**3GPP TSG-RAN WG4 Meeting #100-e *draft R4-2115847***

**Electronic meeting, August 16-27, 2021**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **38.141-2** | **CR** | **<CR#>** | **rev** |  | **Current version:** | **15.10.0** |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](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:***  |  |
|  |  |
| ***Source to WG:*** | MCC, Huawei |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_newRAT-Perf |  | ***Date:*** | 2021-08-30 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-15 |
|  | *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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | This big CRs merge the mutile endorsed draf CRs. The reason for change in each endorsed draft CR is copied below.R4-2112773 Draft CR to 38.141-2: BS FR2 OBUE Cat B requirement table note clarification (6.7.4.5.2)There is critical missing text in FR2 OBUE cat B requirement table note text. “NOTE1”, which is for non-contiguous spectrum operation, describes “cumulative sum” of limit value from both side, however, it has missing description about calcuation with limit values which has different Measurement bandwidth. Correct calculation is to scale per the same measurement bandwidth. FR2 OBUE cat A table is with limit values with the same measurement bandwidth so that there is no need for this calculation note.R4-2115655 OTA transmitter intermodulation 38.141 R15On OTA tranmitter intermodulation, very high power Prated,t,TRP is not feasible for the test chamber. And the power transmitted in closest column could be far below the power Prated,t,TRP since AAS always use multi-column antenna. For co-location blocking requirements, 46 dBm is adopted in terms of TRP. The same interferer level as used for co-location blocking should be re-used.R4-2115657 Draft CR to TS 38.141-2 test configuration correctionsCorrection of NRTC4 description in clause 4.7.2.5.1There is mismach in description for NRTC4 in 38.141-1 and 38.142 specifications in following bullet in clause 4.7.2.5.1In 38-141-1 description explicity mention about NRTC1:*- Each concerned band shall be considered as an independent band and the carrier placement in each band shall be according to NRTC1, where the declared parameters for multi-band operation shall apply. The mirror image of the single-band test configuration shall be used in each alternate band(s) and in the highest band being.*In 38.141-2 description is not clear:*- Each concerned band shall be considered as an independent band and the corresponding test configuration shall be generated in each band. The mirror image of the single band test configuration shall be used in the highest band being tested for the beam.*Similar to LTE TC4 should use TC1, also TC5 should use TC1. TC4 description is similar in LTE 36.141, and both NR 38.141-1 and 38.141-2. Thus only in 38.141-2 correction of NRTC4 is needed. With this update text for NRTC4 is consistent with NRTC5 description already in specification.R4-2115823 draftCR to 38.141-2: Addition of Plane Wave Synthesizer in OTA measurement system set-upThe annex E on OTA measurement system set-up does not include Plane Wave Synthesizer wthin the OTA chamber descriptions, while Plane Wave Synthesizer has been widely recognized and agreed in TR 37.941. |
|  |  |
| ***Summary of change:*** | The summary of change in each each endorsed draft CR is copied below.R4-2112773 Draft CR to 38.141-2: BS FR2 OBUE Cat B requirement table note clarification (6.7.4.5.2)In Table 6.7.4.5.2.3-1, Table 6.7.4.5.2.3-2 clarification text added on NOTE1 for limit values to be appropriately scaleded when measurement bandwidth is different.R4-2115655 OTA transmitter intermodulation 38.141 R15The max interfereing power is defined as 46 dBm which is the same as co-location blocking for Macro BSR4-2115657 Draft CR to TS 38.141-2 test configuration correctionsCorrection to NRTC4 descriprtion by adding NRTC1 reference as it is done in LTE and NR conducted test specifications.R4-2115823 draftCR to 38.141-2: Addition of Plane Wave Synthesizer in OTA measurement system set-upAbbreviation on Plane Wave Synthesizer added, and PWS chamber added to the corresponding annex E clauses on any suitable OTA chamber. |
|  |  |
| ***Consequences if not approved:*** | The consequences if not approved for each endorsed draft CR are coppied below.R4-2112773 Draft CR to 38.141-2: BS FR2 OBUE Cat B requirement table note clarification (6.7.4.5.2)Without this clarification, one can make misinterpret requirement then resulted limit value could be loose from intended limit.R4-2115655 OTA transmitter intermodulation 38.141 R15OTA tranmitter intermodulation can not be tested in the test chamber.R4-2115657 Draft CR to TS 38.141-2 test configuration correctionsDefinition of NRTC4 in OTA specification will be ambigous.R4-2115823 draftCR to 38.141-2: Addition of Plane Wave Synthesizer in OTA measurement system set-upIncomplete description of OTA measurement systems. |
|  |  |
| ***Clauses affected:*** | R4-2112773 Draft CR to 38.141-2: BS FR2 OBUE Cat B requirement table note clarification (6.7.4.5.2)6.7.4R4-2115655 OTA transmitter intermodulation 38.141 R156.8.5R4-2115657 Draft CR to TS 38.141-2 test configuration corrections4.7.2.5.1R4-2115823 draftCR to 38.141-2: Addition of Plane Wave Synthesizer in OTA measurement system set-up3.3, E.1, and E.2 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **x** |  |  Other core specifications  | TS 38.104 |
| ***affected:*** |  |  |  Test specifications |  |
| ***(show related CRs)*** |  |  |  O&M Specifications |  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

***<Start of change1>***

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 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 TR 21.905 [1].

AA Antenna Array

ACLR Adjacent Channel Leakage Ratio

ACS Adjacent Channel Selectivity

AoA Angle of Arrival

AWGN Additive White Gaussian Noise

BS Base Station

BW Bandwidth

CA Carrier Aggregation

CACLR Cumulative ACLR

CATR Compact Antenna Test Range

CPE Common Phase Error

CP-OFDM Cyclic Prefix-OFDM

CLTA Co-Location Test Antenna

CW Continuous Wave

DFT-s-OFDM Discrete Fourier Transform-spread-OFDM

DM-RS Demodulation Reference Signal

EUT Equipment Under Test

DUT Device Under Test

EIRP Equivalent Isotropic Radiated Power

EIS Equivalent Isotropic Sensitivity

FBW Fractional Bandwidth

FR Frequency Range

GSCN Global Synchronization Channel Number

ICS In-Channel Selectivity

ITU‑R Radiocommunication Sector of the International Telecommunication Union

LA Local Area

LNA Low Noise Amplifier

MR Medium Range

NR New Radio

NR-ARFCN NR Absolute Radio Frequency Channel Number

OBUE Operating Band Unwanted Emissions

OCC Orthogonal Covering Code

OSDD OTA Sensitivity Directions Declaration

OTA Over The Air

PT-RS Phase Tracking Reference Signal

PWS Plane Wave Synthesizer

RB Resource Block

RDN Radio Distribution Network

REFSENS Reference Sensitivity

RIB Radiated Interface Boundary

RMS Root Mean Square (value)

RS Reference Signal

RV Redundancy Version

RX Receiver

RoAoA Range of Angles of Arrival

SCS Sub-Carrier Spacing

SSB Synchronization Signal Block

TAB Transceiver Array Boundary

TAE Time Alignment Error

TDD Time Division Duplex

TDL Tapped Delay Line

TRP Total Radiated Power

TT Test Tolerance

UCI Uplink Control Information

ZF Zero Forcing

***<End of change1>***

***<Start of change2>***

##### 4.7.2.5.1 NRTC4 generation

NRTC4 is based on re-using the existing test configuration applicable per band on beams generated using Multi-band transceiver units and hence have declared multi-band dependencies (D.16). It is constructed using the following method:

- The *Base Station RF Bandwidth* of each supported operating band shall be the declared maximum radiated *Base Station RF Bandwidth* (D.17).

- The number of carriers of each supported operating band shall be the declared maximum number of supported carriers per *operating band* in multi-band operation (D.21). Carriers shall be selected according to 4.7.2.1 and shall first be placed at the outermost edges of the declared maximum radiated *Radio Bandwidth* (D.18). Additional carriers shall next be placed at the edges of *Base Station RF Bandwidth*, if possible.

- The allocated *Base Station RF Bandwidth* of the outermost bands shall be located at the outermost edges of the declared maximum radiated *Radio Bandwidth* (D.18).

- Each concerned band shall be considered as an independent band and the carrier placement in each band shall be according to NRTC1 where the declared parameters for multi-band operation shall apply. The mirror image of the single band test configuration shall be used in the highest band being tested for the beam.

- If an operating band with multi-band dependencies supports three carriers only, two carriers shall be placed in one band according to the relevant test configuration while the remaining carrier shall be placed at the edge of the maximum *Radio Bandwidth* in the other band.

- If the sum of the maximum *base station RF bandwidths* of each of the supported operating bands is greater than the declared *total RF bandwidth* BWtot (D.19) of transmitter and receiver for the declared band combinations of the BS, then repeat the steps above for test configurations where the *Base Station RF Bandwidth* of one of the operating band shall be reduced so that the declared *total RF bandwidth* is not exceeded and vice versa.

- If the sum of the maximum number of supported carriers per *operating band* in multi-band operation (D.21) is larger than the declared total maximum number of supported carriers in multi-band operation (D.63), repeat the steps above for test configurations where in each test configuration the number of carriers of one of the operating band shall be reduced so that the total number of supported carriers is not be exceeded and vice versa.

***<End of change2>***

***<Start of change3>***

6.7.4.5.2.3 OTA operating band unwanted emission limits (Category B)

The power of unwanted emission shall not exceed the limits in table 6.7.4.5.2.3-1 or 6.7.4.5.2.3-2.

Table 6.7.4.5.2.3-1: OBUE limits applicable in the frequency range 24.25 – 33.4 GHz

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter -3 dB point, Δf  | Frequency offset of measurement filter centre frequency, f\_offset | Test limit | Measurement bandwidth |
| 0 MHz ≤ Δf < 0.1\*BWcontiguous | 0.5 MHz ≤ f\_offset < 0.1\* BWcontiguous +0.5 MHz | Min(-2.3 dBm, Max(Prated,t,TRP – 32.3 dB, -9.3 dBm)) | 1 MHz |
| 0.1\*BWcontiguous ≤ Δf < ΔfB | 0.1\* BWcontiguous +0.5 MHz ≤ f\_offset < ΔfB +0.5 MHz | Min(-13 dBm, Max(Prated,t,TRP – 43 dB, -20 dBm)) | 1 MHz |
| ΔfB ≤ Δf < Δfmax | ΔfB +5 MHz ≤ f\_offset < f\_ offsetmax | Min(-5 dBm, Max(Prated,t,TRP – 33 dB, -10 dBm)) | 10 MHz |
| NOTE 1: For non-contiguous spectrum operation within any *operating band* the limitwithin sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. NOTE 2: ΔfB = 2\*BWcontiguous when BWcontiguous ≤ 500 MHz, otherwise ΔfB = BWcontiguous + 500 MHz. |

Table 6.7.4.5.2.3-2: OBUE limits applicable in the frequency range 37 – 52.6 GHz

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter -3 dB point, Δf  | Frequency offset of measurement filter centre frequency, f\_offset | Test limit | Measurement bandwidth |
| 0 MHz ≤ Δf < 0.1\*BWcontiguous | 0.5 MHz ≤ f\_offset < 0.1\* BWcontiguous +0.5 MHz | Min(-2.3 dBm, Max(Prated,t,TRP – 30.3 dB, -9.3 dBm)) | 1 MHz |
| 0.1\*BWcontiguous ≤ Δf < ΔfB | 0.1\* BWcontiguous +0.5 MHz ≤ f\_offset < ΔfB +0.5 MHz | Min(-13 dBm, Max(Prated,t,TRP – 41 dB, -20 dBm)) | 1 MHz |
| ΔfB ≤ Δf < Δfmax | ΔfB +5 MHz ≤ f\_offset < f\_ offsetmax | Min(-5 dBm, Max(Prated,t,TRP – 31 dB, -10 dBm)) | 10 MHz |
| NOTE1: For non-contiguous spectrum operation within any *operating band* the limitwithin sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. NOTE 2: ΔfB = 2\*BWcontiguous when BWcontiguous ≤ 500 MHz, otherwise ΔfB = BWcontiguous + 500 MHz. |

***<End of change3>***

***<Start of change4>***

#### 6.8.5.1 Requirement for BS type 1-O

The transmitter intermodulation level shall not exceed the TRP unwanted emission limits specified for OTA transmitter spurious emission in clause 6.7.5 (except co-location with other base stations), OTA out-of-band emissions in clause 6.7.4 and OTA ACLR in clause 6.7.3 in the presence of a wanted signal and an interfering signal, defined in table 6.8.5.1-1.

The requirement is applicable outside the *Base Station RF Bandwidth edges*. The interfering signal offset is defined relative to the *Base Station RF Bandwidth* *edges* or *Radio Bandwidth* edges.

For RIBs supporting operation in *non-contiguous spectrum*, the requirement is also applicable inside a *sub-block gap* for interfering signal offsets where the interfering signal falls completely within the *sub-block gap*. The interfering signal offset is defined relative to the *sub-block* edges.

For RIBs supporting operation in multiple *operating bands*, the requirement shall apply relative to the *Base Station RF Bandwidth* *edges* of each *operating band*. In case the inter *RF Bandwidth* gap is less than 3\*BWChannel MHz (where BWChannel is the minimal *BS channel bandwidth* of the band), the requirement in the gap shall apply only for interfering signal offsets where the interfering signal falls completely within the inter *RF Bandwidth* gap.

Table 6.8.5.1-1: Interfering and wanted signals for the OTA transmitter intermodulation requirement

| **Parameter** | **Value** |
| --- | --- |
| Wanted signal | NR single or multi-carrier, or multiple intra-band contiguously or non-contiguously aggregated carriers |
| Interfering signal type | NR signal, the minimum *BS channel bandwidth* (BWChannel) with 15 kHz SCS of the band defined in clause 5.3.5 of TS 38.104 [2] |
| Interfering signal level | min(46 dBm, Prated,t,TRP) |
| Interfering signal centre frequency offset from the lower (upper) edge of the wanted signal or edge of *sub-block* inside a gap | , for n=1, 2 and 3 |
| NOTE 1: Interfering signal positions that are partially or completely outside of any downlink *operating band* of the BS are excluded from the requirement, unless the interfering signal positions fall within the frequency range of adjacent downlink *operating bands* in the same geographical area.NOTE 2: In Japan, NOTE 1 is not applied in Band n77, n78, n79.NOTE 3: The Prated,t,TRP is split between supported polarizations at the CLTA input ports. |

***<End of change4>***

***<Start of change5>***

# E.1 Transmitter

## E.1.1 Radiated transmit power, OTA output power dynamics, OTA transmitted signal quality, OTA occupied bandwidth, and OTA transmit ON/OFF power (*BS type 2-O*)



Figure E.1.1-1: Measurement set up for radiated transmit power, OTA output power dynamics, OTA transmitted signal quality, OTA occupied bandwidth, and OTA transmit ON/OFF power (*BS type 2-O*)

The OTA chamber shown in figure E.1.1-1 is intended to be generic and can be replaced with any suitable OTA chamber (Far field anechoic chamber, CATR, Near field chamber, PWS, etc.)

## E.1.2 OTA base station output power, OTA ACLR, OTA operating band unwanted emissions



Figure E.1.2-1: Measurement set up for OTA base station output power, OTA ACLR, OTA operating band unwanted emissions

The OTA chamber shown in figure E.1.2-1 is intended to be generic and can be replaced with any suitable OTA chamber (Far field anechoic chamber, CATR, Near field chamber, PWS, etc.)

## E.1.3 OTA spurious emissions



Figure E.1.3-1: Measurement set up for OTA spurious emissions

The OTA chamber shown in figure E.1.3-1 is intended to be generic and can be replaced with any suitable OTA chamber (Far field anechoic chamber, CATR, etc.).

## E.1.4 OTA co-location emissions, OTA transmit ON/OFF power (*BS type 1-O*)



Figure E.1.4-1: Measurement set up for OTA co-location emissions, OTA transmit ON/OFF power (*BS type 1-O*)

The OTA chamber shown in figure E.1.4-1 is intended to be generic and can be replaced with any suitable OTA chamber (Far field anechoic chamber, CATR, Near field chamber, etc.)

## E.1.5 OTA transmitter intermodulation



Figure E.1.5-1: Measurement set up for OTA transmitter intermodulation

The OTA chamber shown in figure E.1.5-1 is intended to be generic and can be replaced with any suitable OTA chamber (Far field anechoic chamber, CATR, etc.). When injecting the interferer signal into the CLTA ports, a splitter might be needed. For testing emission far out-of-band an additional test antenna might be needed.

# E.2 Receiver

## E.2.1 OTA sensitivity and OTA reference sensitivity level



Figure E.2.1-1: Measurement set up for OTA sensitivity and OTA reference sensitivity level

The OTA chamber shown in figure E.2.1-1 is intended to be generic and can be replaced with any suitable OTA chamber (Far field anechoic chamber, CATR, PWS, etc.).

## E.2.2 OTA dynamic range



Figure E.2.2-1: Measurement set up for OTA dynamic range

The OTA chamber shown in figure E.2.2-1 is intended to be generic and can be replaced with any suitable OTA chamber (Far field anechoic chamber, CATR, PWS, etc.).

## E.2.3 OTA adjacent channel selectivity, general OTA blocking, and OTA narrowband blocking



Figure E.2.3-1: Measurement set up for OTA ACS and OTA narrowband blocking

The OTA chamber shown in figure E.2.3-1 is intended to be generic and can be replaced with any suitable OTA chamber (Far field anechoic chamber, CATR, PWS, etc.).



Figure E.2.3-2: Measurement set up for general OTA blocking

The OTA chamber shown in figure E.2.3-2 is intended to be generic and can be replaced with any suitable OTA chamber (Far field anechoic chamber, CATR, PWS, etc.).

## E.2.4 OTA blocking

### E.2.4.1 General OTA out-of-band blocking



Figure E.2.4.1-1: Measurement set up for general OTA out-of-band blocking

The OTA chamber shown in figure E.2.4.1-1 is intended to be generic and can be replaced with any suitable OTA chamber (Far field anechoic chamber, CATR, etc.).

### E.2.4.2 OTA co-location blocking



Figure E.2.4.2-1: Measurement set up for OTA co-location blocking

The OTA chamber shown in figure E.2.4.2-1 is intended to be generic and can be replaced with any suitable OTA chamber (Far field anechoic chamber, CATR, PWS, etc.). For testing blocking far out-of-band several CLTAs might be needed.

## E.2.5 OTA receiver spurious emissions



Figure E.2.5-1: Measurement set up for OTA receiver spurious emissions

The OTA chamber shown in figure E.2.5-1 is intended to be generic and can be replaced with any suitable OTA chamber (Far field anechoic chamber, CATR, etc.).

## E.2.6 OTA receiver intermodulation



Figure E.2.6-1: Measurement set up for OTA receiver intermodulation

The OTA chamber shown in figure E.2.6-1 is intended to be generic and can be replaced with any suitable OTA chamber (Far field anechoic chamber, CATR, PWS, etc.).

## E.2.7 OTA in-channel selectivity



Figure E.2.7-1: Measurement set up for OTA in-channel selectivity

The OTA chamber shown in figure E.2.7-1 is intended to be generic and can be replaced with any suitable OTA chamber (Far field anechoic chamber, CATR, PWS, etc.).

***<End of change5>***