**3GPP TSG-RAN WG4 Meeting #94-e R4-2002904**

**Electronic Meeting, Feb.24th – Mar.6th 2020**

**Agenda item:** 9.25

**Source:** Moderator(Ericsson)

**Title:** Email discussion summary for RAN4#94e\_#37\_NR\_n65\_BW

**Document for:** Information

# Introduction

The scope of this email discussion is to specify REFSENS and A-MPR requirements when introducing 50 MHz channel BWs in band n65.

The focus of the discussion should be on getting possible agreement on REFSENS values and A-MPR assumptions (1st round) and capturing agreements in w Way Forward (2nd round).

# Topic #1: 50 MHz CBW

*Main technical topic overview:* Addition of 50 MHz channel BWin band n65.

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2000089 | Qualcomm | **Proposal 1**: Use at least 5MHz protection region for B34 so upper channel BW is restricted to 2005MHz.  **Proposal 2**: No AMPR requirement for B3 protection is FFS pending agreement on n65 filter rejection at B3 frequency to be at least 37dB.  **Proposal 3**: Define n1 AMPR for B34 protection as shown in section 2.3 with B3 filter rejection assumption   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Channel Bandwidth, MHz | Carrier Center Frequency, Fc, MHz | Regions | | A-MPR | Meas. A-MPR DFT/CP | | RBend\*12\*SCS  MHz | LCRB\*12\*SCS  MHz | | 50 MHz | Fc = 1945 |  |  |  |  | | ≤ 9 | > 0 | A3 | 16.5 | | > 9, < 37.8 | ≥ 9.0 | A4 | 8/9.5 | | > 9, < 37.8 | < 9.0 | A5 | 4/5.5 | | ≥ 37.8 | > 0 | A3 | 16.5 | |  |  |  |  | | 50 MHz | 1945 < FC ≤ 1980 |  |  |  |  | | ≤ 18 | > 0 | A1 | 24/22 | | > 18, < 27.0 | ≥ 0 | A2 | 12.5 | | ≥ 27.0 | > 0 | A1 | 24/22 |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Modulation/Waveform | A1 | A2 | A3 | A4 | A5 | | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | Outer/Inner | | DFT-s-OFDM PI/2 BPSK | 22 | 12.5 | 17 | 8 | 4 | | DFT-s-OFDM QPSK | 22 | 12.5 | 17 | 8 | 4 | | DFT-s-OFDM  16 QAM | 22 | 12.5 | 17 | 8 | 4 | | DFT-s-OFDM  64 QAM | 22 | 12.5 | 17 | 8 | 4 | | DFT-s-OFDM  256 QAM | 22 | 12.5 | 17 | 8 | 4 | | CP-OFDM QPSK | 24 | 12.5 | 17 | 9.5 | 5.5 | | CP-OFDM 16 QAM | 24 | 12.5 | 17 | 9.5 | 5.5 | | CP-OFDM 64 QAM | 24 | 12.5 | 17 | 9.5 | 5.5 | | CP-OFDM 256 QAM | 24 | 12.5 | 17 | 9.5 | 5.5 | |
| R4-2001210 | Ericsson | **Proposal: Approve the REFSENS values and RB allocation for 50MHz CBW as proposed in this contribution (Table 2 and Table 3).**   | Operating Band | SCS kHz | 50  MHz (dBm) | Duplex Mode | | --- | --- | --- | --- | | n65 | 15 | **-79.3** | FDD | | 30 | **-89.3** | | 60 | **-89.4** | |
| R4-2001211 | Ericsson | **Proposal1: Add NS to protect band 33 and band 34, avoiding then any scheduling restriction, as it was already done for bands n1 and n38. A-MPR simulations should then be done based on below assumptions.**  **Proposal2: If confirmed by Japanese operators, NS\_05 (PHS service protection) will not be considered for 50MHz channel BW and corresponding A-MPR table would not be updated.** |

## Open issues summary

A-MPR assumptions and bands protection should be further discussed add agreed.

REFSENS values might be agreeable.

### Sub-topic 1-1

*Sub-topic description:* A-MPR -PHS protection.

**Issue 1-1: A-MPR - PHS protection**

* Proposals
  + Option 1: 50MHz CBW will not be regulated where PHS service exists, no need to udpate NS\_05 for 50MHz CBW.
* Recommended WF

### Sub-topic 1-2

*Sub-topic description:* A-MPR –5 MHz offset in the upper band.

**Issue 1-2: A-MPR – 5 MHz offset**

* Proposals
  + Option 1: Use at least 5MHz protection region for B34 so upper channel BW is restricted to 2005MHz
* Recommended WF

### Sub-topic 1-3

*Sub-topic description:* A-MPR – Band 3 protection

**Issue 1-3: A-MPR – Band 3 protection**

* Proposals
  + Option 1: No AMPR requirement for B3 protection is FFS pending agreement on n65 filter rejection at B3 frequency to be at least 37dB.
* Recommended WF

### Sub-topic 1-4

*Sub-topic description:* A-MPR – Band 34 protection

**Issue 1-4: A-MPR – Band 34 protection**

* Proposals
  + Option 1: A-MPR values according to proposal 3 in R4-2000089
  + Option 2: Protect Band 34 and Band 33 to avoid RB restriction.
* Recommended WF

### Sub-topic 1-5

*Sub-topic description:* REFSENS

**Issue 1-5: REFSENS**

* Proposals
  + Option 1: REFSENS values and RB allocation according to R4-2001210.
* Recommended WF

## Companies views’ collection for 1st round

### Open issues

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| **Company** | **Comments** |
| Qualcomm Inc. | Sub topic 1-5:   1. Regarding R4-2001210: The 15K SCS REFSENS is too high. There is no distortion to cause this REFSENS value. This is possibly a typo. Value should be -89.1dBm when scaled with BW at 15K SCS. 2. The UL configuration is ok.   Sub topic 1-2, 1-3, 1-4:   1. Regarding R4-2001211: Finalizing requirements is mandatory before finalizing AMPR, which includes maximum carrier frequency location for 50MHz BW.   ….  Others: |
| Skyworks | Sub topic 1-5: About R4-2001210:   1. Could there be a copy and paste typo in the UL RB configuration table 3? For n1 we discussed using 128RB, 64RB and 30RBs for SCS15,30 and 60kHz for 50MHz CBW. 2. Same comment for REFSENS. RB scaling would take REFSENS to -89.6 dBm at SCS 15kHz for 50MHz CBW. |
| Ericsson | Sub topic 1-5: Agree, there are typos on the proposed values, it should be -89.3 for 50 MHz 15kHz SCS and the RB allocations should be 128/64/30 for 15/30/60 kHz SCS  Sub topic 1-2 and 1-4: On top of the 5 MHz offset, as initially proposed, we should consider as well an additional offset of 5 MHz to reduce A-MPR.  The considered low band edge would then be at 1920 MHz (fc at 1945 MHz) and the high band edge at:   * 2005 MHz (fc at 1980 MHz). * 2000 MHz (fc at 1975 MHz). |

### CRs/TPs comments collection

*Major close-to-finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

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| **CR/TP number** | **Comments collection** |
| R4-2000089 | [Skyworks]:   1. Observation 2: We agree this observation. We would like to suggest collecting more measurement data at next meeting on this item. 2. Proposal 3: is there a typo in “Define n1 AMPR for B34…” ? |
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## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

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|  | **Status summary** |
| **Sub-topic#1-1**  A-MPR for PHS protection | Tentative agreements: No feedback received. No A-MPR will be specified to protect PHS when 50MHz channel BW is added to badn n65. NS\_05 will not be updated considering 50MHz channel BW.  Recommendations for 2nd round: To be captured in the WF. If any company disagree with this tentative agreement, they should notify it. |
| **Sub-topic#1-2**  **A-MPR**  **5MHz offset** | Tentative agreements: 5MHz offset at higher band edge will be considered for A-MPR  Candidate options:  Recommendations for 2nd round: To be captured in the WF |
| **Sub-topic#1-3**  **B3 protection** | Tentative agreements: No AMPR requirement for B3 protection is FFS pending agreement on n65 filter rejection at B3 frequency to be at least 37dB.  Recommendations for 2nd round: To be captured in the WF. |
| **Sub-topic#1-4**  **Sub-topic#1-B34 protection** | Tentative agreements: Specify new NS to protect B33 and B34. For A-MPR simulations, consider a low band edge at 1920 MHz (fc at 1945 MHz) and the high band edge at 2005 MHz (fc at 1980 MHz) and/or at 2000 MHz (fc at 1975 MHz).  Recommendations for 2nd round: To be captured in the WF. |
| **Sub-topic#1-5**  **REFSENS** | Tentative agreements: REFSENS values:   | SCS kHz | 50  MHz (dBm) | | --- | --- | | 15 | **-89.3** | | 30 | **-89.3** | | 60 | **-89.4** |   RB allocation:   | SCS kHz | 50  MHz | | --- | --- | | 15 | **1281** | | 30 | **641** | | 60 | **301** |   Recommendations for 2nd round To be captured in the WF. |

*Recommendations on WF/LS assignment*

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|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 | WF on UE RF requirements for adding channel BW to band n65 | Ericsson |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

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| **CR/TP number** | **CRs/TPs Status update recommendation** |
| NA | NA |

## Discussion on 2nd round (if applicable)

Comment on the draft WF (R4-2002856) when proposed.

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| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| Apple | Note 27 could be outdated with introducing 50MHz channel BW. Its purpose seems restrict the protected frequency range to RBs 54 and lower. If the note is not changed the frequency range protection will be applicable to the whole 50MHz channel BW.  Proposal for note 27:  This requirement is applicable for any channel bandwidths within the range 1920 - 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 - 1929.5 MHz ~~and,~~ for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 - 1938 MHz and for carriers of 50 MHz bandwidth when carrier centre frequency is within the range 1945 – 19xx MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.*”* |

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

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| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| R4-2002856 | Apple’s comment is related to TS 38.101-1 update and will be further discussed when the corresponding CR will be submitted in coming meetings.  Skyworks has co-signed the WF.  The WF is agreeable. |