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5G; NR Carrier Aggregation band combinations with two SUL cells (3GPP TR 38.718-00-02 version 18.0.0 Release 18)



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## Foreword

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  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

In the present document, modal verbs have the following meanings:

shall indicates a mandatory requirement to do something

shall not indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

| should     | indicates a recommendation to do something     |  |  |  |
|------------|--|--|--|--|
| should not | indicates a recommendation not to do something |  |  |  |
| may        | indicates permission to do something           |  |  |  |
| need not   | indicates permission not to do something       |  |  |  |

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

| can    | indicates that something is possible   |  |  |  |
|--------|--|--|--|--|
| cannot | indicates that something is impossible |  |  |  |

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

| will     | indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document     |
|----------|--|
| will not | indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document |
| might    | indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document           |

| might not    | indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document |
|--------------|--|
| In addition: |  |

is

- s (or any other verb in the indicative mood) indicates a statement of fact
- is not (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

## 1 Scope

The present document is a technical report on NR carrier aggregation band combinations with two SUL cells under Rel-18 timeframe. The purpose is to gather the relevant background information and studies in order to address carrier aggregation band combinations with two SUL cells for the Rel-18 band combinations in Table 1-1 and Table 1-2.

## 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
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- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.
- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] RP-2235533, New WID on NR CA band combinations with two SUL cells in Rel-18, RAN#98

# 3 Definitions of terms, symbols and abbreviations

#### 3.1 Terms

For the purposes of the present document, the terms given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

example: text used to clarify abstract rules by applying them literally.

## 3.2 Symbols

For the purposes of the present document, the following symbols apply:

<symbol><Explanation> $\Delta R_{IB,c}$ Allowed reference sensitivity relaxation due to support for inter-band CA operation, for serving cell c. $\Delta T_{IB,c}$ Allowed maximum configured output power relaxation due to support for inter-band CA operation, for serving cell c.

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

| BS  | Base Station              |
|-----|---------------------------|
| BCS | Bandwidth Combination Set |
| CA  | Carrier Aggregation       |
| CC  | Component Carriers        |
| DC  | Dual Connectivity         |

| DL      | Downlink                              |
|---------|---------------------------------------|
| E-UTRA  | Evolved UMTS Terrestrial Radio Access |
| FDD     | Frequency Division Duplex             |
| MPR     | Allowed maximum power reduction       |
| MSD     | Maximum Sensitivity Degradation       |
| NR      | New Radio                             |
| REFSENS | Reference Sensitivity power level     |
| SCS     | Subcarrier spacing                    |
| TDD     | Time Division Duplex                  |
| UE      | User Equipment                        |
| UL      | Uplink                                |
|         |                                       |

# 4 Background

The present document is a technical report on NR carrier aggregation band combinations with two SUL cells under Rel-18 timeframe. The document covers each band combination specific issues (i.e. one sub-clause defined per band combination)

## 4.1 Background information

NR CA band combinations with SUL band were introduced from Rel-16. In Rel-16, intra-band CA with SUL band combination was supported, and the CA configuration was extended to inter-band CA with SUL band combination in Rel-17.

With fast deployment of 5G in China, more spectrum currently utilized by GSM, UMTS and LTE will be evolved into NR deployment recently. As an example, 1.9GHz and 2GHz TDD bands are previously used by 4G and 3G, which are specified as NR TDD bands n39 and n34 in Rel-15 and also specified as SUL bands n98 and n95 in Rel-16 and Rel-17 respectively. The spectrum for these two bands themselves are not very large, thus single SUL band may not fully comply with the fast increased UL usage demanded by the operator. Therefore, NR CA configurations with two SUL band combinations, i.e. two SUL bands in two cells together with other TDD NR band(s), are emerging as a prospective solution for operators. Similarly, 700MHz, 850MHz, 900MHz, 1.8GHz and 2.1GHz bands defined as SUL bands n83, n89, n81, n80 and n84 in which 2 SUL bands in conjunction with NR TDD bands, e.g. n78, n79 are highly interested by operators holding the spectrum to boost the wide band UL performance.

It is known that SUL band combination includes one SUL band and one NR band in a single cell. Aggregating a SUL band combination with another NR band and follow CA framework to specify the band combination specific requirements was already supported in previous SUL basket WI. However, the current SUL basket WI only considers one SUL band. To address the specific spectrum demand by operators, it is preferred to have a dedicated spectrum WI for NR CA combinations with two SUL cells that follow CA framework specified by both RAN1 and RAN4 specifications.

In addition, since both SUL bands and NR TDD bands could support different power classes, the requirements for NR CA with two SUL cells should cover at least PC3 and PC2 cases in Rel-18.

## 4.2 WI objective

The objectives of the core part are as follows:

- Specify the PC3 band-combination specific RF requirements for the listed CA configurations with two SUL cells including at least
  - Applicable frequencies if necessary
  - Applicable bandwidths and bandwidth sets if necessary
- Analyse combinations that have self-desensitization due to following reasons:
  - TX Harmonic and/or intermodulation overlap of receive band
  - TX signal overlap of receiver harmonic frequency

- TX frequency being in close proximity of one of the receive bands
- Any other identified reasons such that insufficient cross band isolation, harmonic mixing
- For the combination where self-desensitization exists, specify at least needed
  - $\Delta T_{IB, c}$  and  $\Delta R_{IB, c}$
  - Reference sensitivity exceptions including MSD test cases
  - Exceptions to the out-of-band blocking requirement

# 4.3 TR Maintenance

A single company is responsible for introducing all approved TPs in the current TR, i.e. TR editor. However, it is the responsibility of the contact person of each band/band combination to ensure that the TPs related to the band/band combination have been implemented.

# 5 NR Carrier Aggregation band combinations with two SUL cells

- 5.1 CA\_n41A-n83A\_n79A-n95A
- 5.1.1 Operating bands

#### Table 5.1.1.1-1: Operating bands for inter-band CA with two SUL cells

| NR CA Band             | NR Uplink (UL) operating<br>Band band |                     | Downlink (DL) operating<br>band            | Duplex<br>Mode |
|------------------------|---------------------------------------|---------------------|--|----------------|
|                        |                                       | BS receive / UE     |  |                |
|                        |                                       | transmit            | BS transmit / UE receive                   |                |
|                        |                                       | FUL_low - FUL_high  | F <sub>DL_low</sub> – F <sub>DL_high</sub> |                |
| CA_n41A-n83A_n79A-n95A | n41                                   | 2496 MHz – 2690 MHz | 2496 MHz – 2690 MHz                        | TDD            |
|                        | n79                                   | 4400 MHz – 5000 MHz | 4400 MHz – 5000 MHz                        | TDD            |
|                        | n83                                   | 703 MHz – 748 MHz   | N/A  | SUL            |
|                        | n95                                   | 2010 MHz – 2025 MHz | N/A  | SUL            |

## 5.1.2 Configurations

#### Table 5.1.2-1: Supported channel bandwidths for inter-band CA with two SUL cells

| SUL band combination with CA | Uplink CA<br>configuration or<br>SUL configuration | NR<br>Band | Channel bandwidth<br>(MHz) (NOTE 1)                           | Bandwidth<br>combination<br>set |
|------------------------------|--|------------|---|---------------------------------|
| CA_n41A-n83A_n79A-n95A       | SUL_n41A-n83A<br>SUL_n79A-n95A<br>CA_n41A-n79A     | n41        | 10, 15, 20, 25, 30, 35,<br>40, 45, 50, 60, 70, 80,<br>90, 100 | 0                               |
|                              |  | n79        | 10, 20, 30,40, 50, 60,<br>70, 80, 90, 100                     |                                 |
|                              |  | n83        | 5, 10, 15, 20,30  |                                 |
|                              |  | n95        | 5, 10, 15   |                                 |

#### 5.1.3 $\Delta T_{\text{IB}}$ and $\Delta R_{\text{IB}}$ values

For CA\_n41A-n83A\_n79A-n95A, the  $\Delta T_{IB,c}$  values are reused from CA\_n41A-n79A and SUL\_n41A-n83A, and  $\Delta R_{IB,c}$ values are reused from CA\_n41A-n79A.

| Band combination for  | ΔT <sub>IB,c</sub> for NR bands (dB) <sup>1</sup>              |     |     |   |  |
|---|--|-----|-----|---|--|
| SUL   | Component band in order of bands in configuration <sup>2</sup> |     |     |   |  |
| CA_n41A-n83A_n79A-<br>n95A  | 0.3  | 0.3 | 0.8 | - |  |
| NOTE 1: "-" denotes $\Delta T_{IB,c} = 0$ .   |  |     |     |   |  |
| 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_n41A-n83A_n79A-n95A the band order from left to right is           |  |     |     |   |  |
| n41, n83, n79, n9   | n41, n83, n79, n95.  |     |     |   |  |

| Band combination for   | ΔR <sub>IB,c</sub> for NR bands (dB) <sup>1</sup>              |   |     |   |  |
|--|--|---|-----|---|--|
| SUL  | Component band in order of bands in configuration <sup>2</sup> |   |     |   |  |
| CA_n41A-n83A_n79A-<br>n95A   | 0.5  | - | 0.5 | - |  |
| <ul> <li>NOTE 1: "-" denotes ΔR<sub>IB,c</sub> = 0 and ΔR<sub>IB,c</sub> is not applicable to SUL band(s).</li> <li>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_n41A-n83A_n79A-n95A the band order from left to right is n41, n83, n79, n95.</li> </ul> |  |   |     |   |  |

#### 5.2 CA\_n41A-n83A\_n79A-n98A

#### **Operating bands** 5.2.1

| Table 5.2.1.1-1: Operatin | g bands for inter-band CA with two SUL cells |
|---------------------------|--|
|---------------------------|--|

| NR CA Band             | NR   | Uplink (UL) operating | Downlink (DL) operating        | Duplex |
|------------------------|------|-----------------------|--------------------------------|--------|
|                        | Band | band                  | band                           | Mode   |
|                        |      | BS receive / UE       |                                |        |
|                        |      | transmit              | BS transmit / UE receive       |        |
|                        |      | FUL_low - FUL_high    | $F_{DL_{low}} - F_{DL_{high}}$ |        |
| CA_n41A-n83A_n79A-n98A | n41  | 2496 MHz – 2690 MHz   | 2496 MHz – 2690 MHz            | TDD    |
|                        | n79  | 4400 MHz – 5000 MHz   | 4400 MHz – 5000 MHz            | TDD    |
|                        | n83  | 703 MHz – 748 MHz     | N/A                            | SUL    |
|                        | n98  | 1880 MHz – 1920 MHz   | N/A                            | SUL    |

## 5.2.2 Configurations

| SUL band combination with CA | Uplink CA<br>configuration or<br>SUL configuration | NR<br>Band | Channel bandwidth<br>(MHz) (NOTE 1)                           | Bandwidth<br>combination<br>set |
|------------------------------|--|------------|---|---------------------------------|
| CA_n41A-n83A_n79A-n98A       | SUL_n41A-n83A<br>SUL_n79A-n98A<br>CA_n41A-n79A     | n41        | 10, 15, 20, 25, 30, 35,<br>40, 45, 50, 60, 70, 80,<br>90, 100 | 0                               |
|                              |  | n79        | 10, 20, 30,40, 50, 60,<br>70, 80, 90, 100<br>5, 10, 15, 20,30 |                                 |
|                              |  | n98        | 5, 10, 15, 20, 25, 30,<br>40                                  |                                 |

#### Table 5.2.2-1: Supported channel bandwidths for inter-band CA with two SUL cells

#### 5.2.3 $\Delta T_{IB}$ and $\Delta R_{IB}$ values

For CA\_n41A-n83A\_n79A-n98A, the  $\Delta T_{IB,c}$  values are reused from CA\_n41A-n79A, SUL\_n41A-n83A and SUL\_n79A-n98A, and  $\Delta R_{IB,c}$  values are reused from CA\_n41A-n79A.

| Γable 5.2.3-1: ΔT <sub>II</sub> | 3,c for inter-band | CA with two SUL cells |
|---------------------------------|--------------------|-----------------------|
|---------------------------------|--------------------|-----------------------|

| Band combination for       | ΔT <sub>IB,c</sub> for NR bands (dB) <sup>1</sup>  |     |     |     |  |
|----------------------------|--|-----|-----|-----|--|
| SUL                        | Component band in order of bands in configuration <sup>2</sup>                             |     |     |     |  |
| CA_n41A-n83A_n79A-<br>n98A | 0.3  | 0.3 | 0.8 | 0.3 |  |
| NOTE 1: "-" denotes ΔTIB,c | NOTE 1: "-" denotes $\Delta T_{IB,c} = 0$ .  |     |     |     |  |
| NOTE 2: The component b    | 2: The component band order in the configuration should be listed by the order of NR bands |     |     |     |  |
| and SUL band, s            | such as for CA_n41A-n83A_n79A-n95A the band order from left to right is                    |     |     |     |  |
| n41, n83, n79, n9          | 5.   |     |     |     |  |

Table 5.2.3-2:  $\Delta R_{IB,c}$  for inter-band CA with two SUL cells

| Band combination for       | ΔR <sub>IB,c</sub> for NR bands (dB) <sup>1</sup>   |                     |                     |                 |  |  |
|----------------------------|---|---------------------|---------------------|-----------------|--|--|
| SUL                        | Component band in order of bands in configuration <sup>2</sup>                            |                     |                     |                 |  |  |
| CA_n41A-n83A_n79A-<br>n98A | 0.5   | -                   | 0.5                 | -               |  |  |
| NOTE 1: "-" denotes ΔRIB,c | "-" denotes $\Delta R_{IB,c} = 0$ and $\Delta R_{IB,c}$ is not applicable to SUL band(s). |                     |                     |                 |  |  |
| NOTE 2: The component b    | oand order in the co  | onfiguration should | be listed by the or | der of NR bands |  |  |
| and SUL band, s            | and SUL band, such as for CA_n41A-n83A_n79A-n95A the band order from left to right is     |                     |                     |                 |  |  |
| n41, n83, n79, n9          | 95.   |                     |                     |                 |  |  |

## 5.3 CA\_n41A-n95A\_n79A-n98A

#### 5.3.1 Operating bands

#### Table 5.3.1.1-1: Operating bands for inter-band CA with two SUL cells

| NR CA Band | NR   | Uplink (UL) operating                      | Downlink (DL) operating                    | Duplex |
|------------|------|--|--|--------|
|            | Band | band                                       | band                                       | Mode   |
|            |      | BS receive / UE                            |  |        |
|            |      | transmit                                   | BS transmit / UE receive                   |        |
|            |      | F <sub>UL_low</sub> – F <sub>UL_high</sub> | F <sub>DL_low</sub> – F <sub>DL_high</sub> |        |

| CA_n41A-n95A_n79A-n98A | n41 | 2496 MHz – 2690 MHz | 2496 MHz – 2690 MHz | TDD |
|------------------------|-----|---------------------|---------------------|-----|
|                        | n79 | 4400 MHz – 5000 MHz | 4400 MHz – 5000 MHz | TDD |
|                        | n95 | 2010 MHz – 2025 MHz | N/A                 | SUL |
|                        | n98 | 1880 MHz – 1920 MHz | N/A                 | SUL |

## 5.3.2 Configurations

| SUL band combination with CA | Uplink CA<br>configuration or<br>SUL configuration | NR<br>Band | Channel bandwidth<br>(MHz) (NOTE 1)       | Bandwidth<br>combination<br>set |
|------------------------------|--|------------|---|---------------------------------|
|                              | SUL_n41A-n95A                                      |            | 10, 15, 20, 25, 30, 35,                   |                                 |
| CA_n41A-n95A_n79A-n98A       | SUL_n79A-n98A<br>CA_n41A-n79A                      | n41        | 40, 45, 50, 60, 70, 80,<br>90, 100        | 0                               |
|                              |  | n79        | 10, 20, 30,40, 50, 60,<br>70, 80, 90, 100 |                                 |
|                              |  | n95        | 5, 10, 15                                 |                                 |
|                              |  | n98        | 5, 10, 15, 20, 25, 30,<br>40              |                                 |

## 5.3.3 $\Delta T_{IB}$ and $\Delta R_{IB}$ values

For CA\_n41A-n95A\_n79A-n98A, the  $\Delta T_{IB,c}$  values are reused from CA\_n41A-n79A and SUL\_n79A-n98A, and  $\Delta R_{IB,c}$  values are reused from CA\_n41A-n79A.

| Band combination for   | ΔT <sub>IB,c</sub> for NR bands (dB) <sup>1</sup>              |                     |                     |                 |  |
|--|--|---------------------|---------------------|-----------------|--|
| SUL  | Component band in order of bands in configuration <sup>2</sup> |                     |                     |                 |  |
| CA_n41A-n95A_n79A-   | 0.3  | -                   | 0.8                 | 0.3             |  |
| n98A   | 0.0  |                     | 0.0                 | 0.0             |  |
| NOTE 1: "-" denotes ΔTIB,c   | $_{,c} = 0.$   |                     |                     |                 |  |
| NOTE 2: The component b  | band order in the co   | onfiguration should | be listed by the or | der of NR bands |  |
| and SUL band, such as for CA_n41A-n83A_n79A-n95A the band order from left to right i |  |                     |                     |                 |  |
| n41, n83, n79, n9  | 95.  |                     |                     | -               |  |

| <b>Γable 5.3.3-2: ΔR</b> <sub>IE</sub> | <sub>c</sub> for inter-band | CA with two S | SUL cells |
|--|-----------------------------|---------------|-----------|
|--|-----------------------------|---------------|-----------|

| Band combination for   | ΔR <sub>IB,c</sub> for NR bands (dB) <sup>1</sup>              |   |     |   |  |
|--|--|---|-----|---|--|
| SUL  | Component band in order of bands in configuration <sup>2</sup> |   |     |   |  |
| CA_SUL_n41A-<br>n95A_SUL_n79A-n98A   | 0.5  | - | 0.5 | - |  |
| <ul> <li>NOTE 1: "-" denotes ΔR<sub>IB,c</sub> = 0 and ΔR<sub>IB,c</sub> is not applicable to SUL band(s).</li> <li>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_n41A-n83A_n79A-n95A the band order from left to right is n41, n83, n79, n95.</li> </ul> |  |   |     |   |  |

# 5.4 CA\_n41A-n98A\_n79A-n95A

## 5.4.1 Operating bands

#### Table 5.4.1.1-1: Operating bands for inter-band CA with two SUL cells

| NR CA Band             | NR<br>Band | Uplink (UL) operating<br>band              | Downlink (DL) operating<br>band            | Duplex<br>Mode |
|------------------------|------------|--|--|----------------|
|                        |            | BS receive / UE                            |  |                |
|                        |            | transmit                                   | BS transmit / UE receive                   |                |
|                        |            | F <sub>UL_low</sub> – F <sub>UL_high</sub> | F <sub>DL_low</sub> – F <sub>DL_high</sub> |                |
| CA_n41A-n98A_n79A-n95A | n41        | 2496 MHz – 2690 MHz                        | 2496 MHz – 2690 MHz                        | TDD            |
|                        | n79        | 4400 MHz – 5000 MHz                        | 4400 MHz – 5000 MHz                        | TDD            |
|                        | n95        | 2010 MHz – 2025 MHz                        | N/A  | SUL            |
|                        | n98        | 1880 MHz – 1920 MHz                        | N/A  | SUL            |

## 5.4.2 Configurations

#### Table 5.4.2-1: Supported channel bandwidths for inter-band CA with two SUL cells

| SUL band combination with CA | Uplink CA<br>configuration or<br>SUL configuration | NR<br>Band | Channel bandwidth<br>(MHz) (NOTE 1) | Bandwidth<br>combination<br>set |
|------------------------------|--|------------|-------------------------------------|---------------------------------|
|                              | SUL_n41A-n98A                                      |            | 10, 15, 20, 25, 30, 35,             |                                 |
| CA_n41A-n98A_n79A-n95A       | SUL_n79A-n95A                                      | n41        | 40, 45, 50, 60, 70, 80,             | 0                               |
|                              | CA_n41A-n79A                                       |            | 90, 100                             |                                 |
|                              |  | p70        | 10, 20, 30,40, 50, 60,              |                                 |
|                              |  | 1179       | 70, 80, 90, 100                     |                                 |
|                              |  | n95        | 5, 10, 15                           |                                 |
|                              |  | n08        | 5, 10, 15, 20, 25, 30,              |                                 |
|                              |  | 1190       | 40                                  |                                 |

#### 5.4.3 $\Delta T_{IB}$ and $\Delta R_{IB}$ values

For CA\_n41A-n98A\_n79A-n95A, the  $\Delta T_{IB,c}$  values are reused from CA\_n41A-n79A and SUL\_n41A-n98A, and  $\Delta R_{IB,c}$  values are reused from CA\_n41A-n79A.

| Table 5.4.3-1: ΔT <sub>IB,c</sub> for | inter-band CA | with two SUL cells |
|---------------------------------------|---------------|--------------------|
|---------------------------------------|---------------|--------------------|

| Band combination for       | ΔT <sub>IB,c</sub> for NR bands (dB) <sup>1</sup>                                       |     |     |   |  |
|----------------------------|---|-----|-----|---|--|
| SUL                        | Component band in order of bands in configuration <sup>2</sup>                          |     |     |   |  |
| CA_n41A-n98A_n79A-<br>n95A | 0.5   | 0.5 | 0.8 | - |  |
| NOTE 1: "-" denotes ΔTIB,c | $_{3,c} = 0.$   |     |     |   |  |
| NOTE 2: The component b    | The component band order in the configuration should be listed by the order of NR bands |     |     |   |  |
| and SUL band, s            | such as for CA_ n41A-n83A _n79A-n95A the band order from left to right                  |     |     |   |  |
| is n41, n83, n79,          | n95.  |     |     |   |  |

| Band combination for   |  | ΔR <sub>IB,c</sub> for NR bands (dB) <sup>1</sup> |     |   |  |  |
|--|--|---|-----|---|--|--|
| SUL  | Component band in order of bands in configuration <sup>2</sup> |   |     |   |  |  |
| CA_ n41A-n98A_n79A-<br>n95A  | 0.5  | -   | 0.5 | - |  |  |
| <ul> <li>NOTE 1: "-" denotes ΔR<sub>IB,c</sub> = 0 and ΔR<sub>IB,c</sub> is not applicable to SUL band(s).</li> <li>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_ n41A-n83A _n79A-n95A the band order from left to right is n41, n83, n79, n95.</li> </ul> |  |   |     |   |  |  |

Table 5.4.3-2:  $\Delta R_{IB,c}$  for inter-band CA with two SUL cells

#### 5.5 CA\_n78\_n80-n84

#### 5.5.1 Operating bands

#### Table 5.5.1-1: Operating bands for inter-band CA with two SUL cells

| NR Band combination for SUL | NR Band<br>(Table 5.2-1) |
|-----------------------------|--------------------------|
| CA_n78C_n80A-n84A           | n78, n80, n84            |

#### 5.5.2 Configurations

#### Table 5.5.2-1: Supported channel bandwidths for inter-band CA with two SUL cells

| SUL band combination with CA   | UL configuration                          | NR<br>Band | Channel bandwidth (MHz) (NOTE 1)  | Bandwidth<br>combination<br>set |
|--|---|------------|---|---------------------------------|
| CA_n78C_n80A-n84A  | SUL_n78A-n80A<br>SUL_n78A-n84A<br>CA_n78C | n78        | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90,<br>100<br>See CA_n78C Bandwidth Combination Set<br>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   |                                 |
| NOTE 1: The SCS of each channel bandwidth for NR band refers to Table 5.3.5-1. |   |            |   |                                 |

#### 5.5.3 Maximum output power

For UL configuration CA\_n78C, the requirement in clause 6.2A.1.1 from 38.101-1 is applicable.

For other UL configurations, the requirement for each band in clause 6.2.1 from 38.101-1 is applicable.

#### 5.5.4 Spurious emission band UE co-existence

There is only single UL band in uplink so the requirement for each band in clause 6.5.3.2 from 38.101-1 is applicable.

#### 5.5.5 REFSENS requirements

For SUL operation with CA, the reference receive sensitivity (REFSENS) requirement for downlink bands specified in clause 7.3A.2 from TS 38.101-1 is applicable.

Since the 2<sup>nd</sup> harmonic interference of SUL band n80 may fall into the Rx band n78, the MSD due to harmonic interference should be taken care of. The REFSENS requirements can refer to the MSD due to harmonic interference between SUL band n80 and n78 which has been specified in Table 7.3C.2-2, if harmonic interference need to be considered.

## 5.5.6 $\Delta T_{IB}$ and $\Delta R_{IB}$ values

For CA\_n78\_n80-n84, the  $\Delta T_{IB,c}$  and  $\Delta R_{IB,c}$  values are given in the tables below referring to CA\_n1-n3-n78.

| SUL Band combination                        | $\Delta T_{IB,c}$ for NR bands (dB) <sup>*</sup>   |     |     |  |  |  |
|---|--|-----|-----|--|--|--|
|   | Component band in order of bands in configuration**  |     |     |  |  |  |
| CA_n78C_n80A-n84A                           | 0.8  | 0.6 | 0.6 |  |  |  |
| NOTE 1: "-" denotes $\Delta T_{IB,c} = 0$ . |  |     |     |  |  |  |
| NOTE 2: The component b                     | NOTE 2: The component band order in the configuration should be listed by the order of NR bands. |     |     |  |  |  |

#### Table 5.5.6-1: $\Delta T_{IB,c}$ for inter-band CA with two SUL cells

## Table 5.5.6-2: $\Delta R_{IB,c}$ for inter-band CA with two SUL cells

| SUL Band combination                        | $\Delta R_{IB,c}$ for NR bands (dB) <sup>*</sup>    |                           |                                    |  |  |
|---|---|---------------------------|------------------------------------|--|--|
|   | Component band in order of bands in configuration** |                           |                                    |  |  |
| CA_n78C_n80A-n84A                           | 0.5   |                           |                                    |  |  |
| NOTE 1: "-" denotes $\Delta R_{IB,c} = 0$ . |   |                           |                                    |  |  |
| NOTE 2: The component                       | band order in th                                    | e configuration should be | e listed by the order of NR bands. |  |  |

## 5.6 CA\_n78\_n81-n84

#### 5.6.1 Operating bands

#### Table 5.6.1-1: Operating bands for inter-band CA with two SUL cells

| NR Band combination for SUL | NR Band<br>(Table 5.2-1) |  |  |
|-----------------------------|--------------------------|--|--|
| CA_n78C_n81A-n84A           | n78, n81, n84            |  |  |

#### 5.6.2 Configurations

#### Table 5.6.2-1: Supported channel bandwidths for inter-band CA with two SUL cells

| SUL band combination with CA   | UL configuration                          | NR<br>Band | Channel bandwidth (MHz) (NOTE 1)  | Bandwidth<br>combination<br>set |  |
|--|---|------------|---|---------------------------------|--|
| CA_n78C_n81A-n84A  | SUL_n78A-n81A<br>SUL_n78A-n84A<br>CA_n78C | n78        | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90,<br>100<br>See CA_n78C Bandwidth Combination Set<br>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. |   |            |   |                                 |  |

#### 5.6.3 Maximum output power

For UL configuration CA\_n78C, the requirement in clause 6.2A.1.1 from 38.101-1 is applicable.

For other UL configurations, the requirement for each band in clause 6.2.1 from 38.101-1 is applicable.

## 5.6.4 Spurious emission band UE co-existence

There is only single UL band in uplink so the requirement for each band in clause 6.5.3.2 from 38.101-1 is applicable.

## 5.6.5 REFSENS requirements

For SUL operation with CA, the reference receive sensitivity (REFSENS) requirement for downlink bands specified in clause 7.3A.2 from TS 38.101-1 is applicable.

Since the 4<sup>th</sup> harmonic interference of SUL band n81 may fall into the Rx band n78, the MSD due to harmonic interference should be took care of. The REFSENS requirements can refer to the MSD due to harmonic interference between SUL band n81 and n78 which has been specified in Table 7.3C.2-2, if harmonic interference need to be considered.

## 5.6.6 $\Delta T_{IB}$ and $\Delta R_{IB}$ values

For CA\_n78\_n81-n84, the  $\Delta T_{IB,c}$  and  $\Delta R_{IB,c}$  values are given in the tables below referring to CA\_n1-n8-n78.

| SUL Band combination   | ΔT <sub>IB,c</sub> for NR bands (dB) <sup>*</sup> |                         |                             |  |  |  |  |
|--|---|-------------------------|-----------------------------|--|--|--|--|
|  | Component ba                                      | nd in order of bands in | configuration <sup>**</sup> |  |  |  |  |
| CA_n78C_n81A-n84A  | 0.8   | 0.6                     | 0.3                         |  |  |  |  |
| NOTE 1: "-" denotes $\Delta T_{IB,c} = 0$ .  |   |                         |                             |  |  |  |  |
| NOTE 2: The component band order in the configuration should be listed by the order of NR bands. |   |                         |                             |  |  |  |  |

#### Table 5.6.6-1: $\Delta T_{\text{IB,c}}$ for inter-band CA with two SUL cells

#### Table 5.6.6-2: $\Delta R_{IB,c}$ for inter-band CA with two SUL cells

| SUL Band combination   | ΔR <sub>IB,c</sub> for NR bands (dB) <sup>*</sup>   |   |   |  |  |  |
|--|---|---|---|--|--|--|
|  | Component band in order of bands in configuration** |   |   |  |  |  |
| CA_n78C_n81A-n84A  | 0.5   | - | - |  |  |  |
| NOTE 1: "-" denotes $\Delta R_{B,c} = 0$ .   |   |   |   |  |  |  |
| NOTE 2: The component band order in the configuration should be listed by the order of NR bands. |   |   |   |  |  |  |

# Annex A (informative): Change history

|         | Change history |            |    |     |     |   |                |
|---------|----------------|------------|----|-----|-----|---|----------------|
| Date    | Meeting        | TDoc       | CR | Rev | Cat | Subject/Comment   | New<br>version |
| 2023-02 | RAN4#106       | R4-2300809 |    |     |     | Initial TR skeleton   | 0.0.1          |
| 2023-04 | RAN4#106bis    | R4-2304652 |    |     |     | R4-2304652 Draft TR 38.718-00-02: NR Carrier Aggregation band combinations with two SUL cells | 0.1.0          |
| 2024-03 | RAN#103        | RP-240161  |    |     |     | For RAN 1-step approval   | 1.0.0          |

| Change history |         |      |    |     |     |  |         |
|----------------|---------|------|----|-----|-----|--|---------|
| Date           | Meeting | TDoc | CR | Rev | Cat | Subject/Comment  | New     |
|                |         |      |    |     |     |  | version |
| 2024-03        | RAN#103 |      |    |     |     | Approved by plenary – Rel-18 spec under change control | 18.0.0  |

# History

| Document history |          |             |  |  |  |
|------------------|----------|-------------|--|--|--|
| V18.0.0          | May 2024 | Publication |  |  |  |
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