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| 3GPP TR 38.899 V0.10.0 (2024-05) | |
| Technical Report | |
| 3rd Generation Partnership Project;  Technical Specification Group Radio Access Network;  High power UE for  FR1 NR inter-band CA/DC or NR SUL band combination  with y (1<y<=6) bands DL and x (x=1, 2) bands UL  and power class m (m<3) and high power on TDD band(s);  (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 high power UE for NR inter-band Carrier Aggregation or Dual Connection and NR SUL band combinations with y (1<y<=6) bands downlink and x (x=1, 2) bands uplink under Rel-18 time-frame. The purpose is to gather the relevant background information and studies in order to complete the band-combination specific requirements for the newly requested band combinations for power class 2 and power class 1.5 UE. Table 1-1 lists the three types of band combinations covered by this TR.

**Table 1-1 High power UE inter-band CA/DC and SUL band combinations**

|  |  |  |
| --- | --- | --- |
| **#** | **Band combination** | **Power class for uplink** |
| 1 | Power class 2 NR Inter-band CA/DC for y bands DL with x bands UL (x=1, 2) | 1UL(TDD): PC2 on TDD band  2UL (FDD+TDD, TDD+FDD, TDD+TDD): PC3 on FDD band, PC2 or PC3 on TDD band |
| 2 | Power class 1.5 NR Inter-band CA for y bands DL with 1 band UL | 1UL (TDD): PC1.5 on TDD band |
| 3 | Power class 2 SUL band combinations with or without CA for y bands DL with 2 bands UL | SUL: PC3 on SUL band  NUL(TDD): PC2 on TDD band  NUL = Normal Uplink in contrast to SUL. |

# 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 RP-222623: “New WID: High power UE for FR1 NR inter-band CA/DC or NR SUL (supplementary uplink) band combination with y bands downlink (1<y<=6) and x bands uplink (x=1,2) and power class m (m<3) and high power on TDD band(s)”.

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

[4] 3GPP TR 37.865-01-01: “NR Carrier Aggregation for intra-band (m Down Link (DL) / 1 Up Link (UL) bands) and inter-band (n Down Link (DL) / 1 Up Link (UL) bands)”

[5] 3GPP TR38.717-02-01 V17.0.0: “Rel-17 NR inter-band Carrier Aggregation/Dual connectivity for 2 bands DL with x bands UL (x=1, 2) (Release 17)”

[6] 3GPP TR38.716-02-00 V16.0.0: “NR inter-band Carrier Aggregation/Dual connectivity for 2 bands DL with x bands UL (x=1, 2) (Release 16)”

[7] R4-2321924 AdHoc report [109][104] NR\_Baskets\_Part\_1, RAN4#109

…

[x] <doctype> <#>[ ([up to and including]{yyyy[-mm]|V<a[.b[.c]]>}[onwards])]: "<Title>".

# 3 Definitions of terms, symbols and abbreviations

## 3.1 Terms

For the purposes of the present document, the terms given in 3GPP 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 3GPP 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>

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, for serving cell *c*.

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP 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 3GPP TR 21.905 [1].

<ABBREVIATION> <Expansion>

BS Base Station

BCS Bandwidth Combination Set

CA Carrier Aggregation

CC Component Carriers

DC Dual Connectivity

DL Downlink

FDD Frequency Division Duplex

MPR Allowed maximum power reduction

MSD Maximum Sensitivity Degradation

REFSENS Reference Sensitivity power level

SCS Subcarrier spacing

TDD Time Division Duplex

UE User Equipment

UL Uplink

# 4 Background

At 3GPP RAN4#97-e meeting, a basket Work Item on “High power UE for FR1 NR inter-band CA/DC or NR SUL (supplementary uplink) band combination with y bands downlink (1<y<=6) and x bands uplink (x=1,2) and power class m (m<3) and high power on TDD band(s)” [2] was approved for Rel-18. The objectives of the core part are as follows:

Specify the band-combination specific RF requirements for all listed band combinations as defined in attached excel file of this WI.

The requirements that need to analyse and specify include

- Maximum output power.

- Analysing combinations that have self-desensitization, applicable ∆TIB, c and ∆RIB, c and reference sensitivity exceptions including MSD test cases.

- Other additional impact to the requirements due to the high power on UL, if necessary

The present document is a technical report for this basket Work Item.

## 4.1 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 High Power UE CA of 2 bands DL and 1 or 2 bands UL

## 5.x CA\_nX-nY

### 5.x.1 Configurations

*<Editor’s note: the CA configurations and bandwidth combinations sets should be kept same as defined in 38.101-1 Table 5.5A.3.1-1x unless additional clarification>*

**Table 5.x.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| *CA\_nX-nY* | *nX8,9, nY8,9,*  *CA\_nX-nY8* | *nX* |  |  |
| *nY* |  |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 5.x.2 Maximum output power

*<Editor’s note: In table 5.x.2-1, the power class 2 cases supported by the uplink CA should be kept as the same numbering and others that not supported should be removed. >*

Table 5.x.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| *CA\_nX-nY* | *Case a* | *26dBm* | *23dBm* | *23dBm* |
| *Case b* | *26dBm* | *23dBm* | *26dBm* |
| *Case c* | *26dBm* | *26dBm* | *23dBm* |
| *Case d* | *26dBm* | *26dBm* | *26dBm* |

### 5.x.3 REFSENS requirements

*<Editor’s note: This agenda will capture the Reference sensitivity exceptions or MSD requirements due to higher power for CA carrier, please use the same table format as in 38101-1. >*

#### 5.x.3.1 Power class 2 case a

#### 5.x.3.2 Power class 2 case b

#### 5.x.3.3 Power class 2 case c

#### 5.x.3.4 Power class 1.5 for single uplink nX

#### 5.x.3.5 Power class 1.5 for single uplink nY

### 5.x.4 ∆TIB and ∆RIB values

*<Editor’s note: If no change by comparing to the values for power class 3 CA, this section will be void.>*

## 5.1 CA\_n25-n41C

### 5.1.1 Configurations

Table 5.1.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n25(2A)-n41C | n418, 9  CA\_n25A-n41A8  **CA\_n41C8** | n25 | CA\_n25(2A)\_BCS 4 and 5 | 4 and 5 |
|  |  | n41 | CA\_n41C\_BCS 4 and 5 |  |
| CA\_n25A-n41C | n418, 9  CA\_n25A-n41A8  **CA\_n41C8** | n25 | n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n41 | CA\_n41C\_BCS 4 and 5 |  |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 5.1.2 Maximum output power

Table 5.1.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nC** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n41C | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| Case c | 26dBm | 26dBm | 23dBm |
| Case d | 26dBm | 26dBm | 26dBm |

### 5.1.3 REFSENS requirements

#### 5.1.3.1 Power class 2 case a, b, c, d

The MSD for PC3 CA\_n41C into n25:

Table 5.1.3-1 PC3 MSD

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n25-n41 | n25 | N/A | 5 | N/A | 1992.5 | 8.5 | FDD | IMD7 |
|  | n41 | 2545 | 90 | 1 (RBstart=0) | 2545 | N/A | TDD | N/A |
|  |  | 2640 | 100 | 1 (RBstart=221) | 2640 |  |  |  |

For PC2 there should be no difference because for these we have assumed that MPR is applied to meet the SEM mask and thus IMD3 is -13dBm, IMD5 is -25dBm for NS04 and -30dBm for NS01 and then we decay the power of the higher IMDs

The proposed value for PC2 UL CA MSD can be found in Table 5.1.3-2:

Table 5.1.3-2 PC2 MSD

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n25-n41 | n25 | N/A | 5 | N/A | 1992.5 | 8.5 | FDD | IMD7 |
|  | n41 | 2545 | 90 | 1 (RBstart=0) | 2545 | N/A | TDD | N/A |
|  |  | 2640 | 100 | 1 (RBstart=221) | 2640 |  |  |  |

### 5.1.4 ∆TIB and ∆RIB values

Void

## 5.2 CA\_n41C-n66

### 5.2.1 Configurations

Table 5.2.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n41C-n66A | n418, 9  n418, 9  **CA\_n41C8**  CA\_n41A-n66A8 | n41 | CA\_n41C\_BCS 4 and 5 | 4 and 5 |
|  |  | n66 | n66 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n41C-n66(2A) | n418, 9  **CA\_n41C8**  CA\_n41A-n66A8 | n41 | CA\_n41C\_BCS 4 and 5 | 4 and 5 |
|  |  | n66 | CA\_n66(2A)\_BCS 4 and 5 |  |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 5.2.2 Maximum output power

Table 5.2.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nC** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n41C | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| Case c | 26dBm | 26dBm | 23dBm |
| Case d | 26dBm | 26dBm | 26dBm |

### 5.2.3 REFSENS requirements

#### 5.2.3.1 Power class 2 case a, b, c, d

The MSD for PC3 CA\_n41C into n66:

Table 5.2.3-1 PC3 MSD

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n41-n66 | CA\_n41C | n4112 | 2545 | 90 | 1 (RBstart=0) | 2545 | N/A | TDD | N/A |
|  |  |  | 2640 | 100 | 1 (RBstart=171) | 2640 |  |  |  |
|  |  | n66 | N/A | 5 | N/A | 2197.5 | 32.5 | FDD | IMD5 |

For PC2 there should be no difference because for these we have assumed that MPR is applied to meet the SEM mask and thus IMD3 is -13dBm, IMD5 is -25dBm for NS04 and -30dBm for NS01 and then we decay the power of the higher IMDs

The proposed value for PC2 UL CA MSD can be found in Table 5.2.3-2:

Table 5.2.3-2 PC2 MSD

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n41-n66 | CA\_n41C | n4112 | 2545 | 90 | 1 (RBstart=0) | 2545 | N/A | TDD |
|  |  |  | 2640 | 100 | 1 (RBstart=171) | 2640 |  |  |
|  |  | n66 | N/A | 5 | N/A | 2197.5 | 32.5 | FDD |

### 5.2.4 ∆TIB and ∆RIB values

Void

## 5.3 CA\_n41C-n71

### 5.3.1 Configurations

Table 5.3.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n41C-n71A | n418, 9  **CA\_n41C**8  CA\_n41A-n71A8 | n41 | CA\_n41C\_BCS 4 and 5 | 4 and 5 |
|  |  | n71 | n71 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n41C-n71(2A) | n418,9  **CA\_n41C**8  CA\_n41A-n71A8 | n41 | CA\_n41C\_BCS 4 and 5 | 4 and 5 |
|  |  | n71 | CA\_n71(2A)\_BCS 4 and 5 |  |
| CA\_n41C-n71B | n418,9  **CA\_n41C**8  CA\_n41A-n71A8 | n41 | CA\_n41C\_BCS 4 and 5 | 4 and 5 |
|  |  | n71 | CA\_n71B\_BCS 4 and 5 |  |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

Note: DL CA\_n41C-n71(2A) with UL CA\_n41C is not in 38.101-1 17.7.0, but it was in agreed CR R4-2214650 From RAN4#104-e.

### 5.3.2 Maximum output power

Table 5.3.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nC** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n41C | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| Case c | 26dBm | 26dBm | 23dBm |
| Case d | 26dBm | 26dBm | 26dBm |

### 5.3.3 REFSENS requirements

#### 5.3.3.1 Power class 2 case a, b, c, d

For PC3 CA\_n41C there is no MSD into n71.

For PC2 CA\_n41C there should be no MSD into n71.

### 5.3.4 ∆TIB and ∆RIB values

Void

## 5.4 CA\_n41C-n77A

### 5.4.1 Configurations

Table 5.4.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n41C-n77A | n418,9  n778,9  CA\_n41A-n77A8  **CA\_n41C8** | n41 | n41 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 5.4.2 Maximum output power

Table 5.4.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nC** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n41C | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| Case c | 26dBm | 26dBm | 23dBm |
| Case d | 26dBm | 26dBm | 26dBm |

### 5.4.3 REFSENS requirements

#### 5.4.3.1 Power class 2 case a, b, c, d

The MSD for PC3 CA\_n41C into n77:

Table 5.4.3-1 PC3 MSD

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n41-n77 | n4112 | 2545 | 60 | 1 (RBstart=0) | 2545 | N/A | TDD | N/A |
|  |  | 2625 | 100 | 1 (RBstart=272) | 2625 |  |  |  |
|  | n77 | N/A | 10 | N/A | 3305 | 2.7 | FDD | IMD9 |

For PC2 there should be no difference because for these we have assumed that MPR is applied to meet the SEM mask and thus IMD3 is -13dBm, IMD5 is -25dBm for NS04 and -30dBm for NS01 and then we decay the power of the higher IMDs

The proposed value for PC2 UL CA MSD can be found in Table 5.4.3-2.

Table 5.4.3-2 PC2 MSD

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n41-n77 | n4112 | 2545 | 60 | 1 (RBstart=0) | 2545 | N/A | TDD | N/A |
|  |  | 2625 | 100 | 1 (RBstart=272) | 2625 |  |  |  |
|  | n77 | N/A | 10 | N/A | 3305 | 2.7 | FDD | IMD9 |

### 5.4.4 ∆TIB and ∆RIB values

Void

## 5.5 CA\_n77-n79

### 5.5.1 Configurations

The minimum requirements apply only when there is non-simultaneous Rx/Tx operation between n77-n79 NR carriers. This restriction applies also for these carriers when applicable NR CA configuration is part of a higher order configuration. These are shown in Table 5.2A.2.1-1 of TS 38.101-1 [3].

Table 5.5.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n77A-n79A | n77A8,9, n79A8,9  CA\_n77A-n79A­­8 | n77 | 10, 15, 20, 40, 50, 60, 80, 90, 100 | 0 |
| n79 | 40, 50, 60, 80, 100 |
| CA\_n77(2A)-n79A | n77A8,9, n79A8,9  CA\_n77(2A)**8**, 12  CA\_n77A-n79A8 | n77 | CA\_n77(2A)\_BCS1 | 0 |
| n79 | 40, 50, 60, 80, 100 |
| CA\_n77(3A)-n79A | n77A8,9, n79A8,9  CA\_n77(2A)**8**,12  CA\_n77A-n79A8 | n77 | CA\_n77(3A)\_BCS1 | 0 |
| n79 | 40, 50, 60, 80, 100 |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination  NOTE 12: UL configurations are for non simultaneous Rx/Tx operation. | | | | |

### 5.5.2 Maximum output power

Table 5.5.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n77-n79 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| Case c | 26dBm | 26dBm | 23dBm |
| Case d | 26dBm | 26dBm | 26dBm |

### 5.5.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink. For PC3 CA\_n77-n79 with single uplink, the co-existence study is provided in TR 37.865-01-01 [4]. For PC2 CA\_n77-n79 with UL CA\_n77-n79, the co-existence study is provided in TR38.717-02-01[5]. For PC2 and PC1.5 CA\_n77-n79 with single uplink, the co-existence study is provided in TR 37.865-01-01[4]. Analysis is based on these studies.

Additionally, analysis of REFSENS exceptions or MSD requirements is needed due to now added CA\_n77(2A) UL for PC2.

#### 5.5.3.0 Power class 2 case a, b, c and d

Considering both n77 and n79 are TDD bands and synchronous operation for CA\_n77-n79 is assumed, no MSD is needed for dual UL of CA\_n77-n79.

CA\_n77(2A) UL for CA\_n77(2A)-n79A DL and CA\_n77(3A)-n79A DL are already defined for PC3. PC2 is also defined for CA\_n77(2A)-n79A DL and CA\_n77(3A)-n79A DL but not yet for CA\_n77(2A) UL. However, non-simultaneous Rx-Tx operation for CA\_n77-n79 is assumed, therefore no MSD is needed for CA\_n77(2A) UL.

#### 5.5.3.1 Power class 2 for single uplink n77

Based on above,

- the 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of n79.

- the 2nd, 3rd, 4th, and 5th order harmonic mixing do not fall into Rx frequencies of n79.

Therefore, there is no MSD issue for this CA configuration.

#### 5.5.3.2 Power class 2 for single uplink n79

Based on above,

- the 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of n77.

- the 2nd, 3rd, 4th, and 5th order harmonic mixing do not fall into Rx frequencies of n77.

Therefore, there is no MSD issue for this CA configuration.

#### 5.5.3.3 Power class 1.5 for single uplink n77

Based on above,

- the 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of n79.

- the 2nd, 3rd, 4th, and 5th order harmonic mixing do not fall into Rx frequencies of n79.

Therefore, there is no MSD issue for this CA configuration.

#### 5.5.3.4 Power class 1.5 for single uplink n79

Based on above,

- the 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of n77.

- the 2nd, 3rd, 4th, and 5th order harmonic mixing do not fall into Rx frequencies of n77.

Therefore, there is no MSD issue for this CA configuration.

### 5.5.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

## 5.6 CA\_n78-n79

### 5.6.1 Configurations

For UEs supporting band n77, the minimum requirements apply only when there is non-simultaneous Rx/Tx operation between n78-n79 NR carriers. This restriction applies also for these carriers when applicable NR CA configuration is part of a higher order configuration. These are shown in Table 5.2A.2.1-1 of TS 38.101-1 [3].

Table 5.6.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n78A-n79A | n78A8,9, n79A8,9  n78A-n79A8 | n78 | 10, 15, 20, 40, 50, 60, 80, 90, 100 | 0 |
| n79 | 40, 50, 60, 80, 100 |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 5.6.2 Maximum output power

**Table 5.6.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_n78-n79** | **CA power class** | **Carrier n78 power class** | **Carrier n79 power class** |
| CA\_n78-n79 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| Case c | 26dBm | 26dBm | 23dBm |
| Case d | 26dBm | 26dBm | 26dBm |

### 5.6.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink. For PC3 CA\_n78-n79 with single uplink, the co-existence study is provided in TR 37.865-01-01 [4]. In addition, MSD due to cross band isolation is needed for UEs supporting the inter-band carrier aggregation with simultaneous Rx/Tx capability.

#### 5.6.3.0 Power class 2 case a, b, c and d

#### Considering both n78 and n79 are TDD bands, no MSD is needed for dual UL of CA\_n78-n79.5.6.3.1 Power class 2 for single uplink n78

Based on above,

- the 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of n79.

- the 2nd, 3rd, 4th, and 5th order harmonic mixing do not fall into Rx frequencies of n79.

For MSD due to cross band isolation, MSD value of PC2 case will be 3dB higher than that of PC3 case. New MSD values are shown in Table 5.6.3-1 below.

Table 5.6.3-1: Reference sensitivity exceptions (MSD) and uplink/downlink configurations due to cross band isolation from a PC2 aggressor NR UL band for NR CA FR1

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **Cross-band**  **Interference**  **source** |
| **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** |
| n78X1 | n79 | 3750 | 100 | 30 | 270 (RBstart=3) | 4420 | 40 | 5 | >ACLR2 |
| n78X1 | n79 | 3750 | 100 | 30 | 270 (RBstart=3) | 4450 | 100 | 5 | >ACLR2 |
| NOTE X1: The requirements only apply for UEs supporting inter-band carrier aggregation with simultaneous Rx/Tx capability. Simultaneous Rx/Tx capability does not apply for UEs supporting band n78 with a n77 implementation. | | | | | | | | | |

#### 5.6.3.2 Power class 2 for single uplink n79

Based on above,

- the 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of n78.

- the 2nd, 3rd, 4th, and 5th order harmonic mixing do not fall into Rx frequencies of n78.

For MSD due to cross band isolation, MSD value of PC2 case will be 3dB higher than that of PC3 case. New MSD values are shown in Table 5.6.3-2 below.

Table 5.6.3-2: Reference sensitivity exceptions (MSD) and uplink/downlink configurations due to cross band isolation from a PC2 aggressor NR UL band for NR CA FR1

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **Cross-band**  **Interference**  **source** |
| **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** |
| n79 | n78X1 | 4450 | 100 | 30 | 270 (RBstart=0) | 3795 | 10 | 5.6 | >ACLR2 |
| n79 | n78X1 | 4450 | 100 | 30 | 270 (RBstart=0) | 3750 | 100 | 5.6 | >ACLR2 |
| NOTE X1: The requirements only apply for UEs supporting inter-band carrier aggregation with simultaneous Rx/Tx capability. Simultaneous Rx/Tx capability does not apply for UEs supporting band n78 with a n77 implementation. | | | | | | | | | |

#### 5.6.3.3 Power class 1.5 for single uplink n78

Based on above,

- the 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of n79.

- the 2nd, 3rd, 4th, and 5th order harmonic mixing do not fall into Rx frequencies of n79.

For MSD due to cross band isolation, MSD value of PC1.5 case will be 6dB higher than that of PC3 case. New MSD values are shown in Table 5.6.3-3 below.

Table 5.6.3-3: Reference sensitivity exceptions (MSD) and uplink/downlink configurations due to cross band isolation from a PC1.5 aggressor NR single UL band for DL NR CA FR1

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **Cross-band**  **Interference**  **source** |
| **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** |
| n78X1 | n79 | 3750 | 100 | 30 | 270 (RBstart=3) | 4420 | 40 | 8 | >ACLR2 |
| n78X1 | n79 | 3750 | 100 | 30 | 270 (RBstart=3) | 4450 | 100 | 8 | >ACLR2 |
| NOTE X1: The requirements only apply for UEs supporting inter-band carrier aggregation with simultaneous Rx/Tx capability. Simultaneous Rx/Tx capability does not apply for UEs supporting band n78 with a n77 implementation. | | | | | | | | | |

#### 5.6.3.4 Power class 1.5 for single uplink n79

Based on above,

- the 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of n78.

- the 2nd, 3rd, 4th, and 5th order harmonic mixing do not fall into Rx frequencies of n78.

For MSD due to cross band isolation, MSD value of PC2 case will be 3dB higher than that of PC3 case. New MSD values are shown in Table 5.6.3-2 below.

Table 5.6.3-4: Reference sensitivity exceptions (MSD) and uplink/downlink configurations due to cross band isolation from a PC1.5 aggressor NR single UL band for DL NR CA FR1

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **Cross-band**  **Interference**  **source** |
| **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** |
| n79 | n78X1 | 4450 | 100 | 30 | 270 (RBstart=0) | 3795 | 10 | 8.6 | >ACLR2 |
| n79 | n78X1 | 4450 | 100 | 30 | 270 (RBstart=0) | 3750 | 100 | 8.6 | >ACLR2 |
| NOTE X1: The requirements only apply for UEs supporting inter-band carrier aggregation with simultaneous Rx/Tx capability. Simultaneous Rx/Tx capability does not apply for UEs supporting band n78 with a n77 implementation. | | | | | | | | | |

### 5.6.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

## 5.7 CA\_n3-n41

### 5.7.1 Configurations

**Table 5.7.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n3A-n41A | n418,9 | n3 | 5, 10, 15, 20, 25, 30 | 0 |
| n41 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |
| n3 | 5, 10, 15, 20, 25, 30 | 1 |
| n41 | 10, 15, 20, 40, 50, 60 |
| n3 | 5, 10, 15, 20, 25, 30, 40 | 2 |
| n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 |
| n3 | 5, 10, 15, 20, 25, 30, 40, 50 | 3 |
| n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 5.7.2 Maximum output power

This band combination does not support high power UL CA, so this section is omitted.

### 5.7.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 5.7.3.1 Power class 1.5 for single uplink n41

- the 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of n3.

- the 2nd, 3rd, 4th, and 5th order harmonic mixing do not fall into Rx frequencies of n3.

- MSD due to cross band isolation should be defined, PC2 and PC3 of this band combination also suffers this kind of interference.

**Table 5.7.3-1: Reference sensitivity exceptions (MSD) and uplink/downlink configurations due to cross band isolation from a PC2 aggressor NR UL band for NR CA FR1**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **Cross-band**  **Interference**  **source** |
| **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** |
| n41 | n3 | 2546 | 100 | 30 | 270 (RBstart=0) | 1877.5 | 5 | 3.9 | >ACLR2 |

### 5.7.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

## 5.8 CA\_n3-n77

### 5.8.1 Configurations

**Table 5.8.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n3A-n77A | n778,9  CA\_n3A-n77A8 | n3 | 5, 10, 15, 20, 25, 30 | 0 |
| n77 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |
| CA\_n3A-n77(2A) | n778,9  CA\_n77(2A)8  CA\_n3A-n77A8 | n3 | 5, 10, 15, 20, 25, 30 | 0 |
| n77 | CA\_n77(2A)\_BCS0 |
| CA\_n3A-n77(3A) | n778,9  CA\_n77(2A)8  CA\_n3A-n77A8 | n3 | 5, 10, 15, 20, 25, 30, 35, 40 | 0 |
| n77 | CA\_n77(3A)\_BCS0 |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 5.8.2 Maximum output power

**Table 5.8.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n3-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n77(2A) | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 5.8.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 5.8.3.1 Power class 2 case a, b

For UL CA\_n3-n77, based on calculation, IMD 2, 4, 5 of dual UL falls into n3 DL, the MSD exception is defined as below, the values are reused from CA\_n3-n78.

Additionally, IMD 5, 6, 7 and 8 of CA\_n77(2A) UL falls into n3 DL. And for this combination PC3 with CA\_n77(2A) UL is specified, with MSD defined for IMD7. Possible problematic 2UL IMD cases are:

- IMD5: There is no need to specify the MSD because for IMD5 to fall on n3 DL, carriers in n77 would need to exceed 600 MHz spacing which is not allowed in current specification [3].

- IMD6: There is no need to specify the MSD because of the same reason.

- IMD7: The MSD can be evaluated using the same test configuration as for PC3

- IMD8. Because test points for IMD2 and IMD4 exist already, hence it is not recommended to add third test point for even order IMD.

As such, we recommend to specify IMD7 MSD using the same test configuration as was used for PC3. The MSD exception is defined as in Table below.

**Table 5.8.3-1: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n3-n774 | n3 | 1740 | 5 | 25 | 1835 | 31.9 | FDD | IMD2 |
| n77 | 3575 | 10 | 50 | 3575 | N/A | TDD | N/A |
| n3 | 1765 | 5 | 25 | 1860 | 18.5 | FDD | IMD4 |
| n77 | 3435 | 10 | 50 | 3435 | N/A | TDD | N/A |
|  | n3 | N/A | N/A | N/A | N/A | N/A6 | FDD | IMD5 |
|  | n77 | N/A | N/A | N/A | N/A | N/A | TDD | N/A |
|  | n3 | N/A | 5 | N/A | 1877.5 | 13.6 | FDD | IMD7 |
|  | n7712 | 3427.5 | 10 | 1 (RBstart=10) | 3427.5 | N/A | TDD | N/A |
|  |  | 3945 | 10 | 1 (RBstart=0) | 3945 |  |  |  |
| NOTE 4: This band is subject to IMD5 also which MSD is not specified.  NOTE 6: Considering the spectrum holdings of the operator for CA\_n77(2A) (when one uplink sub block is assigned within 3300-3400MHz, the other uplink sub block is not assigned within 4000-4200MHz or vice versa), no IMD5 result will fall in Rx frequency range of band n3. Therefore, no MSD requirement apply for this CA configuration when two uplink sub blocks are assigned within CA\_77(2A).  NOTE 12: This band supports intra-band non-contiguous uplink configuration. | | | | | | | | |

#### 5.8.3.2 Power class 2 for single uplink n77

- the 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of n3.

- the 2th order harmonic mixing falls into Rx frequencies of n3.

Therefore, MSD issue due to harmonic mixing from PC2 n77 UL falling into n3 DL should be defined, the value is reused from CA\_n3-n78.

**Table 5.8.3.2-1: Reference sensitivity exceptions and uplink/downlink configurations due to harmonic mixing from a PC2 aggressor NR UL band for NR DL CA FR1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL BW** | **MSD** | **UL/DL fc condition** | **UL/DL harmonic order** |
| **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(dB)** |
| n77 | n3 | 5 | 15 | 25 (RBstart=0) | 5 | 8.1 | NOTE 4 | UL1/DL2 |
| n77 | n3 | 40 | 15 | 216 (RBstart=0) | 40 | 1 | NOTE 4 | UL1/DL2 |

#### 5.8.3.3 Power class 1.5 for single uplink n77

- the 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of n3.

- the 2th order harmonic mixing falls into Rx frequencies of n3.

Therefore, MSD issue due to harmonic mixing from PC1.5 n77 UL falling into n3 DL should be defined.

**Table 5.8.3.3-1: Reference sensitivity exceptions and uplink/downlink configurations due to harmonic mixing from a PC1.5 aggressor NR UL band for NR DL CA FR1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL BW** | **MSD** | **UL/DL fc condition** | **UL/DL harmonic order** |
| **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(dB)** |
| n77 | n3 | 5 | 15 | 25 (RBstart=0) | 5 | 11.1 | NOTE 4 | UL1/DL2 |
| n77 | n3 | 40 | 15 | 216 (RBstart=0) | 40 | 4 | NOTE 4 | UL1/DL2 |

### 5.8.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

## 5.9 CA\_n8-n78

### 5.9.1 Configurations

**Table 5.9.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n8A-n78A | n788,9  CA\_n8A-n78A8 | n8 | 5, 10, 15, 20 | 0 |
|  |  | n78 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |  |
|  |  | n8 | 5, 10, 15, 20 | 1 |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100 |  |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination. | | | | |

### 5.9.2 Maximum output power

**Table 5.9.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_n8-n78** | **CA power class** | **Carrier n8 power class** | **Carrier n78 power class** |
| CA\_n8-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 5.9.3 REFSENS requirements

For PC2 CA\_n8-n78, the co-existence studies on the harmonic issue and intermodulation issues are the same with the PC3 CA\_n8-n78, where:

4th harmonic frequency of band 8 UL may fall into band n78 DL Rx

4th IMD frequencies (i.e. 3\*f8-fn78) may fall into band 8 DL Rx

4th Harmonic mixing issue, i.e. Band n78 UL may fall into 4th receiver harmonic mixing frequency of band n8

It shall be noted that the MSD values for the above two types of MSD have already been defined for PC3 CA\_n8-n78 configuration in TS38.101-1 specification.

5.9.3.1 Power class 2 case a

For PC2 case a, since the power configuration for each band is 23dBm, therefore:

For the harmonic issue, comparing with PC3 CA\_n8A-n78A, no additional MSD are expected for this PC2 CA\_n8A-n78A with 1 uplink carrier.

For the harmonic mixing issue, comparing with PC3 CA\_n8A-n78A, no additional MSD are expected for this PC2 CA\_n8A-n78A.

For the IMD issue, comparison of the NOTE 1 in Table 7.3A.5-1 (for PC3 2UL/2DL) and Table 7.3A.5-1a (for PC2 2UL/2DL) in TS38.101-1, it can be found that the set for both transmitters is changed from min(+20 dBm, PCMAX\_L,f,c) to min(+23 dBm, PCMAX\_L,f,c), which means the IMD4 MSD for PC2 2UL/2DL CA\_n8A-n78A should be defined additionally.

The IMD4 MSD for PC2 2UL/2DL CA\_n8A-n78A is proposed to be defined in table 5.9.3.1-1, by reusing the same IMD4 MSD of PC2 2UL/2DL DC\_8A\_n78A.

**Table 5.9.3.1-1 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

| NR Band / Channel bandwidth / NRB / MSD | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA Configuration | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | IMD order |
| CA\_n8-n78 | n8 | 897.5 | 5 | 25 | 942.5 | 15.5 | IMD4 |
|  | n78 | 3635 | 10 | 50 | 3635 | N/A | N/A |

5.9.3.2 Power class 2 case b

For PC2 case b, similar with case a, no additional harmonic MSD are expected for this PC2 CA\_n8A-n78A with 1 uplink carrier since the power of band n8 is kept as 23dBm.

For PC2 case b, the harmonic mixing issue, comparing with PC3 CA\_n8A-n78A, additional MSD are expected for this PC2 CA\_n8A-n78A since the power of band n78 is increased to 26dBm. The harmonic mixing MSD for PC2 CA\_n8A-n78A is defined in table 5.9.3.2-1 by referring to the same MSD of PC2 CA\_n5A-n77A.

Table 5.9.3.2-1: Reference sensitivity exceptions and uplink/downlink configurations due to harmonic mixing from a PC2 aggressor NR UL band for NR DL CA FR1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL BW** | **MSD** | **UL/DL fc condition** | **UL/DL harmonic order** |
| **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(dB)** |
| n78 | n8 | 10 | 15 | 25 (RBstart=0) | 5 | 8.1 | NOTE 5 | UL1/DL4 |
| n78 | n8 | 20 | 15 | 20 (RBstart=0) | 20 | 4.3 | NOTE 5 | UL1/DL4 |
| NOTE 5: The requirements should be verified for UL NR-ARFCN of the aggressor (higher) band (superscript HB) such that  in MHz and  with  the carrier frequency in the victim (lower) band and  the channel bandwidth configured in the higher band. | | | | | | | | |

Regarding the power configuration of 23dBm+26dBm in case b, due to the set for both transmitters for MSD calculation is the same, i.e. min(+23 dBm, PCMAX\_L,f,c), as 23+23dBm power configuration in case a, so the IMD4 MSD value defined in table 5.9.3.1-1 can be applied.

#### 5.9.3.3 Power class 1.5 for single uplink n78

Based on above,

- 4th harmonic mixing fall into Rx frequencies of band n8.

Therefore, MSD issue due to harmonic mixing from PC1.5 n79 UL falling into n8 DL should be defined.

**Table 5.9.3.2-1: Reference sensitivity exceptions and uplink/downlink configurations due to harmonic mixing from a PC1.5 aggressor NR UL band for NR DL CA FR1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL BW** | **MSD** | **UL/DL fc condition** | **UL/DL harmonic order** |
| **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(dB)** |
| n78 | n8 | 10 | 15 | 25 (RBstart=0) | 5 | 10.5 | NOTE 5 | UL1/DL4 |
| n78 | n8 | 20 | 15 | 20 (RBstart=0) | 20 | 6.7 | NOTE 5 | UL1/DL4 |
| NOTE 5: The requirements should be verified for UL NR-ARFCN of the aggressor (higher) band (superscript HB) such that  in MHz and  with  the carrier frequency in the victim (lower) band and  the channel bandwidth configured in the higher band. | | | | | | | | |

### 5.9.4 ∆TIB and ∆RIB values

For the ∆TIB,c and ∆RIB,c values, same PC3 CA\_n8A-n78A requirements are applied for PC2 CA\_n8A-n78A.

## 5.10 CA\_n40-n77

### 5.10.1 Configurations

**Table 5.10.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n40A-n77A | n40A8,9  n77A8,9  CA\_n40A-n77A8 | n40 | 10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100 | 0 |
| n77 | 10, 15, 20, 25, 30, 40, 50, 60, 704,80, 904, 100 |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 5.10.2 Maximum output power

Table 5.10.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n40-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| Case c | 26dBm | 26dBm | 23dBm |
| Case d | 26dBm | 26dBm | 26dBm |

### 5.10.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

5.10.3.1 Power class 2 and 1.5 case a, b, c, d

Based on TS 38.101-1 Table 7.3A.4-1, there is no UL harmonic interference issue for this band combination.

Based on TS 38.101-1 Table 7.3A.4-4, there is harmonic mixing issue for n77 to n40 this is treated under the single band exceptions.

Based on TS 38.101-1 Table 7.3A.5-1, there is no IMD issues for this band combination.

Based on TS 38.101-1 Table 7.3A.6-1, there is cross band isolation issues for n77 to n40 this is treated under the single band exceptions.

5.10.3.2 Power class 2 for single uplink n77

- The 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of n40.

- The 2nd, 3rd, 4th, and 5th order harmonic mixing do not fall into Rx frequencies of n40.

- n40 DL suffers UL2/DL3 harmonic mixing from n77.

- Cross band isolation of n77 UL falls into n40 DL.

Therefore, MSD for cross band isolation and harmonic mixing should be defined.

**Table 5.10.3.2-1: Reference sensitivity exceptions (MSD) and uplink/downlink configurations due to cross band isolation from a PC2 aggressor NR UL band for NR CA FR1**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **Cross-band**  **Interference**  **source** |
| **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** |
| n77 | n401 | 3350 | 100 | 30 | 270 (RBstart=0) | 2395 | 10 | 6.5 | >ACLR2 |
| n77 | n401 | 3350 | 100 | 30 | 270 (RBstart=0) | 2350 | 100 | 1.2 | >ACLR2 |

**Table 5.10.3.2-2: Reference sensitivity exceptions and uplink/downlink configurations due to harmonic mixing from a PC2 aggressor NR UL band for NR DL CA FR1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL BW** | **MSD** | **UL/DL fc condition** | **UL/DL harmonic order** |
| **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(dB)** |
| n77 | n40 | 20 | 30 | 50 (RBstart=0) | 10 | 13.2 | NOTE 3 | UL2/DL3 |
| n77 | n40 | 20 | 30 | 50 (RBstart=0) | 100 | 4.4 | NOTE 3 | UL2/DL3 |

5.10.3.3 Power class 1.5 for single uplink n77

Similar as for PC2 MSD should be defined.

**Table 5.10.3.3-1: Reference sensitivity exceptions (MSD) and uplink/downlink configurations due to cross band isolation from a PC1.5 aggressor NR UL band for NR CA FR1**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **Cross-band**  **Interference**  **source** |
| **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** |
| n77 | n401 | 3350 | 100 | 30 | 270 (RBstart=0) | 2395 | 10 | 9.0 | >ACLR2 |
| n77 | n401 | 3350 | 100 | 30 | 270 (RBstart=0) | 2350 | 100 | 2.2 | >ACLR2 |

**Table 5.10.3.3-2: Reference sensitivity exceptions and uplink/downlink configurations due to harmonic mixing from a PC1.5 aggressor NR UL band for NR DL CA FR1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL BW** | **MSD** | **UL/DL fc condition** | **UL/DL harmonic order** |
| **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(dB)** |
| n77 | n40 | 20 | 30 | 50 (RBstart=0) | 10 | 16.1 | NOTE 3 | UL2/DL3 |
| n77 | n40 | 20 | 30 | 50 (RBstart=0) | 100 | 6.7 | NOTE 3 | UL2/DL3 |

5.10.3.4 Power class 2 and 1.5 for single uplink n40

According to previous co-existence studies there are no issues.

### 5.10.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

## 5.11 CA\_n28-n77

### 5.11.1 Configurations

**Table 5.11.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n28A-n77A | n778,9  CA\_n28A-n77A8 | n28 | 5, 10, 15, 20 | 0 |
| n77 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |
| CA\_n28A-n77(2A) | n778,9  CA\_n77(2A)8  CA\_n28A-n77A8 | n28 | 5, 10, 15, 20 | 0 |
| n77 | CA\_n77(2A)\_BCS0 |
| CA\_n28A-n77(3A) | n778,9  CA\_n77(2A) 8  CA\_n28A-n77A8 | n28 | 5, 10 | 0 |
| n77 | CA\_n77(3A)\_BCS0 |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 5.11.2 Maximum output power

**Table 5.11.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY or (CA\_nC)** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n28-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n77(2A) | Case a | 26dBm | 23dBm | 23dBm |
|  | Case b | 26dBm | 23dBm | 26dBm |

### 5.11.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

5.11.3.1 Power class 2 case a, b

For UL CA\_n28A-n77A, based on calculation, IMD5 of dual UL falls into n28 DL, the MSD exception is defined as below.

For UL CA\_n77(2A), based on calculation, IMD 2, 4, 6, 7 and 8 of dual n77 UL falls into n28 DL. Possible problematic cases are

- IMD2: For IMD2 to fall on n28, carriers in n77 would need to exceed 600 MHz spacing which is not allowed in current specification [3].

- IMD4

- IMD6: Considered to be covered by lower even order case of IMD4. A note should be added to clarify that IMD6 is present but the corresponding MSD does not need to be specified (e.g. NOTE X as in Table below).

- IMD7: For IMD7 to fall on n28, carriers in n77 would need to exceed 600 MHz spacing which is not allowed in current specification [3].

- IMD8: Considered to be covered by lower even order case of IMD4

The MSD exception is defined as below.

**Table 5.11.3-1: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n28-n77 | n28 | 705.5 | 5 | 25 | 760.5 | 19.2 | FDD | IMD5 |
|  | n77 | 3582.5 | 10 | 50 | 3582.5 | N/A | TDD | N/A |
|  | n28 | N/A | N/A | N/A | N/A | N/A | FDD | IMD27 |
|  | n7712 | N/A | N/A | N/A | N/A | N/A | TDD | N/A |
|  | n28 | 725 | 5 | 25 | 780 | 18.5 | FDD | IMD4X |
|  | n7712 | 3510 | 10 | 1 RBSTART=25 | 3510 | N/A | TDD | N/A |
|  |  | 3900 | 10 | 1 RBSTART=25 | 3900 | N/A | TDD | N/A |
| NOTE 7: In current release the maximum separation bandwidth class is 600MHz, therefore, no IMD2 MSD requirement apply for this CA configuration when two uplink sub blocks are assigned within CA\_77(2A).  NOTE 12: This band supports intra-band non-contiguous uplink configuration.  NOTE X: This band is subject to IMD6 also which MSD is not specified. | | | | | | | | |

5.11.3.2 Power class 2 for single uplink n77

- the 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of n77.

- the 5th order harmonic mixing falls into Rx frequencies of n28.

Therefore, MSD issue due to harmonic mixing from PC2 n77 UL falling into n28 DL should be defined, the value is reused from CA\_n28-n78.

**Table 5.11.3.2-1: Reference sensitivity exceptions and uplink/downlink configurations due to harmonic mixing from a PC2 aggressor NR UL band for NR DL CA FR1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL BW** | **MSD** | **UL/DL fc condition** | **UL/DL harmonic order** |
| **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(dB)** |
| n77 | n28 | 5 | 15 | 25 (RBstart=0) | 5 | 31 | NOTE 1 | UL1/DL5 |
| n77 | n28 | 30 | 15 | 160 (RBstart=0) | 30 | 11.7 | NOTE 1 | UL1/DL5 |

5.11.3.3 Power class 1.5 for single uplink n77

- the 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of n77.

- the 5th order harmonic mixing falls into Rx frequencies of n28.

Therefore, MSD issue due to harmonic mixing from PC1.5 n77 UL falling into n28 DL should be defined,.

**Table 5.11.3.3-1: Reference sensitivity exceptions and uplink/downlink configurations due to harmonic mixing from a PC1.5 aggressor NR UL band for NR DL CA FR1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL BW** | **MSD** | **UL/DL fc condition** | **UL/DL harmonic order** |
| **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(dB)** |
| n77 | n28 | 5 | 15 | 25 (RBstart=0) | 5 | 34 | NOTE 1 | UL1/DL5 |
| n77 | n28 | 30 | 15 | 160 (RBstart=0) | 30 | 14.7 | NOTE 1 | UL1/DL5 |

### 5.11.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 5.12 CA\_n1-n41

### 5.12.1 Configurations

**Table 5.12.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n1A-n41A | n418,9  CA\_n1A-n41A8 | n1 | 5, 10, 15, 20 | 0 |
| n41 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |
| n1 | 5, 10, 15, 20, 25, 30, 40, 50 | 1 |
| n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 5.12.2 Maximum output power

**Table 5.12.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n1-n41 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 5.12.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

5.12.3.1 Power class 2 case a, b

Based on calculation, no IMD of dual uplink falls into n1 DL, the MSD exception is not needed.

5.12.3.2 Power class 2 for single uplink n41

- the harmonic mixing interference of n41 does not fall into Rx frequencies of n1.

- Cross band isolation interference of PC2 n41 falls into n1

The PC2 MSD due to cross band isolation is specified in following table.

**Table 5.12.3.2-1: Reference sensitivity exceptions (MSD) and uplink/downlink configurations due to cross band isolation from a PC2 aggressor NR UL band for NR CA FR1**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **Cross-band**  **Interference**  **source** |
| **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** |
| n41 | n1 | 2546 | 100 | 30 | 270 (RBstart=0) | 2167.5 | 5 | 20.8 | >ACLR2 |

5.12.3.3 Power class 1.5 for single uplink n41

- the harmonic mixing interference of n41 does not fall into Rx frequencies of n1.

- Cross band isolation interference of PC1.5 n41 falls into n1

The PC1.5 MSD due to cross band isolation is specified in following table.

**Table 5.12.3.3-1: Reference sensitivity exceptions (MSD) and uplink/downlink configurations due to cross band isolation from a PC1.5 aggressor NR UL band for NR CA FR1**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **Cross-band**  **Interference**  **source** |
| **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** |
| n41 | n1 | 2546 | 100 | 30 | 270 (RBstart=0) | 2167.5 | 5 | 23.5 | >ACLR2 |

### 5.12.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 5.13 CA\_n1-n77

### 5.13.1 Configurations

**Table 5.13.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n1A-n77A | n778,9  CA\_n1A-n77A8 | n1 | 5, 10, 15, 20 | 0 |
| n77 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |
| CA\_n1A-n77(2A) | n778,9  CA\_n1A-n77A8  CA\_n77(2A)8 | n1 | 5, 10, 15, 20 | 0 |
| n77 | CA\_n77(2A)\_BCS0 |
| CA\_n1A-n77(3A) | n778,9  CA\_n77(2A)8 | n77 | CA\_n77(2A)\_BCS0 | 0 |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination. | | | | |

### 5.13.2 Maximum output power

**Table 5.13.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n1-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 5.13.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

(The analysis for PC3 is addressed in R4-2313802)

#### 5.13.3.1 Power class 2 case a, b

For UL CA\_n1A-n77A) based on calculation, IMD2/4/5 of dual UL falls into n1 DL, the MSD exception is defined as below, which is reused from DC\_1\_n77.

For UL CA\_n77(2A), based on calculation, IMD 5, 6 and 7 of dual intra-band n77 UL falls into n1 DL. Possible problematic cases are:

- IMD5

- IMD6: For IMD6 to fall on n1 DL, carriers in n77 would need to exceed 600 MHz spacing which is not allowed in current specification [3].

- IMD7: This is not an issue either since it can be covered by IMD5, the lowest odd order in this case. A note should be added to clarify that IMD7 is present but the corresponding MSD does not need to be specified, e.g. NOTE X as in Table below.

**Table 5.13.3-1: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n1-n774 | n1 | 1950 | 5 | 25 | 2140 | 35.8 | FDD | IMD2 |
| n77 | 4090 | 10 | 50 | 4090 | N/A | TDD | N/A |
| 1 | 1950 | 5 | 25 | 2140 | 17.8 | FDD | IMD4 |
| n77 | 3710 | 10 | 50 | 3710 | N/A | TDD | N/A |
|  | n1 | N/A | 5 | N/A | 2130 | 31 | FDD | IMD5X |
|  | n7712 | 3310 | 10 | 1 RBSTART=25 | 3310 | N/A | TDD | N/A |
|  |  | 3900 | 10 | 1 RBSTART=25 | 3900 | N/A | TDD | N/A |
| NOTE 4: This band is subject to IMD5 also which MSD is not specified.  NOTE 12: This band supports intra-band non-contiguous uplink configuration.  NOTE X: This band is subject to IMD7 also which MSD is not specified. | | | | | | | | |

#### 5.13.3.2 Power class 2 for single uplink n77

- No harmonic mixing of n77 falls into Rx frequencies of n1.

- No cross band isolation issue.

Therefore, no MSD exception needs to be defined.

#### 5.13.3.3 Power class 1.5 for single uplink n77

- No harmonic mixing of n77 falls into Rx frequencies of n1.

- No cross band isolation issue.

Therefore, no MSD exception needs to be defined.5.13.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 5.14 CA\_n25-n78

### 5.14.1 Configurations

**Table 5.14.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n25A-n78A | n788,9  CA\_n25A-n78A8 | n25 | 5, 10, 15, 20, 25, 30, 40 | 0 |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100 |  |
|  |  | n25 | 5, 10, 15, 20, 25, 30, 40 | 1 |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
|  |  | n25 | See n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n78 | See n78 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n25A-n78(2A) | n788,9  CA\_n25A-n78A8 | n25 | 5, 10, 15, 20, 25, 30, 40 | 0 |
|  | CA\_n78(2A)8 | n78 | CA\_n78(2A)\_BCS0 |  |
|  |  | n25 | 5, 10, 15, 20, 25, 30, 40 | 1 |
|  |  | n78 | CA\_n78(2A)\_BCS2 |  |
|  |  | n25 | See n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n78 | CA\_n78(2A)\_BCS4 and 5 |  |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 5.14.2 Maximum output power

**Table 5.14.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n25-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 5.14.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 5.14.3.1 Power class 2 case a, b

Based on calculation, IMD2 and IMD5 of dual UL falls into n25 DL. PC2 MSD value is reused from CA\_n2-n77.

**Table 5.14.3-1: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n25-n78 | n25 | 1855 | 5 | 25 | 1935 | 32.10 | FDD | IMD24 |
|  | n78 | 3790 | 10 | 50 | 3790 | N/A | TDD | N/A |
| NOTE 4: This band is subject to IMD5 also which MSD is not specified. | | | | | | | | |

#### 5.14.3.2 Power class 2 for single uplink n78

Table 5.14.3.2-1 lists up to 7th harmonics for n25A-n78A which shows that there are 2nd harmonics issues from UL n25 into DL n78.

**Table 5.14.3.2-1: Impact of UL/DL Harmonic**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | | **5th Harmonic** | | **6th Harmonic** | | **7th Harmonic** | |
|  | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** |
| n25 | 1850 | 1915 | 3700 | 3830 | 5550 | 5745 | 7400 | 7660 | 9250 | 9575 | 11100 | 11490 | 12950 | 13405 |
| n78 | 3300 | 3800 | 6600 | 7600 | 9900 | 11400 | 13200 | 15200 | 16500 | 19000 | 19800 | 22800 | 23100 | 26600 |

Table 5.14.3.2-2 list harmonic mixing issue for the 2DL bands CA with 1 UL. As can be seen there are no harmonic mixing issues.

Table 5.14.3.2-2 Harmonic mixing for 2DLs/1UL

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | |
| **Band** | **UL Low Band Edge** | UL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge |
| n25 | 1850 | 1915 | 1930 | 1995 | 3860 | 3990 | 5790 | 5985 | 7720 | 7980 |
| n78 | 3300 | 3800 | 3300 | 3800 | 6600 | 7600 | 9900 | 11400 | 13200 | 15200 |

No MSD issue due to harmonic or harmonic mixing from PC2 n78 UL need to be defined

#### 5.14.3.3 Power class 1.5 for single uplink n78

No MSD issue due to harmonic or harmonic mixing from PC1.5 n78 UL need to be defined

#### 5.14.3.4 Power class 2 for non-contiguous uplink n78

Table 5.14.3.4-1 lists up to 7th order IMD from UL CA\_n78(2A) UE-to-UE coexistence analysis.

**Table 5.14.3.4-1: CA\_n78(2A) IMD products**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| CC location | fU1L | fU2L | fU3L | fU1H | fU2H | fU3H |
| Frequency | 3300 | 3320 | 3780 | 3800 | 3780 | 3320 |
| 2nd | I fU1L-fU2L I | I fU1L-fU3L I | fU1L + fU2L | fU1H+fU2H |  |  |
| Ranges | 20 | 480 | 6620 | 7580 |  |  |
| 3rd | 2\*fU1L-fU3L | 2\*fU1H-fU3H | 2\*fU1L + fU2L | 2\*fU1H + fU2H |  |  |
| Ranges | 2820 | 4280 | 9920 | 11380 |  |  |
| 4th | I 2\*fU1L - 2\*fU2L I | I 2\*fU1H - 2\*fU3H I | 3\*fU1L - fU3L | 3\*fU1H - fU3H | 3\*fU1L + fU2L | 3\*fU1H + fU2H |
| Ranges | 40 | 960 | 6120 | 8080 | 13220 | 15180 |
| 5th | I 3\*fUL1-2\*fU3L I | I 3\*fUH1-2\*fU3H I | 4\*fUL1-fU3L | 4\*fUH1-fU3H | 4\*fUL1+fU2L | 4\*fUH1+fU2H |
| Ranges | 2340 | 4760 | 9420 | 11880 | 16520 | 18980 |
| 6th | I 3\*fUL1-3\*fU2L I | I 3\*fUH1-3\*fU3H I | 4\*fUL1-2\*fU3L | 4\*fUH1-2\*fU3H | 5\*fUL1-fU3L | 5\*fUH1-fU3H |
| Ranges | 60 | 1440 | 5640 | 8560 | 12720 | 15680 |
| 7th | I 4\*fUL1-3\*fU3L I | I 4\*fUH1-3\*fU3H I | 5\*fUL1-2\*fU3L | 5\*fUH1-2\*fU3H | 6\*fUL1-fU3L | 6\*fUH1-fU3H |
| Ranges | 1860 | 5240 | 8940 | 12360 | 16020 | 19480 |

As can be seen in the co-existence analysis above there are IMD7 products from CA\_n78(2A) affecting band n25 DL. MSD value is reused from PC2 CA\_n25-n77 and test points are reused from PC3 CA\_n25-n78.

Table 5.14.3.4-2: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA  Configuration | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n25-n78 | n25 | N/A | 5 | N/A | 1980 | 13.6 | FDD | IMD7 |
|  | n7812 | 3315 | 10 | 1 (RBSTART=7) | 3315 | N/A | TDD | N/A |
|  |  | 3760 | 10 | 1 (RBSTART=0) | 3760 |  |  |  |
| NOTE 12: This band supports intra-band non-contiguous uplink configuration. | | | | | | | | |

### 5.14.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 5.15 CA\_n66-n78

### 5.15.1 Configurations

**Table 5.15.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n66A-n78A | n788,9  CA\_n66A-n78A8 | n66 | 5, 10, 15, 20, 40 | 0 |
|  |  | n78 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |  |
|  |  | n66 | 5, 10, 15, 20, 25, 30, 40 | 1 |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
|  |  | n66 | See n66 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n78 | See n78 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n66A-n78(2A) | n788,9  CA\_n66A-n78A8 | n66 | 5, 10, 15, 20, 30, 40 | 0 |
|  |  | n78 | CA\_n78(2A)\_BCS1 |  |
|  |  | n66 | 5, 10, 15, 20, 25, 30, 40 | 1 |
|  |  | n78 | CA\_n78(2A)\_BCS2 |  |
|  |  | n66 | See n66 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n78 | CA\_n78(2A)\_BCS4 and 5 |  |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 5.15.2 Maximum output power

**Table 5.15.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n66-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 5.15.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 5.15.3.1 Power class 2 case a, b

Based on calculation, IMD5 of dual UL falls into n66 DL. PC2 MSD value is reused from CA\_n66-n77.

**Table 5.15.3-1: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n66-n78 | n66 | 1760 | 5 | 25 | 2160 | 11.27 | FDD | IMD5 |
|  | n78 | 3720 | 10 | 50 | 3720 | N/A | TDD | N/A |

#### 5.15.3.2 Power class 2 for single uplink n78

Table 5.15.3.2-1 lists up to 7th harmonics for n66A-n78A which shows that there are 2nd harmonics issues from UL n66 into DL n78.

**Table 5.15.3.2-1: Impact of UL/DL Harmonic**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | | **5th Harmonic** | | **6th Harmonic** | | **7th Harmonic** | |
|  | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** |
| n66 | 1710 | 1780 | 3420 | 3560 | 5130 | 5340 | 6840 | 7120 | 8550 | 8900 | 10260 | 10680 | 11970 | 12460 |
| n78 | 3300 | 3800 | 6600 | 7600 | 9900 | 11400 | 13200 | 15200 | 16500 | 19000 | 19800 | 22800 | 23100 | 26600 |

Table 5.15.3.2-2 list harmonic mixing issue for the 2DL bands CA with 1 UL. As can be seen there are no harmonic mixing issues.

Table 5.15.3.2-2 Harmonic mixing for 2DLs/1UL

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | |
| **Band** | **UL Low Band Edge** | UL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge |
| n66 | 1710 | 1780 | 2110 | 2200 | 4220 | 4400 | 6330 | 6600 | 8440 | 8800 |
| n78 | 3300 | 3800 | 3300 | 3800 | 6600 | 7600 | 9900 | 11400 | 13200 | 15200 |

No MSD issue due to harmonic or harmonic mixing from PC2 n78 UL need to be defined

#### 5.15.3.3 Power class 1.5 for single uplink n78

No MSD issue due to harmonic or harmonic mixing from PC1.5 n78 UL need to be defined

### 5.15.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 5.16 CA\_n7-n77

### 5.16.1 Configurations

**Table 5.16.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n7A-n77A | n778, 9  CA\_n7A-n77A8 | n7 | 5, 10, 15, 20, 25, 30, 40, 50 | 0 |
|  |  | n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| CA\_n7(2A)-n77A | n778, 9  CA\_n7A-n77A8 | n7 | CA\_n7(2A)\_BCS0 | 0 |
|  |  | n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| CA\_n7A-n77(2A) | n778, 9  CA\_n77(2A) 8  CA\_n7A-n77A8 | n7 | 5, 10, 15, 20, 25, 30, 40, 50 | 0 |
|  |  | n77 | CA\_n77(2A)\_BCS1 |  |
| CA\_n7(2A)-n77(2A) | n778, 9  CA\_n77(2A) 8  CA\_n7A-n77A8 | n7 | CA\_n7(2A)\_BCS0 | 0 |
|  |  | n77 | CA\_n77(2A)\_BCS1 |  |
| CA\_n7A-n77(3A) | n778, 9  CA\_n77(2A)8  CA\_n7A-n77A8 | n7 | 5, 10, 15, 20, 25, 30, 40, 50 | 0 |
|  |  | n77 | CA\_n77(3A)\_BCS1 |  |
| CA\_n7(2A)-n77(3A) | n778, 9  CA\_n77(2A)8 CA\_n7A-n77A8 | n7 | CA\_n7(2A)\_BCS0 | 0 |
|  |  | n77 | CA\_n77(3A)\_BCS1 |  |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 5.16.2 Maximum output power

**Table 5.16.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n7-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 5.16.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 5.16.3.1 Power class 2 case a, b

Based on co-existence calculations, IMD4 of dual UL and IMD5 of non-contiguous UL falls into n7 DL.

The PC3 IMD4 MSD value for CA\_n7-n77 is 7.1

The PC3 IMD5 MSD value from non-contiguous UL CA\_n7-n77 is 15.

MSD for PC2 UL CA is calculated from MSD for PC2 as follows:

If the input signal increases by 3 dB, the IMD4 interference power increases by 3\*4=12 dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

Text

Description automatically generated

If is increased by dB, then is given by

A picture containing logo

Description automatically generated





The proposed IMD4 and IMD5 MSD values for PC2 based on above calculations can be found in Table 5.16.3-1.

**Table 5.16.3-1: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n7-n77 | n7 | 2540 | 5 | 25 | 2660 | 18.2 | FDD | IMD4 |
|  | n77 | 3870 | 10 | 50 | 3870 | N/A | TDD | N/A |
|  | n7 | N/A | 5 | N/A | 2687.5 | 29.9 | FDD | IMD5x |
|  | n7712 | 3455 | 10 | 1 (RBSTART=0) | 3455 | N/A | TDD | N/A |
|  | 3835 | 10 | 1 (RBSTART=7) | 3835 | N/A | TDD | N/A |
| NOTE 12: This band supports intra-band non-contiguous uplink configuration.  NOTE X: This band is subject to IMD7 also which MSD is not specified. | | | | | | | | |

#### 5.16.3.2 Power class 2 for single uplink n77

Table 5.16.3.2-1 lists up to 7th harmonics for n7A-n77A which shows that there are no harmonics issues.

**Table 5.16.3.2-1: Impact of UL/DL Harmonic**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | | **5th Harmonic** | | **6th Harmonic** | | **7th Harmonic** | |
|  | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** | **UL Low Band Edge** | **UL High Band Edge** |
| n7 | 2500 | 2570 | 5000 | 5140 | 7500 | 7710 | 10000 | 10280 | 12500 | 12850 | 15000 | 15420 | 17500 | 17990 |
| n77 | 3300 | 4200 | 6600 | 8400 | 9900 | 12600 | 13200 | 16800 | 16500 | 21000 | 19800 | 25200 | 23100 | 29400 |

Table 5.16.3.2-2 list harmonic mixing issue for the 2DL bands CA with 1 UL. As can be seen there are no harmonic mixing issues.

Table 5.16.3.2-2 Harmonic mixing for 2DLs/1UL

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  | **2nd Harmonic** | | **3rd Harmonic** | | **4th Harmonic** | |
| **Band** | **UL Low Band Edge** | UL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge | DL Low Band Edge | DL High Band Edge |
| n7 | 2500 | 2570 | 2620 | 2690 | 5240 | 5380 | 7860 | 8070 | 10480 | 10760 |
| n77 | 3300 | 4200 | 3300 | 4200 | 6600 | 8400 | 9900 | 12600 | 13200 | 16800 |

No MSD issue due to harmonic or harmonic mixing from PC2 n77 UL need to be defined.

The cross band isolation needed is defined in PC2 table below. Values from CA\_n7-n78 is reused.

Table 5.16.3.2-3: Reference sensitivity exceptions (MSD) and uplink/downlink configurations due to cross band isolation from a PC2 aggressor NR UL band for NR CA FR1

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | UL Fc | UL BW | SCS of UL band | UL RB Allocation | DL Fc | DL BW | MSD | Cross-band  Interference  source |
| (MHz) | (MHz) | (kHz) | LCRB | (MHz) | (MHz) | (dB) |
| n77 | n7 | 3350 | 100 | 30 | 270 (RBstart=0) | 2687.5 | 5 | 6.5 | >ACLR2 |

#### 5.16.3.3 Power class 1.5 for single uplink n77

No MSD issue due to harmonic or harmonic mixing from PC1.5 n77 UL need to be defined.

The cross band isolation needed is defined in PC1.5 table below. Values from CA\_n41-n77 is reused.

Table 5.16.3.3-1: Reference sensitivity exceptions (MSD) and uplink/downlink configurations due to cross band isolation from a PC1.5 aggressor NR UL band for NR CA FR1

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | UL Fc | UL BW | SCS of UL band | UL RB Allocation | DL Fc | DL BW | MSD | Cross-band  Interference  source |
| (MHz) | (MHz) | (kHz) | LCRB | (MHz) | (MHz) | (dB) |
| n77 | n7 | 3350 | 100 | 30 | 270 (RBstart=0) | 2687.5 | 5 | 9.0 | >ACLR2 |

### 5.16.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 5.17 CA\_n1-n79

### 5.17.1 Configurations

**Table 5.17.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n1A-n79A | n798, 9  CA\_n1A-n79A8 | n1 | 5, 10, 15, 20 | 0 |
|  |  | n79 | 40, 50, 60, 80, 100 |  |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination.  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination. | | | | |

### 5.17.2 Maximum output power

**Table 5.17.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n1-n79 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 5.17.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 5.17.3.1 Power class 2 case a, b

For PC2 CA\_n1-n79, the co-existence studies on the harmonic issue and intermodulation issues are the same with the PC3 CA\_n1-n79.

Based on TR38.716-02-00[6] Table 6.6.1.3-1, there is no harmonic issue for the band combination of n1 and n79.

Based on TR38.716-02-00[6] Table 6.6.1.3-2, there is no harmonic mixing issue for the band combination of n1 and n79.

#### 5.17.3.2 Power class 2 for single uplink n79

Based on above,

- the 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of n79.

Therefore, there is no MSD issue for this CA configuration.

#### 5.17.3.3 Power class 1.5 for single uplink n79

Based on above,

- the 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of n79.

Therefore, there is no MSD issue for this CA configuration.

### 5.17.4 ∆TIB and ∆RIB values

For the ∆TIB,c and ∆RIB,c values, same PC3 CA\_n1A-n79A requirements are applied for PC2 CA\_n1A-n79A and PC1.5 CA\_n1A-n79A.

## 5.18 CA\_n8-n79

### 5.18.1 Configurations

**Table 5.18.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n8A-n79A | n798, 9  CA\_n8A-n798 | n8 | 5, 10, 15, 20 | 0 |
|  |  | n79 | 10, 20, 40, 50, 60, 80, 100 |  |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination.  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination. | | | | |

### 5.18.2 Maximum output power

**Table 5.18.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n8-n79 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 5.18.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

For PC2 and PC1.5 CA\_n8-n79, the co-existence studies on the harmonic issue and intermodulation issues are the same with the PC3 CA\_n8-n79.

According to the study results in TR 37.865-01-01[4] Table 8.14.2-1,

- 5th order IMD may fall into Rx frequencies of band n8.

It shall be noted that the MSD values for the above two types of MSD have already been defined for PC3 CA\_n8-n79 configuration in TS38.101-1[3] Table 7.3A.5-1.

#### 5.18.3.1 Power class 2 case a, b

For PC2 case a, since the power configuration for each band is 23dBm, therefore:

For the harmonic issue, comparing with PC3 CA\_n8A-n79A, no additional MSD are expected for this PC2 CA\_n8A-n79A with 1 uplink carrier.

For the harmonic mixing issue, comparing with PC3 CA\_n8A-n79A, no additional MSD are expected for this PC2 CA\_n8A-n79A.

For the IMD issue, comparison of the NOTE 1 in Table 7.3A.5-1 (for PC3 2UL/2DL) and Table 7.3A.5-1a (for PC2 2UL/2DL) in TS38.101-1, it can be found that the set for both transmitters is changed from min(+20 dBm, PCMAX\_L,f,c) to min(+23 dBm, PCMAX\_L,f,c), which means the IMD5 MSD for PC2 2UL/2DL CA\_n8A-n79A should be defined additionally.

**Table 5.18.3.1-1** **2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  | NR Band / Channel bandwidth / NRB / MSD | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR CA Configuration | | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | Duplex mode | IMD order |
| CA\_n8-n79 | | n8 | 897.5 | 5 | 25 | 942.5 | 21.5 | FDD | IMD5 |
|  | | n79 | 4532.5 | 40 | 216 | 4532.5 | N/A | TDD | N/A |

Regarding the power configuration of 23dBm+26dBm in case b, due to the set for both transmitters for MSD calculation is the same, i.e. min(+23 dBm, PCMAX\_L,f,c), as 23+23dBm power configuration in case a, so the IMD5 MSD value defined in table 5.18.3.1-1 can be applied.

#### 5.18.3.2 Power class 2 for single uplink n79

Based on above,

- 2nd, 3rd, 4th and 5th order harmonic do not fall into Rx frequencies of n8.

- 5th order harmonic mixing falls into Rx frequencies of n8.

Therefore MSD issue due to harmonic mixing from PC2 n79 UL falling into n8 DL should be defined.

**Table 5.18.3.2-1 Reference sensitivity exceptions and uplink/downlink configurations due to harmonic mixing from a PC2 aggressor NR UL bands for NR DL CA FR1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL BW** | **MSD** | **UL/DL fc condition** | **UL/DL harmonic order** |
| **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(dB)** |
| n79 | n8 | 10 | 15 | 25 (RBstart=0) | 5 | 28.0 | NOTE 1 | UL1/DL5 |
| NOTE 1: The requirements should be verified for DL NR-ARFCN of the victim (lower) band (superscript LB) such that  with  the DL carrier frequency in the lower band and the UL carrier frequency in the higher band, both in MHz. | | | | | | | | |

#### 5.18.3.2 Power class 1.5 for single uplink n79

Based on above,

- 2nd, 3rd, 4th and 5th order harmonic do not fall into Rx frequencies of n8.

- 5th order harmonic mixing falls into Rx frequencies of n8.

Therefore MSD issue due to harmonic mixing from PC2 n79 UL falling into n8 DL should be defined.

**Table 5.18.3.2-1 Reference sensitivity exceptions and uplink/downlink configurations due to harmonic mixing from a PC1.5 aggressor NR UL bands for NR DL CA FR1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL BW** | **MSD** | **UL/DL fc condition** | **UL/DL harmonic order** |
| **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(dB)** |
| n79 | n8 | 10 | 15 | 25 (RBstart=0) | 5 | 31.0 | NOTE 1 | UL1/DL5 |
| NOTE 1: The requirements should be verified for DL NR-ARFCN of the victim (lower) band (superscript LB) such that  with  the DL carrier frequency in the lower band and the UL carrier frequency in the higher band, both in MHz. | | | | | | | | |

### 5.18.4 ∆TIB and ∆RIB values

For the ∆TIB,c and ∆RIB,c values, same PC3 CA\_n8A-n79A requirements are applied for PC2 CA\_n8A-n79A and PC1.5 CA\_n8A-n79A.

## 5.19 CA\_n13-n77

### 5.19.1 Configurations

**Table 5.19.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n13A-n77(2A) | CA\_n77(2A)8 | n13 | 5, 10 | 0 |
|  |  | n77 | CA\_n77(2A)\_BCS1 |  |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination | | | | |

### 5.19.2 Maximum output power

**Table 5.19.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY or (CA\_nC)** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n77(2A) | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 5.19.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 5.19.3.1 Power class 2 case a, b

PC3 DL\_n13A-n77(2A)\_UL\_n77(2A) is specified while IMD4/6 are missing. We submit a draft CR R4-2315469 to correct the error. For PC2 case, IMD 4/6 of dual n77 UL falls into n13 DL, which is the same as PC3. The MSD exception is defined as below.

**Table 5.19.3-1: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n13-n77 | n13 | 781 | 5 | 25 | 750 | 18.5 | FDD | IMD414 |
|  | n7712 | 3510 | 10 | 1 RBSTART=25 | 3510 | N/A | TDD | N/A |
|  |  | 3885 | 10 | 1 RBSTART=25 | 3885 |  |  |  |
| NOTE 12: This band supports intra-band non-contiguous uplink configuration.  NOTE 14: This band is subject to IMD6 also which MSD is not specified. | | | | | | | | |

### 5.19.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 5.20 CA\_n5-n77

### 5.20.1 Configurations

To enable CA\_n77(2A) for PC2, below yellow marked update to the existing 38.10-1 configuration tables is needed.

PC1.5 is already enabled for CA\_n5A-n77A, and below yellow marked update also enable PC1.5 for these configurations.

**Table 5.20.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or single uplink carrier10 | NR Band | Channel bandwidth (MHz) (NOTE 3) | Bandwidth combination set |
| CA\_n5A-n77(2A) | n778, 9  CA\_n5A-n77A8  CA\_n77(2A) 8 | n5 | 5, 10, 15, 20 | 0 |
|  |  | n77 | CA\_n77(2A)\_BCS0 |  |
|  |  | n5 | 5, 10, 15, 20 | 1 |
|  |  | n77 | CA\_n77(2A)\_BCS1 |  |
|  |  | n5 | n5 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n77 | CA\_n77(2A)\_BCS4 and 5 |  |
| CA\_n5A-n77(3A) | n778, 9  CA\_n77(2A) 8  CA\_n5A-n77A 8 | n5 | 5, 10, 15, 20 | 0 |
|  |  | n77 | CA\_n77(3A)\_BCS0 |  |
|  |  | n5 | 5, 10, 15, 20 | 1 |
|  |  | n77 | CA\_n77(3A)\_BCS1 |  |

### 5.20.2 Maximum output power

**Table 5.20.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n5-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 5.20.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to now added CA\_n77(2A) UL for PC2.

#### 5.20.3.1 Power class 2 case a, b

CA\_n77(2A) UL for CA\_n5A-n77(2A) DL is already defined for PC3. PC2 is also defined for CA\_n5A-n77(2A) DL but not yet for CA\_n77(2A) UL.

PC2 test points for the now added CA\_n77(2A) UL is reused from PC3, and the MSD value is reused from PC2 CA\_n28-n77.

**Table 5.20.3-1: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n5-n774 | n5 | N/A | 5 | N/A | 880 | 18.5 | FDD | IMD4 |
|  | n7712 | 3410 | 10 | 1 RBSTART=25 | 3410 | N/A | TDD | N/A |
|  |  | 3850 | 10 | 1 RBSTART=25 | 3850 |  |  |  |
| NOTE 12: This band supports intra-band non-contiguous uplink configuration. | | | | | | | | |

#### 5.20.3.2 Power class 2 for single uplink n77

This section is omitted since PC2 single uplink for CA\_n5A-n77(2A) DL is already specified.

#### 5.20.3.3 Power class 1.5 for single uplink n77

This section is omitted since PC1.5 single uplink for CA\_n5A-n77(2A) DL is already specified.

## 5.21 CA\_n66-n77

### 5.21.1 Configurations

To enable CA\_n77(2A) for PC2, below yellow marked update to the existing 38.10-1 configuration tables is needed.

PC1.5 is already enabled for CA\_n66A-n77A, and below yellow marked update also enable PC1.5 for these configurations.

**Table 5.21.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or single uplink carrier10 | NR Band | Channel bandwidth (MHz) (NOTE 3) | Bandwidth combination set |
| CA\_n66A-n77(2A) | n778,9  CA\_n66A-n77A8  CA\_n77(2A) 8 | n66 | 5, 10, 15, 20, 40 | 0 |
|  |  | n77 | CA\_n77(2A)\_BCS0 |  |
|  |  | n66 | 5, 10, 15, 20, 25, 30, 40 | 1 |
|  |  | n77 | CA\_n77(2A)\_BCS1 |  |
|  |  | n66 | n66 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n77 | CA\_n77(2A)\_BCS 4 and 5 |  |
| CA\_n66A-n77(3A) | n778,9  CA\_n77(2A) 8  CA\_n66A-n77A 8 | n66 | 5, 10, 15, 20, 40 | 0 |
|  |  | n77 | CA\_n77(3A)\_BCS0 |  |
|  |  | n66 | 5, 10, 15, 20, 25, 30, 40 | 1 |
|  |  | n77 | CA\_n77(3A)\_BCS1 |  |

### 5.21.2 Maximum output power

**Table 5.21.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n66-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 5.21.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to now added CA\_n77(2A) UL for PC2.

#### 5.21.3.1 Power class 2 case a, b

CA\_n77(2A) UL for CA\_n66A-n77(2A) DL is already defined for PC3. PC2 is also defined for CA\_n66A-n77(2A) DL but not yet for CA\_n77(2A) UL.

PC2 test points for the now added CA\_n77(2A) UL is reused from PC3, and the MSD value is reused from PC2 CA\_n1-n77.

**Table 5.21.3-1: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n66-n774 | n66 | N/A | 5 | N/A | 2197.5 | 31 | FDD | IMD5x |
|  | n7712 | 3305 | 10 | 1 (RBstart=0) | 3305 | N/A | TDD | N/A |
|  |  | 3855 | 10 | 1 (RBstart=8) | 3855 |  |  |  |
| NOTE 12: This band supports intra-band non-contiguous uplink configuration.  NOTE X: This band is subject to IMD7 also which MSD is not specified. | | | | | | | | |

#### 5.21.3.2 Power class 2 for single uplink n77

This section is omitted since PC2 single uplink for CA\_n66A-n77(2A) DL is already specified.

#### 5.21.3.3 Power class 1.5 for single uplink n77

This section is omitted since PC1.5 single uplink for CA\_n66A-n77(2A) DL is already specified.

## 5.22 CA\_n25-n77

### 5.22.1 Configurations

To enable CA\_n77(2A) for PC2, below yellow marked update to the existing 38.10-1 configuration tables is needed.

PC1.5 is already enabled for CA\_n25A-n77A, and below yellow marked update also enable PC1.5 for these configurations.

**Table 5.22.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or single uplink carrier10 | NR Band | Channel bandwidth (MHz) (NOTE 3) | Bandwidth combination set |
| CA\_n25A-n77(2A) | n778,9  CA\_n77(2A) 8  CA\_n25A-n77A8 | n25 | 5, 10, 15, 20, 25, 30, 40 | 0 |
|  |  | n77 | CA\_n77(2A)\_BCS1 |  |
|  |  | n25 | n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n77 | CA\_n77(2A)\_BCS 4 and 5 |  |
| CA\_n25(2A)-n77(2A) | n778,9  CA\_n77(2A) 8  CA\_n25A-n77A8 | n25 | CA\_n25(2A)\_BCS1 | 0 |
|  |  | n77 | CA\_n77(2A)\_BCS1 |  |
|  |  | n25 | CA\_n25(2A)\_BCS0 | 1 |
|  |  | n77 | CA\_n77(2A)\_BCS1 |  |
|  |  | n25 | CA\_n25(2A)\_BCS 4 and 5 | 4 and 5 |
|  |  | n77 | CA\_n77(2A)\_BCS 4 and 5 |  |
| CA\_n25A-n77(3A) | n778,9  CA\_n77(2A) 8  CA\_n25A-n77A 8 | n25 | 5, 10, 15, 20, 25, 30, 40 | 0 |
|  |  | n77 | CA\_n77(3A)\_BCS1 |  |

### 5.22.2 Maximum output power

**Table 5.22.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n25-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 5.22.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to now added CA\_n77(2A) UL for PC2.

#### 5.22.3.1 Power class 2 case a, b

CA\_n77(2A) UL for CA\_n25A-n77(2A) DL is already defined for PC3. PC2 is also defined for CA\_n25A-n77(2A) DL but not yet for CA\_n77(2A) UL.

PC2 test points for the now added CA\_n77(2A) UL is reused from PC3, and the MSD value is reused from PC2 CA\_n3-n77.

**Table 5.22.3-1: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n25-n774 | n25 | N/A | 5 | N/A | 1987.5 | 13.6 | FDD | IMD7 |
|  | n7712 | 3455 | 10 | 1 RBSTART=10 | 3455 | N/A | TDD | N/A |
|  |  | 3945 | 10 | 1 RBSTART=0 | 3945 |  |  |  |
| NOTE 12: This band supports intra-band non-contiguous uplink configuration. | | | | | | | | |

#### 5.22.3.2 Power class 2 for single uplink n77

This section is omitted since PC2 single uplink for CA\_n25A-n77(2A) DL is already specified.

#### 5.22.3.3 Power class 1.5 for single uplink n77

This section is omitted since PC1.5 single uplink for CA\_n25A-n77(2A) DL is already specified.

## 5.23 CA\_n71-n78

### 5.23.1 Configurations

**Table 5.23.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n71A-n78A | n788,9  CA\_n71A-n78A8 | n71 | 5, 10, 15, 20 | 0 |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
|  |  | n71 | See n71 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n78 | See n78 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n71A-n78(2A) | n788,9  CA\_n71A-n78A8 | n71 | 10, 15, 20 | 0 |
|  |  | n78 | CA\_n78(2A)\_BCS2 |  |
|  |  | n71 | See n71 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n78 | CA\_n78(2A)\_BCS4 and 5 |  |
| NOTE 8: Minimum requirements for Power Class 2 are applicable for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Minimum requirements for Power Class 1.5 are applicable for this single uplink carrier in this downlink/uplink combination | | | | |

### 5.23.2 Maximum output power

**Table 5.23.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY or (CA\_nC)** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n71-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 5.23.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 5.23.3.1 Power class 2 case a, b

Based on calculation, IMD5 of dual UL CA\_n71-n78 falls into n71, the MSD values are defined as below.

**Table 5.23.3-1: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n71-n78 | n71 | 681.5 | 5 | 25 | 635.5 | 11.4 | FDD | IMD5 |
|  | n78 | 3361.5 | 10 | 50 | 3361.5 | N/A | TDD | N/A |

#### 5.23.3.2 Power class 2 for single uplink n78

Based on calculation, there is no harmonic issues for Rx of n71.

Therefore, no MSD issue due to harmonic or harmonic mixing from PC2 n78 UL need to be defined.

#### 5.23.3.3 Power class 1.5 for single uplink n78

Based on calculation, there is no harmonic issues for Rx of n71.

Therefore, no MSD issue due to harmonic or harmonic mixing from PC1.5 n78 UL need to be defined.

### 5.23.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 5.24 CA\_n5-n78

### 5.24.1 Configurations

To enable CA\_n78(2A) for PC2, below yellow marked update to the existing 38.10-1 configuration tables is needed.

**Table 5.24.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or single uplink carrier10 | NR Band | Channel bandwidth (MHz) (NOTE 3) | Bandwidth combination set |
| CA\_n5A-n78(2A) | n788, 9  CA\_n5A-n78A8  CA\_n78(2A) 8 | n5 | 5, 10, 15, 20 | 0 |
|  |  | n78 | CA\_n78(2A)\_BCS0 |  |
|  |  | n5 | 5, 10, 15, 20 | 1 |
|  |  | n78 | CA\_n78(2A)\_BCS1 |  |
|  |  | n5 | n5 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n78 | CA\_n78(2A)\_BCS4 and 5 |  |

### 5.24.2 Maximum output power

**Table 5.24.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n5-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 5.24.3 REFSENS reqsuirements

Analysis of REFSENS exceptions or MSD requirements is needed due to now added CA\_n78(2A) UL for PC2.

#### 5.24.3.1 Power class 2 case a, b

CA\_n78(2A) UL for CA\_n5A-n78(2A) DL is already defined for PC3. PC2 is also defined for CA\_n5A-n78(2A) DL but not yet for CA\_n78(2A) UL.

PC2 test points for the now added CA\_n78(2A) UL is reused from PC3, and the MSD value is reused from PC2 CA\_n28-n78.

**Table 5.24.3-1: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n5-n784 | n5 | N/A | 5 | N/A | 880 | 18.5 | FDD | IMD4 |
|  | n7812 | 3340 | 10 | 1 RBSTART=25 | 3340 | N/A | TDD | N/A |
|  |  | 3780 | 10 | 1 RBSTART=25 | 3780 |
| NOTE 12: This band supports intra-band non-contiguous uplink configuration. | | | | | | | | |

#### 5.24.3.2 Power class 2 for single uplink n78

This section is omitted since PC2 single uplink for CA\_n5A-n78(2A) DL is already specified.

## 5.25 DL CA\_n1-n78, UL n78A

### 5.25.1 Configurations

**Table 5.25.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n1A-n78A | **n788,9**  CA\_n1A-n78A8 | n1 | 5, 10, 15, 20 | 0 |
|  |  | n78 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |  |
|  |  | n1 | 5, 10, 15, 20, 25, 30, 40, 50 | 1 |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
|  |  | n1 | 5, 10, 15, 20, 25, 30, 40 | 2 |
|  |  | n78 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |  |
|  |  | n1 | 5, 10, 15, 20 | 3 |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
|  |  | n1 | n1 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n78 | n78 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n1A-n78(2A) | n788,9  CA\_n1A-n78A8 | n1 | 5, 10, 15, 20 | 0 |
|  |  | n78 | CA\_n78(2A)\_BCS0 |  |
|  |  | n1 | 5, 10, 15, 20, 25, 30, 40, 50 | 1 |
|  |  | n78 | CA\_n78(2A)\_BCS1 |  |
|  | n788,9  CA\_n1A-n78A8  CA\_n78(2A)8 | n1 | 5, 10, 15, 20 | 2 |
|  |  | n78 | CA\_n78(2A)\_BCS2 |  |
|  |  | n1 | See n1 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n78 | CA\_n78(2A)\_BCS4 and 5 |  |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 5.25.2 Maximum output power

**Table 5.25.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_n1-n78** | **CA power class** | **Carrier n1 power class** | **Carrier n78 power class** |
| CA\_n1A-n78A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 5.25.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 5.25.3.1 Power class 2 case a

This PC2 band combination of CA\_n1A-n78A is already defined in TS38.101-1, so this section is omitted.

#### 5.25.3.2 Power class 2 case b

This PC2 band combination of CA\_n1A-n78A is already defined in TS38.101-1, so this section is omitted.

#### 5.25.3.3 Power class 2 for single uplink n78

This band combination is already defined in TS38.101-1, so this section is omitted.

#### 5.25.3.4 Power class 1.5 for single uplink n78

For PC3 CA\_n1-n78 with single uplink, the co-existence study is provided in TR 38.716-02-00 [6].

Based on above, there is no harmonic issue for the band combination of n1 and n78.

Based on above, there is no harmonic mixing issue for the band combination of n1 and n78.

For PC1.5 CA\_n1-n78 with single uplink, there is no harmonic and harmonic mixing issue.

#### 5.25.3.5 Power class 2 for non-contiguous uplink n78

Table 5.25.3.5-1 lists up to 7th order IMD from UL CA\_n78(2A) UE-to-UE coexistence analysis.

**Table 5.25.3.5-1: CA\_n78(2A) IMD products**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| CC location | fU1L | fU2L | fU3L | fU1H | fU2H | fU3H |
| Frequency | 3300 | 3320 | 3780 | 3800 | 3780 | 3320 |
| 2nd | I fU1L-fU2L I | I fU1L-fU3L I | fU1L + fU2L | fU1H+fU2H |  |  |
| Ranges | 20 | 480 | 6620 | 7580 |  |  |
| 3rd | 2\*fU1L-fU3L | 2\*fU1H-fU3H | 2\*fU1L + fU2L | 2\*fU1H + fU2H |  |  |
| Ranges | 2820 | 4280 | 9920 | 11380 |  |  |
| 4th | I 2\*fU1L - 2\*fU2L I | I 2\*fU1H - 2\*fU3H I | 3\*fU1L - fU3L | 3\*fU1H - fU3H | 3\*fU1L + fU2L | 3\*fU1H + fU2H |
| Ranges | 40 | 960 | 6120 | 8080 | 13220 | 15180 |
| 5th | I 3\*fUL1-2\*fU3L I | I 3\*fUH1-2\*fU3H I | 4\*fUL1-fU3L | 4\*fUH1-fU3H | 4\*fUL1+fU2L | 4\*fUH1+fU2H |
| Ranges | 2340 | 4760 | 9420 | 11880 | 16520 | 18980 |
| 6th | I 3\*fUL1-3\*fU2L I | I 3\*fUH1-3\*fU3H I | 4\*fUL1-2\*fU3L | 4\*fUH1-2\*fU3H | 5\*fUL1-fU3L | 5\*fUH1-fU3H |
| Ranges | 60 | 1440 | 5640 | 8560 | 12720 | 15680 |
| 7th | I 4\*fUL1-3\*fU3L I | I 4\*fUH1-3\*fU3H I | 5\*fUL1-2\*fU3L | 5\*fUH1-2\*fU3H | 6\*fUL1-fU3L | 6\*fUH1-fU3H |
| Ranges | 1860 | 5240 | 8940 | 12360 | 16020 | 19480 |

As can be seen in the co-existence analysis above there are IMD7 products from CA\_n78(2A) affecting band n1 DL. MSD value is reused from PC2 CA\_n25-n77.

Table 5.25.3.5-2: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA  Configuration | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n1-n78 | n1 | N/A | 5 | N/A | 2140 | 13.6 | FDD | IMD7 |
|  | n7812 | 3305 | 10 | 1 (RBSTART=0) | 3305 | N/A | TDD | N/A |
|  |  | 3675 | 10 | 1 (RBSTART=44) | 3675 |  |  |  |
| NOTE 12: This band supports intra-band non-contiguous uplink configuration. | | | | | | | | |

### 5.25.4 ∆TIB and ∆RIB values

There is no change by comparing to the value for PC3 CA.

## 5.26 DL CA\_n3-n78, UL n78A

### 5.26.1 Configurations

**Table 5.26.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n3A-n78A | **n788,9**  CA\_n3A-n78A8 | n3 | 5, 10, 15, 20, 25, 30 | 0 |
|  |  | n78 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |  |
|  |  | n3 | 5, 10, 15, 20, 25, 30, 40 | 1 |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
|  |  | n3 | n3 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n78 | n78 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n3A-n78(2A) | n788,9  CA\_n3A-n78A8  CA\_n78(2A)8 | n3 | 5, 10, 15, 20, 25, 30 | 0 |
|  |  | n78 | CA\_n78(2A)\_BCS0 |  |
|  |  | n3 | 5, 10, 15, 20, 25, 30, 40 | 1 |
|  |  | n78 | CA\_n78(2A)\_BCS2 |  |
|  |  | n3 | See n3 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n78 | CA\_n78(2A)\_BCS4 and 5 |  |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 5.26.2 Maximum output power

**Table 5.26.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_n3-n78** | **CA power class** | **Carrier n3 power class** | **Carrier n78 power class** |
| CA\_n3A-n78A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 5.26.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 5.26.3.1 Power class 2 case a

This PC2 band combination of CA\_n3A-n78A is already defined in TS38.101-1[3], so this section is omitted.

#### 5.26.3.2 Power class 2 case b

This PC2 band combination of CA\_n3A-n78A is already defined in TS38.101-1[3], so this section is omitted.

#### 5.26.3.3 Power class 2 for single uplink n78

This band combination is already defined in TS38.101-1[3], so this section is omitted.

#### 5.26.3.4 Power class 1.5 for single uplink n78

- the 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of n78.

- the 2nd order harmonic mixing falls into Rx frequencies of n3.

Therefore, MSD issue due to harmonic mixing from PC1.5 n78 UL falling into n3 DL should be defined, the value is reused from CA\_n3-n77.

**Table 5.26.3.4-1: Reference sensitivity exceptions and uplink/downlink configurations due to harmonic mixing from a PC1.5 aggressor NR UL band for NR DL CA FR1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL BW** | **MSD** | **UL/DL fc condition** | **UL/DL harmonic order** |
| **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(dB)** |
| n78 | n3 | 5 | 15 | 25 (RBstart=0) | 5 | 11.1 | NOTE 4 | UL1/DL2 |
| n78 | n3 | 40 | 15 | 216 (RBstart=0) | 40 | 4 | NOTE 4 | UL1/DL2 |

#### 5.26.3.5 Power class 2 for non-contiguous uplink n78

Table 5.26.3.5-1 lists up to 7th order IMD from UL CA\_n78(2A) UE-to-UE coexistence analysis.

**Table 5.26.3.5-1: CA\_n78(2A) IMD products**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| CC location | fU1L | fU2L | fU3L | fU1H | fU2H | fU3H |
| Frequency | 3300 | 3320 | 3780 | 3800 | 3780 | 3320 |
| 2nd | I fU1L-fU2L I | I fU1L-fU3L I | fU1L + fU2L | fU1H+fU2H |  |  |
| Ranges | 20 | 480 | 6620 | 7580 |  |  |
| 3rd | 2\*fU1L-fU3L | 2\*fU1H-fU3H | 2\*fU1L + fU2L | 2\*fU1H + fU2H |  |  |
| Ranges | 2820 | 4280 | 9920 | 11380 |  |  |
| 4th | I 2\*fU1L - 2\*fU2L I | I 2\*fU1H - 2\*fU3H I | 3\*fU1L - fU3L | 3\*fU1H - fU3H | 3\*fU1L + fU2L | 3\*fU1H + fU2H |
| Ranges | 40 | 960 | 6120 | 8080 | 13220 | 15180 |
| 5th | I 3\*fUL1-2\*fU3L I | I 3\*fUH1-2\*fU3H I | 4\*fUL1-fU3L | 4\*fUH1-fU3H | 4\*fUL1+fU2L | 4\*fUH1+fU2H |
| Ranges | 2340 | 4760 | 9420 | 11880 | 16520 | 18980 |
| 6th | I 3\*fUL1-3\*fU2L I | I 3\*fUH1-3\*fU3H I | 4\*fUL1-2\*fU3L | 4\*fUH1-2\*fU3H | 5\*fUL1-fU3L | 5\*fUH1-fU3H |
| Ranges | 60 | 1440 | 5640 | 8560 | 12720 | 15680 |
| 7th | I 4\*fUL1-3\*fU3L I | I 4\*fUH1-3\*fU3H I | 5\*fUL1-2\*fU3L | 5\*fUH1-2\*fU3H | 6\*fUL1-fU3L | 6\*fUH1-fU3H |
| Ranges | 1860 | 5240 | 8940 | 12360 | 16020 | 19480 |

As can be seen in the co-existence analysis above there are IMD7 products from CA\_n78(2A) affecting band n3 DL. MSD value is reused from PC2 CA\_n3-n77.

Table 5.26.3.5-2: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA  Configuration | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n3-n78 | n3 | N/A | 5 | N/A | 1877.5 | 13.6 | FDD | IMD7 |
|  | n7812 | 3305 | 10 | 1 (RBSTART=3) | 3305 | N/A | TDD | N/A |
|  |  | 3780 | 10 | 1 (RBSTART=0) | 3780 |  |  |  |
| NOTE 12: This band supports intra-band non-contiguous uplink configuration. | | | | | | | | |

### 5.26.4 ∆TIB and ∆RIB values

There is no change by comparing to the value for PC3 CA.

## 5.27 DL CA\_n28-n78, UL n78A

### 5.27.1 Configurations

**Table 5.27.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n28A-n78A | **n788,9**  CA\_n28A-n78A8 | n28 | 5, 10, 15, 20 | 0 |
|  |  | n78 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |  |
|  |  | n28 | 5, 10, 15, 20, 25, 30 | 1 |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
|  |  | n28 | n28 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n78 | n78 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n28A-n78(2A) | n788,9  CA\_n78(2A)8  CA\_n28A-n78A8 | n28 | 5, 10, 15, 20 | 0 |
|  |  | n78 | CA\_n78(2A)\_BCS0 |  |
|  |  | n28 | 5, 10, 15, 20 | 1 |
|  |  | n78 | CA\_n78(2A)\_BCS2 |  |
|  |  | n28 | See n28 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n78 | CA\_n78(2A)\_BCS4 and 5 |  |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 5.27.2 Maximum output power

**Table 5.27.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_n28-n78** | **CA power class** | **Carrier n28 power class** | **Carrier n78 power class** |
| CA\_n28A-n78A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 5.27.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 5.27.3.1 Power class 2 case a

This PC2 band combination of CA\_n28A-n78A is already defined in TS38.101-1[3], so this section is omitted.

#### 5.27.3.2 Power class 2 case b

This PC2 band combination of CA\_n28A-n78A is already defined in TS38.101-1[3], so this section is omitted.

#### 5.27.3.3 Power class 2 for single uplink n78

This band combination is already defined in TS38.101-1[3], so this section is omitted.

#### 5.27.3.4 Power class 1.5 for single uplink n78

- the 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of n78.

- the 5th order harmonic mixing falls into Rx frequencies of n28.

Therefore, MSD issue due to harmonic mixing from PC1.5 n78 UL falling into n28 DL should be defined, the value is reused from CA\_n28-n77.

**Table 5.27.3.4-1: Reference sensitivity exceptions and uplink/downlink configurations due to harmonic mixing from a PC1.5 aggressor NR UL band for NR DL CA FR1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL BW** | **MSD** | **UL/DL fc condition** | **UL/DL harmonic order** |
| **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(dB)** |
| n78 | n28 | 5 | 15 | 25 (RBstart=0) | 5 | 34 | NOTE 1 | UL1/DL5 |
| n78 | n28 | 30 | 15 | 160 (Rbstart=0) | 30 | 14.7 | NOTE 1 | UL1/DL5 |

#### 5.27.3.5 Power class 2 for non-contiguous uplink n78

Table 5.27.3.5-1 lists up to 7th order IMD from UL CA\_n78(2A) UE-to-UE coexistence analysis.

**Table 5.27.3.5-1: CA\_n78(2A) IMD products**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| CC location | fU1L | fU2L | fU3L | fU1H | fU2H | fU3H |
| Frequency | 3300 | 3320 | 3780 | 3800 | 3780 | 3320 |
| 2nd | I fU1L-fU2L I | I fU1L-fU3L I | fU1L + fU2L | fU1H+fU2H |  |  |
| Ranges | 20 | 480 | 6620 | 7580 |  |  |
| 3rd | 2\*fU1L-fU3L | 2\*fU1H-fU3H | 2\*fU1L + fU2L | 2\*fU1H + fU2H |  |  |
| Ranges | 2820 | 4280 | 9920 | 11380 |  |  |
| 4th | I 2\*fU1L - 2\*fU2L I | I 2\*fU1H - 2\*fU3H I | 3\*fU1L - fU3L | 3\*fU1H - fU3H | 3\*fU1L + fU2L | 3\*fU1H + fU2H |
| Ranges | 40 | 960 | 6120 | 8080 | 13220 | 15180 |
| 5th | I 3\*fUL1-2\*fU3L I | I 3\*fUH1-2\*fU3H I | 4\*fUL1-fU3L | 4\*fUH1-fU3H | 4\*fUL1+fU2L | 4\*fUH1+fU2H |
| Ranges | 2340 | 4760 | 9420 | 11880 | 16520 | 18980 |
| 6th | I 3\*fUL1-3\*fU2L I | I 3\*fUH1-3\*fU3H I | 4\*fUL1-2\*fU3L | 4\*fUH1-2\*fU3H | 5\*fUL1-fU3L | 5\*fUH1-fU3H |
| Ranges | 60 | 1440 | 5640 | 8560 | 12720 | 15680 |
| 7th | I 4\*fUL1-3\*fU3L I | I 4\*fUH1-3\*fU3H I | 5\*fUL1-2\*fU3L | 5\*fUH1-2\*fU3H | 6\*fUL1-fU3L | 6\*fUH1-fU3H |
| Ranges | 1860 | 5240 | 8940 | 12360 | 16020 | 19480 |

As can be seen in the co-existence analysis above there are IMD4 products from CA\_n78(2A) affecting band n28 DL. MSD value is reused from PC2 CA\_n28-n77.

Table 5.27.3.5-2: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA  Configuration | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n28-n78 | n28 | N/A | 5 | N/A | 780 | 18.5 | FDD | IMD414 |
|  | n7812 | 3310 | 10 | 1 (RBSTART=7) | 3310 | N/A | TDD | N/A |
|  |  | 3700 | 10 | 1 (RBSTART=0) | 3700 |  |  |  |
| NOTE 12: This band supports intra-band non-contiguous uplink configuration.  NOTE 14: This band is subject to IMD6 also which MSD is not specified. | | | | | | | | |

### 5.27.4 ∆TIB and ∆RIB values

There is no change by comparing to the value for PC3 CA.

## 5.28 CA\_n8-n77

### 5.28.1 Configurations

**Table 5.28.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n8A-n77A | n778,9  CA\_n8A-n77A8 | n8 | 5, 10, 15, 20 | 0 |
|  |  | n77 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |  |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 5.28.2 Maximum output power

**Table 5.28.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_n8-n77** | **CA power class** | **Carrier n8 power class** | **Carrier n77 power class** |
| CA\_n8A-n77A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 5.9.3 REFSENS requirements

For PC2 CA\_n8-n77, the co-existence studies on the harmonic issue and intermodulation issues are the same with the PC3 CA\_n8-n77, where:

4th harmonic frequency of band 8 UL may fall into band n77 DL Rx

4th IMD frequencies (i.e. 3\*f8-fn77) may fall into band 8 DL Rx

4th Harmonic mixing issue, i.e. Band n77 UL may fall into 4th receiver harmonic mixing frequency of band n8

It shall be noted that the MSD values for the above two types of MSD have already been defined for PC3 CA\_n8-n77 configuration in TS38.101-1[3] specification.

#### 5.28.3.1 Power class 2 case a

For PC2 case a, since the power configuration for each band is 23dBm, therefore:

For the harmonic issue, comparing with PC3 CA\_n8A-n77A, no additional MSD are expected for this PC2 CA\_n8A-n77A with 1 uplink carrier.

For the harmonic mixing issue, comparing with PC3 CA\_n8A-n77A, no additional MSD are expected for this PC2 CA\_n8A-n77A.

For the IMD issue, comparison of the NOTE 1 in Table 7.3A.5-1 (for PC3 2UL/2DL) and Table 7.3A.5-1a (for PC2 2UL/2DL) in TS38.101-1[3], it can be found that the set for both transmitters is changed from min(+20 dBm, PCMAX\_L,f,c) to min(+23 dBm, PCMAX\_L,f,c), which means the IMD4 MSD for PC2 2UL/2DL CA\_n8A-n77A should be defined additionally.

The IMD4 MSD for PC2 2UL/2DL CA\_n8A-n77A is proposed to be defined in table 5.28.3.1-1, by reusing the same IMD4 MSD of PC2 2UL/2DL CA\_n8A\_n78A.

**Table 5.28.3.1-1 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

| **NR Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **NR CA Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| CA\_n8-n77 | n8 | 897.5 | 5 | 25 | 942.5 | 15.5 | IMD4 |
|  | n77 | 3635 | 10 | 50 | 3635 | N/A | N/A |

#### 5.28.3.2 Power class 2 case b

For PC2 case b, similar with case a, no additional harmonic MSD are expected for this PC2 CA\_n8A-n77A with 1 uplink carrier since the power of band n8 is kept as 23dBm.

For PC2 case b, the harmonic mixing issue, comparing with PC3 CA\_n8A-n77A, additional MSD are expected for this PC2 CA\_n8A-n77A since the power of band n77 is increased to 26dBm. The harmonic mixing MSD for PC2 CA\_n8A-n77A is defined in table 5.28.3.2-1 by referring to the same MSD of PC2 CA\_n8A-n78A.

**Table 5.28.3.2-1: Reference sensitivity exceptions and uplink/downlink configurations due to harmonic mixing from a PC2 aggressor NR UL band for NR DL CA FR1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL BW** | **MSD** | **UL/DL fc condition** | **UL/DL harmonic order** |
| **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(dB)** |
| n77 | n8 | 10 | 15 | 25 (Rbstart=0) | 5 | 8.1 | NOTE 5 | UL1/DL4 |
| n77 | n8 | 20 | 15 | 20 (Rbstart=0) | 20 | 4.3 | NOTE 5 | UL1/DL4 |
| NOTE 5: The requirements should be verified for UL NR-ARFCN of the aggressor (higher) band (superscript HB) such that  in MHz and  with  the carrier frequency in the victim (lower) band and  the channel bandwidth configured in the higher band. | | | | | | | | |

Regarding the power configuration of 23dBm+26dBm in case b, due to the set for both transmitters for MSD calculation is the same, i.e. min(+23 dBm, PCMAX\_L,f,c), as 23+23dBm power configuration in case a, so the IMD4 MSD value defined in table 5.28.3.1-1 can be applied.

### 5.28.4 ∆TIB and ∆RIB values

For the ∆TIB,c and ∆RIB,c values, same PC3 CA\_n8A-n77A requirements are applied for PC2 CA\_n8A-n77A.

## 5.29 CA\_n3-n79

### 5.29.1 Configurations

**Table 5.29.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n3A-n79A | **N798,9**  CA\_n3A-n79A | n3 | 5, 10, 15, 20 | 0 |
|  |  | n79 | 10, 20, 40, 50, 60, 80, 100 |  |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination.  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination. | | | | |

### 5.29.2 Maximum output power

This band combination does not support high power UL CA, so this section is omitted.

### 5.29.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 5.29.3.1 Power class 2 case a, b

This band combination does not support high power UL CA, so this section is omitted.

#### 5.29.3.2 Power class 2 for single uplink n79

This band combination does not support high power UL CA, so this section is omitted.

#### 5.29.3.3 Power class 1.5 for single uplink n79

Based on MSD analysis for PC3, there’re no harmonic/harmonic mixing/cross-band isolation issues. Therefore, no MSD exception needs to be defined.

### 5.29.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 5.30 CA\_n28-n79

### 5.30.1 Configurations

**Table 5.30.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n28A-n79A | n798, 9  CA\_n28A-n79A8 | n28 | 5, 10, 15, 20, 30 | 0 |
|  |  | n79 | 40, 50, 60, 80, 100 |  |
|  |  | n28 | See n28 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n79 | See n79 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination.  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination. | | | | |

### 5.30.2 Maximum output power

**Table 5.30.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_n28-n79** | **CA power class** | **Carrier n28 power class** | **Carrier n79 power class** |
| CA\_n28A-n79A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 5.30.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 5.30.3.1 Power class 2 case a, b

For PC2 CA\_n28-n79, the co-existence studies on the harmonic issue and intermodulation issues have already been defined in TS38.101-1[3] specification.

#### 5.30.3.2 Power class 2 for single uplink n79

For PC2 CA\_n28-n79 for single uplink n79, the co-existence studies on the harmonic issue and intermodulation issues have already been defined in TS38.101-1[3] specification.

#### 5.30.3.3 Power class 1.5 for single uplink n79

For PC1.5 CA\_n28-n79 for single uplink n79,

- the 2nd, 3rd, 4th and 5th order harmonic do not fall into Rx frequencies of n28.

- the 2nd, 3rd, 4th and 5th order harmonic mixing do not fall into Rx frequencies of n28.

Therefore, no MSD exception needs to be defined.

### 5.30.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 5.31 CA\_n41-n79

### 5.31.1 Configurations

**Table 5.31.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n41A-n79A | n418,9  n798,9  CA\_n41A-n79A8 | n41 | 10, 15, 20, 40, 50, 60, 80, 90,100 | 0 |
|  |  | n79 | 40, 50, 60, 80, 100 |  |
|  |  | n41 | 10, 15, 20, 40, 50, 60 | 1 |
|  |  | n79 | 40, 50, 60, 80, 100 |  |
|  |  | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 | 2 |
|  |  | n79 | 40, 50, 60, 80, 100 |  |
|  |  | n41 | See n41 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n79 | See n79 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination.  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination. | | | | |

### 5.31.2 Maximum output power

**Table 5.31.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_n41-n79** | **CA power class** | **Carrier n41 power class** | **Carrier n79 power class** |
| CA\_n41A-n79A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| Case c | 26dBm | 26dBm | 23dBm |
| Case d | 26dBm | 26dBm | 26dBm |

### 5.31.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 5.31.3.1 Power class 2 case a, b, c, d

Based on TS38.101-1[3] Table 7.3A.5-1 and Table 7.3A.5-1b, there is no harmonic issue for this band combination of n41 and n79.

Based on the same tables, there is no harmonic mixing issue for this band combination of n41 and n79.

#### 5.31.3.2 Power class 2 for single uplink n79

For PC2 CA\_n41-n79 for single uplink n79 is already defined in TS38.101-1[3].

So, this section is omitted.

#### 5.31.3.3 Power class 1.5 for single uplink n79

Based on above,

- No harmonic mixing issue.

- No cross band isolation issue.

Therefore, no MSD exception needs to be defined.

#### 5.31.3.4 Power class 2 for single uplink n41

For PC2 CA\_n41-n79 for single uplink n41 is already defined in TS38.101-1[3].

So, this section is omitted.

#### 5.31.3.5 Power class 1.5 for single uplink n41

Based on above,

- No harmonic mixing issue.

- No cross band isolation issue.

Therefore, no MSD exception needs to be defined.

### 5.31.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 5.32 CA\_n18-n41

### 5.32.1 Configurations

**Table 5.32.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n18A-n41A | n41A 8  CA\_n18A-n41A 8 | n18 | 5, 10, 15 | 0 |
| n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 5.32.2 Maximum output power

**Table 5.32.2-1: UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n18A-n41A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 5.32.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink inter-band CA.

- the 3rd order harmonic mixing may fall into Rx frequencies of n18.

- IMD3 of inter-band UL CA, CA\_n18A-n41A, may fall into Rx frequencies of n18.

- No crossband isolation interference.

#### 5.32.3.1 Power class 2 case a, b

MSD due to IMD3 of inter-band UL CA to downlink n18 is defined as below.

**Table 5.32.3-1: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n18-n41 | n18 | 820 | 5 | 25 | 865 | 24.6 | FDD | IMD3 |
| n41 | 2505 | 5 | 25 | 2505 | N/A | TDD | N/A |

#### 5.32.3.2 Power class 2 for single uplink n41

MSD due to harmonic mixing is defined as below.

**Table 5.32.3-2:** **Reference sensitivity exceptions (MSD) due to receiver harmonic mixing from a PC2 aggressor NR UL band for NR DL CA FR1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | UL BW | SCS of UL band | UL RB Allocation | DL BW | MSD | UL/DL fc condition | UL/DL harmonic order |
| (MHz) | (kHz) | LCRB | (MHz) | (dB) |
| n41 | n18X | 5 | 15 | 25 (RBstart=0) | 5 | 27.3 | NOTE Y | UL1/DL3 |
| n41 | n18X | 10 | 15 | 25 (RBstart=0) | 5 | 27.3 | NOTE Y | UL1/DL3 |
| NOTE X: These requirements apply when there is at least one individual RE within the downlink transmission bandwidth of the victim (lower) band for which the 3rd harmonic is within the uplink transmission bandwidth or the uplink adjacent channel's transmission bandwidth of an aggressor (higher) band.  NOTE Y: The requirements should be verified for UL NR-ARFCN of the aggressor (higher) band (superscript HB) such that  in MHz and  with  the carrier frequency in the victim (lower) band and  the channel bandwidth configured in the higher band. | | | | | | | | |

### 5.32.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 DC.

## 5.33 CA\_n18-n77

### 5.33.1 Configurations

**Table 5.33.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n18A-n77A | CA\_n18A-n77A 8 | n18 | 5, 10, 15 | 0 |
| n77 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 5.33.2 Maximum output power

**Table 5.33.2-1: UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n18A-n77A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

Unaffected parts are omitted.

### 5.33.3 REFSENS requirements

Comparing the 3 results, for both IMD4 and IMD5, the biggest difference among the corresponding MSD values are 2.3dB for IMD4 and 2.5dB for IMD5, hence the data from 3 companies are quite consistent. The test points are the same. During RAN4#109 meeting in Chicago, experts from the 3 Companies agree to average the corresponding results to the value for PC2 [7] as shown in Table 5.33.3.1

**Table 5.33.3-1. MSD values for PC2 HPUE CA\_n18-n77**

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **NR-CA Configuration** | **EUTRA or NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| CA\_n18-n77 | n18 | 827.5 | 5 | 25 | 872.5 | 17.5 | IMD4 X |
|  | n77 | 3355 | 10 | 50 | 3355 | N/A | N/A |
|  | n18 | 817.5 | 5 | 25 | 862.5 | 10.5 | IMD5 X |
|  | n77 | 4130 | 10 | 50 | 4130 | N/A | N/A |
| NOTE X: In Japan, n77 band is restricted to 3400 – 4100 MHz frequency range, and there are no valid MSD test points when using this restricted frequency range. | | | | | | | |

## 5.34 CA\_n28-n41

### 5.34.1 Configurations

**Table 5.34.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n28A-n41A | n418,**9**  CA\_n28A-n41A8, 13 | n28 | 5, 10, 15, 20 | 0 |
|  |  | n41 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |  |
|  |  | n28 | 5, 10, 15, 20, 30 | 1 |
|  |  | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 |  |
|  |  | n28 | See n28 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n41 | See n41 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 8: Minimum requirements for Power Class 2 are applicable for this uplink combination with 1Tx antenna connector in each band or single uplink carrier with up to 2Tx antenna connectors in this downlink/uplink combination  NOTE 9: Minimum requirements for Power Class 1.5 are applicable for this single uplink carrier with up to 2Tx antenna connectors in this downlink/uplink combination  NOTE 13: Minimum requirements for Power Class 2 are applicable for this uplink configuration with 1Tx antenna connector in one band and 2Tx antenna connectors in the other band. | | | | |

### 5.34.2 Maximum output power

**Table 5.34.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_n28-n41** | **CA power class** | **Carrier n28 power class** | **Carrier n41 power class** |
| CA\_n28-n41 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 5.34.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 5.34.3.1 Power class 2 case a, b

Based on calculation of previous release, no IMD of dual uplink falls into n28 DL, the MSD exception is not needed.

#### 5.34.3.3 Power class 2 for single uplink n41

Based on calculation of previous release,

No harmonic mixing of n41 fall into Rx frequencies of n28.

No cross band isolation issue.

Therefore, no MSD exception needs to be defined.

#### 5.34.3.4 Power class 1.5 for single uplink n41

Based on above,

No harmonic mixing of n41 fall into Rx frequencies of n28.

No cross band isolation issue.

Therefore, no MSD exception needs to be defined.

### 5.34.4 ∆TIB and ∆RIB values

There is no change by compairing to the values for PC3 CA.

## 5.35 CA\_n7-n78

### 5.35.1 Configurations

**Table 5.35.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CA\_n7A-n78(2A) | n788,9  CA\_n7A-n78A8  CA\_n78(2A) 8 | n7 | 5, 10, 15, 20, 25, 30, 40, 50 | 0 |
|  |  | n78 | CA\_n78(2A)\_BCS0 |  |
|  |  | n7 | 5, 10, 15, 20, 25, 30, 40, 50 | 1 |
|  |  | n78 | CA\_n78(2A)\_BCS2 |  |
|  |  | n7 | See n7 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n78 | CA\_n78(2A)\_BCS4 and 5 |  |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 5.35.2 Maximum output power

Already defined.

### 5.35.3 REFSENS requirements

Table 5.35.2.1-1 lists up to 7th order IMD from UL CA\_n78(2A) UE-to-UE coexistence analysis

**Table 5.35.2.1-1: CA\_n78(2A) IMD products**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| CC location | fU1L | fU2L | fU3L | fU1H | fU2H | fU3H |
| Frequency | 3300 | 3320 | 3780 | 3800 | 3780 | 3320 |
| 2nd | I fU1L-fU2L I | I fU1L-fU3L I | fU1L + fU2L | fU1H+fU2H |  |  |
| Ranges | 20 | 480 | 6620 | 7580 |  |  |
| 3rd | 2\*fU1L-fU3L | 2\*fU1H-fU3H | 2\*fU1L + fU2L | 2\*fU1H + fU2H |  |  |
| Ranges | 2820 | 4280 | 9920 | 11380 |  |  |
| 4th | I 2\*fU1L - 2\*fU2L I | I 2\*fU1H - 2\*fU3H I | 3\*fU1L - fU3L | 3\*fU1H - fU3H | 3\*fU1L + fU2L | 3\*fU1H + fU2H |
| Ranges | 40 | 960 | 6120 | 8080 | 13220 | 15180 |
| 5th | I 3\*fUL1-2\*fU3L I | I 3\*fUH1-2\*fU3H I | 4\*fUL1-fU3L | 4\*fUH1-fU3H | 4\*fUL1+fU2L | 4\*fUH1+fU2H |
| Ranges | 2340 | 4760 | 9420 | 11880 | 16520 | 18980 |
| 6th | I 3\*fUL1-3\*fU2L I | I 3\*fUH1-3\*fU3H I | 4\*fUL1-2\*fU3L | 4\*fUH1-2\*fU3H | 5\*fUL1-fU3L | 5\*fUH1-fU3H |
| Ranges | 60 | 1440 | 5640 | 8560 | 12720 | 15680 |
| 7th | I 4\*fUL1-3\*fU3L I | I 4\*fUH1-3\*fU3H I | 5\*fUL1-2\*fU3L | 5\*fUH1-2\*fU3H | 6\*fUL1-fU3L | 6\*fUH1-fU3H |
| Ranges | 1860 | 5240 | 8940 | 12360 | 16020 | 19480 |

As can be seen in the co-existence analysis above there are IMD5 and IMD7 products from CA\_n78(2A) affecting band n7 DL. MSD value and is reused from CA\_n7-n77 and test points are reused from CA\_n7-n78 PC3.

Table 5.35.2.1-2: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA  Configuration | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n7-n78 | n7 | N/A | 5 | N/A | 2650 | 29.9 | FDD | IMD515 |
|  | n7812 | 3350 | 10 | 1 (RBSTART=25) | 3350 | N/A | TDD | N/A |
|  |  | 3700 | 10 | 1 (RBSTART=25) | 3700 | N/A | TDD | N/A |
| NOTE 12: This band supports intra-band non-contiguous uplink configuration.  NOTE 15: This band is subject to IMD7 also which MSD is not specified. | | | | | | | | |

#### 5.35.3.2 Power class 2 for single uplink n78

Already defined.

#### 5.35.3.3 Power class 1.5 for single uplink n78

Already defined.

### 5.35.4 ∆TIB and ∆RIB values

Already defined.

## 5.36 CA\_n71-n77

### 5.36.1 Configurations

**Table 5.36.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n71A-n77(2A) | CA\_n77(2A)8 | n71 | 5, 10, 15, 20 | 0 |
|  |  | n77 | CA\_n77(2A)\_BCS1 |  |
|  |  | n71 | n71 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n77 | CA\_n77(2A)\_BCS 4 and 5 |  |
| CA\_n71A-n77(3A) | CA\_n77(2A)8 | n71 | 5, 10, 15, 20 | 0 |
|  |  | n77 | CA\_n77(3A)\_BCS1 |  |
| NOTE 8: Minimum requirements for Power Class 2 are applicable for this uplink combination with 1Tx antenna connector in each band or single uplink carrier with up to 2Tx antenna connectors in this downlink/uplink combination | | | | |

### 5.36.2 Maximum output power

**Table 5.36.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY or (CA\_nC)** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n77(2A) | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 5.36.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 5.36.3.1 Power class 2 case a, b

Based on calculation, IMD4/6 of dual UL CA\_n77(2A) falls into n71 DL, the MSD values are defined as below.

**Table 5.36.3-1: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n71-n77 | n71 | N/A | 5 | N/A | 640 | 18.5 | FDD | IMD414 |
|  | n7712 | 3480 | 10 | 1 (RBSTART=25) | 3480 | N/A | TDD | N/A |
|  |  | 3800 | 10 | 1 (RBSTART=25) | 3800 |  |  |  |
| NOTE 12: This band supports intra-band non-contiguous uplink configuration.  NOTE 14: This band is subject to IMD6 also which MSD is not specified. | | | | | | | | |

### 5.36.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 5.37 DL CA\_n77A-n85A, UL n77, UL CA\_n77A-n85A

### 5.37.1 Configurations

Table 5.37.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n77A-n85A | n778,9  CA\_n77A-n85A8 | n77 | See n77 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n85 | See n85 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 5.37.2 Maximum output power

Table 5.37.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n77A-n85A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 26dBm | 23dBm |

### 5.37.3 REFSENS requirements

#### 5.37.3.1 Power class 2 case a

Since there is intermodulation MSD for PC2 CA\_n12A-n77A, it is proposed that the same MSD apply for PC2 CA\_n77A-n85A.

Table 5.37.3.1-1 Intermodulation MSD for PC2 CA\_n12-n77

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n12-n77 | 12 | 702 | 5 | 20 | 732 | 11.7 | FDD | IMD5 |
|  | n77 | 3540 | 10 | 50 | 3540 | N/A | TDD | N/A |

Table 5.37.3.1-2 Proposed Intermodulation MSD for PC2 CA\_n77-n85

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n77-n85 | n77 | 3540 | 10 | 50 | 3540 | N/A | TDD | N/A |
|  | n85 | 702 | 5 | 20 | 732 | 11.7 | FDD | IMD5 |

#### 5.37.3.2 Power class 2 case b

The same MSD applies as proposed in Table 5.37.3-2.

5.37.3.3 Power class 2 case c

N/A

5.37.3.4 Power class 2 for single uplink n77

Table 5.37.3.4-1 Harmonic Mixing MSD for PC2 n77 with DL CA\_n12-n77

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| n77 | n12 | 10 | 15 | 25 (RBstart=0) | 5 | 34 | NOTE 1 | UL1/DL5 |
| n77 | n12 | 15 | 15 | 75 (RBstart=0) | 15 | 29.2 | NOTE 1 | UL1/DL5 |

Table 5.37.3.4-2 Proposed Harmonic Mixing MSD for PC2 n77 with DL CA\_n77-n85

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| n77 | n85 | 10 | 15 | 25 (RBstart=0) | 5 | 34 | NOTE 1 | UL1/DL5 |
| n77 | n85 | 15 | 15 | 75 (RBstart=0) | 15 | 29.2 | NOTE 1 | UL1/DL5 |

There is no cross-band isolation MSD for PC2 n77 into n12, so we propose no cross-band isolation MSD for PC2 n77 into n85.

5.37.3.5 Power class 1.5 for single uplink n77

Table 5.37.3.4-1 Harmonic Mixing MSD for PC1.5 n77 with DL CA\_n12-n77

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| n77 | n12 | 10 | 15 | 25 (RBstart=0) | 5 | 37 | NOTE 1 | UL1/DL5 |
| n77 | n12 | 15 | 15 | 75 (RBstart=0) | 15 | 32.2 | NOTE 1 | UL1/DL5 |

Table 5.37.3.4-2 Proposed Harmonic Mixing MSD for PC1.5 n77 with DL CA\_n77-n85

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| n77 | n85 | 10 | 15 | 25 (RBstart=0) | 5 | 37 | NOTE 1 | UL1/DL5 |
| n77 | n85 | 15 | 15 | 75 (RBstart=0) | 15 | 32.2 | NOTE 1 | UL1/DL5 |

There is no cross-band isolation MSD for PC1.5 n77 into n12, so we propose no cross-band isolation MSD for PC1.5 n77 into n85.

### 5.37.4 Void

## 5.38 CA\_n3A-n41C

### 5.38.1 Configurations

**Table 5.38.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n3A-n41A | n418,9  CA\_n3A-n41A8 | n3 | 5, 10, 15, 20, 25, 30 | 0 |
|  |  | n41 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |  |
|  |  | n3 | 5, 10, 15, 20, 25, 30 | 1 |
|  |  | n41 | 10, 15, 20, 40, 50, 60 |  |
|  |  | n3 | 5, 10, 15, 20, 25, 30, 40 | 2 |
|  |  | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 |  |
|  |  | n3 | 5, 10, 15, 20, 25, 30, 40, 50 | 3 |
|  |  | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 |  |
|  |  | n3 | See n3 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n41 | See n41 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n3A-n41B | CA\_n3A-n41A | n3 | 5, 10, 15, 20 | 0 |
|  |  | n41 | CA\_n41B\_BCS0 |  |
| CA\_n3A-n41C | n418  CA\_n41C8  CA\_n3A-n41A8  CA\_n3A-n41C8 | n3 | 5, 10, 15, 20, 25, 30 | 0 |
| n41 | CA\_n41C\_BCS0 |  |
| n3 | See n3 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
| n41 | CA\_n41C\_BCS4 and 5 |  |
| NOTE 8: Minimum requirements for Power Class 2 are applicable for this uplink combination with 1Tx antenna connector in each band or single uplink carrier with up to 2Tx antenna connectors in this downlink/uplink combination  NOTE 9: Minimum requirements for Power Class 1.5 are applicable for this single uplink carrier with up to 2Tx antenna connectors in this downlink/uplink combination | | | | |

PC2 and PC1.5 for n41 have been supported for CA\_n3A-n41A. Hence, no new MSD analysis is needed for n41 single UL for CA\_n3A\_n41C.

### 5.38.2 Maximum output power

Table 5.38.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_n3-n41** | **CA power class** | **Carrier n3 power class** | **Carrier n41 power class** |
| CA\_n3A-n41C | Case a | 26dBm | 23dBm | 23dBm |
|  | Case b | 26dBm | 23dBm | 26dBm |

In addition, the power class for UL CA\_n41C is PC2 , and PC1.5 n41 single carrier for this band combination.

### 5.38.3 REFSENS requirements

For PC3 CA\_n3-n41, there are cross band isolation MSD and intermodulation MSD for this band combination.

Due to PC2 UL CA\_n41C are supported, the IMDs issue caused by intra-band UL contiguous CA\_n41C can be found in table 5.38.3-1: (By using the template in TR38.718-02-01, where up to 7th IMD is included.)

Table 5.38.3-1: Co-existence studies for Uplink Intra-Band Contiguous CA

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Configuration | Channel BW | Minimum channel separation | Maximum channel separation | Minimum frequency | Maximum frequency |  |
| Data | 10 | 10 | 190 | 2496 | 2690 | - |
| CC location | fU1L | fU2L | fU3L | fU1H | fU2H | fU3H |
| Frequency | 2496 | 2516 | 2686 | 2690 | 2670 | 2500 |
| 2nd order IMD products | IfU1L-fU2LI | IfU1L-fU3LI | fU1L + fU2L | fU1H+fU2H |  |  |
| Interference ranges | 20 | 190 | 5012 | 5360 |  |  |
| 3rd order IMD products | 2\*fU1L-fU3L | 2\*fU1H-fU3H | 2\*fU1L + fU2L | 2\*fU1H + fU2H |  |  |
| Interference ranges | 2306 | 2880 | 7508 | 8050 |  |  |
| 4th order IMD products | I2\*fU1L-2\*fU2LI | I2\*fU1H-2\*fU3H I | 3\*fU1L-fU3L | 3\*fU1H-fU3H | 3\*fU1L+fU2L | 3\*fU1H+fU2H |
| Interference ranges | 40 | 380 | 4802 | 5570 | 10004 | 10740 |
| 5th order IMD products | I3\*fU1L-2\*fU3LI | I3\*fU1H-2\*fU3H I | 4\*fU1L-fU3L | 4\*fU1H-fU3H | 4\*fU1L+fU2L | 4\*fU1H+fU2H |
| Interference ranges | 2116 | 3070 | 7298 | 8260 | 12500 | 13430 |
| 6th order IMD products | I3\*fU1L-3\*fU2LI | I3\*fU1H-3\*fU3H I | 4\*fU1L-2\*fU3L | 4\*fU1H-2\*fU3H | 5\*fU1L-fU3L | 5\*fU1H-fU3H |
| Interference ranges | 60 | 570 | 4612 | 5760 | 9794 | 10950 |
| 7th order IMD products | I4\*fU1L-3\*fU3LI | I4\*fU1H-3\*fU3HI | 5\*fU1L-2\*fU3L | 5\*fU1H-2\*fU3H | 6\*fU1L-fU3L | 6\*fU1H-fU3H |
| Interference ranges | 1926 | 3260 | 7108 | 8450 | 12290 | 13640 |

It can be found that there are no co-existence issues up to 7th caused by CA\_n41C impact band n3 DL.

#### 5.38.3.1 Power class 2 case a, b

Since the power configuration for each band is 23dBm in Case a, comparing with PC3 there are no additional cross band isolation MSD or intermodulation MSD including triple beat IMD for this PC2 CA\_n3A-n41C.

Since the power configuration for band n41 is 26dBm in Case b, comparing with PC2 there is no additional cross band isolation MSD for this PC2 CA\_n3A-n41C.

For the intermodulation caused by UL inter-band CA:

it is proposed to use the approaches of PC3 UL CA\_n3A-n41A and UL\_CA\_n3A-n41C, in which:

- For PC2 UL CA\_n3A-n41A, the IMD requirement have already been defined in the spec.

- For PC2 UL CA\_n3A-n41C, the 1st triple beat MSD should be defined due to the power for n41C is increased.

Based on the existing PC3 MSD requirements in TS38.101-1 (Table 5.38.3.1-1), it can be seen that CA\_n41C may causes IMD9 falling into band n3 DL. And CA\_n3A-n41C may have triple-beat product falling into band n3 DL.

Table 5.38.3.1-1: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC3 CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Band / Channel bandwidth / NRB / Duplex mode | | | | | | | | Source of IMD |
| NR CA band combination | NR band | UL Fc  (MHz) | UL/DL BW  (MHz) | UL  LCRB | DL Fc (MHz) | MSD  (dB) | Duplex mode |  |
| CA\_n3-n41 | n3 | 1740 | 5 | 25 | 1835 | 8.2 | FDD | IMD4 |
|  | n41 | 2657.5 | 10 | 50 | 2657.5 | N/A | TDD | N/A |
|  | n3 | N/A | 5 | N/A | 1877.5 | N/A | FDD | IMD914 |
|  | n41 | 2545 | 60 | 1 (RBSTART= 0) | 2545 | N/A | TDD | N/A |
|  |  | 2625 | 100 | 1 (RBSTART= 272) | 2625 |  |  |  |
|  | n3 | 1747.5 | 5 | 25 (RBSTART= 0) | 1842.5 | 15.3 | FDD | IMD3 |
|  | n41 | 2560 | 60 | 1 (RBSTART= 30) | 2560 | N/A | TDD | N/A |
|  |  | 2620 | 60 | 1 (RBSTART= 127) | 2620 |  |  |  |

The MSD for PC3 triple-beat is specified as 15.3dB. For PC2. Hence, the MSD for PC2 is estimated as 23.1dB.

**Table 5.38.3.1-2: MSD due to IMD issue caused by triple beat**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA band combination** | **NR band** | **UL Fc** | **UL/DL BW** | **UL** | **DL Fc (MHz)** | **MSD** | **Duplex mode** |  |
| **(MHz)** | **(MHz)** | **CLRB** | **(dB)** |
| CA\_n3-n41 | n3 | 1747.5 | 5 | 25 (RBSTART= 0) | 1842.5 | 23.3 | FDD | IMD3 |
|  | n41 | 2560 | 60 | 1 (RBSTART= 30) | 2560 | N/A | TDD | N/A |
|  |  | 2620 | 60 | 1 (RBSTART= 127) | 2620 |  |  |  |

#### 5.38.3.2 Power class 2 for UL CA\_n41C

Due to PC2 UL CA\_n41C is supported in this band combination, in terms of the PC3 UL CA\_n41C in the TR38.718-02-01, there are IMD9 MSD defined but with N.A value considering of the ‘Applicable when n41 spectrum is restricted to 2515-2675MHz’.

Thus, for PC2 UL CA\_n41C, same approach as PC3 can be applied, the IMD value caused by PC2 n41C is defined in the following:

**Table 5.38.3.2-1 MSD due to IMD issue caused by PC2 intra-band contiguous CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA band combination** | **NR band** | **UL Fc** | **UL/DL BW** | **UL** | **DL Fc (MHz)** | **MSD** | **Duplex mode** |  |
| **(MHz)** | **(MHz)** | **CLRB** | **(dB)** |
| CA\_n3-n41 | n3 | N/A | 5 | N/A | 1877.5 | N/AX | FDD | IMD9 |
|  | n41 | 2545 | 60 | 1 RBSTART= 0 | 2545 | N/A | TDD | N/A |
|  |  | 2625 | 100 | 1 RBSTART= 272 | 2625 |  |  |  |
| NOTE X: Applicable when n41 spectrum is restricted to 2515-2675MHz | | | | | | | | |

### 5.38.4 ∆TIB and ∆RIB values

void

## 5.39 CA\_n40A-n41A

### 5.39.1 Configurations

**Table 5.39.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n40A-n41A | n408,9  n418,9  CA\_n40A-n41A8 | n40 | 5, 10, 15, 20, 25, 30, 40, 50, 60, 80 | 0 |
| n41 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |  |
| n40 | 5, 10, 15, 20, 25, 30, 40 | 1 |
| n41 | 10, 15, 20, 40, 50, 60 |  |
| n39 | See n40 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
| n41 | See n41 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 8: Minimum requirements for Power Class 2 are applicable for this uplink combination with 1Tx antenna connector in each band or single uplink carrier with up to 2Tx antenna connectors in this downlink/uplink combination.  NOTE 9: Minimum requirements for Power Class 1.5 are applicable for this single uplink carrier with up to 2Tx antenna connectors in this downlink/uplink combination | | | | |

### 5.39.2 Maximum output power

void

### 5.39.3 REFSENS requirements

For PC3 and PC2 CA\_n40A-n41A, there are cross band isolation MSD for this band combination.

#### 5.39.3.1 Power class 2 for single uplink n40

The cross band isolation MSD for this PC2 CA\_n40A-n41A with UL n40 has already been specified in TS38.101-1.

#### 5.39.3.2 Power class 1.5 for single uplink n40

Since the MOP for n40 is increased to 29dBm, cross band isolation MSD caused by UL PC1.5 n40 should be defined.

The proposed value for PC1.5 UL CA MSD can be found in Table 5.39.3.2-1:

Table 5.39.3.2-1: Reference sensitivity exceptions (MSD) and uplink/downlink configurations due to cross band isolation from a PC1.5 aggressor NR UL band for NR CA FR1

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | UL Fc | UL BW | SCS of UL band | UL RB Allocation | DL Fc | DL BW | MSD | Cross-band  Interference  source |
| (MHz) | (MHz) | (kHz) | LCRB | (MHz) | (MHz) | (dB) |
| n40 | n41 | 2350 | 100 | 30 | 270 (RBstart=3) | 2501 | 10 | [37.9] | ACLR2 |
| NOTE 1: Applicable only when harmonic mixing MSD for this combination is not applied.  NOTE 2: Void.  NOTE 3: The requirements only apply for UEs supporting inter-band carrier aggregation with simultaneous Rx/Tx capability. Simultaneous Rx/Tx capability does not apply for UEs supporting band n78 with a n77 implementation. | | | | | | | | | |

#### 5.39.3.3 Power class 1.5 for single uplink n41

Since the MOP for n41 is increased to 29dBm, cross band isolation MSD caused by UL PC1.5 n41 should be defined.

The proposed value for PC1.5 UL CA MSD can be found in Table 5.39.3.3-1:

Table 5.39.3.3-1-: Reference sensitivity exceptions (MSD) and uplink/downlink configurations due to cross band isolation from a PC1.5 aggressor NR UL band for NR CA FR1

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | UL Fc | UL BW | SCS of UL band | UL RB Allocation | DL Fc | DL BW | MSD | Cross-band  Interference  source |
| (MHz) | (MHz) | (kHz) | LCRB | (MHz) | (MHz) | (dB) |
| n41 | n40 | 2546 | 100 | 30 | 270 (RBstart=0) | 2397.5 | 5 | [41.2] | ACLR2 |
| NOTE 1: Applicable only when harmonic mixing MSD for this combination is not applied.  NOTE 2: Void.  NOTE 3: The requirements only apply for UEs supporting inter-band carrier aggregation with simultaneous Rx/Tx capability. Simultaneous Rx/Tx capability does not apply for UEs supporting band n78 with a n77 implementation. | | | | | | | | | |

### 5.39.4 REFSENS requirements

Void

## 5.40 CA\_n41-n77, UL CA\_n77(2A)

### 5.40.1 Configurations

**Table 5.40.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n41A-n77(2A) | n418,9  n778,9  **CA\_n77(2A)8**  CA\_n41A-n77A8 | n41 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | 0 |
| n77 | CA\_n77(2A)\_BCS1 |
|  | n418,9  n778,9  CA\_n41A-n77A8 | n41 | n41 channel bandwidth in Table5.3.5-1 | 4 and 5 |
| n77 | CA\_n77(2A)\_BCS4 and 5 |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 5.40.2 Maximum output power

**Table 5.40.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n41-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| Case c | 26dBm | 26dBm | 23dBm |
| Case d | 26dBm | 26dBm | 26dBm |

### 5.40.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink. For PC3 CA\_n41-n77 with single uplink and UL CA\_n41-n77, the co-existence study is provided in TR38.717-02-01[5]. For PC3 CA\_n41-n77 with UL CA\_n77(2A), the co-existence study is provided in TR38.718-02-01[9]. For PC2 and PC1.5 CA\_n41-n77 with single uplink, the co-existence study is provided in TR 38.841[10]. Analysis is based on these studies.

For UL CA\_n77(2A), IMD3, IMD5 and IMD7 fall into n41 downlink. IMD5 test point was chosen instead of IMD3, as for IMD3 to fall on n41 the frequency separation would need to be over 600 MHz which is not allowed based on clause 5.3A.5 of 38.101-1.

For PC3 CA\_n41-n77 with UL CA\_n77(2A), analysis of REFSENS exceptions is already defined in the Table 7.3A.5-1a of TS38.101-1[3] as follows.

**Table 5.40.3-1 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC3 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA band combination** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n41-n77 | n41 | N/A | 10 | N/A | 2565 | 17 | TDD | IMD516 |
| n7712 | 3485 | 10 | 1 (RBSTART=25) | 3485 | N/A | TDD | N/A |
|  | 3945 | 10 | 1 (RBSTART=25) | 3945 |  |  |  |
| NOTE 12: This band supports intra-band non-contiguous uplink configuration.  NOTE 16: This band is subject to IMD7 also which MSD is not specified. | | | | | | | | |

MSD for PC2 UL CA is calculated from MSD for PC3 as follows:

If the input signal increases by 3dB, the IMD5 increases by 3\*5=15dB.

The proposed value for PC2 UL CA MSD can be found in Table 5.40.3-2.

**Table 5.40.3-2 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA band combination** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n41-n77 | n41 | N/A | 10 | N/A | 2565 | 32 | TDD | IMD516 |
| n7712 | 3485 | 10 | 1 (RBSTART=25) | 3485 | N/A | TDD | N/A |
|  | 3945 | 10 | 1 (RBSTART=25) | 3945 |  |  |  |
| NOTE 12: This band supports intra-band non-contiguous uplink configuration.  NOTE 16: This band is subject to IMD7 also which MSD is not specified. | | | | | | | | |

### 5.40.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 5.41 CA\_n40-n78

### 5.41.1 Configurations

**Table 5.41.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n40A-n78A | n40A8,9  n78A8,9  CA\_n40A-n78A8 | n40 | 5, 10, 15, 20, 25, 30, 40, 50, 60, 80 | 0 |
| n78 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |
|  |  | n40 | 5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | 1 |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
|  |  | n40 | See n40 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n78 | See n78 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 8: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 5.41.2 Maximum output power

Table 5.41.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n40-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| Case c | 26dBm | 26dBm | 23dBm |
| Case d | 26dBm | 26dBm | 26dBm |

### 5.41.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

5.41.3.1 Power class 2 and 1.5 case a, b, c, d

Based on TS 38.101-1 Table 7.3A.4-1, there is no UL harmonic interference issue for this band combination.

Based on TS 38.101-1 Table 7.3A.4-4, there is harmonic mixing issue for n78 to n40 this is treated under the single band exceptions.

Based on TS 38.101-1 Table 7.3A.5-1, there is no IMD issues for this band combination.

Based on TS 38.101-1 Table 7.3A.6-1, there is cross band isolation issues for n78 to n40 this is treated under the single band exceptions.

5.41.3.2 Power class 2 for single uplink n78

- The 2nd, 3rd, 4th, and 5th order harmonic do not fall into Rx frequencies of n40.

- The 2nd, 3rd, 4th, and 5th order harmonic mixing do not fall into Rx frequencies of n40.

- n40 DL suffers UL2/DL3 harmonic mixing from n78.

- Cross band isolation of n78 UL falls into n40 DL.

Therefore, MSD for cross band isolation and harmonic mixing should be defined.

**Table 5.41.3.2-1: Reference sensitivity exceptions (MSD) and uplink/downlink configurations due to cross band isolation from a PC2 aggressor NR UL band for NR CA FR1**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **Cross-band**  **Interference**  **source** |
| **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** |
| n78 | n401 | 3350 | 100 | 30 | 270 (RBstart=0) | 2395 | 10 | 6.5 | >ACLR2 |
| n78 | n401 | 3350 | 100 | 30 | 270 (RBstart=0) | 2350 | 100 | 1.2 | >ACLR2 |

**Table 5.41.3.2-2: Reference sensitivity exceptions and uplink/downlink configurations due to** **harmonic mixing from a PC2 aggressor NR UL band for NR DL CA FR1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL BW** | **MSD** | **UL/DL fc condition** | **UL/DL harmonic order** |
| **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(dB)** |
| n78 | n40 | 20 | 30 | 50 (RBstart=0) | 10 | 13.2 | NOTE 3 | UL2/DL3 |
| n78 | n40 | 20 | 30 | 50 (RBstart=0) | 100 | 4.4 | NOTE 3 | UL2/DL3 |

5.41.3.3 Power class 1.5 for single uplink n78

Similar as for PC2 MSD should be defined for PC1.5.

**Table 5.41.3.3-1: Reference sensitivity exceptions (MSD) and uplink/downlink configurations due to cross band isolation from a PC1.5 aggressor NR UL band for NR CA FR1**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **Cross-band**  **Interference**  **source** |
| **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** |
| n78 | n401 | 3350 | 100 | 30 | 270 (RBstart=0) | 2395 | 10 | 9.0 | >ACLR2 |
| n78 | n401 | 3350 | 100 | 30 | 270 (RBstart=0) | 2350 | 100 | 2.2 | >ACLR2 |

**Table 5.41.3.3-2: Reference sensitivity exceptions and uplink/downlink configurations due to harmonic mixing from a PC1.5 aggressor NR UL band for NR DL CA FR1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL BW** | **MSD** | **UL/DL fc condition** | **UL/DL harmonic order** |
| **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(dB)** |
| n78 | n40 | 20 | 30 | 50 (RBstart=0) | 10 | 16.1 | NOTE 3 | UL2/DL3 |
| n78 | n40 | 20 | 30 | 50 (RBstart=0) | 100 | 6.7 | NOTE 3 | UL2/DL3 |

5.41.3.4 Power class 2 and 1.5 for single uplink n40

According to previous co-existence studies there are no issues.

### 5.41.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

## 5.42 CA\_n39-n41

### 5.42.1 Configurations

**Table 5.42.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n39A-n41A | n398  n418,9  CA\_n39A-n41A8 | n39 | 5, 10, 15, 20, 25, 30, 40 | 0 |
| n41 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |  |
| n39 | See n39 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
| n41 | See n41 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n39A-n41C | n398  n418,9  CA\_n41C8  CA\_n39A-n41A8  CA\_n39A-n41C8 | n39 | 5, 10, 15, 20, 25, 30, 40 | 0 |
|  |  | n41 | CA\_n41C\_BCS0 |  |
|  |  | n39 | See n39 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n41 | CA\_n41C\_BCS4 and 5 |  |
| NOTE 8: Minimum requirements for Power Class 2 are applicable for this uplink combination with 1Tx antenna connector in each band or single uplink carrier with up to 2Tx antenna connectors in this downlink/uplink combination  NOTE 9: Minimum requirements for Power Class 1.5 are applicable for this single uplink carrier with up to 2Tx antenna connectors in this downlink/uplink combination | | | | |

### 5.42.2 Maximum output power

Table 5.42.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_n39-n41** | **CA power class** | **Carrier n39 power class** | **Carrier n41 power class** |
| CA\_n39A-n41A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
|  | Case c | 26dBm | 26dBm | 23dBm |
|  | Case d | 26dBm | 26dBm | 26dBm |
| CA\_n39A-n41C | Case a | 26dBm | 23dBm | 23dBm |
|  | Case b | 26dBm | 23dBm | 26dBm |
|  | Case c | 26dBm | 26dBm | 23dBm |
|  | Case d | 26dBm | 26dBm | 26dBm |

### 5.42.3 REFSENS requirements

**PC2 UL single carrier**

For PC3 CA\_n39A-n41A, due to simultaneous Rx/Tx operation is supported, there are two types of MSD for this band combination, which are:

1: cross-band isolation MSD

2: Harmonic mixing MSD, where:

- 3rd harmonic of band n41 UL may fall into 4th harmonic of band n39 DL

- 4th harmonic of band n39 UL may fall into 3rd harmonic of band n41 DL.

For PC2 CA\_n39A-n41A, by using the same co-existence study as PC3, and due to either PC2 single band n39 or PC2 single band n41 is supported, the above two types MSD should be defined.

**PC2 UL CA\_n41C**

Due to PC2 UL CA\_n41C are supported, the IMDs issue caused by intra-band UL contiguous CA\_n41C can be found in table 5.42.3-1:

Table 5.42.3-1: Co-existence studies for Uplink Intra-Band Contiguous CA

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Configuration | Channel BW | Minimum channel separation | Maximum channel separation | Minimum frequency | Maximum frequency |  |
| Data | 10 | 10 | 190 | 2496 | 2690 | - |
| CC location | fU1L | fU2L | fU3L | fU1H | fU2H | fU3H |
| Frequency | 2496 | 2516 | 2686 | 2690 | 2670 | 2500 |
| 2nd order IMD products | IfU1L-fU2LI | IfU1L-fU3LI | fU1L + fU2L | fU1H+fU2H |  |  |
| Interference ranges | 20 | 190 | 5012 | 5360 |  |  |
| 3rd order IMD products | 2\*fU1L-fU3L | 2\*fU1H-fU3H | 2\*fU1L + fU2L | 2\*fU1H + fU2H |  |  |
| Interference ranges | 2306 | 2880 | 7508 | 8050 |  |  |
| 4th order IMD products | I2\*fU1L-2\*fU2LI | I2\*fU1H-2\*fU3H I | 3\*fU1L-fU3L | 3\*fU1H-fU3H | 3\*fU1L+fU2L | 3\*fU1H+fU2H |
| Interference ranges | 40 | 380 | 4802 | 5570 | 10004 | 10740 |
| 5th order IMD products | I3\*fU1L-2\*fU3LI | I3\*fU1H-2\*fU3H I | 4\*fU1L-fU3L | 4\*fU1H-fU3H | 4\*fU1L+fU2L | 4\*fU1H+fU2H |
| Interference ranges | 2116 | 3070 | 7298 | 8260 | 12500 | 13430 |
| 6th order IMD products | I3\*fU1L-3\*fU2LI | I3\*fU1H-3\*fU3H I | 4\*fU1L-2\*fU3L | 4\*fU1H-2\*fU3H | 5\*fU1L-fU3L | 5\*fU1H-fU3H |
| Interference ranges | 60 | 570 | 4612 | 5760 | 9794 | 10950 |
| 7th order IMD products | I4\*fU1L-3\*fU3LI | I4\*fU1H-3\*fU3HI | 5\*fU1L-2\*fU3L | 5\*fU1H-2\*fU3H | 6\*fU1L-fU3L | 6\*fU1H-fU3H |
| Interference ranges | 1926 | 3260 | 7108 | 8450 | 12290 | 13640 |

It can be found that there are no co-existence issues caused by CA\_n41C impact band n39 DL.

**PC2 UL CA\_n39A-41A**

For PC2 UL CA\_n39A-n41A, except the cross band isolation and harmonic mixing MSD issue as mentioned as above, additional IMD MSD need to be checked. However, due to both n39 and n41 are TDD bands, there are no IMD issue due to the UL and DL will not operate at the same time.

**PC2 UL CA\_n39A-41C**

For PC2 UL CA\_n39A-n41A, similar with PC2 UL CA\_n39A-n41A, the cross band isolation and harmonic mixing MSD issue have already been included in the PC2 UL single carrier.

For the impacts of PC2 UL CA\_n41C, the analysis are included in the PC2 UL\_CA\_n41C as above.

For the triple beat IMD issue, due to both n39 and n41 are TDD bands, there are no IMD issue due to the UL and DL will not operate at the same time. Therefore, no additional triple beat IMD MSD are foreseen to be be defined to support PC2 UL CA\_n39A-n41C.

To summarize, to support PC2 power class for the UL configuration of single carrier, CA\_n41C, CA\_n39A-n41A and CA\_n39A-n41C, only the cross-band isolation MSD and Harmonic mixing MSD should be defined, which are given in the following sub-clauses. There are no IMD issue caused by UL CA\_n39-n41 for the CA\_n39-n41 band combination.

#### 5.42.3.1 Power class 2 for case a

For PC2 case a, since the power configuration for each band is 23dBm, therefore comparing with PC3 CA\_n39A-n41A, no additional cross-band isolation MSD or harmonic mixing MSD are expected for this PC2 CA\_n39A-n41A with 1 uplink carrier.

#### 5.42.3.2 Power class 2 for case b

For PC2 case b, due to the power class for n39 is still kept as PC3(i.e. 23dBm), comparing with PC3 CA\_n39A-n41A, there are no additional cross-band isolation MSD or harmonic mixing MSD caused by PC3 UL n39 are expected.

However, due to the power class for n41 is increased to 26dBm, therefore comparing with PC3 CA\_n39A-n41A, cross-band isolation MSD or harmonic mixing MSD caused by UL PC2 n41 shall be defined.

the harmonic mixing MSD caused by UL PC2 n39 are proposed in table 5.42.3.2-1.

Table 5.42.3.2-1. Reference sensitivity exceptions and uplink/downlink configurations due to harmonic mixing from a PC2 aggressor NR UL band for DL NR CA FR1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL BW** | **MSD** | **UL/DL fc condition** | **UL/DL harmonic order** |
| **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(dB)** |
| n41 | n39 | 10 | 15 | 25 (RBstart=0) | 5 | 6.1 | NOTE X | UL3/DL4 |
| n41 | n39 | 10 | 15 | 25 (RBstart=0) | 40 | 1.5 | NOTE X | UL3/DL4 |
| NOTE X: The requirements should be verified for UL NR-ARFCN of the aggressor (lower) band (superscript LB) such that in MHz and  with carrier frequency in the victim (higher) band in MHz and  the channel bandwidth configured in the lower band. | | | | | | | | |

Similarly, the cross band isolation caused by UL PC2 n41 is proposed in table 5.42.3.2-2.

Table 5.42.3.2-2. Reference sensitivity exceptions (MSD) and uplink/downlink configurations due to cross band isolation from a PC2 aggressor NR UL band for NR CA FR1

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | UL Fc | UL BW | SCS of UL band | UL RB Allocation | DL Fc | DL BW | MSD | Cross-band  Interference  source |
| (MHz) | (MHz) | (kHz) | LCRB | (MHz) | (MHz) | (dB) |
| n41 | n39 | 2546 | 100 | 30 | 270 (RBstart=3) | 1917.5 | 5 | 2.7 | >ACLR2 |

NOTE： Cross-band isolation between n41C UL (PC3 and PC2) may need to be evaluated and specified, pending on the general MSD framework for cross-band interference between intra-band contiguous UL CA and the victim DL band.

#### 5.42.3.3 Power class 2 for case c

For PC2 case c, due to the power class for n41 is still kept as PC3(i.e. 23dBm), comparing with PC3 CA\_n39A-n41A, there are no additional cross-band isolation MSD or harmonic mixing MSD caused by PC3 UL n41 are expected.

However, due to the power class for n39 is increased to 26dBm, comparing with PC3 CA\_n39A-n41A, cross-band isolation MSD or harmonic mixing MSD caused by UL PC2 n39 shall be defined.

Therefore, the harmonic mixing MSD caused by UL PC2 n39 are proposed in table 5.42.3.3-1.

Table 5.42.3.3-1. Reference sensitivity exceptions and uplink/downlink configurations due to harmonic mixing from a PC2 aggressor NR UL band for DL NR CA FR1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL BW** | **MSD** | **UL/DL fc condition** | **UL/DL harmonic order** |
| **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(dB)** |
| n39 | n41 | 5 | 15 | 25 (RBstart=0) | 5 | 10.6 | NOTE X | UL4/DL3 |
| n39 | n41 | 5 | 15 | 25 (RBstart=0) | 100 | 4.9 | NOTE X | UL4/DL3 |
| NOTE X: The requirements should be verified for UL NR-ARFCN of the aggressor (lower) band (superscript LB) such that in MHz and  with carrier frequency in the victim (higher) band in MHz and  the channel bandwidth configured in the lower band. | | | | | | | | |

Similarily, the cross band isolation caused by UL PC2 n39 is proposed in table 5.42.3.3-2.

Table 5.42.3.3-2. Reference sensitivity exceptions (MSD) and uplink/downlink configurations due to cross band isolation from a PC2 aggressor NR UL band for NR CA FR1

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | UL Fc | UL BW | SCS of UL band | UL RB Allocation | DL Fc | DL BW | MSD | Cross-band  Interference  source |
| (MHz) | (MHz) | (kHz) | LCRB | (MHz) | (MHz) | (dB) |
| n39 | n41 | 1900 | 40 | 15 | 216 (RBstart=0) | 2501 | 10 | 4.7 | >ACLR2 |

5.42.3.4 Power class 2 for case d

For PC2 case d, the power class for both bands n39 and n41 are increased to 26dBm, therefore comparing with PC3 CA\_n39A-n41A, cross-band isolation MSD or harmonic mixing MSD caused by UL PC2 n39 or PC2 n41 shall be defined.

Due to the cross-band isolation MSD or harmonic mixing MSD are the situation of one single band impact another single band, therefore the cross-band isolation MSD or harmonic mixing MSD caused UL PC2 n39 or PC2 n41 are already included in sub-clause 5.42.3.2 and sub-clause 5.42.3.3.

#### 5.42.3.5 Power class 1.5 for single uplink n41

Since the MOP for n41 is increased to 29dBm, harmonic mixing MSD and cross band isolation MSD caused by UL PC1.5 n41 should be defined.

The proposed value for PC1.5 UL CA MSD can be found in Table 5.42.3.5-1 and Table 5.42.3.5-2:

Table 5.42.3.5-1: Reference sensitivity exceptions and uplink/downlink configurations due to harmonic mixing from a PC1.5 aggressor NR UL band for DL NR CA FR1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | UL BW | SCS of UL band | UL RB Allocation | DL BW | MSD | UL/DL fc condition | UL/DL harmonic order |
| (MHz) | (kHz) | LCRB | (MHz) | (dB) |
| n41 | n39 | 10 | 15 | 25 (RBstart=0) | 5 | 10.5 | NOTE X | UL3/DL4 |
| n41 | n39 | 10 | 15 | 25 (RBstart=0) | 40 | 3.0 | NOTE X | UL3/DL4 |
| NOTE X: The requirements should be verified for UL NR-ARFCN of the aggressor (lower) band (superscript LB) such that in MHz and  with carrier frequency in the victim (higher) band in MHz and  the channel bandwidth configured in the lower band. | | | | | | | | |

Table 5.42.3.5-2: Reference sensitivity exceptions (MSD) and uplink/downlink configurations due to cross band isolation from a PC1.5 aggressor NR UL band for NR CA FR1

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | UL Fc | UL BW | SCS of UL band | UL RB Allocation | DL Fc | DL BW | MSD | Cross-band  Interference  source |
| (MHz) | (MHz) | (kHz) | LCRB | (MHz) | (MHz) | (dB) |
| n41 | n39 | 2546 | 100 | 30 | 270 (RBstart=3) | 1917.5 | 5 | 6.7 | >ACLR2 |

### 5.42.4 ∆TIB and ∆RIB values

Void

## 5.43 CA\_n28A-n40A

### 5.43.1 Configurations

**Table 5.43.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n28A-n40A | n408,9  CA\_n28A-n40A8 | n28 | 5, 10, 15, 20 | 0 |
|  |  | n40 | 5, 10, 15, 20, 25, 30, 40, 50, 60, 80 |  |
|  |  | n28 | 5, 10, 15, 20, 25, 30 | 1 |
|  |  | n40 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
|  |  | n28 | See n28 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n40 | See n40 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 8: Minimum requirements for Power Class 2 are applicable for this uplink combination with 1Tx antenna connector in each band or single uplink carrier with up to 2Tx antenna connectors in this downlink/uplink combination  NOTE 9: Minimum requirements for Power Class 1.5 are applicable for this single uplink carrier with up to 2Tx antenna connectors in this downlink/uplink combination | | | | |

### 5.43.2 Maximum output power

Table 5.43.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_n28-n40** | **CA power class** | **Carrier n28 power class** | **Carrier n40 power class** |
| CA\_n28-n40 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

In addition, the power class for PC2 and PC1.5 n40 single carrier for this band combination.

### 5.43.3 REFSENS requirements

For PC3 CA\_n28A-n40A, there are harmonic mixing MSD for this band combination:

band n41 UL may fall into 3rd harmonic of band n28 DL.

#### 5.43.3.1 Power class 2 case a

For PC2 case a, since the power configuration for each band is 23dBm, therefore comparing with PC3 CA\_n28A-n40A, no additional harmonic mixing MSD are expected for this PC2 CA\_n28A-n40A with 1 uplink carrier.

#### 5.43.3.2 Power class 2 case b

For PC2 case b, due to the MOP for n28 is still kept as 23dBm. Since the MOP for n40 is increased to 26dBm, harmonic mixing MSD caused by UL PC2 n40 shall be defined.

The proposed value for PC2 UL CA MSD can be found in Table 5.43.3.2-1:

Table 5.43.3.2-1: Reference sensitivity exceptions and uplink/downlink configurations due to harmonic mixing from a PC2 aggressor NR UL band for DL NR CA FR1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | UL BW | SCS of UL band | UL RB Allocation | DL BW | MSD | UL/DL fc condition | UL/DL harmonic order |
| (MHz) | (kHz) | LCRB | (MHz) | (dB) |
| n40 | n28 | 5 | 15 | 25 (RBstart=0) | 5 | 40.8 | NOTE 7 | UL1/DL3 |
| n40 | n28 | 20 | 15 | 100 (RBstart=0) | 20 | 33.3 | NOTE 7 | UL1/DL3 |
| NOTE 7: The requirements should be verified for UL NR-ARFCN of the aggressor (higher) band (superscript HB) such that  in MHz and with  the carrier frequency in the victim (lower) band and  the channel bandwidth configured in the higher band. | | | | | | | | |

#### 5.43.3.3 Power class 1.5 for single uplink n40

Since the MOP for n40 is increased to 29dBm, harmonic mixing MSD caused by UL PC1.5 n40 should be defined.

The proposed value for PC1.5 UL CA MSD can be found in Table 5.43.3.3-1:

Table 5.43.3.3-1: Reference sensitivity exceptions and uplink/downlink configurations due to harmonic mixing from a PC1.5 aggressor NR UL band for DL NR CA FR1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | UL BW | SCS of UL band | UL RB Allocation | DL BW | MSD | UL/DL fc condition | UL/DL harmonic order |
| (MHz) | (kHz) | LCRB | (MHz) | (dB) |
| n40 | n28 | 5 | 15 | 25 (RBstart=0) | 5 | 43.8 | NOTE X | UL1/DL3 |
| n40 | n28 | 20 | 15 | 100 (RBstart=0) | 20 | 36.3 | NOTE X | UL1/DL3 |
| NOTE X: The requirements should be verified for UL NR-ARFCN of the aggressor (higher) band (superscript HB) such that  in MHz and with  the carrier frequency in the victim (lower) band and  the channel bandwidth configured in the higher band. | | | | | | | | |

### 5.43.4 ∆TIB and ∆RIB values

Void

## 5.44 CA\_ n3A-n40A

### 5.44.1 UE maximum output power

**Table 5.44.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n3A-n40A | n408,9  CA\_n3A-n40A8 | n3 | 5, 10, 15, 20, 25, 30 | 0 |
|  |  | n40 | 5, 10, 15, 20, 25, 30, 40, 50, 60, 80 |  |
|  |  | n3 | 5, 10, 15, 20, 25, 30, 40, 50 | 1 |
|  |  | n40 | 5, 10, 15, 20, 25, 30, 40, 50, 60, 80 |  |
|  |  | n3 | 5, 10, 15, 20, 25, 30, 35,40 | 2 |
|  |  | n40 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
|  |  | n3 | See n3 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n40 | See n40 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 8: Minimum requirements for Power Class 2 are applicable for this uplink combination with 1Tx antenna connector in each band or single uplink carrier with up to 2Tx antenna connectors in this downlink/uplink combination  NOTE 9: Minimum requirements for Power Class 1.5 are applicable for this single uplink carrier with up to 2Tx antenna connectors in this downlink/uplink combination | | | | |

### 5.44.2 Maximum output power

Table 5.44.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_n3-n40** | **CA power class** | **Band n3 power class** | **Band n40 power class** |
| CA\_n3A-n40A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 5.44.3 Reference sensitivity requirements

#### 5.44.3.1 Power class 2 for case A

As existing requirements for PC3 CA\_n3-n40, there is no MSD issue.

#### 5.44.3.2 Power class 2 for case B

Cross band isolation interference of PC2 n40 falls into n3.

The PC2 MSD due to cross band isolation are specified in following table 5.44.3.2-1.

**Table 5.44.3.2-1: Reference sensitivity exceptions (MSD) and uplink/downlink configurations due to cross band isolation from a PC2 aggressor NR UL band for NR CA FR1**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **Cross-band**  **Interference**  **source** |
| **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** |
| n40 | n3 | 2350 | 100 | 30 | 270 (RBstart=0) | 1877.5 | 5 | 0.6 | >ACLR2 |

#### 5.44.3.3 Power class 1.5 for n40

Cross band isolation interference of PC1.5 n40 falls into n3.

The PC1.5 MSD due to cross band isolation are specified in following table 5.44.3.3-1.

**Table 5.44.3.3-1: Reference sensitivity exceptions (MSD) and uplink/downlink configurations due to cross band isolation from a PC1.5 aggressor NR UL band for NR CA FR1**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **Cross-band**  **Interference**  **source** |
| **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** |
| n40 | n3 | 2350 | 100 | 30 | 270 (RBstart=0) | 1877.5 | 5 | 1.2 | >ACLR2 |

### 5.44.4 ∆TIB and ∆RIB values

Void

# 6 High Power UE CA of 3 bands DL and 1 or 2 bands UL

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

### 6.x.1 Configurations

*<Editor’s note: the CA configurations and bandwidth combinations sets should be kept same as defined in 38.101-1 Table 5.5A.3.2-1x unless additional clarification>*

**Table 6.x.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| *CA\_nX-nY-nZ* | *nX7,9, nY7,9,*  *CA\_nX-nY7* | *nX* |  |  |
| *nY* |  |
| *nZ* |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.x.2 Maximum output power

*<Editor’s note: In table 6.x.2-1, the power class 2 cases supported by the uplink CA should be kept as the same numbering and others that not supported should be removed. >*

Table 6.x.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| *CA\_nX-nY* | *Case a* | *26dBm* | *23dBm* | *23dBm* |
| *Case b* | *26dBm* | *23dBm* | *26dBm* |
| *Case c* | *26dBm* | *26dBm* | *23dBm* |
| *Case d* | *26dBm* | *26dBm* | *26dBm* |

### 6.x.3 REFSENS requirements

*<Editor’s note: This agenda will capture the Reference sensitivity exceptions or MSD requirements due to higher power for CA carrier, please use the same table format as in 38101-1. The requirements in this TR are intended to be power class 2 cases based, however how to address in the spec will be further discussed. >*

#### 6.x.3.1 Power class 2 case a

### 6.x.4 ∆TIB and ∆RIB values

*<Editor’s note: If no change by comparing to the values for power class 3 CA, this section will be void.>*

## 6.1 DL CA\_n25-n41-n66, UL CA\_n25A-n41A

### 6.1.1 Configurations

Table 6.1.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n25A-n41A-n66A | **CA\_n25A-n41A7**  CA\_n25A-n66A  CA\_n41A-n66A | n25 | n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n41 | n41 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n66 | n66 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n25A-n41C-n66A | **CA\_n25A-n41A7**  CA\_n25A-n66A  CA\_n41A-n66A | n25 | n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n41 | CA\_n41C\_BCS 4 and 5 |  |
|  |  | n66 | n66 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n25A-n41(2A)-n66A | **CA\_n25A-n41A7**  CA\_n25A-n66A  CA\_n41A-n66A | n25 | n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n41 | CA\_n41(2A)\_BCS 4 and 5 |  |
|  |  | n66 | n66 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.1.2 Maximum output power

Table 6.1.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n25A-n41A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.1.3 REFSENS requirements

#### 6.1.3.1 Power class 2 case a

Since there is no MSD for PC3 UL CA\_n25A-n41A into CA\_n25-n41-n66, none is proposed for PC2.

#### 6.1.3.2 Power class 2 case b

Since there is no MSD for PC3 UL CA\_n25A-n41A into CA\_n25-n41-n66, none is proposed for PC2.

### 6.1.4 Void

## 6.2 DL CA\_n25-n41-n66, UL CA\_n41A-n66A

### 6.2.1 Configurations

**Table 6.2.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n25A-n41A-n66A | CA\_n25A-n41A  CA\_n25A-n66A  **CA\_n41A-n66A7** | n25 | n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n41 | n41 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n66 | n66 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n25A-n41C-n66A | CA\_n25A-n41A  CA\_n25A-n66A  **CA\_n41A-n66A7** | n25 | n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n41 | CA\_n41C\_BCS 4 and 5 |  |
|  |  | n66 | n66 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n25A-n41(2A)-n66A | CA\_n25A-n41A  CA\_n25A-n66A  **CA\_n41A-n66A7** | n25 | n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n41 | CA\_n41(2A)\_BCS 4 and 5 |  |
|  |  | n66 | n66 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.2.2 Maximum output power

Table 6.2.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n41A-n66A | Case a | 26dBm | 23dBm | 23dBm |
| Case c | 26dBm | 26dBm | 23dBm |

### 6.2.3 REFSENS requirements

#### 6.2.3.1 Power class 2 case a

There is 11.0 dB of MSD for PC3 CA\_n41A-n66A into n25:

Table 6.2.3-1 PC3 MSD

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n25-n41-n66 | n25 | 1860 | 5 | 25 | 1940 | 11.0 | FDD | IMD4 |
|  | n41 | 2685 | 10 | 50 | 2685 | N/A | TDD | N/A |
|  | n66 | 1715 | 5 | 25 | 2115 | N/A | FDD | N/A |

MSD for PC2 UL CA is calculated from MSD for PC2 as follows:

If the input signal increases by 3 dB, the IMD4 interference power increases by 3\*4=12 dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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If is increased by dB, then is given by

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Description automatically generated





The proposed value for PC2 UL CA MSD can be found in Table 6.x.3-2.

Table 6.x.3-2 PC2 MSD

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n25-n41-n66 | n25 | 1860 | 5 | 25 | 1940 | 22.7 | FDD | IMD4 |
|  | n41 | 2685 | 10 | 50 | 2685 | N/A | TDD | N/A |
|  | n66 | 1715 | 5 | 25 | 2115 | N/A | FDD | N/A |

#### 6.2.3.2 Power class 2 case c

The same MSD applies for Power class 2 case c as power class 2 case a.

### 6.2.4 Void

## 6.3 DL CA\_n25-n41-n71, UL CA\_n25A-n41A

### 6.3.1 Configurations

Table 6.3.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n25A-n41A-n71A | **CA\_n25A-n41A7**  CA\_n41A-n71A  CA\_n25A-n71A | n25 | n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n41 | n41 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n71 | n77 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n25A-n41(2A)-n71A | **CA\_n25A-n41A7**  CA\_n41A-n71A  CA\_n25A-n71A | n25 | n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n41 | CA\_n41(2A)\_BCS 4 and 5 |  |
|  |  | n71 | n71 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n25A-n41C-n71A | **CA\_n25A-n41A7**  CA\_n41A-n71A  CA\_n25A-n71A  CA\_n41C | n25 | n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n41 | CA\_n41C\_BCS 4 and 5 |  |
|  |  | n71 | n71 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.3.2 Maximum output power

Table 6.3.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n25A-n41A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.3.3 REFSENS requirements

#### 6.3.3.1 Power class 2 case a

Since there is no MSD for PC3 UL CA\_n25A-n41A into n71, none is proposed for PC2.

#### 6.3.3.2 Power class 2 case b

Since there is no MSD for PC3 UL CA\_n25A-n41A into -n71, none is proposed for PC2.

### 6.3.4 Void

## 6.4 DL CA\_n25-n41-n71, UL CA\_n41A-n71A

### 6.4.1 Configurations

Table 6.4.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n25A-n41A-n71A | CA\_n25A-n41A  **CA\_n41A-n71A7**  CA\_n25A-n71A | n25 | n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n41 | n41 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n71 | n77 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n25A-n41(2A)-n71A | CA\_n25A-n41A  **CA\_n41A-n71A7**  CA\_n25A-n71A | n25 | n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n41 | CA\_n41(2A)\_BCS 4 and 5 |  |
|  |  | n71 | n71 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n25A-n41C-n71A | CA\_n25A-n41A  **CA\_n41A-n71A7**  CA\_n25A-n71A  CA\_n41C | n25 | n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n41 | CA\_n41C\_BCS 4 and 5 |  |
|  |  | n71 | n71 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.4.2 Maximum output power

Table 6.4.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n41A-n71A | Case a | 26dBm | 23dBm | 23dBm |
| Case c | 26dBm | 26dBm | 23dBm |

### 6.4.3 REFSENS requirements

#### 6.4.3.1 Power class 2 case a

Since there is no MSD for PC3 UL CA\_n41A-n71A into CA\_n25-n41-n71, none is proposed for PC2.

#### 6.4.3.2 Power class 2 case c

Since there is no MSD for PC3 UL CA\_n41A-n71A into CA\_n25-n41-n71, none is proposed for PC2.

### 6.4.4 Void

## 6.5 DL CA\_n25-n41-n71, UL CA\_n41C

### 6.5.1 Configurations

Table 6.5.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n25A-n41C-n71A | CA\_n25A-n41A  CA\_n41A-n71A  CA\_n25A-n71A  **CA\_n41C7** | n25 | n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n41 | CA\_n41C\_BCS 4 and 5 |  |
|  |  | n71 | n71 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.5.2 Maximum output power

Table 6.5.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n41C | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| Case c | 26dBm | 26dBm | 23dBm |
| Case d | 26dBm | 26dBm | 26dBm |

### 6.5.3 REFSENS requirements

#### 6.5.3.1 Power class 2 case a, case b, case c, case c

Any MSD for UL CA\_n41C PC2 is handled in the 2 band DL fallbacks.

### 6.5.4 Void

## 6.6 DL CA\_n25-n41-n77, UL CA\_n25A-n41A

### 6.6.1 Configurations

Table 6.6.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n25A-n41A-n77A | **CA\_n25A-n41A7**  CA\_n25A-n77A  CA\_n41A-n77A | n25 | n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n41 | n41 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n25(2A)-n41A-n77A | **CA\_n25A-n41A7**  CA\_n25A-n77A  CA\_n41A-n77A | n25 | CA\_n25(2A)\_BCS 4 and 5 | 4 and 5 |
|  |  | n41 | n41 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.6.2 Maximum output power

Table 6.6.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n25A-n41A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.6.3 REFSENS requirements

#### 6.6.3.1 Power class 2 case a

Power class 3 CA for UL CA\_n25A-n41A:

Table 6.6.3.1-1 Power class 3 MSD for 2 bands UL CA\_n25A-n41A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n25-n41-n77 | n25 | 1870 | 5 | 25 | 1950 | N/A | FDD | N/A |
|  | n41 | 2670 | 5 | 25 | 2670 | N/A | TDD | N/A |
|  | n77 | 3470 | 10 | 50 | 3470 | 14.8 | TDD | IMD3 |
|  | n25 | 1900 | 5 | 25 | 1980 | N/A | FDD | N/A |
|  | n41 | 2525 | 5 | 25 | 2645 | N/A | TDD | N/A |
|  | n77 | 3775 | 10 | 50 | 3775 | 4.2 | TDD | IMD5 |

MSD for PC2 UL CA is calculated from MSD for PC2 as follows:

If the input signal increases by 3 dB, the IMD3 increases by 3\*3=9 dB.

If the input signal increases by 3 dB, the IMD5 increases by 3\*5=15 dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

Text

Description automatically generated

If is increased by dB, then is given by

A picture containing logo

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The proposed value for PC2 UL CA MSD can be found in Table 6.6.3.1-1.

Table 6.6.3.1-2 Proposed Power class 2 MSD for UL CA\_n25-n41-n71

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n25-n41-n77 | n25 | 1870 | 5 | 25 | 1950 | N/A | FDD | N/A |
|  | n41 | 2670 | 5 | 25 | 2670 | N/A | TDD | N/A |
|  | n77 | 3470 | 10 | 50 | 3470 | 23.7 | TDD | IMD3 |
|  | n25 | 1900 | 5 | 25 | 1980 | N/A | FDD | N/A |
|  | n41 | 2525 | 5 | 25 | 2645 | N/A | TDD | N/A |
|  | n77 | 3775 | 10 | 50 | 3775 | 17.2 | TDD | IMD5 |

#### 6.6.3.2 Power class 2 case b

The same MSD for case a applies to case b.

### 6.6.4 ∆TIB and ∆RIB values

Void.

## 6.7 DL CA\_n25-n41-n77, UL CA\_n25A-n77A

### 6.7.1 Configurations

Table 6.7.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n25A-n41A-n77A | CA\_n25A-n41A  **CA\_n25A-n77A7**  CA\_n41A-n77A | n25 | n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n41 | n41 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
|  | CA\_n25A-n41A  **CA\_n25A-n77A7**  CA\_n41A-n77A | n25 | CA\_n25(2A)\_BCS 4 and 5 | 4 and 5 |
| CA\_n25(2A)-n41A-n77A |  | n41 | n41 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.7.2 Maximum output power

Table 6.7.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n25A-n77A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.7.3 REFSENS requirements

#### 6.7.3.1 Power class 2 case a

Power class 3 MSD for UL CA\_n25A-n77A:

Table 6.7.3.1-1 Power class 3 MSD for 2 bands UL CA\_n25A-n77A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n25-n41-n77 | n25 | 1870 | 5 | 25 | 1950 | N/A | FDD | N/A |
|  | n41 | 2640 | 5 | 25 | 2640 | 5.3 | TDD | IMD5ZZ |
|  | n77 | 4125 | 10 | 50 | 4125 | N/A | TDD | N/A |
| NOTE 5: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped. | | | | | | | | |

MSD for PC2 UL CA is calculated from MSD for PC2 as follows:

If the input signal increases by 3 dB, the IMD5 increases by 3\*5=15 dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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The proposed value for PC2 UL CA MSD can be found in Table 6.7.3.1-2.

Table 6.7.3.1-2 Proposed power class 2 MSD for 2 bands UL CA\_n25A-n77A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n25-n41-n77 | n25 | 1870 | 5 | 25 | 1950 | N/A | FDD | N/A |
|  | n41 | 2640 | 5 | 25 | 2640 | 18.8 | TDD | IMD55 |
|  | n77 | 4125 | 10 | 50 | 4125 | N/A | TDD | N/A |
| NOTE 5: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped. | | | | | | | | |

#### 6.7.3.2 Power class 2 case c

The same MSD for case a applies to case b.

### 6.7.4 ∆TIB and ∆RIB values

Void

## 6.8 DL CA\_n25-n41-n77, UL CA\_n41A-n77A

### 6.8.1 Configurations

Table 6.8.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n25A-n41A-n77A | CA\_n25A-n41A  CA\_n25A-n77A  **CA\_n41A-n77A7** | n25 | n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n41 | n41 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
|  | CA\_n25A-n41A  CA\_n25A-n77A  **CA\_n41A-n77A7** | n25 | CA\_n25(2A)\_BCS 4 and 5 | 4 and 5 |
| CA\_n25(2A)-n41A-n77A |  | n41 | n41 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.8.2 Maximum output power

Table 6.8.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n41A-n77A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| Case c | 26dBm | 26dBm | 23dBm |
| Case d | 26dBm | 26dBm | 26dBm |

### 6.8.3 REFSENS requirements

#### 6.8.3.1 Power class 2 case a, case b, case c, case c

The MSD is the same for case a, case b, case c and case d.

Power class 3 MSD for UL CA\_n41A-n77A:

Table 6.8.3.1-1 Power class 3 MSD for 2 bands UL CA\_n41A-n77A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n25-n41-n77 | n25 | 1870 | 5 | 25 | 1950 | 17.6 | FDD | IMD3ZZ |
|  | n41 | 2675 | 5 | 25 | 2675 | N/A | TDD | N/A |
|  | n77 | 3400 | 10 | 50 | 3400 | N/A | TDD | N/A |
|  | n25 | 1870 | 5 | 25 | 1950 | 8.6 | FDD | IMD4 |
|  | n41 | 2550 | 5 | 25 | 2685 | N/A | TDD | N/A |
|  | n77 | 3525 | 10 | 50 | 3525 | N/A | TDD | N/A |
| NOTE 5: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped. | | | | | | | | |

MSD for PC2 UL CA is calculated from MSD for PC2 as follows:

If the input signal increases by 3 dB, the IMD3 increases by 3\*3=9 dB.

If the input signal increases by 3 dB, the IMD4 increases by 3\*4=12 dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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The proposed value for PC2 UL CA MSD can be found in Table 6.8.3.1-2.

Table 6.8.3.1-1 Proposed power class 2 MSD for 2 bands UL CA\_n41A-n77A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n25-n41-n77 | n25 | 1870 | 5 | 25 | 1950 | 26.5 | FDD | IMD35 |
|  | n41 | 2675 | 5 | 25 | 2675 | N/A | TDD | N/A |
|  | n77 | 3400 | 10 | 50 | 3400 | N/A | TDD | N/A |
|  | n25 | 1870 | 5 | 25 | 1950 | 20.0 | FDD | IMD4 |
|  | n41 | 2550 | 5 | 25 | 2685 | N/A | TDD | N/A |
|  | n77 | 3525 | 10 | 50 | 3525 | N/A | TDD | N/A |
| NOTE 5: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped. | | | | | | | | |

### 6.8.4 ∆TIB and ∆RIB values

Void

## 6.9 DL CA\_n25-n66-n77, UL CA\_n25A-n77A

### 6.9.1 Configurations

Table 6.9.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n25A-n66A-n77A | CA\_n25A-n66A  **CA\_n25A-n77A7**  CA\_n66A-n77A | n25 | n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n66 | n66 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n25A-n66A-n77(2A) | CA\_n25A-n66A  **CA\_n25A-n77A7**  CA\_n66A-n77A | n25 | n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n66 | n66 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n77 | CA\_n77(2A)\_BCS 4 and 5 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.9.2 Maximum output power

Table 6.9.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n25A-n77A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.9.3 REFSENS requirements

#### 6.9.3.1 Power class 2 case a

Power class 3 MSD for UL CA\_n25A-n77A:

Table 6.9.3.1-1 Power class 3 MSD for 2 bands UL CA\_n25A-n77A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n25-n66-n77 | n25 | 1855 | 5 | 25 | 1935 | N/A | FDD | N/A |
|  | n66 | 1715 | 5 | 25 | 2115 | 29.2 | FDD | IMD2 |
|  | n77 | 3970 | 10 | 50 | 3970 | N/A | TDD | N/A |
|  | n25 | 1900 | 5 | 25 | 1980 | N/A | FDD | N/A |
|  | n66 | 1760 | 5 | 25 | 2160 | 10.4 | FDD | IMD4 |
|  | n77 | 3540 | 10 | 50 | 3540 | 10 | TDD | N/A |
|  | n25 | 1900 | 5 | 25 | 1980 | N/A | FDD | N/A |
|  | n66 | 1760 | 5 | 25 | 2160 | 4.0 | FDD | IMD5 |
|  | n77 | 3930 | 10 | 50 | 3930 | N/A | TDD | N/A |

MSD for PC2 UL CA is calculated from MSD for PC2 as follows:

If the input signal increases by 3 dB, the IMD2 increases by 3\*2=6 dB.

If the input signal increases by 3 dB, the IMD5 increases by 3\*4=12 dB.

If the input signal increases by 3 dB, the IMD5 increases by 3\*5=15 dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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The proposed value for PC2 UL CA MSD can be found in Table 6.9.3.1-2.

Table 6.9.3.1-2 Power class 3 MSD for 2 bands UL CA\_n25A-n77A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n25-n66-n77 | n25 | 1855 | 5 | 25 | 1935 | N/A | FDD | N/A |
|  | n66 | 1715 | 5 | 25 | 2115 | 35.2 | FDD | IMD2 |
|  | n77 | 3970 | 10 | 50 | 3970 | N/A | TDD | N/A |
|  | n25 | 1900 | 5 | 25 | 1980 | N/A | FDD | N/A |
|  | n66 | 1760 | 5 | 25 | 2160 | 22.0 | FDD | IMD4 |
|  | n77 | 3540 | 10 | 50 | 3540 | N/A | TDD | N/A |
|  | n25 | 1900 | 5 | 25 | 1980 | N/A | FDD | N/A |
|  | n66 | 1760 | 5 | 25 | 2160 | 16.9 | FDD | IMD5 |
|  | n77 | 3930 | 10 | 50 | 3930 | N/A | TDD | N/A |

#### 6.9.3.2 Power class 2 case b

The same MSD for case a applies to case b.

### 6.9.4 ∆TIB and ∆RIB values

Void.

## 6.10 DL CA\_n25-n66-n77, UL CA\_n66A-n77A

### 6.10.1 Configurations

Table 6.10.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n25A-n66A-n77A | CA\_n25A-n66A  CA\_n25A-n77A  **CA\_n66A-n77A**7 | n25 | n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n66 | n66 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n25A-n66A-n77(2A) | CA\_n25A-n66A  CA\_n25A-n77A  **CA\_n66A-n77A**7 | n25 | n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n66 | n66 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n77 | CA\_n77(2A)\_BCS 4 and 5 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.10.2 Maximum output power

Table 6.10.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n66A-n77A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.10.3 REFSENS requirements

#### 6.10.3.1 Power class 2 case a

Power class 3 MSD for UL CA\_n66A-n77A:

Table 6.10.3.1-1 Power class 3 MSD for 2 bands UL CA\_n25A-n77A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n25-n66-n77 | n25 | 1880 | 5 | 25 | 1960 | 32.1 | FDD | IMD2 |
|  | n66 | 1760 | 5 | 25 | 2160 | N/A | FDD | N/A |
|  | n77 | 3720 | 10 | 50 | 3720 | N/A | TDD | N/A |
|  | n25 | 1880 | 5 | 25 | 1960 | 9.1 | FDD | IMD4ZZ |
|  | n66 | 1770 | 5 | 25 | 2170 | N/A | FDD | N/A |
|  | n77 | 3350 | 10 | 50 | 3350 | N/A | TDD | N/A |
|  | n25 | 1880 | 5 | 25 | 1960 | 2.1 | FDD | IMD5ZZ |
|  | n66 | 1760 | 5 | 25 | 2160 | N/A | FDD | N/A |
|  | n77 | 3620 | 10 | 50 | 3620 | N/A | TDD | N/A |
| NOTE 5: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped. | | | | | | | | |

MSD for PC2 UL CA is calculated from MSD for PC2 as follows:

If the input signal increases by 3 dB, the IMD2 increases by 3\*2=6 dB.

If the input signal increases by 3 dB, the IMD5 increases by 3\*4=12 dB.

If the input signal increases by 3 dB, the IMD5 increases by 3\*5=15 dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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The proposed value for PC2 UL CA MSD can be found in Table 6.10.3.1-2.

Table 6.10.3.1-2 Proposed power class 2 MSD for 2 bands UL CA\_n66A-n77A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n25-n66-n77 | n25 | 1880 | 5 | 25 | 1960 | 38.1 | FDD | IMD2 |
|  | n66 | 1760 | 5 | 25 | 2160 | N/A | FDD | N/A |
|  | n77 | 3720 | 10 | 50 | 3720 | N/A | TDD | N/A |
|  | n25 | 1880 | 5 | 25 | 1960 | 20.6 | FDD | IMD45 |
|  | n66 | 1770 | 5 | 25 | 2170 | N/A | FDD | N/A |
|  | n77 | 3350 | 10 | 50 | 3350 | N/A | TDD | N/A |
|  | n25 | 1880 | 5 | 25 | 1960 | 13.2 | FDD | IMD55 |
|  | n66 | 1760 | 5 | 25 | 2160 | N/A | FDD | N/A |
|  | n77 | 3620 | 10 | 50 | 3620 | N/A | TDD | N/A |
| NOTE 5: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped. | | | | | | | | |

#### 6.10.3.2 Power class 2 case c

The same MSD for case a applies to case b.

### 6.10.4 ∆TIB and ∆RIB values

Void

## 6.11 DL CA\_n25-n71-n77, UL CA\_n25A-n77A

### 6.11.1 Configurations

Table 6.11.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n25A-n71A-n77A | CA\_n25A-n71A  **CA\_n25A-n77A7**  CA\_n71A-n77A | n25 | n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n71 | n71 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.11.2 Maximum output power

Table 6.11.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n25A-n77A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.11.3 REFSENS requirements

#### 6.11.3.1 Power class 2 case a

There is no MSD for PC3 UL CA\_n25A-n77A, so there should be none for PC2.

#### 6.11.3.2 Power class 2 case b

The same MSD for case a applies to case b.

### 6.11.4 ∆TIB and ∆RIB values

Void.

## 6.12 DL CA\_n25-n71-n77, UL CA\_n71A-n77A

### 6.12.1 Configurations

Table 6.12.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n25A-n71A-n77A | CA\_n25A-n71A  CA\_n25A-n77A  **CA\_n71A-n77A7** | n25 | n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n71 | n71 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.12.2 Maximum output power

Table 6.12.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n71A-n77A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.12.3 REFSENS requirements

#### 6.12.3.1 Power class 2 case a

Power class 3 MSD for UL CA\_n71A-n77A:

Table 6.12.3.1-1 Power class 3 MSD for 2 bands UL CA\_n71A-n77A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n25-n71-n77 | n25 | 1874 | 5 | 25 | 1954 | 16.5 | FDD | IMD32,5 |
|  | n71 | 693 | 5 | 25 | 647 | N/A | FDD | N/A |
|  | n77 | 3340 | 10 | 50 | 3340 | N/A | TDD | N/A |
| NOTE 2: This band is subject to IMD4 also which MSD is not specified.  NOTE 5: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped. | | | | | | | | |

MSD for PC2 UL CA is calculated from MSD for PC2 as follows:

If the input signal increases by 3 dB, the IMD3 increases by 3\*3=9 dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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The proposed value for PC2 UL CA MSD can be found in Table 6.12.3.1-2.

Table 6.12.3.1-2 Proposed power class 2 MSD for 2 bands UL CA\_n71A-n77A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n25-n71-n77 | n25 | 1874 | 5 | 25 | 1954 | 25.4 | FDD | IMD32,5 |
|  | n71 | 693 | 5 | 25 | 647 | N/A | FDD | N/A |
|  | n77 | 3340 | 10 | 50 | 3340 | N/A | TDD | N/A |
| NOTE 2: This band is subject to IMD4 also which MSD is not specified.  NOTE 5: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped. | | | | | | | | |

#### 6.12.3.2 Power class 2 case c

The same MSD for case a applies to case b.

### 6.12.4 ∆TIB and ∆RIB values

Void

## 6.13 DL CA\_n41-n66-n77, UL CA\_n41A-n66A

### 6.13.1 Configurations

Table 6.13.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n41A-n66A-n77A | **CA\_n41A-n66A7**  CA\_n41A-n77A  CA\_n66A-n77A | n41 | n41 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n66 | n66 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n41A-n66(2A)-n77A | **CA\_n41A-n66A**7  CA\_n41A-n77A  CA\_n66A-n77A | n41 | n41 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n66 | CA\_n66(2A)\_BCS 4 and 5 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.13.2 Maximum output power

Table 6.13.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n41A-n66A | Case a | 26dBm | 23dBm | 23dBm |
| Case c | 26dBm | 26dBm | 23dBm |

### 6.13.3 REFSENS requirements

#### 6.13.3.1 Power class 2 case a

Power class 3 CA for UL CA\_n25A-n41A:

Table 6.13.3.1-1 Power class 3 MSD for 2 bands UL CA\_n41A-n66A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n41-n66-n77 | n41 | 2600 | 5 | 25 | 2600 | N/A | TDD | N/A |
|  | n66 | 1730 | 5 | 25 | 2130 | N/A | FDD | N/A |
|  | n77 | 3470 | 10 | 50 | 3470 | 16.1 | 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. | | | | | | | | |

MSD for PC2 UL CA is calculated from MSD for PC2 as follows:

If the input signal increases by 3 dB, the IMD3 increases by 3\*3=9 dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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The proposed value for PC2 UL CA MSD can be found in Table 6.13.3.1-1.

Table 6.13.3.1-2 Proposed Power class 2 MSD for UL CA\_n41-n66

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n41-n66-n77 | n41 | 2600 | 5 | 25 | 2600 | N/A | TDD | N/A |
|  | n66 | 1730 | 5 | 25 | 2130 | N/A | FDD | N/A |
|  | n77 | 3470 | 10 | 50 | 3470 | 25.0 | 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. | | | | | | | | |

#### 6.13.3.2 Power class 2 case b

The same MSD for case a applies to casec.

### 6.13.4 ∆TIB and ∆RIB values

Void.

## 6.14 DL CA\_n41-n66-n77, UL CA\_n41A-n77A

### 6.14.1 Configurations

Table 6.14.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n41A-n66A-n77A | CA\_n41A-n66A  **CA\_n41A-n77A7**  CA\_n66A-n77A | n41 | n41 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n66 | n66 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n41A-n66(2A)-n77A | CA\_n41A-n66A  **CA\_n41A-n77A7**  CA\_n66A-n77A | n41 | n41 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n66 | CA\_n66(2A)\_BCS 4 and 5 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.14.2 Maximum output power

Table 6.14.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n41A-n77A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| Case c | 26dBm | 26dBm | 23dBm |
| Case d | 26dBm | 26dBm | 26dBm |

### 6.14.3 REFSENS requirements

#### 6.14.3.1 Power class 2 case a, case b, case c, case d

Power class 3 MSD for UL CA\_n41A-n77A:

Table 6.14.3.1-1 Power class 3 MSD for 2 bands UL CA\_n41A-n77A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n41-n66-n77 | n41 | 2640 | 5 | 25 | 2640 | N/A | TDD | N/A |
|  | n66 | 1760 | 5 | 25 | 2160 | 9.0 | FDD | IMD4 |
|  | n77 | 3720 | 10 | 50 | 3720 | N/A | TDD | N/A |

MSD for PC2 UL CA is calculated from MSD for PC2 as follows:

If the input signal increases by 3 dB, the IMD4 increases by 3\*4=12 dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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The proposed value for PC2 UL CA MSD can be found in Table 6.14.3.1-2.

Table 6.14.3.1-2 Proposed power class 2 MSD for 2 bands UL CA\_41A-n77A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n41-n66-n77 | n41 | 2640 | 5 | 25 | 2640 | N/A | TDD | N/A |
|  | n66 | 1760 | 5 | 25 | 2160 | 20.5 | FDD | IMD4 |
|  | n77 | 3720 | 10 | 50 | 3720 | N/A | TDD | N/A |

### 6.14.4 ∆TIB and ∆RIB values

Void

## 6.15 DL CA\_n41-n66-n77, UL CA\_n66A-n77A

### 6.15.1 Configurations

Table 6.15.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n41A-n66A-n77A | CA\_n41A-n66A  CA\_n41A-n77A  **CA\_n66A-n77A**7 | n41 | n41 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n66 | n66 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n41A-n66(2A)-n77A | CA\_n41A-n66A  CA\_n41A-n77A  **CA\_n66A-n77A**7 | n41 | n41 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n66 | CA\_n66(2A)\_BCS 4 and 5 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.15.2 Maximum output power

Table 6.15.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n41A-n77A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.15.3 REFSENS requirements

#### 6.15.3.1 Power class 2 case a, case b, case c, case c

The MSD is the same for case a, case b, case c and case d.

Power class 3 MSD for UL CA\_n66A-n77A:

Table 6.15.3.1-1 Power class 3 MSD for 2 bands UL CA\_n66A-n77A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n41-n66-n77 | n41 | 2670 | 5 | 25 | 2670 | 5.2 | TDD | IMD55 |
|  | n66 | 1715 | 5 | 25 | 2115 | N/A | FDD | N/A |
|  | n77 | 4190 | 10 | 50 | 4190 | N/A | TDD | N/A |
| NOTE 5: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped. | | | | | | | | |

MSD for PC2 UL CA is calculated from MSD for PC2 as follows:

If the input signal increases by 3 dB, the IMD3 increases by 3\*5=15 dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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The proposed value for PC2 UL CA MSD can be found in Table 6.15.3.1-2.

Table 6.15.3.1-1 Proposed power class 2 MSD for 2 bands UL CA\_n66A-n77A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n41-n66-n77 | n41 | 2670 | 5 | 25 | 2670 | 18.7 | TDD | IMD55 |
|  | n66 | 1715 | 5 | 25 | 2115 | N/A | FDD | N/A |
|  | n77 | 4190 | 10 | 50 | 4190 | N/A | TDD | N/A |
| NOTE 5: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped. | | | | | | | | |

### 6.15.4 ∆TIB and ∆RIB values

Void

## 6.16 DL CA\_n41-n71-n77, UL CA\_n41A-n71A

### 6.16.1 Configurations

Table 6.16.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n41A-n71A-n77A | **CA\_n41A-n71A7**  CA\_n41A-n77A  CA\_n71A-n77A | n41 | n41 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n71 | n71 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n41A-n71B-n77A | **CA\_n41A-n71A7**  CA\_n41A-n77A  CA\_n71A-n77A | n41 | n41 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n71 | CA\_n71B\_BCS 4 and 5 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n41A-n71(2A)-n77A | **CA\_n41A-n71A7**  CA\_n41A-n77A  CA\_n71A-n77A | n41 | n41 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n71 | CA\_n71(2A)\_BCS 4 and 5 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.16.2 Maximum output power

Table 6.16.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n41A-n71A | Case a | 26dBm | 23dBm | 23dBm |
| Case c | 26dBm | 26dBm | 23dBm |

### 6.16.3 REFSENS requirements

#### 6.16.3.1 Power class 2 case a

Power class 3 CA for UL CA\_n41A-n71A:

Table 6.16.3.1-1 Power class 3 MSD for 2 bands UL CA\_n41A-n71A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n41-n71-n77 | n41 | 2615 | 5 | 25 | 2615 | N/A | TDD | N/A |
|  | n71 | 693 | 5 | 25 | 647 | N/A | FDD | N/A |
|  | n77 | 3308 | 10 | 50 | 3308 | 29.1 | TDD | IMD21,5 |
|  | n41 | 2564 | 5 | 25 | 2564 | N/A | TDD | N/A |
|  | n71 | 693 | 5 | 25 | 647 | N/A | FDD | N/A |
|  | n77 | 3950 | 10 | 50 | 3950 | 16.3 | TDD | IMD31 |
|  | n41 | 2580 | 5 | 25 | 2580 | N/A | TDD | N/A |
|  | n71 | 693 | 5 | 25 | 647 | N/A | FDD | N/A |
|  | n77 | 3774 | 10 | 50 | 3774 | 10.3 | TDD | IMD41 |
| NOTE 1: This band is subject to IMD5 also which MSD is not specified.  NOTE 5: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped. | | | | | | | | |

MSD for PC2 UL CA is calculated from MSD for PC2 as follows:

If the input signal increases by 3 dB, the IMD2 increases by 3\*2=6 dB.

If the input signal increases by 3 dB, the IMD3 increases by 3\*3=9 dB.

If the input signal increases by 3 dB, the IMD4 increases by 3\*4=12 dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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The proposed value for PC2 UL CA MSD can be found in Table 6.16.3.1-1.

Table 6.16.3.1-2 Proposed Power class 2 MSD for UL CA\_n41-n71

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n41-n71-n77 | n41 | 2615 | 5 | 25 | 2615 | N/A | TDD | N/A |
|  | n71 | 693 | 5 | 25 | 647 | N/A | FDD | N/A |
|  | n77 | 3308 | 10 | 50 | 3308 | 35.1 | TDD | IMD21,5 |
|  | n41 | 2564 | 5 | 25 | 2564 | N/A | TDD | N/A |
|  | n71 | 693 | 5 | 25 | 647 | N/A | FDD | N/A |
|  | n77 | 3950 | 10 | 50 | 3950 | 25.2 | TDD | IMD31 |
|  | n41 | 2580 | 5 | 25 | 2580 | N/A | TDD | N/A |
|  | n71 | 693 | 5 | 25 | 647 | N/A | FDD | N/A |
|  | n77 | 3774 | 10 | 50 | 3774 | 21.9 | TDD | IMD41 |
| NOTE 1: This band is subject to IMD5 also which MSD is not specified.  NOTE 5: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped. | | | | | | | | |

#### 6.16.3.2 Power class 2 case c

The same MSD for case a applies to case c.

### 6.16.4 ∆TIB and ∆RIB values

Void.

## 6.17 DL CA\_n41-n71-n77, UL CA\_n41A-n77A

### 6.17.1 Configurations

Table 6.17.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n41A-n71A-n77A | CA\_n41A-n71A  **CA\_n41A-n77A7**  CA\_n71A-n77A | n41 | n41 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n71 | n71 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n41A-n71B-n77A | CA\_n41A-n71A  **CA\_n41A-n77A7**  CA\_n71A-n77A | n41 | n41 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n71 | CA\_n71B\_BCS 4 and 5 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n41A-n71(2A)-n77A | CA\_n41A-n71A  **CA\_n41A-n77A7**  CA\_n71A-n77A | n41 | n41 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n71 | CA\_n71(2A)\_BCS 4 and 5 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.17.2 Maximum output power

Table 6.17.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n41A-n77A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| Case c | 26dBm | 26dBm | 23dBm |
| Case d | 26dBm | 26dBm | 26dBm |

### 6.17.3 REFSENS requirements

#### 6.17.3.1 Power class 2 case a, case b, case c, case d

Power class 3 MSD for UL CA\_n41A-n77A:

Table 6.17.3.1-1 Power class 3 MSD for 2 bands UL CA\_n41A-n77A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n41-n71-n77 | 41 | 2680 | 5 | 25 | 2680 | N/A | TDD | N/A |
|  | n71 | 686 | 5 | 25 | 640 | 30.8 | FDD | IMD25 |
|  | n77 | 3320 | 10 | 50 | 3320 | N/A | TDD | N/A |
| NOTE 5: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped. | | | | | | | | |

MSD for PC2 UL CA is calculated from MSD for PC2 as follows:

If the input signal increases by 3 dB, the IMD2 increases by 3\*2=6 dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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The proposed value for PC2 UL CA MSD can be found in Table 6.17.3.1-2.

Table 6.17.3.1-2 Proposed power class 2 MSD for 2 bands UL CA\_41A-n77A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n41-n71-n77 | 41 | 2680 | 5 | 25 | 2680 | N/A | TDD | N/A |
|  | n71 | 686 | 5 | 25 | 640 | 36.8 | FDD | IMD25 |
|  | n77 | 3320 | 10 | 50 | 3320 | N/A | TDD | N/A |
| NOTE 5: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped. | | | | | | | | |

### 6.17.4 ∆TIB and ∆RIB values

Void

## 6.18 DL CA\_n41-n71-n77, UL CA\_n71A-n77A

### 6.18.1 Configurations

Table 6.18.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n41A-n71A-n77A | CA\_n41A-n71A  CA\_n41A-n77A  **CA\_n71A-n77A7** | n41 | n41 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n71 | n71 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n41A-n71B-n77A | CA\_n41A-n71A  CA\_n41A-n77A  **CA\_n71A-n77A7** | n41 | n41 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n71 | CA\_n71B\_BCS 4 and 5 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n41A-n71(2A)-n77A | CA\_n41A-n71A  CA\_n41A-n77A  **CA\_n71A-n77A7** | n41 | n41 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n71 | CA\_n71(2A)\_BCS 4 and 5 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.18.2 Maximum output power

Table 6.18.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n71A-n77A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.18.3 REFSENS requirements

#### 6.18.3.1 Power class 2 case a, case b, case c, case c

The MSD is the same for case a, case b, case c and case d.

Power class 3 MSD for UL CA\_n71A-n77A:

Table 6.18.3.1-1 Power class 3 MSD for 2 bands UL CA\_n71A-n77A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n41-n71-n77 | n41 | 2615 | 5 | 25 | 2615 | 28.7 | TDD | IMD25 |
|  | n71 | 693 | 5 | 25 | 647 | N/A | FDD | N/A |
|  | n77 | 3308 | 10 | 50 | 3308 | N/A | TDD | N/A |
|  | n41 | 2564 | 5 | 25 | 2564 | 15.5 | TDD | IMD3 |
|  | n71 | 693 | 5 | 25 | 647 | N/A | FDD | N/A |
|  | n77 | 3950 | 10 | 50 | 3950 | N/A | TDD | N/A |
| NOTE 5: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped. | | | | | | | | |

MSD for PC2 UL CA is calculated from MSD for PC2 as follows:

If the input signal increases by 3 dB, the IMD2 increases by 3\*2=6 dB.

If the input signal increases by 3 dB, the IMD3 increases by 3\*3=9 dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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The proposed value for PC2 UL CA MSD can be found in Table 6.18.3.1-2.

Table 6.18.3.1-1 Proposed power class 2 MSD for 2 bands UL CA\_n71A-n77A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n41-n71-n77 | n41 | 2615 | 5 | 25 | 2615 | 34.7 | TDD | IMD25 |
|  | n71 | 693 | 5 | 25 | 647 | N/A | FDD | N/A |
|  | n77 | 3308 | 10 | 50 | 3308 | N/A | TDD | N/A |
|  | n41 | 2564 | 5 | 25 | 2564 | 24.4 | TDD | IMD3 |
|  | n71 | 693 | 5 | 25 | 647 | N/A | FDD | N/A |
|  | n77 | 3950 | 10 | 50 | 3950 | N/A | TDD | N/A |
| NOTE 5: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped. | | | | | | | | |

### 6.18.4 ∆TIB and ∆RIB values

Void

## 6.19 DL CA\_n66-n71-n77, UL CA\_n66A-n77A

### 6.19.1 Configurations

Table 6.19.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n66A-n71A-n77A | CA\_n66A-n71A  **CA\_n66A-n77A7**  CA\_n71A-n77A | n66 | n66 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n71 | n71 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n66A-n71A-n77(2A) | CA\_n66A-n71A  **CA\_n66A-n77A7**  CA\_n71A-n77A | n66 | n66 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n71 | n71 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n77 | CA\_n77(2A)\_BCS 4 and 5 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.19.2 Maximum output power

Table 6.19.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n66A-n77A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.19.3 REFSENS requirements

#### 6.19.3.1 Power class 2 case a

Power class 3 MSD for UL CA\_n66A-n77A:

Table 6.19.3.1-1 Power class 3 MSD for 2 bands UL CA\_n66A-n77A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n66-n71-n77 | n66 | 1720 | 5 | 25 | 2120 | N/A | FDD | N/A |
|  | n71 | 686 | 5 | 25 | 640 | 15.3 | FDD | IMD35 |
|  | n77 | 4080 | 10 | 50 | 4080 | N/A | TDD | N/A |
| NOTE 5: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped. | | | | | | | | |

MSD for PC2 UL CA is calculated from MSD for PC2 as follows:

If the input signal increases by 3 dB, the IMD3 increases by 3\*3=9 dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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If is increased by dB, then is given by

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The proposed value for PC2 UL CA MSD can be found in Table 6.19.3.1-2.

Table 6.19.3.1-2 Proposed power class 2 MSD for 2 bands UL CA\_n66A-n77A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n66-n71-n77 | n66 | 1720 | 5 | 25 | 2120 | N/A | FDD | N/A |
|  | n71 | 686 | 5 | 25 | 640 | 24.2 | FDD | IMD35 |
|  | n77 | 4080 | 10 | 50 | 4080 | N/A | TDD | N/A |
| NOTE 5: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped. | | | | | | | | |

#### 6.19.3.2 Power class 2 case b

The same MSD for case a applies to case b.

### 6.19.4 ∆TIB and ∆RIB values

Void.

## 6.20 DL CA\_n66-n71-n77, UL CA\_n71A-n77A

### 6.20.1 Configurations

Table 6.20.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n66A-n71A-n77A | CA\_n66A-n71A  CA\_n66A-n77A  **CA\_n71A-n77A7** | n66 | n66 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n71 | n71 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n77 | n77 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n66A-n71A-n77(2A) | CA\_n66A-n71A  CA\_n66A-n77A  **CA\_n71A-n77A**7 | n66 | n66 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n71 | n71 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n77 | CA\_n77(2A)\_BCS 4 and 5 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.20.2 Maximum output power

Table 6.20.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n71A-n77A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.20.3 REFSENS requirements

#### 6.20.3.1 Power class 2 case a

Power class 3 MSD for UL CA\_n71A-n77A:

Table 6.20.3.1-1 Power class 3 MSD for 2 bands UL CA\_n71A-n77A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n66-n71-n77 | n66 | 1750 | 5 | 25 | 2150 | 15.5 | FDD | IMD32 |
|  | n71 | 690 | 5 | 25 | 644 | N/A | FDD | N/A |
|  | n77 | 3530 | 10 | 50 | 3530 | N/A | TDD | N/A |
| NOTE 2: This band is subject to IMD4 also which MSD is not specified. | | | | | | | | |

MSD for PC2 UL CA is calculated from MSD for PC2 as follows:

If the input signal increases by 3 dB, the IMD3 increases by 3\*3=9 dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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If is increased by dB, then is given by

A picture containing logo

Description automatically generated





The proposed value for PC2 UL CA MSD can be found in Table 6.20.3.1-2.

Table 6.20.3.1-2 Proposed power class 2 MSD for 2 bands UL CA\_n71A-n77A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CA\_n66-n71-n77 | n66 | 1750 | 5 | 25 | 2150 | 24.4 | FDD | IMD32 |
|  | n71 | 690 | 5 | 25 | 644 | N/A | FDD | N/A |
|  | n77 | 3530 | 10 | 50 | 3530 | N/A | TDD | N/A |
| NOTE 2: This band is subject to IMD4 also which MSD is not specified. | | | | | | | | |

#### 6.20.3.2 Power class 2 case c

The same MSD for case a applies to case b.

### 6.20.4 ∆TIB and ∆RIB values

Void

## 6.21 DL CA\_n41-n66-n71, UL CA\_n41A-n71A

### 6.21.1 Configurations

Table 6.21.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n41A-n66A-n71A | CA\_n41A-n71A7  CA\_n66A-n71A  CA\_n41A-n66A | n41 | n41 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n66 | n66 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n71 | n77 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n41C-n66A-n71A | CA\_n41A-n71A7  CA\_n66A-n71A  CA\_n41A-n66A | n41 | CA\_n41C\_BCS 4 and 5 | 4 and 5 |
|  |  | n66 | n66 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n71 | n71 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n41(2A)-n66A-n71A | CA\_n41A-n71A7  CA\_n66A-n71A  CA\_n41A-n66A | n41 | CA\_n41(2A)\_BCS 4 and 5 | 4 and 5 |
|  |  | n66 | n66 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n71 | n71 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.21.2 Maximum output power

Table 6.21.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n41A-n71A | Case a | 26dBm | 23dBm | 23dBm |
| Case c | 26dBm | 26dBm | 23dBm |

### 6.21.3 REFSENS requirements

#### 6.21.3.1 Power class 2 case a

Since there is no MSD for PC3 UL CA\_n41A-n71A into CA\_n41-n66-n71, none is proposed for PC2.

#### 6.21.3.2 Power class 2 case c

Since there is no MSD for PC3 UL CA\_n41A-n71A into CA\_n41-n66-n71, none is proposed for PC2.

### 6.21.4 Void

## 6.22 DL CA\_n41-n66-n71, UL CA\_n41A-n71A

### 6.22.1 Configurations

Table 6.22.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n41A-n66A-n71A | CA\_n41A-n71A  CA\_n66A-n71A  CA\_n41A-n66A7 | n41 | n41 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n66 | n66 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n71 | n77 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n41C-n66A-n71A | CA\_n41A-n71A  CA\_n66A-n71A  CA\_n41A-n66A7 | n41 | CA\_n41C\_BCS 4 and 5 | 4 and 5 |
|  |  | n66 | n66 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n71 | n71 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n41(2A)-n66A-n71A | CA\_n41A-n71A  CA\_n66A-n71A  CA\_n41A-n66A7 | n41 | CA\_n41(2A)\_BCS 4 and 5 | 4 and 5 |
|  |  | n66 | n66 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n71 | n71 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.22.2 Maximum output power

Table 6.22.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n41A-n66A | Case a | 26dBm | 23dBm | 23dBm |
| Case c | 26dBm | 26dBm | 23dBm |

### 6.22.3 REFSENS requirements

#### 6.22.3.1 Power class 2 case a

Since there is no MSD for PC3 UL CA\_n41A-n66A into CA\_n41-n66-n71, none is proposed for PC2.

#### 6.22.3.2 Power class 2 case c

Since there is no MSD for PC3 UL CA\_n41A-n66A into CA\_n41-n66-n71, none is proposed for PC2.

### 6.22.4 Void

## 6.23 CA\_n3-n28-n41

### 6.23.1 Configurations

**Table 6.23.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n3A-n28A-n41A | CA\_n3A-n28A  CA\_n3A-n41A7  CA\_n28A-n41A7 | n3 | 5, 10, 15, 20, 25, 30, 40 | 0 |
| n28 | 5, 10, 15, 20, 30 |
| n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination | | | | |

### 6.23.2 Maximum output power

**Table 6.23.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n3-n41 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n28-n41 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.23.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

6.23.3.1 Power class 2 case a, b

Based on calculation, IMD2 and IMD3 of dual UL CA\_n3-n41 fall into n28 DL, IMD2 of dual UL CA\_n28-n41 falls into n3 DL.

Table 6.23.3-13 DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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-n28-n41 | n3 | 1720 | 5 | 25 | 1815 | N/A | FDD | N/A |
|  | n28 | 735 | 5 | 25 | 790 | 32 | FDD | IMD24 |
|  | n41 | 2510 | 5 | 25 | 2510 | N/A | TDD | N/A |
|  | n3 | 1737.5 | 5 | 25 | 1832.5 | 32 | FDD | IMD2 |
|  | n28 | 710.5 | 5 | 25 | 765.5 | N/A | FDD | N/A |
|  | n41 | 2543 | 10 | 50 | 2543 | N/A | TDD | N/A |
| NOTE 4: This band is subject to IMD3 also which MSD is not specified. | | | | | | | | |

6.23.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

## 6.24 CA\_n3-n41-n77

### 6.24.1 Configurations

**Table 6.24.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n3A-n41A-n77A | n417  n777  CA\_n3A-n41A7  CA\_n3A-n77A7  CA\_n41A-n77A7 | n3 | 5, 10, 15, 20, 25, 30, 40 | 0 |
| n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 |
| n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |
| CA\_n3A-n41A-n77(2A) | n417  n777  CA\_n3A-n41A7  CA\_n3A-n77A7  CA\_n41A-n77A7  CA\_n77(2A) 7 | n3 | 5, 10, 15, 20, 25, 30, 40 | 0 |
| n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 |
| n77 | CA\_n77(2A)\_BCS0 |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination | | | | |

### 6.24.2 Maximum output power

**Table 6.24.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nC** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n3-n41 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n3-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n41-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| Case c | 26dBm | 26dBm | 23dBm |
| Case d | 26dBm | 26dBm | 26dBm |

### 6.24.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

6.24.3.1 Power class 2 case a, b, c, d

Based on calculation, IMD3/5 of dual UL CA\_n3-n41 fall into n77 DL; IMD3/4 of dual UL CA\_n41-n77 falls into n3 DL; IMD5 of dual UL CA\_n3-n77 falls into n41 DL.

Table 6.24.3-13 DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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-n41-n77 | n3 | 1720 | 5 | 25 | 1815 | N/A | FDD | N/A |
|  | n41 | 2580 | 5 | 25 | 2580 | N/A | TDD | N/A |
|  | n77 | 3440 | 10 | 50 | 3440 | 25.6 | TDD | IMD31 |
|  | n3 | 1745 | 5 | 25 | 1840 | 25.1 | FDD | IMD32 |
|  | n41 | 2620 | 5 | 25 | 2620 | N/A | TDD | N/A |
|  | n77 | 3400 | 10 | 50 | 3400 | N/A | TDD | N/A |
|  | n3 | 1720 | 5 | 25 | 1815 | N/A | FDD | N/A |
|  | n41 | 2640 | 5 | 25 | 2640 | 13 | TDD | IMD5 |
|  | n77 | 3900 | 10 | 50 | 3900 | N/A | TDD | N/A |
| 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. | | | | | | | | |

### 6.24.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

## 6.25 CA\_n3-n28-n77

### 6.25.1 Configurations

**Table 6.25.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n3A-n28A-n77A | n777  CA\_n3A-n28A  CA\_n3A-n77A7  CA\_n28A-n77A7 | n3 | 5, 10, 15, 20, 25, 30 | 0 |
| n28 | 5, 10, 15, 20 |
| n77 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |
| n3 | 5, 10, 15, 20, 25, 30, 40 | 1 |
| n28 | 5, 10, 15, 20, 30 |
| n77 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |
| CA\_n3A-n28A-n77(2A) | n777  CA\_n77(2A)7  CA\_n3A-n28A  CA\_n3A-n77A7  CA\_n28A-n77A7 | n3 | 5, 10, 15, 20, 25, 30 | 0 |
| n28 | 5, 10, 15, 20 |
| n77 | CA\_n77(2A)\_BCS0 |
| n3 | 5, 10, 15, 20, 25, 30, 40 | 1 |
| n28 | 5, 10, 15, 20, 30 |
| n77 | CA\_n77(2A)\_BCS0 |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination | | | | |

### 6.25.2 Maximum output power

**Table 6.25.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n3-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n28-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.25.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

6.25.3.1 Power class 2 case a, b

Based on calculation, IMD3 of dual UL CA\_n3-n77 fall into n28 DL, IMD3/4 of dual UL CA\_n28-n77 falls into n3 DL.

For UL CA\_n77(2A) with DL CA\_n3A-n77(2A), based on calculation, IMD 2, 4, 5 of dual UL falls into n3 DL, the MSD exception are also already defined in Table 7.3A.5-1a of the current TS 38.101-1 [2]. For UL CA\_n77(2A), with DL CA\_n28A-n77(2A), IMD 2, 4, 6, 7 and 8 of dual n77 UL falls into n28 DL. The MSD exception have also been defined in Table 7.3A.5-1a of the current TS 38.101-1 [2].

Table 6.25.3-1 3DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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-n28-n77 | n3 | 1712.5 | 5 | 25 | 1807.5 | N/A | FDD | N/A |
|  | n28 | 715 | 5 | 25 | 770 | 24.2 | FDD | IMD3 |
|  | n77 | 4195 | 10 | 50 | 4195 | N/A | TDD | N/A |
|  | n3 | 1755 | 5 | 25 | 1850 | 25.8 | FDD | IMD32 |
|  | n28 | 735 | 5 | 25 | 790 | N/A | FDD | N/A |
|  | n77 | 3320 | 10 | 50 | 3320 | N/A | TDD | N/A |
| NOTE 2: This band is subject to IMD4 also which MSD is not specified. | | | | | | | | |

### 6.25.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

## 6.26 CA\_n28-n41-n77

### 6.26.1 Configurations

**Table 6.26.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n28A-n41A-n77A | n417,9  n777,9  CA\_n28A-n41A7  CA\_n28A-n77A7  CA\_n41A-n77A7 | n28 | 5, 10, 15, 20, 30 | 0 |
| n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 |
| n77 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 |
| CA\_n28A-n41A-n77(2A) | n417,9  n777,9  CA\_n28A-n41A7  CA\_n28A-n77A7  CA\_n41A-n77A7  CA\_n77(2A) 7 | n28 | 5, 10, 15, 20, 30 | 0 |
| n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 |
| n77 | CA\_n77(2A)\_BCS0 |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination | | | | |

### 6.26.2 Maximum output power

**Table 6.26.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n28-n41 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n28-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n41-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| Case c | 26dBm | 26dBm | 23dBm |
| Case d | 26dBm | 26dBm | 26dBm |

### 6.26.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

6.26.3.1 Power class 2 case a, b, c, d

Based on calculation, IMD2/3/4 of dual UL CA\_n28-n41 fall into n77 DL; IMD2/3/5 of dual UL CA\_n41-n77 falls into n28 DL; IMD2/3 of dual UL CA\_n28-n77 falls into n41 DL.

**Table 6.26.3-****1 3DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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\_n28-n41-n77 | n28 | 743 | 5 | 25 | 798 | N/A | FDD | N/A |
|  | n41 | 2580 | 5 | 25 | 2580 | N/A | TDD | N/A |
|  | n77 | 3323 | 10 | 50 | 3323 | 34.2 | TDD | IMD22,4 |
|  | n28 | 743 | 5 | 25 | 798 | 36.8 | FDD | IMD21,4 |
|  | n41 | 2642 | 5 | 25 | 2642 | N/A | TDD | N/A |
|  | n77 | 3440 | 10 | 50 | 3440 | N/A | TDD | N/A |
|  | n28 | 738 | 5 | 25 | 793 | N/A | FDD | N/A |
|  | n41 | 2642 | 5 | 25 | 2642 | 35.5 | TDD | IMD24 |
|  | n77 | 3380 | 10 | 50 | 3380 | N/A | TDD | N/A |
| 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.  NOTE 4: This band is subject to IMD3 also which MSD is not specified. | | | | | | | | |

6.26.3.2 Power class 1.5 for single UL n41 and n77

The PC 1.5 on single band UL n41 only does not cause further IMD issues, and the harmonic/harmonic mixing issues have been covered by the two band cases, hence no additional MSD is needed.

### 6.26.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

## 6.27 CA\_n2-n48-n77

### 6.27.1 Configurations

**Table 6.27.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n2A-n48A-n77A | n777, 9  CA\_n2A-n48A  **CA\_n2A-n77A7** | n2 | 5, 10, 15, 20 | 0 |
| n48 | 5, 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 |
| n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.27.2 Maximum output power

Table 6.27.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| **CA\_n2A-n77A** | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.27.3 REFSENS requirements

Analysis performed for the PC3 CA\_n2A-n48A-n77A as captured in TR 38.717-03-02, the following co-existence issues due to dual uplink are addressed:

- Simultaneous Tx/Rx operation between NR n48 and n77 carriers are not supported hence, no MSD is needed for IMD4 and IMD5 products produced by Band n2 and n48 that might fall in Rx of band n77.and IMD4 and IMD5 products produced by Band n2 and n77 that might fall in Rx of band n48.

- CA\_n48-n77 is limited for downlink, hence no UL configuration exists.

#### 6.27.3.1 Power class 2 case a, b

No additional MSD is needed, since uplink configuration CA\_n2A-n77A PC2 will still not affect band n48, since n48 and n77 are not simultaneous RX/TX.

### 6.27.4 Void

## 6.28 CA\_n5-n48-n77

### 6.28.1 Configurations

**Table 6.28.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n5A-n48A-n77A | n777, 9  CA\_n5A-n48A  **CA\_n5A-n77A7** | n5 | 5, 10, 15, 20 | 0 |
| n48 | 5, 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 |
| n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.28.2 Maximum output power

Table 6.28.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| **CA\_n5A-n77A** | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.28.3 REFSENS requirements

Analysis performed for the PC3 CA\_n5A-n48A-n77A as captured in TR 38.717-03-02, the following co-existence issues due to dual uplink are addressed:

- Simultaneous Tx/Rx operation between NR n48 and n77 carriers are not supported hence.

- CA\_n48-n77 is limited for downlink, hence no UL configuration exists.

#### 6.28.3.1 Power class 2 case a, b

No additional MSD is needed

### 6.28.4 Void

## 6.29 CA\_n48-n66-n77

### 6.29.1 Configurations

**Table 6.29.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or  single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n48A-n66A-n77A | n777, 9  CA\_n48A-n66A  **CA\_n66A-n77A7** | n48 | 5, 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 | 0 |
| n66 | 5, 10, 15, 20, 25, 30, 40 |
| n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.29.2 Maximum output power

Table 6.29.2-1 UE Power Class 2 for uplink inter-band CA (two bands)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| **CA\_n48A-n77A** | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.29.3 REFSENS requirements

Analysis performed for the PC3 CA\_n48A-n66A-n77A as captured in TR 38.717-03-02, the following co-existence issues due to dual uplink are addressed:

- Simultaneous Tx/Rx operation between NR n48 and n77 carriers are not supported hence, no MSD is needed for IMD4 and IMD5 products produced by Band n48 and n66 that might fall in Rx of band n77 and IMD4 and IMD5 products produced by Band n66 and n77 that might fall in Rx of band n48.

- CA\_n48-n77 is limited for downlink, hence no UL configuration exists.

#### 6.29.3.1 Power class 2 case a, b

No additional MSD is needed, since uplink configuration CA\_n66A-n77A PC2 will still not affect band n48, since n48 and n77 are not simultaneous RX/TX.

### 6.29.4 Void

## 6.30 DL CA\_n2-n5-n77, UL\_ CA\_n2A-n77A

### 6.30.1 Configurations

**Table 6.30.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n2A-n5A-n77C | CA\_n2A-n77A7 | n2 | 5, 10, 15, 20, 25, 30, 40 | 0 |
| n5 | 5, 10, 15, 20, 251 |
| n77 | CA\_n77C\_BCS0 |
| n2 | 5, 10, 15, 20, 25, 30, 40 | 1 |
| n5 | 5, 10, 15, 20, 251 |
| n77 | CA\_n77C\_BCS1 |
| NOTE 1: This UE channel bandwidth is applicable only to downlink  NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination | | | | |

### 6.30.2 Maximum output power

**Table 6.30.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n2-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.30.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements had been studied in R4-2117251 for both case a and b, and the requirements were specified in 38.101-1 due to higher power uplink. Thus, there is no more additional requirement.

### 6.30.4 ∆TIB and ∆RIB values

The values had been specified in 38.101-1. There is no change by comparing to the values, so this section is omitted.

## 6.31 DL CA\_n2-n5-n77, UL\_CA\_n5A-n77A

### 6.31.1 Configurations

**Table 6.31.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n2A-n5A-n77C | CA\_n5A-n77A7 | n2 | 5, 10, 15, 20, 25, 30, 40 | 0 |
| n5 | 5, 10, 15, 20, 251 |
| n77 | CA\_n77C\_BCS0 |
| n2 | 5, 10, 15, 20, 25, 30, 40 | 1 |
| n5 | 5, 10, 15, 20, 251 |
| n77 | CA\_n77C\_BCS1 |
| NOTE 1: This UE channel bandwidth is applicable only to downlink  NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination | | | | |

### 6.31.2 Maximum output power

**Table 6.31.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n5-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.31.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements had been studied in R4-2117251 for both case a and b, and the requirements were specified in 38.101-1 due to higher power uplink. Thus, there is no more additional requirement.

### 6.31.4 ∆TIB and ∆RIB values

The values had been specified in 38.101-1. There is no change by comparing to the values, so this section is omitted.

## 6.32 CA\_n1-n3-n41

### 6.32.1 Configurations

**Table 6.32.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n1A-n3A-n41A | CA\_n1A-n41A7  CA\_n3A-n41A7 | n1 | 5, 10, 15, 20 | 0 |
| n3 | 5, 10, 15, 20, 25, 30 |
| n41 | 10, 15, 20, 30 40, 50, 60, 80, 90, 100 |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination | | | | |

### 6.32.2 Maximum output power

**Table 6.32.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n1-n41 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n3-n41 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.32.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

6.32.3.1 Power class 2 case a, b

Based on calculation, no MSD issue for dual UL CA\_n1-n41 falls into n3 DL or dual UL CA\_n3-n41 falls into n1 DL.

### 6.32.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 6.33 CA\_n7-n66-n78

### 6.33.1 Configurations

**Table 6.33.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n7A-n66A-n78A | n787, 9  CA\_n7A-n78A7  CA\_n66A-n78A7 | n7 | 5, 10, 15, 20, 25, 30, 40, 50 | 0 |
|  |  | n66 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100 |  |
|  |  | n7 | 5, 10, 15, 20, 25, 30, 40, 50 | 1 |
|  |  | n66 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for single uplink carrier in this downlink/uplink combination | | | | |

### 6.33.2 Maximum output power

**Table 6.33.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n7-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n66-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.33.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

6.33.3.1 Power class 2 case a, b

Based on calculation, IMD4 of dual UL CA\_n7-n78 fall into n66 DL, MSD values reused from CA\_n41-n66-n77.

Table 6.33.3-1 3DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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-n66-n78 | n7 | 2540 | 5 | 25 | 2660 | N/A | FDD | N/A |
|  | n66 | 1760 | 5 | 25 | 2160 | 20.5 | FDD | IMD4 |
|  | n78 | 3620 | 10 | 50 | 3620 | N/A | TDD | N/A |
| NOTE 2: This band is subject to IMD4 also which MSD is not specified. | | | | | | | | |

### 6.33.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

## 6.34 CA\_n25-n66-n78

### 6.34.1 Configurations

**Table 6.34.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n25A-n66A-n78A | n787, 9 CA\_n25A-n78A7  CA\_n66A-n78A7 | n25 | 5, 10, 15, 20, 25, 30, 40 | 0 |
|  |  | n66 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100 |  |
|  |  | n25 | 5, 10, 15, 20, 25, 30, 40 | 1 |
|  |  | n66 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| CA\_n25A-n66A-n78(2A) | n787, 9 CA\_n25A-n78A7 CA\_n66A-n78A7 | n25 | 5, 10, 15, 20, 25, 30, 40 | 0 |
|  |  | n66 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n78 | CA\_n78(2A)\_BCS2 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for single uplink carrier in this downlink/uplink combination | | | | |

### 6.34.2 Maximum output power

**Table 6.34.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n25-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n66-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.34.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

6.34.3.1 Power class 2 case a, b

IMD4 of dual UL CA\_n25-n78 falls into n66 DL. MSD value n66 is reused from PC2 DC\_2A-66A\_n77A.

IMD2/4/5 of dual UL CA\_n66-n78 falls into n25 DL, MSD value n25 is reused from PC2 CA\_n2-n66-n77.

Table 6.34.3-1 3DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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\_n25-n66-n78 | n25 | 1880 | 5 | 25 | 1960 | M/A | FDD | N/A |
|  | n66 | 1740 | 5 | 25 | 2140 | 21.1 | FDD | IMD4 |
|  | n78 | 3500 | 10 | 50 | 3500 | N/A | TDD | N/A |
|  | n25 | 1880 | 5 | 25 | 1960 | 37.6 | FDD | IMD21,2 |
|  | n66 | 1760 | 5 | 25 | 2160 | N/A | FDD | N/A |
|  | n78 | 3720 | 10 | 50 | 3720 | N/A | TDD | N/A |
| 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. | | | | | | | | |

### 6.34.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

## 6.35 CA\_n5-n7-n77

### 6.35.1 Configurations

**Table 6.35.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n5A-n7A-n77A | n77A7,9  CA\_n5A-n77A7  CA\_n7A-n77A7 | n5 | 5, 10, 15, 20, 25 | 0 |
|  |  | n7 | 5, 10, 15, 20, 25, 30, 35, 40, 50 |  |
|  |  | n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| CA\_n5A-n7A-n77(2A) | n77A7,9  CA\_n5A-n77A7  CA\_n7A-n77A7 | n5 | 5, 10, 15, 20, 25 | 0 |
|  |  | n7 | 5, 10, 15, 20, 25, 30, 35, 40, 50 |  |
|  |  | n77 | CA\_n77(2A)\_BCS0 |  |
| CA\_n5A-n7A-n77(3A) | n77A7,9  CA\_n5A-n77A7  CA\_n7A-n77A7 | n5 | 5, 10, 15, 20, 25 | 0 |
|  |  | n7 | 5, 10, 15, 20, 25, 30, 35, 40, 50 |  |
|  |  | n77 | CA\_n77(3A)\_BCS0 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.35.2 Maximum output power

**Table 6.35.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n5-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n7-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.35.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.35.3.1 Power class 2 case a, b

Based on calculation, IMD2 of dual UL CA\_n5-n77 falls into n7 DL and IMD2/3/5 of dual UL CA\_n7-n77 falls into n5 DL respectively, the MSD values are defined as below.

**Table 6.35.3-1: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n5-n7-n77 | n5 | N/A | 5 | N/A | 879 | 35.2 | FDD | IMD21,4 |
|  | n7 | 2550 | 5 | 25 | 2670 | N/A | FDD | N/A |
|  | n77 | 3429 | 10 | 50 | 3429 | N/A | TDD | N/A |
|  | n5 | 844 | 5 | 25 | 889 | N/A | FDD | N/A |
|  | n7 | N/A | 5 | N/A | 2645 | 35.1 | FDD | IMD2 |
|  | n77 | 3489 | 10 | 50 | 3489 | N/A | TDD | N/A |
| NOTE 1: This band is subject to IMD5 also which MSD is not specified.  NOTE 4: This band is subject to IMD3 also which MSD is not specified. | | | | | | | | |

### 6.35.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 6.36 CA\_n7-n25-n77

### 6.36.1 Configurations

**Table 6.36.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n7A-n25A-n77A | n77A7,9  CA\_n7A-n77A7  CA\_n25A-n77A7 | n7 | 5, 10, 15, 20, 25, 30, 40, 50 | 0 |
|  |  | n25 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| CA\_n7A-n25(2A)-n77A | n77A7,9  CA\_n7A-n77A7  CA\_n25A-n77A7 | n7 | 5, 10, 15, 20, 25, 30, 40, 50 | 0 |
|  |  | n25 | CA\_n25(2A)\_BCS0 |  |
|  |  | n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| CA\_n7A-n25A-n77(2A) | n77A7,9  CA\_n7A-n77A7  CA\_n25A-n77A7 | n7 | 5, 10, 15, 20, 25, 30, 40, 50 | 0 |
|  |  | n25 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n77 | CA\_n77(2A)\_BCS1 |  |
| CA\_n7A-n25A-n77(3A) | n77A7,9  CA\_n7A-n77A7  CA\_n25A-n77A7 | n7 | 5, 10, 15, 20, 25, 30, 40, 50 | 0 |
|  |  | n25 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n77 | CA\_n77(3A)\_BCS1 |  |
| CA\_n7A-n25(2A)-n77(2A) | n77A7,9  CA\_n7A-n77A7  CA\_n25A-n77A7 | n7 | 5, 10, 15, 20, 25, 30, 40, 50 | 0 |
|  |  | n25 | CA\_n25(2A)\_BCS0 |  |
|  |  | n77 | CA\_n77(2A)\_BCS1 |  |
| CA\_n7(2A)-n25A-n77A | n77A7,9  CA\_n7A-n77A7  CA\_n25A-n77A7 | n7 | CA\_n7(2A)\_BCS0 | 0 |
|  |  | n25 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| CA\_n7(2A)-n25(2A)-n77A | n77A7,9  CA\_n7A-n77A7  CA\_n25A-n77A7 | n7 | CA\_n7(2A)\_BCS0 | 0 |
|  |  | n25 | CA\_n25(2A)\_BCS0 |  |
|  |  | n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| CA\_n7(2A)-n25A-n77(2A) | n77A7,9  CA\_n7A-n77A7  CA\_n25A-n77A7 | n7 | CA\_n7(2A)\_BCS0 | 0 |
|  |  | n25 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n77 | CA\_n77(2A)\_BCS1 |  |
| CA\_n7(2A)-n25(2A)-n77(2A) | n77A7,9  CA\_n7A-n77A7  CA\_n25A-n77A7 | n7 | CA\_n7(2A)\_BCS0 | 0 |
|  |  | n25 | CA\_n25(2A)\_BCS0 |  |
|  |  | n77 | CA\_n77(2A)\_BCS1 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.36.2 Maximum output power

**Table 6.36.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n7-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n25-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.36.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.36.3.1 Power class 2 case a, b

Based on calculation, IMD4 of dual UL CA\_n7-n77 falls into n25 DL and IMD5 of dual UL CA\_n25-n77 falls into n7 DL respectively. The MSD values are defined as below.

**Table 6.36.3-1: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n7-n25-n77 | n7 | 2550 | 5 | 25 | 2670 | N/A | FDD | N/A |
|  | n25 | N/A | 5 | N/A | 1950 | 20.0 | FDD | IMD4 |
|  | n77 | 3525 | 10 | 50 | 3525 | N/A | TDD | N/A |
|  | n7 | N/A | 5 | N/A | 2640 | 18.8 | FDD | IMD5 |
|  | n25 | 1870 | 5 | 25 | 1950 | N/A | FDD | N/A |
|  | n77 | 4125 | 10 | 50 | 4125 | N/A | TDD | N/A |

### 6.36.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 6.37 CA\_n5-n25-n77

### 6.37.1 Configurations

**Table 6.37.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n5A-n25A-n77A | n777, 9  CA\_n5A-n77A7  CA\_n25A-n77A7 | n5 | 5, 10, 15, 20 | 0 |
|  |  | n25 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| CA\_n5A-n25(2A)-n77A | n777, 9  CA\_n5A-n77A7  CA\_n25A-n77A7 | n5 | 5, 10, 15, 20 | 0 |
|  |  | n25 | CA\_n25(2A)\_BCS0 |  |
|  |  | n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| CA\_n5A-n25A-n77(2A) | n777, 9  CA\_n5A-n77A7  CA\_n25A-n77A7 | n5 | 5, 10, 15, 20 | 0 |
|  |  | n25 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n77 | CA\_n77(2A)\_BCS1 |  |
| CA\_n5A-n25A-n77(3A) | n777, 9  CA\_n5A-n77A7  CA\_n25A-n77A7 | n5 | 5, 10, 15, 20 | 0 |
|  |  | n25 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n77 | CA\_n77(3A)\_BCS1 |  |
| CA\_n5A-n25(2A)-n77(2A) | n777, 9  CA\_n5A-n77A7  CA\_n25A-n77A7 | n5 | 5, 10, 15, 20 | 0 |
|  |  | n25 | CA\_n25(2A)\_BCS0 |  |
|  |  | n77 | CA\_n77(2A)\_BCS1 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for single uplink carrier in this downlink/uplink combination | | | | |

### 6.37.2 Maximum output power

**Table 6.37.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n5-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n25-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.37.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.37.3.1 Power class 2 case a, b

Based on calculation, IMD3 of dual UL n5-n77 fall into n25 DL, MSD values reused from CA\_n2-n5-n77.

Based on calculation, IMD5 of dual UL n25-n77 fall into n5 DL, MSD values reused from CA\_n2-n5-n77.

Table 6.37.3-1 3DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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\_n5-n25-n77 | n5 | N/A | 5 | N/A | 889 | 13.6 | FDD | IMD55 |
|  | n25 | 1907 | 5 | 25 | 1987 | N/A | FDD | N/A |
|  | n77 | 3305 | 10 | 50 | 3305 | N/A | TDD | N/A |
|  | n5 | 846.5 | 5 | 25 | 891.5 | N/A | FDD | N/A |
|  | n25 | N/A | 5 | N/A | 1987 | 24.8 | FDD | IMD3 |
|  | n77 | 3680 | 10 | 25 | 3680 | N/A | TDD | N/A |
| NOTE 5: For a UE which supports this band combination only when the Band n77 frequency range restriction defined in NOTE 12 of Table 5.2-1 applies, the MSD test point(s) cannot be verified for the band combination and the test point(s) can be skipped. | | | | | | | | |

### 6.37.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

## 6.38 CA\_n5-n25-n78

### 6.38.1 Configurations

**Table 6.38.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n5A-n25A-n78A | n787, 9  CA\_n5A-n78A7  CA\_n25A-n78A7 | n5 | 5, 10, 15, 20 | 0 |
|  |  | n25 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| CA\_n5A-n25(2A)-n78A | n787, 9  CA\_n5A-n78A7  CA\_n25A-n78A7 | n5 | 5, 10, 15, 20 | 0 |
|  |  | n25 | CA\_n25(2A)\_BCS0 |  |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| CA\_n5A-n25A-n78(2A) | n787, 9  CA\_n5A-n78A7  CA\_n25A-n78A7 | n5 | 5, 10, 15, 20 | 0 |
|  |  | n25 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n78 | CA\_n78(2A)\_BCS2 |  |
| CA\_n5A-n25(2A)-n78(2A) | n787, 9  CA\_n5A-n78A7  CA\_n25A-n78A7 | n5 | 5, 10, 15, 20 | 0 |
|  |  | n25 | CA\_n25(2A)\_BCS0 |  |
|  |  | n78 | CA\_n78(2A)\_BCS2 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for single uplink carrier in this downlink/uplink combination | | | | |

### 6.38.2 Maximum output power

**Table 6.38.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n5-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n25-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.38.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.38.3.1 Power class 2 case a, b

Based on calculation, IMD3 of dual UL n5-n78 fall into n25 DL, MSD values reused from CA\_n2-n5-n77.

Based on calculation, IMD5 of dual UL n25-n78 fall into n5 DL, MSD values reused from CA\_n2-n5-n77.

Table 6.38.3-1 3DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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\_n5-n25-n78 | n5 | N/A | 5 | N/A | 889 | 13.6 | FDD | IMD5 |
|  | n25 | 1907 | 5 | 25 | 1987 | N/A | FDD | N/A |
|  | n78 | 3305 | 10 | 50 | 3305 | N/A | TDD | N/A |
|  | n5 | 846.5 | 5 | 25 | 891.5 | N/A | FDD | N/A |
|  | n25 | N/A | 5 | N/A | 1987 | 24.8 | FDD | IMD3 |
|  | n78 | 3680 | 10 | 50 | 3680 | N/A | TDD | N/A |

### 6.38.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

## 6.39 CA\_n7-n66-n77

### 6.39.1 Configurations

**Table 6.39.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration  or single uplink carrier6 | NR Band | Channel bandwidth (MHz) (NOTE 3) | Bandwidth combination set |
| CA\_n7A-n66A-n77A | n77A7,9  CA\_n7A-n66A  CA\_n7A-n77A7  CA\_n66A-n77A7 | n7 | 5, 10, 15, 20, 25, 30, 40, 50 | 0 |
|  |  | n66 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| CA\_n7A-n66(2A)-n77A | n77A7,9  CA\_n7A-n66A  CA\_n7A-n77A7  CA\_n66A-n77A7 | n7 | 5, 10, 15, 20, 25, 30, 40, 50 | 0 |
|  |  | n66 | CA\_n66(2A)\_BCS1 |  |
|  |  | n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| CA\_n7A-n66A-n77(2A) | n77A7,9  CA\_n7A-n66A CA\_n7A-n77A7 CA\_n66A-n77A7 | n7 | 5, 10, 15, 20, 25, 30, 40, 50 | 0 |
|  |  | n66 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n77 | CA\_n77(2A)\_BCS1 |  |
| CA\_n7A-n66A-n77(3A) | n77A7,9  CA\_n77(2A)7  CA\_n7A-n66A  CA\_n7A-n77A7  CA\_n66A-n77A7 | n7 | 5, 10, 15, 20, 25, 30, 40, 50 | 0 |
|  |  | n66 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n77 | CA\_n77(3A)\_BCS1 |  |
| CA\_n7A-n66(2A)-n77(2A) | n77A7,9  CA\_n7A-n66A CA\_n7A-n77A7 CA\_n66A-n77A7 | n7 | 5, 10, 15, 20, 25, 30, 40, 50 | 0 |
|  |  | n66 | CA\_n66(2A)\_BCS1 |  |
|  |  | n77 | CA\_n77(2A)\_BCS1 |  |
| CA\_n7(2A)-n66A-n77A | n77A7,9  CA\_n7A-n66A CA\_n7A-n77A7 CA\_n66A-n77A7 | n7 | CA\_n7(2A)\_BCS0 | 0 |
|  |  | n66 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| CA\_n7(2A)-n66(2A)-n77A | n77A7,9  CA\_n7A-n66A CA\_n7A-n77A7 CA\_n66A-n77A7 | n7 | CA\_n7(2A)\_BCS0 | 0 |
|  |  | n66 | CA\_n66(2A)\_BCS1 |  |
|  |  | n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| CA\_n7(2A)-n66A-n77(2A) | n77A7,9  CA\_n7A-n66A CA\_n7A-n77A7 CA\_n66A-n77A7 | n7 | CA\_n7(2A)\_BCS0 | 0 |
|  |  | n66 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n77 | CA\_n77(2A)\_BCS1 |  |
| CA\_n7(2A)-n66(2A)-n77(2A) | n77A7,9  CA\_n7A-n66A CA\_n7A-n77A7 CA\_n66A-n77A7 | n7 | CA\_n7(2A)\_BCS0 | 0 |
|  |  | n66 | CA\_n66(2A)\_BCS1 |  |
|  |  | n77 | CA\_n77(2A)\_BCS1 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.39.2 Maximum output power

**Table 6.39.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n7-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n66-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.39.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.39.3.1 Power class 2 case a, b

Based on calculation, IMD4 of dual UL CA\_n7-n77 falls into n66 DL and IMD5 of dual UL CA\_n66-n77 falls into n7 DL respectively. The MSD values are defined as below.

**Table 6.39.3-1: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n7-n66-n77 | n7 | 2550 | 5 | 25 | 2670 | N/A | FDD | N/A |
|  | n66 | N/A | 5 | N/A | 2150 | 20.5 | FDD | IMD4 |
|  | n77 | 3625 | 10 | 50 | 3625 | N/A | TDD | N/A |
|  | n7 | N/A | 5 | N/A | 2640 | 18.8 | FDD | IMD5 |
|  | n66 | 1720 | 5 | 25 | 2120 | N/A | FDD | N/A |
|  | n77 | 3900 | 10 | 50 | 3900 | N/A | TDD | N/A |

### 6.39.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 6.40 CA\_n7-n71-n77

### 6.40.1 Configurations

**Table 6.40.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration  or single uplink carrier6 | NR Band | Channel bandwidth (MHz) (NOTE 3) | Bandwidth combination set |
| CA\_n7A-n71A-n77A | n77A7,9  CA\_n7A-n71A  CA\_n7A-n77A7  CA\_n71A-n77A7 | n7 | 5, 10, 15, 20, 25, 30, 35, 40, 50 | 0 |
|  |  | n71 | 5, 10, 15, 20, 25, 30, 35 |  |
|  |  | n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| CA\_n7A-n71A-n77(2A) | n77A7,9  CA\_n77(2A)  CA\_n7A-n71A  CA\_n7A-n77A7  CA\_n71A-n77A7 | n7 | 5, 10, 15, 20, 25, 30, 35, 40, 50 | 0 |
|  |  | n71 | 5, 10, 15, 20, 25, 30, 35 |  |
|  |  | n77 | CA\_n77(2A)\_BCS0 |  |
| CA\_n7A-n71A-n77(3A) | n77A7,9  CA\_n77(2A)  CA\_n7A-n71A  CA\_n7A-n77A7  CA\_n71A-n77A7 | n7 | 5, 10, 15, 20, 25, 30, 35, 40, 50 | 0 |
|  |  | n71 | 5, 10, 15, 20, 25, 30, 35 |  |
|  |  | n77 | CA\_n77(3A)\_BCS0 |  |
| CA\_n7A-n71A-n77A | n77A7,9  CA\_n7A-n71A  CA\_n7A-n77A7  CA\_n71A-n77A7 | n7 | 5, 10, 15, 20, 25, 30, 35, 40, 50 | 0 |
|  |  | n71 | 5, 10, 15, 20, 25, 30, 35 |  |
|  |  | n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.40.2 Maximum output power

**Table 6.40.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n7-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n71-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.40.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.40.3.1 Power class 2 case a, b

Based on calculation, IMD2 of dual UL CA\_n71-n77 falls into n7 DL respectively. The MSD values are defined as below.

**Table 6.40.3-1: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n7-n71-n77 | n7 | N/A | 5 | N/A | 2670 | 34.6 | FDD | IMD2 |
|  | n71 | 680 | 5 | 25 | 634 | N/A | FDD | N/A |
|  | n77 | 3350 | 10 | 50 | 3350 | N/A | TDD | N/A |

### 6.40.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 6.41 CA\_n13-n25-n77

### 6.41.1 Configurations

**Table 6.41.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration  or single uplink carrier6 | NR Band | Channel bandwidth (MHz) (NOTE 3) | Bandwidth combination set |
| CA\_n13A-n25A-n77A | n77A7,9  CA\_n13A-n25A  CA\_n13A-n77A7  CA\_n25A-n77A7 | n13 | 5, 10 | 0 |
|  |  | n25 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| CA\_n13A-n25A-n77(2A) | n77A7,9  CA\_n77(2A)  CA\_n13A-n25A  CA\_n13A-n77A7  CA\_n25A-n77A7 | n13 | 5, 10 | 0 |
|  |  | n25 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n77 | CA\_n77(2A)\_BCS1 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination.  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.41.2 Maximum output power

**Table 6.41.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n13-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n25-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.41.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.41.3.1 Power class 2 case a, b

Based on calculation, IMD3 of dual UL CA\_n13-n77 falls into n25 DL respectively. The MSD values are defined as below.

**Table 6.41.3-1: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n13-n25-n77 | n13 | 782 | 5 | 25 | 751 | N/A | FDD | N/A |
|  | n25 | N/A | 5 | N/A | 1960 | 24.0 | FDD | IMD3 |
|  | n77 | 3524 | 10 | 50 | 3524 | N/A | TDD | N/A |

### 6.41.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 6.42 CA\_n1-n3-n77

### 6.42.1 Configurations

**Table 6.42.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n1A-n3A-n77A | CA\_n1A-n77A7  CA\_n3A-n77A7 | n1 | 5, 10, 15, 20 | 0 |
|  |  | n3 | 5, 10, 15, 20, 25, 30 |  |
|  |  | n77 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |  |
|  |  | n1 | 5, 10, 15, 20, 25, 30, 40, 50 | 1 |
|  |  | n3 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n77 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |  |
|  |  | n1 | 5, 10, 15, 20 | 2 |
|  |  | n3 | 5, 10, 15, 20, 25, 30, 35, 40 |  |
|  |  | n77 | 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| CA\_n1A-n3A-n77(2A) | CA\_n1A-n77A7  CA\_n3A-n77A7 | n1 | 5, 10, 15, 20 | 0 |
|  |  | n3 | 5, 10, 15, 20, 25, 30 |  |
|  |  | n77 | CA\_n77(2A)\_BCS1 |  |
| NOTE 7: Minimum requirements for Power Class 2 are applicable for this uplink combination or single uplink carrier in this downlink/uplink combination | | | | |

### 6.42.2 Maximum output power

**Table 6.42.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n1-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n3-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.42.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.42.3.1 Power class 2 case a, b

Based on calculation, IMD2/4/5 of dual UL CA\_n1A-n77A falls into n3 DL and IMD2/5 of dual UL CA\_n3A-n77A falls into n1 DL respectively, the MSD exceptions are defined as below, which are reused from DC\_1-3\_n77.

**Table 6.42.3-1: 3DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n1-n3-n77 | n1 | 1950 | 5 | 25 | 2140 | N/A | FDD | N/A |
| n3 | N/A | 5 | N/A | 1807.5 | 37.5 | FDD | IMD21,2 |
| n77 | 3757.5 | 10 | 50 | 3757.5 | N/A | TDD | N/A |
|  | n1 | N/A | 5 | N/A | 2140 | 37.0 | FDD | IMD21 |
|  | n3 | 1775 | 5 | 25 | 1870 | N/A | FDD | N/A |
|  | n77 | 3915 | 10 | 50 | 3915 | N/A | TDD | N/A |
| 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. | | | | | | | | |

### 6.42.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 6.43 DL CA\_n3-n77-n79, UL CA\_n3A-n77A

### 6.43.1 Configurations

**Table 6.43.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n3A-n77A-n79A4 | **CA\_n3A-n77A7**  CA\_n3A-n79A  CA\_n77A-n79A | n3 | n3 channel bandwidth in Table 5.3.5-1 | 0 |
| n77 | n77 channel bandwidth in Table 5.3.5-1 |
| n79 | n79 channel bandwidth in Table 5.3.5-1 |
| CA\_n3A-n77(2A)-n79A4 | **CA\_n3A-n77A7**  CA\_n3A-n79A  CA\_n77A-n79A | n3 | n3 channel bandwidth in Table 5.3.5-1 | 0 |
| n77 | CA\_n77(2A)\_BCS0 |
| n79 | n79 channel bandwidth in Table 5.3.5-1 |
| NOTE 4: The minimum requirements only apply for non-simultaneous Tx/Rx between all carriers for TDD combinations.  NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination.  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination. | | | | |

### 6.43.2 Maximum output power

**Table 6.43.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_n3-n77** | **CA power class** | **Carrier n3 power class** | **Carrier n77 power class** |
| CA\_n3A-n77A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.43.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.43.3.1 Power class 2 case a

There is no MSD for PC3 UL CA\_n3A-n77A into CA n3-n77-n79, none is proposed for PC2.

#### 6.43.3.2 Power class 2 case b

There is no MSD for PC3 UL CA\_n3A-n77A into CA n3-n77-n79, none is proposed for PC2.

### 6.43.4 Void

## 6.44 DL CA\_n3-n77-n79, UL CA\_n3A-n79A

### 6.44.1 Configurations

**Table 6.44.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n3A-n77A-n79A4 | CA\_n3A-n77A  **CA\_n3A-n79A7**  CA\_n77A-n79A | n3 | n3 channel bandwidth in Table 5.3.5-1 | 0 |
| n77 | n77 channel bandwidth in Table 5.3.5-1 |
| n79 | n79 channel bandwidth in Table 5.3.5-1 |
| CA\_n3A-n77(2A)-n79A4 | CA\_n3A-n77A  **CA\_n3A-n79A7**  CA\_n77A-n79A | n3 | n3 channel bandwidth in Table 5.3.5-1 | 0 |
| n77 | CA\_n77(2A)\_BCS0 |
| n79 | n79 channel bandwidth in Table 5.3.5-1 |
| NOTE 4: The minimum requirements only apply for non-simultaneous Tx/Rx between all carriers for TDD combinations.  NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination.  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination. | | | | |

### 6.44.2 Maximum output power

**Table 6.44.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_n3-n79** | **CA power class** | **Carrier n3 power class** | **Carrier n79 power class** |
| CA\_n3A-n79A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.44.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.44.3.1 Power class 2 case a

There is no MSD for PC3 UL CA\_n3A-n79A into CA n3-n77-n79, none is proposed for PC2.

#### 6.44.3.2 Power class 2 case b

There is no MSD for PC3 UL CA\_n3A-n79A into CA n3-n77-n79, none is proposed for PC2.

### 6.44.4 Void

## 6.45 DL CA\_n3-n77-n79, UL CA\_n77A-n79A

### 6.45.1 Configurations

**Table 6.45.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n3A-n77A-n79A4 | CA\_n3A-n77A  CA\_n3A-n79A  **CA\_n77A-n79A7** | n3 | n3 channel bandwidth in Table 5.3.5-1 | 0 |
| n77 | n77 channel bandwidth in Table 5.3.5-1 |
| n79 | n79 channel bandwidth in Table 5.3.5-1 |
| CA\_n3A-n77(2A)-n79A4 | CA\_n3A-n77A  CA\_n3A-n79A  **CA\_n77A-n79A7** | n3 | n3 channel bandwidth in Table 5.3.5-1 | 0 |
| n77 | CA\_n77(2A)\_BCS0 |
| n79 | n79 channel bandwidth in Table 5.3.5-1 |
| NOTE 4: The minimum requirements only apply for non-simultaneous Tx/Rx between all carriers for TDD combinations.  NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination.  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination. | | | | |

### 6.45.2 Maximum output power

**Table 6.45.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_n77-n79** | **CA power class** | **Carrier n77 power class** | **Carrier n79 power class** |
| CA\_n77A-n79A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| Case c | 26dBm | 26dBm | 23dBm |
| Case d | 26dBm | 26dBm | 26dBm |

### 6.45.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.45.3.1 Power class 2 case a, b, c and d

The MSD is same for case a, b ,c and d.

Power class 3 MSD for UL CA\_n77A-n79A:

**Table 6.45.3.1-1 Power class 3 MSD for 2 bands UL CA\_n77A-n79A**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA band combination** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n3-n77-n79 | n77 | 3350 | 10 | 50 | 3350 | N/A | TDD | N/A |
|  | n79 | 4840 | 40 | 216 | 4840 | N/A | TDD | N/A |
|  | n3 | 1765 | 5 | 25 | 1860 | 15.7 | FDD | IMD31, 2  |2\*fBn77-fBn79| |
| 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. | | | | | | | | |

MSD for PC2 UL CA is calculated from MSD for PC3 as follows:

If the input signal increases by 3dB, the IMD3 increases by 3\*3=9dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

Text

Description automatically generated

If is increased by dB, then is given by

A picture containing logo

Description automatically generated





The proposed value for PC2 UL CA MSD can be found in Table 6.45.3.1-2.

**Table 6.45.3.1-2 3DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA band combination** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n3-n77-n79 | n77 | 3350 | 10 | 50 | 3350 | N/A | FDD | N/A |
|  | n79 | 4840 | 40 | 216 | 4840 | N/A | TDD | N/A |
|  | n3 | 1765 | 5 | 25 | 1860 | 24.2 | TDD | IMD31, 2  |2\*fBn77-fBn79| |
| 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. | | | | | | | | |

### 6.45.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 6.46 DL CA\_n28-n77-n79, UL CA\_n28A-n77A

### 6.46.1 Configurations

**Table 6.46.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n28A-n77A-n79A4 | **CA\_n28A-n77A7**  CA\_n28A-n79A  CA\_n77A-n79A | n28 | n28 channel bandwidth in Table 5.3.5-1 | 0 |
| n77 | n77 channel bandwidth in Table 5.3.5-1 |
| n79 | n79 channel bandwidth in Table 5.3.5-1 |
| CA\_n28A-n77(2A)-n79A4 | **CA\_n28A-n77A7**  CA\_n28A-n79A  CA\_n77A-n79A | n28 | n28 channel bandwidth in Table 5.3.5-1 | 0 |
| n77 | CA\_n77(2A)\_BCS0 |
| n79 | n79 channel bandwidth in Table 5.3.5-1 |
| NOTE 4: The minimum requirements only apply for non-simultaneous Tx/Rx between all carriers for TDD combinations.  NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination.  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination. | | | | |

### 6.46.2 Maximum output power

**Table 6.46.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_n28-n77** | **CA power class** | **Carrier n28 power class** | **Carrier n77 power class** |
| CA\_n28A-n77A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.46.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.46.3.1 Power class 2 case a

There is no MSD for PC3 UL CA\_n28A-n77A into CA n28-n77-n79, none is proposed for PC2.

#### 6.46.3.2 Power class 2 case b

There is no MSD for PC3 UL CA\_n28A-n77A into CA n28-n77-n79, none is proposed for PC2.

### 6.46.4 Void

## 6.47 DL CA\_n28-n77-n79, UL CA\_n28A-n79A

### 6.47.1 Configurations

**Table 6.47.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n28A-n77A-n79A4 | CA\_n28A-n77A  **CA\_n28A-n79A7**  CA\_n77A-n79A | n28 | n28 channel bandwidth in Table 5.3.5-1 | 0 |
| n77 | n77 channel bandwidth in Table 5.3.5-1 |
| n79 | n79 channel bandwidth in Table 5.3.5-1 |
| CA\_n28A-n77(2A)-n79A4 | CA\_n28A-n77A  **CA\_n28A-n79A7**  CA\_n77A-n79A | n28 | n28 channel bandwidth in Table 5.3.5-1 | 0 |
| n77 | CA\_n77(2A)\_BCS0 |
| n79 | n79 channel bandwidth in Table 5.3.5-1 |
| NOTE 4: The minimum requirements only apply for non-simultaneous Tx/Rx between all carriers for TDD combinations.  NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination.  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination. | | | | |

### 6.47.2 Maximum output power

**Table 6.47.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_n28-n79** | **CA power class** | **Carrier n28 power class** | **Carrier n79 power class** |
| CA\_n28A-n79A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.47.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.47.3.1 Power class 2 case a

There is no MSD for PC3 UL CA\_n28A-n79A into CA n28-n77-n79, none is proposed for PC2.

#### 6.47.3.2 Power class 2 case b

There is no MSD for PC3 UL CA\_n28A-n79A into CA n28-n77-n79, none is proposed for PC2.

### 6.47.4 Void

## 6.48 DL CA\_n28-n77-n79, UL CA\_n77A-n79A

### 6.48.1 Configurations

**Table 6.48.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n28A-n77A-n79A4 | CA\_n28A-n77A  CA\_n28A-n79A  **CA\_n77A-n79A7** | n28 | n28 channel bandwidth in Table 5.3.5-1 | 0 |
| n77 | n77 channel bandwidth in Table 5.3.5-1 |
| n79 | n79 channel bandwidth in Table 5.3.5-1 |
| CA\_n28A-n77(2A)-n79A4 | CA\_n28A-n77A  CA\_n28A-n79A  **CA\_n77A-n79A7** | n28 | n28 channel bandwidth in Table 5.3.5-1 | 0 |
| n77 | CA\_n77(2A)\_BCS0 |
| n79 | n79 channel bandwidth in Table 5.3.5-1 |
| NOTE 4: The minimum requirements only apply for non-simultaneous Tx/Rx between all carriers for TDD combinations.  NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination.  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination. | | | | |

### 6.48.2 Maximum output power

**Table 6.48.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_n77-n79** | **CA power class** | **Carrier n77 power class** | **Carrier n79 power class** |
| CA\_n77A-n79A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| Case c | 26dBm | 26dBm | 23dBm |
| Case d | 26dBm | 26dBm | 26dBm |

### 6.48.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.48.3.1 Power class 2 case a, b, c and d

The MSD is same for case a, b ,c and d.

Power class 3 MSD for UL CA\_n77A-n79A:

**Table 6.48.3.1-1 Power class 3 MSD for 2 bands UL CA\_n77A-n79A**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA band combination** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n28-n77-n79 | n77 | 3620 | 10 | 52 | 3620 | N/A | TDD | N/A |
|  | n79 | 4420 | 40 | 216 | 4420 | N/A | TDD | N/A |
|  | n28 | 745 | 5 | 25 | 800 | 16.2 | FDD | IMD21, 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. | | | | | | | | |

MSD for PC2 UL CA is calculated from MSD for PC3 as follows:

If the input signal increases by 3dB, the IMD2 increases by 3\*2=6dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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The proposed value for PC2 UL CA MSD can be found in Table 6.48.3.1-2.

**Table 6.48.3.1-2 3DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA band combination** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n28-n77-n79 | n77 | 3620 | 10 | 52 | 3620 | N/A | TDD | N/A |
|  | n79 | 4420 | 40 | 216 | 4420 | N/A | TDD | N/A |
|  | n28 | 745 | 5 | 25 | 800 | 22.7 | FDD | IMD21, 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. | | | | | | | | |

### 6.48.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 6.49 DL CA\_n3-n28-n79, UL CA\_n3A-n79A

### 6.49.1 Configurations

**Table 6.49.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n3A-n28A-n79A | **CA\_n3A-n79A7**  CA\_n28A-n79A | n3 | n3 channel bandwidth in Table 5.3.5-1 | 0 |
| n28 | n28 channel bandwidth in Table 5.3.5-1 |
| n79 | n79 channel bandwidth in Table 5.3.5-1 |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination.  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination. | | | | |

### 6.49.2 Maximum output power

**Table 6.49.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_n3-n79** | **CA power class** | **Carrier n3 power class** | **Carrier n79 power class** |
| CA\_n3A-n79A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.49.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.49.3.1 Power class 2 case a, b

The MSD is same for case a, b.

Power class 3 MSD for UL CA\_n3A-n79A:

**Table 6.49.3.1-1 Power class 3 MSD for 2 bands UL CA\_n77A-n79A**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA band combination** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n3-n28-n79 | n3 | 1770 | 5 | 25 | 1865 | N/A | FDD | N/A |
|  | n79 | 4530 | 40 | 216 | 4530 | N/A | TDD | N/A |
|  | n28 | 725 | 5 | 25 | 780 | 10.3 | FDD | IMD4  |3\*fBn3-fBn79| |

MSD for PC2 UL CA is calculated from MSD for PC3 as follows:

If the input signal increases by 3dB, the IMD4 increases by 3\*4=12dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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The proposed value for PC2 UL CA MSD can be found in Table 6.49.3.1-2.

**Table 6.49.3.1-2 3DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA band combination** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n3-n28-n79 | n3 | 1770 | 5 | 25 | 1865 | N/A | FDD | N/A |
|  | n79 | 4530 | 40 | 216 | 4530 | N/A | TDD | N/A |
|  | n28 | N/A | 5 | N/A | 780 | 21.5 | FDD | IMD4  |3\*fBn3-fBn79| |

### 6.49.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

## 6.50 DL CA\_n3-n28-n79, UL CA\_n28A-n79A

### 6.50.1 Configurations

**Table 6.50.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n3A-n28A-n79A | CA\_n3A-n79A  **CA\_n28A-n79A7** | n3 | n3 channel bandwidth in Table 5.3.5-1 | 0 |
| n28 | n28 channel bandwidth in Table 5.3.5-1 |
| n79 | n79 channel bandwidth in Table 5.3.5-1 |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination.  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination. | | | | |

### 6.50.2 Maximum output power

**Table 6.50.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_n28-n79** | **CA power class** | **Carrier n28 power class** | **Carrier n79 power class** |
| CA\_n28A-n79A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.50.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.50.3.1 Power class 2 case a, b

The MSD is same for case a, b.

Power class 3 MSD for UL CA\_n28A-n79A:

**Table 6.50.3.1-1 Power class 3 MSD for 2 bands UL CA\_n28A-n79A**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA band combination** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n3-n28-n79 | n28 | 725 | 5 | 25 | 780 | N/A | FDD | N/A |
|  | n79 | 4770 | 40 | 216 | 4770 | N/A | TDD | N/A |
|  | n3 | 1775 | 5 | 25 | 1870 | 5.7 | FDD | IMD5  |4\*fBn28-fBn79| |

MSD for PC2 UL CA is calculated from MSD for PC3 as follows:

If the input signal increases by 3dB, the IMD5 increases by 3\*5=15dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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The proposed value for PC2 UL CA MSD can be found in Table 6.50.3.1-2.

**Table 6.50.3.1-2 3DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA band combination** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n3-n28-n79 | n28 | 725 | 5 | 25 | 780 | N/A | FDD | N/A |
|  | n79 | 4770 | 40 | 216 | 4770 | N/A | TDD | N/A |
|  | n3 | N/A | 5 | N/A | 1870 | 20.5 | FDD | IMD5  |4\*fBn28-fBn79| |

### 6.50.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 6.51 CA\_n1-n28-n41

### 6.51.1 Configurations

**Table 6.51.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n1A-n28A-n41A | CA\_n1A-n41A7  CA\_n28A-n41A7 | n1 | 5, 10, 15, 20 | 0 |
|  |  | n28 | 5, 10 |  |
|  |  | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 |  |
| NOTE 7: Minimum requirements for Power Class 2 are applicable for this uplink combination or single uplink carrier in this downlink/uplink combination | | | | |

### 6.51.2 Maximum output power

**Table 6.51.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n1-n41 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n28-n41 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.51.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.51.3.1 Power class 2 case a, b

Based on calculation, IMD2/5 of dual UL CA\_n1A-n41A falls into n28 DL and no IMD issue for dual UL CA\_n28-n41 falls into n1 DL, the MSD exceptions are defined as below

**Table 6.51.3-1: 3DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n1-n28-n41 | n1 | 1923 | 5 | 25 | 2113 | N/A | FDD | N/A |
| n28 | N/A | 5 | N/A | 762 | 36.6 | FDD | IMD21 |
| n41 | 2685 | 10 | 50 | 2685 | N/A | TDD | N/A |
| NOTE 1: This band is subject to IMD5 also which MSD is not specified. | | | | | | | | |

### 6.51.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 6.52 CA\_n18-n28-n77

### 6.52.1 Configurations

**Table 6.52.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n18A-n28A-n77A | n77A7  CA\_n18A-n77A7  CA\_n28A-n77A7 | n18 | 5, 10, 15 | 0 |
| n28 | 5, 10 |
| n77 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |
| n28 | 5, 10 |
| n77 | CA\_n77(2A)\_BCS1 |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination | | | | |

### 6.52.2 Maximum output power

**Table 6.52.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n18-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n28-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.52.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.52.3.1 Power class 2 case a, b

Based on calculation, IMD5 and IMD6 of dual UL CA\_n18A-n77A fall into n18 DL and IMD5 and IMD7 of dual UL CA\_n28A-n77A falls into n28 DL, the same as the two band cases. For UL CA\_n18A-n77A MSD exceptions are defined [4-5] and are reflected as Table 6.52.3-1. For DL and UL CA\_n28A-n77A, and victim n28, the MSD exceptions are already captured in the specification [1]. Hence the necessary MSD values for the two bands fallback cases are available, only 3 bands case need to be investigated.

Based on calculation, IMD5 of dual UL CA\_n18A-n77A falls into n28 DL and IMD5 and IMD7 of dual UL CA\_n28A-n77A falls into n18 DL, the MSD exceptions are defined as in yellow in Table 6.52.3-1. The MSD exception for UL CA\_n18A-n77A falls into n28 DL is borrowed from Table 5.60.3-1 of 3GPP TR 38.898 V0.6.0 (2023-10)[6].

**Table 6.52.3-1: 3DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n18-n28-n77 | n18 | 820 | 5 | 25 | 865 | N/A | FDD | N/A |
| n28 | N/A | 5 | N/A | 778 | 17.5 | FDD | IMD5 |
| n77 | 4058 | 10 | 50 | 4058 | N/A | TDD | N/A |
| n18 | N/A | 5 | N/A | 865 | 12.1 | FDD | IMD5 |
| n28 | 723 | 5 | 25 | 778 | N/A | FDD | N/A |
| n77 | 3757 | 10 | 52 | 3757 | N/A | TDD | N/A |

### 6.52.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 6.53 CA\_n3-n18-n77

### 6.53.1 Configurations

**Table 6.53.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n3A-n18A-n77 | n77A7  CA\_n3A-n77A7  CA\_n18A-n77A7 | n18 | 5, 10, 15 | 0 |
| n18 | 5, 10, 15 |
| n77 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |
| CA\_n3A-n18A-n77(2A) | n77A7  CA\_n3A-n77A7  CA\_n18A-n77A7 | n3 | 5, 10, 15 | 0 |
| n18 | 5, 10, 15 |
| n77 | CA\_n77(2A)\_BCS1 |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination | | | | |

### 6.53.2 Maximum output power

**Table 6.53.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n3-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n18-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.53.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

The MSD exceptions to n3 downlink and n18 downlink due to single UL n77 need not to defined because it drops no IMD and no harmonic mixing into the n3 or n18 downlink.

#### 6.53.3.1 Power class 2 case a, b

Based on calculation, IMD3 of dual UL CA\_n18A-n77A falls into n3 DL and IMD6 and 7 of dual UL CA\_n3A-n77A falls into n18 DL respectively, IMD6 and IMD7 interferences are lower than REFESENS, so we don’t need to define the MSD for IMD6 and IMD7. The MSD exceptions due to CA\_n18A-n77A falls into n3 DL are defined as below.

**Table 6.53.3-1: 2DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n3-n18-n77 | n18 | 820 | 5 | 25 | 865 | N/A | TDD | N/A |
|  | n3 | N/A | 5 | N/A | 1865 | 24.2 | FDD | IMD3 |
|  | n77 | 3505 | 10 | 50 | 3505 | N/A | TDD | N/A |
| 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. | | | | | | | | |

### 6.53.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA

## 6.54 CA\_n18-n41-n77

### 6.54.1 Configurations

**Table 6.54.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n18A-n41A-n77A | CA\_n1**8**A-n41A7  CA\_n18A-n77A7  CA\_n41A-n77A7 | n18 | 5, 10, 15 | 0 |
|  | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 |  |
|  | n77 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |  |
| CA\_n18A-n41A-n77(2A) | CA\_n18A-n41A7  CA\_n18A-n77A7  CA\_n41A-n77A7 | n18 | 5, 10, 15 | 0 |
|  | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 |  |
|  | n77 | CA\_n77(2A)\_BCS1 |  |
| NOTE 7: Minimum requirements for Power Class 2 are applicable for this uplink combination or single uplink carrier in this downlink/uplink combination | | | | |

### 6.54.2 Maximum output power

**Table 6.54.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n18-n41 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n18-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n41-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| Case c | 26dBm | 26dBm | 23dBm |
| Case d | 26dBm | 26dBm | 26dBm |

### 6.54.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.54.3.1 Power class 2 case a, b, c, d

Based on calculation, IMD 2/3/4/ of dual UL CA\_n18A-n41A falls into n77 DL; IMD 2 and 3 of dual UL CA\_n18A-n77A falls into n41 DL; and IMD 2/3/5 of dual UL CA\_n41A-n77A falls into n18 DL respectively, the MSD exceptions are defined as below.

**Table 6.54.3-1: 3DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n18-n41-n77 | n18 | 820 | 5 | 25 | 865 | N/A | FDD | N/A |
|  | n41 | 2570 | 5 | 25 | 2570 | N/A | TDD | N/A |
|  | n77 | N/A | 10 | N/A | 3390 | 33.0 | TDD | IMD22,4 |
|  | n18 | 820 | 5 | 25 | 865 | N/A | FDD | N/A |
|  | n77 | 3450 | 10 | 50 | 3450 | N/A | TDD | N/A |
|  | n41 | N/A | 5 | N/A | 2630 | 32.6 | TDD | IMD24 |
|  | n41 | 2590 | 10 | 50 | 2590 | N/A | TDD | N/A |
|  | n77 | 3460 | 10 | 50 | 3460 | N/A | TDD | N/A |
|  | n18 | N/A | 5 | N/A | 870 | 33.8 | FDD | IMD21,4 |
| 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.  NOTE 4: This band is subject to IMD3 also which MSD is not specified. | | | | | | | | |

For information and for reference, the omitted MSD values for IMD3, IMD4 and IMD5 are shown in the following table.

They are the MSD values corresponding to the following:

1 IMD 2, IMD3(2, 1), IMD3(1, -2), and IMD4(2, -2) of dual UL CA\_n18A-n41A falls into n77 DL;

2 IMD3(2, 1) of dual UL CA\_n18A-n77A falls into n41 DL;

3 IMD3(2, -1), IMD5(3, -2) of dual UL CA\_n41A-n77A falls into n18 DL.

**Table: Additional 3DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n18-n41-n77 | n18 | 820 | 5 | 25 | 865 | N/A | FDD | N/A |
|  | n41 | 2515 | 5 | 25 | 2515 | N/A | TDD | N/A |
|  | n77 | 4155 | 10 | N/A | 4155 | 22.9 | TDD | IMD3(2,1) |
|  | n18 | 820 | 5 | 25 | 865 | N/A | FDD | N/A |
|  | n41 | 2500 | 5 | 25 | 2500 | N/A | TDD | N/A |
|  | n77 | 4180 | 10 | N/A | 4180 | 23.0 | TDD | IMD3(1, -2) |
|  | n18 | 820 | 5 | 25 | 865 | N/A | FDD | N/A |
|  | n41 | 2515 | 5 | 25 | 2515 | N/A | TDD | N/A |
|  | n77 | 3390 | 10 | N/A | 3390 | 18.0 | TDD | IMD4(2,2) |
|  | n18 | 820 | 5 | 25 | 865 | N/A | FDD | N/A |
|  | n77 | 4155 | 10 | 50 | 4155 | N/A | TDD | N/A |
|  | n41 | N/A | 5 | N/A | 2515 | 18.3 | TDD | IMD3(2, -1) |
|  | n41 | 2515 | 5 | 25 | 2515 | N/A | TDD | N/A |
|  | n77 | 4165 | 10 | 50 | 4165 | N/A | TDD | N/A |
|  | n18 | N/A | 5 | N/A | 865 | 21.6 | FDD | IMD3(2, -1) |
|  | n41 | 2640 | 5 | 25 | 2640 | N/A | TDD | N/A |
|  | n77 | 3527.5 | 10 | 50 | 3527.5 | N/A | TDD | N/A |
|  | n18 | N/A | 5 | N/A | 865 | 11.4 | FDD | IMD5(3, -2) |
|  | | | | | | | | |

### 6.54.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 6.55 CA\_n13-n66-n77

### 6.55.1 Configurations

**Table 6.55.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n13A-n66A-n77A | n777, 9  CA\_n13A-n66A  CA\_n13A-n77A7  CA\_n66A-n77A7 | n13 | 5, 10 | 0 |
|  |  | n66 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| NOTE 7: Minimum requirements for Power Class 2 are applicable for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Minimum requirements for Power Class 1.5 are applicable for single uplink carrier in this downlink/uplink combination | | | | |

### 6.55.2 Maximum output power

**Table 6.55.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n13-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n66-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.55.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.55.3.1 Power class 2 case a, b

Based on coexistence studies, IMD3 of dual UL n13-n77 fall into n66 DL. Test points are reused from PC3 and PC3 MSD value n66 of 17.1 is recalculated using formula below.

Based on coexistence studies, IMD3 of dual UL n66-n77 fall into n13 DL, Test points are reused from PC3 and PC3 MSD value n13 of 15.2 is recalculated using formula below.

MSD for PC2 UL CA is calculated from MSD for PC2 as follows:

If the input signal increases by 3 dB, the IMD3 interference power increases by 3\*3=9 dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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Formula above gives IMD3 PC2 MSD for n66 as 26.025 and IMD3 PC2 MSD for n13 as 24.082.

Table 6.55.3-1 3DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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\_n13-n66-n77 | n13 | 782 | 5 | 25 | 751 | N/A | FDD | N/A |
|  | n66 | N/A | 5 | N/A | 2146 | 26.0 | FDD | IMD3 |
|  | n77 | 3710 | 10 | 50 | 3710 | N/A | TDD | N/A |
|  | n13 | N/A | 5 | N/A | 750 | 24.1 | FDD | IMD3 |
|  | n66 | 1710 | 5 | 25 | 2110 | N/A | FDD | N/A |
|  | n77 | 4170 | 10 | 50 | 4170 | N/A | TDD | N/A |

### 6.55.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

## 6.56 CA\_n1-n28-n77

### 6.56.1 Configurations

**Table 6.56.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n1A-n28A-n77A | CA\_n1A-n77A7  CA\_n28A-n77A7 | n1 | 5, 10, 15, 20 | 0 |
|  |  | n28 | 5, 10, 15, 20 |  |
|  |  | n77 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |  |
|  |  | n1 | 5, 10, 15, 20 | 1 |
|  |  | n28 | 5, 10, 15, 20, 25, 30 |  |
|  |  | n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| CA\_n1A-n28A-n77(2A) | CA\_n1A-n77A7  CA\_n28A-n77A7 | n1 | 5, 10, 15, 20 | 0 |
|  |  | n28 | 5, 10, 15, 20 |  |
|  |  | n77 | CA\_n77(2A)\_BCS0 |  |
|  |  | n1 | 5, 10, 15, 20 | 1 |
|  |  | n28 | 5, 10 |  |
|  |  | n77 | CA\_n77(2A)\_BCS1 |  |
| NOTE 7: Minimum requirements for Power Class 2 are applicable for this uplink combination or single uplink carrier in this downlink/uplink combination | | | | |

### 6.56.2 Maximum output power

**Table 6.56.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n1-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n28-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.56.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.56.3.1 Power class 2 case a, b, c, d

Based on calculation, IMD5 of dual UL CA\_n1A-n77A falls into n28 DL and IMD3 of dual UL CA\_n28A-n77A falls into n1 DL respectively, the MSD exceptions are defined as below

**Table 6.56.3-1: 3DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n1-n28-n77 | n1 | 1950 | 5 | 25 | 2140 | N/A | FDD | N/A |
|  | n77 | 3320 | 10 | 50 | 3320 | N/A | TDD | N/A |
|  | n28 | N/A | 5 | N/A | 790 | 16.5 | FDD | IMD5 |
|  | n28 | 740 | 5 | 25 | 795 | N/A | FDD | N/A |
|  | n77 | 3630 | 10 | 50 | 3630 | N/A | TDD | N/A |
|  | n1 | N/A | 5 | N/A | 2150 | 24.7 | FDD | IMD3 |

### 6.56.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 6.57 CA\_n1-n41-n77

### 6.57.1 Configurations

**Table 6.57.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n1A-n41A-n77A | CA\_n1A-n41A7  CA\_n1A-n77A7  CA\_n41A-n77A7 | n1 | 5, 10, 15, 20 | 0 |
|  |  | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 |  |
|  |  | n77 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |  |
| CA\_n1A-n41A-n77(2A) | CA\_n1A-n41A7  CA\_n1A-n77A7  CA\_n41A-n77A7 | n1 | 5, 10, 15, 20 | 0 |
|  |  | n41 | 10, 15, 20, 30, 40, 50, 60, 80, 90, 100 |  |
|  |  | n77 | CA\_n77(2A)\_BCS1 |  |
| NOTE 7: Minimum requirements for Power Class 2 are applicable for this uplink combination or single uplink carrier in this downlink/uplink combination | | | | |

### 6.57.2 Maximum output power

**Table 6.57.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n1-n41 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n1-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n41-n77 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| Case c | 26dBm | 26dBm | 23dBm |
| Case d | 26dBm | 26dBm | 26dBm |

### 6.57.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.57.3.1 Power class 2 case a, b, c, d

Based on calculation, IMD3/4/5 of dual UL CA\_n1A-n41A falls into n77 DL, IMD4/5 of dual UL CA\_n1A-n77A falls into n41 DL, and IMD4 of dual UL CA\_n41A-n77A falls into n1 DL respectively, the MSD exceptions are defined as below

**Table 6.57.3-1: 3DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA**  **Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  CLRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n1-n41-n77 | n1 | 1970 | 5 | 25 | 2160 | N/A | FDD | N/A |
|  | n41 | 2650 | 10 | 50 | 2650 | N/A | TDD | N/A |
|  | n77 | N/A | 10 | N/A | 3330 | 28.2 | TDD | IMD31,2 |
|  | n1 | 1975 | 5 | 10 | 2165 | N/A | FDD | N/A |
|  | n77 | 3410 | 10 | 50 | 3410 | N/A | TDD | N/A |
|  | n41 | N/A | 10 | N/A | 2515 | 22.0 | TDD | IMD41 |
|  | n41 | 2640 | 10 | 50 | 2640 | N/A | TDD | N/A |
|  | n77 | 3710 | 10 | 50 | 3710 | N/A | TDD | N/A |
|  | n1 | N/A | 5 | N/A | 2140 | 21.4 | FDD | IMD4 |
| 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. | | | | | | | | |

### 6.57.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 6.58 CA\_n7-n26-n78

### 6.58.1 Configurations

**Table 6.58.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CA\_n7A-n26A-n78A | CA\_n7A-n26A  CA\_n7A-n78A7  CA\_n26A-n78A7 | 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-n78A7  CA\_n26A-n78A7  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 |  |
| NOTE 7: Minimum requirements for Power Class 2 are applicable for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Minimum requirements for Power Class 1.5 are applicable for single uplink carrier in this downlink/uplink combination | | | | |

### 6.58.2 Maximum output power

**Table 6.58.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n7-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n26-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.58.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.58.3.1 Power class 2 case a, b

Based on coexistence studies, IMD2 of dual UL n7-n78 fall into n26 DL. Test points are reused from PC3 and the PC3 MSD value n26 of 30.2 is recalculated using formula below. The result gives a PC2 IMD2 n26 MSD value of 36.2.

Based on coexistence studies, IMD5 of dual UL n7-n78 fall into n26 DL. Test points are reused from PC3 and the PC3 MSD value n26 of 3.3 is recalculated using formula below. The result gives a PC2 IMD5 n26 MSD value of 15.7.

Based on coexistence studies, IMD2 of dual UL n26-n78 fall into n7 DL, Test points are reused from PC3 and the PC3 MSD value n7 of 30.1 is recalculated using formula below. The result gives a PC2 IMD2 n7 MSD value of 36.1.

MSD for PC2 UL CA is calculated from MSD for PC2 as follows:

If the input signal increases by 3 dB, the IMD3 interference power increases by 3\*3=9 dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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Table 6.58.3-1 3DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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 | N/A | 5 | N/A | 879 | 36.2 | FDD | IMD2 |
|  | n78 | 3429 | 10 | 50 | 3429 | N/A | TDD | N/A |
|  | n7 | 2525 | 5 | 25 | 2645 | N/A | FDD | N/A |
|  | n26 | N/A | 5 | N/A | 875 | 15.7 | FDD | IMD5 |
|  | n78 | 3350 | 10 | 50 | 3350 | N/A | TDD | N/A |
|  | n7 | N/A | 5 | N/A | 2645 | 36.1 | FDD | IMD2 |
|  | n26 | 844 | 5 | 25 | 889 | N/A | FDD | N/A |
|  | n78 | 3489 | 10 | 50 | 3489 | N/A | TDD | N/A |

### 6.58.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

## 6.59 DL CA\_n1-n3-n79, UL CA\_n1A-n79A

### 6.59.1 Configurations

**Table 6.59.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n1A-n3A-n79A | CA\_n1A-n3A  **CA\_n1A-n79A7**  CA\_n3A-n79A | n1 | 5, 10, 15, 20 | 0 |
| n3 | 5, 10, 15, 20, 25, 30 |
| n79 | 40, 50, 60, 80, 100 |
| n1 | 5, 10, 15, 20, 25, 30, 40, 50 | 1 |
| n3 | 5, 10, 15, 20, 25, 30, 40, 50 |
| n79 | 40, 50, 60, 80, 100 |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination. | | | | |

### 6.59.2 Maximum output power

**Table 6.59.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n1A-n79A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.59.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.59.3.1 Power class 2 case a, b

The MSD is same for case a, b.

Since there is no MSD for PC3 UL CA\_n1A-n79A into CA\_n1A-n3A-n79A, none proposed for PC2.

### 6.59.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

## 6.60 DL CA\_n1-n3-n79, UL CA\_n3A-n79A

### 6.60.1 Configurations

**Table 6.60.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n1A-n3A-n79A | CA\_n1A-n3A  CA\_n1A-n79A  **CA\_n3A-n79A7** | n1 | 5, 10, 15, 20 | 0 |
| n3 | 5, 10, 15, 20, 25, 30 |
| n79 | 40, 50, 60, 80, 100 |
| n1 | 5, 10, 15, 20, 25, 30, 40, 50 | 1 |
| n3 | 5, 10, 15, 20, 25, 30, 40, 50 |
| n79 | 40, 50, 60, 80, 100 |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination. | | | | |

### 6.60.2 Maximum output power

**Table 6.60.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n3A-n79A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.60.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.60.3.1 Power class 2 case a, b

The MSD is same for case a, b.

Power class 3 MSD for UL CA\_n3A-n79A:

**Table 6.60.3.1-1 Power class 3 MSD for 2 bands UL CA\_n3A-n79A**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA band combination** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n1-n3-n79 | n3 | 1750 | 5 | 25 | 1845 | N/A | FDD | N/A |
|  | n79 | 4860 | 40 | 216 | 4860 | N/A | TDD | N/A |
|  | n1 | N/A | 5 | N/A | 2140 | 3.6 | FDD | IMD5 |

MSD for PC2 UL CA is calculated from MSD for PC3 as follows:

If the input signal increases by 3dB, the IMD5 increases by 3\*5=15dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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The proposed value for PC2 UL CA MSD can be found in Table 6.60.3.1-2.

**Table 6.60.3.1-2 3DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA band combination** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n1-n3-n79 | n3 | 1750 | 5 | 25 | 1845 | N/A | FDD | N/A |
|  | n79 | 4860 | 40 | 216 | 4860 | N/A | TDD | N/A |
|  | n1 | N/A | 5 | N/A | 2140 | 18.7 | FDD | IMD5 |

### 6.60.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 6.61 DL CA\_n1-n28-n79, UL CA\_n1A-n79A

### 6.61.1 Configurations

**Table 6.61.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n1A-n28A-n79A | CA\_n1A-n28A  **CA\_n1A-n79A7**  CA\_n28A-n79A | n1 | 5, 10, 15, 20 | 0 |
| n28 | 5, 10, 15, 20 |
| n79 | 40, 50, 60, 80, 100 |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination. | | | | |

### 6.61.2 Maximum output power

**Table 6.61.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n1A-n79A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.61.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.61.3.1 Power class 2 case a, b

The MSD is same for case a, b.

Power class 3 MSD for UL CA\_n1A-n79A:

**Table 6.61.3.1-1 Power class 3 MSD for 2 bands UL CA\_n1A-n79A**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA band combination** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n1-n28-n79 | n1 | 1930 | 5 | 25 | 2120 | N/A | FDD | N/A |
|  | n79 | 4648 | 40 | 216 | 4648 | N/A | TDD | N/A |
|  | n28 | N/A | 5 | N/A | 788 | 15.2 | FDD | IMD32 |
| NOTE 2: This band is subject to IMD4 also which MSD is not specified. | | | | | | | | |

MSD for PC2 UL CA is calculated from MSD for PC3 as follows:

If the input signal increases by 3dB, the IMD3 increases by 3\*3=9dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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The proposed value for PC2 UL CA MSD can be found in Table 6.61.3.1-2.

**Table 6.61.3.1-2 3DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA band combination** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n1-n28-n79 | n1 | 1930 | 5 | 25 | 2120 | N/A | FDD | N/A |
|  | n79 | 4648 | 40 | 216 | 4648 | N/A | TDD | N/A |
|  | n28 | N/A | 5 | N/A | 788 | 24.2 | FDD | IMD32 |
| NOTE 2: This band is subject to IMD4 also which MSD is not specified. | | | | | | | | |

### 6.61.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

## 6.62 DL CA\_n1-n28-n79, UL CA\_n28A-n79A

### 6.62.1 Configurations

**Table 6.62.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n1A-n28A-n79A | CA\_n1A-n28A  CA\_n1A-n79A  **CA\_n28A-n79A7** | n1 | 5, 10, 15, 20 | 0 |
| n28 | 5, 10, 15, 20 |
| n79 | 40, 50, 60, 80, 100 |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination. | | | | |

### 6.62.2 Maximum output power

**Table 6.62.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n28A-n79A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.62.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

#### 6.62.3.1 Power class 2 case a, b

The MSD is same for case a, b.

Power class 3 MSD for UL CA\_n28A-n79A:

**Table 6.62.3.1-1 Power class 3 MSD for 2 bands UL CA\_n28A-n79A**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA band combination** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n1-n28-n79 | n28 | 745.5 | 5 | 25 | 800.5 | N/A | FDD | N/A |
|  | n79 | 4420 | 40 | 216 | 4420 | N/A | TDD | N/A |
|  | n1 | N/A | 5 | N/A | 2167.5 | 1.2 | FDD | IMD41 |
| NOTE 1: This band is subject to IMD5 also which MSD is not specified. | | | | | | | | |

MSD for PC2 UL CA is calculated from MSD for PC3 as follows:

If the input signal increases by 3dB, the IMD4 increases by 3\*4=12dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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The proposed value for PC2 UL CA MSD can be found in Table 6.62.3.1-2.

**Table 6.62.3.1-2 3DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Band / Channel bandwidth / NRB / Duplex mode** | | | | | | | | **Source of IMD** |
| **NR CA band combination** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **Duplex mode** |  |
| CA\_n1-n28-n79 | n28 | 745.5 | 5 | 25 | 800.5 | N/A | FDD | N/A |
|  | n79 | 4420 | 40 | 216 | 4420 | N/A | TDD | N/A |
|  | n1 | N/A | 5 | N/A | 2167.5 | 13.4 | FDD | IMD41 |
| NOTE 1: This band is subject to IMD5 also which MSD is not specified. | | | | | | | | |

### 6.62.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 6.63 CA\_n1-n3-n78

### 6.63.1 Configurations

**Table 6.63.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n1A-n3A-n78A | n787,9  CA\_n1A-n3A  CA\_n1A-n78A7  CA\_n3A-n78A7 | n1 | 5, 10, 15, 20 | 0 |
| n3 | 5, 10, 15, 20, 25, 30 |
| n78 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |
| n1 | 5, 10, 15, 20, 25, 30, 40, 50 | 1 |
| n3 | 5, 10, 15, 20, 25, 30, 40 |
| n78 | 10, 15, 20, 40, 50, 60, 70, 80, 90, 100 |
|  |  | n1 | 5, 10, 15, 20 | 2 |
|  |  | n3 | 5, 10, 15, 20, 25, 30, 40 |  |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
|  |  | n1 | n1 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n3 | n3 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n78 | n78 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n1A-n3A-n78(2A) | n787,9  CA\_n78(2A)7  CA\_n1A-n3A  CA\_n1A-n78A7  CA\_n3A-n78A7 | n1 | 5, 10, 15, 20 | 0 |
| n3 | 5, 10, 15, 20, 25, 30, 40 |
| n78 | CA\_n78(2A)\_BCS2 |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.63.2 Maximum output power

**Table 6.63.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n1-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n3-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.63.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

6.63.3.1 Power class 2 case a, b

Based on calculation, IMD2 of dual UL CA\_n1-n78 may fall into n3 DL, MSD value is already defined in TS 38-101-1.

Coexistence analysis for UL n78 and CA\_n78(2A) for lower order fallbacks are performed in R4-2409353.

### 6.63.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

## 6.64 CA\_n1-n28-n78

### 6.64.1 Configurations

**Table 6.64.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n1A-n28A-n78A | n787,9  CA\_n1A-n28A  CA\_n1A-n78A7  CA\_n28A-n78A7 | n1 | 5, 10, 15, 20 | 0 |
| n28 | 5, 10, 15, 202 |
| n78 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |
| n1 | 5, 10, 15, 20 | 1 |
| n28 | 5, 10, 15, 20 |
| n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |
|  |  | n1 | 5, 10, 15, 20, 25, 30, 40, 50 | 2 |
|  |  | n28 | 5, 10, 15, 20, 30 |  |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
| CA\_n1A-n28A-n78(2A) | n787,9  CA\_n78(2A)7  CA\_n1A-n28A  CA\_n1A-n78A7  CA\_n28A-n78A7 | n1 | 5, 10, 15, 20 | 0 |
| n28 | 5, 10, 15, 20 |
| n78 | CA\_n78(2A)\_BCS2 |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.64.2 Maximum output power

**Table 6.64.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n1-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n28-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.64.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

6.64.3.1 Power class 2 case a, b

Based on calculation, IMD5 of dual UL CA\_n1-n78 fall into n28 DL, IMD3 of dual UL CA\_n28-n78 falls into n1 DL.

Coexistence analysis for UL n78 and CA\_n78(2A) for lower order fallbacks are performed in R4-2409353.

MSD for PC2 UL CA is calculated from MSD for PC3 as follows:

If the input signal increases by 3 dB, the IMD3 interference power increases by 3\*3=9 dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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Table 6.25.3-1 3DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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-n28-n78 | n1 | N/A | 5 | N/A | 2150 | 24.6 | FDD | IMD3 |
|  | n28 | 740 | 5 | 25 | 795 | N/A | FDD | N/A |
|  | n78 | 3630 | 10 | 50 | 3630 | N/A | TDD | N/A |
|  | n1 | 1970 | 5 | 25 | 2160 | N/A | FDD | N/A |
|  | n28 | N/A | 5 | N/A | 794 | 17.2 | FDD | IMD5 |
|  | n78 | 3352 | 10 | 50 | 3352 | N/A | TDD | N/A |

### 6.64.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

## 6.65 CA\_n3-n7-n78

### 6.65.1 Configurations

**Table 6.65.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n3A-n7A-n78A | n787,9  CA\_n3A-n7A  CA\_n3A-n78A7  CA\_n7A-n78A7 | n3 | 5, 10, 15, 20, 25, 30 | 0 |
| n7 | 5, 10, 15, 20, 25, 30, 40, 50 |
| n78 | 10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100 |
| n3 | 5, 10, 15, 20, 25, 30, 40 | 1 |
| n7 | 5, 10, 15, 20, 25, 30, 40, 50 |
| n78 | 10, 15, 20, 25, 30, 40, 50, 60, 704, 80, 90, 100 |
|  |  | n3 | n3 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n7 | n7 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n78 | n78 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n3A-n7A-n78(2A) | n787,9  CA\_n78(2A)7  CA\_n3A-n7A  CA\_n3A-n78A7  CA\_n7A-n78A7 | n3 | 5, 10, 15, 20, 25, 30, 40 | 0 |
| n7 | 5, 10, 15, 20, 25, 30, 40, 50 |
| n78 | CA\_n78(2A)\_BCS2 |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.65.2 Maximum output power

**Table 6.65.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n3-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n7-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.65.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

6.65.3.1 Power class 2 case a, b

Based on calculation, IMD3 and IMD4 of dual UL CA\_n7-n78 falls into n3 DL.

Coexistence analysis for UL n78 and CA\_n78(2A) for lower order fallbacks are performed in R4-2409353.

MSD for PC2 UL CA is calculated from MSD for PC3 as follows:

If the input signal increases by 3 dB, the IMD3 interference power increases by 3\*3=9 dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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If is increased by dB, then is given by

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Table 6.65.3-1 3DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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-n78 | n3 | N/A | 5 | N/A | 1820 | 26.6 | FDD | IMD3 |
|  | n7 | 2565 | 5 | 25 | 2685 | N/A | FDD | N/A |
|  | n78 | 3310 | 10 | 50 | 3310 | N/A | TDD | N/A |
|  | n3 | N/A | 5 | N/A | 1820 | 17 | FDD | IMD4 |
|  | n7 | 2565 | 5 | 25 | 2685 | N/A | FDD | N/A |
|  | n78 | 3475 | 10 | 50 | 3475 | N/A | TDD | N/A |

### 6.65.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

## 6.66 CA\_n3-n28-n78

### 6.66.1 Configurations

**Table 6.66.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n3A-n28A-n78A | n787,9  CA\_n3A-n28A  CA\_n3A-n78A7  CA\_n28A-n78A7 | n3 | 5, 10, 15, 20 | 0 |
|  |  | n28 | 5, 10, 15, 202 |  |
|  |  | n78 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |  |
|  |  | n3 | 5, 10, 15, 20, 25, 30, 40 | 1 |
|  |  | n28 | 5, 10, 15, 202 |  |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |
|  |  | n3 | 5, 10, 15, 20, 25, 30, 40 | 2 |
|  |  | n28 | 5, 10 |  |
|  |  | n78 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |  |
| CA\_n3A-n28A-n78(2A) | n787,9  CA\_n3A-n28A  CA\_n3A-n78A7  CA\_n28A-n78A7 | n3 | 5, 10, 15, 20 | 0 |
|  |  | n28 | 5, 10, 15, 202 |  |
|  |  | n78 | CA\_n78(2A)\_BCS0 |  |
|  |  | n3 | 5, 10, 15, 20, 25, 30, 40 | 1 |
|  |  | n28 | 5, 10 |  |
|  |  | n78 | CA\_n78(2A)\_BCS2 |  |
|  | n787,9  CA\_n78(2A)7  CA\_n3A-n28A  CA\_n3A-n78A7  CA\_n28A-n78A7 | n3 | 5, 10, 15, 20, 25, 30, 40 | 2 |
|  |  | n28 | 5, 10, 15, 20 |  |
|  |  | n78 | CA\_n78(2A)\_BCS2 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.66.2 Maximum output power

**Table 6.66.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n3-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n28-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.66.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

6.66.3.1 Power class 2 case a, b

Based on calculation, IMD3 of dual UL CA\_n28-n78 may fall into n3 DL.

Coexistence analysis for UL n78 and CA\_n78(2A) for lower order fallbacks are performed in R4-2409354.

MSD for PC2 UL CA is calculated from MSD for PC3 as follows:

If the input signal increases by 3 dB, the IMD3 interference power increases by 3\*3=9 dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

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Table 6.66.3-1 3DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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-n28-n78 | n3 | N/A | 5 | N/A | 1850 | 29.2 | FDD | IMD3 |
|  | n28 | 735 | 5 | 25 | 790 | N/A | FDD | N/A |
|  | n78 | 3320 | 10 | 50 | 3320 | N/A | TDD | N/A |

### 6.66.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

## 6.67 CA\_n7-n28-n78

### 6.67.1 Configurations

**Table 6.67.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n7A-n28A-n78A | n787,9  CA\_n7A-n78A7  CA\_n28A-n78A7 | n7 | 5, 10, 15, 20, 25, 30, 40, 50 | 0 |
|  |  | n28 | 5, 10, 15, 20 |  |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 80, 90, 100 |  |
|  | n787,9  CA\_n7A-n28A  CA\_n7A-n78A7  CA\_n28A-n78A7 | n7 | 5, 10, 15, 20, 25, 30, 40, 50 | 1 |
|  |  | n28 | 5, 10, 15, 20 |  |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 704, 80, 90, 100 |  |
| CA\_n7A-n28A-n78(2A) | n787,9  CA\_n78(2A)7  CA\_n7A-n28A  CA\_n7A-n78A7  CA\_n28A-n78A7 | n7 | 5, 10, 15, 20, 25, 30, 40, 50 | 0 |
|  |  | n28 | 5, 10, 15, 20 |  |
|  |  | n78 | CA\_n78(2A)\_BCS2 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.67.2 Maximum output power

**Table 6.67.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n7-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n28-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.67.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

6.67.3.1 Power class 2 case a, b

Coexistence studies for UL CA\_n28-n78 and CA\_n7-n78 are already included in TS 38.101-1.

UL n78 and CA\_n78(2A) are already defined for lower order fallbacks in TS 38.101-1.

### 6.67.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

## 6.68 CA\_n1-n77-n79

### 6.68.1 Configurations

**Table 6.68.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n1A-n77A-n79A4 | CA\_n1A-n77A**7**  CA\_n1A-n79A**7**  CA\_n77A-n79A**7** | n1 | 5, 10, 15, 20 | 0 |
| n77 | 10, 15, 20, 40, 50, 60, 80, 90, 100 |
| n79 | 40, 50, 60, 80, 100 |
| CA\_n1A-n77(2A)-n79A4 | CA\_n1A-n77A**7**  CA\_n1A-n79A**7**  CA\_n77A-n79A**7**  CA\_n77A(2A)**7** | n1 | 5, 10, 15, 20 | 0 |
| n77 | CA\_n77(2A) BCS0 |
| n79 | 40, 50, 60, 80, 100 |
| NOTE 4: The minimum requirements only apply for non-simultaneous Tx/Rx between all carriers for TDD combinations.  NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination.  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination. | | | | |

### 6.68.2 Maximum output power

**Table 6.68.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n1A-n77A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n1A-n79A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n77A-n79A | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| Case c | 26dBm | 26dBm | 23dBm |
| Case d | 26dBm | 26dBm | 26dBm |

### 6.68.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

6.68.3.1 Power class 2 case a, b, c, d

MSD analysis of ULCA\_n77(2A) can be skipped. Because the impact of it has already been investigated in PC3’s fallback combination.

Based on PC3’s co-existence studies of 2UL/2DL CA\_n1-n77, CA\_n1-n79, and CA\_n77-n79 in TR38.717-03-02[9], own Rx impact of the 3rd band is the followings

-3rd, 4th and 5th order IMD generated by dual uplink of CA\_n1-n77 may fall into part of own band n79.

=> There is no need to have MSD added because non-simultaneous Rx-Tx operation for CA\_n77-n79 is assumed, therefore no MSD is needed for CA\_n1-n77.

-5th order IMD generated by dual uplink of CA\_n1-n79 may fall into part of own band n77.

=> There is no need to have MSD added because non-simultaneous Rx-Tx operation for CA\_n77-n79 is assumed, therefore no MSD is needed for CA\_n1-n79.

-3rd, 4th and 5th order IMD generated by dual uplink of CA\_n77-n79 may fall into part of own band n1.

=> The MSD values are shown in the following table. This MSD value is the average of the analysis results of the two companies. Also, we define only the highest MSD, and omit the MSDs due to IM4 and IM5. This is described in NOTE2 and NOTE1.

Table 6.68.3-1: MSD for the CA configuration

| **NR Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **CA Configuration** | **NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL**  **LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| CA\_n1A-n77A-n79A | n1 | 1950 | 5 | 25 | 2140 | 24.6 | IMD31,2 |
| n77 | 3400 | 10 | 50 | 3400 | N/A | N/A |
| n79 | 4660 | 40 | 216 | 4660 | N/A | N/A |
| 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. | | | | | | | |

### 6.68.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA.

## 6.69 CA\_n1-n-n78

### 6.69.1 Configurations

**Table 6.69.1-1: NR CA configurations and bandwidth combinations sets defined for inter-band CA (three bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or**  **single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n1A-n7A-n78A | n787,9  CA\_n1A-n7A  CA\_n1A-n78A7  CA\_n7A-n78A7 | n1 | 5, 10, 15, 20 | 0 |
| n7 | 5, 10, 15, 20, 25, 30, 40, 50 |
| n78 | 10, 15, 20, 40, 50, 60, 80, 901,100 |
| n1 | 5, 10, 15, 20 | 1 |
| n7 | 5, 10, 15, 20, 25, 30, 40, 50 |
| n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 901, 100 |
|  |  | n1 | n1 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n7 | n7 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n78 | n78 channel bandwidths in Table 5.3.5-1 |  |
| CA\_n1A-n7A-n78(2A) | n787,9  CA\_n1A-n7A  CA\_n1A-n78A7  CA\_n7A-n78A7 | n1 | 5, 10, 15, 20 | 0 |
|  |  | n7 | 5, 10, 15, 20, 25, 30, 40, 50 |  |
|  |  | n78 | CA\_n78(2A)\_BCS0 |  |
|  | n787,9  CA\_n78(2A)7  CA\_n1A-n7A  CA\_n1A-n78A7  CA\_n7A-n78A7 | n1 | 5, 10, 15, 20 | 1 |
|  |  | n7 | 5, 10, 15, 20, 25, 30, 40, 50 |  |
|  |  | n78 | CA\_n78(2A)\_BCS2 |  |
| NOTE 7: Power Class 2 is allowed for this uplink combination or single uplink carrier in this downlink/uplink combination  NOTE 9: Power Class 1.5 is allowed for this single uplink carrier in this downlink/uplink combination | | | | |

### 6.69.2 Maximum output power

**Table 6.69.2-1 UE Power Class 2 for uplink inter-band CA (two bands)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Uplink CA configuration** | **Power class 2 cases for CA\_nX-nY** | **CA power class** | **Carrier X power class** | **Carrier Y power class** |
| CA\_n1-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |
| CA\_n7-n78 | Case a | 26dBm | 23dBm | 23dBm |
| Case b | 26dBm | 23dBm | 26dBm |

### 6.69.3 REFSENS requirements

Analysis of REFSENS exceptions or MSD requirements is needed due to higher power uplink.

6.69.3.1 Power class 2 case a, b

Based on calculation, IMD4 of dual UL CA\_n1-n78 may fall into n7 DL, IMD4 of dual UL CA\_n7-n78 falls into n1 DL.

Coexistence analysis for UL n78 and CA\_n78(2A) for lower order fallbacks are performed in R4-2409353.

MSD for PC2 UL CA is calculated from MSD for PC3 as follows:

If the input signal increases by 3 dB, the IMD3 interference power increases by 3\*3=9 dB.

MSD due to interference power is given by



where N is the noise spectral density and BW is the bandwidth of the carrier. If the initial MSD is known,

then we have

Text

Description automatically generated

If is increased by dB, then is given by

A picture containing logo

Description automatically generated





Table 6.69.3-1 3DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurations for PC2 CA

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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-n78 | n1 | 1977.5 | 5 | 25 | 2167.5 | N/A | FDD | N/A |
|  | n7 | N/A | 5 | N/A | 2627.5 | 20.6 | FDD | IMD4 |
|  | n78 | 3305 | 10 | 50 | 3305 | N/A | TDD | N/A |
|  | n1 | N/A | 5 | N/A | 2140 | 20.1 | FDD | IMD4 |
|  | n7 | 2510 | 10 | 50 | 2630 | N/A | FDD | N/A |
|  | n78 | 3580 | 10 | 50 | 3580 | N/A | TDD | N/A |

### 6.69.4 ∆TIB and ∆RIB values

There is no change by comparing to the values for PC3 CA, so this section is omitted.

# 7 Power class 2 CA with SUL

## 7.x CA\_nW-nX\_SUL\_nY-nZ

### 7.x.1 Configurations

*<Editor’s note: the CA configurations and bandwidth combinations sets should be kept same as defined in 38.101-1 Table 5.5C-4 unless additional clarification>*

Table 7.x.1-1: NR CA configurations and bandwidth combinations sets for supporting power class 2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink configuration | NR Band | Channel Bandwidth | Bandwidth combination set |
| *CA\_nW-nX\_SUL\_nY-nZ* | *SUL\_nY-nZ* | *nW* |  |  |
| *nX* |  |
| *nY* |  |
| *nZ* |  |

### 7.x.2 Maximum output power

### 7.x.3 REFSENS requirements

*<Editor’s note: This agenda will capture the Reference sensitivity exceptions or MSD requirements due to higher power for CA carrier, please use the same table format as in 38101-1. >*

### 7.x.4 ∆TIB and ∆RIB values

*<Editor’s note: If no change by comparing to the values for power class 3 CA, this section will be void.>*

# Annex <A> (informative): Change history

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Change history** | | | | | | | |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2022-11 | RAN4 #105 | R4-2219272 |  |  |  | TR skeleton | 0.0.1 |
| 2022-11 | RAN4#105 | R4-2220844 |  |  |  | The following TPs are approved:  R4-2220470 TP for HPUE CA\_n77-n79 with 1UL for TR 38.899, NTT DOCOMO Inc  R4-2220471 TP for HPUE CA\_n78-n79 with 1UL for TR 38.899, NTT DOCOMO Inc  R4-2220472 TP for TR38.899 for DL CA\_n25-n41-n66 with PC2 2BUL, T-Mobile USA  R4-2220004 TP for TR38.899 for DL CA\_n25-n41-n71 with PC2 2BUL, T-Mobile USA  R4-2220475 TP for TR38.899 for DL CA\_n25-n41-n77 with PC2 2BUL, T-Mobile USA  R4-2220476 TP for TR38.899 for DL CA\_n25-n66-n77 with PC2 2BUL, T-Mobile USA  R4-2220477 TP for TR38.899 for DL CA\_n25-n71-n77 with PC2 2BUL, T-Mobile USA  R4-2220008 TP for TR38.899 for DL CA\_n41-n66-n71 with PC2 2BUL, T-Mobile USA  R4-2220478 TP for TR38.899 for DL CA\_n41-n66-n77 with PC2 2BUL, T-Mobile USA  R4-2220479 TP for TR38.899 for DL CA\_n41-n71-n77 with PC2 2BUL, T-Mobile USA  R4-2220480 TP for TR38.899 for DL CA\_n66-n71-n77 with PC2 2BUL, T-Mobile USA  R4-2220012 TP for TR38.899 for DL CA\_n25-n41C with PC2 UL CA\_n41C, T-Mobile USA  R4-2220013 TP for TR38.899 for DL CA\_n41C-n66 with PC2 UL CA\_n41C, T-Mobile USA  R4-2220014 TP for TR38.899 for DL CA\_n41C-n71 with PC2 UL CA\_n41C, T-Mobile USA  R4-2220015 TP for TR38.899 for DL CA\_n41C-n77 with PC2 UL CA\_n41C, T-Mobile USA | 0.1.0 |
| 2023-03 | RAN4#106 | R4-2300720 |  |  |  | The following TPs are approved:  R4-2303453 TP for HPUE CA\_n3-n41 with 1UL for TR 38.899, Samsung, KDDI  R4-2303456 TP for HPUE CA\_n3-n77 with 1UL and 2UL for TR 38.899, Samsung, KDDI  R4-2303528 TP for TR38.899 PC2 CA\_n8A-n78A, ZTE Corporation, China Unicom, CHTTL  R4-2303454 TP for HPUE CA\_n40-n77 with 1UL for TR 38.899, Samsung, KDDI  R4-2301130 TP for HPUE CA\_n3-n28-n41 with 2UL for TR 38.899, Samsung, KDDI  R4-2301132 TP for HPUE CA\_n3-n41-n77 with 2UL for TR 38.899, Samsung, KDDI | 0.2.0 |
| 2023-04 | RAN4#106bis-e | R4-2304522 |  |  |  | The following TPs are approved:  R4-2305020 TP for HPUE CA\_n28-n77 with 1UL and 2UL for TR 38.899 Samsung, KDDI, Qualcomm  R4-2305018 TP for HPUE CA\_n3-n28-n77 with 1UL and 2UL for TR 38.899 Samsung, KDDI, Qualcomm  R4-2305019 TP for HPUE CA\_n28-n41-n77 with 1UL and 2UL for TR 38.899 Samsung, KDDI, Qualcomm | 0.3.0 |
| 2023-05 | RAN4#107 | R4-2307920 |  |  |  | The following TPs are approved:  R4-2308074 TP to TR 38.899 Addition of CA\_n2-n48-n77, Nokia, Verizon  R4-2308075 TP to TR 38.899 Addition of CA\_n5-n48-n77, Nokia, Verizon  R4-2308076 TP to TR 38.899 Addition of CA\_n48-n66-n77, Nokia, Verizon  R4-2308139 TP for HPUE CA\_n1-n41 with 1UL and 2UL for TR 38.899, Samsung, KDDI  R4-2308140 TP for HPUE CA\_n1-n77 with 1UL and 2UL for TR 38.899, Samsung, KDDI  R4-2309379 TP for HPUE CA\_n2A-n5A-n77C with 2UL for TR 38.899, Samsung, Verizon, Nokia | 0.4.0 |
| 2023-08 | RAN4#108 | R4-2313487 |  |  |  | The following TPs are approved:  R4-2311967 TP for HPUE CA\_n1-n3-n41 with 2UL for TR 38.899, Samsung, KDDI  R4-2313322 TP for 38.899 adding HPUE for CA\_n25-n78, Ericsson, Bell Mobility  R4-2313330 TP for 38.899 adding HPUE for CA\_n66-n78, Ericsson, Bell Mobility  R4-2313324 TP for 38.899 adding HPUE for CA\_n7-n66-n78, Ericsson, Bell Mobility  R4-2314637 TP for 38.899 adding HPUE for CA\_n7-n77, Ericsson, Bell Mobility  R4-2314638 TP for 38.899 adding HPUE for CA\_n25-n66-n78, Ericsson, Bell Mobility  R4-2314639 TP for adding UL CA\_n77(2A) to DL CA\_n1A-n77(2A) for PC2 HPUE in TR 38.899, KDDI, Samsung, Qualcomm  R4-2314640 TP for adding UL CA\_n77(2A) to DL CA\_n3A-n77(2A) for PC2 HPUE in TR 38.899, KDDI, Samsung, Qualcomm  R4-2314689 TP for adding UL CA\_n77(2A) to DL CA\_n28A-n77(2A) for PC2 HPUE in TR 38.899, KDDI, Samsung, Qualcomm  R4-2314901 TP for TR38.899: CA\_n77-n79, CA\_n3-n77, CA\_n28-n77, CA\_n1-n77, CA\_n1-n79, CA\_n8-n79, SoftBank, LG Electronics | 0.5.0 |
| 2023-10 | RAN4#108bis | R4-2316479 |  |  |  | The following TPs are approved:  R4-2315470 TP for TR 38.899 to include HPUE CA\_n13-n77 Samsung, TELUS, Bell Mobility  R4-2316418 TP for 38.899 adding non-contiguous UL to CA\_n7-n77 Ericsson, Bell Mobility, Huawei, HiSiicon  R4-2316419 TP for 38.899 adding PC1.5 single UL and PC2 non-contiguous UL to CA\_n5-n77 Ericsson, Bell Mobility  R4-2316420 TP for 38.899 adding PC1.5 single UL and PC2 non-contiguous UL to CA\_n66-n77 Ericsson, Bell Mobility  R4-2316421 TP for 38.899 adding PC1.5 single UL and PC2 non-contiguous UL to CA\_n25-n77 Ericsson, Bell Mobility  R4-2317581 TP for TR 38.899 to include HPUE CA\_n5-n7-n77 Samsung, TELUS, Bell Mobility  R4-2317582 TP for TR 38.899 to include HPUE CA\_n7-n25-n77 Samsung, TELUS, Bell Mobility  R4-2317584 TP for 38.899 adding HPUE CA\_n5-n25-n77 Ericsson, Bell Mobility  R4-2317585 TP for 38.899 adding HPUE CA\_n5-n25-n78 Ericsson, Bell Mobility  R4-2317676 TP for 38.899 to include HPUE CA\_n7-n66-n77 Nokia, TELUS, Bell Mobility  R4-2317677 TP for 38.899 to include HPUE CA\_n7-n71-n77 Nokia, TELUS, Bell Mobility  R4-2317678 TP for 38.899 to include HPUE CA\_n13-n25-n77 Nokia, TELUS, Bell Mobility | 0.6.0 |
| 2023-11 | RAN#109 | R4-2320676 |  |  |  | The following TPs are approved:  R4-2319769 TP for TR 38.899 to include HPUE CA\_n71-n78 Samsung, TELUS, Bell Mobility  R4-2319771 TP for HPUE CA\_n1-n3-n77 with 2UL for TR 38.899 Samsung, KDDI, Qualcomm  R4-2320313 TP for 38.899 adding PC2 non-contiguous UL to CA\_n5-n78 Ericsson, Bell Mobility  R4-2321704 TP for TR38.899 PC2 NRCA for FR1 2DL 1or2UL and PC1.5 NRCA for FR1 2DL and 1UL SoftBank, LG Electronics  R4-2321705 TP for HPUE CA\_n1-n28-n41 with 2UL for TR 38.899 Samsung, KDDI, LGE  R4-2321707 TP for adding UL CA\_n77(2A) to DL CA\_n3A-n28A-n77(2A) for PC2 HPUE in TR 38.899 Samsung, KDDI, Qualcomm  R4-2321708 TP for PC2 HPUE CA\_n18-n41 with 2UL for TR 38.899 Samsung, KDDI, Qualcomm  R4-2321709 TP for PC2 HPUE CA\_n18-n77 with 2UL in TR 38.899 KDDI, Samsung, LGE, Murata, Skyworks  R4-2321710 TP for PC2 HPUE CA\_n18-n28-n77 with 2UL in TR 38.899 KDDI, Samsung, Murata  R4-2321978 TP for HPUE CA\_n3-n18-n77 with 2UL in TR 38.899 KDDI, Samsung, LGE | 0.7.0 |
| 2024-03 | RAN#110 | R4-2402217 |  |  |  | The following TPs are approved:  R4-2403618 [HPUE\_FR1\_TDD\_NR\_CADC\_SUL\_R18] TP for adding 1cc UL to CA\_n28A-n41A-n77A for PC1.5 HPUE in TR 38.899, KDDI  R4-2403620 [HPUE\_FR1\_TDD\_NR\_CADC\_SUL\_R18] TP for inter-band 2UL to CA\_n18A-n41A-n77A for PC2 HPUE in TR 38.899, KDDI  R4-2400331 TP for TR38.899 to include new HP-NRCA combinations for FR1, SoftBank  R4-2403847 TP for TR38.899: Addition of uplink configurations to CA\_n8A-n78A, SoftBank  R4-2403621 TP for 38.899 adding CA\_n78(2A) PC2 UL to CA\_n7A-n78(2A), Ericsson, Bell Mobility, TELUS  R4-2401474 TP for 38.899 adding CA\_n78(2A) PC2 UL to CA\_n66A-n78(2A), Ericsson, Bell Mobility, TELUS  R4-2401475 TP for 38.899 adding CA\_n78(2A) PC2 UL to CA\_n25A-n78(2A), Ericsson, Bell Mobility, TELUS  R4-2401476 TP for 38.899 adding CA\_n77(2A) PC2 UL to CA\_n25(2A)-n77(2A), Ericsson, Bell Mobility, TELUS  R4-2403826 TP for 38.899 adding PC2 UL to CA\_n13A-n66A-n77A, Ericsson, Bell Mobility, TELUS  R4-2402356 TP for TR 38.899 to include HPUE CA\_n71-n77 with UL CA\_n77(2A), Samsung, TELUS, Bell Mobility  R4-2402362 TP for HPUE CA\_n1-n28-n77 with 2UL for TR 38.899, Samsung, KDDI Corporation, Qualcomm Incorporated, SoftBank Corp.  R4-2403622 TP for HPUE CA\_n1-n41-n77 with 2UL for TR 38.899, Samsung, KDDI Corporation, Qualcomm Incorporated, LGE  R4-2403623 TP for TR38.899 for DL CA\_n77A-n85A with UL PC2 CA\_n77A-n85A and PC2 and PC1.5 UL n77, T-Mobile USA | 0.8.0 |
| 2024-04 | RAN4#110bis | R4-2404883 |  |  |  | The following TPs are approved:  R4-2406559 TP for TR38.899 to add HP-NRCA n28-n77, n41-n77 and n77-n79, SoftBank Corp.  R4-2406560 TP for TR38.899 to add HP NRCA n1-n41, n1-n3-n79 and n1-n28-n79, SoftBank Corp., LG Electronics  R4-2406561 TP to TR 38.899 Addition of PC2 and PC1.5 for CA\_n40A-n77A, Nokia, NBN  R4-2406562 TP to TR 38.899 Addition of PC2 and PC1.5 for CA\_n40A-n78A, Nokia, NBN  R4-2406563 (HPUE\_FR1\_TDD\_NR\_CADC\_SUL\_R18) TP for TR 38.899 to introduce PC2 and PC1.5 CA\_n39-n41, CMCC, ZTE Corporation, Huawei, HiSilicon, Murata Manufacturing Co Ltd.  R4-2406564 (HPUE\_FR1\_TDD\_NR\_CADC\_SUL\_R18) TP for TR 38.899 to introduce PC2 and PC1.5 CA\_n28A-n40A, CMCC, ZTE Corporation, Huawei, HiSilicon, Murata Manufacturing Co Ltd.  R4-2405372 (HPUE\_FR1\_TDD\_NR\_CADC\_SUL\_R18) TP for TR 38.899 to introduce PC2 CA\_n3A-n41C, CMCC, ZTE Corporation, Huawei, HiSilicon, Murata Manufacturing Co Ltd.  R4-2405373 (HPUE\_FR1\_TDD\_NR\_CADC\_SUL\_R18) TP for TR 38.899 to introduce PC2 and PC1.5 CA\_n40A-n41A, CMCC, ZTE Corporation, Huawei, HiSilicon, Murata Manufacturing Co Ltd. | 0.9.0 |
| 2024-05 | RAN4#111 | R4-2409642 |  |  |  | The following TPs are approved:  R4-2407169 TP for TR38.899 to add new HP-NRCA combinations for FR1, SoftBank Corp.  R4-2410541 TP for TR38.899 to add new HP-NRCA 1-77-79 with 2UL, SoftBank Corp. LGE  R4-2409239 TP for adding UL CA\_n77(2A) to HPUE CA\_n3-n41-n77(2A) for TR 38.899, KDDI, Samsung, Qualcomm  R4-2409298 TP for adding UL CA\_n77(2A) to HPUE CA\_n28-n41-n77(2A) for TR 38.899, KDDI  R4-2409346 TP for 38.899 to add PC2 and PC1.5 UL to CA\_n1-n3-n78, Ericsson, BT plc  R4-2410542 TP for 38.899 to add PC2 and PC1.5 UL to CA\_n1-n7-n78, Ericsson, BT plc  R4-2409348 TP for 38.899 to add PC2 and PC1.5 UL to CA\_n1-n28-n78, Ericsson, BT plc  R4-2409349 TP for 38.899 to add PC2 and PC1.5 UL to CA\_n3-n7-n78, Ericsson, BT plc  R4-2409350 TP for 38.899 to add PC2 and PC1.5 UL to CA\_n3-n28-n78, Ericsson, BT plc  R4-2409351 TP for 38.899 to add PC2 and PC1.5 UL to CA\_n7-n28-n78, Ericsson, BT plc  R4-2410543 TP for 38.899 to add CA\_n78(2A) PC2 UL to CA\_n1A-n78(2A), Ericsson, BT plc  R4-2410544 TP for 38.899 to add CA\_n78(2A) PC2 UL to CA\_n3A-n78(2A), Ericsson, BT plc  R4-2409354 TP for 38.899 to add CA\_n78(2A) PC2 UL to CA\_n28A-n78(2A), Ericsson, BT plc  R4-2407948 (HPUE\_FR1\_TDD\_NR\_CADC\_SUL\_R18) TP for TR 38.899 to introduce PC2 and PC1.5 CA\_n3A-n40A, CMCC, Murata Manufacturing Co Ltd., ZTE Corporation | 0.10.0 |