**3GPP T****SG-RAN WG4 Meeting#101 R4-2120072**

**E-meeting, 1st – 12th Nov, 2021**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **38.101-2** | **CR** |  | **rev** | **-** | **Current version:** | **16.9.0** |  |
|  |
| *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 | **x** | Radio Access Network |  | Core Network |  |

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| ***Title:***  | Big CR for TS 38.101-2 Maintenance (Rel-16) |
|  |  |
| ***Source to WG:*** | MCC, OPPO |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_newRAT-CoreNR\_RF\_FR2\_req\_enh-Core |  | ***Date:*** | 2021-11-16 |
|  |  |  |  |  |
| ***Category:*** | F |  | ***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 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 mutiple endorsed draft CRs. The reason for changes in each endorsed draft CR are copied below.R4-2117546 draft CR removal of FR2 MPR brackets REL16 CATF<Reason for change>PC1 and PC3 CA MPR has still brackets for Cumulative aggregated channel bandwidth of ≥ 800 MHz and ≤ 1400 MHzR4-2117423 Correction of UE enhanced beam correspondence requirements<Reason for change>When Rel-16 enhanced beam correspondence requirements, either based on SSB or CSI-RS, were introduced in clause 6.6.4.1, there was a mix-up of the requirements themselves and the side conditions that are used to verify the requirements, which makes the specs unclear and hard to understand. Besides, clause 6.6.4.4 would benefit from wording improvements for clarity and better readability.R4-2119538 Alignment of description of mpr-PowerBoost-Fr2-r16<Reason for change>The description of mpr-PowerBoost-Fr2-r16 is not aligned between 6.2.4 configured output power and 6.4.2.3 In-band emissions.R4-2119083 <Reason for change>The fallback group of CA\_n257B and CA\_n257C should be merged into one cell with fallback group 1. In addition, the BWchannel of {50, 100} MHz for CA\_n261G and CA\_n261H should be filled in the first CC column of the configuration table as other CA configurations do.R4-2118977 Draft CR to correct the requirement of aggregate power tolerance<Reason for change>The core requirement of aggregate power tolerance is defined for two ranges, “Pint ≥ P ≥ Pmin” and “Pmax ≥ P ≥ Pint”, where P is the target power level : the power ranges are overlapping at Pint.R4-2118056 Update of FR2 UL MIMO transmit signal quality requirements<Reason for change>FR2 UL MIMO requirements have been defined on a per layer basis. For IBE this should not be the case, since here we compare the emissions of occupied RBs to unoccupied RBs, which must be judged for the whole transmission. Therefore it must be measured in the same way as for single layer.Additionally there is some missing text, that the transmit signal quality requirements are defined in the Tx beam peak direction.R4-2118172 Draft CR to TS 38.101-2: Correction on the CA nominal channel spacing<Reason for change>This draft CR is the mirror CR to R4-2118171. |
|  |  |
| ***Summary of change:*** | The summary of changes in each endorsed draft CR are copied below.R4-2117546 draft CR removal of FR2 MPR brackets REL16 CATF <Summary of change>Brackets are removedR4-2117423 Correction of UE enhanced beam correspondence requirements<Summary of change>In clause 6.6.4.1, “side conditions for” is added wherever applicable. In clause 6.6.4.4, the applicability rules for verifying a UE supporting both SSB based and CSI-RS based enhanced beam correspondence are reworded.R4-2119538 Alignment of description of mpr-PowerBoost-Fr2-r16<Summary of change>Updating 6.4.2.3 to keep the alignment of description.R4-2119083 <Summary of change>1. Merge CA\_n257B and CA\_n257C into fallback group 1.
2. Move the BWchannel of {50, 100} MHz for CA\_n261G and CA\_n261H to the first CC column in the CA configuration table.

R4-2118977 Draft CR to correct the requirement of aggregate power tolerance<Summary of change>Correct the title of Table 6.3.4.4-2 from “Pmax ≥ P ≥ Pint” to “Pmax ≥ P > Pint”.R4-2118056 Update of FR2 UL MIMO transmit signal quality requirements<Summary of change>Change IBE requirements to the same metrics as other emission measurements.Added statement that defines the requirements in Tx beam peak direction.R4-2118172 Draft CR to TS 38.101-2: Correction on the CA nominal channel spacing<Summary of change>Updating the descriptions by adding ‘least common multiple of channel raster and ’ in the sentence. |
|  |  |
| ***Consequences if not approved:*** | The consequences if not approved for each endorsed draft CR are coppied below.R4-2117546 draft CR removal of FR2 MPR brackets REL16 CATF<Consequences if not approved>Requirement is untestable.R4-2117423 Correction of UE enhanced beam correspondence requirements<Consequences if not approved>There is ambiguity in the specification.R4-2119538 Alignment of description of mpr-PowerBoost-Fr2-r16<Consequences if not approved>The misaligned description might cause misunderstanding.R4-2119083 <Consequences if not approved>The configuration table for CA\_n257 and CA\_n261 will be inaccurate.R4-2118977 Draft CR to correct the requirement of aggregate power tolerance<Consequences if not approved>Indetermination of which aggregate power tolerance should apply for P = Pint between two values (±3.5dB & ±5.5dB) instead of a single value (±5.5dB).R4-2118056 Update of FR2 UL MIMO transmit signal quality requirements<Consequences if not approved>IBE will be measured incorrectly.R4-2118172 Draft CR to TS 38.101-2: Correction on the CA nominal channel spacing<Consequences if not approved>non-orthogonal may happen for the two adjacent carriers when the channel spacing for intra-band contiguous CA is adjusted, also inconsistency among the specs |
|  |  |
| ***Clauses affected:*** | 5.4A.1, 5.5A.1, 6.2A.2.2.1, 6.2A.2.4.1, 6.3.4.4, 6.4.2.3, 6.4D.2, 6.6.4.1, 6.6.4.4 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** | **x** |  |  Test specifications | TS 38.521-2 |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

## << Start of change1 >>

## 5.4A Channel arrangement for CA

### 5.4A.1 Channel spacing for CA

For intra-band contiguous carrier aggregation with two or more component carriers, the nominal channel spacing between two adjacent NR component carriers is defined as the following unless stated otherwise:

For NR operating bands with 60kHz channel raster:



with

*n = µ0 – 2*

where BWChannel(1) and BWChannel(2) are the channel bandwidths of the two respective NR component carriers according to Table 5.3.2-1 with values in MHz, o is the largest  value among the subcarrier spacing configurations supported in the operating band for both of the channel bandwidths according to Table 5.3.5-1, and *GBChannel(i)* is the minimum guard band for channel bandwidth *i* according to Table 5.3.3-1 for the said  value, with  as defined in TS 38.211 [9].

The channel spacing for intra-band contiguous carrier aggregation can be adjusted to any multiple of least common multiple of channel raster and sub-carrier spacing less than the nominal channel spacing to optimize performance in a particular deployment scenario.

For intra-band non-contiguous carrier aggregation, the channel spacing between two NR component carriers in different sub-blocks shall be larger than the nominal channel spacing defined in this clause.

## << End of change1>>

## << Start of change2 >>

### 5.5A.1 Configurations for intra-band contiguous CA

Table 5.5A.1-1: NR CA configurations, bandwidth combination sets, and fallback group defined for intra-band contiguous CA

| NR CA configuration / Bandwidth combination set / Fallback group |
| --- |
| NR CA configuration | Uplink CA configurations | BWChannel (MHz) | BWChannel (MHz) | BWChannel (MHz) | BWChannel (MHz) | BWChannel (MHz) | BWChannel (MHz) | BWChannel (MHz) | BWChannel (MHz) | Maximum aggregatedBW (MHz) | BCS | Fallback group |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| CA\_n257B | CA\_n257B | 50, 100, 200, 400 | 400 |  |  |  |  |  |  | 800 | 0 | 1 |
| CA\_n257C | CA\_n257B | 50, 100, 200, 400 | 400 | 400 |  |  |  |  |  | 1200 | 0 |  |
| CA\_n257D | CA\_n257D | 50, 100, 200 | 200 |  |  |  |  |  |  | 400 | 0 | 2 |
| CA\_n257E | CA\_n257DCA\_n257E | 50, 100, 200 | 200 | 200 |  |  |  |  |  | 600 | 0 |  |
| CA\_n257F | CA\_n257DCA\_n257ECA\_n257F | 50, 100, 200 | 200 | 200 | 200 |  |  |  |  | 800 | 0 |  |
| CA\_n257G | CA\_n257G | 50, 100 | 100 |  |  |  |  |  |  | 200 | 0 | 3 |
| CA\_n257H | CA\_n257GCA\_n257H | 50, 100 | 100 | 100 |  |  |  |  |  | 300 | 0 |  |
| CA\_n257I | CA\_n257GCA\_n257HCA\_n257I | 50, 100 | 100 | 100 | 100 |  |  |  |  | 400 | 0 |  |
| CA\_n257J | CA\_n257GCA\_n257HCA\_n257ICA\_n257J | 50, 100 | 100 | 100 | 100 | 100 |  |  |  | 500 | 0 |  |
| CA\_n257K | CA\_n257GCA\_n257HCA\_n257ICA\_n257JCA\_n257K | 50, 100 | 100 | 100 | 100 | 100 | 100 |  |  | 600 | 0 |  |
| CA\_n257L | CA\_n257GCA\_n257HCA\_n257ICA\_n257JCA\_n257KCA\_n257L | 50, 100 | 100 | 100 | 100 | 100 | 100 | 100 |  | 700 | 0 |  |
| CA\_n257M | CA\_n257GCA\_n257HCA\_n257ICA\_n257JCA\_n257KCA\_n257LCA\_n257M | 50, 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 800 | 0 |  |
| CA\_n258B | CA\_n258B | 50, 100, 200, 400 | 400 |  |  |  |  |  |  | 800 | 0 | 1 |
| CA\_n258C | CA\_n258BCA\_n258C | 50, 100, 200, 400 | 400 | 400 |  |  |  |  |  | 1200 | 0 |  |
| CA\_n258D | CA\_n258D | 50, 100, 200 | 200 |  |  |  |  |  |  | 400 | 0 | 2 |
| CA\_n258E | CA\_n258DCA\_n258E | 50, 100, 200 | 200 | 200 |  |  |  |  |  | 600 | 0 |  |
| CA\_n258F | CA\_n258DCA\_n258ECA\_n258F | 50, 100, 200 | 200 | 200 | 200 |  |  |  |  | 800 | 0 |  |
| CA\_n258G | CA\_n258G | 50, 100 | 100 |  |  |  |  |  |  | 200 | 0 | 3 |
| CA\_n258H | CA\_n258GCA\_n258H | 50, 100 | 100 | 100 |  |  |  |  |  | 300 | 0 |  |
| CA\_n258I | CA\_n258GCA\_n258HCA\_n258I | 50, 100 | 100 | 100 | 100 |  |  |  |  | 400 | 0 |  |
| CA\_n258J | CA\_n258GCA\_n258HCA\_n258ICA\_n258J | 50, 100 | 100 | 100 | 100 | 100 |  |  |  | 500 | 0 |  |
| CA\_n258K | CA\_n258GCA\_n258HCA\_n258ICA\_n258JCA\_n258K | 50, 100 | 100 | 100 | 100 | 100 | 100 |  |  | 600 | 0 |  |
| CA\_n258L | CA\_n258GCA\_n258HCA\_n258ICA\_n258JCA\_n258KCA\_n258L | 50, 100 | 100 | 100 | 100 | 100 | 100 | 100 |  | 700 | 0 |  |
| CA\_n258M | CA\_n258GCA\_n258HCA\_n258ICA\_n258JCA\_n258KCA\_n258LCA\_n258M | 50, 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 800 | 0 |  |
| CA\_n259B | CA\_n259B | 50, 100, 200, 400 | 400 |  |  |  |  |  |  | 800 | 0 | 1 |
| CA\_n259C | CA\_n259B | 50, 100, 200, 400 | 400 | 400 |  |  |  |  |  | 1200 | 0 |  |
| CA\_n259G | CA\_n259G | 50, 100 | 100 |  |  |  |  |  |  | 200 | 0 | 3 |
| CA\_n259H | CA\_n259GCA\_n259H | 50, 100 | 100 | 100 |  |  |  |  |  | 300 | 0 |  |
| CA\_n259I | CA\_n259GCA\_n259HCA\_n259I | 50, 100 | 100 | 100 | 100 |  |  |  |  | 400 | 0 |  |
| CA\_n259J | CA\_n259GCA\_n259HCA\_n259ICA\_n259J | 50, 100 | 100 | 100 | 100 | 100 |  |  |  | 500 | 0 |  |
| CA\_n259K | CA\_n259GCA\_n259HCA\_n259ICA\_n259JCA\_n259K | 50, 100 | 100 | 100 | 100 | 100 | 100 |  |  | 600 | 0 |  |
| CA\_n259L | CA\_n259GCA\_n259HCA\_n259ICA\_n259JCA\_n259KCA\_n259L | 50, 100 | 100 | 100 | 100 | 100 | 100 | 100 |  | 700 | 0 |  |
| CA\_n259M | CA\_n259GCA\_n259HCA\_n259ICA\_n259JCA\_n259KCA\_n259LCA\_n259M | 50, 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 800 | 0 |  |
| CA\_n260B | CA\_n260B | 50, 100, 200, 400 | 400 |  |  |  |  |  |  | 800 | 0 | 1 |
| CA\_n260C | CA\_n260B | 50, 100, 200, 400 | 400 | 400 |  |  |  |  |  | 1200 | 0 |  |
| CA\_n260D | CA\_n260D | 50, 100, 200 | 200 |  |  |  |  |  |  | 400 | 0 | 2 |
| CA\_n260E | CA\_n260DCA\_n260E | 50, 100, 200 | 200 | 200 |  |  |  |  |  | 600 | 0 |  |
| CA\_n260F | CA\_n260DCA\_n260ECA\_n260F | 50, 100, 200 | 200 | 200 | 200 |  |  |  |  | 800 | 0 |  |
| CA\_n260G | CA\_n260G | 50, 100 | 100 |  |  |  |  |  |  | 200 | 0 | 3 |
| CA\_n260H | CA\_n260GCA\_n260H | 50, 100 | 100 | 100 |  |  |  |  |  | 300 | 0 |  |
| CA\_n260I | CA\_n260GCA\_n260HCA\_n260I | 50, 100 | 100 | 100 | 100 |  |  |  |  | 400 | 0 |  |
| CA\_n260J | CA\_n260GCA\_n260HCA\_n260ICA\_n260J | 50, 100 | 100 | 100 | 100 | 100 |  |  |  | 500 | 0 |  |
| CA\_n260K | CA\_n260GCA\_n260HCA\_n260ICA\_n260JCA\_n260K | 50, 100 | 100 | 100 | 100 | 100 | 100 |  |  | 600 | 0 |  |
| CA\_n260L | CA\_n260GCA\_n260HCA\_n260ICA\_n260JCA\_n260KCA\_n260L | 50, 100 | 100 | 100 | 100 | 100 | 100 | 100 |  | 700 | 0 |  |
| CA\_n260M | CA\_n260GCA\_n260HCA\_n260ICA\_n260JCA\_n260KCA\_n260LCA\_n260M | 50, 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 800 | 0 |  |
| CA\_n260O | CA\_n260O | 50, 100 | 50, 100 |  |  |  |  |  |  | 200 | 0 | 4 |
| CA\_n260P | CA\_n260OCA\_n260P | 50, 100 | 50, 100 | 50, 100 |  |  |  |  |  | 300 | 0 |  |
| CA\_n260Q | CA\_n260OCA\_n260PCA\_n260Q | 50, 100 | 50, 100 | 50, 100 | 50, 100 |  |  |  |  | 400 | 0 |  |
| CA\_n261B | CA\_n261B | 50, 100, 200, 400 | 400 |  |  |  |  |  |  | 800 | 0 | 1 |
| CA\_n261C | CA\_n261B | 50 | 400 | 400 |  |  |  |  |  | 850 | 0 |  |
| CA\_n261D | CA\_n261D | 50, 100, 200 | 200 |  |  |  |  |  |  | 400 | 0 | 2 |
| CA\_n261E | CA\_n261DCA\_n261E | 50, 100, 200 | 200 | 200 |  |  |  |  |  | 600 | 0 |  |
| CA\_n261F | CA\_n261DCA\_n261ECA\_n261F | 50, 100, 200 | 200 | 200 | 200 |  |  |  |  | 800 | 0 |  |
| CA\_n261G | CA\_n261G | 50, 100 | 100 |  |  |  |  |  |  | 200 | 0 | 3 |
| CA\_n261H | CA\_n261GCA\_n261H | 50, 100 | 100 | 100 |  |  |  |  |  | 300 | 0 |  |
| CA\_n261I | CA\_n261GCA\_n261HCA\_n261I | 50, 100 | 100 | 100 | 100 |  |  |  |  | 400 | 0 |  |
| CA\_n261J | CA\_n261GCA\_n261HCA\_n261ICA\_n261J | 50, 100 | 100 | 100 | 100 | 100 |  |  |  | 500 | 0 |  |
| CA\_n261K | CA\_n261GCA\_n261HCA\_n261ICA\_n261JCA\_n261K | 50, 100 | 100 | 100 | 100 | 100 | 100 |  |  | 600 | 0 |  |
| CA\_n261L | CA\_n261GCA\_n261HCA\_n261ICA\_n261JCA\_n261KCA\_n261L | 50, 100 | 100 | 100 | 100 | 100 | 100 | 100 |  | 700 | 0 |  |
| CA\_n261M | CA\_n261GCA\_n261HCA\_n261ICA\_n261JCA\_n261KCA\_n261LCA\_n261M | 50, 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 800 | 0 |  |
| CA\_n261O | CA\_n261O | 50, 100 | 50, 100 |  |  |  |  |  |  | 200 | 0 | 4 |
| CA\_n261P | CA\_n261OCA\_n261P | 50, 100 | 50, 100 | 50, 100 |  |  |  |  |  | 300 | 0 |  |
| CA\_n261Q | CA\_n261OCA\_n261PCA\_n261Q | 50, 100 | 50, 100 | 50, 100 | 50, 100 |  |  |  |  | 400 | 0 |  |
| NOTE 1: VoidNOTE 2: For the NR CA configuration with more than two component carries, the bandwidths in a BCS which may introduce combinations more than requested unintentionally should be listed in a row separately.  |

<< End of change2 >>

## << Start of change3 >>

#### 6.2A.2.2 Maximum output power reduction for power class 1

##### 6.2A.2.2.1 Maximum output power reduction for power class 1 intra-band contiguous UL CA

For power class 1, MPR for intra-band contiguous UL CA with contiguous allocations within the cumulative aggregated bandwidth is defined as:

MPRC\_CA = max(MPRWT\_C\_CA, MPRnarrow)

Where,

 MPRnarrow = 14.4 dB, when BWalloc,RB is less than or equal to 1.44 MHz, MPRnarrow = 10 dB, when 1.44 MHz < BWalloc,RB ≤ 10.8 MHz, where BWalloc,RB is the bandwidth of the RB allocation size.

 MPRWT\_C\_CA is the maximum power reduction due to modulation orders, transmit bandwidth configurations, and waveform types. MPRWT\_C\_CA is defined in Table 6.2A.2.2-1.

Table 6.2A.2.2-1: Maximum power reduction (MPRWT\_C\_CA) for UE power class 1

|  |  |
| --- | --- |
| Waveform Type | Cumulative aggregated channel bandwidth |
|  | < 400 MHz | ≥ 400 MHz and < 800 MHz | ≥ 800 MHz and ≤ 1400 MHz | > 1400 MHz and ≤ 2400 MHz |
| DFT-s-OFDM | Pi/2 BPSK | ≤ 5.51 | 7.71 | 8.2 | ≤ 8.7 |
|  | QPSK | ≤ 6.51 | 8.71 | 9.7 | ≤ 9.7 |
|  | 16 QAM | ≤ 6.5 | 8.7 | 9.2 | ≤ 9.7 |
|  | 64 QAM | ≤ 9.0 | 10.7 | 11.2 | ≤ 11.7 |
| CP-OFDM | QPSK | ≤ 6.5 | 8.7 | 8.7 | ≤ 9.7 |
|  | 16 QAM | ≤ 6.5 | 8.7 | 8.7 | ≤ 9.7 |
|  | 64 QAM | ≤ 9.0 | 10.7 | 11.2 | ≤ 11.7 |
| NOTE 1: (Void) |

In case of a contiguous RB, DFT-s-BPSK or DFT-s-QPSK UL allocation in a single CC of a CA configuration with contiguous CCs, and whose cumulative aggregated BW ≤ 400 MHz, MPRWT\_C\_CA shall be derived instead as MAX(MPR1, MPR2), where:

 MPR1 shall be determined from Table 6.2.2.1-1 if CABW ≤ 200 MHz, from Table 6.2.2.1-2 if CABW > 200 MHz.

 MPR2 shall be determined from Table 6.2.2.1-1 if UL BWchannel\_CA ≤ 200 MHz, from Table 6.2.2.1-2 if UL BWchannel\_CA > 200 MHz.

and assume all UL CCs use the same SCS for the purpose of determination of inner and outer RB allocations in Table 6.2.2.1-1 and Table 6.2.2.1-2:

 NRB shall be chosen as the sum of NRB of all constituent UL CCs in the CA configuration.

 LCRB shall be chosen as BWalloc,RB

 RBstart shall be derived as: RBstart\_allocatedCC+NRB\_unallocatedCC\_low

 RBstart\_allocatedCC is the index of the first allocated RB in the CC with allocation

 NRB\_unallocatedCC\_low is the sum of NRB in all UL CCs lower in frequency compared to the CC with allocation

When different waveform types exist across CCs, the requirement is set by the waveform type used in the configuration with the largest MPRC\_CA.

For intra-band contiguous UL CA with non-contiguous RB allocations, the following rule for MPR applies:

MPR = max(MPRC\_CA, -10\*A + 14.4)

Where:

 A = NRB\_alloc / NRB\_agg\_C.

 NRB\_alloc is the total number of allocated UL RBs

 NRB\_agg\_C is the number of the aggregated RBs within the fully allocated cumulative aggregated channel bandwidth assuming lowest SCS among all configured CCs

##### 6.2A.2.2.2 Maximum output power reduction for power class 1 intra-band non-contiguous UL CA

For intra-band non-contiguous UL CA, the following rule for MPR applies:

MPR = max(MPRNC\_CA, -10\*A + 14.4)

Where:

MPRNC\_CA is derived from table 6.2A.2.2.2-1

Table 6.2A.2.2.2-1: MPRNC\_CA for UE power class 1

|  |  |
| --- | --- |
| Waveform Type | Cumulative aggregated channel bandwidth (CABW) |
|  | < 400 MHz | ≥ 400 MHz and < 800 MHz | ≥ 800 MHz and ≤ 1400 MHz | > 1400 MHz and ≤ 2400 MHz |
| DFT-s-OFDM | Pi/2 BPSK | ≤ 6 | ≤ 7.7 | ≤ 8.2 | ≤ 8.7 |
|  | QPSK | ≤ 7 | ≤ 8.7 | ≤ 9.2 | ≤ 9.7 |
|  | 16 QAM | ≤ 7 | ≤ 8.7 | ≤ 9.2 | ≤ 9.7 |
|  | 64 QAM | ≤ 9.0 | ≤ 10.7 | ≤ 11.2 | ≤ 11.7 |
| CP-OFDM | QPSK | ≤ 7 | ≤ 8.7 | ≤ 9.2 | ≤ 9.7 |
|  | 16 QAM | ≤ 7 | ≤ 8.7 | ≤ 9.2 | ≤ 9.7 |
|  | 64 QAM | ≤ 9.0 | ≤ 10.7 | ≤ 11.2 | ≤ 11.7 |

#### 6.2A.2.3 Maximum output power reduction for power class 2

For power class 2, MPR specified in sub-clause 6.2A.2.4.1 applies for intra-band contiguous UL CA and sub-clause 6.2A.2.4.2 applies for intra-band non-contiguous UL CA.

Table 6.2A.2.3-1: (Void)

#### 6.2A.2.4 Maximum output power reduction for power class 3

##### 6.2A.2.4.1 Maximum output power reduction for power class 3 intra-band contiguous CA

For power class 3, MPR for intra-band contiguous UL CA with contiguous allocations within the cumulative aggregated bandwidth is denoted as MPRC\_CA and is defined in Table 6.2A.2.4-1.

Table 6.2A.2.4-1: Maximum power reduction (MPRC\_CA) for UE power class 3

|  |  |
| --- | --- |
|  | Cumulative aggregated channel bandwidth (CABW) |
|  | ≤ 400 MHz | > 400 MHz and < 800 MHz | ≥ 800 MHz and ≤ 1400 MHz | > 1400 MHz and ≤ 2400 MHz |
| DFT-s-OFDM | Pi/2 BPSK | ≤ 5.01 | ≤ 7.71 | ≤ 8.2 | ≤ 8.7 |
|  | QPSK | ≤ 5.01 | ≤ 7.71 | ≤ 8.2 | ≤ 9.7 |
|  | 16 QAM | ≤ 6.5 | ≤ 8.7 | ≤ 9.3 | ≤ 9.7 |
|  | 64 QAM | ≤ 9.0 | ≤ 10.7 | ≤ 11.2 | ≤ 11.7 |
| CP-OFDM | QPSK | ≤ 5.0 | ≤ 7.5 | ≤ 8.0 | ≤ 9.7 |
|  | 16 QAM | ≤ 6.5 | ≤ 8.7 | ≤ 9.2 | ≤ 9.7 |
|  | 64 QAM | ≤ 9.0 | ≤ 10.7 | ≤ 11.2 | ≤ 11.7 |
| NOTE 1: (Void). |

In case of a contiguous RB, DFT-s-BPSK or DFT-s-QPSK UL allocation in a single CC of a CA configuration with contiguous CCs, and whose cumulative aggregated BW ≤ 400 MHz, MPRC\_CA shall be derived instead as MAX(MPR1, MPR2), where:

 MPR1 shall be determined from Table 6.2.2.3-1 if CABW ≤ 200 MHz, from Table 6.2.2.3-2 if CABW > 200 MHz.

 MPR2 shall be determined from Table 6.2.2.3-1 if UL BWchannel\_CA ≤ 200 MHz, from Table 6.2.2.3-2 if UL BWchannel\_CA > 200 MHz.

and assume all UL CCs use the same SCS for the purpose of determination of inner and outer RB allocations in Table 6.2.2.3-1 and Table 6.2.2.3-2:

 NRB shall be chosen as the sum of NRB of all constituent UL CCs in the CA configuration.

 LCRB shall be chosen as BWalloc,RB

 RBstart shall be derived as: RBstart\_allocatedCC+NRB\_unallocatedCC\_low

 RBstart\_allocatedCC is the index of the first allocated RB in the CC with allocation

 NRB\_unallocatedCC\_low is the sum of NRB in all UL CCs lower in frequency compared to the CC with allocation

When different waveform types exist across CCs, the requirement is set by the waveform type used in the configuration with the highest contiguous MPR.

For intra-band contiguous UL CA with non-contiguous RB allocations, the following rule for MPR applies:

MPR = max(MPRC\_CA, -10\*A +7.0)

Where:

 A = NRB\_alloc / NRB\_agg\_C.

 NRB\_alloc is the total number of allocated UL RBs

 NRB\_agg\_C is the number of the aggregated RBs within the fully allocated cumulative aggregated channel bandwidth assuming lowest SCS among all configured CCs

## << End of change3 >>

<<Start of change4>>

#### 6.3.4.4 Aggregate power tolerance

The aggregate power control tolerance is the ability of the UE transmitter to maintain its power in a sub-frame (1 ms) during non-contiguous transmissions within 21ms in response to 0 dB TPC commands with respect to the first UE transmission and all other power control parameters as specified in 38.213 kept constant.

The minimum requirements specified in Table 6.3.4.4-1 apply when the power of the target and reference sub-frames are within the power range bounded by the minimum output power as defined in clause 6.3.1 and Pint as defined in clause 6.3.4.2. The minimum requirements specified in Table 6.3.4.4-2 apply when the power of the target and reference sub-frames are within the power range bounded by Pint as defined in clause 6.3.4.2 and the maximum output power as specified in clause 6.2.1.

Table 6.3.4.4-1: Aggregate power tolerance, Pint ≥ P ≥ Pmin

|  |  |  |
| --- | --- | --- |
| TPC command | UL channel | Aggregate power tolerance within 21 ms |
| 0 dB | PUCCH | ± 5.5 dB |
| 0 dB | PUSCH | ± 5.5 dB |

Table 6.3.4.4-2: Aggregate power tolerance, Pmax ≥ P > Pint

|  |  |  |
| --- | --- | --- |
| TPC command | UL channel | Aggregate power tolerance within 21 ms |
| 0 dB | PUCCH | ± 3.5 dB |
| 0 dB | PUSCH | ± 3.5 dB |

<<End of change4>>

## << Start of change5 >>

#### 6.4.2.3 In-band emissions

##### 6.4.2.3.1 General

The in-band emission is defined as the average across 12 sub-carriers and as a function of the RB offset from the edge of the allocated UL transmission bandwidth. The in-band emission is measured as the ratio of the UE output power in a non–allocated RB to the UE output power in an allocated RB. The IBE requirement does not apply if UE declares support for *mpr-PowerBoost-FR2-r16,* UL transmission is QPSK,MPRf,c = 0 and when NS\_200 applies, and the network configures the UE to operate with *mpr-PowerBoost-FR2-r16*

The basic in-band emissions measurement interval is identical to that of the EVM test.

The requirement is verified with the test metric of In-band emission (Link=TX beam peak direction, Meas=Link angle).

## << End of change5 >>

## << Start of change6 >>

### 6.4D.2 Transmit modulation quality for UL MIMO

For UE supporting UL MIMO, the transmit modulation quality requirements are specified per layer in terms of:

Error Vector Magnitude (EVM) for the allocated resource blocks (RBs)

EVM equalizer spectrum flatness derived from the equalizer coefficients generated by the EVM measurement process

Carrier leakage (caused by IQ offset)

For UE supporting UL MIMO, the transmit modulation quality requirements are specified as the total component of EIRP in terms of:

In-band emissions for the non-allocated RB

The requirements are defined as directional requirements. The requirements are verified in beam locked mode in the TX beam peak direction (Link=TX beam peak direction, Meas=Link angle).

In case the parameter 3300 or 3301 is reported from UE via the parameter *txDirectCurrentLocation* in *UplinkTxDirectCurrentList* IE (as defined in TS 38.331 [13]), carrier leakage measurement requirement in clause 6.4D.2.2 and 6.4D.2.3 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.

## << End of change6 >>

## << Start of change7 >>

#### 6.6.4.1 General

The beam correspondence requirement for power class 3 UEs consists of three components: UE minimum peak EIRP (as defined in Clause 6.2.1.3), UE spherical coverage (as defined in Clause 6.2.1.3), and beam correspondence tolerance (as defined in Clause 6.6.4.2). The beam correspondence requirement is fulfilled if the UE satisfies one of the following conditions, depending on the UE's beam correspondence capability IE *beamCorrespondenceWithoutUL-BeamSweeping*, as defined in TS 38.306 [14]:

- If *beamCorrespondenceWithoutUL-BeamSweeping* is supported, the UE shall meet the minimum peak EIRP requirement according to Table 6.2.1.3-1 and spherical coverage requirement according to Table 6.2.1.3-3 with its autonomously chosen UL beams and without uplink beam sweeping. Such a UE is considered to have met the beam correspondence tolerance requirement.

- If *beamCorrespondenceWithoutUL-BeamSweeping* and *beamCorrespondenceSSB-based-r16* are supported, the UE shall meet the minimum peak EIRP requirement according to Table 6.2.1.3-1 and spherical coverage requirement according to Table 6.2.1.3-3 using the side conditions for SSB based enhanced beam correspondence requirements as defined in Clause 6.6.4.3.2.

- If *beamCorrespondenceWithoutUL-BeamSweeping* and *beamCorrespondenceCSI-RS-based-r16* are supported, the UE shall meet the minimum peak EIRP requirement according to Table 6.2.1.3-1 and spherical coverage requirement according to Table 6.2.1.3-3 using the side conditions for CSI-RS based enhanced beam correspondence requirements as defined in Clause 6.6.4.3.3.

- If *beamCorrespondenceWithoutUL-BeamSweeping* is not present, the UE shall meet the minimum peak EIRP requirement according to Table 6.2.1.3-1 and spherical coverage requirement according to Table 6.2.1.3-3 with uplink beam sweeping. Such a UE shall meet the beam correspondence tolerance requirement defined in Clause 6.6.4.2 and shall support uplink beam management, as defined in TS 38.306 [14].

- If *beamCorrespondenceWithoutUL-BeamSweeping* is not present and *beamCorrespondenceSSB-based-r16* is supported, the UE shall meet the minimum peak EIRP requirement according to Table 6.2.1.3-1 and spherical coverage requirement according to Table 6.2.1.3-3 with uplink beam sweeping using the side conditions for SSB based enhanced beam correspondence requirements as defined in Clause 6.6.4.3.2. Such a UE shall meet the beam correspondence tolerance requirement defined in Clause 6.6.4.2 and shall support uplink beam management, as defined in TS 38.306 [14].

- If *beamCorrespondenceWithoutUL-BeamSweeping* is not present and *beamCorrespondenceCSI-RS-based-r16* is supported, the UE shall meet the minimum peak EIRP requirement according to Table 6.2.1.3-1 and spherical coverage requirement according to Table 6.2.1.3-3 with uplink beam sweeping using the side conditions for CSI-RS based enhanced beam correspondence requirements as defined in Clause 6.6.4.3.3. Such a UE shall meet the beam correspondence tolerance requirement defined in Clause 6.6.4.2 and shall support uplink beam management, as defined in TS 38.306 [14].

## << End of change7 >>

## << Start of change8 >>

6.6.4.4 Applicability

For UEs supporting more than one type of beam correspondence, the following applicability rules apply:

- If a UE meets enhanced beam correspondence requirements either based on SSB or based on CSI-RS, it is considered to have met the beam correspondence requirements based on SSB and CSI-RS.

- For a UE supporting either SSB based or CSI-RS based enhanced beam correspondence, the UE shall meet the supported enhanced beam correspondence requirements.

- For a UE supporting both SSB based and CSI-RS based enhanced beam correspondence, the UE shall meet both SSB based and CSI-RS based enhanced beam correspondence requirements and the following applicability rules for verifying the requirements apply:

- The enhanced beam correspondence requirements shall be verified with the SSB based enhanced beam correspondence side conditions in clause 6.6.4.3.2. If the UE meets the SSB based enhanced beam correspondence requirements using the side conditions in clause 6.6.4.3.2 and meets the minimum peak EIRP requirement as defined in clasue 6.2.1.3 using the CSI-RS based side conditions in clause 6.6.4.3.3, where the link direction is determined in the SSB based enhanced beam correspondence test, the UE is considered to have met both the SSB based and CSI-RS based enhanced beam correspondence requirements.

- Otherwise, if UE does not meet the minimum peak EIRP requirement as defined in clasue 6.2.1.3 using the CSI-RS based side conditions in clause 6.6.4.3.3, the enhanced beam correspondence requirements shall be further verified for the UE with the CSI-RS based enhanced beam correspondence side conditions in clause 6.6.4.3.3.

## << End of change8 >>