3GPP TSG-RAN WG4 Meeting #109 R4-2318261

Chicago, US, 13th – 17th November 2023

Title: TP for TR38.718-02-01 Support of CA\_n8-n77

Source: Softbank

Agenda Item: 7.10.2

Document for: Approval

# **Introduction**

This contribution is a text proposal for TR 38.718-02-01[5] to include the following NRCA combinations as requested in RAN4#108.

* CA\_n8-n77

# **Reference**

[1] 3GPP TR 21.905 Vocabulary for 3GPP Specifications (Release 17) V17.1.0

[5] TR38.718-02-01, Rel-18 NR Inter-band Carrier Aggregation/Dual Connectivity for2 bands DL with x bands UL (x=1,2) V0.8.0

# **Text Proposal**

# **-- Start of TP –**

**-- Unaffected parts omitted --**

5.x CA\_n8-n77

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 of band n8 and n77**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **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** | | |
| n8 | 880 MHz | – | 915 MHz | 925 MHz | – | 960 MHz | FDD |
| n77 | 3300 MHz | – | 4200 MHz | 3300 MHz | – | 4200 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 of band n8+n77**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR CA configuration** | **Uplink CA configuration or single uplink carrier** | **NR Band** | **Channel bandwidth (MHz)** | **Bandwidth combination set** |
| CA\_n8A-n77A | CA\_n8A-n77A | n8 | 5, 10, 15, 20 | 0 |
|  |  | n77 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |

5.x.1.3 UE co-existence studies

The harmonic / harmonic mixing issue for 1UL/2DL of CA\_n8A-n77A have been analysed in the previous release.

5.x.1.4 ∆TIB and ∆RIB values

The ΔTIB,c and ΔRIB,c have been specified in current spec.

5.x.1.5 REFSENS requirements

The REFSENS requirements for 1UL/2DL of CA\_n8A-n77A have been specified in current spec.

5.x.1.6 OOB blocking exception requirements

Since band n8 is a low band and n77 is a wide band, the OOBB exception is needed.

**Table 5.x.1.6-1: CA band combination with exceptions allowed**

|  |
| --- |
| **CA band combination** |
| CA\_n8-n77 |

5.x.2 Specific for 2 bands UL CA

5.x.2.1 Maximum output power for inter-band CA

**Table 5.x.2.1-1: UE Power Class for uplink inter-band CA**

|  |  |  |
| --- | --- | --- |
| **Uplink CA Configuration** | **Class 3 (dBm)** | **Tolerance (dB)** |
| CA\_n8A-n77A | 23 | +2/-3 |

5.x.2.2 UE co-existence studies

Table 5.x.2.2-1 lists Band n8 + Band n77 2UL bands CA 2nd, 3rd, 4th and 5th order IMD for the UE-to-UE coexistence analysis.

**Table 5.x.2.2-1: Band n8 and Band n77 UL harmonics and IMD products**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL frequencies (MHz) | 880 | 915 | 3300 | 4200 |
| 2nd order IMD products | |fy\_low - fx\_high| | |fy\_high - fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 2385 | 3320 | 4180 | 5115 |
| 3rd order IMD products | |fy\_high - 2\*fx\_low| | |fy\_low - 2\*fx\_high| | |2\*fy\_low - fx\_high| | |2\*fy\_high - fx\_low| |
| IMD frequency limits (MHz) | 2440 | 1470 | 5685 | 7520 |
| 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) | 5060 | 6030 | 7480 | 9315 |
| Two-tone 4th order IMD products | |2\*fx\_low -2\* fy\_high| | |2\*fx\_high - 2\*fy\_low| | |2\*fx\_low +2\* fy\_low| | |2\*fx\_high +2\* fy\_high| |
| IMD frequency limits (MHz) | 6640 | 4770 | 8360 | 10230 |
| 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) | 1560 | 555 | 8985 | 11720 |
| 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) | 5940 | 6945 | 10780 | 13515 |
| 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) | 15920 | 12285 | 360 | 680 |
| 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) | 14080 | 17715 | 6820 | 7860 |
| 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) | 10840 | 8070 | 3855 | 5760 |
| 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) | 11660 | 14430 | 9240 | 11145 |

Based on the table above it can be seen that

* IMD4 may affect own frequencies of band n8.

The Protected bands for the 2UL bands CA configuration is same for CA\_n8-n78 as below.

**Table 5.x.2.2-2: Protected bands for the 2UL bands CA configuration**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **UL NR CA Configuration** | **Spurious emission** | | | | | | |
| **Protected band** | **Frequency range (MHz)** | | | **Maximum Level (dBm)** | **MBW (MHz)** | **NOTE** |
| CA\_n8-n77 | Frequency range | 1884.5 | - | 1915.7 | -41 | 0.3 | 3 |
| NOTE 3: Applicable when co-existence with PHS system operating in 1884.5 -1915.7 MHz | | | | | | | |

5.x.2.3 REFSENS requirements

Based on the co-existence studies MSD would be defined and values could be reused from CA\_n8A-n78A.

**Table 5.x.2.3-1: MSD due to IMD issue**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Operating 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\_n8-n77 | n8 | 897.5 | 5 | 25 | 942.5 | 8.3 | FDD | IMD4 |
| n77 | 3635 | 10 | 50 | 3635 | N/A | TDD | N/A |

**-- Unaffected parts omitted --**

**-- End of TP --**