3GPP TSG-RAN WG4 Meeting # 100-e Rev. 1 of R4-2113729

**Electronic Meeting, August. 16-27, 2021**

**Title: TP to TR 38.717-03-02: Addition of CA\_n48-n66-n70**

**Source: Nokia, DISH Network**

**Agenda item: 8.11.2**

**Document for: Approval**

# 1 Introduction

This is a TP to TR 38.717-03-02 to add CA\_n48-n66-n70 with 2UL.

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### 5.1.x CA\_n48-n66-n70

5.1.x.1 Operating bands for CA

Table 5.1.x.1-1: Inter-band CA operating bands

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **NR CA Band** | **NR Band** | **Uplink (UL) operating band** | | | **Downlink (DL) operating band** | | | **Duplex Mode** |
| **BS receive / UE transmit** | | | **BS transmit / UE receive** | | |
| **FUL\_low – FUL\_high** | | | **FDL\_low – FDL\_high** | | |
| CA\_n48-n66-n70 | n48 | 3550 MHz | – | 3700 MHz | 3550 MHz | – | 3700 MHz | TDD |
| n66 | 1710 MHz | – | 1780 MHz | 2110 MHz | – | 2200 MHz | FDD |
| n70 | 1695 MHz | – | 1710 MHz | 1995 MHz | – | 2020 MHz | FDD |

#### 5.1.x.2 Channel bandwidths per operating band for CA

Table 5.1.x.2-1: Supported channel bandwidths per CA configuration

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **NR CA Configuration** | **UL Config** | | | **NR Band** | | **Channel bandwidth (MHz)** | | | | | | | | | | | | | | | | | | | | | | | **Bandwidth combination set** |
| **5** | | **10** | | **15** | | **20** | | | **25** | **30** | | **40** | | **50** | | | **60** | **70** | **80** | **90** | | **100** |
| CA\_n48A-n66A-n70A | CA\_n48A-n66A  CA\_n48-n70A | | | n48 | | 5 | | 10 | | 15 | | 20 | | |  | 30 | | 40 | | 50 | | | 60 | 70 | 80 | 90 | | 100 | 0 |
| n66 | | 5 | | 10 | | 15 | | 20 | | | 25 | 30 | | 40 | |  | | |  |  |  |  | |  |
| n70 | | 5 | | 10 | | 15 | | 201 | | | 251 |  | |  | |  | | |  |  |  |  | |  |
| CA\_n48A-n66(2A)-n70A | CA\_n48A-n66A  CA\_n48-n70A | | | n48 | | 5 | | 10 | | 15 | | 20 | | |  | 30 | | 40 | | 50 | | | 60 | 70 | 80 | 90 | | 100 | 0 |
| n66 | | See CA\_n66(2A) Bandwidth Combination Set 0 in Table 5.5A.2-1 | | | | | | | | | | | | | | | | | | | | | | |
| n70 | | 5 | | 10 | | 15 | | 201 | | | 251 |  | |  | |  | | |  |  |  |  | |  |
| CA\_n48(2A)-n66A-n70A | CA\_n48A-n66A  CA\_n48-n70A | | | n48 | | See CA\_n48(2A) Bandwidth Combination Set 1 in Table 5.5A.2-1 | | | | | | | | | | | | | | | | | | | | | | | 0 |
| n66 | | 5 | | 10 | | 15 | | 20 | | | 25 | 30 | | 40 | |  | | |  |  |  |  | |  |
| n70 | | 5 | | 10 | | 15 | | 201 | | | 251 |  | |  | |  | | |  |  |  |  | |  |
| CA\_n48B-n66A-n70A | CA\_n48A-n66A  CA\_n48-n70A | | | n48 | | See CA\_n48B Bandwidth Combination Set 2 in Table 5.5A.1-1 | | | | | | | | | | | | | | | | | | | | | | | 0 |
| n66 | | 5 | | 10 | | 15 | | 20 | | | 25 | 30 | | 40 | |  | | |  |  |  |  | |  |
| n70 | | 5 | | 10 | | 15 | | 201 | | | 251 |  | |  | |  | | |  |  |  |  | |  |
| NOTE 1: This UE channel bandwidth is applicable only to downlink | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

#### 5.1.x.3 UE co-existence studies

The harmonic issues have been already analyzed in 3DL/1UL WI. For inter-modulation issues the IMD products are already addressed in 2DL 2UL fall backs for CA\_n48-n66 and CA\_n66-n71 is in the specification 38.101.

For CA\_n48-n70 the 5th order IMD product is falling inside band n66 as shown in the following analysis.

**Table 5.1.x.3-1: Band n48 and Band n70 UL harmonics and IMD products**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL Frequency [MHz] | 3550 | 3700 | 1695 | 1710 |
| DL Frequency [MHz] | 3550 | 3700 | 1995 | 2020 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 2005 | 1840 | 5245 | 5410 |
| 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) | 5390 | 5705 | 310 | 130 |
| 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) | 8795 | 9110 | 6940 | 7120 |
| 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) | 8940 | 9405 | 1385 | 1580 |
| 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) | 3680 | 4010 | 10490 | 10820 |
| 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) | 12345 | 12810 | 8635 | 8830 |
| 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) | 3290 | 3080 | 13105 | 12490 |
| 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) | 1970 | 2315 | 7710 | 7230 |
| 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) | 10330 | 10540 | 15895 | 16510 |
| 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) | 12185 | 12530 | 14040 | 14520 |

Based on the table above, the 5th order IMD may fall into Rx frequencies of band n66.

#### 5.1.x.4 REFSENS requirements

The IMD issues specific to 3DL/2UL are the cases that IMDs generated by dual uplink fall into the third Rx band; otherwise, IMD issues are already specified in 2DL/2UL CAs. For CA\_n48-n70 hitting n66 the values of CA\_n2-n66-n77 IMD5 are reused.

Table 5.1.x.4-1: MSD for the CA configuration

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **EN-DC Configuration** | **EUTRA/NR band** | **UL Fc**  **(MHz)** | **UL/DL BW**  **(MHz)** | **UL**  **LCRB** | **DL Fc (MHz)** | **MSD**  **(dB)** | **Duplex mode** | **IMD order** |
| CA\_n48A-n66A-n70A | n48 | 3625 | 10 | 50 | 3625 | N/À | TDD | N/A |
| n66 | 1742.5 | 5 | 25 | 2142.5 | 2.8 | FDD | IMD5 |
| n70 | 1702.5 | 5 | 25 | 2002.5 | N/A | FDD | N/A |

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