3GPP TSG-RAN WG4 Meeting #112 R4-2412382

Maastricht , Netherlands, 19th – 23th August, 2024

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **38.101-1** | **CR** | **2429** | **rev** | **1** | **Current version:** | **18.6.0** |  |
|  |
| *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:***  | (NonCol\_intraB\_ENDC\_NR\_CA-Core) Specifying different intra-band non-contiguous CA UE capability types |
|  |  |
| ***Source to WG:*** | Huawei, Hisilicon, Nokia, Samsung |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NonCol\_intraB\_ENDC\_NR\_CA-Core  |  | ***Date:*** | 2024-08-09 |
|  |  |  |  |  |
| ***Category:*** | F |  | ***Release:*** | Rel-18 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | - UE types (type 1 and type 2) were removed from the specifications and reduced the readability and the comprehension of the specification. To increase the readibility and understanding of the requirements we propose to introduce multiple intra-band non-contiguous CA UE types, for colocated and non-collocated deployment scenarios.- Modify “Rx requirements” to “power imbalance” and refine the sentence in clause 7.10A.3Note: the CR is based on merging R4-2412382 and R4-2411997 |
|  |  |
| ***Summary of change:*** | Specify different intra-band non-contiguous CA UE types  |
|  |  |
| ***Consequences if not approved:*** | Intra-band non-contiguous CA UE types will not be clearly known and readability of the spec will be impacted  |
|  |  |
| ***Clauses affected:*** | 5.5A.2, 7.2, 7.10A |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** | **x** |  |  Test specifications | TS 38.521-3 |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

**<Start of change>**

## 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\_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) | - | 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) | 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 |
| 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 | 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 | 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: If a UE does not indicate *intraBandNR-CA-non-collocated-r18*, the minimum requirements for intra-band non-contiguous CA apply when the maximum power spectral density imbalance between downlink carriers is within 6 dB (type 1 in Table 7.10A.1-1). If a 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, the power imbalance requirement defined in subclause 7.10A apply (type 2 in Table 7.10A.1-1). If a UE indicates *intraBandNR-CA-non-collocated-r18* and *nonCollocatedTypeNR-CA-r18* is provided, the minimum requirements for intra-band non-contiguous CA apply when the maximum power spectral density imbalance between downlink carriers is within 6 dB (type 1 in Table 7.10A.1-1). 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>**

## 7.2 Diversity characteristics

The UE is required to be equipped with a minimum of two Rx antenna ports in all operating bands except for the bands n7, n38, n41, n48, n77, n78, n79, n104 where the UE is required to be equipped with a minimum of four Rx antenna ports. This requirement applies when the band is used as a standalone band or as part of a band combination.

Unless otherwise stated, the following applicability rules apply,

- For the single carrier REFSENS requirements in Clause 7, the UE shall be verified with two Rx antenna ports in all supported frequency bands, additional requirements for four Rx ports shall be verified in operating bands where the UE is equipped with four Rx antenna ports, and additional requirements for four and eight Rx ports shall be verified in operating bands where the UE is equipped with eight Rx antenna ports.

- For Rx requirements other than single carrier REFSENS in Clause 7, the UE shall be verified with four Rx antenna ports and skip two Rx antenna ports requirements in operating bands where the UE is equipped with four Rx antenna ports, the UE shall be verified with eight Rx antenna ports and skip both two and four Rx antenna ports requirements in operating bands where the UE is equipped with eight Rx antenna ports unless the UE does not support eight Rx ports for band(s) in a band combination in which case those band(s) shall be verified with four Rx antenna ports, otherwise, the UE shall be verified with two Rx antenna ports.

- The above rules apply for all clauses except for clause 7.9.

A Redcap UE is required to be equipped with a minimum of single Rx antenna port and maximum of two Rx antenna ports. Clause 7 requirements for four Rx antenna ports do not apply to a RedCap UE.

If a UE indicates *intraBandNR-CA-non-collocated-r18* for the non-contiguous intra-band NR CA configuration listed in Table 7.10A.2-2*,* both type-2 Rx power imbalance requirements (type 2 in Table 7.10A.1-1) as specified in clause 7.10A and type-1 Rx requirements (type 1 in Table 7.10A.1-1) in clauses 7.3 – 7.9shall be verified.

**<Next change>**

## 7.10A Power imbalance for CA

### 7.10A.1 General

Power imbalance requirement is a measure of the receiver’s ability to receive a wanted signal in the presence of another signal with a power imbalance and a specific frequency offset from the wanted signal.

For intra band non-contiguous NR CA, the following UE types are identified:

Table 7.10A.1-1 Intra-band non-contiguous CA UE types

|  |  |  |
| --- | --- | --- |
| intra-band non-contiguous CA UE types | Type description | dedicated UE capability |
| Type 1 | It supports intra-band RF requirements (with a maximum power spectral density imbalance between downlink carriers, within 6 dB) and MRTD requirements according to clause 7.6.4-1 in 38.133 | N/A |
| Type 2 | The UE supports the inter-band RF requirements (with DL power imbalance as specified in caluse 7.10A.2) and MTTD/MRTD requirements according to Table 7.5.4-1/Table 7.6.4-2 in TS 38.133 | *intraBandNR-CA-non-collocated-r18* |

Power imbalance requirement in this subclause is only applicable for a UE capable of *intraBandNR-CA-non-collocated-r18* and is not provided with *nonCollocatedTypeNR-CA-r18* and is configured with *maxMIMO-Layers* with value less than or equal to 2*.* (i.e. type 2 in Table 7.10A.1-1)

### 7.10A.2 Minimum requirement

For the test parameters in table 7.10A.2-1, the throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.3.2, and A.3.3 (with one sided dynamic OCNG Pattern OP.1 TDD for the DL-signal as described in Annex A.5.2.1).

Table 7.10A.2-1: Power imbalance parameters for intra-band non-contiguous CA

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Test configurations | Carriers | Rx Power in transmission bandwidth configuration (dBm) | channel bandwidth | Center of BWanother Relative to edge of BWwanted |
| 1 | Wanted carrier | REFSENS NOTE 4 + 1 | BWwanted ≤ BWanother | < max (5/2\* BWanother, 50MHz |
| Another wanted carrier  | Power of wanted carrier + 25 |
| 2 | Wanted carrier | REFSENS NOTE 4 + 1 | BWwanted > BWanother |
| Another wanted carrier | Power of wanted carrier + 25 – 10\*log10(BWwanted /BWanother) |
| 3 | Wanted carrier | REFSENS NOTE 4 + 1 | NA | ≥ max (5/2\* BWanother, 50MHz) |
| Another wanted carrier  | Power of wanted carrier + 25 |
| NOTE 1: The transmitter shall be set to 24dB below PCMAX\_L,f,c at the minimum uplink configuration specified in Table 7.3.2-3 with PCMAX\_L,f,c as defined in clause 6.2A.4.NOTE 2: BWwanted is the channel bandwidth of wanted carrier. BWanother is the channel bandwidth of another wanted carrier with 25 dB power imbalance.NOTE 3: It’s allowed to use one of test configurations to verify the RX power imbalance requirement for type 2 capability (type 2 in Table 7.10A.1-1).NOTE 4: REFSENS is the reference sensitivity level for two antenna port in Table 7.3.2-1b.NOTE 5: Void. |

For a UE capable of *intraBandNR-CA-non-collocated-r18* for the following CA band combinations in Table 7.10A.2-2, the Power imbalance requirements are applicable with 2Rx antenna ports for each component carrier if it is not provided with *nonCollocatedTypeNR-CA-r18* and is configured with *maxMIMO-Layers* with value less than or equal to 2 (i.e. type 2 in Table 7.10A.1-1).

Table 7.10A.2-2: NR CA combinations

|  |
| --- |
| CA combination |
| CA\_n77(2A)1 |
| CA\_n78(2A)1 |
| NOTE 1: The applicability is specified in clause 4.2 d) |

**<End of changes>**