**3GPP TSG-RAN4 WG4 Meeting # 94-e *R4-2002807***

**Electronic meeting, 24 Feb- 06 Mar, 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.101-1** | **CR** | 0269 | **rev** | **1** | **Current version:** | **16.2.0** |  |
|  | | | | | | | | |
| *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 |  | Core Network |  |

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| ***Title:*** | CR for intra-band UL CA signal quality | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_RF\_FR1-Core | | | | |  | ***Date:*** | | | 2019-12-04 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *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 can be 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-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | This CR capture the agreement for intra-band UL CA in RAN4 #92 meeting and RAN4 92bis meeting.  Since intra-band UL CA is introduced in Rel-16, the UL RF requirement shall be added. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Adding the intra-band UL CA RF requirement as agreed in the previous RAN4 meeting. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | There is no RF requirement for intra-band UL contiguous CA. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.4A.1, 6.4A.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR … CR … | | |
| ***affected:*** | | **x** |  | Test specifications | | | | TS 38.521-1 | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR … CR … | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |

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| --- | --- |
| ***This CR’s revision history:*** |  |

***<Start of change>***

## 6.4A Transmit signal quality for CA

### 6.4A.1 Frequency error for CA

#### 6.4A.1.1 Frequency error for intra-band CA

For intra-band contiguous carrier aggregation the UE modulated carrier frequencies per band shall be accurate to within ±0.1 PPM observed over a period of one timeslot compared to the carrier frequency of primary component carrier received in the corresponding band.

For intra-band non-contiguous carrier aggregation the requirements in Section 6.5.1 applies per component carrier.

#### 6.4A.1.2 Void

#### 6.4A.1.3 Frequency error for inter-band CA

### For inter-band carrier aggregation with uplink assigned to two NR bands, the frequency error requirements defined in subclause 6.4.1 shall apply on each component carrier with all component carriers active.6.4A.2 Transmit modulation quality for CA

#### 6.4A.2.1 Transmit modulation quality for intra-band CA

For intra-band contiguous and non-coutiguous carrier aggregation, the requirements in subclauses 6.4A.2.3.1, 6.4A.2.3.2 applies.

The requirements in this clause apply with PCC and SCC in the UL configured and activated: PCC with PRB allocation and SCC without PRB allocation and without CSI reporting and SRS configured.

In case the parameter 3300 or 3301 is reported from UE via *txDirectCurrentLocation* IE (as defined in TS 38.331 [13]), carrier leakage measurement requirement in subclause 6.4A.2.3.2 shall be waived, and the RF correction with regard to the carrier leakage and IQ image shall be omitted during the calculation of transmit modulation quality.

#### 6.4A.2.3.1 Error Vector Magnitude

For the intra-band contiguous and non-contiguous carrier aggregation, the Error Vector Magnitude requirement should be defined for each component carrier. Requirements only apply with PRB allocation in one of the component carriers. Similar transmitter impairment removal procedures are applied for CA waveform before EVM calculation as is specified for non-CA waveform in sub-section 6.4.2.1.

When a single component carrier is configured Table 6.4.2.1-1 apply.

The EVM requirements are according to Table 6.4A.2.3.1-1 if CA is configured in uplink with the parameters defined in Table 6.4.2.1-2.

Table 6.4A.2.3.1-1: Minimum requirements for Error Vector Magnitude

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Average EVM Level per CC |
| Pi/2-BPSK | % | 30 |
| QPSK | % | 17.5 |
| 16 QAM | % | 12.5 |
| 64 QAM | % | 8 |
| 256 QAM | % | 3.5 |

#### 6.4A.2.3.2 In-band emissions

For intra-band contiguous carrier aggregation, the requirements in Table 6.4A.2.3.2-1 and 6.4A.2.3.2-2 apply within the aggregated transmission bandwidth configuration with both component carrier (s) active and one single contiguous PRB allocation of bandwidth  at the edge of the aggregated transmission bandwidth configuration.

The inband emission is defined as the interference falling into the non allocated resource blocks for all component carriers. The measurement method for the inband emissions in the component carrier with PRB allocation is specified in annex F.3. For a non allocated component carrier a spectral measurement is specified.

For intra-band non-contiguous carrier aggregation the requirements for in-band emissions should be defined for each component carrier. Requirements only apply with PRB allocation in one of the component carriers according to Table 6.4.2.3-1.

Table 6.4A.2.3.2-1: Minimum requirements for in-band emissions (allocated component carrier)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Limit | | Applicable Frequencies |
| General | dB |  | | Any non-allocated (NOTE 2) |
| IQ Image | dB | -28 | Output power > 10 dBm | Image frequencies  (NOTE 3) |
| -25 | 0≤ Output power ≤ 10 dBm |
| Carrier leakage | dBc | -28 | Output power > 10 dBm | Carrier leakage frequency (NOTE 4,5) |
| -25 | 0 dBm ≤ Output power ≤ 10 dBm |
| -20 | -30 dBm ≤ Output power ≤ 0 dBm |
| -10 | -40 dBm ≤ Output power < -30 dBm |
| NOTE 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of - 30 dB dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. is defined in NOTE 10. The limit is evaluated in each non-allocated RB.  NOTE 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs  NOTE 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the carrier leakage frequency, but excluding any allocated RBs.  NOTE 4: Exceptions to the general limit are allowed for up to two contiguous non-allocated RBs. The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in the non-allocated RB to the measured total power in all allocated RBs.  NOTE 5: The applicable frequencies for this limit depend on the parameter *txDirectCurrentLocation* in *UplinkTxDirectCurrent* IE, and are those that are enclosed either in the RB containing the carrier leakage frequency, or in the two RBs immediately adjacent to the carrier leakage frequency but excluding any allocated RB.  NOTE 6:  is the Transmission Bandwidth (see section 5.3) not exceeding  .  NOTE 7:  is the Transmission Bandwidth Configuration (see section 5.3) of the component carrier with RBs allocated.  NOTE 8:  is the limit specified in Table 6.4.2.1-1 for the modulation format used in the allocated RBs.  NOTE 9:  is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g.  or  for the first adjacent RB outside of the allocated bandwidth).  NOTE 10:  is an average of the transmitted power over 10 sub-frames normalized by the number of allocated RBs, measured in dBm. | | | | |

Table 6.4A.2.3.2-2: Minimum requirements for in-band emissions (not allocated component carrier)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Para-meter | Unit | Meas BW  NOTE 1 | Limit | | | remark | Applicable Frequencies |
| General | dB | BW of 1 RB |  | | | The reference value is the average power per allocated RB in the allocated component carrier | Any RB in the non allocated component carrier.  The frequency raster of the RBs is derived when this component carrier is allocated with RBs |
| IQ Image | dB | BW of 1 RB | NOTE 2 | | | The reference value is the average power per allocated RB in the allocated component carrier | The frequencies of the contiguous non-allocated RBs are unknown.  The frequency raster of the RBs is derived when this component carrier is allocated with RBs |
| -28 | Output power > 10 dBm | |
| -25 | 0≤ Output power ≤ 10 dBm | |
| Carrier leakage | dBc | BW of 1 RB | NOTE 3 | | | The reference value is the total power of the allocated RBs in the allocated component carrier | The frequencies of the up to 2 non-allocated RBs are unknown.  The frequency raster of the RBs is derived when this component carrier is allocated with RBs |
| -28 | | Output power > 10 dBm |
| -25 | | 0 dBm ≤ Output power ≤ 10 dBm |
| -20 | | -30 dBm ≤ Output power ≤ 0 dBm |
| -10 | | -40 dBm ≤ Output power < -30 dBm |
| NOTE1: Resolution BWs smaller than the measurement BW may be integrated to achieve the measurement bandwidth.  NOTE 2: Exceptions to the general limit is are allowed for up to +1 RBs within a contiguous width of +1 non-allocated RBs.  NOTE 3: Two Exceptions to the general limit are allowed for up to two contiguous non-allocated RBs  NOTE 4: NOTES 1, 5, 6, 7, 8, 9 from Table 6.4A.2.3.1-1 apply for Table 6.4A.2.3.2-2 as well.  NOTE 5:  for measured non-allocated RB in the non allocated component carrier may take non-integer values when the carrier spacing between the CCs is not a multiple of RB. | | | | | | | |

#### 6.4A.2.2 Void

#### 6.4A.2.3 Transmit modulation quality for inter-band CA

For inter-band carrier aggregation with uplink assigned to two NR bands, the transmit modulation quality requirements shall apply on each component carrier as defined in clause 6.4.2 with all component carriers active.

***<End of change>***