3GPP TSG-RAN WG4 Meeting #111 revision of R4-2409565

Fukuoka City, Fukuoka, Japan, 20th – 24th May, 2024

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
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|  | **38.115-2** | **CR** |  | **rev** | **1** | **Current version:** | **18.4.0** |  |
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| *For* ***[HE](http://www.3gpp.org/3G_Specs/CRs.htm%22%20%5Cl%20%22_blank)******[LP](http://www.3gpp.org/3G_Specs/CRs.htm%22%20%5Cl%20%22_blank)*** *on using this form: comprehensive instructions can be found at <http://www.3gpp.org/Change-Requests>.* |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network |  |

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| ***Title:***  | Updated Draft CR to TS 38.115-2: Clauses 6.12~6.16 |
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| ***Source to WG:*** | Huawei, HiSilicon |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_netcon\_repeater-Perf |  | ***Date:*** | 2024-04-17 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-18 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
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| ***Reason for change:*** | Based on Draft BigCR to TS 38.115-2 which was Endorsed in R4-2406136, in this Draft CR we provide further updates to clauses 6.12~6.16. |
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| ***Summary of change:*** | Clauses 6.12~6.16 |
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| ***Consequences if not approved:*** | Missing NCR requirements. |
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| ***Clauses affected:*** |  |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  |  |
| ***affected:*** |  | **X** |  Test specifications |  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications |  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

<Start of Change 1>

6.12 OTA reference sensitivity

6.12.1 Definition and applicability

The reference sensitivity power level REFSENS is defined as the EIS level at the centre of the quiet zone in the RX beam peak direction, at which the throughput shall meet or exceed the requirements for the specified reference measurement channel.

This requirement applies to MT RIB only.

6.12.2 Minimum requirement for NCR type 2-O

For WA class NCR type 2-O reference sensitivity level is specified the same as the Wide Area IAB-MT reference sensitivity level requirementin TS 38.174 [22], clause 10.3.3.3.

For LA class NCR type 2-O reference sensitivity level is specified the same as reference sensitivity power level for power class 3 in TS 38.101-2 [14], clause 7.3.2.3.

6.12.3 Test purpose

The test purpose is to verify that the NCR can meet the throughput requirement for a specified measurement channel at the EISREFSENS level and the range of angles of arrival within the *OTA REFSENS RoAoA*.

6.12.4 Method of test

#### 6.12.4.1 Initial conditions

Test environment: Normal, see annex B.2.

RF channels to be tested for single carrier:

- B, M and T; see clause 4.9A.1.

Directions to be tested:

- OTA REFSENS receiver target reference direction (D.XX),

- OTA REFSENS conformance test directions (D.XX).

#### 6.12.4.2 Procedure

1) Place the NCR with its manufacturer declared coordinate system reference point in the same place as calibrated point in the test system

2) Align the manufacturer declared coordinate system orientation of the NCR with the test system.

3) Align the NCR with the test antenna in the declared direction to be tested.

4) Ensure the polarization is accounted for such that all the power from the test antenna is captured by the NCR under test.

5) Start the signal generator for the wanted signal to transmit:

- The test signal as specified in clause 6.12.5.

6) Set the test signal mean power so the calibrated radiated power at the BS Antenna Array coordinate system reference point is as specified in clause 6.12.5.

7) Measure the throughput.

9) Repeat steps 3 to 9 for all OTA REFSENS conformance test directions of the NCR (D.XX), and supported polarizations.

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6.12.5 Test requirements

For *NCR type 2-O* of WA class, the test requirement for OTA reference sensitivity requirement is defined in TS 38.176-2 [x], clause 7.3.5.

For *NCR type 2-O* of LA class, the test requirement for OTA reference sensitivity requirement is defined in TS 38.521-2 [x], clause 7.3.2.5.

This test requirement applies at MT RIB only.

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## 6.13 OTA maximum input level

### 6.13.1 Definition and applicability

The maximum input level is defined as the maximum mean power, for which the throughput shall meet or exceed the minimum requirements for the specified reference measurement channel.

This requirement applies at MT RIB only.

### 6.13.2 Minimum requirement

For *NCR type 2-O* of LA class, the maximum input power is specified in TS 38.101-2 [x], clause 7.4.

### 6.13.3 Test purpose

Maximum input level tests ability to receive data with a given average throughput for a specified reference measurement channel, under conditions of high signal level, ideal propagation and no added noise.

### 6.13.4 Method of test

#### 6.13.4.1 Initial conditions

Test environment: Normal: see annex B.2.

RF channels to be tested for single carrier: M; see clause 4.9A.1.

Directions to be tested: OTA REFSENS receiver target reference direction (D.XX).

#### 6.13.4.2 Procedure

1) Place the NCR with its manufacturer declared coordinate system reference point in the same place as calibrated point in the test system.

2) Align the manufacturer declared coordinate system orientation of the NCR with the test system.

3) Align the NCR with the test antenna in the declared direction to be tested.

4) Ensure the polarization is accounted for such that all the power from the test antenna is captured by the NCR under test.

5) Set the test signal mean power so that the calibrated radiated power at the NCR Antenna Array coordinate system reference point is as follows:

a) Set the signal generator for the wanted signal to transmit as specified in clause 6.13.5.

6) Measure the throughput.

### 6.13.5 Test requirements

For *NCR type 2-O* of LA class, the test requirement for OTA maximum input level is defined in TS 38.521-2 [x], clause 7.4.5.

This test requirement applies at MT RIB only.

## 6.14 OTA adjacent channel selectivity

### 6.14.1 Definition and applicability

Adjacent Channel Selectivity (ACS) is a measure of a receiver's ability to receive a NR signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

This requirement applies at MT RIB only.

### 6.14.2 Minimum requirement

For *NCR type 2-O* of WA class, the ACS requirement is specified in TS 38.174 [x], clause 10.5.1.4.

For *NCR type 2-O* of LA class, the ACS requirement is specified in TS 38.101-2 [x], clause 7.5.

### 6.14.3 Test purpose

Adjacent channel selectivity tests the ability to receive data with a given average throughput for a specified reference measurement channel, in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel, under conditions of ideal propagation and no added noise.

### 6.14.4 Method of test

#### 6.14.4.1 Initial conditions

Test environment: Normal, see annex B.2.

RF channels to be tested for single carrier:

- M; see clause 4.9A.1.

*NCR RF Bandwidth* edge position to be tested for multi-carrier:

- MRFBW in single-band operation, see clause 4.9A.1;

Directions to be tested:

- For NCR *type 2-O*, OTA REFSENS receiver target reference direction (D.xx).

#### 6.14.4.2 Procedure

1) Place the NCR with its manufacturer declared coordinate system reference point in the same place as calibrated point in the test system.

2) Align the manufacturer declared coordinate system orientation of the NCR with the test system.

3) Align the NCR with the test antenna in the declared direction to be tested.

4) Align the NCR so that the wanted signal and interferer signal is *polarization matched* with the test antenna(s).

5) Configure the beam peak direction for the transmitter according to the declared reference beam direction pair for the appropriate beam identifier.

6) Set the test signal mean power so that the calibrated radiated power at the NCR Antenna Array coordinate system reference point is as follows:

a)

For NCR*-MT* *type 2-O,* set the signal generator for the wanted signal to transmit as specified in clause 6.14.5.

b)

For NCR*-MT* *type 2-O*, set the signal generator for the interfering signal at the adjacent channel frequency of the wanted signal to transmit as specified in clause 6.14.5..

7) Measure throughput according to annex A.1 for each supported polarization, for multi-carrier and/or CA operation the throughput shall be measured for relevant carriers specified by the test configuration specified in clauses 4.7.2 and 4.8.

### 6.14.5 Test requirements

For *NCR type 2-O* of WA class, the test requirement for OTA ACS is defined in TS 38.176-2 [x], clause 7.5.1.5.3.

For *NCR type 2-O* of LA class, the test requirement for OTA ACS is defined in TS 38.521-2 [x], clause 7.5.5.

This test requirement applies at MT RIB only.

## 6.15 OTA blocking characteristics

### 6.15.1 Definition and applicability

The blocking characteristic is a measure of the receiver's ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the spurious response or the adjacent channels, without this unwanted input signal causing a degradation of the performance of the receiver beyond a specified limit. The blocking performance shall apply at all frequencies except those at which a spurious response occurs.

This requirement applies at MT RIB only.

### 6.15.2 Minimum requirement

For WA class *NCR type 2-O*, the OTA blocking requirement is specified in TS 38.174 [x], clause 10.5.2.4.

For LA class *NCR type 2-O*, the OTA blocking requirement is specified in TS 38.101-2 [x], clause 7.6.

### 6.15.3 Test purpose

In-band blocking is defined for an unwanted interfering signal falling into the receive band or into the spectrum equivalent to twice the channel bandwidth below or above the receive band at which the relative throughput shall meet or exceed the minimum requirement for the specified measurement channels.

### 6.15.4 Method of test

#### 6.17.4.1 Initial conditions

Test environment: Normal; see annex B.2.

RF channels to be tested for single carrier (SC): M; see clause 4.9A.1.

*NCR RF Bandwidth p*ositions to be tested for multi-carrier (MC):

- MRFBW for *single-band connector(s)*, see clause 4.9A.1,

- BRFBW\_T'RFBW and B'RFBW\_TRFBW for *multi-band connector(s),* see clause 4.9A.1.

#### 6.17.4.2 Procedure for general blocking

The minimum requirement is applied to all connectors under test.

For *NCR type 1-H* the procedure is repeated until all *TAB connectors* necessary to demonstrate conformance have been tested;

1) Connect the connector under test to measurement equipment

2) For FDD operation, set the NCR to transmit:

- For single carrier operation set the connector under test to transmit at manufacturers declared *rated output power per passband* (D.9).

- For a connector under test declared to be capable of multi-carrier operation (D.7) set the connector under test to transmit on all carriers configured using the applicable test configuration and corresponding power setting specified in clauses 4.7 and 4.8 using the corresponding test models or set of physical channels in clause 4.9A.2.

3) Set the signal generator for the wanted signal to transmit as specified in clause 6.17.5.

4) Set the signal generator for the interfering signal to transmit at the frequency offset and as specified in clause 6.17.5. The interfering signal shall be swept with a step size of 1 MHz starting from the minimum offset to the channel edges of the wanted signals as specified in clause 6.17.5.

5) Measure the throughput.

In addition, for a *multi-band* *connector*, the following steps shall apply:

6) For *multi-band* *connector* and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

#### 6.17.4.4 Procedure for out of band blocking

The minimum requirement is applied to all connectors under test.

For NCR *type 1-H* the procedure is repeated until all *TAB connectors* necessary to demonstrate conformance have been tested; .

1) Connect the connector under test to measurement equipment

2) For NCR-MT, set the signal generator for the wanted signal as defined in clause 6.17.5 to transmit.

3) For NCR-MT, set the Signal generator for the interfering signal to transmit at the frequency offset and as specified in clause 6.17.5. The CW interfering signal shall be swept with a step size of 1 MHz over than range 1 MHz to (FUL\_low - ΔfOOB) MHz and (FUL\_high + ΔfOOB) MHz to 12750 MHz.

### 6.15.5 Test requirements

For *NCR type 2-O* of WA class, the test requirement for OTA blocking is defined in TS 38.176-2 [x], clause 7.5.2.5.3.

For *NCR type 2-O* of LA class, the test requirement for OTA blocking is defined in TS 38.521-2 [x], clause 7.6.2.5.

This test requirement applies at MT RIB only.

## 6.16 OTA spurious emissions

### 6.16.1 Definition and applicability

The spurious emissions power is the power of emissions generated or amplified in a receiver. The spurious emissions power level is measured as TRP.

This requirement applies at MT RIB only.

### 6.16.2 Minimum requirement

For *NCR type 2-O* of WA class, the OTA spurious emission requirement is specified in TS 38.174 [x], clause 10.7.3.2.

For *NCR type 2-O* of LA class, the OTA spurious emission requirement is specified in TS 38.101-2 [xx], clause 7.9.

### 6.16.3 Test purpose

Test verifies whether spurious emissions meet the requirements described in clause 6.16.5. Excess spurious emissions increase the interference to other systems.

### 6.16.4 Method of test

#### 6.16.4.1 Initial conditions

Test environment: Normal; see annex B.2.

RF channels to be tested for single carrier, see clause 4.9A.1:

- For FR2:

- B when testing from 30 MHz to FDL\_low - ΔfOBUE

- T when testing from FDL\_high + ΔfOBUE to 2nd harmonic (or to 60 GHz)

RF bandwidth positions to be tested in single-band operation, see clause 4.9A.1:

- For FR2:

- BRFBW when testing from 30 MHz to FDL\_low - ΔfOBUE

- TRFBW when testing from FDL\_high + ΔfOBUE to 2nd harmonic (or to 60 GHz)

Directions to be tested: As the requirement is TRP the beam pattern(s) may be set up to optimise the TRP measurement procedure (see annex I) as long as the required TRP level is achieved.

#### 7.7.4.2 Procedure

The following procedure for measuring TRP is based on the directional power measurements as described in annex I. An alternative method to measure TRP is to use a characterized and calibrated reverberation chamber if so follow steps 1, 3, 4, 5, 7 and 10.

1) Place the NCR at the positioner.

2) Align the manufacturer declared coordinate system orientation (D.2) of the NCR with the test system.

3) Measurements shall use a measurement bandwidth in accordance to the conditions in clause 6.16.5.

4) The measurement device characteristics shall be:

- Detection mode: True RMS.

5) Set the TDD NCR to receive only.

6) Orient the positioner (and NCR) in order that the direction to be tested aligns with the test antenna such that measurements to determine TRP can be performed (see annex I).

7) Measure the emission at the specified frequencies with specified measurement bandwidth

8) Repeat step 6-9 for all directions in the appropriated TRP measurement grid needed for full TRP estimation (see annex I).

NOTE 1: The TRP measurement grid may not be the same for all measurement frequencies.

NOTE 2: The frequency sweep or the TRP measurement grid sweep may be done in any order

9) Calculate TRP at each specified frequency using the directional measurements.

### 6.16.5 Test requirements

For *NCR type 2-O* of WA class, the test requirement for OTA spurious emission is defined in TS 38.176-2 [x], clause 7.7.5.

For *NCR type 2-O* of LA class, the test requirement for OTA spurious emission is defined in TS 38.521-2 [x], clause 7.9.5.

This test requirement applies at MT RIB only.