**3GPP TSG-RAN WG4 Meeting #116 R4-2511755**

**Bengaluru, India, August 25th – 29th, 2025**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
|  |
|  | 38.101-1 | **CR** | Draft CR | **rev** | 1 | **Current version:** | 19.2.0 |  |
|  |
| *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 | **x** | Radio Access Network |  | Core Network |  |

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|  |
| ***Title:***  |  Draft CR for introduction of PC1.5 intra-band UL NC CA |
|  |  |
| ***Source to WG:*** | Xiaomi, Skyworks, Samsung, LGE, CATT |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_ENDC\_RF\_Ph4-Core |  | ***Date:*** | 2025-07-26 |
|  |  |  |  |  |
| ***Category:*** | B |  | ***Release:*** | Rel-19 |
|  | *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)* |
|  |  |
| ***Reason for change:*** | Introduction of PC1.5 intra-band UL NC CA according to the agreements in RAN4 discussion. |
|  |  |
| ***Summary of change:*** | The followings are the summary of changes and the source of the agreements.1. Example Band combinations: CA\_n78(2A), CA\_n77(2A) and CA\_n41(2A) (WID RP-251816)
2. Assumed architecture: Dual PA architecture not TxD (WF R4-2410565 and R4-2414277)
3. MOP tolerance: +2/-3 dB (WF R4-240583)
4. Pcmax tolerance: +2/-3 dB (WF R4-240583 and R4-2410565)
5. The upper bound of Pcmax,c is 26dBm per CC, the upper bound of Pcmax is 29 dBm (WF R4-2414277)
6. PSD: The MPR requirements defined are carrier power and are PSD balance/imbalance agnostic. The MPR values are derived with equal PSD condition with margin reserved to accommodate unequal PSD cases. (WF R4-2502863)
7. ACLR: NR ACLR as 31dB, UTRA ALCR not needed for the example combos (WF R4-240583)
8. SAR solution: Duty cycle solution is considered (WF R4-2410565)
9. Define separate MPR/A-MPR requirements for handheld UE and FWA respectively (WF R4-2410565)
10. MRP/A-MPR requirements: As agreed in WF R4-2507934.
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|  |  |
| ***Consequences if not approved:*** | PC1.5 intra-band UL NC CA is missing. |
|  |  |
| ***Clauses affected:*** | 5.5A.2, 6.2A.1.2, 6.2A2.2, 6.2A.3.1.2, 6.2A4.1.2, 6.5A.2.4.1.2 |
|  |  |
|  | **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:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

## <Beginning of the changes>

### 5.5A.2 Configurations for intra-band non-contiguous CA

Table 5.5A.2-1: NR CA configurations and bandwidth combination sets defined for
intra-band non-contiguous CA

| NR CA Configuration | Uplink CA Configurations or single uplink carrier5 | Channel bandwidths for carrier(MHz) | Channel bandwidths for carrier(MHz) | Channel bandwidths for carrier(MHz) | Channel bandwidths for carrier(MHz) | MaximumAggregated bandwidth(MHz) | Bandwidth combination set |
| --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n1(2A) | - | 5, 10, 15, 20 | 5, 10, 15, 20 |  |  | 40 | 0 |
|  |  | See n1 channel bandwidths in Table 5.3.5-1 for each carrier |  |  | 55 | 4 and 5 |
| CA\_n2(2A) | - | 5, 10, 15, 20 | 5, 10, 15, 20 |  |  | 40 | 0 |
|  | - | See n2 channel bandwidths in Table 5.3.5-1 for each carrier |  |  | 40 | 4 and 5 |
| CA\_n2(3A) | - | See n2 channel bandwidths in Table 5.3.5-1 for each carrier |  | 50 | 4 and 5 |
| CA\_n3(2A) | - | 5, 10, 15, 20 | 5, 10, 15, 20 |  |  | 40 | 0 |
|  |  | 5, 10, 15, 20, 25, 30 | 5, 10, 15, 20, 25, 30 |  |  | 60 | 1 |
|  |  | See n3 channel bandwidths in Table 5.3.5-1 for each carrier |  |  | 70 | 4 and 5 |
| CA\_n5(2A) | - | 5, 10, 15, 20 | 5, 10, 15, 20 |  |  | 25 | 0 |
| CA\_n7(2A) | - | 5, 10, 15, 20 | 5, 10, 15, 20 |  |  | 40 | 0 |
|  |  | See n7 channel bandwidths in Table 5.3.5-1 for each carrier |  |  | 65 | 4 and 5 |
| CA\_n12(2A) | - | 5 | 5 |  |  | 10 | 0 |
| CA\_n25(2A) | n253 | 5, 10, 15, 20 | 5, 10, 15, 20 |  |  | 40 | 0 |
|  |  | 5, 10, 15, 20, 25, 30, 40 | 5, 10, 15, 20, 25, 30, 40 |  |  | 60 | 1 |
|  |  | See n25 channel bandwidths in Table 5.3.5-1 for each carrier |  |  | 60 | 4 and 5 |
| CA\_n25(3A) | n253 | 5, 10, 15, 20, 25, 30, 40 | 5, 10, 15, 20, 25, 30, 40 | 5, 10, 15, 20, 25, 30, 40 |  | 55 | 0 |
|  |  | See n25 channel bandwidths in Table 5.3.5-1 for each carrier |  | 55 | 4 and 5 |
| CA\_n26(2A) | CA\_n26(2A)7 | 5, 10, 15 | 5, 10, 15 |  |  | 30 | 0 |
| CA\_n40(2A) | n403,4CA\_n40(2A)3 | See n40 channel bandwidths in Table 5.3.5-1 for each carrier |  |  | 95 | 4 and 5 |
| CA\_n41(2A) | n413,4 CA\_n41(2A)3,4 | 40, 50, 60, 80, 100 | 40, 50, 60, 80, 100 |  |  | 180 | 0 |
|  |  | 10, 15, 20, 40, 50, 60, 80, 90, 100 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |  |  | 190 | 1 |
|  |  | 10, 15, 20, 30, 40, 50, 60, 80, 90 | 15, 20, 30, 40, 50, 60, 80, 90, 100 |  |  | 190 | 2 |
|  |  | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 |  |  | 190 | 3 |
|  |  | See n41 channel bandwidths in Table 5.3.5-1 for each carrier |  |  | 190 | 4 and 5 |
| CA\_n41(3A) | n413,4 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 |  | 190 | 0 |
|  |  | See n41 channel bandwidths in Table 5.3.5-1 for each carrier |  | 190 | 4 and 5 |
| CA\_n41(4A) | n413 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | 190 | 0 |
|  |  | See n41 channel bandwidths in Table 5.3.5-1 for each carrier | 190 | 4 and 5 |
| CA\_n46(2A) | - | 10, 20, 40, 60, 80 | 10, 20, 40, 60, 80 |  |  | 160 | 0 |
| CA\_n48(2A) | - | 10, 15, 20, 40, 50, 60, 80, 90, 100 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |  |  | 1402 | 0 |
|  |  | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 |  |  | 1402 | 1 |
|  |  | See n48 channel bandwidths in Table 5.3.5-1 for each carrier |  |  | 1402 | 4 and 5 |
| CA\_n48(3A) | - | 10, 15, 20, 40,50, 60, 80, 90, 100 | 10, 15, 20, 40,50, 60, 80, 90, 100 | 10, 15, 20, 40,50, 60, 80, 90, 100 |  | 1402 | 0 |
|  |  | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 |  | 1402 | 1 |
| CA\_n48(4A) | - | 10, 15, 20, 40, 50, 60, 80, 90, 100 | 10, 15, 20, 40, 50, 60, 80, 90, 100 | 10, 15, 20, 40, 50, 60, 80, 90, 100 | 10, 15, 20, 40, 50, 60, 80, 90, 100 | 1352 | 0 |
|  |  | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | 1352 | 1 |
| CA\_n66(2A) | n663 | 5, 10, 15, 20 | 5, 10, 15, 20, 40 |  |  | 60 | 0 |
|  |  | 5, 10, 15, 20, 25, 30, 40 | 5, 10, 15, 20, 25, 30, 40 |  |  | 80 | 1 |
|  |  | 5, 10, 15, 20, 40 | 5, 10, 15, 20, 40 |  |  | 80 | 2 |
|  |  | See n66 channel bandwidths in Table 5.3.5-1 for each carrier |  |  | 85 | 4 and 5 |
| CA\_n66(3A) | - | 5, 10, 15, 20, 40 | 5, 10, 15, 20, 40 | 5, 10, 15, 20, 40 |  | 80 | 0 |
|  |  | See n66 channel bandwidths in Table 5.3.5-1 for each carrier |  | 80 | 4 and 5 |
| CA\_n71(2A) | n713 | 5, 10, 15, 20 | 5,10,15, 20 |  |  | 30 | 0 |
|  |  | See n71 channel bandwidths in Table 5.3.5-1 for each carrier up to 25 MHz per carrier |  |  | 30 | 4 and 5 |
| CA\_n77(2A)6 | n773,4CA\_n77(2A)3 | 20, 40, 80, 100 | 20, 40, 80, 100 |  |  | 200 | 0 |
|  |  | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |  | 200 | 1 |
|  |  | See n77 channel bandwidths in Table 5.3.5-1 for each carrier |  |  | 200 | 4 and 5 |
| CA\_n77(3A) | n773,4CA\_n77(2A)3,4 | 20, 40, 80, 100 | 20, 40, 80, 100 | 20, 40, 80, 100 |  | 300 | 0 |
|  |  | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  | 300 | 1 |
|  |  | See n77 channel bandwidths in Table 5.3.5-1 for each carrier |  | 300 | 4 and 5 |
| CA\_n78(2A)6 | n783,4CA\_n78(2A)3,4 | 10, 20, 40, 50, 60, 80, 90, 100 | 10, 20, 40, 50, 60, 80, 90, 100 |  |  | 200 | 0 |
|  |  | 10, 20, 25, 30, 40, 50, 60, 80, 90, 100 | 10, 20, 25, 30, 40, 50, 60, 80, 90, 100 |  |  | 200 | 1 |
|  |  | 10, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | 10, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |  | 200 | 2 |
|  |  | See n78 channel bandwidths in Table 5.3.5-1 for each carrier |  |  | 200 | 4 and 5 |
| CA\_n79(2A) | CA\_n79(2A) | See n79 channel bandwidths in Table 5.3.5-1 for each carrier |  |  | 200 | 4 and 5 |
| CA\_n96(2A) | - | 20, 40, 60, 80 | 20, 40, 60, 80 |  |  | 160 | 0 |
| CA\_n96(3A) | - | 20, 40, 60, 80 | 20, 40, 60, 80 | 20, 40, 60, 80 |  | 240 | 0 |
| CA\_n96(4A) | - | 20, 40, 60, 80 | 20, 40, 60, 80 | 20, 40, 60, 80 | 20, 40, 60, 80 | 320 | 0 |
| CA\_n102(2A) | - | 20, 40, 60, 80 | 20, 40, 60, 80 |  |  | 160 | 0 |
| CA\_n102(3A) | - | 20, 40, 60, 80 | 20, 40, 60, 80 | 20, 40, 60, 80 |  | 240 | 0 |
| CA\_n102(4A) | - | 20, 40, 60, 80 | 20, 40, 60, 80 | 20, 40, 60, 80 | 20, 40, 60, 80 | 320 | 0 |
| NOTE 1: Void.NOTE 2: Parameter value accounts for both, the maximum frequency range of band n48 (150 MHz), and the minimum frequency gaps in between NR non-contiguous component carriers.NOTE 3: Minimum requirements for Power Class 2 are applicable for this uplink combination or single uplink carrier in this downlink/uplink combinationNOTE 4: Minimum requirements for Power Class 1.5 are applicable for this uplink combination or single uplink carrier in this downlink/uplink combinationNOTE 5: Only single uplink carriers with power class other than PC3 are listed.NOTE 6: Maximum 6 dB power spectral density imbalance between downlink carriers is assumed when UE does not indicate *intraBandNR-CA-non-collocated-r18* or UE indicates *intraBandNR-CA-non-collocated-r18* and *nonCollocatedTypeNR-CA-r18* is provided.Clause 7.10A.2 power imbalance requirement apply if the UE indicates *intraBandNR-CA-non-collocated-r18* and *nonCollocatedTypeNR-CA-r18* is not provided and UE is configured with *maxMIMO-Layers* with value less than or equal to 2. For these UEs, the power spectral density imbalance condition also applies for these carriers when applicable intra-band non-contiguous NR CA configuration is a subset of a higher order NR CA configuration.NOTE 7: Unless otherwise stated, only RF requirements for dual PA architecture are applicable for UL CA\_n26(2A) and UE shall indicate the *dualPA-Architecture* for UL CA\_n26(2A).NOTE 8: For each channel bandwidth of each component carrier, refer to Table 5.3.5-1 for the applicable SCSs. For a given band, not all UE channel bandwidths support the same SCSs. |

## <Next change>

#### 6.2A.1.2 UE maximum output power for Intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation with one uplink carrier on the PCC, the requirements in clause 6.2.1 apply for power class 3 and other power classes if indicated in clause 5.5A.2. For intra-band non-contiguous carrier aggregation with two uplink carriers the maximum output power is specified in Table 6.2A.1.2-1.

Table 6.2A.1.2-1: UE Power Class for intra-band non-contiguous CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA Configuration | Class 1.5 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 5(dBm) | Tolerance (dB) |
| CA\_n26(2A) |  |  |  |  | 23 | +2/-3 |  |  |
| CA\_n40(2A) |  |  | 26 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n41(2A) | 295 | +2/-3 | 26 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n77(2A) | 295 | +2/-3 | 26 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n78(2A) | 295 | +2/-3 | 26 | +2/-3 | 23 | +2/-3 |  |  |
| CA\_n79(2A) |  |  |  |  | 23 | +2/-3 |  |  |
| NOTE 1: An uplink CA configuration in which the band has NOTE 3 in Table 6.2.1-1 is allowed to reduce the lower tolerance limit by 1.5 dB when the transmission bandwidths of the band are confined within FUL\_low and FUL\_low + 4 MHz or FUL\_high - 4 MHz and FUL\_high.NOTE 2: PPowerClass is the maximum UE power specified without taking into account the tolerance.NOTE 3: For intra-band non-contiguous carrier aggregation the maximum power requirement shall apply to the total transmitted power over all component carriers (per UE).NOTE 4: Power class 3 is the default power class unless otherwise stated.NOTE 5: Applicable for a UE indicating capability *dualPA-Architecture* IE.  |

If a UE supports power class 2 for the band combination listed in Table 6.2A.1.2-1 and the supported power class enables the higher maximum output power than that of the default power class:

- if the field of UE capability *maxUplinkDutyCycle-PC2-FR1* is absent and the percentage of total uplink symbols transmitted on all UL CCs in a certain evaluation period is larger than 50% (The exact evaluation period is no less than one radio frame); or

- if the field of UE capability *maxUplinkDutyCycle-PC2-FR1* is not absent and the percentage of total uplink symbols transmitted on all UL CCs in a certain evaluation period is larger than *maxUplinkDutyCycle-PC2-FR1* as defined in TS 38.306 (The exact evaluation period is no less than one radio frame); or

- if 10 log10 ∑ pEMAX,c or PEMAX,CA which defined in clause 6.2A.4.1.2 is 23dBm or lower;

- shall apply all requirements for the default power class to the supported power class and set the configured transmitted power as specified in clause 6.2A.4.1.2;

- else shall apply all requirements for the supported power class and set the configured transmitted power as specified in clause 6.2A.4.1.2.

If a UE supports power class 1.5 for the band combination listed in Table 6.2A.1.2-1 and the supported power class enables the higher maximum output power than that of the power class 2:

- if the field of UE capability *maxUplinkDutyCycle-PC2-FR1* is absent and the field of UE capability *maxUplinkDutyCycle-PC1dot5-MPE-FR1* is absent and the percentage of total uplink symbols transmitted on all UL CCs in a certain evaluation period is larger than 50% (The exact evaluation period is no less than one radio frame); or

- if the field of UE capability *maxUplinkDutyCycle-PC2-FR1* is not absent and the percentage of total uplink symbols transmitted on all UL CCs in a certain evaluation period is larger than *maxUplinkDutyCycle-PC2-FR1* as defined in TS 38.306 (The exact evaluation period is no less than one radio frame); or

- if the field of UE capability *maxUplinkDutyCycle-PC1dot5-MPE-FR1* is not absent and the percentage of total uplink symbols transmitted on all UL CCs in a certain evaluation period is larger than *2\*maxUplinkDutyCycle-PC1dot5-MPE-FR1* as defined in TS 38.306 (The exact evaluation period is no less than one radio frame); or

- if 10 log10 ∑ pEMAX,c or PEMAX,CA which defined in 6.2A.4.1.2 is 23dBm or lower;

- shall apply all requirements for the default power class to the supported power class and set the configured transmitted power as 6.2A.4.1.2;

- if the field of UE capability *maxUplinkDutyCycle-PC2-FR1* is absent and the field of UE capability *maxUplinkDutyCycle-PC1dot5-MPE-FR1* is absent and the percentage of total uplink symbols transmitted on all UL CCs in a certain evaluation period is larger than 25% but less than or equal to 50% (The exact evaluation period is no less than one radio frame); or

- if the field of UE capability *maxUplinkDutyCycle-PC2-FR1* is not absent and the percentage of total uplink symbols transmitted on all UL CCs in a certain evaluation period is larger than 0.5\**maxUplinkDutyCycle-PC2-FR1* but less than or equal to *maxUplinkDutyCycle-PC2-FR1* as defined in TS 38.306 (The exact evaluation period is no less than one radio frame); or

- if the field of UE capability *maxUplinkDutyCycle-PC1dot5-MPE-FR1* is not absent and the percentage of total uplink symbols transmitted on all UL CCs in a certain evaluation period is larger than *maxUplinkDutyCycle-PC1dot5-MPE-FR1* but less than or equal to *2\*maxUplinkDutyCycle-PC1dot5-MPE-FR1* as defined in TS 38.306 (The exact evaluation period is no less than one radio frame); or

- if 10 log10 ∑ pEMAX,c or PEMAX,CA which defined in clause 6.2A.4.1.2 is between 23dBm and 26dBm;

- shall apply all requirements for the power class 2 to the supported power class and set the configured transmitted power as specified in clause 6.2A.4.1.2;

- else

- shall apply all requirements for the power class 1.5 to the supported power class and set the configured transmitted power as specified in clause 6.2A.4.1.2;

## <Next change>

#### 6.2A.2.2 UE maximum output power reduction for Intra-band non-contiguous CA

##### 6.2A.2.2.0 General

For intra-band non-contiguous CA, the allowed Maximum Power Reduction (MPR) for the maximum output power is specified into 2 types: MPR to meet -30dBm/MHz and -13dBm/MHz. The UE determines the MPR type as follows:

For UE indicating *dualPA-Architecture* supported

If OR (LCRB1 = 0, LCRB2 = 0)

MPR defined in Table 6.2.2-1 applies to PC3 intra-band NC UL CA. MPR defined in Table 6.2.2-2 applies to PC2 and PC1.5 intra-band NC UL CA.

Else If AND( FIM3,low\_block,low > SEM-13,low , FIM3,high\_block,high < SEM-13,high )

 MPR defined in Clause 6.2A.2.2.2.1, Clause 6.2A.2.2.2.2 and clause 6.2A.2.2.2.5 applies to PC3, PC2 and PC1.5 intra-band NC UL CA respectively.

Else

 MPR defined in Clause 6.2A.2.2.1.1, Clause 6.2A.2.2.1.2 and clause 6.2A.2.2.1.5 applies to PC3, PC2 and PC1.5 intra-band NC UL CA respectively.

 For UE without indicating *dualPA-Architecture* supported

If OR( LCRB1 = 0, LCRB2 = 0 )

For PC3 UE, MPR defined in Table 6.2.2-1, except for B < 9 MHz where 5.5 dB MPR is used;

For PC2 UE without indicating *TxD*, MPR defined in Table 6.2.2-2 is used, except for B < 11.52 MHz where 6.5 dB MPR is used;

For PC2 UE indicating *TxD*, MPR defined in Table 6.2D.2-1 is used, except for B < 11.52 MHz where the maximum value between 6.5 dB and MPR defined in Table 6.2D.2-1 is used.

Else If AND( FIM3,low\_block,low > SEM-13,low , FIM3,high\_block,high < SEM-13,high )

 MPR defined in Clause 6.2A.2.2.2.3 and Clause 6.2A.2.2.2.4 for PC3 and PC2 UE respectively.

Else

 MPR defined in Clause 6.2A.2.2.1.3 and Clause 6.2A.2.2.1.4 for PC3 and PC2 UE respectively.

where

- LCRB1 is for CC1 which is the component carrier with lower frequency

- LCRB2 is for CC2 which is the component carrier with higher frequency

- B = (LCRB1\* 12\* SCS1 + LCRB2 \* 12 \* SCS2)/1,000 (MHz), where SCS1 and SCS2 are expressed in kHz.

- FIM3,high\_block,high =(2 \* Fhigh\_alloc,high\_edge ) – Flow\_alloc,low\_edge

- FIM3,low\_block,low = (2 \* Flow\_alloc,low\_edge) – Fhigh\_alloc,high\_edge

- Flow\_alloc,low\_edge is the lowermost frequency of the lower transmission bandwidth allocation.

- Flow\_alloc,high\_edge is the uppermost frequency of the lower transmission bandwidth allocation.

- Fhigh\_alloc,low\_edge is the lowermost frequency of the upper transmission bandwidth allocation.

- Fhigh\_alloc,high\_edge is the uppermost frequency of the upper transmission bandwidth allocation.

- SEM-13,low = Threshold frequency where lower spectral emission mask below the lower channel drops from -13 dBm / MHz to -25 dBm / MHz, as specified in Clause 6.5A.2.2.2.

- SEM-13,high = Threshold frequency where upper spectral emission mask above the upper channel drops from -13 dBm / MHz to -25 dBm / MHz, as specified in Clause 6.5A.2.2.2.

MPRs in section 6.2A.2.2.1.3, 6.2A.2.2.1.4, 6.2A.2.2.2.3 and 6.2A.2.2.2.4 are applicable only when the Gap between the component carriers is ≤ the overall channel bandwidth summed across all the component carriers and when UE declares *intraBandFreqSeparationUL-AggBW-GapBW-r16* value ≤ 200 MHz.

The definition of the gap is between the component carriers in a spectrum that is not part of any configured component carrier that is located in between the lowest edge of the component carrier with higher center frequency and the highest edge of the component carrier with center frequency that is located lower in frequency.

#### 6.2A.2.2.1 MPR to meet -30dBm/MHz

*<Unchanged clauses are omitted>*

##### 6.2A.2.2.1.4 PC2 without indicating dualPA-Architecture supported

MPR in this clause is for intra-band non-contiguous CA power class 2 for UEs without indicating IE *dualPA-Architecture* supported. The allowed maximum output power reduction is defined as:

 MPR=MA

Where MA is defined as follows

MA = 19.5; 0 ≤ B < 1.08

 19; 1.08 ≤ B < 2.16

 18; 2.16 ≤ B < 5.04

16.5; 5.04≤ B < 10.08

 16; 10.08 ≤ B < 36

 12; 36 ≤ B < 56.88

 10.5; 56.88 ≤ B

##### 6.2A.2.2.1.5 PC1.5 with indicating dualPA-Architecture supported

MPR in this clause is for intra-band non-contiguous CA power class 1.5 for UEs indicating IE *dualPA-Architecture* supported. The allowed maximum output power reduction is defined as:

MPR=MA+2 where MA is defined in clause 6.2A.2.2.1.2.

MPR in this clause is for intra-band non-contiguous CA power class 1.5 for large FWA form factor indicating IE *dualPA-Architecture* supported. The allowed maximum output power reduction is defined as:

MPR=MA+1.5 where MA is defined in clause 6.2A.2.2.1.2.

#### 6.2A.2.2.2 MPR to meet -13dBm/MHz

*<Unchanged clauses are omitted>*

##### 6.2A.2.2.2.4 PC2 without indicating dualPA-Architecture supported

MPR in this clause is for intra-band non-contiguous CA power class 2 for UEs without indicating IE *dualPA-Architecture* supported. The allowed maximum output power reduction is defined as:

 MPR=MA

Where MA is defined as follows

MA = 14; 0 ≤ B < 1.08

 12; 1.08 ≤ B < 2.16

 11.5; 2.16 ≤ B < 3.24

11; 3.24≤ B < 5.04

 9.5; 5.04 ≤ B < 10.08

 8.5; 10.08 ≤ B < 36

 6.5; 36 ≤ B

##### 6.2A.2.2.2.5 PC1.5 with indicating dualPA-Architecture supported

MPR in this clause is for intra-band non-contiguous CA power class 1.5 for UEs indicating IE *dualPA-Architecture* supported. The allowed maximum output power reduction is defined as:

MPR=MA+2 where MA is defined in clause 6.2A.2.2.2.2.

MPR in this clause is for intra-band non-contiguous CA power class 1.5 for large FWA form factor indicating IE *dualPA-Architecture* supported. The allowed maximum output power reduction is defined as:

MPR=MA+1.5 where MA is defined in clause 6.2A.2.2.2.2.

## <Next change>

##### 6.2A.3.1.2 UE additional maximum output power reduction for Intra-band non-contiguous CA

*<Unchanged clauses are omitted>*

6.2A.3.1.2.1 AMPR for CA\_NC\_NS\_04 (CA\_n41(2A))

For intra-band non-contiguous CA\_n41(2A) and it receives CA\_NC\_NS\_04 for UE indicating *dualPA-Architecture* supported for PC3 and PC2 operation, the UE determines the allowed Additional Maximum Power Reduction (AMPR) for the maximum output power as specified in this clause. The AMPR is specified into 2 types: AMPR to meet -25dBm/MHz and -13dBm/MHz. The A-MPR defined in this clause is used instead of MPR defined in 6.2A.2.2, not additively, so CA MPR=0 when CA\_NC\_NS\_04 is signaled.

The UE determines the AMPR type as follows:

If AND( MIN(FIM3,low\_block,high, SEM-13,low) < Ffilter,low , MAX( SEM-13,high, FIM3,high\_block,low ) > Ffilter,high )

- A-MPRIM3 defined in Clause 6.2A.3.1.2.1.2 for PC3, 6.2A.3.1.2.1.4 for PC2 and 6.2A.3.1.2.1.6 for PC1.5

Else

- A-MPRIM3 defined in Clause 6.2A.3.1.2.1.1 for PC3, 6.2A.3.1.2.1.3 for PC2 and 6.2A.3.1.2.1.5 for PC1.5

where

- LCRB1 is for CC1 which is the component carrier with lower frequency

- LCRB2 is for CC2 which is the component carrier with higher frequency

- B = (LCRB1\* 12\* SCS1 + LCRB2 \* 12 \* SCS2)/1,000 (MHz), where SCS1 and SCS2 are expressed in kHz.

- FIM3,low\_block,high =(2 \* Flow\_alloc,high\_edge ) – Fhigh\_alloc,low\_edge

- FIM3,high\_block,low = (2 \* Fhigh\_alloc,low\_edge) – Flow\_alloc,high\_edge

- Flow\_alloc,low\_edge is the lowermost frequency of lower transmission bandwidth allocation.

- Flow\_alloc,high\_edge is the uppermost frequency of lower transmission bandwidth allocation.

- Fhigh\_alloc,low\_edge is the lowermost frequency of upper transmission bandwidth allocation.

- Fhigh\_alloc,high\_edge is the uppermost frequency of upper transmission bandwidth allocation.

- Ffilter,low = 2480 MHz

- Ffilter,high = 2745 MHz

- SEM-13,high = Threshold frequency where upper spectral emission mask for upper channel drops from -13 dBm / 1MHz to -25 dBm / 1MHz, as specified in Clause 6.5A.2.3.2.

- SEM-13,low = Threshold frequency where lower spectral emission mask below the lower channel drops from -13 dBm / MHz to -25 dBm / MHz, as specified in Clause 6.5A.2.3.2.

*<Unchanged clauses are omitted>*

6.2A.3.1.2.1.4 AMPRIM3 to meet -13dBm/MHz for PC2

AMPR in this clause is for intra-band non-contiguous CA\_n41(2A) power class 2 for UEs indicating IE *dualPA-Architecture* supported. The allowed maximum output power reduction is defined as:

AMPRIM3=MA

Where MA is defined as follows

MA = 9 ; 0 ≤ B < 0.54

 8 ; 0.54 ≤ B < 1.08

 7 ; 1.08 ≤ B < 2.16

 6.5 ; 2.16 ≤ B < 3.24

 6 ; 3.24 ≤ B < 5.4

 5.5 ; 5.4 ≤ B ≤ 10.8

 4 ; 10.8 < B

Where:

 B=(LCRB\_alloc, 1\* 12\* SCS1 + LCRB\_alloc,2 \* 12 \* SCS2)/1,000 (MHz), where SCS1 and SCS2 are expressed in kHz.

6.2A.3.1.2.1.5 AMPRIM3 to meet -25dBm/MHz for PC1.5

AMPR in this clause is for intra-band non-contiguous CA\_n41(2A) power class 1.5 for UEs indicating IE *dualPA-Architecture* supported. The allowed maximum output power reduction is defined as:

AMPRIM3=MA+2Where MA is defined 6.2A.3.1.2.1.3.

6.2A.3.1.2.1.6 AMPRIM3 to meet -13dBm/MHz for PC1.5

AMPR in this clause is for intra-band non-contiguous CA\_n41(2A) power class 1.5 for UEs indicating IE *dualPA-Architecture* supported. The allowed maximum output power reduction is defined as:

AMPRIM3=MA+2, where MA is defined in clause 6.2A.3.1.2.1.4.

## <Next change>

##### 6.2A.4.1.2 Configured transmitted power for Intra-band non-contiguous CA

For uplink carrier aggregation the UE is allowed to set its configured maximum output power PCMAX,*c* for serving cell *c* and its total configured maximum output power PCMAX.

The configured maximum output power PCMAX,*c* on serving cell *c* shall be set as specified in subclause 6.2.4.

For a UE supporting PC1.5 intra-band NC UL CA, the maximum output power of each CC is limited to 26 dBm.

The configured maximum output power PCMAX,c on serving cell c shall be set as specified in subclause 6.2.4, but with MPRc = MPR and A-MPRc = A-MPR with MPR and A-MPR as determined by subclause 6.2A.2 and 6.2A.3, respectively. For PH reporting the following exception applies: if the UE is configured with multiple uplink serving cells, the power PCMAX,c used for the purpose of PH reporting on first serving cell c = c1 does not consider for computation of the PH report transmissions on a second serving cell c2 as exempted in subclause 7.7.1 in [8]. There is one power management term for the UE, denoted P-MPR, and P-MPR c = P-MPR.

The total configured maximum output power PCMAX shall be set within the following bounds:

 PCMAX\_L ≤ PCMAX ≤ PCMAX\_H

For uplink intra-band non-contiguous carrier aggregation when same slot pattern is used in all aggregated serving cells,

 PCMAX\_L  = MIN{10 log10 ∑ pEMAX,c  - TC , PEMAX,CA,(PPowerClass,CA– ΔPPowerClass,CA) – MAX(MAX(MPRc, A-MPRc) + ΔTIB,c + TC + DTRxSRS, P-MPR) }

 PCMAX\_H  = MIN{10 log10 ∑ pEMAX,c , PEMAX,CA ,PPowerClass,CA– ΔPPowerClass,CA)}

where

- pEMAX,c is the linear value of PEMAX,*c* which is given by IE *P-Max* for serving cell *c* in [7];

- PPowerClass,CA is the maximum UE power specified in Table 6.2A.1.2-1 without taking into account the tolerance;

- MPR and A-MPR are specified in subclause 6.2A.2 and subclause 6.2A.3 respectively;

- ΔPPowerClass,CA = 3 dB for a power class 2 or 6 dB for a power class 1.5 UE when the requirements of default power class are applied as specified in sub-clause 6.2.A.1.2; otherwise ΔPPowerClass,CA = 0 dB;

NOTE: UE reports ∆PPowerClass,CA when *deltaPowerClassReporting-r18* is present, dpc-Reporting-FR1 [7] is configured and the reporting is triggered only by uplink duty cycle exceedance or by return to the *powerClass* after the duty cycle exceedance.

- TIB,c is the additional tolerance for serving cell *c* as specified in clause 6.2A.4.2 for NR CA, clause 6.2C.2 for SUL, or TS 38.101-3 clause 6.2B.4.2 for EN-DC; In case the UE supports more than one of band combinations for CA, SUL or DC, and an operating band belongs to more than one band combinations then

a) When the operating band frequency range is ≤ 1 GHz, the applicable additional ∆TIB,c shall be the average value for all band combinations defined in clause 6.2A.4.2, 6.2C.2 in this specification and 6.2B.4.2 in TS 38.101-3 [3], truncated to one decimal place that apply for that operating band among the supported band combinations. In case there is a harmonic relation between low band UL and high band DL, then the maximum ∆TIB,c among the different supported band combinations involving such band shall be applied

b) When the operating band frequency range is > 1 GHz, the applicable additional ∆TIB,c shall be the maximum value for all band combinations defined in clause 6.2A.4.2, 6.2C.2 in this specification and 6.2B.4.2 in TS 38.101-3 [3] for the applicable operating bands.

- P-MPR is the power management term for the UE;

- TC is the highest value TC,c among all serving cells *c*;

- ∆TRxSRS is the highest value among all serving cells *c;*

- PEMAX,CA is the value indicated by *p-NR-FR1* or by *p-UE-FR1* whichever is the smallest if both are present*.*

[For uplink intra-band non-contiguous carrier aggregation, when at least one different numerology/slot pattern is used in aggregated cells, the UE is allowed to set its configured maximum output power PCMAX,c(i),i for serving cell c(i) of slot numerology type *i*, and its total configured maximum output power PCMAX.

The configured maximum output power PCMAX,c(i),i (p) in slot p of serving cell c(i) on slot numerology type *i* shall be set within the following bounds:

 PCMAX\_L,f,c(i),i (p) ≤ PCMAX,f,c(i), i (p) ≤ PCMAX\_H,f,c(i),i (p)

where PCMAX\_L,f,c (i),i (p) and PCMAX\_H,f,c(i),i (p) are the limits for a serving cell c(i) of slot numerology type i as specified in subclause 6.2.4.

The total UE configured maximum output power PCMAX (p,q) in a slot p of slot numerology or symbol pattern *i*, and a slot q of slot numerology or symbol pattern *j* that overlap in time shall be set within the following bounds unless stated otherwise:

 PCMAX\_L(p,q) ≤ PCMAX (p,q) ≤ PCMAX\_H (p,q)

When slots p and q have different transmissions lengths and belong to different cells on different or same bands:

 PCMAX\_L (p,q) = MIN {10 log10 [pCMAX\_L,f,c(i),i (p) + pCMAX\_L,f,c(i),j (q)], PPowerClass,CA, PEMAX,CA}

 PCMAX\_H (p,q) = MIN {10 log10 [pCMAX\_ H,f,c(i),i (p) + pCMAX\_ H,f,c(i),j (q)], PPowerClass,CA, PEMAX,CA}

where pCMAX\_L,f,c (i),i and pCMAX\_ H,f,c(i),i are the respective limits PCMAX\_L,f,c (i),i and PCMAX\_H,f,c(i),i expressed in linear scale.]

TREF and Teval are specified in Table 6.2A.4.1.2-1 when same and different slot patterns are used in aggregated carriers. For each TREF, the PCMAX\_L is evaluated per Teval and given by the minimum value taken over the transmission(s) within the Teval; the minimum PCMAX\_L over the one or more Teval is then applied for the entire TREF. The lesser of PPowerClass,CA and PEMAX,CA shall not be exceeded by the UE during any period of time.

Table 6.2A.4.1.2-1: PCMAX evaluation window for different slot and channel durations

|  |  |  |
| --- | --- | --- |
| TREF | Teval | Teval with frequency hopping |
| TREF of largest slot duration over both UL CCs | Physical channel length | Min(Tno\_hopping, Physical Channel Length) |

If the UE is configured with multiple TAGs and transmissions of the UE on slot *i* for any serving cell in one TAG overlap some portion of the first symbol of the transmission on slot *i* +1 for a different serving cell in another TAG, the UE minimum of PCMAX\_L for slots *i* and *i* + 1 applies for any overlapping portion of slots *i* and *i* + 1. The lesser of PPowerClass,CA and PEMAX,CA shall not be exceeded by the UE during any period of time.

The measured maximum output power PUMAX over all serving cells with same slot pattern shall be within the following range:

 PCMAX\_L – MAX{TL, TLOW(PCMAX\_L) } ≤ PUMAX  ≤ PCMAX\_H + THIGH(PCMAX\_H)

 PUMAX = 10 log10 ∑ pUMAX,c

where pUMAX,c denotes the measured maximum output power for serving cell *c* expressed in linear scale. The tolerances TLOW(PCMAX) and THIGH(PCMAX) for applicable values of PCMAX are specified in Table 6.2A.4.1.2-2. The tolerance TL is the absolute value of the lower tolerance for applicable NR CA configuration as specified in Table 6.2A.1.2-1 for intra-band carrier aggregation.

The measured maximum output power PUMAX over all serving cells, when at least one slot has a different transmission numerology or slot pattern, shall be within the following range:

 P'CMAX\_L– MAX{TL, TLOW (P'CMAX\_L)} ≤ P'UMAX  ≤ P'CMAX\_H + THIGH (P'CMAX\_H)

 P'UMAX = 10 log10 ∑ p'UMAX,c

where p'UMAX,c denotes the average measured maximum output power for serving cell *c* expressed in linear scale over TREF. The tolerances TLOW(P'CMAX) and THIGH(P'CMAX) for applicable values of P'CMAX are specified in Table 6.2A.4.1.2-2 for intra-band carrier aggregation. The tolerance TL is the absolute value of the lower tolerance for applicable NR CA configuration as specified in Table 6.2A.1.2-1 for intra-band carrier aggregation.

where:

 P'CMAX\_L  = MIN{ MIN {10log10∑( pCMAX\_L,f,c(i),i), PPowerClass,CA} over all overlapping slots in TREF}

 P'CMAX\_H = MAX{ MIN{10 log10 ∑ pEMAX,c , PPowerClass,CA} over all overlapping slots in TREF}

Table 6.2A.4.1.2-2: PCMAX tolerance for uplink intra-band non-contiguous CA

|  |  |  |
| --- | --- | --- |
| PCMAX(dBm) | ToleranceTLOW(PCMAX)(dB) | ToleranceTHIGH(PCMAX)(dB) |
| 21 ≤ PCMAX ≤ 29 | 3.0 | 2.0 |
| 20 ≤ PCMAX < 21 | 2.5 |
| 19 ≤ PCMAX < 20 | 3.5 |
| 18 ≤ PCMAX < 19 | 4.0 |
| 13 ≤ PCMAX < 18 | 5.0 |
| 8 ≤ PCMAX < 13 | 6.0 |
| -40 ≤ PCMAX < 8 | 7.0 |

## <Next change>

6.5A.2.4.1.2 NR ACLR for intra-band non-contiguous CA

For intra-band non-contiguous carrier aggregation, CA Adjacent Channel Leakage power Ratio(CAACLR) is the ratio of the sum of the filtered mean power centred on each assigned channel frequency to the filtered mean power centred on an adjacent NR channel frequency at nominal channel spacing. In case the sub-block gap bandwidth Wgap between two uplink sub-blocks is smaller than maximum of the two uplink sub-block bandwidths then no CAACLR requirement is set for the gap. Each assigned NR channel power and adjacent NR channel power are measured with rectangular filters with measurement bandwidths specified in Table 6.5A.2.4.1.2-1 for power class 3 and 6.5A.2.4.1.2-2 for power class 2 and power class 1.5. If the measured adjacent channel power is greater than –50dBm then the ACLR shall be higher than the value specified in Table 6.5A.2.4.1.2-1 for power class 3 and 6.5A.2.4.1.2-2 for power class 2 and power class 1.5.

Table 6.5A.2.4.1.2-1: General requirements for intra-band non-contiguous CA ACLR power class 3

|  |  |
| --- | --- |
|  | ACLR / Measurement bandwidth |
| CA ACLR | 30 dB |
| CA Measurement bandwidth for each sub block(NOTE 1) | MBWACLR |
| Adjacent channel centre frequency offset (in MHz) | + BWChannel/- BWChannel |
| NOTE 1: MBWACLR is the single-channel ACLR measurement bandwidths specified in 6.5.2.4.1. |

Table 6.5A.2.4.1.2-2: General requirements for intra-band non-contiguous CA ACLR power class 2 and power class 1.5

|  |  |
| --- | --- |
|  | ACLR / Measurement bandwidth |
| CA ACLR | 31 dB |
| CA Measurement bandwidth for each sub block(NOTE 1) | MBWACLR |
| Adjacent channel centre frequency offset (in MHz) | + BWChannel/- BWChannel |
| NOTE 1: MBWACLR is the single-channel ACLR measurement bandwidths specified in 6.5.2.4.1. |

## <End of the changes>