**3GPP TSG-RAN4 Meeting #116bis** **R4-2514198**

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

**Source:** Ericsson, Odido

**Title:** TP for TR 38.719-03-01 adding CA\_n7A-n20A-n28A

**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\_n7A-n20A-n28A as defined in WID [1].

# ---Start of changes---

## 5.x CA\_n7-n20-n28

### 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** |
| n7 | 2500 MHz – 2570 MHz | 2620 MHz – 2690 MHz | FDD |
| n20 | 832 MHz – 862 MHz | 791 MHz – 821 MHz | FDD |
| n28 | 703 MHz – 748 MHz | 758 MHz – 803 MHz | FDD |

#### 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\_n7A-n20A-n28A 15 | CA\_n7A-n20ACA\_n7A-n28ACA\_n20A-n28A | n7 | n7 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n20 | n20 channel bandwidths in Table 5.3.5-1 |  |
|  |  | n28 | n28 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 derived from CA\_n5-n7-n28 and given in the tables below.

Table 5.x.1.3-1: ΔTIB,c due to NR CA (three bands)

|  |  |
| --- | --- |
| **Inter-band CA combination** | **ΔTIB,c for NR bands (dB)\*** |
| **Component band in order of bands in configuration\*\*** |
| CA\_n7-n20-n28 | 0.5 | 0.3 | 0.6 |
| NOTE \*: “-” denotes ΔTIB,c = 0.NOTE \*\*: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n5 the band order from left to right is n1, n3 and n5. |

Table 5.x.1.3-2: ΔRIB,c due to NR CA (three bands)

|  |  |
| --- | --- |
| **Inter-band CA combination** | **ΔRIB,c for NR bands (dB)\*** |
| **Component band in order of bands in configuration\*\*** |
| CA\_n7-n20-n28 | - | - | 0.2 |
| NOTE \*: “-” denotes ΔRIB,c = 0.NOTE \*\*: The component band order in the configuration should be listed by the order of NR bands, such as for CA\_n1-n3-n8 the band order from left to right is n1, n3 and n8. |

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

#### 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\_n7A-n20A-n28A with UL CA\_n7A-n20A, UL CA\_n7A-n28A and UL CA\_n20A-n28A.

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) | 2500 | 2570 | 832 | 862 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 1738 | 1638 | 3332 | 3432 |
| 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) | 4308 | 4138 | 906 | 776 |
| 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) | 5832 | 6002 | 4164 | 4294 |
| 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) | 6638 | 6878 | 74 | 86 |
| Two-tone 4th order IMD products | |2\*fx\_low – 2\*fy\_high| | |2\*fx\_high – 2\*fy\_low| |   |   |
| IMD frequency limits (MHz) | 3476 | 3276 |   |   |
| 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) | 8332 | 8572 | 4996 | 5156 |
| Two-tone 4th order IMD products | |2\*fx\_low + 2\*fy\_low| | |2\*fx\_high + 2\*fy\_high| |   |   |
| IMD frequency limits (MHz) | 6664 | 6864 |   |   |
| 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) | 758 | 948 | 9138 | 9448 |
| 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) | 2644 | 2414 | 6046 | 5776 |
| 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) | 5828 | 6018 | 10832 | 11142 |
| 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) | 7496 | 7726 | 9164 | 9434 |

Based on the above table, the 3rd or the 5th IMD generated by UL CA\_n7A-n20A may fall into own Rx of Band n28.

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) | 2500 | 2570 | 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) | 1867 | 1752 | 3203 | 3318 |
| 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) | 4437 | 4252 | 1164 | 1004 |
| 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) | 5703 | 5888 | 3906 | 4066 |
| 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) | 6752 | 7007 | 461 | 256 |
| Two-tone 4th order IMD products | |2\*fx\_low – 2\*fy\_high| | |2\*fx\_high – 2\*fy\_low| |   |   |
| IMD frequency limits (MHz) | 3734 | 3504 |   |   |
| 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) | 8203 | 8458 | 4609 | 4814 |
| Two-tone 4th order IMD products | |2\*fx\_low + 2\*fy\_low| | |2\*fx\_high + 2\*fy\_high| |   |   |
| IMD frequency limits (MHz) | 6406 | 6636 |   |   |
| 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) | 242 | 492 | 9252 | 9577 |
| 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) | 3031 | 2756 | 6304 | 6004 |
| 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) | 5312 | 5562 | 10703 | 11028 |
| 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) | 7109 | 7384 | 8906 | 9206 |

Based on the above table, there is no IMD issue generated by UL CA\_n7A-n28A to Band n20.

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) | 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 5th IMD generated by UL CA\_n20A-n28A may fall into own Rx of Band n7.

#### 5.x.2.2 REFSENS requirements

Based on Table 5.x.2.1.1-2, the 3rd and 5th IMD generated by UL CA\_n7A-n20A may fall into own Rx of Band n28. MSD value is derived from DC\_7A-28A\_n20A.

Based on Table 5.x.2.1.1-3, the 5th IMD generated by UL CA\_n20A-n28A may fall into own Rx of Band n7. MSD value is derived from DC\_7A-28A\_n20A-

|  |  |
| --- | --- |
| 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\_n7-n20-n28 | n7 | N/A | 5 | N/A | 2640 | 5.9 | FDD | IMD5 |
|  | n20 | 842 | 5 | 25 | 801 | N/A | FDD | N/A |
|  | n28 | 728 | 5 | 25 | 783 | N/A | FDD | N/A |
|  | n7 | 2505 | 5 | 25 | 2625 | N/A | FDD | N/A |
|  | n20 | 859 | 5 | 25 | 818 | N/A | FDD | N/A |
|  | n28 | N/A | 5 | N/A | 787 | 17.4 | FDD | IMD31 |
| NOTE 1: This band is subject to IMD5 also which MSD is not specified. |

---End of changes---

# Reference

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