**3GPP TSG-RAN WG4 Meeting # 97-e R4-2016949**

**Electronic Meeting, 2 – 13 Nov., 2020**

**Agenda item:** 5.2 and 6.5.2

**Source:** Skyworks Solution Inc.

**Title:** Email discussion summary for [97e][105] LTE UE RF maintenance

**Document for:** Information

# Introduction

*Briefly introduce background, the scope of this email discussion and provide some guidelines for email discussion if necessary.*

*List of candidate target of email discussion for 1st round and 2nd round*

* 1st round: 5 topics to be discussed for agenda:
* 5.2: LTE UE RF maintenance up to R15 + 6.4.2: LTE UE RF maintenance up to R16
  + Topic 1: R15&16 Corrections to Bands an CA
  + Topic 2: R15&16 Corrections to co-ex and AMPR
  + Topic 3: NB-IoT FCC emission issues
  + Topic 4: R15&16 Corrections to MBMS
* 2nd round: TBA

# Topic #1: Corrections to bands and CA

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2014045**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014045.zip)  Correction of B88 UL EARFCN | Huawei,HiSilicon | In the current spec the UL starting EARFCN of band 88 equals to the UL end EARFCN of band 87 => The UL EARFCN of band 88 is increased by one.  Moderator: comment directly in CR section 1.3.2 |
| [**R4-2014511**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014511.zip)  Band 88 and 87 bracket removal | Nokia | RAN4 M2 REFSENS requirement has brackets which means that the requriement is untestable => Brackets removed.  Moderator: comment directly in C section 1.3.2 |
| [**R4-2016450**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016450.zip)  CR for 36.101: Corrections for UL CA\_41D | T-Mobile USA | There is an incorrect reference to a void section => Delete the reference to 6.6.3.3A.9, and add and CA\_41D to the header of 6.6.3.3A.8  Moderator: comment directly in CR section 1.3.2 |
| [**R4-2014510**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014510.zip) LTE CA corrections | Nokia | R4-2006725 was not implemented properly, CA\_13A-48A-48A-66A disappeared and is still in clauee 7 and errors to other configurations emerged. CA\_2A-48E-66A-66A has wrong aggregated BW. CA\_1A-18A-41C has invalid BCS reference.  Moderator: comment directly in CR section 1.3.2 |
| [**R4-2016340**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016340.zip) Rel-16 CR editorial corrections 36.101 | Ericsson | CA\_48B is defined, now corrected included in Table 5.6A.1-1  Corrected UL for CA\_3A-41A-42C Table 5.6A.1-2a  Correcting CA\_2A-4A-7C in Table 5.6A.1-2a  Correcting CA\_5A-48D-66A and CA\_5A-48D-66A-66A, CA\_2A-5A-48D-66A and CA\_2A-5A-48D-66A-66A  References to CA 66A-66A changed to CA\_66A-66A  References to CA 48C change to CA\_48C  References to CA 48D change to CA\_48D  Corrected UL bands for CA\_2A-13A-48A, CA\_2A-48A-66A and CA\_2A-14A-66A in MSD Table 7.3.1A-0g  Moderator: comment directly in CR section 1.3.2 |

## Open issues summary

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

### Sub-topic 1-1

*Sub-topic description:* Band 87 and 88 corrections: please directly comment in the CR section 1.3.2

### Sub-topic 1-2

*Sub-topic description :* Correction to CA\_41D: please directly comment in the CR section 1.3.2

### Sub-topic 1-3

*Sub-topic description :*: CA\_13A-48A-48A-66A , CA\_2A-48E-66A-66A, CA\_1A-18A-41C corrections: please directly comment in the CR section 1.3.2

### Sub-topic 1-4

*Sub-topic description* : Corrections in Table 5.6A.1-1, 5.6A.1-2a and Table 7.3.1A-0g from [**R4-2016340**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016340.zip): please directly comment in the CR section 1.3.2

## Companies views’ collection for 1st round

### Open issues

Moderator: Comment directly in CR section 1.3.2

### 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** |
| [**R4-2014045**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014045.zip) | Company A |
| Company B |
|  |
| [**R4-2014511**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014511.zip) | Company A |
| Company B |
|  |
| [**R4-2016450**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016450.zip) | Company A |
| Company B |
|  |
| [**R4-2014510**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014510.zip) | Company A |
| Company B |
|  |
| [**R4-2016340**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016340.zip) | [Nokia] Support, addition of CA\_48B is essential correction. |
| [HW]:  1. A-MPR for UL CA\_48B is missing (Clause 6.2.4A.10).  2. In WID RP-200655, the requests are removed from Table 1-4. Maybe we need to introduce UL CA\_48B in Rel-17.  3. The rest corrections can be merged into R4-2014510. |
| [CHTTL] as mentioned by Huawei, it seems like the CA\_48B is not in the Individual combination table of the WID RP-200655. And also there is no other higher order combo related to CA\_48B in the WID, not sure why there are a lots in the spec ? |
| Nokia | To Huawei: CA\_48B A-MPR is already in Rel-16 specs 6.2.4A.10 after CA\_48C only thing missing is the addition in config table proposed in CR |

## Summary for 1st round

Only CR were commented: see CR table below for outcome

### 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** |
| [**R4-2014045**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014045.zip) | No comment received => agreed |
| [**R4-2014511**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014511.zip) | No comment received => agreed |
| [**R4-2016450**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016450.zip) | No comment received => agreed |
| [**R4-2014510**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014510.zip) | No comment received => agreed |
| [**R4-2016340**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016340.zip) | Revision is needed to add CA\_48B related text in other parts of the specification |

## Discussion on 2nd round (if applicable)

Revision is needed to add CA\_48B related text in other parts of the specification and CR update cross-checked. Round2 comment should be added below.

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2016795 Revision of [R4-2016340](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016340.zip) | Ericsson have added CA\_48B related text in other parts of the specification in draft of R4-2016795:   <https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_97_e/Inbox/Drafts/%5B97e%5D%5B105%5D%20LTE_Maintenance/Round%202/draft%20R4-2016795%20Rel-16%20CR%20editorial%20corrections%2036.101.docx> |

## 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** |
| **R4-2016795** | Moderator: Revision of R4-2016340, Draft was circulated and amended according to comments. Available in inbox: agreeable |

# Topic #2: R15&16 Corrections to co-ex and AMPR

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2014311**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014311.zip) Clarifications and corrections on UE co-ex requirements(R15) | SoftBank Corp. | 1. NS related requirements (including Note 7, 8, 15,16) are deleted. 2. A sentence to clarify applicability of additional requirements is added 3. Some errors are corrected:  - In 2UL-CA, note numbers of single band co-ex table seem to be copied in some of “Note 15” -> These should be Note 3(delta FOOB) in the CA table. - In single band table, B74 -> n77-n79 protections are missed.   Moderator: PHS band protection removed? Please comment in CR section 2.3.2 |
| [**R4-2014312**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014312.zip) Clarifications and corrections on UE co-ex requirements(R16) | SoftBank Corp. | Moderator: Release 16 mirror CR (uploaded) will be agreed after R15 CR |
| [**R4-2014896**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014896.zip) Coexistence cleanup for 36101 Rel15 | Apple Inc. | Correction of protected band list: CA\_1-26, CA\_3-28, CA\_7-26, CA\_11-26, CA\_11-18, CA\_19-21 and CA\_11-26  Moderator: Please comment in CR section 2.3.2 |
| [**R4-2014897**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014897.zip) Coexistence cleanup for 36101 Rel16 | Apple Inc. | Moderator(Skyworks) this is not a mirror CR some additional changes versus R15 CR. |
| [**R4-2016426**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016426.zip) LTE CA\_NS\_04 PC2 256QAM AMPR | Qualcomm Incorporated | **Observation 1**: The LTE 256QAM CA\_NS\_04 back-off should be at least be allowed the same back-off as the single CC NR DFT-s-OFDM 256QAM back-off within the similar RB boundary condition. Both back-off is calculated as max (MPR, AMPR).  **Proposal:** Modify Power Class 2 LTE CA\_NS\_04 AMPR as in Table 2.1  Moderator: 256 QAM column: 8dB and 6.5dB depending on RB allocation. Proposal can be commented directly with CR [**R4-2014164**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014164.zip)in CR section 2.3.2 |
| [**R4-2014164**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014164.zip) LTE CA\_NS\_04 PC2 256QAM AMPR | Qualcomm Inc. | Revise 256QAM AMPR for PC2 CA\_NS\_04 in Table 6.2.4A.4-2 from FFS to 8dB and 6.5dB depending on RB allocation.  Moderator: related to discussion paper [**R4-2016426**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016426.zip)Please comment in CR section 2.3.2 |
| R4-2014163 LTE CA\_NS\_04 PC2 256QAM AMPR | Qualcomm Inc. | Moderator: Withdrawn or mirror CR (R16 CR too)? |
| R4-2014162 LTE CA\_NS\_04 PC2 256QAM AMPR | Qualcomm Inc. | Moderator: Withdrawn or mirror CR (R16 CR too)? |
| [**R4-2016008**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016008.zip) LTE CA\_NS\_08 A-MPR Correction | Skyworks Solutions Inc. | Clarification on CA\_NS\_08 region where CA\_MPR should still apply for QPSK and 16 QAM in support for relevant section in CR [**R4-2016035**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016035.zip)  The comments can be done directly in CR section 2.3.2 |
| [**R4-2016035**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016035.zip) CR Correction to B72 coex - CA\_NS\_08 - Band 10 protection 36.101 Rel15 | Skyworks Solutions Inc. | - Restore Band 72 list of protected bands, ie B72 and B31,  - Band 10 protection removal has been agreed in R4-2011521. This CR applies this correction to Release 15,  - Allow CA A-MPR for inner region CA\_NS\_08 allocations (discussed in [**R4-2016008**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016008.zip)**)**  Moderator: Please comment in CR section 2.3.2 |
| [**R4-2016040**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016040.zip) CR Correction to B72 coex - CA\_NS\_08 - Band 10 protection 36.101 Rel16 | Skyworks Solutions Inc. | Moderator: Release 16 mirror CR (uploaded) will be agreed after R15 CR |

## Open issues summary

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

### Sub-topic 2-1

*Sub-topic description:* Corrections to Coex tables: R15 CRs [**R4-2014311**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014311.zip) and [**R4-2014896**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014896.zip) and associated mirror CRs:comment in CR section 2.3.2

### Sub-topic 2-2

*Sub-topic description:* NS\_04 PC2 256 QAM AMPR proposal

**Issue 2-2: NS\_04 PC2 256 QAM AMPR**

* Recommended WF
  + Moderator: 256QAM CA\_NS\_04 back-off should be at least be allowed the same back-off as single CC NS\_04
  + WF: Since this is straight FW the comments can be collected for the CR [**R4-2014164**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014164.zip) directly in section 2.3.2

### Sub-topic 2-3

*Sub-topic description:* CA\_NS\_08 0dB AMPR region

**Issue 2-2: CA\_NS\_08 0dB AMPR region**

* Recommended WF Some allocations in the region where A-MPR is not defined needs to benefit of CA\_MPR instead of 0dB, comments can be collected for the CR [**R4-2016035**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016035.zip) directly in section 2.3.2

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 2-1:  ….  Others: |

### 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** |
| [**R4-2014311**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014311.zip) | [SoftBank] Response to moderator’s comment: This CR is to remove “additional” UE co-ex requirements (that need NS\_signalling) from the “general” UE co-ex table. (This activity was already done in NR based on the comments from various companies.) PHS protection is removed only in the combinations including Band 1 since the requirement need NS\_05, while the rest of PHS protection can be stayed as general requirements.  And to clarify the applicability of additional requirements, new text is proposed to be added. The content is basically common to CRs submitted under [102: 38.101-1] and [104:38.101-3], except the modifications for referenced specs. |
| NTT DOCOMO, INC: We support this CR. Such clarification on additional spurious emission for 2UL case is needed. |
| Apple: We think that a discussion is required with introducing a general rule for CA NS handling. There could be scenarios for inter-band CA where IMDs (created from both ULs) could violate additional spurious emissions. In this case the UE can only keep emission requirements if additional power backoff is used for both bands. Therefore, increased A-MPR might have to be defined for certain CA combinations with NS\_X. This issue has to be checked for all CA combinations.  For example, if NS\_27 is signaled for band 48 in CA\_2\_48. The spurious emission requirements of -40dBm/MHz would be applicable directly outside the channel of band 2. This requirement is not possible to be satisfied with MPR alone.  The proposal from the CR raises further questions. What if NS\_X is signaled for band A and NS\_Y is signaled for band B. What happens in the case of contradicting requirements? How are the additional spurious requirements merged if overlapping? |
| [**R4-2014896**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014896.zip) | Apple: We want to clarify that R4-2014897 is not a simple mirrow CR as it contains additional changes. While most modifications are similar it features further changes for duplicate protections with contradicting requirements. This is the reason why the category ‘F’ should be correct for the Rel-16 CR. |
| Company B |
|  |
| [**R4-2014164**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014164.zip) | HW: The MBW (df\_OOB=0-1 MHz) of the SEM corresponding to LTE CA\_NS\_04 is smaller than that corresponding to NR NS\_04, i.e. 30 kHz vs 2% of CBW. Furthermore, the guard band at the channel edges for CA is generally smaller than those for single carrier due to the unused spectrum in the middle. Therefore CA could require larger backoff. Without dedicated LTE CA simulation results, it’s hard to accurately determine the A-MPR values for the spec. |
| Company B |
|  |
| [**R4-2016035**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016035.zip) | HW: Regarding CA\_NS\_08, a relaxation of A-MPR is requested w/o new simulation/measurement results. The proponent seems to argue that the A-MPR value should also take the form of max(CA-MPR, A-MPR) for QPSK/16QAM. If this is acceptable, one could argue that it should be adopted for all other CA\_NS\_XX signals. I suppose there must be a reason for the existing spec to treat QPSK/16QAM and 64QAM/256QAM differently. Please clarify if such a reason has become invalid hence a CR is needed. |
| Skyworks: To Huawei, our understanding of the history of the CA A-MPR construction is as follows:   * From Rel’10 onward, simulated back-off levels were no longer additional back-off on top of MPR, but became total back-off. This explains the sentence stating that CA MPR is not applicable except for CA\_NS\_09 and CA\_NS\_31. * Later on, when high order modulation were added, it seems the last sentence was needed to account for regions where EVM may become the dominating gating factor. So, in our understanding this explains why the allowed back-off is the max(MPR,A-MPR) only for 64QAM and 256QAM, * For QSPK, 16QAM, voiding CA MPR is fine as long as the A-MPR tables do not contain 0dB regions in regions where CA MPR would have allowed some power back-off. That is the case for nearly all CA A-MPR tables, except CA\_NS\_08. For CA\_NS\_08, we hesitated to formulate a sentence that said that for these RB allocations where A-MPR = 0dB, the UE is allowed to take max(MPR,A-MPR). But sentence would have been too complicated. We acknowledge it is already complicated enough. * In any case, we would like to pursue the LS approach to CEPT based on your feedback at last RAN4 meeting to check if the entire CA\_NS\_08 can be removed since all B42 networks are now synchronous. Thank you for your comments,   To moderator: We need a revision number for this CR and for CR R4-2016040 as we have inadvertently removed B10 protection from band 10. This needs to be corrected. |
|  |

## Summary for 1st round

Only CRs were commented: see CR table below for outcome

Discussion papers [**R4-2016426**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016426.zip)and **[R4-2016008](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016008.zip)** can be noted

### 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** |
| [**R4-2014311**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014311.zip) | Comments needs to be addressed in second round and if revision is needed a Tdoc will be requested (including mirror CR [**R4-2014312**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014312.zip)**)** |
| [**R4-2014896**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014896.zip) | Only clarification that [**R4-2014897**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014897.zip)is not a mirror CR for R16 => agreed |
| [**R4-2014897**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014897.zip) | Given the above we propose that this CR is open for comment in round2 as it was not directly commented in round 1 |
| [**R4-2014164**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014164.zip) | There are comments that are not addressed => further open for comment in round2, needs feedback from proponent |
| [**R4-2016035**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016035.zip) | Will need revision and further discussion in round2 including [**R4-2016040**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016040.zip) which is not a mirror CR for R16, revision will be requested if agreeable |
| [**R4-2016040**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016040.zip) | Given the above we propose that this CR is open for comment in round2 as it was not directly commented in round 1, revision will be requested if agreeable |

## Discussion on 2nd round (if applicable)

Following CRs need further checking and comment needs to be addressed by proponents:

*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** |
| [**R4-2014311**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014311.zip) | [SoftBank]:  To all: Item 2) needs further discussion (Common to 101-1/3) but item 1) and 3) are corrections and we have not received comments on those. Then if the group is agreeable, we’d like to propose 1) and 3) as a correction CR to be approved to avoid further errors in R17 CA/DC to copy/paste the wrong content. We’d like to hear group’s view.  To apple: Comments are responded in [102] thread. Please refer to the thread. |
| [**R4-2014897**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014897.zip) | Moderator: corrections are similar to [**R4-2014896**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014896.zip)that is agreeable |
| [**R4-2014164**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014164.zip) | Qualcomm: 256QAM AMPR for CA\_NS\_04 is mostly derived from the EVM general requirement, so it is almost independent of RB mapping configuration. There are however a few exceptions. The Carrier leakage gets worse for 256QAM modulation. So, the intermodulation of the LO leakage and the TX signal causes more back-off due to the -25dBm/MHz CA\_NS\_04 A-SPUR requirement. Hence, we need 8dB back-off for the lower LCRB allocations near the lower channel edge as indicated in the CR.. The 6.5dB back-off comes from the EVM requirement for all other RB allocations. These changes align the 36.101 spec to be consistent with the single CC NR 38.101-1 for PC2 DFT-s-OFDM waveforms as indicated in the discussion paper. It has nothing to do with the 0-1MHz SEM region. This spec is more relaxed than the -25dBm/M limit and the LTE guard band is higher than the NR guard band, so edge RB allocations should not be an issue.  [HW]: The EVM might be a gating factor for MPR but not for A-MPR. Also for DFT-s-OFDM, the LTE guard band is NOT higher than the NR guard band. Most importantly, when comparing the NR NS\_04 MPR table with the LTE CA\_NS\_04 A-MPR table, the differences are quite big for the same modulation. Hence it’s very likely that NR 256QAM MPR value is not a good estimator for LTE 256QAM A-MPR. We need dedicated simulation results.  Qualcomm: Fair enough. Our discussion paper does not contain simulations. Let’s validate for next meeting. We are ok to postpone CR. |
| [**R4-2016035**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016035.zip) | [HW]:  Thanks Skyworks for the clarification. I’ll give it a go to decode the logic behind the current spec. Yes, from Rel-10 (as indicated by the IE suffix *additionalSpectrumEmissionSCell-r10*), A-MPR takes the value of total back-off. However, this seems to contradict with 64QAM/256QAM, where max(MPR, A-MPR) is used.  As you mentioned, EVM becomes the limiting factor for high order modulation. Intuitively, EVM should be checked in both MPR and A-MPR simulations. However, some corners might be cut to save the simulation time. Compared with MPR, A-MPR typically has tighter out-of-band or spurious emission requirements, but the same EVM limit. Therefore, A-MPR simulations might have not checked EVM. Instead, this is compensated by using max(MPR, A-MPR).  Based on the above logic, it’s still not clear why we would need max(MPR, A-MPR) for QPSK/16QAM as EVM is not the gating factor here. Maybe I missed something?  In relate to CEPT, My understanding is that the current EU regulation (https://docdb.cept.org/download/34f57e2a-1c04/ECCDEC1106.PDF) allows both synchronous and asynchronous networks. So CA\_NS\_08 probably should not be removed until we receive the nod from CEPT.  [SKWS]. Revised document is available in which band 10 self-protection is restored.  To Huawei;  Thank you for sharing the CEPT document. As discussed at last RAN4 meeting and in our discussion paper R4-2016008, we still intend to contact CEPT and check if the asynchronous network assumptions are still valid. We do not have presence at CEPT making the process a little difficult for us at this time.  Regarding the proposed changes in R4-2016008 and companion CRs 6035/6040: for the QPSK/16QAM 0dB A-MPR region “A”, we mention in R4-2016008 that some allocations would have been allowed CA-MPR of 1dB. Our concern is about the top edge of Region A. Taking example of 100RB+100RB, we have retrieved simulations results that indicate some allocations need 1dB back-off but for which A-MPR equations do not allow any backoff, ie these allocations are not covered. See below illustration where CA\_NS\_08 A-MPR regions are overlaid on-top of simulation results from R4-150224.  The highlighted allocations in Region A for LCRB >40 and <48RB (red circles) need 1dB back-off. The reason why we proposed the text change in 6035/6040 was 1) to cover these allocations, 2) to avoid redefining A-MPR equations, which, we believe are already complicated enough to understand. Note that this text proposal is an allowance, ie the UE does not have to make use of CA-MPR. However, we acknowledge that changing the A-MPR equations is more technically correct. So, to fix this issue, we are willing to remove text proposal and instead propose a minor correction to Regions A,B and F. Taking the example 20+20MHz, region A/B/F borders would be lowered from Lcrb=48 to Lcrb=40 – see illustration. This will cover our concern for 20MHz+20MHz. We will come back with formal table proposal and analysis for other channel bandwidth combinations.  **[HW]: Thanks Skyworks for the further clarification. The simulation results from R4-150224 is cited. From which it can be seen that the proposed A-MPR values are different from those defined in the spec. This is because, I think, all proposals from different companies have to be considered and aligned. Similarly, we probably cannot change the spec just based on one company’s old results.**  **On the other hand, I’ve been thinking that in theory the total A-MPR value should be larger than the corresponding MPR value for QPSK/16QAM due to stricter emission requirements. In practice this might not be true because of simulation difference and/or alignment error. So it might be necessary to even use max(A-MPR, MPR) for QPSK/16QAM to eliminate the undesired error. Please confirm if you agree with the fundamental assumption here (i.e. total A-MPR >= MPR).**  **[Skyworks]** Agree with you that the specified values resulted from multiple simulation results. We have found other simulations where the region A,B,F border for 1dB back-off was as low as Lcrb=20, and some contributions where the border is as high as Lcrb=64.  Adopting max(A-MPR, MPR) for QPSK/16QAM was my original intention. We decided to instead propose the current text proposal because the wording would have been difficult to capture since this rule would only apply to CA\_NS\_08 for all modulation schemes, but for all other CA\_NS values, the rule would apply only to 256/64QAM. In our opinion, the current text proposal achieves the same goal. As previously commented, lowering the border of regions ABF down to LCRB=40 achieves the goal and could be a reasonable compromise. Our preference is for text change since this means that the A-MPR table contents do not need to be changed. This table is already quite complicated.  **[HW]: To Skyworks, could you further clarify why max(A-MPR, MPR) rule would only apply to CA\_NS\_08 but not other CA\_NS values? To me, it might be needed to eliminate simulation errors regardless of CA\_NS signals.**  [Skyworks] According to our analysis, all other CA\_NS tables have A-MPR >= MPR for QPSK/16QAM, that is why we focused on CA\_NS\_08. Please check. Our text proposal was motivated by avoiding to add complexity to the A-MPR table. Also, changing text so that max(A-MPR, MPR) applies to all modulations only for CA\_NS\_08 seemed a bit complicated to capture. Our preference is for the current text proposal, but we do not have strong views. Adopting Max(A-MPR,MPR) would also resolve our concerns.  Nokia: We can stop discussing to apply max(A-MPR, MPR) rule to any other than CA\_NS\_08 Nokia will not agree. Nokia is very disappointed that Huawei tries to increase the amount of backoff for LTE CA in general and therefore lowering the performance of UL CA. We do not recall that Huawei actively did any CA A-MPR simulations back then and now suddenly these wild theories emerge. All LTE CA simulations were done with assumption that A-MPR is total BO.  [HW]: To Nokia, our intention is NOT to relax the requirements of UL CA, this CR does. Instead, we’re doing what we believe is technically correct. If Nokia disagrees, we don’t see the point why CA\_NS\_08 should receive any special treatment, either. The CR in the current status is not acceptable.  Skyworks: We agree with Nokia and pointed out in 1st round of comments that A-MPR in these simulations were total back-off, so max(MPR,A-MPR) can not be applied across all CA\_NS values. We were asking for an exception to CA\_NS\_08 based on concerns that some RB allocations close to the top edge border of Region A might have marginal performance. This is the case in the overlaid figure attached to this summary. We have retrieved other simulations where the border between Region A/B and F is as low as Lcrb=20-25, others where it is as high as 60-64. We were hoping that lowering the border to Lcrb=40 was a reasonable compromise, but it seems no consensus can be reached. So we will withdraw this part of the CR and upload updated version accordingly. |
| [**R4-2016040**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016040.zip) | Moderator: corrections are similar to [**R4-2016035**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016035.zip)  [SKWS]: Revised document is available: Changed from Cat A to Cat F, and restored band 10 self-protection. |

## 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** |
| [**R4-2014897**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014897.zip) | Moderator: R16 Cat F CR similar to [**R4-2014896**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014896.zip)open for comment in round 2: not comment received: agreeable |
| [**R4-2014311**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014311.zip) | Moderator: a draft revision has been circulated late no comment, no official Tdoc request for revision available: looking for feedback from proponent but recommend not agreeable |
| [**R4-2014312**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014312.zip) | Corresponding R16 CR to above: not agreeable |
| [**R4-2014164**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2014164.zip) | Based on comments the proponent agreed to postpone  R4-2014162, R4-2014163 mirror CRs are withdrawn |
| [R4-2016996](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Inbox/R4-2016996.zip) | R15 CR R4-2016996 revision of [**R4-2016035**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016035.zip)without controversial part: agreeable |
| [R4-2016997](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Inbox/R4-2016997.zip) | R16 CR according to above Revision of [**R4-2016040**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016040.zip)without controversial part: agreeable |
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# Topic #3: NB-IoT FCC emission issues

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2015807**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015807.zip) Test frequencies for NB-IOT UE in standalone operation | Sony | **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.*

Follow up from RAN4#95/96 on FCC emission requirement for NB-IoT, LS to FCC was sent last meeting without answers yet. Proposal seems similar to the NS signaling approach that was proposed by other companies.

### Sub-topic 3-1

*Sub-topic description:* Is removing NB-IoT edge channels from RAN5 specification and test sufficient to avoid the issue at UE certification in FCC labs?

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Qualcomm | Sub topic 3-1:  We’re still waiting for the reply LS from FCC. The information from FCC will have impact on how to proceed in RAN4/RAN5. |
| T-Mobile USA | Sub-topic 3-1: We agree with Qualcomm. RAN4 needs to wait for the response from the FCC, To ensure the device certification issue is resolved properly. |
| Sony | Sub topic 3-1: Removing NB-IoT edge channels from RAN5 specification (TS 36.508) is the best thing to do when waiting for the answer from FCC. Whether the NS signaling approach works in the test system was put in question in last meeting. Awaiting the interpretation of the FCC rules, it must be secured there is no violation of the FCC emission requirement in the field (by deployment?) and, therefore, the first and last EARFCNs for both stand-alone and guard-band NB-IOT modes) in the TS 36.104 (for BS) and maybe also in TS 36.101 (for UE) specs, for all frequency bands where FCC regulation applies, should be removed. |
| Huawei | FCC regulations are regional requirements. Removing the band edge frequencies entirely may not be feasible. |
| Ericsson | Sub-topic 3-1: First, to Sony, as we explained in previous meetings, there is no issue with guard band as NB-IoT will always be at least 100kHz away from band edge, this is covered by clause 6.6.2F.1 in TS 36.101 and Table 6.6.2F.1-2.  We agree with T-Mobile USA and Qualcomm: we need to wait for FCC’s feedback before updating 36.104 and/or 36.101 to make sure we will fix any issue properly and not with a quick and dirty solution. |

## Summary for 1st round

### Open issues

As already agreed in last meeting, companies are waiting the FCC answer to the LS to design the proper solution in 3GPP. Proposed interim fix is not valid for other regions.

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:* most companies involved in the subject for the last few meeting want to design based on FCC answer to LS sent and proposed interim fix is not valid/needed for all regions  *Candidate options:*  *Recommendations for 2nd round:* close the discussion and note the paper [**R4-2015807**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015807.zip) |

Moderator: Although round1 draft summary was circulated according to deadlines, there has been no comment that this issue should be discussed further. But since the proponent of the discussion paper wanted to restate his position towards the end of the second round, I’ve captured here the email content:

[Sony]: We don’t agree there is no issue with guard-band. We also think we need to continue discussing this while waiting for the FCC feedback, since the feedback may take time.

a.       clause 6.6.2F.1 in TS 36.101 specifies spectrum emission mask – it was shown previously that this mask is NOT compliant with FCC band-edge spectrum emission limits. Also proven by actual testing – all devices meet 3GPP NB-IoT specs (including clause 6.6.2F.1) but fail the FCC test band edge requirements at band edges if no exclusion applied, which was actually the trigger of this discussion.

b.       Table 6.6.2F1-2  specifies where the NB-IoT PRB shall be max positioned in LTE guard band to ensure that any NB-IoT UE will fulfill both NB-IoT SEM and LTE SEM.  It is, however, not reflected in 36.508 nor what is actually measured by the FCC Labs as of today (where FCC limits are violated and all tests are failed).

c.       The Note to Table 6.6.2F1-2 explains the background of Table 6.6.2F1-2 but, in our opinion, doesn’t change the situation.  The Note also refers to guard-band operation, not covering the stand-alone operation that suffers from the same FCC band edge limitations.

d.       The Table and the Note refer to all bands and not to only FCC-regulated bands and is, therefore, not relevant to this specific FCC issue we are discussing now.

e.       Finally, we think the existing NB-IoT specs in 36.101, 36.104 and test conditions in 36.508 are conflicting with FCC band edge spectrum requirements and should be corrected.

f.        The  FCC requirements for most test cases are clear. Further clarifications of specific frequency points won’t change the GENERAL conclusion: **The 100kHz exclusion is mandatory (in actual operation and in 3GPP testing) to match the 3GPP NB stand-alone and guard-band requirements with FCC band-edge requirements.**

# Topic #4: R15&16 Corrections to MBMS

*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** |
| [**R4-2015549**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015549.zip) CR for 36.101 to clarify the SCS supports for LTE MBMS (Rel-14) | Huawei, HiSilicon | Based on the agreement in R4-2012604, UE doesn’t have to support all of the SCS, if UE support LTE MBMS  For MBMS feature, there is no need to meet the minimum requirements of transmitter characteristics for UE.  Moderator, overlapping CR tackling the same issue than [**R4-2016129**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016129.zip) , suggest to merge CRs, co-source and agree on wording for SCS support |
| R4-2015550 CR for 36.101 to clarify the SCS supports for LTE MBMS (Rel-15) | Huawei, HiSilicon | R15 mirror CR |
| R4-2015551 CR for 36.101 to clarify the SCS supports for LTE MBMS (Rel-16) | Huawei, HiSilicon | R16 mirror CR |
| [**R4-2016129**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016129.zip) CR to TS 36.101 clarifications on supported SCS for UE supporting LTE MBMS | ZTE Corporation | There was some ambiguity existing for UE supporting LTE MBMS that whether all SCS should be supported. Based on the agreement in R4-2012604, MBMS UE doesn’t have to support all of the SCS, if UE support LTE MBMS.  Moderator, overlapping CR tackling the same issue than [**R4-2015549**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015549.zip): suggest to merge CRs, co-source and agree on wording for SCS support |
| R4-2016130 CR to TS 36.101 clarifications on supported SCS for UE supporting LTE MBMS | ZTE Corporation | R15 mirror CR |
| R4-2016131 CR to TS 36.101 clarifications on supported SCS for UE supporting LTE MBMS | ZTE Corporation | R16 mirror CR |

## Open issues summary

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

### Sub-topic 4-1

*Sub-topic description:* UEs that only support MBMS do not need to support all SCS and do not need to support UL.

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

**Issue 4-1: MBMS SCS and UL support**

* Recommended WF
  + Moderator note: overlapping CRs from Huawei and ZTE, suggest to merge CRs, co-source and agree on wording for SCS support
  + WF: Chose one company set of CR, co-source and agree on wording. This will need revision, proponent to agree on best starting CR.

## Companies views’ collection for 1st round

### Open issues

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| --- | --- |
| **Company** | **Comments** |
| Qualcomm | Sub topic 4-1:  It doesn’t work if MBMS terminal only support one kind of SCS. Supporting SCS of 15kHz is a must and at least an additional SCS, i.e., 7.5 kHz or 1.2kHz, etc should also be supported.  Others: |

### 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** |
| [**R4-2015549**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015549.zip)  And  [**R4-2016129**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016129.zip) | ZTE: wording in [R4-2015549](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015549.zip) is not aligned with agreement made in last RAN4 meeting, if MBMS UE only support one kind of SCS e.g. 15KHz SCS only or 7.5KHz only, then eMBMS service is not supported for UE. We propose to use ZTE’s version as baseline. |
| Qualcomm: Agree with ZTE. It doesn’t work if MBMS terminal only support one kind of SCS. Supporting SCS of 15kHz is a must and at least an additional SCS, i.e., 7.5 kHz or 1.2kHz, etc should also be supported. |
| HW: Comments on R4-2016129  1. The Release is Rel-14 instead of Rel-15.  2. WI code is not related to Rel-14.  3. We have the similar contribution. This CR can be merged into Huawei’s version. |

## Summary for 1st round

### Open issues

Overlapping CRs from Huawei and ZTE, ZTE version should be the basis for the text as it properly addresses the fact that 15kHz is mandatory + one additional SCS. Given that ZTE CRs have reference issues it is proposed to merge into Huawei’s CR that needs revisions to use ZTE’s text as the basis and include ZTE as co-sourcing company.

### CRs/TPs

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| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| [**R4-2016129**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2016129.zip) | Text is used as basis for the revision of [**R4-2015549**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015549.zip)and co-sourced  Not pursued and R4-201613, R4-2016131are withdrawn. |
| [**R4-2015549**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015549.zip) | **Revised** to include ZTE’s text and ZTE co-sourcing. Same for mirror CRs R4-2015550 and R4-2015551 |

## Discussion on 2nd round (if applicable)

Merged CR to be verified. Please comments on revised CR below

Revision CR is **R4-2016796**

### CRs/TPs

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2016796  revision of [R4-2015549](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Docs/R4-2015549.zip) | Moderator: Huawei and ZTE co-sourcing with text according to ZTE on SCS support |

## 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** |
| [R4-2016796](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Inbox/R4-2016796.zip) | *Revision of merged co-signed HW and ZTE CR. Agreeable*  *Mirror CR* [*R4-2015550*](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Inbox/R4-2015550.zip)[*R4-2015551*](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_97_e/Inbox/R4-2015551.zip) *Agreeable* |