**3GPP TSG-RAN WG4 Meeting #113 R4-2418136**

**Orlando, US, 18th – 22nd November, 2024**

**Agenda item:** 6.1

**Source:** Moderator (CMCC)

**Title:** Topic summary for [113][114] NR\_n28\_PC2\_40MHz

**Document for:** Information

# Introduction

Thread [114] includes agenda 6.20. The way forward agreed in previous meetings are R4-2414274 and R4-2417082.

* 6.20.1 General aspects
* 6.20.2 UE RF requirements

# Topic #1: UE RF requirements

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2418257 | Nokia | 1. NOTE 7 is changed to “For UEs supporting 30 MHz max channel bandwidth, the minimum requirements are specified for any NR UL channel bandwidth confined to 703-733 MHz or 718-748 MHz. For UEs supporting 40 MHz max bandwidth, the minimum requirements are specified for any NR UL channel bandwidth confined to 703-743.04 MHz or 718-748 MHz.”   Proposal 2: It is not necessary to specify the specific UE channel raster entry in UE specifications but is sufficient to cover by Enhanced channel raster.  Proposal 3: The release independence of 40 MHz for n28 is from Rel-16. |
| [**R4-2417745**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2417745.zip) | Apple | According to simulations for PC3, a 40MHz channel would require at least 11dB filter suppression to meet the UE-to-UE coexistence requirements with applying MPR. |
| [**R4-2418231**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2418231.zip) | vivo | **Proposal 1:** As note 7 is indicated for bandwidth 20,25 and 30MHz, to avoid confusion, it is proposed to keep the content in [] of Note 7:   * + NOTE 7: For UEs supporting 30MHz max bandwidth, the minimum requirements are specified for NR UL channel bandwidths confined to [either] 703-733MHz or 718-748MHz[for the 20, 25 and 30MHz bandwidth].   **Proposal 2:** The content in [] of new note is proposed to remove:   * + For UEs supporting 40MHz max bandwidth, the minimum requirements are specified for NR UL channel bandwidths confined to [~~either]~~ 703-743.04MHz or 718-748MHz .~~for the [20, 25, and] 30MHz bandwidth. And for the 40MHz bandwidth, the minimum requirements are specified for NR UL channel bandwidths confined to either 703-743.04MHz.~~   **Proposal 3:** As 40MHz channel bandwidth located in 703-743MHz and 758-798MHz, the exceptional channel raster point of n28 (UL: 723.04MHz, DL: 778.04MHz) is enough, decoupling the enhanced channel raster and 40MHz UE CBW of n28 will encourage UE to support it in the earlier release.  **Proposal 4:** To align with gNB, 40MHz UE CBW is proposed to release independent from Rel16. |
| [**R4-2418687**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2418687.zip) | ZTE Corporation, Sanechips | **Observation 1. For n28 30MHz, there are no exception channel raster points defined in TS38.101-1.**  **Observation 2. For n28 40MHz, UE can supported the gNB exception channel raster points with the enhanced channel raster.**  **Observation 3. Enhanced channel raster is early implemented from R16 in TS38.331.**  **Proposal 1: Prefer to Alt 2 ‘Cover all the channel raster points of n28 based on the enhanced channel raster to UE RF specification TS 38.101-1 for UE CBW 40MHz.’**  **Proposal 2: Release independence from Rel-16 for UE n28 40MHz.** |
| [**R4-2418721**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2418721.zip) | CMCC, CBN, China Broadnet | **Proposal 1: It is proposed the apply the following note for n28:**   * + **NOTE 7: For UEs supporting 30MHz max bandwidth, the minimum requirements are specified for NR UL channel bandwidths confined to 703-733MHz or 718-748MHz.**   + **NOTE X: For UEs supporting 40MHz max bandwidth, the minimum requirements are specified for NR UL channel bandwidths confined to 703-743.04MHz or 718-748MHz.**   **Proposal 2: It is proposed to add the exceptional channel raster point of n28 (UL: 723.04MHz, DL: 778.04MHz) to UE RF specification TS 38.101-1 for UE CBW 40MHz.** |
| [**R4-2418722**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2418722.zip) | CMCC, CBN, China Broadnet | ***CR*** |
| [**R4-2419527**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2419527.zip) | Qualcomm Incorporated | **Proposal 1: No specification update to related to UE-to-UE coex requirements is needed**  **Proposal 2: Enable channel raster points for 40 MHz channel bandwidth from 723.00 MHz to 723.04 MHz unless.**  **Proposal 3: For UEs supporting 40 MHz channel bandwidth, narrower channel bandwidths can be freely placed within the 40 MHz channel bandwidth as long as they are fully contained within 703 to 743.04 MHz.**  **Proposal 4: Confirm the wording on the notes in previous way forward and further consider merging them together under a single note.** |
| [**R4-2419636**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2419636.zip) | Huawei, HiSilicon | **Proposal 1: For NS\_18 A-MPR requirements, limit the frequency range of channel bandwidth to 703-743.04 MHz for BW=25/30/40MHz.**  **Proposal 2: Regarding the channel location, adopt the simplified wording, i.e.,**   * + **NOTE 7: For UEs supporting 30MHz max bandwidth, the minimum requirements are specified for NR UL channel bandwidths confined to 703-733MHz or 718-748MHz.**   + **NOTE X: For UEs supporting 40MHz max bandwidth, the minimum requirements are specified for NR UL channel bandwidths confined to either 703-743.04MHz or 718-748MHz.**   **Proposal 3: Adopt the enhanced channel raster capability in support of 40MHz CBW, and add this requirement to the new note as follows in order to facilitate release independence:**   * + **NOTE X: For UEs supporting 40MHz max bandwidth, the minimum requirements are specified for NR UL channel bandwidths confined to either 703-743.04MHz or 718-748MHz. The UE shall also support the enhanced channel raster capability on band n28.**   **Proposal 4: Release independence from Rel-16 for 40MHz CBW can be supported.** |
| [**R4-2419695**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2419695.zip) | Skyworks Solutions Inc. | **Observation 1: The measured 1Tx performance is marginal for most fully allocated waveforms. Small additional degradation is expected due to 2Tx reverse-IMD.**  **Observation 2: There are no equations defining the regions A1 and A2 regions for either PC3 or PC2. It is not clear which A-MPR requirement applies to outer allocations since both regions apply to “Outer”.**  **Proposal 1: Based on observation 2, clarify the applicable A-MPR for outer allocations for CBW< 25MHz.**  **Proposal 2: Based on observation 1, adopt the PC2 NS\_18 A-MPR of Table 3.**  **Table 3**: Proposed NS\_18 PC2 A-MPR   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Modulation/Waveform** | | **A1 (dB)** | | **A2 (dB)** | **A3 (dB)** | **A4 (dB)** | **A5 (dB)** | **A6 (dB)** | |  | | **Outer** | **Inner** | **Inner/Outer** | **Outer/Inner** | **Outer/Inner** | **Outer/Inner** | **Outer/Inner** | | DFT-s-OFDM | Pi/2 BPSK | ≤ 3.5 | N/A | ≤ 8 | [3+0.5] | [8+2] | [3+2] | [0+2.0] | |  | QPSK | ≤ 3.5 |  | ≤ 8 | [3+1] | [8+3] | [3+2] | [0+3] | |  | 16 QAM | ≤ 4 |  | ≤ 9 | [3+1] | [8+3] | [3+2.5] | [1.0+3] | |  | 64 QAM | ≤ 4.5 |  | ≤ 10 | [3+1] | [8+3] | [4.5+1.5] | [2.5+2] | |  | 256 QAM | ≤ 6.5 |  | ≤ 11 | [3+1] | [8+3] | [5.5+0.5] | [4.5] | | CP-OFDM | QPSK | ≤ 5.5 |  | ≤ 9.5 | [4.5+1] | [9.5+3] | [5+2] | [1.5+3] | |  | 16 QAM | ≤ 5.5 |  | ≤ 10 | [4.5+1] | [9.5+3] | [5+2] | [2.0+3] | |  | 64 QAM | ≤ 6 |  | ≤ 11.5 | [4.5+1] | [9.5+3] | [5.5+1.5] | [3.5+1.5] | |  | 256 QAM | ≤ 9 |  | ≤ 11.5 | [4.5+1] | [9.5+3] | [7.5+0.5] | [6.5] | |
| [**R4-2419723**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_113/Docs/R4-2419723.zip) | Skyworks Solutions Inc. | **Proposal 1: Adopt the 1Tx RSD requirements of Table 1**  **Table 1**: Band n28 RSD from PC3 to PC2 for UE not supporting Tx Diversity   | **Operating Band** | **3**  **MHz (dB)** | **5**  **MHz (dB)** | **10**  **MHz (dB)** | **15**  **MHz (dB)** | **20**  **MHz (dB)** | **25**  **MHz (dB)** | **30 MHz (dB)** | **35 MHz (dB)** | **40**  **MHz (dB)** | **45 MHz (dB)** | **50**  **MHz (dB)** | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | n28 | 0 | 0.5 | 0.5 | 0.5 | 1.0 | 2.1 | 2.7 | - | 3.0 |  |  | | NOTE 1: The transmitter shall be set to PUMAX as defined in clause 6.2G.4 | | | | | | | | | | | |   **Proposal 2: Adopt the 2Tx RSD requirements of Table 22**  **Table 2**: Band n28 RSD from PC3 to PC2 for UE supporting Tx Diversity   | **Operating Band** | **3**  **MHz (dB)** | **5**  **MHz (dB)** | **10**  **MHz (dB)** | **15**  **MHz (dB)** | **20**  **MHz (dB)** | **25**  **MHz (dB)** | **30 MHz (dB)** | **35 MHz (dB)** | **40**  **MHz (dB)** | **45 MHz (dB)** | **50**  **MHz (dB)** | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | n28 | 0.3 | 0.8 | 0.8 | 0.8 | 1.9 | 6.2 | 7.6 | - | 8.2 |  |  | | NOTE 1: The transmitter shall be set to PUMAX as defined in clause 6.2G.4 | | | | | | | | | | | | |

## Open issues summary

*Before Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 1-2 RF requirements

**Issue 1-2-1 NS\_18 A-MPR for PC2 for BW<=40MHz**

**Agreement in RAN4#112bis:**

* Agree on the regions in Table 1 and 2.
* For A-MPR values in Table 3:
* Further check the A-MPR values for 2Tx
* Yellow highlighted values will be further confirmed by measurements.
* Values in [] are to be confirmed

Table 1: PC3 region definition for 25MHz, 30MHz and 40MHz channel bandwidth

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel Bandwidth, MHz | Frequency range of channel bandwidth, MHz | Regions | | A-MPR |
|  |  | RBstart\*12\*SCS  MHz | LCRB\*12\*SCS  MHz |  |
| 25 | [703~748] | >(LCRB\*12\*SCS)/2+3.6 | ≥Max(0, 12\*SCS\*NRB – 1.8 – RBstart\*12\*SCS) | A3 |
|  |  | ≤(LCRB\*12\*SCS)/2+3.6 | ≥5.4 | A4 |
|  |  | ≤6.3 | <5.4 | A5 |
| 30 | [703~748] | >(LCRB\*12\*SCS)/2+5.22 | ≥Max(0, 12\*SCS\*NRB – 1.8 – RBstart\*12\*SCS) | A3 |
|  |  | ≤(LCRB\*12\*SCS)/2+5.22 | ≥5.4 | A4 |
|  |  | ≤7.92 | <5.4 | A5 |
| 40 | 703~743.04 | >(LCRB\*12\*SCS)/2+8.46 | ≥Max(0, 12\*SCS\*NRB – 1.8 –  RBstart\*12\*SCS) | A3 |
|  |  | ≤(LCRB\*12\*SCS)/2+8.46 | ≥5.4 | A4 |
|  |  | ≤**11.16** | <5.4 | A5 |

Table 2: PC2 region definition for 25MHz, 30MHz and 40MHz channel bandwidth

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel Bandwidth, MHz | Frequency range of channel bandwidth, MHz | Regions (PC2) | | A-MPR |
|  |  | RBstart\*12\*SCS  MHz | LCRB\*12\*SCS  MHz |  |
| 25 | [703~748] | >(LCRB\*12\*SCS)/2+3.6 | ≥Max(0, 12\*SCS\*NRB – 1.8 – RBstart\*12\*SCS) | A3 |
|  |  | ≤(LCRB\*12\*SCS)/2+3.6 | ≥5.4 | A4 |
|  |  | ≤6.3 | <5.4 | A5 |
|  |  | >(LCRB\*12\*SCS)/2+3.6  ≤(LCRB\*12\*SCS)/2+5.76 | <Max(0, 12\*SCS\*NRB – 1.8 – RBstart\*12\*SCS)  ≥5.4 | A6 |
| 30 | [703~748] | >(LCRB\*12\*SCS)/2+5.22 | ≥Max(0, 12\*SCS\*NRB – 1.8 – RBstart\*12\*SCS) | A3 |
|  |  | ≤(LCRB\*12\*SCS)/2+5.22 | ≥5.4 | A4 |
|  |  | ≤7.92 | <5.4 | A5 |
|  |  | >(LCRB\*12\*SCS)/2+5.22  ≤(LCRB\*12\*SCS)/2+7.38 | <Max(0, 12\*SCS\*NRB – 1.8 – RBstart\*12\*SCS)  ≥5.4 | A6 |
| 40 | 703~743.04 | >(LCRB\*12\*SCS)/2+8.46 | ≥Max(0, 12\*SCS\*NRB – 1.8 –  RBstart\*12\*SCS) | A3 |
|  |  | ≤(LCRB\*12\*SCS)/2+8.46 | ≥5.4 | A4 |
|  |  | ≤11.16 | <5.4 | A5 |
|  |  | >(LCRB\*12\*SCS)/2+8.46  ≤(LCRB\*12\*SCS)/2+11.7 | <Max(0, 12\*SCS\*NRB – 1.8 –  RBstart\*12\*SCS)  ≥5.4 | A6 |

Table 3: PC2 A-MPR for NS\_18 for [1Tx/2Tx]

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Modulation/Waveform** | | **A1 (dB)** | | **A2 (dB)** | **A3 (dB)** | **A4 (dB)** | **A5 (dB)** | **A6 (dB)** |
|  | | **Outer** | **Inner** | **Inner/Outer** | **Outer/Inner** | **Outer/Inner** | **Outer/Inner** | **Outer/Inner** |
| DFT-s-OFDM | Pi/2 BPSK | ≤ 3.5 | N/A | ≤ 8 | [3+0.5] | [8+2] | [3+2] | [0+2.0] |
|  | QPSK | ≤ 3.5 |  | ≤ 8 | [3+1] | [8+2] | [3+2] | [0+3] |
|  | 16 QAM | ≤ 4 |  | ≤ 9 | [3+1] | [8+3] | [3+2.5] | [1.0+3] |
|  | 64 QAM | ≤ 4.5 |  | ≤ 10 | [3+1] | [8+3] | [4.5+1.5] | [2.5+2] |
|  | 256 QAM | ≤ 6.5 |  | ≤ 11 | [3+1] | [8+3] | [5.5+0.5] | [4.5] |
| CP-OFDM | QPSK | ≤ 5.5 |  | ≤ 9.5 | [4.5+1] | [9.5+2.5] | [5+2] | [1.5+3] |
|  | 16 QAM | ≤ 5.5 |  | ≤ 10 | [4.5+1] | [9.5+2.5] | [5+2] | [2.0+3] |
|  | 64 QAM | ≤ 6 |  | ≤ 11.5 | [4.5+1] | [9.5+3] | [5.5+1.5] | [3.5+1.5] |
|  | 256 QAM | ≤ 9 |  | ≤ 11.5 | [4.5+1] | [9.5+3] | [7.5+0.5] | [6.5] |

**Proposal in RAN4#113**

* **Proposal 1 (Huawei, R4-2419636): For NS\_18 A-MPR requirements, limit the** **frequency range of channel bandwidth to 703-743.04 MHz for BW=25/30/40MHz.**
* **Proposal 2 (Skyworks, R4-2419695):**

**Table 3**: Proposed NS\_18 PC2 A-MPR

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Modulation/Waveform** | | **A1 (dB)** | | **A2 (dB)** | **A3 (dB)** | **A4 (dB)** | **A5 (dB)** | **A6 (dB)** |
|  | | **Outer** | **Inner** | **Inner/Outer** | **Outer/Inner** | **Outer/Inner** | **Outer/Inner** | **Outer/Inner** |
| DFT-s-OFDM | Pi/2 BPSK | ≤ 3.5 | N/A | ≤ 8 | [3+0.5] | [8+2] | [3+2] | [0+2.0] |
|  | QPSK | ≤ 3.5 |  | ≤ 8 | [3+1] | [8+3] | [3+2] | [0+3] |
|  | 16 QAM | ≤ 4 |  | ≤ 9 | [3+1] | [8+3] | [3+2.5] | [1.0+3] |
|  | 64 QAM | ≤ 4.5 |  | ≤ 10 | [3+1] | [8+3] | [4.5+1.5] | [2.5+2] |
|  | 256 QAM | ≤ 6.5 |  | ≤ 11 | [3+1] | [8+3] | [5.5+0.5] | [4.5] |
| CP-OFDM | QPSK | ≤ 5.5 |  | ≤ 9.5 | [4.5+1] | [9.5+3] | [5+2] | [1.5+3] |
|  | 16 QAM | ≤ 5.5 |  | ≤ 10 | [4.5+1] | [9.5+3] | [5+2] | [2.0+3] |
|  | 64 QAM | ≤ 6 |  | ≤ 11.5 | [4.5+1] | [9.5+3] | [5.5+1.5] | [3.5+1.5] |
|  | 256 QAM | ≤ 9 |  | ≤ 11.5 | [4.5+1] | [9.5+3] | [7.5+0.5] | [6.5] |

Recommended WF:

* Discuss whether to limit the frequency range of channel bandwidth to 703-743.04 MHz for BW=25/30/40MHz.
* Discuss proposal 2.

**Qualcomm: for Skyworks proposal of A-MPR, it would be OK. But we do not agree with Huawei proposal for frequency limitation.**

**Huawei: The current A-MPR requirement for Rel-18 is limited to 703 ~ 743.04. Once the frequency goes to region B the A-MPR is not needed. If the carrier moves out of this region, for the guard band on the left side A-MPR can be avoided.**

**Skyworks: 40MHz is now a single wide filter. Block A and block B. Then any channel can be configured. Then we do not need restrict to any filter.**

**Huawei: Once the channel is in the range of block B, the NS\_18 is not needed.**

**Qualcomm: The NS\_18 is applicable for any centre frequency in the band. A-MPR is applicable to only restricted to part of band.**

**Moderator: We have to reach the agreement in this meeting. The restriction seems not necessary. We also need to check if we need extend the restriction.**

**Huawei: even with the current filter, 25 and 30Mhz can be anywhere in the band. A-MPR is only applied to the range 703-733MHz. A-MPR based on the current PC3 is not needed.**

**Agreement:**

* **Agree the following table for A-MPR for PC2 for BW<=40MH for 1Tx and 2Tx**

**Table 3**: Proposed NS\_18 PC2 A-MPR

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Modulation/Waveform** | | **A1 (dB)** | | **A2 (dB)** | **A3 (dB)** | **A4 (dB)** | **A5 (dB)** | **A6 (dB)** |
|  | | **Outer** | **Inner** | **Inner/Outer** | **Outer/Inner** | **Outer/Inner** | **Outer/Inner** | **Outer/Inner** |
| DFT-s-OFDM | Pi/2 BPSK | ≤ 3.5 | N/A | ≤ 8 | [3+0.5] | [8+2] | [3+2] | [0+2.0] |
|  | QPSK | ≤ 3.5 |  | ≤ 8 | [3+1] | [8+3] | [3+2] | [0+3] |
|  | 16 QAM | ≤ 4 |  | ≤ 9 | [3+1] | [8+3] | [3+2.5] | [1.0+3] |
|  | 64 QAM | ≤ 4.5 |  | ≤ 10 | [3+1] | [8+3] | [4.5+1.5] | [2.5+2] |
|  | 256 QAM | ≤ 6.5 |  | ≤ 11 | [3+1] | [8+3] | [5.5+0.5] | [4.5] |
| CP-OFDM | QPSK | ≤ 5.5 |  | ≤ 9.5 | [4.5+1] | [9.5+3] | [5+2] | [1.5+3] |
|  | 16 QAM | ≤ 5.5 |  | ≤ 10 | [4.5+1] | [9.5+3] | [5+2] | [2.0+3] |
|  | 64 QAM | ≤ 6 |  | ≤ 11.5 | [4.5+1] | [9.5+3] | [5.5+1.5] | [3.5+1.5] |
|  | 256 QAM | ≤ 9 |  | ≤ 11.5 | [4.5+1] | [9.5+3] | [7.5+0.5] | [6.5] |

**Issue 1-2-2 PC2 RSD for 1Tx and 2Tx**

**Agreement in RAN4#112: PC2 RSD for 1Tx and 2Tx for BW<=30MHz**

* Define RSD requirements as following:

Table 1: Reference Sensitivity Degradation from PC3 to PC2 for FDD bands for single Tx

| Operating Band | 3  MHz (dB) | 5  MHz (dB) | 10  MHz (dB) | 15  MHz (dB) | 20  MHz (dB) | 25  MHz (dB) | 30 MHz (dB) | 35 MHz (dB) | 40  MHz (dB) | 45 MHz (dB) | 50  MHz (dB) |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| n28 | 0.6 | 0.6 | 0.7 | 0.8 | 1.3 | 2.4 | 2.9 |  |  |  |  |

Table 2 Reference Sensitivity Degradation from PC3 to PC2 for FDD bands for dual Tx

| Operating Band | 3  MHz (dB) | 5  MHz (dB) | 10  MHz (dB) | 15  MHz (dB) | 20  MHz (dB) | 25  MHz (dB) | 30 MHz (dB) | 35 MHz (dB) | 40  MHz (dB) | 45 MHz (dB) | 50  MHz (dB) |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| n28 | 1.1 | 1.1 | 1.1 | 1.3 | 3.0 | 6.6 | 7.9 |  |  |  |  |

**Agreement in RAN4#112bis: PC2 RSD for 1Tx and 2Tx for 40MHz**

* PC2 RSD for 1Tx is 3 dB, for 2Tx is 8.2 dB

**Proposal in RAN4#113 (Skyworks, R4-2419723):**

**Table 1**: Band n28 RSD from PC3 to PC2 for UE not supporting Tx Diversity

| **Operating Band** | **3**  **MHz (dB)** | **5**  **MHz (dB)** | **10**  **MHz (dB)** | **15**  **MHz (dB)** | **20**  **MHz (dB)** | **25**  **MHz (dB)** | **30 MHz (dB)** | **35 MHz (dB)** | **40**  **MHz (dB)** | **45 MHz (dB)** | **50**  **MHz (dB)** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| n28 | 0 | 0.5 | 0.5 | 0.5 | 1.0 | 2.1 | 2.7 | - | 3.0 |  |  |
| NOTE 1: The transmitter shall be set to PUMAX as defined in clause 6.2G.4 | | | | | | | | | | | |

**Table 2**: Band n28 RSD from PC3 to PC2 for UE supporting Tx Diversity

| **Operating Band** | **3**  **MHz (dB)** | **5**  **MHz (dB)** | **10**  **MHz (dB)** | **15**  **MHz (dB)** | **20**  **MHz (dB)** | **25**  **MHz (dB)** | **30 MHz (dB)** | **35 MHz (dB)** | **40**  **MHz (dB)** | **45 MHz (dB)** | **50**  **MHz (dB)** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| n28 | 0.3 | 0.8 | 0.8 | 0.8 | 1.9 | 6.2 | 7.6 | - | 8.2 |  |  |
| NOTE 1: The transmitter shall be set to PUMAX as defined in clause 6.2G.4 | | | | | | | | | | | |

Recommended WF:

Since the RSD values for 5MHz<=BW<=30MHz were agreed in Rel-18, no discussion is needed.

Discuss whether to change the RSD values for 3MHz

Skyworks: if these values are agreed, we are fine with the previous agreement.

Chair: keep the previous agreement.

**Issue 1-2-3 channel location**

|  |
| --- |
| **Agreement in RAN4#112bis:**   * **Update the NOTE 7 as follows:**   + NOTE 7: For UEs supporting 30MHz max bandwidth, the minimum requirements are specified for NR UL channel bandwidths confined to [~~either]~~ 703-733MHz or 718-748MHz ~~[for the 20, 25 and 30MHz bandwidth]~~. * **Introduce the new note as follows:**   + For UEs supporting 40MHz max bandwidth, the minimum requirements are specified for NR UL channel bandwidths confined to [~~either]~~ [703-743.04MHz] or 718-748MHz [~~for the [20, 25, and] 30MHz bandwidth. And for the 40MHz bandwidth, the minimum requirements are specified for NR UL channel bandwidths confined to either 703-743.04MHz.]~~ * **FFS the content in []** |

Proposal 1 (Nokia, CMCC, Qualcomm, Huawei):

NOTE 7: For UEs supporting 30 MHz max channel bandwidth, the minimum requirements are specified for any NR UL channel bandwidth confined to 703-733 MHz or 718-748 MHz. For UEs supporting 40 MHz max bandwidth, the minimum requirements are specified for any NR UL channel bandwidth confined to 703-743.04 MHz or 718-748 MHz.

**Proposal 2 (vivo):**

As note 7 is indicated for bandwidth 20,25 and 30MHz, to avoid confusion, it is proposed to **keep the** content in [] of Note 7:

* + NOTE 7: For UEs supporting 30MHz max bandwidth, the minimum requirements are specified for NR UL channel bandwidths confined to [either] 703-733MHz or 718-748MHz[for the 20, 25 and 30MHz bandwidth].

The content in [] of new note is proposed **to remove:**

* + For UEs supporting 40MHz max bandwidth, the minimum requirements are specified for NR UL channel bandwidths confined to [~~either]~~ 703-743.04MHz or 718-748MHz .~~for the [20, 25, and] 30MHz bandwidth. And for the 40MHz bandwidth, the minimum requirements are specified for NR UL channel bandwidths confined to either 703-743.04MHz.~~

Recommended WF:

Merge the new note to note7 and agree on proposal 1.

Skyworks: What for bandwidth less than 25MHz.

Moderator: cover the smaller ones.

Ericsson: for 30MHz, do we need change to 733.04?

Huawei: that will cause the NBC issue.

Qualcomm: 40MHz needs shift. 30MHz does not need.

Agreement:

* Agree on the following note:
  + NOTE 7: For UEs supporting up to 30 MHz channel bandwidth, the minimum requirements are specified for any NR UL channel bandwidth confined to 703-733 MHz or 718-748 MHz. For UEs supporting 40 MHz channel bandwidth, the minimum requirements are specified for any NR UL channel bandwidth confined to 703-743.04 MHz or 718-748 MHz.

**Issue 1-2-4 channel raster**

**Agreement in RAN4#112bis:**

* Alt1: Add the exceptional channel raster point of n28 (UL: 723.04MHz, DL: 778.04MHz) to UE RF specification TS 38.101-1 for UE CBW 40MHz.
* Alt2: Cover all the channel raster points of n28 based on the enhanced channel raster to UE RF specification TS 38.101-1 for UE CBW 40MHz.

**Proposal in RAN4#113:**

* Alt1 (vivo, CMCC): Add the exceptional channel raster point of n28 (UL: 723.04MHz, DL: 778.04MHz) to UE RF specification TS 38.101-1 for UE CBW 40MHz.
* Alt2 (Nokia, ZTE, Qualcomm, Huawei): Cover all the channel raster points of n28 based on the enhanced channel raster to UE RF specification TS 38.101-1 for UE CBW 40MHz.
  + (Huawei):Add “The UE shall also support the enhanced channel raster capability on band n28.” to the Note in **issue 1-2-3**

Recommended WF:

Agree on Alt 2 and discuss whether to add “The UE shall also support the enhanced channel raster capability on band n28.” to the Note in **issue 1-2-3**

Vivo: the enhanced channel raster is just for 40MHz?

Moderator: enhanced channel raster is mandated for n28, which is not exactly related to a certain channel bandwidth.

Qualcomm: We have separate section in the spec to cover the enhanced channel raster. We do not see the need to have the note.

Huawei: The intention that in Rel-18 it is mandatory. The benefit of note is for release independent.

Ericsson: On the same note, if the band is implemented in the early release for which the enhanced raster is not mandated, we need to introduce the note in the previous release.

Qualcomm: to Ericsson, the release independent will include the parameter, which is covered already.

Huawei: with the additional note, we see no objection.

Apple: adding Rel-19 is conflict with the mandatory. We would like to keep FFS.

Huawei: the benefit is for early release if you want to have early implementation. It is not contradiction.

**Agreement:**

* Cover all the channel raster points of n28 based on the enhanced channel raster to UE RF specification TS 38.101-1 for UE CBW 40MHz.
  + FFS on adding “The UE shall also support the enhanced channel raster capability on band n28.” to the Note in **issue 1-2-3** in Rel-19.

**Issue 1-2-5 Release independence of 40MHz**

**Agreement in RAN4#112bis:**

* Option 1: Rel-16
* Option 2: Rel-15

**Proposal in RAN4#113:**

* Option 1 (Nokia, vivo, Huawei, ZTE): Rel-16
* Option 2: Rel-15

Recommended WF:

The release independence of 40 MHz for n28 is from Rel-16.

**Agreement:**

* The release independence of 40 MHz for n28 is from Rel-16.