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| 3GPP TR 38.818-03-01 V0.1.0 (2022-08) | |
| Technical Report | |
| 3rd Generation Partnership Project;  Technical Specification Group Radio Access Network;  Rel-18 NR Inter-band Carrier Aggregation/Dual Connectivity for3 bands DL with x bands UL (x=1,2)  (Release 18) | |
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# Foreword

This Technical Report has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

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** (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 for power class 3 NR inter-band CA and DC for 3 bands DL with up to 2 bands UL under Rel-18 time frame. The purpose is to gather the relevant background information and studies in order to address NR inter-band CA and DC for 3 bands DL with up to 2 bands UL for the Rel-18 band combinations.

This TR contains the RF requirements of band specific combination part. The actual requirements are added to the corresponding technical specifications.

# 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.

- For a specific reference, subsequent revisions do not apply.

- 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] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone".

[3] 3GPP TS 38.101-2: "NR; User Equipment (UE) radio transmission and reception; Part 2: Range 2 Standalone".

[4] 3GPP TS 38.101-3: "NR; User Equipment (UE) radio transmission and reception; Part 3: Range 1 and Range 2 Interworking operation with other radios".

# 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].

**Carrier aggregation**: Aggregation of two or more component carriers in order to support wider transmission bandwidths.

**Inter-band carrier aggregation:** Carrier aggregation of component carriers in different operating bands.

NOTE: Carriers aggregated in each band can be contiguous or non-contiguous.

## 3.2 Symbols

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

ΔRIB,c Allowed reference sensitivity relaxation due to support for inter-band CA operation, for serving cell *c*

ΔTIB,c Allowed maximum configured output power relaxation due to support for inter-band CA operation, inter-band NR-DC operation and due to support for SUL operations, 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

CA Carrier Aggregation

DC Dual Connectivity

DL DownLink

FDD Frequency Division Duplex

IMD Inter-modulation

MSD Maximum Sensitivity Deduction

SCS Subcarrier spacing

TDD Time Division Duplex

UE User Equipment

UL UpLink

# 4 Background

## 4.1 Introduction

The present document is a technical report for NR inter-band CA and DC for 3 bands DL with up to 2 bands UL under Rel-18 time frame. The document covers the RF requirements for each band combination specific issues (i.e. one sub-clause defined per band combination) including:

1: Common issues for both 1 band UL and 2 bands UL NR CA, including ∆TIB and ∆RIB requirements.

2: 2 bands UL NR CA specific issues, including MSD caused by IMD issue, etc.

It shall be noted that no new issue for inter-band NR DC combination, and the 2 bands UL NR CA specific issues shall be re-used.

## 4.2 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 combination to ensure that the TPs related to the band combination have been implemented.

Editor's note: It is not recommended to bring TP to TR for the following cases:

1. NR CA configurations with additional BCS other than BCS0 (such as BCS1) if there is no additional technical issue.

2. High order DL NR CA configurations, such as DL NR CA configuration CA\_nXA-nYA-nZC

# 5 Both bands within FR1 Carrier Aggregation: Specific Band Combination Part

## 5.x CA\_nX-nY-nZ

### 5.x.1 Common for 1 band UL and 2 bands UL CA

#### 5.x.1.1 Operating bands for CA

Table 5.x.1.1-1: Inter-band CA operating bands involving FR1 (three bands)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| NR Band | Uplink (UL) band | | | Downlink (DL) band | | | Duplex  mode |
| BS receive / UE transmit | | | BS transmit / UE receive | | |
| FUL\_low – FUL\_high | | | FDL\_low – FDL\_high | | |
| nX |  | – |  |  | – |  |  |
| nY |  | – |  |  | – |  |  |
| nZ |  | – |  |  | – |  |  |

#### 5.x.1.2 Channel bandwidths per operating band for CA

Table 5.x.1.2-1: Supported bandwidths per CA band combination of band nX+nY+nZ

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_nXA-nYA-nZA | -\*  or  CA\_nXA-nYA  CA\_nXA-nZA  CA\_nYA-nZA | nX | 5, 10, 15, 20 | 0 |
|  |  | nY | 5, 10, 15, 20, 25, 30 |  |
|  |  | nZ | 5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |

Editor's note\*: ‘-’ is for 1UL

Editor's note: The table format can be referred to Table 5.5A.3.2-1 in TS38.101-1

#### 5.x.1.3 ∆TIB,c and ∆RIB,c values

Editor’s note: for the table of ∆TIB,c and ∆RIB,c values, please use the same table format as in the latest TS 38.101-1, the table below is from the latest Rel.17 38.101-1, note that the table format might be changed in Rel.18.

For CA\_nX-nY-nZ, the ΔTIB,c and ΔRIB,c values are given in the tables below.

Table 5.x.1.3-1: ΔTIB,c



|  |  |  |  |
| --- | --- | --- | --- |
| **Inter-band CA combination** | **ΔTIB,c for NR bands (dB)\*** | | |
| **Component band in order of bands in configuration\*\*** | | |
| CA\_nx-ny-nz |  |  |  |
| NOTE \*: “-” denotes ΔTIB,c = 0.  NOTE \*\*: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n5 the band order from left to right is n1, n3 and n5. | | | |

Table 5.x.1.3-2: ΔRIB,c



|  |  |  |  |
| --- | --- | --- | --- |
| **Inter-band CA combination** | **ΔRIB,c for NR bands (dB)\*** | | |
| **Component band in order of bands in configuration\*\*** | | |
| CA\_nx-ny-nz |  |  |  |
| NOTE \*: “-” denotes ΔRIB,c = 0.  NOTE \*\*: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n8 the band order from left to right is n1, n3 and n8. | | | |

### 5.x.2 Specific for 2 bands UL CA

Editor's note: Text will be added if 2 bands UL CA are supported, otherwise all the clauses shall be void.

#### 5.x.2.1 UE co-existence studies

Editor's note: No co-existence study tables are recommended to be included, since it was already incorporated in the corresponding 2DL fallback band combination TR.

#### 5.x.2.2 REFSENS requirements

Editor's note: Text will be added on reference sensitivity exceptions if IMD issue due to dual uplink operation falling into DL of the third band are identified.

## 5.1 CA\_n1-n41-n79

### 5.1.1 Common for 1 band UL and 2 bands UL CA

#### 5.1.1.1 Operating bands for CA

Table 5.1.1.1-1: Inter-band CA operating bands involving FR1 (three bands)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| NR Band | Uplink (UL) band | | | Downlink (DL) band | | | Duplex  mode |
| BS receive / UE transmit | | | BS transmit / UE receive | | |
| FUL\_low – FUL\_high | | | FDL\_low – FDL\_high | | |
| n1 | 1920 MHz | – | 1980 MHz | 2110 MHz | – | 2170 MHz | FDD |
| n41 | 2496 MHz | – | 2690 MHz | 2496 MHz | – | 2690 MHz | TDD |
| n79 | 4400 MHz | – | 5000 MHz | 4400 MHz | – | 5000 MHz | TDD |

#### 5.1.1.2 Channel bandwidths per operating band for CA

Table 5.1.1.2-1: Supported bandwidths per CA band combination of band n1+n41+n79

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n1A-n41A-n79A | CA\_n1A-n41A  CA\_n1A-n79A  CA\_n41A-n79A | n1 | 5, 10, 15, 20 | 0 |
|  |  | n41 | 10, 15, 20 30, 40, 50, 60, 80, 90, 100 |  |
|  |  | n79 | 40, 50, 60, 80, 100 |  |

#### 5.1.1.3 ∆TIB,c and ∆RIB,c values

For CA\_n1-n41-n79, the ΔTIB,c and ΔRIB,c values are given in the tables below.

Table 5.1.1.3-1: ΔTIB,c

|  |  |  |  |
| --- | --- | --- | --- |
| **Inter-band CA combination** | **ΔTIB,c for NR bands (dB)8** | | |
| **Component band in order of bands in configuration9** | | |
| CA\_n1-n41-n79 | 0.5 | 0.5 | 0.8 |
| NOTE 8: “-” denotes ΔTIB,c = 0.  NOTE 9: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n5 the band order from left to right is n1, n3 and n5. | | | |

Table 5.1.1.3-2: ΔRIB,c

|  |  |  |  |
| --- | --- | --- | --- |
| **Inter-band CA combination** | **ΔRIB,c for NR bands (dB)9** | | |
| **Component band in order of bands in configuration10** | | |
| CA\_n1-n41-n79 | - | 0.5 | 0.5 |
| NOTE 9: “-” denotes ΔRIB,c = 0.  NOTE 10: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n8 the band order from left to right is n1, n3 and n8. | | | |

### 5.1.2 Specific for 2 bands UL CA

#### 5.1.2.1 UE co-existence studies

UE co-existence has been already studied for 2DL/1UL fallback combinations such as CA n1-n41, CA\_n1-n79 and n41-n79 and the impact of harmonic interference has been clarified. The own Rx impact of the 3rd band is shown as the followings.

* 2nd and 5th order IMD generated by dual uplink of Band n1 + Band n41 may fall into own Rx of Band n79.
* 2nd and 5th order IMD generated by dual uplink of Band n1 + Band n79 may fall into own Rx of Band n41.
* 2nd and 5th order IMD generated by dual uplink of Band n41 + Band n79 may fall into own Rx of Band n1.

#### 5.1.2.2 REFSENS requirements

Table 5.1.2.2-1 lists the MSD required for the dual connectivity configuration for the cases that IMD interference fall into the own 3rd Rx frequency band.

Table 5.1.2.2-1: MSD for the CA configuration

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA band combination | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  CLRB | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n1-n41-n79 | n1 | 1970 | 5 | 25 | 2160 | N/A | FDD | N/A |
|  | n41 | 2530 | 10 | 50 | 2530 | N/A | TDD | N/A |
|  | n79 | 4500 | 40 | 216 | 4500 | 19.0 | TDD | IMD21 |
|  | n1 | 1970 | 5 | 25 | 2160 | N/A | FDD | N/A |
|  | n79 | 4500 | 40 | 216 | 4500 | N/A | TDD | N/A |
|  | n41 | 2530 | 10 | 50 | 2530 | 29.4 | TDD | IMD21 |
|  | n41 | 2530 | 10 | 50 | 2530 | N/A | TDD | N/A |
|  | n79 | 4690 | 40 | 216 | 4690 | N/A | TDD | N/A |
|  | n1 | 1970 | 5 | 25 | 2160 | 29.9 | FDD | IMD21 |
| NOTE 1: This band is subject to IMD5 also which MSD is not specified. | | | | | | | | |

## 5.2 CA\_n41-n77-n79

### 5.2.1 Common for 1 band UL and 2 bands UL CA

#### 5.2.1.1 Operating bands for CA

Table 5.2.1.1-1: Inter-band CA operating bands involving FR1 (three bands)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| NR Band | Uplink (UL) band | | | Downlink (DL) band | | | Duplex  mode |
| BS receive / UE transmit | | | BS transmit / UE receive | | |
| FUL\_low – FUL\_high | | | FDL\_low – FDL\_high | | |
| n41 | 2496 MHz | – | 2690 MHz | 2496 MHz | – | 2690 MHz | TDD |
| n77 | 3300 MHz | – | 4200 MHz | 3300 MHz | – | 4200 MHz | TDD |
| n79 | 4400 MHz | – | 5000 MHz | 4400 MHz | – | 5000 MHz | TDD |

#### 5.2.1.2 Channel bandwidths per operating band for CA

Table 5.2.1.2-1: Supported bandwidths per CA band combination of band n41+n77+n79

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n41A-n77A-n79A | CA\_n41A-n77A  CA\_n41A-n79A  CA\_n77A-n79A | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 | 0 |
|  |  | n77 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |  |
|  |  | n79 | 40, 50, 60, 80, 100 |  |

#### 5.2.1.3 ∆TIB,c and ∆RIB,c values

For CA\_n41-n77-n79, the ΔTIB,c and ΔRIB,c values are given in the tables below.

Table 5.2.1.3-1: ΔTIB,c

|  |  |  |  |
| --- | --- | --- | --- |
| **Inter-band CA combination** | **ΔTIB,c for NR bands (dB)8** | | |
| **Component band in order of bands in configuration9** | | |
| CA\_n41-n77-n79 | 0.3 | 0.8 | 0.8 |
| NOTE 8: “-” denotes ΔTIB,c = 0.  NOTE 9: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n5 the band order from left to right is n1, n3 and n5. | | | |

Table 5.2.1.3-2: ΔRIB,c

|  |  |  |  |
| --- | --- | --- | --- |
| **Inter-band CA combination** | **ΔRIB,c for NR bands (dB)9** | | |
| **Component band in order of bands in configuration10** | | |
| CA\_n41-n77-n79 | 0.5 | 0.5 | 0.5 |
| NOTE 9: “-” denotes ΔRIB,c = 0.  NOTE 10: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n8 the band order from left to right is n1, n3 and n8. | | | |

### 5.2.2 Specific for 2 bands UL CA

#### 5.2.2.1 UE co-existence studies

UE co-existence has been already studied for 2DL/1UL fallback combinations such as CA n41-n77, CA\_n41-n79 and n77-n79 and the impact of harmonic interference has been clarified. The own Rx impact of the 3rd band is shown as the followings. Note that there is no IMD impact on CA\_n41-n77 to n79 Rx and that on CA\_n41-n79 to n77 Rx since CA\_n77-n79 is synchronous operation.

* 3rd, 4th and 5th order IMD generated by dual uplink of Band n77 + Band n79 may fall into own Rx of Band n41.

#### 5.2.2.2 REFSENS requirements

Table 5.2.2.2-1 lists the MSD required for the dual connectivity configuration for the cases that IMD interference fall into the own 3rd Rx frequency band.

Table 5.2.2.2-1: MSD for the CA configuration

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA band combination | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  CLRB | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n41-n77-n79 | n77 | 3600 | 10 | 50 | 3600 | N/A | TDD | N/A |
|  | n79 | 4600 | 40 | 216 | 4600 | N/A | TDD | N/A |
|  | n41 | 2600 | 10 | 50 | 2600 | 10.7 | TDD | IMD31,2 |
| NOTE 1: This band is subject to IMD5 also which MSD is not specified.  NOTE 2: This band is subject to IMD4 also which MSD is not specified. | | | | | | | | |

## 5.3 CA\_n3-n28-n40

### 5.3.1 Common for 1 band UL and 2 bands UL CA

#### 5.3.1.1 Operating bands for CA

Table 5.3.1.1-1: Inter-band CA operating bands involving FR1 (three bands)

|  |  |  |
| --- | --- | --- |
| **NR CA Band** | **NR Band**  **(Table 5.2-1)** | **DL interruption allowed**  **(Note 4)** |
| CA\_n3-n28-n403 | n3, n28, n40 |  |
| NOTE 3: Applicable for UE supporting inter-band carrier aggregation with mandatory simultaneous Rx/Tx capability | | |

#### 5.3.1.2 Channel bandwidths per operating band for CA

Table 5.3.1.2-1: Supported bandwidths per CA band combination of band n3+n28+n40

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n3A-n28A-n40A | CA\_n3A-n28A  CA\_n3A-n40A  CA\_n28A-n40A | n3 | 5, 10, 15, 20 | 0 |
|  |  | n28 | 5, 10 |  |
|  |  | n40 | 20, 40 |  |

#### 5.3.1.3 ∆TIB,c and ∆RIB,c values

For CA\_n3-n28-n40, the ΔTIB,c and ΔRIB,c values are given in the tables below, reuse the values of CA\_3-28-40.

Table 5.3.1.3-1: ΔTIB,c

|  |  |  |  |
| --- | --- | --- | --- |
| **Inter-band CA combination** | **ΔTIB,c for NR bands (dB)8** | | |
| **Component band in order of bands in configuration9** | | |
| CA\_n3-n28-n40 | 0.5 | 0.3 | 0.5 |
| NOTE 8: “-” denotes ΔTIB,c = 0.  NOTE 9: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n5 the band order from left to right is n1, n3 and n5. | | | |

Table 5.3.1.3-2: ΔRIB,c

|  |  |  |  |
| --- | --- | --- | --- |
| **Inter-band CA combination** | **ΔRIB,c for NR bands (dB)9** | | |
| **Component band in order of bands in configuration10** | | |
| CA\_n3-n28-n40 | - | - | - |
| NOTE 9: “-” denotes ΔRIB,c = 0.  NOTE 10: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n8 the band order from left to right is n1, n3 and n8. | | | |

### 5.3.2 Specific for 2 bands UL CA

#### 5.3.2.1 UE co-existence studies

For CA combinations with 3 bands DL and 2bands UL, only IMD issues due to dual Tx operation of two bands falling to the third band Rx need to be considered.

Based on the calculation, there is no additional IMD issue.

#### 5.3.2.2 REFSENS requirements

Based on co-existence studies on 5.3.2.1, no need to define exceptional REFSENS requirements.

## 5.4 CA\_n3-n8-n41

### 5.4.1 Common for 1 band UL and 2 bands UL CA

#### 5.4.1.1 Operating bands for CA

Table 5.4.1.1-1: Inter-band CA operating bands involving FR1 (three bands)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| NR Band | Uplink (UL) band | | | Downlink (DL) band | | | Duplex  mode |
| BS receive / UE transmit | | | BS transmit / UE receive | | |
| FUL\_low – FUL\_high | | | FDL\_low – FDL\_high | | |
| n3 | 1710 MHz | – | 1785 MHz | 1805 MHz | – | 1880 MHz | FDD |
| n8 | 880 MHz | – | 915 MHz | 925 MHz | – | 960 MHz | FDD |
| n41 | 2496 MHz | – | 2690 MHz | 2496 MHz | – | 2690 MHz | TDD |

#### 5.4.1.2 Channel bandwidths per operating band for CA

Table 5.4.1.2-1: Supported bandwidths per CA band combination of band n3+n8+n41

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n3A-n8A-n41A | CA\_n3A-n8A  CA\_n3A-n41A  CA\_n8A-n41A | n3 | 5, 10, 15, 20, 25, 30 | 0 |
|  |  | n8 | 5, 10, 15, 20 |  |
|  |  | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 |  |

#### 5.4.1.3 ∆TIB,c and ∆RIB,c values

For CA\_n3A-n8A-n41A, the ΔTIB,c and ΔRIB,c values have already been included in the TS38.101-1.

### 5.4.2 Specific for 2 bands UL CA

#### 5.4.2.1 UE co-existence studies

The co-existence for the fallback 2DL/2UL of CA\_n3A-n8A, CA\_n3A-n41A and CA\_n8A-n41A have already been analyzed. In terms of the co-existence studies of corresponding fallbacks, it can be observed:

IMD 2 and IMD3 caused by n3+n8 may fall into the its own band n41 Rx

IMD 2 and IMD3 caused by n3+n41 may fall into the its own band n8 Rx

IMD2 caused by n8+n41 may fall into the its own band n3 Rx

#### 5.4.2.2 REFSENS requirements

For IMD2 caused by n8+n41, the IMD2 frequency range is calculated by the lower edge and upper edge of the bands, which is 1581MHz~1810MHz (i.e. f41-f8) , while the band n3 DL frequency range is 1805MHz~1880MHz, the overlapping frequency range is only 5MHz. However, considering the minimum channel bandwidths of band n8 and n41, which are 5MHz and 10MHz, respectively. The IMD2 frequency range is 1588.5 MHz ~ 1802.5 MHz, which means there are no test points of the IMD2 product fall into the own band n3 DL frequency range. Therefore, there is no need to define such MSD values.

For the other IMDs, the MSD requirement are defined in table 5.4.2.2-1:

Table 5.4.2.2-1: 3DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA band combination | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  CLRB | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n3-n8-n41 | n3 | 1722.5 | 5 | 25 | 1817.5 | N/A | FDD | N/A |
|  | n8 | 887.5 | 5 | 25 | 932.5 | N/A | FDD | N/A |
|  | n41 | 2610 | 10 | 50 | 2610 | 28.0 | FDD | IMD24 |
|  | n3 | 1725 | 5 | 25 | 1820 | N/A | FDD | N/A |
|  | n8 | 900 | 5 | 25 | 945 | 26.0 | FDD | IMD24 |
|  | n41 | 2516 | 10 | 50 | 2516 | N/A | FDD | N/A |
| NOTE 4: This band is subject to IMD3 also which MSD is not specified. | | | | | | | | |

## 5.5 CA\_n1-n3-n26

### 5.5.1 Common for 1 band UL and 2 bands UL CA

#### 5.5.1.1 Operating bands for CA

Table 5.5.1.1-1: 3DL Inter-band CA operating bands

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **NR CA Band** | **NR Band** | **Uplink (UL) operating band** | | | **Downlink (DL) operating band** | | | **Duplex Mode** |
| **BS receive / UE transmit** | | | **BS transmit / UE receive** | | |
| **FUL\_low – FUL\_high** | | | **FDL\_low – FDL\_high** | | |
| CA\_n1-n3-n26 | n1 | 1920 MHz | – | 1980 MHz | 2110 MHz | – | 2170 MHz | FDD |
| n3 | 1710 MHz | – | 1785 MHz | 1805 MHz | – | 1880 MHz | FDD |
| n26 | 814 MHz | – | 849 MHz | 859 MHz | – | 894 MHz | FDD |

#### 5.5.1.2 Channel bandwidths per operating band for CA

Table 5.5.1.2-1: Supported bandwidths per CA band combination of band n1+n3+n26

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n1A-n3A-n26A | CA\_n1A-n3A  CA\_n1A-n26A  CA\_n3A-n26A | n1 | 5, 10, 15, 20 | 0 |
|  |  | n3 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n26 | 5, 10, 15, 20 |  |

#### 5.5.1.3 ∆TIB,c and ∆RIB,c values

For CA\_n1-n3-n26, the ΔTIB,c and ΔRIB,c values are resused from CA\_1-3-26 and are given in the tables below.

Table 5.5.1.3-1: ΔTIB,c

|  |  |  |  |
| --- | --- | --- | --- |
| **Inter-band CA combination** | **ΔTIB,c for NR bands (dB)8** | | |
| **Component band in order of bands in configuration9** | | |
| CA\_n1-n3-n26 | 0.3 | 0.3 | 0.3 |
| NOTE 8: “-” denotes ΔTIB,c = 0.  NOTE 9: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n5 the band order from left to right is n1, n3 and n5. | | | |

Table 5.5.1.3-2: ΔRIB,c

|  |  |  |  |
| --- | --- | --- | --- |
| **Inter-band CA combination** | **ΔRIB,c for NR bands (dB)9** | | |
| **Component band in order of bands in configuration10** | | |
| CA\_n1-n3-n26 | - | - | - |
| NOTE 9: “-” denotes ΔRIB,c = 0.  NOTE 10: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n8 the band order from left to right is n1, n3 and n8. | | | |

### 5.5.2 Specific for 2 bands UL CA

#### 5.5.2.1 UE co-existence studies

UL n1-n26 does not affect DL n3.

UL n3-n26 does not affect DL n1.

UL n1-n3 does not affect DL n26.

#### 5.5.2.2 REFSENS requirements

Based on the co-existence studies there are no need to defined MSD values.

## 5.6 CA\_n1-n26-n78

### 5.6.1 Common for 1 band UL and 2 bands UL CA

#### 5.6.1.1 Operating bands for CA

Table 5.6.1.1-1: 3DL Inter-band CA operating bands

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **NR CA Band** | **NR Band** | **Uplink (UL) operating band** | | | **Downlink (DL) operating band** | | | **Duplex Mode** |
| **BS receive / UE transmit** | | | **BS transmit / UE receive** | | |
| **FUL\_low – FUL\_high** | | | **FDL\_low – FDL\_high** | | |
| CA\_n1-n26-n78 | n1 | 1920 MHz | – | 1980 MHz | 2110 MHz | – | 2170 MHz | FDD |
| n26 | 814 MHz | – | 849 MHz | 859 MHz | – | 894 MHz | FDD |
| n78 | 3300 MHz | – | 3800 MHz | 3300 MHz | – | 3800 MHz | TDD |

#### 5.6.1.2 Channel bandwidths per operating band for CA

Table 5.6.1.2-1: Supported bandwidths per CA band combination of band n1+n26+n78

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n1A-n26A-n78A | CA\_n1A-n26A  CA\_n1A-n78A  CA\_n26A-n78A | n1 | 5, 10, 15, 20 | 0 |
|  |  | n26 | 5, 10, 15, 20 |  |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |

#### 5.6.1.3 ∆TIB,c and ∆RIB,c values

For CA\_n1-n26-n78, the ΔTIB,c and ΔRIB,c values are resused from CA\_n1-n5-n78 and are given in the tables below.

Table 5.6.1.3-1: ΔTIB,c

|  |  |  |  |
| --- | --- | --- | --- |
| **Inter-band CA combination** | **ΔTIB,c for NR bands (dB)8** | | |
| **Component band in order of bands in configuration9** | | |
| CA\_n1-n26-n78 | 0.6 | 0.6 | 0.8 |
| NOTE 8: “-” denotes ΔTIB,c = 0.  NOTE 9: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n5 the band order from left to right is n1, n3 and n5. | | | |

Table 5.6.1.3-2: ΔRIB,c

|  |  |  |  |
| --- | --- | --- | --- |
| **Inter-band CA combination** | **ΔRIB,c for NR bands (dB)9** | | |
| **Component band in order of bands in configuration10** | | |
| CA\_n1-n26-n78 | 0.2 | 0.2 | 0.5 |
| NOTE 9: “-” denotes ΔRIB,c = 0.  NOTE 10: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n8 the band order from left to right is n1, n3 and n8. | | | |

### 5.6.2 Specific for 2 bands UL CA

#### 5.6.2.1 UE co-existence studies

UL n1-n26 gives IMD3 into DL n78.

UL n1-n78 gives IMD5 into DL n26.

UL n26-n78 gives IMD3 into DL n1.

#### 5.6.2.2 REFSENS requirements

Based on the co-existence studies there are a need to define MSD values. MSD values from CA\_n1-n5-n78 are reused.

Table 5.6.2.2-1: 3DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA band combination | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  CLRB | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n1-n26-n78 | n1 | 1932 | 5 | 25 | 2122 | 18.1 | FDD | IMD3 |
|  | n26 | 829 | 5 | 25 | 874 | N/A | FDD | N/A |
|  | n78 | 3780 | 10 | 50 | 3780 | N/A | TDD | N/A |
|  | n1 | 1975 | 5 | 25 | 2165 | N/A | FDD | N/A |
|  | n26 | 840 | 5 | 25 | 885 | 3.1 | FDD | IMD5 |
|  | n78 | 3405 | 10 | 50 | 3405 | N/A | TDD | N/A |
|  | n1 | 1950 | 5 | 25 | 2140 | N/A | FDD | N/A |
|  | n26 | 830 | 5 | 25 | 875 | N/A | FDD | N/A |
|  | n78 | 3610 | 10 | 50 | 3610 | 15.7 | TDD | IMD3 |

## 5.7 CA\_n3-n26-n78

### 5.7.1 Common for 1 band UL and 2 bands UL CA

#### 5.7.1.1 Operating bands for CA

Table 5.7.1.1-1: 3DL Inter-band CA operating bands

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **NR CA Band** | **NR Band** | **Uplink (UL) operating band** | | | **Downlink (DL) operating band** | | | **Duplex Mode** |
| **BS receive / UE transmit** | | | **BS transmit / UE receive** | | |
| **FUL\_low – FUL\_high** | | | **FDL\_low – FDL\_high** | | |
| CA\_n3-n26-n78 | n3 | 1710 MHz | – | 1785 MHz | 1805 MHz | – | 1880 MHz | FDD |
| n26 | 814 MHz | – | 849 MHz | 859 MHz | – | 894 MHz | FDD |
| n78 | 3300 MHz | – | 3800 MHz | 3300 MHz | – | 3800 MHz | TDD |

#### 5.7.1.2 Channel bandwidths per operating band for CA

Table 5.7.1.2-1: Supported bandwidths per CA band combination of band n3+n26+n78

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n3A-n26A-n78A | CA\_n3A-n26A  CA\_n3A-n78A  CA\_n26A-n78A | n3 | 5, 10, 15, 20, 25, 30, 40 | 0 |
|  |  | n26 | 5, 10, 15, 20 |  |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |

#### 5.7.1.3 ∆TIB,c and ∆RIB,c values

For CA\_n3-n26-n78, the ΔTIB,c and ΔRIB,c values are resused from CA\_n3-n5-n78 and are given in the tables below.

Table 5.7.1.3-1: ΔTIB,c

|  |  |  |  |
| --- | --- | --- | --- |
| **Inter-band CA combination** | **ΔTIB,c for NR bands (dB)8** | | |
| **Component band in order of bands in configuration9** | | |
| CA\_n3-n26-n78 | 0.6 | 0.6 | 0.8 |
| NOTE 8: “-” denotes ΔTIB,c = 0.  NOTE 9: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n5 the band order from left to right is n1, n3 and n5. | | | |

Table 5.7.1.3-2: ΔRIB,c

|  |  |  |  |
| --- | --- | --- | --- |
| **Inter-band CA combination** | **ΔRIB,c for NR bands (dB)9** | | |
| **Component band in order of bands in configuration10** | | |
| CA\_n3-n26-n78 | 0.2 | 0.2 | 0.5 |
| NOTE 9: “-” denotes ΔRIB,c = 0.  NOTE 10: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n8 the band order from left to right is n1, n3 and n8. | | | |

### 5.7.2 Specific for 2 bands UL CA

#### 5.7.2.1 UE co-existence studies

UL n3-n26 gives IMD3 and IMD5 into DL n78.

UL n3-n78 gives no IMD into DL n26.

UL n26-n78 gives IMD3 into DL n3.

#### 5.7.2.2 REFSENS requirements

Based on the co-existence studies there are a need to define MSD values. MSD values from CA\_n3-n5-n78 are reused.

Table 5.7.2.2-1: 3DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA band combination | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  CLRB | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n3-n26-n78 | n3 | 1730 | 5 | 25 | 1825 | N/A | FDD | N/A |
|  | n26 | 839 | 5 | 25 | 884 | N/A | FDD | N/A |
|  | n78 | 3408 | 10 | 50 | 3408 | 16.1 | TDD | IMD3 |
|  | n3 | 1730 | 5 | 25 | 1825 | N/A | FDD | N/A |
|  | n26 | 839 | 5 | 25 | 884 | N/A | FDD | N/A |
|  | n78 | 3512 | 10 | 50 | 3512 | 4.5 | TDD | IMD5 |
|  | n3 | 1767 | 5 | 25 | 1862 | 15.7 | FDD | IMD3 |
|  | n26 | 839 | 5 | 25 | 884 | N/A | FDD | N/A |
|  | n78 | 3540 | 10 | 50 | 3540 | N/A | TDD | N/A |

## 5.8 CA\_n1-n7-n26

### 5.8.1 Common for 1 band UL and 2 bands UL CA

#### 5.8.1.1 Operating bands for CA

Table 5.8.1.1-1: 3DL Inter-band CA operating bands

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **NR CA Band** | **NR Band** | **Uplink (UL) operating band** | | | **Downlink (DL) operating band** | | | **Duplex Mode** |
| **BS receive / UE transmit** | | | **BS transmit / UE receive** | | |
| **FUL\_low – FUL\_high** | | | **FDL\_low – FDL\_high** | | |
| CA\_n1-n7-n26 | n1 | 1920 MHz | – | 1980 MHz | 2110 MHz | – | 2170 MHz | FDD |
| n7 | 2500 MHz | – | 2570 MHz | 2620 MHz | – | 2690 MHz | FDD |
| n26 | 814 MHz | – | 849 MHz | 859 MHz | – | 894 MHz | FDD |

#### 5.8.1.2 Channel bandwidths per operating band for CA

Table 5.8.1.2-1: Supported bandwidths per CA band combination of band n1+n7+n26

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n1A-n7A-n26A | CA\_n1A-n26A  CA\_n1A-n7A  CA\_n7A-n26A | n1 | 5, 10, 15, 20 | 0 |
|  |  | n7 | 5, 10, 15, 20, 25, 30, 40, 50 |  |
|  |  | n26 | 5, 10, 15, 20 |  |
| CA\_n1A-n7B-n26A | CA\_n1A-n26A  CA\_n1A-n7A  CA\_n7A-n26A  CA\_n7B | n1 | 5, 10, 15, 20 | 0 |
|  |  | n7 | CA\_n7B\_BCS0 |  |
|  |  | n26 | 5, 10, 15, 20 |  |

#### 5.8.1.3 ∆TIB,c and ∆RIB,c values

For CA\_n1-n7-n26, the ΔTIB,c and ΔRIB,c values are resused from CA\_1-3-26 and are given in the tables below.

Table 5.8.1.3-1: ΔTIB,c

|  |  |  |  |
| --- | --- | --- | --- |
| **Inter-band CA combination** | **ΔTIB,c for NR bands (dB)8** | | |
| **Component band in order of bands in configuration9** | | |
| CA\_n1-n7-n26 | 0.5 | 0.6 | 0.3 |
| NOTE 8: “-” denotes ΔTIB,c = 0.  NOTE 9: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n5 the band order from left to right is n1, n3 and n5. | | | |

Table 5.8.1.3-2: ΔRIB,c

|  |  |  |  |
| --- | --- | --- | --- |
| **Inter-band CA combination** | **ΔRIB,c for NR bands (dB)9** | | |
| **Component band in order of bands in configuration10** | | |
| CA\_n1-n7-n26 | - | - | - |
| NOTE 9: “-” denotes ΔRIB,c = 0.  NOTE 10: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n8 the band order from left to right is n1, n3 and n8. | | | |

### 5.8.2 Specific for 2 bands UL CA

#### 5.8.2.1 UE co-existence studies

UL n1-n7 gives IMD5 into DL n26.

UL n1-n26 does not affect DL n7.

UL n7-n26 does not affect DL n1.

#### 5.8.2.2 REFSENS requirements

Based on the co-existence studies there are a need to define MSD values. MSD values from CA\_1-7-26 are reused.

Table 5.8.2.2-1: 3DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA band combination | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  CLRB | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n1-n7-n26 | n1 | 1965 | 5 | 25 | 2155 | N/A | FDD | N/A |
|  | n7 | 2510 | 10 | 50 | 2630 | N/A | FDD | N/A |
|  | n26 | 830 | 5 | 50 | 875 | 3.5 | FDD | IMD5 |

## 5.9 CA\_n3-n7-n26

### 5.9.1 Common for 1 band UL and 2 bands UL CA

#### 5.9.1.1 Operating bands for CA

Table 5.9.1.1-1: 3DL Inter-band CA operating bands

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **NR CA Band** | **NR Band** | **Uplink (UL) operating band** | | | **Downlink (DL) operating band** | | | **Duplex Mode** |
| **BS receive / UE transmit** | | | **BS transmit / UE receive** | | |
| **FUL\_low – FUL\_high** | | | **FDL\_low – FDL\_high** | | |
| CA\_n3-n7-n26 | n3 | 1710 MHz | – | 1785 MHz | 1805 MHz | – | 1880 MHz | FDD |
| n7 | 2500 MHz | – | 2570 MHz | 2620 MHz | – | 2690 MHz | FDD |
| n26 | 814 MHz | – | 849 MHz | 859 MHz | – | 894 MHz | FDD |

#### 5.9.1.2 Channel bandwidths per operating band for CA

Table 5.9.1.2-1: Supported bandwidths per CA band combination of band n3+n7+n26

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n3A-n7A-n26A | CA\_n3A-n26A  CA\_n3A-n7A  CA\_n7A-n26A | n3 | 5, 10, 15, 20, 25, 30, 40 | 0 |
|  |  | n7 | 5, 10, 15, 20, 25, 30, 40, 50 |  |
|  |  | n26 | 5, 10, 15, 20 |  |
| CA\_n3A-n7B-n26A | CA\_n3A-n26A  CA\_n3A-n7A  CA\_n7A-n26A  CA\_n7B | n3 | 5, 10, 15, 20, 25, 30, 40 | 0 |
|  |  | n7 | CA\_n7B\_BCS0 |  |
|  |  | n26 | 5, 10, 15, 20 |  |

#### 5.9.1.3 ∆TIB,c and ∆RIB,c values

For CA\_n3-n7-n26, the ΔTIB,c and ΔRIB,c values are resused from CA\_1-3-26 and are given in the tables below.

Table 5.9.1.3-1: ΔTIB,c

|  |  |  |  |
| --- | --- | --- | --- |
| **Inter-band CA combination** | **ΔTIB,c for NR bands (dB)8** | | |
| **Component band in order of bands in configuration9** | | |
| CA\_n3-n7-n26 | 0.5 | 0.5 | 0.3 |
| NOTE 8: “-” denotes ΔTIB,c = 0.  NOTE 9: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n5 the band order from left to right is n1, n3 and n5. | | | |

Table 5.9.1.3-2: ΔRIB,c

|  |  |  |  |
| --- | --- | --- | --- |
| **Inter-band CA combination** | **ΔRIB,c for NR bands (dB)9** | | |
| **Component band in order of bands in configuration10** | | |
| CA\_n3-n7-n26 | - | - | - |
| NOTE 9: “-” denotes ΔRIB,c = 0.  NOTE 10: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n8 the band order from left to right is n1, n3 and n8. | | | |

### 5.9.2 Specific for 2 bands UL CA

#### 5.9.2.1 UE co-existence studies

UL n3-n7 gives IMD3 into DL n26.

UL n3-n26 gives IMD2 and IMD3 into DL n7.

UL n7-n26 does not affect DL n3.

#### 5.9.2.2 REFSENS requirements

Based on the co-existence studies there are a need to define MSD values. MSD values from CA\_3-7-26 are reused.

Table 5.9.2.2-1: 3DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA band combination | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  CLRB | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n3-n7-n26 | n3 | 1720 | 5 | 25 | 1815 | N/A | FDD | N/A |
|  | n7 | 2560 | 10 | 50 | 2680 | N/A | FDD | N/A |
|  | n26 | 835 | 5 | 25 | 880 | 17.5 | FDD | IMD3 |
|  | n3 | 1780 | 5 | 25 | 1875 | N/A | FDD | N/A |
|  | n7 | 2505 | 10 | 50 | 2625 | 29.0 | FDD | IMD24 |
|  | n26 | 845 | 5 | 25 | 890 | N/A | FDD | N/A |
| NOTE 4: This band is subject to IMD3 also which MSD is not specified | | | | | | | | |

## 5.10 CA\_n7-n26-n78

### 5.10.1 Common for 1 band UL and 2 bands UL CA

#### 5.10.1.1 Operating bands for CA

Table 5.10.1.1-1: 3DL Inter-band CA operating bands

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **NR CA Band** | **NR Band** | **Uplink (UL) operating band** | | | **Downlink (DL) operating band** | | | **Duplex Mode** |
| **BS receive / UE transmit** | | | **BS transmit / UE receive** | | |
| **FUL\_low – FUL\_high** | | | **FDL\_low – FDL\_high** | | |
| CA\_n7-n26-n78 | n7 | 2500 MHz | – | 2570 MHz | 2620 MHz | – | 2690 MHz | FDD |
| n26 | 814 MHz | – | 849 MHz | 859 MHz | – | 894 MHz | FDD |
| n78 | 3300 MHz | – | 3800 MHz | 3300 MHz | – | 3800 MHz | TDD |

#### 5.10.1.2 Channel bandwidths per operating band for CA

Table 5.10.1.2-1: Supported bandwidths per CA band combination of band n7+n26+n78

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n7A-n26A-n78A | CA\_n7A-n26A  CA\_n7A-n78A  CA\_n26A-n78A | n7 | 5, 10, 15, 20, 25, 30, 40, 50 | 0 |
|  |  | n26 | 5, 10, 15, 20 |  |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| CA\_n7B-n26A-n78A | CA\_n7A-n26A  CA\_n7A-n78A  CA\_n26A-n78A  CA\_n7B | n7 | CA\_n7B\_BCS0 | 0 |
|  |  | n26 | 5, 10, 15, 20 |  |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |

#### 5.10.1.3 ∆TIB,c and ∆RIB,c values

For CA\_n7-n26-n78, the ΔTIB,c and ΔRIB,c values are resused from CA\_n5-n7-n78 and are given in the tables below.

Table 5.10.1.3-1: ΔTIB,c

|  |  |  |  |
| --- | --- | --- | --- |
| **Inter-band CA combination** | **ΔTIB,c for NR bands (dB)8** | | |
| **Component band in order of bands in configuration9** | | |
| CA\_n7-n26-n78 | 0.6 | 0.6 | 0.8 |
| NOTE 8: “-” denotes ΔTIB,c = 0.  NOTE 9: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n5 the band order from left to right is n1, n3 and n5. | | | |

Table 5.10.1.3-2: ΔRIB,c

|  |  |  |  |
| --- | --- | --- | --- |
| **Inter-band CA combination** | **ΔRIB,c for NR bands (dB)9** | | |
| **Component band in order of bands in configuration10** | | |
| CA\_n7-n26-n78 | 0.2 | 0.2 | 0.5 |
| NOTE 9: “-” denotes ΔRIB,c = 0.  NOTE 10: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n8 the band order from left to right is n1, n3 and n8. | | | |

### 5.10.2 Specific for 2 bands UL CA

#### 5.10.2.1 UE co-existence studies

UL n7-n26 gives IMD2 into DL n78.

UL n7-n78 gives IMD2 and IMD5 into DL n26.

UL n26-n78 gives IMD2 into DL n7.

#### 5.10.2.2 REFSENS requirements

Based on the co-existence studies there are a need to define MSD values. MSD values from CA\_n5-n7-n78 are reused.

Table 5.10.2.2-1: 3DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA band combination | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  CLRB | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n7-n26-n78 | n7 | 2550 | 5 | 25 | 2670 | N/A | FDD | N/A |
|  | n26 | 834 | 5 | 25 | 879 | 30.2 | FDD | IMD2 |
|  | n78 | 3429 | 10 | 50 | 3429 | N/A | TDD | N/A |
|  | n7 | 2525 | 5 | 25 | 2645 | N/A | FDD | N/A |
|  | n26 | 830 | 5 | 25 | 875 | 3.3 | FDD | IMD5 |
|  | n78 | 3350 | 10 | 50 | 3350 | N/A | TDD | N/A |
|  | n7 | 2525 | 5 | 25 | 2645 | 30.1 | FDD | IMD2 |
|  | n26 | 844 | 5 | 25 | 889 | N/A | FDD | N/A |
|  | n78 | 3489 | 10 | 50 | 3489 | N/A | TDD | N/A |
|  | n7 | 2540 | 5 | 25 | 2660 | N/A | FDD | N/A |
|  | n26 | 835 | 5 | 25 | 880 | N/A | FDD | N/A |
|  | n78 | 3375 | 10 | 50 | 3375 | 29.7 | TDD | IMD2 |

# 6 Dual Connectivity: Specific Band Combination Part

## 6.x DC\_nX-nY-nZ

Editor's note: The texts for NR DC can only be added associated with the texts for the corresponding inter-band 2 bands UL CA above, which means pure TP to TR to included NR DC configuration is not allowed.

### 6.x.1 Configurations for DC\_nX-nY-nZ

Table 6.x.1-1: Inter-band NR DC configurations

| NR DC  configuration | Uplink NR DC  configuration |
| --- | --- |
| DC\_nXA-nYA-nZ | DC\_nXA-nYA  DC\_nXA-nZA  DC\_nYA-nZA |

Annex <X> (informative):  
Change history

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Change history | | | | | | | |
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2022-08 | RAN4 #104e | R4-2213383 |  |  |  | TR skeleton | 0.0.0 |
| 2022-08 | RAN4 #104e | R4-2213619 |  |  |  | 1. R4-2212449, TP for TR 38.xxx-xx-xx: CA\_n1-n41-n79, SoftBank Corp., LG Electronics 2. R4-2212456, TP for TR 38.xxx-xx-xx: CA\_n41-n77-n79, SoftBank Corp., LG Electronics 3. R4-2212545, TP for TR 38.XXX-XX-XX: CA\_n3A-n28A-n40A, Samsung, KDDI 4. R4-2212725, TP for TR38.xxx-xx-xx\_3DL/2UL CA\_n3A-n8A-n41A, ZTE Corporation 5. R4-2213107, TP for TR 38.818-03-01: CA\_n1-n3-n26, Ericsson, Telstra 6. R4-2213109, TP for TR 38.818-03-01: CA\_n1-n26-n78, Ericsson, Telstra 7. R4-2213111, TP for TR 38.818-03-01: CA\_n3-n26-n78, Ericsson, Telstra 8. R4-2213108, TP for TR 38.818-03-01: CA\_n1-n7-n26, Ericsson, Telstra 9. R4-2213110, TP for TR 38.818-03-01: CA\_n3-n7-n26, Ericsson, Telstra 10. R4-2213112, TP for TR 38.818-03-01: CA\_n7-n26-n78, Ericsson, Telstra | 0.1.0 |