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**TECHNICAL SPECIFICATION**

LTE;
Base Station (BS) requirements and conformance tests for
shared spectrum channel access
(3GPP TS 37.107 version 16.0.0 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).

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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).

# 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".

# 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 |
| 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. 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 and Band 49, 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 | -72 |
|  | dBm/10MHz | -75 |
| Maximum channel occupancy time | ms | 8 |

### 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 and Band 49 for PDSCH transmission is described in TS 36.213 [4], Clause 15.

### 6.1.2 Minimum requirement

The minimum requirement is in subclause 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

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 subclause 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].

### 6.1.4.2    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). Channel Access Priority Class 3 parameters are selected to be tested based on Table 4.1.1-1 in TS 37.213.

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 of (-72dBm+ 4dB)/20MHz or (-75dBm+4dB)/10MHz for 20 MHz and 10 MHz channel bandwidth, respectively. 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 | -72 + 4dB |
| | dBm/10MHz | -75 + 4dB |
| Maximum channel occupancy time | ms | 8 |

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** |

# History

| Document history | | |
|---|---|---|
| V16.0.0 | September 2020 | Publication |
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