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LTE;
Base Station (BS) requirements and conformance tests for shared spectrum channel access
(3GPP TS 37.107 version 16.3.0 Release 16)

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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).

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Contents

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.

1 Scope

The present document specifies the minimum Radio Frequency (RF) characteristics, minimum performance requirements, and the RF test methods and conformance requirements for E-UTRA with LAA Base Stations (BS) and for NR-U Base Stations (BS).

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 36.141: "Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) conformance testing".

[3] ITU-R Recommendation M.1545: "Measurement uncertainty as it applies to test limits for the terrestrial component of International Mobile Telecommunications-2000".

[4] Void.

[5] 3GPP TS 37.213: "Physical layer procedures for shared spectrum channel access".

[6] 3GPP TS 38.141-1: "NR; Base Station (BS) conformance testing Part 1: Conducted conformance testing".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] 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].

3.2 Symbols

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].

BS	Base Station
E-UTRA	Evolved Universal Terrestrial Radio Access
NR	New Radio
LBT	Listen-Before-Talk

PDSCH	Physical Downlink Shared Channel
RF	Radio Frequency

4 General

4.1 Relationship between minimum requirements and test requirements

The Minimum Requirements given in this specification make no allowance for measurement uncertainty. The test specification TS 36.141 [2] Annex G defines Test Tolerances for E-UTRA, and the test specification TS 38.141-1 [6] Annex C defines Test Tolerances for NR. These Test Tolerances are individually calculated for each test. The Test Tolerances are used to relax the Minimum Requirements in this specification to create Test Requirements.

The measurement results returned by the Test System are compared - without any modification - against the Test Requirements as defined by the shared risk principle.

The Shared Risk principle is defined in ITU-R M.1545 [3].

5 Channel access procedures (core part)

5.1 Downlink channel access procedure

For downlink operation in Band 46, Band 49, Band n46 and Band n96, a channel access procedure for PDSCH transmission as described in TS 37.213 [5], Clause 4.1.1 is specified.

5.1.1 Channel access parameters

Channel access related parameters for PDSCH are listed in Table 5.1.1-1.

Table 5.1.1-1: Channel access parameters for PDSCH

Parameter	Unit	Value
LBT measurement bandwidth	MHz	10, 20
Energy detection threshold	dBm/20MHz dBm/10MHz	-72 or X (Note) -75
Maximum channel occupancy time	ms	8
NOTE: The specific value X is declared by the vendor.		

5.1.2 Minimum requirement

The Base Station shall be able to assess whether the medium is busy or idle with at least 90% probability, using a channel access procedure with the parameters in Table 5.1.1-1.

6 Channel access procedures (performance part)

6.1 Downlink channel access procedure

6.1.1 Definition and applicability

Channel access procedure for downlink operation in band 46, band 49, band n46 and band n96 for PDSCH transmission is described in TS 37.213 [5], Clause 4.

6.1.2 Minimum requirement

The minimum requirement is in clause 5.1.

6.1.3 Test purpose

The test purpose is to verify the accuracy of the energy detection threshold, maximum channel occupancy time (MCOT) and minimum idle time under normal conditions for all band 46 and band 49 transmitters in the BS.

6.1.4 Method of test

6.1.4.1 Initial conditions for band 46 and band 49

Test environment: normal; see Annex D.2 of TS 36.141 [2].

RF channels to be tested for single carrier: B, M and T; see clause 4.7 of TS 36.141 [2].

Connect the signal analyzer to the base station antenna connector as shown in Annex I of TS 36.141 [2].

6.1.4.1a Initial conditions for band n46 and band n96

Test environment: Normal, see annex B.2 of TS 38.141-1 [6].

RF channels to be tested: M; see clause 4.9.1 of TS 38.141-1 [6].

Set the channel set-up of the connector under as shown in annex D.1 for BS type 1-C and annex D.3 for BS type 1-H in [6].

6.1.4.2 Procedure

MCOT and minimum idle time

1) Set the base station to transmit a signal according to E-TM 1.1 at manufacturer's declared rated output power with corresponding channel bandwidth (i.e. 10 MHz or 20 MHz) for band 46 and 49, or

   Set the base station to transmit a signal according to NR-FR1-TM1.1 at manufacturer's declared rated output power with corresponding channel bandwidth i.e. 10 MHz (only for band n46) or 20 MHz for band n46 or n96.

2) Measure the transmitter ON period during the continuous transmission (after the first channel access).

3) Measure the transmitter OFF period between two consecutive transmitter ON periods.

4) Verify minimum idle time as follows:

   The transmitter OFF period between two consecutive transmitter ON periods shall not be less than 25 μs.

5) Verify maximum channel occupancy time (MCOT) as follows:

   a) The duration of each transmitter ON period continuous transmission shall not exceed the maximum channel occupancy time (MCOT) requirement specified in clause 6.1.5.

Energy detection accuracy

6) Generate the interfering signal of AWGN with corresponding channel bandwidth (i.e. 10 MHz or 20 MHz) at the same centre frequency as the tested channel. The interfering signal shall be at a level as specified in table 6.1.5-1. The base station shall stop transmission on the current operating channel and will not resume normal transmissions as long as the interference signal is present.

7) The step 6) is repeated multiple times considering the following sub-steps:

   - Interferer ON: if the interfering signal is present, the interfering signal should be present for 10ms.
   - Interferer OFF: if the interfering signal is removed, the interfering signal should be absent for 10ms.

- The total number of interferer ON duration is assumed to be N and the total number of interferer OFF duration is assumed to be M. The value N, M and the sequence of interferer ON/OFF pattern shall be generated randomly for the test.

8) In the test, a counter is maintained with initial value set to 0 when the test starts.

9) For every 10ms Interferer ON period, the counter is increased by 1 if there is either an ON/OFF transition or no transmission by the DUT. To pass the test, the counter shall not be less than N*0.9.

6.1.5 Test Requirements

In normal conditions, the measurement result shall meet channel access related test requirements for PDSCH as listed in Table 6.1.5-1.

Table 6.1.5-1: Channel access test requirements for PDSCH

Parameter	Unit	Value
LBT measurement bandwidth	MHz	10, 20
Maximum energy detection threshold	dBm/20MHz dBm/10MHz	-72 + 4dB or X + 4dB (Note) -75 + 4dB
Maximum channel occupancy time	ms	8
NOTE: The specific value X is declared by the vendor.		

The Base Station shall be able to assess whether the medium is busy or idle with at least 90% probability, using a channel access procedure with the parameters in Table 6.1.5-1.

Annex A (informative): Change history

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2018-03	RAN4#86	R4-1802453				TS skeleton created from 3GPP TS template.	0.0.1
2018-05	RAN4#87	R4-1807758				Updated TS draft for 37.107 with core part and corrections	0.1.0
2018-06	RAN#80	RP-181132				v1.0.0 submitted for plenary approval	1.0.0
2018-06	RAN#80					Approved by plenary – Rel-15 spec under change control	15.0.0
2018-09	RAN#81	RP-181901	0001		F	Moving Section 9 from 36.141 to 37.107	15.1.0
2020-06	RAN#88	RP-200989	0002	1	F	CR to TS 37.107 with correction to interfering signal for conformance test for energy detection accuracy to align withTS 37.213	15.2.0
2020-06	SA#88	-	-	-	-	Update to Rel-16 version (MCC)	16.0.0
2020-09	RAN#89	RP-201512	0005		A	CR to 37.107 with correction of references to TS 37.213 Rel-16	16.1.0
2020-09	RAN#89	RP-201914	0007		B	CR to TS 37.107 with introduction of NR-U feature – core part	16.1.0
2020-12	RAN#90	RP-202499	0009		A	CR to 37.107 with update of EDT level	16.2.0
2021-06	RAN#92	RP-211094	0010		B	CR to TS 37.107 with NR-U introduction for performance part	16.3.0

History

Document history		
V16.0.0	September 2020	Publication
V16.1.0	November 2020	Publication
V16.2.0	January 2021	Publication
V16.3.0	September 2021	Publication