3GPP TSG-RAN WG4 Meeting # 100-e Rev. 1 of R4-2113731

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

**Title: TP to TR 38.717-03-02: Addition of CA\_n48-n70-n71**

**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-n70-n71 with 2UL.

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### 5.1.x CA\_n48-n66-n71

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-n70-n71 | n48 | 3550 MHz | – | 3700 MHz | 3550 MHz | – | 3700 MHz | TDD |
| n70 | 1695 MHz | – | 1710 MHz | 1995 MHz | – | 2020 MHz | FDD |
| n71 | 663 MHz | – | 698 MHz | 617 MHz | – | 652 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-n70A-n71A | CA\_n48A-n71A  CA\_n70A-n71A  CA\_n48A-n70A | n48 | 5 | 10 | 15 | 20 |  | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 0 |
| n70 | 5 | 10 | 15 | 201 | 251 |  |  |  |  |  |  |  |  |
| n71 | 5 | 10 | 15 | 20 |  |  |  |  |  |  |  |  |  |
| CA\_n48(2A)-n70A-n71A | CA\_n48A-n71A  CA\_n70A-n71A  CA\_n48A-n70A | n48 | See CA\_n48(2A) Bandwidth Combination Set 1 in Table 5.5A.2-1 | | | | | | | | | | | | | 0 |
| n70 | 5 | 10 | 15 | 201 | 251 |  |  |  |  |  |  |  |  |
| n71 | 5 | 10 | 15 | 20 |  |  |  |  |  |  |  |  |  |
| CA\_n48B-n70A-n71A | CA\_n48A-n71A  CA\_n70A-n71A  CA\_n48A-n70A | n48 | See CA\_n48B Bandwidth Combination Set 2 in Table 5.5A.1-1 | | | | | | | | | | | | |  |
| n70 | 5 | 10 | 15 | 201 | 251 |  |  |  |  |  |  |  |  |
| n71 | 5 | 10 | 15 | 20 |  |  |  |  |  |  |  |  |  |
| CA\_n48A-n70A-n71(2A) | CA\_n48A-n71A  CA\_n70A-n71A  CA\_n48A-n70A | n48 | 5 | 10 | 15 | 20 |  | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |  |
| n70 | 5 | 10 | 15 | 201 | 251 |  |  |  |  |  |  |  |  |
| n71 | See CA\_n71(2A) Bandwidth Combination Set 0 in Table 5.5A.2-1 | | | | | | | | | | | | |
| 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-n70 and CA\_n48-n71.

For CA\_n70-n71 the 4th and 5th order IMD products are falling inside band n48 as shown in the following analysis.

**Table 5.1.x.3-1: Band n70 and Band n71 UL harmonics and IMD products**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **UE UL carriers** | **fx\_low** | **fx\_high** | **fy\_low** | **fy\_high** |
| UL Frequency [MHz] | 1695 | 1710 | 663 | 698 |
| DL Frequency [MHz] | 1995 | 2020 | 617 | 652 |
| 2nd order IMD products | |fy\_low – fx\_high| | |fy\_high – fx\_low| | |fy\_low + fx\_low| | |fy\_high + fx\_high| |
| IMD frequency limits (MHz) | 1047 | 997 | 2358 | 2408 |
| 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) | 2692 | 2757 | 384 | 299 |
| 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) | 4053 | 4118 | 3021 | 3106 |
| 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) | 4387 | 4467 | 279 | 399 |
| 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) | 1994 | 2094 | 4716 | 4816 |
| 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) | 5748 | 5828 | 3684 | 3804 |
| 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) | 1097 | 942 | 6177 | 6082 |
| 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) | 1296 | 1431 | 3804 | 3689 |
| 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) | 4347 | 4502 | 7443 | 7538 |
| 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) | 5379 | 5514 | 6411 | 6526 |

Based on the table above, the 4th and 5th order IMD may fall into Rx frequencies of band n48.

#### 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. Requirements taken from existing fallbacks except CA\_n48A-n70A-n71A with CA-n70A-n71A UL creating a potential IMD4 and IMD5 product inside band n48. This requirement is taken from CA\_n66-n71-n78 which has similar issue.

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-n70A-n71A | n48 | 3694 | 10 | 50 | 3694 | 9 | TDD | IMD41 |
| n70 | 1697.5 | 5 | 25 | 1997.5 | N/A | FDD | N/A |
| n71 | 665.5 | 5 | 25 | 619.5 | N/A | FDD | N/A |
| NOTE 1: This band is subject to IMD5 also which MSD is not specified. | | | | | | | | |

## 9.x DC\_n48-n71

### 9.x.1 Operating bands for DC\_n48-n71

**Table 9.x.1-1: Inter-band NR DC operating bands**

|  |  |
| --- | --- |
| **NR DC Band** | **NR Band** |
| DC\_n48-n71 | n48, n71 |

### 9.x.2 Configurations for DC\_n48-n71

**Table 9.x.2-1: Inter-band NR DC configurations**

|  |  |
| --- | --- |
| **NR DC**  **configuration** | **Uplink NR DC**  **configuration** |
| DC\_n48A-n71A | DC\_n48A-n71A |
| DC\_n48(2A)-n71A | DC\_n48A-n71A |
| DC\_n48B-n71A | DC\_n48A-n71A |
| DC\_n48A-n71(2A) | DC\_n48A-n71A |
| DC\_n48B-n71(2A) | DC\_n48A-n71A |
| DC\_n48(2A)-n71(2A) | DC\_n48A-n71A |

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