**3GPP TSG-RAN WG4 Meeting #109 draft\_R4-2318110**

**Chicago, USA, 13-17 Nov 2023**

**Agenda item:** 7.1.2 Issues arising from basket WIs but not subject to block approval

**Source:** Moderator (Skyworks Solutions, Inc.)

**Title:** Draft Topic summary for [109][104] NR\_Baskets\_Part\_1

**Document for:** Information

# Introduction

This summary covers the items under 4.1 Issues arising from basket WIs but not subject to block approval:

Topic 1: NR Intra-band ULCA combinations

Topic 2: NR-U Intra-band ULCA combinations

Topic 3: LBLB combinations

Topic 4: Other band combinations not for block approval

Topic 5 (place holder): Documents moved from block approval.

# Topic #1: NR Intra-band ULCA combinations

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2318418**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318418.zip)  MSD analysis for CA\_n5B | Apple | |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | ***CA configuration*** | ***SCS***  ***(PCC/SCC)***  ***(kHz)*** | ***Aggregated channel bandwidth (PCC+SCC)*** | ***UL PCC allocation***  ***(LCRB)*** | ***UL SCC allocation***  ***(LCRB)*** | ***PCC ΔRIBC (dB)*** | ***SCC ΔRIBC (dB)*** | ***Duplex mode*** | | **CA\_n5Bx** | **15/15** | **5MHz + 20MHz** | **4 (RBSTART = 0)** | **16 (RBSTART = 90)** | **45** | **26** | **FDD** | | NOTE 1: All combinations of channel bandwidths defined in Table 5.5A.1-1.  NOTE 2: The carrier centre frequency of SCC in the UL operating band is configured closer to the DL operating band.  NOTE 3: The transmitted power over both PCC and SCC shall be set to PUMAX as defined in subclause 6.2A.4.  NOTE 4: The PCC allocation is same as Transmission bandwidth configuration NRB as defined in Table 5.3.2-1.  NOTE X: Applicable only to BCS 1. | | | | | | | | |
| [**R4-2320800**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320800.zip)  CA\_n7B BCS4/5 | Murata Manufacturing Co Ltd. | |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **CA configuration** | **SCS**  **(PCC/SCC)**  **(kHz)** | **Aggregated channel bandwidth (PCC+SCC)** | **UL PCC allocation**  **(LCRB)** | **UL SCC allocation**  **(LCRB)** | **PCC ΔRIBC (dB)** | **SCC ΔRIBC (dB)** | **Duplex mode** | | CA\_n7B**X** | 15/15 | 20MHz + 50MHz | 9 (RBSTART = 4) | 36 (RBSTART = 230) | [39.9] | [13.9] | FDD | | NOTE 1: All combinations of channel bandwidths defined in Table 5.5A.1-1.  NOTE 2: The carrier centre frequency of SCC in the UL operating band is configured closer to the DL operating band.  NOTE 3: The transmitted power over both PCC and SCC shall be set to PUMAX as defined in subclause 6.2A.4.  NOTE 4: The PCC allocation is same as Transmission bandwidth configuration NRB as defined in Table 5.3.2-1.  NOTE X: Applicable only to BCS 4-5 | | | | | | | | |
| [**R4-2320993**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320993.zip)  Updated CA\_n5B BCS1 MSD | Skyworks Solutions Inc. | |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | **CA configuration** | **SCS**  **(PCC/SCC)**  **(kHz)** | **Aggregated channel bandwidth (PCC+SCC)** | **UL PCC allocation**  **(LCRB)** | **UL SCC allocation**  **(LCRB)** | **PCC ΔRIBC (dB)** | **SCC ΔRIBC (dB)** | **Duplex mode** | | CA\_n5B | 15/15 | 10MHz + 10MHz | 10 (RBSTART = 0) | 10 (RBSTART = 42) | 30.8 | 26.1 | FDD | | CA\_n5B**X** | 15/15 | 5MHz + 20MHz | 4 (RBSTART = 0) | 16 (RBSTART = 90) | 46.4 | 23.3 | FDD | | NOTE 1: All combinations of channel bandwidths defined in Table 5.5A.1-1.  NOTE 2: The carrier center frequency of SCC in the UL operating band is configured closer to the DL operating band.  NOTE 3: The transmitted power over both PCC and SCC shall be set to PUMAX as defined in subclause 6.2A.4.  NOTE 4: The PCC allocation is the same as the transmission bandwidth configuration NRB as defined in Table 5.3.2-1.  NOTE X: Applicable only to BCS 1. | | | | | | | | |

## Open issues summary

### Sub-topic 1-1 CA\_n5B

**Issue 1-1: CA\_n5B MSD for 25MHz Aggregated CBW**

* Proposals: yellow highlight

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Proposal** | **CA**  **configuration** | **SCS**  **(PCC/SCC)**  **(kHz)** | **Aggregated channel bandwidth (PCC+SCC)** | **UL PCC allocation**  **(LCRB)** | **UL SCC allocation**  **(LCRB)** | **PCC ΔRIBC (dB)** | **SCC ΔRIBC (dB)** | **RAN4 meeting** |
| BCS0 Ref | CA\_n5B | 15/15 | 10MHz + 10MHz | 10 (RBSTART = 0) | 10 (RBSTART = 42) | 30.8 | 26.1 | FDD |
| **Qualcomm #108b**  [**R4-2316266**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108bis/Docs/R4-2316266.zip) | CA\_n5B**x** | 15/15 | 5MHz + 20MHz | 4 (RBSTART = 0) | 16 (RBSTART = 90) | 43.4 | 20.6 | FDD |
| **Murata #108b**  [**R4-2316627**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108bis/Docs/R4-2316627.zip) | CA\_n5B**x** | 15/15 | 5MHz + 20MHz | 4 (RBSTART = 0) | 16 (RBSTART = 90) | [42.5] | [18.2] | FDD |
| **Apple #109**  [**R4-2318418**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318418.zip) | CA\_n5B**x** | 15/15 | 5MHz + 20MHz | 4 (RBSTART = 0) | 16 (RBSTART = 90) | 45 | 26 | FDD |
| **Skyworks #109**  [**R4-2320993**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320993.zip) | CA\_n5B**x** | 15/15 | 5MHz + 20MHz | 4 (RBSTART = 0) | 16 (RBSTART = 90) | 46.4 | 23.3 | FDD |
| **Average** | CA\_n5B**X** | 15/15 | 5MHz + 20MHz | 4 (RBSTART = 0) | 16 (RBSTART = 90) | 44.6 | 23.0 | FDD |
| NOTE 1: All combinations of channel bandwidths defined in Table 5.5A.1-1.  NOTE 2: The carrier centre frequency of SCC in the UL operating band is configured closer to the DL operating band.  NOTE 3: The transmitted power over both PCC and SCC shall be set to PUMAX as defined in subclause 6.2A.4.  NOTE 4: The PCC allocation is same as Transmission bandwidth configuration NRB as defined in Table 5.3.2-1.  NOTE X: Applicable only to BCS 1. | | | | | | | | |

* Recommended WF
  + Test points are all aligned with WF R4-2317656,
  + For PCC/SCC MSD, discuss if the average values captured in table below are acceptable.

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| **CA configuration** | **SCS**  **(PCC/SCC)**  **(kHz)** | **Aggregated channel bandwidth (PCC+SCC)** | **UL PCC allocation**  **(LCRB)** | **UL SCC allocation**  **(LCRB)** | **PCC ΔRIBC (dB)** | **SCC ΔRIBC (dB)** | **Duplex mode** |
| CA\_n5B | 15/15 | 10MHz + 10MHz | 10 (RBSTART = 0) | 10 (RBSTART = 42) | 30.8 | 26.1 | FDD |
| CA\_n5B**x** | 15/15 | 5MHz + 20MHz | 4 (RBSTART = 0) | 16 (RBSTART = 90) | 44.6 | 23.0 | FDD |
| NOTE 1: All combinations of channel bandwidths defined in Table 5.5A.1-1.  NOTE 2: The carrier centre frequency of SCC in the UL operating band is configured closer to the DL operating band.  NOTE 3: The transmitted power over both PCC and SCC shall be set to PUMAX as defined in subclause 6.2A.4.  NOTE 4: The PCC allocation is same as Transmission bandwidth configuration NRB as defined in Table 5.3.2-1.  NOTE X: Applicable only to BCS 1. | | | | | | | |

### Sub-topic 1-2 CA\_n7B

**Issue 1-2: CA\_n7B MSD for BCS4/5**

* Proposals

Table 1 CA\_n7B BCS4-5 MSD proposal from Murata.

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| **CA configuration** | **SCS**  **(PCC/SCC)**  **(kHz)** | **Aggregated channel bandwidth (PCC+SCC)** | **UL PCC allocation**  **(LCRB)** | **UL SCC allocation**  **(LCRB)** | **PCC ΔRIBC (dB)** | **SCC ΔRIBC (dB)** | **Duplex mode** |
| CA\_n7B**X** | 15/15 | 20MHz + 50MHz | 9 (RBSTART = 4) | 36 (RBSTART = 230) | [39.9] | [13.9] | FDD |
| NOTE 1: All combinations of channel bandwidths defined in Table 5.5A.1-1.  NOTE 2: The carrier centre frequency of SCC in the UL operating band is configured closer to the DL operating band.  NOTE 3: The transmitted power over both PCC and SCC shall be set to PUMAX as defined in subclause 6.2A.4.  NOTE 4: The PCC allocation is same as Transmission bandwidth configuration NRB as defined in Table 5.3.2-1.  NOTE X: Applicable only to BCS 4-5 | | | | | | | |

* Recommended WF
  + Discuss if the MSD proposal is agreeable.

# Topic #2: NR-U Intra-band ULCA combinations

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2320035**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320035.zip)  On addition of CA\_n102B and CA\_n102C uplink | Nokia, BT | **Observation 1**: These uplink configurations have previously been discussed within RAN4.  **Observation 2**: The specification already defines MPR for PC5 intra-band contiguous CA for bandwidth class B and class C.  **Observation 3**: The MPR for intra-band contiguous CA for bandwidth class B and class C is larger than the A-MPR defined for NS\_58  **Observation 4**: For NR the maximum allowed power reduction for the UE is given as MAXMPR,A-MPR  **Proposal 1**: Approve the inclusion of intra-band uplink CA configurations CA\_n102B and CA\_n102C to the specification via TP to the TR in Annex A.  **Proposal 2**: Endorse the draftCR for inclusion of intra-band uplink CA configurations CA\_n102B and CA\_n102C to the specification |
| [**R4-2320036**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320036.zip)  draftCR for addition of CA\_n102B and CA\_n102C uplink | Nokia, BT | Moderator: Pending agreement on need/or not of A-MPR for CA\_NS\_58 A-MPR. Refer to Nokia,BT proposal and Skyworks data. |
| [**R4-2320037**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320037.zip)  A-MPR study for CA\_n102B and CA\_n102C uplink | Nokia, BT | **Observation 1**: No A-MPR is needed for CA\_102B and CA\_102C when NS\_58 is signaled. |
| [**R4-2320171**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320171.zip)  A-MPR tables for CA\_NS\_53 and CA\_NS\_54 when introducing NR-U CA\_n96 | Charter Communications, Inc | Moderator: Consider A-MPR proposal for CA\_NS\_53 and CA\_NS\_54 based on merging Charter’s and Skywork's data. |
| [**R4-2320173**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320173.zip)  CR for introducing NR-U uplink CA for NS\_53 and NS\_54 | Charter Communications, Inc | Moderator: draft CR to be reviewed, pending A-MPR agreements. |
| [**R4-2320991**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320991.zip)  PC5 CA\_NS\_53 CA\_NS\_54 A-MPR | Skyworks Solutions Inc. | Moderator: consider consolidation with Charter's and Apple's data. |
| [**R4-2320992**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320992.zip)  PC5 CA\_NS\_58 A-MPR | Skyworks Solutions Inc. | **Proposal**: For CA\_NS\_58, we adopt a similar A-MPR table format and approach as compared to that of CA\_NS\_54. The initial values are provided in brackets. Further evaluation of whether A-MPR is needed for a 30 MHz gap to the OOB PSD frequency range range of f ≤ 5935MHz (Figure 3), hence the Note 5 frequency restriction is proposed in brackets.  Moderator: further discuss need for A-MPR for CA\_NS\_58 considering the similarities with CA\_NS\_53. |
| **rev\_**[**R4-2320994**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320994.zip)  On nominal channel spacing for NR-U | Skyworks Solutions Inc. | Moderator: This document is revised, the draft is shared via the reflector.  **Observation 1:** For intra-band contiguous operation in band n96, the nominal channel spacing specified in clause 5.4A.1 may be exceeded for certain network configurations. For example, in band n96, the spacing between the 20MHz CBW NR-ARFCN 798332 and channel 799668 is 20.04MHz. This spacing exceeds the nominal channel spacing of 19.98MHz by 60kHz. We note however that this channel spacing is valid since it meets the FFT grid alignment.  **Observation 2:** From clause 5.4A.1, UEs designed to support intra-band contiguous CA operation, such a CA\_n96B, may consider that network configurations for which the channel spacing exceeds the nominal channel bandwidth are not valid for intra-band contiguous operation. The initial attach UE behaviour may be uncertain, e.g., the UE may fail the initial attach procedure.  **Proposal:** We propose two options to address the ambiguity of a UE configured to attach to NR-U adjacent CCs whose channel spacing exceeds the nominal channel spacing:   * Option 1: Amend clause 5.4A.1 core requirement text to exceptionally allow NR-U intra-band contiguous operation for the case when the nominal channel spacing is "slightly" exceeded. The term "slightly" would need to be further discussed and captured in the form of an equation. * Option 2: Allow the network to use additional NR-ARFCN channels so that the nominal channel spacing is always met.   In any case, it should be noted that both TS 38.101-1 and TS 38.104 are potentially impacted since this ambiguity exists for both uplink CA and downlink CA. |

## Open issues summary

### Sub-topic 2-1 CA\_NS\_58

**Issue 2-1: Review of Draft CR on CA\_n102B CA\_n102C**

* Proposals
  + Draft CR [**R4-2320036**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320036.zip) from Nokia, BT.
* Recommended WF
  + Draft CR to be reviewed: interested parties should try to flag any issue for the Draft CR before the start of meeting. The need for A-MPR will be discussed during the meeting.

**Issue 2-2: Need for A-MPR for CA\_NS\_58**

* Proposals
  + No A-MPR is needed for CA\_102B and CA\_102C when NS\_58 is signalled – Nokia, BT R4-2320037,
  + A-MPR is needed for CA\_NS\_58, similar table format and approach than CA\_NS\_54. – Skyworks R4-2320992.

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| Pre-coding | Modulation | Aggregated channel bandwidth (Sub-band allocation) / RB Allocation | | | | | | | | | | |
|  |  | **RB Allocation**  (Note 4) | | **40MHz – 60MHz**  (Note 5) | | **80MHz**  (Note 5) | | **100MHz**  (Note 5) | | 120MHz – 160MHz  (Note 5) | |
|  |  | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) |
| DFT-s-OFDM | PI/2 BPSK2 | ≤ 3.0 | | ≤ [4.0] | ≤ [5.0] | ≤ [3.5] | ≤ [4.5] | ≤ [3.5] | ≤ [4.0] | ≤ [3.0] | ≤ [4.0] |
| QPSK | ≤ 3.0 | | ≤ [4.0] | ≤ [5.0] | ≤ [3.5] | ≤ [4.5] | ≤ [3.5] | ≤ [4.0] | ≤ [3.0] | ≤ [4.0] |
|  | 16 QAM | ≤ 3.5 | | ≤ [4.0] | ≤ [5.0] | ≤ [3.5] | ≤ [4.5] | ≤ [3.5] | ≤ [4.0] | ≤ [3.5] | ≤ [3.5] |
|  | 64 QAM | ≤ 4.5 | | ≤ [4.5] | ≤ [5.0] | ≤ [4.5] | ≤ [4.5] | ≤ [4.5] | ≤ [4.5] | ≤ [4.5] | ≤ [4.5] |
|  | 256 QAM | ≤ 6.0 | | ≤ [6.0] | ≤ [6.0] | ≤ [6.0] | ≤ [6.0] | ≤ [6.0] | ≤ [6.0] | ≤ [6.0] | ≤ [6.0] |
| CP-OFDM | QPSK | ≤ 4.0 | | ≤ [5.0] | ≤ [5.5] | ≤ [5.0] | ≤ [5.5] | ≤ [4.5] | ≤ [5.0] | ≤ [4.5] | ≤ [5.0] |
|  | 16 QAM | ≤ 4.5 | | ≤ [5.0] | ≤ [5.5] | ≤ [5.0] | ≤ [5.5] | ≤ [4.5] | ≤ [5.0] | ≤ [4.5] | ≤ [5.0] |
|  | 64 QAM | ≤ 6.0 | | ≤ [6.0] | ≤ [6.0] | ≤ [6.0] | ≤ [6.0] | ≤ [6.0] | ≤ [6.0] | ≤ [6.0] | ≤ [6.0] |
|  | 256 QAM | ≤ 7.0 | | ≤ [7.0] | ≤ [7.0] | ≤ [7.0] | ≤ [7.0] | ≤ [7.0] | ≤ [7.0] | ≤ [7.0] | ≤ [7.0] |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated, and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated.  NOTE 2: The A-MPR for full allocation applies to all RBs in all contiguously transmitted sub-bands for operations that are fully allocated.  NOTE 3: The A-MPR for partial RB allocation applies to all contiguously transmitted sub-bands with interlaced allocations, with uplink resource allocation type 2, as specified in TS38.214 [10].  NOTE 4: Applicable for all valid channels and bandwidth of contiguously transmitted sub-bands, other than those enumerated in Note 5.  NOTE 5: Applicable to aggregated channel’s lower edge at [5945] MHz.  NOTE 6: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0. | | | | | | | | | | | |

* Recommended WF
  + Discuss need for A-MPR based on input documents,
  + Derive a way forward (WF) to collect companies' views on need for A-MPR.

### Sub-topic 2-2 CA\_NS\_53 for CA\_n96B, CA\_n96C

**Issue 2-3: CA\_NS\_53 A-MPR**

* Proposals
  + Charter proposal:

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Pre-coding** | **Modulation** | **Bandwidth of contiguously transmitted sub-bands / RB Allocation / A-MPR (dB)** | | | | | | | | | | | | | | | |
| **20 MHz** | | **40 MHz** | | **60 MHz** | | **80 MHz** | | **100MHz** | | **120MHz** | | **140MHz** | | **160MHz** | |
| **Full** | **Partial** | **Full** | **Partial** | **Full** | **Partial** | **Full** | **Partial** | **Full** | **Partial** | **Full** | **Partial** | **Full** | **Partial** | **Full** | **Partial** |
| DFT-s-OFDM | PI/2 BPSK2 | ≤ 9.0 | ≤ 11.5 | ≤ 5.5 | ≤ 8.5 | ≤ 4.0 | ≤ 6.5 | ≤ 3.5 | ≤ 5.5 | ≤ 3.5 | ≤ 5.0 | ≤ 3.5 | ≤ 4.0 | ≤ 3.5 | ≤ 4.0 | ≤ 3.5 | ≤ 4.0 |
| QPSK | ≤ 9.0 | ≤ 11.5 | ≤ 5.5 | ≤ 8.5 | ≤ 4.0 | ≤ 6.5 | ≤ 3.5 | ≤ 5.5 | ≤ 3.5 | ≤ 5.0 | ≤ 3.5 | ≤ 4.0 | ≤ 3.5 | ≤ 4.0 | ≤ 3.5 | ≤ 4.0 |
| 16 QAM | ≤ 9.0 | ≤ 11.5 | ≤ 5.5 | ≤ 8.5 | ≤ 4.0 | ≤ 6.5 | ≤ 3.5 | ≤ 5.5 | ≤ 3.5 | ≤ 5.0 | ≤ 3.5 | ≤ 4.5 | ≤ 3.5 | ≤ 4.0 | ≤ 3.5 | ≤ 4.0 |
| 64 QAM | ≤ 9.0 | ≤ 11.5 | ≤ 5.5 | ≤ 8.5 | ≤ 4.5 | ≤ 6.5 | ≤ 4.5 | ≤ 5.5 | ≤ 4.5 | ≤ 5.0 | ≤ 4.5 | ≤ 4.5 | ≤ 4.5 | ≤ 4.5 | ≤ 4.5 | ≤ 4.5 |
| 256 QAM | ≤ 9.0 | ≤ 11.5 | ≤ 6.0 | ≤ 8.5 | ≤ 6.0 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| CP-OFDM | QPSK | ≤ 9.0 | ≤ 11.0 | ≤ 5.5 | ≤ 8.5 | ≤ 5.0 | ≤ 6.5 | ≤ 5.0 | ≤ 5.5 | ≤ 5.0 | ≤ 5.0 | ≤ 4.5 | ≤ 5.0 | ≤ 4.5 | ≤ 5.0 | ≤ 4.5 | ≤ 5.0 |
| 16 QAM | ≤ 9.0 | ≤ 11.0 | ≤ 5.5 | ≤ 8.5 | ≤ 5.0 | ≤ 6.5 | ≤ 5.0 | ≤ 5.5 | ≤ 5.0 | ≤ 5.0 | ≤ 5.0 | ≤ 5.0 | ≤ 5.0 | ≤ 5.0 | ≤ 4.5 | ≤ 5.0 |
| 64 QAM | ≤ 9.0 | ≤ 11.0 | ≤ 6.0 | ≤ 8.5 | ≤ 6.0 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| 256 QAM | ≤ 9.0 | ≤ 11.0 | ≤ 7.0 | ≤ 8.5 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel, or all RB’s in all sub-bands for wideband operation, are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated, but when all sub-bands within the channel are transmitted. When not all sub-bands within the channel are transmitted, the A-MPR associated with the channel bandwidth according to the bandwidth of the contiguously transmitted sub-bands and according to the allocation type applies.  NOTE 2: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0. | | | | | | | | | | | | | | | | | |

* + Skyworks proposal:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Pre-coding** | **Modulation** | **Bandwidth of contiguously transmitted sub-bands / RB Allocation / A-MPR (dB)** | | | | | | | | | | | | | | | |
| **20 MHz** | | **40 MHz** | | **60 MHz** | | **80 MHz** | | **100MHz** | | **120MHz** | | **140MHz** | | **160MHz** | |
| **Full** | **Partial** | **Full** | **Partial** | **Full** | **Partial** | **Full** | **Partial** | **Full** | **Partial** | **Full** | **Partial** | **Full** | **Partial** | **Full** | **Partial** |
| DFT-s-OFDM | PI/2 BPSK2 | ≤ 9.0 | ≤ 11.5 | ≤ 6.0 | ≤ 8.5 | ≤ 4.0 | ≤ 7.0 | ≤ 3.5 | ≤ 5.5 | ≤ 3.5 | ≤ 5.0 | ≤ 3.5 | ≤ 4.5 | ≤ 3.0 | ≤ 4.0 | ≤ 3.0 | ≤ 4.0 |
| QPSK | ≤ 9.0 | ≤ 11.5 | ≤ 6.0 | ≤ 8.5 | ≤ 4.0 | ≤ 7.0 | ≤ 3.5 | ≤ 5.5 | ≤ 3.5 | ≤ 5.0 | ≤ 3.5 | ≤ 4.5 | ≤ 3.0 | ≤ 4.0 | ≤ 3.0 | ≤ 4.0 |
| 16 QAM | ≤ 9.0 | ≤ 11.5 | ≤ 6.0 | ≤ 8.5 | ≤ 4.0 | ≤ 7.0 | ≤ 3.5 | ≤ 5.5 | ≤ 3.5 | ≤ 5.0 | ≤ 3.5 | ≤ 4.5 | ≤ 3.5 | ≤ 4.0 | ≤ 3.5 | ≤ 4.0 |
| 64 QAM | ≤ 9.0 | ≤ 11.5 | ≤ 6.0 | ≤ 8.5 | ≤ 4.5 | ≤ 7.0 | ≤ 4.5 | ≤ 5.5 | ≤ 4.5 | ≤ 5.0 | ≤ 4.5 | ≤ 4.5 | ≤ 4.5 | ≤ 4.5 | ≤ 4.5 | ≤ 4.5 |
| 256 QAM | ≤ 9.0 | ≤ 11.5 | ≤ 6.0 | ≤ 8.5 | ≤ 6.0 | ≤ 7.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| CP-OFDM | QPSK | ≤ 9.0 | ≤ 11.0 | ≤ 5.5 | ≤ 8.5 | ≤ 5.0 | ≤ 6.5 | ≤ 5.0 | ≤ 5.5 | ≤ 5.0 | ≤ 5.0 | ≤ 5.0 | ≤ 5.0 | ≤ 5.0 | ≤ 5.0 | ≤ 4.5 | ≤ 4.5 |
| 16 QAM | ≤ 9.0 | ≤ 11.0 | ≤ 5.5 | ≤ 8.5 | ≤ 5.0 | ≤ 6.5 | ≤ 5.0 | ≤ 5.5 | ≤ 5.0 | ≤ 5.0 | ≤ 5.0 | ≤ 5.0 | ≤ 5.0 | ≤ 5.0 | ≤ 4.5 | ≤ 4.5 |
| 64 QAM | ≤ 9.0 | ≤ 11.0 | ≤ 6.0 | ≤ 8.5 | ≤ 6.0 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| 256 QAM | ≤ 9.0 | ≤ 11.0 | ≤ 7.0 | ≤ 8.5 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 |

* Recommended WF

Discuss merging A-MPR proposals based on the A-MPR differences [R4-2320171 - R4-2320991] highlighted in the table below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Pre-coding** | **Modulation** | **Bandwidth of contiguously transmitted sub-bands / RB Allocation / A-MPR (dB)** | | | | | | | | | | | | | | | |
| **20 MHz** | | **40 MHz** | | **60 MHz** | | **80 MHz** | | **100MHz** | | **120MHz** | | **140MHz** | | **160MHz** | |
| **Full** | **Partial** | **Full** | **Partial** | **Full** | **Partial** | **Full** | **Partial** | **Full** | **Partial** | **Full** | **Partial** | **Full** | **Partial** | **Full** | **Partial** |
| DFT-s-OFDM | PI/2 BPSK2 |  |  | -0.5 |  |  | -0.5 |  |  |  |  |  | -0.5 | +0.5 |  | +0.5 |  |
| QPSK |  |  | -0.5 |  |  | -0.5 |  |  |  |  |  | -0.5 | +0.5 |  | +0.5 |  |
| 16 QAM |  |  | -0.5 |  |  | -0.5 |  |  |  |  |  |  |  |  |  |  |
| 64 QAM |  |  | -0.5 |  |  | -0.5 |  |  |  |  |  |  |  |  |  |  |
| 256 QAM |  |  |  |  |  | -0.5 |  |  |  |  |  |  |  |  |  |  |
| CP-OFDM | QPSK |  |  |  |  |  |  |  |  |  |  | -0.5 |  | -0.5 |  |  | +0.5 |
| 16 QAM |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | +0.5 |
| 64 QAM |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 256 QAM |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

### Sub-topic 2-3 CA\_NS\_54

**Issue 2-4: CA\_NS\_54 A\_MPR for CA\_n96B/C**

* Proposals
  + Proposal from Charter

Table 5: A-MPR for NS\_54 power class 5

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Pre-coding** | **Modulation** | **Bandwidth of contiguously transmitted sub-bands / RB Allocation / A-MPR (dB)** | | | | | | | | |
| **RB Allocation**  **(Note 4)** | | **40MHz – 80MHz**  **(Note 5)** | | **100MHz – 120MHz**  **(Note 5)** | | **140MHz – 160MHz**  **(Note 5)** | |
|  | **Full2** | **Partial3** | **Full2** | **Partial3** | **Full2** | **Partial3** | **Full2** | **Partial3** |
| DFT-s-OFDM | PI/2 BPSK7 | ≤ 3.0 | | ≤ 3.5 | ≤ 4.5 | ≤ 3.0 | ≤ 4.0 | ≤ 3.0 | ≤ 3.5 |
| QPSK | ≤ 3.0 | | ≤ 3.5 | ≤ 4.5 | ≤ 3.5 | ≤ 4.0 | ≤ 3.5 | ≤ 3.5 |
| 16 QAM | ≤ 3.5 | | ≤ 4.0 | ≤ 4.5 | ≤ 3.5 | ≤ 4.0 | ≤ 3.5 | ≤ 3.5 |
| 64 QAM | ≤ 4.5 | | ≤ 4.5 | ≤ 4.5 | ≤ 4.5 | ≤ 4.5 | ≤ 4.5 | ≤ 4.5 |
| 256 QAM | ≤ 6.0 | | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| CP-OFDM | QPSK | ≤ 4.0 | | ≤ 4.5 | ≤ 5.0 | ≤ 4.0 | ≤ 4.5 | ≤ 4.0 | ≤ 4.0 |
| 16 QAM | ≤ 4.5 | | ≤ 4.5 | ≤ 5.5 | ≤ 4.5 | ≤ 4.5 | ≤ 4.5 | ≤ 4.0 |
| 64 QAM | ≤ 6.0 | | ≤ 5.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| 256 QAM | ≤ 7.0 | | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated.  NOTE 2: The A-MPR for Full allocation applies to all RBs in all contiguously transmitted sub-bands for operation that are fully allocated.  NOTE 3: The A-MPR for Partial RB allocation applies to all contiguously transmitted sub-bands with interlaced allocations with uplink resource allocation type 2 as specified in TS38.214 [10].  NOTE 4: Applicable for all valid channels and bandwidth of contiguously transmitted sub-bands other than those enumerated in NOTE 5.  NOTE 5: Applicable to aggregated channel’s lower edge at 5945MHz.  NOTE 6: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0. | | | | | | | | | | |

* + Proposal from Skyworks:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Pre-coding** | **Modulation** | **Bandwidth of contiguously transmitted sub-bands / RB Allocation / A-MPR (dB)** | | | | | | | |
| **RB Allocation**  **(Note 4)** | | **40MHz – 80MHz**  **(Note 5)** | | **100MHz – 120MHz**  **(Note 5)** | | **140MHz – 160MHz**  **(Note 5)** | |
|  |  | **Full2** | **Partial3** | **Full2** | **Partial3** | **Full2** | **Partial3** | **Full2** | **Partial3** |
| DFT-s-OFDM | PI/2 BPSK7 | ≤ 3.0 | | ≤ 3.5 | ≤ 4.5 | ≤ 3.0 | ≤ 4.0 | ≤ 3.0 | ≤ 3.5 |
| QPSK | ≤ 3.0 | | ≤ 3.5 | ≤ 4.5 | ≤ 3.0 | ≤ 4.0 | ≤ 3.0 | ≤ 3.5 |
|  | 16 QAM | ≤ 3.5 | | ≤ 4.0 | ≤ 4.5 | ≤ 3.5 | ≤ 4.0 | ≤ 3.5 | ≤ 3.5 |
|  | 64 QAM | ≤ 4.5 | | ≤ 4.5 | ≤ 4.5 | ≤ 4.5 | ≤ 4.5 | ≤ 4.5 | ≤ 4.5 |
|  | 256 QAM | ≤ 6.0 | | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| CP-OFDM | QPSK | ≤ 4.0 | | ≤ 4.5 | ≤ 5.5 | ≤ 4.5 | ≤ 5.0 | ≤ 4.0 | ≤ 4.5 |
|  | 16 QAM | ≤ 4.5 | | ≤ 4.5 | ≤ 5.5 | ≤ 4.5 | ≤ 5.0 | ≤ 4.5 | ≤ 4.5 |
|  | 64 QAM | ≤ 6.0 | | ≤ 5.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
|  | 256 QAM | ≤ 7.0 | | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 | ≤ 7.0 |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated.  NOTE 2: The A-MPR for full allocation applies to all RBs in all contiguously transmitted sub-bands for operation that are fully allocated.  NOTE 3: The A-MPR for partial RB allocation applies to all contiguously transmitted sub-bands with interlaced allocations with uplink resource allocation type 2, as specified in TS38.214 [10].  NOTE 4: Applicable for all valid channels and bandwidth of contiguously transmitted sub-bands, other than those enumerated in NOTE 5.  NOTE 5: Applicable to aggregated channel’s lower edge at 5945 MHz.  NOTE 6: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0. | | | | | | | | | | |

* Recommended WF

Discuss merging A-MPR proposals based on the A-MPR differences [R4-2320171 - R4-2320991] highlighted in the table below.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Pre-coding** | **Modulation** | **Bandwidth of contiguously transmitted sub-bands / RB Allocation / A-MPR (dB)** | | | | | | | |
| **RB Allocation**  **(Note 4)** | | **40MHz – 80MHz**  **(Note 5)** | | **100MHz – 120MHz**  **(Note 5)** | | **140MHz – 160MHz**  **(Note 5)** | |
|  |  | **Full2** | **Partial3** | **Full2** | **Partial3** | **Full2** | **Partial3** | **Full2** | **Partial3** |
| DFT-s-OFDM | PI/2 BPSK7 |  | |  |  |  |  |  |  |
| QPSK |  | |  |  | +0.5 |  | +0.5 |  |
|  | 16 QAM |  | |  |  |  |  |  |  |
|  | 64 QAM |  | |  |  |  |  |  |  |
|  | 256 QAM |  | |  |  |  |  |  |  |
| CP-OFDM | QPSK |  | |  | -0.5 | -0.5 | -0.5 |  | -0.5 |
|  | 16 QAM |  | |  |  |  | -0.5 |  | -0.5 |
|  | 64 QAM |  | |  |  |  |  |  |  |
|  | 256 QAM |  | |  |  |  |  |  |  |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated.  NOTE 2: The A-MPR for full allocation applies to all RBs in all contiguously transmitted sub-bands for operation that are fully allocated.  NOTE 3: The A-MPR for partial RB allocation applies to all contiguously transmitted sub-bands with interlaced allocations with uplink resource allocation type 2, as specified in TS38.214 [10].  NOTE 4: Applicable for all valid channels and bandwidth of contiguously transmitted sub-bands, other than those enumerated in NOTE 5.  NOTE 5: Applicable to aggregated channel’s lower edge at 5945 MHz.  NOTE 6: Applicable to Pi/2-BPSK modulation when IE powerBoostPi2BPSK is set to 0. | | | | | | | | | |

### Sub-topic 2-4

**Issue 2-5: Review CR for CA\_n96B CA\_n96C**

* Proposals
  + CR [**R4-2320173**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320173.zip)from Charter
* Recommended WF
  + CR to be reviewed and potentially revised for A-MPR,
  + Interested parties should try to flag any issue for the CR before the start of the meeting except for A-MPR values that will be discussed during the meeting.

### Sub-topic 2-5

**Issue 2-6: Handling of NR-U intra-band CA configurations exceeding the nominal channel spacing**

Moderator: A revision will be shared on the reflector email thread [109][104] where typos have been corrected in the header section. The technical contents remain unchanged.

* Proposals - Skyworks
  + **Option 1:** Amend clause 5.4A.1 core requirement text to exceptionally allow NR-U intra-band contiguous operation for the case when the nominal channel spacing is "slightly" exceeded. The term "slightly" would need to be further discussed and captured in the form of an equation.
  + **Option 2:** Allow the network to use additional NR-ARFCN channels so that the nominal channel spacing is It should be noted that both TS 38.101-1 and TS 38.104 are potentially impacted since this ambiguity exists for both uplink CA and downlink CA.
* Recommended WF
  + Further discuss this issue during the meeting. Other options not precluded.
  + Derive a WF to reach common agreement for TS 38.104 and TS 38.101-1.

# Topic #3: LBLB combinations

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2318417**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318417.zip) MSD analysis for CA\_n5B-n12, CA\_n5B-n14, and CA\_n5B-n29 with C\_n5B UL | Apple | |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | ***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\_n5-n12 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX | |  |  | 838.9 | 10 | 10 (RBSTART=42) | 883.9 | N/A |  | N/AY | |  | n12 | N/A | 5 | N/A | 743.5 | **8.3** | FDD | IMD9 | | CA\_n5-n12 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX | |  | 838.9 | 10 | 10 (RBSTART=36) | 883.9 | N/A | N/AY | |  | n12 | N/A | 5 | N/A | 743.5 | **24.2** | FDD | IMD11 | | CA\_n5-n14 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX | |  | 838.9 | 10 | 10 (RBSTART=42) | 883.9 | N/A | N/AY | |  | n14 | N/A | 5 | N/A | 765.5 | **10.8** | FDD | IMD7 | | CA\_n5-n14 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX | |  | 838.9 | 10 | 10 (RBSTART=28) | 883.9 | N/A | N/AY | |  | n14 | N/A | 5 | N/A | 765.5 | **30.2** | FDD | IMD9 | | CA\_n5-n29 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX | |  | 838.9 | 10 | 10 (RBSTART=42) | 883.9 | N/A | N/AY | |  | n29 | N/A | 5 | N/A | 725.5 | **6.7** | FDD | IMD11 | | CA\_n5-n29 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX | |  | 838.9 | 10 | 10 (RBSTART=37) | 883.9 | N/A | N/AY | |  | n29 | N/A | 5 | N/A | 725.5 | **19.3** | FDD | IMD13 | | NOTE X: This component carrier is affected by IMD due to CA\_n5B for which the MSD is not specified  NOTE Y: This component carrier is affected by IMD due to CA\_n5B for which the MSD is not specified | | | | | | | | |   **Table 3-1:** Proposal for MSD based on 10RB+10RB UL allocation.  Moderator to Apple: please confirm if the intention is to propose two test-points for each band combination. WF agreement from RAN4 #108-bis was to adopt a single test point per combination. |
| [**R4-2320247**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320247.zip)  MSD for CA\_n5B-n12A, CA\_n5B-n14A, and CA\_n5B-n29A | Qualcomm France | **Proposal 1**: Use the following lowest order full hit MSD text points for CA\_n5B-n12A, CA\_n5B-n14A, and CA\_n5B\_n29A:   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **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\_n5-n12 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX | |  | 838.9 | 10 | 10 (RBSTART=36) | 883.9 | N/A | N/AY | |  | n12 | N/A | 5 | N/A | 743.5 | **15.3** | FDD | IMD11 | | CA\_n5-n14 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX | |  | 838.9 | 10 | 10 (RBSTART=28) | 883.9 | N/A | N/AY | |  | n14 | N/A | 5 | N/A | 765.5 | **22.6** | FDD | IMD9 | | CA\_n5-n29 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX | |  | 838.9 | 10 | 10 (RBSTART=37) | 883.9 | N/A | N/AY | |  | n29 | N/A | 5 | N/A | 725.5 | **10.4** | FDD | IMD13 | | NOTE X: This component carrier is affected by IMD due to CA\_n5B for which the MSD is not specified  NOTE Y: This component carrier is affected by IMD due to CA\_n5B for which the MSD is not specified | | | | | | | | |   **Proposal 2**: No need to send an LS to RAN5 due to n5 PCC/SCC MSD. |
| [**R4-2320801**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320801.zip)  CA\_n5B-n12, CA\_n5B-n14, CA\_n5B-n29 LB-LB | Murata Manufacturing Co Ltd. | **Observation 1:** Higher MSD is obtained with higher IMD order with peak IMD centered in the RX victim BW than the case with using lower IMD order with peak emission not centered in the RX victim BW.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **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\_n5-n12 | n5 | 829 | 10 | 10 (RBSTART= [0]) | 874 | N/A | FDD | N/A | |  |  | 839 | 10 | 10 (RBSTART= [36]) | 884 | N/A |  |  | |  | n12 | N/A | 5 | N/A | [743.5] | [12.3] | FDD | [IMD11] | | CA\_n5-n14 | n5 | 829 | 10 | 10 (RBSTART= [0]) | 874 | N/A | FDD | N/A | |  |  | 839 | 10 | 10 (RBSTART= [28]) | 884 | N/A |  |  | |  | n14 | N/A | 5 | N/A | [765.5] | [16.6] | FDD | [IMD9] | | CA\_n5-n29 | n5 | 829 | 10 | 10 (RBSTART= [0]) | 874 | N/A | FDD | N/A | |  |  | 839 | 10 | 10 (RBSTART= [37]) | 884 | N/A |  |  | |  | n29 | N/A | 5 | N/A | [725.5] | [8.4] | FDD | [IMD13] |   **Table 2-4**: Proposed Specification  **Proposal 1:** Use MSD values as shown in Table 2-4. |
| [**R4-2320995**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320995.zip)  MSD for n12 n14 n29 due to UL-CA\_n5B | Skyworks Solutions Inc. | **Observation:**   * For any UL CA\_n5B RB allocation, the Band n5 PCC/SCC MSD does not exceed within +-0.5 dB of the agreed upon BCS0 MSD level of 30.8 dB and 26.1 dB for PCC/SCC, respectively (Table 7.3A.2.1-1). The worst PCC MSD is observed for CA\_n5-n12 10(RBSTART=0) + 10(RBSTART=36). * The CA\_n5B uplink configuration of 10 MHz+10 MHz 10 (RBSTART=0) + 10 (RBSTART=42) always results in lower MSD for Bands n12/n14/n29 SCCs, as compared to configurations which center respectively onIMD11, IMD9, and IMD13 for each of these Scells (see the measured IMD landscape of Figure 1).   **Proposal 1:** Consider adopting the following guidelines in TR 38.846.  For MSD test points for cross-band MSD due to FDD band dual uplink intra-band contiguous CA interference, we propose the following:   1. FDD band intra-band contiguous uplink CA configuration:    * PCC/SCC: the UL CBW, SCS, and UL RB allocation "Lcrb" should be configured to the specified PCC/SCC CBW/SCS/Lcrb of the band's MSD test point. In case the FDD band UL-CA MSD test point is not specified:      1. The PCC/SCC UL CBW shall be set equal,   If configuring equal CBW is not possible, then set the PCC CBW 5 MHz lower [1],   * + 1. The aggregated UL RB allocation (aka "RBtot") is set equal to the Lcrb specified for the single carrier REFSENS test point that corresponds with the UL-CA aggregated BW.   Example, for UL-CA 10 MHz+10 MHz, adopt the Lcrb specified for 20 MHz CBW REFSENS [1],   * + 1. The PCC/SCC UL RB allocation "Lcrb" should be configured to ensure equal PSD across the PCC and the SCC,   + The PCC/SCC UL RBstart shall be configured to create a direct hit collision of the affected DL SCC with the lowest 2UL IMD product. If conditions to create a direct hit collision cannot be met, then configure the PCC/SCC RBstart that results in a partial collision of the lowest 2UL IMD product,   + The highest IMD order to be considered is [13],   + Configure the UL carrier frequency closest to the affected DL SCC carrier frequency.   + Whenever possible, the UL band configuration should be configured to avoid self-desense.   In case self-desense cannot be avoided:   * + 1. the MSD test point shall not lead to a higher desense than the band's MSD test point (when specified),     2. To prevent radio link failure during conformance test, RAN5 should be informed that self-desense may occur on the UL FDD band.  1. Affected DL band SCC configuration:    * DL SCC carrier frequency: configured closest to the FDD UL-CA carrier,    * DL SCC CBW: configured to its lowest supported CBW.   **Proposal 2:** For CA\_n5-n12, CA\_n5-n14 and CA\_n5-n29, adopt the MSD test points shown in Table 1 and previously agreed upon footnotes to inform RAN5 of Band n5 self-desense.  **Table 1** CA\_n5-n12, CA\_n5-n14, CA\_n5-n29 MSD test points   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **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\_n5-n12 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX | |  | 838.9 | 10 | 10 (RBSTART=36) | 883.9 | N/A | N/AY | |  | n12 | N/A | 5 | N/A | 743.5 | **22.1** | FDD | IMD11 | | CA\_n5-n14 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX | |  | 838.9 | 10 | 10 (RBSTART=28) | 883.9 | N/A | N/AY | |  | n14 | N/A | 5 | N/A | 765.5 | **25.8** | FDD | IMD9 | | CA\_n5-n29 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX | |  | 838.9 | 10 | 10 (RBSTART=37) | 883.9 | N/A | N/AY | |  | n29 | N/A | 5 | N/A | 725.5 | **17.4** | FDD | IMD13 | | NOTE X: This component carrier is affected by IMD due to CA\_n5B for which the MSD is not specified  NOTE Y: This component carrier is affected by IMD due to CA\_n5B for which the MSD is not specified | | | | | | | | | |

## Open issues summary

### Sub-topic 3-1 CA\_n5B\_n12

**Issue 3-1: CA\_n5B\_n12 test point and MSD**

* Proposals

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Proponent | 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 |  |
| Apple  Moderator: please confirm if the proposal can be reduced to 1 test point. | CA\_n5-n12 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX |
|  |  | 838.9 | 10 | 10 (RBSTART=42) | 883.9 | N/A |  | N/AY |
|  | n12 | N/A | 5 | N/A | 743.5 | **8.3** | FDD | IMD9 |
| CA\_n5-n12 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX |
|  |  | 838.9 | 10 | 10 (RBSTART=36) | 883.9 | N/A |  | N/AY |
|  | n12 | N/A | 5 | N/A | 743.5 | **24.2** | FDD | IMD11 |
| Qualcomm | CA\_n5-n12 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX |
|  |  | 838.9 | 10 | 10 (RBSTART=36) | 883.9 | N/A |  | N/AY |
|  | n12 | N/A | 5 | N/A | 743.5 | **15.3** | FDD | IMD11 |
| Murata | CA\_n5-n12 | n5 | 829 | 10 | 10 (RBSTART= [0]) | 874 | N/A | FDD | N/A |
|  |  | 839 | 10 | 10 (RBSTART= [36]) | 884 | N/A |  |  |
|  | n12 | N/A | 5 | N/A | [743.5] | **[12.3]** | FDD | [IMD11] |
| Skyworks | CA\_n5-n12 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX |
|  |  | 838.9 | 10 | 10 (RBSTART=36) | 883.9 | N/A |  | N/AY |
|  | n12 | N/A | 5 | N/A | 743.5 | **22.1** | FDD | IMD11 |
| Apple, Qualcomm, Murata, Skyworks footnotes on CA+n5B MSD issue | NOTE X: This component carrier is affected by IMD due to CA\_n5B for which the MSD is not specified.  NOTE Y: This component carrier is affected by IMD due to CA\_n5B for which the MSD is not specified. | | | | | | | | |

* Recommended WF
  + MSD test point:
    - Pending confirmation of Apple' intentions, all companies agree to select the CA\_n5B PCC/SCC uplink configuration of 10MHz + 10MHz, 10 (RBSTART=0) + 10 (RBSTART=36).
    - This configuration results in lowest IMD order direct hit to the band n12 DL 5MHz CBW SCC at Fc=743.5MHz.
    - Qualcomm and Skyworks have verified this UL configuration does not degrade the agreed CA\_n5B BCS0 MSD.
  + MSD values: further discussions are needed considering the large spread of values. Tentative average MSD is is provided in summary table below.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Proponent | 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\_n5B uplink configuration | CA\_n5-n12 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX |
|  | 838.9 | 10 | 10 (RBSTART=36) | 883.9 | N/A |  | N/AY |
| APPLE | n12 | N/A | 5 | N/A | 743.5 | **24.2** | FDD | IMD11 |
| Qualcomm | n12 | N/A | 5 | N/A | 743.5 | **15.3** | FDD | IMD11 |
| Murata | n12 | N/A | 5 | N/A | [743.5] | **[12.3]** | FDD | [IMD11] |
| Skyworks | n12 | N/A | 5 | N/A | 743.5 | **22.1** | FDD | IMD11 |
| Average MSD | n12 | N/A | 5 | N/A | 743.5 | **[20.8]** | FDD | IMD11 |
| NOTE X: This component carrier is affected by IMD due to CA\_n5B for which the MSD is not specified.  NOTE Y: This component carrier is affected by IMD due to CA\_n5B for which the MSD is not specified. | | | | | | | | | |

### Sub-topic 3-2 CA\_n5B\_n14

**Issue 3-2: CA\_n5B\_n14 test point and MSD**

* Proposals

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Proponent | 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 |  |
| Apple  Moderator: please confirm if the proposal can be reduced to 1 test point. | CA\_n5-n14 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX |
|  |  | 838.9 | 10 | 10 (RBSTART=42) | 883.9 | N/A |  | N/AY |
|  | n14 | N/A | 5 | N/A | 765.5 | **10.8** | FDD | IMD7 |
| CA\_n5-n14 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX |
|  |  | 838.9 | 10 | 10 (RBSTART=28) | 883.9 | N/A |  | N/AY |
|  | n14 | N/A | 5 | N/A | 765.5 | **30.2** | FDD | IMD9 |
| Qualcomm | CA\_n5-n14 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX |
|  |  | 838.9 | 10 | 10 (RBSTART=28) | 883.9 | N/A |  | N/AY |
|  | n14 | N/A | 5 | N/A | 765.5 | 22.6 | FDD | IMD9 |
| Murata | CA\_n5-n14 | n5 | 829 | 10 | 10 (RBSTART= [0]) | 874 | N/A | FDD | N/A |
|  |  | 839 | 10 | 10 (RBSTART= [28]) | 884 | N/A |  |  |
|  | n14 | N/A | 5 | N/A | [765.5] | [16.6] | FDD | [IMD9] |
| Skyworks | CA\_n5-n14 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX |
|  |  | 838.9 | 10 | 10 (RBSTART=28) | 883.9 | N/A |  | N/AY |
|  | n14 | N/A | 5 | N/A | 765.5 | **25.8** | FDD | IMD9 |
| Apple, Qualcomm, Murata, Skyworks footnotes on CA+n5B MSD issue | NOTE X: This component carrier is affected by IMD due to CA\_n5B for which the MSD is not specified.  NOTE Y: This component carrier is affected by IMD due to CA\_n5B for which the MSD is not specified. | | | | | | | | |

* Recommended WF
  + MSD test point:
    - Pending confirmation of Apple' intentions, all companies agree to select the CA\_n5B PCC/SCC uplink configuration of 10MHz + 10MHz, 10 (RBSTART=0) + 10 (RBSTART=28).
    - This configuration results in lowest IMD order direct hit to the band n14 DL 5MHz CBW SCC at Fc=765.5MHz.
    - Qualcomm and Skyworks have verified this UL configuration does not degrade the agreed CA\_n5B BCS0 MSD.
  + MSD values: further discussions are needed considering the large spread of values. Tentative average MSD is is provided in summary table below.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Proponent | 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\_n5B uplink configuration | CA\_n5-n12 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX |
|  | 838.9 | 10 | 10 (RBSTART=28) | 883.9 | N/A |  | N/AY |
| APPLE | n14 | N/A | 5 | N/A | 765.5 | **30.2** | FDD | IMD9 |
| Qualcomm | n14 | N/A | 5 | N/A | 765.5 | **22.6** | FDD | IMD9 |
| Murata | n14 | N/A | 5 | N/A | [765.5] | **[16.6]** | FDD | [IMD9] |
| Skyworks | n14 | N/A | 5 | N/A | 765.5 | **25.8** | FDD | IMD9 |
| Average MSD | n14 | N/A | 5 | N/A | 765.5 | **[26.2]** | FDD | IMD9 |
| NOTE X: This component carrier is affected by IMD due to CA\_n5B for which the MSD is not specified.  NOTE Y: This component carrier is affected by IMD due to CA\_n5B for which the MSD is not specified. | | | | | | | | | |

### Sub-topic 3-3 CA\_n5B\_n29

**Issue 3-3:** **CA\_n5B\_n29 test point**

* Proposals

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Proponent | 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 |  |
| Apple  Moderator: please confirm if the proposal can be reduced to 1 test point. | CA\_n5-n29 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX |
|  |  | 838.9 | 10 | 10 (RBSTART=42) | 883.9 | N/A |  | N/AY |
|  | n29 | N/A | 5 | N/A | 725.5 | **6.7** | FDD | IMD11 |
| CA\_n5-n29 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX |
|  |  | 838.9 | 10 | 10 (RBSTART=37) | 883.9 | N/A |  | N/AY |
|  | n29 | N/A | 5 | N/A | 725.5 | **19.3** | FDD | IMD13 |
| Qualcomm | CA\_n5-n29 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX |
|  |  | 838.9 | 10 | 10 (RBSTART=37) | 883.9 | N/A |  | N/AY |
|  | n29 | N/A | 5 | N/A | 725.5 | **10.4** | FDD | IMD13 |
| Murata | CA\_n5-n29 | n5 | 829 | 10 | 10 (RBSTART= [0]) | 874 | N/A | FDD | N/A |
|  |  | 839 | 10 | 10 (RBSTART= [37]) | 884 | N/A |  |  |
|  | n29 | N/A | 5 | N/A | [725.5] | [8.4] | FDD | [IMD13] |
| Skyworks | CA\_n5-n29 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX |
|  |  | 838.9 | 10 | 10 (RBSTART=37) | 883.9 | N/A |  | N/AY |
|  | n29 | N/A | 5 | N/A | 725.5 | **17.4** | FDD | IMD13 |
| Apple, Qualcomm, Murata, Skyworks footnotes on CA+n5B MSD issue | NOTE X: This component carrier is affected by IMD due to CA\_n5B for which the MSD is not specified.  NOTE Y: This component carrier is affected by IMD due to CA\_n5B for which the MSD is not specified. | | | | | | | | |

* Recommended WF
  + MSD test point:
    - Pending confirmation of Apple' intentions, all companies agree to select the CA\_n5B PCC/SCC uplink configuration of 10MHz + 10MHz, 10 (RBSTART=0) + 10 (RBSTART=37).
    - This configuration results in lowest IMD order direct hit to the band n29 DL 5MHz CBW SCC at Fc=725.5MHz.
    - Qualcomm and Skyworks have verified this UL configuration does not degrade the agreed CA\_n5B BCS0 MSD.
  + MSD values: further discussions are needed considering the large spread of values. Tentative average MSD is is provided in summary table below.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Proponent | 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\_n5B uplink configuration | CA\_n5-n12 | n5 | 829 | 10 | 10 (RBSTART=0) | 874 | N/A | FDD | N/AX |
|  | 838.9 | 10 | 10 (RBSTART=28) | 883.9 | N/A |  | N/AY |
| APPLE | n29 | N/A | 5 | N/A | 725.5 | **19.3** | FDD | IMD13 |
| Qualcomm | n29 | N/A | 5 | N/A | 725.5 | **10.4** | FDD | IMD13 |
| Murata | n29 | N/A | 5 | N/A | [725.5] | **[8.4]** | FDD | [IMD13] |
| Skyworks | n29 | N/A | 5 | N/A | 725.5 | **17.4** | FDD | IMD13 |
| Average MSD | n29 | N/A | 5 | N/A | 725.5 | **[16]** | FDD | IMD13 |
| NOTE X: This component carrier is affected by IMD due to CA\_n5B for which the MSD is not specified.  NOTE Y: This component carrier is affected by IMD due to CA\_n5B for which the MSD is not specified. | | | | | | | | | |

### Sub-topic 3-4 Informing RAN5 on band n5 PCC/SCC self-desense

**Issue 3-4: Inform RAN5 on band n5 PCC/SCC self-desense**

* Proposals
  + Option 1: Qualcomm: No need to send an LS to RAN5 due to n5 PCC/SCC MSD. Notes X and Y should be clear enough so that RAN5 is able to address the aspect appropriately in RAN5.
* Recommended WF: option 1.

### Sub-topic 3-5 Capturing MSD test point guidelines in TR 38.846

**Issue 3-5: Capture cross-band isolation MSD test point due to FDD intra-band uplink CA**

* Proposals
  + Option 1: Skyworks: To capture in TP for TR the proposal 1 guidelines (R4-2320995).

Moderator: Skyworks has files these guidelines in TP for TR [**R4-2320999**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320999.zip)in thread [123] - AI 8.1

* Recommended WF: Further discuss if RAN4 needs to capture this new type of cross-band isolation MSD test points.

# Topic #4: Other band combinations not for block approval

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2318420**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318420.zip)  CR Bug Fixes for Band Combinations in 38101-1-i30\_s00-05 | Apple | CR which corrects some notation bugs. |
| [**R4-2318421**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318421.zip)  CR Bug Fixes for Band Combinations in 38101-3-i30\_s00-05 | Apple | CR which corrects some notation bugs. |
| [**R4-2318506**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318506.zip)  Discussion on clarifying the 1 UL configuration for NR CA | Huawei, Hisilicon | **Proposal 1**:  Introduce the following new text in the core requirements of clause 5.5A.0.  In the CA configuration tables of clause 5.5A.1 and clause 5.5A.2:   * UL CA configuration entries with "-" mean singe UL carrier is valid for intra-band CA   "In the CA configuration tables of clause 5.5A.3:   * UL CA configuration entries with "-" mean that any constituent band of the inter-band DL CA combination can be configured as a valid single uplink carrier * No other single uplink carrier configurations than those specified are valid UL configurations * If an Uplink CA configuration is supported, its fallback single uplink also is supported * Unless otherwise noted, the default power class applies to all valid single uplink carriers or uplink combination(s) specified configurations. The default power class is:   + PC5 for shared spectrum channel access frequency bands,   + PC3 for any NR FR1 band other than shared spectrum channel access,   + PC3 for intra-band UL CA and inter-band UL CA configurations".   Moderator: the yellow highlights are used to capture the proposed text amendments/change marks to previous meeting's Skyworks R4-2316773 proposals . |
| [**R4-2319259**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319259.zip)  DC\_18-n77 and CA\_n18-n77 MSD analysis | LG Electronics France | **Observation**: Analyzing the MSD values specifically for CA\_n18-n77 and DC\_18-n77 would have more accurate results compared to reusing values from similar bands.  **Proposal** : Use the analyzed MSD value for DC\_18\_n77A and CA\_n18-n77 PC2/PC3  **For PC3**   | **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | | | --- | --- | --- | --- | --- | --- | --- | --- | | **NR-CA or ENDC**  **Configuration** | **EUTRA or NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** | | DC\_18A\_n77A | 18 | 827.5 | 5 | 25 | 872.5 | 8.6 | IMD4 X | |  | n77 | 3355 | 10 | 50 | 3355 | N/A | N/A | |  | 18 | 817.5 | 5 | 25 | 862.5 | 1.1 | IMD5 X | |  | n77 | 4130 | 10 | 50 | 4130 | N/A | N/A | | CA\_n18-n77 | n18 | 827.5 | 5 | 25 | 872.5 | 8.6 | IMD4 X | |  | n77 | 3355 | 10 | 50 | 3355 | N/A | N/A | |  | n18 | 817.5 | 5 | 25 | 862.5 | 1.1 | IMD5 X | |  | n77 | 4130 | 10 | 50 | 4130 | N/A | N/A | | NOTE X: In Japan, n77 band is restricted to 3400 – 4100 MHz frequency range, and there are no valid MSD test points when using this restricted frequency range. | | | | | | | |   **For PC2**   | **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | | | --- | --- | --- | --- | --- | --- | --- | --- | | **NR-CA or ENDC**  **Configuration** | **EUTRA or NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** | | DC\_18A\_n77A | 18 | 827.5 | 5 | 25 | 872.5 | 16.1 | IMD4 X | |  | n77 | 3355 | 10 | 50 | 3355 | N/A | N/A | |  | 18 | 817.5 | 5 | 25 | 862.5 | 10.1 | IMD5 X | |  | n77 | 4130 | 10 | 50 | 4130 | N/A | N/A | | CA\_n18-n77 | n18 | 827.5 | 5 | 25 | 872.5 | 16.1 | IMD4 X | |  | n77 | 3355 | 10 | 50 | 3355 | N/A | N/A | |  | n18 | 817.5 | 5 | 25 | 862.5 | 10.1 | IMD5 X | |  | n77 | 4130 | 10 | 50 | 4130 | N/A | N/A | | NOTE X: In Japan, n77 band is restricted to 3400 – 4100 MHz frequency range, and there are no valid MSD test points when using this restricted frequency range. | | | | | | | | |
| [**R4-2319855**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319855.zip)  Discussion on MSD for CA\_n34A-n40A\_BCS4 and 5 | Huawei, HiSilicon | **Proposal 1:** **It’s proposed to specify the following MSD for CA\_n34A-n40A\_BCS4/5.**   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **Cross-band**  **Interference**  **source** | | **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** | | n40 | n34 | 2350 | 100 | 30 | 270 (RBstart=0) | 2022.5 | 5 | 8.6 | >ACLR2 | |
| [**R4-2319856**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319856.zip)  TP for TR 38.718-02-01 to introduce CA\_n34A-n40A\_BCS4 and 5 with MSD analysis | Huawei, HiSilicon. | The MSD test point due to cross band isolation between victim band n34 5MHz and aggressor band n40 100MHz is introduced as below for BCS4 and 5 cases.  **Table 5.X.1.3-1: Reference sensitivity exceptions (MSD) and uplink/downlink configurations due to cross band isolation from a PC3 aggressor NR UL band for NR CA FR1**   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **Cross-band Interference**  **source** | | **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** | | n40 | n34 | 2350 | 100 | 30 | 270 (RBstart=0) | 2022.5 | 5 | 8.6 | >ACLR2 | |
| [**R4-2319858**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319858.zip)  Draft CR for 38.101-1 to introduce CA\_n8A-n20A-n28A-n75A | Huawei, HiSilicon.. | draft CR which introduces the following requirements for CA\_n8A-n20A-n28A-n75A:  1. Operating bands  2. Configurations  3. Delta Tib  4. Delta Rib |
| [**R4-2320802**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320802.zip)  CA\_n34-n40 MSD | Murata Manufacturing Co Ltd. | **Observation 1:** The MSD with n40 as aggressor shows IM2 dominating cross band noise as opposed to TX OOB leakage proposed in [1], but the MSD is equivalent allowing a common requirement for both implementations.  **Proposal 1:** Consider MSD proposal in Table 2-3.   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | UL band | DL band | UL Fc | UL BW | SCS of UL band | UL RB Allocation | DL Fc | DL BW | MSD | Cross-band  Interference  source | | (MHz) | (MHz) | (kHz) | LCRB | (MHz) | (MHz) | (dB) | | n34 | n40 | 2017.5 | 15 | 15 | 75 (RBstart=4) | 2302.5 | 5 | 7.8 | >ACLR2 | | n40 | n34 | 2350 | 100 | 30 | 270 (RBstart=0) | 2022.5 | 5 | 19.6 | >ACLR2 | |

## Open issues summary

### Sub-topic 4-1 Notation bug fix CRs for NR-CA/EN-DC.

**Issue 4-1: Bug fix corrections CRs.**

* Proposals
  + Option 1: CR R4-2318420, R4-2318421 from Apple
* Recommended WF
  + Review CRs CR R4-2318420, R4-2318421 for approval.

### Sub-topic 4-2 Clarifying valid 1 UL configurations for NR CA

**Issue 4-2: Clarifying valid 1 UL configurations for NR CA**

* Proposals: Huawei proposal:
  + Option 1: Introduce the following new text in the core requirements of clause 5.5A.0.

In the CA configuration tables of clause 5.5A.1 and clause 5.5A.2:

* + - UL CA configuration entries with "-" mean singe UL carrier is valid for intra-band CA

"In the CA configuration tables of clause 5.5A.3:

* + - UL CA configuration entries with "-" mean that any constituent band of the inter-band DL CA combination can be configured as a valid single uplink carrier,
    - No other single uplink carrier configurations than those specified are valid UL configurations,
    - If an Uplink CA configuration is supported, its fallback single uplink also is supported,
    - Unless otherwise noted, the default power class applies to all valid single uplink carriers or uplink combination(s) specified configurations. The default power class is:
      * PC5 for shared spectrum channel access frequency bands,
      * PC3 for any NR FR1 band other than shared spectrum channel access,
      * PC3 for intra-band UL CA and inter-band UL CA configurations".
* Recommended WF
  + To discuss:
    - the need to clarify the meaning of "-" entries for intra-band CA,
    - the text amendment highlighted in yellow on clarifying the valid 1 UL configurations for inter-band CA,
  + Capture subsequent agreements in a Way Forward, or Draft TP/CR could be requested.

### Sub-topic 4-3 CA\_n18-n77 and DC\_18\_n77

**Issue 4-3:** **CA\_n18-n77 and DC\_18\_n77**

* Proposals

Option 1: LG proposal to adopt:

**For PC3**

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **NR-CA or ENDC**  **Configuration** | **EUTRA or NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_18A\_n77A | 18 | 827.5 | 5 | 25 | 872.5 | 8.6 | IMD4 X |
|  | n77 | 3355 | 10 | 50 | 3355 | N/A | N/A |
|  | 18 | 817.5 | 5 | 25 | 862.5 | 1.1 | IMD5 X |
|  | n77 | 4130 | 10 | 50 | 4130 | N/A | N/A |
| CA\_n18-n77 | n18 | 827.5 | 5 | 25 | 872.5 | 8.6 | IMD4 X |
|  | n77 | 3355 | 10 | 50 | 3355 | N/A | N/A |
|  | n18 | 817.5 | 5 | 25 | 862.5 | 1.1 | IMD5 X |
|  | n77 | 4130 | 10 | 50 | 4130 | N/A | N/A |
| NOTE X: In Japan, n77 band is restricted to 3400 – 4100 MHz frequency range, and there are no valid MSD test points when using this restricted frequency range. | | | | | | | |

**For PC2**

| **NR or E-UTRA Band / Channel bandwidth / NRB / MSD** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **NR-CA or ENDC**  **Configuration** | **EUTRA or NR band** | **UL Fc  (MHz)** | **UL/DL BW  (MHz)** | **UL  LCRB** | **DL Fc (MHz)** | **MSD  (dB)** | **IMD order** |
| DC\_18A\_n77A | 18 | 827.5 | 5 | 25 | 872.5 | 16.1 | IMD4 X |
|  | n77 | 3355 | 10 | 50 | 3355 | N/A | N/A |
|  | 18 | 817.5 | 5 | 25 | 862.5 | 10.1 | IMD5 X |
|  | n77 | 4130 | 10 | 50 | 4130 | N/A | N/A |
| CA\_n18-n77 | n18 | 827.5 | 5 | 25 | 872.5 | 16.1 | IMD4 X |
|  | n77 | 3355 | 10 | 50 | 3355 | N/A | N/A |
|  | n18 | 817.5 | 5 | 25 | 862.5 | 10.1 | IMD5 X |
|  | n77 | 4130 | 10 | 50 | 4130 | N/A | N/A |
| NOTE X: In Japan, n77 band is restricted to 3400 – 4100 MHz frequency range, and there are no valid MSD test points when using this restricted frequency range. | | | | | | | |

* + Recommended WF
    - Discuss if agreement can be reached between Tdoc [**R4-2319259**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319259.zip)and meeting #108bis contribution from Skyworks [**R4-2316397**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108bis/Docs/R4-2316397.zip)
    - If agreeable, capture the agreed MSD values in a WF or Draft TP/CR could be requested.

### Sub-topic 4-4 CA\_n34-n40 MSD

**Issue 4-4:** **CA\_n34-n40**

* Proposals
  + Option 1: input from Huawei [**R4-2319855**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319855.zip)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **Cross-band**  **Interference**  **source** |
| **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** |
| n40 | n34 | 2350 | 100 | 30 | 270 (RBstart=0) | 2022.5 | 5 | 8.6 | >ACLR2 |

* + Option 2: input from Murata [**R4-2320802**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320802.zip)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UL band | DL band | UL Fc | UL BW | SCS of UL band | UL RB Allocation | DL Fc | DL BW | MSD | Cross-band  Interference  source |
| (MHz) | (MHz) | (kHz) | LCRB | (MHz) | (MHz) | (dB) |
| n34 | n40 | 2017.5 | 15 | 15 | 75 (RBstart=4) | 2302.5 | 5 | 7.8 | >ACLR2 |
| n40 | n34 | 2350 | 100 | 30 | 270 (RBstart=0) | 2022.5 | 5 | 19.6 | >ACLR2 |

* + Option 3: input from meeting #108bis Skyworks [**R4-2316769**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108bis/Docs/R4-2316769.zip)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UL band** | **DL band** | **UL Fc** | **UL BW** | **SCS of UL band** | **UL RB Allocation** | **DL Fc** | **DL BW** | **MSD** | **Cross-band**  **Interference**  **source** |
| **(MHz)** | **(MHz)** | **(kHz)** | **LCRB** | **(MHz)** | **(MHz)** | **(dB)** |
| n34 | n40 | 2017.5 | 15 | 15 | 75 (RBstart=4) | 2302.5 | 5 | 3.2 | >ACLR2 |
| n40 | n34 | 2350 | 100 | 30 | 270 (RBstart=0) | 2022.5 | 5 | 19.5 | >ACLR2 |

* Recommended WF
  + Review proposed MSDs for agreement and capture agreement in WF.

### Sub-topic 4-5 draftCR to introduce CA\_n8A-n20A-n28A-n75A

**Issue 4-5: Review draftCR**

* Proposals
  + Draft CR [**R4-2319858**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319858.zip) from Huawei, DT.
* Recommended WF
  + Draft CR to be reviewed: interested parties should try to flag any issue for the Draft CR before the start of meeting.

# Topic #5: (place holder): Documents moved from block approval.

## Companies’ contributions summary