**3GPP TSG-RAN WG4 Meeting #106R4-2300811**

**Athens, GR, 27 Feb - 03 Mar, 2023**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.101-1** | **CR** | **1339** | **rev** | **-** | **Current version:** | **18.0.0** |  |
|  | | | | | | | | |
| *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 NR CA band combinations with two SUL cells in Rel-18 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | CMCC | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_2SUL\_cell\_combos\_R18 | | | | |  | ***Date:*** | | | 2023-02-14 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***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 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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | To introduce band combination as below:  CA\_n41A-n95A\_n79A-n98A,  CA\_n41A-n98A\_n79A-n95A,  CA\_n41A-n83A\_n79A-n98A,  CA\_n41A-n83A\_n79A-n95A,  CA\_n78C\_n80A-n84A  CA\_n78C\_n81A-n84A | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | To introduce band combination as below:  CA\_n41A-n95A\_n79A-n98A,  CA\_n41A-n98A\_n79A-n95A,  CA\_n41A-n83A\_n79A-n98A,  CA\_n41A-n83A\_n79A-n95A,  CA\_n78C\_n80A-n84A  CA\_n78C\_n81A-n84A | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Current spec can’t support band combination as below:  CA\_n41A-n95A\_n79A-n98A,  CA\_n41A-n98A\_n79A-n95A,  CA\_n41A-n83A\_n79A-n98A,  CA\_n41A-n83A\_n79A-n95A,  CA\_n78C\_n80A-n84A  CA\_n78C\_n81A-n84A | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 5.2C, 5.5C, 6.2C, 7.3C | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |

## ==================Start of 1st changes==================

## 5.2C Operating band combination for SUL

NR operation is designed to operate in the operating band combination defined in Tasble 5.2C-1, Table 5.2C-2, Table 5.2C-3 and Table 5.2C-4, where all operating bands are within FR1.

If the mandatory simultaneous Rx/Tx capability applies for a band combination, when the applicable lower order band combination is a band pair in a higher order band combination, the mandatory simultaneous Rx/Tx capability also applies for the band pair in the higher order band combination.

Table 5.2C-1: Operating band combination for SUL in FR1

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| SUL\_n24-n992 | n24, n99 |
| SUL\_n41-n802 | n41, n80 |
| SUL\_n41-n812 | n41, n81 |
| SUL\_n41-n832 | n41, n83 |
| SUL\_n41-n952 | n41, n95 |
| SUL\_n41-n972 | n41, n97 |
| SUL\_n41-n982 | n41, n98 |
| SUL\_n41-n992 | n41, n99 |
| SUL\_n48-n992 | n48, n99 |
| SUL\_n77-n802 | n77, n80 |
| SUL\_n77-n842 | n77, n84 |
| SUL\_n77-n992 | n77, n99 |
| SUL\_n78-n802 | n78, n80 |
| SUL\_n78-n812 | n78, n81 |
| SUL\_n78-n822 | n78, n82 |
| SUL\_n78-n832 | n78, n83 |
| SUL\_n78-n842 | n78, n84 |
| SUL\_n78-n862 | n78, n86 |
| SUL\_n79-n802 | n79, n80 |
| SUL\_n79-n812 | n79, n81 |
| SUL\_n79-n832 | n79, n83 |
| SUL\_n79-n842 | n79, n84 |
| SUL\_n79-n952 | n79, n95 |
| SUL\_n79-n972 | n79, n97 |
| SUL\_n79-n982 | n79, n98 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory. | |

Table 5.2C-2: Operating SUL band combination with intra-band non-contiguous CA in FR1

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| SUL\_n41(\*)-n992 | n41, n99 |
| SUL\_n48(\*)-n992 | n48, n99 |
| SUL\_n77(\*)-n992 | n77, n99 |
| SUL\_n78(\*)-n862 | n78, n86 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory.  NOTE 3: The notation CA\_nX(\*) in this table indicates intra-band non-contiguous CA for band nX. The configurations for each band are in table 5.5C-2. | |

Table 5.2C-3: Operating SUL band combination with intra-band contiguous CA in FR1

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| SUL\_n41-n80 | n41, n80 |
| SUL\_n41-n83 | n41, n83 |
| SUL\_n41-n95 | n41, n95 |
| SUL\_n78-n80 | n78, n80 |
| SUL\_n78-n81 | n78, n81 |
| SUL\_n78-n84 | n78, n84 |
| SUL\_n79-n80 | n79, n80 |
| SUL\_n79-n83 | n79, n83 |
| SUL\_n79-n95 | n79, n95 |
| NOTE 1: If a UE is configured with both NR UL and NR SUL carriers in a cell, the switching time between NR UL carrier and NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory. | |

Table 5.2C-4: Operating SUL band combination with inter-band CA in FR1

|  |  |
| --- | --- |
| NR Band combination for SUL | NR Band  (Table 5.2-1) |
| CA\_n1\_SUL\_n78-n80 | n1, n78, n80 |
| CA\_n1\_SUL\_n78-n81 | n1, n78, n81 |
| CA\_n1\_SUL\_n78-n84 | n1, n78, n84 |
| CA\_n3\_SUL\_n41-n80 | n3, n41, n80 |
| CA\_n3\_SUL\_n78-n80 | n3, n78, n80 |
| CA\_n3\_SUL\_n79-n80 | n3, n79, n80 |
| CA\_n28\_SUL\_n41-n83 | n28, n41, n83 |
| CA\_n28\_SUL\_n79-n83 | n28, n79, n83 |
| CA\_n41\_SUL\_n79-n80 | n41, n79, n80 |
| CA\_n41\_SUL\_n79-n83 | n41, n79, n83 |
| CA\_n41\_SUL\_n79-n95 | n41, n79, n95 |
| CA\_n41\_SUL\_n79-n97 | n41, n79, n97 |
| CA\_n41\_SUL\_n79-n98 | n41, n79, n98 |
| CA\_n79\_SUL\_n41-n80 | n41, n79, n80 |
| CA\_n79\_SUL\_n41-n83 | n41, n79, n83 |
| CA\_n79\_SUL\_n41-n95 | n41, n79, n95 |
| CA\_n79\_SUL\_n41-n97 | n41, n79, n97 |
| CA\_n79\_SUL\_n41-n98 | n41, n79, n98 |
| CA\_n28-n79\_SUL\_n41-n83 | n28, n41, n79, n83 |
| CA\_n28-n41\_SUL\_n79-n83 | n28, n41, n79, n83 |
| CA\_n41A-n95A\_n79A-n98A | n41, n95, n79, n98 |
| CA\_n41A-n98A\_n79A-n95A | n41, n98, n79, n95 |
| CA\_n41A-n83A\_n79A-n98A | n41, n83, n79, n98 |
| CA\_n41A-n83A\_n79A-n95A | n41, n83, n79, n95 |
| CA\_n78C\_n80A-n84A | n78, n80, n84 |
| CA\_n78C\_n81A-n84A | n78, n81, n84 |
| NOTE 1: If a UE is configured with a single cell consisting of a NR UL carrier and a corresponding NR SUL carrier, the switching time between NR UL carrier and the corresponding NR SUL carrier is 0 us.  NOTE 2: For UE supporting SUL band combination simultaneous Rx/Tx capability is mandatory. | |

## ==================End of 1st changes==================

## ==================Start of 2nd changes==================

## 5.5C Configurations for SUL

The configuration tables for SUL describe Bandwidth Combination Sets. Bandwidth Combination Set 4 and 5 contains all possible defined channel bandwidths for each band in the combination. The fact that BCS4 and BCS5 contains all channel bandwidths for each band does not alter if a bandwidth is mandatory or optional for a given band. Bandwidths that are identified as optional in Table 5.3.5-1 for a given release are still optional for UEs that support BCS4 or BCS5. , where the bandwidths the UE supports for each band, the maximum bandwidth and/or minimum bandwidth for the band in the band combination are indicated in the UE capabilities. Note that the minimum bandwidth is indicated only in BCS5 and BCS5 shall not be indicated together with BCS4 for a SUL configuration. For SUL band combinations including FR1 intra-band CA and with BCS4 or BCS5, the Bandwidth Combination Sets for the FR1 intra-band CA are BCS4 or BCS5.

Table 5.5C-1: Supported channel bandwidths per SUL band combination

| SUL configuration | NR Band | Channel bandwidth (MHz) (NOTE 1) | Bandwidth combination set |
| --- | --- | --- | --- |
| SUL\_n24A-n99A | n24 | 5, 10 | 0 |
|  | n99 | 5, 10 |  |
| SUL\_n41A-n80A | n41 | 10, 15, 20, 40, 50, 60, 80, 90, 100 | 0 |
|  | n80 | 5, 10, 15, 20, 25, 30 |  |
|  | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 | 1 |
|  | n80 | 5, 10, 15, 20, 25, 30, 40 |  |
| SUL\_n41A-n81A | n41 | 10, 15, 20, 40, 50, 60, 80, 90, 100 | 0 |
|  | n81 | 5, 10, 15, 20 |  |
| SUL\_n41A-n83A | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 | 0 |
|  | n83 | 5, 10, 15, 20, 30 |  |
| SUL\_n41A-n95A | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 | 0 |
|  | n95 | 5, 10, 15 |  |
| SUL\_n41A-n97A | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 | 0 |
|  | n97 | 5, 10, 15, 20, 25, 30, 40, 50, 60, 80 |  |
|  | n41 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | 1 |
|  | n97 | 5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| SUL\_n41A-n98A | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 | 0 |
|  | n98 | 5, 10, 15, 20, 25, 30, 40 |  |
| SUL\_n41A-n99A | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 | 0 |
|  | n99 | 5, 10 |  |
| SUL\_n48A-n99A | n48 | 5, 10, 15, 20, 40, 50, 60, 80, 90, 100 | 0 |
|  | n99 | 5, 10 |  |
| SUL\_n77A-n80A | n77 | 10, 15, 20, 40, 50, 60, 80, 90, 100 | 0 |
|  | n80 | 5, 10, 15, 20, 25, 30 |  |
| SUL\_n77A-n84A | n77 | 10, 15, 20, 40, 50, 60, 80, 90, 100 | 0 |
|  | n84 | 5, 10, 15, 20 |  |
| SUL\_n77A-n99A | n77 | 10, 15, 20, 40, 50, 60, 80, 90, 100 | 0 |
|  | n99 | 5, 10 |  |
| SUL\_n78A-n80A | n77 | 10, 15, 20, 40, 50, 60, 80, 90, 100 | 0 |
|  | n80 | 5, 10, 15, 20, 25, 30 |  |
|  | n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | 1 |
|  | n80 | 5, 10, 15, 20, 25, 30, 40 |  |
| SUL\_n78A-n81A | n78 | 10, 15, 20, 40, 50, 60, 80, 90, 100 | 0 |
|  | n81 | 5, 10, 15, 20 |  |
|  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | 1 |
|  | n81 | 5, 10, 15, 20 |  |
| SUL\_n78A-n82A | n78 | 10, 15, 20, 40, 50, 60, 80, 90, 100 | 0 |
|  | n82 | 5, 10, 15, 20 |  |
| SUL\_n78A-n83A | n78 | 10, 15, 20, 40, 50, 60, 80, 90, 100 | 0 |
|  | n83 | 5, 10, 15, 20 |  |
|  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | 1 |
|  | n83 | 5, 10, 15, 20, 30 |  |
| SUL\_n78A-n84A | n78 | 10, 15, 20, 40, 50, 60, 80, 90, 100 | 0 |
|  | n84 | 5, 10, 15, 20 |  |
|  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | 1 |
|  | n84 | 5, 10, 15, 20, 25, 30, 40, 50 |  |
| SUL\_n78A-n86A | n78 | 10, 15, 20, 40, 50, 60, 70, 80, 90, 100 | 0 |
|  | n86 | 5, 10, 15, 20 |  |
| SUL\_n79A-n80A | n79 | 40, 50, 60, 80, 100 | 0 |
|  | n80 | 5, 10, 15, 20, 25, 30 |  |
|  | n79 | 40, 50, 60, 80, 100 | 1 |
|  | n80 | 5, 10, 15, 20, 25, 30, 40 |  |
| SUL\_n79A-n81A | n79 | 40, 50, 60, 80, 100 | 0 |
|  | n81 | 5, 10, 15, 20 |  |
| SUL\_n79A-n83A | n79 | 40, 50, 60, 80, 100 | 0 |
|  | n83 | 5, 10, 15, 20, 30 |  |
| SUL\_n79A-n84A | n79 | 40, 50, 60, 80, 100 | 0 |
|  | n84 | 5, 10, 15, 20 |  |
| SUL\_n79A-n95A | n79 | 40, 50, 60, 80, 100 | 0 |
|  | n95 | 5, 10, 15 |  |
| SUL\_n79A-n97A | n79 | 40, 50, 60, 80, 100 | 0 |
|  | n97 | 5, 10, 15, 20, 25, 30, 40, 50, 60, 80 |  |
|  | n79 | 40, 50, 60, 80, 100 | 1 |
|  | n97 | 5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
|  | n79 | See n79 channel bandwidths in Table 5.3.5-1 for each carrier | BCS4 and BCS5 |
|  | n97 | See n97 channel bandwidths in Table 5.3.5-1 for each carrier |  |
| SUL\_n79A-n98A | n79 | 40, 50, 60, 80, 100 | 0 |
|  | n98 | 5, 10, 15, 20, 25, 30, 40 |  |
| NOTE 1: The SCS of each channel bandwidth for NR band refers to Table 5.3.5-1. | | | |

Table 5.5C-2: Supported channel bandwidths per SUL band combination with intra-band non-contiguous CA

| SUL band combination with intra-band non-contiguous CA | SUL configuration | NR Band | Channel bandwidth (MHz) (NOTE 1) | Bandwidth combination set |
| --- | --- | --- | --- | --- |
| SUL\_n41(2A)-n99A | SUL\_n41A-n99A | n41 | See CA\_n41(2A) Bandwidth Combination Set 0 in Table 5.5A.2-1 | 0 |
|  |  | n99 | 5, 10 |  |
| SUL\_n48(2A)-n99A | SUL\_n48A-n99A | n48 | See CA\_n48(2A) Bandwidth Combination Set 0 in Table 5.5A.2-1 | 0 |
|  |  | n99 | 5, 10 |  |
| SUL\_n77(2A)-n99A | SUL\_n77A-n99A | n77 | See CA\_n77(2A) Bandwidth Combination Set 0 in Table 5.5A.2-1 | 0 |
|  |  | n99 | 5, 10 |  |
| SUL\_n78(2A)-n86A | SUL\_n78A-n86A | n78 | See CA\_n78(2A) Bandwidth Combination Set 0 in Table 5.5A.2-1 | 0 |
|  |  | n86 | 5, 10, 15, 20 |  |
| NOTE 1: The SCS of each channel bandwidth for NR band refers to Table 5.3.5-1. | | | | |

Table 5.5C-3: Supported channel bandwidths per SUL band combination with intra-band contiguous CA

| SUL band combination with CA | SUL configuration | NR Band | Channel bandwidth (MHz) (NOTE 1) | Bandwidth combination set |
| --- | --- | --- | --- | --- |
| SUL\_n41C-n80A | SUL\_n41A-n80A | n41 | See CA\_n41C Bandwidth Combination Set 1 in Table 5.5A.1-1 | 0 |
|  | SUL\_n41C-n80A | n80 | 5, 10, 15, 20, 25, 30, 40 |  |
| SUL\_n41C-n83A | SUL\_n41A-n83A | n41 | See CA\_n41C Bandwidth Combination Set 1 in Table 5.5A.1-1 | 0 |
|  | SUL\_n41C-n83A | n83 | 5, 10, 15, 20, 30 |  |
| SUL\_n41C-n95A | SUL\_n41A-n95A | n41 | See CA\_n41C Bandwidth Combination Set 1 in Table 5.5A.1-1 | 0 |
|  | SUL\_n41C-n95A | n95 | 5, 10, 15 |  |
| SUL\_n78C-n80A | SUL\_n78A-n80A | n78 | See CA\_n78C Bandwidth Combination Set 1 in Table 5.5A.1-1 | 0 |
|  | SUL\_n78C-n80A | n80 | 5, 10, 15, 20, 25, 30, 40 |  |
| SUL\_n78C-n81A | SUL\_n78A-n81A | n78 | See CA\_n78C Bandwidth Combination Set 1 in Table 5.5A.1-1 | 0 |
|  | SUL\_n78C-n81A | n81 | 5, 10, 15, 20 |  |
| SUL\_n78C-n84A | SUL\_n78A-n84A | n78 | See CA\_n78C Bandwidth Combination Set 1 in Table 5.5A.1-1 | 0 |
|  | SUL\_n78C-n84A | n84 | 5, 10, 15, 20, 25, 30, 40, 50 |  |
| SUL\_n79C-n80A | SUL\_n79A-n80A | n79 | See CA\_n79C Bandwidth Combination Set 0 in Table 5.5A.1-1 | 0 |
|  | SUL\_n79C-n80A | n80 | 5, 10, 15, 20, 25, 30, 40 |  |
| SUL\_n79C-n83A | SUL\_n79A-n83A | n79 | See CA\_n79C Bandwidth Combination Set 0 in Table 5.5A.1-1 | 0 |
|  | SUL\_n79C-n83A | n83 | 5, 10, 15, 20, 30 |  |
| SUL\_n79C-n95A | SUL\_n79A-n95A | n79 | See CA\_n79C Bandwidth Combination Set 0 in Table 5.5A.1-1 | 0 |
|  | SUL\_n79C-n95A | n95 | 5, 10, 15 |  |
| NOTE 1: The SCS of each channel bandwidth for NR band refers to Table 5.3.5-1. | | | | |

Table 5.5C-4: Supported channel bandwidths per SUL band combination with inter-band CA

| SUL band combination with CA | SUL configuration | NR Band | Channel bandwidth (MHz) (NOTE 1) | Bandwidth combination set |
| --- | --- | --- | --- | --- |
| CA\_n1A\_SUL\_n78A-n80A | SUL\_n78A-n80A | n1 | 5, 10, 15, 20, 25, 30, 40, 50 | 0 |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
|  |  | n80 | 5, 10, 15, 20, 25, 30, 40 |  |
| CA\_n1A\_SUL\_n78A-n81A | SUL\_n78A-n81A | n1 | 5, 10, 15, 20, 25, 30, 40, 50 | 0 |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
|  |  | n81 | 5, 10, 15, 20 |  |
| CA\_n1A\_SUL\_n78A-n84A | SUL\_n78A-n84A | n1 | 5, 10, 15, 20, 25, 30, 40, 50 | 0 |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
|  |  | n84 | 5, 10, 15, 20, 25, 30, 40, 50 |  |
| CA\_n1A\_SUL\_n78C-n84A | SUL\_n78A-n84A | n1 | 5, 10, 15, 20, 25, 30, 40, 50 | 0 |
|  | SUL\_n78C-n84A | n78 | See CA\_n78C Bandwidth Combination Set 1 in Table 5.5A.1-1 |  |
|  |  | n84 | 5, 10, 15, 20, 25, 30, 40, 50 |  |
| CA\_n3A\_SUL\_n41A-n80A | SUL\_n41A-n80A | n3 | 5, 10, 15, 20, 25, 30, 40 | 0 |
|  |  | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 |  |
|  |  | n80 | 5, 10, 15, 20, 25, 30, 40 |  |
| CA\_n3A\_SUL\_n41C-n80A | SUL\_n41A-n80A | n3 | 5, 10, 15, 20, 25, 30, 40 | 0 |
|  | SUL\_n41C-n80A | n41 | See CA\_n41C Bandwidth Combination Set 1 in Table 5.5A.1-1 |  |
|  |  | n80 | 5, 10, 15, 20, 25, 30, 40 |  |
| CA\_n3A\_SUL\_n78A-n80A | SUL\_n78A-n80A | n3 | 5, 10, 15, 20, 25, 30, 40 | 0 |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
|  |  | n80 | 5, 10, 15, 20, 25, 30, 40 |  |
| CA\_n3A\_SUL\_n78C-n80A | SUL\_n78A-n80A | n3 | 5, 10, 15, 20, 25, 30, 40 | 0 |
|  | SUL\_n78C-n80A | n78 | See CA\_n78C Bandwidth Combination Set 1 in Table 5.5A.1-1 |  |
|  |  | n80 | 5, 10, 15, 20, 25, 30, 40 |  |
| CA\_n3A\_SUL\_n79A-n80A | SUL\_n79A-n80A | n3 | 5, 10, 15, 20, 25, 30, 40 | 0 |
|  |  | n79 | 40, 50, 60, 80, 100 |  |
|  |  | n80 | 5, 10, 15, 20, 25, 30, 40 |  |
| CA\_n3A\_SUL\_n79C-n80A | SUL\_n79A-n80A | n3 | 5, 10, 15, 20, 25, 30, 40 | 0 |
|  | SUL\_n79C-n80A | n79 | See CA\_n79C Bandwidth Combination Set 0 in Table 5.5A.1-1 |  |
|  |  | n80 | 5, 10, 15, 20, 25, 30, 40 |  |
| CA\_n28A\_SUL\_n41A-n83A | SUL\_n41A-n83A | n28 | 5, 10, 15, 20, 30 | 0 |
|  |  | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 |  |
|  |  | n83 | 5, 10, 15, 20, 30 |  |
| CA\_n28A\_SUL\_n41C-n83A | SUL\_n41A-n83A | n28 | 5, 10, 15, 20, 30 | 0 |
|  | SUL\_n41C-n83A | n41 | See CA\_n41C Bandwidth Combination Set 1 in Table 5.5A.1-1 |  |
|  |  | n83 | 5, 10, 15, 20, 30 |  |
| CA\_n28A\_SUL\_n79A-n83A | SUL\_n79A-n83A | n28 | 5, 10, 15, 20, 30 | 0 |
|  |  | n79 | 40, 50, 60, 80, 100 |  |
|  |  | n83 | 5, 10, 15, 20, 30 |  |
| CA\_n28A\_SUL\_n79C-n83A | SUL\_n79A-n83A | n28 | 5, 10, 15, 20, 30 | 0 |
|  | SUL\_n79C-n83A | n79 | See CA\_n79C Bandwidth Combination Set 0 in Table 5.5A.1-1 |  |
|  |  | n83 | 5, 10, 15, 20, 30 |  |
| CA\_n41A\_SUL\_n79A-n80A | SUL\_n79A-n80A | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 | 0 |
|  |  | n79 | 40, 50, 60, 80, 100 |  |
|  |  | n80 | 5, 10, 15, 20, 25, 30, 40 |  |
| CA\_n41A\_SUL\_n79A-n83A | SUL\_n79A-n83A | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 | 0 |
|  |  | n79 | 40, 50, 60, 80, 100 |  |
|  |  | n83 | 5, 10, 15, 20, 30 |  |
| CA\_n41A\_SUL\_n79A-n95A | SUL\_n79A-n95A | n41 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | 0 |
|  |  | n79 | 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 |  |
|  |  | n95 | 5, 10, 15 |  |
| CA\_n41A\_SUL\_n79A-n97A | SUL\_n79A-n97A | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 | 0 |
|  |  | n79 | 40, 50, 60, 80, 100 |  |
|  |  | n97 | 5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| CA\_n41A\_SUL\_n79A-n98A | SUL\_n79A-n98A | n41 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | 0 |
|  |  | n79 | 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 |  |
|  |  | n98 | 5, 10, 15, 20, 25, 30, 40 |  |
| CA\_n79A\_SUL\_n41A-n80A | SUL\_n41A-n80A | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 | 0 |
|  |  | n79 | 40, 50, 60, 80, 100 |  |
|  |  | n80 | 5, 10, 15, 20, 25, 30, 40 |  |
| CA\_n79A\_SUL\_n41A-n83A | SUL\_n41A-n83A | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 | 0 |
|  |  | n79 | 40, 50, 60, 80, 100 |  |
|  |  | n83 | 5, 10, 15, 20, 30 |  |
| CA\_n79A\_SUL\_n41A-n95A | SUL\_n41A-n95A | n41 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | 0 |
|  |  | n79 | 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 |  |
|  |  | n95 | 5, 10, 15 |  |
| CA\_n79A\_SUL\_n41A-n97A | SUL\_n41A-n97A | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 | 0 |
|  |  | n79 | 40, 50, 60, 80, 100 |  |
|  |  | n97 | 5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| CA\_n79A\_SUL\_n41A-n98A | SUL\_n41A-n98A | n41 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | 0 |
|  |  | n79 | 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 |  |
|  |  | n98 | 5, 10, 15, 20, 25, 30, 40 |  |
| CA\_n28A-n79A\_SUL\_n41A-n83A | SUL\_n41A-n83A | n28 | 5, 10, 15, 20, 30 | 0 |
|  |  | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 |  |
|  |  | n79 | 40, 50, 60, 80, 100 |  |
|  |  | n83 | 5, 10, 15, 20, 30 |  |
| CA\_n28A-n41A\_SUL\_n79A-n83A | SUL\_n79A-n83A | n28 | 5, 10, 15, 20, 30 | 0 |
|  |  | n41 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 |  |
|  |  | n79 | 40, 50, 60, 80, 100 |  |
|  |  | n83 | 5, 10, 15, 20, 30 |  |
| NOTE 1: The SCS of each channel bandwidth for NR band refers to Table 5.3.5-1. | | | | |

Table 5.5C-5: Supported channel bandwidths per SUL band combination with inter-band CA (two SUL cells)

| SUL band combination with CA | Uplink CA  configuration or SUL configuration | NR Band | Channel bandwidth (MHz) (NOTE 1) | Bandwidth combination set |
| --- | --- | --- | --- | --- |
| CA\_n41A-n95A\_n79A-n98A | SUL\_n41A-n95A  SUL\_n79A-n98A  CA\_n41A-n79A | n41 | 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 | 0 |
| n79 | 10, 20, 30,40, 50, 60, 70, 80, 90, 100 |
| n95 | 5, 10, 15 |
| n98 | 5, 10, 15, 20, 25, 30, 40 |
| CA\_n41A-n98A\_n79A-n95A | SUL\_n41A-n98A  SUL\_n79A-n95A  CA\_n41A-n79A | n41 | 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 | 0 |
| n79 | 10, 20, 30,40, 50, 60, 70, 80, 90, 100 |
| n95 | 5, 10, 15 |
| n98 | 5, 10, 15, 20, 25, 30, 40 |
| CA\_n41A-n83A\_n79A-n98A | SUL\_n41A-n83A  SUL\_n79A-n98A  CA\_n41A-n79A | n41 | 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 | 0 |
| n79 | 10, 20, 30,40, 50, 60, 70, 80, 90, 100 |
| n83 | 5, 10, 15, 20,30 |
| n98 | 5, 10, 15, 20, 25, 30, 40 |
| CA\_n41A-n83A\_n79A-n95A | SUL\_n41A-n83A  SUL\_n79A-n95A  CA\_n41A-n79A | n41 | 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 | 0 |
| n79 | 10, 20, 30,40, 50, 60, 70, 80, 90, 100 |
| n83 | 5, 10, 15, 20,30 |
| n95 | 5, 10, 15 |
| CA\_n78C\_n80A-n84A | SUL\_n78A-n80A  SUL\_n78A-n84A  CA\_n78C | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 See CA\_n78C Bandwidth Combination Set 1 in Table 5.5A.1-1 of TS 38.101-1 | 0 |
| n80 | 5, 10, 15, 20, 25, 30, 40 |
| n84 | 5, 10, 15, 20, 25, 30, 40, 50 |
| CA\_n78C\_n81A-n84A | SUL\_n78A-n81A  SUL\_n78A-n84A  CA\_n78C | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 See CA\_n78C Bandwidth Combination Set 1 in Table 5.5A.1-1 of TS 38.101-1 | 0 |
| n81 | 5, 10, 15, 20 |  |
| n84 | 5, 10, 15, 20, 25, 30, 40, 50 |  |
| NOTE 1: The SCS of each channel bandwidth for NR band refers to Table 5.3.5-1. | | | | |

## ==================End of 2nd changes==================

## ==================Start of 3rd changes=================

## 6.2C Transmitter power for SUL

### 6.2C.1 Configured transmitted power for SUL

When a UE is configured with both NR UL and NR SUL carriers in a serving cell with active transmission either on the UL carrier(s) or SUL carrier, the configured transmit power requirements specified in clause 6.2.4 and 6.2A.4 are applicable for the UL carrier(s) and the SUL carrier, respectively.

If a UE supports a different power class than the default UE power class for NR UL band of SUL combination and the supported power class enables the higher maximum output power for SUL combination than that of the default power class:

– if the field of UE capability *maxUplinkDutyCycle- SULcombination-PC2* is not absent and the average percentage of uplink symbols transmitted in a certain evaluation period is larger than the maximum percentage of uplink symbols that the UE indicates by *maxUplinkDutyCycle- SULcombination-PC2* as defined in TS 38.331 (The exact evaluation period is no less than one radio frame); or

– if the IE P-Max as defined in TS 38.331 [7] is provided and set to the maximum output power of the default power class 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 6.2.4;

– else;

– shall apply all requirements for the supported power class and set the configured transmitted power as specified in clause 6.2.4 (regardless of the average percentage of uplink symbols if the field of UE capability maxUplinkDutyCycle-interBandCA-PC2 is absent).

The average percentage of uplink symbols is defined as 50% × ( DutyNR, x /maxDutyNR,x + DutyNR, y /maxDutyNR,y, ). DutyNR, x, DutyNR, y represent the actual percentage of uplink symbols transmitted in the same evaluation period (The exact evaluation period is no less than one radio frame) for NR Band x, NR Band y respectively maxDutyNR,x,maxDutyNR,y represent the field of UE capability *maxUplinkDutyCycle-PC2-FR1* per band as defined in TS 38.331. For NR Band x or NR Band y,

– if power class of one or both of the bands within the band combination is power class 2 and the corresponding UE capability maxUplinkDutyCycle-PC2-FR1 is absent;

– the corresponding maxDutyNR,x or maxDutyNR,y is equal to 50%;

– else if the band is configured with power class 3;

– the corresponding maxDutyNR,x or maxDutyNR,y is equal to 100%.

### 6.2C.2 ΔTIB,c

For the UE which supports SUL band combination, ΔTIB,c in Tables below applies. Unless otherwise stated, ΔTIB,c is set to zero.

Table 6.2C.2-1: ΔTIB,c due to SUL

| Band combination for SUL | ΔTIB,c for NR bands (dB)3 | |
| --- | --- | --- |
| Component band in order of bands in configuration4 | |
| SUL\_n41-n80 | 0.31 / 0.82 | 0.5 |
| SUL\_n41-n81 | 0.3 | 0.3 |
| SUL\_n41-n83 | 0.3 | 0.3 |
| SUL\_n41-n97 | 0.5 | 0.5 |
| SUL\_n41-n98 | 0.5 | 0.5 |
| SUL\_n41-n99 | 0.41 / 0.92 | 0.3 |
| SUL\_n48-n99 | 0.6 | 0.8 |
| SUL\_n77-n80 | 0.8 | 0.6 |
| SUL\_n77-n84 | 0.8 | 0.6 |
| SUL\_n77-n99 | 0.6 | 0.8 |
| SUL\_n78-n80 | 0.8 | 0.6 |
| SUL\_n78-n81 | 0.8 | 0.6 |
| SUL\_n78-n82 | 0.8 | 0.6 |
| SUL\_n78-n83 | 0.8 | 0.5 |
| SUL\_n78-n84 | 0.8 | 0.3 |
| SUL\_n78-n86 | 0.8 | 0.6 |
| SUL\_n79-n83 | 0.8 | 0.5 |
| SUL\_n79-n97 | 0.8 | 0.3 |
| SUL\_n79-n98 | 0.8 | 0.3 |
| NOTE 1: The requirement is applied for UE transmitting on the frequency range of 2515 – 2690MHz.  NOTE 2: The requirement is applied for UE transmitting on the frequency range of 2496 - 2515MHz.  NOTE 3: “-” denotes ΔTIB,c = 0.  NOTE 4: The component band order in the configuration should be listed by the order of NR bands such as for SUL\_n41-n81 the band order from left to right is n41 and n81. | | |

Table 6.2C.2-2: ΔTIB,c for SUL band combination (Three bands)

|  |  |  |  |
| --- | --- | --- | --- |
| Band combination for SUL | ΔTIB,c for NR bands (dB)3 | | |
| Component band in order of bands in configuration4 | | |
| CA\_n1\_SUL\_n78-n80 | 0.6 | 0.8 | 0.6 |
| CA\_n1\_SUL\_n78-n81 | 0.3 | 0.8 | 0.6 |
| CA\_n1\_SUL\_n78-n84 | 0.6 | 0.8 | 0.6 |
| CA\_n3\_SUL\_n41-n80 | 0.5 | 0.31 / 0.82 | 0.5 |
| CA\_n3\_SUL\_n78-n80 | 0.6 | 0.8 | 0.6 |
| CA\_n3\_SUL\_n79-n80 | 0.3 | 0.8 | 0.3 |
| CA\_n28\_SUL\_n41-n83 | 0.3 | 0.3 | 0.3 |
| CA\_n28\_SUL\_n79-n83 | 0.5 | 0.8 | 0.5 |
| CA\_n41\_SUL\_n79-n80 | 0.31 / 0.82 | 0.8 | 0.3 |
| CA\_n41\_SUL\_n79-n83 | 0.3 | 0.8 | 0.5 |
| CA\_n41\_SUL\_n79-n95 | 0.3 | 0.8 | 0.3 |
| CA\_n41\_SUL\_n79-n97 | 0.5 | 0.5 | 0.5 |
| CA\_n41\_SUL\_n79-n98 | 0.3 | 0.8 | 0.3 |
| CA\_n78C\_n80A-n84A | 0.8 | 0.6 | 0.6 |
| CA\_n78C\_n81A-n84A | 0.8 | 0.6 | 0.3 |
| CA\_n79\_SUL\_n41-n80 | 0.31 / 0.82 | 0.8 | 0.3 |
| CA\_n79\_SUL\_n41-n83 | 0.3 | 0.8 | 0.5 |
| CA\_n79\_SUL\_n41-n95 | 0.3 | 0.8 | 0.3 |
| CA\_n79\_SUL\_n41-n97 | 0.5 | 0.5 | 0.5 |
| CA\_n79\_SUL\_n41-n98 | 0.3 | 0.8 | 0.3 |
| NOTE 1: The requirement is applied for UE transmitting on the frequency range of 2515-2690MHz.  NOTE 2: The requirement is applied for UE transmitting on the frequency range of 2496-2515MHz.  NOTE 3: “-” denotes ΔTIB,c = 0.  NOTE 4: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1\_SUL\_n78-n80 the band order from left to right is n1, n78 and n80. | | | |

Table 6.2C.2-3: ΔTIB,c for SUL band combination (Four bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Band combination for SUL | ΔTIB,c for NR bands (dB)1 | | | |
| Component band in order of bands in configuration2 | | | |
| CA\_n28-n79\_SUL\_n41-n83 | 0.3 | 0.3 | 0.5 | 0.3 |
| CA\_n28-n41\_SUL\_n79-n83 | 0.3 | 0.3 | 0.5 | 0.3 |
| CA\_n41A-n95A\_n79A-n98A | 0.3 | 0.8 | - | 0.3 |
| CA\_n41A-n98A\_n79A-n95A | 0.5 | 0.8 | 0.5 | - |
| CA\_n41A-n83A\_n79A-n98A | 0.3 | 0.8 | 0.3 | 0.3 |
| CA\_n41A-n83A\_n79A-n95A | 0.3 | 0.8 | 0.3 | - |
| NOTE 1: “-” denotes ΔTIB,c = 0.  NOTE 2: The component band order in the configuration should be listed by the order of NR bands and SUL band, such as for CA\_n28-n79\_SUL\_n41-n83 the band order from left to right is n28, n41, n79 and n83. | | | | |

## ==================End of 3rd changes=================

## ==================Start of 4th changes=================

### 7.3C.3 ΔRIB,c for SUL

#### 7.3C.3.1 General

For a UE supporting a SUL configuration, the ΔRIB,c applies for both SC and SUL operation.

#### 7.3C.3.2 SUL band combination

For the UE which supports SUL band combiantion, the minimum requirement for reference sensitivity in clause 7.3C.2 shall be increased by the amount given in ΔRIB,c defined in clause 7.3C.3.2 for the applicable operating bands. Unless otherwise stated, ΔRIB,c is set to zero.

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

- When the operating band frequency range is ≤ 1 GHz, the applicable additional ΔRIB,c shall be the average value for all band combinations defined in clause 7.3A, 7.3B, 7.3C in this specification and 7.3A, 7.3B 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 ΔRIB,c among the different supported band combinations involving such band shall be applied

- When the operating band frequency range is > 1 GHz, the applicable additional ΔRIB,c shall be the maximum value for all band combinations defined in clause 7.3A, 7.3B, 7.3C in this specification and 7.3A, 7.3B in TS 38.101-3 [3] for the applicable operating bands.

##### 7.3C.3.2.1 ΔRIB,c for two bands

Table 7.3C.3.2.1-1: ΔRIB,c due to SUL (two bands)

| Band combination for SUL | **ΔRIB,c for NR band (dB)2** | |
| --- | --- | --- |
| **Component band in order of bands in configuration3** | |
| SUL\_n41-n80 | 0.51 | - |
| SUL\_n41-n95 | 0.2 | - |
| SUL\_n41-n98 | 0.2 | - |
| SUL\_n48-n99 | 0.5 | - |
| SUL\_n77-n80 | 0.5 | - |
| SUL\_n77-n84 | 0.5 | - |
| SUL\_n77-n99 | 0.5 | - |
| SUL\_n78-n80 | 0.5 | - |
| SUL\_n78-n81 | 0.5 | - |
| SUL\_n78-n82 | 0.5 | - |
| SUL\_n78-n83 | 0.5 | - |
| SUL\_n78-n84 | 0.5 | - |
| SUL\_n78-n86 | 0.5 | - |
| SUL\_n79-n83 | 0.5 | - |
| SUL\_n79-n97 | 0.5 | - |
| SUL\_n79-n98 | 0.5 | - |
| NOTE 1: The requirement is applied for UE transmitting on the frequency range of 2496 – 2515 MHz.  NOTE 2: “-” denotes ΔRIB,c = 0 and ΔRIB,c is not applicable to SUL band(s).  NOTE 3: The component band order in the configuration should be listed by the order of NR band and SUL band, such as for SUL\_n41-n80 the band order from left to right is n41 and n80. | | |

##### 7.3C.3.2.2 ΔRIB,c for three bands

Table 7.3C.3.2.2-1: ΔRIB,c due to SUL (three bands)

|  |  |  |  |
| --- | --- | --- | --- |
| **Band combination for SUL** | **ΔRIB,c for NR bands (dB)2** | | |
| **Component band in order of bands in configuration3** | | |
| CA\_n1\_SUL\_n78-n80 | 0.2 | 0.5 | - |
| CA\_n1\_SUL\_n78-n81 | - | 0.5 | - |
| CA\_n1\_SUL\_n78-n84 | 0.2 | 0.5 | - |
| CA\_n3\_SUL\_n41-n80 | - | 0.51 | - |
| CA\_n3\_SUL\_n78-n80 | 0.2 | 0.5 | - |
| CA\_n3\_SUL\_n79-n80 | - | 0.5 | - |
| CA\_n28\_SUL\_n41-n83 | 0.2 | - | - |
| CA\_n28\_SUL\_n79-n83 | 0.2 | 0.5 | - |
| CA\_n41\_SUL\_n79-n80 | 0.5 | 0.5 | - |
| CA\_n41\_SUL\_n79-n83 | 0.5 | 0.5 | - |
| CA\_n41\_SUL\_n79-n95 | - | 0.5 | - |
| CA\_n41\_SUL\_n79-n97 | - | 0.8 | - |
| CA\_n41\_SUL\_n79-n98 | - | 0.5 | - |
| CA\_n79\_SUL\_n41-n80 | 0.5 | 0.5 | - |
| CA\_n79\_SUL\_n41-n83 | 0.5 | 0.5 | - |
| CA\_n79\_SUL\_n41-n95 | - | 0.5 | - |
| CA\_n79\_SUL\_n41-n97 | - | 0.8 | - |
| CA\_n79\_SUL\_n41-n98 | - | 0.5 | - |
| NOTE 1: The requirement is applied for UE transmitting on the frequency range of 2496 – 2515 MHz.  NOTE 2: “-” denotes ΔRIB,c = 0 and ΔRIB,c is not applicable to SUL band(s).  NOTE 3: The component band order in the configuration should be listed by the order of NR bands and SUL band, such as for CA\_n1\_SUL\_n78-n80 the band order from left to right is n1, n78 and n80. | | | |

##### 7.3C.3.2.3 ΔRIB,c for four bands

Table 7.3C.3.2.3-1: ΔRIB,c due to SUL (four bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Band combination for SUL | ΔRIB,c for NR bands (dB)1 | | | |
| Component band in order of bands in configuration2 | | | |
| CA\_n28-n79\_SUL\_n41-n83 | 0.2 | - | 0.8 | - |
| CA\_n28-n41\_SUL\_n79-n83 | 0.2 | - | 0.8 | - |
| CA\_n41A-n95A\_n79A-n98A | 0.5 | 0.5 | - | - |
| CA\_n41A-n98A\_n79A-n95A | 0.5 | 0.5 | - | - |
| CA\_n41A-n83A\_n79A-n98A | 0.5 | 0.5 | - | - |
| CA\_n41A-n83A\_n79A-n95A | 0.5 | 0.5 | - | - |
| NOTE 1: “-” denotes ΔRIB,c = 0 and ΔRIB,c is not applicable to SUL band(s).  NOTE 2: The component band order in the configuration should be listed by the order of NR bands and SUL band, such as for CA\_n28-n79\_SUL\_n41-n83 the band order from left to right is n28, n41, n79 and n83. | | | | |

## ==================End of 4th changes=================