**3GPP TSG-RAN WG4 Meeting # 98-e R4-2102953**

**Electronic Meeting, 25 Jan. – 05 Feb., 2021**

**Agenda item:** 5.2 and 6.4.2

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

**Title:** Draft Round 1 Email discussion summary for [98e][105] LTE\_Maintenance

**Document for:** Information

# Introduction

This Email thread cover LTE maintenance for UE RF requirements with agenda item:

* 5.2 UE RF requirements up to R15
* 6.4.2 UE RF requirements R16

List of topics:

* Topic 1: band specific aspects
* B48 UL configuration and notes
* Addition of Band 40 in Japan and UE-UE coexistence
* Band 38 UE Coex (should have been Agenda 6.4.2)
* NS\_04 256QAM A-MPR
* Topic 2: Spurious emission clean-up for UE coexistence tables
* Topic 3: NB-IoT

# Topic #1: band specific aspects

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2100053**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2100053.zip) | C Spire Wireless | **Rel-14 CR for missing B48 references in a table and note**  Adds UL configuration to Table 7.3.1-2 and add B48 to Note 5 in Table 7.6.2.1A-0  R15/16/17 Mirror CRs R4-2100645, R4-2100648 and R4-2100651  Moderator: please comment directly in CR section |
| [**R4-2101197**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2101197.zip) | NTT DOCOMO, INC., SoftBank Corp., KDDI Corporation, Rakuten Mobile, Inc | **Addition of UE co-existence requirements for 40 and n40**  Discussion on introduction of band 40 in Japan:  ***Observation 1: It can be expected that modification on UE to UE co-existence to reuse B40/n40 in Japan will not have a significant impact on UE implementation since UEs that meet the current co-existence requirements could meet the modified requirements.***  ***Proposal 1: Co-existence requirements from B40/n40 to Japan bands and PHS should be specified.***  ***Proposal 2: Co-existence requirements from Japan bands to B40 should be specified.***  ***Proposal 3: Co-existence requirements for CAs and DCs should be modified according to modification on co-existence requirements of single band to reuse B40/n40 in Japan.***  ***Observation 2: If the modification on UE to UE co-existence applies from Rel-X (not Rel-8), Japanese regulation would be a blocker for UE being compliant with earlier release than Rel-X to enter in Japanese market.***  ***Proposal 4: Modification on co-existence requirements to reuse B40/n40 in Japan should apply from Rel-8.*** |
| [**R4-2101802**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2101802.zip) | Huawei, HiSilicon, DT | **CR for 36.101 to add missing spurious emissions for band 38 UE co-existence (Rel-16)**  adds n79/n78/n77 spurious emissions for band 38 UEco-existence  R17 Mirror CR R4-2101803  Moderator: please comment directly in CR section |
| [**R4-2102437**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2102437.zip) | Huawei, HiSilicon | **A-MPR for LTE CA\_NS\_04 256QAM PC2**  **Proposal 1: Modify the A-MPR for CA\_NS\_04 (power class 2) as in Table 2.1**  Table 2.1: Contiguous Allocation A-MPR for CA\_NS\_04 (power class 2)   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | CA Bandwidth Class C | Lower edge cutoff frequency [MHz]5 | RBStart | LCRB [RBs] | RBstart + LCRB [RBs] | A-MPR per modulation [dB] | | | | |  | QPSK | 16QAM | 64QAM | 256QAM | | 25 RB / 100 RB | 2513.5 | 0 – 42 | >0 | N/A | ≤5 | ≤5 | ≤5 | 6.5 | | 43 – 81 | N/A | >82 | ≤1 | ≤1.5 | ≤1.5 | 6 | | 82 – 124 | >0 | N/A | ≤1 | ≤1.5 | ≤1.5 | 5 | | 50 RB / 100 RB | 2518.4 | 0 – 52 | >0 | N/A | ≤5 | ≤5 | ≤5 | 6.5 | | 53 – 94 | N/A | >95 | ≤1 | ≤1.5 | ≤1.5 | 6 | | 95 – 149 | >0 | N/A | ≤1 | ≤1.5 | ≤1.5 | 5 | | 75 RB / 75 RB | 2519.0 | 0 – 54 | >0 | N/A | ≤5 | ≤5 | ≤5 | 6.5 | | 55 – 94 | N/A | >95 | ≤2 | ≤2.5 | ≤2.5 | 6 | | 95 – 149 | >0 | N/A | ≤1.5 | ≤2 | ≤2 | 5 | | 75 RB / 100 RB | 2523.4 | 0 – 64 | >0 | N/A | ≤5 | ≤5 | ≤5 | 6.5 | | 65 – 114 | N/A | >115 | ≤2 | ≤2.5 | ≤2.5 | 6 | | 115 – 174 | >0 | N/A | ≤1 | ≤1.5 | ≤2 | 5 | | 100 RB / 100 RB | 2528.3 | 0 – 69 | >0 | N/A | ≤5 | ≤5 | ≤5 | 6.5 | | 70 – 129 | N/A | >130 | ≤2 | ≤2.5 | ≤2.5 | 6 | | 130 – 199 | >0 | N/A | ≤1.5 | ≤1.5 | ≤2 | 5 | | NOTE 1: RBstart indicates the lowest RB index of transmitted resource blocks  NOTE 2: LCRB is the length of a contiguous resource block allocation  NOTE 3: For intra-subframe frequency hopping which intersects regions, notes 1 and 2 apply on a per slot basis  NOTE 4: For intra-subframe frequency hopping which intersects regions, the larger A-MPR value may be applied for both slots in the subframe  NOTE 5: The A-MPR values in this table shall apply when the lower edge of the aggregated channel bandwidth (Figure 5.6A-1) is less than or equal to the lower edge cutoff frequency specified in this table for the corresponding CA bandwidth combination. When the lower edge of the aggregated channel bandwidth exceeds the lower edge cutoff frequency, then the A-MPR shall be equal to the MPR specified in Table 6.2.3A-1a. | | | | | | | | | |

## Open issues summary

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

## Sub-topic 1-1

*Sub-topic description:* R4-2101197 Introduction of Band 40/n40 for Japan

*Open issues and candidate options before e-meeting:*

**Issue 1-1-1: Coexistence tables update**

* Proposals
* ***Proposal 1: Co-existence requirements from B40/n40 to Japan bands and PHS should be specified.***
* ***Proposal 2: Co-existence requirements from Japan bands to B40 should be specified.***
* ***Proposal 3: Co-existence requirements for CAs and DCs should be modified***
* Recommended WF
* Unless a specific issue is identified above proposals are acceptable based on the analysis presented

**Issue 1-1-2: Release independence**

* Proposals
* ***Proposal 4: Modification on co-existence requirements to reuse B40/n40 in Japan should apply from Rel-8.***
* Recommended WF
* Moderator: assuming that for n40 it means Rel.15 the proposal seems acceptable

## Sub-topic 1-2

*Sub-topic description:* R4-2102437A-MPR for LTE CA\_NS\_04 256QAM PC2

*Open issues and candidate options before e-meeting:*

**Issue 1-2:** AMPR values for 256 QAM

* Proposals
  + 256 QAM AMPR is 6.5 dB for lower region of RBstart
  + 256 QAM AMPR is 6 dB for middle region of RBstart
  + 256 QAM AMPR is 5 dB for upper region of RBstart
* Recommended WF
  + Confirm values in the discussion

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| T-Mobile USA | Sub topic 1-1-1:  Sub topic 1-1-2:  Sub topic 1-2: We don’t agree with the proposed A-MPR values. R4- 2102437 says that A-MPR needs to consider EVM, but EVM should be accounted for under MPR, right? The NS\_04 A-MPR is the Max of MPR and A-MPR, so there is no need to account for EVM under A-MPR. From 36.101, 6.24A, “For uplink 64 QAM and 256 QAM, the applied maximum output power reduction is obtained by taking the maximum value of MPR requirements specified in Table 6.2.3A-1 and A-MPR requirements specified in Table 6.2.4A-1.” |
| Qualcomm | Sub topic 1-1-1:  Sub topic 1-1-2:  Sub topic 1-2: The LTE 256QAM AMPR for PC2 should align with the NR 256QAM AMPR for PC2 and if it is EVM dominated, the AMPR should match the single carrier AMPR, These numbers are implementation dependent (especially for low LCRB) and may not fully align with a simulation. In the last meeting we suggested the flowing table in R4-2014164.  Table 6.2.4A.4-2: Contiguous Allocation A-MPR for CA\_NS\_04 (power class 2)   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | CA Bandwidth Class C | Lower edge cutoff frequency [MHz]5 | RBStart | LCRB [RBs] | RBstart + LCRB [RBs] | A-MPR per modulation [dB] | | | | |  | QPSK | 16QAM | 64QAM | 256QAM | | 25 RB / 100 RB | 2513.5 | 0 – 42 | >0 | N/A | ≤5 | ≤5 | ≤5 | 8 | | 43 – 81 | N/A | >82 | ≤1 | ≤1.5 | ≤1.5 | 6.5 | | 82 – 124 | >0 | N/A | ≤1 | ≤1.5 | ≤1.5 | 6.5 | | 50 RB / 100 RB | 2518.4 | 0 – 52 | >0 | N/A | ≤5 | ≤5 | ≤5 | 8 | | 53 – 94 | N/A | >95 | ≤1 | ≤1.5 | ≤1.5 | 6.5 | | 95 – 149 | >0 | N/A | ≤1 | ≤1.5 | ≤1.5 | 6.5 | | 75 RB / 75 RB | 2519.0 | 0 – 54 | >0 | N/A | ≤5 | ≤5 | ≤5 | 8 | | 55 – 94 | N/A | >95 | ≤2 | ≤2.5 | ≤2.5 | 6.5 | | 95 – 149 | >0 | N/A | ≤1.5 | ≤2 | ≤2 | 6.5 | | 75 RB / 100 RB | 2523.4 | 0 – 64 | >0 | N/A | ≤5 | ≤5 | ≤5 | 8 | | 65 – 114 | N/A | >115 | ≤2 | ≤2.5 | ≤2.5 | 6.5 | | 115 – 174 | >0 | N/A | ≤1 | ≤1.5 | ≤2 | 6.5 | | 100 RB / 100 RB | 2528.3 | 0 – 69 | >0 | N/A | ≤5 | ≤5 | ≤5 | 8 | | 70 – 129 | N/A | >130 | ≤2 | ≤2.5 | ≤2.5 | 6.5 | | 130 – 199 | >0 | N/A | ≤1.5 | ≤1.5 | ≤2 | 6.5 | | NOTE 1: RBstart indicates the lowest RB index of transmitted resource blocks  NOTE 2: LCRB is the length of a contiguous resource block allocation  NOTE 3: For intra-subframe frequency hopping which intersects regions, notes 1 and 2 apply on a per slot basis  NOTE 4: For intra-subframe frequency hopping which intersects regions, the larger A-MPR value may be applied for both slots in the subframe  NOTE 5: The A-MPR values in this table shall apply when the lower edge of the aggregated channel bandwidth (Figure 5.6A-1) is less than or equal to the lower edge cutoff frequency specified in this table for the corresponding CA bandwidth combination. When the lower edge of the aggregated channel bandwidth exceeds the lower edge cutoff frequency, then the A-MPR shall be equal to the MPR specified in Table 6.2.3A-1a. | | | | | | | | | |
| NTT DOCOMO, INC | Sub topic 1-1-1:  Sub topic 1-1-2:  Clarification on our proposal:  Regarding release independence, our intention was that apply to B40 from Rel-8, and apply to n40 from Rel-15.  Thank you for moderator’s pointing out it. Sorry for confusion. |
| Huawei | Sub topic 1-2:  To T-Mobile USA: Thanks for confirming that the A-MPR values in the table should not contain the EVM effect. Instead, the EVM is counted in the total power reduction via the max-rule. I can agree with that.(By the way, does this also override the equation in 6.2.5A Configured transmitted power for CA, where MPR+A-MPR is used? )  On the other hand, our paper has provided simulation results for both cases: with and w/o EVM effect. It can be seen that without EVM, the max MPR for the three regions under consideration are 4, 3.5 and 3, respectively. Taking into account some implementation margin, we’d like to propose the following A-MPR values:   |  |  | | --- | --- | | 256 QAM AMPR for lower region of RBstart | 5.5 dB | | 256 QAM AMPR for middle region of RBstart | 5 dB | | 256 QAM AMPR for upper region of RBstart | 4.5 dB |   Furthermore, the PC2 MPR for 256QAM CA is still FFS in **Table 6.2.3A-1a.** Based on our simulation results with EVM effect, we’d like to propose **6.5** dB MPR.  Table 6.2.3A-1a: Maximum Power Reduction (MPR) for Power Class 2   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Modulation | CA bandwidth Class C / Smallest Component Carrier Transmission Bandwidth Configuration | | | | MPR (dB) | | 25 RB | 50 RB | 75 RB | 100 RB | | QPSK | > 6 and ≤ 25 | > 6 and ≤ 50 | > 6 and ≤ 75 | > 6 and ≤ 100 | ≤ 1 | | QPSK | > 25 | > 50 | > 75 | > 100 | ≤ 2 | | 16 QAM | ≤ 6 | ≤ 8 | ≤ 16 | ≤ 18 | ≤ 1.5 | | 16 QAM | > 6 and ≤ 25 | > 8 and ≤ 50 | > 16 and ≤ 75 | > 18 and ≤ 100 | ≤ 2 | | 16 QAM | > 25 | > 50 | > 75 | > 100 | ≤ 3 | | 64 QAM | ≤ 8 and allocation wholly contained within a single CC | ≤ 12 and allocation wholly contained within a single CC | ≤ 16 and allocation wholly contained within a single CC | ≤ 18 and allocation wholly contained within a single CC | ≤ 2 | | 64 QAM | > 8 or allocation extends across two CC's | > 12 or allocation extends across two CC's | > 16 or allocation extends across two CC's | > 18 or allocation extends across two CC's | ≤ 3 | | 256 QAM | ≥1 | | | | ≤6.5 |   Please share your views.  To QC:  Here’s the NR AMPR table you’re referring to.  Table 6.2.3.2-2: A-MPR' values Access   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Modulation/Waveform | | A-MPR' (dB) | | | | | | |  | | PC3\_A1 | PC3\_A2 | PC2\_A3 | PC2\_A4 | PC1.5\_A51 | PC1.5\_A61 | | DFT-s-OFDM | Pi/2-BPSK | ≤ 3.5 | ≤ 3.5 | ≤ 3.5 | ≤ 5.5 | ≤ 5 | ≤ 7 | |  | QPSK | ≤ 4 | ≤ 4 | ≤ 4.5 | ≤ 6 | ≤ 6 | ≤ 7.5 | |  | 16 QAM | ≤ 4 | ≤ 4 | ≤ 5 | ≤ 6 | ≤ 6.5 | ≤ 7.5 | |  | 64 QAM | ≤ 4 | ≤ 4.5 | ≤ 5 | ≤ 6.5 | ≤ 6.5 | ≤ 8 | |  | 256 QAM | ≤ 4.5 | ≤ 6 | ≤ 6.5 | ≤ 8 | ≤ 8 | ≤ 9.5 | | CP-OFDM | QPSK | ≤ 5.5 | ≤ 5.5 | ≤ 6.5 | ≤ 7.5 | ≤ 8 | ≤ 9 | |  | 16 QAM | ≤ 5.5 | ≤ 5.5 | ≤ 6.5 | ≤ 7.5 | ≤ 8 | ≤ 9 | |  | 64 QAM | ≤ 5.5 | ≤ 5.5 | ≤ 6.5 | ≤ 7.5 | ≤ 8 | ≤ 9 | |  | 256 QAM | ≤ 6.5 | ≤ 8 | ≤ 7.5 | ≤ 10 | ≤ 9 | ≤ 11.5 | | NOTE 1: PC1.5 assumes dual Tx. | | | | | | | |   Comparing the NR AMPR values with those of LTE, it can be seen that the NR values are much larger for the same modulation. This was what we pointed out in the last meeting. And that’s also why we need dedicated simulations. |

### 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.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| [**R4-2100053**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2100053.zip) | Company A |
| Company B |
|  |
| [**R4-2101802**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2101802.zip) | Company A |
| Company B |
|  |

## 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.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1-1** | *Tentative agreements:*  **Issue 1-1-1** proposal 1, 2 , 3 are acceptable  **Issue 1-1-2** proposal 4 needs amendment to clarify that n40 is from rel 15 while n  *Candidate options:*  *Recommendations for 2nd round:* Document is revised with above amendment of proposal 4 and discussed for approval in round 2 |
| **Sub-topic#1-2** | *Summary:* NS04 AMPR is FFS for 256QAM in 36.101. LTE AMPR should be feasible to update based on DFT-s-OFDM values from NR if they are EVM limited but since LTE NS04 A-MPR is max MPR/A-MPR, LTE 256QAM MPR value should apply.  *Tentative agreements:* 256QAM back-off is dominated by EVM thus MPR should apply  *Candidate options:* Decide if NS04 256 QAM A-MPR is updated as suggested by Huawei (wo EVM) or if FFS is removed and MPR is applied and use 6.5dB anyhow  *Recommendations for 2nd round:* further discuss the above options in round 2 and capture agreement in a WF (see below) and provide CR accordingly. |

*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 | WF on LTE band 41 NS04 A-MPR for UL 256 QAM | T-Mobile USA |

### CRs/TPs

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| [**R4-2100053**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2100053.zip) | There is no comment on the CR: the CR is approvable  And mirror CRs R4-2100244, R4-2100645, R4-2100648, R4-2100651 should be approvable after upload and verification |
| [**R4-2101802**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2101802.zip) | There is no comment on the CR: the CR is approvable  Mirror CR R4-2101803 should be approvable after upload and verification |

## Discussion on 2nd round (if applicable)

## 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*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #2: Spurious emission clean-up for UE coexistence tables

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2102596**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2102596.zip) | Apple | **R15 CR for TS 36.101: Cleanup for spurious emissions for UE co-existence table**   1. In Table 6.6.3.2-1, for band 28, move protected band 52 to the row without NOTE.   In Table 6.6.3.2A-0,   1. CA\_1-5, band n77, n78 and n79 are missing harmonic exception as found in single band 1 and 5 2. CA\_1-11, band n77 is missing harmonic exception as found in single band 1 3. CA\_1-20, band 42 is missing harmonic exception as found in single band 20 4. CA\_1-21, band n77 band n77 is missing harmonic exception as found in single band 1 5. CA\_1-26, band n77 band n77 is missing harmonic exception as found in single band 1 6. CA\_1-28, bands 32, 50, 51 ,74 are missing harmonic exception as found in single band 28 7. CA\_2-4, band 22 is missing harmonic exception 8. CA\_3-5, bands 22 and 42 are missing harmonic exception as found in single band 3 9. CA\_3-18, band n77 and n78 are missing harmonic exception as found in single band 18 and 3 10. CA\_3-21 band n77 and n78 are missing harmonic exception as found in single band 3 11. CA\_3-41 band n77, n78 and n79 are missing harmonic exception as found in single band 3 and 41 12. CA\_4-12 band 22 is missing harmonic exception 13. CA\_4-13 band 22 is missing harmonic exception 14. CA\_4-17 band 22 is missing harmonic exception 15. CA\_5-12 band 22 and 42 are missing harmonic exception 16. CA\_5-17 band 22 and 42 are missing harmonic exception 17. CA\_11-26 band n77, n78 and n79 are missing harmonic exception as found in single band 11 18. CA\_26-46 band 41 is missing harmonic exception as found in single band 26 19. CA\_26-48 band 41 is missing harmonic exception as found in single band 26 20. CA\_28-41 band 32, 45, 48 are missing harmonic exception   Moderator: please comment directly in CR section |
| [**R4-2102604**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2102604.zip) | Apple | **R16 CR for TS 36.101: Cleanup for spurious emissions for UE co-existence table**  In Table 6.6.3.2-1,   1. For Band 5, move protected Band 53 to the row with NOTE 2. 2. For Band 28, move protected Band 52 to the row without NOTE.   In Table 6.6.3.2A-0,   1. CA\_1-5, band n77, n78 and n79 are missing harmonic exception as found in single band 1 and 5 2. CA\_1-11, band n77 is missing harmonic exception as found in single band 1 3. CA\_1-20, band 42 is missing harmonic exception as found in single band 20 4. CA\_1-21, band n77 band n77 is missing harmonic exception as found in single band 1 5. CA\_1-26, band n77 band n77 is missing harmonic exception as found in single band 1 6. CA\_1-28, bands 32, 50, 51 ,74 are missing harmonic exception as found in single band 28 7. CA\_2-4, band 22 is missing harmonic exception 8. CA\_3-5, bands 22 and 42 are missing harmonic exception as found in single band 3 9. CA\_3-18, band n77 and n78 are missing harmonic exception as found in single band 18 and 3 10. CA\_3-21 band n77 and n78 are missing harmonic exception as found in single band 3 11. CA\_3-41 band n77, n78 and n79 are missing harmonic exception as found in single band 3 and 41 12. CA\_4-12 band 22 is missing harmonic exception 13. CA\_4-13 band 22 is missing harmonic exception 14. CA\_4-17 band 22 is missing harmonic exception 15. CA\_5-12 band 22 and 42 are missing harmonic exception 16. CA\_5-17 band 22 and 42 are missing harmonic exception 17. CA\_11-26 band n77, n78 and n79 are missing harmonic exception as found in single band 11 18. CA\_26-46 band 41, 53 and 77 are missing harmonic exception as found in single band 26 19. CA\_26-48 band 41 is missing harmonic exception as found in single band 26 20. CA\_28-41 band 32, 45, 48 are missing harmonic exception   Moderator: please comment directly in CR section  R17 Mirror CR R4-2102605 |

## Open issues summary

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

### 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.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| [**R4-2102596**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2102596.zip) | Huawei: Thanks for the cleanup work. On the change for CA\_1-26, should n78 be moved to the same row as n77? This looks similar to the case of CA\_1-28. |
| Apple: Good catch. We agree that n78 should also have the harmonic exception. |
|  |
| [**R4-2102604**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2102604.zip) | Company A |
| Company B |
|  |

## 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.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| [**R4-2102596**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2102596.zip) | Need to be revised to account for Huawei comment that n78 need harmonic exception for CA\_1-26 |
| [**R4-2102604**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2102604.zip) | Need to be revised to account for Huawei comment that n78 need harmonic exception for CA\_1-26, same as for R4-2102596. The R17 mirror CR R4-2102605 will need the same correction before upload |

## Discussion on 2nd round (if applicable)

## 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*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
|  | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #3: NB-IoT

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2102098**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2102098.zip) | Sony | **Test frequencies for NB-IOT UE in standalone operation**  It was decided to seek guidance from the FCC on some specific questions which resulted in an LS sent to FCC [2]. In RAN4 #97-e the issue was brought up again [3] and it was decided to wait for the response from FCC [4]. Since no response has been received so far, we bring up this issue again.  **Observation 1: TS 36.104 test conditions (test frequencies) for both stand-alone and guard-band NB-IoT operation may conflict with FCC band-edge spectrum emission requirements.**  **Observation 2: 100 kHz offset for NB-IoT network deployments may solve the violation of the FCC regulation.**  **Proposal 1: Send an LS to RAN5 with proposal to exclude the first and last EARFCNs in TS 36.104 test frequencies for both stand-alone and guard-band IoT operation modes for all frequency bands were FCC regulation applies.** |

## Open issues summary

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

Band-edge emission at stand-alone and guard-band NB-IoT conditions is regulated by FCC OOB emission requirements. How to test the emission according to the FCC requirement was debated in RAN4 #96-e [1]. It was decided to seek guidance from the FCC on some specific questions which resulted in an LS sent to FCC [2]. In RAN4 #97-e the issue was brought up again [3] and it was decided to wait for the response from FCC [4]. Since no response has been received so far, we bring up this issue again.

This document is a resubmission of [3].

### Sub-topic 3-1

*Sub-topic description:* Since FCC has given no answer to the LS should RAN4 decide for a solution in its specification and send LS in RAN5

*Open issues and candidate options before e-meeting:*

**Issue 3-1: Solution to FCC OOB requirement for NB-IoT**

* Proposals
  + Option 1: Wait for FCC response
  + Option 2: Accept proposals in **R4-2102098**
  + Option 3: Amend solutions proposed in [**R4-2102098**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2102098.zip)
* Recommended WF
  + Discuss if solution in [**R4-2102098**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2102098.zip) **is acceptable**

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 3-1:  Sub topic 3-2:  ….  Others: |
| Huawei | The existing 3GPP test frequencies are valid in many regions of the world. Excluding them unconditionally could disrupt the conformance tests/certification process in those regions. Furthermore, avoid testing those frequencies would not necessarily guarantee that the UE meets the FCC requirements. Therefore option 2 seems not acceptable. We prefer option 1 for now, but we’re also open to discuss other solutions. |
| T-Mobile USA | We support Option 1. While we would like to close this issue, we think that RAN4 needs to wait for a response from the FCC. The proposal from Sony is to exclude 100 kHz at the edge of the band for UE testing, but the FCC would need to agree to change their testing procedures. Is the idea to use this to force them to make a decision? Another concern is that the edge of the license is where the FCC emission rules apply and the edge of the band is not always the edge of the license. For instance, for Band 12 in the US, the lower edge of the license is 698 MHz not 699 MHz which is the low edge of the band. Band 13 has a similar issue, where the edge of the band doesn’t align with the edge of the license. |
| Sony | Issue 3-1: Option 2: Send an LS to RAN5 to exclude the first and last EARFCNs in TS 36.508 test frequencies for both stand-alone and guard-band IoT operation modes for all frequency bands were FCC regulation applies.  Operating in those frequencies must also be prohibited: Exclude using the first and last EARFCNs in TS 36.104 for both stand-alone and guard-band IoT operation modes for all frequency bands were FCC regulation applies.  The need for clarification from FCC actually refers to bands 12 and 13 only. The FCC requirements in other bands are quite clear. Since no answer from FCC has been received so far, we believe RAN4 has to act with a general decision for all bands where FCC requirements apply. This decision may need to be adjusted regarding bands 12 and 13 after receiving the clarification from FCC. |
| Qualcomm | Sub topic 3-1:  We are seeking the guidance from FCC to solve NB-IoT emission issues for both BS and UE. The solutions should be based on the feedback from FCC. Therefore, we prefer option 1, i.e., discussing BS and UE solution based on the response from FCC. Meanwhile, we are not sure when FCC could send response to RAN4. We encourage companies to contact FCC per multiple channels and share the information in next RAN4 meeting. |
| DISH | Sub-topic 3-1: Option 1.We should wait for FCC response |
| Ericsson | Sub-topic 3-1: option 1.  We understand NB-IoT UE manufacturers are under pressure to release their products asap and would like to help finding a solution, but we can’t accept any temporary solution that might have to be reconsidered later, once we receive FCC feedback. |

## 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.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#3-1** | It seems that the majority of interested companies want to wait for FCC feedback and also that the proposed solution can impact NB-IoT UE outside the FCC regulation. It is also unclear how this would apply to conformance test. Finally depending on FCC feedback the proposed change may mean re-work of the solution.  *Tentative agreements:* Keep waiting for FCC feedback which was the agreed way forward from past meetings, and encourage 3GPP companies to seek from FCC feedback.  *Candidate options:*  *Recommendations for 2nd round:* As moderator we do not see that new elements can change the above position and result in LS sent to RAN5. So we suggest that [R4-2102098](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2102098.zip) is noted |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 |  |  |

### CRs/TPs

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## 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*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |