

ETSI TS 138 561 V19.0.0 (2026-04)



TECHNICAL SPECIFICATION

**5G;
NR;**

**User Equipment (UE) conformance specification;
UE TRP (Total Radiated Power) and TRS (Total Radiated
Sensitivity) requirements and test methodologies for FR1 (NR
SA and EN-DC)
(3GPP TS 38.561 version 19.0.0 Release 19)**



Reference

RTS/TSGR-0538561 vj00

Keywords

5G

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.

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 2026.
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 IPR online database](#).

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™**, **LTE™** and **5G™** logo 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 at [3GPP to ETSI numbering cross-referencing](#).

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
Foreword.....	7
1 Scope	9
2 References	9
3 Definitions of terms, symbols, and abbreviations	10
3.1 Terms.....	10
3.2 Symbols.....	10
3.3 Abbreviations	10
4 General	11
4.1 Relationship between minimum requirements and test requirements	11
4.2 Applicability of minimum requirements	11
4.2.1 General.....	11
4.2.1 UE mechanical modes	11
4.3 Applicability rules for testing of FR1 SA and NSA UEs	11
4.4 Applicability rules for testing of power class capability of UEs	12
4.5 Applicability rules for test methods.....	12
5 Frequency Bands	12
5.1 General	12
5.2 Operating Bands	12
5.2.1 FR1 Standalone Operating bands.....	12
5.2.2 FR1 EN-DC band combinations	13
5.3 Test parameters for each band.....	15
6 FR1 Transmitter (TRP) Performance	19
6.1 General	19
6.2 TRP Performance for Handheld UE.....	20
6.2.1 TRP Performance for Handheld UE for FR1 (NR SA and EN-DC).....	20
6.2.1.1 Total Radiated Power (TRP) in Browsing Mode with Hand Phantom	20
6.2.1.1.1 Total Radiated Power (TRP) for FR1 NR Standalone (SA) in Browsing Mode with Hand Phantom.....	20
6.2.1.2 Total Radiated Power (TRP) in Talk Mode with Head and Hand Phantom.....	23
6.2.1.2.1 Total Radiated Power (TRP) for FR1 NR Standalone (SA) in Talk Mode with Head and Hand Phantom	23
7 FR1 Receiver (TRS) Performance	27
7.1 General	27
7.2 TRS Performance for Handheld UE.....	27
7.2.1 TRS Performance for Handheld UE for FR1 (NR SA and EN-DC).....	27
7.2.1.1 Total Radiated Sensitivity (TRS) in Browsing Mode with Hand Phantom.....	27
7.2.1.1.1 Total Radiated Sensitivity (TRS) for FR1 NR Standalone (SA) in Browsing Mode with Hand Phantom.....	27
7.2.1.2 Total Radiated Sensitivity (TRS) in Talk Mode with Head and Hand Phantom.....	30
7.2.1.2.1 Total Radiated Sensitivity (TRS) for FR1 NR Standalone (SA) in Talk Mode with Head and Hand Phantom	30
Annex A (normative): Test methodology	34
A.1 General	34
A.2 UE configuration	34
A.2.1 General	34
A.2.2 UE configuration for TRP test.....	34
A.2.3 UE configuration for TRS test.....	34
A.3 Test system of Anechoic Chamber method.....	35
A.3.1 System setup.....	35

A.3.2	Calibration procedure	35
A.3.3	Test procedure	36
A.3.3.1	General	36
A.3.3.2	TRP Test procedure	36
A.3.3.3	TRS Test procedure	37
A.3.3.3.1	Alternate EIS Search Procedure	37
A.3.3.3.1.1	EIS linearization using polynomial interpolation	37
A.3.3.3.2	Alternate TRS Test procedure Using Low UL Power	38
A.3.3.4	TRP/TRS OTA test based on averaging multiple split measurement grids	39
A.3.4	Minimum Range Length	42
A.3.5	Definition of TRP and TRS for AC	43
A.3.5.1	Total Radiated Power (TRP)	43
A.3.5.2	Total Radiated Sensitivity (TRS)	44
A.3.6	TAS OFF verification procedure (Informative)	44
A.3.6	Alternative RC test method	45
A.3.6.1	General	45
A.3.6.2	Test system and test procedure	45
A.3.6.3	Preliminary example MU of RC	45
A.3.7	Ripple test for Quiet Zone	45
A.3.7.1	General	45
A.3.7.2	Ripple test procedure	46
A.4	(Informative): Estimation of measurement uncertainty	50
A.4.1	General	50
A.4.2	Measurement uncertainty contribution descriptions	51
A.4.2.1	Mismatch uncertainty	51
A.4.2.1.1	Mismatch uncertainty between measurement receiver / communication tester and the measurement antenna	51
A.4.2.1.1.1	Mismatch uncertainty through the connector between two elements	51
A.4.2.1.1.2	Mismatch uncertainty due to the interaction of several elements	52
A.4.2.1.1.3	Total combined mismatch uncertainty	53
A.4.2.1.2	Mismatch uncertainty of the RF relay	53
A.4.2.1.2.1	First part: RF Relay switched on the co-polarized signal	54
A.4.2.1.2.1.1	The mismatch through the connector between two elements	54
A.4.2.1.2.1.2	Mismatch due to the interaction between two elements or more	54
A.4.2.1.2.2	Second part: RF relay switched on the cross-polarized signal	55
A.4.2.1.2.2.1	The mismatch through the connector between two elements	55
A.4.2.1.2.2.2	Mismatch due to the interaction between two elements or more	55
A.4.2.1.2.3	Total combined mismatch uncertainty	56
A.4.2.2	Insertion loss	56
A.4.2.2.1	Insertion loss of the measurement antenna cable	56
A.4.2.2.2	Insertion loss of the measurement antenna attenuator (if used)	56
A.4.2.2.3	Insertion loss of the RF relays (if used)	56
A.4.2.2.4	Insertion loss: calibration antenna feed cable	56
A.4.2.2.5	Insertion loss: calibration antenna attenuator (if used)	56
A.4.2.3	Influence of the antenna cable	57
A.4.2.3.1	Measurement antenna cable	57
A.4.2.3.2	Calibration antenna cable	57
A.4.2.4	Measurement receiver: uncertainty of the absolute level	57
A.4.2.5	Communication tester: uncertainty of the absolute level	57
A.4.2.6	Sensitivity measurement: output level step resolution	57
A.4.2.7	Measurement distance	57
A.4.2.7.1	Offset of phase centre from axis(es) of rotation	58
A.4.2.7.1.1	Offset of DUT phase centre from axis(es) of rotation	58
A.4.2.7.1.2	Offset of calibration antenna phase centre from axis(es) of rotation	58
A.4.2.7.2	Mutual coupling	58
A.4.2.7.3	Phase curvature	59
A.4.2.8	Quality of quiet zone	59
A.4.2.9	DUT Tx-power drift	59
A.4.2.10	DUT sensitivity drift	60
A.4.2.11	Uncertainty related to the use of phantoms	60
A.4.2.11.1	Uncertainty from using different types of SAM phantom	60

A.4.2.11.2	Simulated tissue liquid uncertainty	60
A.4.2.11.3	Uncertainty of dielectric properties and shape of the hand phantom	61
A.4.2.11.4	Uncertainty from using different types of Laptop Ground Plane phantom	62
A.4.2.11.5	Positioning Uncertainty from using Phantoms	62
A.4.2.12	Coarse sampling grid	62
A.4.2.13	Random uncertainty	63
A.4.2.14	Frequency response	63
A.4.2.15	Uncertainty of network analyser	64
A.4.2.16	Uncertainty of the gain/efficiency of the calibration antenna	64
A.4.3	Total Radiated Power (TRP)	64
A.4.3.1	Anechoic Chamber Method	64
A.4.4	Total Radiated Sensitivity (TRS)	70
A.4.4.1	Anechoic Chamber Method	70
Annex B (normative): Phantoms definition and Positioning		78
B.1	General	78
B.2	Phantom Definition	78
B.2.1	Head Phantom	78
B.2.2	PDA Grip Hand Phantom	78
B.2.3	Wide Grip Hand Phantom	78
B.2.4	Forearm Phantom	79
B.3	UE positioning guidelines	79
B.3.1	Hand phantom only (Browsing mode)	79
B.3.1.1	Wide Grip Hand	80
B.3.1.2	PDA Grip Hand	80
B.3.2	Head and Hand phantom (Talk Mode)	81
B.3.2.1	General	81
B.3.2.2	Wide Grip Hand and Head	83
B.3.2.3	PDA Grip Hand and Head	83
B.3.3	Forearm phantom (Wrist-worn Mode)	83
B.3.3.1	General	83
B.3.3.2	Forearm phantom positioning in the chamber	83
B.3.3.3	Wrist-Worn RedCap Device mounted on the Forearm Phantom	83
B.3.4	Head phantom for Head-mounted devices	85
B.3.4.1	General	85
B.3.5	Hand phantom only for NTN scenario 2	85
Annex C (normative): Environmental requirements		89
C.1	General	89
C.2	Environmental	89
C.2.1	Temperature	89
C.2.2	Voltage	89
Annex D (normative): Maximum uncertainty of test system and test tolerance		90
D.1	Maximum uncertainty of test system	90
D.2	Test Tolerances	90
Annex E (informative): NTN OTA Test methodology		91
E.1	General	91
E.1.1	NTN Device types	91
E.1.2	NTN UE use scenarios	91
E.1.3	NTN operation bands and test parameters	91
E.2	NTN performance metrics	94
E.2.1	General	94
E.2.2	Total Radiated Power (TRP)	94
E.2.3	Total Radiated Sensitivity (TRS)	94
E.2.4	Partial Radiated Power (PRP)	94

E.2.4.1	Upper Partial Radiated Power Integrated over $\pm 60^\circ$ Sector (UPRP $_{\pm 60}$)	94
E.2.4.2	Upper Hemisphere Partial Radiated Power (UHPRP)	95
E.2.5	Partial Radiated Sensitivity (PRS).....	96
E.2.5.1	Upper Partial Radiated Sensitivity Integrated over $\pm 60^\circ$ Sector (UPRS $_{\pm 60}$)	96
E.2.5.2	Upper Hemisphere Partial Radiated Sensitivity (UHPRS)	97
E.3	Test Procedure for NTN UE.....	97
E.3.1	General	97
E.3.2	TRP and PRP test procedure for NR NTN	98
E.3.2.1	UE configuration	98
E.3.2.2	Test Procedure	99
E.3.3	TRP and PRP test procedure for IoT-NTN	99
E.3.3.1	UE configuration	99
E.3.3.2	Test Procedure for NB-IoT NTN	99
E.3.4	TRS and PRS test procedure for NR NTN	100
E.3.4.1	UE configuration	100
E.3.4.2	Test Procedure	100
E.3.5	TRS and PRS test procedure for IoT-NTN	101
E.3.5.1	UE configuration	101
E.3.5.2	Test Procedure for NB-IoT NTN	101
E.4	NTN MU assessment.....	102
E.4.1	General	102
E.4.2	MU for TRP/PRP test.....	102
E.4.3	MU for TRS/PRS test.....	102
Annex F (informative):	Change History	103
History		106

Sample Document

get full document from standards.iteh.ai

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.

In the present document, modal verbs have the following meanings:

shall indicates a mandatory requirement to do something

shall not indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

should indicates a recommendation to do something

should not indicates a recommendation not to do something

may indicates permission to do something

need not indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

can indicates that something is possible

cannot indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

will indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

will not indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

might indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

might not indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

is (or any other verb in the indicative mood) indicates a statement of fact

is not (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

Sample Document

get full document from standards.iteh.ai

1 Scope

The present document specifies details of conformance testing of UE TRP (Total Radiated Power) and TRS (Total Radiated Sensitivity) requirements and test methodologies for FR1 (NR SA and EN-DC).

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 TS 38.161: "User Equipment (UE) TRP (Total Radiated Power) and TRS (Total Radiated Sensitivity) requirements; Range 1 Standalone and Range 1 Interworking operation with other radios
- [2] 3GPP TS 38.508-1: "5GS; User Equipment (UE) conformance specification; Part 1: Common test environment "
- [3] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone".
- [4] JCGM 100:2008: "Evaluation of measurement data — Guide to the expression of uncertainty in measurement".
- [5] ETSI TR 102 273-1-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties; Part 1: Uncertainties in the measurement of mobile radio equipment characteristics; Sub-part 1: Introduction".
- [6] ETSI TR 100 028-2: "ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2".
- [7] ETSI TR 102 273-1-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties; Part 1: Uncertainties in the measurement of mobile radio equipment characteristics; Sub-part 2: Examples and annexes".
- [8] CTIA Certification™: "CTIA Certification Test Plan for Wireless Device Over-the-Air Performance, CTIA 01.70: Measurement Uncertainty", latest active version available at: <https://ctiacertification.org/test-plans/>
- [9] Foegelle, M.D., "The Surface Standard Deviation Method for TRP Measurement Uncertainty", 25th Proceedings of the Antenna Measurement Techniques Association (AMTA 2003), A03-027
- [10] 3GPP TR 38.834: "Measurements of User Equipment (UE) Over-the-Air (OTA) performance for NR FR1; Total Radiated Power (TRP) and Total Radiated Sensitivity (TRS) test methodology (Release 17)"
- [11] 3GPP TS 38.521-1: "NR; User Equipment (UE) conformance specification; Radio transmission and reception; Part 1: Range 1 Standalone"
- [12] CTIA Certification™: "CTIA Certification Test Plan for Wireless Device Over-the-Air Performance, CTIA 01.72: Near-Field Phantoms", latest active version available at: <https://ctiacertification.org/test-plans/>

- [13] CTIA Certification™: “CTIA Certification Test Plan for Wireless Device Over-the-Air Performance, CTIA 01.71 Device Setup and Positioning Guidelines”, latest active version available at: <https://ctiacertification.org/test-plans/>
- [14] 3GPP TS 38.521-3: "NR; User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Range 1 and Range 2 Interworking operation with other radios"
- [15] 3GPP TS 37.544: "Universal Terrestrial Radio Access (UTRA) and Evolved UTRA (E-UTRA); User Equipment (UE) Over The Air (OTA) performance; Conformance testing"
- [16] 3GPP TS 21.905: “Vocabulary for 3GPP Specifications”
- [17] 3GPP TS 38.101-3: “NR; User Equipment (UE) radio transmission and reception; Part 3: Range 1 and Range 2 Interworking operation with other radios”
- [18] 3GPP TR 38.870, “Enhanced Over-the-Air (OTA) test methods for NR FR1 Total Radiated Power (TRP) and Total Radiated Sensitivity (TRS) (Release 18)”

3 Definitions of terms, symbols, and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in 3GPP TR 21.905 [16] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

Browsing mode usage: This mode corresponds to “data” mode, the device is tested via hand-only phantoms.

Primary mechanical mode: The mode that is most often used for a specific user scenario. Every terminal has at least one primary mechanical mode, if multiple modes are supported, different primary mechanical modes may be applicable for different user scenarios, e.g., different primary mechanical modes for Browsing mode usage and Talk mode usage for the same UE.

Talk mode usage: This mode corresponds to “talk” mode, the device is tested via head & hand phantoms.

Wrist-worn mode usage: This mode corresponds to wearable device for wrist-worn mode, the device is tested via forearm phantoms.

3.2 Symbols

For the purposes of the present document, the following symbols apply:

$TRP_{average}$	The average measured total radiated power of low, mid and high channel. When hand phantom is involved, the average is performed with low, mid and high channel from both hand left and hand right.
$TRS_{average}$	The average measured total radiated sensitivity of low, mid and high channel. When hand phantom is involved, the average is performed with low, mid and high channel from both hand left and hand right.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

AC	Anechoic Chamber
BHHL	Beside Head and Hand Left Side (Head and Hand Phantom)
BHHR	Beside Head and Hand Right Side (Head and Hand Phantom)
CA	Carrier Aggregation
DUT	Device Under Test
E-UTRA	Evolved UTRA

EIRP	Effective Isotropic Radiated Power
EUT	Equipment Under Test
FR1	RF Frequency Range 1
FS	Free Space
HL	Hand Left (Hand Phantom Only)
HR	Hand Right (Hand Phantom Only)
MPR	Allowed maximum power reduction
NR	New Radio
NSA	Non-Standalone, a mode of operation where operation of another radio is assisted with another radio
OTA	Over The Air
QZ	Quiet Zone
RedCap	Reduced Capability
SA	Standalone
SS	System Simulator
TAA	Time-Averaging Algorithm
TAS	Transmit Antenna Switching
TRP	Total Radiated Power
TRS	Total Radiated Sensitivity
TxD	Tx Diversity
UE	User Equipment
UL MIMO	Uplink Multiple Antenna transmission

4 General

4.1 Relationship between minimum requirements and test requirements

The Minimum Requirements given in TS 38.161 [1] make no allowance for measurement uncertainty. This test specification will define test tolerances for FR1 TRP TRS. The test tolerances are used to relax the minimum requirements in TS 38.161 [1] to create test requirements.

4.2 Applicability of minimum requirements

4.2.1 General

The minimum requirements apply only to the corresponding primary mechanical mode of UE in the environmental conditions specified in Annex C.4.2.2.

4.2.1 UE mechanical modes

The mechanical modes of a device under test (DUT) are declared by the manufacturer. A DUT shall have at least one mechanical mode. If only one mode is supported, then this is defined as the primary. If multiple modes are supported, the manufacturer can declare different primary mechanical modes applicable for different user scenarios, e.g., different primary mechanical mode for Browsing mode usage and Talk mode usage for the same UE.

4.3 Applicability rules for testing of FR1 SA and NSA UEs

1. The applicability and test coverage rules for Non-Standalone (NSA) only capable devices shall include the following:
 - a) For each NR band supported by the device, test the UE in EN-DC mode using any one example configuration containing that NR band or configuration declaration decision tree as per recommended TRP/TRS test procedures in this specification.

2. The applicability and test coverage rules for Standalone (SA) and NSA (EN-DC) capable devices shall include the following:
 - a) For each NR band in a device, test the UE in Standalone Mode as per the TRP/TRS test procedures in this specification.
 - b) This shall also fulfil coverage for all EN-DC FR1 minimum performance requirements for that NR band and need not be retested in EN-DC mode.

4.4 Applicability rules for testing of power class capability of UEs

1. The applicability and test coverage rules for PC2 and PC3 UEs shall include the following:
 - a) For UEs that support PC2 in a given band: verify the requirement only with PC2 configuration
 - b) For UEs that only support PC3 in a given band: verify the requirement with PC3 configuration

NOTE 1: The test procedure and requirements in this version of the specification apply only for UEs based on 1 Tx configuration and are not applicable to UEs under TxD and UL MIMO configurations.

4.5 Applicability rules for test methods

Editor's note: The following aspects are incomplete or yet to be determined regarding applicability of the alternative Reverberation Chamber (RC) test method:

- How to verify the results with AC when the performance requirement is not met with RC test method
- Specifics of how to compare test results between RC and Anechoic Chamber (AC) test system using golden/reference UEs

The Anechoic Chamber (AC) system is the reference method to verify FR1 TRP and TRS requirements.

The applicability of alternative Reverberation Chamber (RC) test method is specified as follows:

- Comparison between RC system results and an accredited AC system using golden/reference UEs shall be performed on a regular basis.
- For bands >3GHz, RC test method is harmonized with reference AC method. For the case that directional parameters are not required (e.g. UE antenna pattern, specific directional EIRP/EIS results, partial surface integrated metrics), then the RC test method can be used.
- For certification testing, it is recommended to verify the results using AC test method as reference in case the UE does not meet the performance requirements using the RC test method.

5 Frequency Bands

5.1 General

This clause contains the operating bands for both Standalone (SA) and Non-Standalone (NSA) operation in frequency range 1 (FR1) as well as the test parameters for each band.

5.2 Operating Bands

5.2.1 FR1 Standalone Operating bands

The requirements defined in this specification for FR1 standalone apply to the operating bands defined in Table 5.2.1-1.

Table 5.2.1-1: NR operating bands in FR1 standalone

NR operating band	Uplink (UL) operating band	Downlink (DL) operating band	Duplex Mode
	BS receive / UE transmit F _{UL_low} – F _{UL_high}	BS transmit / UE receive F _{DL_low} – F _{DL_high}	
n1	1920 MHz – 1980 MHz	2110 MHz – 2170 MHz	FDD
n2	1850 MHz – 1910 MHz	1930 MHz – 1990 MHz	FDD
n3	1710 MHz – 1785 MHz	1805 MHz – 1880 MHz	FDD
n5	824 MHz – 849 MHz	869 MHz – 894 MHz	FDD
n7	2500 MHz – 2570 MHz	2620 MHz – 2690 MHz	FDD
n8	880 MHz – 915 MHz	925 MHz – 960 MHz	FDD
n12	699 MHz – 716 MHz	729 MHz – 746 MHz	FDD
n14	788 MHz – 798 MHz	758 MHz – 768 MHz	FDD
n20	832 MHz – 862 MHz	791 MHz – 821 MHz	FDD
n25	1850 MHz – 1915 MHz	1930 MHz – 1995 MHz	FDD
n26	814 MHz – 849 MHz	859 MHz – 894 MHz	FDD
n28	703 MHz – 748 MHz	758 MHz – 803 MHz	FDD
n30	2305 MHz – 2315 MHz	2350 MHz – 2360 MHz	FDD
n34	2010 MHz – 2025 MHz	2010 MHz – 2025 MHz	TDD
n38	2570 MHz – 2620 MHz	2570 MHz – 2620 MHz	TDD
n39	1880 MHz – 1920 MHz	1880 MHz – 1920 MHz	TDD
n40	2300 MHz – 2400 MHz	2300 MHz – 2400 MHz	TDD
n41	2496 MHz – 2690 MHz	2496 MHz – 2690 MHz	TDD
n48	3550 MHz – 3700 MHz	3550 MHz – 3700 MHz	TDD
n50	1432 MHz – 1517 MHz	1432 MHz – 1517 MHz	TDD ¹
n51	1427 MHz – 1432 MHz	1427 MHz – 1432 MHz	TDD
n53	2483.5 MHz – 2495 MHz	2483.5 MHz – 2495 MHz	TDD
n65	1920 MHz – 2010 MHz	2110 MHz – 2200 MHz	FDD ⁴
n66	1710 MHz – 1780 MHz	2110 MHz – 2200 MHz	FDD
n70	1695 MHz – 1710 MHz	1995 MHz – 2020 MHz	FDD
n71	663 MHz – 698 MHz	617 MHz – 652 MHz	FDD
n74	1427 MHz – 1470 MHz	1475 MHz – 1518 MHz	FDD
n75	N/A	1432 MHz – 1517 MHz	SDL
n76	N/A	1427 MHz – 1432 MHz	SDL
n77 ¹²	3300 MHz – 4200 MHz	3300 MHz – 4200 MHz	TDD
n78	3300 MHz – 3800 MHz	3300 MHz – 3800 MHz	TDD
n79	4400 MHz – 5000 MHz	4400 MHz – 5000 MHz	TDD
n80	1710 MHz – 1785 MHz	N/A	SUL
n81	880 MHz – 915 MHz	N/A	SUL
n82	832 MHz – 862 MHz	N/A	SUL
n83	703 MHz – 748 MHz	N/A	SUL
n84	1920 MHz – 1980 MHz	N/A	SUL
n86	1710 MHz – 1780 MHz	N/A	SUL
n95	2010 MHz – 2025 MHz	N/A	SUL

Other operating bands may be considered in future releases.

5.2.2 FR1 EN-DC band combinations

Principle of EN-DC band combinations selection for FR1 TRP TRS OTA testing:

1. Focus on the performance of the NR carrier and do not consider multiple permutations between different LTE bands and NR band under test, i.e., for each NR band, only select one EN-DC band combination.
2. For UE supporting multiple EN-DC band combinations for the same NR band, consider only those EN-DC configurations which have no MSD impact on either LTE or NR, i.e., the selected EN-DC combination should be no MSD issue identified in TS 38.101-3 [17] Section 7.3B.2.3 (Inter-band EN-DC within FR1).

Table 5.2.2-1: Measurement parameters for example inter-band EN-DC band combinations (two bands)

EN-DC configuration	E-UTRA configurations	NR configurations
DC_3A_n28A	Note1	Note2
DC_2A_n41A	Note1	Note2
DC_1A_n78A	Note1	Note2
DC_1A_n79A	Note1	Note2
Note 1: As per TR 37.902 [10], Section 6.4 (Measurement frequencies).		
Note 2: As per Tables 5.3-1 and Table 5.3-2 in this specification.		

With the above basic principle and EN-DC example band combination, the selection logic for testing is defined by the decision tree below.

Sample Document

get full document from standards.iteh.ai