

ETSI TS 138 141-1 V15.13.0 (2022-10)



5G;
NR;

iTeh STANDARD PREVIEW

**Base Station (BS) conformance testing
Part 1: Conducted conformance testing
(3GPP TS 38.141-1 version 15.13.0 Release 15)**

<https://standards.iteh.ai/catalog/standards/sist/3a6f1e89-e7fe-4268-8f0d-3bb74b25e942/etsi-ts-138-141-1-v15-13-0-2022-10>



ReferenceRTS/TSGR-0438141-1vfd0

Keywords5G

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:

<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.

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://standards-portal.etsi.org/People/CommitteeSupportStaff.aspx> 4268-8f0d-

If you find a security vulnerability in the present document, please report it through our

Coordinated Vulnerability Disclosure Program:

<https://www.etsi.org/standards/coordinated-vulnerability-disclosure>

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.

No representation or warranty is made that this deliverable is technically accurate or sufficient or conforms to any law and/or governmental rule and/or regulation and further, no representation or warranty is made of merchantability or fitness for any particular purpose or against infringement of intellectual property rights.

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 2022.
All rights reserved.

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The declarations pertaining to these essential IPRs, if any, are 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 Directives including the ETSI IPR Policy, no investigation regarding the essentiality of IPRs, 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.

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.

Legal Notice

This Technical Specification (TS) has been produced by ETSI 3rd Generation Partnership Project (3GPP).

The present document may refer to technical specifications or reports using their 3GPP identities. These shall be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between 3GPP and ETSI identities can be found under <http://webapp.etsi.org/key/queryform.asp>.

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.

Contents

Intellectual Property Rights	2
Legal Notice	2
Modal verbs terminology.....	2
Foreword.....	12
1 Scope	13
2 References	13
3 Definitions, symbols and abbreviations	15
3.1 Definitions	15
3.2 Symbols.....	17
3.3 Abbreviations	18
4 General conducted test conditions and declarations.....	20
4.1 Measurement uncertainties and test requirements	20
4.1.1 General.....	20
4.1.2 Acceptable uncertainty of Test System.....	20
4.1.2.1 General	20
4.1.2.2 Measurement of transmitter	21
4.1.2.3 Measurement of receiver	22
4.1.2.4 Measurement of performance requirements.....	25
4.1.3 Interpretation of measurement results.....	25
4.2 Conducted requirement reference points	25
4.2.1 BS type 1-C	25
4.2.2 BS type 1-H	26
4.3 Base station classes	27
4.4 Regional requirements	27
4.5 BS configurations	28
4.5.1 BS type 1-C	28
4.5.1.1 Transmit configurations	28
4.5.1.1.1 General	28
4.5.1.1.2 Transmission with multiple transmitter antenna connectors.....	29
4.5.1.2 Receive configurations.....	29
4.5.1.2.1 General	29
4.5.1.2.2 Reception with multiple receiver antenna connectors, receiver diversity.....	29
4.5.1.3 Duplexers	30
4.5.1.4 Power supply options	30
4.5.1.5 Ancillary RF amplifiers.....	30
4.5.2 BS type 1-H.....	31
4.5.2.1 Transmit configurations	31
4.5.2.2 Receive configurations.....	32
4.5.2.3 Power supply options	32
4.5.3 BS with integrated Luant BS modem	32
4.6 Manufacturer declarations	32
4.7 Test configurations	37
4.7.1 General.....	37
4.7.2 Test signal used to build Test Configurations.....	37
4.7.3 NRTC1: Contiguous spectrum operation.....	37
4.7.3.1 NRTC1 generation	37
4.7.3.2 NRTC1 power allocation	38
4.7.4 NRTC2: Contiguous CA occupied bandwidth.....	38
4.7.4.1 NRTC2 generation	38
4.7.4.2 NRTC2 power allocation	38
4.7.5 NRTC3: Non-contiguous spectrum operation	39
4.7.5.1 NRTC3 generation	39
4.7.5.2 NRTC3 power allocation	39
4.7.6 NRTC4: Multi-band test configuration for full carrier allocation.....	39

4.7.6.1	NRTC4 generation	39
4.7.6.2	NRTC4 power allocation	40
4.7.7	NRTC5: Multi-band test configuration with high PSD per carrier	40
4.7.7.1	NRTC5 generation	40
4.7.7.2	NRTC5 power allocation	40
4.8	Applicability of requirements	41
4.8.1	General	41
4.8.2	Requirement set applicability	41
4.8.3	Applicability of test configurations for single-band operation	41
4.8.4	Applicability of test configurations for multi-band operation	42
4.9	RF channels and test models	43
4.9.1	RF channels	43
4.9.2	Test models	44
4.9.2.1	General	44
4.9.2.2	FR1 test models	45
4.9.2.2.1	FR1 test model 1.1 (NR-FR1-TM1.1)	46
4.9.2.2.2	FR1 test model 1.2 (NR-FR1-TM1.2)	46
4.9.2.2.3	FR1 test model 2 (NR-FR1-TM2)	47
4.9.2.2.4	FR1 test model 2a (NR-FR1-TM2a)	47
4.9.2.2.5	FR1 test model 3.1 (NR-FR1-TM3.1)	48
4.9.2.2.6	FR1 test model 3.1a (NR-FR1-TM3.1a)	48
4.9.2.2.7	FR1 test model 3.2 (NR-FR1-TM3.2)	48
4.9.2.2.8	FR1 test model 3.3 (NR-FR1-TM3.3)	49
4.9.2.3	Data content of Physical channels and Signals for NR-FR1-TM	50
4.9.2.3.1	PDCCH	50
4.9.2.3.2	PDSCH	50
4.10	Requirements for contiguous and non-contiguous spectrum	51
4.11	Requirements for BS capable of multi-band operation	52
4.12	Format and interpretation of tests	52
5	Operating bands and channel arrangement	53
6	Conducted transmitter characteristics	54
6.1	General	54
6.1.1	BS type 1-C	54
6.1.2	BS type 1-H	54
6.2	Base station output power	54
6.2.1	Definition and applicability	54
6.2.2	Minimum requirement	55
6.2.3	Test purpose	55
6.2.4	Method of test	55
6.2.4.1	Initial conditions	55
6.2.4.2	Procedure	55
6.2.5	Test requirement	56
6.3	Output power dynamics	56
6.3.1	General	56
6.3.2	RE power control dynamic range	56
6.3.2.1	Definition and applicability	56
6.3.2.2	Minimum requirement	56
6.3.2.3	Test purpose	57
6.3.3	Total power dynamic range	57
6.3.3.1	Definition and applicability	57
6.3.3.2	Minimum requirement	57
6.3.3.3	Test purpose	57
6.3.3.4	Method of test	57
6.3.3.4.1	Initial conditions	57
6.3.3.4.2	Procedure	57
6.3.3.5	Test requirements	58
6.4	Transmit ON/OFF power	58
6.4.1	Transmitter OFF power	58
6.4.1.1	Definition and applicability	58
6.4.1.2	Minimum requirement	58

6.4.1.3	Test purpose	59
6.4.1.4	Method of test	59
6.4.1.5	Test requirements	59
6.4.2	Transmitter transient period	59
6.4.2.1	Definition and applicability	59
6.4.2.2	Minimum requirement	59
6.4.2.3	Test purpose	59
6.4.2.4	Method of test	60
6.4.2.4.1	Initial conditions	60
6.4.2.4.2	Procedure	60
6.4.2.5	Test requirements	60
6.5	Transmitted signal quality	61
6.5.1	General	61
6.5.2	Frequency error	61
6.5.2.1	Definition and applicability	61
6.5.2.2	Minimum Requirement	61
6.5.2.3	Test purpose	61
6.5.2.4	Method of test	61
6.5.2.5	Test Requirements	61
6.5.3	Modulation quality	61
6.5.3.1	Definition and applicability	61
6.5.3.2	Minimum Requirement	62
6.5.3.3	Test purpose	62
6.5.3.4	Method of test	62
6.5.3.4.1	Initial conditions	62
6.5.3.4.2	Procedure	62
6.5.3.5	Test requirements	63
6.5.4	Time alignment error	64
6.5.4.1	Definition and applicability	64
6.5.4.2	Minimum requirement	64
6.5.4.3	Test purpose	65
6.5.4.4	Method of test	65
6.5.4.4.1	Initial conditions	65
6.5.4.4.2	Procedure	65
6.5.4.5	Test requirement	66
6.6	Unwanted emissions	66
6.6.1	General	66
6.6.2	Occupied bandwidth	66
6.6.2.1	Definition and applicability	66
6.6.2.2	Minimum Requirements	67
6.6.2.3	Test purpose	67
6.6.2.4	Method of test	67
6.6.2.4.1	Initial conditions	67
6.6.2.4.2	Procedure	67
6.6.2.5	Test requirements	68
6.6.3	Adjacent Channel Leakage Power Ratio (ACLR)	68
6.6.3.1	Definition and applicability	68
6.6.3.2	Minimum requirement	68
6.6.3.3	Test purpose	69
6.6.3.4	Method of test	69
6.6.3.4.1	Initial conditions	69
6.6.3.4.2	Procedure	69
6.6.3.5	Test requirements	70
6.6.3.5.1	General requirements	70
6.6.3.5.2	Limits and <i>basic limits</i>	70
6.6.3.5.3	<i>BS type 1-C</i>	72
6.6.3.5.4	<i>BS type 1-H</i>	73
6.6.4	Operating band unwanted emissions	73
6.6.4.1	Definition and applicability	73
6.6.4.2	Minimum requirement	75
6.6.4.3	Test purpose	75
6.6.4.4	Method of test	75

6.6.4.4.1	Initial conditions	75
6.6.4.4.2	Procedure	75
6.6.4.5	Test requirements	76
6.6.4.5.1	General requirements	76
6.6.4.5.2	Basic limits for Wide Area BS (Category A)	76
6.6.4.5.3	Basic limits for Wide Area BS (Category B)	77
6.6.4.5.3.1	Category B requirements (Option 1)	77
6.6.4.5.3.2	Category B requirements (Option 2)	78
6.6.4.5.4	Basic limits for Medium Range BS (Category A and B)	79
6.6.4.5.5	Basic limits for Local Area BS (Category A and B)	81
6.6.4.5.6	Basic limits for additional requirements	82
6.6.4.5.6.1	Limits in FCC Title 47	82
6.6.4.5.6.2	Protection of DTT	82
6.6.4.5.6.3	(void)	82
6.6.4.5.7	BS type 1-C	82
6.6.4.5.8	BS type 1-H	83
6.6.5	Transmitter spurious emissions	83
6.6.5.1	Definition and applicability	83
6.6.5.2	Minimum requirement	83
6.6.5.3	Test purpose	83
6.6.5.4	Method of test	83
6.6.5.4.1	Initial conditions	83
6.6.5.4.2	Procedure	84
6.6.5.5	Test requirements	85
6.6.5.5.1	Basic limits	85
6.6.5.5.1.1	Tx spurious emissions	85
6.6.5.5.1.2	Protection of the BS receiver of own or different BS	85
6.6.5.5.1.3	Additional spurious emissions requirements	86
6.6.5.5.1.4	Co-location with other base stations	93
6.6.5.5.2	(void)	98
6.6.5.5.3	BS type 1-C	98
6.6.5.5.4	BS type 1-H	98
6.7	Transmitter intermodulation	98
6.7.1	Definition and applicability	98
6.7.2	Minimum requirement	99
6.7.3	Test purpose	99
6.7.4	Method of test	99
6.7.4.1	Initial conditions	99
6.7.4.2	Procedure	99
6.7.5	Test requirements	100
6.7.5.1	BS type 1-C	100
6.7.5.1.1	Co-location minimum requirements	100
6.7.5.1.2	Additional requirements	101
6.7.5.2	BS type 1-H	101
6.7.5.2.1	Co-location minimum requirements	101
6.7.5.2.2	Intra-system minimum requirements	102
6.7.5.2.3	Additional requirements	102
7	Conducted receiver characteristics	103
7.1	General	103
7.2	Reference sensitivity level	103
7.2.1	Definition and applicability	103
7.2.2	Minimum requirement	103
7.2.3	Test purpose	103
7.2.4	Method of test	104
7.2.4.1	Initial conditions	104
7.2.4.2	Procedure	104
7.2.5	Test requirements	104
7.3	Dynamic range	106
7.3.1	Definition and applicability	106
7.3.2	Minimum requirement	106
7.3.3	Test purpose	106

7.3.4	Method of test	106
7.3.4.1	Initial conditions	106
7.3.4.2	Procedure	106
7.3.5	Test requirements.....	107
7.4	In-band selectivity and blocking	109
7.4.1	Adjacent Channel Selectivity (ACS)	109
7.4.1.1	Definition and applicability.....	109
7.4.1.2	Minimum requirement	109
7.4.1.3	Test purpose	110
7.4.1.4	Method of test	110
7.4.1.4.1	Initial conditions.....	110
7.4.1.4.2	Procedure.....	110
7.4.1.5	Test requirements.....	110
7.4.2	In-band blocking.....	111
7.4.2.1	Definition and applicability.....	111
7.4.2.2	Minimum requirement	111
7.4.2.3	Test purpose	112
7.4.2.4	Method of test	112
7.4.2.4.1	Initial conditions.....	112
7.4.2.4.2	Procedure for general blocking.....	112
7.4.2.4.3	Procedure for narrowband blocking	112
7.4.2.5	Test requirements.....	113
7.5	Out-of-band blocking	115
7.5.1	Definition and applicability	115
7.5.2	Minimum requirement	115
7.5.3	Test purpose.....	115
7.5.4	Method of test	116
7.5.4.1	Initial conditions	116
7.5.4.2	Procedure	116
7.5.5	Test requirements.....	116
7.5.5.1	General requirements	116
7.5.5.2	Co-location requirements.....	117
7.6	Receiver spurious emissions.....	118
7.6.1	Definition and applicability	118
7.6.2	Minimum requirement	118
7.6.3	Test purpose.....	118
7.6.4	Method of test	118
7.6.4.1	Initial conditions	118
7.6.4.2	Procedure	118
7.6.5	Test requirements.....	119
7.6.5.1	Basic limits.....	119
7.6.5.2	BS type 1-C	119
7.6.5.3	BS type 1-H.....	120
7.7	Receiver intermodulation	120
7.7.1	Definition and applicability	120
7.7.2	Minimum requirement	120
7.7.3	Test purpose.....	120
7.7.4	Method of test	120
7.7.4.1	Initial conditions	120
7.7.4.2	Procedure	121
7.7.5	Test requirements.....	121
7.8	In-channel selectivity	125
7.8.1	Definition and applicability	125
7.8.2	Minimum requirement	125
7.8.3	Test purpose.....	125
7.8.4	Method of test	125
7.8.4.1	Initial conditions	125
7.8.4.2	Procedure	125
7.8.5	Test requirements.....	125
8	Conducted performance characteristics.....	129
8.1	General	129

8.1.1	Scope and definitions.....	129
8.1.2	Applicability rule	129
8.1.2.0	General	129
8.1.2.1	Applicability of PUSCH performance requirements.....	129
8.1.2.1.1	Applicability of requirements for different subcarrier spacings	129
8.1.2.1.2	Applicability of requirements for different channel bandwidths	130
8.1.2.1.3	Applicability of requirements for different configurations.....	130
8.1.2.2	Applicability of PUCCH performance requirements	130
8.1.2.2.1	Applicability of requirements for different formats.....	130
8.1.2.2.2	Applicability of requirements for different subcarrier spacings	130
8.1.2.2.3	Applicability of requirements for different channel bandwidths	130
8.1.2.2.4	Applicability of requirements for different configurations.....	130
8.1.2.2.5	Applicability of requirements for multi-slot PUCCH.....	131
8.1.2.3	Applicability of PRACH performance requirements	131
8.1.2.3.1	Applicability of requirements for different formats.....	131
8.1.2.3.2	Applicability of requirements for different subcarrier spacings	131
8.1.2.3.3	Applicability of requirements for different channel bandwidths	131
8.2	Performance requirements for PUSCH	131
8.2.1	Performance requirements for PUSCH with transform precoding disabled	131
8.2.1.1	Definition and applicability.....	131
8.2.1.2	Minimum Requirement	131
8.2.1.3	Test Purpose	131
8.2.1.4	Method of test	131
8.2.1.4.1	Initial Conditions	131
8.2.1.4.2	Procedure.....	132
8.2.1.5	Test Requirement	133
8.2.2	Performance requirements for PUSCH with transform precoding enabled	139
8.2.2.1	Definition and applicability.....	139
8.2.2.2	Minimum Requirement	139
8.2.2.3	Test Purpose	140
8.2.2.4	Method of test	140
8.2.2.4.1	Initial Conditions	140
8.2.2.4.2	Procedure.....	140
8.2.2.5	Test Requirement	141
8.2.3	Performance requirements for UCI multiplexed on PUSCH	142
8.2.3.1	Definition and applicability.....	142
8.2.3.2	Minimum Requirements.....	143
8.2.3.3	Test purpose	143
8.2.3.4	Method of test	143
8.2.3.4.1	Initial conditions	143
8.2.3.4.2	Procedure.....	143
8.2.3.5	Test Requirement	144
8.3	Performance requirements for PUCCH.....	145
8.3.1	Performance requirements for PUCCH format 0.....	145
8.3.1.1	Definition and applicability.....	145
8.3.1.2	Minimum Requirement	145
8.3.1.3	Test purpose	146
8.3.1.4	Method of test	146
8.3.1.4.1	Initial conditions	146
8.3.1.4.2	Procedure.....	146
8.3.1.5	Test Requirement	147
8.3.2	Performance requirements for PUCCH format 1.....	148
8.3.2.1	NACK to ACK detection	148
8.3.2.1.1	Definition and applicability.....	148
8.3.2.1.2	Minimum Requirement	148
8.3.2.1.3	Test purpose	148
8.3.2.1.4	Method of test.....	148
8.3.2.1.4.1	Initial Conditions	148
8.3.2.1.4.2	Procedure	148
8.3.2.1.5	Test Requirement.....	149
8.3.2.2	ACK missed detection.....	150
8.3.2.2.1	Definition and applicability.....	150

8.3.2.2.2	Minimum Requirement	150
8.3.2.2.3	Test purpose	150
8.3.2.2.4	Method of test.....	150
8.3.2.2.4.1	Initial Conditions	150
8.3.2.2.4.2	Procedure	150
8.3.2.2.5	Test Requirement.....	151
8.3.3	Performance requirements for PUCCH format 2.....	152
8.3.3.1	ACK missed detection.....	152
8.3.3.1.1	Definition and applicability	152
8.3.3.1.2	Minimum requirements	152
8.3.3.1.3	Test purpose	152
8.3.3.1.4	Method of test.....	152
8.3.3.1.4.1	Initial Condition.....	152
8.3.3.1.4.2	Procedure	153
8.3.3.1.5	Test requirements	153
8.3.3.2	UCI BLER performance requirements.....	154
8.3.3.2.1	Definition and applicability	154
8.3.3.2.2	Minimum Requirement	154
8.3.3.2.3	Test purpose	154
8.3.3.2.4	Method of test.....	154
8.3.3.2.4.1	Initial Condition.....	154
8.3.3.2.4.2	Procedure	154
8.3.3.2.5	Test requirements	155
8.3.4	Performance requirements for PUCCH format 3.....	156
8.3.4.1	Definition and applicability.....	156
8.3.4.2	Minimum requirement	156
8.3.4.3	Test purpose	156
8.3.4.4	Method of test	156
8.3.4.4.1	Initial conditions.....	156
8.3.4.4.2	Procedure.....	156
8.3.4.5	Test requirement	157
8.3.5	Performance requirements for PUCCH format 4.....	158
8.3.5.1	Definition and applicability.....	158
8.3.5.2	Minimum requirement	159
8.3.5.3	Test purpose	159
8.3.5.4	Method of test	159
8.3.5.4.1	Initial conditions.....	159
8.3.5.4.2	Procedure.....	159
8.3.5.5	Test requirement	160
8.3.6	Performance requirements for multi-slot PUCCH.....	161
8.3.6.1	Performance requirements for multi-slot PUCCH format 1.....	161
8.3.6.1.1	NACK to ACK detection.....	161
8.3.6.1.1.1	Definition and applicability	161
8.3.6.1.1.2	Minimum Requirement.....	161
8.3.6.1.1.3	Test purpose	161
8.3.6.1.1.4	Method of test	161
8.3.6.1.1.4.1	Initial conditions.....	161
8.3.6.1.1.4.2	Procedure.....	162
8.3.6.1.1.5	Test Requirement	163
8.3.6.1.2	ACK missed detection.....	163
8.3.6.1.2.1	Definition and applicability	163
8.3.6.1.2.2	Minimum Requirement.....	163
8.3.6.1.2.3	Test purpose	163
8.3.6.1.2.4	Method of test	163
8.3.6.1.2.4.1	Initial conditions.....	163
8.3.6.1.2.4.2	Procedure.....	163
8.3.6.1.2.5	Test Requirement.....	164
8.4	Performance requirements for PRACH.....	165
8.4.1	PRACH false alarm probability and missed detection.....	165
8.4.1.1	Definition and applicability.....	165
8.4.1.2	Minimum requirement	165
8.4.1.3	Test purpose	165

8.4.1.4	Method of test	165
8.4.1.4.1	Initial conditions	165
8.4.1.4.2	Procedure	166
8.4.1.5	Test requirement	167
Annex A (normative):	Reference measurement channels	169
A.1	Fixed Reference Channels for reference sensitivity level, ACS, in-band blocking, out-of-band blocking, receiver intermodulation and in-channel selectivity (QPSK, R=1/3)	169
A.2	Fixed Reference Channels for dynamic range (16QAM, R=2/3)	169
A.3	Fixed Reference Channels for performance requirements (QPSK, R=193/1024)	170
A.4	Fixed Reference Channels for performance requirements (16QAM, R=658/1024)	172
A.5	Fixed Reference Channels for performance requirements (64QAM, R=567/1024)	174
A.6	PRACH test preambles	174
Annex B (normative):	Environmental requirements for the BS equipment	175
B.1	General	175
B.2	Normal test environment	175
B.3	Extreme test environment	175
B.3.1	Extreme temperature	175
B.4	Vibration	176
B.5	Power supply	176
B.6	Measurement of test environments	176
Annex C (informative):	Test tolerances and derivation of test requirements	177
C.1	Measurement of transmitter	177
C.2	Measurement of receiver	179
C.3	Measurement of performance requirements	180
Annex D (informative):	Measurement system set-up	181
D.1	<i>BS type 1-C</i> transmitter	181
D.1.1	Base station output power, output power dynamics, transmitter ON/OFF power, frequency error, EVM, unwanted emissions for <i>BS type 1-C</i>	181
D.1.2	Transmitter intermodulation for <i>BS type 1-C</i>	181
D.1.3	Time alignment error for <i>BS type 1-C</i>	182
D.2	<i>BS type 1-C</i> receiver	182
D.2.1	Reference sensitivity level for <i>BS type 1-C</i>	182
D.2.2	Dynamic range for <i>BS type 1-C</i>	183
D.2.3	In-channel selectivity for <i>BS type 1-C</i>	183
D.2.4	Adjacent Channel Selectivity (ACS) and narrowband blocking for <i>BS type 1-C</i>	183
D.2.5	Blocking characteristics for <i>BS type 1-C</i>	184
D.2.6	Receiver spurious emission for <i>BS type 1-C</i>	184
D.2.7	Intermodulation characteristics for <i>BS type 1-C</i>	185
D.3	<i>BS type 1-H</i> transmitter	185
D.3.1	Base station output power, output power dynamics, transmitter ON/OFF power, frequency error, EVM, unwanted emissions for <i>BS type 1-H</i>	185
D.3.2	Transmitter intermodulation for <i>BS type 1-H</i>	186
D.3.3	Transmitter spurious emissions for <i>BS type 1-H</i>	186
D.3.4	Time alignment error for <i>BS type 1-H</i>	188
D.4	<i>BS type 1-H</i> receiver	188
D.4.1	Reference sensitivity level for <i>BS type 1-H</i>	188

D.4.2	Receiver dynamic range for BS type 1-H.....	189
D.4.3	Receiver adjacent channel selectivity and narrowband blocking for BS type 1-H.....	189
D.4.4	Receiver spurious emissions.....	189
D.4.5	Receiver In-channel selectivity for BS type 1-H.....	191
D.4.6	Receiver intermodulation for BS type 1-H.....	191
D.5	<i>BS type 1-C</i> performance requirements.....	192
D.5.1	Performance requirements for PUSCH, single user PUCCH, PRACH on single antenna port in multipath fading conditions.....	192
D.5.2	Performance requirements for PUSCH transmission on two antenna ports in multipath fading conditions ..	193
D.5.3	Performance requirements for PRACH in static conditions	193
D.6	<i>BS type 1-H</i> performance requirements.....	194
D.6.1	Performance requirements for PUSCH, single user PUCCH, PRACH on single antenna port in multipath fading conditions.....	194
D.6.2	Performance requirements for PUSCH transmission on two antenna ports in multipath fading conditions ..	195
D.6.3	Performance requirements for PRACH in static conditions	195
Annex E (normative):	Characteristics of interfering signals	196
Annex F (normative):	Void	197
Annex G (normative):	Propagation conditions.....	198
G.1	Static propagation condition.....	198
G.2	Multi-path fading propagation conditions	198
G.2.1	Delay profiles	198
G.2.1.1	Delay profiles for FR1	199
G.2.2	Combinations of channel model parameters	200
G.2.3	MIMO channel correlation matrices.....	201
G.2.3.1	MIMO correlation matrices using Uniform Linear Array	201
G.2.3.1.1	Definition of MIMO correlation matrices	201
G.2.3.1.2	MIMO correlation matrices at high, medium and low level	202
G.2.3.2	Multi-antenna channel models using cross polarized antennas.....	204
G.2.3.2.1	Definition of MIMO correlation matrices using cross polarized antennas.....	205
G.2.3.2.2	Spatial correlation matrices at UE and gNB sides.....	205
G.2.3.2.2.1	Spatial correlation matrices at UE side.....	205
G.2.3.2.2.2	Spatial correlation matrices at gNB side	206
G.2.3.2.3	MIMO correlation matrices using cross polarized antennas	206
Annex H (normative):	In-channel TX tests.....	207
H.1	General	207
H.2	Basic principles	207
H.2.1	Output signal of the TX under test	207
H.2.2	Ideal signal	207
H.2.3	Measurement results.....	208
H.2.4	Measurement points	208
H.3	Pre-FFT minimization process	209
H.4	Timing of the FFT window	209
H.5	Resource element TX power	210
H.6	Post-FFT equalisation.....	211
H.7	EVM.....	212
H.7.0	General.....	212
H.7.1	Averaged EVM (FDD).....	213
H.7.2	Averaged EVM (TDD).....	213
Annex I (informative):	Change history	215
History		223

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
 - 1 presented to TSG for information;
 - 2 presented to TSG for approval;
 - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ETSI TS 138 141-1 V15.13.0 (2022-10)

<https://standards.iteh.ai/catalog/standards/sist/3a6f1e89-e7fe-4268-8f0d-3bb74b25e942/etsi-ts-138-141-1-v15-13-0-2022-10>

1 Scope

The present document specifies the Radio Frequency (RF) test methods and conformance requirements for NR Base Station (BS) *Type 1-C* and *Type 1-H*. These have been derived from, and are consistent with the conducted requirements for *BS Type 1-C* and *BS Type 1-H* in NR BS specification defined in TS 38.104 [2].

A *BS type 1-C* only has conducted requirements so it requires compliance to this specification only.

A *BS type 1-H* has both conducted and radiated requirements so it requires compliance to the applicable requirements of this specification and TS 38.141-2 [3].

BS type 1-O and *BS type 2-O* have only radiated requirements so they require compliance to TS 38.141-2 [3] only.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 38.104: "NR Base Station (BS) radio transmission and reception".
- [3] 3GPP TS 38.141-2: "NR, Base Station (BS) conformance testing, Part 2: Radiated conformance testing".
- [4] ITU-R Recommendation M.1545, "Measurement uncertainty as it applies to test limits for the terrestrial component of International Mobile Telecommunications-2000".
- [5] ITU-R Recommendation SM.329: "Unwanted emissions in the spurious domain".
- [6] IEC 60 721-3-3: "Classification of environmental conditions - Part 3-3: Classification of groups of environmental parameters and their severities - Stationary use at weather protected locations".
- [7] IEC 60 721-3-4: "Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 4: Stationary use at non-weather protected locations".
- [8] IEC 60 721: "Classification of environmental conditions".
- [9] IEC 60 068-2-1 (2007): "Environmental testing - Part 2: Tests. Tests A: Cold".
- [10] IEC 60 068-2-2: (2007): "Environmental testing - Part 2: Tests. Tests B: Dry heat".
- [11] IEC 60 068-2-6: (2007): "Environmental testing - Part 2: Tests - Test Fc: Vibration (sinusoidal)".
- [12] ITU-R Recommendation SM.328: "Spectra and bandwidth of emissions".
- [13] Federal Communications Commission: "Title 47 of the Code of Federal Regulations (CFR)".
- [14] ECC/DEC/(17)06: "The harmonised use of the frequency bands 1427-1452 MHz and 1492-1518 MHz for Mobile/Fixed Communications Networks Supplemental Downlink (MFCN SDL)".
- [15] 3GPP TR 25.942: "RF system scenarios".
- [16] 3GPP TS 38.212: "NR; Multiplexing and channel coding".

- [17] 3GPP TS 38.211: "NR; Physical channels and modulation".
- [18] 3GPP TS 38.214: "NR; Physical layer procedures for data".
- [19] 3GPP TS 38.331: "NR; Radio Resource Control (RRC) protocol specification".
- [20] 3GPP TR 38.901: "Study on channel model for frequencies from 0.5 to 100 GHz".
- [21] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone".
- [22] 3GPP TS 36.104: "Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception".
- [23] ITU-T Recommendation O.150, "Equipment for the measurement of digital and analogue/digital parameters".

i T h S T A N D A R D P R E
(s t a n d a r d s . i t

E T S I T S 1 3 8 . 1 4 1 - 1
h t t p s : / / s t a n d a r d s . i t e h . o r g
3 b b 7 4 b 2 5 e 9 4 2 / e t s i - t