3] ETSI EN 301 390 (V1.3.1) (08-2013): "Fixed Radio Systems; Point-to-point and Multipoint Systems; Unwanted emissions in the spurious domain and receiver immunity limits at equipment/antenna port of Digital Fixed Radio Systems".
- [4] ETSI EN 302 217-1 (V3.2.0) (02-2019): "Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas; Part 1: Overview, common characteristics and system-independent requirements".
- [5] ETSI EN 302 217-4 (V2.1.1) (05-2017): "Fixed Radio Systems; Characteristics and requirements for point-to-point equipment and antennas; Part 4: Antennas".
- [6] Recommendation ITU-T O.151 (10-1992) / Corrigendum 1 (05-2002): "Error performance measuring equipment operating at the primary rate and above".
- [7] Recommendation ITU-T O.181 (05-2002): "Equipment to assess error performance on STM-N interfaces".
- [8] Recommendation ITU-T O.191 (02-2000): "Equipment to measure the cell transfer performance of ATM connections".
- [9] IEEE 802.3™-2012: "IEEE Standard for Ethernet".
- [10] ITU Radio Regulations (2016).