**3GPP TSG-RAN4 Meeting #116bis** **R4-2514199**

**Prague, Czech Republic, 13 October – 17 October 2025**

**Source:** Ericsson, Odido

**Title:** TP for TR 38.719-03-01 adding CA\_n20-n28-n78

**Agenda item:** 5.3.4

**Document for:** Approval

# 1. Introduction

This contribution is a text proposal for TR 38.719-03-01 to include CA\_ n20A-n28A-n78A as defined in WID [1].

# ---Start of changes---

## 5.x CA\_n20-n28-n78

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

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

Table 5.x.1.1-1: CA band combination constituent bands definition

|  |  |  |  |
| --- | --- | --- | --- |
| **NR Band** | **Uplink (UL) band** | **Downlink (DL) band** | **Duplex**  **mode** |
| **BS receive / UE transmit** | **BS transmit / UE receive** |
| **FUL\_low – FUL\_high** | **FDL\_low – FDL\_high** |
| n20 | 832 MHz – 862 MHz | 791 MHz – 821 MHz | FDD |
| n28 | 703 MHz – 748 MHz | 758 MHz – 803 MHz | FDD |
| n78 | 3300 MHz – 3800 MHz | 3300 MHz – 3800 MHz | TDD |

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

Table 5.x.1.2-1: Supported bandwidths per CA band combination

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CA operating/channel bandwidth (MHz) | | | | |
| NR CA configuration | **Uplink CA configuration or single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n20A-n28A-n78A 15 | CA\_n20A-n28A  CA\_n20A-n78A  CA\_n28A-n78A | n20 | n20 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n28 | n28 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n78 | n78 channel bandwidths in Table 5.3.5-1 |  |
| NOTE 15 For UEs supporting CA between n20 and n28, the minimum requirements are specified for any n28 DL channel bandwidth confined to 758-791 MHz. | | | | |

#### 5.x.1.3 ∆TIB,c and ∆RIB,c values

The ΔTIB,c and ΔRIB,c values are already defined in 38.101-1.

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

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

##### 5.x.2.1.1 Co-existence studies for 2UL band with 1CC per band

Table 5.x.2.1.1-1, Table 5.x.2.1.1-2 and Table 5.x.2.1.1-3 provide the two UL bands with one CC per band IMD interference analysis for CA\_n20A-n28A-n78A with UL CA\_n20A-n28A, UL CA\_n20A-n78A and UL CA\_n28A-n78A.

Table 5.x.2.1.1-1: Two UL bands IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 832 | 862 | 703 | 748 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 159 | 84 | 1535 | 1610 |
| Two-tone 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 1021 | 916 | 544 | 664 |
| Two-tone 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 2367 | 2472 | 2238 | 2358 |
| Two-tone 4th order IMD products | |3\*fx\_low – 1\*fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 1748 | 1883 | 1247 | 1412 |
| Two-tone 4th order IMD products | |2\*fx\_low – 2\*fy\_high| | |2\*fx\_high – 2\*fy\_low| |  |  |
| IMD frequency limits (MHz) | 318 | 168 |  |  |
| Two-tone 4th order IMD products | |3\*fx\_low + 1\*fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 3199 | 3334 | 2941 | 3106 |
| Two-tone 4th order IMD products | |2\*fx\_low + 2\*fy\_low| | |2\*fx\_high + 2\*fy\_high| |  |  |
| IMD frequency limits (MHz) | 3070 | 3220 |  |  |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 1950 | 2160 | 2580 | 2745 |
| Two-tone 5th order IMD products | |2\*fx\_low – 3\*fy\_high| | |2\*fx\_high – 3\*fy\_low| | |2\*fy\_low – 3\*fx\_high| | |2\*fy\_high – 3\*fx\_low| |
| IMD frequency limits (MHz) | 385 | 580 | 1180 | 1000 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 3644 | 3854 | 4031 | 4196 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 3773 | 3968 | 3902 | 4082 |

Based on the above table, the 4th or the 5th IMD generated by UL CA\_n20A-n28A may fall into own Rx of Band n78.

Table 5.x.2.1.1-2: Two UL bands IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 832 | 862 | 3300 | 3800 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 2438 | 2968 | 4132 | 4662 |
| Two-tone 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 1576 | 2136 | 5738 | 6768 |
| Two-tone 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 4964 | 5524 | 7432 | 8462 |
| Two-tone 4th order IMD products | |3\*fx\_low – 1\*fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 1304 | 714 | 9038 | 10568 |
| Two-tone 4th order IMD products | |2\*fx\_low – 2\*fy\_high| | |2\*fx\_high – 2\*fy\_low| |  |  |
| IMD frequency limits (MHz) | 4876 | 5936 |  |  |
| Two-tone 4th order IMD products | |3\*fx\_low + 1\*fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 5796 | 6386 | 10732 | 12262 |
| Two-tone 4th order IMD products | |2\*fx\_low + 2\*fy\_low| | |2\*fx\_high + 2\*fy\_high| |  |  |
| IMD frequency limits (MHz) | 8264 | 9324 |  |  |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 12338 | 14368 | 472 | 148 |
| Two-tone 5th order IMD products | |2\*fx\_low – 3\*fy\_high| | |2\*fx\_high – 3\*fy\_low| | |2\*fy\_low – 3\*fx\_high| | |2\*fy\_high – 3\*fx\_low| |
| IMD frequency limits (MHz) | 8176 | 9736 | 4014 | 5104 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 14032 | 16062 | 6628 | 7248 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 11564 | 13124 | 9096 | 10186 |

Based on the above table, the 4th IMD generated by UL CA\_n20A-n78A may fall into own Rx of Band n28.

Table 5.x.2.1.1-3: Two UL bands IMD analysis

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequency (MHz) | 703 | 748 | 3300 | 3800 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 2552 | 3097 | 4003 | 4548 |
| Two-tone 3rd order IMD products | |2\*fx\_low – fy\_high| | |2\*fx\_high – fy\_low| | |2\*fy\_low – fx\_high| | |2\*fy\_high – fx\_low| |
| IMD frequency limits (MHz) | 1804 | 2394 | 5852 | 6897 |
| Two-tone 3rd order IMD products | |2\*fx\_low + fy\_low| | |2\*fx\_high + fy\_high| | |2\*fy\_low + fx\_low| | |2\*fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 4706 | 5296 | 7303 | 8348 |
| Two-tone 4th order IMD products | |3\*fx\_low – 1\*fy\_high| | |3\*fx\_high – 1\*fy\_low| | |3\*fy\_low – 1\*fx\_high| | |3\*fy\_high – 1\*fx\_low| |
| IMD frequency limits (MHz) | 1691 | 1056 | 9152 | 10697 |
| Two-tone 4th order IMD products | |2\*fx\_low – 2\*fy\_high| | |2\*fx\_high – 2\*fy\_low| |  |  |
| IMD frequency limits (MHz) | 5104 | 6194 |  |  |
| Two-tone 4th order IMD products | |3\*fx\_low + 1\*fy\_low| | |3\*fx\_high + 1\*fy\_high| | |3\*fy\_low + 1\*fx\_low| | |3\*fy\_high + 1\*fx\_high| |
| IMD frequency limits (MHz) | 5409 | 6044 | 10603 | 12148 |
| Two-tone 4th order IMD products | |2\*fx\_low + 2\*fy\_low| | |2\*fx\_high + 2\*fy\_high| |  |  |
| IMD frequency limits (MHz) | 8006 | 9096 |  |  |
| Two-tone 5th order IMD products | |fx\_low – 4\*fy\_high| | |fx\_high – 4\*fy\_low| | |fy\_low – 4\*fx\_high| | |fy\_high – 4\*fx\_low| |
| IMD frequency limits (MHz) | 12452 | 14497 | 988 | 308 |
| Two-tone 5th order IMD products | |2\*fx\_low – 3\*fy\_high| | |2\*fx\_high – 3\*fy\_low| | |2\*fy\_low – 3\*fx\_high| | |2\*fy\_high – 3\*fx\_low| |
| IMD frequency limits (MHz) | 8404 | 9994 | 4356 | 5491 |
| Two-tone 5th order IMD products | |fx\_low + 4\*fy\_low| | |fx\_high + 4\*fy\_high| | |fy\_low + 4\*fx\_low| | |fy\_high + 4\*fx\_high| |
| IMD frequency limits (MHz) | 13903 | 15948 | 6112 | 6792 |
| Two-tone 5th order IMD products | |2\*fx\_low + 3\*fy\_low| | |2\*fx\_high + 3\*fy\_high| | |2\*fy\_low + 3\*fx\_low| | |2\*fy\_high + 3\*fx\_high| |
| IMD frequency limits (MHz) | 11306 | 12896 | 8709 | 9844 |

Based on the above table, the 5th IMD generated by UL CA\_n28A-n78A may fall into own Rx of Band n20.

#### 5.x.2.2 REFSENS requirements

Based on Table 5.x.2.1.1-1, the 4th or the 5th IMD generated by UL CA\_n20A-n28A may fall into own Rx of Band n78. IMD4 MSD values is derived from DC\_8A\_n71A-n77A and IMD5 MSD value is derived from DC\_18A\_n28A-n78A.

Based on Table 5.x.2.1.1-2, the 4th IMD generated by UL CA\_n20A-n78A may fall into own Rx of Band n28. MSD values is derived from DC\_8A\_n28A-n77A.

Based on Table 5.x.2.1.1-3, the 5th IMD generated by UL CA\_n28A-n78A may fall into own Rx of Band n20. MSD value is derived from DC\_20A-28A\_n78A.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 5.x.2.2-1: 3DL/2UL interband Reference sensitivity QPSK PREFSENS and uplink/downlink configurationsBand / 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\_n20-n28-n78 | n20 | N/A | 5 | N/A | 808 | 3.8 | FDD | IMD5 |
|  | n28 | 705.5 | 5 | 25 | 760.5 | N/A | FDD | N/A |
|  | n78 | 3630 | 10 | 50 | 3630 | N/A | TDD | N/A |
|  | n20 | 859.5 | 5 | 25 | 818.5 | N/A | FDD | N/A |
|  | n28 | 710 | 5 | 25 | 765 | 11.6 | FDD | IMD4 |
|  | n78 | 3343.5 | 10 | N/A | 3343.5 | N/A | TDD | N/A |
|  | n20 | 859.5 | 5 | 25 | 818.5 | N/A | FDD | N/A |
|  | n28 | 733.5 | 5 | 25 | 788.5 | N/A | FDD | N/A |
|  | n78 | N/A | 10 | N/A | 3312 | 10.3 | TDD | IMD4 |
|  | n20 | 840 | 5 | 25 | 799 | N/A | FDD | N/A |
|  | n28 | 710 | 5 | 25 | 765 | N/A | FDD | N/A |
|  | n78 | N/A | 10 | N/A | 3680 | 4.0 | TDD | IMD5 |

---End of changes---

# Reference

[1] RP-252440. Revised WID NR\_CADC\_SUL\_R19, Ericsson