**3GPP TSG-RAN WG4 Meeting # 110-bis R4-2405057**

**China, Changsha, April 15 – April 19, 2024**

**Title:** **TP to TR 38.899: Addition of PC2 and PC1.5 for CA\_n40A-n78A**

**Source: Nokia, nbn**

**Agenda item: 5.17.2**

**Document for: Approval**

# 1 Introduction

This is a TP to TR 38.899 to add PC2 and PC1.5 for CA\_n40A-n78A. CA\_n40A-n78A PC3 is completed as a fallback. At the same meeting a TP for addition of PC2 and PC1.5 for CA\_n40A-n77A is submitted and due to the frequency overlap of n77 and n78 the analysis is reused with the reduced frequency range for n78.

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## 5.x CA\_n40-n78

### 5.x.1 Configurations

**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\_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.x.2 Maximum output power

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\_n40-n78 | 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

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

5.x.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.x.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.x.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.x.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.x.3.3 Power class 1.5 for single uplink n78

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

**Table 5.x.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.x.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.x.3.4 Power class 2 and 1.5 for single uplink n40

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

### 5.x.4 ∆TIB and ∆RIB values

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

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