**3GPP TSG-RAN WG4 Meeting #108 R4-2311111**

**Toulouse, France, 21st August – 25th August 2023**

**Source:** Ericsson, Bell Mobility

**Title:** TP for 38718-02-01 adding UL CA\_n78(2A) to DL CA\_n25A-n78(2A)

**Agenda item:** 7.10.2

**Document for:** Approval

# 1. Introduction

This contribution is a text proposal for TR [38.718-02-01](https://www.3gpp.org/DynaReport/38718-02-01.htm) adding UL CA\_n78(2A) to DL CA\_n25A-n78(2A).

# 2. Text Proposal

# ---Start of changes---

## 5.x CA\_n25-n78

### 5.x.1 Specific for 1 bands UL CA

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

CA\_n25-n78 has already been specified and this section does not need to be revisited.

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

UL CA\_n78(2A) is to be added to DL CA\_n25A-n78(2A) in the existing configuration table of 38.101-1. See Table 5.x.1-1 below.

Table 5.x.1.2-2: Supported bandwidths per CA band combination of band n25+n78

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CA\_n25A-n78(2A) | CA\_n25A-n78A | n25 | 5, 10, 15, 20, 25, 30, 40 | 0 |
|  |  | n78 | CA\_n78(2A)\_BCS0 |  |
|  | CA\_n78(2A)  CA\_n25A-n78A | n25 | 5, 10, 15, 20, 25, 30, 40 | 1 |
|  |  | n78 | CA\_n78(2A)\_BCS2 |  |
|  | CA\_n25A-n78A | n25 | See n25 channel bandwidths in Table 5.3.5-1 | 4 and 5 |
|  |  | n78 | CA\_n78(2A)\_BCS4 and 5 |  |

#### 5.x.1.3 Co-existence studies

CA\_n25-n78 has already been specified and this section does not need to be revisited.

#### 5.x.1.4 ∆TIB and ∆RIB values

CA\_n25-n78 has already been specified and this section does not need to be revisited.

#### 5.x.1.5 REFSENs requirements

CA\_n25-n78 has already been specified and this section does not need to be revisited.

### 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\_n25A-n78A | 23 | +2/-3 |

#### 5.x.2.2 UE co-existence

Table 5.x.2.2-1 gives IMD interference analysis for CA\_ n25-n78.

**Table 5.x.2.2-1: IMD analysis**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL Frequency [MHz] | 1850 | 1915 | 3300 | 3800 |
| DL Frequency [MHz] | 1930 | 1995 | 3300 | 3800 |
| 2nd order IMD products | |fy\_high – fx\_low| | |fy\_low – fx\_high| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 1950 | 1385 | 5150 | 5715 |
| 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) | 100 | 530 | 4685 | 5750 |
| 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) | 7000 | 7630 | 8450 | 9515 |
| 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) | 3900 | 2770 | 10300 | 11430 |
| 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) | 1750 | 2445 | 7985 | 9550 |
| 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) | 8850 | 9545 | 11750 | 13315 |
| 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) | 13350 | 11285 | 4360 | 3600 |
| 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) | 15050 | 17115 | 10700 | 11460 |
| 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) | 7700 | 6070 | 855 | 2050 |
| 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) | 13600 | 15230 | 12150 | 13345 |

Based on the table 5.x.2.2-1, there are possible IMD2, IMD4 and IMD5 interference issues into band n25.

IMD2 MSD is already defined in Table 7.3A.5-1 of TS 38.101-1.

Table 5.x.2.2-3 gives a non-contiguous uplink IMD interference analysis

**Table 5.x.2.2-3: Non-contiguous uplink IMD analysis**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| CC location | fU1L | fU2L | fU3L | fU1H | fU2H | fU3H |
| Frequency | 3300 | 3320 | 3800 | 3800 | 3780 | 3300 |
| 2nd | I fU1L-fU2L I | I fU1L-fU3L I | fU1L + fU2L | fU1H+fU2H |  |  |
| Interference ranges | 20 | 500 | 6620 | 7580 |  |  |
| 3rd | 2\*fU1L-fU3L | 2\*fU1H-fU3H | 2\*fU1L + fU2L | 2\*fU1H + fU2H |  |  |
| Interference ranges | 2800 | 4300 | 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 |
| Interference ranges | 40 | 1000 | 6100 | 8100 | 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 |
| Interference ranges | 2300 | 4800 | 9400 | 11900 | 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 |
| Interference ranges | 60 | 1500 | 5600 | 8600 | 12700 | 15700 |
| 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 |
| Interference ranges | 1800 | 5300 | 8900 | 12400 | 16000 | 19500 |

Min channel = 10MHz

Min Channel separation = 10MHz

Max channel separation = 500MHz

Based on the table 5.x.2.2-3, there are IMD7 products falling inside n25 DL, which may occur in simultaneous RX/TX configurations.

#### 5.x.2.3 REFSENS requirements

Based on the co-existence studies there is a need to define MSD values. MSD value are reused from CA\_n2A-n77A with CA\_n77(2A) in the UL.

Table 5.x.2.3-1: 3DL/2UL inter-band Reference sensitivity QPSK PREFSENS and uplink/downlink configurations

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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-n78 | n25 | N/A | 5 | N/A | 1980 | 2.7 | 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. | | | | | | | | |

---End of changes---

# Reference

[1] RP-231115, Revised WID: Rel-18 NR Inter-band Carrier Aggregation/Dual Connectivity for 2 bands DL with x bands UL (x=1,2), ZTE

[2] R4-2308181, TR 38.718-02-01 v0.6.0: Rel-18 NR Inter-band Carrier Aggregation/Dual Connectivity for 2 bands DL with x bands UL (x=1,2), ZTE Corporation