

ETSI TS 136 141 V16.14.0 (2022-07)



**LTE ;
Evolved Universal Terrestrial Radio Access (E-UTRA);
Base Station (BS) conformance testing
(3GPP TS 36.141 version 16.14.0 Release 16)**

[ETSI TS 136 141 V16.14.0 \(2022-07\)](https://standards.iteh.ai/catalog/standards/sist/a56f7608-08c2-4f6d-913d-972c0e1e5cbb/etsi-ts-136-141-v16-14-0-2022-07)

<https://standards.iteh.ai/catalog/standards/sist/a56f7608-08c2-4f6d-913d-972c0e1e5cbb/etsi-ts-136-141-v16-14-0-2022-07>



Reference

RTS/TSGR-0436141vge0

Keywords

LTE

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> 4f6d-913d-

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.....	16
1 Scope	18
2 References	18
3 Definitions, symbols and abbreviations	19
3.1 Definitions	19
3.2 Symbols.....	22
3.3 Abbreviations	24
4 General test conditions and declarations	25
4.1 Measurement uncertainties and Test Requirements	25
4.1.1 General.....	25
4.1.2 Acceptable uncertainty of Test System.....	26
4.1.2.1 Measurement of transmitter	27
4.1.2.2 Measurement of receiver	28
4.1.2.3 Measurement of performance requirement	35
4.1.3 Interpretation of measurement results.....	41
4.2 Base station classes	41
4.3 Regional requirements.....	41
4.4 Selection of configurations for testing.....	44
4.5 BS Configurations	44
4.5.1 Transmit configurations.....	44
4.5.1.1 Transmission with multiple transmitter antenna connectors	45
4.5.2 Receive configurations	45
4.5.2.1 Reception with multiple receiver antenna connectors, receiver diversity	45
4.5.3 Duplexers.....	46
4.5.4 Power supply options.....	46
4.5.5 Ancillary RF amplifiers	46
4.5.6 BS with integrated Iuant BS modem	47
4.5.7 BS using antenna arrays.....	47
4.5.7.1 Receiver tests	47
4.5.7.2 Transmitter tests	48
4.6 Manufacturer's declarations of regional and optional requirements	48
4.6.1 Operating band and frequency range	48
4.6.2 Channel bandwidth	49
4.6.3 Base station output power.....	49
4.6.4 Spurious emissions Category.....	49
4.6.5 Additional operating band unwanted emissions	49
4.6.6 Co-existence with other systems.....	50
4.6.7 Co-location with other base stations	50
4.6.8 Manufacturer's declarations of supported RF configurations	50
4.6.9 NB-IoT sub-carrier spacing	52
4.6.10 NB-IoT power dynamic range	52
4.6.11 Sub-PRB allocation.....	52
4.7 Specified frequency range and supported channel bandwidth.....	52
4.7.1 Base Station RF Bandwidth position for multi-carrier and/or CA testing	53
4.7.2 Aggregated Channel Bandwidth position for Contiguous CA occupied bandwidth testing	53
4.7.3 NB-IoT testing.....	54
4.8 Format and interpretation of tests.....	54
4.9 Applicability of requirements.....	55
4.10 Test configurations for multi-carrier and/or CA operation.....	55
4.10.1 ETC1: Contiguous spectrum operation.....	55
4.10.1.1 ETC1 generation	55

4.10.1.2	ETC1 power allocation	56
4.10.2	ETC2: Contiguous CA occupied bandwidth.....	56
4.10.2.1	ETC2 generation	56
4.10.2.2	ETC2 power allocation	57
4.10.3	ETC3: Non-contiguous spectrum operation	57
4.10.3.1	ETC3 generation	57
4.10.3.2	ETC3 power allocation	57
4.10.3.24	VOID.....	57
4.10.4	ETC4: Multi-band test configuration for full carrier allocation.....	57
4.10.4.1	ETC4 generation	57
4.10.4.2	ETC4 power allocation	58
4.10.5	ETC5: Multi-band test configuration with high PSD per carrier	58
4.10.5.1	ETC5 generation	58
4.10.5.2	ETC5 power allocation	59
4.10.6	ETC6: NB-IoT standalone multi-carrier operation.....	59
4.10.6.1	ETC6 generation	59
4.10.6.2	ETC6 power allocation	59
4.10.7	ETC7: E-UTRA and NB-IoT standalone multi-carrier operation.....	59
4.10.7.1	ETC7 generation	59
4.10.7.2	ETC7 power allocation	60
4.10.8	ETC8: E-UTRA and NB-IoT in-band multi-carrier operation.....	60
4.10.8.1	ETC8 generation	60
4.10.8.2	ETC8 power allocation	60
4.10.9	ETC9: E-UTRA and NB-IoT guard-band multi-carrier operation.....	60
4.10.9.1	ETC9 generation	60
4.10.9.2	ETC9 power allocation	61
4.11	Applicability of test configurations	61
4.12	Requirements for BS capable of multi-band operation	66
4.13	Tests for BS capable of multi-band operation with three or more bands	67
5	Operating bands and channel arrangement.....	67
5.1	General	67
5.2	Void.....	67
5.3	Void.....	67
5.4	Void.....	67
5.5	Operating bands.....	67
5.6	Channel bandwidth.....	71
5.7	Channel arrangement.....	75
5.7.1	Channel spacing.....	75
5.7.1A	CA Channel spacing	75
5.7.2	Channel raster	76
5.7.3	Carrier frequency and EARFCN.....	76
5.8	Requirements for contiguous and non-contiguous spectrum.....	79
6	Transmitter characteristics	80
6.1	General	80
6.1.1	E-UTRA Test Models.....	80
6.1.1.1	E-UTRA Test Model 1.1 (E-TM1.1).....	80
6.1.1.2	E-UTRA Test Model 1.2 (E-TM1.2).....	82
6.1.1.3	E-UTRA Test Model 2 (E-TM2)	84
6.1.1.3a	E-UTRA Test Model 2a (E-TM2a).....	87
6.1.1.3b	E-UTRA Test Model 2b (E-TM2b)	87
6.1.1.3c	E-UTRA subslot TTI Test Model 2-1 (sE-TM2-1).....	87
6.1.1.3d	E-UTRA subslot TTI Test Model 2a (sE-TM2a-1).....	89
6.1.1.3e	E-UTRA slot TTI Test Model 2-1 (sE-TM2-1)	89
6.1.1.3f	E-UTRA slot TTI Test Model 2a (sE-TM2a-2)	91
6.1.1.4	E-UTRA Test Model 3.1 (E-TM3.1).....	91
6.1.1.4a	E-UTRA Test Model 3.1a (E-TM3.1a).....	92
6.1.1.4b	E-UTRA Test Model 3.1b (E-TM3.1b).....	92
6.1.1.4c	E-UTRA subslot TTI Test Model 3.1 (sE-TM3.1-1)	93
6.1.1.4d	E-UTRA subslot TTI Test Model 3.1a (sE-TM3.1a-1).....	94
6.1.1.4e	E-UTRA slot TTI Test Model 3.1 (sE-TM3.1-2).....	95

6.1.1.4f	E-UTRA slot TTI Test Model 3.1a (sE-TM3.1a-2)	95
6.1.1.5	E-UTRA Test Model 3.2 (E-TM3.2).....	96
6.1.1.5a	E-UTRA subslot TTI Test Model 3.2 (sE-TM3.2-1)	100
6.1.1.5b	E-UTRA slot TTI Test Model 3.2 (sE-TM3.2-2).....	112
6.1.1.6	E-UTRA Test Model 3.3 (E-TM3.3).....	124
6.1.1.6a	E-UTRA subslot TTI Test Model 3.3 (sE-TM3.3-1)	129
6.1.1.6b	E-UTRA slot TTI Test Model 3.3 (sE-TM3.3-2).....	135
6.1.2	Data content of Physical channels and Signals for E-TM.....	142
6.1.2.1	Reference signals	143
6.1.2.2	Primary Synchronization signal	143
6.1.2.3	Secondary Synchronization signal	143
6.1.2.4	PBCH	143
6.1.2.5	PCFICH.....	143
6.1.2.6	PHICH.....	143
6.1.2.7	PDCCH	144
6.1.2.8	PDSCH or sPDSCH	144
6.1.2.9	sPDCCH.....	144
6.1.3	NB-IoT Test Model	145
6.1.4	Data content of Physical channels and Signals for N-TM	145
6.1.4.1	Reference signals	146
6.1.4.2	Synchronization signals	146
6.1.4.3	NPBCH	146
6.1.4.4	NPDCCH	146
6.1.4.5	NPDSCH.....	146
6.1.5	Test Model for NB-IoT guard band operation.....	147
6.1.6	Test Model for NB-IoT in-band operation.....	147
6.2	Base station output power	147
6.2.1	Definition and applicability	147
6.2.2	Minimum Requirement.....	148
6.2.3	Test purpose.....	148
6.2.4	Method of test	148
6.2.4.1	Initial conditions	148
6.2.4.2	Procedure	149
6.2.5	Test Requirements	149
6.2.6	Home BS output power for adjacent UTRA channel protection.....	150
6.2.6.1	Definition and applicability.....	150
6.2.6.2	Minimum Requirement	151
6.2.6.3	Test purpose	151
6.2.6.4	Method of test	151
6.2.6.4.1	Initial conditions.....	151
6.2.6.4.2	Procedure.....	151
6.2.6.5	Test Requirements.....	152
6.2.7	Home BS output power for adjacent E-UTRA channel protection.....	152
6.2.7.1	Definition and applicability.....	152
6.2.7.2	Minimum Requirement	153
6.2.7.3	Test purpose	153
6.2.7.4	Method of test	153
6.2.7.4.1	Initial conditions.....	153
6.2.7.4.2	Procedure.....	154
6.2.7.5	Test Requirements.....	154
6.2.8	Home BS output power for co-channel E-UTRA protection.....	155
6.2.8.1	Definition and applicability.....	155
6.2.8.2	Minimum Requirement	156
6.2.8.3	Test purpose	156
6.2.8.4	Method of test	156
6.2.8.4.1	Initial conditions.....	156
6.2.8.4.2	Procedure.....	156
6.2.8.5	Test Requirements.....	157
6.3	Output power dynamics.....	157
6.3.1	RE Power control dynamic range	157
6.3.1.1	Definition and applicability.....	157
6.3.1.2	Minimum Requirement	157

6.3.1.3	Method of test	157
6.3.2	Total power dynamic range	158
6.3.2.1	Definition and applicability	158
6.3.2.2	Minimum Requirement	158
6.3.2.3	Test purpose	158
6.3.2.4	Method of test	158
6.3.2.4.1	Initial conditions	158
6.3.2.4.2	Procedure	158
6.3.2.5	Test Requirement	158
6.3.3	NB-IoT RB power dynamic range for in-band or guard band operation	159
6.3.3.1	Definition and applicability	159
6.3.3.2	Minimum Requirement	159
6.3.3.3	Test purpose	159
6.3.3.4	Method of test	159
6.3.3.5	Test Requirement	159
6.4	Transmit ON/OFF power	160
6.4.1	Transmitter OFF power	160
6.4.1.1	Definition and applicability	160
6.4.1.2	Minimum Requirement	160
6.4.1.3	Test purpose	160
6.4.1.4	Method of test	160
6.4.1.4.1	Void	160
6.4.1.4.2	Void	160
6.4.1.5	Test requirement	160
6.4.2	Transmitter transient period	160
6.4.2.1	Definition and applicability	160
6.4.2.2	Minimum Requirement	161
6.4.2.3	Test purpose	161
6.4.2.4	Method of test	161
6.4.2.4.1	Initial conditions	161
6.4.2.4.2	Procedure	161
6.4.2.5	Test requirement	162
6.5	Transmitted signal quality	162
6.5.1	Frequency error	162
6.5.1.1	Definition and applicability	162
6.5.1.2	Minimum Requirement	162
6.5.1.3	Test purpose	162
6.5.1.4	Method of test	162
6.5.1.5	Test requirement	162
6.5.2	Error Vector Magnitude	163
6.5.2.1	Definition and applicability	163
6.5.2.2	Minimum Requirement	163
6.5.2.3	Test purpose	163
6.5.2.4	Method of test	163
6.5.2.4.1	Initial conditions	163
6.5.2.4.2	Procedure	163
6.5.2.5	Test requirement	164
6.5.3	Time alignment error	165
6.5.3.1	Definition and applicability	165
6.5.3.2	Minimum Requirement	165
6.5.3.3	Test Purpose	165
6.5.3.4	Method of Test	165
6.5.3.4.1	Initial Conditions	165
6.5.3.4.2	Procedure	166
6.5.3.5	Test Requirement	166
6.5.4	DL RS power	167
6.5.4.1	Definition and applicability	167
6.5.4.2	Minimum Requirement	167
6.5.4.3	Test purpose	167
6.5.4.4	Method of test	167
6.5.4.4.1	Initial conditions	167
6.5.4.4.2	Procedure	167

6.5.4.5	Test requirement	167
6.6	Unwanted emissions.....	168
6.6.1	Occupied bandwidth	168
6.6.1.1	Definition and applicability.....	168
6.6.1.2	Minimum Requirements.....	168
6.6.1.3	Test purpose	168
6.6.1.4	Method of test	168
6.6.1.4.1	Initial conditions.....	168
6.6.1.4.2	Procedure.....	169
6.6.1.5	Test requirements.....	170
6.6.2	Adjacent Channel Leakage power Ratio (ACLR)	170
6.6.2.1	Definition and applicability.....	170
6.6.2.2	Minimum Requirement	170
6.6.2.3	Test purpose	171
6.6.2.4	Method of test	171
6.6.2.4.1	Initial conditions.....	171
6.6.2.4.2	Procedure.....	171
6.6.2.5	Test Requirement	172
6.6.2.6	Cumulative ACLR test requirement in non-contiguous spectrum	174
6.6.3	Operating band unwanted emissions	176
6.6.3.1	Definition and applicability.....	176
6.6.3.2	Minimum Requirement	177
6.6.3.3	Test purpose	177
6.6.3.4	Method of test	177
6.6.3.4.1	Initial conditions.....	177
6.6.3.4.2	Procedure.....	178
6.6.3.5	Test requirement	178
6.6.3.5.1	Test requirements for Wide Area BS (Category A).....	179
6.6.3.5.2	Test requirements for Wide Area BS (Category B).....	184
6.6.3.5.2.1	Category B test requirements (Option 1).....	184
6.6.3.5.2.2	Category B (Option 2).....	188
6.6.3.5.2A	Test requirements for Local Area BS (Category A and B).....	190
6.6.3.5.2B	Test requirements for Home BS (Category A and B).....	193
6.6.3.5.2C	Test requirements for Medium Range BS (Category A and B).....	194
6.6.3.5.2D	Minimum requirements for Local Area and Medium Range BS in Band 46 (Category A and B).....	199
6.6.3.5.2E	Minimum requirements for stand-alone NB-IoT Wide Area BS.....	200
6.6.3.5.2F	Minimum requirements for stand-alone NB-IoT Local Area BS	201
6.6.3.5.2G	Minimum requirements for stand-alone NB-IoT Home BS	202
6.6.3.5.2H	Minimum requirements for stand-alone NB-IoT Medium Range BS	203
6.6.3.5.3	Additional requirements	204
6.6.4	Transmitter spurious emissions.....	209
6.6.4.1	Definition and applicability.....	209
6.6.4.2	Minimum Requirements.....	209
6.6.4.3	Test Purpose	209
6.6.4.4	Method of Test	209
6.6.4.4.1	Initial conditions.....	209
6.6.4.4.2	Procedure.....	210
6.6.4.5	Test requirements.....	210
6.6.4.5.1	Spurious emissions (Category A)	211
6.6.4.5.2	Spurious emissions (Category B)	211
6.6.4.5.3	Protection of the BS receiver of own or different BS	211
6.6.4.5.4	Co-existence with other systems in the same geographical area	212
6.6.4.5.5	Co-location with other base stations.....	227
6.7	Transmitter intermodulation.....	241
6.7.1	Definition and applicability	241
6.7.2	Minimum Requirement	242
6.7.2A	Additional requirement for Band 41	242
6.7.3	Test purpose.....	242
6.7.4	Method of test	242
6.7.4.1	Initial conditions	242
6.7.4.2	Procedures.....	242

6.7.5	Test Requirements	243
6.7.6	Additional test requirements for Band 41	244
7	Receiver characteristics	244
7.1	General	244
7.2	Reference sensitivity level.....	244
7.2.1	Definition and applicability	244
7.2.2	Minimum Requirement.....	244
7.2.3	Test purpose.....	244
7.2.4	Method of testing	245
7.2.4.1	Initial conditions	245
7.2.4.2	Procedure	245
7.2.5	Test requirement	245
7.3	Dynamic range	251
7.3.1	Definition and applicability	251
7.3.2	Minimum Requirement.....	251
7.3.3	Test purpose.....	251
7.3.4	Method of testing	251
7.3.4.1	Initial conditions	251
7.3.4.2	Procedure	251
7.3.5	Test Requirements	252
7.4	In-channel selectivity	258
7.4.1	Definition and applicability	258
7.4.2	Minimum Requirement.....	258
7.4.3	Test purpose.....	258
7.4.4	Method of testing.....	258
7.4.4.1	Initial conditions	258
7.4.4.2	Procedure	259
7.4.5	Test Requirements	260
7.5	Adjacent Channel Selectivity (ACS) and narrow-band blocking.....	266
7.5.1	Definition and applicability	266
7.5.2	Minimum Requirement.....	266
7.5.3	Test purpose.....	266
7.5.4	Method of test	266
7.5.4.1	Initial conditions	266
7.5.4.2	Procedure for Adjacent Channel Selectivity	266
7.5.4.3	Procedure for narrow-band blocking.....	267
7.5.5	Test Requirements	269
7.6	Blocking	278
7.6.1	Definition and applicability	278
7.6.2	Minimum Requirements	279
7.6.3	Test purpose.....	279
7.6.4	Method of test	279
7.6.4.1	Initial conditions	279
7.6.4.2	Procedure	279
7.6.5	Test Requirements	281
7.6.5.1	General requirement.....	281
7.6.5.2	Co-location with other base stations	295
7.7	Receiver spurious emissions.....	308
7.7.1	Definition and applicability	308
7.7.2	Minimum Requirements	308
7.7.3	Test purpose.....	308
7.7.4	Method of test	308
7.7.4.1	Initial conditions	308
7.7.4.2	Procedure	309
7.7.5	Test requirements.....	309
7.8	Receiver intermodulation	310
7.8.1	Definition and applicability	310
7.8.2	Minimum Requirement.....	310
7.8.3	Test purpose.....	310
7.8.4	Method of test	310
7.8.4.1	Initial conditions	310

7.8.4.2	Procedures	311
7.8.5	Test requirements	312
8	Performance requirement	327
8.1	General	327
8.2	Performance requirements for PUSCH	327
8.2.1	Performance requirements of PUSCH in multipath fading propagation conditions transmission on single antenna port	327
8.2.1.1	Definition and applicability	327
8.2.1.2	Minimum Requirement	328
8.2.1.3	Test Purpose	328
8.2.1.4	Method of test	328
8.2.1.4.1	Initial Conditions	328
8.2.1.4.2	Procedure	328
8.2.1.5	Test Requirement	328
8.2.1A	Performance requirements of PUSCH in multipath fading propagation conditions transmission on two antenna ports	346
8.2.1A.1	Definition and applicability	346
8.2.1A.2	Minimum Requirement	346
8.2.1A.3	Test Purpose	346
8.2.1A.4	Method of test	346
8.2.1A.4.1	Initial Conditions	346
8.2.1A.4.2	Procedure	346
8.2.1A.5	Test Requirement	347
8.2.2	Performance requirements for UL timing adjustment	349
8.2.2.1	Definition and applicability	349
8.2.2.2	Minimum Requirement	349
8.2.2.3	Test Purpose	349
8.2.2.4	Method of test	349
8.2.2.4.1	Initial Conditions	349
8.2.2.4.2	Procedure	349
8.2.2.5	Test Requirement	350
8.2.3	Performance requirements for HARQ-ACK multiplexed on PUSCH	351
8.2.3.1	Definition and applicability	351
8.2.3.2	Minimum Requirement	351
8.2.3.3	Test Purpose	352
8.2.3.4	Method of test	352
8.2.3.4.1	Initial Conditions	352
8.2.3.4.2	Procedure	352
8.2.3.5	Test Requirement	352
8.2.4	Performance requirements for High Speed Train conditions	353
8.2.4.1	Definition and applicability	353
8.2.4.2	Minimum Requirement	353
8.2.4.3	Test Purpose	353
8.2.4.4	Method of test	354
8.2.4.4.1	Initial Conditions	354
8.2.4.4.2	Procedure	354
8.2.4.5	Test Requirement	355
8.2.5	Performance requirements for PUSCH with TTI bundling and enhanced HARQ pattern	358
8.2.5.1	Definition and applicability	358
8.2.5.2	Minimum Requirement	358
8.2.5.3	Test Purpose	359
8.2.5.4	Method of test	359
8.2.5.4.1	Initial Conditions	359
8.2.5.4.2	Procedure	359
8.2.5.5	Test Requirement	360
8.2.6	Enhanced performance requirements type A of PUSCH in multipath fading propagation conditions with synchronous interference	360
8.2.6.1	Definition and applicability	360
8.2.6.2	Minimum Requirement	361
8.2.6.3	Test Purpose	361
8.2.6.4	Method of test	361

8.2.6.4.1	Initial Conditions	361
8.2.6.4.2	Procedure	361
8.2.6.5	Test Requirement	362
8.2.6A	Enhanced performance requirements type A of PUSCH in multipath fading propagation conditions with asynchronous interference	364
8.2.6A.1	Definition and applicability	364
8.2.6A.2	Minimum Requirement	365
8.2.6A.3	Test Purpose	365
8.2.6A.4	Method of test	365
8.2.6A.4.1	Initial Conditions	365
8.2.6A.4.2	Procedure	365
8.2.6A.5	Test Requirement	366
8.2.7	Performance requirements of PUSCH in multipath fading propagation conditions transmission on single antenna port for coverage enhancement	368
8.2.7.1	Definition and applicability	368
8.2.7.2	Minimum Requirement	368
8.2.7.3	Test Purpose	368
8.2.7.4	Method of test	368
8.2.7.4.1	Initial Conditions	368
8.2.7.4.2	Procedure	368
8.2.7.5	Test Requirement	369
8.2.8	Performance requirements of PUSCH with Frame structure type 3	370
8.2.8.1	Definition and applicability	370
8.2.8.2	Minimum Requirement	370
8.2.8.3	Test Purpose	370
8.2.8.4	Method of test	370
8.2.8.4.1	Initial Conditions	370
8.2.8.4.2	Procedure	370
8.2.8.5	Test Requirement	371
8.2.9	Enhanced performance requirements type B of PUSCH in multipath fading propagation conditions	371
8.2.9.1	Definition and applicability	371
8.2.9.2	Minimum Requirement	372
8.2.9.3	Test Purpose	372
8.2.9.4	Method of test	372
8.2.9.4.1	Initial Conditions	372
8.2.9.4.2	Procedure	372
8.2.9.5	Test Requirement	374
8.2.10	Performance requirements of PUSCH in multipath fading propagation conditions transmission on single antenna port for subPRB transmission	376
8.2.10.1	Definition and applicability	376
8.2.10.2	Minimum Requirement	376
8.2.10.3	Test Purpose	377
8.2.10.4	Method of test	377
8.2.10.4.1	Initial Conditions	377
8.2.10.4.2	Procedure	377
8.2.10.5	Test Requirement	378
8.3	Performance requirements for PUCCH	378
8.3.1	ACK missed detection for single user PUCCH format 1a transmission on single antenna port	378
8.3.1.1	Definition and applicability	378
8.3.1.2	Minimum Requirement	379
8.3.1.3	Test purpose	379
8.3.1.4	Method of test	379
8.3.1.4.1	Initial Conditions	379
8.3.1.4.2	Procedure	379
8.3.1.5	Test Requirement	379
8.3.2	CQI performance requirements for PUCCH format 2 transmission on single antenna port	380
8.3.2.1	Definition and applicability	380
8.3.2.2	Minimum Requirement	380
8.3.2.3	Test purpose	380
8.3.2.4	Method of test	380
8.3.2.4.1	Initial Conditions	380
8.3.2.4.2	Procedure	381

8.3.2.5	Test Requirement	381
8.3.3	ACK missed detection for multi user PUCCH format 1a	382
8.3.3.1	Definition and applicability	382
8.3.3.2	Minimum Requirement	382
8.3.3.3	Test purpose	382
8.3.3.4	Method of test	382
8.3.3.4.1	Initial Conditions	382
8.3.3.4.2	Procedure	382
8.3.3.5	Test Requirement	383
8.3.4	ACK missed detection for PUCCH format 1b with Channel Selection	383
8.3.4.1	Definition and applicability	383
8.3.4.2	Minimum Requirement	384
8.3.4.3	Test purpose	384
8.3.4.4	Method of test	384
8.3.4.4.1	Initial Conditions	384
8.3.4.4.2	Procedure	384
8.3.4.5	Test Requirement	385
8.3.5	ACK missed detection for PUCCH format 3	385
8.3.5.1	Definition and applicability	385
8.3.5.2	Minimum Requirement	385
8.3.5.3	Test purpose	385
8.3.5.4	Method of test	386
8.3.5.4.1	Initial Conditions	386
8.3.5.4.2	Procedure	386
8.3.5.5	Test Requirement	386
8.3.6	NACK to ACK detection for PUCCH format 3	387
8.3.6.1	Definition and applicability	387
8.3.6.2	Minimum Requirement	387
8.3.6.3	Test purpose	387
8.3.6.4	Method of test	387
8.3.6.4.1	Initial Conditions	387
8.3.6.4.2	Procedure	388
8.3.6.5	Test Requirement	388
8.3.7	ACK missed detection for PUCCH format 1a transmission on two antenna ports	388
8.3.7.1	Definition and applicability	388
8.3.7.2	Minimum Requirement	389
8.3.7.3	Test purpose	389
8.3.7.4	Method of test	389
8.3.7.4.1	Initial Conditions	389
8.3.7.4.2	Procedure	389
8.3.7.5	Test Requirement	390
8.3.8	CQI performance requirements for PUCCH format 2 transmission on two antenna ports	390
8.3.8.1	Definition and applicability	390
8.3.8.2	Minimum Requirement	390
8.3.8.3	Test purpose	390
8.3.8.4	Method of test	390
8.3.8.4.1	Initial Conditions	390
8.3.8.4.2	Procedure	391
8.3.8.5	Test Requirement	391
8.3.9	CQI performance requirements for PUCCH format 2 with DTX detection	392
8.3.9.1	Definition and applicability	392
8.3.9.2	Minimum Requirement	392
8.3.9.3	Test purpose	392
8.3.9.4	Method of test	392
8.3.9.4.1	Initial Conditions	392
8.3.9.4.2	Procedure	392
8.3.9.5	Test Requirement	393
8.3.10	ACK missed detection for PUCCH format 1a transmission on single antenna port for coverage enhancement	393
8.3.10.1	Definition and applicability	393
8.3.10.2	Minimum Requirement	394
8.3.10.3	Test purpose	394

8.3.10.4	Method of test	394
8.3.10.4.1	Initial Conditions	394
8.3.10.4.2	Procedure	394
8.3.10.5	Test Requirement	395
8.3.11	CQI performance requirements for PUCCH format 2 transmission on single antenna port for coverage enhancement	395
8.3.11.1	Definition and applicability	395
8.3.11.2	Minimum Requirement	395
8.3.11.3	Test purpose	395
8.3.11.4	Method of test	395
8.3.11.4.1	Initial Conditions	395
8.3.11.4.2	Procedure	395
8.3.11.5	Test Requirement	396
8.3.12	ACK missed detection for PUCCH format 4	396
8.3.12.1	Definition and applicability	396
8.3.12.2	Minimum Requirement	397
8.3.12.3	Test purpose	397
8.3.12.4	Method of test	397
8.3.12.4.1	Initial Conditions	397
8.3.12.4.2	Procedure	397
8.3.12.5	Test Requirement	398
8.3.13	ACK missed detection for PUCCH format 5	398
8.3.13.1	Definition and applicability	398
8.3.13.2	Minimum Requirement	399
8.3.13.3	Test purpose	399
8.3.13.4	Method of test	399
8.3.13.4.1	Initial Conditions	399
8.3.13.4.2	Procedure	399
8.3.13.5	Test Requirement	400
8.4	Performance requirements for PRACH	400
8.4.1	PRACH false alarm probability and missed detection	400
8.4.1.1	Definition and applicability	400
8.4.1.2	Minimum Requirement	400
8.4.1.3	Test purpose	401
8.4.1.4	Method of test	401
8.4.1.4.1	Initial Conditions	401
8.4.1.4.2	Procedure	401
8.4.1.5	Test Requirement	402
8.5	Performance requirements for Narrowband IoT	404
8.5.1	Performance requirements for NPUSCH format 1	404
8.5.1.1	Definition and applicability	404
8.5.1.2	Minimum Requirement	404
8.5.1.3	Test Purpose	404
8.5.1.4	Method of test	404
8.5.1.4.1	Initial Conditions	404
8.5.1.4.2	Procedure	405
8.5.1.5	Test Requirement	405
8.5.2	ACK missed detection for NPUSCH format 2	406
8.5.2.1	Definition and applicability	406
8.5.2.2	Minimum Requirement	407
8.5.2.3	Test purpose	407
8.5.2.4	Method of test	407
8.5.2.4.1	Initial Conditions	407
8.5.2.4.2	Procedure	407
8.5.2.5	Test Requirement	408
8.5.3	Performance requirements for NPRACH	408
8.5.3.1	Definition and applicability	408
8.5.3.2	Minimum Requirement	409
8.5.3.3	Test purpose	409
8.5.3.4	Method of test	409
8.5.3.4.1	Initial Conditions	409
8.5.3.4.2	Procedure	409

8.5.3.5	Test Requirement	410
8.6	Performance requirements for subslot-PUSCH	410
8.6.1	Definition and applicability	410
8.6.2	Minimum Requirement	410
8.6.3	Test Purpose	411
8.6.4	Method of test	411
8.6.4.1	Initial Conditions	411
8.6.4.2	Procedure	411
8.6.5	Test Requirement	411
8.7	Performance requirements for SPUCCH	412
8.7.1	ACK missed detection for single user SPUCCH format 1a	412
8.7.1.1	Definition and applicability	412
8.7.1.2	Minimum Requirement	413
8.7.1.3	Test Purpose	413
8.7.1.4	Method of test	413
8.7.1.4.1	Initial Conditions	413
8.7.1.4.2	Procedure	413
8.7.1.5	Test Requirement	414
8.7.2	ACK missed detection requirements for SPUCCH format 4	414
8.7.2.1	Definition and applicability	414
8.7.2.2	Minimum Requirement	414
8.7.2.3	Test Purpose	414
8.7.2.4	Method of test	414
8.7.2.4.1	Initial Conditions	414
8.7.2.4.2	Procedure	415
8.7.2.5	Test Requirement	415
9	(Void)	415
Annex A (normative):	Reference Measurement channels	416
A.0	General	416
A.1	Fixed Reference Channels for reference sensitivity and in-channel selectivity (QPSK, R=1/3)	418
A.2	Fixed Reference Channels for dynamic range (16QAM, R=2/3)	418
A.3	Fixed Reference Channels for performance requirements (QPSK 1/3)	419
A.4	Fixed Reference Channels for performance requirements (16QAM 3/4)	419
A.5	Fixed Reference Channels for performance requirements (64QAM 5/6)	420
A.6	PRACH Test preambles	420
A.7	Fixed Reference Channels for UL timing adjustment (Scenario 1)	421
A.8	Fixed Reference Channels for UL timing adjustment (Scenario 2)	421
A.9	Multi user PUCCH test	422
A.10	PUCCH transmission on two antenna ports test	422
A.11	Fixed Reference Channel for PUSCH with TTI bundling and enhanced HARQ pattern	422
A.14	Fixed Reference Channels for NB-IOT reference sensitivity ($\pi/2$ BPSK, R=1/3)	423
A.14.1	Void	424
A.15	Fixed Reference Channels for NB-IoT dynamic range ($\pi/4$ QPSK, R=2/3)	424
A.16	Fixed Reference Channels for NB-IoT NPUSCH format 1	425
A.16.1	One PRB	425
A.17	Fixed Reference Channels for performance requirements (256QAM 5/6)	425
A.18	Fixed Reference Channels for PUSCH transmission in UpPTS (16QAM 0.65)	426
A.19	Fixed Reference Channels for PUSCH transmission in UpPTS (256QAM 0.69)	426

A.20	Fixed Reference Channels for PUSCH with Frame structure type 3	427
A.21	Fixed Reference Channels for performance requirements (QPSK 3/5)	427
A.22	Fixed Reference Channels for performance requirements (64QAM 1/2)	428
A.23	Fixed Reference Channel for subslot-PUSCH	428
A.24	Fixed Reference Channels for PUSCH with SubPRB transmission	429
Annex B (normative): Propagation conditions		430
B.1	Static propagation condition.....	430
B.2	Multi-path fading propagation conditions.....	430
B.3	High speed train condition	431
B.4	Moving propagation conditions.....	435
B.5	Multi-Antenna channel models	436
B.5.1	Definition of MIMO Correlation Matrices	436
B.5.2	MIMO Correlation Matrices at High, Medium and Low Level	437
B.5A	Multi-Antenna channel models using cross polarized antennas.....	439
B.5A.1	Definition of MIMO Correlation Matrices using cross polarized antennas.....	440
B.5A.2	Spatial Correlation Matrices at UE and eNB sides.....	440
B.5A.2.1	Spatial Correlation Matrices at UE side.....	440
B.5A.2.2	Spatial Correlation Matrices at eNB side.....	441
B.5A.3	MIMO Correlation Matrices using cross polarized antennas	441
B.6	Interference model for enhanced performance requirements type A and type B	442
B.6.1	Dominant interferer proportion	442
B.6.2	Interference model for synchronous scenario.....	442
B.6.3	Interference model for asynchronous scenario	442
Annex C (normative): Characteristics of the interfering signals		444
Annex D (normative): Environmental requirements for the BS equipment.....		445
D.1	General	445
D.2	Normal test environment	445
D.3	Extreme test environment.....	445
D.3.1	Extreme temperature	445
D.4	Vibration.....	446
D.5	Power supply	446
D.6	Measurement of test environments.....	446
Annex E (normative): General rules for statistical testing		447
Annex F (normative): Global In-Channel TX-Test		448
F.1	General	448
F.2.1	Basic principle	448
F.2.2	Output signal of the TX under test	448
F.2.3	Reference signal	448
F.2.4	Measurement results.....	448
F.2.5	Measurement points	449
F.3.1	Pre FFT minimization process.....	449
F.3.2	Timing of the FFT window	450
F.3.3	Resource Element TX power.....	450
F.3.4	Post FFT equalisation.....	451
F.4.1	EVM.....	452
F.4.2	Averaged EVM	453