**3GPP TSG-RAN WG4 Meeting # 112 R4-2413344**

**Maastricht Meeting, Aug. 19th – Aug 23rd, 2024**

**Title: TP to TR 38.719-02-01 Uplink addition of CA\_n41A-n78C**

**Source: Nokia, Etisalat UAE**

**Agenda item: 7.3.3**

**Document for: Approval**

# 1 Introduction

This is a TP to TR 38.719-02-01 to add CA\_n41A-n78C with ULCA CA\_n41A-n78C. CA\_n41-n78 is already specified supporting inter-band carrier aggregation with mandatory simultaneous Rx/Tx capability. Since it is a TDD-TDD combination supporting inter-band carrier aggregation with mandatory simultaneous Rx/Tx capability the analysis of UL CA\_n78C into n41A downlink is included.

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## 5.x CA\_n41-n78

### 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 n41+n78

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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 | | |
| n41 | 2496 MHz | – | 2690 MHz | 2496 MHz | – | 2690 MHz | TDD |
| n78 | 3300 MHz | – | 3800 MHz | 3300 MHz | – | 3800 MHz | TDD |
| NOTE 1: Applicable for UE supporting inter-band carrier aggregation with mandatory simultaneous Rx/Tx capability. | | | | | | | |

This is a TDD-TDD combination supporting inter-band carrier aggregation with mandatory simultaneous Rx/Tx capability.

#### 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 n41+n78

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| NR CA configuration | Uplink CA configuration or single uplink carrier | NR Band | Channel bandwidth (MHz) | Bandwidth combination set |
| CA\_n41A-n78C | CA\_n41A-n78A CA\_n41A-n78C | n41 | 10, 15, 20, 40, 50, 60, 80, 100 | 0 |
|  |  | n78 | 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 |  |

#### 5.x.1.3 UE co-existence studies

Not relevant, since the configuration is already captured in spec.

#### 5.x.1.3.1 UE co-existence studies for 2 Uplink CCs in one Intra-Band CA

1 UL studies have been completed for CA\_n41A-n78A, but the intra-band contiguous ULCA must be analysed for impact into the other TDD band, since they operation in simultaneous Rx/Tx.

Table 5.X.1.3-3 summarizes frequency ranges where IMD products caused by one UL band with 2CC intra-band UL CA may occur for CA\_ n41A-n78C

Table 5.x.1.3-3: Intra-band ULCA IMD overlap with the other DL band analysis.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| All in MHz | flow | fhigh | BB IMD range3 | | |
| n78 fUL | 3300 | 3800 | Order | flow | fhigh |
| n41 fDL | 2496 | 2690 |
| 2CCBW1 | Minimum | Maximum | IMD2  (1-1) | Min2CCBW | Max2CCBW |
| 10 | 100 | 10 | 100 |
| Close to UL IMD range2 | | | IMD4 (2-2) | 2\*Min2CCBW | 2\*Max2CCBW |
| Order | flow | fhigh | 20 | 200 |
| IMD3 (2-1) | fULlow-Max2CCBW | fULhigh+Max2CCBW | IMD6  (3-3) | 3\*Min2CCBW | 3\*Max2CCBW |
| 3200 | 3900 | 30 | 300 |
| IMD5 (3-2) | fULlow-2\*Max2CCLBW | fULhigh+2\*Max2CCBW | Close to H2 IMD range4 | | |
| 3100 | 4000 | Order | flow | fhigh |
| IMD7 (4-3) | fULlow-3\*Max2CCBW | fULhigh+3\*Max2CCBW | IMD4  (3-1) | 2\*fULlow-Max2CCBW | 2\*fULhigh+Max2CCBW |
| 3000 | 4100 | 6500 | 7700 |
| IMD9 (5-4) | fULlow-4\*Max2CCBW | fULhigh+4\*Max2CCBW | IMD6  (4-2) | 2\*fULlow-2\*Max2CCBW | 2\*fULhigh+2\*Max2CCBW |
| 2900 | 4200 | 6400 | 7800 |
| IMD11 (6-5) | fULlow-5\*Max2CCBW | fULhigh+5\*Max2CCBW | Close to H3 IMD range4 | | |
| 2800 | 4300 | Order | flow | fhigh |
| IMD13 (7-6) | fULlow-6\*Max2CCBW | fULhigh+6\*Max2CCBW | IMD5  (4-1) | 3\*fULlow-Max2CCBW | 3\*fULhigh+Max2CCBW |
| 2700 | 4400 | 9800 | 11500 |
| **Analysis** | No issue | | | | |
| NOTE 1: 2CCBW is the instantaneous transmit bandwidth of the two intra-band UL CCs:  - The minimum 2CCBW for contiguous / non-contiguous intra-band ULCA is 0 / minimum UL channel bandwidth  - The maximum 2CCBW for contiguous / non-contiguous ULCA is Min(maximum aggregated bandwidth / maximum separation bandwidth(600MHz),fULhigh-fULlow)  NOTE 2: The close to UL IMD range is the most critical when the victim DL band in proximity to the UL band:  - For contiguous/non-contiguous intra-band ULCA within a TDD band, IMD order up to 9/7 should be considered and MPR assumed  - For intra-band ULCA within a FDD band, IMD order up to 13 should be considered for bands in the same band group and MPR is not assumed. If justified by poor filtering performance, higher order IMD may need to be specified.  NOTE 3: The BB IMD range should only be considered if the DL band is below the UL band and for non-contiguous ULCA within a TDD band >3GHz (assuming CA with 450MHz bands is not considered) - IMD2 is not considered assuming CA with 450MHz bands is not considered  - IMD4 is considered for FDD or SimRx/Tx TDD bands <1GHz  - IMD6 is considered for FDD or SimRx/Tx TDD bands <1.68GHz  NOTE 4: The harmonic 2 and 3 IMD ranges should only be considered if the DL band is above the UL band | | | | | |

The analysis does not show any IMD cases.

5.x.1.4 ∆TIB,c and ∆RIB,c values

Not relevant.

#### 5.x.1.5 REFSENS requirements

Not relevant.

#### 5.x.1.6 OOB blocking exception requirements

Not relevant.

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

Not relevant.

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

Not relevant.

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

Not relevant.

#### 5.x.2.3 REFSENS requirements

Not relevant.

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